PETTIT WATER STORAGE TANK EXPANSION AND TRANSMISSION PIPELINE PROJECT

Final Environmental Impact Report

State Clearinghouse Number: 2022110477

Prepared for
Eastern Municipal Water District

December 2023

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Pettit Water Storage Tank Expansion and Transmission Pipeline Project Final EIR

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CHAPTER 7
Introduction to the Final EIR

This Final Environmental Impact Report (EIR) has been prepared in accordance with the California Environmental Quality Act (CEQA) as amended (Public Resources Code Sections 21000 et seq.) and the CEQA Guidelines (California Code of Regulations, title 14, Sections 15000 et seq.). The Final EIR incorporates, by reference, the Draft EIR (included here as **Appendix A**) prepared by the Eastern Municipal Water District (EMWD) for the Pettit Water Storage Tank Expansion and Transmission Pipeline Project (proposed project; State Clearinghouse No. 2022110477) as it was originally published on September 11, 2023.

7.1 CEQA Requirements

The CEQA Guidelines specify that the Final EIR shall consist of the following:

- The Draft EIR or a revision of that draft;
- Comments and recommendations received on the Draft EIR;
- A list of persons, organizations, and public agencies commenting on the Draft EIR;
- The responses of the lead agency to significant environmental points raised in the review and consultation process; and,
- Any other information added by the lead agency.

7.2 Public Participation Process

A Notice of Preparation (NOP) for the EIR was published by EMWD on November 21, 2022. The NOP was circulated to federal, State, and local agencies, as well as other interested parties, for a period of 30 days until December 21, 2022. The NOP presented an overview of the project, and provided a brief and preliminary list of environmental resources that could be affected. A public scoping meeting was not held. Two comments were received in response to the NOP. The Draft EIR Appendix NOP includes a copy of the NOP and as well as all written comments received on the NOP.

Once the Draft EIR was complete, a Notice of Completion was submitted to the Office of Planning and Research (OPR) as required by CEQA Guidelines Section 15085, along with electronic copies of the Draft EIR for distribution to public agencies via the State Clearinghouse (CEQA Guidelines Section 15087(f)) (https://ceqanet.opr.ca.gov/2022110477/2). At the same time, a Notice of Availability (NOA) of the Draft EIR was posted with the Riverside County Clerk (CEQA Guidelines Section 15087(d)). The NOA also was published in *The Press-Enterprise* on September 11, 2023 (per CEQA Guidelines Section 15087(a)). Printed copies of the Draft EIR were sent to the following public library per CEQA Guidelines Section 15087(g) and the EMWD office: Moreno Valley Public Library, 25480 Alessandro Boulevard, Moreno Valley, CA 92553; EMWD's Office, 2270 Trumble Road Perris, CA 92572. Additionally, EMWD conducted a mailing of the NOA to public agencies and interested parties. The Draft EIR was also posted on EMWD's website (https://www.emwd.org/public-notices). The Draft EIR was made available for public review from September 11, 2023 to October 25, 2023 for a total of 45 days as required by CEQA Guidelines Section 15105(a). A public meeting was not held. Two written comment letters were received by EMWD on the Draft EIR. The comment letters are included in Chapter 8 and the responses are included in Chapter 9. Changes made to the Draft EIR in response to comments are shown in ~~strikeout~~ or underline text.

7.3 Final EIR Certification and Approval

As required by section 15088(b) of the CEQA Guidelines, EMWD will provide the Final EIR, which includes written responses to all comments, to commenters ten days in advance of the meeting at which the Board of Directors will consider certification of the EIR and approval of the project.

Prior to considering the project for approval, EMWD will review and consider the information presented in the Final EIR and will certify that the Final EIR has been adequately prepared in accordance with CEQA. Once the Final EIR is certified, EMWD's Board of Directors may proceed to consider project approval (CEQA Guidelines Section 15090; Section 15096(f)). Prior to approving the project, EMWD must make written findings and adopt statements of overriding considerations for each unmitigated significant environmental effect identified in the Final EIR in accordance with Section 15091 of the CEQA Guidelines.

7.4 Notice of Determination

Pursuant to Section 15094 of the CEQA Guidelines, EMWD will file a Notice of Determination (NOD) with the State Clearinghouse and the Riverside County Clerk within five working days of project approval.

7.5 Mitigation Monitoring and Reporting Program

CEQA requires lead agencies to "adopt a program for monitoring or reporting on the revisions which it has required in the project and the measures it has imposed to mitigate or avoid significant environmental effects." (CEQA Guidelines Section 15097). The mitigation measures included in the Mitigation Monitoring and Reporting Program (MMRP) are included in Chapter 10 to this Final EIR.

CHAPTER 8
Comment Letters

This chapter contains the comment letter received on the Pettit Water Storage Tank Expansion and Transmission Pipeline Project (proposed project). The letter as well as individual comments within the letter have been given an assigned letter and number for cross-referencing. **Table 8-1** lists the comment letter received on the Draft EIR.

TABLE 8-1
LIST OF COMMENT LETTERS

Letter #	Commenter	Date of Comment
1	Agua Caliente Band of Mission Indians	October 20, 2023
2	State Water Resources Control Board	October 25, 2023

Comment Letter 1

AGUA CALIENTE BAND OF CAHUILLA INDIANS

TRIBAL HISTORIC PRESERVATION

03-058-2016-005

October 20, 2023

[VIA EMAIL TO: strattonh@emwd.org]
Eastern Municipal Water District
Ms. Helen Stratton
2270 Trumble Road, P.O. Box 8300
Perris, CA 92572-8300

Re: Pettit Potable Water Storage Tank Expansion and Transmission Line

Dear Ms. Helen Stratton,

The Agua Caliente Band of Cahuilla Indians (ACBCI) appreciates your efforts to include the Tribal Historic Preservation Office (THPO) in the Pettit Potable Water Storage Tank Expansion and Transmission Pipeline project. We have reviewed the documents and have the following comments:

*At this time the concerns of the ACBCI THPO have been addressed and proper mitigation measures have been proposed to ensure the protection of tribal cultural resources. This letter shall conclude our AB52 consultation efforts. 1-1

* Send the treatment plan to ACBCI THPO Consulting email.

* The Environmental Impact Report included standard mitigation measures to address impacts to cultural resources. We found these measures to be sufficient.

Again, the Agua Caliente appreciates your interest in our cultural heritage. If you have questions or require additional information, please call me at (760) 883-1134. You may also email me at ACBCI-THPO@aguacaliente.net.

Cordially,

Claritsa Duarte
Cultural Resources Analyst
Tribal Historic Preservation Office
AGUA CALIENTE BAND
OF CAHUILLA INDIANS

5401 DINAH SHORE DRIVE, PALM SPRINGS, CA 92264
T 760/699/6800 F 760/699/6924 WWW.AGUACALIENTE-NSN.GOV

Comment Letter 2

CALIFORNIA
Water Boards

GAVIN NEWSOM
GOVERNOR

YANA GARCIA
SECRETARY FOR
ENVIRONMENTAL PROTECTION

State Water Resources Control Board

October 25, 2023

GOVERNOR'S OFFICE OF PLANNING AND RESEARCH
Oct 25 2023
STATE OF CALIFORNIA

Eastern Municipal Water District
Attn: Mr. Joe Broadhead
P.O. Box 8300 / 2270 Trumble Road
Perris, CA 92572

EASTERN MUNICIPAL WATER DISTRICT (EMWD), ENVIRONMENTAL IMPACT REPORT (EIR) FOR THE PETTIT WATER STORAGE TANK EXPANSION AND TRANSMISSION PIPELINE PROJECT (PROJECT); STATE CLEARINGHOUSE # 2022110477

Dear Mr. Joe Broadhead:

Thank you for the opportunity to review the EIR for the proposed Project. The State Water Resources Control Board, Division of Drinking Water (State Water Board, DDW) is responsible for issuing water supply permits pursuant to the Safe Drinking Water Act. The Project is within the jurisdiction of the State Water Board, DDW's Riverside District. DDW Riverside District issues domestic water supply permit amendments to the public water systems serviced with a new or modified source of domestic water supply or new domestic water system components pursuant to Waterworks Standards (Title 22 CCR chapter 16 et. seq.). A public water system requires a water supply permit amendment for changes to a water supply source, storage, or treatment and for the operation of new water system components- as specified in the Waterworks Standards. The EMWD may need to apply for a water supply permit amendment for this Project.

2-1

<u>The State Water Board, DDW, as a responsible agency under California Environmental Quality Act (CEQA), has the following comments on the District's EIR:</u>

- Please explain if the new tanks are considered distribution reservoirs as defined under CCR Title 22, chapter 16, article 1. If so, under Section 2.8 "Proposed Project Approvals", Table 2-1 (PDF Page 57), please include "California State Water Resources Control Board, Division of Drinking Water", "Water Supply Permit Amendment" and "Operation of two Water Supply Reservoirs."
- Under Section 2.8 "Proposed Project Approvals", Table 2-1 lists "401 Water Quality Certification" and "Discharge of dredge or fill material into waters of the State". Please list "and/or waste discharge requirements" after "401 Water Quality Certification". 2-2
- The EIR under Biological Resources, Issue 3 indicates there would be no impacts to state and federally protected wetlands, but later states impacts are 2-3

E. JOAQUIN ESQUIVEL, CHAIR | EILEEN SOBECK, EXECUTIVE DIRECTOR

1001 I Street, Sacramento, CA 95814 | Mailing Address: P.O. Box 100, Sacramento, CA 95812-0100 | www.waterboards.ca.gov

Mr. Joe Broadhead - 2 - October 25, 2023

less than significant (PDF page 654.) Please clarify the determination of Project impacts on state and federally protected wetlands. 2-3 (cont.)

- The EIR under Biological Resources, Issue 3 indicates 0.02 acres of non-wetland waters of the state may be impacted through direct removal, increased fill, or hydrological interruption (pdf page 654-658). Under the Hydrology and Water Quality, Issue (1), waste discharge requirements discussion, please include that a Santa Ana Regional Water Quality Control Board (Santa Ana Regional Water Board) application for discharges of dredged or fill material to 2-4
waters of the state (WOTS) will be required. Also, clarify if a permit is needed, how the Project's potential water quality impacts will be addressed. For more information on the waste discharge requirements process please contact Claudia Tenorio of the Santa Ana Regional Water Board at Claudia.Tenorio@waterboards.ca.gov or (951)-782-4963.
- The EIR indicates a sewer line is located within the Moreno Beach Drive right-of-way and intersects the path of the proposed water main (Page 374). California Waterworks Standards contains separation requirements for new water mains crossing a sewer line (Title 22, chapter 16, article 4, section 64572). Please 2-5
indicate if California Water Works standards can be met for this requirement or if a waiver will be needed. If a waiver is needed, please provide the DDW Riverside District Office with the alternate plans and include a waiver approval as part of the listed DDW approvals above.

<u>When the CEQA review process is completed, please forward the following items with your permit application to the State Water Board, DDW Riverside District Office at</u> DWPDIST20@waterboards.ca.gov:

- Copy of the draft and final EIR and Mitigation Monitoring and Reporting Plan (MMRP);
- Copy of any comment letters received and the lead agency responses as appropriate;
- Copy of the Resolution or Board Minutes adopting the EIR and MMRP; and
- Copy of the date stamped Notice of Determination filed at the Riverside County 2-6
Clerk's Office and the Governor's Office of Planning and Research, State Clearinghouse.

Please contact Lori Schmitz of the State Water Board at (916) 449-5285 or Lori.Schmitz@waterboards.ca.gov, if you have any questions regarding this comment letter.

Sincerely,

Lori Schmitz Digitally signed by Lori Schmitz Date: 2023.10.25 08:50:12 -07'00'

Lori Schmitz

Mr. Joe Broadhead - 3 - October 25, 2023

Lori Schmitz
Environmental Scientist
Division of Financial Assistance
Special Project Review Unit
1001 I Street, 16th floor
Sacramento, CA 95814

Cc:

Office of Planning and Research, State Clearinghouse

Chun Huang
District Engineer
Riverside District

Claudia Tenorio
Environmental Scientist
Santa Ana Regional Water Board, Planning Programs

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CHAPTER 9
Response to Comments

This chapter contains EMWD's responses to 'significant environmental points' that were raised in comments received on the Pettit Water Storage Tank Expansion and Transmission Pipeline Project, per CEQA Guidelines Section 15132(d). Each individual comment has been given an assigned number which can be cross-referenced to each comment letter included in Chapter 8.

Letter 1 Response — Agua Caliente Band of Mission Indians, October 20, 2023

1-1 The commenter states that the concerns of the Agua Caliente Band of Mission Indians Tribal Historic Preservation Office have been addressed and that mitigation measures have been proposed to address protection of tribal cultural resources. The commenter also requests that EMWD send the treatment plan to the tribe.

EMWD appreciates the tribe's participation in the Assembly Bill (AB) 52 process and acknowledges mitigation measures proposed to reduce impacts to tribal cultural resources. In accordance with Mitigation Measure CR-2, EMWD will consult with the tribe if resources are unearthed as a result of construction activities: "if any prehistoric archaeological sites are encountered within the project area, consultation with consulting Native American parties will be conducted to apprise them of any such findings and solicit any comments they may have regarding appropriate treatment and disposition of the resources."

Letter 2 Response State Water Resources Control Board October 25, 2023

2-1 The commenter states that the project is within the State Water Resources Control Board (SWRCB) Division of Drinking Water (DDW)'s Riverside District, and that EMWD may need to apply for a water supply permit amendment for changes to a water supply source, storage, or treatment and for the operation of new water system components. The commenter also states that if the water storage reservoirs included under the proposed project are "distribution reservoirs," defined by the California Code of Regulations (CCR) Title 22, chapter 16, article 1, updates should be made to Table 2-1 in the Draft EIR.

The proposed project includes operation of one or more "distribution reservoirs," defined by the California Code of Regulations (CCR) Title 22, chapter 16, article 1, which is connected to the distribution system for the purpose of storing treated/finished water. As a result, EMWD will apply for a water supply permit or amendment for operation of the distribution reservoirs included as part of the proposed project. EMWD will submit an application to DDW when final project plans have been developed. As a result, the Draft EIR text in Table 2-1 on page 2-17 is modified as follows:

TABLE 2-1
REGULATORY PERMITS AND AUTHORIZATIONS

Agency	Type of Approval	Needed for
<u>State Water Resources Control Board Division of Drinking Water</u>	<u>Water Supply Permit Amendment</u>	<u>Operation of two Water Supply Reservoirs</u>

2-2 The commenter states that under Section 2.8 "Proposed Project Approvals," Table 2-1 lists "401 Water Quality Certification" and "Discharge of dredge or fill material into waters of the State." The commenter requests to add "and/or waste discharge requirements" after "401 Water Quality Certification".

Due to the absence of waters of the United States, waters of the State may be regulated under the Porter-Cologne Water Quality Control Act if project activities or discharges could affect California's surface, coastal, or ground waters. Thus, in Table 2-1, "401 Water Quality Certification" was replaced with "Porter-Cologne Water Quality Control Act Waste Discharge Requirement." The Draft EIR text in Table 2-1 on page 2-17 is modified as follows:

TABLE 2-1
REGULATORY PERMITS AND AUTHORIZATIONS

Agency	Type of Approval	Needed for
California Regional Water Quality Control Board, Santa Ana Region	Construction General Permit ~~401 Water Quality Certification~~ Porter-Cologne Water Quality Control Act Waste Discharge Requirement	Construction-related stormwater discharges Discharge of dredge or fill material into waters of the State
California Department of Fish and Wildlife	Lake or Streambed Alteration Agreement (Section 1602 of Fish and Game Code)	Any activity that may substantially modify a river, stream, or lake
City of Moreno Valley	Encroachment Permit	Construction activities within rights-of-way

2-3 The commenter states that EIR Biological Resources Issue 3 indicates there would be no impacts to State and federally protected wetlands, but later states impacts are less than significant. The commenter requests clarification on the determination of project impacts on state and federally protected wetlands.

As stated in the Draft EIR on page 3.3.-34, "No State or federally protected wetlands occur within the BSA; thus, there would be no impacts to State or federally protected wetlands."

The section also includes a discussion of non-wetland waters that may be regulated by the CDFW and the Regional Water Quality Control Board (RWQCB). Although these are not wetlands, and impacts to these non-wetland waters are less than significant under CEQA and no mitigation is required, consultation with the CDFW and RWQCB may still be required to determine whether applications for permits will be necessary. Decisions about whether regulatory permits may be required is subject to the discretion of CDFW and/or RWQCB. EMWD will engage with both agencies if the project is approved.

2-4 The commenter states that Draft EIR Biological Resources Issue 3 indicates 0.02 acre of non-wetland waters of the State may be impacted through direct removal, increased fill, or hydrological interruption. The commenter requests that Draft EIR Hydrology and Water Quality Issue 1 waste discharge requirements discussion include that a Santa Ana RWQCB application for discharges of dredged or fill material to waters of the State will be required. The commenter also requests clarification on whether a permit is needed, and if so, how the project's potential water quality impacts will be addressed.

To acknowledge that a RWQCB application for discharges of dredged or fill material to waters of the State may be required, the text in the Draft EIR on page 3.8-13 is modified as follows:

Construction of the proposed project would involve excavation, trenching, potential blasting, and grading at the proposed water storage tank site and along the transmission pipeline alignment. Sediment associated with earthmoving activities and exposed soil would have the potential to erode and be transported to down gradient areas, potentially resulting in water quality standard violations. In the event of heavy rain, erosion of the soil stockpiles may occur resulting in scouring and sedimentation of local drainages, adversely affecting surface water quality. A Santa Ana RWQCB application for discharges of dredged or fill material to waters of the State may be required. See Draft EIR page 3.3-34 for more information.

As stated in the Draft EIR on page 3.3.-34, "Consultation with the CDFW and RWQCB may still be required to determine whether applications for permits will be necessary (i.e., although impacts are less than significant and no mitigation is required under CEQA, whether regulatory permits may be required is subject to the discretion of CDFW and/or RWQCB)." Although no mitigation is required under CEQA, if permits are required, CDFW and/or RWQCB may include permit conditions to address potential impacts to water quality.

2-5 The commenter states that the proposed water pipeline will cross an existing sewer line, and that California Waterworks Standards requirements Title 22, chapter 16, article 4, section 64572 either must be followed or a waiver received.

As stated in the Draft EIR on page 3.12-8, the proposed project would be designed to avoid the existing sewer lines in Moreno Beach Drive. EMWD will follow all requirements in the California Waterworks Standards.

2-6 The commenter states that EMWD should forward items related to the permit application to the SWRCB when the CEQA process is completed.

EMWD will forward a copy of the Final EIR, which will include the Mitigation Monitoring Reporting Program (MMRP) and comment letters and associated responses, as well as the resolution adopting the Final EIR and Notice of Determination, if and when the project is approved.

CHAPTER 10
Mitigation Monitoring and Reporting Program

The Mitigation Monitoring and Reporting Program (MMRP) for the Pettit Water Storage Tank Expansion and Transmission Pipeline Project (project) has been prepared in accordance with Public Resources Code Section 21081.6 and State CEQA Guidelines Section 15097. Eastern Municipal Water District (EMWD) will use this MMRP to track compliance with the project mitigation measures. EMWD will consider the MMRP during the certification hearing for the Final EIR. The MMRP incorporates all mitigation measures adopted for the project.

This MMRP summarizes potentially significant impacts and mitigation commitments identified in the EIR. **Table 10-1** provides the MMRP which includes all mitigation measures, monitoring process, monitoring timing, and responsible agency/entity for implementation. Impacts and mitigation measures are presented in the same order as in the EIR. The columns in the table provide the following information:

- **Mitigation Measures:** This column lists the action(s) that will be taken to reduce the impact.
- **Monitoring Process:** This column outlines the appropriate steps to implement and verify compliance with the mitigation measures.
- **Monitoring Timing:** This column indicates the general schedule for conducting each monitoring task, either prior to reconstruction, during construction, and/or after construction.
- **Responsible Agency/Entity:** This column lists the agency/entity responsible for ensuring implementation of the mitigation measure.

TABLE 10-1
MITIGATION MONITORING AND REPORTING PROGRAM FOR THE PETTIT WATER STORAGE TANK EXPANSION AND TRANSMISSION PIPELINE PROJECT

Mitigation Measures	Monitoring Process	Monitoring Timing	Responsible Agency/Entity	Verification of Compliance (Date/ Responsible Person)
Aesthetics				
AES-1: Aboveground buildings/structures shall be finished with a non-reflective material and painted with an earth-tone color to blend in with the surrounding landscape and vegetation.	• Include mitigation measure in design specifications and construction contractor specifications • Ensure aboveground buildings/structures are finished with non-reflective material and painted in earth-tone colors • Retain a copy of design specifications and construction monitoring report in project file	• During preparation of design contractor specifications and construction contractor specifications (mitigation measure in specifications) • After construction (implementation) • After construction (retain documentation)	• EMWD Engineer, Design Contractor, and Construction Contractor • EMWD Planner • EMWD Engineer	
AES-2: All new permanent exterior lighting associated with the proposed water storage tanks shall be shielded and directed downward to avoid light spill onto neighboring parcels and visibility from surrounding public vantage points.	• Include mitigation measure in design specifications and construction contractor specifications • Ensure all lighting is directed away from neighboring parcels • Retain a copy of design specifications in project file	• During preparation of design contractor specifications (mitigation measure in specifications) • Periodic verification during operation (implementation) • During operation (retain documentation)	• EMWD Engineer, Design Contractor, and Construction Contractor • EMWD Planner • EMWD Engineer	
AES-3: The proposed water storage tanks and aboveground facilities shall be designed to include non-glare exterior materials and coatings to minimize glare or reflection. The paint used for this purpose should be low-luster (low reflectivity) so as to reduce glare.	• Include mitigation measure in design specifications and construction contractor specifications • Ensure water tank is painted with non-glare materials • Retain a copy of design specifications and construction monitoring report in project file	• During preparation of design contractor specifications and construction contractor specifications (mitigation measure in specifications) • After construction (implementation) • After construction (retain documentation)	• EMWD Engineer, Design Contractor, and Construction Contractor • EMWD Planner • EMWD Engineer	

Mitigation Measures	Monitoring Process	Monitoring Timing	Responsible Agency/Entity	Verification of Compliance (Date/ Responsible Person)
Biological Resources				
BIO-1: Pre-Construction Training. Prior to commencement of construction activities, a qualified biologist shall prepare a Worker Environmental Awareness Program (WEAP) that provides a description of potentially-occurring special-status species that could be affected by the proposed project. The WEAP shall include information on identifying special-status species, and measures to avoid special-status species during construction activities, including (but not limited to): • staying within limits of disturbance, • establishing an onsite speed limit of 15 miles per hour, • covering trenches and open pits at the end of each workday, • installing wildlife escape ramps in open trenches or pits, • and daily trash and debris disposal from the project. The WEAP training shall be provided to all construction personnel by a qualified biologist. Completion of the WEAP training shall be documented for all construction personnel on a sign-in sheet that shall be onsite at all time during construction activities. The qualified biologist shall also verify fencing or marking limits of disturbance (marking habitat suitable to support special-status species as well as sensitive vegetation communities) prior to commencement of construction activities, if applicable.	• Include mitigation measure in construction contracting specifications • Retain a qualified biologist to prepare WEAP and conduct WEAP training • Retain documentation demonstrating the attendance of all construction personnel in training	• During preparation of construction contractor specifications (mitigation measure in specifications) • Prior to ground-disturbing activities (WEAP) • During construction (retain documentation)	• EMWD Engineer and Construction Contractor • EMWD Planner • EMWD Engineer	

Mitigation Measures	Monitoring Process	Monitoring Timing	Responsible Agency/Entity	Verification of Compliance (Date/ Responsible Person)
Mitigation Measure BIO-2: Pre-Construction Surveys and Mitigation for Crotch's Bumble Bee. Within seven (7) days prior to the start of construction activities, a qualified entomologist familiar with the species behavior shall conduct a pre-construction survey for Crotch's bumble bee, within 100 feet of construction activities near host plant communities (including nectar plants for Crotch's bumble bee). If any of these species are present or determined to be within 100 feet of construction areas, construction best management practices (BMPs) will be implemented and incorporation of information about these species will be incorporated into the WEAP training to avoid potential impacts to these species. BMPs shall include • Limiting construction vehicle speeds to 15 miles per hour when operating within 100 feet of the habitat areas. • Fencing habitat areas using temporary silt fencing, and cleaning up all trash and debris daily. In coordination with the CDFW, additional avoidance measures may be required that include establishing a buffer around the species host plants where no work can occur, and onsite monitoring dependent on distance from the work area. Construction personnel will be instructed to not directly harm any special-status species onsite by halting activities until the species can move to offsite areas or contact a qualified biologist to move the species out of harm's way.	• Include mitigation measure in construction contracting specifications • Retain a qualified biologist to conduct survey • If species are found, implement BMPs • If species is found, instruct construction personnel to halt activities or contact a qualified biologist • Consult with CDFW if special-status species cannot be avoided • Retain copies of all surveys and reports in project file	• During preparation of construction contractor specifications (mitigation measure in specifications) • Within 7 days prior to ground-disturbing activity (survey) • During Construction (BMPs) • During Construction (avoidance) • During Construction (consult with CDFW) • After construction (retain documentation)	• EMWD Engineer and Construction Contractor • EMWD Planner • EMWD Planner • EMWD Planner • EMWD Planner • EMWD Engineer	
Mitigation Measure BIO-3: San Diego Desert Woodrat Pre-Construction Survey, and Avoidance or Relocation. Thirty days prior to construction activities, a qualified mammalogist with experience in identifying and trapping San Diego desert woodrat shall conduct a survey within proposed construction disturbance zone and within 200 feet of the disturbance zone for San Diego desert woodrat. The survey shall incorporate appropriate methods to detect San Diego desert woodrat prior to any project activities in areas	• Include mitigation measure in construction contracting specifications • Retain a qualified mammologist to conduct survey • If species' habitat is found in disturbance zone, erect a fence • If habitat cannot be avoided, follow measures to relocate species prior to resuming construction	• During preparation of construction contractor specifications (mitigation measure in specifications) • Thirty (30) days prior to ground-disturbing activity (survey) • During Construction (avoidance) • During Construction (relocation)	• EMWD Engineer and Construction Contractor • EMWD Planner • EMWD Planner • EMWD Planner	

Mitigation Measures	Monitoring Process	Monitoring Timing	Responsible Agency/Entity	Verification of Compliance (Date/ Responsible Person)
that have or may have the potential to support these species. • If active San Diego desert woodrat nests (stick houses) are identified within the disturbance zone, a construction fence shall be erected around the nest site adequate to provide the woodrat sufficient foraging habitat at the discretion of the qualified biologist. The biologist shall be present during those periods when disturbance activities will occur near active nest areas to avoid inadvertent impacts to these nests. • Where nest avoidance is not possible, the project biologist shall clear vegetation from immediately surrounding active nests followed by a night without further disturbance to allow woodrats to vacate the nest. Each occupied nest shall subsequently be gently disturbed by a qualified wildlife biologist in possession of a scientific collecting permit to entice any remaining woodrats to leave the nest and seek refuge outside the project construction area. The stick nests shall be carefully removed from the project construction area and be placed near a suitable vegetation or rocky substrate similar to original nest location. Relocation of special-status species and/or salvaged nest-building material (rocks, sticks, etc.) shall target undeveloped areas of the project that shall not be disturbed. Removal of the nests outside of breeding season is preferred if feasible (i.e., breeding season is May through October). • If young are found within the nest during the dismantling process, clearing and construction within the fenced area shall be postponed or halted until young have left the nest. The material shall be placed back on the nest and the nest shall remain unmolested for two to three weeks in order to give the young enough time to mature and leave the nest on their own accord. After two to three weeks, the nest dismantling process may begin again. The project biologist shall document all woodrat nests moved and provide a written report to EMWD.	• Document all moved nests • Retain copies of all surveys and reports in project file	• After construction (documentation) • After construction (retain documentation)	• EMWD Planner • EMWD Engineer	

Mitigation Measures	Monitoring Process	Monitoring Timing	Responsible Agency/Entity	Verification of Compliance (Date/ Responsible Person)
Mitigation Measure BIO-4: Special-Status Reptile. A qualified herpetologist, who holds a scientific collecting permit, shall conduct a pre-construction clearance survey throughout the project, including a 100-foot buffer, for coastal western whiptail, Belding's orange-throated whiptail, coast patch nosed snake, and red-diamond rattlesnake within two weeks prior to the start of construction activities. If any of these species are observed during the survey, a qualified biologist should relocate the individual to suitable habitat at least 100 feet from the project. Trapping and relocation methods should be conducted in consultation with the EMWD.	• Include mitigation measure in construction contracting specifications • Retain a qualified herpetologist to conduct survey • If species' are found, relocation should occur • Retain copies of all surveys and reports in project file	• During preparation of construction contractor specifications (mitigation measure in specifications) • Within two weeks prior to ground-disturbing activity (survey) • During Construction (relocation) • After construction (retain documentation)	• EMWD Engineer and Construction Contractor • EMWD Planner • EMWD Planner • EMWD Engineer	
Mitigation Measure BIO-5: Nesting Bird Season Avoidance or Pre-Construction Survey. Construction and vegetation removal should occur outside of nesting season (i.e., nesting season is February 1 to August 31 for songbirds, January 15 to August 31 for raptors). If construction and vegetation removal must occur during nesting season (i.e., between January 15 and August 31), a qualified biologist shall conduct a pre-construction survey for breeding and nesting birds and raptors 30 days prior to the start of construction, and then weekly, within 300-feet of the construction limits to determine and map the location and extent of breeding birds that could be affected by the project. During nesting season, the following conditions shall be implemented: • Nesting bird surveys shall be conducted at appropriate nesting times and concentrate on potential roosting or perch sites. • Weekly surveys will take place with the last survey being conducted no more than 3 days prior to the initiation of clearance/construction work. • If project activities are delayed or suspended for more than 7 days after the last survey, surveys shall be repeated before work can resume. • If an active nest is located, clearing and construction within appropriate buffers as determined by a qualified biological monitor, shall be postponed until the nest is vacated and	• Include mitigation measure in construction contracting specifications • If construction occurs between January 15 and August 31, retain a qualified biologist to conduct nesting bird survey. • If active nests are found, construction will be halted until the nest has vacated, or establishment of appropriate buffer around active nests • Onsite construction monitoring by a biologist may be required to ensure no direct or indirect impacts to nests • Retain copies of all surveys and reports in project file	• During preparation of construction contractor specifications (mitigation measure in specifications) • Thirty (30) days prior to construction; weekly surveys until 3 days prior to construction; repeat survey if work has been suspended for 7 days (survey) • Prior to construction (buffer establishment) • During construction (construction monitoring) • Prior/during construction (retain documentation)	• EMWD Engineer and Construction Contractor • EMWD Planner • EMWD Planner • EMWD Planner • EMWD Engineer	

Mitigation Measures	Monitoring Process	Monitoring Timing	Responsible Agency/Entity	Verification of Compliance (Date/ Responsible Person)
juveniles have fledged and when there is no evidence of a second attempt at nesting. • Due to vicinity of natural open spaces adjacent to the project, 500-feet for raptors (including burrowing owls) and 300-feet for passerine birds could suffice for nesting bird buffers however it will be at the discretion of the qualified biologist. The buffer zone from the nest shall be established in the field with flagging and stakes. • The qualified biologist shall retain the ability to increase or decrease buffers as needed to protect the nesting birds (based on bird behavior, construction activities, etc.). • Temporary fencing and signage shall be maintained for the duration of the project. Construction personnel shall be instructed on the sensitivity of the area and be advised not to work, trespass, or engage in activities that would disturb nesting birds near or inside the buffer. Onsite construction monitoring may also be required to ensure that no direct or indirect impacts occur to the active nest. Project activities may encroach into the buffer only at the discretion of the qualified biologist.				
Mitigation Measure BIO-6: Roosting Bat Avoidance or Pre-Construction Survey. Construction and vegetation removal should occur outside of maternity roosting season (September 1– March 31). The following conditions shall be implemented if construction must occur during maternity roosting season: • If construction and vegetation removal must occur during maternity roosting season, then prior to commencement of construction activities within the maternity roosting season (April 1–August 31), a qualified biologist with a scientific collecting permit shall conduct a pre-construction clearance survey of suitable rocky outcroppings located adjacent to the project that have the potential to provide suitable bat roosting habitat to determine if bats are roosting onsite. If bats are determined to be	• Include mitigation measure in construction contracting specifications • If construction occurs between April 1 to August 31, retain a qualified biologist to conduct a bat roosting avoidance survey • If a day roost is present, a biologist must ensure all roosting individuals disperse before removing vegetation • If a maternity roost is present and determined to be impacted by construction, prepare a Bat Avoidance, Minimization, and/or Exclusion Plan	• During preparation of construction contractor specifications (mitigation measure in specifications) • Prior to construction (survey) • Prior to construction (ensure individuals disperse) • Prior to construction (Bat Avoidance, Minimization, and/or Exclusion Plan)	• EMWD Engineer and Construction Contractor • EMWD Planner • EMWD Planner • EMWD Planner	

Mitigation Measures	Monitoring Process	Monitoring Timing	Responsible Agency/Entity	Verification of Compliance (Date/ Responsible Person)
using trees specifically for roosting, the biologist will determine whether a day roost (non-breeding) or maternity roost (lactating females and dependent young) is present. • If a day roost is determined to be present and the removal of any trees or rocky outcroppings supporting a day roost would occur, the biologist will ensure that all roosting individuals disperse from the location prior to removal of the vegetation to prevent direct mortality. • If a maternity roost is observed, the qualified bat biologist will determine whether construction activities are likely to disturb breeding activities. If it is determined that the vegetation or rocky substrate supporting the roost must be removed or activities are expected to disturb the breeding activities, a Bat Avoidance, Minimization, and/or Exclusion Plan shall be prepared in consultation with EMWD. At a minimum, the plan shall include avoidance and minimization measures to reduce potential impacts to breeding bats during construction activities and/or prescribed methods to safely and humanely evict bats from the roost in order to minimize any potential impacts.	• Retain copies of all surveys and reports in project file	• Prior/during construction (retain documentation)	• EMWD Engineer	
Cultural Resources				
Mitigation Measure CR-1: Eastern Municipal Water District (EMWD) shall retain a Qualified Archaeologist under the Secretary of the Interior Standards to carry out all mitigation related to archaeological resources for the proposed project. Prior to the start of ground-disturbing activities, the Qualified Archaeologist or their designee shall conduct construction worker archaeological resources sensitivity training for all construction personnel. Training shall include at a minimum: • Information on how to identify the types of prehistoric and historic archaeological resources that may be encountered.	• Include mitigation measure in construction contracting specifications • Retain a qualified archaeologist to conduct cultural resources sensitivity training for all construction personnel • Retain documentation demonstrating the attendance of all construction personnel in training	• During preparation of construction contractor specifications (mitigation measure in specifications) • Prior to ground-disturbing activities (sensitivity training) • During construction (retain documentation)	• EMWD Engineer and Construction Contractor • EMWD Planner • EMWD Engineer	

Mitigation Measures	Monitoring Process	Monitoring Timing	Responsible Agency/Entity	Verification of Compliance (Date/ Responsible Person)
• Proper procedures to be enacted in the event of an inadvertent discovery of archaeological resources. • Safety precautions to be taken when working with archaeological monitors. EMWD shall ensure that construction personnel are made available for and attend the training and retain documentation demonstrating attendance.				
Mitigation Measure CR-2: The qualified Archaeologist shall oversee an archaeological monitor who shall be present during construction activities and shall work with the monitor to create an Environmentally Sensitive Area of 15-feet around ESA-040423-01F and ESA-040423-02F so that these areas will not be disturbed by the project, and shall remain in place for the duration. At a minimum, the archaeological monitor shall: • Observe activities such as demolition, clearing/grubbing, drilling/auguring, grading, trenching, excavation, or other ground disturbing activity associated with the proposed project. • Have the authority to direct the pace of construction equipment activity in areas of higher sensitivity and to temporarily divert, redirect or halt ground disturbance activities to allow identification, evaluation, and potential recovery of archaeological resources in coordination with the qualified Archaeologist. Full-time monitoring may be reduced to part-time inspections, or ceased entirely, if determined appropriate by the qualified Archaeologist. In the event that historic-period (e.g., bottles, foundations, early infrastructure, refuse dumps/privies, railroads, etc.) or prehistoric (e.g., hearths, burials, stone tools, shell and faunal bone remains, etc.) archaeological resources are unearthed, the following shall occur: • Ground-disturbing activities shall be halted or diverted away from the vicinity of the find so that the find can be evaluated.	• Include mitigation measure in construction contracting specifications • Retain an archaeological monitor to conduct monitoring of all ground disturbance and create an Environmentally Sensitive Area around ESA-040423-01F and ESA-040423-02F • Halt work and establish a 50-foot buffer if an archaeological resource is found • If any resources are found, retain a qualified archaeologist to prepare an Archaeological Resources Treatment Plan, and consult with appropriate native American representatives • If any resources are found, document and retain records regarding discovery of archaeological resources	• During preparation of construction contractor specifications (mitigation measure in specifications) • Prior to and during ground-disturbing activities (monitor) • During construction (halt work) • During construction (prepare plan) • After construction (documentation)	• EMWD Engineer and Construction Contractor • EMWD Planner • EMWD Planner and Construction Contractor • EMWD Planner • EMWD Engineer	

Mitigation Measures	Monitoring Process	Monitoring Timing	Responsible Agency/Entity	Verification of Compliance (Date/ Responsible Person)
• A 50-foot buffer shall be established by the qualified Archaeologist around the find where construction activities shall not be allowed to continue. Work may continue outside of the buffer area. • All archaeological resources unearthed by project construction activities shall be evaluated by the qualified Archaeologist. If a resource is determined by the qualified Archaeologist to constitute a “historical resource” pursuant to CEQA Guidelines Section 15064.5(a) or a “unique archaeological resource” pursuant to Public Resources Code Section 21083.2(g), the Qualified Archaeologist shall coordinate with EMWD to develop a formal treatment plan that would serve to reduce impacts to the resources. • If any prehistoric archaeological sites are encountered within the project area, consultation with consulting Native American parties will be conducted to apprise them of any such findings and solicit any comments they may have regarding appropriate treatment and disposition of the resources. The treatment plan established for the resources shall be in accordance with CEQA Guidelines Section 15064.5(f) for historical resources and Public Resources Code Sections 21083.2(b) for unique archaeological resources. Preservation in place (i.e., avoidance) is the preferred manner of treatment and shall be explored to see if project activities can avoid archaeological resources, such as: if the archaeological site can be deeded into a permanent conservation easement, if the resources can be capped with chemically stable soil or if the resource can be incorporated within open space. If, in coordination with EMWD, it is determined that preservation in place is not feasible, and in order to mitigate potential impacts to significant resources pursuant to Section 15064.5 of CEQA, date recovery is feasible. Appropriate treatment of the resource shall be developed by the qualified Archaeologist in coordination with the district and a data recovery plan				

Mitigation Measures	Monitoring Process	Monitoring Timing	Responsible Agency/Entity	Verification of Compliance (Date/ Responsible Person)
shall be implemented. A data recovery plan will make provision for adequately recovering the scientifically consequential information from and about the historical resources and may include implementation of archaeological data recovery excavations to remove the resource along with subsequent laboratory processing, analysis, reporting, and commemoration in the form of signage or other public education and awareness. Any archaeological material collected shall be curated at a public, non-profit institution with a research interest in the materials, if such an institution agrees to accept the material. If no institution accepts the archaeological material, they shall be donated to a local school or historical society in the area for educational purposes.				
Mitigation Measure CR-3: At the conclusion of the archaeological monitoring, the qualified Archaeologist shall prepare a technical report that follows the format and content guidelines provided in California Office of Historic Preservation's Archaeological Resource Management Reports (ARMR). The technical report shall include the following: • A description of resources unearthed, if any; • Treatment of the resources; • Results of the artifact processing, analysis, and research; • Evaluation of the resources with respect to the California Register of Historical Resources and CEQA; and • Appropriate California Department of Parks and Recreation Site Forms shall also be prepared and provided in an appendix to the report. The technical report shall be prepared under the supervision of the qualified Archaeologist and submitted to EMWD within 150 days of completion of the monitoring. The final draft of the report shall be submitted to the Eastern Information Center.	• Include mitigation measure in construction contracting specifications • Retain a qualified archaeologist to prepare a technical report documenting resources unearthed and evaluation of resources • Retain documentation demonstrating the attendance of all construction personnel in training	• During preparation of construction contractor specifications (mitigation measure in specifications) • Within 150 days of completion of monitoring (prepare report) • During construction (retain documentation)	• EMWD Engineer and Construction Contractor • EMWD Planner • EMWD Engineer	

Mitigation Measures	Monitoring Process	Monitoring Timing	Responsible Agency/Entity	Verification of Compliance (Date/ Responsible Person)
Mitigation Measure CR-4: Inadvertent Discovery of Human Remains. If human skeletal remains are uncovered during ground disturbance the district shall immediately halt work, contact the Riverside County coroner to determine whether the remains are human, and follow the procedures and protocols set forth in Section 15064.5 (e)(1) of the CEQA Guidelines. If the County Coroner determines that the remains are Native American, they shall contact the Native American Heritage Commission (NAHC), in accordance with Health and Safety Code Section 7050.5, subdivision (c), and Public Resources Code Section (PRC) 5097.98 (as amended by AB 2641). The NAHC shall then identify the person(s) thought to be the Most Likely Descendant (MLD) of the deceased Native American, who will then help determine what course of action should be taken in dealing with the remains. Per PRC 5097.98, the landowner shall ensure that the immediate vicinity, according to generally accepted cultural or archaeological standards or practices, where the Native American human remains are located, is not damaged or disturbed by further development activity until the landowner has discussed and conferred, as prescribed in this section (PRC 5097.98), with the MLD regarding their recommendations, if applicable, taking into account the possibility of multiple human remains.	• Include mitigation measure in construction contracting specifications • If human remains are found, coordinate with Riverside County Coroner, and contact the NAHC if applicable • NAHC shall notify most likely descendant, if applicable • Document and retain records regarding discovery of human remains in project file	• During preparation of construction contractor specifications (mitigation measure in specifications) • During construction (contact agencies) • During construction (contact agencies) • During/after construction (retain documentation)	• EMWD Engineer and Construction Contractor • EMWD Planner • NAHC • EMWD Engineer	
Geology, Soils, and Seismicity				
GEO-1: Prior to the start of construction activities, EMWD shall retain a Qualified Paleontologist that meets the standards of the Society for Vertebrate Paleontology (2010) to carry out all mitigation measures related to paleontological resources. Prior to start of any ground disturbing activities, the Qualified Paleontologist shall conduct pre-construction worker paleontological resources sensitivity training. The Qualified Paleontologist shall contribute to any construction worker cultural resources sensitivity training either in person or via a training module. The training shall include information on what types of paleontological resources could be	• Include mitigation measure in construction contractor specifications • Retain a Qualified Paleontologist to conduct paleontological sensitivity training for all construction personnel • Retain documentation demonstrating the attendance of all construction personnel in training	• During preparation of construction contractor specifications (mitigation measure in specifications) • Prior to ground-disturbing activities (sensitivity training)	• EMWD Engineer and Construction Contractor • EMWD Planner • EMWD Engineer	

Mitigation Measures	Monitoring Process	Monitoring Timing	Responsible Agency/Entity	Verification of Compliance (Date/ Responsible Person)
encountered during excavations, what to do in case an unanticipated discovery is made by a worker, and laws protecting paleontological resources. All construction personnel shall be informed of the possibility of encountering fossils and instructed to immediately inform the construction foreman or supervisor if any bones or other potential fossils are unexpectedly unearthed in an area where a paleontological monitor is not present. The Applicant shall ensure that construction personnel are made available for and attend the training and retain documentation demonstrating attendance.				
GEO-2: The Qualified Paleontologist shall supervise a paleontological monitor meeting the Society for Vertebrate Paleontology standards (2010) who shall be present during all excavations in the early Pleistocene 'very old alluvium.' Based on the current information, the base of any artificial fill is anticipated at 5 feet below ground surface. Therefore, monitoring shall be required for all excavations below 5 feet below ground surface. Monitoring shall consist of visually inspecting fresh exposures of rock for larger fossil remains and, where appropriate, collecting wet or dry screened standard sediment samples (up to 4.0 cubic yards) of promising horizons for smaller fossil remains (SVP 2010). Depending on the conditions encountered, such as recognition of sedimentary facies too coarse to likely host significant fossils, full-time monitoring can be reduced to part-time inspections or ceased entirely if determined adequate by the Qualified Paleontologist. The Qualified Paleontologist may spot check the excavation on an intermittent basis and recommend whether the depth of required monitoring should be revised based on his/her observations. Monitoring activities shall be documented in a Paleontological Resources Monitoring Report to be prepared by the Qualified Paleontologist at the completion of construction and shall be provided to EMWD within six (6) months of Project completion. If fossil resources are identified during monitoring, the report will also be filed with the Natural History Museum of Los Angeles County.	• Include mitigation measure in construction contractor specifications • Retain a Qualified Paleontologist to conduct monitoring during construction at depths of 5 feet below ground surface • Retain a Qualified Paleontologist to prepare a Paleontological Resources Monitoring Report • Retain copies of all surveys and reports in project file	• During preparation of construction contractor specifications (mitigation measure in specifications) • During ground-disturbing activates (monitoring) • Six (6) months after construction (report) • During/after construction (retain documentation)	• EMWD Engineer and Construction Contractor • EMWD Planner • EMWD Planner • EMWD Engineer	

Mitigation Measures	Monitoring Process	Monitoring Timing	Responsible Agency/Entity	Verification of Compliance (Date/ Responsible Person)
GEO-3: If a paleontological resource is discovered during construction, the paleontological monitor shall be empowered to temporarily divert or redirect grading and excavation activities in the area of the exposed resource to facilitate evaluation of the discovery. An appropriate buffer area shall be established by the Qualified Paleontologist around the find where construction activities shall not be allowed to continue. Work shall be allowed to continue outside of the buffer area. At the Qualified Paleontologist's discretion and to reduce any construction delay, the grading and excavation contractor shall assist in removing rock samples for initial processing and evaluation of the find. All significant fossils shall be collected by the paleontological monitor and/or the Qualified Paleontologist. Collected fossils shall be prepared to the point of identification and catalogued before they are submitted to their final repository. Any fossils collected shall be curated at a public, non-profit institution with a research interest in the materials, such as the Natural History Museum of Los Angeles County, if such an institution agrees to accept the fossils. If no institution accepts the fossil collection, they shall be donated to a local school in the area for educational purposes. Accompanying notes, maps, photographs, and a technical report shall **also be filed at the repository and/or school.**	• Include mitigation measure in construction contractor specifications • If resources are found, establish a buffer by the qualified paleontologist • If resources are found, collect and appropriately curate them • Retain copies of all surveys and reports in project file	• During preparation of construction contractor specifications (mitigation measure in specifications) • During ground-disturbing activates (monitoring) • During ground-disturbing activates (collection) • During/after construction (retain documentation)	• EMWD Engineer and Construction Contractor • EMWD Planner • EMWD Planner • EMWD Engineer	
Hazards and Hazardous Materials				
Implementation of **TRAF-1** and **WDF-1** (see below).	• See below.	• See below.	• See below.	
Noise				
NOISE-1: Construction Equipment Noise Shielding and Muffling Devices. To reduce construction noise impacts, EMWD shall require construction contractors to implement the following: • During construction, the contractor shall outfit all equipment, fixed or mobile, with properly operating and maintained exhaust and intake mufflers, consistent with manufacturers' standards. All documentation demonstrating the equipment has been maintained in accordance with	• Include mitigation measure in design specifications • Conduct periodic monitoring of BMPs • For Phase 2, install temporary ground-level 10-foot-tall construction noise barriers equipped with noise blankets or equivalent noise	• During preparation of construction contractor specifications (mitigation measure in specifications) • During construction (monitoring) • Prior to issuance of any construction-related permits for Phase 2 only (install barriers)	• EMWD Engineer and Design Contractor • EMWD Planner • EMWD Engineer	

Mitigation Measures	Monitoring Process	Monitoring Timing	Responsible Agency/Entity	Verification of Compliance (Date/ Responsible Person)
manufacturers' specifications shall be maintained on-site at all times. • Impact tools (e.g., jackhammers, pavement breakers) used for construction shall be hydraulically or electrically powered wherever possible to avoid noise associated with compressed air exhaust from pneumatically powered tools. When use of pneumatic tools is unavoidable, an exhaust muffler on the compressed air exhaust shall be used. External jackets on the tools themselves shall be used where feasible. • Stationary noise sources that could affect adjacent receptors shall be located away from adjacent receptors when feasible. • Prior to issuance of any demolition, grading or building permit for Phase 2, the Project shall provide temporary ground-level 10-foot-tall construction noise barriers equipped with noise blankets or equivalent noise reduction materials rated to achieve sound level reductions of at least 12 dBA between the Project Site and the sensitive receptor location R5. These temporary noise barriers shall be used to block the line-of-sight between the construction equipment and the noise-sensitive receptor(s) during the duration of construction activities. The Project applicant shall provide documentation prepared by a qualified noise consultant verifying compliance with this measure.	reduction materials rated to achieve sound level reductions of at least 12 dBA between the Project Site and the sensitive receptor location R5 • Retain a copy of design specifications in project file	• During/after construction (retain documentation)	• EMWD Engineer	
NOISE-2: Blasting Sound Blankets. To reduce construction noise impacts related to blasting, EMWD shall require construction contractors to utilize sound blankets and/or noise barriers to cover/surround at the localized blasting area when feasible to do so. The sound blanket and/or barrier shall achieve a reduction of at least 5 dBA and should block the line of sight to nearby sensitive receptors, particularly receptor R5.	• Include mitigation measure in construction contracting specifications • Conduct periodic monitoring to ensure noise generated from construction of the storage tank is attenuated to at least a 5 dBA reduction from noise barrier • Retain a copy of design specifications in project file	• During preparation of construction contractor specifications (mitigation measure in specifications) • During blasting activities (monitoring) • After construction (retain documentation)	• EMWD Engineer and Construction Contractor • EMWD Planner • EMWD Engineer	

Mitigation Measures	Monitoring Process	Monitoring Timing	Responsible Agency/Entity	Verification of Compliance (Date/ Responsible Person)
NOISE-3: If blasting is necessary in either Phase 1 or Phase 2, notices will be sent out to sensitive receptors (residences, residential areas, schools, and hospitals) within 1,000 feet of the storage tank area at least 10 days prior to the occurrence of any blasting activities.	• Include mitigation measure in construction contracting specifications • Notify residents within 1,000 feet of water storage tank of blasting activities • Retain a copy of design specifications in project file	• During preparation of construction contractor specifications (mitigation measure in specifications) • At least 10 days prior to blasting (notices) • After construction (retain documentation)	• EMWD Engineer and Construction Contractor • EMWD Planner • EMWD Engineer	
NOISE-4: Prior to construction of the storage tanks, EMWD shall notify sensitive receptors (residences, residential areas, schools, and hospitals) within 500 feet of project construction activities of the construction methods and schedule and provide a point of contact for local residences to report excessive noise.	• Include mitigation measure in construction contracting specifications • Notify sensitive receptors within 500 feet of water storage tank construction • Retain a copy of design specifications in project file	• During preparation of construction contractor specifications (mitigation measure in specifications) • Prior to construction of water tanks (notices) • After construction (retain documentation)	• EMWD Engineer and Construction Contractor • EMWD Planner • EMWD Engineer	
Transportation				
TRA-1: Prior to project construction, EMWD shall require the construction contractor to prepare a Traffic Control and Detour Plan, in accordance with the City of Moreno Valley traffic control guidelines. The Traffic Control and Detour Plan shall, at minimum: • Identify staging locations to be used during construction. • Identify safe ingress and egress points from staging areas. • Identify potential road closures. • Establish haul routes for construction-related vehicle traffic. • Include a Detour Plan that identifies alternative safe routes to maintain pedestrian and bicyclist safety during construction. • Include provisions for traffic control measures such as barricades, warning signs, cones, lights, and flag persons, to allow safe circulation of vehicle,	• Include mitigation measure in construction contracting specifications • Prepare Traffic Control Plan • Provide the construction schedule and Traffic Control and Detour Plan to the City of Moreno Valley • Conduct outreach to local residents based on 4-week look ahead provided by construction contractor • Any complaints should be communicated • Retain copy of Traffic Control Plan in project file	• During preparation of construction contractor specifications (mitigation measure in specifications) • Prior to construction (Traffic Control Plan) • Prior to construction (city review) • During construction (outreach) • During construction (complaint notification) • During/after construction (retain documentation)	• EMWD Engineer and Construction Contractor • EMWD Engineer and Construction Contractor • EMWD Engineer • Construction Contractor and EMWD Public and Governmental Affairs Department • Construction Contractor • EMWD Engineer	

Mitigation Measures	Monitoring Process	Monitoring Timing	Responsible Agency/Entity	Verification of Compliance (Date/ Responsible Person)
bicycle, pedestrian, and emergency response traffic. • Ensure access to individual properties. The Traffic Control and Detour Plan shall be reviewed and approved by EMWD's project manager and the construction inspector prior to the commencement of project construction activities. EMWD's construction inspector shall provide the construction schedule and Traffic Control and Detour Plan to the City of Moreno Valley for review, to ensure that construction of the proposed project does not conflict with other construction projects that may be occurring simultaneously in the project vicinity. Prior to project construction, EMWD's Public and Governmental Affairs Department will perform public outreach to local residents informing them of upcoming construction activities. EMWD shall require the construction contractor to provide EMWD with a four (4) week notice for any project activities that may have an impact on surrounding communities. Public outreach to local residents may include any or all of the following: • Written notices (i.e., letters, door hangers, other like forms of community engagement). • Attendance at community events or presentations. • Contact information for community complaints. If the contractor receives complaints directly, the contractor shall forward complaint directly to the Public and Governmental Affair staff and immediately notify the project inspector.				

Mitigation Measures	Monitoring Process	Monitoring Timing	Responsible Agency/Entity	Verification of Compliance (Date/ Responsible Person)
Tribal Cultural Resources				
TRIBAL-1: Tribal Resources Monitoring Agreement. At least 30 days prior to the start of any ground-disturbing activities, Eastern Municipal Water District (EMWD) shall contact the Consulting Tribes(s) to develop a Cultural Resources Treatment Monitoring Agreement ("Agreement"). The Agreement shall address the treatment of archaeological resources that may be Tribal Cultural Resources inadvertently discovered on the project site; project grading; ground disturbance and development scheduling; the designation, responsibilities, and participation of tribal monitor(s) during grading, excavation, and ground disturbing activities; and compensation for the tribal monitors, including overtime, weekend rates, and mileage reimbursements.	• Develop a Cultural Resources Treatment Monitoring Agreement • Retain copies of agreements in project file	• At least 30 days prior to the start of any ground-disturbing activities (agreement) • During/after construction (retain documentation)	• EMWD Planner • EMWD Engineer	
TRIBAL-2: Tribal Monitoring. Prior to the start of ground-disturbing activities, a Tribal monitor may participate in the construction workers archaeological resources sensitivity training, conducted by the project archaeologist. At least seven business days prior to ground-disturbing activities, EMWD shall notify the Consulting Tribes of the grading/excavation schedule and coordinate the Tribal monitoring schedule. A Tribal monitor shall be present for ground-disturbing activities associated with the project. Both the archaeologist and Tribal monitor shall have the authority to stop and redirect grading activities in order to evaluate the nature and significance of any cultural resources discovered within the project limits. Such evaluation shall include culturally appropriate, temporary and permanent treatment pursuant to the Cultural Resources Treatment and Monitoring Agreement, which may include avoidance of resources, in-place preservation, data recovery, and/or reburial so the resources are not subject to further disturbance in perpetuity. Any reburial shall occur at a location determined between EMWD and the Consulting Tribes as described in TRIBAL-4. Treatment may also include curation of the resources at a Tribal curation facility or an archaeological curation facility, as determined in	• Participation of tribal monitor in archaeological resources sensitivity training • Notification of Consulting Tribes of grading/excavation schedule • Participation by Consulting Tribes in monitoring of ground-disturbing activities • If resources are found, conduct appropriate treatment of resource • Retain copies of monitoring in project file	• Prior to ground-disturbing activities (sensitivity training) • At least seven (7) days prior to ground-disturbing activities (notification) • During construction (monitoring) • During construction (monitoring) • During/after construction (retain documentation)	• EMWD Planner • Construction Contractor and EMWD Planner • Construction Contractor and EMWD Planner • EMWD Planner • EMWD Engineer	

Mitigation Measures	Monitoring Process	Monitoring Timing	Responsible Agency/Entity	Verification of Compliance (Date/ Responsible Person)
discussion among EMWD, the Consulting Tribes and the project archaeologist, as addressed in the Cultural Resources Treatment and Monitoring Agreement. The on-site Tribal monitoring shall end when all ground disturbing activities on the project site are completed, or when the Tribal representatives and Tribal monitors have indicated that the project site has little or no potential for impacting Tribal Cultural Resources.				
TRIBAL-3: Disposition of Inadvertent Discoveries. In the event that Tribal Cultural Resources are recovered during the course of grading, EMWD shall relinquish ownership of all cultural resources, including sacred items, burial goods, archaeological artifacts, and non-human remains. EMWD will coordinate with the project archaeologist and the Consulting Tribes to conduct analysis of recovered resources. If it is determined that the resource is a Tribal Cultural Resource and thus significant under CEQA, avoidance of the resources will be explored as the preferred option and on-site reburial will be evaluated as the second option. If avoidance and on-site reburial are not possible, a treatment plan shall be prepared and implemented in accordance with state guidelines and in consultation with the Consulting Tribes. The treatment plan may include, but would not be limited to capping in place, excavation and removal of the resource, interpretive displays, sensitive area signage, or other mutually agreed upon measure. Treatment may also include curation of the cultural resources at a Tribal curation facility, as determined by EMWD and Consulting Tribes.	• If resources are found, conduct appropriate transfer and treatment according to the Consulting Tribes • Retain copies of treatment in project file	• During/after construction (treatment of resources) • During/after construction (retain documentation)	• Construction Contractor, EMWD Engineer, and EMWD Planner • EMWD Engineer	
TRIBAL-4: Non-Disclosure of Reburial Locations. It is understood by all parties that unless otherwise required by law, the site of any reburial of culturally sensitive resources shall not be disclosed and shall not be governed by public disclosure requirements of the California Public Records Act. The Coroner, pursuant to the specific exemption set forth in California Government Code 6254(r), parties, and Lead Agencies will be asked to withhold public disclosure information related to such reburial.	• If resources are found and need to be reburied, the location shall not be disclosed • Retain copies of treatment in project file	• During/after construction (reburial of resources) • During/after construction (retain documentation)	• Construction Contractor, EMWD Engineer, and EMWD Planner • EMWD Engineer	

Mitigation Measures	Monitoring Process	Monitoring Timing	Responsible Agency/Entity	Verification of Compliance (Date/ Responsible Person)
Utilities				
UTIL-1: During design and prior to construction of the proposed project pipeline, EMWD shall conduct an underground utilities search and coordinate with all utility providers that operate in the same public rights-of-way impacted by construction activities. EMWD shall ensure that any temporary disruption in utility service caused by construction is minimized and that any affected parties are notified in advance.	• Include mitigation measure in construction contracting specifications • Conduct an underground utilities search • Coordinate with public utility providers impacted by construction • Retain construction monitoring report in project file	• During preparation of construction contractor specifications (mitigation measure in specifications) • Before construction (utilities search) • Before construction (coordination) • During/after construction (retain documentation)	• EMWD Engineer and Construction Contractor • EMWD Engineer • EMWD Engineer • EMWD Engineer	
Wildfire				
WDF-1: Fire Hazard Reduction Measures. In accordance with S.1-14 of the Moreno Valley 2040 General Plan, prior to construction, EMWD shall prepare a fire protection plan that includes an assessment of site characteristics, brush clearance locations and techniques, equipment requirements for working in dry brush including spark arrestors, spotters for welding activities, fire extinguisher accessibility, use of fire safe building materials, and installation of fire-resistant landscaping. Fire hazard reduction measures outlined in the fire protection plan shall be implemented during construction.	• Include mitigation measure in construction contracting specifications • Prepare a fire protection plan • Implement fire hazard reduction measures outlined in the plan • Retain construction monitoring report in project file	• During preparation of construction contractor specifications (mitigation measure in specifications) • Before construction (plan) • During construction (implement plan) • During/after construction (retain documentation)	• EMWD Engineer and Construction Contractor • EMWD Planner • EMWD Engineer • EMWD Engineer	

Appendix A

Pettit Water Storage Tank Expansion and Transmission Pipeline Project Draft EIR

PETTIT WATER STORAGE TANK EXPANSION AND TRANSMISSION PIPELINE PROJECT

Draft Environmental Impact Report

Prepared for
Eastern Municipal Water District

September 2023

ESA

PETTIT WATER STORAGE TANK EXPANSION AND TRANSMISSION PIPELINE PROJECT

Draft Environmental Impact Report

Prepared for
Eastern Municipal Water District

September 2023

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EXECUTIVE SUMMARY

ES.1 Introduction and Background

Eastern Municipal Water District (EMWD) as the lead agency pursuant to the California Environmental Quality Act (CEQA) is proposing to implement the Pettit Water Storage Tank Expansion and Transmission Pipeline Project (proposed project) in Moreno Valley, California. The proposed project would involve installation of two new 4.5 million gallon (MG) storage tanks at the project site, and demolition of an existing 2 MG storage tank. The new tanks would be supplied by approximately 4,000 linear feet of proposed transmission pipeline to connect to the proposed Cactus II Feeder. The proposed project would be implemented in two phases.

This Draft Environmental Impact Report (EIR) has been prepared in compliance with CEQA of 1970 (as amended), codified at California Public Resources Code Sections 21000 et. seq., and the State CEQA Guidelines in the Code of Regulations, Title 14, Division 6, Chapter 3. The State Clearinghouse Number is 2022110477. The proposed project is described further in Chapter 2, *Project Description* and shown in **Figure ES-1**.

The proposed project would be located within the 1764 Pettit Pressure Zone, which is EMWD's largest pressure zone in Moreno Valley, extending approximately 11 miles from west to east. The zone receives water from the Mills Water Treatment Plant via the Cactus Booster Pump Station (BPS), Ellsworth BPS, Pettit BPS, Moreno 2 BPS and the Cactus/Nason BPS. The pressure zone contains seven storage reservoirs, with the existing Pettit Tank, Lower Landmark Tanks, and the Wolfskill Tank serving the eastern portion of the pressure zone. The new tanks are needed to support planned growth in the eastern portion of the 1764 Pettit Pressure Zone associated with the World Logistics Center and other future development in the area.

ES.2 Project Objectives

The overall intent of the proposed project is to increase potable water storage capacity within the eastern region of the 1764 Pettit Pressure Zone which is currently served by EMWD. The objectives of the proposed project are as follows:

- Provide replacement tanks to increase potable water storage capacity to meet near- and long-term demands associated with planned development in eastern Moreno Valley.
- Provide a transmission pipeline to connect the replacement tanks with existing and proposed infrastructure.
- Maximize usable storage capacity of other tanks within the 1764 Pettit Pressure Zone.
- Further EMWD's strategic planning goal to develop adaptable water storage and delivery system improvements to manage uncertain delivery conditions and emergency outages.

SOURCE: ESA (2022)

Pettit Water Storage Tank Expansion and Transmission Pipeline Project

Figure ES-1
Project Location

ESA

ES.3 Project Description

The proposed project site contains one existing 2 MG water storage tank that has serviced surrounding development since its construction in 1971. The proposed project would involve construction of a new 4.5 MG steel storage tank adjacent to the existing tank, transmission pipeline, and stormwater drainage facilities, including a drainage ditch, detention basin, 18-inch storm drain, energy dissipators, and related improvements as part of the Phase 1 project. Under buildout conditions that are expected to occur after 2045, the Phase 2 project would involve demolition of the existing 2 MG storage tank and construction of a second 4.5 MG storage tank in its place. Total capacity at the project site would encompass 9 MG.

ES.4 Project Alternatives

An EIR must describe a range of reasonable alternatives to the project or alternative project locations that could feasibly attain most of the basic project objectives and would avoid or substantially lessen any of the significant environmental impacts of project. The alternatives analysis must include the "No Project Alternative" as a point of comparison. The No Project Alternative includes existing conditions and reasonably foreseeable future conditions that would exist if the proposed project were not approved (*CEQA Guidelines* §15126.6). The following alternatives are discussed further in Chapter 5, *Alternatives Analysis*.

ES.4.1 No Project Alternative

Under the No Project Alternative, EMWD would not construct the two new 4.5-million-gallon (MG) water storage tanks, transmission pipeline, stormwater drainage facilities, or related improvements. The existing 2 MG storage tank at the project site would continue to be operational. The benefits of the proposed project, which include improved operating conditions in the 1764 Pettit Pressure Zone, would not occur.

ES.4.2 Alternatives Rejected from Further Consideration

EMWD considered two alternatives in addition to the proposed project that were rejected from further consideration in the EIR. Both alternatives are based on the analysis included in the *Pettit Storage Siting Evaluation Technical Memorandum* (Appendix B in Kleinfelder 2017; see **Appendix PDR** to this DEIR), and proposed different tank size and site configurations to achieve 8 MG storage capacity at the project site. The first alternative would involve demolition of the existing 2 MG tank and construction of a new 5 MG tank in its place, and construction of a new 3 MG tank located just to the north of the 5 MG tank on the acquired EMWD property. The second alternative would involve keeping the existing 2 MG tank onsite and construction of a new 6 MG tank located just to the north of the 2 MG tank on the acquired EMWD property.

Under the New 3-MG Tank and New 5-MG Tank Alternative, the northern tank would be constructed and operational prior to demolition of the existing tank and construction of the southern tank. As a result, this alternative would not meet the project objective of providing replacement tanks to increase potable water storage capacity to meet near- and long-term demands associated with planned development in eastern Moreno Valley. Under the Existing 2-

MG Tank to Remain and New 6-MG Tank Alternative, the existing 2 MG tank would still have freeboard issues that eliminate the ability of other storage tanks in the area to maximize usable space. As a result, this alternative would not meet the project objective of maximizing usable storage capacity of other tanks within the 1764 Pettit Pressure Zone. Because of these reasons, EMWD has rejected these alternatives as infeasible. These alternatives are not considered further in this Draft EIR.

ES.5 Areas of Controversy

During the NOP public review period, concerns were raised regarding potential adverse impacts to utilities (medium and high-pressure gas lines) during construction of the proposed transmission pipeline. These concerns have been addressed in Chapter 3 of this Draft EIR. All comments received on the NOP are included in **Appendix IS/NOP** to this Draft EIR.

ES.6 Summary of Impacts

Table ES-1, at the end of this chapter, presents a summary of the impacts and mitigation measures identified for the proposed project. The complete impact statements and mitigation measures are presented in Chapter 3 of this Draft EIR. The level of significance for each impact was determined using significance criteria (thresholds) developed for each category of impacts; these criteria are presented in the appropriate sections of Chapter 3. Significant impacts are those adverse environmental impacts that meet or exceed the significance thresholds; less than significant impacts would not exceed the thresholds. Table ES-1 indicates the measures that will be implemented to avoid, minimize, or otherwise reduce significant impacts to a less than significant level.

The *CEQA Guidelines* require that an EIR discuss the significant environmental effects of the proposed project (Section 15126.2(a)), which are summarized in Table ES-1 and provided in Chapters 3 and 4 of the Draft EIR. The *CEQA Guidelines* also require that an EIR discuss the significant environmental effects which cannot be avoided (Section 15126.2(c)). These are discussed below.

Significant and Unavoidable Environmental Effects

As required by *CEQA Guidelines* Section 15126.2(c), an EIR must describe any significant impacts that cannot be avoided, including those impacts that can be mitigated but not reduced to a less than significant level. Where there are impacts that cannot be alleviated without imposing an alternative design, their implications and the reasons the project is being proposed, notwithstanding their effect, should be described. Chapter 3 of this Draft EIR describes the potential environmental impacts of the proposed project and recommends mitigation measures to reduce impacts, where feasible. The proposed project would not result in any significant and unavoidable impacts as documented in the analyses provided in Chapters 3, 4, and 5 of this Draft EIR.

ES.7 Organization of the Draft EIR

This Draft EIR is organized into the following chapters and appendices:

- **Executive Summary.** This chapter summarizes the contents of the Draft EIR.
- **Chapter 1, Introduction.** This chapter discusses the CEQA process and explains the purpose of the Draft EIR.
- **Chapter 2, Project Description.** This chapter provides an overview of the proposed project, describes the need for and objectives of the proposed project, explains planning for construction and operation of the proposed project, and presents a preliminary list of the agencies and entities, in addition to EMWD, that would use this EIR in their consideration of specific permits and other discretionary approvals for the proposed project.
- **Chapter 3, Environmental Setting, Impacts and Mitigation Measures.** This chapter describes the environmental setting and identifies the direct, indirect, and cumulative impacts of the proposed project for each of the following environmental topics: Aesthetics; Air Quality and Greenhouse Gas Emissions; Biological Resources; Cultural Resources; Energy; Geology and Soils; Hazards and Hazardous Materials; Hydrology and Water Quality; Noise; Transportation; Tribal Cultural Resources; Utilities and Service Systems; and Wildfire. This chapter also summarizes environmental topics for which no significant impact would occur. For the assessment of cumulative impacts, this chapter includes a list of past, current, and probable future projects to be considered together with the proposed project.
- **Chapter 4, Other CEQA Considerations.** This chapter discusses the significant irreversible environmental changes and growth-inducing impacts associated with the proposed project.
- **Chapter 5, Alternatives Analysis.** This chapter presents an overview of the alternatives development process, describes the alternatives to the proposed project that were considered, and describes potential impacts of feasible alternatives relative to those of the proposed project.
- **Chapter 6, Report Preparers.** This chapter identifies the key staff and the authors involved in preparing this Draft EIR.
- **Appendices.** The appendices include materials related to the NOP and scoping process (**Appendix NOP**), as well as technical studies that support the impact analyses, such as an Air Quality, Greenhouse Gas Emissions, and Energy Modeling (**Appendix AQ/GHG/ENERGY**), Biological Resources Technical Report (**Appendix BIO**), Aquatic Resources Delineation Report (**Appendix WATER**), Cultural Resources Technical Report (**Appendix CUL;** *Confidential*), Paleontological Resources Assessment Report (**Appendix PALEO**; *Confidential*), the Tribal Cultural Resources Consultation (**Appendix TRIBAL**), and the Preliminary Design Report prepared for the project (**Appendix PDR**).

ES.8 References

Kleinfelder, 2016. *Pettit Storage Siting Evaluation Technical Memorandum*. Prepared for EMWD as Appendix B within the Pettit 1674-Zone Storage Water Tank Expansion and Transmission Pipeline Project Preliminary Design Report. October 17, 2016.

TABLE ES-1
SUMMARY OF IMPACTS AND MITIGATION MEASURES

Impacts	Mitigation Measures	Significance after Mitigation
Aesthetics		
3.1-1: The proposed project could have a substantial adverse effect on a scenic vista.	None Required	Less than Significant Impact
3.1-2: The proposed project could substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway.	None Required	No Impact
3.1-3: The proposed project could substantially degrade the existing visual character or quality of public views of the site and its surroundings.	**Mitigation Measure AES-1**: Aboveground buildings/structures shall be finished with a non-reflective material and painted with an earth-tone color to blend in with the surrounding landscape and vegetation.	Less than Significant Impact with Mitigation Incorporated
3.1-4: The proposed project could create a new source of substantial light or glare which would adversely affect day or nighttime views in the area.	**Mitigation Measure AES-2**: All new permanent exterior lighting associated with the proposed water storage tanks shall be shielded and directed downward to avoid light spill onto neighboring parcels and visibility from surrounding public vantage points. **Mitigation Measure AES-3**: The proposed water storage tanks and aboveground facilities shall be designed to include non-glare exterior materials and coatings to minimize glare or reflection. The paint used for this purpose should be low-luster (low reflectivity) so as to reduce glare.	Less than Significant Impact with Mitigation Incorporated
3.1-5: Concurrent construction and operation of the proposed project and related projects in the geographic scope could result in cumulative short-term and long-term impacts to aesthetics.	Implement Mitigation Measures AES-1 through AES-3.	Less than Significant Impact with Mitigation Incorporated
Air Quality and Greenhouse Gas Emissions		
3.2-1: The proposed project could conflict with or obstruct implementation of the applicable air quality plan.	None Required	Less than Significant Impact
3.2-2: The proposed project could result in a cumulatively considerable net increase of any criteria pollutant for which the project region is nonattainment under an applicable federal or state ambient air quality standard.	None Required	Less than Significant Impact
3.2-3: The proposed project could expose sensitive receptors to substantial pollutant concentrations.	None Required	Less than Significant Impact
3.2-4: The proposed project could result in other emissions (such as those leading to odors) adversely affecting a substantial number of people.	None Required	No Impact
3.2-5: The proposed project could generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment.	None Required	Less than Significant Impact

Impacts	Mitigation Measures	Significance after Mitigation
3.2-6: The proposed project could conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases.	None Required	Less than Significant Impact
3.2-7: Concurrent construction and operation of the proposed project and related projects in the geographic scope could result in cumulative short-term and long-term impacts to air quality.	None Required	Less than Significant Impact
3.2-8: Concurrent construction and operation of the proposed project and related projects in the geographic scope could result in cumulative short-term and long-term impacts to greenhouse gas emissions.	None Required	Less than Significant Impact
Biological Resources		
3.3-1: The proposed project could have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service.	**Mitigation Measure BIO-1: Pre-Construction Training.** Prior to commencement of construction activities, a qualified biologist shall prepare a Worker Environmental Awareness Program (WEAP) that provides a description of potentially-occurring special-status species that could be affected by the proposed project. The WEAP shall include information on identifying special-status species, and measures to avoid special-status species during construction activities, including (but not limited to): • staying within limits of disturbance, • establishing an onsite speed limit of 15 miles per hour, • covering trenches and open pits at the end of each workday, • installing wildlife escape ramps in open trenches or pits, • and daily trash and debris disposal from the project. The WEAP training shall be provided to all construction personnel by a qualified biologist. Completion of the WEAP training shall be documented for all construction personnel on a sign-in sheet that shall be onsite at all time during construction activities. The qualified biologist shall also verify fencing or marking limits of disturbance (marking habitat suitable to support special-status species as well as sensitive vegetation communities) prior to commencement of construction activities, if applicable. **Mitigation Measure BIO-2: Pre-Construction Surveys and Mitigation for Crotch's Bumble Bee.** Within seven (7) days prior to the start of construction activities, a qualified entomologist familiar with the species behavior shall conduct a pre-construction survey for Crotch's bumble bee, within 100 feet of construction activities near host plant communities (including nectar plants for Crotch's bumble bee). If any of these species are present or determined to be within 100 feet of construction areas, construction best management practices (BMPs) will be implemented and incorporation of information about these	Less than Significant Impact with Mitigation Incorporated

Impacts	Mitigation Measures	Significance after Mitigation
	species will be incorporated into the WEAP training to avoid potential impacts to these species. BMPs shall include • Limiting construction vehicle speeds to 15 miles per hour when operating within 100 feet of the habitat areas. • Fencing habitat areas using temporary silt fencing, and cleaning up all trash and debris daily. In coordination with the CDFW, additional avoidance measures may be required that include establishing a buffer around the species host plants where no work can occur, and onsite monitoring dependent on distance from the work area. Construction personnel will be instructed to not directly harm any special-status species onsite by halting activities until the species can move to offsite areas or contact a qualified biologist to move the species out of harm's way. **Mitigation Measure BIO-3: San Diego Desert Woodrat Pre-Construction Survey, and Avoidance or Relocation.** Thirty days prior to construction activities, a qualified mammalogist with experience in identifying and trapping San Diego desert woodrat shall conduct a survey within proposed construction disturbance zone and within 200 feet of the disturbance zone for San Diego desert woodrat. The survey shall incorporate appropriate methods to detect San Diego desert woodrat prior to any project activities in areas that have or may have the potential to support these species. • If active San Diego desert woodrat nests (stick houses) are identified within the disturbance zone, a construction fence shall be erected around the nest site adequate to provide the woodrat sufficient foraging habitat at the discretion of the qualified biologist. The biologist shall be present during those periods when disturbance activities will occur near active nest areas to avoid inadvertent impacts to these nests. • Where nest avoidance is not possible, the project biologist shall clear vegetation from immediately surrounding active nests followed by a night without further disturbance to allow woodrats to vacate the nest. Each occupied nest shall subsequently be gently disturbed by a qualified wildlife biologist in possession of a scientific collecting permit to entice any remaining woodrats to leave the nest and seek refuge outside the project construction area. The stick nests shall be carefully removed from the project construction area and be placed near a suitable vegetation or rocky substrate similar to original nest location. Relocation of special-status species and/or salvaged nest-building material (rocks, sticks, etc.) shall target undeveloped areas of the project that shall not be disturbed. Removal of the nests outside of breeding season is preferred if feasible (i.e., breeding season is May through October). • If young are found within the nest during the dismantling process, clearing and construction within the fenced area shall be postponed	

Impacts	Mitigation Measures	Significance after Mitigation
	or halted until young have left the nest. The material shall be placed back on the nest and the nest shall remain unmolested for two to three weeks in order to give the young enough time to mature and leave the nest on their own accord. After two to three weeks, the nest dismantling process may begin again. The project biologist shall document all woodrat nests moved and provide a written report to EMWD. **Mitigation Measure BIO-4: Special-Status Reptile.** A qualified herpetologist, who holds a scientific collecting permit, shall conduct a pre-construction clearance survey throughout the project, including a 100-foot buffer, for coastal western whiptail, Belding's orange-throated whiptail, coast patch nosed snake, and red-diamond rattlesnake within two weeks prior to the start of construction activities. If any of these species are observed during the survey, a qualified biologist should relocate the individual to suitable habitat at least 100 feet from the project. Trapping and relocation methods should be conducted in consultation with the EMWD. **Mitigation Measure BIO-5: Nesting Bird Season Avoidance or Pre-Construction Survey.** Construction and vegetation removal should occur outside of nesting season (i.e., nesting season is February 1 to August 31 for songbirds, January 15 to August 31 for raptors). If construction and vegetation removal must occur during nesting season (i.e., between January 15 and August 31), a qualified biologist shall conduct a pre-construction survey for breeding and nesting birds and raptors 30 days prior to the start of construction, and then weekly, within 300-feet of the construction limits to determine and map the location and extent of breeding birds that could be affected by the project. During nesting season, the following conditions shall be implemented: • Nesting bird surveys shall be conducted at appropriate nesting times and concentrate on potential roosting or perch sites. • Weekly surveys will take place with the last survey being conducted no more than 3 days prior to the initiation of clearance/construction work. • If project activities are delayed or suspended for more than 7 days after the last survey, surveys shall be repeated before work can resume. • If an active nest is located, clearing and construction within appropriate buffers as determined by a qualified biological monitor, shall be postponed until the nest is vacated and juveniles have fledged and when there is no evidence of a second attempt at nesting. • Due to vicinity of natural open spaces adjacent to the project, 500-feet for raptors (including burrowing owls) and 300-feet for passerine birds could suffice for nesting bird buffers however it will be at the	

Impacts	Mitigation Measures	Significance after Mitigation
	discretion of the qualified biologist. The buffer zone from the nest shall be established in the field with flagging and stakes. • The qualified biologist shall retain the ability to increase or decrease buffers as needed to protect the nesting birds (based on bird behavior, construction activities, etc.). • Temporary fencing and signage shall be maintained for the duration of the project. Construction personnel shall be instructed on the sensitivity of the area and be advised not to work, trespass, or engage in activities that would disturb nesting birds near or inside the buffer. • Onsite construction monitoring may also be required to ensure that no direct or indirect impacts occur to the active nest. Project activities may encroach into the buffer only at the discretion of the qualified biologist.	
3.3-2: The proposed project could have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service.	None Required	No Impact
3.3-3: The proposed project could have a substantial adverse effect on state or federally protected wetlands (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means.	None Required	Less than Significant Impact
3.3-4: The proposed project could interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites.	**Mitigation Measure BIO-6: Roosting Bat Avoidance or Pre-Construction Survey.** Construction and vegetation removal should occur outside of maternity roosting season (September 1– March 31). The following conditions shall be implemented if construction must occur during maternity roosting season: • If construction and vegetation removal must occur during maternity roosting season, then prior to commencement of construction activities within the maternity roosting season (April 1–August 31), a qualified biologist with a scientific collecting permit shall conduct a pre-construction clearance survey of suitable rocky outcroppings located adjacent to the project that have the potential to provide suitable bat roosting habitat to determine if bats are roosting onsite. If bats are determined to be using trees specifically for roosting, the biologist will determine whether a day roost (non-breeding) or maternity roost (lactating females and dependent young) is present. • If a day roost is determined to be present and the removal of any trees or rocky outcroppings supporting a day roost would occur, the biologist will ensure that all roosting individuals disperse from the location prior to removal of the vegetation to prevent direct mortality.	Less than Significant Impact with Mitigation Incorporated

Impacts	Mitigation Measures	Significance after Mitigation
	• If a maternity roost is observed, the qualified bat biologist will determine whether construction activities are likely to disturb breeding activities. • If it is determined that the vegetation or rocky substrate supporting the roost must be removed or activities are expected to disturb the breeding activities, a Bat Avoidance, Minimization, and/or Exclusion Plan shall be prepared in consultation with EMWD. At a minimum, the plan shall include avoidance and minimization measures to reduce potential impacts to breeding bats during construction activities and/or prescribed methods to safely and humanely evict bats from the roost in order to minimize any potential impacts.	
3.3-5: The proposed project could conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance.	None Required	Less than Significant Impact
3.3-6: The proposed project could conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan.	None Required	No Impact
3.3-7: Concurrent construction and operation of the proposed project and related projects in the geographic scope could result in cumulative impacts to biological resources.	Implement Mitigation Measures BIO-1 through BIO-6.	Less than Significant Impact with Mitigation Incorporated
Cultural Resources		
3.4-1: The proposed project could Cause a substantial adverse change in the significance of a historical resource pursuant to Section 15064.5.	**Mitigation Measure CR-1:** Eastern Municipal Water District (EMWD) shall retain a Qualified Archaeologist under the Secretary of the Interior Standards to carry out all mitigation related to archaeological resources for the proposed project. Prior to the start of ground-disturbing activities, the Qualified Archaeologist or their designee shall conduct construction worker archaeological resources sensitivity training for all construction personnel. Training shall include at a minimum: • Information on how to identify the types of prehistoric and historic archaeological resources that may be encountered. • Proper procedures to be enacted in the event of an inadvertent discovery of archaeological resources. • Safety precautions to be taken when working with archaeological monitors. EMWD shall ensure that construction personnel are made available for and attend the training and retain documentation demonstrating attendance. **Mitigation Measure CR-2:** The qualified Archaeologist shall oversee an archaeological monitor who shall be present during construction activities and shall work with the monitor to create an Environmentally Sensitive Area of 15-feet around ESA-040423-01F and ESA-040423-	Less than Significant Impact with Mitigation Incorporated

Impacts	Mitigation Measures	Significance after Mitigation
	02F so that these areas will not be disturbed by the project, and shall remain in place for the duration. At a minimum, the archaeological monitor shall: • Observe activities such as demolition, clearing/grubbing, drilling/auguring, grading, trenching, excavation, or other ground disturbing activity associated with the proposed project. • Have the authority to direct the pace of construction equipment activity in areas of higher sensitivity and to temporarily divert, redirect or halt ground disturbance activities to allow identification, evaluation, and potential recovery of archaeological resources in coordination with the qualified Archaeologist. Full-time monitoring may be reduced to part-time inspections, or ceased entirely, if determined appropriate by the qualified Archaeologist. In the event that historic-period (e.g., bottles, foundations, early infrastructure, refuse dumps/privies, railroads, etc.) or prehistoric (e.g., hearths, burials, stone tools, shell and faunal bone remains, etc.) archaeological resources are unearthed, the following shall occur: • Ground-disturbing activities shall be halted or diverted away from the vicinity of the find so that the find can be evaluated. • A 50-foot buffer shall be established by the qualified Archaeologist around the find where construction activities shall not be allowed to continue. Work may continue outside of the buffer area. • All archaeological resources unearthed by project construction activities shall be evaluated by the qualified Archaeologist. If a resource is determined by the qualified Archaeologist to constitute a “historical resource” pursuant to CEQA Guidelines Section 15064.5(a) or a “unique archaeological resource” pursuant to Public Resources Code Section 21083.2(g), the Qualified Archaeologist shall coordinate with EMWD to develop a formal treatment plan that would serve to reduce impacts to the resources. • If any prehistoric archaeological sites are encountered within the project area, consultation with consulting Native American parties will be conducted to apprise them of any such findings and solicit any comments they may have regarding appropriate treatment and disposition of the resources. The treatment plan established for the resources shall be in accordance with CEQA Guidelines Section 15064.5(f) for historical resources and Public Resources Code Sections 21083.2(b) for unique archaeological resources. Preservation in place (i.e., avoidance) is the preferred manner of treatment and shall be explored to see if project activities can avoid archaeological resources, such as: if the archaeological site can be deeded into a permanent conservation easement, if the resources can be capped with chemically stable soil or if the resource can be incorporated within open space.	

Impacts	Mitigation Measures	Significance after Mitigation
	If, in coordination with EMWD, it is determined that preservation in place is not feasible, and in order to mitigate potential impacts to significant resources pursuant to Section 15064.5 of CEQA, date recovery is feasible. Appropriate treatment of the resource shall be developed by the qualified Archaeologist in coordination with the district and a data recovery plan shall be implemented. A data recovery plan will make provision for adequately recovering the scientifically consequential information from and about the historical resources and may include implementation of archaeological data recovery excavations to remove the resource along with subsequent laboratory processing, analysis, reporting, and commemoration in the form of signage or other public education and awareness. Any archaeological material collected shall be curated at a public, non-profit institution with a research interest in the materials, if such an institution agrees to accept the material. If no institution accepts the archaeological material, they shall be donated to a local school or historical society in the area for educational purposes. **Mitigation Measure CR-3:** At the conclusion of the archaeological monitoring, the qualified Archaeologist shall prepare a technical report that follows the format and content guidelines provided in California Office of Historic Preservation's Archaeological Resource Management Reports (ARMR). The technical report shall include the following: • A description of resources unearthed, if any; • Treatment of the resources; • Results of the artifact processing, analysis, and research; • Evaluation of the resources with respect to the California Register of Historical Resources and CEQA; and • Appropriate California Department of Parks and Recreation Site Forms shall also be prepared and provided in an appendix to the report. The technical report shall be prepared under the supervision of the qualified Archaeologist and submitted to EMWD within 150 days of completion of the monitoring. The final draft of the report shall be submitted to the Eastern Information Center.	
3.4-2: The proposed project could cause a substantial adverse change in the significance of an archaeological resource pursuant to Section 15064.5.	Implement Mitigation Measures CR-1 through CR-3.	Less than Significant Impact with Mitigation Incorporated

Impacts	Mitigation Measures	Significance after Mitigation
3.4-3: The proposed project could disturb human remains, including those interred outside of formal cemeteries.	**Mitigation Measure CR-4:** Inadvertent Discovery of Human Remains. If human skeletal remains are uncovered during ground disturbance the district shall immediately halt work, contact the Riverside County coroner to determine whether the remains are human, and follow the procedures and protocols set forth in Section 15064.5 (e)(1) of the CEQA Guidelines. If the County Coroner determines that the remains are Native American, they shall contact the Native American Heritage Commission (NAHC), in accordance with Health and Safety Code Section 7050.5, subdivision (c), and Public Resources Code Section (PRC) 5097.98 (as amended by AB 2641). The NAHC shall then identify the person(s) thought to be the Most Likely Descendant (MLD) of the deceased Native American, who will then help determine what course of action should be taken in dealing with the remains. Per PRC 5097.98, the landowner shall ensure that the immediate vicinity, according to generally accepted cultural or archaeological standards or practices, where the Native American human remains are located, is not damaged or disturbed by further development activity until the landowner has discussed and conferred, as prescribed in this section (PRC 5097.98), with the MLD regarding their recommendations, if applicable, taking into account the possibility of multiple human remains.	Less than Significant Impact with Mitigation Incorporated
3.4-4: Concurrent construction and operation of the proposed project and related projects in the geographic scope could result in cumulative impacts to cultural resources.	Implement Mitigation Measures CR-1 through CR-4.	Less than Significant Impact with Mitigation Incorporated
Energy		
3.5-1: The proposed project could result in potentially significant environmental impact due to wasteful, inefficient, or unnecessary consumption of energy resources, during Project construction or operation.	None Required	Less than Significant Impact
3.5-2: The proposed project could conflict with or obstruct a state or local plan for renewable energy or energy efficiency.	None Required	Less than Significant Impact
3.5-3: Concurrent construction and operation of the proposed project and related projects in the geographic scope could result in cumulative short-term and long-term impacts to energy.	None Required	Less than Significant Impact
Geology and Soils		
3.6-1: The proposed project could directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving rupture of a known earthquake fault.	None Required	No Impact
3.6-2: The proposed project could directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving strong seismic ground shaking.	None Required	Less than Significant Impact

Impacts	Mitigation Measures	Significance after Mitigation
3.6-3: The proposed project could directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving seismic-related ground failure, including liquefaction.	None Required	Less than Significant Impact
3.6-4: The proposed project could directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving landslides.	None Required	Less than Significant Impact
3.6-5: The proposed project could result in substantial soil erosion or the loss of topsoil.	None Required	Less than Significant Impact
3.6-6: The proposed project could be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse.	None Required	Less than Significant Impact
3.6-7: The proposed project could be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial direct or indirect risks to life or property.	None Required	Less than Significant Impact
3.6-8: The proposed project could have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water.	None Required	No Impact
3.6-9: The proposed project could directly or indirectly destroy a unique paleontological resource or site or unique geologic feature.	**GEO-1:** Prior to the start of construction activities, EMD shall retain a Qualified Paleontologist that meets the standards of the Society for Vertebrate Paleontology (2010) to carry out all mitigation measures related to paleontological resources. Prior to start of any ground disturbing activities, the Qualified Paleontologist shall conduct pre-construction worker paleontological resources sensitivity training. The Qualified Paleontologist shall contribute to any construction worker cultural resources sensitivity training either in person or via a training module. The training shall include information on what types of paleontological resources could be encountered during excavations, what to do in case an unanticipated discovery is made by a worker, and laws protecting paleontological resources. All construction personnel shall be informed of the possibility of encountering fossils and instructed to immediately inform the construction foreman or supervisor if any bones or other potential fossils are unexpectedly unearthed in an area where a paleontological monitor is not present. The Applicant shall ensure that construction personnel are made available for and attend the training and retain documentation demonstrating attendance. **GEO-2:** The Qualified Paleontologist shall supervise a paleontological monitor meeting the Society for Vertebrate Paleontology standards (2010) who shall be present during all excavations in the early Pleistocene ‘very old alluvium.’ Based on the current information, the base of any artificial fill is anticipated at 5 feet below ground surface.	Less than Significant Impact with Mitigation

Impacts	Mitigation Measures	Significance after Mitigation
	Therefore, monitoring shall be required for all excavations below 5 feet below ground surface. Monitoring shall consist of visually inspecting fresh exposures of rock for larger fossil remains and, where appropriate, collecting wet or dry screened standard sediment samples (up to 4.0 cubic yards) of promising horizons for smaller fossil remains (SVP, 2010). Depending on the conditions encountered, such as recognition of sedimentary facies too coarse to likely host significant fossils, full-time monitoring can be reduced to part-time inspections or ceased entirely if determined adequate by the Qualified Paleontologist. The Qualified Paleontologist may spot check the excavation on an intermittent basis and recommend whether the depth of required monitoring should be revised based on his/her observations. Monitoring activities shall be documented in a Paleontological Resources Monitoring Report to be prepared by the Qualified Paleontologist at the completion of construction and shall be provided to EMWD within six (6) months of Project completion. If fossil resources are identified during monitoring, the report will also be filed with the Natural History Museum of Los Angeles County. **GEO-3:** If a paleontological resource is discovered during construction, the paleontological monitor shall be empowered to temporarily divert or redirect grading and excavation activities in the area of the exposed resource to facilitate evaluation of the discovery. An appropriate buffer area shall be established by the Qualified Paleontologist around the find where construction activities shall not be allowed to continue. Work shall be allowed to continue outside of the buffer area. At the Qualified Paleontologist's discretion and to reduce any construction delay, the grading and excavation contractor shall assist in removing rock samples for initial processing and evaluation of the find. All significant fossils shall be collected by the paleontological monitor and/or the Qualified Paleontologist. Collected fossils shall be prepared to the point of identification and catalogued before they are submitted to their final repository. Any fossils collected shall be curated at a public, non-profit institution with a research interest in the materials, such as the Natural History Museum of Los Angeles County, if such an institution agrees to accept the fossils. If no institution accepts the fossil collection, they shall be donated to a local school in the area for educational purposes. Accompanying notes, maps, photographs, and a technical report shall also be filed at the repository and/or school.	
3.6-10: Concurrent construction and operation of the proposed project and related projects in the geographic scope could result in cumulative short-term and long-term impacts to geology and soils.	Implement Mitigation Measure GEO-1 through GEO-3	Less than Significant Impact with Mitigation Incorporated

Impacts	Mitigation Measures	Significance after Mitigation
Hazards and Hazardous Materials		
3.7-1: The proposed project could create a significant hazard to the public or the environment through the routine transport, use, disposal of hazardous materials, or the upset and accident conditions involving the release of hazardous materials into the environment.	None Required	Less than Significant Impact
3.7-2: The proposed project could emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within 0.25 miles of an existing or proposed school.	None Required	No Impact
3.7-3: The proposed project could be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code § 65962.5 and, as a result, would create a significant hazard to the public or the environment.	None Required	No Impact
3.7-4: The proposed project could result in a safety hazard or excessive noise for people residing or working in the project area within an airport land use plan or 2 miles of a public airport or public use airport.	None Required	No Impact
3.7-5: The proposed project could impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan.	Implement Mitigation Measure TRA-1.	Less than Significant Impact with Mitigation Incorporated
3.7-6: The proposed project could expose people or structures, either directly or indirectly, to a significant risk of loss, injury or death involving wildland fires.	Implement Mitigation Measure WDF-1.	Less than Significant Impact with Mitigation Incorporated
3.7-7: Concurrent construction and operation of the proposed project and related projects in the geographic scope could result in cumulative short-term and long-term impacts to hazards and hazardous materials.	Implement Mitigation Measures TRA-1 and WDF-1.	Less than Significant Impact with Mitigation Incorporated
Hydrology and Water Quality		
3.8-1: The proposed project could violate water quality standards or waste discharge requirements or otherwise substantially degrade surface or ground water quality.	None Required	Less than Significant Impact
3.8-2: The proposed project could substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin.	None Required	Less than Significant Impact

Impacts	Mitigation Measures	Significance after Mitigation
3.8-3: The proposed project could substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would: result in substantial erosion or siltation on- or offsite; substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or offsite; create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff; impede or redirect flood flows.	None Required	Less than Significant Impact
3.8-4: The proposed project could result in flood hazard, tsunami, or seiche zones, risk release of pollutants due to project inundation.	None Required	Less than Significant Impact
3.8-5: The proposed project could conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan.	None Required	No Impact
3.8-6: Concurrent construction and operation of the proposed project and related projects in the geographic scope could result in cumulative short-term and long-term impacts to hydrology and water quality.	None Required	Less than Significant Impact
Noise		
3.9-1: The proposed project could have a significant impact if it would generate a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies.	**Mitigation Measure NOISE-1:** Construction Equipment Noise Shielding and Muffling Devices. To reduce construction noise impacts, EMWD shall require construction contractors to implement the following: • During construction, the contractor shall outfit all equipment, fixed or mobile, with properly operating and maintained exhaust and intake mufflers, consistent with manufacturers' standards. All documentation demonstrating the equipment has been maintained in accordance with manufacturers' specifications shall be maintained on-site at all times. • Impact tools (e.g., jackhammers, pavement breakers) used for construction shall be hydraulically or electrically powered wherever possible to avoid noise associated with compressed air exhaust from pneumatically powered tools. When use of pneumatic tools is unavoidable, an exhaust muffler on the compressed air exhaust shall be used. External jackets on the tools themselves shall be used where feasible. • Stationary noise sources that could affect adjacent receptors shall be located away from adjacent receptors when feasible. • Prior to issuance of any demolition, grading or building permit for Phase 2, the Project shall provide temporary ground-level 10-foot-tall construction noise barriers equipped with noise blankets or equivalent noise reduction materials rated to achieve sound level	Less than Significant Impact with Mitigation Incorporated

Impacts	Mitigation Measures	Significance after Mitigation
	reductions of at least 12 dBA between the Project Site and the sensitive receptor location R5. These temporary noise barriers shall be used to block the line-of-sight between the construction equipment and the noise-sensitive receptor(s) during the duration of construction activities. The Project applicant shall provide documentation prepared by a qualified noise consultant verifying compliance with this measure. **Mitigation Measure NOISE-2:** Blasting Sound Blankets. To reduce construction noise impacts related to blasting, EMWD shall require construction contractors to utilize sound blankets and/or noise barriers to cover/surround at the localized blasting area when feasible to do so. The sound blanket and/or barrier shall achieve a reduction of at least 5 dBA and should block the line of sight to nearby sensitive receptors, particularly receptor R5. **Mitigation Measure NOISE-3: I**f blasting is necessary in either Phase 1 or Phase 2, notices will be sent out to sensitive receptors (residences, residential areas, schools, and hospitals) within 1,000 feet of the storage tank area at least 10 days prior to the occurrence of any blasting activities. **Mitigation Measure NOISE-4:** Prior to construction of the storage tanks, EMWD shall notify sensitive receptors (residences, residential areas, schools, and hospitals) within 500 feet of project construction activities of the construction methods and schedule and provide a point of contact for local residences to report excessive noise.	
3.9-2: The proposed project could have a significant impact if it would generate excessive groundborne vibration or groundborne noise levels.	None Required	Less than Significant Impact
3.9-3: The proposed project could expose people residing or working in the project area to excessive noise levels in the vicinity of a private airstrip or an airport land use plan.	None Required	No Impact
3.9-4: Concurrent construction and operation of the proposed project and related projects in the geographic scope could result in cumulative short-term and long-term impacts to noise and vibration.	Implement Mitigation Measures NOISE-1 through NOISE-4.	Less than Significant Impact with Mitigation Incorporated

Impacts	Mitigation Measures	Significance after Mitigation
Transportation		
3.10-1: The proposed project could conflict with a program plan, ordinance or policy addressing the circulation system, including transit, roadway, bicycle and pedestrian facilities.	**Mitigation Measure TRA-1:** Prior to project construction, EMWD shall require the construction contractor to prepare a Traffic Control and Detour Plan, in accordance with the City of Moreno Valley traffic control guidelines. The Traffic Control and Detour Plan shall, at minimum: • Identify staging locations to be used during construction. • Identify safe ingress and egress points from staging areas. • Identify potential road closures. • Establish haul routes for construction-related vehicle traffic. • Include a Detour Plan that identifies alternative safe routes to maintain pedestrian and bicyclist safety during construction. • Include provisions for traffic control measures such as barricades, warning signs, cones, lights, and flag persons, to allow safe circulation of vehicle, bicycle, pedestrian, and emergency response traffic. • Ensure access to individual properties. The Traffic Control and Detour Plan shall be reviewed and approved by EMWD's project manager and the construction inspector prior to the commencement of project construction activities. EMWD's construction inspector shall provide the construction schedule and Traffic Control and Detour Plan to the City of Moreno Valley for review, to ensure that construction of the proposed project does not conflict with other construction projects that may be occurring simultaneously in the project vicinity. Prior to project construction, EMWD's Public and Governmental Affairs Department will perform public outreach to local residents informing them of upcoming construction activities. EMWD shall require the construction contractor to provide EMWD with a four (4) week notice for any project activities that may have an impact on surrounding communities. Public outreach to local residents may include any or all of the following: • Written notices (i.e., letters, door hangers, other like forms of community engagement). • Attendance at community events or presentations. • Contact information for community complaints. If the contractor receives complaints directly, the contractor shall forward complaint directly to the Public and Governmental Affair staff and immediately notify the project inspector.	Less than Significant Impact with Mitigation Incorporated
3.10-2: The proposed project could conflict or be inconsistent with CEQA Guidelines section 15064.3, subdivision (b).	None Required	Less than Significant Impact

Impacts	Mitigation Measures	Significance after Mitigation
3.10-3: The proposed project could substantially increase hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment).	Implement Mitigation Measure TRA-1	Less than Significant Impact with Mitigation Incorporated
3.10-4: The proposed project could result in inadequate emergency access.	Implement Mitigation Measure TRA-1	Less than Significant Impact with Mitigation Incorporated
3.10-5: Concurrent construction of the proposed project and related projects in the geographic scope could result in cumulative short-term and long-term impacts to traffic and transportation.	Implement Mitigation Measure TRA-1	Less than Significant Impact with Mitigation Incorporated
Tribal Cultural Resources		
3.11-1: The proposed project could cause a substantial adverse change in the significance of a tribal cultural resource, defined in Public Resources Code section 21074 as either a site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe, and that is either listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources as defined in Public Resources Code section 5020.1(k), or is a resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of Public Resources Code Section 5024.1. In applying the criteria set forth in subdivision (c) of Public Resources Code Section 5024.1, the lead agency shall consider the significance of the resource to a California Native American tribe.	**TRIBAL-1:** Tribal Resources Monitoring Agreement. At least 30 days prior to the start of any ground-disturbing activities, Eastern Municipal Water District (EMWD) shall contact the Consulting Tribes(s) to develop a Cultural Resources Treatment Monitoring Agreement (“Agreement”). The Agreement shall address the treatment of archaeological resources that may be Tribal Cultural Resources inadvertently discovered on the project site; project grading; ground disturbance and development scheduling; the designation, responsibilities, and participation of tribal monitor(s) during grading, excavation, and ground disturbing activities; and compensation for the tribal monitors, including overtime, weekend rates, and mileage reimbursements. **TRIBAL-2:** Tribal Monitoring. Prior to the start of ground-disturbing activities, a Tribal monitor may participate in the construction workers archaeological resources sensitivity training, conducted by the project archaeologist. At least seven business days prior to ground-disturbing activities, EMWD shall notify the Consulting Tribes of the grading/excavation schedule and coordinate the Tribal monitoring schedule. A Tribal monitor shall be present for ground-disturbing activities associated with the project. Both the archaeologist and Tribal monitor shall have the authority to stop and redirect grading activities in order to evaluate the nature and significance of any cultural resources discovered within the project limits. Such evaluation shall include culturally appropriate, temporary and permanent treatment pursuant to the Cultural Resources Treatment and Monitoring Agreement, which may include avoidance of resources, in-place preservation, data recovery, and/or reburial so the resources are not subject to further disturbance in perpetuity. Any reburial shall occur at a location determined between EMWD and the Consulting Tribes as described in TRIBAL-4. Treatment may also include curation of the resources at a Tribal curation facility or an archaeological curation facility, as determined in discussion among EMWD, the Consulting Tribes and the project archaeologist, as addressed in the Cultural Resources Treatment and Monitoring Agreement. The on-site Tribal monitoring shall end when all ground disturbing activities on the project site are completed, or when the Tribal representatives and Tribal monitors have	Less than Significant Impact with Mitigation Incorporated

Impacts	Mitigation Measures	Significance after Mitigation
	indicated that the project site has little or no potential for impacting Tribal Cultural Resources. **TRIBAL-3:** Disposition of Inadvertent Discoveries. In the event that Tribal Cultural Resources are recovered during the course of grading, EMWD shall relinquish ownership of all cultural resources, including sacred items, burial goods, archaeological artifacts, and non-human remains. EMWD will coordinate with the project archaeologist and the Consulting Tribes to conduct analysis of recovered resources. If it is determined that the resource is a Tribal Cultural Resource and thus significant under CEQA, avoidance of the resources will be explored as the preferred option and on-site reburial will be evaluated as the second option. If avoidance and on-site reburial are not possible, a treatment plan shall be prepared and implemented in accordance with state guidelines and in consultation with the Consulting Tribes. The treatment plan may include, but would not be limited to capping in place, excavation and removal of the resource, interpretive displays, sensitive area signage, or other mutually agreed upon measure. Treatment may also include curation of the cultural resources at a Tribal curation facility, as determined by EMWD and Consulting Tribes. **TRIBAL-4:** Non-Disclosure of Reburial Locations. It is understood by all parties that unless otherwise required by law, the site of any reburial of culturally sensitive resources shall not be disclosed and shall not be governed by public disclosure requirements of the California Public Records Act. The Coroner, pursuant to the specific exemption set forth in California Government Code 6254(r), parties, and Lead Agencies will be asked to withhold public disclosure information related to such reburial.	
3.11-2: Concurrent construction and operation of the proposed project and related projects in the geographic scope could result in cumulative short-term and long-term impacts to tribal cultural resources.	Implement Mitigation Measures TRIBAL-1 through TRIBAL-4	Less than Significant Impact with Mitigation Incorporated
Utilities and Service Systems		
3.12-1: The proposed project could require or result in the relocation or construction of new or expanded water, wastewater treatment or storm water drainage, electric power, natural gas, or telecommunications facilities, the construction or relocation of which could cause significant environmental effects.	**Mitigation Measure UTIL-1:** During design and prior to construction of the proposed project pipeline, EMWD shall conduct an underground utilities search and coordinate with all utility providers that operate in the same public rights-of-way impacted by construction activities. EMWD shall ensure that any temporary disruption in utility service caused by construction is minimized and that any affected parties are notified in advance.	Less than Significant Impact with Mitigation Incorporated
3.12-2: The proposed project could result in insufficient water supplies available to serve the project and reasonably foreseeable future development during normal, dry and multiple dry years.	None Required	Less than Significant Impact

Impacts	Mitigation Measures	Significance after Mitigation
3.12-3: The proposed project could result in a determination by the wastewater treatment provider which serves or may serve the project that it does not have adequate capacity to serve the project's projected demand in addition to the provider's existing commitments.	None Required	Less than Significant Impact
3.12-4: The proposed project could generate solid waste in excess of State or local standards, or in excess of the capacity of local infrastructure, or otherwise impair the attainment of solid waste reduction goals.	None Required	Less than Significant Impact
3.12-5: The proposed project could not comply with federal, state, and local management and reduction statutes and regulations related to solid waste.	None Required	Less than Significant Impact
3.12-6: Concurrent construction and operation of the proposed project and related projects in the geographic scope could result in cumulative short-term and long-term cumulative impacts to utilities and service systems.	Implement Mitigation Measure UTIL-1	Less than Significant Impact with Mitigation Incorporated
Wildfire		
3.13-1: The proposed project could substantially impair an adopted emergency response plan or emergency evacuation plan.	Implement Mitigation Measure TRA-1	Less than Significant Impact with Mitigation Incorporated
3.13-2: Due to slope, prevailing winds, and other factors, would the project exacerbate wildfire risks, and thereby expose project occupants to, pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire.	**Mitigation Measure WDF-1: Fire Hazard Reduction Measures.** In accordance with S.1-14 of the Moreno Valley 2040 General Plan, prior to construction, EMWD shall prepare a fire protection plan that includes an assessment of site characteristics, brush clearance locations and techniques, equipment requirements for working in dry brush including spark arrestors, spotters for welding activities, fire extinguisher accessibility, use of fire safe building materials, and installation of fire-resistant landscaping. Fire hazard reduction measures outlined in the fire protection plan shall be implemented during construction.	Less than Significant Impact with Mitigation Incorporated
3.13-3: The proposed project could require the installation or maintenance of associated infrastructure (such as roads, fuel breaks, emergency water sources, power lines or other utilities) that may exacerbate fire risk or that may result in temporary or ongoing impacts to the environment.	Implement Mitigation Measure WDF-1	Less than Significant Impact with Mitigation Incorporated
3.13-4: The proposed project could expose people or structures to significant risks, including downslope or downstream flooding or landslides, as a result of runoff, post-fire slope instability, or drainage changes.	None Required	Less than Significant Impact
3.13-5: Concurrent construction and operation of the proposed project and related projects in the geographic scope could result in cumulative short-term and long-term impacts to wildfire.	Implement Mitigation Measures TRA-1 and WDF-1	Less than Significant Impact with Mitigation Incorporated

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CHAPTER 1
Introduction

1.1 Introduction

Eastern Municipal Water District (EMWD) is proposing to implement the Pettit Water Storage Tank Expansion and Transmission Pipeline Project (proposed project) in Moreno Valley, California. The proposed project would provide additional storage capacity to support planned development in east Moreno Valley by installing two new 4.5 million gallon (MG) storage tanks and demolishing an existing 2 MG storage tank at the project site. The new tanks would be supplied by approximately 4,000 linear feet of proposed transmission pipeline to connect to the Cactus II Feeder. The proposed project would be implemented in two phases.

1.2 Purpose of the Draft EIR

EMWD is the lead agency pursuant to the California Environmental Quality Act (CEQA) and has prepared this Draft Environmental Impact Report (EIR) in compliance with CEQA of 1970 (as amended), codified at California Public Resources Code Sections 21000 et. seq., and the State CEQA Guidelines in the Code of Regulations, Title 14, Division 6, Chapter 3. The purpose of the Draft EIR is to provide the public and pertinent agencies with information about the potential effects on the local and regional environment associated with construction and operation of the proposed project. This Draft EIR describes the environmental impacts of the proposed project and suggests mitigation measures where necessary to avoid or reduce any significant impacts. The impact analyses are based on a variety of sources, including publicly available documents, agency consultation, technical studies, and field surveys.

EMWD intends to use this EIR to consider implementation of the proposed project. EMWD's Board of Directors, as the decision-making body for the lead agency, shall consider and certify prior to approving the proposed project that the Draft EIR has been completed in compliance with CEQA, and that the EIR reflects its independent judgment and analysis (CEQA Guidelines Section 15090(a)).

1.3 Draft EIR Organization

This Draft EIR has been organized into the following chapters:

- **Executive Summary.** This chapter summarizes the contents of the Draft EIR.
- **Chapter 1, Introduction.** This chapter discusses the CEQA process and explains the purpose of the Draft EIR.

- **Chapter 2, Project Description.** This chapter provides an overview of the proposed project, describes the need for and objectives of the proposed project, explains planning for construction and operation of the proposed project, and presents a preliminary list of the agencies and entities, in addition to EMWD, that would use this EIR in their consideration of specific permits and other discretionary approvals for the proposed project.
- **Chapter 3, Environmental Setting, Impacts, and Mitigation Measures.** This chapter describes the environmental setting and identifies the direct, indirect, and cumulative impacts of the proposed project for each of the following environmental topics: Aesthetics; Air Quality and Greenhouse Gas Emissions; Biological Resources; Cultural Resources; Energy; Geology and Soils; Hazards and Hazardous Materials; Hydrology and Water Quality; Noise; Transportation; Tribal Cultural Resources; Utilities and Service Systems; and Wildfire. This chapter also summarizes environmental topics for which no significant impact would occur. For the assessment of cumulative impacts, this chapter includes a list of past, current, and probable future projects to be considered together with the proposed project.
- **Chapter 4, Other CEQA Considerations:** This chapter discusses the significant irreversible environmental changes and growth-inducing impacts associated with the proposed project.
- **Chapter 5, Alternatives Analysis.** This chapter presents an overview of the alternatives development process, describes the alternatives to the proposed project that were considered, and describes potential impacts of feasible alternatives relative to those of the proposed project.
- **Chapter 6, Report Preparers.** This chapter identifies the key staff and the authors involved in preparing this Draft EIR.
- **Appendices:** The appendices include materials related to the NOP and scoping process (**Appendix NOP**), as well as technical studies that support the impact analyses, such as an Air Quality, Greenhouse Gas Emissions, and Energy Modeling (**Appendix AQ/GHG/ENERGY**), Biological Resources Technical Report (**Appendix BIO**), Aquatic Resources Delineation Report (**Appendix WATER**), Cultural Resources Technical Report (**Appendix CUL**; *Confidential*), Paleontological Resources Assessment Report (**Appendix PALEO**; *Confidential*), the Tribal Cultural Resources Consultation (**Appendix TRIBAL**), and the Preliminary Design Report prepared for the project (**Appendix PDR**).

1.4 CEQA Environmental Review Process

1.4.1 CEQA Process Overview

The basic purposes of CEQA are to (1) inform decision makers and the public about the potential, significant adverse environmental effects of proposed governmental decisions and activities, (2) identify the ways those environmental effects can be avoided or significantly reduced, (3) prevent significant, avoidable and adverse environmental effects by requiring changes in projects through the use of alternatives or mitigation measures when feasible, and (4) disclose to the public the reasons why an implementing agency may approve a project even if significant unavoidable environmental effects are involved.

An EIR uses a multidisciplinary approach, applying social and natural sciences to make a qualitative and quantitative analysis of all the foreseeable environmental impacts that a proposed project would exert on the surrounding area. As stated in CEQA Guidelines section 15151:

> *An EIR should be prepared with a sufficient degree of analysis to provide decision makers with information which enables them to make a decision which intelligently takes account of environmental consequences. An evaluation of the environmental effects of a proposed project need not be exhaustive, but the sufficiency of an EIR is to be reviewed in the light of what is reasonably feasible.*

This Draft EIR has been prepared to comply with CEQA and the CEQA Guidelines and is to be used by local regulators and the public in their review of the potential significant adverse environmental impacts of the proposed project and alternatives, and mitigation measures that would minimize or avoid those potential environmental effects. EMWD will consider the information presented in this Draft EIR, along with other factors, prior to considering and making any final decisions regarding the proposed project.

1.4.2 Notice of Preparation and Public Scoping

Pursuant to CEQA Guidelines Section 15082, the lead agency is required to send a Notice of Preparation (NOP) stating that an EIR will be prepared to the State Office of Planning and Research (OPR) and responsible and trustee agencies. The NOP must provide sufficient information in order for responsible agencies to make a meaningful response. At a minimum, the NOP must include a description of the project, location of the project, and probable environmental effects of the project (CEQA Guidelines Section 15082(a)(1)). Within 30 days after receiving the NOP, responsible and trustee agencies and OPR shall provide the lead agency with specific detail about the scope and content of the environmental information related to that agency’s area of statutory responsibility that should be included in this Draft EIR (CEQA Guidelines Section 15082(b)).

On November 21, 2022, EMWD published a NOP of an EIR for a 30-day review period and circulated it to OPR and local, state, and federal agencies, including responsible and trustee agencies, as well as organizations and persons who expressed interest in the proposed project. The NOP provided a general description of the proposed project, a description of the proposed project area, and an overview of environmental topics that will be evaluated within the EIR. The NOP was made available at the EMWD’s office, located at 2270 Trumble Road, Perris, CA 92570, as well as at the Moreno Valley Public Library, located at 25480 Alessandro Boulevard, Moreno Valley, CA 92553. The NOP was also available online at the EMWD Web Site (https://www.emwd.org/public-notices). Two NOP comments were received in response to the NOP. A copy of the NOP and comment letters are included in this Draft EIR in **Appendix NOP**.

1.4.3 Draft EIR

This Draft EIR has been prepared pursuant to the requirements of CEQA Guidelines Section 15126. This Draft EIR provides an analysis of reasonably foreseeable impacts associated with the construction and operation of the proposed project. The environmental baseline for determining potential impacts is the date of publication of the NOP for the proposed project unless otherwise indicated (CEQA Guidelines Section 15125(a)). The baseline setting for each environmental topic assessed in this Draft EIR describes the existing conditions as of the publication of the NOP. The impact analysis is based on changes to existing conditions that would result due to implementation of the proposed project.

In accordance with the CEQA Guidelines Section 15126, Chapter 3 of this Draft EIR describes the proposed project site and the existing baseline environmental setting, identifies potential short-term, long-term, and cumulative adverse environmental impacts associated with project implementation, and identifies mitigation measures for potentially significant adverse impacts. Significance criteria are defined at the beginning of each impact analysis section for each environmental topic analyzed in this Draft EIR. In addition, Chapter 4 of this Draft EIR analyzes other types of environmental impacts required by CEQA that are not covered within Chapter 3 including: significant irreversible environmental changes that would be caused by the project and potential growth-inducing impacts. Chapter 5 of this Draft EIR provides an analysis of alternatives to the project.

1.4.4 Draft EIR Public Review

In accordance with Section 15105 of the CEQA Guidelines, this Draft EIR has been submitted to the OPR State Clearinghouse for review by state agencies. In addition, this Draft EIR has been circulated to federal, state, and local agencies and interested parties who may wish to review and provide comments on its contents. A minimum 45-day public review period is required for a Draft EIR submitted to the OPR State Clearinghouse. Please submit all comments to:

Eastern Municipal Water District
2270 Trumble Road or P.O. Box 8300
Perris, CA 92572-8300
Contact: Joe Broadhead, Principal Water Resources Specialist
broadhej@emwd.org

Written comments also may be submitted anytime during the 45-day review period.

1.4.5 Final EIR Publication and Certification

Once this Draft EIR public review period has ended, EMWD will prepare written responses to all timely submitted comments. The Final EIR will be comprised of this Draft EIR, responses to comments received on this Draft EIR, and any changes or corrections to this Draft EIR that are made as part of the responses to comments. As the Lead Agency, EMWD will make the Final EIR available for public review prior to it considering any final decision regarding approval of the proposed project (CEQA Guidelines Section 15089(b)). The Final EIR must be available to commenting agencies at least 10 days prior to certification (CEQA Guidelines Section 15088(b)).

Prior to considering the proposed project for approval, EMWD will review and consider the information presented in the Final EIR and will decide whether to certify that the Final EIR has been adequately prepared in accordance with CEQA. Once the Final EIR is certified, the EMWD Board of Directors may proceed to consider any final decisions regarding the proposed project (CEQA Guidelines Sections15090, 15096(f)). Prior to approving the proposed project, EMWD must make written Findings in accordance with Section 15091 of the CEQA Guidelines. In addition, WMWD must adopt a Statement of Overriding Considerations (SOC) concerning each significant environmental effect identified in the Final EIR (if any) that cannot be fully mitigated to a less than significant level. If one is needed, then the SOC will be included in the record of the proposed project's approval and mentioned in the Notice of Determination (NOD) following CEQA Guidelines Section 15093(c). Pursuant to CEQA Guidelines Section 15094, EMWD will file an NOD with the State Clearinghouse and Riverside County Clerk within five working days, if the proposed project is approved.

1.4.6 Mitigation Monitoring and Reporting Program

CEQA Guidelines Section 15097 requires lead agencies to "adopt a reporting or monitoring project for the changes made to the project or conditions of project approval, adopted in order to mitigate or avoid significant effects on the environment." The mitigation measures, if any, adopted as part of the Final EIR will be included in a Mitigation Monitoring and Reporting Program (MMRP) and implemented by EMWD.

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CHAPTER 2
Project Description

2.1 Overview and Location

Eastern Municipal Water District (EMWD) is proposing to implement the Pettit Water Storage Tank Expansion and Transmission Pipeline Project (proposed project) in Moreno Valley, California. The proposed project would involve installation of two new 4.5 million gallon (MG) storage tanks at the project site, and demolition of an existing 2 MG storage tank. The new tanks would be fed by approximately 4,000 linear feet of proposed transmission pipeline to connect to the proposed Cactus II Feeder. The proposed project would be implemented in two phases: the first phase would involve construction and operation of one 4.5 MG storage tank, onsite and off-site pipeline, and detention basin; the second phase would involve demolition of the existing 2 MG storage tank and installation of a second 4.5 MG storage tank and onsite pipeline in its place. The proposed project would provide additional storage capacity to support planned development in east Moreno Valley.

The proposed water storage tanks would be constructed on two parcels totaling 4.37 acres owned by EMWD located on the western side of Moreno Beach Drive in Moreno Valley (APN 488-170--004; APN 477-310-011). A new energy dissipator would be installed east of Moreno Beach Drive within the right-of-way. The pipeline would be installed within rights-of-way within Moreno Beach Drive and Alessandro Boulevard. Proposed project facilities are shown on **Figure 2-1**.

2.2 Project Background

The proposed project would be located within the 1764 Pettit Pressure Zone, which is EMWD's largest pressure zone in Moreno Valley, extending approximately 11 miles from west to east. The zone receives water from the Mills Water Treatment Plant via the Cactus Booster Pump Station (BPS), Ellsworth BPS, Pettit BPS, Moreno 2 BPS and the Cactus/Nason BPS. The pressure zone contains seven storage reservoirs, with the existing Pettit Tank, Lower Landmark Tanks, and the Wolfskill Tank serving the eastern portion of the pressure zone (see Figure 2-1). Although the existing Pettit Tank is in good condition, it has a floor elevation eight feet higher than the Lower Landmark tanks, limiting the usable storage in Lower Landmark tanks. The new tanks are needed to support planned growth in the eastern portion of the 1764 Pettit Pressure Zone associated with the World Logistics Center and other future development in the area.

SOURCE: ESA (2022)

Pettit Water Storage Tank Expansion and Transmission Pipeline Project

Figure 2-1
Project Location

ESA

2.3 Project Objectives

The overall intent of the proposed project is to increase potable water storage capacity within the eastern region of the 1764 Pettit Pressure Zone which is currently served by EMWD. The objectives of the proposed project are as follows:

- Provide replacement tanks to increase potable water storage capacity to meet near- and long-term demands associated with planned development in eastern Moreno Valley.
- Provide a transmission pipeline to connect the replacement tanks with existing and proposed infrastructure.
- Maximize usable storage capacity of other tanks within the 1764 Pettit Pressure Zone.
- Further EMWD's strategic planning goal to develop adaptable water storage and delivery system improvements to manage uncertain delivery conditions and emergency outages.

2.4 Project Description

The proposed project site contains one existing 2 MG water storage tank that has serviced surrounding development since its construction in 1971. The proposed project would involve construction of a new 4.5 MG steel storage tank adjacent to the existing tank, transmission pipeline, and stormwater drainage facilities, including a drainage ditch, detention basin, 18-inch storm drain, energy dissipators, and related improvements as part of the Phase 1 project. Under buildout conditions that are expected to occur after 2045, the Phase 2 project would involve demolition of the existing 2 MG storage tank and construction of a second 4.5 MG storage tank in its place. Total capacity at the project site would encompass 9 MG.

2.4.1 Phase 1 Project

Water Storage Tank

As part of the Phase 1 project, EMWD would construct a new 4.5 MG steel storage tank to the north of the existing 2 MG storage tank, which would remain in service during Phase 1. The existing tank site currently is developed and graded and includes several ornamental trees. The Phase 1 tank would be approximately 137.5 feet in diameter and approximately 52 feet in height. The tank would be comprised of pre-stressed concrete or welded steel. Grading, excavation, and potential blasting would be required to construct the tank foundation that would extend approximately 10 feet to 35 feet below ground surface (bgs). The majority of grading required to install the Phase 2 storage tank would be completed under Phase 1. A preliminary site plan for Phase 1 is shown on **Figure 2-2**.

Water would be supplied to and from the water storage tank via the proposed transmission pipeline discussed further below. A series of inlet and outlet pipes would be installed onsite to connect the tank to the proposed transmission pipeline. Water supply to the tank would be pumped primarily from the existing Cactus Ave BPS within the 1764 Pettit Pressure Zone via the future Cactus II Feeder, which is under construction and will be completed by 2026. Water supply from the proposed water storage tank to the distribution system would be provided by gravity.

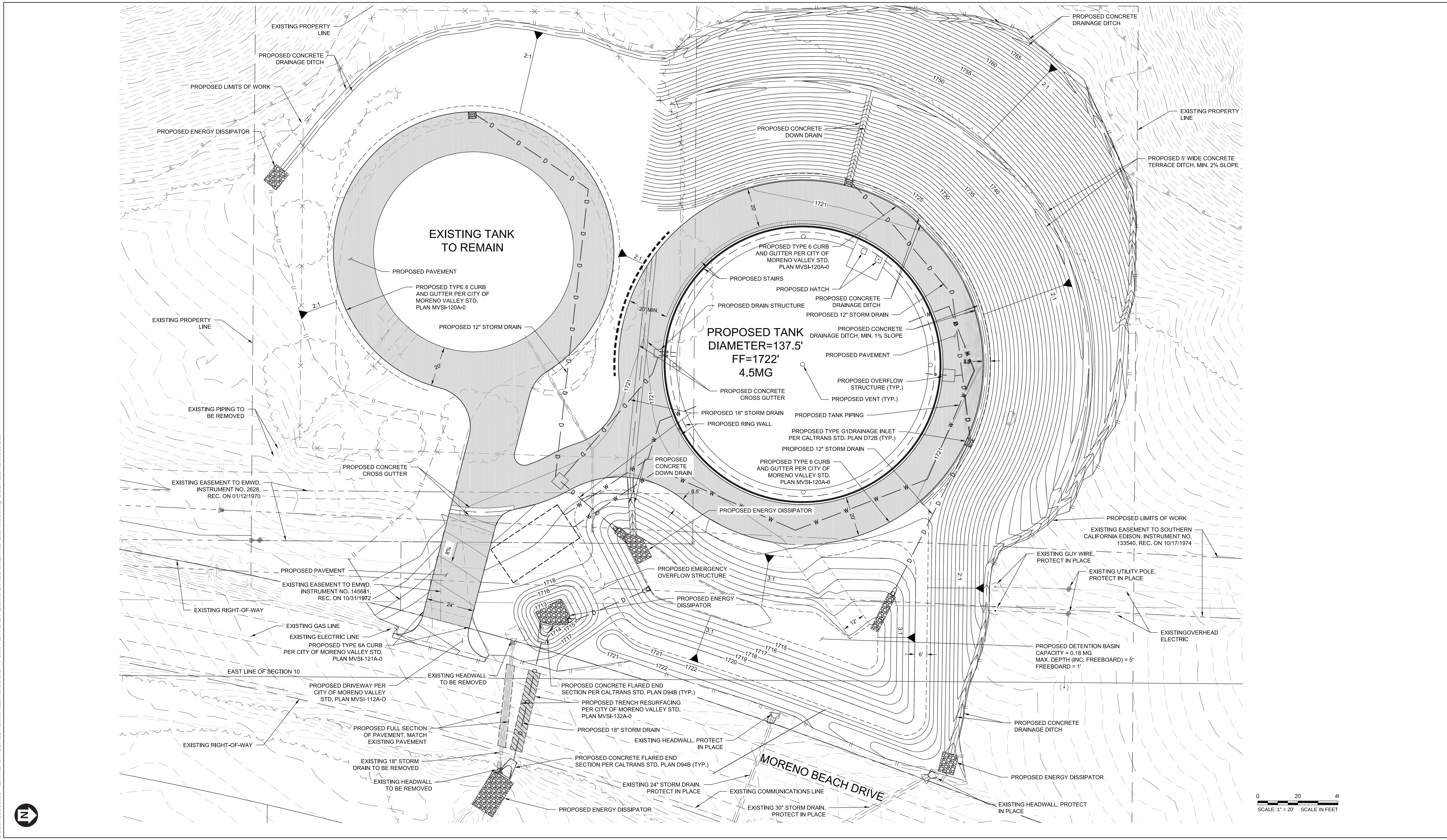
Site improvements would be required to accommodate the Phase 1 tank. A 20-foot access road would be paved around the new tank and a new 25-foot driveway/entrance to the site would be paved in accordance with City of Moreno Valley specifications. Proposed water storage tank appurtenances include lighting and an antenna tower (approximately 40 feet high by 3 feet wide) to be used for SCADA control.

Stormwater Drainage Facilities

The area surrounding the proposed project site does not have engineered stormwater management facilities. As a result, the current drainage design concept includes proposed onsite and offsite drainage facilities that would allow a storm event to be conveyed through and around the site without impacting the water storage tank and other site facilities. The drainage features are shown in Figure 2-2.

At the west end of the project site, a portion of the existing hill would be graded to accommodate both tanks and a retaining wall would be installed between the two tanks due to an elevation difference in the interim condition (Phase 1). To convey storm flows safely around the project site, a concrete drainage ditch would be constructed around the limits of the project site. Additionally, a proposed concrete down drain and a series of 12-to-18-inch storm drains would be installed to safely convey flows onsite. An emergency overflow structure would also be installed on the eastern portion of the project site as would a 0.18 MG detention basin, which would collect flow from all onsite storm drain inlets. The emergency overflow structure and detention basin would primarily be used for onsite stormwater drainage. In emergency situations if the tank itself overflowed, the emergency overflow structure could process 29 cubic feet/second (CFS) of water from the tank which would flow into culverts under Moreno Beach Drive and deposit on the vacant land to the east.

Stormwater would flow to four proposed energy dissipaters at the northern, southern and eastern boundaries of the project site, and would exit the project site in several locations. The first is via an existing 30-inch storm drain at the northeastern corner of the project site that would convey flow under Moreno Beach Drive. The second is via a proposed 18-inch storm drain to be installed under Moreno Beach Drive at the eastern-most portion of the project site. One existing 24-inch storm drain would continue to be used while another 18-inch storm drain adjacent to the proposed 18-inch storm drain would be abandoned. Offsite improvements on the eastern side of Moreno Beach Drive include an energy dissipater (culvert, headwall, and riprap) to contain flow. Drainage facilities are shown on Figure 2-2. This activity would occur within the City of Moreno Valley right-of-way and would require an encroachment permit.



SOURCE: Kleinfelder, 2020

Pettit Water Storage Tank Expansion and Transmission Pipeline Project

Figure 2-2
Proposed Phase 1 Site Plan

ESA

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Transmission Pipeline

A 24-to-30-inch transmission pipeline would be installed to connect the water storage tank to the future Cactus II Feeder within Alessandro Boulevard. The pipeline would be installed to the west of the roadway centerline and entirely within existing rights of way of Moreno Beach Drive and Alessandro Boulevard. **Figure 2-3** shows the pipeline and associated work limits. The pipeline would be approximately 4,000 linear feet in length and would be installed with at least 48 inches of cover per EMWD standard detail B-286B as shown on **Figure 2-4**. The pipeline would be installed at depths of up to 10 feet bgs to avoid utilities within Moreno Beach Drive, including sewer, water, storm drain, electric, telecommunication, and gas pipelines. The pipeline would be equipped with typical appurtenances such as blow-offs (to facilitate pipeline flushing and dewatering activities) and combination air valves (to facilitate release and admittance of air for safe and efficient operation of the pipeline). The appurtenances would be installed above grade per EMWD standard details B-351 and B-578, respectively.

Staging Areas

Staging areas for construction of the water storage tank would be located within the tank site. Construction of the transmission pipeline would require staging areas along the pipeline corridor outside of the tank site. These areas have been identified within the pipeline “work area” on Figure 2-3.

2.4.2 Phase 2 Project

Water Storage Tank

As part of the Phase 2 project, the 2 MG tank and supporting infrastructure such as pipelines and vaults would be demolished. EMWD would construct a new 4.5 MG steel storage tank in its place just south of the tank installed as part of the Phase 1 project. Similar to the Phase 1 tank, the Phase 2 tank would be approximately 137.5 feet in diameter and approximately 52 feet in height. The tank would be comprised of pre-stressed concrete or welded steel. Grading, excavation, and potential blasting would be required to construct the tank foundation that would extend approximately 10 feet to 35 feet bgs. A preliminary site plan for Phase 2 is shown on **Figure 2-5**.

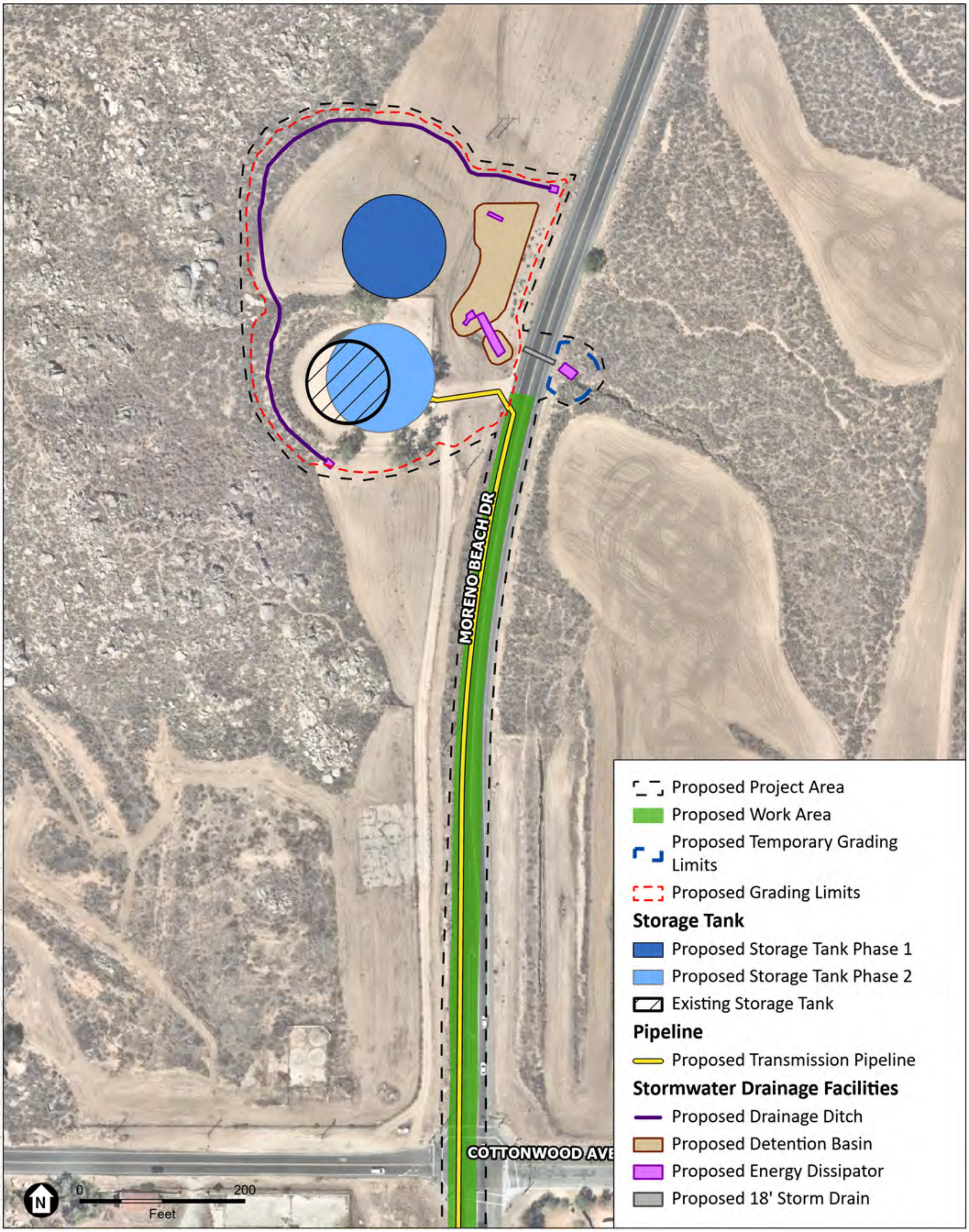
The pipelines and grading/drainage improvements installed as part of Phase 1 would support the second tank onsite. The site would be re-paved and re-graded to support the tank expansion. The retaining wall installed as part of Phase 1 would be demolished.

Additional power needed to supply the new storage tank would be supplied by one of two options:

1. **Solar panels:** Under this option, solar modules would be mounted on a 3-inch pole located on top of the new southern storage tank. The solar system would have a total capacity of 320W.
2. **Moreno Valley Electric Utility (MVU):** Under this option, EMWD would bring in MVU power to the project site.

Staging Areas

Staging areas for construction of the water storage tank would be located on the tank site in an already-improved area.

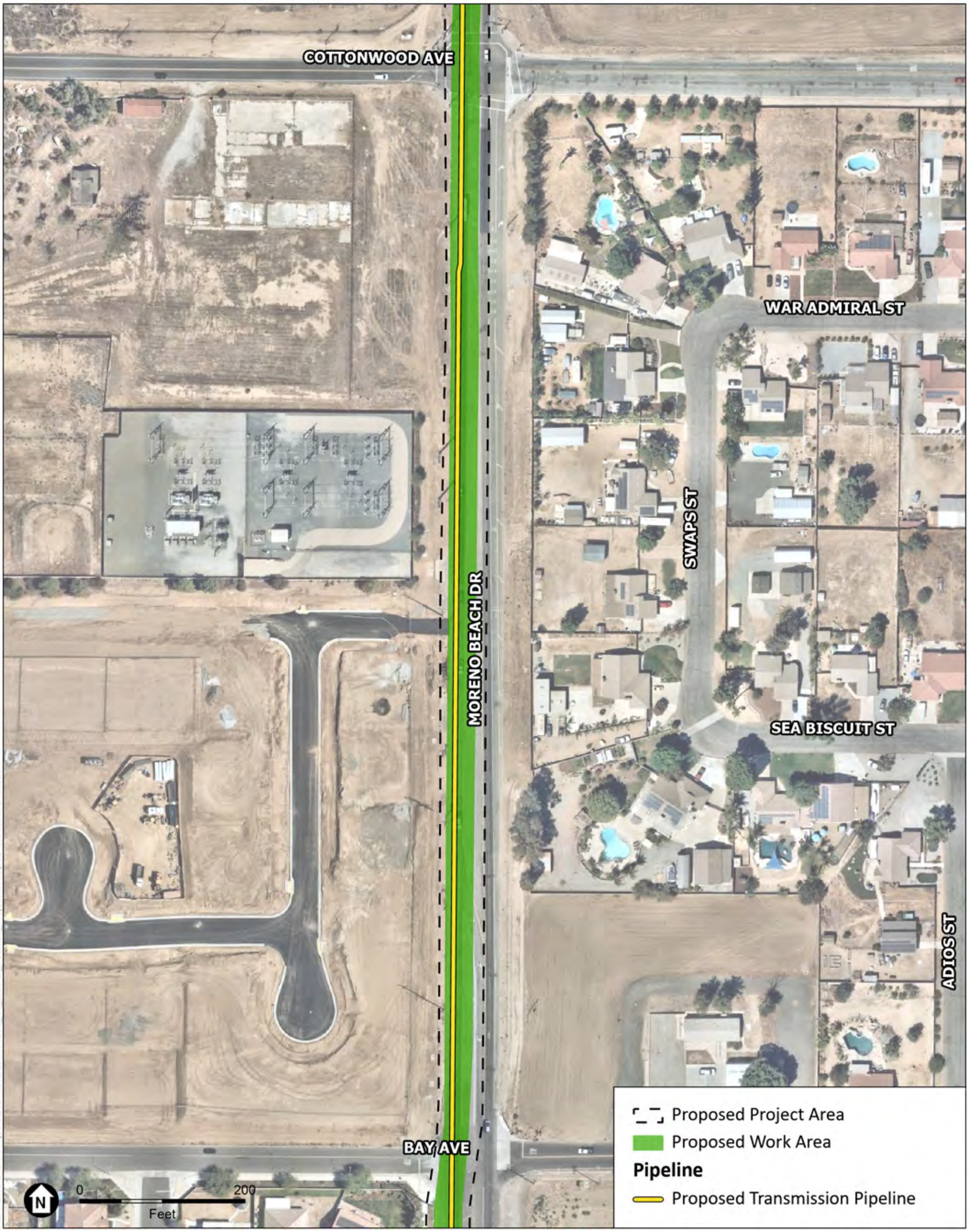


SOURCE: Nearmap (2022), ESA (2022)

Pettit Water Storage Tank Expansion and Transmission Pipeline Project

Figure 2-3a
Project Detail

ESA

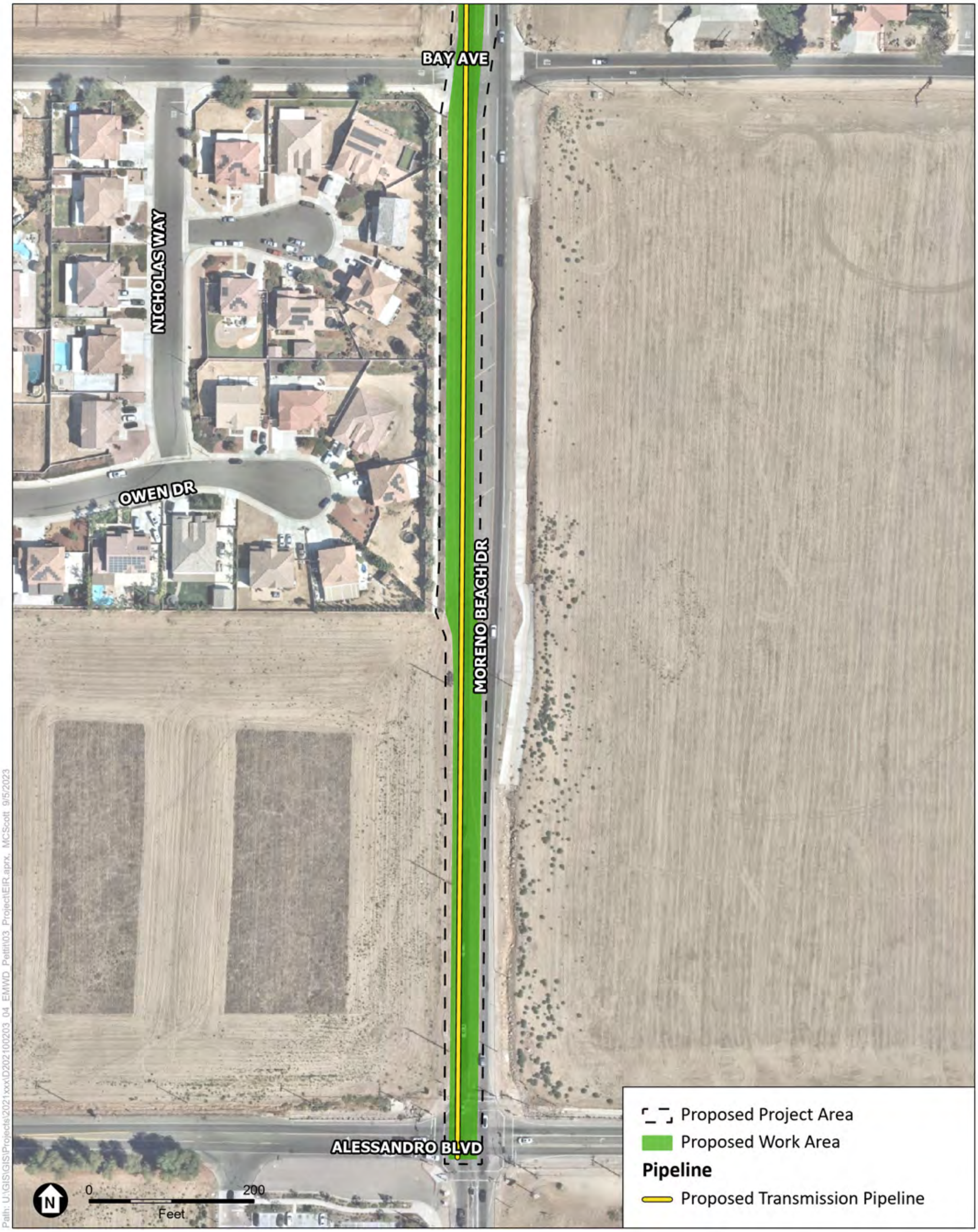


SOURCE: Nearmap (2022), ESA (2022)

Pettit Water Storage Tank Expansion and Transmission Pipeline Project

Figure 2-3b
Project Detail

ESA

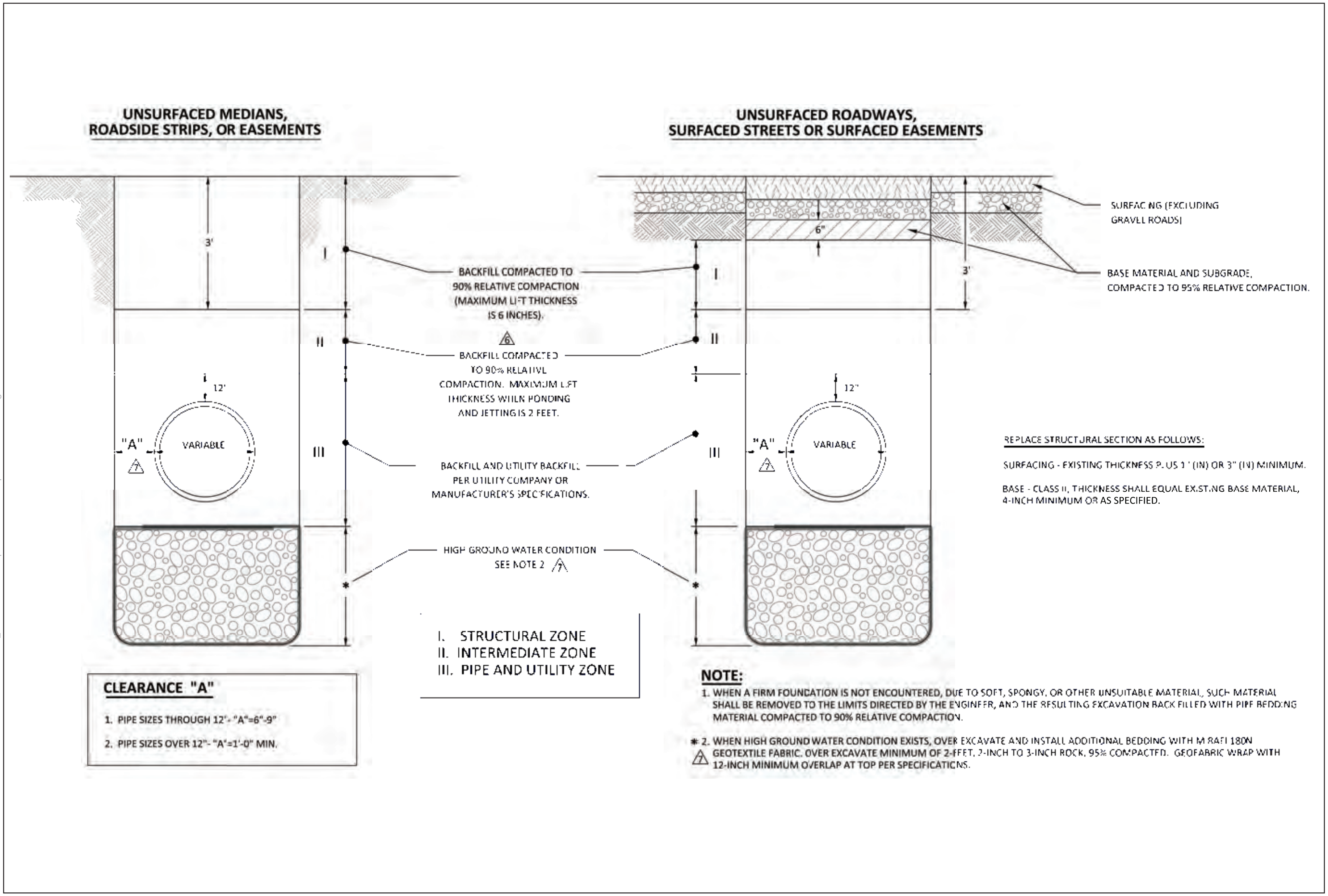


SOURCE: Nearmap (2022), ESA (2022)

Pettit Water Storage Tank Expansion and Transmission Pipeline Project

Figure 2-3c
Project Detail

ESA



SOURCE: EMWD

Pettit Water Storage Tank Expansion and Transmission Pipeline Project

Figure 2-4
Typical Pipeline Cross Section

ESA

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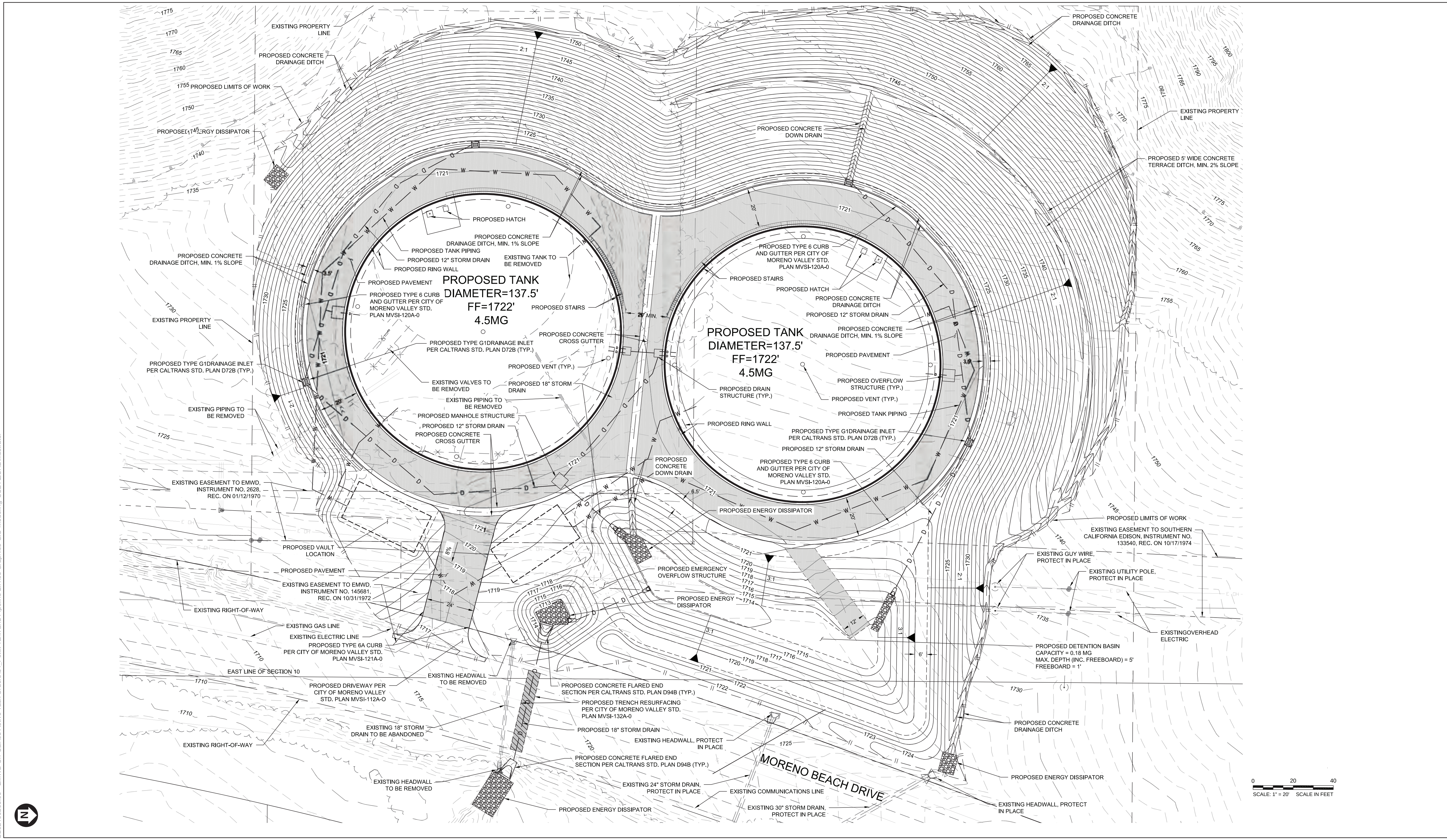

SOURCE: Kleinfelder, 2020

Pettit Water Storage Tank Expansion and Transmission Pipeline Project

Figure 2-5
Proposed Phase 2 Site Plan

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2.5 Construction

2.5.1 Construction Schedule

Construction of the Phase 1 project facilities is assumed to begin in 2026. Construction of the water storage tank would take approximately 10 months and the transmission pipeline would take approximately 5 months. It is assumed there would be overlap of construction of both Phase 1 pipeline and tank and related facilities. Phase 1 is assumed to be completed by mid-2027.

Phase 2 would be initiated around year 2045 based on development needs within the pressure zone. Construction of the Phase 2 water storage tank would take approximately 10 months.

Construction would occur consistent with the City of Moreno Valley municipal codes, which allows construction activities between 7:00 a.m. to 8:00 p.m. Monday through Saturday, or as otherwise specified by the City within the encroachment permit for work within City rights-of-way. No construction activities would occur on Sunday or on holidays. Nighttime work would not be required.

2.5.2 Water Storage Tank and Associated Facilities

Construction of the water storage tank would require use of concrete/industrial saws, rubber-tired dozers, tractors/loaders/backhoes, compactors, excavators, graders, off-highways trucks, scrapers, water trucks, trenchers, hydraulic hammers, jackhammers, concrete mixers, pumps, air compressors, cranes, and welding materials along with supporting equipment. Construction would entail demolition of the existing tank, site clearing/preparation, grading, excavation and earth moving, potential blasting, stormwater drainage installation, tank installation, paving, testing, and start up.

Installation of the proposed water storage tanks would involve excavation up to 35 feet bgs. Construction of the water storage tanks and associated facilities would result in approximately 56,536 cubic yards of soil/rock and 120 cubic yards of demolition debris that would need to be disposed of offsite: 42,402 cubic yards of soil/rock for Phase 1 and 14,134 cubic yards of soil/rock and 120 cubic yards of demolition debris for Phase 2. This would result in approximately 3,029 truck trips for Phase 1 with a maximum of 118 trucks per day and 1,017 truck trips for Phase 2 to/from the project site with a maximum of 42 trucks per day, assuming 14 cubic yards of material per truck. No fill would be imported to the site. Equipment may be temporarily staged at the proposed water storage tank site.

Blasting may be required to extract bedrock material. Blasting would involve controlled use of explosives or other materials to break up the bedrock material. Holes would be drilled and then filled with blasting agent (ammonium-nitrate fuel oil), followed by detonation of each hole. Blasting blankets would be used to contain dust and materials. Once loosened by blasting, the material would be removed by bulldozer and exported offsite (quantities included in cubic yard estimates above). The transportation, storage, and handling of explosives and the associated hazardous substances would be performed or supervised by a licensed explosives expert contracted by EMWD.

A total of up to 10 workers would be needed per day for construction activities associated with each Phase.

2.5.3 Transmission Pipeline

Construction of the proposed transmission pipeline would involve conventional cut and cover trenching technique and could use concrete/industrial saws, compactors, excavators, graders, off-highway trucks, scrapers, water trucks, tractors/loaders/backhoes, trenchers, hydraulic hammers, and jackhammers. The trenching activities would include saw cutting of the pavement where applicable, trench excavation, shoring, pipe installation, trench backfill and compaction, site restoration/pavement replacement, as applicable, and testing. Approximately 2,000 cubic yards of soil would need to be disposed of offsite as a result of pipeline installation. This would result in approximately 143 truck trips to/from the project site, assuming 14 cubic yards of material per truck. This soil was assumed to be hauled off with the excavated soil from construction of the water tank under Phase 1, included in the total maximum of 118 trucks per day. No fill would be imported to the site. The transmission pipeline would be installed up to 120 inches (10 feet) bgs. Localized trench and pipeline dewatering may be required, and water collected from dewatering would be discharged to the nearest sewer manhole or stormwater system if no manhole is available. This may require issuance of a dewatering permit from the Santa Ana Regional Water Quality Control Board (RWQCB) for discharges to the stormwater system.

Construction of the pipeline would require room for access, staging, and off-loading of materials and spoil, which would be accommodated within the work area shown on Figure 2-3. For the 24-to-30-inch pipeline, approximate typical pipeline progress is 80 feet per day. Trenches would be backfilled at the end of each work day or temporarily closed by covering with steel trench plates. Once constructed, pipeline segments would be contained entirely below ground, except for any above-grade pipeline appurtenances such as blow-offs or hydrants.

Work within roadways would potentially require localized closure of traffic lanes, including portions of Moreno Beach Boulevard, Bay Avenue, Cottonwood Avenue, and Alessandro Boulevard. Traffic control would be necessary during pipeline construction within roadways. Typically, two to four workers would be required for traffic control during pipeline installation. Equipment necessary for traffic control includes changeable message signs, delineators, arrow boards, and K-Rails. The Traffic Control Plan for the proposed project would be coordinated with the City of Moreno Valley.

Approximately 5 to 10 workers would be required during various phases of pipeline installation.

2.6 Operation and Maintenance

The existing Cactus Ave BPS within the 1764 Pettit Pressure Zone (see location on Figure 2-1 inset) would be used to pump water to the proposed water storage tank site. The existing pumps have sufficient capacity to accommodate the project without any upgrades. These existing pumps are located within an enclosed structure to minimize operational noise. Water stored in the tank would be gravity fed to the connection point at the intersection of Moreno Beach Drive and Alessandro Boulevard and would not require the use of new pumps.

Onsite permanent lighting at the proposed water storage tank site would be shielded downwards to minimize the amount of light cast on adjacent properties.

As shown in the *Preliminary Design Report for the Pettit 1674-Zone Storage Water Tank Expansion and Transmission Pipeline Project, Appendix F Preliminary Landscape Plan,* which is included as **Appendix PDR** to this DEIR, EMWD would implement trees, shrubs, and ground covers to provide screening of the water storage tanks (Kleinfelder 2017). The preliminary landscape plan is included as **Figure 2-6**.

The proposed water storage tanks would require weekly maintenance consisting of a maximum of two service truck trips per week (1/2 ton pickup). The water storage tanks would only be drained for emergency situations. The transmission pipeline would be installed underground and would not require regular maintenance. No new employees would be required to operate the facilities.

2.7 Energy Consumption

Additional power needed to operate appurtenant facilities associated with the Phase 2 project would be supplied by solar panels or a new SCE connection. The system would have a total capacity of 320W. An emergency generator would not be required. Facilities to be powered include tank mixer, instrumentation, telemetry, lighting, and security devices. Based on current usage, the existing 2 MG storage tank consumes approximately 16,050 kilowatt hour per year (kWh/yr). The estimated additional energy needed for the Phase 1 project is 36,113 kWh/yr, with an additional 56,175 kWh/yr needed for the Phase 2 project, for a total of 92,288 kWh/yr.

Weekly maintenance activities would require travel from the nearest EMWD facility (approximately 10 miles) to the proposed water storage tank site. This round trip would be 20 miles per week of vehicle travels plus the fossil fuel consumption from the monthly deliveries for chemical stocking. Operational activities would not otherwise require the consumption of natural gas.

2.8 Proposed Project Approvals

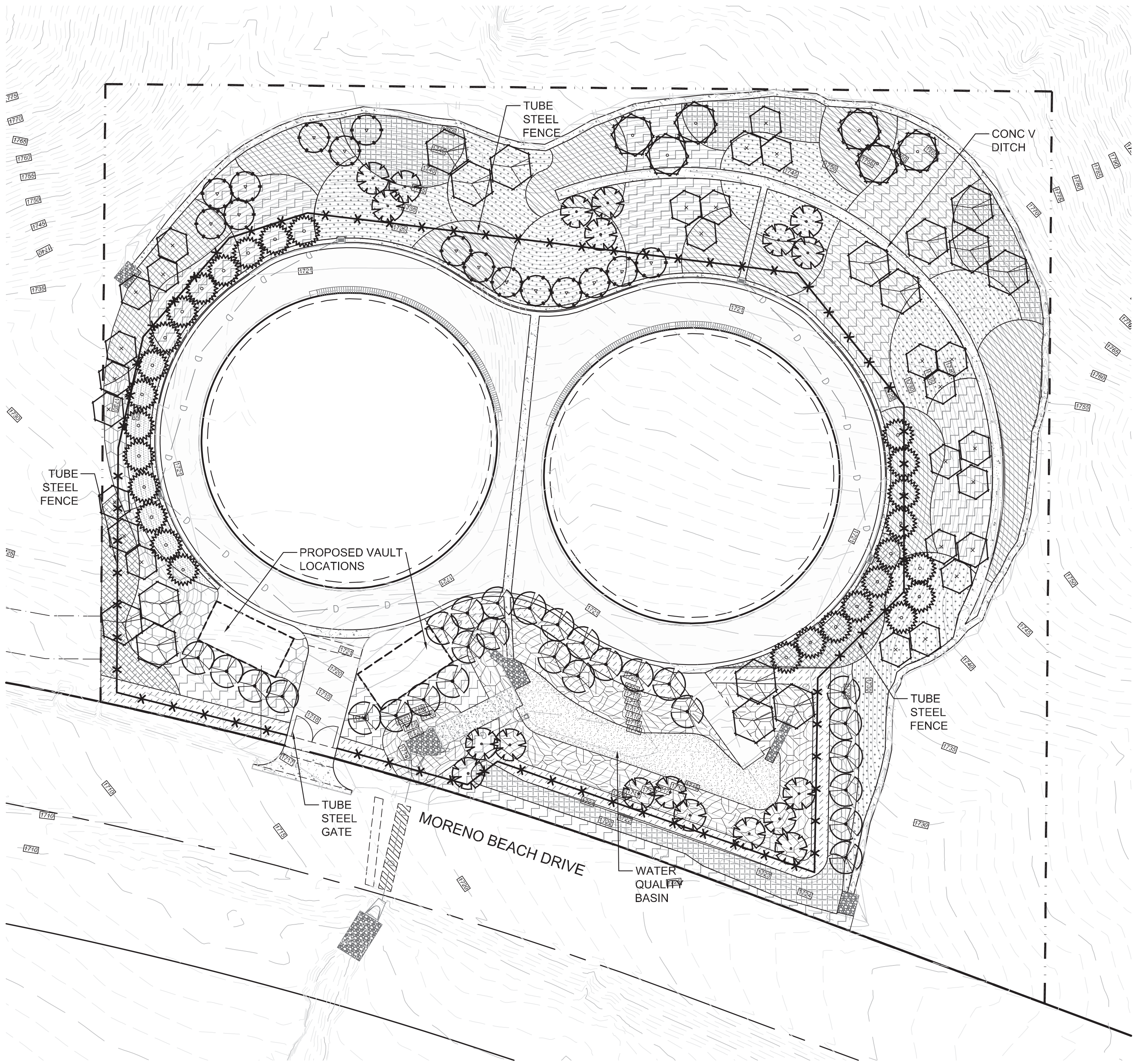
Table 2-1 presents a preliminary list of the agencies and entities in addition to EMWD that would use this EIR in their consideration of specific permits and other discretionary approvals that may apply to this project:

TABLE 2-1
REGULATORY PERMITS AND AUTHORIZATIONS

Agency	Type of Approval	Needed for
California Regional Water Quality Control Board, Santa Ana Region	Construction General Permit	Construction-related stormwater discharges
	401 Water Quality Certification	Discharge of dredge or fill material into waters of the State
California Department of Fish and Wildlife	Lake or Streambed Alteration Agreement (Section 1602 of Fish and Game Code)	Any activity that may substantially modify a river, stream, or lake
City of Moreno Valley	Encroachment Permit	Construction activities within rights-of-way

2.9 References

Kleinfelder, 2017. *Preliminary Design Report for the Pettit 1674-Zone Storage Water Tank Expansion and Transmission Pipeline Project*. Prepared September 12, 2017.



PLANT SCHEDULE

TREES	BOTANICAL NAME	SIZE	WUCOLS	SPACING	QTY
	ARCTOSTAPHYLOS MANZANITA `DR. HURD` Dr. Hurd Manzanita	24"BOX	L		26
	KOELREUTERIA BIPINNATA Chinese Flame Tree	24"BOX	L		19
	LAURUS NOBILIS Sweet Bay	24"BOX	L		15
	MYRICA CALIFORNICA Pacific Wax Myrtle	24"BOX	L		6
	PINUS ELDARICA Afghan Pine	24"BOX	L		28
	RHUS LANCEA African Sumac	24"BOX	L		15
	TRISTANIA CONFERTA Brisbane Box	24"BOX	M		28
SHRUB AREAS	**BOTANICAL NAME**	**SIZE**	**WUCOLS**	**SPACING**	**QTY**
	ACACIA REDOLENS Bank Catclaw	1 GAL	L	72" o.c.	352
	CEANOTHUS ARBOREUS `POWDER BLUE` Ceanothus	1 GAL	L	72" o.c.	95
	ECHIUM CANDICANS Pride Of Madeira	1 GAL	L	96" o.c.	106
	LANTANA X `NEW GOLD` New Gold Lantana	1 GAL	L	72" o.c.	483
	LIGUSTRUM JAPONICUM `TEXANUM` Wax Leaf Privet	1 GAL	L	96" o.c.	94
	PRUNUS ILICIFOLIA LYONII Catalina Cherry	1 GAL	L	96" o.c.	19
	PYRACANTHA KOIDZUMII `SANTA CRUZ` Santa Cruz Pyracantha	1 GAL	L	72" o.c.	400
	RHAMNUS CALIFORNICA `LEATHERLEAF` California Coffeeberry	1 GAL	L	72" o.c.	41
	WESTRINGIA FRUTICOSA Coast Rosemary	1 GAL	L	72" o.c.	114
GROUND COVERS	**BOTANICAL NAME**	**SIZE**	**WUCOLS**	**SPACING**	**QTY**
	BACCHARIS PILULARIS `PIGEON POINT` Coyote Brush	FLAT	L	24" o.c.	2,056
	CAREX PANSA Sanddune Sedge	FLAT	L	18" o.c.	1,315

SOURCE: BMLA Landscape Architecture, 2022

Figure 2-6
Preliminary Landscape Plan

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CHAPTER 3

Environmental Setting, Impact Analysis, and Mitigation Measures

3.0 Introduction to the Analysis

In compliance with CEQA Guidelines Sections 15125 and 15126, Chapter 3 of this Draft EIR provides an analysis of the significant environmental effects of the Pettit Water Storage Tank Expansion and Transmission Pipeline Project (proposed project) with respect to existing baseline conditions. The baseline environmental conditions for the analysis included within this Draft EIR are generally from November 2022 when the Notice of Preparation (NOP) was published, except where otherwise noted in each environmental section. The following environmental topics are assessed in detail in this chapter in accordance with CEQA Guidelines Appendix G:

- Aesthetics
- Air Quality and Greenhouse Gas Emissions
- Biological Resources
- Cultural Resources
- Energy
- Geology and Soils
- Hazards and Hazardous Materials
- Hydrology and Water Quality
- Noise
- Transportation
- Tribal Cultural Resources
- Utilities and Service Systems
- Wildfire

The CEQA Guidelines Section 15128 requires that an EIR "contain a statement briefly indicating the reasons that various possible significant effects of a project were determined not to be significant and therefore were not discussed in detail in the EIR." The following environmental topics from CEQA Guidelines Appendix G are not discussed in detail in this Draft EIR because no significant impacts could occur as a result of implementation of the proposed project:

- Agriculture and Forestry Resources
- Land Use and Land Use Planning
- Mineral Resources
- Population and Housing
- Public Services
- Recreation

The effects found not to be significant associated with these environmental topics are explained further below in Section 3.0.2, *Effects Found Not to Be Significant*.

3.0.1 Format of the Environmental Analysis

This Draft EIR provides analysis of impacts for those environmental topics where it was determined in the NOP, or through subsequent analysis, that the proposed project would result in "potentially significant impacts." Sections 3.1 through 3.13 discuss the environmental impacts that may result with approval and implementation of the proposed project. The format of the environmental analysis for each environmental topic included in Sections 3.1 through 3.13 includes an environmental setting, regulatory framework summary, impact analysis and mitigation measures (if required), and references.

"Significant effect" is defined by the CEQA Guidelines Section 15382 as "a substantial, or potentially substantial, adverse change in any of the physical conditions within the area affected by the project including land, air, water, minerals, flora, fauna, ambient noise, and objects of historic or aesthetic significance. An economic or social change by itself shall not be considered a significant effect on the environment. A social or economic change related to a physical change may be considered in determining whether the physical change is significant."

Determining the severity of project impacts is fundamental to achieving the objectives of CEQA. The level of significance for each impact examined in this Draft EIR was determined by considering the predicted magnitude of the impact to baseline environmental conditions against the applicable threshold. Thresholds were developed using criteria from the CEQA Guidelines and Appendix G Checklist; state, federal, and local schemes; local/regional plans and ordinances; accepted practice; consultation with recognized experts; and other professional opinions.

The assessment of each issue area begins with any relevant baseline setting information that is needed to provide context for the impact analysis that follows. Extraneous setting information that does not shed light on the impact analysis is not included in this Draft EIR.

The impact analysis includes any necessary description of methodologies used and the "significance thresholds," which are those criteria adopted by the State, County, City, or other agencies, universally recognized, or developed specifically for this analysis to determine whether potential effects are significant. Each effect under consideration for an issue area is separately listed with the discussion of the effect and its significance following. Each potentially significant impact includes a numbered impact statement and significance determination.

Following each environmental effect discussion is a list of mitigation measures (if required) and the residual effects or level of significance remaining after the implementation of the measures. In those cases, where the mitigation measure for an impact could have a significant environmental impact in another issue area, this impact is discussed as a residual effect.

Environmental Setting and Baseline

In accordance with CEQA Guidelines Section 15125(a), the environmental setting contains a description of the regional and local physical environmental conditions in the project vicinity at the time of the publication of the NOP (November 2022). This environmental setting constitutes the baseline physical condition against which the implementation of the proposed project is assessed in order to determine whether an environmental impact would occur (CEQA Guidelines Section 15126.2(a)). The Phase 1 project is anticipated to begin construction in 2026 and the Phase 2 project is anticipated to be implemented around year 2045; both phases use the November 2022 baseline unless noted otherwise. Individual resource sections may use alternative baselines, as discussed in each respective section.

Regulatory Framework

Where the project site and/or surrounding area falls within the jurisdiction of federal, state, and local regulatory agencies, the proposed project would be subject to the laws, rules, regulations, and policies of those agencies. These regulations are intended to guide development, reduce adverse effects on sensitive resources, and/or offer general guidance on the protection of such resources. The regulatory framework section summarizes the applicable laws, rules, regulations, and policies for the proposed project. These rules may also set the standards, in the form of significance criteria or thresholds of significance as discussed below, by which the potential impacts of the proposed project are evaluated.

Impact Analysis and Mitigation Measures

Significance Criteria and Methodology

This section presents the significance criteria against which potential impacts are evaluated. As defined by CEQA Guidelines Section 15064.7(a), thresholds of significance are an identifiable quantitative, qualitative, or performance standard for the assessment of a particular environmental impact. Significance criteria are included for each environmental topic according to Appendix G of the CEQA Guidelines.

Impact Analysis

This section provides an analysis of the potential environmental impacts that could result from implementation of the proposed project. This Draft EIR addresses the direct, indirect, and cumulative impacts associated with implementation of the proposed project, including short-term and long-term impacts.

The level of significance for each environmental impact examined in this Draft EIR was determined by considering the predicted magnitude of the impact in relation to baseline environmental setting and the applicable regulatory requirements, measured against the significance criterion. Based on the significance criterion, the significance of each potential environmental impact is determined according to the following categories:

- **Less than Significant Impact with Mitigation:** A potentially significant impact occurs if the proposed project could result in a potentially substantial adverse change in the physical conditions of the environmental topic being evaluated. If such a determination is made, reasonably available and feasible mitigation measures must be considered if they would avoid or substantially reduce the significant impact. An impact that can be reduced to below the significance threshold with such mitigation measures is considered less than significant with mitigation. Such an impact requires findings to be made under Section 15091 of the CEQA Guidelines.

- **Less than Significant Impact:** A less than significant impact is an impact that may be adverse, but does not exceed the significance threshold and does not require mitigation measures. However, mitigation measures that could further lessen the environmental effect may be suggested if readily available and easily achievable.
- **No Impact:** A no impact determination would occur if the project would not result in a substantive change to the environmental topic that is being evaluated.

Mitigation Measures and Significance Determination

Mitigation measures are recommended for any identified potentially significant impacts as a result of the proposed project. The significance determination provides the level of significance after the implementation of recommended mitigation measures, if applicable, based on the categories described above.

3.0.2 Effects Found Not to Be Significant

Agriculture and Forestry Resources

The proposed project would not convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use.

According to the California Department of Conservation's (DOC) Important Farmland Finder, the proposed project storage tanks and pipeline are located within urban and built-up land, and land designated as "other" (DOC 2016). As a result, implementation of the proposed project would not result in the conversion of any Farmland to non-agricultural use. No impact would occur.

The proposed project would not conflict with existing zoning for agricultural use, or a Williamson Act contract.

The *Williamson Act Status Report* shows that there are no active Williamson Act Contracts in the vicinity of the proposed storage tanks or pipeline (DOC 2021). Therefore, no impacts to Williamson Act Contracts would occur.

The proposed project would not conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 12220(g)), timberland (as defined by Public Resources Code section 4526), or timberland zoned Timberland Production (as defined by Government Code section 51104(g)).

The project area is zoned as Residential Agriculture 2 DU/AC (RA2) (City of Moreno Valley 2020), the primary purpose of which "is to provide for suburban life-styles on residential lots larger than are commonly available in suburban subdivisions and to provide for and protect the rural and agricultural atmosphere, including the keeping of animals, that have historically characterized these areas (City of Moreno Valley 2021a)." This zoning category is intended as an area for development of large lot, single-family residential development at a maximum allowable density of two dwelling units per acre. California Government Code Section 53091 specifies that water supply facilities such as those associated with the proposed project, are exempt from zoning restrictions of local municipalities. Specifically, Section 53091 states: "Zoning ordinances of a county or city shall not apply to the location or construction of facilities for the production, generation, storage, treatment, or transmission of water." Therefore, the proposed project construction and operation would not conflict with existing zoning or cause rezoning of forest land. Additionally, there is no land designated as Timberland within the project area; therefore, no impacts regarding zoning or rezoning of forest lands or timberlands would occur.

The proposed project would not result in the loss of forest land or conversion of forest land to non-forest use.

Because the project is not zoned as forest land, the proposed project would not result in the loss of forest land or conversion of forest land to non-forest use. No impact would occur.

The proposed project would not involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use or conversion of forest land to non-forest use.

Implementation of the project would not result in any other changes that would result in conversion of farmland to non-agricultural use or conversion of forest land to non-forest use.

Land Use and Land Use Planning

The proposed project would not physically divide an established community.

The physical division of an established community generally refers to the construction of features that would impact mobility within an existing community or between a community and outlying area, such as an interstate highway, railroad tracks, or permanent removal of a means of access, such as a local road or bridge. The proposed project includes installation of new storage tanks and the implementation of an underground transmission pipeline. The aboveground storage tanks are not linear features that would create a barrier or physically divide an established community. Although the proposed transmission pipeline is a linear feature, it would be installed underground and as such would not permanently divide an established community. As a result, no impact would occur.

The proposed project would not cause a significant environmental impact due to a conflict with any land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect.

As described above, the proposed storage tanks would be located within the City of Moreno Valley in a rural residential area zoned as RA2, which is intended as an area for development of large lot, single-family residential development at a maximum allowable density of two dwelling units per acre. The proposed transmission pipeline would be implemented within the public right-of-way of Moreno Beach Drive. Per Government Code Section 53091, building ordinances of local cities or counties do not apply to the location or construction of facilities for the projection, generation, storage, treatment, or transmission of water or wastewater. Therefore, implementation of the proposed project would not conflict with land use designations or be incompatible with neighboring land uses or be subject to conditional use permit or general plan amendments. Furthermore, the construction of water utilities fundamentally supports the vitality of surrounding communities, and are recognized within the City of Moreno Valley General Plan as essential development features needed to support all land uses throughout the communities (City of Moreno Valley 2006). As a result, there would be no conflict with the City of Moreno Valley's land use plan, policy, or regulation.

Mineral Resources

The proposed project would not result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state.

According to the DOC, the project area is located in the *San Bernardino Production-Consumption Region* (San Bernardino and Riverside Counties, CA), which contains Portland cement concrete-grade aggregates (DOC 2008a). The majority of the area is classified as MRZ-3, where the significance of mineral deposits is undetermined or within "Urban Areas." There are isolated areas designated as MRZ-2 throughout the city, which are areas underlain by mineral deposits where geologic information indicates that significant inferred resources are present (DOC 2008b). None of the project facilities would be within close proximity to the lands that contain these mineral resources. The proposed project areas are not used for mineral extraction and do not contain mineral resources of economic value. Additionally, the proposed project facilities would involve superficial excavation to install utilities and would not result in the loss of a known mineral resources. As such, no impact would occur to known mineral resources.

The proposed project would not result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan.

According to the City of Moreno Valley General Plan Final EIR (pages 4.1-2 through 4.1-3), the entire project area is classified as MRZ-3, which are areas where the significance of the mineral deposits is undetermined (City of Moreno Valley 2021b). There are no active mineral resource extraction facilities within the city. The City's General Plan does not delineate any mineral resource recovery sites, or designate any land for mineral resource production (City of Moreno Valley 2021b). As such, no impact would occur to known mineral resources.

Population and Housing

The proposed project would not induce substantial unplanned population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure).

The City of Moreno Valley is projected to have a population increase of approximately 23 percent by 2040 (City of Moreno Valley 2021b). The proposed project would accommodate existing demand and planned growth in the area for potable water. Implementation of the proposed project would involve installation of storage tanks and a transmission pipeline. Although the proposed project would support population growth, it would support planned population growth identified by the City of Moreno Valley, rather than induce it (see more information in Chapter 4, *Other CEQA Considerations and Growth Inducement*, for a discussion of growth in the project area). The proposed project would not create new housing opportunities or extend roads or other infrastructure to areas not previously served. Neither construction nor operation of the project would create new jobs or necessitate the hiring of a substantial number of new workers. Therefore, the proposed project would not induce substantial unplanned population growth and no impact would occur.

The proposed project would not displace substantial numbers of existing people or housing, necessitating the construction of replacement housing elsewhere.

Implementation of the proposed project would not require the removal of housing. Therefore, the project would not displace substantial numbers of existing people or housing and no impact would occur.

Public Services

The proposed project would not result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service rations, response times or other performance objectives for any of the following public services:

Fire Protection

The City of Moreno Valley Fire Department provides fire and emergency services to the project area (City of Moreno Valley 2022a). The proposed project would not cause an increase in employment or development in the city. As a result, construction of new homes or businesses would not be necessary, and thus additional services or extended response times for fire protection services would not be required. Therefore, no impact would occur to fire protection services.

Police Protection

The City of Moreno Valley Police Department provides police and emergency services to the project area (City of Moreno Valley 2022b). The proposed project would not cause an increase in employment or development in the city. As a result, construction of new homes or businesses would not be necessary, and thus additional services or extended response times for police protection services would not be required. Therefore, no impact would occur to police protection services.

Schools

The project area lies within the Moreno Valley Unified School District (City of Moreno Valley, 2022c). The proposed project would not cause an increase in employment or development in the city. Because construction of new homes or businesses would not result from project implementation, additional student generation rates or enrollment numbers within the Moreno Valley School District would also not occur. As such, the proposed project would not require new or expanded school facilities. No impact to schools would occur.

Parks

The City of Moreno Valley Parks and Community Services Department maintains and operates 28 parks, trails and facilities including a golf course, sports field, senior center, skate parks, equestrian center and community centers within the city (City of Moreno Valley 2022d). The proposed project does not include the addition of residential uses, and its implementation would not increase demand for parks. Therefore, no impacts to parks would occur.

Other Public Facilities

The proposed project does not include the addition of residential uses, and its implementation would not increase demand for other public facilities, such as city administrative offices or library facilities. The proposed project would not require or impact other additional public facilities. Therefore, no impacts to other public facilities would occur.

Recreation

The proposed project would not increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated.

Use of existing neighborhood and regional parks would increase if the proposed project would increase the population within the area. There are multiple parks and open space areas within the project area, including the closest recreational facility, Rock Ridge Park located approximately 0.9 mile to the northwest (City of Moreno Valley 2022e). The proposed project consists of water storage and conveyance facilities. Implementation of the proposed project would not include development of new housing that would attract additional population to the area. Further, implementation of the proposed project would not result in substantial permanent employment that could indirectly induce population growth. Construction of the proposed storage tanks and pipeline would create some short-term construction employment opportunities over the duration of Phase 1 and Phase 2 project activities. However, the amount of opportunities created would not require persons outside of the existing regional work force. Therefore, the project would not create additional housing or increase the population such that substantial physical deterioration of the regional parks or other recreational facilities would occur or be accelerated. No impact would occur.

The proposed project would not include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment.

The proposed project includes installation of two new 4.5 million-gallon (MG) storage tanks on the project site and demolition of an existing 2 MG storage tank. The new tanks would be fed by a proposed 4,000 linear feet transmission pipeline. The proposed project would not require the construction or expansion of additional recreational facilities which might have an adverse physical effect on the environment. Therefore, no impact would occur.

3.0.3 Cumulative Impacts

As indicated above, in addition to direct and indirect impacts associated with implementation of the proposed project, this Draft EIR also includes an assessment of cumulative impacts for each environmental topic evaluated in Chapter 3. The cumulative effects of implementing the proposed project in combination with other past, present, and reasonably foreseeable future projects within and around the project site are considered. The analysis of cumulative impacts considers whether other projects could cause related environmental impacts similar to the environmental impacts anticipated to occur due to the proposed project.

CEQA Guidelines Section 15130 requires that an EIR shall discuss cumulative impacts of a project when the project's incremental effect is "cumulatively considerable." "Cumulative impacts" are defined as "two or more individual effects which, when considered together, are considerable or which compound or increase other environmental impacts" [CEQA Guidelines, Section 15355; see also Public Resources Code, Section 21083(b)]. Stated another way, "a cumulative impact consists of an impact which is created as a result of the combination of the project evaluated in the EIR together with other projects causing related impacts" [CEQA Guidelines, Section 15130(a)(1)]. The definition of cumulatively considerable is provided in Section 15065(a)(3):

> *Cumulatively considerable means that the incremental effects of an individual project are significant when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects.*

According to Section 15130(b) of the CEQA Guidelines:

> *[t]he discussion of cumulative impacts shall reflect the severity of the impacts and their likelihood of occurrence, but the discussion need not provide as great detail as is provided for the effects attributable to the project alone. The discussion should be guided by standards of practicality and reasonableness, and should focus on the cumulative impact to which the identified other projects contribute rather than the attributes of other projects which do not contribute to the cumulative impact.*

For the purposes of this Draft EIR, the proposed project would contribute to a cumulatively considerable and, therefore, significant cumulative impact if:

- The cumulative effects of other past, current, and probable future projects without the proposed project are not significant and the proposed project's incremental impact is substantial enough, when added to the cumulative effects, to result in a significant impact.
- The cumulative effects of other past, current, and probable future projects without the proposed project are already significant and the proposed project would result in a cumulatively considerable contribution to the already significant effect. The standards used to determine whether the contribution is cumulatively considerable include the existing baseline environmental conditions and whether the proposed project would cause a substantial increase in impacts or otherwise exceed an established threshold of significance.

Geographic Scope of Cumulative Impacts

The geographic area affected by the proposed project and the proposed project's potential to contribute to cumulative impacts varies based on the environmental topic being analyzed. **Table 3-1** summarizes the geographic scope of the analyses for cumulative impacts for each environmental resource area discussed in Chapter 3 of this Draft EIR.

TABLE 3-1
GEOGRAPHIC SCOPE OF CUMULATIVE IMPACT ANALYSES

Environmental Issue	Geographic Scope of Cumulative Impact Analyses
Aesthetics	Foreground views immediately surrounding the proposed facilities; long-distance viewshed views within the city
Air Quality and Greenhouse Gas Emissions	South Coast Air Basin (Air Quality); Global
Biological Resources	Biological Study Area identified for the proposed project
Cultural Resources	The city of Moreno Valley and surrounding areas as manifested through cultural resources
Energy	Service areas for Moreno Valley Electric Utility and Southern California Edison (SCE)
Geology and Soils	Geologic sediments and formations within the city of Moreno Valley
Hazards and Hazardous Materials	Storage tank site and pipeline right-of-way
Hydrology and Water Quality	Project site and downstream receiving waters
Noise	Areas within 1,000 feet of project facilities
Transportation	Local roadways, public transit systems, bicycle, and pedestrian facilities within the project area
Tribal Cultural Resources	The city of Moreno Valley and surrounding areas as manifested through tribal cultural resources
Utilities and Service Systems	Utility Service Providers' service areas within the city of Moreno Valley
Wildfire	Project site and surrounding area

Temporal Scope of Cumulative Impacts

The cumulative projects considered in this analysis include those that have recently been completed, are currently under construction, or are reasonably foreseeable (e.g., for which an application has been submitted). A project's schedule is relevant to the consideration of cumulative short-term construction-related impacts and long-term operational impacts. For future cumulative projects, implementation schedules are often broadly estimated and can be subject to change. However, for purposes of evaluating both short-term and long-term cumulative impacts of the proposed project, this analysis assumes future cumulative projects would be implemented concurrently with the proposed project: Phase 1 is anticipated to begin construction in 2026 while Phase 2 is not expected until approximately the year 2045.

Method of Analysis

CEQA Guidelines Section 15130 provides that the following approaches can be used to adequately address cumulative impacts:

- Regional Growth Projections Method — A summary of projections contained in an adopted general plan or related planning document, or in a prior environmental document which has been adopted or certified, which described or evaluated regional or area wide conditions contributing to the cumulative impact. Any such planning document shall be referenced and made available to the public at a location specified by the lead agency.
- List Method — A list of past, present, and probable future projects producing related or cumulative impacts, including, if necessary, those projects outside the control of the lead agency.

For this Draft EIR, the list method is used; and consistent with CEQA, a two-step approach was used to analyze cumulative impacts. The first step was to determine whether the combined effects from the proposed project and cumulative projects would be cumulatively significant. This was done by adding the proposed project's incremental impact to the anticipated impacts of other probable future projects and/or reasonably foreseeable development. Where the combined effect of the projects and/or projected development was determined to result in a significant cumulative effect, the second step was to evaluate whether the proposed project's incremental contribution to the combined significant cumulative impact would be cumulatively considerable, as required by CEQA Guidelines Section 15130(a).

CEQA Guidelines Section 15064(h)(4) states that:

> *… [t]he mere existence of significant cumulative impacts caused by other projects alone shall not constitute substantial evidence that the proposed project's incremental effects are cumulatively considerable.*

Therefore, it is not necessarily true that, even where cumulative impacts are significant, any level of incremental contribution must be deemed cumulatively considerable by the lead agency. In addition, if the proposed project's individual impact is less than significant, its contribution to a significant cumulative impact could also be deemed cumulatively considerable, depending on the nature of the impact and the existing environmental setting. If, for example, a project is located in an air basin determined to be in extreme or severe nonattainment for a particular criteria pollutant, a project's relatively small contribution of the same pollutant could be found to be cumulatively considerable. Thus, depending on the circumstances, an impact that is less than significant when considered individually may still be cumulatively considerable in light of the impact caused by all projects considered in the analysis.

List of Cumulative Projects

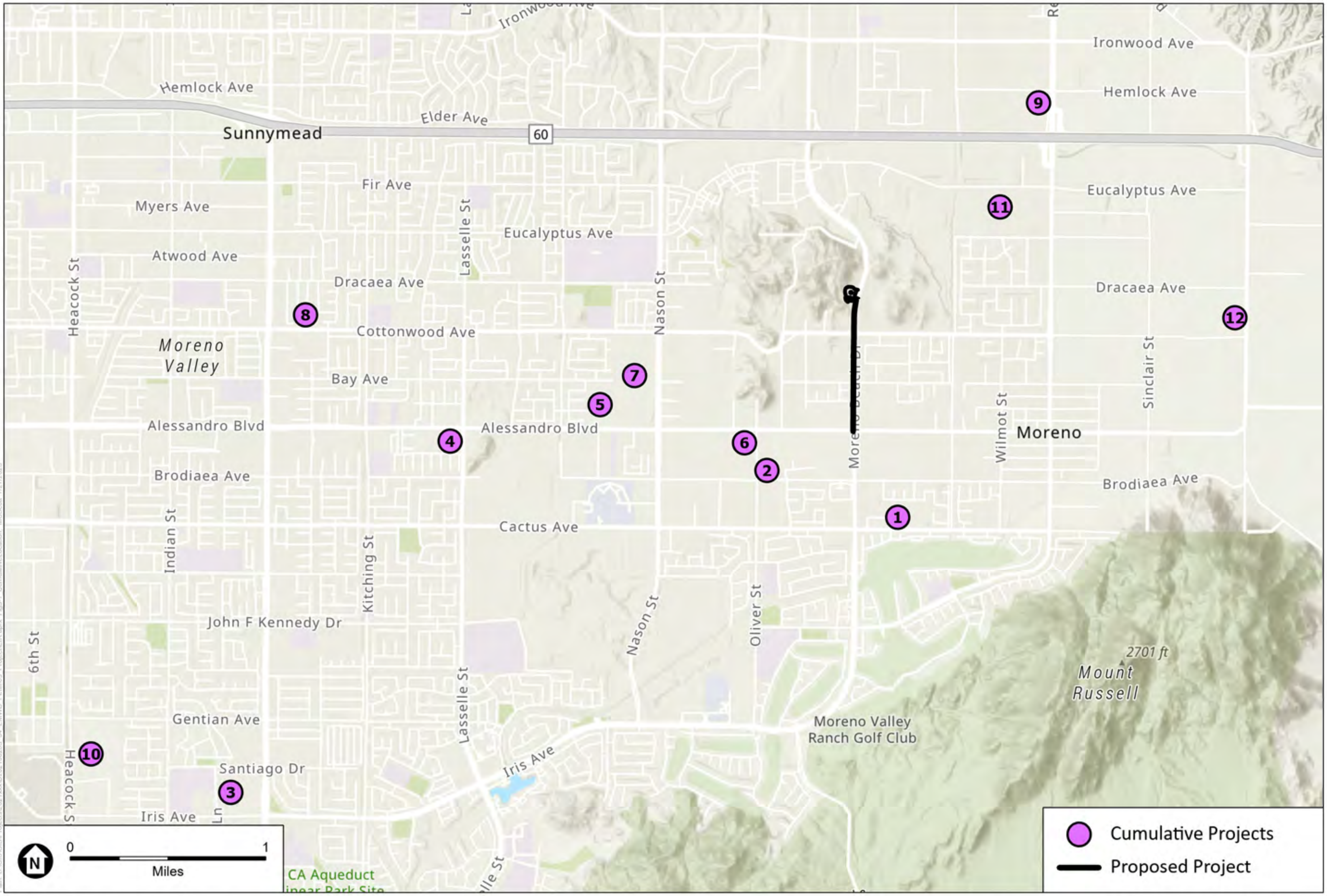
Cumulative effects could result when considering the effects of the proposed project in combination with the effects of other projects in the area. For this Draft EIR analysis, other past, present, and reasonably-foreseeable future projects have been identified that could take place within 3 miles of the proposed project. Both City of Moreno Valley and Riverside County databases were searched when compiling the list of cumulative projects. **Table 3-2** lists specific projects that are included in the analysis of cumulative impacts. **Figure 3-1** graphically displays the location of these cumulative projects.

TABLE 3-2
PROJECTS FOR CUMULATIVE ANALYSIS

No.	Name	Lead Agency	Location	Project Type	Project Description	Status
1	Bradshaw Circle	City of Moreno Valley	Bradshaw Circle and Cactus Avenue	Residential	Residential development consisting of 37 single-family residential lots, onsite roadways with sidewalks, drainage infrastructure, and open space	Planning – Anticipated construction from 2023-2024
2	Discovery Residential	City of Moreno Valley	Oliver Street and Brodiaea Avenue	Residential	Residential development consisting of 67 single-family residential units at a density of 7.63 dwelling units per net acre.	Planning – Construction dates unknown
3	Perris and Pentecostal	City of Moreno Valley	Iris Avenue and Emma Lane	Residential	Residential development consisting of a gated 426-unit apartment complex on 18.05 acres of land. The project includes construction and dedication of 1.845 acres for public open space/recreation, extension of utilities to the project site, and development of two and three-story apartment buildings.	Planning – Anticipated construction from 2022-2023
4	Crystal Cove Apartments	City of Moreno Valley	Alessandro Boulevard and Lasselle Street	Residential	Residential development consisting of 192-unit apartment complex with eight separate buildings providing a total of 84 one-bedroom apartments and 108 two-bedroom apartments. The project would also provide a recreation center building with an outdoor pool and a 14,000 square foot community dog park.	Planning – Construction dates unknown
5	Alessandro Walk Project	City of Moreno Valley	Alessandro Boulevard and Nason Street	Residential	Residential development consisting of the subdivision of 225-lot single-family residential project on an 18.48-acre site in the Downtown Center (DC) District.	Planning – Construction dates unknown
6	Valley and Whitney Project	City of Moreno Valley	Alessandro Boulevard and Oliver Street	Residential	Residential development consisting of the subdivision of 204 homes in the area.	Planning – Construction dates unknown
7	Town Center at Moreno Valley	City of Moreno Valley	Cottonwood Avenue and Nason Street	Mixed Use	The project includes a proposed Specific Plan and TTM to allow for the development of residential, commercial, civic, and park uses.	Planning – Anticipated construction from 2023-2025
8	Cottonwood Village	City of Moreno Valley	Cottonwood Avenue and Perris Boulevard	Residential	The project includes a tentative tract map for condominium purposed to subdivide 9.4 acres of land and plot plan for the Cottonwood Village Project consisting of 23 four-plex buildings with associated amenities and public improvements.	Planning – Construction dates unknown
9	Arco AM/PM Service Station Project	City of Moreno Valley	Redlands Boulevard and Hemlock Avenue		The project includes: an application for a Conditional Use Permit to develop a 2.4-acre portion of a 6.9-acre site with a 6,323-square foot retail building; Building includes a 5,123-square foot food market with office and storage in a mezzanine level and an adjacent 1,200-square foot retail tenant space; and fueling stations.	Planning – Anticipated construction from Jan. 2022- Dec. 2022

No.	Name	Lead Agency	Location	Project Type	Project Description	Status
10	Heacock Commerce Center	City of Moreno Valley	Heacock Street and Gentian Avenue	Industrial	The project includes applications for a general Plan Amendment, Change of Zone, Specific Plan Amendment, and two plot plan applications for two high cube industrial buildings totaling 837, 967 square feet.	Planning – Anticipated construction from 2022-2023
11	Moreno Valley Trade Center	City of Moreno Valley	Redlands Boulevard and Eucalyptus Avenue	Industrial	The project includes: a General Plan Amendment; a change of Zone; a plot plan that provide a development concept for a 1,328,853 square foot warehouse building; and a tentative parcel map.	Planning – Anticipated construction from June 2021- Dec. 2022
12	World Logistics Center Project	City of Moreno Valley	Redlands Boulevard and Eucalyptus Avenue	Industrial	The project site would adopt the World Logistics Center Specific Plan (WLC Specific Plan) which authorizes the construction and operation of 40,600,000 square feet of logistics facilities and associated infrastructure.	Planning– Anticipated construction from 2020-2035
N/A	Capital Improvement Projects 2022/2023	City of Moreno Valley	Various	Public Works/Infrastructure	Capital Improvement Projects are derived from the City's Capital Improvement Plan (CIP). The CIP identifies projects required through the ultimate General Plan build-out of the City to build, improve, and maintain the City's Infrastructure. These projects are typically small and fall under CEQA Exemptions.	Planning – Anticipated construction from 2022-2023

SOURCES: City of Moreno Valley 2019; 2021c, d, e; 2022f through p.



SOURCE: Mapbox, 2022; ESA, 2022

Pettit Water Storage Tank Expansion and Transmission Pipeline Project

Figure 3-1
Cumulative Project Locations

ESA

3.0.4 References

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3.1 Aesthetics

This section addresses aesthetic impacts associated with implementation of the proposed project. This section includes: a description of the existing aesthetics conditions at the proposed project site; a summary of applicable regulations related to aesthetics; and an evaluation of the potential impacts of the proposed project related to aesthetics at the proposed project site and in the surrounding area, including cumulative impacts.

3.1.1 Environmental Setting

Definitions Related to Visual Resources

Visual or aesthetic resources are generally defined as both the natural and built features of the landscape that contribute to the public viewer's experience and appreciation of the environment.[1] Depending on the extent to which a project's presence would alter the perceived visual character and quality of the environment, a visual or aesthetic impact may occur. Key terms that are used to describe aesthetic views include:

Visual character is a general description of the visual attributes of a particular land use setting as defined by local municipalities and other land use agencies. The purpose of defining the visual character of an area is to provide the context within which the visual quality of a particular site or locale is most likely to be perceived by the viewing public. For urban areas, visual character is typically described on the neighborhood level or in terms of areas with common land use, intensity of development, socioeconomic conditions, and/or landscaping and urban design features. For natural and open space settings, visual character is most commonly described in terms of areas with common landscape attributes (such as landform, vegetation, water features, etc.).

Visual quality is defined as the overall visual impression or attractiveness of a site or locale as determined by its aesthetic qualities (such as color, variety, vividness, coherence, uniqueness, harmony, and pattern). For the aesthetic analysis, the visual quality of a site or locale is defined according to three levels:

- **Low**. The location is lacking in natural or cultural visual resource amenities typical of the region. A site with low visual quality will have aesthetic elements that are perceptibly uncharacteristic of the surrounding area.
- **Moderate**. The location is typical or characteristic of the region's natural or cultural visual amenities. A site with moderate visual quality maintains the visual character of the surrounding area, with aesthetic elements that do not stand out as either contributing to or detracting from the visual character of an area.
- **High**. The location has visual resources that are unique or exemplary of the region's natural or cultural scenic amenities. A site with high visual quality is likely to stand out as particularly appealing and makes a notable positive contribution to the visual character of an area.

[1] CEQA Guidelines, Appendix G, Environmental Checklist Form defines public views as those that are experienced from a publicly accessible vantage point.

The identification of public viewer types describes the type of potentially affected viewers within the visual study area (defined below). Land uses that derive value from the quality of their settings are potentially sensitive to changes in visual conditions.

Viewer Exposure addresses the variables that affect the viewing conditions of a site. Viewer exposure considers some or all of the following factors: landscape visibility (the ability to see the landscape); viewing distance (i.e., the proximity of viewers to the project); viewing angle (whether the project would be viewed from a superior, inferior, or level line of sight); extent of visibility (whether the line of sight is open and panoramic to the project area or restricted by terrain, vegetation, and/or structures); and duration of view.

Visual Sensitivity is the overall measure of a site's susceptibility to adverse visual changes. Visual sensitivity is rated as high, moderate, or low and is determined based on the combined factors of visual quality, viewer types, how many viewers, and viewer exposure to the project. Higher visual sensitivity is associated with sites with a higher visual quality and with a greater potential for changes to degrade or detract from the visual character of a public view.

Light originates from human activity from the following two primary sources): light emanating from building interiors that passes through windows, and light originating from exterior sources (e.g., street lighting, building illumination, security lighting, parking lot lighting, landscape lighting, and signage). These sources of light can be a nuisance to adjacent residential areas, diminish the view of the clear night sky, and if uncontrolled, can cause disturbances for motorists traveling in the area. Land uses such as residences and hotels are considered light sensitive, since occupants have expectations of privacy during evening hours and may be subject to disturbances by bright light sources. Light spill is typically defined as the presence of unwanted light on properties adjacent to the property being illuminated.

Glare is caused by the reflection of sunlight or artificial light by highly polished surfaces such as window glass or reflective materials and, to a lesser degree, from broad expanses of light-colored surfaces or vehicle headlights. Perceived glare is the unwanted and potentially objectionable sensation as observed by a person as they look directly into the light source of a luminaire. Daytime glare generation in urban areas is typically associated with buildings with exterior facades largely or entirely comprised of highly reflective glass. Glare can also be produced during evening and nighttime hours by the reflection of artificial light sources, such as automobile headlights. Glare generation is typically related to either moving vehicles or sun angles, although glare resulting from reflected sunlight can occur regularly at certain times of the year. Glare-sensitive uses include residences and transportation corridors.

Shadow and Shading from buildings and structures has the potential to block sunlight on adjacent properties. Although shading is common and expected in urban areas and can be considered a beneficial feature when it provides protection from excess sunlight and heat, shading can have an adverse impact if it interferes with activities that rely on sunlight to function properly, or to provide physical comfort, or to support commercial activity. Such uses include routinely usable outdoor spaces associated with residential, recreational, and institutional uses (e.g., schools, convalescent homes), commercial pedestrian-oriented outdoor eating areas or other spaces, operations such as nurseries and solar collectors.

Regional Setting

The project site is located in western Riverside County (County). The County encompasses approximately 7,400 square miles, stretching from the Colorado River to the Santa Ana Mountains. At its westernmost point, Riverside County is less than 10 miles from the Pacific Ocean. The western half of the county is separated from the eastern half by the San Jacinto and Santa Rosa Mountains. Several man-made lakes are located in the western portion of the County, including Lake Matthews, Lake Perris, Lake Skinner, Vail Lake, and Diamond Valley Lake. These lakes provide water storage and recreational uses. In recent years, Riverside County has experienced substantial urbanization that has altered the regional character from that of a rural, inland desert area, to one of the major population centers of Southern California (County of Riverside 2015). The proposed project is located within the western portion of the County, within the City of Moreno Valley. The major roadway corridor in the project vicinity includes State Route (SR) 60, located approximately 0.8-mile north of the project area.

Visual Study Area

The proposed water storage tanks and proposed transmission pipeline would be located within the City of Moreno Valley (refer to Figure 2-1). Site reconnaissance of the project area was performed in November 2022 to identify the visual study area and take representative photographs of existing visual conditions of the project site and adjacent areas. **Figure 3.1-1** identifies the viewpoints chosen to document the visual study area in and around the proposed project. **Figures 3.1-2** and **3.1-3** include existing views from those viewpoints.

The 4.37-acre parcel proposed for the water storage tanks currently contains one 2.5 million gallon (MG) storage tank situated on a site at the bottom of local rock outcroppings and foothills. The project site is sloped downward to the northeast and southeast. To the east is Moreno Beach Drive, which travels in a north-south direction, beyond which is a large undeveloped area of land.

The proposed transmission pipeline would connect the new storage tanks to the proposed Cactus II Feeder, which would be installed underground within Moreno Beach Drive from the project site to Alessandro Boulevard. The project area adjacent to the proposed transmission pipeline contains residential housing and a power generating station, and is otherwise surrounded by open space.

Scenic Vistas

The City of Moreno Valley's General Plan defines scenic vistas as views of undisturbed natural lands exhibiting a unique or unusual feature that comprises an important or dominant portion of the viewshed. The City is bordered by the Box Spring Mountain Range to the north, the Badlands Mountain Range to the northeast, and the Bernasconi Hills with Lake Perris to the southeast. The City connects to the San Jacinto Valley in the southeast between the Badlands Mountain Range and Bernasconi Hills. To the west, lower hill ranges including Sycamore Canyon are located between the cities of Riverside and Perris, and the Saddleback formation, which is part of the Santa Ana Mountain Range, lies further to the west beyond Lake Mathews. The City's General Plan Environmental Impact Report (EIR) notes that these mountains and hills provide scenic vistas within the City (City of Moreno Valley 2021a, b).

Key scenic vistas that are visible from the proposed project area include the Badlands Mountain Range to the northeast and east, and the Bernasconi Hills to the south.

SOURCE: ESA, 2022; Google Earth, 2022

Pettit Water Storage Tank Expansion and Transmission Pipeline Project

Figure 3.1-1
Viewpoint Map

ESA

SOURCE: ESA, 2022

Pettit Water Storage Tank Expansion and Transmission Pipeline Project

Figure 3.1-2
Existing View of Project Site from Viewpoint 1

ESA

SOURCE: ESA, 2022

Pettit Water Storage Tank Expansion and Transmission Pipeline Project

Figure 3.1-3
Existing View of Project Site from Viewpoint 2

ESA

Scenic Highways and Routes

There are no Officially Designated Scenic Highways within the project area (Caltrans 2022). The nearest Scenic Highway is State Route (SR) 243, approximately 18 miles southeast of the project area. The City of Moreno Valley General Plan designates Moreno Beach Drive as a scenic road, and recognizes the views of hillsides surrounding Moreno Beach Drive as scenic (City of Moreno Valley 2021a, b).

Visual Character

The area consists of sparsely inhabited landscape with views of surrounding local hillsides and mountain ranges. The project site is characterized as a rural residential area that is largely undeveloped. The site is designated and zoned as Residential Agriculture (RA2) (City of Moreno Valley 2021c), which is characterized by low-density residential uses (maximum 2 dwelling units per acre). The current visual character of the immediate area surrounding the project site is largely rural residential and open space flatlands and hillsides, and is consistent with the intended use of the area by the City of Moreno Valley. The slopes of the surrounding mountains and hillsides provide a contrast to the generally flat topography within the city.

Views west of the storage tank project site are towards local hillsides. Views northeast of the project site include varied topography of undeveloped land surrounded by local hillsides with the Badlands Mountains far off in the distance. Views southeast of the project site include flat land developed with residences with the Bernasconi Hills in the distance. Local hillsides can be seen across an undeveloped area to the east, which are considered to have open space value (City of Moreno Valley 2021a, b). Public views of the proposed project site are available to motorists, cyclists and pedestrians traveling north and south along Moreno Beach Drive and east and west along Cottonwood Avenue. Moreno Beach Drive is a major thoroughfare within the city that provides direct access to State Route 60 to the north. Average daily trips for Moreno Beach Boulevard are 14,000 trips in each direction (City of Moreno Valley 2021d). Cottonwood Avenue provides access to a housing tract located southeast of the intersection of Cottonwood Avenue and Moreno Beach Drive and has approximately 3,300 average daily trips in each direction (City of Moreno Valley 2021d). Existing views of the project site (Viewpoints 1 and 2) are shown in Figures 3.1-2 and 3.1-3.

The proposed transmission pipeline alignment is located within the public right-of-way of Moreno Beach Drive immediately adjacent to the project site and extends south to Alessandro Boulevard. Alessandro Boulevard is a main thoroughfare within the city with an average daily trip count of 5,400 vehicles in each direction in the vicinity of the proposed pipeline alignment (City of Moreno Valley 2021d). The visual character of the area along the proposed alignment is comprised of established residential communities, open space, and a power generating station. This area is identified as rural residential. The flat topography and lack of dense vegetation or urban development offer views throughout the southeastern portion of the city, including the surrounding hillsides and mountains (City of Moreno Valley 2021a, b, c).

Views surrounding the proposed transmission pipeline include residential communities and open space that is proposed for development of residences. Public views of the proposed transmission pipeline during construction would temporarily be visible to motorists, cyclists and pedestrians traveling along segments of Moreno Beach Drive, Bay Avenue, Cottonwood Avenue and Alessandro Boulevard.

Visual Quality and Sensitivity

The overall visual sensitivity of the project site from public views is described in terms of its visual quality, potentially affected viewers, and exposure conditions (i.e., landscape visibility, viewing angle, extent of visibility, and duration of view). **Table 3.1-1** summarizes these attributes.

TABLE 3.1-1
SUMMARY OF VISUAL QUALITY AND SENSITIVITY FINDINGS

Viewing Location and Representative Photos	Visual Quality	Affected Viewers and Viewer Exposure Conditions	Visual Sensitivity
Viewpoint 1 (Figure 3.1-2)	Moderate	Low	Low
Viewpoint 2 (Figures 3.1-3)	High	Low	Moderate

Viewpoint 1

Viewpoint 1 (Figure 3.1-2) is looking northwest to the project site from the public right-of-way intersection of Cottonwood Avenue and Moreno Beach Drive. The foreground view includes the traffic signal located at the intersection. Local hillsides are experienced in the immediate background of the project site. Viewpoint 1 does not contain an expansive scenic vista identified by the City of Moreno Valley, but provides views of local hillsides, which are considered to have natural landform and open space value (City of Moreno Valley 2021a, b).

Visual Quality. The area contains EMWD’s existing 2 MG storage tank, existing trees and vegetation, an existing wire fence around the project site, existing aboveground utility poles, and a local hillside. Local hillsides are considered open space areas capable of providing scenic vistas and views (City of Moreno Valley 2021a, b). The visual quality of the area is typical of a rural residential area in the city, which are dispersed throughout open space and surrounded by local hillsides (City of Moreno Valley 2021c). Because the viewpoint is characteristic of typical rural residential areas, the existing visual quality is considered moderate (i.e. it is not lacking visual amenities [i.e. “low”] but is not unique compared with the intended visual character of the area [i.e. “high”]).

Affected Viewers and Exposure Conditions. Public views of the project site are provided to motorists traveling north along Moreno Beach Drive and west along Cottonwood Avenue. Moreno Beach Boulevard has 14,000 average daily trips in each direction and Cottonwood Avenue has 3,300 average daily trips in each direction (City of Moreno Valley 2021d), which means that the project site would be viewed by 14,000 motorists on Moreno Beach Drive and significantly fewer from Cottonwood Avenue. Views of the project site are partially obstructed by existing trees surrounding the site which contains the existing 2 MG storage tank. Direct views of the project site would be available for brief periods of time (i.e. seconds) as motorists, cyclists and pedestrians either pass by the storage tank site on Moreno Beach Drive or wait at the signalized intersection at Cottonwood Avenue going north on Moreno Beach Drive or west on Cottonwood Avenue. Given that views of the project site are partially obstructed, as shown in Figure 3.1-2, and would be observed only briefly by limited daily motorists, cyclists and pedestrians while passing by the site, viewer exposure is considered low.

Visual Sensitivity Conclusion. Because the view of the site from this area has moderate visual quality and low viewer exposure, it is considered to have low visual sensitivity.

Viewpoint 2

Viewpoint 2 (Figure 3.1-3) is looking south to the project site from public right-of-way Moreno Beach Drive. The viewpoint is from motorists, pedestrians, or bicyclists traveling south along Moreno Beach Drive. Views show Moreno Beach Drive, local hillsides immediately behind/adjacent to the project site, existing vegetation and trees, existing aboveground utility poles, an existing fence around the project site, residences in the middle ground, and the Bernasconi Hills to the south in the background. Viewpoint 2 contains an expansive scenic vista of the Bernasconi Hills and provides views of local hillsides, which are considered to have natural landform and open space value (City of Moreno Valley 2021a, b).

Visual Quality. The visual quality of the area is typical of a rural residential area (City of Moreno Valley 2021b). Because the viewpoint is characteristic of typical rural residential and provides views of local hillsides and Bernasconi Hills, the existing visual quality is considered high (i.e. the area contains a scenic vista and visual amenities but is not unique compared with the intended visual character of the area).

Affected Viewers and Exposure Conditions. Public views of the project site are provided to motorists, bicyclists and pedestrians traveling south along Moreno Beach Drive, which has an average of 14,000 daily trips in each direction (City of Moreno Valley 2021d). Views of the project site are partially obstructed by existing trees surrounding the site which contains the existing 2 MG storage tank. Direct views of the project site would be available for brief periods of time (i.e. seconds) as motorists, cyclists and pedestrians pass by the storage tank site on Moreno Beach Drive. Given that the view of the site is relatively unobstructed (refer to Figure 3.1-3), but would be observed only briefly by daily motorists, cyclists and pedestrians while passing by the site, the viewer exposure is considered low.

Visual Sensitivity Conclusion. Because the view of the site from this area has high visual quality and low exposure, it is considered to have moderate visual sensitivity.

Light and Glare

Water Storage Tanks

The project site currently contains an existing 2 MG water storage tank. Existing light and glare in the immediate area is produced from motor vehicles traveling north and south along Moreno Beach Drive. Residential receptors (single family homes) are located to the south of the proposed project site, and emit small amounts of human-generated lighting emanating from building interiors and small amounts of outside lighting. There are no other uses located near or adjacent to the project site that generate glare such as large bodies of water or solar panels.

Transmission Pipeline

Existing light and glare in the immediate area would be produced by motor vehicles traveling north and south along Moreno Beach Drive. Residential receptors (single family homes) located adjacent to the proposed transmission pipeline along Moreno Beach Drive emit small amounts of human-generated lighting emanating from building interiors and small amounts of outside lighting. Other lighting includes street lighting along the paved right-of-way. There are no other uses located near or adjacent to the project site that generate glare such as large bodies of water or solar panels.

3.1.2 Regulatory Framework

Federal

The National Scenic Byways Program is part of the U.S. Department of Transportation, Federal Highway Administration. The program was established under the Intermodal Surface Transportation Efficiency Act of 1991, and was reauthorized in 1998 under the Transportation Equity Act for the 21st Century. Under the program, the U.S. Secretary of Transportation recognizes certain roads as National Scenic Byways or All-American Roads based on their archaeological, cultural, historic, natural, recreational, and scenic qualities. The only National Scenic Byway located within southern California is the Arroyo Seco Historic Parkway – Route 110 in Los Angeles County, which is not located near the project area.

State

State Scenic Highway Program

In 1963, the California legislature created the Scenic Highway Program to protect scenic highway corridors from changes that could diminish the aesthetic value of lands adjacent to the highways. The state regulations and guidelines governing the Scenic Highway Program are found in the Streets and Highways Code, Section 260 et seq. A highway is designated under this program when a local jurisdiction adopts a scenic corridor protection program, applies to the California Department of Transportation (Caltrans) for scenic highway approval, and receives notification from Caltrans that the highway has been designated as a Scenic Highway. When a city or county nominates an eligible scenic highway for official designation, it defines the scenic corridor, which is land generally adjacent to and visible to a motorist on the highway. As discussed above, there are no Officially Designated Scenic Highways within the project area (Caltrans 2022). The nearest Scenic Highway is State Route (SR) 243, approximately 18 miles southeast of the project area.

California Building Code

Title 24 of the California Building Standards Code serves as the basis for the design and construction of buildings in California. In addition to safety, sustainability, new technology and reliability, the California Building Standards Code addresses light pollution and glare hazards through the establishment of maximum allowable backlight, up light, and glare (BUG) ratings (City of Moreno Valley 2021a).

Local

City of Moreno Valley

General Plan, Open Space and Conservation

The Open Space and Conservation section of the General Plan states (City of Moreno Valley 2021b):

> "*A healthy system of open space lands, natural resources, and habitat areas will help ensure clean air and water while also providing recreation opportunities and scenic vistas*"

This section of the General Plan includes measures to protect and enhance open space, natural habitat, and biological and cultural resources, and strategies to promote the wise use of energy and water. Goals and policies that are applicable to the proposed project are included below.

> **Goal OSRC-2**: Preserve and respect Moreno Valley's unique cultural and scenic resources, recognizing their contribution to local character and sense of place.
>
> > **Policy OSRC.2-1**: Limit development on hillsides and ridgelines where structures interrupt the skyline.
> >
> > **Policy OSRC.2-3**: Minimize alteration of the topography, drainage patterns and vegetation of land with slopes of ten percent or more and maintain development standards to protect the environmental and aesthetic integrity of hillside areas.
> >
> > **Policy OSRC.2-5**: Recognize Gilman Springs Road, Moreno Beach Drive, and State Route 60 as local scenic roads and provide large setbacks from scenic roads, as possible, to avoid encroachment of buildings on scenic views of the surrounding mountains. The view of Mystic Lake from Gilman Springs Road should also be protected.
> >
> > **Policy OSRC.2-6**: The use of natural materials such as stone, brick, and wood is preferable to metal posts and rails for roadside appurtenances along local scenic roads.
> >
> > **Policy OSRC.2-7**: Ensure any signage along local scenic roads does not detract from the area's scenic character.

General Plan, Land Use and Community Character

The Land Use and Community Character section of the General Plan states (City of Moreno Valley 2021c):

> "*The primary purpose of areas designated Rural Residential is to provide for and protect rural lifestyles, as well as to protect natural resources and hillsides in the rural portions of the City*"

General Plan EIR, Aesthetics

The City of Moreno Valley General Plan EIR Aesthetics Section does not provide methodology for analyzing potential impacts to aesthetics and the visual character/quality of the City. However, the Aesthetics Section more specifically identifies those natural landscape features that embody the visual character of the City. The visual character of the City consists of an east-west oriented valley with lower hill ranges located throughout the City. The City has a decentralized structure with commercial, retail, public, and institutional uses; however, large areas of vacant land are located on the City's east side beyond Lasselle Street. The City identifies views of the surrounding mountains as scenic vistas, and scenic resources that attribute to the overall visual character of the area include rock outcroppings and boulders (City of Moreno Valley 2021a).

Municipal Code

Chapter 9.16 (Article VI) of the City's Municipal Code contains general requirements for lighting. Section 9.16.280 states (City of Moreno Valley 2022):

> "*Lighting shall serve both safety and aesthetic purposes, while reducing unnecessary light pollution and maintaining dark skies. Effective lighting will highlight building features and add emphasis to important spaces and entryways, while limiting glare and light trespass onto adjacent properties. The intent of these guidelines is to encourage effective and innovative lighting as an integral design component of a project*"

Guidelines also state: exterior lighting should relate to the design of a project and not deflect unnecessary light and glare onto surrounding properties; energy efficient lighting of buildings is encouraged; high-intensity lighting should be concealed by landscaping or building architectural elements; and where low level lighting (below five feet) is used, fixtures should be placed so that they do not produce glare.

3.1.3 Impact Analysis and Mitigation Measures

Thresholds of Significance

The following criteria from CEQA Guidelines Appendix G are used as thresholds of significance to determine the impacts of the proposed project as related to aesthetics. The proposed project would have a significant impact if it would:

1. Have a substantial adverse effect on a scenic vista.
2. Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway.
3. In non-urbanized areas, substantially degrade the existing visual character or quality of public views of the site and its surroundings. (Public views are those that are experienced from publicly accessible vantage point). If the project is in an urbanized area, would the project conflict with applicable zoning and other regulations governing scenic quality.
4. Create a new source of substantial light or glare which would adversely affect sensitive day or nighttime views in the area.
5. Result in cumulatively considerable impacts to aesthetics.

Methodology

Visual Assessment

This visual assessment is based on field observations of the project site and surroundings in addition to a review of topographic maps, aerial, and ground-level photographs of the project area. Additionally, visual simulations were prepared for the proposed project which document the "before and after" visual conditions of implementing the proposed project (both Phase 1 and Phase 2).

Impact Analysis

Scenic Vistas

Impact 3.1-1: The proposed project could have a substantial adverse effect on a scenic vista.

As described above, City-designated scenic vistas in the project area include expansive views of the Badlands Mountain Range and the Bernasconi Hills (City of Moreno Valley 2021a, b). Other mountain ranges considered to be scenic vistas are blocked by existing topography within the immediate project area. Views of City-designated scenic vistas (i.e., Badlands Mountain Range and Bernasconi Hills) are provided to motorists, bicyclists, and pedestrians traveling along Moreno Beach Drive.

Phase 1

Construction

Construction of the proposed water storage tank and associated facilities would take approximately 10 months and the proposed transmission pipeline would take approximately 5 months. Construction of each project component could overlap.

Storage Tank

The construction of the proposed 4.5 MG storage tank and associated facilities would require temporary construction activities within the portion of the project site north of the existing 2 MG storage tank. Construction equipment could include cranes that could be as high as 50 feet tall. While construction equipment and materials would be visible in the immediate vicinity of the project site from Moreno Beach Drive and Cottonwood Avenue, the equipment would not have the scale or massing to significantly obstruct or provide contrast of views of the distant Badlands Mountain Range to the northeast or the Bernasconi Hills to the south, which are the only scenic vistas that can be seen from the project site. Construction equipment would not permanently affect expansive views of the Badlands Mountain Range and Bernasconi Hills. Additionally, construction of the project facilities would not alter or displace any natural landscape features. Given the short-term and temporary presence of construction equipment and materials coupled with the low levels of visual contrast compared with existing conditions, impacts to scenic vistas would be less than significant.

Pipeline

The equipment associated with construction of the proposed transmission pipeline would be less obscured than the storage tank site, and could be experienced by motorists, pedestrians or bicyclists traveling going north and south along Moreno Beach Drive and east and west along Cottonwood Avenue, Bay Avenue, and Allesandro Avenue. Nevertheless, construction of the transmission pipeline would move along a linear route and would not be in the same location for an extended period of time, further reducing the temporal scenic impact from one particular vantage point. Construction equipment would not permanently affect expansive views of the Badlands Mountain Range or the Bernasconi Hills. Additionally, construction of the proposed transmission pipeline would not alter or displace any natural landscape features. Given the short-term and temporary presence of construction equipment and materials coupled with the low levels of view obstruction compared with existing conditions, impacts would be considered less than significant.

Operation

Storage Tank

Implementation of the proposed 4.5 MG water storage tank and associated facilities would create new permanent aboveground facilities within the project area. The proposed water storage tank would be installed just north of the existing 2 MG storage tank. The proposed water storage tank would be approximately 52 feet in height and have a diameter of 137.5 feet. In addition to the tank, an antenna tower would be located at the side of the tank, approximately 40 feet in height and 3 feet wide.

Visual simulations of the proposed water storage tank from key viewpoints are included in **Figure 3.1-4 and Figure 3.1-5**. These figures compare existing views with simulated views after project implementation. The visual simulation from Viewpoints 1 and 2 show that the proposed water storage tank and antenna tower would be partially to fully visible once operational from surrounding public viewpoints. A description of the simulated views in relation to scenic vistas is provided below:

- Figure 3.1-4 shows that while the proposed water storage tank would be visible in the foreground looking north on Moreno Beach Drive, it would not obstruct views of the local hillside, which is considered scenic but not a scenic vista (City of Moreno Valley 2021a, b). As motorists travel west along Cottonwood Avenue and north along Moreno Beach Drive, the proposed storage tank would be visible for brief moments in time; however, would not obstruct views of a scenic vista.
- Figure 3.1-5 shows that while the water storage tank would be visible in the foreground to motorists traveling south along Moreno Beach Drive, the tank would not obstruct expansive views of the Bernasconi Hills in the distance, which is considered a scenic vista (City of Moreno Valley 2021a, b). As motorists travel south along Moreno Beach Drive, the proposed storage tank would be visible for brief moments in time; however, would not obstruct views of a scenic vista.

As shown in Figures 3.1-4 and 3.1-5, the visual simulations do not show obstruction of the Bernasconi Hills, which is the only scenic vista visible from public rights-of-way surrounding the storage tank site (the Badlands Mountain Range is not visible from the project area from these viewpoints). While it is possible other viewpoints not selected may experience slight obstructions from Moreno Beach Drive, motorists, bicyclists, or pedestrians would only experience temporary view obstruction for brief moments of time while passing by the proposed water storage tank site. Overall, the proposed water storage tank and associated facilities would not have the scale or massing (height, length, width) to completely obstruct views of the distant Bernasconi Hills. As a result, impacts to scenic vistas would be less than significant.

Pipeline

The proposed transmission pipeline would be installed completely underground and would not have any aboveground component that could obstruct views of the Badlands Mountain Range or Bernasconi Hills. As a result, no impact to these scenic vistas would occur as a result of operation of the transmission pipeline.

Mitigation Measures

None Required

Significance Determination

Less than Significant Impact

Existing View

Simulated View - Phase 1

SOURCE: ESA, 2022

Figure 3.1-4
Existing and Visual Simulation of View Point 1, Phase 1

ESA

Existing View

Simulated View - Phase 1

SOURCE: ESA, 2022

Pettit Water Storage Tank Expansion and Transmission Pipeline Project

Figure 3.1-5
Existing and Visual Simulation of View Point 2, Phase 1

ESA

Phase 2

Construction

Storage Tank

As part of the Phase 2 project, the existing 2 MG tank and supporting infrastructure such as pipelines and vaults would be demolished. EMWD would construct a new 4.5 MG steel storage tank in its place just south of the tank installed as part of the Phase 1 project. The site would be re-paved and re-graded to support the tank expansion. The retaining wall installed as part of Phase 1 would be demolished. Demolition and construction activities would take approximately 10 months and would require construction equipment such as cranes (up to 50 feet in height). While construction equipment and materials would be visible from the immediate vicinity of the project site from Moreno Beach Drive and Cottonwood Avenue, the equipment would not have the scale or massing to significantly obstruct or provide contrast of views of the Bernasconi Hills to the south, which is the only scenic vistas that can be seen from the project site (the Badlands Mountain Range is not visible from the areas immediately adjacent to the project site). Construction equipment would not permanently affect expansive views of the Bernasconi Hills. Additionally, construction of the project facilities would not alter or displace any natural landscape features. Given the short-term and temporary presence of construction equipment and materials coupled with the low levels of visual contrast compared with existing conditions, impacts to scenic vistas would be less than significant.

Operation

Storage Tank

The Phase 2 storage tank would be approximately 137.5 feet in diameter and approximately 52 feet in height. Additional power needed to supply the new storage tank would either be supplied by solar panels or a new SCE electrical connection. If the former is chosen, solar modules would be pole mounted on a 3-inch pole located on top of the Phase 2 storage tank. The solar panels would be low profile and angled in a such a way as to not add visible height to the Phase 2 tank from surrounding public rights-of-way. If an SCE electrical connection is chosen and lines are installed aboveground, they would be similar to existing power poles existing in the project vicinity.

Visual simulations of the proposed water storage tank from key viewpoints are included in **Figure 3.1-6** and **Figure 3.1-7**. These figures compare existing views with simulated views after project implementation. The visual simulation from Viewpoints 1 and 2 show that the southerly proposed water storage tank would be partially to fully visible once operational from surrounding public viewpoints. A description of the simulated views in relation to scenic vistas is provided below:

- Figure 3.1-6 shows that while the proposed Phase 2 water storage tank would be partially visible in the foreground looking northwest up Moreno Beach Drive, it would not fully obstruct views of the local hillside, which is considered scenic but not a scenic vista (City of Moreno Valley 2021a, b). As motorists travel west along Cottonwood Avenue and north along Moreno Beach Drive, the Phase 2 proposed storage tank would be partially visible behind the Phase 1 storage tank for brief moments in time; however, would not obstruct views of a scenic vista.
- Figure 3.1-7 shows that while the Phase 2 water storage tank would be visible in the foreground to motorists, bicyclists, and pedestrians traveling south along Moreno Beach Drive, the tank would not fully obstruct expansive views of the Bernasconi Hills in the distance, which is considered a scenic vista (City of Moreno Valley 2021a, b). As motorists travel south along Moreno Beach Drive, the proposed storage tank would be visible for brief moments in time; however, would not fully obstruct views of a scenic vista.

Existing View

Simulated View - Phase 2

SOURCE: ESA, 2022

Figure 3.1-6
Existing and Visual Simulation of View Point 1, Phase 2

Existing View

Simulated View - Phase 1

SOURCE: ESA, 2022

Figure 3.1-7
Existing and Visual Simulation of View Point 2, Phase 2

ESA

As shown in Figures 3.1-6 and 3.1-7, the visual simulations do not show complete obstruction of the Bernasconi Hills, which is the only scenic vista visible from public rights-of-way surrounding the storage tank site (the Badlands Mountain Range is not visible from the immediate area surrounding the project). Figure 3.1-7 shows a slight blocking of the western-most edge of the Bernasconi Hills that would be visible for a brief period of time while traveling south along Moreno Beach Drive. While it is possible other viewpoints not selected may experience obstructions from Moreno Beach Drive or Cottonwood Avenue, motorists, bicyclists, or pedestrians would only experience temporary view obstruction for brief moments of time while passing by the Phase 2 project site. Overall, the Phase 2 project site would not have the scale or massing (height, length, width) to completely obstruct views of the Bernasconi Hills on a permanent basis. Impacts to scenic vistas would be less than significant.

Mitigation Measures

None Required

Significance Determination

Less than Significant Impact

Scenic Resources

Impact 3.1-2: The proposed project could substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway.

Phase 1 and Phase 2

Construction and Operation

Storage Tanks and Pipeline

There are no officially-designated State Scenic Highways or Eligible State Scenic Highways near the project area (Caltrans 2022). Therefore, the proposed project would not impact scenic resources within a State Scenic Highway corridor. While the City of Moreno Valley designates Moreno Beach Drive as a scenic roadway, the proposed project facilities would not obstruct long range views of scenic resources in the project area including the Badlands Mountain Range, Bernasconi Hills, and rock outcroppings throughout the city, as discussed above in Impact 3.1-2. As a result, no impacts would occur to trees, rock outcroppings, and historic buildings within a state scenic highway.

Mitigation Measures

None Required

Significance Determination

No Impact

Visual Character or Quality

Impact 3.1-3: The proposed project could substantially degrade the existing visual character or quality of public views of the site and its surroundings.

As described above, the site where the proposed water storage tanks and associated facilities would be installed has low-to-moderate visual quality, but is not considered highly visually sensitive when affected viewers and viewer exposure conditions are taken into account.

Phase 1

Construction

Storage Tank

Construction activities associated with the Phase 1 storage tank would result in short-term impacts to the visual character and quality of the project area. Construction activities would require the use of construction equipment and materials such as excavators, haul trucks, cranes, and stockpiles within the water storage tank site. The proposed water storage tank site is currently partially obstructed by existing trees. Excavated areas, stockpiled soils, other materials, and equipment generated and used during construction could present contrasting visual elements to the existing landscape. Further, as described above, the construction equipment, materials, and disturbed areas could be visible at public vantage points. Public vantage points in the immediate area of the project include motorists, bicyclists and pedestrians traveling north and south along Moreno Valley Drive and west along Cottonwood Avenue. However, these contrasting visual elements of construction would be temporary and would not permanently affect the existing visual character and quality of the surrounding area. All impacts from construction-related activities would be less than significant.

Pipeline

Construction activities associated with the proposed transmission pipeline would result in short-term impacts to the visual character and quality of the project area. Similar to the proposed Phase 1 storage tank and associated facilities, construction activities for the transmission pipeline would require the use of construction equipment along the transmission pipeline alignment to Alessandro Boulevard. Construction equipment, materials, and disturbed areas could be visible at public vantage points from motorists and pedestrians traveling north and south along Moreno beach Drive, east and west along Cottonwood Avenue, Bay Avenue, and Alessandro Boulevard. However, these contrasting visual elements of construction would be temporary and would not permanently affect the existing visual character and quality of the surrounding area. All impacts from proposed transmission pipeline construction-related activities would be less than significant.

Operation

Storage Tank

Implementation of the proposed water storage tank and associated facilities would add permanent facilities as high as 52 feet above the ground surface within a rural residential area of the City of Moreno Valley. The storage tank site currently is developed with an existing 2 MG storage tank. Visual simulations of the proposed water storage tank and antenna tower are included in Figure 3.1-4 and Figure 3.1-5, which compare existing views with simulated views after the Phase 1 project is implemented. A description of the simulated views in relation to visual character and quality is provided below.

As explained in Section 3.1.1, *Environmental Setting* above, the existing visual sensitivity of Viewpoint 1 is considered low based on the moderate visual quality and low viewer exposure. With the addition of the proposed 4.5 MG water storage tank as shown in the simulation provided in Figure 3.1-4, the visual obstruction from southern Moreno Beach Drive would be mostly obscured by the existing 2 MG storage tank. The Phase 1 water storage tank would not obstruct expansive views of the local hillsides which are considered to have natural landform and open space value and helps define the area's visual character and quality. The visual contrast in terms of altered landscape colors and textures would be barely noticeable, and would be comparable in scale to the existing 2 MG storage tank on the project site. Additionally, no existing landforms or ridgelines would be altered from this viewpoint. Impacts to established visual character and quality from this view as a result of project operation would be less than significant.

As explained in Section 3.1.1, *Environmental Setting* above, the existing visual sensitivity of Viewpoint 2 is considered moderate due to high visual quality and low viewer exposure. The addition of the Phase 1 water storage tank as shown in Figure 3.1-5 would not significantly obstruct views of the local hillsides which are considered to have natural landform and open space value to the City of Moreno Valley. Additionally, implementation of the new storage tank and associated facilities would not alter existing landforms or ridgelines. However, depending on the finished material used as coating on the storage tank, the visual contrast of the storage tank compared to the hillside landscape colors and textures could result in a significant impact to visual character and quality. As a result, EMWD would be required to implement **Mitigation Measure AES-1**, which would design the proposed Phase 1 water storage tank and associated facilities to have the same color palettes as the existing 2 MG tank to blend in with the surrounding character of the project site. Furthermore, as shown in the *Preliminary Design Report for the Pettit 1674-Zone Storage Water Tank Expansion and Transmission Pipeline Project, Appendix F Preliminary Landscape Plan*, EMWD would implement trees, shrubs, and ground covers to provide screening of the water storage tanks and cover slopes surrounding the tanks with native vegetation (Kleinfelder 2017; see Chapter 3, *Project Description*, Figure 2-6). The landscape plan would ensure that trees are planted around the entirety of the project site in a manner that would grow to soften the view and impact to the local character in the immediate vicinity. Although the landscaping will take time to mature, over time, the new storage tanks would be obscured and the visual impacts minimized. With implementation of these measures and design features, contrasting features in the visual landscape would be minimized, and impacts to established visual character and quality would be less than significant.

Pipeline

Following construction, the proposed transmission pipeline would be located underground. After the pipeline is installed, each site/area would be restored to pre-construction conditions; thus, no permanent impacts to the existing visual quality of the project site or surrounding area would occur.

Mitigation Measures

> **AES-1**: Aboveground buildings/structures shall be finished with a non-reflective material and painted with an earth-tone color to blend in with the surrounding landscape and vegetation.

Significance Determination

Less than Significant Impact with Mitigation Incorporated

Phase 2

Construction

Storage Tank

Phase 2 of the proposed project would result in short-term impacts to the visual character and quality of the project area due to the use of construction equipment required for demolition and construction activities. Excavated areas, stockpiled soils, other materials, and equipment generated and used during construction and demolition activities could present contrasting visual elements to the existing landscape. Further, as described above, the construction equipment, materials, and disturbed areas would be visible at public vantage points. Public vantage points in the immediate area of the project include motorists traveling north and south along Moreno Valley Drive and west along Cottonwood Avenue. However, these contrasting visual elements of construction would be temporary and would not permanently affect the existing visual character and quality of the surrounding area. All impacts from construction-related activities would be less than significant and no mitigation measures would be required.

Operation

Storage Tank

The Phase 2 storage tank would be approximately 137.5 feet in diameter and approximately 52 feet in height. Additional power needed to supply the new storage tank would either be supplied by solar panels or a new SCE electrical connection. If the former is chosen, solar modules would be pole mounted on a 3-inch pole located on top of the Phase 2 storage tank. The solar panels would be low profile and angled in a such a way as to not add visible height to the Phase 2 tank from surrounding public rights-of-way. At this point in the project's timeline, the proposed project site would already be developed with the proposed Phase 1 storage tank and associated facilities. Visual simulations of the proposed Phase 2 water storage tank from key viewpoints are included in Figure 3.1-6 and Figure 3.1-7, which compare existing views with simulated views after Phase 2 project implementation. A description of the simulated views in relation to visual character and quality is provided below.

As explained in Section 3.1.1, *Environmental Setting* above, the existing visual sensitivity of Viewpoint 1 is considered low based on the moderate visual quality and low viewer exposure. With the addition of the Phase 2 water storage tank as shown in Figure 3.1-6, existing trees would be removed and the proposed Phase 2 tank would be fully visible to the motorists and pedestrians traveling north along Moreno Beach Drive and west on Cottonwood Avenue. The expanded Phase 2 water storage tank would not obstruct expansive views of the local hillsides which are considered to have natural landform and open space value and helps define the area's visual character and quality. However, depending on the finished material used as coating on the storage tank, the visual contrast of the storage tank compared to the hillside landscape colors and textures could result in a significant impact to visual character and quality. As a result, EMWD would be required to implement Mitigation Measure AES-1, which would design the proposed Phase 2 water storage tank and associated facilities to have the same color palettes as the existing onsite storage tank to blend in with the surrounding character of the project site. Furthermore, as shown in the *Preliminary Design Report for the Pettit 1674-Zone Storage Water Tank Expansion and Transmission Pipeline Project, Appendix F Preliminary Landscape Plan*, EMWD would implement trees, shrubs, and ground covers to provide screening of the water storage tanks and cover slopes surrounding the tanks with native vegetation (Kleinfelder 2017; see Chapter 3, *Project Description*, Figure 2-6). The landscape plan would ensure that trees are planted around the entirety of the project site in a manner that would grow to soften the view and impact to the local character in the immediate vicinity. Although the landscaping will take time to mature, over time, the new storage tanks would be obscured and the visual impacts minimized. With implementation of these measures and design features, contrasting features in the visual landscape would be minimized, and impacts to established visual character and quality would be less than significant.

As explained in Section 3.1.1, *Environmental Setting* above, the existing visual sensitivity of Viewpoint 2 is considered moderate due to high visual quality and low viewer exposure. With the addition of the Phase 2 tank as shown in the simulation, existing trees would be removed and the proposed Phase 2 tank would be partially visible to the motorists and pedestrians traveling south along Moreno Beach Drive. As the viewer travels south along Moreno Beach Drive, the scale of the Phase 2 tank would become more prominent based on an increasingly level viewer angle. Impacts to established visual character and quality from this view and elsewhere along Moreno Beach Drive as a result of project operation would be potentially significant. As a result, EMWD would be required to implement Mitigation Measure AES-1, which would design the proposed Phase 2 water storage tank and associated facilities to have the same color palettes as the existing onsite storage tank to blend in with the surrounding character of the project site. Furthermore, as shown in the *Preliminary Design Report for the Pettit 1674-Zone Storage Water Tank Expansion and Transmission Pipeline Project, Appendix F Preliminary Landscape Plan,* EMWD would implement trees, shrubs, and ground covers to provide screening of the water storage tanks and cover slopes surrounding the tanks with native vegetation (Kleinfelder 2017; see Chapter 3, *Project Description*, Figure 2-6). The landscape plan would ensure that trees are planted around the entirety of the project site in a manner that would grow to soften the view and impact to the local character in the immediate vicinity. Although the landscaping will take time to mature, over time, the new storage tanks would be obscured and the visual impacts minimized. With implementation of these measures and design features, contrasting features in the visual landscape would be minimized, and impacts to established visual character and quality would be less than significant.

Mitigation Measures

Implement Mitigation Measure AES-1.

Significance Determination

Less than Significant Impact with Mitigation Incorporated

Light or Glare

Impact 3.1-4: The proposed project could create a new source of substantial light or glare which would adversely affect day or nighttime views in the area.

Phase 1

Construction

Storage Tank and Pipeline

Construction of the Phase 1 project would not require lighting for day-time or nighttime construction activities, therefore construction activities would not introduce new sources of substantial light or glare in the project area. No impacts related to light and glare would occur.

Operation

Storage Tank

The proposed Phase 1 tank and associated facilities would be located within land owned by EMWD that currently contains a 2 MG storage tank. The proposed water storage tank design would require new exterior nighttime lighting for operational and security purposes that would be motion-activated, similar to the existing tank onsite The increase in lighting could result in spill over lighting onto neighboring parcels. Due to the topography of the surrounding areas and largely rural land, the proposed water storage tank lighting could be visible from motorists, bicyclists, or pedestrians traveling along Moreno Beach Drive, or by the nearest sensitive receptors (residences), which would be considered a significant impact. Further, building materials of the proposed storage tank and associated facilities could create sources of glare during various times of the day. **Mitigation Measure AES-2** would require new permeant exterior lighting to be shielded and directed downward to minimize light cast. This mitigation measure would also comply with the City of Moreno Valley Municipal Code, which requires development to reduce unnecessary light pollution and maintain dark skies. **Mitigation Measure AES-3** would ensure that the proposed water storage tank is designed to minimize glare or reflection, including non-glare exterior materials or coatings. With implementation of Mitigation Measures AES-2 and AES-3, potential impacts associated with light or glare would be reduced to a less than significant level.

Pipeline

The proposed transmission pipeline would not require nighttime lighting for operation as the pipeline would be placed underground and therefore would not be visible. As a result, there would be no new sources of lighting to the project area. No impacts related to light and glare would occur.

Mitigation Measures

> **AES-2**: All new permanent exterior lighting associated with the proposed water storage tanks shall be shielded and directed downward to avoid light spill onto neighboring parcels and visibility from surrounding public vantage points.
>
> **AES-3**: The proposed water storage tanks and aboveground facilities shall be designed to include non-glare exterior materials and coatings to minimize glare or reflection. The paint used for this purpose should be low-luster (low reflectivity) so as to reduce glare.

Significance Determination

Less than Significant Impact with Mitigation Incorporated

Phase 2

Construction

Storage Tank

Construction of the Phase 2 project would not require lighting for day-time or nighttime demolition or construction activities, therefore construction activities would not introduce new sources of substantial light or glare in the project area. No impacts related to light and glare would occur.

Operation

Storage Tank

The Phase 2 storage tank design would require new exterior nighttime lighting for operational and security purposes that would be motion-activated, similar to the Phase 1 tank. The increase in lighting could result in spill over lighting onto neighboring parcels and could be visible by motorists, bicyclists, or pedestrians traveling along Moreno Beach Drive, or residences. Additionally, building materials of the proposed storage tank and associated facilities could create sources of glare during various times of the day. However, implementation of Mitigation Measure AES-2 would require new permeant exterior lighting to be shielded and directed downward to minimize light cast. Furthermore, implementation of Mitigation Measure AES-3 would ensure that the Phase 2 tank is designed to minimize glare or reflection, including non-glare exterior materials or coatings. With implementation of Mitigation Measures AES-2 and AES-3, potential impacts associated with light or glare would be reduced to a less than significant level.

Mitigation Measures

Implement Mitigation Measures AES-2 and AES-3.

Significance Determination

Less than Significant Impact with Mitigation Incorporated

Cumulative Impacts

Impact 3.1-5: Concurrent construction and operation of the proposed project and related projects in the geographic scope could result in cumulative short-term and long-term impacts to aesthetics.

The project area and immediate area is mostly rural residential with pockets of developed land. As the City of Moreno Valley continues to develop, future cumulative projects identified in Table 3-2 and depicted on Figure 3-1 would involve residential and commercial development, and could eliminate portions of the remaining natural areas that are within the project area. With regard to the overall visual and scenic character of the project area, cumulative development would result in more alterations of the existing visual quality of the city and could result in cumulatively significant impacts to existing scenic vistas. Additionally, cumulative development could result in increased lighting and glare within the city. However, cumulative development would need to occur directly adjacent to the proposed project site/area in order to result in a cumulatively considerable impact.

The proposed project facilities would be installed within an area already developed with a water storage tank and within the public right-of-way. Because potential impacts to aesthetics associated with the implementation of the proposed project would be less than significant with implementation of Mitigation Measures AES-1 through AES-3, the project's contribution to potential cumulative aesthetics impacts would be less than cumulatively considerable. As a result, a less than significant cumulative aesthetics impact would occur.

Mitigation Measures

Implement Mitigation Measures AES-1 through AES-3.

Significance Determination

Less than Significant Impact with Mitigation Incorporated

3.1.4 References

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3.2 Air Quality and Greenhouse Gas Emissions

This section addresses the air quality and greenhouse gas emissions impacts associated with implementation of the proposed project. This section includes: a description of the existing air quality and greenhouse gas emissions conditions at the proposed project site; a summary of applicable regulations related to air quality and greenhouse gas emissions; and an evaluation of the potential impacts of the proposed project related to air quality and greenhouse gas emissions at the proposed project site and in the surrounding area, including cumulative impacts. The Air Quality and Greenhouse Gas Emissions Modeling is included as **Appendix AQ/GHG/ENERGY**.

3.2.1 Environmental Setting

Regional Climate and Meteorology

The proposed project is located in the eastern portion of the South Coast Air Basin (Air Basin). The Air Basin includes all of Orange County, Los Angeles County (excluding the Antelope Valley portion), the western, non-desert portion of San Bernardino County, the western Coachella Valley and San Gorgonio Pass portions of Riverside County, and the non-desert portions of Los Angeles County, Riverside County, and San Bernardino County. The South Coast Air Quality Management District (SCAQMD) is the local air district with jurisdiction over air pollution sources in the City of Moreno Valley where the proposed project is located. The Air Basin is an approximately 6,745-square-mile area bounded by the Pacific Ocean to the west and the San Gabriel, San Bernardino, and San Jacinto Mountains to the north and east. The Air Basin is a subregion within the western portion of the SCAQMD jurisdiction. While air quality in the Air Basin has improved, the Air Basin requires continued diligence to meet the air quality standards.

Criteria Air Pollutants

Certain air pollutants have been recognized to cause notable health problems and consequential damage to the environment either directly or in reaction with other pollutants, due to their presence in elevated concentrations in the atmosphere. Such pollutants have been identified and regulated as part of the overall endeavor to prevent further deterioration and facilitate improvement in air quality. The following pollutants are regulated by the United States Environmental Protection Agency (USEPA) and are subject to emissions control requirements adopted by Federal, State and local regulatory agencies. These pollutants are referred to as "criteria air pollutants" as a result of the specific standards, or criteria, which have been adopted for them. A description of the health effects of these criteria air pollutants are provided below.

Ozone (O_3)

Ozone is a secondary pollutant formed by the chemical reaction of volatile organic compounds (VOCs) and nitrogen oxides (NO_X) in the presence of sunlight under favorable meteorological conditions, such as high temperature and stagnation episodes. Ozone concentrations are generally highest during the summer months when direct sunlight, light wind, and warm temperature conditions are favorable. According to the USEPA, ozone can cause the muscles in the airways to constrict potentially leading to wheezing and shortness of breath (USEPA 2022a). Ozone can make it more difficult to breathe deeply and vigorously; cause shortness of breath and pain when taking a deep breath; cause coughing and sore or scratchy throat; inflame and damage the airways; aggravate lung diseases such as asthma, emphysema and chronic bronchitis; increase the frequency of asthma attacks; make the lungs more susceptible to infection; continue to damage the lungs even when the symptoms have disappeared; and cause chronic obstructive pulmonary disease (USEPA 2022a). Long-term exposure to ozone is linked to aggravation of asthma, and is likely to be one of many causes of asthma development and long-term exposures to higher concentrations of ozone may also be linked to permanent lung damage, such as abnormal lung development in children (USEPA 2022a). According to the California Air Resources Board (CARB), inhalation of ozone causes inflammation and irritation of the tissues lining human airways, causing and worsening a variety of symptoms and exposure to ozone can reduce the volume of air that the lungs breathe in and cause shortness of breath. The USEPA states that people most at risk from breathing air containing ozone include people with asthma, children, older adults, and people who are active outdoors, especially outdoor workers (USEPA 2022a). Children are at greatest risk from exposure to ozone because their lungs are still developing and they are more likely to be active outdoors when ozone levels are high, which increases their exposure (USEPA 2022a).

Volatile Organic Compounds

VOCs are organic chemical compounds of carbon and are not “criteria” pollutants themselves; however, they contribute with NO_X to form ozone, and are regulated to prevent the formation of ozone (USEPA 2022b). According to CARB, some VOCs are highly reactive and play a critical role in the formation of ozone, other VOCs have adverse health effects, and in some cases, VOCs can be both highly reactive and have adverse health effects (CARB 2023a). VOCs are typically formed from combustion of fuels and/or released through evaporation of organic liquids, internal combustion associated with motor vehicle usage, and consumer products (e.g., architectural coatings, etc.) (CARB 2023a).

Nitrogen Dioxide (NO_2) and Nitrogen Oxides

NO_X is a term that refers to a group of compounds containing nitrogen and oxygen. The primary compounds of air quality concern include nitrogen dioxide (NO_2) and nitric oxide (NO). Ambient air quality standards have been promulgated for NO_2, which is a reddish-brown, reactive gas (CARB 2023b). The principle form of NO_X produced by combustion is NO, but NO reacts quickly in the atmosphere to form NO_2, creating the mixture of NO and NO_2 referred to as NO_X (CARB 2021a). Major sources of NO_X include emissions from cars, trucks and buses, power plants, and off-road equipment (USEPA 2022c). The terms NO_X and NO_2 are sometimes used interchangeably. However, the term NO_X is typically used when discussing emissions, usually from combustion-related activities, and the term NO_2 is typically used when discussing ambient air quality standards. Where NO_X emissions are discussed in the context of the thresholds of significance or impact analyses, the discussions are based on the conservative assumption that all NO_X emissions would oxidize in the atmosphere to form NO_2. According to the USEPA, short-term exposures to NO_2 can potentially aggravate respiratory diseases, particularly asthma, leading to respiratory symptoms (such as coughing, wheezing or difficulty breathing), hospital admissions and visits to emergency rooms while longer exposures to elevated concentrations of

NO_2 may contribute to the development of asthma and potentially increase susceptibility to respiratory infections (USEPA 2022c). According to CARB, controlled human exposure studies that show that NO_2 exposure can intensify responses to allergens in allergic asthmatics (CARB 2022c). In addition, a number of epidemiological studies have demonstrated associations between NO_2 exposure and premature death, cardiopulmonary effects, decreased lung function growth in children, respiratory symptoms, emergency room visits for asthma, and intensified allergic responses (CARB 2021a). Infants and children are particularly at risk from exposure to NO_2 because they have disproportionately higher exposure to NO_2 than adults due to their greater breathing rate for their body weight and their typically greater outdoor exposure duration. Adults risk is to people who have chronic respiratory diseases, such as asthma and chronic obstructive pulmonary disease (CARB 2021a).

Carbon Monoxide (CO)

Carbon monoxide (CO) is primarily emitted from combustion processes and motor vehicles due to the incomplete combustion of fuel, such as natural gas, gasoline, or wood, with the majority of outdoor CO emissions from mobile sources (CARB 2021b). According to the USEPA, breathing air with a high concentration of CO reduces the amount of oxygen that can be transported in the blood stream to critical organs like the heart and brain and at very high levels, which are possible indoors or in other enclosed environments. CO can cause dizziness, confusion, unconsciousness and death (USEPA 2022d). Very high levels of CO are not likely to occur outdoors; however, when CO levels are elevated outdoors, they can be of particular concern for people with some types of heart disease since these people already have a reduced ability for getting oxygenated blood to their hearts and are especially vulnerable to the effects of CO when exercising or under increased stress (USEPA 2022d). In these situations, short-term exposure to elevated CO may result in reduced oxygen to the heart accompanied by chest pain also known as angina (USEPA 2022d). According to CARB, the most common effects of CO exposure are fatigue, headaches, confusion, and dizziness due to inadequate oxygen delivery to the brain (USEPA 2022d). Unborn babies, infants, elderly people, and people with anemia or with a history of heart or respiratory disease are most likely to experience health effects with exposure to elevated levels of CO (USEPA 2022d).

Sulfur Dioxide (SO_2)

According to the USEPA, the largest source of sulfur dioxide (SO_2) emissions in the atmosphere is the burning of fossil fuels by power plants and other industrial facilities while smaller sources of SO_2 emissions include industrial processes such as extracting metal from ore; natural sources such as volcanoes; and locomotives, ships and other vehicles and heavy equipment that burn fuel with a high sulfur content (USEPA 2022e). In 2006, California phased-in the ultra-low-sulfur diesel regulation limiting vehicle diesel fuel to a sulfur content not exceeding 15 parts per million, down from the previous requirement of 500 parts per million, substantially reducing emissions of sulfur from diesel combustion (CARB 2004). According to the USEPA, short-term exposures to SO_2 can harm the human respiratory system and make breathing difficult (USEPA 2022e). According to CARB, health effects at levels near the State one-hour standard are those of asthma exacerbation, including bronchoconstriction accompanied by symptoms of respiratory irritation such as wheezing, shortness of breath and chest tightness, especially during exercise or physical activity and exposure at elevated levels of SO_2 (above 1 part per million (ppm)) results in increased incidence of pulmonary symptoms and disease, decreased pulmonary function, and increased risk of mortality (USEPA 2022e). Children, the elderly, and those with asthma, cardiovascular disease, or chronic lung disease (such as bronchitis or emphysema) are most likely to experience the adverse effects of SO_2 (CARB 2021c; USEPA 2022e).

Particulate Matter (PM10 and PM2.5)

Particulate matter air pollution is a mixture of solid particles and liquid droplets found in the air (USEPA 2022g). Some particles, such as dust, dirt, soot, or smoke, are large or dark enough to be seen with the naked eye while other particles are so small they can only be detected using an electron microscope (USEPA 2022f). Particles are defined by their diameter for air quality regulatory purposes: inhalable particles with diameters that are generally 10 micrometers and smaller (PM10); and fine inhalable particles with diameters that are generally 2.5 micrometers and smaller (PM2.5) (USEPA 2022f). Thus, PM2.5 comprises a portion or a subset of PM10. Sources of PM10 emissions include dust from construction sites, landfills and agriculture, wildfires and brush/waste burning, industrial sources, and wind-blown dust from open lands (CARB 2017a). Sources of PM2.5 emissions include combustion of gasoline, oil, diesel fuel, or wood (CARB 2017a). PM10 and PM2.5 may be either directly emitted from sources (primary particles) or formed in the atmosphere through chemical reactions of gases (secondary particles) such as SO_2, NO_X, and certain organic compounds (CARB 2017a).

According to CARB, both PM10 and PM2.5 can be inhaled, with some depositing throughout the airways. PM_{10} is more likely to deposit on the surfaces of the larger airways of the upper region of the lung while PM2.5 is more likely to travel into and deposit on the surface of the deeper parts of the lung, which can induce tissue damage, and lung inflammation (CARB 2017a). Short-term (up to 24 hours' duration) exposure to PM10 has been associated primarily with worsening of respiratory diseases, including asthma and chronic obstructive pulmonary disease, leading to hospitalization and emergency department visits (CARB 2017a). The effects of long-term (months or years) exposure to PM10 are less clear, although studies suggest a link between long-term PM10 exposure and respiratory mortality. The International Agency for Research on Cancer published a review in 2015 that concluded that particulate matter in outdoor air pollution causes lung cancer (CARB 2017a). Short-term exposure to PM2.5 has been associated with premature mortality, increased hospital admissions for heart or lung causes, acute and chronic bronchitis, asthma attacks, emergency room visits, respiratory symptoms, and restricted activity days; long-term exposure to PM2.5 has been linked to premature death, particularly in people who have chronic heart or lung diseases, and reduced lung function growth in children (CARB 2017a). According to CARB, populations most likely to experience adverse health effects with exposure to PM10 and PM2.5 include older adults with chronic heart or lung disease, and children (CARB 2017a).

Lead (Pb)

Major sources of lead emissions include ore and metals processing, piston-engine aircraft operating on leaded aviation fuel, waste incinerators, utilities, and lead-acid battery manufacturers (USEPA 2022f). In the past, leaded gasoline was a major source of lead emissions; however, the removal of lead from gasoline has resulted in a decrease of lead in the air by 98 percent between

1980 and 2014 (USEPA 2022f). Lead can adversely affect the nervous system, kidney function, immune system, reproductive and developmental systems and the cardiovascular system, and affects the oxygen carrying capacity of blood (USEPA 2022f). The lead effects most commonly encountered in current populations are neurological effects in children, such as behavioral problems and reduced intelligence, anemia, and liver or kidney damage (CARB 2021d). Excessive lead exposure in adults can cause reproductive problems in men and women, high blood pressure, kidney disease, digestive problems, nerve disorders, memory and concentration problems, and muscle and joint pain (CARB 2021d).

Other Criteria Pollutants (California Only)

The California Ambient Air Quality Standards (CAAQS) regulate the same criteria pollutants as the NAAQS but in addition, regulate State-identified criteria pollutants, including sulfates, hydrogen sulfide, visibility-reducing particles, and vinyl chloride (CARB 2021e). With respect to the State-identified criteria pollutants (i.e., sulfates, hydrogen sulfide, visibility reducing particles, and vinyl chloride), the proposed project would either not emit them (i.e., hydrogen sulfide and vinyl chloride), or they would be accounted for as part of the pollutants estimated in this analysis (i.e., sulfates and visibility reducing particles) (CARB 2021f). For example, visibility reducing particles are associated with particulate matter emissions and sulfates are associated with SO2 emissions (CARB 2021g, CARB 2021h, CARB 2021i). Both particulate matter and SO2 are included in the emissions estimates for the proposed project.

Toxic Air Contaminants

In addition to criteria pollutants, the SCAQMD periodically assesses levels of toxic air contaminants (TACs) in the Air Basin. A TAC is defined by California Health and Safety Code Section 39655:

> *"Toxic air contaminant" means an air pollutant which may cause or contribute to an increase in mortality or in serious illness, or which may pose a present or potential hazard to human health. A substance that is listed as a hazardous air pollutant pursuant to subsection (b) of Section 112 of the federal act (42 U.S.C. Sec. 7412(b)) is a toxic air contaminant.*

Diesel particulate matter, which is emitted in the exhaust from diesel engines, was listed by the State as a toxic air contaminant in 1998. Most major sources of diesel emissions, such as ships, trains, and trucks operate in and around ports, railyards, and heavily traveled roadways. These areas are often located near highly populated areas resulting in greater health consequences for urban areas than rural areas (CARB 2021j). Diesel particulate matter has historically been used as a surrogate measure of exposure for all diesel exhaust emissions. Diesel particulate matter consists of fine particles (fine particles have a diameter <2.5 μm), including a subgroup of ultrafine particles (ultrafine particles have a diameter <0.1 μm). Collectively, these particles have a large surface area which makes them an excellent medium for absorbing organics. The visible emissions in diesel exhaust include carbon particles or "soot." Diesel exhaust also contains a variety of harmful gases and cancer-causing substances.

Exposure to diesel particulate matter may be a health hazard, particularly to children whose lungs are still developing and the elderly who may have other serious health problems. Diesel particulate matter levels and resultant potential health effects may be higher in proximity to heavily traveled roadways with substantial truck traffic or near industrial facilities. According to CARB, diesel particulate matter exposure may lead to the following adverse health effects: aggravated asthma; chronic bronchitis; increased respiratory and cardiovascular hospitalizations; decreased lung function in children; lung cancer; and premature deaths for people with heart or lung disease.

Odorous Emissions

Though offensive odors from stationary sources rarely cause any physical harm, they still remain unpleasant and can lead to public distress generating citizen complaints to local governments. The occurrence and severity of odor impacts depend on the nature, frequency and intensity of the source; wind speed and direction; and the sensitivity of receptors. Generally, increasing the distance between the receptor and the source will mitigate odor impacts.

Greenhouse Gas Emissions

Global climate change refers to changes in average climatic conditions on Earth as a whole, including changes in temperature, wind patterns, precipitation, and storms. Historical records indicate that global climate changes have occurred in the past due to natural phenomena; however, data indicates that the current global conditions differ from past climate changes in rate and magnitude. The current changes in global climate have been attributed to anthropogenic (human-caused) activities by the Intergovernmental Panel on Climate Change (IPCC 2014a). The term greenhouse gas emissions (GHG) refers to gases that trap long-wave radiation or heat in the atmosphere, which heats the surface of the Earth. Without human intervention, the Earth maintains an approximate balance between the GHG emissions in the atmosphere and the storage of GHGs in the oceans and terrestrial ecosystems. GHGs are the result of both natural and anthropogenic activities. Forest fires, decomposition, industrial processes, landfills, and consumption of fossil fuels for power generation, transportation, heating, and cooking are the primary sources of GHG emissions.

The Federal Government and State of California recognized that anthropogenic GHG emissions are contributing to changes in the global climate, and that such changes are having and will have adverse effects on the environment, the economy, and public health. While worldwide contributions of GHG emissions are expected to have widespread consequences, it is not possible to link particular changes to the environment of California or elsewhere to GHGs emitted from a particular source or location. In other words, emissions of GHGs have the potential to cause global impacts rather than local impacts. Increased concentrations of GHGs in the Earth's atmosphere have been linked to global climate change and such conditions as rising surface temperatures, melting icebergs and snowpack, rising sea levels, and the increased frequency and magnitude of severe weather conditions (IPCC 2014b). Existing climate change models also show that climate warming portends a variety of impacts on agriculture, including loss of microclimates that support specific crops, increased pressure from invasive weeds and diseases, and loss of productivity due to changes in water reliability and availability (CNRA 2018). In addition, rising temperatures and shifts in microclimates associated with global climate change are expected to increase the frequency and intensity of wildfires (USGCRP 2018).

State law defines GHGs to include the following compounds: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6). The most common GHG that results from human activity is CO_2, which represents 76 percent of total anthropogenic GHG emissions in the atmosphere (as of 2010 data), (IPCC 2014b) followed by CH_4 and N_2O. Scientists have established a Global Warming Potential (GWP) to gauge the potency of each GHG's ability to absorb and re-emit long-wave radiation and these GWP ratios are available from the IPCC. The GWP of a gas is determined using CO_2 as the reference gas with a GWP of 1 over 100 years. For example, a gas with a GWP of 10 is 10 times more potent than CO_2 over 100 years. The sum of each GHG multiplied by its associated GWP is referred to as carbon dioxide equivalents (CO_2e). The measurement unit CO_2e is used to report the combined potency of GHG emissions.

CARB compiles the State's GHG emissions inventory. The most updated inventory reports the State's GHG emissions inventory from calendar year 2020. Based on the 2020 GHG inventory data (i.e., the latest year for which data are available from CARB), California emitted 369.2 $MMTCO_2e$ including emissions resulting from imported electrical power (CARB 2022c). Between April 2010 and July 2020, the population of California grew by an annualized rate of 0.64 percent to a total of 39.78 million (Cal DOF 2022). In addition, the carbon intensity of California's economy (the amount of carbon pollution per million dollars of gross domestic product (GDP)) is declining. The California economy, measured as gross state product, grew from $773 billion in 1990 to $3.4 trillion in 2021 representing an increase of over three times the 1990 gross state product (Cal DOF 2022). According to CARB, as of 2016, statewide GHG emissions dropped below the 2020 GHG Limit (431 $MMTCO_2e$) and have remained below the Limit since that time, due in part to the state's GHG reduction programs (such as the Renewables Portfolio Standard, Low Carbon Fuel Standard (LCFS), vehicle efficiency standards, and declining caps under the Cap and Trade Program).

Existing Conditions

The extent and severity of pollutant concentrations in the Air Basin are a function of the area's natural physical characteristics (weather and topography) and man-made influences (development patterns and lifestyle). Factors such as wind, sunlight, temperature, humidity, rainfall, and topography all affect the accumulation and dispersion of pollutants throughout the Air Basin, making it an area of high pollution potential. The Air Basin's meteorological conditions, in combination with regional topography, are conducive to the formation and retention of ozone, which is a secondary pollutant that forms through photochemical reactions in the atmosphere. Thus, the worst air pollution conditions throughout the Air Basin typically occur from June through September. These conditions are generally attributed to the seasonally light winds and shallow vertical atmospheric mixing, which reduce the potential for the dispersal of air pollutant emissions, thereby causing elevated air pollutant levels. Pollutant concentrations in the Air Basin vary with location, season, and time of day. Concentrations of ozone, for example, tend to be lower along the coast, higher in the near inland valleys, and lower in the far inland areas of the

Air Basin and adjacent desert (SCAQMD 2016a). **Table 3.2-1** shows the attainment status of the Air Basin for each criteria pollutant for the Riverside County portion of the Air Basin.

As shown in Table 3.2-1, the Air Basin is designated under Federal or State ambient air quality standards as nonattainment for ozone, PM10, and fine particulate matter PM2.5. The Los Angeles County portion of the Air Basin is designated as nonattainment for the federal lead standard; however, this is due to localized emissions from two lead-acid battery recycling facilities in the City of Vernon and the City of Industry that are no longer operating (SCAQMD 2012).

As detailed in the AQMP, the major sources of air pollution in the Air Basin are divided into four major source classifications: point, area stationary sources, and on-road and off-road mobile sources. Point and area sources are the two major subcategories of stationary sources (SCAQMD 2012). Point sources are permitted facilities that contain one or more emission sources at an identified location (e.g., power plants, refineries, emergency generator exhaust stacks). Area sources consist of many small emission sources (e.g., residential water heaters, architectural coatings, consumer products, and permitted sources such as large boilers) which are distributed across the region. Mobile sources consist of two main subcategories: On-road sources (such as cars and trucks) and off-road sources (such as heavy construction equipment).

TABLE 3.2-1
SOUTH COAST AIR BASIN ATTAINMENT STATUS (RIVERSIDE COUNTY PORTION)

Pollutant	National Standards (NAAQS)	California Standards (CAAQS)
O_3 (1-hour standard)	N/A [a]	Non-attainment – Extreme
O_3 (8-hour standard)	Non-attainment – Extreme	Non-attainment
CO	Attainment (Maintenance)	Attainment
NO_2	Attainment (Maintenance)	Attainment
SO_2	Attainment/Unclassifiable	Attainment
PM10	Attainment (Maintenance)	Non-attainment
PM2.5	Non-attainment – Serious	Non-attainment
Lead (Pb)	Attainment/Unclassifiable	Attainment
Visibility Reducing Particles	N/A	Unclassified
Sulfates	N/A	Attainment
Hydrogen Sulfide	N/A	Unclassified
Vinyl Chloride [b]	N/A	N/A

N/A = not applicable

[a] The NAAQS for 1-hour ozone was revoked on June 15, 2005, for all areas except Early Action Compact areas.

[b] In 1990, the California Air Resources Board identified vinyl chloride as a toxic air contaminant and determined that it does not have an identifiable threshold. Therefore, the California Air Resources Board does not monitor or make status designations for this pollutant.

SOURCE: USEPA, The Green Book Non-Attainment Areas for Criteria Pollutants, https://www.epa.gov/green-book; CARB, Area Designations Maps/State and National, https://ww2.arb.ca.gov/resources/documents/maps-state-and-federal-area-designations.

The SCAQMD maintains a network of air quality monitoring stations located throughout the Air Basin to measure ambient pollutant concentrations. The proposed project would be located in

Source Receptor Area (SRA) 24, Perris Valley. Criteria pollutants monitored at this station include ozone and PM10 for 2019 and 2020 and only ozone for 2021. SRA 23, Metropolitan Riverside County, were used for NO_2, CO, Pb, PM10 (2020), and PM2.5. The most recent data available from the SCAQMD for this monitoring station are from years 2019 to 2021 (SCAQMD 2023). The pollutant concentration data for these years are summarized in **Table 3.2-2**. As shown in Table 3.2-2, the CAAQS and NAAQS were not exceeded in the proposed project site vicinity for all pollutants between 2018 and 2020, except for O_3, PM10, and PM2.5.

TABLE 3.2-2
AMBIENT AIR QUALITY IN THE PROJECT VICINITY

Pollutant/Standard [a]	2019	2020	2021
Ozone, O_3 (1-hour)			
Maximum Concentration (ppm)	0.118	0.125	0.143
Days > CAAQS (0.09 ppm)	26	34	46
Ozone, O_3 (8-hour)			
Maximum Concentration (ppm)	0.095	0.106	0.115
4th High 8-hour Concentration (ppm)	0.090	0.097	0.102
Days > CAAQS (0.070 ppm)	64	74	81
Days > NAAQS (0.070 ppm)	64	74	81
Nitrogen Dioxide, NO_2 (1-hour)			
Maximum Concentration (ppm)	0.056	0.066	0.066
Days > CAAQS (0.18 ppm)	0	0	0
98th Percentile Concentration (ppm)	0.052	0.054	0.054
Days > NAAQS (0.100 ppm)	0	0	0
Nitrogen Dioxide, NO_2 (Annual)			
Annual Arithmetic Mean (0.030 ppm)	0.01	0.014	0.014
Carbon Monoxide, CO (1-hour)			
Maximum Concentration (ppm)	2.0	1.9	2.1
Days > CAAQS (20 ppm)	0	0	0
Days > NAAQS (35 ppm)	0	0	0
Carbon Monoxide, CO (8-hour)			
Maximum Concentration (ppm)	1.3	1.5	1.8
Days > CAAQS (9.0 ppm)	0	0	0
Days > NAAQS (9 ppm)	0	0	0
Respirable Particulate Matter, PM10 (24-hour)			
Maximum Concentration (µg/m^3)	97	77	76
Samples > CAAQS (50 µg/m^3)	4	6	16
Samples > NAAQS (150 µg/m^3)	0	0	0
Respirable Particulate Matter, PM10 (Annual)			
Annual Arithmetic Mean (20 µg/m^3)	25.3	35.9	34.2
Fine Particulate Matter, PM2.5 (24-hour)			
Maximum Concentration (µg/m^3)	46.7	41.0	82.1
98th Percentile Concentration (µg/m^3)	36.2	29.6	36.7
Samples > NAAQS (35 µg/m^3)	9	4	10
Fine Particulate Matter, PM2.5 (Annual)			
Annual Arithmetic Mean (12 µg/m^3)	12.5	12.6	12.6

Pollutant/Standard [a]	2019	2020	2021
Lead			
Maximum 30-day average ($\mu g/m^3$)	0.008	0.016	0.008
Samples > CAAQS (1.5 $\mu g/m^3$)	0	0	0
Maximum 3-month rolling average ($\mu g/m^3$)	0.007	0.010	0.010
Days > NAAQS (0.15 $\mu g/m^3$)	0	0	0

[a] ppm = parts per million; $\mu g/m^3$ = micrograms per cubic meter

SOURCE: SCAQMD, Historical Data by Year, http://www.aqmd.gov/home/air-quality/air-quality-data-studies/historical-data-by-year; CARB, Air Quality Data Statistics, http://www.arb.ca.gov/adam/; USEPA, AirData, http://www.epa.gov/airdata/ad_rep_mon.html. Accessed January 2023.

Sensitive Receptors

Land uses, such as schools, hospitals, and convalescent homes are considered to be sensitive to poor air quality conditions because infants, children, the elderly, and people with health afflictions (especially respiratory ailments), are more susceptible to respiratory infections and other air-quality-related health problems than the general public. Residential areas are also considered to be sensitive to air pollution because residents (including children and the elderly) tend to be at home for extended periods of time, resulting in sustained exposure to any pollutants present. Recreational land uses are considered moderately sensitive to air pollution. Exercise places a high demand on respiratory functions, which can be impaired by air pollution, even though exposure periods during exercise are generally short.

The proposed project area includes residential uses near the storage tank construction area, where the majority of construction activity will occur. The nearest sensitive receptors to the project site for Phase 1 are listed below and shown in **Figure 3.2-1**:

- Single-family residences approximately 450 feet to the southwest of the project site along Ardell Lane.
- Single-family residences approximately 900 feet to the south of the project site at the corner of Cottonwood Avenue and Moreno Beach Drive.
- Single-family residences approximately 2,600 feet to the east of the project site along Cottonwood Avenue.
- Single-family residences approximately 1,050 feet to the north of the project site along Moreno Beach Drive.

Phase 2 of the proposed project is expected to begin in 2045, significantly later than Phase 1. According to the City's most recent land use map, the area to the east of the storage tank area is zoned residential (R10) (Moreno Valley 2021a). Although there are no known future developments in that area, for the purpose of this technical analysis, and to assume worst-case conservative conditions to potential sensitive receptors, it is assumed that there would be additional new sensitive receptors during Phase 2 as listed below and shown in Figure 3.2-1:

- Single-family residences approximately 80 feet to the east of the project site along Moreno Beach Drive.

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SOURCE: ESA, 2023; Google Earth, 2023

Pettit Water Storage Tank Expansion and Transmission Pipeline Project

Figure 3.2-1
Project Site and Air Quality Sensitive Receptors

ESA

The transmission pipeline connecting the proposed water storage tank to the existing water distribution system would be installed within the existing Moreno Beach Drive right-of-way. Residential uses along Moreno Beach Drive between Cottonwood Avenue and Alessandro Boulevard would be located as close as 25 feet from the proposed transmission pipeline route construction area.[1]

3.2.2 Regulatory Framework

Federal

The federal Clean Air Act (CAA) was enacted in 1955 and has been amended numerous times in subsequent years, with the most recent amendments occurring in 1990 (USC 1970). The CAA is the comprehensive federal law that regulates air emissions in order to protect public health and welfare (USEPA 2022h). The USEPA is responsible for the implementation and enforcement of the CAA, which establishes federal NAAQS, specifies future dates for achieving compliance, and requires USEPA to designate areas as attainment, nonattainment, or maintenance. The CAA also mandates that each state submit and implement a State Implementation Plan (SIP) for each criteria pollutant for which the state has not achieved the applicable NAAQS. The SIP includes pollution control measures that demonstrate how the standards for those pollutants will be met. The sections of the CAA most applicable to the project include Title I (Nonattainment Provisions) and Title II (Mobile Source Provisions) (USEPA 2022i).[2]

Title I requirements are implemented for the purpose of attaining NAAQS for criteria air pollutants. The NAAQS were amended in July 1997 to include an 8-hour standard for ozone and to adopt a NAAQS for PM2.5. The NAAQS were also amended in September 2006 to include an established methodology for calculating PM2.5, as well to revoke the annual PM10 threshold. **Table 3.2-3** shows the NAAQS currently in effect for each criteria pollutant. The NAAQS and the CAAQS for the California criteria air pollutants (discussed below) have been set at levels considered safe to protect public health, including the health of sensitive populations such as asthmatics, children, and the elderly with a margin of safety; and to protect public welfare, including against decreased visibility and damage to animals, crops, vegetation, and buildings (USEPA 2022c). In addition to criteria pollutants, Title I also includes air toxics provisions which require USEPA to develop and enforce regulations to protect the public from exposure to airborne contaminants that are known to be hazardous to human health. In accordance with Section 112, USEPA establishes National Emission Standards for Hazardous Air Pollutants. The list of hazardous air pollutants (HAPs), or air toxics, includes specific compounds that are known or suspected to cause cancer or other serious health effects.

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1 SCAQMD's Localized Significance Threshold Methodology (refer to page 3-3) states for project boundaries located closer than 25 meters (82 feet) to the nearest receptor, such as the proposed project where the nearest receptors are assumed to be located adjacent to the project site, should use the LSTs for receptors located at 25 meters.

2 Mobile sources include on-road vehicles (e.g., cars, buses, motorcycles) and non-road vehicles (e.g., aircraft, trains, construction equipment). Stationary sources are comprised of both point and area sources. Point sources are typically stationary facilities that emit large amount of pollutants (e.g., municipal waste incinerators, power plants). Area sources are typically smaller stationary sources that alone are not large emitters but combined could account for larger amounts of pollutants (e.g., consumer products, residential heating, dry cleaners).

TABLE 3.2-3
AMBIENT AIR QUALITY STANDARDS

Pollutant	Average Time	California Standards[a]		National Standards[b]		
		Concentration[c]	**Method[d]**	**Primary[c,e]**	**Secondary [c,f]**	**Method[g]**
O_3[h]	1 Hour	0.09 ppm (180 µg/m^3)	Ultraviolet Photometry	—	Same as Primary Standard	Ultraviolet Photometry
	8 Hour	0.070 ppm (137 µg/m^3)		0.070 ppm (137 µg/m^3)		
NO_2[i]	1 Hour	0.18 ppm (339 µg/m^3)	Gas Phase Chemi-luminescence	100 ppb (188 µg/m^3)	None	Gas Phase Chemi-luminescence
	Annual Arithmetic Mean	0.030 ppm (57 µg/m^3)		53 ppb (100 µg/m^3)	Same as Primary Standard	
CO	1 Hour	20 ppm (23 mg/m^3)	Non-Dispersive Infrared Photometry (NDIR)	35 ppm (40 mg/m^3)	None	Non-Dispersive Infrared Photometry (NDIR)
	8 Hour	9.0 ppm (10mg/m^3)		9 ppm (10 mg/m^3)		
	8 Hour (Lake Tahoe)	6 ppm (7 mg/m^3)		—	—	
SO_2[j]	1 Hour	0.25 ppm (655 µg/m^3)	Ultraviolet Fluorescence	75 ppb (196 µg/m^3)	—	Ultraviolet Fluorescence; Spectrophotometry (Pararosaniline Method)9
	3 Hour	—		—	0.5 ppm (1300 µg/m^3)	
	24 Hour	0.04 ppm (105 µg/m^3)		0.14 ppm (for certain areas)j	—	
	Annual Arithmetic Mean	—		0.030 ppm (for certain areas) j	—	
PM10[k]	24 Hour	50 µg/m^3	Gravimetric or Beta Attenuation	150 µg/m^3	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	20 µg/m^3		—		
PM2. [k]	24 Hour	No Separate State Standard		35 µg/m^3	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	12 µg/m^3	Gravimetric or Beta Attenuation	12.0 µg/m^3 k	15 µg/m^3	
Lead[l,m]	30 Day Average	1.5 µg/m^3	Atomic Absorption	—	—	High Volume Sampler and Atomic Absorption
	Calendar Quarter	—		1.5 µg/m^3 (for certain areas)m	Same as Primary Standard	
	Rolling 3-Month Average [m]	--		0.15 µg/m^3		

Pollutant	Average Time	California Standards[a]		National Standards[b]		
		Concentration[c]	Method[d]	Primary[c,e]	Secondary [c,f]	Method[g]
Visibility Reducing Particles [n]	8 Hour	Extinction coefficient of 0.23 per kilometer — visibility of 10 miles or more (0.07 — 30 miles or more for Lake Tahoe) due to particles when relative humidity is less than 70 percent. Method: Beta Attenuation and Transmittance through Filter Tape.		No Federal Standards		
Sulfates (SO_4)	24 Hour	25 μg/m^3	Ion Chromatography			
Hydrogen Sulfide	1 Hour	0.03 ppm (42 μg/m^3)	Ultraviolet Fluorescence			
Vinyl Chloride [l]	24 Hour	0.01 ppm (26 μg/m^3)	Gas Chromatography			

a California standards for ozone, carbon monoxide (except 8-hour Lake Tahoe), sulfur dioxide (1 and 24 hour), nitrogen dioxide, and particulate matter (PM_{10}, $PM_{2.5}$, and visibility reducing particles), are values that are not to be exceeded. All others are not to be equaled or exceeded. California ambient air quality standards are listed in the Table of Standards in Section 70200 of Title 17 of the California Code of Regulations.

b National standards (other than ozone, particulate matter, and those based on annual arithmetic mean) are not to be exceeded more than once a year. The ozone standard is attained when the fourth highest 8-hour concentration measured at each site in a year, averaged over three years, is equal to or less than the standard. For PM10, the 24-hour standard is attained when the expected number of days per calendar year with a 24-hour average concentration above 150 micrograms/per cubic meter (μg/m^3) is equal to or less than one. For $PM_{2.5}$, the 24 hour standard is attained when 98 percent of the daily concentrations, averaged over three years, are equal to or less than the standard.

c Concentration expressed first in units in which it was promulgated. Equivalent units given in parentheses are based upon a reference temperature of 25°C and a reference pressure of 760 torr. Most measurements of air quality are to be corrected to a reference temperature of 25°C and a reference pressure of 760 torr; ppm in this table refers to ppm by volume, or micromoles of pollutant per mole of gas.

d Any equivalent procedure which can be shown to the satisfaction of the California Air Resources Board to give equivalent results at or near the level of the air quality standard may be used.

e National Primary Standards: The levels of air quality necessary, with an adequate margin of safety to protect the public health.

f National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.

g Reference method as described by the USEPA. An “equivalent method” of measurement may be used but must have a “consistent relationship to the reference method” and must be approved by the USEPA.

h On October 1, 2015, the national 8-hour ozone primary and secondary standards were lowered from 0.075 to 0.070 ppm.

i To attain the 1-hour national standard, the 3-year average of the annual 98th percentile of the 1-hour daily maximum concentrations at each site must not exceed 100 ppb. Note that the national 1-hour standard is in units of parts per billion (ppb). California standards are in units of parts per million (ppm). To directly compare the national 1-hour standard to the California standards the units can be converted from ppb to ppm. In this case, the national standard of 100 ppb is identical to 0.100 ppm.

j On June 2, 2010, a new 1-hour SO_2 standard was established and the existing 24-hour and annual primary standards were revoked. To attain the 1-hour national standard, the 3-year average of the annual 99th percentile of the 1-hour daily maximum concentrations at each site must not exceed 75 ppb. The 1971 SO_2 national standards (24-hour and annual) remain in effect until one year after an area is designated for the 2010 standard, except that in areas designated non-attainment for the 1971 standards, the 1971 standards remain in effect until implementation plans to attain or maintain the 2010 standards are approved.

k On December 14, 2012, the national annual $PM_{2.5}$ primary standard was lowered from 15 μg/m^3 to 12.0 μg/m^3.

l The California Air Resources Board has identified lead and vinyl chloride as 'toxic air contaminants' with no threshold level of exposure for adverse health effects determined. These actions allow for the implementation of control measures at levels below the ambient concentrations specified for these pollutants.

m The national standard for lead was revised on October 15, 2008 to a rolling three-month average. The 1978 lead standard (1.5 μg/m^3 as a quarterly average) remains in effect until one year after an area is designated for the 2008 standard, except that in areas designated non-attainment for the 1978 standard, the 1978 standard remains in effect until implementation plans to attain or maintain the 2008 standard are approved.

n In 1989, the California Air Resources Board converted both the general statewide 10-mile visibility standard and the Lake Tahoe 30-mile visibility standard to instrumental equivalents, which are "extinction of 0.23 per kilometer" and "extinction of 0.07 per kilometer" for the statewide and Lake Tahoe Air Basin standards, respectively.

SOURCE: California Air Resources Board, Ambient Air Quality Standards (5/4/16). Availablehttps://ww2.arb.ca.gov/resources/documents/ambient-air-quality-standards-0.

Title II requirements pertain to mobile sources, such as cars, trucks, buses, and planes. Reformulated gasoline, automobile pollution control devices, and vapor recovery nozzles on gas pumps are a few of the mechanisms the USEPA uses to regulate mobile air emission sources. The provisions of Title II have resulted in tailpipe emission standards for vehicles, which have been strengthened in recent years to improve air quality. For example, the standards for NO_X emissions have been lowered substantially, and the specification requirements for cleaner burning gasoline are more stringent.

State

California Air Resources Board

The California Clean Air Act (CCAA), signed into law in 1988, requires all areas of California to achieve and maintain the CAAQS. CARB, a part of the California Environmental Protection Agency, is responsible for the coordination and administration of both federal and state air pollution control programs within California. In this capacity, CARB conducts research, sets the CAAQS, compiles emission inventories, develops suggested control measures, and provides oversight of local programs. CARB establishes emissions standards for motor vehicles sold in California, consumer products (such as hairspray, aerosol paints, and barbecue lighter fluid), and various types of commercial equipment. It also sets fuel specifications to further reduce vehicular emissions. CARB has primary responsibility for the development of California's SIP, for which it works closely with the federal government and the local air districts. The SIP is required for the state to take over implementation of the federal CAA from USEPA.

California Clean Air Act

The California Clean Air Act, signed into law in 1988, requires all areas of the state to achieve and maintain the CAAQS by the earliest practical date. The CAAQS are established to protect the health of the most sensitive groups and apply to the same criteria pollutants as the federal Clean Air Act and also includes State-identified criteria pollutants, which are sulfates, visibility-reducing particles, hydrogen sulfide, and vinyl chloride (CARB 2017b). CARB has primary responsibility for ensuring the implementation of the California Clean Air Act (responding to the federal Clean Air Act planning requirements applicable to the state, and regulating emissions from motor vehicles and consumer products within the state.

Health and Safety Code Section 39607(e) requires CARB to establish and periodically review area designation criteria. The Air Basin is designated as attainment for the California standards for sulfates and unclassified for hydrogen sulfide and visibility-reducing particles. The Air Basin is currently in non-attainment for ozone, PM10, and PM2.5 under the CAAQS. Since vinyl chloride is a carcinogenic toxic air contaminant, CARB does not classify attainment status for this pollutant.

California Code of Regulations

The California Code of Regulations (CCR) is the official compilation and publication of regulations adopted, amended or repealed by the state agencies pursuant to the Administrative Procedure Act. The CCR includes regulations that pertain to air quality emissions. Specifically, Section 2485 in Title 13 of the CCR states that the idling of all diesel-fueled commercial vehicles (weighing over 10,000 pounds) during construction shall be limited to five minutes at any location. In addition, Section 93115 in Title 17 of the CCR states that operations of any stationary, diesel-fueled, compression-ignition engines shall meet specified fuel and fuel additive requirements and emissions standards.

California Air Resources Board On-Road and Off-Road Vehicle Rules

In 2004, CARB adopted an Airborne Toxic Control Measure (ATCM) to limit heavy-duty diesel motor vehicle idling in order to reduce public exposure to diesel PM and other TACs (Title 13 California Code of Regulations [CCR], Section 2485). The measure applies to diesel-fueled commercial vehicles with gross vehicle weight ratings greater than 10,000 pounds that are licensed to operate on highways, regardless of where they are registered. This measure does not allow diesel-fueled commercial vehicles to idle for more than five minutes at any given time.

In 2008 CARB approved the Truck and Bus regulation to reduce NO_X, PM10, and PM2.5 emissions from existing diesel vehicles operating in California (13 CCR, Section 2025). The requirements were amended to apply to nearly all diesel-fueled trucks and busses with a gross vehicle weight rating (GVWR) greater than 14,000 pounds. For the largest trucks in the fleet, those with a GVWR greater than 26,000 pounds, there are 2 methods to comply with the requirements. The first method is for the fleet owner to retrofit or replace engines, starting with the oldest engine model year, to meet 2010 engine standards, or better. This is phased over 8 years, starting in 2015 and would be fully implemented by 2023, meaning that all trucks operating in the State subject to this option would meet or exceed the 2010 engine emission standards for NO_X and PM by 2023. The second method, if chosen, required fleet owners, starting in 2012, to retrofit a portion of their fleet with diesel particulate filters achieving at least 85 percent removal efficiency, with installation of diesel particulate filters (DPFs) for their entire fleet by January 1, 2016. However, DPFs do not typically lower NO_X emissions. Thus, fleet owners choosing the second option had until 2020 to comply with the 2010 engine emission standards for their trucks and busses.

In addition to limiting exhaust from idling trucks, CARB promulgated emission standards for off-road diesel construction equipment of greater than 25 horsepower such as bulldozers, loaders, backhoes and forklifts, as well as many other self-propelled off-road diesel vehicles. The regulation adopted by the CARB on July 26, 2007, aims to reduce emissions by the installation of diesel soot filters and encouraging the retirement, replacement, or repower of older, dirtier engines with newer emission-controlled models (13 CCR, Section 2449). Implementation is staggered based on fleet size (which is the total of all off-road horsepower under common ownership or control), with the largest fleets to begin compliance in 2014, medium fleets in 2017, and small fleets in 2019. Each fleet must demonstrate compliance through one of two methods. The first option is to calculate and maintain fleet average emissions targets, which encourages the retirement or repowering of older equipment and rewards the introduction of newer cleaner units into the fleet. The second option is to meet the Best Available Control Technology (BACT) requirements by turning over or installing Verified Diesel Emission Control Strategies (VDECS) on a certain percentage of its total fleet horsepower. The compliance schedule requires that BACT turn overs or retrofits (VDECS installation) be fully implemented by 2023 in all equipment for large and medium fleets and by 2028 for small fleets.

Toxic Air Contaminants

The California Air Toxics Program was established in 1983, when the California Legislature adopted Assembly Bill (AB) 1807 to establish a two-step process of risk identification and risk management to address potential health effects from exposure to toxic substances in the air. In the risk identification step, CARB and Office of Environmental Health Hazard Assessment (OEHHA) determine if a substance should be formally identified, or "listed," as a TAC in California. Since the inception of the program, a number of such substances have been listed (www.arb.ca.gov/toxics.id/taclist.htm). In 1993, the California Legislature amended the program to identify the 189 federal HAPs as TACs. The SCAQMD has not adopted guidance applicable to land use projects that requires a quantitative health risk assessment be performed for construction exposures to TAC emissions (SCAQMD 2016b). The SCAQMD states that: "SCAQMD currently does not have guidance on construction Health Risk Assessments." (SCAQMD 2016b).

In the risk management step, CARB reviews emission sources of an identified TAC to determine whether regulatory action is needed to reduce risk. Based on the results of that review, CARB has promulgated a number of ATCMs, both for mobile and stationary sources. As discussed above, in 2004, CARB adopted an ATCM to limit heavy-duty diesel motor vehicle idling in order to reduce public exposure to diesel particulate matter and other TACs. The measure applies to diesel-fueled commercial vehicles with gross vehicle weight ratings greater than 10,000 pounds that are licensed to operate on highways, regardless of where they are registered. This measure does not allow diesel-fueled commercial vehicles to idle for more than five minutes at any given time.

In addition to limiting exhaust from idling trucks, as discussed above, CARB promulgated emission standards for off-road diesel construction equipment such as bulldozers, loaders, backhoes, and forklifts, as well as many other self-propelled off-road diesel vehicles. The regulation, adopted by CARB on July 26, 2007, aims to reduce emissions by the installation of diesel particulate filters and encouraging the replacement of older, dirtier engines with newer emission-controlled models. Implementation is staggered based on fleet size, with the largest operators beginning compliance in 2014.

The AB 1807 program is supplemented by the AB 2588 Air Toxics "Hot Spots" program, which was established by the California Legislature in 1987. Under this program, facilities are required to report their air toxics emissions, assess health risks, and notify nearby residents and workers of significant risks if present. In 1992, the AB 2588 program was amended by Senate Bill (SB) 1731 to require facilities that pose a significant health risk to the community to reduce their risk through implementation of a risk management plan.

Greenhouse Gas

California has promulgated a series of executive orders, laws, and regulations aimed at reducing both the level of GHGs in the atmosphere and emissions of GHGs from commercial and private activities within the state. Through executive orders, such as Executive Order (ES) S-3-05 and ES B-30-15, California governors established long-term GHG reduction goals for the state which ultimately led to the California Health and Safety Code [HSC], Division 25.5. Since the passing of these executive orders the California Air Resource Board was giving the primary responsibility of adopting rules and regulations directing state actions that would achieve GHG emissions reductions. CARB developed and approved the initial Climate Change Scoping Plan (Scoping Plan) in 2008, outlining the regulations, market-based approaches, voluntary measures, policies, and other emission reduction programs that would be needed to meet the statewide GHG emission limit and initiate the transformations needed to achieve the state's long-range climate objectives. Since then, a number of updates to the 2008 Scoping Plan have been adopted with the 2022 Scoping Plan for Achieving Carbon Neutrality (2022 Scoping Plan) as the most recent update. As summary of the 2022 Scoping Plan is provided below.

2022 Scoping Plan for Achieving Carbon Neutrality

The 2022 Scoping Plan for Achieving Carbon Neutrality (2022 Scoping Plan), adopted by CARB in December 2022, expands on prior Scoping Plans and responds to more recent legislation by outlining a technologically feasible, cost-effective, and equity-focused path to achieve the state's climate target of reducing anthropogenic or human made emissions to 85 percent below 1990 levels and achieving carbon neutrality by 2045 or earlier (CARB 2022a)[3]. The 2022 Scoping Plan outlines the strategies to achieve carbon neutrality by expanding actions to capture and store carbon through the state's natural and working lands (i.e. forests, shrublands/chaparral, croplands, wetlands, etc.) and using a variety of mechanical approaches. The 2022 Scoping Plan requires rapidly moving to zero-emission transportation for cars, buses, trains, and trucks; phasing out the use of fossil gas for heating; clamping down on chemicals and refrigerants; providing communities with sustainable options such as walking, biking, and public transit to reduce reliance on cars; continuing to build out solar arrays, wind turbine capacity, and other resources to provide clean, renewable energy to displace fossil-fuel fired electrical generation; scaling up new options such as renewable hydrogen for hard-to-electrify end uses and biomethane where needed. Under the Scoping Plan Scenario, the demand for liquid petroleum would decrease by 94 percent and total fossil fuels by 86 percent in 2045 relative to 2022. Despite these efforts, some amount of residual emissions will remain from hard-to-abate industries such as cement, internal combustion vehicles still on the road, and other sources of GHGs, including high global warming chemicals used as refrigerants. The 2022 Scoping Plan addresses the remaining emissions by re-envisioning natural and working lands (such as forests, shrublands/chaparral, croplands, wetlands, and other lands) to ensure they incorporate and store as much carbon as possible. Since working lands will not provide enough sequestration (or carbon capture/storage) on their own to address the residual emissions, additional methods of capturing, removing, and storing carbon dioxide need to be explored, developed and deployed including from pulling carbon dioxide from smokestacks of facilities, or drawing it out of the atmosphere itself and then safely and permanently utilizing and storing it (CARB 2022b). Additionally, carbon removal will be necessary to achieve net negative emissions to address historical GHGs already in the atmosphere (CARB 2022b). The 2022 Scoping Plan does not specify how the residual emissions will be removed, as this will require new CCS and DAC technologies to be developed which will need governmental or other incentive support to overcome technology and market barriers (CARB 2022a).

3 Carbon neutrality means balancing the amount of carbon dioxide and other greenhouses gas emissions generated by anthropogenic sources or human made (i.e. transportation, power plants, and industrial processes) with the amount of carbon dioxide stored both in natural sinks and mechanical sequestration.

The 2022 Scoping Plan includes the Scoping Plan Scenario, which “builds on and integrates efforts already underway to reduce the state’s GHG, criteria pollutant, and toxic air contaminant emissions by identifying the clean technologies and fuels that should be phased in as the state transitions away from combustion of fossil fuels.” (CARB 2022a). The 2022 Scoping Plan approaches decarbonization from two perspectives: (1) managing a phasedown of existing energy sources and technology and (2) ramping up, developing, and deploying alternative clean energy sources and technology over time (CARB 2022a). Other key actions to support success of the 2022 Scoping Plan include, but are not limited to a clean electricity grid, sustainable manufacturing and building, carbon dioxide removal (CDR) and capture, and short-lived climate pollutants.

The 2022 Scoping Plan also discusses the role of local governments in meeting the state’s GHG reductions goals because local governments have jurisdiction and land use authority related to community-scale planning and permitting processes, local codes and actions, outreach and education programs, and municipal operations. Local governments’ efforts to reduce GHG emissions within their jurisdictions are critical to achieving the State’s long-term climate goals. Furthermore, local governments make critical decisions on how and when to deploy transportation infrastructure and can choose to support transit, walking, bicycling, and neighborhoods that allow people to transition away from cars; they can adopt building ordinances that exceed statewide building code requirements; and they play a critical role in facilitating the rollout of ZEV infrastructure (CARB 2022a). The 2022 Scoping Plan encourages local governments to take ambitious, coordinated climate action at the community scale; action that is consistent with and supportive of the state’s climate.

California’s Renewables Portfolio Standard

The State of California has adopted standards to increase the percentage that retail sellers of electricity, including investor-owned utilities and community choice aggregators, must provide from renewable sources. The standards are referred to as the Renewables Portfolio Standards (RPS) and required retail sellers of electric services to increase procurement from eligible renewable energy resources to 33 percent by 2020.

On September 10, 2018, Governor Brown signed SB 100, which supersedes prior legislation and requires retail sellers and local publicly owned electric utilities to procure eligible renewable electricity for 44 percent of retail sales by December 31, 2024, 52 percent by December 31, 2027, and 60 percent by December 31, 2030, and that the California Air Resources Board (CARB) should plan for 100 percent eligible renewable energy resources and zero-carbon resources by December 31, 2045. The California Public Utilities Commission (CPUC) and the CEC jointly implement the RPS program. The CPUC’s responsibilities include: (1) determining annual procurement targets and enforcing compliance; (2) reviewing and approving each investor-owned utility’s renewable energy procurement plan; (3) reviewing contracts for RPS-eligible energy; and (4) establishing the standard terms and conditions used in contracts for eligible renewable energy (CPUC 2023).

On September 16, 2022, Governor Gavin Newsom signed SB 1075, which requires CARB, the CEC, California Public Utilities Commission, and the California Workforce Development Board to conduct an evaluation of hydrogen by June 1, 2024. The results of the evaluation must include policy recommendations to accelerate the production and use of hydrogen—specifically, green hydrogen—and its role in decarbonizing the electrical and transportation sectors.

Regional

Air Quality Management Plan

The SCAQMD has adopted a series of AQMPs to meet the CAAQS and NAAQS. The AQMPs serve as a regional blueprint to develop and implement an emission reduction strategy that will bring the Air Basin into attainment with the standards in a timely manner. The 2016 AQMP was adopted by SCAQMD on March 3, 2017 (SCAQMD 2016a). CARB approved the 2016 AQMP on March 23, 2017 (CARB 2017c). Key elements of the 2016 AQMP include implementing fair-share emissions reductions strategies at the federal, State, and local levels; establishing partnerships, funding, and incentives to accelerate deployment of zero and near-zero-emissions technologies; and taking credit from co-benefits from greenhouse gas, energy, transportation and other planning efforts (SCAQMD 2016a). The strategies included in the 2016 AQMP build on the strategies from the previous 2012 AQMP and are intended to demonstrate attainment of the NAAQS, which are set at levels considered safe to protect public health, including the health of sensitive populations such as asthmatics, children, and the elderly with a margin of safety; and to protect public welfare, including against decreased visibility and damage to animals, crops, vegetation, and buildings (USEPA 2022j), for the federal non-attainment pollutants ozone and PM2.5 while accounting for regional growth, increasing development, and maintaining a healthy economy. In general, SCAQMD's criteria for evaluating control strategies for stationary and mobile sources is based on the following: (1) cost-effectiveness; (2) emissions reduction potential; (3) enforceability; (4) legal authority; (5) public acceptability; (6) rate of emission reduction; and (7) technological feasibility. Control strategies in the AQMP with potential applicability to reducing short-term emissions from construction activities associated with the project include strategies denoted in the 2016 AQMP as MOB-08 and MOB-10, which are intended to reduce emissions from on-road and off-road heavy-duty vehicles and equipment (SCAQMD 2016b). Descriptions of measures MOB-08 and MOB-10 are provided below:

- **MOB-08 – Accelerated Retirement of Older On-Road Heavy-Duty Vehicles:** This measure seeks to replace up to 2,000 heavy-duty vehicles per year with newer or new vehicles that at a minimum, meet the 2010 on-road heavy-duty NO_X exhaust emissions standard of 0.2 grams per brake horsepower-hour (g/bhp-hr).
- **MOB-10 – Extension of the SOON Provision for Construction/Industrial Equipment:** This measure continues the Surplus Off-Road Option for NO_X (SOON) provision of the statewide In-Use Off-Road Fleet Vehicle Regulation through the 2031 timeframe.

The SCAQMD adopted the most recent version, the 2022 AQMP on December 2, 2022, which bases its analyses on the 2020–2045 RTP/SCS. On January 26, 2023, CARB adopted Resolution 23-4, which directs the CARB Executive Officer to submit the 2022 AQMP to the USEPA for inclusion in the California SIP to be effective, for purposes of federal law, after notice and public hearing as required by Section 110(l) of the Clean Air Act and 40 Code of Federal Regulations Section 51.102 and approval by the USEPA. USEPA approval has not yet occurred.

The 2022 AQMP builds upon measures already in place from previous AQMPs, including the 2016 AQMP. It also includes a variety of additional strategies such as regulation, accelerated deployment of available cleaner technologies (e.g., zero emissions technologies, when cost-effective and feasible, and low NOx technologies in other applications), best management practices, co-benefits from existing programs (e.g., climate and energy efficiency), incentives, and other CAA measures to achieve the 2015 8-hour ozone standard.

The 2022 AQMP incorporates the transportation strategy and transportation control measures from SCAG's Connect SoCal 2020 (2020-2045 *Regional Transportation Plan/Sustainable Communities Strategy* [2020-2045 RTP/SCS]).[4] SCAG is the regional planning agency for Los Angeles, Orange, Ventura, Riverside, San Bernardino, and Imperial Counties, and addresses regional issues relating to transportation, the economy, community development and the environment. SCAG coordinates with various air quality and transportation stakeholders in Southern California to ensure compliance with the federal and state air quality requirements. Pursuant to California Health and Safety Code Section 40460, SCAG has the responsibility of preparing and approving the portions of the AQMP relating to the regional demographic projections and integrated regional land use, housing, employment, and transportation programs, measures, and strategies. SCAG is required by law to ensure that transportation activities "conform" to, and are supportive of, the goals of regional and state air quality plans to attain the NAAQS. The RTP/SCS includes transportation programs, measures, and strategies generally designed to reduce vehicle miles traveled (VMT), which are contained in the AQMP.

The 2022 AQMP forecasts future emissions inventories with growth based on SCAG's 2020-2045 RTP/SCS. According to the 2022 AQMP, the region is projected to see a 12 percent growth in population, 17 percent growth in housing units, 11 percent growth in employment, and an 8 percent growth in VMT between 2018 and 2037. Despite regional growth in the past, air quality has improved substantially over the years, primarily due to the effects of air quality control programs at the local, state and federal levels.[5]

Noteworthy control strategies for mobile sources in the AQMP with potential applicability to reducing short-term emissions from construction activities associated with the Project include strategies denoted in the 2022 AQMP as MOB-06, MOB-11, and MOB-15, which are intended to reduce emissions from on-road and off-road heavy-duty vehicles and equipment.[6] Descriptions of measures MOB-06, MOB-11, and MOB-15 are provided below:

- **MOB-06 – Accelerated Retirement of Older On-Road Heavy-Duty Vehicles:** This measure seeks additional emission reductions from existing heavy-duty vehicles with GVWR greater than 8,500 lbs through an accelerated vehicle replacement program with zero or low NO_X emission vehicles.
- **MOB-11 – Emission Reductions from Incentive Programs:** This control measure seeks to quantify and take credit for the emission reductions achieved through the implementation of SCAQMD administered incentive programs for SIP purposes. The SCAQMD has been implementing a variety of incentive programs including, but not limited to, Carl Moyer

4 SCAG, Final 2020-2045 RTP/SCS, 2020.
5 SCAQMD, 2022 Air Quality Management Plan, Table 3-3, 2022.
6 SCAQMD, 2022 Air Quality Management Plan, pages 4-21 through 4-30, 2022.

Memorial Air Quality Standards Attainment Program, Proposition 1B, Lower Emission School Bus, Community Air Protection Program, and Volkswagen Environmental Mitigation Trust. Examples of projects funded by these programs include heavy-duty vehicle/equipment replacements, installation of retrofit units, and engine repowers. These incentive programs result in substantial emission reductions that are typically not eligible for credit in plans to attain ozone standards because they are not required by regulation. However, actual emission reductions that are realized and quantified may qualify for credit.

- **MOB-15 – Zero Emission Infrastructure for Mobile Sources:** This control measure is intended to support and accelerate the deployment of zero emission infrastructure needed for the widespread adoption of zero emission vehicles and equipment. AB 2127 estimated that the State will need 157,000 electric vehicle charging stations for medium and heavy-duty vehicles by 2030. AB 8 assessed the fueling needs for hydrogen fuel cell vehicles and found that 1,700 hydrogen stations will be needed to support 1.8 million fuel cell electric vehicles (FCEVs) statewide by 2035. The proposed measure seeks to address these concerns and identify the unique challenges and opportunities for zero emission infrastructure development in the South Coast Air Basin, particularly as it relates to zero emission medium and heavy vehicle deployments.

SCAQMD Air Quality Guidance Documents

The SCAQMD published the *CEQA Air Quality Handbook* to provide local governments with guidance for analyzing and mitigating project-specific air quality impacts (SCAQMD 1993). The *CEQA Air Quality Handbook* provides standards, methodologies, and procedures for conducting air quality analyses in EIRs and was used extensively in the preparation of this analysis. However, the SCAQMD is currently in the process of replacing the *CEQA Air Quality Handbook* with the *Air Quality Analysis Guidance Handbook*. While this process is underway, the SCAQMD recommends that lead agencies avoid using the screening tables in Chapter 6 (Determining the Air Quality Significance of a project) and the on-road mobile source emission factors in Table A9-5-J1 through A9-5 of the *CEQA Air Quality Handbook* as they are outdated.

The SCAQMD instead recommends using other approved models to calculate emissions from land use projects, such as the California Emissions Estimator Model (CalEEMod) software, which is a model developed for California Air Pollution Control Officers Association (CAPCOA) in collaboration with the California Air Districts, which is a Statewide land use emissions computer model designed to provide a uniform platform for government agencies, land use planners, and environmental professionals to quantify potential criteria pollutant and greenhouse gas (GHG) emissions from a variety of land use projects.

The SCAQMD has also adopted land use planning guidelines in its *Guidance Document for Addressing Air Quality Issues in General Plans and Local Planning*, which considers impacts to sensitive receptors from facilities that emit TAC emissions (SCAQMD 2005). SCAQMD’s general land use siting distance recommendations are the same as those provided by CARB (e.g., a 500-foot siting distance for sensitive land uses proposed in proximity to freeways and high-traffic roads, a 1,000-foot siting distance for sensitive land uses proposed in proximity to a major service and maintenance rail yard, and the same siting criteria for distribution centers and dry cleaning facilities). The SCAQMD’s document introduces land use-related policies that rely on design and distance parameters to minimize emissions and lower potential health risk. SCAQMDs guidelines are voluntary initiatives recommended for consideration by local planning agencies.

The SCAQMD has published a guidance document called the *Final Localized Significance Threshold Methodology* for CEQA Evaluations that is intended to provide guidance when evaluating the localized effects from mass emissions during construction (SCAQMD 2008). The SCAQMD adopted additional guidance regarding PM2.5 emissions in a document called *Final Methodology to Calculate Particulate Matter (PM)2.5 and PM2.5 Significance Thresholds* (SCAQMD 2006). This latter document has been incorporated by the SCAQMD into its CEQA significance thresholds and *Final Localized Significance Threshold Methodology*.

SCAQMD has adopted two rules to limit cancer and non-cancer health risks from facilities located within its jurisdiction. Rule 1401 (New Source Review of Toxic Air Contaminants) regulates new or modified facilities, and Rule 1402 (Control of Toxic Air Contaminants from Existing Sources) regulates facilities that are already operating. Rule 1402 incorporates the requirements of the AB 2588 program, including implementation of risk reduction plans for significant risk facilities.

SCAQMD Rules and Regulations

The SCAQMD has adopted many rules and regulations to regulate sources of air pollution in the Air Basin and to help achieve air quality standards. The project may be subject to the following SCAQMD rules and regulations:

Regulation IV – Prohibitions: This regulation sets forth the restrictions for visible emissions, odor nuisance, fugitive dust, various air emissions, fuel contaminants, start-up/shutdown exemptions and breakdown events. The following is a list of rules which apply to the project:

Rule 401 – Visible Emissions: This rule states that a person shall not discharge into the atmosphere from any single source of emission whatsoever any air contaminant for a period or periods aggregating more than three minutes in any one hour which is as dark or darker in shade as that designated No. 1 on the Ringelmann Chart or of such opacity as to obscure an observer's view.

Rule 402 – Nuisance: This rule states that a person shall not discharge from any source whatsoever such quantities of air contaminants or other material which cause injury, detriment, nuisance, or annoyance to any considerable number of persons or to the public, or which endanger the comfort, repose, health or safety of any such persons or the public, or which cause, or have a natural tendency to cause, injury or damage to business or property.

Rule 403 – Fugitive Dust: This rule requires projects to prevent, reduce or mitigate fugitive dust emissions from a site. Rule 403 restricts visible fugitive dust to the project property line, restricts the net PM10 emissions to less than 50 micrograms per cubic meter ($\mu g/m^3$) and restricts the tracking out of bulk materials onto public roads. Additionally, projects must utilize one or more of the best available control measures (identified in the tables within the rule). Control measures may include adding freeboard to haul vehicles, covering loose material on haul vehicles, watering or using non-toxic chemical stabilizers to prevent the generation of visible dust plumes, limiting vehicle speeds to 15 miles per hour on unpaved surfaces, and/or ceasing all activities. Finally, a contingency plan may be required if so determined by USEPA.

Regulation XI – Source Specific Standards: Regulation XI sets emissions standards for specific sources. The following is a list of rules which may apply to the project:

Rule 1113 – Architectural Coatings: This rule requires manufacturers, distributors, and end users of architectural and industrial maintenance coatings to reduce VOC emissions from the use of these coatings, primarily by placing limits on the VOC content of various coating categories.

Rule 1186 – PM10 Emissions from Paved and Unpaved Roads, and Livestock Operations: This rule applies to owners and operators of paved and unpaved roads and livestock operations. The rule is intended to reduce PM10 emissions by requiring the cleanup of material deposited onto paved roads, use of certified street sweeping equipment, and treatment of high-use unpaved roads (see also Rule 403).

Regulation XIV – Toxics and Other Non-Criteria Pollutants: Regulation XIV sets requirements for new permit units, relocations, or modifications to existing permit units which emit toxic air contaminants or other non-criteria pollutants.

Rule 1403 – Asbestos Emissions from Demolition/Renovation Activities: This rule requires owners and operators of any demolition or renovation activity and the associated disturbance of asbestos-containing materials, any asbestos storage facility, or any active waste disposal site to implement work practice requirements to limit asbestos emissions from building demolition and renovation activities, including the removal and associated disturbance of asbestos-containing materials.

Southern California Association of Governments (SCAG)

SCAG is the regional planning agency for Los Angeles, Orange, Ventura, Riverside, San Bernardino and Imperial Counties, and addresses regional issues relating to transportation, the economy, community development and the environment. SCAG is the federally designated Metropolitan Planning Organization (MPO) for the majority of the Southern California region and is the largest MPO in the nation.

Pursuant to Health & Safety Code Section 40460, SCAG is responsible for preparing and approving the portions of the AQMP relating to regional demographic projections and integrated regional land use, housing, employment and transportation programs, measures and strategies (SCAQMD 2016a). With regard to air quality planning, SCAG adopted the *2016-2040 Regional Transportation Plan/Sustainable Communities Strategy* (2016-2040 RTP/SCS) in April 2016, which contains such regional development and growth forecasts. These regional development and growth forecasts form the basis for the land use and transportation control portions of the 2016 AQMP, and its growth forecasts were utilized in the preparation of the air quality forecasts and consistency analysis included in the 2016 AQMP (SCAQMD 2016a). Both the RTP/SCS and the AQMP are based on projections that originate with local jurisdictions. On September 3, 2020, the SCAG Regional Council adopted the 2020-2045 *Regional Transportation Plan/Sustainable Communities Strategy* (2020-2045 RTP/SCS), which is an update to the previous 2016-2040 RTP/SCS (SCAG 2020).

SCAG is required to adopt an SCS along with its RTP pursuant to Senate Bill (SB) 375 (Chapter 728, Statutes of 2008), which required the development of regional targets for reducing passenger vehicle GHG emissions. Under SB 375, CARB is required, in consultation with the state's MPOs, to set regional GHG reduction targets for the passenger vehicle and light-duty truck sector for 2020 and 2035. In February 2011, CARB adopted the final GHG emissions reduction targets for SCAG. SCAG's target is a per capita reduction of 8 percent for 2020 and 13 percent for 2035 compared to the 2005 baseline (SCAG 2016). SCAG's 2016-2040 RTP/SCS meets or exceeds these targets, lowering GHG emissions (below 2005 levels) by eight percent by 2020; 18 percent by 2035; and 21 percent by 2040 (SCAG 2016). The 2020-2045 RTP/SCS includes the CARB updated SB 375 targets from March 2018 to require 8 percent reduction by 2020 and a 19 percent reduction by 2035 in per capita passenger vehicle GHG emissions. Although the RTP/SCS is not focused specifically on air quality emissions, the targets growth projections established in the 2016-2040 RTP/SCS, as incorporated in the 2016 AQMP affect air quality through optimized land use planning and the consequential reduction of emissions from passenger and light-duty vehicles.

SCAG's SCS is "built on a foundation of contributions from communities, cities, counties and other local agencies" and "based on local general plans as well as input from local governments." (SCAG 2016). SCAG's 2016-2040 RTP/SCS and 2020-2045 RTP/SCS provide specific strategies for implementation. These strategies include supporting projects that encourage a diverse job opportunities for a variety of skills and education, recreation and cultures and a full-range of shopping, entertainment and services all within a relatively short distance; encouraging employment development around current and planned transit stations and neighborhood commercial centers; encouraging the implementation of a "Complete Streets" policy that meets the needs of all users of the streets, roads and highways including bicyclists, children, persons with disabilities, motorists, electric vehicles, movers of commercial goods, pedestrians, users of public transportation, and seniors; and supporting alternative fueled vehicles (SCAG 2020). Like the 2016-2040 RTP/SCS, the 2020-2045 RTP/SCS overall land use pattern reinforces the trend of focusing new development and employment in the region's high quality transit areas (HQTAs), which SCAG defines as an area within a one-half mile of a well-serviced transit stop (SCAG 2020). HQTAs are a cornerstone of land use planning best practice in the SCAG region because they concentrate roadway repair investments, leverage transit and active transportation investments, reduce regional life cycle infrastructure costs, improve accessibility, create local jobs, and have the potential to improve public health and availability of community amenities.

Local

City of Moreno Valley General Plan

The City of Moreno Valley's General Plan outlines the concerns of the community and the means of addressing those concerns (Moreno Valley 2021a). Chapter 8, the Environmental Justice Element of the 2040 General Plan, identifies goals and policies that will reduce exposure to pollution; provide safe and sanitary housing; provide access to healthy food; and promote active engagement in civic life (Moreno Valley 2021a). Goals and policies that relate to air quality impacts include the following:

Goal EJ-1: Reduce pollution Exposure and improve community health.

> Policy EJ 1-1: Coordinate air quality planning efforts with other local, regional, and State agencies.

Policy EJ 1-2: Cooperate with SCAQMD and Western Riverside Council of Governments (WRCOG) in efforts to promote public awareness about air pollution and control measures.

Policy EJ 1-4: Collaborate with SCAQMD and other regional partners in the development and implementation of Community Emissions Reduction Plans, consistent with State mandates.

Policy EJ 1-6: Ensure that construction and grading activities minimize short-term impacts to air quality by employing appropriate mitigation measures and best practices.

Policy EJ 1-7: Require new large commercial or light industrial projects to develop and implement a plan to minimize truck idling in order to reduce diesel particulate emissions.

Policy EJ 1-8: Support the incorporation of new technologies and design and construction techniques in new development that minimize pollution and its impacts.

Policy EJ 1-9: Designate truck routes that avoid sensitive land uses, where feasible.

City of Moreno Valley Climate Action Plan

The Climate Action Plan (CAP) is designed to reinforce the City's commitment to reduce GHG emissions, and demonstrate how the City will comply with the State's GHG emission reduction standards (Moreno Valley 2021b). The CAP includes an inventory of the City's GHG emissions, forecasts of future GHG emissions, measure to reduce GHG emissions consistent with the State requirements, and monitoring and reporting processes to ensure targets are met (Moreno Valley 2021b). The CAP was prepared concurrently with the 2040 General Plan.

Moreno Valley Municipal Code

The Moreno Valley Municipal Code establishes the following air quality provisions relative to the Project.

<u>Section 9.10.050 – Air Quality</u>

No operation or activity otherwise permitted under this title shall cause the emission of any smoke, fly ash, dust, fumes, vapors, gases or other forms of air pollution which exceeds the requirements of the SCAQMD or the requirements of any air quality plan or general plan air quality element adopted by the city.

<u>Section 9.10.150 – Odors</u>

No operation or activity shall be permitted which emits odorous gases or other odorous matter in such quantities as to be dangerous, injurious, noxious, or otherwise objectionable to a level that is detectable with or without the aid of instruments at or beyond the lot line of the property containing said operation or activity.

3.2.3 Impact Analysis and Mitigation Measures

Thresholds of Significance

The following criteria from CEQA Guidelines Appendix G are used as thresholds of significance to determine the impacts of the proposed project related air quality and GHG emissions.

Air Quality

The proposed project would have a significant impact related to air quality if it would:

1. Conflict with or obstruct implementation of the applicable air quality plan.
2. Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard.
3. Expose sensitive receptors to substantial pollutant concentrations.
4. Result in other emissions (such as those leading to odors) adversely affecting a substantial number of people.
5. Result in cumulatively considerable impacts to air quality.

A significant impact may occur if a project would add a cumulatively considerable contribution of a federal or state non-attainment pollutant. The Air Basin is currently in non-attainment for ozone, PM10, and PM2.5. SCAQMD methodology recommends that significance thresholds be used to determine the potential cumulative impacts to regional air quality along with a project's consistency with the current AQMP.

The SCAQMD has established numerical significance thresholds for construction and operational activities. The numerical thresholds are based on the recognition that the Air Basin is a distinct geographic area with a critical air pollution problem for which ambient air quality standards have been promulgated to protect public health (SCAQMD 1993). Given that construction impacts are temporary and limited to the construction phase, the SCAQMD has established numerical significance thresholds specific to construction activity. For determining the significance of operational emissions, the SCAQMD has established numerical indicators as significance thresholds based, in part, on Section 182(e) of the CAA, which sets 10 tons per year of VOC as a significance level for stationary source emissions in extreme non-attainment areas for ozone (SCAQMD 1993). As shown in Table 3.2-1, the Air Basin is designated as extreme non-attainment for ozone. The SCAQMD converted this significance level to pounds per day for ozone precursor emissions (10 tons per year × 2,000 pounds per ton ÷ 365 days per year = 55 pounds per day). The numeric indicators for other pollutants are also based on federal stationary source significance levels. Based on the thresholds in the SCAQMD CEQA Air Quality Handbook (SCAQMD 2019), the proposed project would potentially result in a significant impact of a federal or state non-attainment pollutant if emissions of ozone precursors (VOC and NO_X), PM10, or PM2.5 would exceed the values shown in **Table 3.2-4**.

TABLE 3.3-4
SCAQMD REGIONAL EMISSIONS THRESHOLDS (POUNDS PER DAY)

Activity	VOC	NO_X	CO	SO_2	PM10	PM2.5
Construction	75	100	550	150	150	55
Operation	55	55	550	150	150	55

SOURCE: SCAQMD, Air Quality Significance Thresholds, 2019.

Greenhouse Gas Emissions

The proposed project would have a significant impact related to greenhouse gas emissions if it would:

1. Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment.
2. Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases.
3. Result in cumulatively considerable impacts to GHG emissions.

In December 2008, the SCAQMD adopted a 10,000 $MTCO_2e$ per year significance threshold for industrial facilities for projects in which the SCAQMD is the lead agency. Although SCAQMD has not formally adopted a significance threshold for GHG emissions generated by a project for which SCAQMD is not the lead agency, or a uniform methodology for analyzing impacts related to GHG emissions on global climate change, in the absence of any industry-wide accepted standards applicable to this project, the SCAQMD’s significance threshold of 10,000 $MTCO_2e$ per year for industrial projects is the most relevant GHG significance threshold and is used as a benchmark for the proposed project. It should be noted that the SCAQMD’s significance threshold of 10,000 $MTCO_2e$ per year for industrial projects is intended for long-term operational GHG emissions. The SCAQMD has developed guidance for the determination of the significance of GHG construction emissions that recommends that total emissions from construction be amortized over an assumed project lifetime of 30 years and added to operational emissions and then compared to the threshold (SCAQMD 2008).

Methodology

The proposed project includes installation of storage tank and a pipeline in two phases. Phase 1 includes construction of a new 4.5-million-gallon (MG) storage tank to the north of the existing 2 MG storage tank, which would remain in service during Phase 1. A 24-to-30-inch transmission pipeline would be installed to connect the water storage tank to the future Cactus II Feeder within Alessandro Boulevard. The pipeline would be installed within the existing rights-of-way of Moreno Beach Drive and Alessandro Boulevard. Since the area surrounding the proposed project does not have engineered stormwater management facilities, Phase 1 includes proposed onsite and offsite drainage facilities. In addition, a retaining wall would be installed between the two tanks. Phase 1 is expected to occur in 2026.

As part of Phase 2, the existing 2 MG tank would be demolished and the construction of a new 4.5 MG steel storage tank would be constructed in its place. Phase 2 would also include the demolition of the retaining wall constructed in Phase 1. Phase 2 is expected to occur in 2045.

Construction Emissions

Construction of the proposed project has the potential to generate temporary criteria pollutant emissions through the use of heavy-duty construction equipment, such as cranes and excavators, and through vehicle trips generated from worker trips, haul trucks, and vendor/material supply trucks traveling to and from the project areas. In addition, fugitive dust emissions would result from demolition, excavation, and various soil-handling activities. Evaporative emissions of VOCs result from the application of asphalt and architectural/industrial coatings, and can vary depending on the amount of asphalt and coatings applied on a daily basis. Construction emissions can vary substantially from day to day, depending on the level of activity, the specific type of construction activity, and prevailing weather conditions. The assessment of construction air quality impacts considers each of these potential sources of emissions.

Daily regional emissions during construction are forecasted by assuming a conservative estimate of construction activities and applying the mobile source and fugitive dust emissions factors. The emissions are estimated using the California Emissions Estimator Model (CalEEMod) (Version 2020.4.0) software, an emissions inventory software program recommended by SCAQMD. CalEEMod is based on outputs from OFFROAD and EMFAC, which are emissions estimation models developed by CARB and used to calculate emissions from construction activities, including on- and off-road vehicles. The input values used in the CalEEMod analysis were adjusted to be project-specific based on construction information provided by the EMWD based on representative conservative project parameters for each type of project (tank and pipeline). These values were then applied to the construction phasing assumptions used in the criteria pollutant analysis to generate criteria pollutant emissions values for each construction activity. Detailed construction equipment lists, construction scheduling, and emissions calculations are provided in Appendix AQ/GHG/ENERGY of this Draft EIR.

Phase 1

Storage Tank

Phase 1 would include the construction of a new 4.5 MG steel storage tank to the north of the existing 2 MG storage tank, which would remain in service during Phase 1. The Phase 1 tank would be approximately 137.5 feet in diameter and approximately 52 feet in height. The existing tank site is currently developed, graded, and includes several ornamental trees. Grading, excavation, and potential blasting would be required to construct the tank foundation that would extend approximately 10 feet to 35 feet below ground surface (bgs). The majority of grading required to install the Phase 2 storage tank would be completed under Phase 1.

Stormwater Drainage Facilities

To accommodate the additional tank on the project site, site improvements would be required. A 20-foot access road would be paved around the new tank and a new 25-foot paved driveway/entrance to the site would also be included in Phase 1.

The area surrounding the proposed project site will include onsite and offsite drainage facilities to allow a storm event to be conveyed through and around the site without impacting the water storage tank and other facilities. A portion of the existing hill would be graded to accommodate both tanks and a retaining wall would be installed between the two tanks and a concrete drainage ditch would be constructed around the limits of the project site. Additionally, a proposed concrete down drain and a series of storm drains would be installed to safely convey flows onsite as well as an emergency overflow structure and a 0.18 MG detention basin.

Pipeline

A 24-to-30-inch transmission pipeline would be installed to connect the water storage tank to the future Cactus II Feeder within Alessandro Boulevard. The pipeline would be installed entirely within existing rights of way of Moreno Beach Drive and Alessandro Boulevard. The pipeline would be approximately 4,000 linear feet in length.

Phase 2

Storage Tank and Demolition

The existing 2 MG tank and supporting infrastructures such as pipelines and vaults would be demolished. The retaining wall installed as part of Phase 1 would be demolished. As with the new tank under Phase 1, the Phase 2 tank would require grading, excavation, and potential blasting to construct the tank foundation that would extend approximately 10 feet to 35 feet bgs. The site would be re-paved and re-graded to support the tank expansion. Pipeline installation would not be required since that activity was completed as part of Phase 1. Grading/drainage improvements would be minimal under Phase 2.

Construction-Related Toxic Air Contaminant Emissions

Intermittent construction activities associated with Phase 1 and Phase 2 would result in short-term emissions of DPM, which is a TAC. During construction, the exhaust of off-road heavy-duty diesel equipment would emit DPM during general construction activities. DPM poses a carcinogenic health risk that is generally measured using an exposure period of 30 years for sensitive residential receptors, according to the OEHHA *Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments* (OEHHA Guidance) (OEHHA 2015).

Temporary TAC emissions associated with DPM emissions from heavy construction equipment would occur during construction activities. According to the OEHHA, health effects from TACs are described in terms of individual cancer risk based on a lifetime (i.e., 30-year) resident exposure duration. Given the temporary and short-term construction schedule (approximately 10 months for each Phase 1 and Phase 2), the project would not result in a long-term (i.e., lifetime or 30-year) exposure as a result of construction activities. The project’s health risk calculations were performed using a spreadsheet tool consistent with the OEHHA guidance, which incorporates the algorithms, equations, and variables described above as well as in the OEHHA guidance, and incorporates the results of the USEPA AMS/EPA Regulatory Model (AERMOD) model with meteorological data from the closest SCAQMD meteorological monitoring station.

For this risk assessment, AERMOD dispersion model output was converted into specific cancer risks and non-cancer chronic health hazard impacts. Health impacts addressed construction DPM emissions and the effects on nearby sensitive uses (i.e., residences). Consistent with OEHHA methodology, health impact calculations take into account higher estimates of cancer potency during early life exposures and to use different assumptions for breathing rates and length of residential exposures (OEHHA 2015). See Appendix AQ/GHG/ENERGY of this Draft EIR for a list of the risk factors used for the risk assessment.

The proposed project is divided into two phases, Phase 1 and Phase 2. Phase 1 is estimated to begin construction in the second quarter of 2026 with implementation in late 2026. Phase 2 is estimated to begin construction in the first quarter of 2045 with implementation in late 2045. However, if construction commences at a later date, construction impacts would be lower than analyzed here due to use of a more energy-efficient and cleaner burning construction vehicle fleet mix, pursuant to State regulations that require vehicle fleet operators to phase-in less polluting heavy-duty equipment. As a result, should project construction commence at a later date than analyzed in this analysis, air quality impacts would be lower than the impacts disclosed herein.

Operational Emissions

Emissions produced from operation of the proposed project would be analyzed as an increase from existing conditions of the facility. There are no known or expected new sources of stationary emission sources (like emergency generators). During operation of the proposed project, minimal amounts of emissions could be generated from maintenance operations, including routine cleaning and from periodic visits from service vehicles. Therefore, minimal additional emissions would be generated from vehicle trips by worker staff for periodic inspections or maintenance purposes.

During long-term operations of the project, TACs could be emitted as part of periodic maintenance operations, routine cleaning, periodic painting, etc., and from periodic visits from service vehicles. However, these events are expected to be occasional and result in minimal emissions exposure to offsite sensitive receptors. The project would not include sources of substantial TAC emissions. Thus, a qualitative analysis is appropriate for assessing the project’s operational emissions.

In addition to regional pollutant emissions, localized impacts on sensitive receptors must also be addressed from operational activities. Localized impacts are analyzed onsite or around the immediate vicinity of the project site. Proposed project operational activities consist strictly of offsite emission sources (mobile sources and indirect sources) of criteria pollutants, so any localized impacts from mobile sources during operations would not occur. Therefore, this analysis includes a qualitative discussion of associated localized impacts as they relate to the increase electrical energy consumption associated with the increased capacity of the larger tanks.

Greenhouse Gas Emissions

As noted above, the increased concentration of GHGs in the atmosphere has been linked to global warming, which can lead to climate change. Construction and operation of the proposed project would incrementally contribute to GHG emissions along with past, present and future activities. As such, impacts of GHG emissions are analyzed here on a cumulative basis.

Similar to the air quality analysis, GHG emissions are estimated using the CalEEMod Version 2020.4.0. CalEEMod is based on outputs from OFFROAD and EMFAC, which are emissions estimation models developed by CARB and used to calculate emissions from construction activities, including on- and off-road vehicles. As with air quality, the input values used in the CalEEMod analysis were adjusted to be project-specific information provided by EMWD. These values were then applied to the construction phasing assumptions used in the criteria pollutant analysis to generate GHG emissions values for each construction activity. Detailed construction equipment lists, construction scheduling, and emissions calculations are provided in Appendix AQ/GHG/ENERGY of this Draft EIR.

Consistency with Greenhouse Gas Reduction Plans, Policies, and Regulations

The proposed project's GHG emissions are also evaluated by assessing consistency with applicable GHG reduction strategies. As discussed previously, the GHG regulations have been adopted primarily at the Federal and State levels to reduce emissions of GHGs from project sources, such as trucks and energy, under the Clean Air Act and the State's GHG regulatory framework under HSC Division 25.5. Impacts are evaluated based on consistency with these applicable regulations.

Impact Analysis

Conflict with or Obstruct Air Quality Plans

Impact 3.2-1: The proposed project could conflict with or obstruct implementation of the applicable air quality plan.

Phase 1 and Phase 2

Construction

Storage Tank and Pipeline

To evaluate consistency with the AQMP, the SCAQMD recommends that lead agencies evaluate whether a project is consistent with the land use assumptions upon which the AQMP is based. The proposed project is located within EMWD's service area, in Moreno Valley which is located in Riverside County. Emissions control strategies for construction activities outlined in the current 2022 AQMP include MOB-06, MOB-11, and MOB-15 which are intended to reduce emissions from on-road and off-road heavy-duty vehicles and equipment by accelerating the replacement of older, providing incentive programs to reduce emissions, and the supporting the acceleration of zero emission infrastructure needed for the widespread adoption of zero emission vehicles and equipment. Implementation of the project would be subject to CARB requirements for construction activities to minimize short-term emissions from on-road and off-road diesel equipment. Construction activities would also be subject to SCAQMD regulations for controlling fugitive dust pursuant to SCAQMD Rule 403, such as the requirement to apply water spray/mists or similar suppressant (e.g., SoilSeal) at least 3 times per day on active areas of disturbance and unpaved roads, and limit truck speed to 15 miles per hour or less on unpaved roads to minimize dust on unpaved roads at the construction site. Compliance with these regulations would ensure that Riverside FMP project emissions are consistent with the AQMP requirements for control strategies intended to reduce emissions from construction equipment and activities. Because the project would be subject to regulations requiring control strategies intended to reduce emissions from construction equipment, the proposed project would not conflict with or obstruct implementation of the AQMP, and impacts would be less than significant.

Phase 1 and Phase 2

Operation

Storage Tank and Pipeline

As discussed in the *Methodology* section above, a project is deemed to not conflict with the applicable air quality plan if it is consistent with the existing land use plan that was used to generate the growth forecast and does not increase dwelling unit density, vehicle trips, and vehicle miles traveled due to zoning changes, specific plans and general plan amendments. The proposed project does not include residential or commercial development. The project site would not require daily staffing but rather require only periodic maintenance. No new employees would be required to operate the facilities. Implementation of the project would not induce any additional growth within the service area, but rather would accommodate planned growth within the EMWD's service area. The proposed project would not induce unplanned population or employment growth. Therefore, implementation of the project would not conflict with growth or employment projections in the SCAQMD AQMP. As such, the proposed project would not conflict with, or obstruct, implementation of the AQMP, and this impact would be less than significant.

Mitigation Measures

None Required

Significance Determination

Less than Significant Impact

Net Increase of Criteria Pollutants

Impact 3.2-2: The proposed project could result in a cumulatively considerable net increase of any criteria pollutant for which the project region is nonattainment under an applicable federal or state ambient air quality standard.

Phase 1

Construction

Storage Tank and Pipeline

Construction of Phase 1 is anticipated to occur in second quarter 2026 through early 2027 and would last approximately 10 months. The analysis below includes the construction of a new storage tank, stormwater drainage facilities, and transmission pipeline.

The maximum daily emissions from Phase 1 were compared against SCAQMD's air quality significance thresholds. See Appendix AQ/GHG/ENERGY for the estimated construction schedule and equipment list. The maximum daily emissions generated by Phase 1 are shown below in **Table 3.2-5**, which demonstrates that construction of Phase 1 would not exceed any SCAQMD air quality significance thresholds and therefore would not violate a regional air quality standard. Impacts related to an increase in criteria pollutants for the Phase 1 project would be less than significant.

TABLE 3.2-5
PHASE 1 – ESTIMATED MAXIMUM REGIONAL CONSTRUCTION EMISSIONS (POUNDS PER DAY) [a]

Phase 1 (2026)	VOC	NO_X	CO	SO_2	PM10 [b]	PM2.5 [b]
Grading/Excavation - 2026	5.0	64.2	53.8	<1	4.5	2.1
Potholding - 2026	1.9	12.5	18.0	<1	<1	<1
Stormwater Drainage and Foundation - 2026	2.2	57.2	33.1	<1	4.1	1.5
Construction - 2026	1.2	10.7	9.4	<1	<1	<1
Construction - 2027	1.2	10.7	9.4	<1	<1	<1
Finishing - 2026	<1	5.7	11.6	<1	<1	<1
Finishing - 2027	<1	5.7	11.6	<1	<1	<1
Painting - 2026	<1	2.9	5.4	<1	<1	<1
Painting - 2027	<1	2.9	5.3	<1	<1	<1
Installing Pipeline - 2026	1.3	8.5	11.6	<1	<1	<1
Installing Appurtenances - 2026	1.8	11.3	14.8	<1	<1	<1
Pavement Repairs - 2027	2.6	17.0	23.1	<1	1.1	<1
Phase 1 Overlapping Phases (2026)						
Potholing (Phase 1a) + Grading/Excavation (Phase 1b)	6.9	76.7	71.8	<1	5.2	2.6
Install Pipeline (Phase 1a) + Construction/Finishing/Painting (Phase 1b)	4.0	27.9	38.0	<1	2.1	1.3
Install Appurtenances (Phase 1a) + Construction/Finishing/Painting (Phase 1b)	4.5	30.7	41.2	<1	2.2	1.4
Pavement Repairs/Misc. (Phase 1a) + Construction/Finishing/Painting (Phase 1b)	5.3	36.4	49.6	<1	2.7	1.6
Maximum Daily Emissions	6.9	76.7	71.8	<1	5.2	2.6
SCAQMD Numeric Indicators	**75**	**100**	**550**	**150**	**150**	**55**
Exceeds Thresholds?	No	No	No	No	No	No

NOTES:

[a] Totals may not add up exactly due to rounding in the modeling calculations. Detailed emissions calculations are provided in Appendix AQ/GHG/ENERGY of this technical report.

[b] Emissions include fugitive dust control measures consistent with SCAQMD Rule 403.

SOURCE: ESA 2023.

Mitigation Measures

None Required

Significance Determination

Less than Significant Impact

Phase 2

Construction

Storage Tank and Pipeline

Construction of the Phase 2 is anticipated to occur in the first quarter 2045 and would last approximately 10 months. The analysis below includes the demolition of the existing 2 MG storage tank, the retaining wall, and grading/drainage improvements installed under Phase 1. In addition, Phase 2 would include the construction of a new storage tank.

The maximum daily emissions from Phase 2 were compared against SCAQMD's air quality significance thresholds. See Appendix AQ/GHG/ENERGY for the estimated construction schedule and equipment list. The maximum daily emissions generated by Phase 2 are shown below in **Table 3.2-6**, which demonstrates that construction of Phase 2 would not exceed any SCAQMD air quality significance thresholds and therefore would not violate a regional air quality standard. Impacts related to an increase in criteria pollutants for priority projects would be less than significant.

TABLE 3.2-6
PHASE 2 – ESTIMATED MAXIMUM REGIONAL CONSTRUCTION EMISSIONS (POUNDS PER DAY) [a]

Phase 2 (2045)	VOC	NO_X	CO	SO_2	PM10 [b]	PM2.5 [b]
Demolition - 2045	1.3	6.2	17.3	<1	<1	<1
Grading/Excavation - 2045	4.3	15.6	41.2	<1	1.5	<1
Stormwater Drainage and Foundation - 2045	<1	3.9	11.1	<1	<1	<1
Construction - 2045	<1	3.3	7.4	<1	<1	<1
Finishing - 2045	<1	1.0	6.3	<1	<1	<1
Painting - 2045	<1	1.9	5.1	<1	<1	<1
Maximum Daily Emissions	4.3	15.6	41.2	<1	1.5	<1
SCAQMD Numeric Indicators	**75**	**100**	**550**	**150**	**150**	**55**
Exceeds Thresholds?	No	No	No	No	No	No

NOTES:

[a] Totals may not add up exactly due to rounding in the modeling calculations. Detailed emissions calculations are provided in Exhibit B of this technical report.

[b] Emissions include fugitive dust control measures consistent with SCAQMD Rule 403.

SOURCE: ESA 2023.

Phase 1 and 2

Construction

Storage Tank and Pipeline

Implementation of the storage tanks would result in long-term regional emissions for criteria air pollutants and ozone precursors associated with increased electrical energy consumption associated with the use of additional pumps to accommodate the increased capacity onsite from 2 MG to 9 MG. Electrical energy associated with the operation of the pipeline would not result in direct emissions of criteria pollutants. Although the pipelines and storage tanks would involve the transportation and storage of water, the project does not directly use water or generate water wastewater; therefore, no water usage was modeled for this analysis. During operation of the proposed project, minimal amounts of emissions could be generated from maintenance operations, including routine cleaning and from periodic visits from service vehicles. The proposed project would have minimal amounts of emissions generated from periodic (a maximum of two service truck trips per week) visits from service vehicles for inspection and maintenance purposes. Additionally, the project would not result in any new combustion sources directly related to the long-term project operations. So, the project would be a source of indirect emissions rather than direct emissions.

The net increase of energy usage as a result of implementation of the project were used to conservatively calculate and model operational emissions. Existing energy consumption were adjusted to reflect estimated project data. Detailed modeling assumptions are included in Appendix AQ/GHG/ENERGY. Modeled operations emissions are presented in **Table 3.2-7**, which shows that the emissions from operation of the project would not result in long-term regional emissions of VOC, NO_X, CO, SO_2, PM_{10} or $PM_{2.5}$ that exceed regulatory thresholds. Therefore, the operational emissions from the project would not result in pollutant concentrations that would violate an air quality standard, and this impact would be less than significant.

TABLE 3.2-7
PHASE 1 – ESTIMATED MAXIMUM REGIONAL OPERATIONAL EMISSIONS (POUNDS PER DAY) [a]

Source	VOC	NO_X	CO	SO_2	PM10	PM2.5
Proposed Project						
Energy [b]	<1	2	1	<1	<1	<1
Total Project	25	15	135	<1	6	2
SCAQMD Numeric Indicators	**55**	**55**	**550**	**150**	**150**	**55**
Exceeds Thresholds?	No	No	No	No	No	No

NOTES:
[a] Totals may not add up exactly due to rounding in the modeling calculations. Detailed emissions calculations are provided in Exhibit B of this technical report.
[b] Phase 1 represents the energy required for the existing 2 MG storage tank plus the new 4.5 MG storage tank.
SOURCE: ESA 2023.

TABLE 3.2-8
PHASE 2 – ESTIMATED MAXIMUM REGIONAL OPERATIONAL EMISSIONS (POUNDS PER DAY) [a]

Source	VOC	NO_X	CO	SO_2	PM10	PM2.5
Proposed Project						
Energy [b]	<1	2	1	<1	<1	<1
Total Project	25	15	135	<1	6	2
SCAQMD Numeric Indicators	**55**	**55**	**550**	**150**	**150**	**55**
Exceeds Thresholds?	No	No	No	No	No	No

NOTES:
[a] Totals may not add up exactly due to rounding in the modeling calculations. Detailed emissions calculations are provided in Exhibit B of this technical report.
[b] Phase 2 represents the energy required for the 4.5 MG storage tank constructed under Phase 1 plus the new 4.5 MG storage tank.
SOURCE: ESA 2023.

Mitigation Measures

None Required

Significance Determination

Less than Significant Impact

Sensitive Receptors

Impact 3.2-3: The proposed project could expose sensitive receptors to substantial pollutant concentrations.

Phase 1

Construction

Storage Tank and Pipeline

Phase 1 is estimated to begin construction in the second quarter of 2026 with implementation in first quarter 2027. Sensitive receptors would be located approximately 25 feet to the east of the pipeline construction. However, the construction activities of the pipeline would be short-term in nature (i.e. for several weeks at most) at any one location near a residence as construction would occur linearly. The majority of construction activities would occur at the storage tank area. Therefore, in this analysis, it was assumed the nearest receptor would be the residence located approximately 450 feet to the southwest of the project site along Ardell Lane.

Toxic Air Contaminants

Results of the construction HRA for Phase 1 and 2 combined are shown in **Table 3.2-9**. Phase 1 begins in 2026 and continues through 2027 and Phase 2 begins and ends in 2045. Under OEHHA guidance, the lifetime exposure of a potentially maximally exposed individual receptor is 30 years. For the purposes of the lifetime exposure health risk analysis, the construction activities for Phase 1 are assumed to occur beginning at a resident's 3rd trimester and 0 to 2 age bins (to account for the 10 months of construction activities in Phase 1) and the construction activities for Phase 2 will occur during the 16 to 30 age bin (to account for the 10 months of construction activities in Phase 2). To ensure a conservative lifetime exposure health risk analysis, potential impacts are also analyzed assuming the construction activities for Phase 2 will occur beginning during a resident's 3rd trimester and the 0 to 2 age bins (presented in more detail below). This additional analysis is accounting for Phase 2 construction activity occurring during the age bins with higher age sensitivity factors and corresponding potential higher health risk impacts.

As shown in Table 3.2-9, the residential cancer risk would not exceed the SCAQMD significance threshold of 10 per million; therefore, this impact is less than significant, and mitigation measures would not be required. Hazard index values for all receptor types were below the SCAQMD significance threshold of 1.0, therefore, chronic impacts would be less than significant.

TABLE 3.2-9
PHASE 1 & 2 – MAXIMUM UNMITIGATED HEALTH RISK IMPACTS FOR OFF-SITE SENSITIVE RECEPTORS

Sensitive Receptor	Maximum Cancer Risk (# in one million)	Hazard Index
Off-Site Residential Land Use	7.4	0.05
Maximum Individual Cancer Risk Threshold	10	1.0
Exceeds Threshold?	**No**	**No**

SOURCE: ESA 2023.

Localized Significance Thresholds

To evaluate the impacts of localized criteria air pollutants, a localized construction air quality analysis was conducted using the methodology prescribed in the SCAQMD *Final Localized Significance Threshold Methodology*.[7] The project is located in SRA 24 and for the purposes of the LST analysis, the nearest receptor was assumed at a distance of 80 feet (see above discussion for sensitive receptors near the pipeline). The maximum daily localized emissions for the proposed project and the localized significance thresholds are presented in **Table 3.2-10**. The same phasing, equipment assumptions, and compliance with SCAQMD Rule 403 and Rule 1113, were used as for the regional emissions calculations discussed above. As shown in Table 3.2-8, maximum localized construction emissions for sensitive receptors would be below the localized screening indicators for NO_X, CO, PM10, and PM2.5. Therefore, with respect to localized construction emissions, impacts to sensitive receptors would be less than significant.

Mitigation Measures

None Required

Significance Determination

Less than Significant Impact

7 SCAQMD, Final Localized Significance Threshold Methodology. July 2008.

TABLE 3.2-10
PHASE 1 – ESTIMATED MAXIMUM LOCALIZED CONSTRUCTION EMISSIONS (POUNDS PER DAY) [a]

Phase 1 (2026)	NO_X	CO	PM10 [b]	PM2.5 [b]
Grading/Excavation - 2026	33.4	39.0	2.0	1.4
Potholding - 2026	12.5	17.3	<1	<1
Stormwater Drainage and Foundation (1B) - 2026	8.9	10.4	<1	<1
Construction - 2026	9.2	7.5	<1	<1
Construction - 2027	9.2	7.5	<1	<1
Finishing - 2026	5.7	10.9	<1	<1
Finishing - 2027	5.7	10.9	<1	<1
Painting - 2026	2.9	4.6	<1	<1
Painting - 2027	2.9	4.6	<1	<1
Installing Pipeline - 2026	8.4	10.8	<1	<1
Installing Appurtenances - 2026	11.3	14.0	<1	<1
Pavement Repairs - 2027	15.6	21.3	<1	<1
Phase 1 (2026) Overlapping Phases				
Potholing (Phase 1a) + Grading/Excavation (Phase 1b)	45.9	56.3	2.5	1.8
Install Pipeline (Phase 1a) + Construction/Finishing/Painting (Phase 1b)	26.2	33.9	1.1	1.0
Install Appurtenances (Phase 1a) + Construction/Finishing/Painting (Phase 1b)	29.0	37.1	1.2	1.1
Pavement Repairs/Misc. (Phase 1a) + Construction/Finishing/Painting (Phase 1b)	33.3	44.4	1.4	1.3
Maximum Localized (On-Site) Emissions	45.9	56.3	2.5	1.8
SCAQMD Screening Numeric Indicator [c]	**2160.0**	**1577.0**	**13.0**	**8.0**
Exceed Screening Numeric Indicator?	No	No	No	No

NOTES:
[a] Totals may not add up exactly due to rounding in the modeling calculations. Detailed emissions calculations are provided in Exhibit B of this technical report.
[b] Emissions include fugitive dust control measures consistent with SCAQMD Rule 403.
[c] The SCAQMD LSTs are based on Source Receptor Area 24 (Perris Valley) for a 8-acre site (includes storage tank area and pipeline) with sensitive receptors conservatively assumed to be located adjacent to the construction area.

SOURCE: ESA 2023.

Phase 2

Construction

Storage Tank

Phase 2 is estimated to begin construction in the first quarter of 2045 with implementation in late 2045. Currently there are no sensitive receptors located east of the storage tank construction area. If the area continues to remain undeveloped, impacts would be within the parameters of the analysis presented above for Phase 1. However, this analysis for Phase 2 conservatively assumes that future residents could be located approximately 80 feet across and east of Moreno Beach Drive from the storage tank area where Phase 2 construction would occur.

Toxic Air Contaminants

A health risk analysis was conducted using the same assumptions as those performed for Phase 1 and included these new potential future sensitive residential receptors. This HRA assumed that Phase 1 construction activities have been completed and the Phase 2 construction activities starting in 2045 would be occurring during the 3rd trimester and 0 – 2 age bins (with the higher age sensitivity factors). This will capture the highest potential health risk impacts associated with Phase 2 construction activities. Results of the construction HRA for the Phase 2, are shown in **Table 3.2-11**.

As shown in Table 3.2-11, the residential cancer risk for Phase 2 would not exceed the SCAQMD significance threshold of 10 per million, including the new potential future sensitive residential receptors directly to the east of the proposed project site. Therefore, this impact is less than significant, and mitigation measures would not be required. Hazard index values for all receptor types were below the SCAQMD significance threshold of 1.0, therefore, chronic impacts would be less than significant.

TABLE 3.2-11
PHASE 2 – MAXIMUM UNMITIGATED HEALTH RISK IMPACTS FOR OFF-SITE SENSITIVE RECEPTORS

Sensitive Receptor	Maximum Cancer Risk (# in one million)	Hazard Index
Residential Land Use	6.3	0.06
Maximum Individual Cancer Risk Threshold	10	1.0
Exceeds Threshold?	**No**	**No**

SOURCE: ESA 2023.

Localized Significance Thresholds

Localized impacts were analyzed for Phase 2. As presented in **Tables 3.2-12**, localized emissions would be less than the applicable thresholds and impacts would be less than significant.

Mitigation Measures

None Required

Significance Determination

Less than Significant Impact

TABLE 3.2-12
PHASE 2 – ESTIMATED MAXIMUM LOCALIZED CONSTRUCTION EMISSIONS (POUNDS PER DAY) [a]

Phase 2 (2045)	NO_X	CO	PM10 [b]	PM2.5 [b]
Demolition - 2045	6.1	16.8	<1	<1
Grading/Excavation - 2045	10.7	37.1	<1	<1
Stormwater Drainage and Foundation - 2045	3.8	10.6	<1	<1
Construction - 2045	2.9	6.7	<1	<1
Finishing - 2045	1.0	6.0	<1	<1
Painting - 2045	1.9	4.7	<1	<1
Maximum Localized (On-Site) Emissions	10.7	37.1	<1	<1
SCAQMD Screening Numeric Indicator [c]	1080	1346	11	7
Exceed Screening Numeric Indicator?	No	No	No	No

NOTES:
[a] Totals may not add up exactly due to rounding in the modeling calculations. Detailed emissions calculations are provided in Exhibit B of this technical report.
[b] Emissions include fugitive dust control measures consistent with SCAQMD Rule 403.
[c] The SCAQMD LSTs are based on Source Receptor Area 24 (Perris Valley) and conservatively for a 4-acre site (storage tank area only) with sensitive receptors conservatively assumed to be located adjacent to the construction area.
SOURCE: ESA 2023.

Phase 1 and 2

Operation

Storage Tank and Pipeline

Operational activities would consist of the operation of the storage tanks and pipelines. Emissions produced from operation of the proposed project are analyzed as an increase from existing conditions. Additionally, there are no known or expected new sources of stationary emission sources (such as emergency generators). During operation of the proposed project, minimal amounts of emissions from periodic service vehicle visits (a maximum of two service trucks per week) would occur for inspection and maintenance purposes. As such localized impacts from the proposed project operations would be less than significant.

Mitigation Measures

None Required

Significance Determination

Less than Significant Impact

CO Hotspots

Phase 1 and 2

Construction

Storage Tank and Pipeline

A CO hotspot is an area of localized CO pollution that is caused by severe vehicle congestion on major roadways, typically near intersections. Projects may worsen air quality if they increase the percentage of vehicles in cold start modes by two percent or more; significantly increase traffic volumes (by five percent or more) over existing volumes; or worsen traffic flow, defined for signalized intersections as increasing average delay at intersections operating at Level of Service

(LOS) E or F or causing an intersection that would operate at LOS D or better without the proposed project, to operate at LOS E or F.

While construction-related traffic on the local roadways would occur during construction of each phase, the maximum of approximately 10 construction worker vehicle trips per phase to the existing daily traffic volumes on the local roadways would be minimal and would not result in CO hotspots. Additionally, the construction-related vehicle trips would only occur in the short-term, and would cease once construction activities for each phase of the project has been completed. Since construction-related traffic would not substantially increase CO concentrations in the project area, CO hotspot impacts to sensitive receptors would be less than significant.

Phase 1 and 2

Operation

Storage Tank and Pipeline

During operation of the proposed project, a maximum of two service trucks per week would occur for inspection and maintenance purposes. Therefore, minimal emissions would be generated from vehicle trips by worker staff for periodic inspections or maintenance repairs. Since operational related traffic would consist of a maximum of two service trucks per week CO hotspot impacts to sensitive receptors would be less than significant.

Mitigation Measures

None Required

Significance Determination

Less than Significant Impact

Other Emissions

Impact 3.2-4: The proposed project could result in other emissions (such as those leading to odors) adversely affecting a substantial number of people.

Phase 1 and 2

Construction

Storage Tank and Pipeline

During the construction phase of the proposed project, exhaust from construction equipment may produce discernible odors typical of most construction sites; however, such odors would be temporary. The proposed project would comply with the applicable provisions of the CARB ATCM regarding idling limitations for diesel trucks. Through mandatory compliance with SCAQMD Rules, no construction activities or materials are expected to create objectionable odors affecting a substantial number of people. Therefore, construction odors would be considered less than significant.

Phase 1 and 2

Operation

Storage Tank and Pipeline

According to the SCAQMD's CEQA Air Quality Handbook, land uses associated with odor complaints typically include agricultural uses, wastewater treatment plants, food processing plants, chemical plants, composting, refineries, landfills, dairies, and fiberglass molding. Operation of the storage tanks and pipelines would involve the storage and conveyance of water and would not generate odors. Therefore, objectionable odor impacts affecting a substantial number of people from the proposed project would not occur from the operation of these facilities.

Mitigation Measures

None Required

Significance Determination

No Impact

Greenhouse Gas Emissions

Impact 3.2-5: The proposed project could generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment.

Phase 1

Construction

Storage Tank and Pipeline

CalEEMod was used to prepare estimates of annual GHG emissions for the proposed project using the same construction assumptions and the types of projects that would occur in a year as the Air Quality analysis discussed above. **Table 3.2-13** summarizes the modeled worst-case annual GHG emissions that are estimated to occur for Phase 1 of the proposed project.

TABLE 3.2-13
PHASE 1 – ESTIMATED CONSTRUCTION-RELATED GREENHOUSE GAS EMISSIONS

Emission Source	CO_2e Emissions (MT/yr.)
Construction Year 2026	1,370
Construction Year 2027	206
Total Construction Emissions	**1,575**
Amortized Construction Emissions (30 years)	**53**
GHG Significance Threshold	*10,000*
Exceeds Significance Threshold?	**No**

CO_2e= carbon dioxide equivalent; MT/yr = metric tons per year.

SOURCE: ESA 2023.

As shown in Table 3.2-13, construction of the proposed project under Phase 1 would produce approximately 1,575 $MTCO_2e$, or 53 $MTCO_2e$ per year amortized over a 30-year period. This mass rate is substantially below the most applicable quantitative draft interim threshold of 10,000 $MTCO_2e$ per year as recommended by the SCAQMD, representing only 0.53 percent of the limit designed to capture 90 percent of CEQA projects within the SCAQMD jurisdiction. Therefore, construction of Phase 1 would result in a less than significant impact related to GHG emissions.

Mitigation Measures

None Required

Significance Determination

Less than Significant Impact

Phase 2

Construction

Storage Tank

CalEEMod was used to prepare estimates of annual GHG emissions for Phase 2. **Table 3.2-14** summarizes the annual GHG emissions that are estimated to occur during construction of Phase 2.

TABLE 3.2-14
PHASE 2 – ESTIMATED CONSTRUCTION-RELATED GREENHOUSE GAS EMISSIONS

Emission Source	CO_2e Emissions (MT/yr.)
Construction Year 2045	695
Total Construction Emissions	**695**
Amortized Construction Emissions (30 years)	**23**
GHG Significance Threshold	*10,000*
Exceeds Significance Threshold?	**No**

CO_2e= carbon dioxide equivalent; MT/yr = metric tons per year.

WWTF expansion was modeled as one 1000 LF ft pipeline install, and the equivalent of one of each of the following: storage tank construction, pump station and lift station construction.

SOURCE: ESA 2023.

As shown in Table 3.2-14, construction of Phase 2 would produce approximately 695 $MTCO_2e$, or 23 $MTCO_2e$ per year amortized over a 30-year period. This mass rate is substantially below the most applicable quantitative draft interim threshold of 10,000 $MTCO_2e$ per year as recommended by the SCAQMD. Even if Phase 1 and Phase 2 amortized GHG emissions are added together, the resultant 76 $MTCO_2e$ per year amortized GHG emissions would not exceed the threshold. Therefore, construction of the future projects would result in a less than significant impact related to GHG emissions.

Mitigation Measures

None Required

Significance Determination

Less than Significant Impact

Phase 1 and 2

Operation

Storage Tank and Pipeline

The operation of Phase 1 and Phase 2 would generate indirect GHG emissions from electrical consumption to accommodate the increased tank capacity necessary to transmit water to the proposed storage tanks. Periodic maintenance would be minimal with a maximum of two service trucks per week. Additionally, no new generators were assumed in this analysis. Based on the current usage, the existing 2 MG storage tank consumes approximately 16 MWh. The proposed project would result in a projected additional consumption of electricity totaling approximately 36 MWh per year after Phase 1 construction. After the construction of the second tank in Phase 2 the proposed project would result in a projected consumption of electricity totaling approximately 56 MWh per year. The total electricity consumption of the proposed project, taking into account the existing consumption of the 2.5 MG tank, would be 92 MWh. Increased electrical consumption during operation of the proposed project would generate minimal GHG emissions. **Table 3.2-15** presents the summary of the estimated total operational GHG emissions, including maximum amortized construction GHG emissions of Phase 1 and Phase 2. The maximum annual operation related GHG emissions yields a maximum annual GHG emissions of 1,575 MT/year in Phase 1 and 695 MT/year in Phase 2, which is still far below the corresponding GHG significance threshold. Impacts would be less than significant.

TABLE 3.2-15
PHASE 1 & 2 – ESTIMATED PROJECT REGIONAL ANNUAL INDIRECT OPERATIONAL GREENHOUSE GAS EMISSIONS

Emissions Source	Project (MTCO2e/ year)
Operational Emissions Phase 1 (2026)	
Area	0.01
Energy	<0.01
Waste	<0.01
Water	<0.01
Construction Emissions [a]	53
Phase 1 (2026) Project Operational Total:	**53**
Operational Emissions Phase 2 (2045)	
Area	0.01
Energy	<0.01
Waste	<0.01
Water	<0.01
Construction Emissions [a]	23
Phase 2 (2045) Project Operational Total:	**23**

[a] The total construction GHG emissions were amortized over 30 years and added to the operational GHG emissions of the Project.

SOURCE: ESA 2023

Greenhouse Gas Emissions Plans

Impact 3.2-6: The proposed project could conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases.

Phase 1 and Phase 2

Construction and Operation

Storage Tank and Pipeline

As discussed in Impact 3.2-5, the GHG emissions generated by the construction and operation of Phase 1 and Phase 2 would not exceed the SCAQMD's significance threshold of 10,000 MT CO_2e per year. The primary source of GHG emissions generated by project implementation would occur during construction, which would be temporary in nature. EMWD would utilize contractors that would comply with regulations including the USEPA Heavy Duty Vehicle Greenhouse Gas Regulation, CARB ACTM that limits heavy-duty diesel motor vehicle idling, and the low carbon fuel standard. Compliance with these regulations would limit construction-related GHG emissions.

The objectives of the project, as described in Chapter 2, *Project Description*, include providing replacement tanks to increase potable water storage capacity to meet near and long term demands associated with planned development in eastern Moreno Valley; provide a transmission pipeline to connect the replacement tanks with existing and proposed infrastructure; maximize usable storage capacity of other tanks within the 1764 Pettit Pressure Zone; and further EMWD's strategic planning goal to develop adaptable water storage and delivery system improvements to manage uncertain delivery conditions and emergency outages. The proposed project is not a land use project which typically would have GHG emissions associated with mobile sources. However, periodic inspection and maintenance would occur but would be minimal with a maximum of two service trucks per week. The operation of the project itself would not increase water demand or wastewater generation. Rather, the project would provide systems and infrastructure sufficient to serve projected growth and demands within the eastern Moreno Valley. Increased electrical consumption as a result of additional power need to operate appurtenant facilities, increased growth and demand within the 1764 Pettit Pressure Zone as a result of operation of the project facilities would generate minimal GHG emissions as presented in Table 3.2-15. Emissions from electricity would decline as utility providers, including SCE, meet their Renewable Portfolio Standard obligations to supply renewable electricity to their end users or when the solar panels are operational. Impacts would be less than significant.

Mitigation Measures

None Required

Significance Determination

Less than Significant Impact

Cumulative Impacts: Air Quality

Impact 3.2-7: Concurrent construction and operation of the proposed project and related projects in the geographic scope could result in cumulative short-term and long-term impacts to air quality.

Future cumulative developments near the proposed project are identified in Table 3-2 and on Figure 3-1 would involve construction and operation of large-scale residential and industrial projects, some of which are already in the planning stages. The proposed project's potential air quality impacts are well below their corresponding significance thresholds based on conservative assumptions surrounding proximity and schedule. Because implementation of the proposed project would not contribute to an exceedance of an air quality significance threshold and the components of the proposed project are located a considerable distance apart, the proposed project would be less than cumulatively considerable. As previously discussed, the proposed project would result in periodic inspection and maintenance but is not expected to produce any new permanent sources of direct emissions. Therefore, there would not be the potential for the proposed project, in conjunction with other potential planned projects, to result in a cumulatively considerable impact. Impacts would be less than significant.

Mitigation Measures

None Required

Significance Determination

Less than Significant Impact

Cumulative Impacts: Greenhouse Gas Emissions

Impact 3.2-8: Concurrent construction and operation of the proposed project and related projects in the geographic scope could result in cumulative short-term and long-term impacts to greenhouse gas emissions.

Future cumulative development near the proposed project identified in Table 3-2 and on Figure 3-1 would involve construction and operation of large-scale residential and industrial projects, some of which are already in the planning stages. Implementation of cumulative development could result in the generation of GHG emissions. Cumulative development could exceed the GHG thresholds and could conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases. Because the proposed project would be consistent with all relevant GHG reduction plans and policies, the project's contribution to cumulative GHG reduction plans and policies impacts would be less than cumulatively considerable. Therefore, the project's cumulative impacts would be less than significant.

Mitigation Measures

None Required

Significance Determination

Less than Significant Impact

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3.3 Biological Resources

This section addresses the biological resources impacts associated with implementation of the proposed project. This section includes: a description of the existing biological resources conditions at the proposed project site; a summary of applicable regulations related to biological resources; and an evaluation of the potential impacts of the proposed project related to biological resources at the proposed project site and in the surrounding area, including cumulative impacts. The section is based on the *Pettit Water Storage Tank Expansion & Transmission Pipeline Project Aquatic Resources Delineation Report* (ESA 2023a; **Appendix WATER**) and the *Pettit Water Storage Tank Expansion & Pipeline Transmission Project, Biological Resources Technical Report* (ESA 2023b; **Appendix BIO**) for the proposed project.

3.3.1 Environmental Setting

Regional Setting

The biological study area (BSA) encompasses two parcels where the water storage tanks will be constructed totaling 4.37-acres owned by EMWD (APNs 488-170-004 and 477-310-011). The BSA also includes areas affected by appurtenant facilities east of Moreno Beach Drive, approximately 4,000 linear feet within the Moreno Beach Drive right-of-way extending south to Alessandro Boulevard accommodating the proposed pipeline, and a 100-foot buffer surrounding the pipeline alignment.

Biological Resources Reconnaissance

A field survey was conducted by ESA Biologist Douglas Gordon-Blackwood on November 7, 2022. The survey consisted of walking transects throughout the BSA to characterize and map vegetation, and to determine the potential for special-status plants and wildlife to occur within the BSA. Those areas which were deemed inaccessible were scanned with binoculars.

All incidental, visual observations of flora and fauna, including sign (i.e. presence of scat) as well as any audible detections, were noted during the assessment and are described further below in this report. All native and non-native plant communities and land uses were characterized and delineated on aerial photographs during the field survey, and then digitized on aerial maps using a Geographic Information System software (ArcGIS). Most descriptions of vegetation were characterized in the field in accordance with *A Manual of California Vegetation, Second Edition* (Sawyer et al. 2009). A detailed description of each plant community and land use is provided below.

The BSA was also assessed for its potential to support jurisdictional areas based on the presence of definable channels (bed and bank), ordinary flow (Ordinary High Water Mark [OHWM]), hydrology, vegetation communities, and riparian/riverine resources that are subject to the United States Army Corps of Engineers (USACE) jurisdiction pursuant to Section 404 of the Clean Water Act (CWA); California Department of Fish and Wildlife (CDFW) jurisdiction pursuant to Division 2, Chapter 6, Section 1600 of the California Fish and Game Code (CFGC); the Regional Water Quality Control Board (RWQCB) pursuant to Section 401 of the CWA, and riparian/riverine resources pursuant to Section 6.1.2 of the Western Riverside County Multiple Species Habitat Conservation Plan (MSHCP) (RCA 2003). The results of the aquatic resources delineation are discussed in the Aquatic Resources Section below and in Appendix WATER.

Natural Communities and Land Uses

The natural communities and land cover types located within the BSA were characterized and mapped during the biological resources assessment and are depicted in **Figure 3.3-1a-c**. Each natural community and land cover type is described in detail below. A complete list of plant species observed during the site assessment is provided in Appendix BIO, Subappendix A. A summary of acreages of each natural community and land cover type within the BSA, which includes the project and a 100-foot buffer, are presented in **Table 3.3-1,** below.

TABLE 3.3-1
VEGETATION COMMUNITIES AND LAND COVER TYPES WITHIN THE BSA

Natural Community/Land Cover Type[1]	Project (acres)	100-foot Survey Buffer (acres)	BSA Total (acres)
Uplands			
Brittle bush scrub (*Encelia farinosa* Shrubland Alliance)	0.56	2.86	3.42
Urban Land Cover Types			
Developed	0.49	7.22	7.71
Disturbed	1.81	7.71	9.51
TOTAL	**2.85**	**17.79**	**20.65**

[1] Vegetation was characterized in the field in accordance with A Manual of California Vegetation, Online (CNPS, 2022b)

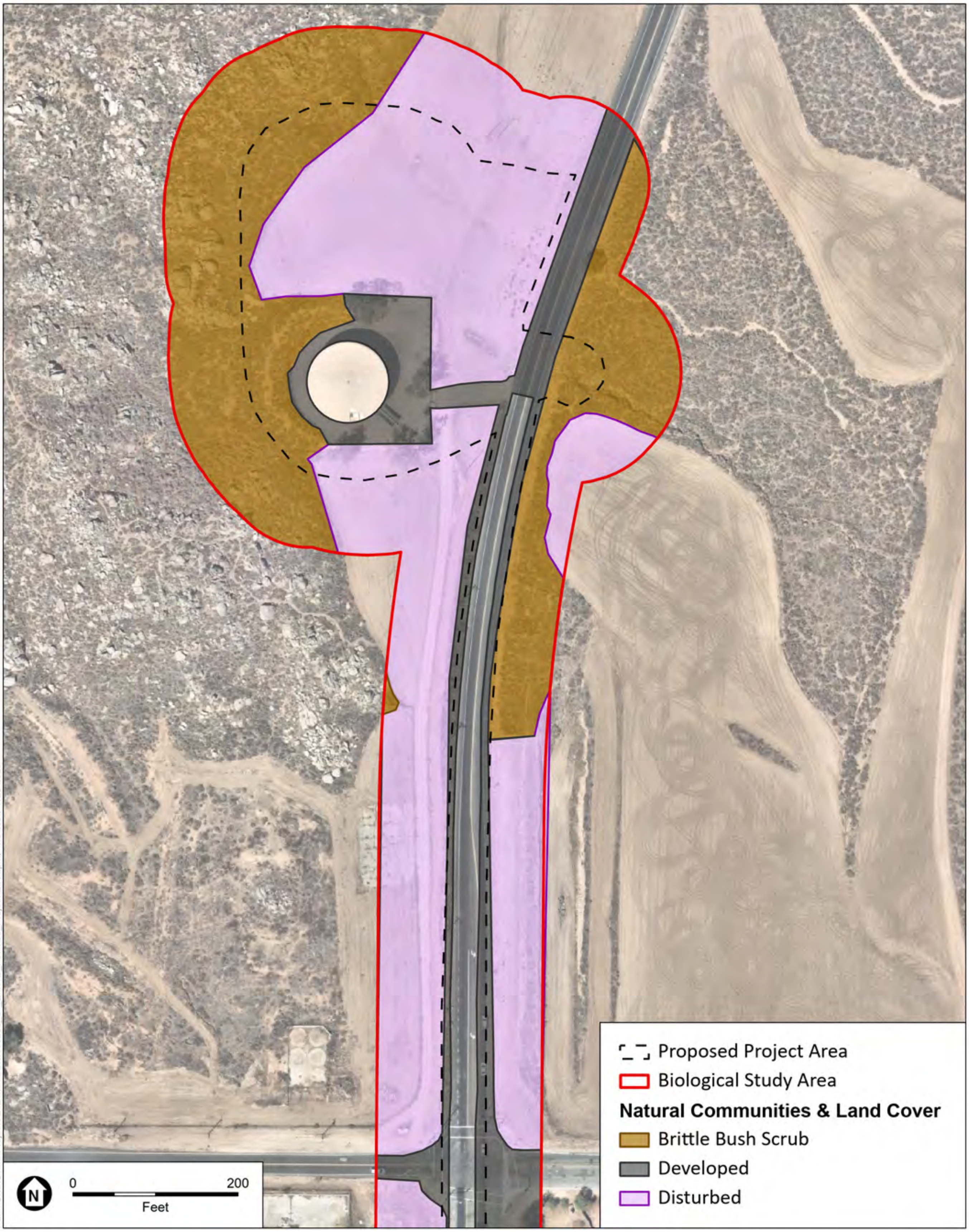
SOURCE: ESA 2023

Brittle Bush Scrub

Brittle bush scrub (*Encelia farinosa* Shrubland Alliance) was mapped within the western portion of the Pettit Water storage tank project site associated with Phases 1 and 2. This community is characterized by a shrub canopy dominated by brittlebush (*Encelia farinosa*), interspersed with various other native species such as orange bush monkeyflower (*Diplacus aurantiacus*), California sagebrush (*Artemisia californica*), and wishbone bush (*Mirabilis laevis* var. *crassifolius*). Brittle bush scrub typically occurs on steep, rocky sites, especially south-facing slopes.

Disturbed

Disturbed land use was mapped throughout the majority of the eastern section of the grading limits associated with the water storage tank project site and portions of the transmission pipeline sections of the project. This community supports mostly barren soils with small amounts of non-native vegetative growth and no native species. Species include Russian thistle (*Salsola tragus*), shortpod mustard (*Hirschfeldia incana*), tumbling pigweed (*Amaranthus albus*), and red-stem filaree (*Erodium cicutarium*).



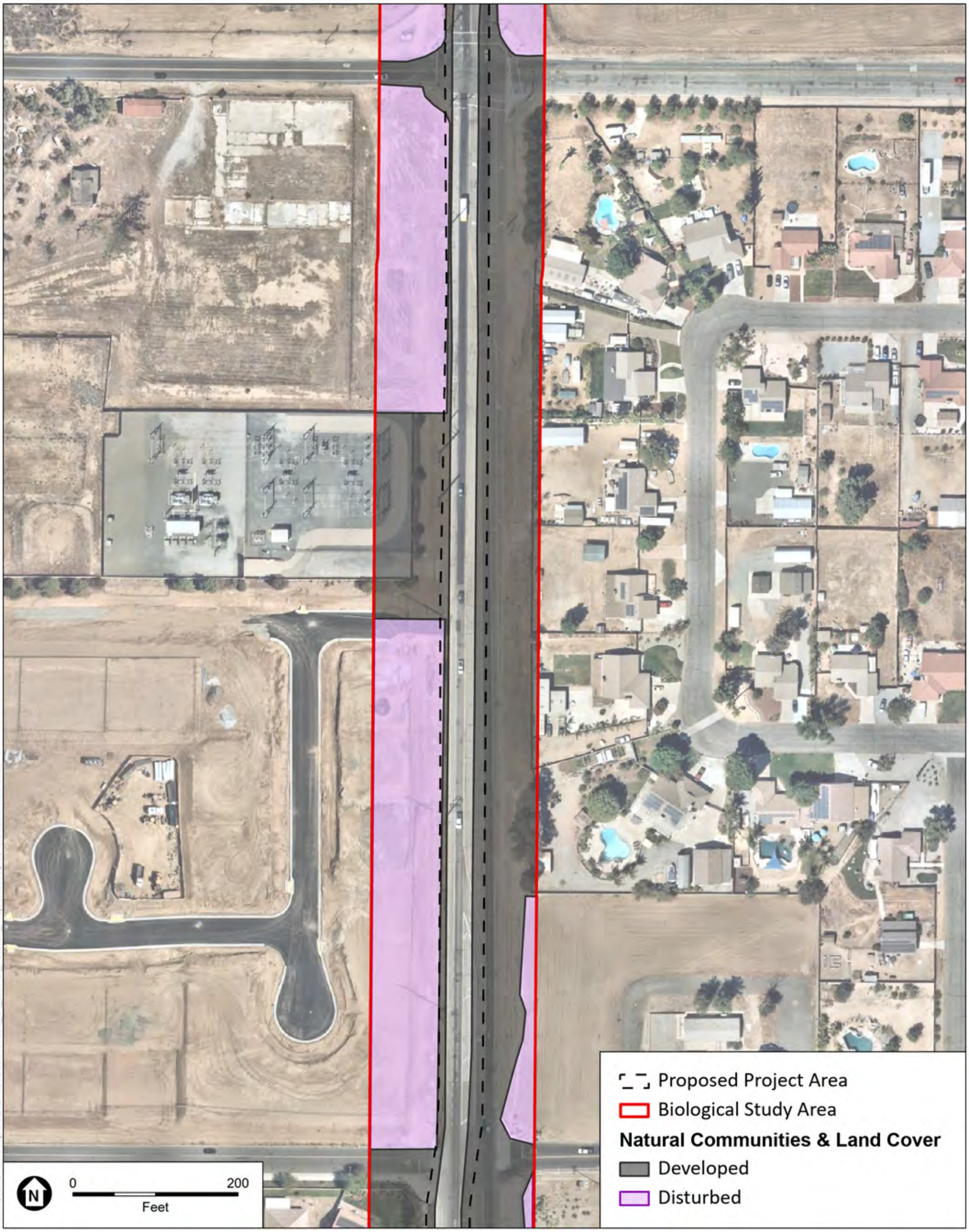
Path: U:\GIS\GIS\Projects\2021xxx\D202100203_04_EMWD_Pettit\03_Project\EIR.aprx, MCScott 7/28/2023

SOURCE: Nearmap (2022), ESA (2022)

Pettit Water Storage Tank Expansion and Transmission Pipeline Project

Figure 3.3-1a
Natural Communities and Land Cover Types

ESA

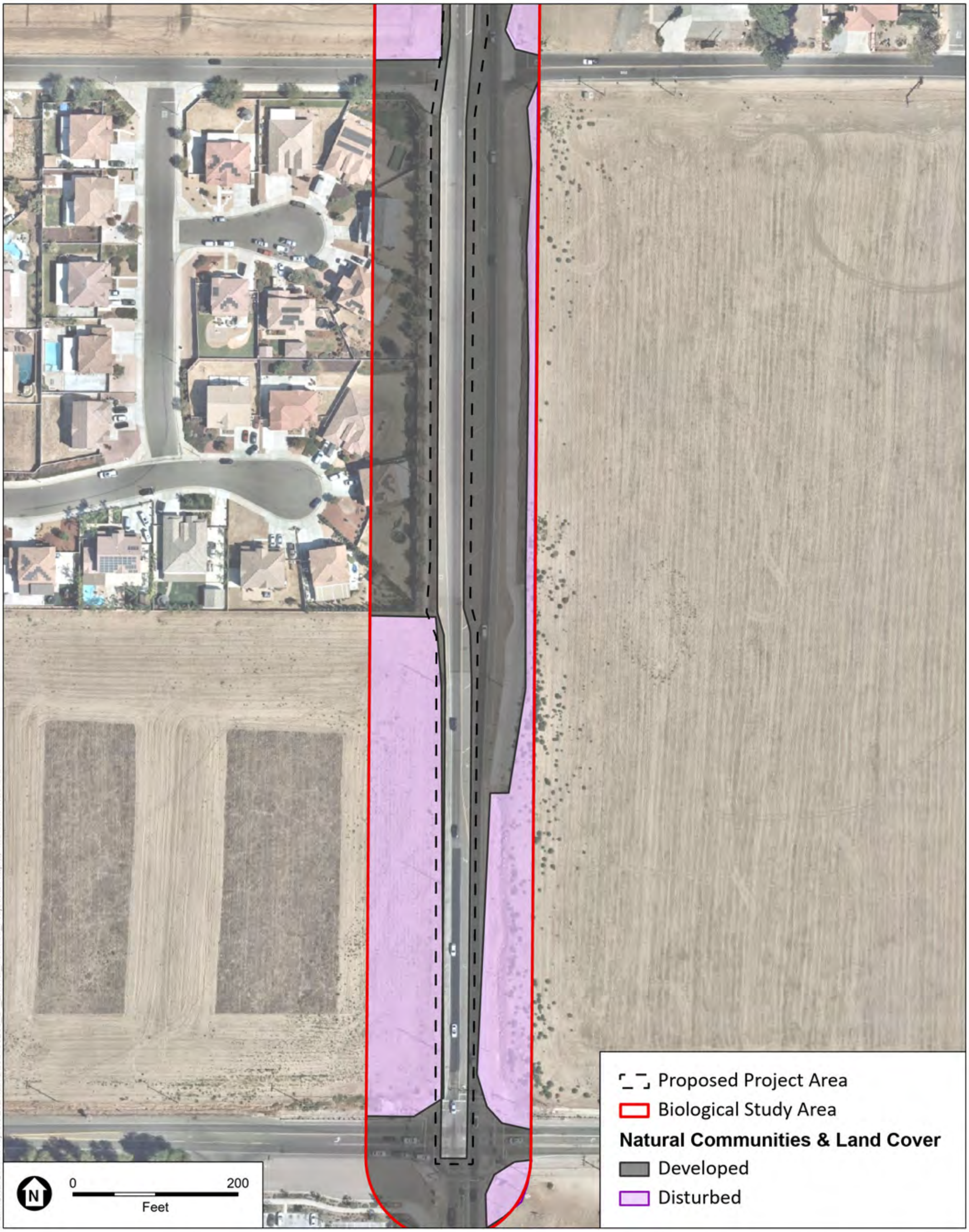


SOURCE: Nearmap (2022), ESA (2022)

Pettit Water Storage Tank Expansion and Transmission Pipeline Project

Figure 3.3-1b
Natural Communities and Land Cover Types

ESA



SOURCE: Nearmap (2022), ESA (2022)

Pettit Water Storage Tank Expansion and Transmission Pipeline Project

Figure 3.3-1c
Natural Communities and Land Cover Types

ESA

Developed

Developed areas in the BSA included paved asphalt associated with Moreno Beach Drive and Alessandro Boulevard. It also includes the existing water storage tank, and residential and commercial developments along Moreno Beach Drive.

Sensitive Biological Resources

Special-Status Plant Species

Special-status plants are defined as those plants that, because of their recognized rarity or vulnerability to various causes of habitat loss or population decline, are recognized by federal, State, or other agencies as under threat from human-associated developments. Some of these species receive specific protection that is defined by federal or State endangered species legislation. Others have been designated as special-status on the basis of adopted policies and expertise of State resource agencies or organizations with acknowledged expertise, or policies adopted by local governmental agencies such as counties, cities, and special districts to meet local conservation objectives. Special-status plants are defined as follows:

- Plants listed or proposed for listing as threatened or endangered, or are candidates for possible future listing as threatened or endangered, under the Federal Endangered Species Act (FESA) or the California Endangered Species Act (CESA);
- Plants that meet the definitions of rare or endangered under *State CEQA Guidelines* Section 15380;
- Plants considered by the CNPS and CDFW to be rare, threatened, or endangered (Rank 1A, 1B, 2A and 2B plants) in California; and
- Plants listed as rare under the California Native Plant Protection Act (Fish and Game Code 1900 et seq.)

A review of the California Natural Diversity Database (CNDDB) (CDFW 2022a) and the CNPS Inventory of Rare and Endangered Plants (CNPS 2022a) revealed 52 special-status plant species recorded within the USGS 9-quadrangle search. The potential for special-status plant species to occur is based on vegetation and habitat quality, topography, elevation, soils, surrounding land uses, habitat preferences and geographic ranges. A complete list of the species generated in the CNDDB and CNPS queries are provided in Appendix BIO, Subappendix C1 – Special-Status Plant Species.

The special-status plants listed in Appendix BIO, Subappendix C1 were determined to have varying levels of potential to occur based on the following criteria:

- **Low Potential:** The BSA supports limited habitat for a particular species. For example, the appropriate vegetation assemblage may be present while the substrate preferred by the species may be absent.
- **Moderate Potential:** The BSA provides marginal habitat for a particular species. For example the habitat may be heavily disturbed and/or may not support all stages of a species life cycle.
- **High Potential:** The BSA provides suitable habitat conditions for a particular species and/or known populations occur in the immediate area.
- **Present:** The species was observed within the BSA during the site visit.

A discussion of each species with a potential to occur within the BSA is included in Appendix BIO, Subappendix C1. Based on the site visit, only two special-status plant species have a low potential to occur in the BSA: Parry's spineflower and chaparral ragwort. These species prefer largely undisturbed habitat which is primarily absent from the BSA; thus, these species with low potential are not discussed further. Based on the absence of suitable habitat, known geographic distributions and/or range restrictions, it was determined that the remainder of the special-status plant species do not have the potential to occur within the BSA and are therefore omitted from further discussion.

Special-Status Wildlife

Special-status wildlife are defined as those animals that, because of their recognized rarity or vulnerability to various forms of habitat loss or population decline, are considered by federal, State, or other agencies to be under threat from human-associated developments. Some of these species receive specific protection that is defined by this federal or State endangered species legislation and others have been designated as special-status on the basis of adopted local policies (i.e. city and county) or the educated opinion of respected resource interest groups (i.e. Western Bat Working Group [WBWG]). Special-status wildlife is defined as follows:

- Wildlife listed or proposed for listing as threatened or endangered, or are candidates for possible future listing as threatened or endangered, under the FESA or CESA;
- Wildlife that meet the definitions of rare or endangered under CEQA Guidelines Section 15380;
- Wildlife designated by CDFW as species of special concern, included on the Watch List or are considered Special Animals;
- Wildlife "fully protected" in California (Fish and Game Code Sections 3511, 4700, and 5050);
- U.S. Fish and Wildlife Service (USFWS) Birds of Conservation Concern (BCC) as identified in the USFWS Information for Planning and Consultation (IPaC) resource list generated for the project (USFWS 2022b);
- Bird species protected by the Migratory Bird Treaty Act (MBTA); and
- Bat species considered priority by the WBWG.

A total of 71 special-status wildlife species were reported in the vicinity based on a CNDDB database search within the 9-quadrangle search area (i.e., Sunnymead and 8 surrounding topographic quadrangles). A complete list of the species generated in the queries are provided in Appendix Bio, Subappendix C2 – Special-Status Animal Species.

The special-status wildlife listed in Appendix BIO, Subappendix C2 were determined to have varying levels of potential to occur based on the following criteria:

- **Low Potential:** The BSA supports limited habitat for a particular species. For example, the appropriate vegetation assemblage may be present while the substrate preferred by the species may be absent.

- **Moderate Potential:** The BSA provides marginal habitat for a particular species. For example; the habitat may be heavily disturbed and/or may not support all stages of a species life cycle.
- **High Potential:** The BSA provides suitable habitat conditions for a particular species and/or known populations occur in the immediate area.
- **Present:** The species was observed within the BSA during the site visit.

A discussion of each species with a potential to occur within the BSA is included in Appendix BIO, Subappendix C2. Based on the condition of the vegetation and habitats that were characterized during the site visit, it was determined that one listed species has a moderate potential to occur within the BSA: Crotch's bumblebee (*Bombus crotchii*) (Federal Candidate Endangered). A total of 6 additional special-status wildlife species have a moderate to high potential to occur within the BSA, and a discussion of each species is included below. Wildlife species generated in the query that have a low potential to occur or are not expected to occur within the BSA based on an absence of suitable habitat, known geographic distributions, and/or range restrictions were omitted and are not discussed further.

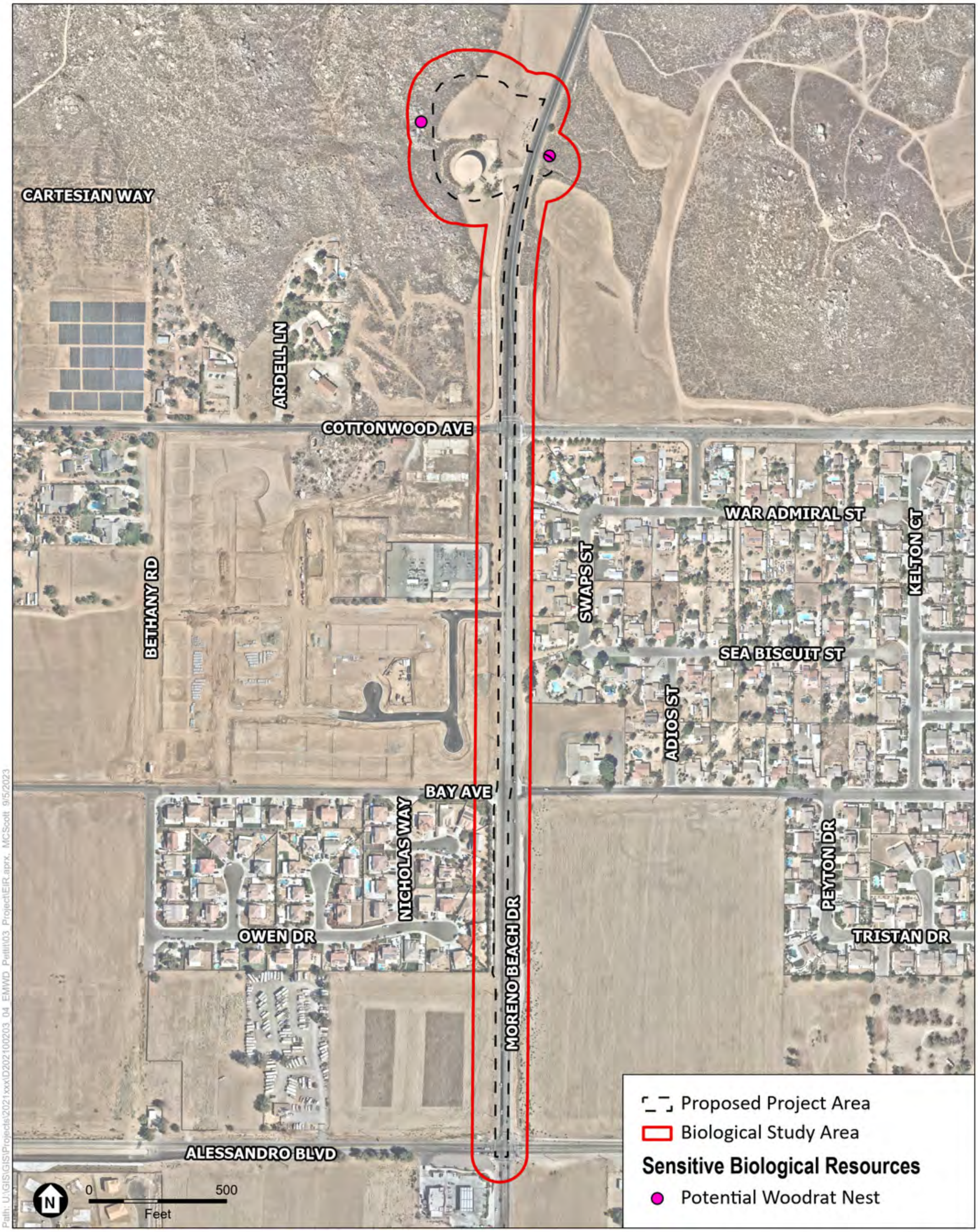
Federally and State Listed Species

Crotch's Bumblebee

Crotch's bumble bee (*Bombus crotchii*) is a State candidate endangered species and has a moderate potential to occur within the BSA. The species prefers grassland and sage shrubland habitats and are dietary generalists, with a wide variety of food plants including milkweeds (*Asclepias* spp), phacelias (*Phacelia* spp.), sages (*Salvia* spp.), medics (*Medicago* spp.), lupines (*Lupinus* spp.), and various members of the Asteraceae. Branching phacelia (*Phacelia ramossissima*), brittle bush (*Encelia farinosa*), and miniature lupine (*Lupinus bicolor*) were all suitable food plant species observed within the BSA. There are 18 CNDDB records in the nine-quadrangle search with the most recent occurring in 2020 three miles east of the BSA (CDFW 2022a).

Other Special-Status Wildlife

Several other species that are not federally or state listed but that are considered special-status have a moderate potential to occur within the BSA. The Southern-California rufous-crowned sparrow (*Aimophila ruficeps canescens*; MSHCP Adequately Covered Species) and San Diego desert woodrat (*Neotoma lepida intermedia*; State Species of Special Concern [SSC]) may forage, and/or breed within the brittle bush scrub within the project and remainder of the BSA. Locations of adjacent unidentified woodrat nests are included in **Figure 3.3-2**. One potential woodrat nest was observed within the 25-foot temporary impact buffer associated with appurtenance facilities east of Moreno Beach Drive. While these woodrat nests could not be positively identified as belonging to a special-status species, each nest is presumed to belong to the species until special-status small mammal surveys can be performed.



SOURCE: Nearmap (2022), ESA (2022)

Pettit Water Storage Tank Expansion and Transmission Pipeline Project

Figure 3.3-2
Sensitive Biological Resources

ESA

The Belding's orange-throated whiptail (*Aspidoscelis hyperythra beldingi*; MSHCP Adequately Covered Species), coastal western whiptail (*Aspidoscelis tigris stejnegeri*; MSHCP Adequately Covered Species), coast patch-nosed snake (*Salvadora hexalepis virgultea*; SSC), and red-diamond rattlesnake (*Crotalus ruber*; SSC, MSHCP Adequately Covered Species) may forage and breed within brittle bush scrub habitat of the project.

Sensitive Natural Communities

Sensitive natural communities are of limited distribution statewide or within a county or region. These communities may or may not contain special-status species or their habitat, and are independently considered sensitive by CDFW. For purposes of this project, sensitive natural communities include vegetation communities identified in the California Natural Communities List with Holland Types (CDFW 2022b) with a CNDDB state rank of S1, S2, or S3.

The nine-quadrangle CNDDB search yielded records for eight sensitive natural communities: Canyon Live Oak Ravine Forest, Riversidian Alluvial Fan Sage Scrub, Southern Coast Live Oak Riparian Forest, Southern Cottonwood Willow Riparian Forest, Southern Riparian Forest, Southern Riparian Scrub, Sycamore Alder Riparian Woodland, and Southern Willow Scrub. Based on the site visit, none of these natural communities were observed to occur within the BSA. The brittle bush scrub (S4), as well as disturbed and developed areas are not considered sensitive natural communities as they are either not ranked or have a rank of S4 or higher.

Critical Habitat

Under the FESA, to the extent feasible, the USFWS is required to designate critical habitat for endangered and threatened species. Critical habitat is defined as areas of land, water, and air space containing the physical and biological features essential for the survival and recovery of endangered and threatened species. Designated critical habitat includes sites for breeding and rearing, movement or migration, feeding, roosting, cover, and shelter that are essential to the survival and recovery of the species, whether the habitat is currently occupied by the species or not. Designated critical habitats require special management and protection of existing resources,

including water quality and quantity, host animals and plants, food availability, pollinators, sunlight, and specific soil types. The BSA is not located within designated critical habitat. The nearest critical habitat to the project is for the spreading navarretia (*Navarretia fossalis*) located southeast of Lake Perris approximately 4.7 mile to the southeast (USFWS 2022a).

Wildlife Movement

Migration corridors are navigable patches or strips of land that connect larger tracts of open space together, allowing them to function as a greater habitat complex. Wildlife movement can exist on a local scale, allowing wildlife to pass through or under an otherwise uninhabitable area including a roadway, housing development, or city through drainage culverts, green belts and waterways; or on a larger scale, providing an opportunity for wildlife to skirt large topographical features (e.g., mountains, lakes, streams) by utilizing adjacent canyons, valleys and upland swaths when migrating.

The project is situated between Moreno Beach Drive and the open space hills to the west that wildlife utilizes to forage and breed, and likely to some extent, to travel both locally and regionally. Numerous species of birds, reptiles, invertebrates, and small mammals would be expected, as well as larger mammals such as the coyote, striped skunk (*Mephitis mephitis*), and raccoon (*Procyon lotor*), who likely utilize the area for hunting and movement. Although regional wildlife movement may occur within the native habitat in the surrounding open space, the BSA only contains a limited portion of native habitat. The majority of the BSA contains disturbed and developed areas that are already subjected to frequent human use (e.g., roadways with moderate to high traffic, etc.) and regional and local wildlife movement is not expected in those areas. The project is unlikely to hinder wildlife movement between areas of contiguous, intact habitat as the project will not separate areas of contiguous open space and the existing facilities will not create barriers between open space and the area subject to frequent human use. Furthermore, Moreno Beach Drive may already act as a barrier to wildlife movement.

Nesting Birds

A single unoccupied stick nest likely belonging to a common raven was observed within a structure of the existing Pettit Water Storage Tank. The eucalyptus trees and brittle bush scrub on site may also provide habitat for nesting birds. The disturbed soils surrounding the existing water storage tank and proposed Phase 1 and 2 tank locations may provide suitable nesting habitat for ground nesting species, such as killdeer (*Charadrius vociferus*). Existing project facilities and surrounding limited habitat currently provide limited habitat for nesting birds, and the project may continue to provide limited nesting habitat.

Aquatic Resources

A formal jurisdictional waters delineation was conducted concurrently with the biological field assessment within the BSA, the results of which are included in a separate report (Appendix WATER, ESA 2023a). Based on the results of the delineation, the BSA supports aquatic resources, including 0.056 acres (761.7 linear feet) of potential non-wetland waters of the State that may be regulated by the RWQCB and the CDFW. The potentially jurisdictional boundaries within the BSA are depicted in **Figure 3.3-3a-c** and summarized in **Table 3.3-2**.

Four ephemeral drainages were considered for their potential to be other (non-wetland) waters of the U.S. within the BSA.

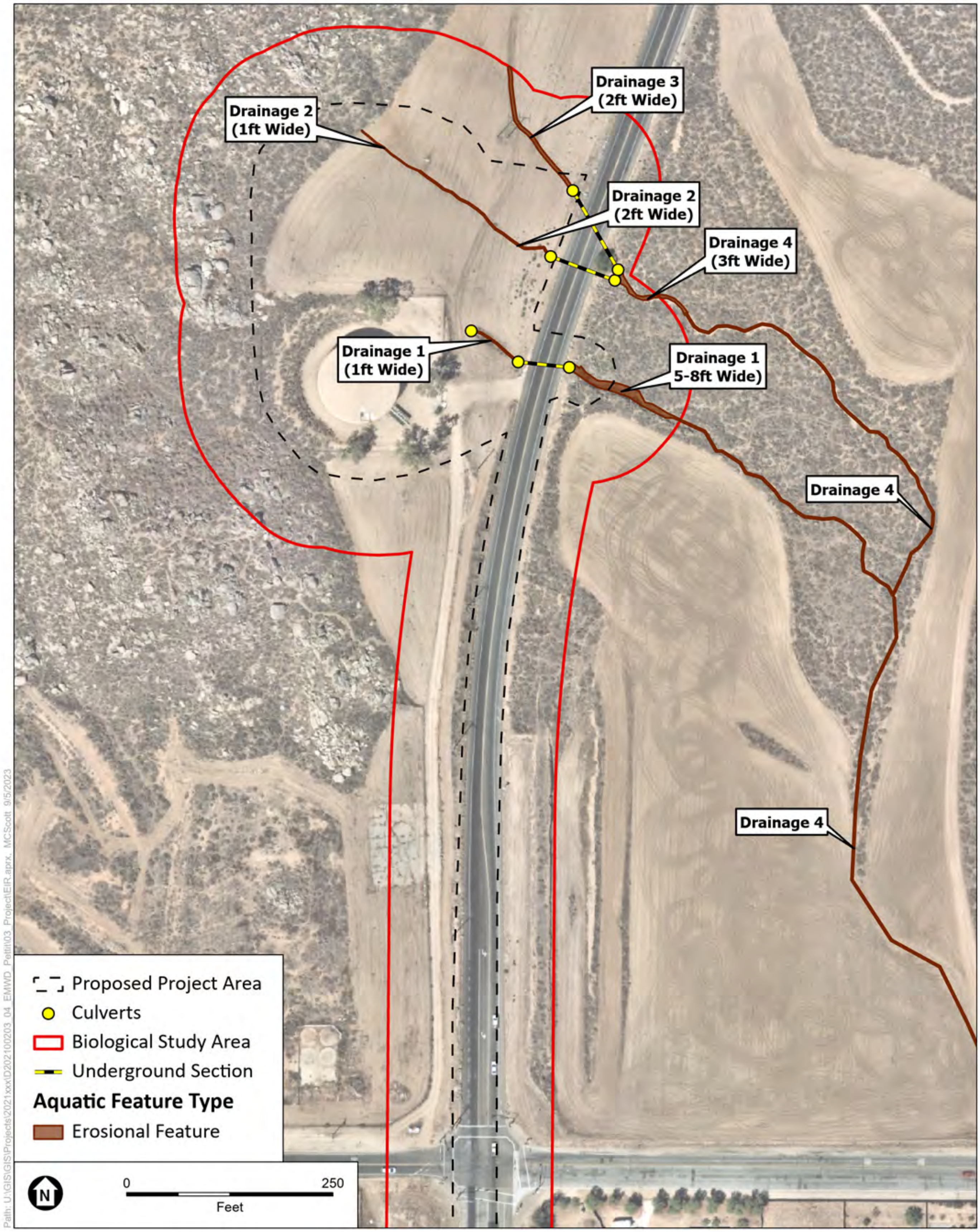
TABLE 3.3-2
AQUATIC RESOURCES IN THE BSA

Aquatic Feature	Cowardin Type	Dominant Vegetation/ Land Cover Type	Feature Width (feet)	Linear Feet	Acres (Square Feet)
Drainage 1	Riverine (ephemeral)	Largely devoid of vegetation/annual forbs	1-8	219.0	0.029 (1,273.13)
Drainage 2	Riverine (ephemeral)	Largely devoid of vegetation/annual forbs	1-2	303.0	0.011 (471.98)
Drainage 3	Riverine (ephemeral)	Largely devoid of vegetation/annual forbs	2	173.7	0.008 (378.86)
Drainage 4	Riverine (ephemeral)	Brittle Bush Scrub	4-7	66 (1,579)[1]	0.008 (356.15) / 0.15 (6,747.1)
			Totals:	**761.7 [2,274.7]**	**0.056 (2,480.12) [0.20 (8,871.07)]**

1 Measurements shown for portion of Drainage 4 associated with water tank expansion survey area, and also includes total area within entire survey area (which includes the transmission pipeline work areas) in brackets.

Drainage 1

Drainage 1 is an ephemeral drainage which lacks riparian vegetation, and contains ruderal nonnative vegetation such as red brome (*Bromus rubens*), shortpod mustard (*Hirschfeldia incana*), and Russian thistle (*Salsola tragus*). The drainage has an average depth of 1 foot upstream from the culvert beneath Moreno Beach Drive and becomes deeply incised to a depth of between 5-8 feet downstream from the culvert beneath Moreno Beach Drive. A portion of Drainage 1 upstream from Moreno Beach Drive has been subject to regular and frequent disturbance in the form of site grading and discing, and lacks a defined OHWM or bed and bank as a result of the disturbance, which results in atypical situation for the purposes of delineating. Despite the lack of a defined OHWM, conditions prior to disturbance are consistent with an ephemeral drainage based on aerial imagery (Google Earth Pro 2022). Drainage 1 originates at an 18-inch wide metal culvert, located 40 feet east of the fence line for the existing Pettit Water Storage Tank. No upslope inlet for the culvert was observed within the BSA. The culvert likely once conveyed stormwater runoff from the area surrounding the existing Pettit Water Storage Tank, however the culvert has since become inundated by sediment from previous storm events and is not capable of efficiently draining stormwater runoff from the area. Drainage 1 conveys flows southeast for approximately 69 feet towards the west side of Moreno Beach Drive, where it enters an 18-inch corrugated metal culvert beneath Moreno Beach Drive. Flows continue southeast from a headwall structure on the east side of Moreno Beach Drive (within the road right-of-way), where the drainage becomes deeply incised. Drainage 1 continues to convey flows outside of the BSA to the southwest where it eventually converges with Drainage 4.

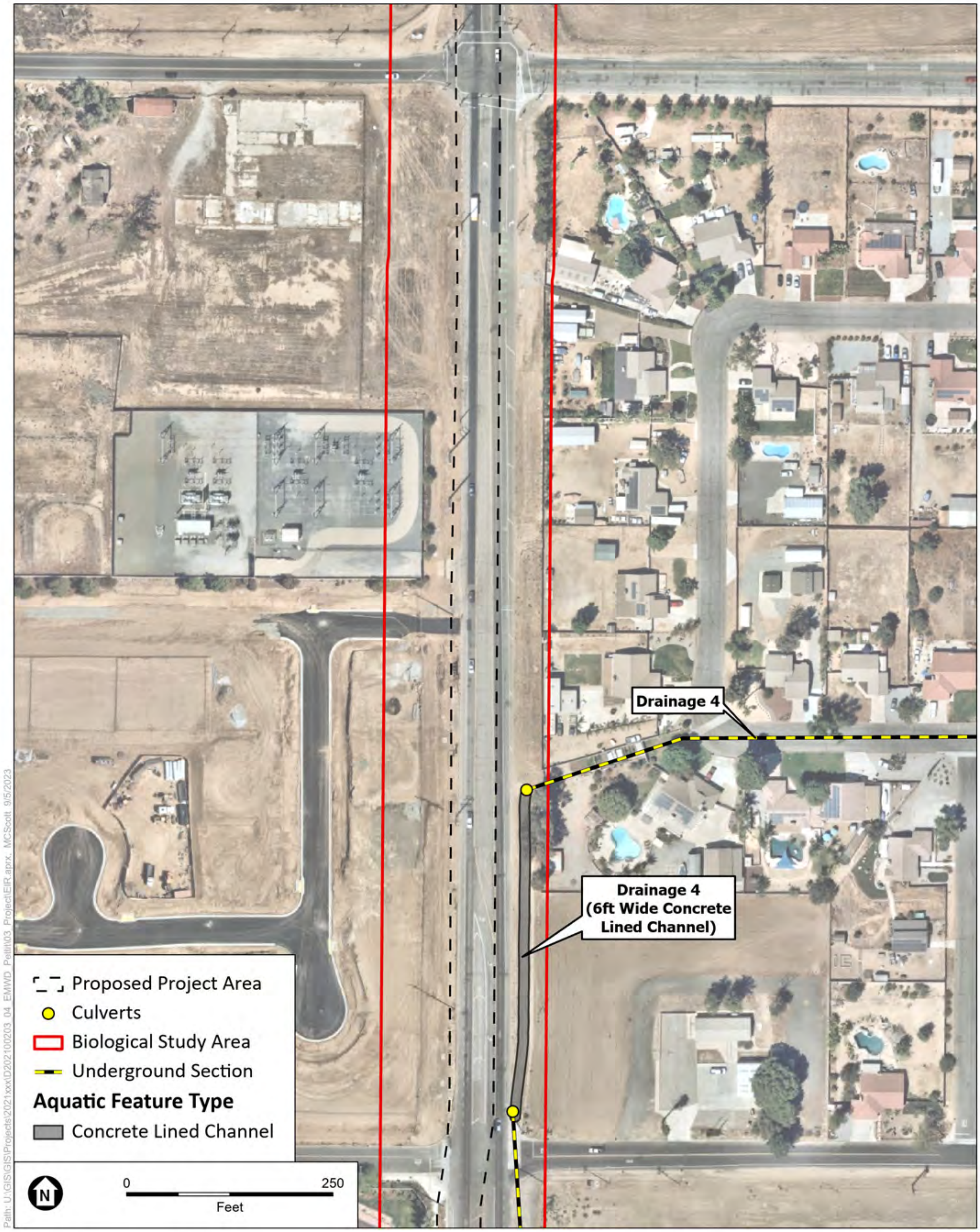


SOURCE: Nearmap (2022), ESA (2022)

Pettit Water Storage Tank Expansion and Transmission Pipeline Project

Figure 3.3-3a
Aquatic Resources

ESA

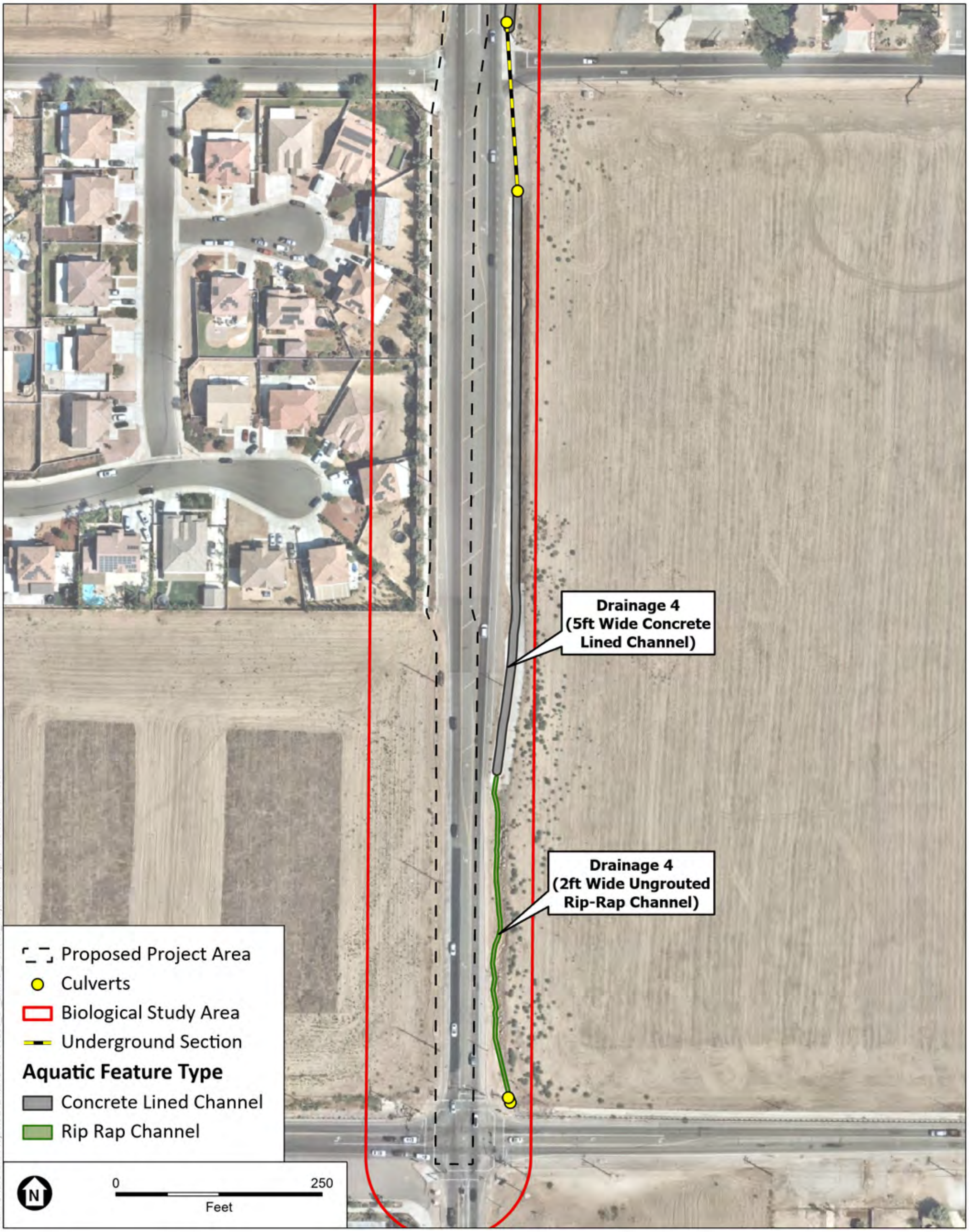


SOURCE: Nearmap (2022), ESA (2022)

Pettit Water Storage Tank Expansion and Transmission Pipeline Project

Figure 3.3-3b
Aquatic Resources

ESA



SOURCE: Nearmap (2022), ESA (2022)

Pettit Water Storage Tank Expansion and Transmission Pipeline Project

Figure 3.3-3c
Aquatic Resources

ESA

Drainage 2

Drainage 2 is a 1-foot wide ephemeral drainage which lacks riparian vegetation, and contains ruderal nonnative vegetation such as tumbling pigweed, shortpod mustard, and Russian thistle. Drainage 2 lacks many recognizable features of a drainage due to frequent site disturbance in the form of site grading and discing. Drainage 2 is situated in a depression topographically, and stormwater runoff from the surrounding uplands drain to create Drainage 2. Drainage 2 conveys flows southeast towards Moreno Beach Drive, where it enters a 24-inch metal corrugated culvert. Drainage 2 then conveys flows eastward where it meets Drainage 3, east of Moreno Beach Drive. Drainage 2 and Drainage 3 then converge on the east side of Moreno Beach Drive to create a larger drainage, Drainage 4. Drainage 4 continues to convey flows outside of the BSA to the southwest, where it eventually converges with Drainage 1.

Drainage 3

Drainage 3 is a 2-foot wide ephemeral drainage with an average depth of 1 foot which lacks riparian vegetation, and contains ruderal nonnative vegetation such as tumbling pigweed, shortpod mustard, and Russian thistle. Drainage 3 lacks many recognizable features of a drainage due to frequent site disturbance in the form of site grading and discing. Drainage 3 is situated in a depression topographically, and stormwater runoff from the surrounding uplands drain into Drainage 3. Drainage 3 continues to convey flows southeast towards Moreno Beach drive, where it enters a 24-inch metal corrugated culvert. Drainage 3 continues to convey flows eastward where it confluences just east of the headwall structure east of Moreno Beach Drive with Drainage 2 to create a larger ephemeral drainage, Drainage 4. Drainage 4 continues to convey flows outside of the BSA to the southwest, where it eventually converges with Drainage 1.

Drainage 4

Drainage 4 is an ephemeral drainage situated east of Moreno Beach Drive and is the result of the confluence of erosional features Drainage 2 and Drainage 3 conveying flows beneath Moreno Beach Drive. Drainage 4 lacks riparian vegetation and hydric soils, and its banks are dominated by brittle bush scrub, which is upland vegetation. Drainage 4 conveys flows southeast approximately 1,252 feet towards a double 18” metal culvert storm drain which is situated just north of Cottonwood Avenue. Drainage 4 continues beneath Cottonwood Avenue, exiting a single metal culvert. Drainage 4 continues to convey flows southeast of the intersection of Cottonwood Avenue and Arcaro Street, where the drainage becomes a 3-foot wide channel with concrete bed and banks. Drainage 4 continues south towards Sea Biscuit Street, where it enters a culvert that directs flows towards the west along Sea Biscuit Street, towards Moreno Beach Drive. Drainage 4 then exits a 36-inch concrete tube culvert which then conveys flows south, parallel with Moreno

Beach Drive, within a 6-foot wide channel with concrete lined bed and banks. Drainage 4 continues into an 8-foot wide box culvert beneath Bay Avenue. Flows within Drainage 4 exit the box culvert approximately 170 feet south of Bay Avenue, where they continue for 466 feet in a 2-foot wide channel with an earthen bank of the eastern side of the channel and concrete lined bank on the west. Drainage 4 then transitions to a 5-foot wide concrete lined channel which continues south for 237 feet, where it then transitions into a 2-foot wide ungrouted rip rap channel. The ungrouted rip-rap portion of Drainage 4 continues for approximately 400 feet along the east side or Moreno Beach Drive, where it meets the intersection of Moreno Beach Drive and Alessandro Boulevard. Drainage 4 conveys flows into two 36-inch metal corrugated culverts beneath the intersection where flows are presumed continue south towards Lake Perris. Drainage 4 is depicted on Figures 3.3-3a-c.

Protected Trees

No trees protected by the City of Moreno Valley were observed in the BSA. Ten red gum (*Eucalyptus camaldulensis*), which are not protected trees, were observed growing along the outer edge of the existing Water Storage Tank. These trees are proposed for removal during Phase 2 of the Water Storage Tank Expansion, with a number of other trees proposed for replacement.

3.3.2 Regulatory Framework

Federal

Federal Endangered Species Act

The United States Congress passed the Federal Endangered Species Act (FESA) in 1973 to protect those species that are endangered or threatened with extinction. FESA is intended to operate in conjunction with the National Environmental Policy Act (NEPA) to help protect the ecosystems upon which endangered and threatened species depend. FESA prohibits the “take” of endangered or threatened wildlife species. “Take” is defined to include harassing, harming, pursuing, hunting, shooting, wounding, killing, trapping, capturing, or collecting wildlife species or any attempt to engage in such conduct (FESA Section 3 [(3)(19)]). Harm is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns (50 Code of Federal Regulations [CFR] Section 17.3). “Harass” is defined as actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns (50 CFR Section 17.3). Actions that result in take can result in civil or criminal penalties.

Migratory Bird Treaty Act

The MBTA protects individuals, as well as any part, nest, or eggs, of any bird listed as migratory. The MBTA prohibits the take of native birds “by any means or manner to pursue, hunt, take, capture (or) kill” any migratory birds except as permitted by regulations issued by the USFWS. The term “take” is defined by USFWS regulation to mean to “pursue, hunt, shoot, wound, kill, trap, capture or collect” any migratory bird or any part, nest, or egg of any migratory bird covered by the conventions, or to attempt those activities.

In practice, federal permits issued for activities that potentially impact migratory birds typically have conditions that require pre-disturbance surveys for nesting birds. In the event nesting is observed, a buffer area with a specified radius must be established, within which no disturbance or intrusion is allowed until the young have fledged and left the nest, or it has been determined that the nest has failed. If not otherwise specified in the permit, the size of the buffer area varies with species and local circumstances (e.g., presence of busy roads, intervening topography, etc.), and is based on the professional judgment of a monitoring biologist. A list of migratory bird species protected under the MBTA is published by USFWS.

Clean Water Act

Pursuant to Section 404 of the CWA, the USACE is authorized to regulate any activity that would result in the discharge of dredged or fill material into jurisdictional waters of the United States, which include those waters listed in 33 CFR Part 328 (Definitions). USACE, with oversight by the U.S. Environmental Protection Agency (EPA), has the principal authority to issue CWA Section 404 Permits.

Pursuant to Section 401 of the CWA, the RWQCB certifies that any discharge into jurisdictional waters of the United States will comply with State water quality standards. The RWQCB, as delegated by EPA, has the principal authority to issue a CWA Section 401 water quality certification or waiver.

State

California Fish and Game Code

The CFGC regulates the taking or possession of birds, mammals, fish, amphibians, and reptiles, as well as natural resources such as wetlands and waters of the State. It includes the California Endangered Species Act (CESA) (Sections 2050–2115) and Streambed Alteration Agreement regulations (Sections 1600–1616). These sections are described further below.

CFGC Sections 1600-1616

Pursuant to Section 1600 et seq. of the CFGC, the CDFW regulates activities of an applicant's project that would substantially alter the flow, bed, channel, or banks of streams or lakes, unless certain conditions outlined by CDFW are met by the applicant. The limits of CDFW jurisdiction are defined in CFGC Section 1600 et seq. as the "bed, channel, or bank of any river, stream,[1] or lake designated by CDFW in which there is at any time an existing fish or wildlife resource or from which these resources derive benefit."[2] However, in practice, CDFW usually extends its jurisdictional limit and assertion to the top of a bank of a stream, the bank of a lake, or outer edge of the riparian vegetation, whichever is greater.

California Endangered Species Act (CFGC Section 2050 et seq.)

CESA establishes the policy of the State to conserve, protect, restore, and enhance threatened or endangered species and their habitats. CESA mandates that State agencies should not approve projects that would jeopardize the continued existence of threatened or endangered species if reasonable and prudent alternatives are available that would avoid jeopardy. There are no State agency consultation procedures under CESA. For projects that would affect a listed species under both CESA and FESA, compliance with FESA would satisfy CESA if CDFW determines that the federal incidental take authorization is "consistent" with CESA under CFGC Section 2080.1. For projects that would result in take of a species listed under the CESA only, the project operator

1 Title 14 California Code of Regulations (CCR) 1.72 defines a stream as "a body of water that flows at least periodically or intermittently through a bed or channel having banks and supports fish or other aquatic life. This includes watercourses having a surface or subsurface flow that supports or has supported riparian vegetation."

2 This also includes the habitat upon which they depend for continued viability (CFGC Division 5, Chapter 1, Section 45, and Division 2, Chapter 1, Section 711.2[a]).

would have to apply for a take permit under Section 2081(b). Further details about the regional MSHCP are discussed in Section 3.3.1 below.

CFGC Sections 2080 and 2081

Section 2080 of the CFGC states that "No person shall import into this state [California], export out of this state, or take, possess, purchase, or sell within this state, any species, or any part or product thereof, that the Commission [State Fish and Game Commission] determines to be an endangered species or threatened species, or attempt any of those acts, except as otherwise provided in this chapter, or the Native Plant Protection Act, or the California Desert Native Plants Act." Pursuant to CFGC Section 2081, CDFW may authorize individuals or public agencies to import, export, take, or possess State-listed endangered, threatened, or candidate species. These otherwise prohibited acts may be authorized through Incidental Take permits or Memoranda of Understanding if the take is incidental to an otherwise lawful activity, impacts of the authorized take are minimized and fully mitigated, the permit is consistent with any regulations adopted pursuant to any recovery plan for the species, and the project operator ensures adequate funding to implement the measures required by CDFW, which makes this determination based on available scientific information and considers the ability of the species to survive and reproduce.

If a local Natural Community Conservation Plan (NCCP) and/or Habitat Conservation Plan (HCP) provides coverage for take of some State-listed species, there would not be a need for an additional 2081 permit process unless a project does not comply with NCCP/HCP requirements and may result in take of a State-listed species or if a State-listed species not covered by the NCCP/HCP were to result in take. Further details about the regional MSHCP are discussed in Section 3.3.1 below.

CFGC Sections 3503, 3503.5, and 3513

Under these sections of the CFGC, the project operator is not allowed to conduct activities that would result in the taking, possessing, or destroying of any birds of prey; the taking or possessing of any migratory nongame bird; the taking, possessing, or needlessly destroying of the nest or eggs of any raptors or nongame birds; or the taking of any nongame bird pursuant to CFGC Section 3800. CFGC Section 3513 adopts the federal migratory bird take provisions under the MBTA that prohibit the intentional take or possession of birds designated by the MBTA as migratory nongame birds except as allowed by federal rules and regulations pursuant to the MBTA. CFGC Section 3513 does not prohibit the incidental take of birds if the underlying purpose of the activity is not to take birds.

California Environmental Quality Act Guidelines, Section 15380

Although threatened and endangered species are protected by specific federal and State statutes, California Environmental Quality Act (CEQA) Guidelines Section 15380(b) provides that a species not listed on the federal or State list of protected species may be considered rare or endangered if the species can be shown to meet certain specified criteria. These criteria have been modeled after the definition in FESA and the section of the CFGC dealing with rare or endangered plants or animals. This section was included in CEQA primarily to deal with situations in which a public agency is reviewing a project that may have a significant effect on, for example, a candidate species that has not been listed by either USFWS or CDFW. Thus, CEQA provides an agency with the ability to protect a species from the potential impacts of a project until the respective government agencies have an opportunity to designate the species as protected, if warranted. CEQA also calls for the protection of other locally or regionally significant resources, including natural communities. Although natural communities do not at present have legal protection of any kind, CEQA calls for an assessment of whether any such resources would be affected and requires findings of significance if there would be substantial losses. Natural communities listed by CNDDB as sensitive are considered by CDFW to be significant resources and fall under the State CEQA Guidelines for addressing impacts. Local planning documents such as General Plans often identify these resources as well.

California Water Quality Control Act (Porter-Cologne California Water Code Section 13260)

The State Water Resources Control Board (SWRCB) and the RWQCB (together "Boards") are the principal State agencies with primary responsibility for the coordination and control of water quality. The Boards regulate activities pursuant to Section 401(a)(1) of the federal CWA as well as the Porter Cologne Water Quality Control Act (Porter-Cologne) (Water Code Section 13260). Section 401 of the CWA specifies that certification from the State is required for any applicant requesting a federal license or permit to conduct any activity including but not limited to the construction or operation of facilities that may result in any discharge into navigable waters. The certification shall originate from the State in which the discharge originates or will originate, or, if appropriate, from the interstate water pollution control agency having jurisdiction over the navigable water at the point where the discharge originates or will originate. Any such discharge will comply with the applicable provisions of Sections 301, 302, 303, 306, and 307 of the CWA.

In Porter-Cologne, the Legislature declared that the "State must be prepared to exercise its full power and jurisdiction to protect the quality of the waters in the State from degradation..." (California Water Code Section 13000). Porter-Cologne grants the Boards the authority to implement and enforce the water quality laws, regulations, policies and plans to protect the groundwater and surface waters of the State. It is important to note that enforcement of the State's water quality requirements is not solely the purview of the Boards and their staff. Other agencies (e.g., CDFW) have the ability to enforce certain water quality provisions in State law.

Regional or Local Regulations

Protected Trees

Trees located within the City of Moreno Valley rights-of-way are regulated by City of Moreno Valley Municipal Code Chapter 9.17.030, which requires development projects to conduct a tree survey prior to construction and, if any Heritage Trees[3] are to be removed, to replace each removed tree at defined ratios (as specified in Municipal Code Chapter 9.17.030). Trees located within "landscape development in public rights-of-way, areas adjacent to the public right-of-way, easements, setbacks, slopes, parking areas, public, quasi-public, commercial, industrial and

3 Heritage Trees include A: Any tree that defines the historical and cultural character of the city including older Palm and Olive trees, and/or any tree designated as such by official action. B: Trees with a fifteen (15) inch diameter measured twenty-four (24) inches above ground level or C: Trees that have reached a height of fifteen (15) feet or greater.

specified residential onsite landscape areas" are subject to the provisions of Chapter 9.17.030 of the City of Moreno Valley Municipal Code. Mandatory compliance with the requirements of the Municipal Code would ensure the project would not conflict with the City of Moreno Valley's ordinance regulating tree removal. Projects necessitating the removal of existing trees with four-inch or greater trunk diameters (calipers), shall be replaced at a three-to-one ratio, with minimum twenty-four (24) inch box size trees of the same species, or a minimum thirty-six (36) inch box for a one to one replacement, where approved. No removal of trees on public rights-of-way are proposed as part of the project. Several eucalyptus trees surrounding the existing tank may be removed during Phase 2, however these trees are located on private land owned by EMWD and are not subject to the City of Moreno Valley Municipal Code Chapter 9.17.030.

Habitat Conservation Plans

Western Riverside County MSHCP

Per CFGC Sections 2800-2840, the NCCP Act (the Act), authorized the preparation of NCCPs to protect natural communities and species while allowing a reasonable amount of economic development.

The MSHCP, adopted by the County of Riverside on June 17, 2003, serves as a HCP pursuant to the Act and pursuant to Section 10 (a)(1)(B) of the FESA. The Implementation Agreement (IA) sets forth the implementation requirements for the MSHCP as well as procedures and minimization measures related to take of habitats and species considered for conservation. Implementation of the MSHCP authorizes participating jurisdictions to "take" specified plant and wildlife species within the MSHCP Plan Area. In addition, the wildlife agencies, namely USFWS and CDFW, allow take of habitat or individual species outside of the MSHCP Conservation Area in exchange for the assembly and management of a coordinated MSHCP Conservation Area. The assembly and long-term management of the MSHCP Conservation Area is the responsibility of Riverside County, federal, and State governments; cities within the western portion of Riverside County; and private and public entities that conduct activities which would potentially impact the habitats and species considered for conservation under the MSHCP. EMWD is not a signatory to the MSHCP; thus, although the MSHCP is discussed within this report as regional HCP, the project is not required to demonstrate consistency with the MSHCP.

Stephens' Kangaroo Rat HCP

The Stephens' Kangaroo Rat Habitat Conservation Plan (SKRHCP) is a comprehensive, multi-jurisdictional HCP focusing on conservation of the Stephens' kangaroo rat (*Dipodomys stephensi*; SKR) and its associated habitats in western Riverside County. Approximately 41,221 acres of occupied and potentially suitable SKR habitat within the HCP plan area was organized into 7 core reserves deemed most important for the preservation of the species, which would be preserved in perpetuity. The nearest core reserve to the proposed project is the SKRHCP San Jacinto/Lake Perris Core Reserve (Core Reserve 5). The BSA is situated outside of this and all other SKR core reserves; therefore, the proposed activities will not result in an impact to this reserve.

The SKRHCP and the County of Riverside - Ordinance No. 663 requires that development proposed outside of a core reserve but within the plan area is reviewed to determine the most appropriate course of action to ensure the survival of the species and provide a method to mitigate for impacts resulting from said development. The Riverside County Habitat Conservation Agency (RCHCA) has obtained a Section 10A permit granted by the USFWS that allows for the incidental "take" of SKR, assuming that the proposed development is sited outside of a core reserve. As a rule, public and private entities that propose development within the plan area are generally required to pay a mitigation fee in accordance with the permit. However, EMWD, as a water resource agency, is exempt from this requirement and therefore, no further action is necessary to comply with the SKRHCP and obtain coverage for the species. If SKR is found in the survey area, EMWD may opt in to obtain coverage.

The project is not located within a core reserve and is not within occupied SKR habitat that is mapped outside of the core areas, so a take agreement with RCHCA is not required. SKR surveys are not required based on coordination with RCHCA (ESA 2022) and pursuant to 5.C.o.vi of the SKR HCP, would not even be required within occupied habitat with a Core Reserve if:

> *"Actions taken by public agencies to operate and/or maintain existing public facilities including, but not limited to, roads and transportation facilities, drainage and flood control facilities, public buildings, landfills and appurtenant facilities, water storage, treatment, and transmission facilities, sewerage transmission and treatment facilities, reclaimed water storage and transmission facilities, public parks, and utility pipelines and transmission lines."*

In addition, since the project is to upgrade existing facilities, no further actions are required.

3.3.3 Impact Analysis and Mitigation Measures

Approach to the Analysis

The analysis of the project impacts to biological resources and corresponding recommendations for avoidance, minimization, and mitigation are discussed in this section. Generally, impacts may be defined as direct or indirect, and permanent or temporary. Definitions of these impact types are provided below.

- **Direct Impacts:** Any alteration, disturbance, or destruction of biological resources that would result from project-related activities is considered a direct impact. Examples include loss of individual species and/or their associated plant communities, diversion of surface water flows, and encroachment into wetlands. Under the FESA, direct impacts are defined as the immediate impacts of a project on a species or its habitat, including construction noise disturbance, sedimentation, or habitat loss.
- **Indirect Impacts:** As a result of project-related activities, biological resources may also be affected in an indirect manner. Under the FESA, indirect impacts are defined as those impacts that are caused by, or would result from, a proposed project but occur later in time and are reasonably certain to occur (50 CFR. Section 402-02). An example of indirect impacts may include irrigation runoff from a developed area into surrounding natural vegetation. Indirect impacts could also include increased wildfire frequency as a result of power line failures.
- **Temporary Impacts:** Any impacts to biological resources that are considered reversible can be viewed as temporary. Examples include the generation of fugitive dust during construction activities and temporary access or staging areas that will be returned to pre-project conditions.

- **Permanent Impacts:** All impacts that result in the irreversible removal of biological resources are considered permanent. Examples include constructing a building or permanent road on an area with native vegetation, such that the native vegetation is permanent removed and replaced with a developed structure.

Thresholds of Significance

The following criteria from CEQA Guidelines Appendix G are used as thresholds of significance to determine the impacts of the proposed project as related to biological resources. The proposed project would have a significant impact if it would:

1. Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service.
2. Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service.
3. Have a substantial adverse effect on state or federally protected wetlands (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means.
4. Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites.
5. Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance.
6. Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan.
7. Result in cumulatively considerable impacts to biological resources.

Impacts and Mitigation Measures

Species Impacts

Impact 3.3 1: The proposed project could have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service.

Special-Status Plants

Phase 1 and Phase 2

Construction

Storage Tanks and Pipeline

There are no special-status plant species identified as having a moderate or high potential to occur within the BSA. Construction would not affect any special-status plant species. Therefore, there would be no impacts to special-status plants, and no mitigation is required.

Operation

Storage Tanks and Pipeline

There are no special-status plant species identified as having a moderate or high potential to occur within the BSA. Operation of the project would not impact special-status plants. The pipeline would be installed underground and would not require regular maintenance. Anticipated maintenance associated with the water storage tank would include weekly maintenance of the tank itself. No impacts to special-status species would occur during the operation phase of the project.

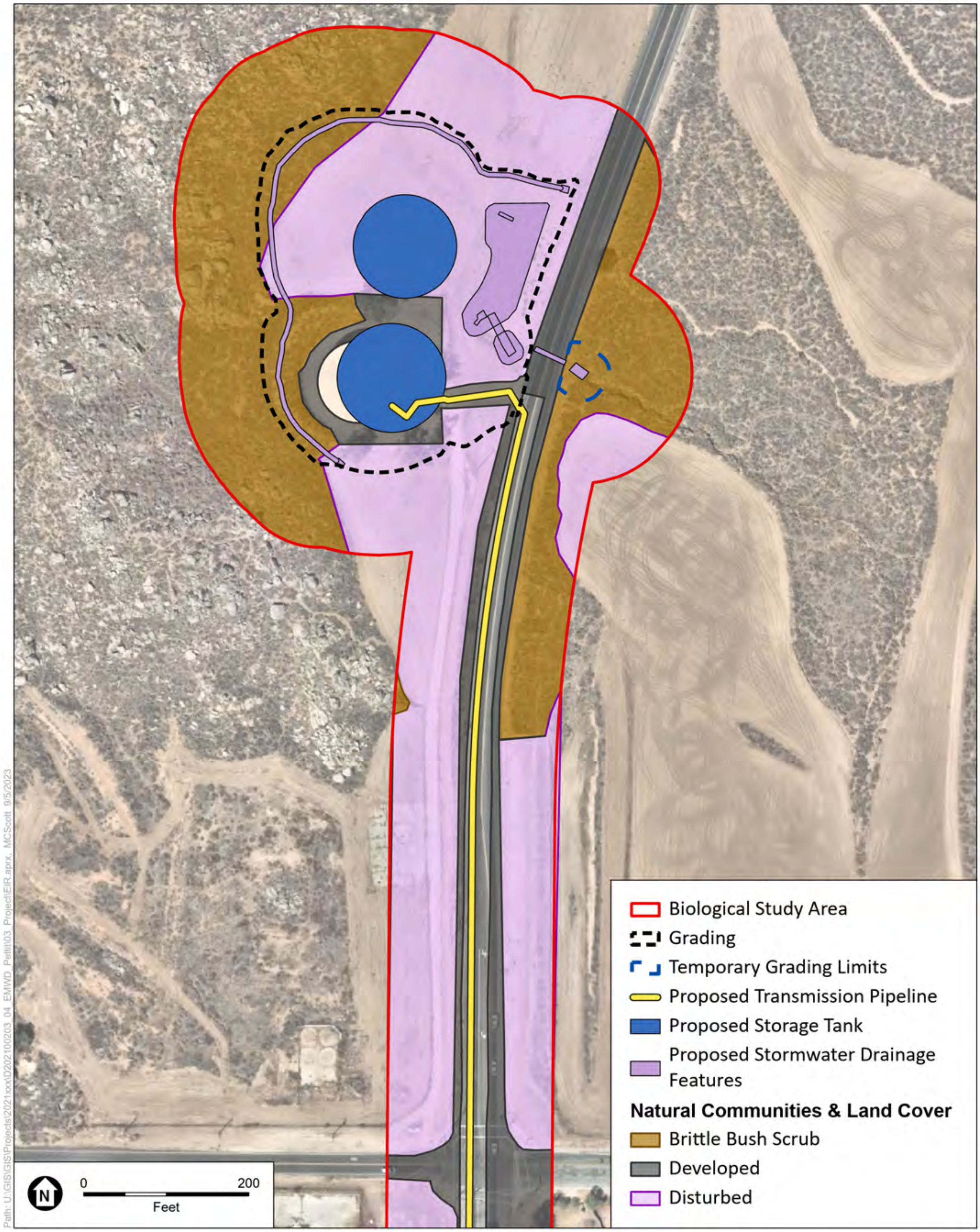
Special-Status Invertebrates

Phase 1 and Phase 2

Construction

Storage Tanks and Pipeline

The majority of the proposed storage tank grading limits are disturbed and do not provide suitable habitat for Crotch's bumblebee, a special-status invertebrate (see **Figures 3.3-4a- c**). Brittle bush scrub located within the storage tank grading limits and temporary impact limits associated with the offsite energy dissipater on the east side of Moreno Beach Drive may provide habitat for Crotch's bumblebee in the form of potential food plants such as Branching phacelia, brittle bush, and miniature lupine. Construction activities have the potential to result in direct mortality or removal of nests if the species is determined to be present. Impacts to special-status invertebrates would be potentially significant. To minimize impacts to biological resources including special-status invertebrates, **Mitigation Measure BIO-1** would require preparation of a Worker Environmental Awareness Program (WEAP), which would be presented to construction crews prior to initiation of construction to inform workers of the potential for special-status wildlife species to occur onsite. The WEAP training should concentrate on identification of sensitive resources and strategies to avoid and minimize impacts to sensitive resources (e.g., staying within limits of disturbance, reduced speed limits, covering trenches/pits or installing wildlife escape ramps, daily trash/debris disposal). To minimize impacts to special-status invertebrates, **Mitigation Measure BIO-2** would require pre-construction surveys be conducted for Crotch's bumble bee. If these species are found on site during the surveys, best management practices as described in Mitigation Measure BIO-2 would be implemented, such as construction area delineation, reduced speed limits, and avoidance of host vegetation, to avoid impacts. Although Phase 2 of the project would occur in the year 2045, conditions within the BSA are not expected to change substantially, and regardless, Mitigation Measure BIO-2 includes a pre-construction survey, which would confirm current conditions and determine presence/absence of Crotch's bumble bee at that time. With implementation of these mitigation measures, impacts to Crotch's bumblebee would be reduced to a less than significant level.

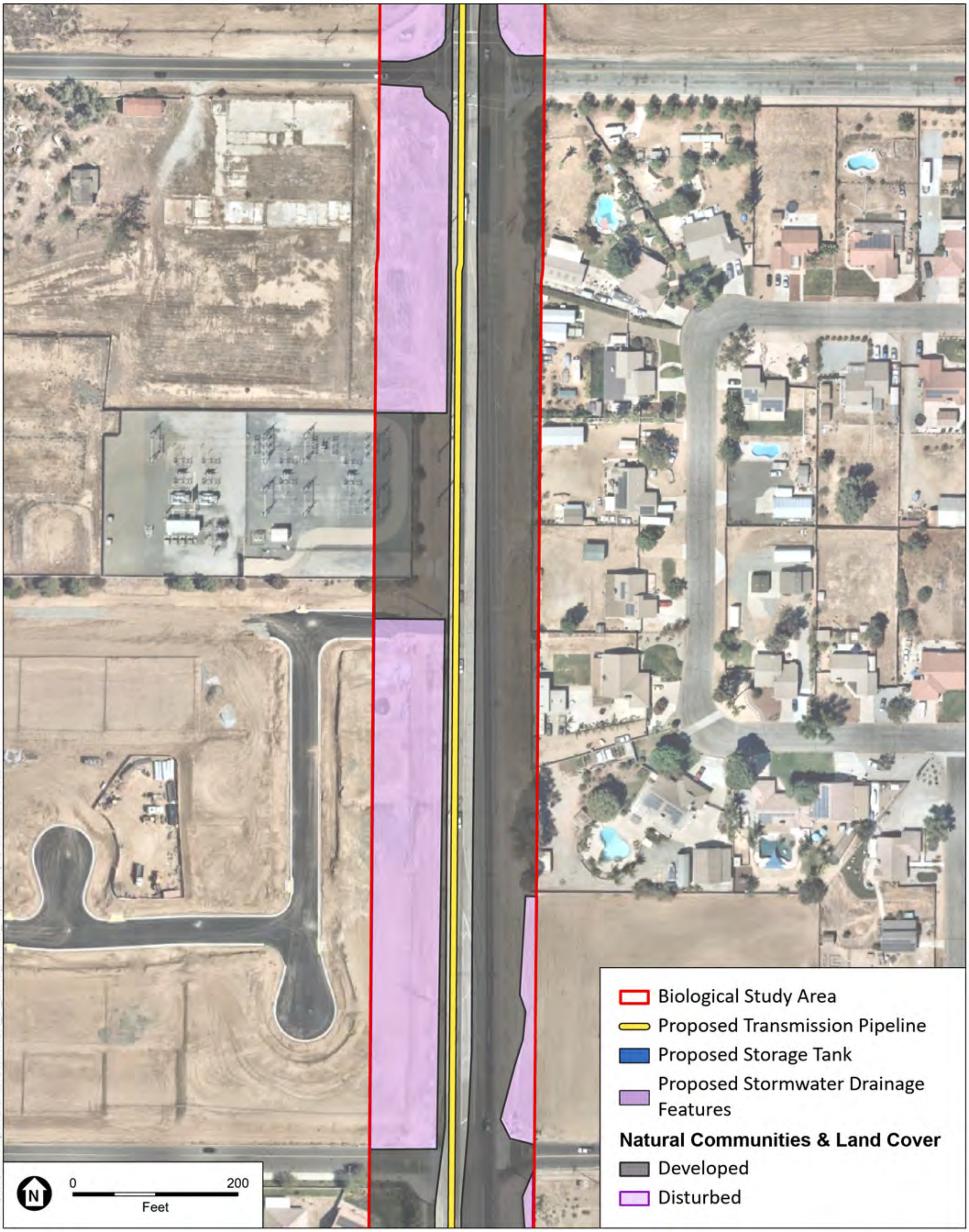


SOURCE: Nearmap (2022), ESA (2022)

Pettit Water Storage Tank Expansion and Transmission Pipeline Project

Figure 3.3-4a
Impacts to Natural Communities and Land Cover Types

ESA



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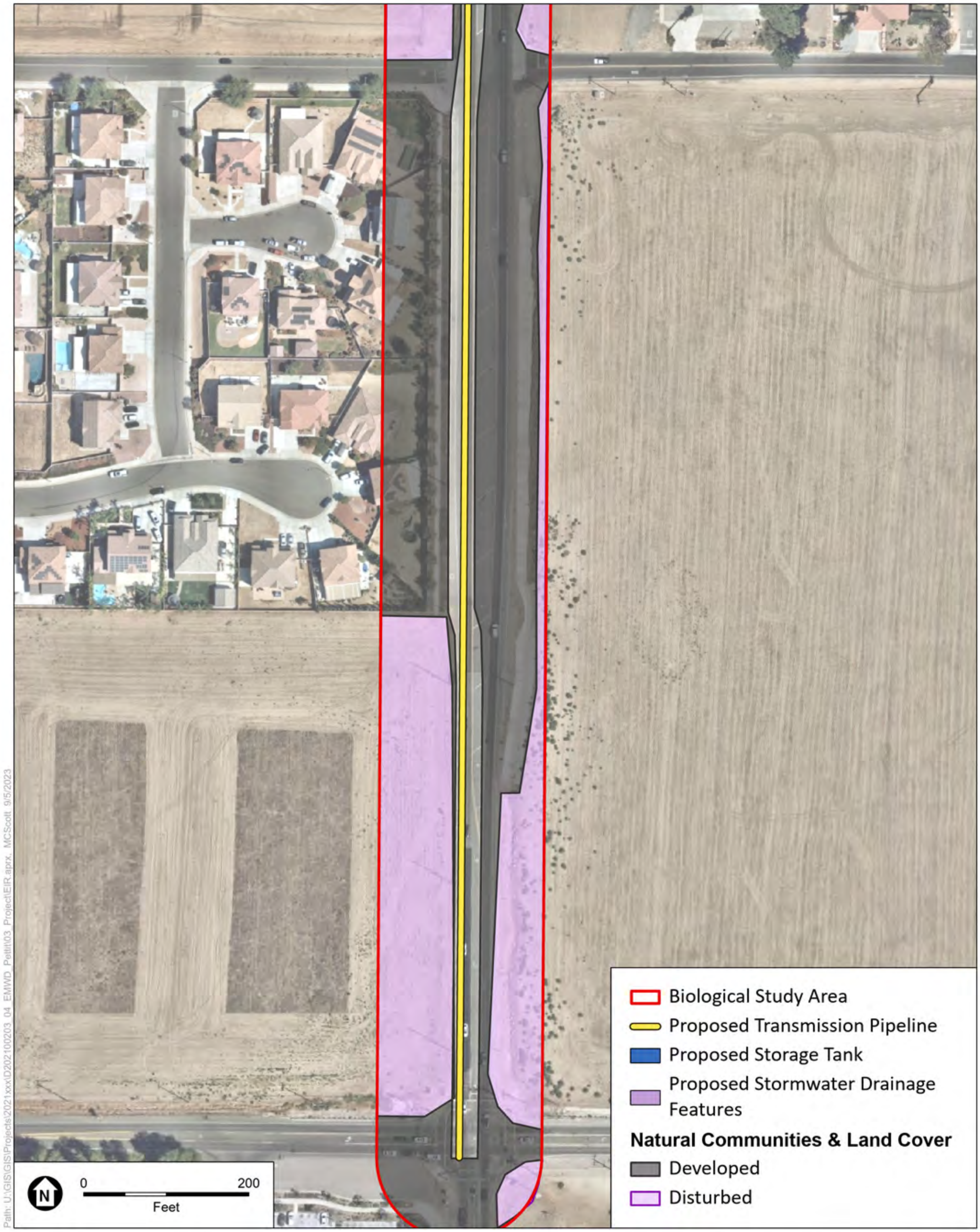
SOURCE: Nearmap (2022), ESA (2022)

Pettit Water Storage Tank Expansion and Transmission Pipeline Project

Figure 3.3-4b
Impacts to Natural Communities and Land Cover Types

ESA



SOURCE: Nearmap (2022), ESA (2022)

Pettit Water Storage Tank Expansion and Transmission Pipeline Project

Figure 3.3-4c
Impacts to Natural Communities and Land Cover Types

ESA

Operation

Storage Tanks and Pipeline

Operation of the project would not impact special-status invertebrates. Anticipated maintenance activities would be limited to disturbed areas around the water storage tank, which do not contain suitable habitat for special-status species. The pipeline would be installed underground and would not require regular maintenance. No impacts to special-status species would occur during the operation phase of the project.

Special-Status Mammals

Phase 1 and Phase 2

Construction

Storage Tanks and Pipeline

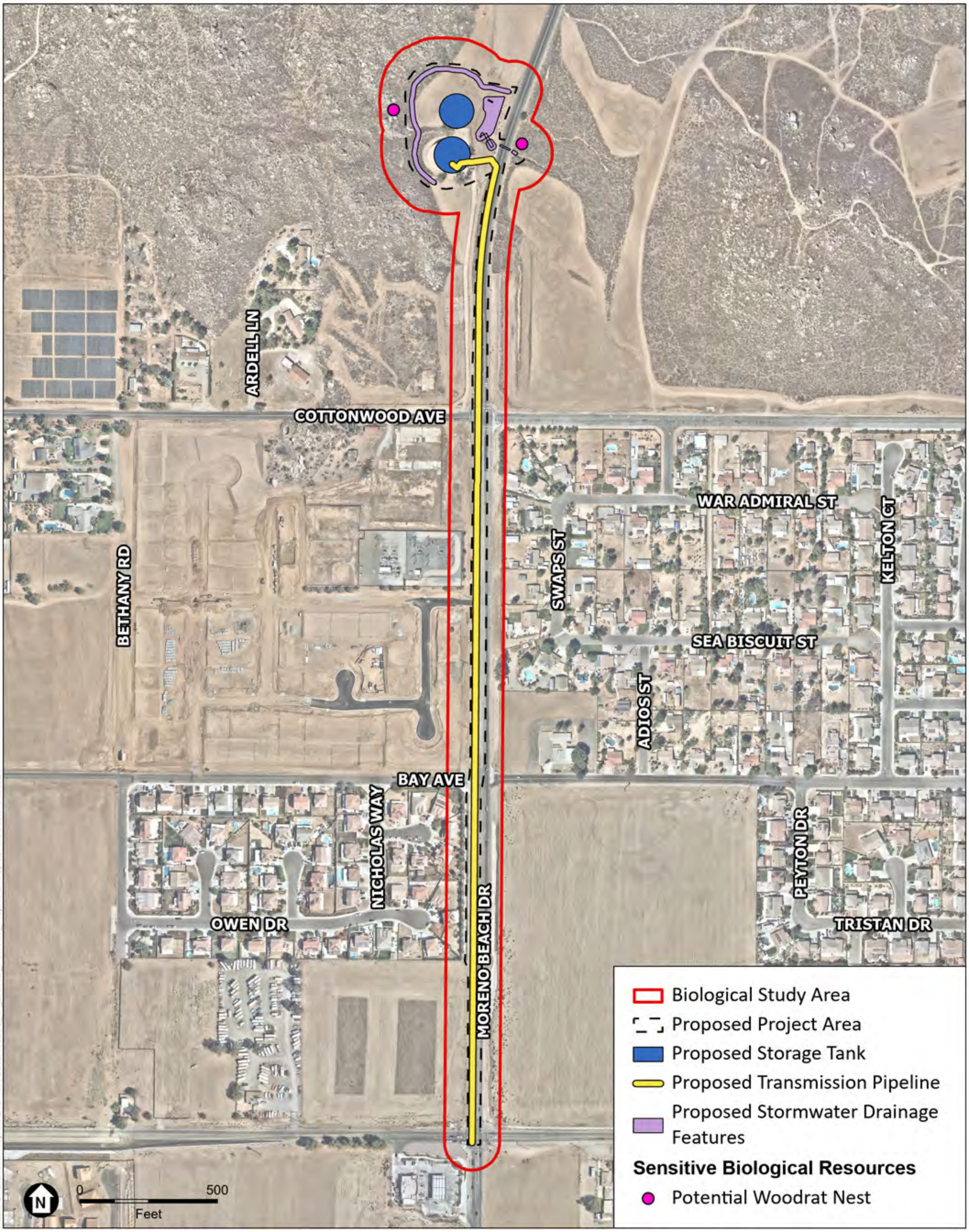
The brittle bush scrub on the west side of the existing storage tank site and surrounding the offsite energy dissipater provides marginal habitat for San Diego desert woodrat (see Figure 3.3-4 for habitat and **Figure 3.3-5** for potential nest locations within that habitat). Construction activities have the potential to result in direct mortality if San Diego desert woodrat are determined to be present and impacts would be potentially significant.

Implementation of **Mitigation Measure BIO-3** requires San Diego desert woodrat pre-construction surveys to determine presence or absence of the species, and if San Diego desert woodrat is found to be present, the species would be avoided or relocated. Although Phase 2 of the project would occur in the year 2045, conditions within the BSA are not expected to change substantially, and regardless, Mitigation Measure BIO-3 includes a pre-construction survey, which would confirm current conditions and determine presence/absence of San Diego desert woodrat at that time. Implementation of mitigation measures would reduce impacts to special-status small mammals to a less than significant level.

Operation

Storage Tanks and Pipeline

Operation of the project would not impact special-status mammals. Anticipated maintenance activities would be limited to disturbed areas around the water storage tank, which do not contain suitable habitat for special-status species. The pipeline would be installed underground and would not require regular maintenance. No impacts to special-status species would occur during the operation phase of the project.



SOURCE: Nearmap (2022), ESA (2022)

Pettit Water Storage Tank Expansion and Transmission Pipeline Project

Figure 3.3-5
Impacts to Sensitive Biological Resources

ESA

Special-Status Reptiles

Phase 1 and Phase 2

Construction

Storage Tanks and Pipeline

The brittle bush scrub on the west side of the proposed storage tank sites provide marginal habitat for Belding's orange-throated whiptail, coastal western whiptail, coast patch-nosed snake, and red-diamond rattlesnake. The majority of the proposed storage tank grading limits is already disturbed and does not provide suitable habitat for special-status species. The brittle bush scrub may provide habitat for these species. Construction activities have the potential to result in direct mortality if any of these species are present. To avoid and minimize potential impacts to Belding's orange-throated whiptail, coastal western whiptail, coast patch-nosed snake, and red-diamond rattlesnake, **Mitigation Measure BIO-4** shall be implemented to conduct pre-construction surveys to determine presence or absence of special-status reptile species. If any of these species are found to be present, a qualified herpetologist would relocate individuals to suitable habitat at least 100 feet from the project. Although Phase 2 of the project would occur in the year 2045, conditions within the BSA are not expected to change substantially, and regardless, Mitigation Measure BIO-4 includes a pre-construction survey, which would confirm current conditions and determine presence/absence of special-status reptiles at that time. With implementation of this mitigation measure, impacts to special-status reptiles would be reduced to a less than significant level.

Operation

Storage Tanks and Pipeline

Operation of the project would not impact special-status reptiles. Anticipated maintenance activities would be limited to disturbed areas around the water storage tank, which do not contain suitable habitat for special-status reptile species. The pipeline would be installed underground and would not require regular maintenance. No impacts to special-status species would occur during the operation phase of the project.

Special-Status Birds

Phase 1 and Phase 2

Construction

Storage Tanks and Pipeline

Southern California rufous-crowned sparrow was identified as having a moderate potential to occur in the BSA. Habitat for this species occurs primarily within the areas surrounding the proposed water storage tank grading limits. Direct impacts to the special-status birds may occur from direct mortality due to construction activity (loss of individuals, nests, or eggs as a result of vegetation removal) and indirect impacts due to the removal of habitat or to active nests due to disturbance from human activities, construction noise, and vibration. Impacts to special-status bird species would be potentially significant. **Mitigation Measure BIO-5** would require pre-construction nesting bird surveys and the implementation of avoidance measures during construction if nests or suitable habitat are found to be active within 500 feet of the proposed project area. Although Phase 2 of the project would occur in the year 2045, conditions within the BSA are not expected to change substantially, and regardless, Mitigation Measure BIO-5 includes a pre-construction survey, which would confirm current conditions and determine presence/absence of special-status birds at that time. With implementation of this mitigation measure, impacts to special-status birds (i.e., southern California rufous-crowned sparrow) during construction would be reduced to a less than significant level.

Mitigation Measures

BIO-1: Pre-Construction Training. Prior to commencement of construction activities, a qualified biologist shall prepare a Worker Environmental Awareness Program (WEAP) that provides a description of potentially-occurring special-status species that could be affected by the proposed project.

The WEAP shall include information on identifying special-status species, and measures to avoid special-status species during construction activities, including (but not limited to):

- staying within limits of disturbance,
- establishing an onsite speed limit of 15 miles per hour,
- covering trenches and open pits at the end of each workday,
- installing wildlife escape ramps in open trenches or pits,
- and daily trash and debris disposal from the project.

The WEAP training shall be provided to all construction personnel by a qualified biologist. Completion of the WEAP training shall be documented for all construction personnel on a sign-in sheet that shall be onsite at all time during construction activities.

The qualified biologist shall also verify fencing or marking limits of disturbance (marking habitat suitable to support special-status species as well as sensitive vegetation communities) prior to commencement of construction activities, if applicable.

BIO-2: Pre-Construction Surveys and Mitigation for Crotch's Bumble Bee. Within seven (7) days prior to the start of construction activities, a qualified entomologist familiar with the species behavior shall conduct a pre-construction survey for Crotch's bumble bee, within 100 feet of construction activities near host plant communities (including nectar plants for Crotch's bumble bee).

If any of these species are present or determined to be within 100 feet of construction areas, construction best management practices (BMPs) will be implemented and incorporation of information about these species will be incorporated into the WEAP training to avoid potential impacts to these species. BMPs shall include

- Limiting construction vehicle speeds to 15 miles per hour when operating within 100 feet of the habitat areas.
- Fencing habitat areas using temporary silt fencing, and cleaning up all trash and debris daily.

In coordination with the CDFW, additional avoidance measures may be required that include establishing a buffer around the species host plants where no work can occur, and onsite monitoring dependent on distance from the work area. Construction personnel will be instructed to not directly harm any special-status species onsite by halting activities until the species can move to offsite areas or contact a qualified biologist to move the species out of harm's way.

BIO-3: San Diego Desert Woodrat Pre-Construction Survey, and Avoidance or Relocation. Thirty days prior to construction activities, a qualified mammalogist with experience in identifying and trapping San Diego desert woodrat shall conduct a survey within proposed construction disturbance zone and within 200 feet of the disturbance zone for San Diego desert woodrat. The survey shall incorporate appropriate methods to detect San Diego desert woodrat prior to any project activities in areas that have or may have the potential to support these species.

- If active San Diego desert woodrat nests (stick houses) are identified within the disturbance zone, a construction fence shall be erected around the nest site adequate to provide the woodrat sufficient foraging habitat at the discretion of the qualified biologist. The biologist shall be present during those periods when disturbance activities will occur near active nest areas to avoid inadvertent impacts to these nests.
- Where nest avoidance is not possible, the project biologist shall clear vegetation from immediately surrounding active nests followed by a night without further disturbance to allow woodrats to vacate the nest. Each occupied nest shall subsequently be gently disturbed by a qualified wildlife biologist in possession of a scientific collecting permit to entice any remaining woodrats to leave the nest and seek refuge outside the project construction area. The stick nests shall be carefully removed from the project construction area and be placed near a suitable vegetation or rocky substrate similar to original nest location. Relocation of special-status species and/or salvaged nest-building material (rocks, sticks, etc.) shall target undeveloped areas of the project that shall not be disturbed. Removal of the nests outside of breeding season is preferred if feasible (i.e., breeding season is May through October).
- If young are found within the nest during the dismantling process, clearing and construction within the fenced area shall be postponed or halted until young have left the nest. The material shall be placed back on the nest and the nest shall remain unmolested for two to three weeks in order to give the young enough time to mature and leave the nest on their own accord. After two to three weeks, the nest dismantling process may begin again.

The project biologist shall document all woodrat nests moved and provide a written report to EMWD.

BIO-4: Special-Status Reptile. A qualified herpetologist, who holds a scientific collecting permit, shall conduct a pre-construction clearance survey throughout the project, including a 100-foot buffer, for coastal western whiptail, Belding's orange-throated whiptail, coast patch nosed snake, and red-diamond rattlesnake within two weeks prior to the start of construction activities.

If any of these species are observed during the survey, a qualified biologist should relocate the individual to suitable habitat at least 100 feet from the project. Trapping and relocation methods should be conducted in consultation with the EMWD.

BIO-5: Nesting Bird Season Avoidance or Pre-Construction Survey. Construction and vegetation removal should occur outside of nesting season (i.e., nesting season is February 1 to August 31 for songbirds, January 15 to August 31 for raptors). If construction and vegetation removal must occur during nesting season (i.e., between January 15 and August 31), a qualified biologist shall conduct a pre-construction survey for breeding and nesting birds and raptors 30 days prior to the start of construction, and then weekly, within 300-feet of the construction limits to determine and map the location and extent of breeding birds that could be affected by the project. During nesting season, the following conditions shall be implemented:

- Nesting bird surveys shall be conducted at appropriate nesting times and concentrate on potential roosting or perch sites.
- Weekly surveys will take place with the last survey being conducted no more than 3 days prior to the initiation of clearance/construction work.
- If project activities are delayed or suspended for more than 7 days after the last survey, surveys shall be repeated before work can resume.
- If an active nest is located, clearing and construction within appropriate buffers as determined by a qualified biological monitor, shall be postponed until the nest is vacated and juveniles have fledged and when there is no evidence of a second attempt at nesting.
- Due to vicinity of natural open spaces adjacent to the project, 500-feet for raptors (including burrowing owls) and 300-feet for passerine birds could suffice for nesting bird buffers however it will be at the discretion of the qualified biologist. The buffer zone from the nest shall be established in the field with flagging and stakes.
- The qualified biologist shall retain the ability to increase or decrease buffers as needed to protect the nesting birds (based on bird behavior, construction activities, etc.).
- Temporary fencing and signage shall be maintained for the duration of the project. Construction personnel shall be instructed on the sensitivity of the area and be advised not to work, trespass, or engage in activities that would disturb nesting birds near or inside the buffer.
- Onsite construction monitoring may also be required to ensure that no direct or indirect impacts occur to the active nest. Project activities may encroach into the buffer only at the discretion of the qualified biologist.

Significance Determination

Less than Significant Impact with Mitigation Incorporated

Sensitive Natural Communities

Impact 3.3-2: The proposed project could have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service.

Phase 1 and Phase 2

Construction

Storage Tanks and Pipeline

Based on the site visit, no riparian habitat or CDFW sensitive natural communities occur within or immediately adjacent to the proposed storage tanks or transmission pipeline; therefore, no impacts would occur during construction activities.

Operation

Storage Tanks and Pipeline

No riparian habitat or CDFW sensitive natural communities occur within or immediately adjacent to the proposed storage tanks or transmission pipeline; therefore, no impacts would occur during the operation phase of the project.

Mitigation Measures

None Required

Significance Determination

No Impact

Wetlands

Impact 3.3-3: The proposed project could have a substantial adverse effect on state or federally protected wetlands (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means.

Phase 1 and Phase 2

Construction and Operation

Storage Tanks and Pipeline

No State or federally protected wetlands occur within the BSA; thus, there would be no impacts to State or federally protected wetlands. However, the BSA supports non-wetland waters that may be regulated by the CDFW and RWQCB. The proposed project will involve the grading and recontouring of the proposed storage tank site for stormwater improvements and may result in impacts to non-wetland waters of the State and aquatic resources subject to Fish and Game Code 1600 (see **Figure 3.3-6a-c** and **Table 3.3-3**). Impacts to 0.020 acre of aquatic resources (i.e., non-wetland waters) would occur through direct removal, increased fill, or hydrological interruption. However, the drainages are already disturbed, lack riparian vegetation, contain ruderal nonnative vegetation, and lack a defined OHWM or bed and bank as a result of the regular and frequent disturbance (i.e., grading and discing). Thus, due to the disturbed nature of the drainages, and because the project proposes installation of a detention basin, which will add beneficial uses (e.g., groundwater infiltration) that will provide some of the similar functions of these disturbed drainages, impacts to 0.020 acre of non-wetland waters are considered less than significant and no mitigation is required. Consultation with the CDFW and RWQCB may still be required to determine whether applications for permits will be necessary (i.e., although impacts are less than significant and no mitigation is required under CEQA, whether regulatory permits may be required is subject to the discretion of CDFW and/or RWQCB).

Within the southern portion of the BSA, project pipeline construction would occur in proximity to aquatic resources identified immediately east of Moreno Beach Drive, but would not infringe on those aquatic resources.

TABLE 3.3-3
IMPACTS TO AQUATIC RESOURCES

Aquatic Feature	Cowardin Type	Dominant Vegetation/ Land Cover Type	Feature Width (feet)	Linear Feet	Acreage of Potentially Regulated Aquatic Resources within Disturbance Limits	
					Non-Wetland Waters of the State	Resources subject to Fish & Game Code 1600
Drainage 1	Riverine (ephemeral)	Largely devoid of vegetation/annual forbs	1	89[1]	0.009[2]	0.009
Drainage 2	Riverine (ephemeral)	Largely devoid of vegetation/annual forbs	1-2	303.0	0.011	0.011
Drainage 3	Riverine (ephemeral)	Largely devoid of vegetation/annual forbs	2	13.7	0.001	0.001
Drainage 4	Riverine (ephemeral)	Brittle Bush Scrub	4-7	-[3]	-	-
			Total Aquatic Features	**405.7**	**0.020**[4]	**0.020**

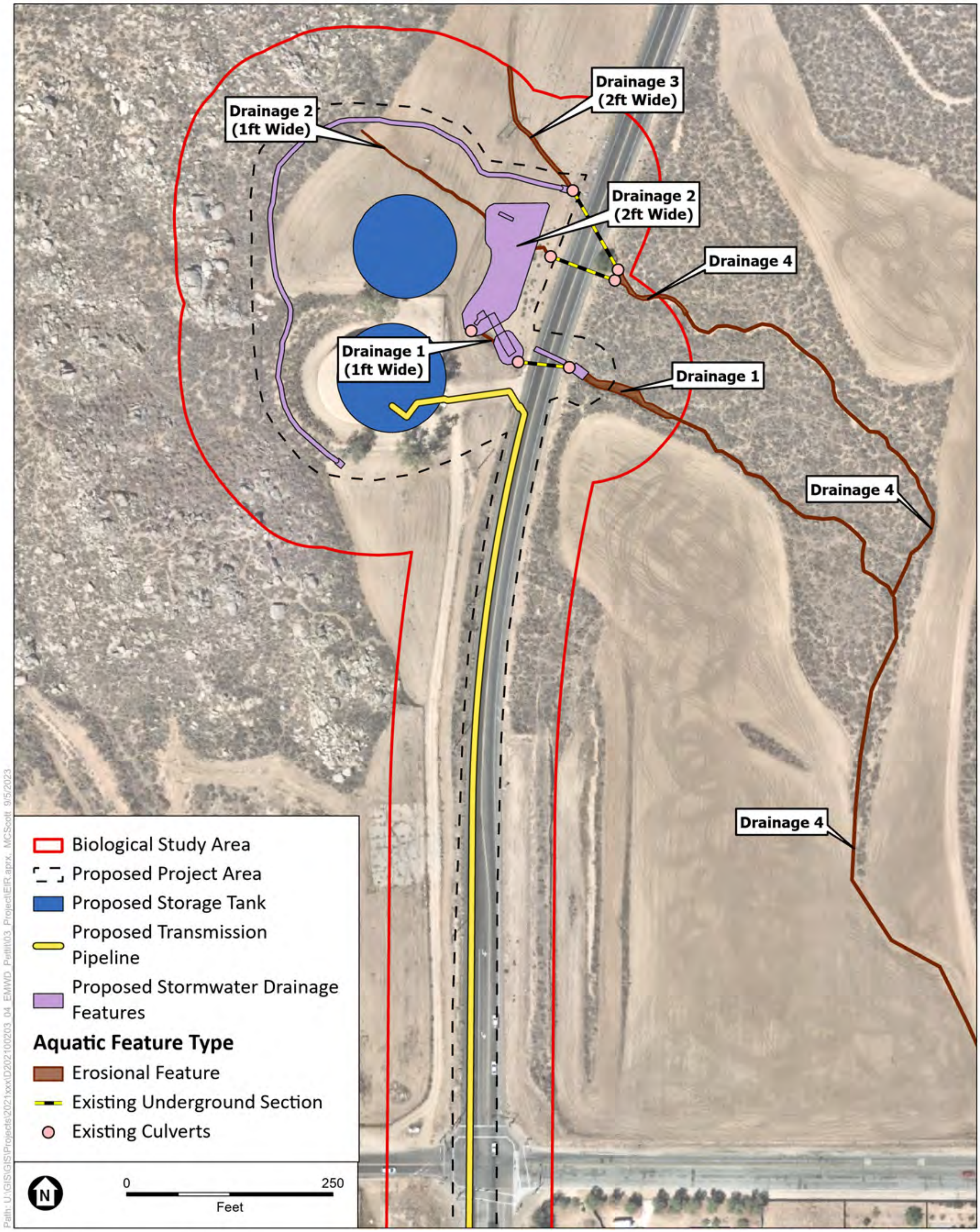
1 Length and acreage measurements only include Drainage 1 within grading limits and area associated with energy dissipater east of Moreno Beach Drive.
2 Total square footage for Drainage 1 impacts (grading and dissipater) = 389 ft2 or 0.00893 acre.
3 Drainage 4 is not included in total lengths and acreage, as it remains completely outside of the grading limits and only within the 100-foot survey buffer. Furthermore, 160 feet of Drainage 3 also remains outside of the grading limits (but within the 100-foot survey buffer and will not be impacted.
4 Total square footage for impacts is equal to 874.68 which is 0.20 acres. The summation of acreage in the table would equal to 0.021, as a result of rounding.

Mitigation Measures

None Required

Significance Determination

Less than Significant Impact

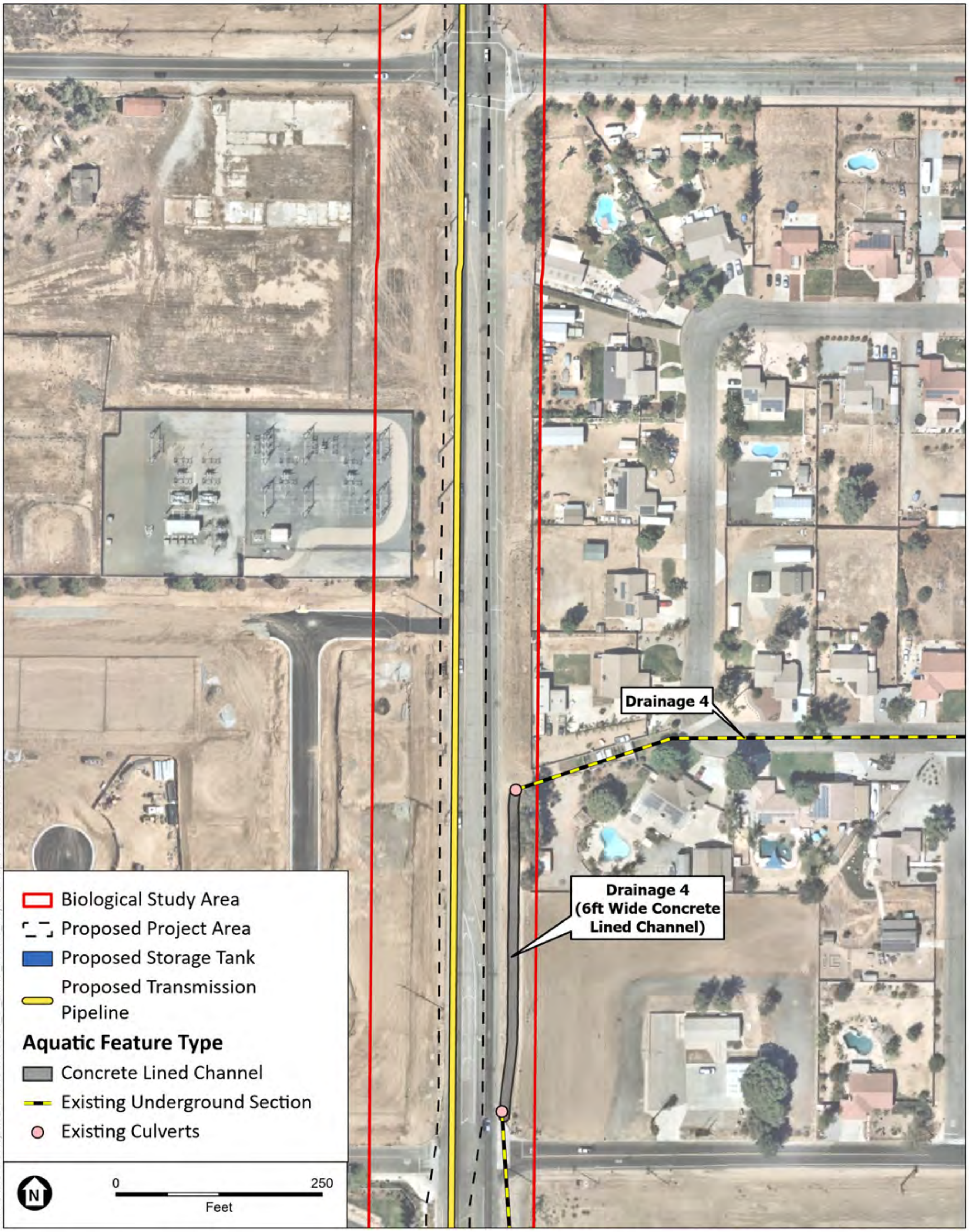


SOURCE: Nearmap (2022), ESA (2022)

Pettit Water Storage Tank Expansion and Transmission Pipeline Project

Figure 3.3-6a
Impacts to Aquatic Resources

ESA

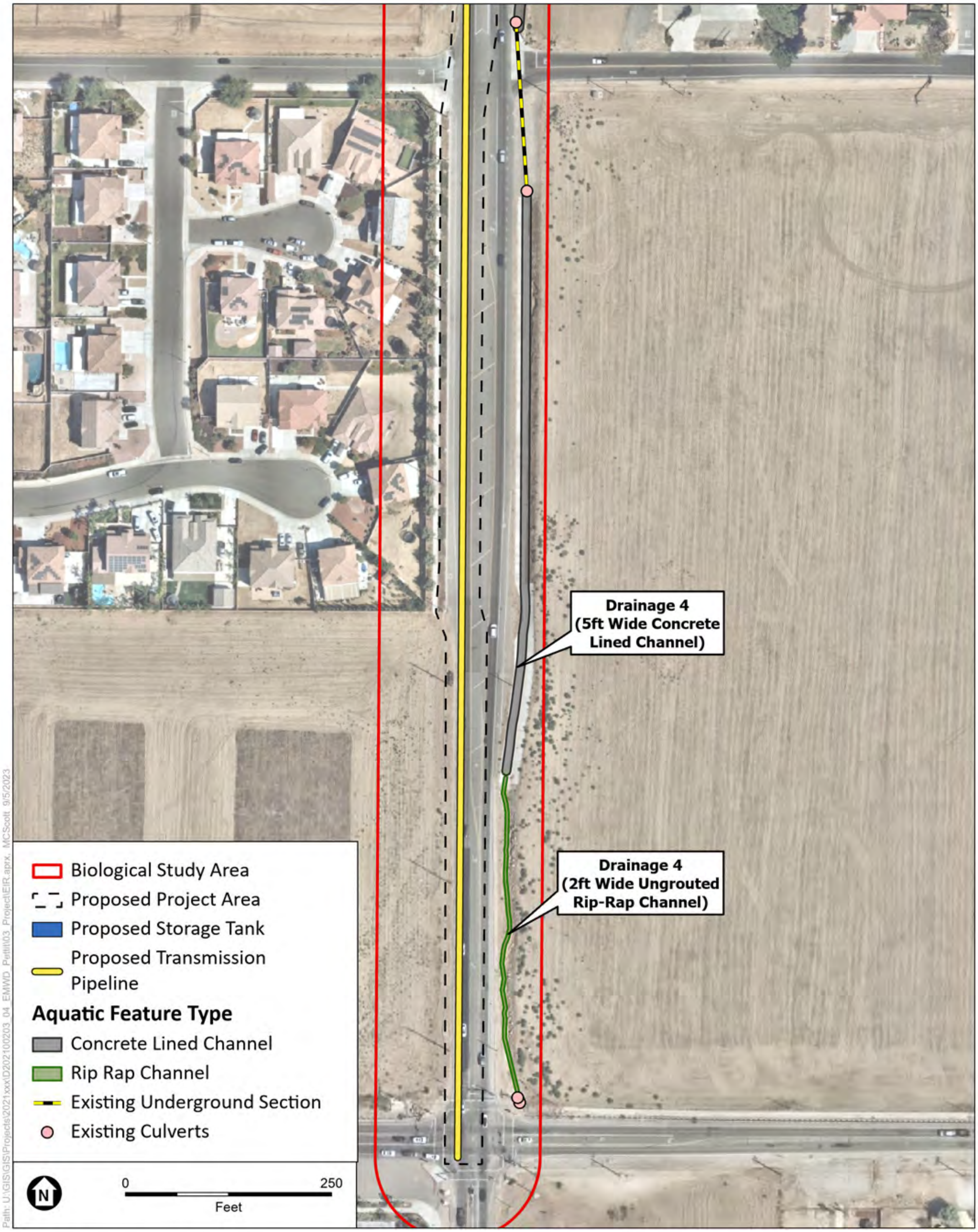


SOURCE: Nearmap (2022), ESA (2022)

Pettit Water Storage Tank Expansion and Transmission Pipeline Project

Figure 3.3-6b
Impacts to Aquatic Resources

ESA



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SOURCE: Nearmap (2022), ESA (2022)

Pettit Water Storage Tank Expansion and Transmission Pipeline Project

Figure 3.3-6c
Impacts to Aquatic Resources

ESA

Wildlife Corridors

Impact 3.3-4: The proposed project could interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites.

Wildlife Movement

Phase 1 and Phase 2

Construction and Operation

Storage Tanks and Pipeline

While wildlife may use the BSA to forage, breed, and for local movement to some extent, the project does not link large areas of contiguous, intact habitat together, and is not expected to function as an important regional migration corridor. Impacts to resident or migratory fish, established native resident or migratory wildlife corridors would be less than significant and no mitigation would be required.

Nursery Sites – Nesting Birds

Phase 1 and Phase 2

Construction

Storage Tanks and Pipeline

The project would be partially constructed within brittle bush scrub habitat as well as disturbed and developed land uses. These areas may provide suitable nesting habitat for birds protected under the MBTA and CFG Code Section 3500. Potential impacts to nesting birds may occur during the general avian nesting season (i.e., from February 1 to August 31 for songbirds, January 15 to August 31 for raptors) during construction. Impacts may include direct mortality to individuals, nests, or eggs as a result of loss of nesting habitat (i.e., vegetation removal). Indirect impacts to active nests may occur due to disturbance from human activities, construction noise, and vibration. Impacts to nesting birds would be potentially significant. Implementation of Mitigation Measure BIO-5, which would require pre-construction nesting bird surveys and the implementation of avoidance and minimization measures during construction if nests are found to be active within 500 feet of the proposed project area, would reduce impacts to a less than significant level.

Operation

Operation of the project would not impact nesting birds. Anticipated maintenance activities would be limited to disturbed areas around the water storage tank and would occur weekly. The pipeline would be installed underground and would not require regular maintenance. No impacts to nesting birds would occur during the operation phase of the project.

Nursery Sites – Roosting Bats

Phase 1 and Phase 2

Construction

Storage Tanks and Pipeline

Roosting bats may utilize the large rocky outcroppings located within 100 feet of the project. Bat colonies utilizing the site may be adapted to living in an urbanized setting with the existing lighting onsite, including the adjacent residential areas and traffic along roads. However, disturbance of large rocky outcroppings through removal or blasting of bedrock within the project area may result in disturbance of maternity roosts, and would be considered a significant impact. **Mitigation Measure BIO-6** would require a pre-construction survey of the BSA by a qualified biologist, and the implementation of bat protection measures to avoid impacts to the species. With implementation of Mitigation Measure BIO-6, impacts to roosting bats would be reduced to a less than significant level.

Operation

Storage Tanks and Pipeline

Operation of the project would not impact roosting bats. Anticipated maintenance activities would be limited to disturbed areas around the water storage tank and would occur weekly. The pipeline would be installed underground and would not require regular maintenance. No impacts to roosting bats would occur during the operation phase of the project.

Mitigation Measures

BIO-6: Roosting Bat Avoidance or Pre-Construction Survey. Construction and vegetation removal should occur outside of maternity roosting season (September 1–March 31). The following conditions shall be implemented if construction must occur during maternity roosting season:

- If construction and vegetation removal must occur during maternity roosting season, then prior to commencement of construction activities within the maternity roosting season (April 1–August 31), a qualified biologist with a scientific collecting permit shall conduct a pre-construction clearance survey of suitable rocky outcroppings located adjacent to the project that have the potential to provide suitable bat roosting habitat to determine if bats are roosting onsite. If bats are determined to be using trees specifically for roosting, the biologist will determine whether a day roost (non-breeding) or maternity roost (lactating females and dependent young) is present.
- If a day roost is determined to be present and the removal of any trees or rocky outcroppings supporting a day roost would occur, the biologist will ensure that all roosting individuals disperse from the location prior to removal of the vegetation to prevent direct mortality.
- If a maternity roost is observed, the qualified bat biologist will determine whether construction activities are likely to disturb breeding activities.
- If it is determined that the vegetation or rocky substrate supporting the roost must be removed or activities are expected to disturb the breeding activities, a Bat Avoidance, Minimization, and/or Exclusion Plan shall be prepared in consultation with EMWD. At a minimum, the plan shall include avoidance and minimization measures to reduce potential impacts to breeding bats during construction activities and/or prescribed methods to safely and humanely evict bats from the roost in order to minimize any potential impacts.

Significance Determination

Less than Significant Impact with Mitigation Incorporated

Local Policies and Ordinances

Impact 3.3-5: The proposed project could conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance.

Phase 1 and Phase 2

Construction and Operation

Storage Tanks and Pipeline

No impacts to city-protected trees are anticipated to occur during the construction or operation phase of the project. Should street tree removal or trimming be required, it would be conducted in accordance with the City of Moreno Valley's Tree Ordinance. Therefore, the proposed project would not conflict with any local policies or ordinance protecting biological resources, and impacts to protected trees would be less than significant.

Mitigation Measures

None Required

Significance Determination

Less than Significant Impact

Habitat Conservation Plan

Impact 3.3-6: The proposed project conflicts with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan.

Western Riverside MSHCP & Stephens Kangaroo Rat HCP

Phase 1 and Phase 2

Construction and Operation

Storage Tanks and Pipeline

The project occurs within both the Western Riverside MSHCP and the SKRHCP. EMWD is not a Participating Entity in the MSCHP and thus is not required to demonstrate project consistency with the goals and provisions of the MSHCP as they pertain to biological resources on EWMD projects. Regardless, special-status species that the MSHCP covers are analyzed previously in this document and avoidance and minimization measures prescribed to reduce any potentially significant impacts to a less than significant level. Thus, the project would not conflict with the MSHCP.

Additionally, Stephens kangaroo rat is not expected to occur onsite. SKR surveys are not required based on coordination with RCHCA (ESA 2022). Additionally, the project is not located within a core reserve and is not within occupied SKR habitat that is mapped outside of the core areas. Therefore, a take agreement with RCHCA is not required and the project would not conflict with the SKRHCP. No impact would occur.

Mitigation Measures

None Required

Significance Determination

No Impact

Cumulative Impacts

Impact 3.3-7: Concurrent construction and operation of the proposed project and related projects in the geographic scope could result in cumulative short-term and long-term impacts to biological resources.

Construction and Operation

Development in the Inland Empire has substantially altered native habitats and adversely affected native plant and wildlife. Historic agricultural use, the expansion of urban areas in the region has resulted in the loss of open space and the degradation of natural areas that historically supported populations of unique or rare species and habitats.

The cumulative projects considered in the analysis of cumulative impacts are listed in Table 3-2 and illustrated on Figure 3-1 in Chapter 3 of this Draft EIR. Cumulative Projects 1 through 8 are residential, commercial, and mixed-use development projects and Projects 10-12 are industrial projects. The majority of developments in the City of Moreno Valley are located in areas that are already substantially developed, or within sites that have previously been altered due to grading or agricultural practices, and would not contribute significantly to direct impacts to biological resources. The effects of the proposed project would not contribute incrementally to the cumulative impacts on biological resources, since few sensitive biological resources are expected to occur, and because the majority of the BSA has already been disturbed or developed. Impacts to special-status species and biological resources within the project area would be avoided, minimized, and/or mitigated through implementation of Mitigation Measures BIO-1 through BIO-6. Furthermore, the project occurs within the Western Riverside MSHCP, which provides for the regional conservation of biological resources within the City of Moreno Valley and surrounding vicinity. Although EMWD is not a Participating Entity in the MSCHP, the City of Moreno Valley is a Participating Entity in the MSHCP and Cumulative Projects 1 through 12, all of which are located within the City of Moreno Valley, would be subject to demonstrating consistency with the MSHCP. Therefore, when considered in addition to anticipated impacts of other projects in the cumulative scenario, the Project's incremental contribution to biological resources impacts would not be cumulatively considerable. With implementation of mitigation measures, impacts would be less than significant.

Mitigation Measures

Implement Mitigation Measures BIO-1 through BIO-6.

Significance Determination

Less than Significant Impact with Mitigation Incorporated

3.3.4 References

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3.4 Cultural Resources

This section addresses the cultural resources impacts associated with implementation of the proposed project. This section includes: a description of the existing cultural resources conditions at the proposed project site; a summary of applicable regulations related to cultural resources; and an evaluation of the potential impacts of the proposed project related to cultural resources at the proposed project site and in the surrounding area, including cumulative impacts. The section is based on the *Cultural Resources Assessment Report* (*Confidential*) (**Appendix CUL** to this Draft EIR).

3.4.1 Environmental Setting

Prehistoric Setting

The chronology of southern California is typically divided into three general time periods: the Early Holocene (11,000 to 8,000 Before Present [B.P.]), the Middle Holocene (8,000 to 4,000 B.P.), and the Late Holocene (4,000 B.P. to A.D. 1769). This chronology is manifested in the archaeological record by particular artifacts and burial practices that indicate specific technologies, economic systems, trade networks, and other aspects of culture.

Early Holocene (11,000 to 8,000 B.P.)

While it is not certain when humans first came to California, their presence in southern California by about 11,000 B.P. has been well documented. At Daisy Cave, on San Miguel Island, cultural remains have been radiocarbon dated to between 11,100 and 10,950 years B.P. (Byrd and Raab 2007). On the mainland, radiocarbon evidence confirms occupation of the Orange County and San Diego County coast by about 9,000 B.P., primarily in lagoon and river valley locations (Gallegos 2002). In western Riverside County, few Early Holocene sites are known to exist. One exception is site CA-RIV-2798, which contains deposits dating to as early as 8,580 cal. B.P. (Grenda 1997). During the Early Holocene, the climate of southern California became warmer and more arid and the human population, residing mainly in coastal or inland desert areas, began exploiting a wider range of plant and animal resources (Byrd and Raab 2007).

The primary Early Holocene cultural complex in coastal southern California was the San Dieguito Complex, occurring between approximately 10,000 and 8,000 B.P. The people of the San Dieguito Complex inhabited the chaparral zones of southwestern California, exploiting the plant and animal resources of these ecological zones (Warren 1967). Leaf-shaped and large-stemmed projectile points, scraping tools, and crescentics are typical of San Dieguito Complex material culture.

Middle Holocene (8,000 to 4,000 B.P.)

During the Middle Holocene, there is evidence for the processing of acorns for food and a shift toward a more generalized economy in coastal and inland southern California. The processing of plant foods, particularly acorns, increased, a wider variety of animals were hunted, and trade with neighboring regions intensified (Byrd and Raab 2007).

The Middle Holocene La Jolla (8,000–4,000 B.P.) Complex is essentially a continuation of the San Dieguito Complex. La Jolla groups lived in chaparral zones or along the coast, often migrating between the two. Coastal settlement focused around the bays and estuaries of coastal Orange and San Diego Counties. La Jolla peoples produced large, coarse stone tools, but also produced well-made projectile points, and milling slabs. The La Jolla Complex represents a period of population growth and increasing social complexity, and it was also during this time period that the first evidence of the exploitation of marine resources and the grinding of seeds for flour appears, as indicated by the abundance of millingstones in the archaeological record (Byrd and Raab 2007).

Contemporary with the La Jolla Complex, the Pauma Complex has been defined at coastal and adjacent inland sites in San Diego and Orange Counties, as well as in inland Riverside County (True 1958). The Pauma Complex is similar in technology to the La Jolla Complex; however, evidence of coastal subsistence is absent from Pauma Complex sites (Moratto 1984). The Pauma and La Jolla Complexes may either be indicative of separate inland and coastal groups with similar subsistence and technological adaptations, or, alternatively, may represent inland and coastal phases of one group’s seasonal rounds. The latter hypothesis is supported by the lack of hidden and deeply buried artifacts at Pauma sites, indicating that these sites may have been temporary camps for resource gathering and processing.

Late Holocene (4,000 B.P. to A.D. 1769)

During the Late Holocene, native populations of southern California were becoming less mobile and populations began to gather in small sedentary villages with satellite resource-gathering camps (Byrd and Raab 2007). Evidence indicates that the overexploitation of larger, high-ranked food resources may have led to a shift in subsistence towards a focus on acquiring greater amounts of smaller resources, such as shellfish and small-seeded plants (Byrd and Raab 2007).

Around 1,000 B.P., there was an episode of sustained drought, known as the Medieval Climatic Anomaly (MCA). While the effects of this environmental change on prehistoric populations are still being debated, it did likely lead to changes in subsistence strategies in order to deal with the substantial stress on resources (Jones and Schwitalla 2008). In coastal southern California, beginning before the MCA but possibly accelerated by it, conditions became drier and many lagoons had been transformed into saltwater marshes. Because of this, populations abandoned coastal mesa and ridge tops to settle nearer to permanent freshwater resources (Gallegos 2002).

Trade intensity reached its zenith in the Late Holocene, with asphaltum (tar), seashells and steatite being traded from southern California to the Great Basin. Major technological changes appeared as well, particularly with the advent of the bow and arrow, which largely replaced the use of the dart and atlatl (Byrd and Raab 2007). Small projectile points, ceramics, including Tizon brownware pottery, and obsidian from Obsidian Butte (Imperial County), are all representative artifacts of the Late Holocene.

It has been postulated that as early as 3,500 B.P., a Takic-speaking people arrived in coastal Los Angeles and Orange Counties, having migrated west from inland desert regions (Kroeber 1925; Warren 1968; Sutton 2009). By around 1,500 to 1,000 B.P., Takic language and cultures had spread to the south and inland to the east. These new arrivals, linguistically and culturally different from earlier coastal populations, may have brought new settlement and subsistence systems with them, along with other new cultural elements. This migration has been postulated as being a factor in several of the significant changes in material culture seen in the Late Holocene (such as the use of smaller projectile points and pottery), as well as the introduction of cremation as a burial practice.

The San Luis Rey culture (divided into San Luis Rey I [AD 1400 to 1750] and San Luis Rey II [AD 1750 to 1850]) represented the Late Period in southwestern Riverside County, northern San Diego County, southern Los Angeles County, and the interior mountains of Orange County (Meighan 1954; Moratto 1984). San Luis Rey I village sites contain manos (hand stones), metates (grinding slabs), bedrock mortars, shell artifacts, and triangular arrow points. In addition to these features, San Luis Rey II sites are characterized by the presence of pottery, pictographs, and the cremation of the dead (Moratto 1984).

San Luis Rey settlement patterns in the upper San Luis Rey River drainage are typified by seasonally occupied lowland villages located in proximity to water sources, and highland villages occupied in the late summer and fall for acorn collection (True and Waugh 1982). However, settlement patterns within southwestern Riverside County are less well known. The available information, stemming primarily from survey data, indicates that four primary site types existed within the region during the Late Period: field camps, resource procurement locations, residential bases, and villages. Resource procurement locations and field camps, the most common site types, contain a limited assemblage of artifacts and subsistence remains, primarily lithic debitage, some tools, fire affected rock, and small amounts of animal bones and charred seeds and nuts. This indicates that these types of sites were used primarily for focused activities and short-term occupancy.

Villages and residential bases, on the other hand, show evidence for long-term occupation by large groups of people. Villages were occupied year-round, while residential bases were occupied seasonally. Artifacts and features found at both village and residential bases, including large amounts of faunal and botanical remains, numerous high-quality tools, fire-affected rock, and anthrosols, indicate a wide range of activities (Mason 1999). Bedrock mortars point to the processing of seeds and acorns, and ceremonial activities are evidenced by the presence of pictographs, petroglyphs, and cupules within village sites.

Identification of Cultural Resources

Eastern Information Center Records Search

A records search for the proposed project was conducted on March 15, 2023 by staff at the California Historical Resources Information System (CHRIS) Eastern Information Center (EIC), housed at the University of California, Riverside. A study area was delineated for the EIC records search, which includes the existing storage tank, proposed storage tank, the grading limits, and the proposed transmission pipeline plus a 0.50-mile radius. The records search included a review of all recorded cultural resources and previous studies within study area.

Previous Studies

A total of 15 cultural resources studies have been conducted within the study area. Of the 15 studies, four (RI-1822, RI-2171, RI-2172, and RI-10813) include portions of the project site.

Previously Recorded Cultural Resources

The records search results indicate that a total of 29 cultural resources have been recorded within a 0.50-mile radius of the project site. Of the 29 resources, 16 are prehistoric archaeological sites; eight are historic-period archaeological sites; two are historic architectural resources; one is a multicomponent site; and two are sites containing human burials of unknown age. Two of these resources are located within portions of the project site.

Native American Heritage Commission

A Sacred Lands File (SLF) search was requested from the Native American Heritage Commission (NAHC) on October 28, 2022. The SLF search results prepared by the NAHC dated November 28, 2022 indicated that the SLF results were negative.

Cultural Resources Survey

An intensive-level pedestrian cultural resources survey of the project site was conducted by ESA staff on April 4, 2023. As a result of the survey, a total of two new resources were documented (ESA-040423-01F and ESA-040423-02F; prehistoric milling features) and one resource updated (historic-period asphalt-paved surface).

Resources ESA-040423-01F and ESA-040423-02F are located adjacent to but just outside of the grading limits for the project.

The historic period asphalt paved surface was relocated and appeared to be in the same condition as previously recorded.

A previously recorded milling feature was not relocated and may have been moved or originally mapped incorrectly. There were no boulders in the area that exhibited milling slicks and it is therefore assumed to not be a resource to be impacted by the project.

A water tank is located within the project site. It was constructed in 1971 and therefore over 45-years in age and meets the eligibility requirements for historical resources pursuant to CEQA Section 15064.5(a).

Archaeological Sensitivity Assessment

Prehistoric Archaeological Analysis

Review of the geotechnical report for the project shows that the entire project site is made up of artificial fill, which likely represents a historic disturbance layer and not imported fill, followed by very old alluvium [($Qvof_a$) composed primarily of sand with some silt and gravel] to at least 10 feet depth. Cretaceous-age tonalite underlies the entire project site at depth underlying the older alluvium deposits. The project site is located on a flat surface and the closest body of water to the project site (per review of historic topographic maps) is Reche Canyon located approximately 1.15 miles northeast of the project site. The NAHC indicated that the SLF search yielded negative results.

There are 16 prehistoric archaeological sites (consisting of bedrock milling features and a rock shelter), one multicomponent site (consisting of a historic-period refuse scatter and a prehistoric scraper), and two human burials of unknown age recorded within the 0.50-mile radius of the project site. Of all these sites, only one resource (the previously recorded bedrock milling feature) is recorded within a portion of the project site. However, this resource was not relocated during the pedestrian survey. Additionally, a total of two resources (ESA-040423-01F and ESA-040423-02F; bedrock milling features) were newly recorded during the pedestrian survey within a portion of the project site. All of these resources are indicative of prehistoric habitation and food preparation in the project site and vicinity. Nevertheless, per review of historic aerials, portions of the project site (most specifically the area of the existing and proposed tanks) were previously graded and an adjacent hill was obliterated for the construction of the current Moreno Beach Drive. Other areas along the project site (proposed transmission line alignment) are also known to have been previously graded. Based on all these factors, the potential for yielding surficial and not deeply buried prehistoric archaeological resources within the project site is considered high.

Historic Archaeological Analysis

Per review of historic aerials, portions of the project site contained a few rural residences throughout the years. However, it is also known that these residences were removed throughout the years and several areas of the project site are known to have been graded. There are a total of eight historic-period archaeological sites (consisting of remains of irrigation features, a fence line, segments of historic-period roads, concrete foundations/structures, asphalt-paved surface) and one muti-component resource (which includes a refuse scatter) recorded within the 0.50-mile radius of the project site. Of all these resources, only one resource, the asphalt-paved surface, is located within a portion of the project site. Based on these results, the potential to encounter historic-period archaeological resources is low to moderate.

3.4.2 Regulatory Framework

State

California Environmental Quality Act

CEQA is the principal statute governing environmental review of projects occurring in the state and is codified at *Public Resources Code (PRC) Section 21000 et seq.* CEQA requires lead agencies to determine if a proposed project would have a significant effect on the environment, including significant effects on historical or unique archaeological resources. Under CEQA (Section 21084.1), a project that may cause a substantial adverse change in the significance of an historical resource is a project that may have a significant effect on the environment.

The *CEQA Guidelines* (Title 14 California Code of Regulations [CCR] Section 15064.5) recognize that historical resources include: (1) a resource listed in, or determined to be eligible by the State Historical Resources Commission, for listing in the CRHR; (2) a resource included in a local register of historical resources, as defined in PRC Section 5020.1(k) or identified as significant in a historical resource survey meeting the requirements of PRC Section 5024.1(g);

and (3) any object, building, structure, site, area, place, record, or manuscript which a lead agency determines to be historically significant or significant in the architectural, engineering, scientific, economic, agricultural, educational, social, political, military, or cultural annals of California by the lead agency, provided the lead agency's determination is supported by substantial evidence in light of the whole record. The fact that a resource does not meet the three criteria outlined above does not preclude the lead agency from determining that the resource may be an historical resource as defined in PRC Sections 5020.1(j) or 5024.1.

If a lead agency determines that an archaeological site is a historical resource, the provisions of Section 21084.1 of CEQA and Section 15064.5 of the *CEQA Guidelines* apply. If an archaeological site does not meet the criteria for a historical resource contained in the *CEQA Guidelines*, then the site may be treated in accordance with the provisions of Section 21083, which is as a unique archaeological resource. As defined in Section 21083.2 of CEQA a "unique" archaeological resource is an archaeological artifact, object, or site, about which it can be clearly demonstrated that without merely adding to the current body of knowledge, there is a high probability that it meets any of the following criteria:

- Contains information needed to answer important scientific research questions and there is a demonstrable public interest in that information;
- Has a special and particular quality such as being the oldest of its type or the best available example of its type; or,
- Is directly associated with a scientifically recognized important prehistoric or historic event or person.

If an archaeological site meets the criteria for a unique archaeological resource as defined in Section 21083.2, then the site is to be treated in accordance with the provisions of Section 21083.2, which state that if the lead agency determines that a project would have a significant effect on unique archaeological resources, the lead agency may require reasonable efforts be made to permit any or all of these resources to be preserved in place (Section 21083.1(a)). If preservation in place is not feasible, mitigation measures shall be required. The *CEQA Guidelines* note that if an archaeological resource is neither a unique archaeological nor a historical resource, the effects of the project on those resources shall not be considered a significant effect on the environment (*CEQA Guidelines* Section 15064.5(c)(4)).

A significant effect under CEQA would occur if a project results in a substantial adverse change in the significance of a historical resource as defined in *CEQA Guidelines* Section 15064.5(a). Substantial adverse change is defined as "physical demolition, destruction, relocation, or alteration of the resource or its immediate surroundings such that the significance of a historical resource would be materially impaired" (*CEQA Guidelines* Section 15064.5(b)(1)). According to *CEQA Guidelines* Section 15064.5(b)(2), the significance of a historical resource is materially impaired when a project demolishes or materially alters in an adverse manner those physical characteristics that:

A. Convey its historical significance and that justify its inclusion in, or eligibility for, inclusion in the CRHR; or

B. Account for its inclusion in a local register of historical resources pursuant to section 5020.1(k) of the Public Resources Code or its identification in a historical resources survey meeting the requirements of section 5024.1(g) of the Public Resources Code, unless the public agency reviewing the effects of the project establishes by a preponderance of evidence that the resource is not historically or culturally significant; or

C. Convey its historical significance and that justify its eligibility for inclusion in the CRHR as determined by a Lead Agency for purposes of CEQA.

In general, a project that complies with the *Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for Preserving, Rehabilitating, Restoring, and Reconstructing Historic Buildings* (Standards) (Grimmer 2017) is considered to have mitigated its impacts to historical resources to a less-than-significant level (CEQA Guidelines Section 15064.5(b)(3)).

California Register of Historical Resources

The CRHR is "an authoritative listing and guide to be used by State and local agencies, private groups, and citizens in identifying the existing historical resources of the State and to indicate which resources deserve to be protected, to the extent prudent and feasible, from substantial adverse change" (PRC Section 5024.1[a]). The criteria for eligibility for the CRHR are based upon NRHP criteria (PRC Section 5024.1[b]). Certain resources are determined by the statute to be automatically included in the CRHR, including California properties formally determined eligible for, or listed in, the NRHP.

To be eligible for the CRHR, a prehistoric or historic-period property must be significant at the local, state, and/or federal level under one or more of the following four criteria:

1. Is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage;
2. Is associated with the lives of persons important in our past;
3. Embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values; or
4. Has yielded, or may be likely to yield, information important in prehistory or history.

A resource eligible for the CRHR must meet one of the criteria of significance described above, and retain enough of its historic character or appearance (integrity) to be recognizable as a historical resource and to convey the reason for its significance. It is possible that a historic resource may not retain sufficient integrity to meet the criteria for listing in the NRHP, but it may still be eligible for listing in the CRHR.

Additionally, the CRHR consists of resources that are listed automatically and those that must be nominated through an application and public hearing process. The CRHR automatically includes the following:

- California properties listed on the NRHP and those formally determined eligible for the NRHP;

- California Registered Historical Landmarks from No. 770 onward; and,
- Those California Points of Historical Interest that have been evaluated by the OHP and have been recommended to the State Historical Commission for inclusion on the CRHR.

Other resources that may be nominated to the CRHR include:

- Historical resources with a significance rating of Category 3 through 5 (those properties identified as eligible for listing in the NRHP, the CRHR, and/or a local jurisdiction register);
- Individual historical resources;
- Historical resources contributing to historic districts; and,
- Historical resources designated or listed as local landmarks, or designated under any local ordinance, such as an historic preservation overlay zone.

California Health and Safety Code Section 7050.5

California Health and Safety Code Section 7050.5 requires that in the event human remains are discovered, the County Coroner be contacted to determine the nature of the remains. In the event the remains are determined to be Native American in origin, the Coroner is required to contact the California Native American Heritage Commission (NAHC) within 24 hours to relinquish jurisdiction.

California Public Resources Code Section 5097.98

California PRC Section 5097.98, as amended by Assembly Bill 2641, provides procedures in the event human remains of Native American origin are discovered during project implementation. PRC Section 5097.98 requires that no further disturbances occur in the immediate vicinity of the discovery, that the discovery is adequately protected according to generally accepted cultural and archaeological standards, and that further activities take into account the possibility of multiple burials. PRC Section 5097.98 further requires the NAHC, upon notification by a County Coroner, designate and notify a Most Likely Descendant (MLD) regarding the discovery of Native American human remains. Once the MLD has been granted access to the site by the landowner and inspected the discovery, the MLD then has 48 hours to provide recommendations to the landowner for the treatment of the human remains and any associated grave goods.

In the event that no descendant is identified, or the descendant fails to make a recommendation for disposition, or if the land owner rejects the recommendation of the descendant, the landowner may, with appropriate dignity, reinter the remains and burial items on the property in a location that will not be subject to further disturbance.

Local

Moreno Valley

The City of Moreno Valley’s 2040 General Plan contains an Open Space & Resource Conservation chapter that focuses on a goal, policies, and actions for the preservation of archaeological sites. These are provided below.

Goal OSRC-2: Preserve and respect Moreno Valley's unique cultural and scenic resources, recognizing their contribution to local character and sense of place.

POLICIES

OSRC.2-8: Require cultural resource assessments prior to the approval of development proposals on properties located in archaeologically sensitive areas.

ACTIONS

OSRC.2-B: Maintain a map of sensitive archaeological sites in Moreno Valley and use it to inform project applicants of the need for cultural resource assessments.

3.4.3 Impact Analysis and Mitigation Measures

Thresholds of Significance

The following criteria from CEQA Guidelines Appendix G are used as thresholds of significance to determine the impacts of the proposed project as related to cultural resources. The proposed project would have a significant impact if it would:

1. Cause a substantial adverse change in the significance of a historical resource pursuant to Section 15064.5.
2. Cause a substantial adverse change in the significance of an archaeological resource pursuant to Section 15064.5.
3. Disturb any human remains, including those interred outside of dedicated cemeteries.
4. Result in cumulatively considerable impacts to cultural resources.

Methodology

To evaluate the project's potential impacts on historical resources, unique archaeological resources, and human remains, ESA conducted a Phase I cultural resources assessment of the project site, which included a review of the SCCIC records search results, SLF results, a pedestrian survey, and an archaeological sensitivity assessment (including historic map and aerial photograph review, geologic map review, geotechnical report review, and review of SCCIC and SLF results) (Clark and Dietler 2023).

Impacts on cultural resources could result from ground-disturbing activities, damage, or destruction. Ground-disturbing activities include project-related excavation, grading, trenching, the operation of heavy equipment, or other surface and sub-surface disturbance that could damage or destroy surficial or buried cultural resources including prehistoric or historic-period archaeological resources, paleontological resources, or human burials.

Impact Analysis

Historical Resources

Impact 3.4-1: The proposed project could cause a substantial adverse change in the significance of a historical resource pursuant to Section 15064.5.

Phase 1 and Phase 2

Construction

Storage Tanks and Pipeline

Per review of historic aerials, portions of the project site contained a few rural residences, but these were removed throughout the years and several areas of the project site are known to have been graded. There are a total of eight historic-period archaeological sites and one muti-component resource (which includes a refuse scatter) recorded within the 0.50-mile radius of the project site. Of all these resources, only one resource, an asphalt-paved road (P-33-28830) is located within a portion of the project site. This resource was relocated and appeared to be in the same condition as previously recorded. This resource was found to not be significant under the CRHR. There is however, one structure, a water tank within the project site, that was constructed in 1971 and is over 45-years in age and meets the eligibility requirements for historical resources pursuant to CEQA Section 15064.5(a). The tank was evaluated using the criteria for the National and California registers. The tank is not considered eligible for listing in the National or California registers, because it was not found to be significant under any of the four eligibility criteria. As such, the tank does not meet the definition of historical resources as outlined in CEQA Guidelines section 15064.5(a)(1) or (2), and the proposed project would not have an impact on previously recorded historic architectural resources qualifying as historical resources. Impacts would be less than significant.

Prehistoric archaeological resources that are found to be significant under CEQA are also considered historical resources under CEQA. As previously mentioned, the entire project site is made up of artificial fill, which likely represents a historic disturbance layer and not imported fill, followed by very old alluvium and Cretaceous-age tonalite. The NAHC indicated that the SLF search yielded negative results. However, there are 16 prehistoric archaeological sites, one multicomponent site, and two human burials of unknown age recorded within the 0.50-mile radius of the project site. Of all these sites, only one resource (the bedrock milling feature) is recorded within a portion of the project site. Additionally, a total of two resources (ESA-040423-01F and ESA-040423-02F; bedrock milling features) were newly recorded during the pedestrian survey within a portion of the project site. All of these resources are indicative of prehistoric habitation and food preparation in the project site and vicinity. Based on all these factors, the potential for yielding surficial and buried prehistoric archaeological resources within the project site is considered high. Should the proposed project encounter surficial or shallowly buried habitation refuse in the area of the bedrock milling features, impacts to archaeological resources qualifying as historical resources would be potentially significant. With implementation of **Mitigation Measures CR-1 through CR-3**, which would require retention of a qualified archaeologist, creation of an environmental sensitive area to avoid impacts to resources ESA-040423-01F and ESA-040423-02F, and provisions to be followed in the event that prehistoric or historic resource are found, impacts would be reduced to a less than significant level.

Operation

Storage Tanks and Pipeline

Operation of the proposed facilities would not involve ground disturbance activities that could result in the destruction of resources. Therefore, no impacts to archaeological resources that could qualify as historical resources would occur.

Mitigation Measures

Mitigation Measure CR-1: Eastern Municipal Water District (EMWD) shall retain a Qualified Archaeologist under the Secretary of the Interior Standards to carry out all mitigation related to archaeological resources for the proposed project. Prior to the start of ground-disturbing activities, the Qualified Archaeologist or their designee shall conduct construction worker archaeological resources sensitivity training for all construction personnel. Training shall include at a minimum:

- Information on how to identify the types of prehistoric and historic archaeological resources that may be encountered.
- Proper procedures to be enacted in the event of an inadvertent discovery of archaeological resources.
- Safety precautions to be taken when working with archaeological monitors.

EMWD shall ensure that construction personnel are made available for and attend the training and retain documentation demonstrating attendance.

Mitigation Measure CR-2: The qualified Archaeologist shall oversee an archaeological monitor who shall be present during construction activities and shall work with the monitor to create an Environmentally Sensitive Area of 15-feet around ESA-040423-01F and ESA-040423-02F so that these areas will not be disturbed by the project, and shall remain in place for the duration. At a minimum, the archaeological monitor shall:

- Observe activities such as demolition, clearing/grubbing, drilling/auguring, grading, trenching, excavation, or other ground disturbing activity associated with the proposed project.
- Have the authority to direct the pace of construction equipment activity in areas of higher sensitivity and to temporarily divert, redirect or halt ground disturbance activities to allow identification, evaluation, and potential recovery of archaeological resources in coordination with the qualified Archaeologist.

Full-time monitoring may be reduced to part-time inspections, or ceased entirely, if determined appropriate by the qualified Archaeologist.

In the event that historic-period (e.g., bottles, foundations, early infrastructure, refuse dumps/privies, railroads, etc.) or prehistoric (e.g., hearths, burials, stone tools, shell and faunal bone remains, etc.) archaeological resources are unearthed, the following shall occur:

- Ground-disturbing activities shall be halted or diverted away from the vicinity of the find so that the find can be evaluated.

- A 50-foot buffer shall be established by the qualified Archaeologist around the find where construction activities shall not be allowed to continue. Work may continue outside of the buffer area.
- All archaeological resources unearthed by project construction activities shall be evaluated by the qualified Archaeologist. If a resource is determined by the qualified Archaeologist to constitute a "historical resource" pursuant to CEQA Guidelines Section 15064.5(a) or a "unique archaeological resource" pursuant to Public Resources Code Section 21083.2(g), the Qualified Archaeologist shall coordinate with EMWD to develop a formal treatment plan that would serve to reduce impacts to the resources.
- If any prehistoric archaeological sites are encountered within the project area, consultation with consulting Native American parties will be conducted to apprise them of any such findings and solicit any comments they may have regarding appropriate treatment and disposition of the resources.

The treatment plan established for the resources shall be in accordance with CEQA Guidelines Section 15064.5(f) for historical resources and Public Resources Code Sections 21083.2(b) for unique archaeological resources. Preservation in place (i.e., avoidance) is the preferred manner of treatment and shall be explored to see if project activities can avoid archaeological resources, such as: if the archaeological site can be deeded into a permanent conservation easement, if the resources can be capped with chemically stable soil or if the resource can be incorporated within open space.

If, in coordination with EMWD, it is determined that preservation in place is not feasible, and in order to mitigate potential impacts to significant resources pursuant to Section 15064.5 of CEQA, date recovery is feasible. Appropriate treatment of the resource shall be developed by the qualified Archaeologist in coordination with the district and a data recovery plan shall be implemented. A data recovery plan will make provision for adequately recovering the scientifically consequential information from and about the historical resources and may include implementation of archaeological data recovery excavations to remove the resource along with subsequent laboratory processing, analysis, reporting, and commemoration in the form of signage or other public education and awareness.

Any archaeological material collected shall be curated at a public, non-profit institution with a research interest in the materials, if such an institution agrees to accept the material. If no institution accepts the archaeological material, they shall be donated to a local school or historical society in the area for educational purposes.

Mitigation Measure CR-3: At the conclusion of the archaeological monitoring, the qualified Archaeologist shall prepare a technical report that follows the format and content guidelines provided in California Office of Historic Preservation's Archaeological Resource Management Reports (ARMR). The technical report shall include the following:

- A description of resources unearthed, if any;
- Treatment of the resources;
- Results of the artifact processing, analysis, and research;

- Evaluation of the resources with respect to the California Register of Historical Resources and CEQA; and
- Appropriate California Department of Parks and Recreation Site Forms shall also be prepared and provided in an appendix to the report.

The technical report shall be prepared under the supervision of the qualified Archaeologist and submitted to EMWD within 150 days of completion of the monitoring. The final draft of the report shall be submitted to the Eastern Information Center.

Significance Determination

Less than Significant Impact with Mitigation Incorporated

Archaeological Resources

Impact 3.4-2: The proposed project could cause a substantial adverse change in the significance of an archaeological resource pursuant to Section 15064.5.

Phase 1 and Phase 2

Construction

Storage Tanks and Pipeline

As noted under Impact 3.4-1, the potential for yielding surficial and buried prehistoric archaeological resources within the project site is considered high. The high potential is due to the fact that there are 16 prehistoric archaeological sites, one multicomponent site, and two human burials of unknown age recorded within the 0.50-mile radius of the project site. A previously recorded prehistoric archaeological resource (the bedrock milling feature) is recorded within a portion of the project site. Additionally, a total of two resources (ESA-040423-01F and ESA-040423-02F; bedrock milling features) were newly recorded during the pedestrian survey within a portion of the project site. Should the proposed project encounter surficial or shallowly buried habitation refuse in the area of the bedrock milling features, impacts to archaeological resources would be potentially significant. With implementation of Mitigation Measures CR-1 through CR-3, which would require retention of a qualified archaeologist, creation of an environmental sensitive area to avoid impacts to resources ESA-040423-01F and ESA-040423-02F, and provisions to be followed in the event that historic or prehistoric resource are found, impacts to prehistoric and historic-period archaeological resources would be less than significant.

Operation

Storage Tanks and Pipeline

Operation of the proposed facilities would not include involve ground disturbance activities that could result in the destruction of resources. Therefore, no impacts to archaeological resources would occur.

Mitigation Measures

Implement Mitigation Measures CR-1 through CR-3.

Significance Determination

Less than Significant Impact with Mitigation Incorporated

Human Remains

Impact 3.4-3: The proposed project could disturb any human remains, including those interred outside of dedicated cemeteries.

Phase 1 and Phase 2

Construction

Storage Tanks and Pipeline

The NAHC was contacted for a SLF search of the project site which came back negative. Project-associated grading and excavation would extend into fill and older alluvium soils making it unlikely to encounter buried human remains. However, two human burials of unknown age are known to exist in the general vicinity of the project site. As a result, although unlikely, construction may disturb human remains, including those interred outside of dedicated cemeteries, which would be a potentially significant impact. Implementation of **Mitigation Measure CR-4**, which would ensure that any discovery of human remains is adequately protected per State and local regulations, would reduce the impact to a less than significant level.

Operation

Storage Tanks and Pipeline

Operation of the proposed facilities would not include involve ground disturbance activities that could result in the destruction of human remains. Therefore, no impacts to human remains would occur.

Mitigation Measures

> **Mitigation Measure CR-4:** Inadvertent Discovery of Human Remains. If human skeletal remains are uncovered during ground disturbance the district shall immediately halt work, contact the Riverside County coroner to determine whether the remains are human, and follow the procedures and protocols set forth in Section 15064.5 (e)(1) of the CEQA Guidelines. If the County Coroner determines that the remains are Native American, they shall contact the Native American Heritage Commission (NAHC), in accordance with Health and Safety Code Section 7050.5, subdivision (c), and Public Resources Code Section (PRC) 5097.98 (as amended by AB 2641). The NAHC shall then identify the person(s) thought to be the Most Likely Descendant (MLD) of the deceased Native American, who will then help determine what course of action should be taken in dealing with the remains. Per PRC 5097.98, the landowner shall ensure that the immediate vicinity, according to generally accepted cultural or archaeological standards or practices, where the Native American human remains are located, is not damaged or disturbed by further development activity until the landowner has discussed and conferred, as prescribed in this section (PRC 5097.98), with the MLD regarding their recommendations, if applicable, taking into account the possibility of multiple human remains.

Significance Determination

Less than Significant Impact with Mitigation Incorporated

Cumulative Impacts

Impact 3.4-4: Concurrent construction and operation of the proposed project and related projects in the geographic scope could result in cumulative short-term and long-term impacts to cultural resources.

Many of the related projects identified in Chapter 3, *Environmental Setting, Impact Analysis, and Mitigation Measures* of this Draft EIR, would require excavation that could potentially expose or damage potential archaeological resources. These related projects are located within previously undeveloped lots, and have the potential to encounter and cause a significant impact on surface resources. Further, in association with CEQA review, and depending on the depth of excavation and sensitivity of respective sites, mitigation measures or conditions of approval would be required for related projects that have the potential to cause significant impacts to undiscovered archaeological resources, including existing regulations for undiscovered human remains. Implementation of such mitigation measures, conditions of approval, and compliance with regulations would avoid significant impacts. State requirements regarding impacts on archaeological resources and CEQA compliance require monitoring of excavation activities and treatment and/or curation of discovered resources where appropriate (Public Resources Code Section 15064.5). Such standard construction practices, particularly over a range of project sites, provide for protection, recovery and curation of discovered resources and preserve their contributions to the knowledge base of past population activity in the area. For those projects not subject to CEQA review, there would be some potential for impacts on archaeological resources and human remains in the event there are excavations that extend into soils conducive to retaining resources, however, regulations contained in the California Health and Safety Code and Penal Code would apply in some instances, and circumstances involving a loss of such resources are expected to be limited. Therefore, the cumulative effects from cumulative projects are considered less than significant. The project is required to comply with the Mitigation Measures CR-1 through CR-4 and regulations cited above in the event resources are found, thus ensuring proper identification, treatment and preservation of any resources, and reducing significant impacts on archaeological resources and human remains to less than significant levels. These regulations require excavation monitoring, and treatment and curation of discoveries. Therefore, to the extent impacts on archaeological resources from cumulative projects may occur, further contribution from the project would not be cumulatively considerable, and the cumulative impacts of the project would be less than significant.

Mitigation Measures

Implement Mitigation Measures CR-1 through CR-4.

Significance Determination

Less than Significant Impact with Mitigation Incorporated

3.4.4 References

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3.5 Energy

This section addresses the energy-related impacts associated with implementation of the proposed project. This section includes: a description of the existing energy resources conditions at the proposed project site; a summary of applicable regulations related to energy resources; and an evaluation of the potential impacts of the proposed project related to energy resources at the proposed project site and in the surrounding area, including cumulative impacts.

3.5.1 Environmental Setting

Electricity

Moreno Valley Electrical Utility (MVU) the electricity provider for the City of Moreno Valley. MVU is connected to the State's power grid through Southern California Edison (SCE). Therefore, SCE is the provider used in the following analysis. SCE provides electricity to approximately 15 million people, 180 incorporated cities, 15 counties, 5,000 large businesses, and 280,000 small businesses throughout its 50,000-square-mile service area (SCE 2023). Recent data from SCE indicates that SCE has reported 82,048 GWh of total energy sales in the 2020-2021 fiscal year (SCE 2021).

SCE produces and purchases its energy from a mix of conventional and renewable generating sources. **Table 3.5-1** displays the electric power mix that was delivered to retail customers for MVU compared to the statewide power mix for 2021, the most recent year in which data is available.

TABLE 3.5-1
MVU ELECTRIC POWER MIX DELIVERED TO RETAIL CUSTOMERS IN 2021

Energy Resource	2021 SCE	2021 Statewide Power Mix
Total Sales/Total Usage (million kilowatt-hours)	**82,048**	**277,764**
Eligible Renewable	**31.4%**	**33.6%**
Biomass & bio-waste[a]	0.1%	2.3%
Geothermal	5.7%	4.8%
Small hydroelectric	0.5%	1.0%
Solar	14.9%	14.2%
Wind	10.2%	11.4%
Coal	**0.0%**	3.0%
Large Hydroelectric	**2.3%**	9.2%
Natural Gas	**22.3%**	37.9%
Nuclear	**9.2%**	9.3%
Other	**0.2%**	**0.2%**
Unspecified sources of power[b]	**34.6%**	**6.8%**
Total	**100%**	**100%**

[a] The Eligible Renewables category is further delineated into the specific sources: biomass & waste, geothermal, small hydroelectric, solar, and wind

[b] "Unspecified sources of power" means electricity from transactions that are not traceable to specific generation sources.

SOURCES: SCE 2021; CEC 2023

Natural Gas

Natural gas is a combustible mixture of simple hydrocarbon compounds (primarily methane) that is used as a fuel source. Natural gas consumed in California is obtained from naturally occurring reservoirs and delivered through high-pressure transmission pipelines. Natural gas provides almost one-third of the State's total energy requirements (US Energy Information Administration 2022). Natural gas is measured in terms of both cubic feet (cf) or British thermal units (Btu).

Natural gas is used for cooking, space heating, water heating, electricity generation, and as an alternative transportation fuel. The proposed project is within the service area of Southern California Gas Company (SoCalGas), which is the principal distributor of natural gas in Southern California, serving residential, commercial, and industrial markets. SoCalGas serves approximately 21.8 million customers in more than 500 communities encompassing approximately 20,000 square miles throughout central and southern California (SoCalGas 2022).

SoCalGas, along with five other California utility providers, released the *2022 California Gas Report*, presenting a forecast of natural gas supplies and requirements for California through the year 2035. This report predicts gas demand for all sectors (residential, commercial, industrial, energy generation and wholesale exports) and presents best estimates, as well as scenarios for hot and cold years. Overall, SoCalGas predicts a decrease in natural gas demand in future years due to a decrease in per capita usage, energy efficiency policies, and the State's transition to renewable energy displacing fossil fuels including natural gas (California Gas and Electric Utilities 2022). Gas supply available to SoCalGas from California sources averaged approximately 2,443 million cubic feet per day or 2,435,000 million Btu (MMBtu) in 2021, the most recent year for which data are available (California Gas and Electric Utilities 2022).

Transportation Energy

The annual transportation fuel consumption in 2021 in California (the most recent year for which statewide data is available) is approximately 1,611 million gallons of diesel and 11,618 million gallons of gasoline. Transportation fuel consumption for Riverside County in 2021 is 309 million gallons of diesel and 981 million gallons of gasoline. The estimated Riverside County and Statewide transportation fuel consumption is based on retail sale data from the California Energy Commission (CEC) (CEC 2023).

The State is now working on developing flexible strategies to reduce petroleum use. Over the last decade, California has implemented several policies, rules, and regulations to improve vehicle efficiency, increase the development and use of alternative fuels, reduce air pollutants and greenhouse gas emissions (GHGs) from the transportation sector, and reduce vehicle miles traveled (VMT). Accordingly, diesel and gasoline consumption in California has declined. The CEC predicts that the demand for gasoline will continue to decline over the next 10 years, and there will be an increase in the use of alternative fuels (CEC 2018).

3.5.2 Regulatory Framework

Federal

Established by the U.S. Congress in 1975, the Corporate Average Fuel Economy (CAFE) standards reduce energy consumption by increasing the fuel economy of passenger cars and light trucks. The National Highway Traffic Safety Administration (NHTSA) and United States Environmental Protection Agency (USEPA) jointly administer the CAFE standards. The U.S. Congress has specified that CAFE standards must be set at the "maximum feasible level" with consideration given for: (1) technological feasibility; (2) economic practicality; (3) effect of other standards on fuel economy; and (4) need for the nation to conserve energy. On April 1, 2010, federal CAFE standards were adopted for passenger cars and light-duty trucks for model years 2012 through 2016 and in August 2012, CAFE standards were adopted for model year 2017 through 2025 for passenger cars and light-duty trucks. The standards surpass the prior CAFE standards.

In March 2020, the USEPA and NHTSA issued the Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule that would maintain the CAFE standards applicable in model year 2020 for model years 2021 through 2026. The estimated CAFE standards for model year 2020 are 43.7 miles per gallon (mpg) for passenger cars and 31.3 mpg for light trucks, projecting an overall industry average of 37 mpg, as compared to 46.7 mpg under the standards issued in 2012. However, Consistent with President Biden's executive order on Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis, USEPA and NHTSA are now evaluating whether and how to replace the SAFE Rule.

Fuel efficiency standards for medium- and heavy-duty trucks have been jointly developed by USEPA and NHTSA. The Phase 1 heavy-duty truck standards apply to combination tractors, heavy-duty pickup trucks and vans, and vocational vehicles for model years 2014 through 2018, and result in a reduction in fuel consumption from 6 to 23 percent over the 2010 baseline, depending on the vehicle type (USEPA 2011). USEPA and NHTSA have also adopted the Phase 2 heavy-duty truck standards, which cover model years 2021 through 2027 and require the phase-in of a 5 to 25 percent reduction in fuel consumption over the 2017 baseline depending on the compliance year and vehicle type.

State

Senate Bill 1389

Senate Bill (SB) 1389 (Public Resources Code Sections 25300–25323; SB 1389) requires the California Energy Commission (CEC) to prepare a biennial integrated energy policy report that assesses major energy trends and issues facing the state's electricity, natural gas, and transportation fuel sectors and provides policy recommendations to conserve resources; protect the environment; ensure reliable, secure, and diverse energy supplies; enhance the state's economy; and protect public health and safety (Public Resources Code Section 25301[a]). The 2019 Integrated Energy Policy Report, the latest published report from CEC, provides the results of the CEC's assessments related to energy sector trends, building decarbonization and energy efficiency, zero-emission vehicles, energy equity, climate change adaptation, electricity reliability in Southern California, natural gas assessment, and electricity, natural gas, and transportation energy demand forecasts.

California's Renewables Portfolio Standard

The State of California has adopted standards to increase the percentage that retail sellers of electricity, including investor-owned utilities and community choice aggregators, must provide from renewable sources. The standards are referred to as the Renewables Portfolio Standards (RPS) and require retail sellers of electric services to increase procurement from eligible renewable energy resources to 33 percent by 2020. This was updated in September 2018, with SB 100, which requires retail sellers and local publicly owned electric utilities to procure eligible renewable electricity for 44 percent of retail sales by December 31, 2024, 52 percent by December 31, 2027, and 60 percent by December 31, 2030, and that the California Air Resources Board (CARB) should plan for 100 percent eligible renewable energy resources and zero-carbon resources by December 31, 2045. The California Public Utilities Commission (CPUC) and the CEC jointly implement the RPS program. The CPUC's responsibilities include: (1) determining annual procurement targets and enforcing compliance; (2) reviewing and approving each investor-owned utility's renewable energy procurement plan; (3) reviewing contracts for RPS-eligible energy; and (4) establishing the standard terms and conditions used in contracts for eligible renewable energy (CPUC 2023).

Refer to Section 3.2, *Air Quality and Greenhouse Gas Emissions*, of this Draft EIR, for additional details regarding this regulation.

California Assembly Bill 1493 (AB 1493, Pavley)

In response to the transportation sector's large share of California's CO_2 emissions, Assembly Bill (AB) 1493 (commonly referred to as the Pavley regulations), enacted on July 22, 2002, requires CARB to set GHG emission standards for new passenger vehicles, light duty trucks, and other vehicles manufactured in and after 2009 whose primary use is non-commercial personal transportation. Phase I of the legislation established standards for model years 2009-2016 and Phase II established standards for model years 2017-2025 (CARB 2002). As discussed above, in September 2019, the USEPA published the SAFE Vehicles Rule in the federal register (Federal Register, Vol. 84, No. 188, Friday, September 27, 2019, Rules and Regulations, 51310-51363) that maintains the vehicle miles per gallon standards applicable in model year 2020 for model years 2021 through 2026. California and 23 other states and environmental groups in November 2019 in U.S. District Court in Washington, filed a petition for the USEPA to reconsider the published rule (USEPA 2019a). In April 2020, the final USEPA and NHTSA SAFE Vehicles Rule was published in the Federal Register, setting fuel economy and carbon dioxide standards that increase 1.5 percent in stringency each year from model years 2021 through 2026 (USEPA 2019b).

On January 20, 2021, President Biden issued Executive Order 13990 "Protecting Public Health and the Environment and Restoring Science To Tackle the Climate Crisis" directing the USEPA to consider whether to propose suspending, revising, or rescinding the standards previously revised under "The Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule for Model Years 2021–2026 Passenger Cars and Light Trucks," promulgated in April 2020. On February 8, 2021, the United States Court of Appeals for the District of Columbia Circuit issued an order granting the Biden Administration's motion to stay litigation over Part 1 of SAFE Rule. On April 28, 2021, the EPA reconsidered the withdrawal of the waiver of preemption for California's zero emission vehicle (ZEV) programs and GHG emission standards within California's Advanced Clean Car program for purposes of rescinding that action under the Clean Air Act. On March 14, 2022, EPA rescinded their 2019 waiver withdrawal, thus bringing back into force the 2013 Advanced Clean Car program waiver, including a waiver of preemption for California's ZEV sales mandate and GHG emissions standards (Federal Register 2022). EPA ruled to revise the greenhouse gas emissions standards under the Clean Air Act section 202(a) for light-duty vehicles for 2023 and later model years to make the standards more stringent (Federal Register 2021). Moreover, on August 5, 2021, the President signed an executive order that targets making half of all new vehicles sold in 2030 zero-emissions vehicles, including battery electric, plug-in hybrid electric, or fuel cell electric vehicles (White House Briefing Room 2021).

On December 30, 2021, the USEPA finalized the federal greenhouse gas emissions standards for passenger and light trucks for model years 2023 through 2026 (USEPA 2021). This rule prompts auto makers to use clean technologies available today and incentivizes them to produce vehicles with zero and near-zero emissions technology. The final rule revises the current SAFE rules standards, beginning in model year 2023 and increases in stringency year over year through model year 2026. The standards finalized for model year 2026 establish the most stringent GHG standards ever set for the light-duty vehicle sector. The final rule sets a stringency increase in model year 2023 by almost 10% (compared to the SAFE rule standards of model year 2022), followed by stringency increases of 5% for model year 2024, 6.6% for model year 2025, and 10% for model year 2026. The USEPA projects that the final standards will result in a reduction of 3.1 billion tons of GHG emissions by 2050 and will also reduce emissions of some criteria pollutants and air toxics.

California Health and Safety Code (HSC), Division 25.5/California Global Warming Solutions Act of 2006

In 2006, the California State Legislature adopted AB 32 (codified in the California Health and Safety Code [HSC], Division 25.5 – California Global Warming Solutions Act of 2006), which focuses on reducing GHG emissions in California to 1990 levels by 2020. Under HSC Division 25.5, CARB has the primary responsibility for reducing the State's GHG emissions; however, AB 32 also tasked the CEC and the CPUC with providing information, analysis, and recommendations to CARB regarding strategies to reduce GHG emissions in the energy sector.

In 2016, the California State Legislature adopted SB 32 and its companion bill AB 197; both were signed by Governor Brown. SB 32 and AB 197 amend HSC Division 25.5 and establish a new climate pollution reduction target of 40 percent below 1990 levels by 2030 and include provisions to ensure that the benefits of state climate policies reach into disadvantaged communities. Refer to Section 3.2, *Air Quality and Greenhouse Gas Emissions*, of this Draft PIR, for additional details regarding these regulations.

Senate Bill 350

SB 350, signed October 7, 2015, is the Clean Energy and Pollution Reduction Act of 2015. The objectives of SB 350 are: (1) to increase the procurement of electricity from renewable sources from 33 percent to 50 percent; and (2) to double the energy efficiency savings in electricity and natural gas final end uses of retail customers through energy efficiency and conservation (State of California 2015).

California Air Resources Board

CARB's Advanced Clean Car Program

The Advanced Clean Cars emissions-control program was approved by CARB in 2012 and is closely associated with the Pavley regulations (CARB 2017). The program requires a greater number of zero-emission vehicle models for years 2015 through 2025 to control smog, soot and GHG emissions. This program includes the Low-Emissions Vehicle (LEV) regulations to reduce criteria pollutants and GHG emissions from light- and medium-duty vehicles; and the Zero-Emissions Vehicle (ZEV) regulations to require manufacturers to produce an increasing number of pure ZEV's (meaning battery and fuel cell electric vehicles) with the provision to produce plug-in hybrid electric vehicles (PHEV) between 2018 and 2025.

Airborne Toxic Control Measure to Limit Diesel-Fueled Commercial Motor Vehicle Idling

In 2004, CARB adopted an Airborne Toxic Control Measure to Limit Diesel-Fueled Commercial Motor Vehicle Idling in order to reduce public exposure to diesel particulate matter emissions (Title 13 California Code of Regulations [CCR] Section 2485 and Title 17 CCR Section 93115). The measure applies to diesel-fueled commercial vehicles with gross vehicle weight ratings greater than 10,000 pounds that are licensed to operate on highways, regardless of where they are registered. This measure does not allow diesel-fueled commercial vehicles to idle for more than five minutes at any given location. While the goal of this measure is primarily to reduce public health impacts from diesel emissions, compliance with the regulation also results in energy savings in the form of reduced fuel consumption from unnecessary idling.

Regulation to Reduce Emissions of Diesel Particulate Matter, Oxides of Nitrogen and other Criteria Pollutants, from In-Use Heavy-Duty Diesel-Fueled Vehicles.

The goals of regulations to reduce emissions from in-use heavy duty diesel-fueled vehicles are primarily to reduce public health impacts from diesel emissions; however, compliance with such regulations has shown an increase in energy savings in the form of reduced fuel consumption from more fuel-efficient engines.

In 2008, CARB approved the Truck and Bus regulation to reduce nitrogen oxide (NO_X), respirable particulate matter (PM10), and fine particulate matter (PM2.5) emissions from existing diesel vehicles operating in California (13 CCR, Section 2025). The phased regulation aims to reduce emissions by requiring installation of diesel soot filters and encouraging the retirement, replacement, or retrofit of older engines with newer emission-controlled models, which would make the vehicles more fuel efficient than vehicles older engines. The phasing of this regulation has full implementation completed by 2023 (CARB 2008).

CARB also promulgated emission standards for off-road diesel construction equipment of greater than 25 horsepower (hp) such as bulldozers, loaders, backhoes and forklifts, as well as many other self-propelled off-road diesel vehicles. The In-Use Off-Road Diesel-Fueled Fleets regulation adopted by CARB on July 26, 2007 aims to reduce emissions by installation of diesel soot filters and encouraging the retirement, replacement, or repower of older, dirtier engines with newer emission-controlled models (13 CCR Section 2449). The compliance schedule requires full implementation by 2023 in all equipment for large and medium fleets and by 2028 for small fleets.

Sustainable Communities Strategy

SB 375 (Chapter 728, Statutes of 2008), which establishes mechanisms for the development of regional targets for reducing passenger vehicle GHG, was adopted by the State on September 30, 2008. Under SB 375, CARB is required, in consultation with the State's Metropolitan Planning Organizations, to set regional GHG reduction targets for the passenger vehicle and light-duty truck sector for 2020 and 2035. In February 2011, CARB adopted the GHG emissions reduction targets of 8 percent by 2020 and 13 percent by 2035 relative to 2005 GHG emissions for SCAG, which is the Metropolitan Planning Organization for the region in which the County is located (SCAG 2020). The proposed reduction targets explicitly exclude emission reductions expected from the Pavley regulations and the LCFS regulations.

Under SB 375, the reduction target must be incorporated within that region's Regional Transportation Plan (RTP), which is used for long-term transportation planning, in a Sustainable Communities Strategy (SCS). The most recent version of such planning is the 2020-2045 Regional Transportation Plan/Sustainable Communities Strategy (2020-2045 RTP/SCS). The 2020-2045 RTP/SCS provides strategies that would support reducing greenhouse gas emissions which would have the co-benefit of decreasing energy consumption by supporting alternative fueled vehicles (SCAG 2020). Certain transportation planning and programming activities would then need to be consistent with the SCS; however, SB 375 expressly provides that the SCS does not regulate the use of land, and further provides that local land use plans and policies (e.g., general plan) are not required to be consistent with either the RTP or SCS.

Refer to Section 3.2, *Air Quality and Greenhouse Gas Emissions*, of this Draft PIR, for additional details regarding the 2020-2045 RTP/SCS.

Local

Moreno Valley Energy Efficiency and Climate Action Strategy

On October 9, 2012, the Moreno Valley City Council approved the Energy Efficiency and Climate Action Strategy (Strategy) (Moreno Valley 2012). The Strategy is a policy document which identifies ways that the City can reduce energy and water consumption and greenhouse gas emissions as an organization and outlines the actions that the City can encourage and community members can employ to reduce their own energy and water consumption and greenhouse gas emissions (Moreno Valley 2012). The Energy Efficiency section's primary focus is to identify potential energy efficiency measure for the City as an organization, both those that have been implemented and those that could be implemented in the future. The document also provides direction and policies the ensure the most effective, practical, and affordable, energy use practices are implemented (Moreno Valley 2012).

City of Moreno Valley Climate Action Plan

The CAP is designed to reinforce the City's commitment to reduce GHG emissions, and demonstrate how the City will comply with the State's GHG emission reduction standards (Moreno Valley 2021). The CAP includes an inventory of the City's GHG emissions, forecasts of future GHG emissions, measure to reduce GHG emissions consistent with the State requirements, and monitoring and reporting processes to ensure targets are met (Moreno Valley 2021). The

CAP summarizes various State and local policies that will contribute to reduced GHG emissions in the City including the Renewable Portfolio Standards for utility companies, the low carbon fuel standard, and Pavley (California Assembly Bill) vehicle emissions standards, and the Renewable Portfolio Standards for utility companies. The CAP was prepared concurrently with the 2040 General Plan.

3.5.3 Impact Analysis and Mitigation Measures

Thresholds of Significance

The following criteria from CEQA Guidelines Appendix G are used as thresholds of significance to determine the impacts of the proposed project as related to energy. The proposed project would have a significant impact if it would:

1. Result in potentially significant environmental impact due to wasteful, inefficient, or unnecessary consumption of energy resources, during project construction or operation.
2. Conflict with or obstruct a state or local plan for renewable energy or energy efficiency.
3. Result in cumulatively considerable impacts to energy.

Methodology

This section analyzes the proposed project's potential energy use to determine if it could have a significant impact. Vehicle Miles Travelled (VMT) for construction-related activities is generally the primary driver of energy consumption during project construction. The energy consumption for each facility type was determined using project and program-related details and factors obtained from California Emissions Estimator Model (CalEEMod) Version 2020.4.0 and the 2021 version of the Emission Factor Model (EMFAC2021). CalEEMod was developed by the California Air Pollution Control Officers Association (CAPCOA) and other California air districts with the purpose to calculate construction and operational criteria pollutant emissions and greenhouse gas emissions from direct and indirect sources, as well as energy usage for the existing facility. EMFAC2021 is database developed and approved by the USEPA to calculate emission rates, fuel consumption, and VMT from motor vehicles that operate on highways, freeways, and local roads in California and is commonly used by the CARB to project changes in future emissions from on-road mobile sources.

There will only be two operation/maintenance-related vehicle trips per week associated with operation of the proposed project, so the primary source of energy consumption would be from indirect power generation to provide additional electricity to operate appurtenant facilities necessary to transmit water, rather than VMT. The estimated annual electricity consumption for a similar facility was used and scaled to account for the operation of the existing facility. These factors for calculating proposed project operating energy consumption were developed based on information provided by the EMWD.

Impact Analysis

Energy Consumption

Impact 3.5-1: The proposed project could result in potentially significant environmental impact due to wasteful, inefficient, or unnecessary consumption of energy resources, during project construction or operation.

Construction, Phase 1 and 2

Storage Tanks and Pipeline

During construction of the proposed project, energy would be consumed in the form of electricity for exterior uses, such as lights and water conveyance for dust control. Proposed project construction would also consume energy in the form of petroleum-based fuels associated with the use of off-road construction vehicles and equipment on the proposed project sites, construction workers traveling to and from the proposed project site and delivery and haul truck trips (e.g., hauling of demolition or excavation material to offsite reuse and disposal facilities). Natural gas would not be for construction purposes. **Table 3.5-2** and **Table 3.5-3** provide a summary of the annual average electricity, gasoline fuel, and diesel fuel estimated to be consumed during construction of the Phase 1 and 2 project, respectively, which is further explained below.

TABLE 3.5-2
PHASE 1 – PROJECT CONSTRUCTION ENERGY USAGE

Energy Type	Total Quantity During Construction [b]
Electricity	
Electricity from Water (Dust Control)	5 MWh
Electricity from Temporary Construction Trailer	13 MWh
Total Electricity	**18 MWh**
Gasoline	
On-Road Construction Equipment	7,408 gallons
Total Gasoline	**7,408 gallons**
Diesel	
On-Road Construction Equipment	57,163 gallons
Off-Road Construction Equipment	89,836 gallons
Total Diesel	**146,999 gallons**

TABLE 3.5-3
PHASE 2 – PROJECT CONSTRUCTION ENERGY USAGE

Energy Type		Total Quantity During Construction [b]
Electricity		
Electricity from Water (Dust Control)		5 MWh
Electricity from Temporary Construction Trailer		13 MWh
	Total Electricity	**18 MWh**
Gasoline		
On-Road Construction Equipment		5,082 gallons
	Total Gasoline	**5,082 gallons**
Diesel		
On-Road Construction Equipment		4,831 gallons
Off-Road Construction Equipment		56,419 gallons
	Total Diesel	**61,245 gallons**

MWh = megawatt-hours

[a] Detailed calculations are provided in Appendix AQ/GHG/ENERGY of this Draft EIR and are based on 10 months of construction in 2045.

[b] Totals may not add up due to rounding of decimals.

SOURCE: ESA 2023; CalEEMod 2020; EMFAC2021.

Electricity

During construction of the proposed project, electricity would be consumed, on a limited basis, to power lighting and supply and convey water for dust control. Electricity would be supplied to the proposed project site by SCE and would be obtained from the existing electrical lines that are connected to the proposed project site. Project construction for Phase 1 is anticipated to take 10 months to complete. Project construction for Phase 2 is anticipated to take approximately 10 months to complete.

Based on Table 3.5-2 and Table 3.5-3, the maximum annual construction electricity usage during both Phase 1 and 2 would be approximately 18,000-kilowatt hour (kWh), or 18 megawatt-hours (MWh). The proposed project electricity demand would be well within the supply and infrastructure capabilities of SCE (which reported 82,048 GWh of total energy sales in 2021 fiscal year) (SCE 2021). The electricity demand at any given time would vary throughout the construction period based on the construction activities being performed and would cease upon completion of construction. Electricity use from construction would be short-term, limited to working hours, used for necessary construction-related activities, and small in comparison to overall SCE annual demand. Therefore, the proposed project would not result in a wasteful, inefficient, and unnecessary consumption of energy associated with electricity used for construction, and impacts would be less than significant.

Natural Gas

As previously stated above, construction activities typically do not involve the consumption of natural gas. Accordingly, natural gas would not be supplied to support proposed project construction activities; thus, there would be no expected demand generated by construction of the proposed project. Therefore, the proposed project would not result in the wasteful, inefficient, and unnecessary consumption of energy associated with natural gas used for construction, and no impact would occur.

Transportation Energy

Table 3.5-2 and Table 3.5-3 report the estimated amount of petroleum-based transportation energy that could potentially be consumed during proposed project construction based on the conservative set of assumptions provided in Appendix AQ/GHG/ENERGY of this Draft EIR. During proposed project construction, on- and off-road vehicles would consume an estimated annual average of approximately 7,408 gallons of gasoline fuel in Phase 1 and 5,082 gallons of gasoline fuel in Phase 2. Phase 1 of the construction would consume approximately 146,999 gallons of diesel (the sum of 89,836 gallons from off-road equipment and 57,163 gallons from on-road vehicles) and approximately 61,245 gallons of diesel (the sum of 56,413 gallons from off-road equipment and 4,831 gallons from on-road vehicles) during Phase 2 (10 months for Phase 1 in 2026 and 10 months for Phase 2 in 2045).

Construction of the proposed project would utilize fuel-efficient trucks and equipment consistent with federal and State regulations, such as fuel efficiency regulations in accordance with CARB's Pavley Phase I and II standards (at a minimum through the model year 2020 standards depending on the outcome of the SAFE Vehicles Rule court challenge), the anti-idling regulation in accordance with CCR, Title 13, Section 2485, and fuel requirements in accordance with CCR, Title 17, Section 93115, as well as the In-Use Off-Road Diesel-Fueled Fleets regulation (CARB 2016). As such, the proposed project would comply with State measures to reduce the inefficient, wasteful, and unnecessary consumption of energy, such as petroleum-based transportation fuels. While these regulations are intended to reduce construction emissions, compliance with the anti-idling and emissions regulations discussed above would also result in fuel savings from the use of more fuel-efficient engines. Diversion of mixed construction and demolition debris would reduce truck trips to landfills, which are typically located some distance away from population centers, and increase the amount of waste recovered (e.g., recycled, reused) at material recovery facilities, thereby further reducing transportation fuel consumption.

Based on the analysis above, construction would utilize transportation fuel energy only for necessary onsite activities and to transport construction materials, excavated fill, and demolition debris to and from the proposed project site. As discussed above, idling restrictions and the use of cleaner, energy-efficient equipment would result in less fuel combustion and energy consumption and, thus, reduce the proposed project's construction-related energy use. Therefore, the proposed project would not result in the wasteful, inefficient, and unnecessary consumption of energy, and impacts associated with transportation fuels for construction would be less than significant.

Operation, Phase 1 and 2

Storage Tank

During operation of the proposed project, electrical energy would be consumed to operate appurtenant facilities to accommodate the increased capacity of the larger tanks. Although the pipelines and storage tanks would involve the transportation or storage of water, the proposed project does not directly use water or generate wastewater; therefore, no water usage was modeled for this analysis. The proposed project would have a maximum of two service truck trips per week for inspection and maintenance purposes. However, these trips would consume a minimal amount of fuel. Therefore, additional vehicle trips for inspections and maintenance purposes were not modeled for this analysis.

Electricity

Table 3.5-4 displays the proposed project's energy demand from electricity. As shown, the proposed project, taking into account the existing consumption of the 2 MG tank, would result in a projected consumption of electricity totaling approximately 36 MWh per year after Phase 1 construction. After the construction of the second tank in Phase 2 the proposed project would result in a projected consumption of electricity totaling approximately 56 MWh per year. The total electricity consumption of the proposed project, taking into account the existing consumption of the 2.5 MG tank, would be 92 MWh per year. Please note that the electrical consumption conservatively does not include solar power but rather electricity from SCE, although either option has been identified by EMWD as a source of electrical power in Phase 2. However, should solar power be included energy consumption would be even lower. Therefore, operation of the proposed project would not result in the wasteful, inefficient, and unnecessary consumption of electricity and impacts related to electricity consumption would be less than significant.

TABLE 3.5-4
PROJECT OPERATIONAL ENERGY USAGE

Phase	No Project Daily Energy Consumption (MWh/day)[a]	Project Daily Energy Consumption (MWh/day)	No Project Annual Energy Consumption (MWh/year)	Project Annual Energy Consumption (MWh/year)
Phase 1	0.04	0.10	16	36
Phase 2	0.10	0.15	36	56
Total Energy at Full Buildout:				92

[a] The No Project scenario includes the existing energy consumption of 16,050 kWh/yr to account for the 2 MG tank.

SOURCE: ESA 2023

Natural Gas

The proposed project would not increase the demand for direct uses of natural gas resources because no new sources are assumed in the project buildout. Therefore, operation of the proposed project would not result in the wasteful, inefficient, and unnecessary consumption of natural gas and no impact related to natural gas would occur.

Transportation Energy

The proposed project would result in two additional operation-related vehicle trips per week, so operational transportation fuel demand would be negligible. By not significantly increasing vehicle trips, the proposed project would not conflict with statewide efforts to improve transportation energy efficiency and reduce transportation energy consumption with respect to private automobiles.

Based on the above, the proposed project would minimize operational transportation fuel demand in line with state, regional, and County goals. Therefore, operation of the proposed project would not result in the wasteful, inefficient, and unnecessary consumption of energy. Overall impacts would be less than significant.

Mitigation Measures

None Required

Significance Determination

Less than Significant Impact

Energy Efficiency Plans

Impact 3.5-2: The proposed project could conflict with or obstruct a state or local plan for renewable energy or energy efficiency.

Construction

Phase 1 and 2

Storage Tanks and Pipeline

The proposed project would utilize construction contractors who must demonstrate compliance with applicable regulations. Construction equipment would be required to comply with federal, state, and regional requirements, where applicable. With respect to truck fleet operators, USEPA and NHSTA have adopted fuel-efficiency standards for medium- and heavy-duty trucks that will be phased in over time. Phase 1 heavy-duty truck standards apply to combination tractors, heavy-duty pickup trucks and vans, and vocational vehicles for model years 2014 through 2018 and result in a reduction in fuel consumption from 6 to 23 percent over the 2010 baseline, depending on the vehicle type (USEPA 2011). USEPA and NHTSA also adopted the Phase 2 heavy-duty truck standards, which cover model years 2021 through 2027 and require the phase-in of a 5 to 25 percent reduction in fuel consumption over the 2017 baseline depending on the compliance year and vehicle type (USEPA 2016). The energy modeling for trucks does not take into account specific fuel reductions from these regulations, since they would apply to fleets as they incorporate newer trucks meeting the regulatory standards. As a result, these regulations would have an overall beneficial effect on reducing fuel consumption from trucks over time as older trucks are replaced with newer models that meet the standards.

In addition, construction equipment and trucks are required to comply with CARB regulations regarding heavy-duty truck idling limits of 5 minutes per occurrence. Additionally, off-road emissions standards will increase equipment efficiencies as they are phased-in overtime and less-efficient equipment is phased out of construction fleets. These limitations would result in an increase in energy savings in the form of reduced fuel consumption from more fuel-efficient engines. Although these requirements are intended to reduce criteria pollutant emissions, compliance with the anti-idling and emissions regulations would also result in the efficient use of construction-related energy. Thus, based on the information above, construction and operation of the Project would comply with existing energy standards.

The proposed project's construction equipment used would be consistent with the energy standards applicable to construction equipment including limiting idling fuel consumption and using contractors that comply with applicable CARB regulatory standards that affect energy efficiency. Furthermore, the proposed project would be consistent with the Advanced Clean Cars and Mobile Source Strategy, which is instituted to reduce mobile source emissions over time. This is expected to reduce energy consumption from future projects.[1] Therefore, the proposed project would comply with existing energy standards, and impacts would be less than significant.

Operation

Phase 1 and 2

Storage Tanks and Pipeline

The proposed project would be designed in a manner that is consistent with relevant energy conservation plans designed to encourage development that results in the efficient use of energy resources.

The proposed project would result in a minimal increase in operation-related vehicle trips (up to two per week); therefore, the proposed project would not result in unplanned growth in VMT and thus not result in adverse impacts to transportation energy consumption. The proposed project would also implement vehicle standards, like the CAFE fuel economy standards and the Pavley Standards, which are designed to result in more efficient use of transportation fuels. The proposed project would require an increase in electricity demand to support the increased capacity of the storage tanks, however the electric utility providers would be required to comply with the State's Renewables Portfolio Standard. CARB has outlined a number of potential strategies for achieving energy consumption reduction goals. These potential strategies include renewable resources for half of the State's electricity by 2030, reducing petroleum use in cars and trucks, and reducing the carbon content of transportation fuels. The proposed project would comply with these future regulations, as promulgated by the USEPA, CARB, CEC, or other agency. In fact, as discussed above, the proposed project's location and development comply with the recommendations in these documents and would meet their goals.

Overall, the proposed project's features would support and promote the use of renewable energy and energy efficiency through compliance with regional and local general plan policies and would not conflict with or obstruct a state or local plan for renewable energy or energy efficiency. Therefore, the proposed project impacts would be less than significant.

Mitigation Measures

None Required

[1] Please note that the energy consumption quantitative analyses does not include reductions from future regulations not currently included in CalEEMod and EMFAC2021.

Significance Determination

Less than Significant Impact

Cumulative Impacts

Impact 3.5-3: Concurrent construction and operation of the proposed project and related projects in the geographic scope could result in cumulative short-term and long-term impacts to energy.

Electricity

The geographic context for the cumulative analysis of electricity is SCE's service area. All cumulative projects listed in Table 3-2 and illustrated on Figure 3-1 in Chapter 3 of this Draft EIR would have electricity supplied by SCE. Growth within this geography is anticipated to increase the demand for electricity and the need for infrastructure, such as the proposed project. Future development under the proposed project would result in the increased use of electricity resources. However, the use of such resources would be minor compared to existing supply and infrastructure within the SCE service area and would be consistent with growth expectations (SCE 2021). Additionally, it is expected that SCE would continue to expand delivery capacity as necessary to meet demand increases within its service area. Furthermore, other cumulative developments would be required to incorporate energy conservation features in order to comply with applicable mandatory regulations including the Title 24 standards, CALGreen Code, the City's General Plan, and the Climate Action Plan (once adopted) as applicable. As such, the proposed project's contribution to cumulative impacts due to wasteful, inefficient, and unnecessary consumption of energy would be less than cumulatively considerable.

Natural Gas and Propane

The geographic context for the cumulative analysis of natural gas is the SoCalGas service area. All cumulative projects listed in Table 3-2 and illustrated on Figure 3-1 in Chapter 3 of this Draft EIR would have natural gas supplied by SoCalGas. Growth within this service area is anticipated to increase the demand for natural gas and the need for infrastructure, such as new or expanded facilities. Cumulative development projects in the SoCalGas service area could result in the use of natural gas resources, however the use of such resources would be consistent with regional and local growth expectations for the SoCalGas service area. Further, SoCalGas expects overall natural gas demand to decline through 2035, even accounting for population and economic growth, with efficiency improvements and the State's transition away from fossil fuel-generated electricity to increased renewable energy. Future development projects, such as those identified in Table 3-2 and depicted on Figure 3-1, would be required to incorporate energy conservation features in order to comply with applicable mandatory regulations including the Title 24 standards, CALGreen Code, the City's General Plan, and the Climate Action Plan (once adopted) as applicable. As such, since the proposed project does not consume any natural gas and consumes minimal amounts of propane, its contribution to cumulative impacts due to wasteful, inefficient, and unnecessary consumption of energy would be less than cumulatively considerable.

Transportation Energy

The geographic context for the cumulative analysis of transportation energy is Riverside County. Growth within this area is anticipated to increase the demand for transportation and the need for infrastructure, such as new or expanded facilities. Most of the cumulative projects listed in Table 3-2 and illustrated on Figure 3-1 in Chapter 3 of this Draft EIR would increase the demand for transportation and the need for expanded infrastructure. Transportation fuels (gasoline and diesel) are produced from crude oil, which can be domestic or imported from various regions around the world. Based on current petroleum production and consumption and future trends, oil production and consumption will grow through 2050 (USEIA 2022). Crude oil supply and utilization in the United States is expected to return to pre-pandemic levels starting in 2023 and stabilize in the long term and therefore would be sufficient to sustain the projected oil consumption through 2050 (USEIA 2022).

Buildout of cumulative projects listed in Table 3-2 and illustrated on Figure 3-1 would be expected to increase overall VMT; however, the effect on transportation fuel demand would be reduced by future improvements to vehicle fuel economy pursuant to federal and state regulations which would increase current vehicle miles per gallon standards. Buildout of the proposed project, as well as cumulative projects identified in Table 3-2 and depicted on Figure 3-1 would cumulatively increase the demand for transportation-related fuel in the state and region. However, as discussed above, the proposed project would not conflict with the energy efficiency policies emphasized by the 2020–2045 RTP/SCS. The proposed project would result in minimal operational vehicle trips. Since the proposed project would not conflict with the 2020–2045 RTP/SCS with respect to energy use, the proposed project’s contribution to cumulative impacts with respect to potentially significant environmental impacts due to conflicts with or obstruction of a state or local plan for transportation energy efficiency would be less than cumulatively considerable.

Mitigation Measures

None Required

Significance Determination

Less than Significant Impact

3.5.4 References

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3.6 Geology and Soils

This section addresses the geology and soils impacts associated with implementation of the proposed project. This section includes: a description of the existing geology, soils, and paleontological resource conditions, based on the Preliminary Design Report (PDR) prepared for the proposed project (Kleinfelder 2017; **Appendix PDR**) and the *Paleontological Resources Assessment Report* prepared for the proposed project by ESA (*Confidential*) (ESA 2023; **Appendix PALEO**); a summary of applicable regulations related to geology and soil hazards, and paleontological resources; and an evaluation of the potential impacts of the proposed project related to geology and soils at the proposed project site and in the surrounding area, including cumulative impacts.

3.6.1 Environmental Setting

Topography

The proposed tank site is located on a parcel bounded to the east by Moreno Beach Drive and to the north and west by Pettit Hill. The site generally slopes from west (high point) to east (low point) at approximately 8.5H: 1V towards Moreno Beach Drive. The existing site elevations range from approximately 1,758 feet to 1,720 feet across the site. The proposed transmission pipeline alignment follows along Moreno Beach Drive and extends south from the proposed tank expansion site to the intersection of Alessandro Boulevard. Moreno Beach Drive gently slopes from north (high point) to south (low point). The existing elevations range from approximately 1,720 feet to 1,595 feet along the proposed alignment.

Regional Geology

The proposed project site is situated within the northern Peninsular Ranges Geomorphic Province of California (California Geological Survey [CGS] 2002a). The Peninsular Ranges are a northwest-southeast oriented complex of blocks separated by similarly trending faults which extend 125 miles from the Transverse Ranges south to the Mexican border and beyond another 775 miles to the tip of Baja California. The province varies in width from approximately 30 to 100 miles and is bounded on the east by the Colorado Desert and the Gulf of California and on the west by the Pacific Ocean. Included within the province is Orange County, as well as portions of Los Angeles, San Bernardino, Riverside, San Diego, and Imperial Counties. The general geologic framework of the northern Peninsular Ranges area is presented in studies by Dibblee (2003), Norris and Webb (1990), Morton and Miller (2006), and Morton (1972).

The Peninsular Ranges contain Jurassic-age and Cretaceous-age igneous and metamorphic rocks, as well as a thick sequence of marine and non-marine sedimentary rock. The igneous rocks are part of the Southern California batholith. The Peninsular Ranges Province is further described by sub-units, which include the Perris Block, the Santa Ana Mountains, and the San Jacinto Mountains. The Perris Block is characterized as a broad area of intermixed valleys and low mountain ranges situated between the Elsinore and San Jacinto fault zones. Geographic features near the proposed project include the Box Springs Mountains, Box Springs Canyon, Moreno Valley, March Field, Perris Valley, and San Jacinto River. Surface outcrops of granitic bedrock of the Southern California batholith are present as the adjacent hills along the western boundary of the site and to the north and east of the site.

Site Geology

According to the geotechnical report that was prepared for the proposed project, which is dated September 21, 2016 and included as Appendix H to the PDR (Kleinfelder 2017; see Appendix PDR to this Draft EIR), the subsurface deposits encountered at the proposed tank expansion site and transmission pipeline site include artificial fill, older alluvial fan deposits (Qvofa), and Tonalite bedrock (Kt) underlying the alluvial soils (Kleinfelder 2016). The geologic units are summarized below from fill materials to bedrock materials:

- **Artificial Fill**: Artificial fill ranging in thickness from approximately 6 to 8 feet was encountered along the proposed pipeline alignment. It is anticipated that the artificial fill and road base will be encountered in the roadway. The fill soils encountered generally consist of sand with varying amounts of silt and clays content. No artificial fill was encountered at the proposed tank site.
- **Older Alluvium**: The older alluvial soils generally consist of medium to very dense sand with varying amounts of silt and clay contents. Clayey sand and silt with sand were observed to have low to medium plasticity and stiff silt with varying sand contents at depths greater than 5 feet below the ground surface (bgs). The coarser grained sand tended to be more abundant than the finer grained soils
- **Tonalite Bedrock**: Cretaceous-age Tonalite underlies the entire tank site at depth underlying the older alluvial soil deposits. However, along the western boundary of the site, this geologic unit is exposed at the surface or covered with a thin layer of soil. This bedrock unit is part of the composite Peninsular Ranges batholith. Although surface outcrops were not present within the site, surface rock float/boulders were present at the surface. Nearby offsite outcrops indicate that the bedrock is in a weathered to slightly weathered condition. Based on a seismic refraction survey conduct on the site, high velocity bedrock is approximately 20 feet below the ground surface.

Faults

A fault is a fracture or line of weakness in the earth’s crust, along which rocks on one side of the fault are offset relative to the same rocks on the other side of the fault. Based on criteria established by the CGS, faults can be categorized as active, potentially active, or inactive (CGS 2002a). Active faults are those that show evidence of surface displacement within the last 11,000 years (Holocene age). Potentially active faults are those that show evidence of displacement within the last 1.6 million years (Quaternary age). Faults showing no evidence of displacement within the last 1.6 million years are considered inactive.

Southern California is a region of high seismic activity with numerous active and potentially active faults. Earthquakes along the San Andreas Fault System, located 13 miles northeast of the proposed project, relieve convergent plate stress in the form of right lateral strike slip offsets. The Transverse Ranges work as a block causing the San Andreas fault to bend, producing compressional stresses that are manifested as reverse, thrust, and right lateral faults. Faulting associated with the compressional forces creates earthquakes and is primarily responsible for the mountain building, basin development, and regional upwarping found in the project area.

Seismicity

The principal active faults in the project area are the San Andreas fault zone, and the San Jacinto and Elsinore fault zones, which are classified as major structural features of the San Andreas Fault System. These fault zones have been the sites of about 90 percent of the earthquake epicenters that have occurred in the County of Riverside (County of Riverside 2000). According to Moreno Valley's Local Hazard Mitigation Plan (LHMP), the southern section of the San Andreas fault typically produces earthquakes above 6.0 in magnitude and geologists estimate that the fault could produce an 8.2 magnitude earthquake. The San Jacinto fault zone is the nearest fault to the proposed project site (approximately 2.2 miles to the northeast) and is considered to be the most active fault in Southern California. This fault has produced approximately ten historical earthquakes with a magnitude greater than 6.0 and has the potential to host a 7.2 magnitude earthquake. The Elsinore Fault (approximately 21 miles to the southwest) is one of the larger faults in the area, however it is extremely quiet in comparison to the San Andreas and San Jacinto faults. Geologists estimate that the interval between major rupture events on the Elsinore fault is 250 years, though it is capable of producing an earthquake between 6.5 and 7.5 in magnitude (City of Moreno Valley 2017; County of Riverside 2021a).

Major earthquakes have affected the region in the past and can be expected to occur again in the future on one of the principal active faults in the San Andreas Fault System (Southern California Earthquake Data Center [SCEDC] 2022). In 1923, the 6.3-magnitude North San Jacinto Fault Earthquake damaged the San Bernardino and Redlands area. The epicenter was located approximately 7 miles north of the proposed project site and is the last known time that this fault ruptured in this area. The largest earthquake to occur within 100 miles of Moreno Valley was the 7.4-magnitude Hector Mine earthquake in 1999, which occurred approximately 61 miles northeast of the city. The U.S. Geological Survey (USGS) estimates that there is a greater than 99 percent chance of a major earthquake occurring within 31 miles of Moreno Valley within the next 50 years (City of Moreno Valley 2017).

Seismic Hazards

People and structures in the project area are subject to risks from the hazards associated with earthquakes. Primary hazards include ground rupture, ground shaking, ground displacement, and subsidence and uplift from earth movement. Seismic hazards can induce secondary hazards such as ground failure (lateral spreading and slope failure) or liquefaction. Potential seismic and geologic hazards that could affect the proposed project are discussed below and evaluated for their potential to occur in the project area.

Surface Fault Rupture and Seismic Ground Shaking

Seismically-induced ground rupture is defined as the physical displacement of surface deposits in response to an earthquake's seismic waves. The magnitude and nature of fault rupture can vary for different faults, or even along different strands of the same fault. Ground rupture is considered more likely along active faults. However, no active faults bisect the proposed project area. The nearest Alquist-Priolo Earthquake Fault Zones to the project area are the San Jacinto, San Andreas, and Elsinore fault zones. As discussed above, these two faults are located approximately

2.2 miles northeast, 13 miles northeast, and 21 miles southwest of the proposed project area, respectively.

Due to the proximity of several significant faults that have the potential to cause large earthquakes, moderate to severe seismic shaking is the hazard that has the greatest potential to severely impact the proposed project.

Liquefaction and Lateral Spreading

Liquefaction is a seismic phenomenon in which loose, saturated, granular soils behave similarly to a fluid when subject to high -intensity ground shaking. Liquefaction occurs when three general conditions exist: (1) shallow groundwater; (2) low -density non-cohesive (granular) soils; and (3) high -intensity ground motion. Liquefaction is typified by a buildup of pore-water pressure in the affected soil layer to a point where a total loss of shear strength occurs, causing the soil to behave as a liquid. Studies indicate that saturated, loose to medium dense, near surface cohesionless soils exhibit the highest liquefaction potential, while dry, dense, cohesionless soils and cohesive soils exhibit low to negligible liquefaction potential (City of Moreno Valley 2021b).

According to the geotechnical report that was prepared for the proposed project, the soils at the tank expansion site generally consist of dense to very dense silty sand and coarse grained clayey sand with medium plasticity clays, which are generally not susceptible to liquefaction. Kleinfelder performed a liquefaction analysis to assess the potential for seismically induced liquefaction settlement at the tank expansion site. For analysis purposes, the investigation utilized a design groundwater table of 30 feet bgs, an earthquake magnitude of 7.6, and a design peak level ground acceleration (PGA) of 0.800 associated with the Maximum Considered Earthquake (MC_r) in accordance with the California Building Code (CBC). Based on the analysis, the potential for liquefaction to occur under current and assumed high groundwater conditions in medium dense to very dense layers of coarse-grained soils is negligible (Kleinfelder 2017; see Appendix PDR to this Draft EIR).

In addition, it should be noted that the proposed tank site and the northern half of the proposed transmission pipeline are designated by the County of Riverside as a Low potential liquefaction zone. However, approximately 2,000 feet of the proposed alignment site is designated as a Moderate potential liquefaction zone (County of Riverside 2022). Although historic groundwater levels beneath the project site are not shallow, as discussed above, fluctuations of the groundwater level, localized zones of shallow perched water, and a rise in soil moisture content may occur during and following the rainy season. Furthermore, irrigation of landscaped areas on or adjacent to the site can also lead to an increase in soil moisture levels and fluctuations of shallow perched groundwater levels.

Geologic Hazards

Landslides and Slope Stability

Landslides occur when masses of rock, earth, or debris move down a slope, including rock falls, deep failure of slopes, and shallow debris flows. Landslides are influenced by human activities such as grading and other construction activities, irrigation of slopes, mining activity, and by natural factors such as precipitation, geology/soil types, surface/subsurface flow of water, and topography. Frequently, they may be triggered by other hazards such as floods and earthquakes. The majority of the Moreno Valley is relatively flat and has been assigned a landslide susceptibility class of 0 (No Risk) by the California Geological Survey. However, some areas within the northern, northeastern and southeastern portions of the city and within its Sphere of Influence have been assigned landslide susceptibility classes ranging from V (Moderate Risk) to X (High Risk) (City of Moreno Valley 2021a)

According to the geotechnical report prepared for the proposed project, landslides or other forms of natural slope instability are not considered to represent a significant hazard because the proposed project is located in a gently sloping site (Kleinfelder 2017; see Appendix PDR to this Draft EIR).

Expansive Soils

Expansive soils are characterized by their ability to undergo significant volume change (shrink or swell) due to variations in moisture content. Changes in soil moisture content can result from rainfall, landscape irrigation, utility leakage, roof drainage, perched groundwater, drought, or other factors, and may cause unacceptable settlement or heave of structures, concrete slabs supported-on-grade, or pavements supported over these materials. Depending on the extent and location below finished subgrade, expansive soils can have a detrimental effect on structures.

The onsite soils generally consist of coarse-grained sands with varying amounts of silts and clays that are considered and may be subject to swelling when wet. As part of the geotechnical investigation, expansion index tests were performed on near-surface soil samples to evaluate their susceptibility to expansion in the presence of water. Based on the results of the testing, the soils on the tank expansion site have a low to medium potential for expansion (Kleinfelder 2017; see Appendix PDR to this Draft EIR).

Subsidence

Subsidence is characterized as a sinking of the ground surface relative to surrounding areas and can generally occur where deep soil deposits are present. Subsidence in areas of deep soil deposits is typically associated with regional groundwater withdrawal or other fluid withdrawal from the ground, such as oil and natural gas. Subsidence can result in the development of ground cracks and damage to sidewalks, pipelines, and other improvements.

In Riverside County, subsidence and fissuring have been caused by falling groundwater tables and by hydrocollapse when groundwater tables rise. In addition, many fissures have occurred along active faults that bound the San Jacinto Valley and Elsinore Trough. Areas of documented subsidence in greater project area include: Elsinore Trough, including Temecula and Murrieta; the San Jacinto Valley from Hemet to Moreno Valley; and the southern Coachella Valley. These areas are all potentially sensitive to the withdrawal of groundwater (County of Riverside 2000).

Subsidence has not been documented in the project area. However, the area is mapped as possibly being susceptible to subsidence (County of Riverside 2022).

Collapse and Settlement

Collapsible soils are low density, fine-grained, granular soils containing minute pores and voids. When saturated, the grains of these soils rearrange and become cemented, causing collapse of the soil structure and differential settlement at the surface. Collapsible soils are extremely sensitive to increased moisture caused by irrigation or a rise in the groundwater table. Collapsible soils are found in areas where deposited materials have not had enough contact with moisture to form a compact soil. In the County of Riverside, collapsible soils occur predominantly at the base of mountains where Holocene-age alluvial fan and wash sediments have been deposited during rapid rain events. In addition, some windblown sands may be vulnerable to collapse and hydroconsolidation. Typically, differential settlement of structures occurs when lawns or plantings are heavily irrigated in proximity to structure foundations (County of Riverside 2000).

As described above, the proposed project site is generally underlain by medium dense to very dense layers of coarse-grained soils that are suitable for development.

Paleontological and Unique Geologic Features

Geologic Map and Literature Review

The proposed project lies in the Moreno Valley adjacent to low hills (inselbergs) of resistant plutonic bedrock. The Moreno Valley is one of several valleys in the northern Peninsular Ranges, specifically bounded on the east by the San Jacinto Fault. East of the fault lies sedimentary rocks of the San Timoteo Formation but the majority of bedrock exposures west of the fault are crystalline plutonic rocks (Dibble and Minch 2003).

The footprint of the proposed project is entirely mapped as alluvium adjacent to an eroded inselberg of Cretaceous granodiorite that is rich is metasedimentary xenoliths (qdx) (Dibblee and Minch, 2003) or tonalite (Kt) (Morton and Matti 2001). Morton and Matti (2001) differentiate the alluvium in the project site as “Very old alluvial fan deposits” ($Qvof_a$). These fans are likely derived from erosion of the plutonic rock. South of the project site, the alluvium is much younger (Qyfa). Based on the topographic profile, the alluvium at the surface south of the project site comprises a large fan that is sourced north of the inselbergs and the San Timoteo Fault directly from the uplifted San Timoteo Anticline.

Paleontological Records Search

A paleontological resources database search was conducted by the LACM on November 20, 2022 (Bell 2022). The search entailed an examination of current geologic maps and known fossil localities within the project site and vicinity. The purpose of the records search was to: (1) determine whether any previously recorded fossil localities occur in the proposed project site or vicinity; (2) assess the potential for disturbance of these localities during construction; and (3) assist in evaluating the paleontological sensitivity of the project site.

The paleontological resources database search results indicate that no fossil localities have been previously recorded directly within the project site, but that fossil localities (LACM VP 1207; LACM VP 4232; LACM VP 1653, LACM IP 437; LACM VP 4540; LACM VP 4619; and LACM VP 7811) do exist nearby from the same Pleistocene sedimentary deposits (of unknown formations) that occur in the project site, either at the surface or at depth (**Table 3.6-1**) (Bell 2022).

TABLE 3.6-1
LACM FOSSIL LOCALITIES

Locality Number	Formation	Taxa	Depth
LACM VP 1207	Unknown formation (Pleistocene)	Bovidae	Unknown
LACM VP 1653, LACM IP 437	Unknown Formation (Pleistocene)	Monkfish (Squatina), Stickleback (Gasterosteus); Invertebrates – insect (Sobobapteron kirkbaye), brachiopod (Terebratalia hemphili)	Unknown
LACM VP 4540	Unnamed Formation (Pleistocene, gravel pit)	Horse Family (Equidae)	Unknown
LACM VP 4619	Unknown Formation (Pleistocene)	Mammoth (Mammuthus)	100 feet bgs
LACM VP 7811	Unknown formation (eolian, tan silt; Pleistocene)	Whip snake (Masticophis)	9-11 feet bgs

SOURCE: Bell 2022

LACM VP 1207 produced a specimen of bovidae from an unknown depth. LACM VP 1653/LACM IP 437 yielded fossil specimens of monkfish (*Squatina*), stickleback (*Gasterosteus*); invertebrates – insect (*Sobobapteron kirkbaye*), brachiopod (*Terebratalia hemphili*) from an unknown depth. LACM VP 4540 produced fossil specimens of the horse Family (Equidae) from an unknown depth. LACM VP 4619 yielded a fossil specimen of mammoth (*Mammuthus*) at 100 feet bgs. LACM VP 7811 produced a fossil specimen of whip snake (*Masticophis*) at 9-11 feet bgs (Bell 2022).

An additional search of the online holdings of the University of California Museum of Paleontology (UCMP accessed 1/22/2023) yielded 136 specimens from the Pleistocene of Riverside County. While detailed locations are not provided, all are from Pleistocene (Irvingtonian or Rancholabrean age) alluvium or lacustrine sediments like those near the project site and potentially underlying the young alluvium (Qa). Fossils include small rodents such as *Mimomys* and larger mammals such as tapirs, horses, deer, sloth, and mammoths.

Literature Records

While there are no published fossil accounts directly in the project site, similar valleys within the northern Peninsular Ranges have yielded a rich fossil record from alluvium and other Pleistocene facies. Of note are extensive fossils from older alluvium and ponded lake sediments from similar fan systems extending south from the San Timoteo Fault (e.g., Frick 1921)

Paleontological Sensitivity Analysis

The literature and geologic mapping review, as well as the LACM records search results, were used to assign paleontological sensitivity to the geologic units at surface and underlying the project site, following the guidelines of the SVP (2010):

$Qvof_a$: Very Old alluvium (early Pleistocene)

"Very old alluvium" is found throughout the project site and surrounds the plutonic inselbergs in the Moreno Valley. As some artificial fill was recorded in the auger borings, the $Qvof_a$ officially ranges from surface to 5 feet below ground surface. The lower termination into bedrock or another unit was not determined. Based on the age and known significant resources in the Peninsular Ranges valleys, this unit is assigned "High Potential" to host paleontological resources.

3.6.2 Regulatory Framework

Federal

American Water Works Association and American National Standards Institute Guidelines for Water Pipelines

The American Water Works Association (AWWA) provides requirements for design, installation, performance, and manufacturing of products used in the water industry, including pipe, chemicals, storage facilities, valves, meters, and other appurtenances. Pipe installation, disinfection of facilities, lining application, and utility management practices are also covered. For pipelines, AWWA provides minimum requirements for design, materials and dimensions, fabrication and manufacture, marking and delivery, installation, and verification, testing, and inspection. AWWA is an American National Standards Institute (ANSI)-approved standards developing organization for the water industry. EMWD requires that its contractors install pipelines in accordance with the AWWA/ANSI standards.

Antiquities Act of 1906

The Antiquities Act of 1906 (54 U.S.C. 320301-320303 and 18 U.S.C. 1866(b)) calls for protection of historic landmarks, historic and prehistoric structures, as well as other objects of historic or scientific interest on federally administered lands, the latter of which would include fossils. The Antiquities Act both establishes a permit system for the disturbance of any object of antiquity on federal land and also sets criminal sanctions for violation of these requirements. The Antiquities Act was extended to specifically apply to paleontological resources by the Federal-Aid Highways Act of 1958.

Federal Land Policy Management Act of 1976

The Federal Land Policy Management Act of 1976 (P.L. 94-579; 90 Stat. 2743, U.S.C. 1701-1782) requires that public lands be managed in a manner that will protect the quality of their scientific values, while Title 40 Code of Federal Regulations (C.F.R.) Section 1508.2 identifies paleontological resources as a subset of scientific resources. The Paleontological Resources Preservation Act (Title VI, Subtitle D of the Omnibus Land Management Act of 2009) furthers the protection of paleontological resources on federal lands by criminalizing the unauthorized removal of fossils.

State

Alquist-Priolo Earthquake Fault Zoning Act

The Alquist-Priolo Earthquake Fault Zoning Act (Public Resources Code [PRC] Section 2621-2630) was signed into law in December of 1972 and requires the delineation of zones along active faults in California. The act was created to identify traces of active faults that constitute a potential hazard to structures from surface faulting or fault creep and to prohibit the siting of most structures for human occupancy[1] across these traces, thereby reducing structural damage and ensuring public safety. Surface fault rupture is not necessarily restricted to an Alquist-Priolo Zone. Each earthquake Fault Zone extends approximately 200 to 500 feet on either side of the mapped fault trace, because many active faults are complex and consist of more than one branch. There is the potential for ground surface rupture along any of the branches. Cities and counties must regulate certain development projects within the zones, which includes withholding permits until geologic investigations demonstrate that development sites are not threatened by future surface displacement.

Seismic Hazards Mapping Act

The Seismic Hazards Mapping Act was passed in 1990 following the Loma Prieta earthquake to reduce threats to public health and safety and to minimize property damage caused by earthquakes. This act requires the State Geologist to delineate various seismic hazard zones, and cities, counties, and other local permitting agencies to regulate certain development projects within these zones. For projects that would locate structures for human occupancy within designated Zones of Required Investigation, the Seismic Hazards Mapping Act requires project applicants to perform a site-specific geotechnical investigation to identify the potential site-specific seismic hazards and corrective measures, as appropriate, prior to receiving building permits. The *CGS Guidelines for Evaluating and Mitigating Seismic Hazards* (Special Publication 117A) provides guidance for evaluating and mitigating seismic hazards (CGS 2008). As explained in Section 3.7.1, there are a number of active faults in the region that could subject the proposed project site to strong ground shaking.

California Building Code

The CBC, which is codified in Title 24 of the California Code of Regulations, Part 2, was promulgated to safeguard the public health, safety, and general welfare by establishing minimum standards related to structural strength, means of egress to facilities (entering and exiting), and general stability of buildings. The purpose of the CBC is to regulate and control the design, construction, quality of materials, use/occupancy, location, and maintenance of all buildings and structures within its jurisdiction. The provisions of the CBC apply to the construction, alteration, movement, replacement, location, and demolition of every building or structure or any appurtenances connected or attached to such buildings or structures throughout California.

The 2022 edition of the CBC is based on the 2021 International Building Code (IBC) published by the International Code Council, which replaced the Uniform Building Code. The code is updated triennially, and the 2022 edition of the CBC was published by the California Building

[1] Title 14 of the California Code of Regulations (CCR), §3601(e), defines buildings intended for human occupancy as those that would be inhabited for more than 2,000 hours per year.

Standards Commission on July 1, 2022, and takes effect on January 1, 2023. The 2019 CBC contains California amendments based on the American Society of Civil Engineers Minimum Design Standard ASCE/SEI 7-16, *Minimum Design Loads for Buildings and Other Structures*, provides requirements for general structural design and includes means for determining earthquake loads[2] as well as other loads (such as wind loads) for inclusion into building codes. Conformance to the current building code recommendations does not constitute any kind of guarantee that significant structural damage would not occur in the event of a maximum magnitude earthquake. However, it is reasonable to expect that a structure designed in accordance with the seismic requirements of the CBC should not collapse in a major earthquake.

Seismic design specifications are determined according to the seismic design category (SDC) in accordance with Chapter 16 of the CBC. Chapter 18 of the CBC covers the requirements of geotechnical investigations (Section 1803), excavation, grading, and fills (Section 1804), load-bearing of soils (1806), as well as foundations (Section 1808), shallow foundations (Section 1809), and deep foundations (Section 1810). For Seismic Design Categories D, E, and F, Chapter 18 requires analysis of slope instability, liquefaction, and surface rupture attributable to faulting or lateral spreading, plus an evaluation of lateral pressures on basement and retaining walls, liquefaction and soil strength loss, and lateral movement or reduction in foundation soil-bearing capacity. It also addresses measures to be considered in structural design, which may include ground stabilization, selecting appropriate foundation type and depths, selecting appropriate structural systems to accommodate anticipated displacements, or any combination of these measures. The potential for liquefaction and soil strength loss must be evaluated for site-specific peak ground acceleration magnitudes and source characteristics consistent with the design earthquake ground motions.

National Pollutant Discharge Elimination System Construction General Permit

Construction associated with the proposed project would disturb more than one acre of land surface affecting the quality of stormwater discharges into waters of the U.S. The proposed Project would, therefore, be subject to the *NPDES General Permit for Stormwater Discharges Associated with Construction and Land Disturbance Activities* (Order 2009-0009-DWQ, NPDES No. CAS000002; as amended by Orders 2010-0014-DWQ and 2012-006-DWQ). The Construction General Permit regulates discharges of pollutants in stormwater associated with construction activity to waters of the U.S. from construction sites that disturb 1 acre or more of land surface, or that are part of a common plan of development or sale that disturbs more than one acre of land surface. The permit regulates stormwater discharges associated with construction or demolition activities, such as clearing and excavation; construction of buildings; and linear underground projects, including installation of water pipelines and other utility lines.

The Construction General Permit requires that construction sites be assigned a Risk Level of 1 (low), 2 (medium), or 3 (high), based both on the sediment transport risk at the site and the receiving waters risk during periods of soil exposure (e.g., grading and site stabilization). The sediment risk level reflects the relative amount of sediment that could potentially be discharged to

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[2] A load is the overall force to which a structure is subjected in supporting a weight or mass, or in resisting externally applied forces. Excess load or overloading may cause structural failure.

receiving water bodies and is based on the nature of the construction activities and the location of the site relative to receiving water bodies. The receiving waters risk level reflects the risk to the receiving waters from the sediment discharge. Depending on the risk level, the construction projects could be subject to any of the following requirements:

- Effluent standards
- Good site management "housekeeping"
- Non-stormwater management
- Erosion and sediment controls
- Run-on and runoff controls
- Inspection, maintenance, and repair
- Monitoring and reporting requirements

The Construction General Permit requires the development and implementation of a Stormwater Pollution Prevention Plan (SWPPP) that includes specific BMPs designed to prevent sediment and pollutants from contacting stormwater from moving off site into receiving waters. The BMPs fall into several categories, including erosion control, sediment control, waste management and good housekeeping, and are intended to protect surface water quality by preventing the off-site migration of eroded soil and construction-related pollutants from the construction area. Routine inspection of all BMPs is required under the provisions of the Construction General Permit. In addition, the SWPPP is required to contain a visual monitoring program, a chemical monitoring program for non-visible pollutants, and a sediment monitoring plan if the site discharges directly to a water body listed on the 303(d) list for sediment.

The SWPPP must be prepared before the construction begins. The SWPPP must contain a site map(s) that delineates the construction work area, existing and proposed buildings, parcel boundaries, roadways, stormwater collection and discharge points, general topography both before and after construction, and drainage patterns across the Project site. The SWPPP must list BMPs and the placement of those BMPs that the applicant would use to protect stormwater runoff. Additionally, the SWPPP must contain a visual monitoring program; a chemical monitoring program for "non-visible" pollutants to be implemented if there is a failure of BMPs; and a sediment monitoring plan if the site discharges directly to a water body listed on the 303(d) list for sediment. Examples of typical construction BMPs include scheduling or limiting certain activities to dry periods, installing sediment barriers such as silt fence and fiber rolls, and maintaining equipment and vehicles used for construction. Non-stormwater management measures include installing specific discharge controls during certain activities, such as paving operations, vehicle and equipment washing and fueling. The Construction General Permit also sets post-construction standards (i.e., implementation of BMPs to reduce pollutants in stormwater discharges from the site following construction).

Public Resources Code Section 5097.5 and Section 30244

These statutes prohibit the removal of any paleontological site or feature from public lands without permission of the jurisdictional agency, define the removal of paleontological sites or features as a misdemeanor, and require reasonable mitigation of adverse impacts to paleontological resources from developments on public (state, county, city, district) lands.

Transport, Use, and Storage of Explosive Materials (CCR Title 8)

The transport, use, and storage of explosive materials is regulated under the General Industry Safety Orders contained in Title 8 of the California Code of Regulations, Division 1, Chapter 4, Subchapter 7 (General Industry Safety Orders), Group 18 (Explosives and Pyrotechnics), Article 116 (Handling and Use of Explosives--Blasting Operations). In accordance with these regulations, any contractor providing blasting services must be licensed by Cal OSHA, and the blaster must be physically present on site when blasting operations are performed. Explosive materials must be stored in an appropriate magazine[3] until they are used, and some materials must be stored in their shipping containers until used. All magazines must be located or protected as to minimize damage from vehicles or falling objects, and a 50-foot buffer around the magazine must be kept clear of brush, dried grass, leaves, and other combustible materials. The ground around the magazines must be sloped away from the magazine or drainage must be protected to protect the magazine from flooding. Smoking, open flames or other sources of ignition are prohibited within 50 feet of any area where explosive materials are being handled, except devices necessary to ignite the fuses of set charges. The transfer of explosive materials must also be arranged so that no undue delay will occur between the time the explosive materials leave the magazine and the time they are used.

Society of Vertebrate Paleontology (SVP)

The SVP has established standard guidelines (SVP 2010) that outline professional protocols and practices for conducting paleontological resource assessments and surveys, monitoring and mitigation, data and fossil recovery, sampling procedures, and specimen preparation, identification, analysis, and curation. Most practicing professional vertebrate paleontologists adhere closely to the SVP's assessment, mitigation, and monitoring requirements as specifically provided in its standard guidelines. Most state regulatory agencies with paleontological resource-specific Laws, Ordinances, Regulations, and Standards (LORS) accept and use the professional standards set forth by the SVP.

As defined by the SVP (2010:11), significant nonrenewable paleontological resources are:

> *Fossils and fossiliferous deposits, here defined as consisting of identifiable vertebrate fossils, large or small, uncommon invertebrate, plant, and trace fossils, and other data that provide taphonomic, taxonomic, phylogenetic, paleoecologic, stratigraphic, and/or biochronologic information. Paleontological resources are considered to be older than recorded human history and/or older than middle Holocene (i.e., older than about 5,000 radiocarbon years)..*

Based on the significance definitions of the SVP (2010), all identifiable vertebrate fossils are considered to have significant scientific value. This position is adhered to because vertebrate fossils are relatively uncommon, and only rarely will a fossil locality yield a statistically significant number of specimens of the same genus. Therefore, every vertebrate fossil found has the potential to provide significant new information on the taxon it represents, its paleoenvironment, and/or its distribution. Furthermore, all geologic units in which vertebrate fossils have previously been found are considered to have high sensitivity. Identifiable plant and

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3 A magazine is a structure specifically designed for the safe storage of explosive materials.

invertebrate fossils are considered significant if found in association with vertebrate fossils or if defined as significant by project paleontologists, specialists, or local government agencies.

A geologic unit known to contain significant fossils is considered to be “sensitive” to adverse impacts if there is a high probability that earth-moving or ground-disturbing activities in that rock unit will either directly or indirectly disturb or destroy fossil remains. Paleontological sites indicate that the containing sedimentary rock unit or formation is fossiliferous. The limits of the entire rock formation, both areal and stratigraphic, therefore define the scope of the paleontological potential in each case (SVP 2010).

Fossils are contained within surficial sediments or bedrock and are therefore not observable or detectable unless exposed by erosion or human activity. Therefore, without natural erosion or human-caused exposure, paleontologists cannot know either the quality or quantity of fossils. As a result, even in the absence of surface fossils, it is necessary to assess the sensitivity of rock units based on their known potential to produce significant fossils elsewhere within the same geologic unit (both within and outside of the study area), a similar geologic unit, or based on whether the unit in question was deposited in a type of environment that is known to be favorable for fossil preservation. Monitoring by experienced paleontologists greatly increases the probability that fossils will be discovered during ground-disturbing activities and that, if the fossils are significant, that successful mitigation and salvage efforts may be undertaken.

Paleontological Sensitivity

Paleontological sensitivity is defined as the potential for a geologic unit to produce scientifically significant fossils. This is determined by rock type, past history of the geologic unit in producing significant fossils, and fossil localities recorded from that unit. Paleontological sensitivity is derived from the known fossil data collected from the entire geologic unit, not just from a specific survey. In its “Standard Guidelines for the Assessment and Mitigation of Adverse Impacts to Non-renewable Paleontologic Resources,” the SVP (2010:1-2) defines four categories of paleontological sensitivity (potential) for rock units: high, low, undetermined, and no potential:

- **High Potential.** Rock units from which vertebrate or significant invertebrate, plant, or trace fossils have been recovered are considered to have a high potential for containing additional significant paleontological resources. Rocks units classified as having high potential for producing paleontological resources include, but are not limited to, sedimentary formations and some volcaniclastic formations (e. g., ashes or tephras), and some low-grade metamorphic rocks which contain significant paleontological resources anywhere within their geographical extent, and sedimentary rock units temporally or lithologically suitable for the preservation of fossils (e. g., middle Holocene and older, fine-grained fluvial sandstones, argillaceous and carbonate-rich paleosols, cross-bedded point bar sandstones, fine-grained marine sandstones, etc.).
- **Low Potential.** Reports in the paleontological literature or field surveys by a qualified professional paleontologist may allow determination that some rock units have low potential for yielding significant fossils. Such rock units will be poorly represented by fossil specimens in institutional collections, or based on general scientific consensus only preserve fossils in rare circumstances and the presence of fossils is the exception not the rule, e. g. basalt flows or Recent colluvium. Rock units with low potential typically will not require impact mitigation measures to protect fossils.

- **Undetermined Potential.** Rock units for which little information is available concerning their paleontological content, geologic age, and depositional environment are considered to have undetermined potential. Further study is necessary to determine if these rock units have high or low potential to contain significant paleontological resources. A field survey by a qualified professional paleontologist to specifically determine the paleontological resource potential of these rock units is required before a paleontological resource impact mitigation program can be developed. In cases where no subsurface data are available, paleontological potential can sometimes be determined by strategically located excavations into subsurface stratigraphy.
- **No Potential.** Some rock units have no potential to contain significant paleontological resources, for instance high-grade metamorphic rocks (such as gneisses and schists) and plutonic igneous rocks (such as granites and diorites). Rock units with no potential require no protection nor impact mitigation measures relative to paleontological resources.

Paleontological Resources Significance Criteria

Numerous paleontological studies have developed criteria for the assessment of significance for fossil discoveries. In general, these studies assess fossils as significant if one or more of the following criteria apply:

1. The fossils provide information on the evolutionary relationships and developmental trends among organisms, living or extinct;
2. The fossils provide data useful in determining the age(s) of the rock unit or sedimentary stratum, including data important in determining the depositional history of the region and the timing of geologic events therein;
3. The fossils provide data regarding the development of biological communities or interaction between paleobotanical and paleozoological biotas;
4. The fossils demonstrate unusual or spectacular circumstances in the history of life; or
5. The fossils are in short supply and/or in danger of being depleted or destroyed by the elements, vandalism, or commercial exploitation, and are not found in other geographic locations.

In summary, significant paleontological resources are determined to be fossils or assemblages of fossils that are unique, unusual, rare, uncommon, or diagnostically important. Significant fossils can include remains of large to very small aquatic and terrestrial vertebrates or remains of plants and animals previously not represented in certain portions of the stratigraphy. Assemblages of fossils that might aid stratigraphic correlation, particularly those offering data for the interpretation of tectonic events, geomorphologic evolution, and paleoclimatology are also critically important.

Local

City of Moreno Valley Municipal Code

Municipal Code Title 8, Chapter 8.21 Grading Regulations of the Municipal Code contains requirements that address potential geological hazards associated with new development. Municipal Code Section 8.21.050 (Grading Permit Requirements) specifies that a geotechnical report is required for all grading projects unless otherwise waived by the city engineer.

Recommendations included in the reports and approved by the city engineer, shall be incorporated into the grading plans and specifications. A preliminary soil report, preliminary engineering geology report and/or seismicity report may be required depending on site specific conditions. Engineering geologic reports are required for all developments on hillside sites where geologic conditions are considered to have a substantial effect on existing and/or future site stability. The required reports must provide specific recommendations to facilitate a safe and stable development.

Title 11 (Peace, Morals, and Safety), Chapter 11.20 (Explosives), Section 11.20.020 (Conditions of Issuance of a Permit to Blast) of the Moreno Valley Municipal Code requires a blasting permit to be obtained from the City fire marshal for blasting operations (Ord. 302 § 2.2, 1991). The ordinance stipulates that blasting operations shall only be conducted between 8 a.m. and 5 p.m. and not on Sundays or legal holidays, unless excepted by the fire marshal. Other requirements include providing notice to residential, commercial, and industrial properties within 500 feet from the blasting activity, and placing signs at intervals of no more than 200 feet on each side of each public street within 2,000 feet, and maintaining a log of the blasting activities and photographs of buildings within 500 feet. Additionally, the ordinance states that the permit procedure is not meant to conflict with any state law and all permittees shall fully comply with the requirements of State law, including without limitation the licensing requirements under the California Health and Safety Code (which license shall be obtained from the Riverside sheriff's substation in Moreno Valley) and under the International Fire Code as adopted and in force within the city.

City of Moreno Valley General Plan

On June 15, 2021, the City of Moreno Valley City Council approved a comprehensive update of the City's General Plan and certified the related Final Program Environmental Impact Report (City of Moreno Valley 2021). Chapter 6, Safety Element of the General Plan includes background information, policies, and standards for community protection from natural and human-made disasters, including promoting safety and community protection from flooding, seismic events, landslides, dam inundation. Additionally, Chapter 10, Open Space and Resource Conservation Element of the City's General Plan includes policies to ensure that cultural resources are appropriately considered. The following goals and policies within the General Plan would be applicable to the proposed project:

Goal S-1: Protect life and property from natural and human-made hazards.

Policy S.1-1: Continue to restrict the development of habitable structures within Alquist-Priolo Earthquake Fault Zones consistent with State law.

Policy S.1-2: In areas of high liquefaction risk (see Map S-2), require that project proponents submit geotechnical investigation reports and demonstration that the project conforms to all recommended mitigation measures prior to City approval.

Policy S.1-5: Continue to regulate development on hillsides where average slope is greater than 10 percent and limit the removal of natural vegetation in hillside areas when retaining natural habitat does not pose threats to public safety

Goal OSRC-2: Preserve and respect Moreno Valley's unique cultural and scenic resources, recognizing their contribution to local character and sense of place.

Policy OSRC.2-8: Require cultural resource assessments prior to the approval of development proposals on properties located in archaeologically sensitive areas.

EMWD Engineering Standards, Specifications, and Drawings

EMWD has established Engineering Standards, Specifications, and Drawings (available at https://www.emwd.org/engineering-standards-specifications-and-drawings) that are required to be incorporated into design and construction bidding documents. These Standards and Specifications establish requirements for the design of water systems, selection of materials, required information on design drawings, and system control equipment. As part of complying with contracts, design consultants and construction contractors are required to conduct all activities in accordance with EMWD's Engineering Standards, Specifications, and Drawings requirements. Note that compliance with regulations, standards, and specifications are conditions of permit approvals.

3.6.3 Impact Analysis and Mitigation Measures

Thresholds of Significance

The following criteria from CEQA Guidelines Appendix G are used as thresholds of significance to determine the impacts of the proposed project as related to geology and soils. The proposed project would have a significant impact if it would:

1. Directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving:
   - Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map, issued by the State Geologist for the area or based on other substantial evidence of a known fault.
   - Strong seismic ground shaking.
   - Seismic-related ground failure, including liquefaction.
   - Landslides.
2. Result in substantial soil erosion or the loss of topsoil.
3. Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse.
4. Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial direct or indirect risks to life or property.
5. Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water.
6. Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature.
7. Result in cumulatively considerable impacts to geology and soils.

Methodology

The PDR prepared by Kleinfelder for the proposed project includes a review of published and unpublished geological literature, summarizes recent field explorations at the project site, which consisted of excavating five test pits and conducting a seismic refraction survey, and provides the results of laboratory testing. The analysis of available field and laboratory data in conjunction with the proposed site plan and the assumed structural loads was used to inform develop geotechnical recommendations for the design and construction of the proposed project (Kleinfelder 2017; see Appendix PDR to this Draft EIR). Additionally, the environmental settings and environmental impacts of the proposed project rely specifically on the PDR's evaluation of potential foundations systems, settlement, earthwork considerations, and potential geologic hazards.

As described above, the project area was the subject of thorough paleontological background research and analysis to assess its paleontological sensitivity. The research included a paleontological records search conducted by the Natural History Museum of Los Angeles County (LACM), review of the geotechnical report prepared by Kleinfelder (2016) for the proposed project, as well as geologic map and literature reviews.

Impact Analysis

Rupture of an Earthquake Fault

Impact 3.6-1: The proposed project could directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving rupture of a known earthquake fault.

Phase 1 and Phase 2

Construction

Storage Tanks and Pipeline

The nearest active fault to the proposed storage tank and transmission pipeline site is the San Jacinto fault zone, located approximately 2.2 miles to the northeast. Consequently, the proposed storage tank and pipeline would not be located within an Alquist-Priolo Earthquake Fault Zone and thus, none of the project facilities would be located adjacent to an active fault that would be susceptible to fault creep or surface fault rupture. Ground disturbing construction activities (i.e., site clearing/preparation, grading, excavation, earth moving, and rock breaking and/or blasting of the bedrock layer) would not intersect with an active fault and therefore could not activate movement along an active fault nor cause a seismic event (earthquake). No impact would occur.

Operation

Storage Tanks and Pipeline

As discussed above, the project area is not located on an active earthquake fault. Operation of the storage tank and pipeline would not include the injection or extraction of groundwater or crude petroleum oil and therefore could not change subsurface pressure conditions nor move water or oil along a fault plane. Therefore, the proposed project could not activate movement along an active fault nor cause a seismic event (earthquake). No impact would occur.

Mitigation Measures

None Required

Significance Determination

No Impact

Seismic Ground Shaking

Impact 3.6-2: The proposed project could directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving strong seismic ground shaking.

Phase 1 and Phase 2

Construction and Operation

Storage Tanks and Pipeline

The project area lies within a region that is seismically active. In the event of an earthquake, the proposed project is therefore expected to be subject to strong seismic groundshaking during the construction operational life of the proposed facilities. Known active faults in the vicinity include the San Jacinto, San Andreas, and Elsinore fault zones, which are capable of producing earthquakes at distances of approximately 2 to 21 miles away from the project site. In the event of a seismic event, the water storage tanks could be subjected to seismic shaking that could damage the tanks and possibly result in a large scale-release of water from the water storage tanks. Although a potential effect of the environment (i.e., an earthquake) on the proposed project is not subject to CEQA analysis, structural and mechanical failure of facilities onset by seismic ground shaking could threaten the safety of workers or the public, resulting in a potentially significant impact and are considered below for informational purposes.

The PDR prepared for the proposed project concluded that the proposed project is geotechnically feasible, provided the recommendations presented in the report are incorporated into the project design and construction (Kleinfelder 2017; see Appendix PDR to this Draft EIR). All structural components of the proposed project may undergo further design-level geotechnical evaluations as necessary to comply with the CBC and EMWD's Engineering Standards, Specifications, and Drawings. The geotechnical engineer, as a registered professional with the State of California, is required to comply with the CBC and local codes, such as EMWD's Engineering Standards and Specifications, while applying standard engineering practice and the appropriate standard of care required for projects in the Riverside County area. The California Professional Engineers Act (Building and Professions Code Sections 6700-6799), and the Codes of Professional Conduct, as administered by the California Board of Professional Engineers and Land Surveyors, provides the basis for regulating and enforcing engineering practice in California. Adherence to standards established by the City of Moreno Valley, the CBC, and EMWD would ensure the strongest structure feasible at the proposed locations, with no increased risk to human life. These design standards consider proximity to potential seismic sources and the maximum anticipated groundshaking possible. Compliance with these building safety design standards would reduce the potential to threaten the safety of workers and the public. Therefore, with incorporation of recommendations included in the PDR and continued compliance with existing regulations, the impact relative to seismic shaking would be less than significant.

Mitigation Measures

None Required

Significance Determination

Less than Significant Impact

Liquefaction

Impact 3.6-3: The proposed project could directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving seismic-related ground failure, including liquefaction.

Phase 1 and Phase 2

Construction and Operation

Storage Tanks

As discussed previously, the soils at the tank expansion site generally consist of dense to very dense silty sand and coarse-grained clayey sand with medium plasticity clays, which are generally not susceptible to liquefaction. Kleinfelder performed a liquefaction analysis to assess the potential for seismically induced liquefaction settlement at the tank expansion site. According to the previous geotechnical investigation included in the PDR, the potential for liquefaction to occur in the event of a Max Probable Earthquake (7.6 magnitude) and high groundwater conditions (30 feet bgs)[4] at the project site is negligible (Kleinfelder 2017; see Appendix PDR to this Draft EIR). According to Appendix PDR, it is also anticipated the total static plus seismic induced settlements would be within the tolerable settlement criteria for the proposed tank pad supported on shallow spread foundations. Final design and construction of all structural components at the storage tank site, including stormwater drainage facilities, would adhere to the recommendations included in the PDR as well as standards established by the City of Moreno Valley, the CBC, and EMWD to ensure the strongest structure feasible at the proposed locations, with no increased risk to human life as a result of seismic-related ground failure. Therefore, impacts relative to seismic-related ground failure would be less than significant.

Pipeline

The southern half of the proposed transmission pipeline is within an area that is designated as a Moderate potential liquefaction zone (County of Riverside 2022). Undocumented fill soils along the pipeline alignment include sands that may be liquefiable if saturated by rain or irrigation. The proposed pipeline would be installed in accordance with applicable AWWA/ANSI standards as required by EMWD. Compliance with all applicable regulations would ensure that liquefaction impacts would not increase risk to the public or the environment as a result of damage to the pipe. Therefore, impacts would be less than significant.

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4 Historic groundwater levels for the site range from approximately 60 to more than 100 feet bgs.

Mitigation Measures

None Required

Significance Determination

Less than Significant Impact

Landslides

Impact 3.6-4: The proposed project could directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving landslides.

Phase 1 and Phase 2

Construction and Operation

Storage Tanks

According to the PDR prepared for the proposed project, landslides or other forms of natural slope instability are not considered to represent a significant hazard because the proposed tank expansion site is a gently sloping site. However, there may be a moderate potential for rock fall hazard at the proposed tank expansion site depending on final site configuration and tank distance from the adjacent hillside to the west (Kleinfelder 2017; see Appendix PDR to this Draft EIR). Construction of the proposed storage tank would require grading, ripping, as well as potential blasting into the adjacent hillside to accommodate both tanks, which could exacerbate landslide risk. Such activities would be carried out in accordance with applicable regulations established by the City of Moreno Valley, the CBC, and EMWD. Therefore, impacts related to landslides would be less than significant.

Pipeline

The proposed pipeline alignment is located on a slight north-south slope and entirely within existing rights-of-way. The proposed alignment is not within a landslide susceptibility area and would not involve construction adjacent to any substantial slopes (City of Moreno Valley 2021b). Once operational, the pipeline would be located underground. Therefore, no impact would occur.

Mitigation Measures

None Required

Significance Determination

Less than Significant Impact

Soil Erosion

Impact 3.6-5: The proposed project could result in substantial soil erosion or the loss of topsoil.

Phase 1 and Phase 2

Construction

Storage Tanks and Pipeline

Construction of the proposed water storage tank and the proposed transmission pipeline would include activities such as excavation, grading and backfilling. Ground disturbance and stockpiling of soils and construction materials could result in soil erosion during rain or high-wind events. The extent of erosion that would occur would vary depending on slope steepness/stability, vegetation/cover, concentration of runoff, and weather conditions.

Construction activities would be required to comply with SCAQMD Rule 403 for dust control that would ensure the prevention and/or management of wind erosion and subsequent topsoil loss (see Section 3.2, *Air Quality*, for information about SCAQMD Rule 403). Compliance with SCAQMD Rule 403 would ensure that construction activities generating wind-induced soil erosion are below SCAQMD significance thresholds.

Because the overall footprint of construction activities would exceed one acre, construction of the proposed project would require preparation and implementation of a SWPPP in accordance with the requirements of the statewide Construction General Permit to prevent erosion associated with runoff from the construction area for each individual facility (refer to Section 3.6.2, *Regulatory Framework, NPDES Construction General Permit*). The SWPPP would include specific BMPs to control erosion, sedimentation, and hazardous materials potentially released from construction sites into surface waters. Compliance with the Construction General Permit, required SWPPP, and identified BMPs would ensure soil erosion and loss of topsoil impacts would be reduced to less than significant.

Operation

Storage Tanks and Pipeline

Once the proposed facilities are constructed, activities that increase the likelihood of erosion or loss of top soil such as excavation and grading would not take place; therefore, operational impacts regarding significant soil erosion or top soil loss are not expected to occur, resulting in no impact.

Mitigation Measures

None Required

Significance Determination

Less than Significant Impact

Unstable Geologic Soils

Impact 3.6-6: The proposed project could be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse.

Phase 1 and Phase 2

Construction

Storage Tanks and Pipeline

The geologic units encountered during previous subsurface investigations at the project site include undocumented artificial fill, older alluvial fan deposits (Qvofa), and Tonalite bedrock (Kt) underlying the alluvial soils. Ground disturbing activities during construction would have the potential to impact stability of geologic units and soils underlying the proposed project sites. However, according to the PDR for the proposed project and the results of previous subsurface investigations, the proposed project was determined to be geotechnically feasible, provided its recommendations are incorporated into the project design and construction (Kleinfelder 2017; see Appendix PDR to this Draft EIR). Project impacts related to landslides, liquefaction/lateral spreading, and collapse/settlement have been analyzed above in the discussions for Impacts 3.7-3 and Impact 3.7-4, and resulted in a determination of less than significance.

Subsidence has not been documented in the project area, but the proposed facilities may be susceptible to future subsidence if drawdown of the underlying groundwater table were to occur (County of Riverside 2022). Localized trench and pipeline dewatering may be required depending on location of the transmission pipeline and groundwater depths at the site of installation. However, construction would not involve substantial groundwater withdrawal or other fluid withdrawal from the ground, such as oil and natural gas, and thus would not result in substantial drawdown resulting in subsidence. Construction of the proposed project would be carried out in accordance with applicable regulations established by the City of Moreno Valley, the CBC, and EMWD. Through compliance with applicable regulations, impacts to geologic units and unstable soils would be less than significant.

Operation

Storage Tanks and Pipeline

Operation of the proposed facilities would not include involve ground disturbance activities, and would not involve substantial irrigation, groundwater injection/extraction, or other activities that could result in geologic instability, increased moisture in soils, or a reduction of underlying groundwater levels. Therefore, impacts would be considered less than significant.

Mitigation Measures

None Required

Significance Determination

Less than Significant Impact

Expansive Soils

Impact 3.6-7: The proposed project could be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial direct or indirect risks to life or property.

Phase 1 and Phase 2

Construction and Operation

Storage Tanks and Pipeline

Based on the results of the PDR, the soils on the tank expansion site have a low to medium potential for expansion (Kleinfelder 2017). Soils along the pipeline route have similar composition. Construction of the proposed project would be carried out in accordance with applicable regulations established by the City of Moreno Valley, the CBC, and EMWD, and would adhere to all construction and design recommendations that are included in the PDR. Operation would not involve activities that would result in substantial wetting of soils. Therefore, through compliance with the recommendations of the PDR and applicable regulations, impacts related to expansive soils would be less than significant.

Mitigation Measures

None Required

Significance Determination

Less than Significant Impact

Septic Tanks

Impact 3.6-8: The proposed project could have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water.

Phase 1 and Phase 2

Construction and Operation

Storage Tanks and Pipeline

The proposed facilities would not require the use of septic tanks or alternative reclaimed water disposal systems. During construction of the project components, portable toilet facilities would be provided if necessary, and waste would be collected by a certified waste hauler and appropriately disposed of for treatment. The facilities would not require onsite employees that would generate wastewater, nor would the facilities themselves generate wastewater during operation—therefore, no waste disposal facilities are needed. Therefore, there would be no impact related to soils being incapable of adequately supporting septic tanks or alternative reclaimed water disposal systems.

Mitigation Measures

None Required

Significance Determination

No Impact

Paleontological Resources

Impact 3.6-9: The proposed project could directly or indirectly destroy a unique paleontological resource or site or unique geologic feature.

Phase 1 and Phase 2

Construction

Storage Tanks and Pipeline

As previously discussed in the geotechnical report that was prepared for the proposed project (see Appendix PDR to this Draft EIR), the subsurface deposits encountered at the project site (proposed tank expansion site and transmission pipeline) include artificial fill, older alluvial fan deposits (Qvofa), and Tonalite bedrock (Kt) underlying the alluvial soils. The LACM records indicate that no fossil localities have been previously recorded directly within the project site, but that fossil localities do exist nearby from the same Pleistocene sedimentary deposits (of unknown formations) that occur in the project site, either at the surface or at depth. These fossil localities have yielded specimens of bovidae, monkfish (*Squatina*), stickleback (*Gasterosteus*); invertebrates – insect (*Sobobapteron kirkbaye*), brachiopod (*Terebratalia hemphili*), horse Family (Equidae), mammoth (*Mammuthus*), and whip snake (*Masticophis*). The UCMP search also indicated that approximately 136 specimens were found from the Pleistocene of Riverside County. These fossils include small rodents, and larger mammals such as tapirs, horses, deer, sloth, and mammoths. The paleontological sensitivity analysis indicates that very old alluvium is found throughout the project site and generally ranges from surface to 5 feet below ground surface. Based on the age and known significant resources in the Peninsular Ranges valleys, this very old alluvium unit is assigned "High Potential" to host paleontological resources. While no fossils are recorded at the LACM in the project site, there are significant finds from similar facies near the project site. Therefore, as the proposed project could directly or indirectly destroy unique paleontological resources, impacts on buried paleontological resources are considered potentially significant. EMWD would be required to implement **Mitigation Measures GEO-1 through GEO-3**, which would retain a qualified paleontologist to oversee mitigation implementation, implement paleontological resources monitoring and measures to protect resources if found. With implementation of these mitigation measures, impacts would be reduced to a less than significant level.

Mitigation Measures

> **GEO-1:** Prior to the start of construction activities, EMWD shall retain a Qualified Paleontologist that meets the standards of the Society for Vertebrate Paleontology (2010) to carry out all mitigation measures related to paleontological resources. Prior to start of any ground disturbing activities, the Qualified Paleontologist shall conduct pre-construction worker paleontological resources sensitivity training. The Qualified Paleontologist shall contribute to any construction worker cultural resources sensitivity training either in person or via a training module. The training shall include information on what types of paleontological resources could be encountered during excavations,

what to do in case an unanticipated discovery is made by a worker, and laws protecting paleontological resources. All construction personnel shall be informed of the possibility of encountering fossils and instructed to immediately inform the construction foreman or supervisor if any bones or other potential fossils are unexpectedly unearthed in an area where a paleontological monitor is not present. The Applicant shall ensure that construction personnel are made available for and attend the training and retain documentation demonstrating attendance.

GEO-2: The Qualified Paleontologist shall supervise a paleontological monitor meeting the Society for Vertebrate Paleontology standards (2010) who shall be present during all excavations in the early Pleistocene 'very old alluvium.' Based on the current information, the base of any artificial fill is anticipated at 5 feet below ground surface. Therefore, monitoring shall be required for all excavations below 5 feet below ground surface. Monitoring shall consist of visually inspecting fresh exposures of rock for larger fossil remains and, where appropriate, collecting wet or dry screened standard sediment samples (up to 4.0 cubic yards) of promising horizons for smaller fossil remains (SVP 2010). Depending on the conditions encountered, such as recognition of sedimentary facies too coarse to likely host significant fossils, full-time monitoring can be reduced to part-time inspections or ceased entirely if determined adequate by the Qualified Paleontologist. The Qualified Paleontologist may spot check the excavation on an intermittent basis and recommend whether the depth of required monitoring should be revised based on his/her observations. Monitoring activities shall be documented in a Paleontological Resources Monitoring Report to be prepared by the Qualified Paleontologist at the completion of construction and shall be provided to EMWD within six (6) months of Project completion. If fossil resources are identified during monitoring, the report will also be filed with the Natural History Museum of Los Angeles County.

GEO-3: If a paleontological resource is discovered during construction, the paleontological monitor shall be empowered to temporarily divert or redirect grading and excavation activities in the area of the exposed resource to facilitate evaluation of the discovery. An appropriate buffer area shall be established by the Qualified Paleontologist around the find where construction activities shall not be allowed to continue. Work shall be allowed to continue outside of the buffer area. At the Qualified Paleontologist's discretion and to reduce any construction delay, the grading and excavation contractor shall assist in removing rock samples for initial processing and evaluation of the find. All significant fossils shall be collected by the paleontological monitor and/or the Qualified Paleontologist. Collected fossils shall be prepared to the point of identification and catalogued before they are submitted to their final repository. Any fossils collected shall be curated at a public, non-profit institution with a research interest in the materials, such as the Natural History Museum of Los Angeles County, if such an institution agrees to accept the fossils. If no institution accepts the fossil collection, they shall be donated to a local school in the area for educational purposes. Accompanying notes, maps, photographs, and a technical report shall also be filed at the repository and/or school.

Significance Determination

Less than Significant Impact with Mitigation Incorporated

Phase 1 and Phase 2

Operation

Storage Tanks and Pipeline

Operation of the proposed facilities would not involve ground disturbance activities that could result in the destruction of paleontological resources. Therefore, no impacts to paleontological resources would occur.

Mitigation Measures

None Required

Significance Determination

No Impact

Cumulative Impacts

Impact 3.6-10: Concurrent construction and operation of the proposed project and related projects in the geographic scope could result in cumulative short-term and long-term impacts to geology and soils.

The cumulative projects considered in the analysis of cumulative impacts are listed in Table 3-2 and illustrated on Figure 3-1 in Chapter 3 of this Draft EIR. The cumulative projects include residential, mixed-use, industrial developments that would involve structures with the potential to expose people and property in the project area to hazards associated with seismic ground shaking, liquefaction, landslides, erosion, unstable geologic units, and expansive soils. However, because impacts relative to geologic hazards are generally site-specific, the geographic scope of analysis for cumulative geologic impacts encompasses and is limited to the project site and its immediately adjacent area. For example, the effect of erosion would tend to be limited to the localized area of a project and could only be cumulative if erosion occurred as the result of two or more adjacent projects that spatially overlapped.

None of the cumulative projects shown on Figure 3-1 would be located in proximity to the proposed project, and thus the projects could not have the potential to combine together with the proposed project to create a cumulatively considerable impact. Furthermore, the structural elements of the cumulative projects would undergo appropriate design-level geotechnical evaluations prior to final design and construction, and each proposed project would be required to comply with the applicable federal, state, and local regulations and engineering standards discussed in Section 3.6.2, *Regulatory Framework*. Operational activities required for the proposed project would not include activities that could result in geology and soils impacts. Therefore, the project's contribution to cumulative geology and soils impacts would be less than cumulatively considerable.

The region is known to have paleontological resources, and like the proposed project, other related projects in the vicinity that involve excavation into native soils have the potential to encounter paleontological resources due to prior discoveries in the area and the generally high sensitivity of underlying soils. Accordingly, cumulative impacts prior to mitigation would be significant. Similar to the proposed project, related projects would be required to implement monitoring and preservation measures or conditions of approval. With implementation of these measures, impacts would be reduced to a less than significant level.

Mitigation Measures

Implementation of Mitigation Measures GEO-1 through GEO-3.

Significance Determination

Less than Significant Impact with Mitigation Incorporated

3.6.4 References

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3.7 Hazards and Hazardous Materials

This section addresses the hazards and hazardous materials impacts associated with implementation of the proposed project. This section includes: a description of the existing hazards and hazardous materials in and around the proposed project site; a summary of applicable regulations related to hazards and hazardous materials; and an evaluation of the potential impacts of the proposed project related to hazards and hazardous materials at the proposed project site and in the surrounding area, including cumulative impacts.

Definition of Hazardous Materials and Hazardous Wastes. A “hazardous material” is defined as any material that, because of quantity, concentration, or physical or chemical characteristics, poses a significant present or potential hazard to human health and safety or to the environment if released into the workplace or the environment (State of California Health and Safety Code Chapter 6.95, Section 25501(p)). The term “hazardous materials” refers to both hazardous substances and hazardous wastes. Under federal and state laws, any material, including wastes, may be considered hazardous if it is specifically listed by statute as such or if it is toxic (causes adverse human health effects), ignitable (has the ability to burn), corrosive (causes severe burns or damage to materials), or reactive (causes explosions or generates toxic gases) (22 California Code of Regulations [CCR] 66261.21 to 66261.24).

In some cases, past industrial or commercial activities on a site could have resulted in spills or leaks of hazardous materials to the ground, resulting in soil and/or groundwater contamination. Hazardous materials may also be present in building materials and released during building demolition activities. If improperly handled, hazardous materials can cause health hazards when released to the soil, groundwater, or air. Individuals are typically exposed to hazardous materials through inhalation or bodily contact. Exposure can come as a result of an accidental release during transportation, storage, or handling of hazardous materials. Disturbance of subsurface soil during construction can also lead to exposure of workers or the public from stockpiling, handling, or transportation of soils contaminated by hazardous materials from previous spills or leaks.

3.7.1 Environmental Setting

The following sections describe the environmental setting for hazards and hazardous materials within the project area located in the city of Moreno Valley.

Existing Site Conditions

The proposed project site is located adjacent to Moreno Beach Drive just north of its intersection with Cottonwood Avenue in the city of Moreno Valley. The site is a steep hill rising in elevation from approximately 1,680 to 2,067 feet above mean seal level (amsl). The site is covered with boulders and has limited vegetation. The site is currently undeveloped with the exception of the existing EMWD water storage tank in the southeast corner of the property. An electrical transmission line parallels Moreno Beach Drive adjacent to the easterly property boundary. None of the poles contain transformers in this area.

Hazardous Materials in Soil and Groundwater

The potential for contamination in soil and groundwater within the project area is based on an environmental database review conducted to identify environmental cases, permitted hazardous materials uses, and spill sites within the boundaries of the city of Moreno Valley. Environmental cases are those sites that are suspected of releasing hazardous substances or have had cause for hazardous substances investigations and are identified on regulatory agency lists. Permitted hazardous material uses are facilities that use hazardous materials or handle hazardous wastes that operate under appropriate permits and comply with current hazardous materials and hazardous waste regulations. Spill sites are locations where a spill has been reported to the state or federal regulatory agencies. Such spills do not always involve a release of hazardous materials.

California Government Code Section 65962.5 requires state and local agencies to compile and update, at least annually, lists of hazardous waste sites and facilities. While Government Code Section 65962.5 makes reference to a “list,” commonly referred to as the Cortese List, this information is currently available from the following online data resources (California Environmental Protection Agency [CalEPA] 2022a):

- California State Water Resources Control Board (SWRCB) GeoTracker database, which identifies sites that impact groundwater or require groundwater cleanup, and
- California Department of Toxic Substances Control (DTSC) EnviroStor database, which identifies sites with known hazardous material contamination or warrant further investigation as well as facilities that treat, store, transfer, or dispose of hazardous waste.

These databases have compiled information from various sources that list known hazardous waste and hazardous substances sites in California. A review of the SWRCB GeoTracker and DTSC EnviroStor databases was conducted to identify active hazardous waste sites and facilities in the vicinity of proposed project.

The closest hazardous material site is the Moreno Valley USD- New Elementary School Site located approximately 1 mile southwest of the project area. The Moreno Valley Unified School District (MVUSD) proposes to acquire the 8.97-acre parcel to construct a new elementary school. Approximately 0.72-acres of the northwest corner is occupied by a residential dwelling and barn and 8.25-acres are vacant undeveloped former agriculture land that was used as a citrus orchard from at least 1938 to 2004. A 500-gallon diesel Aboveground Storage Tank (AST) was located south of the barn that was removed on July 11, 2017 by the owner. A gasoline powered windmill, located in the center of the field, was removed in early 2018. These past uses that caused contamination included agricultural/orchard chemicals and potential contaminants of concern included chlordane and lead (DTSC 2022a, b; SWRCB 2022). After investigation of soils on the site, it was determined that there were no previous releases of hazardous materials or naturally occurring hazardous materials at the site, and DTSC issued a No Further Action letter on August 29, 2019 (DTSC 2019). No other sites are located within 1 mile of the proposed project site.

Sensitive Receptors

Certain land uses, such as preschools, schools, daycare centers, nursing homes, and hospitals are considered sensitive receptors because children and the elderly are more susceptible to health problems related to hazardous materials and hazardous air emissions. The nearest school to the project site is Moreno Elementary School (26700 Cottonwood Avenue, Moreno Valley, CA) located approximately 1.3 miles west of the project site.

As shown in Figure 3.2-1 (refer to Section 3.2, *Air Quality and Greenhouse Gas Emissions*), the nearest sensitive receptors to the Phase 1 project site include:

- Single-family residences approximately 450 feet to the southwest of the project site along Ardell Lane.
- Single-family residences approximately 900 feet to the south of the project site at the corner of Cottonwood Avenue and Moreno Beach Drive.
- Single-family residences approximately 2,600 feet to the east of the project site along Cottonwood Avenue.
- Single-family residences approximately 1,050 feet to the north of the project site along Moreno Beach Drive.

Phase 2 of the proposed project is expected to begin in 2045, significantly later than Phase 1. Although there are no known future developments in that area, for the purpose of this analysis, and to assume worst-case conservative conditions to potential sensitive receptors, it is assumed that there would be additional new sensitive receptors during Phase 2 as listed below:

- Single-family residences approximately 80 feet to the east of the project site along Moreno Beach Drive.

The transmission pipeline connecting the proposed water storage tank to the existing water distribution system would be installed within the existing Moreno Beach Drive right-of-way. Residential uses along Moreno Beach Drive between Cottonwood Avenue and Alessandro Boulevard would be located as close as 25 feet from the proposed transmission pipeline construction area.

Airports

Riverside County Airport Land Use Commission (ALUC) is responsible for airport planning in the region and reviews land use compatibility issues for development surrounding airports including safety, noise, overflight and airspace protection. These compatibility issues are identified and analyzed in the Airport Land Use Compatibility Plans (ALUCPs) for each airport, and implementation of ALUCPs promotes compatible development around the airports (Riverside County ALUC 2004). An ALUCP focuses on a defined area around each airport known as the Airport Influence Area (AIA).

As described in Section 3.9, *Noise*, the nearest airport is the March Air Reserve Base located approximately 5 miles southwest of the project site. The Redlands Municipal Airport is the next closest airport, located approximately 10.8 miles northwest of the project site. The project site is not located within an AIA (Redlands City Council 2003; Riverside County ALUC 2014).

Emergency Operations Planning

The City of Moreno Valley Emergency Management and Volunteer Services is responsible for emergency response planning in the project area (City of Moreno Valley 2022a). Emergency plans that would be applicable to the proposed project are discussed in the local regulatory settings.

Wildfire Hazards

California Department of Forestry and Fire Protection (CAL FIRE) maps the Fire Hazard Severity Zones (FHSZ) for State and Local Responsibility Areas, including the City of Moreno Valley. The FHSZ are based on an evaluation of fuels, topography, dwelling density, weather, infrastructure, building materials, brush clearance, and fire history. According to the CAL FIRE FHSZ Viewer, the project area is located within a very high fire hazard severity zone (CAL FIRE 2022). See also Figure 3.13-1 in Section 3.13, *Wildfire*.

3.7.2 Regulatory Framework

Hazards and hazardous materials are subject to numerous federal, state, and local laws and regulations intended to protect health, safety, and the environment. The U.S. Environmental Protection Agency (USEPA), CalEPA, DTSC, Regional Water Quality Control Board (RWQCB), and City of Moreno Valley are the primary agencies enforcing these regulations. Local regulatory agencies enforce many federal and state regulations through the Certified Unified Program Agency (CUPA) program.

Federal

Federal agencies with responsibility for hazardous materials management include the USEPA, Department of Labor (Federal OSHA), and United States Department of Transportation (USDOT). Major federal laws and issue areas include the following statutes and regulations:

Resources Conservation and Recovery Act 42 USC 6901 et seq.

The Resources Conservation and Recovery Act (RCRA) is the principal law governing the management and disposal of hazardous materials. RCRA is considered a “cradle to grave” statute for hazardous wastes in that it addresses all aspects of hazardous materials from creation to disposal. RCRA applies to this project because RCRA is used to define hazardous materials, offsite disposal facilities and the wastes each may accept are regulated under RCRA.

Emergency Planning and Community Right-to-Know Act (from SARA Title III)

Emergency Planning and Community Right-to-Know Act (EPCRA) improved community access to information regarding chemical hazards and facilitated the development of business chemical inventories and emergency response plans. EPCRA also established reporting obligations for facilities that store or manage specified chemicals. EPCRA applies to this project because contractors who use hazardous materials (e.g., fuels, paints and thinners, solvents, etc.) would be required to prepare and implement written emergency response plans to properly manage hazardous materials and respond to accidental spills.

USDOT Hazardous Materials Transportation Act of 1975 (49 USC 5101)

USDOT, in conjunction with the USEPA, is responsible for enforcement and implementation of federal laws and regulations pertaining to safe storage and transportation of hazardous materials. CFR 49, 171–180, regulates the transportation of hazardous materials, types of material defined as hazardous, and the marking of vehicles transporting hazardous materials. This regulation applies to this project because contractors will be required to comply with its storage and transportation requirements, which would reduce the possibility of spills.

The Federal Motor Carrier Safety Administration (49 CFR Part 383-397)

The Federal Motor Carrier Safety Administration, a part of the USDOT, issues regulations concerning highway transportation of hazardous materials, the hazardous materials endorsement for a commercial driver's license, highway hazardous material safety permits, and financial responsibility requirements for motor carriers of hazardous materials. This regulation applies to this project because contractors would be required to comply with its storage and transportation requirements, which would reduce the possibility of spills.

Occupational Safety and Health Administration (29 USC 15)

OSHA is the federal agency responsible for ensuring worker safety. These regulations provide standards for safe workplaces and work practices, including those relating to hazardous materials handling. OSHA applies to this project because contractors would be required to comply with its hazardous materials management and handling requirements, which would reduce the possibility of spills.

State

The primary state agencies with jurisdiction over hazardous chemical materials management for the project area are the DTSC and the SWRCB, overseen by the local Santa Ana RWQCB. Other state agencies involved in hazardous materials management are the Department of Industrial Relations (State OSHA implementation), State Office of Emergency Services (OES)—California Accidental Release Prevention (CalARP) implementation, the California Air Resources Board (CARB), the California Department of Transpiration (Caltrans), the California Office of Environmental Health Hazard Assessment (Proposition 65 implementation), and California Integrated Waste Management Board. Hazardous materials management laws in California include the following statutes and regulations promulgated thereunder:

Hazardous Waste Control Act (California Health and Safety Code, Section 25100 et seq.)

The Hazardous Waste Control Act (HWCA) is the state equivalent of RCRA and regulates the generation, treatment, storage, and disposal of hazardous waste. This act implements the RCRA "cradle-to-grave" waste management system in California and extends regulation to certain hazardous wastes not covered by RCRA. The HWCA is also more stringent in its regulation of spent lubricating oil, small-quantity generators, transportation and permitting requirements, and includes increased penalties for violations.

Health and Safety Code, Section 2550 et seq.

This code and the related regulations in 19 CCR 2620 et seq., require local governments to regulate local business storage of hazardous materials in excess of certain quantities. The law also requires that entities storing hazardous materials be prepared to respond to releases. Those using and storing hazardous materials are required to submit a Hazardous Materials Business Plan (HMBP) to their local CUPA and to report releases to their CUPA and the State Office of Emergency Services. The Riverside County Department of Environmental Health (RCDEH), Environmental Protection and Oversight division is the designated CUPA in the County of Riverside. This code would apply to the project because the contractors would be required to prepare a HMBP that would provide procedures for the safe handling, storage, and transportation of hazardous materials.

California Accidental Release Prevention Program

The purpose of the CalARP is to prevent accidental releases of substances that can cause serious harm to the public and the environment, to minimize the damage if releases do occur, and to satisfy community right-to-know laws. This is accomplished by requiring businesses that handle more than a threshold quantity of a regulated substance listed in the regulations to develop a Risk Management Plan (RMP). An RMP is a detailed engineering analysis of the potential accident factors present at a business and the mitigation measures that can be implemented to reduce this accident potential. The RMP contains safety information, hazards review, operating procedures, training requirements, maintenance requirements, compliance audits, and incident investigation procedures (CalEPA 2022b).

California Hazardous Materials Release Response Plans and Inventory Law of 1985 (Business Plan Act)

The Business Plan Act requires preparation of hazardous materials business plans and disclosure of hazardous materials inventories, including an inventory of hazardous materials handled, plans showing where hazardous materials are stored, an emergency response plan, and provisions for employee training in safety and emergency response procedures (Health and Safety Code [HSC], Division 20, Chapter 6.95, Article 1). Statewide, DTSC has primary regulatory responsibility for management of hazardous materials, with delegation of authority to local jurisdictions that enter into agreements with the state. Local agencies are responsible for administering these regulations.

Several state agencies regulate the transportation and use of hazardous materials to minimize potential risks to public health and safety, including the CalEPA and the California Emergency Management Agency. The California Highway Patrol and Caltrans enforce regulations specifically related to the transport of hazardous materials. Together, these agencies determine which container types may be used to transport hazardous materials and grant licenses to hazardous waste haulers for hazardous waste transportation on public roadways.

The Business Plan Act applies to this project because contractors will be required to comply with its handling, storage, and transportation requirements that would reduce the possibility of spills, and to prepare an emergency response plan to respond to accidental spills.

California Division of Occupational Safety and Health

Cal/OSHA is responsible for developing and enforcing workplace safety standards and assuring worker safety in the handling and use of hazardous materials. Among other requirements, Cal/OSHA requires many entities to prepare injury and illness prevention plans and chemical hygiene plans, and provides specific regulations to limit exposure of construction workers to lead. OSHA applies to this project because contractors will be required to comply with its handling and use requirements that increase worker safety and reduce the possibility of spills, and to prepare an emergency response plan to respond to accidental spills.

Government Code Section 65962.5, Cortese List

The provisions in Government Code Section 65962.5 are commonly referred to as the “Cortese List” (after the legislator who authored and enacted the legislation). The list, or a site’s presence on the list, has bearing on the local permitting process, as well on compliance with CEQA. The list is developed with input from the State Department of Health Services, SWRCB, California Integrated Waste Management Board, and DTSC. At a minimum, at least annually, the DTSC is required to submit to the Secretary for Environmental Protection a list of the following:

1. All hazardous waste facilities subject to corrective action pursuant to Section 25187.5 of the Health and Safety Code.
2. All land designated as hazardous waste property or border zone property pursuant to Article 11 (commencing with Section 25220) of Chapter 6.5 of Division 20 of the Health and Safety Code.
3. All information received by the DTSC pursuant to Section 25242 of the Health and Safety Code on hazardous waste disposals on public land.
4. All sites listed pursuant to Section 25356 of the Health and Safety Code
5. All public drinking water wells that contain detectable levels of organic contaminants and that are subject to water analysis pursuant to Section 116395 of the Health and Safety Code.
6. All underground storage tanks for which an unauthorized release report is filed pursuant to Section 25295 of the Health and Safety Code.
7. All solid waste disposal facilities from which there is a migration of hazardous waste and for which a California Regional Water Quality Control Board has notified the Department of Toxic Substances Control pursuant to subdivision (e) of Section 13273 of the Water Code.
8. All cease and desist orders issued after January 1, 1986, pursuant to Section 13301 of the Water Code, and all cleanup or abatement orders issued after January 1, 1986, pursuant to Section 13304 of the Water Code, that concern the discharge of wastes that are hazardous materials.
9. All solid waste disposal facilities from which there is a known migration of hazardous waste.

The Secretary for Environmental Protection consolidates the information submitted pursuant to this section and distributes it in a timely fashion to each city and county in which sites on the lists are located, and to any other person upon request. The secretary may charge a reasonable fee to persons requesting the information, other than cities and counties, to cover the cost of developing, maintaining, and reproducing and distributing the information.

Utility Notification Requirements

Title 8, Section 1541 of the CCR requires excavators to determine the approximate locations of subsurface utility installations (e.g., sewer, telephone, fuel, electric, water lines, or any other subsurface installations that may reasonably be encountered during excavation work) prior to opening an excavation. The California Government Code (Section 4216 et seq.) requires owners and operators of underground utilities to become members of and participate in a regional notification center. According to Section 4216.1, operators of subsurface installations who are members or participate and share in the costs of a regional notification center are in compliance with this section of the code. Underground Services Alert of Southern California (known as DigAlert) receives planned excavation reports from public and private excavators and transmits those reports to all participating members of DigAlert that may have underground facilities at the location of excavation. Members will mark or stake their facilities, provide information, or give clearance to dig (DigAlert 2022). This requirement would apply to this project because any excavation would be required to identify underground utilities before excavation.

California Fire Code

The California Fire Code, Article 80, includes specific requirements for the safe storage and handling of hazardous materials. These requirements reduce the potential for a release of hazardous materials and for mixing of incompatible chemicals, and specify the following design features to reduce the potential for a release of hazardous materials that could affect public health or the environment:

- Separation of incompatible materials with a noncombustible partition.
- Spill control in all storage, handling, and dispensing areas.
- Separate secondary containment for each chemical storage system. The secondary containment must hold the entire contents of the tank, plus the volume of water needed to supply the fire-suppression system for a period of 20 minutes in the event of a catastrophic spill.

The California Fire Code, Article 79, includes specific requirements for the safe storage and handling of flammable and combustible liquids. Specific requirements address fire protection; prevention and assessment of unauthorized discharges; labeling and signage; protection from sources of ignition; specifications for piping, valving, and fittings; maintenance of aboveground tanks; requirements for storage vessels, vaults, and overfill protection; and requirements for dispensing, using, mixing, and handling of flammable and combustible liquids.

California Public Resources Code

The California Public Resources Code (PRC) was established in 1939 by the California Code Commission. The PRC contains law relating to natural resources, the conservation, utilization, and supervision thereof, along with mines and mining, oil and gas, and forestry. The following sections of the PRC are relevant to the proposed project:

PRC 4427

During any time of the year when burning permits are required in an area pursuant to this article, no person shall use or operate any motor, engine, boiler, stationary equipment, welding equipment, cutting torches, tarpots, or grinding devices from which a spark, fire, or flame may originate, which is located on or near any forest-covered land, brush-covered land, or grass-covered land, without doing both of the following:

(a) First clearing away all flammable material, including snags, from the area around such operation for a distance of 10 feet.

(b) Maintain one serviceable round point shovel with an overall length of not less than 46 inches and one backpack pump water-type fire extinguisher fully equipped and ready for use at the immediate area during the operation.

This section does not apply to portable power saws and other portable tools powered by a gasoline-fueled internal combustion engine.

PRC 4428

No person, except any member of an emergency crew or except the driver or owner of any service vehicle owned or operated by or for, or operated under contract with, a publicly or privately owned utility, which is used in the construction, operation, removal, or repair of the property or facilities of such utility when engaged in emergency operations, shall use or operate any vehicle, machine, tool or equipment powered by an internal combustion engine operated on hydrocarbon fuels, in any industrial operation located on or near any forest, brush, or grass-covered land between April 1 and December 1 of any year, or at any other time when ground litter and vegetation will sustain combustion permitting the spread of fire, without providing and maintaining, for firefighting purposes only, suitable and serviceable tools in the amounts, manner and location prescribed in this section:

(a) On any such operation a sealed box of tools shall be located, within the operating area, at a point accessible in the event of fire. This fire toolbox shall contain: one backpack pump-type fire extinguisher filled with water, two axes, two McLeod fire tools, and a sufficient number of shovels so that each employee at the operation can be equipped to fight fire.

(b) One or more serviceable chainsaws of three and one-half or more horsepower with a cutting bar 20 inches in length or longer shall be immediately available within the operating area, or, in the alternative, a full set of timber-felling tools shall be located in the fire toolbox, including one crosscut falling saw six feet in length, one double-bit ax with a 36-inch handle, one sledge hammer or maul with a head weight of six, or more, pounds and handle length of 32 inches, or more, and not less than two falling wedges.

(c) Each rail speeder and passenger vehicle, used on such operation shall be equipped with one shovel and one ax, and any other vehicle used on the operation shall be equipped with one shovel. Each tractor used in such operation shall be equipped with one shovel.

(d) As used in this section:

    (1) "Vehicle" means a device by which any person or property may be propelled, moved, or drawn over any land surface, excepting a device moved by human power or used exclusively upon stationary rails or tracks.

(2) "Passenger vehicle" means a vehicle which is self-propelled and which is designed for carrying not more than 10 persons including the driver, and which is used or maintained for the transportation of persons but does not include any motortruck or truck tractor.

PRC 4431

During any time of the year when burning permits are required in an area pursuant to this article, no person shall use or operate or cause to be operated in the area any portable saw, auger, drill, tamper, or other portable tool powered by a gasoline-fueled internal combustion engine on or near any forest-covered land, brush-covered land, or grass-covered land, within 25 feet of any flammable material, without providing and maintaining at the immediate locations of use or operation of the saw or tool, for firefighting purposes one serviceable round point shovel, with an overall length of not less than 46 inches, or one serviceable fire extinguisher. The Director of Forestry and Fire Protection shall by administrative regulation specify the type and size of fire extinguisher necessary to provide at least minimum assurance of controlling fire caused by use of portable power tools under various climatic and fuel conditions. The required fire tools shall at no time be farther from the point of operation of the power saw or tool than 25 feet with unrestricted access for the operator from the point of operation.

PRC 4442

(a) Except as otherwise provided in this section, no person shall use, operate, or allow to be used or operated, any internal combustion engine which uses hydrocarbon fuels on any forest-covered land, brush-covered land, or grass-covered land unless the engine is equipped with a spark arrester, as defined in subdivision (c), maintained in effective working order or the engine is constructed, equipped, and maintained for the prevention of fire pursuant to Section 4443.

(b) Spark arresters affixed to the exhaust system of engines or vehicles subject to this section shall not be placed or mounted in such a manner as to allow flames or heat from the exhaust system to ignite any flammable material.

(c) A spark arrester is a device constructed of nonflammable materials specifically for the purpose of removing and retaining carbon and other flammable particles over 0.0232 of an inch in size from the exhaust flow of an internal combustion engine that uses hydrocarbon fuels or which is qualified and rated by the United States Forest Service.

(d) Engines used to provide motive power for trucks, truck tractors, buses, and passenger vehicles, except motorcycles, are not subject to this section if the exhaust system is equipped with a muffler as defined in the Vehicle Code.

(e) Turbocharged engines are not subject to this section if all exhausted gases pass through the rotating turbine wheel, there is no exhaust bypass to the atmosphere, and the turbocharger is in effective mechanical condition.

(f) Motor vehicles when being operated in an organized racing or competitive event upon a closed course are not subject to this section if the event is conducted under the auspices of a recognized sanctioning body and by permit issued by the fire protection authority having jurisdiction.

Local

Certified Unified Program Agency

In 1993, SB 1082 was passed by the state legislature to streamline the permitting process for those businesses that use, store, or manufacture hazardous materials. The passage of SB 1082 provided for the designation of a CUPA that would be responsible for the permitting process and collection of fees. The CUPA would be responsible for implementing at the local level the Unified Program, which serves to consolidate, coordinate, and make consistent the administrative requirements, permits, inspections, and enforcement activities for the following environmental and emergency management programs:

- Hazardous Waste
- Hazardous Materials Business Plan
- California Accidental Release Prevention Program
- Underground Hazardous Materials Storage Tanks
- Aboveground Petroleum Storage Tanks/Spill Prevention Control & Countermeasure Plans
- Hazardous Waste Generator and OnSite Hazardous Waste Treatment (tiered permitting) Programs

As described above, the RCDEH Environmental Protection and Oversight division is the designated CUPA in the County of Riverside and includes the City of Moreno Valley.

Riverside County Emergency Operations Plan

The County of Riverside Emergency Operations Plan (EOP) was formally adopted by the County Board of Supervisors in 2019. The EOP detailed emergency response checklists outlining procedures to be followed in the event of natural disasters, severe storms, major system failures, or terrorist attacks within the Riverside County Operational Area (OA), which includes the project area. The EOP focuses on coordinating mutual aid and provides an overview of the operational concepts relating to various emergency situations, identifies components of the emergency response, and describes the overall responsibilities of the OA for supporting stakeholders in protecting life and property. In addition, the EOP addresses the roles and responsibilities of the County during all-hazards emergency response. Specifically, the EOP identifies and describes interaction with the County of Riverside, State, and Federal entities, the role of the OA Emergency Operations Center (EOC), and the coordination that occurs between the EOC and OA departments and agencies (County of Riverside 2019).

Riverside County Multi-Jurisdictional Local Hazard Mitigation Plan (MJLHP)

The Riverside County OA's MJLHP identifies the County's hazards, reviews and assess past disaster occurrences, estimates the probability of future occurrences, and set goals to mitigate potential risks to reduce or eliminate long-term risk to people and property from natural and man-made hazards. The plan was prepared pursuant to the requirements of the Disaster Mitigation Act of 2000 to achieve eligibility and potentially secure mitigation funding through Federal Emergency Management Agency (FEMA) Flood Mitigation Assistance, Pre-Disaster Mitigation, and Hazard Mitigation Grant Programs (County of Riverside 2018).

Riverside County Hazardous Waste Management Plan

The Riverside County Hazardous Waste Management Plan (CHWMP) was adopted in 1989 and uses a framework of 24 programs to serve as the county's primary planning document for the management of hazardous substances. Its policies include:

- Comply with federal and state laws pertaining to the management of hazardous wastes and materials.
- Ensure active public participation in hazardous waste and hazardous materials management decisions in Riverside County.
- Coordinate hazardous waste facility responsibilities on a regional basis through the Southern California Hazardous Waste Management Authority.
- Encourage and promote the programs, practices, and recommendations contained in the County Hazardous Waste Management Plan, giving the highest waste management priority to the reduction of hazardous waste at its source.

City of Moreno Valley Local Hazard Mitigation Plan

The City of Moreno Valley Local Hazard Mitigation Plan (LHMP) is designed to identify, reduce, or eliminate the long-term natural hazard risks to life, property, and the environment. Key components of the plan include hazard identification, asset inventory, risk analysis, loss estimation, and mitigation strategies to reduce the effects of these hazards. The primary goal of the LHMP is to (City of Moreno Valley 2017):

> "*Achieve acceptable levels of protection from natural and man-made hazards to life, health, and property"*

City of Moreno Valley General Plan

The following policies within the City of Moreno Valley General Plan are related to hazards and hazardous materials (City of Moreno Valley 2021):

Goal S-1: Protect life and property from natural and humanmade hazards.

S.1-12: Work to prevent wildland fire and to protect lives, property, and watersheds from fire dangers.

S.1-13: Jointly with State, County, local and other agencies, inform property owners of wildfire risks and measures to reduce those risks.

S.1-14: Require new development in Very High FHSZs to prepare a Fire Protection Plan that minimizes risks by:

- Assessing site-specific characteristics such as topography, slope, vegetation type, wind patterns etc.;
- Siting and designing development to avoid hazardous locations (eg. through fire breaks) to the extent feasible;
- Incorporating fuel modification and brush clearance techniques in accordance with applicable fire safety requirements and carried out in a manner which reduces impacts to environmentally sensitive habitat to the maximum feasible extent;

- Using fire-safe building materials and design features, consistent with the adopted Municipal Code and Fire and Building Code standards;
- Using fire-resistant landscaping; and
- Complying with established standards and specifications for fuel modification, defensible space, access, and water facilities.

S.1-15: Avoid, where feasible, locating new development in areas subject to high wildfire risk. If avoidance is not feasible, condition such new development on implementation of measures to reduce risks associated with that development.

S.1-16: Require that all new development located in a Very High Fire Hazard Severity Zone (VHFHSZ) or a State Responsibility Area (SRA) is served by adequate infrastructure, including safe access for emergency response vehicles, visible street signs, and water supplies for fire suppression.

S.1-17: Require new development in VHFHSZs to enter into a long-term maintenance agreement for vegetation management in defensible space, fuel breaks, and roadside fuel reduction.

S.1-18: Continue to require proactive weed abatement, brush thinning, and removal services on new and existing development in High and Very High Fire Hazard Severity Areas in order to curb potential fire hazards

S.1-25: Consistent with State regulations, require proper storage and disposal of hazardous materials to reduce the likelihood of leakage, explosions, or fire, and to properly contain potential spills from leaving the site.

Goal S-2: Provide effective response to disasters and emergencies.

S.2-1: Use the adopted Local Hazard Mitigation Plan and Emergency Operations Plan to guide actions and investments for emergency preparedness and response.

3.7.3 Impact Analysis and Mitigation Measures

Thresholds of Significance

The following criteria from CEQA Guidelines Appendix G are used as thresholds of significance to determine the impacts of the proposed project as related to hazards and hazardous materials. The proposed project would have a significant impact if it would:

1. Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials.
2. Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment.
3. Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within 0.25 miles of an existing or proposed school.
4. Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code § 65962.5 and, as a result, would it create a significant hazard to the public or the environment.

5. For a project located within an airport land use plan or, where such a plan has not been adopted, within 2 miles of a public airport or public use airport, would the project result in a safety hazard or excessive noise for people residing or working in the project area.
6. Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan.
7. Expose people or structures, either directly or indirectly, to a significant risk of loss, injury or death involving wildland fires.
8. Result in cumulatively considerable impacts to hazards and hazardous materials.

Impact Analysis

Transport and Release of Hazardous Materials

Impact 3.7-1: The proposed project could create a significant hazard to the public or the environment through the routine transport, use, disposal of hazardous materials, or the upset and accident conditions involving the release of hazardous materials into the environment.

Phase 1 and Phase 2

Construction

Storage Tanks and Pipeline

Construction activities would be required for installation of both Phase 1 and Phase 2 storage tanks, associated facilities, and the transmission pipeline. The construction activities would involve site preparation and clearing, demolition, trenching, excavation, facility installation, grading, and other ground-disturbing activities. The anticipated construction activities would temporarily require the transport, use, and disposal of hazardous materials including gasoline, diesel fuel, hydraulic fluids, paint, and other similarly related materials. In addition, construction activities would require the use of heavy equipment that would contain oil, gasoline, or other fluids, and would likely be stored on and transported to the various project locations during the construction period.

Accidental release of these materials could occur during routine transport, disposal, or use, and could potentially injure construction workers, contaminate soil, and/or affect nearby groundwater or surface water bodies. Impacts associated with accidental release, although likely localized, could potentially create a significant hazard to the public or the environment. Cal/OSHA regulations provide for the proper labeling, storage, and handling of hazardous materials to reduce the potential harmful health effects that could result from worker exposure to hazardous materials. If not properly handled; however, accidental release of these substances could expose construction workers, degrade soils, or become entrained in stormwater runoff, resulting in adverse effects on the public or the environment. EMWD is required to comply with all relevant and applicable federal, State and local laws and regulations that pertain to the transport, storage, use, and disposal of hazardous materials and waste during construction of proposed facilities.

As discussed in Section 3.8, *Hydrology and Water Quality*, construction projects that disturb one acre of land or more are required to obtain coverage under the National Pollutant Discharge and Elimination System (NPDES) General Construction Permit. EMWD would prepare a SWPPP in compliance with Section 402 of the Federal CWA and would file a Notice of Intent with the

SWRCB to obtain coverage under the SWRCB NPDES General Construction Permit (Order 2009-0009-DWQ as amended by 2010-0014-DWQ and 2012-0006-DWQ). The SWPPP would include spill prevention measures to avoid and, if necessary, clean up accidental releases of hazardous materials. Compliance with all NPDES Construction General Permit requirements including the preparation and implementation of a SWPPP and associated best management practices (BMPs) would minimize the potential for mishandling and/or the release of hazardous materials. Therefore, compliance with the applicable regulations would ensure that construction of the proposed facilities under Phase 1 and Phase 2 would not create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials, or the accidental release of hazardous materials. Impacts would be less than significant.

Operation

Storage Tanks and Pipeline

Operation of the proposed project would consist of facilities designed to store and transport water. Maintenance activities of the facilities may include, but are not limited to, replacement of non-operational machinery and inspection and maintenance of all structures. Implementation of the proposed project would not require any new employees for operation or maintenance activities. The use of maintenance equipment and worker vehicles transporting workers to the project area would require periodic transport and use of fuels and chemicals. Thus, hazardous materials are not anticipated to be used during operation and maintenance of the facilities more than compared to existing conditions. Further, any use of hazardous materials and substances during operations would be subject to the federal, state, and local health and safety requirements for the handling, storage, transportation, and disposal of hazardous materials. Compliance with all applicable regulations is required. As a result, operational impacts related to the transport, use, or disposal of hazardous materials, and the accidental release of hazardous materials would be less than significant.

Mitigation Measures

None Required

Significance Determination

Less than Significant Impact

Emit Hazardous Materials Near Schools

Impact 3.7-2: The proposed project could emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within 0.25 miles of an existing or proposed school.

Phase 1 and Phase 2

Construction and Operation

Storage Tanks and Pipeline

As discussed above in Section 3.7.1, *Environmental Setting*, there are no schools 0.25 miles of existing or proposed facilities. Therefore, the proposed project would not emit hazardous emissions or handle hazardous materials, substances, or waste within 0.25 miles of an existing or proposed school. No impact would occur.

Mitigation Measures

None Required

Significance Determination

No Impact

Hazardous Materials Sites

Impact 3.7-3: The proposed project could be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code § 65962.5 and, as a result, would create a significant hazard to the public or the environment.

Phase 1 and Phase 2

Construction and Operation

Storage Tanks and Pipeline

Government Code Section 65962.5 requires the CalEPA to develop and annually update the Cortese List, which is a list of hazardous waste sites and other contaminated sites. While the Cortese list is no longer maintained as a single list, federal, State, and local regulatory agencies publish databases of businesses and properties that handle hazardous materials or hazardous waste to comply with Government Code 65962.5. As discussed in Section 3.7.1, *Environmental Setting*, the SWRCB GeoTracker and DTSC EnviroStor online databases were reviewed to identify active sites and facilities in the project area that could be disturbed or otherwise impacted by the project, thereby exposing people or the environment to contamination and adverse health impacts. If a listed site was identified in proximity to the project site, further review of available groundwater/soil monitoring data, treatment records and interagency letters was conducted to evaluate the level of contamination that is present in the project area.

The hazardous sites analysis undertaken for this project revealed that the proposed project is not located on a hazardous materials site or hazardous waste site. The closest hazardous material site (Moreno Valley USD – New Elementary School Site) is located approximately 1 mile southwest of the project area. After investigation of soils on this site, DTSC issued a No Further Action letter on August 29, 2019 and the site is now “closed” (DTSC 2019). The case-closed status indicates that DTSC has determined the existing soil contamination at this site no longer poses a substantial threat to people or the environment. Therefore, the proposed project would not be located on or immediately adjacent to a hazardous material site and would not create a significant hazard to the public or environment during construction or operation.

Mitigation Measures

None Required

Significance Determination

No Impact

Airports

Impact 3.7-4: The proposed project could result in a safety hazard or excessive noise for people residing or working in the project area within an airport land use plan or 2 miles of a public airport or public use airport.

Phase 1 and Phase 2

Construction and Operation

Storage Tanks and Pipeline

As discussed above in Section 3.7.1, *Environmental Setting*, the closest airport to the project area is the Redlands Municipal Airport located approximately 10.8 miles northwest of the project site. The project site is not located within the airport's AIA zone (Redlands City Council 2003). Therefore, the proposed project would not be located within an airport land use plan or within 2 miles of a public airport or public use airport, and therefore, would not result in a safety hazard or excessive noise for people residing or working in the project area.

Mitigation Measures

None Required

Significance Determination

No Impact

Emergency Response or Evacuation Plan

Impact 3.7-5: The proposed project could impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan.

Phase 1 and Phase 2

Construction

Storage Tanks

Construction of the Phase 1 and 2 storage tanks would be located outside the public rights-of-ways. As such, public evacuation routes would not be impacted. During construction, truck haul trips would transport construction equipment and materials to and from the proposed project site; however, these trips would not impact the roadway in a way that would impede emergency evacuations. The truck trips would not require closure of any roadways and would only temporary slow traffic near the project site. Project-related vehicles would not block existing street access to the sites. Therefore, no impacts related to an emergency evacuation plan would occur during construction.

Pipeline

Construction activities associated with the proposed transmission pipeline route would occur within the public right-of-way and would temporarily restrict vehicular traffic. The proposed project would include localized closure of traffic lanes, including portions of Moreno Beach Drive, Cottonwood Avenue, Bay Avenue, and Alessandro Boulevard, in order to install the proposed pipeline. Lane closures have the potential to increase traffic on local roads and intersections, block access to roadways or driveways, and disrupt or delay the response times of emergency responders. During partial road closures, impacts on emergency responders would be limited, since passage through intersections would be maintained. Although the construction-related impacts would be temporary, they could potentially impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan. The City of Moreno Valley Local Hazard Mitigation Plan provides an evacuation map which designates Moreno Beach Drive as a primary evacuation route (City of Moreno Valley 2022b). However, in order to ensure emergency access and safety on the local roadway network, **Mitigation Measure TRA-1** (Refer to Section 3.10, *Transportation*) would require preparation of a Traffic Control Plan identifying specific traffic control measures and that appropriate emergency service providers are notified ahead of planned road closures. Therefore, impacts to emergency response and emergency evacuation planning during construction would be reduced to less than significant levels with implementation of mitigation.

Operation

Storage Tanks

Operation of the proposed Phase 1 and Phase 2 facilities would not impair or physically interfere with an adopted emergency response plan or emergency evacuation plan. The facilities consist of water storage and transport infrastructure which, during operation, would not interfere with traffic flows. The proposed facilities would require periodic maintenance activities, including, but not limited to replacement of non-operational machinery and inspection of structures. Maintenance activities would require minimal trips that would not significantly impact the surrounding roadways. Therefore, operation of the proposed aboveground facilities would have a less than significant impact to emergency response plans and emergency evacuation.

Pipeline

Following construction, operation of the proposed transmission pipeline would not impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan as the pipelines would be located underground. Maintenance activities would require minimal trips and would not significantly impact the surrounding roadways. Impacts to an adopted emergency plan or emergency evacuation plan during operation would be considered less than significant.

Mitigation Measures

Implement Mitigation Measure TRA-1 (Refer to Section 3.10, *Transportation*).

Significance Determination

Less than Significant Impact with Mitigation Incorporated

Wildland Fires

Impact 3.7-6: The proposed project could expose people or structures, either directly or indirectly, to a significant risk of loss, injury or death involving wildland fires.

Phase 1 and Phase 2

Construction

Storage Tanks and Pipeline

According to the CAL FIRE FHSZ Viewer, the project area is located within a very high fire hazard severity zone (CAL FIRE 2022) and therefore, the project area would be subject to high wildfire risks (see Figure 3.13-1 in Section 3.13, *Wildfire*). The primary fire hazards from project construction would involve the use of vehicles and equipment. Heat or sparks from construction vehicles and equipment could ignite dry vegetation and create hazardous fire conditions. Additionally, construction activities (e.g., tank construction) could result in sparks creating a source of ignition. Therefore, depending on the time of year (as seasonality may affect climate conditions, prevailing winds, and vegetation/fuels) and the type/location of construction activities, the increase in sources of potential ignition associated with project construction could exacerbate the risk of wildfire. This is considered a potentially significant impact.

As explained above in Section 3.7.2, *Regulatory Framework* and in further detail in Section 3.13, *Wildfire*, all personnel on the proposed project sites would be required to comply with Public Resources Code (PRC) Sections 4427, 4428, 4431, and 4442, which include regulations relating to the handling of combustible fuels and equipment that can exacerbate fire risks. During construction, strict adherence to these PRC sections would ensure that contractors are responsible for all monitoring and safety measures ensuring that any risk to exacerbate wildfire would be reduced. Additionally, all construction must comply with fire protection and prevention requirements specified by the California Code of Regulations (CCR) and Cal/OSHA. This includes various measures such as easy accessibility of firefighting equipment, proper storage of combustible liquids, no smoking in service and refueling areas, operation of a blaster and handling of explosive materials during blasting activities, and worker training for firefighter extinguisher use. Furthermore, implementation of **Mitigation Measure WDF-1** would be required to ensure fire hazard reduction measures are implemented during proposed project activities to further reduce the potential for wildfire impacts on project workers. As a result, the potential impact during construction would be reduced to a less than significant level with mitigation.

Operation

Storage Tanks and Pipeline

Operation-related activities would involve a limited number of maintenance trucks for inspections and material delivery. These trucks would be limited to established roads and would have a low potential of producing sparks, fire, or flame, that could result in uncontrolled spread of wildfire. As a result, impacts would be less than significant.

Mitigation Measures

Implement Mitigation Measure WDF-1 (Refer to Section 3.13, *Wildfire*).

Significance Determination

Less than Significant Impact with Mitigation Incorporated

Cumulative Impacts

Impact 3.7-7: Concurrent construction and operation of the proposed project and related projects in the geographic scope could result in cumulative short-term and long-term impacts to hazards and hazardous materials.

The cumulative projects considered in the analysis of cumulative impacts are listed in Table 3-2 and illustrated on Figure 3-1 in Chapter 3 of this Draft EIR. While none of the cumulative projects 1 through 12 are located in Very High Fire Hazard Severity Zones, they could result in significant cumulative environmental effects due to exposure of people or structures to hazards and hazardous materials during construction and operation.

Similar to the proposed project, construction of cumulative projects 1 through 12 would temporarily require the transport, use, and disposal of hazardous materials including fuels, oils and lubricants, solvents and cleaners, cements and adhesives, paints and thinners, degreasers, cement and concrete, asphalt mixtures and other similarly related materials. As with the proposed project, cumulative projects 1 through 12 would be required to comply with applicable federal, state and local regulations regarding the handling, storage, transportation, and disposal of hazardous materials. In addition, in the event that the project design of cumulative projects has the potential to adversely affect emergency access routes during construction, the cumulative projects would be required to implement a mitigation measure similar to Mitigation Measure TRA-1 that would implement a traffic control plan to prevent interfering with emergency access. Furthermore, as with the proposed project, cumulative projects 1 through 12 would be located within areas designated as a very high fire hazards risk area. Other cumulative developments would also be required to implement fire reduction building techniques and design to reduce potential impacts regarding wildland fires. Because the potential impacts to schools, airport hazards, emergency response and emergency evacuation plans, and wildfire risk associated with the implementation of the proposed project would be less than significant with implementation of Mitigation Measures TRA-1 and WDF-1, the proposed project’s contribution to cumulative hazards and hazardous materials impacts would be considered less than cumulatively considerable. Thus, a less than significant cumulative impact would occur to hazards and hazardous materials.

Mitigation Measures

> Implement Mitigation Measures TRA-1 (refer to Section 3.10, *Transportation*) and WDF-1 (refer to Section 3.13, *Wildfire*).

Significance Determination

Less than Significant Impact with Mitigation Incorporated

3.7.4 References

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State Water Resources Control Board (SWRCB), 2022. GeoTracker. Available online at: https://geotracker.waterboards.ca.gov/map/?CMD=runreport&myaddress=moreno+valley, accessed November 2022.

3.8 Hydrology and Water Quality

This section addresses the hydrology and water quality impacts associated with implementation of the proposed project. This section includes: a description of the existing hydrology and water quality conditions in and around the proposed project site; a summary of applicable regulations related to hydrology and water quality; and an evaluation of the potential impacts of the proposed project related to hydrology and water quality at the proposed project site and in the surrounding area, including cumulative impacts. The information in this section is partially based on the *Preliminary Design Report for the Pettit 1674-Zone Storage Water Tank Expansion and Transmission Pipeline Project* (PDR) (Kleinfelder 2017), and Appendix H to the PDR, the *Report of Geotechnical Investigation – Proposed Pettit Potable Water Storage Tank Expansion and Transmission Pipeline*, dated September 2016, that were prepared for the proposed project. The PDR and supporting appendices is included as Appendix PDR to this Draft EIR.

3.8.1 Environmental Setting

Surface Water Hydrology

Watersheds are defined as areas of land where the water that is under it, or that drains off it, flows to the same place. The Santa Ana Regional Water Quality Control Board (RWQCB) identifies watersheds and various groupings and subdivisions (e.g., watershed management areas, watersheds, hydrologic areas, and hydrologic subareas) in the Santa Ana RWQCB Basin Plan. Moreno Valley is located within the Santa Ana River and the San Jacinto River watersheds; the two watersheds are separated by a minor topographic divide extending southward from the Box Springs Mountains across the western portion of the city.

The proposed water storage tank and transmission pipeline site is located approximately 6 miles north of the San Jacinto River. The river drains approximately 540 square miles to the Railroad Canyon Reservoir (Canyon Lake), which occasionally discharges into Lake Elsinore and Temescal Wash, a tributary of the Santa Ana River, during periods of high rainfall. However, discharges from the two lakes are very rare (Santa Ana Watershed Project Authority [SAWPA] 2018; City of Moreno Valley 2021a). There are no other perennial rivers or streams near or within the footprint of the proposed water storage tank or transmission pipeline alignment.

EMWD holds a right to divert up to 5,760 AFY of San Jacinto River flows for recharge and subsequent use from September 1st through June 30th each year. EMWD's diverted water is recharged into the groundwater aquifer of the Canyon Groundwater Management Zone and is not used for direct use or sale. The San Jacinto River is an ephemeral river and, consequently, river flows may be insufficient for any diversion at all in some years. Water that is recharged helps the regional water balance and contributes to the safe yield of the basin (EMWD 2021a).

Drainage

Most of Moreno Valley including the proposed project site drains from north to south into the San Jacinto River via three major storm drain channels: the Sunnymead Storm drain, the Kitching Storm Drain, and the Perris Valley Storm Drain (City of Moreno Valley 2021a, 2021b). The

Riverside County Flood Control and Water Conservation District (RCFCWCD) is responsible for regional flood control and drainage facilities in the project area, while the City of Moreno Valley controls a number of local facilities that feed into the RCFCWCD regional system. The proposed water storage tank site slopes steeply down from west to east. Two existing stormdrains located near the eastern boundary of the site convey stormwater under Moreno Beach Drive (Refer to Figure 2-2). The vacant land to the east of the storage tank site and opposite Moreno Beach Drive includes two ephemeral drainages that convey water southeast towards a metal culvert storm drain, which connects to a concrete channel that conveys stormwater flows south of Cottonwood Avenue and back west to Moreno Beach Drive. South of Cottonwood Avenue, Moreno Beach Drive includes drainage ditches and a concrete channel on the along the eastern side of the roadway that receive flows from northern storm drains/pipes and convey to the broader storm drain system described above. Ultimately, stormwater flows from the project area are conveyed southwest to the Perris Valley Channel and the San Jacinto River via the existing RCFCWCD drainage network (RCFCWD 2023). The drainages that convey water in a southerly direction from the project site are discussed further in Section 3.3, *Biological Resources* and are shown in Figures 3.3-3a-c.

Surface Water Quality

Surface water quality in the project area is regulated by the Santa Ana RWQCB (Region 8). The Santa Ana Regional Water Quality Control Board Basin Plan (Basin Plan) establishes water quality standards for all the ground and surface waters of the region (Santa Ana RWQCB 2008). As noted above, there are no established rivers, streams, or lakes within the project footprint, and thus no surface water quality data. Furthermore, the Santa Ana RWQCB does not identify any water bodies within the project area, or within the area which the project area drains into, as currently listed on the federal Clean Water Act (CWA) 303(d) list (City of Moreno Valley 2021b).

Groundwater

EMWD produces potable groundwater from wells in two management plan areas within the San Jacinto Groundwater Basin (DWR Bulletin 118 Groundwater Basin Number 8-05). The areas are the West San Jacinto Groundwater Sustainability Agency Plan Area (West San Jacinto Basin), where the proposed project site is located, and the Hemet/San Jacinto Water Management Plan area (Hemet/San Jacinto Basin). EMWD also owns and operates three desalination plants that convert brackish groundwater from the West San Jacinto Basin into potable water: the Menifee Desalter, the Perris I Desalter, and the Perris II Desalter. Desalination of groundwater from the West San Jacinto Basin increases groundwater supply reliability in the basin by helping manage increasing groundwater levels that are due to decreased production, and also prevents migration of brackish groundwater that could otherwise contaminate potable groundwater supplies. Groundwater extraction for use in the desalter program has caused local declines in water levels to date; but the overall West San Jacinto Basin shows groundwater levels that continue to exhibit a stable or upward trend (EMWD 2021a). DWR has deemed the West San Jacinto Basin a high priority basin, but not critically overdrafted (EMWD 2022).

EMWD has an extensive and proactive groundwater monitoring program that includes collecting, compiling and analyzing data related to groundwater quality. According to EMWD's Final 2020 Urban Water Management Plan (UWMP) (EMWD 2021a), there are no known significant threats to EMWD's groundwater supply that cannot be mitigated by treatment or blending and EMWD does not anticipate a significant loss of supply due to water quality issues. The West San Jacinto Basin was formerly governed by the West San Jacinto Groundwater Basin Management Plan. EMWD, now acting as the Groundwater Sustainability Agency (GSA) for the non-adjudicated portions of the San Jacinto Groundwater Basin, has developed a Groundwater Sustainability Plan (GSP) in compliance with the 2014 Sustainable Groundwater Management Act (SGMA). EMWD's GSP for the West San Jacinto Basin is discussed further below in Section 3.8.2, *Regulatory Framework*, *Sustainable Groundwater Management Act*.

During the geotechnical investigation conducted for the proposed storage tank site (Kleinfelder 2016), groundwater was not encountered to the maximum depth explored (31.5 feet bgs) and review of the nearest well records indicated that groundwater depths in the site vicinity ranged between 61 and 197 feet bgs. A recent review of the California Department of Water Resources (DWR) data library indicates that depths recorded by the wells have not changed substantially since the report was prepared (DWR 2022). As such, groundwater at the site is not anticipated to be encountered during construction. However, the report states that fluctuations of the groundwater level, localized zones of shallow perched water, and a rise in soil moisture content should be anticipated during and following the rainy season. Irrigation of landscaped areas on or adjacent to the site can also lead to an increase in soil moisture levels and fluctuations of shallow perched groundwater levels

Imported Water

EMWD has a diverse portfolio of local and imported supplies, including recycled water, potable groundwater, and desalinated groundwater. In addition to local supplies, EMWD receives imported water from the Metropolitan Water District of Southern California (Metropolitan) in three forms: delivered directly as potable water, delivered to EMWD as raw water and then treated at EMWD's two local filtration plants, or delivered to EMWD as raw water for non-potable use and groundwater recharge. About half of the water used in EMWD's service area is imported by Metropolitan. Through the implementation of local supply projects and increased water use efficiency, EMWD has been able to maintain a balance of local and imported water even as new connections have been added. Based on information provided by EMWD and other Metropolitan member agencies, Metropolitan has determined it is able to meet the demands of all member agencies through 2045 (EMWD 2021a).

Flood Hazards

There are four types of flooding conditions that exist in Moreno Valley: flooding in defined watercourses; ponding; sheet flow; and dam inundation. Flooding within defined watercourses occurs within drainage channels and immediately adjacent floodplains. Ponding occurs when water flow is obstructed due to manmade obstacles such as the embankments of SR-60 and other roadways. Sheet flow occurs when capacities of defined watercourses are exceeded and water flows over broad areas (City of Moreno Valley 2017). Dam failure can result from causes such as earthquakes, erosion, improper siting, rapidly rising floodwaters, or structural/design flaws, and can result in severe flooding in downstream areas (City of Moreno Valley 2021a).

Based on review of Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRMs) and the Riverside County General Plan, the segment of the proposed transmission pipeline between Cottonwood Avenue and Alessandro Boulevard is mapped as Zone X (0.2% annual chance flood zone) (FEMA 2008). This designation is given to “moderate flood hazard areas” that would be inundated by a flood event having a 0.2 percent chance of being equaled or exceeded in a given year (i.e. areas that are between the limits of the base flood, or 100-year flood, and the 500-year flood) (FEMA 2020). The proposed storage tank site is located outside of the 500-year flood zone.

With regard to dam inundation, two dams are located near the proposed project: Pigeon Pass Dam and Perris Dam. Failure of the Pigeon Pass Dam located approximately 4.5 miles northwest of the project area could result in extensive flooding along the downstream watercourse; however, the proposed project is 3 miles east of the dam inundation zone and would not be at risk of flooding in the event of dam failure. Failure of the Perris Dam would only affect a very small area south of Nandina Avenue along the Perris Valley Storm Drain and the Mystic Lake area in the southeast corner of Moreno Valley (City of Moreno Valley 2021b); dam failure would not reach the project area due to site topography. Based on review of the California Department of Water Resources (DWR) Division of Safety of Dams’ (DSOD) dam breach inundation map database, the project site is not in an area that would be subject to inundation hazards (DSOD 2022).

Tsunami and Seiche Hazards

A tsunami is a large wave or series of waves generated by an earthquake, volcanic eruption, or coastal landslide on the ocean. Similar in cause to a tsunami, a seiche is a standing wave that occurs on rivers, reservoirs, ponds, and lakes when seismic waves from an earthquake pass through the area. The proposed project site is not located near the ocean or standing water bodies (e.g., lakes) and therefore is not within a tsunami or seiche hazard zone.

3.8.2 Regulatory Framework

Federal

Safe Drinking Water Act

The Safe Drinking Water Act (SDWA) was established to protect the quality of drinking water in the United States. The SDWA focuses on all waters actually or potentially designed for drinking uses, whether from above ground or underground sources. The principal federal agency involved in drinking water regulation is the United States Environmental Protection Agency (USEPA). USEPA is responsible for implementing federal drinking water law and setting national drinking water requirements. Under the SDWA, the USEPA sets minimum drinking water quality standards. In California, the SWRCB’s Division of Drinking Water (DDW) regulates public drinking water systems. DDW works with county environmental health departments to regulate drinking water suppliers through a permit program with monitoring and reporting requirements that enforce water quality standards.

Floodplain Management, Executive Order No. 11988

Executive Order 11988 requires federal agencies avoid, to the extent possible, the long and short-term adverse impacts associated with the occupancy and modification of flood plains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative. If a project has a potential impact to or within a floodplain, there is an eight-step process that agencies can carry out during their decision-making process on the project. The eight-step process includes: (1) determine if a proposed action is in the base floodplain or area which has a one percent or greater chance of flooding in any given year, (2) conduct early public review, (3) identify and evaluate practicable alternatives to locating in the base floodplain, (4) identify impacts of the proposed action, (5) develop measures to minimize the impacts and restore and preserve the floodplain if impacts cannot be avoided, (6) re-evaluate the alternatives, (7) present the findings and a public explanation, and (8) implement the action.

Clean Water Act

The CWA is administered in California by the USEPA, the SWRCB, and the RWQCBs. The CWA serves as the primary federal law protecting the quality of waters of the United States, including lakes, rivers, and coastal wetlands. Waters of the United States are defined as "All waters which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide."

CWA Section 303(d)

CWA Section 303(d) requires states to develop lists of water bodies that will not attain water quality standards after implementation of technology-based effluent limitations by point-source dischargers. These water bodies, referred to as "water quality limited segments," do not meet water quality standards even after discharges of wastes from point sources have been treated by the minimum required levels of pollution control technology. Section 303(d) requires states to develop a total maximum daily load (TMDL) for each of the listed pollutants and water bodies. A TMDL is the amount of pollutant loading that the water body can receive and still meet water quality standards. As stated previously, Santa Ana RWQCB does not identify any water bodies within the project area, or within the area which the project area drains into, on the CWA 303(d) list.

CWA Section 402

CWA Section 402 regulates storm water discharges to surface waters through the National Pollutant Discharge Elimination System (NPDES) program. In California, the USEPA authorizes the SWRCB to oversee the NPDES program through the RWQCBs. The RWQCBs, under the guidance of the USEPA, issue NPDES permits to any construction project over one acre that are not covered by an individual NPDES permit.

National Pollutant Discharge Elimination System Program

The NPDES permit program is administered in the State of California by the SWRCB and RWQCBs under the authority of the USEPA to control water pollution by regulating point sources that discharge pollutants into Waters of the US. If discharges from industrial, municipal, and other facilities go directly to surface waters, those project applicants must obtain permits. An individual NPDES permit is specifically tailored to a discharge to waters of the United States. A general NPDES permit covers multiple facilities within a specific activity category such as construction activities. A general permit applies with same or similar conditions to all dischargers covered under the general permit. The proposed program would be covered under the general permits discussed below.

General Dewatering Permit

The SWRCB has issued General Waste Discharge Requirements (WDRs) under Order No. R8-2003-0061, NPDES No. CAG 998001 (Dewatering General Permit) governing non-stormwater construction-related discharges from activities such as dewatering, water line testing, and sprinkler system testing. The discharge requirements include provisions mandating notification, testing, and reporting of dewatering and testing-related discharges. The General WDRs authorize such construction-related discharges so long as all conditions of the permit are fulfilled. This permit would apply to proposed projects if shallow perched groundwater is encountered during construction and requires dewatering.

Construction General Permit

The Construction General Permit *NPDES General Permit for Stormwater Discharges Associated with Construction and Land Disturbance Activities* (Order 2009-0009-DWQ, NPDES No. CAS000002, Construction General Permit, as amended by 2010-0014-DWQ and 2012-0006-DWQ) regulates discharges of pollutants in stormwater associated with construction activity to waters of the U.S. from construction sites that disturb one or more acres of land surface, or that are part of a common plan of development or sale that disturbs more than one acre of land surface. The permit regulates stormwater discharges associated with construction or demolition activities, such as clearing and excavation; construction of buildings; and linear underground projects (LUP), including installation of water pipelines and other utility lines.

In the project area, the Construction General Permit is implemented and enforced by the Santa Ana RWQCB, which administers the stormwater permitting program. To obtain coverage under this permit, project operators must electronically file Permit Registration Documents, which include a Notice of Intent, a Stormwater Pollution Prevention Plan (SWPPP), and other compliance-related documents. An appropriate permit fee must also be mailed to SWRCB. The SWPPP identifies best management practices (BMPs) that must be implemented to reduce construction effects on receiving water quality based on potential pollutants. The BMPs to be identified are directed at implementing both sediment and erosion control measures as well as other measures to control potential chemical contaminants. Examples of typical construction BMPs include scheduling or limiting certain activities to dry periods, installing sediment barriers such as silt fence and fiber rolls, and maintaining equipment and vehicles used for construction. Non-stormwater management measures include installing specific discharge controls during certain activities, such as paving operations, and vehicle and equipment washing and fueling. Routine inspection of all BMPs is required under the provisions of the Construction General Permit. In addition, the SWPPP is required to contain a visual monitoring program, a chemical monitoring program for non-visible pollutants, and a sediment monitoring plan if the site discharges directly to a water body listed on the 303(d) list for sediment. The SWPPP also includes descriptions of the BMPs to reduce pollutants in stormwater discharges after all construction phases have been completed at the site (post-construction BMPs).

Municipal Stormwater Permitting (MS4)

The State's Municipal Stormwater Permitting Program regulates stormwater discharges from Municipal Separate Storm Sewer Systems (MS4s). MS4 Permits were issued in two phases. Phase I was initiated in 1990, under which the RWQCBs adopted NPDES stormwater permits for medium (serving between 100,000 and 250,000 people) and large (serving more than 250,000 people) municipalities. As part of Phase II, the SWRCB adopted a General Permit for small MS4s (serving less than 100,000 people) and non-traditional small MS4s including governmental facilities such as military bases, public campuses, and hospital complexes. The permit also requires permittees to develop Comprehensive Bacteria Reduction Plans (CBRP). Riverside County has prepared a CBRP.

The RWQCB issued an MS4 Permit (Waste Discharge Requirement Permit for the RCFCWCD, the County of Riverside, and the Incorporated Cities of Riverside County within the Santa Ana Region, Order No. R8-2010-0033 NPDES No. CAS618033) in February of 2010. The permit requires the development of a site-specific water quality management plan (WQMP) for certain types of development, including new industrial development projects that create 10,000 square feet or more of impervious surface collectively over the project site or which add or replace 5,000 square feet of impervious surface on an existing developed site. The WQMPs should be based on the model WQMP Guidance and Template, and must include site design (including, where feasible, Low Impact Development (LID) principles), source control and treatment control elements to reduce the discharge of pollutants into urban runoff. All proposed facilities would be located within this jurisdiction and would be included in this permit coverage.

National Flood Insurance Program

The National Flood Insurance Program (NFIP) was created to promote flood awareness and reduce flood losses of properties within Special Flood Hazard Areas. Drainage and related flooding hazards are managed in response to requirements established by the National Flood Insurance Act of 1986 and the Flood Disaster Protection Act of 1973, as amended. Requirements of the NFIP are included in respective municipality Building Codes and through interagency programs for flood management. In implementing the NFIP, FEMA requires that new construction in a flood hazard area meet minimum design standards to place occupied structures above flood hazard areas. FEMA identifies areas throughout the United States that are at risk for flooding. The FEMA Flood Insurance Rate Map identifies areas that have a 1-percent or greater (100-year flood area) of being inundated by a flood event in a given year.

State

Porter-Cologne Water Quality Act

The Porter-Cologne Water Quality Control Act, also known as the California Water Code, is California's statutory authority for the protection of water quality. Under this act, the State must adopt water quality policies, plans, and objectives that protect the State's waters. The act sets forth the obligations of the SWRCB and RWQCBs pertaining to the adoption of Basin Plans and establishment of water quality objectives. Unlike the federal CWA, which regulates only surface water, the Porter-Cologne Act regulates both surface water and groundwater and this authority serves as the basis for Waste Discharge Requirements issued to municipal sewage treatment facilities by the RWQCBs. The Porter-Cologne Water Quality Act is promulgated in the California Code of Regulations Title 22. Title 22 includes treatment and reuse requirements for recycled water projects throughout California.

Anti-Degradation Policy

The SWRCB's Anti-Degradation Policy, otherwise known as Resolution No. 68-16, sets specific restrictions for surface and groundwater that have higher than the required quality in order to avoid degradation of those water bodies. Requirements of this policy must be included within all Water Quality Control Plans throughout California (discussed below). Under this policy, actions that would lower the water quality in designated water bodies would only be allowed: if the action would provide a maximum benefit to the people of California, if it will not unreasonably affect beneficial uses, and if it will not lower water quality below applicable standards.

Sustainable Groundwater Management Act

In 2014, the California State Legislature approved a combination of bills that together SGMA. SGMA requires the formation of local GSAs that must develop GSPs for medium or high priority groundwater basins in California by 2022. These plans must quantify basin characteristics and supplies and must establish management actions and projects to achieve basin sustainability within 20 years of implementation (by 2042). The SGMA imposes many new monitoring and reporting requirements, and other procedural and substantive mandates related to groundwater management.

On December 7, 2016, EMWD's Board approved Resolution 2016-135 to become the GSA for the West San Jacinto Groundwater Basin. The San Jacinto Groundwater Basin, as defined in Bulletin 118 (Basin No. 8-005), was identified by DWR as a "high priority" basin, making it subject to more aggressive deadlines in the SGMA regulations. EMWD's Board of Directors approved Resolution No. 2016-135 in December 2016, which formalized EMWD's intention to be the GSA for the West San Jacinto GSA Area. EMWD's Board of Directors became the exclusive GSA for the western portion of the San Jacinto Groundwater Basin on April 24, 2017. EMWD, as the GSA, initiated the development of the San Jacinto Groundwater Basin GSP in February 2019, and submitted the GSP to DWR in November 2021 (DWR 2023; EMWD 2021b). The purpose of the GSP is to define the conditions under which the groundwater resources of the West San Jacinto GSA Plan Area, which support agricultural, domestic, municipal and industrial, and environmental uses, will be managed sustainably in the future. The adoption of the GSP represents the commitment of the West San Jacinto GSA to maintain long-term, sustainable use of groundwater resources within the West San Jacinto GSA Plan Area, as required by SGMA. Over the next 20 years, data will continue to be gathered, analyzed, and used to refine the estimated sustainable yield and understanding of the sources of and influences on degraded water quality (EMWD 2021a, b).

Regional

Water Quality Control Plan for the Santa Ana River Basin (Basin Plan)

The Santa Ana RWQCB Basin Plan (Santa Ana RWQCB 2016) is designed to preserve and enhance water quality and protect the beneficial uses of all regional terrestrial surface water bodies (e.g., creeks, rivers, streams, and lakes), groundwater, coastal drainages, estuaries, coastal lagoons, and enclosed bays within the jurisdictional area. The preparation and adoption of Basin Plans are required by California Water Code Section 13240. According to Water Code Section 13050, Basin Plans establish the beneficial uses to be protected for the waters within a specified area, water quality objectives to protect those uses, and an implementation program for achieving the objectives. Because beneficial uses, together with their corresponding water quality objectives, can be defined per federal regulations as water quality standards, the Basin Plans are regulatory references for meeting the state and federal requirements for water quality control. The water quality objectives are thus incorporated into NPDES permits. The Basin Plan is designed to preserve and enhance water quality and protect beneficial uses of all waters. Specifically, it:

- Designates beneficial uses for surface water and groundwater.
- Sets narrative and numerical objectives that must be attained or maintained to protect the designated beneficial uses and conform to the state's anti-degradation policy.
- Describes implementation programs for achieving objectives to protect all waters in the region.

In addition, the Basin Plan incorporates all applicable SWRCB and RWQCB plans and policies and other pertinent water quality policies and regulations. The Santa Ana Region Basin Plan covers parts of southwestern San Bernardino County, western Riverside County, and northwestern Orange County. Water quality objectives specified for the creeks and streams include TDS, hardness, sodium, chloride, sulfate, total inorganic nitrogen, and chemical oxygen demand.

Local

Municipal NPDES Permit No. CAS 618033, Order No. R8-2010-0033 - NPDES Permit and Waste Discharge Requirements for the Riverside County Flood Control and Water Conservation District, the County of Riverside, and the Incorporated Cities of Riverside County within the Santa Ana Region Area-Wide Urban Runoff Management Program

The NPDES municipal general permits issued by the RWQCB establish regulations covering discharge prohibitions, receiving water limitations, municipal operations (such as the proposed project), new development, construction site controls (construction site runoff), and other regulations to regulate surface water quality. The discharge prohibitions prohibit the discharge of non-stormwater (materials other than stormwater) into storm drain systems and watercourses and includes a tiered categorization of non-stormwater discharges based on potential for pollutant content that may be discharged upon adequate assurance that the discharge contains no pollutants of concern at concentrations that will impact beneficial uses or cause exceedances of water quality standards. The receiving water limitations provide narrative and numeric water quality standards. The municipal operations regulations include a number of requirements to control and reduce non-stormwater discharges and polluted stormwater to storm drains and watercourses during operation, inspection, and routine repair and maintenance activities of municipal facilities and infrastructure, such as the proposed project. The requirements include source control, site design, and stormwater treatment requirements, such as minimizing disturbance of natural infiltration areas and the addition of impervious surfaces, controlling and directing runoff, and the use of infiltration and bioretention measures, among other measures.

RWQCB Order No. R8-2015-0004, NPDES No. CAG998001 - General Waste Discharge Requirements for Discharges to Surface Waters That Pose an Insignificant (De Minimis) Threat to Water Quality (supersedes Order R8-2009-0003)

Order No. R8-2015-0004, NPDES No. CAG998001, was adopted by the Santa Ana RWQCB on June 19, 2015, for discharges to surface waters of various types of wastes that pose an insignificant threat to water quality. The Order supersedes Order No. RS-2009-0003, which expired on March 1, 2014. This Order regulates discharges to surface waters within the Santa Ana Region that pose an insignificant threat to water quality as listed below.

- Construction dewatering wastes, except for storm water discharges regulated under a statewide general construction storm water permit or a MS4 permit;
- Wastes associated with well installation, development, test pumping and purging, and aquifer testing;
- Dewatering wastes from subterranean seepage (except for discharges from utility vaults);
- Discharges resulting from hydrostatic testing of vessels, pipelines, tanks, etc;
- Maintenance and disinfection of potable water supply pipelines, tanks, reservoirs, etc.;
- Discharges from potable water supply systems resulting from initial system startup, routine startup, sampling of influent flow, system failures, pressure releases, etc.;
- Discharges from fire hydrant testing or flushing, air conditioning condensate, or swimming pool discharge;
- Discharges resulting from diverted stream flows;
- Decanted filter backwash wastewater and/or sludge dewatering filtrate water from water treatment facilities; and
- Other similar types of wastes as determined by the RWQCB Executive Officer, which pose a de minimis threat to water quality yet must be regulated under waste discharge requirements.

This Order prohibits the following:

- The discharge of oil, trash, industrial waste sludge, or other solids directly to the surface waters or in any manner that will ultimately affect surface waters;
- The discharge of any substances in concentrations toxic to aquatic life, animal life, or plant life;
- The discharge of wastes to property not owned or controlled by the Discharger is prohibited, except to surface waters as authorized under this Order;

- Odors, vectors, and other nuisances of waste origin are prohibited beyond the limits of each Discharger's facility;
- The addition of chemicals to the extracted groundwater, exclusive of chlorine to control biofouling in treatment systems, is prohibited except when approved in writing by the RWQCB.
- The direct discharges of waste to Areas of Special Biological Significance such as Newport Beach Marine Life Refuge and Irvine Coast Marine Life Refuge.

The Order provides the effluent limitations listed below in **Table 3.9-1**:

TABLE 3.9-1
EFFLUENT LIMITATIONS

Constituent	Maximum Daily Concentration Limit in milligrams per liter (mg/L)
Total petroleum hydrocarbons (TPH)	0.1
Total residual chlorine	0.1
Suspended Solids	75
Sulfides	0.4

SOURCE: RWQCB Order No. R8-2015-0004, NPDES No. CAG998001

The Order requires that the pH of discharges shall be 6.5 to 8.5 pH units. There shall be no visible oil and grease in the discharge. The discharge of decanted filter backwash wastewater and/or sludge dewatering filtrate water from water treatment facilities shall not contain a total suspended solids maximum daily concentration in excess of 30 milligrams per liter (mg/L). Additional requirements and provisions are discussed in the Order. To obtain coverage under this this Order, the discharger shall submit a complete Notice of Intent and application to the RWQCB least 45 days before the start of a new discharge.

Master Drainage Plans

Master Drainage Plans (MDPs), as administered by the RCFCWCD, identifies a conceptual network of drainage facilities needed to properly convey water at a regional level throughout portions of the city. There are four MDPs, managed by the RCFCWCD, that cover the majority of the City of Moreno Valley: the Moreno MDP which encompasses the project site, the West End MDP, the Sunnymead MDP, and the Perris Valley MDP. The MDPs address regional level facilities in Moreno Valley and provide a network of drainage facilities which, when implemented, will provide proper water conveyance to the community as development continues. The fully implemented MDPs should, in conjunction with ultimate street improvements for the area within the plan boundaries, contain the 100-year frequency flows. The MDPs identify preferred facility alignments, sizing, and right-of-way required for the future construction of MDP facilities to protect existing and future development. The MDPs are intended to be used as a guide for future developments and that such developments be required to conform to the MDPs.

City of Moreno Valley General Plan

On June 15, 2021, the City of Moreno Valley City Council approved a comprehensive update of the City's General Plan and certified the related Final Program Environmental Impact Report (City of Moreno Valley 2021). Chapter 6, Safety Element, and Chapter 10, Open Space and Resource Conservation, of the General Plan includes the following goals and policies that would be applicable to the proposed project:

Goal S-1: Protect life and property from natural and human-made hazards.

> **Policy S.1-6**: Coordinate with the Riverside County Flood Control and Water Conservation District to address storm drainage and flood control on a sub-regional basis in order to optimize the use of existing and planned conveyance facilities.
>
> **Policy S.1-7**: Design, construct and maintain street and storm drain flood control systems to accommodate 10-year and 100-year storm flows respectively, employing "green infrastructure" techniques as feasible and appropriate. The storm drain system shall conform to Riverside County Flood Control and Water Conservation District master drainage plans and the requirements of the Federal Emergency Management Agency.
>
> **Policy S.1-8**: Permit in the 100-year floodplain only that development which represents an acceptable use of the land in relation to the hazards involved and the costs of providing flood control facilities. Locate critical facilities, such as hospitals, fire stations, police stations, public administration buildings, and schools outside of flood hazard areas.
>
> **Policy S.1-9**: Encourage project designs that minimize drainage concentrations, minimize impervious coverage, utilize pervious paving materials, utilize low impact development (LID) strategies, and utilize best management practices (BMPs) to reduce stormwater runoff and minimize increases in downstream runoff resulting from new development.
>
> **Policy S.1-10**: Through development agreements and compliance with adopted master drainage plans and existing regulations, require that new development provide necessary storm drainage improvements and ensure that upstream stormwater generators fully address stormwater needs on their property.

Goal OSRC-1: Preserve, protect, and enhance natural resources, habitats, and watersheds in Moreno Valley and the surrounding area, promoting responsible management practices.

> **Policy OSRC.1-5:** Design stormwater detention basins as multi-use amenities providing recreation, aesthetic value, and wildlife habitat along with flood control.
>
> > **OSRC.1-7:** Require that grading plans include appropriate and feasible measures to minimize erosion, sedimentation, wind erosion and fugitive dust. Particularly in hillside areas, new roadways and trails should follow natural contours to minimize grading.
> >
> > **OSRC.1-18:** Preserve natural drainage courses in their natural state to the extent feasible.
> >
> > **OSRC.1-19:** Maximize the amount of pervious surfaces in public spaces to permit the percolation of urban runoff while implementing best practices for stormwater pollution prevention.

> **OSRC.1-21:** Continue to regulate new commercial and industrial activities as well as construction and demolition practices to minimize discharge of pollutants and sedimentation into the stormwater drainage system.

3.8.3 Impact Analysis and Mitigation Measures

Thresholds of Significance

The following criteria from CEQA Guidelines Appendix G are used as thresholds of significance to determine the impacts of the proposed project as related to hydrology and water quality. The proposed project would have a significant impact if it would:

1. Violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or ground water quality.
2. Substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin.
3. Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would:
   a) Result in substantial erosion or siltation on- or offsite;
   b) Substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or offsite;
   c) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff; or
   d) Impede or redirect flood flows.
4. In flood hazard, tsunami, or seiche zones, risk release of pollutants due to project inundation.
5. Conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan.
6. Result in a cumulatively considerable impact to hydrology and water quality.

Impact Analysis

Water Quality

Impact 3.8-1: The proposed project could violate water quality standards or waste discharge requirements or otherwise substantially degrade surface or ground water quality.

Phase 1 and Phase 2

Construction

Storage Tanks and Pipeline

Construction of the proposed project would involve excavation, trenching, potential blasting, and grading at the proposed water storage tank site and along the transmission pipeline alignment. Sediment associated with earthmoving activities and exposed soil would have the potential to erode and be transported to down gradient areas, potentially resulting in water quality standard violations. In the event of heavy rain, erosion of the soil stockpiles may occur resulting in scouring and sedimentation of local drainages, adversely affecting surface water quality.

During construction of the proposed project, construction equipment and materials would include fuels, oils and lubricants, solvents and cleaners, cements and adhesives, paints and thinners, degreasers, cement and concrete, and asphalt mixtures, which are all commonly used in construction. Additionally, potential blasting activities involve controlled use of explosive blasting agents (ammonium-nitrate fuel oil). Stormwater passing through the construction site would have the potential to pick up construction-related chemicals and oils, which have the potential to be conveyed into the local stormwater collection system, impacting water quality.

Construction activities would be required to comply with numerous hazardous materials regulations designed to ensure that hazardous materials are transported, used, stored, and disposed of in a safe manner to protect worker safety, and to reduce the potential for a release of construction-related fuels or other hazardous materials into the environment, including stormwater (refer to Section 3.7 *Hazards and Hazardous Materials*).

The overall footprint of construction activities would exceed one acre, and thus the proposed project would be required to comply with the Construction General Permit. Additionally, the proposed project would be required to comply with the Moreno Master Drainage Plan, and the stormwater policies included in the City of Moreno Valley's General Plan and municipal code. These State and local requirements were developed to ensure that stormwater is managed and erosion is controlled on construction sites. The Construction General Permit requires preparation and implementation of a SWPPP, which requires applications of BMPs to control run-on and runoff from construction work sites. The BMPs would include, but would not be limited to, physical barriers to prevent erosion and sedimentation, construction of sedimentation basins, limitations on work periods during storm events, use of infiltration swales, protection of stockpiled materials, and a variety of other measures that would substantially reduce or prevent erosion and the potential for impacts to surface water quality from occurring during construction.

As discussed in Section 3.8.1, *Environmental Setting*, *Groundwater*, the proposed project is not expected to encounter groundwater. Excavation and potential blasting for the water storage tank would occur at depths up to 35 feet bgs; the excavation depths for transmission and drainage pipelines would be to depths up to 10 feet bgs. Given that the depth to groundwater is anticipated to be greater than 50 feet, construction of the proposed water storage tank and transmission pipeline facilities would not encounter groundwater.

The required compliance with the regulations discussed above would substantially reduce or prevent runoff and erosion from construction activities. As a result, the potential for adverse effects to water quality would be reduced to a less than significant level.

Operation

Storage Tanks and Pipeline

Once constructed, the proposed transmission pipeline would be located underground and would not require regular maintenance, and therefore would not impact water quality. As described in Chapter 2, *Project Description*, the proposed project would include various onsite drainage facilities capable of collecting and conveying storm flows at the storage tank site (Refer to Figure 2-2). The water storage tanks would only be drained for emergency situations. When draining the tank, the water would be conveyed to an emergency overflow structure capable of processing 29 cubic feet/second (CFS) from the tank, which would flow into culverts under Moreno Beach Drive and deposit onto the vacant land to the east. If both of the proposed storage tanks were to be full during emergency drainage, up to 9 MG would dissipate over the undeveloped area. As described in Section 3.8.1, *Environmental Setting*, the vacant area includes ephemeral drainages that would convey project-related emergency water as well as stormwater flows southeast towards a metal culvert storm drain; from there, the existing storm drain system would convey the water south of Cottonwood Avenue and back west to a concrete lined channel that runs parallel to Moreno Beach Drive, where flows would continue south (refer to Figures 3.3-3a-c). Ultimately, these flows would connect to the Perris Valley Channel and the San Jacinto River. The Santa Ana RWQCB considers potable water discharges from maintenance and disinfection of potable water supply pipelines, tanks, and reservoirs as posing an insignificant (*de minimis*) threat to water quality (Order No. R8-2015-0004, NPDES No. CAG998001). Therefore, with implementation of the above-described project drainage and emergency overflow facilities, and compliance with the NPDES permit, local drainage plans regulated by RCFCD, and all applicable federal, State, and local laws regulating discharges to surface water described above in Section 3.8.2, *Regulatory Framework*, impacts would be less than significant.

Mitigation Measures

None Required

Significance Determination

Less than Significant Impact

Groundwater Supplies

Impact 3.8-2: The proposed project could substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin.

Phase 1 and Phase 2

Construction

Storage Tanks and Pipeline

The proposed project includes construction of a water storage tank and transmission pipeline and would not extract groundwater during construction. Dewatering would not be needed because the depth to groundwater is anticipated to be greater than 50 feet and construction activities would not extend to that depth. Further, the proposed project would not result in the use of groundwater during construction and would not substantially deplete groundwater supplies. No impact would occur.

Operation

Storage Tanks and Pipeline

The operation of the water storage tank and transmission pipeline would not include any facilities that would extract groundwater. The water storage facility and associated paved areas would result in the addition of impervious surfaces on the 4.37-acre storage tank site which could interfere with groundwater recharge. However, the minimal amount of new impervious surface constructed on the storage tank site would have a negligible effect on recharge to the underlying aquifer. Rain falling on the storage tank facility would be routed to proposed onsite drainage facilities and remain onsite a detention basin. Flows exceeding the capacity of onsite drainage facilities would convey to an emergency overflow structure and eventually deposit on the vacant land to the east. As a result, impacts would be less than significant.

Mitigation Measures

None Required

Significance Determination

Less than Significant Impact

Drainage Patterns

Impact 3.8-3: The proposed project could substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would: result in substantial erosion or siltation on- or offsite; substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or offsite; create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff; impede or redirect flood flows.

Phase 1 and Phase 2

Construction

Pipeline

Construction of the proposed transmission pipeline would involve the use of heavy duty equipment for ground disturbing activities such as excavation, grading, and backfilling, as well as stockpiling of soils. Such construction activities could temporarily alter existing drainage patterns and flows at the proposed project site by exposing the underlying soils, modifying flow direction, and making the project site temporarily more permeable. Exposed and stockpiled soils could be temporarily subject to erosion and conveyance into nearby storm drains during storm events. Sediment and other pollutants generated during construction would have the potential to be mobilized and transported by stormwater runoff, potentially degrading surface and groundwater quality onsite and offsite.

As discussed under Impact 3.9-1, because the proposed construction site would be greater than one acre, the proposed project would require the preparation and implementation of a site-specific SWPPP in accordance with the requirements of the statewide Construction General Permit to prevent erosion associated with the runoff. Construction activities would be temporary, and flow directions and runoff volumes during construction would be controlled. Therefore, construction of the proposed project would not result in substantial changes to drainage patterns or associated erosion, sedimentation, and would not contribute runoff water which would result in substantial flooding or the exceedance of drainage system capacities. The proposed project would result in a less than significant impact.

Storage Tanks

Construction the proposed storage tanks would involve ground disturbing activities that are the same as those discussed above for the transmission pipeline, in addition to grading and potential blasting, which could temporarily alter existing drainage patterns and flows at the project site. The proposed project would comply with NPDES Construction General Permit requirements including preparation of a SWPPP, implementation of BMPs, and compliance with applicable City grading regulations. Impacts would be less than significant.

Operation

Pipeline

The transmission pipeline would be installed underground within existing or future public street rights-of-way and have no impact on drainage patterns during operation.

Storage Tanks

Large storm flows may occur through the water storage tank site during operation of the Phase 1 and Phase 2 project. Additionally, the project may involve emergency release of water stored in the storage tanks. Various site improvements would be required to accommodate the additional tank on project site, including a 20-foot access road and a new 25-foot driveway/entrance. These improvements would require paving of additional impermeable surfaces, which could result in increased runoff rates and/or quantities. As discussed in Chapter 2, *Project Description*, Section 2.4.1, the current drainage design concept includes proposed onsite and offsite drainage facilities that would allow a storm event to be conveyed through and around the site without impacting the water storage tank and other site facilities. To convey storm flows safely around the project site, a concrete drainage ditch would be constructed around the limits of the project site. Additionally, a proposed concrete down drain and a series of 12-to-18-inch storm drains would be installed to safely convey flows onsite. An emergency overflow structure would also be installed on the eastern portion of the project site as would a 0.18 MG detention basin, which would collect flow from all onsite storm drain inlets.

Stormwater would lead to four proposed energy dissipaters at the northern, southern and eastern boundaries of the project site and would leave the project site in several locations. The first is via an existing 30-inch storm drain at the northeastern corner of the project site that would convey flow under Moreno Beach Drive. The second is via a proposed 18-inch storm drain to be installed under Moreno Beach Drive at the eastern-most portion of the project site. One existing 24-inch storm drain would continue to be used while another 18-inch storm drain adjacent to the proposed 18-inch storm drain would be abandoned. Offsite improvements on the eastern side of Moreno Beach Drive include an energy dissipater (culvert, headwall, and riprap) to contain flow. Drainage facilities are shown on Figure 2-2. This activity would occur within the City of Moreno Valley right-of-way and would require an encroachment permit.

The drainage infrastructure discussed above would enable stormwater to flow around or through the site in a manner that would prevent erosion, siltation, flooding, or polluted runoff that could impact adjacent properties, and would not substantially increase flows to the stormwater drainage system under normal operating conditions. The water storage tanks would not be drained as part of routine maintenance activities and would only be drained in emergency situations. While the proposed drainage system discussed above would be designed to capture additional water volumes during emergencies, if an emergency event were to occur at a time the two tanks are filled to levels substantially above ground surface elevation, the emergency discharge from the tanks could exceed the capacity of the onsite drainage system and be conveyed under Moreno Beach Drive. The large vacant land east of Moreno Beach Drive would receive the emergency flows and allow the water to dissipate, thereby reducing the water depth, and existing ephemeral drainages on the property would convey flows to the RCFCWCD storm drain network. With implementation of the drainage facilities that are part of the project, impacts are considered less than significant.

Mitigation Measures

None Required

Significance Determination

Less than Significant Impact

Release Pollutants in Flood Hazard Zone

Impact 3.8-4: The proposed project could be located in flood hazard, tsunami, or seiche zones, and risk release of pollutants due to project inundation.

Phase 1 and Phase 2

Construction and Operation

Storage Tanks and Pipeline

As discussed in Section 3.8.1, *Environmental Setting*, the proposed project site is not located in an area susceptible to tsunamis or seiches. Therefore, no impact would occur.

As discussed in Section 3.9.1, *Environmental Setting*, the proposed storage tank site is not designated by FEMA as a 100-year flood zone. However, the surrounding areas are known to be in an area susceptible to large storm flows and flooding. As discussed above in Impact 3.9-3, the proposed project includes the construction of a stormwater drainage system as a project design feature that would reduce the impact of flooding on-site to less a than significant level. Existing drainage features on the vacant land east of Moreno Beach Drive would have capacity to receive emergency flows from the tank site and convey the water into the RCFCWCD stormwater drainage system. Flooding would not have the potential to impact underground transmission pipelines.

Mitigation Measures

None Required

Significance Determination

Less than Significant Impact

Water Plans

Impact 3.8-5: The proposed project could conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan.

Phase 1 and Phase 2

Construction and Operation

Storage Tanks and Pipeline

As discussed in Section 3.8.1, *Environmental Setting*, the proposed project is located within the western portion of the San Jacinto Groundwater Basin. Although the West San Jacinto Basin has been designated by the DWR as a high-priority basin, EMWD's 2020 UWMP indicates that, overall, the basin shows groundwater levels that continue to exhibit a stable or upward trend (EMWD 2021a). As discussed in Section 3.8-2, *Regulatory Framework*, EMWD as the local GSA will be required to implement the Groundwater Sustainability Plan (GSP) to maintain long-term, sustainable use of groundwater resources within the basin.

The proposed project would not adversely affect water quality because the construction of the project would not be deep enough to reach groundwater, which would be consistent with the water quality control plan (Basin Plan) and the GSP. Additionally, as discussed above in Impact 3.8-2, the proposed project would not adversely impact groundwater recharge or supplies because the proposed project would not use groundwater. No impact would occur.

Mitigation Measures

None Required

Significance Determination

No Impact

Cumulative Impacts

Impact 3.8-6: Concurrent construction and operation of the proposed project and related projects in the geographic scope could result in cumulative short-term and long-term impacts to hydrology and water quality.

The cumulative projects considered in the analysis of cumulative impacts are listed in Table 3-2 and illustrated on Figure 3-1 in Chapter 3 of this Draft EIR. Some cumulative projects, such as cumulative projects 1, 2, and 6, are located downslope or within the same drainage area of the proposed projects and could combine together with the proposed project to create a cumulatively considerable impact to hydrology. All other projects are likely located too far away or within a different watershed to result in cumulatively considerable impacts.

If the proposed project and one or more cumulative projects are constructed at the same time, the erosion effects with a potential for the release of sediment and/or other pollutants affecting water quality, or changing drainage patterns that could result in erosion, siltation, and flooding, could be cumulatively considerable. However, the state Construction General Permit would require the proposed project and each cumulative project to prepare and implement a SWPPP, and local grading and erosion control plans (i.e., the Moreno Plan described in Section 3.8-2, *Regulatory Framework*) would similarly require preventing erosion that could affect water quality. The SWPPPs and local plans would describe BMPs to control runoff and prevent erosion for each project. Through compliance with these requirements, the potential for erosion impacts would be reduced and thus water quality would be protected. The Construction General Permit has been developed to address cumulative conditions arising from construction throughout the State, and is intended to maintain cumulative effects of projects subject to this requirement below levels that would be considered significant. For example, Cumulative projects 1, 2, and 6 would be required to implement BMPs to reduce and control the release of sediment and/or other pollutants in any runoff leaving their respective sites. The runoff water from cumulative project sites would be required to achieve the same action levels, measured as a maximum amount of sediment or pollutant allowed per unit volume of runoff water. Thus, even if the runoff waters were to combine after leaving the sites, the sediments and/or pollutants in the combined runoff would still be at concentrations (amount of sediment or pollutants per volume of runoff water) below action levels. Therefore, the combined impacts to water quality within the geographic scope would not be considered cumulatively significant and impacts would be less than significant.

Mitigation Measures

None Required

Significance Determination

Less than Significant Impact

3.8.4 References

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3.9 Noise

This section addresses the noise and vibration impacts associated with implementation of the proposed project. This section includes: a description of the existing noise and vibration conditions in and around the proposed project site; a summary of applicable regulations related to noise and vibration; and an evaluation of the potential impacts of the proposed project related to noise and vibration at the proposed project site and in the surrounding area, including cumulative impacts.

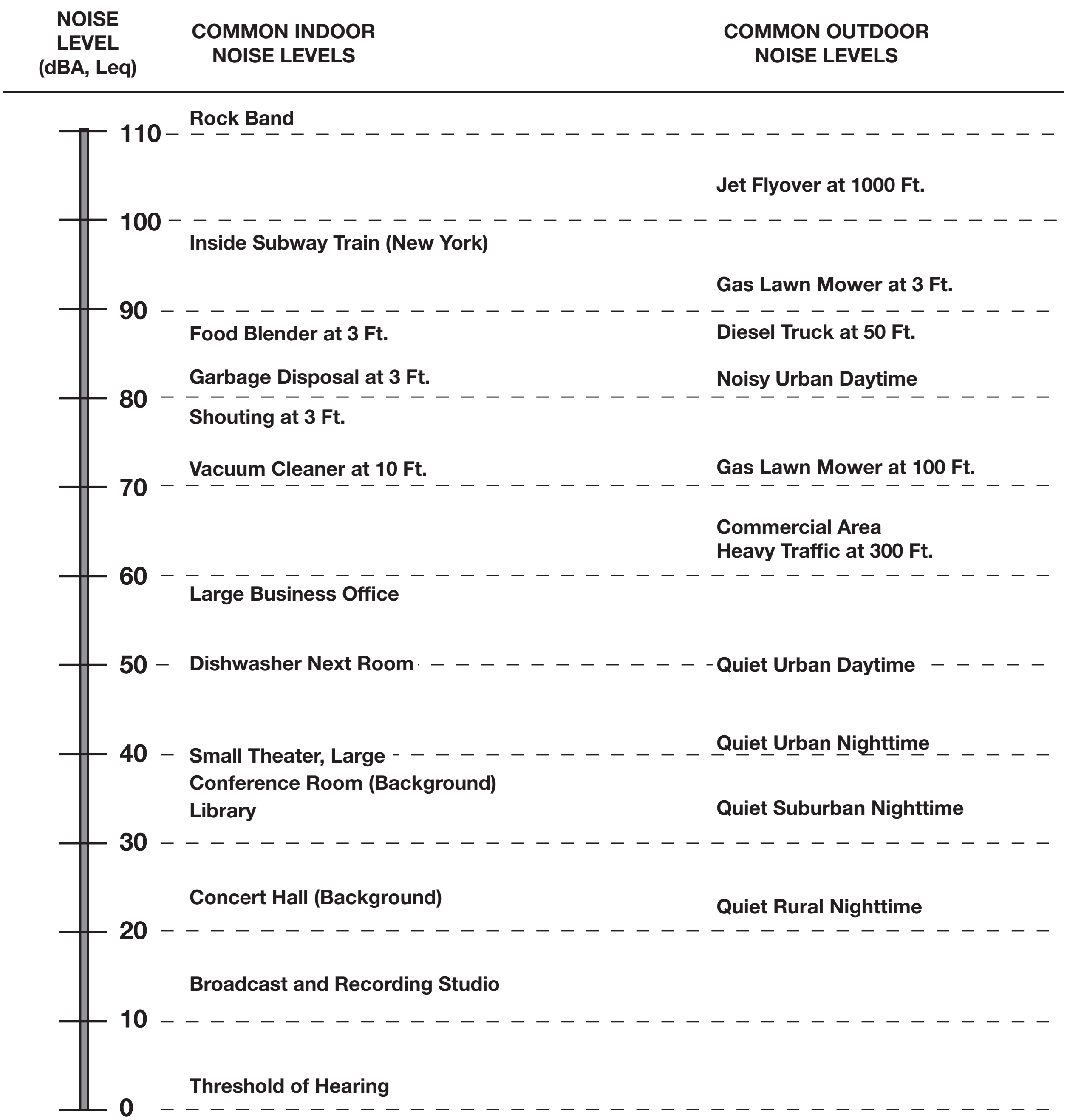
3.9.1 Environmental Setting

Noise Principals and Descriptors

Noise is generally defined as unwanted sound, traveling in the form of waves from a source and exerting a sound pressure level (referred to as sound level) that is measured in decibels (dB), which is the standard unit of sound amplitude measurement. The dB scale is a logarithmic scale that describes the physical intensity of the pressure vibrations that make up any sound, with 0 dB corresponding roughly to the threshold of human hearing and 120 to 140 dB corresponding to the threshold of pain. Pressure waves traveling through air exert a force registered by the human ear as sound.

Sound pressure fluctuations can be measured in units of hertz (Hz), which correspond to the frequency of a particular sound. Typically, sound does not consist of a single frequency, but rather a broad band of frequencies varying in levels of magnitude. When all the audible frequencies of a sound are measured, a sound spectrum is plotted consisting of a range of frequency spanning 20 to 20,000 Hz. The sound pressure level, therefore, constitutes the additive force exerted by a sound corresponding to the sound frequency/sound power level spectrum.

The typical human ear is not equally sensitive to all frequencies of the audible sound spectrum. As a consequence, when assessing potential noise impacts, sound is measured using an electronic filter that deemphasizes the frequencies below 1,000 Hz and above 5,000 Hz in a manner corresponding to the human ear’s decreased sensitivity to extremely low and extremely high frequencies. This method of frequency weighting is referred to as A-weighting and is expressed in units of A-weighted decibels (dBA). A-weighting follows an international standard methodology of frequency de-emphasis and is typically applied to community noise measurements. Some representative noise sources and their corresponding A-weighted noise levels are shown in **Figure 3.9-1**.



SOURCE: State of California, Department of Transportation (Caltrans), Technical Noise Supplement (TeNS). October 1998.

Pettit Water Storage Tank Expansion and Transmission Pipeline Project

Figure 3.9-1
Decibel Scale and Common Noise Sources

ESA

Noise Exposure and Community Noise

An individual's noise exposure is a measure of noise over a period of time. A noise level is a measure of noise at a given instant in time. The noise levels presented in Figure 3.9-1 are representative of measured noise at a given instant in time; however, they rarely persist consistently over a long period of time. Rather, community noise varies continuously over a period of time with respect to the contributing sound sources of the community noise environment. Community noise is primarily the product of many distant noise sources, which constitute a relatively stable background noise exposure, with the individual contributors unidentifiable. The background noise level changes throughout a typical day, but does so gradually, corresponding with the addition and subtraction of distant noise sources such as traffic. What makes community noise constantly variable throughout a day, besides the slowly changing background noise, is the addition of short duration, single-event noise sources (e.g., aircraft flyovers, motor vehicles, sirens), which are readily identifiable to the individual.

These successive additions of sound to the community noise environment change the community noise level from instant to instant, thus requiring that noise exposure be measured over a period of time to legitimately characterize a community noise environment and evaluate cumulative noise impacts. This time-varying characteristic of environmental noise is described using statistical noise descriptors. The most frequently used noise descriptors are summarized below:

L_{eq}: The L_{eq}, or equivalent sound level, is used to describe noise over a specified period of time in terms of a single numerical value; the L_{eq} of a time-varying signal and that of a steady signal are the same if they deliver the same acoustic energy over a given time. The L_{eq} may also be referred to as the average sound level.

L_{max}: The maximum, instantaneous noise level experienced during a given period of time.

L_{min}: The minimum, instantaneous noise level experienced during a given period of time.

L_{50}: The noise level that is equaled or exceeded 50 percent of the specified time period. The L_{50} represents the median sound level.

L_{90}: The noise level that is equaled or exceeded 90 percent of the specified time period. The L_{90} is generally considered to be representing the background or ambient level of a noise environment.

L_{dn}: Also termed the day-night average noise level (DNL), the L_{dn} is the average A-weighted noise level during a 24-hour day, obtained after an addition of 10 dBA to measured noise levels between the hours of 10:00 P.M. and 7:00 A.M. to account nighttime noise sensitivity.

CNEL: CNEL, or Community Noise Equivalent Level, is the average A-weighted noise level during a 24-hour day that is obtained after an addition of 5 dBA to measured noise levels between the hours of 7:00 P.M. and 10:00 P.M. and after an addition of 10 dBA to noise levels between the hours of 10:00 P.M. and 7:00 A.M. to account for noise sensitivity in the evening and nighttime, respectively.

Effects of Noise on People

Noise is generally loud, unpleasant, unexpected, or undesired sound that is typically associated with human activity that is a nuisance or disruptive. The effects of noise on people can be placed into four general categories:

- Subjective effects (e.g., dissatisfaction, annoyance)
- Interference effects (e.g., communication, sleep, and learning interference)
- Physiological effects (e.g., startle response)
- Physical effects (e.g., hearing loss)

Although exposure to high noise levels has been demonstrated to cause physical and physiological effects, the principal human responses to typical environmental noise exposure are related to subjective effects and interference with activities. Interference effects of environmental noise refer to those effects that interrupt daily activities and include interference with human communication activities, such as normal conversations, watching television, telephone conversations, and interference with sleep. Sleep interference effects can include both awakening and arousal to a lesser state of sleep. With regard to the subjective effects, the responses of individuals to similar noise events are diverse and are influenced by many factors, including the type of noise, the perceived importance of the noise, the appropriateness of the noise to the setting, the duration of the noise, the time of day and the type of activity during which the noise occurs, and individual noise sensitivity.

Overall, there is no completely satisfactory way to measure the subjective effects of noise, or the corresponding reactions of annoyance and dissatisfaction on people. A wide variation in individual thresholds of annoyance exists, and different tolerances to noise tend to develop based on an individual's past experiences with noise. Thus, an important way of predicting a human reaction to a new noise environment is the way it compares to the existing environment to which one has adapted (i.e., comparison to the ambient noise environment). In general, the more a new noise level exceeds the previously existing ambient noise level, the less acceptable the new noise level will be judged by those hearing it. With regard to increases in A-weighted noise level, the following relationships generally occur:

- Except in carefully controlled laboratory experiments, a change of 1 dBA cannot be perceived.
- Outside of the laboratory, a 3 dBA change in noise levels is considered to be a barely perceivable difference.
- A change in noise levels of 5 dBA is considered to be a readily perceivable difference.
- A change in noise levels of 10 dBA is subjectively heard as doubling of the perceived loudness.

These relationships occur in part because of the logarithmic nature of sound and the decibel system. The human ear perceives sound in a nonlinear fashion; hence, the decibel scale was developed. Because the decibel scale is based on logarithms, two noise sources do not combine in a simple additive fashion, but rather logarithmically. For example, if two identical noise sources produce noise levels of 50 dBA, the combined sound level would be 53 dBA, not 100 dBA.

Noise Attenuation

Stationary point sources of noise, including stationary mobile sources such as idling vehicles, attenuate (lessen) at a rate between 6 dBA for hard sites and 7.5 dBA for soft sites for each doubling of distance from the reference measurement (typically, 50 feet). Hard sites are those with a reflective surface between the source and the receiver, such as asphalt or concrete surfaces or smooth bodies of water. No excess ground attenuation is assumed for hard sites and the change in noise levels with distance (drop-off rate) is simply the geometric spreading of the noise from the source. Soft sites have an absorptive ground surface such as soft dirt, grass, or scattered bushes and trees. In addition to geometric spreading, an excess ground attenuation value of 1.5 dBA (per doubling distance) is normally assumed for soft sites. Line sources (i.e., vehicle traffic noise on roadways) attenuate at a rate between 3 dBA for hard sites and 4.5 dBA for soft sites for each doubling of distance from the reference measurement.

Fundamentals of Vibration

As described in the Federal Transit Administration's (FTA's) *Transit Noise and Vibration Impact Assessment* (FTA 2018), groundborne vibration can be a serious concern for nearby neighbors of a transit system route or maintenance facility, causing buildings to shake and rumbling sounds to be heard. In contrast to airborne noise, groundborne vibration is not a common environmental problem. It is unusual for vibration from sources such as buses and trucks to be perceptible, even in locations close to major roads. Some common sources of groundborne vibration are trains, buses on rough roads, and construction activities such as blasting, pile-driving, and operation of heavy earthmoving equipment.

There are several different methods that are used to quantify vibration. The peak particle velocity (PPV) is defined as the maximum instantaneous peak of the vibration signal. The PPV is most frequently used to describe vibration impacts to buildings. The root mean square (RMS) amplitude is most frequently used to describe the effect of vibration on the human body. The RMS amplitude is defined as the average of the squared amplitude of the signal. Decibel notation (VdB) is commonly used to measure RMS. The relationship of PPV to RMS velocity is expressed in terms of the "crest factor," defined as the ratio of the PPV amplitude to the RMS amplitude. PPV is typically a factor of 1.7 to 6 times greater than RMS vibration velocity (FTA 2018). The decibel notation acts to compress the range of numbers required to describe vibration. Typically, groundborne vibration generated by man-made activities attenuates rapidly with distance from the source of the vibration. Sensitive receptors for vibration include structures (especially older masonry structures), people (especially residents, the elderly, and sick), and vibration-sensitive equipment.

The effects of groundborne vibration include movement of the building floors, rattling of windows, shaking of items on shelves or hanging on walls, and rumbling sounds. In extreme cases, the vibration can cause damage to buildings. Building damage is not a factor for most projects, with the occasional exception of blasting and pile-driving during construction.

Annoyance from vibration often occurs when the vibration levels exceed the threshold of perception by only a small margin. A vibration level that causes annoyance will be well below the damage threshold for normal buildings. The FTA measure of the threshold of architectural damage for conventional sensitive structures is 0.2 in/sec PPV (FTA 2018).

In residential areas, the background vibration velocity level is typically approximately 50 VdB (approximately 0.0013 in/sec PPV). This level is well below the vibration velocity level threshold of perception for humans, which is approximately 65 VdB. A vibration velocity level of 75 VdB is considered to be the approximate dividing line between barely perceptible and distinctly perceptible levels for healthy human hearing (FTA 2018).

Project Area

Sensitive Receptors

Some land uses are considered more sensitive to noise than others due to the types of activities that typically occur at the receptor location. Noise-sensitive receptors are typically defined as land uses that are considered more sensitive to intrusive noise than others, such as residences, schools, motels and hotels, libraries, and hospitals, due to the land use activities typically occurring at the receptor (i.e., sleeping, concentrating, and convalescing).

The proposed project is located within low-density residential or single-family residential use areas within the City of Moreno Valley and would be located adjacent to or within the vicinity of residential use sensitive receptors. The nearest sensitive receptors to the storage tank construction site are listed below and shown in **Figure 3.9-2**.

- R1: Single-family residences approximately 450 feet to the southwest of the project site along Ardell Lane.
- R2: Single-family residences approximately 900 feet to the south of the project site at the corner of Cottonwood Avenue and Moreno Beach Drive.
- R3: Single-family residences approximately 2,600 feet to the east of the project site along Cottonwood Avenue.
- R4: Single-family residences approximately 1,050 feet to the north of the project site along Moreno Beach Drive.

Phase 2 of the proposed project is expected to begin in 2045, significantly later than Phase 1. According to the City's most recent land use map, the area to the east of the storage tank area has been rezoned residential (R10) (Moreno Valley 2022), and is shown on Figure 3.9-2. Although there are no known future developments in that area, for the purpose of this technical analysis, it is conservatively assumed that there would be additional new sensitive receptors during Phase 2 as follows:

- R5: Residences approximately 80 feet to the east of the project site along Moreno Beach Drive.[1]

The transmission pipeline connecting the proposed water storage tank to the existing water distribution system would be installed within the existing Moreno Beach Drive right-of-way.

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1 Although no known future developments are currently planned in the area to the east of the storage tank, it is conservatively estimated that residences will be located as close as 80 feet from the storage tank area. This distance does not consider any potential features such as property setbacks.

SOURCE: ESA, 2023; Google Earth, 2023

Pettit Water Storage Tank Expansion and Transmission Pipeline Project

Figure 3.9-2
Project Site and Noise Sensitive Receptor Locations

ESA

Sensitive receptors along Moreno Beach Drive between Cottonwood Avenue and Alessandro Boulevard would be located as close as 25 feet from the proposed transmission pipeline route construction area.

Existing Noise Sources

The primary noise sources of the project area are related to transportation including automobiles, trucks, motorcycles, buses, and planes. The predominant ambient noise sources include roadway traffic noise. Major highways through the project area include State Route (SR) 60, which connects to Interstate (I) 215 and I-15. Secondary noise sources include activities related to the operation of commercial businesses in the area and periodic landscape maintenance and other occasional outdoor noise associated with residential uses.

Existing Vibration-Sensitive Sources

Aside from periodic construction work that may occur throughout the area, other sources of groundborne vibration in the project area include heavy-duty vehicular travel (e.g., refuse trucks, delivery trucks) on local roadways. Truck traffic at a distance of 50 feet typically generates groundborne vibration velocity levels of approximately 63 VdB (approximately 0.006 in/sec PPV). Groundborne vibration levels could reach 72 VdB (approximately 0.016 in/sec PPV) where trucks pass over irregularities in the road surface.

Airports

The nearest airport is the March Air Reserve Base which is located approximately 5 miles to the southwest of the project site and is located outside of the 65 dBA CNEL contour for the March Reserve Base. The Redlands Municipal Airport is located further from the project site at approximately 10.8 miles.

3.9.2 Regulatory Framework

Federal

U.S. Environmental Protection Agency

Under the authority of the Noise Control Act of 1972, the United States Environmental Protection Agency (USEPA) established noise emission criteria and testing methods published in Parts 201 through 205 of Title 40 of the Code of Federal Regulations that apply to some transportation equipment (e.g., interstate rail carriers, medium trucks, and heavy trucks) and construction equipment. In 1974, USEPA issued guidance levels for the protection of public health and welfare in residential land use areas (USEPA 1974). The guidance levels specified an outdoor L_{dn} of 55 dBA and an indoor L_{dn} of 45 dBA. These guidance levels are not considered as standards or regulations and were developed without consideration of technical or economic feasibility. There are no federal noise standards that directly regulate environmental noise related to the construction or operation of the proposed project.

National Institute for Occupational Safety and Health

The National Institute for Occupational Safety and Health (NIOSH) establishes Recommended Exposure Limits (REL) for noise based on the best available science and practice. The NIOSH REL for noise is 85 decibels, using the A-weighted frequency response (dBA) over an 8-hour average, usually referred to as Time-Weighted Average (TWA). Exposures at or above this level are considered hazardous.

Federal Transit Authority Vibration Standards

FTA has adopted vibration standards that are used to evaluate potential building damage impacts related to construction activities. The vibration damage criteria adopted by FTA are shown in **Table 3.9-1**.

TABLE 3.9-1
CONSTRUCTION VIBRATION DAMAGE CRITERIA

Building Category	PPV (in/sec)
I. Reinforced-concrete, steel or timber (no plaster)	0.5
II. Engineered concrete and masonry (no plaster)	0.3
III. Non-engineered timber and masonry buildings	0.2
IV. Buildings extremely susceptible to vibration damage	0.12

SOURCE: FTA 2018.

In addition, FTA has also adopted standards associated with human annoyance for groundborne vibration impacts for the following three land-use categories: Vibration Category 1 – High Sensitivity, Vibration Category 2 – Residential, and Vibration Category 3 – Institutional. FTA defines Category 1 as buildings where vibration would interfere with operations within the building, including vibration-sensitive research and manufacturing facilities, hospitals with vibration-sensitive equipment, and university research operations. Vibration-sensitive equipment includes, but is not limited to, electron microscopes, high-resolution lithographic equipment, and normal optical microscopes. Category 2 refers to all residential land uses and any buildings where people sleep, such as hotels and hospitals. Category 3 refers to institutional land uses such as schools, churches, other institutions, and quiet offices that do not have vibration-sensitive equipment, but still have the potential for activity interference. The vibration thresholds associated with human annoyance for these three land-use categories are shown in **Table 3.9-2**. No thresholds have been adopted or recommended for commercial and office uses.

TABLE 3.9-2
GROUNDBORNE VIBRATION IMPACT CRITERIA FOR GENERAL ASSESSMENT

Land Use Category	Frequent Events[a]	Occasional Events[b]	Infrequent Events[c]
Category 1: Buildings where vibration would interfere with interior operations.	65 VdB[d]	65 VdB[d]	65 VdB[d]
Category 2: Residences and buildings where people normally sleep.	72 VdB	75 VdB	80 VdB
Category 3: Institutional land uses with primarily daytime use.	75 VdB	78 VdB	83 VdB

[a] “Frequent Events” is defined as more than 70 vibration events of the same source per day.
[b] “Occasional Events” is defined as between 30 and 70 vibration events of the same source per day.
[c] “Infrequent Events” is defined as fewer than 30 vibration events of the same kind per day.
[d] This criterion is based on levels that are acceptable for most moderately sensitive equipment such as optical microscopes.

SOURCE: FTA 2018.

State

Noise

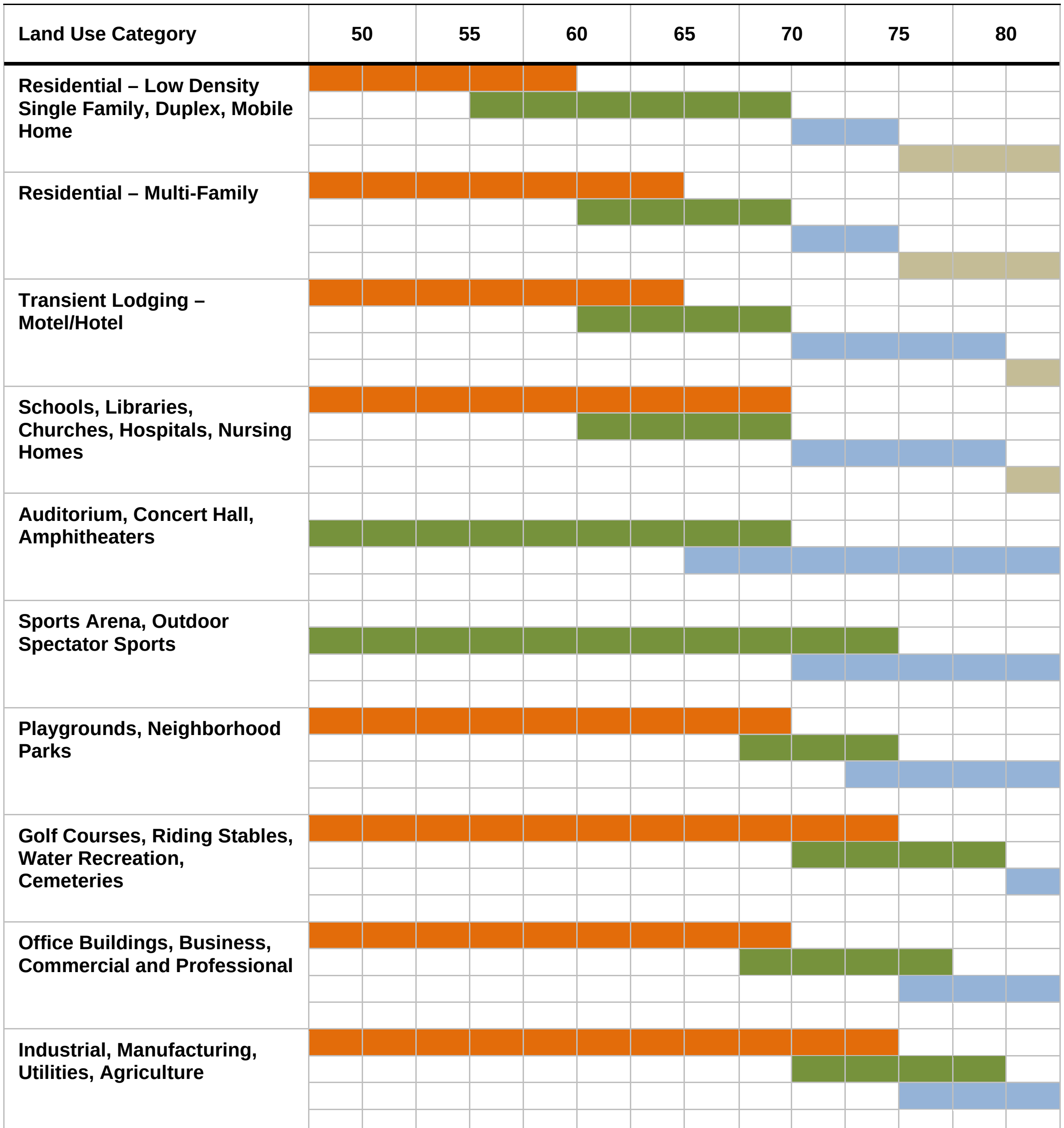
The State of California does not have statewide standards for environmental noise, but the California Department of Public Health (DPH) has established guidelines for evaluating the compatibility of various land uses as a function of community noise exposure (**Table 3.9-3**).

The purpose of these guidelines is to maintain acceptable noise levels in a community setting for different land use types. Noise compatibility by different land uses types is categorized into four general levels: “normally acceptable,” “conditionally acceptable,” “normally unacceptable,” and “clearly unacceptable.” For instance, a noise environment ranging from 50 dBA CNEL to 65 dBA CNEL is considered to be “normally acceptable” for multi-family residential uses, while a noise environment of 75 dBA CNEL or above for multi-family residential uses is considered to be “clearly unacceptable.”

In addition, Per State of California Government Code Section 53091, building ordinances of local cities or counties do not apply to the location or construction of facilities for the projection, generation, storage, treatment, or transmission of water or wastewater. Specifically, Sections 53091(d) and (e) state:

> *(d) Building ordinances of a county or city shall not apply to the location or construction of facilities for the production, generation, storage, treatment, or transmission of water, wastewater, or electrical energy by a local agency.*
>
> *(e) Zoning ordinances of a county or city shall not apply to the location or construction of facilities for the production, generation, storage, treatment, or transmission of water.*

TABLE 3.9-3
COMMUNITY NOISE EXPOSURE – LDN OR CNEL (DBA)



Normally Acceptable	Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction, without any special noise insulation requirements
Conditionally Acceptable	New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features are included in the design. Conventional construction, but with closed windows and fresh air supply systems or air conditioning will normally suffice.
Normally Unacceptable	New construction or development should be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirement must be made and needed noise insulation features included in the design.
Clearly Unacceptable	New construction or development generally should not be undertaken.

SOURCE: State of California, Governor's Office of Planning and Research, 2003.

Vibration

There are no state vibration standards. Moreover, according to the California Department of Transportation's (Caltrans) *Transportation and Construction Vibration Guidance Manual*, there are no official Caltrans standards for vibration. However, this manual provides guidelines that can be used as screening tools for assessing the potential for adverse vibration effects related to structural damage and human annoyance. The manual is meant to provide practical guidance to Caltrans engineers, planners, and consultants who must address vibration issues associated with the construction, operation, and maintenance of Caltrans projects. The vibration criteria established by Caltrans for assessing structural damage and human are shown in **Table 3.9-4**, and **Table 3.9-5**, respectively.

TABLE 3.9-4
CALTRANS VIBRATION DAMAGE POTENTIAL THRESHOLD CRITERIA

	Maximum PPV (in/sec)	
Structure and Condition	**Transient Sources**	**Continuous/Frequent Intermittent Sources**
Extremely fragile historic buildings, ruins, ancient monuments	0.12	0.08
Fragile buildings	0.2	0.1
Historic and some old buildings	0.5	0.25
Older residential structures	0.5	0.3
New residential structures	1.0	0.5
Modern industrial/commercial buildings	2.0	0.5

NOTE: Transient sources create a single isolated vibration event, such as blasting or drop balls. Continuous/frequent intermittent sources include impact pile drivers, pogo-stick compactors, crack and-seat equipment, vibratory pile drivers, and vibratory compaction equipment.

SOURCE: Caltrans 2013.

TABLE 3.9-5
CALTRANS VIBRATION ANNOYANCE POTENTIAL CRITERIA

	Maximum PPV (in/sec)	
Structure and Condition	**Transient Sources**	**Continuous/Frequent Intermittent Sources**
Barely perceptible	0.04	0.01
Distinctly perceptible	0.25	0.04
Strongly perceptible	0.9	0.10
Severe	2.0	0.4

NOTE: Transient sources create a single isolated vibration event, such as blasting or drop balls. Continuous/frequent intermittent sources include impact pile drivers, pogo-stick compactors, crack and-seat equipment, vibratory pile drivers, and vibratory compaction equipment.

SOURCE: Caltrans 2013.

Local

Local noise regulation involves implementation of the noise goals and policies of the applicable municipal general plan noise element and the noise standards of the applicable municipal code noise ordinance. The project site is located in the City of Moreno Valley in Riverside County; therefore, the City's General Plan Noise Elements and Municipal Code Noise Ordinances are applicable to the project.

City of Moreno Valley

General Plan Noise Element

The City's Noise Element typically provides the standards for land use compatibility for community noise exposure. However, the City's General Plan does not include a noise element or specific transportation-related noise standards. Rather, noise is considered in the Environmental Safety section of the General Plan Safety Element. While the General Plan provides background and noise fundamentals, it does not identify criteria to assess the impacts associated with offsite transportation-related noise impacts. Therefore, for this analysis, the transportation noise criteria are derived from standards contained in the California Office of Planning and Research (OPR) General Plan Guidelines. The OPR land use/noise compatibility standards are used by many California cities and counties and specify the maximum noise levels allowable for new developments impacted by transportation noise sources.

The OPR land use/noise compatibility criteria, found in Figure 2 of the General Plan Guidelines, Appendix D: Noise Element Guidelines, identify the criteria for industrial land uses such as the project. When the unmitigated exterior noise levels approach 70 dBA CNEL, industrial land use is considered normally acceptable. With exterior noise levels ranging from 70 to 80 dBA CNEL, industrial land uses are considered conditionally acceptable, and with exterior noise levels greater than 80 dBA CNEL, they are considered normally unacceptable. For normally unacceptable land use, new construction or development should generally be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design.

For the purposes of this analysis, land use such as the proposed project does not contain outdoor living areas requiring exterior noise mitigation as outlined in the OPR General Plan Guidelines, and therefore, only the interior noise levels experienced by employees at the project site are evaluated against the appropriate noise level standards. The purpose of the transportation noise criteria is to protect, create, and maintain an environment free from noise and vibration that may jeopardize the health or welfare of sensitive receptors, or degrade quality of life. City General Policies (City of Moreno Valley General Plan, pp.9-31, 9-32) act to ensure that when exterior noise levels exceed 65 dBA CNEL at sensitive receivers, mitigation is provided to ensure that interior noise levels of 45 dBA CNEL are maintained. General Plan Policies in this regard are consistent with, and support, the California Building Code interior noise standards.

Municipal Code Noise Ordinance

General Noise Standards

The City's noise standards are provided in Municipal Code Section 11.80.030 (C), Table 11.80.030-2, and are reproduced in **Table 3.9-6**.

TABLE 3.9-6
NOISE STANDARDS FROM THE SOURCE LAND USE

Residential (dBA L_{eq}) [a]		Commercial (dBA L_{eq}) [a]	
Daytime [b]	Nighttime [c]	Daytime [b]	Nighttime [c]
60	55	65	60[3]

[a] Noise levels are measured at a distance of two hundred (200) feet or more from the real property line of the source of the sound, if the sound occurs on privately owned property, or from the source of the sound, if the sound occurs on public right-of-way, public space or other publicly owned property. Any source of sound in violation of this subsection shall be deemed prima facie to be a noise disturbance.

[b] "Daytime" means eight a.m. to ten p.m. the same day.

[c] "Nighttime" means 10:01 p.m. to 7:59 a.m. the following day.

SOURCE: City of Moreno Valley Municipal Code, Section 11.80.030 (C).

Construction Noise Standards

To analyze noise impacts originating from the construction of the proposed project site, noise from construction activities is typically evaluated against standards established under a City's Municipal Code. The Municipal Code noise standards for construction are described below for the City to determine the potential noise impacts at the nearest sensitive receiver locations.

As a subset of its stationary-source noise regulations, the City Municipal Code establishes permitted hours of construction activity. More specifically, Municipal Code Section 11.80.030 (D)(7), Construction and Demolition, provides the following:

> *No person shall operate, or cause operation of any tools or equipment used in construction, drilling, repair, alteration, or demolition work between the hours of eight p.m. and seven a.m. the following day such that the sound there from creates a noise disturbance, except for emergency work by public service utilities or for other work approved by the city manager or designee. Therefore, based on the Section 11.80.030 (D)(7) construction regulations, a construction-related noise disturbance occurs if Project construction activity occurs outside of the permitted hours. This section shall not apply to the use of power tools as provided in subsection (D)(9) of this section.*

In addition, grading operations shall be limited to the hours identified in Section 8.21.050 (O) of 7:00 a.m. to 6:00 p.m., Monday through Friday, and 8:00 a.m. to 4:00 p.m. on weekends and holidays or as approved by the City Engineer. The City Engineer may permit grading or equipment operations before or after the allowable hours if determined that such operations are not detrimental to the health, safety, or welfare of residents or the general public. Permitted hours of operations may be shortened by the City Engineer's finding of a previously unforeseen effect on the health, safety, or welfare of the surrounding community.

Operational Noise Standards

To analyze noise impacts originating from a designated fixed location or private property, stationary-source (operational) noise such as the expected loading dock activity, entry gate & truck movements, roof-top air conditioning units, trash enclosure activity, and parking lot vehicle movements are typically evaluated against standards established under a City's Municipal Code.

The City's Municipal Code, Chapter 11.80 Noise Regulation, provides performance standards and noise control guidelines for determining and mitigating non-transportation or stationary source noise impacts from operations at private properties. The City's Municipal Code defines Maximum Sound Levels (in dB(A)) for Source Land Uses in Municipal Code Section 11.80.030 (C), Table 11.80.030-2 for Residential and Commercial noise source land uses (reproduced in Table 3.9-6, above). As defined by the Municipal Code, Section 11.80.020 Definitions, residential land use means all uses of land primarily for dwelling units, as well as hospitals, schools, colleges and universities, and places of religious assembly. Commercial land use means all uses of land not otherwise classified as residential.

For the purpose of this analysis, the proposed project is considered Commercial land use since it is not classified as Residential. Based on this standard, the operational noise level limits for commercial source land use of 65 dBA L_{eq} during the daytime (8:00 a.m. to 10:00 p.m.) hours and 60 dBA L_{eq} during the nighttime (10:01 p.m. to 7:59 a.m.) hours shall apply to the operational noise source activities from the project. Further, Section 11.80.030 (C) Prohibited Acts, Non-impulsive Sound Decibel Limits, states: No person shall maintain, create, operate or cause to be operated on private property any source of sound in such a manner as to create any non-impulsive sound which exceeds the limits set forth for the source land use category (as defined in Section 11.80.020) in Table 11.80.030-2 of the Municipal Code, when measured at a distance of two hundred (200) feet or more from the real property line of the source of the sound, if the sound occurs on a privately owned property. Therefore, at a distance of 200 feet from the property line, the project's operational noise levels shall not exceed the 65 dBA L_{eq} daytime and 60 dBA L_{eq} nighttime noise level standards for commercial land uses, as shown on Table 3.9-6.

The City's Municipal Code also identifies continuous sound level limits in Table 11.80.030-1 of the Municipal Code, based on the Center for Disease Control and Prevention and the NIOSH noise exposure guidelines. A division of the U.S. Department of Health and Human Services, NIOSH identifies a noise level threshold based on the duration of exposure to the source. The City's noise level threshold starts at 90 dBA for more than eight hours per day, and for every increase, the exposure time is reduced. The City of Moreno Valley identifies noise level thresholds of 92 dBA for more than 6 hours per day, 95 dBA for more than 4 hours per day, 97 dBA for more than 3 hours per day, and up to 100 dBA for more than 2 hours per day. However, this noise study uses the more restrictive City commercial noise level limits identified on Table 11.80.030-2 of the Municipal Code for source land uses in the Municipal Code, shown on Table 3.9-6 of this report, to evaluate the potential operational noise levels due to the operation of the project.

Vibration Standards

Construction activity can result in varying degrees of ground-borne vibration, depending on the equipment and methods used, distance to the affected structures and soil type. Construction vibration is generally associated with pile driving and rock blasting. Other construction equipment such as air compressors, light trucks, hydraulic loaders, etc., generates little or no ground vibration.

The City of Moreno Valley does not identify specific vibration level limits in its Municipal Code. The Federal Transit Administration (FTA) *Transit Noise and Vibration Impact Assessment Manual* (September 2018) provides guidelines for the maximum-acceptable vibration criteria for different types of land uses. These guidelines allow 90 VdB for industrial (workshop) use, 84 VdB for office use and 78 VdB for daytime residential uses and 72 VdB for nighttime uses in buildings where people normally sleep.

3.9.3 Impact Analysis and Mitigation Measures

Thresholds of Significance

The following criteria from CEQA Guidelines Appendix G are used as thresholds of significance to determine the impacts of the proposed project as related to noise and vibration. The proposed project would have a significant impact if it would:

1. Generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies.
2. Generation of excessive groundborne vibration or groundborne noise levels.
3. For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels.
4. Result in a cumulatively considerable impact to noise and vibration.

Construction Noise

Pursuant to the City of Moreno Valley Municipal Code, construction, repair, remodeling, or grading that takes place within permissible times (7:00 a.m. to 6:00 p.m. on weekdays and 8:00 a.m. to 4:00 p.m. on Saturdays) are exempt from the provisions of the City’s noise control ordinance. This means that proposed project construction can occur at any noise level within these hours. Noise impacts from short-term construction activities could exceed noise thresholds and could result in a significant construction impact if short-term construction activity occurred outside of the daytime hours permitted by the City’s municipal code noise ordinance.

Operational Noise

Pursuant to Moreno Valley Municipal Code Section 11.80.030 (C), a daytime noise level threshold of 65 dBA at 200 feet from a commercial source (Project) is applied to onsite operational noise impacts.

Operational noise levels would be generated from offsite mobile noise sources such as vehicular traffic. The noise levels generated by these mobile noise sources are assessed in this study with the FHWA approved traffic noise source noise modeling guidelines. For project-related operational traffic noise, the impacts are assessed relative to the land use compatibility categories identified in Table 3.9-3. If the project would either cause the ambient noise levels measured at the property line of affected uses to increase by 3 dBA CNEL to or within the "normally unacceptable" or "clearly unacceptable" categories; or the project would cause the ambient noise levels measured at the property line of affected uses to increase by 5 dBA CNEL or more within the "normally acceptable" or "conditionally acceptable" categories, an impact would be considered significant.

Groundborne Vibration

Construction Vibration Structural Damage

The City does not have local standards regarding construction-related vibration, and there are no binding state or federal standards that would apply to this impact. For this Draft EIR, EMWD relies on the guidelines regarding construction-related vibration impacts on buildings based on the age and/or condition of the structures that are located in proximity to construction activity that have been developed by the FTA (as shown in Table 3.9-1) and Caltrans (as shown in Table 3.9-4). Specifically, Caltrans provides guidelines for transient sources of vibration such as blasting (i.e., an isolated vibration event). Based on these two tables, construction impacts relative to ground-borne vibration would be considered significant if any of the following were to occur:

- Project construction activities would cause a PPV ground-borne vibration level to exceed 2.0 inch per second at a modern industrial/commercial building for transient sources of vibration.
- Project construction activities would cause a PPV ground-borne vibration level to exceed 1.0 inch per second at a new residential structure for transient sources of vibration.
- Project construction activities would cause a PPV ground-borne vibration level to exceed 0.5 inch per second at a reinforced concrete, steel, or timber building for non-transient sources of vibration.
- Project construction activities would cause a PPV ground-borne vibration level to exceed 0.3 inch per second at any engineered concrete and masonry building for non-transient sources of vibration.
- Project construction activities would cause a PPV ground-borne vibration level to exceed 0.2 inch per second at any non-engineered timber and masonry buildings for non-transient sources of vibration.
- Project construction activities would cause a PPV ground-borne vibration level to exceed 0.12 inch per second at any buildings "extremely susceptible to vibration damage" (e.g., a historical building) for non-transient sources of vibration.

Nearby buildings are considered to be "new residential" structures and the 1.0 in/sec PPV threshold would be applied to assess potential structural damage as a result of project implementation. The analysis also considers the existing storage tank as a vibration sensitive use and uses a threshold of 2.0 in/sec PPV for industrial/commercial buildings.

Vibration Human Annoyance

Under conditions where there are an infrequent number of events per day,[2] which would be the case during project construction activities when equipment would be used or blasting would occur on an infrequent and periodic basis, the FTA has established thresholds of 65 VdB for Category 1 buildings, 80 VdB for Category 2 buildings, and 83 VdB for Category 3 buildings. Category 1 refers to buildings where vibration would interfere with interior operations such as a laboratory with sensitive instruments, Category 2 refers to residences and buildings where people normally sleep, and Category 3 refers to institutional uses with primarily daytime use. In terms of ground-borne vibration impacts associated with human annoyance, this analysis uses the FTA's vibration impact threshold of 80 VdB for residences (Category 2 buildings) under conditions where there are an infrequent number of events per day (FTA 2018).

Methodology

Construction Noise

Onsite Construction Noise

Construction noise associated with the project was analyzed based on the project's potential construction equipment inventory, construction durations, and construction schedule. The construction equipment noise levels are based on the published noise data (equipment source levels) by the FHWA Roadway Construction Noise Model (RCNM).[3] The construction noise levels were then calculated for sensitive receptor locations based on the standard point source (e.g., generator or bulldozer) noise-distance attenuation factor of 6 dBA for each doubling of distance.

Project construction would include the following construction sites and associated construction phases as shown in **Table 3.9-7**.

Construction of the pipeline and storage tank under Phase 1 may also occur at the same time, and could impact the same sensitive receptors (i.e. R2). Therefore, the construction noise analysis assumes overlapping construction phases.[4]

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2 "Infrequent events" is defined by the FTA as being fewer than 30 vibration events of the same kind per day.

3 FHWA, Roadway Construction Noise Model, 2006.

4 The overlapping phases include Potholing (Phase 1 Pipeline) and Grading/Excavation (Phase 1 Storage Tank); Install Pipeline (Phase 1 Pipeline) and Construction/Finishing/Painting (Phase 1 Storage Tank); Install appurtenances (Phase 1 Pipeline) and Construction/Finishing/Painting (Phase 1 Storage Tank); and Pavement Repairs/Miscellaneous (Phase 1 Pipeline) and Construction/Finishing/Painting (Phase 1 Storage Tank).

TABLE 3.9-7
PROJECT CONSTRUCTION PHASES

Phase	Individual Phases
Phase 1 (Pipeline)	• Potholing • Install Pipeline • Install Appurtenances • Pavement Repairs/Miscellaneous
Phase 1 (Storage Tank)	• Grading/Excavation • Stormwater Drainage and Foundation • Construction/Finishing/Painting
Phase 2 (Storage Tank)	• Demolition • Grading/Excavation • Stormwater Drainage and Foundation • Construction/Finishing/Painting

SOURCE: ESA 2023.

Types of construction equipment expected to be used during project construction could produce maximum noise levels of 74 dBA L_{max} to 90 dBA L_{max} at a reference distance of 50 feet from the noise source according to FHWA reference noise levels. **Table 3.9-8** lists the construction equipment type assumed for project construction and FHWA reference noise levels (L_{max}) at 50 feet. These maximum noise levels would occur when equipment is operating at full power. Construction equipment does not typically operate at full power consistently throughout the duration of a given construction stage. The estimated usage factor for the equipment is also shown in Table 3.9-8 and represents the percentage of a specified time period (i.e., an hour) that a piece of equipment is expected to be operational, allowing for the calculation of an average noise level (dBA L_{eq}). The usage factors are based on FHWA's RCNM.[5]

The analysis of construction noise incorporates conservative assumptions to provide an environmentally protective analysis to avoid underestimating construction noise levels. These conservative assumptions include (1) assuming all pieces of construction equipment anticipated to be used for the specific construction stages and construction activities would be in use simultaneously; (2) assuming that the noisiest equipment used during the various construction stages and construction activities would be located on the project site in the applicable construction work area for the construction activity at the closest distance to the sensitive receptor location; (3) estimating noise levels at the property line of each sensitive receptor location and without benefit of any intervening walls, landscaping, windows, or structures; and (4) assuming the more conservative attenuation rate of 6 dBA per doubling of distance for acoustically "hard" sites (e.g., asphalt and concrete surfaces) instead of 7.5 dBA per doubling of distance for acoustically "soft" sites (e.g., soft dirt, grass or scattered bushes and trees).

To present a conservative impact analysis, the estimated noise levels were calculated with all pieces of construction equipment assumed to be operating simultaneously and located at the construction

5 FHWA, Roadway Construction Noise Model User's Guide, 2006.

area nearest to the affected receptors. The noise model assumed the two noisiest pieces of construction equipment would operate in the construction area nearest to the affected receptors.

TABLE 3.9-8
PROJECT CONSTRUCTION EQUIPMENT AND ASSOCIATED NOISE LEVELS

Type of Equipment[a]	Reference Noise Level at 50 Feet, L_{max}	Estimated Usage Factor
Aerial Lift	75	20%
Air Compressor	78	40%
Blasting Equipment	94	N/A[c]
Bore/Drill Rig	84	20%
Cement/Mortar Mixer	80	50%
Concrete Saw	90	20%
Crane	81	16%
Crawler Tractor	84	40%
Compactor (ground)	83	20%
Compressor (air)	78	40%
Concrete Saw	90	20%
Crane	81	16%
Drum Mixer	80	50%
Dump Truck	76	40%
Excavator	81	40%
Forklift	75	10%
Grader	85	40%
Hydra Break Ram	90	10%
Jackhammer	89	20%
Man Lift	75	20%
Other Equipment	85	50%
Paver	77	50%
Pumps	81	50%
Roller	80	20%
Scraper	84	40%
Slurry Trenching Machine	80	50%
Tractor/Loader/Backhoe	78	40%
Welder	74	40%

[a] The number and types of equipment used would vary by the specific project component being demolished or constructed. Certain types of equipment may only be used for limited durations or locations within each construction stage. Detailed equipment lists used during each construction stage during each month of construction activity are provided in Appendix G of this Draft EIR.

[b] Reference noise level is based on the operation of one piece of equipment.

[c] Blasting is an instantaneous event that is assumed to last no more than 3 seconds and therefore does not have a usage factor applied

SOURCE: FHWA 2006; ESA 2022.

Blasting Noise

Blasting noise levels were estimated using blasting noise levels identified in the FHWA RCNM. Blasting could occur on the project site, specifically at the location of the proposed water storage tank. The proposed water storage tank is located approximately 450 feet from receptor R1, 900 feet from receptor R2, 2,600 feet from receptor R3, and 1,050 feet from receptor R4. If, by the time Phase 2 is built, sensitive residential receptors (R5) are located across Moreno Beach Drive from the proposed storage tank site, blasting could occur as close as 80 feet. Blasting would only occur if needed and at depths greater than 10 feet bgs.

OffSite Roadway Noise (Construction and Operation)

Roadway noise levels were assessed qualitatively for construction and operation of the project. Generally speaking, a doubling of traffic volumes results in a perceptible 3 dBA noise level increase over ambient conditions (Colorado Department of Transportation 2011). The expected number of trips from construction are assessed relation to this standard.

Groundborne Vibration (Construction and Operation)

Groundborne vibration and noise impacts were evaluated for potential building damage and human annoyance impacts by identifying the project's potential vibration sources, estimating the distance between the project's vibration sources and the nearest structure and vibration annoyance receptor locations, and making a significance determination based on the significance thresholds described below.

The FTA guidance classifies the vibration impact levels based on whether the vibration-producing events are frequent, occasional, or infrequent. "Frequent Events" is defined as more than 70 vibration events of the same source per day. "Occasional Events" is defined as between 30 and 70 vibration events of the same source per day. "Infrequent Events" is defined as fewer than 30 vibration events of the same kind per day. For the purposes of providing a conservative analysis, the vibration analysis provided herein for potential human annoyance compares the estimated vibration levels generated during construction and operation of the project to the 72 VdB significance threshold for offsite residential uses for "Frequent Events." The vibration analysis for the project conservatively used the closest distance to construction activity and the construction phase with the equipment mix that would result in the greatest potential vibration.

Construction activities may generate groundborne vibration and noise from transient sources due to the temporary and sporadic use of vibration-generating equipment. Operation of the project has no potential to cause structure damage to the project's own buildings or to offsite buildings that are farther away because the project would not include any equipment that would generate substantial groundborne vibration or noise levels. Construction and operational activities may generate groundborne vibration and noise levels that could be felt by people as a result of trucks and vehicles driving to and from the project site, or from the operation of typical commercial-grade stationary mechanical and electrical equipment, such as air handling units, condenser units, and exhaust fans, which could produce groundborne vibration and noise.

Operational Stationary Noise

Since the project is an infrastructure upgrade with minimal noise-generating operational components, operational stationary noise was assessed qualitatively relative to the existing conditions onsite.

Impact Analysis

Increase in Ambient Noise Levels

Impact 3.9-1: The proposed project could generate a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies.

Phase 1

Construction (Onsite)

Storage Tank and Pipeline

Construction noise levels associated with installation of the proposed project would fluctuate depending on the type, number, and duration of uses of various pieces of construction equipment. Material haul truck trips (from spoils and pipelines) would raise ambient noise levels along haul routes, depending on the number of haul trips made and types of vehicles used. Table 3.9-8 shows the typical maximum noise levels produced by various types of construction equipment and their associated acoustical usage factor.

Consistent with the modeling conducted for the air quality and greenhouse gas emissions analysis, construction noise is estimated based on the same types and number of construction equipment expected to be used in each construction phase for the components of the proposed project. The reference noise levels and usage factors for each piece of equipment are derived from FHWA’s RCNM. As a worst-case scenario, based on the known pipeline alignments, construction of the pipelines would occur as close as 25 feet of the property line of sensitive receivers along the pipeline routes.

The noise levels shown below in **Table 3.9-9** represent composite noise levels associated with typical construction activities, which take into account both the number of pieces and spacing of heavy construction equipment that are typically used during each phase of construction. As shown in Table 3.9-9, construction of the pipelines would result in noise levels up to 84.7 dBA L_{eq} at 25 feet where the nearest sensitive receptor property lines would be located.

TABLE 3.9-9
ESTIMATED CONSTRUCTION NOISE LEVELS AT NEAREST EXISTING OFFSITE SENSITIVE RECEPTORS DURING PHASE 1

Noise Receptor	Construction Phases	Distance between Nearest Receptor and Construction Site, feet	Estimated Construction Noise Levels at Noise Sensitive Receptor by Construction Phase,[a,b,c] Hourly L_{eq} (dBA)	Estimated Construction Noise Level at 200 feet (dBA L_{eq})
R1	**Phase 1 (Pipeline)**			
	Potholing	600 to 700 feet	59.6	59.6
	Install Pipeline		56.8	56.8
	Install Appurtenances		57.5	57.5
	Pavement Repairs/Misc.		60.4	60.4
	Phase 1 (Storage Tank)			
	Grading/Excavation	450 to 875 feet	69.1	69.1
	Stormwater Drainage and Foundation		64.6	64.6
	Construction/Finishing/Painting		64.3	64.3
	Maximum Combined Noise Levels		69.6	69.6
R2	**Phase 1 (Pipeline)**			
	Potholing	25 to 100 feet	84.7	69.7
	Install Pipeline		79.5	67.1
	Install Appurtenances		79.6	67.9
	Pavement Repairs/Misc.		84.3	70.6
	Phase 1 (Storage Tank)			
	Grading/Excavation	900 to 1,350 feet	63.5	63.5
	Stormwater Drainage and Foundation		58.9	58.9
	Construction/Finishing/Painting		58.7	58.7
	Maximum Combined Noise Levels		84.7	70.9
R3	**Phase 1 (Pipeline)**			
	Potholing	2,600 to 2,700 feet	47.3	47.3
	Install Pipeline		44.7	44.7
	Install Appurtenances		45.4	45.4
	Pavement Repairs/Misc.		48.2	48.2
	Phase 1 (Storage Tank)			
	Grading/Excavation	2,600 to 2,900 feet	55.0	55.0
	Stormwater Drainage and Foundation		50.2	50.2
	Construction/Finishing/Painting		50.1	50.1
	Maximum Combined Noise Levels		55.7	55.7

Noise Receptor	Construction Phases	Distance between Nearest Receptor and Construction Site, feet	Estimated Construction Noise Levels at Noise Sensitive Receptor by Construction Phase,[a,b,c] Hourly L_{eq} (dBA)	Estimated Construction Noise Level at 200 feet (dBA L_{eq})
R4	**Phase 1 (Pipeline)**			
	Potholing	1,050 to 1,150 feet	54.9	54.9
	Install Pipeline		52.3	52.3
	Install Appurtenances		53.0	53.0
	Pavement Repairs/Misc.		55.8	55.8
	Phase 1 (Storage Tank)			
	Grading/Excavation	1,050 to 1,450 feet	62.4	62.4
	Stormwater Drainage and Foundation		57.8	57.8
	Construction/Finishing/Painting		57.5	57.5
	Maximum Combined Noise Levels		63.1	63.1

SOURCE: ESA 2023.

Exposure of sensitive receptors would exceed the 65 dBA when located at 200 feet or greater from an active construction area at receptors R1 and R2 during construction of the Phase 1 pipeline and storage tank. However, pipeline construction would be short-term in duration and would expose sensitive receptors to temporary increases in noise levels because the construction activities would move along the pipeline route (i.e., roadways) as the pipeline is installed. Implementation of **Mitigation Measure NOISE-1** would ensure that construction equipment are equipped with reasonable noise attenuating equipment and such noise attenuating equipment are properly maintained. As a result, temporary construction noise impacts would be reduced to a less than significant level.

Blasting Noise

When necessary, blasting could be used to clear bedrock material at depths greater than 10 feet bgs. Blasting, if needed, would only occur at the location of the proposed water storage tank within the proposed tank site. Construction equipment would be used prior to and after the actual blasting event to prepare the site for blasting and to clear the site of earthen materials. The nearest distances that blasting-related construction equipment would be used relative to the property lines of the noise-sensitive receptors would be approximately 450 feet from receptor R1, 900 feet from receptor R2, 2,600 feet from receptor R3, and 1,050 feet from receptor R4. Construction equipment noise levels related to blasting activities are shown in **Table 3.9-10**. As shown, the construction equipment noise levels at sensitive receptors within the City of Moreno Valley would not exceed the City's 65 dBA standard and construction noise impacts from blasting-related construction equipment would be less than significant.

TABLE 3.9-10
EXTERIOR NOISE AT OFFSITE SENSITIVE USES FROM PROJECT TANK SITE BLASTING-RELATED CONSTRUCTION EQUIPMENT – CITY OF MORENO VALLEY

Offsite Sensitive Land Uses	Location	Closest Approximate Distance to Project Site Construction Area (ft.)[a]	Estimated Blasting Noise Levels (dBA L_{eq})
R1	Southwest of proposed tank site	450	61.9
R2	South of proposed tank site	900	55.9
R3	East of proposed tank site	2,600	46.7
R4	North of proposed tank site	1,050	54.5

Phase 2

Construction (Onsite)

Storage Tank

The noise levels associated with construction during Phase 2 would be similar to Phase 1 shown in Table 3.9-9. However, the future baseline conditions may include an additional new sensitive receptor (R5) at the time of construction in 2045. **Table 3.9-11** summarizes potential noise impacts for construction during Phase 2.

TABLE 3.9-11
ESTIMATED CONSTRUCTION NOISE LEVELS AT NEAREST EXISTING OFFSITE SENSITIVE RECEPTORS DURING PHASE 2

Noise Receptor	Construction Phases	Distance between Nearest Receptor and Construction Site, feet	Estimated Construction Noise Levels at Noise Sensitive Receptor by Construction Phase,[a,b,c] Hourly L_{eq} (dBA)	Estimated Construction Noise Level at 200 feet (dBA L_{eq})
R5	**Storage Tank**			
	Demolition	80 to 450 feet	79.7	73.0
	Grading/Excavation		82.2	76.2
	Stormwater Drainage and Foundation		78.9	71.9
	Construction/Finishing/Painting		78.7	71.4
	Maximum Combined Noise Levels		82.2	76.2

SOURCE: ESA 2023.

As shown in Tables 3.9-9 and 3.9-11, construction of the proposed storage tank, which would involve demolition of the existing tank onsite and construction of a larger tank and appurtenant facilities, would result in noise levels in exceedance of 65 dBA at sensitive receptors R1 and R5. As a result, temporary construction noise during Phase 2 would be significant. With implementation of Mitigation Measure NOISE-1, noise levels associated with construction equipment would be decreased and impacts would be less than significant.

Blasting Noise

When necessary, blasting could be used to clear bedrock material at depths greater than 10 feet bgs. Blasting, if needed, would only occur at the location of the proposed water storage tank within the proposed storage tank area. Construction equipment would be used prior to and after the actual blasting event to prepare the site for blasting and to clear the site of earthen materials. The nearest distances that blasting-related construction equipment would be used relative to the property lines of the noise-sensitive receptors would be approximately 450 feet from receptor R1, 900 feet from receptor R2, 2,600 feet from receptor R3, 1,050 feet from receptor R4, and 200 feet from receptor R5[6]. Construction equipment noise levels related to blasting activities are shown in **Table 3.9-12**. As shown, the construction equipment noise levels at sensitive receptors within the City of Moreno Valley would exceed the City's 65 dBA standard at receptor R5. However, blasting noise is not sustained, and would result in infrequent disturbances during daytime hours. Regardless, blasting noise would result in an exceedance of the Noise Ordinance ambient noise thresholds. Implementation of **Mitigation Measures NOISE-2** through **NOISE-4** would ensure that noise impacts associated with blasting activities would be reduced to a less than significant level.

TABLE 3.9-12
EXTERIOR NOISE AT OFFSITE SENSITIVE USES FROM PROJECT TANK SITE BLASTING-RELATED CONSTRUCTION EQUIPMENT – CITY OF MORENO VALLEY

Offsite Sensitive Land Uses	Location	Closest Approximate Distance to Project Site Construction Area (ft.)[a]	Estimated Blasting Noise Levels (dBA L_{eq})
R1	Southwest of proposed tank site	450	61.9
R2	South of proposed tank site	900	55.9
R3	East of proposed tank site	2,600	46.7
R4	North of proposed tank site	1,050	54.5
R5	East of proposed tank site	200	68.9

NOTES:
[a] The approximate distances are measured from the sensitive-receptor property line to the nearest construction area at the project site. This analysis conservatively assumes all blasting-related construction equipment are located at the same distance.
[b] The City of Moreno Valley has established a noise standard of 65 dBA at a distance of 200 ft

SOURCE: ESA 2023

Phase 1 and Phase 2

Construction (Offsite)

Storage Tanks and Pipeline

Delivery and haul truck trips would occur throughout the construction period, although no truck trips would occur between 7:00 a.m. and 6:00 p.m. Monday Through Friday or before 8:00 a.m. or after 4:00 p.m. on Saturday. Therefore, offsite construction noise impacts would be less than significant.

[6] As previously stated, R5 represents a potential future residential development. There are currently no known planned residential developments at this location. However, it is conservatively estimated that residences will be located as close as 80 feet from the storage tank area with structures located approximately 200 feet from the storage tank area.

The addition of 184 truck trips per day during the grading/excavation phase of construction of each storage tank would not result in a doubling of traffic volumes on Moreno Beach Drive and would result in a less than perceptible 3 dBA noise level increase nor would construction traffic noise increase noise levels by a "clearly noticeable" increase of 5 dBA over the land use compatibility categories identified in Table 3.9-3, above. The remainder of the construction activities would have less truck trips than the grading/excavation phase and thus lower noise levels. Therefore, based on this additional supporting evidence, noise impacts from offsite construction traffic would be less than significant and no mitigation measures are required.

Mitigation Measures

NOISE-1: Construction Equipment Noise Shielding and Muffling Devices. To reduce construction noise impacts, EMWD shall require construction contractors to implement the following:

- During construction, the contractor shall outfit all equipment, fixed or mobile, with properly operating and maintained exhaust and intake mufflers, consistent with manufacturers' standards. All documentation demonstrating the equipment has been maintained in accordance with manufacturers' specifications shall be maintained on-site at all times.
- Impact tools (e.g., jackhammers, pavement breakers) used for construction shall be hydraulically or electrically powered wherever possible to avoid noise associated with compressed air exhaust from pneumatically powered tools. When use of pneumatic tools is unavoidable, an exhaust muffler on the compressed air exhaust shall be used. External jackets on the tools themselves shall be used where feasible.
- Stationary noise sources that could affect adjacent receptors shall be located away from adjacent receptors when feasible.
- Prior to issuance of any demolition, grading or building permit for Phase 2, the Project shall provide temporary ground-level 10-foot-tall construction noise barriers equipped with noise blankets or equivalent noise reduction materials rated to achieve sound level reductions of at least 12 dBA between the Project Site and the sensitive receptor location R5. These temporary noise barriers shall be used to block the line-of-sight between the construction equipment and the noise-sensitive receptor(s) during the duration of construction activities. The Project applicant shall provide documentation prepared by a qualified noise consultant verifying compliance with this measure.

NOISE-2: Blasting Sound Blankets. To reduce construction noise impacts related to blasting, EMWD shall require construction contractors to utilize sound blankets and/or noise barriers to cover/surround at the localized blasting area when feasible to do so. The sound blanket and/or barrier shall achieve a reduction of at least 5 dBA and should block the line of sight to nearby sensitive receptors, particularly receptor R5.

NOISE-3: If blasting is necessary in either Phase 1 or Phase 2, notices will be sent out to sensitive receptors (residences, residential areas, schools, and hospitals) within 1,000 feet of the storage tank area at least 10 days prior to the occurrence of any blasting activities.

NOISE-4: Prior to construction of the storage tanks, EMWD shall notify sensitive receptors (residences, residential areas, schools, and hospitals) within 500 feet of project construction activities of the construction methods and schedule and provide a point of contact for local residences to report excessive noise.

Significance Determination

Less than Significant Impact with Mitigation Incorporated

Phase 1 and Phase 2

Operation

Storage Tanks and Pipeline

Project operations that would generate noise include maintenance vehicle trips and the operation of certain mechanical equipment such as stationary pumps. Implementation of the proposed project would not result in new employees. Maintenance inspection of storage tanks would occur weekly in line with existing maintenance trips. The pipeline alignments would be largely underground and serviced on an as-need basis as well. As a result, maintenance and inspection of the facility would result in a minimal increase in traffic trips, and therefore, operational vehicle trip increases would not generate a substantial increase in noise along local roadways.

Storage tanks would involve passive conveyance and storage of water and would produce minimal operational noise. The proposed project would be designed in accordance with noise ordinances of the City to ensure that noise thresholds at the property boundary do not exceed day and nighttime limitations for neighboring land uses. Additionally, new equipment would be designed to generate similar levels of noise as existing EMWD infrastructure. As a result, impacts would be less than significant.

Mitigation Measures

None Required

Significance Determination

Less than Significant Impact

Groundborne Vibration and Noise

Impact 3.9-2: The proposed project could generate excessive groundborne vibration or groundborne noise levels.

Construction

Typical activities that could generate groundborne vibration during construction include demolition, pile driving, and excavation in close proximity to structures. FTA's threshold of architectural damage for conventional sensitive structures is 0.2 in/sec PPV and the FTA threshold of human annoyance to groundborne vibration is 80 RMS (FTA 2018). Construction of the project would employ conventional construction activities and the equipment/techniques to be used would not cause excessive groundborne vibration. As shown in **Table 3.9-13**, use of heavy equipment during construction could generate vibration levels of up to 0.089 in/sec PPV or 87 RMS (large bulldozer) at a distance of 25 feet.

TABLE 3.9-13
VIBRATION VELOCITIES FOR CONSTRUCTION EQUIPMENT

Construction Equipment	PPV at 25 Feet (inches/second)	RMS at 25 Feet (VdB)
Large Bulldozer	0.089	87
Loaded Trucks	0.076	86
Jackhammer	0.035	79
Small Bulldozer	0.003	58

SOURCE: FTA 2018

Phase 1

Pipeline

Construction of pipelines would not require activities (such as jack and bore techniques) that would generate substantial groundborne vibration. The proposed project could get as close as 25 feet from sensitive receptors during pipeline construction and would exceed the human annoyance threshold of 80 RMS. The pipeline construction would not exceed the potential structural damage threshold of 0.2 in/sec PPV for conventional sensitive structures. The potential for heavy trucks and equipment to generate vibration is minimal and would occur during temporary construction activities during daytime hours. As a result, the potential for human annoyance from excessive vibration would be less than significant.

Storage Tank

Construction of the storage tank may require blasting to extract bedrock material in order to install the tank foundation. The existing onsite storage tank is located approximately 100 feet from where blasting would occur to install the Phase 1 storage tank. The existing storage tank is considered an industrial/commercial structure with a significance threshold of 2.0 in/sec PPV. At a distance of 100 feet, the blasting vibration would be up to 0.87 in/sec PPV at the existing onsite storage tank, which would not exceed the 2.0 in/sec PPV damage threshold for industrial/commercial buildings. Impacts would be less than significant.

Phase 2

Storage Tank

Construction of the storage tank during Phase 2 may require blasting to extract bedrock material in order to install the tank foundation at depths greater than 10 feet bgs. A minimum recommended blast distance of greater than 130 feet to register a vibration level of 0.75 in/sec would be required for a 15.0 in/sec PPV, pure 40 Hz impulse recorded at 50 feet. With blasting occurring at depths of at least 10 feet bgs, this distance would be reduced to approximately 110 feet (for a vibration level of 0.75 in/sec). By the time Phase 2 is implemented in 2045, the closest offsite receptors could be future structures (i.e., walls or buildings) located to the east of the project site. While there are no known development plans, this analysis conservatively assumes the nearest structure could be approximately 200 feet away (Sensitive Receptor R5) to the east of the proposed water storage tank. At the closest distance of approximately 200 feet, the blasting vibration could be up to 0.31 in/sec PPV, which would not exceed the 1 in/sec PPV damage threshold for new residential buildings (see Table 3.9-4). Impacts would be less than significant.

Operation

Phase 1 and Phase 2

Storage Tanks and Pipeline

Operation of the proposed project would not generate substantial vibration to affect receivers adjacent to the proposed project. Impacts would be less than significant.

Mitigation Measures

None Required

Significance Determination

Less than Significant Impact

Airport Noise

Impact 3.9-3: The proposed project could expose people residing or working in the project area to excessive noise levels in the vicinity of a private airstrip or an airport land use plan.

Phase 1 and Phase 2

Construction and Operation

Storage Tanks and Pipeline

The March Air Reserve Base is located approximately 5 miles to the southwest of the project site. The project site is located outside of the 65 dBA CNEL contour for the March Air Reserve Base. Because of the nature of the proposed project, which includes pipelines and storage tanks, the project would not result in people residing or working in the project area exposed to excessive noise levels. Future employees to perform maintenance and inspection at the facility sites would be minimal and periodic, and therefore, employees would not be subjected to excessive noise levels from an airport or airstrip. Therefore, implementation of the proposed project would not expose people to excessive airport noise levels, and no impact would occur.

Mitigation Measures

None Required

Significance Determination

No Impact

Cumulative Impacts

Impact 3.9-4: Concurrent construction and operation of the proposed project and related projects in the geographic scope could result in cumulative short-term and long-term impacts to noise and vibration.

The cumulative projects considered in the analysis of cumulative impacts are listed in Table 3-2 and illustrated on Figure 3-1 in Chapter 3 of this Draft EIR, which include a mix of residential, commercial, industrial, and mixed-use development projects. Future cumulative development would require noise-and-vibration-generating activities during construction and operation. Significant environmental effects to noise and vibration could result during the construction of these facilities, especially for some of the large-scale residential and commercial projects already in the planning stages. However, the closest cumulative projects to the proposed project are Projects 1, 2, and 6, and are located too far away from the proposed project to combine together to result in a cumulative noise or vibration-related impact. The proposed project would result in potentially significant impacts to noise and vibration that would be mitigated to a less than significant level through implementation of Mitigation Measures NOISE-1 through NOISE-4. The project's contribution to local noise levels in combination with other projects' noise emissions would not result in a cumulative increase in ambient noise levels because the projects are not close enough in proximity to combine together to result in significant noise impacts. As a result, noise emissions would be less than cumulatively considerable, and a less than significant cumulative noise and vibration impact would occur.

Mitigation Measures

Implement Mitigation Measures NOISE-1 through NOISE-4

Significance Determination

Less than Significant Impact with Mitigation Incorporated

3.9.4 References

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Federal Highway Administration (FHWA), 2006. *FHWA Highway Construction Noise Handbook*. August.

Federal Transit Administration (FTA), 2018. *Transit Noise and Vibration Impact Assessment Manual*. September.

United States Environmental Protection Agency (USEPA), 1974. "EPA Identifies Noise Levels Affecting Health and Welfare." April 12. Available at: https://archive.epa.gov/epa/aboutepa/epa-identifies-noise-levels-affecting-health-and-welfare.html; accessed on December 16, 2022.

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3.10 Transportation

This section addresses the transportation impacts associated with implementation of the proposed project. This section includes: a description of the existing transportation conditions in and around the proposed project site; a summary of applicable regulations related to transportation; and an evaluation of the potential impacts of the proposed project related to transportation at the proposed project site and in the surrounding area, including cumulative impacts.

3.10.1 Environmental Setting

Regional Circulation System

The proposed project would be implemented within the City of Moreno Valley in western Riverside County, California. The northern border of Moreno Valley is adjacent to the Reche Canyon/Box Springs Mountain Reserve, which is just south of the Riverside/San Bernardino County line. To the east of Moreno Valley lies the City of Beaumont, to the south is the City of Perris, and to the West is the City of Riverside. Moreno Valley is connected regionally by State Route 60 (SR-60) and Interstates 215 (I-215), described below. The highways are accessed by multiple on/off ramps throughout Moreno Valley and intersect just outside of the western city limits, approximately 6.8 miles west of the proposed project (City of Moreno Valley 2021a).

SR-60 is an east-west freeway that runs through the northern portion of Moreno Valley approximately 0.8-mile north of the proposed storage tank site. SR-60 provides connectivity to the eastern side of the Los Angeles metropolitan area and the San Gabriel Valley. In the vicinity of the proposed project, SR-60 has three travel lanes in each direction. It is expected that most project-generated traffic would use SR-60 to reach the proposed storage tank and transmission pipeline sites during construction to move materials to and from the project area.

I-215 is a north-south freeway that borders Moreno Valley on the west and provides connectivity to the City of San Bernardino to the north and the cities of Marietta, Menifee, Perris to the south. In the vicinity of the project area, I-215 has three travel lanes in each direction.

Local Circulation System

There are five basic functional systems that make up the local roadway system in Moreno Valley: divided major arterials, divided arterials, arterials, minor arterials, and collector streets. Moreno Valley's local roadway network primarily consists an arterial grid defining "superblocks" of residential streets that rarely connect across the surrounding arterials (City of Moreno Valley 2014). The proposed project area encompasses two parcels located on the western side of Moreno Beach Drive as well as the Moreno Beach Drive, Cottonwood Avenue, Bay Avenue, and Alessandro Boulevard rights-of-way. The roadways below are located in proximity to the proposed project would provide local access for construction vehicles, including trucks that would transport equipment and material as well as individual construction worker trips.

Moreno Beach Drive is a divided major arterial (south of SR-60) and an arterial (north of SR-60) that travels in a north-south direction through Moreno Valley. Moreno Beach Drive would provide primary access between SR-60 and the proposed storage tank and transmission pipeline during construction. In the project vicinity, the roadway has one southbound lane and one northbound lane. The posted speed limit on Moreno Beach Drive is 45 miles per hour. Notable features include bike lanes on both the northbound and southbound sides of the roadway. Other than one paved sidewalk fronting a residential development south of Bay Avenue, there are no sidewalks on either side of the roadway. Moreno Beach Drive from Alessandro Boulevard to SR-60 has an average daily traffic load of 14,000 vehicles, while the segment south of Alessandro Boulevard has an average daily traffic load of 19,000 vehicles (City of Moreno Valley 2021b).

Cottonwood Avenue is an east-west minor arterial that intersects with Moreno Beach Drive approximately 900 feet south of the proposed storage tank site, where construction of the transmission pipeline is proposed. The intersection includes stoplights in each direction and turning lanes for vehicles traveling along Moreno Beach Drive. Cottonwood Avenue has two lanes running west of Moreno Beach Drive and three lanes east of the intersection (one lane going west and two going east). The posted speed limit is 40 miles per hour. Average daily traffic on Cottonwood Avenue is approximately 3,300 vehicles in the vicinity of the proposed project, with traffic gradually increasing in western parts of the city (City of Moreno Valley 2021b).

Alessandro Boulevard is both a divided major arterial and a divided arterial with two lanes traveling in an east-west direction across Moreno Valley. Construction of the proposed transmission pipeline would extend to the intersection of Alessandro Boulevard and Moreno Beach Drive, which includes stop lights and turning lanes, but no paved sidewalks. The posted speed limit on Alessandro Boulevard is 45 miles per hour. Alessandro Boulevard has an average daily traffic load range of 5,400 vehicles in the project area, with lower traffic counts occurring east of the proposed transmission pipeline and higher traffic counts occurring in western parts of the city (City of Moreno Valley 2021b).

Eucalyptus Avenue is an east-west arterial that includes two lanes in each direction. Eucalyptus Avenue intersects with Moreno Beach Drive approximately 0.7-mile north of the proposed storage tank site, and provides access to various north-south arterials connecting to SR- 60 on/off ramps in the project area. Average daily traffic on this arterial is approximately 8,000 vehicles in the vicinity of the proposed project (City of Moreno Valley 2021b).

Bay Avenue is an east-west neighborhood collector that intersects with Moreno Beach Drive approximately a 0.4-mile south of the proposed storage tank site, where construction of the transmission pipeline is proposed (City of Moreno Valley 2021b). Bay Avenue provides primary access to a residential community located southwest of the intersection and has stop signs for vehicles accessing Moreno Beach Drive. Sidewalks border the block southwest of the intersection and provide pedestrian access to the residential community.

Public Transit System

The Riverside Transit Agency (RTA) provides the majority of public transportation within the project area via fixed route and paratransit bus services. Major Moreno Valley bus routes include Routes 11, 16, 18, 19, 19A, 20, and 31, which connect Moreno Valley to major destinations such as the Moreno Valley/March Field Metrolink Station, Perris Station Transit Center, University of

California, Riverside (UCR), and Moreno Valley Mall. RTA also provides Dial-A-Ride services for seniors and persons with disabilities. Two bus routes have stops in the project vicinity:

- RTA Route 20 runs from Moreno Valley College to the Magnolia Shopping Center in the City of Riverside. Route 20 travels south along Moreno Beach Drive and west along Alessandro Boulevard, with existing bus stops at the intersection. The southern terminus of the proposed transmission pipeline would involve construction in the Alessandro Boulevard/Moreno Beach Drive rights-of-way to supply water from the proposed storage tank to the future Cactus II Feeder.
- RTA Route 31 links the Moreno Valley Mall located near the western city limits to the Hemet Valley Mall in the City of San Jacinto. Route 31 also provides connections to Beaumont, Banning, Hemet, and San Jacinto and passengers can transfer in Beaumont to Sunline Route 10 for service to the Coachella Valley. The route includes a stop at the Stoneridge Town Center approximately 0.5-mile norther of the proposed storage tank site and utilizes Eucalyptus Avenue and SR-60. Construction vehicles would also use these routes to access the proposed project site and could contribute to traffic on these roadways.

Additionally, the city is accessible by rail through Metrolink, a commuter rail program operated by the Southern California Regional Rail Authority (SCRRA) which provides service from outlying suburban communities to employment centers such as Burbank, Irvine, and downtown Los Angeles. The nearest Metrolink Station is the Moreno Valley/March Field station located less than one-half mile west of the city limits. The 91/Perris Valley Line train services Metrolink stations in the cities of Perris, Riverside, Corona, Fullerton, Buena Park, Norwalk/Santa Fe Springs, and Los Angeles (City of Moreno Valley 2021c).

Bicycle and Pedestrian Transportation

Moreno Valley is relatively flat, which makes regular cycling feasible for most riders. Along with level terrain, its grid street system and weather support year round cycling. There are also several flood control channels with the potential to provide relatively lengthy off-street routes more appealing to casual cyclists (City of Moreno Valley 2014). The different types of bicycle facilities designated in Moreno Valley are described below:

- Class I Bikeways (Multi-Use Paths) are facilities that are physically separated from vehicles, designated for the exclusive use of bicyclists and pedestrians with minimal vehicle crossings.
- Class II Bikeways (Bike Lanes) are striped lanes designated for the use of bicycles on a street or highway. Vehicle parking and vehicle/pedestrian cross flow are permitted at designated locations.
- Class III Bikeways (Bike Routes) are only identified by signs or pavement markings. A bicycle route is meant for use by bicyclists and for motor vehicle travel (i.e., shared use).
- Class IV Bikeways (Cycle Tracks) are protected bike lanes, which provide a right-of-way designated exclusively for bicycle travel within a roadway that is protected from vehicular traffic with devices.

Figure 3.10-1 shows the locations of existing and proposed bicycle and pedestrian facilities within the city. There are substantial east-west Class III bicycle route segments and Class II bicycle lanes on some arterials within the city, as well as some segments of Class I multi-use paths along flood channels. Moreno Valley classifies Moreno Beach Drive as a Class II bike lane. No official bike paths exist along the other east-west roadways where the transmission pipeline would be installed. However, the city has proposed a Class III bike route along Cottonwood Avenue and a Class II bike lane along Alessandro Boulevard (City of Moreno Valley 2021c).

Pedestrian facilities in Moreno Valley consist of sidewalks and crosswalks, along with multiuse trails. Most residential and commercial developments provide sidewalks on public streets and internal circulation. Areas with no existing sidewalks are mainly located in undeveloped areas or in a more rural area in the eastern portion of the city and along the city boundary. Sidewalks in Moreno Valley vary from wide and meandering curb-separated sidewalks to narrow pathways on the side of the road. Sidewalks are sometimes obstructed, incomplete mid-block, or damaged (City of Moreno Valley 2021c). As discussed above, a majority of the roadways where the transmission pipeline would be constructed do not include paved sidewalks. Along most of the proposed pipeline route, pedestrian access is limited and provided only by unpaved dirt pathways on both sides of Moreno Beach Drive. One paved sidewalk provides pedestrian access on the western side of Moreno Beach Drive near the southern end of the proposed pipeline. This sidewalk spans the length of the existing residential community located south of Bay Avenue.

Existing multi-use trails in the project area are maintained by the Moreno Valley Parks and Community Services Department to accommodate pedestrians, equestrians, and bicyclists. The nearest trail to the proposed project is the Cold Creek Trail, which is an out-and-back multi-use trail located in the hills to the west of the proposed storage tank site. As shown in **Figure 3.10-2**, Moreno Valley's *Master Plan of Trails* includes plans to finish the southern loop of Cold Creek Trail, and proposes new trail connections between Cold Creek Trail and another existing trail along Cactus Avenue (City of Moreno Valley 2021c, 2021d).

3.10.2 Regulatory Framework

State

California Department of Transportation

Caltrans manages interregional transportation, including management and construction of the California highway system. In addition, Caltrans is responsible for permitting and regulation of the use of state roadways. Caltrans has jurisdiction over state highways and sets maximum load limits for trucks and safety requirements for oversized vehicles that operate on highways.

Caltrans' construction practices require temporary traffic control planning "when the normal function of a roadway, or private road open to public travel, is suspended" (FHWA 2012).

SOURCE: ESA (2022)

Pettit Water Storage Tank Expansion and Transmission Pipeline Project

Figure 3.10-1
Existing and Proposed Bikeways

ESA

SOURCE: Nearmap (2022), ESA (2022)

Pettit Water Storage Tank Expansion and Transmission Pipeline Project

Figure 3.10-2
Existing and Proposed Trails

ESA

The project area includes two highways that provide critical access to Riverside County and fall under Caltrans' jurisdiction: SR-60 and I-215. As such, the following Caltrans regulations apply to potential transportation and traffic impacts associated with the proposed project:

- **California Vehicle Code (CVC), division 15, chapters 1 through 5 (Size, Weight, and Load).** Includes regulations pertaining to licensing, size, weight, and load of vehicles operated on highways.
- **California Street and Highway Code Sections 660-711**. Caltrans encroachment regulations would apply to construction of the proposed project components within and immediately adjacent to roadways, as well as the transportation of construction crews and construction equipment throughout the project area. Caltrans requires that permits be obtained for transportation of oversized loads, certain materials, and construction-related traffic disturbance.

Senate Bill No. 743

Approved in 2013, Senate Bill (SB) 743 amended the CEQA Guidelines to provide an alternative to level of service (LOS) for evaluating transportation impacts. In accordance with Senate Bill (SB) 743, the new CEQA Guidelines Section 15064.3, subdivision (b) was adopted in December 2018 by the California Natural Resources Agency. These revisions to the CEQA Guidelines criteria for determining the significance of transportation impacts are primarily focused on projects within transit priority areas and shift the focus from automobile delay to reduction of greenhouse gas emissions, creation of multimodal networks, and promotion of a mix of land uses. Automobile delay, as measured by LOS and other similar metrics, generally no longer constitutes a significant environmental effect under CEQA. The intent of this legislation is to balance the need for traffic LOS standards with the need to build infill housing and mixed-use commercial developments within walking distance of mass transit facilities, downtowns, and town centers. In doing so, this legislation aims to provide greater flexibility to local governments to balance these sometimes competing needs. However, a jurisdiction may still adopt LOS as a performance standard for analyzing traffic conditions and maintaining throughput on its highway system. The Governor's Office of Planning and Research (OPR) has adopted changes to the CEQA Guidelines that identify vehicle miles traveled (VMT) as the most appropriate metric to evaluate a project's transportation impacts. Vehicle miles traveled, or VMT, is a measure of the total number of miles driven to or from a development and is sometimes expressed as an average per trip or per person.

OPR stated that lead agencies, including the City of Moreno Valley, had until July 1, 2020 to implement the new VMT requirements. Western Riverside Council of Governments (WRCOG) released the *WRCOG SB 743 Implementation Pathway* in March 2019, a guiding document for VMT analysis methodology, thresholds, and mitigation strategies for transportation impact evaluation for WRCOG agencies such as Moreno Valley (WRCOG 2019). In June 2020, based on WRCOG's *Implementation Pathway,* Moreno Valley adopted the *Traffic Impact Preparation Guide* (City of Moreno Valley 2020), which identifies the screening criteria, analysis requirements, thresholds, and mitigation options for VMT analysis associated with the operation of new projects in the city. According to Moreno Valley's *Traffic Impact Preparation Guide*, projects generating fewer than 400 daily vehicle trips do not meet the daily trip screening threshold and are excluded from further VMT impact analysis. Neither OPR nor the City of Moreno Valley have adopted specific VMT metrics or thresholds of significance for construction-related traffic. Many jurisdictions in Southern California consider construction-related traffic to cause adverse but not lasting intersection deficiencies because, while sometimes inconvenient, construction-related traffic efforts are temporary.

Local

Connect SoCal 2024 – The 2024-2050 Regional Transportation Plan/Sustainable Communities Strategy

On May 7, 2020, the Southern California Association of Governments (SCAG) adopted its 2024-2050 Regional Transportation Plan (RTP) known as Connect SoCal 2024. Connect SoCal 2024 is a long-range visioning plan that balances future mobility and housing needs with economic and environmental and goals. Connect SoCal 2024 embodies a collective vision for the region's future based on input from local governments, county transportation commissions (CTCs), tribal governments, non-profit organizations, businesses and local stakeholders within the counties of Imperial, Los Angeles, Orange, Riverside, San Bernardino and Ventura.

Connect SoCal 2024 is an important planning document for the region, allowing project sponsors to qualify for federal funding. In addition, Connect SoCal 2024 identifies a combination of transportation and land use strategies that help the region achieve state greenhouse gas emission reduction goals and federal Clean Air Act requirements, preserve open space areas, improve public health and roadway safety, and support the vital goods movement industry.

City of Moreno Valley General Plan

Chapter 4, Circulation, of the Moreno Valley General Plan satisfies the statutory requirements of the General Plan Circulation Element and provides a circulation diagram identifying major thoroughfares; transportation routes for vehicles, transit, bicycles, and pedestrians; and also a military airport. The Circulation Element includes policies for "complete streets," which provide a balanced multimodal transportation network serving all uses and abilities. As described above, impacts to LOS standards no longer represent a significant impact under CEQA, and thus policies related to LOS are not applicable. The following goals and policies in the Circulation Element would be applicable to the proposed project during construction within roadway rights-of-way.

Goal C-2: Plan, design, construct, and maintain a local transportation network that provides safe and efficient access throughout the city and optimizes travel by all modes.

Policy C.2-5: Prohibit points of access from conflicting with other existing or planned access points. Require points of access to roadways to be separated sufficiently to maintain capacity, efficiency, and safety of the traffic flow.

Policy C.2-7: Plan access and circulation of each development project to accommodate vehicles (including emergency vehicles and trash trucks), pedestrians, and bicycles.

Goal C-3: Manage the City's transportation system to minimize congestion, improve flow and improve air quality.

Policy C.3-4: Require development projects to complete traffic impact studies that conduct vehicle miles traveled analysis and level of service assessment as appropriate per traffic impact study guidelines.

Goal C-5: Enhance the range of transportation operations in Moreno Valley and reduce vehicle miles travelled.

Policy C.5-3: Encourage bicycling as an alternative to single occupant vehicle travel for the purpose of reducing fuel consumption, traffic congestion, and air pollution.

City of Moreno Valley Bicycle Master Plan

The Bicycle Master Plan, last updated in 2014, provides a vision for cycling in Moreno Valley and updated the City's 2006 Bicycle Transportation Plan to conform to WRCOG's Non-motorized Transportation Plan, as well as other regional plans. In addition, the plan identifies deficiencies and opportunities in the existing bicycle facility system within Moreno Valley and in terms of connectivity with adjacent jurisdictions (City of Moreno Valley 2014).

3.10.3 Impact Analysis and Mitigation Measures

Thresholds of Significance

The following criteria from CEQA Guidelines Appendix G are used as thresholds of significance to determine the impacts of the proposed project as related to transportation. The proposed project would have a significant impact if it would:

1. Conflict with a program plan, ordinance or policy addressing the circulation system, including transit, roadway, bicycle and pedestrian facilities.
2. Conflict or be inconsistent with CEQA Guidelines section 15064.3, subdivision (b).
3. Substantially increase hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment).
4. Result in inadequate emergency access.
5. Result in a cumulatively considerable impact to transportation.

Impact Analysis

Circulation System

Impact 3.10-1: The proposed project could conflict with a program plan, ordinance or policy addressing the circulation system, including transit, roadway, bicycle and pedestrian facilities.

Phase 1

Construction

Storage Tank and Pipeline

During the Phase 1 project, construction of the proposed 4.5 MG water storage tank, stormwater drainage facilities, and the proposed transmission line would generate truck and vehicle trips. The trips would be generated primarily by construction workers commuting to and from the project sites, and trucks hauling materials and equipment to and from the proposed construction sites. This analysis conservatively assumes that construction activities for the proposed storage tank and transmission pipeline would overlap, including the daily worker vehicle and truck trips described in Chapter 2, *Project Description*. As such, because a maximum of 10 daily workers would be needed for construction of the storage tank and related facilities and 5 to 10 daily workers would be required during installation of the transmission pipeline, up to 20 worker vehicle round trips would travel to and from the project sites on any given day that the construction activities overlap. Additionally, disposal of soil and bedrock material at the nearest landfill (approximately 10 miles from the project site) would result in 3,029 haul truck trips to/from the tank and pipeline construction site (approximately 118 round trips per day) and the delivery of concrete for the tank foundations would result in 4,856 vendor truck trips to/from the tank construction site (approximately 184 round trips per day).

Construction trucks and vehicles would use the regional circulation system, as well as roadways within the City of Moreno Valley. Based on the designated truck routes established in Chapter 12.36 of the Moreno Valley Municipal Code, construction trucks would primarily use Moreno Beach Drive and Alessandro Boulevard to bring construction materials and construction workers to the project area. These increases in trips per day on local and regional roadways could affect roadway capacity and circulation. Slower movements and larger turning radii of construction trucks compared to passenger vehicles could also lessen roadway capacities. As described in Section 3.10.1, *Environmental Setting* above, Moreno Beach Drive has an average daily traffic load of 14,000 vehicles on the truck route designated between Alessandro Boulevard and SR-60. However, while construction of the proposed Phase 1 project facilities would have the potential to generate up to 20 vehicle roundtrips and 184 truck roundtrips per day, traffic levels would not substantially increase above baseline daily traffic loads. Additionally, the additional trips would be temporary in nature as traffic levels would return to pre-construction conditions once construction is complete. Although local drivers could experience increased travel times if they were traveling behind a heavy truck due to slower movement and turning radii compared to passenger vehicles, these delays would be intermittent throughout the day and would also cease once construction activities are completed.

While construction of the water storage tank and transmission pipeline would not significantly increase the number of vehicles on the local and regional circulation systems, construction of the transmission pipeline would require partial closure of traffic lanes, which may include closures of portions of Moreno Beach Drive, Bay Avenue, Alessandro Boulevard, and Cottonwood Avenue. Road closures would not have the potential to impact nearby off-road bicycle routes, such as Cold Creek Trail (refer to Figure 3.10-2), since Moreno Valley's existing trail network does not include trails or crossings within the proposed construction area. With regard to the rest of the alternative transportation system, existing Class II bike lanes that run on both sides of Moreno Beach Drive could be affected by trucks entering and exiting Moreno Beach Drive as well as by lane closures that may occur during construction of the transmission pipeline and drainage facilities. The existing RTA Route 20 bus route, which includes bus stops at the Moreno Beach Drive/Alessandro Boulevard intersection, would also have the potential to be disrupted during installation of the transmission pipeline. As a result, construction activities within roadways could potentially impact the performance of applicable roadways and alternative transportation methods. EMWD would be required to implement **Mitigation Measure TRA-1**, which would require the preparation and implementation of a Traffic Control Plan. The Traffic Control Plan would include traffic control measures to guide motorists, bicyclists, and pedestrians safely through the construction area and allow for adequate access and circulation to the satisfaction of the City of Moreno Valley. Therefore, with implementation of Mitigation Measure TRA-1, impacts would be less than significant.

Operation

Storage Tank and Pipeline

Once constructed, the proposed transmission pipeline would be contained underground with surfaces restored and pavement replaced, and would not require periodic maintenance or additional trips on local roadways. The proposed water storage tank would require weekly maintenance consisting of a maximum of two service truck trips per week (1/2 ton pickup). No new employees would be required to operate the facilities. Since the number of truck trips would be minimal during operation of the Phase 1 project, the effects on the surrounding local and regional circulation system would be negligible and would not cause existing roadway levels of operation to decrease. Therefore, impacts to the applicable program plans, ordinances or policies addressing the circulation system during operation, including transit, roadway, bicycle and pedestrian facilities, would be less than significant.

Mitigation Measures

Mitigation Measure TRA-1: Prior to project construction, EMWD shall require the construction contractor to prepare a Traffic Control and Detour Plan, in accordance with the City of Moreno Valley traffic control guidelines. The Traffic Control and Detour Plan shall, at minimum:

- Identify staging locations to be used during construction.
- Identify safe ingress and egress points from staging areas.
- Identify potential road closures.
- Establish haul routes for construction-related vehicle traffic.
- Include a Detour Plan that identifies alternative safe routes to maintain pedestrian and bicyclist safety during construction.
- Include provisions for traffic control measures such as barricades, warning signs, cones, lights, and flag persons, to allow safe circulation of vehicle, bicycle, pedestrian, and emergency response traffic.
- Ensure access to individual properties.

The Traffic Control and Detour Plan shall be reviewed and approved by EMWD’s project manager and the construction inspector prior to the commencement of project construction activities. EMWD’s construction inspector shall provide the construction schedule and Traffic Control and Detour Plan to the City of Moreno Valley for review, to ensure that construction of the proposed project does not conflict with other construction projects that may be occurring simultaneously in the project vicinity.

Prior to project construction, EMWD’s Public and Governmental Affairs Department will perform public outreach to local residents informing them of upcoming construction activities. EMWD shall require the construction contractor to provide EMWD with a four (4) week notice for any project activities that may have an impact on surrounding communities. Public outreach to local residents may include any or all of the following:

- Written notices (i.e., letters, door hangers, other like forms of community engagement).
- Attendance at community events or presentations.
- Contact information for community complaints.

If the contractor receives complaints directly, the contractor shall forward complaint directly to the Public and Governmental Affair staff and immediately notify the project inspector.

Significance Determination

Less than Significant Impact with Mitigation Incorporated

Phase 2

Construction

Storage Tank

The Phase 2 project would include demolition of the existing 2 MG water storage tank and supporting infrastructure and installation of a new 4.5 MG steel storage tank in its place. Construction for Phase 2 is anticipated to occur over a period of 10 months in the year 2045. Demolition, excavation, and potential blasting would be implemented for the proposed tank installation and would generate excess soil that would need to be disposed of offsite, resulting in 1,017 truck haul trips to/from the project site (approximately 42 haul truck round trips per day). Additionally, up to 10 workers would be needed per day for construction activities, which would result in 10 daily vehicle trips commuting to/from the project site. Construction worker vehicles and trucks that would travel to/from the project site during construction of the Phase 2 project would not substantially increase baseline daily traffic loads in the project area and any increases to travel times would be intermittent and temporary in nature. Additionally, Phase 2 construction would not involve construction outside of the proposed tank site that could affect roadways, bicycle lanes, public transit routes, or pedestrian facilities in the project area. It should be noted that Moreno Valley's *Master Plan of Trails* includes plans to finish the southern loop of Cold Creek Trail, as shown in Figure 3.10-2, which could be located within or adjacent to the water tank site. While the Cold Creek Trail project has not been planned, construction of the Phase 2 project could occur after the trail is built, resulting in a potential impact to trail access. EMWD would coordinate with the City of Moreno Valley to ensure the public would be able to continue to access the trail during construction and operation of Phase 2. Therefore, impacts to the applicable program plans, ordinances or policies addressing the circulation system during construction would be less than significant.

Operation

Storage Tank

The proposed water storage tank would require weekly maintenance consisting of a maximum of two service truck trips per week. No new employees would be required to operate the facilities. Thus, trips generated during operation of the site would be minimal and would not substantially impact circulation system performance. Impacts would be less than significant.

Mitigation Measures

None Required

Significance Determination

Less than Significant Impact

Vehicle Miles Traveled

Impact 3.10-2: The proposed project could conflict or be inconsistent with CEQA Guidelines section 15064.3, subdivision (b).

Phase 1 and Phase 2

Construction and Operation

Storage Tanks and Pipeline

As explained in Section 3.10.2, *Regulatory Framework*, neither OPR nor the City of Moreno Valley have adopted specific VMT metrics or thresholds of significance for construction-related traffic. Temporary construction-related traffic impacts, while inconvenient, are generally considered to cause adverse but less than significant impacts. However, in an effort to document the potential impacts that may occur, the City of Moreno Valley's operational VMT thresholds will be applied to the vehicle trips that would occur during construction periods for the Phase 1 and Phase 2 facilities. According to Moreno Valley's *Traffic Impact Preparation Guide*, projects generating fewer than 400 daily vehicle trips do not meet the daily trip screening threshold and are excluded from further VMT impact analysis (City of Moreno Valley 2020). As discussed above for Impact 3.10-1, the proposed project would not generate more than 400 daily vehicle trips at any point during construction or operation of Phase 1 and Phase 2. Therefore, the proposed project would not exceed the City of Moreno Valley's daily trip screening threshold, and requires no further VMT impact analysis. Impacts are considered less than significant.

Mitigation Measures

None Required

Significance Determination

Less than Significant Impact

Traffic Hazards

Impact 3.10-3: The proposed project could substantially increase hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment).

Phase 1 and Phase 2

Construction

Storage Tanks and Pipeline

The proposed project does not include the construction of a new roadway or intersection, which could be determined to be a hazardous design feature. The project would involve the hauling of heavy construction equipment, soils, and bedrock material from the project sites. The use of oversize vehicles during construction could be an incompatible use and could create a hazard to the public by limiting motorist views on roadways by the obstruction of space. However, oversize loads associated with construction of the proposed project would be required to comply with applicable CVC and Caltrans requirements applicable to licensing, size, weight, load, and roadway encroachment of construction vehicles. Compliance with regulatory requirements to reduce hazards caused by incompatible roadway uses during construction would minimize the potential for hazards to other vehicles to less than significant levels.

As discussed above for Impact 3.10-1, construction of the transmission pipeline would require partial road closures on some local roadways, which would potentially result in hazardous driving conditions. However, implementation of Mitigation Measure TRA-1 would require the preparation and implementation of a Traffic Control Plan to minimize the effects on roadway safety. Therefore, construction of the proposed project would not result in a hazardous design feature within the project area. Impacts during construction would be less than significant with mitigation.

Operation

Storage Tanks and Pipeline

The proposed project would not involve any roadway improvements or alterations and would thus not increase hazards due to a design feature such as a sharp curve or dangerous intersections. Operation of the proposed water storage tanks would require weekly maintenance consisting of a maximum of two service truck trips per week. Existing staff would perform routine operations similar to what occurs at other water storage facilities in EMWD's service area. Once constructed, the transmission pipeline would be contained underground and would require minimal maintenance and associated trips on local roadways. As a result, impacts during operation of the proposed project would be less than significant.

Mitigation Measures

Implement Mitigation Measure TRA-1.

Significance Determination

Less than Significant Impact with Mitigation Incorporated

Emergency Access

Impact 3.10-4: The proposed project could result in inadequate emergency access.

Phase 1 and Phase 2

Construction

Storage Tanks and Pipeline

As described in Impact 3.10-1, construction of the proposed storage tanks and its related facilities as well as the transmission pipeline would not significantly increase the amount of trucks and vehicles on the local and regional circulation system, and thus would not substantially increase traffic levels or travel times on the surrounding circulation systems. However, construction activities within roadways would require partial road closures, which would have the potential to interfere with emergency vehicles accessing the project area. In order to reduce impacts to emergency access during construction of the proposed project, EMWD would be required to implement Mitigation Measure TRA-1, which would require the preparation and implementation of a Traffic Control Plan. The Traffic Control Plan would be coordinated with the City of Moreno Valley, as necessary, as well as with emergency responders, which include fire departments, police departments, and ambulances that have jurisdiction within the project area. The mitigation measure also requires that EMWD notify emergency responders of proposed partial or full lane closures at least 30 days prior to impacts. Therefore, with implementation of Mitigation Measure TRA-1, impacts would be less than significant.

Operation

Storage Tanks and Pipeline

Once constructed, the transmission pipeline would be contained underground and the water storage tank and its related facilities would be located on a parcel owned by EMWD. These facilities would not interfere with emergency access. The proposed water storage tanks would require weekly maintenance consisting of a maximum of two service truck trips per week, while the proposed transmission pipeline would not require regular maintenance. Due to the relatively limited amount of vehicle trips associated with operation and maintenance of the proposed project facilities, it is reasonable to assume these trips would not interfere with emergency access. Thus, impacts to emergency access during operation would be less than significant.

Mitigation Measures

Implement Mitigation Measure TRA-1.

Significance Determination

Less than Significant Impact with Mitigation Incorporated

Cumulative Impacts

Impact 3.10-5: Concurrent construction and operation of the proposed project and related projects in the geographic scope could result in cumulative short-term and long-term impacts to transportation.

The cumulative projects considered in the analysis of cumulative impacts are listed in Table 3-2 and illustrated on Figure 3-1 in Chapter 3 of this Draft EIR. Cumulative Projects 1 through 8 are development projects and Projects 10-12 are industrial projects that have the potential to affect traffic patterns on roadways in the project area. These projects could combine together with the proposed project to create a cumulatively considerable impact.

The construction-related traffic trips associated with all of the cumulative projects would be short-term and temporary in nature. Some of the larger developments, including Cumulative Projects 3, 4, 5, and 6, which are residential developments consisting of 426, 192, 225, and 204 apartments/single-family homes, respectively, as well as the industrial facilities proposed by Cumulative Projects 10-12, would permanently affect traffic in the area due to a greater number of people living in the area and traveling to/from the residences in their cars. Although on a much greater scale, these cumulative projects would be similar to the proposed project in that the EIR prepared for the developments analyzed all impacts to traffic and transportation. Furthermore, the permanent increase in daily trips associated with new large-scale developments listed above are part of the planned growth within the City of Moreno Valley and would not be expected to increase stress on traffic systems and transportation routes that would reduce the effectiveness of the circulation system.

The proposed project would involve installation of water storage tanks, as well as drainage facilities and transmission pipelines that may require temporary road closures during construction and increase roadway traffic volumes during operations. The effects of the project are evaluated throughout the EIR and would not separately cause significant environmental effects not analyzed in the EIR. Mitigation Measure TRA-1 would require EMWD to implement a Traffic Control Plan and would ensure coordination with appropriate agencies/private property owners to reduce construction-related effects of the project to less than significant levels. The Traffic Control Plan should also take into consideration the effects of other construction occurring simultaneously in the project area. As a result, the project would not combine together with Cumulative Projects 1 through 8 and 10 through 12 to result in significant impacts to traffic and transportation in the project area. Therefore, the combined impacts to traffic and transportation within the geographic scope would not be considered cumulatively significant and impacts would be less than cumulatively considerable.

Mitigation Measures

Implement Mitigation Measure TRA-1.

Significance Determination

Less than Significant Impact with Mitigation Incorporated

3.10.4 References

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City of Moreno Valley 2021b. City of Moreno Valley Traffic Counts. Available online at: https://moval.gov/departments/public-works/transportation/pdfs/traffic-counts.pdf, accessed December 16, 2022.

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3.11 Tribal Cultural Resources

This section addresses the tribal cultural resources impacts associated with implementation of the proposed project. This section includes: a description of the existing tribal cultural resources in and around the proposed project site; a summary of applicable regulations related to tribal cultural resources; and an evaluation of the potential impacts of the proposed project related to tribal cultural resources at the proposed project site and in the surrounding area, including cumulative impacts. The results of the Native American consultation conducted by EMWD for purposes of compliance with CEQA requirements prompted by Assembly Bill (AB) 52 are in **Appendix TRIBAL** of this Draft EIR.

3.11.1 Environmental Setting

Prehistoric Setting

The chronology of southern California is typically divided into three general time periods: the Early Holocene (11,000 to 8,000 Before Present [B.P.]), the Middle Holocene (8,000 to 4,000 B.P.), and the Late Holocene (4,000 B.P. to A.D. 1769). This chronology is manifested in the archaeological record by particular artifacts and burial practices that indicate specific technologies, economic systems, trade networks, and other aspects of culture.

Early Holocene (11,000 to 8,000 B.P.)

While it is not certain when humans first came to California, their presence in southern California by about 11,000 B.P. has been well documented. At Daisy Cave, on San Miguel Island, cultural remains have been radiocarbon dated to between 11,100 and 10,950 years B.P. (Byrd and Raab 2007). On the mainland, radiocarbon evidence confirms occupation of the Orange County and San Diego County coast by about 9,000 B.P., primarily in lagoon and river valley locations (Gallegos 2002). In western Riverside County, few Early Holocene sites are known to exist. One exception is site CA-RIV-2798, which contains deposits dating to as early as 8,580 cal. B.P. (Grenda 1997). During the Early Holocene, the climate of southern California became warmer and more arid and the human population, residing mainly in coastal or inland desert areas, began exploiting a wider range of plant and animal resources (Byrd and Raab 2007).

The primary Early Holocene cultural complex in coastal southern California was the San Dieguito Complex, occurring between approximately 10,000 and 8,000 B.P. The people of the San Dieguito Complex inhabited the chaparral zones of southwestern California, exploiting the plant and animal resources of these ecological zones (Warren 1967). Leaf-shaped and large-stemmed projectile points, scraping tools, and crescentics are typical of San Dieguito Complex material culture.

Middle Holocene (8,000 to 4,000 B.P.)

During the Middle Holocene, there is evidence for the processing of acorns for food and a shift toward a more generalized economy in coastal and inland southern California. The processing of plant foods, particularly acorns, increased, a wider variety of animals were hunted, and trade with neighboring regions intensified (Byrd and Raab 2007).

The Middle Holocene La Jolla (8,000–4,000 B.P.) Complex is essentially a continuation of the San Dieguito Complex. La Jolla groups lived in chaparral zones or along the coast, often migrating between the two. Coastal settlement focused around the bays and estuaries of coastal Orange and San Diego Counties. La Jolla peoples produced large, coarse stone tools, but also produced well-made projectile points, and milling slabs. The La Jolla Complex represents a period of population growth and increasing social complexity, and it was also during this time period that the first evidence of the exploitation of marine resources and the grinding of seeds for flour appears, as indicated by the abundance of millingstones in the archaeological record (Byrd and Raab 2007).

Contemporary with the La Jolla Complex, the Pauma Complex has been defined at coastal and adjacent inland sites in San Diego and Orange Counties, as well as in inland Riverside County (True 1958). The Pauma Complex is similar in technology to the La Jolla Complex; however, evidence of coastal subsistence is absent from Pauma Complex sites (Moratto 1984). The Pauma and La Jolla Complexes may either be indicative of separate inland and coastal groups with similar subsistence and technological adaptations, or, alternatively, may represent inland and coastal phases of one group’s seasonal rounds. The latter hypothesis is supported by the lack of hidden and deeply buried artifacts at Pauma sites, indicating that these sites may have been temporary camps for resource gathering and processing.

Late Holocene (4,000 B.P. to A.D. 1769)

During the Late Holocene, native populations of southern California were becoming less mobile and populations began to gather in small sedentary villages with satellite resource-gathering camps (Byrd and Raab 2007). Evidence indicates that the overexploitation of larger, high-ranked food resources may have led to a shift in subsistence towards a focus on acquiring greater amounts of smaller resources, such as shellfish and small-seeded plants (Byrd and Raab 2007).

Around 1,000 B.P., there was an episode of sustained drought, known as the Medieval Climatic Anomaly (MCA). While the effects of this environmental change on prehistoric populations are still being debated, it did likely lead to changes in subsistence strategies in order to deal with the substantial stress on resources (Jones and Schwitalla 2008). In coastal southern California, beginning before the MCA but possibly accelerated by it, conditions became drier and many lagoons had been transformed into saltwater marshes. Because of this, populations abandoned coastal mesa and ridge tops to settle nearer to permanent freshwater resources (Gallegos 2002).

Trade intensity reached its zenith in the Late Holocene, with asphaltum (tar), seashells and steatite being traded from southern California to the Great Basin. Major technological changes appeared as well, particularly with the advent of the bow and arrow, which largely replaced the use of the dart and atlatl (Byrd and Raab 2007). Small projectile points, ceramics, including Tizon brownware pottery, and obsidian from Obsidian Butte (Imperial County), are all representative artifacts of the Late Holocene.

It has been postulated that as early as 3,500 B.P., a Takic-speaking people arrived in coastal Los Angeles and Orange Counties, having migrated west from inland desert regions (Kroeber 1925; Warren 1968; Sutton 2009). By around 1,500 to 1,000 B.P., Takic language and cultures had spread to the south and inland to the east. These new arrivals, linguistically and culturally different from earlier coastal populations, may have brought new settlement and subsistence systems with them, along with other new cultural elements. This migration has been postulated as being a factor in several of the significant changes in material culture seen in the Late Holocene (such as the use of smaller projectile points and pottery), as well as the introduction of cremation as a burial practice.

The San Luis Rey culture (divided into San Luis Rey I [AD 1400 to 1750] and San Luis Rey II [AD 1750 to 1850]) represented the Late Period in southwestern Riverside County, northern San Diego County, southern Los Angeles County, and the interior mountains of Orange County (Meighan 1954; Moratto 1984). San Luis Rey I village sites contain manos (hand stones), metates (grinding slabs), bedrock mortars, shell artifacts, and triangular arrow points. In addition to these features, San Luis Rey II sites are characterized by the presence of pottery, pictographs, and the cremation of the dead (Moratto 1984).

San Luis Rey settlement patterns in the upper San Luis Rey River drainage are typified by seasonally occupied lowland villages located in proximity to water sources, and highland villages occupied in the late summer and fall for acorn collection (True and Waugh 1982). However, settlement patterns within southwestern Riverside County are less well known. The available information, stemming primarily from survey data, indicates that four primary site types existed within the region during the Late Period: field camps, resource procurement locations, residential bases, and villages (Mason 1999). Resource procurement locations and field camps, the most common site types, contain a limited assemblage of artifacts and subsistence remains, primarily lithic debitage, some tools, fire affected rock, and small amounts of animal bones and charred seeds and nuts. This indicates that these types of sites were used primarily for focused activities and short-term occupancy.

Villages and residential bases, on the other hand, show evidence for long-term occupation by large groups of people. Villages were occupied year-round, while residential bases were occupied seasonally. Artifacts and features found at both village and residential bases, including large amounts of faunal and botanical remains, numerous high-quality tools, fire-affected rock, and anthrosols, indicate a wide range of activities (Mason 1999). Bedrock mortars point to the processing of seeds and acorns, and ceremonial activities are evidenced by the presence of pictographs, petroglyphs, and cupules within village sites.

Ethnographic Setting

The Native American group occupying the area of the proposed project is known as the Cahuilla. The Cahuilla spoke a language belonging to the Cupan group of the Takic subfamily (Bean 1978). The Cahuilla are generally divided into three groups based on their geographic setting: the Pass Cahuilla of the Beaumont/Banning area; the Mountain Cahuilla of the San Jacinto and Santa Rosa Mountains; and the Desert Cahuilla from the Coachella Valley, as far south as the Salton Sea. The Cahuilla occupied territories that ranged from low or moderately low desert to the mountain regions of the Transverse and Peninsular ranges.

Villages were placed near canyons that received substantial precipitation or were adjacent to streams and springs (Bean 1978). House structures of the Cahuilla ranged from "brush shelters to dome-shaped or rectangular structures 15-20 feet long" (Bean 1978). The Cahuilla social structure revolved around clans and exogamous moieties (components connected through inter-marriage). Hunting, in conjunction with the exploitation of a variety of available resources, governed the Cahuilla subsistence strategy. The material culture of the Cahuilla was extensive and varied, and included pottery, ornamental items, and a number of knapped stone tools.

Prior to European contact, population estimates for the Cahuilla range from 3,600 to as high as 10,000 persons. Due to European diseases, such as smallpox, the Cahuilla population was decimated during the 19th century. However, unlike other Native American populations in southern California, the Cahuilla were able to retain their autonomy even after the arrival and increasing control of European explorers and the settling governments that followed. It was not until 1891 that the Cahuilla culture and its population began to succumb to the pressure of European and, later, United States governing bodies (Bean 1978).

Today, there are nine federally recognized tribes in California who share Cahuilla tribal affiliation, language, and culture, including the Agua Caliente Band of Cahuilla Indians (Agua Caliente), Augustine Band of Cahuilla Indians (Augustine), Cabazon Band of Mission Indians (Cabazon), Cahuilla Band of Mission Indians, Los Coyotes Band of Cahuilla and Cupeño Indians (Los Coyotes), Morongo Band of Mission Indians (Morongo), Ramona Band of Cahuilla Indians (Ramona), Santa Rosa Band of Cahuilla Indians (Santa Rosa), and Torres-Martinez Desert Cahuilla Indians (Torres-Martinez).

Archival Research Summary and Cultural Resources Survey

A records search for the proposed project was conducted on March 15, 2023 by staff at the California Historical Resources Information System (CHRIS) Eastern Information Center (EIC), housed at the University of California, Riverside. The records search results indicate that a total of 29 cultural resources have been recorded within the 0.50-mile radius. Of the 29 resources, 16 are prehistoric archaeological sites (CA-RIV-2863, -2864, -2865, -2866, -3232, -3233, -3234, -8056, P-33-15148, -15149, -15150, -28080, -28082, -28083, -28084, and -28085); eight are historic-period archaeological sites (P-33-19919, -28081, -28580, -28581, -28827, -28828, -28829, and -28830); two are historic architectural resources (P-33-7281 and -15934); one is a multicomponent site (P-33-28163); and two (P-33-4286 and -13710) are sites containing human burials of unknown age. Two of these resources (CA-RIV-2866 and P-33-28830) are located within portions of the project site.

An intensive-level pedestrian cultural resources survey of the project site was conducted by ESA archaeologists on April 4, 2023. As a result of the survey, a total of two new resources were documented (ESA-040423-01F and ESA-040423-02F; prehistoric milling features) and one previously recorded resource was updated (P-33-28830; historic-period asphalt-paved surface). The historic period asphalt paved surface was relocated and appeared to be in the same condition as previously recorded. The second previously recorded resource (CA-RIV-2866) could not be relocated and may have been moved or originally mapped incorrectly. There were no boulders in the area that exhibited milling slicks and it is therefore assumed to not be a resource to be impacted by the project.

Identification of Tribal Cultural Resources

Tribal Cultural Resources Definition

According to Public Resources Code Section 21074, tribal cultural resources are:

Sites, features, places, cultural landscapes, sacred places, and objects with cultural value to a California Native American tribe that are any of the following:

A. Included or determined to be eligible for inclusion in the California Register of Historical Resources (California Register)
B. Included in a local register of historical resources
C. A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant.

A cultural landscape that meets these criteria is a tribal cultural resource to the extent that the landscape is geographically defined in terms of the size and scope of the landscape. Historical resources, unique archaeological resources, or non-unique archaeological resources may also be tribal cultural resources if they meet these criteria.

Native American Consultation

The Native American Heritage Commission (NAHC) maintains a confidential file that contains sites of traditional, cultural, or religious value to the Native American community. The NAHC was contacted on October 28, 2022. The Sacred Land File (SLF) search results prepared by the NAHC on November 28, 2022 indicated that the SLF results were negative.

EMWD submitted notification and request to consult letters to six (6) individuals and organizations (listed on EMWD's Master List) on November 17, 2022, pursuant to Assembly Bill (AB) 52. In particular, AB 52 letters were sent via certified mail to the following California Native American tribes and individuals:

- Katy Croft, Agua Caliente Band of Cahuilla Indians
- Travis Armstrong, Morongo Band of Mission Indians
- Ebru Ozdil, Pechanga Band of Luiseño Mission Indiansss
- Cheryl Madrigal, Rincon Band of Luiseño Indians
- Jessica Mauck, San Manuel Band of Mission Indians
- Joe Ontiveros, Soboba Band of Luiseño Indians

To date, EMWD has conducted consultation with two federally recognized Native Tribes: The Agua Caliente Band of Cahuilla Indians (Agua Caliente) and The Rincon Band of Luiseńo Indians (Rincon). The four additional Native Tribes that were contacted declined consultation or did not respond. On March 2, 2023, EMWD engaged in consultation with the two tribes: the

Rincon on March 2, 2023, and the Agua Caliente on March 3, 2023. Both tribes highlighted their concerns noting that the project site is situated within their Traditional Use Areas, and that the project site is considered sensitive as there are existing sites in the surrounding areas. The tribes provided mitigation recommendations, expressed concern regarding potential unearthing of unknown artifacts during construction, and recommended tribal monitoring consistent with measures used in prior EMWD CEQA documents.

To date, no other responses from the Native American community have been received as part of the AB 52 tribal consultation effort. The AB 52 consultation documentation is provided in Appendix TRIBAL of this Draft EIR.

3.11.2 Regulatory Framework

State

Native American Heritage Commission

Public Resources Code (PRC) Section 5097.91 established the Native American Heritage Commission (NAHC), the duties of which include inventorying places of religious or social significance to Native Americans and identifying known graves and cemeteries of Native Americans on private lands. PRC Section 5097.98 specifies a protocol to be followed when the NAHC receives notification of a discovery of Native American human remains from a county coroner.

Assembly Bill 52 and Related Public Resources Code Sections

AB 52 was approved by California State Governor Edmund Gerry “Jerry” Brown, Jr. on September 25, 2014. The act amended California PRC Section 5097.94, and added PRC Sections 21073, 21074, 21080.3.1, 21080.3.2, 21082.3, 21083.09, 21084.2, and 21084.3.

The primary intent of AB 52 is to include California Native American Tribes early in the environmental review process and to establish a new category of resources related to Native Americans that require consideration under CEQA, known as tribal cultural resources. PRC Section 21074(a)(1) and (2) defines tribal cultural resources as “sites, features, places, cultural landscapes, sacred places, and objects with cultural value to a California Native American Tribe” that are either included or determined to be eligible for inclusion in the California Register or included in a local register of historical resources, or a resource that is determined to be a tribal cultural resource by a lead agency, in its discretion and supported by substantial evidence. On July 30, 2016, the California Natural Resources Agency adopted the final text for tribal cultural resources update to CEQA Guidelines Appendix G, which was approved by the Office of Administrative Law on September 27, 2016.

PRC Section 21080.3.1 requires that within 14 days of a lead agency determining that an application for a project is complete, or a decision by a public agency to undertake a project, the lead agency provide formal notification to the designated contact, or a tribal representative, of California Native American Tribes that are traditionally and culturally affiliated with the geographic area of the project (as defined in PRC Section 21073) and who have requested in writing to be informed by the lead agency (PRC Section 21080.3.1(b)). Tribes interested in consultation must respond in writing within 30 days from receipt of the lead agency’s formal notification and the lead agency must begin consultation within 30 days of receiving the tribe's request for consultation (PRC Sections 21080.3.1(d) and 21080.3.1(e)).

PRC Section 21080.3.2(a) identifies the following as potential consultation discussion topics: the type of environmental review necessary; the significance of tribal cultural resources; the significance of the project's impacts on the tribal cultural resources; project alternatives or appropriate measures for preservation; and mitigation measures. Consultation is considered concluded when either: (1) the parties agree to measures to mitigate or avoid a significant effect, if a significant effect exists, on a tribal cultural resource; or (2) a party, acting in good faith and after reasonable effort, concludes that mutual agreement cannot be reached (PRC Section 21080.3.2(b)).

If a California Native American tribe has requested consultation pursuant to Section 21080.3.1 and has failed to provide comments to the lead agency, or otherwise failed to engage in the consultation process, or if the lead agency has complied with Section 21080.3.1(d) and the California Native American tribe has failed to request consultation within 30 days, the lead agency may certify an EIR or adopt an MND (PRC Section 21082.3(d)(2) and (3)).

PRC Section 21082.3(c)(1) states that any information, including, but not limited to, the location, description, and use of the tribal cultural resources, that is submitted by a California Native American tribe during the environmental review process shall not be included in the environmental document or otherwise disclosed by the lead agency or any other public agency to the public without the prior consent of the tribe that provided the information. If the lead agency publishes any information submitted by a California Native American tribe during the consultation or environmental review process, that information shall be published in a confidential appendix to the environmental document unless the tribe that provided the information consents, in writing, to the disclosure of some or all of the information to the public.

California Health and Safety Code Section 7050.5

California Health and Safety Code Section 7050.5 requires that in the event human remains are discovered, the County Coroner be contacted to determine the nature of the remains. In the event the remains are determined to be Native American in origin, the Coroner is required to contact the California Native American Heritage Commission (NAHC) within 24 hours to relinquish jurisdiction.

California Public Resources Code Section 5097.98

California PRC Section 5097.98, as amended by Assembly Bill 2641, provides procedures in the event human remains of Native American origin are discovered during project implementation. PRC Section 5097.98 requires that no further disturbances occur in the immediate vicinity of the discovery, that the discovery is adequately protected according to generally accepted cultural and archaeological standards, and that further activities take into account the possibility of multiple burials. PRC Section 5097.98 further requires the NAHC, upon notification by a County Coroner, designate and notify a Most Likely Descendant (MLD) regarding the discovery of Native American human remains. Once the MLD has been granted access to the site by the landowner and inspected the discovery, the MLD then has 48 hours to provide recommendations to the landowner for the treatment of the human remains and any associated grave goods.

In the event that no descendant is identified, or the descendant fails to make a recommendation for disposition, or if the land owner rejects the recommendation of the descendant, the landowner may, with appropriate dignity, reinter the remains and burial items on the property in a location that will not be subject to further disturbance.

Local

Moreno Valley

The City of Moreno Valley's 2040 General Plan contains an Open Space & Resource Conservation chapter that focuses on a goal, policies, and actions for the preservation of archaeological sites. These are provided below.

Goal OSRC-2: Preserve and respect Moreno Valley's unique cultural and scenic resources, recognizing their contribution to local character and sense of place.

POLICIES

OSRC.2-8: Require cultural resource assessments prior to the approval of development proposals on properties located in archaeologically sensitive areas.

ACTIONS

OSRC.2-B: Maintain a map of sensitive archaeological sites in Moreno Valley and use it to inform project applicants of the need for cultural resource assessments.

3.11.3 Impact Analysis and Mitigation Measures

Thresholds of Significance

The following criteria from CEQA Guidelines Appendix G are used as thresholds of significance to determine the impacts of the proposed project as related to tribal cultural resources. The proposed project would have a significant impact if it would:

1. Cause a substantial adverse change in the significance of a tribal cultural resource, defined in Public Resources Code section 21074 as either a site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe, and that is:
   - Listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources as defined in Public Resources Code section 5020.1(k).
   - A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of Public Resources Code Section 5024.1. In applying the criteria set forth in subdivision (c) of Public Resources Code Section 5024.1, the lead agency shall consider the significance of the resource to a California Native American tribe.
2. Result in a cumulatively considerable impact to tribal cultural resources.

Impact Analysis

Tribal Cultural Resources

Impact 3.11-1: The proposed project could cause a substantial adverse change in the significance of a tribal cultural resource, defined in Public Resources Code section 21074 as either a site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe, and that is either listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources as defined in Public Resources Code section 5020.1(k), or is a resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of Public Resources Code Section 5024.1. In applying the criteria set forth in subdivision (c) of Public Resources Code Section 5024.1, the lead agency shall consider the significance of the resource to a California Native American tribe.

Phase 1 and 2

Construction

Storage Tanks and Pipeline

During AB 52 consultation, the Rincon Band of Luiseño Indians and the Agua Caliente Band of Cahuilla Indians indicated that the project site is situated within their Traditional Use Areas, and that the project site is considered sensitive as there are existing sites in the surrounding areas. The tribes expressed concern for the potential unearthing of unknown artifacts while grading the project site. As a result of consultation, no known tribal cultural resources, as defined in PRC Sections 21074(a)(1), or resources determined by EMWD in its discretion and supported by substantial evidence to be significant pursuant to PRC Section 5024.1, have been identified within the project site. The records search results indicated that a total of 29 cultural resources [including 16 prehistoric archaeological sites, eight historic-period archaeological sites, two historic architectural resources, one multi-component site, and two sites containing human burials of unknown age] are recorded within a 0.50-mile radius of the project site. Two of these resources, CA-RIV-2866, which is a prehistoric archaeological milling site, and P-33-28830, which is a historic-period asphalt-paved surface, are recorded as located within portions of the project site. Resource CA-RIV-2866 could not be relocated during the pedestrian survey and may have been moved or originally mapped incorrectly. There were no boulders in the area that exhibited milling slicks and it is therefore assumed to not be a resource to be impacted by the project. Resources P-33-28830 was relocated and appeared to be in the same condition as previously recorded. As a result of the pedestrian survey, a total of two new previously unrecorded resources were also documented (ESA-040423-01F and ESA-040423-02F). However, these two resources are outside the grading limits for the project and the project will avoid them, and as defined in Mitigation Measure CR-2 in Section 3.4, *Cultural Resources*, of this document, an Environmentally Sensitive Area will be created for the protection of these resources. Based on these findings and in consultation with the tribes, the project site appears to have a high potential for encountering tribal cultural resources during construction. As a result, the project could cause a substantial adverse change in the significance of a tribal cultural resource as described in PRC Section 21084.2. Accordingly, impacts on tribal cultural resources are considered potentially significant. EMWD would be required to implement **Mitigation Measures TRIBAL-1** through **TRIBAL-4**, which would establish tribal monitoring agreements, provisions for trial monitoring, and avoidance/treatment of resources if found. With implementation of these mitigation measures, impacts to tribal cultural resources would be reduced to a less than significant level.

Operation

Storage Tanks and Pipeline

Operation of the proposed facilities would not include involve ground disturbance activities that could result in the destruction of potential tribal cultural resources. Therefore, no impacts to tribal cultural resources would occur during operation.

Mitigation Measures

TRIBAL-1: Tribal Resources Monitoring Agreement. At least 30 days prior to the start of any ground-disturbing activities, Eastern Municipal Water District (EMWD) shall contact the Consulting Tribes(s) to develop a Cultural Resources Treatment Monitoring Agreement ("Agreement"). The Agreement shall address the treatment of archaeological resources that may be Tribal Cultural Resources inadvertently discovered on the project site; project grading; ground disturbance and development scheduling; the designation, responsibilities, and participation of tribal monitor(s) during grading, excavation, and ground disturbing activities; and compensation for the tribal monitors, including overtime, weekend rates, and mileage reimbursements.

TRIBAL-2: Tribal Monitoring. Prior to the start of ground-disturbing activities, a Tribal monitor may participate in the construction workers archaeological resources sensitivity training, conducted by the project archaeologist. At least seven business days prior to ground-disturbing activities, EMWD shall notify the Consulting Tribes of the grading/excavation schedule and coordinate the Tribal monitoring schedule. A Tribal monitor shall be present for ground-disturbing activities associated with the project. Both the archaeologist and Tribal monitor shall have the authority to stop and redirect grading activities in order to evaluate the nature and significance of any cultural resources discovered within the project limits. Such evaluation shall include culturally appropriate, temporary and permanent treatment pursuant to the Cultural Resources Treatment and Monitoring Agreement, which may include avoidance of resources, in-place preservation, data recovery, and/or reburial so the resources are not subject to further disturbance in perpetuity. Any reburial shall occur at a location determined between EMWD and the Consulting Tribes as described in TRIBAL-4. Treatment may also include curation of the resources at a Tribal curation facility or an archaeological curation facility, as determined in discussion among EMWD, the Consulting Tribes and the project archaeologist, as addressed in the Cultural Resources Treatment and Monitoring Agreement. The on-site Tribal monitoring shall end when all ground disturbing activities on the project site are completed, or when the Tribal representatives and Tribal monitors have indicated that the project site has little or no potential for impacting Tribal Cultural Resources.

TRIBAL-3: Disposition of Inadvertent Discoveries. In the event that Tribal Cultural Resources are recovered during the course of grading, EMWD shall relinquish ownership of all cultural resources, including sacred items, burial goods, archaeological artifacts, and non-human remains. EMWD will coordinate with the project archaeologist and the Consulting Tribes to conduct analysis of recovered resources. If it is determined that the resource is a Tribal Cultural Resource and thus significant under CEQA, avoidance of the resources will be explored as the preferred option and on-site reburial will be evaluated as the second option. If avoidance and on-site reburial are not possible, a treatment plan shall be prepared and implemented in accordance with state guidelines and in consultation with the Consulting Tribes. The treatment plan may include, but would not be limited to capping in place, excavation and removal of the resource, interpretive displays, sensitive area signage, or other mutually agreed upon measure. Treatment may also include curation of the cultural resources at a Tribal curation facility, as determined by EMWD and Consulting Tribes.

TRIBAL-4: Non-Disclosure of Reburial Locations. It is understood by all parties that unless otherwise required by law, the site of any reburial of culturally sensitive resources shall not be disclosed and shall not be governed by public disclosure requirements of the California Public Records Act. The Coroner, pursuant to the specific exemption set forth in California Government Code 6254(r), parties, and Lead Agencies will be asked to withhold public disclosure information related to such reburial.

Significance Determination

Less than Significant Impact with Mitigation Incorporated

Cumulative Impacts

Impact 3.11-2: Concurrent construction and operation of the proposed project and related projects in the geographic scope could result in cumulative short-term and long-term impacts to tribal cultural resources.

Many of the related projects identified in Chapter 3, *Environmental Setting, Impact Analysis, and Mitigation Measures* of this Draft EIR, would require excavation that could potentially expose or damage potential tribal cultural resources. These related projects are located within previously undeveloped lots and have the potential to encounter and cause a significant impact on resources. Further, in association with CEQA review, and depending on the depth of excavation and sensitivity of respective sites, mitigation measures or conditions of approval would be required for related projects that have the potential to cause significant impacts to undiscovered tribal cultural resources. Implementation of such mitigation measures, conditions of approval, and compliance with regulations would avoid significant impacts. State requirements regarding impacts on tribal cultural resources (PRC Sections 5097.94, 21073, 21074, 21080.3.1, 21080.3.2, 21082.3, 21083.09, 21084.2, and 21084.3) would be adhered to by all cumulative projects. Such standard practices, particularly over a range of project sites, could provide for protection, recovery and curation of discovered tribal cultural resources and preserve their contributions to the knowledge base of past population activity in the area. Therefore, the cumulative effects from cumulative projects are considered less than significant. The project is required to comply with the Mitigation Measures TRIBAL-1 through TRIBAL-4 in the event tribal cultural resources are found, thus ensuring proper identification, treatment and preservation of any resources, and reducing significant impacts on tribal cultural resources to less than significant levels. These regulations require excavation monitoring, and treatment and curation of discoveries. Therefore, to the extent impacts on tribal cultural resources from cumulative projects may occur, further contribution from the project would not be cumulatively considerable, and the cumulative impacts of the project would be less than significant.

Mitigation Measures

Implement Mitigation Measures TRIBAL-1 through TRIBAL-4.

Significance Determination

Less than Significant Impact with Mitigation Incorporated

3.11.4 References

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3.12 Utilities and Service Systems

This section addresses the utilities and service systems impacts associated with implementation of the proposed project. This section includes: a description of the existing utilities and service systems in and around the proposed project site; a summary of applicable regulations related to utilities and service systems; and an evaluation of the potential impacts of the proposed project related to utilities and service systems at the proposed project site and in the surrounding area, including cumulative impacts.

3.12.1 Environmental Setting

EMWD has a service area of 558 square miles located in Riverside County. The information below is focused on utility services within EMWD's service area.

Water Supply

EMWD is a water retailer that provides potable water, wastewater treatment, and recycled water services for portions of Riverside County, including the cities of Perris, Moreno Valley, San Jacinto, Menifee and Temecula. EMWD is one of 26 member agencies of MWD. The majority of EMWD's water supplies consist of imported water purchased through MWD, which delivers supplies from the Colorado River Aqueduct and the State Water Project (EMWD 2021). The remainder of EMWD's water is supplied through local resources including groundwater, desalinated groundwater, and recycled water. Groundwater is pumped from the Hemet/San Jacinto and West San Jacinto areas of the San Jacinto Groundwater Basin. In addition, EMWD operates three desalination plants that convert brackish groundwater from the West San Jacinto Basin into potable water. EMWD also owns, operates, and maintains its own recycled water system that consists of four Regional Water Reclamation Facilities (RWRFs) and multiple storage ponds throughout EMWD's service area. Recycled water is sold to customers, discharged to Temescal Creek, or percolated in storage ponds throughout the EMWD service area.

Table 3.12-1 shows the existing and projected water demand in the EMWD service area taken from 2020 Urban Water Management Plan (UWMP) (EMWD 2021). Demand projections are based on information about planned development and land use, and assume typical hydrologic conditions.

As shown in Table 3.14-1, demand for both potable and recycled water is expected to increase through 2045. According to EMWD's 2020 UWMP, EMWD plans to meet projected demand increases through a combination of local supply development projects and ongoing water conservation. Future projects to increase water supply within the EMWD service area include enhanced recharge and recovery, groundwater contamination prevention and remediation, water replenishment, and construction of a desalter (EMWD 2021).

TABLE 3.12-1
EXISTING AND PROJECTED RETAIL WATER DEMAND IN THE EMWD SERVICE AREA (AFY)

Source	2020	2025	2030	2035	2040	2045
Retail Water						
Potable and Raw Water Demand	84,673	102,600	108,300	114,400	118,900	123,000
Recycled Water Demand	31,243	43,330	49,020	54,500	59,800	64,100
Total Retail Water Use	115,916	145,930	157,320	168,900	178,700	187,100
Wholesale Water						
Potable and Raw Water Demand	36,384	58,200	52,400	54,400	56,700	58,800
Recycled Water Demand	1,285	4,770	5,180	5,600	5,600	5,600
Total Wholesale Water Use	37,699	62,970	57,580	60,000	62,300	64,400
Total Demand	**153,615**	**208,900**	**214,900**	**228,900**	**241,000**	**251,500**

SOURCE: EMWD 2021, Tables 6-13 through 6-16.

Wastewater

EMWD provides wastewater collection and treatment services to approximately 239,000 customers within its service area. Effluent is conveyed via approximately 1,813 miles of sewer pipeline to four active RWRFs (EMWD 2021): the San Jacinto Valley Regional Water Reclamation Facility, Moreno Valley Regional Water Reclamation Facility, Temecula Valley Regional Water Reclamation Facility, and the Perris Valley Regional Water Reclamation Facility. These plants have recently completed expansions and produce tertiary effluent suitable for California Department of Health Services permitted uses including almost any use but human consumption (EMWD 2021). The four RWRFs produce tertiary effluent that is suitable for all permitted uses, including irrigation of food crops and full-body contact, and have a collective treatment capacity of 86,300 AFY (EMWD 2021). A sewer line is located within the Moreno Beach Drive right-of-way and intersects the path of the proposed transmission pipeline.

Stormwater

The project is located within the jurisdiction of the Riverside County Flood Control and Water Conservation District (RCFCWCD). RCFCWCD operates a stormwater drainage system consisting of over 420 miles of major underground storm drains, open channels and levees, along with 40 dams and detention basins in Riverside County. In the City of Moreno Valley, RCFCD owns all drainage facilities, some of which are located within the same rights-of-way in which project infrastructure would be installed.

Solid Waste Management

The closest landfill to the proposed project facilities in Riverside County is the Lamb Canyon Sanitary Landfill located at 16411 State Hwy 79 in Beaumont, approximately 10.63 miles southeast from the project area. The landfill had a remaining capacity of 19,242,950 cubic yards as of 2015 and is expected to operate until 2032 (CalRecycle 2022a). The second closest landfill is the Frank R. Bowerman Sanitary located at 11002 Bee Canyon Access Road in Irvine. The landfill has a remaining capacity of 205,000,000 as of 2008 and is expected to operate until 2053 (CalRecycle 2022b). It should be noted that the Badlands Sanitary Landfill, which is located approximately 3.57 miles northeast from the project site, is expected to operate until 2026 (CalRecycle 2022c), before the proposed project has been fully implemented.

Electric Power

Moreno Valley Utility (MVU) is the electricity provider for the City of Moreno Valley. MVU is connected to the State's power grid through the Southern California Edison (SCE), and provides electrical services to 6,500 customers throughout its 33.48 square-mile service area in 2020 (MVDPW 2022). SCE provides electricity services to more than 15 million people in a 50,000 square-mile area of central, coastal and Southern California. In 2021, SCE's reported an estimated 82,048 million kilowatt hours (KWh) in energy sales. SCE obtains energy from its own generating plants and through contracts with energy producers and sellers (Edison International 2021). Aboveground SCE electric power lines cross the Pettit storage tank site and are located within the Moreno Beach Drive right-of-way where the pipeline would be installed.

Natural Gas

The project area is within service area of Southern California Gas Company (SoCalGas), which is the principal distributor of natural gas in Southern California, serving residential, commercial, and industrial markets. SoCalGas serves approximately 21.8 million customers in more than 500 communities encompassing approximately 20,000 square miles throughout central and southern California (SoCalGas 2022). Gas supply available to SoCalGas from California sources averaged approximately 2,435 million cubic feet per day or 2,508,050 million Btu (MMBtu) in 2020, the most recent year for which data are available. This equates to an annual average of 888,775 million cubic feet per year or 915,438,250 MMBtu per year (CGEU 2020). SoCal gas lines occur within Moreno Beach Drive and Cottonwood Avenue (SoCal Gas NOP Comment, December 7, 2022; see *Appendix NOP*), streets within which the proposed project would be installed. One 4-inch gas main runs along the east side of Moreno Beach Drive (west of the centerline). The gas main runs north to south and tees into a 30-inch high pressure gas main which runs east to west in the center of Cottonwood Avenue. An additional 4-inch gas main runs east to west just north of the main in Cottonwood Avenue (Kleinfelder 2017; Appendix PDR to this Draft EIR).

Telecommunication

Most telecommunication services in the City of Moreno Valley are delivered by private service providers, including Frontier, Spectrum, and AT&T. One telecom conduit runs along the east side of Moreno Beach Drive east of the paved edge. The telecom conduit crosses Moreno Beach Drive south of Cottonwood Avenue to provide service to a development. Additionally, the conduit connects to an east-west conduit at Alessandro Boulevard (Kleinfelder 2017; Appendix PDR to this Draft EIR).

3.12.2 Regulatory Framework

Federal

Resource Conservation and Recovery Act

The Resource Conservation and Recovery Act (RCRA) (40 CFR, Part 258 Subtitle D) establishes minimum location standards for siting municipal solid waste landfills. In addition, because California laws and regulations governing the approval of solid waste landfills meet the requirements of Subtitle D, the U.S. EPA has delegated the enforcement responsibility to the State of California.

State

California Integrated Waste Management Act of 1989

The California Integrated Waste Management Act of 1989 (Public Resources Code [PRC] Division 30) enacted through AB 939 emphasized conservation of natural resources through reduction, recycling, and reuse of solid waste. AB 939 requires that all cities and counties divert 25 percent of solid waste streams from landfills by 1995 and 50 percent by 2000. In accordance with AB 939, each local agency must submit an annual report to the California Integrated Waste Management Board summarizing its progress in diverting solid waste disposal.

Protection of Underground Infrastructure

The California Government Code Section 4216-4216.9 "Protection of Underground Infrastructure" requires an excavator to contact a regional notification center (e.g., Underground Services Alert or Dig Alert) at least two days prior to excavation of any subsurface installations. Any utility provider seeking to begin a project that could damage underground infrastructure can call Underground Service Alert, the regional notification center for southern California. Underground Service Alert will notify the utilities that may have buried lines within 1,000 feet of the project. Representatives of the utilities are then notified and are required to mark the specific location of their facilities within the work area prior to the start of project activities in the area.

Assembly Bill 341

Since the passage of AB 939 in 1989, State diversion rates are now equivalent to 65 percent, the statewide recycling rate is 50 percent, and the beverage container recycling rate is 80 percent. With the passage of AB 341 (Chesbro, Chapter 476, Statutes of 2011), the Governor and the Legislature established a policy goal for the State that a minimum of 75 percent of solid waste must be reduced, recycled, or composted by the year 2020. The State provided strategies to achieve that 75 percent goal:

1. Moving organics out of the landfill
2. Expanding the recycling/manufacturing infrastructure
3. Exploring new approaches for state and local funding of sustainable waste management programs
4. Promoting state procurement of post-consumer recycled content products
5. Promoting extended producer responsibility

To achieve these strategies, the State recommended legislative and regulatory changes including mandatory organics recycling, solid waste facility inspections, and revising packaging. With regard to construction and demolition, the State recommended an expansion of California Green Building Code standards that incentivize green building practices and increase diversion of recoverable construction and demolition materials. Current standards require 50 percent waste diversion on construction and some renovation projects, although this may be raised to 65 percent for nonresidential construction in upcoming changes to the standards. The State also recommends promotion of the recovery of construction and demolition materials suitable for reuse, compost or anaerobic digestion before residual wastes are considered for energy recovery (CalRecycle 2017c).

2008 California Energy Action Plan II

The California Energy Commission (CEC) prepared the California Energy Action Plan Update in February 2008 and it serves as the state's principal energy planning and policy document. The plan identifies state-wide energy goals, describes a coordinated implementation plan for state energy policies, and identifies specific action areas to ensure that California's energy is adequate, affordable, technologically advanced, and environmentally sound. In accordance with this plan, the first priority actions to address California's increasing energy demands are energy efficiency and demand response (i.e., reduction of customer energy usage during peak periods in order to address system reliability and support the best use of energy infrastructure). Additional priorities include the use of renewable sources of power and distributed generation (i.e., the use of relatively small power plants near or at centers of high demand). To the extent that these actions are unable to satisfy the increasing energy and capacity needs, clean and efficient fossil-fired generation is supported.

The State of California adopted standards to increase the percentage of electricity that retail sellers, including investor-owned utilities and community choice aggregators, must provide from renewable resources. The standards are referred to as the Renewables Portfolio Standards (RPS). The legislation requires utilities to increase the percentage of electricity obtained from renewable sources to 33 percent by 2020 and 50 percent by 2030. On September 10, 2018, Governor Jerry Brown signed SB 100, which further increased the California RPS and requires retail sellers and local publicly owned electric utilities to procure eligible renewable electricity for 44 percent of retail sales by December 31, 2024; 52 percent by December 31, 2027; and 60 percent by December 31, 2030.

Renewables Portfolio Standard

The California Renewables Portfolio Standard (RPS) was established in 2002 and required retail sellers of electricity, including investor-owned utilities and community choice aggregators, to provide at least 20 percent of their supply from renewable sources by 2013. California Senate Bill 350 (Chapter 547, Statues of 2015) is the most recent update to the state's RPS requirements. The RPS requires publicly owned utilities and retail sellers of electricity in California to procure 33 percent of their electricity sales from eligible renewable sources by 2020 and 50 percent by the end of 2030.

California Water Code Section 13260

California Water Code Section 13260 requires any person who discharges waste, other than into a community sewer system, or proposes to discharge waste that could affect the quality of waters of the State to submit a report of waste discharge to the applicable Regional Water Quality Control Board (RWQCB). Any actions of the proposed project that would be applicable under California Water Code Section 13260 would be reported to the Santa Ana RWQCB.

California Urban Water Management Planning Act

Section 10610 of the California Water Code establishes the Urban Water Management Planning Act. The act states that every urban water service provider that serves 3,000 or more customers or that supplies over 3,000 acre-feet of water annually should prepare an Urban Water Management Plan (UWMP) every 5 years. The goal of a UWMP is to ensure the appropriate level of reliability in its water service sufficient to meet the needs of its various categories of customers during normal, dry, and multiple dry years. Western prepared it's 2020 UWMP in 2021.

NPDES Construction General Permit

Construction associated with the proposed project would disturb more than 1 acre of land surface for centralized and regional structural Best Management Practices (BMPs) (and possibly for those distributed structural BMPs larger than 1 acre), affecting the quality of stormwater discharges into waters of the United States. The proposed project would therefore be subject to the National Pollutant Discharge Elimination System (NPDES) General Permit for Stormwater Discharges Associated with Construction and Land Disturbance Activities (Order 2009-0009-DWQ, NPDES No. CAS000002, Construction General Permit [CGP]), as amended by Order 2010-0014-DWQ and Order 2012-0006-DWQ). The CGP regulates discharges of pollutants in stormwater associated with construction activity to waters of the United States from construction sites that disturb one or more acres of land surface, or that are part of a common plan of development or sale that disturbs more than 1 acre of land surface.

The CGP requires the development and implementation of a Stormwater Pollution Prevention Plan (SWPPP) that includes specific BMPs designed to prevent pollutants from contacting stormwater and keep all products of erosion from moving offsite into receiving waters. The SWPPP BMPs are intended to protect surface water quality by preventing the offsite migration of eroded soil and construction-related pollutants from the construction area. The CGP and SWPPPs are described in more detail in Section 3.8, *Hydrology and Water Quality*.

California Green Building Code Section 5.408

5.408.1 Construction waste diversion. Recycle and/or salvage for reuse a minimum of 65 percent of the nonhazardous construction and demolition waste in accordance with Section 5.408.1.1, 5.408.1.2 or 5.408.1.3; or meet a local construction and demolition waste management ordinance, whichever is more stringent.

> *5.408.1.1 Construction waste management plan. Where a local jurisdiction does not have a construction and demolition waste management ordinance that is more stringent, submit a construction waste management plan that: 1. Identifies the construction and demolition waste materials to be diverted from disposal by*

efficient usage, recycling, reuse on the project or salvage for future use or sale. 2. Indicates if construction and demolition waste materials will be sorted onsite (source separated) or bulk mixed (single stream). 3. Identifies diversion facilities where construction and demolition waste material collected will be taken. 4. Specifies that the amount of construction waste and demolition materials diverted shall be calculated by weight or volume, but not by both.

Local

Riverside County California Green Building Code Integration

Riverside County adopted the State of California Green Building Code Requirements (known as "CalGreen") that took effect January 1, 2011, which sets forth recycling requirements for construction and demolition projects in the unincorporated areas of Riverside County. The provisions of the Code apply to any project that requires a construction permit, demolition permit, and/or grading permit. According to the Code, non-residential construction projects consisting of commercial, industrial, or retail structures, irrespective of the square footage, must recycle a minimum of 65 percent of the debris generated by weight, which would apply to the proposed project. The County requires the completion of a Construction and Demolition Waste Recycling Plan and Waste Reporting Form, which requires a project description and completion of appropriate attachments depending on the type of project.

3.12.3 Impact Analysis and Mitigation Measures

Thresholds of Significance

The following criteria from CEQA Guidelines Appendix G are used as thresholds of significance to determine the impacts of the proposed project as related to utilities and service systems. The proposed project would have a significant impact if it would:

1. Require or result in the relocation or construction of new or expanded water, wastewater treatment or storm water drainage, electric power, natural gas, or telecommunications facilities, the construction or relocation of which could cause significant environmental effects.
2. Have sufficient water supplies available to serve the project and reasonably foreseeable future development during normal, dry and multiple dry years.
3. Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments.
4. Generate solid waste in excess of state or local standards, or in excess of the capacity of local infrastructure, or otherwise impair the attainment of solid waste reduction goals.
5. Comply with federal, state, and local management and reduction statutes and regulations related to solid waste.
6. Result in a cumulatively considerable impact to utilities and service systems.

Impact Analysis

Relocation of Utilities

Impact 3.12-1: The proposed project could require or result in the relocation or construction of new or expanded water, wastewater treatment or storm water drainage, electric power, natural gas, or telecommunications facilities, the construction or relocation of which could cause significant environmental effects.

Phase 1

Construction

Storage Tank

The Phase 1 project includes the construction of one 4.5 MG water storage tank in the City of Moreno Valley. In addition to installation of water infrastructure, the project includes installation of stormwater drainage facilities to allow for storm flows to be appropriately conveyed offsite. Portions of the storm drain alignment would occur outside of EMWD's property on the east side of Moreno Beach Drive and would therefore require coordination with the City of Moreno Valley. The potential impacts of constructing the water storage and stormwater facilities are evaluated throughout this Draft EIR. No additional environmental effects would occur in addition to those presented in this Draft EIR. Impacts regarding the expansion or relocation of utilities would be less than significant during construction.

Pipeline

Construction of conveyance facilities would occur mainly underground within existing public rights-of-way where existing water, wastewater, electric, natural gas, and telecommunications facilities occur within the Moreno Beach Drive right-of-way. Utilities with underground or overhead service lines that would be impacted by the proposed project could include but would not be limited to EMWD, Moreno Valley Utility, RCFCWCD, SoCal Gas, private telecommunication providers (Frontier, Spectrum, and AT&T), and SCE. According to the *Preliminary Design Report for the Pettit 1674-Zone Storage Water Tank Expansion and Transmission Pipeline Project*, Appendix C, the proposed project would be designed to avoid the existing sewer, telecommunication, and gas lines which intersect the proposed pipeline route (Kleinfelder 2017; Appendix PDR to this Draft EIR). No utility relocations are proposed. In order to ensure that existing utilities are not impacted by construction of the proposed project, EMWD would implement **Mitigation Measure UTIL-1** for the pipeline, which would require an underground utilities search and coordination with utility providers operating within proposed construction impact areas during the design phase and prior to construction. With implementation of Mitigation Measure UTIL-1, impacts would be less than significant.

Operation

Storage Tank and Pipeline

Operation of the pipeline and storage tanks would not result in the relocation of utilities. The project would provide an expansion of water facilities within the service area to support planned development, the impacts of which are analyzed throughout this EIR. No new or expanded wastewater, stormwater, electric power, telecommunications or natural gas facilities are proposed during operation. Therefore, impacts would be less than significant.

Mitigation Measures

UTIL-1: During design and prior to construction of the proposed project pipeline, EMWD shall conduct an underground utilities search and coordinate with all utility providers that operate in the same public rights-of-way impacted by construction activities. EMWD shall ensure that any temporary disruption in utility service caused by construction is minimized and that any affected parties are notified in advance.

Significance Determination

Less than Significant Impact with Mitigation Incorporated

Phase 2

Construction

Storage Tank

Demolition of the existing 2 MG tank and construction of the new 4.5 MG tank would not require relocation of utilities. However, additional power is needed to supply the new storage tank. The storage tank would either be powered by solar panels mounted on top of the storage tank or a new electrical service line on the project site. If a new electrical service line is required, it would tie into the existing MVU line within the Moreno Beach Drive right-of-way. Construction associated with the new line is included as part of the proposed project and analyzed within this EIR; no additional construction outside of the Pettit tank site would be required. Additionally, EMWD will coordinate with MVU regarding installation of any new electrical service line infrastructure. As a result, impacts related to new or relocated utilities would be less than significant.

Operation

Storage Tank

Operation of the pipeline and storage tanks would not result in the relocation of utilities. The project would provide an expansion of water facilities within the service area to support planned development, the impacts of which are analyzed throughout this EIR. As mentioned previously, construction of the southern storage tank will require solar panels or installation of an additional MVU electrical service line. Operation of the solar panels or MVU electrical service line would require minimal amounts of maintenance that would not result in significant environmental effects. Impacts related to the operation would be less than significant.

Mitigation Measures

None Required

Significance Determination

Less than Significant Impact

Water Supplies

Impact 3.12-2: The proposed project could have sufficient water supplies available to serve the project and reasonably foreseeable future development during normal, dry and multiple dry years.

Phase 1 and Phase 2

Construction

Storage Tanks and Pipeline

Construction of the storage tanks and pipeline would require minimal water for dust control and concrete washout activities. All water supplies required for construction would be supplied by onsite water trucks or existing water connections. Water demand during construction would not require new or expanded water supply resources. Impacts would be less than significant.

Operation

Storage Tanks and Pipeline

Operation of the proposed project would store and distribute potable water to various end users within the service area. The EMWD facility would provide the infrastructure necessary to meet the projected growth and water demand of the service area. No additional water supply resources or entitlements are required for implementation of the proposed project. Impacts would be less than significant.

Mitigation Measures

None Required

Significance Determination

Less than Significant Impact

Wastewater Treatment

Impact 3.12-3: The proposed project could result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments.

Phase 1 and Phase 2

Construction

Storage Tanks and Pipeline

Construction associated with the proposed facilities would generate minor wastewater from worker portable toilet use. Per Riverside County Municipal Code requirements, wastewater generated from portable toilets within Riverside County would be collected by a permitted entity and disposed of at an appropriate location, such as the Lamb Canyon Landfill or the Frank R. Bowerman Sanitary Landfill, and would not exceed applicable wastewater treatment requirements. Construction is not expected to generate other forms of wastewater requiring treatment. The volume of wastewater would be negligible compared to the local wastewater treatment capacities, resulting in a less than significant impact. Construction activities would generate negligible to no storm water runoff.

Construction of the pipeline may involve localized trench and pipeline dewatering that could generate minimal amounts of wastewater. This wastewater collected from dewatering would be discharged to the nearest sewer manhole or stormwater system if no manhole is available. This may require issuance of a dewatering permit from the Santa Ana Regional Water Quality Control Board (RWQCB) for discharges to the stormwater system. As a result, impacts would be reduced to a less than significant level.

Operation

Storage Tanks and Pipeline

Operation of the storage tanks and pipeline would not involve wastewater generation or treatment. As a result, no impact would occur.

Mitigation Measures

None Required

Significance Determination

Less than Significant Impact

Solid Waste

Impact 3.12-4: The proposed project could generate solid waste in excess of state or local standards, or in excess of the capacity of local infrastructure, or otherwise impair the attainment of solid waste reduction goals.

Phase 1 and Phase 2

Construction

Storage Tanks and Pipeline

Construction of the proposed project would generate solid waste requiring disposal at a landfill or recycling facility. The Frank R. Bowerman Sanitary Landfill has a remaining capacity of 205,000,000 cubic yards as of February 2008 and is expected to operate until 2053 (CalRecycle 2022a). The Lamb Canyon Sanitary Landfill has a remaining capacity of 7,300,00 cubic yards as of 2023 and will not cease operation until 2032 (CalRecycle 2022b; Riverside County Department of Waste Resources 2023). Therefore, both facilities would be able to accommodate solid waste generated by the Phase 1 project, and the Frank K. Bowerman Sanitary Landfill would be able to accommodate waste generated as part of the Phase 2 project. Further, all construction activities for the proposed project would be required to divert construction waste from landfills per State CALGreen construction waste diversion requirements. Riverside County requires preparation of a Waste Recycling Plan and Waste Reporting form to demonstrate compliance with these State diversion requirements. Therefore, impacts related to sufficient landfill capacity during construction would be less than significant.

Operation

Storage Tanks and Pipeline

During operation, maintenance activities associated with the pipeline and storage tank would generate minimal solid waste. If needed, existing landfills in the project vicinity are anticipated to be able to accommodate waste associated with project operation. Therefore, impacts related to sufficient landfill capacity during operation would be less than significant.

Mitigation Measures

None Required

Significance Determination

Less than Significant Impact

Solid Waste Regulations

Impact 3.12-5: The proposed project would comply with federal, state, and local management and reduction statutes and regulations related to solid waste.

Phase 1 and Phase 2

Construction and Operation

Storage Tanks and Pipeline

The proposed project facilities would comply with Section 5.408.1.1 of the 2019 CalGreen Code which requires recycling of at least 65 percent of the waste generated during construction. Additionally, the project would comply with Riverside County's Construction and Demolition Waste Recycling Plan and Waste Reporting Form, which requires identification of the expected material types, locations for recycling of construction and demolition waste resulting from the project, and demonstrates the actual quantity of construction and demolition waste recycled. The proposed project facilities would not generate solid waste during operation. Therefore, the proposed project would comply with all applicable solid waste regulations during construction and operation, and impacts would be less than significant.

Mitigation Measures

None Required

Significance Determination

Less than Significant Impact

Cumulative Impacts

Impact 3.12-6: Concurrent construction and operation of the proposed project and related projects in the geographic scope could result in cumulative short-term and long-term impacts to utilities and service systems.

The cumulative projects considered in the analysis of cumulative impacts are listed in Table 3-2 and illustrated on Figure 3-1 in Chapter 3 of this Draft EIR. Cumulative projects 1 through 8 are development projects and Projects 10-12 are industrial projects that would require expanded utility services such as water, wastewater, stormwater electricity, telecommunications, and natural gas. These projects could combine together with the proposed project to create a cumulatively considerable impact.

The proposed project would require either solar panels or a MVU electrical service line connection. The project would also involve construction of a stormdrain system that would convey flows offsite. The effects of these utilities are evaluated throughout the EIR and would not separately cause significant environmental effects not analyzed in the EIR. Mitigation Measure UTIL-1 would ensure that the appropriate utilities are coordinated with to lessen impacts. Cumulative Projects 1 through 8 and 10 through 12 would involve substantial new utility services to support hundreds of additional homes and industrial facilities, such as water, wastewater, stormwater and electrical services. Although on a much greater scale, these cumulative projects would be similar to the proposed project in that the EIR prepared for the developments analyzed all impacts to the expanded utility services. While Cumulative Projects 1 through 8 and 10 through 12 would require expansion of existing facilities above existing conditions, the development has been approved by the City of Moreno Valley and is accounted for in the planned growth of the city. As a result, the project would not combine together with Cumulative Projects 1 through 8 and 10 through 12 to result in significant impacts to utilities and service systems. Therefore, the combined impacts to utilities and service systems within the geographic scope would not be considered cumulatively significant and impacts would be less than cumulatively considerable.

Mitigation Measures

Implement Mitigation Measure UTIL-1.

Significance Determination

Less than Significant Impact with Mitigation Incorporated

3.12.4 References

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3.13 Wildfire

This section addresses the wildfire impacts associated with implementation of the proposed project. This section includes: a description of the existing wildfire conditions in and around the proposed project site; a summary of applicable regulations related to wildfire; and an evaluation of the potential impacts of the proposed project related to wildfire at the proposed project site and in the surrounding area, including cumulative impacts.

3.13.1 Environmental Setting

Fire Environment

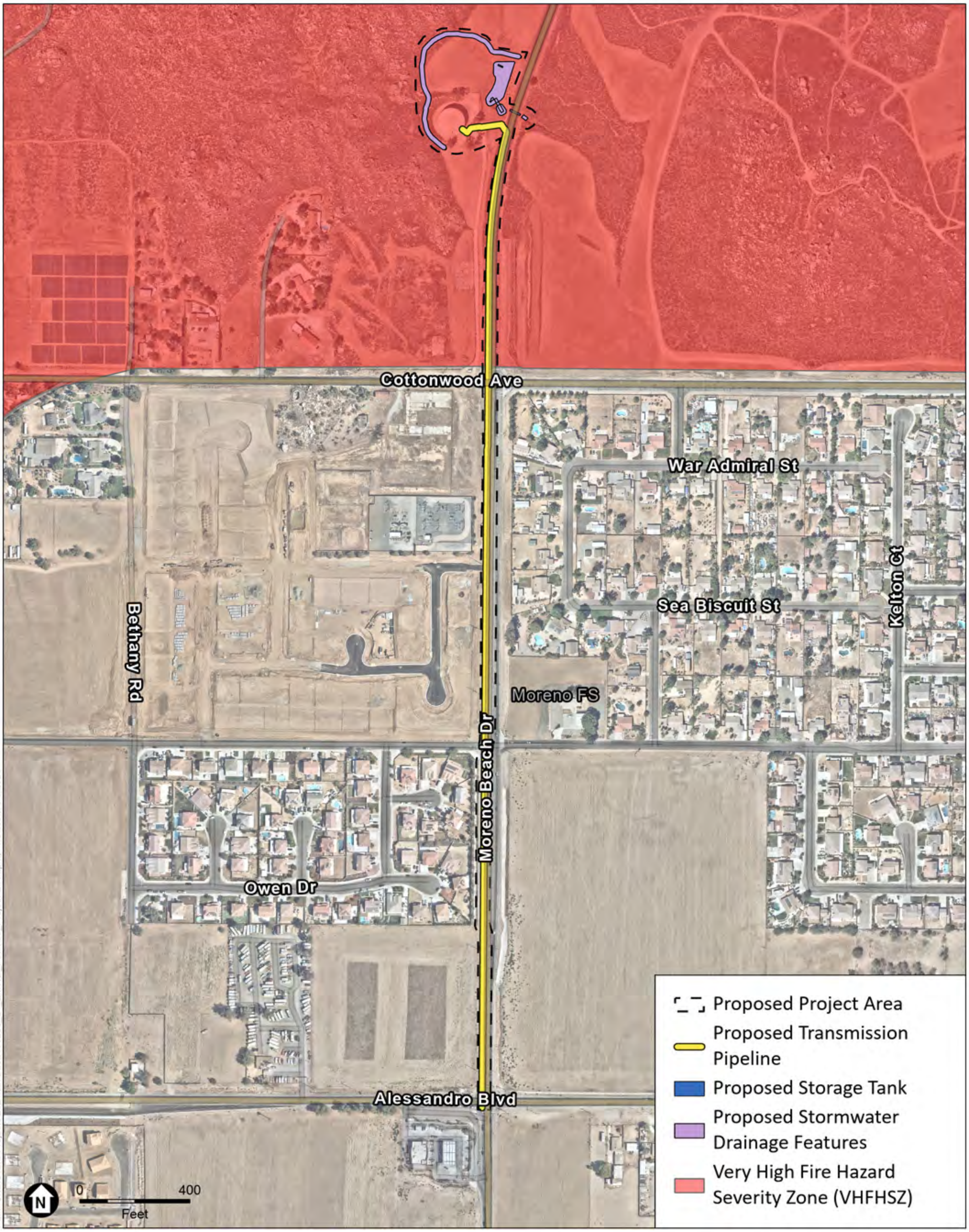
Fire environments are dynamic systems and include many types of environmental factors and site characteristics. Fires can occur in any environment where conditions are conducive to ignition and fire movement. The three major components of fire environment are vegetation (fuels), climate, and topography. The state of each of these components and their interactions with each other determines the potential characteristics and behavior of a fire at any given moment. It is important to note that wildland fire may transition to urban fire if structures are receptive to ignition. Understanding the existing wildland vegetation and fuel conditions on and around the project site is necessary to understand the fire environment. The climate of Southern California has been characterized by fire climatologists as the worst fire climate in the United States with high winds (Santa Ana) occurring during autumn exacerbated by periods of drought.

As defined by the Public Resources Code (PRC) 4126, State Responsibility Areas are State and privately owned forest, watershed, and rangeland for which the primary financial responsibility of preventing and suppressing wildland fires rests with the State. State Responsibility Areas, by definition, do not include any lands within city limits. CAL FIRE provides recommendations for fire hazard severity zones within Local Responsibility Areas but the responsibility for mapping Local Responsibility Areas lies within the local jurisdiction responsible for fire management and control within the Local Responsibility Area. While fire hazard severity zones do not predict when or where a wildfire will occur, they do identify areas where wildfire hazards could be more severe and therefore are of greater concern.

Fire hazard severity zones in and around the proposed project site are shown on **Figure 3.13-1**. According to the mapping completed by CAL FIRE, the proposed project facilities are located in a Local Responsibility Area Very High Fire Hazard Severity Zone (CAL FIRE 2022).

Vegetation (Fuels)

Vegetation and land cover types were identified as part of the biological resources analysis in this Draft EIR (see Section 3.3 *Biological Resources*). Land within 100 feet of the proposed project sites is classified as bush scrub and disturbed land. The scrub community is dominated by brittlebush (*Encelia farinosa*), a native species, as well as orange bush monkeyflower (*Diplacus aurantiacus*) and California sagebrush (*Artemisia californica*). The disturbed land is mostly comprised of barren soils with small amounts of non-native vegetative growth and no native species. Species in this area include Russian thistle (*Salsola tragus*) and shortpod mustard (*Hirschfeldia incana*). The scrub species are highly flammable.



SOURCE: ESA (2022)

Pettit Water Storage Tank Expansion and Transmission Pipeline Project

Figure 3.13-1
Fire Hazard Severity Zones

ESA

Fire History

Fire history information can provide an understanding of fire frequency, fire type, most vulnerable locations, and significant ignition sources. The fire history data for EMWD's service area is based on CAL FIRE's California Statewide Fire Map that displays fires from 1950 to the present day, as well as CAL FIRE's Fire Resource Assessment Program (FRAP) database that assesses the amount and extent of California's forests and rangelands, analyzes their conditions, and identifies alternative management and policy guidelines. These tools show there is significant wildfire potential in the region and the potential for the proposed project to be subject to occasional wildfire encroachment, most likely originating from the open space areas surrounding the proposed project site. According to data available from CAL FIRE's California Statewide Fire Map, there have been 6 fires in close proximity to the proposed project site since 2013 as presented in **Table 3.13-1**. Of these, the largest include the Smiley Fire of 2013 and the Reche Fire of 2019 (CAL FIRE 2013, 2017, 2018, 2019).

TABLE 3.13-1
FIRE HISTORY

Fire Name	Date	Acres Burned	Location
Nearby Fires			
Smiley Fire	May 25, 2013	124	Off Smiley Blvd & Vista Suelto Rd, north of Moreno Valley
Viper Fire	June 8, 2013	42	Off San Timoteo Canyon Rd and Viper Rd, north of Moreno Valley
Smiley Fire	May 21, 2017	35	Reche Canyon Road and Smiley Boulevard
Moreno Fire	May 23, 2017	10	Ironwood Avenue and Moreno Beach Drive
Country Fire	August 25, 2018	32	Off High Country Drive in Moreno Valley
Reche Fire	October 10, 2019	350	Reche Canyon Rd and Jordan Dr, Moreno Valley

Emergency Response

The City of Moreno Valley 2040 General Plan Safety Element identifies the City's major evacuation routes and existing infrastructure that can influence response times during a major disaster, which include Interstate 215 and Route 60 as major evacuation routes (City of Moreno Valley 2021).

3.13.2 Regulatory Framework

State

Transport, Use, and Storage of Explosive Materials (California Code of Regulations Title 8)

The transport, use, and storage of explosive materials is regulated under the General Industry Safety Orders contained in Title 8 of the California Code of Regulations, Division 1, Chapter 4, Subchapter 7 (General Industry Safety Orders), Group 18 (Explosives and Pyrotechnics), Article 116 (Handling and Use of Explosives--Blasting Operations). In accordance with these regulations, any contractor providing blasting services must be licensed by Cal OSHA, and the blaster must be physically present on site when blasting operations are performed. Explosive materials must be stored in an appropriate magazine[1] until they are used, and some materials must be stored in their shipping containers until used. All magazines must be located or protected as to minimize damage from vehicles or falling objects, and a 50-foot buffer around the magazine must be kept clear of brush, dried grass, leaves, and other combustible materials. The ground around the magazines must be sloped away from the magazine or drainage must be protected to protect the magazine from flooding. Smoking, open flames or other sources of ignition are prohibited within 50 feet of any area where explosive materials are being handled, except devices necessary to ignite the fuses of set charges. The transfer of explosive materials must also be arranged so that no undue delay will occur between the time the explosive materials leave the magazine and the time they are used.

California Fire Code (CCR Title 24, Part 9)

The California Fire Code is found in Title 24, Part 9 of the CCR, as a subsect of the California Building Code (CBC). The California Fire Code combines the Uniform Fire Code with amendments necessary to address California's unique needs. The California Fire Code (Title 24, Part 9 of the CCR) establishes regulations to safeguard against the hazards of fire, explosion, or dangerous conditions in new and existing buildings, structures, and premises. The California Fire Code also establishes requirements intended to provide safety for and assistance to firefighters and emergency responders during emergency operations. The provisions of the California Fire Code apply to the construction, alteration, movement, enlargement, replacement, repair, equipment, use and occupancy, location, maintenance, removal, and demolition of every building or structure throughout California. The California Fire Code includes regulations regarding fire-resistance-rated construction, fire protection systems such as alarm and sprinkler systems, fire service features such as fire apparatus access roads, means of egress, fire safety during construction and demolition, and wildland-urban interface areas.

Typical fire safety requirements of the California Fire Code include: the installation of sprinklers in all high-rise buildings; the establishment of fire resistance standards for fire doors, building materials, and particular types of construction; and the clearance of debris and vegetation within a prescribed distance from occupied structures in wildfire hazard areas. The California Fire Code applies to all occupancies in California, except where more stringent standards have been adopted by local agencies.

Cal/Occupational Safety and Health Administration (OSHA) Regulations (CCR Title 8)

Cal/OSHA has primary responsibility for developing and enforcing workplace safety regulations in California. Because California has a federally approved OSHA program, it is required to adopt regulations that are at least as stringent as those found in Title 29 of the Code of Federal Regulations (CFR). Cal/OSHA standards are generally more stringent than federal regulations. The use of hazardous materials in the workplace require employee safety training, safety

[1] A magazine is a structure specifically designed for the safe storage of explosive materials.

equipment, accident and illness prevention programs, hazardous substance exposure warnings, and emergency action and fire prevention plan preparation.

California Public Resources Code

The California Public Resources Code (PRC) was established in 1939 by the California Code Commission. The PRC contains law relating to natural resources, the conservation, utilization, and supervision thereof, along with mines and mining, oil and gas, and forestry. The following sections of the PRC are relevant to the proposed project:

PRC 4427

During any time of the year when burning permits are required in an area pursuant to this article, no person shall use or operate any motor, engine, boiler, stationary equipment, welding equipment, cutting torches, tarpots, or grinding devices from which a spark, fire, or flame may originate, which is located on or near any forest-covered land, brush-covered land, or grass-covered land, without doing both of the following:

(a) First clearing away all flammable material, including snags, from the area around such operation for a distance of 10 feet.

(b) Maintain one serviceable round point shovel with an overall length of not less than 46 inches and one backpack pump water-type fire extinguisher fully equipped and ready for use at the immediate area during the operation.

This section does not apply to portable power saws and other portable tools powered by a gasoline-fueled internal combustion engine.

PRC 4428

No person, except any member of an emergency crew or except the driver or owner of any service vehicle owned or operated by or for, or operated under contract with, a publicly or privately owned utility, which is used in the construction, operation, removal, or repair of the property or facilities of such utility when engaged in emergency operations, shall use or operate any vehicle, machine, tool or equipment powered by an internal combustion engine operated on hydrocarbon fuels, in any industrial operation located on or near any forest, brush, or grass-covered land between April 1 and December 1 of any year, or at any other time when ground litter and vegetation will sustain combustion permitting the spread of fire, without providing and maintaining, for firefighting purposes only, suitable and serviceable tools in the amounts, manner and location prescribed in this section:

(a) On any such operation a sealed box of tools shall be located, within the operating area, at a point accessible in the event of fire. This fire toolbox shall contain: one backpack pump-type fire extinguisher filled with water, two axes, two McLeod fire tools, and a sufficient number of shovels so that each employee at the operation can be equipped to fight fire.

(b) One or more serviceable chainsaws of three and one-half or more horsepower with a cutting bar 20 inches in length or longer shall be immediately available within the operating area, or, in the alternative, a full set of timber-felling tools shall be located in the fire toolbox, including one crosscut falling saw six feet in length, one double-bit ax with a 36-inch handle, one sledge hammer or maul with a head weight of six, or more, pounds and handle length of 32 inches, or more, and not less than two falling wedges.

(c) Each rail speeder and passenger vehicle, used on such operation shall be equipped with one shovel and one ax, and any other vehicle used on the operation shall be equipped with one shovel. Each tractor used in such operation shall be equipped with one shovel.

(d) As used in this section:

  (1) "Vehicle" means a device by which any person or property may be propelled, moved, or drawn over any land surface, excepting a device moved by human power or used exclusively upon stationary rails or tracks.

  (2) "Passenger vehicle" means a vehicle which is self-propelled and which is designed for carrying not more than 10 persons including the driver, and which is used or maintained for the transportation of persons but does not include any motortruck or truck tractor.

PRC 4431

During any time of the year when burning permits are required in an area pursuant to this article, no person shall use or operate or cause to be operated in the area any portable saw, auger, drill, tamper, or other portable tool powered by a gasoline-fueled internal combustion engine on or near any forest-covered land, brush-covered land, or grass-covered land, within 25 feet of any flammable material, without providing and maintaining at the immediate locations of use or operation of the saw or tool, for firefighting purposes one serviceable round point shovel, with an overall length of not less than 46 inches, or one serviceable fire extinguisher. The Director of Forestry and Fire Protection shall by administrative regulation specify the type and size of fire extinguisher necessary to provide at least minimum assurance of controlling fire caused by use of portable power tools under various climatic and fuel conditions. The required fire tools shall at no time be farther from the point of operation of the power saw or tool than 25 feet with unrestricted access for the operator from the point of operation.

PRC 4442

(a) Except as otherwise provided in this section, no person shall use, operate, or allow to be used or operated, any internal combustion engine which uses hydrocarbon fuels on any forest-covered land, brush-covered land, or grass-covered land unless the engine is equipped with a spark arrester, as defined in subdivision (c), maintained in effective working order or the engine is constructed, equipped, and maintained for the prevention of fire pursuant to Section 4443.

(b) Spark arresters affixed to the exhaust system of engines or vehicles subject to this section shall not be placed or mounted in such a manner as to allow flames or heat from the exhaust system to ignite any flammable material.

(c) A spark arrester is a device constructed of nonflammable materials specifically for the purpose of removing and retaining carbon and other flammable particles over 0.0232 of an inch in size from the exhaust flow of an internal combustion engine that uses hydrocarbon fuels or which is qualified and rated by the United States Forest Service.

(d) Engines used to provide motive power for trucks, truck tractors, buses, and passenger vehicles, except motorcycles, are not subject to this section if the exhaust system is equipped with a muffler as defined in the Vehicle Code.

(e) Turbocharged engines are not subject to this section if all exhausted gases pass through the rotating turbine wheel, there is no exhaust bypass to the atmosphere, and the turbocharger is in effective mechanical condition.

(f) Motor vehicles when being operated in an organized racing or competitive event upon a closed course are not subject to this section if the event is conducted under the auspices of a recognized sanctioning body and by permit issued by the fire protection authority having jurisdiction.

California Building Code

The CBC includes regulations that are consistent with nationally recognized standards of good practice, intended to facilitate protection of life and property. Among other things, its regulations address the mitigation of the hazards of fire explosion, management and control of the storage, handling and use of hazardous materials and devices, mitigation of conditions considered hazardous to life or property in the use or occupancy of buildings, and provisions to assist emergency response personnel.

Chapter 7 of the CBC details the materials, systems, and assemblies used in the exterior design and construction of new buildings located within a Wildland-Urban Interface Fire Area. A Wildland-Urban Interface Area is defined in Section 702A as a geographical area identified by the areas of a fire hazard severity zones in accordance with Public Resources Code Sections 4201 through 4204 and Government Code Sections 51175 through 51189, or other areas designated by the enforcing agency to be at a significant risk from wildfires. Fire hazard severity zones are geographical areas classified as Very High, High, or Moderate in State Responsibility Areas or as Local Responsibility Areas as Very High Fire Hazard Severity Zones. Fire hazard severity zones, which are determined based on factors such as fuel, slope, and fire weather, do not predict when or where a wildfire will occur, but they do identify the degree of fire hazard (very high, high or moderate). The CBC details the materials, systems, and assemblies used for structural fire resistance and fire-resistance-rated construction separation of adjacent spaces to safeguard against the spread of fire and smoke within a building and the spread of fire to or from buildings.

Local

City of Moreno Valley Municipal Code

Title 11 (Peace, Morals, and Safety), Chapter 11.20 (Explosives), Section 11.20.020 (Conditions of Issuance of a Permit to Blast) of the Moreno Valley Municipal Code requires a blasting permit to be obtained from the City Fire Marshal for blasting operations (Ord. 302 § 2.2, 1991). The ordinance stipulates that blasting operations shall only be conducted between 8 a.m. and 5 p.m. and not on Sundays or legal holidays, unless excepted by the Fire Marshal. Other requirements include providing notice to residential, commercial, and industrial properties within 500 feet from the blasting activity, and placing signs at intervals of no more than 200 feet on each side of each public street within 2,000 feet, and maintaining a log of the blasting activities and photographs of buildings within 500 feet.

Title 8 (Building and Construction), Chapter 8.36 (California Fire Code) describes various provisions that have been adopted by the City from the 2019 California Fire Code. Section 8.36.060 (Hazardous Materials) stipulates that explosives shall not be possessed, kept, stored, sold, offered for sale, given away, used, discharged, transported or disposed of within wildland-urban interface areas, or hazardous fire areas except by permit from the Fire Code Official (i.e. the City Fire Marshal and members of the Moreno Valley Fire Prevention Bureau).

City of Moreno Valley 2040 General Plan

The following is a selected list of General Plan goals, objectives, and polices that are applicable to the proposed project respective to wildfires (City of Moreno Valley 2021).

Wildfire Hazards Policies

S.1-12: Work to prevent wildland fire and to protect lives, property, and watersheds from fire dangers.

S.1-13: Jointly with State, County, local and other agencies, inform property owners of wildfire risks and measures to reduce those risks.

S.1-14: Require new development in Very High FHSZs to prepare a Fire Protection Plan that minimizes risks by:

- Assessing site-specific characteristics such as topography, slope, vegetation type, wind patterns etc.;
- Siting and designing development to avoid hazardous locations (eg. through fire breaks) to the extent feasible;
- Incorporating fuel modification and brush clearance techniques in accordance with applicable fire safety requirements and carried out in a manner which reduces impacts to environmentally sensitive habitat to the maximum feasible extent;
- Using fire-safe building materials and design features, consistent with the adopted Municipal Code and Fire and Building Code standards;
- Using fire-resistant landscaping; and
- Complying with established standards and specifications for fuel modification, defensible space, access, and water facilities.

S.1-15: Avoid, where feasible, locating new development in areas subject to high wildfire risk. If avoidance is not feasible, condition such new development on implementation of measures to reduce risks associated with that development.

S.1-16: Require that all new development located in a Very High Fire Hazard Severity Zone (VHFHSZ) or a State Responsibility Area (SRA) is served by adequate infrastructure, including safe access for emergency response vehicles, visible street signs, and water supplies for fire suppression.

S.1-17: Require new development in VHFHSZs to enter into a long-term maintenance agreement for vegetation management in defensible space, fuel breaks, and roadside fuel reduction.

S.1-18: Continue to require proactive weed abatement, brush thinning, and removal services on new and existing development in High and Very High Fire Hazard Severity Areas in order to curb potential fire hazards.

S.1-19: Cooperate with the Riverside County Fire Department and CALFIRE to ensure that all portions of the Planning Area are served and accessible within an effective response time and to address regional wildfire threats.

S.1-20: Work with responsible agencies and nongovernmental organizations to plan for post-fire recovery in a manner that reduces further losses or damages from future fires.

Actions

S.1-G: Maintain and make publicly available an up-to-date a map of high and very high fire hazard areas, consistent with CALFIRE designations.

S.1-H: Consider developing alternative fire protection standards suitable for Rural Residential areas not exposed to high wildland fire hazards.

S.1-I: Disseminate information on fire weather watches and fire risks via the City's website and encourage all Moreno Valley residents to engage in risk reduction and fire preparedness activities.

3.13.3 Impact Analysis and Mitigation Measures

Thresholds of Significance

The following criteria from CEQA Guidelines Appendix G are used as thresholds of significance to determine the impacts of the proposed project as related to wildfire. If located in or near State Responsibility Areas or lands classified as Very High Fire Hazard Severity Zone, the proposed project would have a significant impact if it would:

1. Substantially impair an adopted emergency response plan or emergency evacuation plan.
2. Due to slope, prevailing winds, and other factors, exacerbate wildfire risks, and thereby expose project occupants to, pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire.
3. Require the installation or maintenance of associated infrastructure (such as roads, fuel breaks, emergency water sources, power lines or other utilities) that may exacerbate fire risk or that may result in temporary or ongoing impacts to the environment.
4. Expose people or structures to significant risks, including downslope or downstream flooding or landslides, as a result of runoff, post-fire slope instability, or drainage changes.
5. Result in a cumulatively considerable impact to wildfire.

Impact Analysis

Emergency Response Plan

Impact 3.13-1: The proposed project could substantially impair an adopted emergency response plan or emergency evacuation plan.

Phase 1

Construction

Storage Tank

The proposed storage tank would be constructed within the existing Pettit storage tank site, and would not impact evacuation routes within rights-of-ways. No Impact would occur.

Pipeline

The pipeline would be installed entirely within existing rights of way of Moreno Beach Drive. Pipeline installation would require localized closure of traffic lanes, including portions of Moreno Beach Boulevard, Cottonwood Avenue, Bay Avenue, and Alessandro Boulevard. Potential road closures or detours could congest local roadways that could be used by the public and emergency responders if an emergency or disaster were to occur. Impacts would be potentially significant. As a result, **Mitigation Measure TRA-1** would require preparation of a Traffic Control Plan and other measures to ensure that impacts to emergency evacuation routes do not occur as a result of the proposed project. The Traffic Control Plan would be used during construction to guide motorists, bicyclists, and pedestrians safely through the construction area and allow for adequate emergency access and circulation. The Construction Traffic Control Plan would be coordinated with the City of Moreno Valley and provided to emergency responders, including fire departments, police departments, and ambulances that have jurisdiction within the proposed project area. Therefore, with implementation of Mitigation Measure TRA-1, construction of the pipeline would not impair or physically interfere with emergency response teams or an evacuation plan. Impacts would be less than significant with implementation of mitigation measures.

Operation

Storage Tank and Pipeline

The proposed water storage tanks would require weekly maintenance consisting of a maximum of two service truck trips per week (1/2 ton pickup) that would travel normally on public rights-of-ways. The pipeline would be installed entirely underground. As a result, no operation-related activities would occur within surrounding rights-of-ways or along evacuation routes. The proposed project would not result in impacts on emergency response plans or emergency evacuations. As a result, no impact would occur.

Mitigation Measures

Implement Mitigation Measure TRA-1 (Refer to Section 3.10, *Transportation*).

Significance Determination

Less than Significant Impact with Mitigation Incorporated

Phase 2

Construction

Storage Tank

The proposed storage tank would be constructed on the existing Pettit storage tank site, and would not impact evacuation routes within rights-of-ways. No Impact would occur.

Operation

Storage Tank

Maintenance of the second storage tank would consist of a maximum of two service truck trips per week (1/2 ton pickup) that would travel normally on public rights-of-ways. As a result, the proposed project would not result in impacts on emergency response plans or emergency evacuations and no impact would occur.

Mitigation Measures

None Required

Significance Determination

No Impact

Exposure to Wildfire Pollutant Concentrations

Impact 3.13-2: Due to slope, prevailing winds, and other factors, would the project exacerbate wildfire risks, and thereby expose project occupants to, pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire.

Phase 1 and Phase 2

Construction

Storage Tanks and Pipeline

The proposed project site is located in a Local Responsibility Area classified as Very High Fire Hazard Severity Zone. The eastern section of the project site is mostly comprised of barren soils with small amounts of vegetative growth. The western section of the project site and surrounding area is dominated by a shrub canopy which can be highly flammable. In addition, the project site rests on a slope. Any sparks or flames would have the potential to ignite vegetation on the western edge of the project site that could act as wildfire fuel. During construction, equipment and onsite diesel fuel could pose a risk to wildfire with possible ignition sources such as internal combustion engines, gasoline-powered tools, blasting equipment, and equipment that could produce a spark, fire, or flame. The use of spark-producing construction machinery within fire risk areas could expose temporary project workers and contractors to pollutant concentrations from a wildfire or the uncontrolled spread of wildfire, resulting in a potentially significant impact. However, all personnel on the project site would have to comply with PRC Sections 4427, 4428, 4431, and 4442, which include regulations relating to the handling of combustible fuels and equipment that can exacerbate fire risks. During construction, strict adherence to these PRC sections would ensure that contractors are responsible for all monitoring and safety measures ensuring that any risk to exacerbate wildfire would be reduced. Additionally, all construction must comply with fire protection and prevention requirements specified by the CCR and Cal/OSHA. This includes various measures such as easy accessibility of firefighting equipment, proper storage of combustible liquids, no smoking in service and refueling areas, operation of a blaster and handling of explosive materials during blasting activities, and worker training for firefighter extinguisher use. Furthermore, implementation of **Mitigation Measure WDF-1** would be required to ensure a fire protection plan and fire hazard reduction measures are implemented during proposed project activities to further reduce the potential for wildfire impacts on project workers. As a result, impacts would be reduced to a less than significant level with mitigation.

Operation

Storage Tanks and Pipeline

Operation-related activities would involve a limited number of maintenance trucks for inspections and material delivery. These trucks would be limited to established roads and would have a low potential of producing sparks, fire, or flame, that could result in uncontrolled spread of wildfire. As a result, impacts would be less than significant.

Mitigation Measures

WDF-1: Fire Hazard Reduction Measures. In accordance with S.1-14 of the Moreno Valley 2040 General Plan, prior to construction, EMWD shall prepare a fire protection plan that includes an assessment of site characteristics, brush clearance locations and techniques, equipment requirements for working in dry brush including spark arrestors, spotters for welding activities, fire extinguisher accessibility, use of fire safe building materials, and installation of fire-resistant landscaping. Fire hazard reduction measures outlined in the fire protection plan shall be implemented during construction.

Significance Determination

Less than Significant with Mitigation Incorporated

Infrastructure that Exacerbates Wildfire Risk

Impact 3.13-3: The proposed project could require the installation or maintenance of associated infrastructure (such as roads, fuel breaks, emergency water sources, power lines or other utilities) that may exacerbate fire risk or that may result in temporary or ongoing impacts to the environment.

Phase 1

Construction

Storage Tank and Pipeline

The proposed project includes construction of a new proposed pipeline and storage tank to support planned development in east Moreno Valley. This new infrastructure does not pose additional risk to exacerbation of wildfires other than what is discussed in Impact 3.13-2 above. Construction would require compliance with PRC Sections 4427, 4428, 4431, and 4442, which include regulations relating to the handling of combustible fuels and equipment that can exacerbate fire risks. Construction will also comply with Cal OSHA regulations by ensuring that the blaster is physically present on site when blasting operations are performed and storing explosive materials in an appropriate magazine until they are used. Additionally, Mitigation Measure WDF-1 would be required to ensure a fire protection plan and fire hazard reduction measures are implemented during proposed project activities to further reduce the potential for wildfire impacts on project workers. Impacts would be reduced to a less than significant level with mitigation.

Operation

Storage Tank and Pipeline

As previously mentioned, the water storage tank would require weekly maintenance consisting of a maximum of two service truck trips per week (1/2 ton pickup) that would be limited to established roads and would have a low potential of producing sparks, fire, or flame, that could result in uncontrolled spread of wildfire. There are no required operation-related activities for the pipeline. As a result, impacts would be less than significant.

Mitigation Measures

Implement Mitigation Measure WDF-1.

Significance Determination

Less than Significant Impact with Mitigation Incorporated

Phase 2

Construction

Storage Tank

The proposed project includes construction of a new proposed storage tank to support planned development in east Moreno Valley. This new infrastructure does not pose additional risk to exacerbation of wildfires other than what is discussed in Impact 3.13-2 above. Construction would require compliance with PRC Sections 4427, 4428, 4431, and 4442, which include regulations relating to the handling of combustible fuels and equipment that can exacerbate fire risks. Construction would also require compliance with Cal OSHA regulations, which includes regulations related to the operation of a blaster and handling of explosive materials. Additionally, Mitigation Measure WDF-1 would be required to ensure a fire protection plan and fire hazard reduction measures are implemented during proposed project activities to further reduce the potential for wildfire impacts on project workers. Impacts would be reduced to a less than significant level with mitigation.

Operation

Storage Tank

The water storage tank would require weekly maintenance consisting of a maximum of two service truck trips per week (1/2 ton pickup) that would be limited to established roads and would have a low potential of producing sparks, fire, or flame, that could result in uncontrolled spread of wildfire. It is possible that the new SCE electrical service line could exacerbate fire risk if compromised by high winds or other utility failure, resulting in a potentially significant impact. Site preparation for the electrical service line would include the clearance of vegetation. In addition, S.1-14 of the Moreno Valley 2040 General Plan would require brush clearance and fire-resistant landscaping. As a result, impacts would be reduced to a less than significant level during operation.

Mitigation Measures

Implement Mitigation Measure WDF-1.

Significance Determination

Less than Significant Impact with Mitigation Incorporated

Post-Fire Slope or Drainage

Impact 3.13-4: The proposed project could expose people or structures to significant risks, including downslope or downstream flooding or landslides, as a result of runoff, post-fire slope instability, or drainage changes.

Phase 1 and Phase 2

Construction

Storage Tanks and Pipeline

The movement of substantial quantities of soil and earth materials has the potential to result in landslides as a result of runoff or drainage changes during construction. Given that the size of the proposed project exceeds one acre, and the slope upon which the storage tanks would be constructed, the project would be required to comply with the NPDES General Permit for Discharges of Storm Water Runoff Associated with Construction and Land Disturbance Activities (Order 2009-0009-DWQ, NPDES No. CAS000002; as amended by Orders 2010-0014-DWQ and 2012-006-DWQ) (Construction General Permit) and local stormwater ordinances. These state and local requirements were developed to ensure that erosion is controlled on construction sites. The Construction General Permit requires preparation and implementation of a SWPPP, which requires applications of BMPs to control runon and runoff from construction work sites. The BMPs would include, but would not be limited to, physical barriers to prevent erosion and sedimentation, construction of sedimentation basins, limitations on work periods during storm events, protection of stockpiled materials, and a variety of other measures that would substantially reduce or prevent erosion from occurring during construction. In the event that a wildland fire is followed by a rain event, and results in downstream flooding or landslides as a result of post-fire runoff during construction, the BMP measures required to be implemented under the SWPPP would reduce the risk of runoff, post-fire slope instability, and drainage changes. With compliance with existing regulations, impacts would be less than significant.

Operation

Storage Tanks and Pipeline

Once constructed, the proposed project would be designed to withstand a variety of site conditions to maintain capacity for the purpose of water conveyance and storage. Pipeline infrastructure would remain underground and would not expose people or structures to significant risks. The storage tanks at the site may require periodic maintenance including removal of accumulated sediment and debris, replacement of non-operational machinery, and inspection and maintenance of all structures. Onsite personnel could be put at risk should landslides or flooding occur as a result of wildland fires. However, a concrete drainage ditch would be constructed around the limits of the project site and a proposed concrete down drain and a series of 12-to-18-inch storm drains would be installed to safely convey flows onsite. In the event that a wildland fire is followed by a rain event, and results in downstream flooding or landslides as a result of post-fire runoff, the onsite stormwater drainage facilities reduce the risk of runoff, post-fire slope instability, and drainage changes. Operation of the proposed project would be managed in a way that would not result in runoff, post-fire slope instability, or drainage changes as a result of potential wildland fire. As a result, impacts would be less than significant.

Mitigation Measures

None Required

Significance Determination

Less than Significant Impact

Cumulative Impacts

Impact 3.13-5: Concurrent construction and operation of the proposed project and related projects in the geographic scope could result in cumulative short-term and long-term impacts to wildfire.

The cumulative projects considered in the analysis of cumulative impacts are listed in Table 3-2 and illustrated on Figure 3-1 in Chapter 3 of this Draft EIR. None of the cumulative projects 1 through 12 are located in Very High Fire Hazard Severity Zones.

The proposed project is located on a slope and is surrounded by flammable vegetation. During construction, equipment and onsite diesel fuel could pose a risk to wildfire with possible ignition sources such as internal combustion engines, gasoline-powered tools, blasting equipment, and equipment that could produce a spark, fire, or flame. The risks posed by the surrounding vegetation and construction are evaluated throughout the EIR and would not separately cause significant environmental effects not analyzed in the EIR. Mitigation Measures WDF-1 and TRA-1 would ensure that the appropriate fire hazard reduction measures and Traffic Control Plan are implemented so that the potential for wildfire impacts on project workers is reduced and impacts to emergency evacuation routes do not occur. As a result, the project would not combine together with Cumulative Projects 1 through 8 and 10 through 12 to result in significant impacts to wildfires. Therefore, the combined impacts to wildfires within the geographic scope would not be considered cumulatively significant and impacts would be less than cumulatively considerable

Mitigation Measures

Implement Mitigation Measures TRA-1 and WDF-1.

Significance Determination

Less than Significant Impact with Mitigation Incorporated

3.13.4 References

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CHAPTER 4

Other CEQA Considerations and Growth Inducement

4.1 Significant Irreversible Environmental Changes

CEQA Guidelines 21100(b) (2) and 15126.2(d) require that any significant effect on the environment that would be irreversible must be identified. A project would generally result in a significant irreversible impact if:

- Primary and secondary impacts (such as roadway improvements that provide access to previously inaccessible areas, etc.) would commit future generations to similar uses.
- The project would involve a large commitment of nonrenewable resources.
- The project would involve uses in which irreversible damage could result from any potential environmental accidents associated with the project.

Construction and operation of the proposed project would require the use and consumption of nonrenewable resources, such as steel and other metals. Renewable resources, such as lumber and other wood byproducts, would also be used. Unlike renewable resources, nonrenewable resources cannot be regenerated over time. Construction of facilities would require the commitment of a relatively small amount of building materials. The small quantity of building materials used during implementation of proposed projects would not result in a significant impact because these types of resources are anticipated to be in adequate supply into the foreseeable future.

Energy would be consumed during both construction and operation of the proposed project. Nonrenewable resources and energy would also be consumed during the manufacturing and transportation of building materials, preparation of the site, and construction and site restoration activities. The proposed project would result in the irretrievable and irreversible commitment of energy resources in the form of diesel fuel, gasoline and electricity during construction and operation. Annual diesel fuel consumption associated with construction of the proposed project would be approximately 146,999 gallons per year during Phase 1 and approximately 61,245 gallons per year during Phase 2. During proposed project construction, on- and off-road vehicles would consume an estimated annual average of approximately 7,408 gallons of gasoline fuel in Phase 1 and 5,082 gallons of gasoline fuel in Phase 2. Construction of the proposed project would utilize fuel-efficient trucks and equipment consistent with federal and State regulations, such as fuel efficiency regulations in accordance with CARB's Pavley Phase I and II standards Operation-related fuel use would be negligible compared to construction. As such, the proposed project would comply with State measures to reduce the inefficient, wasteful, and unnecessary consumption of energy, such as petroleum-based transportation fuels. The total operation-related electricity consumption of the proposed project, taking into account the existing consumption of the 2.5 MG tank, would be 92 MWh per year. This is less than 0.001 percent of Southern California Edison's annual consumption, and energy consumption may be even lower should EMWD include solar power as a source of electrical power for the proposed project. The project would not result in the wasteful, inefficient or unnecessary consumption of energy during construction or operation. Therefore, impacts due to these irretrievable and irreversible commitments of resources are considered less than significant.

4.2 Growth Inducement

4.2.1 Overview

CEQA Guidelines Section 15126.2(e) requires that an EIR discuss the potential growth-inducing impacts of a proposed project. The *CEQA Guidelines* provide the following guidance for such discussion:

> *Discuss the ways in which the proposed project could foster economic or population growth, or the construction of additional housing, either directly or indirectly, in the surrounding environment. Included in this are projects which would remove obstacles to population growth (a major expansion of a wastewater treatment plant might, for example, allow for more construction in service areas). Increases in the population may tax existing community service facilities, requiring construction of new facilities that could cause significant environmental effects. Also discuss the characteristic of some projects which may encourage and facilitate other activities that could significantly affect the environment, either individually or cumulatively. It must not be assumed that growth in any area is necessarily beneficial, detrimental, or of little significance to the environment.*

A project can have direct and/or indirect growth-inducement potential. Direct growth inducement would result if a project involves construction of new housing. A project can have indirect growth-inducement potential if it establishes substantial new permanent employment opportunities (e.g., commercial, industrial, or governmental enterprises) or if it involves a construction effort with substantial short-term employment opportunities that indirectly stimulates the need for additional housing and services to support the new employment demand. Similarly, under CEQA, a project would indirectly induce growth if it removes an obstacle to additional growth and development, such as removing a constraint on a required public service.

Water storage and supply is one of the primary public services needed to support growth and community development. While water supply plays a role in supporting growth, it is not the single determinant of such growth. Other factors, including general plan policies, land use plans, and zoning, the availability of wastewater treatment and solid waste disposal capacity, public schools, transportation services, and other essential public infrastructure, also influence business and residential population growth. Economic factors, in particular, greatly affect development rates and locations.

Growth inducement itself is not necessarily an adverse environmental impact. It is the potential consequences of growth, the secondary effects of growth, which may result in environmental impacts. Potential secondary effects of growth include increased demand on other public services; increased traffic and noise; degradation of air quality; loss of plant and animal habitats; and the conversion of agriculture and open space to developed uses. Growth inducement may result in adverse impacts if the growth is not consistent with the land use plans and growth management plans and policies for the area, as "disorderly" growth could indirectly result in additional adverse environmental impacts. Thus, it is important to assess the degree to which the growth accommodated by a project would or would not be consistent with applicable land use plans.

As stated in Chapter 2, *Project Description*, the proposed project would involve construction and operation of two new 4.5 MG potable water storage tanks and associated transmission pipeline. The proposed project would be implemented in phases: the first phase would involve construction and operation of one 4.5 MG storage tank and associated pipeline; the second phase would involve demolition of the existing 2 MG storage tank and installation of a second 4.5 MG storage tank in its place. The proposed storage tanks are needed to support planned growth in the eastern portion of the 1764 Pettit Pressure Zone associated with the World Logistics Center and other future development in the area. As such, this chapter evaluates the potential for the proposed project to induce growth in EMWD's service area. This chapter reviews the population growth projections for the EMWD service area and describes the existing and projected water demand and water supply conditions. It provides a description of EMWD's role in providing water to customers within their service area and evaluates the potential for the proposed project to induce growth.

4.2.2 Project Area Population and Water Demand Projections

Population Projections

Southern California Association of Governments Population Projections

The proposed project area is located entirely within EMWD's service area within the City of Moreno Valley. The City of Moreno Valley's adopted General Plan guides the type and location of land uses and the intensity of development in response to projected population growth and associated housing needs. The City of Moreno Valley has assessed the growth-related impacts associated with planned land use and build-out scenarios allowed under their General Plans.

The proposed project and the EMWD service area are located within the jurisdiction of the South Coast Association of Governments (SCAG). SCAG consists of local governments from Orange, Ventura, San Bernardino, Los Angeles, Riverside, and Imperial Counties. One of SCAG's primary functions is to forecast population, housing, and employment growth for each region, subregion, and city within its jurisdiction. SCAG adopted the 2020-2045 Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS) which acts as a long-term planning and management tool for the regional transportation system, providing mitigation measures to off-set the impacts of projected growth. SCAG population estimates are included in **Table 4-1** for the City of Moreno Valley beginning with the base year 2016 and including SCAG forecasting for the year

2045. As shown in Table 4-1, the population of the City of Moreno Valley is anticipated to increase through 2045 and result in an estimated growth rate of 29.7 percent.

TABLE 4-1
POPULATION PROJECTIONS

	2016	2020	2025	2030	2035	2040	2045	% Change
City of Moreno Valley	205,700						266,800	29.7%
EMWD Service Area	761,221[1]	859,160	921,200	983,300	1,045,300	1,088,300	1,131,300	48.6%

[1] EMWD's 2020 UWMP does not include population estimates for the year 2016. Instead, 2015 is used as the comparison year.

SOURCE: SCAG 2020a; EMWD 2021.

Eastern Municipal Water District's 2020 Urban Management Plan Projections

EMWD provides potable water and recycled water to a large portion of western Riverside County. EMWD's primary service area covers approximately 558 square miles and includes the cities of Canyon Lake, Hemet, Menifee, Moreno Valley, Murrieta, Perris, San Jacinto, and Temecula as well portions of unincorporated Riverside County, which include the communities of French Valley, Good Hope, Homeland, Lakeview, Mead Valley, Murrieta Hot Springs, Nuevo, Romoland, Valle Vista and Winchester (EMWD 2023). EMWD's service area includes both the retail service area which represents the area directly served by EMWD's distribution system and the wholesale area which represents the areas served by agencies which buy water from EMWD. In 2015, which is the latest data presented in the 2020 UWMP, EMWD served a retail area consisting of 546,146 people and a wholesale area consisting of 215,075 people, for a total service area population of 761,221 people (EMWD 2021).

Population projections for the EMWD service area were obtained from the EMWD's 2020 UWMP (EMWD 2021). UWMPs are prepared by California's urban water suppliers to support long-term resource planning and ensure adequate water supplies are available to meet existing and future water demands. Every urban water supplier that either provides over 3,000 AF of water annually or serves more than 3,000 connections is required to assess the reliability of its water sources over a 20-year planning horizon considering normal, dry, and multiple dry years. This reliability assessment is required to be included in its UWMP, which are to be prepared every five years and submitted to DWR for consistency review under the Urban Water Management Planning Act. The UWMP takes into account the projected population growth for the water supplier's service area when determining future available water supply and future anticipated water demand.

As stated in EMWD's 2020 UWMP, the population of EMWD's service area has grown rapidly, from 342,655 people in 1990 to 761,221 people in 2015 (EWMD 2021). As shown in Table 4-1, EMWD's service area is anticipated to continue to experience steady growth from 2015 through 2045 with an anticipated growth rate of approximately 48.6 percent. EMWD's 2020 UWMP population projections for 2020-2045 were estimated using growth projects prepared by SCAG (EMWD 2021).

Water Supply and Demand

EMWD is one of 29 water agencies that have a State Water Project (SWP) Water Supply Contract with DWR. The majority of EMWD's water supplies consist of imported water purchased through MWD from the SWP and the Colorado River Aqueduct (CRA). The availability of these imported supplies is dependent on the amount of precipitation in the watershed, the amount of that precipitation that runs off into the watershed, water use by others in the watershed and the amount of water in storage in the SWP's Lake Oroville at the beginning of the year. Variability in the location, timing, amount and form (rain or snow) of precipitation, as well as how wet or dry the previous year was, produces variability from year to year in the amount of water that is available for the SWP. EMWD's local supplies include groundwater, desalinated groundwater, and recycled water. Groundwater is pumped from the Hemet/San Jacinto and West San Jacinto areas of the San Jacinto Groundwater Basin. EMWD owns and operates three desalination plants that convert brackish groundwater from the West San Jacinto Basin into potable water. EMWD also owns, operates, and maintains its own recycled water system that consists of four recycled water reclamation facilities and several storage ponds spread throughout EMWD's service area that are connected through the recycled water system (EMWD 2021).

Water demand projections for the service area, including retail and wholesale, are provided in **Table 4-2**. Since 2020, imported water accounted for approximately 63 percent of the EMWD's water supply consisting of a combined 101,961 acre-feet per year (AFY) for retail and wholesale customers. As shown in Table 4-2, by 2045 imported water is anticipated to account for approximately 57 percent of EMWD's water supply consisting of 143,247 AFY, which represents an increase of approximately 40 percent by the year 2045. While imported water supplies will increase, they will make up a smaller portion of EMWD's overall water supply due to increases in desalinated groundwater and recycled water supply. Over the same period, potable water demand for EMWD's retail and wholesale customers is projected to increase from 121,057 AFY to 181,800 AFY, which is an anticipated increase of 50 percent. With the expected demand for potable water increasing significantly over the next 25 years, EMWD intends to continue to rely heavily on the use of imported water to be able to meet demand within the service area.

TABLE 4-2
EMWD EXISTING AND PROJECTED WATER SUPPLY AND DEMAND (AFY)

Source	2020	2025	2030	2035	2040	2045
Retail Water Demand						
Potable and Raw Water Demand	84,673	102,600	108,300	114,400	118,900	123,000
Recycled Water Demand	31,243	43,330	49,020	54,500	59,800	64,100
Total Retail Water Use	115,916	145,930	157,320	168,900	178,700	187,100
Wholesale Water Demand						
Potable and Raw Water Demand	36,384	58,200	52,400	54,400	56,700	58,800
Recycled Water Demand	1,285	4,770	5,180	5,600	5,600	5,600
Total Wholesale Water Use	37,699	62,970	57,580	60,000	62,300	64,400
Retail Water Supplies						
Purchased or Imported Water	65,577	66,447	72,147	70,247	74,747	78,847
Groundwater	11,785	18,753	18,753	18,753	18,753	18,753
Desalinated Groundwater	7,310	13,400	13,400	13,400	13,400	13,400
Recycled Water	39,642	43,330	49,020	54,500	59,800	64,100
Other		4,000	4,000	12,000	12,000	12,000
Total Retail Water Supply:	124,314	145,930	157,320	168,900	178,700	187,100
Wholesale Water Supplies						
Purchased or Imported Water	36,384	58,200	54,400	54,400	56,700	58,800
Recycled Water	1,285	4,770	5,180	5,600	5,600	5,600
Total Wholesale Water Supply	37,669	62,970	57,580	60,000	62,300	64,400
Total Demand	**153,615**	**208,900**	**214,900**	**228,900**	**241,000**	**251,500**
Total Supply	**161,983**	**208,900**	**214,900**	**228,900**	**241,000**	**251,500**

SOURCE: EMWD 2021, Tables 6-13 through 6-16.

4.2.3 Growth Inducement Potential

Implementation of the proposed project would not have a direct growth inducement effect, as it does not propose development of new housing that would attract additional population to the area. Further, implementation of the proposed project would not result in substantial permanent employment that could indirectly induce population growth. Although construction activities would create some short-term construction employment opportunities over the duration of construction activities, the amount of opportunities created would not require persons outside of the County of Riverside work force. Further, no new permanent employees would be required to operate the proposed facilities.

The objectives of the proposed project are to provide replacement tanks to increase potable water storage capacity to meet near- and long-term demands associated with planned development in eastern Moreno Valley; provide a transmission pipeline to connect the replacement tanks with existing and proposed infrastructure; maximize usable storage capacity of other tanks within the 1764 Pettit Pressure Zone; and to further EMWD's strategic planning goal to develop adaptable water storage and delivery system improvements to manage uncertain delivery conditions and emergency outages. Implementation of the proposed project would not create a new or expanded water supply that could create an indirect growth inducement potential. Although the proposed project includes construction and operation of water storage and conveyance facilities, the water to be stored comes from an existing supply source via the SWP, and therefore does not represent a new supply.

The City of Moreno Valley governs land use and development within the proposed project area. The City's adopted General Plan documents guide the type, location, and level of land use and development within the project area. The City of Moreno Valley has assessed the growth-related impacts associated with planned land use and growth allowed under its General Plan and the CEQA EIRs it has prepared for those plans. In addition, SCAG prepared the Regional Comprehensive Plan (RCP) (SCAG 2008), which combines regional planning efforts into a single focused document. The RCP addresses growth management as well as several core elements including housing, transportation, air quality, and water. The principal objectives of the RCP are to coordinate regional and local decisions with respect to future growth and development and to minimize future environmental impacts. SCAG has also prepared the 2020-2045 RTP/SCS as mentioned about (SCAG 2020b). The RTP/SCS acts as a long-term planning and management plan for the regional transportation system, providing mitigation measures to off-set the impacts of growth projected in the RCP. The Final RTP/SCS Program EIR identifies significant unavoidable impacts in a number of issue areas, and concludes that when population and employment growth is held constant, many adverse environmental impacts will be significant and unavoidable regardless of whether the RTP/SCS is approved (SCAG 2020c).

EMWD does not have the authority to make land use decisions to halt or alter growth and development patterns or approvals, nor does it have the authority to address many of the potentially significant, secondary effects of planned growth. Authority to implement those measures lies with the City of Moreno Valley. However, EMWD does have the authority to take actions and implement projects to help mitigate the secondary effects of growth on water resources and water supply services within the service area.

While the proposed project would provide future water system infrastructure within EMWD's service area, the components to be constructed as part of the proposed project would support planned population growth that has been identified within the service area. The proposed project would not create a new water supply that would induce future growth. Rather, as a water supply/pressure deficiency correction project, the proposed project would accommodate the population growth already planned by local jurisdictions with authority over land use approvals within the service area. The new facilities would support water infrastructure reliability to avoid impediments to already-planned growth. As a result, the proposed project neither supports nor encourages growth within the EMWD service area to a greater degree than presently estimated by the City of Moreno Valley and SCAG as described above, and other land use agencies with jurisdiction over the proposed project area. The proposed project would not directly or indirectly induce growth.

4.2.4 References

Eastern Municipal Water District (EMWD), 2021. Eastern Municipal Water District 2020 Final Urban Water Management Plan. July 1, 2021. Available online at: https://www.emwd.org/post/urban-water-management-plan, accessed January 23, 2023.

EMWD, 2023. Who We Are. Available online at: https://www.emwd.org/who-we-are, accessed January 23, 2023.

Southern California Association of Governments (SCAG), 2008. Regional Comprehensive Plan. Available online at: http://www.scag.ca.gov/NewsAndMedia/Pages/RegionalComprehensivePlan.aspx, accessed January 25, 2023.

Southern California Association of Governments (SCAG), 2020a. 2020-2045 RTP/SCS. Demographics and Growth Forecast Technical Report. Adopted September 3, 2020. Available online at: https://scag.ca.gov/sites/main/files/file-attachments/0903fconnectsocal_demographics-and-growth-forecast.pdf?1606001579, accessed January 23, 2023

SCAG, 2020b. 2020-2045 Regional Transportation Plan/Sustainable Communities Strategy. Available online at: https://scag.ca.gov/read-plan-adopted-final-connect-socal-2020, accessed January 23, 2023.

SCAG, 2020c. 2020-2045 RTP/SCS Final Program Environmental Impact Report (SCH #20199011061). Certified May 2020. Available online at: http://scagrtpscs.net/Pages/FINAL2016PEIR.aspx¸ accessed January 25, 2023.

CHAPTER 5
Alternatives Analysis

5.1 Overview of Alternatives Analysis

CEQA requires that a Draft EIR describe and evaluate a reasonable range of feasible alternatives to a project, or to the location of a project, that would attain most of the project objectives and avoid or substantially lessen significant project impacts. The alternatives analysis must also include the "No Project Alternative" as a point of comparison. The No Project Alternative includes existing conditions and reasonably foreseeable future conditions that would exist if the project were not approved (*CEQA Guidelines* Section 15126(d)). The environmental impacts associated with the alternatives are evaluated relative to the impacts associated with the proposed project.

CEQA Guidelines (§15126.6) set forth the following criteria for alternatives:

- **Identifying Alternatives**. The range of alternatives is limited to those that would avoid or substantially lessen any of the significant effects of the project, are feasible, and would attain most of the basic objectives of the project. Factors that may be considered when addressing the feasibility of an alternative include site suitability, availability of infrastructure, general plan consistency, other plans or regulatory limitations, jurisdictional boundaries, economic viability, and whether the proponent can reasonably acquire, control or otherwise have access to the alternative site. An EIR need not consider an alternative whose impact cannot be reasonably ascertained and whose implementation is remote and speculative. The specific alternative of 'no project' shall also be evaluated along with its impact.
- **Range of Alternatives**. An EIR need not consider every conceivable alternative, but must consider a reasonable range of alternatives that will foster informed decision-making and public participation. The "rule of reason" governs the selection and consideration of EIR alternatives, requiring that an EIR set forth only those alternatives necessary to permit a reasoned choice.
- **Evaluation of Alternatives**. EIRs are required to include sufficient information about each alternative to allow meaningful evaluation, analysis, and comparison with the project. Matrices may be used to display the major characteristics of each alternative and significant environmental effects of each alternative to summarize the comparison. If an alternative would cause one or more significant effects in addition to those that would be caused by the project as proposed, the significant effects of the alternative must be discussed, but in less detail than the significant effects of the project.

5.1.1 Project Objectives

The overall intent of the proposed project is to increase potable water storage capacity within the eastern region of the 1764 Pettit Pressure Zone which is currently served by EMWD. The objectives of the proposed project are as follows:

- Provide replacement tanks to increase potable water storage capacity to meet near- and long-term demands associated with planned development in eastern Moreno Valley.
- Provide a transmission pipeline to connect the replacement tanks with existing and proposed infrastructure.
- Maximize usable storage capacity of other tanks within the 1764 Pettit Pressure Zone.
- Further EMWD's strategic planning goal to develop adaptable water storage and delivery system improvements to manage uncertain delivery conditions and emergency outages.

5.1.2 Potentially Significant Impacts of the Proposed Project

Chapter 3 of this Draft EIR identifies potential impacts associated with the proposed project for each environmental issue area in Appendix G of the *CEQA Guidelines*, including cumulative impacts. See Section 3.0 for existing conditions of environmental topic areas found to have no impact as a result of Project implementation. Chapter 4 addresses impacts anticipated related to growth-inducement. Mitigation measures were identified to reduce potentially significant impacts to a less than significant level. There are no significant and unavoidable impacts resulting from construction or operation of the proposed project. A summary of the significance of the greatest impacts for each environmental resource analyzed in Chapter 3 is presented in **Table 5-1**. Specific impacts and all mitigation measures are provided in Table ES-1 in the Executive Summary of this Draft EIR.

TABLE 5-1
SUMMARY OF PROPOSED PROJECT IMPACT ANALYSIS

Environmental Resource	Proposed Project Significance Determination
Aesthetics	LTSM
Air Quality and Greenhouse Gas Emissions	LTS
Biological Resources	LTSM
Cultural Resources	LTSM
Energy	LTS
Geology, Soils, and Paleontology	LTSM
Hazards and Hazardous Materials	LTSM
Hydrology and Water Quality	LTS
Noise and Vibration	LTSM
Transportation	LTSM
Tribal Cultural Resources	LTSM
Utilities and Service Systems	LTSM
Wildfire	LTSM

NOTES:
LTS = Less than Significant
LTSM = Less than Significant with Mitigation

5.2 Alternatives to the Proposed Project

5.2.1 Alternatives Considered but Rejected

In October 2016, EMWD prepared the *Pettit Storage Siting Evaluation Technical Memorandum* (Appendix B in Kleinfelder 2017; see Draft EIR Appendix PDR) which identified two alternatives in addition to the proposed project to achieve 8 MG storage capacity at the project site. These alternatives which were considered by EMWD, but ultimately rejected in favor of the proposed project, are described below.

New 3-MG Tank and New 5-MG Tank

This alternative includes the demolition of the existing 2 MG tank and construction of a new 5 MG tank at the location of the existing tank, and a 3 MG tank located just to the north of the 5 MG tank on EMWD property. The access road to the tank would have a 7% slope uphill towards the tank. The detention basin would be located on the northeastern portion of the site. The northern tank would be constructed and operational prior to demolition of the existing tank and construction of the southern tank.

The alternative would involve similar environmental impacts as the proposed project because two tanks would be built at the project site. The alternative would provide the least storage capacity for immediate use. As a result, the alternative would not meet the project objective of providing replacement tanks to increase potable water storage capacity to meet near- and long-term demands associated with planned development in eastern Moreno Valley. Because of these reasons, EMWD has rejected the alternative as infeasible and it is not considered further in this DEIR.

Existing 2-MG Tank to Remain and New 6-MG Tank

This alternative involves keeping the existing 2 MG tank onsite and construction of a new 6 MG tank located just to the north of the 2 MG tank on EMWD property. The access road to the tank would have a 15% slope uphill towards the tank. This alternative also requires the construction of a retaining wall on the northern side of the site. The detention basin would be located on the northeastern portion of the site.

The alternative would involve fewer environmental impacts as the proposed project because only one tank would be built at the project site, resulting in fewer construction-related air quality emissions and aesthetics impacts. However, the existing 2 MG tank would still have freeboard issues that eliminates the ability of other storage tanks in the area to maximize usable space. As a result, the alternative would not meet the project objective of maximizing usable storage capacity of other tanks within the 1764 Pettit Pressure Zone. Because of these reasons, EMWD has rejected the alternative as infeasible and it is not considered further in this DEIR.

5.2.2 No Project Alternative

According to Section 15126.6(e) of the *CEQA Guidelines*, discussion of the No Project Alternative must include a description of existing conditions and reasonably-foreseeable future conditions that would exist if the project were not approved. Under the No Project Alternative, EMWD would not construct two new 4.5-million-gallon (MG) water storage tanks, transmission pipeline, stormwater drainage facilities, or related improvements. The existing 2 MG storage tank at the project site would continue to be operational. The benefits of the proposed project, which include improved operating conditions in the 1764 Pettit Pressure Zone, would not occur.

Ability to Meet Project Objectives

The No Project Alternative would meet none of the project objectives. Without the proposed project, replacement tanks and pipeline would not be installed, and therefore potable water storage capacity would not be increased to meet near- and long-term demands associated with planned development in eastern Moreno Valley. Additionally, usable storage capacity at other storage tanks within the 1764 Pettit Pressure Zone would not be maximized. The No Project Alternative would not further EMWD's goal of developing adaptable water storage and delivery system improvements to manage uncertain delivery conditions and emergency outages.

Impact Analysis

Aesthetics

The introduction of new facilities associated with the proposed project would not occur under this alternative. The No Project Alternative would have no potential to impact scenic vistas or visual character within the proposed project area. The Draft EIR found that the proposed project would have a less than significant impact after implementation of mitigation measures to scenic vistas and visual character resulting from implementation of the water storage tanks. Since the No Project Alternative would not introduce any above-ground facilities to the project area, it would result in fewer aesthetic impacts when compared to the proposed project.

Air Quality and Greenhouse Gas Emissions

The No Project Alternative would not involve any construction activities or operation of any proposed project facilities, and would therefore not generate emissions that could impact air quality. The proposed project would result in generation of emissions, but not at significant levels. As such, the No Project Alternative would result in fewer air quality impacts when compared to the proposed project.

The No Project Alternative would not involve an increase in greenhouse gas emissions from existing conditions because no infrastructure would be constructed. The proposed project would result in greenhouse gas emissions but not at significant levels, and as such, the No Project Alternative would result in fewer greenhouse gas emissions impacts when compared to the proposed project.

Biological Resources

The No Project Alternative would not involve any construction activities or operation of any proposed project facilities, and would therefore not alter the existing site conditions at the existing water storage tank site. The proposed project has the potential to impact sensitive species and their habitat, which would be reduced to levels of less than significance with implementation of mitigation measures. However, the No Project Alternative would completely avoid potential impacts to special-status species. Therefore, the No Project Alternative would result in fewer potential biological resource impacts than the proposed project.

Cultural Resources

The No Project Alternative would not involve any construction activities or operation of any proposed project facilities, and would therefore not result ground disturbance that would disrupt and affect archaeological, historic, or human remains. Construction of the water storage tank could impact known archaeological resources. Additionally, construction activities would involve substantial grading and excavation that could significantly impact undiscovered cultural resources. While mitigation measures would avoid and reduce impacts to historic resources, archaeological resources, and human remains, the No Project Alternative would not impact any resources, and as a result would impact fewer impacts to cultural resources than the proposed project.

Energy

The No Project Alternative would not involve an increase in energy usage from existing conditions because no infrastructure would be constructed. The proposed project would result in an increased usage of electricity and transportation-related fuels, but not at significant levels. Therefore, the No Project Alternative would result in fewer energy impacts when compared to the proposed project.

Geology and Soils

The No Project Alternative would not involve construction activities or operation of any facilities. As a result, geologic impacts related to ground shaking and soil erosion would not occur to any people or structures. The impacts to geologic hazards would constitute a less than significant impact and no mitigation measures would be required. For paleontological resources, the trenching for the pipeline would occur up to depths that could encounter paleontological resources in alluvial fan sediments. Mitigation measures would reduce the impact to less than significant levels. As a result, since the No Project Alternative would not result in any ground disturbing activities or potential to uncover paleontological resources, the alternative would result in fewer geological, soil, and paleontological impacts when compared to the proposed project.

Hazards and Hazardous Materials

No new facilities would be constructed or operated under the No Project Alternative. While the proposed project would involve routine transport and use of potentially hazardous materials, including fuels, lubricants, and blasting agents, compliance with existing regulations would reduce all impacts to a level of less than significant. Construction of the project pipeline could interfere with emergency operations, which would be mitigated to a less than significant level. The project water storage tank would be implemented within a very high fire hazard severity zone, which would require fire hazard reduction measures to be implemented during proposed project activities. The No Project Alternative would not involve transport of potentially hazardous materials, or implement structures at risk of wildland fire. As a result, the No Project Alternative would result in fewer impacts to hazards and hazardous materials when compared to the proposed project.

Hydrology and Water Quality

The No Project Alternative would not involve any construction activities or operation of any proposed project facilities, and would therefore not result in ground disturbance that could impact surface water, groundwater, or associated drainage patterns. Under the proposed project, construction of new facilities would involve ground-disturbing activities that could impact surface water quality due to polluted runoff from the construction sites. Such potential impacts would be reduced with implementation of required regulatory requirements such as SWPPPs and BMPs. However, the No Project Alternative would not involve ground-disturbing activities and would not have the potential for such water quality impacts. As a result, the No Project Alternative would result in fewer impacts to hydrology and water quality impacts when compared to the proposed project.

Noise and Vibration

The No Project Alternative would not involve activities that would generate noise. The proposed project would result in a temporary increase in noise levels during construction, but would be mitigated to less than significant levels with implementation of mitigation measures. While vibration levels would increase as a result of project implementation, the levels would not exceed vibration thresholds and no mitigation measures would be required. The No Project Alternative would not alter the existing noise environment and as a result would have fewer noise impacts than the proposed project.

Transportation

The No Project Alternative would not result in construction activities or operation of any facilities. The proposed project would result in temporary impacts to traffic and circulation patterns due to construction of pipelines within rights-of-way. All the proposed project impacts would be temporary and would be reduced to less than significant levels with implementation of mitigation measures such as a Traffic Control Plan. Therefore, the No Project Alternative would result in fewer impacts than the proposed project.

Tribal Cultural Resources

Under the No Project Alternative, the proposed project site would remain undeveloped and no ground disturbing activities would occur. The Rincon Band of Luiseño Indians and the Agua Caliente Band of Cahuilla Indians indicated that the project site is situated within their Traditional Use Areas. As a result, the project site is considered sensitive as there are existing sites in the surrounding areas. The tribes expressed concern for the potential unearthing of unknown artifacts while grading the selected project site. Based on these findings and in consultation with the tribes, the project site appears to have a high potential for encountering tribal cultural resources during construction. With implementation of mitigation measures, impacts to tribal cultural resource as described in PRC Section 21084.2 would be reduced to a less than significant level. Because the

No Project Alternative would not result in ground disturbance, it would not cause a substantial adverse change in the significant of a tribal cultural resources with cultural value to a California Native American tribe. Therefore, the No Project Alternative would result in fewer impacts related to tribal cultural resources compared to the proposed project.

Utilities and Service Systems

The No Project Alternative would not result in any new facilities that would require additional use of utilities or services currently provided in the proposed project area. The proposed project would place new minor demand on existing utilities, including electrical, water or wastewater, stormwater, or landfills; however, impacts would be less than significant. Nevertheless, since the No Project Alternative would result in no additional demands on public services and utilities, the No Project Alternative would result in fewer impacts than the proposed project.

Wildfire

The No Project Alternative would not involve construction or operation of any new facilities, and therefore would not alter the existing wildfire risk at the project sites. The proposed project would require operation of construction equipment that has the potential produce a spark, fire or flame in an area that includes highly flammable vegetation and prevailing winds. As a result, construction of the proposed project has potential to increase the risk of wildfire; however, implementation of mitigation measures that include fire hazard reduction measures would ensure impacts associated with wildfire risk are reduced to less than significant levels. While the proposed project would involve construction within right-of-ways that could impede emergency access, mitigation measures would be required to reduce impacts to evacuation routes. Nonetheless, the No Project Alternative would not exacerbate the risk of wildland fire or conflict with emergency response because no new facilities would be built. As a result, the No Project Alternative would result in fewer impacts associated with wildfire when compared to the proposed project.

5.3 Environmentally Superior Alternative

CEQA requires that an EIR identify the environmentally superior alternative of a project other than the No Project Alternative (CEQA Guidelines Section 15126.6(e)(2)). One of the primary purposes of the alternatives analysis is to identify project alternatives that may avoid or substantially lessen significant project impacts (CEQA Guidelines Section 15126.6). With incorporation of mitigation measures, the proposed project would result in no significant and unavoidable impacts.

As stated above and summarized in **Table 5-2**, the No Project Alternative would avoid all of the mitigated environmental impacts associated with the proposed project, but would not meet all of the project objectives. Because the proposed project does not result in any significant and unavoidable impacts, the No Project Alternative does not avoid or substantially lessen significant and unavoidable impacts. EMWD additionally evaluated use of two project alternatives, the New 3-MG Tank and New 5-MG Tank Alternative and the Existing 2-MG Tank to Remain and New 6-MG Tank, which were rejected from further consideration because they did not meet the project objectives and did not substantially lessen significant environmental impacts. The proposed project is the environmentally superior alternative because it meets all of the project objectives and does not result in significant and unavoidable impacts.

TABLE 5-2
SUMMARY OF ALTERNATIVES ANALYSIS
IMPACTS AS COMPARED TO THE PROPOSED PROJECT

Environmental Resource	Proposed Project	No Project Alternative
Meets All Project Objectives?	Yes	No
Environmental Impacts		
Aesthetics	LTSM	-
Air Quality and Greenhouse Gas Emissions	LTS	-
Biological Resources	LTSM	-
Cultural Resources	LTSM	-
Energy	LTS	-
Geology, Soils, and Paleontology	LTSM	-
Hazards and Hazardous Materials	LTSM	-
Hydrology and Water Quality	LTS	-
Noise and Vibration	LTSM	-
Transportation	LTSM	-
Tribal Cultural Resources	LTSM	-
Utilities and Service Systems	LTSM	-
Wildfire	LTSM	-

NOTES:
- = fewer impacts
+ = greater impacts
0 = similar impacts

5.4 References

Kleinfelder, 2016. *Pettit Storage Siting Evaluation Technical Memorandum*. Prepared for EMWD as Appendix B within the Pettit 1674-Zone Storage Water Tank Expansion and Transmission Pipeline Project Preliminary Design Report. October 17, 2016.

CHAPTER 6
List of Preparers

6.1 Lead Agency

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Appendix AQ/GHG/ ENERGY

Air Quality, Greenhouse Gas Emissions, and Energy Modeling

ESA

Appendix AQ/GHG/Energy-1 Assumptions

ESA

Pettit Water Storage Tank Expansion And Transmission Pipeline Project

Water Storage Tank Area / Site (acres):	4.370	*Data Needs pg. 1*
Location:	City of Moreno Valley	*Data Needs*
CEC Forecasting Climate Zone:	10	*Data Needs*
Utility:	Moreno Valley Electrical Utility (MVU)	*MVU-servarea.pdf (moval.gov)*
Operational Year:	2026 and 2045	*Data Needs*

Project Land Uses 4.37 = Tank Area

	Land Use Type	CalEEMod LandUse Type	CalEEMod LandUse Subtype	Amount	Unit	Building SF	Notes		
Phase 1	Paving Area (Pipeline)	Parking	Other Asphalt Area	2.9	acres	126,324	*Data Needs pg. 5*		1 acre = 43560 SF
Phase 1	Paving Area (Tank)	Parking	Other Asphalt Area	0.225	acres	9,801	*Data Needs pg. 5*	*Total acreage of Water Storage Tank Area split between both tanks*	
Phase 1	Industrial (Tank)	Parking	Other Non-Asphalt	1.96	acres	85,378	*Data Needs pg. 1*	*Total acreage of Water Storage Tank Area split between both tanks*	
Phase 2	Paving Area (Tank)	Parking	Other Asphalt Area	0.225	acres	9,801	*Data Needs pg. 5*	*Total acreage of Water Storage Tank Area split between both tanks*	
Phase 2	Industrial (Tank)	Parking	Other Non-Asphalt	1.96	acres	85,378	*Data Needs pg. 1*	*Total acreage of Water Storage Tank Area split between both tanks*	
	Total acreage might not match PD because total pipeline differs in CalEEMod				**Total**	**316,681**			

Construction Data[2]

	Start	End	Total Work Days
Phase 1A	May-26	May-26	**26**
Phase 1A	Oct-26	Jan-27	**105**
Phase 1B	May-26	Feb-27	**260**
Phase 2	Jan-45	Oct-45	**260**
	Total Construction Site Area (acres)	4.37	

Project Description pg. 10 **CalEEMod defaults*

	Construction Phase	CalEEMod Phase Type	Start Date	End Date	Workdays (6 days/week)	Worker Vehicles/Day	Workers Trips (In/Out)/Day	Vendor Trips/Day (In/Out)	Total Haul (or Concrete) Trips (In/Out)	Total Haul (or Concrete) Trucks/Day	Haul (or Concrete) Trips/Day (In/Out)
Phase 1B	Grading/Excavation	Grading	5/1/2026	6/30/2026	52	10	20	0	6,058	0	118
Phase 1A	Potholding	Trenching	5/1/2026	5/31/2026	26	10	20	0	0	0	0
Phase 1B	Stormwater Drainage and Foundation Concrete	Building Construction	7/1/2026	8/31/2026	53	10	20	0	9,712	0	184
Phase 1B	Construction[1]	Building Construction	9/1/2026	2/28/2027	155	10	20	36	0	0	0
Phase 1B	Finishing[1]	Paving	9/1/2026	2/28/2027	155	10	20	0	0	0	0
Phase 1B	Painting[1]	Architectural Coating	9/1/2026	2/28/2027	155	10	20	0	0	0	0
Phase 1A	Installing Pipeline	Trenching	10/1/2026	11/30/2026	52	10	20	0	0	0	0
Phase 1A	Install Appurtenances	Building Construction	12/1/2026	12/31/2026	27	10	20	0	0	0	0
Phase 1A	Pavement Repairs	Paving	1/1/2027	1/31/2027	26	10	20	36	0	0	0
Phase 2	Demolition	Demolition	1/1/2045	1/31/2045	26	10	20	0	14	0	2
Phase 2	Grading/Excavation	Grading	2/1/2045	3/31/2045	51	10	20	0	2,020	0	40
Phase 2	Stormwater Drainage and Foundation Concrete	Building Construction	4/1/2045	4/30/2045	25	10	20	0	2	0	2
Phase 2	Construction[1]	Building Construction	5/1/2045	10/31/2045	158	10	20	16	0	0	0
Phase 2	Finishing[1]	Paving	5/1/2045	10/31/2045	158	10	20	0	0	0	0
Phase 2	Painting[1]	Architectural Coating	5/1/2045	10/31/2045	158	10	20	0	0	0	0

"A total of up to 10 workers would be needed per day for construction activities associated with each water storage tank construction."

PD pg. 10

Pettit Water Storage Tank Expansion And Transmission Pipeline Project

Demolition Quantities Phase 2 (2045)		
Buildings	**Amount**	
Total Demolition Debris (CY)	**120**	Data Needs pg. 2 Tank+Retaining Wall
Haul Truck Capacity (CY)	14	Data Needs pg. 2
Total Haul Trucks Required	7	Calculation
Total Haul Truck Trips (In/Out)	**14**	Calculation
Haul Days	**26**	Data Needs Construction Schedule
Total Haul Truck Trips (In/Out) per day	2	Calculation
Tons of Debris	97	pg 370 of Preliminary Design Report

Excavation Quantities Phase 1 (2026)		
Parameters	**Amount**	
Excavation Volume (Export) (CY)	**42,402**	PD confirmed by PM
Haul Truck Capacity (CY)	14	Data Needs pg. 3
Total Haul Trucks Required	3,029	Calculation
Total Haul Truck Trips (In/Out)	**6,058**	Calculation
Haul Days	**52**	Data Needs Construction Schedule
Daily Haul Amount (CY)	**815**	Calculation
Total Haul Truck Trips (In/Out) per day	118	Calculation

Excavation Quantities Phase 2 (2045)		
Parameters	**Amount**	
Excavation Volume (Export) (CY)	**14,134**	PD confirmed by PM
Haul Truck Capacity (CY)	14	Data Needs pg. 3
Total Haul Trucks Required	1,010	Calculation
Total Haul Truck Trips (In/Out)	**2,020**	Calculation
Haul Days	**51**	Data Needs Construction Schedule
Daily Haul Amount (CY)	**277**	Calculation
Total Haul Truck Trips (In/Out) per day	40	Calculation

Foundations/Concrete Quantities Phase 1 (2026)		
Foundations	**Amount**	
Total Concrete Volume (CY)	43,700	Data Needs; assuming majority of concrete required for new tank installatio
Concrete Truck Capacity (CY)	9	Data Needs pg. 4
Total Concrete Trucks Required	4,856	Calculation
Total Concrete Truck Trips (In/Out)	**9,712**	Calculation
Daily Max Concrete Amount (CY)	825	Calculation
Haul Days	53	Data Needs Construction Schedule
Max Concrete Truck Trips (In/Out) per Day	184	Calculation
Days Needed	53	Calculation
Total Haul Truck Trips (In/Out) per day	184	Calculation

Foundations/Concrete Quantities Phase 2 (2045)		
Foundations	**Amount**	
Total Concrete Volume (CY)	10	Data Needs; assuming 10 CY concrete required for misc items during tank re
Concrete Truck Capacity (CY)	9	Data Needs pg. 4
Total Concrete Trucks Required	1	Calculation
Total Concrete Truck Trips (In/Out)	**2**	Calculation
Haul Days	25	Data Needs Construction Schedule
Daily Max Concrete Amount (CY)	0	Calculation
Max Concrete Truck Trips (In/Out) per Day	2	Calculation
Days Needed	2	Calculation

Notes:

1 CalEEMod User's Guide, Appendix A

2 CalRecycle Weights and Volumes

Appendix AQ/GHG/Energy-2 Construction Emissions

ESA

Appendix AQ/GHG/Energy-2A Construction Emissions Calculations Phase 1

ESA

Pettit Water Storage Tank Expansion and Transmission Project - Phase 1
Air Quality Construction Analysis

Regional Emissions Summary	ROG	NOX	CO	SO2	Total PM10	Total PM2.5
Source			lb/day			
3.2 Grading/Excavation (1B) - 2026	5.0	64.2	53.8	<1	4.5	2.1
3.3 Potholding (1A) - 2026	1.9	12.5	18.0	<1	<1	<1
3.4 Stormwater Drainage and Foundation (1B) - 2026	2.2	57.2	33.1	<1	4.1	1.5
3.5 Construction (1B) - 2026	1.2	10.7	9.4	<1	<1	<1
3.5 Construction (1B) - 2027	1.2	10.7	9.4	<1	<1	<1
3.6 Finishing (1B) - 2026	<1	5.7	11.6	<1	<1	<1
3.6 Finishing (1B) - 2027	<1	5.7	11.6	<1	<1	<1
3.7 Painting (1B) - 2026	<1	2.9	5.4	<1	<1	<1
3.7 Painting (1B) - 2027	<1	2.9	5.3	<1	<1	<1
3.8 Installing Pipeline (1A) - 2026	1.3	8.5	11.6	<1	<1	<1
3.9 Installing Appurtenances (1A) - 2026	1.8	11.3	14.8	<1	<1	<1
3.10 Pavement Repairs (1A) - 2027	2.6	17.0	23.1	<1	1.1	<1
Overlapping Phases						
Potholing (Phase 1a) + Grading/Excavation (Phase 1b)	6.9	76.7	71.8	<1	5.2	2.6
Install Pipeline (Phase 1a) + Construction/Finishing/Painting (Phase 1b)	4.0	27.9	38.0	<1	2.1	1.3
Install Appurtenances (Phase 1a) + Construction/Finishing/Painting (Phase 1b)	4.5	30.7	41.2	<1	2.2	1.4
Pavement Repairs/Misc. (Phase 1a) + Construction/Finishing/Painting (Phase 1b)	5.3	36.4	49.6	<1	2.7	1.6
Project Daily Maximum Emissions	**6.9**	**76.7**	**71.8**	**<1**	**5.2**	**2.6**
SCAQMD Regional Significance Threholds	**75**	**100**	**550**	**150**	**150**	**55**
Exceeds Thresholds?	**No**	**No**	**No**	**No**	**No**	**No**

Localized Emissions Summary	NOX	CO	Total PM10	Total PM2.5
Source		lb/day		
3.2 Grading/Excavation (1B) - 2026	33.4	39.0	2.0	1.4
3.3 Potholding (1A) - 2026	12.5	17.3	<1	<1
3.4 Stormwater Drainage and Foundation (1B) - 2026	8.9	10.4	<1	<1
3.5 Construction (1B) - 2026	9.2	7.5	<1	<1
3.5 Construction (1B) - 2027	9.2	7.5	<1	<1
3.6 Finishing (1B) - 2026	5.7	10.9	<1	<1
3.6 Finishing (1B) - 2027	5.7	10.9	<1	<1
3.7 Painting (1B) - 2026	2.9	4.6	<1	<1
3.7 Painting (1B) - 2027	2.9	4.6	<1	<1
3.8 Installing Pipeline (1A) - 2026	8.4	10.8	<1	<1
3.9 Installing Appurtenances (1A) - 2026	11.3	14.0	<1	<1
3.10 Pavement Repairs (1A) - 2027	15.6	21.3	<1	<1
Overlapping Phases				
Potholing (Phase 1a) + Grading/Excavation (Phase 1b)	45.9	56.3	2.5	1.8
Install Pipeline (Phase 1a) + Construction/Finishing/Painting (Phase 1b)	26.2	33.9	1.1	1.0
Install Appurtenances (Phase 1a) + Construction/Finishing/Painting (Phase 1b)	29.0	37.1	1.2	1.1
Pavement Repairs/Misc. (Phase 1a) + Construction/Finishing/Painting (Phase 1b)	33.3	44.4	1.4	1.3
Project Daily Maximum Emissions	**45.9**	**56.3**	**2.5**	**1.8**
Threshold	**2160.0**	**1577.0**	**13.0**	**8.0**
Significant Impact?	**No**	**No**	**No**	**No**

Pettit Water Storage Tank Expansion and Transmission Project - Phase 1

Air Quality Construction Analysis

Regional Maximums	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
Source					lb/day					
3.2 Grading/Excavation (1B) - 2026	5.0	64.2	53.8	0.2	3.0	1.5	4.5	0.7	1.4	2.1
3.3 Potholding (1A) - 2026	1.9	12.5	18.0	0.1	0.2	0.5	0.7	0.1	0.4	0.5
3.4 Stormwater Drainage and Foundation (1B) - 2026	2.2	57.2	33.1	0.2	3.6	0.5	4.1	1.0	0.5	1.5
3.5 Construction (1B) - 2026	1.2	10.7	9.4	0.0	0.4	0.4	0.8	0.1	0.4	0.5
3.5 Construction (1B) - 2027	1.2	10.7	9.4	0.0	0.4	0.4	0.8	0.1	0.4	0.5
3.6 Finishing (1B) - 2026	0.8	5.7	11.6	0.0	0.2	0.3	0.5	0.1	0.3	0.3
3.6 Finishing (1B) - 2027	0.7	5.7	11.6	0.0	0.2	0.3	0.5	0.1	0.3	0.3
3.7 Painting (1B) - 2026	0.8	2.9	5.4	0.0	0.2	0.1	0.3	0.1	0.1	0.2
3.7 Painting (1B) - 2027	0.8	2.9	5.3	0.0	0.2	0.1	0.3	0.1	0.1	0.2
3.8 Installing Pipeline (1A) - 2026	1.3	8.5	11.6	0.0	0.2	0.3	0.5	0.1	0.3	0.3
3.9 Installing Appurtenances (1A) - 2026	1.8	11.3	14.8	0.0	0.2	0.4	0.6	0.1	0.4	0.4
3.10 Pavement Repairs (1A) - 2027	2.6	17.0	23.1	0.1	0.4	0.6	1.1	0.1	0.6	0.7
Overlapping Phases										
	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
Potholing (Phase 1a) + Grading/Excavation (Phase 1b)	6.9	76.7	71.8	0.2	3.2	2.0	5.2	0.7	1.8	2.6
Install Pipeline (Phase 1a) + Construction/Finishing/Painting (Phase 1b)	4.0	27.9	38.0	0.1	1.0	1.1	2.1	0.3	1.0	1.3
Install Appurtenances (Phase 1a) + Construction/Finishing/Painting (Phase 1b)	4.5	30.7	41.2	0.1	1.0	1.2	2.2	0.3	1.1	1.4
Pavement Repairs/Misc. (Phase 1a) + Construction/Finishing/Painting (Phase 1b)	5.3	36.4	49.6	0.1	1.2	1.4	2.7	0.3	1.3	1.6
Project Daily Maximum Emissions	**6.9**	**76.7**	**71.8**	**0.2**	**3.6**	**2.0**	**5.2**	**1.0**	**1.8**	**2.6**

Localized Maximum	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
Source					lb/day					
3.2 Grading/Excavation (1B) - 2026	4.1	33.4	39.0	0.1	0.7	1.4	2.0	0.1	1.3	1.4
3.3 Potholding (1A) - 2026	1.9	12.5	17.3	0.1	0.0	0.5	0.5	0.0	0.4	0.4
3.4 Stormwater Drainage and Foundation (1B) - 2026	0.9	8.9	10.4	0.0	0.0	0.3	0.3	0.0	0.3	0.3
3.5 Construction (1B) - 2026	1.1	9.2	7.5	0.0	0.0	0.4	0.4	0.0	0.4	0.4
3.5 Construction (1B) - 2027	1.1	9.2	7.5	0.0	0.0	0.4	0.4	0.0	0.4	0.4
3.6 Finishing (1B) - 2026	0.7	5.7	10.9	0.0	0.0	0.3	0.3	0.0	0.3	0.3
3.6 Finishing (1B) - 2027	0.7	5.7	10.9	0.0	0.0	0.3	0.3	0.0	0.3	0.3
3.7 Painting (1B) - 2026	0.7	2.9	4.6	0.0	0.0	0.1	0.1	0.0	0.1	0.1
3.7 Painting (1B) - 2027	0.7	2.9	4.6	0.0	0.0	0.1	0.1	0.0	0.1	0.1
3.8 Installing Pipeline (1A) - 2026	1.2	8.4	10.8	0.0	0.0	0.3	0.3	0.0	0.3	0.3
3.9 Installing Appurtenances (1A) - 2026	1.7	11.3	14.0	0.0	0.0	0.4	0.4	0.0	0.4	0.4
3.10 Pavement Repairs (1A) - 2027	2.5	15.6	21.3	0.1	0.0	0.6	0.6	0.0	0.6	0.6
Overlapping Phases										
	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
Potholing (Phase 1a) + Grading/Excavation (Phase 1b)	6.0	45.9	56.3	0.2	0.7	1.9	2.5	0.1	1.7	1.8
Install Pipeline (Phase 1a) + Construction/Finishing/Painting (Phase 1b)	3.7	26.2	33.9	0.1	0.0	1.1	1.1	0.0	1.0	1.0
Install Appurtenances (Phase 1a) + Construction/Finishing/Painting (Phase 1b)	4.2	29.0	37.1	0.1	0.0	1.2	1.2	0.0	1.1	1.1
Pavement Repairs/Misc. (Phase 1a) + Construction/Finishing/Painting (Phase 1b)	5.0	33.3	44.4	0.1	0.0	1.4	1.4	0.0	1.3	1.3
Project Daily Maximum Emissions	**6.0**	**45.9**	**56.3**	**0.2**	**0.7**	**1.9**	**2.5**	**0.1**	**1.7**	**1.8**
Threshold		**2160.0**	**1577.0**				**13.0**			**8.0**
Significant Impact?		**No**	**No**				**No**			**No**

Pettit Water Storage Tank Expansion and Transmission Project - Phase 1

Air Quality Construction Analysis

Summer	Onsite Emissions										Offsite Emissions									
	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
Source						lb/day										lb/day				
3.2 Grading/Excavation (1B) - 2026	4.11	33.42	39.04	0.10	0.66	1.39	2.05	0.07	1.29	1.36	0.85	30.74	14.74	0.09	2.36	0.13	2.49	0.63	0.12	0.75
3.3 Potholding (1A) - 2026	1.86	12.49	17.28	0.05	0.00	0.48	0.48	0.00	0.44	0.44	0.06	0.05	0.74	0.00	0.21	0.00	0.21	0.05	0.00	0.05
3.4 Stormwater Drainage and Foundation (1B) - 2026	0.93	8.85	10.39	0.02	0.00	0.34	0.34	0.00	0.32	0.32	1.30	48.31	22.75	0.14	3.59	0.20	3.79	0.95	0.19	1.15
3.5 Construction (1B) - 2026	1.07	9.21	7.54	0.02	0.00	0.38	0.38	0.00	0.36	0.36	0.13	1.53	1.89	0.01	0.42	0.01	0.43	0.11	0.01	0.12
3.5 Construction (1B) - 2027	1.07	9.21	7.54	0.02	0.00	0.38	0.38	0.00	0.36	0.36	0.12	1.47	1.82	0.01	0.42	0.01	0.43	0.11	0.01	0.12
3.6 Finishing (1B) - 2026	0.69	5.70	10.88	0.02	0.00	0.27	0.27	0.00	0.25	0.25	0.06	0.05	0.74	0.00	0.21	0.00	0.21	0.05	0.00	0.05
3.6 Finishing (1B) - 2027	0.69	5.70	10.88	0.02	0.00	0.27	0.27	0.00	0.25	0.25	0.05	0.05	0.69	0.00	0.21	0.00	0.21	0.05	0.00	0.05
3.7 Painting (1B) - 2026	0.75	2.87	4.64	0.01	0.00	0.12	0.12	0.00	0.12	0.12	0.06	0.05	0.74	0.00	0.21	0.00	0.21	0.05	0.00	0.05
3.7 Painting (1B) - 2027	0.75	2.87	4.64	0.01	0.00	0.12	0.12	0.00	0.12	0.12	0.05	0.05	0.69	0.00	0.21	0.00	0.21	0.05	0.00	0.05
3.8 Installing Pipeline (1A) - 2026	1.22	8.40	10.83	0.03	0.00	0.31	0.31	0.00	0.29	0.29	0.06	0.05	0.74	0.00	0.21	0.00	0.21	0.05	0.00	0.05
3.9 Installing Appurtenances (1A) - 2026	1.70	11.27	14.02	0.05	0.00	0.42	0.42	0.00	0.38	0.38	0.06	0.05	0.74	0.00	0.21	0.00	0.21	0.05	0.00	0.05
3.10 Pavement Repairs (1A) - 2027	2.47	15.56	21.30	0.06	0.00	0.62	0.62	0.00	0.57	0.57	0.12	1.47	1.82	0.01	0.42	0.01	0.43	0.11	0.01	0.12

Regional Emissions	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
3.2 Grading/Excavation (1B) - 2026	4.96	64.16	53.78	0.19	3.02	1.52	4.54	0.70	1.41	2.11
3.3 Potholding (1A) - 2026	1.92	12.54	18.01	0.05	0.21	0.48	0.68	0.05	0.44	0.49
3.4 Stormwater Drainage and Foundation (1B) - 2026	2.24	57.17	33.15	0.16	3.59	0.54	4.14	0.95	0.52	1.47
3.5 Construction (1B) - 2026	1.20	10.74	9.43	0.03	0.42	0.39	0.81	0.11	0.37	0.47
3.5 Construction (1B) - 2027	1.19	10.68	9.36	0.03	0.42	0.39	0.81	0.11	0.37	0.47
3.6 Finishing (1B) - 2026	0.75	5.75	11.62	0.02	0.21	0.27	0.48	0.05	0.25	0.30
3.6 Finishing (1B) - 2027	0.75	5.74	11.58	0.02	0.21	0.27	0.48	0.05	0.25	0.30
3.7 Painting (1B) - 2026	0.80	2.92	5.37	0.01	0.21	0.12	0.33	0.05	0.12	0.17
3.7 Painting (1B) - 2027	0.80	2.92	5.33	0.01	0.21	0.12	0.33	0.05	0.12	0.17
3.8 Installing Pipeline (1A) - 2026	1.28	8.46	11.57	0.03	0.21	0.31	0.52	0.05	0.29	0.34
3.9 Installing Appurtenances (1A) - 2026	1.75	11.32	14.75	0.05	0.21	0.42	0.62	0.05	0.38	0.43
3.10 Pavement Repairs (1A) - 2027	2.59	17.03	23.13	0.07	0.42	0.63	1.05	0.11	0.58	0.69

Note: Offsite emissions pasted over from EMFAC2021 analysis

Overlapping Phases										
	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
Potholing (Phase 1a) + Grading/Excavation (Phase 1b)	6.88	76.71	71.79	0.24	3.22	2.00	5.22	0.75	1.85	2.60
Install Pipeline (Phase 1a) + Construction/Finishing/Painting (Phase 1b)	4.03	27.86	37.99	0.09	1.03	1.10	2.13	0.26	1.03	1.29
Install Appurtenances (Phase 1a) + Construction/Finishing/Painting (Phase 1b)	4.51	30.73	41.18	0.10	1.03	1.20	2.24	0.26	1.12	1.38
Pavement Repairs/Misc. (Phase 1a) + Construction/Finishing/Painting (Phase 1b)	5.34	36.44	49.55	0.12	1.24	1.42	2.66	0.32	1.32	1.64
Project Daily Maximum Emissions	**6.88**	**76.71**	**71.79**	**0.24**	**3.59**	**2.00**	**5.22**	**0.95**	**1.85**	**2.60**

Pettit Water Storage Tank Expansion and Transmission Project - Phase 1
Air Quality Construction Analysis

Winter

Source	Onsite Emissions ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10 (lb/day)	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
3.2 Grading/Excavation (1B) - 2026	4.11	33.42	39.04	0.10	0.66	1.39	2.05	0.07	1.29	1.36
3.3 Potholding (1A) - 2026	1.86	12.49	17.28	0.05	0.00	0.48	0.48	0.00	0.44	0.44
3.4 Stormwater Drainage and Foundation (1B) - 2026	0.93	8.85	10.39	0.02	0.00	0.34	0.34	0.00	0.32	0.32
3.5 Construction (1B) - 2026	1.07	9.21	7.54	0.02	0.00	0.38	0.38	0.00	0.36	0.36
3.5 Construction (1B) - 2027	1.07	9.21	7.54	0.02	0.00	0.38	0.38	0.00	0.36	0.36
3.6 Finishing (1B) - 2026	0.69	5.70	10.88	0.02	0.00	0.27	0.27	0.00	0.25	0.25
3.6 Finishing (1B) - 2027	0.69	5.70	10.88	0.02	0.00	0.27	0.27	0.00	0.25	0.25
3.7 Painting (1B) - 2026	0.75	2.87	4.64	0.01	0.00	0.12	0.12	0.00	0.12	0.12
3.7 Painting (1B) - 2027	0.75	2.87	4.64	0.01	0.00	0.12	0.12	0.00	0.12	0.12
3.8 Installing Pipeline (1A) - 2026	1.22	8.40	10.83	0.03	0.00	0.31	0.31	0.00	0.29	0.29
3.9 Installing Appurtenances (1A) - 2026	1.70	11.27	14.02	0.05	0.00	0.42	0.42	0.00	0.38	0.38
3.10 Pavement Repairs (1A) - 2027	2.47	15.56	21.30	0.06	0.00	0.62	0.62	0.00	0.57	0.57

Source	Offsite Emissions ROG	NOX	CO	SO2	Fugitive PM10 (lb/day)	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
3.2 Grading/Excavation (1B) - 2026	0.85	30.74	14.74	0.09	2.36	0.13	2.49	0.63	0.12	0.75
3.3 Potholding (1A) - 2026	0.06	0.05	0.74	0.00	0.21	0.00	0.21	0.05	0.00	0.05
3.4 Stormwater Drainage and Foundation (1B) - 2026	1.30	48.31	22.75	0.14	3.59	0.20	3.79	0.95	0.19	1.15
3.5 Construction (1B) - 2026	0.13	1.53	1.89	0.01	0.42	0.01	0.43	0.11	0.01	0.12
3.5 Construction (1B) - 2027	0.12	1.47	1.82	0.01	0.42	0.01	0.43	0.11	0.01	0.12
3.6 Finishing (1B) - 2026	0.06	0.05	0.74	0.00	0.21	0.00	0.21	0.05	0.00	0.05
3.6 Finishing (1B) - 2027	0.05	0.05	0.69	0.00	0.21	0.00	0.21	0.05	0.00	0.05
3.7 Painting (1B) - 2026	0.06	0.05	0.74	0.00	0.21	0.00	0.21	0.05	0.00	0.05
3.7 Painting (1B) - 2027	0.05	0.05	0.69	0.00	0.21	0.00	0.21	0.05	0.00	0.05
3.8 Installing Pipeline (1A) - 2026	0.06	0.05	0.74	0.00	0.21	0.00	0.21	0.05	0.00	0.05
3.9 Installing Appurtenances (1A) - 2026	0.06	0.05	0.74	0.00	0.21	0.00	0.21	0.05	0.00	0.05
3.10 Pavement Repairs (1A) - 2027	0.12	1.47	1.82	0.01	0.42	0.01	0.43	0.11	0.01	0.12

Note: Offsite emissions pasted over from EMFAC2021 analysis

Regional Emissions	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
3.2 Grading/Excavation (1B) - 2026	4.96	64.16	53.78	0.19	3.02	1.52	4.54	0.70	1.41	2.11
3.3 Potholding (1A) - 2026	1.92	12.54	18.01	0.05	0.21	0.48	0.68	0.05	0.44	0.49
3.4 Stormwater Drainage and Foundation (1B) - 2026	2.24	57.17	33.15	0.16	3.59	0.54	4.14	0.95	0.52	1.47
3.5 Construction (1B) - 2026	1.20	10.74	9.43	0.03	0.42	0.39	0.81	0.11	0.37	0.47
3.5 Construction (1B) - 2027	1.19	10.68	9.36	0.03	0.42	0.39	0.81	0.11	0.37	0.47
3.6 Finishing (1B) - 2026	0.75	5.75	11.62	0.02	0.21	0.27	0.48	0.05	0.25	0.30
3.6 Finishing (1B) - 2027	0.75	5.74	11.58	0.02	0.21	0.27	0.48	0.05	0.25	0.30
3.7 Painting (1B) - 2026	0.80	2.92	5.37	0.01	0.21	0.12	0.33	0.05	0.12	0.17
3.7 Painting (1B) - 2027	0.80	2.92	5.33	0.01	0.21	0.12	0.33	0.05	0.12	0.17
3.8 Installing Pipeline (1A) - 2026	1.28	8.46	11.57	0.03	0.21	0.31	0.52	0.05	0.29	0.34
3.9 Installing Appurtenances (1A) - 2026	1.75	11.32	14.75	0.05	0.21	0.42	0.62	0.05	0.38	0.43
3.10 Pavement Repairs (1A) - 2027	2.59	17.03	23.13	0.07	0.42	0.63	1.05	0.11	0.58	0.69

Overlapping Phases

	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
Potholing (Phase 1a) + Grading/Excavation (Phase 1b)	6.88	76.71	71.79	0.24	3.22	2.00	5.22	0.75	1.85	2.60
Install Pipeline (Phase 1a) + Construction/Finishing/Painting (Phase 1b)	4.03	27.86	37.99	0.09	1.03	1.10	2.13	0.26	1.03	1.29
Install Appurtenances (Phase 1a) + Construction/Finishing/Painting (Phase 1b)	4.51	30.73	41.18	0.10	1.03	1.20	2.24	0.26	1.12	1.38
Pavement Repairs/Misc. (Phase 1a) + Construction/Finishing/Painting (Phase 1b)	5.34	36.44	49.55	0.12	1.24	1.42	2.66	0.32	1.32	1.64
Project Daily Maximum Emissions	**6.88**	**76.71**	**71.79**	**0.24**	**3.59**	**2.00**	**5.22**	**0.95**	**1.85**	**2.60**

Pettit Water Storage Tank Expansion and Transmission Project - Phase 1 - South Coast Air Basin, Annual

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Pettit Water Storage Tank Expansion and Transmission Project - Phase 1

South Coast Air Basin, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Other Asphalt Surfaces	136.13	1000sqft	3.12	136,125.00	0
Other Non-Asphalt Surfaces	85.38	1000sqft	1.96	85,378.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	31
Climate Zone	10			**Operational Year**	2027
Utility Company	Southern California Edison				
CO2 Intensity (lb/MWhr)	280.11	**CH4 Intensity (lb/MWhr)**	0.033	**N2O Intensity (lb/MWhr)**	0.004

1.3 User Entered Comments & Non-Default Data

Project Characteristics - MVU is connected to the power grid through SCE.

Land Use - Project Assumptions - Phase 1 Land Use Types

Construction Phase - Project Assumptions - Phase 1 Construction Phase

Off-road Equipment - Project Assumptions - Phase 1 Construction

Off-road Equipment - Project Assumptinos - Paving Phase 1

Off-road Equipment -

Off-road Equipment - drill rig = Hydraulic hammer, Other Construction Equipment = Jackhammer, Compactor = Paving equipment

Off-road Equipment - Project Assumptions - Phase 1

Off-road Equipment - Project Assumptions - Phase 1

Off-road Equipment - Project Assumptions - Phase 1 Architectural Coating

Off-road Equipment - Project Assumption - Phase 1 (Compactor = Paving Equipment)

Off-road Equipment - Project Assumptions - Phase 1

Off-road Equipment - Compactor = Paving Equipment

Trips and VMT - Project Assumptions - Phase 1

Grading - Project Assumptions - Phase 1 Grading. 75% of total grading

Construction Off-road Equipment Mitigation -

Mobile Land Use Mitigation -

Table Name	Column Name	Default Value	New Value
tblConstructionPhase	NumDays	20.00	155.00
tblConstructionPhase	NumDays	230.00	53.00
tblConstructionPhase	NumDays	230.00	155.00
tblConstructionPhase	NumDays	230.00	27.00
tblConstructionPhase	NumDays	20.00	52.00
tblConstructionPhase	NumDays	20.00	155.00
tblConstructionPhase	NumDays	20.00	26.00
tblConstructionPhase	NumDaysWeek	5.00	6.00
tblConstructionPhase	NumDaysWeek	5.00	6.00
tblConstructionPhase	NumDaysWeek	5.00	6.00
tblConstructionPhase	NumDaysWeek	5.00	6.00
tblConstructionPhase	NumDaysWeek	5.00	6.00
tblConstructionPhase	NumDaysWeek	5.00	6.00
tblConstructionPhase	NumDaysWeek	5.00	6.00
tblConstructionPhase	NumDaysWeek	5.00	6.00
tblConstructionPhase	NumDaysWeek	5.00	6.00
tblGrading	MaterialExported	0.00	42,402.00

Pettit Water Storage Tank Expansion and Transmission Project - Phase 1 - South Coast Air Basin, Annual

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

tblLandUse	LandUseSquareFeet	136,130.00	136,125.00
tblLandUse	LandUseSquareFeet	85,380.00	85,378.00
tblLandUse	LotAcreage	3.13	3.12
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	2.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	2.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	2.00
tblOffRoadEquipment	UsageHours	6.00	8.00
tblOffRoadEquipment	UsageHours	7.00	8.00
tblOffRoadEquipment	UsageHours	7.00	8.00
tblOffRoadEquipment	UsageHours	7.00	8.00
tblProjectCharacteristics	CO2IntensityFactor	390.98	280.11
tblTripsAndVMT	HaulingTripNumber	5,300.00	6,058.00
tblTripsAndVMT	HaulingTripNumber	0.00	9,712.00
tblTripsAndVMT	VendorTripNumber	36.00	0.00
tblTripsAndVMT	VendorTripNumber	36.00	0.00
tblTripsAndVMT	VendorTripNumber	0.00	36.00
tblTripsAndVMT	WorkerTripNumber	33.00	20.00
tblTripsAndVMT	WorkerTripNumber	15.00	20.00
tblTripsAndVMT	WorkerTripNumber	93.00	20.00
tblTripsAndVMT	WorkerTripNumber	93.00	20.00
tblTripsAndVMT	WorkerTripNumber	10.00	20.00
tblTripsAndVMT	WorkerTripNumber	19.00	20.00
tblTripsAndVMT	WorkerTripNumber	10.00	20.00
tblTripsAndVMT	WorkerTripNumber	93.00	20.00

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2026	0.3735	3.6595	3.6463	0.0127	0.2489	0.1134	0.3623	0.0608	0.1057	0.1666	0.0000	1,169.7018	1,169.7018	0.2246	0.0744	1,197.4785
2027	0.1005	0.7010	0.9166	2.1900e-003	0.0279	0.0278	0.0558	7.6200e-003	0.0260	0.0336	0.0000	194.7775	194.7775	0.0466	3.6200e-003	197.0225
Maximum	**0.3735**	**3.6595**	**3.6463**	**0.0127**	**0.2489**	**0.1134**	**0.3623**	**0.0608**	**0.1057**	**0.1666**	**0.0000**	**1,169.7018**	**1,169.7018**	**0.2246**	**0.0744**	**1,197.4785**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2026	0.3735	3.6595	3.6463	0.0127	0.2222	0.1134	0.3356	0.0579	0.1057	0.1636	0.0000	1,169.7010	1,169.7010	0.2246	0.0744	1,197.4777
2027	0.1005	0.7010	0.9166	2.1900e-003	0.0279	0.0278	0.0558	7.6200e-003	0.0260	0.0336	0.0000	194.7773	194.7773	0.0466	3.6200e-003	197.0223

Pettit Water Storage Tank Expansion and Transmission Project - Phase 1 - South Coast Air Basin, Annual

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Maximum	0.3735	3.6595	3.6463	0.0127	0.2222	0.1134	0.3356	0.0579	0.1057	0.1636	0.0000	1,169.7010	1,169.7010	0.2246	0.0744	1,197.4777

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	0.00	0.00	0.00	0.00	9.64	0.00	6.38	4.31	0.00	1.47	0.00	0.00	0.00	0.00	0.00	0.00

Quarter	Start Date	End Date	Maximum Unmitigated ROG + NOX (tons/quarter)	Maximum Mitigated ROG + NOX (tons/quarter)
1	5-1-2026	7-31-2026	1.9830	1.9830
2	8-1-2026	10-31-2026	1.1337	1.1337
3	11-1-2026	1-31-2027	1.4228	1.4228
4	2-1-2027	4-30-2027	0.2615	0.2615
		Highest	1.9830	1.9830

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Grading/Excavation (1B)	Grading	5/1/2026	6/30/2026	6	52	
2	Potholding (1A)	Trenching	5/1/2026	5/31/2026	6	26	
3	Stormwater Drainage and Foundation (1B)	Building Construction	7/1/2026	8/31/2026	6	53	
4	Construction (1B)	Building Construction	9/1/2026	2/28/2027	6	155	
5	Finishing (1B)	Paving	9/1/2026	2/28/2027	6	155	
6	Painting (1B)	Architectural Coating	9/1/2026	2/27/2027	6	155	
7	Installing Pipeline (1A)	Trenching	10/1/2026	11/30/2026	6	52	
8	Installing Appurtenances (1A)	Building Construction	12/1/2026	12/31/2026	6	27	
9	Pavement Repairs (1A)	Paving	1/1/2027	1/31/2027	6	26	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 78

Acres of Paving: 5.08

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 13,290 (Architectural Coating

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Potholding (1A)	Excavators	1	8.00	158	0.38
Potholding (1A)	Off-Highway Trucks	3	8.00	402	0.38
Potholding (1A)	Tractors/Loaders/Backhoes	2	8.00	97	0.37
Grading/Excavation (1B)	Bore/Drill Rigs	1	8.00	221	0.50
Grading/Excavation (1B)	Concrete/Industrial Saws	1	8.00	81	0.73
Grading/Excavation (1B)	Excavators	1	8.00	158	0.38
Grading/Excavation (1B)	Graders	1	8.00	187	0.41
Grading/Excavation (1B)	Off-Highway Trucks	3	8.00	402	0.38
Grading/Excavation (1B)	Other Construction Equipment	1	8.00	172	0.42
Grading/Excavation (1B)	Paving Equipment	1	8.00	132	0.36
Grading/Excavation (1B)	Scrapers	1	8.00	367	0.48
Grading/Excavation (1B)	Tractors/Loaders/Backhoes	2	8.00	97	0.37
Grading/Excavation (1B)	Trenchers	1	8.00	78	0.50
Stormwater Drainage and Foundation (1B)	Cement and Mortar Mixers	1	8.00	9	0.56
Stormwater Drainage and Foundation (1B)	Graders	1	8.00	187	0.41
Stormwater Drainage and Foundation (1B)	Paving Equipment	1	8.00	132	0.36
Stormwater Drainage and Foundation (1B)	Pumps	1	8.00	84	0.74
Stormwater Drainage and Foundation (1B)	Tractors/Loaders/Backhoes	1	8.00	97	0.37

Construction (1B)	Air Compressors	1	8.00	78	0.48
Construction (1B)	Cranes	2	8.00	231	0.29
Construction (1B)	Welders	1	8.00	46	0.45
Finishing (1B)	Pavers	2	8.00	130	0.42
Finishing (1B)	Paving Equipment	2	8.00	132	0.36
Installing Pipeline (1A)	Off-Highway Trucks	2	8.00	402	0.38
Installing Pipeline (1A)	Tractors/Loaders/Backhoes	2	8.00	97	0.37
Installing Appurtenances (1A)	Off-Highway Trucks	3	8.00	402	0.38
Installing Appurtenances (1A)	Tractors/Loaders/Backhoes	2	8.00	97	0.37
Pavement Repairs (1A)	Off-Highway Trucks	3	8.00	402	0.38
Pavement Repairs (1A)	Pavers	1	8.00	130	0.42
Pavement Repairs (1A)	Paving Equipment	1	8.00	132	0.36
Pavement Repairs (1A)	Rollers	1	8.00	80	0.38
Pavement Repairs (1A)	Tractors/Loaders/Backhoes	2	8.00	97	0.37
Painting (1B)	Aerial Lifts	1	8.00	63	0.31
Painting (1B)	Air Compressors	1	8.00	78	0.48
Painting (1B)	Forklifts	1	8.00	89	0.20

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Potholding (1A)	6	20.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Grading/Excavation (1B)	13	20.00	0.00	6,058.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Stormwater Drainage and Foundation (1B)	5	20.00	0.00	9,712.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Construction (1B)	4	20.00	36.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Finishing (1B)	4	20.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Installing Pipeline (1A)	4	20.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Installing Appurtenances (1A)	5	20.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Pavement Repairs (1A)	8	20.00	36.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Painting (1B)	3	20.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Water Exposed Area

3.2 Grading/Excavation (1B) - 2026

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0438	0.0000	0.0438	4.8300e-003	0.0000	4.8300e-003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.1069	0.8690	1.0151	2.6600e-003		0.0362	0.0362		0.0335	0.0335	0.0000	233.0863	233.0863	0.0715	0.0000	234.8733
Total	**0.1069**	**0.8690**	**1.0151**	**2.6600e-003**	**0.0438**	**0.0362**	**0.0800**	**4.8300e-003**	**0.0335**	**0.0383**	**0.0000**	**233.0863**	**233.0863**	**0.0715**	**0.0000**	**234.8733**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e

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EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Category	tons/yr										MT/yr					
Hauling	6.0400e-003	0.3876	0.1088	1.6500e-003	0.0521	2.6300e-003	0.0547	0.0143	2.5100e-003	0.0168	0.0000	165.8673	165.8673	0.0108	0.0264	174.0083
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.3400e-003	9.1000e-004	0.0139	4.0000e-005	5.7100e-003	3.0000e-005	5.7300e-003	1.5200e-003	3.0000e-005	1.5400e-003	0.0000	4.2170	4.2170	9.0000e-005	9.0000e-005	4.2472
Total	**7.3800e-003**	**0.3885**	**0.1228**	**1.6900e-003**	**0.0578**	**2.6600e-003**	**0.0605**	**0.0158**	**2.5400e-003**	**0.0184**	**0.0000**	**170.0843**	**170.0843**	**0.0109**	**0.0265**	**178.2555**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0171	0.0000	0.0171	1.8800e-003	0.0000	1.8800e-003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.1069	0.8690	1.0151	2.6600e-003		0.0362	0.0362		0.0335	0.0335	0.0000	233.0861	233.0861	0.0715	0.0000	234.8730
Total	**0.1069**	**0.8690**	**1.0151**	**2.6600e-003**	**0.0171**	**0.0362**	**0.0533**	**1.8800e-003**	**0.0335**	**0.0354**	**0.0000**	**233.0861**	**233.0861**	**0.0715**	**0.0000**	**234.8730**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	6.0400e-003	0.3876	0.1088	1.6500e-003	0.0521	2.6300e-003	0.0547	0.0143	2.5100e-003	0.0168	0.0000	165.8673	165.8673	0.0108	0.0264	174.0083
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.3400e-003	9.1000e-004	0.0139	4.0000e-005	5.7100e-003	3.0000e-005	5.7300e-003	1.5200e-003	3.0000e-005	1.5400e-003	0.0000	4.2170	4.2170	9.0000e-005	9.0000e-005	4.2472
Total	**7.3800e-003**	**0.3885**	**0.1228**	**1.6900e-003**	**0.0578**	**2.6600e-003**	**0.0605**	**0.0158**	**2.5400e-003**	**0.0184**	**0.0000**	**170.0843**	**170.0843**	**0.0109**	**0.0265**	**178.2555**

3.3 Potholding (1A) - 2026

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0242	0.1624	0.2246	6.6000e-004		6.1800e-003	6.1800e-003		5.6900e-003	5.6900e-003	0.0000	58.3004	58.3004	0.0189	0.0000	58.7718
Total	**0.0242**	**0.1624**	**0.2246**	**6.6000e-004**		**6.1800e-003**	**6.1800e-003**		**5.6900e-003**	**5.6900e-003**	**0.0000**	**58.3004**	**58.3004**	**0.0189**	**0.0000**	**58.7718**

Unmitigated Construction Off-Site

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	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	6.7000e-004	4.5000e-004	6.9700e-003	2.0000e-005	2.8500e-003	1.0000e-005	2.8700e-003	7.6000e-004	1.0000e-005	7.7000e-004	0.0000	2.1085	2.1085	4.0000e-005	5.0000e-005	2.1236
Total	**6.7000e-004**	**4.5000e-004**	**6.9700e-003**	**2.0000e-005**	**2.8500e-003**	**1.0000e-005**	**2.8700e-003**	**7.6000e-004**	**1.0000e-005**	**7.7000e-004**	**0.0000**	**2.1085**	**2.1085**	**4.0000e-005**	**5.0000e-005**	**2.1236**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0242	0.1624	0.2246	6.6000e-004		6.1800e-003	6.1800e-003		5.6900e-003	5.6900e-003	0.0000	58.3003	58.3003	0.0189	0.0000	58.7717
Total	**0.0242**	**0.1624**	**0.2246**	**6.6000e-004**		**6.1800e-003**	**6.1800e-003**		**5.6900e-003**	**5.6900e-003**	**0.0000**	**58.3003**	**58.3003**	**0.0189**	**0.0000**	**58.7717**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	6.7000e-004	4.5000e-004	6.9700e-003	2.0000e-005	2.8500e-003	1.0000e-005	2.8700e-003	7.6000e-004	1.0000e-005	7.7000e-004	0.0000	2.1085	2.1085	4.0000e-005	5.0000e-005	2.1236
Total	**6.7000e-004**	**4.5000e-004**	**6.9700e-003**	**2.0000e-005**	**2.8500e-003**	**1.0000e-005**	**2.8700e-003**	**7.6000e-004**	**1.0000e-005**	**7.7000e-004**	**0.0000**	**2.1085**	**2.1085**	**4.0000e-005**	**5.0000e-005**	**2.1236**

3.4 Stormwater Drainage and Foundation (1B) - 2026

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0248	0.2346	0.2754	5.6000e-004		9.0900e-003	9.0900e-003		8.6100e-003	8.6100e-003	0.0000	48.3251	48.3251	0.0111	0.0000	48.6033
Total	**0.0248**	**0.2346**	**0.2754**	**5.6000e-004**		**9.0900e-003**	**9.0900e-003**		**8.6100e-003**	**8.6100e-003**	**0.0000**	**48.3251**	**48.3251**	**0.0111**	**0.0000**	**48.6033**

Unmitigated Construction Off-Site

Pettit Water Storage Tank Expansion and Transmission Project - Phase 1 - South Coast Air Basin, Annual

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	9.6800e-003	0.6214	0.1745	2.6400e-003	0.0835	4.2100e-003	0.0878	0.0229	4.0300e-003	0.0270	0.0000	265.9133	265.9133	0.0174	0.0423	278.9648
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.3600e-003	9.3000e-004	0.0142	5.0000e-005	5.8100e-003	3.0000e-005	5.8400e-003	1.5400e-003	3.0000e-005	1.5700e-003	0.0000	4.2981	4.2981	9.0000e-005	1.0000e-004	4.3289
Total	**0.0110**	**0.6223**	**0.1887**	**2.6900e-003**	**0.0894**	**4.2400e-003**	**0.0936**	**0.0245**	**4.0600e-003**	**0.0285**	**0.0000**	**270.2114**	**270.2114**	**0.0175**	**0.0424**	**283.2937**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0248	0.2346	0.2754	5.6000e-004		9.0900e-003	9.0900e-003		8.6100e-003	8.6100e-003	0.0000	48.3251	48.3251	0.0111	0.0000	48.6032
Total	**0.0248**	**0.2346**	**0.2754**	**5.6000e-004**		**9.0900e-003**	**9.0900e-003**		**8.6100e-003**	**8.6100e-003**	**0.0000**	**48.3251**	**48.3251**	**0.0111**	**0.0000**	**48.6032**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	9.6800e-003	0.6214	0.1745	2.6400e-003	0.0835	4.2100e-003	0.0878	0.0229	4.0300e-003	0.0270	0.0000	265.9133	265.9133	0.0174	0.0423	278.9648
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.3600e-003	9.3000e-004	0.0142	5.0000e-005	5.8100e-003	3.0000e-005	5.8400e-003	1.5400e-003	3.0000e-005	1.5700e-003	0.0000	4.2981	4.2981	9.0000e-005	1.0000e-004	4.3289
Total	**0.0110**	**0.6223**	**0.1887**	**2.6900e-003**	**0.0894**	**4.2400e-003**	**0.0936**	**0.0245**	**4.0600e-003**	**0.0285**	**0.0000**	**270.2114**	**270.2114**	**0.0175**	**0.0424**	**283.2937**

3.5 Construction (1B) - 2026

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0563	0.4833	0.3957	9.5000e-004		0.0199	0.0199		0.0188	0.0188	0.0000	80.9850	80.9850	0.0191	0.0000	81.4633
Total	**0.0563**	**0.4833**	**0.3957**	**9.5000e-004**		**0.0199**	**0.0199**		**0.0188**	**0.0188**	**0.0000**	**80.9850**	**80.9850**	**0.0191**	**0.0000**	**81.4633**

Unmitigated Construction Off-Site

Pettit Water Storage Tank Expansion and Transmission Project - Phase 1 - South Coast Air Basin, Annual

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	1.8500e-003	0.0721	0.0258	3.3000e-004	0.0119	3.9000e-004	0.0123	3.4400e-003	3.7000e-004	3.8100e-003	0.0000	32.0487	32.0487	1.2500e-003	4.6700e-003	33.4718
Worker	2.7000e-003	1.8300e-003	0.0281	9.0000e-005	0.0115	6.0000e-005	0.0116	3.0600e-003	5.0000e-005	3.1100e-003	0.0000	8.5152	8.5152	1.7000e-004	1.9000e-004	8.5761
Total	**4.5500e-003**	**0.0739**	**0.0539**	**4.2000e-004**	**0.0234**	**4.5000e-004**	**0.0239**	**6.5000e-003**	**4.2000e-004**	**6.9200e-003**	**0.0000**	**40.5638**	**40.5638**	**1.4200e-003**	**4.8600e-003**	**42.0480**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0563	0.4833	0.3957	9.5000e-004		0.0199	0.0199		0.0188	0.0188	0.0000	80.9849	80.9849	0.0191	0.0000	81.4632
Total	**0.0563**	**0.4833**	**0.3957**	**9.5000e-004**		**0.0199**	**0.0199**		**0.0188**	**0.0188**	**0.0000**	**80.9849**	**80.9849**	**0.0191**	**0.0000**	**81.4632**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	1.8500e-003	0.0721	0.0258	3.3000e-004	0.0119	3.9000e-004	0.0123	3.4400e-003	3.7000e-004	3.8100e-003	0.0000	32.0487	32.0487	1.2500e-003	4.6700e-003	33.4718
Worker	2.7000e-003	1.8300e-003	0.0281	9.0000e-005	0.0115	6.0000e-005	0.0116	3.0600e-003	5.0000e-005	3.1100e-003	0.0000	8.5152	8.5152	1.7000e-004	1.9000e-004	8.5761
Total	**4.5500e-003**	**0.0739**	**0.0539**	**4.2000e-004**	**0.0234**	**4.5000e-004**	**0.0239**	**6.5000e-003**	**4.2000e-004**	**6.9200e-003**	**0.0000**	**40.5638**	**40.5638**	**1.4200e-003**	**4.8600e-003**	**42.0480**

3.5 Construction (1B) - 2027

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0268	0.2301	0.1884	4.5000e-004		9.4700e-003	9.4700e-003		8.9300e-003	8.9300e-003	0.0000	38.5643	38.5643	9.1100e-003	0.0000	38.7920
Total	**0.0268**	**0.2301**	**0.1884**	**4.5000e-004**		**9.4700e-003**	**9.4700e-003**		**8.9300e-003**	**8.9300e-003**	**0.0000**	**38.5643**	**38.5643**	**9.1100e-003**	**0.0000**	**38.7920**

Unmitigated Construction Off-Site

Pettit Water Storage Tank Expansion and Transmission Project - Phase 1 - South Coast Air Basin, Annual

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	8.6000e-004	0.0341	0.0122	1.5000e-004	5.6700e-003	1.8000e-004	5.8600e-003	1.6400e-003	1.8000e-004	1.8100e-003	0.0000	14.9613	14.9613	5.9000e-004	2.1800e-003	15.6268
Worker	1.2100e-003	8.0000e-004	0.0127	4.0000e-005	5.4900e-003	3.0000e-005	5.5100e-003	1.4600e-003	2.0000e-005	1.4800e-003	0.0000	3.9714	3.9714	8.0000e-005	9.0000e-005	3.9989
Total	**2.0700e-003**	**0.0349**	**0.0249**	**1.9000e-004**	**0.0112**	**2.1000e-004**	**0.0114**	**3.1000e-003**	**2.0000e-004**	**3.2900e-003**	**0.0000**	**18.9327**	**18.9327**	**6.7000e-004**	**2.2700e-003**	**19.6257**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0268	0.2301	0.1884	4.5000e-004		9.4700e-003	9.4700e-003		8.9300e-003	8.9300e-003	0.0000	38.5643	38.5643	9.1100e-003	0.0000	38.7920
Total	**0.0268**	**0.2301**	**0.1884**	**4.5000e-004**		**9.4700e-003**	**9.4700e-003**		**8.9300e-003**	**8.9300e-003**	**0.0000**	**38.5643**	**38.5643**	**9.1100e-003**	**0.0000**	**38.7920**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	8.6000e-004	0.0341	0.0122	1.5000e-004	5.6700e-003	1.8000e-004	5.8600e-003	1.6400e-003	1.8000e-004	1.8100e-003	0.0000	14.9613	14.9613	5.9000e-004	2.1800e-003	15.6268
Worker	1.2100e-003	8.0000e-004	0.0127	4.0000e-005	5.4900e-003	3.0000e-005	5.5100e-003	1.4600e-003	2.0000e-005	1.4800e-003	0.0000	3.9714	3.9714	8.0000e-005	9.0000e-005	3.9989
Total	**2.0700e-003**	**0.0349**	**0.0249**	**1.9000e-004**	**0.0112**	**2.1000e-004**	**0.0114**	**3.1000e-003**	**2.0000e-004**	**3.2900e-003**	**0.0000**	**18.9327**	**18.9327**	**6.7000e-004**	**2.2700e-003**	**19.6257**

3.6 Finishing (1B) - 2026

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0337	0.2990	0.5714	9.2000e-004		0.0144	0.0144		0.0132	0.0132	0.0000	80.9006	80.9006	0.0262	0.0000	81.5547
Paving	2.7700e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0364**	**0.2990**	**0.5714**	**9.2000e-004**		**0.0144**	**0.0144**		**0.0132**	**0.0132**	**0.0000**	**80.9006**	**80.9006**	**0.0262**	**0.0000**	**81.5547**

Unmitigated Construction Off-Site

Pettit Water Storage Tank Expansion and Transmission Project - Phase 1 - South Coast Air Basin, Annual

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.7000e-003	1.8300e-003	0.0281	9.0000e-005	0.0115	6.0000e-005	0.0116	3.0600e-003	5.0000e-005	3.1100e-003	0.0000	8.5152	8.5152	1.7000e-004	1.9000e-004	8.5761
Total	**2.7000e-003**	**1.8300e-003**	**0.0281**	**9.0000e-005**	**0.0115**	**6.0000e-005**	**0.0116**	**3.0600e-003**	**5.0000e-005**	**3.1100e-003**	**0.0000**	**8.5152**	**8.5152**	**1.7000e-004**	**1.9000e-004**	**8.5761**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0337	0.2990	0.5714	9.2000e-004		0.0144	0.0144		0.0132	0.0132	0.0000	80.9005	80.9005	0.0262	0.0000	81.5546
Paving	2.7700e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0364**	**0.2990**	**0.5714**	**9.2000e-004**		**0.0144**	**0.0144**		**0.0132**	**0.0132**	**0.0000**	**80.9005**	**80.9005**	**0.0262**	**0.0000**	**81.5546**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.7000e-003	1.8300e-003	0.0281	9.0000e-005	0.0115	6.0000e-005	0.0116	3.0600e-003	5.0000e-005	3.1100e-003	0.0000	8.5152	8.5152	1.7000e-004	1.9000e-004	8.5761
Total	**2.7000e-003**	**1.8300e-003**	**0.0281**	**9.0000e-005**	**0.0115**	**6.0000e-005**	**0.0116**	**3.0600e-003**	**5.0000e-005**	**3.1100e-003**	**0.0000**	**8.5152**	**8.5152**	**1.7000e-004**	**1.9000e-004**	**8.5761**

3.6 Finishing (1B) - 2027

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0160	0.1424	0.2721	4.4000e-004		6.8300e-003	6.8300e-003		6.2900e-003	6.2900e-003	0.0000	38.5241	38.5241	0.0125	0.0000	38.8356
Paving	1.3200e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0174**	**0.1424**	**0.2721**	**4.4000e-004**		**6.8300e-003**	**6.8300e-003**		**6.2900e-003**	**6.2900e-003**	**0.0000**	**38.5241**	**38.5241**	**0.0125**	**0.0000**	**38.8356**

Pettit Water Storage Tank Expansion and Transmission Project - Phase 1 - South Coast Air Basin, Annual

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.2100e-003	8.0000e-004	0.0127	4.0000e-005	5.4900e-003	3.0000e-005	5.5100e-003	1.4600e-003	2.0000e-005	1.4800e-003	0.0000	3.9714	3.9714	8.0000e-005	9.0000e-005	3.9989
Total	**1.2100e-003**	**8.0000e-004**	**0.0127**	**4.0000e-005**	**5.4900e-003**	**3.0000e-005**	**5.5100e-003**	**1.4600e-003**	**2.0000e-005**	**1.4800e-003**	**0.0000**	**3.9714**	**3.9714**	**8.0000e-005**	**9.0000e-005**	**3.9989**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0160	0.1424	0.2721	4.4000e-004		6.8300e-003	6.8300e-003		6.2900e-003	6.2900e-003	0.0000	38.5240	38.5240	0.0125	0.0000	38.8355
Paving	1.3200e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0174**	**0.1424**	**0.2721**	**4.4000e-004**		**6.8300e-003**	**6.8300e-003**		**6.2900e-003**	**6.2900e-003**	**0.0000**	**38.5240**	**38.5240**	**0.0125**	**0.0000**	**38.8355**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.2100e-003	8.0000e-004	0.0127	4.0000e-005	5.4900e-003	3.0000e-005	5.5100e-003	1.4600e-003	2.0000e-005	1.4800e-003	0.0000	3.9714	3.9714	8.0000e-005	9.0000e-005	3.9989
Total	**1.2100e-003**	**8.0000e-004**	**0.0127**	**4.0000e-005**	**5.4900e-003**	**3.0000e-005**	**5.5100e-003**	**1.4600e-003**	**2.0000e-005**	**1.4800e-003**	**0.0000**	**3.9714**	**3.9714**	**8.0000e-005**	**9.0000e-005**	**3.9989**

3.7 Painting (1B) - 2026

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	0.0209					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0183	0.1505	0.2434	3.8000e-004		6.3700e-003	6.3700e-003		6.1500e-003	6.1500e-003	0.0000	32.6682	32.6682	5.7600e-003	0.0000	32.8122

Total	**0.0392**	**0.1505**	**0.2434**	**3.8000e-004**		**6.3700e-003**	**6.3700e-003**		**6.1500e-003**	**6.1500e-003**	**0.0000**	**32.6682**	**32.6682**	**5.7600e-003**	**0.0000**	**32.8122**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.7000e-003	1.8300e-003	0.0281	9.0000e-005	0.0115	6.0000e-005	0.0116	3.0600e-003	5.0000e-005	3.1100e-003	0.0000	8.5152	8.5152	1.7000e-004	1.9000e-004	8.5761
Total	**2.7000e-003**	**1.8300e-003**	**0.0281**	**9.0000e-005**	**0.0115**	**6.0000e-005**	**0.0116**	**3.0600e-003**	**5.0000e-005**	**3.1100e-003**	**0.0000**	**8.5152**	**8.5152**	**1.7000e-004**	**1.9000e-004**	**8.5761**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	0.0209					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0183	0.1505	0.2434	3.8000e-004		6.3700e-003	6.3700e-003		6.1500e-003	6.1500e-003	0.0000	32.6682	32.6682	5.7600e-003	0.0000	32.8122
Total	**0.0392**	**0.1505**	**0.2434**	**3.8000e-004**		**6.3700e-003**	**6.3700e-003**		**6.1500e-003**	**6.1500e-003**	**0.0000**	**32.6682**	**32.6682**	**5.7600e-003**	**0.0000**	**32.8122**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.7000e-003	1.8300e-003	0.0281	9.0000e-005	0.0115	6.0000e-005	0.0116	3.0600e-003	5.0000e-005	3.1100e-003	0.0000	8.5152	8.5152	1.7000e-004	1.9000e-004	8.5761
Total	**2.7000e-003**	**1.8300e-003**	**0.0281**	**9.0000e-005**	**0.0115**	**6.0000e-005**	**0.0116**	**3.0600e-003**	**5.0000e-005**	**3.1100e-003**	**0.0000**	**8.5152**	**8.5152**	**1.7000e-004**	**1.9000e-004**	**8.5761**

3.7 Painting (1B) - 2027

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					

Archit. Coating	9.9400e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	8.7200e-003	0.0717	0.1159	1.8000e-004		3.0300e-003	3.0300e-003		2.9300e-003	2.9300e-003	0.0000	15.5563	15.5563	2.7400e-003	0.0000	15.6249
Total	**0.0187**	**0.0717**	**0.1159**	**1.8000e-004**		**3.0300e-003**	**3.0300e-003**		**2.9300e-003**	**2.9300e-003**	**0.0000**	**15.5563**	**15.5563**	**2.7400e-003**	**0.0000**	**15.6249**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.2100e-003	8.0000e-004	0.0127	4.0000e-005	5.4900e-003	3.0000e-005	5.5100e-003	1.4600e-003	2.0000e-005	1.4800e-003	0.0000	3.9714	3.9714	8.0000e-005	9.0000e-005	3.9989
Total	**1.2100e-003**	**8.0000e-004**	**0.0127**	**4.0000e-005**	**5.4900e-003**	**3.0000e-005**	**5.5100e-003**	**1.4600e-003**	**2.0000e-005**	**1.4800e-003**	**0.0000**	**3.9714**	**3.9714**	**8.0000e-005**	**9.0000e-005**	**3.9989**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	9.9400e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	8.7200e-003	0.0717	0.1159	1.8000e-004		3.0300e-003	3.0300e-003		2.9300e-003	2.9300e-003	0.0000	15.5563	15.5563	2.7400e-003	0.0000	15.6248
Total	**0.0187**	**0.0717**	**0.1159**	**1.8000e-004**		**3.0300e-003**	**3.0300e-003**		**2.9300e-003**	**2.9300e-003**	**0.0000**	**15.5563**	**15.5563**	**2.7400e-003**	**0.0000**	**15.6248**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.2100e-003	8.0000e-004	0.0127	4.0000e-005	5.4900e-003	3.0000e-005	5.5100e-003	1.4600e-003	2.0000e-005	1.4800e-003	0.0000	3.9714	3.9714	8.0000e-005	9.0000e-005	3.9989
Total	**1.2100e-003**	**8.0000e-004**	**0.0127**	**4.0000e-005**	**5.4900e-003**	**3.0000e-005**	**5.5100e-003**	**1.4600e-003**	**2.0000e-005**	**1.4800e-003**	**0.0000**	**3.9714**	**3.9714**	**8.0000e-005**	**9.0000e-005**	**3.9989**

3.8 Installing Pipeline (1A) - 2026

Unmitigated Construction On-Site

Pettit Water Storage Tank Expansion and Transmission Project - Phase 1 - South Coast Air Basin, Annual

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0317	0.2185	0.2816	8.5000e-004		8.1400e-003	8.1400e-003		7.4900e-003	7.4900e-003	0.0000	74.6160	74.6160	0.0241	0.0000	75.2193
Total	**0.0317**	**0.2185**	**0.2816**	**8.5000e-004**		**8.1400e-003**	**8.1400e-003**		**7.4900e-003**	**7.4900e-003**	**0.0000**	**74.6160**	**74.6160**	**0.0241**	**0.0000**	**75.2193**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.3400e-003	9.1000e-004	0.0139	4.0000e-005	5.7100e-003	3.0000e-005	5.7300e-003	1.5200e-003	3.0000e-005	1.5400e-003	0.0000	4.2170	4.2170	9.0000e-005	9.0000e-005	4.2472
Total	**1.3400e-003**	**9.1000e-004**	**0.0139**	**4.0000e-005**	**5.7100e-003**	**3.0000e-005**	**5.7300e-003**	**1.5200e-003**	**3.0000e-005**	**1.5400e-003**	**0.0000**	**4.2170**	**4.2170**	**9.0000e-005**	**9.0000e-005**	**4.2472**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0317	0.2185	0.2816	8.5000e-004		8.1400e-003	8.1400e-003		7.4900e-003	7.4900e-003	0.0000	74.6159	74.6159	0.0241	0.0000	75.2192
Total	**0.0317**	**0.2185**	**0.2816**	**8.5000e-004**		**8.1400e-003**	**8.1400e-003**		**7.4900e-003**	**7.4900e-003**	**0.0000**	**74.6159**	**74.6159**	**0.0241**	**0.0000**	**75.2192**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.3400e-003	9.1000e-004	0.0139	4.0000e-005	5.7100e-003	3.0000e-005	5.7300e-003	1.5200e-003	3.0000e-005	1.5400e-003	0.0000	4.2170	4.2170	9.0000e-005	9.0000e-005	4.2472
Total	**1.3400e-003**	**9.1000e-004**	**0.0139**	**4.0000e-005**	**5.7100e-003**	**3.0000e-005**	**5.7300e-003**	**1.5200e-003**	**3.0000e-005**	**1.5400e-003**	**0.0000**	**4.2170**	**4.2170**	**9.0000e-005**	**9.0000e-005**	**4.2472**

3.9 Installing Appurtenances (1A) - 2026

Unmitigated Construction On-Site

Pettit Water Storage Tank Expansion and Transmission Project - Phase 1 - South Coast Air Basin, Annual

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0229	0.1521	0.1892	6.2000e-004		5.6100e-003	5.6100e-003		5.1600e-003	5.1600e-003	0.0000	54.4151	54.4151	0.0176	0.0000	54.8551
Total	**0.0229**	**0.1521**	**0.1892**	**6.2000e-004**		**5.6100e-003**	**5.6100e-003**		**5.1600e-003**	**5.1600e-003**	**0.0000**	**54.4151**	**54.4151**	**0.0176**	**0.0000**	**54.8551**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	6.9000e-004	4.7000e-004	7.2400e-003	2.0000e-005	2.9600e-003	1.0000e-005	2.9800e-003	7.9000e-004	1.0000e-005	8.0000e-004	0.0000	2.1896	2.1896	4.0000e-005	5.0000e-005	2.2053
Total	**6.9000e-004**	**4.7000e-004**	**7.2400e-003**	**2.0000e-005**	**2.9600e-003**	**1.0000e-005**	**2.9800e-003**	**7.9000e-004**	**1.0000e-005**	**8.0000e-004**	**0.0000**	**2.1896**	**2.1896**	**4.0000e-005**	**5.0000e-005**	**2.2053**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0229	0.1521	0.1892	6.2000e-004		5.6100e-003	5.6100e-003		5.1600e-003	5.1600e-003	0.0000	54.4150	54.4150	0.0176	0.0000	54.8550
Total	**0.0229**	**0.1521**	**0.1892**	**6.2000e-004**		**5.6100e-003**	**5.6100e-003**		**5.1600e-003**	**5.1600e-003**	**0.0000**	**54.4150**	**54.4150**	**0.0176**	**0.0000**	**54.8550**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	6.9000e-004	4.7000e-004	7.2400e-003	2.0000e-005	2.9600e-003	1.0000e-005	2.9800e-003	7.9000e-004	1.0000e-005	8.0000e-004	0.0000	2.1896	2.1896	4.0000e-005	5.0000e-005	2.2053
Total	**6.9000e-004**	**4.7000e-004**	**7.2400e-003**	**2.0000e-005**	**2.9600e-003**	**1.0000e-005**	**2.9800e-003**	**7.9000e-004**	**1.0000e-005**	**8.0000e-004**	**0.0000**	**2.1896**	**2.1896**	**4.0000e-005**	**5.0000e-005**	**2.2053**

3.10 Pavement Repairs (1A) - 2027

Unmitigated Construction On-Site

Pettit Water Storage Tank Expansion and Transmission Project - Phase 1 - South Coast Air Basin, Annual

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0280	0.2023	0.2770	7.4000e-004		8.1200e-003	8.1200e-003		7.4700e-003	7.4700e-003	0.0000	65.4122	65.4122	0.0212	0.0000	65.9411
Paving	4.0900e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0321**	**0.2023**	**0.2770**	**7.4000e-004**		**8.1200e-003**	**8.1200e-003**		**7.4700e-003**	**7.4700e-003**	**0.0000**	**65.4122**	**65.4122**	**0.0212**	**0.0000**	**65.9411**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	4.5000e-004	0.0177	6.3200e-003	8.0000e-005	2.9500e-003	1.0000e-004	3.0500e-003	8.5000e-004	9.0000e-005	9.4000e-004	0.0000	7.7799	7.7799	3.1000e-004	1.1400e-003	8.1259
Worker	6.3000e-004	4.2000e-004	6.6000e-003	2.0000e-005	2.8500e-003	1.0000e-005	2.8700e-003	7.6000e-004	1.0000e-005	7.7000e-004	0.0000	2.0651	2.0651	4.0000e-005	4.0000e-005	2.0794
Total	**1.0800e-003**	**0.0181**	**0.0129**	**1.0000e-004**	**5.8000e-003**	**1.1000e-004**	**5.9200e-003**	**1.6100e-003**	**1.0000e-004**	**1.7100e-003**	**0.0000**	**9.8450**	**9.8450**	**3.5000e-004**	**1.1800e-003**	**10.2054**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0280	0.2023	0.2770	7.4000e-004		8.1200e-003	8.1200e-003		7.4700e-003	7.4700e-003	0.0000	65.4122	65.4122	0.0212	0.0000	65.9410
Paving	4.0900e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0321**	**0.2023**	**0.2770**	**7.4000e-004**		**8.1200e-003**	**8.1200e-003**		**7.4700e-003**	**7.4700e-003**	**0.0000**	**65.4122**	**65.4122**	**0.0212**	**0.0000**	**65.9410**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	4.5000e-004	0.0177	6.3200e-003	8.0000e-005	2.9500e-003	1.0000e-004	3.0500e-003	8.5000e-004	9.0000e-005	9.4000e-004	0.0000	7.7799	7.7799	3.1000e-004	1.1400e-003	8.1259
Worker	6.3000e-004	4.2000e-004	6.6000e-003	2.0000e-005	2.8500e-003	1.0000e-005	2.8700e-003	7.6000e-004	1.0000e-005	7.7000e-004	0.0000	2.0651	2.0651	4.0000e-005	4.0000e-005	2.0794
Total	**1.0800e-003**	**0.0181**	**0.0129**	**1.0000e-004**	**5.8000e-003**	**1.1000e-004**	**5.9200e-003**	**1.6100e-003**	**1.0000e-004**	**1.7100e-003**	**0.0000**	**9.8450**	**9.8450**	**3.5000e-004**	**1.1800e-003**	**10.2054**

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EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Electricity Unmitigated						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			

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Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.0177	3.0000e-005	2.8200e-003	0.0000		1.0000e-005	1.0000e-005		1.0000e-005	1.0000e-005	0.0000	5.5000e-003	5.5000e-003	1.0000e-005	0.0000	5.8500e-003
Unmitigated	0.0177	3.0000e-005	2.8200e-003	0.0000		1.0000e-005	1.0000e-005		1.0000e-005	1.0000e-005	0.0000	5.5000e-003	5.5000e-003	1.0000e-005	0.0000	5.8500e-003

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	3.0800e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.0143					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	2.6000e-004	3.0000e-005	2.8200e-003	0.0000		1.0000e-005	1.0000e-005		1.0000e-005	1.0000e-005	0.0000	5.5000e-003	5.5000e-003	1.0000e-005	0.0000	5.8500e-003
Total	**0.0177**	**3.0000e-005**	**2.8200e-003**	**0.0000**		**1.0000e-005**	**1.0000e-005**		**1.0000e-005**	**1.0000e-005**	**0.0000**	**5.5000e-003**	**5.5000e-003**	**1.0000e-005**	**0.0000**	**5.8500e-003**

Mitigated

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EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	3.0800e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.0143					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	2.6000e-004	3.0000e-005	2.8200e-003	0.0000		1.0000e-005	1.0000e-005		1.0000e-005	1.0000e-005	0.0000	5.5000e-003	5.5000e-003	1.0000e-005	0.0000	5.8500e-003
Total	**0.0177**	**3.0000e-005**	**2.8200e-003**	**0.0000**		**1.0000e-005**	**1.0000e-005**		**1.0000e-005**	**1.0000e-005**	**0.0000**	**5.5000e-003**	**5.5000e-003**	**1.0000e-005**	**0.0000**	**5.8500e-003**

7.0 Water Detail

7.1 Mitigation Measures Water

	Total CO2	CH4	N2O	CO2e
Category	MT/yr			
Mitigated	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Other Asphalt Surfaces	0 / 0	0.0000	0.0000	0.0000	0.0000
Other Non-Asphalt Surfaces	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Other Asphalt Surfaces	0 / 0	0.0000	0.0000	0.0000	0.0000
Other Non-Asphalt Surfaces	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

Pettit Water Storage Tank Expansion and Transmission Project - Phase 1 - South Coast Air Basin, Annual

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

Pettit Water Storage Tank Expansion and Transmission Project - Phase 1 - South Coast Air Basin, Summer

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Pettit Water Storage Tank Expansion and Transmission Project - Phase 1

South Coast Air Basin, Summer

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Other Asphalt Surfaces	136.13	1000sqft	3.12	136,125.00	0
Other Non-Asphalt Surfaces	85.38	1000sqft	1.96	85,378.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	31
Climate Zone	10			**Operational Year**	2027
Utility Company	Southern California Edison				
CO2 Intensity (lb/MWhr)	280.11	**CH4 Intensity (lb/MWhr)**	0.033	**N2O Intensity (lb/MWhr)**	0.004

1.3 User Entered Comments & Non-Default Data

Project Characteristics - MVU is connected to the power grid through SCE.

Land Use - Project Assumptions - Phase 1 Land Use Types

Construction Phase - Project Assumptions - Phase 1 Construction Phase

Off-road Equipment - Project Assumptions - Phase 1 Construction

Off-road Equipment - Project Assumptinos - Paving Phase 1

Off-road Equipment -

Off-road Equipment - drill rig = Hydraulic hammer, Other Construction Equipment = Jackhammer, Compactor = Paving equipment

Off-road Equipment - Project Assumptions - Phase 1

Off-road Equipment - Project Assumptions - Phase 1

Off-road Equipment - Project Assumptions - Phase 1 Architectural Coating

Off-road Equipment - Project Assumption - Phase 1 (Compactor = Paving Equipment)

Off-road Equipment - Project Assumptions - Phase 1

Off-road Equipment - Compactor = Paving Equipment

Trips and VMT - Project Assumptions - Phase 1

Grading - Project Assumptions - Phase 1 Grading. 75% of total grading

Construction Off-road Equipment Mitigation -

Mobile Land Use Mitigation -

Table Name	Column Name	Default Value	New Value
tblConstructionPhase	NumDays	20.00	52.00
tblConstructionPhase	NumDays	230.00	53.00
tblConstructionPhase	NumDays	230.00	155.00
tblConstructionPhase	NumDays	20.00	155.00
tblConstructionPhase	NumDays	20.00	155.00
tblConstructionPhase	NumDays	230.00	27.00
tblConstructionPhase	NumDays	20.00	26.00
tblConstructionPhase	NumDaysWeek	5.00	6.00
tblConstructionPhase	NumDaysWeek	5.00	6.00
tblConstructionPhase	NumDaysWeek	5.00	6.00
tblConstructionPhase	NumDaysWeek	5.00	6.00
tblConstructionPhase	NumDaysWeek	5.00	6.00
tblConstructionPhase	NumDaysWeek	5.00	6.00
tblConstructionPhase	NumDaysWeek	5.00	6.00
tblConstructionPhase	NumDaysWeek	5.00	6.00
tblConstructionPhase	NumDaysWeek	5.00	6.00
tblGrading	MaterialExported	0.00	42,402.00

Pettit Water Storage Tank Expansion and Transmission Project - Phase 1 - South Coast Air Basin, Summer

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

tblLandUse	LandUseSquareFeet	136,130.00	136,125.00
tblLandUse	LandUseSquareFeet	85,380.00	85,378.00
tblLandUse	LotAcreage	3.13	3.12
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	2.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	2.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	2.00
tblOffRoadEquipment	UsageHours	6.00	8.00
tblOffRoadEquipment	UsageHours	7.00	8.00
tblOffRoadEquipment	UsageHours	7.00	8.00
tblOffRoadEquipment	UsageHours	7.00	8.00
tblProjectCharacteristics	CO2IntensityFactor	390.98	280.11
tblTripsAndVMT	HaulingTripNumber	5,300.00	6,058.00
tblTripsAndVMT	HaulingTripNumber	0.00	9,712.00
tblTripsAndVMT	VendorTripNumber	36.00	0.00
tblTripsAndVMT	VendorTripNumber	36.00	0.00
tblTripsAndVMT	VendorTripNumber	0.00	36.00
tblTripsAndVMT	WorkerTripNumber	15.00	20.00
tblTripsAndVMT	WorkerTripNumber	33.00	20.00
tblTripsAndVMT	WorkerTripNumber	93.00	20.00
tblTripsAndVMT	WorkerTripNumber	93.00	20.00
tblTripsAndVMT	WorkerTripNumber	10.00	20.00
tblTripsAndVMT	WorkerTripNumber	10.00	20.00
tblTripsAndVMT	WorkerTripNumber	93.00	20.00
tblTripsAndVMT	WorkerTripNumber	19.00	20.00

2.0 Emissions Summary

2.1 Overall Construction (Maximum Daily Emission)

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2026	6.3185	60.1198	61.6269	0.2203	4.1670	1.9714	6.1384	0.9374	1.8248	2.6874	0.0000	22,227.9623	22,227.9623	5.0963	1.7640	22,691.0790
2027	5.2498	36.0372	47.4898	0.1192	1.3551	1.4172	2.7723	0.3699	1.3186	1.6885	0.0000	11,681.1620	11,681.1620	2.9313	0.2063	11,815.9296
Maximum	**6.3185**	**60.1198**	**61.6269**	**0.2203**	**4.1670**	**1.9714**	**6.1384**	**0.9374**	**1.8248**	**2.6874**	**0.0000**	**22,227.9623**	**22,227.9623**	**5.0963**	**1.7640**	**22,691.0790**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2026	6.3185	60.1198	61.6269	0.2203	3.4275	1.9714	5.1118	0.9374	1.8248	2.5741	0.0000	22,227.9623	22,227.9623	5.0963	1.7640	22,691.0790
2027	5.2498	36.0372	47.4898	0.1192	1.3551	1.4172	2.7723	0.3699	1.3186	1.6885	0.0000	11,681.1620	11,681.1620	2.9313	0.2063	11,815.9296

Pettit Water Storage Tank Expansion and Transmission Project - Phase 1 - South Coast Air Basin, Summer

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Maximum	6.3185	60.1198	61.6269	0.2203	3.4275	1.9714	5.1118	0.9374	1.8248	2.5741	0.0000	22,227.9623	22,227.9623	5.0963	1.7640	22,691.0790

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	0.00	0.00	0.00	0.00	13.39	0.00	11.52	0.00	0.00	2.59	0.00	0.00	0.00	0.00	0.00	0.00

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Grading/Excavation (1B)	Grading	5/1/2026	6/30/2026	6	52	
2	Potholding (1A)	Trenching	5/1/2026	5/31/2026	6	26	
3	Stormwater Drainage and Foundation (1B)	Building Construction	7/1/2026	8/31/2026	6	53	
4	Construction (1B)	Building Construction	9/1/2026	2/28/2027	6	155	
5	Finishing (1B)	Paving	9/1/2026	2/28/2027	6	155	
6	Painting (1B)	Architectural Coating	9/1/2026	2/27/2027	6	155	
7	Installing Pipeline (1A)	Trenching	10/1/2026	11/30/2026	6	52	
8	Installing Appurtenances (1A)	Building Construction	12/1/2026	12/31/2026	6	27	
9	Pavement Repairs (1A)	Paving	1/1/2027	1/31/2027	6	26	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 78

Acres of Paving: 5.08

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 13,290 (Architectural Coating

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Potholding (1A)	Excavators	1	8.00	158	0.38
Potholding (1A)	Off-Highway Trucks	3	8.00	402	0.38
Potholding (1A)	Tractors/Loaders/Backhoes	2	8.00	97	0.37
Grading/Excavation (1B)	Bore/Drill Rigs	1	8.00	221	0.50
Grading/Excavation (1B)	Concrete/Industrial Saws	1	8.00	81	0.73
Grading/Excavation (1B)	Excavators	1	8.00	158	0.38
Grading/Excavation (1B)	Graders	1	8.00	187	0.41
Grading/Excavation (1B)	Off-Highway Trucks	3	8.00	402	0.38
Grading/Excavation (1B)	Other Construction Equipment	1	8.00	172	0.42
Grading/Excavation (1B)	Paving Equipment	1	8.00	132	0.36
Grading/Excavation (1B)	Scrapers	1	8.00	367	0.48
Grading/Excavation (1B)	Tractors/Loaders/Backhoes	2	8.00	97	0.37
Grading/Excavation (1B)	Trenchers	1	8.00	78	0.50
Stormwater Drainage and Foundation (1B)	Cement and Mortar Mixers	1	8.00	9	0.56
Stormwater Drainage and Foundation (1B)	Graders	1	8.00	187	0.41
Stormwater Drainage and Foundation (1B)	Paving Equipment	1	8.00	132	0.36
Stormwater Drainage and Foundation (1B)	Pumps	1	8.00	84	0.74
Stormwater Drainage and Foundation (1B)	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Construction (1B)	Air Compressors	1	8.00	78	0.48
Construction (1B)	Cranes	2	8.00	231	0.29
Construction (1B)	Welders	1	8.00	46	0.45
Finishing (1B)	Pavers	2	8.00	130	0.42
Finishing (1B)	Paving Equipment	2	8.00	132	0.36

Installing Pipeline (1A)	Off-Highway Trucks	2	8.00	402	0.38
Installing Pipeline (1A)	Tractors/Loaders/Backhoes	2	8.00	97	0.37
Installing Appurtenances (1A)	Off-Highway Trucks	3	8.00	402	0.38
Installing Appurtenances (1A)	Tractors/Loaders/Backhoes	2	8.00	97	0.37
Pavement Repairs (1A)	Off-Highway Trucks	3	8.00	402	0.38
Pavement Repairs (1A)	Pavers	1	8.00	130	0.42
Pavement Repairs (1A)	Paving Equipment	1	8.00	132	0.36
Pavement Repairs (1A)	Rollers	1	8.00	80	0.38
Pavement Repairs (1A)	Tractors/Loaders/Backhoes	2	8.00	97	0.37
Painting (1B)	Aerial Lifts	1	8.00	63	0.31
Painting (1B)	Air Compressors	1	8.00	78	0.48
Painting (1B)	Forklifts	1	8.00	89	0.20

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Potholding (1A)	6	20.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Grading/Excavation (1B)	13	20.00	0.00	6,058.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Stormwater Drainage and Foundation (1B)	5	20.00	0.00	9,712.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Construction (1B)	4	20.00	36.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Finishing (1B)	4	20.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Installing Pipeline (1A)	4	20.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Installing Appurtenances (1A)	5	20.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Pavement Repairs (1A)	8	20.00	36.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Painting (1B)	3	20.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Water Exposed Area

3.2 Grading/Excavation (1B) - 2026

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					1.6830	0.0000	1.6830	0.1857	0.0000	0.1857			0.0000			0.0000
Off-Road	4.1114	33.4217	39.0422	0.1022		1.3928	1.3928		1.2888	1.2888		9,882.0659	9,882.0659	3.0305		9,957.8272
Total	**4.1114**	**33.4217**	**39.0422**	**0.1022**	**1.6830**	**1.3928**	**3.0758**	**0.1857**	**1.2888**	**1.4746**		**9,882.0659**	**9,882.0659**	**3.0305**		**9,957.8272**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.2387	14.1457	4.1644	0.0634	2.0370	0.1009	2.1379	0.5583	0.0966	0.6549		7,029.0625	7,029.0625	0.4599	1.1192	7,374.0642
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0521	0.0312	0.5726	1.7800e-003	0.2236	1.1000e-003	0.2247	0.0593	1.0100e-003	0.0603		186.6790	186.6790	3.5600e-003	3.7000e-003	187.8706

Pettit Water Storage Tank Expansion and Transmission Project - Phase 1 - South Coast Air Basin, Summer

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Total	**0.2909**	**14.1768**	**4.7370**	**0.0652**	**2.2605**	**0.1020**	**2.3626**	**0.6176**	**0.0976**	**0.7152**		**7,215.7415**	**7,215.7415**	**0.4634**	**1.1229**	**7,561.9349**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.6564	0.0000	0.6564	0.0724	0.0000	0.0724			0.0000			0.0000
Off-Road	4.1114	33.4217	39.0422	0.1022		1.3928	1.3928		1.2888	1.2888	0.0000	9,882.0659	9,882.0659	3.0305		9,957.8272
Total	**4.1114**	**33.4217**	**39.0422**	**0.1022**	**0.6564**	**1.3928**	**2.0492**	**0.0724**	**1.2888**	**1.3613**	**0.0000**	**9,882.0659**	**9,882.0659**	**3.0305**		**9,957.8272**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.2387	14.1457	4.1644	0.0634	2.0370	0.1009	2.1379	0.5583	0.0966	0.6549		7,029.0625	7,029.0625	0.4599	1.1192	7,374.0642
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0521	0.0312	0.5726	1.7800e-003	0.2236	1.1000e-003	0.2247	0.0593	1.0100e-003	0.0603		186.6790	186.6790	3.5600e-003	3.7000e-003	187.8706
Total	**0.2909**	**14.1768**	**4.7370**	**0.0652**	**2.2605**	**0.1020**	**2.3626**	**0.6176**	**0.0976**	**0.7152**		**7,215.7415**	**7,215.7415**	**0.4634**	**1.1229**	**7,561.9349**

3.3 Potholding (1A) - 2026

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.8641	12.4901	17.2751	0.0511		0.4754	0.4754		0.4374	0.4374		4,943.4759	4,943.4759	1.5988		4,983.4464
Total	**1.8641**	**12.4901**	**17.2751**	**0.0511**		**0.4754**	**0.4754**		**0.4374**	**0.4374**		**4,943.4759**	**4,943.4759**	**1.5988**		**4,983.4464**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000

Pettit Water Storage Tank Expansion and Transmission Project - Phase 1 - South Coast Air Basin, Summer

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Worker	0.0521	0.0312	0.5726	1.7800e-003	0.2236	1.1000e-003	0.2247	0.0593	1.0100e-003	0.0603		186.6790	186.6790	3.5600e-003	3.7000e-003	187.8706
Total	**0.0521**	**0.0312**	**0.5726**	**1.7800e-003**	**0.2236**	**1.1000e-003**	**0.2247**	**0.0593**	**1.0100e-003**	**0.0603**		**186.6790**	**186.6790**	**3.5600e-003**	**3.7000e-003**	**187.8706**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.8641	12.4901	17.2751	0.0511		0.4754	0.4754		0.4374	0.4374	0.0000	4,943.4759	4,943.4759	1.5988		4,983.4464
Total	**1.8641**	**12.4901**	**17.2751**	**0.0511**		**0.4754**	**0.4754**		**0.4374**	**0.4374**	**0.0000**	**4,943.4759**	**4,943.4759**	**1.5988**		**4,983.4464**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0521	0.0312	0.5726	1.7800e-003	0.2236	1.1000e-003	0.2247	0.0593	1.0100e-003	0.0603		186.6790	186.6790	3.5600e-003	3.7000e-003	187.8706
Total	**0.0521**	**0.0312**	**0.5726**	**1.7800e-003**	**0.2236**	**1.1000e-003**	**0.2247**	**0.0593**	**1.0100e-003**	**0.0603**		**186.6790**	**186.6790**	**3.5600e-003**	**3.7000e-003**	**187.8706**

3.4 Stormwater Drainage and Foundation (1B) - 2026

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.9349	8.8508	10.3940	0.0211		0.3431	0.3431		0.3248	0.3248		2,010.1637	2,010.1637	0.4628		2,021.7324
Total	**0.9349**	**8.8508**	**10.3940**	**0.0211**		**0.3431**	**0.3431**		**0.3248**	**0.3248**		**2,010.1637**	**2,010.1637**	**0.4628**		**2,021.7324**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.3755	22.2501	6.5502	0.0997	3.2040	0.1588	3.3628	0.8781	0.1519	1.0300		11,056.1592	11,056.1592	0.7233	1.7603	11,598.8196
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000

Pettit Water Storage Tank Expansion and Transmission Project - Phase 1 - South Coast Air Basin, Summer

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Worker	0.0521	0.0312	0.5726	1.7800e-003	0.2236	1.1000e-003	0.2247	0.0593	1.0100e-003	0.0603		186.6790	186.6790	3.5600e-003	3.7000e-003	187.8706
Total	**0.4277**	**22.2812**	**7.1228**	**0.1015**	**3.4275**	**0.1599**	**3.5874**	**0.9374**	**0.1529**	**1.0903**		**11,242.8383**	**11,242.8383**	**0.7269**	**1.7640**	**11,786.6902**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.9349	8.8508	10.3940	0.0211		0.3431	0.3431		0.3248	0.3248	0.0000	2,010.1637	2,010.1637	0.4628		2,021.7324
Total	**0.9349**	**8.8508**	**10.3940**	**0.0211**		**0.3431**	**0.3431**		**0.3248**	**0.3248**	**0.0000**	**2,010.1637**	**2,010.1637**	**0.4628**		**2,021.7324**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.3755	22.2501	6.5502	0.0997	3.2040	0.1588	3.3628	0.8781	0.1519	1.0300		11,056.1592	11,056.1592	0.7233	1.7603	11,598.8196
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0521	0.0312	0.5726	1.7800e-003	0.2236	1.1000e-003	0.2247	0.0593	1.0100e-003	0.0603		186.6790	186.6790	3.5600e-003	3.7000e-003	187.8706
Total	**0.4277**	**22.2812**	**7.1228**	**0.1015**	**3.4275**	**0.1599**	**3.5874**	**0.9374**	**0.1529**	**1.0903**		**11,242.8383**	**11,242.8383**	**0.7269**	**1.7640**	**11,786.6902**

3.5 Construction (1B) - 2026

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.0732	9.2053	7.5367	0.0181		0.3789	0.3789		0.3573	0.3573		1,700.3943	1,700.3943	0.4017		1,710.4357
Total	**1.0732**	**9.2053**	**7.5367**	**0.0181**		**0.3789**	**0.3789**		**0.3573**	**0.3573**		**1,700.3943**	**1,700.3943**	**0.4017**		**1,710.4357**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0360	1.3079	0.4843	6.2100e-003	0.2305	7.3400e-003	0.2378	0.0664	7.0200e-003	0.0734		672.4118	672.4118	0.0263	0.0979	702.2534

Worker	0.0521	0.0312	0.5726	1.7800e-003	0.2236	1.1000e-003	0.2247	0.0593	1.0100e-003	0.0603		186.6790	186.6790	3.5600e-003	3.7000e-003	187.8706
Total	**0.0882**	**1.3390**	**1.0569**	**7.9900e-003**	**0.4540**	**8.4400e-003**	**0.4625**	**0.1256**	**8.0300e-003**	**0.1337**		**859.0908**	**859.0908**	**0.0299**	**0.1016**	**890.1240**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.0732	9.2053	7.5367	0.0181		0.3789	0.3789		0.3573	0.3573	0.0000	1,700.3943	1,700.3943	0.4017		1,710.4357
Total	**1.0732**	**9.2053**	**7.5367**	**0.0181**		**0.3789**	**0.3789**		**0.3573**	**0.3573**	**0.0000**	**1,700.3943**	**1,700.3943**	**0.4017**		**1,710.4357**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0360	1.3079	0.4843	6.2100e-003	0.2305	7.3400e-003	0.2378	0.0664	7.0200e-003	0.0734		672.4118	672.4118	0.0263	0.0979	702.2534
Worker	0.0521	0.0312	0.5726	1.7800e-003	0.2236	1.1000e-003	0.2247	0.0593	1.0100e-003	0.0603		186.6790	186.6790	3.5600e-003	3.7000e-003	187.8706
Total	**0.0882**	**1.3390**	**1.0569**	**7.9900e-003**	**0.4540**	**8.4400e-003**	**0.4625**	**0.1256**	**8.0300e-003**	**0.1337**		**859.0908**	**859.0908**	**0.0299**	**0.1016**	**890.1240**

3.5 Construction (1B) - 2027

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.0732	9.2053	7.5367	0.0181		0.3789	0.3789		0.3573	0.3573		1,700.3943	1,700.3943	0.4017		1,710.4357
Total	**1.0732**	**9.2053**	**7.5367**	**0.0181**		**0.3789**	**0.3789**		**0.3573**	**0.3573**		**1,700.3943**	**1,700.3943**	**0.4017**		**1,710.4357**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0353	1.2984	0.4795	6.0900e-003	0.2305	7.3200e-003	0.2378	0.0664	7.0000e-003	0.0734		659.1878	659.1878	0.0263	0.0961	688.4918

Pettit Water Storage Tank Expansion and Transmission Project - Phase 1 - South Coast Air Basin, Summer

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Worker	0.0492	0.0285	0.5420	1.7300e-003	0.2236	1.0300e-003	0.2246	0.0593	9.5000e-004	0.0602		182.8364	182.8364	3.2500e-003	3.5100e-003	183.9649
Total	**0.0845**	**1.3269**	**1.0215**	**7.8200e-003**	**0.4540**	**8.3500e-003**	**0.4624**	**0.1256**	**7.9500e-003**	**0.1336**		**842.0242**	**842.0242**	**0.0295**	**0.0996**	**872.4567**

<u>Mitigated Construction On-Site</u>

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.0732	9.2053	7.5367	0.0181		0.3789	0.3789		0.3573	0.3573	0.0000	1,700.3943	1,700.3943	0.4017		1,710.4357
Total	**1.0732**	**9.2053**	**7.5367**	**0.0181**		**0.3789**	**0.3789**		**0.3573**	**0.3573**	**0.0000**	**1,700.3943**	**1,700.3943**	**0.4017**		**1,710.4357**

<u>Mitigated Construction Off-Site</u>

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0353	1.2984	0.4795	6.0900e-003	0.2305	7.3200e-003	0.2378	0.0664	7.0000e-003	0.0734		659.1878	659.1878	0.0263	0.0961	688.4918
Worker	0.0492	0.0285	0.5420	1.7300e-003	0.2236	1.0300e-003	0.2246	0.0593	9.5000e-004	0.0602		182.8364	182.8364	3.2500e-003	3.5100e-003	183.9649
Total	**0.0845**	**1.3269**	**1.0215**	**7.8200e-003**	**0.4540**	**8.3500e-003**	**0.4624**	**0.1256**	**7.9500e-003**	**0.1336**		**842.0242**	**842.0242**	**0.0295**	**0.0996**	**872.4567**

3.6 Finishing (1B) - 2026

<u>Unmitigated Construction On-Site</u>

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.6412	5.6956	10.8845	0.0176		0.2734	0.2734		0.2515	0.2515		1,698.6213	1,698.6213	0.5494		1,712.3555
Paving	0.0527					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**0.6940**	**5.6956**	**10.8845**	**0.0176**		**0.2734**	**0.2734**		**0.2515**	**0.2515**		**1,698.6213**	**1,698.6213**	**0.5494**		**1,712.3555**

<u>Unmitigated Construction Off-Site</u>

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000

Pettit Water Storage Tank Expansion and Transmission Project - Phase 1 - South Coast Air Basin, Summer

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0521	0.0312	0.5726	1.7800e-003	0.2236	1.1000e-003	0.2247	0.0593	1.0100e-003	0.0603		186.6790	186.6790	3.5600e-003	3.7000e-003	187.8706
Total	**0.0521**	**0.0312**	**0.5726**	**1.7800e-003**	**0.2236**	**1.1000e-003**	**0.2247**	**0.0593**	**1.0100e-003**	**0.0603**		**186.6790**	**186.6790**	**3.5600e-003**	**3.7000e-003**	**187.8706**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.6412	5.6956	10.8845	0.0176		0.2734	0.2734		0.2515	0.2515	0.0000	1,698.6213	1,698.6213	0.5494		1,712.3555
Paving	0.0527					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**0.6940**	**5.6956**	**10.8845**	**0.0176**		**0.2734**	**0.2734**		**0.2515**	**0.2515**	**0.0000**	**1,698.6213**	**1,698.6213**	**0.5494**		**1,712.3555**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0521	0.0312	0.5726	1.7800e-003	0.2236	1.1000e-003	0.2247	0.0593	1.0100e-003	0.0603		186.6790	186.6790	3.5600e-003	3.7000e-003	187.8706
Total	**0.0521**	**0.0312**	**0.5726**	**1.7800e-003**	**0.2236**	**1.1000e-003**	**0.2247**	**0.0593**	**1.0100e-003**	**0.0603**		**186.6790**	**186.6790**	**3.5600e-003**	**3.7000e-003**	**187.8706**

3.6 Finishing (1B) - 2027

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.6412	5.6956	10.8845	0.0176		0.2734	0.2734		0.2515	0.2515		1,698.6213	1,698.6213	0.5494		1,712.3555
Paving	0.0527					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**0.6940**	**5.6956**	**10.8845**	**0.0176**		**0.2734**	**0.2734**		**0.2515**	**0.2515**		**1,698.6213**	**1,698.6213**	**0.5494**		**1,712.3555**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e

Pettit Water Storage Tank Expansion and Transmission Project - Phase 1 - South Coast Air Basin, Summer

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0492	0.0285	0.5420	1.7300e-003	0.2236	1.0300e-003	0.2246	0.0593	9.5000e-004	0.0602		182.8364	182.8364	3.2500e-003	3.5100e-003	183.9649
Total	**0.0492**	**0.0285**	**0.5420**	**1.7300e-003**	**0.2236**	**1.0300e-003**	**0.2246**	**0.0593**	**9.5000e-004**	**0.0602**		**182.8364**	**182.8364**	**3.2500e-003**	**3.5100e-003**	**183.9649**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.6412	5.6956	10.8845	0.0176		0.2734	0.2734		0.2515	0.2515	0.0000	1,698.6213	1,698.6213	0.5494		1,712.3555
Paving	0.0527					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**0.6940**	**5.6956**	**10.8845**	**0.0176**		**0.2734**	**0.2734**		**0.2515**	**0.2515**	**0.0000**	**1,698.6213**	**1,698.6213**	**0.5494**		**1,712.3555**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0492	0.0285	0.5420	1.7300e-003	0.2236	1.0300e-003	0.2246	0.0593	9.5000e-004	0.0602		182.8364	182.8364	3.2500e-003	3.5100e-003	183.9649
Total	**0.0492**	**0.0285**	**0.5420**	**1.7300e-003**	**0.2236**	**1.0300e-003**	**0.2246**	**0.0593**	**9.5000e-004**	**0.0602**		**182.8364**	**182.8364**	**3.2500e-003**	**3.5100e-003**	**183.9649**

3.7 Painting (1B) - 2026

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Archit. Coating	0.3974					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.3487	2.8663	4.6370	7.1700e-003		0.1214	0.1214		0.1172	0.1172		685.9147	685.9147	0.1209		688.9383
Total	**0.7462**	**2.8663**	**4.6370**	**7.1700e-003**		**0.1214**	**0.1214**		**0.1172**	**0.1172**		**685.9147**	**685.9147**	**0.1209**		**688.9383**

Unmitigated Construction Off-Site

Pettit Water Storage Tank Expansion and Transmission Project - Phase 1 - South Coast Air Basin, Summer

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0521	0.0312	0.5726	1.7800e-003	0.2236	1.1000e-003	0.2247	0.0593	1.0100e-003	0.0603		186.6790	186.6790	3.5600e-003	3.7000e-003	187.8706
Total	**0.0521**	**0.0312**	**0.5726**	**1.7800e-003**	**0.2236**	**1.1000e-003**	**0.2247**	**0.0593**	**1.0100e-003**	**0.0603**		**186.6790**	**186.6790**	**3.5600e-003**	**3.7000e-003**	**187.8706**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Archit. Coating	0.3974					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.3487	2.8663	4.6370	7.1700e-003		0.1214	0.1214		0.1172	0.1172	0.0000	685.9147	685.9147	0.1209		688.9383
Total	**0.7462**	**2.8663**	**4.6370**	**7.1700e-003**		**0.1214**	**0.1214**		**0.1172**	**0.1172**	**0.0000**	**685.9147**	**685.9147**	**0.1209**		**688.9383**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0521	0.0312	0.5726	1.7800e-003	0.2236	1.1000e-003	0.2247	0.0593	1.0100e-003	0.0603		186.6790	186.6790	3.5600e-003	3.7000e-003	187.8706
Total	**0.0521**	**0.0312**	**0.5726**	**1.7800e-003**	**0.2236**	**1.1000e-003**	**0.2247**	**0.0593**	**1.0100e-003**	**0.0603**		**186.6790**	**186.6790**	**3.5600e-003**	**3.7000e-003**	**187.8706**

3.7 Painting (1B) - 2027

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Archit. Coating	0.3974					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.3487	2.8663	4.6370	7.1700e-003		0.1214	0.1214		0.1172	0.1172		685.9147	685.9147	0.1209		688.9383
Total	**0.7462**	**2.8663**	**4.6370**	**7.1700e-003**		**0.1214**	**0.1214**		**0.1172**	**0.1172**		**685.9147**	**685.9147**	**0.1209**		**688.9383**

Pettit Water Storage Tank Expansion and Transmission Project - Phase 1 - South Coast Air Basin, Summer

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0492	0.0285	0.5420	1.7300e-003	0.2236	1.0300e-003	0.2246	0.0593	9.5000e-004	0.0602		182.8364	182.8364	3.2500e-003	3.5100e-003	183.9649
Total	**0.0492**	**0.0285**	**0.5420**	**1.7300e-003**	**0.2236**	**1.0300e-003**	**0.2246**	**0.0593**	**9.5000e-004**	**0.0602**		**182.8364**	**182.8364**	**3.2500e-003**	**3.5100e-003**	**183.9649**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Archit. Coating	0.3974					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.3487	2.8663	4.6370	7.1700e-003		0.1214	0.1214		0.1172	0.1172	0.0000	685.9147	685.9147	0.1209		688.9383
Total	**0.7462**	**2.8663**	**4.6370**	**7.1700e-003**		**0.1214**	**0.1214**		**0.1172**	**0.1172**	**0.0000**	**685.9147**	**685.9147**	**0.1209**		**688.9383**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0492	0.0285	0.5420	1.7300e-003	0.2236	1.0300e-003	0.2246	0.0593	9.5000e-004	0.0602		182.8364	182.8364	3.2500e-003	3.5100e-003	183.9649
Total	**0.0492**	**0.0285**	**0.5420**	**1.7300e-003**	**0.2236**	**1.0300e-003**	**0.2246**	**0.0593**	**9.5000e-004**	**0.0602**		**182.8364**	**182.8364**	**3.2500e-003**	**3.5100e-003**	**183.9649**

3.8 Installing Pipeline (1A) - 2026

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.2194	8.4023	10.8303	0.0327		0.3131	0.3131		0.2880	0.2880		3,163.4626	3,163.4626	1.0231		3,189.0408
Total	**1.2194**	**8.4023**	**10.8303**	**0.0327**		**0.3131**	**0.3131**		**0.2880**	**0.2880**		**3,163.4626**	**3,163.4626**	**1.0231**		**3,189.0408**

Pettit Water Storage Tank Expansion and Transmission Project - Phase 1 - South Coast Air Basin, Summer

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0521	0.0312	0.5726	1.7800e-003	0.2236	1.1000e-003	0.2247	0.0593	1.0100e-003	0.0603		186.6790	186.6790	3.5600e-003	3.7000e-003	187.8706
Total	**0.0521**	**0.0312**	**0.5726**	**1.7800e-003**	**0.2236**	**1.1000e-003**	**0.2247**	**0.0593**	**1.0100e-003**	**0.0603**		**186.6790**	**186.6790**	**3.5600e-003**	**3.7000e-003**	**187.8706**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.2194	8.4023	10.8303	0.0327		0.3131	0.3131		0.2880	0.2880	0.0000	3,163.4626	3,163.4626	1.0231		3,189.0408
Total	**1.2194**	**8.4023**	**10.8303**	**0.0327**		**0.3131**	**0.3131**		**0.2880**	**0.2880**	**0.0000**	**3,163.4626**	**3,163.4626**	**1.0231**		**3,189.0408**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0521	0.0312	0.5726	1.7800e-003	0.2236	1.1000e-003	0.2247	0.0593	1.0100e-003	0.0603		186.6790	186.6790	3.5600e-003	3.7000e-003	187.8706
Total	**0.0521**	**0.0312**	**0.5726**	**1.7800e-003**	**0.2236**	**1.1000e-003**	**0.2247**	**0.0593**	**1.0100e-003**	**0.0603**		**186.6790**	**186.6790**	**3.5600e-003**	**3.7000e-003**	**187.8706**

3.9 Installing Appurtenances (1A) - 2026

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.6970	11.2684	14.0157	0.0459		0.4155	0.4155		0.3823	0.3823		4,443.1380	4,443.1380	1.4370		4,479.0630
Total	**1.6970**	**11.2684**	**14.0157**	**0.0459**		**0.4155**	**0.4155**		**0.3823**	**0.3823**		**4,443.1380**	**4,443.1380**	**1.4370**		**4,479.0630**

Pettit Water Storage Tank Expansion and Transmission Project - Phase 1 - South Coast Air Basin, Summer

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0521	0.0312	0.5726	1.7800e-003	0.2236	1.1000e-003	0.2247	0.0593	1.0100e-003	0.0603		186.6790	186.6790	3.5600e-003	3.7000e-003	187.8706
Total	**0.0521**	**0.0312**	**0.5726**	**1.7800e-003**	**0.2236**	**1.1000e-003**	**0.2247**	**0.0593**	**1.0100e-003**	**0.0603**		**186.6790**	**186.6790**	**3.5600e-003**	**3.7000e-003**	**187.8706**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.6970	11.2684	14.0157	0.0459		0.4155	0.4155		0.3823	0.3823	0.0000	4,443.1380	4,443.1380	1.4370		4,479.0630
Total	**1.6970**	**11.2684**	**14.0157**	**0.0459**		**0.4155**	**0.4155**		**0.3823**	**0.3823**	**0.0000**	**4,443.1380**	**4,443.1380**	**1.4370**		**4,479.0630**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0521	0.0312	0.5726	1.7800e-003	0.2236	1.1000e-003	0.2247	0.0593	1.0100e-003	0.0603		186.6790	186.6790	3.5600e-003	3.7000e-003	187.8706
Total	**0.0521**	**0.0312**	**0.5726**	**1.7800e-003**	**0.2236**	**1.1000e-003**	**0.2247**	**0.0593**	**1.0100e-003**	**0.0603**		**186.6790**	**186.6790**	**3.5600e-003**	**3.7000e-003**	**187.8706**

3.10 Pavement Repairs (1A) - 2027

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	2.1546	15.5592	21.3047	0.0573		0.6248	0.6248		0.5748	0.5748		5,546.5106	5,546.5106	1.7939		5,591.3569
Paving	0.3144					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000

Pettit Water Storage Tank Expansion and Transmission Project - Phase 1 - South Coast Air Basin, Summer

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Total	**2.4690**	**15.5592**	**21.3047**	**0.0573**		**0.6248**	**0.6248**		**0.5748**	**0.5748**		**5,546.5106**	**5,546.5106**	**1.7939**		**5,591.3569**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0353	1.2984	0.4795	6.0900e-003	0.2305	7.3200e-003	0.2378	0.0664	7.0000e-003	0.0734		659.1878	659.1878	0.0263	0.0961	688.4918
Worker	0.0492	0.0285	0.5420	1.7300e-003	0.2236	1.0300e-003	0.2246	0.0593	9.5000e-004	0.0602		182.8364	182.8364	3.2500e-003	3.5100e-003	183.9649
Total	**0.0845**	**1.3269**	**1.0215**	**7.8200e-003**	**0.4540**	**8.3500e-003**	**0.4624**	**0.1256**	**7.9500e-003**	**0.1336**		**842.0242**	**842.0242**	**0.0295**	**0.0996**	**872.4567**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	2.1546	15.5592	21.3047	0.0573		0.6248	0.6248		0.5748	0.5748	0.0000	5,546.5106	5,546.5106	1.7939		5,591.3569
Paving	0.3144					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**2.4690**	**15.5592**	**21.3047**	**0.0573**		**0.6248**	**0.6248**		**0.5748**	**0.5748**	**0.0000**	**5,546.5106**	**5,546.5106**	**1.7939**		**5,591.3569**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0353	1.2984	0.4795	6.0900e-003	0.2305	7.3200e-003	0.2378	0.0664	7.0000e-003	0.0734		659.1878	659.1878	0.0263	0.0961	688.4918
Worker	0.0492	0.0285	0.5420	1.7300e-003	0.2236	1.0300e-003	0.2246	0.0593	9.5000e-004	0.0602		182.8364	182.8364	3.2500e-003	3.5100e-003	183.9649
Total	**0.0845**	**1.3269**	**1.0215**	**7.8200e-003**	**0.4540**	**8.3500e-003**	**0.4624**	**0.1256**	**7.9500e-003**	**0.1336**		**842.0242**	**842.0242**	**0.0295**	**0.0996**	**872.4567**

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

Pettit Water Storage Tank Expansion and Transmission Project - Phase 1 - South Coast Air Basin, Summer

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000

5.2 Energy by Land Use - NaturalGas

<u>**Unmitigated**</u>

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

<u>**Mitigated**</u>

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	0.0974	2.0000e-004	0.0226	0.0000		8.0000e-005	8.0000e-005		8.0000e-005	8.0000e-005		0.0485	0.0485	1.3000e-004		0.0516
Unmitigated	0.0974	2.0000e-004	0.0226	0.0000		8.0000e-005	8.0000e-005		8.0000e-005	8.0000e-005		0.0485	0.0485	1.3000e-004		0.0516

6.2 Area by SubCategory

Pettit Water Storage Tank Expansion and Transmission Project - Phase 1 - South Coast Air Basin, Summer

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	0.0169					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	0.0785					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	2.0800e-003	2.0000e-004	0.0226	0.0000		8.0000e-005	8.0000e-005		8.0000e-005	8.0000e-005		0.0485	0.0485	1.3000e-004		0.0516
Total	**0.0974**	**2.0000e-004**	**0.0226**	**0.0000**		**8.0000e-005**	**8.0000e-005**		**8.0000e-005**	**8.0000e-005**		**0.0485**	**0.0485**	**1.3000e-004**		**0.0516**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	0.0169					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	0.0785					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	2.0800e-003	2.0000e-004	0.0226	0.0000		8.0000e-005	8.0000e-005		8.0000e-005	8.0000e-005		0.0485	0.0485	1.3000e-004		0.0516
Total	**0.0974**	**2.0000e-004**	**0.0226**	**0.0000**		**8.0000e-005**	**8.0000e-005**		**8.0000e-005**	**8.0000e-005**		**0.0485**	**0.0485**	**1.3000e-004**		**0.0516**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Pettit Water Storage Tank Expansion and Transmission Project - Phase 1
South Coast Air Basin, Winter

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Other Asphalt Surfaces	136.13	1000sqft	3.12	136,125.00	0
Other Non-Asphalt Surfaces	85.38	1000sqft	1.96	85,378.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	31
Climate Zone	10			**Operational Year**	2027
Utility Company	Southern California Edison				
CO2 Intensity (lb/MWhr)	280.11	**CH4 Intensity (lb/MWhr)**	0.033	**N2O Intensity (lb/MWhr)**	0.004

1.3 User Entered Comments & Non-Default Data

Project Characteristics - MVU is connected to the power grid through SCE.

Land Use - Project Assumptions - Phase 1 Land Use Types

Construction Phase - Project Assumptions - Phase 1 Construction Phase

Off-road Equipment - Project Assumptions - Phase 1 Construction

Off-road Equipment - Project Assumptinos - Paving Phase 1

Off-road Equipment -

Off-road Equipment - drill rig = Hydraulic hammer, Other Construction Equipment = Jackhammer, Compactor = Paving equipment

Off-road Equipment - Project Assumptions - Phase 1

Off-road Equipment - Project Assumptions - Phase 1

Off-road Equipment - Project Assumptions - Phase 1 Architectural Coating

Off-road Equipment - Project Assumption - Phase 1 (Compactor = Paving Equipment)

Off-road Equipment - Project Assumptions - Phase 1

Off-road Equipment - Compactor = Paving Equipment

Trips and VMT - Project Assumptions - Phase 1

Grading - Project Assumptions - Phase 1 Grading. 75% of total grading

Construction Off-road Equipment Mitigation -

Mobile Land Use Mitigation -

Table Name	Column Name	Default Value	New Value
tblConstructionPhase	NumDays	20.00	52.00
tblConstructionPhase	NumDays	230.00	53.00
tblConstructionPhase	NumDays	230.00	155.00
tblConstructionPhase	NumDays	20.00	155.00
tblConstructionPhase	NumDays	20.00	155.00
tblConstructionPhase	NumDays	230.00	27.00
tblConstructionPhase	NumDays	20.00	26.00
tblConstructionPhase	NumDaysWeek	5.00	6.00
tblConstructionPhase	NumDaysWeek	5.00	6.00
tblConstructionPhase	NumDaysWeek	5.00	6.00
tblConstructionPhase	NumDaysWeek	5.00	6.00
tblConstructionPhase	NumDaysWeek	5.00	6.00
tblConstructionPhase	NumDaysWeek	5.00	6.00
tblConstructionPhase	NumDaysWeek	5.00	6.00
tblConstructionPhase	NumDaysWeek	5.00	6.00
tblConstructionPhase	NumDaysWeek	5.00	6.00
tblGrading	MaterialExported	0.00	42,402.00
tblLandUse	LandUseSquareFeet	136,130.00	136,125.00
tblLandUse	LandUseSquareFeet	85,380.00	85,378.00
tblLandUse	LotAcreage	3.13	3.12
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	2.00

Pettit Water Storage Tank Expansion and Transmission Project - Phase 1 - South Coast Air Basin, Winter

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	2.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	2.00
tblOffRoadEquipment	UsageHours	6.00	8.00
tblOffRoadEquipment	UsageHours	7.00	8.00
tblOffRoadEquipment	UsageHours	7.00	8.00
tblOffRoadEquipment	UsageHours	7.00	8.00
tblProjectCharacteristics	CO2IntensityFactor	390.98	280.11
tblTripsAndVMT	HaulingTripNumber	5,300.00	6,058.00
tblTripsAndVMT	HaulingTripNumber	0.00	9,712.00
tblTripsAndVMT	VendorTripNumber	36.00	0.00
tblTripsAndVMT	VendorTripNumber	36.00	0.00
tblTripsAndVMT	VendorTripNumber	0.00	36.00
tblTripsAndVMT	WorkerTripNumber	15.00	20.00
tblTripsAndVMT	WorkerTripNumber	33.00	20.00
tblTripsAndVMT	WorkerTripNumber	93.00	20.00
tblTripsAndVMT	WorkerTripNumber	93.00	20.00
tblTripsAndVMT	WorkerTripNumber	10.00	20.00
tblTripsAndVMT	WorkerTripNumber	10.00	20.00
tblTripsAndVMT	WorkerTripNumber	93.00	20.00
tblTripsAndVMT	WorkerTripNumber	19.00	20.00

2.0 Emissions Summary

2.1 Overall Construction (Maximum Daily Emission)

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2026	6.3107	60.7653	61.5803	0.2201	4.1670	1.9716	6.1386	0.9374	1.8250	2.6876	0.0000	22,214.7142	22,214.7142	5.0955	1.7662	22,678.3095
2027	5.2619	36.1714	47.3328	0.1188	1.3551	1.4172	2.7724	0.3699	1.3187	1.6885	0.0000	11,642.9042	11,642.9042	2.9314	0.2077	11,778.0695
Maximum	**6.3107**	**60.7653**	**61.5803**	**0.2201**	**4.1670**	**1.9716**	**6.1386**	**0.9374**	**1.8250**	**2.6876**	**0.0000**	**22,214.7142**	**22,214.7142**	**5.0955**	**1.7662**	**22,678.3095**

Pettit Water Storage Tank Expansion and Transmission Project - Phase 1 - South Coast Air Basin, Winter

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2026	6.3107	60.7653	61.5803	0.2201	3.4275	1.9716	5.1120	0.9374	1.8250	2.5743	0.0000	22,214.7142	22,214.7142	5.0955	1.7662	22,678.3095
2027	5.2619	36.1714	47.3328	0.1188	1.3551	1.4172	2.7724	0.3699	1.3187	1.6885	0.0000	11,642.9042	11,642.9042	2.9314	0.2077	11,778.0695
Maximum	**6.3107**	**60.7653**	**61.5803**	**0.2201**	**3.4275**	**1.9716**	**5.1120**	**0.9374**	**1.8250**	**2.5743**	**0.0000**	**22,214.7142**	**22,214.7142**	**5.0955**	**1.7662**	**22,678.3095**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**13.39**	**0.00**	**11.52**	**0.00**	**0.00**	**2.59**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Grading/Excavation (1B)	Grading	5/1/2026	6/30/2026	6	52	
2	Potholding (1A)	Trenching	5/1/2026	5/31/2026	6	26	
3	Stormwater Drainage and Foundation (1B)	Building Construction	7/1/2026	8/31/2026	6	53	
4	Construction (1B)	Building Construction	9/1/2026	2/28/2027	6	155	
5	Finishing (1B)	Paving	9/1/2026	2/28/2027	6	155	
6	Painting (1B)	Architectural Coating	9/1/2026	2/27/2027	6	155	
7	Installing Pipeline (1A)	Trenching	10/1/2026	11/30/2026	6	52	
8	Installing Appurtenances (1A)	Building Construction	12/1/2026	12/31/2026	6	27	
9	Pavement Repairs (1A)	Paving	1/1/2027	1/31/2027	6	26	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 78

Acres of Paving: 5.08

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 13,290 (Architectural Coating –

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Potholding (1A)	Excavators	1	8.00	158	0.38
Potholding (1A)	Off-Highway Trucks	3	8.00	402	0.38
Potholding (1A)	Tractors/Loaders/Backhoes	2	8.00	97	0.37
Grading/Excavation (1B)	Bore/Drill Rigs	1	8.00	221	0.50
Grading/Excavation (1B)	Concrete/Industrial Saws	1	8.00	81	0.73
Grading/Excavation (1B)	Excavators	1	8.00	158	0.38
Grading/Excavation (1B)	Graders	1	8.00	187	0.41
Grading/Excavation (1B)	Off-Highway Trucks	3	8.00	402	0.38
Grading/Excavation (1B)	Other Construction Equipment	1	8.00	172	0.42
Grading/Excavation (1B)	Paving Equipment	1	8.00	132	0.36
Grading/Excavation (1B)	Scrapers	1	8.00	367	0.48
Grading/Excavation (1B)	Tractors/Loaders/Backhoes	2	8.00	97	0.37
Grading/Excavation (1B)	Trenchers	1	8.00	78	0.50
Stormwater Drainage and Foundation (1B)	Cement and Mortar Mixers	1	8.00	9	0.56
Stormwater Drainage and Foundation (1B)	Graders	1	8.00	187	0.41
Stormwater Drainage and Foundation (1B)	Paving Equipment	1	8.00	132	0.36
Stormwater Drainage and Foundation (1B)	Pumps	1	8.00	84	0.74
Stormwater Drainage and Foundation (1B)	Tractors/Loaders/Backhoes	1	8.00	97	0.37

Pettit Water Storage Tank Expansion and Transmission Project - Phase 1 - South Coast Air Basin, Winter

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Construction (1B)	Air Compressors	1	8.00	78	0.48
Construction (1B)	Cranes	2	8.00	231	0.29
Construction (1B)	Welders	1	8.00	46	0.45
Finishing (1B)	Pavers	2	8.00	130	0.42
Finishing (1B)	Paving Equipment	2	8.00	132	0.36
Installing Pipeline (1A)	Off-Highway Trucks	2	8.00	402	0.38
Installing Pipeline (1A)	Tractors/Loaders/Backhoes	2	8.00	97	0.37
Installing Appurtenances (1A)	Off-Highway Trucks	3	8.00	402	0.38
Installing Appurtenances (1A)	Tractors/Loaders/Backhoes	2	8.00	97	0.37
Pavement Repairs (1A)	Off-Highway Trucks	3	8.00	402	0.38
Pavement Repairs (1A)	Pavers	1	8.00	130	0.42
Pavement Repairs (1A)	Paving Equipment	1	8.00	132	0.36
Pavement Repairs (1A)	Rollers	1	8.00	80	0.38
Pavement Repairs (1A)	Tractors/Loaders/Backhoes	2	8.00	97	0.37
Painting (1B)	Aerial Lifts	1	8.00	63	0.31
Painting (1B)	Air Compressors	1	8.00	78	0.48
Painting (1B)	Forklifts	1	8.00	89	0.20

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Potholding (1A)	6	20.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Grading/Excavation (1B)	13	20.00	0.00	6,058.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Stormwater Drainage and Foundation (1B)	5	20.00	0.00	9,712.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Construction (1B)	4	20.00	36.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Finishing (1B)	4	20.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Installing Pipeline (1A)	4	20.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Installing Appurtenances (1A)	5	20.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Pavement Repairs (1A)	8	20.00	36.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Painting (1B)	3	20.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Water Exposed Area

3.2 Grading/Excavation (1B) - 2026

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					1.6830	0.0000	1.6830	0.1857	0.0000	0.1857			0.0000			0.0000
Off-Road	4.1114	33.4217	39.0422	0.1022		1.3928	1.3928		1.2888	1.2888		9,882.0659	9,882.0659	3.0305		9,957.8272
Total	**4.1114**	**33.4217**	**39.0422**	**0.1022**	**1.6830**	**1.3928**	**3.0758**	**0.1857**	**1.2888**	**1.4746**		**9,882.0659**	**9,882.0659**	**3.0305**		**9,957.8272**

Pettit Water Storage Tank Expansion and Transmission Project - Phase 1 - South Coast Air Basin, Winter

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.2231	14.7853	4.2173	0.0635	2.0370	0.1011	2.1381	0.5583	0.0968	0.6550		7,036.5514	7,036.5514	0.4590	1.1204	7,381.8920
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0561	0.0341	0.5229	1.6800e-003	0.2236	1.1000e-003	0.2247	0.0593	1.0100e-003	0.0603		176.3105	176.3105	3.6300e-003	3.9300e-003	177.5720
Total	**0.2792**	**14.8194**	**4.7401**	**0.0651**	**2.2605**	**0.1022**	**2.3628**	**0.6176**	**0.0978**	**0.7153**		**7,212.8619**	**7,212.8619**	**0.4626**	**1.1243**	**7,559.4640**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.6564	0.0000	0.6564	0.0724	0.0000	0.0724			0.0000			0.0000
Off-Road	4.1114	33.4217	39.0422	0.1022		1.3928	1.3928		1.2888	1.2888	0.0000	9,882.0659	9,882.0659	3.0305		9,957.8272
Total	**4.1114**	**33.4217**	**39.0422**	**0.1022**	**0.6564**	**1.3928**	**2.0492**	**0.0724**	**1.2888**	**1.3613**	**0.0000**	**9,882.0659**	**9,882.0659**	**3.0305**		**9,957.8272**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.2231	14.7853	4.2173	0.0635	2.0370	0.1011	2.1381	0.5583	0.0968	0.6550		7,036.5514	7,036.5514	0.4590	1.1204	7,381.8920
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0561	0.0341	0.5229	1.6800e-003	0.2236	1.1000e-003	0.2247	0.0593	1.0100e-003	0.0603		176.3105	176.3105	3.6300e-003	3.9300e-003	177.5720
Total	**0.2792**	**14.8194**	**4.7401**	**0.0651**	**2.2605**	**0.1022**	**2.3628**	**0.6176**	**0.0978**	**0.7153**		**7,212.8619**	**7,212.8619**	**0.4626**	**1.1243**	**7,559.4640**

3.3 Potholding (1A) - 2026

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.8641	12.4901	17.2751	0.0511		0.4754	0.4754		0.4374	0.4374		4,943.4759	4,943.4759	1.5988		4,983.4464
Total	**1.8641**	**12.4901**	**17.2751**	**0.0511**		**0.4754**	**0.4754**		**0.4374**	**0.4374**		**4,943.4759**	**4,943.4759**	**1.5988**		**4,983.4464**

Unmitigated Construction Off-Site

Pettit Water Storage Tank Expansion and Transmission Project - Phase 1 - South Coast Air Basin, Winter

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0561	0.0341	0.5229	1.6800e-003	0.2236	1.1000e-003	0.2247	0.0593	1.0100e-003	0.0603		176.3105	176.3105	3.6300e-003	3.9300e-003	177.5720
Total	**0.0561**	**0.0341**	**0.5229**	**1.6800e-003**	**0.2236**	**1.1000e-003**	**0.2247**	**0.0593**	**1.0100e-003**	**0.0603**		**176.3105**	**176.3105**	**3.6300e-003**	**3.9300e-003**	**177.5720**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.8641	12.4901	17.2751	0.0511		0.4754	0.4754		0.4374	0.4374	0.0000	4,943.4759	4,943.4759	1.5988		4,983.4464
Total	**1.8641**	**12.4901**	**17.2751**	**0.0511**		**0.4754**	**0.4754**		**0.4374**	**0.4374**	**0.0000**	**4,943.4759**	**4,943.4759**	**1.5988**		**4,983.4464**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0561	0.0341	0.5229	1.6800e-003	0.2236	1.1000e-003	0.2247	0.0593	1.0100e-003	0.0603		176.3105	176.3105	3.6300e-003	3.9300e-003	177.5720
Total	**0.0561**	**0.0341**	**0.5229**	**1.6800e-003**	**0.2236**	**1.1000e-003**	**0.2247**	**0.0593**	**1.0100e-003**	**0.0603**		**176.3105**	**176.3105**	**3.6300e-003**	**3.9300e-003**	**177.5720**

3.4 Stormwater Drainage and Foundation (1B) - 2026

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.9349	8.8508	10.3940	0.0211		0.3431	0.3431		0.3248	0.3248		2,010.1637	2,010.1637	0.4628		2,021.7324
Total	**0.9349**	**8.8508**	**10.3940**	**0.0211**		**0.3431**	**0.3431**		**0.3248**	**0.3248**		**2,010.1637**	**2,010.1637**	**0.4628**		**2,021.7324**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.3509	23.2560	6.6334	0.0998	3.2040	0.1591	3.3631	0.8781	0.1522	1.0303		11,067.9386	11,067.9386	0.7219	1.7622	11,611.1322

Pettit Water Storage Tank Expansion and Transmission Project - Phase 1 - South Coast Air Basin, Winter

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0561	0.0341	0.5229	1.6800e-003	0.2236	1.1000e-003	0.2247	0.0593	1.0100e-003	0.0603		176.3105	176.3105	3.6300e-003	3.9300e-003	177.5720
Total	**0.4070**	**23.2902**	**7.1563**	**0.1015**	**3.4275**	**0.1602**	**3.5877**	**0.9374**	**0.1532**	**1.0906**		**11,244.2492**	**11,244.2492**	**0.7255**	**1.7662**	**11,788.7041**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.9349	8.8508	10.3940	0.0211		0.3431	0.3431		0.3248	0.3248	0.0000	2,010.1637	2,010.1637	0.4628		2,021.7324
Total	**0.9349**	**8.8508**	**10.3940**	**0.0211**		**0.3431**	**0.3431**		**0.3248**	**0.3248**	**0.0000**	**2,010.1637**	**2,010.1637**	**0.4628**		**2,021.7324**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.3509	23.2560	6.6334	0.0998	3.2040	0.1591	3.3631	0.8781	0.1522	1.0303		11,067.9386	11,067.9386	0.7219	1.7622	11,611.1322
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0561	0.0341	0.5229	1.6800e-003	0.2236	1.1000e-003	0.2247	0.0593	1.0100e-003	0.0603		176.3105	176.3105	3.6300e-003	3.9300e-003	177.5720
Total	**0.4070**	**23.2902**	**7.1563**	**0.1015**	**3.4275**	**0.1602**	**3.5877**	**0.9374**	**0.1532**	**1.0906**		**11,244.2492**	**11,244.2492**	**0.7255**	**1.7662**	**11,788.7041**

3.5 Construction (1B) - 2026

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.0732	9.2053	7.5367	0.0181		0.3789	0.3789		0.3573	0.3573		1,700.3943	1,700.3943	0.4017		1,710.4357
Total	**1.0732**	**9.2053**	**7.5367**	**0.0181**		**0.3789**	**0.3789**		**0.3573**	**0.3573**		**1,700.3943**	**1,700.3943**	**0.4017**		**1,710.4357**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0344	1.3698	0.4997	6.2200e-003	0.2305	7.3800e-003	0.2379	0.0664	7.0600e-003	0.0734		673.5877	673.5877	0.0262	0.0982	703.4975
Worker	0.0561	0.0341	0.5229	1.6800e-003	0.2236	1.1000e-003	0.2247	0.0593	1.0100e-003	0.0603		176.3105	176.3105	3.6300e-003	3.9300e-003	177.5720
Total	**0.0905**	**1.4040**	**1.0226**	**7.9000e-003**	**0.4540**	**8.4800e-003**	**0.4625**	**0.1256**	**8.0700e-003**	**0.1337**		**849.8982**	**849.8982**	**0.0298**	**0.1021**	**881.0694**

Pettit Water Storage Tank Expansion and Transmission Project - Phase 1 - South Coast Air Basin, Winter

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.0732	9.2053	7.5367	0.0181		0.3789	0.3789		0.3573	0.3573	0.0000	1,700.3943	1,700.3943	0.4017		1,710.4357
Total	**1.0732**	**9.2053**	**7.5367**	**0.0181**		**0.3789**	**0.3789**		**0.3573**	**0.3573**	**0.0000**	**1,700.3943**	**1,700.3943**	**0.4017**		**1,710.4357**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0344	1.3698	0.4997	6.2200e-003	0.2305	7.3800e-003	0.2379	0.0664	7.0600e-003	0.0734		673.5877	673.5877	0.0262	0.0982	703.4975
Worker	0.0561	0.0341	0.5229	1.6800e-003	0.2236	1.1000e-003	0.2247	0.0593	1.0100e-003	0.0603		176.3105	176.3105	3.6300e-003	3.9300e-003	177.5720
Total	**0.0905**	**1.4040**	**1.0226**	**7.9000e-003**	**0.4540**	**8.4800e-003**	**0.4625**	**0.1256**	**8.0700e-003**	**0.1337**		**849.8982**	**849.8982**	**0.0298**	**0.1021**	**881.0694**

3.5 Construction (1B) - 2027

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.0732	9.2053	7.5367	0.0181		0.3789	0.3789		0.3573	0.3573		1,700.3943	1,700.3943	0.4017		1,710.4357
Total	**1.0732**	**9.2053**	**7.5367**	**0.0181**		**0.3789**	**0.3789**		**0.3573**	**0.3573**		**1,700.3943**	**1,700.3943**	**0.4017**		**1,710.4357**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0337	1.3600	0.4947	6.1000e-003	0.2305	7.3500e-003	0.2378	0.0664	7.0300e-003	0.0734		660.3577	660.3577	0.0261	0.0964	689.7284
Worker	0.0530	0.0312	0.4951	1.6300e-003	0.2236	1.0300e-003	0.2246	0.0593	9.5000e-004	0.0602		172.6870	172.6870	3.3200e-003	3.7300e-003	173.8816
Total	**0.0868**	**1.3913**	**0.9898**	**7.7300e-003**	**0.4540**	**8.3800e-003**	**0.4624**	**0.1256**	**7.9800e-003**	**0.1336**		**833.0447**	**833.0447**	**0.0295**	**0.1001**	**863.6100**

Mitigated Construction On-Site

Pettit Water Storage Tank Expansion and Transmission Project - Phase 1 - South Coast Air Basin, Winter

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.0732	9.2053	7.5367	0.0181		0.3789	0.3789		0.3573	0.3573	0.0000	1,700.3943	1,700.3943	0.4017		1,710.4357
Total	**1.0732**	**9.2053**	**7.5367**	**0.0181**		**0.3789**	**0.3789**		**0.3573**	**0.3573**	**0.0000**	**1,700.3943**	**1,700.3943**	**0.4017**		**1,710.4357**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0337	1.3600	0.4947	6.1000e-003	0.2305	7.3500e-003	0.2378	0.0664	7.0300e-003	0.0734		660.3577	660.3577	0.0261	0.0964	689.7284
Worker	0.0530	0.0312	0.4951	1.6300e-003	0.2236	1.0300e-003	0.2246	0.0593	9.5000e-004	0.0602		172.6870	172.6870	3.3200e-003	3.7300e-003	173.8816
Total	**0.0868**	**1.3913**	**0.9898**	**7.7300e-003**	**0.4540**	**8.3800e-003**	**0.4624**	**0.1256**	**7.9800e-003**	**0.1336**		**833.0447**	**833.0447**	**0.0295**	**0.1001**	**863.6100**

3.6 Finishing (1B) - 2026

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.6412	5.6956	10.8845	0.0176		0.2734	0.2734		0.2515	0.2515		1,698.6213	1,698.6213	0.5494		1,712.3555
Paving	0.0527					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**0.6940**	**5.6956**	**10.8845**	**0.0176**		**0.2734**	**0.2734**		**0.2515**	**0.2515**		**1,698.6213**	**1,698.6213**	**0.5494**		**1,712.3555**

Pettit Water Storage Tank Expansion and Transmission Project - Phase 1 - South Coast Air Basin, Winter

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0561	0.0341	0.5229	1.6800e-003	0.2236	1.1000e-003	0.2247	0.0593	1.0100e-003	0.0603		176.3105	176.3105	3.6300e-003	3.9300e-003	177.5720
Total	**0.0561**	**0.0341**	**0.5229**	**1.6800e-003**	**0.2236**	**1.1000e-003**	**0.2247**	**0.0593**	**1.0100e-003**	**0.0603**		**176.3105**	**176.3105**	**3.6300e-003**	**3.9300e-003**	**177.5720**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.6412	5.6956	10.8845	0.0176		0.2734	0.2734		0.2515	0.2515	0.0000	1,698.6213	1,698.6213	0.5494		1,712.3555
Paving	0.0527					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**0.6940**	**5.6956**	**10.8845**	**0.0176**		**0.2734**	**0.2734**		**0.2515**	**0.2515**	**0.0000**	**1,698.6213**	**1,698.6213**	**0.5494**		**1,712.3555**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0561	0.0341	0.5229	1.6800e-003	0.2236	1.1000e-003	0.2247	0.0593	1.0100e-003	0.0603		176.3105	176.3105	3.6300e-003	3.9300e-003	177.5720
Total	**0.0561**	**0.0341**	**0.5229**	**1.6800e-003**	**0.2236**	**1.1000e-003**	**0.2247**	**0.0593**	**1.0100e-003**	**0.0603**		**176.3105**	**176.3105**	**3.6300e-003**	**3.9300e-003**	**177.5720**

3.6 Finishing (1B) - 2027

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.6412	5.6956	10.8845	0.0176		0.2734	0.2734		0.2515	0.2515		1,698.6213	1,698.6213	0.5494		1,712.3555
Paving	0.0527					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**0.6940**	**5.6956**	**10.8845**	**0.0176**		**0.2734**	**0.2734**		**0.2515**	**0.2515**		**1,698.6213**	**1,698.6213**	**0.5494**		**1,712.3555**

Pettit Water Storage Tank Expansion and Transmission Project - Phase 1 - South Coast Air Basin, Winter

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0530	0.0312	0.4951	1.6300e-003	0.2236	1.0300e-003	0.2246	0.0593	9.5000e-004	0.0602		172.6870	172.6870	3.3200e-003	3.7300e-003	173.8816
Total	**0.0530**	**0.0312**	**0.4951**	**1.6300e-003**	**0.2236**	**1.0300e-003**	**0.2246**	**0.0593**	**9.5000e-004**	**0.0602**		**172.6870**	**172.6870**	**3.3200e-003**	**3.7300e-003**	**173.8816**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.6412	5.6956	10.8845	0.0176		0.2734	0.2734		0.2515	0.2515	0.0000	1,698.6213	1,698.6213	0.5494		1,712.3555
Paving	0.0527					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**0.6940**	**5.6956**	**10.8845**	**0.0176**		**0.2734**	**0.2734**		**0.2515**	**0.2515**	**0.0000**	**1,698.6213**	**1,698.6213**	**0.5494**		**1,712.3555**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0530	0.0312	0.4951	1.6300e-003	0.2236	1.0300e-003	0.2246	0.0593	9.5000e-004	0.0602		172.6870	172.6870	3.3200e-003	3.7300e-003	173.8816
Total	**0.0530**	**0.0312**	**0.4951**	**1.6300e-003**	**0.2236**	**1.0300e-003**	**0.2246**	**0.0593**	**9.5000e-004**	**0.0602**		**172.6870**	**172.6870**	**3.3200e-003**	**3.7300e-003**	**173.8816**

3.7 Painting (1B) - 2026

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Archit. Coating	0.3974					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.3487	2.8663	4.6370	7.1700e-003		0.1214	0.1214		0.1172	0.1172		685.9147	685.9147	0.1209		688.9383
Total	**0.7462**	**2.8663**	**4.6370**	**7.1700e-003**		**0.1214**	**0.1214**		**0.1172**	**0.1172**		**685.9147**	**685.9147**	**0.1209**		**688.9383**

Pettit Water Storage Tank Expansion and Transmission Project - Phase 1 - South Coast Air Basin, Winter

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0561	0.0341	0.5229	1.6800e-003	0.2236	1.1000e-003	0.2247	0.0593	1.0100e-003	0.0603		176.3105	176.3105	3.6300e-003	3.9300e-003	177.5720
Total	**0.0561**	**0.0341**	**0.5229**	**1.6800e-003**	**0.2236**	**1.1000e-003**	**0.2247**	**0.0593**	**1.0100e-003**	**0.0603**		**176.3105**	**176.3105**	**3.6300e-003**	**3.9300e-003**	**177.5720**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Archit. Coating	0.3974					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.3487	2.8663	4.6370	7.1700e-003		0.1214	0.1214		0.1172	0.1172	0.0000	685.9147	685.9147	0.1209		688.9383
Total	**0.7462**	**2.8663**	**4.6370**	**7.1700e-003**		**0.1214**	**0.1214**		**0.1172**	**0.1172**	**0.0000**	**685.9147**	**685.9147**	**0.1209**		**688.9383**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0561	0.0341	0.5229	1.6800e-003	0.2236	1.1000e-003	0.2247	0.0593	1.0100e-003	0.0603		176.3105	176.3105	3.6300e-003	3.9300e-003	177.5720
Total	**0.0561**	**0.0341**	**0.5229**	**1.6800e-003**	**0.2236**	**1.1000e-003**	**0.2247**	**0.0593**	**1.0100e-003**	**0.0603**		**176.3105**	**176.3105**	**3.6300e-003**	**3.9300e-003**	**177.5720**

3.7 Painting (1B) - 2027

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Archit. Coating	0.3974					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.3487	2.8663	4.6370	7.1700e-003		0.1214	0.1214		0.1172	0.1172		685.9147	685.9147	0.1209		688.9383
Total	**0.7462**	**2.8663**	**4.6370**	**7.1700e-003**		**0.1214**	**0.1214**		**0.1172**	**0.1172**		**685.9147**	**685.9147**	**0.1209**		**688.9383**

Pettit Water Storage Tank Expansion and Transmission Project - Phase 1 - South Coast Air Basin, Winter

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0530	0.0312	0.4951	1.6300e-003	0.2236	1.0300e-003	0.2246	0.0593	9.5000e-004	0.0602		172.6870	172.6870	3.3200e-003	3.7300e-003	173.8816
Total	**0.0530**	**0.0312**	**0.4951**	**1.6300e-003**	**0.2236**	**1.0300e-003**	**0.2246**	**0.0593**	**9.5000e-004**	**0.0602**		**172.6870**	**172.6870**	**3.3200e-003**	**3.7300e-003**	**173.8816**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Archit. Coating	0.3974					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.3487	2.8663	4.6370	7.1700e-003		0.1214	0.1214		0.1172	0.1172	0.0000	685.9147	685.9147	0.1209		688.9383
Total	**0.7462**	**2.8663**	**4.6370**	**7.1700e-003**		**0.1214**	**0.1214**		**0.1172**	**0.1172**	**0.0000**	**685.9147**	**685.9147**	**0.1209**		**688.9383**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0530	0.0312	0.4951	1.6300e-003	0.2236	1.0300e-003	0.2246	0.0593	9.5000e-004	0.0602		172.6870	172.6870	3.3200e-003	3.7300e-003	173.8816
Total	**0.0530**	**0.0312**	**0.4951**	**1.6300e-003**	**0.2236**	**1.0300e-003**	**0.2246**	**0.0593**	**9.5000e-004**	**0.0602**		**172.6870**	**172.6870**	**3.3200e-003**	**3.7300e-003**	**173.8816**

3.8 Installing Pipeline (1A) - 2026

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.2194	8.4023	10.8303	0.0327		0.3131	0.3131		0.2880	0.2880		3,163.4626	3,163.4626	1.0231		3,189.0408
Total	**1.2194**	**8.4023**	**10.8303**	**0.0327**		**0.3131**	**0.3131**		**0.2880**	**0.2880**		**3,163.4626**	**3,163.4626**	**1.0231**		**3,189.0408**

Pettit Water Storage Tank Expansion and Transmission Project - Phase 1 - South Coast Air Basin, Winter

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0561	0.0341	0.5229	1.6800e-003	0.2236	1.1000e-003	0.2247	0.0593	1.0100e-003	0.0603		176.3105	176.3105	3.6300e-003	3.9300e-003	177.5720
Total	**0.0561**	**0.0341**	**0.5229**	**1.6800e-003**	**0.2236**	**1.1000e-003**	**0.2247**	**0.0593**	**1.0100e-003**	**0.0603**		**176.3105**	**176.3105**	**3.6300e-003**	**3.9300e-003**	**177.5720**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.2194	8.4023	10.8303	0.0327		0.3131	0.3131		0.2880	0.2880	0.0000	3,163.4626	3,163.4626	1.0231		3,189.0408
Total	**1.2194**	**8.4023**	**10.8303**	**0.0327**		**0.3131**	**0.3131**		**0.2880**	**0.2880**	**0.0000**	**3,163.4626**	**3,163.4626**	**1.0231**		**3,189.0408**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0561	0.0341	0.5229	1.6800e-003	0.2236	1.1000e-003	0.2247	0.0593	1.0100e-003	0.0603		176.3105	176.3105	3.6300e-003	3.9300e-003	177.5720
Total	**0.0561**	**0.0341**	**0.5229**	**1.6800e-003**	**0.2236**	**1.1000e-003**	**0.2247**	**0.0593**	**1.0100e-003**	**0.0603**		**176.3105**	**176.3105**	**3.6300e-003**	**3.9300e-003**	**177.5720**

3.9 Installing Appurtenances (1A) - 2026

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.6970	11.2684	14.0157	0.0459		0.4155	0.4155		0.3823	0.3823		4,443.1380	4,443.1380	1.4370		4,479.0630
Total	**1.6970**	**11.2684**	**14.0157**	**0.0459**		**0.4155**	**0.4155**		**0.3823**	**0.3823**		**4,443.1380**	**4,443.1380**	**1.4370**		**4,479.0630**

Pettit Water Storage Tank Expansion and Transmission Project - Phase 1 - South Coast Air Basin, Winter

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0561	0.0341	0.5229	1.6800e-003	0.2236	1.1000e-003	0.2247	0.0593	1.0100e-003	0.0603		176.3105	176.3105	3.6300e-003	3.9300e-003	177.5720
Total	**0.0561**	**0.0341**	**0.5229**	**1.6800e-003**	**0.2236**	**1.1000e-003**	**0.2247**	**0.0593**	**1.0100e-003**	**0.0603**		**176.3105**	**176.3105**	**3.6300e-003**	**3.9300e-003**	**177.5720**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.6970	11.2684	14.0157	0.0459		0.4155	0.4155		0.3823	0.3823	0.0000	4,443.1380	4,443.1380	1.4370		4,479.0630
Total	**1.6970**	**11.2684**	**14.0157**	**0.0459**		**0.4155**	**0.4155**		**0.3823**	**0.3823**	**0.0000**	**4,443.1380**	**4,443.1380**	**1.4370**		**4,479.0630**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0561	0.0341	0.5229	1.6800e-003	0.2236	1.1000e-003	0.2247	0.0593	1.0100e-003	0.0603		176.3105	176.3105	3.6300e-003	3.9300e-003	177.5720
Total	**0.0561**	**0.0341**	**0.5229**	**1.6800e-003**	**0.2236**	**1.1000e-003**	**0.2247**	**0.0593**	**1.0100e-003**	**0.0603**		**176.3105**	**176.3105**	**3.6300e-003**	**3.9300e-003**	**177.5720**

3.10 Pavement Repairs (1A) - 2027

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	2.1546	15.5592	21.3047	0.0573		0.6248	0.6248		0.5748	0.5748		5,546.5106	5,546.5106	1.7939		5,591.3569
Paving	0.3144					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**2.4690**	**15.5592**	**21.3047**	**0.0573**		**0.6248**	**0.6248**		**0.5748**	**0.5748**		**5,546.5106**	**5,546.5106**	**1.7939**		**5,591.3569**

Pettit Water Storage Tank Expansion and Transmission Project - Phase 1 - South Coast Air Basin, Winter

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0337	1.3600	0.4947	6.1000e-003	0.2305	7.3500e-003	0.2378	0.0664	7.0300e-003	0.0734		660.3577	660.3577	0.0261	0.0964	689.7284
Worker	0.0530	0.0312	0.4951	1.6300e-003	0.2236	1.0300e-003	0.2246	0.0593	9.5000e-004	0.0602		172.6870	172.6870	3.3200e-003	3.7300e-003	173.8816
Total	**0.0868**	**1.3913**	**0.9898**	**7.7300e-003**	**0.4540**	**8.3800e-003**	**0.4624**	**0.1256**	**7.9800e-003**	**0.1336**		**833.0447**	**833.0447**	**0.0295**	**0.1001**	**863.6100**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	2.1546	15.5592	21.3047	0.0573		0.6248	0.6248		0.5748	0.5748	0.0000	5,546.5106	5,546.5106	1.7939		5,591.3569
Paving	0.3144					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**2.4690**	**15.5592**	**21.3047**	**0.0573**		**0.6248**	**0.6248**		**0.5748**	**0.5748**	**0.0000**	**5,546.5106**	**5,546.5106**	**1.7939**		**5,591.3569**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0337	1.3600	0.4947	6.1000e-003	0.2305	7.3500e-003	0.2378	0.0664	7.0300e-003	0.0734		660.3577	660.3577	0.0261	0.0964	689.7284
Worker	0.0530	0.0312	0.4951	1.6300e-003	0.2236	1.0300e-003	0.2246	0.0593	9.5000e-004	0.0602		172.6870	172.6870	3.3200e-003	3.7300e-003	173.8816
Total	**0.0868**	**1.3913**	**0.9898**	**7.7300e-003**	**0.4540**	**8.3800e-003**	**0.4624**	**0.1256**	**7.9800e-003**	**0.1336**		**833.0447**	**833.0447**	**0.0295**	**0.1001**	**863.6100**

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000

Pettit Water Storage Tank Expansion and Transmission Project - Phase 1 - South Coast Air Basin, Winter

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	0.0974	2.0000e-004	0.0226	0.0000		8.0000e-005	8.0000e-005		8.0000e-005	8.0000e-005		0.0485	0.0485	1.3000e-004		0.0516
Unmitigated	0.0974	2.0000e-004	0.0226	0.0000		8.0000e-005	8.0000e-005		8.0000e-005	8.0000e-005		0.0485	0.0485	1.3000e-004		0.0516

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	0.0169					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	0.0785					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	2.0800e-003	2.0000e-004	0.0226	0.0000		8.0000e-005	8.0000e-005		8.0000e-005	8.0000e-005		0.0485	0.0485	1.3000e-004		0.0516
Total	**0.0974**	**2.0000e-004**	**0.0226**	**0.0000**		**8.0000e-005**	**8.0000e-005**		**8.0000e-005**	**8.0000e-005**		**0.0485**	**0.0485**	**1.3000e-004**		**0.0516**

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Pettit Water Storage Tank Expansion and Transmission Project - Phase 1 - South Coast Air Basin, Winter

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	0.0169					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	0.0785					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	2.0800e-003	2.0000e-004	0.0226	0.0000		8.0000e-005	8.0000e-005		8.0000e-005	8.0000e-005		0.0485	0.0485	1.3000e-004		0.0516
Total	**0.0974**	**2.0000e-004**	**0.0226**	**0.0000**		**8.0000e-005**	**8.0000e-005**		**8.0000e-005**	**8.0000e-005**		**0.0485**	**0.0485**	**1.3000e-004**		**0.0516**

Appendix AQ/GHG/Energy-2B Construction Emissions Calculations Phase 2

ESA

Pettit Water Storage Tank Expansion and Transmission Pipeline Project - Phase 2

Air Quality Construction Analysis

Regional Emissions Summary	ROG	NOX	CO	SO2	Total PM10	Total PM2.5
Source	lb/day					
3.2 Demolition - 2045	1.3	6.2	17.3	<1	<1	<1
3.3 Grading/Excavation - 2045	4.3	15.6	41.2	<1	1.5	<1
3.4 Stormwater Drainage and Foundation - 2045	<1	3.9	11.1	<1	<1	<1
3.5 Construction - 2045	<1	3.3	7.4	<1	<1	<1
3.6 Finishing - 2045	<1	1.0	6.3	<1	<1	<1
3.7 Painting - 2045	<1	1.9	5.1	<1	<1	<1
Project Daily Maximum Emissions	**4.3**	**15.6**	**41.2**	**<1**	**1.5**	**<1**
SCAQMD Regional Significance Threholds	**75**	**100**	**550**	**150**	**150**	**55**
Exceeds Thresholds?	**No**	**No**	**No**	**No**	**No**	**No**

Localized Emissions Summary	NOX	CO	Total PM10	Total PM2.5
Source	lb/day			
3.2 Demolition - 2045	6.1	16.8	<1	<1
3.3 Grading/Excavation - 2045	10.7	37.1	<1	<1
3.4 Stormwater Drainage and Foundation - 2045	3.8	10.6	<1	<1
3.5 Construction - 2045	2.9	6.7	<1	<1
3.6 Finishing - 2045	1.0	6.0	<1	<1
3.7 Painting - 2045	1.9	4.7	<1	<1
Project Daily Localized Maximum Emissions	**10.7**	**37.1**	**<1**	**<1**
SCAQMD Localized Significance Threholds	**1080**	**1346**	**11**	**7**
Exceeds Thresholds?	**No**	**No**	**No**	**No**

Pettit Water Storage Tank Expansion and Transmission Pipeline Project - Phase 2

Air Quality Construction Analysis

Regional Maximums	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
Source						**lb/day**				
3.2 Demolition - 2045	1.3	6.2	17.3	0.0	0.2	0.1	0.4	0.1	0.1	0.2
3.3 Grading/Excavation - 2045	4.3	15.6	41.2	0.1	1.2	0.3	1.5	0.2	0.3	0.5
3.4 Stormwater Drainage and Foundation - 2045	0.9	3.9	11.1	0.0	0.2	0.1	0.3	0.1	0.1	0.1
3.5 Construction - 2045	0.8	3.3	7.4	0.0	0.3	0.0	0.3	0.1	0.0	0.1
3.6 Finishing - 2045	0.4	1.0	6.3	0.0	0.2	0.0	0.3	0.1	0.0	0.1
3.7 Painting - 2045	0.5	1.9	5.1	0.0	0.2	0.0	0.2	0.1	0.0	0.1
Project Daily Maximum Emissions	**4.3**	**15.6**	**41.2**	**0.1**	**1.2**	**0.3**	**1.5**	**0.2**	**0.3**	**0.5**

Localized Maximum	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
Source						**lb/day**				
3.2 Demolition - 2045	1.3	6.1	16.8	0.0	0.0	0.1	0.1	0.0	0.1	0.1
3.3 Grading/Excavation - 2045	4.1	10.7	37.1	0.1	0.6	0.3	0.9	0.1	0.3	0.4
3.4 Stormwater Drainage and Foundation - 2045	0.8	3.8	10.6	0.0	0.0	0.1	0.1	0.0	0.1	0.1
3.5 Construction - 2045	0.8	2.9	6.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3.6 Finishing - 2045	0.4	1.0	6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3.7 Painting - 2045	0.5	1.9	4.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Project Daily Maximum Emissions	**4.1**	**10.7**	**37.1**	**0.1**	**0.6**	**0.3**	**0.9**	**0.1**	**0.3**	**0.4**
Threshold		**1080.0**	**1345.7**				**11.0**			**6.7**
Significant Impact?		**No**	**No**				**No**			**No**

Pettit Water Storage Tank Expansion and Transmission Pipeline Project - Phase 2
Air Quality Construction Analysis

Summer	Onsite Emissions									
	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
Source	lb/day									
3.2 Demolition - 2045	1.31	6.10	16.78	0.04	0.03	0.11	0.14	0.00	0.11	0.12
3.3 Grading/Excavation - 2045	4.09	10.70	37.07	0.11	0.63	0.30	0.93	0.07	0.30	0.37
3.4 Stormwater Drainage and Foundation - 2045	0.83	3.79	10.64	0.02	0.00	0.08	0.08	0.00	0.08	0.08
3.5 Construction - 2045	0.76	2.91	6.68	0.02	0.00	0.05	0.05	0.00	0.05	0.05
3.6 Finishing - 2045	0.38	1.01	5.97	0.01	0.00	0.05	0.05	0.00	0.05	0.05
3.7 Painting - 2045	0.46	1.92	4.73	0.01	0.00	0.02	0.02	0.00	0.02	0.02

Summer	Offsite Emissions									
	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
Source	lb/day									
3.2 Demolition - 2045	0.03	0.14	0.48	0.002	0.21	0.00	0.22	0.05	0.00	0.05
3.3 Grading/Excavation - 2045	0.26	4.90	4.13	0.014	0.57	0.02	0.59	0.15	0.02	0.17
3.4 Stormwater Drainage and Foundation - 2045	0.03	0.14	0.48	0.002	0.21	0.00	0.22	0.05	0.00	0.05
3.5 Construction - 2045	0.05	0.42	0.77	0.004	0.30	0.00	0.30	0.08	0.00	0.08
3.6 Finishing - 2045	0.03	0.02	0.38	0.001	0.21	0.00	0.21	0.05	0.00	0.05
3.7 Painting - 2045	0.03	0.02	0.38	0.001	0.21	0.00	0.21	0.05	0.00	0.05

Note: Offsite emissions pasted over from EMFAC2021 analysis

Regional Emissions	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
3.2 Demolition - 2045	1.34	6.24	17.26	0.04	0.25	0.11	0.36	0.06	0.11	0.17
3.3 Grading/Excavation - 2045	4.35	15.60	41.20	0.13	1.20	0.32	1.52	0.22	0.32	0.54
3.4 Stormwater Drainage and Foundation - 2045	0.86	3.93	11.11	0.03	0.21	0.08	0.29	0.05	0.08	0.13
3.5 Construction - 2045	0.81	3.33	7.45	0.02	0.30	0.05	0.35	0.08	0.05	0.12
3.6 Finishing - 2045	0.41	1.03	6.35	0.01	0.21	0.05	0.25	0.05	0.05	0.10
3.7 Painting - 2045	0.49	1.94	5.12	0.01	0.21	0.02	0.22	0.05	0.02	0.07
Project Daily Maximum Emissions	**4.35**	**15.60**	**41.20**	**0.13**	**1.20**	**0.32**	**1.52**	**0.22**	**0.32**	**0.54**

**Note: No overlapping phases for Phase 2 of Pettit Project*

Pettit Water Storage Tank Expansion and Transmission Pipeline Project - Phase 2
Air Quality Construction Analysis

Winter	Onsite Emissions										Offsite Emissions									
	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
Source	lb/day										lb/day									
3.2 Demolition - 2045	1.31	6.10	16.78	0.04	0.03	0.11	0.14	0.00	0.11	0.12	0.03	0.14	0.48	0.00	0.21	0.00	0.22	0.05	0.00	0.05
3.3 Grading/Excavation - 2045	4.09	10.70	37.07	0.11	0.63	0.30	0.93	0.07	0.30	0.37	0.26	4.90	4.13	0.01	0.57	0.02	0.59	0.15	0.02	0.17
3.4 Stormwater Drainage and Foundation - 2045	0.83	3.79	10.64	0.02	0.00	0.08	0.08	0.00	0.08	0.08	0.03	0.14	0.48	0.00	0.21	0.00	0.22	0.05	0.00	0.05
3.5 Construction - 2045	0.76	2.91	6.68	0.02	0.00	0.05	0.05	0.00	0.05	0.05	0.05	0.42	0.77	0.00	0.30	0.00	0.30	0.08	0.00	0.08
3.6 Finishing - 2045	0.38	1.01	5.97	0.01	0.00	0.05	0.05	0.00	0.05	0.05	0.03	0.02	0.38	0.00	0.21	0.00	0.21	0.05	0.00	0.05
3.7 Painting - 2045	0.46	1.92	4.73	0.01	0.00	0.02	0.02	0.00	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Note: Offsite emissions pasted over from EMFAC2021 analysis

Regional Emissions	ROG	NOX	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
3.2 Demolition - 2045	1.34	6.24	17.26	0.04	0.25	0.11	0.36	0.06	0.11	0.17
3.3 Grading/Excavation - 2045	4.35	15.60	41.20	0.13	1.20	0.32	1.52	0.22	0.32	0.54
3.4 Stormwater Drainage and Foundation - 2045	0.86	3.93	11.11	0.03	0.21	0.08	0.29	0.05	0.08	0.13
3.5 Construction - 2045	0.81	3.33	7.45	0.02	0.30	0.05	0.35	0.08	0.05	0.12
3.6 Finishing - 2045	0.41	1.03	6.35	0.01	0.21	0.05	0.25	0.05	0.05	0.10
3.7 Painting - 2045	0.46	1.92	4.73	0.01	0.00	0.02	0.02	0.00	0.02	0.02
Project Daily Maximum Emissions	**4.35**	**15.60**	**41.20**	**0.13**	**1.20**	**0.32**	**1.52**	**0.22**	**0.32**	**0.54**

**Note: No overlapping phases for Phase 2 of Pettit Project*

Pettit Water Storage Tank Expansion and Transmission Pipeline Project Phase 2 - South Coast Air Basin, Annual

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Pettit Water Storage Tank Expansion and Transmission Pipeline Project Phase 2

South Coast Air Basin, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Other Asphalt Surfaces	9.80	1000sqft	0.22	9,801.00	0
Other Non-Asphalt Surfaces	85.38	1000sqft	1.96	85,378.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	31
Climate Zone	10			**Operational Year**	2045
Utility Company	Southern California Edison				
CO2 Intensity (lb/MWhr)	0	**CH4 Intensity (lb/MWhr)**	0.033	**N2O Intensity (lb/MWhr)**	0.004

1.3 User Entered Comments & Non-Default Data

Project Characteristics - Project Assumptions - Phase 2. Intensity Factor gathered from SCE CO2 Intensity Factor RPS under SB100.

Land Use - Project Assumptions - Phase 2

Construction Phase - Project Assumptions - Phase 2

Off-road Equipment - Project Assumptions - Phase 2

Off-road Equipment - Jackhammer = Other Construction Equipment

Off-road Equipment - Project Assumptions - Phase 2

Off-road Equipment - Compactor = Paving equipment, Jackhammer = Other Construction Equipment

Off-road Equipment - Project Assumptions - Phase 2

Off-road Equipment - Compactor = Paving Equipment

Trips and VMT - Project Assumptions - Phase 2

Demolition - pg 370 of Preliminary Design Report.

Grading -

Construction Off-road Equipment Mitigation -

Table Name	Column Name	Default Value	New Value
tblConstructionPhase	NumDays	10.00	158.00
tblConstructionPhase	NumDays	220.00	25.00
tblConstructionPhase	NumDays	220.00	158.00
tblConstructionPhase	NumDays	20.00	26.00
tblConstructionPhase	NumDays	6.00	51.00
tblConstructionPhase	NumDays	10.00	158.00
tblConstructionPhase	NumDaysWeek	5.00	6.00
tblConstructionPhase	NumDaysWeek	5.00	6.00
tblConstructionPhase	NumDaysWeek	5.00	6.00
tblConstructionPhase	NumDaysWeek	5.00	6.00
tblConstructionPhase	NumDaysWeek	5.00	6.00
tblConstructionPhase	NumDaysWeek	5.00	6.00
tblGrading	MaterialExported	0.00	14,134.00
tblLandUse	LandUseSquareFeet	9,800.00	9,801.00
tblLandUse	LandUseSquareFeet	85,380.00	85,378.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	2.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	1.00
tblOffRoadEquipment	UsageHours	6.00	8.00
tblOffRoadEquipment	UsageHours	6.00	8.00
tblOffRoadEquipment	UsageHours	7.00	8.00
tblProjectCharacteristics	CO2IntensityFactor	390.98	0
tblTripsAndVMT	HaulingTripNumber	10.00	14.00
tblTripsAndVMT	HaulingTripNumber	1,767.00	2,020.00
tblTripsAndVMT	VendorTripNumber	16.00	0.00
tblTripsAndVMT	VendorTripNumber	16.00	0.00
tblTripsAndVMT	WorkerTripNumber	15.00	20.00
tblTripsAndVMT	WorkerTripNumber	33.00	20.00
tblTripsAndVMT	WorkerTripNumber	40.00	20.00
tblTripsAndVMT	WorkerTripNumber	40.00	20.00
tblTripsAndVMT	WorkerTripNumber	40.00	20.00

Pettit Water Storage Tank Expansion and Transmission Pipeline Project Phase 2 - South Coast Air Basin, Annual

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

tblTripsAndVMT	WorkerTripNumber	5.00	20.00
tblTripsAndVMT	WorkerTripNumber	8.00	20.00

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2045	0.2699	1.0293	2.8492	7.8500e-003	0.1841	0.0202	0.2043	0.0419	0.0201	0.0620	0.0000	713.3815	713.3815	0.0244	0.0103	717.0675
Maximum	**0.2699**	**1.0293**	**2.8492**	**7.8500e-003**	**0.1841**	**0.0202**	**0.2043**	**0.0419**	**0.0201**	**0.0620**	**0.0000**	**713.3815**	**713.3815**	**0.0244**	**0.0103**	**717.0675**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2045	0.2699	1.0293	2.8492	7.8500e-003	0.1582	0.0202	0.1784	0.0391	0.0201	0.0592	0.0000	713.3808	713.3808	0.0244	0.0103	717.0668
Maximum	**0.2699**	**1.0293**	**2.8492**	**7.8500e-003**	**0.1582**	**0.0202**	**0.1784**	**0.0391**	**0.0201**	**0.0592**	**0.0000**	**713.3808**	**713.3808**	**0.0244**	**0.0103**	**717.0668**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**14.05**	**0.00**	**12.67**	**6.78**	**0.00**	**4.58**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Quarter	Start Date	End Date	Maximum Unmitigated ROG + NOX (tons/quarter)	Maximum Mitigated ROG + NOX (tons/quarter)
1	**1-1-2045**	**3-31-2045**	0.5909	0.5909
2	**4-1-2045**	**6-30-2045**	0.2732	0.2732
3	**7-1-2045**	**9-30-2045**	0.3218	0.3218
		Highest	0.5909	0.5909

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Demolition	Demolition	1/1/2045	1/31/2045	6	26	
2	Grading/Excavation	Grading	2/1/2045	3/31/2045	6	51	
3	Stormwater Drainage and Foundation	Building Construction	4/1/2045	4/30/2045	6	25	
4	Construction	Building Construction	5/1/2045	10/31/2045	6	158	
5	Finishing	Paving	5/1/2045	10/31/2045	6	158	
6	Painting	Architectural Coating	5/1/2045	10/31/2045	6	158	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 76.5

Acres of Paving: 2.18

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 5,711 (Architectural Coating –

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Demolition	Concrete/Industrial Saws	1	8.00	81	0.73
Demolition	Other Construction Equipment	1	8.00	172	0.42
Demolition	Rubber Tired Dozers	1	8.00	247	0.40
Demolition	Tractors/Loaders/Backhoes	3	8.00	97	0.37
Grading/Excavation	Bore/Drill Rigs	1	8.00	221	0.50

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EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Grading/Excavation	Concrete/Industrial Saws	1	8.00	81	0.73
Grading/Excavation	Excavators	1	8.00	158	0.38
Grading/Excavation	Graders	1	8.00	187	0.41
Grading/Excavation	Off-Highway Trucks	3	8.00	402	0.38
Grading/Excavation	Other Construction Equipment	1	8.00	172	0.42
Grading/Excavation	Paving Equipment	1	8.00	132	0.36
Grading/Excavation	Scrapers	1	8.00	367	0.48
Grading/Excavation	Tractors/Loaders/Backhoes	2	8.00	97	0.37
Grading/Excavation	Trenchers	1	8.00	78	0.50
Stormwater Drainage and Foundation	Cement and Mortar Mixers	1	8.00	9	0.56
Stormwater Drainage and Foundation	Graders	1	8.00	187	0.41
Stormwater Drainage and Foundation	Paving Equipment	1	8.00	132	0.36
Stormwater Drainage and Foundation	Pumps	1	8.00	84	0.74
Stormwater Drainage and Foundation	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Construction	Air Compressors	1	8.00	78	0.48
Construction	Cranes	2	8.00	231	0.29
Construction	Welders	1	8.00	46	0.45
Finishing	Pavers	1	8.00	130	0.42
Finishing	Paving Equipment	1	8.00	132	0.36
Painting	Aerial Lifts	1	8.00	63	0.31
Painting	Air Compressors	1	8.00	78	0.48
Painting	Forklifts	1	8.00	89	0.20

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Demolition	6	20.00	0.00	14.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Grading/Excavation	13	20.00	0.00	2,020.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Stormwater Drainage and Foundation	5	20.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Construction	4	20.00	16.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Construction	4	20.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Finishing	2	20.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Painting	3	20.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Water Exposed Area

3.2 Demolition - 2045

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					1.0400e-003	0.0000	1.0400e-003	1.6000e-004	0.0000	1.6000e-004	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0171	0.0793	0.2181	4.6000e-004		1.4600e-003	1.4600e-003		1.4600e-003	1.4600e-003	0.0000	39.9348	39.9348	1.3500e-003	0.0000	39.9685
Total	**0.0171**	**0.0793**	**0.2181**	**4.6000e-004**	**1.0400e-003**	**1.4600e-003**	**2.5000e-003**	**1.6000e-004**	**1.4600e-003**	**1.6200e-003**	**0.0000**	**39.9348**	**39.9348**	**1.3500e-003**	**0.0000**	**39.9685**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	1.0000e-005	8.1000e-004	2.7000e-004	0.0000	1.2000e-004	1.0000e-005	1.3000e-004	3.0000e-005	1.0000e-005	4.0000e-005	0.0000	0.2970	0.2970	2.0000e-005	5.0000e-005	0.3118
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	3.0000e-004	2.1000e-004	4.3900e-003	2.0000e-005	2.8500e-003	1.0000e-005	2.8600e-003	7.6000e-004	1.0000e-005	7.6000e-004	0.0000	1.7970	1.7970	2.0000e-005	3.0000e-005	1.8071

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Total	**3.1000e-004**	**1.0200e-003**	**4.6600e-003**	**2.0000e-005**	**2.9700e-003**	**2.0000e-005**	**2.9900e-003**	**7.9000e-004**	**2.0000e-005**	**8.0000e-004**	**0.0000**	**2.0940**	**2.0940**	**4.0000e-005**	**8.0000e-005**	**2.1189**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					4.0000e-004	0.0000	4.0000e-004	6.0000e-005	0.0000	6.0000e-005	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0171	0.0793	0.2181	4.6000e-004		1.4600e-003	1.4600e-003		1.4600e-003	1.4600e-003	0.0000	39.9347	39.9347	1.3500e-003	0.0000	39.9685
Total	**0.0171**	**0.0793**	**0.2181**	**4.6000e-004**	**4.0000e-004**	**1.4600e-003**	**1.8600e-003**	**6.0000e-005**	**1.4600e-003**	**1.5200e-003**	**0.0000**	**39.9347**	**39.9347**	**1.3500e-003**	**0.0000**	**39.9685**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	1.0000e-005	8.1000e-004	2.7000e-004	0.0000	1.2000e-004	1.0000e-005	1.3000e-004	3.0000e-005	1.0000e-005	4.0000e-005	0.0000	0.2970	0.2970	2.0000e-005	5.0000e-005	0.3118
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	3.0000e-004	2.1000e-004	4.3900e-003	2.0000e-005	2.8500e-003	1.0000e-005	2.8600e-003	7.6000e-004	1.0000e-005	7.6000e-004	0.0000	1.7970	1.7970	2.0000e-005	3.0000e-005	1.8071
Total	**3.1000e-004**	**1.0200e-003**	**4.6600e-003**	**2.0000e-005**	**2.9700e-003**	**2.0000e-005**	**2.9900e-003**	**7.9000e-004**	**2.0000e-005**	**8.0000e-004**	**0.0000**	**2.0940**	**2.0940**	**4.0000e-005**	**8.0000e-005**	**2.1189**

3.3 Grading/Excavation - 2045

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0414	0.0000	0.0414	4.5000e-003	0.0000	4.5000e-003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.1042	0.2728	0.9453	2.8800e-003		7.6900e-003	7.6900e-003		7.6900e-003	7.6900e-003	0.0000	271.5893	271.5893	8.3000e-003	0.0000	271.7969
Total	**0.1042**	**0.2728**	**0.9453**	**2.8800e-003**	**0.0414**	**7.6900e-003**	**0.0491**	**4.5000e-003**	**7.6900e-003**	**0.0122**	**0.0000**	**271.5893**	**271.5893**	**8.3000e-003**	**0.0000**	**271.7969**

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EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	1.8900e-003	0.1162	0.0390	4.2000e-004	0.0174	7.9000e-004	0.0182	4.7700e-003	7.6000e-004	5.5300e-003	0.0000	42.8536	42.8536	3.5900e-003	6.8400e-003	44.9817
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	6.0000e-004	4.1000e-004	8.6200e-003	3.0000e-005	5.6000e-003	1.0000e-005	5.6100e-003	1.4900e-003	1.0000e-005	1.5000e-003	0.0000	3.5249	3.5249	3.0000e-005	6.0000e-005	3.5448
Total	**2.4900e-003**	**0.1166**	**0.0477**	**4.5000e-004**	**0.0230**	**8.0000e-004**	**0.0238**	**6.2600e-003**	**7.7000e-004**	**7.0300e-003**	**0.0000**	**46.3785**	**46.3785**	**3.6200e-003**	**6.9000e-003**	**48.5265**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0161	0.0000	0.0161	1.7600e-003	0.0000	1.7600e-003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.1042	0.2728	0.9453	2.8800e-003		7.6900e-003	7.6900e-003		7.6900e-003	7.6900e-003	0.0000	271.5890	271.5890	8.3000e-003	0.0000	271.7966
Total	**0.1042**	**0.2728**	**0.9453**	**2.8800e-003**	**0.0161**	**7.6900e-003**	**0.0238**	**1.7600e-003**	**7.6900e-003**	**9.4500e-003**	**0.0000**	**271.5890**	**271.5890**	**8.3000e-003**	**0.0000**	**271.7966**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	1.8900e-003	0.1162	0.0390	4.2000e-004	0.0174	7.9000e-004	0.0182	4.7700e-003	7.6000e-004	5.5300e-003	0.0000	42.8536	42.8536	3.5900e-003	6.8400e-003	44.9817
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	6.0000e-004	4.1000e-004	8.6200e-003	3.0000e-005	5.6000e-003	1.0000e-005	5.6100e-003	1.4900e-003	1.0000e-005	1.5000e-003	0.0000	3.5249	3.5249	3.0000e-005	6.0000e-005	3.5448
Total	**2.4900e-003**	**0.1166**	**0.0477**	**4.5000e-004**	**0.0230**	**8.0000e-004**	**0.0238**	**6.2600e-003**	**7.7000e-004**	**7.0300e-003**	**0.0000**	**46.3785**	**46.3785**	**3.6200e-003**	**6.9000e-003**	**48.5265**

Pettit Water Storage Tank Expansion and Transmission Pipeline Project Phase 2 - South Coast Air Basin, Annual

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.4 Stormwater Drainage and Foundation - 2045

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0103	0.0474	0.1329	3.0000e-004		9.5000e-004	9.5000e-004		9.5000e-004	9.5000e-004	0.0000	25.8326	25.8326	8.2000e-004	0.0000	25.8532
Total	**0.0103**	**0.0474**	**0.1329**	**3.0000e-004**		**9.5000e-004**	**9.5000e-004**		**9.5000e-004**	**9.5000e-004**	**0.0000**	**25.8326**	**25.8326**	**8.2000e-004**	**0.0000**	**25.8532**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.9000e-004	2.0000e-004	4.2200e-003	2.0000e-005	2.7400e-003	1.0000e-005	2.7500e-003	7.3000e-004	1.0000e-005	7.3000e-004	0.0000	1.7279	1.7279	1.0000e-005	3.0000e-005	1.7376
Total	**2.9000e-004**	**2.0000e-004**	**4.2200e-003**	**2.0000e-005**	**2.7400e-003**	**1.0000e-005**	**2.7500e-003**	**7.3000e-004**	**1.0000e-005**	**7.3000e-004**	**0.0000**	**1.7279**	**1.7279**	**1.0000e-005**	**3.0000e-005**	**1.7376**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0103	0.0474	0.1329	3.0000e-004		9.5000e-004	9.5000e-004		9.5000e-004	9.5000e-004	0.0000	25.8326	25.8326	8.2000e-004	0.0000	25.8532
Total	**0.0103**	**0.0474**	**0.1329**	**3.0000e-004**		**9.5000e-004**	**9.5000e-004**		**9.5000e-004**	**9.5000e-004**	**0.0000**	**25.8326**	**25.8326**	**8.2000e-004**	**0.0000**	**25.8532**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.9000e-004	2.0000e-004	4.2200e-003	2.0000e-005	2.7400e-003	1.0000e-005	2.7500e-003	7.3000e-004	1.0000e-005	7.3000e-004	0.0000	1.7279	1.7279	1.0000e-005	3.0000e-005	1.7376
Total	**2.9000e-004**	**2.0000e-004**	**4.2200e-003**	**2.0000e-005**	**2.7400e-003**	**1.0000e-005**	**2.7500e-003**	**7.3000e-004**	**1.0000e-005**	**7.3000e-004**	**0.0000**	**1.7279**	**1.7279**	**1.0000e-005**	**3.0000e-005**	**1.7376**

Pettit Water Storage Tank Expansion and Transmission Pipeline Project Phase 2 - South Coast Air Basin, Annual

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.5 Construction - 2045

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0601	0.2300	0.5274	1.6300e-003		3.6400e-003	3.6400e-003		3.6400e-003	3.6400e-003	0.0000	138.0056	138.0056	4.7700e-003	0.0000	138.1248
Total	**0.0601**	**0.2300**	**0.5274**	**1.6300e-003**		**3.6400e-003**	**3.6400e-003**		**3.6400e-003**	**3.6400e-003**	**0.0000**	**138.0056**	**138.0056**	**4.7700e-003**	**0.0000**	**138.1248**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	1.1100e-003	0.0453	0.0169	1.7000e-004	0.0136	2.4000e-004	0.0139	3.6800e-003	2.3000e-004	3.9100e-003	0.0000	17.0725	17.0725	8.2000e-004	2.5200e-003	17.8431
Worker	3.7000e-003	2.5400e-003	0.0534	2.1000e-004	0.0647	7.0000e-005	0.0648	0.0166	6.0000e-005	0.0167	0.0000	21.8405	21.8405	1.9000e-004	4.0000e-004	21.9636
Total	**4.8100e-003**	**0.0478**	**0.0703**	**3.8000e-004**	**0.0783**	**3.1000e-004**	**0.0786**	**0.0203**	**2.9000e-004**	**0.0206**	**0.0000**	**38.9130**	**38.9130**	**1.0100e-003**	**2.9200e-003**	**39.8066**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0601	0.2300	0.5274	1.6300e-003		3.6400e-003	3.6400e-003		3.6400e-003	3.6400e-003	0.0000	138.0054	138.0054	4.7700e-003	0.0000	138.1246
Total	**0.0601**	**0.2300**	**0.5274**	**1.6300e-003**		**3.6400e-003**	**3.6400e-003**		**3.6400e-003**	**3.6400e-003**	**0.0000**	**138.0054**	**138.0054**	**4.7700e-003**	**0.0000**	**138.1246**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	1.1100e-003	0.0453	0.0169	1.7000e-004	0.0136	2.4000e-004	0.0139	3.6800e-003	2.3000e-004	3.9100e-003	0.0000	17.0725	17.0725	8.2000e-004	2.5200e-003	17.8431
Worker	3.7000e-003	2.5400e-003	0.0534	2.1000e-004	0.0647	7.0000e-005	0.0648	0.0166	6.0000e-005	0.0167	0.0000	21.8405	21.8405	1.9000e-004	4.0000e-004	21.9636
Total	**4.8100e-003**	**0.0478**	**0.0703**	**3.8000e-004**	**0.0783**	**3.1000e-004**	**0.0786**	**0.0203**	**2.9000e-004**	**0.0206**	**0.0000**	**38.9130**	**38.9130**	**1.0100e-003**	**2.9200e-003**	**39.8066**

Pettit Water Storage Tank Expansion and Transmission Pipeline Project Phase 2 - South Coast Air Basin, Annual

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.6 Finishing - 2045

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0298	0.0798	0.4713	8.5000e-004		3.7100e-003	3.7100e-003		3.7100e-003	3.7100e-003	0.0000	73.3559	73.3559	2.3900e-003	0.0000	73.4157
Paving	2.9000e-004					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0301**	**0.0798**	**0.4713**	**8.5000e-004**		**3.7100e-003**	**3.7100e-003**		**3.7100e-003**	**3.7100e-003**	**0.0000**	**73.3559**	**73.3559**	**2.3900e-003**	**0.0000**	**73.4157**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.8500e-003	1.2700e-003	0.0267	1.1000e-004	0.0173	3.0000e-005	0.0174	4.6000e-003	3.0000e-005	4.6400e-003	0.0000	10.9202	10.9202	9.0000e-005	2.0000e-004	10.9818
Total	**1.8500e-003**	**1.2700e-003**	**0.0267**	**1.1000e-004**	**0.0173**	**3.0000e-005**	**0.0174**	**4.6000e-003**	**3.0000e-005**	**4.6400e-003**	**0.0000**	**10.9202**	**10.9202**	**9.0000e-005**	**2.0000e-004**	**10.9818**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0298	0.0798	0.4713	8.5000e-004		3.7100e-003	3.7100e-003		3.7100e-003	3.7100e-003	0.0000	73.3558	73.3558	2.3900e-003	0.0000	73.4156
Paving	2.9000e-004					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0301**	**0.0798**	**0.4713**	**8.5000e-004**		**3.7100e-003**	**3.7100e-003**		**3.7100e-003**	**3.7100e-003**	**0.0000**	**73.3558**	**73.3558**	**2.3900e-003**	**0.0000**	**73.4156**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.8500e-003	1.2700e-003	0.0267	1.1000e-004	0.0173	3.0000e-005	0.0174	4.6000e-003	3.0000e-005	4.6400e-003	0.0000	10.9202	10.9202	9.0000e-005	2.0000e-004	10.9818
Total	**1.8500e-003**	**1.2700e-003**	**0.0267**	**1.1000e-004**	**0.0173**	**3.0000e-005**	**0.0174**	**4.6000e-003**	**3.0000e-005**	**4.6400e-003**	**0.0000**	**10.9202**	**10.9202**	**9.0000e-005**	**2.0000e-004**	**10.9818**

Pettit Water Storage Tank Expansion and Transmission Pipeline Project Phase 2 - South Coast Air Basin, Annual

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.7 Painting - 2045

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	0.0132					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0233	0.1518	0.3739	6.3000e-004		1.5100e-003	1.5100e-003		1.5100e-003	1.5100e-003	0.0000	53.7095	53.7095	1.8300e-003	0.0000	53.7553
Total	**0.0366**	**0.1518**	**0.3739**	**6.3000e-004**		**1.5100e-003**	**1.5100e-003**		**1.5100e-003**	**1.5100e-003**	**0.0000**	**53.7095**	**53.7095**	**1.8300e-003**	**0.0000**	**53.7553**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.8500e-003	1.2700e-003	0.0267	1.1000e-004	0.0173	3.0000e-005	0.0174	4.6000e-003	3.0000e-005	4.6400e-003	0.0000	10.9202	10.9202	9.0000e-005	2.0000e-004	10.9818
Total	**1.8500e-003**	**1.2700e-003**	**0.0267**	**1.1000e-004**	**0.0173**	**3.0000e-005**	**0.0174**	**4.6000e-003**	**3.0000e-005**	**4.6400e-003**	**0.0000**	**10.9202**	**10.9202**	**9.0000e-005**	**2.0000e-004**	**10.9818**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	0.0132					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0233	0.1518	0.3739	6.3000e-004		1.5100e-003	1.5100e-003		1.5100e-003	1.5100e-003	0.0000	53.7095	53.7095	1.8300e-003	0.0000	53.7553
Total	**0.0366**	**0.1518**	**0.3739**	**6.3000e-004**		**1.5100e-003**	**1.5100e-003**		**1.5100e-003**	**1.5100e-003**	**0.0000**	**53.7095**	**53.7095**	**1.8300e-003**	**0.0000**	**53.7553**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.8500e-003	1.2700e-003	0.0267	1.1000e-004	0.0173	3.0000e-005	0.0174	4.6000e-003	3.0000e-005	4.6400e-003	0.0000	10.9202	10.9202	9.0000e-005	2.0000e-004	10.9818
Total	**1.8500e-003**	**1.2700e-003**	**0.0267**	**1.1000e-004**	**0.0173**	**3.0000e-005**	**0.0174**	**4.6000e-003**	**3.0000e-005**	**4.6400e-003**	**0.0000**	**10.9202**	**10.9202**	**9.0000e-005**	**2.0000e-004**	**10.9818**

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

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EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Electricity Unmitigated						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

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EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	7.5900e-003	1.0000e-005	1.2100e-003	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.3600e-003	2.3600e-003	1.0000e-005	0.0000	2.5100e-003
Unmitigated	7.5900e-003	1.0000e-005	1.2100e-003	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.3600e-003	2.3600e-003	1.0000e-005	0.0000	2.5100e-003

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	1.3200e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	6.1500e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	1.1000e-004	1.0000e-005	1.2100e-003	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.3600e-003	2.3600e-003	1.0000e-005	0.0000	2.5100e-003
Total	**7.5800e-003**	**1.0000e-005**	**1.2100e-003**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**2.3600e-003**	**2.3600e-003**	**1.0000e-005**	**0.0000**	**2.5100e-003**

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Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	1.3200e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	6.1500e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	1.1000e-004	1.0000e-005	1.2100e-003	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.3600e-003	2.3600e-003	1.0000e-005	0.0000	2.5100e-003
Total	**7.5800e-003**	**1.0000e-005**	**1.2100e-003**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**2.3600e-003**	**2.3600e-003**	**1.0000e-005**	**0.0000**	**2.5100e-003**

7.0 Water Detail

7.1 Mitigation Measures Water

	Total CO2	CH4	N2O	CO2e
Category	MT/yr			
Mitigated	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Other Asphalt Surfaces	0 / 0	0.0000	0.0000	0.0000	0.0000
Other Non-Asphalt Surfaces	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Other Asphalt Surfaces	0 / 0	0.0000	0.0000	0.0000	0.0000
Other Non-Asphalt Surfaces	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

Pettit Water Storage Tank Expansion and Transmission Pipeline Project Phase 2 - South Coast Air Basin, Annual

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

Pettit Water Storage Tank Expansion and Transmission Pipeline Project Phase 2 - South Coast Air Basin, Summer

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Pettit Water Storage Tank Expansion and Transmission Pipeline Project Phase 2

South Coast Air Basin, Summer

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Other Asphalt Surfaces	9.80	1000sqft	0.22	9,801.00	0
Other Non-Asphalt Surfaces	85.38	1000sqft	1.96	85,378.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	31
Climate Zone	10			**Operational Year**	2045
Utility Company	Southern California Edison				
CO2 Intensity (lb/MWhr)	0	**CH4 Intensity (lb/MWhr)**	0.033	**N2O Intensity (lb/MWhr)**	0.004

1.3 User Entered Comments & Non-Default Data

Project Characteristics - Project Assumptions - Phase 2. Intensity Factor gathered from SCE CO2 Intensity Factor RPS under SB100.

Land Use - Project Assumptions - Phase 2

Construction Phase - Project Assumptions - Phase 2

Off-road Equipment - Project Assumptions - Phase 2

Off-road Equipment - Jackhammer = Other Construction Equipment

Off-road Equipment - Project Assumptions - Phase 2

Off-road Equipment - Compactor = Paving equipment, Jackhammer = Other Construction Equipment

Off-road Equipment - Project Assumptions - Phase 2

Off-road Equipment - Compactor = Paving Equipment

Trips and VMT - Project Assumptions - Phase 2

Demolition - pg 370 of Preliminary Design Report.

Grading -

Construction Off-road Equipment Mitigation -

Pettit Water Storage Tank Expansion and Transmission Pipeline Project Phase 2 - South Coast Air Basin, Summer

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Table Name	Column Name	Default Value	New Value
tblConstructionPhase	NumDays	10.00	158.00
tblConstructionPhase	NumDays	220.00	25.00
tblConstructionPhase	NumDays	220.00	158.00
tblConstructionPhase	NumDays	20.00	26.00
tblConstructionPhase	NumDays	6.00	51.00
tblConstructionPhase	NumDays	10.00	158.00
tblConstructionPhase	NumDaysWeek	5.00	6.00
tblConstructionPhase	NumDaysWeek	5.00	6.00
tblConstructionPhase	NumDaysWeek	5.00	6.00
tblConstructionPhase	NumDaysWeek	5.00	6.00
tblConstructionPhase	NumDaysWeek	5.00	6.00
tblConstructionPhase	NumDaysWeek	5.00	6.00
tblGrading	MaterialExported	0.00	14,134.00
tblLandUse	LandUseSquareFeet	9,800.00	9,801.00
tblLandUse	LandUseSquareFeet	85,380.00	85,378.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	2.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	1.00
tblOffRoadEquipment	UsageHours	6.00	8.00
tblOffRoadEquipment	UsageHours	6.00	8.00
tblOffRoadEquipment	UsageHours	7.00	8.00
tblProjectCharacteristics	CO2IntensityFactor	390.98	0
tblTripsAndVMT	HaulingTripNumber	10.00	14.00
tblTripsAndVMT	HaulingTripNumber	1,767.00	2,020.00
tblTripsAndVMT	VendorTripNumber	16.00	0.00
tblTripsAndVMT	VendorTripNumber	16.00	0.00
tblTripsAndVMT	WorkerTripNumber	15.00	20.00
tblTripsAndVMT	WorkerTripNumber	33.00	20.00
tblTripsAndVMT	WorkerTripNumber	40.00	20.00
tblTripsAndVMT	WorkerTripNumber	40.00	20.00
tblTripsAndVMT	WorkerTripNumber	40.00	20.00
tblTripsAndVMT	WorkerTripNumber	5.00	20.00
tblTripsAndVMT	WorkerTripNumber	8.00	20.00

Pettit Water Storage Tank Expansion and Transmission Pipeline Project Phase 2 - South Coast Air Basin, Summer

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

2.0 Emissions Summary

2.1 Overall Construction (Maximum Daily Emission)

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2045	4.1872	15.0347	38.9571	0.1307	2.5383	0.3333	2.8716	0.4256	0.3320	0.7576	0.0000	13,750.9296	13,750.9296	0.5156	0.2981	13,852.6494
Maximum	**4.1872**	**15.0347**	**38.9571**	**0.1307**	**2.5383**	**0.3333**	**2.8716**	**0.4256**	**0.3320**	**0.7576**	**0.0000**	**13,750.9296**	**13,750.9296**	**0.5156**	**0.2981**	**13,852.6494**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2045	4.1872	15.0347	38.9571	0.1307	1.5488	0.3333	1.8821	0.3800	0.3320	0.6499	0.0000	13,750.9296	13,750.9296	0.5156	0.2981	13,852.6494
Maximum	**4.1872**	**15.0347**	**38.9571**	**0.1307**	**1.5488**	**0.3333**	**1.8821**	**0.3800**	**0.3320**	**0.6499**	**0.0000**	**13,750.9296**	**13,750.9296**	**0.5156**	**0.2981**	**13,852.6494**

	ROG	**NOx**	**CO**	**SO2**	**Fugitive PM10**	**Exhaust PM10**	**PM10 Total**	**Fugitive PM2.5**	**Exhaust PM2.5**	**PM2.5 Total**	**Bio- CO2**	**NBio-CO2**	**Total CO2**	**CH4**	**N20**	**CO2e**
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**38.98**	**0.00**	**34.46**	**10.73**	**0.00**	**14.21**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

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Pettit Water Storage Tank Expansion and Transmission Pipeline Project Phase 2 - South Coast Air Basin, Summer

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Demolition	Demolition	1/1/2045	1/31/2045	6	26	
2	Grading/Excavation	Grading	2/1/2045	3/31/2045	6	51	
3	Stormwater Drainage and Foundation	Building Construction	4/1/2045	4/30/2045	6	25	
4	Construction	Building Construction	5/1/2045	10/31/2045	6	158	
5	Finishing	Paving	5/1/2045	10/31/2045	6	158	
6	Painting	Architectural Coating	5/1/2045	10/31/2045	6	158	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 76.5

Acres of Paving: 2.18

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 5,711 (Architectural Coating –

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Demolition	Concrete/Industrial Saws	1	8.00	81	0.73
Demolition	Other Construction Equipment	1	8.00	172	0.42
Demolition	Rubber Tired Dozers	1	8.00	247	0.40
Demolition	Tractors/Loaders/Backhoes	3	8.00	97	0.37
Grading/Excavation	Bore/Drill Rigs	1	8.00	221	0.50
Grading/Excavation	Concrete/Industrial Saws	1	8.00	81	0.73
Grading/Excavation	Excavators	1	8.00	158	0.38
Grading/Excavation	Graders	1	8.00	187	0.41
Grading/Excavation	Off-Highway Trucks	3	8.00	402	0.38
Grading/Excavation	Other Construction Equipment	1	8.00	172	0.42
Grading/Excavation	Paving Equipment	1	8.00	132	0.36
Grading/Excavation	Scrapers	1	8.00	367	0.48
Grading/Excavation	Tractors/Loaders/Backhoes	2	8.00	97	0.37
Grading/Excavation	Trenchers	1	8.00	78	0.50
Stormwater Drainage and Foundation	Cement and Mortar Mixers	1	8.00	9	0.56
Stormwater Drainage and Foundation	Graders	1	8.00	187	0.41
Stormwater Drainage and Foundation	Paving Equipment	1	8.00	132	0.36
Stormwater Drainage and Foundation	Pumps	1	8.00	84	0.74
Stormwater Drainage and Foundation	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Construction	Air Compressors	1	8.00	78	0.48
Construction	Cranes	2	8.00	231	0.29
Construction	Welders	1	8.00	46	0.45
Finishing	Pavers	1	8.00	130	0.42
Finishing	Paving Equipment	1	8.00	132	0.36
Painting	Aerial Lifts	1	8.00	63	0.31
Painting	Air Compressors	1	8.00	78	0.48
Painting	Forklifts	1	8.00	89	0.20

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Demolition	6	20.00	0.00	14.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Grading/Excavation	13	20.00	0.00	2,020.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Stormwater Drainage and Foundation	5	20.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Construction	4	20.00	16.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Construction	4	20.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Finishing	2	20.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Painting	3	20.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Water Exposed Area

Pettit Water Storage Tank Expansion and Transmission Pipeline Project Phase 2 - South Coast Air Basin, Summer

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.2 Demolition - 2045

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.0798	0.0000	0.0798	0.0121	0.0000	0.0121			0.0000			0.0000
Off-Road	1.3113	6.0964	16.7780	0.0358		0.1120	0.1120		0.1120	0.1120		3,386.1969	3,386.1969	0.1144		3,389.0570
Total	**1.3113**	**6.0964**	**16.7780**	**0.0358**	**0.0798**	**0.1120**	**0.1918**	**0.0121**	**0.1120**	**0.1241**		**3,386.1969**	**3,386.1969**	**0.1144**		**3,389.0570**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	1.0400e-003	0.0588	0.0207	2.3000e-004	9.4200e-003	4.2000e-004	9.8400e-003	2.5800e-003	4.1000e-004	2.9900e-003		25.1707	25.1707	2.1100e-003	4.0200e-003	26.4207
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0233	0.0145	0.3611	1.4000e-003	0.2236	4.4000e-004	0.2240	0.0593	4.0000e-004	0.0597		159.2050	159.2050	1.2700e-003	2.5800e-003	160.0048
Total	**0.0244**	**0.0732**	**0.3818**	**1.6300e-003**	**0.2330**	**8.6000e-004**	**0.2338**	**0.0619**	**8.1000e-004**	**0.0627**		**184.3757**	**184.3757**	**3.3800e-003**	**6.6000e-003**	**186.4255**

Pettit Water Storage Tank Expansion and Transmission Pipeline Project Phase 2 - South Coast Air Basin, Summer

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.0311	0.0000	0.0311	4.7100e-003	0.0000	4.7100e-003			0.0000			0.0000
Off-Road	1.3113	6.0964	16.7780	0.0358		0.1120	0.1120		0.1120	0.1120	0.0000	3,386.1969	3,386.1969	0.1144		3,389.0570
Total	**1.3113**	**6.0964**	**16.7780**	**0.0358**	**0.0311**	**0.1120**	**0.1431**	**4.7100e-003**	**0.1120**	**0.1167**	**0.0000**	**3,386.1969**	**3,386.1969**	**0.1144**		**3,389.0570**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	1.0400e-003	0.0588	0.0207	2.3000e-004	9.4200e-003	4.2000e-004	9.8400e-003	2.5800e-003	4.1000e-004	2.9900e-003		25.1707	25.1707	2.1100e-003	4.0200e-003	26.4207
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0233	0.0145	0.3611	1.4000e-003	0.2236	4.4000e-004	0.2240	0.0593	4.0000e-004	0.0597		159.2050	159.2050	1.2700e-003	2.5800e-003	160.0048
Total	**0.0244**	**0.0732**	**0.3818**	**1.6300e-003**	**0.2330**	**8.6000e-004**	**0.2338**	**0.0619**	**8.1000e-004**	**0.0627**		**184.3757**	**184.3757**	**3.3800e-003**	**6.6000e-003**	**186.4255**

3.3 Grading/Excavation - 2045

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					1.6221	0.0000	1.6221	0.1765	0.0000	0.1765			0.0000			0.0000
Off-Road	4.0873	10.6968	37.0721	0.1128		0.3018	0.3018		0.3018	0.3018		11,740.2344	11,740.2344	0.3590		11,749.2083
Total	**4.0873**	**10.6968**	**37.0721**	**0.1128**	**1.6221**	**0.3018**	**1.9238**	**0.1765**	**0.3018**	**0.4783**		**11,740.2344**	**11,740.2344**	**0.3590**		**11,749.2083**

Pettit Water Storage Tank Expansion and Transmission Pipeline Project Phase 2 - South Coast Air Basin, Summer

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0765	4.3235	1.5239	0.0166	0.6926	0.0311	0.7238	0.1898	0.0298	0.2196		1,851.4901	1,851.4901	0.1554	0.2955	1,943.4363
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0233	0.0145	0.3611	1.4000e-003	0.2236	4.4000e-004	0.2240	0.0593	4.0000e-004	0.0597		159.2050	159.2050	1.2700e-003	2.5800e-003	160.0048
Total	**0.0998**	**4.3379**	**1.8850**	**0.0180**	**0.9162**	**0.0316**	**0.9477**	**0.2491**	**0.0302**	**0.2793**		**2,010.6952**	**2,010.6952**	**0.1567**	**0.2981**	**2,103.4411**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.6326	0.0000	0.6326	0.0688	0.0000	0.0688			0.0000			0.0000
Off-Road	4.0873	10.6968	37.0721	0.1128		0.3018	0.3018		0.3018	0.3018	0.0000	11,740.2344	11,740.2344	0.3590		11,749.2083
Total	**4.0873**	**10.6968**	**37.0721**	**0.1128**	**0.6326**	**0.3018**	**0.9344**	**0.0688**	**0.3018**	**0.3706**	**0.0000**	**11,740.2344**	**11,740.2344**	**0.3590**		**11,749.2083**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0765	4.3235	1.5239	0.0166	0.6926	0.0311	0.7238	0.1898	0.0298	0.2196		1,851.4901	1,851.4901	0.1554	0.2955	1,943.4363
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0233	0.0145	0.3611	1.4000e-003	0.2236	4.4000e-004	0.2240	0.0593	4.0000e-004	0.0597		159.2050	159.2050	1.2700e-003	2.5800e-003	160.0048
Total	**0.0998**	**4.3379**	**1.8850**	**0.0180**	**0.9162**	**0.0316**	**0.9477**	**0.2491**	**0.0302**	**0.2793**		**2,010.6952**	**2,010.6952**	**0.1567**	**0.2981**	**2,103.4411**

Pettit Water Storage Tank Expansion and Transmission Pipeline Project Phase 2 - South Coast Air Basin, Summer

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.4 Stormwater Drainage and Foundation - 2045

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.8265	3.7900	10.6350	0.0242		0.0761	0.0761		0.0761	0.0761		2,278.0453	2,278.0453	0.0726		2,279.8601
Total	**0.8265**	**3.7900**	**10.6350**	**0.0242**		**0.0761**	**0.0761**		**0.0761**	**0.0761**		**2,278.0453**	**2,278.0453**	**0.0726**		**2,279.8601**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0233	0.0145	0.3611	1.4000e-003	0.2236	4.4000e-004	0.2240	0.0593	4.0000e-004	0.0597		159.2050	159.2050	1.2700e-003	2.5800e-003	160.0048
Total	**0.0233**	**0.0145**	**0.3611**	**1.4000e-003**	**0.2236**	**4.4000e-004**	**0.2240**	**0.0593**	**4.0000e-004**	**0.0597**		**159.2050**	**159.2050**	**1.2700e-003**	**2.5800e-003**	**160.0048**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.8265	3.7900	10.6350	0.0242		0.0761	0.0761		0.0761	0.0761	0.0000	2,278.0453	2,278.0453	0.0726		2,279.8601
Total	**0.8265**	**3.7900**	**10.6350**	**0.0242**		**0.0761**	**0.0761**		**0.0761**	**0.0761**	**0.0000**	**2,278.0453**	**2,278.0453**	**0.0726**		**2,279.8601**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0233	0.0145	0.3611	1.4000e-003	0.2236	4.4000e-004	0.2240	0.0593	4.0000e-004	0.0597		159.2050	159.2050	1.2700e-003	2.5800e-003	160.0048
Total	**0.0233**	**0.0145**	**0.3611**	**1.4000e-003**	**0.2236**	**4.4000e-004**	**0.2240**	**0.0593**	**4.0000e-004**	**0.0597**		**159.2050**	**159.2050**	**1.2700e-003**	**2.5800e-003**	**160.0048**

Pettit Water Storage Tank Expansion and Transmission Pipeline Project Phase 2 - South Coast Air Basin, Summer

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.5 Construction - 2045

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.7608	2.9114	6.6760	0.0207		0.0461	0.0461		0.0461	0.0461		1,925.6342	1,925.6342	0.0665		1,927.2973
Total	**0.7608**	**2.9114**	**6.6760**	**0.0207**		**0.0461**	**0.0461**		**0.0461**	**0.0461**		**1,925.6342**	**1,925.6342**	**0.0665**		**1,927.2973**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0144	0.5465	0.2114	2.1900e-003	0.1754	3.0300e-003	0.1785	0.0474	2.9000e-003	0.0503		238.0112	238.0112	0.0115	0.0351	248.7491
Worker	0.0467	0.0289	0.7222	2.8000e-003	0.8358	8.7000e-004	0.8367	0.2140	8.0000e-004	0.2148		318.4101	318.4101	2.5400e-003	5.1500e-003	320.0096
Total	**0.0611**	**0.5754**	**0.9336**	**4.9900e-003**	**1.0112**	**3.9000e-003**	**1.0151**	**0.2614**	**3.7000e-003**	**0.2651**		**556.4212**	**556.4212**	**0.0141**	**0.0402**	**568.7587**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.7608	2.9114	6.6760	0.0207		0.0461	0.0461		0.0461	0.0461	0.0000	1,925.6342	1,925.6342	0.0665		1,927.2973
Total	**0.7608**	**2.9114**	**6.6760**	**0.0207**		**0.0461**	**0.0461**		**0.0461**	**0.0461**	**0.0000**	**1,925.6342**	**1,925.6342**	**0.0665**		**1,927.2973**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0144	0.5465	0.2114	2.1900e-003	0.1754	3.0300e-003	0.1785	0.0474	2.9000e-003	0.0503		238.0112	238.0112	0.0115	0.0351	248.7491
Worker	0.0467	0.0289	0.7222	2.8000e-003	0.8358	8.7000e-004	0.8367	0.2140	8.0000e-004	0.2148		318.4101	318.4101	2.5400e-003	5.1500e-003	320.0096
Total	**0.0611**	**0.5754**	**0.9336**	**4.9900e-003**	**1.0112**	**3.9000e-003**	**1.0151**	**0.2614**	**3.7000e-003**	**0.2651**		**556.4212**	**556.4212**	**0.0141**	**0.0402**	**568.7587**

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Pettit Water Storage Tank Expansion and Transmission Pipeline Project Phase 2 - South Coast Air Basin, Summer

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.6 Finishing - 2045

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.3769	1.0106	5.9652	0.0108		0.0470	0.0470		0.0470	0.0470		1,023.5568	1,023.5568	0.0334		1,024.3914
Paving	3.6500e-003					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**0.3806**	**1.0106**	**5.9652**	**0.0108**		**0.0470**	**0.0470**		**0.0470**	**0.0470**		**1,023.5568**	**1,023.5568**	**0.0334**		**1,024.3914**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0233	0.0145	0.3611	1.4000e-003	0.2236	4.4000e-004	0.2240	0.0593	4.0000e-004	0.0597		159.2050	159.2050	1.2700e-003	2.5800e-003	160.0048
Total	**0.0233**	**0.0145**	**0.3611**	**1.4000e-003**	**0.2236**	**4.4000e-004**	**0.2240**	**0.0593**	**4.0000e-004**	**0.0597**		**159.2050**	**159.2050**	**1.2700e-003**	**2.5800e-003**	**160.0048**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.3769	1.0106	5.9652	0.0108		0.0470	0.0470		0.0470	0.0470	0.0000	1,023.5568	1,023.5568	0.0334		1,024.3914
Paving	3.6500e-003					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**0.3806**	**1.0106**	**5.9652**	**0.0108**		**0.0470**	**0.0470**		**0.0470**	**0.0470**	**0.0000**	**1,023.5568**	**1,023.5568**	**0.0334**		**1,024.3914**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0233	0.0145	0.3611	1.4000e-003	0.2236	4.4000e-004	0.2240	0.0593	4.0000e-004	0.0597		159.2050	159.2050	1.2700e-003	2.5800e-003	160.0048
Total	**0.0233**	**0.0145**	**0.3611**	**1.4000e-003**	**0.2236**	**4.4000e-004**	**0.2240**	**0.0593**	**4.0000e-004**	**0.0597**		**159.2050**	**159.2050**	**1.2700e-003**	**2.5800e-003**	**160.0048**

3.7 Painting - 2045

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Archit. Coating	0.1675					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.2953	1.9221	4.7327	7.9100e-003		0.0191	0.0191		0.0191	0.0191		749.4256	749.4256	0.0256		750.0647
Total	**0.4628**	**1.9221**	**4.7327**	**7.9100e-003**		**0.0191**	**0.0191**		**0.0191**	**0.0191**		**749.4256**	**749.4256**	**0.0256**		**750.0647**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0233	0.0145	0.3611	1.4000e-003	0.2236	4.4000e-004	0.2240	0.0593	4.0000e-004	0.0597		159.2050	159.2050	1.2700e-003	2.5800e-003	160.0048
Total	**0.0233**	**0.0145**	**0.3611**	**1.4000e-003**	**0.2236**	**4.4000e-004**	**0.2240**	**0.0593**	**4.0000e-004**	**0.0597**		**159.2050**	**159.2050**	**1.2700e-003**	**2.5800e-003**	**160.0048**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Archit. Coating	0.1675					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.2953	1.9221	4.7327	7.9100e-003		0.0191	0.0191		0.0191	0.0191	0.0000	749.4256	749.4256	0.0256		750.0647
Total	**0.4628**	**1.9221**	**4.7327**	**7.9100e-003**		**0.0191**	**0.0191**		**0.0191**	**0.0191**	**0.0000**	**749.4256**	**749.4256**	**0.0256**		**750.0647**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0233	0.0145	0.3611	1.4000e-003	0.2236	4.4000e-004	0.2240	0.0593	4.0000e-004	0.0597		159.2050	159.2050	1.2700e-003	2.5800e-003	160.0048
Total	**0.0233**	**0.0145**	**0.3611**	**1.4000e-003**	**0.2236**	**4.4000e-004**	**0.2240**	**0.0593**	**4.0000e-004**	**0.0597**		**159.2050**	**159.2050**	**1.2700e-003**	**2.5800e-003**	**160.0048**

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000

Pettit Water Storage Tank Expansion and Transmission Pipeline Project Phase 2 - South Coast Air Basin, Summer

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Pettit Water Storage Tank Expansion and Transmission Pipeline Project Phase 2 - South Coast Air Basin, Summer

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	0.0419	9.0000e-005	9.6600e-003	0.0000		3.0000e-005	3.0000e-005		3.0000e-005	3.0000e-005		0.0208	0.0208	5.0000e-005		0.0222
Unmitigated	0.0419	9.0000e-005	9.6600e-003	0.0000		3.0000e-005	3.0000e-005		3.0000e-005	3.0000e-005		0.0208	0.0208	5.0000e-005		0.0222

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	7.2500e-003					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	0.0337					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	8.8000e-004	9.0000e-005	9.6600e-003	0.0000		3.0000e-005	3.0000e-005		3.0000e-005	3.0000e-005		0.0208	0.0208	5.0000e-005		0.0222
Total	**0.0418**	**9.0000e-005**	**9.6600e-003**	**0.0000**		**3.0000e-005**	**3.0000e-005**		**3.0000e-005**	**3.0000e-005**		**0.0208**	**0.0208**	**5.0000e-005**		**0.0222**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	7.2500e-003					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	0.0337					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	8.8000e-004	9.0000e-005	9.6600e-003	0.0000		3.0000e-005	3.0000e-005		3.0000e-005	3.0000e-005		0.0208	0.0208	5.0000e-005		0.0222
Total	**0.0418**	**9.0000e-005**	**9.6600e-003**	**0.0000**		**3.0000e-005**	**3.0000e-005**		**3.0000e-005**	**3.0000e-005**		**0.0208**	**0.0208**	**5.0000e-005**		**0.0222**

Pettit Water Storage Tank Expansion and Transmission Pipeline Project Phase 2 - South Coast Air Basin, Winter

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Pettit Water Storage Tank Expansion and Transmission Pipeline Project Phase 2
South Coast Air Basin, Winter

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Other Asphalt Surfaces	9.80	1000sqft	0.22	9,801.00	0
Other Non-Asphalt Surfaces	85.38	1000sqft	1.96	85,378.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	31
Climate Zone	10			**Operational Year**	2045
Utility Company	Southern California Edison				
CO2 Intensity (lb/MWhr)	0	**CH4 Intensity (lb/MWhr)**	0.033	**N2O Intensity (lb/MWhr)**	0.004

1.3 User Entered Comments & Non-Default Data

Project Characteristics - Project Assumptions - Phase 2. Intensity Factor gathered from SCE CO2 Intensity Factor RPS under SB100.

Land Use - Project Assumptions - Phase 2

Construction Phase - Project Assumptions - Phase 2

Off-road Equipment - Project Assumptions - Phase 2

Off-road Equipment - Jackhammer = Other Construction Equipment

Off-road Equipment - Project Assumptions - Phase 2

Off-road Equipment - Compactor = Paving equipment, Jackhammer = Other Construction Equipment

Off-road Equipment - Project Assumptions - Phase 2

Off-road Equipment - Compactor = Paving Equipment

Trips and VMT - Project Assumptions - Phase 2

Demolition - pg 370 of Preliminary Design Report.

Grading -

Construction Off-road Equipment Mitigation -

Pettit Water Storage Tank Expansion and Transmission Pipeline Project Phase 2 - South Coast Air Basin, Winter

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Table Name	Column Name	Default Value	New Value
tblConstructionPhase	NumDays	10.00	158.00
tblConstructionPhase	NumDays	220.00	25.00
tblConstructionPhase	NumDays	220.00	158.00
tblConstructionPhase	NumDays	20.00	26.00
tblConstructionPhase	NumDays	6.00	51.00
tblConstructionPhase	NumDays	10.00	158.00
tblConstructionPhase	NumDaysWeek	5.00	6.00
tblConstructionPhase	NumDaysWeek	5.00	6.00
tblConstructionPhase	NumDaysWeek	5.00	6.00
tblConstructionPhase	NumDaysWeek	5.00	6.00
tblConstructionPhase	NumDaysWeek	5.00	6.00
tblConstructionPhase	NumDaysWeek	5.00	6.00
tblGrading	MaterialExported	0.00	14,134.00
tblLandUse	LandUseSquareFeet	9,800.00	9,801.00
tblLandUse	LandUseSquareFeet	85,380.00	85,378.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	2.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	1.00
tblOffRoadEquipment	UsageHours	6.00	8.00
tblOffRoadEquipment	UsageHours	6.00	8.00
tblOffRoadEquipment	UsageHours	7.00	8.00
tblProjectCharacteristics	CO2IntensityFactor	390.98	0
tblTripsAndVMT	HaulingTripNumber	10.00	14.00
tblTripsAndVMT	HaulingTripNumber	1,767.00	2,020.00
tblTripsAndVMT	VendorTripNumber	16.00	0.00
tblTripsAndVMT	VendorTripNumber	16.00	0.00
tblTripsAndVMT	WorkerTripNumber	15.00	20.00
tblTripsAndVMT	WorkerTripNumber	33.00	20.00
tblTripsAndVMT	WorkerTripNumber	40.00	20.00
tblTripsAndVMT	WorkerTripNumber	40.00	20.00
tblTripsAndVMT	WorkerTripNumber	40.00	20.00
tblTripsAndVMT	WorkerTripNumber	5.00	20.00
tblTripsAndVMT	WorkerTripNumber	8.00	20.00

Pettit Water Storage Tank Expansion and Transmission Pipeline Project Phase 2 - South Coast Air Basin, Winter

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

2.0 Emissions Summary

2.1 Overall Construction (Maximum Daily Emission)

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2045	4.1843	15.2381	38.9432	0.1307	2.5383	0.3334	2.8716	0.4256	0.3320	0.7576	0.0000	13,744.3316	13,744.3316	0.5153	0.2986	13,846.2026
Maximum	**4.1843**	**15.2381**	**38.9432**	**0.1307**	**2.5383**	**0.3334**	**2.8716**	**0.4256**	**0.3320**	**0.7576**	**0.0000**	**13,744.3316**	**13,744.3316**	**0.5153**	**0.2986**	**13,846.2026**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2045	4.1843	15.2381	38.9432	0.1307	1.5488	0.3334	1.8822	0.3800	0.3320	0.6500	0.0000	13,744.3316	13,744.3316	0.5153	0.2986	13,846.2026
Maximum	**4.1843**	**15.2381**	**38.9432**	**0.1307**	**1.5488**	**0.3334**	**1.8822**	**0.3800**	**0.3320**	**0.6500**	**0.0000**	**13,744.3316**	**13,744.3316**	**0.5153**	**0.2986**	**13,846.2026**

	ROG	**NOx**	**CO**	**SO2**	**Fugitive PM10**	**Exhaust PM10**	**PM10 Total**	**Fugitive PM2.5**	**Exhaust PM2.5**	**PM2.5 Total**	**Bio- CO2**	**NBio-CO2**	**Total CO2**	**CH4**	**N20**	**CO2e**
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**38.98**	**0.00**	**34.46**	**10.73**	**0.00**	**14.21**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Pettit Water Storage Tank Expansion and Transmission Pipeline Project Phase 2 - South Coast Air Basin, Winter

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Demolition	Demolition	1/1/2045	1/31/2045	6	26	
2	Grading/Excavation	Grading	2/1/2045	3/31/2045	6	51	
3	Stormwater Drainage and Foundation	Building Construction	4/1/2045	4/30/2045	6	25	
4	Construction	Building Construction	5/1/2045	10/31/2045	6	158	
5	Finishing	Paving	5/1/2045	10/31/2045	6	158	
6	Painting	Architectural Coating	5/1/2045	10/31/2045	6	158	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 76.5

Acres of Paving: 2.18

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 5,711 (Architectural Coating –

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Demolition	Concrete/Industrial Saws	1	8.00	81	0.73
Demolition	Other Construction Equipment	1	8.00	172	0.42
Demolition	Rubber Tired Dozers	1	8.00	247	0.40
Demolition	Tractors/Loaders/Backhoes	3	8.00	97	0.37
Grading/Excavation	Bore/Drill Rigs	1	8.00	221	0.50
Grading/Excavation	Concrete/Industrial Saws	1	8.00	81	0.73
Grading/Excavation	Excavators	1	8.00	158	0.38
Grading/Excavation	Graders	1	8.00	187	0.41
Grading/Excavation	Off-Highway Trucks	3	8.00	402	0.38
Grading/Excavation	Other Construction Equipment	1	8.00	172	0.42
Grading/Excavation	Paving Equipment	1	8.00	132	0.36
Grading/Excavation	Scrapers	1	8.00	367	0.48
Grading/Excavation	Tractors/Loaders/Backhoes	2	8.00	97	0.37
Grading/Excavation	Trenchers	1	8.00	78	0.50
Stormwater Drainage and Foundation	Cement and Mortar Mixers	1	8.00	9	0.56
Stormwater Drainage and Foundation	Graders	1	8.00	187	0.41
Stormwater Drainage and Foundation	Paving Equipment	1	8.00	132	0.36
Stormwater Drainage and Foundation	Pumps	1	8.00	84	0.74
Stormwater Drainage and Foundation	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Construction	Air Compressors	1	8.00	78	0.48
Construction	Cranes	2	8.00	231	0.29
Construction	Welders	1	8.00	46	0.45
Finishing	Pavers	1	8.00	130	0.42
Finishing	Paving Equipment	1	8.00	132	0.36
Painting	Aerial Lifts	1	8.00	63	0.31
Painting	Air Compressors	1	8.00	78	0.48
Painting	Forklifts	1	8.00	89	0.20

Pettit Water Storage Tank Expansion and Transmission Pipeline Project Phase 2 - South Coast Air Basin, Winter

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Demolition	6	20.00	0.00	14.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Grading/Excavation	13	20.00	0.00	2,020.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Stormwater Drainage and Foundation	5	20.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Construction	4	20.00	16.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Construction	4	20.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Finishing	2	20.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Painting	3	20.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Water Exposed Area

3.2 Demolition - 2045

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.0798	0.0000	0.0798	0.0121	0.0000	0.0121			0.0000			0.0000
Off-Road	1.3113	6.0964	16.7780	0.0358		0.1120	0.1120		0.1120	0.1120		3,386.1969	3,386.1969	0.1144		3,389.0570
Total	**1.3113**	**6.0964**	**16.7780**	**0.0358**	**0.0798**	**0.1120**	**0.1918**	**0.0121**	**0.1120**	**0.1241**		**3,386.1969**	**3,386.1969**	**0.1144**		**3,389.0570**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	9.6000e-004	0.0615	0.0210	2.3000e-004	9.4200e-003	4.2000e-004	9.8400e-003	2.5800e-003	4.1000e-004	2.9900e-003		25.2025	25.2025	2.1100e-003	4.0200e-003	26.4539
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0261	0.0158	0.3297	1.3200e-003	0.2236	4.4000e-004	0.2240	0.0593	4.0000e-004	0.0597		150.2680	150.2680	1.3100e-003	2.7300e-003	151.1141
Total	**0.0270**	**0.0773**	**0.3507**	**1.5500e-003**	**0.2330**	**8.6000e-004**	**0.2338**	**0.0619**	**8.1000e-004**	**0.0627**		**175.4705**	**175.4705**	**3.4200e-003**	**6.7500e-003**	**177.5680**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.0311	0.0000	0.0311	4.7100e-003	0.0000	4.7100e-003			0.0000			0.0000
Off-Road	1.3113	6.0964	16.7780	0.0358		0.1120	0.1120		0.1120	0.1120	0.0000	3,386.1969	3,386.1969	0.1144		3,389.0570
Total	**1.3113**	**6.0964**	**16.7780**	**0.0358**	**0.0311**	**0.1120**	**0.1431**	**4.7100e-003**	**0.1120**	**0.1167**	**0.0000**	**3,386.1969**	**3,386.1969**	**0.1144**		**3,389.0570**

Pettit Water Storage Tank Expansion and Transmission Pipeline Project Phase 2 - South Coast Air Basin, Winter

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	9.6000e-004	0.0615	0.0210	2.3000e-004	9.4200e-003	4.2000e-004	9.8400e-003	2.5800e-003	4.1000e-004	2.9900e-003		25.2025	25.2025	2.1100e-003	4.0200e-003	26.4539
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0261	0.0158	0.3297	1.3200e-003	0.2236	4.4000e-004	0.2240	0.0593	4.0000e-004	0.0597		150.2680	150.2680	1.3100e-003	2.7300e-003	151.1141
Total	**0.0270**	**0.0773**	**0.3507**	**1.5500e-003**	**0.2330**	**8.6000e-004**	**0.2338**	**0.0619**	**8.1000e-004**	**0.0627**		**175.4705**	**175.4705**	**3.4200e-003**	**6.7500e-003**	**177.5680**

3.3 Grading/Excavation - 2045

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					1.6221	0.0000	1.6221	0.1765	0.0000	0.1765			0.0000			0.0000
Off-Road	4.0873	10.6968	37.0721	0.1128		0.3018	0.3018		0.3018	0.3018		11,740.2344	11,740.2344	0.3590		11,749.2083
Total	**4.0873**	**10.6968**	**37.0721**	**0.1128**	**1.6221**	**0.3018**	**1.9238**	**0.1765**	**0.3018**	**0.4783**		**11,740.2344**	**11,740.2344**	**0.3590**		**11,749.2083**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0709	4.5256	1.5414	0.0166	0.6926	0.0312	0.7238	0.1898	0.0298	0.2197		1,853.8291	1,853.8291	0.1551	0.2959	1,945.8802
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0261	0.0158	0.3297	1.3200e-003	0.2236	4.4000e-004	0.2240	0.0593	4.0000e-004	0.0597		150.2680	150.2680	1.3100e-003	2.7300e-003	151.1141
Total	**0.0970**	**4.5413**	**1.8711**	**0.0179**	**0.9162**	**0.0316**	**0.9478**	**0.2491**	**0.0302**	**0.2794**		**2,004.0971**	**2,004.0971**	**0.1564**	**0.2986**	**2,096.9943**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.6326	0.0000	0.6326	0.0688	0.0000	0.0688			0.0000			0.0000
Off-Road	4.0873	10.6968	37.0721	0.1128		0.3018	0.3018		0.3018	0.3018	0.0000	11,740.2344	11,740.2344	0.3590		11,749.2083
Total	**4.0873**	**10.6968**	**37.0721**	**0.1128**	**0.6326**	**0.3018**	**0.9344**	**0.0688**	**0.3018**	**0.3706**	**0.0000**	**11,740.2344**	**11,740.2344**	**0.3590**		**11,749.2083**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0709	4.5256	1.5414	0.0166	0.6926	0.0312	0.7238	0.1898	0.0298	0.2197		1,853.8291	1,853.8291	0.1551	0.2959	1,945.8802
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0261	0.0158	0.3297	1.3200e-003	0.2236	4.4000e-004	0.2240	0.0593	4.0000e-004	0.0597		150.2680	150.2680	1.3100e-003	2.7300e-003	151.1141
Total	**0.0970**	**4.5413**	**1.8711**	**0.0179**	**0.9162**	**0.0316**	**0.9478**	**0.2491**	**0.0302**	**0.2794**		**2,004.0971**	**2,004.0971**	**0.1564**	**0.2986**	**2,096.9943**

3.4 Stormwater Drainage and Foundation - 2045

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e

Pettit Water Storage Tank Expansion and Transmission Pipeline Project Phase 2 - South Coast Air Basin, Winter

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Category	lb/day										lb/day					
Off-Road	0.8265	3.7900	10.6350	0.0242		0.0761	0.0761		0.0761	0.0761		2,278.0453	2,278.0453	0.0726		2,279.8601
Total	**0.8265**	**3.7900**	**10.6350**	**0.0242**		**0.0761**	**0.0761**		**0.0761**	**0.0761**		**2,278.0453**	**2,278.0453**	**0.0726**		**2,279.8601**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0261	0.0158	0.3297	1.3200e-003	0.2236	4.4000e-004	0.2240	0.0593	4.0000e-004	0.0597		150.2680	150.2680	1.3100e-003	2.7300e-003	151.1141
Total	**0.0261**	**0.0158**	**0.3297**	**1.3200e-003**	**0.2236**	**4.4000e-004**	**0.2240**	**0.0593**	**4.0000e-004**	**0.0597**		**150.2680**	**150.2680**	**1.3100e-003**	**2.7300e-003**	**151.1141**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.8265	3.7900	10.6350	0.0242		0.0761	0.0761		0.0761	0.0761	0.0000	2,278.0453	2,278.0453	0.0726		2,279.8601
Total	**0.8265**	**3.7900**	**10.6350**	**0.0242**		**0.0761**	**0.0761**		**0.0761**	**0.0761**	**0.0000**	**2,278.0453**	**2,278.0453**	**0.0726**		**2,279.8601**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0261	0.0158	0.3297	1.3200e-003	0.2236	4.4000e-004	0.2240	0.0593	4.0000e-004	0.0597		150.2680	150.2680	1.3100e-003	2.7300e-003	151.1141
Total	**0.0261**	**0.0158**	**0.3297**	**1.3200e-003**	**0.2236**	**4.4000e-004**	**0.2240**	**0.0593**	**4.0000e-004**	**0.0597**		**150.2680**	**150.2680**	**1.3100e-003**	**2.7300e-003**	**151.1141**

3.5 Construction - 2045

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.7608	2.9114	6.6760	0.0207		0.0461	0.0461		0.0461	0.0461		1,925.6342	1,925.6342	0.0665		1,927.2973
Total	**0.7608**	**2.9114**	**6.6760**	**0.0207**		**0.0461**	**0.0461**		**0.0461**	**0.0461**		**1,925.6342**	**1,925.6342**	**0.0665**		**1,927.2973**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0136	0.5735	0.2177	2.1900e-003	0.1754	3.0400e-003	0.1785	0.0474	2.9100e-003	0.0503		238.5028	238.5028	0.0115	0.0352	249.2669
Worker	0.0522	0.0315	0.6594	2.6500e-003	0.8358	8.7000e-004	0.8367	0.2140	8.0000e-004	0.2148		300.5360	300.5360	2.6300e-003	5.4600e-003	302.2281
Total	**0.0657**	**0.6050**	**0.8771**	**4.8400e-003**	**1.0112**	**3.9100e-003**	**1.0151**	**0.2614**	**3.7100e-003**	**0.2651**		**539.0388**	**539.0388**	**0.0141**	**0.0406**	**551.4951**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.7608	2.9114	6.6760	0.0207		0.0461	0.0461		0.0461	0.0461	0.0000	1,925.6342	1,925.6342	0.0665		1,927.2973
Total	**0.7608**	**2.9114**	**6.6760**	**0.0207**		**0.0461**	**0.0461**		**0.0461**	**0.0461**	**0.0000**	**1,925.6342**	**1,925.6342**	**0.0665**		**1,927.2973**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0136	0.5735	0.2177	2.1900e-003	0.1754	3.0400e-003	0.1785	0.0474	2.9100e-003	0.0503		238.5028	238.5028	0.0115	0.0352	249.2669
Worker	0.0522	0.0315	0.6594	2.6500e-003	0.8358	8.7000e-004	0.8367	0.2140	8.0000e-004	0.2148		300.5360	300.5360	2.6300e-003	5.4600e-003	302.2281
Total	**0.0657**	**0.6050**	**0.8771**	**4.8400e-003**	**1.0112**	**3.9100e-003**	**1.0151**	**0.2614**	**3.7100e-003**	**0.2651**		**539.0388**	**539.0388**	**0.0141**	**0.0406**	**551.4951**

3.6 Finishing - 2045

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.3769	1.0106	5.9652	0.0108		0.0470	0.0470		0.0470	0.0470		1,023.5568	1,023.5568	0.0334		1,024.3914
Paving	3.6500e-003					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000

Pettit Water Storage Tank Expansion and Transmission Pipeline Project Phase 2 - South Coast Air Basin, Winter

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Total	**0.3806**	**1.0106**	**5.9652**	**0.0108**		**0.0470**	**0.0470**		**0.0470**	**0.0470**		**1,023.5568**	**1,023.5568**	**0.0334**		**1,024.3914**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0261	0.0158	0.3297	1.3200e-003	0.2236	4.4000e-004	0.2240	0.0593	4.0000e-004	0.0597		150.2680	150.2680	1.3100e-003	2.7300e-003	151.1141
Total	**0.0261**	**0.0158**	**0.3297**	**1.3200e-003**	**0.2236**	**4.4000e-004**	**0.2240**	**0.0593**	**4.0000e-004**	**0.0597**		**150.2680**	**150.2680**	**1.3100e-003**	**2.7300e-003**	**151.1141**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.3769	1.0106	5.9652	0.0108		0.0470	0.0470		0.0470	0.0470	0.0000	1,023.5568	1,023.5568	0.0334		1,024.3914
Paving	3.6500e-003					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**0.3806**	**1.0106**	**5.9652**	**0.0108**		**0.0470**	**0.0470**		**0.0470**	**0.0470**	**0.0000**	**1,023.5568**	**1,023.5568**	**0.0334**		**1,024.3914**

Pettit Water Storage Tank Expansion and Transmission Pipeline Project Phase 2 - South Coast Air Basin, Winter

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0261	0.0158	0.3297	1.3200e-003	0.2236	4.4000e-004	0.2240	0.0593	4.0000e-004	0.0597		150.2680	150.2680	1.3100e-003	2.7300e-003	151.1141
Total	**0.0261**	**0.0158**	**0.3297**	**1.3200e-003**	**0.2236**	**4.4000e-004**	**0.2240**	**0.0593**	**4.0000e-004**	**0.0597**		**150.2680**	**150.2680**	**1.3100e-003**	**2.7300e-003**	**151.1141**

3.7 Painting - 2045

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Archit. Coating	0.1675					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.2953	1.9221	4.7327	7.9100e-003		0.0191	0.0191		0.0191	0.0191		749.4256	749.4256	0.0256		750.0647
Total	**0.4628**	**1.9221**	**4.7327**	**7.9100e-003**		**0.0191**	**0.0191**		**0.0191**	**0.0191**		**749.4256**	**749.4256**	**0.0256**		**750.0647**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0261	0.0158	0.3297	1.3200e-003	0.2236	4.4000e-004	0.2240	0.0593	4.0000e-004	0.0597		150.2680	150.2680	1.3100e-003	2.7300e-003	151.1141
Total	**0.0261**	**0.0158**	**0.3297**	**1.3200e-003**	**0.2236**	**4.4000e-004**	**0.2240**	**0.0593**	**4.0000e-004**	**0.0597**		**150.2680**	**150.2680**	**1.3100e-003**	**2.7300e-003**	**151.1141**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Archit. Coating	0.1675					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.2953	1.9221	4.7327	7.9100e-003		0.0191	0.0191		0.0191	0.0191	0.0000	749.4256	749.4256	0.0256		750.0647
Total	**0.4628**	**1.9221**	**4.7327**	**7.9100e-003**		**0.0191**	**0.0191**		**0.0191**	**0.0191**	**0.0000**	**749.4256**	**749.4256**	**0.0256**		**750.0647**

Pettit Water Storage Tank Expansion and Transmission Pipeline Project Phase 2 - South Coast Air Basin, Winter

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0261	0.0158	0.3297	1.3200e-003	0.2236	4.4000e-004	0.2240	0.0593	4.0000e-004	0.0597		150.2680	150.2680	1.3100e-003	2.7300e-003	151.1141
Total	**0.0261**	**0.0158**	**0.3297**	**1.3200e-003**	**0.2236**	**4.4000e-004**	**0.2240**	**0.0593**	**4.0000e-004**	**0.0597**		**150.2680**	**150.2680**	**1.3100e-003**	**2.7300e-003**	**151.1141**

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Pettit Water Storage Tank Expansion and Transmission Pipeline Project Phase 2 - South Coast Air Basin, Winter

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	0.0419	9.0000e-005	9.6600e-003	0.0000		3.0000e-005	3.0000e-005		3.0000e-005	3.0000e-005		0.0208	0.0208	5.0000e-005		0.0222
Unmitigated	0.0419	9.0000e-005	9.6600e-003	0.0000		3.0000e-005	3.0000e-005		3.0000e-005	3.0000e-005		0.0208	0.0208	5.0000e-005		0.0222

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	7.2500e-003					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	0.0337					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	8.8000e-004	9.0000e-005	9.6600e-003	0.0000		3.0000e-005	3.0000e-005		3.0000e-005	3.0000e-005		0.0208	0.0208	5.0000e-005		0.0222
Total	**0.0418**	**9.0000e-005**	**9.6600e-003**	**0.0000**		**3.0000e-005**	**3.0000e-005**		**3.0000e-005**	**3.0000e-005**		**0.0208**	**0.0208**	**5.0000e-005**		**0.0222**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	7.2500e-003					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	0.0337					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	8.8000e-004	9.0000e-005	9.6600e-003	0.0000		3.0000e-005	3.0000e-005		3.0000e-005	3.0000e-005		0.0208	0.0208	5.0000e-005		0.0222
Total	**0.0418**	**9.0000e-005**	**9.6600e-003**	**0.0000**		**3.0000e-005**	**3.0000e-005**		**3.0000e-005**	**3.0000e-005**		**0.0208**	**0.0208**	**5.0000e-005**		**0.0222**

Appendix
AQ/GHG/Energy-2C
Mobile Construction Emissions
Phase 1

ESA

Pettit Water Storage Tank Expansion and Transmission Popeline Project - Phase 1

Total Emissions

Construction Phase	Daily One-Way Trips	Haul Days per Phase (days)	Work Hours per Day (hours/day)	One-Way Trip Distance per Day (miles)	Idling per Day (minutes)	Regional Emissions (pounds/day) ROG	NOX	CO	SO2	PM10 Dust	PM10 Exh	Total PM10	PM2.5 Dust	PM2.5 Exh	Total PM2.5	(MT/yr) Total CO2e
Potholding (1A)	2026															
Total Haul Trips	0															
Hauling	0	26	8	20	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	26	8	6.9	6.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	20	26	8	14.7	0	0.06	0.05	0.74	0.00	0.21	0.00	0.21	0.05	0.00	0.05	2.26
					Total	**0.06**	**0.05**	**0.74**	**0.00**	**0.21**	**0.00**	**0.21**	**0.05**	**0.00**	**0.05**	**2.26**
Installing Pipeline (1A)	2026															
Total Haul Trips	0															
Hauling	0	52	8	20	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	52	8	6.9	6.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	20	52	8	14.7	0	0.06	0.05	0.74	0.00	0.21	0.00	0.21	0.05	0.00	0.05	4.52
					Total	**0.06**	**0.05**	**0.74**	**0.00**	**0.21**	**0.00**	**0.21**	**0.05**	**0.00**	**0.05**	**4.52**
Installing Appurtenances (1A)	2026															
Total Haul Trips	0															
Hauling	0	27	8	20	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	27	8	6.9	6.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	20	27	8	14.7	0	0.06	0.05	0.74	0.00	0.21	0.00	0.21	0.05	0.00	0.05	2.35
					Total	**0.06**	**0.05**	**0.74**	**0.00**	**0.21**	**0.00**	**0.21**	**0.05**	**0.00**	**0.05**	**2.35**
Pavement Repairs (1A)	2027															
Total Haul Trips	0															
Hauling	0	26	8	20	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	36	26	8	6.9	6.9	0.07	1.42	1.13	0.01	0.21	0.01	0.22	0.06	0.01	0.06	10.57
Worker	20	26	8	14.7	0	0.05	0.05	0.69	0.00	0.21	0.00	0.21	0.05	0.00	0.05	2.21
					Total	**0.12**	**1.47**	**1.82**	**0.01**	**0.42**	**0.01**	**0.43**	**0.11**	**0.01**	**0.12**	**12.78**
Grading/Excavation (1B)	2026															
Total Haul Trips	6058															
Hauling	117	52	8	20	15	0.79	30.69	14.00	0.09	2.15	0.13	2.28	0.57	0.12	0.70	235.53
Vendor	0	52	8	6.9	6.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	20	52	8	14.7	0	0.06	0.05	0.74	0.00	0.21	0.00	0.21	0.05	0.00	0.05	4.52
					Total	**0.85**	**30.74**	**14.74**	**0.09**	**2.36**	**0.13**	**2.49**	**0.63**	**0.12**	**0.75**	**240.05**
Stormwater Drainange and Foun	2026															
Total Haul Trips	9712															
Hauling	184	53	8	20	15	1.25	48.26	22.01	0.13	3.39	0.20	3.59	0.90	0.19	1.09	377.53
Vendor	0	53	8	6.9	6.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	20	53	8	14.7	0	0.06	0.05	0.74	0.00	0.21	0.00	0.21	0.05	0.00	0.05	4.60
					Total	**1.30**	**48.31**	**22.75**	**0.14**	**3.59**	**0.20**	**3.79**	**0.95**	**0.19**	**1.15**	**382.13**
Construction (1B) 2026	2026															
Total Haul Trips	0															
Hauling	0	104	8	20	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	36	104	8	6.9	6.9	0.07	1.48	1.15	0.01	0.21	0.01	0.22	0.06	0.01	0.06	43.11
Worker	20	104	8	14.7	0	0.06	0.05	0.74	0.00	0.21	0.00	0.21	0.05	0.00	0.05	9.04
					Total	**0.13**	**1.53**	**1.89**	**0.01**	**0.42**	**0.01**	**0.43**	**0.11**	**0.01**	**0.12**	**52.15**
Construction (1B) 2027	2027															
Total Haul Trips	0															
Hauling	0	51	8	20	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	36	51	8	6.9	6.9	0.07	1.42	1.13	0.01	0.21	0.01	0.22	0.06	0.01	0.06	20.73
Worker	20	51	8	14.7	0	0.05	0.05	0.69	0.00	0.21	0.00	0.21	0.05	0.00	0.05	4.33
					Total	**0.12**	**1.47**	**1.82**	**0.01**	**0.42**	**0.01**	**0.43**	**0.11**	**0.01**	**0.12**	**25.06**
Finishing (1B) 2026	2026															
Total Haul Trips	0															
Hauling	0	104	8	20	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	104	8	6.9	6.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	20	104	8	14.7	0	0.06	0.05	0.74	0.00	0.21	0.00	0.21	0.05	0.00	0.05	9.04
					Total	**0.06**	**0.05**	**0.74**	**0.00**	**0.21**	**0.00**	**0.21**	**0.05**	**0.00**	**0.05**	**9.04**
Finishing (1B) 2027	2027															
Total Haul Trips	0															
Hauling	0	51	8	20	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	51	8	6.9	6.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	20	51	8	14.7	0	0.05	0.05	0.69	0.00	0.21	0.00	0.21	0.05	0.00	0.05	4.33
					Total	**0.05**	**0.05**	**0.69**	**0.00**	**0.21**	**0.00**	**0.21**	**0.05**	**0.00**	**0.05**	**4.33**
Painting (1B) 2026	2026															
Total Haul Trips	0															
Hauling	0	104	8	20	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	104	8	6.9	6.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	20	104	8	14.7	0	0.06	0.05	0.74	0.00	0.21	0.00	0.21	0.05	0.00	0.05	9.04
					Total	**0.06**	**0.05**	**0.74**	**0.00**	**0.21**	**0.00**	**0.21**	**0.05**	**0.00**	**0.05**	**9.04**
Painting (1B) 2027	2027															
Total Haul Trips	0															
Hauling	0	51	8	20	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	51	8	6.9	6.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	20	51	8	14.7	0	0.05	0.05	0.69	0.00	0.21	0.00	0.21	0.05	0.00	0.05	4.33
					Total	**0.05**	**0.05**	**0.69**	**0.00**	**0.21**	**0.00**	**0.21**	**0.05**	**0.00**	**0.05**	**4.33**

Pettit Water Storage Tank Expansion and Transmission Popeline Project - Phase 1
Running Emissions

		Running Emissions Factor (grams/mile)						Running Emissions Factor (grams/mile)		
		ROG_RUNEX	NOx_RUNEX	CO_RUNEX	SOx_RUNEX	PM10_RUNEX	PM2.5_RUNEX	CO2_RUNEX	CH4_RUNEX	N2O_RUNEX
2026	2026Hauling Hauling	0.01376405	1.595849109	0.49695887	0.01364807	0.02370376	0.02267409	1504.81428	0.07447891	0.23998519
2026	2026Vendor Vendor	0.01588145	1.125637812	0.37555792	0.01233428	0.01550079	0.01482427	1332.37984	0.04136649	0.18835672
2026	2026Worker Worker	0.01474423	0.064876665	0.92148333	0.00284763	0.00151768	0.00139649	288.065796	0.00359651	0.00581535
2027	2027Hauling Hauling	0.01322008	1.536397393	0.47417014	0.01337135	0.02376842	0.02273616	1474.76922	0.06997872	0.23521638
2027	2027Vendor Vendor	0.01440232	1.064732037	0.34654864	0.0120909	0.01519791	0.0145347	1306.68278	0.03905997	0.18528831
2027	2027Worker Worker	0.0132844	0.05897072	0.863434	0.00278193	0.00142337	0.00130945	281.41861	0.00327875	0.00546182

Construction Phase	Daily One-Way Trips	Haul Days per Phase (days)	Work Hours per Day (hours/day)	One-Way Trip Distance per Day (miles)	Regional Emissions (pounds/day) ROG	NOX	CO	SO2	PM10	PM2.5	Regional Emissions (MT/year) CO2	CH4	N2O	CO2e
Potholding (1A)	2026													
Total Haul Trips	0													
Hauling	0	26	8	20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	26	8	6.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	20	26	8	14.7	0.01	0.04	0.60	0.00	0.00	0.00	2.20	0.00	0.01	2.22
				Total	**0.01**	**0.04**	**0.60**	**0.00**	**0.00**	**0.00**	**2.20**	**0.00**	**0.01**	**2.22**
Installing Pipeline (1A)	2026													
Total Haul Trips	0													
Hauling	0	52	8	20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	52	8	6.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	20	52	8	14.7	0.01	0.04	0.60	0.00	0.00	0.00	4.40	0.00	0.03	4.43
				Total	**0.01**	**0.04**	**0.60**	**0.00**	**0.00**	**0.00**	**4.40**	**0.00**	**0.03**	**4.43**
Installing Appurtenances (1.	2026													
Total Haul Trips	0													
Hauling	0	27	8	20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	27	8	6.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	20	27	8	14.7	0.01	0.04	0.60	0.00	0.00	0.00	2.29	0.00	0.01	2.30
				Total	**0.01**	**0.04**	**0.60**	**0.00**	**0.00**	**0.00**	**2.29**	**0.00**	**0.01**	**2.30**
Pavement Repairs (1A)	2027													
Total Haul Trips	0													
Hauling	0	26	8	20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	36	26	8	6.9	0.01	0.58	0.19	0.01	0.01	0.01	8.44	0.01	0.36	8.80
Worker	20	26	8	14.7	0.01	0.04	0.56	0.00	0.00	0.00	2.15	0.00	0.01	2.16
				Total	**0.02**	**0.62**	**0.75**	**0.01**	**0.01**	**0.01**	**10.59**	**0.01**	**0.37**	**10.97**
Grading/Excavation (1B)	2026													
Total Haul Trips	6058													
Hauling	117	52	8	20	0.07	8.23	2.56	0.07	0.12	0.12	183.11	0.23	8.70	192.03
Vendor	0	52	8	6.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	20	52	8	14.7	0.01	0.04	0.60	0.00	0.00	0.00	4.40	0.00	0.03	4.43
				Total	**0.08**	**8.27**	**3.16**	**0.07**	**0.12**	**0.12**	**187.51**	**0.23**	**8.73**	**196.47**
Stormwater Drainange and	2026													
Total Haul Trips	9712													
Hauling	184	53	8	20	0.11	12.95	4.03	0.11	0.19	0.18	293.50	0.36	13.95	307.81
Vendor	0	53	8	6.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	20	53	8	14.7	0.01	0.04	0.60	0.00	0.00	0.00	4.49	0.00	0.03	4.52
				Total	**0.12**	**12.99**	**4.63**	**0.11**	**0.19**	**0.18**	**297.99**	**0.36**	**13.98**	**312.33**
Construction (1B) 2026	2026													
Total Haul Trips	0													
Hauling	0	104	8	20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	36	104	8	6.9	0.01	0.62	0.21	0.01	0.01	0.01	34.42	0.03	1.45	35.90
Worker	20	104	8	14.7	0.01	0.04	0.60	0.00	0.00	0.00	8.81	0.00	0.05	8.86
				Total	**0.02**	**0.66**	**0.80**	**0.01**	**0.01**	**0.01**	**43.23**	**0.03**	**1.50**	**44.76**
Construction (1B) 2027	2027													
Total Haul Trips	0													
Hauling	0	51	8	20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	36	51	8	6.9	0.01	0.58	0.19	0.01	0.01	0.01	16.55	0.01	0.70	17.27
Worker	20	51	8	14.7	0.01	0.04	0.56	0.00	0.00	0.00	4.22	0.00	0.02	4.25
				Total	**0.02**	**0.62**	**0.75**	**0.01**	**0.01**	**0.01**	**20.77**	**0.01**	**0.72**	**21.51**
Finishing (1B) 2026	2026													
Total Haul Trips	0													
Hauling	0	104	8	20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	104	8	6.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	20	104	8	14.7	0.01	0.04	0.60	0.00	0.00	0.00	8.81	0.00	0.05	8.86
				Total	**0.01**	**0.04**	**0.60**	**0.00**	**0.00**	**0.00**	**8.81**	**0.00**	**0.05**	**8.86**
Finishing (1B) 2027	2027													
Total Haul Trips	0													
Hauling	0	51	8	20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	51	8	6.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	20	51	8	14.7	0.01	0.04	0.56	0.00	0.00	0.00	4.22	0.00	0.02	4.25
				Total	**0.01**	**0.04**	**0.56**	**0.00**	**0.00**	**0.00**	**4.22**	**0.00**	**0.02**	**4.25**
Painting (1B) 2026	2026													
Total Haul Trips	0													
Hauling	0	104	8	20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	104	8	6.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	20	104	8	14.7	0.01	0.04	0.60	0.00	0.00	0.00	8.81	0.00	0.05	8.86
				Total	**0.01**	**0.04**	**0.60**	**0.00**	**0.00**	**0.00**	**8.81**	**0.00**	**0.05**	**8.86**
Painting (1B) 2027	2027													
Total Haul Trips	0													
Hauling	0	51	8	20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	51	8	6.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	20	51	8	14.7	0.01	0.04	0.56	0.00	0.00	0.00	4.22	0.00	0.02	4.25
				Total	**0.01**	**0.04**	**0.56**	**0.00**	**0.00**	**0.00**	**4.22**	**0.00**	**0.02**	**4.25**

Pettit Water Storage Tank Expansion and Transmission Popeline Project - Phase 1
Mitigated Start Emissions

			ROG_STREX	NOX_STREX	CO_STREX	SOx_STREX	PM10_STREX	PM2.5_STREX	CO2_STREX	CH4_STREX	N2O_STREX
			Start Emissions Factor (grams/trip)						Start Emissions Factor (grams/trip)		
2026	2026Hauling	Hauling	0.000593978	2.700584219	0.00281799	3.07275E-07	5.76835E-07	5.30378E-07	0.03108176	7.36588E-08	6.71372E-06
2026	2026Vendor	Vendor	0.072237744	2.002754741	0.56331633	5.24735E-05	5.67385E-05	5.2169E-05	5.30785243	0.005143979	0.003831506
2026	2026Worker	Worker	1.082116369	0.26253092	3.17302049	0.000708966	0.002142237	0.001969708	71.7140515	0.069812922	0.031730685
2027	2027Hauling	Hauling	0.000486315	2.684459969	0.00257919	2.64881E-07	4.40977E-07	4.05462E-07	0.02679352	6.69096E-08	5.70925E-06
2027	2027Vendor	Vendor	0.067811943	1.987864891	0.52445847	4.98542E-05	5.38735E-05	4.95347E-05	5.04289677	0.004849021	0.003638759
2027	2027Worker	Worker	1.034003809	0.249591845	2.98593445	0.000691122	0.002039546	0.001875287	69.9090072	0.065749162	0.030824112
	GWP			N/A					1	25	298

Construction Phase	Daily One-Way Trips	Haul Days per Phase (days)	Work Hours per Day (hours/day)	One-Way Trip Distance per Day (miles)	ROG	NOX	CO	SO2	PM10	PM2.5	CO2	CH4	N2O	CO2e
					Regional Emissions (pounds/day)						Regional Emissions (MT/year)			
Potholding (1A)	2026													
Total Haul Trips	0													
Hauling	0	26	8	20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	26	8	6.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	20	26	8	14.7	0.05	0.01	0.14	0.00	0.00	0.00	0.04	0.00	0.00	0.04
Installing Pipeline (1A)	2026													
Total Haul Trips	0													
Hauling	0	52	8	20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	52	8	6.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	20	52	8	14.7	0.05	0.01	0.14	0.00	0.00	0.00	0.07	0.00	0.00	0.09
Installing Appurtenances (1/	2026													
Total Haul Trips	0													
Hauling	0	27	8	20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	27	8	6.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	20	27	8	14.7	0.05	0.01	0.14	0.00	0.00	0.00	0.04	0.00	0.00	0.04
Pavement Repairs (1A)	2027													
Total Haul Trips	0													
Hauling	0	26	8	20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	36	26	8	6.9	0.01	0.16	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Worker	20	26	8	14.7	0.05	0.01	0.13	0.00	0.00	0.00	0.04	0.00	0.00	0.04
Grading/Excavation (1B)	2026													
Total Haul Trips	6058													
Hauling	117	52	8	20	0.00	13.93	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	52	8	6.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	20	52	8	14.7	0.05	0.01	0.14	0.00	0.00	0.00	0.07	0.00	0.00	0.09
Stormwater Drainange and	2026													
Total Haul Trips	9712													
Hauling	184	53	8	20	0.00	21.91	0.02	0.00	0.00	0.00	0.01	0.00	0.00	0.01
Vendor	0	53	8	6.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	20	53	8	14.7	0.05	0.01	0.14	0.00	0.00	0.00	0.08	0.00	0.00	0.09
Construction (1B) 2026	2026													
Total Haul Trips	0													
Hauling	0	104	8	20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	36	104	8	6.9	0.01	0.16	0.04	0.00	0.00	0.00	0.02	0.00	0.00	0.02
Worker	20	104	8	14.7	0.05	0.01	0.14	0.00	0.00	0.00	0.15	0.00	0.00	0.17
Construction (1B) 2027	2027													
Total Haul Trips	0													
Hauling	0	51	8	20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	36	51	8	6.9	0.01	0.16	0.04	0.00	0.00	0.00	0.01	0.00	0.00	0.01
Worker	20	51	8	14.7	0.05	0.01	0.13	0.00	0.00	0.00	0.07	0.00	0.00	0.08
Finishing (1B) 2026	2026													
Total Haul Trips	0													
Hauling	0	104	8	20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	104	8	6.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	20	104	8	14.7	0.05	0.01	0.14	0.00	0.00	0.00	0.15	0.00	0.00	0.17
Finishing (1B) 2027	2027													
Total Haul Trips	0													
Hauling	0	51	8	20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	51	8	6.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	20	51	8	14.7	0.05	0.01	0.13	0.00	0.00	0.00	0.07	0.00	0.00	0.08
Painting (1B) 2026	2026													
Total Haul Trips	0													
Hauling	0	104	8	20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	104	8	6.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	20	104	8	14.7	0.05	0.01	0.14	0.00	0.00	0.00	0.15	0.00	0.00	0.17
Painting (1B) 2027	2027													
Total Haul Trips	0													
Hauling	0	51	8	20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	51	8	6.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	20	51	8	14.7	0.05	0.01	0.13	0.00	0.00	0.00	0.07	0.00	0.00	0.08

Pettit Water Storage Tank Expansion and Transmission Popeline Project - Phase 1
Idling Emissions

			ROG_IDLEX	NOx_IDLEX	CO_IDLEX	SOx_IDLEX	PM10_IDLEX	PM2.5_IDLEX	CO2_IDLEX	CH4_IDLEX	N2O_IDLEX
			Idling Emissions Factor (grams/minute)						Idling Emissions Factor (grams/minute)		
2026	2026Hauling	Hauling	0.18581453	2.20283162	2.95149578	0.00398172	0.00118326	0.0011293	453.111594	0.09241587	0.07289884
2026	2026Vendor	Vendor	0.0996196	1.287653231	1.65082764	0.00234189	0.0008589	0.00082019	264.786505	0.05126821	0.04228174
2026	2026Worker	Worker	0	0	0	0	0	0	0	0	0
2027	2027Hauling	Hauling	0.18444656	2.142407261	2.93701424	0.0038895	0.00113452	0.00108256	443.460401	0.09083936	0.07138232
2027	2027Vendor	Vendor	0.09868778	1.248580039	1.64179772	0.00229123	0.00078955	0.00075377	259.526004	0.05052808	0.04146862
2027	2027Worker	Worker	0	0	0	0	0	0	0	0	0
		GWP	N/A	N/A	N/A	N/A	N/A	N/A	1	25	290

Construction Phase	Daily One-Way Trips	Haul Days per Phase (days)	Work Hours per Day (hours/day)	Idling minutes per Day	ROG	NOX	CO	SO2	PM10	PM2.5	CO2	CH4	N2O	CO2e
					Regional Emissions (pounds/day)						Regional Emissions (MT/year)			
Potholding (1A)	2026													
Total Haul Trips	0													
Hauling	0	26	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	26	8	6.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	20	26	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Installing Pipeline (1A)	2026													
Total Haul Trips	0													
Hauling	0	52	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	52	8	6.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	20	52	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Installing Appurtenances (1	2026													
Total Haul Trips	0													
Hauling	0	27	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	27	8	6.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	20	27	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pavement Repairs (1A)	2027													
Total Haul Trips	0													
Hauling	0	26	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	36	26	8	6.9	0.05	0.68	0.90	0.00	0.00	0.00	1.68	0.01	0.08	1.76
Worker	20	26	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Grading/Excavation (1B)	2026													
Total Haul Trips	6058													
Hauling	117	52	8	15	0.72	8.52	11.42	0.02	0.00	0.00	41.35	0.21	1.93	43.49
Vendor	0	52	8	6.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	20	52	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Stormwater Drainange and	2026													
Total Haul Trips	9712													
Hauling	184	53	8	15	1.13	13.40	17.96	0.02	0.01	0.01	66.28	0.34	3.09	69.71
Vendor	0	53	8	6.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	20	53	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Construction (1B) 2026	2026													
Total Haul Trips	0													
Hauling	0	104	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	36	104	8	6.9	0.05	0.71	0.90	0.00	0.00	0.00	6.84	0.03	0.32	7.19
Worker	20	104	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Construction (1B) 2027	2027													
Total Haul Trips	0													
Hauling	0	51	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	36	51	8	6.9	0.05	0.68	0.90	0.00	0.00	0.00	3.29	0.02	0.15	3.46
Worker	20	51	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Finishing (1B) 2026	2026													
Total Haul Trips	0													
Hauling	0	104	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	104	8	6.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	20	104	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Finishing (1B) 2027	2027													
Total Haul Trips	0													
Hauling	0	51	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	51	8	6.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	20	51	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Painting (1B) 2026	2026													
Total Haul Trips	0													
Hauling	0	104	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	104	8	6.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	20	104	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Painting (1B) 2027	2027													
Total Haul Trips	0													
Hauling	0	51	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	51	8	6.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	20	51	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Pettit Water Storage Tank Expansion and Transmission Popeline Project - Phase 1

Road Dust, Break Wear, and Tire wear Emissions

		Emission Factors (grams/mile)					
		PM10			PM2.5		
		RD	PM10_PMBW	PM10_PMTW	RD	PM2.5_PMBW	PM2.5_PMTW
2026	2026Hauling Hauling	0.29984991	0.082405307	0.03529039	0.07359952	0.02884186	0.0088226
2026	2026Vendor Vendor	0.29984991	0.062625784	0.02364519	0.07359952	0.02191902	0.0059113
2026	2026Worker Worker	0.29984991	0.008948145	0.008	0.07359952	0.00313185	0.002
2027	2027Hauling Hauling	0.29984991	0.082414193	0.03529623	0.07359952	0.02884497	0.00882406
2027	2027Vendor Vendor	0.29984991	0.062505591	0.02364812	0.07359952	0.02187696	0.00591203
2027	2027Worker Worker	0.29984991	0.008900193	0.008	0.07359952	0.00311507	0.002

Construction Phase	Daily One-Way Trips	Haul Days per Phase (days)	Work Hours per Day (hours/day)	One-Way Trip Distance per Day (miles)	Regional Emissions (pounds/day) PM10 RD	PM10 BW	PM10 TW	PM2.5 RD	PM2.5 BW	PM2.5 TW
Potholding (1A)	2026									
Total Haul Trips	0			**Total**	**6.80**	**1.27**	**0.57**	**1.67**	**0.44**	**0.14**
Hauling	0	26	8	20	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	26	8	6.9	0.00	0.00	0.00	0.00	0.00	0.00
Worker	20	26	8	14.7	0.19	0.01	0.01	0.05	0.00	0.00
Installing Pipeline (1A)	2026									
Total Haul Trips	0									
Hauling	0	52	8	20	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	52	8	6.9	0.00	0.00	0.00	0.00	0.00	0.00
Worker	20	52	8	14.7	0.19	0.01	0.01	0.05	0.00	0.00
Installing Appurtenances (1	2026									
Total Haul Trips	0									
Hauling	0	27	8	20	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	27	8	6.9	0.00	0.00	0.00	0.00	0.00	0.00
Worker	20	27	8	14.7	0.19	0.01	0.01	0.05	0.00	0.00
Pavement Repairs (1A)	2027									
Total Haul Trips	0									
Hauling	0	26	8	20	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	36	26	8	6.9	0.16	0.03	0.01	0.04	0.01	0.00
Worker	20	26	8	14.7	0.19	0.01	0.01	0.05	0.00	0.00
Grading/Excavation (1B)	2026									
Total Haul Trips	6058									
Hauling	117	52	8	20	1.55	0.43	0.18	0.38	0.15	0.05
Vendor	0	52	8	6.9	0.00	0.00	0.00	0.00	0.00	0.00
Worker	20	52	8	14.7	0.19	0.01	0.01	0.05	0.00	0.00
Stormwater Drainange and	2026									
Total Haul Trips	9712									
Hauling	184	53	8	20	2.43	0.67	0.29	0.60	0.23	0.07
Vendor	0	53	8	6.9	0.00	0.00	0.00	0.00	0.00	0.00
Worker	20	53	8	14.7	0.19	0.01	0.01	0.05	0.00	0.00
Construction (1B) 2026	2026									
Total Haul Trips	0									
Hauling	0	104	8	20	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	36	104	8	6.9	0.16	0.03	0.01	0.04	0.01	0.00
Worker	20	104	8	14.7	0.19	0.01	0.01	0.05	0.00	0.00
Construction (1B) 2027	2027									
Total Haul Trips	0									
Hauling	0	51	8	20	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	36	51	8	6.9	0.16	0.03	0.01	0.04	0.01	0.00
Worker	20	51	8	14.7	0.19	0.01	0.01	0.05	0.00	0.00
Finishing (1B) 2026	2026									
Total Haul Trips	0									
Hauling	0	104	8	20	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	104	8	6.9	0.00	0.00	0.00	0.00	0.00	0.00
Worker	20	104	8	14.7	0.19	0.01	0.01	0.05	0.00	0.00
Finishing (1B) 2027	2027									
Total Haul Trips	0									
Hauling	0	51	8	20	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	51	8	6.9	0.00	0.00	0.00	0.00	0.00	0.00
Worker	20	51	8	14.7	0.19	0.01	0.01	0.05	0.00	0.00
Painting (1B) 2026	2026									
Total Haul Trips	0									
Hauling	0	104	8	20	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	104	8	6.9	0.00	0.00	0.00	0.00	0.00	0.00
Worker	20	104	8	14.7	0.19	0.01	0.01	0.05	0.00	0.00
Painting (1B) 2027	2027									
Total Haul Trips	0									
Hauling	0	51	8	20	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	51	8	6.9	0.00	0.00	0.00	0.00	0.00	0.00
Worker	20	51	8	14.7	0.19	0.01	0.01	0.05	0.00	0.00

Pettit Water Storage Tank Expansion and Transmission Popeline Project - Phase 1

Total On-Road Fuel Consumption

		gal/mile
2026Hauling	Hauling	0.1612349
2026Vendor	Vendor	0.13616514
2026Worker	Worker	0.03612173
2027Hauling	Hauling	0.15897566
2027Vendor	Vendor	0.13483512
2027Worker	Worker	0.03542319

Total On-Road Fuel Consumption

Source	Fuel Type	Total Fuel Use (gal)
Hauling	Diesel	51,066
Vendor	Diesel	6,097
Worker	Gasoline	7,408

Fuel Type	Total Fuel Use	Annual Fuel Use
Diesel	57,163	68,860
Gasoline	7,408	8,923

Duration of Construction	
Start	5/1/2026
End	2/28/2027
0.8	years

Construction Phase	Daily One-Way Trips	Haul Days per Phase (days)	Work Hours per Day (hours/day)	One-Way Trip Distance per Day (miles)	Idling per Day (minutes)	Regional Emissions (gallons) gal/mile	gal/min	gal/day	Total Gallons/yr
Potholding (1A)	2026								
Total Haul Trips	0								
Hauling	0	26	8	20	15	0.16	0.00E+00	0	0
Vendor	0	26	8	6.9	6.9	0.14	0.00E+00	0	0
Worker	20	26	8	14.7	0	0.04	0.00E+00	11	276
Installing Pipeline (1A)	2026								
Total Haul Trips	0								
Hauling	0	52	8	20	15	0.16	0.00E+00	0	0
Vendor	0	52	8	6.9	6.9	0.14	0.00E+00	0	0
Worker	20	52	8	14.7	0	0.04	0.00E+00	11	552
Installing Appurtenances (1A)	2026								
Total Haul Trips	0								
Hauling	0	27	8	20	15	0.16	0.00E+00	0	0
Vendor	0	27	8	6.9	6.9	0.14	0.00E+00	0	0
Worker	20	27	8	14.7	0	0.04	0.00E+00	11	287
Pavement Repairs (1A)	2027								
Total Haul Trips	0								
Hauling	0	26	8	20	15	0.16	0.00E+00	0	0
Vendor	36	26	8	6.9	6.9	0.13	0.00E+00	33	871
Worker	20	26	8	14.7	0	0.04	0.00E+00	10	271
Grading/Excavation (1B)	2026								
Total Haul Trips	6058								
Hauling	117	52	8	20	15	0.16	0.00E+00	377	19,619
Vendor	0	52	8	6.9	6.9	0.14	0.00E+00	0	0
Worker	20	52	8	14.7	0	0.04	0.00E+00	11	552
Stormwater Drainange and Foun	2026								
Total Haul Trips	9712								
Hauling	184	53	8	20	15	0.16	0.00E+00	593	31,447
Vendor	0	53	8	6.9	6.9	0.14	0.00E+00	0	0
Worker	20	53	8	14.7	0	0.04	0.00E+00	11	563
Construction (1B) 2026	2026								
Total Haul Trips	0								
Hauling	0	104	8	20	15	0.16	0.00E+00	0	0
Vendor	36	104	8	6.9	6.9	0.14	0.00E+00	34	3,518
Worker	20	104	8	14.7	0	0.04	0.00E+00	11	1,104
Construction (1B) 2027	2027								
Total Haul Trips	0								
Hauling	0	51	8	20	15	0.16	0.00E+00	0	0
Vendor	36	51	8	6.9	6.9	0.13	0.00E+00	33	1,708
Worker	20	51	8	14.7	0	0.04	0.00E+00	10	531
Finishing (1B) 2026	2026								
Total Haul Trips	0								
Hauling	0	104	8	20	15	0.16	0.00E+00	0	0
Vendor	0	104	8	6.9	6.9	0.14	0.00E+00	0	0
Worker	20	104	8	14.7	0	0.04	0.00E+00	11	1,104
Finishing (1B) 2027	2027								
Total Haul Trips	0								
Hauling	0	51	8	20	15	0.16	0.00E+00	0	0
Vendor	0	51	8	6.9	6.9	0.13	0.00E+00	0	0
Worker	20	51	8	14.7	0	0.04	0.00E+00	10	531
Painting (1B) 2026	2026								
Total Haul Trips	0								
Hauling	0	104	8	20	15	0.16	0.00E+00	0	0
Vendor	0	104	8	6.9	6.9	0.14	0.00E+00	0	0
Worker	20	104	8	14.7	0	0.04	0.00E+00	11	1,104
Painting (1B) 2027	2027								
Total Haul Trips	0								
Hauling	0	51	8	20	15	0.16	0.00E+00	0	0
Vendor	0	51	8	6.9	6.9	0.13	0.00E+00	0	0
Worker	20	51	8	14.7	0	0.04	0.00E+00	10	531

Appendix
AQ/GHG/Energy-2D
Mobile Construction Emissions
Phase 2

ESA

Pettit Water Storage Tank Expansion and Transmission Pipeline Project Phase 2

Total Emissions

Construction Phase	Daily One-Way Trips	Haul Days per Phase (days)	Work Hours per Day (hours/day)	One-Way Trip Distance per Day (miles)	Idling per Day (minutes)	Regional Emissions (pounds/day) ROG	NOX	CO	SO2	PM10 Dust	PM10 Exh	Total PM10	PM2.5 Dust	PM2.5 Exh	Total PM2.5	(MT/yr) Total CO2e
Demolition	2045															
Total Haul Trips	14															
Hauling	1	26	8	10	15	0.01	0.12	0.09	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.43
Vendor	0	26	8	6.9	6.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	20	26	8	14.7	0	0.03	0.02	0.38	0.00	0.21	0.00	0.21	0.05	0.00	0.05	1.80
					Total	**0.03**	**0.14**	**0.48**	**0.00**	**0.21**	**0.00**	**0.22**	**0.05**	**0.00**	**0.05**	**2.22**
Grading/Excavation	2045															
Total Haul Trips	2020															
Hauling	40	51	8	10	15	0.23	4.88	3.75	0.01	0.37	0.02	0.38	0.10	0.02	0.11	33.63
Vendor	0	51	8	6.9	6.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	20	51	8	14.7	0	0.03	0.02	0.38	0.00	0.21	0.00	0.21	0.05	0.00	0.05	3.52
					Total	**0.26**	**4.90**	**4.13**	**0.01**	**0.57**	**0.02**	**0.59**	**0.15**	**0.02**	**0.17**	**37.15**
Stormwater Drainage and Found	2045															
Total Haul Trips	2															
Hauling	1	25	8	10	15	0.01	0.12	0.09	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.41
Vendor	0	25	8	6.9	6.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	20	25	8	14.7	0	0.03	0.02	0.38	0.00	0.21	0.00	0.21	0.05	0.00	0.05	1.73
					Total	**0.03**	**0.14**	**0.48**	**0.00**	**0.21**	**0.00**	**0.22**	**0.05**	**0.00**	**0.05**	**2.14**
Construction	2045															
Total Haul Trips	0															
Hauling	0	158	8	10	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	16	158	8	6.9	6.9	0.02	0.40	0.39	0.00	0.09	0.00	0.10	0.02	0.00	0.03	17.93
Worker	20	158	8	14.7	0	0.03	0.02	0.38	0.00	0.21	0.00	0.21	0.05	0.00	0.05	10.92
					Total	**0.05**	**0.42**	**0.77**	**0.00**	**0.30**	**0.00**	**0.30**	**0.08**	**0.00**	**0.08**	**28.84**
Finishing	2045															
Total Haul Trips	0															
Hauling	0	158	8	10	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	158	8	6.9	6.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	20	158	8	14.7	0	0.03	0.02	0.38	0.00	0.21	0.00	0.21	0.05	0.00	0.05	10.92
					Total	**0.03**	**0.02**	**0.38**	**0.00**	**0.21**	**0.00**	**0.21**	**0.05**	**0.00**	**0.05**	**10.92**
Painting	2045															
Total Haul Trips	0															
Hauling	0	158	8	10	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	158	8	6.9	6.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	20	158	8	14.7	0	0.03	0.02	0.38	0.00	0.21	0.00	0.21	0.05	0.00	0.05	10.92
					Total	**0.03**	**0.02**	**0.38**	**0.00**	**0.21**	**0.00**	**0.21**	**0.05**	**0.00**	**0.05**	**10.92**

Pettit Water Storage Tank Expansion and Transmission Pipeline Project Phase 2
Running Emissions

			Running Emissions Factor (grams/mile)						Running Emissions Factor (grams/mile)		
			ROG_RUNEX	NOx_RUNEX	CO_RUNEX	SOx_RUNEX	PM10_RUNEX	PM2.5_RUNEX	CO2_RUNEX	CH4_RUNEX	N2O_RUNEX
2045	2045Hauling	Hauling	0.00860447	0.962926108	0.19746745	0.00964371	0.01951631	0.0186701	1052.73895	0.02431371	0.16743667
2045	2045Vendor	Vendor	0.00572871	0.539454946	0.11995724	0.00729861	0.010701	0.01023577	789.463387	0.01457815	0.11922755
2045	2045Worker	Worker	0.00330846	0.018886422	0.48824892	0.00227184	0.00052943	0.00048695	229.815204	0.00110885	0.00301589
0		GWP	N/A	N/A	N/A	N/A	N/A	N/A	1	25	298

Construction Phase	Daily One-Way Trips	Haul Days per Phase (days)	Work Hours per Day (hours/day)	One-Way Trip Distance per Day (miles)	Regional Emissions (pounds/day) ROG	NOX	CO	SO2	PM10	PM2.5	Regional Emissions (MT/year) CO2	CH4	N2O	CO2e
Demolition	2045													
Total Haul Trips	14													
Hauling	1	26	8	10	0.00	0.02	0.00	0.00	0.00	0.00	0.27	0.00	0.01	0.29
Vendor	0	26	8	6.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	20	26	8	14.7	0.00	0.01	0.32	0.00	0.00	0.00	1.76	0.00	0.01	1.76
Grading/Excavation	2045													
Total Haul Trips	2020													
Hauling	40	51	8	10	0.01	0.85	0.17	0.01	0.02	0.02	21.48	0.01	1.02	22.51
Vendor	0	51	8	6.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	20	51	8	14.7	0.00	0.01	0.32	0.00	0.00	0.00	3.45	0.00	0.01	3.46
Stormwater Drainage and F	2045													
Total Haul Trips	2													
Hauling	1	25	8	10	0.00	0.02	0.00	0.00	0.00	0.00	0.26	0.00	0.01	0.28
Vendor	0	25	8	6.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	20	25	8	14.7	0.00	0.01	0.32	0.00	0.00	0.00	1.69	0.00	0.01	1.70
Construction	2045													
Total Haul Trips	0													
Hauling	0	158	8	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	16	158	8	6.9	0.00	0.13	0.03	0.00	0.00	0.00	13.77	0.01	0.62	14.40
Worker	20	158	8	14.7	0.00	0.01	0.32	0.00	0.00	0.00	10.68	0.00	0.04	10.72
Finishing	2045													
Total Haul Trips	0													
Hauling	0	158	8	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	158	8	6.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	20	158	8	14.7	0.00	0.01	0.32	0.00	0.00	0.00	10.68	0.00	0.04	10.72
Painting	2045													
Total Haul Trips	0													
Hauling	0	158	8	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	158	8	6.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	20	158	8	14.7	0.00	0.01	0.32	0.00	0.00	0.00	10.68	0.00	0.04	10.72

Pettit Water Storage Tank Expansion and Transmission Pipeline Project Phase 2
Mitigated Start Emissions

			Start Emissions Factor (grams/trip)							Start Emissions Factor (grams/trip)	
			ROG_STREX	NOX_STREX	CO_STREX	SOx_STREX	PM10_STREX	PM2.5_STREX	CO2_STREX	CH4_STREX	N2O_STREX
2045	2045Hauling	Hauling	3.44422E-05	2.01380474	0.00055764	4.99317E-08	5.96916E-08	5.48842E-08	0.00505074	1.88821E-08	4.18717E-06
2045	2045Vendor	Vendor	0.023074717	1.286036666	0.13907638	1.53782E-05	2.04345E-05	1.87888E-05	1.55554778	0.00152692	0.001203214
2045	2045Worker	Worker	0.535348824	0.155691226	1.53659853	0.000540171	0.000800114	0.000735675	54.6398739	0.031527913	0.024192876
	GWP			N/A					1	25	298

Construction Phase	Daily One-Way Trips	Haul Days per Phase (days)	Work Hours per Day (hours/day)	One-Way Trip Distance per Day (miles)	Regional Emissions (pounds/day) ROG	NOX	CO	SO2	PM10	PM2.5	Regional Emissions (MT/year) CO2	CH4	N2O	CO2e
Demolition	2045													
Total Haul Trips	14													
Hauling	1	26	8	10	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	26	8	6.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	20	26	8	14.7	0.02	0.01	0.07	0.00	0.00	0.00	0.03	0.00	0.00	0.03
Grading/Excavation	2045													
Total Haul Trips	2020													
Hauling	40	51	8	10	0.00	1.78	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	51	8	6.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	20	51	8	14.7	0.02	0.01	0.07	0.00	0.00	0.00	0.06	0.00	0.00	0.06
Stormwater Drainage and F	2045													
Total Haul Trips	2													
Hauling	1	25	8	10	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	25	8	6.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	20	25	8	14.7	0.02	0.01	0.07	0.00	0.00	0.00	0.03	0.00	0.00	0.03
Construction	2045													
Total Haul Trips	0													
Hauling	0	158	8	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	16	158	8	6.9	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	20	158	8	14.7	0.02	0.01	0.07	0.00	0.00	0.00	0.17	0.00	0.00	0.20
Finishing	2045													
Total Haul Trips	0													
Hauling	0	158	8	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	158	8	6.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	20	158	8	14.7	0.02	0.01	0.07	0.00	0.00	0.00	0.17	0.00	0.00	0.20
Painting	2045													
Total Haul Trips	0													
Hauling	0	158	8	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	158	8	6.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	20	158	8	14.7	0.02	0.01	0.07	0.00	0.00	0.00	0.17	0.00	0.00	0.20

Pettit Water Storage Tank Expansion and Transmission Pipeline Project Phase 2
Idling Emissions

			Idling Emissions Factor (grams/minute)						Idling Emissions Factor (grams/minute)		
			ROG_IDLEX	NOx_IDLEX	CO_IDLEX	SOx_IDLEX	PM10_IDLEX	PM2.5_IDLEX	CO2_IDLEX	CH4_IDLEX	N2O_IDLEX
2045	2045Hauling	Hauling	0.17099297	1.704756868	2.69960855	0.00306814	0.00081114	0.00077315	345.972455	0.05731587	0.05552529
2045	2045Vendor	Vendor	0.08831958	0.916647724	1.44447507	0.00170956	0.00043507	0.00041463	192.444951	0.03169226	0.03079777
2045	2045Worker	Worker	0	0	0	0	0	0	0	0	0
		GWP	N/A	N/A	N/A	N/A	N/A	N/A	1	25	290

Construction Phase	Daily One-Way Trips	Haul Days per Phase (days)	Work Hours per Day (hours/day)	Idling minutes per Day	Regional Emissions (pounds/day)						Regional Emissions (MT/year)			
					ROG	NOX	CO	SO2	PM10	PM2.5	CO2	CH4	N2O	CO2e
Demolition	2045													
Total Haul Trips	14													
Hauling	1	26	8	15	0.01	0.06	0.09	0.00	0.00	0.00	0.13	0.00	0.01	0.14
Vendor	0	26	8	6.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	20	26	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Grading/Excavation	2045													
Total Haul Trips	2020													
Hauling	40	51	8	15	0.23	2.26	3.57	0.00	0.00	0.00	10.59	0.04	0.49	11.12
Vendor	0	51	8	6.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	20	51	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Stormwater Drainage and F	2045													
Total Haul Trips	2													
Hauling	1	25	8	15	0.01	0.06	0.09	0.00	0.00	0.00	0.13	0.00	0.01	0.14
Vendor	0	25	8	6.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	20	25	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Construction	2045													
Total Haul Trips	0													
Hauling	0	158	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	16	158	8	6.9	0.02	0.22	0.35	0.00	0.00	0.00	3.36	0.01	0.16	3.53
Worker	20	158	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Finishing	2045													
Total Haul Trips	0													
Hauling	0	158	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	158	8	6.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	20	158	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Painting	2045													
Total Haul Trips	0													
Hauling	0	158	8	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	158	8	6.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Worker	20	158	8	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Pettit Water Storage Tank Expansion and Transmission Pipeline Project Phase 2
Road Dust, Break Wear, and Tire wear Emissions

			Emission Factors (grams/mile)					
			PM10			PM2.5		
			RD	PM10_PMBW	PM10_PMTW	RD	PM2.5_PMBW	PM2.5_PMTW
2045	2045Hauling	Hauling	0.29984991	0.079390685	0.03534959	0.07359952	0.02778674	0.0088374
2045	2045Vendor	Vendor	0.29984991	0.056036748	0.0236748	0.07359952	0.01961286	0.0059187
2045	2045Worker	Worker	0.29984991	0.008688695	0.008	0.07359952	0.00304104	0.002

Construction Phase	Daily One-Way Trips	Haul Days per Phase (days)	Work Hours per Day (hours/day)	One-Way Trip Distance per Day (miles)	Regional Emissions (pounds/day) PM10 RD	PM10 BW	PM10 TW	PM2.5 RD	PM2.5 BW	PM2.5 TW
Demolition	2045									
Total Haul Trips	14			**Total**	**1.52**	**0.12**	**0.07**	**0.37**	**0.04**	**0.02**
Hauling	1	26	8	10	0.01	0.00	0.00	0.00	0.00	0.00
Vendor	0	26	8	6.9	0.00	0.00	0.00	0.00	0.00	0.00
Worker	20	26	8	14.7	0.19	0.01	0.01	0.05	0.00	0.00
Grading/Excavation	2045									
Total Haul Trips	2020									
Hauling	40	51	8	10	0.26	0.07	0.03	0.06	0.02	0.01
Vendor	0	51	8	6.9	0.00	0.00	0.00	0.00	0.00	0.00
Worker	20	51	8	14.7	0.19	0.01	0.01	0.05	0.00	0.00
Stormwater Drainage and F	2045									
Total Haul Trips	2									
Hauling	1	25	8	10	0.01	0.00	0.00	0.00	0.00	0.00
Vendor	0	25	8	6.9	0.00	0.00	0.00	0.00	0.00	0.00
Worker	20	25	8	14.7	0.19	0.01	0.01	0.05	0.00	0.00
Construction	2045									
Total Haul Trips	0									
Hauling	0	158	8	10	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	16	158	8	6.9	0.07	0.01	0.01	0.02	0.00	0.00
Worker	20	158	8	14.7	0.19	0.01	0.01	0.05	0.00	0.00
Finishing	2045									
Total Haul Trips	0									
Hauling	0	158	8	10	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	158	8	6.9	0.00	0.00	0.00	0.00	0.00	0.00
Worker	20	158	8	14.7	0.19	0.01	0.01	0.05	0.00	0.00
Painting	2045									
Total Haul Trips	0									
Hauling	0	158	8	10	0.00	0.00	0.00	0.00	0.00	0.00
Vendor	0	158	8	6.9	0.00	0.00	0.00	0.00	0.00	0.00
Worker	20	158	8	14.7	0.19	0.01	0.01	0.05	0.00	0.00

Pettit Water Storage Tank Expansion and Transmission Pipeline Project Phase 2
Total On-Road Fuel Consumption

		gal/mile
2045Hauling	Hauling	0.13350758
2045Vendor	Vendor	0.11694236
2045Worker	Worker	0.03001091

Pettit Water Storage Tank Expansion and Transmission Pipeline Project
Total On-Road Fuel Consumption

Source	Fuel Type	Total Fuel Use (gal)
Hauling	Diesel	2,792
Vendor	Diesel	2,040
Worker	Gasoline	5,082

Fuel Type	Total Fuel Use	Annual Fuel Use
Diesel	4,831	5,820
Gasoline	5,082	6,122

Duration of Construction	
Start	1/1/2045
End	10/31/2045
0.8	years

Construction Phase	Daily One-Way Trips	Haul Days per Phase (days)	Work Hours per Day (hours/day)	One-Way Trip Distance per Day (miles)	Idling per Day (minutes)	Regional Emissions (gallons) gal/mile	gal/min	gal/day	Total Gallons/yr
Demolition	2045								
Total Haul Trips	14								
Hauling	1	26	8	10	15	0.13	0.00E+00	1	35
Vendor	0	26	8	6.9	6.9	0.12	0.00E+00	0	0
Worker	20	26	8	14.7	0	0.03	0.00E+00	9	229
Grading/Excavation	2045								
Total Haul Trips	2020								
Hauling	40	51	8	10	15	0.13	0.00E+00	53	2,724
Vendor	0	51	8	6.9	6.9	0.12	0.00E+00	0	0
Worker	20	51	8	14.7	0	0.03	0.00E+00	9	450
Stormwater Drainage and Found	2045								
Total Haul Trips	2								
Hauling	1	25	8	10	15	0.13	0.00E+00	1	33
Vendor	0	25	8	6.9	6.9	0.12	0.00E+00	0	0
Worker	20	25	8	14.7	0	0.03	0.00E+00	9	221
Construction	2045								
Total Haul Trips	0								
Hauling	0	158	8	10	15	0.13	0.00E+00	0	0
Vendor	16	158	8	6.9	6.9	0.12	0.00E+00	13	2,040
Worker	20	158	8	14.7	0	0.03	0.00E+00	9	1,394
Finishing	2045								
Total Haul Trips	0								
Hauling	0	158	8	10	15	0.13	0.00E+00	0	0
Vendor	0	158	8	6.9	6.9	0.12	0.00E+00	0	0
Worker	20	158	8	14.7	0	0.03	0.00E+00	9	1,394
Painting	2045								
Total Haul Trips	0								
Hauling	0	158	8	10	15	0.13	0.00E+00	0	0
Vendor	0	158	8	6.9	6.9	0.12	0.00E+00	0	0
Worker	20	158	8	14.7	0	0.03	0.00E+00	9	1,394

Appendix
AQ/GHG/Energy-2E
Construction Health Risk Assessment
Phase 1 & 2

ESA

Pettit Tank and Pipeline Construction HRA

Health Risk Assessment Exposure Duration Assumptions for Offroad Equipment and Haul Activities (Residential Receptors)

OFFROAD

Phase		Start Date	End Date	Hrs/Day	Duration (days)	3rd Tri	0<2	2<16	16<30	
					Start Date	*5/1/2026*	*7/31/2026*	*7/31/2028*	*7/29/2042*	
					End Date	*7/30/2026*	*7/30/2028*	*7/28/2042*	*7/25/2056*	
					Days	*90*	*730*	*5110*	*5110*	
Grading/Excavation	2026	5/1/2026	6/30/2026	13	61	61	0	0	0	Phase 1
Potholding	2026	5/1/2026	5/31/2026	13	31	31	0	0	0	Phase 1
Stormwater Drainage and Foundatio	2026	7/1/2026	8/31/2026	13	62	30	32	0	0	Phase 1
Construction	2026	9/1/2026	12/31/2026	13	122	0	122	0	0	Phase 1
Construction	2027	1/1/2027	2/28/2027	13	59	0	59	0	0	Phase 1
Finishing	2026	9/1/2026	12/31/2026	13	122	0	122	0	0	Phase 1
Finishing	2027	1/1/2027	2/28/2027	13	59	0	59	0	0	Phase 1
Painting	2026	9/1/2026	12/31/2026	13	122	0	122	0	0	Phase 1
Painting	2027	1/1/2027	2/28/2027	13	59	0	59	0	0	Phase 1
Installing Pipeline	2026	10/1/2026	11/30/2026	13	61	0	61	0	0	Phase 1
Install Appurtenances	2026	12/1/2026	12/31/2026	13	31	0	31	0	0	Phase 1
Pavement Repairs	2027	1/1/2027	1/31/2027	13	31	0	31	0	0	Phase 1
Demolition	2045	1/1/2045	1/31/2045	13	31	0	0	0	31	Phase 2
Grading/Excavation	2045	2/1/2045	3/31/2045	13	59	0	0	0	59	Phase 2
Stormwater Drainage and Foundatio	2045	4/1/2045	4/30/2045	13	30	0	0	0	30	Phase 2
Construction	2045	5/1/2045	10/31/2045	13	184	0	0	0	184	Phase 2
Finishing	2045	5/1/2045	10/31/2045	13	184	0	0	0	184	Phase 2
Painting	2045	5/1/2045	10/31/2045	13	184	0	0	0	184	Phase 2

Notes:

Hours per day provided in Project Description, 7 AM - 8 PM, Monday through Saturday.

Risk Factors

	Abbreviation	UOM	3rd Trimester	0<2	2<16	16<30
Daily Breathing Rate (95th %'ile)	DBR	L/kg-day	361	1090	572	261
Fraction Of Time At Home [a]	FAH	unitless	1	1	1	0.73
Exposure Frequency	EF	days/year	0.96	0.96	0.96	0.96
Age Sensitivity Factor	ASF	unitless	10	10	3	1
Inhalation Absorption Factor	A	unitless	1	1	1	1
Conversion Factor	CF_1	m^3/L	0.001	0.001	0.001	0.001
Conversion Factor	CF_2	$\mu g/m^3$	0.001	0.001	0.001	0.001
Cancer Potency Factor (diesel exhaust)	CPF	$mg/kg\text{-}day^{-1}$	1.1	1.1	1.1	1.1
Averaging Time (for residential exposure)	AT	years	70.00	70.00	70.00	70.00

[a] assume school or daycare will have cancer risk of >1 per million

Intake Factor for Inhalation, IF (m^3/kg-day) / Risk Calculation Part 1, R1

Phase	Year	Equation	3rd Trimester	0<2	2<16	16<30	Equation	3rd Trimester	0<2	2<16	16<30	
Grading/Excavation	2026	$\frac{DBR \cdot FAH \cdot EF \cdot ED \cdot ASF \cdot A \cdot CF_1}{AT}$	0.00826459	0	0	0	$IF \cdot CPF \cdot CF_2$	9.09105E-06	0	0	0	Phase 1
Potholding	2026		0.004200038	0	0	0		4.62004E-06	0	0	0	Phase 1
Stormwater Drainage and Foundatio	2026		0.004064552	0.013090636	0	0		4.47101E-06	1.43997E-05	0	0	Phase 1
Construction	2026		0	0.04990805	0	0		0	5.48989E-05	0	0	Phase 1
Construction	2027		0	0.02413586	0	0		0	2.65494E-05	0	0	Phase 1
Finishing	2026		0	0.04990805	0	0		0	5.48989E-05	0	0	Phase 1
Finishing	2027		0	0.02413586	0	0		0	2.65494E-05	0	0	Phase 1
Painting	2026		0	0.04990805	0	0		0	5.48989E-05	0	0	Phase 1
Painting	2027		0	0.02413586	0	0		0	2.65494E-05	0	0	Phase 1
Installing Pipeline	2026		0	0.024954025	0	0		0	2.74494E-05	0	0	Phase 1
Install Appurtenances	2026		0	0.012681554	0	0		0	1.39497E-05	0	0	Phase 1
Pavement Repairs	2027		0	0.012681554	0	0		0	1.39497E-05	0	0	Phase 1
Demolition	2045	$\frac{DBR \cdot FAH \cdot EF \cdot ED \cdot ASF \cdot A \cdot CF_1}{AT}$	0	0	0	0.001998754	$IF \cdot CPF \cdot CF_2$	0	0	0	2.199E-06	Phase 2
Grading/Excavation	2045		0	0	0	0.00380408		0	0	0	4.184E-06	Phase 2
Stormwater Drainage and Foundatio	2045		0	0	0	0.001934278		0	0	0	2.128E-06	Phase 2
Construction	2045		0	0	0	0.011863571		0	0	0	1.305E-05	Phase 2
Finishing	2045		0	0	0	0.011863571		0	0	0	1.305E-05	Phase 2
Painting	2045		0	0	0	0.011863571		0	0	0	1.305E-05	Phase 2

Pettit Tank and Pipeline Construction HRA

Offroad DPM Emissions, Ground Level Concentrations and Health Risk Calculations
Residential Receptors (Phase 1 + Phase 2)

	Phase		Start Date	End Date	Work Days	Emissions (lbs/day)	Emissions (lbs/yr)	Emissions (g/s)	
Phase 1	Grading/Excavation	2026	5/1/2026	6/30/2026	43	1.39	59.9	1.35E-02	Phase 1
Phase 1	Potholding	2026	5/1/2026	5/31/2026	21	0.48	10.0	4.61E-03	Phase 1
Phase 1	Stormwater Drainage and Foundatic	2026	7/1/2026	8/31/2026	44	0.34	15.1	3.33E-03	Phase 1
Phase 1	Construction	2026	9/1/2026	12/31/2026	88	0.38	33.3	3.67E-03	Phase 1
Phase 1	Construction	2027	1/1/2027	2/28/2027	41	0.38	15.5	3.67E-03	Phase 1
Phase 1	Finishing	2026	9/1/2026	12/31/2026	88	0.27	24.1	2.65E-03	Phase 1
Phase 1	Finishing	2027	1/1/2027	2/28/2027	41	0.27	11.2	2.65E-03	Phase 1
Phase 1	Painting	2026	9/1/2026	12/31/2026	88	0.12	10.7	1.18E-03	Phase 1
Phase 1	Painting	2027	1/1/2027	2/28/2027	41	0.12	5.0	1.18E-03	Phase 1
Phase 1	Installing Pipeline	2026	10/1/2026	11/30/2026	43	0.31	13.5	3.03E-03	Phase 1
Phase 1	Install Appurtenances	2026	12/1/2026	12/31/2026	23	0.42	9.6	4.03E-03	Phase 1
Phase 1	Pavement Repairs	2027	1/1/2027	1/31/2027	21	0.62	13.1	6.06E-03	Phase 1
Phase 2	Demolition	2045	1/1/2045	1/31/2045	22	0.11	2.5	1.08E-03	Phase 2
Phase 2	Grading/Excavation	2045	2/1/2045	3/31/2045	43	0.30	13.0	2.93E-03	Phase 2
Phase 2	Stormwater Drainage and Foundatic	2045	4/1/2045	4/30/2045	20	0.08	1.5	7.35E-04	Phase 2
Phase 2	Construction	2045	5/1/2045	10/31/2045	132	0.05	6.1	4.47E-04	Phase 2
Phase 2	Finishing	2045	5/1/2045	10/31/2045	132	0.05	6.2	4.56E-04	Phase 2
Phase 2	Painting	2045	5/1/2045	10/31/2045	132	0.02	2.5	1.85E-04	Phase 2

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
																					Res MAX:	7.4124693				
AERMOD Column Identifier:			4	4	4	4	4	4	4	4	4	6	6	6	5	5	5	5	5	5						
			Grading/Excavation	Potholding	Stormwater Drainage and Foundation Concrete	Construction	Construction	Finishing	Finishing	Painting	Painting	Installing Pipeline	Install Appurtenances	Pavement Repairs	Demolition	Grading/Excavation	Drainage and Foundation Concrete	Construction	Finishing	Painting	Maximum Individual Cancer Risk (MICR)					
Unique Identifier	X (UTM)	Y (UTM)	2026	2026	2026	2026	2027	2026	2027	2026	2027	2026	2026	2027	2045	2045	2045	2045	2045	2045	3rd Trimester	0<2	2<16	16<30	Total	per million
483702.433753999.04	483702.43	3753999.04	0.063623917	0.02171655	0.015673008	0.017308373	0.017308373	0.012489072	0.012489072	0.005545623	0.005545623	0.00862978	0.011452168	0.017220973	0.007817417	0.021137791	0.00530018	0.003223461	0.003286392	0.001335534	7.48814E-07	3.7412E-06	0	2.193E-07	4.71E-06	4.709295
483694.263753916.12	483694.26	3753916.12	0.038964077	0.01329948	9.60E-03	0.010599863	0.010599863	0.007648463	0.007648463	0.003396208	0.003396208	0.009587377	0.012722948	0.019131885	0.004451244	0.012035877	0.003017927	0.001835441	0.001871274	0.000760454	4.58583E-07	2.6087E-06	0	1.2487E-07	3.19E-06	3.192108
483697.73753861.82	483697.7	3753861.82	0.031421968	0.01072516	0.007740435	0.008548093	0.008548093	0.006167983	0.006167983	0.002738819	0.002738819	0.009845833	0.013065933	0.019647642	0.003452143	0.009334374	0.002340541	0.001423469	0.001451259	0.000589767	3.69817E-07	2.2597E-06	0	9.6841E-08	2.73E-06	2.726397
483584.93753882.87	483584.9	3753882.87	0.021352683	0.00728824	0.005259984	0.005808825	0.005808825	0.00419143	0.00419143	0.001861154	0.001861154	0.005563686	0.007383302	0.011102495	0.002164194	0.005851841	0.001467316	0.000892391	0.000909813	0.000369733	2.51308E-07	1.4524E-06	0	6.0711E-08	1.76E-06	1.764444
483549.823753855.91	483549.82	3753855.91	0.017648652	0.00602396	0.004347539	0.004801173	0.004801173	0.003464346	0.003464346	0.001538302	0.001538302	0.004837751	0.006419947	0.00965387	0.001742033	0.004710345	0.001181092	0.000718316	0.000732339	0.00029761	2.07714E-07	1.2181E-06	0	4.8868E-08	1.47E-06	1.474708
483515.523753852.37	483515.52	3753852.37	0.015783474	0.00538732	0.003888074	0.004293767	0.004293767	0.003098221	0.003098221	0.001375728	0.001375728	0.00430964	0.005719117	0.00860001	0.001525762	0.004125562	0.001034461	0.000629138	0.00064142	0.000260662	1.85762E-07	1.0881E-06	0	4.2801E-08	1.32E-06	1.31671
483339.193753860.79	483339.19	3753860.79	0.009923899	0.00338729	0.002444637	0.002699717	0.002699717	0.001948014	0.001948014	0.000864992	0.000864992	0.002642343	0.003506527	0.005272871	0.000883277	0.002388324	0.000598859	0.000364214	0.000371324	0.0001509	1.16798E-07	6.792E-07	0	2.4778E-08	8.21E-07	0.820781
483124.173753854.26	483124.17	3753854.26	0.006575435	0.00224437	0.001619782	0.001788794	0.001788794	0.001290727	0.001290727	0.000573132	0.000573132	0.001698918	0.002254552	0.003390239	0.000564717	0.001526957	0.000382876	0.000232857	0.000237403	9.64766E-05	7.73888E-08	4.462E-07	0	1.5842E-08	5.39E-07	0.539435
483070.493753861.97	483070.49	3753861.97	0.005552065	0.00189507	0.001367686	0.001510394	0.001510394	0.001089844	0.001089844	0.000483932	0.000483932	0.001473812	0.001955825	0.002941033	0.000472688	0.001278119	0.000320481	0.00019491	0.000198715	8.07545E-05	6.53443E-08	3.7966E-07	0	1.326E-08	4.58E-07	0.458264
483954.733753733.9	483954.73	3753733.9	0.04581098	0.01563652	0.011285	0.012462508	0.012462508	0.008992477	0.008992477	0.003993002	0.003993002	0.047970902	0.063659885	0.095727307	0.005007845	0.013540889	0.003395301	0.002064952	0.002105266	0.000855544	5.39167E-07	5.7754E-06	0	1.4048E-07	6.46E-06	6.455023
483977.613753750.69	483977.61	3753750.69	0.052461876	0.01790665	0.01292337	0.01427183	0.01427183	0.010298016	0.010298016	0.004572711	0.004572711	0.032392113	0.04298602	0.064639387	0.005657925	0.015298665	0.003836053	0.002333009	0.002378555	0.000966604	6.17443E-07	4.9502E-06	0	1.5872E-07	5.73E-06	5.726354
484012.023753748.78	484012.02	3753748.78	0.05517642	0.01883319	0.013592066	0.0150103	0.0150103	0.010830868	0.010830868	0.004809317	0.004809317	0.021214001	0.028152084	0.042333146	0.005668187	0.015326412	0.00384301	0.00233724	0.002382869	0.000968357	6.49392E-07	4.2577E-06	0	1.5901E-07	5.07E-06	5.06611
484038.993753749.36	484038.99	3753749.36	0.056646882	0.0193351	0.013954297	0.015410327	0.015410327	0.011119513	0.011119513	0.004937487	0.004937487	0.016285668	0.021611929	0.032498516	0.005544356	0.01499158	0.003759053	0.002286179	0.002330811	0.000947202	6.66698E-07	3.9658E-06	0	1.5553E-07	4.79E-06	4.787986
484074.893753746.12	484074.89	3753746.12	0.055713281	0.01901644	0.013724316	0.015156348	0.015156348	0.010936251	0.010936251	0.004856112	0.004856112	0.012040361	0.015978186	0.024026885	0.005085537	0.013750964	0.003447976	0.002096988	0.002137927	0.000868817	6.5571E-07	3.6069E-06	0	1.4266E-07	4.41E-06	4.405278
483951.713753696.43	483951.71	3753696.43	0.038407507	0.01310951	0.009461241	0.010448452	0.010448452	0.007539211	0.007539211	0.003347696	0.003347696	0.050671358	0.06724353	0.101116143	0.004120472	0.01114149	0.002793665	0.00169905	0.00173222	0.000703945	4.52032E-07	5.6134E-06	0	1.1559E-07	6.18E-06	6.181058
483951.593753657.88	483951.59	3753657.88	0.032713297	0.01116593	0.008058538	0.008899388	0.008899388	0.006421464	0.006421464	0.002851374	0.002851374	0.050423826	0.066915042	0.100622186	0.003440463	0.009302789	0.002332621	0.001418652	0.001446348	0.000587771	3.85015E-07	5.3173E-06	0	9.6513E-08	5.8E-06	5.798867
483950.463753618.15	483950.46	3753618.15	0.028039216	0.00957054	0.006907133	0.007627843	0.007627843	0.005503965	0.005503965	0.00244397	0.00244397	0.05109787	0.067809534	0.10196726	0.002894698	0.007827076	0.001962595	0.00119361	0.001216912	0.000494532	3.30004E-07	5.139E-06	0	8.1203E-08	5.55E-06	5.550233
483946.613753587.64	483946.61	3753587.64	0.024936977	0.00851166	0.006142933	0.006783903	0.006783903	0.00489501	0.00489501	0.002173571	0.002173571	0.05529253	0.073376065	0.110337823	0.002541625	0.006872391	0.001723213	0.001048023	0.001068483	0.000434213	2.93493E-07	5.2972E-06	0	7.1299E-08	5.66E-06	5.662013
483960.333753539.03	483960.33	3753539.03	0.021978504	0.00750185	0.005414147	0.005979075	0.005979075	0.004314275	0.004314275	0.001915702	0.001915702	0.04123917	0.054726526	0.082293943	0.002196192	0.005938362	0.00148901	0.000905585	0.000923265	0.000375199	2.58673E-07	4.1158E-06	0	6.1608E-08	4.44E-06	4.436038
483980.253753458.18	483980.25	3753458.18	0.018046607	0.00615979	0.004445571	0.004909434	0.004909434	0.003542463	0.003542463	0.001572988	0.001572988	0.030112313	0.039960607	0.060089981	0.00175652	0.004749518	0.001190914	0.00072429	0.00073843	0.000300085	2.12397E-07	3.1028E-06	0	4.9275E-08	3.36E-06	3.364439
484041.353753435.67	484041.35	3753435.67	0.018853451	0.00643519	0.004644327	0.005128929	0.005128929	0.003700843	0.003700843	0.001643315	0.001643315	0.016594499	0.022021764	0.033114797	0.001814665	0.004906737	0.001230336	0.000748265	0.000762873	0.000310019	2.21893E-07	2.1445E-06	0	5.0906E-08	2.42E-06	2.41734
484049.623753516.7	484049.62	3753516.7	0.024210183	0.00826358	0.005963896	0.006586185	0.006586185	0.004752343	0.004752343	0.002110221	0.002110221	0.01572885	0.020873003	0.03138737	0.002360462	0.006382538	0.001600385	0.000973321	0.000992323	0.000403263	2.84939E-07	2.342E-06	0	6.6217E-08	2.69E-06	2.693176
484003.093753540.22	484003.09	3753540.22	0.024048733	0.00820848	0.005924124	0.006542264	0.006542264	0.004720652	0.004720652	0.002096149	0.002096149	0.023530216	0.031225822	0.04695522	0.00239012	0.00646273	0.001620493	0.00098555	0.001004791	0.00040833	2.83039E-07	2.9099E-06	0	6.7049E-08	3.26E-06	3.25996
484067.243753589.88	484067.24	3753589.88	0.031346778	0.0106995	0.007721912	0.008527638	0.008527638	0.006153223	0.006153223	0.002732265	0.002732265	0.013723165	0.018211355	0.027384969	0.003046713	0.008238115	0.00206566	0.001256292	0.001280818	0.000520503	3.68932E-07	2.5422E-06	0	8.5468E-08	3E-06	2.996611
484033.573753592.07	484033.57	3753592.07	0.030149538	0.01029085	0.007426986	0.008201939	0.008201939	0.005918211	0.005918211	0.002627911	0.002627911	0.017775593	0.023589138	0.035471704	0.002998385	0.00810744	0.002032894	0.001236365	0.001260502	0.000512246	3.54841E-07	2.7829E-06	0	8.4112E-08	3.22E-06	3.221812
484006.163753595.1	484006.16	3753595.1	0.029043688	0.00991339	0.007154573	0.007901101	0.007901101	0.005701138	0.005701138	0.002531522	0.002531522	0.022877384	0.03035948	0.045652474	0.002928809	0.00791931	0.001985722	0.001207675	0.001231252	0.00050036	3.41826E-07	3.1054E-06	0	8.216E-08	3.53E-06	3.529393
484000.573753691.15	484000.57	3753691.15	0.041912831	0.01430597	0.010324736	0.011402048	0.011402048	0.008227289	0.008227289	0.003653229	0.003653229	0.024325675	0.032281437	0.048542579	0.004348467	0.011757974	0.002948245	0.001793062	0.001828067	0.000742895	4.93288E-07	3.8402E-06	0	1.2198E-07	4.46E-06	4.455469
484038.563753695.15	484038.56	3753695.15	0.045217693	0.01543401	0.01113885	0.012301108	0.012301108	0.008876018	0.008876018	0.003941289	0.003941289	0.016857386	0.022370628	0.033639395	0.004499723	0.012166962	0.003050796	0.001855431	0.001891655	0.000768736	5.32184E-07	3.4503E-06	0	1.2623E-07	4.11E-06	4.108709
484066.343753695.82	484066.34	3753695.82	0.04620799	0.01577203	0.011382798	0.012570511	0.012570511	0.009070408	0.009070408	0.004027606	0.004027606	0.013417369	0.017805547	0.026774744	0.004418618	0.011947657	0.002995807	0.001821988	0.001857558	0.00075488	5.43839E-07	3.2447E-06	0	1.2395E-07	3.91E-06	3.91254
484100.923753692.13	484100.92	3753692.13	0.04542882	0.01550607	0.011190859	0.012358544	0.012358544	0.008917461	0.008917461	0.003959692	0.003959692	0.010412817	0.01381835	0.020779074	0.004119605	0.011139146	0.002793077	0.001698692	0.001731855	0.000703797	5.34669E-07	2.985E-06	0	1.1556E-07	3.64E-06	3.635233
4836593753057.49	483659	3753057.49	0.004698244	0.00160364	0.001157357	0.001278119	0.001278119	0.000922243	0.000922243	0.000409511	0.000409511	0.003960965	0.005256407	0.00790422	0.000417924	0.001130041	0.000283351	0.000172328	0.000175693	7.13985E-05	5.52954E-08	5.2155E-07	0	1.1724E-08	5.89E-07	0.588568
484038.613752969.05	484038.61	3752969.05	0.007161973	0.00244457	0.001764268	0.001948357	0.001948357	0.001405861	0.001405861	0.000624256	0.000624256	0.01224902	0.016255087	0.024443269	0.000641748	0.001735245	0.000435103	0.000264621	0.000269787	0.000109637	8.42919E-08	1.2534E-06	0	1.8003E-08	1.36E-06	1.355698
484056.443752967.39	484056.44	3752967.39	0.007285355	0.00248669	0.001794662	0.001981922	0.001981922	0.001430081	0.001430081	0.00063501	0.00063501	0.011118391	0.014754683	0.022187066	0.000653071	0.001765863	0.00044278	0.00026929	0.000274547	0.000111571	8.57441E-08	1.176E-06	0	1.832E-08	1.28E-06	1.280049
484083.423752968.02	484083.42	3752968.02	0.007504987	0.00256165	0.001848766	0.002041671	0.002041671	0.001473193	0.001473193	0.000654154	0.000654154	0.009780559	0.012979311	0.019517385	0.000673421	0.001820887	0.000456577	0.000277681	0.000283102	0.000115048	8.8329E-08	1.088E-06	0	1.8891E-08	1.2E-06	1.195191
483468.163753775.07	483468.16	3753775.07	0.011844558	0.00404287	0.002917768	0.003222216	0.003222216	0.00232503	0.00232503	0.001032402	0.001032402	0.003610895	0.004791845	0.007205643	0.001118662	0.003024791	0.000758449	0.000461273	0.000470278	0.000191113	1.39403E-07	8.4439E-07	0	3.1381E-08	1.02E-06	1.015179
483414.963753768.2	483414.96	3753768.2	0.010369911	0.00353953	0.002554506	0.002821051	0.002821051	0.002035564	0.002035564	0.000903868	0.000903868	0.00307101	0.00407539	0.006128288	0.000960753	0.002597814	0.000651387	0.00039616	0.000403894	0.000164136	1.22047E-07	7.326E-07	0	2.6951E-08	8.82E-07	0.8816
483321.053753785.73	483321.05	3753785.73	0.008710866	0.00297325	0.00214582	0.002369721	0.002369721	0.001709901	0.001709901	0.000759261	0.000759261	0.002427221	0.003221048	0.004843588	0.000779861	0.002108693	0.000528743	0.00032157	0.000327848	0.000133232	1.02521E-07	6.0414E-07	0	2.1877E-08	7.29E-07	0.728542
483885.393754561.24	483885.39	3754561.24	0.043068088	0.01470029	0.01060932	0.011716326	0.011716326	0.00845406	0.00845406	0.003753924	0.003753924	0.002528819	0.003355874	0.00504633	0.00258408	0.006987185	0.001751997	0.001065528	0.001086331	0.000441466	5.06884E-07	2.288E-06	0	7.249E-08	2.87E-06	2.867363
4839203753820	483920	3753820	0.065018514	0.02219256	0.016016551	0.017687762	0.017687762	0.012762824	0.012762824	0.005667179	0.005667179	0.121141928	0.160761645	0.241742181	0.007794824	0.021076702	0.005284863	0.003214145	0.003276894	0.001331674	7.65227E-07	1.2112E-05	0	2.1866E-07	1.31E-05	13.09634
4839403753820	483940	3753820	0.069700694	0.02379072	0.017169951	0.018961511	0.018961511	0.013681914	0.013681914	0.00607529	0.00607529	0.069819104	0.092653585	0.139326017	0.008159328	0.022062298	0.005531995	0.003364446	0.003430129	0.001393946	8.20333E-07	8.5534E-06	0	2.2889E-07	9.6E-06	9.60258
4839603753820	483960	3753820	0.07371696	0.02516158	0.018159312	0.020054104	0.020054104	0.014470288	0.014470288	0.006425358	0.006425358	0.043704111	0.05799763	0.087212802	0.008343352	0.022559886	0.005656763	0.003440327	0.003507491	0.001425385	8.67602E-07	6.8221E-06	0	2.3405E-07	7.92E-06	7.923726
4839803753820	483980	3753820	0.07680921	0.02621704	0.018921051	0.020895326	0.020895326	0.015077282	0.015077282	0.006694887	0.006694887	0.031220638	0.041431412	0.062301675	0.008326155	0.022513388	0.005645104	0.003433236	0.003500262	0.001422447	9.03996E-07	6.0517E-06	0	2.3357E-07	7.19E-06	7.189252
4840003753820	484000	3753820	0.078700981	0.02686276	0.019387067	0.021409967	0.021409967	0.015448627	0.015448627	0.006859778	0.006859778	0.023839502	0.031636261	0.047572408	0.00810697	0.021920724	0.005496496	0.003342856	0.003408118	0.001385001	9.26261E-07	5.5993E-06	0	2.2742E-07	6.75E-06	6.752955
4840203753820	484020	3753820	0.079214489	0.02703803	0.019513563	0.021549662	0.021549662	0.015549426	0.015549426	0.006904537	0.006904537	0.018916783	0.025103556	0.037748981	0.007712396	0.020853823	0.005228977	0.003180156	0.003242242	0.001317592	9.32305E-07	5.261E-06	0	2.1635E-07	6.41E-06	6.409696
4840403753820	484040	3753820	0.078247545	0.02670799	0.019275368	0.021286613	0.021286613	0.01535962	0.01535962	0.006820256	0.006820256	0.015356809	0.020379285	0.030644951	0.007182506	0.019421033	0.004869713	0.002961659	0.003019479	0.001227065	9.20925E-07	4.9511E-06	0	2.0149E-07	6.07E-06	6.073551
4840603753820	484060	3753820	0.075897883	0.02590598	0.018696556	0.020647407	0.020647407	0.014898393	0.014898393	0.006615453	0.006615453	0.012677019	0.016823064	0.025297354	0.006570134	0.017765218	0.004454527	0.002709152	0.002762042	0.001122447	8.93271E-07	4.6387E-06	0	1.8431E-07	5.72E-06	5.71631
4840803753820	484080	3753820	0.072390804	0.02470892	0.017832628	0.019693334	0.019693334	0.01420997	0.01420997	0.006309767	0.006309767	0.010600567	0.014067505	0.021153735	0.005925514	0.016022009	0.004017477	0.002443347	0.002491048	0.00101232	8.51994E-07	4.3144E-06	0	1.6622E-07	5.33E-06	5.332596
4841003753820	484100	3753820	0.068030039	0.02322048	0.016758405	0.018507023	0.018507023	0.013353972	0.013353972	0.005929672	0.005929672	0.0089675	0.01190034	0.017894903	0.005288816	0.014300617	0.003585798	0.002180809	0.002223384	0.000903545	8.00671E-07	3.9811E-06	0	1.4836E-07	4.93E-06	4.930124
4841203753820	484120	3753820	0.063046018	0.0215193	0.01553065	0.017151161	0.017151161	0.012375633	0.012375633	0.005495252	0.005495252	0.007647755	0.010148969	0.015261314	0.00468093	0.012656932	0.003173654	0.001930151	0.001967833	0.000799694	7.42012E-07	3.6405E-06	0	1.3131E-07	4.51E-06	4.513839
4839203753840	483920	3753840	0.073603432	0.02512283	0.018131345	0.02002322	0.02002322	0.014448003	0.014448003	0.006415463	0.006415463	0.121737012	0.161551353	0.242929688	0.009009112	0.024360058	0.006108146	0.003714848	0.003787373	0.001539124	8.66266E-07	1.2575E-05	0	2.5273E-07	1.37E-05	13.69423
4839403753840	483940	3753840	0.078951795	0.02694837	0.019448852	0.021478199	0.021478199	0.015497861	0.015497861	0.00688164	0.00688164	0.070123686	0.093057782	0.13993382	0.009368946	0.025333026	0.006352112	0.003863224	0.003938644	0.001600598	9.29213E-07	9.0272E-06	0	2.6282E-07	1.02E-05	10.21925
4839603753840	483960	3753840	0.083425818	0.02847547	0.020550975	0.022695321	0.022695321	0.01637609	0.01637609	0.007271607	0.007271607	0.043755759	0.058066171	0.087315869	0.009487056	0.025652387	0.00643219	0.003911925	0.003988297	0.001620776	9.8187E-07	7.2996E-06	0	2.6613E-07	8.55E-06	8.5476
4839803753840	483980	3753840	0.086635915	0.02957116	0.021341745	0.023568602	0.023568602	0.017006217	0.017006217	0.007551407	0.007551407	0.031136367	0.04131958	0.062133511	0.009343948	0.025265433	0.006335163	0.003852916	0.003928135	0.001596327	1.01965E-06	6.5249E-06	0	2.6212E-07	7.81E-06	7.806701
4840003753840	484000	3753840	0.0882249	0.03011352	0.021733173	0.024000872	0.024000872	0.017318127	0.017318127	0.007689907	0.007689907	0.023671447	0.031413242	0.047237048	0.008954478	0.024212332	0.006071104	0.003692321	0.003764405	0.00152979	1.03835E-06	6.0516E-06	0	2.5119E-07	7.34E-06	7.341106
4840203753840	484020	3753840	0.087922924	0.03001045	0.021658785	0.023918722	0.023918722	0.017258851	0.017258851	0.007663586	0.007663586	0.018645703	0.024743818	0.037208033	0.008360678	0.022606735	0.00566851	0.003447471	0.003514775	0.001428345	1.0348E-06	5.6659E-06	0	2.3454E-07	6.94E-06	6.935269
4840403753840	484040	3753840	0.085760226	0.02927227	0.021126029	0.023330377	0.023330377	0.016834323	0.016834323	0.0074758	0.0074758	0.0150183	0.019930066	0.029969447	0.007633371	0.020640144	0.005175398	0.003147571	0.00320902	0.001304091	1.00934E-06	5.2927E-06	0	2.1413E-07	6.52E-06	6.516194
4840603753840	484060	3753840	0.082057274	0.02800835	0.02021385	0.022323019	0.022323019	0.016107452	0.016107452	0.007152321	0.007152321	0.012309226	0.016334984	0.024563413	0.006851603	0.018526294	0.004645363	0.002825214	0.00288037	0.001170533	9.65763E-07	4.9121E-06	0	1.922E-07	6.07E-06	6.070083
4840803753840	484080	3753840	0.077184757	0.02634523	0.019013563	0.02099749	0.02099749	0.015151	0.015151	0.00672762	0.00672762	0.010235627	0.01358321	0.020425486	0.006073899	0.016423432	0.004118082	0.002504533	0.002553428	0.00103767	9.08416E-07	4.5213E-06	0	1.7039E-07	5.6E-06	5.600153
4841003753840	484100	3753840	0.071532663	0.02441602	0.017621235	0.019459884	0.019459884	0.014041521	0.014041521	0.006234969	0.006234969	0.008625228	0.011446127	0.01721189	0.00533827	0.014434339	0.003619328	0.002201201	0.002244174	0.000911994	8.41895E-07	4.1267E-06	0	1.4975E-07	5.12E-06	5.118375
4841203753840	484120	3753840	0.065395005	0.02232107	0.016109295	0.017790183	0.017790183	0.012836728	0.012836728	0.005699995	0.005699995	0.007335374	0.009734423	0.014637948	0.004660548	0.01260182	0.003159835	0.001921746	0.001959264	0.000796212	7.69658E-07	3.7321E-06	0	1.3074E-07	4.63E-06	4.632471
4839203753860	483920	3753860	0.084079717	0.02869866	0.020712055	0.022873208	0.022873208	0.016504448	0.016504448	0.007328603	0.007328603	0.122857536	0.163038347	0.245165726	0.010516312	0.02843543	0.007130022	0.004336333	0.00442099	0.001796615	9.89566E-07	1.3169E-05	0	2.9501E-07	1.45E-05	14.45366
4839403753860	483940	3753860	0.090201851	0.03078831	0.022220172	0.024538686	0.024538686	0.017706193	0.017706193	0.007862223	0.007862223	0.070499915	0.093557057	0.140684596	0.010835458	0.02929838	0.007346402	0.00446793	0.004555157	0.001851138	1.06162E-06	9.6039E-06	0	3.0396E-07	1.1E-05	10.96947
4839603753860	483960	3753860	0.095081658	0.03245392	0.023422255	0.025866198	0.025866198	0.018664076	0.018664076	0.00828756	0.00828756	0.043879692	0.058230636	0.08756318	0.010822867	0.029264334	0.007337865	0.004462738	0.004549863	0.001848987	1.11905E-06	7.8775E-06	0	3.0361E-07	9.3E-06	9.300109
4839803753860	483980	3753860	0.098107627	0.03348676	0.024167667	0.026689388	0.026689388	0.019258059	0.019258059	0.008551311	0.008551311	0.030929044	0.041044451	0.061719791	0.010466706	0.028301299	0.007096389	0.004315878	0.004400136	0.00178814	1.15467E-06	7.0694E-06	0	2.9362E-07	8.52E-06	8.517636
4840003753860	484000	3753860	0.098963473	0.03377889	0.024378495	0.026922214	0.026922214	0.019426058	0.019426058	0.008625909	0.008625909	0.023332088	0.030962895	0.046559848	0.009825305	0.026566991	0.006661521	0.0040514	0.004130495	0.001678563	1.16474E-06	6.5505E-06	0	2.7562E-07	7.99E-06	7.99083
4840203753860	484020	3753860	0.097480321	0.03327265	0.024013138	0.026518735	0.026518735	0.019134922	0.019134922	0.008496633	0.008496633	0.018241404	0.024207292	0.036401242	0.008981817	0.024286254	0.006089639	0.003703593	0.003775898	0.001534461	1.14728E-06	6.1024E-06	0	2.5196E-07	7.5E-06	7.501663
4840403753860	484040	3753860	0.093783445	0.03201081	0.023102455	0.025513029	0.025513029	0.018409243	0.018409243	0.008174404	0.008174404	0.014588571	0.019359793	0.02911191	0.00803035	0.021713549	0.005444549	0.003311262	0.003375907	0.001371911	1.10377E-06	5.6525E-06	0	2.2527E-07	6.98E-06	6.981511
4840603753860	484060	3753860	0.088426173	0.03018222	0.021782754	0.024055627	0.024055627	0.017357636	0.017357636	0.007707451	0.007707451	0.011893578	0.015783397	0.023733974	0.007069565	0.019115648	0.00479314	0.002915089	0.002972	0.00120777	1.04072E-06	5.1922E-06	0	1.9832E-07	6.43E-06	6.431231
4840803753860	484080	3753860	0.081862617	0.02794191	0.020165899	0.022270064	0.022270064	0.016069241	0.016069241	0.007135354	0.007135354	0.00983591	0.013052765	0.01962784	0.006153098	0.01663758	0.004171778	0.00253719	0.002586723	0.0010512	9.63472E-07	4.7201E-06	0	1.7261E-07	5.86E-06	5.856173
4841003753860	484100	3753860	0.074697538	0.02549627	0.018400865	0.020320863	0.020320863	0.014662771	0.014662771	0.006510828	0.006510828	0.008257557	0.010958208	0.016478191	0.005321876	0.01439009	0.003608213	0.002194441	0.002237282	0.000909193	8.79143E-07	4.254E-06	0	1.4929E-07	5.28E-06	5.28245
4841203753860	484120	3753860	0.067341852	0.02298558	0.016588878	0.018319808	0.018319808	0.013218885	0.013218885	0.005869688	0.005869688	0.007020808	0.009316977	0.014010223	0.004586648	0.012402	0.003109731	0.001891274	0.001928197	0.000783586	7.92571E-07	3.8038E-06	0	1.2867E-07	4.73E-06	4.725087
4839203753880	483920	3753880	0.09686449	0.03306245	0.023861435	0.026351203	0.026351203	0.019014038	0.019014038	0.008442956	0.008442956	0.123377636	0.163728545	0.246203598	0.012384191	0.033486056	0.008396437	0.00510654	0.005206234	0.002115725	1.14003E-06	1.3831E-05	0	3.4741E-07	1.53E-05	15.3187
4839403753880	483940	3753880	0.103980836	0.03549145	0.025614464	0.028287147	0.028287147	0.020410942	0.020410942	0.009063235	0.009063235	0.070774364	0.093921265	0.141232266	0.012609694	0.034095802	0.008549328	0.005199525	0.005301034	0.00215425	1.22379E-06	1.0296E-05	0	3.5373E-07	1.19E-05	11.87396
4839603753880	483960	3753880	0.109204737	0.03727451	0.02690131	0.029708267	0.029708267	0.021436369	0.021436369	0.009518563	0.009518563	0.04380322	0.058129154	0.087410578	0.012372478	0.033454383	0.008388496	0.00510171	0.00520131	0.002113724	1.28527E-06	8.5609E-06	0	3.4708E-07	1.02E-05	10.19324
4839803753880	483980	3753880	0.111709774	0.03812954	0.027518397	0.030389742	0.030389742	0.021928096	0.021928096	0.009736909	0.009736909	0.030630986	0.040648913	0.061125008	0.011695687	0.031624385	0.007929634	0.00482264	0.004916792	0.0019981	1.31475E-06	7.711E-06	0	3.2809E-07	9.35E-06	9.353876
4840003753880	484000	3753880	0.111336927	0.03800228	0.027426551	0.030288313	0.030288313	0.021854908	0.021854908	0.009704411	0.009704411	0.022912464	0.030406033	0.045722477	0.010712829	0.028966801	0.00726326	0.004417365	0.004503604	0.001830188	1.31037E-06	7.1232E-06	0	3.0052E-07	8.73E-06	8.73411
4840203753880	484020	3753880	0.107981984	0.03685715	0.0266001	0.029375627	0.029375627	0.021196349	0.021196349	0.009411985	0.009411985	0.017727738	0.023525631	0.035376207	0.009548007	0.025817195	0.006473514	0.003937058	0.004013921	0.001631189	1.27088E-06	6.5769E-06	0	2.6784E-07	8.12E-06	8.11563
4840403753880	484040	3753880	0.102248491	0.03490015	0.025187721	0.027815877	0.027815877	0.020070891	0.020070891	0.008912239	0.008912239	0.014086133	0.018693032	0.028109281	0.008345432	0.022565512	0.005658173	0.003441185	0.003508366	0.00142574	1.2034E-06	6.0284E-06	0	2.3411E-07	7.47E-06	7.465923
4840603753880	484060	3753880	0.094738509	0.03233679	0.023337724	0.025772847	0.025772847	0.018596718	0.018596718	0.00825765	0.00825765	0.011410106	0.015141805	0.022769193	0.007192605	0.01944834	0.00487656	0.002965824	0.003023725	0.00122879	1.11501E-06	5.4645E-06	0	2.0177E-07	6.78E-06	6.781285
4840803753880	484080	3753880	0.086196248	0.02942109	0.021233438	0.023448994	0.023448994	0.016919913	0.016919913	0.007513085	0.007513085	0.009396895	0.012470169	0.018751773	0.006145296	0.016616485	0.004166489	0.002533973	0.002583443	0.001049867	1.01448E-06	4.8991E-06	0	1.7239E-07	6.09E-06	6.086005
4841003753880	484100	3753880	0.077430576	0.02642913	0.019074117	0.021064363	0.021064363	0.015199253	0.015199253	0.006749046	0.006749046	0.007887033	0.010466503	0.015738799	0.005237324	0.014161388	0.003550887	0.002159576	0.002201737	0.000894749	9.11309E-07	4.36E-06	0	1.4692E-07	5.42E-06	5.41825
4841203753880	484120	3753880	0.068784506	0.023478	0.016944259	0.01871227	0.01871227	0.013502071	0.013502071	0.005995433	0.005995433	0.006710581	0.008905291	0.013391157	0.004458038	0.012054248	0.003022534	0.001838243	0.00187413	0.000761615	8.09551E-07	3.8513E-06	0	1.2506E-07	4.79E-06	4.785953
4839203753900	483920	3753900	0.11272032	0.03847447	0.027767333	0.030664653	0.030664653	0.022126461	0.022126461	0.009824991	0.009824991	0.123109529	0.163372754	0.245668584	0.014721866	0.039806977	0.009981372	0.006070465	0.006188978	0.002515095	1.32665E-06	1.4585E-05	0	4.1298E-07	1.63E-05	16.32474
4839403753900	483940	3753900	0.120920918	0.04127355	0.029787455	0.03289556	0.03289556	0.0237362	0.0237362	0.010539776	0.010539776	0.070911922	0.094103812	0.141506767	0.01473423	0.039840408	0.009989755	0.006075563	0.006194175	0.002517207	1.42316E-06	1.1133E-05	0	4.1333E-07	1.3E-05	12.96962
4839603753900	483960	3753900	0.126398332	0.04314314	0.031136752	0.034385646	0.034385646	0.02481139	0.02481139	0.011017201	0.011017201	0.043656953	0.057935049	0.087118698	0.014135727	0.038222096	0.009583972	0.005828775	0.005942569	0.002414959	1.48763E-06	9.389E-06	0	3.9654E-07	1.13E-05	11.27318
4839803753900	483980	3753900	0.12787055	0.04364565	0.031499415	0.034786151	0.034786151	0.025100379	0.025100379	0.011145523	0.011145523	0.030246806	0.040139086	0.060358366	0.012998384	0.035146793	0.008812858	0.005359799	0.005464437	0.002220654	1.50496E-06	8.4712E-06	0	3.6464E-07	1.03E-05	10.34078
4840003753900	484000	3753900	0.125535602	0.04284867	0.030924228	0.034150947	0.034150947	0.02464204	0.02464204	0.010942003	0.010942003	0.022381198	0.029701014	0.044662319	0.011569895	0.03128425	0.007844347	0.004770771	0.004863909	0.00197661	1.47748E-06	7.7768E-06	0	3.2456E-07	9.58E-06	9.578833
4840203753900	484020	3753900	0.119492573	0.04078602	0.029435599	0.03250699	0.03250699	0.023455822	0.023455822	0.010415277	0.010415277	0.017131713	0.022734675	0.034186823	0.010022613	0.0271005	0.006795296	0.004132759	0.004213442	0.001712271	1.40635E-06	7.0945E-06	0	2.8116E-07	8.78E-06	8.782052
4840403753900	484040	3753900	0.110852443	0.03783691	0.027307204	0.030156513	0.030156513	0.021759806	0.021759806	0.009662182	0.009662182	0.013479002	0.017887337	0.026897733	0.008533422	0.023073823	0.00578563	0.003518701	0.003587396	0.001457857	1.30466E-06	6.4034E-06	0	2.3938E-07	7.95E-06	7.947456
4840603753900	484060	3753900	0.100721872	0.03437908	0.024811656	0.027400572	0.027400572	0.019771223	0.019771223	0.008779175	0.008779175	0.010866762	0.014420759	0.021684934	0.007196235	0.019458156	0.004879021	0.00296732	0.003025251	0.00122941	1.18543E-06	5.7163E-06	0	2.0187E-07	7.1E-06	7.103647
4840803753900	484080	3753900	0.090021637	0.0307268	0.022175778	0.02448966	0.02448966	0.017670818	0.017670818	0.007846515	0.007846515	0.008950051	0.011877184	0.017860083	0.00604383	0.016342127	0.004097695	0.002492134	0.002540787	0.001032533	1.0595E-06	5.0528E-06	0	1.6954E-07	6.28E-06	6.281852
4841003753900	484100	3753900	0.079502965	0.02713649	0.019584626	0.02162814	0.02162814	0.015606053	0.015606053	0.006929681	0.006929681	0.007520181	0.009979671	0.015006736	0.005077367	0.013728873	0.003442436	0.002093619	0.002134492	0.000867421	9.357E-07	4.4341E-06	0	1.4243E-07	5.51E-06	5.512196
4841203753900	484120	3753900	0.06960647	0.02375856	0.01714674	0.018935878	0.018935878	0.013663418	0.013663418	0.006067077	0.006067077	0.006426027	0.008527673	0.012823321	0.004276615	0.011563691	0.00289953	0.001763434	0.001797861	0.00073062	8.19225E-07	3.8704E-06	0	1.1997E-07	4.81E-06	4.809643
4839203753920	483920	3753920	0.132812183	0.04533236	0.032716729	0.036130483	0.036130483	0.026070398	0.026070398	0.011576249	0.011576249	0.122768016	0.162919548	0.244987085	0.017677645	0.047799213	0.01198538	0.007289261	0.007431568	0.003020063	1.56312E-06	1.554E-05	0	4.959E-07	1.76E-05	17.59924
4839403753920	483940	3753920	0.142109586	0.04850581	0.035007036	0.038659766	0.038659766	0.027895434	0.027895434	0.012386634	0.012386634	0.070440194	0.093477805	0.140565421	0.017264336	0.046681654	0.011705158	0.007118836	0.007257816	0.002949453	1.67254E-06	1.2132E-05	0	4.8431E-07	1.43E-05	14.28899
4839603753920	483960	3753920	0.147577687	0.05037222	0.036354038	0.040147319	0.040147319	0.028968796	0.028968796	0.012863248	0.012863248	0.043414641	0.057613488	0.086635156	0.016097379	0.043526277	0.010913965	0.006637649	0.006767235	0.002750089	1.7369E-06	1.0405E-05	0	4.5157E-07	1.26E-05	12.59297
4839803753920	483980	3753920	0.147087533	0.05020492	0.036233294	0.040013976	0.040013976	0.028872581	0.028872581	0.012820524	0.012820524	0.029730713	0.039454203	0.059328487	0.014311321	0.038696889	0.009703024	0.00590118	0.006016387	0.002444957	1.73113E-06	9.3707E-06	0	4.0147E-07	1.15E-05	11.50333
4840003753920	484000	3753920	0.141567191	0.04832068	0.034873423	0.038512212	0.038512212	0.027788965	0.027788965	0.012339357	0.012339357	0.021725816	0.028831289	0.043354487	0.012314864	0.0332986	0.008349434	0.005077954	0.00517709	0.002103881	1.66616E-06	8.5106E-06	0	3.4546E-07	1.05E-05	10.52226
4840203753920	484020	3753920	0.131661111	0.04493947	0.032433176	0.035817343	0.035817343	0.025844448	0.025844448	0.011475918	0.011475918	0.016415124	0.021783724	0.032756849	0.01033296	0.027939659	0.00700571	0.004260729	0.00434391	0.001765291	1.54957E-06	7.6354E-06	0	2.8986E-07	9.47E-06	9.474814
4840403753920	484040	3753920	0.119287791	0.04071612	0.029385153	0.032451281	0.032451281	0.023415625	0.023415625	0.010397428	0.010397428	0.01279288	0.016976818	0.025528558	0.00855907	0.023143175	0.005803019	0.003529277	0.003598178	0.001462238	1.40394E-06	6.7643E-06	0	2.401E-07	8.41E-06	8.408395
4840603753920	484060	3753920	0.106209951	0.03625231	0.02616358	0.02889356	0.02889356	0.020848507	0.020848507	0.00925753	0.00925753	0.010317622	0.013692021	0.020589109	0.007074246	0.019128305	0.004796313	0.002917019	0.002973967	0.00120857	1.25002E-06	5.9436E-06	0	1.9845E-07	7.39E-06	7.392064
4840803753920	484080	3753920	0.092917204	0.03171513	0.022889067	0.025277376	0.025277376	0.018239204	0.018239204	0.0080989	0.0080989	0.008479022	0.011252103	0.01692013	0.00583289	0.015771759	0.003954679	0.002405154	0.002452109	0.000996496	1.09358E-06	5.1593E-06	0	1.6363E-07	6.42E-06	6.416532
4841003753920	484100	3753920	0.080669157	0.02753455	0.019871904	0.021945393	0.021945393	0.015834971	0.015834971	0.007031329	0.007031329	0.007158275	0.009499404	0.014284542	0.004840952	0.013089623	0.003282148	0.001996135	0.002035105	0.000827032	9.49425E-07	4.4643E-06	0	1.358E-07	5.55E-06	5.549481
4841203753920	484120	3753920	0.069649262	0.02377316	0.017157282	0.01894752	0.01894752	0.013671818	0.013671818	0.006070807	0.006070807	0.00616754	0.008184647	0.012307503	0.004045456	0.010938651	0.002742804	0.001668117	0.001700683	0.000691129	8.19728E-07	3.8535E-06	0	1.1348E-07	4.79E-06	4.786674
4839203753940	483920	3753940	0.158698555	0.05416807	0.039093534	0.043172661	0.043172661	0.03115177	0.03115177	0.013832571	0.013832571	0.12262369	0.162728021	0.24469908	0.021411334	0.057894868	0.014516808	0.008828824	0.009001187	0.003657929	1.86778E-06	1.6793E-05	0	6.0064E-07	1.93E-05	19.26103
4839403753940	483940	3753940	0.169123543	0.0577264	0.041661608	0.046008695	0.046008695	0.033198145	0.033198145	0.014741239	0.014741239	0.069954022	0.092832629	0.13959525	0.020230333	0.054701519	0.013716094	0.008341846	0.008504702	0.003456166	1.99048E-06	1.3414E-05	0	5.6751E-07	1.6E-05	15.97231
4839603753940	483960	3753940	0.173700699	0.05928871	0.042789137	0.047253873	0.047253873	0.034096619	0.034096619	0.015140196	0.015140196	0.042983	0.057040678	0.085773805	0.018166327	0.049120578	0.012316705	0.007490766	0.007637007	0.00310355	2.04435E-06	1.1647E-05	0	5.0961E-07	1.42E-05	14.20119
4839803753940	483980	3753940	0.169597768	0.05788827	0.041778428	0.046137704	0.046137704	0.033291233	0.033291233	0.014782574	0.014782574	0.028966723	0.03844035	0.057803924	0.01550099	0.041913678	0.010509616	0.006391732	0.006516516	0.002648201	1.99606E-06	1.0413E-05	0	4.3484E-07	1.28E-05	12.84356
4840003753940	484000	3753940	0.15909327	0.0543028	0.039190768	0.04328004	0.04328004	0.03122925	0.03122925	0.013866975	0.013866975	0.02084193	0.027658326	0.041590667	0.012829173	0.034689257	0.008698133	0.005290026	0.005393302	0.002191746	1.87243E-06	9.3005E-06	0	3.5989E-07	1.15E-05	11.53285
4840203753940	484020	3753940	0.143996632	0.04914991	0.035471887	0.039173122	0.039173122	0.028265852	0.028265852	0.012551114	0.012551114	0.015546835	0.02063146	0.031024154	0.010409136	0.028145632	0.007057357	0.004292139	0.004375934	0.001778305	1.69475E-06	8.1732E-06	0	2.92E-07	1.02E-05	10.15993
4840403753940	484040	3753940	0.127118782	0.04338905	0.031314226	0.034581639	0.034581639	0.024952811	0.024952811	0.011079997	0.011079997	0.012056293	0.015999328	0.024058677	0.008394984	0.022699497	0.005691769	0.003461617	0.003529197	0.001434206	1.49611E-06	7.0921E-06	0	2.355E-07	8.82E-06	8.823686
4840603753940	484060	3753940	0.110430865	0.03769302	0.027203353	0.030041826	0.030041826	0.021677052	0.021677052	0.009625436	0.009625436	0.009711097	0.012887132	0.019378772	0.006793361	0.018368811	0.004605875	0.002801198	0.002855885	0.001160583	1.2997E-06	6.1048E-06	0	1.9057E-07	7.6E-06	7.595047
4840803753940	484080	3753940	0.094599603	0.03228938	0.023303506	0.025735059	0.025735059	0.018569451	0.018569451	0.008245543	0.008245543	0.008013697	0.010634593	0.015991561	0.005519	0.01492302	0.003741862	0.002275724	0.002320152	0.00094287	1.11338E-06	5.2071E-06	0	1.5482E-07	6.48E-06	6.475274
4841003753940	484100	3753940	0.080634599	0.02752275	0.019863391	0.021935992	0.021935992	0.015828187	0.015828187	0.007028317	0.007028317	0.006805321	0.009031016	0.013580213	0.004532317	0.012255094	0.003072895	0.001868871	0.001905357	0.000774305	9.49019E-07	4.4365E-06	0	1.2714E-07	5.51E-06	5.512683
4841203753940	484120	3753940	0.068703917	0.02345049	0.016924407	0.018690346	0.018690346	0.013486251	0.013486251	0.005988409	0.005988409	0.005928597	0.007867556	0.011830684	0.003770108	0.010194129	0.00255612	0.001554579	0.001584929	0.000644088	8.08602E-07	3.7897E-06	0	1.0576E-07	4.7E-06	4.704065
4839203753960	483920	3753960	0.193805926	0.06615116	0.047741824	0.052723338	0.052723338	0.038043179	0.038043179	0.016892619	0.016892619	0.122911522	0.163109988	0.245273455	0.026203482	0.070852527	0.017765867	0.010804835	0.011015775	0.004476623	2.28097E-06	1.8527E-05	0	7.3507E-07	2.15E-05	21.54285
4839403753960	483940	3753960	0.204317038	0.06973889	0.050331114	0.055582801	0.055582801	0.04010646	0.04010646	0.017808794	0.017808794	0.069658149	0.09243999	0.139004827	0.023592388	0.063792299	0.015995555	0.009728167	0.009918088	0.004030542	2.40468E-06	1.511E-05	0	6.6182E-07	1.82E-05	18.17615
4839603753960	483960	3753960	0.205878079	0.07027171	0.050715658	0.05600747	0.05600747	0.040412885	0.040412885	0.017944858	0.017944858	0.042199134	0.056000447	0.084209578	0.020153963	0.054495018	0.013664315	0.008310355	0.008472596	0.003443119	2.42306E-06	1.3159E-05	0	5.6537E-07	1.61E-05	16.1478
4839803753960	483980	3753960	0.195435408	0.06670735	0.048143228	0.053166626	0.053166626	0.038363039	0.038363039	0.017034649	0.017034649	0.027861069	0.036973088	0.055597559	0.016379412	0.044288876	0.011105183	0.006753944	0.006885799	0.002798272	2.30015E-06	1.1592E-05	0	4.5948E-07	1.44E-05	14.35137
4840003753960	484000	3753960	0.177632191	0.06063063	0.043757614	0.048323404	0.048323404	0.034868352	0.034868352	0.015482875	0.015482875	0.019725047	0.026176165	0.039361896	0.012997582	0.035144625	0.008812314	0.005359468	0.0054641	0.002220517	2.09062E-06	1.0123E-05	0	3.6461E-07	1.26E-05	12.57789
4840203753960	484020	3753960	0.155789219	0.05317504	0.038376853	0.0423812	0.0423812	0.030580681	0.030580681	0.013578986	0.013578986	0.01457355	0.019339859	0.029081935	0.010196516	0.027570723	0.006913202	0.004204467	0.00428655	0.001741981	1.83354E-06	8.6767E-06	0	2.8604E-07	1.08E-05	10.79631
4840403753960	484040	3753960	0.133453257	0.04555118	0.03287465	0.036304882	0.036304882	0.026196238	0.026196238	0.011632126	0.011632126	0.011255676	0.014936868	0.022461023	0.008011648	0.021662979	0.005431868	0.003303551	0.003368045	0.001368716	1.57066E-06	7.3421E-06	0	2.2475E-07	9.14E-06	9.137471
4840603753960	484060	3753960	0.112881095	0.03852935	0.027806938	0.030708391	0.030708391	0.022158021	0.022158021	0.009839004	0.009839004	0.009086426	0.01205816	0.018132223	0.006363496	0.017206483	0.004314427	0.002623946	0.002675173	0.001087145	1.32854E-06	6.1782E-06	0	1.7851E-07	7.69E-06	7.685277
4840803753960	484080	3753960	0.094610402	0.03229307	0.023306167	0.025737996	0.025737996	0.018571571	0.018571571	0.008246484	0.008246484	0.007557324	0.010028963	0.015080856	0.00511086	0.013819437	0.003465145	0.00210743	0.002148573	0.000873143	1.11351E-06	5.1739E-06	0	1.4337E-07	6.43E-06	6.430799
4841003753960	484100	3753960	0.079269835	0.02705692	0.019527197	0.021564719	0.021564719	0.015560291	0.015560291	0.006909361	0.006909361	0.006486628	0.008608093	0.012944252	0.004172917	0.011283298	0.002829223	0.001720675	0.001754267	0.000712904	9.32956E-07	4.3464E-06	0	1.1706E-07	5.4E-06	5.39643
4841203753960	484120	3753960	0.066555257	0.02271709	0.01639511	0.018105821	0.018105821	0.01306448	0.01306448	0.005801126	0.005801126	0.005687498	0.007547606	0.011349565	0.003460021	0.009355674	0.002345882	0.001426717	0.001454571	0.000591113	7.83314E-07	3.6671E-06	0	9.7062E-08	4.55E-06	4.547449
4839203753980	483920	3753980	0.242704567	0.08284158	0.059787433	0.066025819	0.066025819	0.047641749	0.047641749	0.021154749	0.021154749	0.124537973	0.165268374	0.248519086	0.032196145	0.087056303	0.021828871	0.01327587	0.013535052	0.005500415	2.85648E-06	2.1033E-05	0	9.0318E-07	2.48E-05	24.79234
4839403753980	483940	3753980	0.251914361	0.08598513	0.062056158	0.068531269	0.068531269	0.049449588	0.049449588	0.021957498	0.021957498	0.069667465	0.092452353	0.139023418	0.027220385	0.073602169	0.018455324	0.011224148	0.011443275	0.004650352	2.96487E-06	1.7433E-05	0	7.636E-07	2.12E-05	21.16115
4839603753980	483960	3753980	0.245362549	0.08374882	0.060442196	0.066748901	0.066748901	0.048163499	0.048163499	0.021386425	0.021386425	0.040876141	0.054244768	0.081569509	0.02175291	0.058818467	0.014748395	0.00896967	0.009144783	0.003716284	2.88776E-06	1.4988E-05	0	6.1022E-07	1.85E-05	18.48624
4839803753980	483980	3753980	0.22441727	0.07659963	0.055282571	0.061050907	0.061050907	0.04405204	0.04405204	0.019560782	0.019560782	0.026386165	0.035015814	0.052654346	0.016740308	0.045264715	0.011349869	0.006902757	0.007037518	0.002859927	2.64125E-06	1.2897E-05	0	4.6961E-07	1.6E-05	16.00782
4840003753980	484000	3753980	0.196102266	0.06693496	0.048307501	0.053348039	0.053348039	0.03849394	0.03849394	0.017092774	0.017092774	0.018371102	0.024379409	0.036660059	0.012713458	0.034376371	0.008619679	0.005242311	0.005344656	0.002171977	2.308E-06	1.0924E-05	0	3.5664E-07	1.36E-05	13.58857
4840203753980	484020	3753980	0.165742141	0.05657224	0.040828639	0.045088812	0.045088812	0.032534392	0.032534392	0.014446508	0.014446508	0.013487408	0.017898492	0.026914507	0.009657036	0.026112004	0.006547436	0.003982016	0.004059756	0.001649816	1.95068E-06	9.0822E-06	0	2.709E-07	1.13E-05	11.30378
4840403753980	484040	3753980	0.137367876	0.04688734	0.03383897	0.037369822	0.037369822	0.026964659	0.026964659	0.011973334	0.011973334	0.010422497	0.013831197	0.020798391	0.007420806	0.020065381	0.00503128	0.003059921	0.003119659	0.001267776	1.61673E-06	7.4716E-06	0	2.0817E-07	9.3E-06	9.296483
4840603753980	484060	3753980	0.11295372	0.03855413	0.027824829	0.030728148	0.030728148	0.022172277	0.022172277	0.009845334	0.009845334	0.008459904	0.011226733	0.01688198	0.005811165	0.015713015	0.003939949	0.002396196	0.002442976	0.000992784	1.32939E-06	6.1355E-06	0	1.6302E-07	7.63E-06	7.627944
4840803753980	484080	3753980	0.092665175	0.03162911	0.022826983	0.025208813	0.025208813	0.018189732	0.018189732	0.008076933	0.008076933	0.007120707	0.009449548	0.014209574	0.004639299	0.012544365	0.003145428	0.001912984	0.001950331	0.000792581	1.09061E-06	5.0468E-06	0	1.3014E-07	6.27E-06	6.267544
4841003753980	484100	3753980	0.076424215	0.02608563	0.018826212	0.020790591	0.020790591	0.015001709	0.015001709	0.006661329	0.006661329	0.00619115	0.008215978	0.012354616	0.003786242	0.010237756	0.002567059	0.001561232	0.001591712	0.000646845	8.99465E-07	4.1858E-06	0	1.0621E-07	5.19E-06	5.191443
4841203753980	484120	3753980	0.063449778	0.02165711	0.015630111	0.017261	0.017261	0.012454889	0.012454889	0.005530444	0.005530444	0.005487943	0.007282786	0.010951347	0.00314962	0.008516369	0.002135431	0.001298725	0.00132408	0.000538084	7.46764E-07	3.5008E-06	0	8.8354E-08	4.34E-06	4.335943
4839203754000	483920	3754000	0.311790509	0.10642246	0.076805947	0.084820092	0.084820092	0.06120299	0.06120299	0.027176456	0.027176456	0.123871061	0.164383346	0.247188242	0.039096499	0.105714415	0.026507286	0.016121186	0.016435916	0.006679277	3.66958E-06	2.4354E-05	0	1.0968E-06	2.91E-05	29.12061
4839403754000	483940	3754000	0.316070954	0.10788349	0.077860385	0.085984552	0.085984552	0.062043221	0.062043221	0.02754955	0.02754955	0.069620277	0.092389732	0.138929253	0.03051204	0.082502592	0.020687054	0.012581441	0.012827065	0.005212701	3.71996E-06	2.056E-05	0	8.5594E-07	2.51E-05	25.1354
4839603754000	483960	3754000	0.293096078	0.10004155	0.072200793	0.079734423	0.079734423	0.057533363	0.057533363	0.025547002	0.025547002	0.038926536	0.05165754	0.077679015	0.022539488	0.060945325	0.015281692	0.009294011	0.009475456	0.003850664	3.44956E-06	1.7173E-05	0	6.3229E-07	2.13E-05	21.25522
4839803754000	483980	3754000	0.25509071	0.0870693	0.062838615	0.069395369	0.069395369	0.05007309	0.05007309	0.022234357	0.022234357	0.02449018	0.032499744	0.048870855	0.016366973	0.044255241	0.011096749	0.006748814	0.00688057	0.002796147	3.00226E-06	1.4254E-05	0	4.5913E-07	1.77E-05	17.71504
4840003754000	484000	3754000	0.212418417	0.0725041	0.052326794	0.057786716	0.057786716	0.041696723	0.041696723	0.018514931	0.018514931	0.016798575	0.022292584	0.033522037	0.011915816	0.032219598	0.00807888	0.004913409	0.005009332	0.002035707	2.50003E-06	1.1604E-05	0	3.3427E-07	1.44E-05	14.43826
4840203754000	484020	3754000	0.172303132	0.05881168	0.042444863	0.046873677	0.046873677	0.033822283	0.033822283	0.01501838	0.01501838	0.012339815	0.016375577	0.024624453	0.008817687	0.023842459	0.00597836	0.003635916	0.003706899	0.001506421	2.0279E-06	9.3176E-06	0	2.4736E-07	1.16E-05	11.59288
4840403754000	484040	3754000	0.137920801	0.04707607	0.033975177	0.037520241	0.037520241	0.027073196	0.027073196	0.012021529	0.012021529	0.009608103	0.012750453	0.019173245	0.006674265	0.018046784	0.004525128	0.00275209	0.002805818	0.001140237	1.62324E-06	7.4385E-06	0	1.8723E-07	9.25E-06	9.248925
4840603754000	484060	3754000	0.110199219	0.03761395	0.02714629	0.029978808	0.029978808	0.021631581	0.021631581	0.009605245	0.009605245	0.007873134	0.010448059	0.015711065	0.005187686	0.014027168	0.003517232	0.002139108	0.00218087	0.000886268	1.29698E-06	5.9578E-06	0	1.4553E-07	7.4E-06	7.400336
4840803754000	484080	3754000	0.088706415	0.03027788	0.021851788	0.024131864	0.024131864	0.017412646	0.017412646	0.007731877	0.007731877	0.006739804	0.008944071	0.013449472	0.00414872	0.011217873	0.002812818	0.001710698	0.001744095	0.000708771	1.04402E-06	4.8255E-06	0	1.1638E-07	5.99E-06	5.985925
4841003754000	484100	3754000	0.072179137	0.02463668	0.017780487	0.019635752	0.019635752	0.014168421	0.014168421	0.006291318	0.006291318	0.005937973	0.00788	0.011849396	0.003404	0.009204197	0.0023079	0.001403617	0.00143102	0.000581542	8.49503E-07	3.96E-06	0	9.549E-08	4.9E-06	4.90495
4841203754000	484120	3754000	0.059558243	0.02032883	0.014671477	0.016202339	0.016202339	0.011690999	0.011690999	0.005191248	0.005191248	0.005332754	0.007076842	0.010641663	0.002861356	0.007736923	0.001939989	0.001179862	0.001202896	0.000488836	7.00963E-07	3.2995E-06	0	8.0268E-08	4.08E-06	4.080728
4839203754020	483920	3754020	0.413331239	0.14108104	0.10181932	0.112443428	0.112443428	0.081134952	0.081134952	0.036027005	0.036027005	0.121219826	0.16086502	0.241897629	0.045877096	0.124048712	0.031104507	0.018917121	0.019286436	0.007837679	4.86465E-06	2.9113E-05	0	1.287E-06	3.53E-05	35.26459
4839403754020	483940	3754020	0.40072398	0.13677784	0.098713668	0.109013725	0.109013725	0.078660207	0.078660207	0.034928124	0.034928124	0.06771613	0.089862829	0.135129472	0.032352982	0.08748038	0.021935206	0.013340541	0.013600985	0.005527209	4.71627E-06	2.4549E-05	0	9.0758E-07	3.02E-05	30.1732
4839603754020	483960	3754020	0.347335252	0.11855484	0.085561979	0.094489752	0.094489752	0.068180254	0.068180254	0.030274626	0.030274626	0.035979368	0.047746494	0.071797857	0.02201261	0.059520681	0.014924471	0.009076756	0.00925396	0.003760652	4.08792E-06	1.9602E-05	0	6.1751E-07	2.43E-05	24.30773

			Grading/Excavation	Potholding	Stormwater Drainage and Foundation Concrete	Construction	Construction	Finishing	Finishing	Painting	Painting	Installing Pipeline	Install Appurtenances	Pavement Repairs	Demolition	Grading/Excavation	Drainage and Foundation Concrete	Construction	Finishing	Painting	Maximum Individual Cancer Risk (MICR)					
Unique Identifier	X (UTM)	Y (UTM)	2026	2026	2026	2026	2027	2026	2027	2026	2027	2026	2026	2027	2045	2045	2045	2045	2045	2045	3rd Trimester	0<2	2<16	16<30	Total	per million
4839803754020	483980	3754020	0.283604827	0.09680193	0.069862734	0.077152404	0.077152404	0.055670275	0.055670275	0.02471972	0.02471972	0.022054979	0.029268105	0.04401134	0.015127936	0.040904965	0.010256687	0.006237906	0.006359687	0.002584469	3.33785E-06	1.5465E-05	0	4.2438E-07	1.92E-05	19.22741
4840003754020	484000	3754020	0.223804409	0.07639045	0.0551316	0.060884183	0.060884183	0.043931738	0.043931738	0.019507363	0.019507363	0.015108427	0.02004967	0.030149299	0.010667677	0.028844711	0.007232647	0.004398747	0.004484623	0.001822474	2.63404E-06	1.2035E-05	0	2.9925E-07	1.5E-05	14.96807
4840203754020	484020	3754020	0.173780344	0.05931589	0.042808756	0.04727554	0.04727554	0.034112253	0.034112253	0.015147138	0.015147138	0.011231763	0.014905134	0.022413304	0.007774377	0.021021414	0.005271	0.003205714	0.003268298	0.001328181	2.04529E-06	9.3079E-06	0	2.1809E-07	1.16E-05	11.5713
4840403754020	484040	3754020	0.134428436	0.04588403	0.033114874	0.036570171	0.036570171	0.026387661	0.026387661	0.011717125	0.011717125	0.008887781	0.011794549	0.017735822	0.005860131	0.015845418	0.003973148	0.002416387	0.002463561	0.001001149	1.58214E-06	7.2149E-06	0	1.6439E-07	8.96E-06	8.961427
4840603754020	484060	3754020	0.104478685	0.03566138	0.025737103	0.028422583	0.028422583	0.020508668	0.020508668	0.009106629	0.009106629	0.00734642	0.009749082	0.014659991	0.004557153	0.012322247	0.003089733	0.001879112	0.001915798	0.000778548	1.22965E-06	5.6398E-06	0	1.2784E-07	7E-06	6.997336
4840803754020	484080	3754020	0.082752075	0.0282455	0.020385007	0.022512034	0.022512034	0.016243838	0.016243838	0.007212882	0.007212882	0.006400901	0.008494329	0.012773181	0.003675317	0.00993782	0.002491852	0.001515493	0.00154508	0.000627894	9.7394E-07	4.51E-06	0	1.031E-07	5.59E-06	5.587033
4841003754020	484100	3754020	0.066764899	0.02278865	0.016446752	0.018162852	0.018162852	0.013105631	0.013105631	0.005819399	0.005819399	0.005721516	0.007592749	0.011417448	0.003051881	0.00825209	0.002069165	0.001258423	0.001282991	0.000521386	7.85781E-07	3.6798E-06	0	8.5613E-08	4.55E-06	4.551206
4841203754020	484120	3754020	0.054957194	0.01875836	0.013538062	0.014950661	0.014950661	0.010787835	0.010787835	0.004790209	0.004790209	0.005181267	0.006875811	0.010339366	0.00260172	0.007034884	0.001763957	0.001072802	0.001093747	0.00044448	6.46812E-07	3.0638E-06	0	7.2985E-08	3.78E-06	3.783621
4839203754040	483920	3754040	0.578460384	0.19744405	0.142496954	0.157365479	0.157365479	0.113549016	0.113549016	0.050420082	0.050420082	0.118784139	0.157632737	0.237037145	0.0507055	0.137104406	0.034378147	0.020908082	0.021316266	0.008662568	6.80812E-06	3.699E-05	0	1.4224E-06	4.52E-05	45.22068
4839403754040	483940	3754040	0.507316901	0.17316087	0.124971589	0.138011469	0.138011469	0.099583889	0.099583889	0.044219035	0.044219035	0.062936218	0.083519638	0.125591023	0.031541936	0.085287364	0.02138532	0.013006111	0.013260027	0.005388649	5.9708E-06	2.9397E-05	0	8.8483E-07	3.63E-05	36.25308
4839603754040	483960	3754040	0.401313622	0.1369791	0.09885892	0.109174132	0.109174132	0.078775951	0.078775951	0.034979519	0.034979519	0.031754818	0.042140296	0.063367646	0.019935807	0.053905137	0.013516406	0.0082204	0.008380885	0.003405849	4.72321E-06	2.1924E-05	0	5.5925E-07	2.72E-05	27.20669
4839803754040	483980	3754040	0.304746653	0.10401821	0.075070776	0.082903868	0.082903868	0.059820315	0.059820315	0.026562495	0.026562495	0.019331673	0.025654136	0.038576905	0.013184759	0.035650739	0.008939219	0.005436649	0.005542788	0.002252495	3.58668E-06	1.6296E-05	0	3.6986E-07	2.03E-05	20.2523
4840003754040	484000	3754040	0.227160972	0.07753613	0.05595845	0.061797309	0.061797309	0.044590616	0.044590616	0.01979993	0.01979993	0.013457729	0.017859107	0.026855283	0.009160141	0.02476843	0.006210543	0.003777124	0.003850864	0.001564926	2.67354E-06	1.2077E-05	0	2.5696E-07	1.5E-05	15.00724
4840203754040	484020	3754040	0.168972892	0.05767498	0.041624497	0.045967712	0.045967712	0.033168573	0.033168573	0.014728108	0.014728108	0.01026831	0.013626581	0.020490705	0.006678307	0.018057712	0.004527868	0.002753756	0.002807517	0.001140927	1.98871E-06	9.0023E-06	0	1.8734E-07	1.12E-05	11.17831
4840403754040	484040	3754040	0.126556947	0.04319728	0.031175825	0.034428796	0.034428796	0.024842525	0.024842525	0.011031026	0.011031026	0.008267237	0.010971054	0.016497508	0.00506846	0.013704789	0.003436398	0.002089946	0.002130748	0.0008659	1.4895E-06	6.785E-06	0	1.4218E-07	8.42E-06	8.416717
4840603754040	484060	3754040	0.096219771	0.03284239	0.023702616	0.026175812	0.026175812	0.018887482	0.018887482	0.008386761	0.008386761	0.006923761	0.009188192	0.013816564	0.003982316	0.010767925	0.002699996	0.001642082	0.00167414	0.000680342	1.13245E-06	5.2057E-06	0	1.1171E-07	6.45E-06	6.44985
4840803754040	484080	3754040	0.075080644	0.02562704	0.018495239	0.020425083	0.020425083	0.014737973	0.014737973	0.00654422	0.00654422	0.006067975	0.008052519	0.012108818	0.003244043	0.008771682	0.002199449	0.00133766	0.001363775	0.000554215	8.83652E-07	4.1111E-06	0	9.1003E-08	5.09E-06	5.085775
4841003754040	484100	3754040	0.060215652	0.02055322	0.014833422	0.016381182	0.016381182	0.011820045	0.011820045	0.00524855	0.00524855	0.005477352	0.007268732	0.010930213	0.002727599	0.007375253	0.001849303	0.001124708	0.001146665	0.000465985	7.087E-07	3.3422E-06	0	7.6516E-08	4.13E-06	4.127461
4841203754040	484120	3754040	0.049675652	0.01695563	0.012237016	0.01351386	0.01351386	0.009751094	0.009751094	0.004329856	0.004329856	0.005006262	0.00664357	0.009990139	0.002361719	0.006385936	0.001601237	0.000973839	0.000992852	0.000403478	5.84651E-07	2.7932E-06	0	6.6252E-08	3.44E-06	3.444117
4839203754060	483920	3754060	0.836012124	0.28535336	0.205941815	0.227430352	0.227430352	0.164105194	0.164105194	0.072868949	0.072868949	0.109831417	0.145752009	0.219171733	0.049448682	0.13370605	0.033526029	0.020389841	0.020787907	0.008447852	9.83934E-06	4.8896E-05	0	1.3872E-06	6.01E-05	60.12234
4839403754060	483940	3754060	0.620900627	0.21193004	0.152951612	0.168911005	0.168911005	0.121879833	0.121879833	0.054119282	0.054119282	0.053023897	0.070365472	0.105810702	0.027627333	0.07470253	0.018731233	0.01139195	0.011614353	0.004719875	7.30761E-06	3.4208E-05	0	7.7501E-07	4.23E-05	42.29051
4839603754060	483960	3754060	0.443121565	0.15124928	0.109157818	0.120547646	0.120547646	0.086982651	0.086982651	0.038623606	0.038623606	0.026509308	0.035179232	0.052900083	0.016702437	0.045162315	0.011324193	0.006887141	0.007021597	0.002853458	5.21526E-06	2.3577E-05	0	4.6854E-07	2.93E-05	29.26081
4839803754060	483980	3754060	0.312213032	0.10656668	0.076910031	0.084935036	0.084935036	0.06128593	0.06128593	0.027213284	0.027213284	0.016725199	0.022195209	0.033375612	0.010929425	0.029552463	0.007410111	0.004506677	0.00459466	0.001867192	3.67455E-06	1.6468E-05	0	3.066E-07	2.04E-05	20.44885
4840003754060	484000	3754060	0.220126836	0.07513519	0.054225673	0.059883729	0.059883729	0.043209848	0.043209848	0.019186816	0.019186816	0.012103845	0.016062432	0.024153568	0.007655411	0.020699738	0.005190341	0.003156659	0.003218286	0.001307856	2.59075E-06	1.1634E-05	0	2.1475E-07	1.44E-05	14.43912
4840203754060	484020	3754060	0.157307063	0.05369312	0.038750756	0.042794117	0.042794117	0.030878627	0.030878627	0.013711285	0.013711285	0.009481409	0.012582323	0.018920422	0.005665705	0.015319702	0.003841328	0.002336217	0.002381826	0.000967934	1.85141E-06	8.375E-06	0	1.5894E-07	1.04E-05	10.38534
4840403754060	484040	3754060	0.114893548	0.03921625	0.028302683	0.031255863	0.031255863	0.022553056	0.022553056	0.010014415	0.010014415	0.007771536	0.010313233	0.015508323	0.004375957	0.011832306	0.002966883	0.001804397	0.001839624	0.000747592	1.35223E-06	6.1794E-06	0	1.2276E-07	7.65E-06	7.654361
4840603754060	484060	3754060	0.08616439	0.02941022	0.02122559	0.023440327	0.023440327	0.016913659	0.016913659	0.007510308	0.007510308	0.006590957	0.008746544	0.013152444	0.003496093	0.009453211	0.002370339	0.001441591	0.001469735	0.000597275	1.0141E-06	4.6905E-06	0	9.8074E-08	5.8E-06	5.802685
4840803754060	484080	3754060	0.066797027	0.02279962	0.016454667	0.018171592	0.018171592	0.013111938	0.013111938	0.005822199	0.005822199	0.005817986	0.00772077	0.011609956	0.002887394	0.007807329	0.001957643	0.001190598	0.001213842	0.000493285	7.86159E-07	3.6885E-06	0	8.0998E-08	4.56E-06	4.555657
4841003754060	484100	3754060	0.053497126	0.01826	0.013178392	0.014553461	0.014553461	0.010501231	0.010501231	0.004662946	0.004662946	0.005266569	0.006989012	0.01050959	0.002455405	0.006639257	0.001664756	0.00101247	0.001032237	0.000419483	6.29628E-07	2.9989E-06	0	6.888E-08	3.7E-06	3.697388
4841203754060	484120	3754060	0.04431379	0.01512549	0.010916184	0.012055209	0.012055209	0.008698586	0.008698586	0.003862503	0.003862503	0.004830013	0.006409678	0.009638428	0.002150866	0.005815803	0.00145828	0.000886896	0.00090421	0.000367456	5.21546E-07	2.5186E-06	0	6.0337E-08	3.1E-06	3.100475
4839403754080	483940	3754080	0.711951169	0.24300803	0.175380849	0.19368057	0.19368057	0.13975262	0.13975262	0.06205548	0.06205548	0.038824543	0.05152219	0.077475486	0.021907709	0.059237035	0.014853349	0.009033501	0.00920986	0.00374273	8.37922E-06	3.7603E-05	0	6.1456E-07	4.66E-05	46.59629
4839603754080	483960	3754080	0.461270361	0.15744395	0.113628562	0.125484879	0.125484879	0.090545173	0.090545173	0.040205501	0.040205501	0.021732765	0.028840511	0.043368355	0.013254238	0.035838606	0.008986326	0.005465298	0.005571996	0.002264364	5.42886E-06	2.411E-05	0	3.7181E-07	2.99E-05	29.91069
4839803754080	483980	3754080	0.302083541	0.10310922	0.074414749	0.08217939	0.08217939	0.059297559	0.059297559	0.026330372	0.026330372	0.014711867	0.019523413	0.02935795	0.008871671	0.023988427	0.006014961	0.003658176	0.003729593	0.001515643	3.55533E-06	1.5825E-05	0	2.4887E-07	1.96E-05	19.62909
4840003754080	484000	3754080	0.202449431	0.06910142	0.049871051	0.055074734	0.055074734	0.039739858	0.039739858	0.017646009	0.017646009	0.011106343	0.014738696	0.022163025	0.006390921	0.017280639	0.004333022	0.002635255	0.002686702	0.00109183	2.3827E-06	1.0697E-05	0	1.7928E-07	1.33E-05	13.25947
4840203754080	484020	3754080	0.140175294	0.04784559	0.034530545	0.038133557	0.038133557	0.027515742	0.027515742	0.012218036	0.012218036	0.008882805	0.011787944	0.017725891	0.004846175	0.013103745	0.003285689	0.001998289	0.002037301	0.000827924	1.64978E-06	7.4949E-06	0	1.3595E-07	9.28E-06	9.280651
4840403754080	484040	3754080	0.100907755	0.03444252	0.024857446	0.02745114	0.02745114	0.019807711	0.019807711	0.008795377	0.008795377	0.007395702	0.009814481	0.014758334	0.003823658	0.010338926	0.002592427	0.001576661	0.001607441	0.000653237	1.18762E-06	5.4693E-06	0	1.0726E-07	6.76E-06	6.764137
4840603754080	484060	3754080	0.075400574	0.02573624	0.01857405	0.020512118	0.020512118	0.014800773	0.014800773	0.006572106	0.006572106	0.006331044	0.008401626	0.01263378	0.003107501	0.008402483	0.002106875	0.001281358	0.001306374	0.000530888	8.87418E-07	4.1461E-06	0	8.7173E-08	5.12E-06	5.120734
4840803754080	484080	3754080	0.058576315	0.01999367	0.014429591	0.015935214	0.015935214	0.011498251	0.011498251	0.005105661	0.005105661	0.005608993	0.007443426	0.011192906	0.002599802	0.007029699	0.001762657	0.001072012	0.00109294	0.000444152	6.89407E-07	3.272E-06	0	7.2931E-08	4.03E-06	4.034311
4841003754080	484100	3754080	0.047235951	0.0161229	0.011636024	0.012850159	0.012850159	0.009272192	0.009272192	0.004117206	0.004117206	0.005095358	0.006761805	0.010167932	0.002236804	0.006048175	0.001516545	0.000922332	0.000940338	0.000382137	5.55938E-07	2.6808E-06	0	6.2748E-08	3.3E-06	3.299437
4841203754080	484120	3754080	0.039430203	0.01345859	0.00971317	0.010726669	0.010726669	0.007739961	0.007739961	0.003436837	0.003436837	0.004679345	0.006209734	0.009337767	0.001976605	0.005344614	0.001340131	0.00081504	0.000830952	0.000337685	4.64069E-07	2.2692E-06	0	5.5449E-08	2.79E-06	2.788713
4839403754100	483940	3754100	0.771440837	0.26331345	0.190035433	0.209864254	0.209864254	0.151430158	0.151430158	0.067240751	0.067240751	0.030011231	0.039826465	0.059888268	0.016816213	0.045469956	0.011401332	0.006934056	0.007069428	0.002872895	9.07938E-06	3.9855E-05	0	4.7174E-07	4.94E-05	49.40581
4839603754100	483960	3754100	0.450758439	0.15385595	0.111039073	0.122625196	0.122625196	0.088481733	0.088481733	0.039289255	0.039289255	0.019078527	0.025318198	0.038071746	0.010630922	0.028745328	0.007207727	0.004383591	0.004469171	0.001816195	5.30514E-06	2.3401E-05	0	2.9822E-07	2.9E-05	29.00461
4839803754100	483980	3754100	0.2744304	0.09367046	0.067602721	0.074656576	0.074656576	0.053869379	0.053869379	0.023920054	0.023920054	0.013485617	0.017896116	0.026910935	0.007405354	0.020023601	0.005020804	0.003053549	0.003113163	0.001265137	3.22987E-06	1.4385E-05	0	2.0774E-07	1.78E-05	17.82276
4840003754100	484000	3754100	0.176353552	0.0601942	0.043442636	0.047975561	0.047975561	0.034617361	0.034617361	0.015371425	0.015371425	0.010404411	0.013807195	0.0207623	0.005492626	0.014851706	0.003723981	0.002264848	0.002309064	0.000938364	2.07557E-06	9.3724E-06	0	1.5408E-07	1.16E-05	11.60207
4840203754100	484020	3754100	0.120204518	0.04102903	0.029610978	0.032700669	0.032700669	0.023595574	0.023595574	0.010477332	0.010477332	0.008439086	0.011199107	0.016840438	0.004260535	0.011520211	0.002888627	0.001756804	0.001791101	0.000727873	1.41473E-06	6.4878E-06	0	1.1952E-07	8.02E-06	8.022025
4840403754100	484040	3754100	0.086552491	0.02954269	0.021321194	0.023545907	0.023545907	0.016989841	0.016989841	0.007544136	0.007544136	0.007105776	0.009429735	0.01417978	0.003420904	0.009249904	0.002319361	0.001410587	0.001438126	0.00058443	1.01867E-06	4.7474E-06	0	9.5965E-08	5.86E-06	5.862072
4840603754100	484060	3754100	0.065201427	0.022255	0.01606161	0.017737522	0.017737522	0.012798729	0.012798729	0.005683123	0.005683123	0.006127969	0.008132134	0.012228538	0.002817775	0.007619081	0.001910441	0.001161891	0.001184574	0.000481391	7.6738E-07	3.6335E-06	0	7.9045E-08	4.48E-06	4.479949
4840803754100	484080	3754100	0.051159073	0.01746196	0.01260244	0.013917413	0.013917413	0.010042282	0.010042282	0.004459155	0.004459155	0.00543244	0.007209131	0.01084059	0.002379176	0.006433137	0.001613073	0.000981038	0.00100019	0.00040646	6.0211E-07	2.897E-06	0	6.6742E-08	3.57E-06	3.565896
4841003754100	484100	3754100	0.041729918	0.01424354	0.010279678	0.011352287	0.011352287	0.008191384	0.008191384	0.003637286	0.003637286	0.004942808	0.006559364	0.009863516	0.002063942	0.005580765	0.001399345	0.000851053	0.000867668	0.000352605	4.91135E-07	2.4008E-06	0	5.7899E-08	2.95E-06	2.949879
4841203754100	484120	3754100	0.035325247	0.01205745	0.008701962	0.009609948	0.009609948	0.006934178	0.006934178	0.003079039	0.003079039	0.00455083	0.006039188	0.009081311	0.001842144	0.00498104	0.001248967	0.000759596	0.000774426	0.000314713	4.15756E-07	2.0594E-06	0	5.1677E-08	2.53E-06	2.526856
4839403754120	483940	3754120	0.790066422	0.26967086	0.194623628	0.214931194	0.214931194	0.155086272	0.155086272	0.068864204	0.068864204	0.024245106	0.032174518	0.048381803	0.014214416	0.038434867	0.009637323	0.005861222	0.005975649	0.002428402	9.29859E-06	4.0338E-05	0	3.9875E-07	5E-05	50.03528
4839603754120	483960	3754120	0.407774045	0.13918422	0.10045037	0.110931638	0.110931638	0.080044101	0.080044101	0.035542626	0.035542626	0.016695581	0.022155905	0.033316509	0.009286106	0.025109034	0.006295947	0.003829065	0.003903819	0.001586446	4.79925E-06	2.1128E-05	0	2.605E-07	2.62E-05	26.18784
4839803754120	483980	3754120	0.232694408	0.07942484	0.057321547	0.063302636	0.063302636	0.045676803	0.045676803	0.020282238	0.020282238	0.012424146	0.016487489	0.024792739	0.006611472	0.017876995	0.004482554	0.002726197	0.00277942	0.001129509	2.73867E-06	1.227E-05	0	1.8547E-07	1.52E-05	15.19458
4840003754120	484000	3754120	0.146957806	0.05016064	0.036201338	0.039978685	0.039978685	0.028847117	0.028847117	0.012809217	0.012809217	0.00978766	0.012988735	0.019531556	0.004978176	0.013460668	0.003375186	0.002052718	0.002092793	0.000850476	1.7296E-06	7.8926E-06	0	1.3965E-07	9.76E-06	9.761887
4840203754120	484020	3754120	0.100946228	0.03445566	0.024866923	0.027461607	0.027461607	0.019815263	0.019815263	0.008798731	0.008798731	0.00808941	0.010735068	0.016142649	0.00391068	0.010574228	0.002651427	0.001612544	0.001644025	0.000668104	1.18807E-06	5.5223E-06	0	1.097E-07	6.82E-06	6.820103
4840403754120	484040	3754120	0.073862076	0.02521111	0.018195059	0.020093582	0.020093582	0.014498773	0.014498773	0.006438007	0.006438007	0.006878273	0.009127826	0.01372579	0.003169644	0.008570514	0.002149008	0.001306982	0.001332498	0.000541505	8.6931E-07	4.1115E-06	0	8.8916E-08	5.07E-06	5.069689
4840603754120	484060	3754120	0.056574932	0.01931054	0.013936573	0.015390754	0.015390754	0.011105389	0.011105389	0.004931215	0.004931215	0.005958578	0.007907344	0.011890513	0.002627174	0.007103708	0.001781214	0.001083298	0.001104447	0.000448828	6.65851E-07	3.2001E-06	0	7.3699E-08	3.94E-06	3.939671
4840803754120	484080	3754120	0.045027625	0.01536914	0.011092029	0.012249402	0.012249402	0.008838708	0.008838708	0.003924723	0.003924723	0.005275916	0.007001415	0.010528241	0.002226489	0.006020282	0.001509551	0.000918078	0.000936002	0.000380375	5.29947E-07	2.5863E-06	0	6.2458E-08	3.18E-06	3.178734
4841003754120	484100	3754120	0.037224172	0.01270561	0.00916974	0.010126536	0.010126536	0.007306928	0.007306928	0.003244554	0.003244554	0.004806191	0.006378066	0.009590891	0.00193998	0.005245582	0.0013153	0.000799938	0.000815555	0.000331428	4.38105E-07	2.1709E-06	0	5.4421E-08	2.66E-06	2.663447
4841203754120	484120	3754120	0.031921977	0.01089583	0.007863606	0.008684116	0.008684116	0.006266132	0.006266132	0.002782401	0.002782401	0.004428475	0.005876817	0.008837148	0.001740743	0.004706858	0.001180218	0.000717784	0.000731797	0.00029739	3.75702E-07	1.8843E-06	0	4.8832E-08	2.31E-06	2.308876
4839403754140	483940	3754140	0.729113986	0.24886616	0.179608708	0.198349576	0.198349576	0.1431216	0.1431216	0.063551434	0.063551434	0.018317238	0.024307929	0.036552572	0.013640002	0.036881687	0.009247872	0.005624366	0.005734169	0.002330269	8.58121E-06	3.6926E-05	0	3.8263E-07	4.59E-05	45.89035
4839603754140	483960	3754140	0.333436124	0.11381069	0.082138092	0.090708607	0.090708607	0.065451921	0.065451921	0.029063143	0.029063143	0.014238986	0.018895875	0.028414303	0.008914765	0.02410495	0.006044179	0.003675945	0.00374771	0.001523005	3.92433E-06	1.732E-05	0	2.5008E-07	2.15E-05	21.49415
4839803754140	483980	3754140	0.187967949	0.0641585	0.046303707	0.051135164	0.051135164	0.036897212	0.036897212	0.016383766	0.016383766	0.011307112	0.015005126	0.022563665	0.006367288	0.017216737	0.004316999	0.00262551	0.002676767	0.001087793	2.21226E-06	1.0006E-05	0	1.7862E-07	1.24E-05	12.39661
4840003754140	484000	3754140	0.121352216	0.04142077	0.0298937	0.033012891	0.033012891	0.023820861	0.023820861	0.010577369	0.010577369	0.009216034	0.012230156	0.018390858	0.004801467	0.012982857	0.003255377	0.001979853	0.002018506	0.000820286	1.42824E-06	6.6011E-06	0	1.3469E-07	8.16E-06	8.164043
4840203754140	484020	3754140	0.085674911	0.02924315	0.021105013	0.023307168	0.023307168	0.016817577	0.016817577	0.007467644	0.007467644	0.007748382	0.010282507	0.015462118	0.00377843	0.010216631	0.002561762	0.001558011	0.001588428	0.00064551	1.00834E-06	4.752E-06	0	1.0599E-07	5.87E-06	5.866378
4840403754140	484040	3754140	0.064178597	0.02190588	0.015809647	0.017459269	0.017459269	0.012597953	0.012597953	0.00559397	0.00559397	0.006667793	0.008848509	0.013305772	0.003063281	0.008282913	0.002076893	0.001263124	0.001287783	0.000523333	7.55342E-07	3.6235E-06	0	8.5932E-08	4.46E-06	4.46473
4840603754140	484060	3754140	0.05009534	0.01709888	0.012340402	0.013628033	0.013628033	0.009833476	0.009833476	0.004366438	0.004366438	0.005806151	0.007705064	0.01158634	0.002538277	0.006863338	0.001720943	0.001046642	0.001067075	0.000433641	5.89591E-07	2.8727E-06	0	7.1205E-08	3.53E-06	3.533518
4840803754140	484080	3754140	0.040419151	0.01379614	0.009956785	0.010995704	0.010995704	0.007934087	0.007934087	0.003523036	0.003523036	0.005141847	0.006823499	0.010260704	0.002147258	0.005806047	0.001455833	0.000885408	0.000902693	0.000366839	4.75708E-07	2.3516E-06	0	6.0236E-08	2.89E-06	2.887524
4841003754140	484100	3754140	0.033652702	0.01148657	0.00828995	0.009154946	0.009154946	0.006605865	0.006605865	0.002933255	0.002933255	0.004652367	0.006173934	0.009283932	0.001860468	0.005030585	0.00126139	0.000767152	0.000782129	0.000317844	3.96071E-07	1.9853E-06	0	5.2191E-08	2.43E-06	2.433572
4841203754140	484120	3754140	0.029044498	0.00991367	0.007154773	0.007901321	0.007901321	0.005701296	0.005701296	0.002531593	0.002531593	0.004288459	0.005691008	0.008557742	0.001664135	0.004499713	0.001128277	0.000686195	0.000699591	0.000284302	3.41836E-07	1.7336E-06	0	4.6683E-08	2.12E-06	2.122131
4839603754160	483960	3754160	0.260020734	0.08875205	0.064053069	0.070736542	0.070736542	0.051040831	0.051040831	0.02266407	0.02266407	0.012257122	0.016265839	0.024459438	0.008993313	0.02431734	0.006097434	0.003708334	0.003780731	0.001536425	3.06028E-06	1.3591E-05	0	2.5228E-07	1.69E-05	16.90398
4839803754160	483980	3754160	0.155158133	0.05295963	0.038221393	0.042209518	0.042209518	0.030456802	0.030456802	0.013523979	0.013523979	0.010201033	0.013537301	0.020356452	0.006434102	0.017397396	0.004362298	0.00265306	0.002704855	0.001099207	1.82611E-06	8.3233E-06	0	1.8049E-07	1.03E-05	10.32986
4840003754160	484000	3754160	0.104292802	0.03559793	0.025691313	0.028372015	0.028372015	0.02047218	0.02047218	0.009090427	0.009090427	0.008594336	0.011405132	0.017150243	0.00484728	0.013106734	0.003286439	0.001998744	0.002037765	0.000828113	1.22746E-06	5.7229E-06	0	1.3598E-07	7.09E-06	7.086311
4840203754160	484020	3754160	0.07570984	0.0258418	0.018650234	0.020596251	0.020596251	0.014861481	0.014861481	0.006599063	0.006599063	0.007375309	0.009787419	0.01471764	0.003804934	0.010288297	0.002579732	0.00156894	0.00159957	0.000650038	8.91057E-07	4.2383E-06	0	1.0674E-07	5.24E-06	5.236094
4840403754160	484040	3754160	0.057851951	0.01974642	0.014251152	0.015738156	0.015738156	0.011356062	0.011356062	0.005042524	0.005042524	0.006418926	0.008518249	0.012809151	0.00307585	0.0083169	0.002085415	0.001268307	0.001293068	0.000525481	6.80881E-07	3.2964E-06	0	8.6285E-08	4.06E-06	4.063568
4840603754160	484060	3754160	0.045778583	0.01562546	0.011277019	0.012453694	0.012453694	0.008986118	0.008986118	0.003990178	0.003990178	0.005637275	0.007480958	0.011249344	0.002538115	0.006862898	0.001720833	0.001046575	0.001067007	0.000433613	5.38785E-07	2.6496E-06	0	7.12E-08	3.26E-06	3.259623
4840803754160	484080	3754160	0.037322176	0.01273906	0.009193882	0.010153197	0.010153197	0.007326165	0.007326165	0.003253096	0.003253096	0.005015821	0.006656255	0.010009214	0.002139489	0.005785039	0.001450566	0.000882204	0.000899427	0.000365512	4.39259E-07	2.1912E-06	0	6.0018E-08	2.69E-06	2.690449
4841003754160	484100	3754160	0.031140646	0.01062914	0.007671134	0.008471561	0.008471561	0.00611276	0.00611276	0.002714298	0.002714298	0.004511623	0.005987158	0.009003072	0.001834614	0.004960677	0.001243861	0.000756491	0.00077126	0.000313427	3.66506E-07	1.8524E-06	0	5.1465E-08	2.27E-06	2.270327
4841203754160	484120	3754160	0.026789195	0.00914387	0.006599205	0.007287784	0.007287784	0.005258591	0.005258591	0.002335015	0.002335015	0.004140492	0.005494648	0.00826247	0.001618657	0.004376744	0.001097444	0.000667443	0.000680473	0.000276533	3.15292E-07	1.6127E-06	0	4.5407E-08	1.97E-06	1.973352
4839603754180	483960	3754180	0.223499598	0.07628641	0.055056514	0.060801262	0.060801262	0.043871906	0.043871906	0.019480795	0.019480795	0.010359742	0.013747917	0.020673161	0.009100642	0.024607549	0.006170202	0.00375259	0.003825851	0.001554761	2.63045E-06	1.1669E-05	0	2.5529E-07	1.46E-05	14.5552
4839803754180	483980	3754180	0.138869791	0.04739998	0.03420895	0.037778406	0.037778406	0.027259478	0.027259478	0.012104245	0.012104245	0.009125785	0.012110391	0.018210764	0.006553934	0.017721416	0.004443544	0.002702472	0.002755232	0.001119679	1.63441E-06	7.4492E-06	0	1.8385E-07	9.27E-06	9.267427
4840003754180	484000	3754180	0.095883237	0.03272752	0.023619715	0.026084261	0.026084261	0.018821422	0.018821422	0.008357427	0.008357427	0.007936679	0.010532386	0.015837869	0.004980452	0.013466821	0.003376728	0.002053657	0.00209375	0.000850864	1.12849E-06	5.264E-06	0	1.3971E-07	6.53E-06	6.532221
4840203754180	484020	3754180	0.070592717	0.02409519	0.017389691	0.019204179	0.019204179	0.013857014	0.013857014	0.006153041	0.006153041	0.006938692	0.009208005	0.013846358	0.003909835	0.010571943	0.002650854	0.001612195	0.00164367	0.000667959	8.30832E-07	3.9564E-06	0	1.0968E-07	4.9E-06	4.896916
4840403754180	484040	3754180	0.05453305	0.01861359	0.01343358	0.014835276	0.014835276	0.010704578	0.010704578	0.00475324	0.00475324	0.006121627	0.008123718	0.012215882	0.003162146	0.008550239	0.002143924	0.00130389	0.001329346	0.000540224	6.4182E-07	3.1125E-06	0	8.8706E-08	3.84E-06	3.843053
4840603754180	484060	3754180	0.04343783	0.0148265	0.010700402	0.011816911	0.011816911	0.008526639	0.008526639	0.003786152	0.003786152	0.005436264	0.007214205	0.01084822	0.002602544	0.007037111	0.001764515	0.001073142	0.001094093	0.000444621	5.11236E-07	2.5206E-06	0	7.3008E-08	3.1E-06	3.104837
4840803754180	484080	3754180	0.035552438	0.012135	0.008757927	0.009671754	0.009671754	0.006978774	0.006978774	0.003098841	0.003098841	0.004869948	0.006462674	0.00971812	0.002184089	0.005905635	0.001480804	0.000900595	0.000918177	0.000373131	4.1843E-07	2.0941E-06	0	6.1269E-08	2.57E-06	2.573758
4841003754180	484100	3754180	0.029727825	0.0101469	0.007323102	0.008087215	0.008087215	0.00583543	0.00583543	0.002591153	0.002591153	0.004396339	0.00583417	0.008773019	0.001862732	0.005036708	0.001262926	0.000768086	0.000783081	0.000318231	3.49878E-07	1.7749E-06	0	5.2254E-08	2.18E-06	2.177046
4841203754180	484120	3754180	0.025391493	0.0086668	0.006254898	0.006907551	0.006907551	0.004984229	0.004984229	0.002213187	0.002213187	0.004007	0.005317498	0.007996083	0.001618028	0.004375044	0.001097017	0.000667183	0.000680209	0.000276425	2.98842E-07	1.5346E-06	0	4.539E-08	1.88E-06	1.878836
4839803754200	483980	3754200	0.132431237	0.04520233	0.032622887	0.036026849	0.036026849	0.02599562	0.02599562	0.011543044	0.011543044	0.008057486	0.010692703	0.016078944	0.006601417	0.017849805	0.004475737	0.002722051	0.002775193	0.001127791	1.55863E-06	7.0562E-06	0	1.8519E-07	8.8E-06	8.799994
4840003754200	484000	3754200	0.093032217	0.03175439	0.022917399	0.025308664	0.025308664	0.018261781	0.018261781	0.008108925	0.008108925	0.007201973	0.009557393	0.014371743	0.005092255	0.01376913	0.003452531	0.002099758	0.002140751	0.000869965	1.09493E-06	5.0707E-06	0	1.4285E-07	6.31E-06	6.308476
4840203754200	484020	3754200	0.068910723	0.02352108	0.016975351	0.018746606	0.018746606	0.013526846	0.013526846	0.006006434	0.006006434	0.006457617	0.008569594	0.01288636	0.004021378	0.010873548	0.00272648	0.001658189	0.001690562	0.000687015	8.11036E-07	3.8388E-06	0	1.1281E-07	4.76E-06	4.762679
4840403754200	484040	3754200	0.053455818	0.0182459	0.013168216	0.014542224	0.014542224	0.010493122	0.010493122	0.004659345	0.004659345	0.005785394	0.007677519	0.011544919	0.003266928	0.008833562	0.002214965	0.001347096	0.001373395	0.000558125	6.29141E-07	3.0352E-06	0	9.1645E-08	3.76E-06	3.75594
4840603754200	484060	3754200	0.042657174	0.01456004	0.010508096	0.01160454	0.01160454	0.0083734	0.0083734	0.003718108	0.003718108	0.005199717	0.006900295	0.010376184	0.002692741	0.007280998	0.001825669	0.001110334	0.001132011	0.00046003	5.02048E-07	2.465E-06	0	7.5538E-08	3.04E-06	3.042634
4840803754200	484080	3754200	0.034908258	0.01191512	0.008599241	0.00949651	0.00949651	0.006852325	0.006852325	0.003042693	0.003042693	0.004698615	0.006235306	0.0093762	0.002256309	0.006100914	0.001529769	0.000930374	0.000948538	0.00038547	4.10848E-07	2.05E-06	0	6.3295E-08	2.52E-06	2.524127
4841003754200	484100	3754200	0.029268449	0.00999011	0.00720994	0.007962245	0.007962245	0.005745257	0.005745257	0.002551113	0.002551113	0.004270919	0.005667732	0.008522741	0.001926728	0.005209749	0.001306315	0.000794474	0.000809984	0.000329164	3.44471E-07	1.7432E-06	0	5.4049E-08	2.14E-06	2.141765
4841203754200	484120	3754200	0.025029851	0.00854336	0.006165811	0.006809169	0.006809169	0.00491324	0.00491324	0.002181666	0.002181666	0.003911228	0.005190404	0.007804968	0.001671644	0.004520017	0.001133368	0.000689291	0.000702748	0.000285585	2.94586E-07	1.5099E-06	0	4.6894E-08	1.85E-06	1.851371
4839803754220	483980	3754220	0.129634213	0.04424763	0.031933873	0.035265942	0.035265942	0.025446578	0.025446578	0.011299249	0.011299249	0.007146288	0.009483497	0.014260623	0.006575606	0.017780015	0.004458237	0.002711408	0.002764342	0.001123382	1.52571E-06	6.8525E-06	0	1.8446E-07	8.56E-06	8.562635
4840003754220	484000	3754220	0.092501566	0.03157327	0.022786679	0.025164304	0.025164304	0.018157616	0.018157616	0.008062672	0.008062672	0.006519341	0.008651505	0.013009531	0.005134406	0.013883104	0.003481109	0.002117139	0.002158471	0.000877166	1.08869E-06	4.9944E-06	0	1.4403E-07	6.23E-06	6.227144
4840203754220	484020	3754220	0.069031811	0.02356241	0.01700518	0.018779547	0.018779547	0.013550615	0.013550615	0.006016989	0.006016989	0.005934605	0.00787553	0.011842674	0.004094401	0.011070996	0.002775989	0.001688299	0.00172126	0.000699491	8.12461E-07	3.8061E-06	0	1.1486E-07	4.73E-06	4.733464
4840403754220	484040	3754220	0.053712437	0.0183335	0.013231431	0.014612035	0.014612035	0.010543495	0.010543495	0.004681713	0.004681713	0.005394447	0.007158712	0.010764774	0.003348131	0.009053131	0.002270021	0.00138058	0.001407533	0.000571997	6.32162E-07	3.0188E-06	0	9.3923E-08	3.74E-06	3.744908
4840603754220	484060	3754220	0.042909743	0.01464625	0.010570314	0.011673249	0.011673249	0.008422978	0.008422978	0.003740123	0.003740123	0.004921263	0.006530772	0.009820521	0.002773987	0.007500683	0.001880753	0.001143836	0.001166166	0.00047391	5.05021E-07	2.4568E-06	0	7.7817E-08	3.04E-06	3.039659
4840803754220	484080	3754220	0.035236152	0.01202704	0.008680014	0.009585711	0.009585711	0.006916689	0.006916689	0.003071273	0.003071273	0.004496662	0.005967305	0.008973218	0.002341359	0.006330883	0.001587433	0.000965444	0.000984292	0.0004	4.14707E-07	2.0511E-06	0	6.5681E-08	2.53E-06	2.531467
4841003754220	484100	3754220	0.029749154	0.01015418	0.007328356	0.008093017	0.008093017	0.005839617	0.005839617	0.002593012	0.002593012	0.004112816	0.005457922	0.008207243	0.002018984	0.005459203	0.001368864	0.000832515	0.000848768	0.000344925	3.50129E-07	1.755E-06	0	5.6637E-08	2.16E-06	2.161798
4841203754220	484120	3754220	0.025472218	0.00869435	0.006274783	0.006929511	0.006929511	0.005000075	0.005000075	0.002220224	0.002220224	0.003782774	0.005019938	0.007548634	0.001755523	0.004746822	0.001190239	0.000723879	0.000738011	0.000299915	2.99792E-07	1.522E-06	0	4.9247E-08	1.87E-06	1.871035
4839803754240	483980	3754240	0.126198545	0.04307495	0.031087536	0.034331296	0.034331296	0.024772173	0.024772173	0.010999787	0.010999787	0.006211421	0.008242879	0.012395068	0.006398084	0.017300006	0.004337878	0.002638208	0.002689713	0.001093054	1.48528E-06	6.6158E-06	0	1.7948E-07	8.28E-06	8.280595
4840003754240	484000	3754240	0.091692292	0.03129704	0.022587324	0.024944148	0.024944148	0.01799876	0.01799876	0.007992134	0.007992134	0.005936881	0.00787855	0.011847216	0.005069684	0.0137081	0.003437228	0.002090451	0.002131263	0.000866109	1.07916E-06	4.912E-06	0	1.4222E-07	6.13E-06	6.133334
4840203754240	484020	3754240	0.069440025	0.02370174	0.017105739	0.018890598	0.018890598	0.013630746	0.013630746	0.00605257	0.00605257	0.005471799	0.007261362	0.010919131	0.004102885	0.011093937	0.002781741	0.001691798	0.001724826	0.00070094	8.17266E-07	3.7919E-06	0	1.151E-07	4.72E-06	4.724269
4840403754240	484040	3754240	0.054438961	0.01858148	0.013410402	0.01480968	0.01480968	0.010686109	0.010686109	0.004745039	0.004745039	0.005027018	0.006671115	0.010031559	0.003387649	0.009159985	0.002296814	0.001396875	0.001424146	0.000578749	6.40712E-07	3.0272E-06	0	9.5032E-08	3.76E-06	3.7629
4840603754240	484060	3754240	0.044202152	0.01508738	0.010888683	0.012024839	0.012024839	0.008676672	0.008676672	0.003852772	0.003852772	0.004607698	0.006114655	0.009194793	0.002864737	0.007746064	0.001942281	0.001181256	0.001204317	0.000489414	5.20232E-07	2.4967E-06	0	8.0363E-08	3.1E-06	3.097334
4840803754240	484080	3754240	0.036690416	0.01252342	0.009038255	0.009981332	0.009981332	0.007202154	0.007202154	0.00319803	0.00319803	0.00423159	0.005615541	0.00844426	0.002453422	0.006633896	0.001663411	0.001011653	0.001031403	0.000419145	4.31823E-07	2.1025E-06	0	6.8824E-08	2.6E-06	2.60312
4841003754240	484100	3754240	0.031245399	0.01066489	0.007696939	0.008500059	0.008500059	0.006133323	0.006133323	0.002723429	0.002723429	0.003886254	0.005157261	0.00775513	0.002138589	0.005782607	0.001449956	0.000881833	0.000899049	0.000365358	3.67739E-07	1.8113E-06	0	5.9993E-08	2.24E-06	2.239047
4841203754240	484120	3754240	0.026695376	0.00911185	0.006576094	0.007262262	0.007262262	0.005240175	0.005240175	0.002326837	0.002326837	0.003595236	0.004771065	0.007174396	0.00186063	0.005031024	0.001261501	0.000767219	0.000782197	0.000317872	3.14188E-07	1.5678E-06	0	5.2195E-08	1.93E-06	1.934219
4840003754260	484000	3754260	0.089837914	0.03066409	0.02213052	0.024439679	0.024439679	0.017634754	0.017634754	0.007830502	0.007830502	0.005310965	0.007047928	0.010598183	0.004926782	0.013321702	0.003340341	0.002031526	0.002071188	0.000841695	1.05734E-06	4.7753E-06	0	1.3821E-07	5.97E-06	5.97083
4840203754260	484020	3754260	0.069237673	0.02363267	0.017055891	0.01883555	0.01883555	0.013591025	0.013591025	0.006034932	0.006034932	0.005058123	0.006712393	0.010093629	0.004047699	0.010944716	0.002744325	0.001669042	0.001701626	0.000691512	8.14884E-07	3.7515E-06	0	1.1355E-07	4.68E-06	4.679938
4840403754260	484040	3754260	0.055704506	0.01901344	0.013722154	0.015153961	0.015153961	0.010934529	0.010934529	0.004855347	0.004855347	0.004667965	0.006194633	0.009315058	0.003423808	0.009257756	0.00232133	0.001411785	0.001439347	0.000584926	6.55607E-07	3.0624E-06	0	9.6046E-08	3.81E-06	3.81406
4840603754260	484060	3754260	0.046811942	0.01597817	0.011531575	0.012734811	0.012734811	0.009188961	0.009188961	0.004080248	0.004080248	0.004193385	0.00556484	0.00836802	0.002985014	0.008071285	0.002023829	0.001230851	0.001254881	0.000509962	5.50947E-07	2.5935E-06	0	8.3737E-08	3.23E-06	3.228184
4840803754260	484080	3754260	0.03987959	0.01361197	0.009823871	0.010848921	0.010848921	0.007828173	0.007828173	0.003476007	0.003476007	0.003784322	0.005021992	0.007551722	0.002613607	0.007067026	0.001772016	0.001077704	0.001098744	0.000446511	4.69358E-07	2.2251E-06	0	7.3318E-08	2.77E-06	2.767746
4841003754260	484100	3754260	0.034208192	0.01167617	0.008426788	0.009306063	0.009306063	0.006714905	0.006714905	0.002981673	0.002981673	0.003406302	0.00452034	0.006797373	0.002290647	0.006193763	0.001553051	0.000944533	0.000962973	0.000391336	4.02609E-07	1.9205E-06	0	6.4258E-08	2.39E-06	2.387323
4841203754260	484120	3754260	0.029264264	0.00998868	0.007208909	0.007961107	0.007961107	0.005744436	0.005744436	0.002550748	0.002550748	0.003138044	0.004164348	0.006262056	0.002001278	0.005411328	0.00135686	0.000825214	0.000841325	0.0003419	3.44422E-07	1.6594E-06	0	5.6141E-08	2.06E-06	2.059999
4840003754280	484000	3754280	0.088327224	0.03014845	0.021758379	0.024028708	0.024028708	0.017338213	0.017338213	0.007698826	0.007698826	0.004726776	0.006272677	0.009432416	0.00478479	0.012937765	0.003244071	0.001972977	0.002011495	0.000817437	1.03956E-06	4.6585E-06	0	1.3422E-07	5.83E-06	5.832246
4840203754280	484020	3754280	0.068397486	0.0233459	0.016848921	0.018606984	0.018606984	0.0134261	0.0134261	0.005961699	0.005961699	0.004591251	0.006092829	0.009161972	0.003955584	0.010695644	0.002681872	0.001631059	0.001662902	0.000675775	8.04996E-07	3.6761E-06	0	1.1096E-07	4.59E-06	4.592016
4840403754280	484040	3754280	0.057857216	0.01974822	0.014252449	0.015739589	0.015739589	0.011357096	0.011357096	0.005042982	0.005042982	0.004127413	0.005477292	0.00823637	0.003471832	0.00938761	0.00235389	0.001431587	0.001459536	0.000593131	6.80943E-07	3.1275E-06	0	9.7393E-08	3.91E-06	3.905885
4840603754280	484060	3754280	0.049319544	0.01683408	0.012149293	0.013416984	0.013416984	0.009681191	0.009681191	0.004298817	0.004298817	0.003381115	0.004486916	0.006747112	0.003006122	0.00812836	0.00203814	0.001239555	0.001263754	0.000513568	5.8046E-07	2.6559E-06	0	8.4329E-08	3.32E-06	3.320695
4840803754280	484080	3754280	0.038335692	0.013085	0.00944355	0.010428916	0.010428916	0.007525114	0.007525114	0.003341437	0.003341437	0.002706949	0.003592263	0.005401795	0.002415215	0.006530587	0.001637507	0.000995898	0.001015341	0.000412617	4.51187E-07	2.0702E-06	0	6.7753E-08	2.59E-06	2.589172
4841003754280	484100	3754280	0.029736194	0.01014976	0.007325164	0.008089492	0.008089492	0.005837073	0.005837073	0.002591883	0.002591883	0.002262685	0.003002701	0.004515252	0.001936058	0.005234976	0.00131264	0.000798321	0.000813906	0.000330758	3.49976E-07	1.6179E-06	0	5.4311E-08	2.02E-06	2.02215
4841203754280	484120	3754280	0.026254899	0.0089615	0.006467587	0.007142433	0.007142433	0.005153712	0.005153712	0.002288444	0.002288444	0.002207273	0.002929166	0.004404677	0.00175704	0.004750924	0.001191267	0.000724504	0.000738648	0.000300174	3.09004E-07	1.4439E-06	0	4.9289E-08	1.8E-06	1.802208
4840003754300	484000	3754300	0.083838622	0.02861637	0.020652665	0.022807621	0.022807621	0.016457122	0.016457122	0.007307588	0.007307588	0.004268157	0.005664067	0.00851723	0.004529229	0.012246743	0.003070801	0.001867598	0.001904059	0.000773777	9.86728E-07	4.4056E-06	0	1.2706E-07	5.52E-06	5.519397
4840203754300	484020	3754300	0.068154906	0.0232631	0.016789164	0.018540992	0.018540992	0.013378483	0.013378483	0.005940555	0.005940555	0.004090118	0.005427799	0.008161947	0.003879441	0.010489758	0.002630247	0.001599662	0.001630892	0.000662767	8.02141E-07	3.6272E-06	0	1.0883E-07	4.54E-06	4.538207
4840403754300	484040	3754300	0.057329129	0.01956797	0.014122361	0.015595927	0.015595927	0.011253435	0.011253435	0.004996953	0.004996953	0.003341756	0.004434685	0.00666857	0.003337111	0.009023333	0.002262549	0.001376036	0.0014029	0.000570115	6.74728E-07	3.0438E-06	0	9.3614E-08	3.81E-06	3.812144
4840603754300	484060	3754300	0.039017129	0.01331759	0.009611414	0.010614295	0.010614295	0.007658876	0.007658876	0.003400832	0.003400832	0.002321829	0.003081188	0.004633276	0.002356973	0.006373103	0.001598019	0.000971882	0.000990856	0.000402667	4.59207E-07	2.0751E-06	0	6.6119E-08	2.6E-06	2.600386
4840803754300	484080	3754300	0.022818691	0.00778863	0.005621118	0.006207641	0.006207641	0.0044792	0.0044792	0.001988935	0.001988935	0.001698341	0.002253787	0.003389088	0.001450811	0.003922899	0.000983645	0.000598232	0.000609912	0.000247858	2.68562E-07	1.2387E-06	0	4.0699E-08	1.55E-06	1.547958
4841003754300	484100	3754300	0.014637802	0.00499627	0.003605851	0.003982096	0.003982096	0.002873331	0.002873331	0.001275868	0.001275868	0.00138332	0.001835738	0.002760455	0.000969996	0.002622806	0.000657654	0.000399971	0.00040778	0.000165715	1.72278E-07	8.1629E-07	0	2.7211E-08	1.02E-06	1.015779
4841203754300	484120	3754300	0.013597827	0.0046413	0.003349666	0.003699179	0.003699179	0.002669189	0.002669189	0.001185221	0.001185221	0.001347481	0.001788178	0.002688938	0.000918179	0.002482697	0.000622522	0.000378605	0.000385997	0.000156862	1.60038E-07	7.629E-07	0	2.5757E-08	9.49E-07	0.948698

Pettit Tank and Pipeline Construction HRA

Onroad DPM Emissions, Ground Level Concentrations and Health Risk Calculations

Residential Receptors (Phase 1 + Phase 2)

Phase		Start Date	End Date	Work Days	Emissions (lbs/day)	Emissions (lbs/yr)	Emissions (g/s)	
Grading/Excavation	2026	5/1/2026	6/30/2026	43	1.28E-01	5.5	1.24E-03	Phase 1
Potholding	2026	5/1/2026	5/31/2026	21	1.08E-03	0.0	1.04E-05	Phase 1
Stormwater Drainage and Foundation C	2026	7/1/2026	8/31/2026	44	2.01E-01	8.8	1.94E-03	Phase 1
Construction	2026	9/1/2026	12/31/2026	88	1.00E-02	0.9	9.73E-05	Phase 1
Construction	2027	1/1/2027	2/28/2027	41	9.77E-03	0.4	9.47E-05	Phase 1
Finishing	2026	9/1/2026	12/31/2026	88	1.08E-03	0.1	1.04E-05	Phase 1
Finishing	2027	1/1/2027	2/28/2027	41	1.01E-03	0.0	9.81E-06	Phase 1
Painting	2026	9/1/2026	12/31/2026	88	1.08E-03	0.1	1.04E-05	Phase 1
Painting	2027	1/1/2027	2/28/2027	41	1.01E-03	0.0	9.81E-06	Phase 1
Installing Pipeline	2026	10/1/2026	11/30/2026	43	1.08E-03	0.0	1.04E-05	Phase 1
Install Appurtenances	2026	12/1/2026	12/31/2026	23	1.08E-03	0.0	1.04E-05	Phase 1
Pavement Repairs	2027	1/1/2027	1/31/2027	21	9.77E-03	0.2	9.47E-05	Phase 1
Demolition	2045	1/1/2045	1/31/2045	22	8.36E-04	0.0	8.10E-06	Phase 2
Grading/Excavation	2045	2/1/2045	3/31/2045	43	1.87E-02	0.8	1.81E-04	Phase 2
Stormwater Drainage and Foundation C	2045	4/1/2045	4/30/2045	20	8.36E-04	0.0	8.10E-06	Phase 2
Construction	2045	5/1/2045	10/31/2045	132	3.09E-03	0.4	2.99E-05	Phase 2
Finishing	2045	5/1/2045	10/31/2045	132	3.78E-04	0.0	3.67E-06	Phase 2
Painting	2045	5/1/2045	10/31/2045	132	3.78E-04	0.0	3.67E-06	Phase 2

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
																					Res MAX:	7.412469			2.48564	
		AERMOD Column Identifier:	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7						
			Grading/Excavation	Potholding	and Foundation Concrete	Construction	Construction	Finishing	Finishing	Painting	Painting	Installing Pipeline	Appurtenances	Pavement Repairs	Demolition	Grading/Excavation	Drainage and Foundation	Construction	Finishing	Painting	Maximum Individual Cancer Risk (MICR)					
Unique Identifier	X (UTM)	Y (UTM)	2026	2026	2026	2026	2027	2026	2027	2026	2027	2026	2026	2027	2045	2045	2045	2045	2045	2045	3rd Trimester	0<2	2<16	16<30	Total	per million
483702.433753999.04	483702.43	3753999.04	0.003526404	2.97165E-05	0.00552878	0.000276773	0.000269338	2.97165E-05	2.79069E-05	2.97165E-05	2.79069E-05	2.97165E-05	2.97165E-05	0.000269338	2.3029E-05	0.000514366	2.3029E-05	8.51559E-05	1.04306E-05	1.04306E-05	5.69152E-08	1.12E-07	0	3.64E-09	1.72E-07	0.1722408
483694.263753916.12	483694.26	3753916.12	0.003917708	3.3014E-05	0.006142277	0.000307485	0.000299225	3.3014E-05	3.10036E-05	3.3014E-05	3.10036E-05	3.3014E-05	3.3014E-05	0.000299225	2.55844E-05	0.000571442	2.55844E-05	9.46051E-05	1.1588E-05	1.1588E-05	6.32308E-08	1.24E-07	0	4.04E-09	1.91E-07	0.1913534
483697.73753861.82	483697.7	3753861.82	0.004023322	3.3904E-05	0.00630786	0.000315774	0.000307292	3.3904E-05	3.18394E-05	3.3904E-05	3.18394E-05	3.3904E-05	3.3904E-05	0.000307292	2.62741E-05	0.000586847	2.62741E-05	9.71555E-05	1.19004E-05	1.19004E-05	6.49353E-08	1.27E-07	0	4.15E-09	1.97E-07	0.1965119
483584.93753882.87	483584.9	3753882.87	0.0022735	1.91585E-05	0.003564448	0.000178438	0.000173645	1.91585E-05	1.79918E-05	1.91585E-05	1.79918E-05	1.91585E-05	1.91585E-05	0.000173645	1.4847E-05	0.000331616	1.4847E-05	5.49006E-05	6.7247E-06	6.7247E-06	3.66937E-08	7.2E-08	0	2.34E-09	1.11E-07	0.111045
483549.823753855.91	483549.82	3753855.91	0.001976859	1.66587E-05	0.003099367	0.000155155	0.000150988	1.66587E-05	1.56443E-05	1.66587E-05	1.56443E-05	1.66587E-05	1.66587E-05	0.000150988	1.29098E-05	0.000288347	1.29098E-05	4.77373E-05	5.84728E-06	5.84728E-06	3.1906E-08	6.26E-08	0	2.04E-09	9.66E-08	0.0965561
483515.523753852.37	483515.52	3753852.37	0.001761057	1.48402E-05	0.002761027	0.000138218	0.000134505	1.48402E-05	1.39365E-05	1.48402E-05	1.39365E-05	1.48402E-05	1.48402E-05	0.000134505	1.15005E-05	0.00025687	1.15005E-05	4.25261E-05	5.20896E-06	5.20896E-06	2.8423E-08	5.58E-08	0	1.82E-09	8.6E-08	0.0860156
483339.193753860.79	483339.19	3753860.79	0.001079746	9.09887E-06	1.69E-03	8.47447E-05	8.24684E-05	9.09887E-06	8.54478E-06	9.09887E-06	8.54478E-06	9.09887E-06	9.09887E-06	8.24684E-05	7.05122E-06	0.000157493	7.05122E-06	2.60738E-05	3.19374E-06	3.19374E-06	1.74268E-08	3.42E-08	0	1.11E-09	5.27E-08	0.0527382
483124.173753854.26	483124.17	3753854.26	0.000694232	5.8502E-06	0.001088434	5.44874E-05	5.30238E-05	5.8502E-06	5.49394E-06	5.8502E-06	5.49394E-06	5.8502E-06	5.8502E-06	5.30238E-05	4.53365E-06	0.000101262	4.53365E-06	1.67644E-05	2.05344E-06	2.05344E-06	1.12047E-08	2.2E-08	0	7.16E-10	3.39E-08	0.0339085
483070.493753861.97	483070.49	3753861.97	0.000602246	5.07505E-06	0.000944216	4.72678E-05	4.59982E-05	5.07505E-06	4.766E-06	5.07505E-06	4.766E-06	5.07505E-06	5.07505E-06	4.59982E-05	3.93294E-06	8.78444E-05	3.93294E-06	1.45431E-05	1.78136E-06	1.78136E-06	9.7201E-09	1.91E-08	0	6.21E-10	2.94E-08	0.0294156
483954.733753733.9	483954.73	3753733.9	0.019602442	0.000165187	0.030733177	0.001538514	0.001497188	0.000165187	0.000155128	0.000165187	0.000155128	0.000165187	0.000165187	0.001497188	0.000128013	0.002859237	0.000128013	0.000473361	5.79813E-05	5.79813E-05	3.16378E-07	6.21E-07	0	2.02E-08	9.57E-07	0.957446
483977.613753750.69	483977.61	3753750.69	0.013236451	0.000111542	0.020752425	0.001038874	0.001010969	0.000111542	0.000104749	0.000111542	0.000104749	0.000111542	0.000111542	0.001010969	8.644E-05	0.001930686	8.644E-05	0.000319635	3.91516E-05	3.91516E-05	2.13633E-07	4.19E-07	0	1.36E-08	6.47E-07	0.6465106
484012.023753748.78	484012.02	3753748.78	0.008668718	7.30501E-05	0.013591024	0.000680371	0.000662096	7.30501E-05	6.86016E-05	7.30501E-05	6.86016E-05	7.30501E-05	7.30501E-05	0.000662096	5.66106E-05	0.00126443	5.66106E-05	0.000209333	2.56409E-05	2.56409E-05	1.39911E-07	2.75E-07	0	8.94E-09	4.23E-07	0.4234079
484038.993753749.36	484038.99	3753749.36	0.006654844	5.60794E-05	0.010433623	0.000522311	0.000508281	5.60794E-05	5.26644E-05	5.60794E-05	5.26644E-05	5.60794E-05	5.60794E-05	0.000508281	4.34591E-05	0.000970684	4.34591E-05	0.000160702	1.96841E-05	1.96841E-05	1.07407E-07	2.11E-07	0	6.86E-09	3.25E-07	0.3250439
484074.893753746.12	484074.89	3753746.12	0.004920076	4.14608E-05	0.007713813	0.000386156	0.000375784	4.14608E-05	3.8936E-05	4.14608E-05	3.8936E-05	4.14608E-05	4.14608E-05	0.000375784	3.21303E-05	0.000717649	3.21303E-05	0.00011881	1.45529E-05	1.45529E-05	7.94087E-08	1.56E-07	0	5.07E-09	2.4E-07	0.2403123
483951.713753696.43	483951.71	3753696.43	0.020705934	0.000174486	0.032463259	0.001625122	0.00158147	0.000174486	1.64E-04	0.000174486	0.000163861	0.000174486	0.000174486	0.00158147	0.000135219	0.003020194	0.000135219	0.000500008	6.12453E-05	6.12453E-05	3.34188E-07	6.56E-07	0	2.13E-08	1.01E-06	1.0113441
483951.593753657.88	483951.59	3753657.88	0.020604785	0.000173634	0.032304674	0.001617183	0.001573745	0.000173634	0.00016306	0.000173634	0.00016306	0.000173634	0.000173634	0.001573745	0.000134558	0.00300544	0.000134558	0.000497566	6.09461E-05	6.09461E-05	3.32556E-07	6.53E-07	0	2.12E-08	1.01E-06	1.0064036
483950.463753618.15	483950.46	3753618.15	0.02088022	0.000175955	0.032736509	0.001638801	0.001594782	0.000175955	0.00016524	0.000175955	0.00016524	0.000175955	0.000175955	0.001594782	0.000136357	0.003045616	0.000136357	0.000504217	6.17608E-05	6.17608E-05	3.37001E-07	6.61E-07	0	2.15E-08	1.02E-06	1.0198568
483946.613753587.64	483946.61	3753587.64	0.022594292	0.000190399	0.035423872	0.001773332	0.001725698	0.000190399	0.000178804	0.000190399	0.000178804	0.000190399	0.000190399	0.001725698	0.000147551	0.003295633	0.000147551	0.000545609	6.68308E-05	6.68308E-05	3.64666E-07	7.16E-07	0	2.33E-08	1.1E-06	1.1035776
483960.333753539.03	483960.33	3753539.03	0.016851641	0.000142006	0.026420406	0.001322615	0.001287088	0.000142006	0.000133359	0.000142006	0.000133359	0.000142006	0.000142006	0.001287088	0.000110049	0.002458002	0.000110049	0.000406935	4.98448E-05	4.98448E-05	2.71981E-07	5.34E-07	0	1.74E-08	8.23E-07	0.8230881
483980.253753458.18	483980.25	3753458.18	0.012304852	0.000103691	0.019291842	0.000965756	0.000939815	0.000103691	9.73769E-05	0.000103691	9.73769E-05	0.000103691	0.000103691	0.000939815	8.03562E-05	0.001794802	8.03562E-05	0.000297138	3.63961E-05	3.63961E-05	1.98597E-07	3.9E-07	0	1.27E-08	6.01E-07	0.6010084
484041.353753435.67	484041.35	3753435.67	0.006781042	5.71429E-05	0.01063148	0.000532216	0.00051792	5.71429E-05	5.36631E-05	5.71429E-05	5.36631E-05	5.71429E-05	5.71429E-05	0.00051792	4.42832E-05	0.000989092	4.42832E-05	0.000163749	2.00574E-05	2.00574E-05	1.09444E-07	2.15E-07	0	6.99E-09	3.31E-07	0.3312078
484049.623753516.7	484049.62	3753516.7	0.00642731	5.4162E-05	0.010076891	0.000504453	0.000490903	5.4162E-05	5.08638E-05	5.4162E-05	5.08638E-05	5.4162E-05	5.4162E-05	0.000490903	4.19732E-05	0.000937496	4.19732E-05	0.000155207	1.90111E-05	1.90111E-05	1.03735E-07	2.04E-07	0	6.63E-09	3.14E-07	0.3139304
484003.093753540.22	484003.09	3753540.22	0.009615197	8.10259E-05	0.015074937	0.000754657	0.000734386	8.10259E-05	7.60918E-05	8.10259E-05	7.60918E-05	8.10259E-05	8.10259E-05	0.000734386	6.27915E-05	0.001402485	6.27915E-05	0.000232188	2.84404E-05	2.84404E-05	1.55187E-07	3.05E-07	0	9.91E-09	4.7E-07	0.469637
484067.243753589.88	484067.24	3753589.88	0.005607723	4.72555E-05	0.008791923	0.000440127	0.000428305	4.72555E-05	4.43778E-05	4.72555E-05	4.43778E-05	4.72555E-05	4.72555E-05	0.000428305	3.66209E-05	0.00081795	3.66209E-05	0.000135416	1.65869E-05	1.65869E-05	9.05072E-08	1.78E-07	0	5.78E-09	2.74E-07	0.2738992
484033.573753592.07	484033.57	3753592.07	0.007263675	6.121E-05	0.011388163	0.000570095	0.000554782	6.121E-05	5.74825E-05	6.121E-05	5.74825E-05	6.121E-05	6.121E-05	0.000554782	4.74351E-05	0.001059489	4.74351E-05	0.000175404	2.1485E-05	2.1485E-05	1.17234E-07	2.3E-07	0	7.49E-09	3.55E-07	0.3547811
484006.163753595.1	484006.16	3753595.1	0.009348429	7.87779E-05	0.014656691	0.000733719	0.000714011	7.87779E-05	7.39806E-05	7.87779E-05	7.39806E-05	7.87779E-05	7.87779E-05	0.000714011	6.10494E-05	0.001363574	6.10494E-05	0.000225747	2.76514E-05	2.76514E-05	1.50881E-07	2.96E-07	0	9.64E-09	4.57E-07	0.4566072
484000.573753691.15	484000.57	3753691.15	0.009940247	8.37651E-05	0.015584557	0.000780168	0.000759212	8.37651E-05	7.86641E-05	8.37651E-05	7.86641E-05	8.37651E-05	8.37651E-05	0.000759212	6.49143E-05	0.001449897	6.49143E-05	0.000240038	2.94019E-05	2.94019E-05	1.60433E-07	3.15E-07	0	1.02E-08	4.86E-07	0.4855135
484038.563753695.15	484038.56	3753695.15	0.006888466	5.80481E-05	0.010799902	0.000540647	0.000526125	5.80481E-05	5.45132E-05	5.80481E-05	5.45132E-05	5.80481E-05	5.80481E-05	0.000526125	4.49848E-05	0.001004761	4.49848E-05	0.000166343	2.03751E-05	2.03751E-05	1.11178E-07	2.18E-07	0	7.1E-09	3.36E-07	0.3364547
484066.343753695.82	484066.34	3753695.82	0.005482765	4.62025E-05	0.008596011	0.000430319	0.000418761	4.62025E-05	4.3389E-05	4.62025E-05	4.3389E-05	4.62025E-05	4.62025E-05	0.000418761	3.58049E-05	0.000799723	3.58049E-05	0.000132398	1.62173E-05	1.62173E-05	8.84904E-08	1.74E-07	0	5.65E-09	2.68E-07	0.2677958
484100.923753692.13	484100.92	3753692.13	0.004255009	3.58564E-05	0.006671106	0.000333958	0.000324988	3.58564E-05	3.36729E-05	3.58564E-05	3.36729E-05	3.58564E-05	3.58564E-05	0.000324988	2.77871E-05	0.000620641	2.77871E-05	0.00010275	1.25857E-05	1.25857E-05	6.86747E-08	1.35E-07	0	4.39E-09	2.08E-07	0.2078283
48365937 53057.49	483659	3753057.49	0.001618577	1.36395E-05	0.002537644	0.000127035	0.000123623	1.36395E-05	1.28089E-05	1.36395E-05	1.28089E-05	1.36395E-05	1.36395E-05	0.000123623	1.057E-05	0.000236088	1.057E-05	3.90855E-05	4.78753E-06	4.78753E-06	2.61234E-08	5.13E-08	0	1.67E-09	7.91E-08	0.0790565
484038.613752969.05	484038.61	3752969.05	0.00500534	4.21793E-05	0.007847493	0.000392848	0.000382296	4.21793E-05	3.96108E-05	4.21793E-05	3.96108E-05	4.21793E-05	4.21793E-05	0.000382296	3.26871E-05	0.000730085	3.26871E-05	0.000120869	1.48051E-05	1.48051E-05	8.07849E-08	1.59E-07	0	5.16E-09	2.44E-07	0.2444768
484056.443752967.39	484056.44	3752967.39	0.004543329	3.8286E-05	0.00712314	0.000356587	0.000347009	3.8286E-05	3.59545E-05	3.8286E-05	3.59545E-05	3.8286E-05	3.8286E-05	0.000347009	2.967E-05	0.000662696	2.967E-05	0.000109713	1.34385E-05	1.34385E-05	7.33281E-08	1.44E-07	0	4.68E-09	2.22E-07	0.2219107
484083.423752968.02	484083.42	3752968.02	0.003996649	3.36792E-05	0.006266041	0.00031368	0.000305255	3.36792E-05	3.16283E-05	3.36792E-05	3.16283E-05	3.36792E-05	3.36792E-05	0.000305255	2.60999E-05	0.000582956	2.60999E-05	9.65114E-05	1.18215E-05	1.18215E-05	6.45048E-08	1.27E-07	0	4.12E-09	1.95E-07	0.1952091
483468.163753775.07	483468.16	3753775.07	0.001475527	1.24341E-05	0.002313366	0.000115808	0.000112697	1.24341E-05	1.16769E-05	1.24341E-05	1.16769E-05	1.24341E-05	1.24341E-05	0.000112697	9.63585E-06	0.000215222	9.63585E-06	3.56311E-05	4.3644E-06	4.3644E-06	2.38146E-08	4.67E-08	0	1.52E-09	7.21E-08	0.0720694
483414.963753768.2	483414.96	3753768.2	0.001254913	1.0575E-05	0.001967482	9.84928E-05	9.58472E-05	1.0575E-05	9.931E-06	1.0575E-05	9.931E-06	1.0575E-05	1.0575E-05	9.58472E-05	8.19514E-06	0.000183043	8.19514E-06	3.03037E-05	3.71186E-06	3.71186E-06	2.0254E-08	3.97E-08	0	1.29E-09	6.13E-08	0.0612939
483321.053753785.73	483321.05	3753785.73	0.00099184	8.3581E-06	0.00155503	7.78454E-05	7.57544E-05	8.3581E-06	7.84912E-06	8.3581E-06	7.84912E-06	8.3581E-06	8.3581E-06	7.57544E-05	6.47716E-06	0.000144671	6.47716E-06	2.3951E-05	2.93373E-06	2.93373E-06	1.6008E-08	3.14E-08	0	1.02E-09	4.84E-08	0.0484446
483885.393754561.24	483885.39	3754561.24	0.001033356	8.70795E-06	0.00162012	8.11038E-05	7.89253E-05	8.70795E-06	8.17767E-06	8.70795E-06	8.17767E-06	8.70795E-06	8.70795E-06	7.89253E-05	6.74828E-06	0.000150727	6.74828E-06	2.49536E-05	3.05652E-06	3.05652E-06	1.66781E-08	3.27E-08	0	1.07E-09	5.05E-08	0.0504724
4839203753820	483920	3753820	0.049502458	0.00041715	0.077611139	0.003885241	0.00378088	0.00041715	0.000391748	0.00041715	0.000391748	0.00041715	0.00041715	0.00378088	0.000323273	0.007220492	0.000323273	0.001195389	0.000146421	0.000146421	7.98957E-07	1.57E-06	0	5.1E-08	2.42E-06	2.4178585
4839403753820	483940	3753820	0.028530314	0.000240421	0.044730509	0.002239225	0.002179078	0.000240421	0.00022578	0.000240421	0.00022578	0.000240421	0.000240421	0.002179078	0.000186316	0.004161468	0.000186316	0.000688952	8.43887E-05	8.43887E-05	4.60472E-07	9.04E-07	0	2.94E-08	1.39E-06	1.3935119
4839603753820	483960	3753820	0.017858894	0.000150494	0.027999602	0.00140167	0.00136402	0.000150494	0.00014133	0.000150494	0.00014133	0.000150494	0.000150494	0.00136402	0.000116627	0.002604921	0.000116627	0.000431258	5.28242E-05	5.28242E-05	2.88238E-07	5.66E-07	0	1.84E-08	8.72E-07	0.8722856
4839803753820	483980	3753820	0.012757749	0.000107508	0.020001904	0.001001302	0.000974407	0.000107508	0.000100961	0.000107508	0.000100961	0.000107508	0.000107508	0.000974407	8.33138E-05	0.001860862	8.33138E-05	0.000308075	3.77357E-05	3.77357E-05	2.05907E-07	4.04E-07	0	1.32E-08	6.23E-07	0.6231293
4840003753820	484000	3753820	0.009741582	8.2091E-05	0.015273085	0.000764576	0.000744039	8.2091E-05	7.70919E-05	8.2091E-05	7.70919E-05	8.2091E-05	8.2091E-05	0.000744039	6.36169E-05	0.00142092	6.36169E-05	0.00023524	2.88143E-05	2.88143E-05	1.57227E-07	3.09E-07	0	1E-08	4.76E-07	0.47581
4840203753820	484020	3753820	0.007730001	6.51396E-05	0.012119281	0.000606696	0.000590399	6.51396E-05	6.11729E-05	6.51396E-05	6.11729E-05	6.51396E-05	6.51396E-05	0.000590399	5.04804E-05	0.001127508	5.04804E-05	0.000186665	2.28643E-05	2.28643E-05	1.2476E-07	2.45E-07	0	7.97E-09	3.78E-07	0.377558
4840403753820	484040	3753820	0.006275282	5.28809E-05	0.009838538	0.000492521	0.000479291	5.28809E-05	4.96607E-05	5.28809E-05	4.96607E-05	5.28809E-05	5.28809E-05	0.000479291	4.09804E-05	0.000915321	4.09804E-05	0.000151536	1.85614E-05	1.85614E-05	1.01281E-07	1.99E-07	0	6.47E-09	3.07E-07	0.3065049
4840603753820	484060	3753820	0.005180235	4.36531E-05	0.008121696	0.000406575	0.000395654	4.36531E-05	4.09948E-05	4.36531E-05	4.09948E-05	4.36531E-05	4.36531E-05	0.000395654	3.38293E-05	0.000755596	3.38293E-05	0.000125093	1.53224E-05	1.53224E-05	8.36076E-08	1.64E-07	0	5.34E-09	2.53E-07	0.2530192
4840803753820	484080	3753820	0.00433173	3.65029E-05	0.00679139	0.000339979	0.000330847	3.65029E-05	3.428E-05	3.65029E-05	3.428E-05	3.65029E-05	3.65029E-05	0.000330847	2.82881E-05	0.000631832	2.82881E-05	0.000104603	1.28127E-05	1.28127E-05	6.9913E-08	1.37E-07	0	4.47E-09	2.12E-07	0.2115756
4841003753820	484100	3753820	0.003664407	3.08794E-05	0.005745145	0.000287604	0.000279879	3.08794E-05	2.8999E-05	3.08794E-05	2.8999E-05	3.08794E-05	3.08794E-05	0.000279879	2.39302E-05	0.000534495	2.39302E-05	8.84884E-05	1.08388E-05	1.08388E-05	5.91426E-08	1.16E-07	0	3.78E-09	1.79E-07	0.1789814
4841203753820	484120	3753820	0.003125117	2.63349E-05	0.004899633	0.000245277	0.000238689	2.63349E-05	2.47312E-05	2.63349E-05	2.47312E-05	2.63349E-05	2.63349E-05	0.000238689	2.04084E-05	0.000455834	2.04084E-05	7.54655E-05	9.24367E-06	9.24367E-06	5.04386E-08	9.9E-08	0	3.22E-09	1.53E-07	0.1526407
4839203753840	483920	3753840	0.049745628	0.000419199	0.077992387	0.003904327	0.003799453	0.000419199	0.000393672	0.000419199	0.000393672	0.000419199	0.000419199	0.003799453	0.000324861	0.007255962	0.000324861	0.001201261	0.000147141	0.000147141	8.02881E-07	1.58E-06	0	5.13E-08	2.43E-06	2.4297357
4839403753840	483940	3753840	0.028654776	0.00024147	0.044925644	0.002248994	0.002188584	0.00024147	0.000226765	0.00024147	0.000226765	0.00024147	0.00024147	0.002188584	0.000187129	0.004179623	0.000187129	0.000691958	8.47569E-05	8.47569E-05	4.6248E-07	9.08E-07	0	2.95E-08	1.4E-06	1.399591
4839603753840	483960	3753840	0.01788	0.000150672	0.028032692	0.001403326	0.001365632	0.000150672	0.000141497	0.000150672	0.000141497	0.000150672	0.000150672	0.001365632	0.000116764	0.002608	0.000116764	0.000431768	5.28866E-05	5.28866E-05	2.88578E-07	5.66E-07	0	1.84E-08	8.73E-07	0.8733164
4839803753840	483980	3753840	0.012723313	0.000107218	0.019947915	0.0009986	0.000971776	0.000107218	0.000100688	0.000107218	0.000100688	0.000107218	0.000107218	0.000971776	8.30889E-05	0.001855839	8.30889E-05	0.000307244	3.76338E-05	3.76338E-05	2.05351E-07	4.03E-07	0	1.31E-08	6.21E-07	0.6214474
4840003753840	484000	3753840	0.009672909	8.15123E-05	0.015165417	0.000759186	0.000738794	8.15123E-05	7.65485E-05	8.15123E-05	7.65485E-05	8.15123E-05	8.15123E-05	0.000738794	6.31684E-05	0.001410903	6.31684E-05	0.000233582	2.86111E-05	2.86111E-05	1.56118E-07	3.06E-07	0	9.97E-09	4.72E-07	0.4724558
4840203753840	484020	3753840	0.007619229	6.42062E-05	0.01194561	0.000598001	0.000581939	6.42062E-05	6.02963E-05	6.42062E-05	6.02963E-05	6.42062E-05	6.42062E-05	0.000581939	4.9757E-05	0.001111351	4.9757E-05	0.00018399	2.25366E-05	2.25366E-05	1.22972E-07	2.41E-07	0	7.85E-09	3.72E-07	0.3721475
4840403753840	484040	3753840	0.006136957	5.17153E-05	0.009621668	0.000481664	0.000468726	5.17153E-05	4.8566E-05	5.17153E-05	4.8566E-05	5.17153E-05	5.17153E-05	0.000468726	4.00771E-05	0.000895144	4.00771E-05	0.000148196	1.81523E-05	1.81523E-05	9.90488E-08	1.94E-07	0	6.33E-09	3E-07	0.2997486
4840603753840	484060	3753840	0.005029943	4.23866E-05	0.007886065	0.000394779	0.000384175	4.23866E-05	3.98054E-05	4.23866E-05	3.98054E-05	4.23866E-05	4.23866E-05	0.000384175	3.28478E-05	0.000733674	3.28478E-05	0.000121463	1.48779E-05	1.48779E-05	8.11819E-08	1.59E-07	0	5.19E-09	2.46E-07	0.2456785
4840803753840	484080	3753840	0.004182604	3.52462E-05	0.006557586	0.000328275	0.000319457	3.52462E-05	3.30999E-05	3.52462E-05	3.30999E-05	3.52462E-05	3.52462E-05	0.000319457	2.73143E-05	0.00061008	2.73143E-05	0.000101002	1.23716E-05	1.23716E-05	6.75061E-08	1.32E-07	0	4.31E-09	2.04E-07	0.2042918
4841003753840	484100	3753840	0.003524544	2.97008E-05	0.005525864	0.000276627	0.000269196	2.97008E-05	2.78922E-05	2.97008E-05	2.78922E-05	2.97008E-05	2.97008E-05	0.000269196	2.30168E-05	0.000514094	2.30168E-05	8.51109E-05	1.04251E-05	1.04251E-05	5.68852E-08	1.12E-07	0	3.63E-09	1.72E-07	0.17215
4841203753840	484120	3753840	0.002997468	2.52592E-05	0.004699502	0.000235259	0.000228939	2.52592E-05	2.37211E-05	2.52592E-05	2.37211E-05	2.52592E-05	2.52592E-05	0.000228939	1.95748E-05	0.000437215	1.95748E-05	7.23831E-05	8.8661E-06	8.8661E-06	4.83783E-08	9.49E-08	0	3.09E-09	1.46E-07	0.1464059
4839203753860	483920	3753860	0.05020351	0.000423058	0.078710265	0.003940264	0.003834425	0.000423058	0.000397295	0.000423058	0.000397295	0.000423058	0.000423058	0.003834425	0.000327851	0.007322749	0.000327851	0.001212318	0.000148495	0.000148495	8.10271E-07	1.59E-06	0	5.18E-08	2.45E-06	2.4521001
4839403753860	483940	3753860	0.028808515	0.000242765	0.04516668	0.00226106	0.002200326	0.000242765	0.000227982	0.000242765	0.000227982	0.000242765	0.000242765	0.002200326	0.000188133	0.004202047	0.000188133	0.00069567	8.52116E-05	8.52116E-05	4.64962E-07	9.12E-07	0	2.97E-08	1.41E-06	1.4071001
4839603753860	483960	3753860	0.017930643	0.000151099	0.028112091	0.001407301	0.0013695	0.000151099	0.000141898	0.000151099	0.000141898	0.000151099	0.000151099	0.0013695	0.000117095	0.002615387	0.000117095	0.00043299	5.30364E-05	5.30364E-05	2.89396E-07	5.68E-07	0	1.85E-08	8.76E-07	0.87579
4839803753860	483980	3753860	0.012638594	0.000106504	0.019815091	0.00099195	0.000965306	0.000106504	0.000100018	0.000106504	0.000100018	0.000106504	0.000106504	0.000965306	8.25357E-05	0.001843482	8.25357E-05	0.000305198	3.73832E-05	3.73832E-05	2.03984E-07	4E-07	0	1.3E-08	6.17E-07	0.6173094
4840003753860	484000	3753860	0.009534236	8.03437E-05	0.014948003	0.000748302	0.000728202	8.03437E-05	7.54511E-05	8.03437E-05	7.54511E-05	8.03437E-05	8.03437E-05	0.000728202	6.22628E-05	0.001390676	6.22628E-05	0.000230233	2.8201E-05	2.8201E-05	1.5388E-07	3.02E-07	0	9.83E-09	4.66E-07	0.4656826
4840203753860	484020	3753860	0.00745402	6.2814E-05	0.01168659	0.000585035	0.00056932	6.2814E-05	5.89889E-05	6.2814E-05	5.89889E-05	6.2814E-05	6.2814E-05	0.00056932	4.86781E-05	0.001087253	4.86781E-05	0.00018	2.2048E-05	2.2048E-05	1.20306E-07	2.36E-07	0	7.68E-09	3.64E-07	0.3640782
4840403753860	484040	3753860	0.005961356	5.02355E-05	0.009346356	0.000467882	0.000455314	5.02355E-05	4.71764E-05	5.02355E-05	4.71764E-05	5.02355E-05	5.02355E-05	0.000455314	3.89303E-05	0.000869531	3.89303E-05	0.000143955	1.76329E-05	1.76329E-05	9.62147E-08	1.89E-07	0	6.15E-09	2.91E-07	0.2911717
4840603753860	484060	3753860	0.004860095	4.09553E-05	0.007619774	0.000381449	0.000371203	4.09553E-05	3.84613E-05	4.09553E-05	3.84613E-05	4.09553E-05	4.09553E-05	0.000371203	3.17386E-05	0.0007089	3.17386E-05	0.000117362	1.43755E-05	1.43755E-05	7.84406E-08	1.54E-07	0	5.01E-09	2.37E-07	0.2373826
4840803753860	484080	3753860	0.004019267	3.38698E-05	0.006301503	0.000315455	0.000306982	3.38698E-05	3.18073E-05	3.38698E-05	3.18073E-05	3.38698E-05	3.38698E-05	0.000306982	2.62476E-05	0.000586255	2.62476E-05	9.70576E-05	1.18884E-05	1.18884E-05	6.48699E-08	1.27E-07	0	4.14E-09	1.96E-07	0.1963139
4841003753860	484100	3753860	0.003374301	2.84348E-05	0.00529031	0.000264835	0.000257721	2.84348E-05	2.67032E-05	2.84348E-05	2.67032E-05	2.84348E-05	2.84348E-05	0.000257721	2.20357E-05	0.00049218	2.20357E-05	8.14829E-05	9.98072E-06	9.98072E-06	5.44603E-08	1.07E-07	0	3.48E-09	1.65E-07	0.1648117
4841203753860	484120	3753860	0.002868926	2.4176E-05	0.004497971	0.00022517	0.000219122	2.4176E-05	2.27038E-05	2.4176E-05	2.27038E-05	2.4176E-05	2.4176E-05	0.000219122	1.87354E-05	0.000418465	1.87354E-05	6.9279E-05	8.48589E-06	8.48589E-06	4.63037E-08	9.09E-08	0	2.96E-09	1.4E-07	0.1401275
4839203753880	483920	3753880	0.050416039	0.000424849	0.079043473	0.003956944	0.003850657	0.000424849	0.000398977	0.000424849	0.000398977	0.000424849	0.000424849	0.003850657	0.000329239	0.007353749	0.000329239	0.00121745	0.000149124	0.000149124	8.13701E-07	1.6E-06	0	5.2E-08	2.46E-06	2.4624808
4839403753880	483940	3753880	0.028920664	0.00024371	0.045342509	0.002269862	0.002208892	0.00024371	0.000228869	0.00024371	0.000228869	0.00024371	0.00024371	0.002208892	0.000188865	0.004218405	0.000188865	0.000698378	8.55433E-05	8.55433E-05	4.66772E-07	9.16E-07	0	2.98E-08	1.41E-06	1.4125778
4839603753880	483960	3753880	0.017899394	0.000150836	0.028063098	0.001404849	0.001367113	0.000150836	0.00014165	0.000150836	0.00014165	0.000150836	0.000150836	0.001367113	0.000116891	0.002610829	0.000116891	0.000432236	5.29439E-05	5.29439E-05	2.88891E-07	5.67E-07	0	1.85E-08	8.74E-07	0.8742637
4839803753880	483980	3753880	0.012516798	0.000105477	0.019624136	0.000982391	0.000956003	0.000105477	9.90542E-05	0.000105477	9.90542E-05	0.000105477	0.000105477	0.000956003	8.17403E-05	0.001825716	8.17403E-05	0.000302257	3.7023E-05	3.7023E-05	2.02018E-07	3.96E-07	0	1.29E-08	6.11E-07	0.6113605
4840003753880	484000	3753880	0.009362764	7.88987E-05	0.014679166	0.000734844	0.000715106	7.88987E-05	7.40941E-05	7.88987E-05	7.40941E-05	7.88987E-05	7.88987E-05	0.000715106	6.1143E-05	0.001365665	6.1143E-05	0.000226093	2.76938E-05	2.76938E-05	1.51113E-07	2.97E-07	0	9.65E-09	4.57E-07	0.4573074
4840203753880	484020	3753880	0.007244119	6.10452E-05	0.011357504	0.000568561	0.000553289	6.10452E-05	5.73278E-05	6.10452E-05	5.73278E-05	6.10452E-05	6.10452E-05	0.000553289	4.73073E-05	0.001056637	4.73073E-05	0.000174932	2.14271E-05	2.14271E-05	1.16918E-07	2.29E-07	0	7.47E-09	3.54E-07	0.353826
4840403753880	484040	3753880	0.005756044	4.85054E-05	0.009024463	0.000451768	0.000439633	4.85054E-05	4.55516E-05	4.85054E-05	4.55516E-05	4.85054E-05	4.85054E-05	0.000439633	3.75895E-05	0.000839584	3.75895E-05	0.000138997	1.70256E-05	1.70256E-05	9.2901E-08	1.82E-07	0	5.93E-09	2.81E-07	0.2811436
4840603753880	484060	3753880	0.004662534	3.92905E-05	0.007310032	0.000365943	0.000356113	3.92905E-05	3.68979E-05	3.92905E-05	3.68979E-05	3.92905E-05	3.92905E-05	0.000356113	3.04484E-05	0.000680083	3.04484E-05	0.000112591	1.37911E-05	1.37911E-05	7.52521E-08	1.48E-07	0	4.81E-09	2.28E-07	0.2277331
4840803753880	484080	3753880	0.003839871	3.23581E-05	0.006020242	0.000301375	0.00029328	3.23581E-05	3.03876E-05	3.23581E-05	3.03876E-05	3.23581E-05	3.23581E-05	0.00029328	2.50761E-05	0.000560089	2.50761E-05	9.27255E-05	1.13578E-05	1.13578E-05	6.19745E-08	1.22E-07	0	3.96E-09	1.88E-07	0.1875516
4841003753880	484100	3753880	0.003222893	2.71589E-05	0.005052929	0.000252951	0.000246157	2.71589E-05	2.5505E-05	2.71589E-05	2.5505E-05	2.71589E-05	2.71589E-05	0.000246157	2.10469E-05	0.000470095	2.10469E-05	7.78267E-05	9.53287E-06	9.53287E-06	5.20166E-08	1.02E-07	0	3.32E-09	1.57E-07	0.1574164
4841203753880	484120	3753880	0.002742158	2.31078E-05	0.00429922	0.00021522	0.000209439	2.31078E-05	2.17006E-05	2.31078E-05	2.17006E-05	2.31078E-05	2.31078E-05	0.000209439	1.79075E-05	0.000399975	1.79075E-05	6.62178E-05	8.11092E-06	8.11092E-06	4.42577E-08	8.69E-08	0	2.83E-09	1.34E-07	0.1339358
4839203753900	483920	3753900	0.050306483	0.000423926	0.078871708	0.003948346	0.00384229	0.000423926	0.00039811	0.000423926	0.00039811	0.000423926	0.000423926	0.00384229	0.000328524	0.007337769	0.000328524	0.001214805	0.0001488	0.0001488	8.11933E-07	1.59E-06	0	5.19E-08	2.46E-06	2.4571296
4839403753900	483940	3753900	0.028976874	0.000244184	0.045430637	0.002274274	0.002213185	0.000244184	0.000229314	0.000244184	0.000229314	0.000244184	0.000244184	0.002213185	0.000189232	0.004226604	0.000189232	0.000699736	8.57096E-05	8.57096E-05	4.67679E-07	9.18E-07	0	2.99E-08	1.42E-06	1.4153233
4839603753900	483960	3753900	0.017839624	0.000150332	0.02796939	0.001400158	0.001362548	0.000150332	0.000141177	0.000150332	0.000141177	0.000150332	0.000150332	0.001362548	0.000116501	0.002602111	0.000116501	0.000430793	5.27672E-05	5.27672E-05	2.87927E-07	5.65E-07	0	1.84E-08	8.71E-07	0.8713444
4839803753900	483980	3753900	0.01235981	0.000104154	0.019378006	0.00097007	0.000944013	0.000104154	9.78118E-05	0.000104154	9.78118E-05	0.000104154	0.000104154	0.000944013	8.07151E-05	0.001802818	8.07151E-05	0.000298466	3.65586E-05	3.65586E-05	1.99484E-07	3.91E-07	0	1.27E-08	6.04E-07	0.6036927
4840003753900	484000	3753900	0.009145672	7.70693E-05	0.014338803	0.000717806	0.000698525	7.70693E-05	7.23761E-05	7.70693E-05	7.23761E-05	7.70693E-05	7.70693E-05	0.000698525	5.97253E-05	0.001333999	5.97253E-05	0.00022085	2.70516E-05	2.70516E-05	1.47609E-07	2.9E-07	0	9.43E-09	4.47E-07	0.4467039
4840203753900	484020	3753900	0.007000565	5.89928E-05	0.010975653	0.000549445	0.000534687	5.89928E-05	5.54004E-05	5.89928E-05	5.54004E-05	5.89928E-05	5.89928E-05	0.000534687	4.57168E-05	0.001021111	4.57168E-05	0.00016905	2.07067E-05	2.07067E-05	1.12987E-07	2.22E-07	0	7.22E-09	3.42E-07	0.34193
4840403753900	484040	3753900	0.00550795	4.64147E-05	0.008635496	0.000432296	0.000420684	4.64147E-05	4.35883E-05	4.64147E-05	4.35883E-05	4.64147E-05	4.64147E-05	0.000420684	3.59694E-05	0.000803397	3.59694E-05	0.000133006	1.62918E-05	1.62918E-05	8.88969E-08	1.74E-07	0	5.68E-09	2.69E-07	0.2690259
4840603753900	484060	3753900	0.004440506	3.74195E-05	0.006961931	0.000348517	0.000339155	3.74195E-05	3.51408E-05	3.74195E-05	3.51408E-05	3.74195E-05	3.74195E-05	0.000339155	2.89985E-05	0.000647698	2.89985E-05	0.00010723	1.31344E-05	1.31344E-05	7.16686E-08	1.41E-07	0	4.58E-09	2.17E-07	0.2168885
4840803753900	484080	3753900	0.003657277	3.08194E-05	0.005733966	0.000287044	0.000279334	3.08194E-05	2.89426E-05	3.08194E-05	2.89426E-05	3.08194E-05	3.08194E-05	0.000279334	2.38837E-05	0.000533455	2.38837E-05	8.83162E-05	1.08177E-05	1.08177E-05	5.90275E-08	1.16E-07	0	3.77E-09	1.79E-07	0.1786331
4841003753900	484100	3753900	0.003072986	2.58956E-05	0.004817901	0.000241186	0.000234707	2.58956E-05	2.43187E-05	2.58956E-05	2.43187E-05	2.58956E-05	2.58956E-05	0.000234707	2.0068E-05	0.00044823	2.0068E-05	7.42067E-05	9.08947E-06	9.08947E-06	4.95972E-08	9.73E-08	0	3.17E-09	1.5E-07	0.1500945
4841203753900	484120	3753900	0.00262588	2.21279E-05	0.004116917	0.000206094	0.000200558	2.21279E-05	2.07804E-05	2.21279E-05	2.07804E-05	2.21279E-05	2.21279E-05	0.000200558	1.71482E-05	0.000383014	1.71482E-05	6.34099E-05	7.76699E-06	7.76699E-06	4.2381E-08	8.32E-08	0	2.71E-09	1.28E-07	0.1282564
4839203753920	483920	3753920	0.050166929	0.00042275	0.078652913	0.003937393	0.003831631	0.00042275	0.000397006	0.00042275	0.000397006	0.00042275	0.00042275	0.003831631	0.000327613	0.007317413	0.000327613	0.001211435	0.000148387	0.000148387	8.09681E-07	1.59E-06	0	5.17E-08	2.45E-06	2.4503134
4839403753920	483940	3753920	0.028784111	0.00024256	0.045128419	0.002259145	0.002198462	0.00024256	0.000227789	0.00024256	0.000227789	0.00024256	0.00024256	0.002198462	0.000187973	0.004198488	0.000187973	0.000695081	8.51394E-05	8.51394E-05	4.64568E-07	9.12E-07	0	2.97E-08	1.41E-06	1.4059081
4839603753920	483960	3753920	0.017740608	0.000149498	0.027814149	0.001392386	0.001354986	0.000149498	0.000140394	0.000149498	0.000140394	0.000149498	0.000149498	0.001354986	0.000115854	0.002587668	0.000115854	0.000428401	5.24743E-05	5.24743E-05	2.86329E-07	5.62E-07	0	1.83E-08	8.67E-07	0.8665081
4839803753920	483980	3753920	0.012148918	0.000102377	0.019047364	0.000953518	0.000927906	0.000102377	9.61429E-05	0.000102377	9.61429E-05	0.000102377	0.000102377	0.000927906	7.93379E-05	0.001772057	7.93379E-05	0.000293373	3.59348E-05	3.59348E-05	1.9608E-07	3.85E-07	0	1.25E-08	5.93E-07	0.593392
4840003753920	484000	3753920	0.008877862	7.48125E-05	0.013918924	0.000696786	0.00067807	7.48125E-05	7.02567E-05	7.48125E-05	7.02567E-05	7.48125E-05	7.48125E-05	0.00067807	5.79764E-05	0.001294936	5.79764E-05	0.000214383	2.62595E-05	2.62595E-05	1.43286E-07	2.81E-07	0	9.15E-09	4.34E-07	0.4336232
4840203753920	484020	3753920	0.006707743	5.65252E-05	0.010516561	0.000526463	0.000512322	5.65252E-05	5.30831E-05	5.65252E-05	5.30831E-05	5.65252E-05	5.65252E-05	0.000512322	4.38046E-05	0.0009784	4.38046E-05	0.000161979	1.98406E-05	1.98406E-05	1.08261E-07	2.12E-07	0	6.92E-09	3.28E-07	0.3276277
4840403753920	484040	3753920	0.005227579	4.40521E-05	0.008195924	0.000410291	0.00039927	4.40521E-05	4.13695E-05	4.40521E-05	4.13695E-05	4.40521E-05	4.40521E-05	0.00039927	3.41384E-05	0.000762501	3.41384E-05	0.000126236	1.54625E-05	1.54625E-05	8.43717E-08	1.66E-07	0	5.39E-09	2.55E-07	0.2553317
4840603753920	484060	3753920	0.00421611	3.55286E-05	0.006610117	0.000330905	0.000322016	3.55286E-05	3.3365E-05	3.55286E-05	3.3365E-05	3.55286E-05	3.55286E-05	0.000322016	2.75331E-05	0.000614967	2.75331E-05	0.000101811	1.24707E-05	1.24707E-05	6.80469E-08	1.34E-07	0	4.35E-09	2.06E-07	0.2059283
4840803753920	484080	3753920	0.003464799	2.91974E-05	0.005432195	0.000271938	0.000264633	2.91974E-05	2.74194E-05	2.91974E-05	2.74194E-05	2.91974E-05	2.91974E-05	0.000264633	2.26267E-05	0.00050538	2.26267E-05	8.36682E-05	1.02484E-05	1.02484E-05	5.59209E-08	1.1E-07	0	3.57E-09	1.69E-07	0.1692319
4841003753920	484100	3753920	0.0029251	2.46494E-05	0.004586041	0.000229579	0.000223412	2.46494E-05	2.31484E-05	2.46494E-05	2.31484E-05	2.46494E-05	2.46494E-05	0.000223412	1.91022E-05	0.000426659	1.91022E-05	7.06355E-05	8.65204E-06	8.65204E-06	4.72103E-08	9.26E-08	0	3.02E-09	1.43E-07	0.1428712
4841203753920	484120	3753920	0.002520254	2.12378E-05	0.003951314	0.000197804	0.000192491	2.12378E-05	1.99445E-05	2.12378E-05	1.99445E-05	2.12378E-05	2.12378E-05	0.000192491	1.64584E-05	0.000367607	1.64584E-05	6.08593E-05	7.45456E-06	7.45456E-06	4.06762E-08	7.98E-08	0	2.6E-09	1.23E-07	0.1230973
4839203753940	483920	3753940	0.050107953	0.000422253	0.078560449	0.003932764	0.003827127	0.000422253	0.000396539	0.000422253	0.000396539	0.000422253	0.000422253	0.003827127	0.000327227	0.007308811	0.000327227	0.001210011	0.000148212	0.000148212	8.08729E-07	1.59E-06	0	5.17E-08	2.45E-06	2.4474328
4839403753940	483940	3753940	0.028585446	0.000240886	0.044816946	0.002243552	0.002183289	0.000240886	0.000226217	0.000240886	0.000226217	0.000240886	0.000240886	0.002183289	0.000186676	0.00416951	0.000186676	0.000690283	8.45518E-05	8.45518E-05	4.61362E-07	9.05E-07	0	2.95E-08	1.4E-06	1.3962047
4839603753940	483960	3753940	0.017564226	0.000148011	0.027537613	0.001378543	0.001341514	0.000148011	0.000138998	0.000148011	0.000138998	0.000148011	0.000148011	0.001341514	0.000114702	0.002561941	0.000114702	0.000424142	5.19526E-05	5.19526E-05	2.83482E-07	5.56E-07	0	1.81E-08	8.58E-07	0.857893
4839803753940	483980	3753940	0.011836728	9.97465E-05	0.018557905	0.000929015	0.000904061	9.97465E-05	9.36723E-05	9.97465E-05	9.36723E-05	9.97465E-05	9.97465E-05	0.000904061	7.72991E-05	0.00172652	7.72991E-05	0.000285834	3.50114E-05	3.50114E-05	1.91042E-07	3.75E-07	0	1.22E-08	5.78E-07	0.5781437
4840003753940	484000	3753940	0.008516678	7.17689E-05	0.013352651	0.000668438	0.000650484	7.17689E-05	6.73984E-05	7.17689E-05	6.73984E-05	7.17689E-05	7.17689E-05	0.000650484	5.56177E-05	0.001242254	5.56177E-05	0.000205661	2.51912E-05	2.51912E-05	1.37457E-07	2.7E-07	0	8.78E-09	4.16E-07	0.4159818
4840203753940	484020	3753940	0.006352933	5.35353E-05	0.009960281	0.000498615	0.000485222	5.35353E-05	5.02752E-05	5.35353E-05	5.02752E-05	5.35353E-05	5.35353E-05	0.000485222	4.14875E-05	0.000926647	4.14875E-05	0.000153411	1.87911E-05	1.87911E-05	1.02535E-07	2.01E-07	0	6.55E-09	3.1E-07	0.3102976
4840403753940	484040	3753940	0.004926586	4.15157E-05	0.007724019	0.000386667	0.000376281	4.15157E-05	3.89875E-05	4.15157E-05	3.89875E-05	4.15157E-05	4.15157E-05	0.000376281	3.21728E-05	0.000718598	3.21728E-05	0.000118968	1.45722E-05	1.45722E-05	7.95138E-08	1.56E-07	0	5.08E-09	2.41E-07	0.2406302
4840603753940	484060	3753940	0.003968264	3.344E-05	0.00622154	0.000311452	0.000303087	3.344E-05	3.14036E-05	3.344E-05	3.14036E-05	3.344E-05	3.344E-05	0.000303087	2.59145E-05	0.000578816	2.59145E-05	9.58259E-05	1.17376E-05	1.17376E-05	6.40467E-08	1.26E-07	0	4.09E-09	1.94E-07	0.1938227
4840803753940	484080	3753940	0.003274652	2.7595E-05	0.005134078	0.000257014	0.00025011	2.7595E-05	2.59146E-05	2.7595E-05	2.59146E-05	2.7595E-05	2.7595E-05	0.00025011	2.13849E-05	0.000477645	2.13849E-05	7.90765E-05	9.68597E-06	9.68597E-06	5.2852E-08	1.04E-07	0	3.38E-09	1.6E-07	0.1599445
4841003753940	484100	3753940	0.002780871	2.3434E-05	0.004359917	0.000218259	0.000212396	2.3434E-05	2.2007E-05	2.3434E-05	2.2007E-05	2.3434E-05	2.3434E-05	0.000212396	1.81603E-05	0.000405622	1.81603E-05	6.71527E-05	8.22543E-06	8.22543E-06	4.48825E-08	8.81E-08	0	2.87E-09	1.36E-07	0.1358267
4841203753940	484120	3753940	0.002422614	2.0415E-05	0.003798232	0.000190141	0.000185033	2.0415E-05	1.91718E-05	2.0415E-05	1.91718E-05	2.0415E-05	2.0415E-05	0.000185033	1.58208E-05	0.000353366	1.58208E-05	5.85015E-05	7.16576E-06	7.16576E-06	3.91003E-08	7.67E-08	0	2.5E-09	1.18E-07	0.1183282
4839203753960	483920	3753960	0.050225571	0.000423244	0.078744852	0.003941995	0.00383611	0.000423244	0.00039747	0.000423244	0.00039747	0.000423244	0.000423244	0.00383611	0.000327995	0.007325967	0.000327995	0.001212851	0.00014856	0.00014856	8.10627E-07	1.59E-06	0	5.18E-08	2.45E-06	2.4531776
4839403753960	483940	3753960	0.028464543	0.000239867	0.044627391	0.002234063	0.002174054	0.000239867	0.00022526	0.000239867	0.00022526	0.000239867	0.000239867	0.002174054	0.000185886	0.004151875	0.000185886	0.000687364	8.41942E-05	8.41942E-05	4.5941E-07	9.02E-07	0	2.93E-08	1.39E-06	1.3902994
4839603753960	483960	3753960	0.017243913	0.000145312	0.027035419	0.001353403	0.001317049	0.000145312	0.000136463	0.000145312	0.000136463	0.000145312	0.000145312	0.001317049	0.00011261	0.002515219	0.00011261	0.000416407	5.10051E-05	5.10051E-05	2.78312E-07	5.46E-07	0	1.78E-08	8.42E-07	0.8422479
4839803753960	483980	3753960	0.011384922	9.59392E-05	0.017849553	0.000893555	0.000869553	9.59392E-05	9.00968E-05	9.59392E-05	9.00968E-05	9.59392E-05	9.59392E-05	0.000869553	7.43486E-05	0.001660619	7.43486E-05	0.000274924	3.3675E-05	3.3675E-05	1.8375E-07	3.61E-07	0	1.17E-08	5.56E-07	0.556076
4840003753960	484000	3753960	0.008060284	6.79229E-05	0.012637106	0.000632618	0.000615625	6.79229E-05	6.37867E-05	6.79229E-05	6.37867E-05	6.79229E-05	6.79229E-05	0.000615625	5.26373E-05	0.001175683	5.26373E-05	0.00019464	2.38412E-05	2.38412E-05	1.30091E-07	2.55E-07	0	8.31E-09	3.94E-07	0.3936901
4840203753960	484020	3753960	0.005955218	5.01838E-05	0.009336733	0.0004674	0.000454845	5.01838E-05	4.71278E-05	5.01838E-05	4.71278E-05	5.01838E-05	5.01838E-05	0.000454845	3.88902E-05	0.000868636	3.88902E-05	0.000143807	1.76147E-05	1.76147E-05	9.61156E-08	1.89E-07	0	6.14E-09	2.91E-07	0.2908719
4840403753960	484040	3753960	0.004599428	3.87587E-05	0.007211094	0.00036099	0.000351293	3.87587E-05	3.63985E-05	3.87587E-05	3.63985E-05	3.87587E-05	3.87587E-05	0.000351293	3.00363E-05	0.000670879	3.00363E-05	0.000111067	1.36045E-05	1.36045E-05	7.42336E-08	1.46E-07	0	4.74E-09	2.25E-07	0.2246508
4840603753960	484060	3753960	0.003713004	3.1289E-05	0.005821336	0.000291418	0.00028359	3.1289E-05	2.93836E-05	3.1289E-05	2.93836E-05	3.1289E-05	3.1289E-05	0.00028359	2.42476E-05	0.000541584	2.42476E-05	8.96619E-05	1.09826E-05	1.09826E-05	5.99269E-08	1.18E-07	0	3.83E-09	1.81E-07	0.181355
4840803753960	484080	3753960	0.003088164	2.60235E-05	0.004841697	0.000242377	0.000235867	2.60235E-05	2.44388E-05	2.60235E-05	2.44388E-05	2.60235E-05	2.60235E-05	0.000235867	2.01671E-05	0.000450444	2.01671E-05	7.45732E-05	9.13436E-06	9.13436E-06	4.98421E-08	9.78E-08	0	3.18E-09	1.51E-07	0.1508358
4841003753960	484100	3753960	0.002650643	2.23366E-05	0.004155742	0.000208038	0.00020245	2.23366E-05	2.09764E-05	2.23366E-05	2.09764E-05	2.23366E-05	2.23366E-05	0.00020245	1.73099E-05	0.000386626	1.73099E-05	6.40079E-05	7.84024E-06	7.84024E-06	4.27807E-08	8.4E-08	0	2.73E-09	1.29E-07	0.1294659
4841203753960	484120	3753960	0.002324093	1.95848E-05	0.003643769	0.000182408	0.000177509	1.95848E-05	1.83922E-05	1.95848E-05	1.83922E-05	1.95848E-05	1.95848E-05	0.000177509	1.51774E-05	0.000338995	1.51774E-05	5.61224E-05	6.87435E-06	6.87435E-06	3.75102E-08	7.36E-08	0	2.4E-09	1.14E-07	0.1135162
4839203753980	483920	3753980	0.050890191	0.000428845	0.079786859	0.003994158	0.003886872	0.000428845	0.00040273	0.000428845	0.00040273	0.000428845	0.000428845	0.003886872	0.000332336	0.007422909	0.000332336	0.0012289	0.000150526	0.000150526	8.21354E-07	1.61E-06	0	5.25E-08	2.49E-06	2.4856398
4839403753980	483940	3753980	0.02846835	0.000239899	0.04463336	0.002234362	0.002174345	0.000239899	0.00022529	0.000239899	0.00022529	0.000239899	0.000239899	0.002174345	0.000185911	0.00415243	0.000185911	0.000687456	8.42055E-05	8.42055E-05	4.59472E-07	9.02E-07	0	2.93E-08	1.39E-06	1.3904853
4839603753980	483960	3753980	0.016703296	0.000140756	0.026187827	0.001310972	0.001275758	0.000140756	0.000132185	0.000140756	0.000132185	0.000140756	0.000140756	0.001275758	0.00010908	0.002436364	0.00010908	0.000403352	4.94061E-05	4.94061E-05	2.69587E-07	5.29E-07	0	1.72E-08	8.16E-07	0.8158424
4839803753980	483980	3753980	0.010782229	9.08603E-05	0.016904637	0.000846252	0.000823521	9.08603E-05	8.53273E-05	9.08603E-05	8.53273E-05	9.08603E-05	9.08603E-05	0.000823521	7.04128E-05	0.00157271	7.04128E-05	0.00026037	3.18923E-05	3.18923E-05	1.74022E-07	3.42E-07	0	1.11E-08	5.27E-07	0.5266386
4840003753980	484000	3753980	0.007507019	6.32606E-05	0.011769684	0.000589195	0.000573368	6.32606E-05	5.94083E-05	6.32606E-05	5.94083E-05	6.32606E-05	6.32606E-05	0.000573368	4.90242E-05	0.001094983	4.90242E-05	0.00018128	2.22047E-05	2.22047E-05	1.21161E-07	2.38E-07	0	7.74E-09	3.67E-07	0.3666668
4840203753980	484020	3753980	0.005511385	4.64437E-05	0.008640882	0.000432566	0.000420947	4.64437E-05	4.36154E-05	4.64437E-05	4.36154E-05	4.64437E-05	4.64437E-05	0.000420947	3.59918E-05	0.000803898	3.59918E-05	0.000133089	1.63019E-05	1.63019E-05	8.89523E-08	1.75E-07	0	5.68E-09	2.69E-07	0.2691937
4840403753980	484040	3753980	0.004258965	3.58897E-05	0.006677307	0.000334268	0.00032529	3.58897E-05	3.37042E-05	3.58897E-05	3.37042E-05	3.58897E-05	3.58897E-05	0.00032529	2.7813E-05	0.000621218	2.7813E-05	0.000102846	1.25974E-05	1.25974E-05	6.87386E-08	1.35E-07	0	4.39E-09	2.08E-07	0.2080215
4840603753980	484060	3753980	0.003456987	2.91315E-05	0.005419946	0.000271324	0.000264036	2.91315E-05	2.73575E-05	2.91315E-05	2.73575E-05	2.91315E-05	2.91315E-05	0.000264036	2.25757E-05	0.000504241	2.25757E-05	8.34796E-05	1.02253E-05	1.02253E-05	5.57948E-08	1.09E-07	0	3.56E-09	1.69E-07	0.1688503
4840803753980	484080	3753980	0.002909748	2.452E-05	0.004561973	0.000228374	0.00022224	2.452E-05	2.30269E-05	2.452E-05	2.30269E-05	2.452E-05	2.452E-05	0.00022224	1.9002E-05	0.00042442	1.9002E-05	7.02648E-05	8.60663E-06	8.60663E-06	4.69626E-08	9.22E-08	0	3E-09	1.42E-07	0.1421214
4841003753980	484100	3753980	0.002529901	2.13191E-05	0.00396644	0.000198561	0.000193228	2.13191E-05	2.00209E-05	2.13191E-05	2.00209E-05	2.13191E-05	2.13191E-05	0.000193228	1.65214E-05	0.000369015	1.65214E-05	6.10922E-05	7.4831E-06	7.4831E-06	4.08319E-08	8.01E-08	0	2.61E-09	1.24E-07	0.1235685
4841203753980	484120	3753980	0.002242549	1.88976E-05	0.003515921	0.000176008	0.000171281	1.88976E-05	1.77469E-05	1.88976E-05	1.77469E-05	1.88976E-05	1.88976E-05	0.000171281	1.46448E-05	0.000327101	1.46448E-05	5.41532E-05	6.63315E-06	6.63315E-06	3.61941E-08	7.1E-08	0	2.31E-09	1.1E-07	0.1095333
4839203754000	483920	3754000	0.050617669	0.000426548	0.079359593	0.003972769	0.003866057	0.000426548	0.000400573	0.000426548	0.000400573	0.000426548	0.000426548	0.003866057	0.000330556	0.007383159	0.000330556	0.001222319	0.00014972	0.00014972	8.16956E-07	1.6E-06	0	5.22E-08	2.47E-06	2.472329
4839403754000	483940	3754000	0.028449067	0.000239736	0.044603128	0.002232848	0.002172872	0.000239736	0.000225137	0.000239736	0.000225137	0.000239736	0.000239736	0.002172872	0.000185785	0.004149618	0.000185785	0.00068699	8.41484E-05	8.41484E-05	4.5916E-07	9.01E-07	0	2.93E-08	1.39E-06	1.3895435
4839603754000	483960	3754000	0.015906625	0.000134043	0.024938787	0.001248445	0.00121491	0.000134043	0.00012588	0.000134043	0.00012588	0.000134043	0.000134043	0.00121491	0.000103877	0.002320161	0.000103877	0.000384114	4.70496E-05	4.70496E-05	2.56729E-07	5.04E-07	0	1.64E-08	7.77E-07	0.7769305
4839803754000	483980	3754000	0.010007469	8.43316E-05	0.01568995	0.000785444	0.000764347	8.43316E-05	7.91961E-05	8.43316E-05	7.91961E-05	8.43316E-05	8.43316E-05	0.000764347	6.53533E-05	0.001459702	6.53533E-05	0.000241661	2.96007E-05	2.96007E-05	1.61518E-07	3.17E-07	0	1.03E-08	4.89E-07	0.4887968
4840003754000	484000	3754000	0.006864434	5.78456E-05	0.010762224	0.000538761	0.000524289	5.78456E-05	5.43231E-05	5.78456E-05	5.43231E-05	5.78456E-05	5.78456E-05	0.000524289	4.48278E-05	0.001001255	4.48278E-05	0.000165763	2.03041E-05	2.03041E-05	1.1079E-07	2.17E-07	0	7.08E-09	3.35E-07	0.3352809
4840203754000	484020	3754000	0.005042442	4.2492E-05	0.007905662	0.00039576	0.00038513	4.2492E-05	3.99044E-05	4.2492E-05	3.99044E-05	4.2492E-05	4.2492E-05	0.00038513	3.29294E-05	0.000735497	3.29294E-05	0.000121765	1.49149E-05	1.49149E-05	8.13837E-08	1.6E-07	0	5.2E-09	2.46E-07	0.246289
4840403754000	484040	3754000	0.003926178	3.30854E-05	0.006155555	0.000308149	0.000299872	3.30854E-05	3.10706E-05	3.30854E-05	3.10706E-05	3.30854E-05	3.30854E-05	0.000299872	2.56397E-05	0.000572677	2.56397E-05	9.48096E-05	1.16131E-05	1.16131E-05	6.33675E-08	1.24E-07	0	4.05E-09	1.92E-07	0.1917671
4840603754000	484060	3754000	0.003217214	2.7111E-05	0.005044025	0.000252506	0.000245723	2.7111E-05	2.54601E-05	2.7111E-05	2.54601E-05	2.7111E-05	2.7111E-05	0.000245723	2.10098E-05	0.000469267	2.10098E-05	7.76895E-05	9.51608E-06	9.51608E-06	5.1925E-08	1.02E-07	0	3.32E-09	1.57E-07	0.157139
4840803754000	484080	3754000	0.002754099	2.32084E-05	0.004317943	0.000216158	0.000210352	2.32084E-05	2.17951E-05	2.32084E-05	2.17951E-05	2.32084E-05	2.32084E-05	0.000210352	1.79855E-05	0.000401716	1.79855E-05	6.65062E-05	8.14625E-06	8.14625E-06	4.44504E-08	8.72E-08	0	2.84E-09	1.35E-07	0.134519
4841003754000	484100	3754000	0.002426445	2.04473E-05	0.003804239	0.000190442	0.000185326	2.04473E-05	1.92022E-05	2.04473E-05	1.92022E-05	2.04473E-05	2.04473E-05	0.000185326	1.58458E-05	0.000353924	1.58458E-05	5.8594E-05	7.17709E-06	7.17709E-06	3.91622E-08	7.69E-08	0	2.5E-09	1.19E-07	0.1185154
4841203754000	484120	3754000	0.002179133	1.83633E-05	0.003416498	0.000171031	0.000166437	1.83633E-05	1.7245E-05	1.83633E-05	1.7245E-05	1.83633E-05	1.83633E-05	0.000166437	1.42307E-05	0.000317851	1.42307E-05	5.26219E-05	6.44558E-06	6.44558E-06	3.51706E-08	6.9E-08	0	2.25E-09	1.06E-07	0.1064359
4839203754020	483920	3754020	0.04953429	0.000417419	0.077661045	0.003887739	0.003783312	0.000417419	0.000391999	0.000417419	0.000391999	0.000417419	0.000417419	0.003783312	0.000323481	0.007225135	0.000323481	0.001196158	0.000146516	0.000146516	7.9947E-07	1.57E-06	0	5.11E-08	2.42E-06	2.4194133
4839403754020	483940	3754020	0.027670972	0.000233179	0.043383212	0.002171779	0.002113443	0.000233179	0.00021898	0.000233179	0.00021898	0.000233179	0.000233179	0.002113443	0.000180704	0.004036124	0.000180704	0.000668201	8.18469E-05	8.18469E-05	4.46602E-07	8.76E-07	0	2.85E-08	1.35E-06	1.3515388
4839603754020	483960	3754020	0.014702318	0.000123894	0.023050646	0.001153924	0.001122928	0.000123894	0.00011635	0.000123894	0.00011635	0.000123894	0.000123894	0.001122928	9.60127E-05	0.002144499	9.60127E-05	0.000355033	4.34874E-05	4.34874E-05	2.37292E-07	4.66E-07	0	1.52E-08	7.18E-07	0.7181083
4839803754020	483980	3754020	0.009012368	7.5946E-05	0.014129806	0.000707343	0.000688343	7.5946E-05	7.13212E-05	7.5946E-05	7.13212E-05	7.5946E-05	7.5946E-05	0.000688343	5.88548E-05	0.001314556	5.88548E-05	0.000217631	2.66573E-05	2.66573E-05	1.45457E-07	2.85E-07	0	9.29E-09	4.4E-07	0.4401929
4840003754020	484000	3754020	0.006173786	5.20256E-05	0.009679409	0.000484555	0.000471539	5.20256E-05	4.88575E-05	5.20256E-05	4.88575E-05	5.20256E-05	5.20256E-05	0.000471539	4.03176E-05	0.000900516	4.03176E-05	0.000149085	1.82612E-05	1.82612E-05	9.96433E-08	1.96E-07	0	6.36E-09	3.02E-07	0.3015475

			Grading/Excavation	Potholding	and Foundation Concrete	Construction	Construction	Finishing	Finishing	Painting	Painting	Installing Pipeline	Appurtenances	Pavement Repairs	Demolition	Grading/Excavation	Drainage and Foundation	Construction	Finishing	Painting	Maximum Individual Cancer Risk (MICR)					
Unique Identifier	X (UTM)	Y (UTM)	2026	2026	2026	2026	2027	2026	2027	2026	2027	2026	2026	2027	2045	2045	2045	2045	2045	2045	3rd Trimester	0<2	2<16	16<30	Total	per million
4840203754020	484020	3754020	0.004589657	3.86764E-05	0.007195774	0.000360223	0.000350547	3.86764E-05	3.63212E-05	3.86764E-05	3.63212E-05	3.86764E-05	3.86764E-05	0.000350547	2.99725E-05	0.000669453	2.99725E-05	0.000110831	1.35756E-05	1.35756E-05	7.40758E-08	1.45E-07	0	4.73E-09	2.24E-07	0.2241735
4840403754020	484040	3754020	0.003631831	3.06049E-05	0.005694072	0.000285047	0.000277391	3.06049E-05	2.87412E-05	3.06049E-05	2.87412E-05	3.06049E-05	3.06049E-05	0.000277391	2.37175E-05	0.000529744	2.37175E-05	8.77017E-05	1.07425E-05	1.07425E-05	5.86168E-08	1.15E-07	0	3.74E-09	1.77E-07	0.1773903
4840603754020	484060	3754020	0.003001982	2.52973E-05	0.004706579	0.000235613	0.000229284	2.52973E-05	2.37568E-05	2.52973E-05	2.37568E-05	2.52973E-05	2.52973E-05	0.000229284	1.96043E-05	0.000437873	1.96043E-05	7.24921E-05	8.87945E-06	8.87945E-06	4.84512E-08	9.51E-08	0	3.09E-09	1.47E-07	0.1466264
4840803754020	484080	3754020	0.002615612	2.20414E-05	0.00410082	0.000205288	0.000199774	2.20414E-05	2.06992E-05	2.20414E-05	2.06992E-05	2.20414E-05	2.20414E-05	0.000199774	1.70811E-05	0.000381517	1.70811E-05	6.3162E-05	7.73662E-06	7.73662E-06	4.22153E-08	8.28E-08	0	2.7E-09	1.28E-07	0.1277549
4841003754020	484100	3754020	0.002337994	1.97019E-05	0.003665563	0.000183499	0.00017857	1.97019E-05	1.85022E-05	1.97019E-05	1.85022E-05	1.97019E-05	1.97019E-05	0.00017857	1.52681E-05	0.000341023	1.52681E-05	5.6458E-05	6.91546E-06	6.91546E-06	3.77346E-08	7.41E-08	0	2.41E-09	1.14E-07	0.1141951
4841203754020	484120	3754020	0.002117231	1.78416E-05	0.003319445	0.000166173	0.000161709	1.78416E-05	1.67551E-05	1.78416E-05	1.67551E-05	1.78416E-05	1.78416E-05	0.000161709	1.38265E-05	0.000308822	1.38265E-05	5.1127E-05	6.26248E-06	6.26248E-06	3.41715E-08	6.71E-08	0	2.18E-09	1.03E-07	0.1034123
4839203754040	483920	3754040	0.04853899	0.000409031	0.076100591	0.003809623	0.003707293	0.000409031	0.000384123	0.000409031	0.000384123	0.000409031	0.000409031	0.003707293	0.000316981	0.00707996	0.000316981	0.001172123	0.000143572	0.000143572	7.83406E-07	1.54E-06	0	5E-08	2.37E-06	2.3707997
4839403754040	483940	3754040	0.025717747	0.00021672	0.0403209	0.002018479	0.001964261	0.00021672	0.000203522	0.00021672	0.000203522	0.00021672	0.00021672	0.001964261	0.000167948	0.003751224	0.000167948	0.000621034	7.60696E-05	7.60696E-05	4.15078E-07	8.15E-07	0	2.65E-08	1.26E-06	1.2561371
4839603754040	483960	3754040	0.012976032	0.000109347	0.020344133	0.001018435	0.000991079	0.000109347	0.000102688	0.000109347	0.000102688	0.000109347	0.000109347	0.000991079	8.47393E-05	0.001892701	8.47393E-05	0.000313346	3.83813E-05	3.83813E-05	2.0943E-07	4.11E-07	0	1.34E-08	6.34E-07	0.6337909
4839803754040	483980	3754040	0.007899538	6.65683E-05	0.012385085	0.000620002	0.000603348	6.65683E-05	6.25146E-05	6.65683E-05	6.25146E-05	6.65683E-05	6.65683E-05	0.000603348	5.15875E-05	0.001152237	5.15875E-05	0.000190759	2.33657E-05	2.33657E-05	1.27496E-07	2.5E-07	0	8.14E-09	3.86E-07	0.3858387
4840003754040	484000	3754040	0.005499258	4.63415E-05	0.008621868	0.000431614	0.00042002	4.63415E-05	4.35195E-05	4.63415E-05	4.35195E-05	4.63415E-05	4.63415E-05	0.00042002	3.59126E-05	0.000802129	3.59126E-05	0.000132796	1.6266E-05	1.6266E-05	8.87566E-08	1.74E-07	0	5.67E-09	2.69E-07	0.2686013
4840203754040	484020	3754040	0.004195959	3.53588E-05	0.006578525	0.000329323	0.000320477	3.53588E-05	3.32056E-05	3.53588E-05	3.32056E-05	3.53588E-05	3.53588E-05	0.000320477	2.74015E-05	0.000612028	2.74015E-05	0.000101324	1.24111E-05	1.24111E-05	6.77217E-08	1.33E-07	0	4.33E-09	2.05E-07	0.2049441
4840403754040	484040	3754040	0.003378257	2.84681E-05	0.005296512	0.000265145	0.000258023	2.84681E-05	2.67345E-05	2.84681E-05	2.67345E-05	2.84681E-05	2.84681E-05	0.000258023	2.20615E-05	0.000492757	2.20615E-05	8.15784E-05	9.99242E-06	9.99242E-06	5.45242E-08	1.07E-07	0	3.48E-09	1.65E-07	0.1650049
4840603754040	484060	3754040	0.00282927	2.38419E-05	0.004435797	0.000222058	0.000216093	2.38419E-05	2.239E-05	2.38419E-05	2.239E-05	2.38419E-05	2.38419E-05	0.000216093	1.84764E-05	0.000412681	1.84764E-05	6.83214E-05	8.36859E-06	8.36859E-06	4.56637E-08	8.96E-08	0	2.92E-09	1.38E-07	0.1381906
4840803754040	484080	3754040	0.002479568	2.0895E-05	0.003887527	0.000194611	0.000189384	2.0895E-05	1.96226E-05	2.0895E-05	1.96226E-05	2.0895E-05	2.0895E-05	0.000189384	1.61927E-05	0.000361673	1.61927E-05	5.98768E-05	7.33422E-06	7.33422E-06	4.00196E-08	7.85E-08	0	2.56E-09	1.21E-07	0.1211101
4841003754040	484100	3754040	0.002238221	1.88612E-05	0.003509136	0.000175669	0.00017095	1.88612E-05	1.77126E-05	1.88612E-05	1.77126E-05	1.88612E-05	1.88612E-05	0.00017095	1.46166E-05	0.00032647	1.46166E-05	5.40487E-05	6.62035E-06	6.62035E-06	3.61243E-08	7.09E-08	0	2.31E-09	1.09E-07	0.1093219
4841203754040	484120	3754040	0.002045718	1.7239E-05	0.003207326	0.00016056	0.000156247	1.7239E-05	1.61892E-05	1.7239E-05	1.61892E-05	1.7239E-05	1.7239E-05	0.000156247	1.33595E-05	0.000298391	1.33595E-05	4.94002E-05	6.05095E-06	6.05095E-06	3.30174E-08	6.48E-08	0	2.11E-09	9.99E-08	0.0999194
4839203754060	483920	3754060	0.044880622	0.000378203	0.070364914	0.003522493	0.003427875	0.000378203	0.000355172	0.000378203	0.000355172	0.000378203	0.000378203	0.003427875	0.000293091	0.006546346	0.000293091	0.001083781	0.000132751	0.000132751	7.24361E-07	1.42E-06	0	4.63E-08	2.19E-06	2.1921133
4839403754060	483940	3754060	0.021667257	0.000182587	0.033970443	0.001700572	0.001654894	0.000182587	0.000171468	0.000182587	0.000171468	0.000182587	0.000182587	0.001654894	0.000141497	0.003160414	0.000141497	0.000523223	6.40888E-05	6.40888E-05	3.49704E-07	6.86E-07	0	2.23E-08	1.06E-06	1.0582982
4839603754060	483960	3754060	0.010832549	9.12844E-05	0.01698353	0.000850202	0.000827364	9.12844E-05	8.57255E-05	9.12844E-05	8.57255E-05	9.12844E-05	9.12844E-05	0.000827364	7.07414E-05	0.00158005	7.07414E-05	0.000261585	3.20412E-05	3.20412E-05	1.74834E-07	3.43E-07	0	1.12E-08	5.29E-07	0.5290964
4839803754060	483980	3754060	0.00683445	5.7593E-05	0.010715214	0.000536407	0.000521999	5.7593E-05	5.40858E-05	5.7593E-05	5.40858E-05	5.7593E-05	5.7593E-05	0.000521999	4.4632E-05	0.000996882	4.4632E-05	0.000165039	2.02154E-05	2.02154E-05	1.10306E-07	2.16E-07	0	7.05E-09	3.34E-07	0.3338164
4840003754060	484000	3754060	0.004946017	4.16794E-05	0.007754484	0.000388192	0.000377765	4.16794E-05	3.91413E-05	4.16794E-05	3.91413E-05	4.16794E-05	4.16794E-05	0.000377765	3.22997E-05	0.000721432	3.22997E-05	0.000119437	1.46296E-05	1.46296E-05	7.98274E-08	1.57E-07	0	5.1E-09	2.42E-07	0.2415793
4840203754060	484020	3754060	0.003874406	3.26491E-05	0.006074387	0.000304086	0.000295918	3.26491E-05	3.06609E-05	3.26491E-05	3.06609E-05	3.26491E-05	3.26491E-05	0.000295918	2.53016E-05	0.000565126	2.53016E-05	9.35594E-05	1.146E-05	1.146E-05	6.25319E-08	1.23E-07	0	3.99E-09	1.89E-07	0.1892384
4840403754060	484040	3754060	0.003175698	2.67612E-05	0.004978935	0.000249247	0.000242552	2.67612E-05	2.51315E-05	2.67612E-05	2.51315E-05	2.67612E-05	2.67612E-05	0.000242552	2.07387E-05	0.000463211	2.07387E-05	7.6687E-05	9.39328E-06	9.39328E-06	5.12549E-08	1.01E-07	0	3.27E-09	1.55E-07	0.1551112
4840603754060	484060	3754060	0.002693276	2.26959E-05	0.004222582	0.000211384	0.000205706	2.26959E-05	2.13138E-05	2.26959E-05	2.13138E-05	2.26959E-05	2.26959E-05	0.000205706	1.75883E-05	0.000392845	1.75883E-05	6.50374E-05	7.96634E-06	7.96634E-06	4.34688E-08	8.53E-08	0	2.78E-09	1.32E-07	0.1315482
4840803754060	484080	3754060	0.002377415	2.00341E-05	0.003727367	0.000186593	0.000181581	2.00341E-05	1.88141E-05	2.00341E-05	1.88141E-05	2.00341E-05	2.00341E-05	0.000181581	1.55256E-05	0.000346773	1.55256E-05	5.741E-05	7.03207E-06	7.03207E-06	3.83708E-08	7.53E-08	0	2.45E-09	1.16E-07	0.1161205
4841003754060	484100	3754060	0.002152088	1.81353E-05	0.003374096	0.000168908	0.000164371	1.81353E-05	1.7031E-05	1.81353E-05	1.7031E-05	1.81353E-05	1.81353E-05	0.000164371	1.40541E-05	0.000313906	1.40541E-05	5.19688E-05	6.36558E-06	6.36558E-06	3.47341E-08	6.82E-08	0	2.22E-09	1.05E-07	0.1051149
4841203754060	484120	3754060	0.001973697	1.66321E-05	0.00309441	0.000154907	0.000150746	1.66321E-05	1.56192E-05	1.66321E-05	1.56192E-05	1.66321E-05	1.66321E-05	0.000150746	1.28891E-05	0.000287886	1.28891E-05	4.7661E-05	5.83792E-06	5.83792E-06	3.18549E-08	6.25E-08	0	2.03E-09	9.64E-08	0.0964017
4839403754080	483940	3754080	0.015864947	0.000133692	0.024873444	0.001245173	0.001211727	0.000133692	0.00012555	0.000133692	0.00012555	0.000133692	0.000133692	0.001211727	0.000103605	0.002314082	0.000103605	0.000383108	4.69263E-05	4.69263E-05	2.56056E-07	5.02E-07	0	1.64E-08	7.75E-07	0.7748948
4839603754080	483960	3754080	0.008880702	7.48364E-05	0.013923376	0.000697009	0.000678287	7.48364E-05	7.02792E-05	7.48364E-05	7.02792E-05	7.48364E-05	7.48364E-05	0.000678287	5.7995E-05	0.001295351	5.7995E-05	0.000214452	2.62679E-05	2.62679E-05	1.43332E-07	2.81E-07	0	9.16E-09	4.34E-07	0.4337619
4839803754080	483980	3754080	0.006011738	5.06601E-05	0.009425347	0.000471836	0.000459162	5.06601E-05	4.75751E-05	5.06601E-05	4.75751E-05	5.06601E-05	5.06601E-05	0.000459162	3.92593E-05	0.00087688	3.92593E-05	0.000145172	1.77819E-05	1.77819E-05	9.70279E-08	1.9E-07	0	6.2E-09	2.94E-07	0.2936325
4840003754080	484000	3754080	0.004538406	3.82445E-05	0.007115422	0.000356201	0.000346633	3.82445E-05	3.59156E-05	3.82445E-05	3.59156E-05	3.82445E-05	3.82445E-05	0.000346633	2.96378E-05	0.000661978	2.96378E-05	0.000109594	1.3424E-05	1.3424E-05	7.32487E-08	1.44E-07	0	4.68E-09	2.22E-07	0.2216703
4840203754080	484020	3754080	0.003629798	3.05878E-05	0.005690883	0.000284888	0.000277235	3.05878E-05	2.87251E-05	3.05878E-05	2.87251E-05	3.05878E-05	3.05878E-05	0.000277235	2.37042E-05	0.000529447	2.37042E-05	8.76526E-05	1.07364E-05	1.07364E-05	5.8584E-08	1.15E-07	0	3.74E-09	1.77E-07	0.1772909
4840403754080	484040	3754080	0.00302212	2.5467E-05	0.004738152	0.000237194	0.000230822	2.5467E-05	2.39161E-05	2.5467E-05	2.39161E-05	2.5467E-05	2.5467E-05	0.000230822	1.97358E-05	0.00044081	1.97358E-05	7.29784E-05	8.93901E-06	8.93901E-06	4.87762E-08	9.57E-08	0	3.12E-09	1.48E-07	0.14761
4840603754080	484060	3754080	0.002587067	2.18009E-05	0.004056065	0.000203048	0.000197594	2.18009E-05	2.04733E-05	2.18009E-05	2.04733E-05	2.18009E-05	2.18009E-05	0.000197594	1.68947E-05	0.000377353	1.68947E-05	6.24727E-05	7.65219E-06	7.65219E-06	4.17546E-08	8.19E-08	0	2.67E-09	1.26E-07	0.1263606
4840803754080	484080	3754080	0.002292014	1.93145E-05	0.003593474	0.000179891	0.000175059	1.93145E-05	1.81383E-05	1.93145E-05	1.81383E-05	1.93145E-05	1.93145E-05	0.000175059	1.49679E-05	0.000334316	1.49679E-05	5.53477E-05	6.77946E-06	6.77946E-06	3.69925E-08	7.26E-08	0	2.36E-09	1.12E-07	0.1119493
4841003754080	484100	3754080	0.002082126	1.75458E-05	0.003264407	0.000163417	0.000159028	1.75458E-05	1.64773E-05	1.75458E-05	1.64773E-05	1.75458E-05	1.75458E-05	0.000159028	1.35972E-05	0.000303702	1.35972E-05	5.02793E-05	6.15864E-06	6.15864E-06	3.3605E-08	6.59E-08	0	2.15E-09	1.02E-07	0.1016977
4841203754080	484120	3754080	0.00191213	1.61133E-05	0.002997883	0.000150075	0.000146044	1.61133E-05	1.5132E-05	1.61133E-05	1.5132E-05	1.61133E-05	1.61133E-05	0.000146044	1.24871E-05	0.000278906	1.24871E-05	4.61742E-05	5.65582E-06	5.65582E-06	3.08613E-08	6.06E-08	0	1.97E-09	9.34E-08	0.0933945
4839403754100	483940	3754100	0.012263547	0.000103343	0.019227082	0.000962515	0.000936661	0.000103343	9.705E-05	0.000103343	9.705E-05	0.000103343	0.000103343	0.000936661	8.00865E-05	0.001788777	8.00865E-05	0.000296141	3.62739E-05	3.62739E-05	1.9793E-07	3.88E-07	0	1.26E-08	5.99E-07	0.5989909
4839603754100	483960	3754100	0.007796095	6.56966E-05	0.012222904	0.000611883	0.000595447	6.56966E-05	6.16959E-05	6.56966E-05	6.16959E-05	6.56966E-05	6.56966E-05	0.000595447	5.0912E-05	0.001137148	5.0912E-05	0.000188261	2.30598E-05	2.30598E-05	1.25827E-07	2.47E-07	0	8.04E-09	3.81E-07	0.3807862
4839803754100	483980	3754100	0.005510654	4.64375E-05	0.008639735	0.000432508	0.000420891	4.64375E-05	4.36097E-05	4.64375E-05	4.36097E-05	4.64375E-05	4.64375E-05	0.000420891	3.5987E-05	0.000803791	3.5987E-05	0.000133072	1.62998E-05	1.62998E-05	8.89405E-08	1.75E-07	0	5.68E-09	2.69E-07	0.269158
4840003754100	484000	3754100	0.004251574	3.58274E-05	0.00666572	0.000333688	0.000324725	3.58274E-05	3.36457E-05	3.58274E-05	3.36457E-05	3.58274E-05	3.58274E-05	0.000324725	2.77647E-05	0.00062014	2.77647E-05	0.000102667	1.25756E-05	1.25756E-05	6.86193E-08	1.35E-07	0	4.38E-09	2.08E-07	0.2076605
4840203754100	484020	3754100	0.00344848	2.90599E-05	0.005406609	0.000270657	0.000263387	2.90599E-05	2.72902E-05	2.90599E-05	2.72902E-05	2.90599E-05	2.90599E-05	0.000263387	2.25201E-05	0.000503	2.25201E-05	8.32741E-05	1.02001E-05	1.02001E-05	5.56576E-08	1.09E-07	0	3.56E-09	1.68E-07	0.1684348
4840403754100	484040	3754100	0.002903647	2.44686E-05	0.004552407	0.000227895	0.000221774	2.44686E-05	2.29786E-05	2.44686E-05	2.29786E-05	2.44686E-05	2.44686E-05	0.000221774	1.89621E-05	0.00042353	1.89621E-05	7.01175E-05	8.58859E-06	8.58859E-06	4.68641E-08	9.2E-08	0	2.99E-09	1.42E-07	0.1418234
4840603754100	484060	3754100	0.002504084	2.11016E-05	0.003925963	0.000196535	0.000191256	2.11016E-05	1.98166E-05	2.11016E-05	1.98166E-05	2.11016E-05	2.11016E-05	0.000191256	1.63528E-05	0.000365249	1.63528E-05	6.04688E-05	7.40674E-06	7.40674E-06	4.04152E-08	7.93E-08	0	2.58E-09	1.22E-07	0.1223075
4840803754100	484080	3754100	0.002219868	1.87065E-05	0.003480363	0.000174228	0.000169548	1.87065E-05	1.75674E-05	1.87065E-05	1.75674E-05	1.87065E-05	1.87065E-05	0.000169548	1.44967E-05	0.000323793	1.44967E-05	5.36055E-05	6.56607E-06	6.56607E-06	3.58281E-08	7.03E-08	0	2.29E-09	1.08E-07	0.1084255
4841003754100	484100	3754100	0.002019789	1.70205E-05	0.003166674	0.000158525	0.000154267	1.70205E-05	1.5984E-05	1.70205E-05	1.5984E-05	1.70205E-05	1.70205E-05	0.000154267	1.31901E-05	0.000294609	1.31901E-05	4.8774E-05	5.97426E-06	5.97426E-06	3.25989E-08	6.4E-08	0	2.08E-09	9.87E-08	0.098653
4841203754100	484120	3754100	0.001859614	1.56707E-05	0.002915548	0.000145953	0.000142033	1.56707E-05	1.47164E-05	1.56707E-05	1.47164E-05	1.56707E-05	1.56707E-05	0.000142033	1.21441E-05	0.000271246	1.21441E-05	4.49061E-05	5.50048E-06	5.50048E-06	3.00137E-08	5.89E-08	0	1.92E-09	9.08E-08	0.0908295
4839403754120	483940	3754120	0.009907324	8.34876E-05	0.01553294	0.000777584	0.000756698	8.34876E-05	7.84036E-05	8.34876E-05	7.84036E-05	8.34876E-05	8.34876E-05	0.000756698	6.46993E-05	0.001445095	6.46993E-05	0.000239243	2.93045E-05	2.93045E-05	1.59902E-07	3.14E-07	0	1.02E-08	4.84E-07	0.4839054
4839603754120	483960	3754120	0.006822347	5.7491E-05	0.010696239	0.000535458	0.000521075	5.7491E-05	5.399E-05	5.7491E-05	5.399E-05	5.7491E-05	5.7491E-05	0.000521075	4.4553E-05	0.000995116	4.4553E-05	0.000164747	2.01796E-05	2.01796E-05	1.10111E-07	2.16E-07	0	7.03E-09	3.33E-07	0.3332253
4839803754120	483980	3754120	0.005076903	4.27824E-05	0.00795969	0.000398465	0.000387762	4.27824E-05	4.01771E-05	4.27824E-05	4.01771E-05	4.27824E-05	4.27824E-05	0.000387762	3.31544E-05	0.000740524	3.31544E-05	0.000122597	1.50168E-05	1.50168E-05	8.19399E-08	1.61E-07	0	5.23E-09	2.48E-07	0.2479722
4840003754120	484000	3754120	0.00399955	3.37037E-05	0.006270591	0.000313908	0.000305476	3.37037E-05	3.16512E-05	3.37037E-05	3.16512E-05	3.37037E-05	3.37037E-05	0.000305476	2.61189E-05	0.00058338	2.61189E-05	9.65814E-05	1.18301E-05	1.18301E-05	6.45517E-08	1.27E-07	0	4.12E-09	1.95E-07	0.1953508
4840203754120	484020	3754120	0.003305591	2.78558E-05	0.005182585	0.000259442	0.000252473	2.78558E-05	2.61595E-05	2.78558E-05	2.61595E-05	2.78558E-05	2.78558E-05	0.000252473	2.1587E-05	0.000482158	2.1587E-05	7.98237E-05	9.77748E-06	9.77748E-06	5.33514E-08	1.05E-07	0	3.41E-09	1.61E-07	0.1614556
4840403754120	484040	3754120	0.002810682	2.36852E-05	0.004406654	0.000220599	0.000214673	2.36852E-05	2.22429E-05	2.36852E-05	2.22429E-05	2.36852E-05	2.36852E-05	0.000214673	1.8355E-05	0.00040997	1.8355E-05	6.78726E-05	8.31361E-06	8.31361E-06	4.53637E-08	8.9E-08	0	2.9E-09	1.37E-07	0.1372827
4840603754120	484060	3754120	0.002434865	2.05183E-05	0.00381744	0.000191102	0.000185969	2.05183E-05	1.92688E-05	2.05183E-05	1.92688E-05	2.05183E-05	2.05183E-05	0.000185969	1.59008E-05	0.000355153	1.59008E-05	5.87973E-05	7.202E-06	7.202E-06	3.92981E-08	7.71E-08	0	2.51E-09	1.19E-07	0.1189266
4840803754120	484080	3754120	0.002155908	1.81675E-05	0.003380084	0.000169208	0.000164663	1.81675E-05	1.70612E-05	1.81675E-05	1.70612E-05	1.81675E-05	1.81675E-05	0.000164663	1.4079E-05	0.000314463	1.4079E-05	5.2061E-05	6.37688E-06	6.37688E-06	3.47958E-08	6.83E-08	0	2.22E-09	1.05E-07	0.1053014
4841003754120	484100	3754120	0.001963963	1.655E-05	0.003079148	0.000154143	0.000150003	1.655E-05	1.55422E-05	1.655E-05	1.55422E-05	1.655E-05	1.655E-05	0.000150003	1.28256E-05	0.000286466	1.28256E-05	4.74259E-05	5.80913E-06	5.80913E-06	3.16978E-08	6.22E-08	0	2.02E-09	9.59E-08	0.0959262
4841203754120	484120	3754120	0.001809616	1.52494E-05	0.00283716	0.000142029	0.000138214	1.52494E-05	1.43208E-05	1.52494E-05	1.43208E-05	1.52494E-05	1.52494E-05	0.000138214	1.18176E-05	0.000263953	1.18176E-05	4.36987E-05	5.3526E-06	5.3526E-06	2.92067E-08	5.73E-08	0	1.87E-09	8.84E-08	0.0883874
4839403754140	483940	3754140	0.007485008	6.30751E-05	0.011735175	0.000587467	0.000571687	6.30751E-05	5.92341E-05	6.30751E-05	5.92341E-05	6.30751E-05	6.30751E-05	0.000571687	4.88805E-05	0.001091773	4.88805E-05	0.000180749	2.21396E-05	2.21396E-05	1.20806E-07	2.37E-07	0	7.72E-09	3.66E-07	0.3655918
4839603754140	483960	3754140	0.005818504	4.90317E-05	0.00912239	0.00045667	0.000444404	4.90317E-05	4.60459E-05	4.90317E-05	4.60459E-05	4.90317E-05	4.90317E-05	0.000444404	3.79974E-05	0.000848695	3.79974E-05	0.000140506	1.72103E-05	1.72103E-05	9.39091E-08	1.84E-07	0	6E-09	2.84E-07	0.2841944
4839803754140	483980	3754140	0.004620447	3.89359E-05	0.007244047	0.00036264	0.000352899	3.89359E-05	3.65648E-05	3.89359E-05	3.65648E-05	3.89359E-05	3.89359E-05	0.000352899	3.01736E-05	0.000673944	3.01736E-05	0.000111575	1.36666E-05	1.36666E-05	7.45728E-08	1.46E-07	0	4.76E-09	2.26E-07	0.2256774
4840003754140	484000	3754140	0.003765965	3.17353E-05	0.005904371	0.000295575	0.000287636	3.17353E-05	2.98027E-05	3.17353E-05	2.98027E-05	3.17353E-05	3.17353E-05	0.000287636	2.45934E-05	0.000549309	2.45934E-05	9.09408E-05	1.11392E-05	1.11392E-05	6.07817E-08	1.19E-07	0	3.88E-09	1.84E-07	0.1839418
4840203754140	484020	3754140	0.003166236	2.66814E-05	0.004964101	0.000248505	0.00024183	2.66814E-05	2.50566E-05	2.66814E-05	2.50566E-05	2.66814E-05	2.66814E-05	0.00024183	2.06769E-05	0.000461831	2.06769E-05	7.64585E-05	9.36529E-06	9.36529E-06	5.11022E-08	1E-07	0	3.26E-09	1.55E-07	0.1546491
4840403754140	484040	3754140	0.002724673	2.29604E-05	0.004271808	0.000213848	0.000208104	2.29604E-05	2.15622E-05	2.29604E-05	2.15622E-05	2.29604E-05	2.29604E-05	0.000208104	1.77933E-05	0.000397424	1.77933E-05	6.57956E-05	8.05921E-06	8.05921E-06	4.39755E-08	8.63E-08	0	2.81E-09	1.33E-07	0.1330818
4840603754140	484060	3754140	0.002372578	1.99934E-05	0.003719785	0.000186214	0.000181212	1.99934E-05	1.87759E-05	1.99934E-05	1.87759E-05	1.99934E-05	1.99934E-05	0.000181212	1.5494E-05	0.000346067	1.5494E-05	5.72932E-05	7.01776E-06	7.01776E-06	3.82928E-08	7.51E-08	0	2.45E-09	1.16E-07	0.1158843
4840803754140	484080	3754140	0.002101123	1.77059E-05	0.003294191	0.000164908	0.000160479	1.77059E-05	1.66277E-05	1.77059E-05	1.66277E-05	1.77059E-05	1.77059E-05	0.000160479	1.37213E-05	0.000306473	1.37213E-05	5.07381E-05	6.21483E-06	6.21483E-06	3.39116E-08	6.65E-08	0	2.17E-09	1.03E-07	0.1026256
4841003754140	484100	3754140	0.001901106	1.60204E-05	0.002980599	0.00014921	0.000145202	1.60204E-05	1.50448E-05	1.60204E-05	1.50448E-05	1.60204E-05	1.60204E-05	0.000145202	1.24151E-05	0.000277298	1.24151E-05	4.5908E-05	5.62321E-06	5.62321E-06	3.06833E-08	6.02E-08	0	1.96E-09	9.29E-08	0.0928561
4841203754140	484120	3754140	0.001752401	1.47672E-05	0.002747456	0.000137539	0.000133844	1.47672E-05	1.3868E-05	1.47672E-05	1.3868E-05	1.47672E-05	1.47672E-05	0.000133844	1.1444E-05	0.000255607	1.1444E-05	4.23171E-05	5.18336E-06	5.18336E-06	2.82833E-08	5.55E-08	0	1.81E-09	8.56E-08	0.0855929
4839603754160	483960	3754160	0.005008651	4.22072E-05	0.007852683	0.000393108	0.000382549	4.22072E-05	3.9637E-05	4.22072E-05	3.9637E-05	4.22072E-05	4.22072E-05	0.000382549	3.27087E-05	0.000730568	3.27087E-05	0.000120949	1.48149E-05	1.48149E-05	8.08383E-08	1.59E-07	0	5.16E-09	2.45E-07	0.2446386
4839803754160	483980	3754160	0.004168468	3.51271E-05	0.006535423	0.000327166	0.000318378	3.51271E-05	3.2988E-05	3.51271E-05	3.2988E-05	3.51271E-05	3.51271E-05	0.000318378	2.7222E-05	0.000608018	2.7222E-05	0.00010066	1.23298E-05	1.23298E-05	6.7278E-08	1.32E-07	0	4.3E-09	2.04E-07	0.2036013
4840003754160	484000	3754160	0.00351192	2.95945E-05	0.005506072	0.000275636	0.000268232	2.95945E-05	2.77923E-05	2.95945E-05	2.77923E-05	2.95945E-05	2.95945E-05	0.000268232	2.29344E-05	0.000512253	2.29344E-05	8.48061E-05	1.03878E-05	1.03878E-05	5.66815E-08	1.11E-07	0	3.62E-09	1.72E-07	0.1715334
4840203754160	484020	3754160	0.003013787	2.53968E-05	0.004725087	0.00023654	0.000230186	2.53968E-05	2.38502E-05	2.53968E-05	2.38502E-05	2.53968E-05	2.53968E-05	0.000230186	1.96814E-05	0.000439595	1.96814E-05	7.27771E-05	8.91437E-06	8.91437E-06	4.86417E-08	9.55E-08	0	3.11E-09	1.47E-07	0.147203
4840403754160	484040	3754160	0.002622978	2.21035E-05	0.004112368	0.000205867	0.000200337	2.21035E-05	2.07575E-05	2.21035E-05	2.07575E-05	2.21035E-05	2.21035E-05	0.000200337	1.71292E-05	0.000382591	1.71292E-05	6.33399E-05	7.75841E-06	7.75841E-06	4.23342E-08	8.31E-08	0	2.7E-09	1.28E-07	0.1281146
4840603754160	484060	3754160	0.002303571	1.94119E-05	0.003611593	0.000180798	0.000175941	1.94119E-05	1.82298E-05	1.94119E-05	1.82298E-05	1.94119E-05	1.94119E-05	0.000175941	1.50433E-05	0.000336002	1.50433E-05	5.56268E-05	6.81364E-06	6.81364E-06	3.7179E-08	7.3E-08	0	2.37E-09	1.13E-07	0.1125138
4840803754160	484080	3754160	0.002049624	1.72719E-05	0.00321345	0.000160866	0.000156545	1.72719E-05	1.62201E-05	1.72719E-05	1.62201E-05	1.72719E-05	1.72719E-05	0.000156545	1.3385E-05	0.000298961	1.3385E-05	4.94945E-05	6.06251E-06	6.06251E-06	3.30804E-08	6.49E-08	0	2.11E-09	1E-07	0.1001102
4841003754160	484100	3754160	0.001843593	1.55357E-05	0.002890429	0.000144696	0.000140809	1.55357E-05	1.45896E-05	1.55357E-05	1.45896E-05	1.55357E-05	1.55357E-05	0.000140809	1.20395E-05	0.000268909	1.20395E-05	4.45192E-05	5.45309E-06	5.45309E-06	2.97551E-08	5.84E-08	0	1.9E-09	9E-08	0.090047
4841203754160	484120	3754160	0.001691937	1.42577E-05	0.00265266	0.000132793	0.000129226	1.42577E-05	1.33895E-05	1.42577E-05	1.33895E-05	1.42577E-05	1.42577E-05	0.000129226	1.10491E-05	0.000246788	1.10491E-05	4.0857E-05	5.00452E-06	5.00452E-06	2.73074E-08	5.36E-08	0	1.74E-09	8.26E-08	0.0826396
4839603754180	483960	3754180	0.004233321	3.56736E-05	0.006637102	0.000332256	0.000323331	3.56736E-05	3.35012E-05	3.56736E-05	3.35012E-05	3.56736E-05	3.56736E-05	0.000323331	2.76455E-05	0.000617478	2.76455E-05	0.000102227	1.25216E-05	1.25216E-05	6.83247E-08	1.34E-07	0	4.36E-09	2.07E-07	0.206769
4839803754180	483980	3754180	0.003729087	3.14245E-05	0.005846552	0.00029268	0.000284819	3.14245E-05	2.95109E-05	3.14245E-05	2.95109E-05	3.14245E-05	3.14245E-05	0.000284819	2.43526E-05	0.000543929	2.43526E-05	9.00503E-05	1.10301E-05	1.10301E-05	6.01865E-08	1.18E-07	0	3.84E-09	1.82E-07	0.1821405
4840003754180	484000	3754180	0.00324318	2.73298E-05	0.005084736	0.000254544	0.000247706	2.73298E-05	2.56656E-05	2.73298E-05	2.56656E-05	2.73298E-05	2.73298E-05	0.000247706	2.11794E-05	0.000473054	2.11794E-05	7.83166E-05	9.59288E-06	9.59288E-06	5.23441E-08	1.03E-07	0	3.34E-09	1.58E-07	0.1584073
4840203754180	484020	3754180	0.002835371	2.38933E-05	0.004445362	0.000222536	0.000216559	2.38933E-05	2.24383E-05	2.38933E-05	2.24383E-05	2.38933E-05	2.38933E-05	0.000216559	1.85162E-05	0.000413571	1.85162E-05	6.84687E-05	8.38664E-06	8.38664E-06	4.57621E-08	8.98E-08	0	2.92E-09	1.38E-07	0.1384886
4840403754180	484040	3754180	0.002501492	2.10797E-05	0.003921899	0.000196332	0.000191058	2.10797E-05	1.97961E-05	2.10797E-05	1.97961E-05	2.10797E-05	2.10797E-05	0.000191058	1.63359E-05	0.000364871	1.63359E-05	6.04062E-05	7.39907E-06	7.39907E-06	4.03734E-08	7.92E-08	0	2.58E-09	1.22E-07	0.1221809
4840603754180	484060	3754180	0.002221431	1.87197E-05	0.003482813	0.000174351	0.000169668	1.87197E-05	1.75797E-05	1.87197E-05	1.75797E-05	1.87197E-05	1.87197E-05	0.000169668	1.45069E-05	0.000324021	1.45069E-05	5.36433E-05	6.57069E-06	6.57069E-06	3.58533E-08	7.04E-08	0	2.29E-09	1.09E-07	0.1085018
4840803754180	484080	3754180	0.001990016	1.67696E-05	0.003119995	0.000156188	0.000151993	1.67696E-05	1.57484E-05	1.67696E-05	1.57484E-05	1.67696E-05	1.67696E-05	0.000151993	1.29957E-05	0.000290266	1.29957E-05	4.80551E-05	5.88619E-06	5.88619E-06	3.21183E-08	6.3E-08	0	2.05E-09	9.72E-08	0.0971988
4841003754180	484100	3754180	0.001796484	1.51387E-05	0.002816571	0.000140999	0.000137211	1.51387E-05	1.42168E-05	1.51387E-05	1.42168E-05	1.51387E-05	1.51387E-05	0.000137211	1.17318E-05	0.000262038	1.17318E-05	4.33816E-05	5.31375E-06	5.31375E-06	2.89948E-08	5.69E-08	0	1.85E-09	8.77E-08	0.087746
4841203754180	484120	3754180	0.001637388	1.3798E-05	0.002567136	0.000128512	0.00012506	1.3798E-05	1.29578E-05	1.3798E-05	1.29578E-05	1.3798E-05	1.3798E-05	0.00012506	1.06929E-05	0.000238832	1.06929E-05	3.95398E-05	4.84317E-06	4.84317E-06	2.6427E-08	5.19E-08	0	1.69E-09	8E-08	0.0799753
4839803754200	483980	3754200	0.003292546	2.77458E-05	0.005162132	0.000258418	0.000251477	2.77458E-05	2.60562E-05	2.77458E-05	2.60562E-05	2.77458E-05	2.77458E-05	0.000251477	2.15018E-05	0.000480255	2.15018E-05	7.95086E-05	9.7389E-06	9.7389E-06	5.31408E-08	1.04E-07	0	3.39E-09	1.61E-07	0.1608185
4840003754200	484000	3754200	0.002942956	2.47999E-05	0.004614037	0.00023098	0.000224776	2.47999E-05	2.32897E-05	2.47999E-05	2.32897E-05	2.47999E-05	2.47999E-05	0.000224776	1.92188E-05	0.000429263	1.92188E-05	7.10667E-05	8.70486E-06	8.70486E-06	4.74985E-08	9.32E-08	0	3.03E-09	1.44E-07	0.1437434
4840203754200	484020	3754200	0.002638789	2.22367E-05	0.004137156	0.000207107	0.000201544	2.22367E-05	2.08826E-05	2.22367E-05	2.08826E-05	2.22367E-05	2.22367E-05	0.000201544	1.72325E-05	0.000384897	1.72325E-05	6.37217E-05	7.80517E-06	7.80517E-06	4.25893E-08	8.36E-08	0	2.72E-09	1.29E-07	0.1288869
4840403754200	484040	3754200	0.002364097	1.99219E-05	0.003706487	0.000185548	0.000180564	1.99219E-05	1.87087E-05	1.99219E-05	1.87087E-05	1.99219E-05	1.99219E-05	0.000180564	1.54386E-05	0.00034483	1.54386E-05	5.70884E-05	6.99267E-06	6.99267E-06	3.81559E-08	7.49E-08	0	2.44E-09	1.15E-07	0.11547
4840603754200	484060	3754200	0.00212477	1.79051E-05	0.003331266	0.000166764	0.000162285	1.79051E-05	1.68148E-05	1.79051E-05	1.68148E-05	1.79051E-05	1.79051E-05	0.000162285	1.38757E-05	0.000309922	1.38757E-05	5.13091E-05	6.28478E-06	6.28478E-06	3.42932E-08	6.73E-08	0	2.19E-09	1.04E-07	0.1037806
4840803754200	484080	3754200	0.001920004	1.61796E-05	0.003010228	0.000150693	0.000146645	1.61796E-05	1.51943E-05	1.61796E-05	1.51943E-05	1.61796E-05	1.61796E-05	0.000146645	1.25385E-05	0.000280054	1.25385E-05	4.63644E-05	5.67911E-06	5.67911E-06	3.09884E-08	6.08E-08	0	1.98E-09	9.38E-08	0.0937791
4841003754200	484100	3754200	0.001745234	1.47068E-05	0.002736219	0.000136976	0.000133297	1.47068E-05	1.38113E-05	1.47068E-05	1.38113E-05	1.47068E-05	1.47068E-05	0.000133297	1.13972E-05	0.000254562	1.13972E-05	4.2144E-05	5.16216E-06	5.16216E-06	2.81676E-08	5.53E-08	0	1.8E-09	8.52E-08	0.0852428
4841203754200	484120	3754200	0.001598253	1.34683E-05	0.002505779	0.00012544	0.000122071	1.34683E-05	1.26481E-05	1.34683E-05	1.26481E-05	1.34683E-05	1.34683E-05	0.000122071	1.04373E-05	0.000233123	1.04373E-05	3.85947E-05	4.72741E-06	4.72741E-06	2.57954E-08	5.06E-08	0	1.65E-09	7.81E-08	0.0780638
4839803754220	483980	3754220	0.002920201	2.46081E-05	0.004578362	0.000229194	0.000223038	2.46081E-05	2.31096E-05	2.46081E-05	2.31096E-05	2.46081E-05	2.46081E-05	0.000223038	1.90702E-05	0.000425944	1.90702E-05	7.05172E-05	8.63755E-06	8.63755E-06	4.71313E-08	9.25E-08	0	3.01E-09	1.43E-07	0.142632
4840003754220	484000	3754220	0.002664011	2.24492E-05	0.0041767	0.000209087	0.000203471	2.24492E-05	2.10822E-05	2.24492E-05	2.10822E-05	2.24492E-05	2.24492E-05	0.000203471	1.73972E-05	0.000388576	1.73972E-05	6.43307E-05	7.87978E-06	7.87978E-06	4.29964E-08	8.44E-08	0	2.75E-09	1.3E-07	0.1301188
4840203754220	484020	3754220	0.002425069	2.04357E-05	0.003802081	0.000190334	0.000185221	2.04357E-05	1.91913E-05	2.04357E-05	1.91913E-05	2.04357E-05	2.04357E-05	0.000185221	1.58368E-05	0.000353724	1.58368E-05	5.85607E-05	7.17302E-06	7.17302E-06	3.914E-08	7.68E-08	0	2.5E-09	1.18E-07	0.1184481
4840403754220	484040	3754220	0.002204343	1.85757E-05	0.003456022	0.00017301	0.000168363	1.85757E-05	1.74445E-05	1.85757E-05	1.74445E-05	1.85757E-05	1.85757E-05	0.000168363	1.43953E-05	0.000321528	1.43953E-05	5.32306E-05	6.52014E-06	6.52014E-06	3.55775E-08	6.98E-08	0	2.27E-09	1.08E-07	0.1076672
4840603754220	484060	3754220	0.002010985	1.69463E-05	0.00315287	0.000157834	0.000153594	1.69463E-05	1.59143E-05	1.69463E-05	1.59143E-05	1.69463E-05	1.69463E-05	0.000153594	1.31326E-05	0.000293325	1.31326E-05	4.85614E-05	5.94822E-06	5.94822E-06	3.24568E-08	6.37E-08	0	2.07E-09	9.82E-08	0.0982229
4840803754220	484080	3754220	0.00183748	1.54842E-05	0.002880845	0.000144216	0.000140342	1.54842E-05	1.45413E-05	1.54842E-05	1.45413E-05	1.54842E-05	1.54842E-05	0.000140342	1.19996E-05	0.000268017	1.19996E-05	4.43716E-05	5.43501E-06	5.43501E-06	2.96564E-08	5.82E-08	0	1.89E-09	8.97E-08	0.0897484
4841003754220	484100	3754220	0.001680628	1.41624E-05	0.002634929	0.000131905	0.000128362	1.41624E-05	1.33E-05	1.41624E-05	1.33E-05	1.41624E-05	1.41624E-05	0.000128362	1.09753E-05	0.000245139	1.09753E-05	4.05839E-05	4.97107E-06	4.97107E-06	2.71249E-08	5.32E-08	0	1.73E-09	8.21E-08	0.0820873
4841203754220	484120	3754220	0.001545762	1.30259E-05	0.002423483	0.00012132	0.000118062	1.30259E-05	1.22327E-05	1.30259E-05	1.22327E-05	1.30259E-05	1.30259E-05	0.000118062	1.00945E-05	0.000225467	1.00945E-05	3.73272E-05	4.57215E-06	4.57215E-06	2.49482E-08	4.9E-08	0	1.59E-09	7.55E-08	0.0755
4839803754240	483980	3754240	0.002538185	2.13889E-05	0.003979427	0.000199212	0.000193861	2.13889E-05	2.00864E-05	2.13889E-05	2.00864E-05	2.13889E-05	2.13889E-05	0.000193861	1.65755E-05	0.000370223	1.65755E-05	6.12923E-05	7.5076E-06	7.5076E-06	4.09656E-08	8.04E-08	0	2.62E-09	1.24E-07	0.1239731
4840003754240	484000	3754240	0.002425999	2.04436E-05	0.003803539	0.000190407	0.000185292	2.04436E-05	1.91986E-05	2.04436E-05	1.91986E-05	2.04436E-05	2.04436E-05	0.000185292	1.58429E-05	0.000353859	1.58429E-05	5.85832E-05	7.17577E-06	7.17577E-06	3.9155E-08	7.68E-08	0	2.5E-09	1.18E-07	0.1184936
4840203754240	484020	3754240	0.002235952	1.88421E-05	0.003505579	0.000175491	0.000170777	1.88421E-05	1.76946E-05	1.88421E-05	1.76946E-05	1.88421E-05	1.88421E-05	0.000170777	1.46018E-05	0.000326139	1.46018E-05	5.39939E-05	6.61364E-06	6.61364E-06	3.60877E-08	7.08E-08	0	2.31E-09	1.09E-07	0.109211
4840403754240	484040	3754240	0.0020542	1.73105E-05	0.003220624	0.000161226	0.000156895	1.73105E-05	1.62563E-05	1.73105E-05	1.62563E-05	1.73105E-05	1.73105E-05	0.000156895	1.34148E-05	0.000299628	1.34148E-05	4.9605E-05	6.07604E-06	6.07604E-06	3.31542E-08	6.51E-08	0	2.12E-09	1E-07	0.1003337
4840603754240	484060	3754240	0.001882853	1.58665E-05	0.002951981	0.000147777	0.000143808	1.58665E-05	1.49003E-05	1.58665E-05	1.49003E-05	1.58665E-05	1.58665E-05	0.000143808	1.22959E-05	0.000274635	1.22959E-05	4.54673E-05	5.56922E-06	5.56922E-06	3.03887E-08	5.96E-08	0	1.94E-09	9.2E-08	0.0919645
4840803754240	484080	3754240	0.001729163	1.45714E-05	0.002711023	0.000135715	0.000132069	1.45714E-05	1.36841E-05	1.45714E-05	1.36841E-05	1.45714E-05	1.45714E-05	0.000132069	1.12922E-05	0.000252218	1.12922E-05	4.1756E-05	5.11463E-06	5.11463E-06	2.79082E-08	5.48E-08	0	1.78E-09	8.45E-08	0.0844579
4841003754240	484100	3754240	0.001588047	1.33823E-05	0.002489779	0.000124639	0.000121291	1.33823E-05	1.25673E-05	1.33823E-05	1.25673E-05	1.33823E-05	1.33823E-05	0.000121291	1.03707E-05	0.000231635	1.03707E-05	3.83483E-05	4.69723E-06	4.69723E-06	2.56307E-08	5.03E-08	0	1.64E-09	7.76E-08	0.0775653
4841203754240	484120	3754240	0.001469128	1.23801E-05	0.002303334	0.000115306	0.000112209	1.23801E-05	1.16262E-05	1.23801E-05	1.16262E-05	1.23801E-05	1.23801E-05	0.000112209	9.59407E-06	0.000214289	9.59407E-06	3.54766E-05	4.34548E-06	4.34548E-06	2.37113E-08	4.65E-08	0	1.51E-09	7.18E-08	0.0717569
4840003754260	484000	3754260	0.00217023	1.82882E-05	0.003402539	0.000170332	0.000165757	1.82882E-05	1.71745E-05	1.82882E-05	1.71745E-05	1.82882E-05	1.82882E-05	0.000165757	1.41726E-05	0.000316553	1.41726E-05	5.24069E-05	6.41924E-06	6.41924E-06	3.50269E-08	6.87E-08	0	2.24E-09	1.06E-07	0.106001
4840203754260	484020	3754260	0.002066911	1.74176E-05	0.003240552	0.000162223	0.000157866	1.74176E-05	1.63569E-05	1.74176E-05	1.63569E-05	1.74176E-05	1.74176E-05	0.000157866	1.34979E-05	0.000301482	1.34979E-05	4.99119E-05	6.11364E-06	6.11364E-06	3.33594E-08	6.55E-08	0	2.13E-09	1.01E-07	0.1009545
4840403754260	484040	3754260	0.00190748	1.60741E-05	0.002990592	0.00014971	0.000145689	1.60741E-05	1.50952E-05	1.60741E-05	1.50952E-05	1.60741E-05	1.60741E-05	0.000145689	1.24567E-05	0.000278227	1.24567E-05	4.6062E-05	5.64206E-06	5.64206E-06	3.07862E-08	6.04E-08	0	1.97E-09	9.32E-08	0.0931674
4840603754260	484060	3754260	0.001713551	1.44399E-05	0.002686546	0.000134489	0.000130877	1.44399E-05	1.35605E-05	1.44399E-05	1.35605E-05	1.44399E-05	1.44399E-05	0.000130877	1.11903E-05	0.000249941	1.11903E-05	4.1379E-05	5.06845E-06	5.06845E-06	2.76563E-08	5.43E-08	0	1.77E-09	8.37E-08	0.0836953
4840803754260	484080	3754260	0.001546395	1.30313E-05	0.002424474	0.00012137	0.00011811	1.30313E-05	1.22377E-05	1.30313E-05	1.22377E-05	1.30313E-05	1.30313E-05	0.00011811	1.00986E-05	0.000225559	1.00986E-05	3.73424E-05	4.57402E-06	4.57402E-06	2.49584E-08	4.9E-08	0	1.59E-09	7.55E-08	0.0755309
4841003754260	484100	3754260	0.001391924	1.17295E-05	0.002182291	0.000109246	0.000106312	1.17295E-05	1.10153E-05	1.17295E-05	1.10153E-05	1.17295E-05	1.17295E-05	0.000106312	9.08989E-06	0.000203028	9.08989E-06	3.36123E-05	4.11712E-06	4.11712E-06	2.24653E-08	4.41E-08	0	1.43E-09	6.8E-08	0.067986
4841203754260	484120	3754260	0.001282305	1.08058E-05	0.002010428	0.000100643	9.79394E-05	1.08058E-05	1.01478E-05	1.08058E-05	1.01478E-05	1.08058E-05	1.08058E-05	9.79394E-05	8.37403E-06	0.000187039	8.37403E-06	3.09652E-05	3.79288E-06	3.79288E-06	2.06961E-08	4.06E-08	0	1.32E-09	6.26E-08	0.0626319
4840003754280	484000	3754280	0.001931511	1.62766E-05	0.00302827	0.000151596	0.000147524	1.62766E-05	1.52854E-05	1.62766E-05	1.52854E-05	1.62766E-05	1.62766E-05	0.000147524	1.26136E-05	0.000281733	1.26136E-05	4.66423E-05	5.71314E-06	5.71314E-06	3.11741E-08	6.12E-08	0	1.99E-09	9.43E-08	0.0943412
4840203754280	484020	3754280	0.001876132	1.58099E-05	0.002941444	0.00014725	0.000143294	1.58099E-05	1.48471E-05	1.58099E-05	1.48471E-05	1.58099E-05	1.58099E-05	0.000143294	1.2252E-05	0.000273655	1.2252E-05	4.5305E-05	5.54934E-06	5.54934E-06	3.02803E-08	5.94E-08	0	1.93E-09	9.16E-08	0.0916363
4840403754280	484040	3754280	0.001686593	1.42127E-05	0.00264428	0.000132374	0.000128818	1.42127E-05	1.33472E-05	1.42127E-05	1.33472E-05	1.42127E-05	1.42127E-05	0.000128818	1.10142E-05	0.000246009	1.10142E-05	4.0728E-05	4.98871E-06	4.98871E-06	2.72212E-08	5.34E-08	0	1.74E-09	8.24E-08	0.0823786
4840603754280	484060	3754280	0.001381631	1.16428E-05	0.002166155	0.000108438	0.000105526	1.16428E-05	1.09338E-05	1.16428E-05	1.09338E-05	1.16428E-05	1.16428E-05	0.000105526	9.02267E-06	0.000201527	9.02267E-06	3.33637E-05	4.08668E-06	4.08668E-06	2.22992E-08	4.38E-08	0	1.42E-09	6.75E-08	0.0674833
4840803754280	484080	3754280	0.001106146	9.32134E-06	0.001734242	8.68168E-05	8.44848E-05	9.32134E-06	8.75371E-06	9.32134E-06	8.75371E-06	9.32134E-06	9.32134E-06	8.44848E-05	7.22363E-06	0.000161344	7.22363E-06	2.67113E-05	3.27183E-06	3.27183E-06	1.78529E-08	3.5E-08	0	1.14E-09	5.4E-08	0.0540277
4841003754280	484100	3754280	0.000924605	7.79152E-06	0.001449618	7.25684E-05	7.06192E-05	7.79152E-06	7.31705E-06	7.79152E-06	7.31705E-06	7.79152E-06	7.79152E-06	7.06192E-05	6.03809E-06	0.000134864	6.03809E-06	2.23274E-05	2.73485E-06	2.73485E-06	1.49229E-08	2.93E-08	0	9.53E-10	4.52E-08	0.0451607
4841203754280	484120	3754280	0.000901962	7.60071E-06	0.001414118	7.07912E-05	6.88897E-05	7.60071E-06	7.13786E-06	7.60071E-06	7.13786E-06	7.60071E-06	7.60071E-06	6.88897E-05	5.89022E-06	0.000131561	5.89022E-06	2.17807E-05	2.66788E-06	2.66788E-06	1.45574E-08	2.86E-08	0	9.3E-10	4.41E-08	0.0440547
4840003754300	484000	3754300	0.001744105	1.46973E-05	0.00273445	0.000136888	0.000133211	1.46973E-05	1.38023E-05	1.46973E-05	1.38023E-05	1.46973E-05	1.46973E-05	0.000133211	1.13898E-05	0.000254397	1.13898E-05	4.21168E-05	5.15882E-06	5.15882E-06	2.81494E-08	5.52E-08	0	1.8E-09	8.52E-08	0.0851877
4840203754300	484020	3754300	0.001671353	1.40843E-05	0.002620387	0.000131177	0.000127654	1.40843E-05	1.32266E-05	1.40843E-05	1.32266E-05	1.40843E-05	1.40843E-05	0.000127654	1.09147E-05	0.000243786	1.09147E-05	4.03599E-05	4.94363E-06	4.94363E-06	2.69752E-08	5.29E-08	0	1.72E-09	8.16E-08	0.0816342
4840403754300	484040	3754300	0.001365548	1.15073E-05	0.002140939	0.000107176	0.000104297	1.15073E-05	1.08065E-05	1.15073E-05	1.08065E-05	1.15073E-05	1.15073E-05	0.000104297	8.91764E-06	0.000199181	8.91764E-06	3.29754E-05	4.0391E-06	4.0391E-06	2.20396E-08	4.33E-08	0	1.41E-09	6.67E-08	0.0666977
4840603754300	484060	3754300	0.000948773	7.99518E-06	0.00148751	7.44653E-05	7.24651E-05	7.99518E-06	7.50831E-06	7.99518E-06	7.50831E-06	7.99518E-06	7.99518E-06	7.24651E-05	6.19592E-06	0.000138389	6.19592E-06	2.29111E-05	2.80634E-06	2.80634E-06	1.5313E-08	3.01E-08	0	9.78E-10	4.63E-08	0.0463411
4840803754300	484080	3754300	0.000693996	5.84821E-06	0.001088064	5.44689E-05	5.30058E-05	5.84821E-06	5.49208E-06	5.84821E-06	5.49208E-06	5.84821E-06	5.84821E-06	5.30058E-05	4.53211E-06	0.000101227	4.53211E-06	1.67587E-05	2.05275E-06	2.05275E-06	1.12009E-08	2.2E-08	0	7.15E-10	3.39E-08	0.033897
4841003754300	484100	3754300	0.000565269	4.76344E-06	0.000886242	4.43656E-05	4.31739E-05	4.76344E-06	4.47337E-06	4.76344E-06	4.47337E-06	4.76344E-06	4.76344E-06	4.31739E-05	3.69146E-06	8.24508E-05	3.69146E-06	1.36501E-05	1.67199E-06	1.67199E-06	9.12329E-09	1.79E-08	0	5.83E-10	2.76E-08	0.0276095
4841203754300	484120	3754300	0.000550624	4.64003E-06	0.000863281	4.32162E-05	4.20553E-05	4.64003E-06	4.35747E-06	4.64003E-06	4.35747E-06	4.64003E-06	4.64003E-06	4.20553E-05	3.59582E-06	8.03147E-05	3.59582E-06	1.32965E-05	1.62867E-06	1.62867E-06	8.88692E-09	1.74E-08	0	5.68E-10	2.69E-08	0.0268942

Pettit Tank and Pipeline Construction HRA

Residential Health Risk Assessment Results Summary

Phase 1 + Phase 2

EXISTING RESIDENTIAL RECEPTORS ONLY — **MAX:** **7.41**

FOR CHRONIC CALCS — **MAX:** **0.265**

Unique Identifier	X (UTM)	Y (UTM)	Total Risk	Overlapping Phases - Maximum GLC 2026	2027	2045
483702.433753999.04	483702.43	3753999.04	4.882	0.159	0.053	0.042
483694.263753916.12	483694.26	3753916.12	3.383	0.108	0.041	0.024
483697.73753861.82	483697.7	3753861.82	2.923	0.092	0.037	0.019
483584.93753882.87	483584.9	3753882.87	1.875	0.111	0.026	0.015
483549.823753855.91	483549.82	3753855.91	1.571	0.085	0.022	0.012
483515.523753852.37	483515.52	3753852.37	1.403	0.067	0.019	0.010
483339.193753860.79	483339.19	3753860.79	0.874	0.045	0.012	0.006
483124.173753854.26	483124.17	3753854.26	0.573	0.031	0.008	0.004
483070.493753861.97	483070.49	3753861.97	0.488	0.071	0.010	0.006
483954.733753733.9	483954.73	3753733.9	7.412	0.265	0.125	0.031
483977.613753750.69	483977.61	3753750.69	6.373	0.244	0.097	0.034
484012.023753748.78	484012.02	3753748.78	5.490	0.228	0.077	0.035
484038.993753749.36	484038.99	3753749.36	5.113	0.205	0.067	0.033
484074.893753746.12	484074.89	3753746.12	4.646	0.181	0.057	0.030
483951.713753696.43	483951.71	3753696.43	7.192	0.218	0.124	0.023
483951.593753657.88	483951.59	3753657.88	6.805	0.205	0.120	0.020
483950.463753618.15	483950.46	3753618.15	6.570	0.205	0.119	0.017
483946.613753587.64	483946.61	3753587.64	6.766	0.197	0.125	0.015
483960.333753539.03	483960.33	3753539.03	5.259	0.163	0.096	0.013
483980.253753458.18	483980.25	3753458.18	3.965	0.134	0.072	0.011
484041.353753435.67	484041.35	3753435.67	2.749	0.106	0.045	0.012
484049.623753516.7	484049.62	3753516.7	3.007	0.107	0.046	0.014
484003.093753540.22	484003.09	3753540.22	3.730	0.121	0.061	0.014
484067.243753589.88	484067.24	3753589.88	3.271	0.111	0.046	0.017
484033.573753592.07	484033.57	3753592.07	3.577	0.110	0.052	0.016
484006.163753595.1	484006.16	3753595.1	3.986	0.129	0.063	0.017
484000.573753691.15	484000.57	3753691.15	4.941	0.159	0.073	0.024
484038.563753695.15	484038.56	3753695.15	4.445	0.147	0.059	0.025
484066.343753695.82	484066.34	3753695.82	4.180	0.134	0.053	0.024
484100.923753692.13	484100.92	3753692.13	3.843	0.125	0.046	0.022
4836593753057.49	483659	3753057.49	0.668	0.022	0.011	0.002
484038.613752969.05	484038.61	3752969.05	1.600	0.047	0.029	0.004
484056.443752967.39	484056.44	3752967.39	1.502	0.175	0.035	0.013
484083.423752968.02	484083.42	3752968.02	1.390	0.116	0.028	0.009
483468.163753775.07	483468.16	3753775.07	1.087	0.082	0.017	0.009
483414.963753768.2	483414.96	3753768.2	0.943	0.064	0.014	0.008
483321.053753785.73	483321.05	3753785.73	0.777	0.051	0.011	0.006
483885.393754561.24	483885.39	3754561.24	2.918	0.119	0.030	0.015

Pettit Tank and Pipeline Construction HRA

Maximum Individual Non-Cancer Impact Calculations - Sensitive Receptors (Maximum Impacted Senior Residential Receptor) (IMPACT AT ALL OTHER LOCATIONS ON THE PROJECT SITE WOULD BE LESS THAN SHOWN)

Maximum Non-cancer Chronic Hazards / Toxicological Endpoints*

Phase 1 + Phase 2

Receptor Group	Pollutant	CREL[1]	CONC	WFrac	$CONC_{WF}$	HI		ALIM	BN	CVS	DEV	ENDC	EYE	HEM	IMMUN	KIDN	NS	REPRO	RESP	SK
Project:																				
MEI - Max	DPM	5.00E+00	2.65E-01	1.00E+00	2.65E-01	5.30E-02		-	-	-	-	-	-	-	-	-	-	-	5.30E-02	-
							Total Risk				-			-				-	0.053	
							Threshold				1.00			1.00				1.00	1.00	
							Over?				NO			NO				NO	NO	

Notes:

1. California Air Resources Board, "Consolidated Table of OEHHA/ARB Approved Risk Assessment Health Values," "OEHHA/ARB Approved Chronic Reference Exposure Levels and Target Organs," "OEHHA/ARB Approved Acute Reference Exposure Levels and Target Organs," and "OEHHA/ARB Approved 8-Hour Reference Exposure Levels and Target Organs," http://www.arb.ca.gov/toxics/healthval/healthval.htm. Tables last updated: May 8, 2018. Downloaded: 08/14/18.

Source: ESA, 2020

Where:

$CONC_{WF}$	Pollutant Concentration ($\mu g/m^3$) multiplied by the weight fraction
CREL	Chronic Reference Exposure Level
HI	Hazard Index
MEI	Maximally Exposed Individual
WFrac	Weight fraction of speciated component

* Key to Toxicological Endpoints

ALIM	Alimentary Tract	EYE	Eye	NS	Nervous System
BN	Bone	HEM	Hematologic System	REPRO	Reproductive System
CVS	Cardiovascular System	IMMUN	Immune System	RESP	Respiratory System
DEV	Developmental System	KIDN	Kidney	SK	Skin
ENDC	Endocrine System				

Appendix AQ/GHG/Energy-2F Construction Health Risk Assessment Phase 2

ESA

Pettit Tank and Pipeline Construction HRA

Health Risk Assessment Exposure Duration Assumptions for Offroad Equipment and Haul Activities (Residential Receptors)

OFFROAD

					Start Date	*1/1/2045*	*4/2/2045*	*4/3/2047*	*3/31/2061*	
					End Date	*4/1/2045*	*4/2/2047*	*3/30/2061*	*3/28/2075*	
					Days	*90*	*730*	*5110*	*5110*	
Phase		Start Date	End Date	Hrs/Day	Duration (days)	3rd Tri	0<2	2<16	16<30	
Grading/Excavation	2026	5/1/2026	6/30/2026	13	61	0	0	0	0	Phase 1
Potholding	2026	5/1/2026	5/31/2026	13	31	0	0	0	0	Phase 1
Stormwater Drainage and Foundation Concrete	2026	7/1/2026	8/31/2026	14	62	0	0	0	0	Phase 1
Construction	2026	9/1/2026	12/31/2026	15	122	0	0	0	0	Phase 1
Construction	2027	1/1/2027	2/28/2027	16	59	0	0	0	0	Phase 1
Finishing	2026	9/1/2026	12/31/2026	17	122	0	0	0	0	Phase 1
Finishing	2027	1/1/2027	2/28/2027	18	59	0	0	0	0	Phase 1
Painting	2026	9/1/2026	12/31/2026	19	122	0	0	0	0	Phase 1
Painting	2027	1/1/2027	2/28/2027	20	59	0	0	0	0	Phase 1
Installing Pipeline	2026	10/1/2026	11/30/2026	21	61	0	0	0	0	Phase 1
Install Appurtenances	2026	12/1/2026	12/31/2026	22	31	0	0	0	0	Phase 1
Pavement Repairs	2027	1/1/2027	1/31/2027	23	31	0	0	0	0	Phase 1
Demolition	2045	1/1/2045	1/31/2045	24	31	31	0	0	0	Phase 2
Grading/Excavation	2045	2/1/2045	3/31/2045	25	59	59	0	0	0	Phase 2
Stormwater Drainage and Foundation Concrete	2045	4/1/2045	4/30/2045	26	30	0	29	0	0	Phase 2
Construction	2045	5/1/2045	10/31/2045	27	184	0	184	0	0	Phase 2
Finishing	2045	5/1/2045	10/31/2045	28	184	0	184	0	0	Phase 2
Painting	2045	5/1/2045	10/31/2045	13	184	0	184	0	0	Phase 2

Notes:

Hours per day provided in Project Description, 7 AM - 8 PM, Monday through Saturday.

Risk Factors

	Abbreviation	UOM	3rd Trimester	0<2	2<16	16<30
Daily Breathing Rate (95th %'ile)	DBR	L/kg-day	361	1090	572	261
Fraction Of Time At Home [a]	FAH	unitless	1	1	1	0.73
Exposure Frequency	EF	days/year	0.96	0.96	0.96	0.96
Age Sensitivity Factor	ASF	unitless	10	10	3	1
Inhalation Absorption Factor	A	unitless	1	1	1	1
Conversion Factor	CF_1	m^3/L	0.001	0.001	0.001	0.001
Conversion Factor	CF_2	$\mu g/m^3$	0.001	0.001	0.001	0.001
Cancer Potency Factor (diesel exhaust)	CPF	$mg/kg\text{-}day^{-1}$	1.1	1.1	1.1	1.1
Averaging Time (for residential exposure)	AT	years	70.00	70.00	70.00	70.00

[a] assume school or daycare will have cancer risk of >1 per million

Intake Factor for Inhalation, IF (m^3/kg-day) / Risk Calculation Part 1, R1

Phase	Year	Equation	3rd Trimester	0<2	2<16	16<30	Equation	3rd Trimester	0<2	2<16	16<30
Grading/Excavation	2026	$\frac{DBR \cdot FAH \cdot EF \cdot ED \cdot ASF \cdot A \cdot CF_1}{AT}$	0	0	0	0	$IF \cdot CPF \cdot CF_2$	0	0	0	0
Potholding	2026		0	0	0	0		0	0	0	0
Stormwater Drainage and Foundation	2026		0	0	0	0		0	0	0	0
Construction	2026		0	0	0	0		0	0	0	0
Construction	2027		0	0	0	0		0	0	0	0
Finishing	2026		0	0	0	0		0	0	0	0
Finishing	2027		0	0	0	0		0	0	0	0
Painting	2026		0	0	0	0		0	0	0	0
Painting	2027		0	0	0	0		0	0	0	0
Installing Pipeline	2026		0	0	0	0		0	0	0	0
Install Appurtenances	2026		0	0	0	0		0	0	0	0
Pavement Repairs	2027		0	0	0	0		0	0	0	0
Demolition	2045	$\frac{DBR \cdot FAH \cdot EF \cdot ED \cdot ASF \cdot A \cdot CF_1}{AT}$	0.004200038	0	0	0	$IF \cdot CPF \cdot CF_2$	4.62004E-06	0	0	0
Grading/Excavation	2045		0.00799362	0	0	0		8.79298E-06	0	0	0
Stormwater Drainage and Foundation	2045		0	0.011863389	0	0		0	1.30497E-05	0	0
Construction	2045		0	0.075271158	0	0		0	8.27983E-05	0	0
Finishing	2045		0	0.075271158	0	0		0	8.27983E-05	0	0
Painting	2045		0	0.075271158	0	0		0	8.27983E-05	0	0

Pettit Tank and Pipeline Construction HRA

Offroad DPM Emissions, Ground Level Concentrations and Health Risk Calculations
Residential Receptors (Phase 2 Only Future Hypothetical Receptors)

Phase		Start Date	End Date	Work Days	Emissions (lbs/day)	Emissions (lbs/yr)	Emissions (g/s)	
Grading/Excavation	2026	5/1/2026	6/30/2026	43	n/a	n/a	n/a	Phase 1
Potholding	2026	5/1/2026	5/31/2026	21	n/a	n/a	n/a	Phase 1
Stormwater Drainage and Foundation	2026	7/1/2026	8/31/2026	44	n/a	n/a	n/a	Phase 1
Construction	2026	9/1/2026	12/31/2026	88	n/a	n/a	n/a	Phase 1
Construction	2027	1/1/2027	2/28/2027	41	n/a	n/a	n/a	Phase 1
Finishing	2026	9/1/2026	12/31/2026	88	n/a	n/a	n/a	Phase 1
Finishing	2027	1/1/2027	2/28/2027	41	n/a	n/a	n/a	Phase 1
Painting	2026	9/1/2026	12/31/2026	88	n/a	n/a	n/a	Phase 1
Painting	2027	1/1/2027	2/28/2027	41	n/a	n/a	n/a	Phase 1
Installing Pipeline	2026	10/1/2026	11/30/2026	43	n/a	n/a	n/a	Phase 1
Install Appurtenances	2026	12/1/2026	12/31/2026	23	n/a	n/a	n/a	Phase 1
Pavement Repairs	2027	1/1/2027	1/31/2027	21	n/a	n/a	n/a	Phase 1
Demolition	2045	1/1/2045	1/31/2045	22	0.11	2.5	1.08E-03	Phase 2
Grading/Excavation	2045	2/1/2045	3/31/2045	43	0.30	13.0	2.93E-03	Phase 2
Stormwater Drainage and Foundation	2045	4/1/2045	4/30/2045	20	0.08	1.5	7.35E-04	Phase 2
Construction	2045	5/1/2045	10/31/2045	132	0.05	6.1	4.47E-04	Phase 2
Finishing	2045	5/1/2045	10/31/2045	132	0.05	6.2	4.56E-04	Phase 2
Painting	2045	5/1/2045	10/31/2045	132	0.02	2.5	1.85E-04	Phase 2

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
																					Res MAX:	6.29			6.10179	
AERMOD Column Identifier:			4	4	4	4	4	4	4	4	4	6	6	6	5	5	5	5	5	5						
			Grading/Excavation	Potholding	Stormwater Drainage and Foundation Concrete	Construction	Construction	Finishing	Finishing	Painting	Painting	Installing Pipeline	Install Appurtenances	Pavement Repairs	Demolition	Grading/Excavation	Stormwater Drainage and Foundation	Construction	Finishing	Painting	Maximum Individual Cancer Risk (MICR)					
Unique Identifier	X (UTM)	Y (UTM)	2026	2026	2026	2026	2027	2026	2027	2026	2027	2026	2026	2027	2045	2045	2045	2045	2045	2045	3rd Trimester	0<2	2<16	16<30	Total	per million
483702.433753999.04	483702.43	3753999.04	0	0	0	0	0	0	0	0	0	0	0	0	0.007817417	0.021137791	0.00530018	0.003223461	0.00328639	0.00133553	2.2198E-07	7.19E-07	0	0	9.41E-07	0.940731
483694.263753916.12	483694.26	3753916.12	0	0	0	0	0	0	0	0	0	0	0	0	0.004451244	0.012035877	0.003017927	0.001835441	0.00187127	0.00076045	1.264E-07	4.09E-07	0	0	5.36E-07	0.535653
483697.73753861.82	483697.7	3753861.82	0	0	0	0	0	0	0	0	0	0	0	0	0.003452143	0.009334374	0.002340541	0.001423469	0.00145126	0.00058977	9.8026E-08	3.17E-07	0	0	4.15E-07	0.415424
483584.93753882.87	483584.9	3753882.87	0	0	0	0	0	0	0	0	0	0	0	0	0.002164194	0.005851841	0.001467316	0.000892391	0.00090981	0.00036973	6.1454E-08	1.99E-07	0	0	2.6E-07	0.260435
483549.823753855.91	483549.82	3753855.91	0	0	0	0	0	0	0	0	0	0	0	0	0.001742033	0.004710345	0.001181092	0.000718316	0.00073234	0.00029761	4.9466E-08	1.6E-07	0	0	2.1E-07	0.209633
483515.523753852.37	483515.52	3753852.37	0	0	0	0	0	0	0	0	0	0	0	0	0.001525762	0.004125562	0.001034461	0.000629138	0.00064142	0.00026066	4.3325E-08	1.4E-07	0	0	1.84E-07	0.183607
483339.193753860.79	483339.19	3753860.79	0	0	0	0	0	0	0	0	0	0	0	0	0.000883277	0.002388324	0.000598859	0.000364214	0.00037132	0.0001509	2.5081E-08	8.12E-08	0	0	1.06E-07	0.106292
483124.173753854.26	483124.17	3753854.26	0	0	0	0	0	0	0	0	0	0	0	0	0.000564717	0.001526957	0.000382876	0.000232857	0.0002374	9.6477E-05	1.6036E-08	5.19E-08	0	0	6.8E-08	0.067957
483070.493753861.97	483070.49	3753861.97	0	0	0	0	0	0	0	0	0	0	0	0	0.000472688	0.001278119	0.000320481	0.00019491	0.00019872	8.0754E-05	1.3422E-08	4.35E-08	0	0	5.69E-08	0.056882
483954.733753733.9	483954.73	3753733.9	0	0	0	0	0	0	0	0	0	0	0	0	0.005007845	0.013540889	0.003395301	0.002064952	0.00210527	0.00085554	1.422E-07	4.6E-07	0	0	6.03E-07	0.602633
483977.613753750.69	483977.61	3753750.69	0	0	0	0	0	0	0	0	0	0	0	0	0.005657925	0.015298665	0.003836053	0.002333009	0.00237856	0.0009666	1.6066E-07	5.2E-07	0	0	6.81E-07	0.680863
484012.023753748.78	484012.02	3753748.78	0	0	0	0	0	0	0	0	0	0	0	0	0.005668187	0.015326412	0.00384301	0.00233724	0.00238287	0.00096836	1.6095E-07	5.21E-07	0	0	6.82E-07	0.682098
484038.993753749.36	484038.99	3753749.36	0	0	0	0	0	0	0	0	0	0	0	0	0.005544356	0.01499158	0.003759053	0.002286179	0.00233081	0.0009472	1.5744E-07	5.1E-07	0	0	6.67E-07	0.667196
484074.893753746.12	484074.89	3753746.12	0	0	0	0	0	0	0	0	0	0	0	0	0.005085537	0.013750964	0.003447976	0.002096988	0.00213793	0.00086882	1.4441E-07	4.68E-07	0	0	6.12E-07	0.611983
483951.713753696.43	483951.71	3753696.43	0	0	0	0	0	0	0	0	0	0	0	0	0.004120472	0.01114149	0.002793665	0.00169905	0.00173222	0.00070394	1.17E-07	3.79E-07	0	0	4.96E-07	0.495849
483951.593753657.88	483951.59	3753657.88	0	0	0	0	0	0	0	0	0	0	0	0	0.003440463	0.009302789	0.002332621	0.001418652	0.00144635	0.00058777	9.7694E-08	3.16E-07	0	0	4.14E-07	0.414018
483950.463753618.15	483950.46	3753618.15	0	0	0	0	0	0	0	0	0	0	0	0	0.002894698	0.007827076	0.001962595	0.00119361	0.00121691	0.00049453	8.2197E-08	2.66E-07	0	0	3.48E-07	0.348342
483946.613753587.64	483946.61	3753587.64	0	0	0	0	0	0	0	0	0	0	0	0	0.002541625	0.006872391	0.001723213	0.001048023	0.00106848	0.00043421	7.2171E-08	2.34E-07	0	0	3.06E-07	0.305854
483960.333753539.03	483960.33	3753539.03	0	0	0	0	0	0	0	0	0	0	0	0	0.002196192	0.005938362	0.00148901	0.000905585	0.00092326	0.0003752	6.2362E-08	2.02E-07	0	0	2.64E-07	0.264285
483980.253753458.18	483980.25	3753458.18	0	0	0	0	0	0	0	0	0	0	0	0	0.00175652	0.004749518	0.001190914	0.00072429	0.00073843	0.00030009	4.9878E-08	1.61E-07	0	0	2.11E-07	0.211376
484041.353753435.67	484041.35	3753435.67	0	0	0	0	0	0	0	0	0	0	0	0	0.001814665	0.004906737	0.001230336	0.000748265	0.00076287	0.00031002	5.1529E-08	1.67E-07	0	0	2.18E-07	0.218373
484049.623753516.7	484049.62	3753516.7	0	0	0	0	0	0	0	0	0	0	0	0	0.002360462	0.006382538	0.001600385	0.000973321	0.00099232	0.00040326	6.7027E-08	2.17E-07	0	0	2.84E-07	0.284053
484003.093753540.22	484003.09	3753540.22	0	0	0	0	0	0	0	0	0	0	0	0	0.00239012	0.00646273	0.001620493	0.00098555	0.00100479	0.00040833	6.7869E-08	2.2E-07	0	0	2.88E-07	0.287622
484067.243753589.88	484067.24	3753589.88	0	0	0	0	0	0	0	0	0	0	0	0	0.003046713	0.008238115	0.00206566	0.001256292	0.00128082	0.0005205	8.6514E-08	2.8E-07	0	0	3.67E-07	0.366635
484033.573753592.07	484033.57	3753592.07	0	0	0	0	0	0	0	0	0	0	0	0	0.002998385	0.00810744	0.002032894	0.001236365	0.0012605	0.00051225	8.5141E-08	2.76E-07	0	0	3.61E-07	0.360819
484006.163753595.1	484006.16	3753595.1	0	0	0	0	0	0	0	0	0	0	0	0	0.002928809	0.00791931	0.001985722	0.001207675	0.00123125	0.00050036	8.3166E-08	2.69E-07	0	0	3.52E-07	0.352447
484000.573753691.15	484000.57	3753691.15	0	0	0	0	0	0	0	0	0	0	0	0	0.004348467	0.011757974	0.002948245	0.001793062	0.00182807	0.0007429	1.2348E-07	4E-07	0	0	5.23E-07	0.523285
484038.563753695.15	484038.56	3753695.15	0	0	0	0	0	0	0	0	0	0	0	0	0.004499723	0.012166962	0.003050796	0.001855431	0.00189165	0.00076874	1.2777E-07	4.14E-07	0	0	5.41E-07	0.541487
484066.343753695.82	484066.34	3753695.82	0	0	0	0	0	0	0	0	0	0	0	0	0.004418618	0.011947657	0.002995807	0.001821988	0.00185756	0.00075488	1.2547E-07	4.06E-07	0	0	5.32E-07	0.531727
484100.923753692.13	484100.92	3753692.13	0	0	0	0	0	0	0	0	0	0	0	0	0.004119605	0.011139146	0.002793077	0.001698692	0.00173186	0.0007038	1.1698E-07	3.79E-07	0	0	4.96E-07	0.495744
4836593753057.49	483659	3753057.49	0	0	0	0	0	0	0	0	0	0	0	0	0.000417924	0.001130041	0.000283351	0.000172328	0.00017569	7.1399E-05	1.1867E-08	3.84E-08	0	0	5.03E-08	0.050292
484038.613752969.05	484038.61	3752969.05	0	0	0	0	0	0	0	0	0	0	0	0	0.000641748	0.001735245	0.000435103	0.000264621	0.00026979	0.00010964	1.8223E-08	5.9E-08	0	0	7.72E-08	0.077227
484056.443752967.39	484056.44	3752967.39	0	0	0	0	0	0	0	0	0	0	0	0	0.000653071	0.001765863	0.00044278	0.00026929	0.00027455	0.00011157	1.8544E-08	6E-08	0	0	7.86E-08	0.078589
484083.423752968.02	484083.42	3752968.02	0	0	0	0	0	0	0	0	0	0	0	0	0.000673421	0.001820887	0.000456577	0.000277681	0.0002831	0.00011505	1.9122E-08	6.19E-08	0	0	8.1E-08	0.081038
483468.163753775.07	483468.16	3753775.07	0	0	0	0	0	0	0	0	0	0	0	0	0.001118662	0.003024791	0.000758449	0.000461273	0.00047028	0.00019111	3.1765E-08	1.03E-07	0	0	1.35E-07	0.134617
483414.963753768.2	483414.96	3753768.2	0	0	0	0	0	0	0	0	0	0	0	0	0.000960753	0.002597814	0.000651387	0.00039616	0.00040389	0.00016414	2.7281E-08	8.83E-08	0	0	1.16E-07	0.115615
483321.053753785.73	483321.05	3753785.73	0	0	0	0	0	0	0	0	0	0	0	0	0.000779861	0.002108693	0.000528743	0.00032157	0.00032785	0.00013323	2.2145E-08	7.17E-08	0	0	9.38E-08	0.093847
483885.393754561.24	483885.39	3754561.24	0	0	0	0	0	0	0	0	0	0	0	0	0.00258408	0.006987185	0.001751997	0.001065528	0.00108633	0.00044147	7.3377E-08	2.38E-07	0	0	3.11E-07	0.310963
4839203753820	483920	3753820	0	0	0	0	0	0	0	0	0	0	0	0	0.007794824	0.021076702	0.005284863	0.003214145	0.00327689	0.00133167	2.2134E-07	7.17E-07	0	0	9.38E-07	0.938013
4839403753820	483940	3753820	0	0	0	0	0	0	0	0	0	0	0	0	0.008159328	0.022062298	0.005531995	0.003364446	0.00343013	0.00139395	2.3169E-07	7.5E-07	0	0	9.82E-07	0.981876
4839603753820	483960	3753820	0	0	0	0	0	0	0	0	0	0	0	0	0.008343352	0.022559886	0.005656763	0.003440327	0.00350749	0.00142538	2.3692E-07	7.67E-07	0	0	1E-06	1.004021
4839803753820	483980	3753820	0	0	0	0	0	0	0	0	0	0	0	0	0.008326155	0.022513388	0.005645104	0.003433236	0.00350026	0.00142245	2.3643E-07	7.66E-07	0	0	1E-06	1.001952
4840003753820	484000	3753820	0	0	0	0	0	0	0	0	0	0	0	0	0.00810697	0.021920724	0.005496496	0.003342856	0.00340812	0.001385	2.302E-07	7.45E-07	0	0	9.76E-07	0.975576
4840203753820	484020	3753820	0	0	0	0	0	0	0	0	0	0	0	0	0.007712396	0.020853823	0.005228977	0.003180156	0.00324224	0.00131759	2.19E-07	7.09E-07	0	0	9.28E-07	0.928093
4840403753820	484040	3753820	0	0	0	0	0	0	0	0	0	0	0	0	0.007182506	0.019421033	0.004869713	0.002961659	0.00301948	0.00122706	2.0395E-07	6.6E-07	0	0	8.64E-07	0.864328
4840603753820	484060	3753820	0	0	0	0	0	0	0	0	0	0	0	0	0.006570134	0.017765218	0.004454527	0.002709152	0.00276204	0.00112245	1.8656E-07	6.04E-07	0	0	7.91E-07	0.790636
4840803753820	484080	3753820	0	0	0	0	0	0	0	0	0	0	0	0	0.005925514	0.016022209	0.004017477	0.002443347	0.00249105	0.00101232	1.6826E-07	5.45E-07	0	0	7.13E-07	0.713064
4841003753820	484100	3753820	0	0	0	0	0	0	0	0	0	0	0	0	0.005288816	0.014300617	0.003585798	0.002180809	0.00222338	0.00090355	1.5018E-07	4.86E-07	0	0	6.36E-07	0.636445
4841203753820	484120	3753820	0	0	0	0	0	0	0	0	0	0	0	0	0.00468093	0.012656932	0.003173654	0.001930151	0.00196783	0.00079969	1.3292E-07	4.3E-07	0	0	5.63E-07	0.563293
4839203753840	483920	3753840	0	0	0	0	0	0	0	0	0	0	0	0	0.009009112	0.024360058	0.006108146	0.003714848	0.00378737	0.00153912	2.5582E-07	8.28E-07	0	0	1.08E-06	1.084137
4839403753840	483940	3753840	0	0	0	0	0	0	0	0	0	0	0	0	0.009368946	0.025333026	0.006352112	0.003863224	0.00393864	0.0016006	2.6604E-07	8.61E-07	0	0	1.13E-06	1.127439
4839603753840	483960	3753840	0	0	0	0	0	0	0	0	0	0	0	0	0.009487056	0.025652387	0.00643219	0.003911925	0.0039883	0.00162078	2.6939E-07	8.72E-07	0	0	1.14E-06	1.141652
4839803753840	483980	3753840	0	0	0	0	0	0	0	0	0	0	0	0	0.009343948	0.025265433	0.006335163	0.003852916	0.00392814	0.00159633	2.6533E-07	8.59E-07	0	0	1.12E-06	1.124431
4840003753840	484000	3753840	0	0	0	0	0	0	0	0	0	0	0	0	0.008954478	0.024212332	0.006071104	0.003692321	0.0037644	0.00152979	2.5427E-07	8.23E-07	0	0	1.08E-06	1.077563
4840203753840	484020	3753840	0	0	0	0	0	0	0	0	0	0	0	0	0.008360678	0.022606735	0.00566851	0.003447471	0.00351478	0.00142834	2.3741E-07	7.69E-07	0	0	1.01E-06	1.006106
4840403753840	484040	3753840	0	0	0	0	0	0	0	0	0	0	0	0	0.007633371	0.020640144	0.005175398	0.003147571	0.00320902	0.00130409	2.1675E-07	7.02E-07	0	0	9.19E-07	0.918584
4840603753840	484060	3753840	0	0	0	0	0	0	0	0	0	0	0	0	0.006851603	0.018526294	0.004645363	0.002825214	0.00288037	0.00117053	1.9456E-07	6.3E-07	0	0	8.25E-07	0.824507
4840803753840	484080	3753840	0	0	0	0	0	0	0	0	0	0	0	0	0.006073899	0.016423432	0.004118082	0.002504533	0.00255343	0.00103767	1.7247E-07	5.58E-07	0	0	7.31E-07	0.73092
4841003753840	484100	3753840	0	0	0	0	0	0	0	0	0	0	0	0	0.00533827	0.014434339	0.003619328	0.002201201	0.00224417	0.00091199	1.5158E-07	4.91E-07	0	0	6.42E-07	0.642396
4841203753840	484120	3753840	0	0	0	0	0	0	0	0	0	0	0	0	0.004660548	0.01260182	0.003159835	0.001921746	0.00195926	0.00079621	1.3234E-07	4.29E-07	0	0	5.61E-07	0.56084
4839203753860	483920	3753860	0	0	0	0	0	0	0	0	0	0	0	0	0.010516312	0.02843543	0.007130022	0.004336333	0.00442099	0.00179662	2.9862E-07	9.67E-07	0	0	1.27E-06	1.265511
4839403753860	483940	3753860	0	0	0	0	0	0	0	0	0	0	0	0	0.010835458	0.02929838	0.007346402	0.00446793	0.00455516	0.00185114	3.0768E-07	9.96E-07	0	0	1.3E-06	1.303916
4839603753860	483960	3753860	0	0	0	0	0	0	0	0	0	0	0	0	0.010822867	0.029264334	0.007337865	0.004462738	0.00454986	0.00184899	3.0732E-07	9.95E-07	0	0	1.3E-06	1.302401
4839803753860	483980	3753860	0	0	0	0	0	0	0	0	0	0	0	0	0.010466706	0.028301299	0.007096389	0.004315878	0.00440014	0.00178814	2.9721E-07	9.62E-07	0	0	1.26E-06	1.259541
4840003753860	484000	3753860	0	0	0	0	0	0	0	0	0	0	0	0	0.009825305	0.026566991	0.006661521	0.0040514	0.00413049	0.00167856	2.79E-07	9.03E-07	0	0	1.18E-06	1.182356
4840203753860	484020	3753860	0	0	0	0	0	0	0	0	0	0	0	0	0.008981817	0.024286254	0.006089639	0.003703593	0.0037759	0.00153446	2.5504E-07	8.26E-07	0	0	1.08E-06	1.080853
4840403753860	484040	3753860	0	0	0	0	0	0	0	0	0	0	0	0	0.00803035	0.021713549	0.005444549	0.003311262	0.00337591	0.00137191	2.2803E-07	7.38E-07	0	0	9.66E-07	0.966355
4840603753860	484060	3753860	0	0	0	0	0	0	0	0	0	0	0	0	0.007069565	0.019115648	0.00479314	0.002915089	0.002972	0.00120777	2.0075E-07	6.5E-07	0	0	8.51E-07	0.850736
4840803753860	484080	3753860	0	0	0	0	0	0	0	0	0	0	0	0	0.006153098	0.01663758	0.004171778	0.00253719	0.00258672	0.0010512	1.7472E-07	5.66E-07	0	0	7.4E-07	0.740451
4841003753860	484100	3753860	0	0	0	0	0	0	0	0	0	0	0	0	0.005321876	0.014390009	0.003608213	0.002194441	0.00223728	0.00090919	1.5112E-07	4.89E-07	0	0	6.4E-07	0.640423
4841203753860	484120	3753860	0	0	0	0	0	0	0	0	0	0	0	0	0.004586648	0.012402	0.003109731	0.001891274	0.0019282	0.00078359	1.3024E-07	4.22E-07	0	0	5.52E-07	0.551947
4839203753880	483920	3753880	0	0	0	0	0	0	0	0	0	0	0	0	0.012384191	0.033486056	0.008396437	0.00510654	0.00520623	0.00211573	3.5166E-07	1.14E-06	0	0	1.49E-06	1.490287
4839403753880	483940	3753880	0	0	0	0	0	0	0	0	0	0	0	0	0.012609694	0.034095802	0.008549328	0.005199525	0.00530103	0.00215425	3.5806E-07	1.16E-06	0	0	1.52E-06	1.517424
4839603753880	483960	3753880	0	0	0	0	0	0	0	0	0	0	0	0	0.012372478	0.033454383	0.008388496	0.00510171	0.00520131	0.00211372	3.5133E-07	1.14E-06	0	0	1.49E-06	1.488878
4839803753880	483980	3753880	0	0	0	0	0	0	0	0	0	0	0	0	0.011695687	0.031624385	0.007929634	0.00482264	0.00491679	0.0019981	3.3211E-07	1.08E-06	0	0	1.41E-06	1.407434
4840003753880	484000	3753880	0	0	0	0	0	0	0	0	0	0	0	0	0.010712829	0.028966801	0.00726326	0.004417365	0.0045036	0.00183019	3.042E-07	9.85E-07	0	0	1.29E-06	1.289159
4840203753880	484020	3753880	0	0	0	0	0	0	0	0	0	0	0	0	0.009548007	0.025817195	0.006473514	0.003937058	0.00401392	0.00163119	2.7112E-07	8.78E-07	0	0	1.15E-06	1.148987
4840403753880	484040	3753880	0	0	0	0	0	0	0	0	0	0	0	0	0.008345432	0.022565512	0.005658173	0.003441185	0.00350837	0.00142574	2.3697E-07	7.67E-07	0	0	1E-06	1.004272
4840603753880	484060	3753880	0	0	0	0	0	0	0	0	0	0	0	0	0.007192605	0.01944834	0.00487656	0.002965824	0.00302372	0.00122879	2.0424E-07	6.61E-07	0	0	8.66E-07	0.865543
4840803753880	484080	3753880	0	0	0	0	0	0	0	0	0	0	0	0	0.006145296	0.016616485	0.004166489	0.002533973	0.00258344	0.00104987	1.745E-07	5.65E-07	0	0	7.4E-07	0.739512
4841003753880	484100	3753880	0	0	0	0	0	0	0	0	0	0	0	0	0.005237324	0.014161388	0.003550887	0.002159576	0.00220174	0.00089475	1.4872E-07	4.82E-07	0	0	6.3E-07	0.630248
4841203753880	484120	3753880	0	0	0	0	0	0	0	0	0	0	0	0	0.004458038	0.012054248	0.003022534	0.001838243	0.00187413	0.00076161	1.2659E-07	4.1E-07	0	0	5.36E-07	0.536471
4839203753900	483920	3753900	0	0	0	0	0	0	0	0	0	0	0	0	0.014721866	0.039806977	0.009981372	0.006070465	0.00618898	0.0025151	4.1804E-07	1.35E-06	0	0	1.77E-06	1.771598
4839403753900	483940	3753900	0	0	0	0	0	0	0	0	0	0	0	0	0.01473423	0.039840408	0.009989755	0.006075563	0.00619418	0.00251721	4.1839E-07	1.35E-06	0	0	1.77E-06	1.773086
4839603753900	483960	3753900	0	0	0	0	0	0	0	0	0	0	0	0	0.014135727	0.038222096	0.009583972	0.005828775	0.00594257	0.00241496	4.0139E-07	1.3E-06	0	0	1.7E-06	1.701063
4839803753900	483980	3753900	0	0	0	0	0	0	0	0	0	0	0	0	0.012998384	0.035146793	0.008812858	0.005359799	0.00546444	0.00222065	3.691E-07	1.2E-06	0	0	1.56E-06	1.564198
4840003753900	484000	3753900	0	0	0	0	0	0	0	0	0	0	0	0	0.011569895	0.03128425	0.007844347	0.004770771	0.00486391	0.00197661	3.2854E-07	1.06E-06	0	0	1.39E-06	1.392297
4840203753900	484020	3753900	0	0	0	0	0	0	0	0	0	0	0	0	0.010022613	0.0271005	0.006795296	0.004132759	0.00421344	0.00171227	2.846E-07	9.22E-07	0	0	1.21E-06	1.2061
4840403753900	484040	3753900	0	0	0	0	0	0	0	0	0	0	0	0	0.008533422	0.023073823	0.00578563	0.003518701	0.0035874	0.00145786	2.4231E-07	7.85E-07	0	0	1.03E-06	1.026894
4840603753900	484060	3753900	0	0	0	0	0	0	0	0	0	0	0	0	0.007196235	0.019458156	0.004879021	0.00296732	0.00302525	0.00122941	2.0434E-07	6.62E-07	0	0	8.66E-07	0.86598
4840803753900	484080	3753900	0	0	0	0	0	0	0	0	0	0	0	0	0.00604383	0.016342127	0.004097695	0.002492134	0.00254079	0.00103253	1.7162E-07	5.56E-07	0	0	7.27E-07	0.727302
4841003753900	484100	3753900	0	0	0	0	0	0	0	0	0	0	0	0	0.005077367	0.013728873	0.003442436	0.002093619	0.00213449	0.00086742	1.4418E-07	4.67E-07	0	0	6.11E-07	0.611
4841203753900	484120	3753900	0	0	0	0	0	0	0	0	0	0	0	0	0.004276615	0.011563691	0.00289953	0.001763434	0.00179786	0.00073062	1.2144E-07	3.93E-07	0	0	5.15E-07	0.514639
4839203753920	483920	3753920	0	0	0	0	0	0	0	0	0	0	0	0	0.017677645	0.047799213	0.01198538	0.007289261	0.00743157	0.00302006	5.0197E-07	1.63E-06	0	0	2.13E-06	2.12729
4839403753920	483940	3753920	0	0	0	0	0	0	0	0	0	0	0	0	0.017264336	0.046681654	0.011705158	0.007118836	0.00725782	0.00294945	4.9023E-07	1.59E-06	0	0	2.08E-06	2.077554
4839603753920	483960	3753920	0	0	0	0	0	0	0	0	0	0	0	0	0.016097379	0.043526277	0.010913965	0.006637649	0.00676723	0.00275009	4.571E-07	1.48E-06	0	0	1.94E-06	1.937124
4839803753920	483980	3753920	0	0	0	0	0	0	0	0	0	0	0	0	0.014311321	0.038696889	0.009703024	0.00590118	0.00601639	0.00244496	4.0638E-07	1.32E-06	0	0	1.72E-06	1.722194
4840003753920	484000	3753920	0	0	0	0	0	0	0	0	0	0	0	0	0.012314864	0.0332986	0.008349434	0.005077954	0.00517709	0.00210388	3.4969E-07	1.13E-06	0	0	1.48E-06	1.481945
4840203753920	484020	3753920	0	0	0	0	0	0	0	0	0	0	0	0	0.01033296	0.027939659	0.00700571	0.004260729	0.00434391	0.00176529	2.9341E-07	9.5E-07	0	0	1.24E-06	1.243446
4840403753920	484040	3753920	0	0	0	0	0	0	0	0	0	0	0	0	0.00855907	0.023143175	0.005803019	0.003529277	0.00359818	0.00146224	2.4304E-07	7.87E-07	0	0	1.03E-06	1.02998
4840603753920	484060	3753920	0	0	0	0	0	0	0	0	0	0	0	0	0.007074246	0.019128305	0.004796313	0.002917019	0.00297397	0.00120857	2.0088E-07	6.5E-07	0	0	8.51E-07	0.8513
4840803753920	484080	3753920	0	0	0	0	0	0	0	0	0	0	0	0	0.00583289	0.015771759	0.003954679	0.002405154	0.00245211	0.0009965	1.6563E-07	5.36E-07	0	0	7.02E-07	0.701918
4841003753920	484100	3753920	0	0	0	0	0	0	0	0	0	0	0	0	0.004840952	0.013089623	0.003282148	0.001996135	0.00203511	0.00082703	1.3746E-07	4.45E-07	0	0	5.83E-07	0.58255
4841203753920	484120	3753920	0	0	0	0	0	0	0	0	0	0	0	0	0.004045456	0.010938651	0.002742804	0.001668117	0.00170068	0.00069113	1.1487E-07	3.72E-07	0	0	4.87E-07	0.486822
4839203753940	483920	3753940	0	0	0	0	0	0	0	0	0	0	0	0	0.021411334	0.057894868	0.014516808	0.008828824	0.00900119	0.00365793	6.0799E-07	1.97E-06	0	0	2.58E-06	2.576594
4839403753940	483940	3753940	0	0	0	0	0	0	0	0	0	0	0	0	0.020230333	0.054701519	0.013716094	0.008341846	0.0085047	0.00345617	5.7445E-07	1.86E-06	0	0	2.43E-06	2.434475
4839603753940	483960	3753940	0	0	0	0	0	0	0	0	0	0	0	0	0.018166327	0.049120578	0.012316705	0.007490766	0.00763701	0.00310355	5.1585E-07	1.67E-06	0	0	2.19E-06	2.186097
4839803753940	483980	3753940	0	0	0	0	0	0	0	0	0	0	0	0	0.01550099	0.041913678	0.010509616	0.006391732	0.00651652	0.0026482	4.4016E-07	1.43E-06	0	0	1.87E-06	1.865356
4840003753940	484000	3753940	0	0	0	0	0	0	0	0	0	0	0	0	0.012829173	0.034689257	0.008698133	0.005290026	0.0053933	0.00219175	3.6429E-07	1.18E-06	0	0	1.54E-06	1.543835
4840203753940	484020	3753940	0	0	0	0	0	0	0	0	0	0	0	0	0.010409136	0.028145632	0.007057357	0.004292139	0.00437593	0.0017783	2.9557E-07	9.57E-07	0	0	1.25E-06	1.252613
4840403753940	484040	3753940	0	0	0	0	0	0	0	0	0	0	0	0	0.008394984	0.022699497	0.005691769	0.003461617	0.0035292	0.00143421	2.3838E-07	7.72E-07	0	0	1.01E-06	1.010235
4840603753940	484060	3753940	0	0	0	0	0	0	0	0	0	0	0	0	0.006793361	0.018368811	0.004605875	0.002801198	0.00285589	0.00116058	1.929E-07	6.25E-07	0	0	8.17E-07	0.817499
4840803753940	484080	3753940	0	0	0	0	0	0	0	0	0	0	0	0	0.005519	0.01492302	0.003741862	0.002275724	0.00232015	0.00094287	1.5672E-07	5.07E-07	0	0	6.64E-07	0.664145
4841003753940	484100	3753940	0	0	0	0	0	0	0	0	0	0	0	0	0.004532317	0.012255094	0.003072895	0.001868871	0.00190536	0.0007743	1.287E-07	4.17E-07	0	0	5.45E-07	0.545409
4841203753940	484120	3753940	0	0	0	0	0	0	0	0	0	0	0	0	0.003770108	0.010194129	0.00255612	0.001554579	0.00158493	0.00064409	1.0705E-07	3.47E-07	0	0	4.54E-07	0.453687
4839203753960	483920	3753960	0	0	0	0	0	0	0	0	0	0	0	0	0.026203482	0.070852527	0.017765867	0.010804835	0.01101577	0.00447662	7.4407E-07	2.41E-06	0	0	3.15E-06	3.153271
4839403753960	483940	3753960	0	0	0	0	0	0	0	0	0	0	0	0	0.023592388	0.063792299	0.015995555	0.009728167	0.00991809	0.00403054	6.6992E-07	2.17E-06	0	0	2.84E-06	2.839058
4839603753960	483960	3753960	0	0	0	0	0	0	0	0	0	0	0	0	0.020153963	0.054495018	0.013664315	0.008310355	0.0084726	0.00344312	5.7229E-07	1.85E-06	0	0	2.43E-06	2.425285
4839803753960	483980	3753960	0	0	0	0	0	0	0	0	0	0	0	0	0.016379412	0.044288876	0.011105183	0.006753944	0.0068858	0.00279827	4.651E-07	1.51E-06	0	0	1.97E-06	1.971064
4840003753960	484000	3753960	0	0	0	0	0	0	0	0	0	0	0	0	0.012997582	0.035144625	0.008812314	0.005359468	0.0054641	0.00222052	3.6908E-07	1.2E-06	0	0	1.56E-06	1.564101
4840203753960	484020	3753960	0	0	0	0	0	0	0	0	0	0	0	0	0.010196516	0.027570723	0.006913202	0.004204467	0.00428655	0.00174198	2.8954E-07	9.37E-07	0	0	1.23E-06	1.227027
4840403753960	484040	3753960	0	0	0	0	0	0	0	0	0	0	0	0	0.008011648	0.021662979	0.005431868	0.003303551	0.00336805	0.00136872	2.275E-07	7.37E-07	0	0	9.64E-07	0.964105
4840603753960	484060	3753960	0	0	0	0	0	0	0	0	0	0	0	0	0.006363496	0.017206483	0.004314427	0.002623946	0.00267517	0.00108714	1.807E-07	5.85E-07	0	0	7.66E-07	0.76577
4840803753960	484080	3753960	0	0	0	0	0	0	0	0	0	0	0	0	0.00511086	0.013819437	0.003465145	0.00210743	0.00214857	0.00087314	1.4513E-07	4.7E-07	0	0	6.15E-07	0.61503
4841003753960	484100	3753960	0	0	0	0	0	0	0	0	0	0	0	0	0.004172917	0.011283298	0.002829223	0.001720675	0.00175427	0.0007129	1.1849E-07	3.84E-07	0	0	5.02E-07	0.50216
4841203753960	484120	3753960	0	0	0	0	0	0	0	0	0	0	0	0	0.003460021	0.009355674	0.002345882	0.001426717	0.00145457	0.00059111	9.825E-08	3.18E-07	0	0	4.16E-07	0.416372
4839203753980	483920	3753980	0	0	0	0	0	0	0	0	0	0	0	0	0.032196145	0.087056303	0.021828871	0.01327587	0.01353505	0.00550041	9.1423E-07	2.96E-06	0	0	3.87E-06	3.874416
4839403753980	483940	3753980	0	0	0	0	0	0	0	0	0	0	0	0	0.027220385	0.073602169	0.018455324	0.011224148	0.01144327	0.00465035	7.7294E-07	2.5E-06	0	0	3.28E-06	3.275643
4839603753980	483960	3753980	0	0	0	0	0	0	0	0	0	0	0	0	0.02175291	0.058818467	0.014748395	0.00896967	0.00914478	0.00371628	6.1769E-07	2E-06	0	0	2.62E-06	2.617699
4839803753980	483980	3753980	0	0	0	0	0	0	0	0	0	0	0	0	0.016740308	0.045264715	0.011349869	0.006902757	0.00703752	0.00285993	4.7535E-07	1.54E-06	0	0	2.01E-06	2.014493
4840003753980	484000	3753980	0	0	0	0	0	0	0	0	0	0	0	0	0.012713458	0.034376371	0.008619679	0.005242311	0.00534466	0.00217198	3.6101E-07	1.17E-06	0	0	1.53E-06	1.529911
4840203753980	484020	3753980	0	0	0	0	0	0	0	0	0	0	0	0	0.009657036	0.026112004	0.006547436	0.003982016	0.00405976	0.00164982	2.7422E-07	8.88E-07	0	0	1.16E-06	1.162107
4840403753980	484040	3753980	0	0	0	0	0	0	0	0	0	0	0	0	0.007420806	0.020065381	0.00503128	0.003059921	0.00311966	0.00126778	2.1072E-07	6.82E-07	0	0	8.93E-07	0.893004
4840603753980	484060	3753980	0	0	0	0	0	0	0	0	0	0	0	0	0.005811165	0.015713015	0.003939949	0.002396196	0.00244298	0.00099278	1.6501E-07	5.34E-07	0	0	6.99E-07	0.699303
4840803753980	484080	3753980	0	0	0	0	0	0	0	0	0	0	0	0	0.004639299	0.012544365	0.003145428	0.001912984	0.00195033	0.00079258	1.3174E-07	4.27E-07	0	0	5.58E-07	0.558283

Unique Identifier	X (UTM)	Y (UTM)	Grading/Excavation	Potholding	Stormwater Drainage and Foundation Concrete	Construction	Construction	Finishing	Finishing	Painting	Painting	Installing Pipeline	Install Appurtenances	Pavement Repairs	Demolition	Grading/Excavation	Stormwater Drainage and Foundation	Construction	Finishing	Painting	Maximum Individual Cancer Risk (MICR)					
			2026	2026	2026	2026	2027	2026	2027	2026	2027	2026	2026	2027	2045	2045	2045	2045	2045	2045	3rd Trimester	0<2	2<16	16<30	Total	per million
4841003753980	484100	3753980	0	0	0	0	0	0	0	0	0	0	0	0	0.003786242	0.010237756	0.002567059	0.001561232	0.00159171	0.00064684	1.0751E-07	3.48E-07	0	0	4.56E-07	0.455628
4841203753980	484120	3753980	0	0	0	0	0	0	0	0	0	0	0	0	0.00314962	0.008516369	0.002135431	0.001298725	0.00132408	0.00053808	8.9436E-08	2.9E-07	0	0	3.79E-07	0.379019
4839203754000	483920	3754000	0	0	0	0	0	0	0	0	0	0	0	0	0.039096499	0.105714415	0.026507286	0.016121186	0.01643592	0.00667928	1.1102E-06	3.59E-06	0	0	4.7E-06	4.70479
4839403754000	483940	3754000	0	0	0	0	0	0	0	0	0	0	0	0	0.03051204	0.082502592	0.020687054	0.012581441	0.01282707	0.0052127	8.6641E-07	2.81E-06	0	0	3.67E-06	3.671754
4839603754000	483960	3754000	0	0	0	0	0	0	0	0	0	0	0	0	0.022539488	0.060945325	0.015281692	0.009294011	0.00947546	0.00385066	6.4002E-07	2.07E-06	0	0	2.71E-06	2.712354
4839803754000	483980	3754000	0	0	0	0	0	0	0	0	0	0	0	0	0.016366973	0.044255241	0.011096749	0.006748814	0.00688057	0.00279615	4.6475E-07	1.5E-06	0	0	1.97E-06	1.969567
4840003754000	484000	3754000	0	0	0	0	0	0	0	0	0	0	0	0	0.011915816	0.032219598	0.00807888	0.004913409	0.00500933	0.00203571	3.3836E-07	1.1E-06	0	0	1.43E-06	1.433924
4840203754000	484020	3754000	0	0	0	0	0	0	0	0	0	0	0	0	0.008817687	0.023842459	0.00597836	0.003635916	0.0037069	0.00150642	2.5038E-07	8.11E-07	0	0	1.06E-06	1.061102
4840403754000	484040	3754000	0	0	0	0	0	0	0	0	0	0	0	0	0.006674265	0.018046784	0.004525128	0.00275209	0.00280582	0.00114024	1.8952E-07	6.14E-07	0	0	8.03E-07	0.803167
4840603754000	484060	3754000	0	0	0	0	0	0	0	0	0	0	0	0	0.005187686	0.014027168	0.003517232	0.002139108	0.00218087	0.00088627	1.4731E-07	4.77E-07	0	0	6.24E-07	0.624275
4840803754000	484080	3754000	0	0	0	0	0	0	0	0	0	0	0	0	0.00414872	0.011217873	0.002812818	0.001710698	0.0017441	0.00070877	1.1781E-07	3.81E-07	0	0	4.99E-07	0.499248
4841003754000	484100	3754000	0	0	0	0	0	0	0	0	0	0	0	0	0.003404	0.009204197	0.0023079	0.001403617	0.00143102	0.00058154	9.6659E-08	3.13E-07	0	0	4.1E-07	0.40963
4841203754000	484120	3754000	0	0	0	0	0	0	0	0	0	0	0	0	0.002861356	0.007736923	0.001939989	0.001179862	0.0012029	0.00048884	8.125E-08	2.63E-07	0	0	3.44E-07	0.34433
4839203754020	483920	3754020	0	0	0	0	0	0	0	0	0	0	0	0	0.045877096	0.124048712	0.031104507	0.018917121	0.01928644	0.00783768	1.3027E-06	4.22E-06	0	0	5.52E-06	5.520752
4839403754020	483940	3754020	0	0	0	0	0	0	0	0	0	0	0	0	0.032352982	0.08748038	0.021935206	0.013340541	0.01360099	0.00552721	9.1869E-07	2.97E-06	0	0	3.89E-06	3.893289
4839603754020	483960	3754020	0	0	0	0	0	0	0	0	0	0	0	0	0.02201261	0.059520681	0.014924471	0.009076756	0.00925396	0.00376065	6.2506E-07	2.02E-06	0	0	2.65E-06	2.648951
4839803754020	483980	3754020	0	0	0	0	0	0	0	0	0	0	0	0	0.015127936	0.040904965	0.010256687	0.006237906	0.00635969	0.00258447	4.2957E-07	1.39E-06	0	0	1.82E-06	1.820464
4840003754020	484000	3754020	0	0	0	0	0	0	0	0	0	0	0	0	0.010667677	0.028844711	0.007232647	0.004398747	0.00448462	0.00182247	3.0292E-07	9.81E-07	0	0	1.28E-06	1.283726
4840203754020	484020	3754020	0	0	0	0	0	0	0	0	0	0	0	0	0.007774377	0.021021414	0.005271	0.003205714	0.0032683	0.00132818	2.2076E-07	7.15E-07	0	0	9.36E-07	0.935552
4840403754020	484040	3754020	0	0	0	0	0	0	0	0	0	0	0	0	0.005860131	0.015845418	0.003973148	0.002416387	0.00246356	0.00100115	1.664E-07	5.39E-07	0	0	7.05E-07	0.705196
4840603754020	484060	3754020	0	0	0	0	0	0	0	0	0	0	0	0	0.004557153	0.012322247	0.003089733	0.001879112	0.0019158	0.00077855	1.294E-07	4.19E-07	0	0	5.48E-07	0.548398
4840803754020	484080	3754020	0	0	0	0	0	0	0	0	0	0	0	0	0.003675317	0.00993782	0.002491852	0.001515493	0.00154508	0.00062789	1.0436E-07	3.38E-07	0	0	4.42E-07	0.44228
4841003754020	484100	3754020	0	0	0	0	0	0	0	0	0	0	0	0	0.003051881	0.00825209	0.002069165	0.001258423	0.00128299	0.00052139	8.666E-08	2.81E-07	0	0	3.67E-07	0.367257
4841203754020	484120	3754020	0	0	0	0	0	0	0	0	0	0	0	0	0.00260172	0.007034884	0.001763957	0.001072802	0.00109375	0.00044448	7.3878E-08	2.39E-07	0	0	3.13E-07	0.313086
4839203754040	483920	3754040	0	0	0	0	0	0	0	0	0	0	0	0	0.0507055	0.137104406	0.034378147	0.020908082	0.02131627	0.00866257	1.4398E-06	4.66E-06	0	0	6.1E-06	6.101792
4839403754040	483940	3754040	0	0	0	0	0	0	0	0	0	0	0	0	0.031541936	0.085287364	0.02138532	0.013006111	0.01326003	0.00538865	8.9566E-07	2.9E-06	0	0	3.8E-06	3.79569
4839603754040	483960	3754040	0	0	0	0	0	0	0	0	0	0	0	0	0.019935807	0.053905137	0.013516406	0.0082204	0.00838088	0.00340585	5.6609E-07	1.83E-06	0	0	2.4E-06	2.399033
4839803754040	483980	3754040	0	0	0	0	0	0	0	0	0	0	0	0	0.013184759	0.035650739	0.008939219	0.005436649	0.00554279	0.00225249	3.7439E-07	1.21E-06	0	0	1.59E-06	1.586626
4840003754040	484000	3754040	0	0	0	0	0	0	0	0	0	0	0	0	0.009160141	0.02476843	0.006210543	0.003777124	0.00385086	0.00156493	2.6011E-07	8.42E-07	0	0	1.1E-06	1.102312
4840203754040	484020	3754040	0	0	0	0	0	0	0	0	0	0	0	0	0.006678307	0.018057712	0.004527868	0.002753756	0.00280752	0.00114093	1.8964E-07	6.14E-07	0	0	8.04E-07	0.803653
4840403754040	484040	3754040	0	0	0	0	0	0	0	0	0	0	0	0	0.00506846	0.013704789	0.003436398	0.002089946	0.00213075	0.0008659	1.4392E-07	4.66E-07	0	0	6.1E-07	0.609928
4840603754040	484060	3754040	0	0	0	0	0	0	0	0	0	0	0	0	0.003982316	0.010767925	0.002699996	0.001642082	0.00167414	0.00068034	1.1308E-07	3.66E-07	0	0	4.79E-07	0.479223
4840803754040	484080	3754040	0	0	0	0	0	0	0	0	0	0	0	0	0.003244043	0.008771682	0.002199449	0.00133766	0.00136377	0.00055421	9.2117E-08	2.98E-07	0	0	3.9E-07	0.390381
4841003754040	484100	3754040	0	0	0	0	0	0	0	0	0	0	0	0	0.002727599	0.007375253	0.001849303	0.001124708	0.00114667	0.00046599	7.7452E-08	2.51E-07	0	0	3.28E-07	0.328234
4841203754040	484120	3754040	0	0	0	0	0	0	0	0	0	0	0	0	0.002361719	0.006385936	0.001601237	0.000973839	0.00099285	0.00040348	6.7063E-08	2.17E-07	0	0	2.84E-07	0.284204
4839203754060	483920	3754060	0	0	0	0	0	0	0	0	0	0	0	0	0.049448682	0.13370605	0.033526029	0.020389841	0.02078791	0.00844785	1.4041E-06	4.55E-06	0	0	5.95E-06	5.950549
4839403754060	483940	3754060	0	0	0	0	0	0	0	0	0	0	0	0	0.027627333	0.07470253	0.018731233	0.01139195	0.01161435	0.00471988	7.845E-07	2.54E-06	0	0	3.32E-06	3.324615
4839603754060	483960	3754060	0	0	0	0	0	0	0	0	0	0	0	0	0.016702437	0.045162315	0.011324193	0.006887141	0.0070216	0.00285346	4.7428E-07	1.54E-06	0	0	2.01E-06	2.009936
4839803754060	483980	3754060	0	0	0	0	0	0	0	0	0	0	0	0	0.010929425	0.029552463	0.007410111	0.004506677	0.00459466	0.00186719	3.1035E-07	1E-06	0	0	1.32E-06	1.315224
4840003754060	484000	3754060	0	0	0	0	0	0	0	0	0	0	0	0	0.007655411	0.020699738	0.005190341	0.003156659	0.00321829	0.00130786	2.1738E-07	7.04E-07	0	0	9.21E-07	0.921236
4840203754060	484020	3754060	0	0	0	0	0	0	0	0	0	0	0	0	0.005665705	0.015319702	0.003841328	0.002336217	0.00238183	0.00096793	1.6088E-07	5.21E-07	0	0	6.82E-07	0.681799
4840403754060	484040	3754060	0	0	0	0	0	0	0	0	0	0	0	0	0.004375957	0.011832306	0.002966883	0.001804397	0.00183962	0.00074759	1.2426E-07	4.02E-07	0	0	5.27E-07	0.526593
4840603754060	484060	3754060	0	0	0	0	0	0	0	0	0	0	0	0	0.003496093	0.009453211	0.002370339	0.001441591	0.00146974	0.00059728	9.9274E-08	3.21E-07	0	0	4.21E-07	0.420712
4840803754060	484080	3754060	0	0	0	0	0	0	0	0	0	0	0	0	0.002887394	0.007807329	0.001957643	0.001190598	0.00121384	0.00049328	8.199E-08	2.65E-07	0	0	3.47E-07	0.347463
4841003754060	484100	3754060	0	0	0	0	0	0	0	0	0	0	0	0	0.002455405	0.006639257	0.001664756	0.00101247	0.00103224	0.00041948	6.9723E-08	2.26E-07	0	0	2.95E-07	0.295478
4841203754060	484120	3754060	0	0	0	0	0	0	0	0	0	0	0	0	0.002150866	0.005815803	0.00145828	0.000886896	0.00090421	0.00036746	6.1075E-08	1.98E-07	0	0	2.59E-07	0.258831
4839403754080	483940	3754080	0	0	0	0	0	0	0	0	0	0	0	0	0.021907709	0.059237035	0.014853349	0.009033501	0.00920986	0.00374273	6.2208E-07	2.01E-06	0	0	2.64E-06	2.636327
4839603754080	483960	3754080	0	0	0	0	0	0	0	0	0	0	0	0	0.013254238	0.035838606	0.008986326	0.005465298	0.005572	0.00226436	3.7636E-07	1.22E-06	0	0	1.59E-06	1.594987
4839803754080	483980	3754080	0	0	0	0	0	0	0	0	0	0	0	0	0.008871671	0.023988427	0.006014961	0.003658176	0.00372959	0.00151564	2.5192E-07	8.16E-07	0	0	1.07E-06	1.067598
4840003754080	484000	3754080	0	0	0	0	0	0	0	0	0	0	0	0	0.006390921	0.017280639	0.004333022	0.002635255	0.0026867	0.00109183	1.8147E-07	5.88E-07	0	0	7.69E-07	0.76907
4840203754080	484020	3754080	0	0	0	0	0	0	0	0	0	0	0	0	0.004846175	0.013103745	0.003285689	0.001998289	0.0020373	0.00082792	1.3761E-07	4.46E-07	0	0	5.83E-07	0.583178
4840403754080	484040	3754080	0	0	0	0	0	0	0	0	0	0	0	0	0.003823658	0.010338926	0.002592427	0.001576661	0.00160744	0.00065324	1.0858E-07	3.52E-07	0	0	4.6E-07	0.460131
4840603754080	484060	3754080	0	0	0	0	0	0	0	0	0	0	0	0	0.003107501	0.008402483	0.002106875	0.001281358	0.00130637	0.00053089	8.824E-08	2.86E-07	0	0	3.74E-07	0.37395
4840803754080	484080	3754080	0	0	0	0	0	0	0	0	0	0	0	0	0.002599802	0.007029699	0.001762657	0.001072012	0.00109294	0.00044415	7.3823E-08	2.39E-07	0	0	3.13E-07	0.312855
4841003754080	484100	3754080	0	0	0	0	0	0	0	0	0	0	0	0	0.002236804	0.006048175	0.001516545	0.000922332	0.00094034	0.00038214	6.3516E-08	2.06E-07	0	0	2.69E-07	0.269172
4841203754080	484120	3754080	0	0	0	0	0	0	0	0	0	0	0	0	0.001976605	0.005344614	0.001340131	0.00081504	0.00083095	0.00033768	5.6127E-08	1.82E-07	0	0	2.38E-07	0.23786
4839403754100	483940	3754100	0	0	0	0	0	0	0	0	0	0	0	0	0.016816213	0.045469956	0.011401332	0.006934056	0.00706943	0.0028729	4.7751E-07	1.55E-06	0	0	2.02E-06	2.023627
4839603754100	483960	3754100	0	0	0	0	0	0	0	0	0	0	0	0	0.010630922	0.028745328	0.007207727	0.004383591	0.00446917	0.0018162	3.0187E-07	9.77E-07	0	0	1.28E-06	1.279303
4839803754100	483980	3754100	0	0	0	0	0	0	0	0	0	0	0	0	0.007405354	0.020023601	0.005020804	0.003053549	0.00311316	0.00126514	2.1028E-07	6.81E-07	0	0	8.91E-07	0.891145
4840003754100	484000	3754100	0	0	0	0	0	0	0	0	0	0	0	0	0.005492626	0.014851706	0.003723981	0.002264848	0.00230906	0.00093836	1.5597E-07	5.05E-07	0	0	6.61E-07	0.660971
4840203754100	484020	3754100	0	0	0	0	0	0	0	0	0	0	0	0	0.004260535	0.011520211	0.002888627	0.001756804	0.0017911	0.00072787	1.2098E-07	3.92E-07	0	0	5.13E-07	0.512704
4840403754100	484040	3754100	0	0	0	0	0	0	0	0	0	0	0	0	0.003420904	0.009249904	0.002319361	0.001410587	0.00143813	0.00058443	9.7139E-08	3.15E-07	0	0	4.12E-07	0.411664
4840603754100	484060	3754100	0	0	0	0	0	0	0	0	0	0	0	0	0.002817775	0.007619081	0.001910441	0.001161891	0.00118457	0.00048139	8.0013E-08	2.59E-07	0	0	3.39E-07	0.339085
4840803754100	484080	3754100	0	0	0	0	0	0	0	0	0	0	0	0	0.002379176	0.006433137	0.001613073	0.000981038	0.00100019	0.00040646	6.7558E-08	2.19E-07	0	0	2.86E-07	0.286305
4841003754100	484100	3754100	0	0	0	0	0	0	0	0	0	0	0	0	0.002063942	0.005580765	0.001399345	0.000851053	0.00086767	0.00035261	5.8607E-08	1.9E-07	0	0	2.48E-07	0.24837
4841203754100	484120	3754100	0	0	0	0	0	0	0	0	0	0	0	0	0.001842144	0.00498104	0.001248967	0.000759596	0.00077443	0.00031471	5.2309E-08	1.69E-07	0	0	2.22E-07	0.22168
4839403754120	483940	3754120	0	0	0	0	0	0	0	0	0	0	0	0	0.014214416	0.038434867	0.009637323	0.005861222	0.00597565	0.0024284	4.0363E-07	1.31E-06	0	0	1.71E-06	1.710533
4839603754120	483960	3754120	0	0	0	0	0	0	0	0	0	0	0	0	0.009286106	0.025109034	0.006295947	0.003829065	0.00390382	0.00158645	2.6369E-07	8.54E-07	0	0	1.12E-06	1.11747
4839803754120	483980	3754120	0	0	0	0	0	0	0	0	0	0	0	0	0.006611472	0.017876995	0.004482554	0.002726197	0.00277942	0.00112951	1.8774E-07	6.08E-07	0	0	7.96E-07	0.795611
4840003754120	484000	3754120	0	0	0	0	0	0	0	0	0	0	0	0	0.004978176	0.013460668	0.003375186	0.002052718	0.00209279	0.00085048	1.4136E-07	4.58E-07	0	0	5.99E-07	0.599063
4840203754120	484020	3754120	0	0	0	0	0	0	0	0	0	0	0	0	0.00391068	0.010574228	0.002651427	0.001612544	0.00164402	0.0006681	1.1105E-07	3.6E-07	0	0	4.71E-07	0.470603
4840403754120	484040	3754120	0	0	0	0	0	0	0	0	0	0	0	0	0.003169644	0.008570514	0.002149008	0.001306982	0.0013325	0.0005415	9.0004E-08	2.91E-07	0	0	3.81E-07	0.381428
4840603754120	484060	3754120	0	0	0	0	0	0	0	0	0	0	0	0	0.002627174	0.007103708	0.001781214	0.001083298	0.00110445	0.00044883	7.46E-08	2.42E-07	0	0	3.16E-07	0.316148
4840803754120	484080	3754120	0	0	0	0	0	0	0	0	0	0	0	0	0.002226489	0.006020282	0.001509551	0.000918078	0.000936	0.00038038	6.3223E-08	2.05E-07	0	0	2.68E-07	0.267931
4841003754120	484100	3754120	0	0	0	0	0	0	0	0	0	0	0	0	0.00193998	0.005245582	0.0013153	0.000799938	0.00081556	0.00033143	5.5087E-08	1.78E-07	0	0	2.33E-07	0.233453
4841203754120	484120	3754120	0	0	0	0	0	0	0	0	0	0	0	0	0.001740743	0.004706858	0.001180218	0.000717784	0.0007318	0.00029739	4.943E-08	1.6E-07	0	0	2.09E-07	0.209477
4839403754140	483940	3754140	0	0	0	0	0	0	0	0	0	0	0	0	0.013640002	0.036881687	0.009247872	0.005624366	0.00573417	0.00233027	3.8732E-07	1.25E-06	0	0	1.64E-06	1.641409
4839603754140	483960	3754140	0	0	0	0	0	0	0	0	0	0	0	0	0.008914765	0.02410495	0.006044179	0.003675945	0.00374771	0.00152301	2.5314E-07	8.2E-07	0	0	1.07E-06	1.072784
4839803754140	483980	3754140	0	0	0	0	0	0	0	0	0	0	0	0	0.006367288	0.017216737	0.004316999	0.00262551	0.00267677	0.00108779	1.808E-07	5.85E-07	0	0	7.66E-07	0.766226
4840003754140	484000	3754140	0	0	0	0	0	0	0	0	0	0	0	0	0.004801467	0.012982857	0.003255377	0.001979853	0.00201851	0.00082029	1.3634E-07	4.41E-07	0	0	5.78E-07	0.577798
4840203754140	484020	3754140	0	0	0	0	0	0	0	0	0	0	0	0	0.00377843	0.010216631	0.002561762	0.001558011	0.00158843	0.00064551	1.0729E-07	3.47E-07	0	0	4.55E-07	0.454688
4840403754140	484040	3754140	0	0	0	0	0	0	0	0	0	0	0	0	0.003063281	0.008282913	0.002076893	0.001263124	0.00128778	0.00052333	8.6984E-08	2.82E-07	0	0	3.69E-07	0.368629
4840603754140	484060	3754140	0	0	0	0	0	0	0	0	0	0	0	0	0.002538277	0.006863338	0.001720943	0.001046642	0.00106708	0.00043364	7.2076E-08	2.33E-07	0	0	3.05E-07	0.305451
4840803754140	484080	3754140	0	0	0	0	0	0	0	0	0	0	0	0	0.002147258	0.005806047	0.001455833	0.000885408	0.00090269	0.00036684	6.0973E-08	1.97E-07	0	0	2.58E-07	0.258396
4841003754140	484100	3754140	0	0	0	0	0	0	0	0	0	0	0	0	0.001860468	0.005030585	0.00126139	0.000767152	0.00078213	0.00031784	5.2829E-08	1.71E-07	0	0	2.24E-07	0.223885
4841203754140	484120	3754140	0	0	0	0	0	0	0	0	0	0	0	0	0.001664135	0.004499713	0.001128277	0.000686195	0.00069959	0.0002843	4.7254E-08	1.53E-07	0	0	2E-07	0.200258
4839603754160	483960	3754160	0	0	0	0	0	0	0	0	0	0	0	0	0.008993313	0.02431734	0.006097434	0.003708334	0.00378073	0.00153642	2.5537E-07	8.27E-07	0	0	1.08E-06	1.082236
4839803754160	483980	3754160	0	0	0	0	0	0	0	0	0	0	0	0	0.006434102	0.017397396	0.004362298	0.00265306	0.00270485	0.00109921	1.827E-07	5.92E-07	0	0	7.74E-07	0.774266
4840003754160	484000	3754160	0	0	0	0	0	0	0	0	0	0	0	0	0.00484728	0.013106734	0.003286439	0.001998744	0.00203777	0.00082811	1.3764E-07	4.46E-07	0	0	5.83E-07	0.583311
4840203754160	484020	3754160	0	0	0	0	0	0	0	0	0	0	0	0	0.003804934	0.010288297	0.002579732	0.00156894	0.00159957	0.00065004	1.0804E-07	3.5E-07	0	0	4.58E-07	0.457878
4840403754160	484040	3754160	0	0	0	0	0	0	0	0	0	0	0	0	0.00307585	0.0083169	0.002085415	0.001268307	0.00129307	0.00052548	8.7341E-08	2.83E-07	0	0	3.7E-07	0.370141
4840603754160	484060	3754160	0	0	0	0	0	0	0	0	0	0	0	0	0.002538115	0.006862898	0.001720833	0.001046575	0.00106701	0.00043361	7.2072E-08	2.33E-07	0	0	3.05E-07	0.305431
4840803754160	484080	3754160	0	0	0	0	0	0	0	0	0	0	0	0	0.002139489	0.005785039	0.001450566	0.000882204	0.00089943	0.00036551	6.0752E-08	1.97E-07	0	0	2.57E-07	0.257462
4841003754160	484100	3754160	0	0	0	0	0	0	0	0	0	0	0	0	0.001834614	0.004960677	0.001243861	0.000756491	0.00077126	0.00031343	5.2095E-08	1.69E-07	0	0	2.21E-07	0.220774
4841203754160	484120	3754160	0	0	0	0	0	0	0	0	0	0	0	0	0.001618657	0.004376744	0.001097444	0.000667443	0.00068047	0.00027653	4.5963E-08	1.49E-07	0	0	1.95E-07	0.194786
4839603754180	483960	3754180	0	0	0	0	0	0	0	0	0	0	0	0	0.009100642	0.024607549	0.006170202	0.00375259	0.00382585	0.00155476	2.5842E-07	8.37E-07	0	0	1.1E-06	1.095152
4839803754180	483980	3754180	0	0	0	0	0	0	0	0	0	0	0	0	0.006553934	0.017721416	0.004443544	0.002702472	0.00275523	0.00111968	1.861E-07	6.03E-07	0	0	7.89E-07	0.788687
4840003754180	484000	3754180	0	0	0	0	0	0	0	0	0	0	0	0	0.004980452	0.013466821	0.003376728	0.002053657	0.00209375	0.00085086	1.4142E-07	4.58E-07	0	0	5.99E-07	0.599337
4840203754180	484020	3754180	0	0	0	0	0	0	0	0	0	0	0	0	0.003909835	0.010571943	0.002650854	0.001612195	0.00164367	0.00066796	1.1102E-07	3.59E-07	0	0	4.71E-07	0.470501
4840403754180	484040	3754180	0	0	0	0	0	0	0	0	0	0	0	0	0.003162146	0.008550239	0.002143924	0.00130389	0.00132935	0.00054022	8.9791E-08	2.91E-07	0	0	3.81E-07	0.380526
4840603754180	484060	3754180	0	0	0	0	0	0	0	0	0	0	0	0	0.002602544	0.007037111	0.001764515	0.001073142	0.00109409	0.00044462	7.3901E-08	2.39E-07	0	0	3.13E-07	0.313185
4840803754180	484080	3754180	0	0	0	0	0	0	0	0	0	0	0	0	0.002184089	0.005905635	0.001480804	0.000900595	0.00091818	0.00037313	6.2019E-08	2.01E-07	0	0	2.63E-07	0.262829
4841003754180	484100	3754180	0	0	0	0	0	0	0	0	0	0	0	0	0.001862732	0.005036708	0.001262926	0.000768086	0.00078308	0.00031823	5.2894E-08	1.71E-07	0	0	2.24E-07	0.224157
4841203754180	484120	3754180	0	0	0	0	0	0	0	0	0	0	0	0	0.001618028	0.004375044	0.001097017	0.000667183	0.00068021	0.00027643	4.5945E-08	1.49E-07	0	0	1.95E-07	0.19471
4839803754200	483980	3754200	0	0	0	0	0	0	0	0	0	0	0	0	0.006601417	0.017849805	0.004475737	0.002722051	0.00277519	0.00112779	1.8745E-07	6.07E-07	0	0	7.94E-07	0.7944
4840003754200	484000	3754200	0	0	0	0	0	0	0	0	0	0	0	0	0.005092255	0.01376913	0.003452531	0.002099758	0.00214075	0.00086996	1.446E-07	4.68E-07	0	0	6.13E-07	0.612791
4840203754200	484020	3754200	0	0	0	0	0	0	0	0	0	0	0	0	0.004021378	0.010873548	0.00272648	0.001658189	0.00169056	0.00068702	1.1419E-07	3.7E-07	0	0	4.84E-07	0.483924
4840403754200	484040	3754200	0	0	0	0	0	0	0	0	0	0	0	0	0.003266928	0.008833562	0.002214965	0.001347096	0.0013734	0.00055812	9.2767E-08	3E-07	0	0	3.93E-07	0.393135
4840603754200	484060	3754200	0	0	0	0	0	0	0	0	0	0	0	0	0.002692741	0.007280998	0.001825669	0.001110334	0.00113201	0.00046003	7.6462E-08	2.48E-07	0	0	3.24E-07	0.324039
4840803754200	484080	3754200	0	0	0	0	0	0	0	0	0	0	0	0	0.002256309	0.006100914	0.001529769	0.000930374	0.00094854	0.00038547	6.4069E-08	2.07E-07	0	0	2.72E-07	0.271519
4841003754200	484100	3754200	0	0	0	0	0	0	0	0	0	0	0	0	0.001926728	0.005209749	0.001306315	0.000794474	0.00080998	0.00032916	5.4711E-08	1.77E-07	0	0	2.32E-07	0.231858
4841203754200	484120	3754200	0	0	0	0	0	0	0	0	0	0	0	0	0.001671644	0.004520017	0.001133368	0.000689291	0.00070275	0.00028558	4.7467E-08	1.54E-07	0	0	2.01E-07	0.201162
4839803754220	483980	3754220	0	0	0	0	0	0	0	0	0	0	0	0	0.006575606	0.017780015	0.004458237	0.002711408	0.00276434	0.00112338	1.8672E-07	6.05E-07	0	0	7.91E-07	0.791294
4840003754220	484000	3754220	0	0	0	0	0	0	0	0	0	0	0	0	0.005134406	0.013883104	0.003481109	0.002117139	0.00215847	0.00087717	1.458E-07	4.72E-07	0	0	6.18E-07	0.617864
4840203754220	484020	3754220	0	0	0	0	0	0	0	0	0	0	0	0	0.004094401	0.011070996	0.002775989	0.001688299	0.00172126	0.00069949	1.1626E-07	3.76E-07	0	0	4.93E-07	0.492711
4840403754220	484040	3754220	0	0	0	0	0	0	0	0	0	0	0	0	0.003348131	0.009053131	0.002270021	0.00138058	0.00140753	0.000572	9.5073E-08	3.08E-07	0	0	4.03E-07	0.402907
4840603754220	484060	3754220	0	0	0	0	0	0	0	0	0	0	0	0	0.002773987	0.007500683	0.001880753	0.001143836	0.00116617	0.00047391	7.8769E-08	2.55E-07	0	0	3.34E-07	0.333816
4840803754220	484080	3754220	0	0	0	0	0	0	0	0	0	0	0	0	0.002341359	0.006330883	0.001587433	0.000965444	0.00098429	0.0004	6.6485E-08	2.15E-07	0	0	2.82E-07	0.281754
4841003754220	484100	3754220	0	0	0	0	0	0	0	0	0	0	0	0	0.002018984	0.005459203	0.001368864	0.000832515	0.00084877	0.00034492	5.733E-08	1.86E-07	0	0	2.43E-07	0.24296
4841203754220	484120	3754220	0	0	0	0	0	0	0	0	0	0	0	0	0.001755523	0.004746822	0.001190239	0.000723879	0.00073801	0.00029991	4.9849E-08	1.61E-07	0	0	2.11E-07	0.211256
4839803754240	483980	3754240	0	0	0	0	0	0	0	0	0	0	0	0	0.006398084	0.017300006	0.004337878	0.002638208	0.00268971	0.00109305	1.8168E-07	5.88E-07	0	0	7.7E-07	0.769932
4840003754240	484000	3754240	0	0	0	0	0	0	0	0	0	0	0	0	0.005069684	0.0137081	0.003437228	0.002090451	0.00213126	0.00086611	1.4396E-07	4.66E-07	0	0	6.1E-07	0.610075
4840203754240	484020	3754240	0	0	0	0	0	0	0	0	0	0	0	0	0.004102885	0.011093937	0.002781741	0.001691798	0.00172483	0.00070094	1.165E-07	3.77E-07	0	0	4.94E-07	0.493732
4840403754240	484040	3754240	0	0	0	0	0	0	0	0	0	0	0	0	0.003387649	0.009159985	0.002296814	0.001396875	0.00142415	0.00057875	9.6195E-08	3.11E-07	0	0	4.08E-07	0.407662
4840603754240	484060	3754240	0	0	0	0	0	0	0	0	0	0	0	0	0.002864737	0.007746064	0.001942281	0.001181256	0.00120432	0.00048941	8.1346E-08	2.63E-07	0	0	3.45E-07	0.344736
4840803754240	484080	3754240	0	0	0	0	0	0	0	0	0	0	0	0	0.002453422	0.006633896	0.001663411	0.001011653	0.0010314	0.00041914	6.9667E-08	2.26E-07	0	0	2.95E-07	0.29524
4841003754240	484100	3754240	0	0	0	0	0	0	0	0	0	0	0	0	0.002138589	0.005782607	0.001449956	0.000881833	0.00089905	0.00036536	6.0727E-08	1.97E-07	0	0	2.57E-07	0.257353
4841203754240	484120	3754240	0	0	0	0	0	0	0	0	0	0	0	0	0.00186063	0.005031024	0.001261501	0.000767219	0.0007822	0.00031787	5.2834E-08	1.71E-07	0	0	2.24E-07	0.223904
4840003754260	484000	3754260	0	0	0	0	0	0	0	0	0	0	0	0	0.004926782	0.013321702	0.003340341	0.002031526	0.00207119	0.0008417	1.399E-07	4.53E-07	0	0	5.93E-07	0.592879
4840203754260	484020	3754260	0	0	0	0	0	0	0	0	0	0	0	0	0.004047699	0.010944716	0.002744325	0.001669042	0.00170163	0.00069151	1.1494E-07	3.72E-07	0	0	4.87E-07	0.487091
4840403754260	484040	3754260	0	0	0	0	0	0	0	0	0	0	0	0	0.003423808	0.009257756	0.00232133	0.001411785	0.00143935	0.00058493	9.7221E-08	3.15E-07	0	0	4.12E-07	0.412014
4840603754260	484060	3754260	0	0	0	0	0	0	0	0	0	0	0	0	0.002985014	0.008071285	0.002023829	0.001230851	0.00125488	0.00050996	8.4762E-08	2.74E-07	0	0	3.59E-07	0.35921
4840803754260	484080	3754260	0	0	0	0	0	0	0	0	0	0	0	0	0.002613607	0.007067026	0.001772016	0.001077704	0.00109874	0.00044651	7.4215E-08	2.4E-07	0	0	3.15E-07	0.314516
4841003754260	484100	3754260	0	0	0	0	0	0	0	0	0	0	0	0	0.002290647	0.006193763	0.001553051	0.000944533	0.00096297	0.00039134	6.5045E-08	2.11E-07	0	0	2.76E-07	0.275652
4841203754260	484120	3754260	0	0	0	0	0	0	0	0	0	0	0	0	0.002001278	0.005411328	0.00135686	0.000825214	0.00084132	0.0003419	5.6828E-08	1.84E-07	0	0	2.41E-07	0.24083
4840003754280	484000	3754280	0	0	0	0	0	0	0	0	0	0	0	0	0.00478479	0.012937765	0.003244071	0.001972977	0.0020115	0.00081744	1.3587E-07	4.4E-07	0	0	5.76E-07	0.575792
4840203754280	484020	3754280	0	0	0	0	0	0	0	0	0	0	0	0	0.003955584	0.010695644	0.002681872	0.001631059	0.0016629	0.00067578	1.1232E-07	3.64E-07	0	0	4.76E-07	0.476007
4840403754280	484040	3754280	0	0	0	0	0	0	0	0	0	0	0	0	0.003471832	0.00938761	0.00235389	0.001431587	0.00145954	0.00059313	9.8585E-08	3.19E-07	0	0	4.18E-07	0.417793
4840603754280	484060	3754280	0	0	0	0	0	0	0	0	0	0	0	0	0.003006122	0.00812836	0.00203814	0.001239555	0.00126375	0.00051357	8.5361E-08	2.76E-07	0	0	3.62E-07	0.36175
4840803754280	484080	3754280	0	0	0	0	0	0	0	0	0	0	0	0	0.002415215	0.006530587	0.001637507	0.000995898	0.00101534	0.00041262	6.8582E-08	2.22E-07	0	0	2.91E-07	0.290642
4841003754280	484100	3754280	0	0	0	0	0	0	0	0	0	0	0	0	0.001936058	0.005234976	0.00131264	0.000798321	0.00081391	0.00033076	5.4976E-08	1.78E-07	0	0	2.33E-07	0.232981
4841203754280	484120	3754280	0	0	0	0	0	0	0	0	0	0	0	0	0.00175704	0.004750924	0.001191267	0.000724504	0.00073865	0.00030017	4.9892E-08	1.62E-07	0	0	2.11E-07	0.211439
4840003754300	484000	3754300	0	0	0	0	0	0	0	0	0	0	0	0	0.004529229	0.012246743	0.003070801	0.001867598	0.00190406	0.00077378	1.2861E-07	4.16E-07	0	0	5.45E-07	0.545038
4840203754300	484020	3754300	0	0	0	0	0	0	0	0	0	0	0	0	0.003879441	0.010489758	0.002630247	0.001599662	0.00163089	0.00066277	1.1016E-07	3.57E-07	0	0	4.67E-07	0.466844
4840403754300	484040	3754300	0	0	0	0	0	0	0	0	0	0	0	0	0.003337111	0.009023333	0.002262549	0.001376036	0.0014029	0.00057011	9.476E-08	3.07E-07	0	0	4.02E-07	0.401581
4840603754300	484060	3754300	0	0	0	0	0	0	0	0	0	0	0	0	0.002356973	0.006373103	0.001598019	0.000971882	0.00099086	0.00040267	6.6928E-08	2.17E-07	0	0	2.84E-07	0.283633
4840803754300	484080	3754300	0	0	0	0	0	0	0	0	0	0	0	0	0.001450811	0.003922899	0.000983645	0.000598232	0.00060991	0.00024786	4.1197E-08	1.33E-07	0	0	1.75E-07	0.174588
4841003754300	484100	3754300	0	0	0	0	0	0	0	0	0	0	0	0	0.000969996	0.002622806	0.000657654	0.000399971	0.00040778	0.00016571	2.7544E-08	8.92E-08	0	0	1.17E-07	0.116727
4841203754300	484120	3754300	0	0	0	0	0	0	0	0	0	0	0	0	0.000918179	0.002482697	0.000622522	0.000378605	0.000386	0.00015686	2.6072E-08	8.44E-08	0	0	1.1E-07	0.110492

Pettit Tank and Pipeline Construction HRA

Onroad DPM Emissions, Ground Level Concentrations and Health Risk Calculations

Residential Receptors (Phase 2 Only Future Hypothetical Receptors)

Phase		Start Date	End Date	Work Days	Emissions (lbs/day)	Emissions (lbs/yr)	Emissions (g/s)	
Grading/Excavation	2026	5/1/2026	6/30/2026	43	n/a	n/a	n/a	Phase 1
Potholding	2026	5/1/2026	5/31/2026	21	n/a	n/a	n/a	Phase 1
Stormwater Drainage and Foundation C	2026	7/1/2026	8/31/2026	44	n/a	n/a	n/a	Phase 1
Construction	2026	9/1/2026	12/31/2026	88	n/a	n/a	n/a	Phase 1
Construction	2027	1/1/2027	2/28/2027	41	n/a	n/a	n/a	Phase 1
Finishing	2026	9/1/2026	12/31/2026	88	n/a	n/a	n/a	Phase 1
Finishing	2027	1/1/2027	2/28/2027	41	n/a	n/a	n/a	Phase 1
Painting	2026	9/1/2026	12/31/2026	88	n/a	n/a	n/a	Phase 1
Painting	2027	1/1/2027	2/28/2027	41	n/a	n/a	n/a	Phase 1
Installing Pipeline	2026	10/1/2026	11/30/2026	43	n/a	n/a	n/a	Phase 1
Install Appurtenances	2026	12/1/2026	12/31/2026	23	n/a	n/a	n/a	Phase 1
Pavement Repairs	2027	1/1/2027	1/31/2027	21	n/a	n/a	n/a	Phase 1
Demolition	2045	1/1/2045	1/31/2045	22	n/a	n/a	n/a	Phase 1
Grading/Excavation	2045	2/1/2045	3/31/2045	43	1.87E-02	0.8	1.81E-04	Phase 2
Stormwater Drainage and Foundation C	2045	4/1/2045	4/30/2045	20	8.36E-04	0.0	8.10E-06	Phase 2
Construction	2045	5/1/2045	10/31/2045	132	3.09E-03	0.4	2.99E-05	Phase 2
Finishing	2045	5/1/2045	10/31/2045	132	3.78E-04	0.0	3.67E-06	Phase 2
Painting	2045	5/1/2045	10/31/2045	132	3.78E-04	0.0	3.67E-06	Phase 2

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
																					Res MAX:	6.29			0.196284	
AERMOD Column Identifier:			7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7						
			vation	Potholding	and Foundation	Construction	Construction	Finishing	Finishing	Painting	Painting	Pipeline	Appurtenanc	Repairs	Demolition	vation	Drainage and	Construction	Finishing	Painting	Maximum Individual Cancer Risk (MICR)					
Unique Identifier	X (UTM)	Y (UTM)	2026	2026	2026	2026	2027	2026	2027	2026	2027	2026	2026	2027	2045	2045	2045	2045	2045	2045	3rd Trimester	0<2	2<16	16<30	Total	per million
483702.433753999.04	483702.43	3753999.04	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000514366	2.3029E-05	8.51559E-05	1.04306E-05	1.04306E-05	4.52281E-09	9.08E-09	0	0	1.36E-08	0.0136014
483694.263753916.12	483694.26	3753916.12	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000571442	2.55844E-05	9.46051E-05	1.1588E-05	1.1588E-05	5.02468E-09	1.01E-08	0	0	1.51E-08	0.0151106
483697.73753861.82	483697.7	3753861.82	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000586847	2.62741E-05	9.71555E-05	1.19004E-05	1.19004E-05	5.16013E-09	1.04E-08	0	0	1.55E-08	0.015518
483584.93753882.87	483584.9	3753882.87	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000331616	1.4847E-05	5.49006E-05	6.7247E-06	6.7247E-06	2.91589E-09	5.85E-09	0	0	8.77E-09	0.0087689
483549.823753855.91	483549.82	3753855.91	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000288347	1.29098E-05	4.77373E-05	5.84728E-06	5.84728E-06	2.53543E-09	5.09E-09	0	0	7.62E-09	0.0076248
483515.523753852.37	483515.52	3753852.37	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00025687	1.15005E-05	4.25261E-05	5.20896E-06	5.20896E-06	2.25865E-09	4.53E-09	0	0	6.79E-09	0.0067924
483339.193753860.79	483339.19	3753860.79	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000157493	7.05122E-06	2.60738E-05	3.19374E-06	3.19374E-06	1.38483E-09	2.78E-09	0	0	4.16E-09	0.0041646
483124.173753854.26	483124.17	3753854.26	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000101262	4.53365E-06	1.67644E-05	2.05344E-06	2.05344E-06	8.90391E-10	1.79E-09	0	0	2.68E-09	0.0026777
483070.493753861.97	483070.49	3753861.97	0	0	0	0	0	0	0	0	0	0	0	0	0	8.78444E-05	3.93294E-06	1.45431E-05	1.78136E-06	1.78136E-06	7.72415E-10	1.55E-09	0	0	2.32E-09	0.0023229
483954.733753733.9	483954.73	3753733.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0.002859237	0.000128013	0.000473361	5.79813E-05	5.79813E-05	2.51412E-08	5.05E-08	0	0	7.56E-08	0.0756068
483977.613753750.69	483977.61	3753750.69	0	0	0	0	0	0	0	0	0	0	0	0	0	0.001930686	8.644E-05	0.000319635	3.91516E-05	3.91516E-05	1.69765E-08	3.41E-08	0	0	5.11E-08	0.0510531
484012.023753748.78	484012.02	3753748.78	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00126443	5.66106E-05	0.000209333	2.56409E-05	2.56409E-05	1.11181E-08	2.23E-08	0	0	3.34E-08	0.0334353
484038.993753749.36	484038.99	3753749.36	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000970684	4.34591E-05	0.000160702	1.96841E-05	1.96841E-05	8.53521E-09	1.71E-08	0	0	2.57E-08	0.0256678
484074.893753746.12	484074.89	3753746.12	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000717649	3.21303E-05	0.00011881	1.45529E-05	1.45529E-05	6.31027E-09	1.27E-08	0	0	1.9E-08	0.0189768
483951.713753696.43	483951.71	3753696.43	0	0	0	0	0	0	0	0	0	0	0	0	0	0.003020194	0.000135219	0.000500008	6.12453E-05	6.12453E-05	2.65565E-08	5.33E-08	0	0	7.99E-08	0.0798629
483951.593753657.88	483951.59	3753657.88	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00300544	0.000134558	0.000497566	6.09461E-05	6.09461E-05	2.64268E-08	5.3E-08	0	0	7.95E-08	0.0794728
483950.463753618.15	483950.46	3753618.15	0	0	0	0	0	0	0	0	0	0	0	0	0	0.003045616	0.000136357	0.000504217	6.17608E-05	6.17608E-05	2.678E-08	5.38E-08	0	0	8.05E-08	0.0805352
483946.613753587.64	483946.61	3753587.64	0	0	0	0	0	0	0	0	0	0	0	0	0	0.003295633	0.000147551	0.000545609	6.68308E-05	6.68308E-05	2.89784E-08	5.82E-08	0	0	8.71E-08	0.0871463
483960.333753539.03	483960.33	3753539.03	0	0	0	0	0	0	0	0	0	0	0	0	0	0.002458002	0.000110049	0.000406935	4.98448E-05	4.98448E-05	2.16132E-08	4.34E-08	0	0	6.5E-08	0.0649969
483980.253753458.18	483980.25	3753458.18	0	0	0	0	0	0	0	0	0	0	0	0	0	0.001794802	8.03562E-05	0.000297138	3.63961E-05	3.63961E-05	1.57817E-08	3.17E-08	0	0	4.75E-08	0.0474599
484041.353753435.67	484041.35	3753435.67	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000989092	4.42832E-05	0.000163749	2.00574E-05	2.00574E-05	8.69706E-09	1.75E-08	0	0	2.62E-08	0.0261545
484049.623753516.7	484049.62	3753516.7	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000937496	4.19732E-05	0.000155207	1.90111E-05	1.90111E-05	8.24338E-09	1.65E-08	0	0	2.48E-08	0.0247902
484003.093753540.22	484003.09	3753540.22	0	0	0	0	0	0	0	0	0	0	0	0	0	0.001402485	6.27915E-05	0.000232188	2.84404E-05	2.84404E-05	1.2332E-08	2.48E-08	0	0	3.71E-08	0.0370859
484067.243753589.88	484067.24	3753589.88	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00081795	3.66209E-05	0.000135416	1.65869E-05	1.65869E-05	7.19222E-09	1.44E-08	0	0	2.16E-08	0.021629
484033.573753592.07	484033.57	3753592.07	0	0	0	0	0	0	0	0	0	0	0	0	0	0.001059489	4.74351E-05	0.000175404	2.1485E-05	2.1485E-05	9.31607E-09	1.87E-08	0	0	2.8E-08	0.028016
484006.163753595.1	484006.16	3753595.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.001363574	6.10494E-05	0.000225747	2.76514E-05	2.76514E-05	1.19899E-08	2.41E-08	0	0	3.61E-08	0.036057
484000.573753691.15	484000.57	3753691.15	0	0	0	0	0	0	0	0	0	0	0	0	0	0.001449897	6.49143E-05	0.000240038	2.94019E-05	2.94019E-05	1.27489E-08	2.56E-08	0	0	3.83E-08	0.0383396
484038.563753695.15	484038.56	3753695.15	0	0	0	0	0	0	0	0	0	0	0	0	0	0.001004761	4.49848E-05	0.000166343	2.03751E-05	2.03751E-05	8.83484E-09	1.77E-08	0	0	2.66E-08	0.0265689
484066.343753695.82	484066.34	3753695.82	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000799723	3.58049E-05	0.000132398	1.62173E-05	1.62173E-05	7.03195E-09	1.41E-08	0	0	2.11E-08	0.0211471
484100.923753692.13	484100.92	3753692.13	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000620641	2.77871E-05	0.00010275	1.25857E-05	1.25857E-05	5.45729E-09	1.1E-08	0	0	1.64E-08	0.0164116
4836593753057.49	483659	3753057.49	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000236088	1.057E-05	3.90855E-05	4.78753E-06	4.78753E-06	2.07591E-09	4.17E-09	0	0	6.24E-09	0.0062429
484038.613752969.05	484038.61	3752969.05	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000730085	3.26871E-05	0.000120869	1.48051E-05	1.48051E-05	6.41963E-09	1.29E-08	0	0	1.93E-08	0.0193056
484056.443752967.39	484056.44	3752967.39	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000662696	2.967E-05	0.000109713	1.34385E-05	1.34385E-05	5.82707E-09	1.17E-08	0	0	1.75E-08	0.0175237
484083.423752968.02	484083.42	3752968.02	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000582956	2.60999E-05	9.65114E-05	1.18215E-05	1.18215E-05	5.12592E-09	1.03E-08	0	0	1.54E-08	0.0154151
483468.163753775.07	483468.16	3753775.07	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000215222	9.63585E-06	3.56311E-05	4.3644E-06	4.3644E-06	1.89245E-09	3.8E-09	0	0	5.69E-09	0.0056911
483414.963753768.2	483414.96	3753768.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000183043	8.19514E-06	3.03037E-05	3.71186E-06	3.71186E-06	1.6095E-09	3.23E-09	0	0	4.84E-09	0.0048402
483321.053753785.73	483321.05	3753785.73	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000144671	6.47716E-06	2.3951E-05	2.93373E-06	2.93373E-06	1.27209E-09	2.55E-09	0	0	3.83E-09	0.0038255
483885.393754561.24	483885.39	3754561.24	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000150727	6.74828E-06	2.49536E-05	3.05652E-06	3.05652E-06	1.32534E-09	2.66E-09	0	0	3.99E-09	0.0039857
4839203753820	483920	3753820	0	0	0	0	0	0	0	0	0	0	0	0	0	0.007220492	0.000323273	0.001195389	0.000146421	0.000146421	6.34897E-08	1.27E-07	0	0	1.91E-07	0.1909313
4839403753820	483940	3753820	0	0	0	0	0	0	0	0	0	0	0	0	0	0.004161468	0.000186316	0.000688952	8.43887E-05	8.43887E-05	3.65917E-08	7.34E-08	0	0	1.1E-07	0.1100416
4839603753820	483960	3753820	0	0	0	0	0	0	0	0	0	0	0	0	0	0.002604921	0.000116627	0.000431258	5.28242E-05	5.28242E-05	2.2905E-08	4.6E-08	0	0	6.89E-08	0.0688819
4839803753820	483980	3753820	0	0	0	0	0	0	0	0	0	0	0	0	0	0.001860862	8.33138E-05	0.000308075	3.77357E-05	3.77357E-05	1.63625E-08	3.28E-08	0	0	4.92E-08	0.0492067
4840003753820	484000	3753820	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00142092	6.36169E-05	0.00023524	2.88143E-05	2.88143E-05	1.24941E-08	2.51E-08	0	0	3.76E-08	0.0375733
4840203753820	484020	3753820	0	0	0	0	0	0	0	0	0	0	0	0	0	0.001127508	5.04804E-05	0.000186665	2.28643E-05	2.28643E-05	9.91416E-09	1.99E-08	0	0	2.98E-08	0.0298147
4840403753820	484040	3753820	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000915321	4.09804E-05	0.000151536	1.85614E-05	1.85614E-05	8.0484E-09	1.62E-08	0	0	2.42E-08	0.0242038
4840603753820	484060	3753820	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000755596	3.38293E-05	0.000125093	1.53224E-05	1.53224E-05	6.64394E-09	1.33E-08	0	0	2E-08	0.0199802
4840803753820	484080	3753820	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000631832	2.82881E-05	0.000104603	1.28127E-05	1.28127E-05	5.55569E-09	1.12E-08	0	0	1.67E-08	0.0167075
4841003753820	484100	3753820	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000534495	2.39302E-05	8.84884E-05	1.08388E-05	1.08388E-05	4.69981E-09	9.43E-09	0	0	1.41E-08	0.0141336
4841203753820	484120	3753820	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000455834	2.04084E-05	7.54655E-05	9.24367E-06	9.24367E-06	4.00814E-09	8.05E-09	0	0	1.21E-08	0.0120536
4839203753840	483920	3753840	0	0	0	0	0	0	0	0	0	0	0	0	0	0.007255962	0.000324861	0.001201261	0.000147141	0.000147141	6.38015E-08	1.28E-07	0	0	1.92E-07	0.1918692
4839403753840	483940	3753840	0	0	0	0	0	0	0	0	0	0	0	0	0	0.004179623	0.000187129	0.000691958	8.47569E-05	8.47569E-05	3.67513E-08	7.38E-08	0	0	1.11E-07	0.1105217
4839603753840	483960	3753840	0	0	0	0	0	0	0	0	0	0	0	0	0	0.002608	0.000116764	0.000431768	5.28866E-05	5.28866E-05	2.29321E-08	4.6E-08	0	0	6.9E-08	0.0689633
4839803753840	483980	3753840	0	0	0	0	0	0	0	0	0	0	0	0	0	0.001855839	8.30889E-05	0.000307244	3.76338E-05	3.76338E-05	1.63184E-08	3.28E-08	0	0	4.91E-08	0.0490739
4840003753840	484000	3753840	0	0	0	0	0	0	0	0	0	0	0	0	0	0.001410903	6.31684E-05	0.000233582	2.86111E-05	2.86111E-05	1.2406E-08	2.49E-08	0	0	3.73E-08	0.0373085
4840203753840	484020	3753840	0	0	0	0	0	0	0	0	0	0	0	0	0	0.001111351	4.9757E-05	0.00018399	2.25366E-05	2.25366E-05	9.77209E-09	1.96E-08	0	0	2.94E-08	0.0293874
4840403753840	484040	3753840	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000895144	4.00771E-05	0.000148196	1.81523E-05	1.81523E-05	7.87099E-09	1.58E-08	0	0	2.37E-08	0.0236703
4840603753840	484060	3753840	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000733674	3.28478E-05	0.000121463	1.48779E-05	1.48779E-05	6.45118E-09	1.29E-08	0	0	1.94E-08	0.0194005
4840803753840	484080	3753840	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00061008	2.73143E-05	0.000101002	1.23716E-05	1.23716E-05	5.36442E-09	1.08E-08	0	0	1.61E-08	0.0161323
4841003753840	484100	3753840	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000514094	2.30168E-05	8.51109E-05	1.04251E-05	1.04251E-05	4.52042E-09	9.07E-09	0	0	1.36E-08	0.0135942
4841203753840	484120	3753840	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000437215	1.95748E-05	7.23831E-05	8.8661E-06	8.8661E-06	3.84442E-09	7.72E-09	0	0	1.16E-08	0.0115613
4839203753860	483920	3753860	0	0	0	0	0	0	0	0	0	0	0	0	0	0.007322749	0.000327851	0.001212318	0.000148495	0.000148495	6.43888E-08	1.29E-07	0	0	1.94E-07	0.1936353
4839403753860	483940	3753860	0	0	0	0	0	0	0	0	0	0	0	0	0	0.004202047	0.000188133	0.00069567	8.52116E-05	8.52116E-05	3.69485E-08	7.42E-08	0	0	1.11E-07	0.1111146
4839603753860	483960	3753860	0	0	0	0	0	0	0	0	0	0	0	0	0	0.002615387	0.000117095	0.00043299	5.30364E-05	5.30364E-05	2.2997E-08	4.62E-08	0	0	6.92E-08	0.0691586
4839803753860	483980	3753860	0	0	0	0	0	0	0	0	0	0	0	0	0	0.001843482	8.25357E-05	0.000305198	3.73832E-05	3.73832E-05	1.62097E-08	3.25E-08	0	0	4.87E-08	0.0487471
4840003753860	484000	3753860	0	0	0	0	0	0	0	0	0	0	0	0	0	0.001390676	6.22628E-05	0.000230233	2.8201E-05	2.8201E-05	1.22282E-08	2.45E-08	0	0	3.68E-08	0.0367736
4840203753860	484020	3753860	0	0	0	0	0	0	0	0	0	0	0	0	0	0.001087253	4.86781E-05	0.00018	2.2048E-05	2.2048E-05	9.5602E-09	1.92E-08	0	0	2.88E-08	0.0287502
4840403753860	484040	3753860	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000869531	3.89303E-05	0.000143955	1.76329E-05	1.76329E-05	7.64577E-09	1.53E-08	0	0	2.3E-08	0.022993
4840603753860	484060	3753860	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0007089	3.17386E-05	0.000117362	1.43755E-05	1.43755E-05	6.23334E-09	1.25E-08	0	0	1.87E-08	0.0187454
4840803753860	484080	3753860	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000586255	2.62476E-05	9.70576E-05	1.18884E-05	1.18884E-05	5.15493E-09	1.03E-08	0	0	1.55E-08	0.0155023
4841003753860	484100	3753860	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00049218	2.20357E-05	8.14829E-05	9.98072E-06	9.98072E-06	4.32773E-09	8.69E-09	0	0	1.3E-08	0.0130147
4841203753860	484120	3753860	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000418465	1.87354E-05	6.9279E-05	8.48589E-06	8.48589E-06	3.67956E-09	7.39E-09	0	0	1.11E-08	0.0110655
4839203753880	483920	3753880	0	0	0	0	0	0	0	0	0	0	0	0	0	0.007353749	0.000329239	0.00121745	0.000149124	0.000149124	6.46614E-08	1.3E-07	0	0	1.94E-07	0.194455
4839403753880	483940	3753880	0	0	0	0	0	0	0	0	0	0	0	0	0	0.004218405	0.000188865	0.000698378	8.55433E-05	8.55433E-05	3.70924E-08	7.45E-08	0	0	1.12E-07	0.1115472
4839603753880	483960	3753880	0	0	0	0	0	0	0	0	0	0	0	0	0	0.002610829	0.000116891	0.000432236	5.29439E-05	5.29439E-05	2.2957E-08	4.61E-08	0	0	6.9E-08	0.0690381
4839803753880	483980	3753880	0	0	0	0	0	0	0	0	0	0	0	0	0	0.001825716	8.17403E-05	0.000302257	3.7023E-05	3.7023E-05	1.60535E-08	3.22E-08	0	0	4.83E-08	0.0482774
4840003753880	484000	3753880	0	0	0	0	0	0	0	0	0	0	0	0	0	0.001365665	6.1143E-05	0.000226093	2.76938E-05	2.76938E-05	1.20083E-08	2.41E-08	0	0	3.61E-08	0.0361122
4840203753880	484020	3753880	0	0	0	0	0	0	0	0	0	0	0	0	0	0.001056637	4.73073E-05	0.000174932	2.14271E-05	2.14271E-05	9.29099E-09	1.86E-08	0	0	2.79E-08	0.0279406
4840403753880	484040	3753880	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000839584	3.75895E-05	0.000138997	1.70256E-05	1.70256E-05	7.38245E-09	1.48E-08	0	0	2.22E-08	0.0222011
4840603753880	484060	3753880	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000680083	3.04484E-05	0.000112591	1.37911E-05	1.37911E-05	5.97996E-09	1.2E-08	0	0	1.8E-08	0.0179834
4840803753880	484080	3753880	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000560089	2.50761E-05	9.27255E-05	1.13578E-05	1.13578E-05	4.92485E-09	9.89E-09	0	0	1.48E-08	0.0148104
4841003753880	484100	3753880	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000470095	2.10469E-05	7.78267E-05	9.53287E-06	9.53287E-06	4.13354E-09	8.3E-09	0	0	1.24E-08	0.0124307
4841203753880	484120	3753880	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000399975	1.79075E-05	6.62178E-05	8.11092E-06	8.11092E-06	3.51697E-09	7.06E-09	0	0	1.06E-08	0.0105765
4839203753900	483920	3753900	0	0	0	0	0	0	0	0	0	0	0	0	0	0.007337769	0.000328524	0.001214805	0.0001488	0.0001488	6.45209E-08	1.3E-07	0	0	1.94E-07	0.1940324
4839403753900	483940	3753900	0	0	0	0	0	0	0	0	0	0	0	0	0	0.004226604	0.000189232	0.000699736	8.57096E-05	8.57096E-05	3.71645E-08	7.46E-08	0	0	1.12E-07	0.111764
4839603753900	483960	3753900	0	0	0	0	0	0	0	0	0	0	0	0	0	0.002602111	0.000116501	0.000430793	5.27672E-05	5.27672E-05	2.28803E-08	4.59E-08	0	0	6.88E-08	0.0688076
4839803753900	483980	3753900	0	0	0	0	0	0	0	0	0	0	0	0	0	0.001802818	8.07151E-05	0.000298466	3.65586E-05	3.65586E-05	1.58521E-08	3.18E-08	0	0	4.77E-08	0.0476719
4840003753900	484000	3753900	0	0	0	0	0	0	0	0	0	0	0	0	0	0.001333999	5.97253E-05	0.00022085	2.70516E-05	2.70516E-05	1.17298E-08	2.35E-08	0	0	3.53E-08	0.0352749
4840203753900	484020	3753900	0	0	0	0	0	0	0	0	0	0	0	0	0	0.001021111	4.57168E-05	0.00016905	2.07067E-05	2.07067E-05	8.97861E-09	1.8E-08	0	0	2.7E-08	0.0270012
4840403753900	484040	3753900	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000803397	3.59694E-05	0.000133006	1.62918E-05	1.62918E-05	7.06425E-09	1.42E-08	0	0	2.12E-08	0.0212442
4840603753900	484060	3753900	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000647698	2.89985E-05	0.00010723	1.31344E-05	1.31344E-05	5.6952E-09	1.14E-08	0	0	1.71E-08	0.0171271
4840803753900	484080	3753900	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000533455	2.38837E-05	8.83162E-05	1.08177E-05	1.08177E-05	4.69066E-09	9.42E-09	0	0	1.41E-08	0.0141061
4841003753900	484100	3753900	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00044823	2.0068E-05	7.42067E-05	9.08947E-06	9.08947E-06	3.94128E-09	7.91E-09	0	0	1.19E-08	0.0118525
4841203753900	484120	3753900	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000383014	1.71482E-05	6.34099E-05	7.76699E-06	7.76699E-06	3.36784E-09	6.76E-09	0	0	1.01E-08	0.010128
4839203753920	483920	3753920	0	0	0	0	0	0	0	0	0	0	0	0	0	0.007317413	0.000327613	0.001211435	0.000148387	0.000148387	6.43419E-08	1.29E-07	0	0	1.93E-07	0.1934942
4839403753920	483940	3753920	0	0	0	0	0	0	0	0	0	0	0	0	0	0.004198488	0.000187973	0.000695081	8.51394E-05	8.51394E-05	3.69172E-08	7.41E-08	0	0	1.11E-07	0.1110205
4839603753920	483960	3753920	0	0	0	0	0	0	0	0	0	0	0	0	0	0.002587668	0.000115854	0.000428401	5.24743E-05	5.24743E-05	2.27533E-08	4.57E-08	0	0	6.84E-08	0.0684256
4839803753920	483980	3753920	0	0	0	0	0	0	0	0	0	0	0	0	0	0.001772057	7.93379E-05	0.000293373	3.59348E-05	3.59348E-05	1.55817E-08	3.13E-08	0	0	4.69E-08	0.0468585
4840003753920	484000	3753920	0	0	0	0	0	0	0	0	0	0	0	0	0	0.001294936	5.79764E-05	0.000214383	2.62595E-05	2.62595E-05	1.13864E-08	2.29E-08	0	0	3.42E-08	0.034242
4840203753920	484020	3753920	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0009784	4.38046E-05	0.000161979	1.98406E-05	1.98406E-05	8.60305E-09	1.73E-08	0	0	2.59E-08	0.0258718
4840403753920	484040	3753920	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000762501	3.41384E-05	0.000126236	1.54625E-05	1.54625E-05	6.70466E-09	1.35E-08	0	0	2.02E-08	0.0201628
4840603753920	484060	3753920	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000614967	2.75331E-05	0.000101811	1.24707E-05	1.24707E-05	5.4074E-09	1.09E-08	0	0	1.63E-08	0.0162616
4840803753920	484080	3753920	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00050538	2.26267E-05	8.36682E-05	1.02484E-05	1.02484E-05	4.4438E-09	8.92E-09	0	0	1.34E-08	0.0133638
4841003753920	484100	3753920	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000426659	1.91022E-05	7.06355E-05	8.65204E-06	8.65204E-06	3.7516E-09	7.53E-09	0	0	1.13E-08	0.0112821
4841203753920	484120	3753920	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000367607	1.64584E-05	6.08593E-05	7.45456E-06	7.45456E-06	3.23237E-09	6.49E-09	0	0	9.72E-09	0.0097206
4839203753940	483920	3753940	0	0	0	0	0	0	0	0	0	0	0	0	0	0.007308811	0.000327227	0.001210011	0.000148212	0.000148212	6.42662E-08	1.29E-07	0	0	1.93E-07	0.1932667
4839403753940	483940	3753940	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00416951	0.000186676	0.000690283	8.45518E-05	8.45518E-05	3.66624E-08	7.36E-08	0	0	1.1E-07	0.1102543
4839603753940	483960	3753940	0	0	0	0	0	0	0	0	0	0	0	0	0	0.002561941	0.000114702	0.000424142	5.19526E-05	5.19526E-05	2.25271E-08	4.52E-08	0	0	6.77E-08	0.0677453
4839803753940	483980	3753940	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00172652	7.72991E-05	0.000285834	3.50114E-05	3.50114E-05	1.51813E-08	3.05E-08	0	0	4.57E-08	0.0456543
4840003753940	484000	3753940	0	0	0	0	0	0	0	0	0	0	0	0	0	0.001242254	5.56177E-05	0.000205661	2.51912E-05	2.51912E-05	1.09231E-08	2.19E-08	0	0	3.28E-08	0.0328489
4840203753940	484020	3753940	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000926647	4.14875E-05	0.000153411	1.87911E-05	1.87911E-05	8.14799E-09	1.64E-08	0	0	2.45E-08	0.0245033
4840403753940	484040	3753940	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000718598	3.21728E-05	0.000118968	1.45722E-05	1.45722E-05	6.31862E-09	1.27E-08	0	0	1.9E-08	0.0190019
4840603753940	484060	3753940	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000578816	2.59145E-05	9.58259E-05	1.17376E-05	1.17376E-05	5.08952E-09	1.02E-08	0	0	1.53E-08	0.0153056
4840803753940	484080	3753940	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000477645	2.13849E-05	7.90765E-05	9.68597E-06	9.68597E-06	4.19992E-09	8.43E-09	0	0	1.26E-08	0.0126304
4841003753940	484100	3753940	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000405622	1.81603E-05	6.71527E-05	8.22543E-06	8.22543E-06	3.56662E-09	7.16E-09	0	0	1.07E-08	0.0107258
4841203753940	484120	3753940	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000353366	1.58208E-05	5.85015E-05	7.16576E-06	7.16576E-06	3.10714E-09	6.24E-09	0	0	9.34E-09	0.009344
4839203753960	483920	3753960	0	0	0	0	0	0	0	0	0	0	0	0	0	0.007325967	0.000327995	0.001212851	0.00014856	0.00014856	6.44171E-08	1.29E-07	0	0	1.94E-07	0.1937204
4839403753960	483940	3753960	0	0	0	0	0	0	0	0	0	0	0	0	0	0.004151875	0.000185886	0.000687364	8.41942E-05	8.41942E-05	3.65074E-08	7.33E-08	0	0	1.1E-07	0.1097879
4839603753960	483960	3753960	0	0	0	0	0	0	0	0	0	0	0	0	0	0.002515219	0.00011261	0.000416407	5.10051E-05	5.10051E-05	2.21163E-08	4.44E-08	0	0	6.65E-08	0.0665099
4839803753960	483980	3753960	0	0	0	0	0	0	0	0	0	0	0	0	0	0.001660619	7.43486E-05	0.000274924	3.3675E-05	3.3675E-05	1.46018E-08	2.93E-08	0	0	4.39E-08	0.0439117
4840003753960	484000	3753960	0	0	0	0	0	0	0	0	0	0	0	0	0	0.001175683	5.26373E-05	0.00019464	2.38412E-05	2.38412E-05	1.03378E-08	2.08E-08	0	0	3.11E-08	0.0310886
4840203753960	484020	3753960	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000868636	3.88902E-05	0.000143807	1.76147E-05	1.76147E-05	7.6379E-09	1.53E-08	0	0	2.3E-08	0.0229693
4840403753960	484040	3753960	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000670879	3.00363E-05	0.000111067	1.36045E-05	1.36045E-05	5.89902E-09	1.18E-08	0	0	1.77E-08	0.01774
4840603753960	484060	3753960	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000541584	2.42476E-05	8.96619E-05	1.09826E-05	1.09826E-05	4.76213E-09	9.56E-09	0	0	1.43E-08	0.0143211
4840803753960	484080	3753960	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000450444	2.01671E-05	7.45732E-05	9.13436E-06	9.13436E-06	3.96074E-09	7.95E-09	0	0	1.19E-08	0.0119111
4841003753960	484100	3753960	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000386626	1.73099E-05	6.40079E-05	7.84024E-06	7.84024E-06	3.3996E-09	6.82E-09	0	0	1.02E-08	0.0102235
4841203753960	484120	3753960	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000338995	1.51774E-05	5.61224E-05	6.87435E-06	6.87435E-06	2.98078E-09	5.98E-09	0	0	8.96E-09	0.008964
4839203753980	483920	3753980	0	0	0	0	0	0	0	0	0	0	0	0	0	0.007422909	0.000332336	0.0012289	0.000150526	0.000150526	6.52695E-08	1.31E-07	0	0	1.96E-07	0.1962838
4839403753980	483940	3753980	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00415243	0.000185911	0.000687456	8.42055E-05	8.42055E-05	3.65122E-08	7.33E-08	0	0	1.1E-07	0.1098026
4839603753980	483960	3753980	0	0	0	0	0	0	0	0	0	0	0	0	0	0.002436364	0.00010908	0.000403352	4.94061E-05	4.94061E-05	2.14229E-08	4.3E-08	0	0	6.44E-08	0.0644247
4839803753980	483980	3753980	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00157271	7.04128E-05	0.00026037	3.18923E-05	3.18923E-05	1.38288E-08	2.78E-08	0	0	4.16E-08	0.0415871
4840003753980	484000	3753980	0	0	0	0	0	0	0	0	0	0	0	0	0	0.001094983	4.90242E-05	0.00018128	2.22047E-05	2.22047E-05	9.62817E-09	1.93E-08	0	0	2.9E-08	0.0289546
4840203753980	484020	3753980	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000803898	3.59918E-05	0.000133089	1.63019E-05	1.63019E-05	7.06866E-09	1.42E-08	0	0	2.13E-08	0.0212575
4840403753980	484040	3753980	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000621218	2.7813E-05	0.000102846	1.25974E-05	1.25974E-05	5.46236E-09	1.1E-08	0	0	1.64E-08	0.0164269
4840603753980	484060	3753980	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000504241	2.25757E-05	8.34796E-05	1.02253E-05	1.02253E-05	4.43378E-09	8.9E-09	0	0	1.33E-08	0.0133336
4840803753980	484080	3753980	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00042442	1.9002E-05	7.02648E-05	8.60663E-06	8.60663E-06	3.73191E-09	7.49E-09	0	0	1.12E-08	0.0112229
4841003753980	484100	3753980	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000369015	1.65214E-05	6.10922E-05	7.4831E-06	7.4831E-06	3.24474E-09	6.51E-09	0	0	9.76E-09	0.0097578
4841203753980	484120	3753980	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000327101	1.46448E-05	5.41532E-05	6.63315E-06	6.63315E-06	2.87619E-09	5.77E-09	0	0	8.65E-09	0.0086495
4839203754000	483920	3754000	0	0	0	0	0	0	0	0	0	0	0	0	0	0.007383159	0.000330556	0.001222319	0.00014972	0.00014972	6.492E-08	1.3E-07	0	0	1.95E-07	0.1952327
4839403754000	483940	3754000	0	0	0	0	0	0	0	0	0	0	0	0	0	0.004149618	0.000185785	0.00068699	8.41484E-05	8.41484E-05	3.64875E-08	7.32E-08	0	0	1.1E-07	0.1097282
4839603754000	483960	3754000	0	0	0	0	0	0	0	0	0	0	0	0	0	0.002320161	0.000103877	0.000384114	4.70496E-05	4.70496E-05	2.04011E-08	4.1E-08	0	0	6.14E-08	0.061352
4839803754000	483980	3754000	0	0	0	0	0	0	0	0	0	0	0	0	0	0.001459702	6.53533E-05	0.000241661	2.96007E-05	2.96007E-05	1.28351E-08	2.58E-08	0	0	3.86E-08	0.0385989
4840003754000	484000	3754000	0	0	0	0	0	0	0	0	0	0	0	0	0	0.001001255	4.48278E-05	0.000165763	2.03041E-05	2.03041E-05	8.80402E-09	1.77E-08	0	0	2.65E-08	0.0264762
4840203754000	484020	3754000	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000735497	3.29294E-05	0.000121765	1.49149E-05	1.49149E-05	6.46721E-09	1.3E-08	0	0	1.94E-08	0.0194487
4840403754000	484040	3754000	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000572677	2.56397E-05	9.48096E-05	1.16131E-05	1.16131E-05	5.03554E-09	1.01E-08	0	0	1.51E-08	0.0151433
4840603754000	484060	3754000	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000469267	2.10098E-05	7.76895E-05	9.51608E-06	9.51608E-06	4.12626E-09	8.28E-09	0	0	1.24E-08	0.0124088
4840803754000	484080	3754000	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000401716	1.79855E-05	6.65062E-05	8.14625E-06	8.14625E-06	3.53229E-09	7.09E-09	0	0	1.06E-08	0.0106226
4841003754000	484100	3754000	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000353924	1.58458E-05	5.8594E-05	7.17709E-06	7.17709E-06	3.11205E-09	6.25E-09	0	0	9.36E-09	0.0093588
4841203754000	484120	3754000	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000317851	1.42307E-05	5.26219E-05	6.44558E-06	6.44558E-06	2.79486E-09	5.61E-09	0	0	8.4E-09	0.0084049
4839203754020	483920	3754020	0	0	0	0	0	0	0	0	0	0	0	0	0	0.007225135	0.000323481	0.001196158	0.000146516	0.000146516	6.35305E-08	1.28E-07	0	0	1.91E-07	0.1910541
4839403754020	483940	3754020	0	0	0	0	0	0	0	0	0	0	0	0	0	0.004036124	0.000180704	0.000668201	8.18469E-05	8.18469E-05	3.54896E-08	7.12E-08	0	0	1.07E-07	0.1067271
4839603754020	483960	3754020	0	0	0	0	0	0	0	0	0	0	0	0	0	0.002144499	9.60127E-05	0.000355033	4.34874E-05	4.34874E-05	1.88565E-08	3.79E-08	0	0	5.67E-08	0.0567069
4839803754020	483980	3754020	0	0	0	0	0	0	0	0	0	0	0	0	0	0.001314556	5.88548E-05	0.000217631	2.66573E-05	2.66573E-05	1.15589E-08	2.32E-08	0	0	3.48E-08	0.0347608
4840003754020	484000	3754020	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000900516	4.03176E-05	0.000149085	1.82612E-05	1.82612E-05	7.91822E-09	1.59E-08	0	0	2.38E-08	0.0238123
4840203754020	484020	3754020	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000669453	2.99725E-05	0.000110831	1.35756E-05	1.35756E-05	5.88649E-09	1.18E-08	0	0	1.77E-08	0.0177023

			vation	Potholding	and Foundation	Construction	Construction	Finishing	Finishing	Painting	Painting	Pipeline	Appurtenanc	Repairs	Demolition	vation	Drainage and	Construction	Finishing	Painting	Maximum Individual Cancer Risk (MICR)					
Unique Identifier	X (UTM)	Y (UTM)	2026	2026	2026	2026	2027	2026	2027	2026	2027	2026	2026	2027	2045	2045	2045	2045	2045	2045	3rd Trimester	0<2	2<16	16<30	Total	per million
4840403754020	484040	3754020	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000529744	2.37175E-05	8.77017E-05	1.07425E-05	1.07425E-05	4.65803E-09	9.35E-09	0	0	1.4E-08	0.014008
4840603754020	484060	3754020	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000437873	1.96043E-05	7.24921E-05	8.87945E-06	8.87945E-06	3.85021E-09	7.73E-09	0	0	1.16E-08	0.0115787
4840803754020	484080	3754020	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000381517	1.70811E-05	6.3162E-05	7.73662E-06	7.73662E-06	3.35467E-09	6.73E-09	0	0	1.01E-08	0.0100884
4841003754020	484100	3754020	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000341023	1.52681E-05	5.6458E-05	6.91546E-06	6.91546E-06	2.99861E-09	6.02E-09	0	0	9.02E-09	0.0090177
4841203754020	484120	3754020	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000308822	1.38265E-05	5.1127E-05	6.26248E-06	6.26248E-06	2.71547E-09	5.45E-09	0	0	8.17E-09	0.0081662
4839203754040	483920	3754040	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00707996	0.000316981	0.001172123	0.000143572	0.000143572	6.2254E-08	1.25E-07	0	0	1.87E-07	0.1872152
4839403754040	483940	3754040	0	0	0	0	0	0	0	0	0	0	0	0	0	0.003751224	0.000167948	0.000621034	7.60696E-05	7.60696E-05	3.29844E-08	6.62E-08	0	0	9.92E-08	0.0991935
4839603754040	483960	3754040	0	0	0	0	0	0	0	0	0	0	0	0	0	0.001892701	8.47393E-05	0.000313346	3.83813E-05	3.83813E-05	1.66425E-08	3.34E-08	0	0	5E-08	0.0500486
4839803754040	483980	3754040	0	0	0	0	0	0	0	0	0	0	0	0	0	0.001152237	5.15875E-05	0.000190759	2.33657E-05	2.33657E-05	1.01316E-08	2.03E-08	0	0	3.05E-08	0.0304686
4840003754040	484000	3754040	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000802129	3.59126E-05	0.000132796	1.6266E-05	1.6266E-05	7.0531E-09	1.42E-08	0	0	2.12E-08	0.0212107
4840203754040	484020	3754040	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000612028	2.74015E-05	0.000101324	1.24111E-05	1.24111E-05	5.38155E-09	1.08E-08	0	0	1.62E-08	0.0161838
4840403754040	484040	3754040	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000492757	2.20615E-05	8.15784E-05	9.99242E-06	9.99242E-06	4.3328E-09	8.7E-09	0	0	1.3E-08	0.01303
4840603754040	484060	3754040	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000412681	1.84764E-05	6.83214E-05	8.36859E-06	8.36859E-06	3.6287E-09	7.28E-09	0	0	1.09E-08	0.0109125
4840803754040	484080	3754040	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000361673	1.61927E-05	5.98768E-05	7.33422E-06	7.33422E-06	3.18018E-09	6.38E-09	0	0	9.56E-09	0.0095637
4841003754040	484100	3754040	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00032647	1.46166E-05	5.40487E-05	6.62035E-06	6.62035E-06	2.87064E-09	5.76E-09	0	0	8.63E-09	0.0086328
4841203754040	484120	3754040	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000298391	1.33595E-05	4.94002E-05	6.05095E-06	6.05095E-06	2.62375E-09	5.27E-09	0	0	7.89E-09	0.0078903
4839203754060	483920	3754060	0	0	0	0	0	0	0	0	0	0	0	0	0	0.006546346	0.000293091	0.001083781	0.000132751	0.000132751	5.75619E-08	1.16E-07	0	0	1.73E-07	0.1731049
4839403754060	483940	3754060	0	0	0	0	0	0	0	0	0	0	0	0	0	0.003160414	0.000141497	0.000523223	6.40888E-05	6.40888E-05	2.77895E-08	5.58E-08	0	0	8.36E-08	0.0835708
4839603754060	483960	3754060	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00158005	7.07414E-05	0.000261585	3.20412E-05	3.20412E-05	1.38933E-08	2.79E-08	0	0	4.18E-08	0.0417812
4839803754060	483980	3754060	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000996882	4.4632E-05	0.000165039	2.02154E-05	2.02154E-05	8.76556E-09	1.76E-08	0	0	2.64E-08	0.0263605
4840003754060	484000	3754060	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000721432	3.22997E-05	0.000119437	1.46296E-05	1.46296E-05	6.34354E-09	1.27E-08	0	0	1.91E-08	0.0190768
4840203754060	484020	3754060	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000565126	2.53016E-05	9.35594E-05	1.146E-05	1.146E-05	4.96914E-09	9.97E-09	0	0	1.49E-08	0.0149436
4840403754060	484040	3754060	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000463211	2.07387E-05	7.6687E-05	9.39328E-06	9.39328E-06	4.07301E-09	8.18E-09	0	0	1.22E-08	0.0122487
4840603754060	484060	3754060	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000392845	1.75883E-05	6.50374E-05	7.96634E-06	7.96634E-06	3.45428E-09	6.93E-09	0	0	1.04E-08	0.010388
4840803754060	484080	3754060	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000346773	1.55256E-05	5.741E-05	7.03207E-06	7.03207E-06	3.04917E-09	6.12E-09	0	0	9.17E-09	0.0091697
4841003754060	484100	3754060	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000313906	1.40541E-05	5.19688E-05	6.36558E-06	6.36558E-06	2.76017E-09	5.54E-09	0	0	8.3E-09	0.0083006
4841203754060	484120	3754060	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000287886	1.28891E-05	4.7661E-05	5.83792E-06	5.83792E-06	2.53138E-09	5.08E-09	0	0	7.61E-09	0.0076126
4839403754080	483940	3754080	0	0	0	0	0	0	0	0	0	0	0	0	0	0.002314082	0.000103605	0.000383108	4.69263E-05	4.69263E-05	2.03477E-08	4.08E-08	0	0	6.12E-08	0.0611912
4839603754080	483960	3754080	0	0	0	0	0	0	0	0	0	0	0	0	0	0.001295351	5.7995E-05	0.000214452	2.62679E-05	2.62679E-05	1.139E-08	2.29E-08	0	0	3.43E-08	0.0342529
4839803754080	483980	3754080	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00087688	3.92593E-05	0.000145172	1.77819E-05	1.77819E-05	7.71039E-09	1.55E-08	0	0	2.32E-08	0.0231873
4840003754080	484000	3754080	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000661978	2.96378E-05	0.000109594	1.3424E-05	1.3424E-05	5.82076E-09	1.17E-08	0	0	1.75E-08	0.0175047
4840203754080	484020	3754080	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000529447	2.37042E-05	8.76526E-05	1.07364E-05	1.07364E-05	4.65542E-09	9.34E-09	0	0	1.4E-08	0.0140002
4840403754080	484040	3754080	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00044081	1.97358E-05	7.29784E-05	8.93901E-06	8.93901E-06	3.87604E-09	7.78E-09	0	0	1.17E-08	0.0116563
4840603754080	484060	3754080	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000377353	1.68947E-05	6.24727E-05	7.65219E-06	7.65219E-06	3.31806E-09	6.66E-09	0	0	9.98E-09	0.0099783
4840803754080	484080	3754080	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000334316	1.49679E-05	5.53477E-05	6.77946E-06	6.77946E-06	2.93964E-09	5.9E-09	0	0	8.84E-09	0.0088403
4841003754080	484100	3754080	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000303702	1.35972E-05	5.02793E-05	6.15864E-06	6.15864E-06	2.67044E-09	5.36E-09	0	0	8.03E-09	0.0080308
4841203754080	484120	3754080	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000278906	1.24871E-05	4.61742E-05	5.65582E-06	5.65582E-06	2.45241E-09	4.92E-09	0	0	7.38E-09	0.0073751
4839403754100	483940	3754100	0	0	0	0	0	0	0	0	0	0	0	0	0	0.001788777	8.00865E-05	0.000296141	3.62739E-05	3.62739E-05	1.57287E-08	3.16E-08	0	0	4.73E-08	0.0473006
4839603754100	483960	3754100	0	0	0	0	0	0	0	0	0	0	0	0	0	0.001137148	5.0912E-05	0.000188261	2.30598E-05	2.30598E-05	9.99893E-09	2.01E-08	0	0	3.01E-08	0.0300696
4839803754100	483980	3754100	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000803791	3.5987E-05	0.000133072	1.62998E-05	1.62998E-05	7.06772E-09	1.42E-08	0	0	2.13E-08	0.0212546
4840003754100	484000	3754100	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00062014	2.77647E-05	0.000102667	1.25756E-05	1.25756E-05	5.45288E-09	1.09E-08	0	0	1.64E-08	0.0163984
4840203754100	484020	3754100	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000503	2.25201E-05	8.32741E-05	1.02001E-05	1.02001E-05	4.42287E-09	8.88E-09	0	0	1.33E-08	0.0133008
4840403754100	484040	3754100	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00042353	1.89621E-05	7.01175E-05	8.58859E-06	8.58859E-06	3.72409E-09	7.48E-09	0	0	1.12E-08	0.0111994
4840603754100	484060	3754100	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000365249	1.63528E-05	6.04688E-05	7.40674E-06	7.40674E-06	3.21163E-09	6.45E-09	0	0	9.66E-09	0.0096583
4840803754100	484080	3754100	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000323793	1.44967E-05	5.36055E-05	6.56607E-06	6.56607E-06	2.8471E-09	5.71E-09	0	0	8.56E-09	0.008562
4841003754100	484100	3754100	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000294609	1.31901E-05	4.8774E-05	5.97426E-06	5.97426E-06	2.59049E-09	5.2E-09	0	0	7.79E-09	0.0077903
4841203754100	484120	3754100	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000271246	1.21441E-05	4.49061E-05	5.50048E-06	5.50048E-06	2.38506E-09	4.79E-09	0	0	7.17E-09	0.0071725
4839403754120	483940	3754120	0	0	0	0	0	0	0	0	0	0	0	0	0	0.001445095	6.46993E-05	0.000239243	2.93045E-05	2.93045E-05	1.27067E-08	2.55E-08	0	0	3.82E-08	0.0382126
4839603754120	483960	3754120	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000995116	4.4553E-05	0.000164747	2.01796E-05	2.01796E-05	8.75004E-09	1.76E-08	0	0	2.63E-08	0.0263138
4839803754120	483980	3754120	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000740524	3.31544E-05	0.000122597	1.50168E-05	1.50168E-05	6.51141E-09	1.31E-08	0	0	1.96E-08	0.0195816
4840003754120	484000	3754120	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00058338	2.61189E-05	9.65814E-05	1.18301E-05	1.18301E-05	5.12965E-09	1.03E-08	0	0	1.54E-08	0.0154263
4840203754120	484020	3754120	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000482158	2.1587E-05	7.98237E-05	9.77748E-06	9.77748E-06	4.2396E-09	8.51E-09	0	0	1.27E-08	0.0127497
4840403754120	484040	3754120	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00040997	1.8355E-05	6.78726E-05	8.31361E-06	8.31361E-06	3.60486E-09	7.24E-09	0	0	1.08E-08	0.0108408
4840603754120	484060	3754120	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000355153	1.59008E-05	5.87973E-05	7.202E-06	7.202E-06	3.12285E-09	6.27E-09	0	0	9.39E-09	0.0093913
4840803754120	484080	3754120	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000314463	1.4079E-05	5.2061E-05	6.37688E-06	6.37688E-06	2.76507E-09	5.55E-09	0	0	8.32E-09	0.0083154
4841003754120	484100	3754120	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000286466	1.28256E-05	4.74259E-05	5.80913E-06	5.80913E-06	2.51889E-09	5.06E-09	0	0	7.58E-09	0.007575
4841203754120	484120	3754120	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000263953	1.18176E-05	4.36987E-05	5.3526E-06	5.3526E-06	2.32093E-09	4.66E-09	0	0	6.98E-09	0.0069797
4839403754140	483940	3754140	0	0	0	0	0	0	0	0	0	0	0	0	0	0.001091773	4.88805E-05	0.000180749	2.21396E-05	2.21396E-05	9.59994E-09	1.93E-08	0	0	2.89E-08	0.0288697
4839603754140	483960	3754140	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000848695	3.79974E-05	0.000140506	1.72103E-05	1.72103E-05	7.46256E-09	1.5E-08	0	0	2.24E-08	0.022442
4839803754140	483980	3754140	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000673944	3.01736E-05	0.000111575	1.36666E-05	1.36666E-05	5.92598E-09	1.19E-08	0	0	1.78E-08	0.0178211
4840003754140	484000	3754140	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000549309	2.45934E-05	9.09408E-05	1.11392E-05	1.11392E-05	4.83006E-09	9.7E-09	0	0	1.45E-08	0.0145254
4840203754140	484020	3754140	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000461831	2.06769E-05	7.64585E-05	9.36529E-06	9.36529E-06	4.06087E-09	8.15E-09	0	0	1.22E-08	0.0122122
4840403754140	484040	3754140	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000397424	1.77933E-05	6.57956E-05	8.05921E-06	8.05921E-06	3.49455E-09	7.01E-09	0	0	1.05E-08	0.0105091
4840603754140	484060	3754140	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000346067	1.5494E-05	5.72932E-05	7.01776E-06	7.01776E-06	3.04296E-09	6.11E-09	0	0	9.15E-09	0.0091511
4840803754140	484080	3754140	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000306473	1.37213E-05	5.07381E-05	6.21483E-06	6.21483E-06	2.69481E-09	5.41E-09	0	0	8.1E-09	0.008104
4841003754140	484100	3754140	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000277298	1.24151E-05	4.5908E-05	5.62321E-06	5.62321E-06	2.43827E-09	4.89E-09	0	0	7.33E-09	0.0073326
4841203754140	484120	3754140	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000255607	1.1444E-05	4.23171E-05	5.18336E-06	5.18336E-06	2.24755E-09	4.51E-09	0	0	6.76E-09	0.006759
4839603754160	483960	3754160	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000730568	3.27087E-05	0.000120949	1.48149E-05	1.48149E-05	6.42387E-09	1.29E-08	0	0	1.93E-08	0.0193184
4839803754160	483980	3754160	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000608018	2.7222E-05	0.00010066	1.23298E-05	1.23298E-05	5.34629E-09	1.07E-08	0	0	1.61E-08	0.0160778
4840003754160	484000	3754160	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000512253	2.29344E-05	8.48061E-05	1.03878E-05	1.03878E-05	4.50423E-09	9.04E-09	0	0	1.35E-08	0.0135455
4840203754160	484020	3754160	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000439595	1.96814E-05	7.27771E-05	8.91437E-06	8.91437E-06	3.86535E-09	7.76E-09	0	0	1.16E-08	0.0116242
4840403754160	484040	3754160	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000382591	1.71292E-05	6.33399E-05	7.75841E-06	7.75841E-06	3.36412E-09	6.75E-09	0	0	1.01E-08	0.0101168
4840603754160	484060	3754160	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000336002	1.50433E-05	5.56268E-05	6.81364E-06	6.81364E-06	2.95446E-09	5.93E-09	0	0	8.88E-09	0.0088849
4840803754160	484080	3754160	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000298961	1.3385E-05	4.94945E-05	6.06251E-06	6.06251E-06	2.62876E-09	5.28E-09	0	0	7.91E-09	0.0079054
4841003754160	484100	3754160	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000268909	1.20395E-05	4.45192E-05	5.45309E-06	5.45309E-06	2.36451E-09	4.75E-09	0	0	7.11E-09	0.0071108
4841203754160	484120	3754160	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000246788	1.10491E-05	4.0857E-05	5.00452E-06	5.00452E-06	2.17E-09	4.36E-09	0	0	6.53E-09	0.0065258
4839603754180	483960	3754180	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000617478	2.76455E-05	0.000102227	1.25216E-05	1.25216E-05	5.42947E-09	1.09E-08	0	0	1.63E-08	0.0163279
4839803754180	483980	3754180	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000543929	2.43526E-05	9.00503E-05	1.10301E-05	1.10301E-05	4.78276E-09	9.6E-09	0	0	1.44E-08	0.0143831
4840003754180	484000	3754180	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000473054	2.11794E-05	7.83166E-05	9.59288E-06	9.59288E-06	4.15956E-09	8.35E-09	0	0	1.25E-08	0.012509
4840203754180	484020	3754180	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000413571	1.85162E-05	6.84687E-05	8.38664E-06	8.38664E-06	3.63652E-09	7.3E-09	0	0	1.09E-08	0.010936
4840403754180	484040	3754180	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000364871	1.63359E-05	6.04062E-05	7.39907E-06	7.39907E-06	3.2083E-09	6.44E-09	0	0	9.65E-09	0.0096483
4840603754180	484060	3754180	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000324021	1.45069E-05	5.36433E-05	6.57069E-06	6.57069E-06	2.84911E-09	5.72E-09	0	0	8.57E-09	0.0085681
4840803754180	484080	3754180	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000290266	1.29957E-05	4.80551E-05	5.88619E-06	5.88619E-06	2.55231E-09	5.12E-09	0	0	7.68E-09	0.0076755
4841003754180	484100	3754180	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000262038	1.17318E-05	4.33816E-05	5.31375E-06	5.31375E-06	2.30409E-09	4.62E-09	0	0	6.93E-09	0.0069291
4841203754180	484120	3754180	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000238832	1.06929E-05	3.95398E-05	4.84317E-06	4.84317E-06	2.10004E-09	4.22E-09	0	0	6.32E-09	0.0063154
4839803754200	483980	3754200	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000480255	2.15018E-05	7.95086E-05	9.7389E-06	9.7389E-06	4.22287E-09	8.48E-09	0	0	1.27E-08	0.0126994
4840003754200	484000	3754200	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000429263	1.92188E-05	7.10667E-05	8.70486E-06	8.70486E-06	3.77451E-09	7.58E-09	0	0	1.14E-08	0.011351
4840203754200	484020	3754200	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000384897	1.72325E-05	6.37217E-05	7.80517E-06	7.80517E-06	3.38439E-09	6.79E-09	0	0	1.02E-08	0.0101778
4840403754200	484040	3754200	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00034483	1.54386E-05	5.70884E-05	6.99267E-06	6.99267E-06	3.03209E-09	6.09E-09	0	0	9.12E-09	0.0091183
4840603754200	484060	3754200	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000309922	1.38757E-05	5.13091E-05	6.28478E-06	6.28478E-06	2.72514E-09	5.47E-09	0	0	8.2E-09	0.0081953
4840803754200	484080	3754200	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000280054	1.25385E-05	4.63644E-05	5.67911E-06	5.67911E-06	2.46251E-09	4.94E-09	0	0	7.41E-09	0.0074055
4841003754200	484100	3754200	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000254562	1.13972E-05	4.2144E-05	5.16216E-06	5.16216E-06	2.23836E-09	4.49E-09	0	0	6.73E-09	0.0067314
4841203754200	484120	3754200	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000233123	1.04373E-05	3.85947E-05	4.72741E-06	4.72741E-06	2.04985E-09	4.11E-09	0	0	6.16E-09	0.0061645
4839803754220	483980	3754220	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000425944	1.90702E-05	7.05172E-05	8.63755E-06	8.63755E-06	3.74532E-09	7.52E-09	0	0	1.13E-08	0.0112632
4840003754220	484000	3754220	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000388576	1.73972E-05	6.43307E-05	7.87978E-06	7.87978E-06	3.41674E-09	6.86E-09	0	0	1.03E-08	0.0102751
4840203754220	484020	3754220	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000353724	1.58368E-05	5.85607E-05	7.17302E-06	7.17302E-06	3.11029E-09	6.24E-09	0	0	9.35E-09	0.0093535
4840403754220	484040	3754220	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000321528	1.43953E-05	5.32306E-05	6.52014E-06	6.52014E-06	2.82719E-09	5.67E-09	0	0	8.5E-09	0.0085022
4840603754220	484060	3754220	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000293325	1.31326E-05	4.85614E-05	5.94822E-06	5.94822E-06	2.5792E-09	5.18E-09	0	0	7.76E-09	0.0077564
4840803754220	484080	3754220	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000268017	1.19996E-05	4.43716E-05	5.43501E-06	5.43501E-06	2.35667E-09	4.73E-09	0	0	7.09E-09	0.0070872
4841003754220	484100	3754220	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000245139	1.09753E-05	4.05839E-05	4.97107E-06	4.97107E-06	2.1555E-09	4.33E-09	0	0	6.48E-09	0.0064822
4841203754220	484120	3754220	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000225467	1.00945E-05	3.73272E-05	4.57215E-06	4.57215E-06	1.98253E-09	3.98E-09	0	0	5.96E-09	0.005962
4839803754240	483980	3754240	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000370223	1.65755E-05	6.12923E-05	7.5076E-06	7.5076E-06	3.25536E-09	6.53E-09	0	0	9.79E-09	0.0097898
4840003754240	484000	3754240	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000353859	1.58429E-05	5.85832E-05	7.17577E-06	7.17577E-06	3.11148E-09	6.25E-09	0	0	9.36E-09	0.0093571
4840203754240	484020	3754240	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000326139	1.46018E-05	5.39939E-05	6.61364E-06	6.61364E-06	2.86773E-09	5.76E-09	0	0	8.62E-09	0.0086241
4840403754240	484040	3754240	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000299628	1.34148E-05	4.9605E-05	6.07604E-06	6.07604E-06	2.63463E-09	5.29E-09	0	0	7.92E-09	0.0079231
4840603754240	484060	3754240	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000274635	1.22959E-05	4.54673E-05	5.56922E-06	5.56922E-06	2.41486E-09	4.85E-09	0	0	7.26E-09	0.0072622
4840803754240	484080	3754240	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000252218	1.12922E-05	4.1756E-05	5.11463E-06	5.11463E-06	2.21775E-09	4.45E-09	0	0	6.67E-09	0.0066694
4841003754240	484100	3754240	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000231635	1.03707E-05	3.83483E-05	4.69723E-06	4.69723E-06	2.03676E-09	4.09E-09	0	0	6.13E-09	0.0061251
4841203754240	484120	3754240	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000214289	9.59407E-06	3.54766E-05	4.34548E-06	4.34548E-06	1.88424E-09	3.78E-09	0	0	5.67E-09	0.0056664
4840003754260	484000	3754260	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000316553	1.41726E-05	5.24069E-05	6.41924E-06	6.41924E-06	2.78344E-09	5.59E-09	0	0	8.37E-09	0.0083706
4840203754260	484020	3754260	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000301482	1.34979E-05	4.99119E-05	6.11364E-06	6.11364E-06	2.65093E-09	5.32E-09	0	0	7.97E-09	0.0079721
4840403754260	484040	3754260	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000278227	1.24567E-05	4.6062E-05	5.64206E-06	5.64206E-06	2.44645E-09	4.91E-09	0	0	7.36E-09	0.0073572
4840603754260	484060	3754260	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000249941	1.11903E-05	4.1379E-05	5.06845E-06	5.06845E-06	2.19772E-09	4.41E-09	0	0	6.61E-09	0.0066092
4840803754260	484080	3754260	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000225559	1.00986E-05	3.73424E-05	4.57402E-06	4.57402E-06	1.98334E-09	3.98E-09	0	0	5.96E-09	0.0059645
4841003754260	484100	3754260	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000203028	9.08989E-06	3.36123E-05	4.11712E-06	4.11712E-06	1.78522E-09	3.58E-09	0	0	5.37E-09	0.0053687
4841203754260	484120	3754260	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000187039	8.37403E-06	3.09652E-05	3.79288E-06	3.79288E-06	1.64463E-09	3.3E-09	0	0	4.95E-09	0.0049459
4840003754280	484000	3754280	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000281733	1.26136E-05	4.66423E-05	5.71314E-06	5.71314E-06	2.47727E-09	4.97E-09	0	0	7.45E-09	0.0074499
4840203754280	484020	3754280	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000273655	1.2252E-05	4.5305E-05	5.54934E-06	5.54934E-06	2.40624E-09	4.83E-09	0	0	7.24E-09	0.0072363
4840403754280	484040	3754280	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000246009	1.10142E-05	4.0728E-05	4.98871E-06	4.98871E-06	2.16315E-09	4.34E-09	0	0	6.51E-09	0.0065052
4840603754280	484060	3754280	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000201527	9.02267E-06	3.33637E-05	4.08668E-06	4.08668E-06	1.77202E-09	3.56E-09	0	0	5.33E-09	0.005329
4840803754280	484080	3754280	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000161344	7.22363E-06	2.67113E-05	3.27183E-06	3.27183E-06	1.41869E-09	2.85E-09	0	0	4.27E-09	0.0042664
4841003754280	484100	3754280	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000134864	6.03809E-06	2.23274E-05	2.73485E-06	2.73485E-06	1.18586E-09	2.38E-09	0	0	3.57E-09	0.0035662
4841203754280	484120	3754280	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000131561	5.89022E-06	2.17807E-05	2.66788E-06	2.66788E-06	1.15682E-09	2.32E-09	0	0	3.48E-09	0.0034789
4840003754300	484000	3754300	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000254397	1.13898E-05	4.21168E-05	5.15882E-06	5.15882E-06	2.23691E-09	4.49E-09	0	0	6.73E-09	0.006727
4840203754300	484020	3754300	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000243786	1.09147E-05	4.03599E-05	4.94363E-06	4.94363E-06	2.1436E-09	4.3E-09	0	0	6.45E-09	0.0064464
4840403754300	484040	3754300	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000199181	8.91764E-06	3.29754E-05	4.0391E-06	4.0391E-06	1.75139E-09	3.52E-09	0	0	5.27E-09	0.0052669
4840603754300	484060	3754300	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000138389	6.19592E-06	2.29111E-05	2.80634E-06	2.80634E-06	1.21685E-09	2.44E-09	0	0	3.66E-09	0.0036594
4840803754300	484080	3754300	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000101227	4.53211E-06	1.67587E-05	2.05275E-06	2.05275E-06	8.90089E-10	1.79E-09	0	0	2.68E-09	0.0026767
4841003754300	484100	3754300	0	0	0	0	0	0	0	0	0	0	0	0	0	8.24508E-05	3.69146E-06	1.36501E-05	1.67199E-06	1.67199E-06	7.24989E-10	1.46E-09	0	0	2.18E-09	0.0021802
4841203754300	484120	3754300	0	0	0	0	0	0	0	0	0	0	0	0	0	8.03147E-05	3.59582E-06	1.32965E-05	1.62867E-06	1.62867E-06	7.06206E-10	1.42E-09	0	0	2.12E-09	0.0021238

Pettit Tank and Pipeline Construction HRA

Residential Health Risk Assessment Results Summary

Phase 1 + Phase 2

FOR CHRONIC CALCS

ALL POTENTIAL RESIDENTIAL RECEPTORS — **MAX:** **6.29**

MAX: **0.274**

Unique Identifier	X (UTM)	Y (UTM)	Total Risk	Overlapping Phases - Maximum GLC 2026	2027	2045
483702.433753999.04	483702.43	3753999.04	0.954	0	0	0.042
483694.263753916.12	483694.26	3753916.12	0.551	0	0	0.024
483697.73753861.82	483697.7	3753861.82	0.431	0	0	0.019
483584.93753882.87	483584.9	3753882.87	0.269	0	0	0.015
483549.823753855.91	483549.82	3753855.91	0.217	0	0	0.012
483515.523753852.37	483515.52	3753852.37	0.190	0	0	0.010
483339.193753860.79	483339.19	3753860.79	0.110	0	0	0.006
483124.173753854.26	483124.17	3753854.26	0.071	0	0	0.004
483070.493753861.97	483070.49	3753861.97	0.059	0	0	0.006
483954.733753733.9	483954.73	3753733.9	0.678	0	0	0.031
483977.613753750.69	483977.61	3753750.69	0.732	0	0	0.034
484012.023753748.78	484012.02	3753748.78	0.716	0	0	0.035
484038.993753749.36	484038.99	3753749.36	0.693	0	0	0.033
484074.893753746.12	484074.89	3753746.12	0.631	0	0	0.030
483951.713753696.43	483951.71	3753696.43	0.576	0	0	0.023
483951.593753657.88	483951.59	3753657.88	0.493	0	0	0.020
483950.463753618.15	483950.46	3753618.15	0.429	0	0	0.017
483946.613753587.64	483946.61	3753587.64	0.393	0	0	0.015
483960.333753539.03	483960.33	3753539.03	0.329	0	0	0.013
483980.253753458.18	483980.25	3753458.18	0.259	0	0	0.011
484041.353753435.67	484041.35	3753435.67	0.245	0	0	0.012
484049.623753516.7	484049.62	3753516.7	0.309	0	0	0.014
484003.093753540.22	484003.09	3753540.22	0.325	0	0	0.014
484067.243753589.88	484067.24	3753589.88	0.388	0	0	0.017
484033.573753592.07	484033.57	3753592.07	0.389	0	0	0.016
484006.163753595.1	484006.16	3753595.1	0.389	0	0	0.017
484000.573753691.15	484000.57	3753691.15	0.562	0	0	0.024
484038.563753695.15	484038.56	3753695.15	0.568	0	0	0.025
484066.343753695.82	484066.34	3753695.82	0.553	0	0	0.024
484100.923753692.13	484100.92	3753692.13	0.512	0	0	0.022
4836593753057.49	483659	3753057.49	0.057	0	0	0.002
484038.613752969.05	484038.61	3752969.05	0.097	0	0	0.004
484056.443752967.39	484056.44	3752967.39	0.096	0	0	0.013
484083.423752968.02	484083.42	3752968.02	0.096	0	0	0.009
483468.163753775.07	483468.16	3753775.07	0.140	0	0	0.009
483414.963753768.2	483414.96	3753768.2	0.120	0	0	0.008
483321.053753785.73	483321.05	3753785.73	0.098	0	0	0.006
483885.393754561.24	483885.39	3754561.24	0.315	0	0	0.015
4839203753820	483920	3753820	1.129	0	0	0.043
4839403753820	483940	3753820	1.092	0	0	0.045
4839603753820	483960	3753820	1.073	0	0	0.046
4839803753820	483980	3753820	1.051	0	0	0.046
4840003753820	484000	3753820	1.013	0	0	0.044
4840203753820	484020	3753820	0.958	0	0	0.051
4840403753820	484040	3753820	0.889	0	0	0.044
4840603753820	484060	3753820	0.811	0	0	0.039
4840803753820	484080	3753820	0.730	0	0	0.034
4841003753820	484100	3753820	0.651	0	0	0.030
4841203753820	484120	3753820	0.575	0	0	0.027
4839203753840	483920	3753840	1.276	0	0	0.050
4839403753840	483940	3753840	1.238	0	0	0.051
4839603753840	483960	3753840	1.211	0	0	0.052
4839803753840	483980	3753840	1.174	0	0	0.051
4840003753840	484000	3753840	1.115	0	0	0.049
4840203753840	484020	3753840	1.035	0	0	0.054
4840403753840	484040	3753840	0.942	0	0	0.046
4840603753840	484060	3753840	0.844	0	0	0.040

Pettit Tank and Pipeline Construction HRA

Residential Health Risk Assessment Results Summary

Phase 1 + Phase 2

ALL POTENTIAL RESIDENTIAL RECEPTORS **MAX:** **6.29**

FOR CHRONIC CALCS **MAX:** **0.274**

Unique Identifier	X (UTM)	Y (UTM)	Total Risk	Overlapping Phases - Maximum GLC 2026	2027	2045
4840803753840	484080	3753840	0.747	0	0	0.035
4841003753840	484100	3753840	0.656	0	0	0.030
4841203753840	484120	3753840	0.572	0	0	0.026
4839203753860	483920	3753860	1.459	0	0	0.058
4839403753860	483940	3753860	1.415	0	0	0.059
4839603753860	483960	3753860	1.372	0	0	0.059
4839803753860	483980	3753860	1.308	0	0	0.057
4840003753860	484000	3753860	1.219	0	0	0.053
4840203753860	484020	3753860	1.110	0	0	0.058
4840403753860	484040	3753860	0.989	0	0	0.049
4840603753860	484060	3753860	0.869	0	0	0.041
4840803753860	484080	3753860	0.756	0	0	0.035
4841003753860	484100	3753860	0.653	0	0	0.030
4841203753860	484120	3753860	0.563	0	0	0.026
4839203753880	483920	3753880	1.685	0	0	0.068
4839403753880	483940	3753880	1.629	0	0	0.069
4839603753880	483960	3753880	1.558	0	0	0.067
4839803753880	483980	3753880	1.456	0	0	0.064
4840003753880	484000	3753880	1.325	0	0	0.058
4840203753880	484020	3753880	1.177	0	0	0.061
4840403753880	484040	3753880	1.026	0	0	0.050
4840603753880	484060	3753880	0.884	0	0	0.042
4840803753880	484080	3753880	0.754	0	0	0.035
4841003753880	484100	3753880	0.643	0	0	0.030
4841203753880	484120	3753880	0.547	0	0	0.025
4839203753900	483920	3753900	1.966	0	0	0.080
4839403753900	483940	3753900	1.885	0	0	0.080
4839603753900	483960	3753900	1.770	0	0	0.077
4839803753900	483980	3753900	1.612	0	0	0.071
4840003753900	484000	3753900	1.428	0	0	0.063
4840203753900	484020	3753900	1.233	0	0	0.063
4840403753900	484040	3753900	1.048	0	0	0.051
4840603753900	484060	3753900	0.883	0	0	0.042
4840803753900	484080	3753900	0.741	0	0	0.035
4841003753900	484100	3753900	0.623	0	0	0.029
4841203753900	484120	3753900	0.525	0	0	0.024
4839203753920	483920	3753920	2.321	0	0	0.096
4839403753920	483940	3753920	2.189	0	0	0.094
4839603753920	483960	3753920	2.006	0	0	0.087
4839803753920	483980	3753920	1.769	0	0	0.078
4840003753920	484000	3753920	1.516	0	0	0.067
4840203753920	484020	3753920	1.269	0	0	0.065
4840403753920	484040	3753920	1.050	0	0	0.051
4840603753920	484060	3753920	0.868	0	0	0.041
4840803753920	484080	3753920	0.715	0	0	0.034
4841003753920	484100	3753920	0.594	0	0	0.028
4841203753920	484120	3753920	0.497	0	0	0.023
4839203753940	483920	3753940	2.770	0	0	0.116
4839403753940	483940	3753940	2.545	0	0	0.110
4839603753940	483960	3753940	2.254	0	0	0.098
4839803753940	483980	3753940	1.911	0	0	0.084
4840003753940	484000	3753940	1.577	0	0	0.070
4840203753940	484020	3753940	1.277	0	0	0.065
4840403753940	484040	3753940	1.029	0	0	0.050
4840603753940	484060	3753940	0.833	0	0	0.040
4840803753940	484080	3753940	0.677	0	0	0.032
4841003753940	484100	3753940	0.556	0	0	0.026

Pettit Tank and Pipeline Construction HRA

Residential Health Risk Assessment Results Summary

Phase 1 + Phase 2

ALL POTENTIAL RESIDENTIAL RECEPTORS — MAX: 6.29

FOR CHRONIC CALCS — MAX: 0.274

Unique Identifier	X (UTM)	Y (UTM)	Total Risk	Overlapping Phases - Maximum GLC 2026	2027	2045
4841203753940	484120	3753940	0.463	0	0	0.021
4839203753960	483920	3753960	3.347	0	0	0.142
4839403753960	483940	3753960	2.949	0	0	0.128
4839603753960	483960	3753960	2.492	0	0	0.109
4839803753960	483980	3753960	2.015	0	0	0.089
4840003753960	484000	3753960	1.595	0	0	0.070
4840203753960	484020	3753960	1.250	0	0	0.064
4840403753960	484040	3753960	0.982	0	0	0.048
4840603753960	484060	3753960	0.780	0	0	0.037
4840803753960	484080	3753960	0.627	0	0	0.029
4841003753960	484100	3753960	0.512	0	0	0.024
4841203753960	484120	3753960	0.425	0	0	0.020
4839203753980	483920	3753980	4.071	0	0	0.174
4839403753980	483940	3753980	3.385	0	0	0.147
4839603753980	483960	3753980	2.682	0	0	0.118
4839803753980	483980	3753980	2.056	0	0	0.091
4840003753980	484000	3753980	1.559	0	0	0.069
4840203753980	484020	3753980	1.183	0	0	0.061
4840403753980	484040	3753980	0.909	0	0	0.045
4840603753980	484060	3753980	0.713	0	0	0.034
4840803753980	484080	3753980	0.570	0	0	0.027
4841003753980	484100	3753980	0.465	0	0	0.022
4841203753980	484120	3753980	0.388	0	0	0.018
4839203754000	483920	3754000	4.900	0	0	0.211
4839403754000	483940	3754000	3.781	0	0	0.165
4839603754000	483960	3754000	2.774	0	0	0.122
4839803754000	483980	3754000	2.008	0	0	0.089
4840003754000	484000	3754000	1.460	0	0	0.065
4840203754000	484020	3754000	1.081	0	0	0.057
4840403754000	484040	3754000	0.818	0	0	0.041
4840603754000	484060	3754000	0.637	0	0	0.031
4840803754000	484080	3754000	0.510	0	0	0.024
4841003754000	484100	3754000	0.419	0	0	0.019
4841203754000	484120	3754000	0.353	0	0	0.016
4839203754020	483920	3754020	5.712	0	0	0.248
4839403754020	483940	3754020	4.000	0	0	0.175
4839603754020	483960	3754020	2.706	0	0	0.119
4839803754020	483980	3754020	1.855	0	0	0.082
4840003754020	484000	3754020	1.308	0	0	0.058
4840203754020	484020	3754020	0.953	0	0	0.051
4840403754020	484040	3754020	0.719	0	0	0.036
4840603754020	484060	3754020	0.560	0	0	0.027
4840803754020	484080	3754020	0.452	0	0	0.021
4841003754020	484100	3754020	0.376	0	0	0.017
4841203754020	484120	3754020	0.321	0	0	0.015
4839203754040	483920	3754040	6.289	0	0	0.274
4839403754040	483940	3754040	3.895	0	0	0.170
4839603754040	483960	3754040	2.449	0	0	0.108
4839803754040	483980	3754040	1.617	0	0	0.071
4840003754040	484000	3754040	1.124	0	0	0.050
4840203754040	484020	3754040	0.820	0	0	0.044
4840403754040	484040	3754040	0.623	0	0	0.031
4840603754040	484060	3754040	0.490	0	0	0.023
4840803754040	484080	3754040	0.400	0	0	0.019
4841003754040	484100	3754040	0.337	0	0	0.016
4841203754040	484120	3754040	0.292	0	0	0.013
4839203754060	483920	3754060	6.124	0	0	0.267

Pettit Tank and Pipeline Construction HRA

Residential Health Risk Assessment Results Summary

Phase 1 + Phase 2

ALL POTENTIAL RESIDENTIAL RECEPTORS **MAX:** **6.29**

FOR CHRONIC CALCS **MAX:** **0.274**

				Overlapping Phases - Maximum GLC		
Unique Identifier	X (UTM)	Y (UTM)	Total Risk	2026	2027	2045
4839403754060	483940	3754060	3.408	0	0	0.149
4839603754060	483960	3754060	2.052	0	0	0.090
4839803754060	483980	3754060	1.342	0	0	0.059
4840003754060	484000	3754060	0.940	0	0	0.042
4840203754060	484020	3754060	0.697	0	0	0.033
4840403754060	484040	3754060	0.539	0	0	0.025
4840603754060	484060	3754060	0.431	0	0	0.020
4840803754060	484080	3754060	0.357	0	0	0.016
4841003754060	484100	3754060	0.304	0	0	0.014
4841203754060	484120	3754060	0.266	0	0	0.012
4839403754080	483940	3754080	2.698	0	0	0.118
4839603754080	483960	3754080	1.629	0	0	0.072
4839803754080	483980	3754080	1.091	0	0	0.048
4840003754080	484000	3754080	0.787	0	0	0.035
4840203754080	484020	3754080	0.597	0	0	0.028
4840403754080	484040	3754080	0.472	0	0	0.022
4840603754080	484060	3754080	0.384	0	0	0.018
4840803754080	484080	3754080	0.322	0	0	0.015
4841003754080	484100	3754080	0.277	0	0	0.013
4841203754080	484120	3754080	0.245	0	0	0.011
4839403754100	483940	3754100	2.071	0	0	0.091
4839603754100	483960	3754100	1.309	0	0	0.058
4839803754100	483980	3754100	0.912	0	0	0.040
4840003754100	484000	3754100	0.677	0	0	0.030
4840203754100	484020	3754100	0.526	0	0	0.025
4840403754100	484040	3754100	0.423	0	0	0.020
4840603754100	484060	3754100	0.349	0	0	0.016
4840803754100	484080	3754100	0.295	0	0	0.014
4841003754100	484100	3754100	0.256	0	0	0.012
4841203754100	484120	3754100	0.229	0	0	0.010
4839403754120	483940	3754120	1.749	0	0	0.077
4839603754120	483960	3754120	1.144	0	0	0.050
4839803754120	483980	3754120	0.815	0	0	0.036
4840003754120	484000	3754120	0.614	0	0	0.027
4840203754120	484020	3754120	0.483	0	0	0.022
4840403754120	484040	3754120	0.392	0	0	0.018
4840603754120	484060	3754120	0.326	0	0	0.015
4840803754120	484080	3754120	0.276	0	0	0.013
4841003754120	484100	3754120	0.241	0	0	0.011
4841203754120	484120	3754120	0.216	0	0	0.010
4839403754140	483940	3754140	1.670	0	0	0.074
4839603754140	483960	3754140	1.095	0	0	0.048
4839803754140	483980	3754140	0.784	0	0	0.035
4840003754140	484000	3754140	0.592	0	0	0.026
4840203754140	484020	3754140	0.467	0	0	0.021
4840403754140	484040	3754140	0.379	0	0	0.017
4840603754140	484060	3754140	0.315	0	0	0.014
4840803754140	484080	3754140	0.267	0	0	0.012
4841003754140	484100	3754140	0.231	0	0	0.010
4841203754140	484120	3754140	0.207	0	0	0.009
4839603754160	483960	3754160	1.102	0	0	0.049
4839803754160	483980	3754160	0.790	0	0	0.035
4840003754160	484000	3754160	0.597	0	0	0.026
4840203754160	484020	3754160	0.470	0	0	0.021
4840403754160	484040	3754160	0.380	0	0	0.017
4840603754160	484060	3754160	0.314	0	0	0.014
4840803754160	484080	3754160	0.265	0	0	0.012

Pettit Tank and Pipeline Construction HRA

Residential Health Risk Assessment Results Summary

Phase 1 + Phase 2

ALL POTENTIAL RESIDENTIAL RECEPTORS MAX: 6.29

FOR CHRONIC CALCS MAX: 0.274

Unique Identifier	X (UTM)	Y (UTM)	Total Risk	Overlapping Phases - Maximum GLC 2026	2027	2045
4841003754160	484100	3754160	0.228	0	0	0.010
4841203754160	484120	3754160	0.201	0	0	0.009
4839603754180	483960	3754180	1.111	0	0	0.049
4839803754180	483980	3754180	0.803	0	0	0.036
4840003754180	484000	3754180	0.612	0	0	0.027
4840203754180	484020	3754180	0.481	0	0	0.022
4840403754180	484040	3754180	0.390	0	0	0.018
4840603754180	484060	3754180	0.322	0	0	0.014
4840803754180	484080	3754180	0.271	0	0	0.012
4841003754180	484100	3754180	0.231	0	0	0.010
4841203754180	484120	3754180	0.201	0	0	0.009
4839803754200	483980	3754200	0.807	0	0	0.036
4840003754200	484000	3754200	0.624	0	0	0.028
4840203754200	484020	3754200	0.494	0	0	0.022
4840403754200	484040	3754200	0.402	0	0	0.018
4840603754200	484060	3754200	0.332	0	0	0.015
4840803754200	484080	3754200	0.279	0	0	0.013
4841003754200	484100	3754200	0.239	0	0	0.011
4841203754200	484120	3754200	0.207	0	0	0.009
4839803754220	483980	3754220	0.803	0	0	0.036
4840003754220	484000	3754220	0.628	0	0	0.028
4840203754220	484020	3754220	0.502	0	0	0.023
4840403754220	484040	3754220	0.411	0	0	0.018
4840603754220	484060	3754220	0.342	0	0	0.015
4840803754220	484080	3754220	0.289	0	0	0.013
4841003754220	484100	3754220	0.249	0	0	0.011
4841203754220	484120	3754220	0.217	0	0	0.010
4839803754240	483980	3754240	0.780	0	0	0.035
4840003754240	484000	3754240	0.619	0	0	0.028
4840203754240	484020	3754240	0.502	0	0	0.022
4840403754240	484040	3754240	0.416	0	0	0.019
4840603754240	484060	3754240	0.352	0	0	0.016
4840803754240	484080	3754240	0.302	0	0	0.014
4841003754240	484100	3754240	0.263	0	0	0.012
4841203754240	484120	3754240	0.230	0	0	0.010
4840003754260	484000	3754260	0.601	0	0	0.027
4840203754260	484020	3754260	0.495	0	0	0.022
4840403754260	484040	3754260	0.419	0	0	0.019
4840603754260	484060	3754260	0.366	0	0	0.016
4840803754260	484080	3754260	0.320	0	0	0.014
4841003754260	484100	3754260	0.281	0	0	0.013
4841203754260	484120	3754260	0.246	0	0	0.011
4840003754280	484000	3754280	0.583	0	0	0.026
4840203754280	484020	3754280	0.483	0	0	0.022
4840403754280	484040	3754280	0.424	0	0	0.019
4840603754280	484060	3754280	0.367	0	0	0.016
4840803754280	484080	3754280	0.295	0	0	0.013
4841003754280	484100	3754280	0.237	0	0	0.011
4841203754280	484120	3754280	0.215	0	0	0.010
4840003754300	484000	3754300	0.552	0	0	0.024
4840203754300	484020	3754300	0.473	0	0	0.021
4840403754300	484040	3754300	0.407	0	0	0.018
4840603754300	484060	3754300	0.287	0	0	0.013
4840803754300	484080	3754300	0.177	0	0	0.008
4841003754300	484100	3754300	0.119	0	0	0.005
4841203754300	484120	3754300	0.113	0	0	0.005

Pettit Tank and Pipeline Construction HRA

Maximum Individual Non-Cancer Impact Calculations - Sensitive Receptors (Maximum Impacted Senior Residential Receptor) (IMPACT AT ALL OTHER LOCATIONS ON THE PROJECT SITE WOULD BE LESS THAN SHOWN)

Maximum Non-cancer Chronic Hazards / Toxicological Endpoints*

Phase 2

Receptor Group	Pollutant	CREL[1]	CONC	WFrac	$CONC_{WF}$	HI		ALIM	BN	CVS	DEV	ENDC	EYE	HEM	IMMUN	KIDN	NS	REPRO	RESP	SK
Project:																				
MEI - Max	DPM	5.00E+00	2.74E-01	1.00E+00	2.74E-01	5.47E-02		-	-	-	-	-	-	-	-	-	-	-	5.47E-02	-
							Total Risk				-			-				-	0.055	
							Threshold				1.00			1.00				1.00	1.00	
							Over?				NO			NO				NO	NO	

Notes:

1. California Air Resources Board, "Consolidated Table of OEHHA/ARB Approved Risk Assessment Health Values," "OEHHA/ARB Approved Chronic Reference Exposure Levels and Target Organs," "OEHHA/ARB Approved Acute Reference Exposure Levels and Target Organs," and "OEHHA/ARB Approved 8-Hour Reference Exposure Levels and Target Organs," http://www.arb.ca.gov/toxics/healthval/healthval.htm. Tables last updated: May 8, 2018. Downloaded: 08/14/18.

Source: ESA, 2020

Where:

$CONC_{WF}$	Pollutant Concentration ($\mu g/m^3$) multiplied by the weight fraction
CREL	Chronic Reference Exposure Level
HI	Hazard Index
MEI	Maximally Exposed Individual
WFrac	Weight fraction of speciated component

* Key to Toxicological Endpoints

ALIM	Alimentary Tract	EYE	Eye	NS	Nervous System
BN	Bone	HEM	Hematologic System	REPRO	Reproductive System
CVS	Cardiovascular System	IMMUN	Immune System	RESP	Respiratory System
DEV	Developmental System	KIDN	Kidney	SK	Skin
ENDC	Endocrine System				

Appendix
AQ/GHG/Energy-3
GHG Emissions

Appendix AQ/GHG/Energy-3A GHG Construction Emissions

ESA

Pettit Water Storage Tank Expansion And Transmission Pipeline Project
GHG Construction Summary

Year	On-Site Emissions	Mobile Emissions	Annual Total
2026	668	702	1,370
2027	159	46	206
Grand Total	**827**	**748**	**1,575**
Amortized	**-**	**-**	**53**

Year	On-Site Emissions	Mobile Emissions	Annual Total
2045	603	92	695
Grand Total	**603**	**92**	**695**
Amortized	**-**	**-**	**23**

Appendix AQ/GHG/Energy-3B GHG Operational Emissions

ESA

Pettit Water Storage Tank Expansion And Transmission Pipeline Project

Greenhouse Gas Emissions Summary

Project Operations Summary Phase 1 (Full Buildout Year 2026)	
Category	**$mTCO_2e/yr$**
Area[1]	0.01
Energy[1]	0.00
Waste[1]	0.00
Water[1]	0.00
Construction[1]	1,575
Amortized Construction (30 year period)	53
Project Total	**1,575**

Project Operations Summary Phase 2 (Full Buildout Year 2045)	
Category	**$mTCO_2e/yr$**
Area[1]	0.003
Energy[1]	0.00
Waste[1]	0.00
Water[1]	0.00
Construction[1]	695
Amortized Construction (30 year period)	23
Project Total	**695**

Project Operations Summary Phase 1 & 2 (Full Buildout Year 2026 & 2045)	
Category	**$mTCO_2e/yr$**
Area[1]	0.01
Energy[1]	0.00
Waste[1]	0.00
Water[1]	0.00
Construction[1]	2270
Project Total	**2,270**

$mTCO_2e$=Metric Tons Carbon Dioxide equivalents

1 = CalEEMod

Appendix AQ/GHG/Energy-4 Energy Emissions

ESA

Appendix AQ/GHG/Energy-4A Construction Energy Emissions Phase 1

ESA

Pettit Water Storage Tank Expansion And Transmission Pipeline Project
Construction Energy Analysis

Annual Fuel Summary

	Heavy-Duty Construction Equipment
89,836	Total Project Consumption
	Haul Trucks
51,066	Total Project Consumption
	Vendor Trucks
6,097	Total Project Consumption
	Workers
7,408	Total Project Consumption
57,163	Project Consumption of diesel for Haul Trucks and Vendors
57,163	Total Gallons Diesel
7,408	Total Gallons Gasoline

0.8 Estimated Project Construction Duration (years)

68,860 Average Gallons Diesel
8,923 Average Gallons Gasoline

Riverside County			**Percent of Annual Project Compared to Riverside County**
Source	**Fuel Type**	**Gallons**	
Workers	Gasoline	981,000,000	0.000910%
Off-Road/Vendor/Haul Trucks	Diesel	309,322,034	0.022%

Notes:
1 Gasoline and diesel amounts from CEC, 2019. Available: https://www.energy.ca.gov/data-reports/energy-almanac/transportation-energy/california-retail-fuel-outlet-annual-reporting

Annual Electricity Summary		
Temporary Construction Trailer - Electricity	12,990	kWh/year
Water Conveyance for Dust Control	4,917	kWh/year
Total	**17,907**	**kWh/year**

82,048,000,000	Total SCE, 2021
0.00002%	Project percentage of SCE
82,048,000	

Pettit Water Storage Tank Expansion And Transmission Pipeline Project
Construction Energy Analysis

Off-Road Equipment

Equipment ≤ 100 hp		
pounds diesel fuel/hp-hr (lb/hp-hr):[1]	0.408	lb/hp-hr
diesel density (lb/gal):[1]	7.11	lb/gal
diesel gallons/hp-hr:	0.0574	gal/hp-hr
Total <100	360,750	hp-hr
Total diesel gallons:	20,704	gal
Equipment > 100 hp		
pounds diesel fuel/hp-hr (lb/hp-hr):[1]	0.367	lb/hp-hr
diesel density (lb/gal):[1]	7.11	lb/gal
diesel gallons/hp-hr:	0.0516	gal/hp-hr
Total >100	1,339,094	hp-hr
Total diesel gallons:	69,131	gal
Total diesel gallons (off-road equipment):	**89,836**	**gal**

1. OFFROAD2017 Emission Factor Documentation

Construction Phase	Equipment	Number	Hours/Day	HP	Load	Days	Total hp-hr
Potholding (1A)	Excavators	1	8	158	0.38	26	12,488
Potholding (1A)	Off-Highway Trucks	3	8	402	0.38	26	95,322
Potholding (1A)	Tractors/Loaders/Backhoes	2	8	97	0.37	26	14,930
Grading/Excavation (1B)	Bore/Drill Rigs	1	8	221	0.5	52	45,968
Grading/Excavation (1B)	Concrete/Industrial Saws	1	8	81	0.73	52	24,598
Grading/Excavation (1B)	Excavators	1	8	158	0.38	52	24,977
Grading/Excavation (1B)	Graders	1	8	187	0.41	52	31,895
Grading/Excavation (1B)	Off-Highway Trucks	3	8	402	0.38	52	190,644
Grading/Excavation (1B)	Other Construction Equipment	1	8	172	0.42	52	30,052
Grading/Excavation (1B)	Paving Equipment	1	8	132	0.36	52	19,768
Grading/Excavation (1B)	Scrapers	1	8	367	0.48	52	73,283
Grading/Excavation (1B)	Tractors/Loaders/Backhoes	2	8	97	0.37	52	29,860
Grading/Excavation (1B)	Trenchers	1	8	78	0.5	52	16,224
Stormwater Drainage and Foundation	Cement and Mortar Mixers	1	8	9	0.56	53	2,137
Stormwater Drainage and Foundation	Graders	1	8	187	0.41	53	32,508
Stormwater Drainage and Foundation	Paving Equipment	1	8	132	0.36	53	20,148
Stormwater Drainage and Foundation	Pumps	1	8	84	0.74	53	26,356
Stormwater Drainage and Foundation	Tractors/Loaders/Backhoes	1	8	97	0.37	53	15,217
Construction (1B)	Air Compressors	1	8	78	0.48	155	46,426
Construction (1B)	Cranes	2	8	231	0.29	155	166,135
Construction (1B)	Welders	1	8	46	0.45	155	25,668
Finishing (1B)	Pavers	2	8	130	0.42	155	135,408
Finishing (1B)	Paving Equipment	2	8	132	0.36	155	117,850
Installing Pipeline (1A)	Off-Highway Trucks	2	8	402	0.38	52	127,096
Installing Pipeline (1A)	Tractors/Loaders/Backhoes	2	8	97	0.37	52	29,860
Installing Appurtenances (1A)	Off-Highway Trucks	3	8	402	0.38	27	98,988
Installing Appurtenances (1A)	Tractors/Loaders/Backhoes	2	8	97	0.37	27	15,504
Pavement Repairs (1A)	Off-Highway Trucks	3	8	402	0.38	26	95,322
Pavement Repairs (1A)	Pavers	1	8	130	0.42	26	11,357
Pavement Repairs (1A)	Paving Equipment	1	8	132	0.36	26	9,884
Pavement Repairs (1A)	Rollers	1	8	80	0.38	26	6,323
Pavement Repairs (1A)	Tractors/Loaders/Backhoes	2	8	97	0.37	26	14,930
Painting (1B)	Aerial Lifts	1	8	63	0.31	155	24,217
Painting (1B)	Air Compressors	1	8	78	0.48	155	46,426
Painting (1B)	Forklifts	1	8	89	0.2	155	22,072
						Total >100	1,339,094
						Total <100	360,750

Pettit Water Storage Tank Expansion And Transmission Pipeline Project
Construction Energy Analysis

Temporary Construction Trailer - Electricity						
Land Use	**Square Feet**	**Energy Use per year (kWh)**	**Total Energy Use (kWh)**	**GHG Emissions/ year (MTCO2e)**	**Total GHG Emissions for Construction Duration**	**Energy Use per SF**
General Office	1,000	12,990	10,783	2.5	10.0	13.0
Note: CalEEMod 2016.3.2 used to estimate energy use for temporary construction office						

Pettit Water Storage Tank Expansion And Transmission Pipeline Project
Construction Energy

Construction Water Energy Estimates

Source	Acreage/Day	Number of Days	Total Construction Water Use (Mgal)	Electricity Demand from Water Conveyance (MWh)	Annual Electricity Demand from Water Conveyance (MWh)
Potholding (1A)	0.0	26	0.000	0.0	0.0
Grading/Excavation (1B)	1.5	52	0.234	3.0	3.7
Stormwater Drainage and Foundation (1B)	0.5	53	0.080	1.0	1.2
Construction (1B)	0.0	155	0.000	0.0	0.0
Finishing (1B)	0.0	155	0.000	0.0	0.0
Installing Pipeline (1A)	0.0	52	0.000	0.0	0.0
Installing Appurtenances (1A)	0.0	27	0.000	0.0	0.0
Pavement Repairs (1A)	0.0	26	0.000	0.0	0.0
Painting (1B)	0.0	155	0.000	0.0	0.0
	0.0				
Total			**0.314**	**4.1**	**4.9**

CalEEMod Water Electricity Factors	Electricity Intensity Factor To Supply (kWh/Mgal)	Electricity Intensity Factor To Treat (kWh/Mgal)	Electricity Intensity Factor To Distribute (kWh/Mgal)	Electricity Intensity Factor For Wastewater Treatment (kWh/Mgal)
	9727	111	1272	1911

Construction Water GHG	Electricity Emission (MT CO2e/MWh)	Electricity Emission (lbs CO2e/MWh)
0.55	0.13	295.67

Sources and Assumptions:

1. CalEEMod Appendix A, Pg. 8, based on given piece of equipment can pass over in an 8-hour workday

-Electricity Intensity Factors - California Emissions Estimator Model (CalEEMod).

-Estimated construction water use assumed to be generally equivalent to landscape irrigation, based on a factor of 20.94 gallons per year per square foot of landscaped area within the Los Angeles area (Mediterranean climate), which assumes high water demand landscaping materials and an irrigation system efficiency of 85%. Factor is therefore (20.94 GAL/SF/year) x (43,560 SF/acre) / (365 days/year) / (0.85) = 2,940 gallons/acre/day, rounded up to 3,000 gallons/acre/day. (U.S. Department of Energy, Energy Efficiency & Renewable Energy, Federal Energy Management Program. “Guidelines for Estimating Unmetered Landscaping Water Use." July 2010. Page 12, Table 4 - Annual Irrigation Factor – Landscaped Areas with High Water Requirements).

2. CalEEMod Appendix D, Pg. 342, electricity intensity for supply, treatment, distribution, and wastewater.

Appendix AQ/GHG/Energy-4B Construction Energy Emissions Phase 2

ESA

Pettit Water Storage Tank Expansion And Transmission Pipeline Project
Construction Energy Analysis

Annual Fuel Summary

	Heavy-Duty Construction Equipment
56,413	Total Project Consumption
	Haul Trucks
2,792	Total Project Consumption
	Vendor Trucks
2,040	Total Project Consumption
	Workers
5,082	Total Project Consumption
4,831	Project Consumption of diesel for Haul Trucks and Vendors
4,831	Total Gallons Diesel
5,082	Total Gallons Gasoline

0.8 Estimated Project Construction Duration (years)

5,820 Average Gallons Diesel
6,122 Average Gallons Gasoline

Riverside County			**Percent of Annual Project Compared to Riverside County**
Source	**Fuel Type**	**Gallons**	
Workers	Gasoline	981,000,000	0.000624%
Off-Road/Vendor/Haul Trucks	Diesel	309,322,034	0.002%

Notes:
1 Gasoline and diesel amounts from CEC, 2019. Available: https://www.energy.ca.gov/data-reports/energy-almanac/transportation-energy/california-retail-fuel-outlet-annual-reporting

Annual Electricity Summary		
Temporary Construction Trailer - Electricity	12,990	kWh/year
Water Conveyance for Dust Control	4,800	kWh/year
Total	**17,790**	**kWh/year**

82,048,000,000	Total SCE, 2021
0.00002%	Project percentage of SCE
82,048,000	

Pettit Water Storage Tank Expansion And Transmission Pipeline Project
Construction Energy Analysis

Off-Road Equipment

Equipment ≤ 100 hp		
pounds diesel fuel/hp-hr (lb/hp-hr):[1]	0.408	lb/hp-hr
diesel density (lb/gal):[1]	7.11	lb/gal
diesel gallons/hp-hr:	0.0574	gal/hp-hr
Total <100	292,634	hp-hr
Total diesel gallons:	16,795	gal
Equipment > 100 hp		
pounds diesel fuel/hp-hr (lb/hp-hr):[1]	0.367	lb/hp-hr
diesel density (lb/gal):[1]	7.11	lb/gal
diesel gallons/hp-hr:	0.0516	gal/hp-hr
Total >100	767,420	hp-hr
Total diesel gallons:	39,618	gal
Total diesel gallons (off-road equipment):	**56,413**	**gal**

1. OFFROAD2017 Emission Factor Documentation

Construction Phase	Equipment	Number	Hours/Day	HP	Load	Days	Total hp-hr
Demolition	Concrete/Industrial Saws	1	8	81	0.73	26	12,299
Demolition	Other Construction Equipment	1	8	172	0.42	26	15,026
Demolition	Rubber Tired Dozers	1	8	247	0.4	26	20,550
Demolition	Tractors/Loaders/Backhoes	3	8	97	0.37	26	22,395
Grading/Excavation	Bore/Drill Rigs	1	8	221	0.5	51	45,084
Grading/Excavation	Concrete/Industrial Saws	1	8	81	0.73	51	24,125
Grading/Excavation	Excavators	1	8	158	0.38	51	24,496
Grading/Excavation	Graders	1	8	187	0.41	51	31,281
Grading/Excavation	Off-Highway Trucks	3	8	402	0.38	51	186,978
Grading/Excavation	Other Construction Equipment	1	8	172	0.42	51	29,474
Grading/Excavation	Paving Equipment	1	8	132	0.36	51	19,388
Grading/Excavation	Scrapers	1	8	367	0.48	51	71,873
Grading/Excavation	Tractors/Loaders/Backhoes	2	8	97	0.37	51	29,286
Grading/Excavation	Trenchers	1	8	78	0.5	51	15,912
Stormwater Drainage and Foundation	Cement and Mortar Mixers	1	8	9	0.56	25	1,008
Stormwater Drainage and Foundation	Graders	1	8	187	0.41	25	15,334
Stormwater Drainage and Foundation	Paving Equipment	1	8	132	0.36	25	9,504
Stormwater Drainage and Foundation	Pumps	1	8	84	0.74	25	12,432
Stormwater Drainage and Foundation	Tractors/Loaders/Backhoes	1	8	97	0.37	25	7,178
Construction	Air Compressors	1	8	78	0.48	158	47,324
Construction	Cranes	2	8	231	0.29	158	169,351
Construction	Welders	1	8	46	0.45	158	26,165
Finishing	Pavers	1	8	130	0.42	158	69,014
Finishing	Paving Equipment	1	8	132	0.36	158	60,065
Painting	Aerial Lifts	1	8	63	0.31	158	24,686
Painting	Air Compressors	1	8	78	0.48	158	47,324
Painting	Forklifts	1	8	89	0.2	158	22,499
						Total >100	767,420
						Total <100	292,634

Pettit Water Storage Tank Expansion And Transmission Pipeline Project
Construction Energy Analysis

Temporary Construction Trailer - Electricity						
Land Use	**Square Feet**	**Energy Use per year (kWh)**	**Total Energy Use (kWh)**	**GHG Emissions/year (MTCO2e)**	**Total GHG Emissions for Construction Duration**	**Energy Use per SF**
General Office	1,000	12,990	10,783	2.5	10.0	13.0
Note: CalEEMod 2016.3.2 used to estimate energy use for temporary construction office						

Pettit Water Storage Tank Expansion And Transmission Pipeline Project
Construction Energy

Construction Water Energy Estimates

Source	Acreage/Day	Number of Days	Total Construction Water Use (Mgal)	Electricity Demand from Water Conveyance (MWh)	Annual Electricity Demand from Water Conveyance (MWh)
Demolition	0.5	26	0.039	0.5	0.6
Grading/Excavation	1.5	51	0.230	3.0	3.6
Stormwater Drainage and Foundation	0.5	25	0.038	0.5	0.6
Construction	0.0	158	0.000	0.0	0.0
Finishing	0.0	158	0.000	0.0	0.0
Painting	0.0	158	0.000	0.0	0.0
Total			**0.3**	**4.0**	**4.8**

CalEEMod Water Electricity Factors[2]	Electricity Intensity Factor To Supply (kWh/Mgal)	Electricity Intensity Factor To Treat (kWh/Mgal)	Electricity Intensity Factor To Distribute (kWh/Mgal)	Electricity Intensity Factor For Wastewater Treatment (kWh/Mgal)
	9727	111	1272	1911

Construction Water GHG	Electricity Emission (MT CO2e/MWh)	Electricity Emission (lbs CO2e/MWh)
0.00	0.00	0.00

Sources and Assumptions:

1. CalEEMod Appendix A, Pg. 8, based on given piece of equipment can pass over in an 8-hour workday
 -Electricity Intensity Factors - California Emissions Estimator Model (CalEEMod).
 -Estimated construction water use assumed to be generally equivalent to landscape irrigation, based on a factor of 20.94 gallons per year per square foot of
 landscaped area within the Los Angeles area (Mediterranean climate), which assumes high water demand landscaping materials and an irrigation system efficiency of 85%.
 Factor is therefore (20.94 GAL/SF/year) x (43,560 SF/acre) / (365 days/year) / (0.85) = 2,940 gallons/acre/day, rounded up to 3,000 gallons/acre/day.
 (U.S. Department of Energy, Energy Efficiency & Renewable Energy, Federal Energy Management Program. “Guidelines for Estimating Unmetered Landscaping Water Use."
 July 2010. Page 12, Table 4 - Annual Irrigation Factor – Landscaped Areas with High Water Requirements).
2. CalEeMod Appendix D, Pg. 342, electricity intensity factors for water supply, treatment, distribution, and wastewater

Appendix BIO

Biological Resources Technical Report

Draft

PETTIT WATER STORAGE TANK EXPANSION AND TRANSMISSION PIPELINE PROJECT

Biological Resources Technical Report

Prepared for
Eastern Municipal Water District

August 2023

Draft

PETTIT WATER STORAGE TANK EXPANSION AND TRANSMISSION PIPELINE PROJECT

Biological Resources Technical Report

Prepared for
Eastern Municipal Water District

August 2023

420 Exchange, Suite 260
Irvine, CA 92602

Bend	Oakland	San Diego
Camarillo	Orlando	San Francisco
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Destin	Petaluma	Sarasota
Irvine	Portland	Seattle
Los Angeles	Sacramento	Tampa

ESA

The undersigned certifies that this report is a complete and accurate account of the findings and conclusions of a comprehensive biological resources assessment for the above-referenced project.

August 1, 2023

Douglas Gordon-Blackwood, Senior Biologist   Date

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EXECUTIVE SUMMARY

At the request of Eastern Municipal Water District (EMWD), Environmental Science Associates (ESA) conducted a biological resources assessment for the Pettit Water Storage Tank Expansion & Transmission Pipeline Project (project). Based on the results of the biological reconnaissance survey, the natural communities and land cover types within the Biological Study Area (BSA) primarily consist of disturbed/developed areas, with brittle bush scrub located along the west side of the proposed water storage tank expansion area grading limits and surrounding stormwater facilities east of Moreno Beach Drive.

No special-status plant or animal species were detected during field reconnaissance. The removal of 0.56 acre of brittle bush scrub, along with impacts to 1.81 acres of disturbed lands, and 0.49 acre of developed lands resulting from the project is not expected to result in significant impacts to special-status plant or wildlife species, their habitats, or sensitive habitats. Implementation of Mitigation Measure BIO-1 would provide worker environmental awareness trainings to construction staff. Implementation of Mitigation Measures BIO-2 through Mitigation Measure BIO-6 would avoid and minimize potential impacts to special-status wildlife to a less-than-significant level. The project may result in the disturbance of nesting birds (passerine and raptors) protected by the Migratory Bird Treaty Act (MBTA) and California Fish and Game Code (CFGC) 3503 and 3503.5. Impacts to nesting birds would be potentially significant. Mitigation Measure BIO-5 would avoid and minimize potential impacts to nesting birds to a less-than-significant level.

The project does not occur within or immediately adjacent to designated critical habitat and no sensitive natural communities occur within the construction limits. The project is not located within an established wildlife migration corridor and potential impacts to localized wildlife movement would be less-than-significant.

Wetland waters of the U.S. regulated by U.S. Army Corps of Engineers (USACE) were not observed in the BSA. Four drainages that are potentially jurisdictional non-wetland waters of the State regulated by California Department of Fish and Wildlife (CDFW) and Santa Ana Regional Water Quality Control Board (RWQCB) were observed within the BSA. These features are not considered Waters of the U.S. Impacts to aquatic resources within the BSA would be less-than-significant.

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CHAPTER 1
Introduction

1.1 Project Location and Background

Eastern Municipal Water District (EMWD) is proposing to implement the Pettit Water Storage Tank Expansion and Transmission Pipeline Project (project) in the City of Moreno Valley, California. The project seeks to provide additional storage capacity to support planned development in east Moreno Valley. The proposed water storage tanks would be constructed on two parcels totaling 4.37 acres owned by EMWD located on the western side of Moreno Beach Drive in Moreno Valley (APN 488-170-004; APN 477-310-011). Appurtenant facilities would be installed east of Moreno Beach Drive within the existing right-of-way. The pipeline would be installed within existing rights-of-way within Moreno Beach Drive and Alessandro Boulevard. Proposed project facilities are depicted in **Figure 1 – Regional Map**, and **Figure 2 – Project Location**. The project occurs within a relatively disturbed area at the interface of natural habitat and is subject to on-going and historic disturbances associated with agricultural activities, road construction, and regular brush clearing activities.

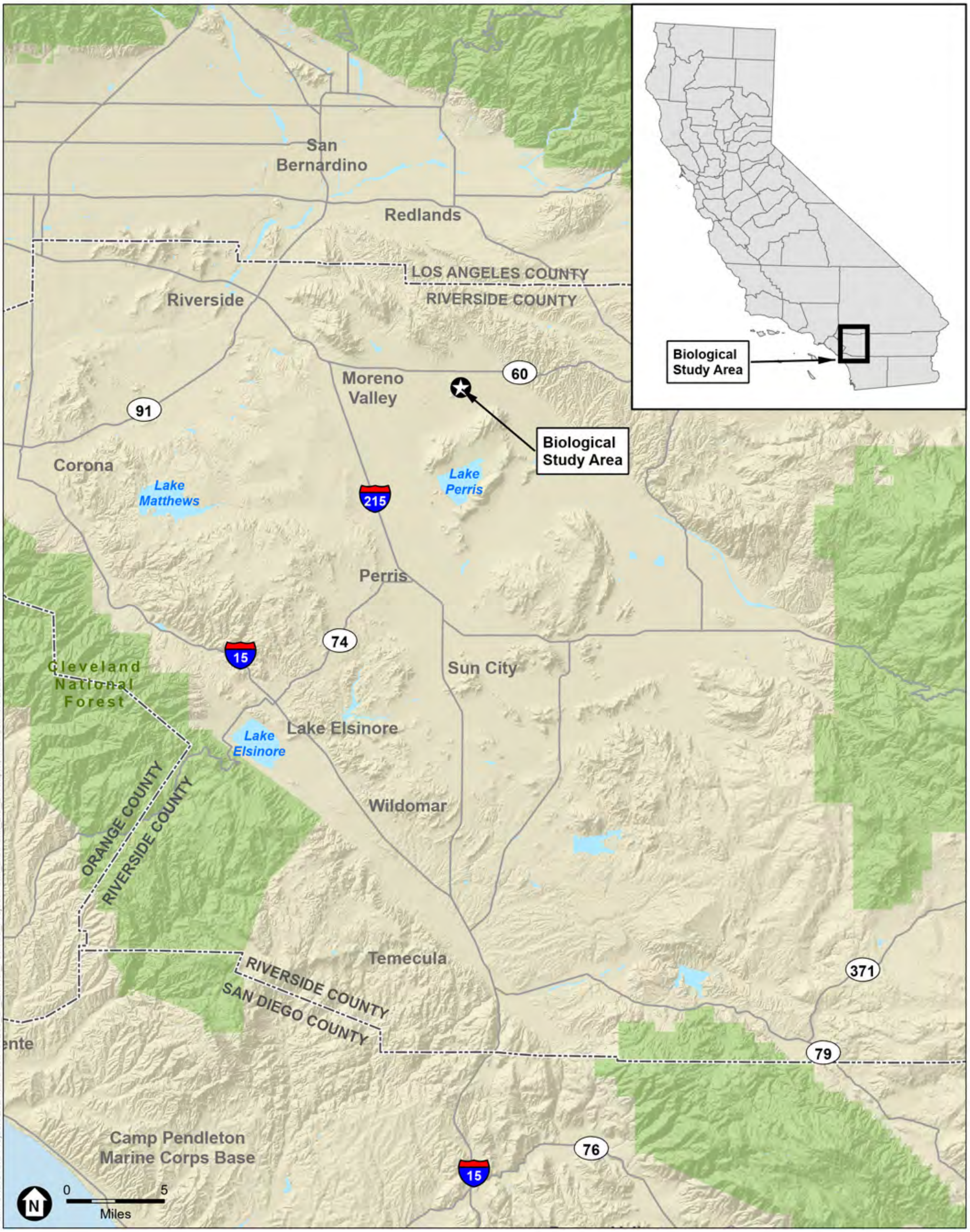
1.2 Project Description and Design Features

The project would involve installation of two new 4.5-million-gallon (MG) storage tanks, and demolition of an existing 2 MG storage tank. The new tanks would be fed by approximately 4,000 linear feet of proposed transmission pipeline to connect to the proposed Cactus II Feeder. The project would be implemented in two phases: the first phase would involve construction and operation of one 4.5 MG storage tank and associated pipeline; the second phase would involve demolition of the existing 2 MG storage tank and installation of a second 4.5 MG storage tank in its place. Further description of each phase is included below.

1.2.1 Phase 1 Project

1.2.1.1 Water Storage Tank

As part of the Phase 1 project, EMWD would construct a new 4.5 MG steel storage tank to the north of the existing 2 MG storage tank, which would remain in service during Phase 1. The existing tank site currently is developed and graded and includes several ornamental trees. The Phase 1 tank would be approximately 137.5 feet in diameter and approximately 52 feet in height. The tank would be comprised of pre-stressed concrete or welded steel. Grading, excavation, and potential blasting would be required to construct the tank foundation that would extend approximately 10 feet to 35 feet below ground surface (bgs). The majority of grading required to install the Phase 2 storage tank would be completed under Phase 1. A preliminary site plan for Phase 1 is shown on **Figure 3 – Site Plans**.

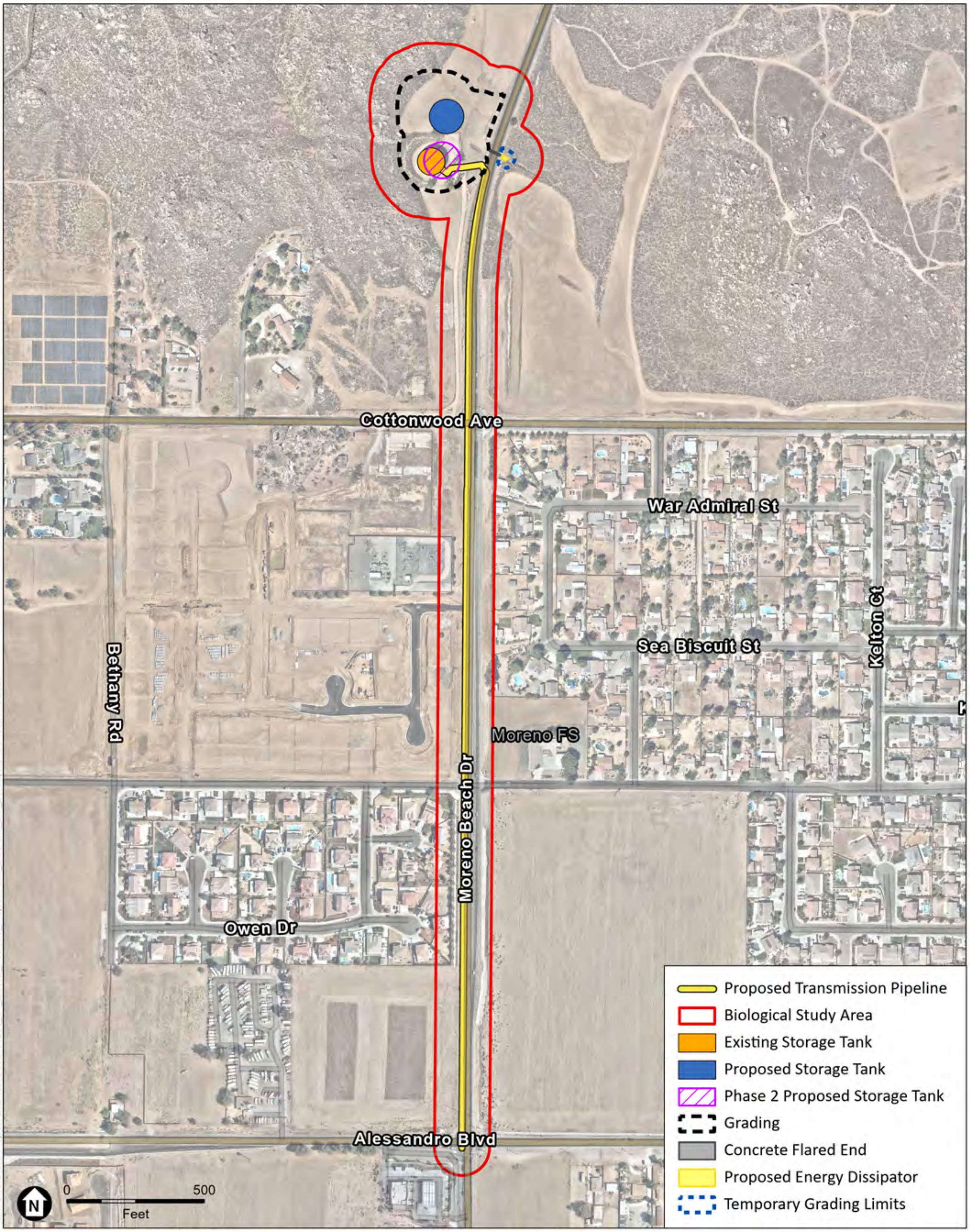


SOURCE: ESRI; ESA (2022)

Pettit Water Storage Tank Expansion and Transmission Pipeline Project

Figure 1
Regional Map

ESA

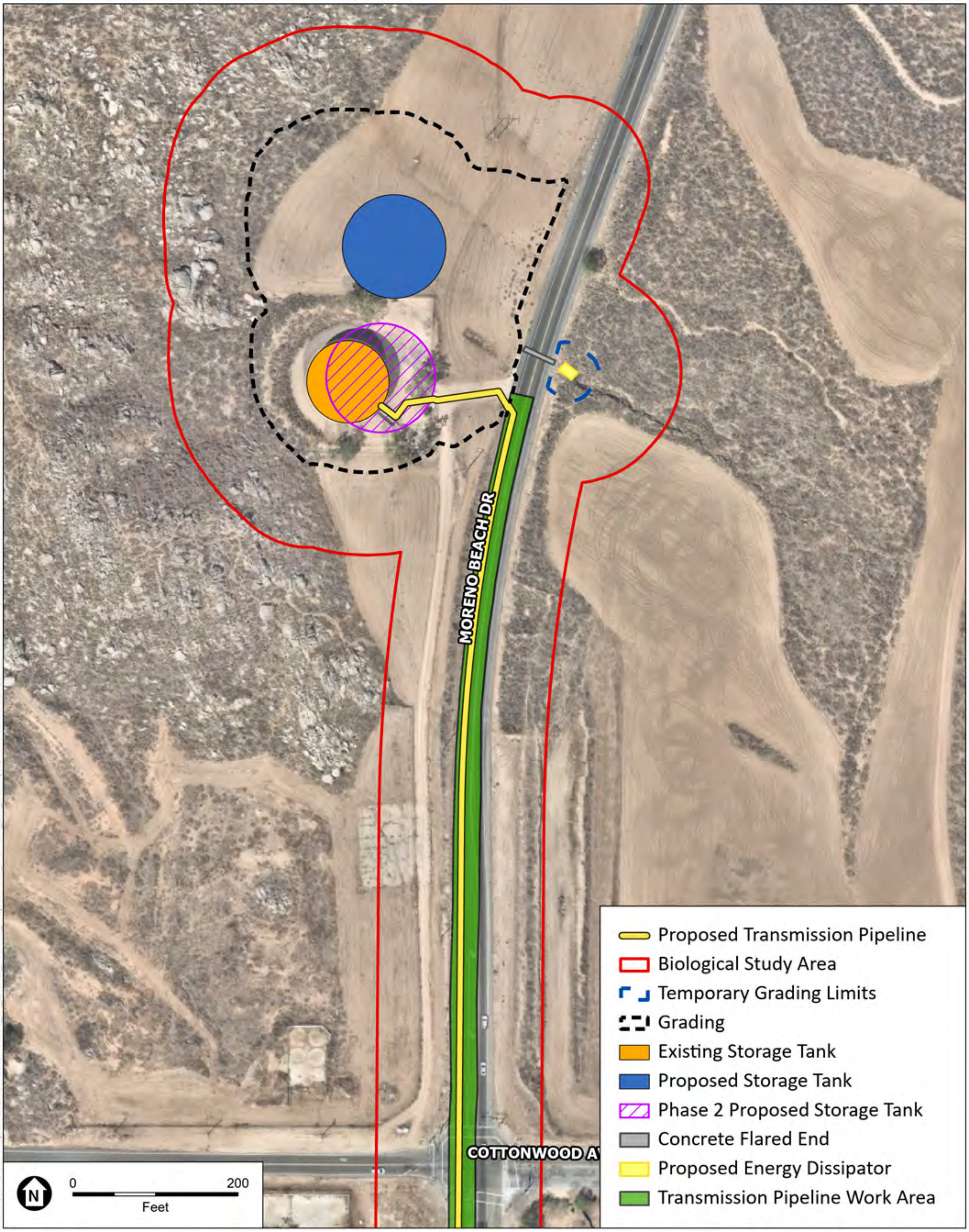


SOURCE: Mapbox (2022); ESA (2022)

Pettit Water Storage Tank Expansion and Transmission Pipeline Project

Figure 2
Project Location

ESA

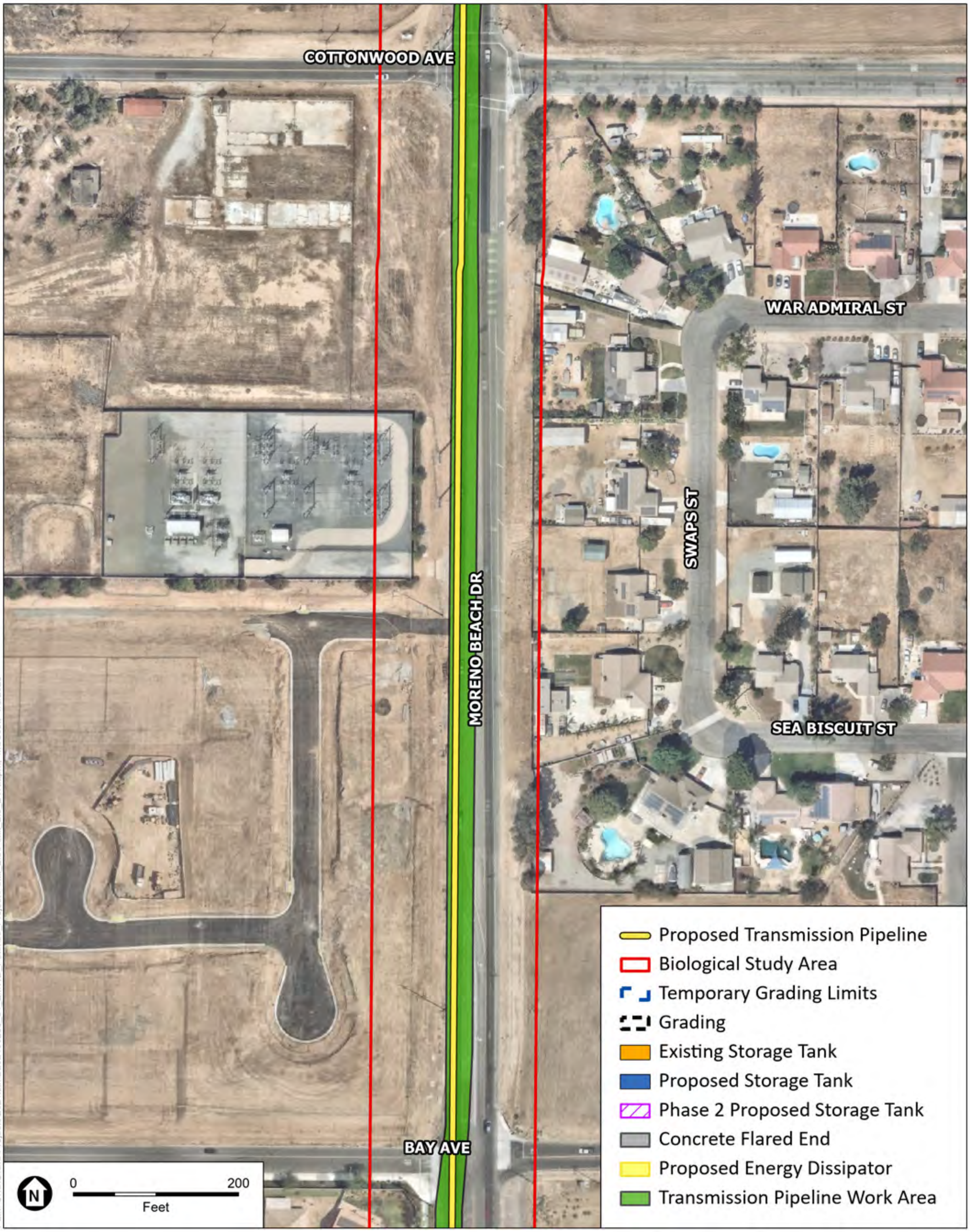


SOURCE: Nearmap (2022), ESA (2022)

Pettit Water Storage Tank Expansion and Transmission Pipeline Project

Figure 3a
Site Plan

ESA



Path: U:\GIS\GIS\Projects\2021xxx\D202100203_04_EMWD_Pettit\03_Project\Pettit_Bio\Pettit_Bio_BTR.aprx, MCScott 1/5/2023

SOURCE: Nearmap (2022), ESA (2022)

Pettit Water Storage Tank Expansion and Transmission Pipeline Project

Figure 3b
Site Plan

ESA

SOURCE: Nearmap (2022), ESA (2022)

Pettit Water Storage Tank Expansion and Transmission Pipeline Project

Figure 3c
Site Plan

ESA

Water would be supplied to and from the water storage tank via the proposed transmission pipeline discussed further below. A series of inlet and outlet pipes would be installed to connect the tank to the proposed transmission pipeline. Water supply from the proposed water storage tank would be provided by gravity.

To accommodate the additional tank on the project, site improvements would be required. A 20-foot access road would be paved around the new tank and a new 25-foot driveway/entrance to the site would be paved in accordance with City of Moreno Valley specifications. Proposed water storage tank appurtenances include lighting and an antenna tower (approximately 40 feet high by 3 feet wide) to be used for SCADA control.

1.2.1.2 Stormwater Drainage Facilities

The area surrounding the project does not have engineered stormwater management facilities. As a result, the current drainage design concept includes proposed onsite and offsite drainage facilities that would allow a storm event to be conveyed through and around the site without impacting the water storage tank and other site facilities. The drainage facilities are depicted in Figure 3. At the west end of the project, a portion of the existing hill would be graded to accommodate both tanks and a retaining wall would be installed between the two tanks due to an elevation difference in the interim condition (Phase 1). To convey storm flows safely around the project, a concrete drainage ditch would be constructed around the limits of the project site. Additionally, a proposed concrete down drain and a series of 12-to-18-inch storm drains would be installed to safely convey flows onsite. An emergency overflow structure would also be installed on the eastern portion of the project as would a 0.18 MG detention basin, which would collect flow from all onsite storm drain inlets. The emergency overflow structure and detention basin would primarily be used for onsite stormwater drainage. In emergency situations if the tank itself overflowed, the emergency overflow structure could process 29 cubic feet/second (CFS) of raw water from the tank which would flow into culverts under Moreno Beach Drive and deposit on the vacant land to the east.

Stormwater flow would lead to four proposed energy dissipaters at the northern, southern and eastern boundaries of the project and would leave the project in several locations. The first is via an existing 30-inch storm drain at the northeastern corner of the project that would convey flow under Moreno Beach Drive. The second is via a proposed 18-inch storm drain to be installed under Moreno Beach Drive at the eastern-most portion of the project site. One existing 24-inch storm drain would continue to be used while another 18-inch storm drain adjacent to the proposed 18-inch storm drain would be abandoned. Offsite improvements on the eastern side of Moreno Beach Drive include an energy dissipater (culvert, headwall, and riprap) to contain flow. Drainage facilities are shown on Figure 3. This activity would occur within the City of Moreno Valley right-of-way and would require an encroachment permit.

1.2.1.3 Transmission Pipeline

A 24-to-30-inch transmission pipeline would be installed to connect the water storage tank to the future Cactus II Feeder within Alessandro Boulevard. The pipeline would be installed to the west of the roadway centerline and entirely within existing rights of way of Moreno Beach Drive and

Alessandro Boulevard. The pipeline would be approximately 4,000 linear feet in length and would be installed with at least 48 inches of cover. The pipeline would be installed at depths of up to 10 feet below ground surface (bgs) to avoid utilities within Moreno Beach Drive, including sewer, water, storm drain, electric, telecommunication, and gas pipelines. Blow off and air valves would be installed along the transmission pipeline route, generally at low points and high points in the pipeline profile, respectively.

1.2.1.4 Staging Areas

Staging areas for construction of the water storage tank would be located within the tank site. Construction of the transmission pipeline would require staging areas along the pipeline corridor outside of the tank site. A smaller 25-foot temporary impact area would surround the offsite improvements on the eastern side of Moreno Beach Drive.

1.2.2 Phase 2 Project

1.2.2.1 Water Storage Tank

As part of the Phase 2 project, the 2 MG tank and supporting infrastructure such as pipelines and vaults would be demolished. EMWD would construct a new 4.5 MG steel storage tank in its place just south of the tank installed as part of the Phase 1 project. Similar to the Phase 1 tank, the Phase 2 tank would be approximately 137.5 feet in diameter and approximately 52 feet in height. The tank would be comprised of pre-stressed concrete or welded steel. Grading, bedrock blasting, and excavation would be required to construct the tank foundation that would extend approximately 10 feet to 35 feet bgs. A preliminary location for the Phase 2 Proposed Storage Tank is depicted in Figure 3.

The pipelines and grading/drainage improvements installed as part of Phase 1 would support the second tank onsite. The site would be re-paved and re-graded to support the tank expansion. The retaining wall installed as part of Phase 1 would be demolished.

Additional power needed to supply the new storage tank would be supplied by solar panels. The solar modules are to be pole mounted on a 3-inch pole located on top of the new southern storage tank. The solar system would have a total capacity of 320W. EMWD is also considering bringing Southern California Edison power to the project site instead of installing solar panels.

1.2.2.2 Staging Areas

Staging areas for construction of the water storage tank would be located on the tank site in an already-improved area.

CHAPTER 2
Methodology

This report is based on information compiled through field reconnaissance and appropriate reference materials. Surveys included a general biological survey and vegetation mapping conducted by ESA.

2.1 Biological Study Area

The BSA consists of the two water storage tanks, stormwater drainage facilities, and staging areas constructed on two parcels totaling 4.37-acres owned by EMWD (APNs 488-170-004 and 477-310-011). The BSA also includes appurtenant facilities east of Moreno Beach Drive, approximately 4000 linear feet of pipeline within the Moreno Beach Drive right-of-way extending south to Alessandro Boulevard, and a 100-foot buffer surrounding the pipeline alignment. In total, the BSA comprises 20.65 acres.

2.2 Existing Literature and Database Review

Prior to conducting the field assessment, ESA conducted a query of available resource inventory databases to analyze the potential for sensitive resources to occur within the BSA:

- California Department of Fish and Wildlife's (CDFW) California Natural Communities List (CDFW 2022a)
- California Natural Diversity Data Base (CNDDB) (CDFW 2022b). Database was queried for special status species records in the Sunnymead U.S. Geological Survey (USGS) 7.5-minute quadrangle and eight surrounding quadrangles including Yucaipa, San Bernardino South, Redlands, Lakeview, Perris, Steele Peak, El Casco, and Riverside East.
- CDFW BIOS Habitat Connectivity Viewer (CDFW 2022c)
- California Native Plant Society (CNPS) Inventory of Rare and Endangered Vascular Plants of California (CNPS 2022). Database was queried for special status species records in the Sunnymead USGS 7.5-minute quadrangle and eight surrounding quadrangles including Yucaipa, San Bernardino South, Redlands, Lakeview, Perris, Steele Peak, El Casco, and Riverside East.
- Natural Resource Conservation Service (NRCS) Web Soil Survey (NRCS 2022)
- South Coast Missing Linkages: A Wildland Network for the South Coast Ecoregion (South Coast Wildlands 2008)
- U.S. Fish and Wildlife Service (USFWS) Critical Habitat Portal (USFWS 2022a)

2.3 Field Surveys

A field survey was conducted by ESA Biologist Douglas Gordon-Blackwood on November 7, 2022. The survey consisted of walking transects throughout the BSA to characterize and map vegetation, and to determine the potential for special-status plants and wildlife to occur within the BSA. Those areas which were deemed inaccessible were scanned with binoculars.

All incidental, visual observations of flora and fauna, including sign (i.e. presence of scat) as well as any audible detections, were noted during the assessment and are described further below in this report. All native and non-native plant communities and land uses were characterized and delineated on aerial photographs during the field survey, and then digitized on aerial maps using a Geographic Information System software (ArcGIS). Most descriptions of vegetation were characterized in the field in accordance with *A Manual of California Vegetation, Second Edition* (Sawyer et al. 2009). A detailed description of each plant community and land use is provided in Section 4.3 of this report.

The BSA was also assessed for its potential to support jurisdictional areas based on the presence of definable channels (bed and bank), ordinary flow (Ordinary High Water Mark [OHWM]), hydrology, vegetation communities, and riparian/riverine resources that are subject to the United States Army Corps of Engineers (USACE) jurisdiction pursuant to Section 404 of the Clean Water Act (CWA); CDFW jurisdiction pursuant to Division 2, Chapter 6, Section 1600 of the California Fish and Game Code (CFGC); the Regional Water Quality Control Board (RWQCB) pursuant to Section 401 of the CWA, and riparian/riverine resources pursuant to Section 6.1.2 of the Western Riverside County Multiple Species Habitat Conservation Plan (MSHCP) (MSHCP 2004). The results of the aquatic resources delineation are discussed in Section 4.6 below, and in a separate *Pettit Water Storage Tank Expansion & Transmission Pipeline Project Aquatic Resources Delineation Report* prepared for the project (ESA 2023).

CHAPTER 3
Regulatory Framework

This section provides a summary of the federal, State, and local environmental regulations that govern the biological resources applicable to the project. This section also provides a summary of other State and local environmental guidelines or listings that evaluate the rarity of species or the habitats they depend on.

3.1 Federal Regulations

3.1.1 Federal Endangered Species Act

The United States Congress passed the Federal Endangered Species Act (FESA) in 1973 to protect those species that are endangered or threatened with extinction. FESA is intended to operate in conjunction with the National Environmental Policy Act (NEPA) to help protect the ecosystems upon which endangered and threatened species depend. FESA prohibits the "take" of endangered or threatened wildlife species. "Take" is defined to include harassing, harming, pursuing, hunting, shooting, wounding, killing, trapping, capturing, or collecting wildlife species or any attempt to engage in such conduct (FESA Section 3 [(3)(19)]). Harm is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns (50 Code of Federal Regulations [CFR] Section 17.3). "Harass" is defined as actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns (50 CFR Section 17.3). Actions that result in take can result in civil or criminal penalties.

3.1.2 Migratory Bird Treaty Act

The Migratory Bird Treaty Act (MBTA) protects individuals, as well as any part, nest, or eggs, of any bird listed as migratory. The MBTA prohibits the take of native birds "by any means or manner to pursue, hunt, take, capture (or) kill" any migratory birds except as permitted by regulations issued by the USFWS. The term "take" is defined by USFWS regulation to mean to "pursue, hunt, shoot, wound, kill, trap, capture or collect" any migratory bird or any part, nest, or egg of any migratory bird covered by the conventions, or to attempt those activities.

In practice, federal permits issued for activities that potentially impact migratory birds typically have conditions that require pre-disturbance surveys for nesting birds. In the event nesting is observed, a buffer area with a specified radius must be established, within which no disturbance or intrusion is allowed until the young have fledged and left the nest, or it has been determined that the nest has failed. If not otherwise specified in the permit, the size of the buffer area varies with species and local circumstances (e.g., presence of busy roads, intervening topography, etc.), and is based on the professional judgment of a monitoring biologist. A list of migratory bird species protected under the MBTA is published by USFWS.

3.1.3 Clean Water Act

Pursuant to Section 404 of the CWA, the USACE is authorized to regulate any activity that would result in the discharge of dredged or fill material into jurisdictional waters of the United States, which include those waters listed in 33 CFR Part 328 (Definitions). USACE, with oversight by the U.S. Environmental Protection Agency (EPA), has the principal authority to issue CWA Section 404 Permits.

Pursuant to Section 401 of the CWA, the RWQCB certifies that any discharge into jurisdictional waters of the United States will comply with State water quality standards. The RWQCB, as delegated by EPA, has the principal authority to issue a CWA Section 401 water quality certification or waiver.

3.2 State Regulations

3.2.1 California Fish and Game Code

The CFGC regulates the taking or possession of birds, mammals, fish, amphibians, and reptiles, as well as natural resources such as wetlands and waters of the State. It includes the California Endangered Species Act (CESA) (Sections 2050–2115) and Streambed Alteration Agreement regulations (Sections 1600–1616). These sections are described further below.

3.2.1.1 CFGC Sections 1600-1616

Pursuant to Section 1600 et seq. of the CFGC, the CDFW regulates activities of an applicant's project that would substantially alter the flow, bed, channel, or banks of streams or lakes, unless certain conditions outlined by CDFW are met by the applicant. The limits of CDFW jurisdiction are defined in CFGC Section 1600 et seq. as the "bed, channel, or bank of any river, stream,[1] or lake designated by CDFW in which there is at any time an existing fish or wildlife resource or from which these resources derive benefit."[2] However, in practice, CDFW usually extends its jurisdictional limit and assertion to the top of a bank of a stream, the bank of a lake, or outer edge of the riparian vegetation, whichever is greater.

3.2.1.2 California Endangered Species Act (CFGC Section 2050 et seq.)

CESA establishes the policy of the State to conserve, protect, restore, and enhance threatened or endangered species and their habitats. CESA mandates that State agencies should not approve projects that would jeopardize the continued existence of threatened or endangered species if reasonable and prudent alternatives are available that would avoid jeopardy. There are no State

[1] Title 14 California Code of Regulations (CCR) 1.72 defines a stream as "a body of water that flows at least periodically or intermittently through a bed or channel having banks and supports fish or other aquatic life. This includes watercourses having a surface or subsurface flow that supports or has supported riparian vegetation."

[2] This also includes the habitat upon which they depend for continued viability (CFGC Division 5, Chapter 1, Section 45, and Division 2, Chapter 1, Section 711.2[a]).

agency consultation procedures under CESA. For projects that would affect a listed species under both CESA and FESA, compliance with FESA would satisfy CESA if CDFW determines that the federal incidental take authorization is "consistent" with CESA under CFGC Section 2080.1. For projects that would result in take of a species listed under the CESA only, the project operator would have to apply for a take permit under Section 2081(b). Further details about the regional MSHCP are discussed in Section 3.3.1 below.

3.2.1.3 CFGC Sections 2080 and 2081

Section 2080 of the CFGC states that "No person shall import into this state [California], export out of this state, or take, possess, purchase, or sell within this state, any species, or any part or product thereof, that the Commission [State Fish and Game Commission] determines to be an endangered species or threatened species, or attempt any of those acts, except as otherwise provided in this chapter, or the Native Plant Protection Act, or the California Desert Native Plants Act." Pursuant to CFGC Section 2081, CDFW may authorize individuals or public agencies to import, export, take, or possess State-listed endangered, threatened, or candidate species. These otherwise prohibited acts may be authorized through Incidental Take permits or Memoranda of Understanding if the take is incidental to an otherwise lawful activity, impacts of the authorized take are minimized and fully mitigated, the permit is consistent with any regulations adopted pursuant to any recovery plan for the species, and the project operator ensures adequate funding to implement the measures required by CDFW, which makes this determination based on available scientific information and considers the ability of the species to survive and reproduce.

If a local Natural Community Conservation Plan (NCCP) and/or Habitat Conservation Plan (HCP) provides coverage for take of some State-listed species, there would not be a need for an additional 2081 permit process unless a project does not comply with NCCP/HCP requirements and may result in take of a State-listed species or if a State-listed species not covered by the NCCP/HCP were to result in take. Further details about the regional MSHCP are discussed in Section 3.3.1 below.

3.2.1.4 CFGC Sections 3503, 3503.5, and 3513

Under these sections of the CFGC, the project operator is not allowed to conduct activities that would result in the taking, possessing, or destroying of any birds of prey; the taking or possessing of any migratory nongame bird; the taking, possessing, or needlessly destroying of the nest or eggs of any raptors or nongame birds; or the taking of any nongame bird pursuant to CFGC Section 3800. CFGC Section 3513 adopts the federal migratory bird take provisions under the MBTA that prohibit the intentional take or possession of birds designated by the MBTA as migratory nongame birds except as allowed by federal rules and regulations pursuant to the MBTA. CFGC Section 3513 does not prohibit the incidental take of birds if the underlying purpose of the activity is not to take birds.

3.2.2 California Environmental Quality Act Guidelines, Section 15380

Although threatened and endangered species are protected by specific federal and State statutes, California Environmental Quality Act (CEQA) Guidelines Section 15380(b) provides that a species not listed on the federal or State list of protected species may be considered rare or endangered if the species can be shown to meet certain specified criteria. These criteria have been modeled after the definition in FESA and the section of the CFGC dealing with rare or endangered plants or animals. This section was included in CEQA primarily to deal with situations in which a public agency is reviewing a project that may have a significant effect on, for example, a candidate species that has not been listed by either USFWS or CDFW. Thus, CEQA provides an agency with the ability to protect a species from the potential impacts of a project until the respective government agencies have an opportunity to designate the species as protected, if warranted. CEQA also calls for the protection of other locally or regionally significant resources, including natural communities. Although natural communities do not at present have legal protection of any kind, CEQA calls for an assessment of whether any such resources would be affected and requires findings of significance if there would be substantial losses. Natural communities listed by CNDDB as sensitive are considered by CDFW to be significant resources and fall under the State CEQA Guidelines for addressing impacts. Local planning documents such as General Plans often identify these resources as well.

3.2.3 California Water Quality Control Act (Porter-Cologne California Water Code Section 13260)

The State Water Resources Control Board (SWRCB) and the RWQCB (together “Boards”) are the principal State agencies with primary responsibility for the coordination and control of water quality. The Boards regulate activities pursuant to Section 401(a)(1) of the federal CWA as well as the Porter Cologne Water Quality Control Act (Porter-Cologne) (Water Code Section 13260). Section 401 of the CWA specifies that certification from the State is required for any applicant requesting a federal license or permit to conduct any activity including but not limited to the construction or operation of facilities that may result in any discharge into navigable waters. The certification shall originate from the State in which the discharge originates or will originate, or, if appropriate, from the interstate water pollution control agency having jurisdiction over the navigable water at the point where the discharge originates or will originate. Any such discharge will comply with the applicable provisions of Sections 301, 302, 303, 306, and 307 of the CWA.

In Porter-Cologne, the Legislature declared that the “State must be prepared to exercise its full power and jurisdiction to protect the quality of the waters in the State from degradation...” (California Water Code Section 13000). Porter-Cologne grants the Boards the authority to implement and enforce the water quality laws, regulations, policies and plans to protect the groundwater and surface waters of the State. It is important to note that enforcement of the State's water quality requirements is not solely the purview of the Boards and their staff. Other agencies (e.g., CDFW) have the ability to enforce certain water quality provisions in State law.

3.3 Regional or Local Regulations

3.3.1 Western Riverside County MSHCP

Per CFGC Sections 2800-2840, the NCCP Act (the Act), authorized the preparation of NCCPs to protect natural communities and species while allowing a reasonable amount of economic development.

The MSHCP, adopted by the County of Riverside on June 17, 2003, serves as a HCP pursuant to the Act and pursuant to Section 10 (a)(1)(B) of the FESA. The Implementation Agreement (IA) sets forth the implementation requirements for the MSHCP as well as procedures and minimization measures related to take of habitats and species considered for conservation. Implementation of the MSHCP authorizes participating jurisdictions to "take" specified plant and wildlife species within the MSHCP Plan Area. In addition, the wildlife agencies, namely USFWS and CDFW, allow take of habitat or individual species outside of the MSHCP Conservation Area in exchange for the assembly and management of a coordinated MSHCP Conservation Area. The assembly and long-term management of the MSHCP Conservation Area is the responsibility of Riverside County, federal, and State governments; cities within the western portion of Riverside County; and private and public entities that conduct activities which would potentially impact the habitats and species considered for conservation under the MSHCP. EMWD is not a signatory to the MSHCP; thus, although the MSHCP is discussed within this report as regional HCP, the project is not required to demonstrate consistency with the MSHCP.

3.3.2 Stephens' Kangaroo Rat HCP

The Stephens' Kangaroo Rat Habitat Conservation Plan (SKRHCP) is a comprehensive, multi-jurisdictional HCP focusing on conservation of the Stephens' kangaroo rat (*Dipodomys stephensi*; SKR) and its associated habitats in western Riverside County. Approximately 41,221 acres of occupied and potentially suitable SKR habitat within the HCP plan area was organized into 7 core reserves deemed most important for the preservation of the species, which would be preserved in perpetuity. The nearest core reserve to the proposed project is the SKRHCP San Jacinto/Lake Perris Core Reserve (Core Reserve 5). The BSA is situated outside of this and all other SKR core reserves; therefore, the proposed activities will not result in an impact to this reserve.

The SKRHCP and the County of Riverside - Ordinance No. 663 requires that development proposed outside of a core reserve but within the plan area is reviewed to determine the most appropriate course of action to ensure the survival of the species and provide a method to mitigate for impacts resulting from said development. The Riverside County Habitat Conservation Agency (RCHCA) has obtained a Section 10A permit granted by the USFWS that allows for the incidental "take" of SKR, assuming that the proposed development is sited outside of a core reserve. As a rule, public and private entities that propose development within the plan area are generally required to pay a mitigation fee in accordance with the permit. However, EMWD, as a water resource agency, is exempt from this requirement and therefore, no further action is necessary to comply with the SKRHCP and obtain coverage for the species. If SKR is found in the survey area, EMWD may opt in to obtain coverage.

The project is not located within a core reserve and is not within occupied SKR habitat that is mapped outside of the core areas, so a take agreement with RCHCA is not required. SKR surveys are not required based on coordination with RCHCA (ESA 2022) and pursuant to 5.C.o.vi of the SKR HCP, would not even be required within occupied habitat with a Core Reserve if:

> *"Actions taken by public agencies to operate and/or maintain existing public facilities including, but not limited to, roads and transportation facilities, drainage and flood control facilities, public buildings, landfills and appurtenant facilities, water storage, treatment, and transmission facilities, sewerage transmission and treatment facilities, reclaimed water storage and transmission facilities, public parks, and utility pipelines and transmission lines."*

In addition, since the project is to upgrade existing facilities, no further actions are required.

3.3.3 Protected Trees

Trees located within the City of Moreno Valley rights-of-way are regulated by City of Moreno Valley Municipal Code Chapter 9.17.030, which requires development projects to conduct a tree survey prior to construction and, if any Heritage Trees[3] are to be removed, to replace each removed tree at defined ratios (as specified in Municipal Code Chapter 9.17.030). Trees located within "landscape development in public rights-of-way, areas adjacent to the public right-of-way, easements, setbacks, slopes, parking areas, public, quasi-public, commercial, industrial and specified residential on-site landscape areas" are subject to the provisions of Chapter 9.17.030 of the City of Moreno Valley Municipal Code. Mandatory compliance with the requirements of the Municipal Code would ensure the project would not conflict with the City of Moreno Valley's ordinance regulating tree removal. Projects necessitating the removal of existing trees with four-inch or greater trunk diameters (calipers), shall be replaced at a three-to-one ratio, with minimum twenty-four (24) inch box size trees of the same species, or a minimum thirty-six (36) inch box for a one to one replacement, where approved. No removal of trees on public rights-of-way are proposed as part of the project. Several eucalyptus trees surrounding the existing tank may be removed during Phase 2, however these trees are located on private land owned by EMWD and are not subject to the City of Moreno Valley Municipal Code Chapter 9.17.030.

[3] Heritage Trees include A: Any tree that defines the historical and cultural character of the city including older Palm and Olive trees, and/or any tree designated as such by official action. B: Trees with a fifteen (15) inch diameter measured twenty-four (24) inches above ground level or C: Trees that have reached a height of fifteen (15) feet or greater.

CHAPTER 4
Existing Conditions

The BSA occurs within a relatively disturbed area within the City of Moreno Valley subject to on-going and historic disturbances associated with agricultural activities, road construction, and brush clearing activities. Moreno Valley and the surrounding area consists of gently sloping grasslands, sage scrub, and natural and man-made wetlands in a semi-arid climate. The BSA is located north of Lake Perris, southeast of Box Springs Mountain Range, south of Reche Canyon, and east of the City of San Jacinto.

4.1 Topography and Watersheds

Topography within the water storage tank expansion area generally slopes in a west-east orientation, ranging between an elevation of 1,758 feet above mean sea level (amsl) and 1,711 feet amsl. Topography associated with the transmission pipeline slopes in a north-south orientation, ranging between an elevation of 1,732 amsl and 1,594 amsl.

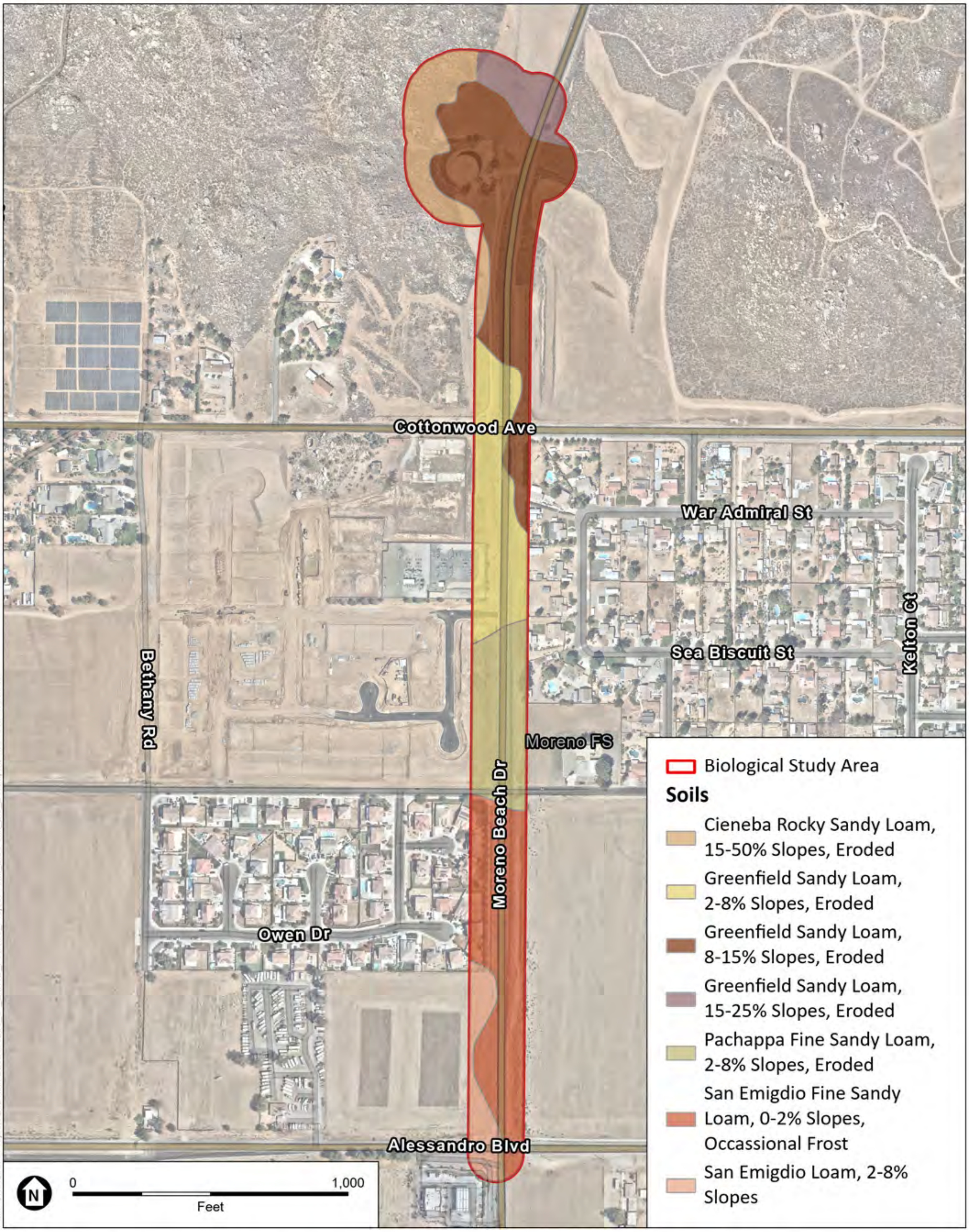
The BSA is identified by USGS as being located within the San Jacinto watershed (USGS Hydrologic Unit Code 18070202). Overall site hydrology drains from west to east from the adjacent hills toward Moreno Beach Drive, then south towards Lake Perris.

4.2 Soils

A total of seven soil types were mapped within the BSA, including Cieneba rocky sandy loam, 15 to 50 percent slopes, eroded; Greenfield sandy loam, 2 to 8 percent slopes, eroded; Greenfield sandy loam, 8 to 15 percent slopes, eroded; Greenfield sandy loam, 15 to 25 percent slopes, eroded; Panchappa fine sandy loam, 2 to 8 percent slopes, eroded; San Emigdio fine sandy loam, 0 to 2 percent slopes, occasional frost; and San Emigdio fine sandy loam, 2 to 8 percent slopes (NRCS 2022). Within the Western Riverside Area soil survey area (CA679), these soils are not considered hydric (NRCS 2022). A brief description of each soil type is provided below and are depicted in **Figure 4 – Soils Map**.

Cieneba rocky sandy loam, 15 to 50 percent slopes, eroded

This soil type was mapped in the northwest corner of the BSA. It consists of somewhat excessively drained soils consisting of residuum weathered from igneous rock. The depth to restrictive feature is approximately 14-22 inches, and the typical soil profile consists of sandy loam 0-14 inches, and weathered bedrock 14-22 inches.



SOURCE: Web Soil Survey, 2022; Nearmap (2022), ESA (2022)

Pettit Water Storage Tank Expansion and Transmission Pipeline Project

Figure 4
Soils Map

ESA

Greenfield sandy loam, 2 to 8 percent slopes, eroded

This soil type was mapped in the center of the BSA, associated with the transmission pipeline. It consists of well drained soils consisting of alluvium derived from granite. The depth to restrictive feature is more than 80 inches, and the typical soil profile consists of fine sandy loam 0-26 inches, fine sandy loam 26-43 inches, loam 43-60 inches and stratified loamy sand to sandy loam 60-72 inches.

Greenfield sandy loam, 8 to 15 percent slopes, eroded

This soil type was mapped in the northern portion of the BSA, associated with the water storage tank expansion area and transmission pipeline. It consists of well drained soils consisting of alluvium derived from granite. The depth to restrictive feature is more than 80 inches, and the typical soil profile consists of sandy loam 0-26 inches, fine sandy loam 26-43 inches, and loam 43-60.

Greenfield sandy loam, 15 to 25 percent slopes, eroded

This soil type was mapped in the northern portion of the BSA, associated with the water storage tank expansion area grading limits. It consists of well drained soils consisting of alluvium derived from granite. The depth to restrictive feature is more than 80 inches, and the typical soil profile consists of sandy loam 0-26 inches, fine sandy loam 26-43 inches, and loam 43-60.

Panchappa fine sandy loam, 2 to 8 percent slopes, eroded

This soil type was mapped in the center of the BSA, associated with the transmission pipeline. It consists of well drained soils consisting of alluvium derived from granite. The depth to restrictive feature is more than 80 inches, and the typical soil profile consists of fine sandy loam 0-20 inches, loam 20-40 inches, and fine sandy loam 40-63 inches.

San Emigdio fine sandy loam, 0 to 2 percent slopes, occasional frost

This soil type was mapped in the southern portion of the BSA, associated with the transmission pipeline. It consists of well drained soils consisting of residuum weathered from sedimentary rock. The depth to restrictive feature is more than 80 inches, and the typical soil profile consists of fine sandy loam 0-8 inches, fine sandy loam 8-40 inches, and stratified fine sandy loam to silt loam 40-60 inches.

San Emigdio fine sandy loam, 2 to 8 percent slopes

This soil type was mapped in the southwest portion of the BSA, associated with the transmission pipeline. It consists of well drained soils consisting of residuum weathered from sedimentary rock. The depth to restrictive feature is more than 80 inches, and the typical soil profile consists of loam 0-8 inches, fine sandy loam 8-40 inches, and stratified sandy loam to silt loam 40-60 inches.

4.3 Natural Communities and Land Cover Types

The natural communities and land cover types located within the survey area were characterized and mapped during the biological resources assessment and are depicted in **Figure 5 – Natural**

Communities and Land Cover Types. Each natural community and land cover type is described in detail below. A complete list of plant species observed during the site assessment is provided in **Appendix A – Species Compendia**. Representative photographs are shown in **Appendix B – Site Photographs**. A summary of acreages of each natural community and land cover type within the BSA, which includes the project and a 100-foot buffer, are presented in **Table 1**.

TABLE 1
VEGETATION COMMUNITIES AND LAND COVER TYPES WITHIN THE BSA

Natural Community/Land Cover Type[1]	Project (acres)	100-foot Survey Buffer	BSA Total (acres)
Uplands			
Brittle bush scrub (*Encelia farinosa* Shrubland Alliance)	0.56	2.86	3.42
Urban Land Cover Types			
Developed	0.49	7.22	7.71
Disturbed	1.81	7.71	9.51
TOTAL	**2.85**	**17.79**	**20.65**

[1] Vegetation was characterized in the field in accordance with A Manual of California Vegetation, Online (CNPS 2022)

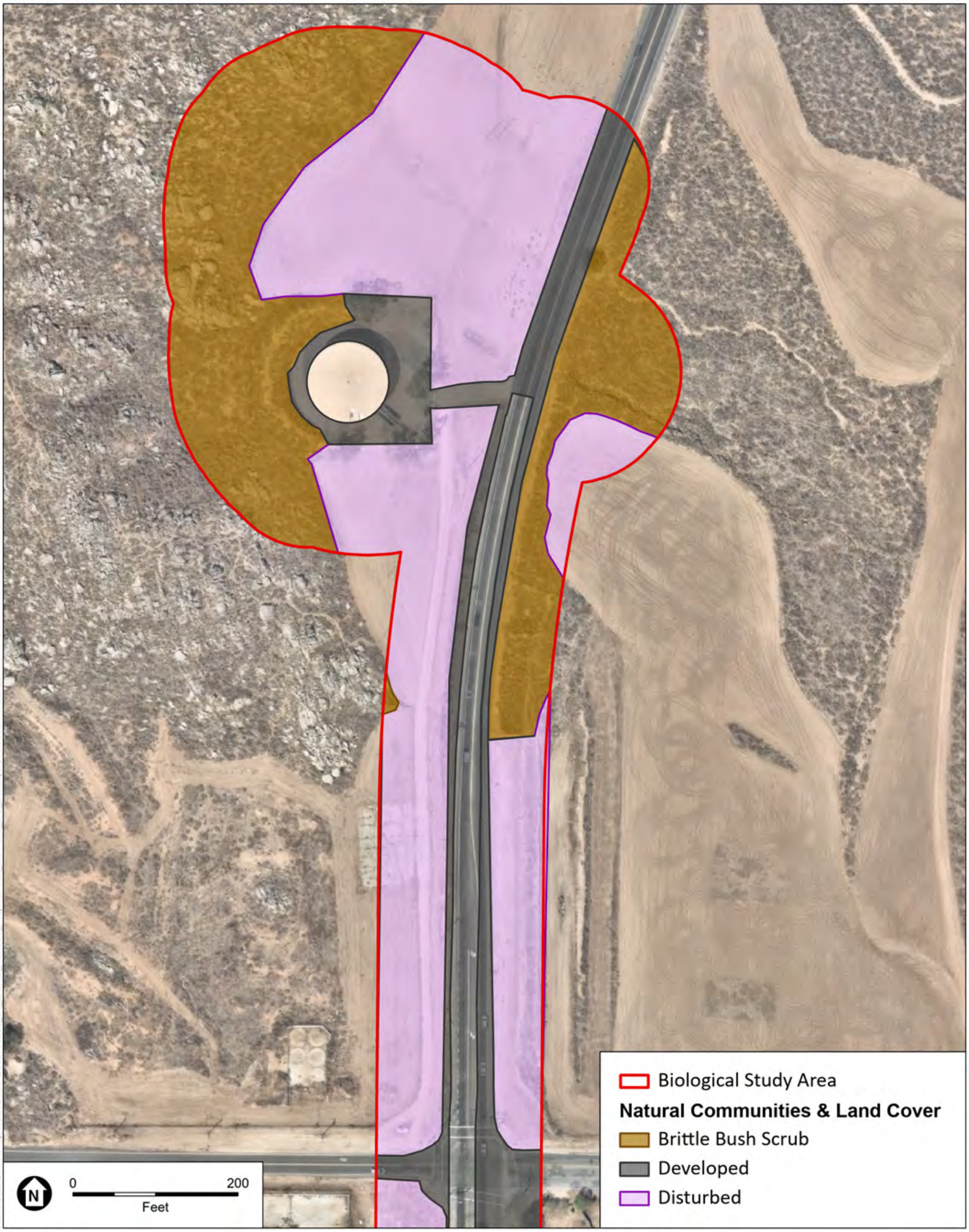
SOURCE: ESA 2022

4.3.1 Brittle Bush Scrub

Brittle bush scrub (*Encelia farinosa* Shrubland Alliance) was mapped within the western portion of the Pettit Water storage tank project site associated with Phases 1 and 2. This community is characterized by a shrub canopy dominated by brittlebush (*Encelia farinosa*), interspersed with various other native species such as orange bush monkeyflower (*Diplacus aurantiacus*), California sagebrush (*Artemisia californica*), and wishbone bush (*Mirabilis laevis* var. *crassifolius*). Brittle bush scrub typically occurs on steep, rocky sites, especially south-facing slopes.

4.3.2 Disturbed

Disturbed land use was mapped throughout the majority of the eastern section of the grading limits associated with the water storage tank project site and portions of the transmission pipeline sections of the project. This community supports mostly barren soils with small amounts of non-native vegetative growth and no native species. Species include Russian thistle (*Salsola tragus*), shortpod mustard (*Hirschfeldia incana*), tumbling pigweed (*Amaranthus albus*), and red-stem filaree (*Erodium cicutarium*).

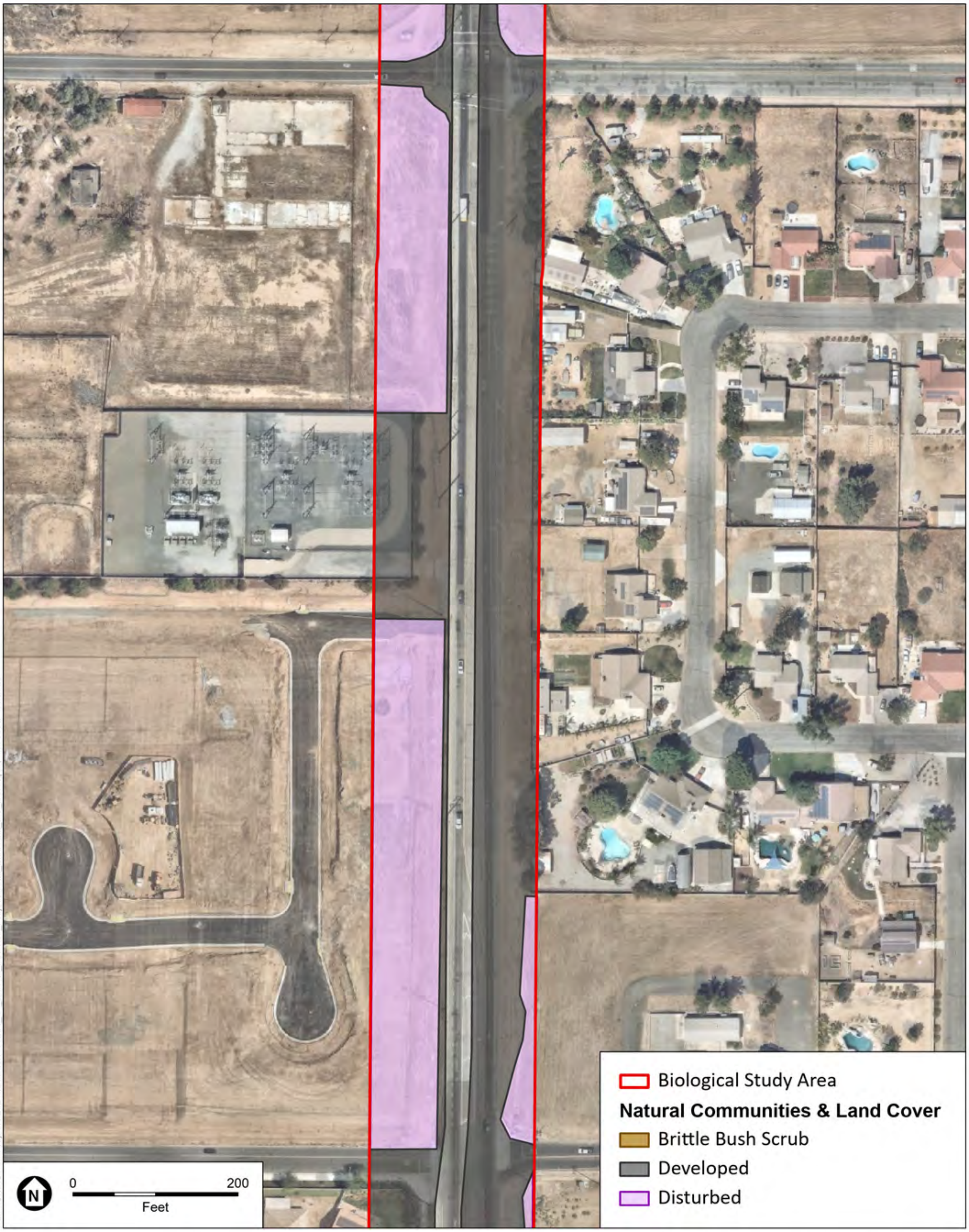


SOURCE: Nearmap (2022), ESA (2022)

Pettit Water Storage Tank Expansion and Transmission Pipeline Project

Figure 5a
Natural Communities and Land Cover Types

ESA

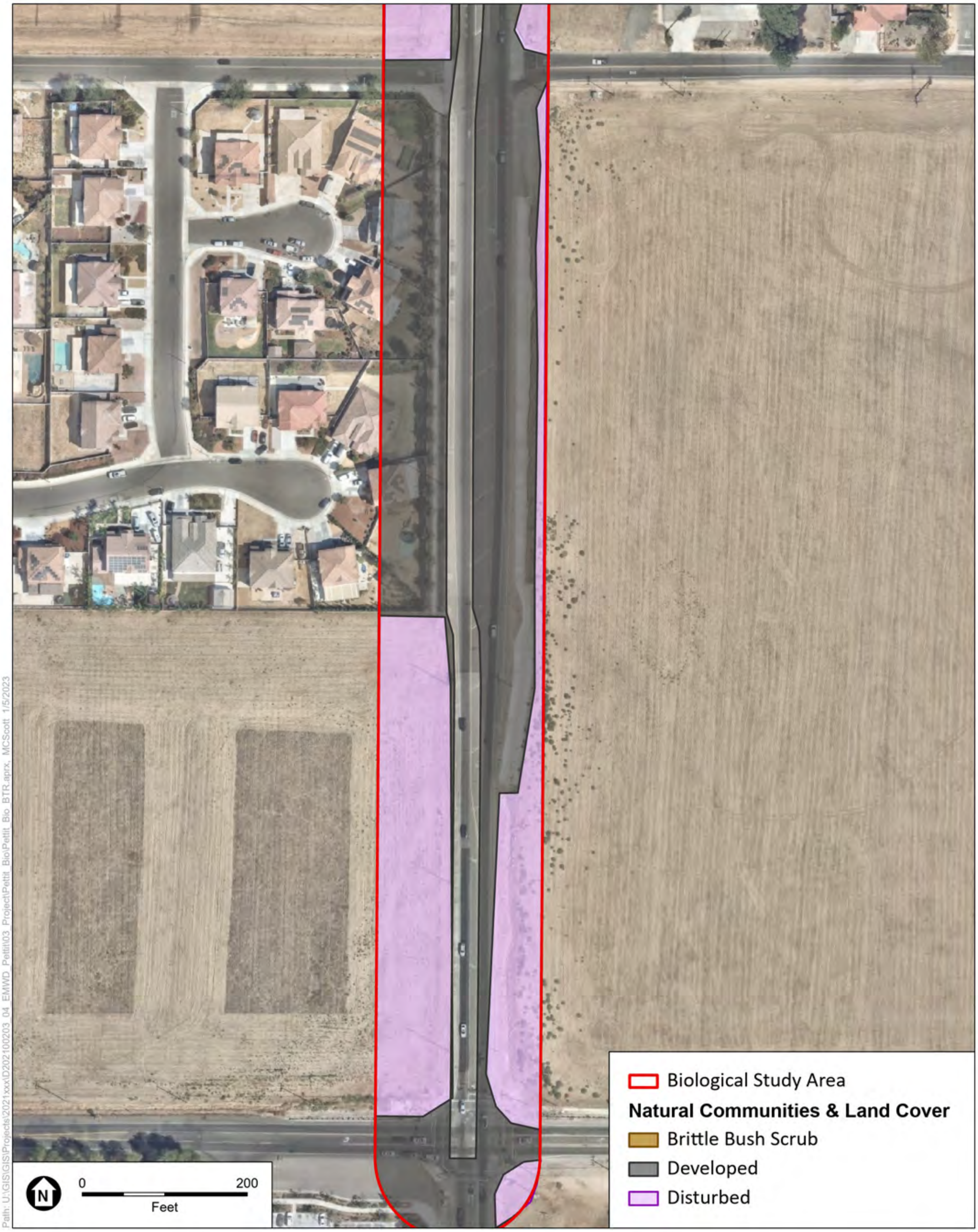


SOURCE: Nearmap (2022), ESA (2022)

Pettit Water Storage Tank Expansion and Transmission Pipeline Project

Figure 5b
Natural Communities and Land Cover Types

ESA



SOURCE: Nearmap (2022), ESA (2022)

Pettit Water Storage Tank Expansion and Transmission Pipeline Project

Figure 5c
Natural Communities and Land Cover Types

ESA

4.3.3 Developed

Developed areas in the BSA included paved asphalt associated with Moreno Beach Drive and Alessandro Boulevard. It also includes the existing water storage tank, and residential and commercial developments along Moreno Beach Drive.

4.4 General Plant and Wildlife Species

The generally contiguous natural topography, friable soils and unimpaired connection with adjacent native habitats to the west and north suggest that many species of wildlife are likely to utilize the brittle bush scrub within the BSA for both foraging and breeding. Avian species observed during the field assessment include California towhee (*Melozone crissalis*), house finch (*Haemorhous mexicanus)*, bushtit (*Psaltriparus minimus*), yellow-rumped warbler (*Setophaga coronata*), white-crowned sparrow (*Zonotrichia leucophrys*), and rock wren (*Salpinctes obsoletus*). Mammal species observed during the field assessment include coyote (*Canis latrans*) and brush rabbit (*Syvilagus bachmanii*). Invertebrate species observed during the field assessment include variegated meadowhawk dragonfly (*Sympetrum corruptum*) and southern California shoulderband snail (*Helmnithoglypta tudiculata*). A list of wildlife species observed within the BSA is included in Appendix A – Species Compendia.

Plants within the BSA are associated with brittle bush scrub in varying states of disturbance, interspersed with disturbed and developed land use. Disturbance and development within the BSA includes frequently disced soils, unpaved dirt roads, paved roads, driveways and residential and commercial properties. All plants observed throughout the BSA during the assessment were recorded and a comprehensive list is provided in Appendix A – Species Compendia; those that were unidentified in the field were keyed to the species level using the 2012 Jepson Manual (Baldwin et al. 2012).

4.5 Sensitive Biological Resources

4.5.1 Special-Status Plants

Special-status plants are defined as those plants that, because of their recognized rarity or vulnerability to various causes of habitat loss or population decline, are recognized by federal, State, or other agencies as under threat from human-associated developments. Some of these species receive specific protection that is defined by federal or State endangered species legislation. Others have been designated as special-status on the basis of adopted policies and expertise of State resource agencies or organizations with acknowledged expertise, or policies adopted by local governmental agencies such as counties, cities, and special districts to meet local conservation objectives. Special-status plants are defined as follows:

- Plants listed or proposed for listing as threatened or endangered, or are candidates for possible future listing as threatened or endangered, under the federal Endangered Species Act or the California Endangered Species Act;
- Plants that meet the definitions of rare or endangered under *State CEQA Guidelines* Section 15380;

- Plants considered by the CNPS and CDFW to be rare, threatened, or endangered (Rank 1A, 1B, 2A and 2B plants) in California; and
- Plants listed as rare under the California Native Plant Protection Act (Fish and Game Code 1900 et seq.)

A review of the CNDDB (CDFW 2022b) and the CNPS Inventory of Rare and Endangered Plants (CNPS 2022) revealed 52 special-status plant species recorded within the USGS 9-quadrangle search. The potential for special-status plant species to occur is based on vegetation and habitat quality, topography, elevation, soils, surrounding land uses, habitat preferences and geographic ranges. A complete list of the species generated in the CNDDB and CNPS queries are provided in **Appendix C1 – Special-Status Plant Species**.

The special-status plants listed in Appendix C1 were determined to have varying levels of potential to occur based on the following criteria:

- **Low Potential:** The BSA supports limited habitat for a particular species. For example, the appropriate vegetation assemblage may be present while the substrate preferred by the species may be absent.
- **Moderate Potential:** The BSA provides marginal habitat for a particular species. For example; the habitat may be heavily disturbed and/or may not support all stages of a species life cycle.
- **High Potential:** The BSA provides suitable habitat conditions for a particular species and/or known populations occur in the immediate area.
- **Present:** The species was observed within the BSA during the site visit.

A discussion of each species with a potential to occur within the BSA is included in Appendix C1. Based on the site visit, only two special-status plant species have a low potential to occur in the BSA: Parry's spineflower and chaparral ragwort. These species prefer largely undisturbed habitat which is primarily absent from the BSA; thus, these species with low potential are not discussed further in this report. Based on the absence of suitable habitat, known geographic distributions and/or range restrictions, it was determined that the remainder of the special-status plant species do not have the potential to occur within the BSA and are therefore omitted from further discussion in this report.

4.5.2 Special-Status Wildlife

Special-status wildlife are defined as those animals that, because of their recognized rarity or vulnerability to various forms of habitat loss or population decline, are considered by federal, State, or other agencies to be under threat from human-associated developments. Some of these species receive specific protection that is defined by this federal or State endangered species legislation and others have been designated as special-status on the basis of adopted local policies (i.e. city and county) or the educated opinion of respected resource interest groups (i.e. Western Bat Working Group [WBWG]). Special-status wildlife is defined as follows:

- Wildlife listed or proposed for listing as threatened or endangered, or are candidates for possible future listing as threatened or endangered, under the FESA or CESA;

- Wildlife that meet the definitions of rare or endangered under CEQA Guidelines Section 15380;
- Wildlife designated by CDFW as species of special concern, included on the Watch List or are considered Special Animals;
- Wildlife "fully protected" in California (Fish and Game Code Sections 3511, 4700, and 5050);
- USFWS Birds of Conservation Concern (BCC) as identified in the USFWS Information for Planning and Consultation (IPaC) resource list generated for the project (USFWS 2022b);
- Bird species protected by the MBTA; and
- Bat species considered priority by the WBWG.

A total of 71 special-status wildlife species were reported in the vicinity based on a CNDDB database search within the 9-quadrangle search area (i.e., Sunnymead and 8 surrounding topographic quadrangles). A complete list of the species generated in the queries are provided in **Appendix C2 – Special-Status Animal Species**.

The special-status wildlife listed in Appendix C2 were determined to have varying levels of potential to occur based on the following criteria:

- **Low Potential:** The BSA supports limited habitat for a particular species. For example, the appropriate vegetation assemblage may be present while the substrate preferred by the species may be absent.
- **Moderate Potential:** The BSA provides marginal habitat for a particular species. For example; the habitat may be heavily disturbed and/or may not support all stages of a species life cycle.
- **High Potential:** The BSA provides suitable habitat conditions for a particular species and/or known populations occur in the immediate area.
- **Present:** The species was observed within the BSA during the site visit.

A discussion of each species with a potential to occur within the BSA is included in Appendix C2. Based on the condition of the vegetation and habitats that were characterized during the site visit, it was determined that one listed species has a moderate potential to occur within the BSA: Crotch’s bumblebee (*Bombus crotchii*) (Federal Candidate Endangered). A total of 6 additional special-status wildlife species have a moderate to high potential to occur within the BSA, and a discussion of each species is included below. Wildlife species generated in the query that have a low potential to occur or are not expected to occur within the BSA based on an absence of suitable habitat, known geographic distributions, and/or range restrictions were omitted and are not discussed further in this report.

4.5.2.1 Federally and State Listed Species

Crotch’s Bumblebee

Crotch’s bumble bee (*Bombus crotchii*) is a State candidate endangered species and has a moderate potential to occur within the BSA. The species prefers grassland and sage shrubland habitats and are dietary generalists, with a wide variety of food plants including milkweeds (*Asclepias* spp), phacelias (*Phacelia* spp.), sages (*Salvia* spp.), medics (*Medicago* spp), lupines (*Lupinus* spp), and various members of the Asteraceae. Branching phacelia (*Phacelia ramossissima*), brittle bush (*Encelia farinosa*), and miniature lupine (*Lupinus bicolor*) were all suitable food plant species observed within the BSA. There are 18 CNDDB records with the most recent occurring in 2020 three miles east of the BSA (CNDDB 2022).

4.5.2.2 Other Special-Status Wildlife

Several other species that are not federally or state listed but that are considered special-status have a moderate potential to occur within the BSA. The Southern-California rufous-crowned sparrow (*Aimophila ruficeps canescens*; MSHCP Adequately Covered Species) and San Diego desert woodrat (*Neotoma lepida intermedia*; State Species of Special Concern [SSC]) may forage, and/or breed within the brittle bush scrub within the project and remainder of the BSA. Locations of adjacent unidentified woodrat nests are included in **Figure 6 – Sensitive Biological Resources**, below. One potential woodrat nest was observed within the 25-foot temporary impact buffer associated with appurtenance facilities east of Moreno Beach Drive. While these woodrat nests could not be positively identified as belonging to a special-status species, each nest is presumed to belong to the species until special-status small mammal surveys can be performed.

The Belding’s orange-throated whiptail (*Aspidoscelis hyperythra beldingi*; MSHCP Adequately Covered Species), coastal western whiptail (*Aspidoscelis tigris stejnegeri*; MSHCP Adequately Covered Species), coast patch-nosed snake (*Salvadora hexalepis virgultea*; SSC), and red-diamond rattlesnake (*Crotalus ruber*; SSC, MSHCP Adequately Covered Species) may forage and breed within brittle bush scrub habitat of the project.

4.5.3 Sensitive Natural Communities

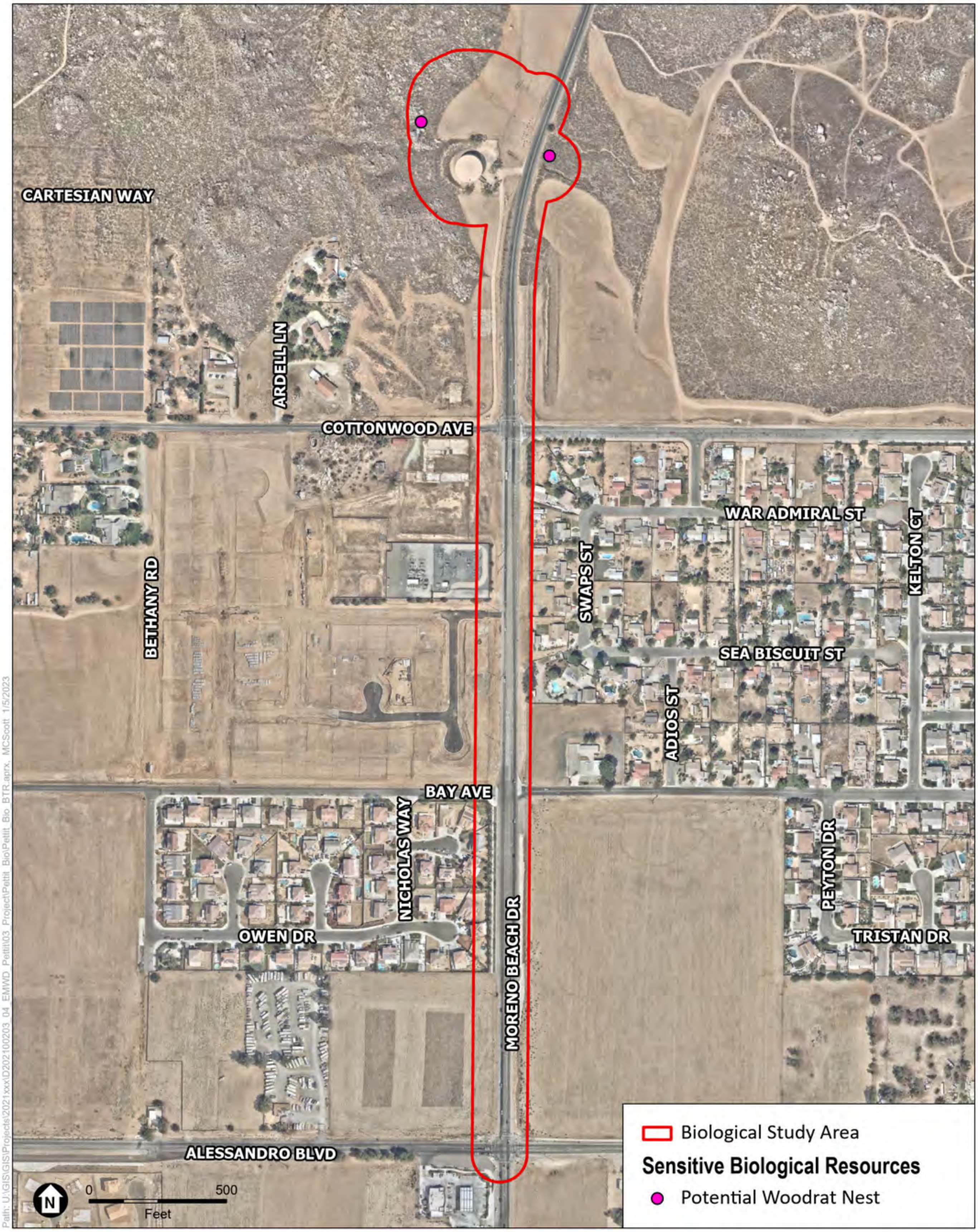
Sensitive natural communities are of limited distribution statewide or within a county or region. These communities may or may not contain special-status species or their habitat, and are independently considered sensitive by CDFW. For purposes of this project, sensitive natural communities include vegetation communities identified in the California Natural Communities List with Holland Types (CDFW 2022a) with a CNDDB state rank of S1, S2, or S3.

The nine-quadrangle CNDDB search yielded records for eight sensitive natural communities: Canyon Live Oak Ravine Forest, Riversidian Alluvial Fan Sage Scrub, Southern Coast Live Oak Riparian Forest, Southern Cottonwood Willow Riparian Forest, Southern Riparian Forest, Southern Riparian Scrub, Sycamore Alder Riparian Woodland, and Southern Willow Scrub. Based on the site visit, none of these natural communities were observed to occur within the BSA. The brittle bush scrub (S4), as well as disturbed and developed areas are not considered sensitive natural communities as they are either not ranked or have a rank of S4 or higher.

4.5.4 Critical Habitat

Under the FESA, to the extent feasible, the USFWS is required to designate critical habitat for endangered and threatened species. Critical habitat is defined as areas of land, water, and air space containing the physical and biological features essential for the survival and recovery of endangered and threatened species. Designated critical habitat includes sites for breeding and rearing, movement or migration, feeding, roosting, cover, and shelter that are essential to the survival and recovery of the species, whether the habitat is currently occupied by the species or not. Designated critical habitats require special management and protection of existing resources, including water quality and quantity, host animals and plants, food availability, pollinators, sunlight, and specific soil types.

The BSA is not located within designated critical habitat. The nearest critical habitat to the project is for the spreading navarretia (*Navarretia fossalis*) located southeast of Lake Perris approximately 4.7 mile to the southeast (USFWS 2022a).



Path: U:\GIS\GIS\Projects\2021xxx\D202100203_04_EMWD_Pettit\03_Project\Pettit_Bio\Pettit_Bio_BTR.aprx, MCScott 1/5/2023

SOURCE: Nearmap (2022), ESA (2022)

EMWD Pettit Tank and Pipeline EIR

Figure 6
Sensitive Biological Resources

ESA

4.5.5 Protected Trees

No trees protected by the City of Moreno Valley were observed in the BSA. Ten red gum (*Eucalyptus camaldulensis*), which are not protected trees, were observed growing along the outer edge of the existing Water Storage Tank. These trees are proposed for removal during Phase 2 of the Water Storage Tank Expansion, with a number of other trees proposed for replacement.

4.6 Aquatic Resources

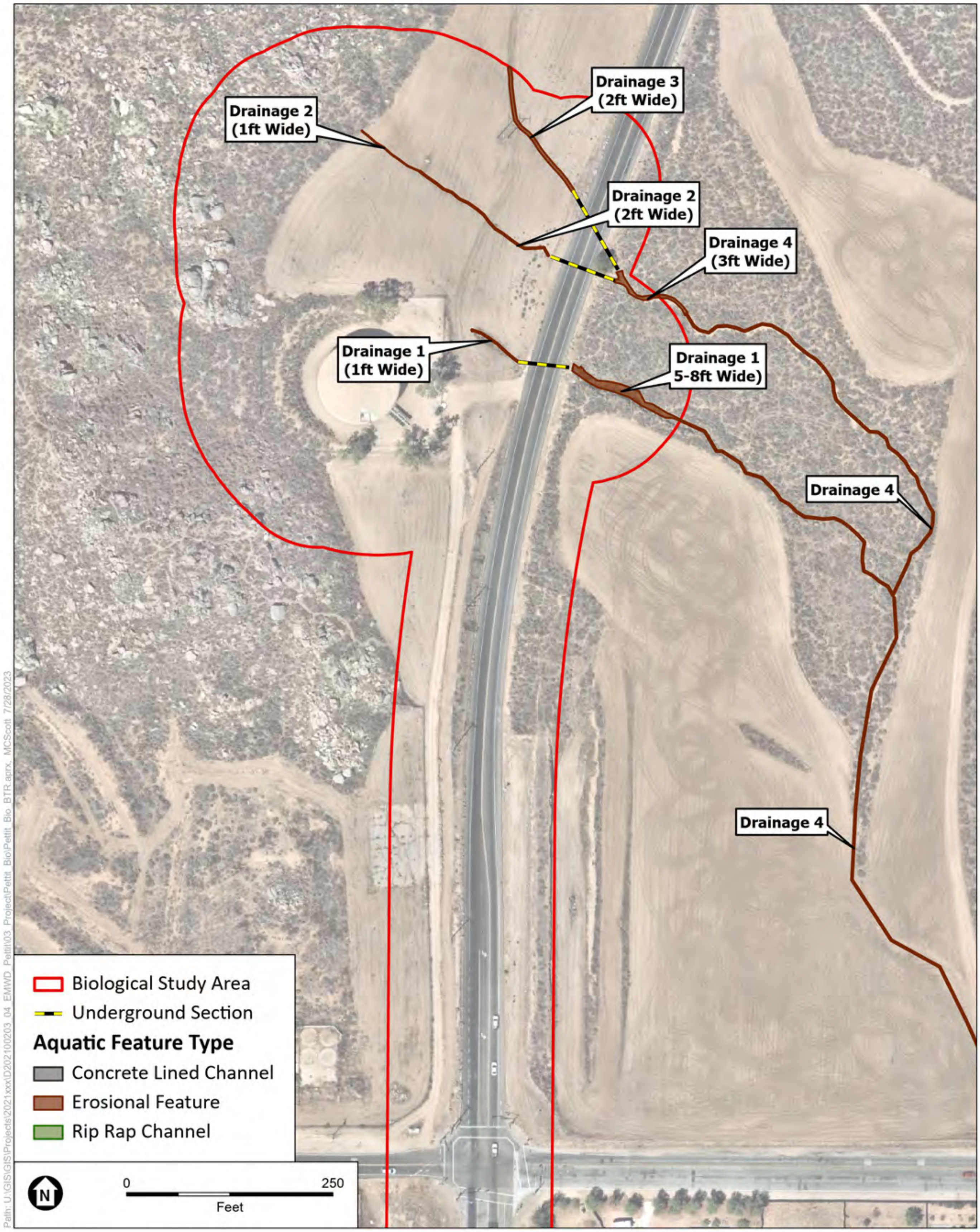
A formal jurisdictional waters delineation was conducted concurrently with the biological field assessment within the BSA, the results of which are included in a separate report (ESA 2023). Based on the results of the delineation, the BSA supports aquatic resources, including 0.056 acres (761.7 linear feet) of potential non-wetland waters of the State that may be regulated by the RWQCB and the CDFW. The potentially jurisdictional boundaries within the BSA are depicted in **Figure 7 – Aquatic Resources** and summarized in **Table 2 – Aquatic Resources in the BSA**.

TABLE 2
AQUATIC RESOURCES IN THE BSA

Aquatic Feature	Cowardin Type	Dominant Vegetation/ Land Cover Type	Feature Width (feet) (range from within BSA)	Linear Feet	Acres (Square Feet)
Drainage 1	Riverine (ephemeral)	Largely devoid of vegetation/annual forbs	1 (1-8)	219.0	0.029 (1,273.13)
Drainage 2	Riverine (ephemeral)	Largely devoid of vegetation/annual forbs	1-2	303.0	0.011 (471.98)
Drainage 3	Riverine (ephemeral)	Largely devoid of vegetation/annual forbs	2	173.7	0.008 (378.86)
Drainage 4	Riverine (ephemeral)	Brittle Bush Scrub	4-7	66 (1,579)[1]	0.008 (356.15) / 0.15 (6,747.1)
			Totals:	**761.7 (2,274.7)**	**0.056 (2,480.12) / 0.20 (8,871.07)**

1 Measurements shown for segments of Drainage 4 associated with tank expansion work area adjacent to Moreno Beach Drive in addition to total area which includes lengths/acreage delineated along transmission pipeline BSA.

Four ephemeral drainages were considered for their potential to be other (non-wetland) waters of the U.S. within the BSA.

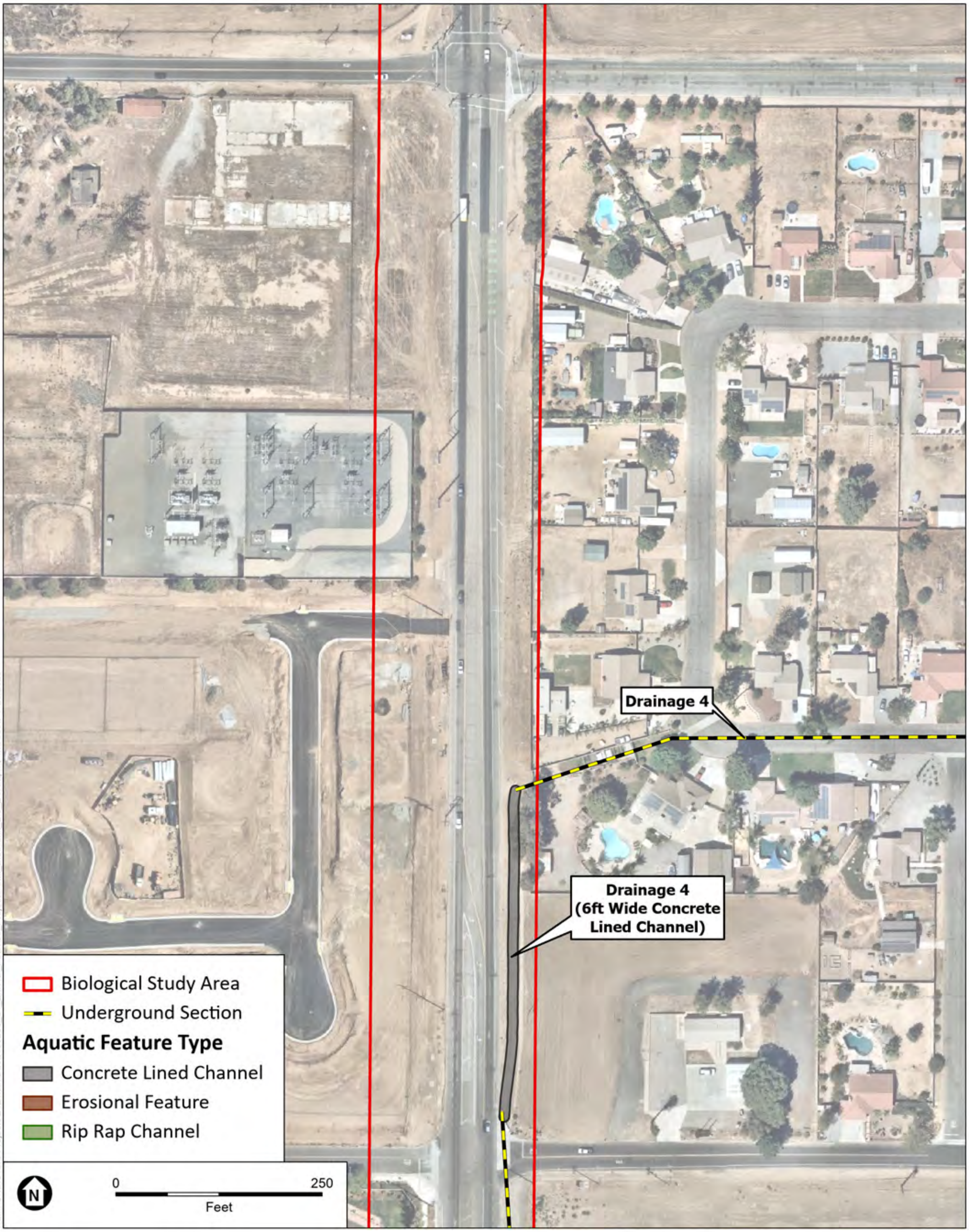


SOURCE: Nearmap (2022), ESA (2022)

Pettit Water Storage Tank Expansion and Transmission Pipeline Project

Figure 7a
Aquatic Resources

ESA

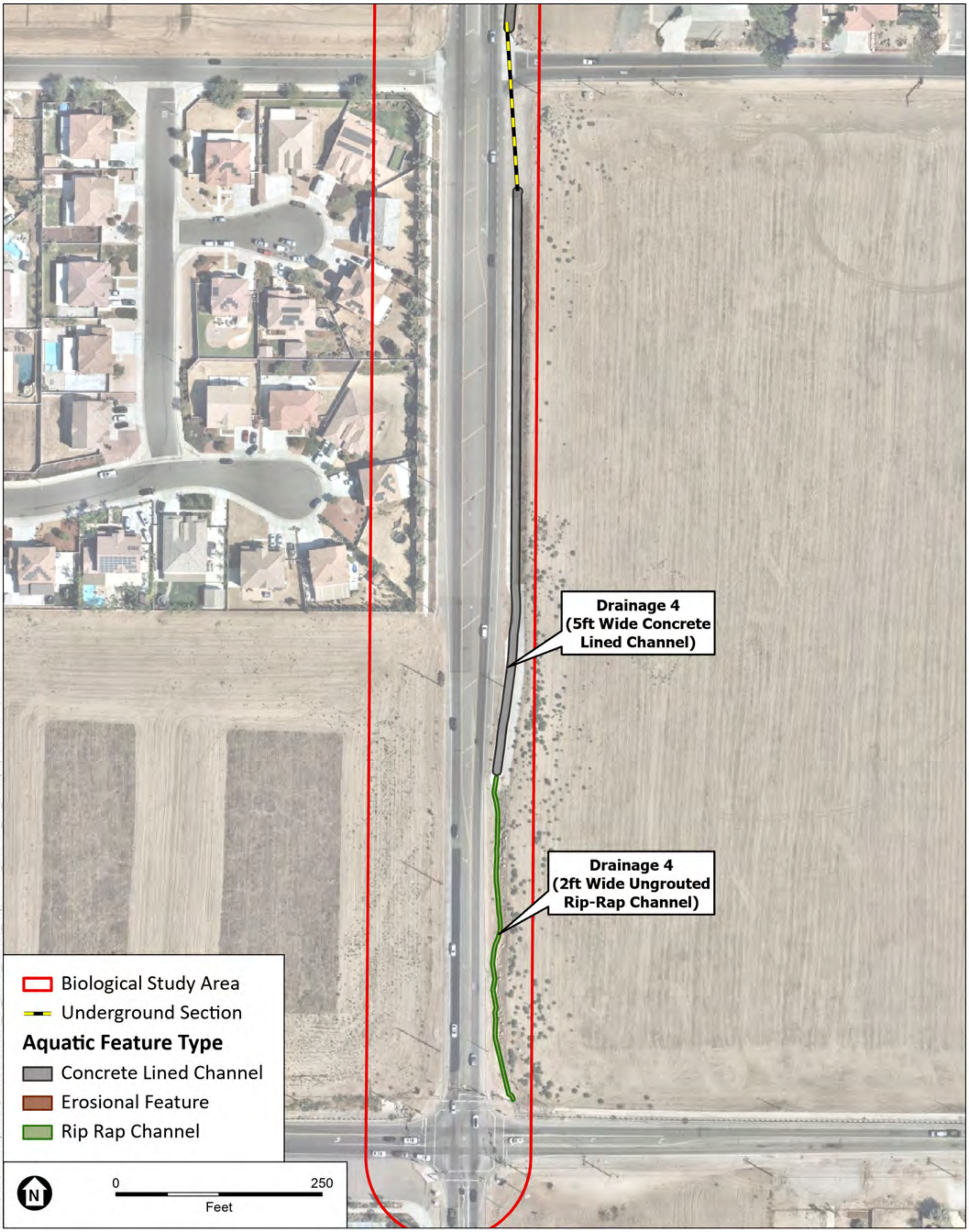


SOURCE: Nearmap (2022), ESA (2022)

Pettit Water Storage Tank Expansion and Transmission Pipeline Project

Figure 7b
Aquatic Resources

ESA



SOURCE: Nearmap (2022), ESA (2022)

Pettit Water Storage Tank Expansion and Transmission Pipeline Project

Figure 7c
Aquatic Resources

ESA

Drainage 1

Drainage 1 is an ephemeral drainage which lacks riparian vegetation, and contains ruderal nonnative vegetation such as red brome (*Bromus rubens*), shortpod mustard (*Hirschfeldia incana*), and Russian thistle (*Salsola tragus*). The drainage has an average depth of 1 foot upstream from the culvert beneath Moreno Beach Drive and becomes deeply incised to a depth of between 5-8 feet downstream from the culvert beneath Moreno Beach Drive. A portion of Drainage 1 upstream from Moreno Beach Drive has been subject to regular and frequent disturbance in the form of site grading and discing, and lacks a defined OHWM or bed and bank as a result of the disturbance, which results in atypical situation for the purposes of delineating. Despite the lack of a defined OHWM, based on aerial imagery (Google Earth), conditions prior to disturbance are consistent with an ephemeral drainage. Drainage 1 originates at an 18-inch wide metal culvert, located 40 feet east of the fence line for the existing Pettit Water Storage Tank. No upslope inlet for the culvert was observed within the BSA. The culvert likely once conveyed stormwater runoff from the area surrounding the existing Pettit Water Storage Tank, however the culvert has since become inundated by sediment from previous storm events and is not capable of efficiently draining stormwater runoff from the area. Drainage 1 conveys flows southeast for approximately 69 feet towards the west side of Moreno Beach Drive, where it enters an 18-inch corrugated metal culvert beneath Moreno Beach Drive. Flows continue southeast from a headwall structure on the east side of Moreno Beach Drive (within the road right-of-way), where the drainage becomes deeply incised. Drainage 1 continues to convey flows outside of the BSA to the southwest where it eventually converges with Drainage 4.

Drainage 2

Drainage 2 is a 1-foot wide ephemeral drainage which lacks riparian vegetation, and contains ruderal nonnative vegetation such as tumbling pigweed, shortpod mustard, and Russian thistle. Drainage 2 lacks many recognizable features of a drainage due to frequent site disturbance in the form of site grading and discing. Drainage 2 is situated in a depression topographically, and stormwater runoff from the surrounding uplands drain to create Drainage 2. Drainage 2 conveys flows southeast towards Moreno Beach Drive, where it enters a 24-inch metal corrugated culvert. Drainage 2 then conveys flows eastward where it meets Drainage 3, east of Moreno Beach Drive. Drainage 2 and Drainage 3 then converge on the east side of Moreno Beach Drive to create a larger drainage, Drainage 4. Drainage 4 continues to convey flows outside of the BSA to the southwest, where it eventually converges with Drainage 1.

Drainage 3

Drainage 3 is a 2-foot wide ephemeral drainage with an average depth of 1 foot which lacks riparian vegetation, and contains ruderal nonnative vegetation such as tumbling pigweed, shortpod mustard, and Russian thistle. Drainage 3 lacks many recognizable features of a drainage due to frequent site disturbance in the form of site grading and discing. Drainage 3 is situated in a depression topographically, and stormwater runoff from the surrounding uplands drain into Drainage 3. Drainage 3 continues to convey flows southeast towards Moreno Beach drive, where it enters a 24-inch metal corrugated culvert. Drainage 3 continues to convey flows eastward where it confluences just east of the headwall structure east of Moreno Beach Drive with

Drainage 2 to create a larger ephemeral drainage, Drainage 4. Drainage 4 continues to convey flows outside of the BSA to the southwest, where it eventually converges with Drainage 1.

Drainage 4

Drainage 4 is an ephemeral drainage situated east of Moreno Beach Drive and is the result of the confluence of erosional features Drainage 2 and Drainage 3 conveying flows beneath Moreno Beach Drive. Drainage 4 lacks riparian vegetation and hydric soils, and its banks are dominated by brittle bush scrub, which is upland vegetation. Drainage 4 conveys flows southeast approximately 1,252 feet towards a double 18" metal culvert storm drain which is situated just north of Cottonwood Avenue. Drainage 4 continues beneath Cottonwood Avenue, exiting a single metal culvert. Drainage 4 continues to convey flows southeast of the intersection of Cottonwood Avenue and Arcaro Street, where the drainage becomes a 3-foot wide channel with concrete bed and banks. Drainage 4 continues south towards Sea Biscuit Street, where it enters a culvert that directs flows towards the west along Sea Biscuit Street, towards Moreno Beach Drive. Drainage 4 then exits a 36-inch concrete tube culvert which then conveys flows south, parallel with Moreno Beach Drive, within a 6-foot wide channel with concrete lined bed and banks. Drainage 4 continues into an 8-foot wide box culvert beneath Bay Avenue. Flows within Drainage 4 exit the box culvert approximately 170 feet south of Bay Avenue, where they continue for 466 feet in a 2-foot wide channel with an earthen bank of the eastern side of the channel and concrete lined bank on the west. Drainage 4 then transitions to a 5-foot wide concrete lined channel which continues south for 237 feet, where it then transitions into a 2-foot wide ungrouted rip rap channel. The ungrouted rip-rap portion of Drainage 4 continues for approximately 400 feet along the east side or Moreno Beach Drive, where it meets the intersection of Moreno Beach Drive and Alessandro Boulevard. Drainage 4 conveys flows into two 36-inch metal corrugated culverts beneath the intersection where flows are presumed continue south towards Lake Perris. Drainage 4 is shown on Figures 7a, 7b, and 7c.

4.7 Wildlife Movement and Nursery Sites

4.7.1 Wildlife Movement

Migration corridors are navigable patches or strips of land that connect larger tracts of open space together, allowing them to function as a greater habitat complex. Wildlife movement can exist on a local scale, allowing wildlife to pass through or under an otherwise uninhabitable area including a roadway, housing development, or city through drainage culverts, green belts and waterways; or on a larger scale, providing an opportunity for wildlife to skirt large topographical features (e.g., mountains, lakes, streams) by utilizing adjacent canyons, valleys and upland swaths when migrating.

The project is situated between Moreno Beach Drive and the open space hills to the west that wildlife utilizes to forage and breed, and likely to some extent, to travel both locally and regionally. Numerous species of birds, reptiles, invertebrates, and small mammals would be expected, as well as larger mammals such as the coyote, striped skunk (*Mephitis mephitis*), and raccoon (*Procyon lotor*), who likely utilize the area for hunting and movement. Although regional wildlife movement may occur within the native habitat in the surrounding open space, the BSA only contains a limited portion of native habitat. The majority of the BSA contains disturbed and developed areas that are already subjected to frequent human use (e.g., roadways with moderate to high traffic, etc.) and regional and local wildlife movement is not expected in those areas. The project is unlikely to hinder wildlife movement between areas of contiguous, intact habitat as the project will not separate areas of contiguous open space and the existing facilities will not create barriers between open space and the area subject to frequent human use. Furthermore, Moreno Beach Drive may already act as a barrier to wildlife movement.

4.7.2 Nesting Birds

A single unoccupied stick nest likely belonging to a common raven, was observed within a structure of the existing Pettit Water Storage Tank. The eucalyptus trees and brittle bush scrub on site may also provide habitat for nesting birds. Even the disturbed soils surrounding the existing water storage tank and proposed Phase 1 and 2 tank locations may provide suitable nesting habitat for ground nesting species, such as killdeer (*Charadrius vociferus*). Existing project facilities and surrounding limited habitat currently provide limited habitat for nesting birds, and the project may continue to provide limited nesting habitat.

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CHAPTER 5
Project Impacts and Avoidance, Minimization, and Mitigation

5.1 Approach to the Analysis

The analysis of the project impacts to biological resources and corresponding recommendations for avoidance, minimization, and mitigation are discussed in this section. Generally, impacts may be defined as direct or indirect, and permanent or temporary. Definitions of these impact types are provided below.

- **Direct Impacts:** Any alteration, disturbance, or destruction of biological resources that would result from project-related activities is considered a direct impact. Examples include loss of individual species and/or their associated plant communities, diversion of surface water flows, and encroachment into wetlands. Under the FESA, direct impacts are defined as the immediate impacts of a project on a species or its habitat, including construction noise disturbance, sedimentation, or habitat loss.
- **Indirect Impacts:** As a result of project-related activities, biological resources may also be affected in an indirect manner. Under the FESA, indirect impacts are defined as those impacts that are caused by, or would result from, a proposed project but occur later in time and are reasonably certain to occur (50 CFR. Section 402-02). An example of indirect impacts may include irrigation runoff from a developed area into surrounding natural vegetation. Indirect impacts could also include increased wildfire frequency as a result of power line failures.
- **Temporary Impacts:** Any impacts to biological resources that are considered reversible can be viewed as temporary. Examples include the generation of fugitive dust during construction activities and temporary access or staging areas that will be returned to pre-project conditions.
- **Permanent Impacts:** All impacts that result in the irreversible removal of biological resources are considered permanent. Examples include constructing a building or permanent road on an area with native vegetation, such that the native vegetation is permanent removed and replaced with a developed structure.

5.2 Thresholds of Significance

Based on 2022 CEQA Guidelines Appendix G, the project would result in a significant impact on biological resources if it would:

1. Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans,

policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service.

2. Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Game or US Fish and Wildlife Service.
3. Have a substantial adverse effect on State or federally protected wetlands (including, but not limited to, marsh, vernal pool, coastal) through direct removal, filling, hydrological interruption, or other means.
4. Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites.
5. Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance.
6. Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or State habitat conservation plan.

5.3 Impacts Analysis

Issue 1: Would the proposed project have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?

Special-Status Plants

Phase 1 and Phase 2

Construction

Storage Tanks and Pipeline

There are no special-status plant species identified as having a moderate or high potential to occur within the BSA (see Appendix C1). Construction would not affect any special-status plant species. Therefore, there would be no impacts to special-status plants, and no mitigation is required.

Operation

Storage Tanks and Pipeline

There are no special-status plant species identified as having a moderate or high potential to occur within the BSA (see Appendix C1). Operation of the project would not impact special-status plants. Anticipated maintenance activities would be limited to disturbed areas around the water storage tank. The pipeline would be installed underground and would not require regular maintenance. Anticipated maintenance associated with the water storage tank would include weekly maintenance of the tank itself. No impacts to special-status species would occur during the operation phase of the project.

Special-Status Invertebrates

Phase 1 and Phase 2

Construction

Storage Tanks and Pipeline

The majority of the proposed storage tank grading limits are disturbed and do not provide suitable habitat for Crotch's bumblebee, a special-status invertebrate (**Figure 8 – Impacts to Natural Communities and Land Cover Types**). Brittle bush scrub located within the storage tank grading limits and temporary impact limits associated with the offsite energy dissipater on the east side of Moreno Beach Drive may provide habitat for Crotch's bumblebee in the form of potential food plants such as Branching phacelia, brittle bush, and miniature lupine. Construction activities have the potential to result in direct mortality or removal of nests if the species is determined to be present. Impacts to special-status invertebrates would be potentially significant.

To minimize impacts to biological resources including special-status invertebrates, **Mitigation Measure BIO-1** would require preparation of a Worker Environmental Awareness Program (WEAP), which would be presented to construction crews prior to initiation of construction to inform workers of the potential for special-status wildlife species to occur onsite. The WEAP training should concentrate on identification of sensitive resources and strategies to avoid and minimize impacts to sensitive resources (e.g., staying within limits of disturbance, reduced speed limits, covering trenches/pits or installing wildlife escape ramps, daily trash/debris disposal). To minimize impacts to special-status invertebrates, **Mitigation Measure BIO-2** would require pre-construction surveys be conducted for Crotch's bumble bee. If these species are found on site during the surveys, best management practices as described in Mitigation Measure BIO-2 would be implemented, such as construction area delineation, reduced speed limits, and avoidance of host vegetation, to avoid impacts. Although Phase 2 of the project would occur in the year 2045, conditions within the BSA are not expected to chance substantially, and regardless, Mitigation Measure BIO-2 includes a pre-construction survey, which would confirm current conditions and determine presence/absence of Crotch's bumble bee at that time. With implementation of these mitigation measures, impacts to Crotch's bumblebee would be reduced to a less than significant level.

Operation

Storage Tanks and Pipeline

Operation of the project would not impact special-status invertebrates. Anticipated maintenance activities would be limited to disturbed areas around the water storage tank, which do not contain suitable habitat for special-status species. The pipeline would be installed underground and would not require regular maintenance. No impacts to special-status species would occur during the operation phase of the Project.

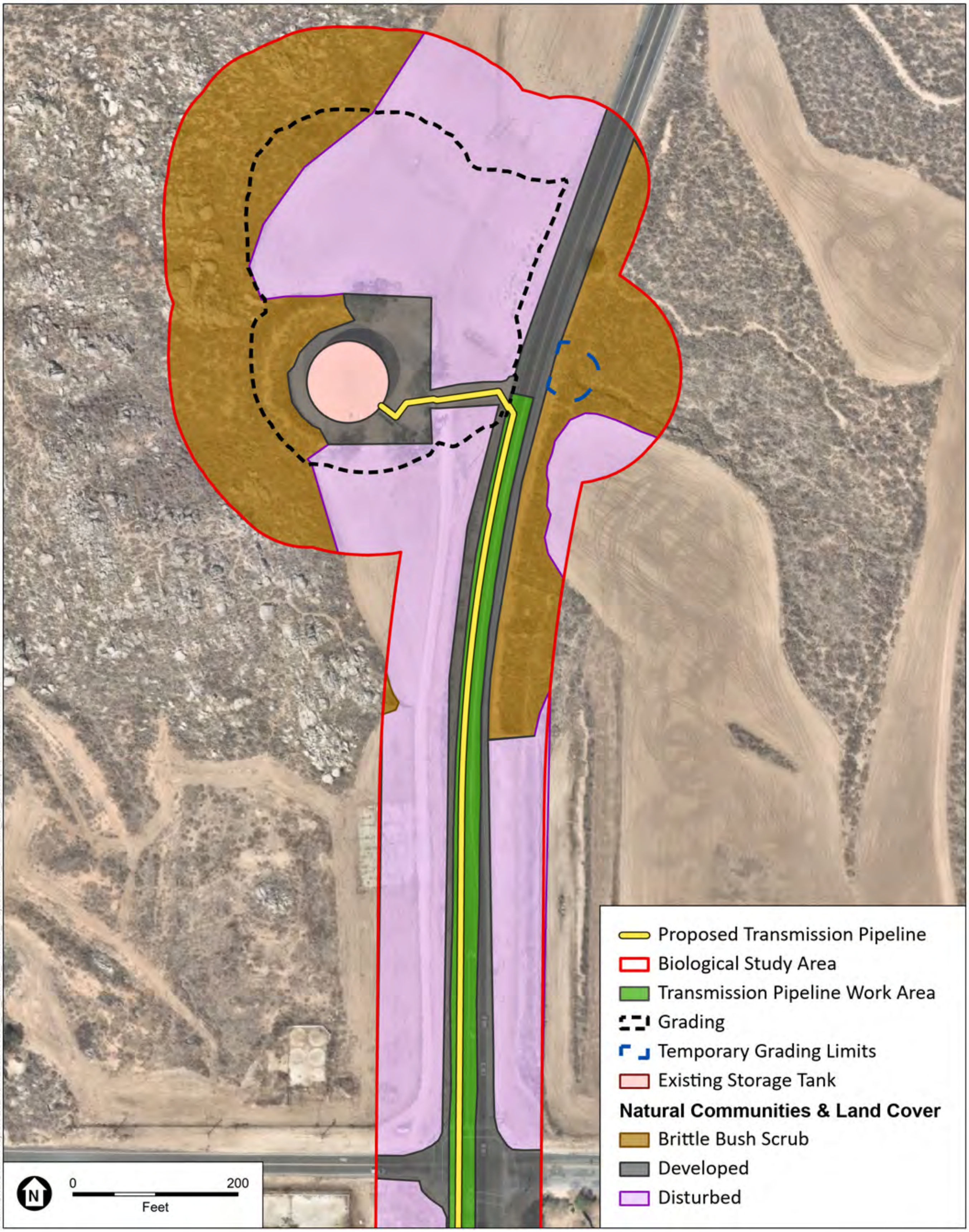
Special-Status Mammals

Phase 1 and Phase 2

Construction

Storage Tanks and Pipeline

The brittle bush scrub on the west side of the existing storage tank site and surrounding the offsite energy dissipater provides marginal habitat for San Diego desert woodrat (see Figure 8 for habitat

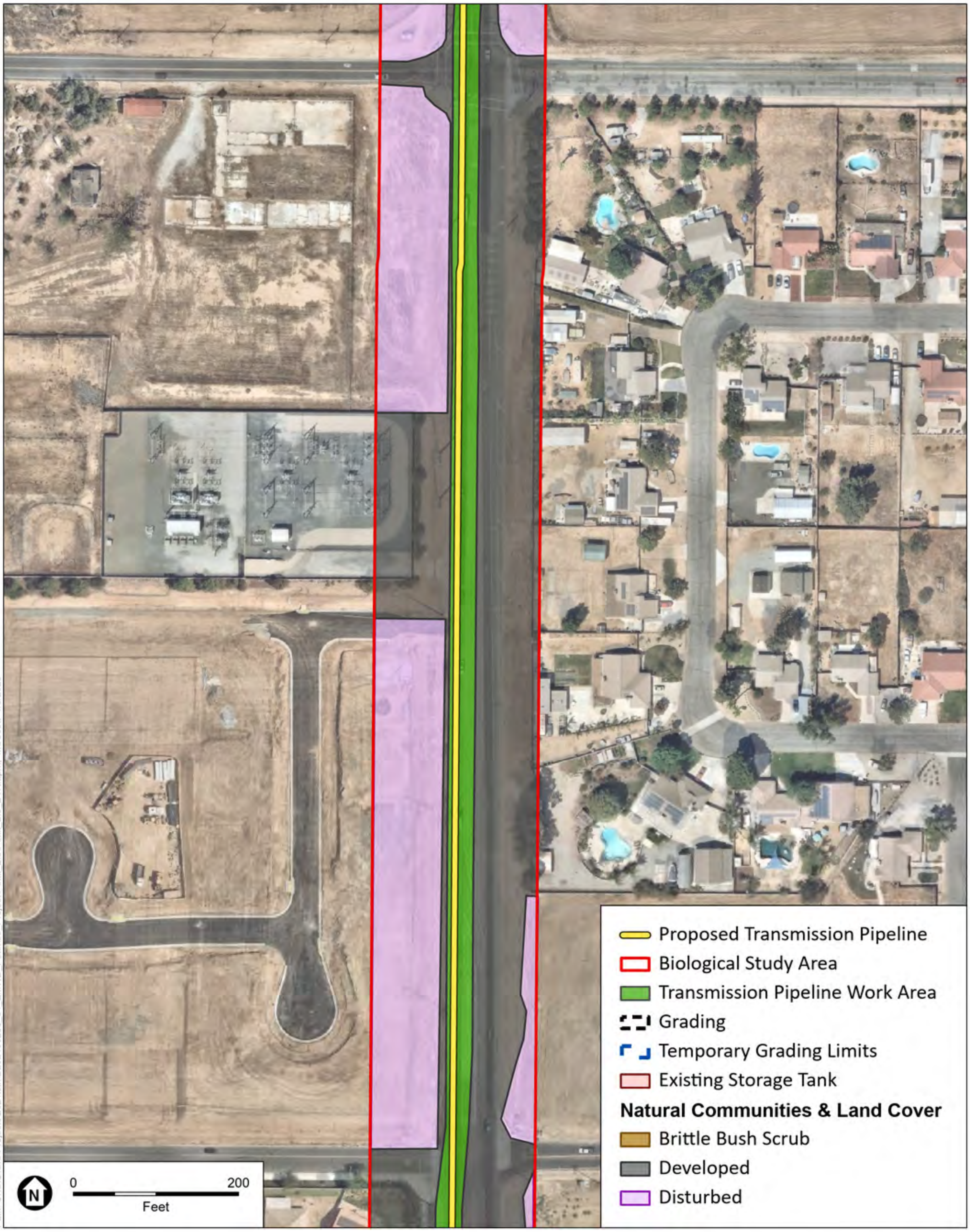


SOURCE: Nearmap (2022), ESA (2022)

Pettit Water Storage Tank Expansion and Transmission Pipeline Project

Figure 8a
Impacts to Natural Communities and Land Cover Types

ESA

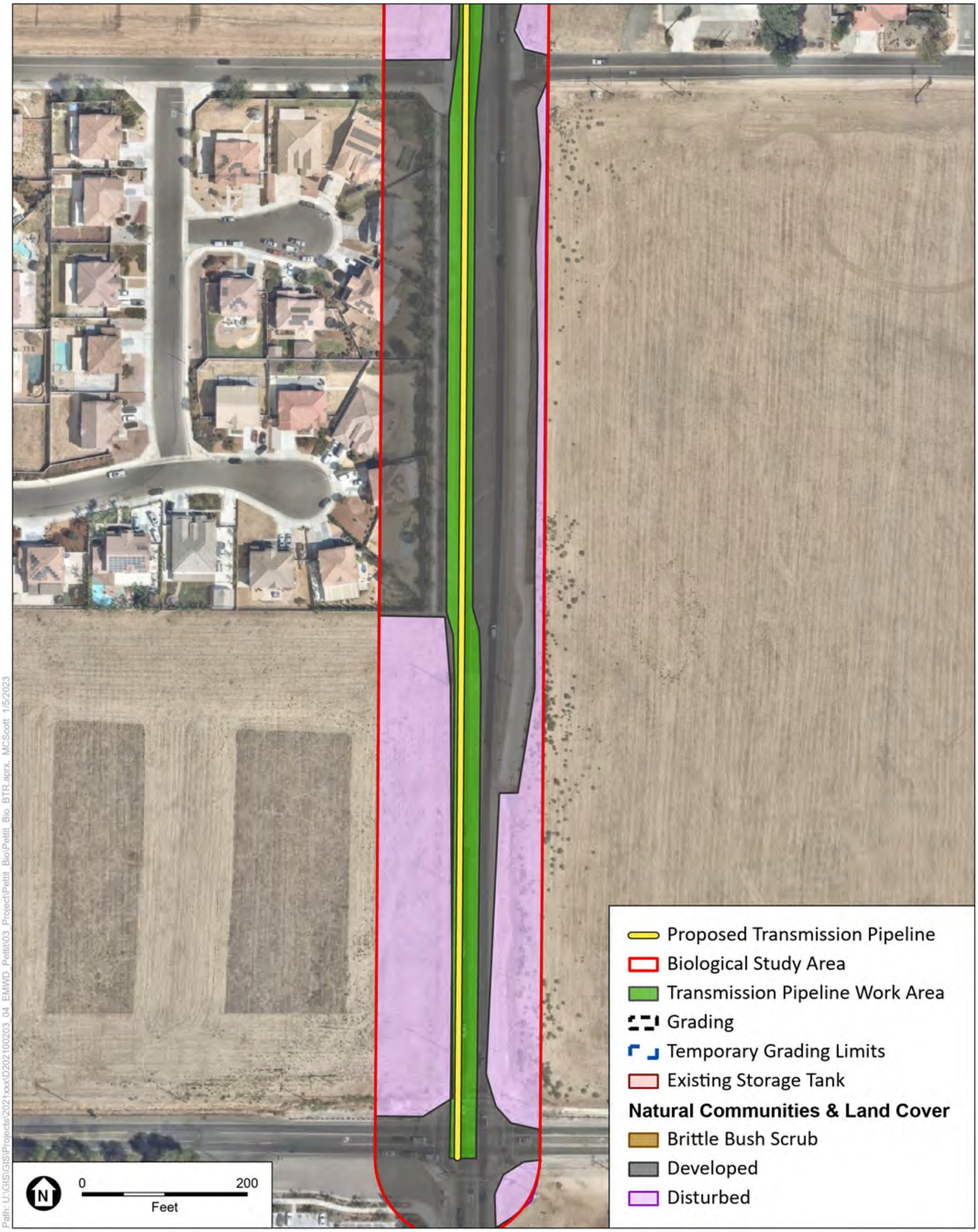


SOURCE: Nearmap (2022), ESA (2022)

Pettit Water Storage Tank Expansion and Transmission Pipeline Project

Figure 8b
Impacts to Natural Communities and Land Cover Types

ESA

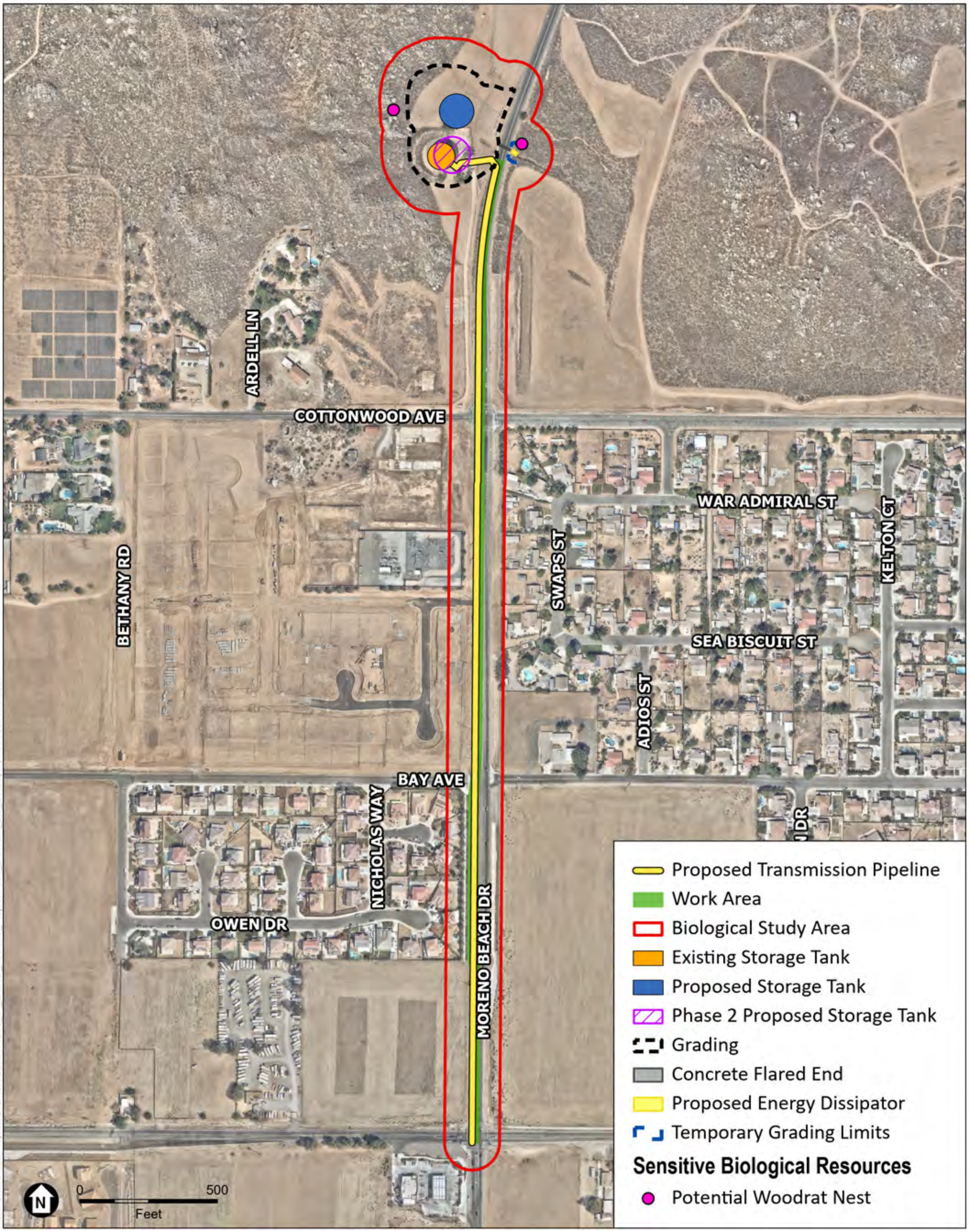


SOURCE: Nearmap (2022), ESA (2022)

Pettit Water Storage Tank Expansion and Transmission Pipeline Project

Figure 8c
Impacts to Natural Communities and Land Cover Types

ESA



SOURCE: Nearmap (2022), ESA (2022)

EMWD Pettit Tank and Pipeline EIR

Figure 9
Impacts to Sensitive Biological Resources

ESA

and **Figure 9 – Impacts to Sensitive Biological Resources** for potential nest locations within that habitat). Construction activities have the potential to result in direct mortality if San Diego desert woodrat are determined to be present and impacts would be potentially significant. Implementation of **Mitigation Measure BIO-3** requires San Diego desert woodrat preconstruction surveys to determine presence or absence of the species, and if San Diego desert woodrat is found to be present, the species would be avoided or relocated. Although Phase 2 of the project would occur in the year 2045, conditions within the BSA are not expected to chance substantially, and regardless, Mitigation Measure BIO-3 includes a pre-construction survey, which would confirm current conditions and determine presence/absence of San Diego desert woodrat at that time. Implementation of mitigation measures would reduce impacts to special-status small mammals to a less than significant level.

Operation

Storage Tanks and Pipeline

Operation of the project would not impact special-status mammals. Anticipated maintenance activities would be limited to disturbed areas around the water storage tank, which do not contain suitable habitat for special-status species. The pipeline would be installed underground and would not require regular maintenance. No impacts to special-status species would occur during the operation phase of the project.

Special-Status Reptiles

Phase 1 and Phase 2

Construction

Storage Tanks and Pipeline

The brittle bush scrub on the west side of the proposed storage tank sites provide marginal habitat for Belding's orange-throated whiptail, coastal western whiptail, coast patch-nosed snake, and red-diamond rattlesnake. The majority of the proposed storage tank grading limits is already disturbed and does not provide suitable habitat for special-status species. The brittle bush scrub may provide habitat for these species. Construction activities have the potential to result in direct mortality if any of these species are present.

To avoid and minimize potential impacts to Belding's orange-throated whiptail, coastal western whiptail, coast patch-nosed snake, and red-diamond rattlesnake, **Mitigation Measure BIO-4** shall be implemented to conduct preconstruction surveys to determine presence or absence of special-status reptile species. If any of these species are found to be present, a qualified herpetologist would relocate individuals to suitable habitat at least 100 feet from the project. Although Phase 2 of the project would occur in the year 2045, conditions within the BSA are not expected to chance substantially, and regardless, Mitigation Measure BIO-4 includes a pre-construction survey, which would confirm current conditions and determine presence/absence of special-status reptiles at that time. With implementation of this mitigation measure, impacts to special-status reptiles would be reduced to a less than significant level.

Operation

Storage Tanks and Pipeline

Operation of the project would not impact special-status reptiles. Anticipated maintenance activities would be limited to disturbed areas around the water storage tank, which do not contain suitable habitat for special-status reptile species. The pipeline would be installed underground and would not require regular maintenance. No impacts to special-status species would occur during the operation phase of the project.

Special-Status Birds

Phase 1 and Phase 2

Construction

Storage Tanks and Pipeline

Southern California rufous-crowned sparrow was identified as having a moderate potential to occur in the BSA. Habitat for this species occurs primarily within the areas surrounding the proposed water storage tank grading limits. Direct impacts to the special-status birds may occur from direct mortality due to construction activity (loss of individuals, nests, or eggs as a result of vegetation removal) and indirect impacts due to the removal of habitat or to active nests due to disturbance from human activities, construction noise, and vibration. Impacts to special-status bird species would be potentially significant. **Mitigation Measure BIO-5** would require preconstruction nesting bird surveys and the implementation of avoidance measures during construction if nests or suitable habitat are found to be active within 500 feet of the proposed project area. Although Phase 2 of the project would occur in the year 2045, conditions within the BSA are not expected to chance substantially, and regardless, Mitigation Measure BIO-5 includes a pre-construction survey, which would confirm current conditions and determine presence/absence of special-status birds at that time. With implementation of this mitigation measure, impacts to special-status birds (i.e., southern California rufous-crowned sparrow) during construction would be reduced to a less than significant level.

Issue 2: Would the proposed project have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Game or US Fish and Wildlife Service?

Phase 1 and Phase 2

Construction

Storage Tanks and Pipeline

Based on the site visit, no riparian habitat or CDFW sensitive natural communities occur within or immediately adjacent to the proposed storage tanks or transmission pipeline; therefore, no impacts would occur during construction activities.

Operation

Storage Tanks and Pipeline

No riparian habitat or CDFW sensitive natural communities occur within or immediately adjacent to the proposed storage tanks or transmission pipeline; therefore, no impacts would occur during the operation phase of the project.

Issue 3: Would the proposed project have a substantial adverse effect on State or federally protected wetlands (including, but not limited to, marsh, vernal pool, coastal) through direct removal, filling, hydrological interruption, or other means?

Phase 1 and Phase 2

Construction and Operation

Storage Tanks and Pipeline

No State or federally protected wetlands occur within the BSA; thus, there would be no impacts to State or federally protected wetlands. However, the BSA supports non-wetland waters that may be regulated by the CDFW and RWQCB. The proposed project will involve the grading and recontouring of the proposed storage tank site for stormwater improvements and may result in impacts to non-wetland waters of the State and aquatic resources subject to Fish and Game Code 1600 (**Figure 10 – Impacts to Aquatic Resources**, **Table 3 – Impacts to Aquatic Resources**). Impacts to 0.020 acre of aquatic resources (i.e., non-wetland waters) would occur through direct removal, increased fill, or hydrological interruption. However, the drainages are already disturbed, lack riparian vegetation, contain ruderal nonnative vegetation, and lack a defined OHWM or bed and bank as a result of the regular and frequent disturbance (i.e., grading and discing). Thus, due to the disturbed nature of the drainages, and because the project proposes installation of a detention basin, which will add beneficial uses (e.g., groundwater infiltration) that will provide some of the similar functions of these disturbed drainages, impacts to 0.020 acre of non-wetland waters are considered less than significant and no mitigation is required. Consultation with the CDFW and RWQCB may still be required to determine whether applications for permits will be necessary (i.e., although impacts are less than significant and no mitigation is required under CEQA, whether regulatory permits may be required is subject to the discretion of CDFW and/or RWQCB). Within the southern portion of the BSA, project pipeline construction would occur in proximity to aquatic resources identified immediately east of Moreno Beach Drive, but would not infringe on those aquatic resources.

TABLE 3
IMPACTS TO AQUATIC RESOURCES

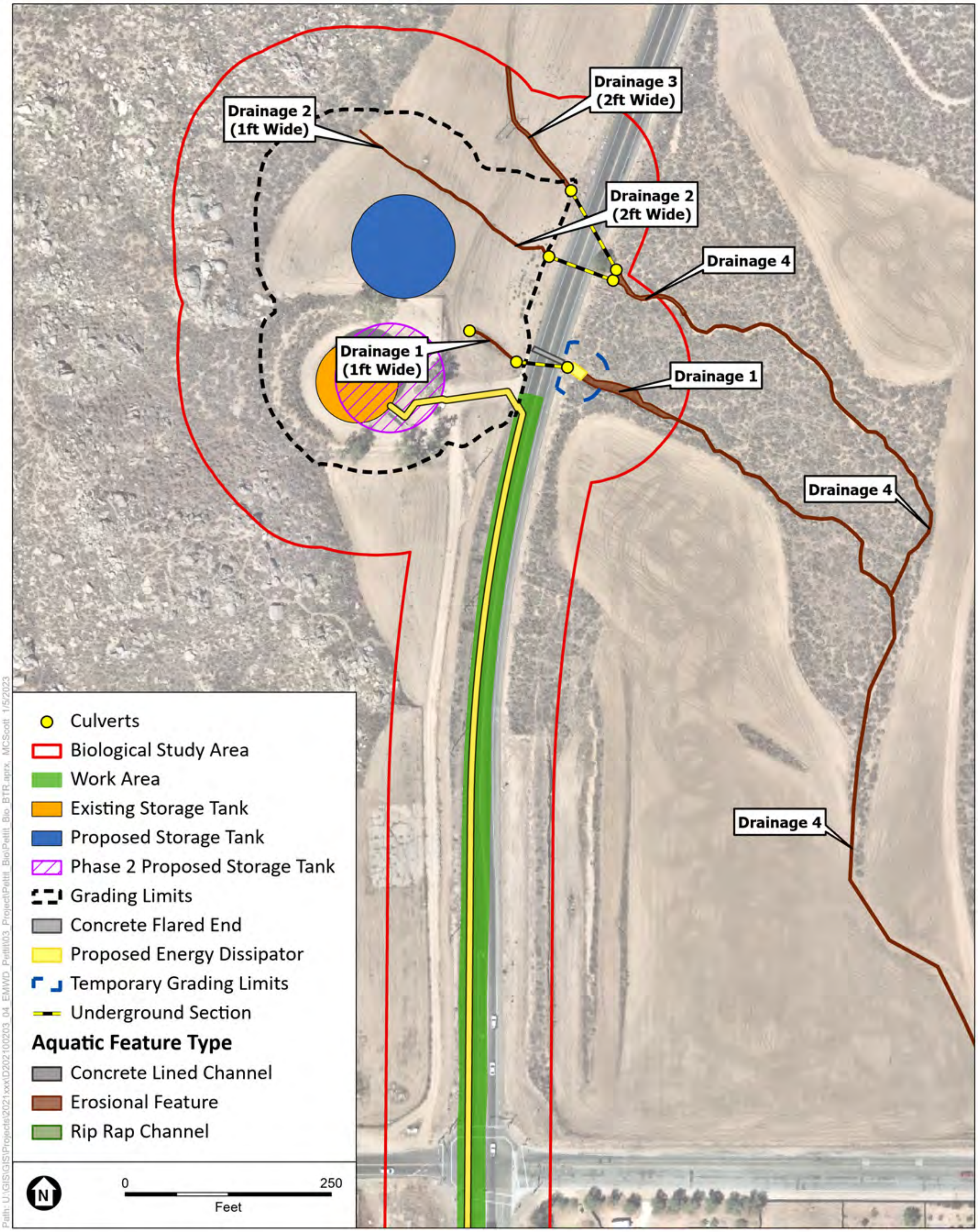
Aquatic Feature	Cowardin Type	Dominant Vegetation/ Land Cover Type	Feature Width (feet) (range from within the BSA)	Linear Feet	Acreage of Potentially Regulated Aquatic Resources within Disturbance Limits	
					Non-Wetland Waters of the State	Resources subject to Fish & Game Code 1600
Drainage 1	Riverine (ephemeral)	Largely devoid of vegetation/annual forbs	1 (1-8)	89[1]	0.009[2]	0.009
Drainage 2	Riverine (ephemeral)	Largely devoid of vegetation/annual forbs	1-2	303.0	0.011	0.011
Drainage 3	Riverine (ephemeral)	Largely devoid of vegetation/annual forbs	2	13.7	0.001	0.001
Drainage 4	Riverine (ephemeral)	Brittle Bush Scrub	4-7	-[3]	-	-
			Total Aquatic Features	**405.7**	**0.020**[4]	**0.020**

[1] Length and acreage measurements only include Drainage 1 within grading limits and area associated with energy dissipater east of Moreno Beach Drive.

[2] Total square footage for Drainage 1 impacts (grading and dissipater) = 389 ft^2 or 0.00893 acre.

[3] Drainage 4 is not included in total lengths and acreage, as it remains completely outside of the grading limits and only within the 100-foot survey buffer. Furthermore, 160 feet of Drainage 3 also remains outside of the grading limits (but within the 100-foot survey buffer and will not be impacted.

[4] Total square footage for impacts is equal to 874.68 which is 0.20 acres. The summation of acreage in the table would equal to 0.021, as a result of rounding.

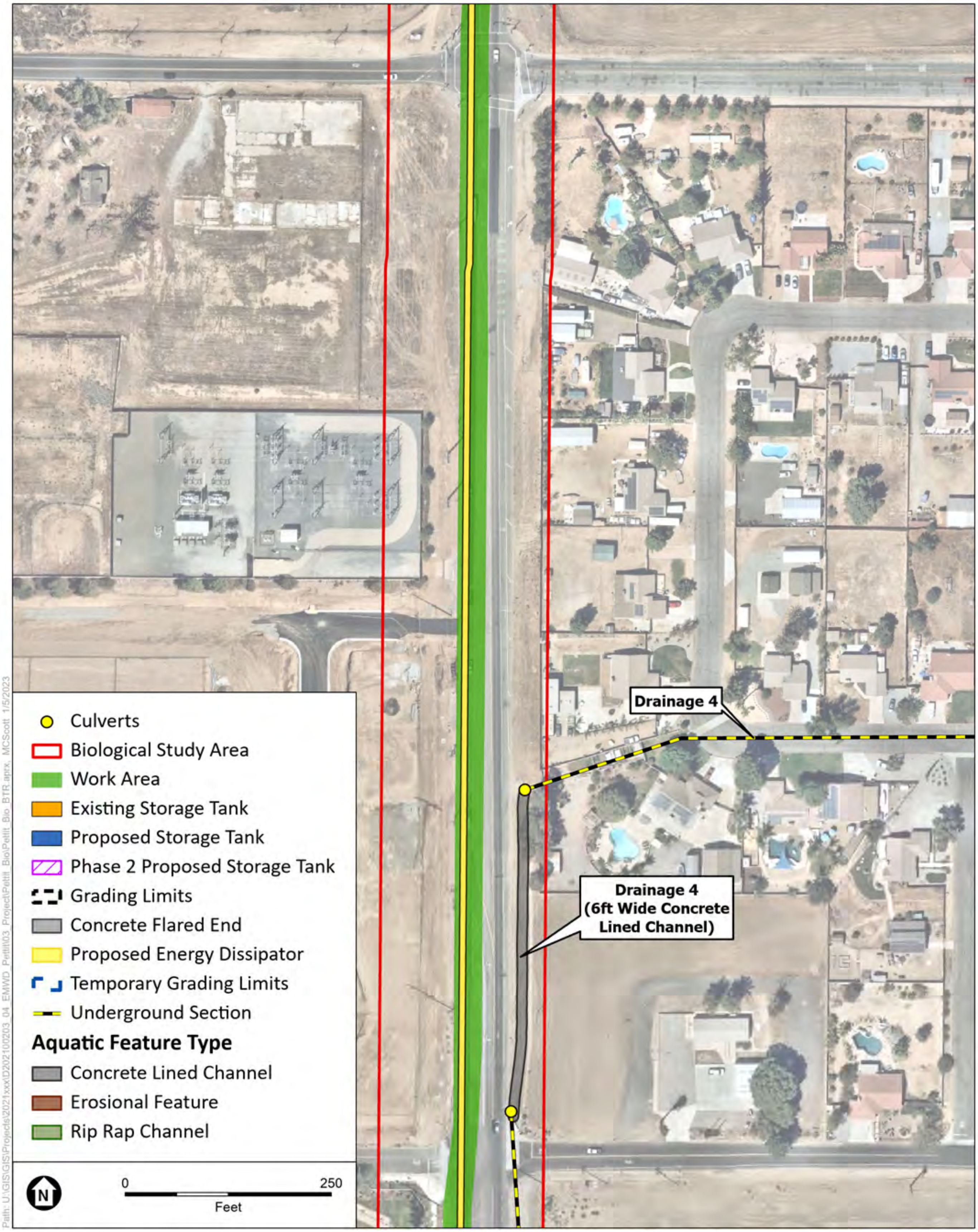


SOURCE: Nearmap (2022), ESA (2022)

Pettit Water Storage Tank Expansion and Transmission Pipeline Project

Figure 10a
Impacts to
Aquatic Resources

ESA

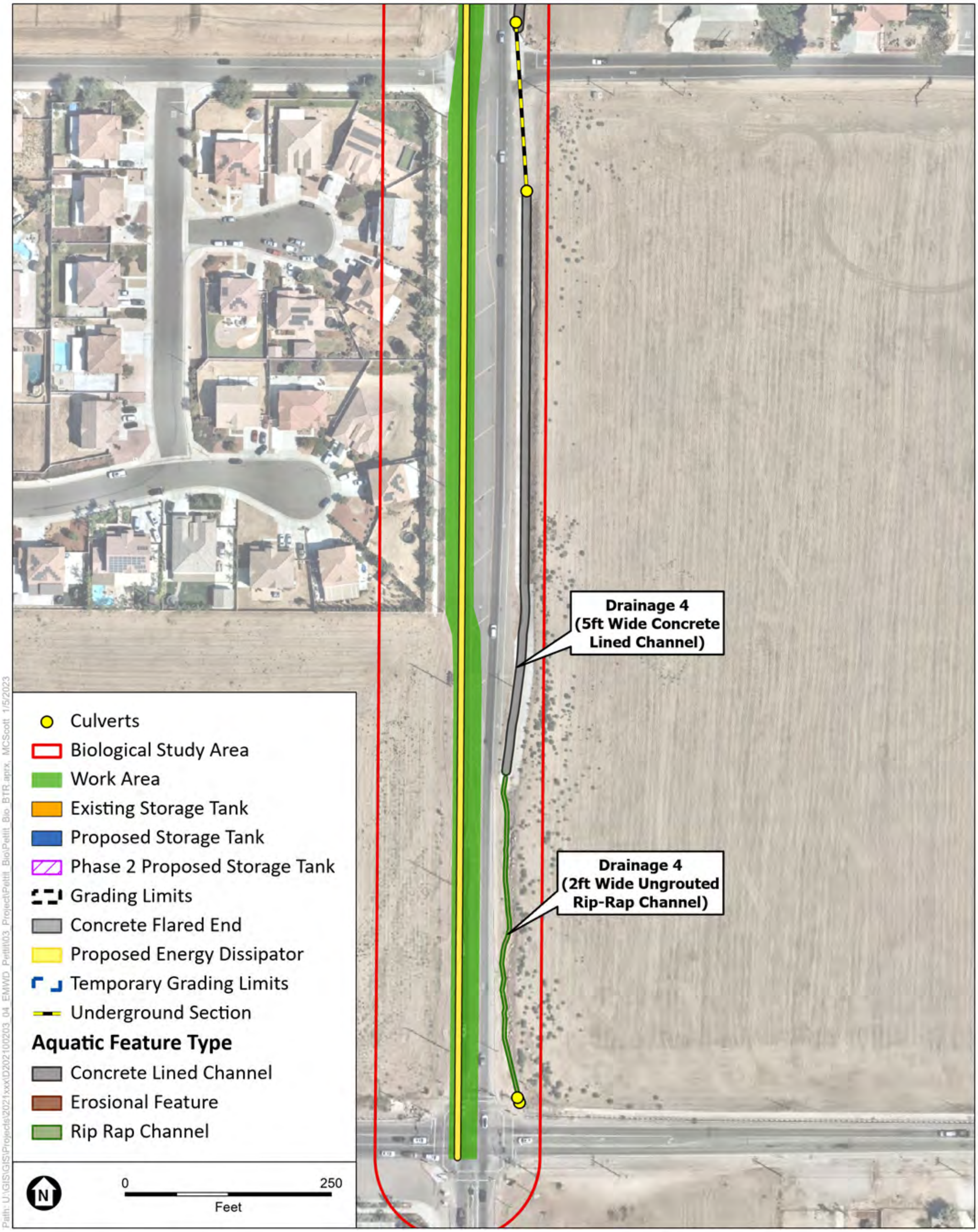


SOURCE: Nearmap (2022), ESA (2022)

Pettit Water Storage Tank Expansion and Transmission Pipeline Project

Figure 10b
Impacts to
Aquatic Resources

ESA



SOURCE: Nearmap (2022), ESA (2022)

Pettit Water Storage Tank Expansion and Transmission Pipeline Project

Figure 10c
Impacts to
Aquatic Resources

ESA

Issue 4: Would the proposed project interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?

Wildlife Movement

Phase 1 and Phase 2

Construction and Operation

Storage Tanks and Pipeline

While wildlife may use the BSA to forage, breed, and for local movement to some extent, the project does not link large areas of contiguous, intact habitat together, and is not expected to function as an important regional migration corridor. Impacts to resident or migratory fish, established native resident or migratory wildlife corridors would be less than significant and no mitigation would be required.

Nursery Sites – Nesting Birds

Phase 1 and Phase 2

Construction

Storage Tanks and Pipeline

The project would be partially constructed within brittle bush scrub habitat as well as disturbed and developed land uses. These areas may provide suitable nesting habitat for birds protected under the MBTA and CFG Code Section 3500. Potential impacts to nesting birds may occur during the general avian nesting season (i.e., from February 1 to August 31 for songbirds, January 15 to August 31 for raptors) during construction. Impacts may include direct mortality to individuals, nests, or eggs as a result of loss of nesting habitat (i.e., vegetation removal). Indirect impacts to active nests may occur due to disturbance from human activities, construction noise, and vibration. Impacts to nesting birds would be potentially significant. Implementation of Mitigation Measure BIO-5, which would require pre-construction nesting bird surveys and the implementation of avoidance and minimization measures during construction if nests are found to be active within 500 feet of the proposed project area, would reduce impacts to a less than significant level.

Operation

Operation of the project would not impact nesting birds. Anticipated maintenance activities would be limited to disturbed areas around the water storage tank and would occur weekly. The pipeline would be installed underground and would not require regular maintenance. No impacts to nesting birds would occur during the operation phase of the project.

Nursery Sites – Roosting Bats

Phase 1 and Phase 2

Construction

Storage Tanks and Pipeline

Roosting bats may utilize the large rocky outcroppings located within 100 feet of the project. Bat colonies utilizing the site may be adapted to living in an urbanized setting with the existing lighting on-site, including the adjacent residential areas and traffic along roads. However, disturbance of large rocky outcroppings through removal or blasting of bedrock within the project area may result in disturbance of maternity roosts, and would be considered a significant impact. **Mitigation Measure BIO-6** would require a preconstruction survey of the BSA by a qualified biologist, and the implementation of bat protection measures to avoid impacts to the species. With implementation of Mitigation Measure BIO-6, impacts to roosting bats would be reduced to a less than significant level.

Operation

Operation of the project would not impact roosting bats. Anticipated maintenance activities would be limited to disturbed areas around the water storage tank and would occur weekly. The pipeline would be installed underground and would not require regular maintenance. No impacts to roosting bats would occur during the operation phase of the project.

Issue 5: Would the proposed project conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?

Phase 1 and Phase 2

Construction and Operation

Storage Tanks and Pipeline

No impacts to city-protected trees are anticipated to occur during the construction or operation phase of the project. Should street tree removal or trimming be required, it would be conducted in accordance with the City of Moreno Valley's Tree Ordinance. Therefore, the proposed project would not conflict with any local policies or ordinance protecting biological resources, and impacts to protected trees would be less than significant.

Issue 6: Would the proposed project conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or State habitat conservation plan?

Western Riverside MSHCP & Stephens Kangaroo Rat HCP

Phase 1 and Phase 2

Construction and Operation

Storage Tanks and Pipeline

The project occurs within both the Western Riverside MSHCP and the SKRHCP. EMWD is not a Participating Entity in the MSCHP and thus is not required to demonstrate project consistency with the goals and provisions of the MSHCP as they pertain to biological resources on EWMD projects. Regardless, special-status species that the MSHCP covers are analyzed previously in this document and avoidance and minimization measures prescribed to reduce any potentially significant impacts to a less than significant level. Thus, the project would not conflict with the MSHCP.

Additionally, as summarized in Appendix C, Stephens kangaroo rat is not expected to occur on-site. SKR surveys are not required based on coordination with RCHCA (ESA 2022). Additionally, the project is not located within a core reserve and is not within occupied SKR habitat that is mapped outside of the core areas. Therefore, a take agreement with RCHCA is not required and the project would not conflict with the SKRHCP.

5.4 Avoidance, Minimization, and Mitigation Measures

BIO-1: Pre-Construction Training. Prior to commencement of construction activities, a qualified biologist shall prepare a Worker Environmental Awareness Program (WEAP) that provides a description of potentially-occurring special-status species that could be affected by the proposed project.

The WEAP shall include information on identifying special-status species, and measures to avoid special-status species during construction activities, including (but not limited to):

- staying within limits of disturbance,
- establishing an onsite speed limit of 15 miles per hour,
- covering trenches and open pits at the end of each workday,
- installing wildlife escape ramps in open trenches or pits,
- and daily trash and debris disposal from the project.

The WEAP training shall be provided to all construction personnel by a qualified biologist. Completion of the WEAP training shall be documented for all construction personnel on a sign-in sheet that shall be onsite at all time during construction activities.

The qualified biologist shall also verify fencing or marking limits of disturbance (marking habitat suitable to support special-status species as well as sensitive vegetation communities) prior to commencement of construction activities, if applicable.

BIO-2: Pre-Construction Surveys and Mitigation for Crotch's Bumble Bee. Within seven (7) days prior to the start of construction activities, a qualified entomologist familiar with the species behavior shall conduct a pre-construction survey for Crotch's bumble bee, within 100 feet of construction activities near host plant communities (including nectar plants for Crotch's bumble bee).

If any of these species are present or determined to be within 100 feet of construction areas, construction best management practices (BMPs) will be implemented and incorporation of information about these species will be incorporated into the WEAP training to avoid potential impacts to these species. BMPs shall include

- Limiting construction vehicle speeds to 15 miles per hour when operating within 100 feet of the habitat areas.
- Fencing habitat areas using temporary silt fencing, and cleaning up all trash and debris daily.

In coordination with the CDFW, additional avoidance measures may be required that include establishing a buffer around the species host plants where no work can occur, and onsite monitoring dependent on distance from the work area. Construction personnel will be instructed to not directly harm any special-status species onsite by halting activities until the species can move to offsite areas or contact a qualified biologist to move the species out of harm's way.

BIO-3: San Diego Desert Woodrat Pre-Construction Survey, and Avoidance or Relocation. Thirty days prior to construction activities, a qualified mammalogist with experience in identifying and trapping San Diego desert woodrat shall conduct a survey within proposed construction disturbance zone and within 200 feet of the disturbance zone for San Diego desert woodrat. The survey shall incorporate appropriate methods to detect San Diego desert woodrat prior to any project activities in areas that have or may have the potential to support these species.

- If active San Diego desert woodrat nests (stick houses) are identified within the disturbance zone, a construction fence shall be erected around the nest site adequate to provide the woodrat sufficient foraging habitat at the discretion of the qualified biologist. The biologist shall be present during those periods when disturbance activities will occur near active nest areas to avoid inadvertent impacts to these nests.

- Where nest avoidance is not possible, the project biologist shall clear vegetation from immediately surrounding active nests followed by a night without further disturbance to allow woodrats to vacate the nest. Each occupied nest shall subsequently be gently disturbed by a qualified wildlife biologist in possession of a scientific collecting permit to entice any remaining woodrats to leave the nest and seek refuge outside the project construction area. The stick nests shall be carefully removed from the project construction area and be placed near a suitable vegetation or rocky substrate similar to original nest location. Relocation of special-status species and/or salvaged nest-building material (rocks, sticks, etc.) shall target undeveloped areas of the project that shall not be disturbed. Removal of the nests outside of breeding season is preferred if feasible (i.e., breeding season is May through October).

- If young are found within the nest during the dismantling process, clearing and construction within the fenced area shall be postponed or halted until young have left the nest. The material shall be placed back on the nest and the nest shall remain unmolested for two to three weeks in order to give the young enough time to mature and leave the nest on their own accord. After two to three weeks, the nest dismantling process may begin again.

The project biologist shall document all woodrat nests moved and provide a written report to EMWD.

BIO-4: Special-Status Reptile. A qualified herpetologist, who holds a scientific collecting permit, shall conduct a pre-construction clearance survey throughout the project, including a 100-foot buffer, for coastal western whiptail, Belding's orange-throated whiptail, coast patch nosed snake, and red-diamond rattlesnake within two weeks prior to the start of construction activities.

If any of these species are observed during the survey, a qualified biologist should relocate the individual to suitable habitat at least 100 feet from the project. Trapping and relocation methods should be conducted in consultation with the EMWD.

BIO-5: Nesting Bird Season Avoidance or Pre-Construction Survey. Construction and vegetation removal should occur outside of nesting season (i.e., nesting season is February 1 to August 31 for songbirds, January 15 to August 31 for raptors). If construction and vegetation removal must occur during nesting season (i.e., between January 15 and August 31), a qualified biologist shall conduct a pre-construction survey for breeding and nesting birds and raptors 30 days prior to the start of construction, and then weekly, within 300-feet of the construction limits to determine and map the location and extent of breeding birds that could be affected by the project. During nesting season, the following conditions shall be implemented:

- Nesting bird surveys shall be conducted at appropriate nesting times and concentrate on potential roosting or perch sites.
- Weekly surveys will take place with the last survey being conducted no more than 3 days prior to the initiation of clearance/construction work.
- If project activities are delayed or suspended for more than 7 days after the last survey, surveys shall be repeated before work can resume.
- If an active nest is located, clearing and construction within appropriate buffers as determined by a qualified biological monitor, shall be postponed until the nest is vacated and juveniles have fledged and when there is no evidence of a second attempt at nesting.
- Due to vicinity of natural open spaces adjacent to the project, 500-feet for raptors (including burrowing owls) and 300-feet for passerine birds could suffice for nesting bird buffers however it will be at the discretion of the qualified biologist. The buffer zone from the nest shall be established in the field with flagging and stakes.
- The qualified biologist shall retain the ability to increase or decrease buffers as needed to protect the nesting birds (based on bird behavior, construction activities, etc.).
- Temporary fencing and signage shall be maintained for the duration of the project. Construction personnel shall be instructed on the sensitivity of the area and be advised not to work, trespass, or engage in activities that would disturb nesting birds near or inside the buffer.
- Onsite construction monitoring may also be required to ensure that no direct or indirect impacts occur to the active nest. Project activities may encroach into the buffer only at the discretion of the qualified biologist.

BIO-6: Roosting Bat Avoidance or Pre-Construction Survey. Construction and vegetation removal should occur outside of maternity roosting season (September 1–March 31). The following conditions shall be implemented if construction must occur during maternity roosting season:

- If construction and vegetation removal must occur during maternity roosting season, then prior to commencement of construction activities within the maternity roosting season (April 1–August 31), a qualified biologist with a scientific collecting permit shall conduct a pre-construction clearance survey of suitable rocky outcroppings located adjacent to the project that have the potential to provide suitable bat roosting habitat to determine if bats are roosting onsite. If bats are determined to be using trees specifically for roosting, the biologist will determine whether a day roost (non-breeding) or maternity roost (lactating females and dependent young) is present.

- If a day roost is determined to be present and the removal of any trees or rocky outcroppings supporting a day roost would occur, the biologist will ensure that all roosting individuals disperse from the location prior to removal of the vegetation to prevent direct mortality.
- If a maternity roost is observed, the qualified bat biologist will determine whether construction activities are likely to disturb breeding activities.
- If it is determined that the vegetation or rocky substrate supporting the roost must be removed or activities are expected to disturb the breeding activities, a Bat Avoidance, Minimization, and/or Exclusion Plan shall be prepared in consultation with EMWD. At a minimum, the plan shall include avoidance and minimization measures to reduce potential impacts to breeding bats during construction activities and/or prescribed methods to safely and humanely evict bats from the roost in order to minimize any potential impacts.

5.5 Cumulative Impacts

Construction and Operation

Development in the Inland Empire has substantially altered native habitats and adversely affected native plant and wildlife. Historic agricultural use, the expansion of urban areas in the region has resulted in the loss of open space and the degradation of natural areas that historically supported populations of unique or rare species and habitats.

As summarized in **Table 4 – Projects for Cumulative Analysis**, Cumulative Projects 1 through 8 are residential, commercial, and mixed-use development projects and Projects 10-12 are industrial projects. The majority of developments in the City of Moreno Valley are located in areas that are already substantially developed, or within sites that have previously been altered due to grading or agricultural practices, and would not contribute significantly to direct impacts to biological resources. The effects of the proposed project would not contribute incrementally to the cumulative impacts on biological resources, since few sensitive biological resource are expected to occur, and because the majority of the BSA has already been disturbed or developed. Impacts to special-status species and biological resources within the project area would be avoided, minimized, and/or mitigated through implementation of Mitigation Measures BIO-1 through BIO-6. Furthermore, the project occurs within the Western Riverside MSHCP, which provides for the regional conservation of biological resources within the City of Moreno Valley and surrounding vicinity. Although EMWD is not a Participating Entity in the MSCHP, the City of Moreno Valley is a Participating Entity in the MSHCP and Cumulative Projects 1 through 12, all of which are located within the City of Moreno Valley, would be subject to demonstrating consistency with the MSHCP. Therefore, when considered in addition to anticipated impacts of other projects in the cumulative scenario, the Project's incremental contribution to biological resources impacts would not be cumulatively considerable. With implementation of mitigation measures, impacts would be less than significant.

TABLE 4
PROJECTS FOR CUMULATIVE ANALYSIS

No.	Name	Lead Agency	Location	Project Type	Project Description	Status
1	Bradshaw Circle	City of Moreno Valley	Bradshaw Circle and Cactus Avenue	Residential	Residential development consisting of 37 single-family residential lots, onsite roadways with sidewalks, drainage infrastructure, and open space	Planning – Anticipated construction from 2023-2024
2	Discovery Residential	City of Moreno Valley	Oliver Street and Brodiaea Avenue	Residential	Residential development consisting of 67 single-family residential units at a density of 7.63 dwelling units per net acre.	Planning – Construction dates unknown
3	Perris and Pentecostal	City of Moreno Valley	Iris Avenue and Emma Lane	Residential	Residential development consisting of a gated 426-unit apartment complex on 18.05 acres of land. The project includes construction and dedication of 1.845 acres for public open space/recreation, extension of utilities to the project site, and development of two and three-story apartment buildings.	Planning – Anticipated construction from 2022-2023
4	Crystal Cove Apartments	City of Moreno Valley	Alessandro Boulevard and Lasselle Street	Residential	Residential development consisting of 192-unit apartment complex with eight separate buildings providing a total of 84 one-bedroom apartments and 108 two-bedroom apartments. The project would also provide a recreation center building with an outdoor pool and a 14,000 square foot community dog park.	Planning – Construction dates unknown
5	Alessandro Walk Project	City of Moreno Valley	Alessandro Boulevard and Nason Street	Residential	Residential development consisting of the subdivision of 225-lot single-family residential project on an 18.48-acre site in the Downtown Center (DC) District.	Planning – Construction dates unknown
6	Valley and Whitney Project	City of Moreno Valley	Alessandro Boulevard and Oliver Street	Residential	Residential development consisting of the subdivision of 204 homes in the area.	Planning – Construction dates unknown
7	Town Center at Moreno Valley	City of Moreno Valley	Cottonwood Avenue and Nason Street	Mixed Use	The project includes a proposed Specific Plan and TTM to allow for the development of residential, commercial, civic, and park uses.	Planning – Anticipated construction from 2023-2025
8	Cottonwood Village	City of Moreno Valley	Cottonwood Avenue and Perris Boulevard	Residential	The project includes a tentative tract map for condominium purposed to subdivide 9.4 acres of land and plot plan for the Cottonwood Village Project consisting of 23 four-plex buildings with associated amenities and public improvements.	Planning – Construction dates unknown

No.	Name	Lead Agency	Location	Project Type	Project Description	Status
9	Arco AM/PM Service Station Project	City of Moreno Valley	Redlands Boulevard and Hemlock Avenue		The project includes: an application for a Conditional Use Permit to develop a 2.4-acre portion of a 6.9-acre site with a 6,323-square foot retail building; Building includes a 5,123-square foot food market with office and storage in a mezzanine level and an adjacent 1,200-square foot retail tenant space; and fueling stations.	Planning – Anticipated construction from Jan. 2022- Dec. 2022
10	Heacock Commerce Center	City of Moreno Valley	Heacock Street and Gentian Avenue	Industrial	The project includes applications for a general Plan Amendment, Change of Zone, Specific Plan Amendment, and two plot plan applications for two high cube industrial buildings totaling 837, 967 square feet.	Planning – Anticipated construction from 2022-2023
11	Moreno Valley Trade Center	City of Moreno Valley	Redlands Boulevard and Eucalyptus Avenue	Industrial	The project includes: a General Plan Amendment; a change of Zone; a plot plan that provide a development concept for a 1,328,853 square foot warehouse building; and a tentative parcel map.	Planning – Anticipated construction from June 2021- Dec. 2022
12	World Logistics Center Project	City of Moreno Valley	Redlands Boulevard and Eucalyptus Avenue	Industrial	The project site would adopt the World Logistics Center Specific Plan (WLC Specific Plan) which authorizes the construction and operation of 40,600,000 square feet of logistics facilities and associated infrastructure.	Planning– Anticipated construction from 2020-2035
N/A	Capital Improvement Projects 2022/2023	City of Moreno Valley	Various	Public Works/Infrastructure	Capital Improvement Projects are derived from the City's Capital Improvement Plan (CIP). The CIP identifies projects required through the ultimate General Plan build-out of the City to build, improve, and maintain the City's Infrastructure. These projects are typically small and fall under CEQA Exemptions.	Planning – Anticipated construction from 2022-2023

Sources: City of Moreno Valley 2019; 2021c, d, e; 2022f through p.

CHAPTER 6
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Appendix A
Species Compendia

Floral Compendium

Family	Scientific Name	Common Name	Nativity	Special Status?
EUDICOTS				
AMARANTHACEAE		**AMARANTH FAMILY**		
	Amaranthus albus	tumbling pigweed	Naturalized	No
ASTERACEAE		**SUNFLOWER FAMILY**		
	Artemisia californica	California sagebrush	Native	No
	Brickellia californica	California brickellbush	Native	No
	Centaurea melitensis	tocalote	Naturalized	No
	Corethrogyne filaginifolia	common sandaster	Native	No
	Encelia farinosa	brittlebush	Native	No
	Helianthus annuus	common sunflower	Native	No
	Oncosiphon piluliferum	stinknet	Native	No
	Pseudognaphalium biolettii	two-color rabbit-tobacco	Native	No
	Pseudognaphalium californicum	ladies' tobacco	Native	No
	Sonchus asper ssp. *asper*	spiny sowthistle	Naturalized	No
BORAGINACEAE		**BORAGE FAMILY**		
	Amsinckia intermedia	common fiddleneck	Native	No
BRASSICACEAE		**MUSTARD FAMILY**		
	Hirschfeldia incana	shortpodded mustard	Naturalized	No
CHENOPODIACEAE		**GOOSEFOOT FAMILY**		
	Chenopodium album	lamb's quarters	Naturalized	No
	Chenopodium murale	nettle-leaved goosefoot	Naturalized	No
	Dysphania pumilio	Tasmanian goosefoot	Naturalized	No
	Salsola tragus	prickly Russian thistle	Naturalized	No
CUCURBITACEAE		**GOURD FAMILY**		
	Marah macrocarpus	Cucamonga manroot	Native	No
EUPHORBIACEAE		**SPURGE FAMILY**		
	Croton setiger	dove weed	Native	No
	Euphorbia maculata	spotted spurge	Naturalized	No
FABACEAE		**LEGUME FAMILY**		
	Acmispon glaber	deerweed	Native	No
	Lupinus bicolor	miniature lupine	Native	No
	Parkinsonia florida	blue paloverde	Naturalized	No
GERANIACEAE		**GERANIUM FAMILY**		
	Erodium botrys	longbeak stork's bill	Naturalized	No
	Erodium cicutarium	redstem filaree	Naturalized	No
HYDROPHYLLACEAE		**WATERLEAF FAMILY**		
	Phacelia ramosissima	branching phacelia	Native	No

Family	Scientific Name	Common Name	Nativity	Special Status?
MALVACEAE		**MALLOW FAMILY**		
	Malva parviflora	cheeseweed	Naturalized	No
MONTIACEAE		**PURSLANE FAMILY**		
	Portulaca oleracea	common purslane	Naturalized	No
MYRTACEAE		**MYRTLE FAMILY**		
	Eucalyptus camaldulensis	red gum	Naturalized	No
NYCTAGINACEAE		**FOUR O'CLOCK FAMILY**		
	Mirabilis laevis var. *crassifolia*	wishbone bush	Native	No
PHRYMACEAE		**LOPSEED FAMILY**		
	Diplacus aurantiacus	orange bush monkeyflower	Native	No
RUBIACEAE		**MADDER FAMILY**		
	Galium angustifolium ssp. *angustifolium*	narrow-leaved bedstraw	Native	No
SCROPHULARIACEAE		**FIGWORT FAMILY**		
	Scrophularia californica	California figwort	Native	No
SOLANACEAE		**NIGHTSHADE FAMILY**		
	Datura wrightii	Jimsonweed	Native	No
ZYGOPHYLLACEAE		**CALTROP FAMILY**		
	Tribulus terrestris	puncture vine	Naturalized	No
MONOCOTS				
ARECACEAE		**PALM FAMILY**		
	Washingtonia robusta	Mexican fan palm	Naturalized	No
POACEAE		**GRASS FAMILY**		
	Avena barbata	slender wild oat	Naturalized	No
	Bromus rubens	foxtail chess	Naturalized	No
	Cynodon dactylon	Bermuda grass	Naturalized	No
	Digitaria sanguinalis	hairy crabgrass	Naturalized	No
	Schismus barbatus	old han schismus	Naturalized	No
	Sorghum halepense	Johnsongrass	Naturalized	No

Faunal Compendium

Scientific Name	Common Name	Special-Status?
VERTEBRATES		
BIRDS		
CORVIDAE	JAYS AND CROWS	
Corvus corax	common raven	No
AEGITHALIDAE	BUSHTITS	
Psaltriparus minimus	bushtit	No
PARULIDAE	WOOD WARBLERS	
Setophaga coronata	yellow-rumped warbler	No
EMBERIZIDAE	EMBERIZINE SPARROWS AND ALLIES	
Melozone crissalis	California towhee	No
Zonotrichia leucophrys	white-crowned sparrow	No
FRINGILLIDAE	FINCHES	
Haemorhous mexicanus	house finch	No
TROGLODYTIDAE	WREN	
Salpinctes obsoletus	rock wren	No
MAMMALS		
CANIDAE	CANINES	
Canis latrans	coyote	No
LEPORIDAE	HARES AND RABBITS	
Syvilagus bachmani	brush rabbit	No
INVERTEBRATES		
GASTROPODA	SNAILS AND SLUGS	
Helminthoglypta tudiculata	Southern California shoulderband	No
INSECTA (ORDER ODONATA)	DRAGONFLIES & DAMSELFLIES	
Sympetrum corruptum	variegated meadowhawk	No

Appendix B
Site Photographs

Photograph 1: View of east side of existing Pettit Water Storage Tank and entry gate, facing west. Photo depicts unpaved driveway and location of proposed transmission pipeline.

Photograph 2: View of existing Pettit Water Storage Tank, facing northeast. Photo depicts southwest side of existing Pettit Water Storage Tank and adjacent brittle bush scrub on west side of tank.

Photograph 3: View of proposed Phase 1 water storage tank location facing east from west of the tank. Photo depicts disturbed land north of existing Pettit water storage tank.

Photograph 4: View of Phase 1 water storage tank location facing northeast from southwest boundary of proposed water tank location. Photo depicts disturbed land north of existing Pettit water storage tank.

Photograph 5: View of Phase 1 water storage tank location, facing west from Moreno Beach Drive. Photo depicts disturbed land north of the existing Pettit Water Storage Tank.

Photograph 6: View of Phase 1 water storage tank location, facing south from northern boundary of proposed grading limits. Photo depicts disturbed land north of the existing Pettit Water Storage Tank and brittle bush scrub west and south of the existing Pettit Water Storage Tank.

Photograph 7: View of Moreno Beach Drive and proposed Transmission Pipeline location, facing south from driveway at 13325 Moreno Beach Drive.

Photograph 8: View of Moreno Beach Drive and Alessandro Boulevard intersection, facing southwest. Photo depicts proposed transmission pipeline tie-in location west of the center line for Moreno Beach Drive, completely within the road right-of-way.

Photograph 9: View of erosional feature EF1, facing upstream and west from its intersection with Moreno Beach drive. Photo depicts the complete limits of EF1 within the grading limits, and its upstream boundary and metal culvert.

Photograph 10: View of erosional feature EF1, facing downstream and southeast towards its intersection with a metal culvert beneath Moreno Beach Drive.

Photograph 11: View of erosional feature EF2 facing downstream and southeast from its northern terminus, towards its intersection with Moreno Beach Drive.

Photograph 12: View of erosional feature EF2 facing upstream and west from its northern terminus, towards its intersection with Moreno Beach Drive.

Photograph 13: View of erosional feature EF3 facing downstream and southeast from its northern terminus, towards its intersection with Moreno Beach Drive.

Photograph 14: View of erosional feature EF3 facing upstream and northwest from its intersection with Moreno Beach Drive.

Photograph 15: View of western upstream 30-inch EF1 culvert on western side of Moreno Beach Drive, facing downstream and east. Culvert is proposed for complete removal, and an 18-inch storm drain to installed immediately north of this location.

Photograph 16: View of eastern outlet of EF1 culvert, downstream and east of Moreno Beach Drive. Photo depicts existing 30" corrugated metal culvert which will be replaced with an appurtenant facility which will include an energy dissipater which consists of a headwall, rip-rap, and 18-inch storm drain and culvert.

Photograph 17: View of eastern downstream 30-inch EF1 culvert on eastern side of Moreno Beach Drive, facing upstream and west. Culvert is proposed for complete removal, and an 18-inch storm drain to installed immediately north of this location.

Photograph 18: View of ephemeral drainage EF1, facing downstream from its intersection with Moreno Beach Drive. Photo depicts a deeply incised channel surrounded by upland brittle bush scrub vegetation.

Photograph 19: View upstream and west along EF1 toward Moreno Beach Drive. Photo depicts a deeply incised channel surrounded by upland brittle bush scrub vegetation.

Photograph 20: View upstream towards two 30" culverts for EF2 (left) and EF3 (right), facing west, and their confluence just east of Moreno Beach Drive. Channel continues as a single ephemeral channel downstream conveying flows to the east.

Photograph 21: View downstream and southeast of ephemeral drainage EF4, from confluence of EF2 and EF3 just east of Moreno Beach Drive. No impacts to culverts or drainages EF2, EF3, or EF4 are proposed at this time.

Photograph 22: View downstream from concrete culvert into 5-foot-wide concrete lined channel, facing south along Moreno Beach Drive.

Appendix C
Special-Status Species

Appendix C1: Special-Status Plant Species

Common Name ***Scientific Name***	Sensitivity Status[1]	Flowering Period	Preferred Habitat/Known Elevation and Distribution[2]	Presence/Potential to Occur Within Biological Study Area
BRYOPHYTES (Mosses)				
Bryaceae **(Moss Family)**				
California screw moss *Tortula californica*	Federal: None State: S2 Local: 1B.2	N/A	Chenopod scrub, Valley and foothill grassland; grows within sandy soils. Elevation range extends from 10-1,640 meters.	**Not Expected.** This species is not expected to occur within the study area due to lack of suitable chenopod or grassland habitat.

Common Name *Scientific Name*	Sensitivity Status[1]	Flowering Period	Preferred Habitat/Known Elevation and Distribution[2]	Presence/Potential to Occur Within Biological Study Area
Asteraceae (Sunflower Family)				
smooth tarplant *Centromadia pungens* ssp. *laevis*	Federal: None State: None Local: 1B.1 MSCHP(d)	Apr.-Sep.	Valley and foothill grasslands with poorly drained alkaline soil conditions at low elevations. Elevation range extends from 0-640 meters. Found in Riverside, San Bernardino, San Diego counties.	**Not Expected.** This species is not expected to occur within the study area due lack of suitable alkaline soils or habitat.

Common Name ***Scientific Name***	**Sensitivity Status[1]**	**Flowering Period**	**Preferred Habitat/Known Elevation and Distribution[2]**	**Presence/Potential to Occur Within Biological Study Area**
Los Angeles sunflower *Helianthus nuttallii* ssp. *parishii*	Federal: None State: None Local: 1A	Aug.-Oct.	Freshwater marsh, salt marsh. Elevation range extends from 10-1,675 meters. Found in Los Angeles, Orange, San Bernardino counties.	**Not Expected.** This species is not expected to occur within the study area due lack of suitable riparian habitat. Species is most likely extinct.
Coulter's goldfields *Lasthenia glabrata* ssp. *coulteri*	Federal: None State: None Local: 1B.1 MSHCP (d)	Feb.-Jun.	Salt-marsh, playas, vernal-pools, coastal; usually occurs in wetlands but occasionally in non-wetlands. Elevation range extends from 1-1,220 meters. Found in Orange, Riverside, Ventura, San Diego, and possibly Los Angeles, Kern and San Bernardino counties.	**Not Expected.** This species is not expected to occur within the study area due lack of suitable mesic habitat.
chaparral ragwort *Senecio aphanactis*	Federal: None State: None Local: 2B.2	Jan.-Apr.	Chaparral, cismontane woodland, coastal scrub; sometimes alkaline soil. Elevation range extends from 15-800 meters. Found in Los Angeles, Riverside, Orange, San Diego, Santa Barbara, Ventura counties.	**Low Potential.** This species low potential to occur within the study area due lack of suitable alkaline habitat. Species has low potential to occur in open spaces among brittle bush scrub, but is unlikely.

Common Name ***Scientific Name***	**Sensitivity Status[1]**	**Flowering Period**	**Preferred Habitat/Known Elevation and Distribution[2]**	**Presence/Potential to Occur Within Biological Study Area**
San Bernardino aster *Symphyotrichum defoliatum*	Federal: None State: None Local: 1B.2	Jul.-Nov.	Near ditches, springs, and streams; cismontane woodland, coastal scrub, lower montane coniferous forest, meadows and seeps, marshes and swamps, valley and foothill grassland (vernally mesic) Elevation range extends from 2-2,040 meters. Found in Los Angeles, Kern, Imperial, Riverside, San Bernardino, Orange, San Diego counties.	**Not Expected.** This species is not expected to occur within the study area due to lack of suitable mesic habitat.
Wright's trichocoronis *Trichocoronis wrightii* var. *wrightii*	Federal: None State: None Local: 2B.1 MSHCP(b)	May-Sep.	Meadows and seeps, marshes and swamps, riparian scrub, vernal. Elevation range extends from 5-435 meters. Found in Riverside County.	**Not Expected.** This species is not expected to occur within the study area due to lack of suitable riparian habitat.
Berberidaceae **(Barberry Family)**				
Nevin's barberry *Berberis nevinii*	Federal: FE State: CE Local: 1B.1	Mar.-Jun.	Sandy soils in low-gradient washes, alluvial terraces, and canyon bottoms, along gravelly wash margins, or on coarse soils on steep, generally north-facing slopes in alluvial scrub, cismontane (e.g., chamise) chaparral, coastal sage scrub, oak woodland, and/or riparian scrub or woodland. Elevation range extends from 274-825 meters. Found in Los Angeles, Riverside, San Bernardino, San Diego counties.	**Not Expected.** This species is not expected to occur within the study area due to lack of suitable habitat. Species is highly conspicuous and was not observed during the site visit.
Boraginaceae **(Borage Family)**				
mud nama *Nama stenocarpa*	Federal: None State: None Local: 2B2 MSHCP(d)	Jan.-Jul.	Marches and swamps (lake margins, riverbanks). Elevation range extends from 5-500 meters. Found in Orange, Riverside, San Diego, possibly Los Angeles counties.	**Not Expected.** This species is not expected to occur within the study area due to lack of suitable riparian habitat.

Common Name ***Scientific Name***	**Sensitivity Status[1]**	**Flowering Period**	**Preferred Habitat/Known Elevation and Distribution[2]**	**Presence/Potential to Occur Within Biological Study Area**
Brand's star phacelia *Phacelia stellaris*	Federal: FC State: None Local: 1B.1 MSHCP(b)	Mar.-Jun.	Open areas within coastal dunes and scrub habitats. Elevation range extends from 1-400 meters. Found in Los Angeles, Orange, Riverside, San Bernardino San Diego counties.	**Not Expected.** This species is not expected to occur within the study area due to lack of suitable dune or dune scrub habitat.
Brassicaceae **(Cabbage Family)**				
Gambel's water cress *Nasturtium gambelii*	Federal: FE State: CT Local: 1B.1	Apr.-Oct.	Marshes or swamps. Elevation range extends from 5-330 meters. Found in Los Aneles, Orange, San Diego, possibly San Bernardino counties.	**Not Expected.** This species is not expected to occur within the study area due to lack of suitable riparian habitat.
southern jewel-flower *Streptanthus campestris*	Federal: None State: None Local: 1B.2	(Apr.), May-Jul.	Chaparral, Lower montane coniferous forest, pinyon and juniper woodland/rocky. Elevation range extends from 900-2300 meters. Found in Imperial, Riverside, Santa Barbara, San Bernardino, San Diego, Ventura counties, Baja California.	**Not Expected.** This species is not expected to occur within the study area as the study area is outside the known range of the species.
Caryophyllaceae **(Pink Family)**				
marsh sandwort *Arenaria paludicola*	Federal: FE State: SE Local: 1B.1	May-Aug.	Marshes and swamps (freshwater or brackish)/sandy, openings Elevation range extends from 3-170 meters. Found in Los Angeles, San Bernardino, San Luis Obispo counties.	**Not Expected.** This species is not expected to occur within the study area due to lack of suitable riparian habitat. Study area is also outside the known elevation range of the species.
Chenopodiaceae **(Goosefoot Family)**				
San Jacinto Valley crownscale *Atriplex coronata* var. *notatior*	Federal: FE State: None Local: 1B.1 MSHCP(d)	Apr.-Aug.	Alkaline flats, playas, valley and foothill grassland, vernal pools. Elevation range extends from 370-488 meters. Found in Riverside and Kern counties.	**Not Expected.** This species is not expected to occur within the study area due to lack of suitable alkaline soils or vernal pools.

Common Name *Scientific Name*	Sensitivity Status[1]	Flowering Period	Preferred Habitat/Known Elevation and Distribution[2]	Presence/Potential to Occur Within Biological Study Area
Parish's brittlescale *Atriplex parishii*	Federal: None State: None Local: 1B.1 MSHCP(d)	Jun.-Oct.	Shadscale scrub, alkali sinks, freshwater wetlands, wetland-riparian; playas, vernal pools. Elevation range extends from 25-1,900 meters. Found in Orange, Riverside, San Diego, and possibly Los Angeles and San Bernardino counties.	**Not Expected.** This species is not expected to occur within the study area due to lack of suitable alkaline soils or vernal pools.
Davidson's saltscale *Atriplex serenana* var. *davidsonii*	Federal: None State: None Local: 1B.2 MSHCP(d)	Apr.-Oct.	Coastal sage scrub, wetland-riparian; coastal. Elevation range extends from 10-200 meters. Found in Orange, Riverside, San Diego, and possibly Los Angeles and San Bernardino counties.	**Not Expected.** This species is not expected to occur within the study area due to lack of suitable riparian habitat. Study area is also outside the known elevation range of the species.
Convolvulaceae **(Morning-glory Family)**				
Small-flowered morning-glory *Convolvulus simulans*	Federal: None State: None Local: 4.2 MSHCP	Mar.-Jul.	Clay soils, serpentinite seeps; openings in chaparral; coastal sage scrub; valley and foothill grassland. Elevation range extends from 0-305 meters. Found in Kern, Los Angeles, Riverside, Orange, San Diego, Santa Barbara counties.	**Not Expected.** This species is not expected to occur within the study area due to lack of suitable clay soils and mesic habitat. Study area is also outside the known elevation range of the species.
Peruvian dodder *Cuscuta obtusiflora* var. *glandulosa*	Federal: None State: None Local: 2B.2	Jul.-Oct.	Marshes and swamps (freshwater). Elevation range extends from 15-280 meters.	**Not Expected.** This species is not expected to occur within the study area due to lack of suitable riparian habitat. Study area is also outside the known elevation range of the species.

Common Name ***Scientific Name***	**Sensitivity Status[1]**	**Flowering Period**	**Preferred Habitat/Known Elevation and Distribution[2]**	**Presence/Potential to Occur Within Biological Study Area**
Ericaceae (Heather Family)				
rainbow manzanita *Arctostaphylos rainbowensis*	Federal: None State: None Local: 1B.1	Dec.-Mar.	Chaparral (rocky). Elevation range extends from 205-670 meters. Found in Riverside, San Diego counties.	**Not Expected.** This species is not expected to occur within the study area due lack of suitable chaparral habitat and the study area is outside of the known range of the species. Manzanita are highly conspicuous and none were observed during the site visit.
Fabaceae (Legume Family)				
Horn's milk-vetch *Astragalus hornii* var. *hornii*	Federal: None State: None Local: 1B.1	May-Oct.	Meadows and seeps, Playas/lake margins, alkaline Elevation range extends from 60-850 meters. Found in Kern, San Bernardino* counties, Nevada.	**Not Expected.** This species is not expected to occur within the study area due to lack of suitable riparian habitat. Species is likely extirpated from Riverside county.
San Antonio milk-vetch *Astragalus lentiginosus* var. *antonius*	Federal: None State: None Local: 1B.1	Dec.-Jun.	Rocky (sometimes), Sandy (sometimes) in Chaparral, Cismontane woodland, Coastal scrub, Valley and foothill grassland Elevation range extends from 365-975 meters. Found in Riverside, San Diego counties.	**Not Expected.** This species is not expected to occur within the study area due lack of suitable habitat and the study area is outside of the known range of the species. Species is isolated to northern slopes of Mt. San Antonio, and has never been recorded in the vicinity of Moreno Valley.
Jaegers milk-vetch *Astragalus pahcypus* var. *jaegeri*	Federal: None State: None Local: 1B.2	May-Jul.	Lower montane coniferous forest, Pebble plain, Pinyon and juniper woodland, Upper montane coniferous forest/rocky Elevation range extends from 4-640 meters. Found in Los Angeles, Orange, Riverside, Ventura counties.	**Not Expected.** This species is not expected to occur within the study area due lack of suitable habitat and the study area is outside of the known range of the species.
Grossulariaceae (Gooseberry Family)				
Parish's gooseberry *Ribes divaricatum var. parishii*	Federal: None State: None Local: 1A	Feb.-Apr.	Riparian woodland. Elevation range extends from 65-300 meters. Found in Los Angeles*, San Bernardino counties.	**Not Expected.** This species is not expected to occur within the study area due lack of suitable habitat. Species is likely extinct.

Common Name *Scientific Name*	Sensitivity Status[1]	Flowering Period	Preferred Habitat/Known Elevation and Distribution[2]	Presence/Potential to Occur Within Biological Study Area
Lamiaceae (Mint Family)				
Hall's monardella *Monardella macrantha* ssp. *hallii*	Federal: None State: None Local: 1B.3 MSHCP	Jun.-Oct.	Broadleafed upland forest, chaparral, cismontane woodland, lower montane coniferous forest, valley and foothill grassland. Elevation range extends from 730-2,195 meters. Found in Los Angeles, Orange, Riverside, San Bernardino, San Diego counties.	**Not Expected.** This species is not expected to occur within the study area due to lack of suitable habitat. Study area is also outside the known elevation range of the species.
Pringle's monardella *Monardella pringlei*	Federal: None State: None Local: 1A	May-Jun.	Interior sand dunes in and around Colton,Coastal scrub(sandy) Elevation range extends from 300 to 400 meters. Found in Riverside*, San Bernardino* counties.	**Not Expected.** This species is not expected to occur within the study area due lack of suitable habitat. Species is likely extinct as litte relictual interior dune habitat remains in area, and recent searches of appropriate habitat have failed to relocate the species.
Malvaceae (Mallow Family)				
Parish's bush-mallow *Malacothamnus parishii*	Federal: None State: None Local: 1A	Jun.-Jul.	Recent burn scars and possibly mesic areas in Chaparral, coastal scrub Elevation range extends from 305-455 meters. Found in San Bernardino county.	**Not Expected.** This species is not expected to occur within the study area due lack of suitable habitat. Only two collections of this plant in 1895 were made in San Bernardino, and may be misidentified as a sport of the more common chaparral mallow - *Malacothamnus fasciculatus*. Additionally, Malacothamnus species are highly conspicuous and none were observed during the site visit.
salt spring checkerbloom *Sidalcea neomexicana*	Federal: None State: None Local: 2.2	Mar.-Jun.	Chaparral, coastal scrub, lower montane coniferous forest, Mojavean desert scrub, playas; alkaline and mesic soils. Elevation range extends from 15-1,530 meters. Found in Kern, Orange, Riverside, Ventura, San Bernardino, San Diego, possibly Los Angeles counties.	**Not Expected.** This species is not expected to occur within the study area due to lack of suitable mesic habitat.

Common Name *Scientific Name*	Sensitivity Status[1]	Flowering Period	Preferred Habitat/Known Elevation and Distribution[2]	Presence/Potential to Occur Within Biological Study Area
Parish's checkerbloom *Sidalcea hickmanii* ssp. *parishii*	Federal: None State: CR Local: 1B.2	(May)Jun.-Aug.	Chaparral, Cismontane woodland, Lower montane coniferous forest Elevation range extends from 1,000-2,500 meters. Found in Kern, Santa Barbara, San Bernardino, San Diego, and San Luis Obispo counties.	**Not Expected.** This species is not expected to occur within the study area due lack of suitable habitat and the study area is outside of the known elevation range of the species.
Nyctaginaceae **(Four O'clock Family)**				
chaparral sand-verbena *Abronia villosa* var. *aurita*	Federal: None State: None Local: 1B.1	Jan.-Sep.	Sandy soils in chaparral, coastal scrub, and desert dunes/sandy areas. Elevation range extends from 0-1,600 meters. Found in Los Angeles, Riverside, San Diego, San Bernardino, possibly Orange counties.	**Not Expected.** This species is not expected to occur within the study area due lack of suitable sandy soils or desert dune habitat.
Orobanchaceae **(Broomrape Family)**				
Salt marsh bird's beak *Chloropyron maritimum ssp. maritimum*	Federal: FE State: SE Local: 1B.2	May-Oct.	Coastal dunes, marshes, and swamps. Elevation range extends from 0-30 meters. Found in Los Angeles, Orange, San Diego, San Bernardino, Ventura counties.	**Not Expected.** This species is not expected to occur within the study area due lack of suitable riparian or salt marsh habitat.
Papaveraceae **(Poppy Family)**				
Coulter's matilija poppy *Romneya coulteri*	Federal: None State: None Local: 4.2 MSHCP(e)	Mar.-Jul.	Dry washes and canyons in sage scrub and chaparral. Elevation range extends from 0-1,200 meters. Found in Los Angeles, Orange, Riverside, San Diego counties.	**Not Expected.** This species is not expected to occur within the study area due lack of suitable habitat. Species is conspicuous and was not observed during the site visit.
Phrymaceae **(Lopseed Family)**				
Cleveland's bush monkeyflower *Diplacus clevelandii*	Federal: None State: None Local: 4.2 MSHCP(f)	Apr.-Jul.	Chaparral, cismontane woodland, lower montane coniferous forest; grows within disturbed gravelly areas, such as long roadside. Elevation range extends from 450-2,000 meters.	**Not Expected.** This species is not expected to occur within the study area because it is well outside the known range of the species. Species is restricted to the Peninsular Ranges which are at least 20 miles southeast of the study area, with the nearest occurrence even further.

Common Name ***Scientific Name***	**Sensitivity Status[1]**	**Flowering Period**	**Preferred Habitat/Known Elevation and Distribution[2]**	**Presence/Potential to Occur Within Biological Study Area**
Polemoniaceae **(Phlox Family)**				
Santa Ana River woollystar *Eriastrum densifolium* ssp. *sanctorum*	Federal: FE State: SE Local: 1B.1	Apr.-Sep.	Chaparral, coastal scrub (alluvial fan)/sandy or gravelly. Elevation range extends from 91-610 meters. Found in Riverside, San Bernardino, possibly Orange counties.	**Not Expected.** This species is not expected to occur within the study area due lack of suitable alluvial fan habitat.
spreading navarretia *Navarretia fossalis*	Federal: FT State: None Local: 1B.1 MSHCP(b)	Apr.-Jun.	Coastal sage scrub, wetland-riparian; occurs almost always under natural conditions in wetlands. Elevation range extends from 30-655 meters. Found in Los Angeles, Riverside, San Diego counties.	**Not Expected.** This species is not expected to occur within the study area due lack of suitable vernal/wetland habitat.
Polygonaceae **(Buckwheat Family)**				
Parry's spineflower *Chorizanthe parryi* var. *parryi*	Federal: None State: None Local: 1B.1 MSHCP(e)	Apr.-Jun.	Openings/clearings in coastal or desert sage scrub, chaparral or interface; dry slopes or flat ground; sandy soils. Elevation range extends from 275-1,220 meters. Found in Los Angeles, Riverside, San Bernardino counties.	**Low Potential.** This species has a low potential to occur due to marginally suitable habitat. Species prefers primarily undisturbed sandy soils, which are mostly absent from the study area.
long-spined spineflower *Chorizanthe polygonoides* var. *longispina*	Federal: None State: None Local: 1B.2 MSHCP	Apr.-Jul.	Primarily associated with clay soils but also found on sandy or gravelly soils within open areas of chaparral, sage scrub, or needlegrass grassland. Elevation range extends from 30-1,530 meters. Found in Orange, Riverside, Santa Barbara, San Diego counties.	**Not Expected.** This species is not expected to occur within the study area due lack of suitable clay soils and the study area is outside of the known range of the species.
white-bracted spineflower *Chorizanthe xanti* var. *leucotheca*	Federal: None State: None Local: 1B.2	Apr.-Jun.	Sandy or gravelly soils in coastal scrub (alluvial fans); Mojavean desert scrub; Pinyon and juniper woodland. Elevation range extends from 300-1,200 meters. Found in Los Angeles, Riverside, San Bernardino, San Diego counties.	**Not Expected.** This species is not expected to occur within the study area due lack of suitable alluvial fan habitat.

Common Name *Scientific Name*	Sensitivity Status[1]	Flowering Period	Preferred Habitat/Known Elevation and Distribution[2]	Presence/Potential to Occur Within Biological Study Area
slender-horned spineflower *Dodecahema leptoceras*	Federal: FE State: SE Local: 1B.1	Apr.-Jun.	Scrub and chaparral in sandy soils and alluvial fans. Elevation range extends from 200-760 meters. Found in Los Angeles, Riverside, San Bernardino counties.	**Not Expected.** This species is not expected to occur within the study area due lack of suitable alluvial fan habitat.
Ranunculaceae (Buttercup Family)				
little mousetail *Myosurus minimus* ssp. *apus*	Federal: None State: None Local: 3.1 MSHCP(d)	Mar.-Jun.	Associated with vernal pools and inundated grassland habitats. Elevation range extends from 20-640 meters. Found in Alameda, Riverside, San Bernardino, San Diego counties.	**Not Expected.** This species is not expected to occur within the study area due lack of suitable vernal pool habitat.
Rosaceae (Rose Family)				
mesa horkelia *Horkelia cuneata* var. *puberula*	Federal: None State: None Local: 1B.1	Feb.-Jul. (uncommonly Sep.)	Chaparral (maritime), cismontane woodland, coastal scrub/sandy or gravelly. Elevation range extends from 70-810 meters. Found in Los Angeles, Orange, San Bernardino, San Diego, Ventura, possibly Riverside counties.	**Not Expected.** This species is not expected to occur within the study area due lack of suitable habitat and the study area is outside of the known range of the species.
Rubiaceae (Coffee Family)				
Alvin Meadow bedstraw *Galium californicum* ssp. *primum*	Federal: None State: None Local: 1B.2	May-Jul.	Chaparral, Lower montane coniferous forest/granitic, sandy Elevation range extends from 1,350-1,700 meters. Found in Riverside, San Bernardino counties.	**Not Expected.** This species is not expected to occur within the study area due lack of suitable habitat and the study area is outside of the known elevation range of the species. Observations associated with Moreno Valley likely erroneous and have poor locational integrity.

Common Name ***Scientific Name***	**Sensitivity Status[1]**	**Flowering Period**	**Preferred Habitat/Known Elevation and Distribution[2]**	**Presence/Potential to Occur Within Biological Study Area**
Solanaceae **(Nightshade Family)**				
Parish's box thorn *Lycium parishii*	Federal: None State: None Local: 2B.3	Mar.-Apr.	Coastal scrub, Sonoran Desert scrub Elevation range extends from 135-1,000 meters. Found in Imperial, Riverside, San Bernardino*, San Diego counties, Arizona.	**Not Expected.** This species is not expected to occur within the study area due lack of suitable habitat. Species is conspicuous and was not observed during the site visit.
ANGIOSPERMS (MONOCOTYLEDONS)				
Alliaceae (Liliaceae) **(Onion Family-Lily Family)**				
Yucaipa onion *Allium marvinii*	Federal: None State: None Local: 1B.2	(Jan.)Mar-Sep.	Dry slopes and ridges in chaparral Elevation range extends from 760-1065 meters. Found in Orange, Riverside, San Bernardino, and San Diego Counties.	**Not Expected.** This species is not expected to occur within the study area due lack of suitable habitat and the study area is outside the known elevation range of the species.
Munz's onion *Allium munzii*	Federal: FE State: ST Local: 1B.1 MSHCP(b)	Mar.-May	Chaparral, cismontane woodland, coastal scrub, pinyon and juniper woodland, valley and foothill grassland communities; clay soils. Elevation range extends from 297-1,070 meters. Found in Riverside County.	**Not Expected.** This species is not expected to occur within the study area due lack of suitable clay soils.
Cyperaceae **(Sedge Family)**				
bristly sedge *Carex comosa*	Federal: None State: None Local: 2B.1	May-Sep.	Coastal prairie, Marshes and swamps (lake margins), Valley and foothill grassland. Elevation range extends from 0-625 meters. Found in much of the United States, Sacramento, San Bernardino, Santa Cruz, San Francisco.	**Not Expected.** This species is not expected to occur within the study area due lack of suitable marsh or riparian habitat.

Common Name *Scientific Name*	Sensitivity Status[1]	Flowering Period	Preferred Habitat/Known Elevation and Distribution[2]	Presence/Potential to Occur Within Biological Study Area
Liliaceae **(Lily Family)**				
Plummer's mariposa lily *Calochortus plummerae*	Federal: None State: None Local: 4.2 MSHCP(e)	May-Jul.	Chaparral (openings), cismontane woodland, coastal scrub, valley and foothill grassland, granitic/rocky. Elevation range extends from 100- 1,700 meters. Found in Los Angeles, Orange, Riverside, San Bernardino, Ventura counties.	**Not Expected.** This species is not expected to occur within the study area due lack of suitable habitat.
ocellated Humboldt lily *Lilium humboldtii ssp. ocellatum*	Federal: None State: None Local: 4.2 *MSHCP**	Mar.-Jul.	Chaparral, cismontane woodland, coastal scrub, lower montane coniferous forest, riparian woodland, openings. Elevation range extends from 30-1,800 meters. Found in Los Angeles, San Bernardino, Riverside, Orange, San Diego counties.	**Not Expected.** This species is not expected to occur within the study area due lack of suitable habitat and the study area is outside of the known range of the species.
Poaceae **(True Grass Family)**				
three-awned grama *Bouteloua trifida*	Federal: None State: None Local: 2B.3	(Apr.)May-Sep.	Mojavean desert scrub Elevation range extends from 700-2,000 meters. Found in Inyo, Riverside, and San Bernardino Counties.	**Not Expected.** This species is not expected to occur within the study area due lack of suitable habitat and the study area is outside of the known elevation range of the species.
vernal barley *Hordeum intercedens*	Federal: None State: None Local: 3.2 MSHCP	Mar.-Jun.	Coastal dunes, coastal scrub, valley and foothill grassland (saline flats and depressions), vernal pools. Elevation range extends from 5-1,000 meters. Found in Los Angeles, Orange, Riverside, San Diego, Ventura counties.	**Not Expected.** This species is not expected to occur within the study area due lack of suitable vernal pool habitat.
California satintail *Imperata brevifolia*	Federal: None State: None Local: 2.1	Sep.-May	Chaparral, coastal sage scrub, Mojavean desert scrub, meadows and seeps (often alkali), riparian scrub/mesic. Elevation range extends from 0-1,215 meters. Found in Kern, Los Angele, Riverside, San Bernardino, Ventura, Orange counties.	**Not Expected.** This species is not expected to occur within the study area due lack of suitable habitat and the study area is outside of the known range of the species.

Common Name ***Scientific Name***	**Sensitivity Status[1]**	**Flowering Period**	**Preferred Habitat/Known Elevation and Distribution[2]**	**Presence/Potential to Occur Within Biological Study Area**
prairie wedge grass *Sphenopholis obtusata*	Federal: None State: None Local: 2B.2	Apr.-Jul.	Cismontane woodland, meadows and seeps/mesic. Elevation range extends from 300-2,000 meters. Found in much of the United States, Riverside, San Bernardino, San Diego counties, Baja California.	**Not Expected.** This species is not expected to occur within the study area due lack of suitable habitat and the study area is outside of the known range of the species.
Themidaceae (Butcher's-Broom Family)				
Thread-leaved brodiaea *Brodiaea filifolia*	Federal: FT State: CE Local: 1B.1	Mar.-Jun.	Clay soils in coastal scrub, valley and foothill grassland, cismontane woodland, and vernal pools. Elevation range extends from 25-1,120 meters. Found in Los Angeles, Orange, Riverside, San Diego, San Bernardino counties.	**Not Expected.** This species is not expected to occur within the study area due lack of suitable habitat and the study area is outside of the known range of the species.

[1] **Sensitivity Status**

Federal

FE	*Federally Endangered*
FT	*Federally Threatened*
FC	*Federal Candidate*
FPE	*Federally Proposed as Endangered*
FPT	*Federally Proposed as Threatened*
FPD	*Federally Proposed for Delisting*

State

SE	*State Listed as Endangered*
ST	*State Listed as Threatened*
SCE	*State Candidate for Endangered*
SCT	*State Candidate for Threatened*
SR	*State Rare*

Local

CRPR *California Rare Plant Ranks:*

California Rare Plant Rank 1A	Plants presumed extirpated in California and either rare or extinct elsewhere
California Rare Plant Rank 1B	Plants rare, threatened, or endangered in California and elsewhere
California Rare Plant Rank 2A	Plants presumed extirpated in California but common elsewhere
California Rare Plant Rank 2B	Plants rare, threatened, or endangered in California, but common elsewhere

California Rare Plant Rank 3	Plants about which more information is needed, a review list
California Rare Plant Rank 4	Plants of limited distribution, a watch list

Threat Code extensions and their meanings:

0.1-Seriously threatened in California (over 80% of occurrences threatened / high degree and immediacy of threat)
0.2-Moderately threatened in California (20-80% occurrences threatened / moderate degree and immediacy of threat)
0.3-Not very threatened in California (less than 20% of occurrences threatened / low degree and immediacy of threat or no current threats known)

MSHCP	*Western Riverside County Multiple Species Habitat Conservation Plan covered species*
MSHCP (a)	*Surveys may be required as part of wetlands mapping per MSHCP Section 6.1.2.*
MSHCP (b)	*Surveys may be required within Narrow Endemic Plant Species survey area per MSHCP Section 6.1.3.*
MSHCP (c)	*Surveys may be required per MSHCP Section 6.3.2.*
MSHCP (d)	*Surveys may be required within Criteria Area per MSHCP Section 6.3.2.*
MSHCP (e)	*These Covered Species will be considered to be Covered Species Adequately Conserved when conservation requirements identified in species-specific conservation objectives have been met per MSHCP Section 9.0 (Table 9-3).*
MSHCP (f)	*These Covered Species will be considered to be Covered Species Adequately Conserved when a Memorandum of Understanding is executed with the Forest Service that addresses management for these species on Forest Service Land per MSHCP Table 9-3.*

[2] Sources for Preferred Habitat:

Calflora. 2022. Information on Wild California Plants. Available online at: https://www.calflora.org/. Accessed on November 02, 2022.
CDFW. 2022. California Natural Diversity Database (CNDDB). RareFind, Version 5.0 (Commercial Subscription). Sacramento, California: CDFW, Biogeographic Data Branch. Available online at: https://www.wildlife.ca.gov/Data/CNDDB/Maps-and-Data. Accessed on November 02, 2022.

Source: ESA, 2022.

Appendix C2: Special-Status Wildlife Species

Common Name *Scientific Name*	**Sensitivity Status[1]**	**Preferred Habitat/Known Distribution[2]**	**Presence/Potential to Occur Within Biological Study Area**
INVERTEBRATES			
Order Anostraca (fairy shrimp) ***Crustacea***			
vernal pool fairy shrimp *Branchinecta lynchi*	Federal: FT State: None Local: S3	Limited to vernal pools in Oregon and California. Occasionally will be found in habitats other than vernal pools, such as artificial pools created by roadside ditches.	**Not Expected.** This species is not expected to occur within the study area due to lack of suitable vernal pool habitat.
Riverside fairy shrimp *Streptocephalus wootoni*	Federal: FE State: None Local: (MSHCP) WS, S2	Endemic to western Riverside, Orange and San Diego Counties in areas of tectonic swales/earth slump basins in grassland and coastal sage scrub. Inhabit seasonally astatic pools filled by winter/spring rains greater than 12 inches in depth. Hatch in warm water later in the season. Typically observed January through March.	**Not Expected.** This species is not expected to occur within the study area due to lack of suitable vernal pool habitat.
Order Diptera (flies) ***Insecta***			
Delhi Sands flower-loving fly *Rhaphiomidas terminatus abdominalis*	Federal: FE State: None Local: G1/T1 S1	Found only in areas of the Delhi Sands interior dune formations in southwestern San Bernardino and northwestern Riverside counties.	**Not Expected.** This species is not expected to occur within the study area due to lack of suitable Delhi Sands habitat.
Order Hydropsychidae (caddisflies) ***Insecta***			
California diplectrona caddisfly *Dplectrona californica*	Federal: None State: None Local: G1 S1	San Bernardino County, California. Known only from the type locality in Claremont, Los Angeles County and Thurman Flats, San Bernardino County. Larvae in the genus live in fast-flowing, cool streams. *Diplectrona* larvae live in fixed retreats made mostly from plant materials, and spin attached silken "capture nets" which filter food particles from the water.	**Not Expected.** This species is not expected to occur within the study area due to lack of suitable aquatic habitat.

Common Name ***Scientific Name***	**Sensitivity Status**[1]	**Preferred Habitat/Known Distribution**[2]	**Presence/Potential to Occur Within Biological Study Area**
Order Lepidoptera (butterflies & moths) ***Insecta***			
monarch butterfly – California overwintering population *Danaus plexippus* pop. *1*	Federal: FPE State: None Local: S2	Wintering sites in California are associated with wind-protected groves of large trees (primarily eucalyptus or pine [*Pinus* spp.]) with nectar and water sources nearby that are generally near the coast.	**Not Expected.** This species is not expected to occur within the study area due to lack of suitable wind-protected groves near the coast in addition to a lack of suitable nectar and water sources.
Busck's gall moth *Eugnosta busckana*	Federal: None State: None Local: G2 SH	Coastal dunes and dune scrub.	**Not Expected.** This species is not expected to occur within the study area due to lack of suitable dune habitat.
Quino checkerspot butterfly *Euphydryas editha quino*	Federal: FE State: None Local: S1S2	Sunny openings within native and non-native grasslands, coastal sage scrub, open chaparral, and other open plant community types with rocky outcroppings, cryptogrammic crusts, and presence of host plant species (*Plantago erecta*, *P*. *insularis*, and *Castilleja exserta*) and nectar sources. Hills and mesas near the coast.	**Not Expected.** This species is not expected to occur within the study area due to lack of suitable host plant species and is outside the known range of the species.
Order Hymenoptera (ants, bees, & wasps) ***Insecta***			
Crotch bumble bee *Bombus crotchii*	Federal: None State: SCE Local: S1S2	Open grassland and scrub habitats that support potential nectar sources such as plants within the *Fabaceae*, *Apocynaceae*, *Asteraceae*, *Lamiaceae*, and *Boraginaceae* families.	**Moderate Potential.** This species has a moderate potential to occur due to potential nectar sources on site, which include *Encelia farinosa* (*Asteraceae*), and *Phacelia* spp. (*Boraginaceae*).

Common Name ***Scientific Name***	**Sensitivity Status[1]**	**Preferred Habitat/Known Distribution[2]**	**Presence/Potential to Occur Within Biological Study Area**
Desert cuckoo wasp *Ceratochrysis longimala*	Federal: None State: None Local: S1	Chaparral habitats. Cryptic nest parasites of *Crabronidae* and *Vespidae.*	**Not Expected.** This species is not expected to occur within the study area due to lack of suitable chaparral habitat.
white cuckoo bee *Neolarra alba*	Federal: None State: None Local: S1	Cleptoparasitic in the nests of perdita bees. Known only from localities in Southern California, near Perris and Redlands.	**Not Expected.** This species is not expected to occur within the study area due to lack of suitable habitat. Perdita bees not observed during site visit.
FISH			
Trout & Salmon ***Salmonidae***			
steelhead - southern California DPS *Oncorhynchus mykiss irideus* pop. *10*	Federal: FE State: None Local: S1	South coast flowing waters with variable temperatures. Found in streams and rivers with at least 7 inches minimum depth.	**Not Expected.** This species is not expected to occur within the study area due to lack of suitable aquatic habitat.
Minnows & Carp ***Cyprinidae***			
Arroyo chub *Gila orcutti*	Federal: None State: SSC Local: (MSHCP) AC, S2	Los Angeles Basin south coastal streams. Prefers slow water stream sections with muddy or sandy bottoms. Feeds on aquatic vegetation, insects, and associated invertebrates.	**Not Expected.** This species is not expected to occur within the study area due to lack of suitable aquatic habitat.
Santa Ana speckled dace *Rhinichthys osculus* ssp. *3*	Federal: None State: SSC Local: S1	Prefer south coast flowing water in habitat that includes clear, well oxygenated water with movement due to a current or waves. In addition the fish thrive in areas with deep cover or overhead protection from vegetation or woody debris.	**Not Expected.** This species is not expected to occur within the study area due to lack of suitable aquatic habitat.
Suckers ***Catostomidae***			
Santa Ana sucker *Catostomus santaanae*	Federal: FT State: None Local: S1	Habitat generalists, but prefer sand-rubble-boulder bottoms, cool, clear water, and algae.	**Not Expected.** This species is not expected to occur within the study area due to lack of suitable aquatic habitat.

Common Name *Scientific Name*	**Sensitivity Status[1]**	**Preferred Habitat/Known Distribution[2]**	**Presence/Potential to Occur Within Biological Study Area**
AMPHIBIANS			
Spadefoot Toads ***Scaphiopodidae***			
western spadefoot *Spea hammondii*	Federal: None State: SSC Local: (MSHCP) AC, S3	Mixed woodland, grasslands, chaparral, sandy washes, lowlands, river floodplains, alluvial fans, playas, alkali flats, foothills, and mountains. Prefers washes and other sandy areas with patches of brush and rocks. Rain pools or shallow temporary pools, which do not contain bullfrogs, fish, or crayfish are necessary for breeding. Perennial plants necessary for its major food-termites.	**Not Expected.** This species is not expected to occur within the study area due to lack of suitable vernal pool habitat.
True Frogs ***Ranidae***			
southern mountain yellow-legged frog *Rana muscosa*	Federal: FE State: SE, WL Local: S1	Occurs in San Jacinto Mountains, San Bernardino Mountains, and San Gabriel Mountains in Southern California and the Southern Sierra Nevada.	**Not Expected.** This species is not expected to occur within the study area due to lack of suitable aquatic habitat.
REPTILES			
Box & Water Turtles ***Emydidae***			
western pond turtle *Emys marmorata*	Federal: None State: SSC Local: (MSHCP) AC; S3	Known to occur in slow-moving permanent or intermittent streams, ponds, small lakes, rivers, streams, marshes, irrigation ditches with abundant vegetation, reservoirs with emergent basking sites, and either rocky or muddy bottoms. In woodland, forest, or grassland habitats. In creeks that pool to shallower areas and with logs, rocks, cattail mats, and/or exposed banks for basking are required. Could enter brackish or even seawater. Adjacent uplands used during winter.	**Not Expected.** This species is not expected to occur within the study area due to lack of suitable aquatic habitat.

Common Name *Scientific Name*	Sensitivity Status[1]	Preferred Habitat/Known Distribution[2]	Presence/Potential to Occur Within Biological Study Area
Geckos ***Gekkonidae***			
San Diego banded gecko *Coleonyx variegatus abbotti*	Federal: None State: SSC Local: S1S2	Most common in desert scrub, desert wash, and Joshua tree habitats; occurs in almost every desert habitat. Require friable soil for burrow and nest construction. Creosote bush habitat with large annual wildflower blooms preferred.	**Not Expected.** This species is not expected to occur within the study area due to lack of suitable habitat. Desert scrub and friable soils absent from study area.
Spiny Lizards ***Phrynosomatidae***			
coast horned lizard *Phrynosoma blainvillii*	Federal: None State: SSC Local: (MSHCP) AC, S4	Prefers sandy riparian and sage scrub habitats but also occurs in valley-foothill hardwood, conifer, pine-cypress, juniper and annual grassland habitats below 6,000 feet, open country, especially sandy areas, washes, flood plains, and windblown deposits. Requires open areas for sunning, bushes and loose soil for cover and abundant supply of harvester ants.	**Not Expected.** This species is not expected to occur within the study area due to lack of suitable habitat. Harvester ants not observed in study area during survey.
Whiptails & relatives ***Teiidae***			
Belding's orange-throated whiptail *Aspidoscelis hyperythra beldingi*	Federal: None State: WL Local: (MSHCP) AC, S2S3	Species requires intact habitat within chaparral, cismontane woodland, and coastal scrub plant communities. Prefers washes and other sandy areas with patches of brush and rocks. Perennial plants necessary for its major food-termites.	**High Potential.** This species has a high potential to occur due to presence of suitable habitat and previous occurrences within the habitat to the northwest of the BSA.
coastal western whiptail *Aspidoscelis tigris stejnegeri*	Federal: None State: SSC Local: (MSHCP) AC, S3	Found in deserts and semi-arid areas with sparse vegetation and open areas. Also found in woodland and riparian areas. Ground may be firm soil, sandy, or rocky.	**High Potential.** This species has a high potential to occur due to presence of suitable habitat and previous occurrences within the habitat to the northwest of the BSA.

Common Name *Scientific Name*	Sensitivity Status[1]	Preferred Habitat/Known Distribution[2]	Presence/Potential to Occur Within Biological Study Area
Legless Lizards ***Anniellidae***			
southern California legless lizard [=silvery legless lizard] *Anniella stebbinsi* [=*Anniella pulchra*]	Federal: None State: SSC Local: S3	Occurs in moist warm loose soil with plant cover. Moisture is essential. Occurs in sparsely vegetated areas of beach/coastal dunes, chaparral, pine-oak woodlands, desert scrub, sandy washes, and stream terraces with sycamores, cottonwoods, or oaks. Leaf litter under trees and bushes in sunny areas and dunes stabilized with bush lupine and mock heather often indicate suitable habitat. Often can be found under surface objects such as rocks, boards, driftwood, and logs. Can also be found by gently raking leaf litter under bushes and trees. Sometimes found in suburban gardens in Southern California.	**Low Potential.** This species has a low potential to occur due to lack of suitable duff or leaf litter habitat. Species may be present in areas of heavy duff below boulders immediately adjacent to site, but soil moisture on site is likely inadequate for species to occur.
Egg-Laying Snakes ***Colubridae***			
California glossy snake *Arizona elegans occidentalis*	Federal: None State: SSC Local: S2	Inhabits arid scrub, rocky washes, and grasslands, and chaparral habitats. Appears to prefer microhabitats of open areas with friable soils for burrowing.	**Low Potential.** This species has a low potential to occur due to lack of suitable microhabitat.
San Bernardino ringneck snake *Diadophis punctatus modestus*	Federal: None State: None Local: S2?	Most common in open, relatively rocky areas within valley-foothill, mixed chaparral, and annual grass habitats. Often in somewhat moist microhabitats near intermittent streams. Avoids moving through open or barren areas by restricting movements to areas of surface litter or herbaceous vegetation.	**Not Expected.** This species is not expected to occur within the study area due to lack of suitable habitat.
coast patch-nosed snake *Salvadora hexalepis virgultea*	Federal: None State: SSC Local: S2S3	Known to inhabit semi-arid brushy areas and chaparral in canyons, rocky hillsides, and plains with sandy soils and leaf litter.	**Moderate Potential.** This species has a moderate potential to occur due to presence of suitable rocky and semi-arid brushy habitat.

Common Name *Scientific Name*	Sensitivity Status[1]	Preferred Habitat/Known Distribution[2]	Presence/Potential to Occur Within Biological Study Area
Live-Bearing Snakes ***Natricidae***			
two-striped garter snake *Thamnophis hammondii*	Federal: None State: SSC Local: S3S4	Habitat includes marsh and swamp, riparian scrub, riparian woodland, and wetland. Highly aquatic, found in or near permanent fresh water. Often along streams with rocky beds and riparian growth.	**Not Expected.** This species is not expected to occur within the study area due to lack of suitable aquatic habitat.
Vipers ***Viperiidae***			
red-diamond rattlesnake *Crotalus ruber*	Federal: None State: SSC Local: (MSHCP) AC; S3	Known to occur in chaparral, Mojavean desert scrub, and Sonoran Desert scrub communities. Occurs in rocky areas and dense vegetation. Needs rodent burrows, cracks in rocks, or surface cover objects.	**Moderate Potential.** This species has a moderate potential to occur due to presence of suitable rocky habitat among boulders adjacent to site.
BIRDS			
Ibises & Spoonbills ***Threskiornithidae***			
white-faced ibis *Plegadis chihi*	Federal: None State: WL Local: S3S4	Wading bird that seeks open, shallow, aquatic bodies such as lagoons, wetlands, ephemeral ponds, and stock ponds to forage. Nests in marsh growth (cattails) or low shrubs and trees above water.	**Not Expected.** This species is not expected to occur within the study area due to lack of suitable aquatic habitat.
Hawks, Kites, Harriers, & Eagles ***Accipitridae***			
Cooper's hawk *Accipiter cooperii*	Federal: None State: WL Local: (MSHCP) AC; S4	Inhabits cismontane woodland, riparian forest, riparian woodland, upper montane coniferous forest, or other forest habitats near water. Nests and forages near open water or in riparian vegetation.	**Not Expected.** This species is not expected to occur within the study area due to lack of suitable woodland habitat.

Common Name ***Scientific Name***	**Sensitivity Status**[1]	**Preferred Habitat/Known Distribution**[2]	**Presence/Potential to Occur Within Biological Study Area**
golden eagle *Aquila chrysaetos*	Federal: BGEPA, BCC State: FP, WL Local: (MSHCP) AC; S3	Known to live in open and semi-open country featuring native vegetation across most of the Northern Hemisphere. They avoid developed areas and uninterrupted stretches of forest. They are found primarily in mountains up to 12,000 feet, Canyonlands, rimrock terrain, and riverside cliffs and bluffs. Nest on cliffs and steep escarpments in grassland, chaparral, shrubland, forest, and other vegetated areas. Forages for mammalian prey in grasslands, coastal sage scrub, chaparral, oak savannahs, open coniferous forest, and over open areas	**Not Expected.** This species is not expected to occur within the study area due to lack of suitable nesting or foraging habitat.
ferruginous hawk *Buteo regalis*	Federal: BCC State: WL Local: S3S4	Open grasslands, sagebrush flats, desert scrub, low foothills and fringes of pinyon and juniper habitats.	**Not Expected.** This species is not expected to occur within the study area due to lack of suitable habitat.
Swainson's hawk *Buteo swainsoni*	Federal: BCC State: ST Local: S3	Found in Great Basin grassland, riparian forest, riparian woodland, valley and foothill grassland. Breeds in grasslands with scattered trees, juniper-sage flats, riparian areas, savannahs, and agricultural or ranch lands with groves or lines of trees. Requires adjacent suitable foraging areas such as grasslands, or alfalfa or grain fields supporting rodent populations.	**Not Expected.** This species is not expected to occur within the study area because the study area is outside of the known nesting range of the species.
white-tailed kite *Elanus leucurus*	Federal: None State: FP Local: (MSHCP) AC; S3S4	Rolling foothills and valley margins with scattered oaks and river bottomlands or marshes nest to deciduous woodland. Open grasslands, meadows, or marshes for foraging close to isolated, dense-topped trees for nesting and perching.	**Not Expected.** This species is not expected to occur within the study area due to lack of suitable habitat.

Common Name *Scientific Name*	**Sensitivity Status**[1]	**Preferred Habitat/Known Distribution**[2]	**Presence/Potential to Occur Within Biological Study Area**
bald eagle *Haliaeetus leucocephalus*	Federal: Delisted; BGEPA State: SE, FP Local: S3	Typically nest in forested areas adjacent to large bodies of water, staying away from heavily developed areas when possible. Tolerant of human activity when feeding, and may congregate around fish processing plants, dumps, and below dams where fish concentrate. For perching, bald eagles prefer tall, mature coniferous or deciduous trees that afford a wide view of the surroundings. In winter, bald eagles can also be seen in dry, open uplands if there is access to open water for fishing.	**Not Expected.** This species is not expected to occur within the study area due to lack of suitable aquatic or perching habitat.
Falcons Falconidae			
merlin *Falco columbarius*	Federal: None State: WL Local: S3S4	Occupies seacoast, tidal estuaries, open woodlands, savannahs, edges of grasslands and deserts, farms, and ranches. Clumps of trees or windbreaks are required for roosting in open country.	**Not Expected.** This species is not expected to occur within the study area due to lack of suitable habitat.
Rails, Coots, & Gallinules Rallidae			
California black rail *Laterallus jamaicensis coturniculus*	Federal: BCC State: ST, FP Local: S1	Known to occur in brackish and freshwater marshes. Inhabits riparian thickets of willow and other brushy tangles near watercourses. Needs water depths of about 1 inch that does not fluctuate during the year and dense vegetation for nesting habitat.	**Not Expected.** This species is not expected to occur within the study area due to lack of suitable aquatic habitat.
Cuckoos & relatives Cuculidae			
western yellow-billed cuckoo *Coccyzus americanus occidentalis*	Federal: FT, BCC State: SE Local: (MSHCP) WS; S1	Riparian forest nester, along the broad, lower flood-bottoms of larger river systems. Nests in riparian jungles of willow, often mixed with cottonwoods, with lower story of blackberry nettles, or wild grape.	**Not Expected.** This species is not expected to occur within the study area due to lack of suitable riparian habitat.

Common Name *Scientific Name*	**Sensitivity Status[1]**	**Preferred Habitat/Known Distribution[2]**	**Presence/Potential to Occur Within Biological Study Area**
True Owls ***Strigidae***			
long-eared owl *Asio otus*	Federal: None State: SSC Local: S3?	Roosts in dense vegetation and forage in open grasslands or shrublands; also open confirerous or deciduous woodlands. They occur at elevations ranging from near sea level to above 6,500 feet.	**Not Expected.** This species is not expected to occur within the study area due to lack of suitable riparian habitat.
burrowing owl *Athene cunicularia*	Federal: BCC State: SSC Local: (MSHCP) AS; S3	Inhabits coastal prairie, coastal scrub, Great Basin scrub, Mojavean desert scrub, Sonoran Desert scrub, annual and perennial grasslands, bare ground, and disturbed habitats characterized by low-growing vegetation. A subterranean nester dependent upon burrowing mammals, particularly the California ground squirrel.	**Low Potential.** This species has a low potential to occur due to lack of suitable nesting habitat.
Woodpeckers ***Picidae***			
Nuttall's woodpecker *Picoides nuttallii*	Federal: BCC State: None Local: None	Year-round resident of California oak woodlands, nesting in tree cavities.	**Not Expected.** This species is not expected to occur within the study area due to lack of oak woodlands and other suitable habitats.
Tyrant Flycatchers ***Tyrannidae***			
southwestern willow flycatcher *Empidonax traillii extimus*	Federal: FE State: SE Local: (MSHCP) WS; S1	For nesting, species requires dense riparian habitats (cottonwood/willow and tamarisk vegetation) with microclimatic conditions dictated by the local surroundings. Saturated soils, standing water, or nearby streams, pools, or cienegas are a component of nesting habitat that also influences the microclimate and density vegetation component. Habitat not suitable for nesting may be used for migration and foraging. Recurrent flooding and a natural hydrograph are important to withstand invading exotic species (tamarisk).	**Not Expected.** This species is not expected to occur within the study area due to lack of suitable habitat.

Common Name ***Scientific Name***	**Sensitivity Status**[1]	**Preferred Habitat/Known Distribution**[2]	**Presence/Potential to Occur Within Biological Study Area**
Shrikes ***Laniidae***			
loggerhead shrike *Lanius ludovicianus*	Federal: BCC State: SSC Local: S4	Found in broken woodlands, savannah, pinyon-juniper, Joshua tree, and riparian woodlands, desert oases, scrub and washes. Prefers open country for hunting, with perches for scanning, and fairly dense shrubs and brush for nesting.	**Not Expected.** This species is not expected to occur within the study area due to lack of suitable habitat.
Vireos ***Vireonidae***			
least Bell's vireo *Vireo bellii pusillus*	Federal: FE State: SE, SSC Local: (MSHCP) WS; S2	Known to occur in riparian forest, scrub, and woodland habitats. Summer resident of Southern California in low riparian in vicinity of water or in dry river bottoms; below 2,000 feet. Highly territorial and nests primarily in willow, mule fat, or mesquite habitats.	**Not Expected.** This species is not expected to occur within the study area due to lack of suitable riparian habitat.
Larks ***Alaudidae***			
California horned lark *Eremophila alpestris actia*	Federal: None State: WL Local: S4	Found from grasslands along the coast and deserts near sea level to alpine dwarf-shrub habitat above the tree line. During the winter, this species typically flocks in desert lowlands.	**Not Expected.** This species is not expected to occur within the study area due to lack of suitable habitat.
Wrens ***Troglodytidae***			
coastal cactus wren *Campylorhynchus brunneicapillus sandiegensis*	Federal: None State: SSC Local: S2	Known to occur in coastal scrub habitats. Nest almost exclusively in prickly pear (*Opuntia littoralis* and *O. oricola*) and coastal cholla (*O. prolifera*).	**Not Expected.** This species is not expected to occur within the study area due to lack of suitable habitat.

Common Name *Scientific Name*	Sensitivity Status[1]	Preferred Habitat/Known Distribution[2]	Presence/Potential to Occur Within Biological Study Area
Gnatcatchers ***Polioptilidae***			
coastal California gnatcatcher *Polioptila californica californica*	Federal: FT State: SSC Local: (MSHCP) AC; S2	Species is an obligate, permanent resident of coastal sage scrub habitats dominated by California sagebrush and flat-topped buckwheat, mainly on cismontane slopes below 1,500 feet in elevation. Low coastal sage scrub in arid washes, on mesas and slopes.	**Not Expected.** This species is not expected to occur within the study area due to lack of suitable sagebrush habitat.
Mockingbirds & Thrashers ***Mimidae***			
California thrasher *Toxostoma redivivum*	Federal: BCC State: None Local: None	A key species of California chaparral. Prefers areas of dense brush in chaparral.	**Not Expected.** This species is not expected to occur within the study area due to lack of suitable habitat.
Sparrows ***Passerellidae***			
southern California rufous-crowned sparrow *Aimophila ruficeps canescens*	Federal: None State: WL Local: (MSHCP) AC; S3	Known to frequent relatively steep, often rocky hillsides with grass and forb species. Resident in southern California coastal sage scrub and mixed chaparral habitats.	**Moderate Potential.** This species has a moderate potential to occur due to presence of suitable rocky hillside and scrub habitat.
Bell's sage sparrow *Artemisiospiza belli belli*	Federal: None State: WL Local: (MSHCP) AC; S3	Inhabits large, unfragmented blocks of coastal sage scrub, southern mixed chaparral habitats	**Not Expected.** This species is not expected to occur within the study area due to lack of suitable habitat.
Belding's savannah sparrow *Passerculus sandwichensis beldingi*	Federal: BCC State: SE Local: S3	Inhabits coastal salt marshes, from Santa Barbara south through San Diego County. Nests in *Salicornia* on and about margins of tidal flats.	**Not Expected.** This species is not expected to occur within the study area due to lack of suitable habitat.

Common Name *Scientific Name*	Sensitivity Status[1]	Preferred Habitat/Known Distribution[2]	Presence/Potential to Occur Within Biological Study Area
Yellow-Breasted Chats ***Icteriidae***			
yellow-breasted chat *Icteria virens*	Federal: None State: SSC Local: S3	Known to occur with riparian forest, scrub, and woodland habitats. Summer resident; inhabits riparian thickets of willow and other brushy tangles near watercourses. Nests in low, dense riparian, consisting of willow, blackberry, wild grape; forages and nests within 10 feet of ground.	**Not Expected.** This species is not expected to occur within the study area due to lack of suitable riparian habitat.
Blackbirds ***Icteridae***			
tricolored blackbird *Agelaius tricolor*	Federal: None State: ST; SSC Local: S1S2	Known to occur in freshwater marsh, marsh, swap, and wetland. Highly colonial species, most numerous in Central Valley and vicinity. Requires open water, protected nesting substrate, and foraging area with insect prey within a few kilometers of the colony.	**Not Expected.** This species is not expected to occur within the study area due to lack of suitable riparian habitat.
Bullock's oriole *Icterus bullockii*	Federal: BCC State: None Local: None	Known to occur in riparian and open woodlands.	**Not Expected.** This species is not expected to occur within the study area due to lack of suitable habitat.
yellow-headed blackbird *Xanthocephalus xanthocephalus*	Federal: None State: SSC Local: S3	Nests only where large insects such as Odonata are abundant, nesting timed with maximum emergence of aquatic insects. Nests in freshwater emergent wetlands with dense vegetation and deep water. Often along borders of lakes or ponds.	**Not Expected.** This species is not expected to occur within the study area due to lack of suitable habitat.
Finches ***Fringillidae***			
Lawrence's goldfinch *Spinus lawrencei*	Federal: BCC State: None Local: None	Occurs in valley foothill hardwood, valley foothill hardwood-conifer, desert riparian, palm oasis, pinyon-juniper and lower montane habitats	**Not Expected.** This species is not expected to occur within the study area due to lack of suitable habitat.
Wood-Warblers ***Parulidae***			
common yellowthroat *Geothlypis trichas*	Federal: BCC State: None Local: None	Often among tangled reeds, tule and rush, at the edge of marshes and wetlands.	**Not Expected.** This species is not expected to occur within the study area due to lack of suitable riparian habitat.

Common Name ***Scientific Name***	**Sensitivity Status[1]**	**Preferred Habitat/Known Distribution[2]**	**Presence/Potential to Occur Within Biological Study Area**
yellow warbler *Setophaga petechia*	Federal: None State: SSC Local: S3S4	Found in riparian forest, scrub, and woodland. Riparian plant associations in close proximity to water. Also nests in montane shrubbery in open conifer forests in Cascades and Sierra Nevada. Frequently found nesting and foraging in willow shrubs and thickets, and in other riparian plants including cottonwoods, sycamores, ash, and alders.	**Not Expected.** This species is not expected to occur within the study area due to lack of suitable riparian habitat.
Sylviid warblers, parrotbills ***Sylviidae***			
wrentit *Chamaea fasciata*	Federal: BCC State: None Local: None	Inhabitant of coastal scrub and chaparral along the west coast, often under dense vegetation.	**Low Potential.** This species has a low potential to occur due to marginal suitable habitat within the study area.
Hummingbirds ***Trochilidae***			
Allen’s hummingbird *Selasphorus sasin*	Federal: BCC State: None Local: None	Inhabitant of scrub and chaparral habitats along the Pacific Coast.	**Low Potential.** This species has a low potential to occur due to the presence of suitable foraging within the study area, but lacks suitable habitat for nesting within the study area.
MAMMALS			
Leaf-Nosed Bats ***Phyllostomidae***			
Lesser long-nosed bat *Leptonycteris yerbabuenae*	Federal: Delisted State: None Local: S1	Arid regions such as desert grasslands and shrub land. Suitable day roosts (caves, mines) and suitable concentrations of food plants (columnar cacti, agaves) are critical resources. No maternity roosts known from California; may only be vagrant.	**Not Expected.** This species is not expected to occur within the study area due to lack of suitable habitat.

Common Name ***Scientific Name***	**Sensitivity Status[1]**	**Preferred Habitat/Known Distribution[2]**	**Presence/Potential to Occur Within Biological Study Area**
Evening Bats ***Vespertilionidae***			
pallid bat *Antrozous pallidus*	Federal: None State: SSC Local: S3; WBWG-R	Occurs in a wide variety of habitats including chaparral, coastal scrub, desert wash, Great Basin grassland, Great Basin scrub, Mojavean desert scrub, riparian woodland, Sonoran Desert scrub, upper montane coniferous forest, valley and foothill grasslands. Most common in open, dry habitats with rocky areas for roosting. For roosting, prefers rocky outcrops, cliffs and crevices with access to open habitats for foraging. Roosts must protect species from high temperatures. Very sensitive to disturbance of roosting sites.	**Low Potential.** This species has a low potential to occur due to marginal roosting habitat present as large rocky outcroppings immediately adjacent to the project area.
western yellow bat *Lasiurus xanthinus*	Federal: None State: SSC Local: S3; WBWG-R	Known only in Los Angeles and San Bernardino Counties south to the Mexican border. This species has been recorded below 600 m (2000 ft) in valley foothill riparian, desert riparian, desert wash, and palm oasis habitats. Roosts primarily in trees, including under palm trees, and forages for insects over water and among trees.	**Not Expected.** This species is not expected to occur within the study area due to lack of suitable habitat.
Free-Tailed Bats ***Molossidae***			
western mastiff bat *Eumops perotis californicus*	Federal: None State: SSC Local: S3S4; WBWG-R	Known to occur in habitat consisting of extensive open areas within dry desert washes, flood plains, chaparral, cismontane oak woodland, coastal scrub, open ponderosa pine forest, and grasslands. Roosts primarily in crevices in rock outcrops and buildings.	**Low Potential.** This species has a low potential to occur due to marginal roosting habitat present in large rocky outcroppings immediately adjacent to the project area.

Common Name ***Scientific Name***	**Sensitivity Status[1]**	**Preferred Habitat/Known Distribution[2]**	**Presence/Potential to Occur Within Biological Study Area**
pocketed free-tailed bat *Nyctinomops femorosaccus*	Federal: None State: SSC Local: S3; WBWG-Y	Inhabits pinyon-juniper woodlands, riparian scrub, Sonoran Desert scrub, desert succulent shrub, desert riparian, desert wash, alkali desert scrub, Joshua tree woodland, and palm oasis. Typically roosts in caves and rocky outcrops; prefers cliffs in order to obtain flight speed. Feeds on insects flying over bodies of water or arid desert habitats to capture prey.	**Not Expected.** This species is not expected to occur within the study area due to lack of suitable foraging habitat.
Rabbits & Hares ***Leporidae***			
San Diego black-tailed jackrabbit *Lepus californicus bennettii*	Federal: None State: SSC Local: S3S4	Inhabits open grasslands, agricultural fields, and sparse coastal scrub where they occur primarily in arid regions with short grass.	**Not Expected.** This species is not expected to occur within the study area due to lack of suitable habitat.
Kangaroo rats, Pocket mice, & Kangaroo mice ***Heteromyidae***			
northwestern San Diego pocket mouse *Chaetodipus fallax fallax*	Federal: None State: SSC Local: S3S4	Moderate canopy coverage of coastal scrub, sagebrush, chaparral, grasslands, pinyon-juniper, and desert wash and scrub. Found in sandy, herbaceous areas with nearby shrubs for cover. Burrows are typically dug within gravelly or sandy soil.	**Low Potential.** This species has a low potential to occur due to the limited amount of sandy herbaceous areas for foraging. Moderate canopy coverage is present within brittle bush scrub but species is unlikely to forage in majority of BSA.
San Bernardino kangaroo rat *Dipodomys merriami parvus*	Federal: FE State: CE, SSC Local: S1	Alluvial scrub vegetation on sandy loam substrates characteristic of alluvial fans and flood plains among coastal scrub.	**Not Expected.** This species is not expected to occur within the study area due to lack of alluvial fan scrub habitat in the study area.
Stephens' kangaroo rat *Dipodomys stephensi*	Federal: FE State: ST Local: (MSHCP) AC; S2	Inhabits annual and perennial grassland habitats, but may occur in coastal scrub or sagebrush with sparse canopy cover, or in disturbed areas. Known to occur in sparse perennial vegetation with firm soil, "neither hard nor sandy."	**Not Expected.** This species is not expected to occur due to the project being located outside occupied SKR habitat and is not located within an SKR HCP Core Reserve.
Los Angeles pocket mouse *Perognathus longimembris brevinasus*	Federal: None State: SSC Local: (MSHCP) AS; S1S2	Found in lower elevation grasslands and coastal sage scrub communities associated with sandy washes or areas of windblown sand.	**Low Potential.** This species has a low potential to occur due to the marginal presence of suitable habitat such as sandy washes and areas of windblown sand. Grassland and coastal sage scrub communities are absent from the BSA.

Common Name ***Scientific Name***	**Sensitivity Status[1]**	**Preferred Habitat/Known Distribution[2]**	**Presence/Potential to Occur Within Biological Study Area**
Mice, Rats, & Voles ***Muridae***			
San Diego desert woodrat *Neotoma lepida intermedia*	Federal: None State: SSC Local: S3S4	Found in a variety of coastal scrub, desert scrub, chaparral, cactus, and rocky habitats. Nests primarily against rock outcroppings, boulders, cacti, or areas of dense undergrowth.	**Moderate Potential.** This species has a moderate potential to occur due to presence of suitable habitat and the presence of unidentified woodrat nests in rocky outcroppings adjacent to the 100-foot buffer.
southern grasshopper mouse *Onychomys torridus ramona*	Federal: None State: SSC Local: S3S4	Alkali desert scrub and desert scrub habitats are preferred, with somewhat lower densities expected in other desert habitats, including succulent shrub, wash, and riparian areas. Also occurs in coastal scrub, mixed chaparral, sagebrush, low sage, and bitterbrush habitats. Uncommon in valley foothill and montane riparian, and in a variety of other habitats.	**Not Expected.** This species is not expected to occur within the study area due to lack of suitable habitat.
Weasels & relatives ***Mustelidae***			
American badger *Taxidea taxus*	Federal: None State: SSC Local: S3	Found in a variety of habitats, including alkali marsh, desert wash, Great Basin scrub, marsh and swamp, meadow and seep, Mojavean desert scrub, riparian scrub, riparian woodland, valley and foothill grassland. Most abundant in drier open stages of most shrub, forest, and herbaceous habitats, with friable soils. Needs sufficient food, friable soils, and open, uncultivated ground to dig burrows. Preys on burrowing rodents.	**Not Expected.** This species is not expected to occur within the study area due to lack of suitable habitat.

[1] **Sensitivity Status**

Federal (USFWS)

BGEPA	*Bald and Golden Eagle Protection Act*
FE	*Federally Endangered*
FT	*Federally Threatened*
FPE	*Federally Proposed as Endangered*
FPT	*Federally Proposed as Threatened*
BCC	*Bird of Conservation Concern*

State

FP	*Fully Protected*
SE	*State Endangered*
ST	*State Threatened*
SCE	*State Candidate as Endangered*
SCT	*State Candidate as Threatened*
SSC	*State Species of Special Concern*
WL	*Watch List*
WBWG	*Western Bat Working Group Regional Priority Matrix Species*

The California Natural Diversity Database (CNDDB) uses the same ranking methodology originally developed by The Nature Conservancy and now maintained and recently revised by NatureServe. The state rank (S-rank) refers to the imperilment status only within California's state boundaries. It is a reflection of the overall status of an element through its state range. The state rank represents a letter + number score that reflects a combination of Rarity, Threat, and Trend factors, with weighting being heavier on Rarity than the other two.

S1 = Critically Imperiled - Critically imperiled in the state because of extreme rarity (often 5 or fewer populations) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the state.
S2 = Imperiled - Imperiled in the state because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the state.
S3 = Vulnerable - Vulnerable in the state due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation from the state.
S4 = At a fairly low risk of extirpation in the state due to an extensive range and/or many populations or occurrences, but with possible cause for some concern as a result of local recent declines, threats, or other factors
SXSX = expresses the ranks as a range of values: e.g., S3S4 indicates the rank is somewhere between S3 and S4.

Local Include the local sensitivity rankings as applicable to the project.

Western Riverside County MSHCP (MSHCP)

- WS = Wetland Species under the MSHCP – additional surveys may be required as part of wetlands mapping per the MSHCP
- AS = Additional surveys may be required for these species within locations shown on survey maps as described in *Section 6.3.2* of the MSHCP.
- AC = Adequately Conserved Species under the MSHCP

[2] **Sources for Preferred Habitat:**

CDFW. 2022. California Natural Diversity Database (CNDDB). RareFind, Version 5.0 (Commercial Subscription). Sacramento, California: CDFW, Biogeographic Data Branch. Available online at: https://www.wildlife.ca.gov/Data/CNDDB/Maps-and-Data. Accessed on November 02, 2022.

CDFW. 2022b. California Wildlife Habitat Relationships. Available online at: https://wildlife.ca.gov/Data/CWHR/Life-History-and-Range. Accessed on November 02, 2022

eBird. 2022. Species Maps. Available online at: https://ebird.org/map. Accessed on November 02, 2022

iNaturalist. 2022. Observations. Available online at: https://www.inaturalist.org/observations. Accessed on November 02, 2022

Source: ESA, 2023.

Appendix CUL

Cultural Resources Technical Report (Confidential)

ESA

Appendix NOP

Notice of Preparation and Comments Received

NOTICE OF PREPARATION
OF AN ENVIRONMENTAL IMPACT REPORT

DATE: November 21, 2022

TO: Responsible Agencies, Trustee Agencies, Interested Parties

LEAD AGENCY: Eastern Municipal Water District

PROJECT TITLE: Pettit Water Storage Tank Expansion and Transmission Pipeline Project

PUBLIC REVIEW PERIOD: November 21, 2022 through December 21, 2022

PROJECT DESCRIPTION: This Notice of Preparation (NOP) has been prepared to notify agencies and interested parties that Eastern Municipal Water District (EMWD), as the lead agency pursuant to the California Environmental Quality Act (CEQA), is preparing an Environmental Impact Report (EIR) for the Pettit Water Storage Tank Expansion and Transmission Pipeline Project (proposed project). The proposed project would involve installation of two new 4.5 million-gallon (MG) storage tanks on the project site and demolition of an existing 2 MG storage tank. The new tanks would be fed by approximately 4,000 linear feet of proposed transmission pipeline to connect to the Cactus II Feeder. The proposed project would be implemented in phases: the first phase would involve construction and operation of one 4.5 MG storage tank and associated pipeline; the second phase would involve demolition of the existing 2 MG storage tank and installation of a second 4.5 MG storage tank in its place. The proposed project would support planned development in east Moreno Valley. A brief, initial discussion of potential environmental impacts is included in **Attachment A** to this NOP.

PROJECT LOCATION: The proposed water storage tanks would be constructed on parcels owned by EMWD located on the western side of Moreno Beach Drive in Moreno Valley. Appurtenant facilities would be installed just east of Moreno Beach Drive within the roadway right-of-way. The pipeline would be installed within rights-of-way within Moreno Beach Drive and Alessandro Boulevard. Proposed project facilities are shown on **Figure 1**.

PUBLIC REVIEW AND COMMENTS: EMWD is soliciting comments from responsible and trustee agencies as well as interested parties as to the scope and content of the environmental information to be included in the EIR. In accordance with CEQA, agencies are requested to review the project description provided in this NOP and provide comments on environmental issues related to the statutory responsibilities of the agency. The EIR will be used by EMWD when considering approval of the proposed project as well as any related discretionary approvals. All comments to the NOP are due no later than **4:00 p.m.** on **December 21, 2022**. Please send your comments to the mailing address or email address shown below. Include a return address or email address and a contact name for your agency or party with your comments.

CONTACT PERSON: Eastern Municipal Water District
2270 Trumble Road or P.O. Box 8300
Perris, CA 92572-8300
Attn: Joe Broadhead, Principal Water Resources Specialist
broadhej@emwd.org
Phone: 951-928-3777 ext. 4545

DOCUMENT AVAILABILITY: Copies of the NOP are available at EMWD's office, located at 2270 Trumble Road, Perris, CA 92570, as well as at the Moreno Valley Public Library located at 25480 Alessandro Boulevard, Moreno Valley, CA 92553. The NOP is also available online at the EMWD Web Site (https://www.emwd.org/public-notices).

SOURCE: ESA (2022)

EMWD Pettit

Figure 1
Project Location

ESA

ATTACHMENT A

Potential Environmental Impacts

The EIR will assess and disclose the reasonably foreseeable direct, indirect, and cumulative impacts that would likely result from the construction and operation of the proposed project. Potential impacts to resources listed in Appendix G of the CEQA Guidelines are summarized below. The EIR will identify mitigation measures if necessary to avoid, minimize, and offset potentially significant impacts of the project. The EIR also will evaluate alternatives to the proposed project that would avoid, minimize, and offset potentially significant impacts of the project while attempting to meet the objectives of the proposed project.

Aesthetics

Views in the project area consist mainly of residential land uses and open space with distant mountain vistas in the background. There are no officially designated California State Scenic Highways within the project area and local roadways are not considered scenic. Implementation of the proposed project would require demolition of an existing storage tank and construction and operation of two 4.5 MG storage tanks, along with an underground 4,000 linear foot transmission pipeline. The EIR will evaluate the potential for construction and operation of the proposed project to affect aesthetic resources, including potential impacts to scenic vistas and views, impacts to the visual character and public views of the project area, and potential impacts related to new light or glare sources.

Agriculture and Forestry Resources

The proposed project area includes lands primarily classified as "urban and built-up land," and land designated as "other" by the California Department of Conservation. There are no active Williamson Act Contracts, forestland, or timberland within the project area. The EIR will evaluate whether the proposed project would impact Farmland Mapping and Monitoring Program-designated farmland, or whether any agricultural or forestry land would be converted to non-agricultural or non-forestry uses.

Air Quality

Construction and operation of the proposed project could create air emissions that would result from construction equipment exhaust, ground disturbance during construction, material hauling, construction employee-commute travel, vehicle operational maintenance trips, and vehicle trips associated with any increases in employment. The EIR will estimate pollutant emissions from construction and operational activities.

Biological Resources

The proposed project could result in changes to wildlife habitat and disturbance of sensitive species during construction and operation. Site grading and introduction of new storage and transmission facilities could impact existing floral and faunal species or their habitats. The EIR will discuss local ordinances and state and federal regulations governing biological resources, and will evaluate the potential for construction and operation of the proposed project to affect special-status species, riparian habitat or sensitive natural communities, wetlands, wildlife movement corridors, plans or ordinances, and conservation plans.

Cultural Resources

The proposed project would require ground disturbing activities during construction that could unearth known or unknown archeological and historic sites, as well as human remains. Additionally, operation of project facilities could affect the integrity of historical or archaeological resources. The EIR will assess the potential effects of the proposed project on cultural resources during construction and operation.

Energy

The proposed project could require generation of energy during construction and operation of the proposed project. The EIR will evaluate energy demand from construction equipment, haul trucks, vendor trucks, and construction workers, and will assess the project's anticipated operational energy needs. The EIR will assess the potential effects of consumption of energy resources during project implementation as well as any conflicts the project may have with existing energy efficiency policies.

Geology and Soils

The proposed project is located in Riverside County, which is a seismically active region in California. The construction of new facilities could be subject to potential seismic hazards including ground shaking. In addition, construction activities could expose soils to storm water erosion. The EIR will evaluate geologic hazards in the region and in the project area, such as the potential for ground shaking, liquefaction, expansive soils, soil erosion and landslides, as well as the likelihood that the project would destroy a unique paleontological resource or unique geologic feature.

Greenhouse Gas Emissions

Implementation of the proposed project would result in the generation of greenhouse gas (GHG) emissions associated with construction and operation. The EIR will estimate construction-related emissions and long-term operational emissions, including total CO2-equivalent emissions for evaluating the effects of GHGs. The EIR will examine the project's effects on global climate change and evaluate consistency of the project with the State's GHG emissions reduction goals.

Hazards and Hazardous Materials

Excavation activities during construction of the proposed storage tanks and transmission pipeline could uncover contaminated soils or hazardous substances that pose a substantial hazard to human health or the environment. The EIR will assess the potential for the public or the environment to be affected by routine use and accidental release of hazardous materials due to project construction and operation. Additionally, the EIR will assess the potential for the project area to be located within a hazardous material site, the potential for the project to result in safety hazards associated with a nearby airport or school, interference with an emergency response plan, or exposure of people or structures to an increased wildfire risk.

Hydrology and Water Quality

Construction and operation of the proposed project could affect water quality and drainage patterns, particularly if excavation activities result in sediment or spills runoff. The EIR will identify all impacts to water quality, erosion, drainage patterns, surface runoff, groundwater resources, and flood zone impacts as a result of project implementation, and will assess the project's compliance with water quality control or sustainable groundwater management plans.

Land Use and Planning

The proposed project would construct facilities within the City of Moreno Valley in a rural residential area zoned as Residential Agriculture 2 DU/AC (RA2). The project's infrastructure would be installed within public rights-of-way or on property owned by EMWD. The EIR will evaluate the compatibility of the proposed projects with surrounding land use, and will assess whether the proposed project will divide an established community.

Mineral Resources

The proposed project would involve ground-disturbing activities that could impact the availability of known mineral resources. A majority of the project area is within Mineral Resources Zone 3, where the significance of mineral deposits is undetermined or within "Urban Areas." There are isolated areas designated as Mineral Resource Zone 2 throughout the City of Moreno Valley, which are areas underlain by mineral deposits where geologic information indicates that significant inferred resources are present. The EIR will identify if impacts to mineral resources or mineral resource recovery sites would result from implementation of the proposed project.

Noise

Implementation of the proposed project would require construction and operation of project elements that would generate noise and vibration. Construction activities that could be a significant source of noise and vibration include trucking operations and use of heavy construction equipment (e.g., graders, cranes, frontend loaders, and blasting equipment). During project operation, it is unlikely that project facilities could generate permanent sources of noise. The EIR will describe the City of Moreno Valley noise policies and ordinances, and assess potential noise and vibration impacts associated with an increase in ambient noise or vibration levels, and excessive noise generated near airports.

Population and Housing/Growth

Implementation of the proposed project would expand EMWD's potable water system and accommodate planned growth in the area. The proposed project would not build new housing or otherwise have a direct impact on population growth in the project area, nor would it require displacement of existing residents. The EIR will evaluate the potential for the proposed project to indirectly induce growth and result in secondary environmental effects associated with growth.

Public Services

Implementation of the proposed project is unlikely to affect demand for public services, or require new or expanded facilities for public service providers. The EIR will include an assessment of the project's potential to affect existing police and fire protection services, schools, parks, or other facilities during construction and operational activities.

Recreation

The EIR will identify existing recreational areas within the project area and will analyze potential effects to existing local recreational resources or the need to construct/expand additional recreational resources.

Transportation

Construction of the proposed project could affect traffic on local roadways as a result of hauling of material and equipment, road detours, and an increase in traffic hazards caused by construction activities. Additionally, the construction of the proposed transmission pipeline would occur within the established right-of-way of Moreno Beach Drive, which could impact local circulation patterns in the City of Moreno Valley. It is not anticipated that operation of the project would result in significant traffic impacts once all facilities are installed. The EIR will evaluate whether the project conflicts with applicable circulation system plans and policies, be inconsistent with regulations related to vehicle miles traveled, substantially increase geometric design-related hazards, or result in inadequate emergency access the project area.

Tribal Cultural Resources

Pursuant to AB 52, EMWD will conduct consultation with Native American Tribes who have requested to be informed of activities initiated by EMWD. There is a potential for the proposed project to affect tribal cultural resources during ground-disturbing activities associated with construction of the proposed project. The EIR will evaluate potential impacts to tribal cultural resources and incorporate the results of AB 52 consultations into the analysis.

Utilities and Service Systems

The proposed project could result in the relocation or temporary disruption of existing water, wastewater, stormwater, electricity, telecommunications, gas utilities, and solid waste facilities serving the project's local community. Existing and projected regional utility supplies, demands, and facilities will be described along with any constraints or service deficiencies in the region. The EIR will evaluate the project's potential to affect these utilities and service systems in the project area.

Wildfire

The project site is located within rural residential area in the City of Moreno Valley. The project site is located within a Local Responsibility Area and within a Very High Fire Hazard Severity Zone. During construction, equipment and on-site diesel fuel could pose a risk to wildfire with possible ignition sources such as internal combustion engines, gasoline-powered tools, and equipment that could produce a spark, fire, or flame. The use of spark-producing construction machinery within fire risk areas such as the project area could expose temporary project workers and contractors to pollutant concentrations from a wildfire or the uncontrolled spread of wildfire. The EIR will evaluate potential impacts of wildfires due to implementation of the proposed project.

NATIVE AMERICAN HERITAGE COMMISSION

NAHC HEADQUARTERS
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(916) 373-3710
nahc@nahc.ca.gov
NAHC.ca.gov

November 21, 2022

Joe Broadhead
Eastern Municipal Water District
2270 Trumble Road
Perris, CA 92572

Re: 2022110477, Pettit Water Storage Tank Expansion and Transmission Pipeline Project, Riverside County

Dear Mr. Broadhead:

The Native American Heritage Commission (NAHC) has received the Notice of Preparation (NOP), Draft Environmental Impact Report (DEIR) or Early Consultation for the project referenced above. The California Environmental Quality Act (CEQA) (Pub. Resources Code §21000 et seq.), specifically Public Resources Code §21084.1, states that a project that may cause a substantial adverse change in the significance of a historical resource, is a project that may have a significant effect on the environment. (Pub. Resources Code § 21084.1; Cal. Code Regs., tit.14, §15064.5 (b) (CEQA Guidelines §15064.5 (b)). If there is substantial evidence, in light of the whole record before a lead agency, that a project may have a significant effect on the environment, an Environmental Impact Report (EIR) shall be prepared. (Pub. Resources Code §21080 (d); Cal. Code Regs., tit. 14, § 5064 subd.(a)(1) (CEQA Guidelines §15064 (a)(1)). In order to determine whether a project will cause a substantial adverse change in the significance of a historical resource, a lead agency will need to determine whether there are historical resources within the area of potential effect (APE).

CEQA was amended significantly in 2014. Assembly Bill 52 (Gatto, Chapter 532, Statutes of 2014) (AB 52) amended CEQA to create a separate category of cultural resources, "tribal cultural resources" (Pub. Resources Code §21074) and provides that a project with an effect that may cause a substantial adverse change in the significance of a tribal cultural resource is a project that may have a significant effect on the environment. (Pub. Resources Code §21084.2). Public agencies shall, when feasible, avoid damaging effects to any tribal cultural resource. (Pub. Resources Code §21084.3 (a)). AB 52 applies to any project for which a notice of preparation, a notice of negative declaration, or a mitigated negative declaration is filed on or after July 1, 2015. If your project involves the adoption of or amendment to a general plan or a specific plan, or the designation or proposed designation of open space, on or after March 1, 2005, it may also be subject to Senate Bill 18 (Burton, Chapter 905, Statutes of 2004) (SB 18). Both SB 18 and AB 52 have tribal consultation requirements. If your project is also subject to the federal National Environmental Policy Act (42 U.S.C. § 4321 et seq.) (NEPA), the tribal consultation requirements of Section 106 of the National Historic Preservation Act of 1966 (154 U.S.C. 300101, 36 C.F.R. §800 et seq.) may also apply.

The NAHC recommends consultation with California Native American tribes that are traditionally and culturally affiliated with the geographic area of your proposed project as early as possible in order to avoid inadvertent discoveries of Native American human remains and best protect tribal cultural resources. Below is a brief summary of portions of AB 52 and SB 18 as well as the NAHC's recommendations for conducting cultural resources assessments.

Consult your legal counsel about compliance with AB 52 and SB 18 as well as compliance with any other applicable laws.

AB 52

AB 52 has added to CEQA the additional requirements listed below, along with many other requirements:

1. Fourteen Day Period to Provide Notice of Completion of an Application/Decision to Undertake a Project: Within fourteen (14) days of determining that an application for a project is complete or of a decision by a public agency to undertake a project, a lead agency shall provide formal notification to a designated contact of, or tribal representative of, traditionally and culturally affiliated California Native American tribes that have requested notice, to be accomplished by at least one written notice that includes:

a. A brief description of the project.
b. The lead agency contact information.
c. Notification that the California Native American tribe has 30 days to request consultation. (Pub. Resources Code §21080.3.1 (d)).
d. A "California Native American tribe" is defined as a Native American tribe located in California that is on the contact list maintained by the NAHC for the purposes of Chapter 905 of Statutes of 2004 (SB 18). (Pub. Resources Code §21073).

2. Begin Consultation Within 30 Days of Receiving a Tribe's Request for Consultation and Before Releasing a Negative Declaration, Mitigated Negative Declaration, or Environmental Impact Report: A lead agency shall begin the consultation process within 30 days of receiving a request for consultation from a California Native American tribe that is traditionally and culturally affiliated with the geographic area of the proposed project. (Pub. Resources Code §21080.3.1, subds. (d) and (e)) and prior to the release of a negative declaration, mitigated negative declaration or Environmental Impact Report. (Pub. Resources Code §21080.3.1(b)).

a. For purposes of AB 52, "consultation shall have the same meaning as provided in Gov. Code §65352.4 (SB 18). (Pub. Resources Code §21080.3.1 (b)).

3. Mandatory Topics of Consultation If Requested by a Tribe: The following topics of consultation, if a tribe requests to discuss them, are mandatory topics of consultation:

a. Alternatives to the project.
b. Recommended mitigation measures.
c. Significant effects. (Pub. Resources Code §21080.3.2 (a)).

4. Discretionary Topics of Consultation: The following topics are discretionary topics of consultation:

a. Type of environmental review necessary.
b. Significance of the tribal cultural resources.
c. Significance of the project's impacts on tribal cultural resources.
d. If necessary, project alternatives or appropriate measures for preservation or mitigation that the tribe may recommend to the lead agency. (Pub. Resources Code §21080.3.2 (a)).

5. Confidentiality of Information Submitted by a Tribe During the Environmental Review Process: With some exceptions, any information, including but not limited to, the location, description, and use of tribal cultural resources submitted by a California Native American tribe during the environmental review process shall not be included in the environmental document or otherwise disclosed by the lead agency or any other public agency to the public, consistent with Government Code §6254 (r) and §6254.10. Any information submitted by a California Native American tribe during the consultation or environmental review process shall be published in a confidential appendix to the environmental document unless the tribe that provided the information consents, in writing, to the disclosure of some or all of the information to the public. (Pub. Resources Code §21082.3 (c)(1)).

6. Discussion of Impacts to Tribal Cultural Resources in the Environmental Document: If a project may have a significant impact on a tribal cultural resource, the lead agency's environmental document shall discuss both of the following:

a. Whether the proposed project has a significant impact on an identified tribal cultural resource.
b. Whether feasible alternatives or mitigation measures, including those measures that may be agreed to pursuant to Public Resources Code §21082.3, subdivision (a), avoid or substantially lessen the impact on the identified tribal cultural resource. (Pub. Resources Code §21082.3 (b)).

7. Conclusion of Consultation: Consultation with a tribe shall be considered concluded when either of the following occurs:

a. The parties agree to measures to mitigate or avoid a significant effect, if a significant effect exists, on a tribal cultural resource; or

b. A party, acting in good faith and after reasonable effort, concludes that mutual agreement cannot be reached. (Pub. Resources Code §21080.3.2 (b)).

8. Recommending Mitigation Measures Agreed Upon in Consultation in the Environmental Document: Any mitigation measures agreed upon in the consultation conducted pursuant to Public Resources Code §21080.3.2 shall be recommended for inclusion in the environmental document and in an adopted mitigation monitoring and reporting program, if determined to avoid or lessen the impact pursuant to Public Resources Code §21082.3, subdivision (b), paragraph 2, and shall be fully enforceable. (Pub. Resources Code §21082.3 (a)).

9. Required Consideration of Feasible Mitigation: If mitigation measures recommended by the staff of the lead agency as a result of the consultation process are not included in the environmental document or if there are no agreed upon mitigation measures at the conclusion of consultation, or if consultation does not occur, and if substantial evidence demonstrates that a project will cause a significant effect to a tribal cultural resource, the lead agency shall consider feasible mitigation pursuant to Public Resources Code §21084.3 (b). (Pub. Resources Code §21082.3 (e)).

10. Examples of Mitigation Measures That, If Feasible, May Be Considered to Avoid or Minimize Significant Adverse Impacts to Tribal Cultural Resources:

a. Avoidance and preservation of the resources in place, including, but not limited to:

i. Planning and construction to avoid the resources and protect the cultural and natural context.

ii. Planning greenspace, parks, or other open space, to incorporate the resources with culturally appropriate protection and management criteria.

b. Treating the resource with culturally appropriate dignity, taking into account the tribal cultural values and meaning of the resource, including, but not limited to, the following:

i. Protecting the cultural character and integrity of the resource.

ii. Protecting the traditional use of the resource.

iii. Protecting the confidentiality of the resource.

c. Permanent conservation easements or other interests in real property, with culturally appropriate management criteria for the purposes of preserving or utilizing the resources or places.

d. Protecting the resource. (Pub. Resource Code §21084.3 (b)).

e. Please note that a federally recognized California Native American tribe or a non-federally recognized California Native American tribe that is on the contact list maintained by the NAHC to protect a California prehistoric, archaeological, cultural, spiritual, or ceremonial place may acquire and hold conservation easements if the conservation easement is voluntarily conveyed. (Civ. Code §815.3 (c)).

f. Please note that it is the policy of the state that Native American remains and associated grave artifacts shall be repatriated. (Pub. Resources Code §5097.991).

11. Prerequisites for Certifying an Environmental Impact Report or Adopting a Mitigated Negative Declaration or Negative Declaration with a Significant Impact on an Identified Tribal Cultural Resource: An Environmental Impact Report may not be certified, nor may a mitigated negative declaration or a negative declaration be adopted unless one of the following occurs:

a. The consultation process between the tribes and the lead agency has occurred as provided in Public Resources Code §21080.3.1 and §21080.3.2 and concluded pursuant to Public Resources Code §21080.3.2.

b. The tribe that requested consultation failed to provide comments to the lead agency or otherwise failed to engage in the consultation process.

c. The lead agency provided notice of the project to the tribe in compliance with Public Resources Code §21080.3.1 (d) and the tribe failed to request consultation within 30 days. (Pub. Resources Code §21082.3 (d)).

SB 18

SB 18 applies to local governments and requires local governments to contact, provide notice to, refer plans to, and consult with tribes prior to the adoption or amendment of a general plan or a specific plan, or the designation of open space. (Gov. Code §65352.3). Local governments should consult the Governor's Office of Planning and Research's "Tribal Consultation Guidelines," which can be found online at: https://www.opr.ca.gov/docs/09_14_05_Updated_Guidelines_922.pdf.

Some of SB 18's provisions include:

1. Tribal Consultation: If a local government considers a proposal to adopt or amend a general plan or a specific plan, or to designate open space it is required to contact the appropriate tribes identified by the NAHC by requesting a "Tribal Consultation List." If a tribe, once contacted, requests consultation the local government must consult with the tribe on the plan proposal. A tribe has 90 days from the date of receipt of notification to request consultation unless a shorter timeframe has been agreed to by the tribe. (Gov. Code §65352.3 (a)(2)).
2. No Statutory Time Limit on SB 18 Tribal Consultation. There is no statutory time limit on SB 18 tribal consultation.
3. Confidentiality: Consistent with the guidelines developed and adopted by the Office of Planning and Research pursuant to Gov. Code §65040.2, the city or county shall protect the confidentiality of the information concerning the specific identity, location, character, and use of places, features and objects described in Public Resources Code §5097.9 and §5097.993 that are within the city's or county's jurisdiction. (Gov. Code §65352.3 (b)).
4. Conclusion of SB 18 Tribal Consultation: Consultation should be concluded at the point in which:
   a. The parties to the consultation come to a mutual agreement concerning the appropriate measures for preservation or mitigation; or
   b. Either the local government or the tribe, acting in good faith and after reasonable effort, concludes that mutual agreement cannot be reached concerning the appropriate measures of preservation or mitigation. (Tribal Consultation Guidelines, Governor's Office of Planning and Research (2005) at p. 18).

Agencies should be aware that neither AB 52 nor SB 18 precludes agencies from initiating tribal consultation with tribes that are traditionally and culturally affiliated with their jurisdictions before the timeframes provided in AB 52 and SB 18. For that reason, we urge you to continue to request Native American Tribal Contact Lists and "Sacred Lands File" searches from the NAHC. The request forms can be found online at: http://nahc.ca.gov/resources/forms/.

NAHC Recommendations for Cultural Resources Assessments

To adequately assess the existence and significance of tribal cultural resources and plan for avoidance, preservation in place, or barring both, mitigation of project-related impacts to tribal cultural resources, the NAHC recommends the following actions:

1. Contact the appropriate regional California Historical Research Information System (CHRIS) Center (https://ohp.parks.ca.gov/?page_id=30331) for an archaeological records search. The records search will determine:
   a. If part or all of the APE has been previously surveyed for cultural resources.
   b. If any known cultural resources have already been recorded on or adjacent to the APE.
   c. If the probability is low, moderate, or high that cultural resources are located in the APE.
   d. If a survey is required to determine whether previously unrecorded cultural resources are present.

2. If an archaeological inventory survey is required, the final stage is the preparation of a professional report detailing the findings and recommendations of the records search and field survey.
   a. The final report containing site forms, site significance, and mitigation measures should be submitted immediately to the planning department. All information regarding site locations, Native American human remains, and associated funerary objects should be in a separate confidential addendum and not be made available for public disclosure.
   b. The final written report should be submitted within 3 months after work has been completed to the appropriate regional CHRIS center.

3. Contact the NAHC for:

a. A Sacred Lands File search. Remember that tribes do not always record their sacred sites in the Sacred Lands File, nor are they required to do so. A Sacred Lands File search is not a substitute for consultation with tribes that are traditionally and culturally affiliated with the geographic area of the project's APE.

b. A Native American Tribal Consultation List of appropriate tribes for consultation concerning the project site and to assist in planning for avoidance, preservation in place, or, failing both, mitigation measures.

4. Remember that the lack of surface evidence of archaeological resources (including tribal cultural resources) does not preclude their subsurface existence.

a. Lead agencies should include in their mitigation and monitoring reporting program plan provisions for the identification and evaluation of inadvertently discovered archaeological resources per Cal. Code Regs., tit. 14, §15064.5(f) (CEQA Guidelines §15064.5(f)). In areas of identified archaeological sensitivity, a certified archaeologist and a culturally affiliated Native American with knowledge of cultural resources should monitor all ground-disturbing activities.

b. Lead agencies should include in their mitigation and monitoring reporting program plans provisions for the disposition of recovered cultural items that are not burial associated in consultation with culturally affiliated Native Americans.

c. Lead agencies should include in their mitigation and monitoring reporting program plans provisions for the treatment and disposition of inadvertently discovered Native American human remains. Health and Safety Code §7050.5, Public Resources Code §5097.98, and Cal. Code Regs., tit. 14, §15064.5, subdivisions (d) and (e) (CEQA Guidelines §15064.5, subds. (d) and (e)) address the processes to be followed in the event of an inadvertent discovery of any Native American human remains and associated grave goods in a location other than a dedicated cemetery.

If you have any questions or need additional information, please contact me at my email address: Andrew.Green@nahc.ca.gov.

Sincerely,

Andrew Green

Andrew Green
Cultural Resources Analyst

cc: State Clearinghouse

Sarah Spano

From: Broadhead, Joseph <broadhej@emwd.org>
Sent: Wednesday, December 7, 2022 10:55 AM
To: Liao, William
Cc: Castellanos, David; SCG SE Region Redlands Utility Request; Samartin, Emilio T.; Tapia, Valerie; Garcia, Jethro; Sarah Spano; Carey, Christopher
Subject: RE: Pettit Water Storage Tank Expansion and Transmission Pipeline Project

William,

Thank you for the quick response on Pettit Tanks. We will include your information in our document, and will be sure to call prior to any excavations.

Thanks again.

Joseph Broadhead
Principal Water Resource Specialist
Eastern Municipal Water District
2270 Trumble Road
P.O. Box 8300
Perris, CA 92572-8300
T (951) 928-3777 ext. 4545
broadhej@emwd.org

From: Liao, William <WLiao@socalgas.com>
Sent: Wednesday, December 7, 2022 10:45 AM
To: Broadhead, Joseph <broadhej@emwd.org>
Cc: Castellanos, David <DCastellanos@socalgas.com>; SCG SE Region Redlands Utility Request <SCGSERegionRedlandsUtilityRequest@semprautilities.com>; Samartin, Emilio T. <ETSamartin@socalgas.com>; Tapia, Valerie <VTapia@socalgas.com>; Garcia, Jethro <JGarcia8@socalgas.com>
Subject: Pettit Water Storage Tank Expansion and Transmission Pipeline Project

Hi Joe.

I just received via mail some paperwork regarding the Pettit Water Storage Tank Expansion and Transmission Pipeline Project.

SoCalGas has both Medium Pressure and High Pressure facilities in your project area:

- MP line on Bay crossing Moreno Beach
- MP and HP (Transmission) lines on Cottonwood crossing Moreno Beach
- MP line on Moreno Beach north of Cottonwood
- Possibly others

Please be sure to contact USA / Dig Alert prior to any excavations so our District personnel can have a chance to locate and mark out our facilities. Excavations over our HP lines will require Transmission personnel to be on-site for High Pressure Stand-By.

If you need maps, please contact SCG SE Region Redlands Utility Request at SCGSERegionRedlandsUtilityRequest@semprautilities.com.

If there is any need for gas service, please contact our New Business section via their website to initiate the application process, at https://www.socalgas.com/for-your-business/builder-services.

Please let me know if you have any questions.

Will Liao
Region Planning Supervisor
Redlands HQ / Southeast Region
Desk: 213-244-4543
Mobile: 562-889-1981

Appendix PALEO

Paleontological Resources Assessment Report (Confidential)

ESA

Appendix PDR

Preliminary Design Report

ESA

KLEINFELDER
Bright People. Right Solutions.

September 14, 2017
Kleinfelder Project No. 20164763.001A

Ms. Leslie Parada, PE
Civil Engineer I
CIP Water Division
Eastern Municipal Water District
2270 Trumble Road
P.O. Box 8300
Perris, California 92572-8300

SUBJECT: Preliminary Design Report

Dear Ms. Parada:

Please find attached Kleinfelder's 30% Preliminary Design Report for the Pettit 1674-Zone Storage Water Tank Expansion and Transmission Pipeline Project. We appreciate the opportunity to provide our preliminary design engineering services to the Eastern Municipal Water District on this project.

If you have any questions, please contact the Marc Weinberger at 619.831.4537.

Respectfully submitted,

KLEINFELDER

Marc Weinberger

Eric G Ng

Marc Weinberger, PE, BCEE
Project Manager

Eric Ng, PE, SE
Principal in Charge

PETTIT WATER STORAGE EXPANSION AND TRANSMISSION PIPELINE PRELIMINARY DESIGN REPORT
PROJECT # 20164763.001A

EASTERN MUNICIPAL WATER DISTRICT
AGREEMENT NO. 99572

SEPTEMBER 14, 2017

KLEINFELDER
Bright People. Right Solutions.

A Report Prepared for:

Ms. Leslie Parada, PE
Civil Engineer I
CIP Water Division
Eastern Municipal Water District
2270 Trumble Road
P.O. Box 8300
Perris, California 92572-8300

PETTIT STORAGE TANK EXPANSION AND TRANSMISSION PIPELINE PRELIMINARY DESIGN REPORT

Prepared by:

Rachel Norris
Assistant Project Manager

Reviewed by:

Marc Weinberger, PE, BCEE
Project Manager

REGISTERED PROFESSIONAL ENGINEER
MARC WEINBERGER
EXP. 3/31/2018
No. C26441
CIVIL
STATE OF CALIFORNIA

KLEINFELDER
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RFYEAGER ENGINEERING
9562 Winter Garden Blvd D-151
Lakeside, CA 92040

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TABLES

FIGURES

APPENDICES

LIST OF ACRONYMS

BPS	Booster Pump Station
CFS	Cubic Feet per Second
CML&C	Cement Mortar Lined and Coated
DDW	Division of Drinking Water
EMWD	Eastern Municipal Water District
HWL	High Water Level
HGL	Hydraulic Grade Line
LCP	Local Control Panels
LF	Linear Feet
MG	Million Gallons
MOV	Motor Actuated Valve
OPCC	Opinion of Probable Construction Cost
TM	Technical Memorandum
WTP	Water Treatment Plant

1 INTRODUCTION AND BACKGROUND

1.1 INTRODUCTION

The District's existing storage facilities in the 1764 Pressure Zone require expansion to support the planned development in east Moreno Valley. The proposed project will expand the Pettit Tank site with a current total storage of 2.0 million gallons (MG) to a total of up to 9.0 MG of storage. In addition to the water storage tanks, approximately 4,000 linear feet (LF) of transmission pipeline is required to connect the proposed storage tank(s) to the proposed Cactus II Feeder (currently in design).

1.2 PROJECT DESCRIPTION

Eastern Municipal Water District (EMWD) has an existing 2.0-MG storage facility at the Pettit Tank site (Site). The Site is located on the west side of Moreno Beach Drive approximately 1,000 linear feet (LF) north of Cottonwood Avenue as shown on the site map included in Appendix A. The existing 2.0 MG tank is located on the south side of the 2.17-acre parcel (APN 488-170-003 & 004). EMWD acquired additional property immediately north of the existing site to allow space for the additional storage volume required. Based on the 2015 Water Facilities Master Plan Update, additional water storage capacity is needed to support a planned development in east Moreno Valley.

Additional storage will be added to the site through construction of one or more water storage tanks to reach a total of 9.0 MG. The new tank(s) will be fed by approximately 4,000 LF of transmission main to connect the proposed storage tank(s) to the proposed Cactus II Feeder, currently in design. The tie in to the Cactus II Feeder will be located at the intersection of Moreno Beach Drive and Alessandro Boulevard. Tie-in details to the Cactus II Feeder are currently undeveloped because the design of the Cactus II Feeder has not been completed.

1.3 SCOPE OF WORK OVERVIEW

The preliminary engineering performed for this project identifies the following items required for the ultimate master plan of the site: two steel tanks totaling 9-MG of storage volume, associated piping, solar power to the site, site piping (overflow line, etc.), miscellaneous onsite improvements (access, fencing, landscaping, etc.), and transmission pipeline to connect to the existing water main in Alessandro Boulevard.

1.4 OBJECTIVES

This Preliminary Design Report presents the design criteria associated with each of the facilities, proposed locations of the facilities, conceptual layouts of the tank and pipeline(s), necessary site improvements, proposed alignment of the transmission pipeline(s) including any looping opportunities, preliminary budgetary-level construction cost estimates for the proposed improvements, and preliminary project schedule. It also focuses on these objectives:

- Tank Site Configuration and Preliminary Grading Plan
- Storage Tank Materials and Architectural/Visual Aesthetics
- Division of Drinking Water (DDW) Requirements
- Coordination with other Agencies
- Constraints Analysis
  - Construction
  - Geotechnical
  - Site
- Corrosivity and Corrosion Protection – Tank & Pipeline(s)
- Mixing Equipment (tank)
- Disinfection Equipment (tank)
- Electrical Requirements
- Hydraulic Analysis
- Landscaping Requirements
- Instrumentation and Control (SCADA)
- Right-of-Way Requirements
- Retaining Walls, Fencing and Gates
- Safety
- Site Drainage
- Work Sequence/Control Strategy
- A demolition plan for the tank, appurtenances, and pipeline. The District prefers to utilize the existing tank as long as possible to recover/return on the initial investment prior consideration of demolition. In this case, Kleinfelder has prepared a phasing plan (proposed tanks and future demolition of the existing tank) as applicable.

- Summary of the findings for the tank material conceptual study provided within the “Storage Siting Evaluation TM”, which is provided in Appendix B.
- Summary of the findings from the existing tank evaluation, which was based upon a recent dive report performed in 2014. The full existing tank assessment can be as part of the “Storage Siting Evaluation TM”, which is provided in Appendix B.
- A budgetary level construction cost estimate. Cost has been prepared and presented separately for conveyance and storage recommendations. The cost estimate will differentiate costs for design and construction including soft costs. The cost estimate will be provided in Appendix E.
- The anticipated construction schedule differentiating the tank and pipeline.
- Summary of conceptual layouts for three alternatives for both the tank site and transmission pipeline(s) alignments (six total).

2 DATA GATHERING AND SYSTEM HYDRAULIC EVALUATION

West Yost Associates prepared a system hydraulic evaluation. This section summarizes the findings.

2.1 PETTIT TANK HYDRAULICS

This section summarizes various tank hydraulic issues. Because the proposed tanks are on the same site as the existing tank, and transmission improvements were evaluated as part of the 2015 Water Facilities Master Plan, the hydraulic analysis focused on confirming tank sizing, overflow elevation, inlet/outlet pipeline sizing and evaluating potential water quality issues.

2.2 OVERVIEW OF PETTIT TANK AND 1764 PETTIT PRESSURE ZONE

The proposed Pettit Tanks will be located at the existing Pettit Tank site in the 1764 Pettit Pressure Zone (1764 Pettit Zone) in Moreno Valley. The 1764 Pettit Zone is the largest pressure zone in Moreno Valley, extending approximately 11 miles from west to east. The zone receives water from the Mills Water Treatment Plant (WTP) via the Cactus Booster Pump Station (BPS), Ellsworth BPS, Pettit BPS, Moreno 2 BPS and the Cactus/Nason BPS. The pressure zone contains seven storage reservoirs, with the existing Pettit Tank, Lower Landmark Tanks, and the Wolfskill Tank serving the eastern portion of the pressure zone. The District plans to retire the Wolfskill Tank by 2025.

Figure 2-1 shows existing and planned facilities in the central and eastern portion of the pressure zone.

Currently, the Moreno 2 BPS, Pettit BPS and Cactus, and Nason BPS supply the zone. With the completion of the Cactus II Feeder project, the Cactus BPS will become the principal supply to the zone, and Moreno 2 BPS and Cactus/Nason BPS will be de-commissioned. The Cactus II Feeder will connect to the planned Pettit Tank transmission pipeline, just east of Turnout 4, at the intersection of Moreno Beach Drive and Alessandro Blvd.

The current Pettit Tank has a capacity of 1.9-MG. Although the existing tank is in good condition, it has a floor elevation 8 feet higher than the Lower Landmark tanks, limiting the usable storage in Lower Landmark tanks. Also, freeboard is less than required by current seismic design codes. The tank will be replaced with two 4.5-MG tanks at the same site (phased construction is assumed), with a floor elevation of 1722 feet. The new tanks are needed to support planned growth in the eastern portion of the 1764 Pettit pressure zone, associated with the World Logistics Center, and infill development.

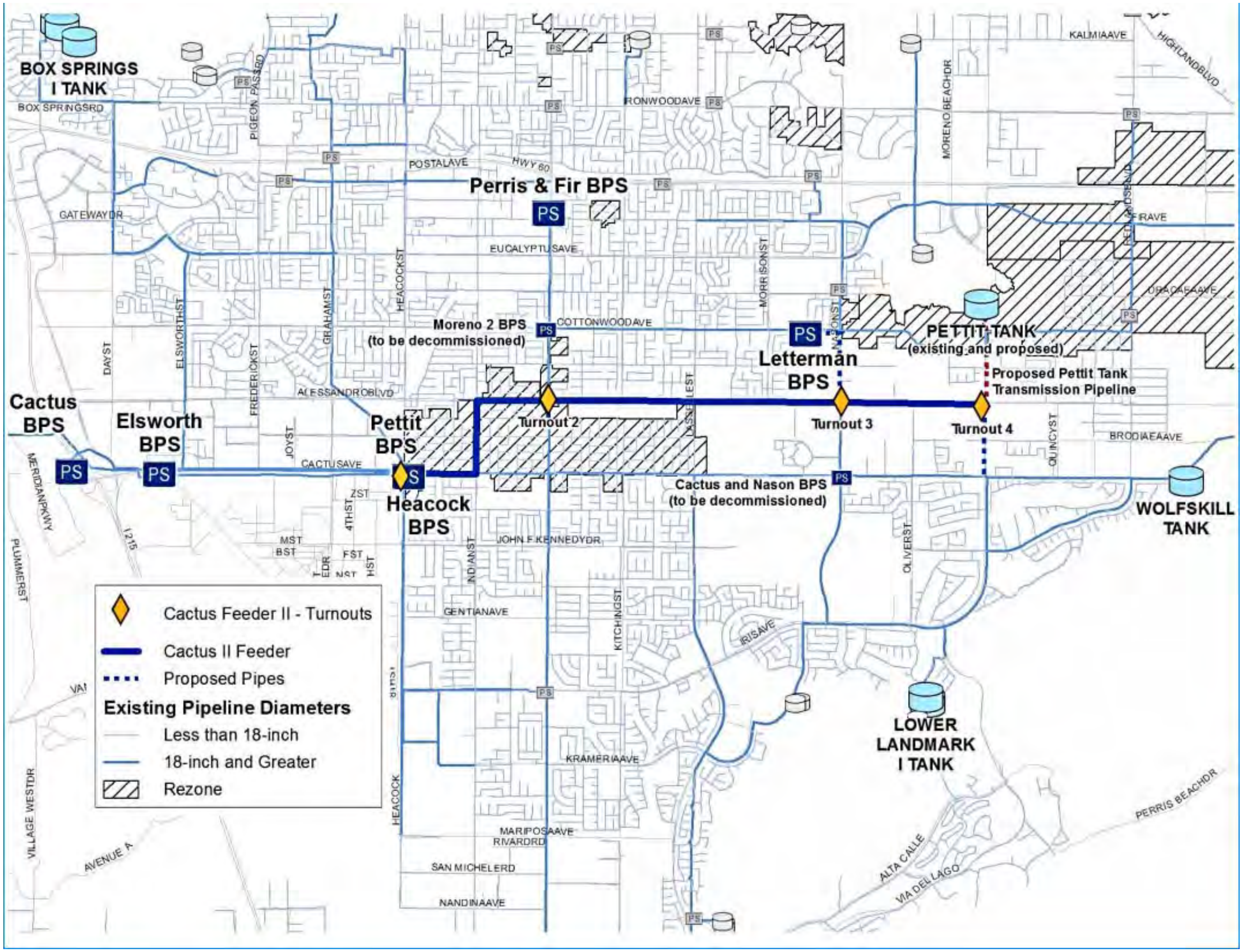


Figure 2-1 – Existing and Planned Utilities in the Central And Eastern 1764 Pressure Zone

2.3 TANK SIZING

Sizing for the Pettit Tanks is based on an analysis of demands and storage requirements for the eastern portion of the Pettit Zone using District storage sizing criteria. Storage sizing calculations are based on usable storage volumes, which take into account dead storage at the bottom of the tank, and freeboard from the high water level to the tank overflow. Depending on tank geometry, usable storage is typically around 80 to 85 percent of the nominal storage volume. Storage sizing includes reserves for operational, fire and emergency needs, with the following requirements for the eastern portion of the Pettit Zone:

- Total Usable Storage Requirement = the sum of three storage components:
  - **Operational storage**, including equalization storage volume of 25 percent of maximum day demand plus pump through storage volume of 10 percent of higher zone maximum day demand
  - **Fire storage,** 1.2 MG based on meeting 5,000 gallons per minute (gpm) for 4 hours from all area tanks
  - **Emergency storage,** 25 percent of maximum day demand.

Table 2-1 summarizes the usable storage needs for the eastern portion of the Pettit Zone, comparing usable storage requirements with existing usable storage. Columns on the left show storage requirements by future planning year. Columns on the right show the usable storage surplus or deficit, both with the existing Pettit Tank included in the calculations, and the existing Pettit Tank excluded from the calculations. Calculations show that additional storage is needed by 2035, and that the buildout requirement is 5.8 MG, and increases to 7.3 MG if the existing Pettit Tank is excluded from the calculations. Based on the usable storage requirements, two tanks are proposed, each with a nominal storage of 4.5 MG, for a total of 9.0 MG for the site.

Table 2-1: Usable Storage Requirements for Eastern 1764 Pettit Pressure Zone

Planning Year	Required Usable Storage (MG)				Existing Usable Storage MG [(a)]	Usable Storage Surplus or Deficit MG [(b)]	Usable Storage Surplus (Deficit), Excluding Existing Pettit Tank [(c)] MG
	Operational	Fire	Emergency	Total			
2018	3.2	1.2	2.3	6.7	11.4	4.7	3.2
2020	3.4	1.2	3.2	7.8	11.4	3.6	2.1
2022	3.8	1.2	3.9	8.8	11.4	2.6	1.0
2025	4.1	1.2	4.4	9.7	10.9	1.2	(0.3)
2030	4.6	1.2	5.2	10.9	10.9	0.0	(1.5)
2035	5.1	1.2	6.1	12.3	10.9	(1.4)	(2.9)
2040	5.5	1.2	6.9	13.7	10.9	(2.8)	(4.3)
2045	5.9	1.2	7.5	14.6	10.9	(3.7)	(5.2)
Buildout	6.8	1.2	8.8	16.7	10.9	(5.8)	(7.3)

[(a)] Includes Lower Landmark I and II tanks (9.4 MG usable), Wolfskill Tank (0.5 MG usable), and the existing Pettit Tank (1.5 MG usable). Calculations assume that Wolfskill Tank is retired by 2025.

[(b)] Calculated as the difference between existing usable storage (including the existing Pettit Tank) and the required usable storage.

[(c)] Calculated as the difference between existing usable storage (excluding the existing Pettit Tank) and the required usable storage.

2.4 TANK OVERFLOW ELEVATION

The proposed tank overflow elevation is 1763 feet, to match the overflow elevation of Lower Landmark II Tank.[1]

2.5 TANK INLET/OUTLET PIPELINE SIZING

The tank inlet/outlet pipeline will connect to the planned 24-inch diameter transmission pipeline on Moreno Beach Drive, and the existing 24-inch diameter transmission pipeline on Cottonwood Avenue, in the vicinity of Moreno Beach Drive and Cottonwood Avenue.

[1] Lower Landmark I Tank has an overflow elevation 0.5 feet lower than Lower Landmark Tank II.

Table 2-2 summarizes District requirements for minimum inlet/outlet pipeline sizing. Based on these requirements, a 30-inch inlet/outlet pipeline is recommended. The Riverside Regional Medical Center, located on Nason Street, north of Cactus Avenue, and potential land uses within the planned World Logistics Center, located east of the Pettit Tank site, have fire flow requirements of 5,000 gpm, which is the primary reason for the 30 inch-diameter pipeline.

Table 2-2: Minimum Tank Inlet/Outlet Pipeline Diameter, Inches[a]

Tank Volume, MG	Deep Cycle Fill in 8 hours (a)	Operational Fill in 8 hours (a)	Maximum Day Demand Plus Fire Flow
			5,000 gpm
8	24	24	30
10	30	30	30
[a] Source: 2015 Water Facilities Master Plan, Table 5-11.			

2.6 TANK WATER QUALITY OPERATIONS

The District's distribution system hydraulic model was used to perform water quality modeling to evaluate different strategies for providing operational flexibility to increase tank turnover during lower seasonal demand periods. The model was used to perform 60-day extended period simulations of buildout hourly average day demand conditions, and calculate water age. A long simulation period was used to make sure that calculations were not influenced by model initial conditions.

Four scenarios were evaluated:

- Baseline (no water quality mitigation)
- Add a motorized operating valve (MOV) and bypass on the tank inlet/outlet, so that the MOV could be periodically closed to eliminate tank inflow but allow tank outflow to draw down tanks;
- Seasonally remove a tank from service during low demand months; and,
- Periodically deep cycle the tanks by reducing the flowrate of the Cactus BPS to draw down the tanks.

Table 2-3 summarizes the estimated average water age in the Pettit Tank for the three simulation scenarios. Water age will vary widely, depending on demand conditions and tank operation. However, the estimates shown in Table 3 provide a relative measure of how different operational strategies will affect water age.

Table 2-3: Summary of Water Age Analysis for Water Quality Operations

Scenario	Operational Notes	Tanks Average Level and Range	Estimated Water Age	Notes
Baseline	Cactus BPS operated at constant flow rate. Pettit Tanks cycle in response to system demand	76 percent (68 percent to 88 percent)	9 days	
Add MOV and bypass on tank	MOV closed for 48 hours to draw down tank, open for 24 hours to refill tank	68 percent (60 percent to 88 percent)	15 days	Reduced exchange volume increases water age
One Tank Offline	One tank valved out. The remaining tank cycles in response to demand.	76 percent (62 percent to 95 percent)	6 days	Operations has concerns about this option, because it is labor intensive and difficult to implement.
Deep Cycle	Vary Cactus BPS flow to cycle tanks	70 percent (60 percent to 90 percent	8 days	Operations implements deep cycling at other District reservoirs.

The two best strategies for reducing water age are taking a tank out of service seasonally, or deep cycling the tank. Based on Operations preferences, deep cycling is the recommended strategy for water quality operations.

3 INVESTIGATIONS

3.1 SURVEY

Cozad and Fox, Inc. performed site survey and prepared a survey base file that includes 1-foot contour intervals, right-of-way lines, existing easements, centerlines, pavement lines, overhead utilities, storm drains, catch basins, manholes, valve covers, and surface utilities. The full boundary, topo, and utility exhibit is included as part of Appendix D.

3.2 GEOTECHNICAL

Kleinfelder performed a geotechnical investigation of the tank site and proposed transmission pipeline area and prepared a report titled “Report of Geotechnical Investigation: Proposed Pettit Potable Water Storage Tank Expansion and Transmission Pipeline” (geotechnical report). The report was submitted to EMWD on September 21, 2016 and is included in Appendix H. Summaries of the items included in the report are included in the below.

3.2.1 Review of Background Geological Data

Kleinfelder reviewed published and unpublished geologic literature in their files and the files of public agencies, including selected publications prepared by the California Geological Survey and the U.S. Geological Survey. Kleinfelder also reviewed readily available seismic and faulting information, including data for designated earthquake fault zones and in Kleinfelder’s in-house database of faulting in the general site vicinity. Kleinfelder also reviewed aerial photographs in order to evaluate the impacts of the prior development of the site to the proposed development.

3.2.2 Field Exploration

Kleinfelder conducted a field exploration, which consisted of excavating five test pits and conducting a seismic refraction survey at the proposed tank expansion site and drilling five hollow-stem auger borings along the proposed transmission alignment.

A detailed explanation of the field exploration techniques is provided in the geotechnical report, see Appendix H.

3.2.3 Laboratory Testing

Laboratory testing was performed on representative samples of soil collected from the excavations to substantiate field classifications and to provide engineering parameters for geotechnical design. A summary of the testing performed and the results are presented in Appendix B of the geotechnical report (Appendix H).

3.2.4 Analysis and Recommendations

The available field and laboratory data were analyzed in conjunction with the proposed site plan and the assumed structural loads to develop geotechnical recommendations for the design and construction of the proposed development. Potential foundations systems, settlement, and earthwork considerations were evaluated. Potential geologic hazards, such as ground shaking, liquefaction potential, flood hazard, fault rupture hazard and seismically-induced settlement, were also evaluated.

Based on the results of the field exploration, laboratory testing and geotechnical analyses conducted during the study, it was concluded that the proposed project is geotechnically feasible, provided the recommendations presented in the Report are incorporated into the project design and construction. The full conclusions and recommendations are provided in Section 4 of the geotechnical report (Appendix H).

3.3 UTILITY RESEARCH

Kleinfelder contacted utility owners in the proximity of the project to identify potential conflicts with both existing and planned utilities. Using the information obtaining during utilities research, Kleinfelder produced a utilities base map for use in planning the transmission main alignment alternatives. The project team used the aerial and topographic survey to verify the existing utility information obtained to the extent possible. The base map should be field-verified prior to design.

A summary of the existing utilities that the proposed transmission main will cross is as follows:

- Sewer – One sewer main runs along the east side of Moreno Beach Drive approximately 700 LF south of Bay Avenue and parallel to the proposed transmission line for approximately 600 LF. The sewer main angles and terminates into a development on the west side of Moreno Beach Drive.

- Storm drain –Two 36-inch Corrugated Metal Pipes run east to west on the north side of the intersection of Moreno Beach Drive and Alessandro Boulevard. The pipe inverts are approximately 4 – 5 feet below grade.
- Water – One existing 12-inch water main runs along Moreno Beach Drive between the Site and Cottonwood Avenue. The existing water main serves the existing 2-MG tank and is located east of Moreno Beach Drive outside of City right-of-way and within an EMWD easement.
- The existing water main transitions to the east side of Moreno Beach Drive at Cottonwood Avenue and continues to Bay Avenue. The water main between Cottonwood Avenue and Bay Avenue is 24 inches in diameter. The 24-inch water main transitions to a 12-inch water main south of Bay Avenue and north of Alessandro Boulevard.
- Gas – One 4-inch gas main runs along the east side of Moreno Beach Drive (west of the centerline). The gas main runs north to south and tees into a 30-inch high pressure gas (HPG) main which runs east to west in the center of Cottonwood Avenue. An additional 4-inch gas main runs east to west just north of the HPG main in Cottonwood Avenue.
- Electric – Two electric lines run along the west side of Moreno Beach Drive, one underground and one overhead. Both lines run east of the edge of pavement. The overhead lines cross Moreno Beach Drive in three locations along the proposed alignment but no impacts are anticipated. One underground electric line runs east to west along the south side of Bay Avenue.
- Cable/Telecom – One telecom duct bank runs along the east side of Moreno Beach Drive east of the paved edge. The telecom duct bank has a lateral, which crosses Moreno Beach Drive south of Cottonwood Avenue to provide service to a development. Additionally, at Alessandro Boulevard the duct bank angles and connects to a duct bank running east to west on the south side of the intersection.

The proposed Cactus II Feeder on Alessandro Blvd is currently in design. Base mapping at this connection point will be updated upon receipt of additional information.

The placement of the transmission main alignment and tank was carefully considered to avoid conflicts with any existing or proposed utilities. The full existing utilities base map can be found in Appendix D.

4 PRELIMINARY DESIGN

4.1 REVIEW OF TECHNICAL MEMORANDA

Kleinfelder conducted studies and produced technical memoranda (TM) for storage siting alternatives for the two tanks and detention basins as well as the transmission pipeline alignment alternatives. The technical memoranda addressed the advantages and disadvantages of each of the alternatives and included the considerations summarized in Table 4-1, below.

Table 4-1: TM Alternative Analysis Considerations

Transmission Pipeline TM	Storage Siting TM
• Public right-of-way • Existing Utilities • Planned Utilities and ultimate improvements (if applicable) • Easements • Traffic • Permits • Easements • Cost • Access • Community impacts • Potential environmental constraints • Adherence to agency standards	• Existing utilities • Construction phasing and impacts • Storage capacity • On-site retention • Cost • Access • Community impacts/aesthetics • Adherence to agency standards

Based on the considerations above, three alternatives for the transmission main alignment were chosen. With respect to the alignment within Moreno Beach Drive, the three alignments were:

- Alignment Alternative 1: west side of roadway
- Alignment Alternative 2: east side of roadway
- Alignment Alternative 3: center of roadway

Based on the advantages and disadvantages of each alternative and after discussions with the District, Alignment Alternative 1 was chosen since it had minimal impacts, adheres to all agency design standards and proposes the fewest additional bends. Transmission pipeline alignment

Alternative 1 aligns the transmission pipeline parallel the existing roadway centerline and requires no property acquisition and no easements. Alternative 1 also posed the lowest construction cost of the three alternatives since it had the fewest bends. The chosen alignment is shown in Figure 4-1. The remaining alternatives are included in the transmission pipeline alignment TM is included as Appendix C.

The size of the transmission main was not determined within the transmission pipeline alternative alignment TM. Based on the hydraulic study described in Section 2, the transmission main will be 30" from the site up to Cottonwood Avenue, then it will reduce to a 24" line up to the future Cactus II Feeder connection point.

For the storage siting alternatives, the criteria in Table 4-1 were taken into consideration, along with the on-site storage capacity during each phase of construction. The phases were described as follows:

- Phase 1: Construct one new tank and keep existing 2-MG tank in service
- Phase 2: Demolish the existing 2-MG tank and construct a new tank in its place

Based on these criteria, three storage siting alternatives were chosen. The three alternatives featured:

- Siting Alternative 1: two 4-MG tanks, 0.45 MG detention basin
- Siting Alternative 2: one 3-MG tank, one 5-MG tank, 0.47 MG detention basin. The 5-MG tank would be constructed during Phase 1, and the 3-MG tank in Phase 2.
- Siting Alternative 3: one 2-MG tank (existing), one 6-MG tank, 0.29 MG detention basin. The 6-MG tank would be constructed during Phase 1, and a new 2-MG tank during Phase 2.

Based on the studies and the recommendations provided to and discussed with the District, storage siting Alternative 1 was chosen. Storage siting Alternative 1 allows for more storage capacity during Phase 1 while still providing a sufficient detention area for the site.

After the storage siting TM was submitted, based on the hydraulic study summarized in section 2 of this report, a total storage volume of 9-MG was recommended. Thus, the design will henceforth be based on two 4.5-MG steel tanks. The 4.5-MG of storage will also meet the east 1764-zone storage demands until the year 2035 and will alleviate the current operational issues faced due to the floor of existing tank being eight feet too high. The proposed storage siting plan from the

TM is shown in Figure 4-2. The storage siting TM is included as Appendix B and the transmission pipeline alignment TM is included as Appendix C.

4.2 EXISTING TANK ASSESSMENT

As part of the storage siting TM, an evaluation of the existing 2-MG Pettit tank was developed based on the existing dive report to note conditions of the reservoir interior prepared by Liquivision Technology Diving Services dated December 9, 2014 and a site visit conducted by Kleinfelder on April 22, 2016. It was determined that the tank is in overall good condition, with some areas of minor corrosion on the interior and exterior of the tank, and some moderate corrosion on the interior roof members. The full evaluation is included in the storage siting TM, Appendix B.

4.3 SITE DESCRIPTION AND PRELIMINARY GRADING PLAN

The existing site topography, which slopes steeply down from west to east, makes providing the 9 MG of storage and on-site retention difficult. The area surrounding the site does not have engineered storm water management facilities; therefore, surface water runoff and tank drainage must be contained on site in aboveground detention facilities. In addition, cutting into the existing slope will be required to accommodate the two proposed tanks. Proposed slopes would not exceed 2:1. Proposed slopes in the northwest corner of the site will exceed thirty feet in height and require a terrace ditch. Brow ditches would be required at the top of slope as well. In adherence with EMWD design standards, a drainage ditch at the toe of the proposed slope will also be required.

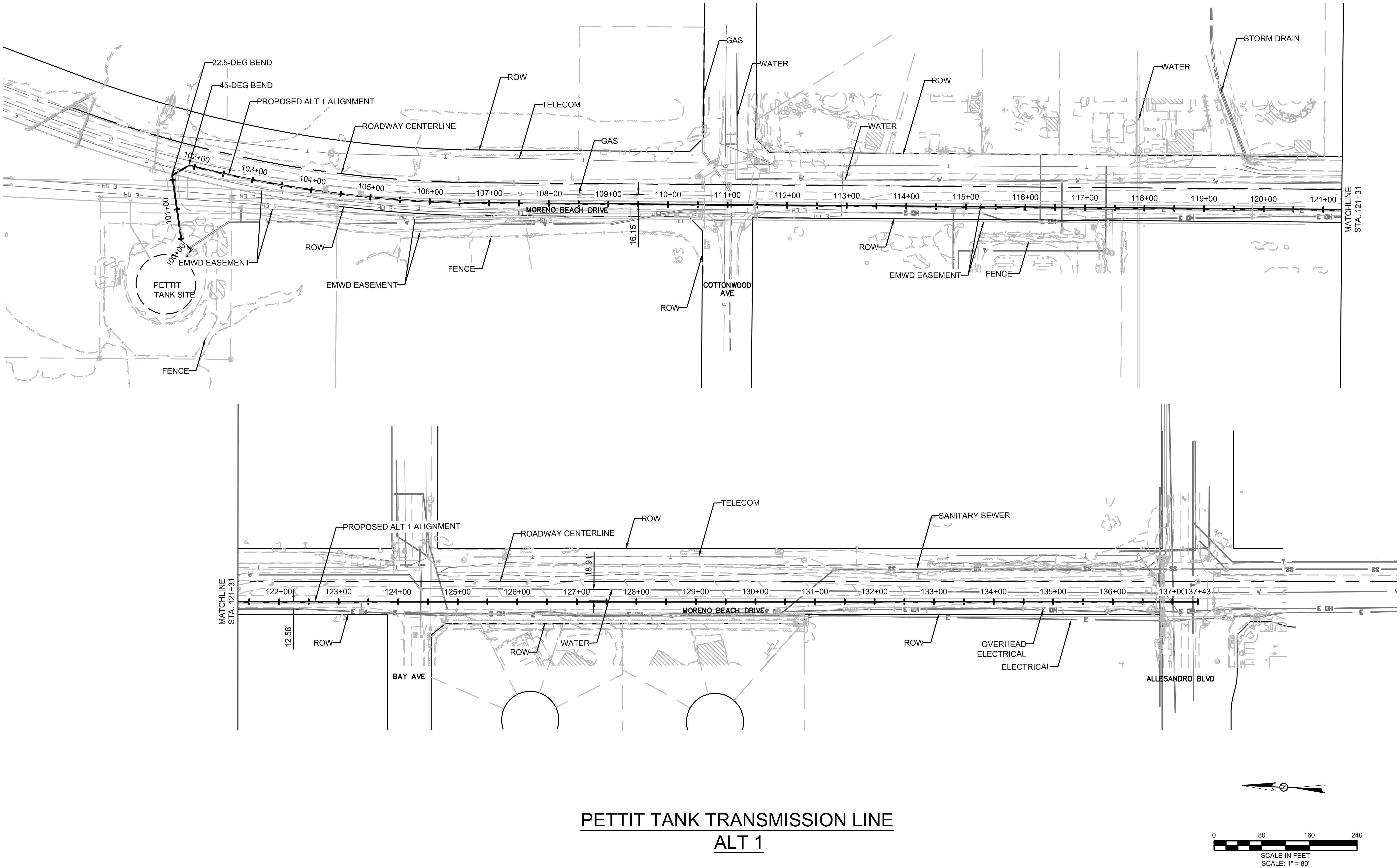
A small berm is proposed along Moreno Beach Drive to help screen the site from the road.

Access to the site will be provided via construction of a new driveway per Moreno Valley standard plans. Driveways around the site will be a minimum of twenty feet wide from the most exterior edge of the tank (ring wall or edge of stairs) to the edge of proposed face of curb. The cross slopes of the driveways should be a minimum of 1%, and maximum of 5%.

The proposed grading plan is shown in Figure 4-3, which considers the ultimate condition of two new 4.5-MG tanks.

4.4 DRAINAGE

Runoff from the top of the slope behind the tank of the proposed grading will be conveyed in two different directions. In the north to south direction, the runoff will be conveyed via a drainage ditch



PETTIT TANK TRANSMISSION LINE
ALT 1

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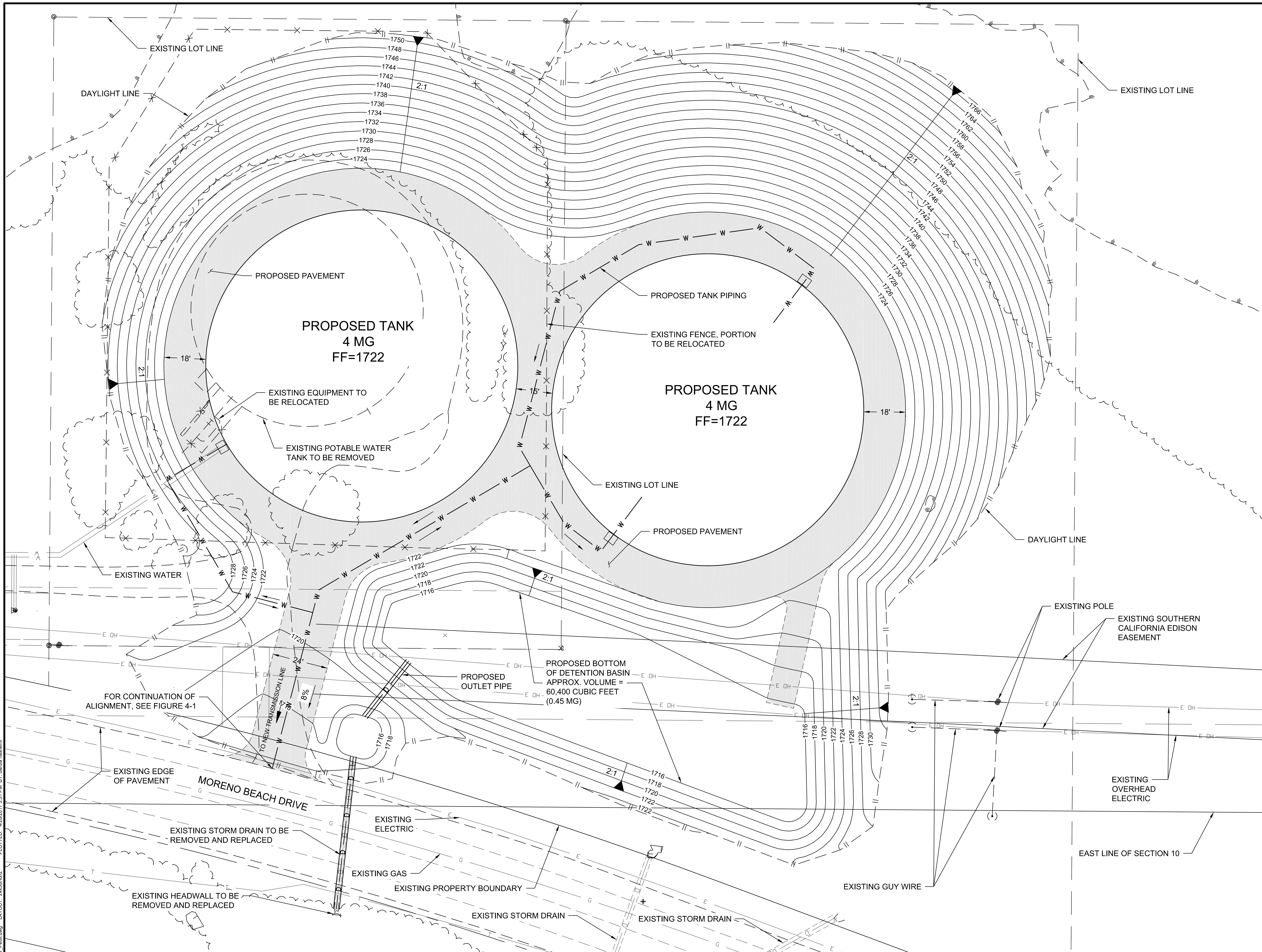
KLEINFELDER Bright People. Right Solutions.	PROJECT NO. DRAWN BY CHECKED BY DATE: REVISED:	ALT 1 Pettit Tank Transmission Line Moreno Valley, CA	FIGURE 6 PAGE: XX of XX



SUMMARY	
TANK SIZE	2-4 MG TANKS, DIAMETER = 134'
DETENTION BASIN	VOLUME = 60,400 CUBIC FEET (0.45 MG)
PAVEMENT	19,500 SQUARE FEET
EARTHWORK	CUT = 45,229 CUBIC YARDS
	FILL = 29 CUBIC YARDS
	EXPORT = 45,200 CUBIC YARDS

0 20 40 60
SCALE: 1" = 20' SCALE IN FEET

SPEC. No. XXXXX

Underground Service Alert
Call: TOLL FREE
811
TWO WORKING DAYS BEFORE YOU DIG

SCALE VERIFICATION
THIS BAR IS 1 INCH IN LENGTH ON ORIGINAL DRAWING
0 1"
IF IT'S NOT 1 INCH ON THIS SHEET ADJUST YOUR SCALES ACCORDINGLY

PLANS PREPARED BY:
KLEINFELDER
Bright People. Right Solutions.

REVISIONS				
NO.	DATE	INITIAL	DESCRIPTION	APP'VD/DATE

APPROVED BY:
DIRECTOR OF ENGINEERING XX/XXXX DATE

REFERENCES

EASTERN MUNICIPAL WATER DISTRICT
PROJECT MANAGER XX/XXXX DATE

APPROVALS		INITIAL	DATE
	PROJECT ENGR.	XX	XX/XXXX
	INSPECTION	XX	XX/XXXX
	WTR. OPERATIONS	XX	XX/XXXX
	MAINTENANCE	XX	XX/XXXX

	DATE
DESIGNED	XX/XXXX
DRAWN	XX/XXXX
TRACED	
CHECKED	XX/XXXX
SUBMITTED	XX/XXXX

SCALE: AS SHOWN

EASTERN MUNICIPAL WATER DISTRICT
RIVERSIDE COUNTY, CALIFORNIA

PETTIT TANK
ALTERNATIVE 1
2-4 MG TANKS
ULTIMATE CONDITION
FIGURE 4-2

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S.A. XX
W.O. XXXXXX
C.O.
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CAD FILE: C:\pwworking\... \Option_1_Pettit.dwg LAYOUT: 24x36Horiz PLOTTED: 4/28/2017 3:31 PM BY: bardia hashemi at the top of slope to the south and will be discharged to the existing site. In the east to west direction, runoff will be conveyed via a drainage ditch and discharged into an existing storm drain within EMWD's ROW limits. At mid-height of the slope, a terrace drain will be added at the mid-slope height to convey runoff (from the top of the slope to mid-slope height) to the ditch at the toe of slope and ultimately to a storm drain inlet at the westerly side of Morena Beach Drive. Runoff from behind the tank and paved areas will be directed around the tank via concrete drainage ditches, discharging into storm drain inlets. All storm drain inlets will discharge into the on-site detention basin.

The basin size in the chosen alternative is sufficient for the stormwater flow requirements from the site, which were calculated to be 4,150 ft^3, or 31,044 gallons. The freeboard of the basin will be one foot, and the maximum depth of the basin including the freeboard will be five feet.

The District has expressed concern about the limited amount of retention space on site. Possible options to increase retention volume are to implement retaining walls to reduce the slops or use of partially-buried prestressed concrete tanks. These options are to be further investigated during final design.

Moreno Beach Drive that will be utilized will need to be abandoned and replaced with a culvert approximately 4 feet lower than the existing to convey runoff from the basin. The culvert is within the City of Moreno Valley Right-of-Way. An encroachment permit would need to be obtained from the City in order to perform this work. In addition to replacing the culvert, a new headwall and riprap pad to dissipate storm water would be required at the culvert outlet on the east side of Moreno Beach Drive.

The proposed site drainage is shown in Figure 4-3.

4.5 SITE LAYOUTS

The location and sizing of the tanks was analyzed in detail as part of the Storage Siting TM. The preliminary design was based on the layout, recommended alternative 1. The layout featured two tanks of identical size and the largest available on-site detention storage area. The proposed tank layout is shown in Figure 4-3.

SPEC. No. XXXXX

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IF IT'S NOT 1 INCH ON THIS SHEET ADJUST YOUR SCALES ACCORDINGLY

PLANS PREPARED BY:
KLEINFELDER
Bright People. Right Solutions.

REVISIONS

NO.	DATE	INITIAL	DESCRIPTION	APP'VD/DATE

APPROVED BY:
XX/XXXX
DIRECTOR OF ENGINEERING — DATE

REFERENCES

EASTERN MUNICIPAL WATER DISTRICT
XX/XXXX
PROJECT MANAGER — DATE

APPROVALS

	INITIAL	DATE
PROJECT ENGR.	XX	XX/XXXX
INSPECTION	XX	XX/XXXX
WTR. OPERATIONS	XX	XX/XXXX
MAINTENANCE	XX	XX/XXXX

	DATE
DESIGNED	XX/XXXX
DRAWN	XX/XXXX
TRACED	
CHECKED	XX/XXXX
SUBMITTED	XX/XXXX

SCALE: AS SHOWN

EASTERN MUNICIPAL WATER DISTRICT
RIVERSIDE COUNTY, CALIFORNIA

PETTIT TANK
PRELIMINARY GRADING PLAN
ULTIMATE CONDITION

I.D. XX
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4.6 TANK MATERIALS OF CONSTRUCTION

Due to the requirement of aboveground on-site detention facilities, alternatives for tank sizing were considered that implemented retaining walls or a partially buried reservoir. Partially buried reservoirs would need to be constructed of concrete. Concrete tanks, however, are not allowed to be constructed at the site due to restrictions established in the title deed for the property, which require improvement projects to be of similar design and construction as existing facilities. This will need to be confirmed by the District.

Webb Associates conducted an analysis on tank materials of construction between prestressed concrete and welded steel tanks in a TM titled "Vista and Ellis Zones Water System Improvement Project, Task No. 4 – Tank Materials of Construction" dated May 18, 2011. Within the study, a life cycle cost analysis was conducted to compare the two materials for a 5.63-MG tank of two different height to diameter ratios. For the sizes compared, welded steel tanks offered the lowest initial cost of construction at $0.45 per gallon for a 5.63-MG, 156-foot diameter by 40-foot nominal shell height, which is similar to the tank being recommended for the Pettit site. Per the study, welded steel also offered the lowest estimated life cycle cost of $0.57 per gallon based on assumptions of $7/square foot (project cost) for recoating a welded steel tank every 20 years for the interior and every 25 years for the exterior.

A partially buried tank would need to be constructed of prestressed concrete due to issues with corrosion with steel tanks installed next to buried soil. If it is found that the District is permitted to construct the tank of dissimilar materials to that of existing facilities, the District could consider building a partially buried 6-MG prestressed concrete tank. This would save the District money by reducing the amount of exported soil from the site. Additionally, as a general rule, 6-MG is the tipping point that makes prestressed concrete tanks cheaper than welded steel tanks due to costs associated with coating that are required for welded steel tanks but not prestressed concrete tanks.

4.7 SITE CONSTRAINTS

Due to the size of the required tanks and grading necessary to accommodate them, the on-site detention basin will be approximately 0.18 MG, equivalent to 1.6 feet of water in the tank. The detention basin design is based on the Riverside County Design Handbook for Low Impact Development Best Management Practices, current edition. The proposed basin floor elevation is at 1714 feet. The maximum depth of the basin will be five feet deep, with one foot of freeboard. An existing culvert along Moreno Beach Drive will need to be removed and replaced to serve the detention basin. The new culvert will require an energy dissipater on the east side of Moreno Beach Drive. Work within Moreno Beach Drive will require an encroachment permit from the City of Moreno Valley.

Existing electrical poles are present at the northern perimeter of the site. The poles should be protected in place, and any work associated with the site should be closely coordinated with the utility owner. Overhead electric lines will also cross the proposed detention basin and proposed pad for valves servicing the tanks. Use of maintenance equipment and/or vehicles under the overhead electric lines should use extreme caution.

4.8 PRELIMINARY PIPING DESIGN

4.8.1 Inlet/Outlet Piping and Valve Enclosure

Based on the hydraulic analysis summarized in Section 2 of this report, the inlet/outlet pipeline should be 30 inches in diameter. The inlet/outlet piping will enter the piping enclosure where it will split into separate inlet and outlet pipes. Within the enclose there will be an altitude valve, two butterfly valves, and a check valve on the inlet pipe and a check valve and two butterfly valves on the outlet pipe to control the flow in and out of the reservoir. The altitude valve will be located prior to the split per EMWD Standard Specifications. The pipes will exit the enclosure and run to the tanks where they will penetrate the tank approximately 180-degrees from each other. A seismic valve actuator will be installed on a butterfly valve next to the tank at both the inlet and outlet pipes and will be connected to a seismic controller to isolate the tank in a seismic event. Figure 4-44 and Figure 4-55 show the proposed configuration of the inlet/outlet piping within the valve enclosure. Figure 4-77 and Figure 4-66 show the inlet/outlet piping as it exits the ground and enters the tank.

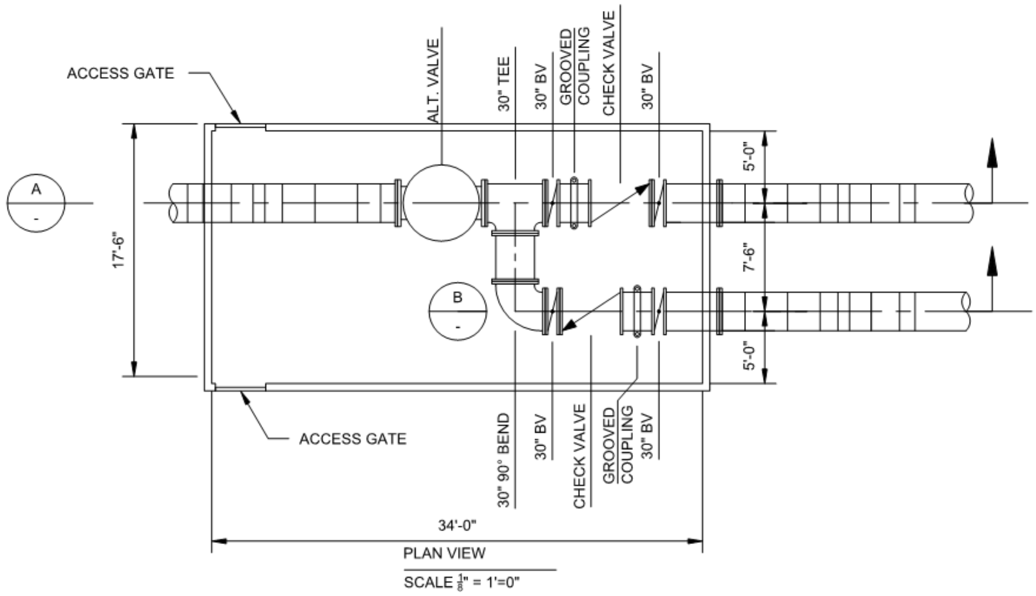


Figure 4-4: Inlet/Outlet Piping Valve Enclosure (Plan)

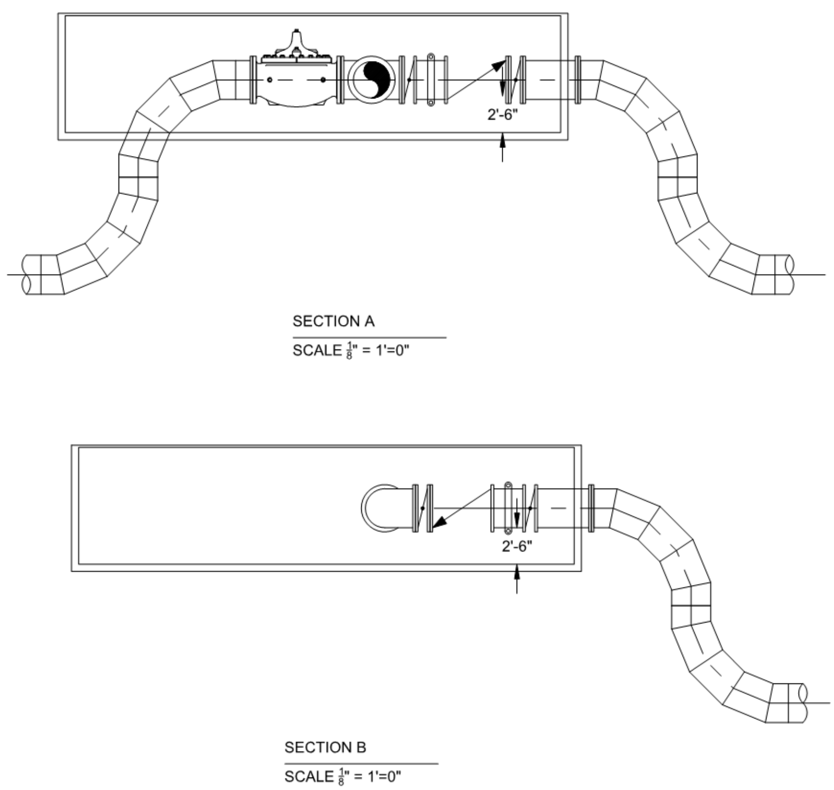


Figure 4-5: Inlet/Outlet Piping Valve Enclosure (Sections)

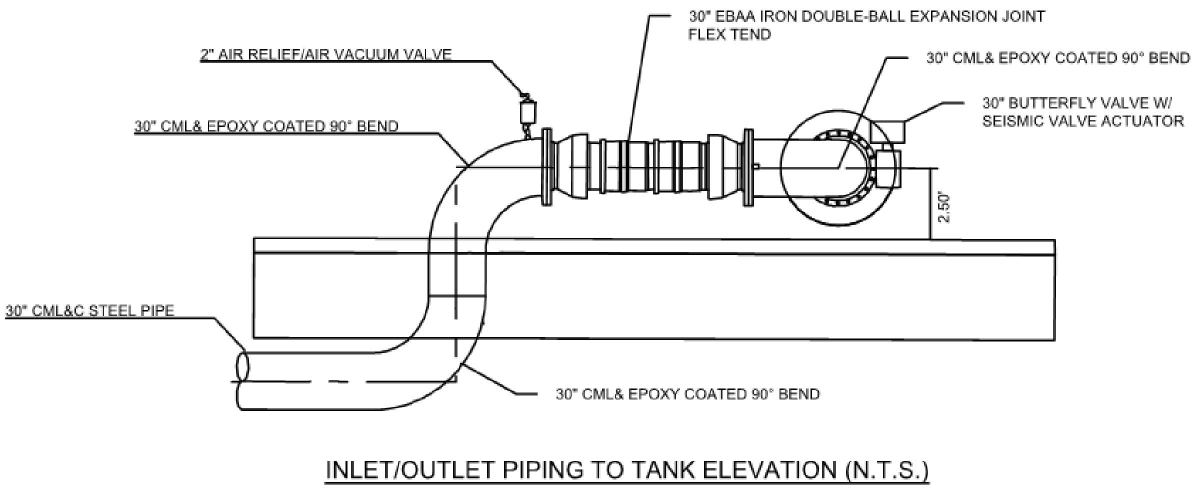


Figure 4-6: Inlet/Outlet Piping to Tank (Elevation)

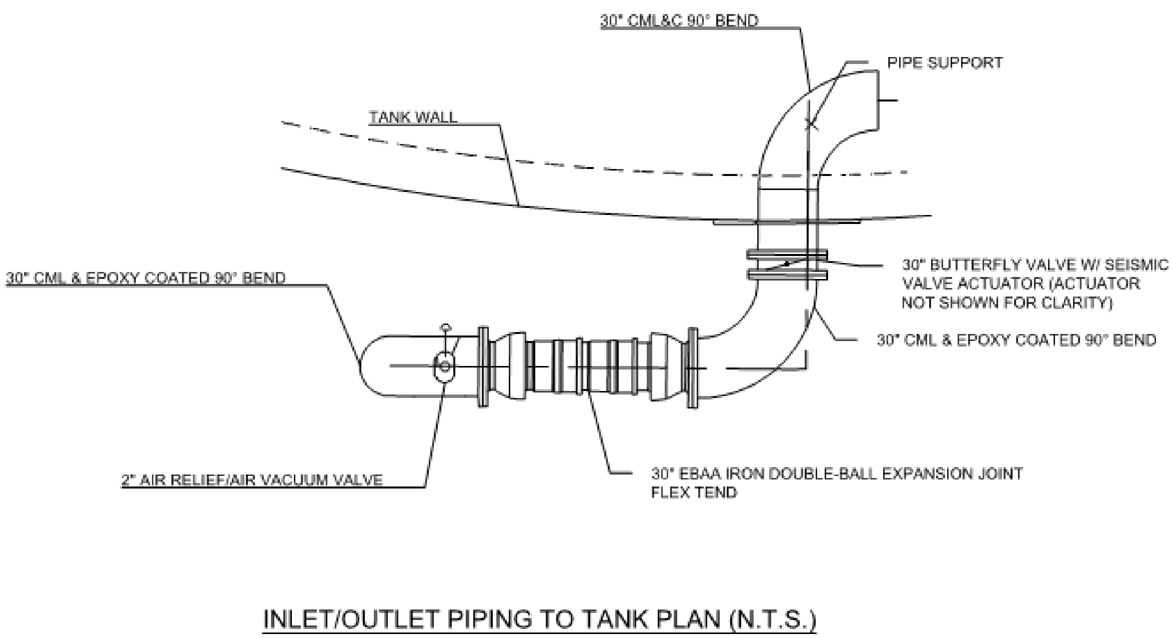


Figure 4-7: Inlet/Outlet Piping to Tank (Plan)

4.8.2 Overflow and Tank Drain

An 18-inch overflow pipe with a 36-inch cone weir opening will be installed. The overflow elevation for the Pettit tank will be set at 1763 to match the Lower Landmark II tank. The overflow pipe will penetrate out of the tank and run down the outside the tank where it will discharge into a concrete overflow/drain inlet. An 18-inch storm drain will connect the overflow/drain inlet to the detention basin.

The reservoir will have two flush manway openings positioned 180 degrees from each other. The openings will be designed per EMWD Standards and will be 36 inches tall and 48 inches wide. Each manway will include an 8-inch drain. The centerline of the drain will be 1.50 feet from the tank floor elevation and will include a manually-operated gate valve. One drain will discharge into the overflow/drain inlet as described above and the other will discharge into a concrete drain box which will connect to the 12-inch site storm drain.

4.8.3 Sampling Station

A sampling port will be included at an elevation on the tank shell per EMWD Reservoir Design Standards. The port will extend two feet into the reservoir and will include a locking enclosure.

4.9 CORROSION CATHODIC PROTECTION

RFYeager Engineering conducted a soil corrosivity assessment of the Project site and pipeline alignment to determine the aggressiveness of the soil and to assess the affect it may have on the associated underground metallic structures. The details of the study and the methodology can be found in Appendix J.

The following recommendations apply the new steel underground piping at the Project site:

1. Provide all steel underground piping with a high-quality mortar coating per AWWA C-205 standards. Cathodic protection is not recommended for these new structures.
2. Electrically isolate the new buried piping from other pipelines at the tie-in points. This will require the use of flange isolation kits if the new piping is to tie into existing metallic pipelines. All buried flange isolation kits shall have a 4-wire test station and be wax tape coated. Note that no insulators are required at tie-in points to non-metallic piping.
3. Provide all steel air/vac and blow-off piping shall be coated in accordance to District standards. This piping must be fully continuous along its length and fully continuous with the pipeline. Electrically isolate copper air/vac or blow-off piping from the main pipeline

with insulating bushings, insulated couplings, etc. Do not wrap copper tubing. Protect buried copper piping by fully encasing them in a clean sand backfill.

4. Provide corrosion monitoring test stations, joint bonds (for inline valves, flanges, couplings, adapters, etc.), pipe joint bonds (for non-welded pipe joints), insulators, and attendant wiring. The number and location of corrosion control facilities shall be provided during the design phase of the project.
5. Provide full time inspection for field-applied coatings at all pipe joints, for insulating flange kit installations, and for coatings on all in-line appurtenances.
6. Provide all non-coated buried valves, flanges, couplings, adapters, and bare sections of pipe with a 3-part wax tape coating system per AWWA C-217. Additionally, all buried insulating flanges shall be wax tape coated. No bare metallic surfaces shall be in direct contact with the soil.
7. Electrically isolate any electrical grounding systems such as motorized valves, electrical flow meters, and telemetry units from buried steel piping.
8. The initial potential survey should include testing to determine the level of DC interference (if any) on the new pipeline due to the nearby foreign rectifiers
9. The corrosion monitoring system should be inspected and tested by a qualified

Corrosion Engineer. The testing should include native pipe-to-soil potentials, test lead resistance measurements, insulating flange inspections, and pipeline continuity testing through all mechanical joints, valves, couplings, adapters, flanges, and non-welded pipe joints. All test data should be provided to the owner before the project is considered complete.

The entire soil corrosivity assessment is included in Appendix J.

4.10 MIXING & DISINFECTION

Per a hydraulic study performed by West Yost, the retention time of water in the tank is approximately 190 hours. To encourage turnover or water inside the reservoirs and reduce stratification, a review of two dynamic reservoir mixing options was performed. Kleinfelder has reviewed two products that are readily available and widely used for these purposes.

4.10.1 Pax Water Mixer

The PAX Model PWM400 mixer (120/240V, 350W) is the recommended model for both the Pettit storage tanks. The mixer consists of an impeller mounted on a tripod that sits near the center of the tank floor. The recommended mixer is capable of mixing tanks up to 9 MG. For chemical addition in the tanks, the mixer is available to have sufficient mixing capacity to properly disperse chemicals when dosed directly above the mixer impeller. The mixer will be installed near the center of the tank to maximize mixing efficiency.

4.10.2 Tank Shark

The Tank Shark system is capable of mixing the water in the tank with no moving or electrical parts inside the tank, as all mechanical and electrical parts are placed outside the tank and connected via an opening in the roof. The system uses a proprietary Eductor Nozzle that is able to put out five times flow increase to produce a 75-500 GPM upward flow and applies motive energy to send the mass of water inside the reservoir in motion. The system may also be designed to include chemical injection.

4.10.3 Conclusions

Both products may be installed via a standard roof hatch. A future chloramination building for chemical injection system will also be included as part of the mixing system. The injection system will not be designed at this time.

4.11 VENTS

The air vents were sized such that the reservoir headspace does not exceed a pressure differential of more than 2 inches of water column during a change in the headspace volume caused by either a maximum outflow or inflow of water into the reservoir (per AWWA D110). The design maximum rate of change in reservoir headspace volume is considered to occur in the event of a rupture of one of the 30-inch reservoir pipelines at a location near the reservoir, such as at a flexible coupling, when the reservoir is at the design HWL. The resulting flow out of the reservoir and air pulled into the reservoir through the vent would be 37.8 cubic feet per second (cfs).

A 14-inch air vent at the top of the reservoir will accommodate the design maximum inflow of air into the reservoir without creating a differential pressure of more than 2 inches of water column. EMWD's standard design guidelines call for a center vent and four perimeter vents at 90 degrees apart located 5 feet from the connection to the knuckle plate with a minimum diameter of 24 inches. However, EMWD has indicated that they prefer slanted screened vents around the perimeter and a mushroom style vent in the center. The 5 vents will allow for more than sufficient air inflow for maximum water outflow through the reservoir.

4.12 STRUCTURAL

4.12.1 Foundation

A ring footing is the recommended design for the tank foundation. The footing would be 4.0-feet wide by 4.5-feet deep. The footing would extend 1.25 feet beyond the tank shell.

4.12.2 Freeboard

Using ground motion parameters for the 1764-Zone site, the required freeboard height of the tank necessary to overcome sloshing was calculated. The ground motion design parameters were based on 2016 CBC and ASCE 7-10. Using and internal diameter of 137.5 feet and a side water depth of 41 feet, the necessary calculated freeboard for the tank is 11 feet. See Appendix K for freeboard calculations. Table 4-2 summarizes the design criteria for the site.

Table 4-2: Seismic Design Criteria

Seismic Design Parameters	Seismic Design Values
Site Class	C
S_S	2.070g
S_1	0.932g
S_{MS}	2.07g
S_{M1}	1.21g
S_{DS}	1.380g
S_{D1}	0.808g
Seismic Design Category	F
Seismic Risk Category	IV

4.13 ELECTRICAL AND I&C

Moraes Pham and Associates completed the preliminary electrical and I&C design. Below is a summary of the design.

The new tanks will be provided with a solar system for local power distribution. The solar system will have a total capacity of 320W at 24VDC nominal. The solar modules are to be pole mounted on a 3-inch pole located on top of one of the new storage tanks. The average power consumption of the solar power system shall be calculated as follows:

Kingfisher PLC = 70 Watts X 24 hrs. each day @ 24 Vdc for 5-day backup

MDS TransNET 900 Radio = 7.1 Watts X 24 hrs. each day @ 24 Vdc for 5-day backup

Misc. = 15 Watts x 24 hrs. each Day @ 24 Vdc for 5-day backup

Total Daily Load = 92.1 Amp Hours each Day @ 24 Vdc (nominal)

The electrical and I&C preliminary design drawings can be found in Appendix E.

The preliminary electrical design does not account for the PAX Mixer and security devices. These items are to be included in the electrical design during final design.

The District has suggested that they may want to bring Southern California Edison power to the site instead of updating their existing solar system. This option is to be further studied during final design.

4.14 SCADA

Moraes Pham and Associates completed the preliminary SCADA design. Below is a summary of the design.

The contractor will be responsible for providing and installing the RTU enclosure along with the antenna mast. The District will provide the antenna, RTU enclosure back panel, PLC hardware, and radio. The RTU assembled back panel will then be installed in the field by the contractor.

The anticipated PLC I/O list is shown in Table 4-3:

Table 4-3: PLC Input/Output

Digital Input	Analog Input
RTU Intrusion	Tank 1 Level
Overflow vault flooded	Tank 2 Level
Altitude valve 1 open	
Altitude valve 1 closed	
Altitude valve 2 open	
Altitude valve 2 closed	
Tank hatch intrusion	
Intrusion override	
Tank 1 HWL float	
Tank 1 LWL float	
Tank 2 HWL float	
Tank 2 LWL float	
Rolling gate	
Swing check valve 1 open/closed	
Swing check valve 2 open/closed	

The preliminary SCADA design can be found in Appendix E.

4.15 LANDSCAPE

This landscape will consist of California-Friendly, low and medium water use plant material. All plants have been chosen from the low or medium water use category according to WUCOLS. Trees and shrubs have been selected as fast-growing spreaders to cover the slopes and provide screening of the water tank. Plants have been chosen to create a uniform theme across the site consisting of Mediterranean and California friendly plant material. Maintenance and longevity of plant material has been taken into consideration. A 3" layer of shredded wood mulch will be used in all landscape areas.

The plan can be found in Appendix F.

The District has expressed interest in limiting the amount of landscaping needed while still meeting all land deed requirements. This is to be further studied during final design.

4.16 RIGHT OF WAY

As discussed in section 4.7, the culvert to be replaced is within the City of Moreno Valley Right-of-Way. An encroachment permit will need to be obtained from the City in order to perform this work. In addition to replacing the culvert, a new headwall and riprap pad to dissipate storm water would be required at the culvert outlet on the east side of Moreno Beach Drive.

The transmission pipeline is within the City of Moreno Valley Right-of-Way. An encroachment permit will need to be obtained from the City to perform this work.

All other work that is to be performed will be within EMWD owned property.

4.17 TANK ACCESS CONTROL

The top of the reservoir will have one steel roof hatch located near the exterior stairs for access into the tank. The 30” x 30” hatch will serve as an observation hatch for the tank interior and access to the tank if needed. The hatch will be per EMWD Standard Drawing B-984 which includes recessed padlock hasp and fall protection grating. The hatch will be surrounded by a roof platform and handrail with a davit crane base plate as shown on EMWD’s Standard Drawings B-979. The standard detail will be modified during final design to allow for easier recoating of the platform and surrounding roof.

4.18 SAFETY AND SECURITY

The following security items will be included at the reservoir site, per EMWD Reservoir Design Standards:

- A six-foot high chain-link fence will be placed around the entire site. The top of the fence will be lined with barbed wire and concertina wire per EMWD Reservoir Design Standards. There shall be one 16-foot clear double swing gate located across the access road in accordance with EMWD Standard Drawing D-672, and one four-foot clear man-gate. A second gate shall be installed at the beginning of the access road.
- A stairway to the roof will be added that includes a landing platform immediately in front of the stairway access gate (approximately 10’ above the ringwall).
- Intrusion alarms will be included on all gates and access hatches.
- At the inlet/outlet vault, motion sensitive security lighting will be placed at the gates.
- Photo sensitive security lights will also be included at the entrance gate.

- Video surveillance cameras will be included at the following areas: entrance gate, inlet/outlet structures, and tank stairs.

The contractor shall furnish all conductors, conduits, and junction boxes for EMWD security consultant to install security system.

4.19 SEISMIC PROTECTION OF VALVES

A seismic protection valve will be installed on the inlet/outlet piping to isolate the tank in the event of seismic activity. The seismic protection system consists of the inlet/outlet valve, a seismic actuator, and a seismic controller. The valve and actuators will be placed on the inlet/outlet piping next to the tank. The seismic controller is an instrument that senses the seismic activity and sends a signal to the electric valve actuator to close the valve. The seismic controller will be housed in the inlet/outlet valve enclosure and can potentially be integrated into the District's SCADA system.

Seismic valve actuators from Rexa (Rexa X2R) and Rotork (Rotork IQ/IWD) valve actuators are available. The District has stated that Koso is the preferred manufacturer of seismic actuator. Upon review, Koso does not manufacture seismic actuators fit for this application. Rexa, a manufacturing company owned by Koso, makes actuators for water systems.

Seismic instruments from AES Water Systems (AES T6 Seismic Instrument) and Flo-Loc (FL200 Seismic Controller and SS-1001 seismic sensor) were reviewed. Products from both manufacturers achieve the same function, with the main difference being that AES Water Systems is a proprietary seismic instrument that is placed in the ground that can detect seismic motion. The AES seismic instruments require a special technician to service which make them harder to maintain.

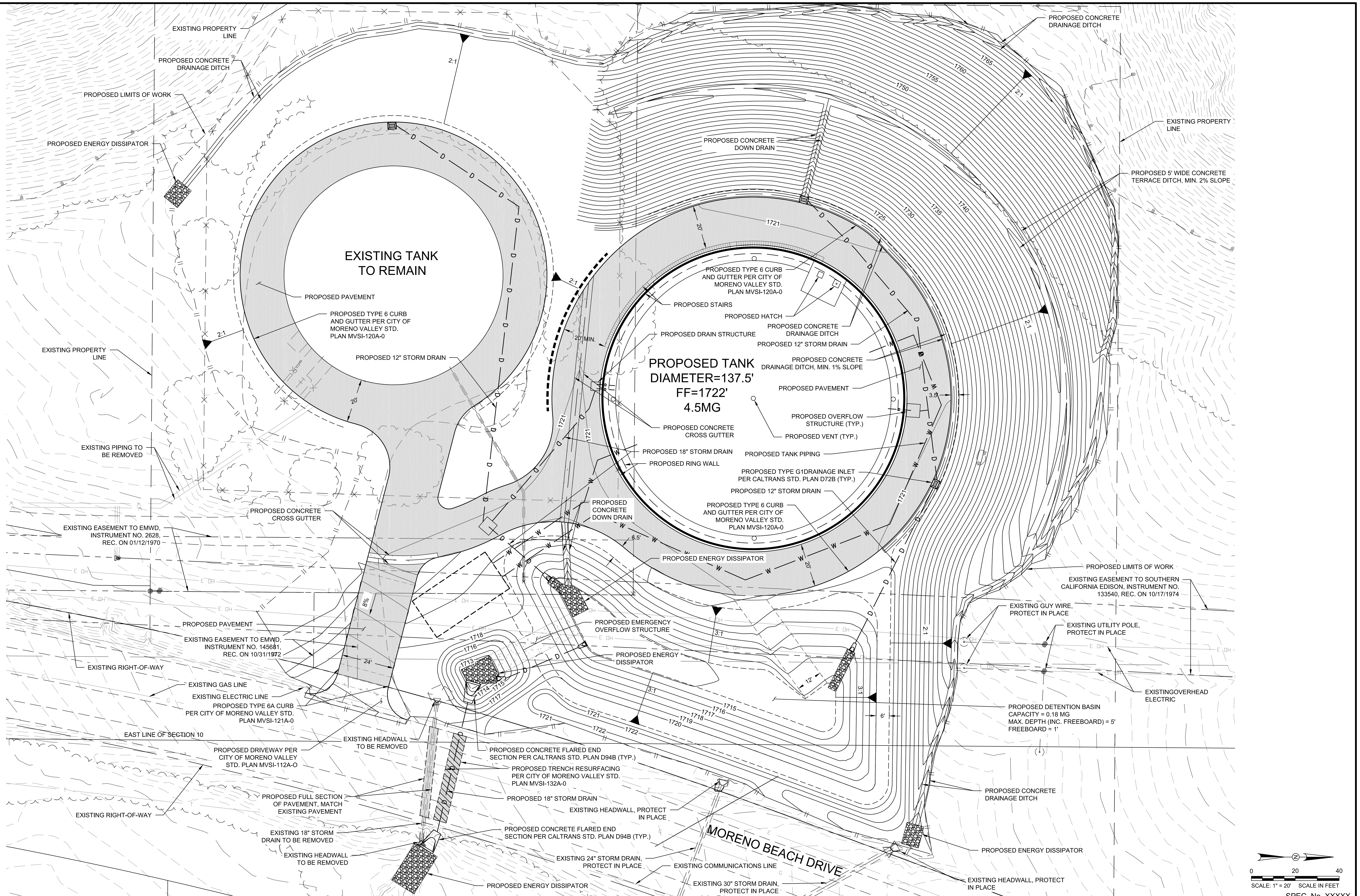
4.20 CONSTRUCTION SEQUENCING

The ultimate construction of the tanks will occur in two phases:

- Phase 1: The northernmost, new 4.5-MG, tank will be constructed while the existing 2-MG tank will remain in service. The northern portion of the site will be fully graded per the design drawings. The existing site will remain as-is, with the exception of a new paved area that will be added. The paved area will feature a 20-foot access road around both the existing and new tanks. A small retaining wall behind the new tank will be necessary until the existing tank site is re-graded for the new tank.

- Phase 2: The existing 2-MG tank will be demolished and a new 4.5-MG tank will be constructed. The site will be re-paved and graded according to the grading plan of the ultimate condition – see Figure 4-4. The retaining wall constructed during Phase 1 will be demolished and the area will be paved to match the paving on the northernmost tank.

A schematic interim grading plan can be seen in Figure 4-8.



SPEC. No. XXXXX

Underground Service Alert	SCALE VERIFICATION	PLANS PREPARED BY:
Call: TOLL FREE 811 TWO WORKING DAYS BEFORE YOU DIG	THIS BAR IS 1 INCH IN LENGTH ON ORIGINAL DRAWING 0 1" IF IT'S NOT 1 INCH ON THIS SHEET ADJUST YOUR SCALES ACCORDINGLY	KLEINFELDER Bright People. Right Solutions.

REVISIONS

NO.	DATE	INITIAL	DESCRIPTION	APP'VD/DATE

APPROVED BY: XX/XXXX
DIRECTOR OF ENGINEERING DATE
REFERENCES

EASTERN MUNICIPAL WATER DISTRICT
XX/XXXX
PROJECT MANAGER DATE

APPROVALS		INITIAL	DATE
	PROJECT ENGR.	XX	XX/XXXX
	INSPECTION	XX	XX/XXXX
	WTR. OPERATIONS	XX	XX/XXXX
	MAINTENANCE	XX	XX/XXXX

	DATE
DESIGNED	XX/XXXX
DRAWN	XX/XXXX
TRACED	
CHECKED	XX/XXXX
SUBMITTED	XX/XXXX

SCALE: AS SHOWN

EASTERN MUNICIPAL WATER DISTRICT
RIVERSIDE COUNTY, CALIFORNIA

PETTIT TANK
PRELIMINARY GRADING PLAN
INTERIM CONDITION

I.D. XX
S.A. XX
W.O. XXXXXX
C.O.
COORD. XX-X-XX
SHT.____ OF XX
D-_ _ _ _

CAD FILE: C:\pwworking\...\Pettit_PDR_Interim_Grading_Plan.dwg LAYOUT: PDR Grading Plan PLOTTED: 4/24/2017 10:20 AM BY: bardia hashemi

4.21 DDW REQUIREMENTS

The following Table 4-4 lists the regulations posed by the DDW for safe potable use and states the design consideration that adheres to the regulation, if applicable.

Table 4-4: DDW Regulations and Design Considerations

Title 22 Section Number	Regulation	Design Consideration
64585(a)(1)	Any reservoir coatings or linings shall be installed in accordance with manufacturer's instructions	Specifications will include appropriate installation requirements.
64585(a)(2)	Vents and other openings shall be constructed and designed to prevent the entry of rainwater or runoff, and birds, insects, rodents, or other animals	Vent(s) will be equipped with a hood and protective screening.
64585(a)(3)	At least one sampling tap shall be available to enable representative sampling of the water in the reservoir that will be entering the distribution system; the tap shall be protected against freezing, if necessary	The reservoirs will be equipped with one sampling tap.
64585(a)(4)	A reservoir shall not be designed, constructed, or used for any activity that creates a contaminated hazard	Not applicable.
64585(b)(1)	If it is a tank, constructed in accordance with American Water Works Association (AWWA) standards, which are hereby incorporated by reference, as follows: AWWA D100-05 (Welded Carbon Steel Tanks for Water Storage), D102-03 (Coating Steel Water-Storage Tanks), D103-97 (Factory-Coated Bolted Steel Tanks for Water Storage), D110-04 (Wire-and Strand-Wound, Circular, Prestressed Concrete Water Tanks), and D120-02 (Thermosetting Fiberglass-Reinforced Plastic Tanks)	Reservoirs to be designed in accordance with AWWA D100-11.
64585(b)(2)	Constructed of an impervious material that prevents the movement of water into or out of the reservoir;	Reservoirs will be welded steel.
64585(b)(3)	Covered with (A) A rigid structural roof made of impervious material that prevents the movement of water or other liquids into or out of the reservoir; or	Reservoirs will have a welded steel roof.
	(B) A floating cover designed, constructed, and maintained in	

Title 22 Section Number	Regulation	Design Consideration
	conformance with the AWWA California-Nevada Section's "Reservoir Floating Cover Guidelines" (April 1999), AWWA Manual M25 (2000), and AWWA D130-02 (Flexible-Membrane Materials for Potable Water Applications), which are hereby incorporated by reference.	
64585(b)(4)	Equipped with at least one separate inlet and outlet (internal or external), and designed to minimize short-circuiting and stagnation of the water flow through the reservoir;	The reservoirs will have a separate inlet and outlet pipe. The inlet/outlet pipe will split in the valve enclosure, a 180-degree separation between the inlet and outlet pipes will minimize short-circuiting. Additionally, the design includes a mixing system to further prevent short-circuiting.
64585(b)(5)	Equipped with drainage facilities that allow the tank to be drained and all residual sediment removed, and an overflow device. The reservoir drainage facilities and overflow device shall not be connected directly to a sewer or storm drain and shall be free of cross-connections;	The reservoirs will have two flush cleanouts will be provided per EMWD standard detail.
64585(b)(6)	Equipped with controls to maintain and monitor reservoir water levels	Reservoirs will be fitted with level sensors (sonic and floats).
64585(b)(7)	Equipped to prevent access by unauthorized persons	The site will be enclosed with fencing per EMWD standard design guidelines. All reservoir access hatches will be locked.
64585(b)(8)	Designed to allow authorized access and adequate lighting of reservoir interior for inspections, cleaning or repair	Reservoir roof will be designed with one access hatch and 5 roof vents for adequate lighting and access for inspections, cleaning or repair.
64585(b)(9)	Equipped with isolation valves, and designed and operated to allow continued distribution of water when the reservoir is removed from service. The isolation valves shall be located within 100 feet of the reservoir. For a reservoir used to meet the disinfectant contact time requirements of chapter 17 (Surface Water Treatment), bypass lines shall be blind-flanged closed during normal operations;	The isolation valve vault will be located within 100 feet of the reservoir. The reservoir is not used to meet disinfectant contact time.

Title 22 Section Number	Regulation	Design Consideration
64585(b)(10)	Designed and constructed to prevent the entry of surface runoff, subsurface flow, or drainage into the reservoir	Reservoir roof, access hatches, and vents will be designed to prevent the entry of surface runoff or drainage into the reservoir.
64585(b)(11)	Designed to prevent corrosion of the interior walls of the reservoir	Interior walls will be coated to prevent corrosion and a corrosion protection systems will be installed.
64585(b)(12)	For a subsurface reservoir:	Not applicable

4.22 FINAL DESIGN PHASE TASKS

The following is a breakdown of tasks necessary for the completion of final design:

- Connection to Cactus II Feeder
- Preparation of Operational Control Strategy
- CEQA
- Permit acquisition
- Conceptual traffic control plans
- Study options to increase retention volume on site
- Study option of bringing Southern California Edison service to site instead of increasing existing solar power system
- Study ways to minimize landscaping options while meeting deed requirements

5 ENGINEER’S OPINION OF PROBABLE CONSTRUCTION COST

The Engineer’s Opinion of Probable Construction Cost (OPCC) and schedule is included in Appendix G. This estimate is split up into the two different phases of the construction and combines them into one final cost estimate for the ultimate condition with two new 4.5-MG tanks and all associated work.

The Engineer’s OPCC for the construction of the ultimate conditions of the project is $17,390,000.

6 DESIGN CRITERIA

6.1 TABLE OF DESIGN CRITERIA

Table 6-1:Table of Design Criteria

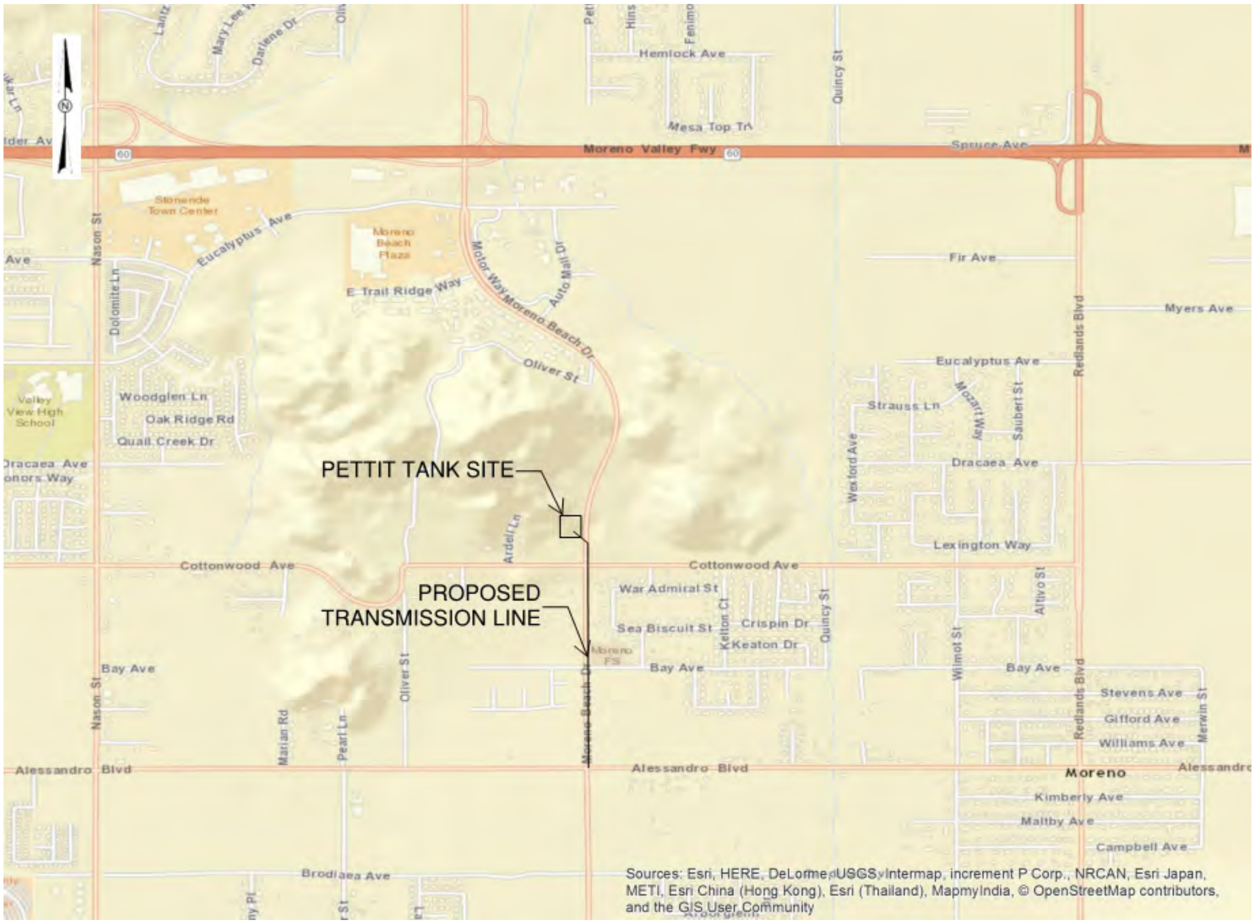
Description	Units	Criteria
Tank Type		AWWA D-100-11 Welded Carbon Steel Tank
Volume	MG	4.5
Diameter	Feet	137.5
Side water depth	Feet	41
High water level	EL. (ft.)	1763
Overflow level	EL. (ft.)	1763
Pipe connections		
Inlet/Outlet Pipes	Inches	30
Drain	Inches	8
Overflow	Inches	18
Max Inflow	CFS	29
Max Outflow		
Overflow	CFS	29
To Distribution (Outlet Pipe)	CFS	34

APPENDIX A SITE MAP

PETTIT POTABLE WATER STORAGE TANK & TRANSMISSION PIPELINE

PETTIT TANK TO ALESSANDRO BLVD

SITE MAP



APPENDIX B
PETTIT STORAGE SITING EVALUATION TM

KLEINFELDER
Bright People. Right Solutions.

October 17, 2016
Kleinfelder Project No. 20164763.001A
Contract No. 99572

Ms. Leslie Parada, PE
Civil Engineer I
CIP Water Division
Eastern Municipal Water District
P.O. Box 2270 Trumble Road
Perris, California 92572-8300

SUBJECT: Pettit Storage Siting Evaluation Technical Memorandum

Dear Ms. Parada;

Kleinfelder is pleased to submit the attached Pettit Storage Siting Evaluation Technical Memorandum for your review and comment.

If you have any questions about this report or the recommendations herein, please do not hesitate to contact us.

Sincerely,

KLEINFELDER

Marc Weinberger

Marc Weinberger, PE, BCEE
Project Manager

PETTIT STORAGE SITING EVALUATION
TECHNICAL MEMORANDUM
MORENO VALLEY, CALIFORNIA
KLEINFELDER PROJECT NO. 20164763.001A
EMWD AGREEMENT NO. 99572

OCTOBER 17, 2016

A Report Prepared for:

Ms. Leslie Parada, PE
Civil Engineer I
CIP Water Division
Eastern Municipal Water District
P.O. Box 2270 Trumble Road
Perris, California 92572-8300

PETTIT STORAGE SITING EVALUATION
TECHNICAL MEMORANDUM
MORENO VALLEY, CALIFORNIA

Prepared by:

Rachel Norris
Project Engineer

Reviewed by:

Marc Weinberger, PE, BCEE
Project Manager

REGISTERED PROFESSIONAL ENGINEER
MARC WEINBERGER
EXP. 3/31/2018
No. C26441
CIVIL
STATE OF CALIFORNIA

KLEINFELDER
550 West C Street, Suite 1200
San Diego, California 92101
Phone: 619.831.4600
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October 17, 2016
Kleinfelder Project No. 20164763.001A
City Contract No. 99572

TABLE OF CONTENTS

Section **Page**

1 INTRODUCTION

Eastern Municipal Water District (EMWD) has an existing 2.0 million gallon (MG) storage facility, the Pettit Tank Site (Site). The Site is located in the city of Moreno Valley, CA on the west side of Moreno Beach Drive approximately 1,000 linear feet (LF) north of Cottonwood Avenue, as shown on the site map included in Appendix A. The existing 2.0 MG tank is located on the south side of a 3.53 acre parcel. EMWD acquired additional land located immediately north of the existing site to allow space to construct up to 6 million gallons of additional storage. Based on the 2015 Water Facilities Master Plan Update, additional water storage capacity is needed to support a planned development in east Moreno Valley.

Additional storage will be added to the site through construction of one or more water storage tanks to reach a total of 8.1 MG. The new tank(s) will be fed by approximately 4,000 LF of transmission pipeline to connect the proposed storage tank(s) to the proposed Cactus II Feeder, currently in design. The tie in to the Cactus II Feeder will be located at the intersection of Moreno Beach Drive and Alessandro Boulevard.

2 SCOPE OF WORK

The purpose of this Technical Memorandum (TM) is to:

- Evaluate the condition of the existing 2-MG Pettit Tank and,
- Prepare a conceptual design study of the Pettit Tank site to determine the optimal storage configuration, including total tank storage and on-site reservoir drainage and stormwater retention.

The reservoir siting study was based on a review of site storage requirements, site topography, on-site stormwater and reservoir drainage requirements, and site access. A desktop evaluation of the existing steel tank was performed by reviewing the dive report and existing information to determine the suitability of the existing tank for continual use. Additionally, this technical memorandum addresses the advantages and disadvantages of each layout and recommends a preferred siting option. The analysis includes the following considerations:

- Existing utilities
- Construction phasing and impacts
- Storage capacity
- On-site retention
- Cost
- Access
- Community impacts/aesthetics
- Adherence to agency standards

3 EXISTING PETTIT TANK EVALUATION

The evaluation of the existing 2 MG Pettit tank was developed based on the existing interior diving report prepared by Liquivision Technology Diving Services dated December 9, 2014 and a site visit conducted by Kleinfelder on April 22, 2016.

Overall, the existing 2 MG Pettit tank is in good condition. There are some areas of minor corrosion on the interior and exterior of the tank, and some moderate corrosion on the interior roof members. However, EMWD has operational issues with the tank due to the floor elevation being 8-feet higher than the other tanks within the same pressure zone. Since the tanks are hydraulically connected, cycling the water in the tanks becomes problematic since the Pettit tank will completely drain while the other tanks have 8 feet of remaining water. Additionally, the Pettit tank does not have sufficient freeboard to meet current code requirements for seismic activity. From visual inspection of record drawings, the reservoir currently has less than 2 feet of freeboard. To meet the current code, the tank roof would need to be raised approximately 10 feet.

3.1 RESERVOIR CONDITION ASSESSMENT RATING SCALE

The rating scale used in the evaluation of each major component is shown in Table 1. Each component was assigned a value based on the percentage of the value of the component that was required to return each component to essentially new condition (i.e., restored to original physical condition, no performance issues, etc.).

Table 1
Rating Scale for Physical Condition and Performance

Rating	Physical Condition	Performance
1 - Excellent	No Visible Degradation	Component Functioning as Intended
2 - Good	Slightly Visible Degradation	In-service, but Higher Than Expected O&M
3 - Moderate	Visible Degradation	In-service, but Function is Impaired
4 - Poor	Integrity of Component Moderately Compromised	In-service, but Function is Highly Impaired
5 - Critical	Integrity of Component Severely Compromised	Component not Functioning as Intended

3.2 INTERIOR EVALUATION

3.2.1 Roof

A number of photos of the roof were shown in the report. It is not known if these photos are representative of the condition of the entire roof. Therefore, the evaluation of the roof is limited to the photos provided in the dive report.

The interior roof is constructed of concentric roof rafters spanning from the center of the reservoir to intermediate girders and from the girders to the shell walls. Kicker plates are welded to the shell wall to support the ends of the rafters. Figure 1 shows where the rafters meet the kicker plates. There was minor to moderate corrosion on the roof rafters where the rafters meet the roof plates. There was minor corrosion along the weld seems of the roof plates. Figure 2 shows the minor corrosion at the welds of the roof plates. Overall, the roof appears to be in moderate condition.

Figure 1: Moderate to minor corrosion where rafters meet kicker plates

Figure 2: Moderate to minor corrosion along weld seems of roof plates

3.2.2 Shell Walls and Appurtenances

The following is a summary of the reservoir shell walls, wall penetrations and appurtenances:

- The shell walls appear to be in good condition with a few isolated corrosion spots.

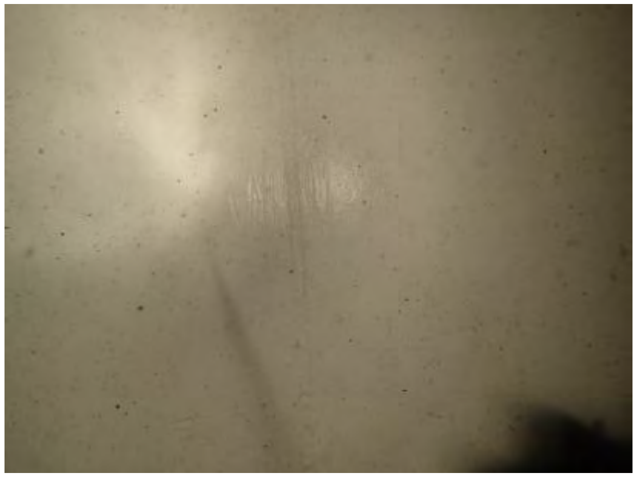


Figure 3: Tank interior shell wall with few isolated corrosion spots.

- There are five water sample tap penetrations and each has moderate to severe corrosion isolated at the penetration (Figure 4). The shell wall plates do not appear affected by this corrosion. There is an additional small penetration for the level indicator, which has similar corrosion to the water taps (Figure 5).

Figure 4: One sample tap penetration with moderate to severe corrosion

Figure 5: Penetration for level indicator with moderate to severe corrosion

- A common inlet/outlet pipe penetrates through the sidewall. There was no corrosion present at the opening at the time of the dive inspection. (Figure 6)

- One manway entrance is located in the sidewall. The Interior of the manway appeared to be in good condition with only minor rust on the wing arm. However, there was no internal support for the manway at the time of the inspection. (Figure 7).
- One doghouse-style drain penetrates through the shell wall. There was no corrosion

Figure 6: Inlet/outlet penetration with no corrosion

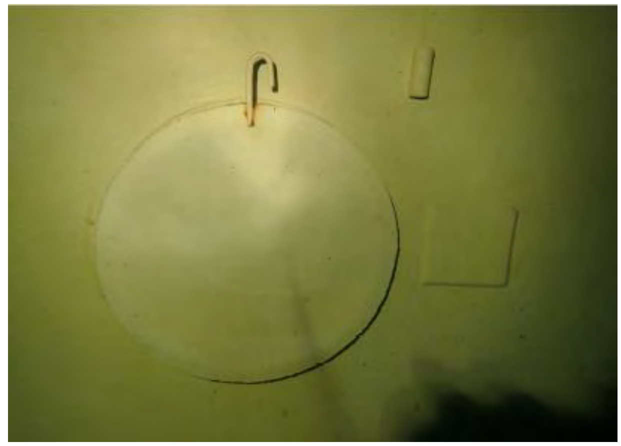


Figure 7: Man way entrance with minor rust on wing arm

present at the time of the dive inspection and the drain was in good condition. (Figure 8)

- The overflow weir is a half cylinder shaped weir attached directly to the shell wall near the roof. The dive report has only one photo from below the weir, and it appears to be in good condition with a few minor corrosion spots. The condition of the top and inside of the weir are not known. (Figure 9)

Figure 8: Doghouse-style drain through wall with no corrosion

Figure 9: Overflow weir in good condition

3.2.3 Floor

The floor plates appeared to be in good condition with a few areas of isolated corrosion spotting. There was little to no sedimentation present at the time of the dive inspection. (Figure 10)

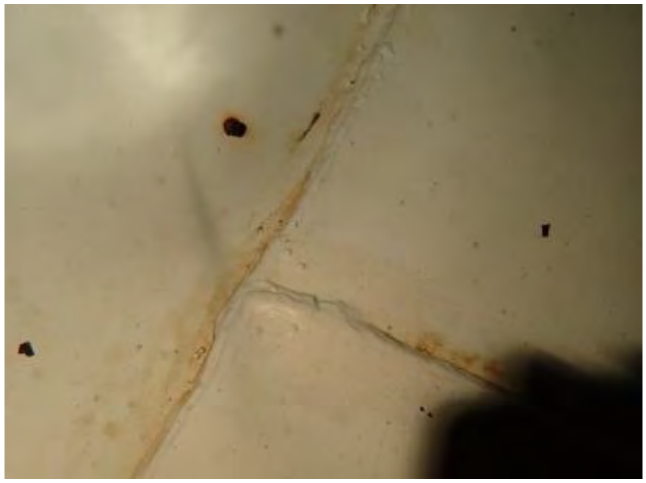


Figure 10: Floor plates with isolated corrosion spotting

3.2.4 Columns

According to the LiquiVision Technology report, there are seven support columns. Only the base of one of the columns is shown in the report. The section shown appears to be in good condition with little to no corrosion and according to the report there was little to no corrosion on the remaining columns. (Figure 11)

3.2.5 Interior Ladder

The interior ladder appears to be in good condition. The LiquiVision report states that the rungs above the water line have rust scale occurring but that there was still a significant amount of steel

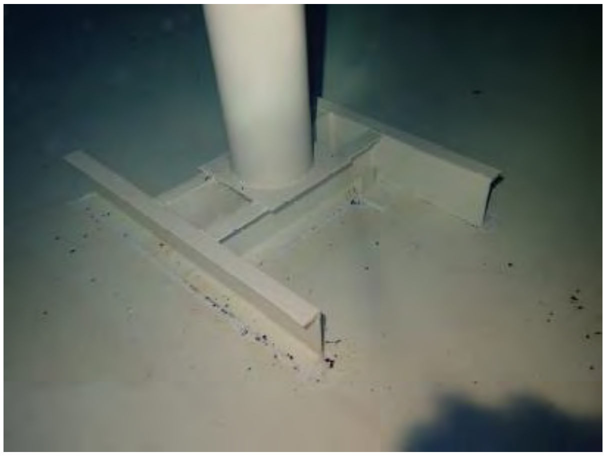


Figure 11: Column base in good condition

Figure 12: Interior ladder in good condition

present at the time of the inspection. There is no information regarding the ladder offsets, rung sizes, or other measurements to verify that the ladder is in compliance with CalOSHA standards. (Figure 12)

3.3 EXTERIOR EVALUATION

3.3.1 Roof

The exterior roof plates appear to be in good condition. There are a few areas of corrosion spotting and some staining near the roof vent, see Figure 13. The roof vent appeared to be in

Figure 13: Roof plates in good condition with isolated corrosion spotting

Figure 14: Roof vent in poor condition with moderate corrosion around base

poor condition with moderate corrosion, however, at the time of the LiquiVision inspection the mesh screen was intact, see Figure 14. The roof hatch appeared to be in moderate condition, there are some areas of corrosion on the lid and the hatch lip, see Figure 15. It is unclear from the report how large the opening is, how high the lip curb is, whether the hatch was locked at the time of the site visit, or whether the lid had confined space entry signage. The roof has two cathodic protection anode covers that appear to be in good condition.

Figure 15: Roof hatch in moderate condition with areas of moderate corrosion

3.3.2 Shell Walls

The shell walls appear to be in good condition with a few isolated corrosion spots. Summarized below are the multiple wall penetrations and appurtenances.

- There are five water tap penetrations. The water taps all appear to be in good condition, with only some minor corrosion around the penetration. (Figure 16).

Figure 16: One water tap penetration with minor corrosion around the penetration

- A level indicator penetration is near the inlet/outlet pipe. The exterior of the penetration appears to be in good condition and the meter appears to be in good condition. (Figure 17).
- A common inlet/outlet pipe penetrates through the sidewall. The inlet outlet piping appears to be in good condition. (Figure 18).

Figure 17: Penetration for level indicator in good condition with no visible corrosion

Figure 18: Inlet/outlet penetration in good condition

- One manway entrance is located in the sidewall. The manway appears to be in good condition, the cross member and bolt have mild corrosion. (Figure 19).
- One doghouse-style drain penetrates through the shell wall. The drain cover, bolts and valve all appear in good condition. (Figure 20).
- The overflow pipe penetrates through the shell wall near the top of the tank and is supported along the height of the tank. It terminates near the ground level and has a screen cover to prevent insects and other animals from entering the tank. Overall the overflow pipe appears to be in good condition. (Figure 21).

Figure 19: Manway entrance in good condition and mild corrosion on cross member and bolt

Figure 20: Doghouse drain in overall good condition

Figure 21: Overflow pipe in good condition

3.3.3 Exterior Ladder

The exterior ladder appears to be in good condition. The LiquiVision report states that the rungs above the water line have rust scale occurring but that there was still a significant amount of steel present at the time of the inspection see Figure 22. There is no information regarding the ladder offsets, rung sizes, or other measurements are available to verify if the ladder is in compliance with CalOSHA standards.

Figure 22: Exterior ladder in overall good condition with minor corrosion spots

The condition assessment of each of the tank's elements is summarized in Table 2.

Table 2

Summary of Tank Condition Assessment

Tank Condition Assessment Summary	
Element	**Condition**
Interior Roof	Moderate
Interior Shell Walls	Good
Interior Appurtenances:	
• Water Tap Penetrations	Moderate
• Inlet/Outlet Pipe	Good
• Manhole Penetration	Good
• Doghouse Drain	Good
• Overflow Weir	Good
Interior Floor	Good
Interior Columns	Good
Interior Ladder	Good
Exterior Roof	Good
Exterior Shell Walls	Good
Exterior Appurtenances:	
• Water Tap Penetrations	Good
• Level Indicator	Good
• Exterior Inlet/Outlet Pipe	Good
• Manway entrance	Good
• Doghouse-Style Drain	Good
• Overflow Pipe	Good
Exterior Ladder	Good

4 TANK SITE ALTERNATIVES

Alternatives were developed that provide two tanks with a combined storage volume of 8 MG and a detention basin for tank draining and storm water, all within the EMWD property. The following criteria were considered in developing the alternatives: existing utilities, construction phasing and impacts, detention basin capacity, cost, access, community impacts/aesthetics, and adherence to agency standards.

The design criteria are described as follows:

The site topography, which slopes steeply down from west to east, makes providing the 8 million gallons of storage and on-site retention difficult. The area surrounding the site does not have engineered storm water management facilities, therefore surface water runoff and tank drainage must be contained on site in above-ground detention facilities. In order to maximize the size of the detention basin, alternatives were considered that would require retaining walls or a partially buried reservoir. Partially buried reservoirs would need to be constructed of concrete instead of steel. Concrete tanks, however, are not allowed to be constructed at the site due to restrictions established in the title deed for the property, which require improvement projects to be of similar design and construction as existing facilities.

Three alternatives were developed that employed on site grading with maximum 2:1 slopes. This would limit the need for retaining walls and avoid the need for buried tanks, but decrease the available space and volume of the detention basin.

The detention basin in the alternatives will have 2:1 side slopes and a minimum 6-foot bench along the perimeter. The elevation at the bottom of the basins will be 1716 feet and the 1722 feet at the top of the berm. This would provide 1 foot of freeboard at the design high water level. Due to the level of the bottom of the proposed basins, the existing culvert that will be utilized will need to be replaced with a culvert approximately 4 feet lower than the existing to convey runoff from the basin. The culvert is within the City of Moreno Valley Right-of-Way. An encroachment permit would need to be obtained from the City in order to perform this work. In addition to replacing the culvert, a new headwall and riprap pad to dissipate storm water would be required at the culvert outlet on the east side of Moreno Beach Drive.

The basins in all three alternatives are sufficient for the stormwater flow requirements for the site, which were calculated to be 8,500 ft^3, or 64,000 gallons. Freeboard and slope stability requirements will be determined in a future geotechnical investigation and analysis.

For alternatives 1 and 2, an interim plan would need to be developed to keep the existing 2 MG tank in service while the most northern proposed tank was installed and placed in service. Once this new tank is in service, the existing 2 MG tank could be removed and the second proposed tank could be installed. To achieve this interim condition, a temporary 2:1 cut slope would be graded between the existing tank pad and the new tank pad to the north. Based on the proposed tank locations of each alternative, there is sufficient room to install the temporary cut slope.

The existing 2 MG tank has a floor elevation approximately 8 feet above the other tanks in the pressure zone, which causes operational issues, and the tank has insufficient freeboard. Alternatives 1 and 2 will keep the existing 2 MG tank in service until the new second tank is installed, while Alternative 3 does not remove the existing tank. This issue will persist in all 3 alternatives until the existing tank is demolished and replaced (Alternatives 1 and 2 only). The existing tank also has an insufficient freeboard, which is a concern during seismic events.

The three alternatives are described in the following sections.

4.1 ALTERNATIVE 1 – TWO NEW 4-MG TANKS

Alternative 1 includes the demolition of the existing 2 MG tank and construction of two new 4 MG tanks. One tank will be located on the existing tank site, and the other tank just to the north on the acquired EMWD property. The detention basin would be located on the northeast portion of the site and have a capacity of 0.45 MG, equivalent to 4.3 feet of water in one tank. The access road to the tank will have an 8% slope uphill towards the tank.

The northern tank would be constructed and operational prior to demolition of the existing tank and construction of the southern tank. Alternative 1 is shown in Figure 23. It was determined no utilities are in conflict with this siting alternative.

4.2 ALTERNATIVE 2 – NEW 3-MG TANK AND NEW 5-MG TANK

Alternative 2 includes the demolition of the existing 2 MG tank and construction of a new 5 MG tank at the location of the existing tank, and a 3 MG tank located just to the north of the 5 MG tank on the acquired EMWD property. The access road to the tank will have a 7% slope uphill towards the tank.

The detention basin would be located on the north eastern portion of the site and have a capacity of 0.47 MG, equivalent to 6.4 feet of water in the 3 MG tank and 3.7 feet of water in the 5 MG tank.

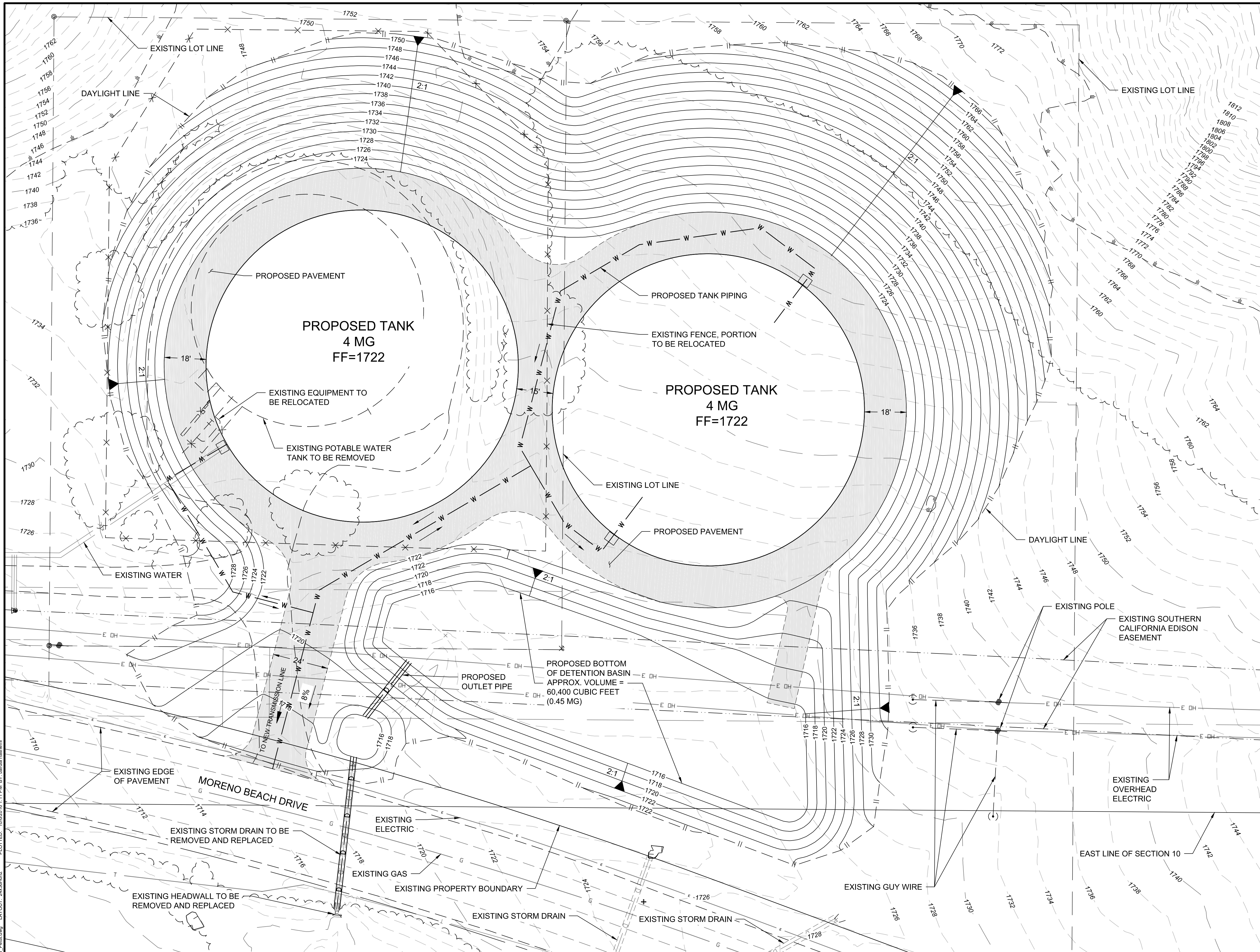
The northern tank to be constructed and operational prior to demolition of the existing tank and construction of the southern tank. Alternative 2 is shown in Figure 24. It was determined no utilities are in conflict with this siting alternative.

4.3 ALTERNATIVE 3 – EXISTING 2-MG TANK TO REMAIN AND NEW 6-MG TANK

Alternative 3 includes the existing 2 MG tank remaining and construction of a new 6 MG tank located just to the north of the 2 MG tank on the acquired EMWD property. The access road to the tank will have a 15% slope uphill towards the tank. This alternative also requires the construction of a retaining wall on the northern side of the site.

The detention basin would be located on the north eastern portion of the site and have a capacity of 0.29 MG, equivalent to 5.0 feet of water in the 2 MG tank and 1.8 feet of water in the 5 MG tank. Alternative 3 is shown in Figure 25. It was determined no utilities are in conflict with this siting alternative.

A summary of tank and detention basin dimensions with pavement and earthwork quantities for each alternative is included in Table 3 below.



SUMMARY

TANK SIZE	2-4 MG TANKS, DIAMETER = 134'
DETENTION BASIN	VOLUME = 60,400 CUBIC FEET (0.45 MG)
PAVEMENT	19,500 SQUARE FEET
EARTHWORK	CUT = 45,229 CUBIC YARDS
	FILL = 29 CUBIC YARDS
	EXPORT = 45,200 CUBIC YARDS

0 20 40 60
SCALE: 1" = 20' SCALE IN FEET

SPEC. No. XXXXX

Underground Service Alert
Call: TOLL FREE 811
TWO WORKING DAYS BEFORE YOU DIG

SCALE VERIFICATION
THIS BAR IS 1 INCH IN LENGTH ON ORIGINAL DRAWING
0 1"
IF IT'S NOT 1 INCH ON THIS SHEET ADJUST YOUR SCALES ACCORDINGLY

PLANS PREPARED BY:
KLEINFELDER
Bright People. Right Solutions.

REVISIONS

NO.	DATE	INITIAL	DESCRIPTION	APPVD/DATE

APPROVED BY:
XX/XXXX
DIRECTOR OF ENGINEERING DATE
REFERENCES

EASTERN MUNICIPAL WATER DISTRICT
XX/XXXX
PROJECT MANAGER DATE

APPROVALS

	INITIAL	DATE
PROJECT ENGR.	XX	XX/XXXX
INSPECTION	XX	XX/XXXX
WTR. OPERATIONS	XX	XX/XXXX
MAINTENANCE	XX	XX/XXXX

	DATE
DESIGNED	XX/XXXX
DRAWN	XX/XXXX
TRACED	
CHECKED	XX/XXXX
SUBMITTED	XX/XXXX

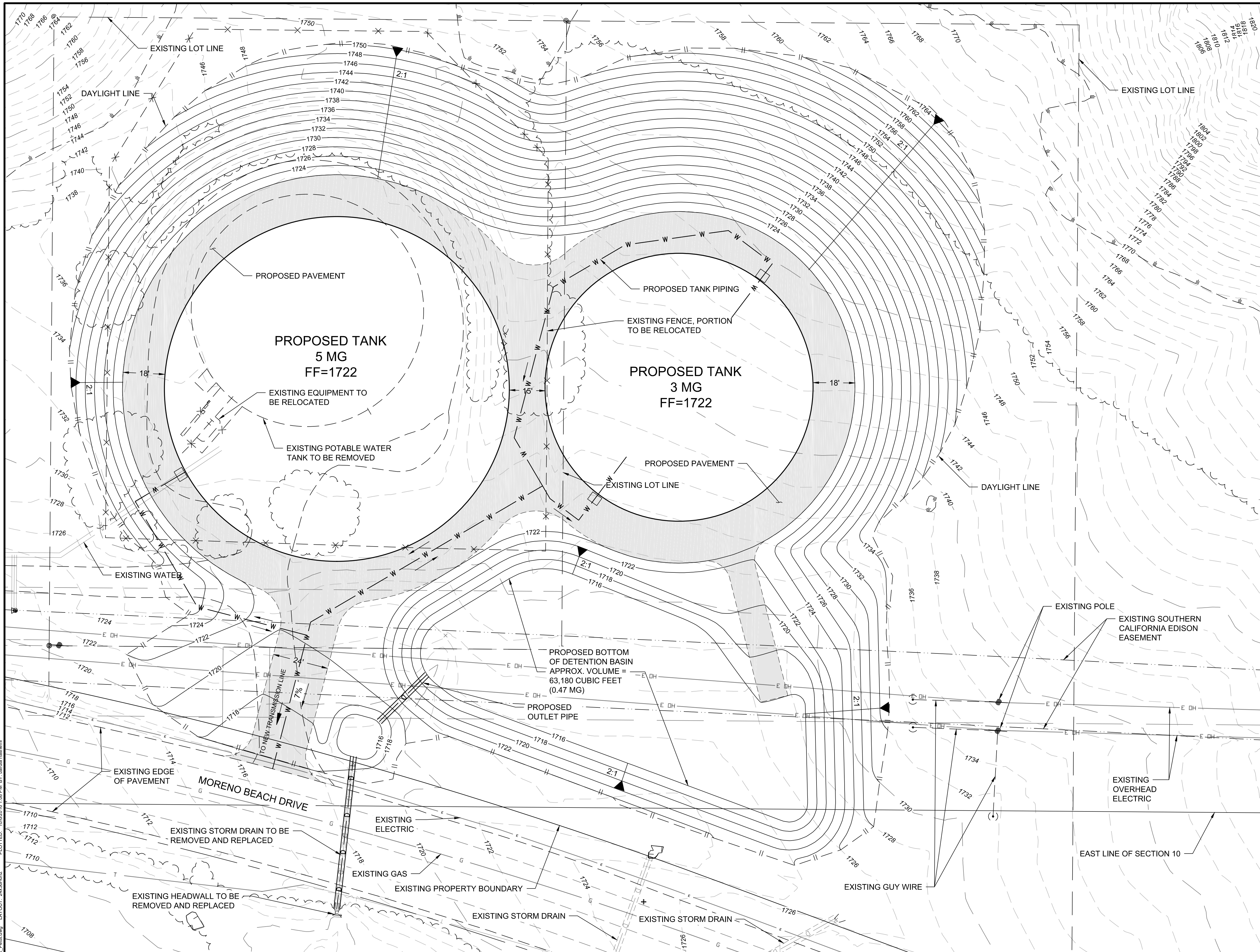
SCALE: AS SHOWN

EASTERN MUNICIPAL WATER DISTRICT
RIVERSIDE COUNTY, CALIFORNIA

PETTIT TANK
ALTERNATIVE 1
2-4 MG TANKS
ULTIMATE CONDITION
FIGURE 23

I.D. XX
S.A. XX
W.O. XXXXXX
C.O.
COORD. XX-X-XX
SHT____ OF XX
D-_ _ _ _ _

CAD FILE: C:\pwworking\d0168521\Option_1_Pettit.dwg LAYOUT: 24x36Horiz PLOTTED: 10/6/2016 1:11 PM BY: bardia hashemi



SUMMARY	
TANK SIZE	1-3 MG TANK, DIAMETER = 115', 1-5 MG TANK, DIAMETER = 148'
DETENTION BASIN	VOLUME = 63,180 CUBIC FEET (0.47 MG)
PAVEMENT	18,800 SQUARE FEET
EARTHWORK	CUT = 42,335 CUBIC YARDS
	FILL = 25 CUBIC YARDS
	EXPORT = 42,300 CUBIC YARDS

0 20 40 60
SCALE: 1" = 20' SCALE IN FEET

SPEC. No. XXXXX

Underground Service Alert
Call: TOLL FREE
811
TWO WORKING DAYS BEFORE YOU DIG

SCALE VERIFICATION
THIS BAR IS 1 INCH IN LENGTH ON ORIGINAL DRAWING
0 1"
IF IT'S NOT 1 INCH ON THIS SHEET ADJUST YOUR SCALES ACCORDINGLY

PLANS PREPARED BY:
KLEINFELDER
Bright People. Right Solutions.

REVISIONS				
NO.	DATE	INITIAL	DESCRIPTION	APPV'D/DATE

APPROVED BY:
XX/XXXX
DIRECTOR OF ENGINEERING DATE
REFERENCES

EASTERN MUNICIPAL WATER DISTRICT
XX/XXXX
PROJECT MANAGER DATE

APPROVALS		INITIAL	DATE
	PROJECT ENGR.	XX	XX/XXXX
	INSPECTION	XX	XX/XXXX
	WTR. OPERATIONS	XX	XX/XXXX
	MAINTENANCE	XX	XX/XXXX

	DATE
DESIGNED	XX/XXXX
DRAWN	XX/XXXX
TRACED	
CHECKED	XX/XXXX
SUBMITTED	XX/XXXX

SCALE: AS SHOWN

EASTERN MUNICIPAL WATER DISTRICT
RIVERSIDE COUNTY, CALIFORNIA

PETTIT TANK
ALTERNATIVE 2
5 MG AND 3 MG TANKS
ULTIMATE CONDITION
FIGURE 24

I.D. XX
S.A. XX
W.O. XXXXXX
C.O.
COORD. XX-X-XX
SHT ____ OF XX
D-_ _ _ _ _

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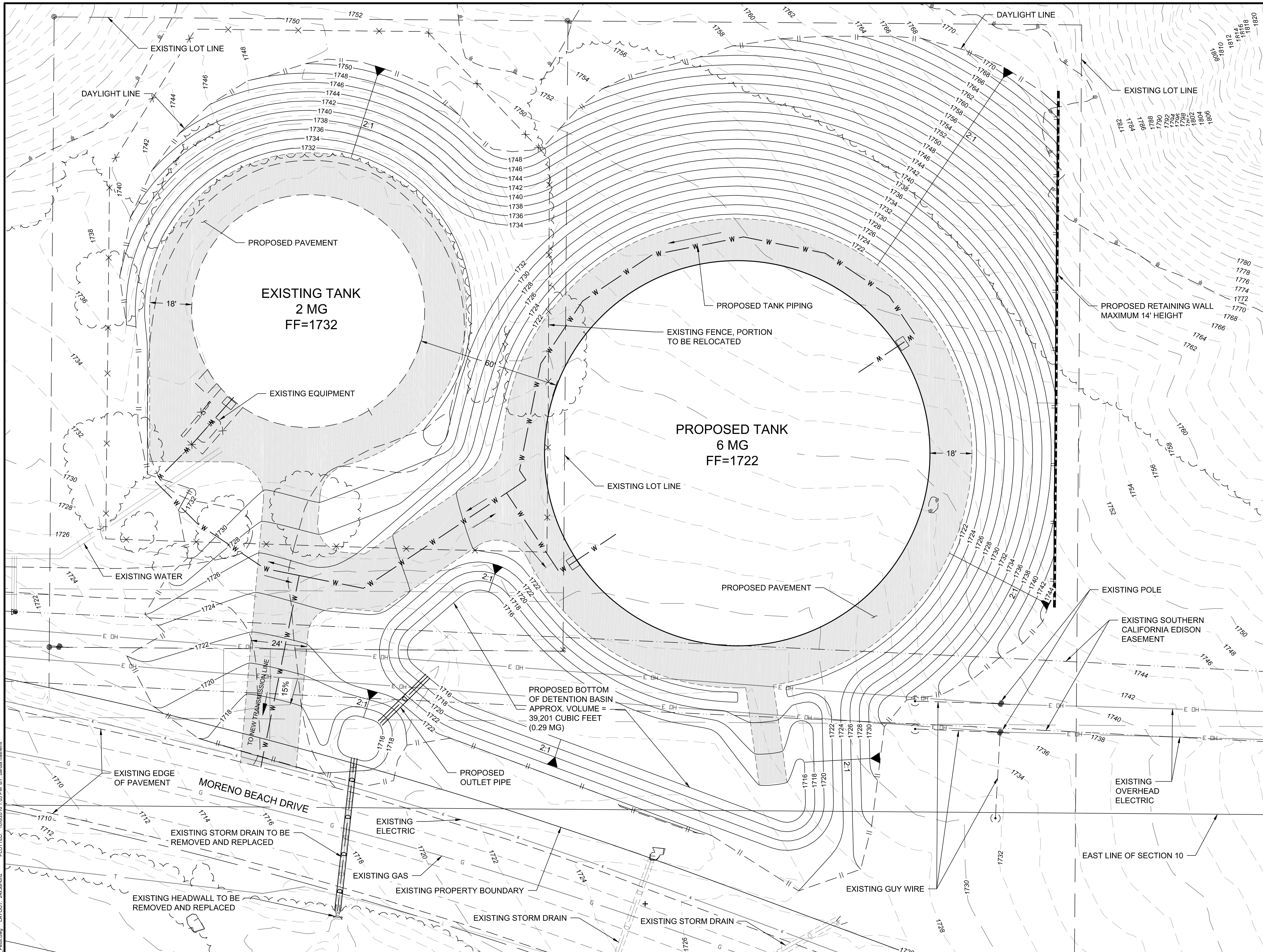

SUMMARY	
TANK SIZE	1-6 MG TANK, DIAMETER = 165' EXISTING 2 MG TANK
DETENTION BASIN	VOLUME = 39,201 CUBIC FEET (0.29 MG)
PAVEMENT	23,900 SQUARE FEET
EARTHWORK	CUT = 41,514 CUBIC YARDS
	FILL = 32 CUBIC YARDS
	EXPORT = 41,482 CUBIC YARDS

0 20 40 60
SCALE: 1" = 20' SCALE IN FEET

SPEC. No. XXXXX

Underground Service Alert
Call: TOLL FREE
811
TWO WORKING DAYS BEFORE YOU DIG

SCALE VERIFICATION
THIS BAR IS 1 INCH IN LENGTH ON ORIGINAL DRAWING
0 1"
IF IT'S NOT 1 INCH ON THIS SHEET ADJUST YOUR SCALES ACCORDINGLY

PLANS PREPARED BY:
KLEINFELDER
Bright People. Right Solutions.

REVISIONS				
NO.	DATE	INITIAL	DESCRIPTION	APPVD/DATE

APPROVED BY:
XX/XXXX
DIRECTOR OF ENGINEERING DATE
REFERENCES

EASTERN MUNICIPAL WATER DISTRICT
XX/XXXX
PROJECT MANAGER DATE

APPROVALS	INITIAL	DATE
PROJECT ENGR.	XX	XX/XXXX
INSPECTION	XX	XX/XXXX
WTR. OPERATIONS	XX	XX/XXXX
MAINTENANCE	XX	XX/XXXX

	DATE
DESIGNED	XX/XXXX
DRAWN	XX/XXXX
TRACED	
CHECKED	XX/XXXX
SUBMITTED	XX/XXXX

SCALE: AS SHOWN

EASTERN MUNICIPAL WATER DISTRICT
RIVERSIDE COUNTY, CALIFORNIA

PETTIT TANK
ALTERNATIVE 3
EXISTING 2 MG TANK AND PROPOSED 6 MG TANK
ULTIMATE CONDITION
FIGURE 25

I.D. XX
S.A. XX
W.O. XXXXXX
C.O.
COORD. XX-X-XX
SHT ___ OF XX
D-_ _ _ _ _

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CAD FILE: C:\pwworking\d0168521\Option_3_Pettit.dwg

Table 3

Siting Alternative Summary

SUMMARY					
ALTERNATIVE 1		**ALTERNATIVE 2**		**ALTERNATIVE 3**	
Tank Size	2-4 MG Tanks Dia = 134’	Tank Size	1-3 MG, Tank Dia = 115’ 1-5 MG Tank, Dia = 148’	Tank Size	1-6 MG Tank, Dia = 165’ Existing 2 MG Tank
Detention Basin	Vol. = 60,400 ft^3 (0.45 MG)	Detention Basin	Vol. = 63,180 ft^3 (0.47 MG)	Detention Basin	Vol. = 39,201 ft^3 (0.29 MG)
Pavement	19,500 ft^2	Pavement	18,800 ft^2	Pavement	23,900 ft^2
Earthwork	Cut = 45,229 yd^3	Earthwork	Cut = 42,335 yd^3	Earthwork	Cut = 41,514 yd^3
	Fill = 29 yd^3		Fill = 25 yd^3		Fill = 32 yd^3
	Export = 45,200 yd^3		Export = 42,300 yd^3		Export = 41,482 yd^3

5 ALTERNATIVES EVALUATION

The advantages and disadvantages of each alternative are displayed in Table 4 below.

Table 4

Tank Alternative Advantages and Disadvantages

Alternative	Advantages	Disadvantages
Alternative 1 Two 4 million gallon tanks	-Two tanks of identical configuration -Smaller tank footprint than 5 or 6 MG tank -Once existing tank is replaced, issues due to difference in floor elevation in other tanks within pressure zone are mitigated -New tanks will both have sufficient freeboard	-Requires interim 2:1 slope to be cut prior to installation of second tank -Smaller detention basin capacity -Requires demolition of existing tank -Lowers invert elevation of culvert -Provides less storage capacity for immediate use
Alternative 2 One 3 million gallon tank and one 5 million gallon tank	-Largest detention basin capacity -Smaller tank footprint than 6 MG tank -Once existing tank is replaced, issues due to difference in floor elevation in other tanks within pressure zone are mitigated -New tanks will both have sufficient freeboard	-Requires interim 2:1 slope to be cut prior to installation of second tank -Non-identical tank configurations -Requires demolition of existing tank -Lowers invert elevation of culvert -Provides least storage capacity for immediate use
Alternative 3 One 6 million gallon tank and one 2 million gallon tank	-Requires no demolition since 2 MG tank remains as is -Provides most storage capacity for immediate use -Lowest cost of completion since alternative only requires construction of one new tank	-Non-identical tank configurations -Largest footprint (6 MG tank) -Smallest detention basin capacity -Lowers invert elevation of culvert -Requires construction of retaining wall on northern portion of site -Larger volume of cut earthwork -Steepest access road at 15% -Operational issues due to difference in tank floor height persist. The tank floor will remain as is in this alternative. -Tank maintains insufficient freeboard.

The tank dimensions and detention basin capacities for each alternative are tabulated in Table 5 below.

Table 5
Tank Dimensions and Detention Basin Capacities

Alternative	1	2		3	
Tank Vol (MG)	4 (each tank)	5	3	6	2
Equiv. Vol (ft^3)	534,759	668,449	401,070	802,139	267,380
Tank Dia. (ft)	134	148	115	165	100
Detention Basin Vol. (ft^3)	75,390	79,027	79,027	39,202	39,202
Detention Basin Vol. (MG)	0.56	0.59	0.59	0.29	0.29
Equiv. Height of Water in Tank (ft)	5.3	4.6	7.6	1.8	5.0

A preliminary exploratory cost was determined for each alternative and is shown in Table 6. Tank manufacturers were contacted and estimated costs of the tanks and their foundations for each size were obtained. These preliminary costs reflect the construction of two (2) new tanks, a concrete ring wall foundation for each tank, tank interior and exterior coating, final grading work, yard piping, and a retaining wall for Alternative 3. For Alternative 3, it is assumed the existing 2 MG tank will be replaced with a new 2 MG tank, thus the cost for a 2 MG tank has also been included. These costs do not reflect a final construction cost and are only used for a comparative analysis of the alternatives.

Table 6

Cost Comparison for each Alternative

Cost Item	Alternative 1	Alternative 2	Alternative 3
Steel Tank (includes tank and, tank interior/exterior coating, and concrete foundation)	Phase 1: 4MG Tank = **$2,910,000** Phase 2: 4MG Tank = **$2,910,000**	Phase 1: 3 MG Tank = **$2,380,000** Phase 2: 5 MG Tank = **$3,585,000**	Phase 1: 6 MG Tank = **$4,109,000** Phase 2: 2 MG Tank = **$1,910,000**
Earthwork Export	45,229 CY x $3/CY = **$135,687**	42,335 CY x $3/CY = **$127,005**	41,514 CY x $3/CY = **$124,542**
Retaining Wall	N/A	N/A	225 LF x $100/LF = **$22,500**
Yard Piping	613 LF x $180/LF = **$110,340**	461 LF x $180/LF = **$82,980**	667 LF x $180/LF = **$120,060**
Total Cost	**$6,066,027**	**$6,174,985**	**$6,286,102**

6 RECOMMENDATIONS

After reviewing the "1764 Pettit Pressure Zone East Demand, Storage Requirement, and Existing Storage" hydraulic modelling study done by West Yost Associates, Phase 1 of all three alternatives will meet the pressure zone's demand for required storage until the year 2035. Additionally, all three alternatives will replace the existing tank with a new tank that is eight feet lower, which will alleviate the current operational issues faced. Based on the above analysis of the three alternatives, Alternative 1 is recommended from a constructability and feasibility standpoint, since it allows for more storage capacity during Phase 1 while still providing a sufficient detention area on the site. The four million gallons of storage will meet the east 1764 storage demands until the year 2045. Finally, this alternative avoids the need for retaining walls because the tank footprint is small enough to use 2:1 slopes.

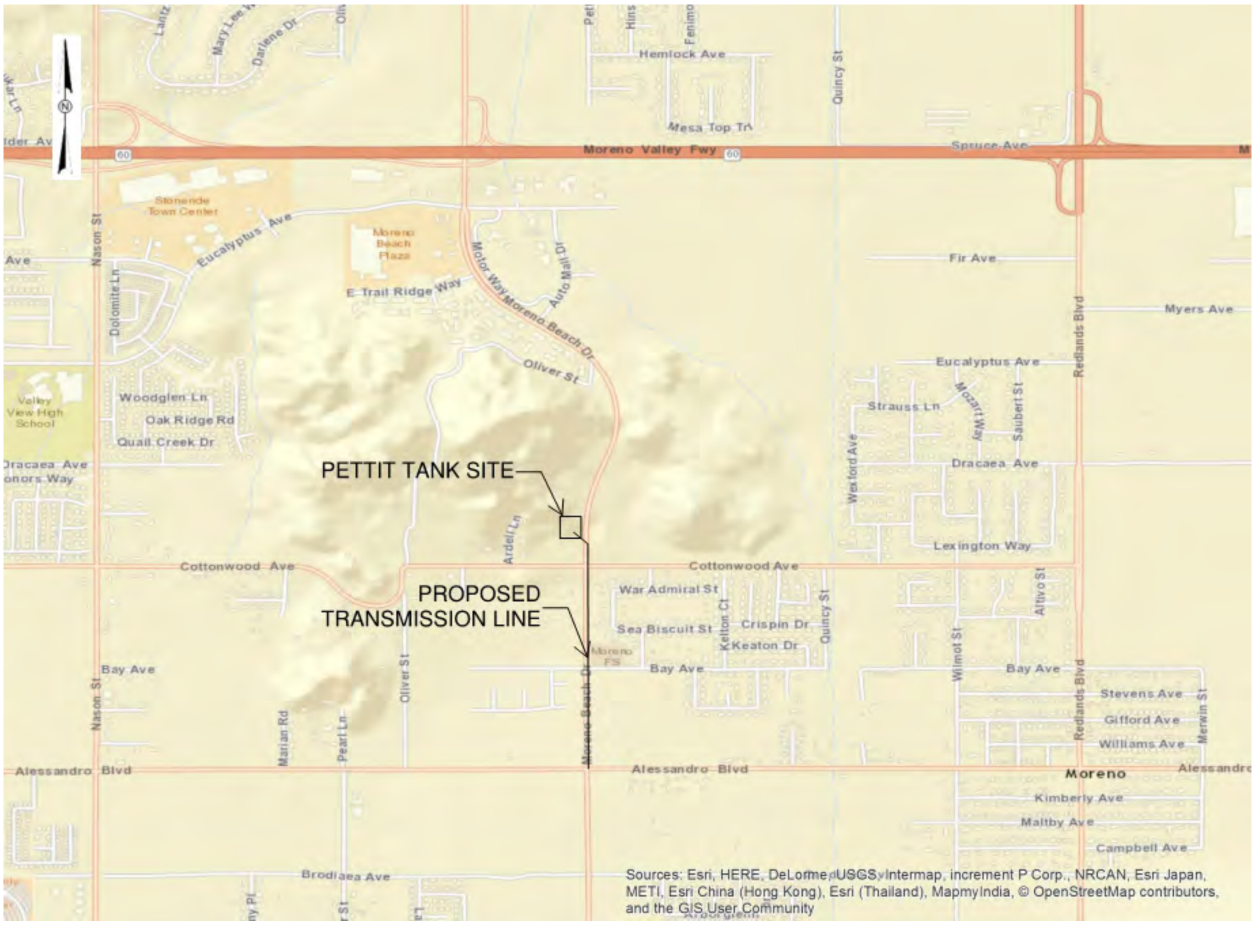
APPENDIX A

Site Map

PETTIT POTABLE WATER STORAGE TANK - TRANSMISSION PIPELINE

PETTIT TANK TO ALESSANDRO BLVD

SITE MAP



APPENDIX C
PETTIT TRANSMISSION PIPELINE TM

October 17, 2016
Kleinfelder Project No. 20164763.001A
EMWD Contract No. 99572

Ms. Leslie Parada, PE
Civil Engineer I
CIP Water Division
Eastern Municipal Water District
P.O. 2270 Trumble Road
Perris, CA 92572-8300

SUBJECT: Pettit Transmission Pipeline Technical Memorandum

Dear Ms. Parada;

Attached is the Pettit transmission pipeline alignment study for your review and comment.

If you have any questions about this report or the recommendations herein, please do not hesitate to contact us.

Sincerely,

KLEINFELDER

Marc Weinberger, PE, BCEE
Project Manager

PETTIT TRANSMISSION PIPELINE
TECHNICAL MEMORANDUM
MORENO VALLEY, CALIFORNIA
KLEINFELDER PROJECT NO. 20164763.001A
EMWD AGREEMENT NO. 99572

OCTOBER 17, 2016

A Report Prepared for:

Ms. Leslie Parada, PE
Civil Engineer I
CIP Water Division
Eastern Municipal Water District
P.O. 2270 Trumble Road
Perris, California 92572-8300

PETTIT TRANSMISSION PIPELINE
TECHNICAL MEMORANDUM
MORENO VALLEY, CALIFORNIA
EMWD Agreement No. 99572

Prepared by:

Rachel Norris
Project Engineer

Reviewed by:

Marc Weinberger, PE, BCEE
Project Manager

KLEINFELDER
550 West C Street, Suite 1200
San Diego, California 92101
Phone: 619.831.4600
Fax: 619.232.1039

October 17, 2016
Kleinfelder Project No. 20164763.001A
EMWD Contract No. 99572

TABLE OF CONTENTS

1 INTRODUCTION

The preliminary design for the Pettit Potable Water Storage Tank Expansion and Transmission Pipeline is a part of Eastern Municipal Water District's (EMWD) 2015 Water Facilities Master Plan Update.

Eastern Municipal Water District (EMWD) has an existing 2.0 million gallon (MG) storage facility, the Pettit Tank site (Site). The Site is located in the city of Moreno Valley, CA on the west side of Moreno Beach Drive approximately 1,000 linear feet (LF) north of Cottonwood Avenue as shown on the site map included in Appendix A. The existing 2.0 MG tank is located on the south side of the 2.17 acre parcel (APN 477-310-011). EMWD recently acquired additional land to expand the parcel to its current size to allow space for the additional storage volume required. Based on the 2015 Water Facilities Master Plan Update, additional water storage capacity is needed to support a planned development in east Moreno Valley.

Additional storage will be added to the site through construction of one or more water storage tanks to reach a total of 8.1 MG. The new tank(s) will be fed by approximately 4,000 LF of transmission pipeline to connect the proposed storage tank(s) to the proposed Cactus II Feeder, currently in design. The tie in to the Cactus II Feeder will be located at the intersection of Moreno Beach Drive and Alessandro Boulevard. Tie-in details to the Cactus II Feeder are currently undeveloped because the design of the Cactus II Feeder has not yet been finalized. The tie-in design will be prepared upon receipt of the design plans for the Cactus II Feeder.

A site map can be found in Appendix A.

2 SCOPE OF WORK

The purpose of this Technical Memorandum (TM) is to identify and evaluate three transmission pipeline alignment alternatives, address advantages and disadvantages of each and recommend a preferred alignment. The alignment analysis includes the following considerations:

- Public right-of-way
- Existing utilities
- Planned utilities, and ultimate improvements (if applicable)
- Easements
- Traffic
- Permits
- Cost
- Access
- Community impacts
- Potential environmental constraints, and
- Adherence to agency standards.

Kleinfelder has identified permanent easements, rights of entry, and temporary construction easements required. To aid in the alignment evaluation, Kleinfelder utilized existing information and aerial mapping furnished by the District, County, United States Geologic Survey (USGS), and other agencies as well as aerial and topographic survey information. Additionally, the project team obtained existing utility information from the City of Moreno Valley, Riverside Flood Control District, EMWD, and utility owners to aid in the evaluation.

3 UTILITY RESEARCH

Kleinfelder contacted utility owners in the proximity of the project to identify potential utility conflicts as well as any planned utility replacements. Below is a summary of the research process:

- Contacted the City of Moreno Valley (City) with a formal research request. The City provided the following record drawings electronically for projects in the vicinity of the project:
  - Traffic Signal Project: Cottonwood Avenue at Moreno Beach Drive engineering design drawings dated 12/11/03.
  - Street Improvement Plan- Moreno Beach Drive Access Road engineering design drawings dated 12/06/06.
  - Draft Geometric Approval Drawings undated and unsigned.
  - Riverside County Road Department Plans for Construction on Moreno Beach Drive County Highway as-builts, dated 10/03/1972.
  - Electrical Backbone UG Structure and Electrical System Moreno Beach Drive – Cottonwood Avenue engineering drawings dated 10/31/06.
- Contacted the Riverside County Flood Control District (RCFCD) with a formal research request. RCFCD owns all drainage facilities in the City. RCFCD provided an interactive map showing locations of all drainage facilities in the City. No drainage facilities were found to be within project limits.
- Contacted a consulting firm that prepared Geometric Approval Design (GAD) drawings for the City. The consultant, Willdan Engineering, submitted CAD files electronically.

The full existing utilities base map can be found in Appendix C. Below is a summary of the results of the utility research:

- Sewer – One sewer main runs along the east side of Moreno Beach Drive approximately 700 LF south of Bay Avenue and parallel to the proposed transmission line for approximately 600 LF. The sewer main angles and terminates into a development on the west side of Moreno Beach Drive. The proposed transmission main will need to cross the sewer main at the location where it angles to the development. Figure 1 shows the location:

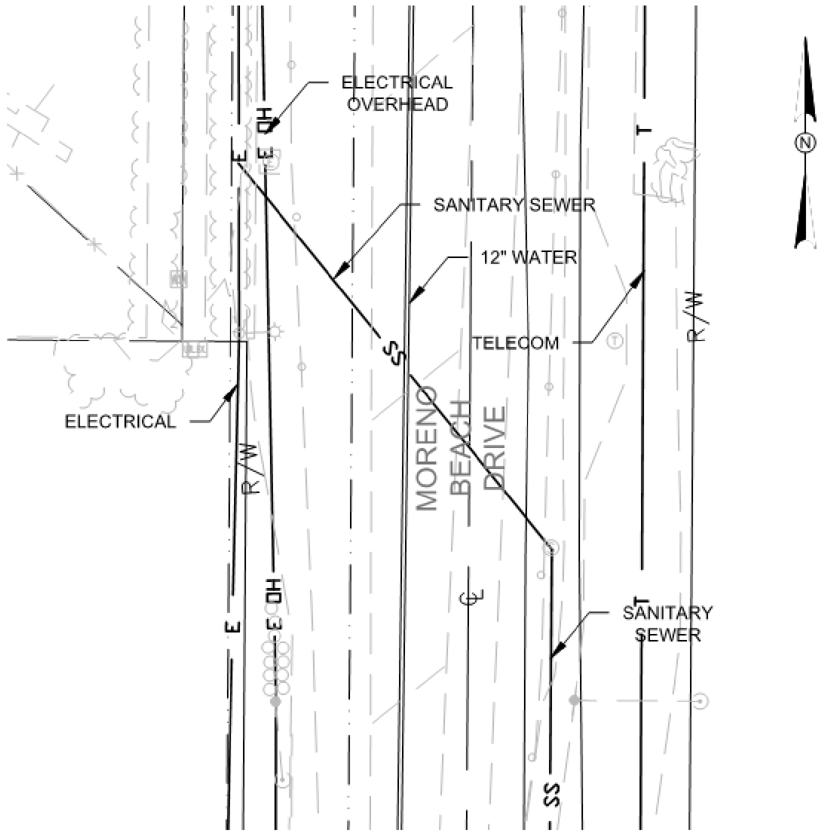


Figure 1

- Storm drain – Figure 2 shows two 36-inch Corrugated Metal Pipes running east to west on the north side of the intersection of Moreno Beach Drive and Allesandro Boulevard. The pipe inverts are approximately 4 – 5 feet below grade. The proposed transmission main design will need to take these pipes into consideration. One storm drain and associated manholes runs north to south along Moreno Beach drive beginning approximately 450 feet north of Bay Avenue. The storm drain is outside the pavement limits and therefore is not anticipated to impact the proposed transmission main.

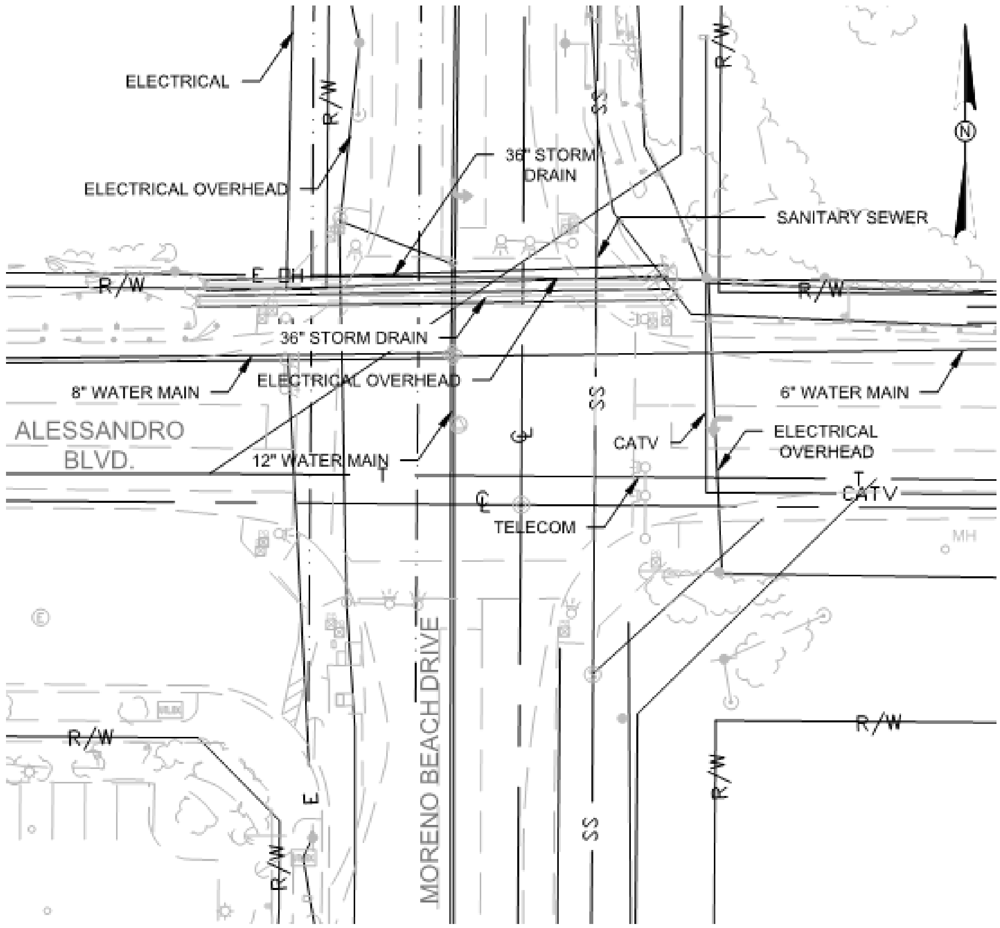


Figure 2

- Water – One existing 24-inch water main runs along Moreno Beach Drive. Between the Site and Cottonwood Avenue. The existing water main serves the existing 2-MG tank and is located east of Moreno Beach Drive outside of City right-of-way and within an EMWD easement. The existing water main is in the center of the 20-foot easement; the easement would not be able to accommodate an additional transmission line after factoring in constructability tolerances. Therefore, the existing easement was not considered in this analysis because a hydraulic analyses must be performed in order to determine whether the existing water main will remain in place.

- The 24-inch water main transitions to the east side of Moreno Beach Drive at Cottonwood Avenue and continues to Bay Avenue. Record drawings show that the water main at Allessandro Boulevard is 12 inches in diameter. The 24-inch water main transitions to a 12-inch water main south of Bay Avenue and north of Allessandro Boulevard. Figures 3 and 4 below show the location of the existing facilities. There is a 24-inch water lateral that serves a residential community approximately 57 feet west of Moreno Beach Drive. There are no anticipated impacts to the existing water main along Moreno Beach Drive.

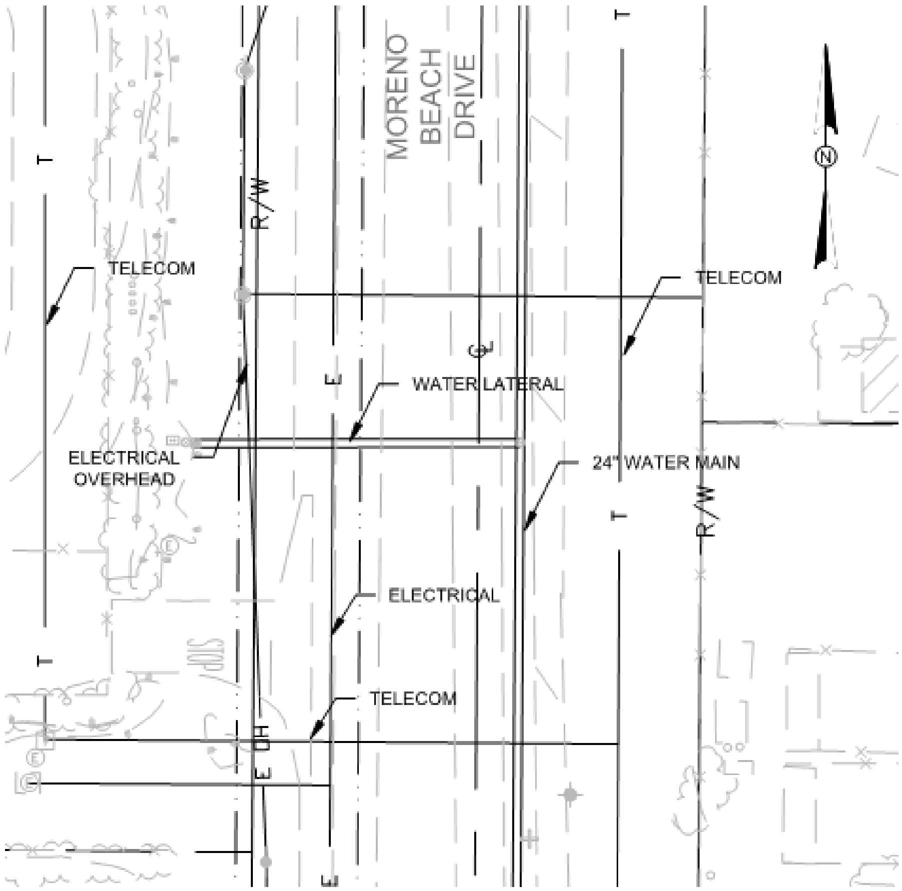


Figure 3

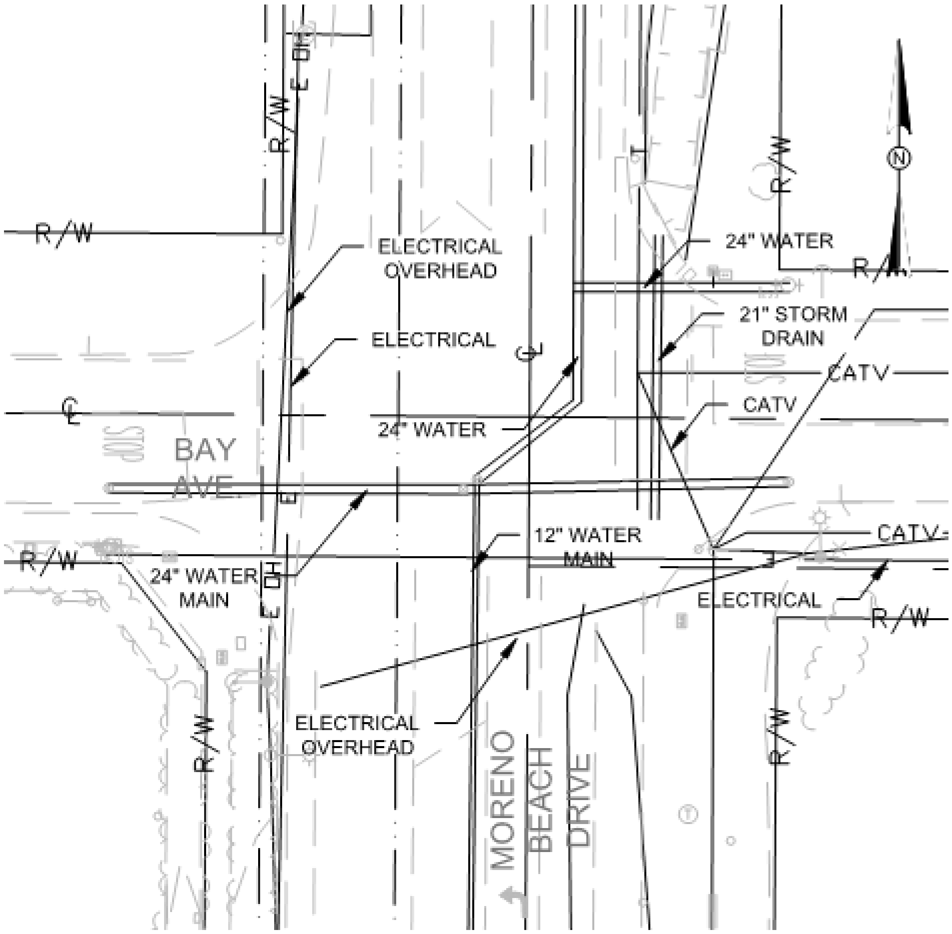


Figure 4

- Gas – One 4-inch gas main runs along the east side of Moreno Beach Drive (west of the centerline). The gas main runs north to south and tees into a 30-inch high pressure gas (HPG) main which runs east to west in the center of Cottonwood Avenue. An additional 4-inch gas main runs east to west just north of the HPG main in Cottonwood Avenue. The proposed alignment will need to cross both the 4-inch and 30-inch gas mains in Cottonwood Avenue, therefore the correct separation will need to be considered during the design. Figure 5 below shows the locations of the exiting gas facilities.

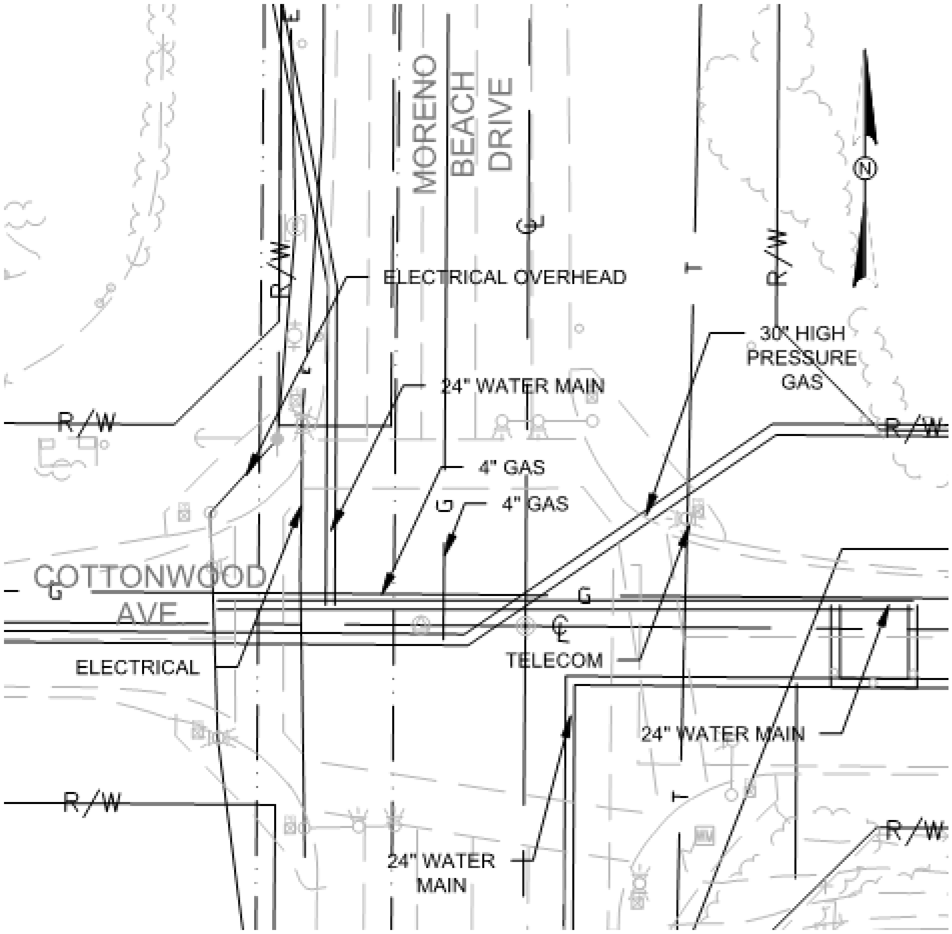


Figure 5

- Electric – Two electric lines run along the west side of Moreno Beach Drive, one underground and one overhead. Both lines run east of the edge of pavement. The overhead lines cross Moreno Beach Drive in three locations along the proposed alignment but no impacts are anticipated. One underground electric line runs east to west along the south side of Bay Avenue; this line should be considered during the design of the transmission pipeline.
- Cable/Telecom – One telecom duct bank runs along the east side of Moreno Beach Drive east of the paved edge. The telecom duct bank has a lateral which crosses Moreno Beach Drive south of Cottonwood Avenue to provide service to a development. Additionally, at Allesandro Boulevard the duct bank angles and connects to a duct bank running east to west on the south side of the intersection. The locations where the telecom duct banks cross the proposed alignment should be considered during design.

4 BASE MAPPING

Using the information obtaining during utilities research, Kleinfelder produced a utilities base map for use in planning alignment alternatives. The project team used the aerial and topographic survey to verify the existing utility information obtained to the extent possible. The base map should be field-verified prior to preliminary design.

Cozad and Fox, Inc. performed site survey and prepared a survey base file that includes 1-foot contour intervals, right-of-way lines, existing easements, centerlines, pavement lines, overhead utilities, storm drains, catch basins, manholes, valve covers, and surface utilities.

The proposed Cactus II Feeder on Alessandro Blvd is currently in design. Base mapping at this connection point will be updated upon receipt of additional information.

5 ALIGNMENT ALTERNATIVES

Three alignments were evaluated for the Pettit Tank(s) transmission pipeline:

5.1 ALTERNATIVE 1 (ALT 1) – WEST SIDE OF ROADWAY (FIGURE 6)

Alt 1 includes design of a new water main from the existing Pettit tank inlet/outlet piping through the driveway to the transmission line perpendicular to the existing roadway centerline.

This alternative takes into consideration EMWD's minimum offset design standard. Between the tank and Alessandro Boulevard, the alignment is offset 34 feet west of the roadway centerline, which satisfies the standard minimum 7-foot offset from the face of the curb. The edge of pavement was assumed to be the curb in this segment.

Alt 1 places the water main within the existing right-of-way and requires no property acquisition and no easements. There is an underground electrical line on southbound Moreno Beach Drive and a water main in the center of Moreno Beach Drive. Alt 1 maintains a minimum of 3 feet of horizontal clearance from the existing electrical line and water main and 10 feet from the existing sewer main. A minimum of 1-foot vertical clearance above the sewer main will be considered during design.

5.2 ALTERNATIVE 2 (ALT 2) – EAST SIDE OF ROADWAY (FIGURE 7)

Alt 2 includes design of a new water main from the existing Pettit tank inlet/outlet piping through the driveway to the transmission line perpendicular to the existing roadway centerline.

Alt 2 also satisfies EMWD's minimum offset design standard from face of curb. However, the standard requires that the water main be installed on the west side of the roadway. Alt 2 deviates from this standard and includes design of the water main on the east side of the road. Between the tank and Cottonwood Avenue, the alignment is 11-feet offset west of the roadway centerline on the east side and adheres to the minimum 7-foot offset required by EMWD. At Cottonwood Avenue, the alignment elbows 45 degrees southeast and lies on top of the roadway centerline due to the roadway widening south of Cottonwood Avenue. The 45-degree bends consistently hold the alignment along the east side of the roadway while maintaining a minimum of 3 feet from the existing water main and 10 feet from the existing sewer main.

Alt 2 places the water main within the existing right-of-way and requires no property acquisition and no easements. There is a sewer main on northbound Moreno Beach Drive south of Bay

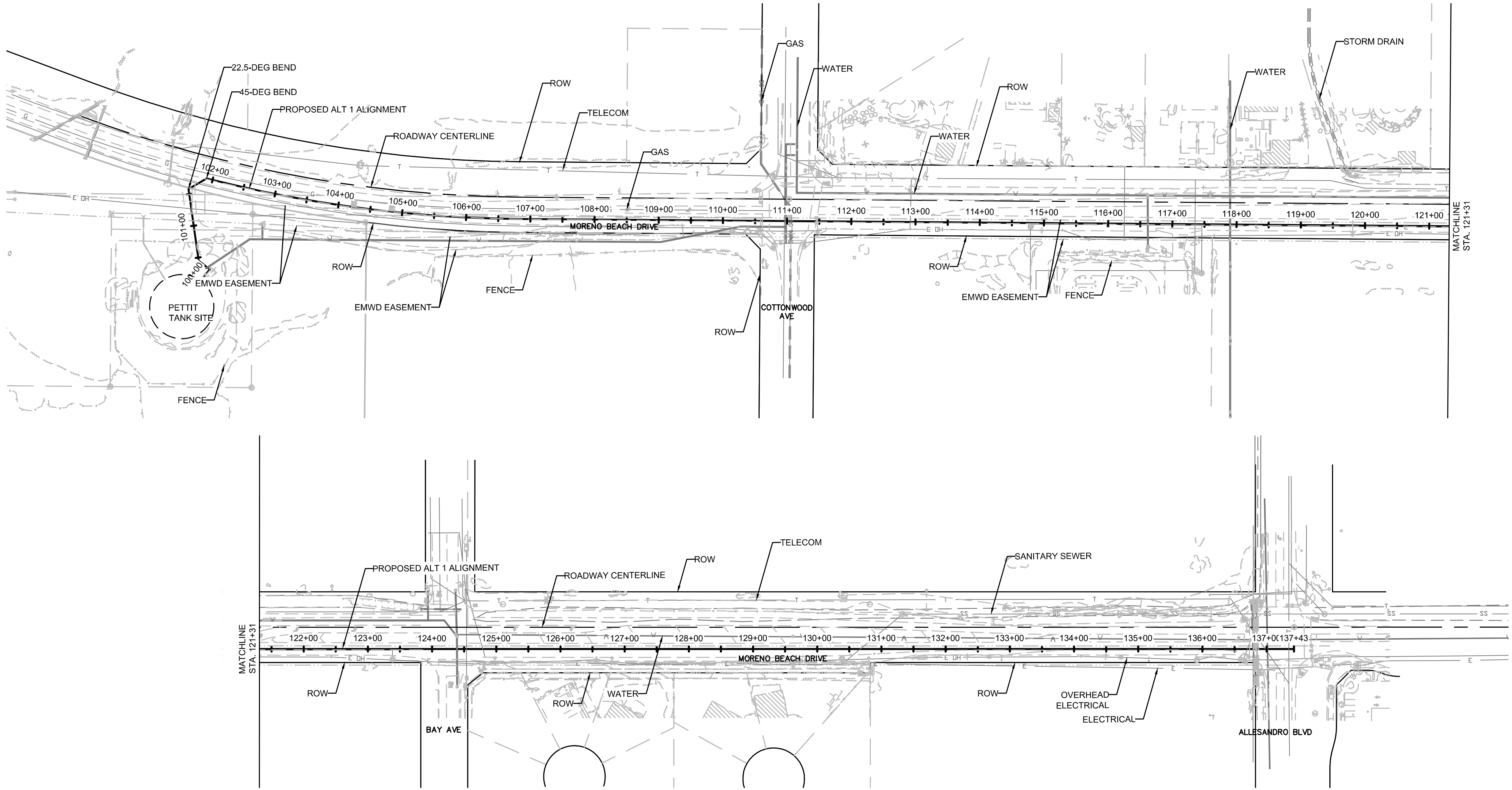
Avenue. Alt 2 maintains 10 feet of horizontal clearance from the sewer main. A minimum of 1 foot vertical clearance above the sewer main will be considered during design.

5.3 ALTERNATIVE 3 (ALT 3) – CENTER OF ROADWAY (FIGURE 8)

Alt 3 includes design of the water main from the existing Pettit tank inlet/outlet piping through the driveway and to the transmission line perpendicular to the existing roadway centerline.

Alt 3 takes into consideration EMWD's minimum offset design standard. However, the standard requires that the water main be installed on the west side of the road. Alt 3 deviates from this standard in alternating between the east side and the center of the roadway. Between the tank and Alessandro Boulevard, the alignment is 11 feet offset west of the roadway centerline in the northbound travel way and adheres to the minimum 7-foot offset required by EMWD. Under Alt 3 the water main would follow the alignment of the Alt 2 between Pettit tank and Cottonwood Avenue. At Bay Avenue, the alignment elbows 45 degrees southwest and 45 degrees south and is 25' offset west of the roadway centerline. The 45-degree bends hold the alignment between the east side and west side of the roadway.

Alt 3 places the water main within the existing right-of-way and requires no property acquisition and no easements. There is a sewer main on east side of Moreno Beach Drive south of Bay between Bay Avenue and Alessandro Boulevard. Alt 3 maintains 10 feet of horizontal clearance from the sewer main. A minimum of 1-foot vertical clearance above the sewer main will be considered during design.



PETTIT TANK TRANSMISSION LINE
ALT 1

0 80 160 240

SCALE IN FEET
SCALE: 1" = 80'

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PROJECT NO.	ALT 1	FIGURE
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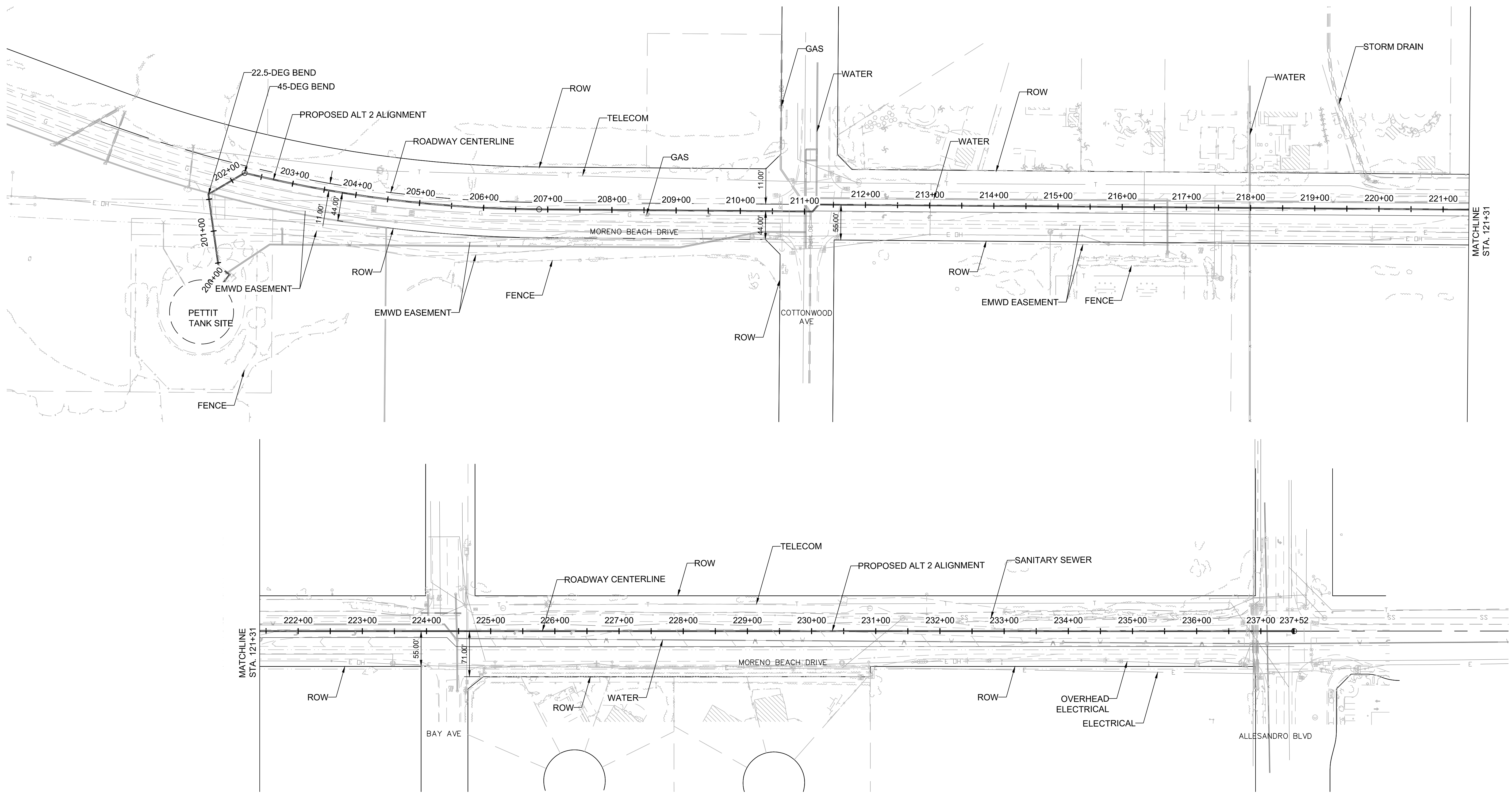
DATE:		
REVISED:	Moreno Valley, CA	PAGE: XX of XX



PETTIT TANK TRANSMISSION LINE
ALT 2

0 80 160 240

SCALE IN FEET
SCALE: 1" = 80'

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PROJECT NO.	ALT 2	FIGURE
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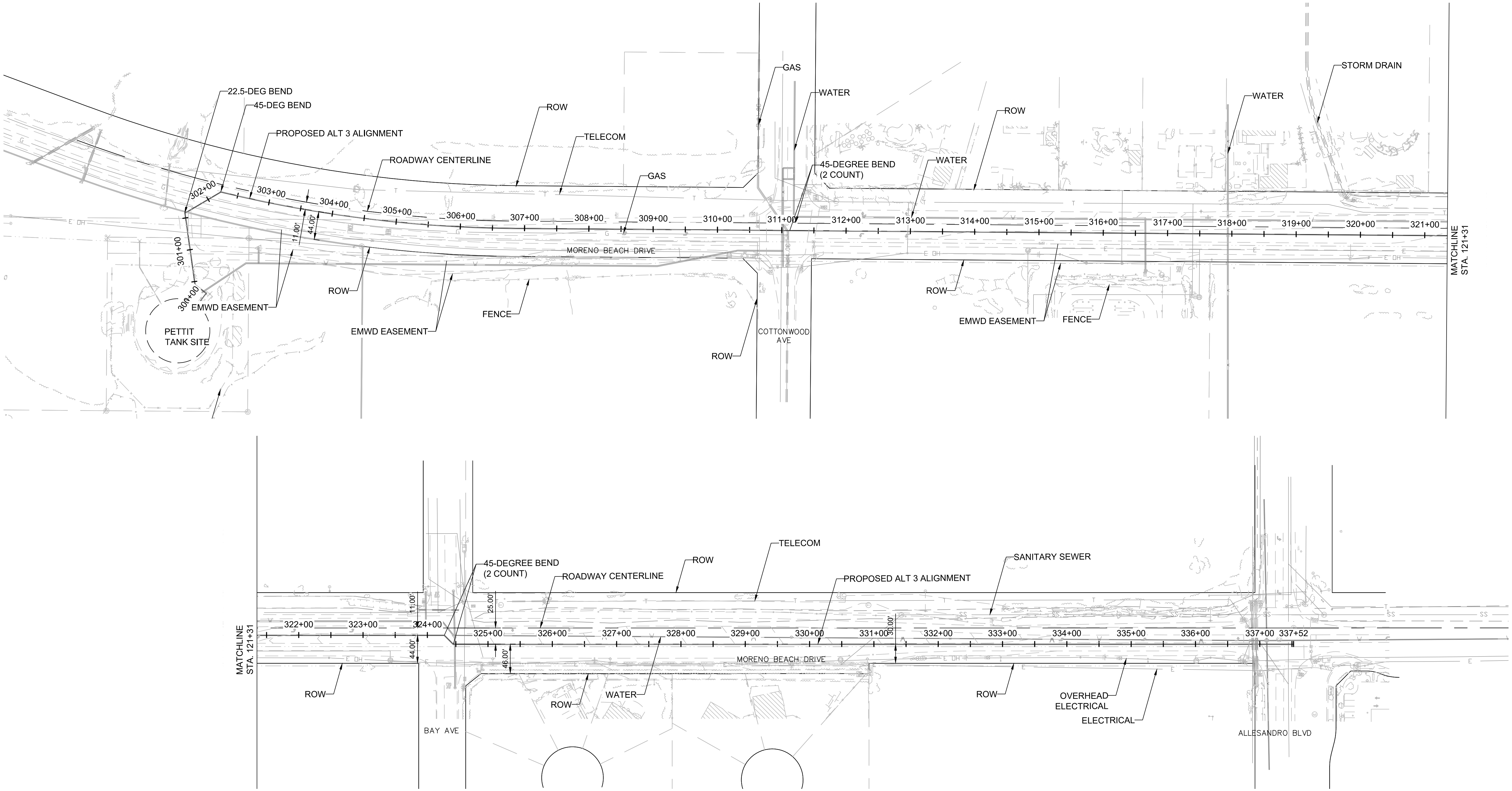
REVISED:	Moreno Valley, CA	PAGE: XX of XX

CAD FILE: C:\pwworking\...\Transmission Line Sheet File.dwg LAYOUT: ALGN 2

PLOTTED: 8/16/2016 3:26 PM BY: amanda lai



PETTIT TANK TRANSMISSION LINE
ALT 3

0 80 160 240

SCALE IN FEET
SCALE: 1" = 80'

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PROJECT NO.	ALT 3	FIGURE
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CHECKED BY	Pettit Tank Transmission Line	8
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REVISED:	Moreno Valley, CA	PAGE: XX of XX

CAD FILE: C:\pwworking\...\Transmission Line Sheet File.dwg LAYOUT: ALGN 3
PLOTTED: 8/16/2016 3:27 PM BY: amanda lai

6 ALIGNMENT EVALUATION MATRIX

As part of the alternatives analysis, Kleinfelder developed an evaluation matrix to compare each of the alternatives. The matrix illustrates comparative strengths and weaknesses of each alternative.

	Alt 1	Alt 2	Alt 3
Public Right-of-Way	- Within existing R/W. No acquisition required	- Within existing R/W. No acquisition required	- Within existing R/W. No acquisition required
Existing Utilities	- Crossings with existing water, sewer, and gas facilities	- Crossings with existing water, sewer, and gas facilities	- Crossings with existing water, sewer, and gas facilities - Horizontal water and sewer separation issues
Planned Utilities	- No impacts to planned utilities are anticipated	- No impacts to planned utilities are anticipated	- No impacts to planned utilities are anticipated
Easements	- Within existing R/W. No easements required - No impacts to existing easements	- Within existing R/W. No easements required - No impacts to existing easements	- Within existing R/W. No easements required - No impacts to existing easements
Traffic	- Traffic handling required for mitigating impacts to southbound traffic'	- Traffic handling required for mitigating impacts to northbound traffic'	- Traffic handling required for mitigating impacts to northbound and southbound traffic'
Permits	- No additional permits required	- No additional permits required	- No additional permits required
Cost	- Lowest cost because fewest bends	- 2 additional 45-deg bends	- 2 additional 45-deg bends
Access	- No maintenance or access impacts anticipated	- No maintenance or access impacts anticipated	- No maintenance or access impacts anticipated
Community Impacts	- No community impacts anticipated	- No community impacts anticipated	- No community impacts anticipated
Environmental Constraints	- No environmental impacts anticipated	- No environmental impacts anticipated	- No environmental impacts anticipated
Adherence to Standards	- Complies with all agency design standards	- Does not comply with agency design standard stating that water mains shall be on the west	- Does not comply with agency design standard stating that water mains shall be on the west side of the roadway

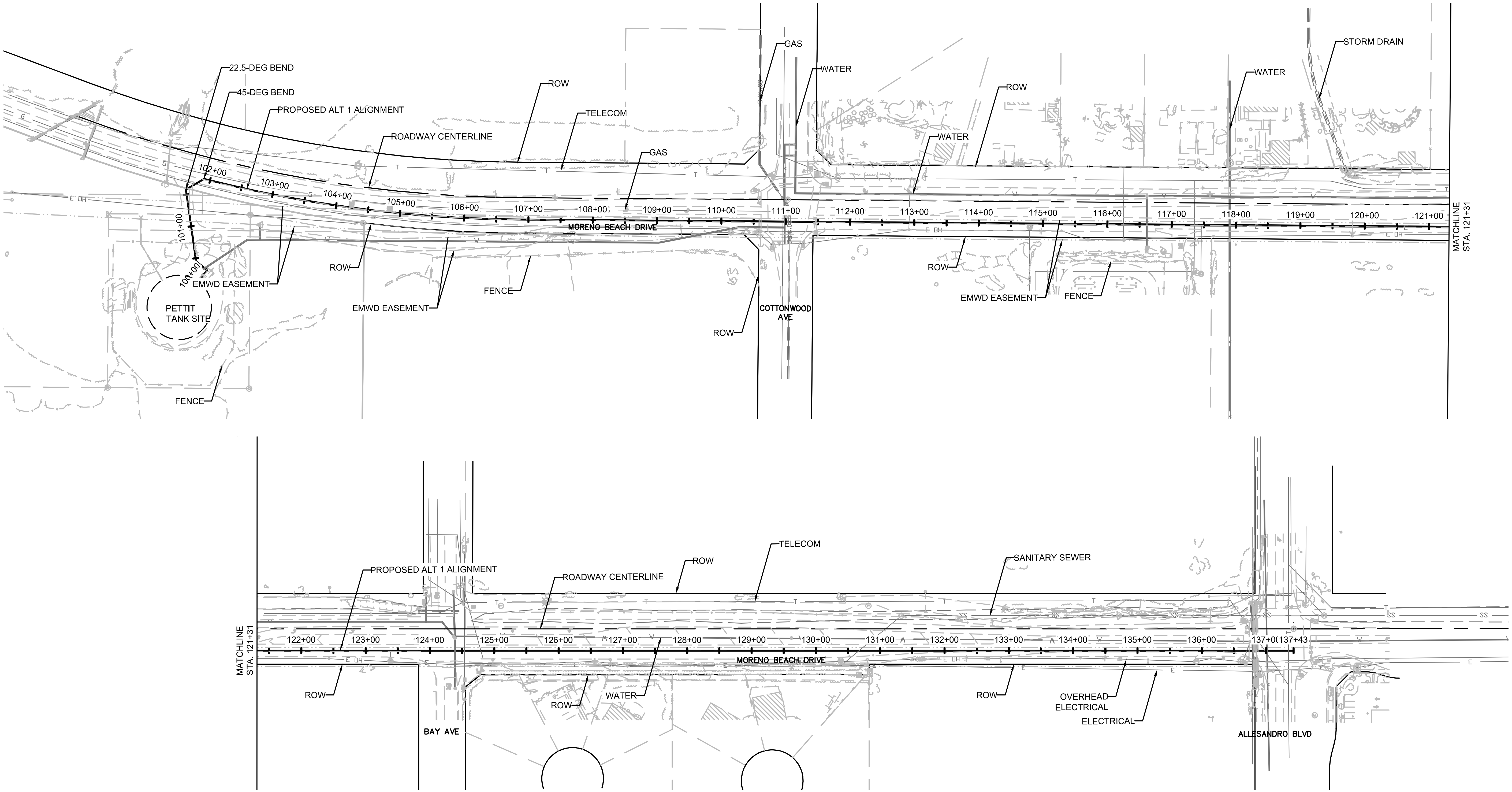
7 RECOMMENDATIONS

Kleinfelder recommends Alt 1 for the Pettit Tank transmission pipeline. The alternative has minimal impacts, adheres to all agency design standards and proposes the fewest additional bends.

APPENDIX A

Site Map

APPENDIX B
Alignment Alternative Figures
Alt 1 (Figure 6)
Alt 2 (Figure 7)
Alt 3 (Figure 8)



PETTIT TANK TRANSMISSION LINE
ALT 1

0 80 160 240

SCALE IN FEET
SCALE: 1" = 80'

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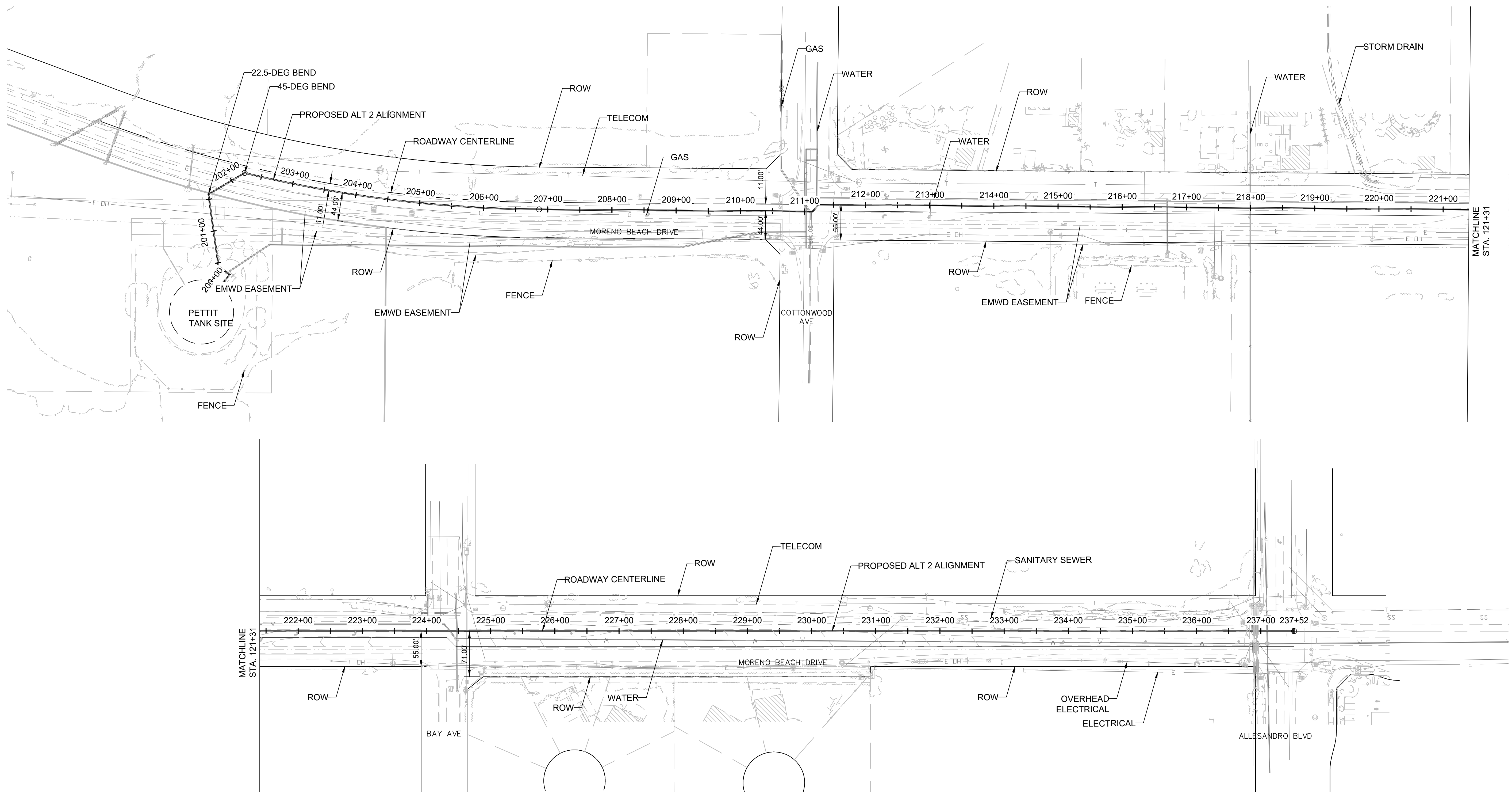
KLEINFELDER Bright People. Right Solutions.	PROJECT NO. DRAWN BY CHECKED BY DATE: REVISED:	ALT 1 Pettit Tank Transmission Line Moreno Valley, CA	FIGURE 6 PAGE: XX of XX



PETTIT TANK TRANSMISSION LINE
ALT 2

0 80 160 240
SCALE IN FEET
SCALE: 1" = 80'

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PROJECT NO. DRAWN BY CHECKED BY DATE: REVISED:	ALT 2 Pettit Tank Transmission Line Moreno Valley, CA	FIGURE 7 PAGE: XX of XX

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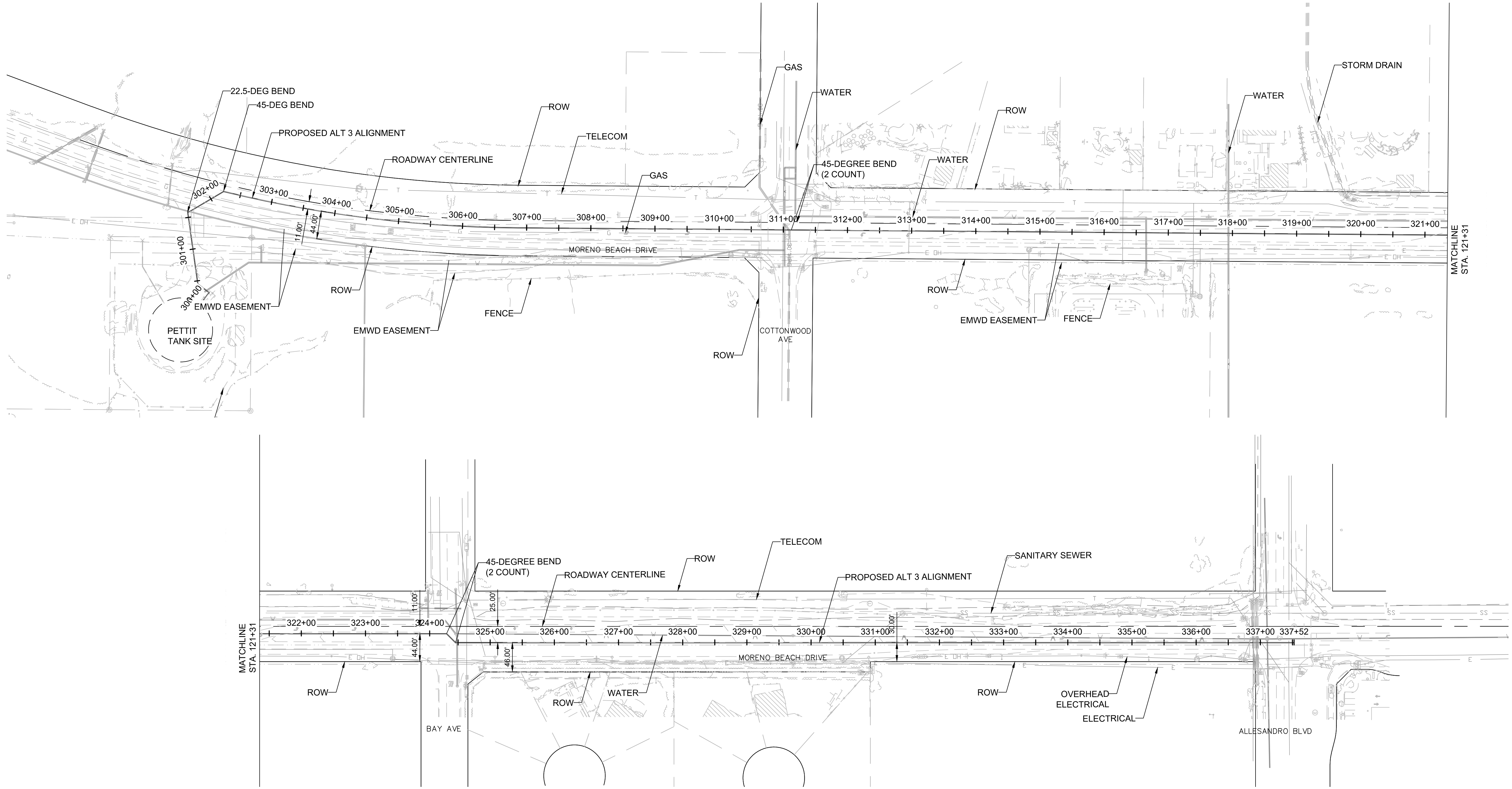
PLOTTED: 8/16/2016 3:26 PM BY: amanda lai



PETTIT TANK TRANSMISSION LINE
ALT 3

0 80 160 240

SCALE IN FEET
SCALE: 1" = 80'

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PROJECT NO.	ALT 3	FIGURE
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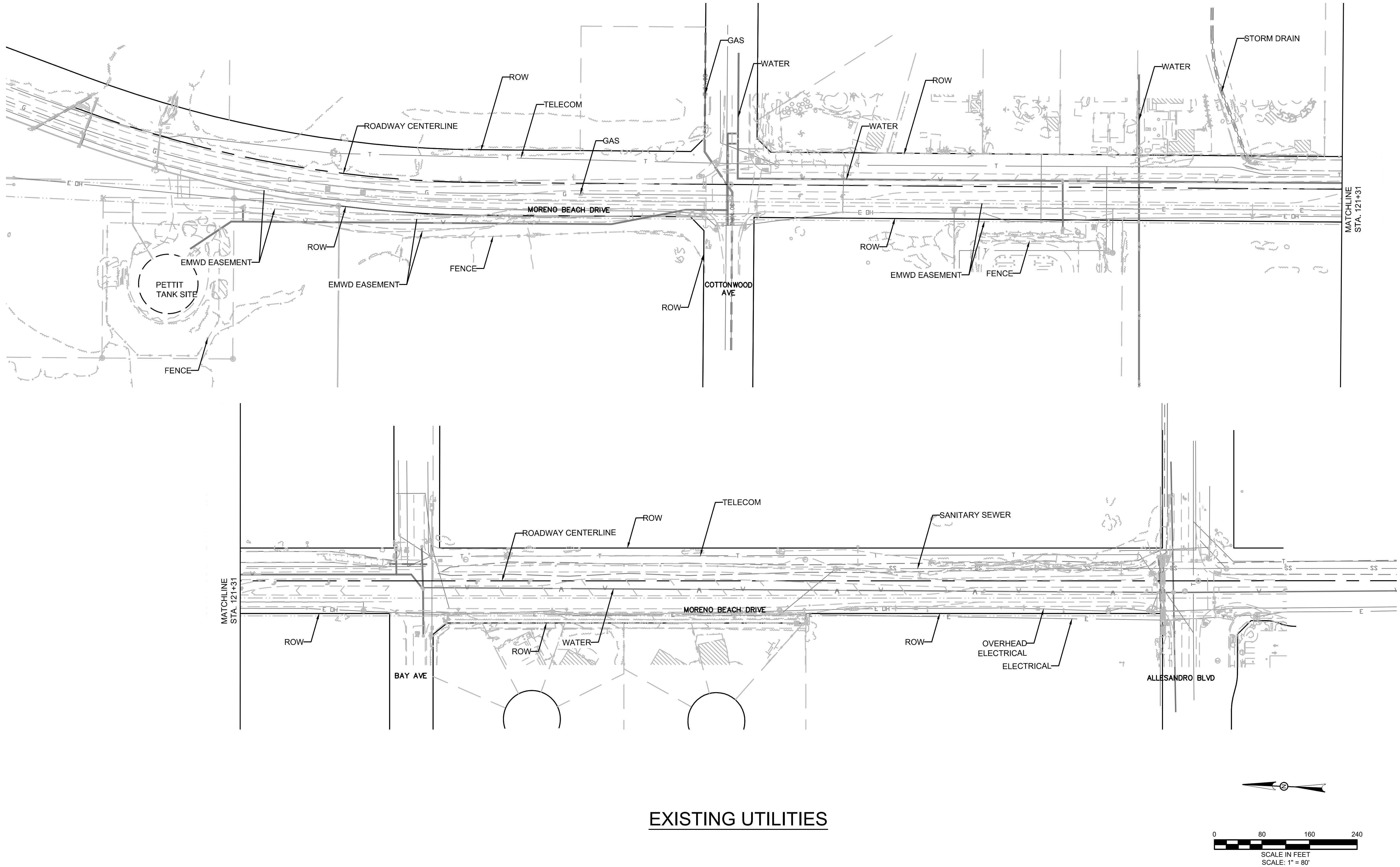
APPENDIX C

Existing Utilities Basemap



EXISTING UTILITIES

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PROJECT NO.	Appendix C Exsiting Utilities	FIGURE
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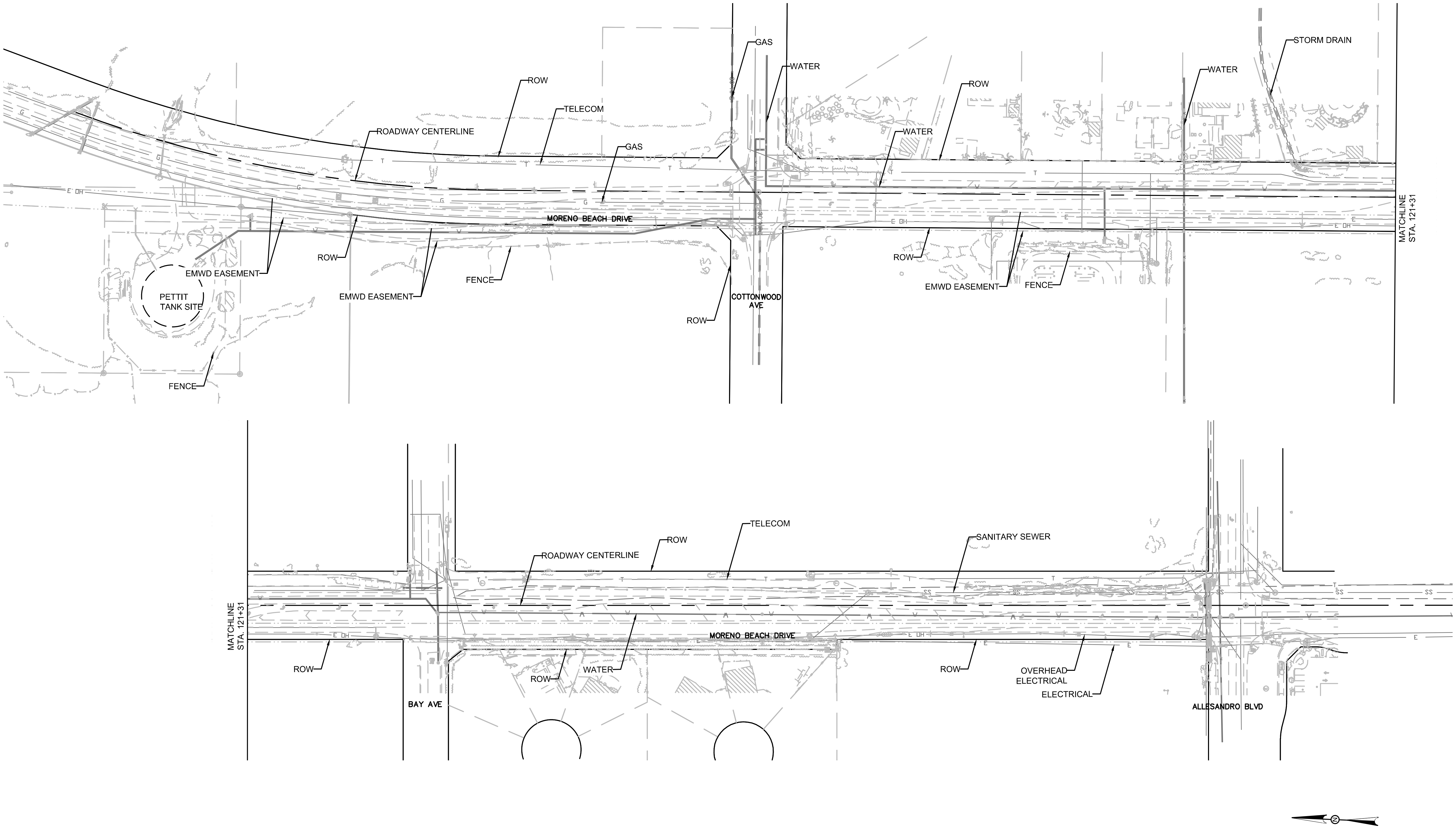
REVISED:	Moreno Valley, CA	PAGE: XX of XX

APPENDIX D
BOUNDARY, TOPO, AND UTILITIES EXHIBIT



EXISTING UTILITIES

0 80 160 240

SCALE IN FEET
SCALE: 1" = 80'

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PROJECT NO.	Appendix C Exsiting Utilities	FIGURE
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REVISED:	Moreno Valley, CA	PAGE: XX of XX

APPENDIX E
PRELIMINARY ELECTRICAL DESIGN

CONDUIT PLAN	SINGLE LINE DIAGRAM	SCHEMATIC DIAGRAM	DESCRIPTION
	50A 3P		CIRCUIT BREAKER. UPPER NUMBER IS TRIP RATING. LOWER NUMBER IS NUMBER OF POLES
			THREE POSITION SWITCH. MAINTAINED CONTACT FUNCTION MAY VARY AS NOTED ON DIAGRAMS. CENTER POSITION IS OFF
			TWO POSITION SWITCH. MAINTAINED CONTACT FUNCTION MAY VARY AS NOTED ON DIAGRAMS
			MOMENTARY CONTACT PUSHBUTTON. FUNCTION MAY VARY AS NOTED ON DIAGRAMS
LOS		LOS	MOMENTARY CONTACT PUSHBUTTON WITH PROVISION FOR LOCKOUT.
			LOCKABLE DISCONNECT SWITCH. RATING AND DETAILS AS NOTED ON DRAWINGS.
ZS			LIMIT SWITCH. NORMALLY OPEN
ZS			LIMIT SWITCH. NORMALLY CLOSED
		NOTO	TIME DELAY RELAY CONTACT. OFF DELAY, NORMALLY OPEN, TIME OPEN
		NCTC	TIME DELAY RELAY CONTACT. OFF DELAY, NORMALLY CLOSED, TIME CLOSED
		NOTC	TIME DELAY RELAY CONTACT. ON DELAY, NORMALLY OPEN, TIME CLOSED
		NCTO	TIME DELAY RELAY CONTACT. ON DELAY, NORMALLY CLOSED, TIME OPEN
SOV			SOLENOID OPERATED VALVE
			MOTOR CONTROL CENTER DRAWOUT STABS
	2		MOTOR STARTER WITH THERMAL OVERLOADS. NUMBER INDICATES NEMA SIZE
		OL	MOTOR OVERLOAD CONTACT
2	2	2	MOTOR, NUMBER INDICATES HORSEPOWER
		R	INDICATING LIGHT, PUSH–TO–TEST. LETTER INDICATES COLOR. R=RED B=BLUE G=GREEN A=AMBER W=WHITE
		M	CONTACTOR OR RELAY COIL. LETTER OR NUMBER IS DESIGNATION
		M	NORMALLY CLOSED CONTACT. LETTER OR NUMBER IS DESIGNATION
		M	NORMALLY OPEN CONTACT. LETTER OR NUMBER IS DESIGNATION
		RTM	RUNNING TIME METER, NON–RESETTABLE
	20A	5A	FUSE, NUMBER INDICATES RATING
			CONTROL TRANSFORMER. RATING AS NOTED ON DRAWINGS OR AS REQUIRED BASED ON LOAD SERVED.
	KW		KILOWATT METER
PS			PRESSURE SWITCH. CONTACT ACTION AS NOTED ON DRAWINGS

CONDUIT PLAN	SINGLE LINE DIAGRAM	SCHEMATIC DIAGRAM	DESCRIPTION
T			POWER TRANSFORMER. RATINGS AS NOTED ON DRAWINGS
			DUPLEX RECEPTACLE. 20A, SPEC GRADE GROUNDING TYPE. UNLESS OTHERWISE NOTED ON DRAWINGS.
			TELEPHONE OUTLET
J			JUNCTION BOX OR CONDUIT FITTING AS NOTED OR REQUIRED. (SHOWN WITH CONDUIT TURNING UP)
LS			LEVEL SWITCH, CONTACT ACTION AS NOTED ON DRAWINGS
			CONTROL PANEL OR EQUIPMENT AS NOTED
FS			FLOW SWITCH, CONTACT ACTION AS NOTED ON DRAWINGS
$			FLUSH TOGGLE SWITCH, SINGLE POLE, SINGLE THROW
$³			FLUSH TOGGLE SWITCH, THREE WAY
			FLUORESCENT FIXTURE. SEE LIGHTING SCHEDULE.
			LIGHTING FIXTURE, WALL MOUNTED SEE LIGHTING SCHEDULE
PB			MH–MANHOLE PB–PULLBOX HH–HANDHOLE OR AS NOTED ON DRAWINGS
—T—			TELEPHONE CONDUIT. SIZE AS NOTED
—G—			GROUNDING GRID OR GROUNDING CONDUCTOR SIZE AS REQUIRED OR AS NOTED ON DRAWINGS
G			GROUND PIGTAIL. SIZE AS NOTED ON DRAWINGS
G			EXOTHERMIC GROUND CONNECTION
G			BOLTED GROUND CONNECTION
			CONDUIT BENDING UP
			CONDUIT BENDING DOWN
			UNDERGROUND OR CONCEALED CONDUIT, 1" MINIMUM
			EXPOSED CONDUIT, 3/4" MINIMUM.
PB1 1,3,5			HOMERUN CONDUIT WITH 3 CONDUCTORS, NEUTRAL AND GROUND, CIRCUITS 1,3,5 PANEL PB1, NO HASHMARKS INDICATE 2 CONDUCTORS AND GROUND
			DRIVEN GROUND ROD/TEST WELL 3/4" X 10' Cu CLAD STEEL
			PANELBOARD OR AS NOTED ON DRAWING
			LIQUIDTIGHT FLEXIBLE CONDUIT
XXX	XXX		CONDUIT NUMBER 'XXX', REFER TO CONDUIT SCHEDULE FOR DESCRIPTION

CONDUIT PLAN	SINGLE LINE DIAGRAM	SCHEMATIC DIAGRAM	DESCRIPTION
$M	M	M	MANUAL MOTOR STARTER
			GROUND
			HEATER, RATING AS NOTED ON DRAWING
			HORN OR AUDIBLE SIGNAL
Ø	Ø	Ø	PHASE
			TERMINAL, INTERNAL WIRING
			TERMINAL, FIELD WIRING
DS			DOOR SWITCH
			CONDUIT STUB OUT
F XX	XX		DISCONNECT SWITCH, F = FUSED NF = NON–FUSED XX = AMP RATING
		T	TELEMETRY INPUT POINT
		P	PLC INPUT POINT AT RTU

STANDARD ABBREVIATIONS

A	AMPERES
AC	ALTERNATING CURRENT
AF	AMPERE FRAME
AFC	ABOVE FINISHED CONCRETE
AFF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
AT	AMPERE TRIP
ATS	AUTOMATIC TRANSFER SWITCH
AUX	AUXILIARY
AUTO	AUTOMATIC
AWG	AMERICAN WIRE GAUGE
BC	BARE COPPER
BD	BOARD
BKR	BREAKER
C	CONDUIT
CAB	CABINET
CB	CIRCUIT BREAKER
CKT	CIRCUIT
CLG	CEILING
C.O.	CONDUIT ONLY
COMPT	COMPARTMENT
COND	CONDUCTOR
CONT	CONTROL
CONTD	CONTINUED
CPT	CONTROL POWER TRANSFORMER
CP	CONTROL PANEL
CT	CURRENT TRANSFORMER
CU	COPPER
CR	CONTROL RELAY
DC	DIRECT CURRENT
DISC	DISCONNECT
DISC SW	DISCONNECT SWITCH
DPDT	DOUBLE POLE DOUBLE THROW
DPST	DOUBLE POLE SINGLE THROW
DWG	DRAWING
DS	DOOR SWITCH
EL,ELEV	ELEVATION
EMT	ELECTRICAL METALLIC TUBING
EO	ELECTRICALLY OPERATED
EXIST	EXISTING
FBO	FURNISHED BY OWNER
FDR	FEEDER
FIN	FINISHED
FLA	FULL LOAD AMPS
FLEX	FLEXIBLE
FM	FLOW METER
FS	FLOW SWITCH
FT OR '	FEET OR FOOT
FT	FLOW TRANSMITTER
FUT	FUTURE
FVNR	FULL VOLTAGE NON REVERSING
GALV	GALVANIZED
GD	GAS DETECTORS
GFI	GROUND FAULT INTERRUPTER
GFP	GROUND FAULT PROTECTION
GND OR G	GROUND
HCU	HARMONIC CONTROL UNIT
HH	HANDHOLE
HOA	HAND/OFF/AUTO
HTR	HEATER
IC	INTERRUPTING CURRENT
IN OR "	INCHES OR INCH
IND	INDICATING
INST	INSTANTANEOUS
INSTR	INSTRUMENT
INTLK	INTERLOCK
JB OR J	JUNCTION BOX, CONDULET OR FITTING AS REQUIRED BY NEC. UNLESS OTHERWISE NOTED
KW	KILOWATTS
LCL	LONG CONTINUOUS LOAD
LCP	LOCAL CONTROL PANEL
LEV	LEVEL
LIM	LIMIT
LR	LOCAL/REMOTE
LOS	LOCKOUT STOP STATION
LS	LEVEL OR LIMIT SWITCH
LSIG	LONG TIME, SHORT TIME, INSTANTANEOUS AND GROUND FAULT ADJUSTMENTS
LT	LIGHT
LTG	LIGHTING
LV	LOW VOLTAGE
MA	MILLIAMPERE
MAINT	MAINTAINED
MAN	MANUAL
MAX	MAXIMUM
MC	MAINTAINED CONTACT
MCC	MOTOR CONTROL CENTER
MCM	THOUSAND CIRCULAR MILS
MCP	MOTOR CIRCUIT PROTECTOR
MH	MANHOLE
MIN	MINIMUM OR MINUTE
MLO	MAIN LUGS ONLY
MOV	MOTOR OPERATED VALVE ACTUATOR
MSB	MAIN SWITCHBOARD
MTG	MOUNTING
MTR	MOTOR
N	NEUTRAL
NA	NON–AUTOMATIC
NC	NORMALLY CLOSED
NCIO	NORMALLY CLOSED, INSTANTANEOUS OPEN
NCTC	NORMALLY CLOSED, TIME CLOSE
NCTO	NORMALLY CLOSE, TIME OPEN
NEC	NATIONAL ELECTRIC CODE
NIC	NOT IN CONTRACT
No	NUMBER
NO	NORMALLY OPEN
NOIC	NORMALLY OPEN, INSTANTANEOUS CLOSE
NOTC	NORMALLY OPEN, TIME CLOSE
NOTO	NORMALLY OPEN, TIME OPEN
NP	NAMEPLATE
NTS	NOT TO SCALE
OL	OVERLOAD
OTT	OVERTEMP SWITCH
PB	PUSHBUTTON
PB	PULLBOX
PC	PHOTOCELL
PCV	PUMP CONTROL VALVE
PMR	POWER MONITOR RELAY
PNL	PANEL
POS	POSITION
PR	PAIR
PRI	PRIMARY
PS	PRESSURE SWITCH
PT	POTENTIAL TRANSFORMER
PVC	POLYVINYL CHLORIDE
PVC/RGS	PVC JACKETED RIGID GALVANIZED STEEL CONDUIT
PW	PART WINDING
RECEP	RECEPTACLE
RCP	REMOTE CONTROL PANEL
RGS	RIGID GALVANIZED STEEL CONDUIT
RTU	REMOTE TERMINAL UNIT
RVAT	REDUCED VOLTAGE AUTO TRANSFORMER
RVYD	REDUCED VOLTAGE WYE DELTA
SCE	SOUTHERN CALIFORNIA EDISON
SEC	SECONDARY
SEL	SELECTOR
SP	SPARE
SPEC	SPECIFICATION
SPDT	SINGLE POLE DOUBLE THROW
SPST	SINGLE POLE SINGLE THROW
SS	STAINLESS STEEL
SSRV	SOLID STATE REDUCED VOLTAGE STARTER
ST	SHUNT TRIP
STA	STATION
STL	STEEL
STP	SHIELDED TWISTED PAIR
STR	STARTER
STT	SHIELDED TWISTED TRIPLET
SV	SOLENOID VALVE
SW	SWITCH
SWBD	SWITCHBOARD
TB	TERMINAL BOX
TEL	TELEPHONE
TEMP	TEMPERATURE
TERM	TERMINAL
TM	TELEMETRY
TS	TEMPERATURE SWITCH
TS2W	TWO SPEED TWO WINDING
TVSS	TRANSIENT VOLTAGE SURGE SUPPRESSOR
TW/SH	TWISTED SHIELDED
TYP	TYPICAL
UG	UNDERGROUND
UON	UNLESS OTHERWISE NOTED
V	VOLTS
W	WATTS
W/	WITH
W/O	WITHOUT
WP	WEATHERPROOF
XFMR	TRANSFORMER
XP	EXPLOSION PROOF
ZS	POSITION SWITCH OR LIMIT SWITCH
3W	THREE WIRE
4W	FOUR WIRE

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SPEC. No. XXXXX

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SCALE VERIFICATION
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PLANS PREPARED BY:
KLEINFELDER
Bright People. Right Solutions.

REGISTERED PROFESSIONAL ENGINEER
SCOTT D. NELSON
No. E18069
Exp. 6/30/17
ELECTRICAL
STATE OF CALIFORNIA

REVISIONS

NO.	DATE	INITIAL	DESCRIPTION	APP'VD/DATE

APPROVED BY:
XX/XXXX
DIRECTOR OF ENGINEERING DATE

REFERENCES

EASTERN MUNICIPAL WATER DISTRICT
XX/XXXX
PROJECT MANAGER DATE

APPROVALS		INITIAL	DATE
	PROJECT ENGR.	XX	XX/XXXX
	INSPECTION	XX	XX/XXXX
	WTR. OPERATIONS	XX	XX/XXXX
	MAINTENANCE	XX	XX/XXXX

		DATE
DESIGNED	SDN	4/17
DRAWN	CAD	4/17
TRACED		
CHECKED	JMM	4/17
SUBMITTED		XX/XXXX

SCALE: AS SHOWN

EASTERN MUNICIPAL WATER DISTRICT
RIVERSIDE COUNTY, CALIFORNIA

PETTIT TANK

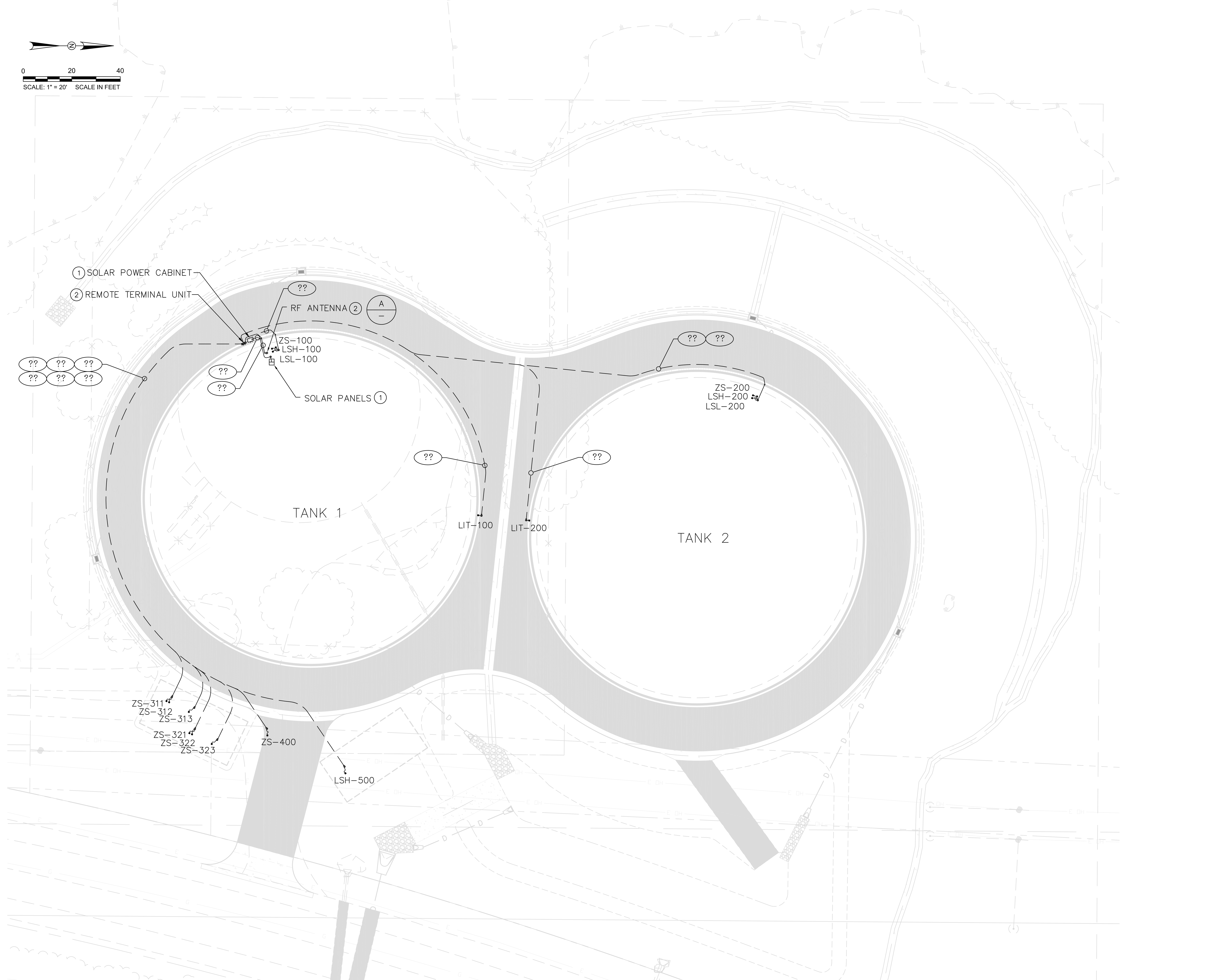
STANDARD ELECTRICAL SYMBOLS
AND ABBREVIATIONS

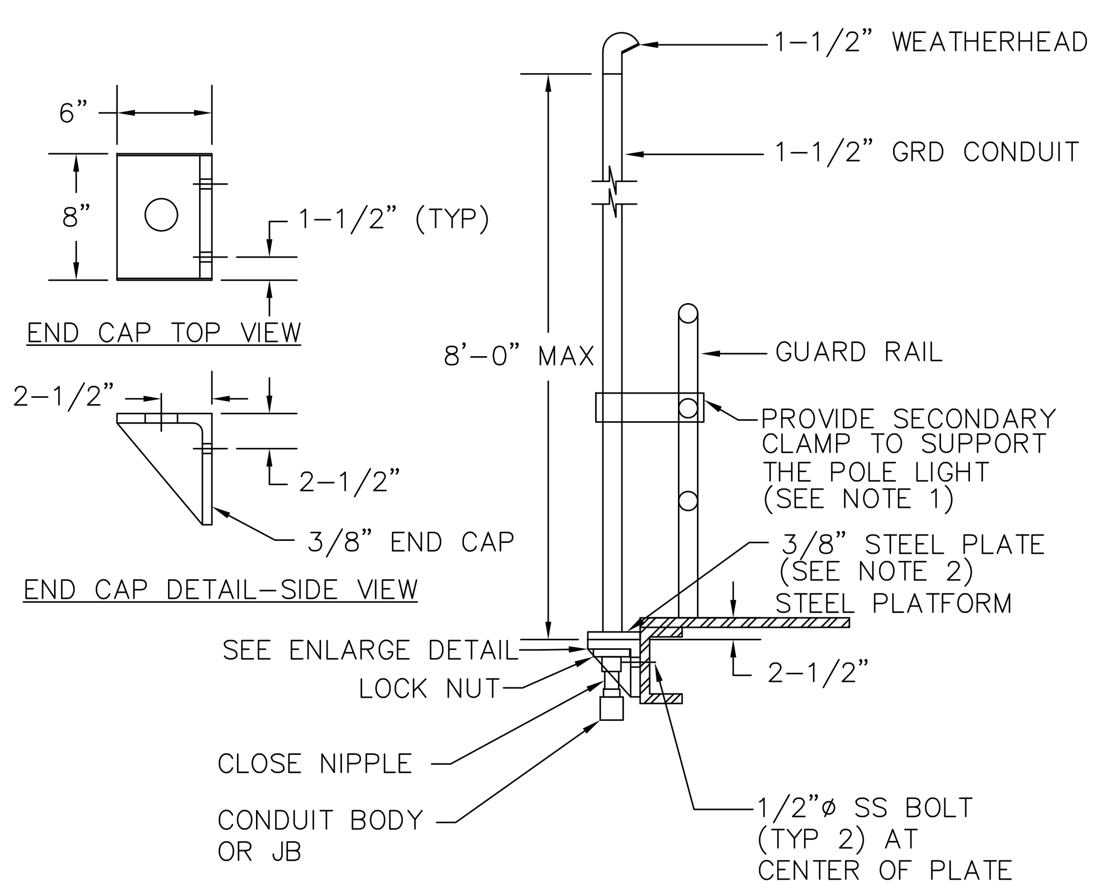
I.D. XX
S.A. XX
W.O. XXXXXX
C.O.
COORD. XX-X-XX
SHT. XX OF XX
D-XXXX
E–1

CAD FILE: Y:\Projects\EMWD Pettit Tank\30% Submittal\Plans\E-1.dwg LAYOUT: E-1 PLOTTED: 4/13/2017 4:20 PM BY: scott nelson

NOTES

1. SOLAR POWER SYSTEM SHOWN ON DRAWINGS E-3 AND E-4.
2. THE CONTRACTOR IS RESPONSIBLE FOR PROVIDING AND INSTALLING THE RTU ENCLOSURE ALONG WITH THE ANTENNA MAST. THE DISTRICT WILL PROVIDE THE ANTENNA, RTU ENCLOSURE BACK PANEL, PLC HARDWARE, RADIO, AND COAX CABLE. THE RTU ASSEMBLED BACK PANEL WILL THEN BE INSTALLED IN THE FIELD BY THE CONTRACTOR.





A ANTENNA MAST MOUNTING ON PLATFORM
NOT TO SCALE

NOTE:

1. CONTRACTOR SHALL SUBMIT SUPPORT DETAIL FOR REVIEW AND APPROVAL BY TVWD.
2. PLACE A HOLE IN THE 3/8" X 6" X 8" STEEL PLATE FOR THE 1-1/2" CONDUIT. WELD THE CONDUIT TO THE STEEL PLATE AND SECURE THE LIGHT POLE ASSEMBLY TO THE 3/8" END CAP WITH A LOCK NUT AS SHOWN.

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CAD FILE: Y:\Projects\EMWD Pettit Tank\30% Submittal\Plans\E-2.dwg LAYOUT: E-2 PLOTTED: 4/13/2017 4:36 PM BY: scott nelson

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PLANS PREPARED BY:
KLEINFELDER
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REVISIONS				
NO.	DATE	INITIAL	DESCRIPTION	APP'VD/DATE

APPROVED BY:
DIRECTOR OF ENGINEERING XX/XXXX DATE

REFERENCES

EASTERN MUNICIPAL WATER DISTRICT
PROJECT MANAGER XX/XXXX DATE

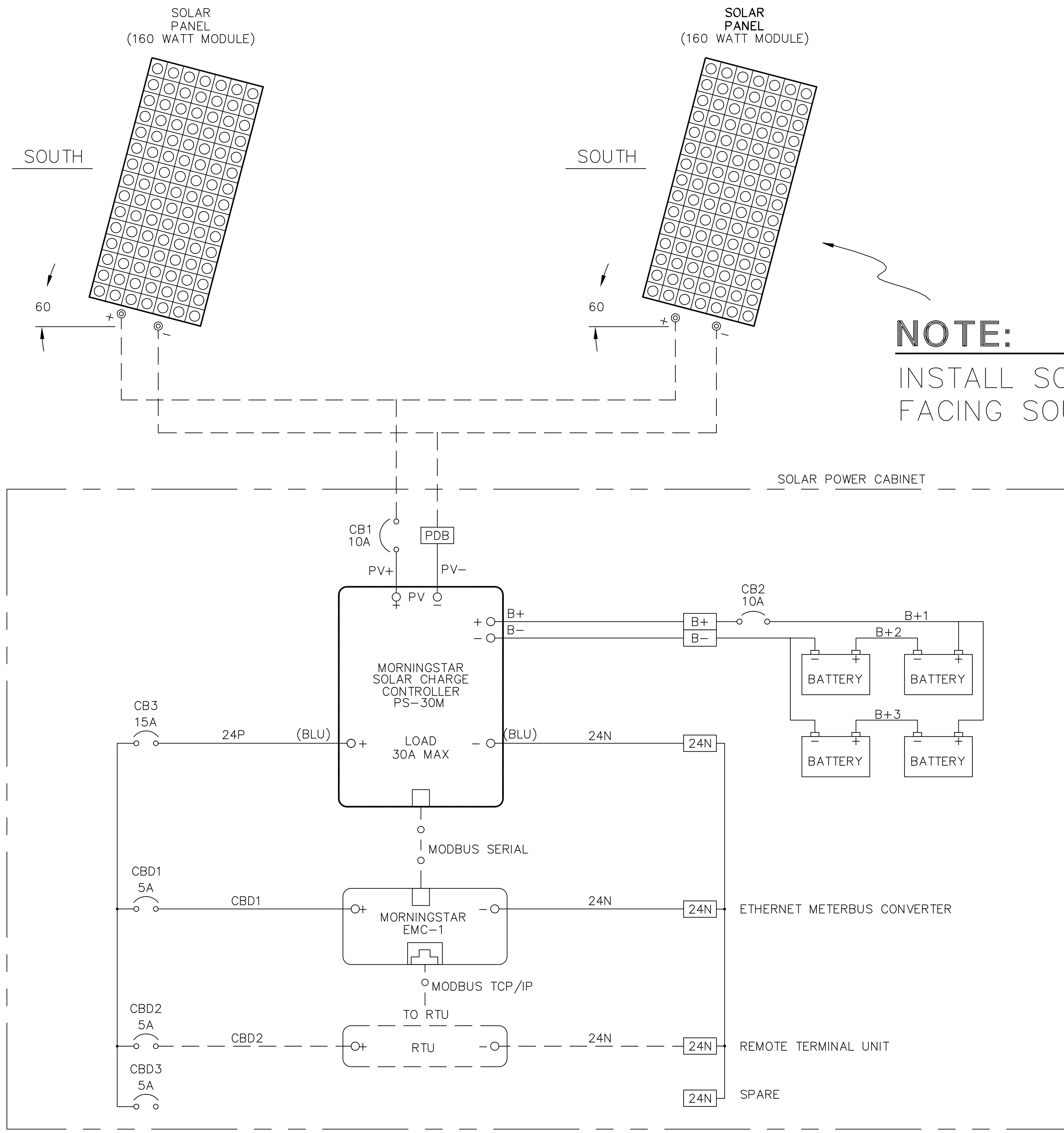
APPROVALS		INITIAL	DATE
	PROJECT ENGR.	XX	XX/XXXX
	INSPECTION	XX	XX/XXXX
	WTR. OPERATIONS	XX	XX/XXXX
	MAINTENANCE	XX	XX/XXXX

		DATE
DESIGNED	SDN	4/17
DRAWN	CAD	4/17
TRACED		
CHECKED	JMM	4/17
SUBMITTED		XX/XXXX

SCALE: AS SHOWN

EASTERN MUNICIPAL WATER DISTRICT
RIVERSIDE COUNTY, CALIFORNIA
PETTIT TANK
ELECTRICAL SITE PLAN

I.D. XX
S.A. XX
W.O. XXXXXX
C.O.
COORD. XX-X-XX
SHT. XX OF XX
D-XXXX
E-2



CAUTION: COVER SOLAR PANELS UNTIL THEY ARE INSTALLED TO REDUCE THE POSSIBILITY OF SHOCK.

NOTE:

INSTALL SOLAR PANELS FACING SOUTH AT 45 DEG. ANGLE

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CAD FILE: Y:\Projects\EMWD Pettit Tank\30% Submittal\Plans\E-3.dwg LAYOUT: E-3 PLOTTED: 4/13/2017 4:23 PM BY: scott nelson

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REGISTERED PROFESSIONAL ENGINEER
SCOTT D. NELSON
No. E18069
Exp. 6/30/17
ELECTRICAL
STATE OF CALIFORNIA

REVISIONS

NO.	DATE	INITIAL	DESCRIPTION	APP'VD/DATE

APPROVED BY:
XX/XXXX
DIRECTOR OF ENGINEERING — DATE

REFERENCES

EASTERN MUNICIPAL WATER DISTRICT
XX/XXXX
PROJECT MANAGER — DATE

APPROVALS		INITIAL	DATE
	PROJECT ENGR.	XX	XX/XXXX
	INSPECTION	XX	XX/XXXX
	WTR. OPERATIONS	XX	XX/XXXX
	MAINTENANCE	XX	XX/XXXX

		DATE
DESIGNED	SDN	4/17
DRAWN	CAD	4/17
TRACED		
CHECKED	JMM	4/17
SUBMITTED		XX/XXXX

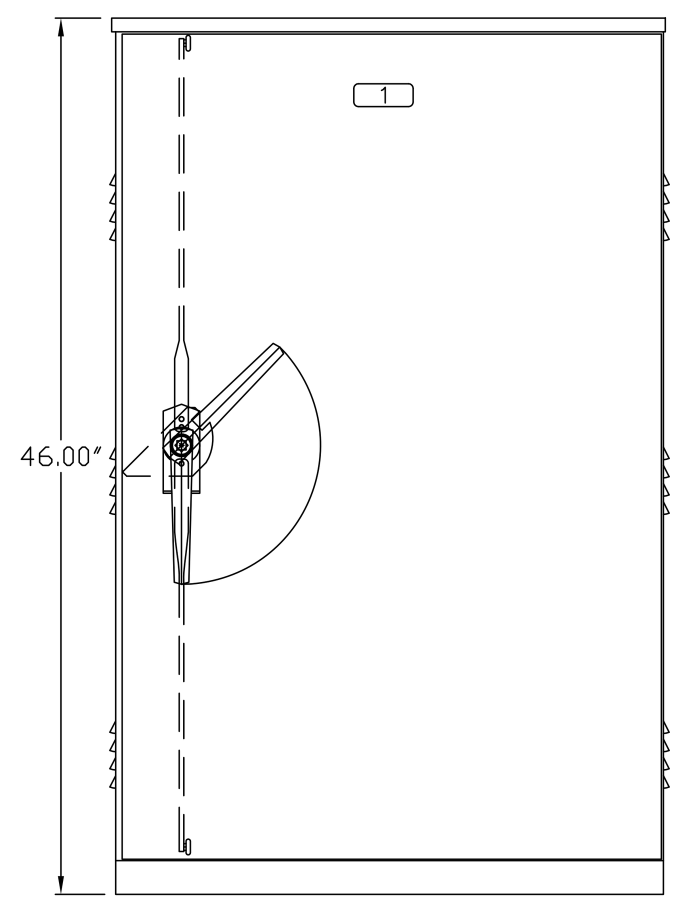
SCALE: AS SHOWN

EASTERN MUNICIPAL WATER DISTRICT
RIVERSIDE COUNTY, CALIFORNIA

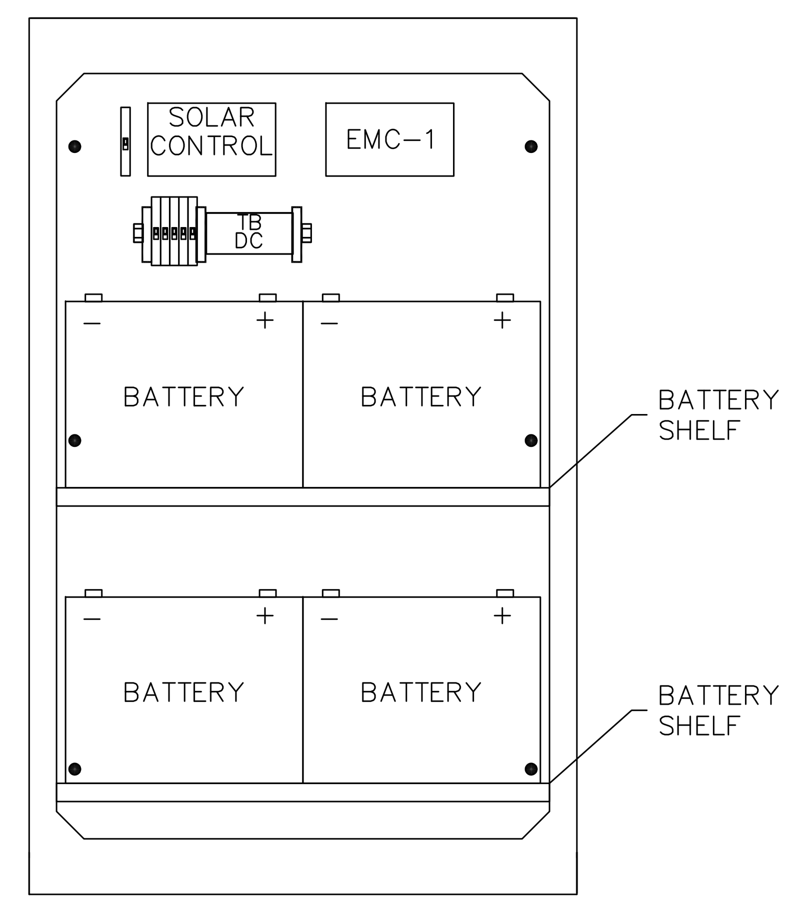
PETTIT TANK

SOLAR POWER CONTROL DIAGRAM

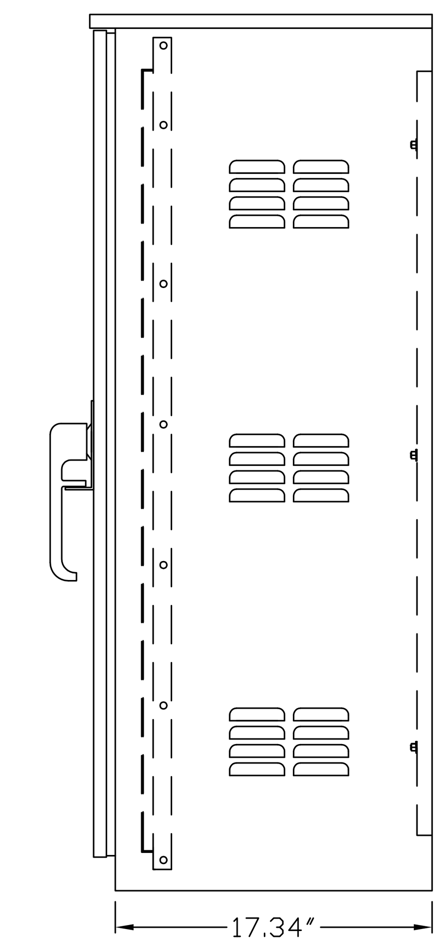
I.D. XX
S.A. XX
W.O. XXXXXX
C.O.
COORD. XX-X-XX
SHT. XX OF XX
D-XXXX
E−3



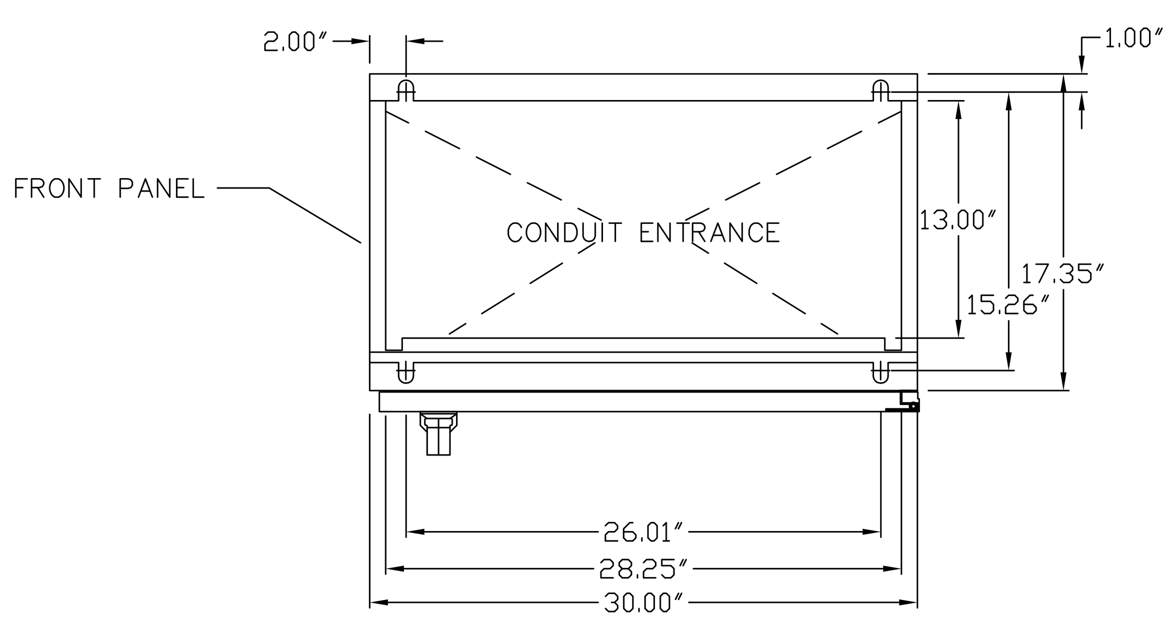
FRONT PANEL ELEVATION



PANEL BACKPAN



PANEL SIDE VIEW



PANEL BASE PLAN

NAME PLATE SCHEDULE				
TAG #	QTY	TYPE	SIZE	INSCRIPTION
1	1	PLATE	1" X 4"	SOLAR POWER CABINET

ENCLOSURE CONSTRUCTION NOTES

1. EXTERIOR 12 GA. H.D. GALV. STEEL AND INTERIOR 14 GA. COLD ROLLED STEEL ELECTRICALLY WELDED AND REINFORCED WHERE REQUIRED.
2. CONSTRUCTION WILL BE NEMA 3R.
3. ALL NUTS, BOLTS, SCREWS AND HINGES WILL BE STAINLESS STEEL.
4. NUTS, BOLTS & SCREWS WILL NOT BE VISIBLE FROM OUTSIDE OF ENCLOSURE.
5. PLASTIC NAMEPLATES WILL BE PROVIDED AS REQUIRED.
6. CONTROL WIRING WILL BE MARKED AT BOTH ENDS BY PERMANENT WIRE MARKERS.
7. A PLASTIC COVERED WIRING DIAGRAM WILL BE ATTACHED TO THE INSIDE OF THE FRONT DOOR.
8. ENCLOSURE WILL BE FACTORY WIRED AND CONFORM TO REQUIRED NEMA STANDARDS.
9. COLOR TO BE: **TAN**

POLY-PORC COATING SYSTEM

INCLUDES A FIVE STAGE DIP TANK METAL PREPARATION PROCESS:

1. ALKALINE CLEANER 160°F.
2. CLEAR WATER RINSE.
3. IRON PHOSPHATE APPLICATION 150°F.
4. CLEAR WATER RINSE.
5. INHIBITIVE RINSE TO SEAL PHOSPHATED SURFACES 120°F

FINISHED WITH AN ELECTROSTATICALLY APPLIED DRY POLYESTER POWDER COATING THEN BAKED @ 380°F TO CURE.

CAD FILE: Y:\Projects\EMWD Pettit Tank\30% Submittal\Plans\E-4.dwg LAYOUT: E-4 PLOTTED: 4/13/2017 4:24 PM BY: scott nelson

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PLANS PREPARED BY:
KLEINFELDER
Bright People. Right Solutions.

REGISTERED PROFESSIONAL ENGINEER SCOTT D. NELSON No. E18069 Exp. 6/30/17 ELECTRICAL STATE OF CALIFORNIA

REVISIONS				
NO.	DATE	INITIAL	DESCRIPTION	APP'VD/DATE

APPROVED BY: XX/XXXX
DIRECTOR OF ENGINEERING DATE

REFERENCES

EASTERN MUNICIPAL WATER DISTRICT
PROJECT MANAGER XX/XXXX DATE

APPROVALS	INITIAL	DATE
PROJECT ENGR.	XX	XX/XXXX
INSPECTION	XX	XX/XXXX
WTR. OPERATIONS	XX	XX/XXXX
MAINTENANCE	XX	XX/XXXX

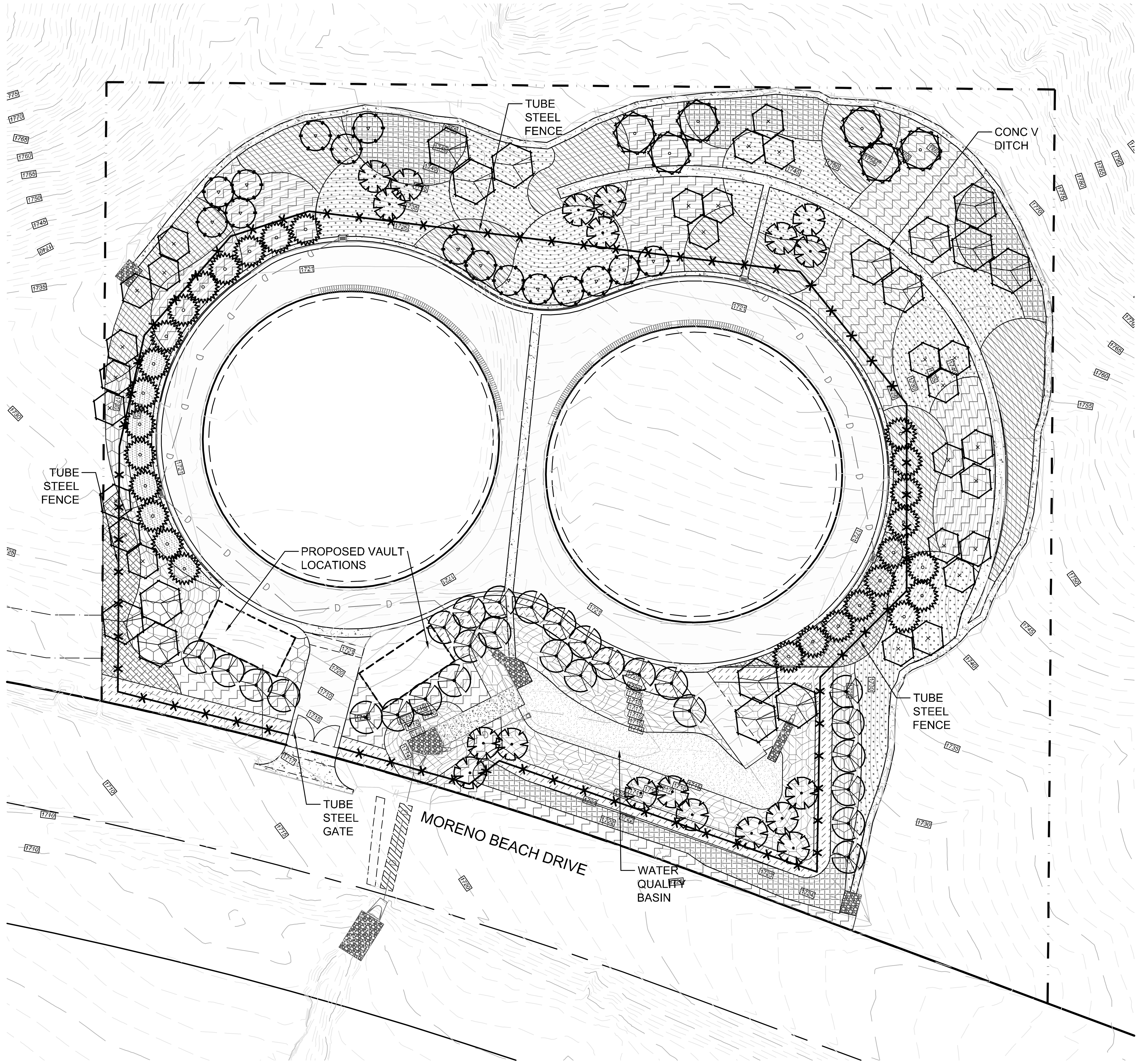
		DATE
DESIGNED	SDN	4/17
DRAWN	CAD	4/17
TRACED		
CHECKED	JMM	4/17
SUBMITTED		XX/XXXX

SCALE: AS SHOWN

EASTERN MUNICIPAL WATER DISTRICT
RIVERSIDE COUNTY, CALIFORNIA
PETTIT TANK
SOLAR POWER CABINET LAYOUT

I.D. XX
S.A. XX
W.O. XXXXXX
C.O.
COORD. XX-X-XX
SHT. XX OF XX
D-XXXX
E-4

APPENDIX F
PRELIMINARY LANDSCAPE PLAN



PLANT SCHEDULE

TREES	BOTANICAL NAME	SIZE	WUCOLS	SPACING	QTY
	ARCTOSTAPHYLOS MANZANITA `DR. HURD` Dr. Hurd Manzanita	24"BOX	L		26
	KOELREUTERIA BIPINNATA Chinese Flame Tree	24"BOX	L		19
	LAURUS NOBILIS Sweet Bay	24"BOX	L		15
	MYRICA CALIFORNICA Pacific Wax Myrtle	24"BOX	L		6
	PINUS ELDARICA Afghan Pine	24"BOX	L		28
	RHUS LANCEA African Sumac	24"BOX	L		15
	TRISTANIA CONFERTA Brisbane Box	24"BOX	M		28
SHRUB AREAS	BOTANICAL NAME	SIZE	WUCOLS	SPACING	QTY
	ACACIA REDOLENS Bank Catclaw	1 GAL	L	72" o.c.	352
	CEANOTHUS ARBOREUS `POWDER BLUE` Ceanothus	1 GAL	L	72" o.c.	95
	ECHIUM CANDICANS Pride Of Madeira	1 GAL	L	96" o.c.	106
	LANTANA X `NEW GOLD` New Gold Lantana	1 GAL	L	72" o.c.	483
	LIGUSTRUM JAPONICUM `TEXANUM` Wax Leaf Privet	1 GAL	L	96" o.c.	94
	PRUNUS ILICIFOLIA LYONII Catalina Cherry	1 GAL	L	96" o.c.	19
	PYRACANTHA KOIDZUMII `SANTA CRUZ` Santa Cruz Pyracantha	1 GAL	L	72" o.c.	400
	RHAMNUS CALIFORNICA `LEATHERLEAF` California Coffeeberry	1 GAL	L	72" o.c.	41
	WESTRINGIA FRUTICOSA Coast Rosemary	1 GAL	L	72" o.c.	114
GROUND COVERS	BOTANICAL NAME	SIZE	WUCOLS	SPACING	QTY
	BACCHARIS PILULARIS `PIGEON POINT` Coyote Brush	FLAT	L	24" o.c.	2,056
	CAREX PANSA Sanddune Sedge	FLAT	L	18" o.c.	1,315

SPEC. No. XXXXX

CAD FILE: Y:\DRAWINGS\GOV\EMWD\Pettit Potable Water Storage Tank\2.0 DESIGN\CAD\Conceptual Planting Plan.dwg LAYOUT: conceptual landscape plan PLOTTED: 4/28/2017 11:14 AM BY: brett

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PLANS PREPARED BY:
bmla LANDSCAPE ARCHITECTURE
310 NORTH JOY STREET CORONA, CA 92879
CONTACT: STEVE SHIRREL, PROJECT MANAGER
PHONE: 951-737-1124, EX. 116
FAX: 951-737-6551

REGISTERED LANDSCAPE ARCHITECT
STEVEN L. SHIRREL RLA# 5052
SIGNATURE
12/31/16
EXP. DATE
4/28/2017
DATE
STATE OF CALIFORNIA

REVISIONS

NO.	DATE	INITIAL	DESCRIPTION	APP'VD/DATE

APPROVED BY:
XX/XXXX
DIRECTOR OF ENGINEERING DATE
REFERENCES

EASTERN MUNICIPAL WATER DISTRICT
XX/XXXX
PROJECT MANAGER DATE

APPROVALS		INITIAL	DATE
	PROJECT ENGR.	XX	XX/XXXX
	INSPECTION	XX	XX/XXXX
	WTR. OPERATIONS	XX	XX/XXXX
	MAINTENANCE	XX	XX/XXXX

	DATE
DESIGNED	04/2017
DRAWN	04/2017
TRACED	
CHECKED	04/2017
SUBMITTED	XX/XXXX

SCALE: AS SHOWN

EASTERN MUNICIPAL WATER DISTRICT
RIVERSIDE COUNTY, CALIFORNIA
PETTIT TANK

I.D. XX
S.A. XX
W.O. XXXXXX
C.O.
COORD. XX-X-XX
SHT. 1 OF 2
D-_ _ _ _ _

PLANT SCHEDULE

TREES	BOTANICAL NAME	SIZE	WUCOLS		QTY
	ARCTOSTAPHYLOS MANZANITA `DR. HURD` Dr. Hurd Manzanita	24"BOX	L		26
	KOELREUTERIA BIPINNATA Chinese Flame Tree	24"BOX	L		19
	LAURUS NOBILIS Sweet Bay	24"BOX	L		15
	MYRICA CALIFORNICA Pacific Wax Myrtle	24"BOX	L		6
	PINUS ELDARICA Afghan Pine	24"BOX	L		28
	RHUS LANCEA African Sumac	24"BOX	L		15
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	CEANOTHUS ARBOREUS `POWDER BLUE` Ceanothus	1 GAL	L	72" o.c.	95
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	LANTANA X `NEW GOLD` New Gold Lantana	1 GAL	L	72" o.c.	483
	LIGUSTRUM JAPONICUM `TEXANUM` Wax Leaf Privet	1 GAL	L	96" o.c.	94
	PRUNUS ILICIFOLIA LYONII Catalina Cherry	1 GAL	L	96" o.c.	19
	PYRACANTHA KOIDZUMII `SANTA CRUZ` Santa Cruz Pyracantha	1 GAL	L	72" o.c.	400
	RHAMNUS CALIFORNICA `LEATHERLEAF` California Coffeeberry	1 GAL	L	72" o.c.	41
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GROUND COVERS	**BOTANICAL NAME**	**SIZE**	**WUCOLS**	**SPACING**	**QTY**
	BACCHARIS PILULARIS `PIGEON POINT` Coyote Brush	FLAT	L	24" o.c.	2,056
	CAREX PANSA Sanddune Sedge	FLAT	L	18" o.c.	1,315

WATER EFFICIENT LANDSCAPE WORKSHEET

PROJECT: Pettit Water Tank — DATE: 4/18/2017

This w orksheet is filled out by the project applicant and it is a required element of the Landscape Documentation Package.

Reference Evapotranspiration (ETo) 56.4

Conversion Factor 0.62

Hydrozone # /Planting Description[a]	Plant Factor (PF)	Irrigation Method[b]	Irrigation Efficiency (IE)[c]	ETAF (PF/IE)	Landscape Area (sq, ft,)	ETAF x Area	Estimated Total Water Use (ETWU)[d]
Regular Landscape Areas							
Low water use plantings	0.3	Drip	0.81	0.37	0	0	0
Medium water use plantings	0.5	Drip	0.81	0.62	0	0	0
High water use turf	0.7	Drip	0.81	0.86	0	0	0
Low use plantings	0.3	Rotary Nozzles or Rotors	0.75	0.40	90942	36376.8	1,272,024
Med use plantings	0.5	Rotary Nozzles or Rotors	0.75	0.67	0	0	0
High water use turf	0.7	Rotary Nozzles or Rotors	0.75	0.93	0	0	0
				TOTALS	**90,942**	**36377**	**1,272,024**
Special Landscape Areas							
Turf areas parks				1	0	0	0
Irrigated w/ recycled water				1	0	0	0
Water features				1	0	0	0
				TOTALS	**0**	***0***	**0**
						ETWU Total	**1,272,024**
						Maximum Allowed Water Allowance (MAWA)[e]	**1,590,030**

MAWA

ETAF for residential areas is .55 or .45 for commercial areas

MAWA =	ETO *	Conv Factor *	((ETAF	*	LA)	+	(1-ETAF)	*	SLA))
	56.4	0.62	0.50		90,942		0.50		0
MAWA=	**1,590,030**								

ETAF Calculations

Regular Landscape Areas		All Landscape Areas	
Total ETAF x Area	36,377	Total ETAF x Area	36,377
Total Area	90,942	Total Area	90,942
Average ETAF	**0.40**	**Sitewide ETAF**	**0.40**

Average ETAF for Regular Landscape Aeas must be 0.55 or below for residential areas, and 0.45 or below for non-residential areas.

NOTES

1. A COMPREHENSIVE AGRONOMIC SOIL ANALYSIS IS REQUIRED FOLLOWING ROUGH GRADING. THE SOIL TEST SHALL ANALYZE TEXTURE, ORGANIC MATTER, ESTIMATED NITROGEN RELEASE, PHOSPHORUS (P1, P2), POTASSIUM, MAGNESIUM, CALCIUM, SOIL PH, CATION EXCHANGE CAPACITY, PERCENT BASE SATURATION, SOLUBLE SALTS, EXCESS LIME RATE, SODIUM, AND BORON. A COPY OF THE AGRONOMIC SOIL ANALYSIS SHALL BE FORWARDED TO THE DEPARTMENT OF WATER AND POWER.
2. SOIL SAMPLES SHALL BE ANALYZED BY A CERTIFIED LAB. CHECK WITH SOIL/PLANT LAB FOR TESTS FOR TURF, AND CERTIFICATIONS.
3. ALL NON-TURF PLANTER AREAS TO RECEIVE A 3" LAYER OF MEDIUM GRIND BARK MULCH
4. QUANTITIES PROVIDED ARE LISTED FOR CONVENIENCE ONLY. THE ACTUAL NUMBER OF PLANTS SHOWN ON THE PLAN TAKE PRECEDENCE OVER QUANTITIES LISTED.
5. ALL TREES PLANTED WITHIN 5' OF ANY STRUCTURE OR PAVING SHALL HAVE A ROOT BARRIER INSTALLED.

Landscape Theme Statement

THIS LANDSCAPE WILL CONSIST OF CALIFORNIA-FRIENDLY, LOW AND MEDIUM WATER USE PLANT MATERIAL. ALL PLANTS HAVE BEEN CHOSEN FROM THE LOW OR MEDIUM WATER USE CATEGORY ACCORDING TO WUCOLS. TREES AND SHRUBS HAVE BEEN SELECTED AS FAST GROWING SPREADERS TO COVER THE SLOPES AND PROVIDE SCREENING OF THE WATER TANK. PLANTS HAVE BEEN CHOSEN TO CREATE A UNIFORM THEME ACROSS THE SITE CONSISTING OF MEDITERRANEAN AND CALIFORNIA FRIENDLY PLANT MATERIAL. MAINTENANCE AND LONGEVITY OF PLANT MATERIAL HAS BEEN TAKEN INTO CONSIDERATION. A 3" LAYER OF SHREDDED WOOD MULCH WILL BE USED IN ALL LANDSCAPE AREAS.

IRRIGATION SYSTEM DESIGN STATEMENT

A PERMANENT AUTOMATIC IRRIGATION SYSTEM SHALL BE DESIGNED AND INSTALLED TO IRRIGATE ALL PLANTING AREAS. THE DESIGN OF THE IRRIGATION SYSTEM SHALL EMPHASIZE WATER CONSERVATION AND PROVIDE EFFICIENT AND UNIFORM DISTRIBUTION OF IRRIGATION WATER. THE SYSTEM SHALL BE DESIGNED TO UTILIZE RECYCLED WATER WHEN IT BECOMES AVAILABLE, IN ACCORDANCE WITH STATE OF CALIFORNIA AND LOCAL WATER DISTRICT RULES AND REGULATIONS.

IN PLANTER AREAS WHERE APPROPRIATE, DRIP AND/OR BUBBLER IRRIGATION, OR OTHER LOW-VOLUME, LOW-PRESSURE, MICRO-IRRIGATION SYSTEM MAY BE INSTALLED TO PROVIDE WATER DIRECTLY TO THE ROOT ZONE OF PLANTS THE IRRIGATION SYSTEM MAY UTILIZE EFFICIENT ROTATOR NOZZLES IN LARGER PLANTING AREAS. THE AUTOMATIC IRRIGATION SYSTEM SHALL BE DESIGNED IN ACCORDANCE WITH THE CITY OF CORONA ORDINANCES AND REQUIREMENTS AND SHALL BE DESIGNED TO ACCOMMODATE RECYCLED WATER USING PURPLE COLORED IRRIGATION LINES AND VALVES.

A REDUCED PRESSURE BACKFLOW PREVENTER SHALL BE INSTALLED AS PART OF THE IRRIGATION SYSTEM TO PROTECT THE POTABLE WATER SUPPLY IN ACCORDANCE WITH STATE OF CALIFORNIA, CITY OF CORONA, AND LOCAL WATER DISTRICT STANDARDS AND REQUIREMENTS.

SPEC. No. XXXXX

Underground Service Alert
Call: TOLL FREE 811
TWO WORKING DAYS BEFORE YOU DIG

SCALE VERIFICATION
THIS BAR IS 1 INCH IN LENGTH ON ORIGINAL DRAWING
0 1"
IF IT'S NOT 1 INCH ON THIS SHEET ADJUST YOUR SCALES ACCORDINGLY

PLANS PREPARED BY:
bmla LANDSCAPE ARCHITECTURE
310 NORTH JOY STREET CORONA, CA 92879
CONTACT: STEVE SHIRREL, PROJECT MANAGER
PHONE: 951-737-1124, EX. 116
FAX: 951-737-6551

REGISTERED LANDSCAPE ARCHITECT — STATE OF CALIFORNIA — 12/31/16 EXP. DATE — 4/28/2017 DATE

REVISIONS				
NO.	DATE	INITIAL	DESCRIPTION	APP'VD/DATE

APPROVED BY: XX/XXXX
DIRECTOR OF ENGINEERING — DATE
REFERENCES

EASTERN MUNICIPAL WATER DISTRICT
PROJECT MANAGER — XX/XXXX DATE

APPROVALS	INITIAL	DATE
PROJECT ENGR.	XX	XX/XXXX
INSPECTION	XX	XX/XXXX
WTR. OPERATIONS	XX	XX/XXXX
MAINTENANCE	XX	XX/XXXX

	DATE
DESIGNED	04/2017
DRAWN	04/2017
TRACED	
CHECKED	04/2017
SUBMITTED	XX/XXXX

SCALE: AS SHOWN

EASTERN MUNICIPAL WATER DISTRICT
RIVERSIDE COUNTY, CALIFORNIA
PETTIT TANK

I.D. XX
S.A. XX
W.O. XXXXXX
C.O.
COORD. XX-X-XX
SHT. 2 OF 2
D-_ _ _ _ _

CAD FILE: Y:\DRAWINGS\GOV\EMWD\Pettit Potable Water Storage Tank\2.0 DESIGN\CAD\Conceptual Planting Plan.dwg LAYOUT: conceptual landscape plan (2) PLOTTED: 4/28/2017 11:14 AM BY: brett

APPENDIX G
ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST

Opinion of Probable Construction Cost

Project:	Pettit Water Storage Expansion and Transmission Pipeline - Phase 1	Job No.:	20164763.001A
Client:	Eastern Municipal Water District	Estimate by:	AJL
Date:	April 28, 2017	Job Status:	PDR
Area:	Pettit Tank and Transmission Pipeline		

	Item Description	Qty	Unit	Materials $/Unit	Installation $/Unit	Total $/Unit	Total Net Cost $
1	**Division 1 - General Requirements**						**$ 1,147,000**
2	General Conditions	1	LS			845,000	$ 845,000
3	Insurance and Bonds	1	LS			302,000	$ 302,000
	Division 2 - Sitework						**$ 1,160,200**
	Excavation	47,000	CY			$ 3	$ 141,000
	Off-Site Disposal	47,000	CY			$ 7	$ 329,000
	Clearing and Grubbing	2	LS			$ 10,000	$ 20,000
	Curb and Gutter	600	LF			$ 15	$ 9,000
	Storm Drain Catch Basins	5	EA			$ 3,000	$ 15,000
	12-in PVC Storm Drain Piping and Fittings	810	LF			$ 120	$ 97,200
	18-in PVC Storm Drain Piping and Fittings	250	LF			$ 180	$ 45,000
	Detention Basin	270	SY		$ 55	$ 55	$ 15,000
	Concrete V-Ditch	2,060	LF			$ 30	$ 62,000
	Rock Energy Dissipator	755	SF				
	Asphalt Concrete	42,800	SF			$ 2	$ 86,000
	Concrete Driveway	900	SF			$ 5	$ 5,000
	Phase 1 CMU Retaining Wall	2	LS			$ 8,000	$ 16,000
	Slope Groundcover/shrubs	1	LS			$ 277,872	$ 278,000
	Trees	1	LS			$ 41,100	$ 42,000
	Division 3 - Concrete						**$ 30,000**
	Emergency Detention Basin Overflow Structure	2	EA			$ 5,000	$ 10,000
	Reservoir Overflow Structure	2	EA			$ 10,000	$ 20,000
	Division 5 - Metals						**$ 78,600**
	Reservoir Metal Stairs	2	LS			$ 20,000	$ 40,000
	Tube Steel Fence	1	LS			$ 36,032	$ 36,032
	Tube Steel Gate	1	LS			$ 2,500	$ 2,500
	Division 11 - Equipment						**$ 5,940,600**
	Steel Tanks (Phase 1)	2	LS		$ 2,910,000	$ 2,910,000	$ 5,820,000
	Submersible Sample Sump Pump	2	EA	$ 3,000	$ 1,800	$ 4,800	$ 9,600
	Pax Mixer	2	EA	$ 37,000	$ 18,500	$ 55,500	$ 111,000
	Division 15 - Mechanical						**$ 4,042,600**
	24-inch CML&C Transmission Pipeline and Fittings	2,800	LF			$ 720	$ 2,016,000
	30-inch CML&C Transmission Pipeline and Fittings	1,920	LF			$ 900	$ 1,728,000
	Seismic Valve Actuator	2	EA	$ 30,000	$ 5,000	$ 35,000	$ 70,000
	Sampling Station	2	EA			$ 2,000	$ 4,000
	30-inch Butterfly Valve	4	EA	$ 30,000	$ 18,000	$ 48,000	$ 192,000
	x-in Flap Valves	2	EA			$ 4,800	$ 9,600
	Blowoff Valve Assembly	2	EA			$ 6,500	$ 13,000
	Air Relief Valve Assembly	2	EA			$ 5,000	$ 10,000
	Divisions 16 & 17 - Electrical & Instrumentation						**$ 101,600**
	General Electrical	1	LS			$ 101,552	$ 101,552
	SubTotal						**$ 12,500,600**
					Project Level Allowance	35.0%	$ 4,376,000
					Subtotal		$ 16,877,000
					Escalation to Midpoint (3%/yr x 1 yrs)	3.0%	$ 507,000
					TOTAL		**$ 17,390,000**

X:_Clients\EMWD\Pettit Tank\Documents\Cost Estimate\30%\Pettit OPCC_30%.xlsx, Printed On: 4/28/2017, 3:15 PM

APPENDIX H
REPORT OF GEOTECHNICAL INVESTIGATION – PROPOSED PETTIT POTABLE WATER STORAGE TANK EXPANSION AND TRANSMISSION PIPELINE

KLEINFELDER
Bright People. Right Solutions.

September 21, 2016
Kleinfelder Project No. 20164763.001A

Mr. Greg Kowalski, PE
Eastern Municipal Water District (EMWD)
2270 Trumble Road
Post Office Box 8330
Perris, California 92572

SUBJECT: Report of Geotechnical Investigation
Proposed Pettit Potable Water Storage Tank
Expansion and Transmission Pipeline
Moreno Beach Drive
City of Moreno Valley, California

Dear Mr. Kowalski:

Kleinfelder is pleased to present this report summarizing the geotechnical investigation performed for the subject site, located on Moreno Beach Drive in the city of Moreno Valley, California. Our work consisted of a subsurface exploration, laboratory testing, engineering analyses, and preparation of this report.

We appreciate the opportunity to provide geotechnical engineering services to you on this project. If you have any questions regarding this report or if we can be of further service, please do not hesitate to contact the undersigned.

Sincerely,

KLEINFELDER

Francisco J. Jaime
Project Professional

Michael O. Cook, PG, CEG
Senior Engineering Geologist

Eric W. Noel, PE, GE
Principal Geotechnical Engineer

3880 Lemon Street, 3rd Floor, Riverside, Ca 92501 p | 951.801.3681 f | 951.682.0192

REPORT OF
GEOTECHNICAL INVESTIGATION
PROPOSED PETTIT POTABLE WATER STORAGE TANK EXPANSION AND TRANSMISSION PIPELINE
MORENO BEACH DRIVE
MORENTO VALLEY, CALIFORNIA
KLEINFELDER PROJECT NO. 20164763.001A

SEPTEMBER 21, 2016

A Report Prepared for:

Eastern Municipal Water District
2270 Trubmle Road
Post Office Box 8300
Perris, California 92572

REPORT OF
GEOTECHNICAL INVESTIGATION
PROPOSED PETTIT POTABLE WATER STORAGE TANK
EXPANSION AND TRANSMISSION PIPELINE
MORENO BEACH DRIVE
MORENO VALLEY, CALIFORNIA

Prepared by:

Francisco J. Jaime
Project Professional

Michael O. Cook, PG, CEG
Senior Engineering Geologist

Reviewed by:

Eric W. Noel, PE, GE
Principal Geotechnical Engineer

KLEINFELDER
3880 Lemon St., 3rd Floor
Riverside, CA 92501
Phone: 951.801.3681
Fax: 951.682.0192

September 21, 2016
Kleinfelder Project No. 20164763.001A

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1 INTRODUCTION

1.1 GENERAL

This report presents the results of Kleinfelder's geotechnical evaluation performed for the proposed Pettit Potable Water Tank Expansion and Transmission Pipeline. The proposed water tank expansion is located approximately 1,100 feet north of Cottonwood Avenue on Moreno Beach Drive. The proposed transmission pipeline alignment starts at the water tank expansion site and extends to the intersection of Alessandro Boulevard on Moreno Beach Drive. Both the proposed water tank and pipeline projects are located in the City of Moreno Valley, California. The location of the proposed site is shown on Figure 1, Site Vicinity Map. Our evaluation was performed in general accordance with Kleinfelder Proposal dated January 12, 2016.

This report includes the findings of our geotechnical evaluations. Our findings are based upon the subsurface conditions encountered at the locations of our explorations and are subject to the provisions stated in the limitation section of this report. In addition, an article prepared by The Geoprofessional Business Association (GBA), Important Information about This Geotechnical Engineering Report, has been included in APPENDIX C. We recommend that all individuals using recommendations from this report read the limitation section of this report along with the included GBA document.

1.2 PROJECT DESCRIPTION

We understand that Eastern Municipal Water District's (EMWD's) existing storage facilities requires additional water storage tanks to support planned development in east Moreno Valley. The proposed project will expand the Pettit Tank site with a current total storage of 2 million gallons (MG) to a total of up to 8.1 MG of storage (Water Facilities Master Plan Update, 2015). In addition to the water storage tank, approximately 4,000 lineal feet of transmission pipeline is required to connect the proposed storage tank(s) to the proposed Cactus II Feeder (currently in design).

EMWD is currently planning to construct one or two above ground steel tanks ranging in size from 3 to 5 MG. We anticipate that the tank will be founded on a shallow perimeter ring foundation with one or more interior spread footings. If two tanks are constructed, then the existing Pettit tank will need to be demolished. We understand that the tank pad elevation may be at the approximate elevation of 1722 feet.

1.3 SCOPE OF SERVICES

The scope of our geotechnical investigation consisted of subsurface exploration, geotechnical laboratory testing, engineering evaluation and analysis, and preparation of this report. Our report includes a description of the work performed, a discussion of the geotechnical conditions observed at the site, and geotechnical recommendations developed from our engineering analysis of field and laboratory data. A description of our scope of services performed for this project is presented below.

Task 1 – Background Data Review. We reviewed published and unpublished geologic literature in our files and the files of public agencies, including selected publications prepared by the California Geological Survey and the U.S. Geological Survey. We also reviewed readily available seismic and faulting information, including data for designated earthquake fault zones and our in-house database of faulting in the general site vicinity. We also reviewed aerial photographs in order to evaluate the impacts of the prior development of the site to the proposed development.

Task 2 – Field Exploration. Our scope of work included a field exploration which consisted of excavating five test pits and conducting a seismic refraction survey at the proposed tank expansion site and drilling five hollow-stem auger borings along the proposed transmission pipeline alignment.

The test pits were excavated on June 20, 2016 and the exploratory borings were drilled on July 13, 2016. The borings and test pits were conducted to evaluate the general subsurface conditions at the site and proposed pipeline alignment and to evaluate the engineering properties of the near-surface soils at the site. The hollow-stem auger borings ranged in depth from approximately 16½ to 31½ feet below ground surface (bgs) and the test pits ranged from approximately 9 to 17½ feet bgs. The locations of our borings and test pits are shown on Figure 2, Exploration Location Map.

The seismic survey was conducted at the proposed tank site location to assess the general seismic velocity characteristics of the underlying earth materials. Three distinct layers were defined with velocities of approximately 1,482 feet per second (fps), 2,815 fps, and 7,338 fps. The results of the seismic refraction survey are presented in Appendix C.

Prior to commencement of the fieldwork, each of our proposed exploration locations were cleared for known existing utility lines and with the participating utility companies through Underground Service Alert (USA). A Kleinfelder representative supervised the field operations and logged the borings. Selected bulk and drive samples were retrieved, sealed and transported to our laboratory for further evaluation. Our typical sampling interval was every 5 feet to full depths explored. The number of blows necessary to drive both Standard Penetration Test (SPT) and modified California-type samplers were recorded. A description of the field exploration and the logs of the borings, including a Legend to the Logs of Borings, are presented in Appendix A.

Task 3 – Laboratory Testing. Laboratory testing was performed on representative samples of soil collected from our excavations to substantiate field classifications and to provide engineering parameters for geotechnical design. Laboratory testing included moisture content and unit weight, direct shear, consolidation, maximum dry density and optimum moisture, expansion index, corrosion tests, and R-value testing. A summary of the testing performed and the results are presented in Appendix B.

Task 4 – Geotechnical Analyses. The available field and laboratory data were analyzed in conjunction with the proposed site plan presented on Figure 2 and our assumed structural loads to develop geotechnical recommendations for the design and construction of the proposed development. We evaluated potential foundation systems, settlement, and earthwork considerations. Potential geologic hazards, such as ground shaking, liquefaction potential, flood hazard, fault rupture hazard and seismically-induced settlement, were also evaluated.

Task 5 – Report Preparation. This report summarizes the work performed, data acquired, and our findings, conclusions, and geotechnical recommendations for the design and construction of the proposed development. Recommendations for the following are presented in this report:

- Earthwork, including site preparation, excavation, trenching, shoring, site drainage, and the placement of engineered fill;
- Treatment wet and/or soft soils (and conversely recommendations for moisture conditioning drier soils);
- Design of suitable foundation systems including allowable bearing capacity, lateral resistance, and settlement estimates;

- Seismic design parameters, including the recommended soil coefficient;
- Preliminary results of our corrosion testing;
- Pavements, including flexible asphalt concrete and rigid PCC pavement; and
- In-grading/in-construction field observation and testing services.

This report also contains reference maps and graphics, as well as the logs of the borings and laboratory test results.

2 SITE AND SUBSURFACE CONDITIONS

2.1 SITE DESCRIPTION

The proposed tank expansion site is located on a 2.2 acre parcel (APN 477.310.011) adjacent to and just north of the existing Pettit tank site (APN 488.170.004). The site is bounded to the east by Moreno Beach Drive and to the north and west by Pettit Hill. The site generally slopes from west (high point) to east (low point) at approximately 8.5H: 1V towards Moreno Beach Drive. The existing site elevations range from approximately 1,758 feet to 1,720 feet across the site (Google Earth, 2016). Drainage features were observed throughout the site, originating from the base of Pettit Hill. The proposed pad elevation for the tank is 1722 feet.

The proposed transmission pipeline alignment follows along Moreno Beach Drive and extends south from the proposed tank expansion site to the intersection of Alessando Boulevard. Moreno Beach Drive gently slopes from north (high point) to south (low point). The existing elevations range from approximately 1,720 feet to 1,595 feet across the site.

2.2 SUBSURFACE CONDITIONS

The site is generally underlain by artificial fill and mostly alluvial deposits. A discussion of the subsurface deposits encountered is presented in the following sections. Detailed descriptions of the deposits are provided in our boring logs presented in Appendix A.

<u>Artificial Fill (Undocumented)</u>

Artificial fill was encountered in borings B-3 and B-5 along the proposed pipe alignment. The artificial fill ranged in thickness from approximately 6 to 8 feet along the proposed pipeline alignment. It should be noted that borings B-1 through B-4 were located off of the street at least 4 feet behind the curb or edge of pavement. Boring B-5 was located within a paved shoulder along Allesandro Boulevard. It is anticipated that the artificial fill and road base will be encountered in the roadway should the pipeline alignment be placed within the street. The fill soils encountered generally consisted of sand with varying amounts of silt and clays content. The artificial fill may be suitable for structural backfill once any construction debris, vegetation, and other deleterious materials have been removed. No artificial fill was encountered in the test pits and boring B-1 that were drilled at the proposed tank expansion site.

Older Alluvium

The older alluvial soils generally consisted of medium to very dense sand with varying amounts of silt and clay contents. In Borings B-1, B-3 and B-5, clayey sand and silt with sand were observed to have low to medium plasticity and stiff silt with varying sand contents at depths greater than 5 feet bgs. The coarser grained sand tended to be more abundant than the finer grained soils.

Tonalite Bedrock (Kt)

Cretaceous-age Tonalite underlies the entire site at depth underlying the older alluvial soil deposits. However, along the western boundary of the site, this geologic unit is exposed at the surface or covered with a thin layer of soil. This bedrock unit is part of the composite Peninsular Ranges batholith. Although surface outcrops were not present within the site, surface rock float/boulders were present at the surface. Nearby offsite outcrops indicate that the bedrock is in a weathered to slightly weathered condition. Based on a seismic refraction survey conduct on the site, high velocity bedrock is approximately 20 feet below the ground surface. See Figure 4 and Appendix C for details of the seismic refraction survey.

Grading Considerations

The moisture content of the soils encountered at the proposed tank expansion site generally ranged from 2.3 to 6.8 percent based on laboratory test results of samples collected from our test pits and boring B-1. The optimum moisture content for the upper coarse-grained soils is approximately 7.3 percent based on a single laboratory test. While some variation should be anticipated for the optimum moisture content, the proposed tank expansion on-site soils are drier than the optimum moisture content. Moisture conditioning of the on-site soils during grading will be required. No optimum moisture content was tested for soils along the proposed pipeline alignment. The moisture content of the proposed alignment generally ranged from approximately 2.0 to 7.9 percent based on laboratory tests from the borings. The specific moisture contents and dry densities for the various soils encountered on-site are shown on the Logs of Borings, presented in Appendix A. See section 4.4, Earthwork, for additional details regarding rippability of on-site soils and bedrock.

2.3 GROUNDWATER CONDITIONS

Groundwater was not encountered to the maximum depth explored of 31½ feet below the existing grades. Groundwater at the site is not anticipated to be a factor in the design and construction of the proposed developments. According to the Department of Water Resources (DWR) water data library (www.water.ca.gov, 2016), the closest wells to the site are listed in the table below:

TABLE 1

GROUNDWATER ELEVATIONS

Well ID	Date	Ground Elevation (ft.)	Water Elevation (ft.)	Depth to GW (ft.)	Distance & Bearing from Tank Site (miles, degrees)
EMWD14352	04/16/2015	1786.9	1590	196.9	0.8 @ N30E
10N03W26K001S	02/06/1959	2172.6	2068.4	104.2	0.8 @ N86E
EMWD10141	10/07/2015	1545.8	1484.3	61.5	1.4 @ S06E

Note: Proposed tank site elevation is approximately 1722 feet

Fluctuations of the groundwater level, localized zones of shallow perched water, and a rise in soil moisture content should be anticipated during and following the rainy season. Irrigation of landscaped areas on or adjacent to the site can also lead to an increase in soil moisture levels and fluctuations of shallow perched groundwater levels.

3 GEOLOGIC CONDITIONS

3.1 REGIONAL GEOLOGY

The site is situated within the northern Peninsular Ranges Geomorphic Province of California (CGS, 2002). The Peninsular Ranges are a northwest-southeast oriented complex of blocks separated by similarly trending faults which extend 125 miles from the Transverse Ranges south to the Mexican border and beyond another 775 miles to the tip of Baja California. The province varies in width from approximately 30 to 100 miles and is bounded on the east by the Colorado Desert and the Gulf of California and on the west by the Pacific Ocean. The general geologic framework of the northern Peninsular Ranges area is presented in studies by Dibblee (2003), Norris and Webb (1990), Morton and Miller (2006), and Morton (1972).

The Peninsular Ranges contain Jurassic-age and Cretaceous-age igneous and metamorphic rocks, as well as a thick sequence of marine and non-marine sedimentary rock. The igneous rocks are part of the Southern California batholith. The Peninsular Ranges Province is further described by sub-units, which include the Perris Block, the Santa Ana Mountains, and the San Jacinto Mountains. The Perris Block is characterized as a broad area of intermixed valleys and low mountain ranges situated between the Elsinore and San Jacinto fault zones. Geographic features near the Pettit Tank include the Box Springs Mountains, Box Springs Canyon, Moreno Valley, March Field, Perris Valley, and San Jacinto River. Stratigraphic units within the Pettit Tank site consist of older alluvial fan deposits ($Qvof_a$) overlying granitic (Kt) bedrock. Surface outcrops of granitic bedrock of the Southern California batholith are present as the adjacent hills along the western boundary of the site and to the north and east of the site.

The Pettit tank site is situated between the San Jacinto Fault Zone (approximately 2.2 miles to the northeast) and Elsinore fault zone (approximately 21 miles to the southwest). These two faults are major structural features of the San Andreas Fault System which located approximately 13 miles to the northeast. A major seismic event on these faults could cause significant ground shaking at the site.

The proposed Pettit Tank site is situated on an old alluvial fan surface directly adjacent to the southeast end of the Pettit hills. This fan was deposited on an eroded surface cut into Cretaceous age granitic basement rock exposed adjacent to the west side of the project site. Boulders are present exposed within the older alluvial surface.

Detailed descriptions of the subsurface conditions encountered during our field investigation are presented on the Logs of Borings provided in Appendix A and in the sections below.

3.2 FAULTING AND SEISMICITY

The most significant geologic hazard to this project is the potential for moderate to severe seismic shaking that is likely to occur during the design life of the proposed project.

3.3 OTHER GEOLOGIC HAZARDS

Because the site is located in a gently sloping site we do not consider landslides or other forms of natural slope instability to represent a significant hazard to the project. Depending on final site configuration and tank distance from the adjacent hillside there is a moderate potential for rock fall hazard.

Based on the elevated and inland location of the site a tsunami is not considered a potential hazard to the project. The site is not located near any large impounded open water and the adjacent existing Pettit tank is a closed tank, therefore a potential seiche hazard is considered low.

3.3.1 Liquefaction

Liquefaction occurs when loose, coarse-grained or silty soils are subjected to strong shaking resulting from earthquake motions. The coarse-grained or silty soils typically lose a portion or all of their shear strength, and regain strength sometime after the shaking stops. Soil movements (both vertical and lateral) have been observed under these conditions due to consolidation of the liquefied soils.

The site is located within a Riverside County designated Low potential to liquefaction zone (Riverside County, 2016). Historic groundwater levels for the site are on the order of 100 feet bgs (DWR, 2016). Liquefaction potential is further discussed in Section 4.

3.3.2 Flooding

Based on the Federal Emergency Management Agency Flood Hazard Web Page, the project site is located within an area which has been designated as Zone X, which is an area outside the 0.2% annual chance floodplain (FEMA, 2008).

4 CONCLUSIONS AND RECOMMENDATIONS

4.1 GENERAL

Based on the results of our field exploration, laboratory testing and geotechnical analyses conducted during this study, it is our professional opinion that the proposed project is geotechnically feasible, provided the recommendations presented in this report are incorporated into the project design and construction.

The following opinions, conclusions, and recommendations are based on the properties of the materials encountered in the borings, the seismic refraction lines, the results of our literature review, the results of the laboratory-testing program, and our engineering analyses performed. Our recommendations regarding the geotechnical aspects of the design and construction of the project are presented in the following sections. The recommendations presented below are based on an anticipated finished pad elevation of 1722 feet MSL. Cuts on the order of 10 to 35 feet may be required to bring the pad to finished grade elevation. If the pad elevation changes from the elevation used in our analyses or the development configuration changes, our recommendations may have to be modified accordingly.

Based on our findings, the site is suitable for shallow spread foundations provided the recommendations presented in the following sections are followed. We anticipate that the onsite soils may be reusable as engineered fill once organic vegetation, debris, and oversized materials are removed. Overexcavation and recompaction of the upper fill and native materials should provide adequate support for both shallow foundations and flexible and rigid pavements.

The onsite soils generally consist of coarse-grained sands with varying amounts of silts and clays that are considered expansive and may be subject to swelling when wet. Based on the results of our expansion index testing, our knowledge of the regional geology, our literature review, and engineering judgement, we have presented our recommendations for soils that have a low to medium potential for expansion. Our recommendations on earthwork and drainage should be followed in order to reduce the impacts of this hazard. We did not encountered any abandoned utilities in our test pits or borings. A diligent search should be conducted during grading operations in an effort to uncover any underground structures, irrigation, or utility lines which should be properly abandoned or removed prior to site development.

4.2 SEISMIC DESIGN CONSIDERATIONS

4.2.1 General

The site is located in a seismically active region of southern California. The proposed site can be expected to be subject to strong seismic shaking during its design life. Potential seismic hazards include ground shaking, localized liquefaction, ground rupture due to faulting, and seismic settlement. The following sections discuss these potential seismic hazards where relevant with respect to this site.

4.2.2 Seismic Site Class

Based on information obtained from the investigation, published geologic literature and maps, and on our interpretation of the American Water Works Association (AWWA) Standard D100-11, it is our opinion that the project site may be classified as Site Class C, very dense soil or soft rock, according to Table 25, Site Class Definitions of AWWA D100-11.

4.2.3 Seismic Design Parameters

The Risk-Targeted Maximum Considered Earthquake (MCE_R) mapped spectral accelerations for 0.2 seconds and 1 second periods (S_s and S_1) were estimated using Section 13 of the AWWA D100-11 and the U.S. Geological Survey (USGS) web based application (available at http://earthquake.usgs.gov/designmaps/us/application.php). The mapped acceleration values and associated soil amplification factors (F_a and F_v) based on the AWWA D100-11 and corresponding site modified spectral accelerations (S_{MS} and S_{M1}) and design spectral accelerations (S_{DS} and S_{D1}) are presented in Table 2. The approximate coordinates for the site are noted below:

Latitude: 33.927701°N
Longitude: -117.174644°W

TABLE 2

SEISMIC DESIGN PARAMETERS

Design Parameter	Value
Seismic Use Group	III
Seismic Importance Factor	1.50
Site Class	C
S_s (g)	2.070
S_1 (g)	0.932
F_a	1.000
F_v	1.300
S_{MS} (g)	2.070
S_{M1} (g)	1.212
S_{DS} (g)	1.380
S_{D1} (g)	0.808
T_L (sec)	8
PGA (g)	0.802
PGA_M (g)	0.802
Response Modification Factor for Mechanically Anchored Tanks (R_i/R_c)	3.0 (Impulsive) /1.5 (Convective)
Response Modification Factor for Self-Anchored Tanks (R_i/R_c)	2.5 (Impulsive) /1.5 (Convective)
Design Response Acceleration for Impulsive Components (S_{ai})	To Be Determined*
Design Response Acceleration for Convective Components (S_{ac})	To Be Determined*
Seismic Design Category	D

* Factors require tank design information to calculate. Factors should be calculated by tank designers using Section 13 of AWWA D100-11

4.2.4 Liquefaction and Seismic Settlement

Liquefaction occurs when loose, coarse-grained or silty soils are subjected to strong shaking resulting from earthquake motions. The coarse-grained or silty soils typically lose a portion or all of their shear strength, and regain strength sometime after the shaking stops. Soil movements (both vertical and lateral) have been observed under these conditions due to consolidation of the liquefied soils.

In general, the site soils consist of dense to very dense silty sand and coarse grained clayey sand with medium plasticity clays, which are generally not susceptible to liquefaction. We performed a liquefaction analysis to assess the potential for seismically induced liquefaction settlement.

To assess the potential for liquefaction of subsurface soils at the site, we used the simplified liquefaction analysis procedure recommended by NCEER (Youd and Idriss, 1997, 2001). For estimating the resulting ground settlements, we used the method proposed by Tokimatsu and Seed (1987). Both these methods utilize the standard penetration test (SPT) blow count data to characterize the liquefaction resistance of sandy soils to evaluate the triggering of liquefaction and estimate the amount of volumetric compaction or settlement during an earthquake. For analysis purposes, we conservatively utilized a design groundwater table of 30 feet below ground surface. We utilized an earthquake magnitude of 7.6 and a design level peak ground acceleration (PGA) of 0.800 associated with the Maximum Considered Earthquake (MCE_r) in accordance with the 2013 California Building Code.

Based on our analyses, the potential for liquefaction to occur under current and assumed high groundwater conditions in medium dense to very dense layers of coarse-grained soils is negligible.

4.3 FOUNDATIONS

4.3.1 General

Based on our analysis, the structural loads for the proposed Storage Tank may be supported on conventional shallow foundations underlain by engineered fill provided that the Storage pad preparation recommendations included in this report are implemented. Recommendations for shallow foundations are presented in the following sections. Also, refer to the American Water Works Associate (AWWA) Standard for Welded Carbon Steel Tanks for Water Storage (AWWA, 2011), section 12.6 through 12.8 for additional tank, specific requirements for foundation design. The recommendations are based on the design of the tank using a Type-1 foundation consists of tanks supported on ringwall footings. See section 12.6.1 of the AWWA Manual for Type-1 foundations.

4.3.2 Allowable Bearing Capacity

Spread and continuous foundations underlain by a minimum of 3 feet of engineered fill may be designed for an allowable bearing pressure of 3,000 psf. All footings should have a minimum width of 2½ feet and be established at a depth of at least 2½ feet below the lowest adjacent grade or finished slab grade, whichever is deeper. Note that at a depth of 2½ feet, the allowable bearing capacity can be increased to 3,500 psf if the footing width is increased to 3½ feet. If the depth of the footing is increased to 4 feet and the footing width is increased to 3½ feet, the allowable bearing capacity can be increased to 4,000 psf. In addition to the depth of the depth of the footing, per the AWWA Standard, the top of the foundation needs to be a minimum of 6-inches above the finished grade, unless otherwise specified.

The footing dimensions and reinforcement should be designed by the structural engineer. Footings should be deepened as recommended in Section 4.3.4 to avoid surcharging existing buried utilities and/or walls. The engineered fill should be prepared as recommended in Section 4.4.

The allowable bearing pressure provided above is a net value; therefore, the weight of the foundation (which extends below grade) may be neglected when computing dead loads. The allowable bearing pressure applies to dead plus live loads. This value may be increased by one-third for short-term loading due to wind or seismic forces.

4.3.3 Estimated Settlements

The total and differential settlement of the proposed structures supported on conventional shallow spread or continuous foundations are anticipated to be less than 1 inch and ½ inch, respectively. Note that this settlement is in addition to an estimated seismic induced settlement of less than ½ inch. We anticipate that the total static plus seismic induced settlements discussed herein are within tolerable settlement criteria for the proposed tank pad supported on shallow spread foundations.

Per the seismic refraction survey, the higher velocity layer (V3, 7,338 fps) was located at depths along the survey from approximately 20 to 37 feet bgs within the boundary of the proposed tank. Proposed cuts range from 10 to 25 feet which will result in the proposed tank to bear on two different layer types. See Figure 4 Cross-Section A-A'. To reduce the risk of differential settlement, the proposed tank will need to be supported on at least 3 feet of uniform material. Refer to section 4.4, Earthwork, for more details.

4.3.4 Lateral Resistance

Lateral load resistance may be derived from passive resistance along the vertical sides of the footings, friction acting at the base of the footing, or a combination of the two. An allowable passive resistance of 250 psf per foot of depth may be used for design. Allowable passive resistance values should not exceed 2,500 psf. An allowable coefficient of friction of 0.35 between the base of the footings and the engineered fill soils can be used for sliding resistance using the dead load normal stresses. Friction and passive resistance may be combined without reduction. We recommend that the first foot of soil cover be neglected in the passive resistance calculations if the ground surface is not protected from erosion or disturbance by a slab, pavement or in a similar manner.

4.3.5 Foundations Adjacent to Buried Utilities

To avoid surcharging existing utilities and walls below grade, foundations should be deepened below a 1:1 (H:V) plane projected from the bottom of the utility or wall. Alternatively, the utilities or wall could be evaluated for potential surcharge pressures due to the foundation loads.

4.4 EARTHWORK

4.4.1 Site Preparation

Prior to general site grading, existing vegetation, organic topsoil, debris, and oversized materials (greater than 3 inches in maximum dimension) should be stripped and disposed of outside the construction limits. We estimate the depth of stripping to be approximately 3 to 4 inches over most portions of the site. Deeper stripping or grubbing may be required where higher concentrations of vegetation are encountered during site grading. The stripping work should include the removal of existing fill embankments, undocumented fill, and topsoil that, in the judgment of the geotechnical engineer, is compressible or contains significant voids.

Boulders within the upper colluviual/alluvial soils should be removed and resultant voids backfilled with engineered fill. The stripping operation must expose a firm, non-yielding subgrade that is free of large voids. Stripped topsoil (less any debris) and/or boulders may be stockpiled and reused for landscaping purposes; however, this material should be evaluated for suitability if it is desired to use this material for engineered fill below structures.

All debris, including any produced by demolition operations, (wood, steel, piping, plastics, etc.), should be separated and disposed off-site. A diligent search should be conducted during grading operations in an effort to uncover any underground structures, irrigation, or utility lines which should be removed within the property line prior to site development. Existing utility pipelines which extend beyond the property line and are to be abandoned in place should be plugged with cement grout to prevent migration of soil and/or water. The grading contractor should anticipate the complete removal and abandonment of any utilities and other underground structures prior to site development.

4.4.2 Overexcavation

Recommendations for overexcavation of the proposed water tank foundations and pavement areas are presented below. All site preparation and earthwork operations should be performed in accordance with applicable codes, safety regulations and other local, state or federal specifications. All references to maximum unit weights are established in accordance with the latest version of ASTM Standard Test Method D1557.

In order to provide a uniform blanket of engineered fill below the tank foundations and to reduce the potential for differential settlements, we recommend that the site soils be overexcavated and replaced as engineered fill to a depth of 2 feet below the proposed pad elevation and at least 3 feet below the bottom of footings, whichever is greater. All overexcavations should extend horizontally beyond the edges of all foundation elements a minimum of 5 feet, or equal to the depth of fill beneath foundations, whichever is greater. Existing undocumented artificial fill soils are not considered suitable for support of the foundations and should be overexcavated, processed, and replaced as engineered fill.

After overexcavating as recommended, and prior to placing fill, the area should be proofrolled and evaluated by the geotechnical engineer of record for suitability to support the proposed pavements and additional fill.

4.4.3 Scarification and Compaction

Following site stripping and any required grubbing and/or overexcavation, we recommend all areas to receive engineered fill be scarified to a minimum depth of 8 inches, uniformly moisture-conditioned and compacted to at least 90 percent of the maximum dry density obtained using ASTM (American Society for Testing and Materials) Test Method D 1557. The moisture content of fine grained soils (which are expected to be the primary soil type encountered during site grading) should be within 1 to 5 percent above optimum moisture at the time of compaction and the moisture content of granular soils (sands, silty sands and gravels) should be within 2 percent of the optimum moisture content at the time of compaction.

Grading operations during the wet season or in areas where the soils are saturated may require significant provisions for drying of soils prior to compaction. If the project necessitates fill placement and compaction in wet conditions, we can provide alternatives for drying the soil. Conversely, additional moisture may be required during the dry months. A sufficient water source should be available to provide adequate water during compaction. During dry months, moisture conditioning of the subgrade soils may be required if left exposed for greater than a few days.

4.4.4 Rippability

Rippability is the ease in which soil or rock can be mechanically excavated. Based on the results of the seismic refraction survey, there are three distinct layers at the proposed tank location (See Figure 4, Cross-Section A-A'). The first layer ranges in thickness from approximately 8 to 15 feet thick and with an average velocity of 1,482 fps. The second layer ranges in thickness from approximately 12 to 29 feet with an average velocity of 2,815 fps. The third and deepest layer has an average velocity of 7,338 fps. The depth of the third layer ranges from approximately 20 to 37 feet bgs. The Caltrans Rippability Chart, presented in the table below, is based on published Caltrans studies (Stephens, 1978).

Table 3

Standard Caltrans Rippability Chart

Velocity (ft/s)	Rippability
<3,500	Easily Ripped
3,500 – 5,000	Moderately difficult
5,000 – 6,600	Difficult Ripping / Light Blasting
>6,600	Blasting Required

The proposed tank location is located on an alluvial fan deposit underlain by shallow bedrock. The alluvial soils are anticipated to consist of sands, gravels, cobbles and clays. The bedrock consists of tonalite intrusive rock, which is locally characterized by resistant core stones in a weathered bedrock matrix.

The grading of the tank pad could encounter core stones and/or fresh, less weathered bedrock, which could impact excavation, site grading methods, and cost of construction. Depending on final site configuration, pad elevation, and tank distance from the adjacent hillside there is a moderate potential for rock fall hazard.

4.4.5 Engineered Fill

We anticipate that most of the on-site soils may be reusable as engineered fill once any debris and oversized materials greater than 3 inches in diameter have been removed, and after any vegetation and organic debris is cleared and disposed offsite. Fill should be placed in lifts no greater than 8 inches thick, loose measurement, and should be compacted to at least 90 percent of the maximum dry density. The moisture content of fine grained soils (which are expected to be the primary soil type encountered during site grading) should be within 1 to 5 percent above optimum moisture at the time of compaction and the moisture content of granular soils (sands, silty sands and gravels) should be within 2 percent of the optimum moisture content at the time of compaction. Engineered fill placed beneath the proposed water tank should be compacted to at least 95 percent of maximum dry density obtained by the ASTM D1557 method of compaction.

4.4.6 Import Soils

We recommend that import materials be granular in nature and have an expansion index of less than 20 and be uniformly graded with no more than 30 percent of the particles passing the No. 200 sieve and no particles greater than 3 inches in maximum dimension. Other import soils may be acceptable, but should be evaluated on a case by case basis by the geotechnical engineer of record. Kleinfelder should evaluate all proposed import materials for suitability as engineered fill prior to their transportation to the site. The earthwork operations should be observed and tested by a representative of Kleinfelder.

4.4.7 Excavations

All excavations must comply with applicable local, state, and federal safety regulations including the current OSHA Excavation and Trench Safety Standards. Construction site safety generally is the sole responsibility of the Contractor, who shall also be solely responsible for the means, methods, and sequencing of construction operations. We are providing the information below solely as a service to our client. Under no circumstances should the information provided be interpreted to mean that Kleinfelder is assuming responsibility for construction site safety or the Contractor's activities; such responsibility is not being implied and should not be inferred.

Temporary cut slopes up to 15 feet high may be sloped back at an inclination of no steeper than 1.5:1 (horizontal to vertical) in the existing site soils. Minor sloughing and/or raveling of sandy slopes should be anticipated as they dry out. If signs of slope instability are observed, the inclination recommended above should be decreased until stability of the slope is obtained. In addition, at the first signs of slope instability, Kleinfelder should be contacted. Where space for sloped embankments is not available, shoring will be necessary. All applicable excavation safety requirements and regulations, including OSHA requirements, should be met.

Where sloped excavations are used, the tops of the slopes should be barricaded so that vehicles and storage loads do not encroach the tops of excavated slopes within a distance equal to the depth of the excavation. Greater setback may be necessary when considering heavy vehicles, such as concrete trucks and cranes. Kleinfelder should be advised of such heavy vehicle loadings so that specific setback requirements can be established. If temporary construction slopes are to be maintained during the rainy season, berms are recommended along the tops of the slopes to reduce runoff that may enter the excavation and erode the slope faces.

Temporary, shallow excavations with vertical side slopes less than 4 feet high should generally be stable, although sloughing may be encountered in the granular deposits. Vertical excavations greater than 4 feet high should not be attempted without appropriate shoring to prevent local instability. All trench excavations should be braced and shored in accordance with good construction practice and all applicable safety ordinances and codes. The contractor should be responsible for the structural design and safety of the temporary shoring system, and we recommend that this design be submitted to Kleinfelder for review to check that our recommendations have been incorporated. For planning purposes, the on-site soils may be considered as a Type C soil, as defined using the current OSHA soil classification.

4.4.8 Permanent Slopes

Based on our current understanding of the proposed project, we anticipate the construction of new fill slopes or cut slopes on the order of 15 to 25 feet in height. Permanent slopes, either in cut or fill, should be no steeper than 2:1 H:V. Slopes excavated into native soil or bedrock should be mapped by a qualified engineering geologist during slope grading. Kleinfelder should review the final grading plans to evaluate the proposed slopes. Additional recommendations or analysis may be needed based on the final project design.

4.4.9 Pipe Bedding and Trench Backfill

Pipe bedding and pipe zone material should consist of sand or similar granular material having a minimum sand equivalent value of 19. The sand should be placed in a zone that extends a minimum of 6 inches below and 12 inches above the pipe for the full trench width. The bedding material should be compacted to a minimum of 90 percent of the maximum dry density or to the satisfaction of the geotechnical engineer's representative observing the compaction of the bedding material. Bedding material should consist of sand, gravel, crushed aggregate, or native free-draining granular material with a maximum particle size of ¾ inch. Bedding materials should also conform to the pipe manufacturer's specifications, if available. Trench backfill above bedding and pipe zone materials may consist of approved, on-site or import soils placed in lifts no greater than 8 inches loose thickness and compacted to 90 percent of the maximum dry density based on ASTM Test Method D1557. Jetting of backfill is not recommended. The on-site soils are not suitable for pipe bedding. However, the on-site soils are suitable for backfill of utility trenches from one foot above the top of the pipe to the surface provided the material is free of organic and deleterious substances.

4.4.10 Temporary Shoring

Shoring may be required where soil conditions, space or other restrictions do not allow a sloped excavation. A braced or cantilevered shoring system may be used.

A temporary cantilevered shoring system should be designed to resist an active earth pressure equivalent to a fluid weighing 45 pounds per cubic foot (pcf). Shoring below the groundwater table should be designed to resist an active earth pressure equivalent to a fluid weighing 25 pounds per cubic foot (pcf) and should include water pressure. Braced or restrained excavations above the groundwater table should be designed to resist a uniform horizontal equivalent soil pressure of 65 pounds per cubic foot (pcf). Braced or restrained shoring below the groundwater table should be designed to resist an active earth pressure equivalent to a fluid weighing 35 pounds per cubic foot (pcf) and should include water pressure. The values provided above assume a level ground surface adjacent to the top of the shoring and do not include a factor of safety.

Fifty percent of an aerial surcharge placed adjacent to the shoring may be assumed to act as a uniform horizontal pressure against the shoring. Special cases such as combinations of slopes and shoring or other surcharge loads may require an increase in the design values recommended above. These conditions should be evaluated by the project geotechnical engineer on a case-by-case basis. The above pressures do not include hydrostatic pressures; it is assumed that drainage will be provided. If drainage is not provided, shoring extending below the groundwater level should be evaluated on a case-by-case basis.

Cantilevered shoring must extend to a sufficient depth below the excavation bottom to provide the required lateral resistance. We recommend required embedment depths be determined using methods for evaluating sheet pile walls and based on the principles of force and moment equilibrium. For this method, the allowable passive pressure against shoring, which extends below the level of excavation may be assumed to be equivalent to a fluid weighing 300 pcf.

Additionally, we recommend a factor of safety of at least 1.2 be applied to the calculated embedment depth and that passive pressure be limited to 2,000 psf.

The contractor should be responsible for the structural design and safety of all temporary shoring systems.

4.4.11 Stockpiling Excess Material

All stockpiles of excess soil materials should be kept away from the top of the excavations a minimum distance equal to the depth of the excavation. We recommend that stockpiles be constructed with a slope ratio of at least 2:1 (horizontal to vertical) and compacted to at least 85 percent relative compaction. The height of stockpiles should not exceed 10 feet. Compaction requirements and slope ratios are provided only for temporary stockpiling considerations, such as erosion control and temporary influences on excavations. We have not considered any long-term or structural support usage of stockpiles.

4.5 EXPANSIVE SOILS

Expansive soils are characterized by their ability to undergo significant volume change (shrink or swell) due to variations in moisture content. Changes in soil moisture content can result from rainfall, landscape irrigation, utility leakage, roof drainage, perched groundwater, drought, or other factors, and may cause unacceptable settlement or heave of structures, concrete slabs supported-on-grade, or pavements supported over these materials. Depending on the extent and location below finished subgrade, expansive soils can have a detrimental effect on structures. Three expansion index tests were performed on near surface soil samples to evaluate their susceptibility to expansion in the presence of water. The results of the testing are summarized below in Table 4, Expansion Index Testing.

TABLE 4

EXPANSION INDEX TESTING

Exploration Location	Depth (feet)	Expansion Index	Expansion Potential*
B-1	0 – 5	5	Very Low
TP-1	3 – 5	0	Very Low

*Testing performed in accordance with ASTM D4829, with the corresponding qualitative classification from Table 1 of ASTM D4829.

The above testing results indicate that the soils have a very low expansion potential. The recommendations included herein are based on moderately expansive soils for the subgrade soil conditions. To reduce the potential for the expansive soils to significantly impact the planned structure, we recommend that the following items be incorporated into design and construction in order to reduce the potential for drying and wetting cycles of the subgrade soils.

- The foundations should be embedded a minimum of 2 ½ feet below grade.
- Beneath the tank and around the footings should be underlain by a minimum of 6 inches of aggregate base material.
- We recommend that a continuous foundation system be used around the perimeter of the tank to act as a cut off wall for subsurface moisture and free water and to reduce the potential of drying and wetting cycles of soils below floor slabs.
- The moisture content of the engineered fill at the time of placement should conform to the recommendations presented in this report.
- We recommend that hardscape be constructed adjacent to the proposed tank to divert water away from the foundations.
- Where buried utilities cross under or through perimeter foundations, we recommend that the backfill consist of fine grained soils (clays) or slurry for a distance of 3 feet on either side of the foundation to reduce the potential for seepage through typically more highly permeable bedding and pipe zone materials.

The recommendations above are intended to reduce the potential for drying and wetting cycles of the foundation supporting soils.

Grading activities can sometimes change the character of the near-surface soils below foundations. The expansion potential of the final subgrade soils should be evaluated during grading and the recommendations presented herein should be modified as necessary.

4.6 DRAINAGE AND LANDSCAPING

It is important that positive surface drainage be provided to prevent ponding and/or saturation of the soils in the vicinity of foundations, concrete slabs-on-grade, or pavements. We recommend that the site be graded to carry surface water away from the improvements and that positive measures be implemented to carry away roof runoff. Poor perimeter or surface drainage could allow migration of water beneath the pavement areas, which may result in distress to project improvements. Per the AWWA Standard, it recommends that the foundation be graded to slope uniformly upward to the center of the tank with a minimum slope of 1-inch vertical to 10-feet horizontal, unless otherwise specified. The top of the foundation outside the tank or base plate should be level or sloped to drain away from the tank or base plate.

If planted areas adjacent to structures are desired, we suggest that care be taken not to over irrigate and to maintain a leak-free sprinkler piping system. In addition, it is recommended that planter areas next to structures have a minimum of 5 percent positive fall away from tank perimeters to a distance of at least 5 feet. Landscaping after construction should not promote ponding of water adjacent to structures.

4.7 CORROSIVITY

Kleinfelder has completed laboratory testing to provide data regarding corrosivity of onsite soils. Our scope of services does not include corrosion engineering and, therefore, a detailed analysis of the corrosion test results is not included in this report. A qualified corrosion engineer should be retained to review the test results and design protective systems that may be required. Kleinfelder may be able to provide those services.

Laboratory chloride concentration, sulfate concentration, sulfide concentration, pH, oxidation reduction potential, and electrical resistivity tests were performed for soil samples obtained from the borings. The results of the tests are attached and are summarized in Table 5. If fill materials will be imported to the project site, similar corrosion potential laboratory testing should be completed on the imported material.

Table 5

Chemistry Laboratory Test Results

Boring	Depth, feet	Material	Resistivity, ohm-cm	pH	Oxidation Reduction Potential, mV	Water-Soluble Ion Concentration		
						Chloride (ppm)	Sulfide	Sulfate (ppm)
TP-1	2.0	Silty Sand (SM)	6,448	8.0	-	39	-	59
B-2	0-5	Silty Sand (SM)	401	7.2	-	819	-	111
B-4	0-5	Silty Sand (SM)	1,381	7.7	-	90	-	88

Ferrous metal and concrete elements in contact with soil, whether part of a foundation or part of the supported structure, are subject to degradation due to corrosion or chemical attack. Therefore, buried ferrous metal and concrete elements should be designed to resist corrosion and degradation based on accepted practices.

Based on the "10-point" method developed by the American Water Works Association (AWWA) in standard AWWA C105/A21.5, the soils at the site have a moderately corrosion potential for buried ferrous metal piping, cast iron pipes, or other objects made of these materials. We recommend that a corrosion engineer be consulted to recommend appropriate protective measures.

The degradation of concrete or cement grout can be caused by chemical agents in the soil or groundwater that react with concrete to either dissolve the cement paste or precipitate larger compounds within the concrete, causing cracking and flaking. The concentration of water-soluble sulfates in the soils is a good indicator of the potential for chemical attack of concrete or cement grout. The American Concrete Institute (ACI) in their publication Guide to Durable Concrete (ACI 201.2R-08) provides guidelines for this assessment. The test results indicate that the samples has a slight sulfate concentration 88 to 111 ppm (88 ppm = 0.088%). The results of sulfate tests indicate the potential for deterioration of concrete is mild, no special requirements should be necessary for the concrete mix. We recommend that a corrosion engineer be consulted to recommend appropriate protective measures.

Concrete and the reinforcing steel within it are at risk of corrosion when exposed to water-soluble chloride in the soil or groundwater. Chloride tests indicated that the sample had a measureable concentration. The project structural engineer should review this data to determine if remedial measures are necessary for the concrete reinforcing steel.

Per the AWWA Manual, for Type-1 tanks, an oiled sand cushion should be used under the tank bottom, unless otherwise specified. The resistivity of the sand before adding oil should be greater than 3,000 ohm-cm when saturated with distilled or deionized water. If a cushion of compacted crushed stone, fine gravel or clean sand is used, the chloride content of the under-bottom material should be less than 100 ppm and the sulfate content should be less than 200 ppm.

4.8 PAVEMENT SECTIONS

The recommended pavement structural sections presented below are for flexible (asphaltic concrete) and rigid (Portland cement concrete) and an R-Value of 50 was used for our analysis. The required pavement structural sections will depend on the expected wheel loads, volume of traffic, and subgrade soils. The Traffic Indexes (TI’s) assumed should be reviewed by the project Owner, Architect, and/or Civil Engineer to evaluate their suitability for this project. Changes in the TI's will affect the corresponding pavement section. The pavement subgrade should be prepared just prior to placement of the base course. Positive drainage of the paved areas should be provided since moisture infiltration into the subgrade may decrease the life of pavements. Below are the recommendations:

PRELIMINARY FLEXIBLE ASPHALT CONCRETE PAVEMENT SECTIONS

Assumed Traffic Index (TI)	Asphalt Concrete (inches)	Aggregate Base (inches)
5	3.0	4.5
6	3.5	4.5
7	4.5	4.5

RIGID PCC PAVEMENT OVER AGGREGATE BASE/ENGINEERED FILL

DERIVED FROM NATIVE SOILS

Assumed Traffic Index (TI)	Concrete Thickness; using f'c=3,000 psi (inches)	Concrete Thickness; using f'c=4,000 psi (inches)
5	6.5	6.0
6	7.0	6.5
7	7.5	7.0

*f'c denotes the 28-day compressive strength.

4.8.1 Subgrade Preparation and Engineered Fill

We anticipate the final subgrade soils will consist of a blend of the near surface materials. Since the characteristics of the near-surface soils can change as a result of grading, we recommend that the subgrade soils be retested for pavement support characteristics, to confirm the parameters used in design and allow for a possible reduction in structural section thickness. Pavement sections provided above are contingent on the following recommendations being implemented during construction.

- The pavement sections recommended above should be placed on at least 24 inches of engineered fill compacted to at least 90 percent of maximum dry density. The upper 12 inches of the engineered fill in the pavement area should be compacted to at least 95 percent relative compaction. The overexcavation of the pavement areas should be conducted as recommended in the earthwork section of this referenced report.
- Subgrade soils should be in a stable, non-pumping condition at the time aggregate base materials are placed and compacted.
- Aggregate base materials should be compacted to at least 95 percent relative compaction.
- Adequate drainage (both surface and subsurface) should be provided such that the subgrade soils and aggregate base materials are not allowed to become wet.
- Aggregate base materials should meet current Caltrans specifications for Class 2 aggregate baserock, or crushed miscellaneous base as specified in "Standard Specifications for Public Work Construction" ("Greenbook").

- The asphalt pavement should be placed in accordance with “Green Book” specifications. We recommend that the asphalt pavement be placed in a single layer of ½-inch aggregate mix.
- Based on our analyses and our experience with similar projects, it is our professional opinion that the as-built asphalt pavement sections should have a tolerance of +/- ¼-inch in order to remain valid for satisfying the intent of the recommendations presented herein. Typically, the loose thickness should be ¼ inch per inch greater than the required compacted thickness. In addition to loose measurements prior to compaction, this is typically evaluated by averaging the thickness of several cores in a specific area. Individual measurements (loose thickness or core dimension) should be within at least ¾-inch of the design thickness.
- All concrete curbs separating pavement and landscaped areas should extend into the subgrade and below the bottom of adjacent, aggregate base materials.

Pavement sections provided above are based on the soil conditions encountered during our field investigation, our assumptions regarding final site grades, and R-Value testing results. Since the actual pavement subgrade materials exposed during grading may be significantly different than those tested for this study, we recommend that representative subgrade samples be obtained and additional R-value tests performed during grading. Should the results of these tests indicate a significant difference, the design pavement section(s) provided above may need to be revised.

5 ADDITIONAL SERVICES

5.1 PLANS AND SPECIFICATIONS REVIEW

We recommend that a general review of the project plans and specifications be conducted before they are finalized to verify that our geotechnical recommendations have been properly interpreted and implemented during design. If we are not accorded the privilege of performing this review, we can assume no responsibility for misinterpretation of our recommendations. The review can be completed on a time-and-expense basis in accordance with our current Fee Schedule.

5.2 CONSTRUCTION OBSERVATION AND TESTING

The construction process is an integral design component with respect to the geotechnical aspects of a project. Because geotechnical engineering is an inexact science due to the variability of natural processes and materials, and because we sample only a small portion of the soils affecting the performance of the proposed project, unanticipated or changed conditions can be disclosed during grading. Proper geotechnical observation and testing during construction is imperative to allow the geotechnical engineer the opportunity to verify assumptions made during the design process. Therefore, we recommend that Kleinfelder be retained during the construction of the proposed development to observe compliance with the design concepts and geotechnical recommendations, and to allow design changes in the event that subsurface conditions or methods of construction differ from those assumed while completing this study.

6 LIMITATIONS

This report has been prepared for the exclusive use of Eastern Municipal Water District and its consultants and contractors. The findings, conclusions and recommendations presented in this report were prepared in a manner consistent with the standards of care and skill ordinarily exercised by members of our profession practicing under similar conditions in the geographic vicinity and at the time the services will be performed. No warranty or guarantee, express or implied, is made. We have not reviewed the final grading plans or foundation plans for the project. Our field exploration program for the geotechnical study of this project was based on the approximate tank locations provided to us by Kleinfelder's design group.

The client has the responsibility to see that all parties to the project, including the designer, contractor, subcontractors, etc., are made aware of this report in its entirety. This report contains information that may be useful in the preparation of contract specifications. However, this report is not designed as a specification document and may not contain sufficient information for this use without proper modification.

This report may be used only by the client and only for the purposes stated, within a reasonable time from its issuance, but in no event later than one year from the date of the report. Land use, site conditions (both on site and off site) or other factors may change over time, and additional work may be required with the passage of time. Any party, other than the client who wishes to use this report shall notify Kleinfelder of such intended use. Based on the intended use of this report and the nature of the new project, Kleinfelder may require that additional work be performed and that an updated report be issued. Non-compliance with any of these requirements by the client or anyone else will release Kleinfelder from any liability resulting from the use of this report by any unauthorized party and the client agrees to defend, indemnify, and hold harmless Kleinfelder from any claims or liability associated with such unauthorized use or non-compliance.

The scope of our geotechnical services did not include any environmental site assessment for the presence or absence of hazardous/toxic materials, including methane or other landfill related gases. Kleinfelder will assume no responsibility or liability whatsoever for any claim, damage, or injury which results from pre-existing hazardous materials being encountered or present on the project site, or from the discovery of such hazardous materials.

7 REFERENCES

American Concrete Institute (ACI), 2011. Building Code Requirements for Structural Concrete (ACI 318-11) and Commentary.

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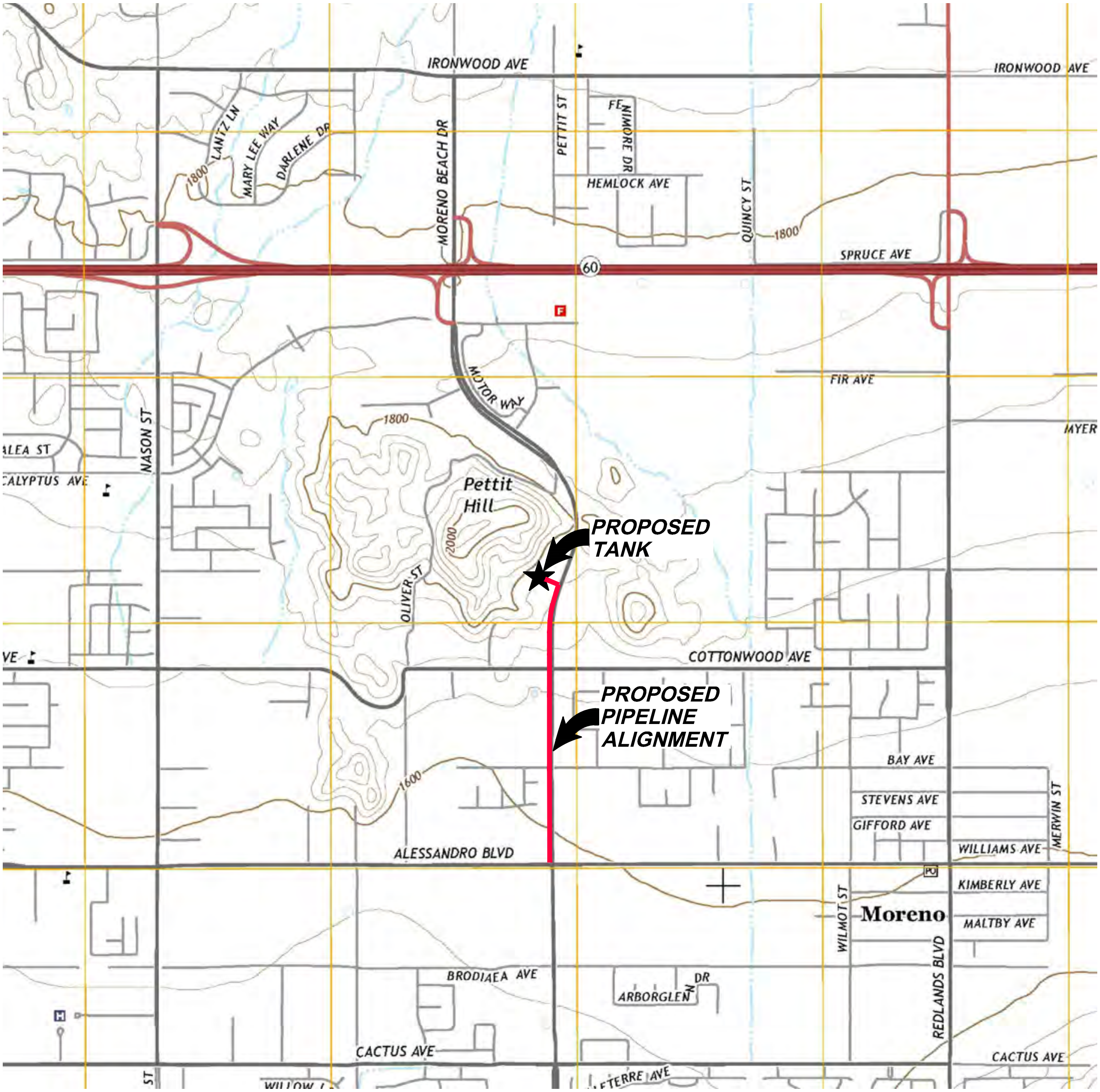
FIGURES



SOURCE: U.S.G.S. 7.5' topographic series, Sunnymead, California quadrangles dated 2015.

N

2,000 1,000 0 2,000

APPROXIMATE SCALE (feet)

PLOTTED: 15 Sep 2016, 6:51pm, DFahrney
CAD FILE: L:\CADD\CADD 2016\20164763\ LAYOUT: 1
Images: CA_Sunnymead_20150310_TM_geo.jpg
ATTACHED IMAGES:
ATTACHED XREFS:
LONG BEACH, CA

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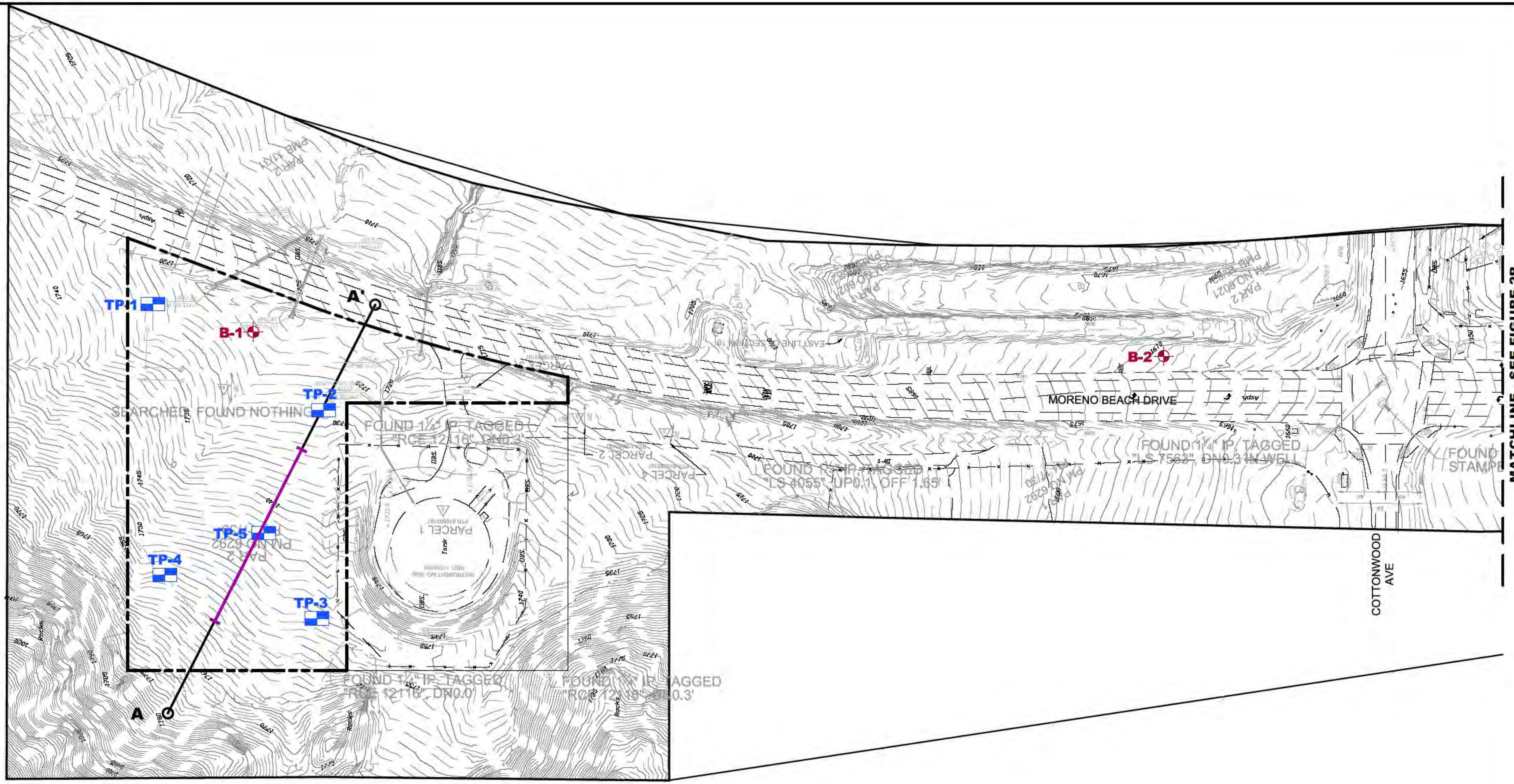
DRAWN BY:	DMF
CHECKED BY:	FJ
FILE NAME: 20164763_F1.dwg	

SITE VICINITY MAP

PROPOSED PETTIT POTABLE WATER STORAGE TANK EXPANSION AND TRANSMISSION PIPELINE
MORENO BEACH DRIVE
MORENO VALLEY, CALIFORNIA

FIGURE 1



100 50 0 100

APPROXIMATE SCALE (feet)

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EXPLANATION

B-5 APPROXIMATE SOIL BORING LOCATION

TP-5 APPROXIMATE TEST PIT LOCATION

APPROXIMATE SEISMIC LINE LOCATION

APPROXIMATE APN PROPERTY BOUNDARY

A A' CROSS-SECTION LOCATION

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EXPLORATION LOCATION MAP

PROPOSED PETTIT POTABLE WATER STORAGE TANK EXPANSION AND TRANSMISSION PIPELINE
MORENO BEACH DRIVE
MORENO VALLEY, CALIFORNIA

FIGURE **2A**

PLOTTED: 19 Sep 2016, 5:42pm, DFahmey

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PLOTTED: 13 Sep 2016, 12:45pm, dfahrney LAYOUT: 2B

ATTACHED IMAGES: Images: AERIAL-EXPLORATION-LOCATIONS.jpg
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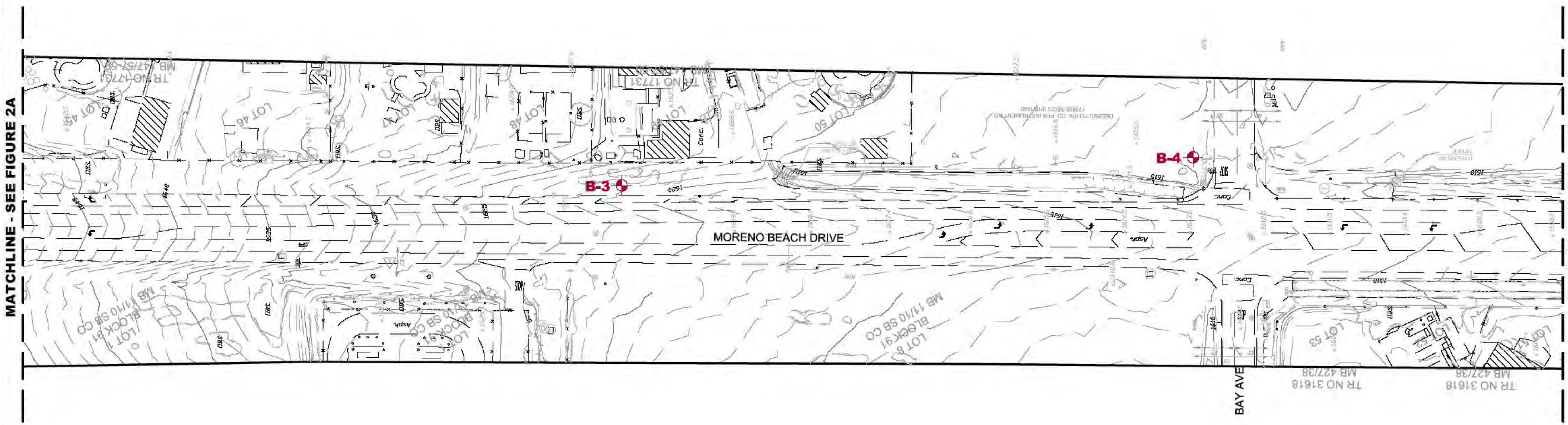
RIVERSIDE, CA CAD FILE: L:\CADD\CADD 2016\20164763\



100 50 0 100
APPROXIMATE SCALE (feet)

EXPLANATION

B-5 APPROXIMATE SOIL BORING LOCATION

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FILE NAME:	20164763_F2.dwg

EXPLORATION LOCATION MAP

PROPOSED PETTIT POTABLE WATER STORAGE
TANK EXPANSION AND TRANSMISSION PIPELINE
MORENO BEACH DRIVE
MORENO VALLEY, CALIFORNIA

FIGURE
2B

PLOTTED: 13 Sep 2016, 12:46pm, dfahrney   LAYOUT: 2C

ATTACHED IMAGES: Images: AERIAL-EXPLORATION-LOCATIONS.jpg
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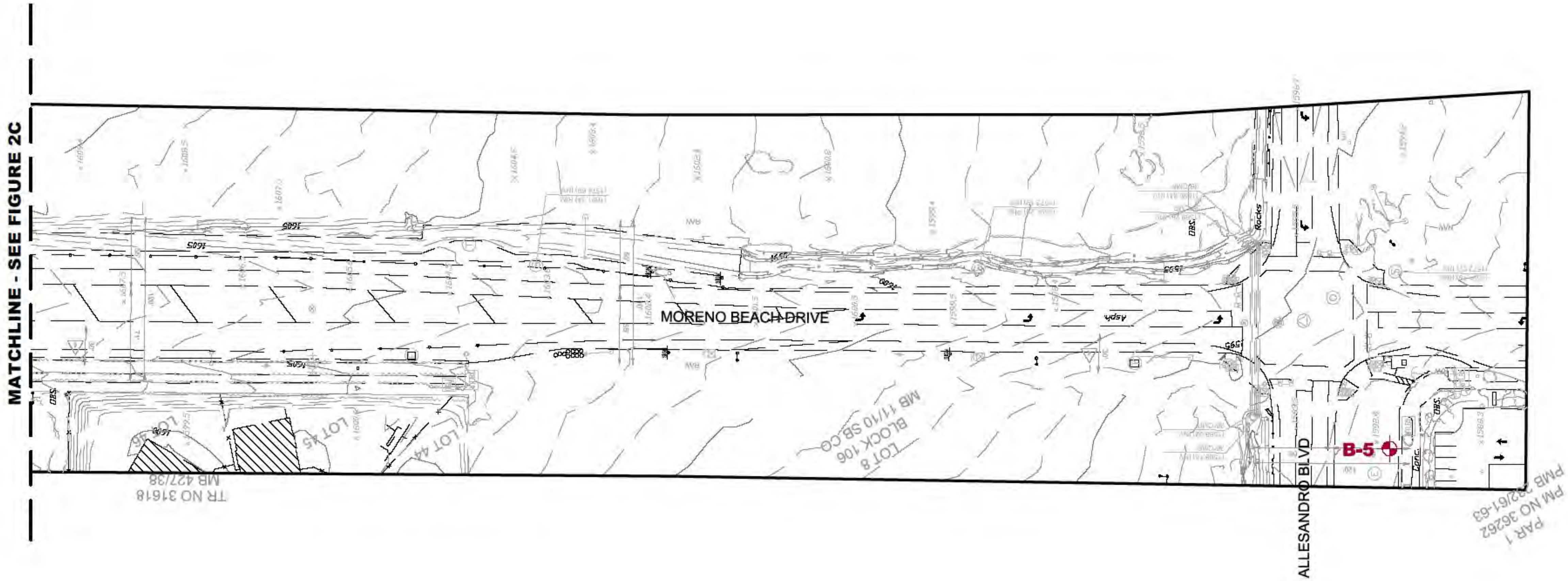

100 50 0 100
APPROXIMATE SCALE (feet)

EXPLANATION

B-5 APPROXIMATE SOIL BORING LOCATION

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CHECKED BY:	FJ
FILE NAME:	20164763_F2.dwg

EXPLORATION LOCATION MAP

PROPOSED PETTIT POTABLE WATER STORAGE
TANK EXPANSION AND TRANSMISSION PIPELINE
MORENO BEACH DRIVE
MORENO VALLEY, CALIFORNIA

FIGURE
2C

PLOTTED: 19 Sep 2016, 8:30am, DFahmey
CAD FILE: L:\CADD\CADD 2016\20164763\ LAYOUT: 3
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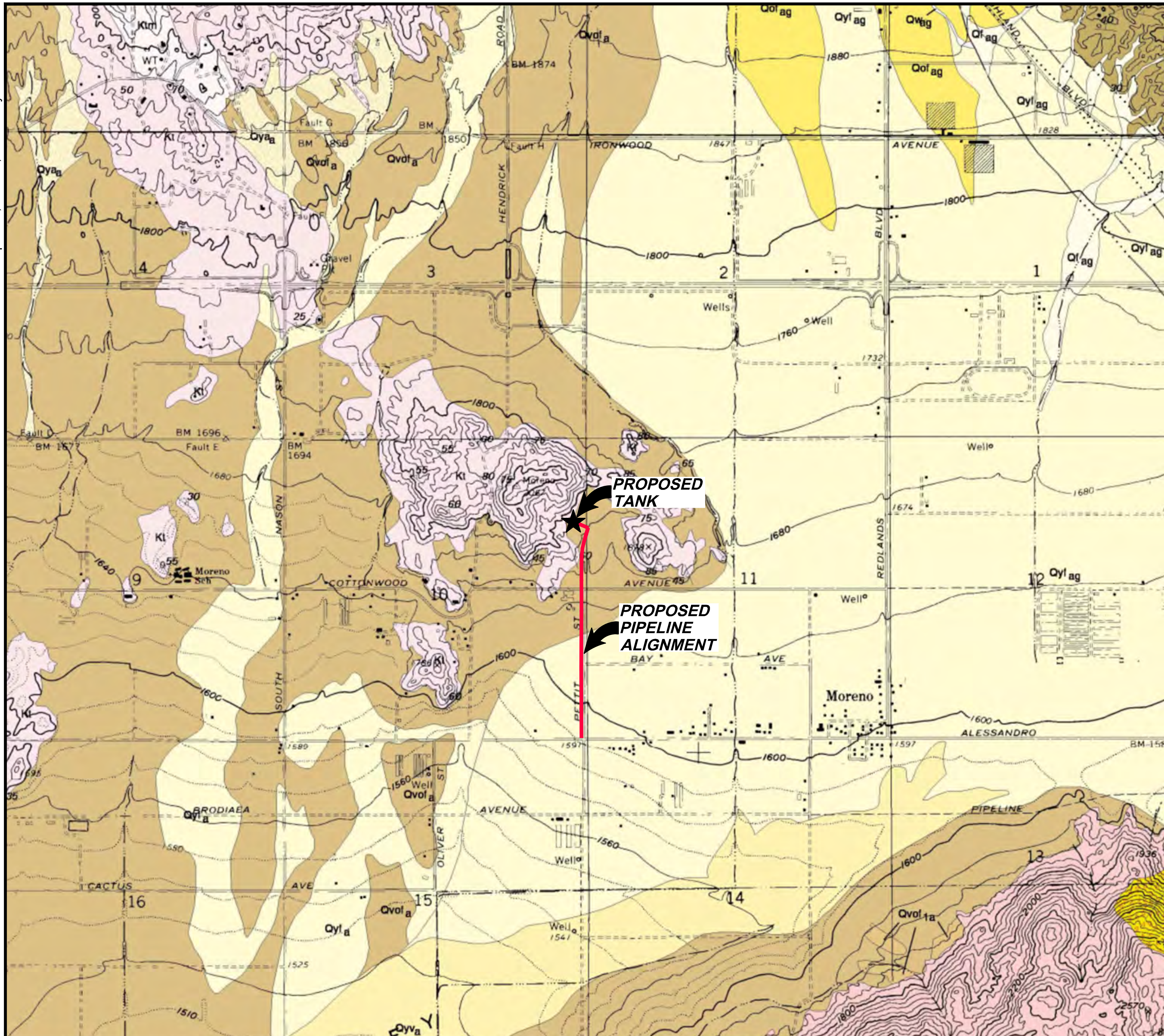
RIVERSIDE, CA



EXPLANATION

Qyf — **Young alluvial fan deposits (Holocene and late Pleistocene)**—Gray-hued sand and cobble- and gravel-sand deposits derived from lithicly diverse sedimentary units. Extensively developed in eastern Moreno Valley and in San Timoteo Canyon and its tributary canyons, where unit is mostly sand and gravel-sand. In most other parts of quadrangle, unit is mainly sand

Qvof — **Very old alluvial fan deposits (early Pleistocene)**—Mostly well-dissected, well-indurated, reddish-brown sand deposits, containing minor gravel. Commonly contains duripans and locally silcretes. Forms widespread deposits north and south of Moreno Valley, flanking bedrock areas. Deposits on older erosion surfaces lack diagnostic features, and may or may not be alluvial fan deposits

Kt — **Tonalite, undifferentiated (Cretaceous)**—Mainly biotite-hornblende tonalite not associated with specific plutons. Underlies large area in central part of quadrangle. Gray, medium-grained, typically foliated. Forms large mass west of Reche Canyon

Contact—Generally located within ±15 meters

Fault—High angle. Strike-slip component on all faults is right-lateral; dip-slip component is unknown, but probably reflects vally-highland relations. Dashed where located within ±30 meters; dotted where concealed; queried where existence questionable. Arrow and number indicate measured dip of fault plane

Kg—Granite Dikes.

Strike and dip of beds

70 **Inclined**

Horizontal

Strike and dip of igneous foliation

70 **Inclined**

Vertical

Strike and dip of igneous joint

70 **Inclined**

Strike and dip of metamorphic foliation

70 **Inclined**

Vertical

Bearing and plunge of linear features

70 **Inclined**

2,000 1,000 0 2,000

APPROXIMATE SCALE (feet)

N

SOURCE: USGS GEOLOGIC MAP OF THE SUNNYMEAD 7.5' QUADRANGLE, RIVERSIDE COUNTY, CALIFORNIA OFR 01-450

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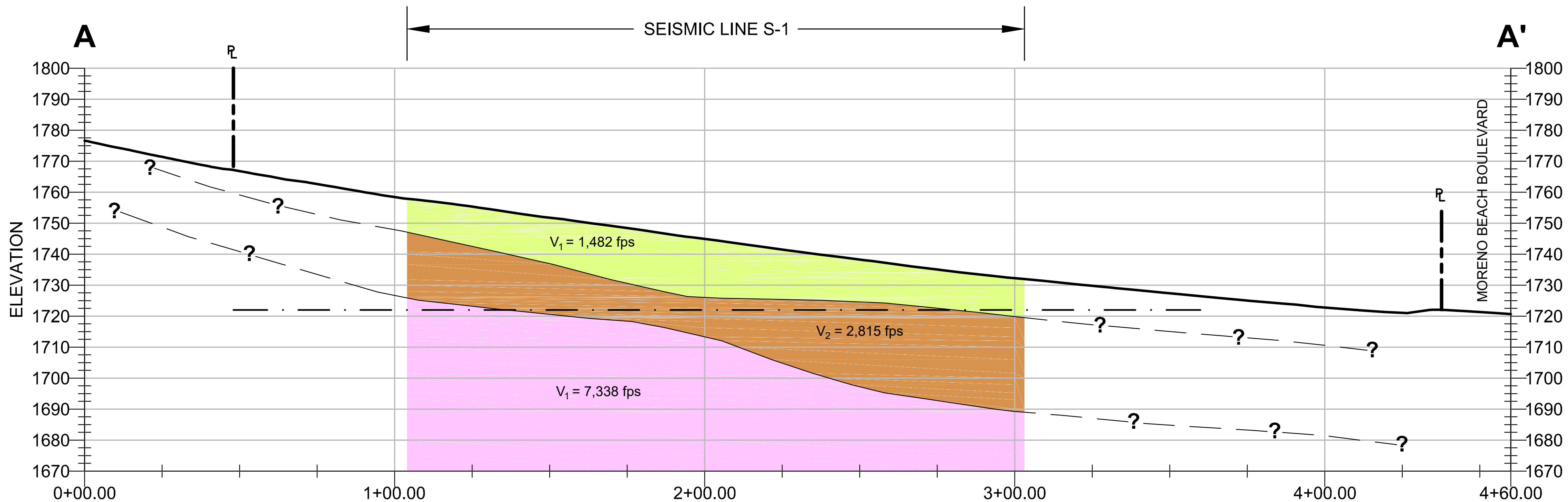
REGIONAL GEOLOGIC MAP

PROPOSED PETTIT POTABLE WATER STORAGE
TANK EXPANSION AND TRANSMISSION PIPELINE
MORENO BEACH DRIVE
MORENO VALLEY, CALIFORNIA

FIGURE

3



EXPLANATION

?—?— — —— APPROXIMATE BOUNDARY P-WAVE VELOCITY (FEET/SECOND) DASHED WHERE APPROXIMATE, QUERIED WHERE UNCERTAIN

PROPOSED TANK PAD ELEVATION (1722')

APPROXIMATE APN PROPERTY BOUNDARY

VELOCITY LAYERS

V_1 = LIKELY TOPSOIL, COLLUVIUM, ALLUVIUM AND OR COMPLETELY WEATHERED BEDROCK

V_2 = OLDER ALLUVIAL SOIL OR HIGHLY WEATHERED GRANITIC BEDROCK

V_3 = GRANITIC BEDROCK, MODERATELY WEATHERED

REFERENCE: APPENDIX C, TERRA GEOSCIENCES, SEISMIC REFRACTION SURVEY, JUNE 20, 2016

40 20 0 40

APPROXIMATE SCALE (feet)

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FILE NAME:	20164763_F2.dwg

CROSS-SECTIION A-A'

PROPOSED PETTIT POTABLE WATER STORAGE TANK EXPANSION AND TRANSMISSION PIPELINE
MORENO BEACH DRIVE
MORENO VALLEY, CALIFORNIA

FIGURE
4

PLOTTED: 19 Sep 2016, 5:31pm, DFahrney

ATTACHED IMAGES: Images: 00000001.jpg Images: AERIAL-EXPLORATION-LOCATIONS.jpg
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RIVERSIDE, CA CAD FILE: L:\CADD\CADD 2016\20164763\ LAYOUT: A-A'

APPENDIX A
FIELD EXPLORATION

APPENDIX A
FIELD EXPLORATION

The subsurface exploration program for the proposed project consisted of the excavation and logging a total of five hollow-stem auger borings and five test pits. The borings were drilled with a Mobile B-61 truck-mounted drill rig equipped with 6.5 inches diameter hollow-stem augers, provided by California Pacific Drilling of Calimesa, California. The test pits were excavated with a backhoe equipped with a 24-inch bucket, provided by Staib Backhoe and Excavation of San Dimas, California. A seismic refraction survey was performed along one approximately 200 foot line located in the general location of the proposed tank. The survey was provided by Terra Geosciences of Loma Linda, California. The locations of the borings, test pits, and seismic refraction survey line are shown on Figure 2, Exploration Location Map. The results of the seismic refraction survey are presented in Appendix C.

The logs of borings and test pits are presented as Figures A-2 through A-11. An explanation to the logs is presented on Figures A-1 and A-2. The Logs of Borings describe the earth materials encountered, samples obtained, and show field and laboratory tests performed. The logs also show the boring number, drilling date, boring elevation and the name of the logger and drilling subcontractor. A Kleinfelder staff engineer logged the borings utilizing the Unified Soil Classification System. The boundaries between soil types shown on the logs are approximate because the transition between different soil layers may be gradual. Bulk and drive samples of representative earth materials were obtained from the borings and pits at maximum intervals of about 5 feet.

A California sampler was used to obtain drive samples of the soil encountered. This sampler consists of a 3 inch O.D., 2.4 inch I.D. split barrel shaft that is driven a total of 12 inches into the soil at the bottom of the boring. The soil was retained in six 1-inch brass rings for laboratory testing. The sampler was driven using a 140-pound hammer falling 30 inches. The total number of hammer blows required driving the sampler the 12 inches is termed the blow count and is recorded on the Logs of Borings. Where the sample was driven less than 12 inches, the number of blows to drive the sample for each 6-inch segment, or portion thereof, is shown on the logs. For example, 50/4" indicates 50 blows to drive the sampler 4 inches to refusal.

Samples were also obtained using a Standard Penetration Sampler (SPT). This sampler consists of a 2-inch O.D., 1.4-inch I.D. split barrel shaft that is advanced into the soils at the bottom of the drill hole a total of 18 inches. The sampler was driven using a 140 pounds hammer falling 30 inches. The total number of hammer blows required to drive the sampler the final 12 inches is termed the blow count (N-value) and is recorded on the Logs of Borings. Where the sample was driven less than 12 inches, the number of blows to drive the sample for each 6-inch segment, or portion thereof, is shown on the logs. The procedures we employed in the field are generally consistent with those described in ASTM Standard Test Method D-1586.

Soil samples obtained by the SPT were stored in plastic bags. Bulk samples of the sub-surface soils were retrieved directly from the soil cuttings and placed in large plastic bags. Bulk samples of the soils were retrieved directly from the auger blades or backhoe bucket.

SAMPLE/SAMPLER TYPE GRAPHICS

- BULK SAMPLE
- CALIFORNIA SAMPLER (3 in. (76.2 mm.) outer diameter)
- GRAB SAMPLE
- STANDARD PENETRATION SPLIT SPOON SAMPLER (2 in. (50.8 mm.) outer diameter and 1-3/8 in. (34.9 mm.) inner diameter)

GROUND WATER GRAPHICS

- WATER LEVEL (level where first observed)
- WATER LEVEL (level after exploration completion)
- WATER LEVEL (additional levels after exploration)
- OBSERVED SEEPAGE

NOTES

- The report and graphics key are an integral part of these logs. All data and interpretations in this log are subject to the explanations and limitations stated in the report.
- Lines separating strata on the logs represent approximate boundaries only. Actual transitions may be gradual or differ from those shown.
- No warranty is provided as to the continuity of soil or rock conditions between individual sample locations.
- Logs represent general soil or rock conditions observed at the point of exploration on the date indicated.
- In general, Unified Soil Classification System designations presented on the logs were based on visual classification in the field and were modified where appropriate based on gradation and index property testing.
- Fine grained soils that plot within the hatched area on the Plasticity Chart, and coarse grained soils with between 5% and 12% passing the No. 200 sieve require dual USCS symbols, ie., GW-GM, GP-GM, GW-GC, GP-GC, GC-GM, SW-SM, SP-SM, SW-SC, SP-SC, SC-SM.
- If sampler is not able to be driven at least 6 inches then 50/X indicates number of blows required to drive the identified sampler X inches with a 140 pound hammer falling 30 inches.

UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2487)

COARSE GRAINED SOILS (More than half of material is larger than the #200 sieve)	GRAVELS (More than half of coarse fraction is larger than the #4 sieve)	CLEAN GRAVEL WITH <5% FINES	Cu ≥4 and 1≤ Cc≤3	GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES
			Cu <4 and/ or 1>Cc >3	GP	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES
		GRAVELS WITH 5% TO 12% FINES	Cu ≥4 and 1≤ Cc≤3	GW-GM	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE FINES
				GW-GC	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE CLAY FINES
			Cu <4 and/ or 1>Cc >3	GP-GM	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE FINES
				GP-GC	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE CLAY FINES
		GRAVELS WITH > 12% FINES		GM	SILTY GRAVELS, GRAVEL-SILT-SAND MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
				GC-GM	CLAYEY GRAVELS, GRAVEL-SAND-CLAY-SILT MIXTURES
	SANDS (More than half of coarse fraction is smaller than the #4 sieve)	CLEAN SANDS WITH <5% FINES	Cu ≥6 and 1≤ Cc≤3	SW	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE OR NO FINES
			Cu <6 and/ or 1>Cc >3	SP	POORLY GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE OR NO FINES
		SANDS WITH 5% TO 12% FINES	Cu ≥6 and 1≤ Cc≤3	SW-SM	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE FINES
				SW-SC	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE CLAY FINES
			Cu <6 and/ or 1>Cc >3	SP-SM	POORLY GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE FINES
				SP-SC	POORLY GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE CLAY FINES
		SANDS WITH > 12% FINES		SM	SILTY SANDS, SAND-GRAVEL-SILT MIXTURES
				SC	CLAYEY SANDS, SAND-GRAVEL-CLAY MIXTURES
				SC-SM	CLAYEY SANDS, SAND-SILT-CLAY MIXTURES

FINE GRAINED SOILS (More than half of material is smaller than the #200 sieve)	SILTS AND CLAYS (Liquid Limit less than 50)	ML	INORGANIC SILTS AND VERY FINE SANDS, SILTY OR CLAYEY FINE SANDS, SILTS WITH SLIGHT PLASTICITY
		CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
		CL-ML	INORGANIC CLAYS-SILTS OF LOW PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
		OL	ORGANIC SILTS & ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS (Liquid Limit greater than 50)	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILT
		CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
		OH	ORGANIC CLAYS & ORGANIC SILTS OF MEDIUM-TO-HIGH PLASTICITY

KLEINFELDER Bright People. Right Solutions.	PROJECT NO.: 20164763 DRAWN BY: CHECKED BY: DATE: REVISED: -	GRAPHICS KEY Proposed Pettit Potable Water Storage Tank Expansion and Transmission Pipeline Moreno Beach Drive City of Moreno Valley, California	FIGURE A-1

Date Begin - End:	7/13/2016	**Drilling Company:**	Cal Pac Drilling		**BORING LOG B-1**
Logged By:	Z. Jarecki	**Drill Crew:**	Travis, Randy		
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	B61 Mobile	**Hammer Type - Drop:**	140 lb. Auto - 30 in.
Plunge:	-90 degrees	**Drilling Method:**	Hollow Stem Auger		
Weather:	Sunny, warm	**Bore Diameter:**	6.5 in. O.D.		

Approximate Ground Surface Elevation (ft.): 1,723.00
Surface Condition: Loose Soil (Tilled)

Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in.	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
			FIELD EXPLORATION						LABORATORY RESULTS						
			Older Alluvium: **Silty SAND (SM)**: olive to pale olive, dry, loose, fine to medium grained sand, disturbed/tilled in the upper 24 inches	1					5.9						**Expansion Index=** 5 Hand auger to 2 feet bgs. **ASTM D1557 Method B=** Max. Dry Unit Wt.: 134.1 pcf Opt. Water Content: 7.3%
			Clayey SAND (SC): medium plasticity, dark reddish brown, moist, fine to coarse grained sand												
1720															
	5		medium dense, weakly cemented	2		BC=11 14 16			6.8	124.0					**Consolidation Test**
1715															
	10		dense	3		BC=9 17 22									
1710															
			Silty SAND (SM): pale olive to olive, moist, very dense, fine to coarse grained sand												
	15			4		BC=42 42 44			4.2	118.0					
1705															

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PROJECT NO.:	20164763
DRAWN BY:	ZJ
CHECKED BY:	FJ
DATE:	7/13/2016
REVISED:	-

BORING LOG B-1

Proposed Pettit Potable Water Storage Tank
Expansion and Transmission Pipeline
Moreno Beach Drive
City of Moreno Valley, California

FIGURE
A-1

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Date Begin - End:	7/13/2016	**Drilling Company:**	Cal Pac Drilling		**BORING LOG B-1**
Logged By:	Z. Jarecki	**Drill Crew:**	Travis, Randy		
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	B61 Mobile	**Hammer Type - Drop:**	140 lb. Auto - 30 in.
Plunge:	-90 degrees	**Drilling Method:**	Hollow Stem Auger		
Weather:	Sunny, warm	**Bore Diameter:**	6.5 in. O.D.		

Approximate Ground Surface Elevation (ft.): 1,723.00
Surface Condition: Loose Soil (Tilled)

Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in.	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
			Silty SAND (SM): pale olive to olive, moist, very dense, fine to coarse grained sand olive brown, dense, increase in fines content	5		BC=11 22 27									
1700															
	25		very dense, weakly cemented, white carbonate veins	6		BC=27 27 39			7.9	124.0					
1695															
	30		olive, fine to medium grained sand, trace coarse grained sand	7		BC=13 27 33									
1690															
	35														
1685															

The boring was terminated at approximately 31.5 ft. below ground surface. The boring was backfilled with auger cuttings on July 13, 2016.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not encountered during drilling or after completion.

GENERAL NOTES:
The exploration location and elevation are approximate and were estimated by Kleinfelder.

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PROJECT NO.: 20164763	BORING LOG B-1	FIGURE
DRAWN BY: ZJ		A-2
CHECKED BY: FJ	Proposed Pettit Potable Water Storage Tank Expansion and Transmission Pipeline	
DATE: 7/13/2016	Moreno Beach Drive	
REVISED: -	City of Moreno Valley, California	PAGE: 2 of 2

Date Begin - End:	7/13/2016	**Drilling Company:**	Cal Pac Drilling
Logged By:	Z. Jarecki	**Drill Crew:**	Travis, Randy
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	B61 Mobile
Plunge:	-90 degrees	**Drilling Method:**	Hollow Stem Auger
Weather:	Sunny, warm	**Bore Diameter:**	6.5 in. O.D.

BORING LOG B-2

Hammer Type - Drop: 140 lb. Auto - 30 in.

Approximate Ground Surface Elevation (ft.): 1,669.00
Surface Condition: Bare Earth

Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description (FIELD EXPLORATION)	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in.	Recovery (NR=No Recovery)	USCS Symbol (LABORATORY RESULTS)	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
			Older Alluvium: **Silty SAND (SM)**: low plasticity, pale olive, dry, fine to coarse grained sand, trace fine gravel, trace rootlets in the upper 18 inches	1											Hand auger to 5 feet bgs. **Sand Equivalent=** 19
									2.0		91	27			**Corrosion Testing:** Resistivity= 401 ohm-cm Chloride= 819 ppm Sulfate= 111 ppm pH= 7.2
1665															
	5		olive brown, moist, medium dense	2		BC=7 5 6			5.6						
1660															
	10		dense, fine to coarse grained sand, increase in sand content	3		BC=14 22 24			6.2	130.0					
1655															
	15			4		BC=8 14 14									
1650															

The boring was terminated at approximately 16.5 ft. below ground surface. The boring was backfilled with auger cuttings on July 13, 2016.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not encountered during drilling or after completion.
GENERAL NOTES:
The exploration location and elevation are approximate and were estimated by Kleinfelder.

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PROJECT NO.:	20164763	BORING LOG B-2	FIGURE
DRAWN BY:	ZJ		A-3
CHECKED BY:	FJ	Proposed Pettit Potable Water Storage Tank Expansion and Transmission Pipeline Moreno Beach Drive City of Moreno Valley, California	
DATE:	7/13/2016		
REVISED:	-		PAGE: 1 of 1

Date Begin - End:	7/13/2016	**Drilling Company:**	Cal Pac Drilling		**BORING LOG B-3**
Logged By:	Z. Jarecki	**Drill Crew:**	Travis, Randy		
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	B61 Mobile	**Hammer Type - Drop:**	140 lb. Auto - 30 in.
Plunge:	-90 degrees	**Drilling Method:**	Hollow Stem Auger		
Weather:	Sunny, warm	**Bore Diameter:**	6.5 in. O.D.		

FIELD EXPLORATION | LABORATORY RESULTS

Approximate Ground Surface Elevation (ft.): 1,622.00
Surface Condition: Bare Earth

Approximate Elevation (feet)	Depth (feet)	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in.	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
	0	**Fill:** **Silty SAND (SM)**: olive brown, moist, fine to medium grained sand, trace coarse grained sand, trace rootlets in the upper 18 inches	1					7.5						Hand auger to 5 feet bgs.
1620														
	5	low plasticity, loose, debris present	2		BC=3 4 5			5.8	105.0			23	3	
1615														
		Older Alluvium: **Clayey SAND (SC)**: medium plasticity, olive brown, moist, medium dense, fine to medium grained sand, trace coarse grained sand												
	10		3		BC=5 9 10									
1610														
		Silty SAND (SM): olive, moist, medium dense, fine to medium grained sand, trace coarse grained sand												
	15		4		BC=10 15 14			4.4	119.0					
1605														

The boring was terminated at approximately 16.5 ft. below ground surface. The boring was backfilled with auger cuttings on July 13, 2016.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not encountered during drilling or after completion.

GENERAL NOTES:
The exploration location and elevation are approximate and were estimated by Kleinfelder.

KLEINFELDER Bright People. Right Solutions.	PROJECT NO.: 20164763	BORING LOG B-3	FIGURE
	DRAWN BY: ZJ		A-4
	CHECKED BY: FJ	Proposed Pettit Potable Water Storage Tank Expansion and Transmission Pipeline	
	DATE: 7/13/2016	Moreno Beach Drive	
	REVISED: -	City of Moreno Valley, California	PAGE: 1 of 1

Date Begin - End:	7/13/2016	Drilling Company:	Cal Pac Drilling	**BORING LOG B-4**
Logged By:	Z. Jarecki	**Drill Crew:**	Travis, Randy	
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	B61 Mobile	**Hammer Type - Drop:** 140 lb. Auto - 30 in.
Plunge:	-90 degrees	**Drilling Method:**	Hollow Stem Auger	
Weather:	Sunny, warm	**Bore Diameter:**	6.5 in. O.D.	

Approximate Ground Surface Elevation (ft.): 1,613.00
Surface Condition: Bare Earth

Approximate Elevation (feet)	Depth (feet)	Lithologic Description	Sample Number	Blow Counts(BC)= Uncorr. Blows/6 in.	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
	0	**Older Alluvium:** **Silty SAND (SM)**: low plasticity, pale olive, dry, fine grained to medium grained sand, trace rootlets in the upper 24 inches	1				3.0		97	45			Hand auger to 5 feet bgs. **Corrosion Testing:** Resistivity= 1,381 ohm-cm Chloride= 90 ppm Sulfate= 88 ppm pH= 7.7
1610													
	5	loose, increase in sand content, fine to medium grained sand, trace coarse grained sand	2	BC=3 4 4			3.2		99	42			
1605		dry to moist, loose, fine grained sand, trace medium grained sand											
	10		3	BC=3 4 5			3.8	104.0					
1600		**SILT with Sand (ML)**: low plasticity, olive gray to olive brown, moist, soft, fine grained sand, interbedded clay bed											
	15		4	BC=2 3 3									
1595													

The boring was terminated at approximately 16.5 ft. below ground surface. The boring was backfilled with auger cuttings on July 13, 2016.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not encountered during drilling or after completion.
GENERAL NOTES:
The exploration location and elevation are approximate and were estimated by Kleinfelder.

KLEINFELDER Bright People. Right Solutions.	PROJECT NO.: 20164763	BORING LOG B-4	FIGURE
	DRAWN BY: ZJ		
	CHECKED BY: FJ	Proposed Pettit Potable Water Storage Tank Expansion and Transmission Pipeline Moreno Beach Drive City of Moreno Valley, California	A-5
	DATE: 7/13/2016		
	REVISED: -		PAGE: 1 of 1

Date Begin - End:	7/13/2016	**Drilling Company:**	Cal Pac Drilling		**BORING LOG B-5**
Logged By:	Z. Jarecki	**Drill Crew:**	Travis, Randy		
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	B61 Mobile	**Hammer Type - Drop:**	140 lb. Auto - 30 in.
Plunge:	-90 degrees	**Drilling Method:**	Hollow Stem Auger		
Weather:	Sunny, warm	**Bore Diameter:**	6.5 in. O.D.		

Approximate Elevation (feet)	Depth (feet)	Graphical Log	FIELD EXPLORATION: Approximate Ground Surface Elevation (ft.): 1,593.00 Surface Condition: Bare Earth — Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in.	Recovery (NR=No Recovery)	LABORATORY RESULTS: USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
			asphalt approximately 8 inches over 9 inches of base								90	40			Hand auger to 5 feet bgs.
			Fill: **Silty SAND (SM)**: low plasticity, olive brown, dry, fine to medium grained sand, trace rootlets	1					5.3						**ASTM D1557 Method B=** Max. Dry Unit Wt.: 127.2 pcf Opt. Water Content: 9.0%
1590															
	5		olive, medium dense	2		BC=5 6 9			3.6	103.0					**Direct Shear Test:** Peak Cohesion= 156 psf Peak Friction Angle= 23° Ultimate Cohesion= 102 psf Ultimate Friction Angle= 24°
1585			**Older Alluvium:** **SILT with Sand (ML)**: low plasticity, pale olive, dry, stiff, fine grained sand												
	10			3		BC=4 4 4									
1580															
	15		olive brown, moist, stiff to very stiff, increase in sand content, clay seam with white carbonate veins	4		BC=7 11 14			5.9	108.0					
1575															

The boring was terminated at approximately 16.5 ft. below ground surface. The boring was backfilled with slurry and patched at the surface with cold patch asphalt on July 13, 2016.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not encountered during drilling or after completion.
GENERAL NOTES:
The exploration location and elevation are approximate and were estimated by Kleinfelder.

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PROJECT NO.: 20164763	BORING LOG B-5	FIGURE
DRAWN BY: ZJ		A-6
CHECKED BY: FJ	Proposed Pettit Potable Water Storage Tank Expansion and Transmission Pipeline Moreno Beach Drive City of Moreno Valley, California	
DATE: 7/13/2016		
REVISED: -		PAGE: 1 of 1

Date Begin - End:	6/20/2016	**Excavation Company:**	Staib Backhoe & Excavation
Logged By:	Z. Jarecki	**Excavation Crew:**	Carl
Hor.-Vert. Datum:	Not Available	**Excavation Equip.:**	Case 580 Super L
Plunge:	N/A	**Excav. Dimensions:**	2X14 ft
Weather:	Sunny, hot		

TEST PIT LOG TP-1

FIELD EXPLORATION / LABORATORY RESULTS

Approximate Ground Surface Elevation (ft.): 1,730.00
Surface Condition: Loose Soil (Tilled)

Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
			Older Alluvium: **Silty SAND (SM)**: pale olive to olive brown, dry, fine to coarse grained sand, very loose in the upper 6-8 inches, increase moisture content with depth, trace fine gravel	1									**Sand Equivalent=**34
			dark reddish brown, moist, weakly cemented, strong reaction with HCL along carbonate veins	2			5.6		91	22			At 3 feet bgs, harder excavating **Expansion Index=** 0 **Corrosion Testing:** Resistivity= 6,448 ohm-cm Chloride= 39 ppm Sulfate= 59 ppm pH= 8.0
1725	5												
			olive brown										
				3									
1720	10												
1715	15												

The test pit was terminated because of backhoe refusal (↑) at approximately 9 ft. below ground surface. The test pit was backfilled with excavated material on June 20, 2016.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not encountered during excavation or after completion.

GENERAL NOTES:
The exploration location and elevation are approximate and were estimated by Kleinfelder.

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PROJECT NO.: 20164763	TEST PIT LOG TP-1		FIGURE
DRAWN BY: ZJ			
CHECKED BY: FJ	Proposed Pettit Potable Water Storage Tank Expansion and Transmission Pipeline Moreno Beach Drive City of Moreno Valley, California		A-7
DATE: 6/20/2016			
REVISED: -			PAGE: 1 of 1

Date Begin - End:	6/20/2016	**Excavation Company:**	Staib Backhoe & Excavation
Logged By:	Z. Jarecki	**Excavation Crew:**	Carl
Hor.-Vert. Datum:	Not Available	**Excavation Equip.:**	Case 580 Super L
Plunge:	N/A	**Excav. Dimensions:**	2X12 ft
Weather:	Sunny, hot		

TEST PIT LOG TP-2

FIELD EXPLORATION / LABORATORY RESULTS

Approximate Ground Surface Elevation (ft.): 1,725.00
Surface Condition: Loose Soil (Tilled)

Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
			Older Alluvium: **Silty SAND (SM)**: pale olive to light brownish gray, dry, fine to coarse grained sand, trace fine gravel, very loose in the upper 6-8 inches										
			moist										
				1	X		5.3						
1720	5												
													At 6 feet bgs, harder excavating
			low plasticity, olive brown, weakly cemented, trace fine gravel, trace clay	2	X								
1715	10												
			Clayey SAND (SC): medium plasticity, dark reddish brown, moist, fine to coarse grained sand, weakly cemented, cemented granules, strong reaction with HCL along carbonate veins	3	X								
1710	15												

The test pit was terminated at approximately 14 ft. below ground surface. The test pit was backfilled with excavated material on June 20, 2016.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not encountered during excavation or after completion.

GENERAL NOTES:
The exploration location and elevation are approximate and were estimated by Kleinfelder.

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PROJECT NO.:	20164763	TEST PIT LOG TP-2	FIGURE
DRAWN BY:	ZJ		A-8
CHECKED BY:	FJ	Proposed Pettit Potable Water Storage Tank Expansion and Transmission Pipeline Moreno Beach Drive City of Moreno Valley, California	
DATE:	6/20/2016		
REVISED:	-		PAGE: 1 of 1

Date Begin - End:	6/20/2016	Excavation Company:	Staib Backhoe & Excavation	TEST PIT LOG TP-3
Logged By:	Z. Jarecki	Excavation Crew:	Carl	
Hor.-Vert. Datum:	Not Available	Excavation Equip.:	Case 580 Super L	
Plunge:	N/A	Excav. Dimensions:	2X14 ft	
Weather:	Sunny, hot			

FIELD EXPLORATION / LABORATORY RESULTS

Approximate Ground Surface Elevation (ft.): 1,748.00
Surface Condition: Loose Soil (Tilled)

Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
			Older Alluvium: **Silty SAND (SM)**: pale olive to light brownish gray, dry, fine to coarse grained sand, trace fine gravel, micaceous, very loose in the upper 6-8 inches										
			olive brown, moist	1			4.3						**R-Value=** 78
1745													
	5												
			increase in moisture content with depth										
1740			increase in sand content										
	10			2									
			few to little subangular fine to coarse gravel, weakly cemented, some cemented granules										
1735													
	15												
				3									
1730													

The test pit was terminated at approximately 17.5 ft. below ground surface. The test pit was backfilled with excavated material on June 20, 2016.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not encountered during excavation or after completion.
GENERAL NOTES:
The exploration location and elevation are approximate and were estimated by Kleinfelder.

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PROJECT NO.: 20164763	TEST PIT LOG TP-3	FIGURE
DRAWN BY: ZJ		
CHECKED BY: FJ	Proposed Pettit Potable Water Storage Tank Expansion and Transmission Pipeline Moreno Beach Drive City of Moreno Valley, California	A-9
DATE: 6/20/2016		
REVISED: -		PAGE: 1 of 1

Date Begin - End:	6/20/2016	**Excavation Company:**	Staib Backhoe & Excavation
Logged By:	Z. Jarecki	**Excavation Crew:**	Carl
Hor.-Vert. Datum:	Not Available	**Excavation Equip.:**	Case 580 Super L
Plunge:	N/A	**Excav. Dimensions:**	2X13 ft
Weather:	Sunny, hot		

TEST PIT LOG TP-4

FIELD EXPLORATION / LABORATORY RESULTS

Approximate Ground Surface Elevation (ft.): 1,753.00
Surface Condition: Loose Soil (Tilled)

Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
			Older Alluvium: **Silty SAND (SM)**: pale olive to light brownish gray, dry, fine to coarse grained sand, trace fine gravel, micaceous, very loose in the upper 6-8 inches,	1									
			olive brown, moist, increase in sand content										
1750			weakly cemented										At 3 feet bgs, difficult excavating
	5												
			Clayey SAND (SC): medium plasticity, reddish brown, moist, fine to coarse grained sand, trace fine gravel, moderately cemented, strong reaction with HCL along carbonate veins	2			5.2				25	8	
				3									
1745													
	10												
1740													
	15												
1735													

The test pit was terminated because of backhoe refusal (↑) at approximately 9.5 ft. below ground surface. The test pit was backfilled with excavated material on June 20, 2016.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not encountered during excavation or after completion.

GENERAL NOTES:
The exploration location and elevation are approximate and were estimated by Kleinfelder.

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PROJECT NO.:	20164763
DRAWN BY:	ZJ
CHECKED BY:	FJ
DATE:	6/20/2016
REVISED:	-

TEST PIT LOG TP-4

Proposed Pettit Potable Water Storage Tank Expansion and Transmission Pipeline
Moreno Beach Drive
City of Moreno Valley, California

FIGURE
A-10

PAGE: 1 of 1

Date Begin - End:	6/20/2016	**Excavation Company:**	Staib Backhoe & Excavation
Logged By:	Z. Jarecki	**Excavation Crew:**	Carl
Hor.-Vert. Datum:	Not Available	**Excavation Equip.:**	Case 580 Super L
Plunge:	N/A	**Excav. Dimensions:**	2X13 ft
Weather:	Sunny, hot		

TEST PIT LOG TP-5

FIELD EXPLORATION / LABORATORY RESULTS

Approximate Ground Surface Elevation (ft.): 1,742.00
Surface Condition: Loose Soil (Tilled)

Approximate Elevation (feet)	Depth (feet)	Graphical Log	Lithologic Description	Sample Number	Sample Type	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
			Older Alluvium: **Silty SAND (SM)**: pale olive to light brownish gray, dry, fine to coarse grained sand, trace fine gravel, very loose in the upper 6-8 inches	1			2.3		97	25			**ASTM D1557 Method B=** Max. Dry Unit Wt.: 134.1 pcf Opt. Water Content: 6.6% **Sand Equivalent=** 30
1740			olive brown, moist										**Direct Shear Test:** Peak Cohesion= 316 psf Peak Friction Angle= 28° Ultimate Cohesion= 116 psf Ultimate Friction Angle= 26°
	5												
			increase in moisture content with depth										
1735													
	10												
1730			dark olive brown to dark reddish brown, weakly to moderately cemented, some intact nodules/granules, strong reaction with HCL along carbonate veins	2									At 12 feet bgs, harder excavating
	15												
1725													

The test pit was terminated at approximately 14.5 ft. below ground surface. The test pit was backfilled with excavated material on June 20, 2016.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not encountered during excavation or after completion.
GENERAL NOTES:
The exploration location and elevation are approximate and were estimated by Kleinfelder.

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PROJECT NO.: 20164763	TEST PIT LOG TP-5	FIGURE
DRAWN BY: ZJ		A-11
CHECKED BY: FJ	Proposed Pettit Potable Water Storage Tank Expansion and Transmission Pipeline Moreno Beach Drive City of Moreno Valley, California	
DATE: 6/20/2016		
REVISED: -		PAGE: 1 of 1

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APPENDIX B
LABORATORY TESTING

APPENDIX B
LABORATORY TESTING

Laboratory tests were performed on representative intact and bulk soil samples to estimate engineering characteristics of the various earth materials encountered. Laboratory testing was performed by both Kleinfelder and AP Engineering and Testing Inc. of Pomona, California. Testing was performed in accordance with one of the following references:

1. Lambe, T. William, Soil Testing for Engineers, Wiley, New York, 1951.
2. Laboratory Soils Testing, U.S. Army, Office of the Chief of Engineers, Engineering Manual No. 1110-2-1906, November 30, 1970.
3. ASTM Standards for Soil Testing, latest revisions.
4. State of California Department of Transportation, Standard Test Methods, latest revisions.

LABORATORY MOISTURE DETERMINATIONS AND UNIT WEIGHTS

Natural moisture content and unit weight tests were performed on selected samples. The moisture content and unit weight tests were performed in general accordance with ASTM Test Method D2216 and ASTM Test Method D7263 respectively. The results are presented on the Logs of Borings and Test Pits and in Table 1 below.

SIEVE ANALYSIS

Sieve analyses were performed on selected samples of the on-site soils to determine the grain size distribution characteristics and classification. The tests were performed in general accordance with ASTM Test Method D422. The test results are presented on Figures B-1 and B-2.

PLASTICITY INDEX

Plasticity index testing was performed on selected samples of the on-site soils to determine plasticity characteristics and to aid in the classification of the soil. The testing was performed in accordance with ASTM Standard Test Method D4318. The test results are presented on the Logs of Borings and on Figures B-3 and B-4.

EXPANSION INDEX

Samples of the near-surface soils were subjected to an evaluation of the expansion index in accordance with ASTM Test Method D4829. The below table presents the qualitative classification of potential expansion based on the measured expansion index value. The results of these tests are presented in Table 2 below.

R-VALUE TEST

Resistance value (R-value) testing was performed on a select bulk soil sample to evaluate pavement support characteristics of the near-surface onsite soils. R-value testing was performed in accordance with Caltrans Standard Test Method 301. The test result is presented in Table 3 below.

CORROSION TESTS

A series of chemical tests were performed on select near-surface soil samples to evaluate pH, resistivity, sulfate and chloride contents. The results of these tests are presented in Table 4 below.

CONSOLIDATION TESTS

Consolidation testing was performed on a relatively undisturbed sample in accordance with ASTM Standard Test Method D2435. The test result is presented on Figure B-5.

DIRECT SHEAR

Selected samples of a relatively undisturbed soil were subjected to direct shear testing for shear strength and cohesion values of the in situ soils in accordance with ASTM Standard Test Method D3080. The results are presented on Figures B-6 and B-7.

MAXIMUM DENSITY

A Maximum density tests were performed on a select bulk samples of the on-site soils to determine compaction characteristics. The testing was performed in accordance with ASTM Standard Test Method D1557. The test results are presented in Table 5 below.

SAND EQUIVALENT

Sand equivalent testing was performed on samples of the near-surface soils to evaluate their relative proportions of clay-like or plastic fines and dust in granular soils that pass the 4.75-mm (No. 4) sieve. The test was performed in accordance with ASTM Standard Test Method D 2419. The test result is presented in Table 6 below.

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Table 1

Moisture Content and Dry Densities

Exploration Location	Depth (feet)	Moisture Content (%)	Dry Density (pcf)
B-1	0 - 5	5.9	-
B-1	5	6.8	124
B-1	15	4.2	118
B-1	25	7.9	124
B-2	0 - 5	2	-
B-2	5	5.6	-
B-2	10	6.2	130
B-3	0 - 5	7.5	-
B-3	5	5.8	105
B-3	15	4.4	119
B-4	0 - 5	3	-
B-4	5	3.2	-
B-4	10	3.8	104
B-5	2 - 5	5.3	-
B-5	15	5.9	108
B-5	5	3.6	103
TP-1	3 - 5	5.6	-
TP-2	4 – 6	5.3	-
TP-3	2 – 4	4.3	-
TP-4	6 – 8	5.2	-
TP-5	0 - 2	2.3	-

Table 2

Expansion Index Test Results

Exploration Location	Depth (feet)	Expansion Index	Expansion Potential
B-1	0 – 5	5	Very Low
TP-1	3 – 5	0	Very Low

Table 3

R-Value Test Results

Exploration Location	Depth (feet)	R-Value	Design R-Value
TP-3	2 – 4	78	50

Table 4

Corrosion Test Results

Exploration Location	Depth (feet)	pH	Sulfate (ppm)	Chloride (ppm)	Resistivity (ohm-cm)
TP-1	2.0	8.0	59	39	6,448
B-2	0-5	7.2	111	819	401
B-4	0-5	7.7	88	90	1,381

Table 5

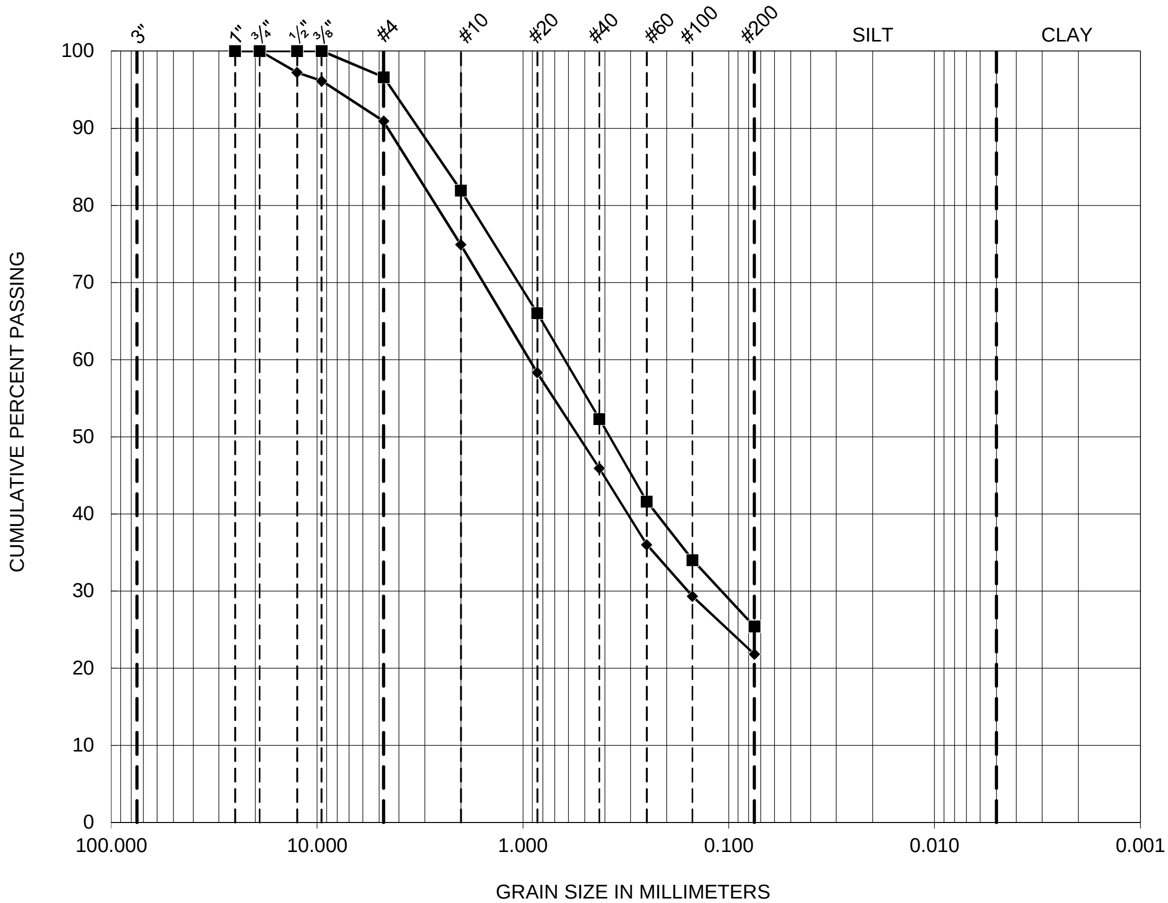
Maximum Dry Density and Optimum Moisture

Exploration Location	Depth (feet)	Maximum Density (pcf)	Optimum Moisture (%)
TP-5	0-2	134.1	6.6
B-1	0-5	134.1	7.3
B-5	2-5	127.2	9.0

Table 6

Sand Equivalent Test Results

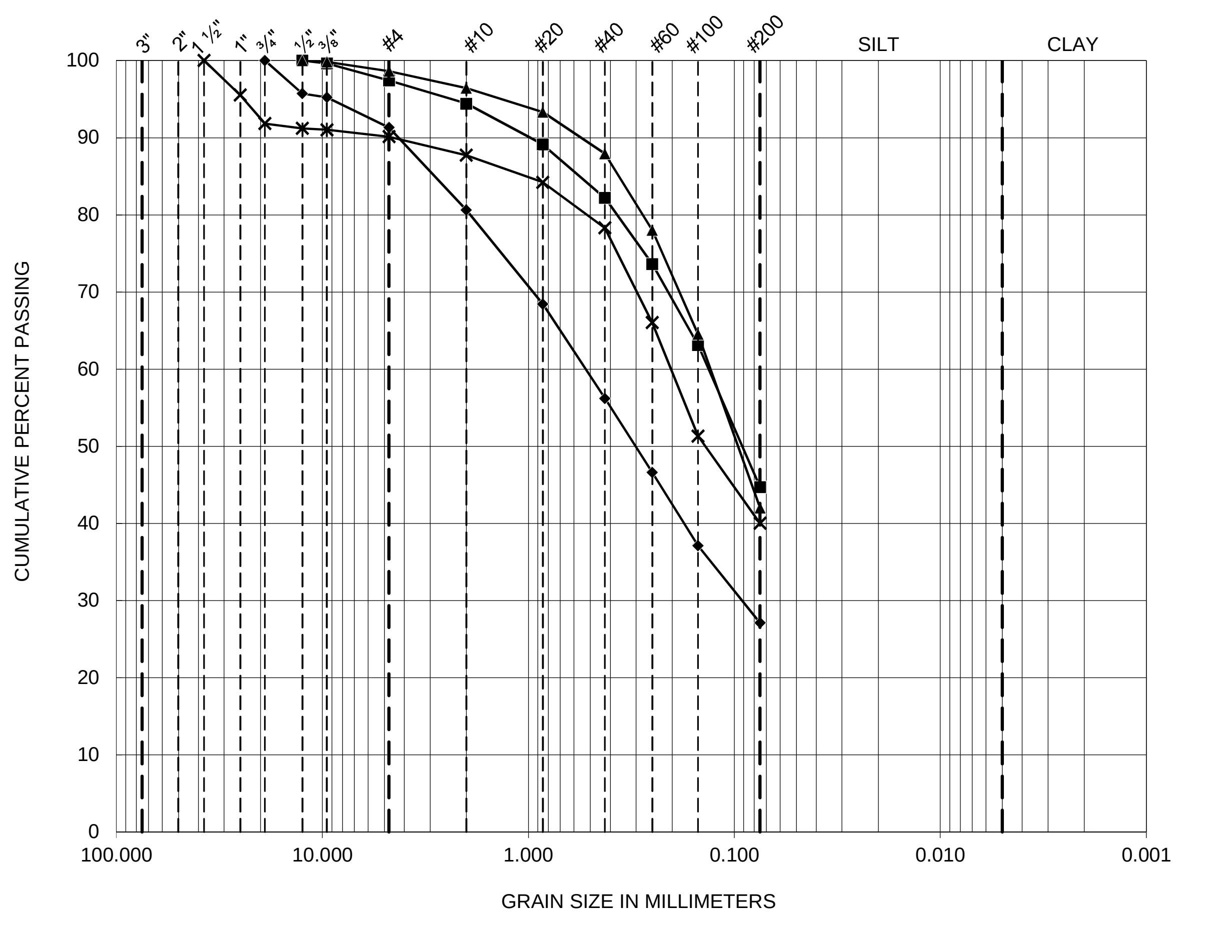
Exploration Location	Depth (feet)	Sand Equivalent Result
B-2	0-5	19
TP-1	0-2	33
TP-5	0-2	30



COBBLE	GRAVEL	SAND	SILT	CLAY

SYMBOL	SAMPLE IDENTIFICATION			PERCENTAGES			ATTERBERG LIMITS			SOIL CLASSIFICATION
	BORING NO.	SAMPLE NO.	DEPTH (ft.)	GRAVEL	SAND	FINES	LL	PL	PI	
◆	TP-1	2	3-5'	9.1	69.1	21.8	N/A	N/A	N/A	Silty Sand (SM)
■	TP-5	1	0-2'	3.4	71.2	25.4	N/A	N/A	N/A	Silty Sand (SM)
▲							N/A	N/A	N/A	
×							N/A	N/A	N/A	
●							N/A	N/A	N/A	

KLEINFELDER Bright People. Right Solutions.	PROJECT NO.: 20164763 TESTED BY: C. Massa DATE: 6/24/2016 CHECKED BY: J. Diaz DATE: 7/1/2016	GRAIN SIZE DISTRIBUTION Proposed Pettit Potable Water Storage Tank Expansion and Transmission Pipeline Moreno Beach Drive City of Moreno Valley, California	FIGURE B-1



COBBLE	GRAVEL	SAND	SILT	CLAY

SYMBOL	SAMPLE IDENTIFICATION			PERCENTAGES			ATTERBERG LIMITS			SOIL CLASSIFICATION
	BORING NO.	SAMPLE NO.	DEPTH (ft.)	GRAVEL	SAND	FINES	LL	PL	PI	
◆	B-2	1	0-5	8.7	64.2	27.1	N/A	N/A	N/A	Silty Sand (SM)
■	B-4	1	0-5	2.6	52.7	44.7	N/A	N/A	N/A	Silty Sand (SM)
▲	B-4	2	5	1.4	56.6	42.0	N/A	N/A	N/A	Silty Sand (SM)
×	B-5	1	2-5	9.9	50.1	40.0	N/A	N/A	N/A	Silty Sand (SM)
●							N/A	N/A	N/A	

KLEINFELDER
Bright People. Right Solutions.

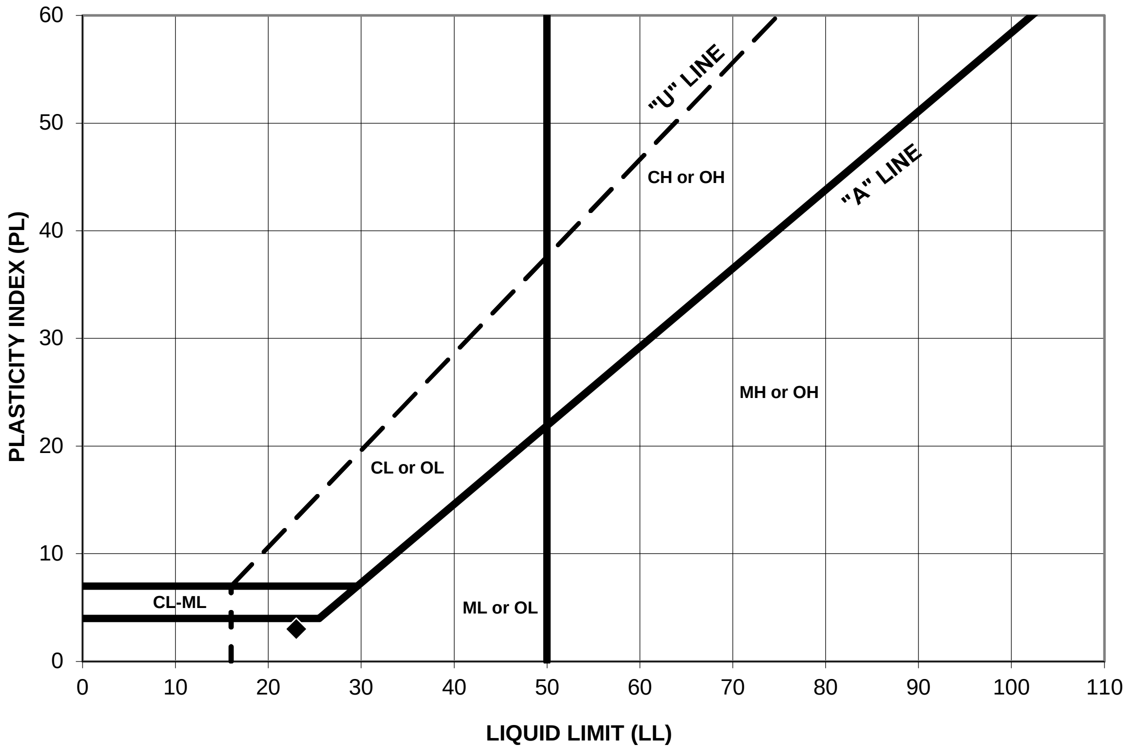
PROJECT NO.: 20164763	
TESTED BY:	CM
DATE:	7/18/2016
CHECKED BY:	JD
DATE:	07/20/2016

GRAIN SIZE DISTRIBUTION

Proposed Pettit Potable Water Storage Tank
Expansion and Transmission Pipeline
Moreno Beach Drive
City of Moreno Valley, California

FIGURE

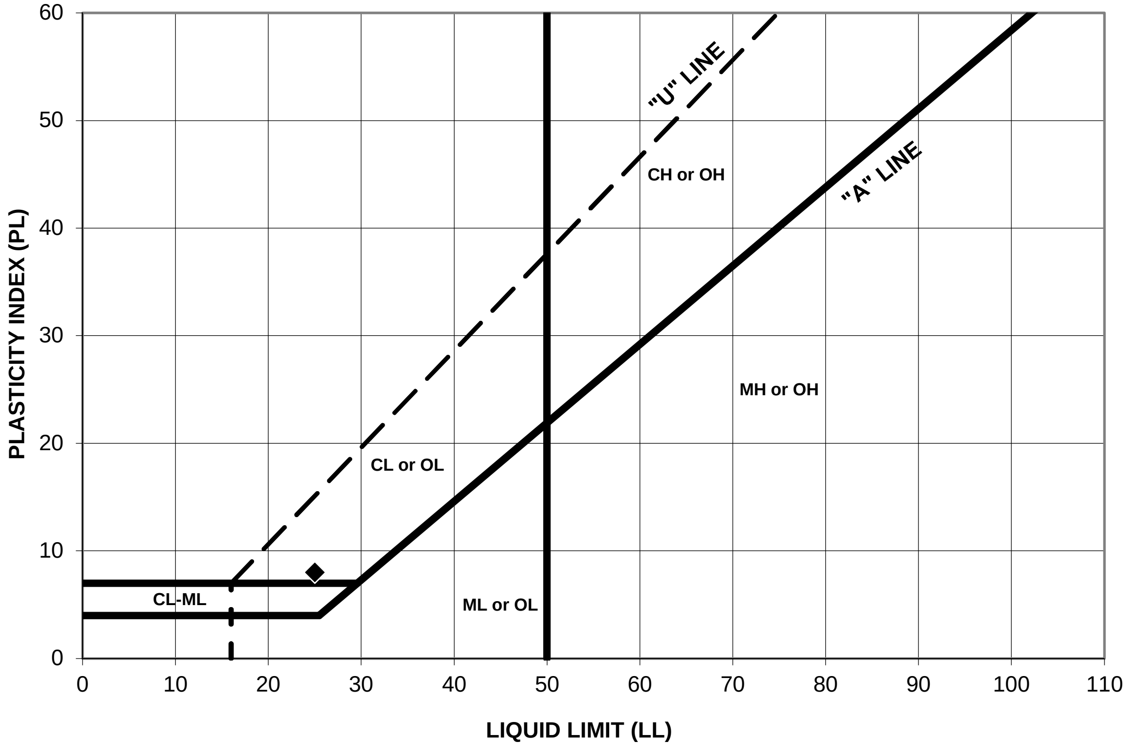
B-2



SYMBOL	SAMPLE IDENTIFICATION			ATTERBERG LIMITS			SOIL CLASSIFICATION
	BORING NO.	SAMPLE NO.	DEPTH (ft)	LL	PL	PI	
◆	B-3	2	5'	23	20	3	Silty Sand (SM)

Testing performed in general accordance with ASTM D4318

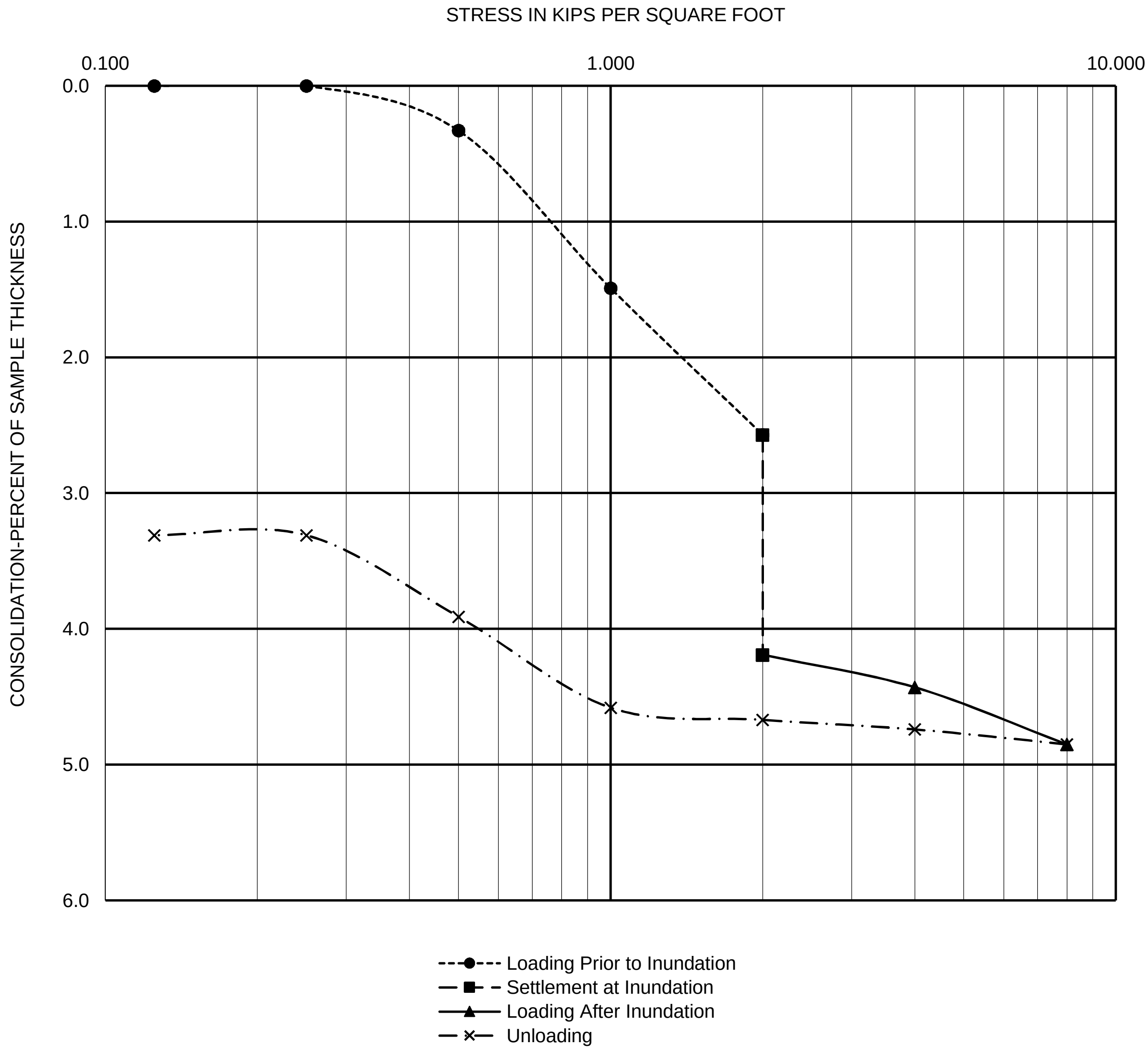
KLEINFELDER Bright People. Right Solutions.	PROJECT NO.: 20164763.001A	PLASTICITY TESTING	FIGURE
	TESTED BY: J. Diaz		
	DATE: 7/20/2016	Proposed Pettit Potable Water Storage Tank Expansion and Transmission Pipeline Moreno Beach Drive City of Moreno Valley, California	B-3
	CHECKED BY: Z. Jarecki		
	DATE: 7/25/2016		



SYMBOL	SAMPLE IDENTIFICATION			ATTERBERG LIMITS			SOIL CLASSIFICATION
	BORING NO.	SAMPLE NO.	DEPTH (ft)	LL	PL	PI	
◆	TP-4	2	6-8'	25	17	8	Silty Sand (SM)

Testing performed in general accordance with ASTM D4318

KLEINFELDER Bright People. Right Solutions.	PROJECT NO.: 20164763.001A TESTED BY: C. Massa DATE: 6/28/2016 CHECKED BY: J. Diaz DATE: 7/1/2016	PLASTICITY TESTING Proposed Pettit Potable Water Storage Tank Expansion and Transmission Pipeline Moreno Beach Drive City of Moreno Valley, California	FIGURE B-4



SAMPLE IDENTIFICATION			SOIL CLASSIFICATION
BORING NO.	SAMPLE NO.	DEPTH (ft.)	
B-1	2	5'	Clayey Sand (SC)

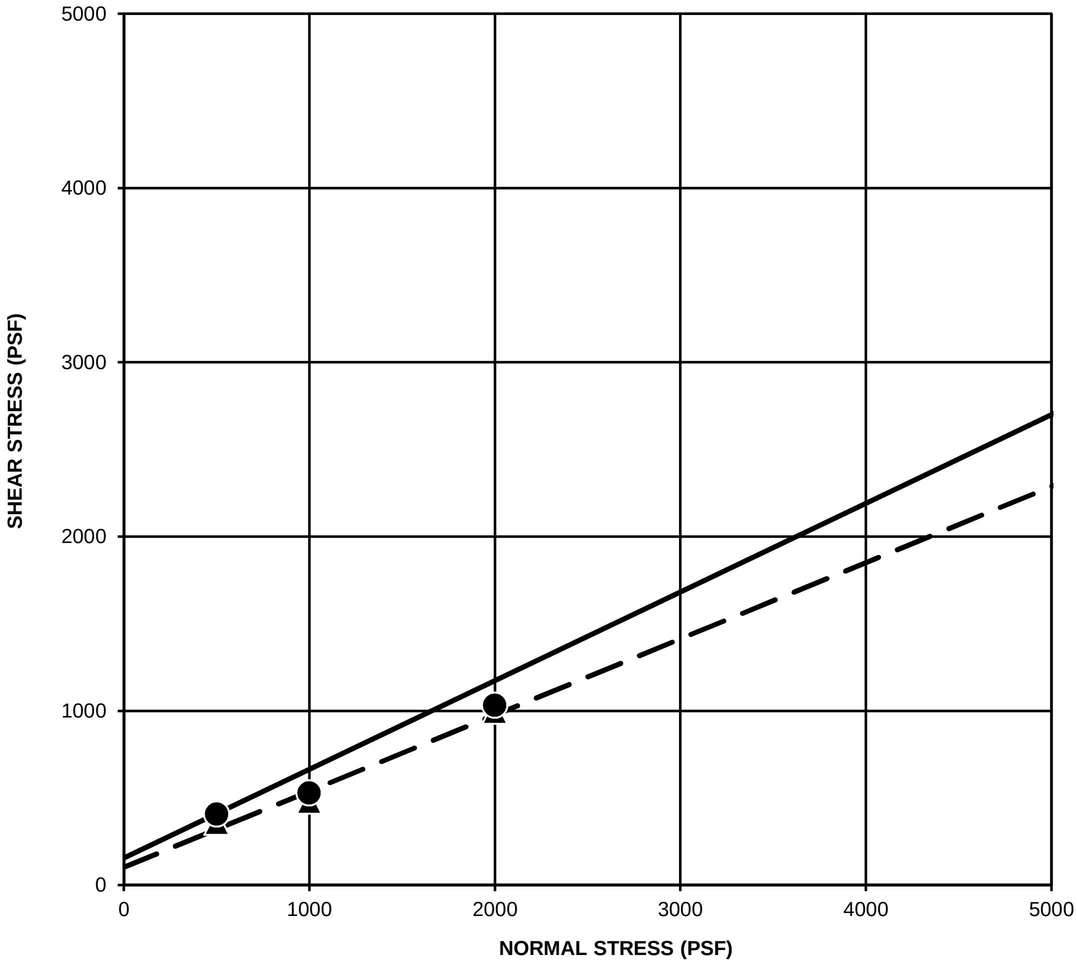
INITIAL MOISTURE (%): 6.8

INITIAL DRY DENSITY (PCF): 114.0

FINAL MOISTURE(%): 13.9

Testing performed in general accordance with ASTM D2435/D2435M - 11

KLEINFELDER Bright People. Right Solutions.	PROJECT NO.: 20160223.001A TESTED BY: E. Degener DATE: 10/1/2015 CHECKED BY: J. Diaz DATE: 10/2/2015	CONSOLIDATION TEST	Proposed Pettit Potable Water Storage Tank Expansion and Transmission Pipeline Moreno Beach Drive City of Moreno Valley, California	FIGURE B-5

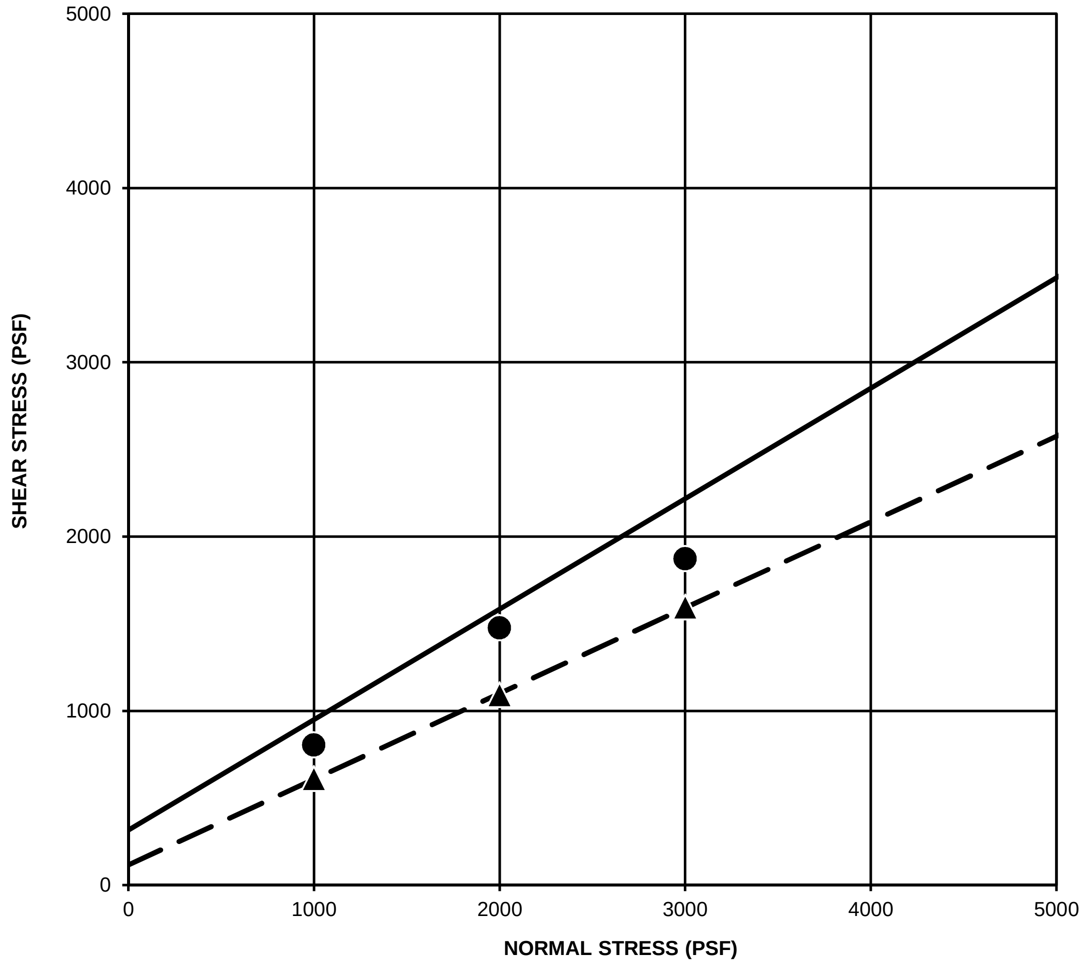


SYMBOL		BORING NO.	SAMPLE NO.	DEPTH (ft)	COHESION (psf)	FRICTION ANGLE (deg)	SOIL CLASSIFICATION
PEAK	●	B-5	2	5'	156.0	23	Silty Sand (SM)
ULTIMATE	▲	B-5	2	5'	102.0	24	Silty Sand (SM)

INITIAL MOISTURE (%):	3.6%	Normal Stress (psf)	500	1000	2000
INITIAL DRY DENSTIY (pcf):	104.4	Peak Stress (psf)	408	528	1032
FINAL MOISTURE (%):	23.2%	Ultimate Stress (psf)	360	480	996

Performed in general accordance with ASTM D 3080

KLEINFELDER Bright People. Right Solutions.	PROJECT NO.20164763 TESTED BY: J. Diaz DATE: 7/20/2016 CHECKED BY: J. Diaz DATE: 7/20/2016	DIRECT SHEAR TEST Proposed Pettit Potable Water Storage Tank Expansion and Transmission Pipeline Moreno Beach Drive City of Moreno Valley, California	FIGURE B-6



SYMBOL		BORING NO.	SAMPLE NO.	DEPTH (ft)	COHESION (psf)	FRICTION ANGLE (deg)	SOIL CLASSIFICATION
PEAK	●	TP-5	1	0-2'	316.0	28	Silty Sand (SM)
ULTIMATE	▲	TP-5	1	0-2'	116.0	26	Silty Sand (SM)

INITIAL MOISTURE (%):	6.6%	Normal Stress (psf)	1000	2000	3000
INITIAL DRY DENSTIY (pcf):	120.8	Peak Stress (psf)	804	1476	1872
FINAL MOISTURE (%):	14.2%	Ultimate Stress (psf)	612	1092	1596

Performed in general accordance with ASTM D 3080

KLEINFELDER Bright People. Right Solutions.	PROJECT NO.20164763 TESTED BY: J. Diaz DATE: 6/30/2016 CHECKED BY: J. Diaz DATE: 7/1/2016	DIRECT SHEAR TEST Proposed Pettit Potable Water Storage Tank Expansion and Transmission Pipeline Moreno Beach Drive City of Moreno Valley, California	FIGURE B-7

APPENDIX C
SEISMIC REFRACTION SURVEY RESULTS

SEISMIC REFRACTION SURVEY

PETTIT WATER STORAGE TANK PROJECT

MORENO BEACH DRIVE, NORTH OF COTTONWOOD AVENUE

CITY OF MORENO VALLEY, CALIFORNIA

Project No. 162880-1

June 20, 2016

Prepared for:

Kleinfelder
3880 Lemon Street
Suite 300
Riverside, CA 92501

Consulting Engineering Geology & Geophysics

P.O. Box 1090, Loma Linda, CA 92354 • 909 796-4667

Kleinfelder
3880 Lemon Street, Suite 300
Riverside, CA 92501

Attention: Mr. Francisco Jaime

Regarding: Seismic Refraction Survey
Pettit Water Storage Tank Project
Moreno Beach Drive, North of Cottonwood Avenue
City of Moreno Valley, California
Kleinfelder Project No. 20164763.001A

INTRODUCTION

As requested, this firm has performed a geophysical survey using the seismic refraction method for the above-referenced site. The purpose of this investigation was to assess the general seismic velocity characteristics of the underlying earth materials and to evaluate whether high velocity earth materials (non-rippable) are present which could possibly indicate areas of potential excavation difficulties, and also to aid in evaluating the subsurface structure and seismic velocity layer distribution. The local underlying bedrock earth materials at depth have been mapped to consist of Cretaceous age granitic rocks comprised of a gray-weathering, medium-grained, typically-foliated, biotite hornblende tonalite (Morton and Matti, 2001). Surficially mapped are very old alluvial fan deposits (early Pleistocene) comprised of well-indurated sand deposits with minor gravel. The location of the survey line has been approximated on a captured Google™ Earth image (Google™ Earth, 2013), which is presented as the Seismic Line Location Map, Plate 2, for reference. In addition, photographs of the survey line are presented on Plate 1 for visual and reference purposes. As authorized by you, the following services were performed during this study:

- ***Review of available published and unpublished geologic/geophysical data in our files pertinent to the site.***

- ***Performing a geophysical survey by a State of California licensed Professional Geophysicist; to include one seismic refraction traverse.***

- ***Preparation of this report, presenting our findings and conclusions with respect to the subsurface velocity characteristics and the expected excavation potentials.***

Accompanying Map, Illustrations, and Appendices

Plate 1 - Seismic Line Photographs
Plate 2 - Seismic Line Location Map
Appendix A - Layer Velocity Model
Appendix B - Refraction Tomographic Model
Appendix C - Excavation Considerations
Appendix D - References

SEISMIC REFRACTION SURVEY

Methodology

The seismic refraction method consists of measuring (at known points along the surface of the ground) the travel times of compressional waves generated by an impulsive energy source and can be used to estimate the layering, structure, and seismic acoustic velocities of subsurface horizons. Seismic waves travel down and through the soils and rocks, and when the wave encounters a contact between two earth materials having different velocities, some of the wave's energy travels along the contact at the velocity of the lower layer. The fundamental assumption is that each successively deeper layer has a velocity greater than the layer immediately above it. As the wave travels along the contact, some of the wave's energy is refracted toward the surface where it is detected by a series of motion-sensitive transducers (geophones). The arrival time of the seismic wave at the geophone locations can be related to the relative seismic velocities of the subsurface layers in feet per second (fps), which can then be used to aid in interpreting both the depth and type of materials encountered.

Field Procedures

One, 200-foot long seismic refraction survey line (Seismic Line S-1), was performed at the subject site as delineated by your firm. The traverse was located in the field by use of Google™ Earth (2013) imagery and GPS coordinates. Twenty-four 14-Hertz geophones, spaced at eight-foot intervals, were employed to detect both the direct and refracted waves, with a 16-pound sledge-hammer being used as the energy source to produce the seismic waves. The seismic wave arrivals were digitally recorded in SEG-2 format on a Geometrics StrataVisor™ NZXP model signal enhancement refraction seismograph. Seven shot points were utilized along the spread using forward, reverse, and several intermediate locations in order to obtain high resolution survey data for velocity analysis and depth modeling purposes. The data was acquired using a sampling rate of 0.0625 milliseconds having a record length of 0.08 seconds with no acquisition filters. During acquisition, the seismograph displays the seismic wave arrivals on the computer screen which were used to analyze the arrival time of the primary seismic "P"-waves at each geophone station, in the form of a wiggle trace for quality control purposes in the field. Each geophone and seismic shot location was surveyed using a hand level and ruler for relative topographic correction, with "0" representing the lowest point along the line.

Data Processing

The recorded seismic data was subsequently transferred to our office computer for processing and analysis purposes, using the computer programs **SIPwin** (**S**eismic Refraction **I**nterpretation **P**rogram for **Win**dows) developed by Rimrock Geophysics, Inc. (2004); **Refractor** (Geogiga, 2001-2015); and **Rayfract™** (Intelligent Resources, Inc., 1996-2016). All of the computer programs perform their analysis using exactly the same input data which includes the first-arrival "P"-waves and survey line geometry. These programs are summarized below for reference.

- **SIPwin** is a ray-trace modeling program that evaluates the subsurface using layer assignments based on time-distance curves and is better suited for layered media, using the "Seismic Refraction Modeling by Computer" method (Scott, 1973). The first step in the modeling procedure is to compute layer velocities by least-squares techniques. Then the program uses the delay-time method to estimate depths to the top of layer-2. A forward modeling routine traces rays from the shot points to each geophone that received a first-arrival ray refracted along the top of layer-2. The travel time of each such ray is compared with the travel time recorded in the field by the seismic system. The program then adjusts the layer-2 depths so as to minimize discrepancies between the computed ray-trace travel times and the first arrival times picked from the seismic waveform record. The process of ray tracing and model adjustment is repeated a total of six times to improve the accuracy of depths to the top of layer-2. This first-arrival picks were then used to generate the Layer Velocity Models using the **SIPwin** computer program, which presents the subsurface velocities as individual layers and are presented within Appendix A for reference. In addition, the associated Time-Distance Plot for the survey line which shows the individual data picks of the first "P-wave" arrival times, also appears in Appendix A.

- **Refractor** is seismic refraction software that also evaluates the subsurface using layer assignments utilizing interactive and interchangeable analytical methods that include the Delay-Time method, the ABC method, and the Generalized Reciprocal Method (GRM). These methods are used for defining irregular non-planar refractors and are briefly described below. The Delay-Time method will measure the delay time depth to a refractor beneath each geophone rather than at shot points. Delay-time is the time spent by a wave to travel up or down through the layer (slant path) compared to the time the wave would spend if traveling along the projection of the slant path on the refractor. The ABC (intercept time) method makes use of critically refracted rays converging on a common surface position. This method involves using three surface to surface travel times between three geophones and the velocity of the first layer in an equation to calculate depth under the central geophone and is applied to all other geophones on the survey line. The GRM method is a technique for delineating undulating refractors at depth from in-line seismic refraction data consisting of forward and reverse travel-times and is capable of resolving dips of up to 20% and does not over-smooth or average the subsurface refracting layers. In addition, the technique provides an approach for recognizing and compensating for hidden layer conditions.

- **Rayfract™** is seismic refraction tomography software that models subsurface refraction, transmission, and diffraction of acoustic waves which generally indicates the relative structure and velocity distribution of the subsurface using first break energy propagation modeling. An initial 1D gradient model is created using the DeltatV method (Gebrande and Miller, 1985) which gives a good initial fit between modeled and picked first breaks. The DeltatV method is a turning-ray inversion method which delivers continuous depth vs. velocity profiles for all profile stations. These profiles consist of horizontal inline offset, depth, and velocity triples. The method handles real-life geological conditions such as velocity gradients, linear increasing of velocity with depth, velocity inversions, pinched-out layers and outcrops, and faults and local velocity anomalies. This initial model is then refined automatically with a true 2D WET (Wavepath Eikonal Traveltime) tomographic inversion (Schuster and Quintus-Bosz, 1993).

WET tomography models multiple signal propagation paths contributing to one first break, whereas conventional ray tracing tomography is limited to the modeling of just one ray per first break. This computer program performs the analysis by using the same first-arrival P-wave times and survey line geometry that were generated during the layer velocity model analyses. The associated Refraction Tomographic Model which displays the subsurface earth material velocity structure, is represented by the velocity contours (isolines displayed in feet/second), supplemented with the color-coded velocity shading for visual reference, and is presented within Appendix B.

The combined use of these computer programs provided a more thorough and comprehensive analysis of the subsurface structure and velocity characteristics. Each computer program has a specific purpose based on the objective of the analysis being performed. **SIPwin** and **Refractor** were primarily used for detecting generalized subsurface velocity layers providing “weighted average velocities.” The processed seismic data of these two programs were compared and averaged to provide a final composite layer velocity model which provided a more thorough representation of the subsurface. **Rayfract™** provided tomographic velocity and structural imaging that is very conducive to detecting strong lateral velocity characteristics such as imaging corestones, dikes, and other subsurface structural characteristics.

SUMMARY OF GEOPHYSICAL INTERPRETATION

To begin our discussion, it is important to consider that the seismic velocities obtained within bedrock materials are influenced by the nature and character of the localized major structural discontinuities (foliation, fracturing, relic bedding, etc.), creating anisotropic conditions. Anisotropy (direction-dependent properties of materials) can be caused by “micro-cracks,” jointing, foliation, layered or inter-bedded rocks with unequal layer stiffness, small-scale lithologic changes, etc (Barton, 2007). Velocity anisotropy complicates interpretation and it should be noted that the seismic velocities obtained during this survey may have been influenced by the nature and character of localized structural discontinuities within the bedrock underlying the subject site. Generally, it is expected that higher (truer) velocities will be obtained when the seismic waves propagate along direction (strike) of the dominant structure, with a damping effect when the seismic waves travel in a perpendicular direction. Such variable directions can result in velocity differentials of between 2% to 40% depending upon the degree of the structural fabric (i.e., weakly-moderately-strongly foliated, respectively). Therefore, the seismic velocities obtained during our field study and as discussed below, should be considered minimum velocities at this time.

The first method described below used for data analysis is the traditional layer method (**SIPwin** and **Refractor**). Using this method, it should be understood that the data obtained represents an average of seismic velocities within any given layer. For example, high seismic velocity boulders, dikes, or other local lithologic inconsistencies, may be isolated within a low velocity matrix, thus yielding an average medium velocity for that layer. Therefore, in any given layer, a range of velocities could be anticipated, which can also result in a wide range of excavation characteristics.

In general, the site where locally surveyed was noted to be characterized by three major subsurface layers with respect to seismic velocities. The following layer summaries have been prepared using the **SIPwin** and **Refractor** analysis, with the representative Layer Velocity Model presented within Appendix A along with the respective Time-Distance Plot.

- **Velocity Layer V1**:

  This uppermost velocity layer (V1) is most likely comprised of topsoil, colluvium, younger alluvial sediments, and/or completely-weathered and fractured bedrock materials. This layer has an average weighted velocity of 1,482 fps, which is typical for these types of unconsolidated surficial earth materials.

- **Velocity Layer V2**:

  The second layer (V2) yielded a seismic velocity of 2,815 fps. This velocity may be representative of somewhat indurated older alluvial sediments such as surficially mapped (Morton and Matti, 2001). This velocity may also indicate highly-weathered granitic bedrock materials. Typically, granitic bedrock with this velocity may indicate the presence of homogeneous weathering with a relatively wide spaced joint/fracture system and/or the possibility of buried relatively-fresher boulders within a highly decomposed bedrock matrix. Additionally, this layer may contain a mixture of both earth materials due to their similar seismic velocities.

- **Velocity Layer V3**:

  The third layer (V3) indicates the presence of moderately-weathered granitic bedrock, having a seismic velocity of 7,338 fps. This higher velocity signifies the decreasing effect of weathering as a function of depth and could indicate the presence of abundant widely-scattered buried fresh large crystalline boulders in highly-weathered matrix, or possibly a slightly-weathered to fresher crystalline bedrock matrix, that has a wide-spaced fracture system.

Using **Rayfract™**, a tomographic model was also prepared for comparative purposes to better illustrate the general structure and velocity distribution of the subsurface, as presented within Appendix B. Although no discrete velocity layers or boundaries are created, this model generally resembles the corresponding overall average layer velocities as presented within Appendix A. In general, the seismic velocity of the bedrock and/or older alluvial deposits gradually increases with depth.

GENERALIZED RIPPABILITY CHARACTERISTICS OF BEDROCK

A summary of the generalized rippability characteristics of bedrock based on a compilation of rippability performance charts prepared by Caterpillar, Inc. (2016), Caltrans (Stephens, 1978), and Santi (2006), has been provided to aid in evaluating potential excavation difficulties with respect to the seismic velocities obtained along the local area surveyed. These seismic velocity ranges and rippability potentials have been tabulated below for reference.

TABLE 1- CATERPILLAR RIPPABILITY CHART (D9 Ripper)

Granitic Rock Velocity	Rippability
< 6,800	Rippable
6,800 – 8,000	Moderately Rippable
> 8,000	Non-Rippable

Additionally, we have provided the Caltrans Rippability Chart as presented below within Table 2 for comparison. These values are from published Caltrans studies (Stephens, 1978) that are based on their experience which are more conservative than Caterpillar's rippability charts. It should be noted that the type of bedrock was not indicated.

TABLE 2- STANDARD CALTRANS RIPPABILITY CHART

Velocity (feet/sec ±)	Rippability
< 3,500	Easily Ripped
3,500 – 5,000	Moderately Difficult
5,000 – 6,600	Difficult Ripping / Light Blasting
> 6,600	Blasting Required

Table 3 is partially modified from the "Engineering Behavior from Weathering Grade" as presented by Santi (2006), which also provides velocity ranges with respect to rippability potentials, along with other rock engineering properties that may be pertinent.

TABLE 3- SUMMARY OF ROCK ENGINEERING PROPERTIES

ENGINEERING PROPERTY:	Slightly Weathered	Moderately Weathered	Highly Weathered	Completely Weathered
Excavatability	Blasting necessary	Blasting to rippable	Generally rippable	Rippable
Slope Stability	½ :1 to 1:1 (H:V)	1:1 (H:V)	1:1 to 1.5:1 (H:V)	1.5:1 to 2:1 (H:V)
Schmidt Hammer Value	51 – 56	37 – 48	12 – 21	5 – 20
Seismic Velocity (fps)	8,200 – 13,125	5,000 – 10,000	3,300 – 6,600	1,650 – 3,300

Additionally, as presented below on Figure 1, the Caterpillar D9R Ripper Performance Chart (Caterpillar, 2016) has been provided for reference.

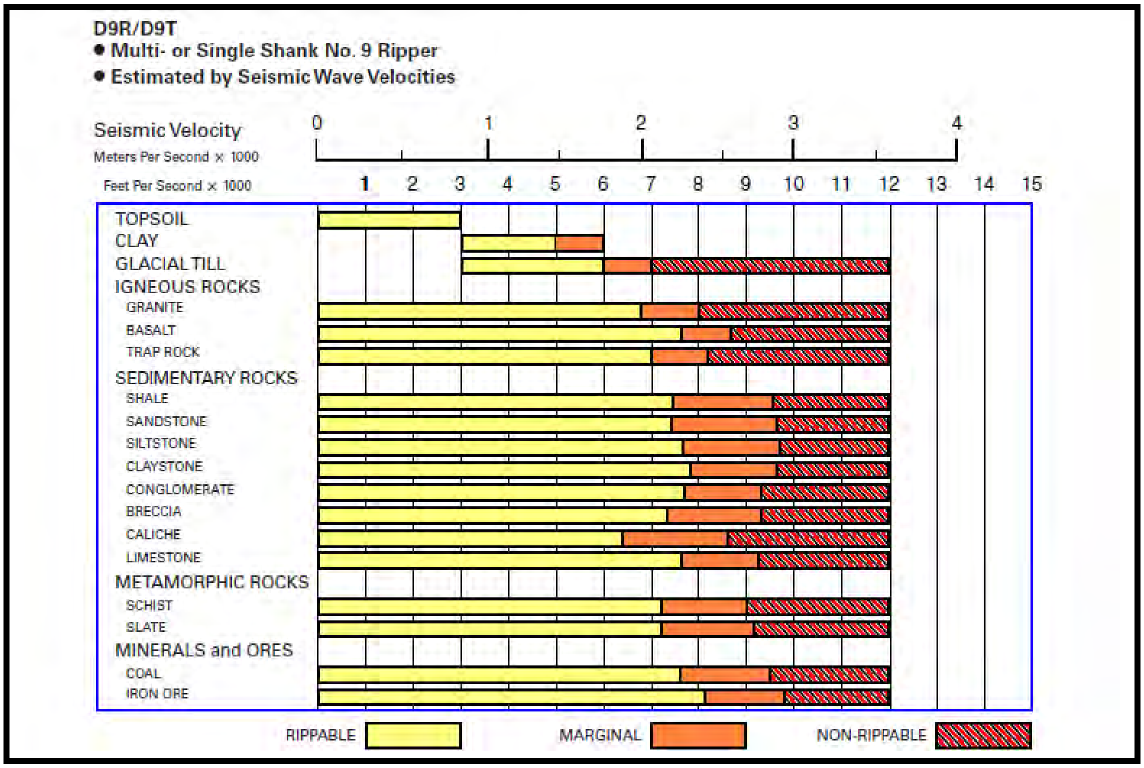


FIGURE 1- Caterpillar D9R Ripper Performance Chart

For purposes of the discussion in this report with respect to the expected bedrock rippability characteristics, we are assuming that a D9R/D9T dozer will be used as a minimum, such as illustrated above. Smaller excavating equipment will most likely result in slower production rates and possible refusal within relatively lower velocity bedrock materials. It should be noted that the decision for blasting of bedrock materials for facilitating the excavation process is sometimes made based upon economic production reasons and not solely on the rippability (velocity/hardness) characteristics of the bedrock.

A summary of the generalized rippability characteristics of granitic bedrock has been provided to aid in evaluating potential excavation difficulties with respect to the seismic velocities obtained along the local area surveyed. The velocity ranges described below are approximate and assume typical, good-working, heavy excavation equipment, such as single shank D9R dozer, such as described by Caterpillar, Inc. (2000 and 2016); however, different excavating equipment (i.e., trenching equipment) <u>may not</u> correlate well with these velocity ranges. Trenching operations which utilize large excavator-type equipment within granitic bedrock materials, typically encounter very difficult to non-productable conditions where seismic velocities are generally greater than 4,000± fps, and less for smaller backhoe-type equipment.

- **Rippable Condition (0 - 4,000 ft/sec)**:

  This velocity range indicates rippable materials which may consist of alluvial-type deposits and decomposed granitic bedrock, with random hardrock floaters. These materials typically break down into silty sands (depending on parent lithologic materials), whereas floaters will require special disposal. Some areas containing numerous hardrock floaters may present utility trench problems. Large floaters exposed at or near finished grade may present problems for footing or infrastructure trenching.

- **Marginally Rippable Condition (4,000 - 7,000 ft/sec)**:

  This range of seismic velocities indicates materials which may consist of moderately weathered bedrock and/or large areas of fresh bedrock materials separated by weathered fractured zones. These bedrock materials are generally rippable with difficulty by a Caterpillar D9R or equivalent. Excavations may produce material that will partially break down into a coarse, silty to clean sand, with a high percentage of very coarse sand to pebble-sized material depending on the parent bedrock lithology. Less fractured or weathered materials will probably require blasting to facilitate removal.

- **Non-Rippable Condition (7,000 ft/sec or greater)**:

  This velocity range includes non-rippable material consisting primarily of moderately fractured bedrock at lower velocities and only slightly fractured or unfractured rock at higher velocities. Materials in this velocity range may be marginally rippable, depending upon the degree of fracturing and the skill and experience of the operator. Tooth penetration is often the key to ripping success, regardless of seismic velocity. If the fractures and joints do not allow tooth penetration, the material may not be ripped effectively; however, pre-blasting or "popping" may induce sufficient fracturing to permit tooth entry. In their natural state, materials with these velocities are generally not desirable for building pad grade, due to difficulty in footing and utility trench excavation. Blasting will most likely produce oversized material, requiring special disposal.

GEOLOGIC & EARTHWORK CONSIDERATIONS

To evaluate whether a particular bedrock material can be ripped or excavated, this geophysical survey should be used in conjunction with the geologic and/or geotechnical report and/or information gathered for the subject project which may describe the physical properties of the bedrock. The physical characteristics of bedrock materials that favor ripping generally include the presence of fractures, faults, and other structural discontinuities, weathering effects, brittleness or crystalline structure, stratification or lamination, large grain size, moisture permeated clay, and low compressive strength. If the bedrock is foliated and/or fractured at depth, this structure could aid in excavation production.

Unfavorable bedrock conditions can include such characteristics as massive and homogeneous formations, non-crystalline structure, absence of planes of weakness, fine-grained materials, and formations of clay origin where moisture makes the material plastic. Use of these physical bedrock conditions along with the subsurface velocity characteristics as presented within this report should aid in properly evaluating the type of equipment that will be necessary and the production levels that can be anticipated for this project.

A summary of excavation considerations is included within Appendix C in order to provide a better understanding of the complexities of excavation in bedrock materials. These concepts should be understood so that proper planning and excavation techniques can be employed by the selected grading contractor.

SUMMARY OF FINDINGS AND CONCLUSIONS

The raw field data was considered to be of good quality with minor amounts of ambient “noise” being introduced during our survey, mostly from vehicular traffic along Moreno Beach Drive to the east. Analysis of the data and picking of the primary “P”-wave arrivals required very minor interpolation, with the aid of applying appropriate frequency filters. Based on the results of our comparative seismic analyses of the computer programs **SIPwin**, **Refractor**, and **Rayfract™**, the seismic refraction survey line models appear to generally coincide with one another, with some minor variances due to the methods that these programs process and integrate the input data. The anticipated excavation potentials of the velocity layers encountered locally during our survey are as follows:

- **Velocity Layer V1**:

  No excavating difficulties are expected to be encountered within the uppermost, low-velocity layer V1 (average weighted velocity of 1,482 fps) and should excavate with conventional ripping. This layer is expected to be comprised of topsoil, colluvium, possible younger alluvial sediments, and/or completely-weathered and fractured bedrock materials. Localized boulders should be anticipated based on nearby surficial exposures, which may require more significant excavation techniques.

- **Velocity Layer V2**:

  The second layer V2 (average weighted velocity of 2,815 fps) is believed to consist of somewhat indurated older alluvial sediments and/or highly-weathered granitic bedrock. Using the rock classifications as presented within Tables 1 through 3, seismic wave velocities of less than 6,800± fps are generally noted to be within the threshold for conventional ripping. Isolated floaters (i.e., boulders, corestones, etc.) should be expected to be present within this layer and could produce somewhat difficult conditions locally. Placement of infrastructure within this velocity layer may require some breaking and/or light blasting to obtain desired grade.

- **Velocity Layer V3**:

  The third layer V3 is believed to consist of moderately-weathered granitic bedrock. Extremely hard excavation difficulties within this deeper velocity layer (average weighted velocity range of 7,338 fps) will be encountered. This layer may consist of relatively fresher homogeneous bedrock, or may contain higher velocity scattered corestones, dikes, and other lithologic variables, within a relatively lower velocity bedrock matrix. Continuous blasting will most likely be required within this velocity layer to achieve desired grade, including any infrastructure.

The ray sampling coverage of the subsurface seismic waves that were acquired during the processing of the tomographic model appeared to be of very good quality which was verified by having a Root Mean Square Error (RMS) of 0.6 percent (see lower right-hand corner of model). The RMS error (misfit between picked and modeled first break times) is automatically calculated during the processing routine, with a value of less than 2.0% being preferred, of which was obtained. Based on the tomographic model and typical excavation characteristics observed within granitic bedrock of the southern California region, anticipation of gradual increasing hardness with depth should be anticipated during grading. The possibility of encountering buried boulders/corestones should be considered due to the numerous bedrock outcrops just to the west.

CLOSURE

The field geophysical survey was performed on June 17, 2016 by the undersigned using "state of the art" geophysical equipment and techniques along a selected portion of the subject study area as directed by you. The seismic data was further evaluated using recently developed tomographic inversion techniques to provide a more thorough analysis and understanding of the subsurface structural conditions. It should be noted that our data was obtained along only one specific location therefore other areas in the local vicinity beyond the limits of our seismic line may contain different velocity layers and depths not encountered during our field survey. Additional survey traverses may be necessary to further evaluate the excavation characteristics across other portions of the site where cut grading will be proposed, if warranted.

It is important to understand that the fundamental limitation for seismic refraction surveys is known as nonuniqueness, wherein a specific seismic refraction data set does not provide sufficient information to determine a single “true” earth model. Therefore, the interpretation of any seismic data set uses “best-fit” approximations along with the geologic models that appear to be most reasonable for the local area being surveyed. Client should also understand that when using the theoretical geophysical principles and techniques discussed in this report, sources of error are possible in both the data obtained and in the interpretation and that the results of this survey may not represent actual subsurface conditions. These are all factors beyond **Terra Geosciences** control and no guarantees as to the results of this survey can be made. We make no warranty, either expressed or implied.

In summary, the results of this seismic refraction survey are to be considered as an aid to assessing the rippability and excavation potentials of the earth materials locally. This information should be carefully reviewed by the grading contractor and representative "test" excavations with the proposed type of excavation equipment for the proposed construction should be considered, so that they may be correlated with the data presented within this report. Estimates of layer velocity boundaries as presented in this report are generally considered to be within 10± percent of the total depth of the contact.

This opportunity to be of service is sincerely appreciated. If you should have questions regarding this report or do not understand the limitations of this study or the data and results that are presented, please do not hesitate to contact our office.

Respectfully submitted,
TERRA GEOSCIENCES

Donn C. Schwartzkopf
Principal Geophysicist
PGP 1002

SEISMIC LINE PHOTOGRAPHS

View looking northwest along Seismic Line S-1.

View looking southeast along Seismic Line S-1.

SEISMIC LINE LOCATION MAP

PROJECT NO. 162880-1

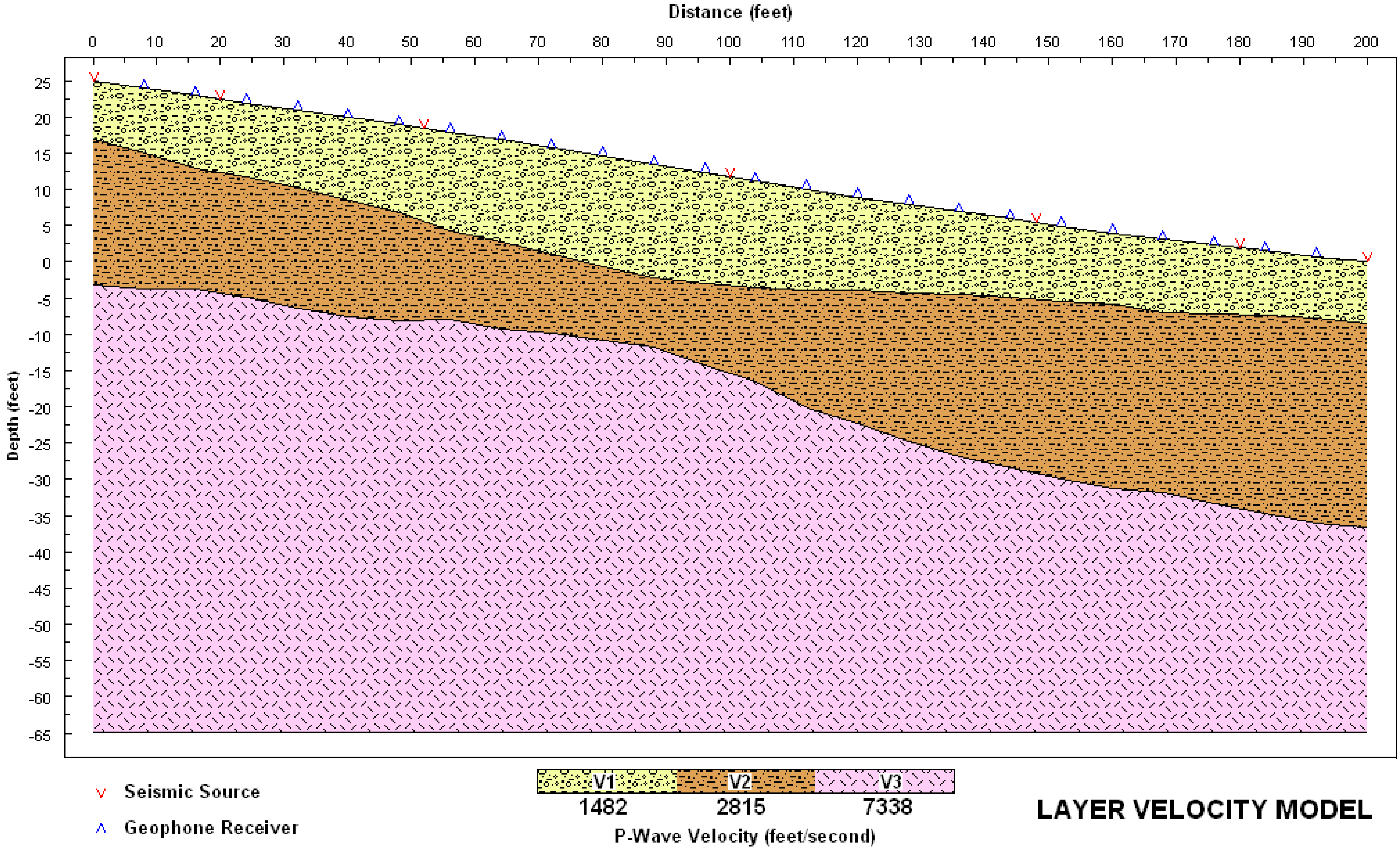
PLATE 2

APPENDIX A

LAYER VELOCITY MODEL

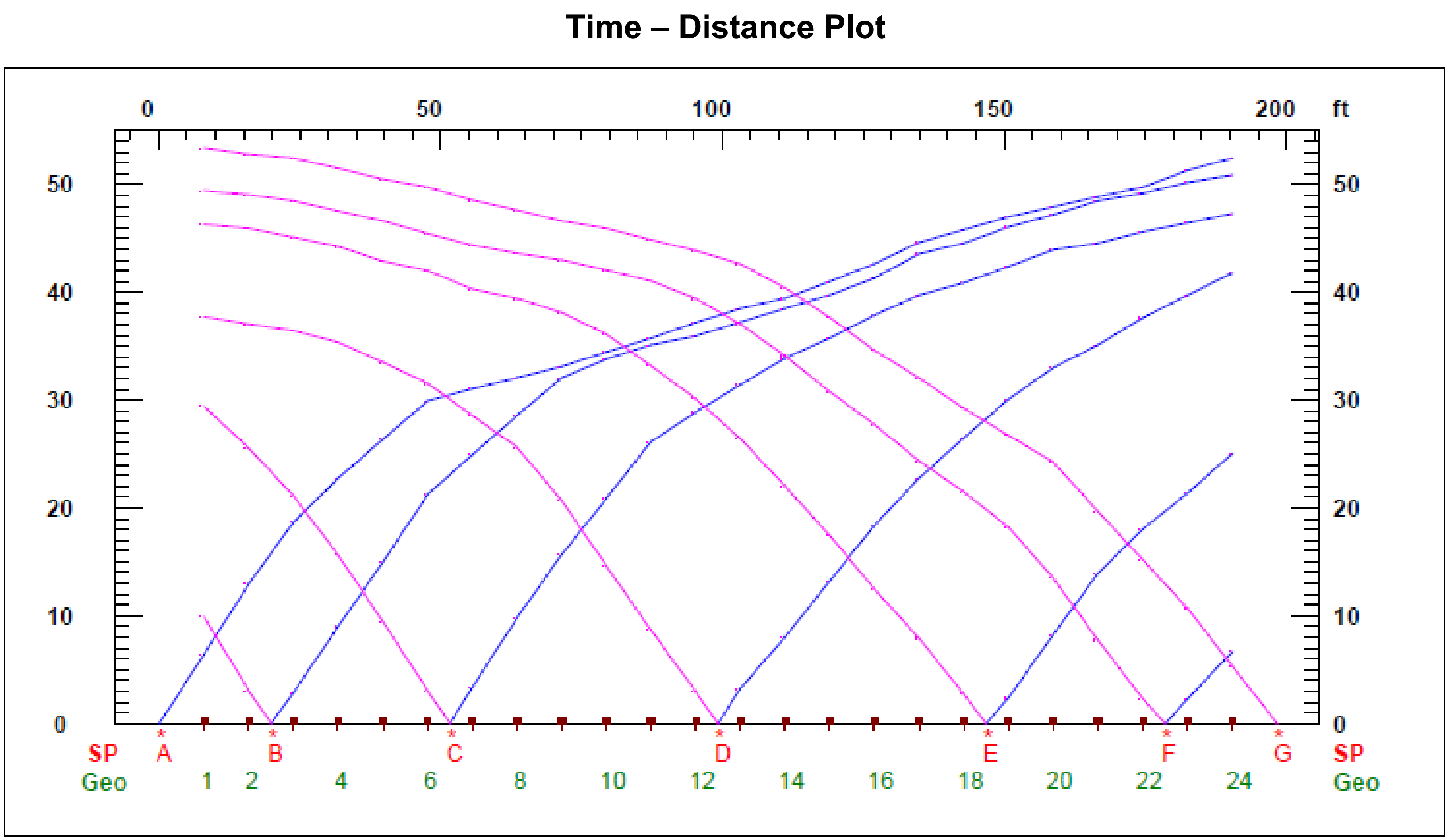
SEISMIC LINE S-1

South 63° East >



LAYER VELOCITY MODEL

SEISMIC LINE S-1



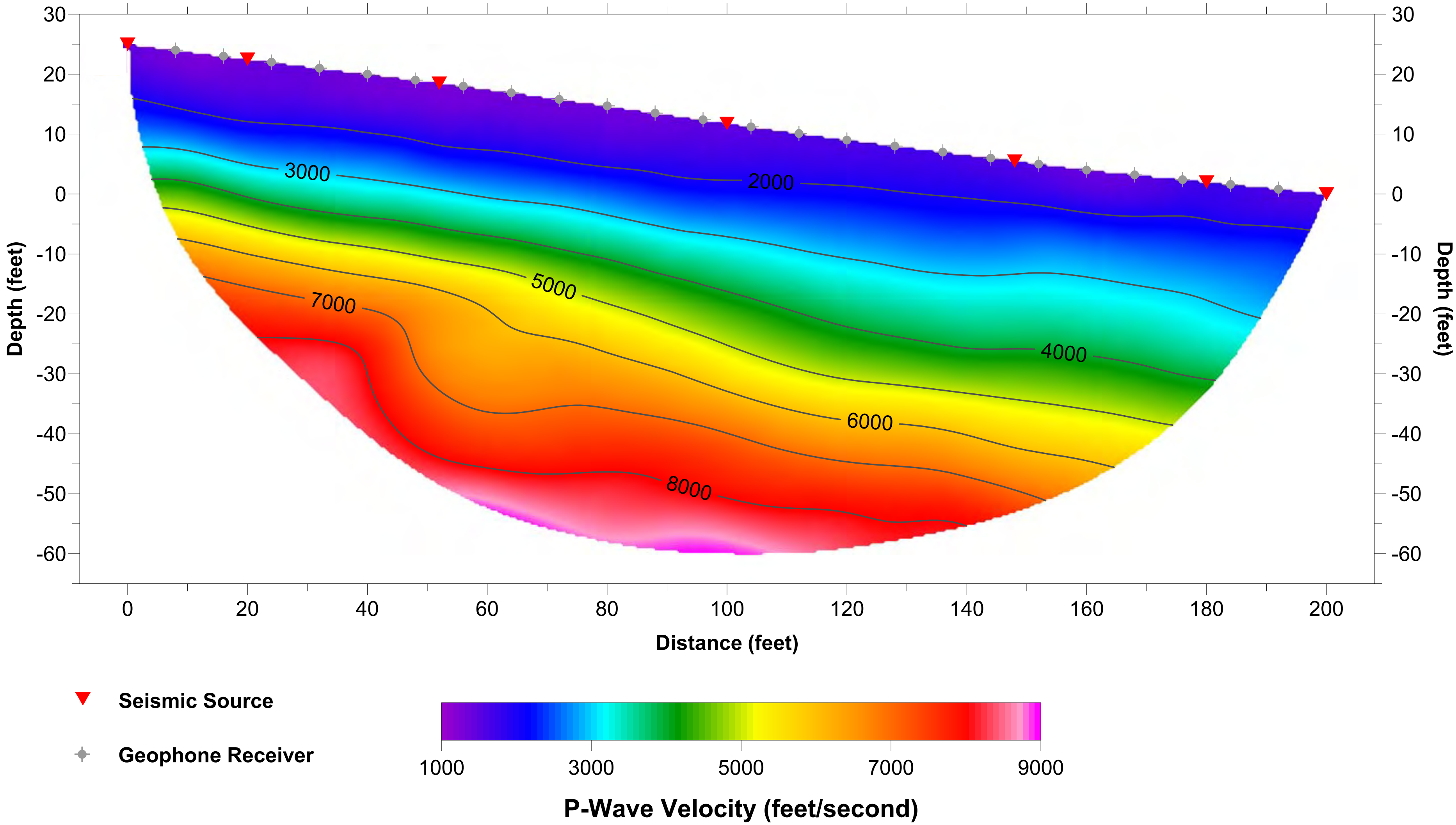
APPENDIX B

REFRACTION TOMOGRAPHIC MODEL

SEISMIC LINE S-1

South 63° East →

REFRACTION TOMOGRAPHIC MODEL



SCALE: 1" = 25' (Horizontal & Vertical)

RMS error 0.6 %, Rayfract Version 3.34

APPENDIX C

EXCAVATION CONSIDERATIONS

EXCAVATION CONSIDERATIONS

These excavation considerations have been included to provide the client with a brief overall summary of the general complexity of hard bedrock excavation. It is considered the clients responsibility to insure that the grading contractor they select is both properly licensed and qualified, with experience in hard-bedrock ripping processes. To evaluate whether a particular bedrock material can be ripped, this geophysical survey should be used in conjunction with the geologic or geotechnical report prepared for the project which describes the physical properties of the bedrock. The physical characteristics of bedrock materials that favor ripping generally include the presence of fractures, faults and other structural discontinuities, weathering effects, brittleness or crystalline structure, stratification of lamination, large grain size, moisture permeated clay, and low compressive strength. Unfavorable conditions can include such characteristics as massive and homogeneous formations, non-crystalline structure, absence of planes of weakness, fine-grained materials, and formations of clay origin where moisture makes the material plastic.

When assessing the potential rippability of the underlying bedrock of a given site, the above geologic characteristics along with the estimated seismic velocities can then be used to evaluate what type of equipment may be appropriate for the proposed grading. When selecting the proper ripping equipment there are three primary factors to consider, which are:

- ***Down Pressure available at the tip, which determines the ripper penetration that can be attained and maintained,***
- ***Tractor flywheel horsepower, which determines whether the tractor can advance the tip, and,***
- ***Tractor gross-weight, which determines whether the tractor will have sufficient traction to use the horsepower.***

In addition to selecting the appropriate tractor, selection of the proper ripper design is also important. There are basically three designs, being radial, parallelogram, and adjustable parallelogram, of which the contractor should be aware of when selecting the appropriate design to be used for the project. The penetration depth will depend upon the down-pressure and penetration angle, as well as the length of the shank tips (short, intermediate, and long).

Also important in the excavation process is the ripping technique used as well as the skill of the individual tractor operator. These techniques include the use of one or more ripping teeth, up- and down-hill ripping, and the direction of ripping with respect to the geologic structure of the bedrock locally. The use of two tractors (one to push the first tractor-ripper) can extend the range of materials that can be ripped. The second tractor can also be used to supply additional down-pressure on the ripper. Consideration of light blasting can also facilitate the ripper penetration and reduce the cost of moving highly consolidated rock formations.

All of the combined factors above should be considered by both the client and the grading contractor, to insure that the proper selection of equipment and ripping techniques are used for the proposed grading.

APPENDIX D

REFERENCES

REFERENCES

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APPENDIX D
GBA INSERT

Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, clients can benefit from a lowered exposure to the subsurface problems that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed below, contact your GBA-member geotechnical engineer. Active involvement in the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Geotechnical-Engineering Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. *Those who rely on a geotechnical-engineering report prepared for a different client can be seriously misled.* No one except authorized client representatives should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one – not even you – should apply this report for any purpose or project except the one originally contemplated.*

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read it *in its entirety*. Do not rely on an executive summary. Do not read selected elements only. *Read this report in full.*

You Need to Inform Your Geotechnical Engineer about Change

Your geotechnical engineer considered unique, project-specific factors when designing the study behind this report and developing the confirmation-dependent recommendations the report conveys. A few typical factors include:

- the client's goals, objectives, budget, schedule, and risk-management preferences;
- the general nature of the structure involved, its size, configuration, and performance criteria;
- the structure's location and orientation on the site; and
- other planned or existing site improvements, such as retaining walls, access roads, parking lots, and underground utilities.

Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light-industrial plant to a refrigerated warehouse;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.*

This Report May Not Be Reliable

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, that it could be unwise to rely on a geotechnical-engineering report whose reliability may have been affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If your geotechnical engineer has not indicated an "apply-by" date on the report, ask what it should be*, and, in general, *if you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying it. A minor amount of additional testing or analysis – if any is required at all – could prevent major problems.

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface through various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing were performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgment to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team from project start to project finish, so the individual can provide informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, *they are not final*, because the geotechnical engineer who developed them relied heavily on judgment and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* revealed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a full-time member of the design team, to:

- confer with other design-team members,
- help develop specifications,
- review pertinent elements of other design professionals' plans and specifications, and
- be on hand quickly whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction observation.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for informational purposes only*. To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report, but they may rely on the factual data relative to the specific times, locations, and depths/elevations referenced. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely*. Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures*. If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. As a general rule, *do not rely on an environmental report prepared for a different client, site, or project, or that is more than six months old.*

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, none of the engineer's services were designed, conducted, or intended to prevent uncontrolled migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, ***proper implementation of the geotechnical engineer's recommendations will not of itself be sufficient to prevent moisture infiltration.*** Confront the risk of moisture infiltration by including building-envelope or mold specialists on the design team. ***Geotechnical engineers are not building-envelope or mold specialists.***

GEOPROFESSIONAL
BUSINESS
ASSOCIATION

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e-mail: info@geoprofessional.org www.geoprofessional.org

APPENDIX I
TANK MATERIALS OF CONSTRUCTION TM

ALBERT A.
WEBB
ASSOCIATES

Technical Memorandum

Distribution Greg Kowalski, Debbie Hoffman, Khos Ghaderi, Rick Gingras, Anna Kalan, Mark Iverson, File

Prepared By: Brad Sackett, A.A. Webb Associates

Date: May 18, 2011

Re: Task No. 4 – Tank Materials of Construction
Project Name: Vista and Ellis Zones Water System Improvement Project
Subject: Task No. 4 – Tank Materials of Construction

EXECUTIVE SUMMARY

Eastern Municipal Water District (District) in Perris, CA, is a public water agency and community water system that provides domestic and agricultural water, wastewater, wastewater collection and treatment service, and recycled water in western Riverside County, CA. The District currently owns and operates 77 steel water storage reservoirs and no concrete reservoirs.

The District is interested in examining construction of a concrete reservoir to minimize life cycle costs of a water storage reservoir and provide options for site selection where a partially buried tank could be better suited to available tank sites.

The focus of this document is to provide a cost and performance comparison for construction of a 5.63 million gallon (MG) water storage reservoir either from concrete or welded steel. A concrete tank could be constructed to AWWA D110-04, Type I standards with ASCE 7-05, and the welded steel to tank AWWA D100-05.

Welded Steel tank has the lowest initial project cost of \$2.534M or \$0.45 per gallon for a 156ft dia by 40 ft nominal shell height.

For an above ground installation, a welded steel tank designed and constructed to AWWA D100-05, that is 156 ft by 40 ft has the lowest estimated life cycle cost of \$0.57 per gallon based on assumptions of \$7/sqft (project cost) for recoating a welded steel tank every 20 years for the interior and every 25 years for the exterior.

For a partially buried application, a concrete tank designed and constructed to AWWA D110-04, Type I, that is 156 ft by 40 ft has the lowest estimated life cycle cost at \$0.76 per gallon.

INTRODUCTION

Purpose

The focus of this document is to provide a cost and performance comparison for construction of a 5.63 million gallon (MG) water storage reservoir using either concrete or welded steel as the basic construction material. A concrete tank could be constructed to AWWA D110-04, Type I standards with ASCE 7-05, and the welded steel to AWWA D100-05.

Background

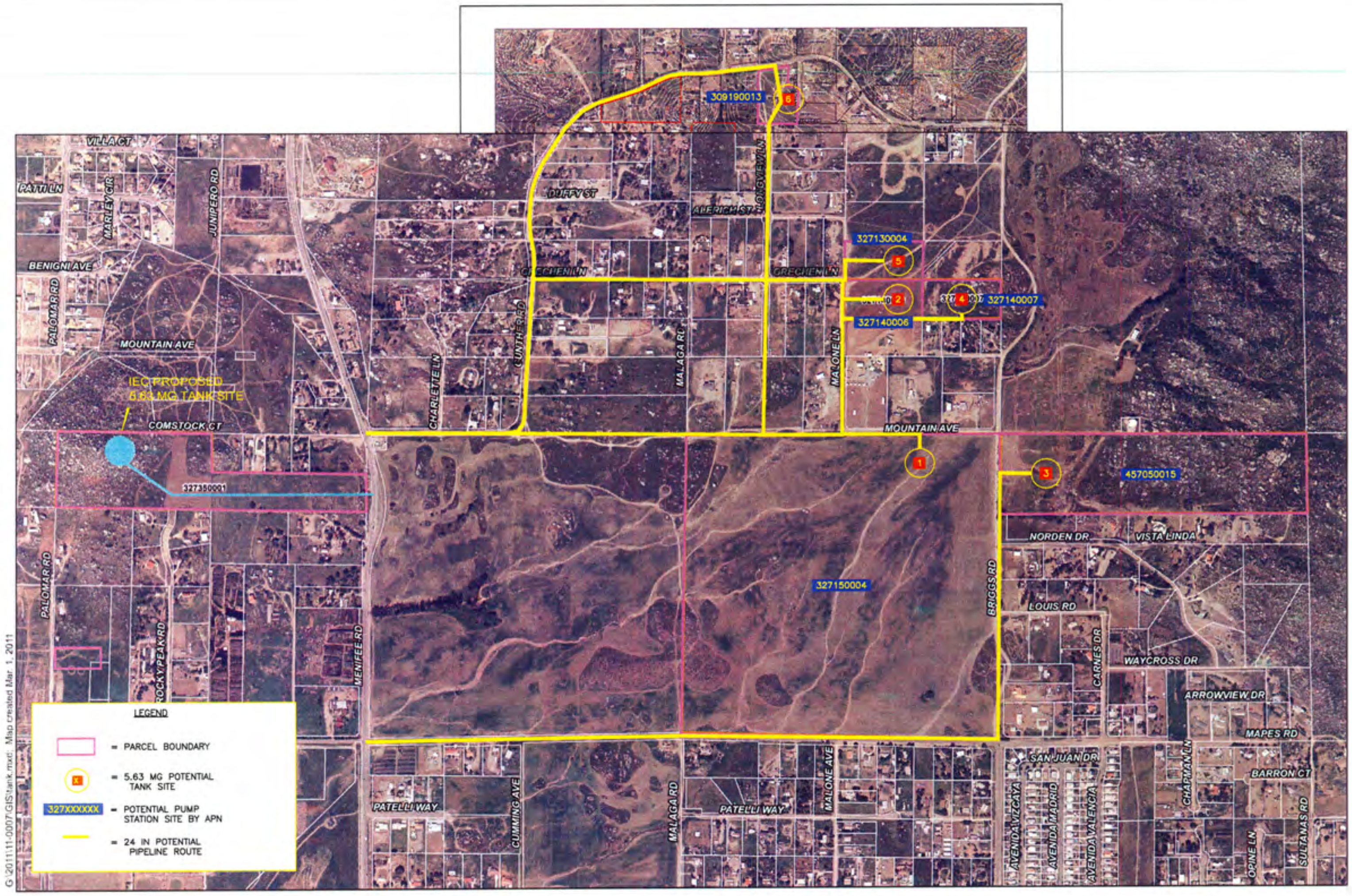
Eastern Municipal Water District (District) in Perris, CA, is a public water agency and community water system that provides domestic and agricultural water, wastewater, wastewater collection and treatment service, and recycled water in a 555 square mile service area with a population of 575,000 in western Riverside County, CA. The District is located in one of the most rapidly growing regions in the United States. Since 1990, over 230,000 people have been added to the District's service area nearly doubling the population. The District currently owns and operates 77 steel water storage reservoirs and no concrete reservoirs. The District does have some experience operating a small concrete potable water tank. The tank, originally constructed more than 30 years ago, is no longer in service due to leaking.

The District is interested in examining construction of a concrete reservoir to potentially minimize life cycle costs of a water storage reservoir and provide options for site selection where a partially buried tank could be better suited to available tank sites.

Infrastructure Engineering Corporation (IEC) performed a study on behalf of the District in which the proposed locating the 5.63 MG tank at a site off of Mountain Avenue, just east of Menifee Road as shown in **Exhibit 1** (*Ellis Pressure Zone Study Final Report, April 2009*). Webb Associates has proposed six alternative sites that will be ranked in comparison to the site proposed by IEC which are also shown in **Exhibit 1**.

District design standards as they relate to access roads; overflow detention basis; tank height limitation; tank appurtenances; and aesthetics apply no matter what tank type is constructed and will not be specifically addressed in this discussion unless it directly impacts tank type choice.

Because the exact location of the tank has yet to be determined, and there is no geotechnical report for any of the sites, subsequent adjustments to this document may be required in the future, but are not anticipated to impact the comparison between concrete and welded steel tank life cycle costs.



FOR REVIEW ONLY

ALBERT A. WEBB ASSOCIATES ENGINEERING CONSULTANTS	EASTERN MUNICIPAL WATER DISTRICT RIVERSIDE COUNTY, CALIFORNIA 5.63 MG 1720S ELLIS TANK SITE ALTERNATIVES	EXHIBIT 1

Concrete Water Tanks

Concrete water tanks designed and constructed to AWWA D110-04 standards along with ASCE 7-05 can be of four different types: Type I cast-in-place with vertical pre-stressed reinforcement; Type II shot-crete with a steel diaphragm; Type III pre-cast concrete with a steel diaphragm; and Type IV cast-in-place with a steel diaphragm. Types I and III are both constructed using pre-stressing of circumferentially wrapped wire strands. Pre-stressing introduces compressive stresses into a structural member with high-strength steel that counteract the tensile stresses resulting from applied loads. Tanks structures can be precast in panels and erected or formed and cast-in-place on site. Typically, the concrete tanks require no additional interior coating. They can also be partially or fully buried with uniform backfill conditions with little or no structural modification as compared to an above ground placement. Tanks with over 30MG storage capacity have been constructed. For this study, only Type I is examined in detail and considered because of its proven performance in seismic zone 4.

Welded steel Water Tanks

Tanks designed and constructed to AWWA D100-05 standards are welded steel tanks and are generally constructed above ground. The District has extensive experience with welded steel tank construction, operations and maintenance and has developed design standards based on this experience. Tanks with over 10MG storage have been constructed. Other types of steel tanks, namely bolted steel, are used for potable water storage but are not being considered for this project or analysis.

Tank Parameters

The District requires that the proposed Vista/Ellis storage reservoir be constructed at 5.63 MG storage capacity with a high water level elevation of 1720. Two tank heights and diameters are considered for this analysis tank design: 32 ft high and 176 ft diameter and 40 ft high and 156 ft diameter. The various tank configurations analyzed are summarized in **Table 1**.

Table 1 – Tank Configurations

Material Type	Internal Diameter (ft)	High Water Level (ft)	Sloshing Height Required (ft)
Welded steel	176	32	3.5
Concrete Type I	176	32	5
Concrete Type III	176	32	4
Welded steel	156	40	4.4
Concrete Type I	156	40	5
Concrete Type III	156	40	4

Notes: (1) See **Appendix A** for vendor information, quotations and seismic design calculations for sloshing height.

The District's Reservoir and Reservoir Site Design and Submittal Guidelines (1 March 2010), Section III (G) (3) state that the "[n]ominal reservoir height shall be 32 ft or 40 ft from the top of ringwall to bottom of knuckle". The shell height for the tank is defined in the District's draft EMWD Tank Nomenclature drawing located in **Appendix C** of this document and is assumed different than the reservoir height. Webb will later refine the District's design standards in order to clarify the definition of reservoir height, shell height, operational freeboard, freeboard required for seismic, maximum operations level, and overflow height for this project in a later technical memorandum. For this discussion, the liquid volume is calculated based upon a water depth (reservoir height) of 32 ft or 40 ft. Freeboard required for sloshing is assumed to be above this height.

<u>CONCRETE versus WELED STEEL</u>

When deciding to construct a water storage reservoir of either concrete or welded steel, the choice is not simply one between material types, but rather between design parameters and construction methods used for each material type, and future maintenance requirements. Each tank type must be constructed to minimum standards given by AWWA and any specific standards or requirements dictated by the local agency. A definitive answer as to which method or material of construction is best for any particular application is generally not obvious because the answer depends of the relative weights of the selection criteria used and cost assumptions for future maintenance. All methods of design and construction to AWWA D100-05 and D110-04 will produce satisfactory designs with 60 to 75-year service lives if the tank is properly sited, built and maintained.

Welded steel tanks of the capacity considered in this technical memorandum are not expected to be anchored to the foundation based on the estimated seismic parameters and results of preliminary seismic design calculations per AWWA D100. For concrete tanks, the tank shell is expected to be attached to the foundation with seismic cables embedded into foundation and wrapped under the pre-tensioning cables per AWWA D110.

Inlet and Outlet

The location and number of inlet/outlets for a tank significantly impacts mixing characteristics. To promote water quality, the California Department of Public Health (CDPH) requires separate inlets and outlets. AWWA standards require flexible connections on inlets or outlets.

Typically, the inlet and outlet in a concrete tank are through the bottom of the slab and under the perimeter ring wall foundation which minimizes the additional engineering and construction cost associated with accommodating a large side penetration interfering with the wire strands wrapped around the tank shell. Side outlets are not recommended because of the impact to the most critical wire-wrapped area of a pre-stressed concrete tank and seismic cables securing the shell to the foundation. Side penetrations can be constructed if required, but are typically not placed within the bottom 3 ft of the shell, limiting the useable water volume and potentially creating a stagnant water area.

Welded Steel tanks can be constructed with either side, or bottom inlets and outlets. Side inlet and outlets are more commonly constructed today to avoid damage during tank uplift during a seismic event. The District's current standards are for side inlets and outlets. For welded steel tanks, these inlets and outlets can be constructed close to the tank floor elevation to maximize usable water volume.

Retrofitting

Retrofitting of a welded steel tank due to changes such as minimum access opening requirements, seismic standards, venting, ladder replacement, mixing or sampling taps can be easily accomplished. It is well understood how new appurtenances can be welded to existing tanks with the appropriate reinforcement plates and how to repair the coatings around modifications. A pre-stressed concrete tank, however, is more difficult to retrofit. Modifications, in many cases, are limited to areas with existing penetrations or appurtenances. In cases where a new penetration into the tank must be made, pre-stressing wire must be secured to welded steel plates before a new wall penetration can be cut. Retrofit appurtenances in concrete tanks are more costly and difficult to construct. In some cases, it may not be possible to modify a concrete tank without weakening the structure.

Site Selection – Above Grade or Below Ground

Both types of tanks will likely have similar foundation requirements from a structural standpoint. Hence, a comparison of concrete construction versus welded steel on this point is not material to this technical memo. The welded steel tank will require a larger finished graded area surrounding the tank. A 20 ft-wide maintenance track is required for construction and future recoating for the welded steel tank. Slope(s) or retaining wall(s) may be required beyond the 20 ft-wide maintenance track to transition from the edge of the maintenance track up or down to the existing ground surface. The concrete tank only requires a 12 ft-wide track to construct. Post construction, the concrete tank can be backfilled up to the tank wall completely covering the track used to build it.

A pre-stressed, concrete reservoir can be placed below finished grade and more easily concealed from view. If the tank is buried uniformly, then the cost to construct is comparable to an above ground tank for the reservoir itself. If differential backfilling is required at the site, then additional cost will be incurred in construction of the tank to resist the unequal distribution of lateral loading.

Webb does not recommend burial of welded steel tanks due to the high potential for corrosion as a result of possible metal/soil contact and the significant increase in material and engineering required to build a welded steel tank capable of resisting lateral earth loads during static and seismically induced loading. Thus, when considering construction of a welded steel tank, it is assumed in this analysis that it will be an above ground structure.

In order to make the site more aesthetically pleasing, a variety of concealment strategies can be implemented. At additional cost, concrete tanks can be provided with various architectural features. Welded steel tanks can be painted, though paint colors are generally limited to lighter colors to reduce solar heating effects. If the reservoir is above ground, trees or other forms of landscaping could enhance the site. Although more costly, a mechanically stabilized earth berm could be constructed around a tank or placed directly against a properly engineered concrete tank. The best concealment option is locating the tank such that the natural topography hides the tank from most views. These issues are generally site specific and generally independent of tank type.

Recoating

A welded steel tank will require periodic internal recoating due to direct contact with the water and high humidity of the space above the liquid level. The District currently recoats the interior of its welded steel tanks on a 15-yr interval. With recently added practices to increase the initial coating warranty period to two years, installation of sacrificial cathodic protection systems in the tank and routine diving inspections, the recoating interval is anticipated to increase to 20 years. A welded steel tank requires external recoating due to UV exposure and weather related corrosion. The District currently recoats the exterior on a 25-yr interval. Recoating costs add significantly to the O&M costs of owning a welded steel tank. A concrete tank typically has no internal coating. While some concrete tanks are lined with a plastic liner or coated, this is typically not required to prevent corrosion and aging of the concrete structure. A discussion of the cost consequence of recoating is given below in the Costs section of this document.

Coating Material Options

Typical coating materials used for recoating welded steel tanks contain volatile organic compounds (VOC's). VOC's are smog precursors and are regulated locally by South Coast Air Quality Management District (SCAQMD). Over the last 30+ years, the VOC content of coatings have been reduced as more stringent regulations are issued. As coating formulations change to meet the stricter regulations, there is some risk that the new coatings will not have the durability and expected life cycle of the older coatings. Some coating failures have been attributable to formulation changes and those particular coating formulations are no longer on the market. According to the coating suppliers, there are no pending regulations that will eliminate current VOC coating options. In the long term, there is a risk that regulations will further reduce the allowable VOC content and eliminate proven coating formulations. This could make the welded steel tank option more of a risk because reasonably priced coating systems may not be available.

There are 100% solids coatings that contain no VOC's that are currently on the market. The 100% solids coating have been used in potable water tanks, at or below the water level. These coatings have a short cure time, as little as four hours and pose little risk of VOC contamination of potable water. These systems are typically more expensive for materials and require special application/mixing equipment but can be applied in one coat potentially saving labor costs.

Recent bids for the typical VOC based coatings range in the $4 to $5 per square foot. Historically, 100% solids coating are approximately $10 per square foot but some recent bids have been as low as $7 per square foot. The current cost differential has decreased between VOC based coating and 100% solids coatings. As coating contractors become more experienced in applying coatings with 100% solids, coating prices are expected to fall. 100% solids coatings are now a reasonably priced alternative if VOC based coatings are no longer available.

Water Tightness

A welded steel tank is constructed water tight and no leaking is allowed on during the initial inspection. Welded steel tank typically remain water tight unless coating failure and corrosion are not addressed during routine maintenance. Since the District has improved its tank maintenance practices, welded steel tanks are not expected to leak during their expected lifecycle.

A concrete tank has a potential to leak water over time. Section 5.13 of AWWA D-110 standard for pre-stressed concrete tanks allows a 0.05 of 1% loss per day upon initial testing. For a 5.63MG tank, this equates to 2,815 gallons per day or 3.15 ac-ft per year. ACI 350 standard can be used as an alternate. "Hydrostatic Test – No Measurable Loss" (HST-NML) is the tightest level, meaning the drop in the water surface shall not exceed 0.125 inches in three days and no visible water is observed flowing or seeping from the tank. For a 5.63 MG tank, this is a maximum 1,490 gallons in three days.

Site Acquisition

The choice of site is coupled to the selection criteria for the tank. A concrete tank provides more flexibility in site selection than welded steel because it can be buried more easily. A site that can accommodate an above ground reservoir only, perhaps due to geological constraints such as rocks, can accommodate a welded steel or concrete tank equally as well assuming all of the geotechnical engineering requirements can be satisfied. It should be noted, however, that if a buried tank option is selected, careful consideration should be given as to the distance from the tank inlet/outlet to the point where the tank can be gravity drained for maintenance. This drain point may be significantly distant from the tank site, making that site choice unacceptable to District operation's staff.

For a buried concrete tank, sites that require differential back fill will require additional tank foundation to resist lateral earth pressures. Costs for this additional foundation and grading should be balanced against land costs to minimize total project costs.

For above grade, partially buried, or completely buried tanks, a preliminary grading analysis should be undertaken in order to estimate earthwork cut and fill volumes for site grading, berm construction, access road construction, and on-site detention before an offer to acquire a site is made. Also, and most importantly, a preliminary geotechnical investigation should be undertaken for all sites under consideration as a first step in the acquisition process.

Initial Construction Cost

Initial construction cost for the various tank types have been estimated based on recent vendor coordination and cost data. Project costs were estimated at 140% of estimate construction costs. Tank sizes used are nominal sizes including the required sloshing/freeboard height for the associated tank type/configuration. Costs are for the tank only, adjusted from vendor pricing to reflect similar appurtenances on each tank. Additional costs will be incurred to complete the project for on-site piping and flexible couplings, site work, grading, telemetry and other site improvements; see **Table 2**.

Table 2 – Tank Cost

Material Type	Dia. (ft)	HWL (ft)	Construction Cost	Project Cost
Welded steel	176	32	\$2.000M	\$2.800M
Concrete Type I	176	32	\$2.750M	\$3.850M
Welded steel	156	40	\$1.810M	\$2.534M
Concrete Type I	156	40	\$2.625M	\$3.675M

<u>SELECTION CRITERIA</u>

Several criteria should be considered in selecting a tank design and construction method. These factors include maintenance, service life, water tightness, site constraints, construction schedule, and available budget. **Table 3** provides a comparison of welded steel verses concrete by design standard for each of the criteria listed above.

<u>LIFE CYCLE COST ANALYSIS</u>

Figure 1 shows estimated life cycle costs for the tank geometries based on calculations given in **Tables 1A and 1B** of **Appendix B**. Cost include project overhead costs, welded steel recoating cost of \$7/sqft (project cost) and a discount rate of 4%. This analysis is based upon cleaning intervals for the D110 tanks of every 12 years and adding an interior liner at 30 years. The welded steel tank recoating interval is based upon the District's practice of recoating the interior and exterior every 20 years and 25 years respectively. Welded steel tank recoating costs are based on recent bid data obtained by Webb with adjustments for project costs. **Figure 2** shows the sensitivity of overall tank ownership costs to changes in coating cost and interior recoating intervals for the model welded steel tank. Recoating costs for the welded steel tank are the primary barrier to lowering the overall life cycle cost of this type of tank. Welded steel tanks are approximately \$1M less expensive to initially construct so if these recoating costs are less than \$1M, welded steel tanks will have the lowest overall cost.

Table 3 – Selection Criteria Comparison

Design Standard	Maintenance	Service Live (yrs)	Water Tightness	Site Constraints	Construction Schedule	Retrofit	Inlet/Outlet	Available Budget
D100-05 (Steel)	Inspect every 5 years. Recoat interior every 20 years. Recoat exterior every 25 years.	75	Constructed leak tight.	No direct burial. Requires berms or landscaping to hide tank.	Shortest of all tanks considered	Easily retrofit	Can be bottom or side outlet	Lowest initial cost.
D110-04 Type I	Inspect every 5 years. Requires washing and interior/exterior every 12 years.	60	Conventionally reinforced roof and floor slab. If floor has joints, they can leak. Walls are vertically post tensioned which helps reduce leaks and improves seismic resistance.	Can bury directly if uniform backfill or with slight modifications if not uniform back fill.	Longer than steel	More difficult to retrofit, limited to only certain locations	Bottom outlet recommended	Higher initial cost than steel.
D110-04 Type II	Inspect every 5 years. Requires washing and interior/exterior every 12 years.	60	Conventionally reinforced roof and floor slab. If floor has joints, they can leak. No vertical post tensioning.	Can bury directly if uniform backfill or with slight modifications if not uniform back fill.	Longer than steel	More difficult to retrofit, limited to only certain locations	Bottom outlet recommended	Higher initial cost than steel.
D110-04 Type III	Inspect every 5 years. Requires washing and interior/exterior every 12 years.	60	Conventionally reinforced roof and floor slab. If floor has joints, they can leak. Wall has thin steel membrane cast within wall panels.	Can bury directly if uniform backfill or with slight modifications if not uniform back fill.	Longer than steel	More difficult to retrofit, limited to only certain locations	Bottom outlet recommended	Often lowest initial cost of D110 type tanks.

Figure 1
Life Cycle Cost v. Time

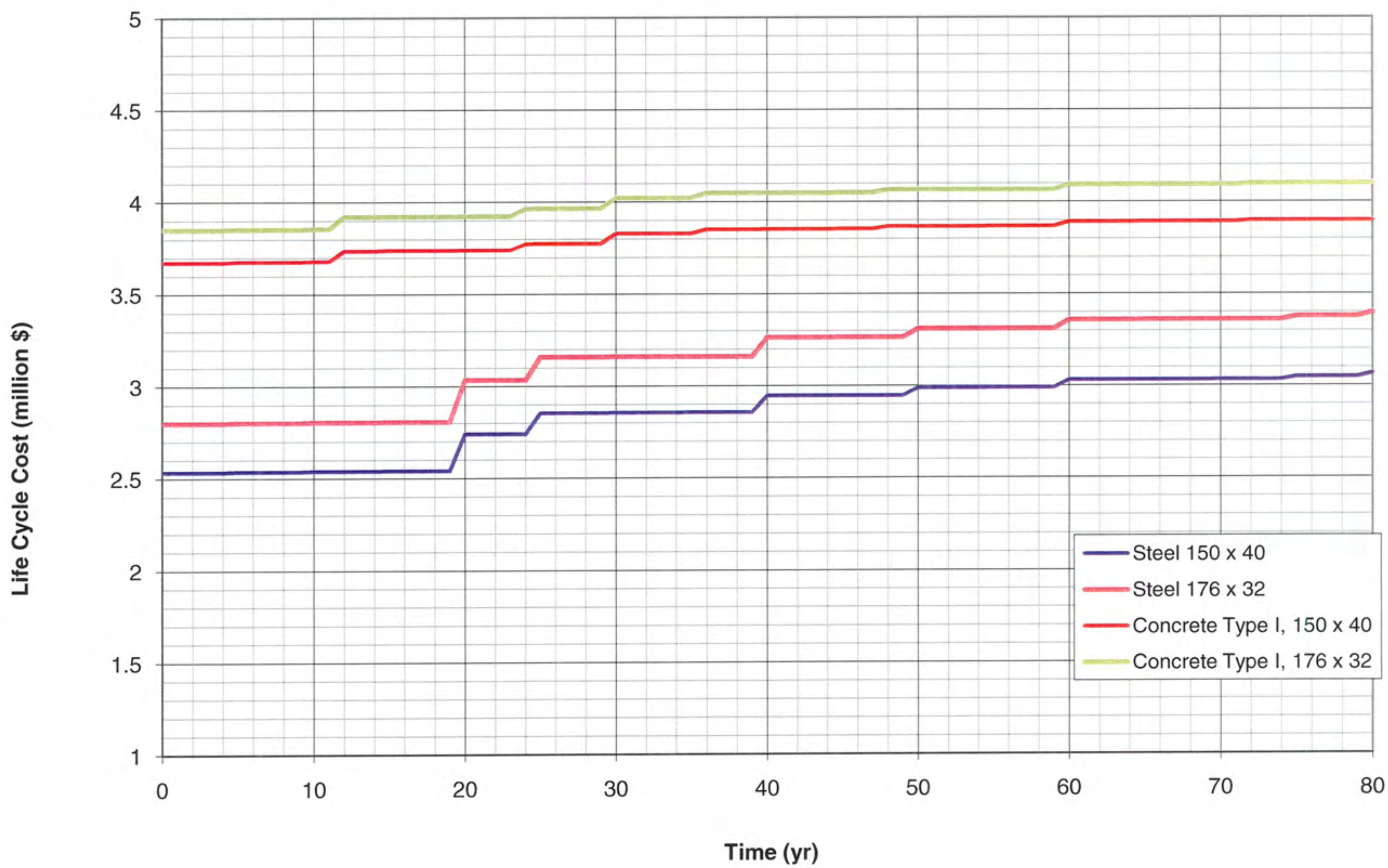


Figure 2
Total Coating Cost for a 150' x 40' Steel Tank
4% Discount, Constant Exterior Recoating Interval of 25 yrs

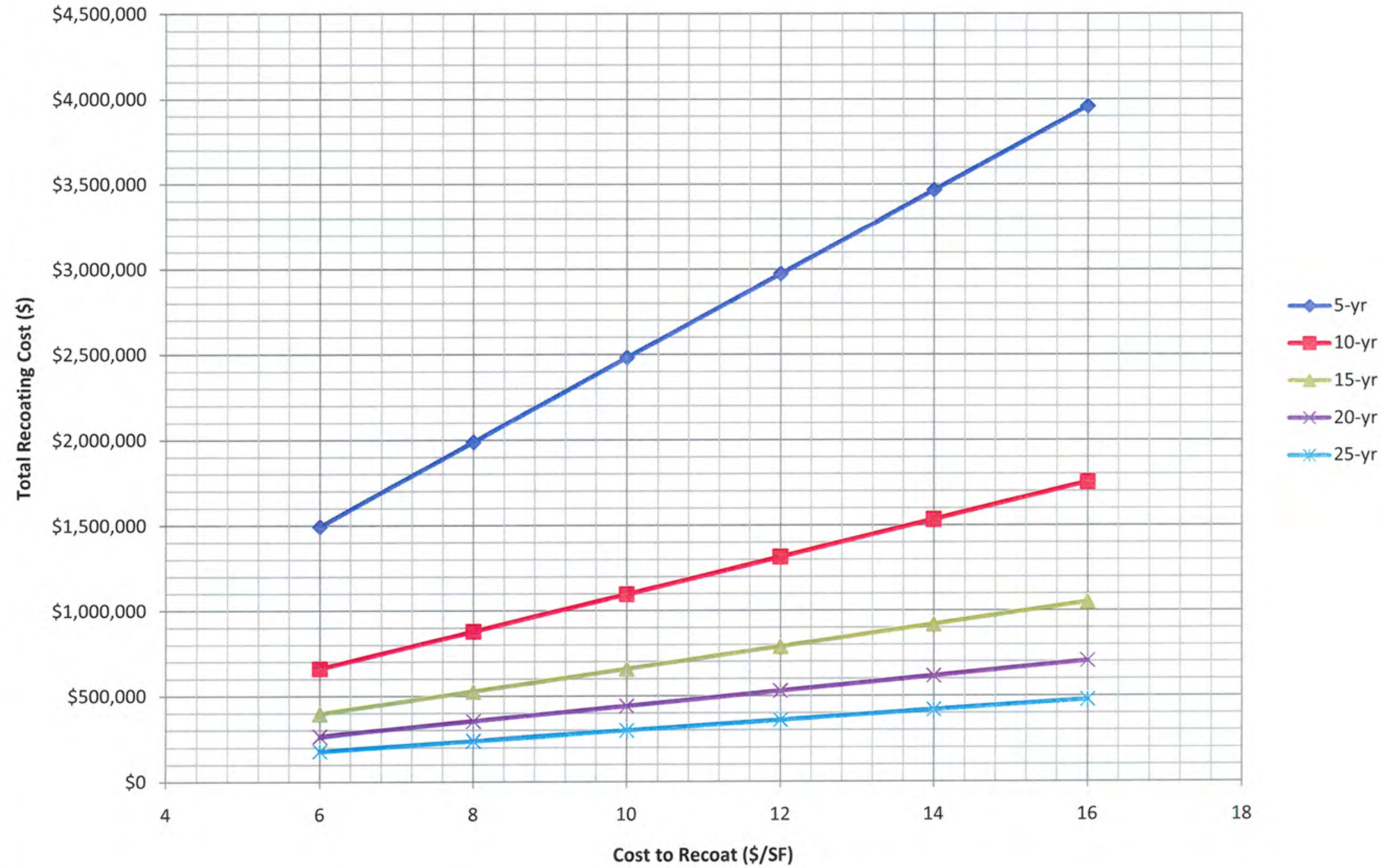


Table 4, below, gives a summary of estimated tank construction and operations and maintenance costs. As indicated, for an above ground installation, an AWWA D100, 156 ft by 40 ft, welded steel tank has the lowest estimated life cycle cost of $0.57 per gallon. Again from Table 3, for a partially buried application, a Type I, 156 ft by 40 ft pre-stressed concrete tank has the lowest estimated life cycle cost at $0.76 per gallon.

OPERATIONS AND MAINTENANCE (O&M)

A buried concrete tank will require access vaults for inlet and outlet piping. If the piping is at significant depth, e.g. in excess of 15 ft, then additional cost is incurred with vault construction and installation of piping at depth. Deeply buried vaults and pipes can make maintenance of the system more difficult for District staff if internal safety standards or CAL/OSHA treat the vault as a confined space. Additional cost will also be incurred if the roof structure of the reservoir must accept traffic loads. For this analysis, Webb assumes no traffic loading on the roof with a dome roof on the tank. A domed roof helps keep water off of the tank structure which inhibits the creation of a corrosion path into the tank roof due to water ponding. A flat roof is also an option on the concrete tank at an additional cost (See **Appendix A**). A flat roof must be properly designed to shed water quickly.

No operational distinction exists between a welded steel tank and a concrete tank with respect to water quality benefits or utilization of the full tank capacity provided that proper engineering analysis is done to assure full mixing of the tank volume as a result of sufficient number and proper placement of inlet and outlet nozzles along with tank operation. Differences in dead volumes between the two types will depend on final inlet/outlet location and configuration.

Non-Cost

Non-cost factors influencing the choice between a welded steel and concrete tank include ease of site acquisition, operational flexibility, ease of maintenance, constructability, and contractor experience. The site acquisition process for each tank type is assumed to be the same as each site should undergo to same preliminary investigation process prior to purchase consideration. The purchase price is invariant with respect to tank type. No distinction exists between a welded steel tank and a concrete one with respect to hydraulics and operational flexibility except for the different recoating intervals resulting in different down time intervals. A welded steel tank will be out of service between 4 and 6 months for recoating, having potential significant operational impact during the recoating period.

With a uniform backfill, little or no additional structural enhancement of the concrete tank should be necessary for partially buried or fully buried concrete tank.

Table 4 - Cost Comparison for AWWA D110-04 Type I, Pre-stressed Concrete Tank with AWWA D100-05 Welded Steel Tank

Material Type	Internal Diameter (ft)	High Water Level (ft)	Buried	Construction Cost Tank Only [(1)]	Project Overhead (40% of construction cost)	Total Project Cost	Total O&M [(2)]	Life Cycle Cost [(3)]	Useable Volume (MG) [(4)]	Life Cycle Cost per Gallon of Useable Volume ($/gal) [(4)]
Steel	176	32	N	$2,000,000	$800,000	$2,800,000	$600,195	$3,547,989	5.630	0.630
Concrete Type I	176	32	N	$2,750,000	$1,100,000	$3,850,000	$252,175	$4,468,157	5.630	0.794
Steel	150	40	N	$1,810,000	$724,000	$2,534,000	$534,339	$3,202,093	5.630	0.569
Concrete Type I	156	40	N	$2,625,000	$1,050,000	$3,675,000	$225,597	$4,249,944	5.630	0.755

Material Type	Internal Diameter (ft)	High Water Level (ft)	Buried 15 ft Below Finished Grade [(7)]	Construction Cost Tank Only [(5), (6)]	Project Overhead (40% of construction cost)	Total Project Cost	Total O&M [(2)]	Life Cycle Cost [(3)]	Useable Volume (MG) [(4)]	Life Cycle Cost per Gallon of Useable Volume ($/gal) [(4)]
Concrete Type I	176	32	Y	$2,774,277	$1,109,711	$3,883,988	$252,175	$4,505,376	5.630	0.800
Concrete Type I	156	40	Y	$2,649,277	$1,059,711	$3,708,988	$225,597	$4,287,162	5.630	0.761

Notes:

(1) Concrete tank cost based upon DN Tank data provided to Webb on 25 February 2011. Concrete tank quote includes: standard spread footing; dome roof; Six-inch membrane slab; hatch; vent; and overflow small piping appurtenances. An assumed additional $100,000 was added to the estimated tank cost from DN for the addition of a spiral staircase and three intermediate landings for each concrete tank. This figure does not include site work or additional tank accessories such as a staircase and 360 degree hand railing. Steel tank costs based upon 7 March 2011 and 14 March 2011 Paso Robles Tank quote and includes: foundation; tank; coatings; sealed welded roof; 360 degree hand railing; (1) center vent and (5) perimeter roof vents; spiral stairway with (3) intermediate platforms; flush cleanout. Steel tank quotation also includes coating dehumidification at an additional cost of $48,000. An additional $75,000 was added to the construction cost for cathodic protection.

(2) Assuming 20-yr maintenance interval for recoating of interior of steel tank at $0.20/gal or $4/SF per EMWD (16 March 2011). Steel tank exterior recoat every 25 years. Maintenance costs are brought back to present value assuming 4% inflation rate. See Appendix B. Per manufacturer (Preload, Inc.) power was of tank exterior every 12 years is recommended. For buried concrete tanks this cost was also included as there will be some structure maintenance.

(3) Cost to construct tank plus O & M over an assumed 80-yr service life.

(4) The tank volume is a nominal value used for planning purposes only.

(5) Cost includes (4) 8 ft x 8 ft x 8 ft vaults with the vault top 6 ft below finished grade. Assume one vault each for inlet, outlet and two manways. Vault access through 60 IN manhole. Cost to excavate beyond depth

(6) 60 IN manhole = 10035.05/8267.19*$5000 (Webb 2005-0025 Engineer's Estimate with ENR (LA) escalator from May 2005 to March 2011); 72 IN x 72 IN vault ratio up to 96 IN x 96 IN = 10035.05/8267.19*$7500 (Webb 2005-0025 Engineer's Estimate with ENR (LA) escalator from May 2005 to March 2011).

(7) Assumes tank is uniformly buried (DN Tank 14 March 2011). If tank has differential backfill, the cost to construct increases (DN Tank, 14 March 2011).

(8) Price for concrete tank assumes project is bid in 2011.

A maintenance free tank does not exist. Each tank type will require periodic inspection, cleaning, site upkeep, and recoating. Each tank type is assumed able to be constructed on an appropriately configured site by an experienced, competent contractor. Contractor experience with the specific tank type and design standard is a key to a successful project. No exceptions to contractor experience should be made for a reduced project price.

Key Disadvantages of Concrete tanks

The primary disadvantages of the above ground concrete tank are more expensive initial cost and a longer construction period than a comparable welded steel tank. A concrete tank will also be more costly to modify if regulatory requirements change for minimum access opening size, access ladders or seismic standards. At the end of the tank's service life, demolition costs for a concrete tank will likely be higher than for a welded steel tank.

A partially buried concrete tank will likely have a greater daylight distance from the tank discharge to an existing or proposed system connection point because of the increased start depth. The result could be higher connection costs. Accessing tank appurtenances will require using deep vaults. Gravity draining a buried concrete tank could also pose operational challenges if the drain point is located off-site.

Concrete tanks have a tendency to leak over their expected lifecycle. Spot or local repairs can be done if leaks are located or liners can be installed covering the entire tank interior.

APPENDIX A

From:	Peacock, Kevin [kpeacock@Natgun.com]
Sent:	Wednesday, April 20, 2011 9:03 PM
To:	James Baker
Cc:	Peacock, Kevin
Subject:	RE: Vista/Ellis 5.63 MG Tank - Spiral Staircase Estimates

Hi Jed,

Estimates are as follows:

- 32' (vertical height) aluminum exterior spiral staircase budget estimate is $64,000.00
- 40' (vertical height) aluminum exterior spiral staircase budget estimate is $80,000.00
- (3) aluminum landings at approximately 9 sq ft per landing budget estimate is $9,000.00

If you have any comments or questions feel free to email me or call me at 949-698-2740.

Best Regards,

Kevin

Kevin Peacock | Regional Manager
Office: 949 585 5111 | Fax: 949 585 51[illegible]
Cell: 949-698-2740

kpeacock@natgun.com

Natgun Corporation | California Office | A Division of DN Tanks

101 Pacifica Drive, Suite 250 | Irvine, CA 92618 | www.natgun.com

From: James Baker [mailto:james.baker@webbassociates.com]
Sent: Wednesday, April 20, 2011 11:30 AM
To: Peacock, Kevin
Subject: Vista/Ellis 5.63 MG Tank

Hi Kevin,
Can you please give me a rough estimate of how much a spiral stairway with three (3) intermediate platforms would add to the cost estimate for each tank?

Thanks,
Jed

James "Jed" Baker
Associate Engineer
Albert A. **WEBB** Associates
T. 951.320.6062

DYK INCORPORATED

ADDRESS: 351 CYPRESS LANE • EL CAJON, CA 92020 • MAILING: P.O. BOX 696 • EL CAJON, CA 92022-0696
PHONE: (619) 440-8181 • FAX: (619) 440-8653 • WEB: WWW.DYK.COM • EMAIL: DYKINC@DYK.COM

March 15, 2011

Brad Sackett, P.E.
Albert A. Webb Associates
3788 McCray Street
Riverside, CA 92506

REFERENCE: Proposed 5.63 MG Water Storage Tank
Eastern Municipal Water District – Ellis Pressure Zone
Prestressed Concrete Tank Budget Letter

Dear Mr. Sackett:

Thank you for your interest in prestressed concrete water storage tanks. We have provided below budgeting for the proposed Ellis Pressure Zone 5.63 MG tank.

	5.63 MG Option 1	**5.63 MG Option 2**
ID (ft)	176'	156'
SWD (ft)	32'	40'
Sloshing (ft)	6.33'	8'
AWWA D110 Type I Prestressed Concrete Tank		
Freeboard (ft)	5'	5'
Budget (Flat Slab Roof)	$2,850,000.00	$2,700,000.00
Budget (Dome Roof)	$2,750,000.00	$2,600,000.00

These budget-estimating figures include the tank complete with a standard spread footing, 6" membrane slab, hatch, vent, and overflow and small piping appurtenances. If a deep foundation is required this budget may need to be re-evaluated. The figures do not include site work or additional tank accessories. Local, state, and federal taxes, if applicable, are not included in the above price. The budget estimates assume the project will be bid in the 2011 calendar year.

The above tank is designed and constructed in accordance with AWWA standard D110, ASCE 7-05, CBC, and National Standards.

Thank you for this opportunity to be of service. Please feel free to contact me if you have any questions or if I can be of any further assistance.

Sincerely,

DYK INC. / NATGUN CORPORATION
Divisions of DN Tanks

Kevin Peacock

Kevin G. Peacock
Regional Manager
101 Pacifica, Suite 250
Irvine, CA 92618
Direct: 949-698-2740
Email: kpeacock@natgun.com

James Baker

From: Peacock, Kevin [kpeacock@Natgun.com]
Sent: Sunday, March 13, 2011 8:55 PM
To: James Baker; Greg Tseng
Cc: Peacock, Kevin
Subject: RE: 5.63 MG Tank @ 1720S Pressure Zone - Sloshing Height Information
Attachments: Sloshing Height Calculations 176' ID - 32' SWD.pdf; Sloshing Height Calculations 156' ID - 40' SWD.pdf

Jed,

Attached please find two attachments providing a summary of the approximate sloshing heights for the two size tank options you are considering for EMWD 1720 pressure zone. The sloshing height summary sheet provides sloshing height calculated in both AWWA D110-04 and ASCE 7-05. Also provided in each attachment is a print out from USGS with the site specific Ss and S1 as determined by the provided latitude and longitude below. Please considering the following:

- For tank option 1 – 176' ID x 32' SWD – sloshing heights were calculated of 37.25" and 75.77" utilizing AWWA D110-04 and ASCE 7-05 respectively. With this in mind ASCE 7-05 controls with a sloshing height of 75.77" or 6.31'. One of the benefits of prestressed concrete tanks, is a portion of the sloshing loads can be resisted by the concrete roof. Sloshing heights can be reduced anywhere from 2'-5' respectively. For budgeting purposes we have assumed that the roof can resist approximately 3.5' of the sloshing wave. With the sloshing wave calculated at 6.31', and the roof able to resist 3.5' the required freeboard height would be +/- 3'. The budget letter provided on 02-25-11 accounted for the 3' of freeboard.
- For tank option 2 – 156' ID x 40' SWD – sloshing heights were calculated of 48.94" and 95.55" utilizing AWWA D110-04 and ASCE 7-05 respectively. With this in mind ASCE 7-05 controls with a sloshing height of 95.55" or 7.96'. One of the benefits of prestressed concrete tanks, is a portion of the sloshing loads can be resisted by the concrete roof. Sloshing heights can be reduced anywhere from 2'-5' respectively. For budgeting purposes we have assumed that the roof can resist approximately 3.5' of the sloshing wave. With the sloshing wave calculated at 7.96', and the roof able to resist 3.5' the required freeboard height would be +/- 4.5'. The budget letter provided on 02-25-11 accounted for the 4.5' of freeboard.

If you have any questions on the attached information please feel free to email me or call me directly at 949-698-2740.

Best Regards,

Kevin

Kevin Peacock | Regional Manager
Office: 949.585.5111 | Fax: 949.585.5113
Cell: 949-698-2740

kpeacock@natgun.com

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From: James Baker [mailto:james.baker@webbassociates.com]
Sent: Friday, March 11, 2011 9:41 AM
To: Peacock, Kevin; Greg Tseng
Subject: 5.63 MG Tank @ 1720S Pressure Zone

Hi Kevin and Greg,

NATGUN CORPORATION

Design Engineers and Contractors

Prospect Name: Sun City, CA
Tank Dimensions: 176.00' ID - 32' SWD
Date: 3/13/2011
Run By: KGP

Sloshing Height Calculation (ASCE 7 vs. AWWA D110) :

Maximum Sloshing Height, d Per AWWA D110

$d = ZIC_Cr$ — AWWA D110-04 (Eq. 4-39)

$d =$ 47.28 in.

but need not exceed:

$$d = \frac{3r\coth\left(\sqrt{3.375}\,\frac{H}{r}\right)}{\frac{6T_C^2}{ZIC_Cr} - \sqrt{54}}$$

AWWA D110-04 (Eq. 4-40)

$d =$ 37.25 in.

Maximum Sloshing Height, δ_s Per ASCE 7-05

$\delta_s = 0.5D_i\,I\,Sac$ — ASCE 7-05 (15.7-13)

$$\text{For } T_C \le T_L;\ S_{ac} = \frac{1.5S_{D1}}{T_C} \le 1.5S_{DS}$$

$$\text{For } T_C > T_L;\ S_{ac} = \frac{1.5S_{D1}T_L}{T_C^2}$$

$S_{ac} =$ 0.07

$\delta_s =$ 6.31 ft. — ASCE 7-05 (15.7.6.1)

$\delta_s =$ 75.77 in.

Sloshing Height: Summary

Sloshing height per AWWA D110:

$d =$ 37.25 in.

Sloshing height per ASCE 7:

$\delta_s =$ 75.77 in.

Maximum sloshing height (ASCE 7 governs):

$d =$ 75.77 in.

NATGUN CORPORATION

Design Engineers and Contractors

Prospect Name: Sun City, CA
Tank Dimensions: 156.00' ID - 40' SWD
Date: 3/13/2011
Run By: KGP

Sloshing Height Calculation (ASCE 7 vs. AWWA D110) :

Maximum Sloshing Height, d Per AWWA D110

$d = ZIC_Cr$ — AWWA D110-04 (Eq. 4-39)

$d =$ 59.63 in.

but need not exceed:

$$d = \frac{3r\coth\left(\sqrt{3.375}\frac{H}{r}\right)}{\frac{6T_C^2}{ZIC_Cr} - \sqrt{54}}$$ AWWA D110-04 (Eq. 4-40)

$d =$ 48.94 in.

Maximum Sloshing Height, δ_s Per ASCE 7-05

$\delta_s = 0.5D_i\ I\ Sac$ — ASCE 7-05 (15.7-13)

$$\text{For } T_C \le T_L;\ S_{ac} = \frac{1.5S_{D1}}{T_C} \le 1.5S_{DS}$$

$$\text{For } T_C > T_L;\ S_{ac} = \frac{1.5S_{D1}T_L}{T_C^2}$$

$S_{ac} =$ 0.10

$\delta_s =$ 7.96 ft. — ASCE 7-05 (15.7.6.1)

$\delta_s =$ 95.55 in.

Sloshing Height: Summary

Sloshing height per AWWA D110:

$d =$ 48.94 in.

Sloshing height per ASCE 7:

$\delta_s =$ 95.55 in.

Maximum sloshing height (ASCE 7 governs):

$d =$ 95.55 in.

Conterminous 48 States
2003 NEHRP Seismic Design Provisions
Latitude = 33.768588
Longitude = -117.13917
Spectral Response Accelerations Ss and S1
Ss and S1 = Mapped Spectral Acceleration Values
Site Class B - Fa = 1.0 ,Fv = 1.0
Data are based on a 0.01 deg grid spacing

Period	Sa
(sec)	(g)
0.2	1.500 (Ss, Site Class B)
1.0	0.600 (S1, Site Class B)

James Baker

From:	Larry Wombles [larry@pasoroblestank.com]
Sent:	Monday, March 14, 2011 10:27 AM
To:	James Baker
Subject:	RE: Eastern Proposal

150 diameter x 40' shell high + 3' radius knuckle

- Foundation $149,800.00
- Tank $1,080,780.00
- Coatings $435,200.00

Larry Wombles

ASSOCIATED CONSTRUCTION & ENGINEERING INC.
RSH Construction Inc. / Canyon Springs Enterprises Inc.
Paso Robles Tank Inc.
West Coast Industrial Coatings Inc.

SSPC QP1 & QP2 · Steel Plate Fabricators Association · STI Steel Tank Institute

SAFETY + QUALITY = PRODUCTION
3883 Wentworth Drive
Hemet, CA 92545
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e-mail: LWombles@pasoroblestank.com
Company E-mail: www.Pasoroblestank.com

ONE NATION UNDER GOD & IN GOD WE TRUST!

From: James Baker [mailto:james.baker@webbassociates.com]
Sent: Friday, March 11, 2011 3:02 PM
To: Larry Wombles
Subject: RE: Eastern Proposal

Hi Larry,
What's the cost look like if we have a 154' x 40' with a 3' knuckle assuming everything else that can stay the same does?

Thanks,
Jed

James "Jed" Baker

Associate Engineer
Albert A. WEBB Associates
T. 951.320.6062

From: Larry Wombles [mailto:larry@pasoroblestank.com]
Sent: Monday, March 07, 2011 4:42 PM
To: James Baker
Subject: RE: Eastern Proposal

172' diameter x 36' shell high + 3' radius knuckle

- Foundation $178,800.00
- Tank $1,205,300.00
- Coatings $500,325.00

Clarifications

- Above numbers are budget numbers based upon today pricing and market conditions.
- Includes prevailing wages with certified payroll
- Schedule
    - Submittals 04 weeks
    - Owner approval TBD
    - Material procurement 10-12 weeks
    - Shop fab & priming 08-12 weeks (Depends on season)
    - Field erection 14-16 weeks
    - Field coatings 10-12 weeks
- No Dehumidification – Add $48,000.00 for DH and reduce field coatings to 09-11 weeks.

Should you need any other assistance, please do not hesitate to call me at 951-925-2288.

Larry Wombles

ASSOCIATED CONSTRUCTION & ENGINEERING INC.
RSH Construction Inc. / Canyon Springs Enterprises Inc.
Paso Robles Tank Inc.
West Coast Industrial Coatings Inc.

SAFETY + QUALITY = PRODUCTION

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Company E-mail: www.Pasoroblestank.com

ONE NATION UNDER GOD & IN GOD WE TRUST!

From: James Baker [mailto:james.baker@webbassociates.com]
Sent: Monday, March 07, 2011 4:10 PM
To: Larry Wombles
Subject: FW: Eastern Proposal

Hi Larry,
I was speaking with Dave Algranti today and he suggested I contact you. When you have a chance, could you please give us a hand with a budgetary cost estimate for a 172' X 36' + 3' knuckle steel tank similar to the one you gave Chris, below? This one is for EMWD too. Please don't hesitate to contact me if I can get you any additional information.

Regards,
Jed

James "Jed" Baker
Associate Engineer
Albert A. **WEBB** Associates
T. 951.320.6062

ALBERT A. WEBB ASSOCIATES

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History. Consistency. Progress.

From: Chris Bartleman
Sent: Monday, March 07, 2011 1:35 PM
To: James Baker
Cc: Brad Sackett
Subject: FW: Eastern Proposal

Jed,

Please see below information regarding tank costs.

Regards,

Chris Bartleman
Assistant Engineer
Albert A. **WEBB** Associates
T. 951.248.4290

From: Larry Wombles [mailto:larry@pasoroblestank.com]
Sent: Monday, September 27, 2010 11:31 AM
To: Chris Bartleman
Subject: RE: Eastern Proposal

Probably same pricing as 32' as when you get over 32, then additional safety needs come into play and then cost starts to get much closer. You could probably deduct another $50,000 to go to 40'

Larry Wombles
Paso Robles Tank Inc.

West Coast Industrial Coatings
SSPC QP-1 Contractor

3883 Wentworth Drive
Hemet, CA 92545
Phone: 951-925-2288 / Fax: 951-925-1288
e-mail: LWombles@pasoroblestank.com
Company E-mail: www.Pasoroblestank.com

ONE NATION UNDER GOD & IN GOD WE TRUST!

From: Chris Bartleman [mailto:Chris.Bartleman@webbassociates.com]
Sent: Monday, September 27, 2010 11:24 AM
To: Larry Wombles
Subject: RE: Eastern Proposal

Thanks Larry, I assume a 40' tall tank would even be more economical?

Chris Bartleman
Assistant Engineer
ALBERT A. **WEBB** ASSOCIATES

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From: Larry Wombles [mailto:larry@pasoroblestank.com]
Sent: Monday, September 27, 2010 11:08 AM
To: Chris Bartleman
Subject: RE: Eastern Proposal

Chris,
A good budget number for each tank would be as follows (via Eastern MWD standards):

- 200 x 24 + 3 knuckle = $2,195,250.00 (tank and tank painting)

- 176 x 32 + 3 knuckle = $1,915,125.00 (tank and tank painting)

Clarifications:

- Eastern MWD standards
  - SAFETY – SAFETY - SAFETY
  - Tank
    - AWWA D100-05 standards with section 14
    - Seal welded roof
    - 360 degree hand railing
    - (1) center vent and (5) perimeter roof vents
    - Spiral stairway with (3) intermediate platforms
    - Flush Cleanout
  - Coatings
    - Dehumidification
    - Paid for Shop coatings inspection
    - Exterior dust control
    - Check and see if they are going to SSPC QP1 and QP2 Coatings contractors... I heard they were.

Larry Wombles
Paso Robles Tank Inc.

West Coast Industrial Coatings
SSPC QP-1 Contractor

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Company E-mail: www.Pasoroblestank.com

ONE NATION UNDER GOD & IN GOD WE TRUST!

From: Chris Bartleman [mailto:Chris.Bartleman@webbassociates.com]
Sent: Monday, September 27, 2010 10:32 AM
To: Larry Wombles
Subject: Eastern Proposal

Larry,

I'm working on a proposal to EMWD for a 5.63 MG tank in Menifee. I'm using a budgetary cost of $4,335,100 for a 206.5' dia. X 24' tall (knuckle roof) welded steel reservoir. Would a 176' dia. X 32' tall (knuckle roof) have the same cost?

Thanks,

Chris Bartleman
Assistant Engineer

ALBERT A. WEBB ASSOCIATES

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A L B E R T A. WEBB A S S O C I A T E S

ANALYSIS OF STEEL WATER STORAGE TANKS (AWWA D-100-05)

Ground Supported Flat-Bottom Tanks (Sec. 13.5)

Version 1.2

Tank: **MITTRY TANK (NEW)**

Date Prepared:	4/20/2011
Work Order:	2011-0007
Preparer:	EAP
Client / Job Name:	EMWD
Description:	NEW TANK
Scenario:	**Anchored Condition**

GENERAL INFORMATION

D = Tank Diameter = 172.0 ft
H = TCL = Top Capacity Level (Lip of Overflow) = 32.0 ft
Ht = Total height of tank shell = 36.0 ft
Number of shell rings = 4
Tank Capacity = 5,561,582 gal

Type of Tank? New Tank

Type of Foundation? Reinforced Concrete (Type V)

Specific gravity = G = 1.0
E = Steel Modulus of eleasticity = 29,000,000 psi
D / H = 5.38
γ_w = 62.4 pcf
Steel Density = 490.0 pcf

Cylindrical Shell Plates

t (in) = required design shell plate thickness $t = \frac{2.6 h_p D G}{s E_J}$ Eq. 3-40

E_J = Joint efficiency as described in Section 3.7 = 100% Ok Table 15

Design Criteria:

1. Existing Tank - AWWA D-100 (GENERIC)
2. Existing Tank designed using (Old) AWWA Appendix C
3. AWWA D-100-05 per Table 1 and Tables 4 through 9 (GENERIC)
4. AWWA D100-05 (Section 14)

HYDROSTATIC SHELL ANALYSIS

Minimum thickness of cylindrical shell plates in contact with water per Table 16 = 0.3125 in

Ring	Height (ft)	Water Height (ft)	Design Criteria	Steel Designation	(s) Allow. Stress (1) (psi)	Min. Calculated Thickness(2) (in)	Governing Thickness (in)	(t) Design or Actual Thickness (in)	Comment
Bottom	10.00	32.0	3	ASTM A36	15,000	0.9540	0.9540	1.0625	Ok
2nd	10.00	22.00	3	ASTM A36	15,000	0.6559	0.6559	0.8125	Ok
3rd	8.00	12.00	3	ASTM A36	15,000	0.3578	0.3578	0.5000	Ok
4th	8.00	4.00	3	ASTM A36	15,000	0.1193	0.3125	0.3125	Ok
5th		N/A			N/A	N/A	N/A		
6th		N/A			N/A	N/A	N/A		
7th		N/A			N/A	N/A	N/A		
8th		N/A			N/A	N/A	N/A		

(1) Excluding Joint Efficiency (2) Thickness Reflects Inclusion of Joint Effciency for non-section 14 tanks only.

Structure Weights

$$Wshell = \pi D \cdot H_{ring}(t/12) \cdot 490\,pcf$$

Bottom Ring	Wring	=	234,435	Lb
2nd Ring	Wring	=	179,274	Lb
3rd Ring	Wring	=	88,258	Lb
4th Ring	Wring	=	55,161	Lb
5th Ring	Wring	=	0	Lb
6th Ring	Wring	=	0	Lb
7th Ring	Wring	=	0	Lb
8th Ring	Wring	=	0	Lb
	Σ Ws	=	557,127	Lb

$$Wroof = (\pi D^2/4)(t/12) \cdot 490\,pcf$$

Roof Plate t (in) = 0.1875 — Wroof plate = 177,895 Lb
Roof Rafters are assumed to be 33% of Roof Plate Weight — Weight of rafters = 58,705 Lb (Assumption)
Total Weight of Roof = 236,600 Lb

$$Wbottom = (\pi D^2/4)(t/12) \cdot 490\,pcf$$

Tank Bottom t (in) = 0.5000 — Wf = 474,386 Lb

SEISMIC DESIGN OF STEEL WATER STORAGE TANKS (AWWA D-100-05, Section 13)

Acceleration Parameters

Name: N/A

Information from:
- ☑ Geotechnical Engineer
- ☐ ASCE 7-05 and AWWA D-100-05 Maps and Tables
- ☐ USGS - NSHMP Hazard Maps & Earthquake Ground Motion Parameter Calculator

Site Coordinates:
- Latitude = 33.7686
- Longitude = -117.1392

S_S = Mapped acceleration, 5% damped at 0.2 sec period	=	1.500	g	ASCE 7-05
S_1 = Mapped acceleration, 5% damped at 1.0 sec period	=	0.600	g	ASCE 7-05
Site Class ☑ Assumption ☐ Determined	=	B		Section 13.2
Fa = Site coefficient for 0.2 sec period	=	1.00		
Fv = Site coefficient for 1.0 sec period	=	1.00		
Seismic use group	=	III		Section 13.2.1
I_E = Seismic Importance factor	=	1.50		Table 24
Ri = Impulsive response modification factor (Self-Anchored)	=	2.50		Table 28
Rc = Convective response modification factor	=	1.50		Table 28
S_{MS} = Fa * Ss = MCE Spectral response acceleration for 0.2 sec period	=	1.50	g	Section 13.2.7.2
S_{M1} = Fv * S_1 = MCE Spectral response acceleration for 1.0 sec period	=	0.60	g	Section 13.2.7.2

Design Response Spectra

Design Response Spectral Acceleration	AWWA General Procedure (Sec. 13.2.7)	80% of General Procedure (Sec. 13.2.8.6)	Probabilistic 10% in 100 years
PGA		0.000	
S_{DS} = Sai	1.000	0.800	
S_{D1}	0.400	0.320	

S_{DS} = Design spectral response acceleration for 0.2 sec period

S_{D1} = Design spectral response acceleration for 1.0 sec period

Design Response Spectra Procedure for Impulsive Component (Ai) ? AWWA Gen. Procedure

Design Response Spectra Procedure for Convective Component (Ac) ? 80% of Gen Procedure

Design Spectral Response Acceleration for Impulsive Components

Ti= Natural period of the structure	=	0.00	sec	Section 13.5.1
Ts = S_{D1} / S_{DS}	=	0.40	sec	Section 13.2.7.3.1
T_L = Region dependant transition period	=	8.00	sec	ASCE 7-05

Sai = Design response spectrum for impulsive components (5% damping)

For	$0 \le Ti \le Ts$	$Sai = S_{DS}$	=	1.00	g	Eq. 13-9	Governs
For	$Ts \le Ti \le T_L$	$Sai = S_{D1}/Ti \le S_{DS}$	=	N/A	g	Eq. 13-10	
For	$Ti > T_L$	$Sai = T_L S_{D1}/Ti^2$	=	N/A	g	Eq. 13-11	

Design Spectral Response Acceleration for Convective Components

Tc = First mode sloshing wave period $Tc = 2\pi\sqrt{\dfrac{D}{3.68 \cdot g \cdot \tanh\left(\dfrac{3.68H}{D}\right)}}$ = 9.82 sec Section 13.5

K = Damping scaling factor = 1.50

Sac = Design response spectrum for convective components (0.5% damping)

For	$Tc \le T_L$	$Sac = KS_{D1}/Tc \le S_{DS}$	=	N/A	g	Eq. 13-12	
For	$Tc > T_L$	$Sac = KT_L S_{D1}/Tc^2$	=	0.04	g	Eq. 13-13	Governs

Horizontal Design Accelerations

Ai = Impulsive design acceleration

$$Ai = Soi \cdot I_E / 1.4Ri \geq 0.36 S_1 I_E / Ri \quad = 0.429 \text{ g} \quad \text{Eq. 13-17}$$
$$\geq 0.130$$

Select Ai for Design
Ai = $\boxed{0.430}$ g Ok

Ac = Convective design acceleration $Ac = Sac \cdot I_E / 1.4Rc$ = 0.028 g Eq. 13-18

Design Overturning Moment at Bottom of Shell

W_T = Total weight of tank contents $W_T = 62.4GH(\pi D^2/4) = 49GHD^2$ = 46,387,712 Lb Eq. 13-27

For $D/H \geq 1.333$ Governs

Wi = Effective impulsive weight $Wi = \dfrac{\tanh(0.866\,D/H)}{0.866\,D/H} W_T$ = 9,963,867 Lb Eq. 13-24

Xi = Height from bottom of shell to centroid of lateral seismic force

$Xi = 0.375H$ = 12.00 ft Eq. 13-28

For $D/H < 1.333$ False

Wi = Effective impulsive weight $Wi = (1.0 - 0.218D/H)W_T$ = N/A Lb Eq. 13-25

Xi = Height from bottom of shell to centroid of lateral seismic force applied to the impulsive effective weight

$Xi = (0.5 - 0.094D/H)H$ = N/A ft Eq. 13-29

For all proportions of D/H

Wc = Effective convective weight $Wc = 0.230 \dfrac{D}{H} \tanh\left(\dfrac{3.67H}{D}\right) W_T$ = 34,025,619 Lb Eq. 13-26

Xc = Height from bottom of shell to centroid of lateral seismic force applied to the convective effective weight

$$Xc = \left[1.0 - \frac{\cosh(3.67H/D) - 1}{(3.67H/D)\sinh(3.67H/D)}\right] H \quad = 16.59 \text{ ft} \quad \text{Eq. 13-30}$$

Xs = Height from the bottom of the shell to the center of gravity of the shell = 13.90 ft

Ms = Design overturning moment at the bottom of the shell caused by horizontal design acceleration

$Ms = \sqrt{[Ai(WsXs + WrHt + WiXi)]^2 + [AcWcXc]^2}$ Ms (Self-Anchored) = **60,576,109** Lb-ft Eq. 13-23

Ms' (Mechanically Anchored) = **N/A** Lb-ft Eq. 13-23

Design Shear at Top of Foundation (Seismic Base Shear)

Vf = Design shear at top of foundation due to horizontal design acceleration

$$Vf = \sqrt{[Ai(Ws + Wr + Wf + Wi)^2 + [AcWc]^2]} \quad = 4,925,857 \text{ Lb} \quad \text{Eq. 13-31}$$

RESISTANCE TO OVERTURNING (Checking Uplift)

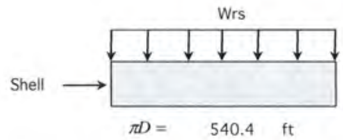
Fy = Minimum specified yield strength of bottom annulus = 30,000 psi (Assumption)

W_L = Maximum resisting weight of tank contents used to resist the shell overturning moment

$$W_L = 7.9 t_b \sqrt{Fy \cdot H \cdot G} \le 1.28 H \cdot D \cdot G$$

	=	3,870.19	Lb-ft Eq. 13-37
	≤	7,045.12	Lb-ft
Ok, Use WL =		3,870.19	Lb-ft

Wrs = Roof load acting on the shell = 145.95 Lb/ft (Assumption)



wt = Weight of the tank shell and portion of the roof reacting on the shell

$$w_t = \frac{Ws}{\pi D} + w_{rs}$$ = 1177.0 Lb/ft Eq. 13-41

Av = Vertical acceleration — The largest of

$Av = 0.14 \cdot S_{DS}$	=	0.14	g
0.50 Ai	=	0.22	g
Use Av	=	0.22	g

Thus, for Self -Anchored Tanks Only:

J = Overturning ratio

$$J = \frac{Ms}{D^2 \left[w_t (1 - 0.4 Av) + W_L \right]}$$ = **0.414** Eq. 13-36

J< 0.785, Therefore, No shell uplift because of the overturning (Tank is self anchored).

REMARKS:

a) AWWA Gen. Procedure was used to calculate the seismic design response spectra.

b) **Analysis performed using Ai =0.43g, Ac =0.028g and Av =0.22g**

c) 80% of Gen Procedure was used to calculate the AWWA sloshing wave height. Sloshing wave height (d) = 3.42 ft

d)

e)

f)

ANALYSIS NOTES:

a) J< 0.785, Therefore, No shell uplift because of the overturning (Tank is self anchored).

b)

c)

d) Tank is OK for seismic analysis.

e)

f)

g)

Tank: MITTRY TANK (NEW)

Scenario: Anchored Condition

HYDRODYNAMIC HOOP TENSILE STRESS (AWWA D-100-05, Section 13.5.4.2.3)

D / H = 5.38

0.75 D = 129.0 ft

Ring	(t) Design or Actual Thickness	Y (ft)	Ni (Lb/in)	Nc (Lb/in)	Nh (Lb/in)	σ_s (psi)	Fhs (psi)	F (comb) (psi)	F (allow) (psi)	Comment
Bottom	1.0625	32.0	5,324	663.4	14,310	5,855	13,469	19,323	20,000	Ok
2nd	0.8125	22.0	4,804	678.6	9,838	6,539	12,109	18,648	20,000	Ok
3rd	0.5000	12.0	3,244	725.1	5,366	7,056	10,733	17,789	20,000	Ok
4th	0.3125	4.0	1,248	786.0	1,789	4,884	5,724	10,609	20,000	Ok
5th										
6th										
7th										
8th										

Summary of Formulas

Ni= Impulsive hoop tensile force

For $D/H \geq 1.333$ $$N_i = 4.5 \cdot A_i \cdot GDH\left[\frac{Y}{H} - 0.5\left(\frac{Y}{H}\right)^2\right]\tanh\left(0.866\frac{D}{H}\right)$$ Eq. 13-43

For $D/H < 1.333$ and $Y < 0.75D$ $$N_i = 2.77 \cdot A_i \cdot GD^2\left[\frac{Y}{0.75D} - 0.5\left(\frac{Y}{0.75D}\right)^2\right]$$ Eq. 13-44

For $D/H < 1.333$ and $Y \geq 0.75D$ $$N_i = 1.39A_iGD^2$$ Eq. 13-45

Nc = Convective hoop tensile force $$N_c = \frac{0.98 \cdot A_c \cdot GD^2\cosh\left[\frac{3.68(H-Y)}{D}\right]}{\cosh\frac{3.68H}{D}}$$ Eq. 13-46

Nh = Hydrostatic hoop tensile force $$Nh = 2.6GYD$$ Section 13.5.4.2.3

$\sigma_s =$ Hydrodynamic hoop tensile stress $$\sigma_s = \frac{\sqrt{N_i^2 + N_c^2 + (Nh \cdot Av)^2}}{t_1}$$ Eq. 13-42

Fhs = Hydrostatic hoop stress $Fhs = N_h/t_s$

$F_{allowable} = 1.333 \cdot s \cdot E_j$

$F_{comb} = Fhs + \sigma_s$

Thus, $F_{comb} \leq F_{allowable}$

Tank: MITTRY TANK (NEW)

Scenario: **Anchored Condition**

SHELL COMPRESSION STRESSES (AWWA D-100-05, Section 13.5.4.2)

ts	=	1.0625	in	Is the tank mechanically anchored? No
ts/R	=	0.00103		Is critical buckling stress allowed? No
				If so, enter Factor of Safety (F.S.) 2.00

P = Hydrostatic pressure at the point of consideration $P = \gamma_w G H_w / 144$ = 13.87 psi

$(P/E)(R/t)^2$ = 0.451

$\Delta Cc =$ Pressure-stabilizing buckling coefficient

For $(P/E)(R/t)^2 \leq 0.064$ $\Delta Cc = 0.72\left[(P/E)(R/t)^2\right]^{0.84}$ = N/A Eq. 13-50

For $(P/E)(R/t)^2 > 0.064$

$\Delta Cc = 0.045 \cdot \ln\left[(P/E)(R/t)^2 + 0.0018\right] + 0.194$ = N/A Eq. 13-51

≤ 0.22

$\Delta\sigma_{cr} =$ Critical buckling stress $\Delta\sigma_{cr} = \Delta Cc E \cdot t/R$ = 0 Eq. 13-49

Longitudinal Shell Compression Stress for (No Uplift) Self or Mechanically Anchored Tanks, Section 13.5.4.2.1

For $J < 0.785$ Governs

$\sigma_a =$ Compression stress for Class 2 materials from Table 11 = 1,838 psi Section 3.4.2

$\sigma_e =$ Allowable compression stress in a seismic event

$\sigma_e = 1.333 \cdot \sigma_a$ = 2,450 psi Eq. 13-48

$\sigma_e = 1.333\left(\sigma_a + \dfrac{\Delta\sigma_{cr}}{F.S.}\right)$ = N/A psi Eq. 13-47

$\sigma_c =$ Maximum longitudinal shell compression stress

$\sigma_c = \left[w_t(1+0.4Av) + \dfrac{1.273Ms}{D^2}\right]\dfrac{1}{12t_s}$ = 305 psi Eq. 13-39

The requirement is $\sigma_e > \sigma_c$ Ok

Longitudinal Shell Compression Stress when Uplift Occurs, Section 13.5.4.2.1

For $0.785 \leq J \leq 1.54$ or $J > 1.54$ False

(t/R)c = Thickness to radius ratio at which buckling changes from elastic to inelastic

For Class 2 materials (t/R)c = 0.0035372 Section 3.4.3.1.2

F_L = Allowable local buckling compression stress per Section 3.4.3.1.2

When:

- $0 \leq t/R \leq (t/R)c$ — Elastic buckling controls — $F_L = 17.5(10^6)(t/R)\left[1 + 50{,}000(t/R)^2\right]$ = N/A psi Eq. 3-11
- $(t/R)c \leq t/R \leq 0.0125$ — Inelastic buckling controls — $F_L = 6{,}925 + 886(10^3)(t/R)$ = N/A psi Eq. 3-13
- $t/R > 0.0125$ — Plastic buckling controls — F_L = N/A psi

Then, $\sigma_a =$ Allowable compression = F_L = N/A psi

$\sigma_e =$ Allowable compression stress in a seismic event =

$\sigma_e = 1.333 \cdot \sigma_a$ = N/A

$\sigma_e = 1.333\left(\sigma_a + \dfrac{\Delta\sigma_{cr}}{F.S.}\right)$ = N/A Eq. 13-47

$\sigma_c =$ Maximum longitudinal shell compression stress

$\sigma_c = \left[\dfrac{w_t(1+0.4Av) + W_L}{0.607 - 0.18667 \cdot J^{2.3}} - W_L\right]\dfrac{1}{12t_s}$ = N/A psi Eq. 13-47

The requirement is $\sigma_e > \sigma_c$

SLOSHING WAVE HEIGHT (AWWA D-100-05, Section 13.5.4.3)

Design Response Spectra

Design Response Spectral Acceleration	AWWA General Procedure (Sec. 13.2.7)	80% of General Procedure	Site Specific <<if available>> (Sec. 13.2.8)	Probabilistic 10% in 100 years <<if available>>
S_{DS} = Sai	1.000	0.800		
S_{D1}	0.400	0.320		

Design Response Spectra Procedure? 80% of Gen Procedure

For seismic groups I and II

When	$Tc \le 4$	$A_f = KS_{D1}I_E/T_C$	=	N/A	g	Eq. 13-53
When	$Tc > 4$	$A_f = 4KS_{D1}I_E/Tc^2$	=	N/A	g	Eq. 13-54

For seismic group III

When	$Tc \le T_L$	$A_f = KS_{D1}/Tc$	=	N/A	g	Eq. 13-55	
When	$Tc > T_L$	$A_f = KS_{D1}T_L/Tc^2$	=	0.040	g	Eq. 13-56	Governs

d = Sloshing wave height above MOL $d = 0.5DA_f$ = 3.43 ft Eq. 13-52

The freeboard shall meet the requirements of Table 29 as well, Minimum freeboard = 3.43 ft

Table 29 Minimum freeboard requirements

	Seismic Use Group		
S_{DS}	I	II	III
$S_{DS} < 0.33$ g	None	None	d
$S_{DS} \ge 0.33$ g	None	$0.7d$	d

Taken from AWWA D-100-05 Page 155

Minimum freeboard above the MOL to be provided per AWWA. d = 3.43 ft

ANALYSIS OF STEEL WATER STORAGE TANKS (AWWA D-100-05)

Ground Supported Flat-Bottom Tanks (Sec. 13.5)

Version 1.2

Tank: MITTRY TANK (NEW)

Date Prepared: 4/20/2011
Work Order: 2011-0007
Preparer: EAP
Client / Job Name: EMWD
Description: NEW TANK

Scenario: **Anchored Condition**

GENERAL INFORMATION

D = Tank Diameter = 150.0 ft
H = TCL = Top Capacity Level (Lip of Overflow) = 40.0 ft
Ht = Total height of tank shell = 44.0 ft
Number of shell rings = 5
Tank Capacity = 5,287,300 gal

Type of Tank? New Tank

Type of Foundation? Reinforced Concrete (Type V)

Specific gravity = G = 1.0
E = Steel Modulus of eleasticity = 29,000,000 psi
D / H = 3.75
γ_w = 62.4 pcf
Steel Density = 490.0 pcf

Cylindrical Shell Plates

t (in) = required design shell plate thickness $t = \frac{2.6 h_p D G}{s E_J}$ Eq. 3-40

E_J = Joint efficiency as described in Section 3.7 = 100% Ok Table 15

Design Criteria:
1. Existing Tank - AWWA D-100 (GENERIC)
2. Existing Tank designed using (Old) AWWA Appendix C
3. AWWA D-100-05 per Table 1 and Tables 4 through 9 (GENERIC)
4. AWWA D100-05 (Section 14)

HYDROSTATIC SHELL ANALYSIS

Minimum thickness of cylindrical shell plates in contact with water per Table 16 = 0.3125 in

Ring	Height (ft)	Water Height (ft)	Design Criteria	Steel Designation	(s) Allow. Stress (1) (psi)	Min. Calculated Thickness(2) (in)	Governing Thickness (in)	(t) Design or Actual Thickness (in)	Comment
Bottom	10.00	40.0	3	ASTM A36	15,000	1.0400	1.0400	1.1250	Ok
2nd	10.00	30.00	3	ASTM A36	15,000	0.7800	0.7800	0.9375	Ok
3rd	8.00	20.00	3	ASTM A36	15,000	0.5200	0.5200	0.6875	Ok
4th	8.00	12.00	3	ASTM A36	15,000	0.3120	0.3125	0.4375	Ok
5th	8.00	4.00	3	ASTM A36	15,000	0.1040	0.3125	0.3125	Ok
6th		N/A			N/A	N/A	N/A		
7th		N/A			N/A	N/A	N/A		
8th		N/A			N/A	N/A	N/A		

(1) Excluding Joint Efficiency (2) Thickness Reflects Inclusion of Joint Effciency for non-section 14 tanks only.

Structure Weights

$W shell = \pi D \cdot H_{ring} (t/12) \cdot 490 pcf$

Bottom Ring	Wring	=	216,475	Lb
2nd Ring	Wring	=	180,396	Lb
3rd Ring	Wring	=	105,832	Lb
4th Ring	Wring	=	67,348	Lb
5th Ring	Wring	=	48,106	Lb
6th Ring	Wring	=	0	Lb
7th Ring	Wring	=	0	Lb
8th Ring	Wring	=	0	Lb
	Σ Ws	=	618,157	Lb

$W roof = (\pi D^2/4)(t/12) \cdot 490 pcf$

Roof Plate t (in) = 0.1875 — Wroof plate = 135,297 Lb
Roof Rafters are assumed to be 33% of Roof Plate Weight — Weight of rafters = 44,648 Lb (Assumption)
Total Weight of Roof = 179,945 Lb

$W bottom = (\pi D^2/4)(t/12) \cdot 490 pcf$

Tank Bottom t (in) = 0.5000 — Wf = 360,792 Lb

SEISMIC DESIGN OF STEEL WATER STORAGE TANKS (AWWA D-100-05, Section 13)

Acceleration Parameters

Information from: ☑ Geotechnical Engineer — Name: N/A
☐ ASCE 7-05 and AWWA D-100-05 Maps and Tables
☐ USGS - NSHMP Hazard Maps & Earthquake Ground Motion Parameter Calculator

Site Coordinates:
Latitude = 33.7686
Longitude = -117.1392

Ss = Mapped acceleration, 5% damped at 0.2 sec period	=	1.500	g	ASCE 7-05
S_1 = Mapped acceleration, 5% damped at 1.0 sec period	=	0.600	g	ASCE 7-05
Site Class ☑ Assumption ☐ Determined	=	B		Section 13.2
Fa = Site coefficient for 0.2 sec period	=	1.00		
Fv = Site coefficient for 1.0 sec period	=	1.00		
Seismic use group	=	III		Section 13.2.1
I_E = Seismic Importance factor	=	1.50		Table 24
Ri = Impulsive response modification factor — Self-Anchored	=	2.50		Table 28
Rc = Convective response modification factor	=	1.50		Table 28
S_{MS} = Fa * Ss = MCE Spectral response acceleration for 0.2 sec period	=	1.50	g	Section 13.2.7.2
S_{M1} = Fv * S_1 = MCE Spectral response acceleration for 1.0 sec period	=	0.60	g	Section 13.2.7.2

Design Response Spectra

Design Response Spectral Acceleration	AWWA General Procedure (Sec. 13.2.7)	80% of General Procedure (Sec. 13.2.8.6)	Probabilistic 10% in 100 years
PGA		0.000	
S_{DS} = Sai	1.000	0.800	
S_{D1}	0.400	0.320	

S_{DS} = Design spectral response acceleration for 0.2 sec period

S_{D1} = Design spectral response acceleration for 1.0 sec period

Design Response Spectra Procedure for Impulsive Component (Ai) ? AWWA Gen. Procedure

Design Response Spectra Procedure for Convective Component (Ac) ? 80% of Gen Procedure

Design Spectral Response Acceleration for Impulsive Components

Ti= Natural period of the structure	=	0.00	sec	Section 13.5.1
Ts = S_{D1} / S_{DS}	=	0.40	sec	Section 13.2.7.3.1
T_L = Region dependant transition period	=	8.00	sec	ASCE 7-05

Sai = Design response spectrum for impulsive components (5% damping)

For	$0 \le Ti \le Ts$	$Sai = S_{DS}$	=	1.00	g	Eq. 13-9	Governs
For	$Ts \le Ti \le T_L$	$Sai = S_{D1}/Ti \le S_{DS}$	=	N/A	g	Eq. 13-10	
For	$Ti > T_L$	$Sai = T_L S_{D1}/Ti^2$	=	N/A	g	Eq. 13-11	

Design Spectral Response Acceleration for Convective Components

Tc = First mode sloshing wave period $Tc = 2\pi\sqrt{\dfrac{D}{3.68 \cdot g \cdot \tanh\left(\dfrac{3.68H}{D}\right)}}$ = 8.14 sec Section 13.5

K = Damping scaling factor = 1.50

Sac = Design response spectrum for convective components (0.5% damping)

For	$Tc \le T_L$	$Sac = KS_{D1}/Tc \le S_{DS}$	=	N/A	g	Eq. 13-12	
For	$Tc > T_L$	$Sac = KT_L S_{D1}/Tc^2$	=	0.06	g	Eq. 13-13	Governs

Horizontal Design Accelerations

Ai = Impulsive design acceleration

$Ai = Sai \cdot I_E / 1.4Ri \geq 0.36 S_1 I_E / Ri$	=	0.429	g	Eq. 13-17
	≥	0.130		
Select Ai for Design Ai	=	$\boxed{0.430}$	g	Ok

Ac = Convective design acceleration

$Ac = Sac \cdot I_E / 1.4Rc$	=	0.041	g	Eq. 13-18

Design Overturning Moment at Bottom of Shell

W_T = Total weight of tank contents $W_T = 62.4GH(\pi D^2/4) = 49GHD^2$	=	44,100,000	Lb	Eq. 13-27

For $D/H \geq 1.333$ Governs

Wi = Effective impulsive weight

$$Wi = \frac{\tanh(0.866\,D/H)}{0.866\,D/H} W_T \quad = \quad 13{,}538{,}701 \text{ Lb} \quad \text{Eq. 13-24}$$

Xi = Height from bottom of shell to centroid of lateral seismic force

$$Xi = 0.375H \quad = \quad 15.00 \text{ ft} \quad \text{Eq. 13-28}$$

For $D/H < 1.333$ False

Wi = Effective impulsive weight

$$Wi = (1.0 - 0.218D/H)W_T \quad = \quad \text{N/A Lb} \quad \text{Eq. 13-25}$$

Xi = Height from bottom of shell to centroid of lateral seismic force applied to the impulsive effective weight

$$Xi = (0.5 - 0.094D/H)H \quad = \quad \text{N/A ft} \quad \text{Eq. 13-29}$$

For all proportions of D/H

Wc = Effective convective weight

$$Wc = 0.230\frac{D}{H}\tanh\left(\frac{3.67H}{D}\right)W_T \quad = \quad 28{,}621{,}827 \text{ Lb} \quad \text{Eq. 13-26}$$

Xc = Height from bottom of shell to centroid of lateral seismic force applied to the convective effective weight

$$Xc = \left[1.0 - \frac{\cosh(3.67H/D) - 1}{(3.67H/D)\sinh(3.67H/D)}\right]H \quad = \quad 21.46 \text{ ft} \quad \text{Eq. 13-30}$$

Xs = Height from the bottom of the shell to the center of gravity of the shell = 14.88 ft

Ms = Design overturning moment at the bottom of the shell caused by horizontal design acceleration

$$Ms = \sqrt{[Ai(WsXs + WrHt + WiXi)]^2 + [Ac\,Wc\,Xc]^2}$$

Ms (Self-Anchored)	=	**98,033,392**	Lb-ft	Eq. 13-23
Ms' (Mechanically Anchored)	=	**N/A**	Lb-ft	Eq. 13-23

Design Shear at Top of Foundation (Seismic Base Shear)

Vf = Design shear at top of foundation due to horizontal design acceleration

$$Vf = \sqrt{[Ai(Ws + Wr + Wf + Wi)^2 + [AcWc]^2]} \quad = \quad 6{,}429{,}900 \text{ Lb} \quad \text{Eq. 13-31}$$

RESISTANCE TO OVERTURNING (Checking Uplift)

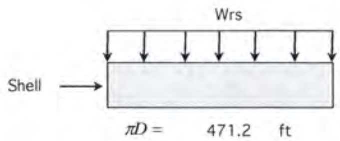
Fy = Minimum specified yield strength of bottom annulus = 30,000 psi (Assumption)

W_L = Maximum resisting weight of tank contents used to resist the shell overturning moment

$$W_L = 7.9 t_b \sqrt{Fy \cdot H \cdot G} \leq 1.28 H \cdot D \cdot G$$

=	4,327.01	Lb-ft	Eq. 13-37
≤	7,680.00	Lb-ft	
Ok, Use WL =	4,327.01	Lb-ft	

W_{rs} = Roof load acting on the shell = 127.29 Lb/ft (Assumption)



w_t = Weight of the tank shell and portion of the roof reacting on the shell

$$w_t = \frac{Ws}{\pi D} + w_{rs} = 1439.1 \text{ Lb/ft} \quad \text{Eq. 13-41}$$

Av = Vertical acceleration — The largest of

$Av = 0.14 \cdot S_{DS}$	=	0.14	g
0.50 Ai	=	0.22	g
Use Av	=	0.22	g

Thus, for Self -Anchored Tanks Only:

J = Overturning ratio

$$J = \frac{Ms}{D^2\left[w_t(1-0.4Av)+W_L\right]} = \mathbf{0.773} \quad \text{Eq. 13-36}$$

J< 0.785, Therefore, No shell uplift because of the overturning (Tank is self anchored).

REMARKS:

a) AWWA Gen. Procedure was used to calculate the seismic design response spectra.

b) **Analysis performed using Ai =0.43g, Ac =0.041g and Av =0.22g**

c) 80% of Gen Procedure was used to calculate the AWWA sloshing wave height. Sloshing wave height (d) = 4.34 ft

d)

e)

f)

ANALYSIS NOTES:

a) J< 0.785, Therefore, No shell uplift because of the overturning (Tank is self anchored).

b)

c)

d) Tank is OK for seismic analysis.

e)

f)

g)

Tank: MITTRY TANK (NEW)

Scenario: Anchored Condition

HYDRODYNAMIC HOOP TENSILE STRESS (AWWA D-100-05, Section 13.5.4.2.3)

D / H = 3.75
0.75 D = 112.5 ft

Ring	(t) Design or Actual Thickness	Y (ft)	Ni (Lb/in)	Nc (Lb/in)	Nh (Lb/in)	σ_s (psi)	Fhs (psi)	F (comb) (psi)	F (allow) (psi)	Comment
Bottom	1.1250	40.0	5,787	599.5	15,600	6,005	13,867	19,871	20,000	Ok
2nd	0.9375	30.0	5,426	617.6	11,700	6,440	12,480	18,920	20,000	Ok
3rd	0.6875	20.0	4,341	673.1	7,800	6,859	11,345	18,205	20,000	Ok
4th	0.4375	12.0	2,952	746.6	4,680	7,346	10,697	18,043	20,000	Ok
5th	0.3125	4.0	1,100	848.9	1,560	4,579	4,992	9,571	20,000	Ok
6th										
7th										
8th										

Summary of Formulas

Ni= Impulsive hoop tensile force

For $D/H \geq 1.333$ $$N_i = 4.5 \cdot A_i \cdot GDH\left[\frac{Y}{H} - 0.5\left(\frac{Y}{H}\right)^2\right]\tanh\left(0.866\frac{D}{H}\right)$$ Eq. 13-43

For $D/H < 1.333$ and $Y < 0.75D$ $$N_i = 2.77 \cdot A_i \cdot GD^2\left[\frac{Y}{0.75D} - 0.5\left(\frac{Y}{0.75D}\right)^2\right]$$ Eq. 13-44

For $D/H < 1.333$ and $Y \geq 0.75D$ $$N_i = 1.39 A_i GD^2$$ Eq. 13-45

Nc = Convective hoop tensile force $$N_c = \frac{0.98 \cdot A_c \cdot GD^2 \cosh\left[\frac{3.68(H-Y)}{D}\right]}{\cosh\frac{3.68H}{D}}$$ Eq. 13-46

Nh = Hydrostatic hoop tensile force $Nh = 2.6GYD$ Section 13.5.4.2.3

$\sigma_s =$ Hydrodynamic hoop tensile stress $$\sigma_s = \frac{\sqrt{N_i^2 + N_c^2 + (Nh \cdot Av)^2}}{t_s}$$ Eq. 13-42

Fhs = Hydrostatic hoop stress $Fhs = N_h / t_s$

$F_{allowable} = 1.333 \cdot s \cdot E_j$

$F_{comb} = Fhs + \sigma_s$

Thus, $F_{comb} \leq F_{allowable}$

Tank: MITTRY TANK (NEW)

Scenario: **Anchored Condition**

SHELL COMPRESSION STRESSES (AWWA D-100-05, Section 13.5.4.2)

ts	=	1.1250 in		Is the tank mechanically anchored?	No
ts/R	=	0.00125		Is critical buckling stress allowed?	No
				If so, enter Factor of Safety (F.S.)	2.00

P = Hydrostatic pressure at the point of consideration $P = \gamma_s G H_w / 144$ = 17.33 psi

$(P/E)(R/t)^2$ = 0.383

$\Delta Cc =$ Pressure-stabilizing buckling coefficient

For $(P/E)(R/t)^2 \leq 0.064$ $\Delta Cc = 0.72\left[(P/E)(R/t)^2\right]^{0.84}$ = N/A Eq. 13-50

For $(P/E)(R/t)^2 > 0.064$

$\Delta Cc = 0.045 \cdot \ln\left[(P/E)(R/t)^2 + 0.0018\right] + 0.194$ = N/A Eq. 13-51

≤ 0.22

$\Delta\sigma_{cr} =$ Critical buckling stress $\Delta\sigma_{cr} = \Delta Cc E \cdot t/R$ = 0 Eq. 13-49

Longitudinal Shell Compression Stress for (No Uplift) Self or Mechanically Anchored Tanks, Section 13.5.4.2.1

For $J < 0.785$ Governs

$\sigma_a =$ Compression stress for Class 2 materials from Table 11 = 2,251 psi Section 3.4.2

$\sigma_e =$ Allowable compression stress in a seismic event

$\sigma_e = 1.333 \cdot \sigma_a$ = 3,001 psi Eq. 13-48

$\sigma_e = 1.333\left(\sigma_a + \frac{\Delta\sigma_{cr}}{F.S.}\right)$ = N/A psi Eq. 13-47

$\sigma_c =$ Maximum longitudinal shell compression stress

$\sigma_c = \left[w_t(1+0.4Av) + \frac{1.273Ms}{D^2}\right]\frac{1}{12t_s}$ = 527 psi Eq. 13-39

The requirement is $\sigma_e > \sigma_c$ Ok

Longitudinal Shell Compression Stress when Uplift Occurs, Section 13.5.4.2.1

For $0.785 \leq J \leq 1.54$ or $J > 1.54$ False

(t/R)c = Thickness to radius ratio at which buckling changes from elastic to inelastic

For Class 2 materials (t/R)c = 0.0035372 Section 3.4.3.1.2

F_L = Allowable local buckling compression stress per Section 3.4.3.1.2

When:

- $0 \leq t/R \leq (t/R)c$ — Elastic buckling controls: $F_L = 17.5(10^6)(t/R)\left[1 + 50{,}000(t/R)^2\right]$ = N/A psi Eq. 3-11
- $(t/R)c \leq t/R \leq 0.0125$ — Inelastic buckling controls: $F_L = 6{,}925 + 886(10^3)(t/R)$ = N/A psi Eq. 3-13
- $t/R > 0.0125$ — Plastic buckling controls: F_L = N/A psi

Then, $\sigma_a =$ Allowable compression = F_L = N/A psi

$\sigma_e =$ Allowable compression stress in a seismic event =

$\sigma_e = 1.333 \cdot \sigma_a$ = N/A

$\sigma_e = 1.333\left(\sigma_a + \frac{\Delta\sigma_{cr}}{F.S.}\right)$ = N/A Eq. 13-47

$\sigma_c =$ Maximum longitudinal shell compression stress

$\sigma_c = \left[\frac{w_t(1+0.4Av) + W_L}{0.607 - 0.18667 \cdot J^{2.3}} - W_L\right]\frac{1}{12t_s}$ = N/A psi Eq. 13-47

The requirement is $\sigma_e > \sigma_c$

Tank: MITTRY TANK (NEW)

Scenario: Anchored Condition

SLOSHING WAVE HEIGHT (AWWA D-100-05, Section 13.5.4.3)

Design Response Spectra

Design Response Spectral Acceleration	AWWA General Procedure (Sec. 13.2.7)	80% of General Procedure	Site Specific <<if available>> (Sec. 13.2.8)	Probabilistic 10% in 100 years <<if available>>
S_{DS} = Sai	1.000	0.800		
S_{D1}	0.400	0.320		

Design Response Spectra Procedure? 80% of Gen Procedure

For seismic groups I and II

When	$Tc \le 4$	$A_f = KS_{D1}I_E/T_C$	=	N/A	g	Eq. 13-53
When	$Tc > 4$	$A_f = 4KS_{D1}I_E/Tc^2$	=	N/A	g	Eq. 13-54

For seismic group III

When	$Tc \le T_L$	$A_f = KS_{D1}/Tc$	=	N/A	g	Eq. 13-55	
When	$Tc > T_L$	$A_f = KS_{D1}T_L/Tc^2$	=	0.058	g	Eq. 13-56	Governs

d = Sloshing wave height above MOL $d = 0.5DA_f$ = 4.34 ft Eq. 13-52

The freeboard shall meet the requirements of Table 29 as well, Minimum freeboard = 4.34 ft

Table 29 Minimum freeboard requirements

S_{DS}	Seismic Use Group I	II	III
$S_{DS} < 0.33$ g	None	None	d
$S_{DS} \ge 0.33$ g	None	$0.7d$	d

Taken from AWWA D-100-05 Page 155

Minimum freeboard above the MOL to be provided per AWWA. d = 4.34 ft

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March 17, 2011

Ms. Debbie Hoffman, PE
Eastern Municipal Water District
2270 Trumble Road
Perris, CA 92570

SUBJECT: **Prestressed Concrete Water Storage Tank**
Riverside, CA

Dear Debbie:

Preload is pleased to offer the following budget estimate for the above referenced project. The budget scope includes engineering, design, and construction of one (1) 5.63 MG with a 32' SWD and one (1) 5.63 MG with a 40' SWD, wire-wound, prestressed concrete water tank with a cast-in-place dome roof, provided per ANSI/AWWA D110 Type III standards. Preload offers single-party responsibility for all of the engineering, design and construction facets of the D110 Type III tank(s).

Qty	Description	Budget Price
1	5.63 MG wire-wound, prestressed concrete tank w/ cast-in-place dome roof per AWWA D110 Type III standards Dimensions: 172' I.D. x 32' S.W.D. w/ 4' freeboard	**$2,515,000**
1	5.63 MG wire-wound, prestressed concrete tank w/ cast-in-place dome roof per AWWA D110 Type III standards Dimensions: 154' I.D. x 40' S.W.D. w/ 4' freeboard	**$2,425,000**

These prices include Preload's standard cast-in-place, membrane type, reinforced concrete floor slab; a precast, circumferentially prestressed concrete wall incorporating a continuous mechanically bonded steel diaphragm; a cast in place concrete dome roof; appurtenances including; one (1) interior and one (1) exterior ladder, one (1) roof ventilator, one (1) roof hatch, one (1) wall manway, water blasting the dome and standard decorative coating (two coats of Thorocoat), and accommodations for "high seismic region design." Other appurtenances can be added as required for an additional cost.

This estimate is based on current construction costs, utilizing open-shop prevailing wages, for tanks completed in accordance with Preload's design standards and normal construction procedures. If this project will be constructed with Union Labor, we will need to revise our pricing in accordance with the jurisdictional terms of a single-project collective bargaining agreement.

Preload has not yet visited the site and therefore assumes that there is sufficient work access and room for our construction activities. We are also assuming that the geotechnical conditions (bearing capacity, total and differential settlements, etc...) are satisfactory to support the applicable loads of the tank. We have also assumed that the tank need not be designed for hydrostatic uplift.

Excluded from this budget price are all required site work activities such as excavation, subgrade preparation, backfilling, installation of underslab piping, underdrains and yard piping, fencing, and any landscaping activities. Mechanical equipment installation as well as electrical and instrumentation work are excluded from the scope. We have not included sales tax.

Preload anticipates the construction duration of the tank work to be approximately **22-24 weeks** for this tank with a cast-in-place dome roof. Additionally, Preload normally requires a period of six (6) weeks from Notice to Proceed to beginning construction for design, drawing submittals, and mobilization.

If you should have any questions or require any additional information, please contact me directly.

Sincerely,

Derrik Fischer
Sales Engineer - West Region

Preload Inc.
2225 East Bayshore Road, Suite 200
Palo Alto, CA 94303
Phone: 360-631-8804
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60 Year Life-Cycle Cost Analysis: AWWA D110 Type III Prestressed Concrete Tank vs. Welded Steel Tank — Tank Vol: 5.6 MG

Project Location: Riverside, CA **Project Name:** 5.63 MG Water Storage Tank for EMWD **Date:** 3/17/2011

The total future reservoir maintenance values are derived from current costs assuming that the Owner will maintain an equivalent ability to pay for tank maintenance (i.e., inflation rate equals the discount rate). Routine visual inspections & cleaning are not part of this evaluation and are considered incidental to the total cost. The unit costs for abrasive blasting & recoating are derived from recent interior & exterior welded steel tank repair projects.

AWWA D110 Type III Prestressed Concrete

Inside Diameter	154.00	feet
Side Water Depth	40.00	feet
Additional Freeboard (only if req'd)	4.00	feet
Wall Height	44.75	feet
Dome Rise (1:8 or 1:10)	1 : 10	
Wall Thickness	6.00	inches
Liquid Volume	5,578,003	gallons
Total Volume (swd + freeboard)	6,135,804	gallons
Area of Tank Floor	18,617	square feet
Area of Tank Wall (interior)	21,639	square feet
Area of Tank Wall (exterior)	21,710	square feet
Area of Tank Roof (interior & exterior):	38,752	square feet
Initial Prestressed Construction COST	$ 2,425,000.00	

Welded Steel

Inside Diameter	154.00	feet
Side Water Depth	40.00	feet
Additional Freeboard (only if req'd)	4.00	feet
Wall Height	44.92	feet
Cone Rise (1.0' unless otherwise specified)	1.00	foot
Wall Thickness	1.00	inch
Liquid Volume	5,578,003	gallons
Total Volume (swd + freeboard)	6,135,804	gallons
Area of Tank Floor	18617	square feet
Area of Tank Wall (interior)	21722	square feet
Area of Tank Wall (exterior)	21733	square feet
Area of Tank Roof (interior; incl. rafters):	28,934	square feet
Area of Tank Roof (exterior):	18,627	square feet
Cost of Steel Tank (as a % of the Concrete Tank):	80%	
Initial Welded Steel Construction COST:	$ 1,940,000.00	

ANTICIPATED SERVICE LIFE = 60 years (use a maximum life of 60 years for the purpose of this exercise)
PLANNED SERVICE CYCLE = every 12 years

Exterior Power Washing UNIT COST	$ 1.50	per SF
Exterior Power Washing COST	$ 61,600.00	Total
Will the PSC Tank be Washed over Life of Tank?	YES	

If YES, At Which Cycle(s)?

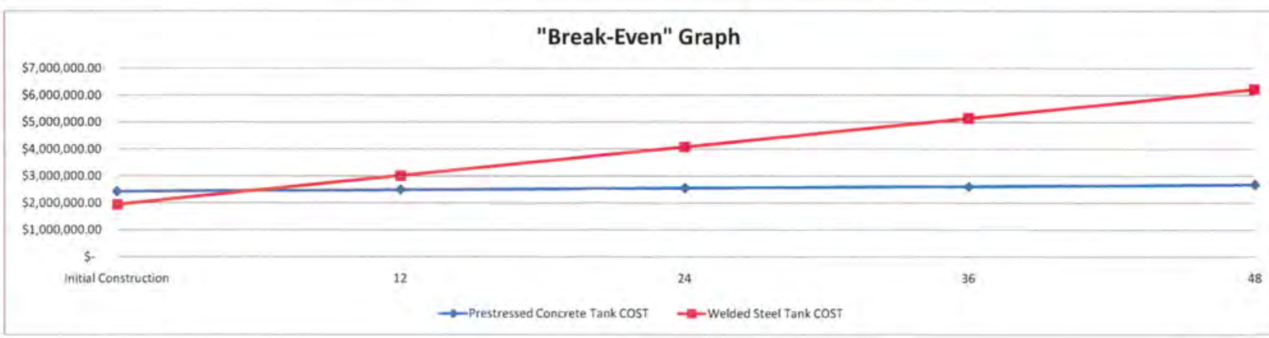
Cycle #1 @	12 years	YES	
Cycle #2 @	24 years	YES	
Cycle #3 @	36 years	YES	
Cycle #4 @	48 years	YES	(YES or NO)
Cycle #5 @	0 years	NO	
Cycle #6 @	0 years	NO	
Cycle #7 @	0 years	NO	

Interior Abrasive Blasting & Painting UNIT COST	$ 9.11	per SF
Exterior Abrasive Blasting & Painting UNIT COST	$ 8.41	per SF
Engineering, Testing, & Inspection Fee	10%	per CYCLE

'STRAIGHT' LINE ANALYSIS over 60 year LIFE-CYCLE

	Prestressed Concrete	Welded Steel
TOTAL Maintenance COST Over Specified Life:	$ 246,400.00	$ 4,270,400.00
TOTAL Initial Project COST:	$ 2,425,000.00	$ 1,940,000.00
TOTAL COST of Ownership over Life of Tank:	$ 2,671,400.00	$ 6,210,400.00

TOTAL Savings Over Life of Prestressed Concrete Tank: $ 3,539,000.00



Revision 08.18.10

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60 Year Life-Cycle Cost Analysis: AWWA D110 Type III Prestressed Concrete Tank vs. Welded Steel Tank — Tank Vol: 5.6 MG

Project Location: Riverside, CA — **Project Name:** 5.63 MG Water Storage Tank for EMWD — **Date:** 3/17/2011

The total future reservoir maintenance values are derived from current costs assuming that the Owner will maintain an equivalent ability to pay for tank maintenance (i.e., inflation rate equals the discount rate). Routine visual inspections & cleaning are not part of this evaluation and are considered incidental to the total cost. The unit costs for abrasive blasting & recoating are derived from recent interior & exterior welded steel tank repair projects.

AWWA D110 Type III Prestressed Concrete

Inside Diameter	172.00	feet
Side Water Depth	32.00	feet
Additional Freeboard (only if req'd)	4.00	feet
Wall Height	36.75	feet
Dome Rise (1:8 or 1:10)	1 : 10	
Wall Thickness	6.00	inches
Liquid Volume	5,566,525	gallons
Total Volume (swd + freeboard)	6,262,341	gallons
Area of Tank Floor	23,223	square feet
Area of Tank Wall (interior)	19,848	square feet
Area of Tank Wall (exterior)	19,906	square feet
Area of Tank Roof (interior & exterior):	48,340	square feet
Initial Prestressed Construction COST	$ 2,515,000.00	

Welded Steel

Inside Diameter	172.00	feet
Side Water Depth	32.00	feet
Additional Freeboard (only if req'd)	4.00	feet
Wall Height	36.92	feet
Cone Rise (1.0' unless otherwise specified)	1.00	foot
Wall Thickness	1.00	inch
Liquid Volume	5,566,525	gallons
Total Volume (swd + freeboard)	6,262,341	gallons
Area of Tank Floor	23223	square feet
Area of Tank Wall (interior)	19940	square feet
Area of Tank Wall (exterior)	19949	square feet
Area of Tank Roof (interior; incl. rafters):	36,092	square feet
Area of Tank Roof (exterior):	23,235	square feet
Cost of Steel Tank (as a % of the Concrete Tank):	80%	
Initial Welded Steel Construction COST:	$ 2,012,000.00	

ANTICIPATED SERVICE LIFE = 60 years (use a maximum life of 60 years for the purpose of this exercise)
PLANNED SERVICE CYCLE = every 12 years

Exterior Power Washing UNIT COST	$ 1.50	per SF
Exterior Power Washing COST	$ 66,100.00	Total
Will the PSC Tank be Washed over Life of Tank?	YES	

If YES, At Which Cycle(s)?

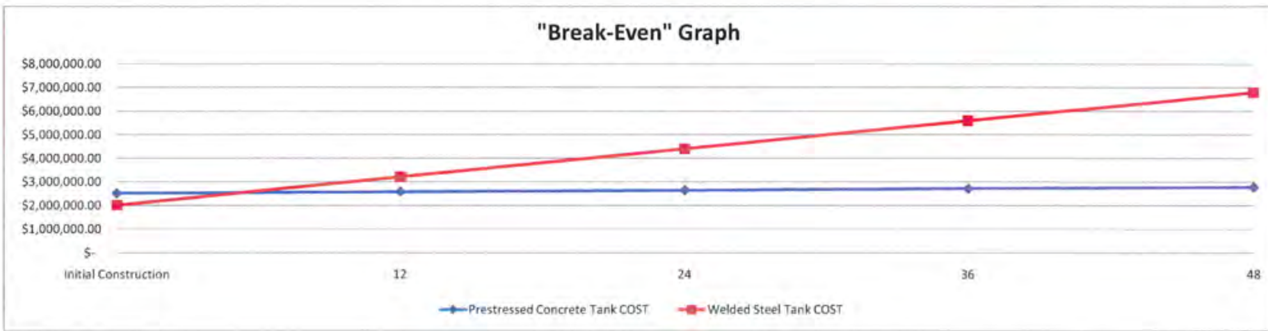
Cycle #1 @	12 years	YES
Cycle #2 @	24 years	YES
Cycle #3 @	36 years	YES
Cycle #4 @	48 years	YES (YES or NO)
Cycle #5 @	0 years	NO
Cycle #6 @	0 years	NO
Cycle #7 @	0 years	NO

Interior Abrasive Blasting & Painting UNIT COST	$ 9.11	per SF
Exterior Abrasive Blasting & Painting UNIT COST	$ 8.41	per SF
Engineering, Testing, & Inspection Fee	10%	per CYCLE

'STRAIGHT' LINE ANALYSIS over 60 year LIFE-CYCLE

	Prestressed Concrete	Welded Steel
TOTAL Maintenance COST Over Specified Life:	$ 264,400.00	$ 4,774,800.00
TOTAL Initial Project COST:	$ 2,515,000.00	$ 2,012,000.00
TOTAL COST of Ownership over Life of Tank:	**$ 2,779,400.00**	**$ 6,786,800.00**

TOTAL Savings Over Life of Prestressed Concrete Tank: $ 4,007,400.00



Revision 08.18.10

PRELOAD

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Palo Alto, CA 94303

Prestrestressed Concrete Tanks
"An Equal Opportunity Employer"

631-231-8100 • Fax 631-231-8881
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Life-Cycle Cost Analysis: AWWA D110 Type III Prestressed Concrete Tank vs. Welded Steel Tank — CYCLE COSTS

Project Location: Riverside, CA — **Date: 3/17/2011**

CYCLE # 1 — After Year 12

Power Wash Exterior?	YES	YES/NO	Interior Abrasive Blasting & Painting UNIT COST	$ 9.11	
Estimated Power Washing COST	$ 66,100.00		Abrasive Blast & Paint Tank Interior TOTAL COST	$ 722,000.00	
			Exterior Abrasive Blasting & Painting UNIT COST	$ 8.41	
OPTIONAL Decorative Coating UNIT COST	$ -	per square foot	Abrasive Blast & Paint Tank Exterior TOTAL COST	$ 363,200.00	
TOTAL Decorative Coating COST	$ -	OPTIONAL	SUB-TOTAL	$ 1,085,200.00	
			Engineering, Testing, & Inspection Fee	10%	
TOTAL PRESTRESSED CONCRETE MAINTENANCE COST	**$ 66,100.00**	**@ Cycle #1**	**TOTAL WELDED STEEL MAINTENANCE COST**	**$ 1,193,700.00**	**@ Cycle #1**

CYCLE # 2 — After Year 24

Power Wash Exterior?	YES	YES/NO	Interior Abrasive Blasting & Painting UNIT COST	$ 9.11	
Estimated Power Washing COST	$ 66,100.00		Abrasive Blast & Paint Tank Interior TOTAL COST	$ 722,000.00	
			Exterior Abrasive Blasting & Painting UNIT COST	$ 8.41	
OPTIONAL Decorative Coating UNIT COST		per square foot	Abrasive Blast & Paint Tank Exterior TOTAL COST	$ 363,200.00	
TOTAL Decorative Coating COST	$ -	OPTIONAL	SUB-TOTAL	$ 1,085,200.00	
			Engineering, Testing, & Inspection Fee	10%	
TOTAL PRESTRESSED CONCRETE MAINTENANCE COST	**$ 66,100.00**	**@ Cycle #2**	**TOTAL WELDED STEEL MAINTENANCE COST**	**$ 1,193,700.00**	**@ Cycle #2**

CYCLE # 3 — After Year 36

Power Wash Exterior?	YES	YES/NO	Interior Abrasive Blasting & Painting UNIT COST	$ 9.11	
Estimated Power Washing COST	$ 66,100.00		Abrasive Blast & Paint Tank Interior TOTAL COST	$ 722,000.00	
			Exterior Abrasive Blasting & Painting UNIT COST	$ 8.41	
OPTIONAL Decorative Coating UNIT COST	$ -	per square foot	Abrasive Blast & Paint Tank Exterior TOTAL COST	$ 363,200.00	
TOTAL Decorative Coating COST	$ -	OPTIONAL	SUB-TOTAL	$ 1,085,200.00	
			Engineering, Testing, & Inspection Fee	10%	
TOTAL PRESTRESSED CONCRETE MAINTENANCE COST	**$ 66,100.00**	**@ Cycle #3**	**TOTAL WELDED STEEL MAINTENANCE COST**	**$ 1,193,700.00**	**@ Cycle #3**

CYCLE # 4 — After Year 48

Power Wash Exterior?	YES	YES/NO	Interior Abrasive Blasting & Painting UNIT COST	$ 9.11	
Estimated Power Washing COST	$ 66,100.00		Abrasive Blast & Paint Tank Interior TOTAL COST	$ 722,000.00	
			Exterior Abrasive Blasting & Painting UNIT COST	$ 8.41	
OPTIONAL Decorative Coating UNIT COST	$ -	per square foot	Abrasive Blast & Paint Tank Exterior TOTAL COST	$ 363,200.00	
TOTAL Decorative Coating COST	$ -	OPTIONAL	SUB-TOTAL	$ 1,085,200.00	
			Engineering, Testing, & Inspection Fee	10%	
TOTAL PRESTRESSED CONCRETE MAINTENANCE COST	**$ 66,100.00**	**@ Cycle #4**	**TOTAL WELDED STEEL MAINTENANCE COST**	**$ 1,193,700.00**	**@ Cycle #4**

Revision 08.18.10

James Baker

From:	Larry Wombles [larry@pasoroblestank.com]
Sent:	Monday, March 14, 2011 10:27 AM
To:	James Baker
Subject:	RE: Eastern Proposal

150 diameter x 40' shell high + 3' radius knuckle

- Foundation $149,800.00
- Tank $1,080,780.00
- Coatings $435,200.00

Larry Wombles

ASSOCIATED CONSTRUCTION & ENGINEERING INC.
RSH Construction Inc. / Canyon Springs Enterprises Inc.
Paso Robles Tank Inc.
West Coast Industrial Coatings Inc.

SAFETY + QUALITY = PRODUCTION
3883 Wentworth Drive
Hemet, CA 92545
Phone: 951-925-2288 / Fax: 951-925-1288
e-mail: LWombles@pasoroblestank.com
Company E-mail: www.Pasoroblestank.com

ONE NATION UNDER GOD & IN GOD WE TRUST!

From: James Baker [mailto:james.baker@webbassociates.com]
Sent: Friday, March 11, 2011 3:02 PM
To: Larry Wombles
Subject: RE: Eastern Proposal

Hi Larry,
What's the cost look like if we have a 154' x 40' with a 3' knuckle assuming everything else that can stay the same does?

Thanks,
Jed

James "Jed" Baker

APPENDIX B

Appendix B
Life Cycle Costs

Table 1A

Captial Cost Steel	1810000	$
Capital Cost Concrete	2625000	$
Overhead Multiplier	1.4	$
Project Costs		
Steel	2534000	$
Concrete	3675000	$
Total Project + O&M		
Steel	$3,068,339	$
Concrete	$3,900,597	$
Inspection	4000	$/Inspection
Steel		
Interior Recoating	7	$/SF
Exterior Recoating	7	$/SF
Interior Recoating	432,121	$
Exterior Recoating	298,327	$
Concrete		
Interior Recoating	4	$/SF
Interior Recoating	241,124	$
Discount Rate:	4	%

												Present Value Cost of Maintenance (2011 Dollars) in Years from Date of Tank Comr												
Material	Shell Height (ft)	Internal Diameter (ft)	High Water Level (ft)	Freeboard Required (ft)	Inside Surface Area (cylinder) (ft^2)	Outside Surface Area (cylinder) (ft^2)	Liquid Volume (MG)	Maintenance Activity	2011 Maintenance Cost ($)	Maintence Interval (yr)	Sub-total Maintenance Cost ($)	Total Maintenance Cost ($)	1	2	3	4	5	6	7	8	9	10	11	12
Steel (S1)	47.96	156	40	7.96	61732	42618	5.72	Inspection	$4,000	5	$17,662	$534,339	$0	$0	$0	$0	$3,288	$0	$0	$0	$0	$2,702	$0	$0
								Re-coat Interior	$432,121	20	$347,045		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
								Re-coat Exterior	$298,327	25	$169,632		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
												Running Total	$0	$0	$0	$0	$3,288	$3,288	$3,288	$3,288	$3,288	$5,990	$5,990	$5,990
Concrete Type I (C2)	45	156	40	5	60281	41167	5.72	Inspection	$4,000	5	$17,662	$225,597	$0	$0	$0	$0	$3,288	$0	$0	$0	$0	$2,702	$0	$0
								Exterior Power Washing (3)	$90,421	12	$141,511		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$56,477
								Interior Recoat and Lining	$164,670	30	$66,424		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
												Running Total	$0	$0	$0	$0	$3,288	$3,288	$3,288	$3,288	$3,288	$5,990	$5,990	$62,467

nissioning

13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
$0	$0	$2,221	$0	$0	$0	$0	$1,826	$0	$0	$0	$0	$1,500	$0	$0	$0	$0	$1,233	$0	$0	$0	$0	$1,014	$0
$0	$0	$0	$0	$0	$0	$0	$197,214	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$111,907	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
$5,990	$5,990	$8,211	$8,211	$8,211	$8,211	$8,211	$207,251	$207,251	$207,251	$207,251	$207,251	$320,659	$320,659	$320,659	$320,659	$320,659	$321,892	$321,892	$321,892	$321,892	$321,892	$322,906	$322,906

$0	$0	$2,221	$0	$0	$0	$0	$1,826	$0	$0	$0	$0	$1,500	$0	$0	$0	$0	$1,233	$0	$0	$0	$0	$1,014	$0
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$35,275	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$22,033
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$50,771	$0	$0	$0	$0	$0	$0
$62,467	$62,467	$64,688	$64,688	$64,688	$64,688	$64,688	$66,513	$66,513	$66,513	$66,513	$101,789	$103,289	$103,289	$103,289	$103,289	$103,289	$155,293	$155,293	$155,293	$155,293	$155,293	$156,307	$178,340

37	38	39	40	41	42	43	44	45	46	47	48
$0	$0	$0	$833	$0	$0	$0	$0	$685	$0	$0	$0
$0	$0	$0	$90,006	$0	$0	$0	$0	$0	$0	$0	$0
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
$322,906	$322,906	$322,906	$413,745	$413,745	$413,745	$413,745	$413,745	$414,430	$414,430	$414,430	$414,430
$0	$0	$0	$833	$0	$0	$0	$0	$685	$0	$0	$0
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$13,762
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
$178,340	$178,340	$178,340	$179,173	$179,173	$179,173	$179,173	$179,173	$179,858	$179,858	$179,858	$193,619

49	50	51	52	53	54	55	56	57	58	59	60
$0	$563	$0	$0	$0	$0	$463	$0	$0	$0	$0	$380
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$41,078
$0	$41,978	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
$414,430	$456,971	$456,971	$456,971	$456,971	$456,971	$457,433	$457,433	$457,433	$457,433	$457,433	$498,891
$0	$563	$0	$0	$0	$0	$463	$0	$0	$0	$0	$380
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$8,595
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$15,654
$193,619	$194,182	$194,182	$194,182	$194,182	$194,182	$194,645	$194,645	$194,645	$194,645	$194,645	$219,274

61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
$0	$0	$0	$0	$313	$0	$0	$0	$0	$257	$0	$0	$0	$0	$211	$0	$0	$0	$0	$174
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$18,747
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$15,747	$0	$0	$0	$0	$0
$498,891	$498,891	$498,891	$498,891	$499,204	$499,204	$499,204	$499,204	$499,204	$499,461	$499,461	$499,461	$499,461	$499,461	$515,419	$515,419	$515,419	$515,419	$515,419	$534,339

$0	$0	$0	$0	$313	$0	$0	$0	$0	$257	$0	$0	$0	$0	$211	$0	$0	$0	$0	$174
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$5,369	$0	$0	$0	$0	$0	$0	$0	$0
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
$219,274	$219,274	$219,274	$219,274	$219,587	$219,587	$219,587	$219,587	$219,587	$219,844	$219,844	$225,212	$225,212	$225,212	$225,423	$225,423	$225,423	$225,423	$225,423	$225,597

Appendix B
Life Cycle Costs

Table 1B

Captial Cost Steel	2000000	$
Capital Cost Concrete	2750000	$
Overhead Multiplier	1.4	$
Project Costs		
Steel	2800000	$
Concrete	3850000	$
Total Project + O&M		
Steel	$3,400,195	$
Concrete	$4,102,175	$
Inspection	4000	$/Inspection
Steel		
Interior Recoating	7	$/SF
Exterior Recoating	7	$/SF
Interior Recoating	495,262	$
Exterior Recoating	324,962	$
Concrete		
Interior Recoating	4	$/SF
Interior Recoating	276,460	$
Discount Rate:	4	%

													Present Value Cost of Maintenance (2011 Dollars) in Years from Date of Tank Comr											
Material	Shell Height (ft)	Internal Diameter (ft)	High Water Level (ft)	Freeboard Required (ft)	Inside Surface Area (cylinder) (ft^2)	Outside Surface Area (cylinder) (ft^2)	Liquid Volume (MG)	Maintenance Activity	2011 Maintenance Cost ($)	Maintence Interval (yr)	Sub-total Maintenance Cost ($)	Total Maintenance Cost ($)	1	2	3	4	5	6	7	8	9	10	11	12
Steel (S1)	39.96	176	32	7.96	70752	46423	5.82	Inspection	$4,000	5	$17,662	$600,195	$0	$0	$0	$0	$3,288	$0	$0	$0	$0	$2,702	$0	$0
								Re-coat Interior	$495,262	20	$397,755		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
								Re-coat Exterior	$324,962	25	$184,778		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
												Running Total	$0	$0	$0	$0	$3,288	$3,288	$3,288	$3,288	$3,288	$5,990	$5,990	$5,990
Concrete Type I (C2)	37	176	32	5	69115	44787	5.82	Inspection	$4,000	5	$17,662	$252,175	$0	$0	$0	$0	$3,288	$0	$0	$0	$0	$2,702	$0	$0
								Exterior Power Washing (3)	$103,673	12	$162,249		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$64,754
								Interior Recoat and Lining	$179,146	30	$72,264		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
												Running Total	$0	$0	$0	$0	$3,288	$3,288	$3,288	$3,288	$3,288	$5,990	$5,990	$70,744

nissioning

13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
$0	$0	$2,221	$0	$0	$0	$0	$1,826	$0	$0	$0	$0	$1,500	$0	$0	$0	$0	$1,233	$0	$0	$0	$0	$1,014	$0
$0	$0	$0	$0	$0	$0	$0	$226,031	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$121,899	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
$5,990	$5,990	$8,211	$8,211	$8,211	$8,211	$8,211	$236,068	$236,068	$236,068	$236,068	$236,068	$359,467	$359,467	$359,467	$359,467	$359,467	$360,700	$360,700	$360,700	$360,700	$360,700	$361,714	$361,714

$0	$0	$2,221	$0	$0	$0	$0	$1,826	$0	$0	$0	$0	$1,500	$0	$0	$0	$0	$1,233	$0	$0	$0	$0	$1,014	$0
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$40,445	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$25,262
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$55,234	$0	$0	$0	$0	$0	$0
$70,744	$70,744	$72,965	$72,965	$72,965	$72,965	$72,965	$74,790	$74,790	$74,790	$74,790	$115,235	$116,736	$116,736	$116,736	$116,736	$116,736	$173,203	$173,203	$173,203	$173,203	$173,203	$174,217	$199,478

37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
$0	$0	$0	$833	$0	$0	$0	$0	$685	$0	$0	$0	$0	$563	$0	$0	$0	$0	$463	$0	$0	$0	$0	$380
$0	$0	$0	$103,158	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$47,080
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$45,726	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
$361,714	$361,714	$361,714	$465,705	$465,705	$465,705	$465,705	$465,705	$466,389	$466,389	$466,389	$466,389	$466,389	$512,679	$512,679	$512,679	$512,679	$512,679	$513,141	$513,141	$513,141	$513,141	$513,141	$560,601

$0	$0	$0	$833	$0	$0	$0	$0	$685	$0	$0	$0	$0	$563	$0	$0	$0	$0	$463	$0	$0	$0	$0	$380
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$15,778	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$9,855
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$17,030
$199,478	$199,478	$199,478	$200,311	$200,311	$200,311	$200,311	$200,311	$200,996	$200,996	$200,996	$216,775	$216,775	$217,338	$217,338	$217,338	$217,338	$217,338	$217,800	$217,800	$217,800	$217,800	$217,800	$245,065

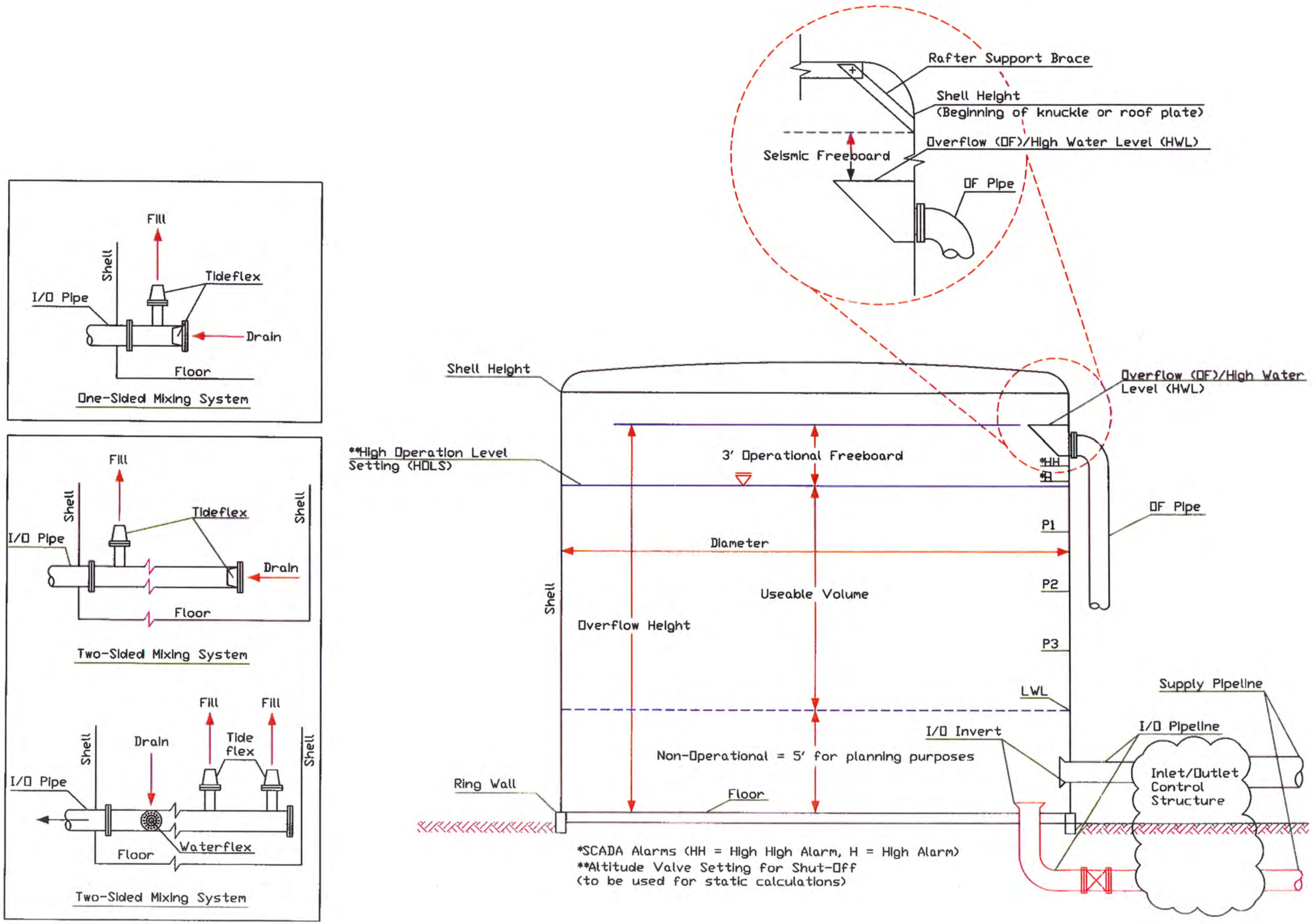
61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
$0	$0	$0	$0	$313	$0	$0	$0	$0	$257	$0	$0	$0	$0	$211	$0	$0	$0	$0	$174
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$21,487
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$17,153	$0	$0	$0	$0	$0
$560,601	$560,601	$560,601	$560,601	$560,914	$560,914	$560,914	$560,914	$560,914	$561,171	$561,171	$561,171	$561,171	$561,171	$578,534	$578,534	$578,534	$578,534	$578,534	$600,195

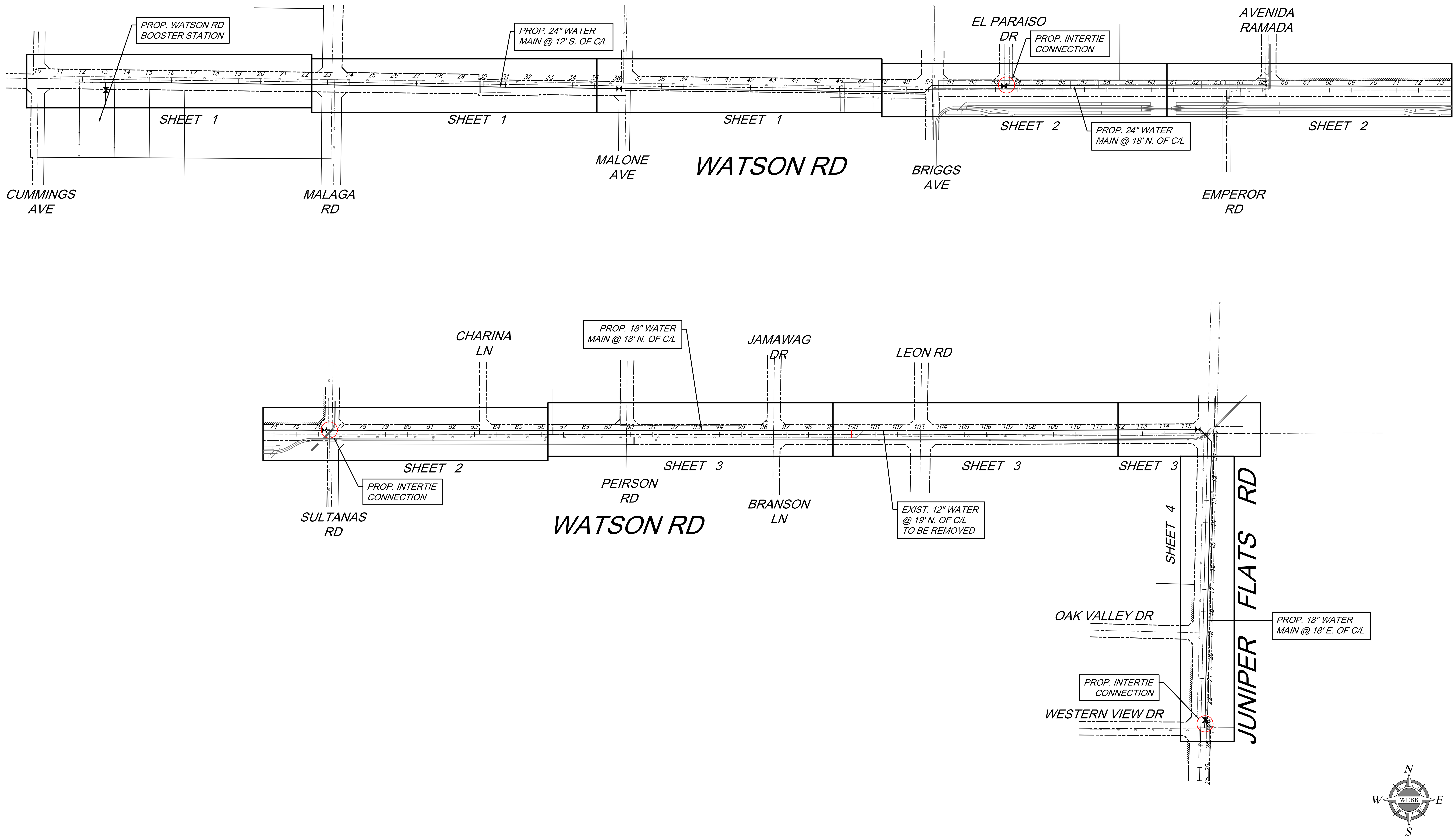
$0	$0	$0	$0	$313	$0	$0	$0	$0	$257	$0	$0	$0	$0	$211	$0	$0	$0	$0	$174
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$6,156	$0	$0	$0	$0	$0	$0	$0	$0
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
$245,065	$245,065	$245,065	$245,065	$245,378	$245,378	$245,378	$245,378	$245,378	$245,635	$245,635	$251,790	$251,790	$251,790	$252,001	$252,001	$252,001	$252,001	$252,001	$252,175

APPENDIX C

DRAFT

EMWD TANK NOMENCLATURE





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INSPECTION		
WTR. OPERATIONS		
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SCALE:
1" = 200'
100 0 200

EASTERN MUNICIPAL WATER DISTRICT
RIVERSIDE COUNTY, CALIFORNIA
WATSON ROAD BOOSTER STATION
SPECIFICATION No. ___
WATSON RD WATER PIPELINE
INDEX SHEET

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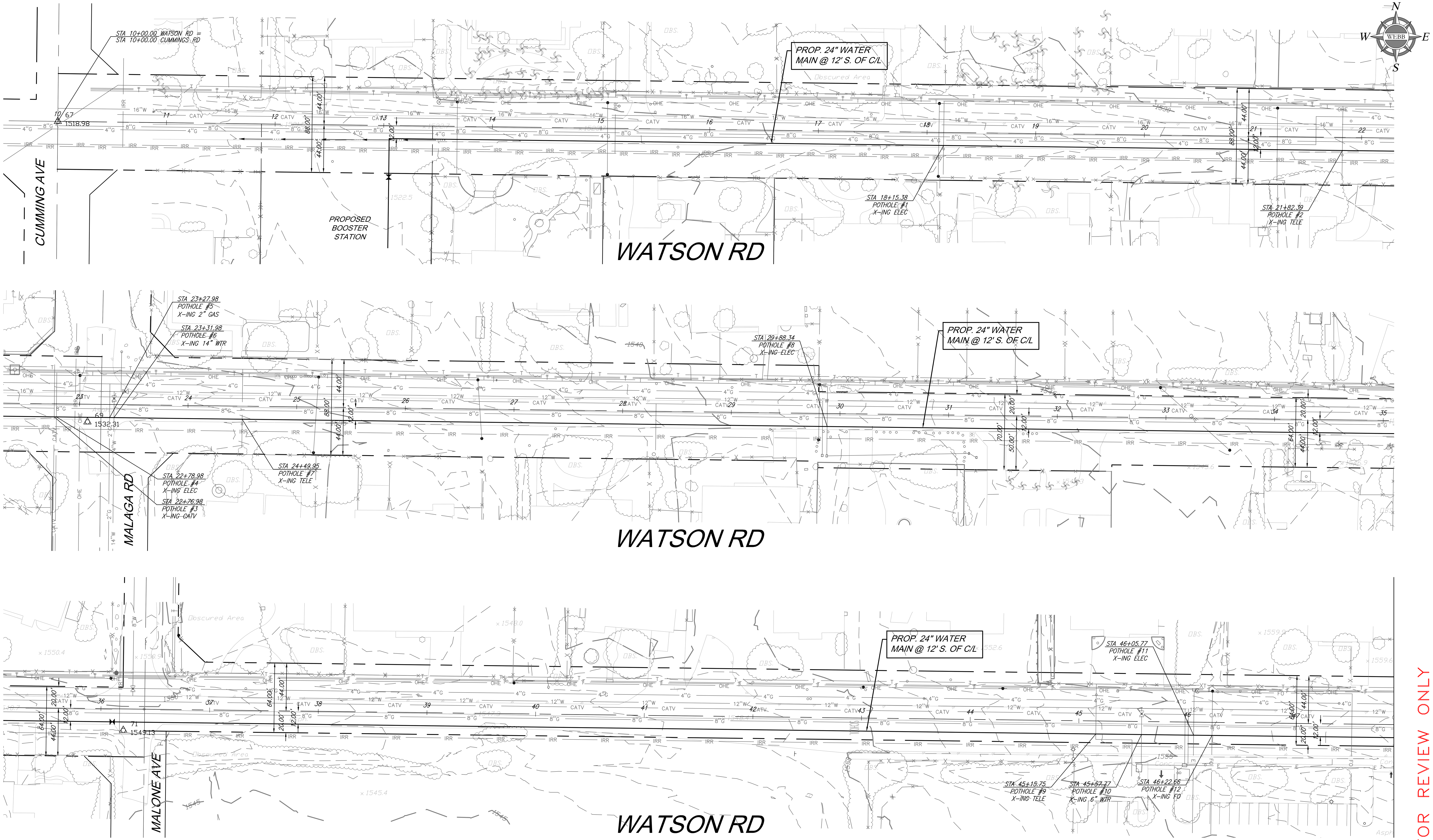

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WATSON RD WATER PIPELINE PRELIMINARY ALIGNMENT

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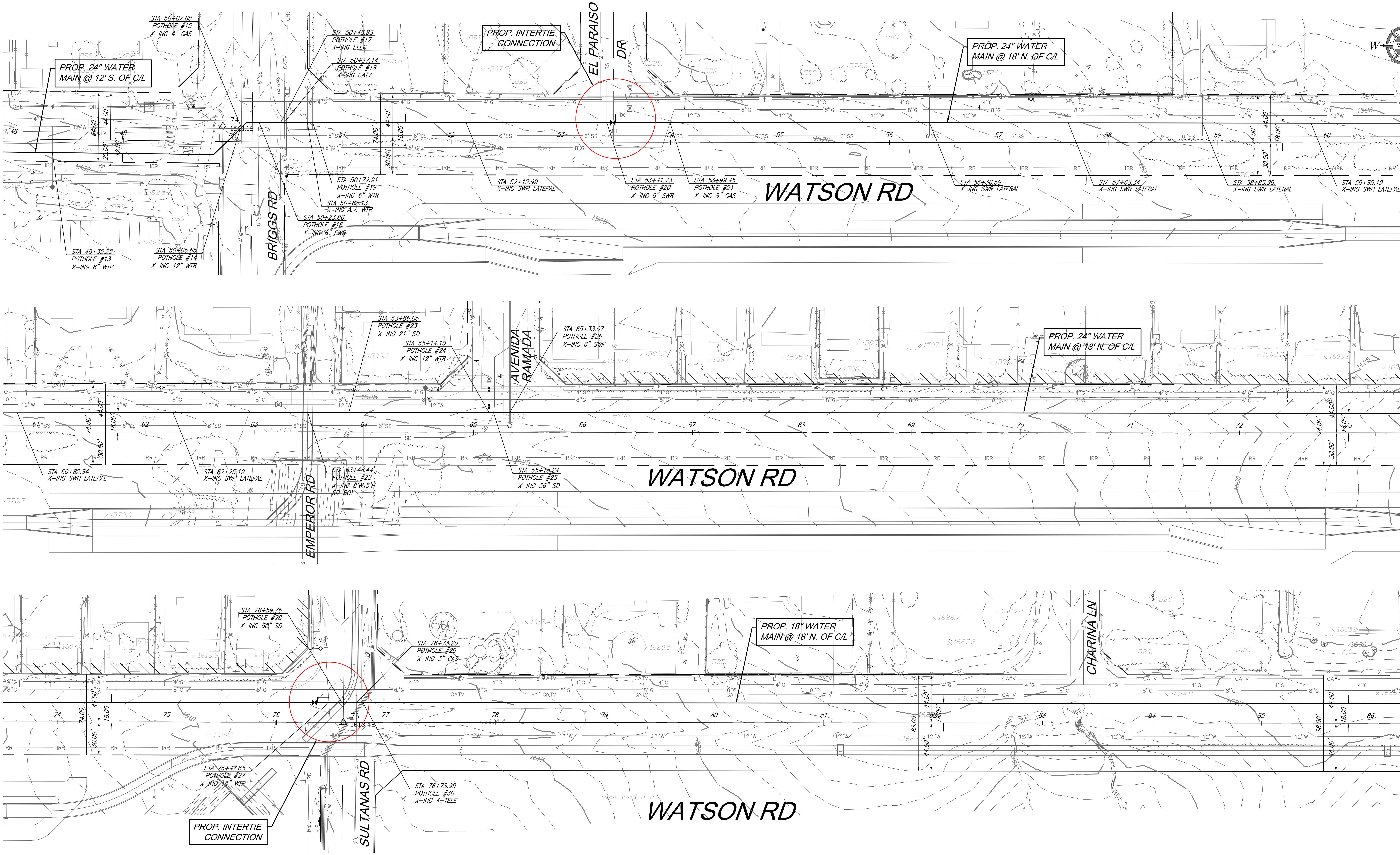

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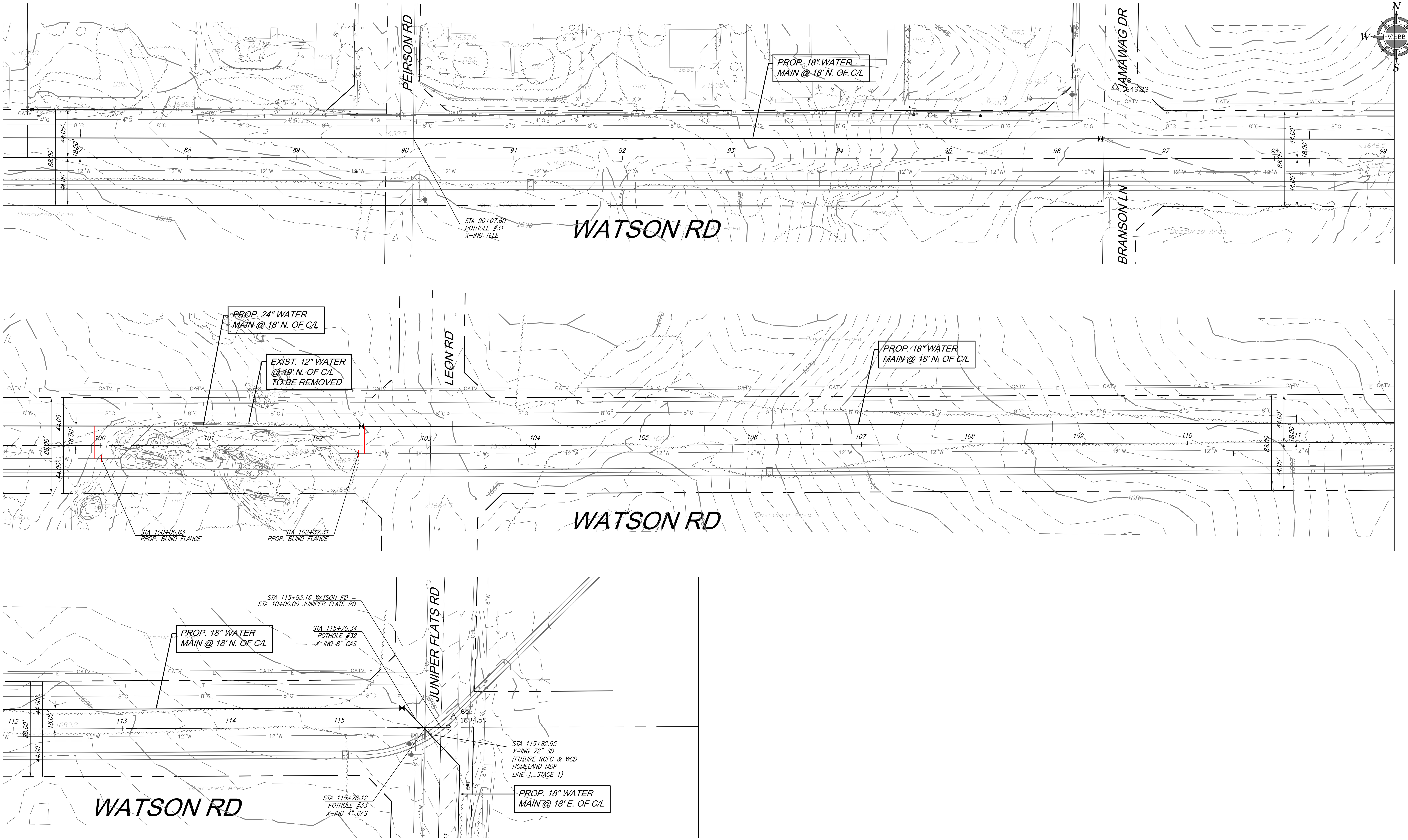

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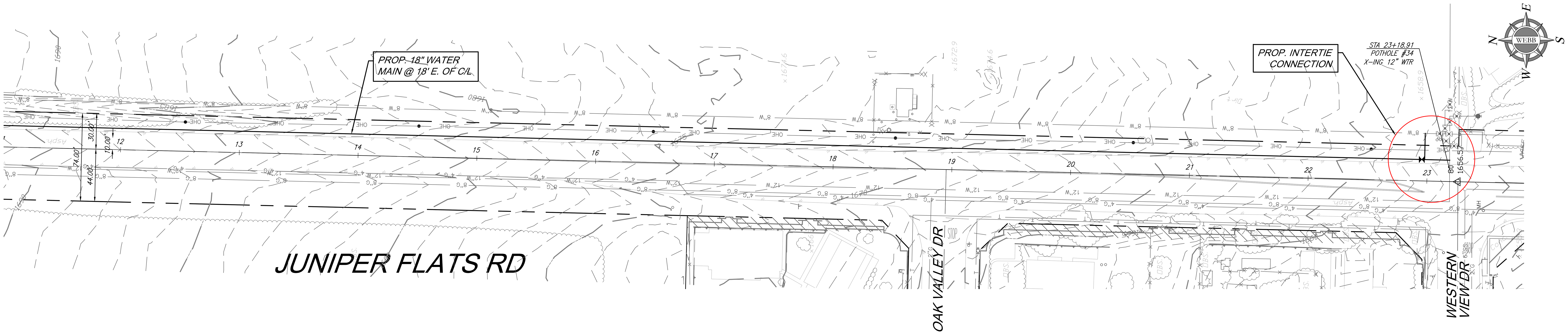

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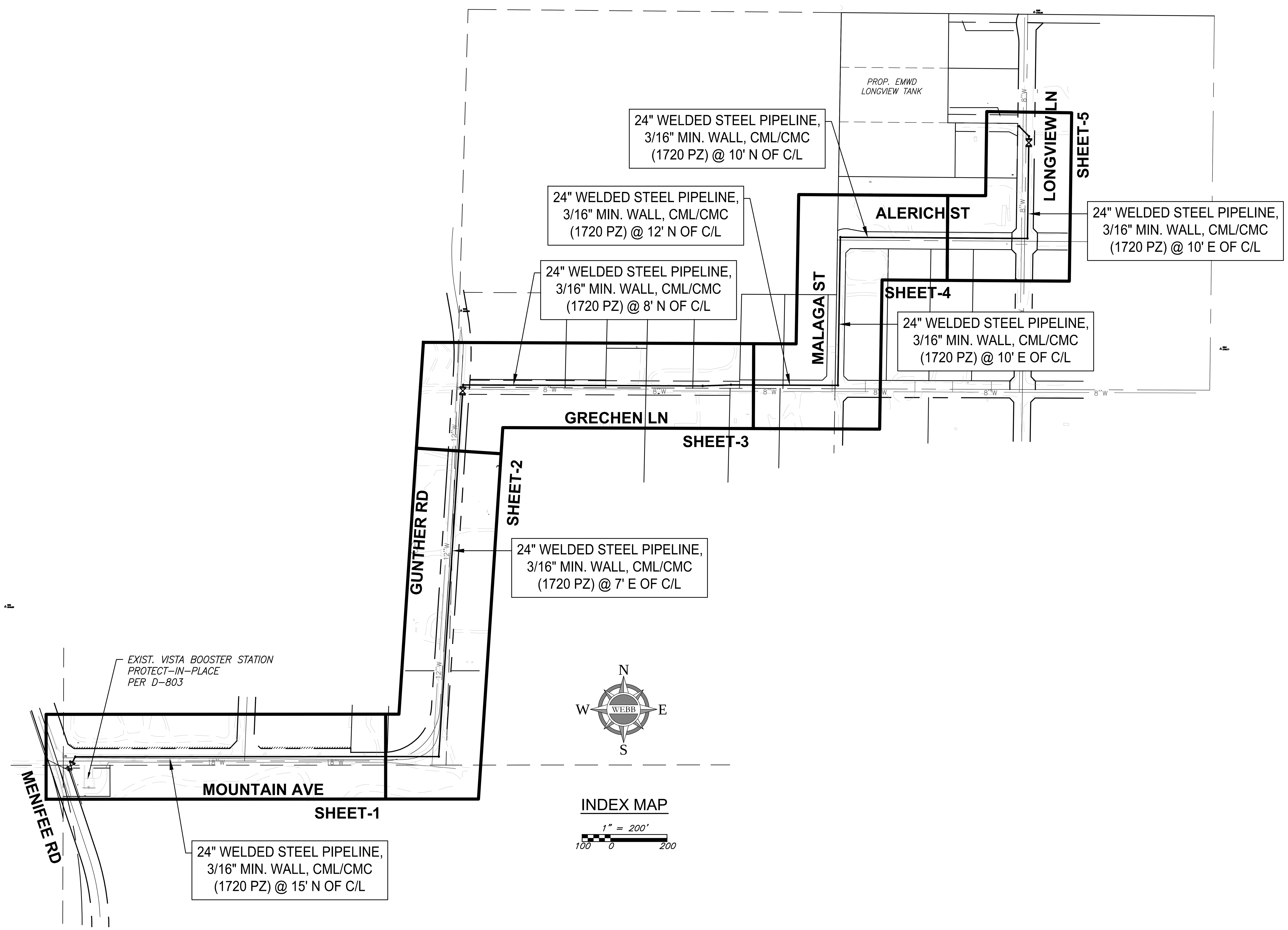

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LONGVIEW TANK SUPPLY PIPELINE
SPECIFICATION No. ____

INDEX MAP, NOTES, LEGEND AND ABBREVIATION

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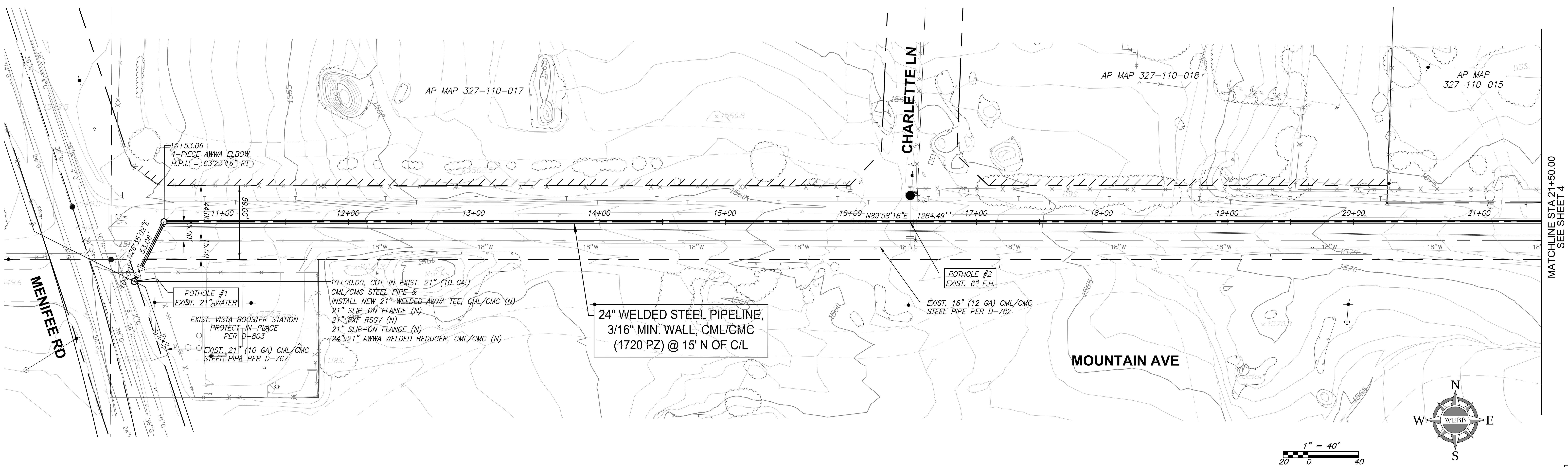

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LONGVIEW TANK SUPPLY PIPELINE
SPECIFICATION No. ____

STA 10+00.00 TO STA 21+50.00 MOUNTAIN AVE

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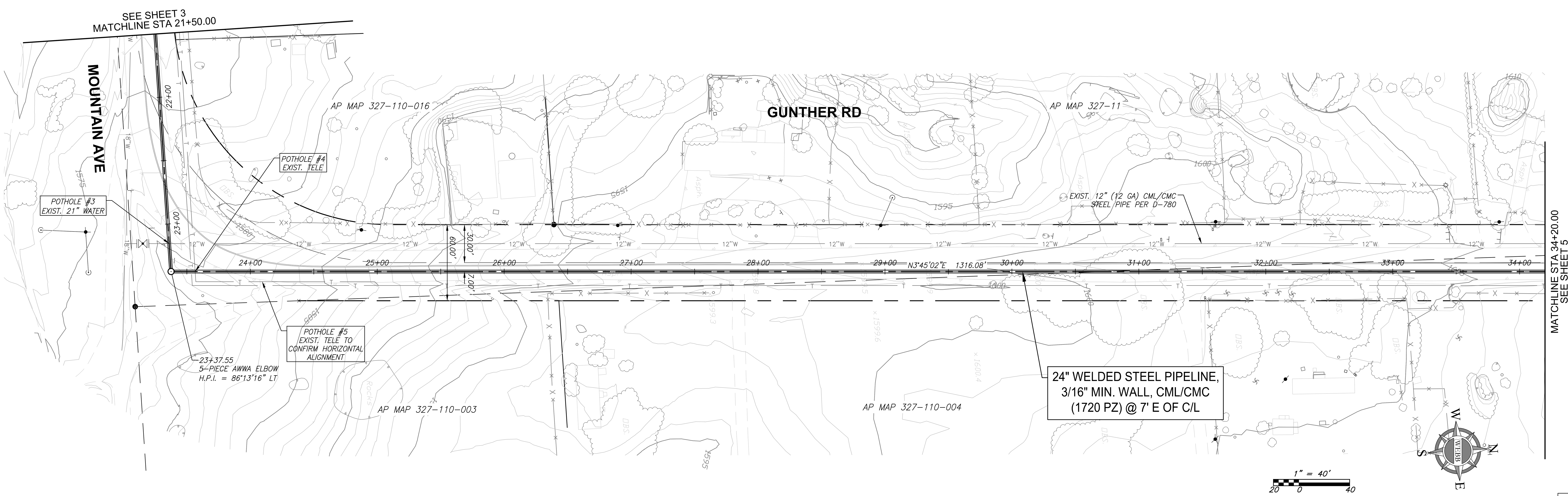

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STA 21+50.00 MPOUNTAIN AVE
TO STA 34+20.00 GUNTHER RD

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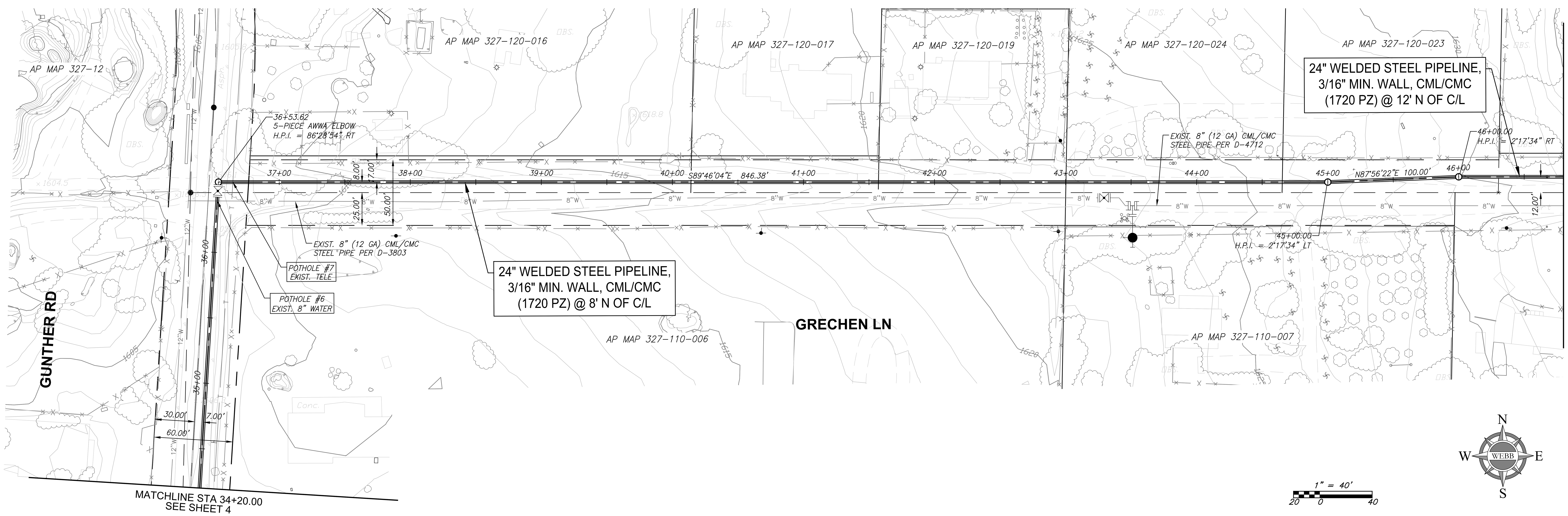

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RIVERSIDE COUNTY, CALIFORNIA
LONGVIEW TANK SUPPLY PIPELINE
SPECIFICATION No. ____
STA 34+20.00 GUNTHER RD
TO STA 46+80.00 GRECHEN LN

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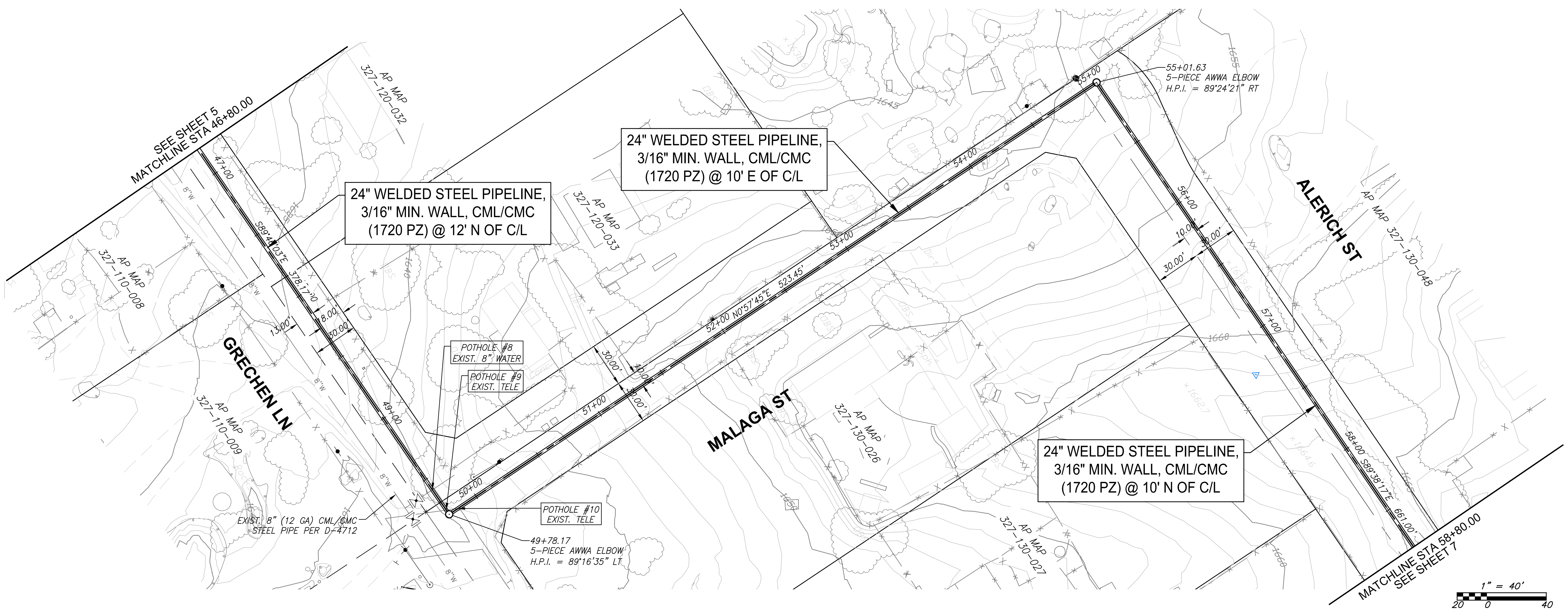

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LONGVIEW TANK SUPPLY PIPELINE
SPECIFICATION No. ____

STA 46+80.00 GRECHEN LN
TO STA 58+80.00 ALERICH ST

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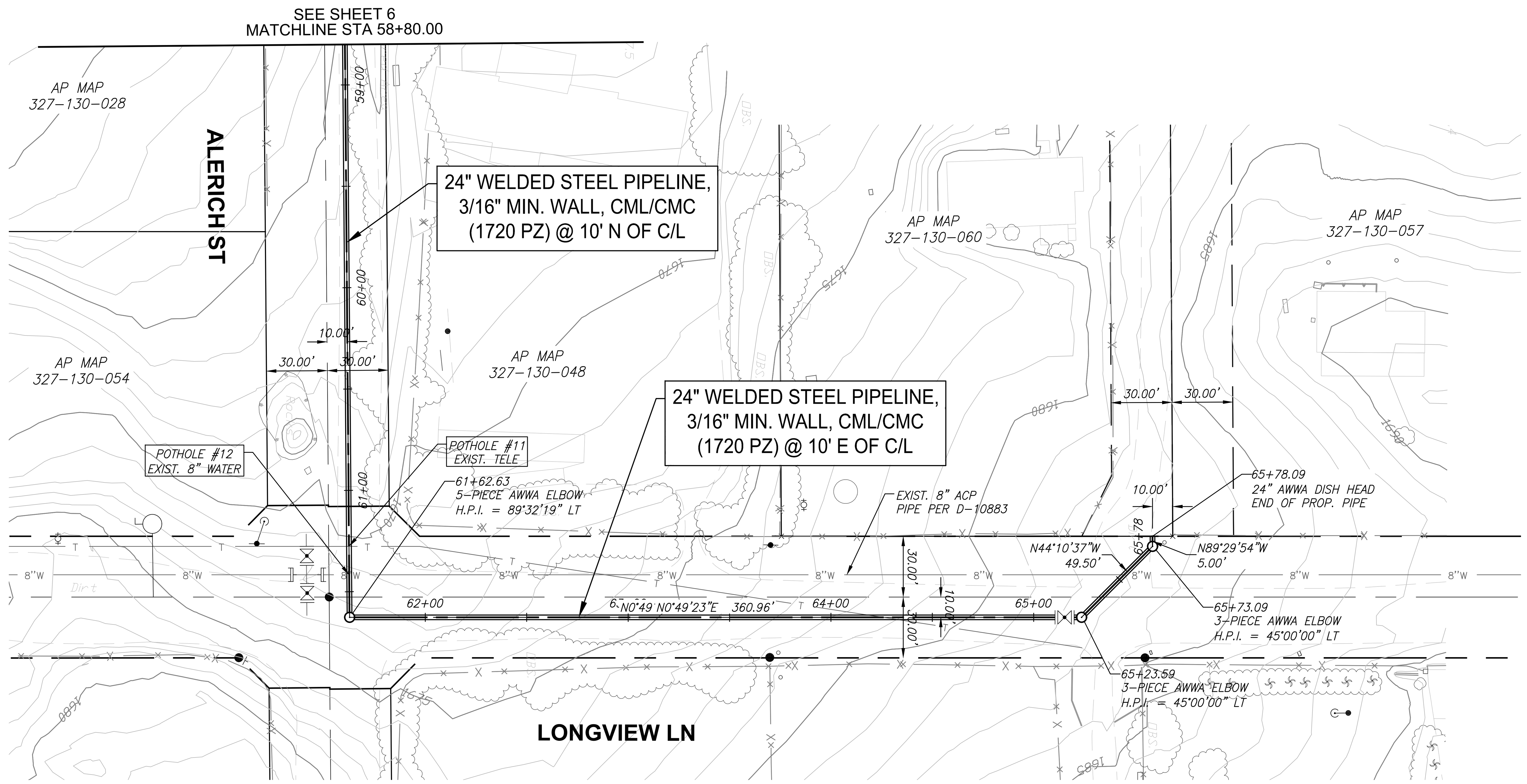

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STA 58+80.00 ALERICH ST
STA 66+00.37 LONGVIEW LN

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C.O.
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SHT. 7 OF. 7
D-

STRATEGIES FOR COMBINING FREE AMMONIA AND BOOSTING CHLORAMINES IN DISTRIBUTION SYSTEMS – SURVEY OF UTILITY PRACTICE

Andrzej Wilczak, Associate Civil Engineer
East Bay Municipal Utility District, Oakland, CA

Charlotte D. Smith, President
Charlotte Smith and Associates, Inc., San Francisco, CA

Y. Koby Cohen, Vice President
Southwest Water Company, Covina, CA

Peter B. Martin, Associate Civil Engineer
East Bay Municipal Utility District, Oakland, CA

Abstract

A survey of combined chlorine (chloramine) booster stations currently in use in the United States has been conducted. The purpose of the survey was to obtain data from actual full-scale chloramine boosting applications, review process control and evaluate the success of these applications. The objective of this survey was to provide water utilities that use chloramine secondary disinfection with recommendations for selecting the location of the booster stations and required process control components based on full-scale utility experiences.

Introduction and “First Things First”

Chloramines are typically more stable than free chlorine and elimination of booster stations has been one of the benefits of chloramine conversion for some utilities. However, in cases where chloramine demand/decay is high or for larger systems with longer water age, boosting chloramine residual may be used for nitrification prevention or disinfectant maintenance. Typically, boosting chloramine would be considered after other operational or engineering options not requiring chemical additions in the system have been investigated. Kirmeyer et al. (2000) states that the causes of disinfectant loss within the distribution system should be determined first prior to installing booster facilities. Operational or maintenance practices may enhance chloramine residual maintenance, without the expense of installing and operating booster disinfection facilities.

Cohen (1998) stated that operating a chloramine boosting station could be expensive and labor-intensive. Boosting chloramine is more difficult due to fact that two different chemicals must be added at different dosage rates and at a specific ratio to the water. Also, day-to-day variation of water quality in the distribution system based on factors such as demand, temperature, type of pipes, and variation water flow and chemicals strength will require constant adjustment of the chemical dosage. Cohen recommended several measures to be considered prior to installing booster stations in the distribution system:

- Establish water quality monitoring program and baseline levels for water quality parameters such as chloramine residual, total ammonia and nitrite.
- Establish a program to circulate the reservoirs daily.
- Make hydraulic modifications to increase circulation within the distribution system.
- Implement a specific flushing program to address problem areas.
- Establish dead-end flushing program.
- Establish a valve maintenance program.
- Follow up all customer complaints with comprehensive investigations.
- Consider increasing chloramine dosage at the source or treatment plant.
- Establish a main replacement or recoating program to address old and deteriorated pipelines with high disinfectant demand.

The above measures were aimed at increasing chloramine residual by attempting to reduce distribution system water age and chloramine demand in distribution system pipes and reservoirs. Grayman et al. (2000) reviewed the methods to improve mixing within a storage reservoir. Wilczak et al. (2003) presented several examples of treatment effects on chloramine stability; these and other factors, such as optimizing corrosion control, should be investigated, chloramine demand/decay in finished water should be characterized and minimized prior to embarking on a chloramine booster station project.

Nomenclature, Potential Benefits and Disadvantages

Booster chlorination typically refers to the addition of chlorine at an appropriate location in the distribution system. The vast majority of booster chlorination applications are for free chlorinated distribution systems and the desired outcome is to raise the free chlorine residual. In the case of a chloraminated system "booster chlorination" - would apply also to the addition of chlorine only; however, the desired outcome would be to bind the available free ammonia and any nitrite present to raise the combined chlorine residual - without developing a free chlorine residual. "Booster chloramination" in a chloraminated system - refers to the addition of both chlorine and ammonia at a distribution system location, typically where free ammonia and nitrite would not be present in sufficient quantities and the desired outcome would be also to raise the combined chlorine residual. According to Kirmeyer et al. (2000) if chloramine residuals are boosted in the system, then it would be preferable to have the ability to add both chlorine and ammonia. Further discussion will explicitly differentiate between booster chlorination and booster chloramination - since these present different design and operational challenges.

The benefits of boosting chloramine residual can be summarized as follows:

- Boosting chloramine will minimize free ammonia available to the nitrifying bacteria and would help in reducing nitrite levels. Chloramine demand is increased in the presence of nitrifying bacteria and nitrite and, therefore, boosting will improve chloramine stability and residual maintenance. This is the main objective of boosting in a chloraminated system. Harrington et al. (2003) presented an excellent explanation of the need to combine free ammonia.
- Boosting chloramine would allow for lower chloramine concentrations to enter the distribution system, thus minimizing its decay rate. The rate of chloramine loss is concentration-dependent. The higher the concentration, the faster it decays and

more free ammonia is being released. Uber et al. (2003) referred to this as the "chemical kinetic effect". For example, as it is the case with free chlorine, the lower disinfectant dose applied at the treatment plant may also lower the levels of disinfection by-products (DBPs) produced and improve the taste and odor of the water in the service areas near the plant.

- Boosting chloramine residual can reduce disinfectant use by better matching the dose to the unique ultimate residence time of the water, rather than dose large flows near the treatment plant to levels that may only be required by relatively smaller flows with long residence times (Uber et al., 2003). So far, the tendency has been to increase chloramine residuals in treatment plant effluents to help maintain the disinfectant in the distribution system. The use of booster stations offers another alternative to these increases.

The main disadvantages of boosting chloramine residual are:

- The mixing of free chlorine with chloramines, if not controlled properly, can result in breakpoint chlorination, loss of residual, increased DBP production at breakpoint and potential for bacteriological regrowth, total coliform rule violation and customer complaints. A utility practicing chloramination must carefully operate and monitor the rechloramination process.
- The need for remote chemical storage, feeds, increased maintenance and monitoring associated with boosting. If insufficient ammonia is present it must be added along with chlorine. Storing and handling chemicals off-site, often in residential areas, is considered undesirable, utility staff have expressed concerns about the safety to workers associated with chemical handling. For these reasons, utilities have been reluctant to employ booster stations.
- The operational challenges of adding two different chemicals at different dosage while trying to maintain a specific weight ratio.

Cohen (1998) offered several comments on distribution system chloramine booster stations from his experience:

- Proper mixing of the chemicals needs to be allowed prior to the distribution system; 10 or even 20 pipe diameters distance was not enough for proper mixing. Static mixer may need to be installed.
- Ammonia stock concentration should not be too high (< 20%) to minimize evaporation in hot climate areas. Ammonia tank needs to be designed with proper pressure relief to allow for trouble free tank filling. Bury the ammonia lines 1 ft below grade to minimize chemical pump vapor locking and maintain constant ammonia dose.
- In case of flow-through reservoir, always add chlorine at the influent and ammonia at the effluent of the reservoir. This will minimize nitrification inside the reservoir.
- Maintaining a 5:1 Cl_2:NH_3-N weight ratio consistently is difficult. A set of guidelines for the operators and the use of supervisory control and data acquisition (SCADA) system and computers to control the ratio may help.
- If an attempt to automatically control the dosage is made, set the chlorine analyzer to control the chlorine pump to achieve total chlorine residual goal. And then, phase the ammonia pump at 5:1 ratio to the chlorine pump and prevent the ammonia pump from running without the chlorine pump being on.

- Hook up alarms to warn of chlorine chemical pumps out of service, chlorine residual out of range and low chemical levels.

Kirmeyer et al. (2000 and 1999) list the following criteria in selecting the location of booster stations:

- The location should be such that a relatively large volume of water can be disinfected.
- The water to be treated travels in one direction.
- The chlorine residual in the water has begun to decrease, but has not totally dissipated.
- The chlorine can be applied uniformly into the water.
- The location is acceptable by neighbors and is easily accessible for chemical delivery vehicles with room for chemical storage and feed equipment.
- Power is readily available.
- Communications systems are readily available for SCADA system.
- Flow and/or residual pacing can be used.
- Safety concerns can be addressed.
- For a common inlet/outlet line, chlorine should be injected as the storage facility is filling, although mixing the chlorine throughout the contents may be difficult.

Summary of Combined Chlorine Full-Scale Booster Station Design and Operational Experiences

Several utilities were contacted to provide case studies. The authors had personal knowledge of these applications. The survey is not meant to be an exhaustive presentation; recently, more installations have come on-line, especially in Southern California and in Florida. Rather, we tried to contact the utilities that represented established booster operations with several years of operational experiences. Eight utilities (and ten cases) applying booster chlorination or chloramination in chloraminated distribution systems were surveyed and the details of the survey were presented in Table 1. The table is organized into several categories depending on the location of the booster station; these different locations typically present different objectives and different challenges of boosting.

Table 1. Summary of Existing Combined Chlorine Full-Scale Booster Stations

Location/Objectives	Process Control	Water Quality	Chemical Storage	Maintenance	Effectiveness
Boosting with Chlorine at a Large Transmission Reservoir Close to Water Treatment Plant					
Continuous Cl_2 boosting at an outlet of a big transmission uncovered flow-through reservoir to increase residual. 4-7 days old water. 75 Mgal reservoir divided into two parts with separate inlets and outlets. One side of the reservoir is in service at any time to improve turnover. Location: Oregon	Flow-paced Cl_2 injection. Cl_2 analyzer upstream for trending but none downstream. Very careful dose adjustments by the operators based on Cl_2:NH_3-N ratio at the outlet and free NH_3 downstream. Chlorine feed to twin 30-in effluent pipes flowing at 3–15 MGD. Capability of influent feed – not used. Stable flow & Cl_2, NH_3 conditions.	Before boosting: 0.8 – 1.2 mg/L Cl_2 measured on-line. 0.05 – 0.15 mg/L free NH_3-N measured with grab samples weekly (summer), monthly (winter). NO_2 not measured. Boosting dose: 0.2 – 0.5 mg/L Cl_2. After boosting: Grab Cl_2 and NH_3-N weekly or monthly 30 – 45 min downstream.	12.5% hypochlorite stored in four 1,500-gal tanks in a separate building. Safety equipment typical for NaOCl storage.	Calibrate Cl_2 analyzer and metering pumps once per week. Delivery of NaOCl every two weeks to monthly. Small maintenance items: broken pipe, leaks etc.	Successful in residual boosting for years without breakpoint but nitrification still occurs at ends of the system. Reservoir will be replaced with smaller covered facility.
Continuous Cl_2 boosting at inlet and outlet of several large transmission flow-through reservoirs to increase Cl_2 residual and combine free NH_3. 80 – 522 Mgal covered reservoirs Location: S. California	Flow-paced Cl_2 dose with post Cl_2 analyzer residual trim. Cl_2 analyzers before and after boosting at influent and effluent. Flow meters on the influent and effluent. Operator can adjust based on grabs. Flows may fluctuate but water quality remains stable.	Influent boosting: 2.3 – 2.4 mg/L Cl_2 before boosting 0.2 – 0.3 mg/L dose. 2.5 mg/L Cl_2 target and 5:1 ratio Daily grab Cl_2 sample 2 per week NH_3, NO_2 Effluent boosting: 2.0 mg/L Cl_2 residual, Cl_2 dose to bring the ratio to 5:1.	5.25% NaOCl for hypochlorite decay control. Manual NH_3 feed capability to influent and effluent – used only after reservoir outages (very infrequently).	Check pumps daily, rotate monthly. Redundant systems. Regular preventive maintenance.	Maintain 5:1 ratio and high chloramine residual at the influent to and effluent from the storage reservoirs

Table 1 (continued). Summary of Existing Combined Chlorine Full-Scale Booster Stations

Location/Objectives	Process Control	Water Quality	Chemical Storage	Maintenance	Effectiveness
Boosting with Chlorine and Ammonia at a Blending Point in the Wholesale System					
Continuous boosting of total Cl_2 to tie up free NH_3 and boost total Cl_2 in a blend of surface and ground water to meet residual setpoint target of 4.25 after booster. Prior to boosting, treated surface water and treated groundwater are blended together in the transmission main. Then the final product residual is boosted before delivery to customer. Water is 8-24 hours old. Location: Florida	Total Cl_2 analyzer controls the output of NaOCL metering pumps (variable speed & fixed stroke). Free NH_3 monitored via Hach APA 6000 analyzer. Process control for NH_3 pumps based on total Cl_2 analyzer value and PLC calculation which maintains a fixed ratio for the injection of NaOCL and NH_3. Fixed ratio value is adjustable via SCADA system based on free NH_3 in finished water. Booster NH_3 dose can be adjusted from 2:1 to 6:1 CL_2:NH_3-N ratio. This provides the flexibility to optimize free NH_3 in the blend. Manual override capability available for all metering pumps. All flow, pressure and water quality data collected and stored in SCADA system.	Before boosting: 3.0 – 3.5 mg/L Cl_2 On-line monitoring for monochloramine, total CL_2, free NH_3, pH CL_2 Booster dose: 0.75 – 1.25 mg/L Cl_2 to combine free NH_3. NH_3 Booster dose: 0.0 – 0.2 mg/L NH_3-N After boosting: 4.25 mg/L total Cl_2 +/- 0.1 mg/L free NH_3 Total Cl_2 analyzer Daily Cl_2 grab sample 2-3/week NH_3 sample Cl_2 grab sample every 8 hours. 1/week NH_3 On-line monitoring: total CL_2, free NH_3, pH, monochloramine. Guidelines for Cl_2, NH_3, ranges and what to do if these ranges are not met. Alarm limits on all parameters set within SCADA system to alert operator of potential problems.	12.5% NaOCl in 4-9300-gal RFP tanks with containment for both Cl_2 feeds in one climate controlled building. 19% NH_4OH in a 2-1900 gal Stainless tanks in a separate room. One ammonia vapor scrubber manifolded to both tanks.		Reduced nitrification in the distribution system and increased chloramine residuals in other parts of the distribution system.

Table 1 (continued). Summary of Existing Combined Chlorine Full-Scale Booster Stations

Location/Objectives	Process Control	Water Quality	Chemical Storage	Maintenance	Effectiveness
Boosting with Chlorine and Ammonia at the Entry to a Consecutive Distribution System					
<u>NH_3 and Cl_2 boosted at a remote facility to a 16-in main flowing up to 0.2 MGD to increase chloramine residuals in a consecutive system.</u> Water age: several days. Location: Pennsylvania	NH_3 followed by Cl_2. Pump stroke and speed (on SCADA system) manually adjusted with flow and dosage set point. Flow varies from zero (or reverse flow) to 1,000 gpm. Magnetic meter measures flow in either direction. During flow reversal all chemical feeds are shut down	<u>Before boosting:</u> 0.2 – 2.0 mg/L Cl_2 0.1 – 0.5 mg/L NH_3-N Operators monitor pre- and post-total Cl_2 analyzer levels, adjust feed rate and Cl_2:NH_3-N ratio (4:1) based on these observations. <u>After Boosting</u>: 0.5 – 2.0 mg/L Cl_2	12.5% NaOCl and 10% NH_4OH in 55-gal drums fed with a diaphragm metering pump (one redundant pump for each feed). Continuous chemical inventory with platform scales.	Typical maintenance for a chemical feed facility.	<u>Ensures adequate Cl_2 in consecutive system</u>. Decreased total Cl_2 residual leaving WTP from 2.5 to 2.0 mg/L, which lowered T&O complaints.
Boosting with Chlorine at a Transmission Pumping Plant within the Distribution System					
<u>Cl_2 boosting year-round (primarily in winter when demands drop off) at a pumping plant (3-11 MGD flow) partway in the distribution system to produce consistent total Cl_2 residual, reduce HPC growth and nitrification in upper pressure zones.</u> 1-7 days old water Location: N. California	Cl_2 fed to the intake of four pumps –metering pump speed based on number of pumps on. No flow meter. Pump stroke based on residual feedback to maintain constant residual set point of 2.25 mg/L. If residual > set point, pump stroke would go down to zero. High dose cutoff. Operator can see effluent Cl_2 residual at the plant.	<u>Before boosting:</u> 1.9 – 2.6 mg/L Cl_2 in summer; lower levels in winter. 2.6 mg/L Cl_2 and 5:1 ratio in plant effluent. NH_3 and total Cl_2 measured every other day before and after boosting. <u>Boosting Dose</u>: Small adjustments of Cl_2 dose made based on free NH_3-N grab readings – not much variation. 5:1 ratio. <u>After Boosting</u>: Total Cl_2 analyzer.	Installed at an old free Cl_2 booster station. Wallace & Tiernan OSEC on-site Cl_2 generator producing 0.8% hypochlorite solution. Ventilation needed for hydrogen off gassing. OSEC has built-in alarms and shutoffs. Installed hydrogen monitors.	Visits every other day to check Cl_2 and NH_3 residuals, check the salt concentration with hydrometer. Calibrate Cl_2 analyzer. Other maintenance less frequent. $250,000 capital cost.	<u>Booster station is effective and has been operated and maintained for 10 years. Nitrification still occurs in tanks with insufficient turnover; however, residuals entering the tanks are as high as 2.0 mg/L due to the booster station.</u> Booster contributed to delaying onset of nitrification in the summer. Operated since 1994.

Table 1 (continued). Summary of Existing Combined Chlorine Full-Scale Booster Stations

Location/Objectives	Process Control	Water Quality	Chemical Storage	Maintenance	Effectiveness
Boosting with Chlorine and Ammonia at a Flow-Through Reservoir within the Distribution System					
Continuous boosting of Cl_2 at the influent to tie up free NH_3 and boosting Cl_2 & NH_3 at the effluent of 1.5 Mgal flow-through reservoirs in the distribution system to prevent nitrification within these facilities and increase total residual for the rest of the system. 1-2 days old water Location: S. California	Grab samples and manual dose changes by the operators. Manual adjustments needed for multiple chemical feeds. Guidelines for inlet and outlet Cl_2, NH_3, NO_2 ranges and what to do if these ranges are not met. Influent flow read by reservoir level raise rate, effluent flow meter.	Before boosting: 1.0 – 1.5 mg/L Cl_2 Daily Cl_2 grab sample 2-3/week NH_3 & NO_2 1st booster dose: 0.4 – 0.6 mg/L Cl_2 to combine all free NH_3. 2nd booster doses: 0.6 – 0.8 mg/L Cl_2 0.1 – 0.2 mg/L NH_3-N After boosting: 2.5 mg/L total Cl_2 < 0.05 mg/L free NH_3 Total Cl_2 analyzer Daily Cl_2 grab sample 2-3/week NH_3 sample	12.5% NaOCl in a 500-gal tank with containment for both Cl2 feeds in one building. 19% NH_4OH in a 500-gal double wall tank in a separate building.	$20,000 - $30,000 per building. Operating costs mostly chemicals.	Reduced nitrification in the distribution system and reservoirs and increased chloramine residuals in other parts of the distribution system since 1998. NH_3 added to reservoir influent in the initial trials – resulted in nitrification within the reservoir – addition point was moved to effluent.
Boosting with Chlorine at a Water Storage Facility at the Ends of the Distribution System					
Seasonal (summer and early fall) Cl_2 boosting into I/O line during pumping between two tanks at the end of the system serving a small pressure zone with low demand. 1-2 weeks old water. 1 Mgal tank pumps to 0.13 Mgal tank. Larger tank kept 2/3 full, has common inlet/outlet line. Location: Oregon	Operator enters water flow to chlorinator. Dose based on that flow & temperature. Chlorinator stream is flow-paced based on flow meter at I/O pumping plant with temperature adjust. Cl_2 analyzer downstream of the booster for trending only.	Before boosting: 0.5 – 0.9 mg/L Cl_2 On-line Cl_2 analyzer, no grab samples for NH_3 or NO_2. Boosting dose: 0.2 – 0.4 mg/L Cl_2. After boosting: 0.8 – 1.3 mg/L Cl_2 On-line Cl_2 analyzer, no grab samples.	Tablet feeder inside pump station above ground. Water flows through the bottom of 3 ft high stack of approx. 40 tablets. Operators prefer tablets to liquid. Chlorinator turned brass fittings green and Cl_2 odor was present. Ventilation was improved to correct that problem.	$5,000 to install. Replenish tablets once per week. Tablets can swell and jam the unit if not used for a while. It would be easier to operate continuously. Small hypochlorite tank and metering pump would be better.	For the most part satisfied – 6 years old system. Still nitrification in the zone but booster helps maintain residuals. Prior attempts with recirculation pump on the 1 Mgal tank and pump-back into the lower pressure zone did not work well to maintain residual in that tank.

Table 1 (continued). Summary of Existing Combined Chlorine Full-Scale Booster Stations

Location/Objectives	Process Control	Water Quality	Chemical Storage	Maintenance	Effectiveness
Recirculation loop with continuous (May-Nov) Cl_2 boosting at three 1 – 5 Mgal distribution system standpipes to increase residual, minimize nitrification and stabilize pH. Several days old water. Startup in spring when there is no nitrification. Discontinued when water gets cold. Location: Maine	200 gpm (0.3 MGD) of water is taken from standpipe I/O line and returned on top. Cl_2 dose adjusted manually on a weekly basis based on grab total Cl_2 and free NH_3-N to combine free ammonia in the recirculated stream. No on-line Cl_2 analyzers. Metering pump and NaOCl scale readings are used for daily dose calculations. Smaller standpipes with larger turnover are monitored more frequently	Weekly monitoring of system water, water before & after booster for: total and free Cl_2, free NH_3-N, NO_2, pH, temperature. System water: 0.7 – 0.9 mg/L Cl_2 0.2 – 0.3 mg/L free NH_3-N Boosting dose: 0.7 – 1.5 mg/L Cl_2. After boosting: 1.0 – 1.2 mg/L Cl_2 within the standpipe. Without boosting it would be zero 0.2 mg/L free NH_3-N inside standpipe.	10x12-ft insulated & vented storage shed on a concrete slab floor. Equipped with 5 HP metering pump, chemical feed pump, scale, 12% 30-gal NaOCl drums and sink.	Capital costs \$8,000. Monthly operating costs \$2,500. Would like to install Cl_2 analyzers and connect to SCADA system. Would like to connect the hypochlorite scale reading to SCADA system.	Nitrification reduced in standpipes with good turnover without DBP formed. Nitrite still increasing in the standpipes. Further optimization ongoing. 5 Mgal standpipe at the end of the system (30 days old water) with poor circulation. Only 0.7 mg/L Cl_2 in system water. 0.2 mg/L Cl_2 and 0.34 mg/L free NH_3-N inside standpipe (would be zero with no boosting). Will add another loop with booster to double recirculation rate.
Cl_2 boosting (May – Nov) at a distribution pumping plant supplying water to a 1 Mgal standpipe and a portion of a distribution system. Several days old water. Location: Maine	Cl_2 feed turned on automatically with 1,000 gpm pumps (constant pumping rate). Dose set based on grab total Cl_2 and free NH_3-N samples to combine free ammonia in the recirculated stream. No on-line Cl_2 analyzers.	System water: 1.2 mg/L Cl_2 0.2 mg/L NH_3-N Boosting dose: 0.2 – 0.8 mg/L Cl_2 After boosting: 1.0 mg/L Cl_2 and (without boosting it would be zero) 0.12 mg/L free NH_3-N in the standpipe			Nitrification reduced but nitrite still is increasing in the standpipe. Further optimization ongoing. Recirculation loop is better because allows more NH_3 to be combined inside standpipe than at the pumping plant.

Table 1 (continued). Summary of Existing Combined Chlorine Full-Scale Booster Stations

Location/Objectives	Process Control	Water Quality	Chemical Storage	Maintenance	Effectiveness
Boosting with Chlorine and Ammonia at a Water Storage Facility at the Ends of the Distribution System					
ClorTec Reservoir Management System™ (Chlorine and ammonia feed with mixing pump inside a 10MG storage tank at end of system. Goal: Maintain total chlorine residual in tank. Location: S. California	On-line combined chlorine residual analyzer and PLC control chlorine and ammonia feed (also on-site brine generator and sodium hypochlorite generator). SCADA to off-site location for monitoring.	System water approximately 2.5 mg/L total chlorine residual. After boosting: Target 2.3 mg/L residual achieved inside tank without deep cycling.	4 ton brine solution tank 450 gallon tank for 0.8% NaOCl 100 gallon tank for 19% aqueous ammonia	$85,000 installation cost. Relatively low maintenance after initial start-up. Ammonia injector to be acid washed once per year. All system components carry 2 year warranty	Target 2.3 mg/L total chlorine residual maintained at all times inside tank. Before booster installation: detectable residual inside tank due to deep cycling.

Survey Results

A variety of booster station locations and process controls were applied depending on the case and funds available. Overall, several utilities have successfully boosted at their flow-through transmission facilities for years with careful monitoring with both on-line or grab samples. A great deal of operator attention is required in the operation of these facilities since the success of boosting combined chlorine residual impacts the entire downstream distribution system. The applications at the smaller reservoirs or pumping plants at the ends of the distribution systems are typically newer and a significant amount of experimentation is still going on to optimize the process. However, these attempts have been successful in maintaining greater total chlorine residuals in storage facilities served by the booster stations. The numbers of booster stations at the storage facilities in the further ends of the distribution system is likely to increase significantly in the near future as more systems are converted to chloramines and the practice of seasonal (annual) breakpoint of the entire distribution system becomes less attractive due to more stringent DBP regulations and concerns regarding disinfection by-products.

The following is the tabular summary of the process control measures employed for boosting chloramine residual based on the limited survey conducted. Table 2 may help discern general trends in the information included in Table 1.

Table 2. Booster Station Locations, Chemical Use and Process Control Measures (Frequency per 10 Surveyed Cases)

Item	No. Cases
1. Booster location at a flow-through facility*	6
Booster location at a pumping plant discharging into a reservoir	2
Booster location at a reservoir with a recirculation loop or internal mixing*	2
2. Chlorine boosting	10
Gaseous chlorine	0
Liquid hypochlorite	7
On-site hypochlorite generation	2
Tablet chlorinator	1
Ammonia boosting	5 (3)**
3. Water flow meter available	6
Water flow assumed based on water pump flow	4
4. Chemical feed flow-paced only***	3
Chemical feed flow-paced plus chlorine residual set-point feedback***	4
Chemical feed flow-paced plus chlorine dose set-point***	1
Chemical feed adjusted manually only***	2
5. On-line total chlorine analyzer before booster	5
On-line total chlorine analyzer after booster	7
On-line ammonia analyzer	1
6. Grab total chlorine measurement before and after booster	10
Grab ammonia measurement before and after booster	8
Grab nitrite measurement before and/or after booster	4

* Multiple applications at several utilities.

** Three locations with continuous ammonia addition (as needed); two locations with ammoniation facilities not used.

*** Dose could be fine-tuned as needed by the operators in majority of cases based on on-line or grab water quality analyses.

The following observations and comments from the current survey are emphasized:

- Booster facilities may be operated continuously throughout the year or seasonally.
- Nitrification still occurred at far ends of the distribution systems in spite of boosting at transmission reservoirs and/or transmission pumping plants. However, the onset of nitrification occurred later and areas impacted were smaller.
- Boosters located on a recirculation loop at a storage facility were more effective for that facility than boosters located at a pumping plant because they allowed more free ammonia to be combined inside a tank than was available for boosting at a pumping plant.
- Booster is successful in tanks with good turnover or induced mixing. Combining free ammonia in a booster loop alone may not be sufficient to control nitrification long-term. Breakpoint chlorination at the tank influent may be needed to control nitrification.
- Prior attempts to recirculate only at a reservoir or to pump back into a lower zone were unsuccessful and boosting had to be implemented.
- Three boosting applications where ammonia was continuously added were successful. More instrumentation was needed and more operator attention seems necessary. Manual dose adjustments are needed where more than one chemical is used. Flow and dose set-point control was needed whereas flow and residual set point was too difficult.
- Residual total chlorine leaving the treatment plant was lowered in one instance after the booster station was placed in service.
- On-line total chlorine analyzers, liquid hypochlorite feed systems with remote chemical inventory measurement, and connection to a SCADA system were preferred for booster operation.
- Cost of the booster stations varied from inexpensive (less than $10,000) at a small storage facility to costly ($250,000 and more) for a major pumping plant or transmission reservoir.
- Reverse flows require a meter that can measure flow in both directions. A downstream on-line total chlorine analyzer was needed in reverse flow cases to prevent breakpoint chlorination.
- No accidents or safety violations associated with the remote booster stations were reported in the survey. Small chemical leaks were taken care of with proper maintenance and safety measures. Booster stations should have the same safety and redundancy measures as any chemical storage and feed facilities.

Proposed Controls and Water Quality Sampling for a Chloramine Booster Station

Several different process controls and water quality sampling schedules are applied by utilities depending on the location of the booster station, boosting objectives, variation in water quality, water flows, funds and staff availability. Therefore, it is not possible to recommend an “ideal” process control and water quality testing configuration that would fit every case. However, based on gathered information four alternative approaches are summarized below:

- A compound loop (residual feedback) control for flow-through boosting of one chemical only (chlorine). This control scenario provides a consistent total chlorine residual downstream, which is a significant benefit where influent residuals are highly variable. This application is possible where enough free ammonia is always present to combine with the added chlorine. Adequate mixing conditions must be provided to allow for the chlorine to mix with the ammonia at the booster station; in many cases this can be achieved by adding hypochlorite at a pump inlet. The process controls and water quality sampling plan are shown in Figure 1.
- A dose setpoint control for a flow-through boosting of one or two chemicals (chlorine only or chlorine and ammonia) with manual adjustments based on grab or on-line water quality measurements. The process controls and water quality sampling plan for this case are shown in Figure 2.
- A water recirculation loop for a water storage reservoir with dose setpoint control. For single chlorine feed applications enough free ammonia must be available to combine with the chlorine added at the booster station. The process controls and water quality sampling plan are shown in Figure 3. Complete mixing of the reservoir contents is essential to the success of boosting.
- A water recirculation loop for a water storage reservoir with compound loop (residual feedback) control for chlorine or chlorine and ammonia feeds is shown in Figure 4. An external water recirculation loop or an internal mixer can be applied to deliver the chemicals and mix the reservoir contents. A total chlorine residual analyzer sampling reservoir contents sends the feedback signal to the chemical feed pump(s) controller.

Conceivably**,** one could control the process with the use of the on-line total chlorine residual, free ammonia and nitrite analyzer. An instrument capable of measuring all of these water quality parameters and controlling chemical feed(s) has not been tested yet for this purpose. Ever increasing applications of chloramine boosting will tell whether total chlorine analyzers are going to be sufficient for the purpose of disinfectant residual boosting within chloraminated systems or whether more expensive and sophisticated instruments capable of doing several analyses in one would be needed or preferable for some applications

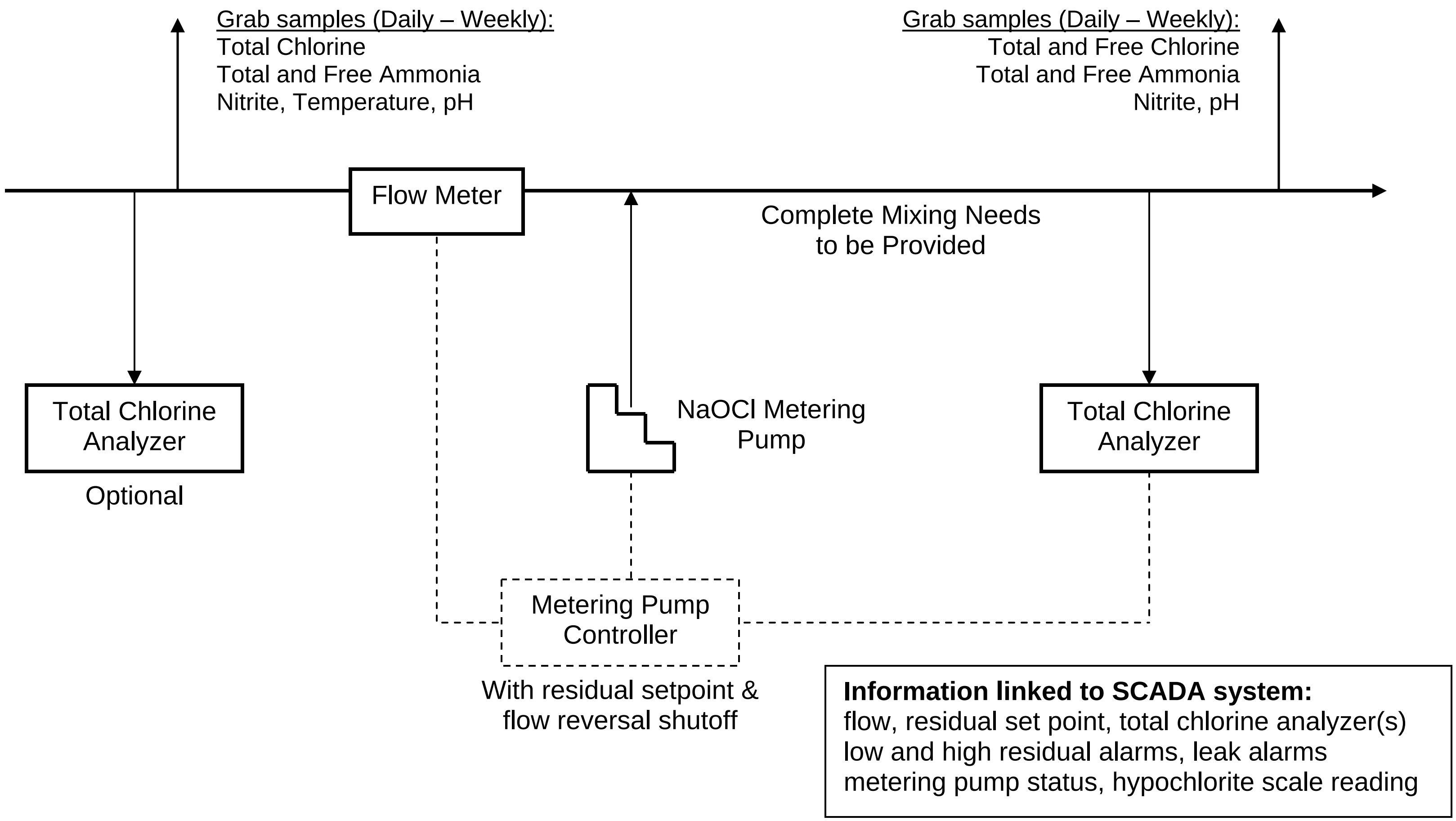

Figure 1. Compound loop (residual feedback) control at a flow-through booster station

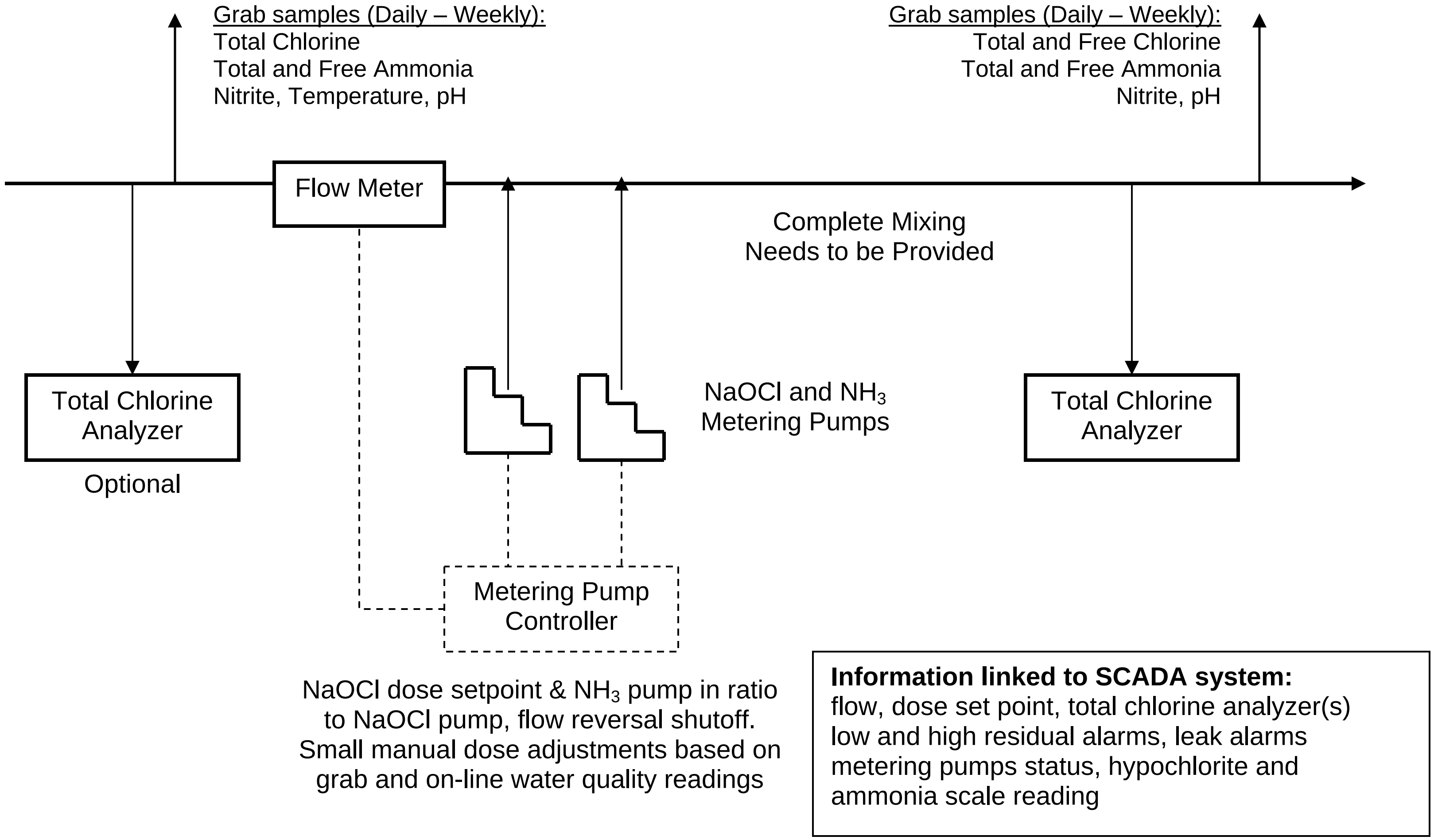

Figure 2. Hypochlorite and ammonia dose control at a flow-through booster station

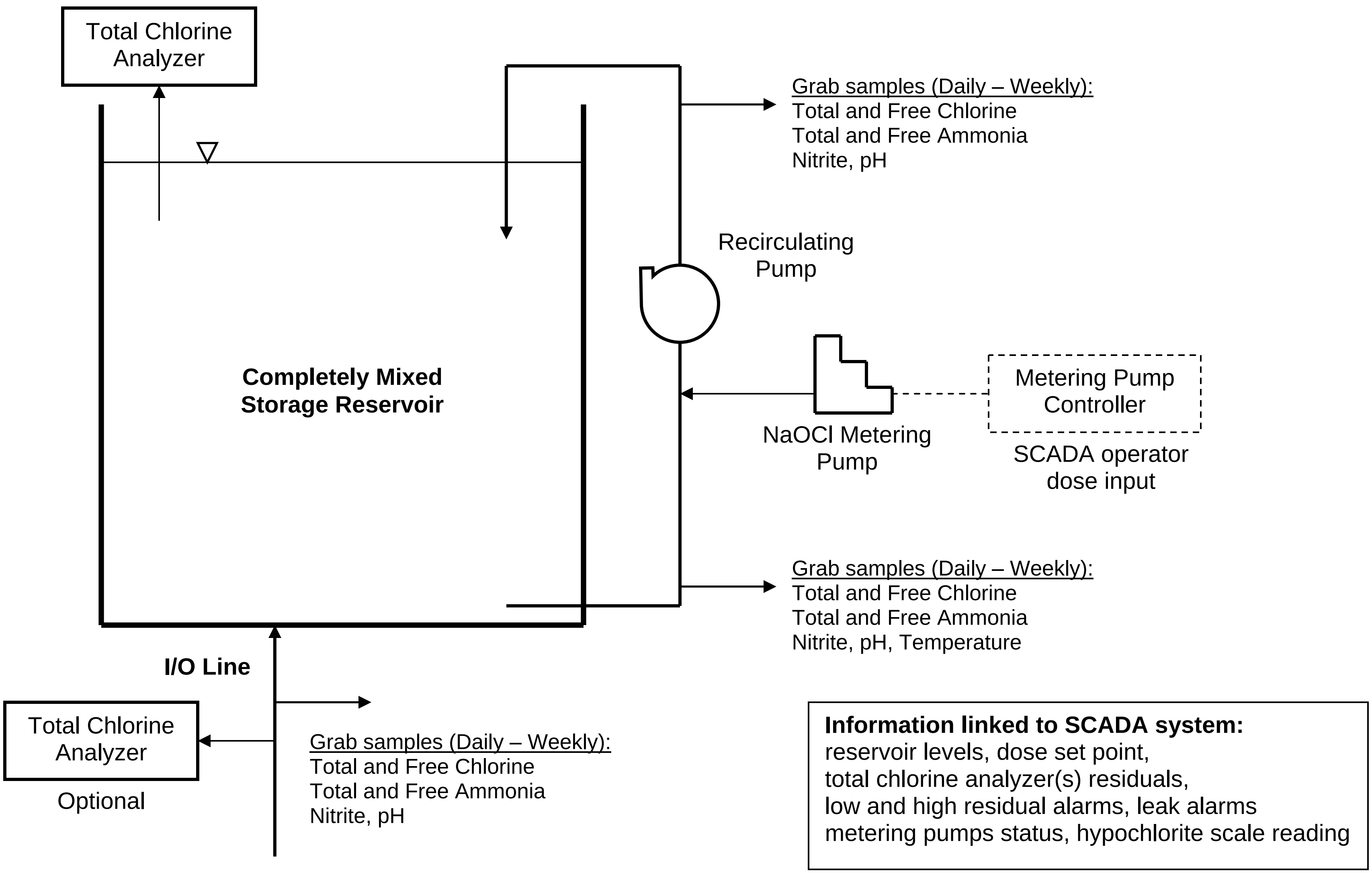

Figure 3. Hypochlorite dose control at a water storage reservoir recirculation loop booster station

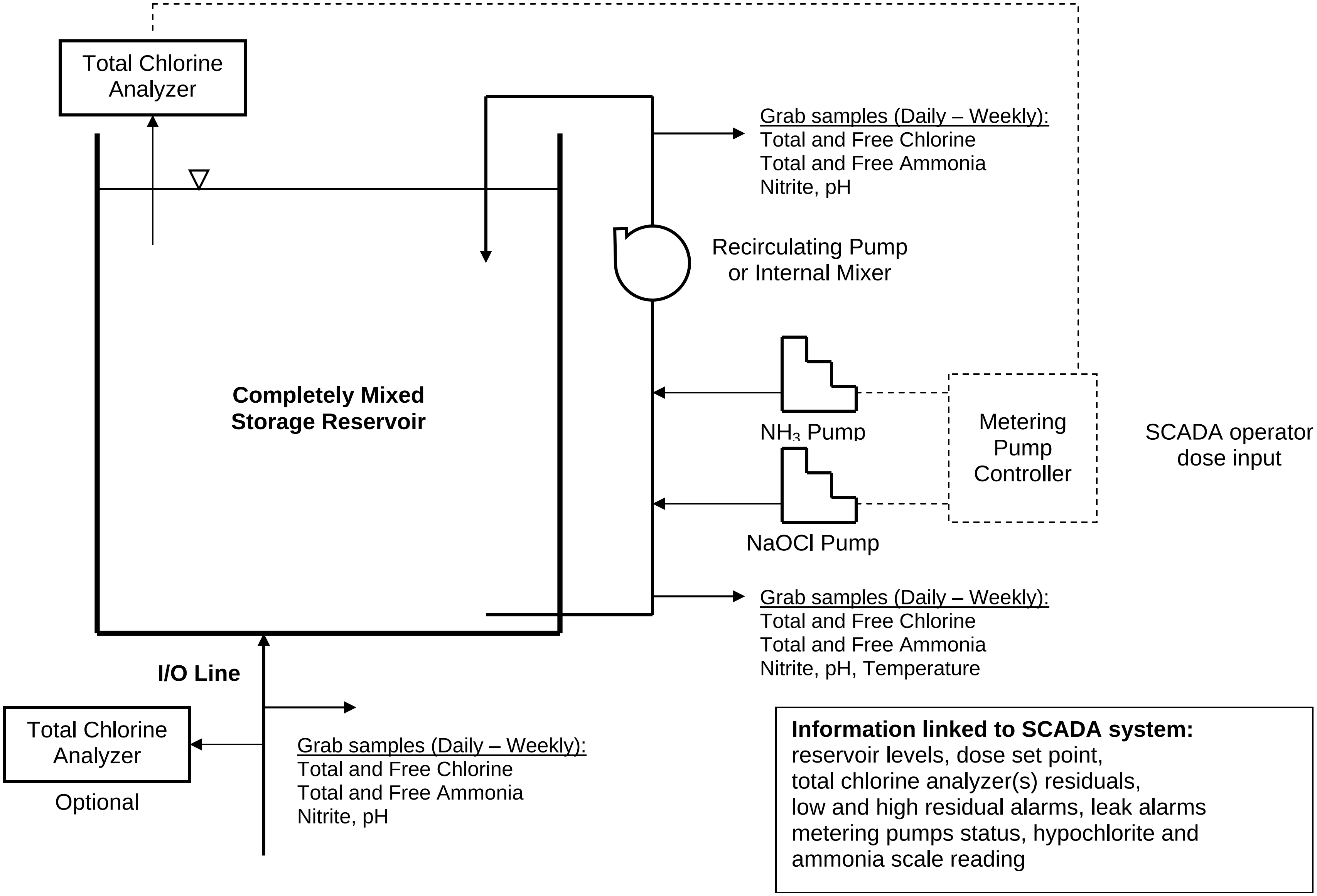

Figure 4. Compound loop (residual feedback) for chlorine and ammonia feeds at a reservoir booster station

Conclusions

The application of boosting chloramine residuals is expected to become more and more common in the future. The chloramine residual may be successfully boosted without achieving breakpoint chlorination and DBP formation. When boosting chloramine with chlorine alone, it is necessary to apply the chemical at a point where sufficient free ammonia is present due to chloramine demand and decay but where nitrification is not occurring or has been stopped due to prior boosting. Large reservoirs with high water age seem especially well suited for boosting as are small reservoirs at the ends of the distribution system.

Careful monitoring of chlorine and ammonia was practiced by all utilities surveyed. On-line combined chlorine analyzers were used in the majority of cases. Nitrite, pH and on-line free ammonia analyses were conducted in minority of cases. Ammonia feed facilities were available in half of the cases surveyed.

A variety of process controls were applied, depending on the case, including manual dose control, flow-paced feed, flow-paced with combined chlorine residual feedback, and flow-paced with dose set point. In all cases, operators could fine-tune the chemical doses depending on water quality analyses.

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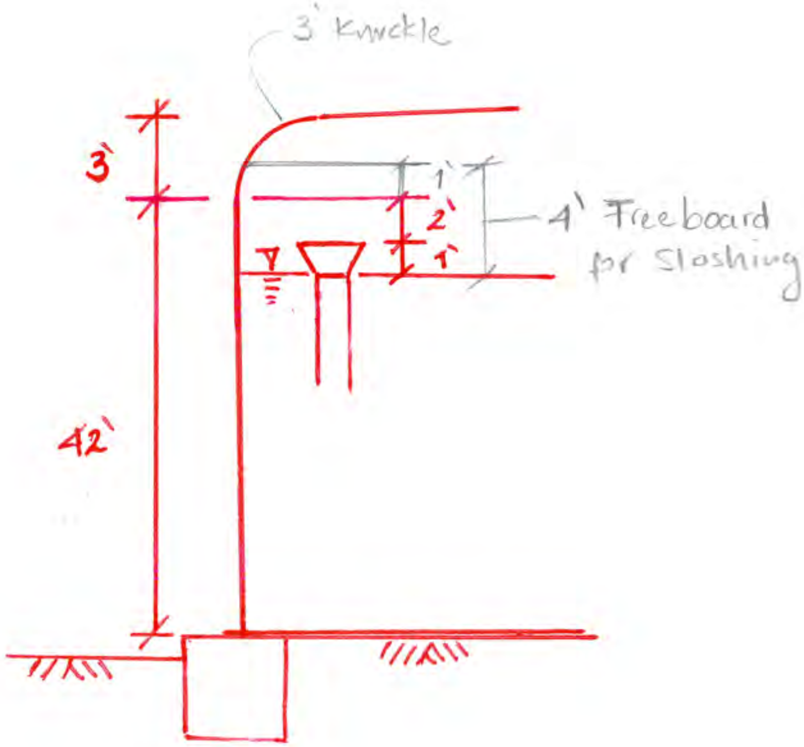
Uber J.G. et al. (2003), Maintaining Distribution System Residuals Through Booster Chlorination, AwwaRF, Denver, CO.

Tank Basic Dimensions

NOT INCLUDING storage below the inlet/outlet piping extension through the tank shell.

Top Capacity Level (Lip pf Overflow) =	1,720.00	ft
HWL =	1,719.00	ft
Top of Ringwall =	1,680.00	ft
Inlet Invert Elev =	1,681.33	ft
Effective Water Storage Height =	37.67	ft
Tank Shell Top Elevation =	1,722.00	ft
Tank Shell Height =	42.00	ft
Diamater =	160.00	ft
Area =	20,106.19	SF
Volume =	757,400	CF
Volume =	5,665,747	Gal



To find the latitude and longitude of a point **Click** on the map, **Drag** the marker, or enter the...

Address: 123 Street, City State/Country [Go]

Map Center: Get Address - Land Plat Size - Street View - Google Earth 3D - Area Photographs

Try out the Google Earth Plug-in. Google Earth gives you a 3D look of the area around the center of the map, which is usually your last click point, and includes latitude, longitude and elevation information.

Latitude and Longitude of a Point

Note: Right click on a **blue marker** to remove it.

[Clear/Reset All Markers] [Center Red Marker]

Get the Latitude and Longitude of a Point

When you click on the map, move the marker or enter an address the latitude and longitude coordinates of the point are inserted in the boxes below.

Latitude:	33.771563
Longitude:	-117.144658

	Degrees	Minutes	Seconds
Latitude:	33	46	17.6268
Longitude:	-117	8	40.7688

Show Point from Latitude and Longitude

Use this if you know the latitude and longitude coordinates of a point and want to see where on the map the point is.

Use: + for *N* Lat or *E* Long - for *S* Lat or *W* Long.
Example: +40.689060 -74.044636
Note: Your entry should not have any embedded spaces.

Decimal Deg. Latitude:

Decimal Deg. Longitude:

[Show Point]

Example: **+34 40 50.12** for *34N 40' 50.12"*

	Degrees	Minutes	Seconds
Latitude:			
Longitude:			

[Show Point]

ALBERT A. WEBB ASSOCIATES

ANALYSIS OF STEEL WATER STORAGE TANKS (AWWA D-100-05)

Ground Supported Flat-Bottom Tanks (Sec. 13.5)

Version 1.3

Tank: **LONGVIEW TANK (NEW)**

Date Prepared: 9/19/2012
Work Order: 11-0007
Preparer: EAP
Client / Job Name: EASTERN MUNICIPAL WATER DISTRICT
Description: NEW WELDED STEEL TANK
Scenario: **NEW 6.0 MG WELDED STEEL TANK**

GENERAL INFORMATION

D = Tank Diameter = 160.0 ft
H = TCL = Top Capacity Level (Lip of Overflow) = 40.0 ft
Ht = Total height of tank shell = 42.0 ft
Number of shell rings = 5
Tank Capacity = 6,015,773 gal

Type of Tank? New Tank

Type of Foundation? Reinforced Concrete (Type V)

Specific gravity = G = 1.0
E = Steel Modulus of eleasticity = 29,000,000 psi
D / H = 4.00
γ_w = 62.4 pcf
Steel Density = 490.0 pcf

Cylindrical Shell Plates

t (in) = required design shell plate thickness $t = \dfrac{2.6 h_p D G}{s E_J}$ Eq. 3-40

E_J = Joint efficiency as described in Section 3.7 = 100% (Ok) Table 15

Design Criteria:

1. Existing Tank - AWWA D-100 (GENERIC)
2. Existing Tank designed using (Old) AWWA Appendix C
3. AWWA D-100-05 per Table 1 and Tables 4 through 9 (GENERIC)
4. AWWA D100-05 (Section 14)

HYDROSTATIC SHELL ANALYSIS

Minimum thickness of cylindrical shell plates in contact with water per Table 16 = 0.3125 in

Ring	Height (ft)	Water Height (ft)	Design Criteria	Steel Designation	(s) Allow. Stress (1) (psi)	Min. Calculated Thickness(2) (in)	Governing Thickness (in)	(t) Design or Actual Thickness (in)	Comment
Bottom	10.00	40.0	4	ASTM A36	19,330	0.8608	0.8608	1.0000	Ok
2nd	8.00	30.00	4	ASTM A36	19,330	0.6456	0.6456	0.8125	Ok
3rd	8.00	22.00	4	ASTM A36	19,330	0.4735	0.4735	0.6250	Ok
4th	8.00	14.00	4	ASTM A36	19,330	0.3013	0.3125	0.4375	Ok
5th	8.00	6.00	4	ASTM A36	19,330	0.1291	0.3125	0.3125	Ok
6th		N/A			N/A	N/A	N/A		
7th		N/A			N/A	N/A	N/A		
8th		N/A			N/A	N/A	N/A		

(1) Excluding Joint Efficiency (2) Thickness Reflects Inclusion of Joint Effciency for non-section 14 tanks only.

Structure Weights

$$Wshell = \pi D \cdot H_{ring} (t/12) \cdot 490 pcf$$

Bottom Ring	W_{ring}	=	205,251	Lb
2nd Ring	W_{ring}	=	133,413	Lb
3rd Ring	W_{ring}	=	102,625	Lb
4th Ring	W_{ring}	=	71,838	Lb
5th Ring	W_{ring}	=	51,313	Lb
6th Ring	W_{ring}	=	0	Lb
7th Ring	W_{ring}	=	0	Lb
8th Ring	W_{ring}	=	0	Lb
	ΣW_s	=	564,439	Lb

$$Wroof = (\pi D^2/4)(t/12) \cdot 490 pcf$$

Roof Plate t (in) = 0.1875 — $W_{roof\ plate}$ = 153,938 Lb
Roof Rafters are assumed to be 33% of Roof Plate Weight — Weight of rafters = 50,800 Lb (Assumption)
Total Weight of Roof = 204,738 Lb

$$Wbottom = (\pi D^2/4)(t/12) \cdot 490 pcf$$

Tank Bottom t (in) = 0.2500 — W_f = 205,251 Lb

SEISMIC DESIGN OF STEEL WATER STORAGE TANKS (AWWA D-100-05, Section 13)

Acceleration Parameters

Name: Inline Foundation

Project:

Information from: ☑ Geotechnical Engineer

☐ ASCE 7-05 and AWWA D-100-05 Maps and Tables

☐ USGS - NSHMP Hazard Maps & Earthquake Ground Motion Parameter Calculator

Site Coordinates:

Latitude = 33.7716

Longitude = -117.1447

Ss = Mapped acceleration, 5% damped at 0.2 sec period	=	1.500	g	ASCE 7-05
S_1 = Mapped acceleration, 5% damped at 1.0 sec period	=	0.600	g	ASCE 7-05
Site Class ☐ Assumption ☑ Determined	=	C		Section 13.2
Fa = Site coefficient for 0.2 sec period	=	1.00		
Fv = Site coefficient for 1.0 sec period	=	1.30		
Seismic use group	=	III		Section 13.2.1
I_E = Seismic Importance factor	=	1.50		Table 24
Ri = Impulsive response modification factor — Self-Anchored	=	2.50		Table 28
Rc = Convective response modification factor	=	1.50		Table 28
S_{MS} = Fa * Ss = MCE Spectral response acceleration for 0.2 sec period	=	1.50	g	Section 13.2.7.2
S_{M1} = Fv * S_1 = MCE Spectral response acceleration for 1.0 sec period	=	0.78	g	Section 13.2.7.2

Design Response Spectra

Design Response Spectral Acceleration	AWWA General Procedure (Sec. 13.2.7)	80% of General Procedure (Sec. 13.2.8.6)	Probabilistic 10% in 100 years
PGA	0.400	0.320	0.470
S_{DS} = Sai	1.000	0.800	1.170
S_{D1}	0.520	0.416	0.360

S_{DS} = Design spectral response acceleration for 0.2 sec period

S_{D1} = Design spectral response acceleration for 1.0 sec period

Design Response Spectra Procedure for Impulsive Component (Ai) ? AWWA Gen. Procedure

Design Response Spectra Procedure for Convective Component (Ac) ? 80% of Gen Procedure

Design Spectral Response Acceleration for Impulsive Components

Ti= Natural period of the structure	=	0.00	sec	Section 13.5.1
Ts = S_{D1} / S_{DS}	=	0.52	sec	Section 13.2.7.3.1
T_L = Region dependant transition period	=	8.00	sec	ASCE 7-05

Sai = Design response spectrum for impulsive components (5% damping)

For	$0 \le Ti \le Ts$	$Sai = S_{DS}$	=	1.00	g	Eq. 13-9	Governs
For	$Ts \le Ti \le T_L$	$Sai = S_{D1}/Ti \le S_{DS}$	=	N/A	g	Eq. 13-10	
For	$Ti > T_L$	$Sai = T_L S_{D1}/Ti^2$	=	N/A	g	Eq. 13-11	

Design Spectral Response Acceleration for Convective Components

Tc = First mode sloshing wave period $Tc = 2\pi\sqrt{\dfrac{D}{3.68 \cdot g \cdot \tanh\left(\dfrac{3.68H}{D}\right)}}$ = 8.57 sec Section 13.5

K = Damping scaling factor = 1.50

Sac = Design response spectrum for convective components (0.5% damping)

For	$Tc \le T_L$	$Sac = KS_{D1}/Tc \le S_{DS}$	=	N/A	g	Eq. 13-12	
For	$Tc > T_L$	$Sac = KT_L S_{D1}/Tc^2$	=	0.07	g	Eq. 13-13	Governs

Horizontal Design Accelerations

Ai = Impulsive design acceleration $Ai = Sai \cdot I_E / 1.4Ri \geq 0.36 S_1 I_E / Ri$ = 0.429 g Eq. 13-17
≥ 0.130

Select Ai for Design
Ai = 0.470 g Ok

Selected Ai is greater than the Design Selection

Ac = Convective design acceleration $Ac = Sac \cdot I_E / 1.4Rc$ = 0.049 g Eq. 13-18

Design Overturning Moment at Bottom of Shell

W_T = Total weight of tank contents $W_T = 62.4GH(\pi D^2/4) = 49GHD^2$ = 50,176,000 Lb Eq. 13-27

For $D/H \geq 1.333$ Governs

Wi = Effective impulsive weight $Wi = \frac{\tanh(0.866\,D/H)}{0.866\,D/H} W_T$ = 14,456,627 Lb Eq. 13-24

Xi = Height from bottom of shell to centroid of lateral seismic force

$Xi = 0.375H$ = 15.00 ft Eq. 13-28

For $D/H < 1.333$ False

Wi = Effective impulsive weight $Wi = (1.0 - 0.218D/H)W_T$ = N/A Lb Eq. 13-25

Xi = Height from bottom of shell to centroid of lateral seismic force applied to the impulsive effective weight

$Xi = (0.5 - 0.094D/H)H$ = N/A ft Eq. 13-29

For all proportions of D/H

Wc = Effective convective weight $Wc = 0.230\frac{D}{H}\tanh\left(\frac{3.67H}{D}\right)W_T$ = 33,454,124 Lb Eq. 13-26

Xc = Height from bottom of shell to centroid of lateral seismic force applied to the convective effective weight

$Xc = \left[1.0 - \frac{\cosh(3.67H/D) - 1}{(3.67H/D)\sinh(3.67H/D)}\right]H$ = 21.29 ft Eq. 13-30

Xs = Height from the bottom of the shell to the center of gravity of the shell = 14.24 ft

Ms = Design overturning moment at the bottom of the shell caused by horizontal design acceleration

$Ms = \sqrt{[Ai(WsXs + WrHt + WiXi)]^2 + [AcWcXc]^2}$

Ms (Self-Anchored) = **115,060,941** Lb-ft Eq. 13-23

Ms' (Mechanically Anchored) = **N/A** Lb-ft Eq. 13-23

Design Shear at Top of Foundation (Seismic Base Shear)

Vf = Design shear at top of foundation due to horizontal design acceleration

$Vf = \sqrt{[Ai(Ws + Wr + Wf + Wi)^2 + [AcWc]^2]}$ = 7,432,284 Lb Eq. 13-31

RESISTANCE TO OVERTURNING (Checking Uplift)

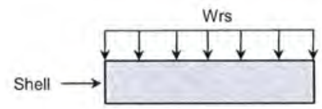
Fy = Minimum specified yield strength of bottom annulus = 30,000 psi (Assumption)

W_L = Maximum resisting weight of tank contents used to resist the shell overturning moment

$$W_L = 7.9t_b\sqrt{Fy \cdot H \cdot G} \le 1.28H \cdot D \cdot G$$

	=	2,163.50	Lb-ft Eq. 13-37
	≤	8,192.00	Lb-ft
Ok, Use WL =		2,163.50	Lb-ft

W_{rs} = Roof load acting on the shell = 135.77 Lb/ft (Assumption)



$\pi D =$ 502.7 ft

w_t = Weight of the tank shell and portion of the roof reacting on the shell

$$w_t = \frac{Ws}{\pi D} + w_{rs}$$ = 1258.7 Lb/ft Eq. 13-41

Av = Vertical acceleration

The largest of	$Av = 0.14 \cdot S_{DS}$ =	0.14	g
	0.50 Ai =	0.24	g
	Use Av =	0.24	g

Thus, for Self -Anchored Tanks Only:

J = Overturning ratio

$$J = \frac{Ms}{D^2[w_t(1-0.4Av)+W_L]}$$ = **1.361** Eq. 13-36

0.785<= J <= 1.54, Therefore, there is shell uplift. Tank is stable if shell compression requirements of Sec. 13.5.4.2 are satisfied.

REMARKS:

a) AWWA Gen. Procedure was used to calculate the seismic design response spectra.

b) **Analysis performed using Ai =0.47g, Ac =0.048g and Av =0.24g**

c) Site Specific Procedure was used to calculate the AWWA sloshing wave height. Sloshing wave height (d) = 4.18 ft

d)

e) Selected Ai is based on governing MCE at PGA in 10% in 100 years.

f)

ANALYSIS NOTES:

a) 0.785<= J <= 1.54, Therefore, there is shell uplift. Tank is stable if shell compression requirements of Sec. 13.5.4.2 are satisfied.

b)

c)

d) Tank is OK for seismic analysis.

e)

f)

g)

Tank: LONGVIEW TANK (NEW)

Scenario: NEW 6.0 MG WELDED STEEL TANK

HYDRODYNAMIC HOOP TENSILE STRESS (AWWA D-100-05, Section 13.5.4.2.3)

D / H = 4.00
0.75 D = 120.0 ft

Ring	(t) Design or Actual Thickness	Y (ft)	Ni (Lb/in)	Nc (Lb/in)	Nh (Lb/in)	σ_s (psi)	Fhs (psi)	F (comb) (psi)	F (allow) (psi)	Comment
Bottom	1.0000	40.0	6,755	837.9	16,640	7,892	16,640	24,532	25,773	Ok
2nd	0.8125	30.0	6,333	860.1	12,480	8,687	15,360	24,047	25,773	Ok
3rd	0.6250	22.0	5,387	910.7	9,152	9,421	14,643	24,065	25,773	Ok
4th	0.4375	14.0	3,901	992.2	5,824	9,739	13,312	23,051	25,773	Ok
5th	0.3125	6.0	1,874	1,107.4	2,496	7,226	7,987	15,213	25,773	Ok
6th										
7th										
8th										

Summary of Formulas

Ni= Impulsive hoop tensile force

For $D/H \geq 1.333$ $$N_i = 4.5 \cdot A_i \cdot GDH\left[\frac{Y}{H} - 0.5\left(\frac{Y}{H}\right)^2\right]\tanh\left(0.866\frac{D}{H}\right)$$ Eq. 13-43

For $D/H < 1.333$ and $Y < 0.75D$ $$N_i = 2.77 \cdot A_i \cdot GD^2\left[\frac{Y}{0.75D} - 0.5\left(\frac{Y}{0.75D}\right)^2\right]$$ Eq. 13-44

For $D/H < 1.333$ and $Y \geq 0.75D$ $$N_i = 1.39 A_i G D^2$$ Eq. 13-45

Nc = Convective hoop tensile force $$N_c = \frac{0.98 \cdot A_c \cdot GD^2 \cosh\left[\frac{3.68(H-Y)}{D}\right]}{\cosh\frac{3.68H}{D}}$$ Eq. 13-46

Nh = Hydrostatic hoop tensile force $Nh = 2.6GYD$ Section 13.5.4.2.3

$\sigma_s =$ Hydrodynamic hoop tensile stress $$\sigma_s = \frac{\sqrt{N_i^2 + N_c^2 + (Nh \cdot Av)^2}}{t_s}$$ Eq. 13-42

Fhs = Hydrostatic hoop stress $Fhs = N_h / t_s$

$$F_{allowable} = 1.333 \cdot s \cdot E_s$$

$$F_{comb} = Fhs + \sigma_s$$

Thus, $F_{comb} \leq F_{allowable}$

A L B E R T A. WEBB A S S O C I A T E S

Tank: LONGVIEW TANK (NEW)
Scenario: NEW 6.0 MG WELDED STEEL TANK

SHELL COMPRESSION STRESSES (AWWA D-100-05, Section 13.5.4.2)

ts	=	1.0000 in		Is the tank mechanically anchored?	No
ts/R	=	0.00104		Is critical buckling stress allowed?	No
				If so, enter Factor of Safety (F.S.)	2.00

P = Hydrostatic pressure at the point of consideration $P = \gamma_w G H_w / 144$ = 17.33 psi

$(P/E)(R/t)^2$ = 0.551

ΔCc = Pressure-stabilizing buckling coefficient

For $(P/E)(R/t)^2 \leq 0.064$ $\Delta Cc = 0.72\left[(P/E)(R/t)^2\right]^{0.84}$ = N/A Eq. 13-50

For $(P/E)(R/t)^2 > 0.064$

$\Delta Cc = 0.045 \cdot \ln\left[(P/E)(R/t)^2 + 0.0018\right] + 0.194$ = N/A Eq. 13-51
≤ 0.22

$\Delta\sigma_{cr}$ = Critical buckling stress $\Delta\sigma_{cr} = \Delta Cc E \cdot t/R$ = 0 Eq. 13-49

Longitudinal Shell Compression Stress for (No Uplift) Self or Mechanically Anchored Tanks, Section 13.5.4.2.1

For $J < 0.785$ False

σ_a = Compression stress for Class 2 materials from Table 11 = N/A psi Section 3.4.2

σ_e = Allowable compression stress in a seismic event

$\sigma_e = 1.333 \cdot \sigma_a$ = N/A psi Eq. 13-48

$\sigma_e = 1.333\left(\sigma_a + \frac{\Delta\sigma_{cr}}{F.S.}\right)$ = N/A psi Eq. 13-47

σ_c = Maximum longitudinal shell compression stress

$\sigma_c = \left[w_t(1 + 0.4Av) + \frac{1.273Ms}{D^2}\right]\frac{1}{12t_s}$ = N/A psi Eq. 13-39

The requirement is $\sigma_e > \sigma_c$

Longitudinal Shell Compression Stress when Uplift Occurs, Section 13.5.4.2.1

For $0.785 \leq J \leq 1.54$ or $J > 1.54$ Governs

(t/R)c = Thickness to radius ratio at which buckling changes from elastic to inelastic
For Class 2 materials (t/R)c = 0.0035372 Section 3.4.3.1.2

F_L = Allowable local buckling compression stress per Section 3.4.3.1.2

When:

- $0 \leq t/R \leq (t/R)c$ — Elastic buckling controls: $F_L = 17.5(10^5)(t/R)\left[1 + 50{,}000(t/R)^2\right]$ = 1,922 psi Eq. 3-11 Governs
- $(t/R)c \leq t/R \leq 0.0125$ — Inelastic buckling controls: $F_L = 6{,}925 + 886(10^3)(t/R)$ = N/A psi Eq. 3-13
- $t/R > 0.0125$ — Plastic buckling controls F_L = N/A psi

Then, σ_a = Allowable compression = F_L = 1,922 psi

σ_e = Allowable compression stress in a seismic event =

$\sigma_e = 1.333 \cdot \sigma_a$ = 2,562

$\sigma_e = 1.333\left(\sigma_a + \frac{\Delta\sigma_{cr}}{F.S.}\right)$ = N/A Eq. 13-47

σ_c = Maximum longitudinal shell compression stress

$\sigma_c = \left[\frac{w_t(1 + 0.4Av) + W_L}{0.607 - 0.18667 \cdot J^{2.3}} - W_L\right]\frac{1}{12t_s}$ = 1,118 psi Eq. 13-47

The requirement is $\sigma_e > \sigma_c$ Ok

A L B E R T A.
WEBB
A S S O C I A T E S

Tank: LONGVIEW TANK (NEW)

Scenario: NEW 6.0 MG WELDED STEEL TANK

SLOSHING WAVE HEIGHT (AWWA D-100-05, Section 13.5.4.3)

Design Response Spectra

Design Response Spectral Acceleration	AWWA General Procedure (Sec. 13.2.7)	80% of General Procedure	Site Specific <<if available>> (Sec. 13.2.8)	Probabilistic 10% in 100 years <<if available>>
S_{DS} = Sai	1.000	0.800	1.000	1.170
S_{D1}	0.520	0.416	0.320	0.360

Design Response Spectra Procedure? Site Specific Procedure

For seismic groups I and II

When	$Tc \le 4$	$A_f = KS_{D1}I_E/T_C$	=	N/A	g	Eq. 13-53	
When	$Tc > 4$	$A_f = 4KS_{D1}I_E/Tc^2$	=	N/A	g	Eq. 13-54	

For seismic group III

When	$Tc \le T_L$	$A_f = KS_{D1}/Tc$	=	N/A	g	Eq. 13-55	
When	$Tc > T_L$	$A_f = KS_{D1}T_L/Tc^2$	=	0.052	g	Eq. 13-56	Governs

d = Sloshing wave height above MOL $d = 0.5DA_f$ = 4.18 ft Eq. 13-52

The freeboard shall meet the requirements of Table 29 as well, Minimum freeboard = 4.18 ft

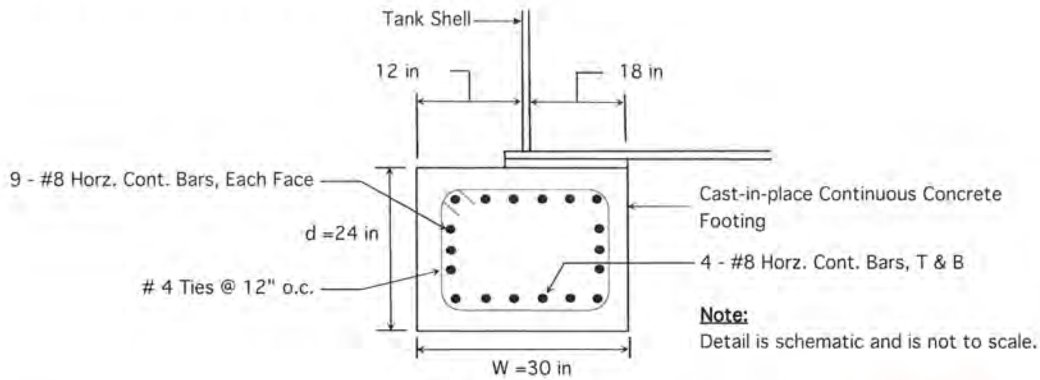
Table 29 Minimum freeboard requirements

S_{DS}	Seismic Use Group I	II	III
S_{DS} < 0.33 g	None	None	d
$S_{DS} \ge$ 0.33 g	None	$0.7d$	d

Taken from AWWA D-100-05 Page 155

Minimum freeboard above the MOL to be provided per AWWA. d = 4.18 ft

FOUNDATION DESIGN (AWWA D-100-05, Section 12.6)



Is the tank mechanically anchored?		No	
W = Footing width	=	30.00	in
d = Footing depth	=	24.00	in
L_1 = Width of footing outside tank shell	=	12.00	in
L_2 = Width of footing supporting the weight of the liquid	=	18.00	in
Concrete density	=	145	pcf
$f'c$ = Concrete compressive strength	=	4,000	psi
fy = Minimum yield strength of reinforcement	=	60,000	psi
q_{allow} = Allowable static soil bearing	=	4,000	psf
W_1 = Tank shell load	=	1,122.9	plf
$W_2 = W_{rs}$ = Roof load acting on the shell	=	135.77	plf
W_3 = Weight of liquid acting on footing $\quad Ww = \gamma_w G \cdot H \cdot A_{in}$	=	3,709	plf
W_4 = Weight of footing	=	725	plf

Foundation Resisting to Uplift

Fr = Resisting force = $W_1 + W_2 + W_3$ (+ W_4 if anchored) = **N/A** plf

Note: The resistance due to the friction between the footing and the soil is ignored in the calculation and therefore considered an additional factor of safety against uplift

U = Uplift force	$U = 1.273 \cdot Ms/D^2$	=	N/A	plf
W' = Dead load of structure for uplift resistance (Shell + Roof) [per linear foot]		=	N/A	plf
Fo = Overturning force	$Fo = U - W'$	=	N/A	plf
	Use Fo (Overturning force) for design	=		plf

Factor of safety against uplift: $F_{resisting} / F_{overturning}$ = N/A

$$F_{resisting} > F_{overturning}$$

Ringwall Seismic Toe Pressure

A = Area of footing	$A = \frac{\pi}{4}\left(OD_{ringwall}{}^2 - ID_{ringwall}{}^2\right)$	=	1,253	SF
A_{in} = Area of footing under tank	$A_{in} = \frac{\pi}{4}\left(D^2 - ID_{ringwall}{}^2\right)$	=	747	SF
Wt = $(W_1 + W_2)\,\pi D$		=	632,685	Lb
Ww = Weight of water on ringwall	$Ww = \gamma_w G \cdot H \cdot A_{in}$	=	1,864,296	Lb

P = Wt + Ww	=	2,496,982	Lb
V = Seismic base shear	=	7,432,284	Lb
Ms = Seismic overturning moment	=	115,060,941	Lb-ft
Mv = Moment from base shear to bottom of ringwall = V * d	=	14,864,569	Lb-ft
M total = Ms (+ Mv if seismic sliding is Not Good)	=	115,060,941	Lb-ft
S = Section modulus of ringwall $S = \frac{\pi}{32 \cdot OD_{ringwall}}\left(OD_{ringwall}^{4} - ID_{ringwall}^{4}\right)$	=	49,193	cf
$q_{seismic}$ = Seismic overturning bearing pressure = $\frac{P}{A} + \frac{M}{S}$	=	**4,332**	psf
$q_{allow\text{-}seismic}$ = Seismic overturning bearing pressure = 1.33 * q_{allow}	=	**5,333**	psf

$$q_{allow} > q_{seismic}$$ Ok

Circunferential Reinforcement

kh = Lateral earth pressure coefficient		=	0.33	
Tr = Ringwall tension	$Tr = 31.2 \cdot Kh \cdot HDdG$	=	131,789	Lb
As (required)	$As(required) = (1.7 \cdot Tr)/(0.9 fy)$	=	4.15	in^2
As (Minimum)	$As(\min) = 0.00052 \cdot d \cdot D \cdot H_{OVERFLOW}$	=	6.82	in^2
	As (Governing)	=	6.82	in^2

Summary:

Use 9 # 8 Cont. rebar

As (Provided)	=	**7.11**	**in^2**	Ok
Cover	=	3.00	in	
Spacing	=	2.13	in	

Longitudinal Reinforcement (Flexural per ACI 318 Section 10.5.4)

As (Minimum)	$As(\min) = 0.0018 \cdot w \cdot d$	=	1.30	in^2

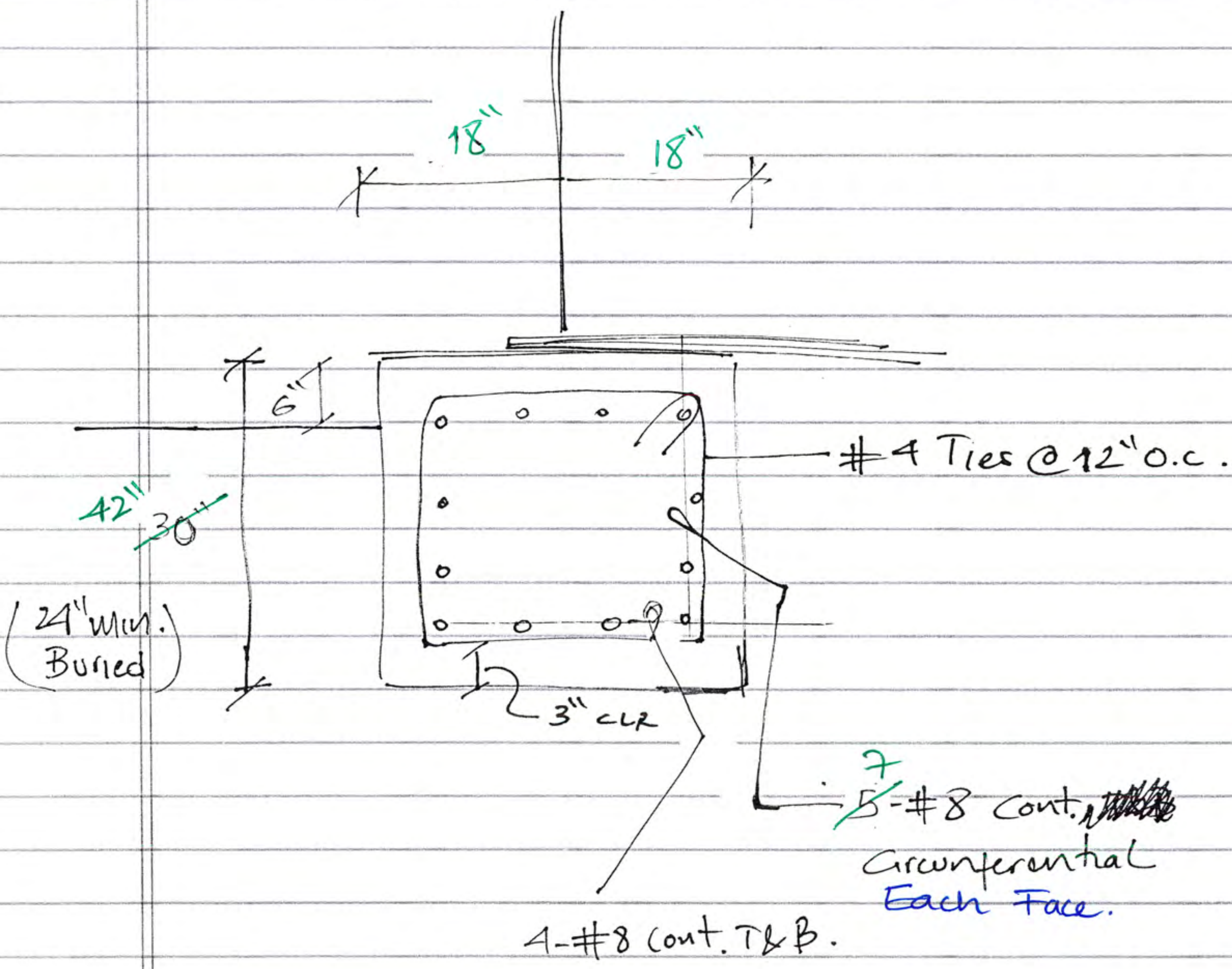
Summary:

Use 4 # 8 Cont. rebar

As (Provided)	=	**3.16**	**in^2**	Ok
Cover	=	3.00	in	
Spacing	=	7.67	in	

2/18/13.

Minimum Cont. Ring Wall

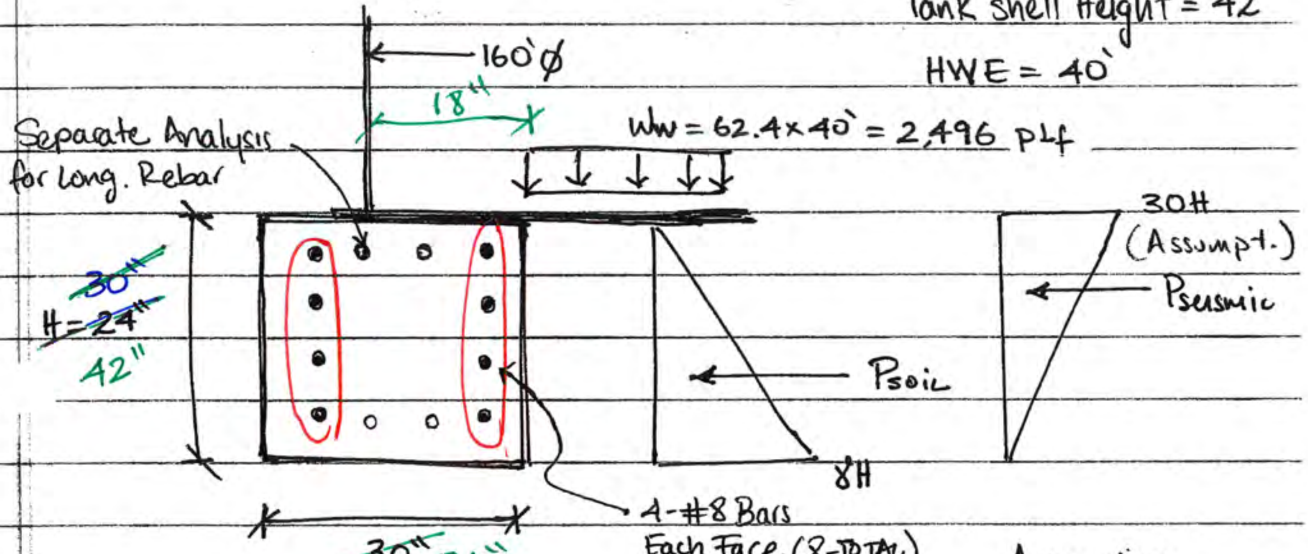


Longview Tank (EMWD)
By: Eduardo P. 9/18/12

Circumferential Reinforcement

Tank shell Height = 42'

HWE = 40'



Assumption

$P_{soil} = \frac{1}{2}\gamma H^2 K_a = \frac{1}{2} \times 125 \times \cancel{2^2}_{3.5} \times 0.5 = \cancel{125}$ lb/ft. ~~195.3~~ 383

$P_{uniform} = W_W = W_W \times H \times K_a = 2496 \times \cancel{2}_{3.5} \times 0.5 = \cancel{2496}$ lb/ft. ~~3120~~ 4368

$T = (P_{soil} + P_{uniform}) \times 0.5 \times \phi$

$T = (125 + \cancel{2496}) \times 0.5 \times 160 = \cancel{209{,}680}$ lb

~~3120~~ 4368 ~~259,600 lb~~ 359,440 lb

$P_{seismic} = \frac{1}{2}\gamma H^2 = \frac{1}{2} \times 30\,H^2 = 15 \times \cancel{4}_{3.5^2} = \cancel{60}$ lb. ~~94~~ 184 lb

Load Combinations

$T = 1.6 \times \cancel{209{,}680} + 1.0 \times \cancel{60} = \cancel{335{,}548}$ lb

(~~259,600~~ 359,440; ~~94~~ 184; ~~415,454~~ 575,288 lb)

$A_{ST} = \frac{T}{0.9 \cdot f_y} = \cancel{335{,}548}\,/\,(0.9 \times 60000)$ 575,288 11.06 in² "OK"

$A_s(prov) = \cancel{10}\cancel{8}\ 14 \times 0.79 = \cancel{6.32}\ \cancel{7.9}\ in^2 > A_{s\,req.}$

$A_{ST} = \cancel{6.21}\ in^2$ → Use total of ~~8~~ ~~10~~ 14 - #8 Bars.

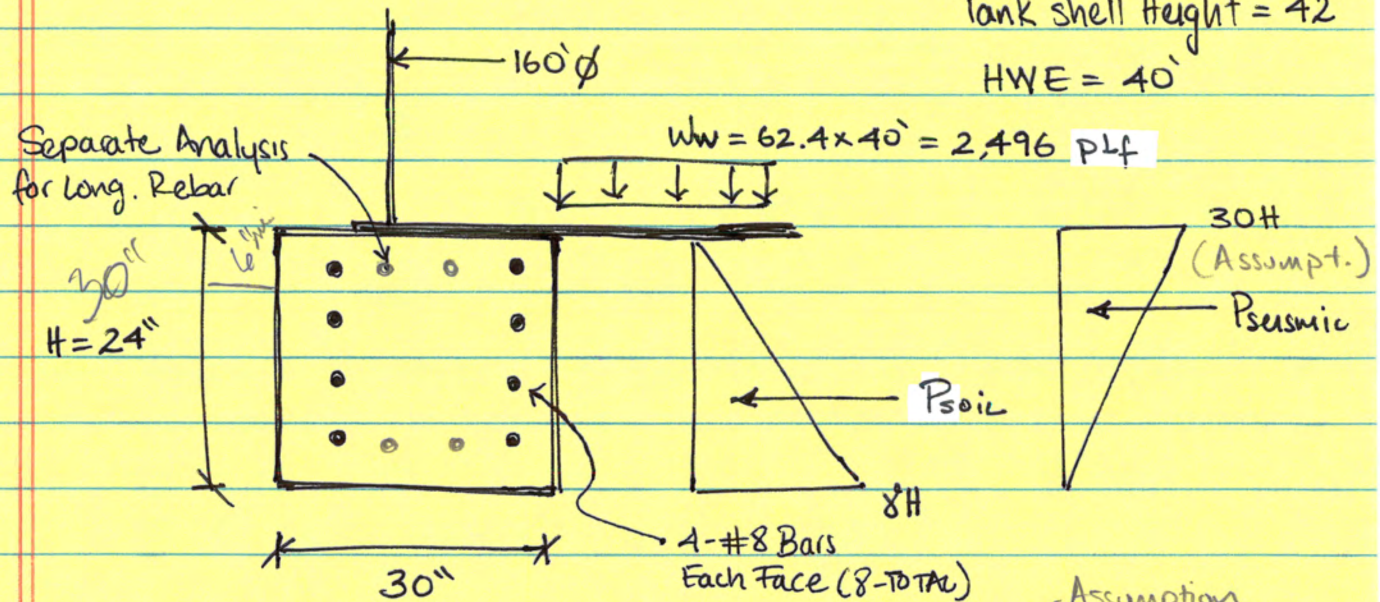
~~7.69 in²~~

10.65 in² Required

Longview Tank (EMWD)
By: Eduardo P. 9/18/12

Circumferential Reinforcement

Tank shell Height = 42'
HWE = 40'



Assumption

$$P_{soil} = \frac{1}{2}\gamma H^2 K_a = \frac{1}{2} \times 125 \times 2^2 \times 0.5 = 125 \text{ lb/ft.}$$

$$P_{uniform} = W_W = W_W \times H \times K_a = 2496 \times 2 \times 0.5 = 2496 \text{ lb/ft.}$$

$$T = (P_{soil} + P_{uniform}) \times 0.5 \times \phi$$

$$T = (125 + 2496) \times 0.5 \times 160 = 209{,}680 \text{ lb}$$

$$P_{seismic} = \frac{1}{2}\gamma H^2 = \frac{1}{2} \times 30\,H^2 = 15 \times 4 = 60 \text{ lb.}$$

Load Combinations

$$T = 1.6 \times 209{,}680 + 1.0 \times 60 = 335{,}548 \text{ lb}$$

$$A_{ST} = \frac{T}{0.9 \cdot f_y} = 335{,}548 / (0.9 \times 60000)$$

"OK"

$A_{s(prov)} = 8 \times 0.79 = 6.32\,in^2 > A_{s\,req.}$

$A_{ST} = 6.21\ in^2$ ⟶ Use total of 8-#8 Bars.

→ Vertical Reinforcement

$b = 30'' = 2.5'$

$$A_T = 0.0012 \times \frac{b}{2} \times 12''$$

$$A_{s\,required} = A_T = 0.0012 \times (2.5/2) \times 12'' = 0.018 \text{ in}^2/\text{ft}$$

Use #4 Stirrups @ 12" o.c.

$$A_{s\,provided} = 0.2 \text{ in}^2/\text{ft} > A_{s\,req}.$$

EMWD - LONGVIEW TANK
Fri Sep 14 10:28:59 PDT 2012

Conterminous 48 States
2005 ASCE 7 Standard
Latitude = 33.771563
Longitude = -117.144658
Spectral Response Accelerations Ss and S1
Ss and S1 = Mapped Spectral Acceleration Values
Site Class B - Fa = 1.0 ,Fv = 1.0
Data are based on a 0.01 deg grid spacing

Period (sec)	Sa (g)
0.2	1.500 (Ss, Site Class B)
1.0	0.600 (S1, Site Class B)

Conterminous 48 States
2005 ASCE 7 Standard
Latitude = 33.771563
Longitude = -117.144658
Spectral Response Accelerations SMs and SM1
SMs = Fa x Ss and SM1 = Fv x S1
Site Class C - Fa = 1.0 ,Fv = 1.3

Period (sec)	Sa (g)
0.2	1.500 (SMs, Site Class C)
1.0	0.780 (SM1, Site Class C)

Conterminous 48 States
2005 ASCE 7 Standard
Latitude = 33.771563
Longitude = -117.144658
Design Spectral Response Accelerations SDs and SD1
SDs = 2/3 x SMs and SD1 = 2/3 x SM1
Site Class C - Fa = 1.0 ,Fv = 1.3

Period (sec)	Sa (g)
0.2	1.000 (SDs, Site Class C)
1.0	0.520 (SD1, Site Class C)

Conterminous 48 States
2005 ASCE 7 Standard
Latitude = 33.771563
Longitude = -117.144658
MCE Response Spectrum for Site Class B
Ss and S1 = Mapped Spectral Acceleration Values
Site Class B - Fa = 1.0 ,Fv = 1.0

Period (sec)	Sa (g)	Sd (inches)
0.000	0.600	0.000
0.080	1.500	0.094
0.200	1.500	0.586
0.400	1.500	2.345
0.500	1.200	2.931
0.600	1.000	3.517
0.700	0.857	4.103
0.800	0.750	4.690
0.900	0.667	5.276
1.000	0.600	5.862
1.100	0.545	6.448

1.200	0.500	7.034
1.300	0.462	7.621
1.400	0.429	8.207
1.500	0.400	8.793
1.600	0.375	9.379
1.700	0.353	9.965
1.800	0.333	10.552
1.900	0.316	11.138
2.000	0.300	11.724

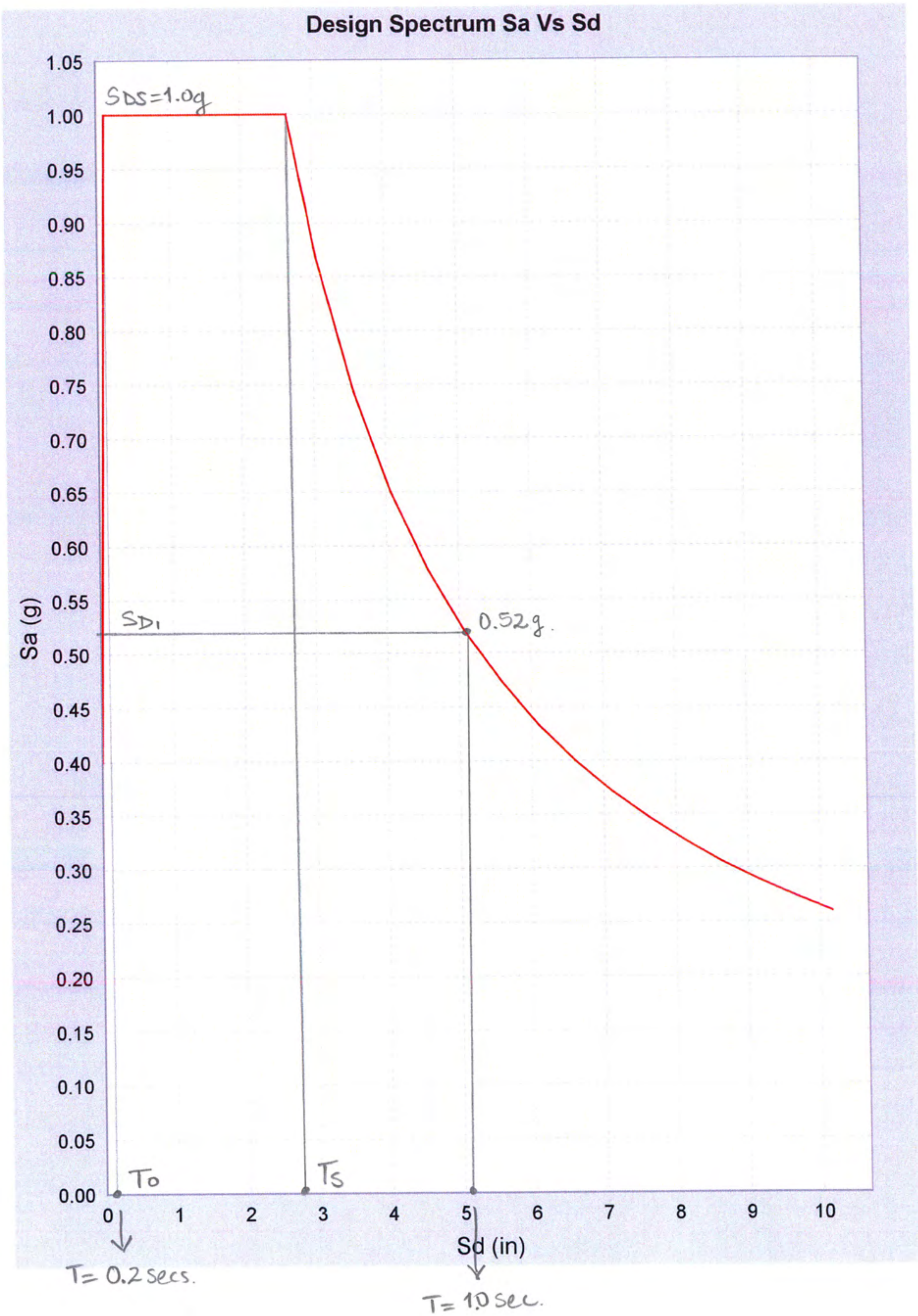
Conterminous 48 States
2005 ASCE 7 Standard
Latitude = 33.771563
Longitude = -117.144658
Site Modified Response Spectrum for Site Class C
SMs = FaSs and SM1 = FvS1
Site Class C - Fa = 1.0 ,Fv = 1.3

Period (sec)	Sa (g)	Sd (inches)
0.000	0.600	0.000
0.104	1.500	0.159
0.200	1.500	0.586
0.520	1.500	3.963
0.600	1.300	4.572
0.700	1.114	5.334
0.800	0.975	6.096
0.900	0.867	6.859
1.000	0.780	7.621
1.100	0.709	8.383
1.200	0.650	9.145
1.300	0.600	9.907
1.400	0.557	10.669
1.500	0.520	11.431
1.600	0.488	12.193
1.700	0.459	12.955
1.800	0.433	13.717
1.900	0.411	14.479
2.000	0.390	15.241

Conterminous 48 States
2005 ASCE 7 Standard
Latitude = 33.771563
Longitude = -117.144658
Design Response Spectrum for Site Class C
SDs = 2/3 x SMs and SD1 = 2/3 x SM1
Site Class C - Fa = 1.0 ,Fv = 1.3

Period (sec)	Sa (g)	Sd (inches)
0.000	0.400	0.000
0.104	1.000	0.106
0.200	1.000	0.391
0.520	1.000	2.642
0.600	0.867	3.048
0.700	0.743	3.556
0.800	0.650	4.064
0.900	0.578	4.572
1.000	0.520	5.080
1.100	0.473	5.588
1.200	0.433	6.096
1.300	0.400	6.605
1.400	0.371	7.113
1.500	0.347	7.621

1.600	0.325	8.129
1.700	0.306	8.637
1.800	0.289	9.145
1.900	0.274	9.653
2.000	0.260	10.161



Design Spectrum Sa Vs Sd
Sa (g)
Sd (in)
1.05
1.00
0.95
0.90
0.85
0.80
0.75
0.70
0.65
0.60
0.55
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0
1
2
3
4
5
6
7
8
9
10
SDS=1.0g
SD1
0.52g.
To
Ts
T= 0.2 secs.
T= 1.0 sec.

USGS_Probabilistic 2% in 50 yrs

EMWD - Longview Tank
Thu Aug 30 11:26:50 PDT 2012

USGS Data. 2002

Conterminous 48 States
2002 Data
Hazard Curve for PGA
Latitude = 33.771563
Longitude = -117.144658
Data are based on a 0.05 deg grid spacing
Frequency of Exceedance values less than
1E-4 should be used with caution.

Ground Motion (g)	Frequency of Exceedance (per year)
0.005	8.8229E-01
0.007	7.9143E-01
0.010	6.7841E-01
0.014	5.5007E-01
0.019	4.1753E-01
0.027	2.9781E-01
0.038	2.0306E-01
0.053	1.3454E-01
0.074	8.8248E-02
0.103	5.7136E-02
0.145	3.4925E-02
0.203	1.9592E-02
0.284	9.4638E-03
0.397	3.7258E-03
0.556	1.1257E-03
0.778	2.5335E-04
1.090	4.0381E-05
1.520	4.960E-06
2.130	2.772E-07

MCE

Ground Motion (g)	Freq. of Exceed. (per year)	Return Pd. (years)	P.E. %	Exp. Time (years)
0.7019	4.000E-04	2500.00	1.98	50.0

Conterminous 48 States
2002 Data
Hazard Curve for 0.2sec
Latitude = 33.771563
Longitude = -117.144658
Data are based on a 0.05 deg grid spacing
Frequency of Exceedance values less than
1E-4 should be used with caution.

Ground Motion (g)	Frequency of Exceedance (per year)
0.005	1.0069E00
0.007	9.4719E-01
0.011	8.5481E-01
0.017	7.2936E-01
0.025	5.7886E-01
0.038	4.242E-01
0.057	2.8948E-01
0.085	1.8766E-01
0.128	1.1852E-01
0.192	7.3538E-02
0.288	4.3697E-02
0.432	2.3443E-02
0.649	1.0428E-02
0.973	3.5704E-03
1.460	8.7179E-04
2.190	1.4395E-04
3.280	1.5137E-05

4.920	1.0001E-06
7.380	1.1759E-09

Ground Motion (g)	Freq. of Exceed. (per year)	Return Pd. (years)	P.E. %	Exp. Time (years)
1.7399	4.000E-04	2500.00	1.98	50.0

Conterminous 48 States
2002 Data
Hazard Curve for 1.0sec
Latitude = 33.771563
Longitude = -117.144658
Data are based on a 0.05 deg grid spacing
Frequency of Exceedance values less than
1E-4 should be used with caution.

Ground Motion (g)	Frequency of Exceedance (per year)
0.002	8.5578E-01
0.004	7.3846E-01
0.006	6.0498E-01
0.008	4.7182E-01
0.013	3.5027E-01
0.019	2.5015E-01
0.029	1.7169E-01
0.043	1.1467E-01
0.064	7.4685E-02
0.096	4.6914E-02
0.144	2.728E-02
0.216	1.3731E-02
0.324	5.5657E-03
0.487	1.680E-03
0.730	3.5284E-04
1.090	4.3483E-05
1.640	1.6998E-06
2.460	4.2499E-08
3.690	0.000E00
5.540	0.000E00

Ground Motion (g)	Freq. of Exceed. (per year)	Return Pd. (years)	P.E. %	Exp. Time (years)
0.7066	4.000E-04	2500.00	1.98	50.0

USGS_Probabilistic 10% in 100 yrs

EMWD - Longview Tank
Thu Aug 30 11:28:00 PDT 2012

Conterminous 48 States
2002 Data
Hazard Curve for PGA
Latitude = 33.771563
Longitude = -117.144658
Data are based on a 0.05 deg grid spacing
Frequency of Exceedance values less than
1E-4 should be used with caution.

Ground Motion (g)	Frequency of Exceedance (per year)
0.005	8.8229E-01
0.007	7.9143E-01
0.010	6.7841E-01
0.014	5.5007E-01
0.019	4.1753E-01
0.027	2.9781E-01
0.038	2.0306E-01
0.053	1.3454E-01
0.074	8.8248E-02
0.103	5.7136E-02
0.145	3.4925E-02
0.203	1.9592E-02
0.284	9.4638E-03
0.397	3.7258E-03
0.556	1.1257E-03
0.778	2.5335E-04
1.090	4.0381E-05
1.520	4.960E-06
2.130	2.772E-07

10% in 50

Ground Motion (g)	Freq. of Exceed. (per year)	Return Pd. (years)	P.E. %	Exp. Time (years)
0.5710	1.000E-03	1000.00	4.88	50.0
		975		

Conterminous 48 States
2002 Data
Hazard Curve for 0.2sec
Latitude = 33.771563
Longitude = -117.144658
Data are based on a 0.05 deg grid spacing
Frequency of Exceedance values less than
1E-4 should be used with caution.

Ground Motion (g)	Frequency of Exceedance (per year)
0.005	1.0069E00
0.007	9.4719E-01
0.011	8.5481E-01
0.017	7.2936E-01
0.025	5.7886E-01
0.038	4.242E-01
0.057	2.8948E-01
0.085	1.8766E-01
0.128	1.1852E-01
0.192	7.3538E-02
0.288	4.3697E-02
0.432	2.3443E-02
0.649	1.0428E-02
0.973	3.5704E-03
1.460	8.7179E-04
2.190	1.4395E-04
3.280	1.5137E-05

4.920	1.0001E-06
7.380	1.1759E-09

Ground Motion (g)	Freq. of Exceed. (per year)	Return Pd. (years)	P.E. %	Exp. Time (years)
1.4035	1.000E-03	1000.00	4.88	50.0

Conterminous 48 States
2002 Data
Hazard Curve for 1.0sec
Latitude = 33.771563
Longitude = -117.144658
Data are based on a 0.05 deg grid spacing
Frequency of Exceedance values less than
1E-4 should be used with caution.

Ground Motion (g)	Frequency of Exceedance (per year)
0.002	8.5578E-01
0.004	7.3846E-01
0.006	6.0498E-01
0.008	4.7182E-01
0.013	3.5027E-01
0.019	2.5015E-01
0.029	1.7169E-01
0.043	1.1467E-01
0.064	7.4685E-02
0.096	4.6914E-02
0.144	2.728E-02
0.216	1.3731E-02
0.324	5.5657E-03
0.487	1.680E-03
0.730	3.5284E-04
1.090	4.3483E-05
1.640	1.6998E-06
2.460	4.2499E-08
3.690	0.000E00
5.540	0.000E00

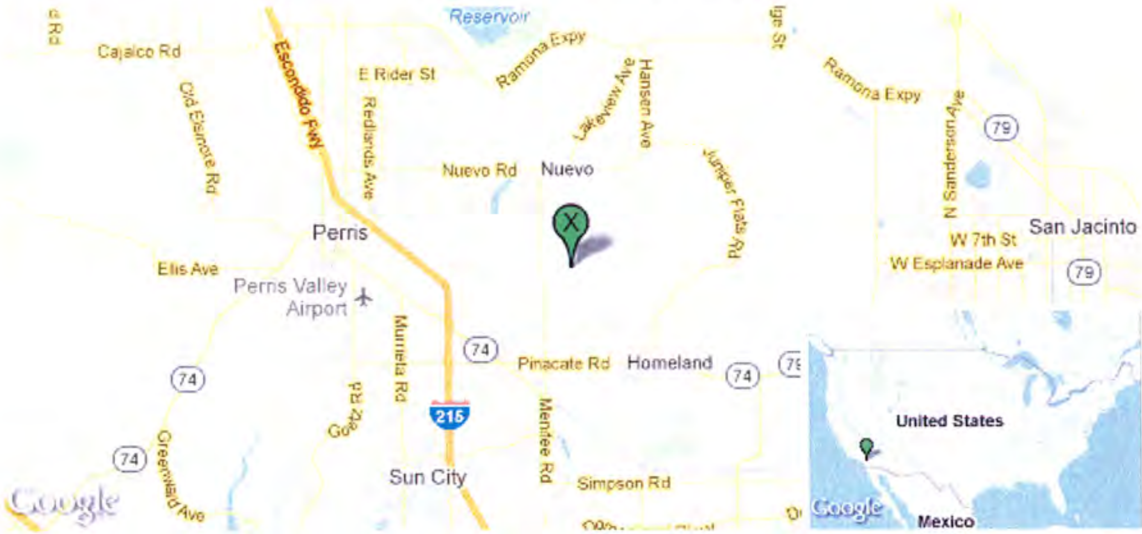
Ground Motion (g)	Freq. of Exceed. (per year)	Return Pd. (years)	P.E. %	Exp. Time (years)
0.5572	1.000E-03	1000.00	4.88	50.0

2 0.36g.

USGS Design Maps Summary Report

User–Specified Input

Report Title	EMWD - Longview Tank Tue September 18, 2012 17:35:16 UTC
Building Code Reference Document	ASCE 7-10 Standard (which makes use of 2008 USGS hazard data)
Site Coordinates	33.7713°N, 117.1446°W
Site Soil Classification	Site Class C – "Very Dense Soil and Soft Rock"
Risk Category	IV (e.g. essential facilities)

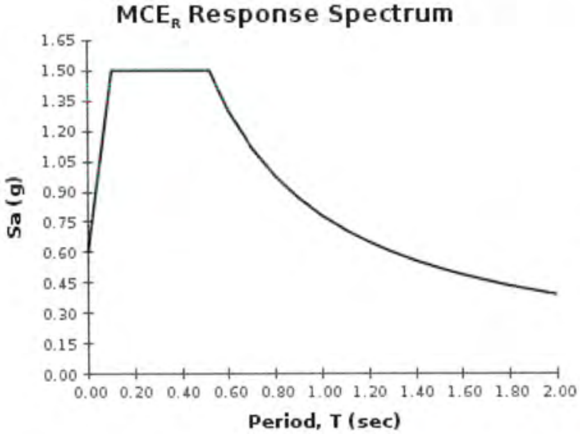


USGS–Provided Output

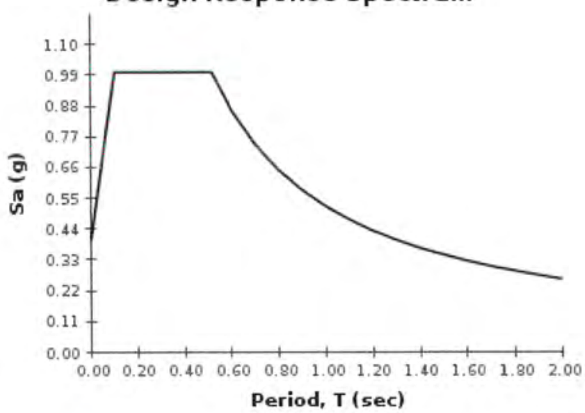
S_S =	1.500 g	S_{MS} =	1.500 g	S_{DS} =	1.000 g
S_1 =	0.600 g	S_{M1} =	0.780 g	S_{D1} =	0.520 g

For information on how the SS and S1 values above have been calculated from probabilistic (risk-targeted) and deterministic ground motions in the direction of maximum horizontal response, please return to the application and select the "2009 NEHRP" building code reference document.

MCE_R Response Spectrum



Design Response Spectrum



For PGA_M, T_L, C_{RS}, and C_{R1} values, please view the detailed report.

Although this information is a product of the U.S. Geological Survey, we provide no warranty, expressed or implied, as to the accuracy of the data contained therein. This tool is not a substitute for technical subject-matter knowledge.

USGS Design Maps Detailed Report

ASCE 7-10 Standard (33.7713°N, 117.1446°W)

Section 11.4.1 — Mapped Acceleration Parameters

Note: Ground motion values provided below are for the direction of maximum horizontal spectral response acceleration. They have been converted from corresponding geometric mean ground motions computed by the USGS by applying factors of 1.1 (to obtain S_S) and 1.3 (to obtain S_1). Maps in the 2010 ASCE-7 Standard are provided for Site Class B. Adjustments for other Site Classes are made, as needed, in Section 11.4.3.

From Figure 22-1 [1] S_S = 1.500 g

From Figure 22-2 [2] S_1 = 0.600 g

Section 11.4.2 — Site Class

The authority having jurisdiction (not the USGS), site-specific geotechnical data, and/or the default has classified the site as Site Class C, based on the site soil properties in accordance with Chapter 20.

Table 20.3–1 Site Classification

Site Class	$\bar{v}_s$	$\bar{N}$ or $\bar{N}_{ch}$	$\bar{s}_u$
A. Hard Rock	>5,000 ft/s	N/A	N/A
B. Rock	2,500 to 5,000 ft/s	N/A	N/A
C. Very dense soil and soft rock	1,200 to 2,500 ft/s	>50	>2,000 psf
D. Stiff Soil	600 to 1,200 ft/s	15 to 50	1,000 to 2,000 psf
E. Soft clay soil	<600 ft/s	<15	<1,000 psf
	Any profile with more than 10 ft of soil having the characteristics: • Plasticity index PI > 20, • Moisture content $w \geq 40\%$, and • Undrained shear strength $\bar{s}_u$ < 500 psf		
F. Soils requiring site response analysis in accordance with Section 21.1	See Section 20.3.1		

For SI: 1ft/s = 0.3048 m/s 1lb/ft² = 0.0479 kN/m²

Section 11.4.3 — Site Coefficients and Risk–Targeted Maximum Considered Earthquake (MCE_R) Spectral Response Acceleration Parameters

Table 11.4–1: Site Coefficient F_a

Site Class	Mapped MCE $_R$ Spectral Response Acceleration Parameter at Short Period				
	$S_S \le 0.25$	$S_S = 0.5$	$S_S = 0.75$	$S_S = 1$	$S_S \ge 1.25$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F	See Section 11.4.7 of ASCE 7				

Note: Use straight–line interpolation for intermediate values of S_S

For Site Class = C and S_S = 1.500 g, F_a = 1.000

Table 11.4–2: Site Coefficient F_v

Site Class	Mapped MCE $_R$ Spectral Response Acceleration Parameter at 1–s Period				
	$S_1 \le 0.1$	$S_1 = 0.2$	$S_1 = 0.3$	$S_1 = 0.4$	$S_1 \ge 0.5$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.7	1.6	1.5	1.4	1.3
D	2.4	2.0	1.8	1.6	1.5
E	3.5	3.2	2.8	2.4	2.4
F	See Section 11.4.7 of ASCE 7				

Note: Use straight–line interpolation for intermediate values of S_1

For Site Class = C and S_1 = 0.600 g, F_v = 1.300

Equation (11.4-1):	$S_{MS} = F_aS_S = 1.000 \times 1.500 = 1.500$ g
Equation (11.4-2):	$S_{M1} = F_vS_1 = 1.300 \times 0.600 = 0.780$ g

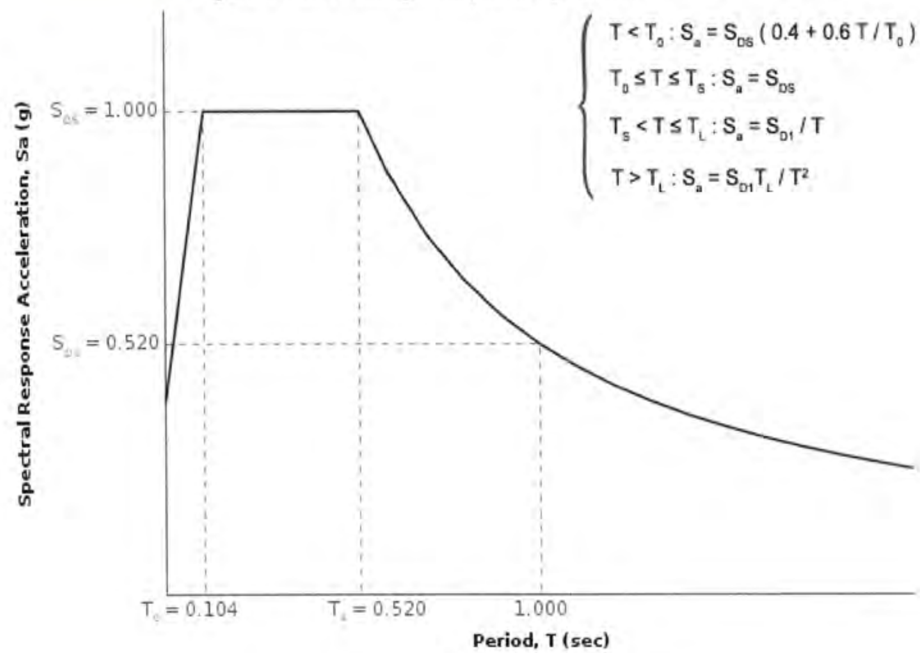
Section 11.4.4 — Design Spectral Acceleration Parameters

Equation (11.4-3):	$S_{DS} = ⅔\ S_{MS} = ⅔ \times 1.500 = 1.000$ g
Equation (11.4-4):	$S_{D1} = ⅔\ S_{M1} = ⅔ \times 0.780 = 0.520$ g

Section 11.4.5 — Design Response Spectrum

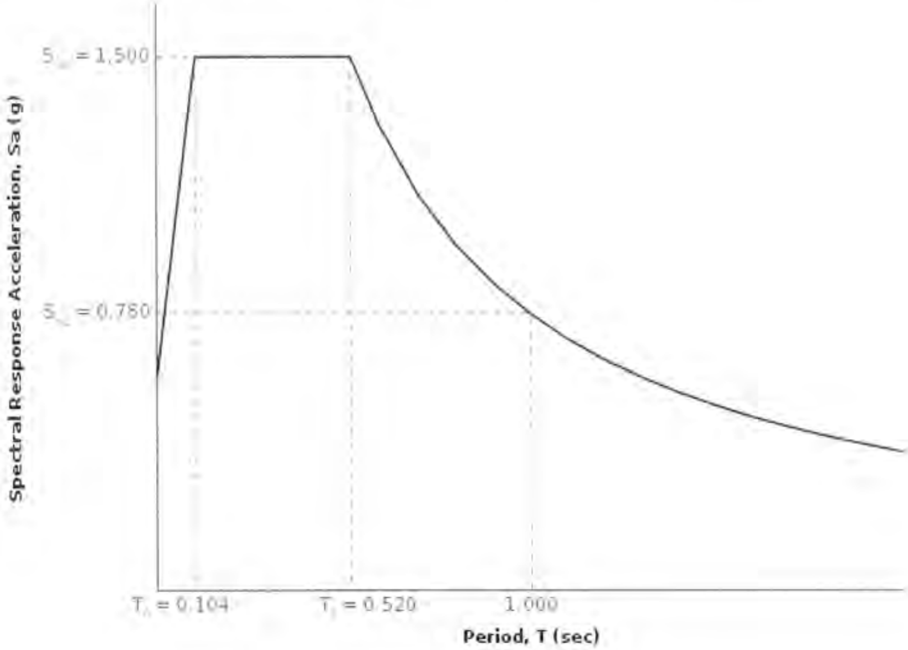
From Figure 22-12 [3]	T_L = 8 seconds

Figure 11.4–1: Design Response Spectrum



Section 11.4.6 — Risk-Targeted Maximum Considered Earthquake (MCE_R) Response Spectrum

The MCE_R Response Spectrum is determined by multiplying the design response spectrum above by 1.5.



Section 11.8.3 — Additional Geotechnical Investigation Report Requirements for Seismic Design Categories D through F

From Figure 22-7 [4] PGA = 0.600

Equation (11.8–1): $PGA_M = F_{PGA}PGA = 1.000 \times 0.600 = 0.6$ g

Table 11.8–1: Site Coefficient F_{PGA}

Site Class	Mapped MCE Geometric Mean Peak Ground Acceleration, PGA				
	PGA ≤ 0.1	PGA = 0.2	PGA = 0.3	PGA = 0.4	PGA ≥ 0.5
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F	See Section 11.4.7 of ASCE 7				

Note: Use straight–line interpolation for intermediate values of PGA

For Site Class = C and PGA = 0.600 g, F_{PGA} = 1.000

Section 21.2.1.1 — Method 1 (from Chapter 21 – Site-Specific Ground Motion Procedures for Seismic Design)

From Figure 22-17 [5] C_{RS} = 1.046

From Figure 22-18 [6] C_{R1} = 1.016

Section 11.6 — Seismic Design Category

Table 11.6-1 Seismic Design Category Based on Short Period Response Acceleration Parameter

A E FS $_s$	S CA EG		
	or		
S_s 0.167g	A	A	A
0.167g S_s 0.33g	B	B	C
0.33g S_s 0.50g	C	C	D
0.50g S_s	D	D	D

For is Categor = and S_s = 1.000 g, Seismic esign Categor =

Table 11.6-2 Seismic Design Category Based on 1-S Period Response Acceleration Parameter

A E FS $_1$	S CA EG		
	or		
S_1 0.067g	A	A	A
0.067g S_1 0.133g	B	B	C
0.133g S_1 0.20g	C	C	D
0.20g S_1	D	D	D

For is Categor = and S_1 = 0.520 g, Seismic esign Categor =

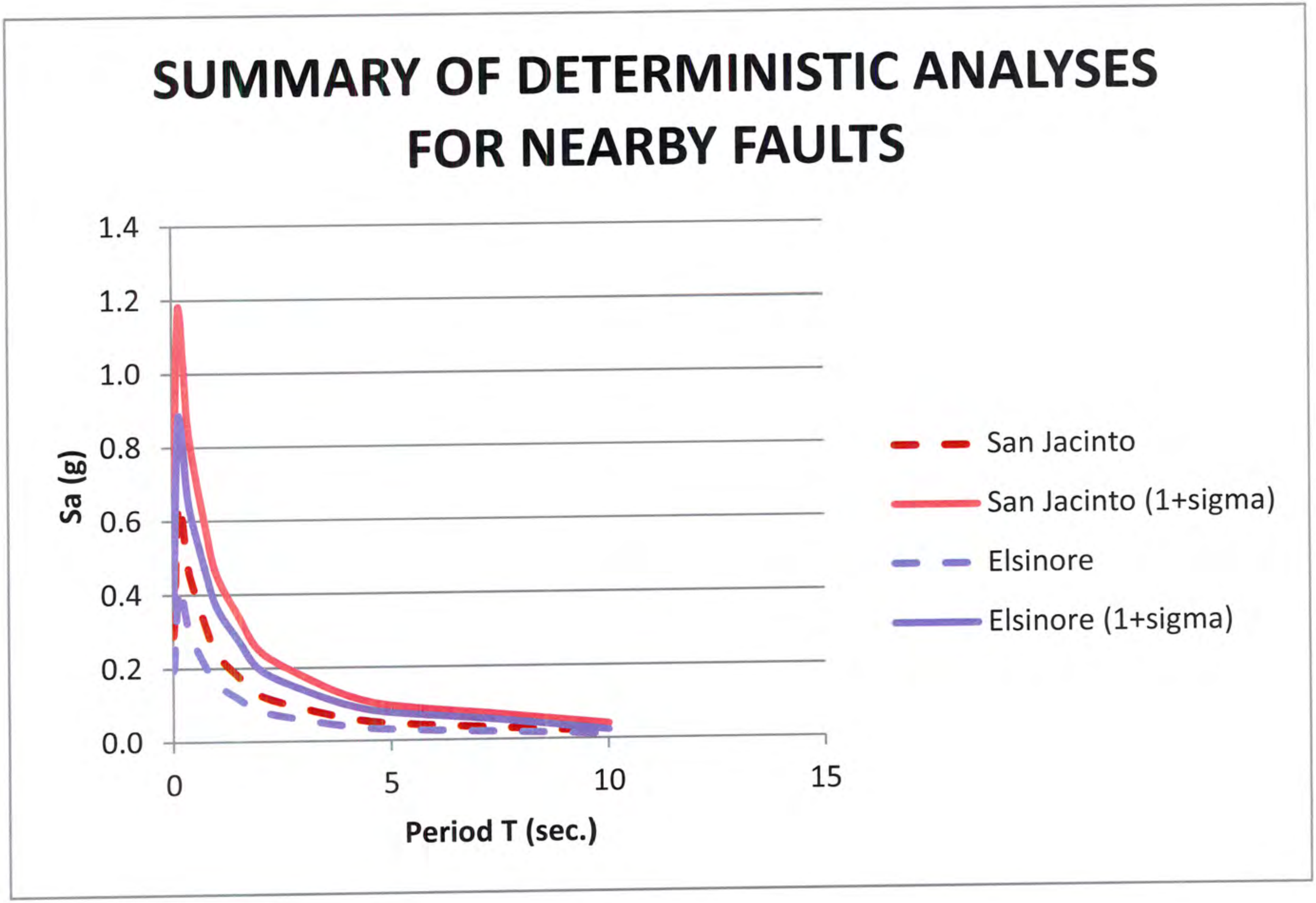
Note: When S_1 is greater than or equal to 0.75g, the Seismic Design Category is **E** for buildings in Risk Categories I, II, and III, and **F** for those in Risk Category IV, irrespective of the above.

Seismic Design Category ≡ "the more severe design category in accordance with Table 11.6-1 or 11.6-2" = D

Note: See Section 11.6 for alternative approaches to calculating Seismic Design Category.

References

1. r : http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-1.pdf
2. r : http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-2.pdf
3. r : http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-12.pdf
4. r : http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-7.pdf
5. r : http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-17.pdf
6. r : http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-18.pdf



SUMMARY OF DETERMINISTIC ANALYSES
FOR NEARBY FAULTS
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
Sa (g)
0
5
10
15
Period T (sec.)
San Jacinto
San Jacinto (1+sigma)
Elsinore
Elsinore (1+sigma)

ASCE 7-05 - GROUND MOTION ANALYSIS

Use Maximum Rotated Horizontal Component?* (Y/N) n

*Computed per Beyer & Bommer (2006)

Deterministic & Probablistic Analyses using NGA Relationships of Chiou & Youngs (2008), Campbell et.al. and Boore & Atkinson (2008)

Probabilistic MCE per 21.2.1

OpenSHA data

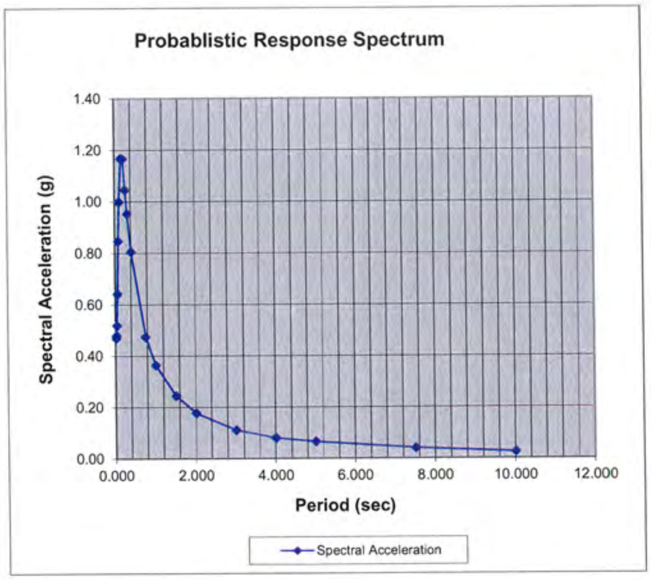
10% Probability of Exceedence in 100 Years

Presented data is the average of Chiou & Youngs (2008), Campbell & Bozorgnia (2008) and Boore & Atkinson (2008) NGA Relationships

T	Acc
0.010	0.47
0.020	0.48
0.030	0.52
0.050	0.64
0.075	0.85
0.100	1.00
0.150	1.17
0.200	1.17
0.250	1.05
0.300	0.95
0.400	0.81
0.750	0.47
1.000	0.36
1.500	0.25
2.000	0.18
3.000	0.11
4.000	0.08
5.000	0.07
7.500	0.04
10.000	0.02

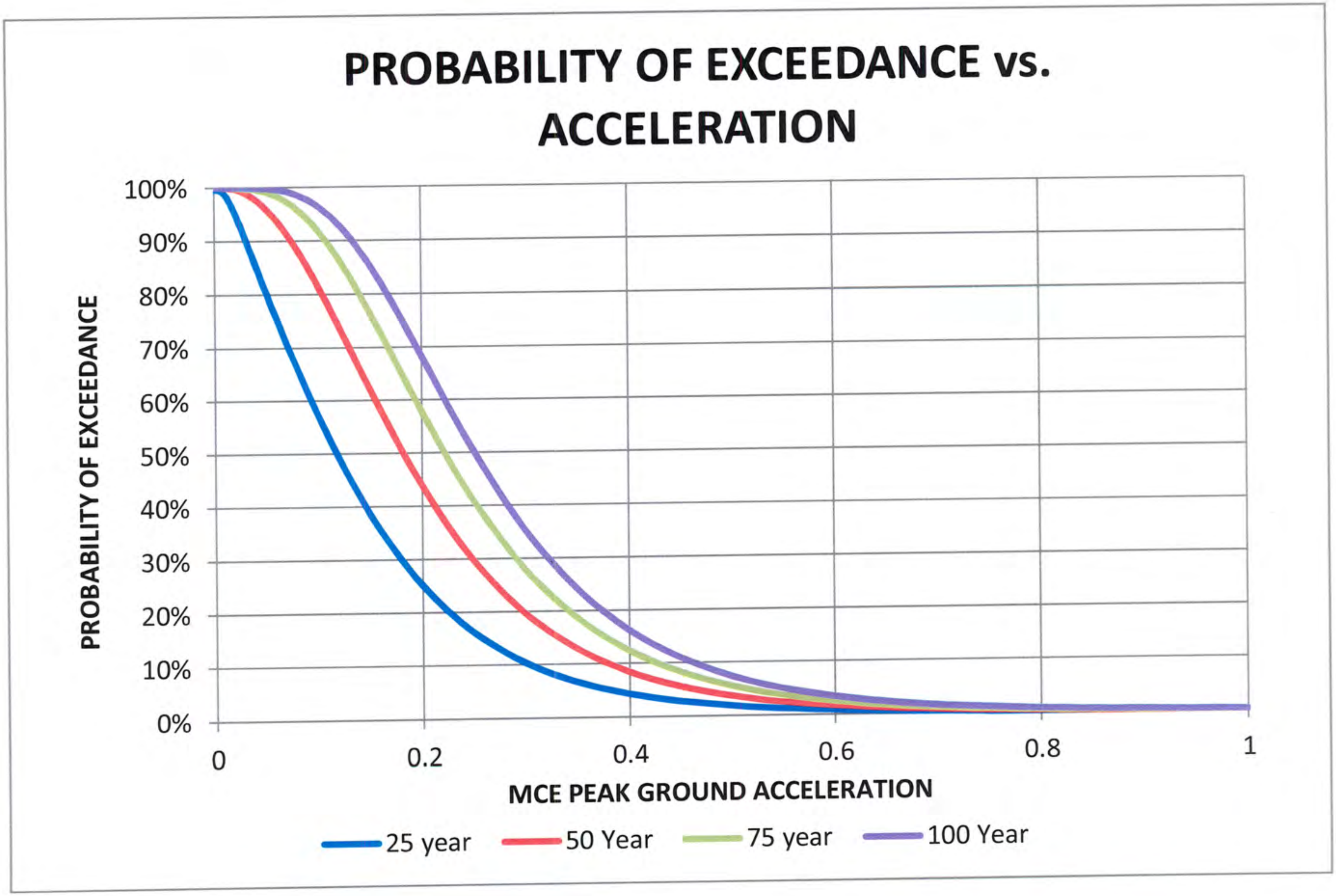
.06

S_s=	1.17
S_1=	0.36



$S_{ai} = 1.17$.

$$A_i = \frac{S_{ai}\, I_E}{1.4 \cdot R_i} = \frac{1.17 \times 1.5}{1.4 \times 2.5} = 0.501$$



PROBABILITY OF EXCEEDANCE vs.
ACCELERATION
PROBABILITY OF EXCEEDANCE
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
0
0.2
0.4
0.6
0.8
1
MCE PEAK GROUND ACCELERATION
25 year
50 Year
75 year
100 Year

DESIGN SPECTRUM per Section 21.3

SITE SPECIFIC DESIGN ACCELERATION PARAMETERS per Section 21.4 ASCE-7

Highest value of S_a for any period exceeding 0.2 sec.=	1.000
90%of Highest Value =	0.900
2 X Sa @ T= 2 sec.=	0.313

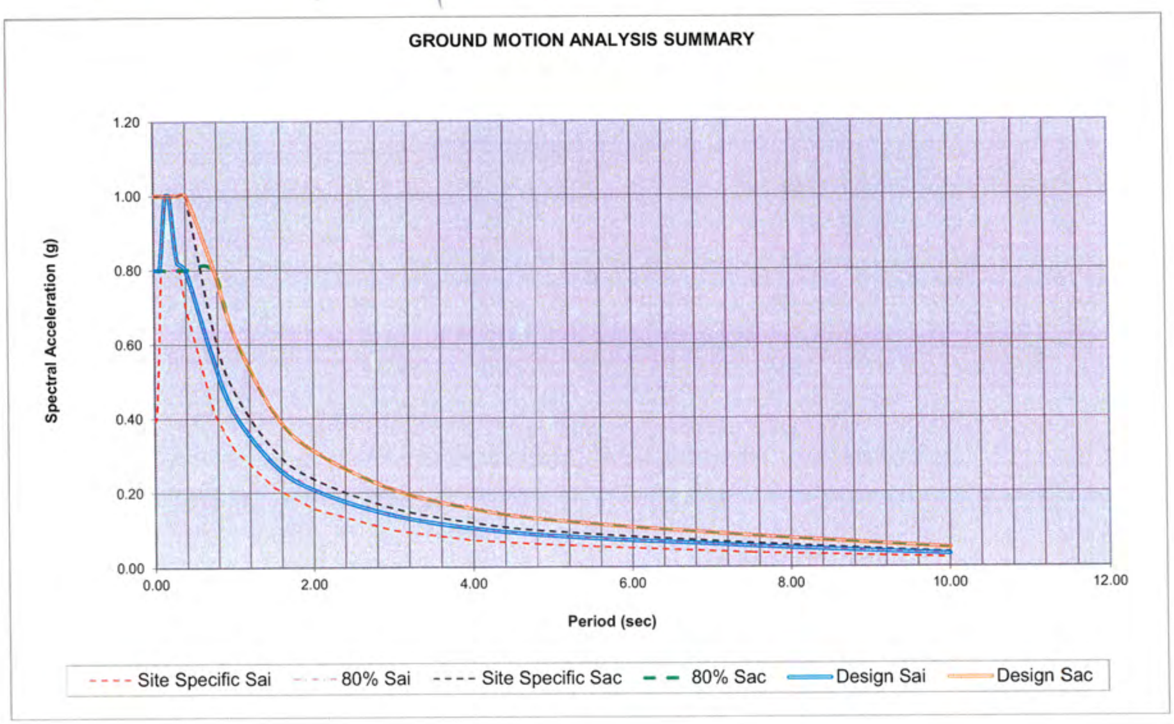
S_{DS}=	1.000
S_{D1}=	0.316 ←
PGA=	0.40

S_{MS}=	1.500
S_{M1}=	0.474

Period T	Site Specific S_{ai}	Site Specific S_{ac}	80% General Design S_{ai}	80% General Design S_{ac}	Design Impulsive Sa	Design Convective Sa
0.00	0.40		0.80		0.80	
0.010	0.39	1.00	0.80	0.80	0.80	1.00
0.020	0.40	1.00	0.80	0.80	0.80	1.00
0.030	0.44	1.00	0.80	0.80	0.80	1.00
0.050	0.55	1.00	0.80	0.80	0.80	1.00
0.075	0.73	1.00	0.80	0.80	0.80	1.00
0.100	0.86	1.00	0.80	0.80	0.86	1.00
0.150	1.00	1.00	0.80	0.80	1.00	1.00
0.200	1.00	1.00	0.80	0.80	1.00	1.00
0.250	0.90	1.00	0.80	0.80	0.90	1.00
0.300	0.82	1.00	0.80	0.80	0.82	1.00
0.400	0.69	1.00	0.80	0.80	0.80	1.00
0.750	0.41	0.63	0.55	0.80	0.55	0.80
1.000	0.32	0.47	0.42	0.62	0.42	0.62
1.500	0.21	0.32	0.28	0.42	0.28	0.42
2.000	0.16	0.24	0.21	0.31	0.21	0.31
3.000	0.10	0.16	0.14	0.21	0.14	0.21
4.000	0.07	0.12	0.10	0.16	0.10	0.16
5.000	0.06	0.09	0.08	0.12	0.08	0.12
7.500	0.04	0.06	0.06	0.08	0.06	0.08
10.000	0.02	0.04	0.03	0.05	0.03	0.05

$S_{ac} = A_f = K \cdot S_{D1} \cdot T_L / T_c^2$

$\frac{1}{2.5} \times .02$



SEISMIC DESIGN PARAMETERS SUMMARY

2% Probabability of Excedence in 50 Years

Project: EMWD Longview Tank
Project #: W175-067
Date: 9/5/2012

Lattitude: 33.7713
Longitude: -117.1446

AWWA D100-11

Mapped Acceleration Parameters per Figure 8 (Section 13.2.3)

S_s= 1.5
S_1= 0.6

Site Class per Table 25
Site Class= C

Site Coefficients per Tables 26 and 27

F_a= 1 Table 26
F_v= 1.3 Table 27

Design Spectral Response Acceleration per 13.2.7

S_{MS}=	1.5	Eq. 13-5
S_{M1}=	0.78	Eq. 13-6

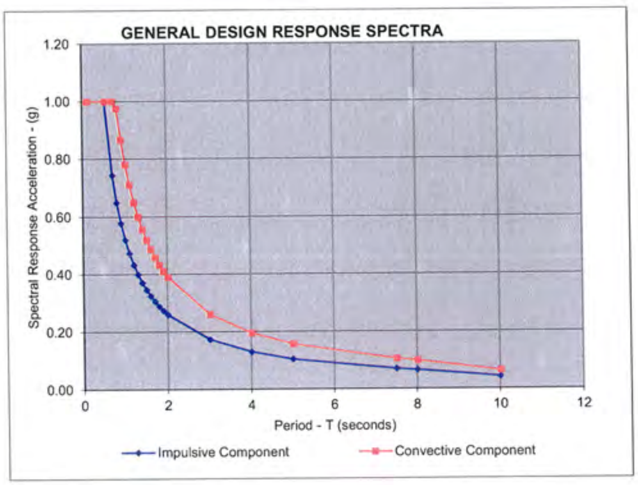
S_{DS}=	1	Eq. 13-7
S_{D1}=	0.52	Eq. 13-8

T_0= 0.104 sec
T_S= 0.52 sec
T_L= 8 sec From Fig 22-16
K= 1.5 Damping Factor 13.2.7.3.2

General w/o Factors

Response Spectra

Period (T)	Sa_i	Sa_c
0.00	1.00	
0.10	1.00	1.000
0.52	1.00	1.000
0.70	0.74	1.000
0.80	0.65	0.975
0.90	0.58	0.867
1.00	0.52	0.780
1.10	0.47	0.709
1.20	0.43	0.650
1.30	0.40	0.600
1.40	0.37	0.557
1.50	0.35	0.520
1.60	0.33	0.488
1.70	0.31	0.459
1.80	0.29	0.433
1.90	0.27	0.411
2.00	0.26	0.390
3.00	0.17	0.260
4.00	0.13	0.195
5.00	0.10	0.156
7.50	0.07	0.104
8.00	0.07	0.098
10.00	0.04	0.062



.2 sec. Sa_i = 1.00
A_i = .43g X

ASCE 7-05 - GROUND MOTION ANALYSIS

Use Maximum Rotated Horizontal Component?* (Y/N) n

*Computed per Beyer & Bommer (2006)

Deterministic & Probablistic Analyses using NGA Relationships of Chiou & Youngs (2008), Campbell et.al. and Boore & Atkinson (2008)

Probabilistic MCE per 21.2.1

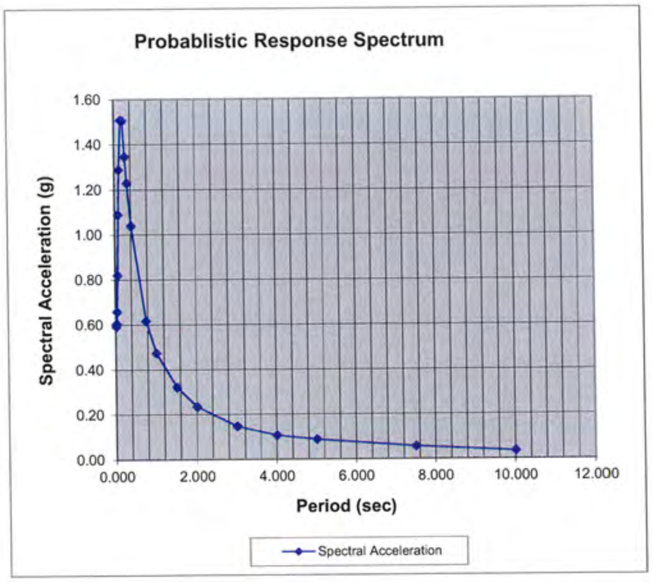
OpenSHA data

2% Probability Of Exceedance in 50 years

Presented data is the average of Chiou & Youngs (2008), Campbell & Bozorgnia (2008) and Boore & Atkinson (2008) NGA Relationships

T	Acc
0.010	0.59
0.020	0.60
0.030	0.66
0.050	0.82
0.075	1.09
0.100	1.29
0.150	1.51
0.200	1.51
0.250	1.35
0.300	1.23
0.400	1.04
0.750	0.62
1.000	0.47
1.500	0.32
2.000	0.24
3.000	0.15
4.000	0.11
5.000	0.09
7.500	0.06
10.000	0.04

S_s=	1.51
S_1=	0.47

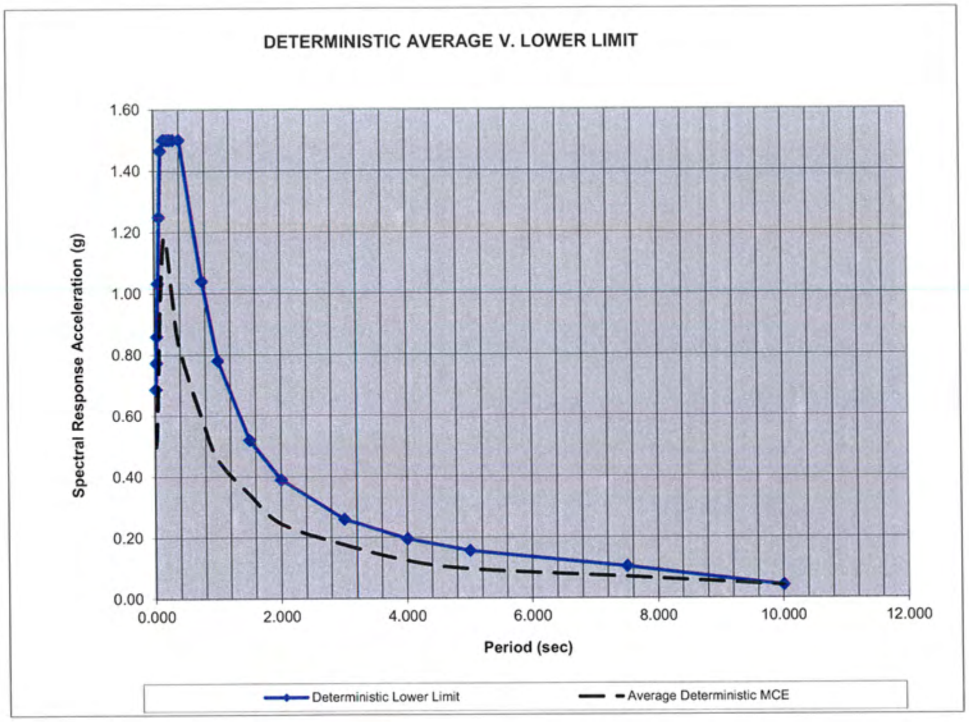


DETERMINISITC MCE per 21.2.2

Input Parameters		
M	= Moment magnitude	7.8
R_{RUP}	= Closest distance to coseismic rupture (km)	11.44
R_{JB}	= Closest distance to surface projection of coseismic rupture (km)	11.44
Rx	= Horizontal distance to top edge of rupture measured perpendicular to strike (km)	11.44
F_{RV}	= Reverse-faulting factor: 0 for strike slip, normal, normal-oblique; 1 for reverse, reverse-oblique and thrust	0
F_{NM}	= Normal-faulting factor: 0 for strike slip, reverse, reverse-oblique and thrust; 1 for normal and normal-oblique	0
US	= Unspecified Faulting Flag (Boore et.al.)	0
SS	=Strike-Slip Faulting Flag (Boore et.al.)	1
NS	=Normal Faulting Flag (Boore et.al.)	0
RS	= Reverse Faulting Flag (Boore et.al.)	0
Z_{TOR}	= Depth to top of coseismic rupture (km)	0
δ	= Average dip of rupture plane (degrees)	90
V_{S30}	= Average shear-wave velocity in top 30m of site profile	760
$Z_{1.0}$	= Depth to Shear Wave Velocity of 1.0 km/sec (m)	4
$Z_{2.5}$	= Depth to Shear Wave Velocity of 2.5 km/sec (km)	0.014
σ	=Standard Deviation	1

Deterministic Summary and Comparison with Deterministic Lower Limit - Section 21.2.2

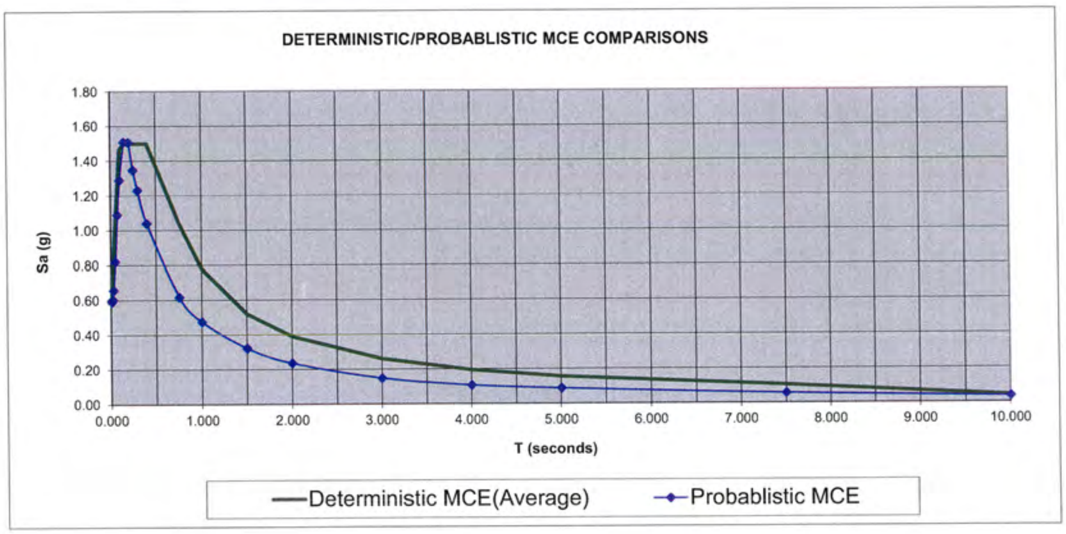
T	Chiou & Youngs	Campbell	Boore	Average	Lower Limit	Value	Method
0.010	0.582	0.413	0.498	0.50	0.69	0.69	Lower Limit
0.020	0.593	0.422	0.509	0.51	0.77	0.77	Lower Limit
0.030	0.646	0.462	0.542	0.55	0.86	0.86	Lower Limit
0.050	0.816	0.580	0.623	0.67	1.03	1.03	Lower Limit
0.075	1.052	0.761	0.794	0.87	1.25	1.25	Lower Limit
0.100	1.242	0.905	0.893	1.01	1.47	1.47	Lower Limit
0.150	1.429	1.052	1.056	1.18	1.50	1.50	Lower Limit
0.200	1.371	1.075	1.005	1.15	1.50	1.50	Lower Limit
0.250	1.261	0.945	0.965	1.06	1.50	1.50	Lower Limit
0.300	1.149	0.846	0.889	0.96	1.50	1.50	Lower Limit
0.400	0.959	0.725	0.771	0.82	1.50	1.50	Lower Limit
0.750	0.594	0.667	0.500	0.59	1.04	1.04	Lower Limit
1.000	0.477	0.498	0.391	0.46	0.78	0.78	Lower Limit
1.500	0.331	0.391	0.305	0.34	0.52	0.52	Lower Limit
2.000	0.240	0.260	0.238	0.25	0.39	0.39	Lower Limit
3.000	0.151	0.196	0.182	0.18	0.26	0.26	Lower Limit
4.000	0.110	0.130	0.132	0.12	0.20	0.20	Lower Limit
5.000	0.084	0.099	0.106	0.10	0.16	0.16	Lower Limit
7.500	0.046	0.086	0.077	0.07	0.10	0.10	Lower Limit
10.000	0.027	0.062	0.036	0.04	0.04	0.04	Lower Limit



DETERMINISTIC AVERAGE V. LOWER LIMIT
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
Spectral Response Acceleration (g)
0.000
2.000
4.000
6.000
8.000
10.000
12.000
Period (sec)
Deterministic Lower Limit
Average Deterministic MCE

SITE SPECIFIC MCE - Compare Deterministic MCE Values (S_a) with Probablistic Values (S_a) per 21.2.3
'Presented data are the average of Chiou & Youngs (2008), Campbell & Bozorgnia (2008)and Boore & Atkinson (2008) NGA Relationships

Period T	Determisitic MCE - (S_a)	Probablistic S_a	Lower Value	Governing Method
0.010	0.69	0.59	0.59	ProbablisticGoverns
0.020	0.77	0.60	0.60	ProbablisticGoverns
0.030	0.86	0.66	0.66	ProbablisticGoverns
0.050	1.03	0.82	0.82	ProbablisticGoverns
0.075	1.25	1.09	1.09	ProbablisticGoverns
0.100	1.47	1.29	1.29	ProbablisticGoverns
0.150	1.50	1.51	1.50	Deterministic Governs
0.200	1.50	1.51	1.50	Deterministic Governs
0.250	1.50	1.35	1.35	ProbablisticGoverns
0.300	1.50	1.23	1.23	ProbablisticGoverns
0.400	1.50	1.04	1.04	ProbablisticGoverns
0.750	1.04	0.62	0.62	ProbablisticGoverns
1.000	0.78	0.47	0.47	ProbablisticGoverns
1.500	0.52	0.32	0.32	ProbablisticGoverns
2.000	0.39	0.24	0.24	ProbablisticGoverns
3.000	0.26	0.15	0.15	ProbablisticGoverns
4.000	0.20	0.11	0.11	ProbablisticGoverns
5.000	0.16	0.09	0.09	ProbablisticGoverns
7.500	0.10	0.06	0.06	ProbablisticGoverns
10.000	0.04	0.04	0.04	ProbablisticGoverns



DESIGN SPECTRUM per Section 21.3

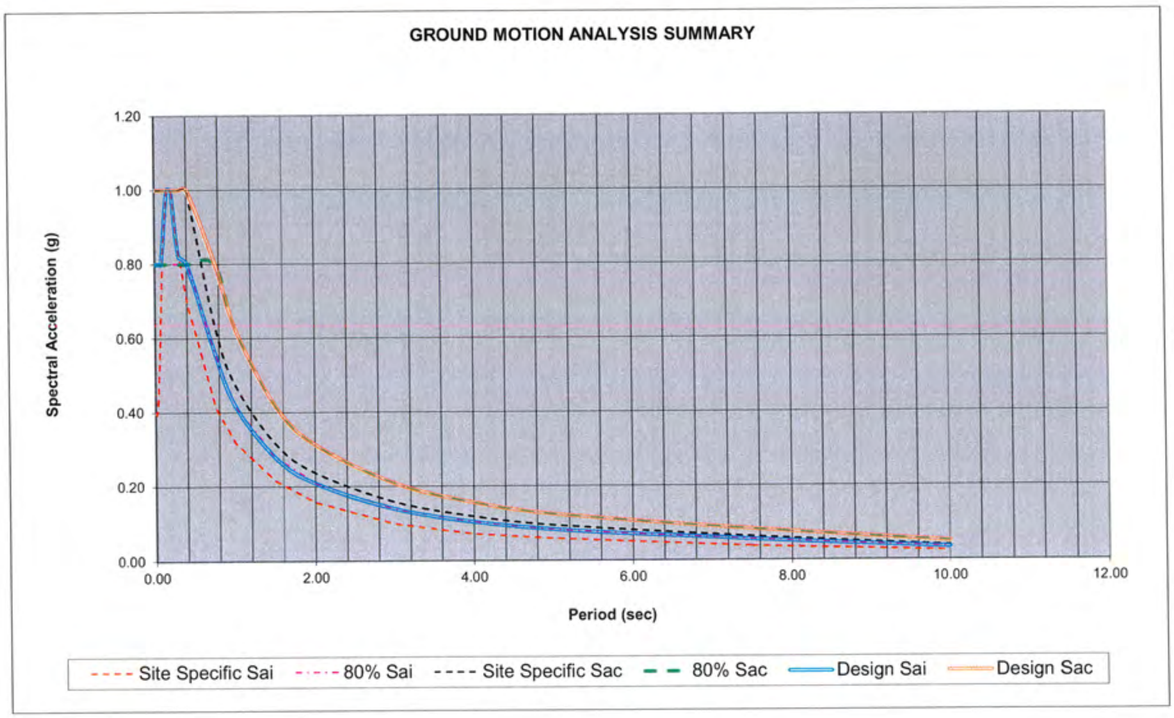
SITE SPECIFIC DESIGN ACCELERATION PARAMETERS per Section 21.4 ASCE-7

Highest value of S_a for any period exceeding 0.2 sec.=	1.000
90%of Highest Value =	0.900
2 X Sa @ T= 2 sec.=	0.313

S_{DS}=	1.000
S_{D1}=	0.316
PGA=	0.40

S_{MS}=	1.500
S_{M1}=	0.474

Period T	Site Specific S_{ai}	Site Specific S_{ac}	80% General Design S_{ai}	80% General Design S_{ac}	Design Impulsive Sa	Design Convective Sa
0.00	0.40		0.80		0.80	
0.010	0.39	1.00	0.80	0.80	0.80	1.00
0.020	0.40	1.00	0.80	0.80	0.80	1.00
0.030	0.44	1.00	0.80	0.80	0.80	1.00
0.050	0.55	1.00	0.80	0.80	0.80	1.00
0.075	0.73	1.00	0.80	0.80	0.80	1.00
0.100	0.86	1.00	0.80	0.80	0.86	1.00
0.150	1.00	1.00	0.80	0.80	1.00	1.00
0.200	1.00	1.00	0.80	0.80	1.00	1.00
0.250	0.90	1.00	0.80	0.80	0.90	1.00
0.300	0.82	1.00	0.80	0.80	0.82	1.00
0.400	0.69	1.00	0.80	0.80	0.80	1.00
0.750	0.41	0.63	0.55	0.80	0.55	0.80
1.000	0.32	0.47	0.42	0.62	0.42	0.62
1.500	0.21	0.32	0.28	0.42	0.28	0.42
2.000	0.16	0.24	0.21	0.31	0.21	0.31
3.000	0.10	0.16	0.14	0.21	0.14	0.21
4.000	0.07	0.12	0.10	0.16	0.10	0.16
5.000	0.06	0.09	0.08	0.12	0.08	0.12
7.500	0.04	0.06	0.06	0.08	0.06	0.08
10.000	0.02	0.04	0.03	0.05	0.03	0.05



SEISMIC DESIGN PARAMETERS SUMMARY

10% Probabability of Excedence in 100 Years
Project: EMWD Longview Tank
Project #: W175-067
Date: 9/5/2012

Lattitude: 33.7713
Longitude: -117.1446

AWWA D100-11

Mapped Acceleration Parameters per Figure 8 (Section 13.2.3)

S_s= 1.5
S_1= 0.6

Site Class per Table 25

Site Class= C

Site Coefficients per Tables 26 and 27

F_a= 1 Table 26
F_v= 1.3 Table 27

Design Spectral Response Acceleration per 13.2.7

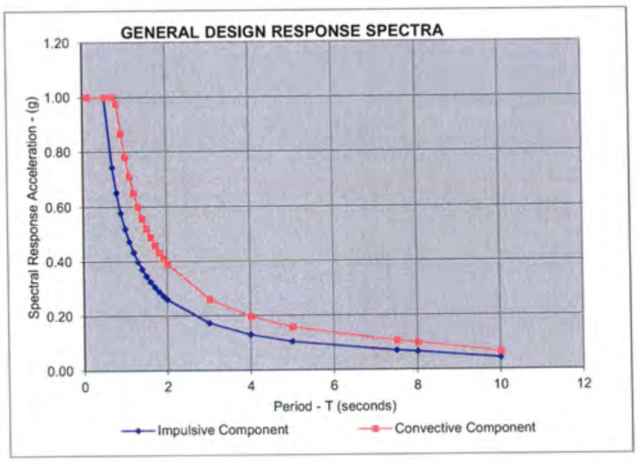
S_{MS}=	1.5	Eq. 13-5
S_{M1}=	0.78	Eq. 13-6

S_{DS}=	1	Eq. 13-7
S_{D1}=	0.52	Eq. 13-8

T_0=	0.104	sec	
T_S=	0.52	sec	
T_L=	8	sec	From Fig 22-16
K=	1.5	Damping Factor 13.2.7.3.2	

Response Spectra

Period (T)	Sa_i	Sa_c
0.00	1.00	
0.10	1.00	1.00
0.52	1.00	1.00
0.70	0.74	1.00
0.80	0.65	0.98
0.90	0.58	0.87
1.00	0.52	0.78
1.10	0.47	0.71
1.20	0.43	0.65
1.30	0.40	0.60
1.40	0.37	0.56
1.50	0.35	0.52
1.60	0.33	0.49
1.70	0.31	0.46
1.80	0.29	0.43
1.90	0.27	0.41
2.00	0.26	0.39
3.00	0.17	0.26
4.00	0.13	0.20
5.00	0.10	0.16
7.50	0.07	0.10
8.00	0.07	0.10
10.00	0.04	0.06



ASCE 7-05 - GROUND MOTION ANALYSIS

Use Maximum Rotated Horizontal Component?* (Y/N) n

*Computed per Beyer & Bommer (2006)

Deterministic & Probablistic Analyses using NGA Relationships of Chiou & Youngs (2008), Campbell et.al. and Boore & Atkinson (2008)

Probabilistic MCE per 21.2.1

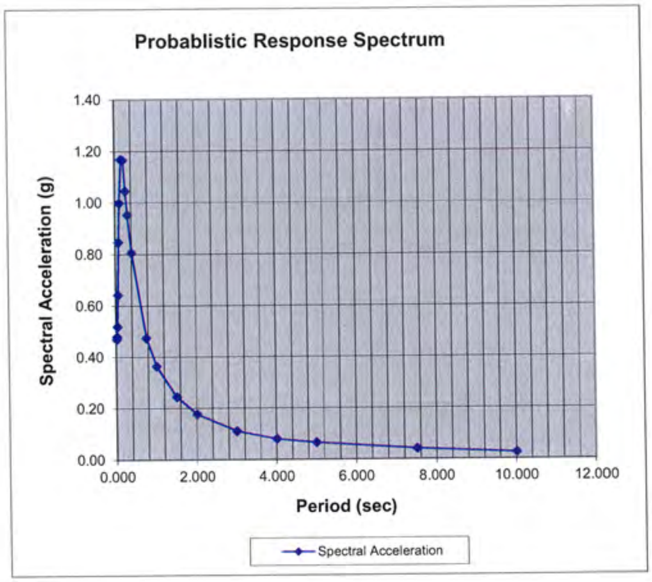
OpenSHA data

10% Probability of Exceedence in 100 Years

Presented data is the average of Chiou & Youngs (2008), Campbell & Bozorgnia (2008) and Boore & Atkinson (2008) NGA Relationships

T	Acc
0.010	0.47
0.020	0.48
0.030	0.52
0.050	0.64
0.075	0.85
0.100	1.00
0.150	1.17
0.200	1.17
0.250	1.05
0.300	0.95
0.400	0.81
0.750	0.47
1.000	0.36
1.500	0.25
2.000	0.18
3.000	0.11
4.000	0.08
5.000	0.07
7.500	0.04
10.000	0.02

S_s=	1.17
S_1=	0.36

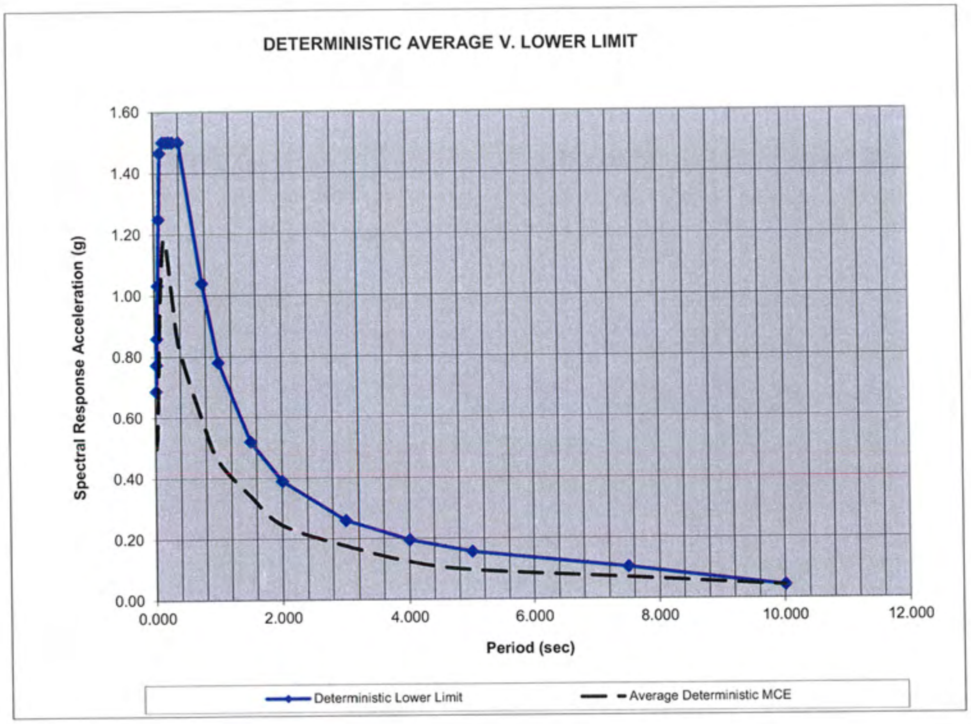


DETERMINISITC MCE per 21.2.2

Input Parameters		
M	= Moment magnitude	7.8
R_{RUP}	= Closest distance to coseismic rupture (km)	11.44
R_{JB}	= Closest distance to surface projection of coseismic rupture (km)	11.44
Rx	= Horizontal distance to top edge of rupture measured perpendicular to strike (km)	11.44
F_{RV}	= Reverse-faulting factor: 0 for strike slip, normal, normal-oblique; 1 for reverse, reverse-oblique and thrust	0
F_{NM}	= Normal-faulting factor: 0 for strike slip, reverse, reverse-oblique and thrust; 1 for normal and normal-oblique	0
US	= Unspecified Faulting Flag (Boore et.al.)	0
SS	=Strike-Slip Faulting Flag (Boore et.al.)	1
NS	=Normal Faulting Flag (Boore et.al.)	0
RS	= Reverse Faulting Flag (Boore et.al.)	0
Z_{TOR}	= Depth to top of coseismic rupture (km)	0
δ	= Average dip of rupture plane (degrees)	90
V_{S30}	= Average shear-wave velocity in top 30m of site profile	760
$Z_{1.0}$	= Depth to Shear Wave Velocity of 1.0 km/sec (m)	4
$Z_{2.5}$	= Depth to Shear Wave Velocity of 2.5 km/sec (km)	0.014
σ	=Standard Deviation	1

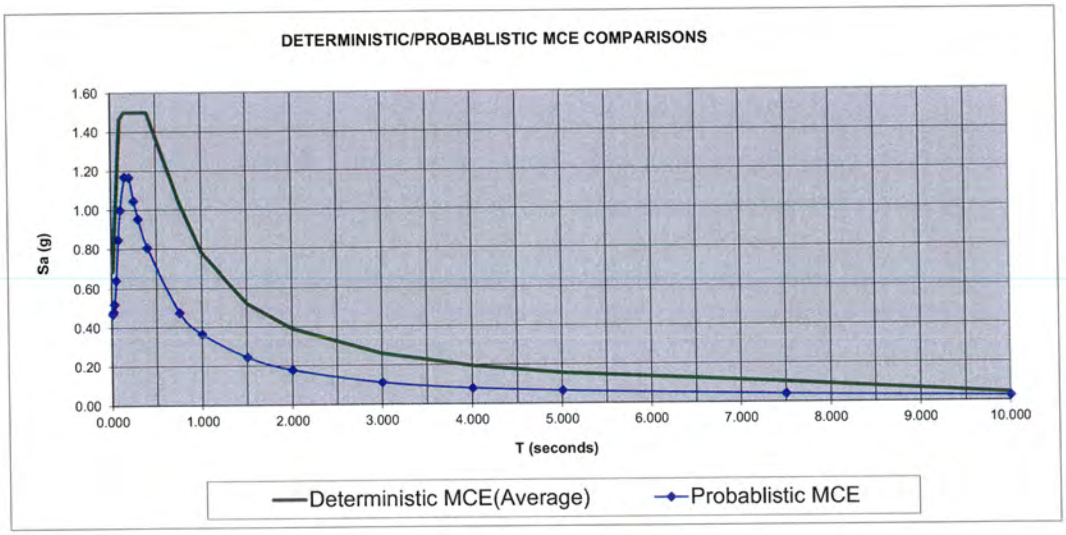
Deterministic Summary and Comparison with Deterministic Lower Limit - Section 21.2.2

T	Chiou & Youngs	Campbell	Boore	Average	Lower Limit	Value	Method
0.010	0.582	0.413	0.498	0.50	0.69	0.69	Lower Limit
0.020	0.593	0.422	0.509	0.51	0.77	0.77	Lower Limit
0.030	0.646	0.462	0.542	0.55	0.86	0.86	Lower Limit
0.050	0.816	0.580	0.623	0.67	1.03	1.03	Lower Limit
0.075	1.052	0.761	0.794	0.87	1.25	1.25	Lower Limit
0.100	1.242	0.905	0.893	1.01	1.47	1.47	Lower Limit
0.150	1.429	1.052	1.056	1.18	1.50	1.50	Lower Limit
0.200	1.371	1.075	1.005	1.15	1.50	1.50	Lower Limit
0.250	1.261	0.945	0.965	1.06	1.50	1.50	Lower Limit
0.300	1.149	0.846	0.889	0.96	1.50	1.50	Lower Limit
0.400	0.959	0.725	0.771	0.82	1.50	1.50	Lower Limit
0.750	0.594	0.667	0.500	0.59	1.04	1.04	Lower Limit
1.000	0.477	0.498	0.391	0.46	0.78	0.78	Lower Limit
1.500	0.331	0.391	0.305	0.34	0.52	0.52	Lower Limit
2.000	0.240	0.260	0.238	0.25	0.39	0.39	Lower Limit
3.000	0.151	0.196	0.182	0.18	0.26	0.26	Lower Limit
4.000	0.110	0.130	0.132	0.12	0.20	0.20	Lower Limit
5.000	0.084	0.099	0.106	0.10	0.16	0.16	Lower Limit
7.500	0.046	0.086	0.077	0.07	0.10	0.10	Lower Limit
10.000	0.027	0.062	0.036	0.04	0.04	0.04	Lower Limit


DETERMINISTIC AVERAGE V. LOWER LIMIT
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
Spectral Response Acceleration (g)
0.000
2.000
4.000
6.000
8.000
10.000
12.000
Period (sec)
Deterministic Lower Limit
Average Deterministic MCE

SITE SPECIFIC MCE - Compare Deterministic MCE Values (S_a) with Probablistic Values (S_a) per 21.2.3
'Presented data are the average of Chiou & Youngs (2008), Campbell & Bozorgnia (2008)and Boore & Atkinson (2008) NGA Relationships

Period T	Determisitic MCE - (S_a)	Probablistic S_a	Lower Value	Governing Method
0.010	0.69	0.47	0.47	ProbablisticGoverns
0.020	0.77	0.48	0.48	ProbablisticGoverns
0.030	0.86	0.52	0.52	ProbablisticGoverns
0.050	1.03	0.64	0.64	ProbablisticGoverns
0.075	1.25	0.85	0.85	ProbablisticGoverns
0.100	1.47	1.00	1.00	ProbablisticGoverns
0.150	1.50	1.17	1.17	ProbablisticGoverns
0.200	1.50	1.17	1.17	ProbablisticGoverns
0.250	1.50	1.05	1.05	ProbablisticGoverns
0.300	1.50	0.95	0.95	ProbablisticGoverns
0.400	1.50	0.81	0.81	ProbablisticGoverns
0.750	1.04	0.47	0.47	ProbablisticGoverns
1.000	0.78	0.36	0.36	ProbablisticGoverns
1.500	0.52	0.25	0.25	ProbablisticGoverns
2.000	0.39	0.18	0.18	ProbablisticGoverns
3.000	0.26	0.11	0.11	ProbablisticGoverns
4.000	0.20	0.08	0.08	ProbablisticGoverns
5.000	0.16	0.07	0.07	ProbablisticGoverns
7.500	0.10	0.04	0.04	ProbablisticGoverns
10.000	0.04	0.02	0.02	ProbablisticGoverns



DESIGN SPECTRUM per Section 21.3

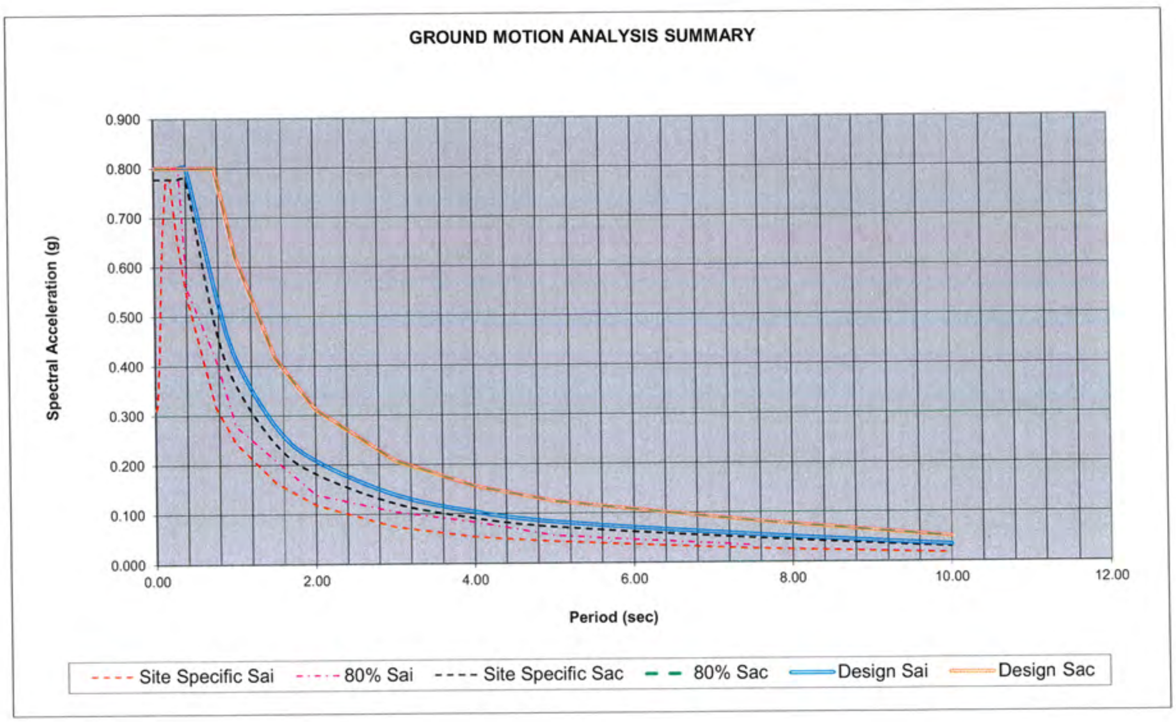
SITE SPECIFIC DESIGN ACCELERATION PARAMETERS per Section 21.4 ASCE-7

Highest value of S_a for any period exceeding 0.2 sec.=	0.777
90%of Highest Value =	0.700
2 X Sa @ T= 2 sec.=	0.237

S_{DS}=	0.777
S_{D1}=	0.243
PGA=	0.31

S_{MS}=	1.166
S_{M1}=	0.364

Period T	Site Specific S_{ai}	Site Specific S_{ac}	80% General Design S_{ai}	80% General Design S_{ac}	Design Impulsive Sa	Design Convective Sa
0.00	0.311		0.80		0.800	
0.010	0.313	0.777	0.80	0.800	0.800	0.800
0.020	0.320	0.777	0.80	0.800	0.800	0.800
0.030	0.346	0.777	0.80	0.800	0.800	0.800
0.050	0.428	0.777	0.80	0.800	0.800	0.800
0.075	0.565	0.777	0.80	0.800	0.800	0.800
0.100	0.666	0.777	0.80	0.800	0.800	0.800
0.150	0.779	0.777	0.80	0.800	0.800	0.800
0.200	0.777	0.777	0.80	0.800	0.800	0.800
0.250	0.697	0.777	0.80	0.800	0.800	0.800
0.300	0.636	0.777	0.80	0.800	0.800	0.800
0.400	0.537	0.777	0.80	0.800	0.800	0.800
0.750	0.317	0.485	0.55	0.800	0.555	0.800
1.000	0.243	0.364	0.42	0.624	0.416	0.624
1.500	0.163	0.243	0.28	0.416	0.277	0.416
2.000	0.119	0.182	0.21	0.312	0.208	0.312
3.000	0.074	0.121	0.14	0.208	0.139	0.208
4.000	0.053	0.091	0.10	0.156	0.104	0.156
5.000	0.044	0.073	0.08	0.125	0.083	0.125
7.500	0.027	0.049	0.06	0.083	0.055	0.083
10.000	0.017	0.029	0.03	0.050	0.033	0.050



Tank Mixing System
Evaluation for EMWD Longview Tank

Mixing System	Budget Estimate	Power Requirements	Advantages	Disadvantages
PAX - Model PWM-400	$32,800	1/3 HP	District Experience CFD Modeling Performance	None
Vortex Mixer	$50,000	5 HP	CFD Modeling Performance	Not specifically NSF 61 approved, higher energy demand
RMS	$20,000	1 HP	Severn Trent Experience	Higher energy demand
Solar Bee GS-12 (2)	$26,000	48V	Cost	Large equipment to handle inside tank
Tank Shark	$40,000	1 HP	None	No CFD Modeling presented
Tideflex	Budget not provided	NA	Passive - no significant energy consumed	Works better with pipeline along bottom of tank, no mixing action unless tank is actively filling or draining at higher capcities

APPENDIX J
SOIL CORROSIVITY REPORT

April 7, 2017

Marc Weinberger, P.E, BCEE
Kleinfelder
550 West C Street, Suite 1200
San Diego, CA 92101

SUBJECT: PETTIT WATER STORAGE TANK EXPANSION AND TRANSIMISSION PIPELINE SOIL CORROSIVITY ASSESSMENT

RFYeager Engineering Project No.: 15178

Dear Marc:

RFYeager Engineering has conducted a soil corrosivity assessment for the Eastern Municipal Water District's (District) Pettit Water Storage Tank Expansion and Transmission Pipeline Project (Project) located in Moreno Valley, California. Kleinfelder contracted RFYeager Engineering to conduct a soil corrosivity assessment at the Project tank site and transmission pipeline alignment to determine the relative corrosivity of the soils and to assess the potential for premature corrosion on buried metallic piping. It is our understanding that the preliminary materials of construction for the buried metallic piping associated with the Project is cement mortar lined and coated (CML&C) steel pipe. Accordingly, the corrosion control findings and recommendations made in this corrosivity assessment letter report consider pipe material, coating options, and available corrosion control methods. These methods include electrical isolation from other utilities, pipeline continuity, and the installation of corrosion monitoring test stations.

Project Description

The new Pettit Reservoirs will be located north of Cottonwood Ave in the City of Moreno Valley. It is our understanding that the Project design includes the construction of two new aboveground potable water storage tanks, each with a capacity of 4.5 million gallons (MG). In addition to the new water storage facilities, approximately 1,500 feet of 24 inch diameter steel water transmission main and associated buried steel yard piping connecting the transmission pipeline with the proposed reservoirs will be constructed.

The proposed material for all of the new piping is cement mortar lined and coated (CML&C) steel pipe.

Scope

RFYeager Engineering conducted a soil corrosivity assessment of the Project site and pipeline alignment to determine the aggressiveness of the soil and to assess the affect it may have on the associated underground metallic structures. The soil corrosivity assessment included: a visual inspection of the project site topography; a field soil resistivity survey; a review of soil sample chemical analysis data provided by Kleinfelder; an assessment of the potential for stray current interference; and recommendations for corrosion control. The soil samples were tested for minimum soil resistivity, pH, water soluble chloride concentration, and water soluble sulfate concentration.

Conclusions, Observations, and Recommendations

The following are significant conclusions, observations, and recommendations resulting from this evaluation:

<u>Conclusions and Observations</u>

1. The in-situ field soil resistivity test data for the Project indicate that soils at the Project site should be considered as relatively non-aggressive to buried ferrous pipe (see Table 1). The readings indicate conditions ranging from “fairly corrosive” to “slightly corrosive”. All of the in-situ test readings are above 2,000 ohm-cm.

2. Geotechnical soil borings and test pits found that the Project site and pipeline alignment consist primarily of coarse grained sands with varying amounts of silts and clays, underlain by Tonalite bedrock. The subsurface excavations had a maximum depth of 31.5 feet. Groundwater was not encountered during the geotechnical investigation. These site conditions are not considered to be aggressive.

3. Three soil samples were collected from the project site and subjected to laboratory tests. The sulfate concentrations for all three soil samples are considered to be relatively low and representative of non-corrosive soil. Additionally, the pH readings of all soil samples indicate a relatively alkaline soils condition. One of the three soil samples had a chloride concentration above 300 ppm which is the level considered to be corrosive to buried steel. The remaining two soil sample chloride concentrations are relatively low and indicative of non-corrosive soil conditions.

4. RFYeager Engineering's contacted pipeline operators in the area including Southern California Gas Company (SoCal Gas). Two cathodic protection rectifiers were identified within one mile of the project site. Based upon the proximity of these rectifiers, there is a possibility that the impressed current cathodic protection systems will cause a stray current interference condition on the new Project transmission pipeline.

5. Since the soil conditions are relatively non-aggressive, dielectric coatings and cathodic protection is not recommended for the Project buried yard piping and transmission main. However, standard corrosion control measures are warranted for long-term, corrosion-free service and to preserve future corrosion control options.

Recommendations

The following recommendations apply the new steel underground piping at the Project site.

1. Provide all steel underground piping with a high quality mortar coating per AWWA C-205 standards. Cathodic protection is not recommended for these new structures.

2. Electrically isolate the new buried piping from other pipelines at the tie-in points. This will require the use of flange isolation kits if the new piping is to tie into existing metallic pipelines. All buried flange isolation kits shall have a 4-wire test station and be wax tape coated. Note that no insulators are required at tie-in points to non-metallic piping.

3. Provide all steel air/vac and blow-off piping with the same coating system as the new pipeline. This piping must be fully continuous along its length and fully continuous with the pipeline. Electrically isolate copper air/vac or blow-off piping from the main pipeline with insulating bushings, insulated couplings, etc. Do not wrap copper tubing. Protect buried copper piping by fully encasing them in a clean sand backfill.

4. Provide corrosion monitoring test stations, joint bonds (for inline valves, flanges, couplings, adapters, etc.), pipe joint bonds (for non-welded pipe joints), insulators, and attendant wiring. The number and location of corrosion control facilities shall be provided during the design phase of the project.

5. Provide full time inspection for field-applied coatings at all pipe joints, for insulating flange kit installations, and for coatings on all in-line appurtenances.

1. Provide all non-coated buried valves, flanges, couplings, adapters, and bare sections of pipe with a 3-part wax tape coating system per AWWA C-217. Additionally, all buried insulating flanges shall be wax tape coated. <u>No bare metallic surfaces shall be in direct contact with the soil.</u>

2. Electrically isolate any electrical grounding systems such as motorized valves, electrical flow meters, and telemetry units from buried steel piping.

3. The initial potential survey should include testing to determine the level of DC interference (if any) on the new pipeline due to the nearby foreign rectifiers

4. The corrosion monitoring system should be inspected and tested by a qualified Corrosion Engineer. The testing should include native pipe-to-soil potentials, test lead resistance measurements, insulating flange inspections, and pipeline continuity testing through all mechanical joints, valves, couplings, adapters, flanges, and non-welded pipe joints. All test data should be provided to the owner before the project is considered complete.

Discussion

<u>Corrosive Soil Criteria</u>

External corrosion of buried ferrous structures is dependent upon many factors. Some of these factors include temperature, pH, soil resistivity, soluble ion concentrations, moisture content, and the amount of free oxygen in the soil to allow for the oxidation (corrosion) reaction to occur. The combination of these factors can lead to extreme variations in corrosion attack. However, some general rules can be assumed. Soils with high moisture content, high electrical conductivity (inversely low resistivity), high acidity (low pH), and high levels of soluble ions (dissolved salts) typically will be the most corrosive to buried ferrous metals.

Chlorides are the most aggressive of common soil salts. Soils with chloride concentrations above 300 ppm (0.030%) are considered corrosive to buried or concrete embedded steel. Additionally, soils with low pH (below 5.5) and high sulfate concentrations (above 1000 ppm or 0.10%) may be considered detrimental to mortar or concrete in contact with the soil.

<u>Soil Conditions</u>

As part of the corrosivity evaluation, RFYeager Engineering reviewed the data from five test pits excavated at the Project site and five borings drilled along the proposed pipeline alignment. The excavation logs indicate that the project site has an artificial fill material that consists of mainly of coarse grained sand with varying amounts of silts and clays. The artificial fill material extends from existing grade to eight feet below along the pipeline alignment. No artificial fill was identified at the proposed tank site. Older alluvium materials were encountered at depths below the fill and throughout the tank site test pits. The alluvial soils mainly consisted of medium to very dense sands with varying amounts of silts and clays. The entire project site is underlain with Tonalite bedrock at an approximate depth of 20 feet below the ground surface. Sands and gravels tend to be less corrosive than silts and clays since sands and gravels are typically well drained and retain less soluble ions (salts). Overall, the soil conditions shown in the excavation logs are not indicative of high corrosivity.

Soil Resistivity

Soil resistivity is one common indicator in which to determine soil corrosivity. Corrosion is an electrochemical process that deteriorates a substance, or its properties, due to a reaction with its environment. In corrosive soils, the reaction of the metal to its environment is high, and metal loss occurs. Soil resistivity is not the only measure of soil corrosivity, nor is it completely sufficient, but it is a strong indicator and should be given the most weight when assessing soil corrosivity. A low soil resistivity indicates the potential for high local currents between anodic (more electropositive) and cathodic (more electronegative) areas on the metal surface, whereas high resistivity soils would reduce the potential for current flow between anodic and cathodic sites.

One method to determine in-situ soil resistivities is by using the Wenner 4-Pin Method. The Wenner 4-pin Method provides an average resistivity of a hemisphere of soil (essentially) whose diameter is approximately equal to the pin spacing. For example, the resistivity value obtained with the pins spaced at 5 feet apart is the average resistivity of a hemisphere of soil from the surface to a depth of 5 feet. By taking readings at different pin spacings (or depths), average soil resistivity conditions can be obtained within areas at, above, and below trench zones.

Soil resistivity measurements were taken at nine separate test sites at the proposed project site and alignment. The Soil Resistivity test data and the Frequency Distribution of the test data for the project site are found in Table 1 and Table 2 below:

Table 1

Pettit PW Storage Tank Expansion and Transmission PL Soil Resistivity Test Data Prepared by: RFYeager Engineering Test Date: 03.20.2017 and 03.28.2017						
Test Site		Soil Resistivity (Ohm-cm) Ave. Soil Depth (feet)				
Test No.	Location	20	15	10	5	2.5
1	Tank Site - NW Side	6358	7239	9115	14784	16038
2	Tank Site - NE Side	8081	9336	14535	24991	22597
3	Tank Site – SW Side	5132	4969	6243	8493	12017
4	Tank Site – SE Side	4673	4912	14880	8799	9910
5	Moreno Beach DR N of Cottonwood	5171	6061	8330	7114	10260
6	Moreno Beach DR at Cottonwood	6932	7066	6320	7267	6932
7	Moreno Beach DR at Bay AV NW	10188	9824	8100	5793	5056
8	Moreno Beach Drive N of Alessandro	9881	11231	10935	12448	13070
9	Moreno Beach Drive at Alessandro	2145	2442	2413	3342	3519

*See Figure 1 for test locations

Table 2

Pettit PW Storage Tank Expansion and Transmission PL Frequency Distribution of Soil Resistivity Test Data Prepared by: RFYeager Engineering Test Date: 03.20.2017 and 03.28.2017				
Resistivity Range (ohm-cm)	Corrosivity Classification	No. of readings within range	% of Total	Cumulative % of Total
0 - 1000	Very Corrosive	0	0.0	0.0
1001 - 2000	Corrosive	0	0.0	0.0
2001 - 5000	Fairly Corrosive	8	17.8	17.8
5001 - 12000	Moderately Corrosive	28	62.2	80.0
12001 - 30000	Slightly Corrosive	9	20.0	100.0
Above 30000	Negligible	0	0.0	100.0
	Total No. of Readings	45		

It can be seen from Tables 1 and 2 above that all of the soil resistivity readings are above 2,000 ohm-cm and that the majority of the readings are in the Moderately Corrosive Soil Classification.

Barnes Layer Analysis of Soil Resistivity

The field soil resistivity test data can be analyzed further by using the Barnes method for soil resistivity layer analysis. With this method, the average soil resistance for a given layer of soil can be found using the equation $R_{Layer} = \{1/\ [1/R_n - 1/R_{n-1}]\}$. For example, the average resistance of a layer of soil between 5 feet and 10 feet would be {1/ [1/ (the resistance of soil between zero and 10 feet) – 1/ (the resistance of soil between zero and 5 feet)]. The Barnes Layer Analysis of the Project Soil resistivity test data are found in Table 3 below. The frequency distribution of the Barnes Layer resistivities is listed by layer in Table 4 below.

Table 3

Pettit PW Storage Tank Expansion and Transmission PL Soil Resistivity Test Data - Barnes Layer Analysis Prepared by: RFYeager Engineering Test Date: 03.20.2017 and 03.28.2017						
	Test Site	**Soil Resistivity (Ohm-cm) Soil Layer (feet)**				
Test No.	**Location[1]**	**20 - 15**	**15 - 10**	**10 - 5**	**5 - 2.5**	**2.5 - 0**
1	Tank Site Location 1	4657	5127	6589	13711	16038
2	Tank Site Location 2	5760	5442	10247	27952	22597
3	Tank Site Location 3	5691	3529	4935	6567	12017
4	Tank Site Location 4	4077	2099	48149	7913	9910
5	Moreno Beach DR N of Cottonwood	3589	3923	10048	5445	10260
6	Moreno Beach DR at Cottonwood	6559	9254	5590	7637	6932
7	Moreno Beach DR at Bay AV NW	11461	17101	13464	6782	5056
8	Moreno Beach Drive N of Alessandro	7262	11876	9750	11882	13070
9	Moreno Beach Drive at Alessandro	1572	2501	1888	3182	3519

1- see Figure 1 for test locations

Table 4

Pettit PW Storage Tank Expansion and Transmission PL **Frequency Distribution of Barnes Layer Resistivity Test Data** Prepared by: RFYeager Engineering Test Date: 03.20.2017 and 03.28.2017				
Resistivity Range (ohm-cm)	Corrosivity Classification	No. of readings within range	% of Total	Cumulative % of Total
0 - 1000	Very Corrosive	0	0.0	0.0
1001 - 2000	Corrosive	2	4.4	4.4
2001 - 5000	Fairly Corrosive	10	22.2	26.7
5001 - 12000	Moderately Corrosive	24	53.3	80.0
12001 - 30000	Slightly Corrosive	8	17.8	97.8
Above 30000	Negligible	1	2.2	100.0
	Total No. of Readings	49		

The Barnes Layer Soil Resistivity Test Data found in Tables 3 and 4 above indicate that the corrosivity of the various layers is relatively consistent with the general resistivity data. The layer analysis frequency distribution table indicates that only two of the forty-nine (4.4%) resistivities have levels within the “Corrosive” range.

In general, the Wenner 4-pin results indicate relatively non-aggressive soil conditions. Typically, a ferrous pipeline is not considered to be at a significant risk of premature corrosion failure until the majority of the soil resistivity readings are less than 2000 ohm-cm. Based upon these test results, cathodic protection measures are not justified.

Soil Chemical Analysis

Three soil samples were taken from excavations at the Project site. The soil samples were tested for chloride concentration, sulfate concentration, pH, and soil box resistivity in the saturated condition (minimum soil box resistivity). The soil chemical analysis data for the tests conducted on each sample are shown in Table 5 below:

Table 5

Pettit PW Storage Tank Expansion and Transmission PL Soil Chemical Analysis Data[1] Prepared by: RFYeager Engineering				
Test Pit No.[1] (Depth)	**Min. Soil Box Resistivity - CalTest 643 (ohm-cm)**	**Chloride Concentration - CalTest 422 (ppm)**	**Sulfate Concentration - CalTest 417 (ppm)**	**pH CalTest 643**
TP-1 @ 2.0 ft	6,448	39	59	8.0
B-2 @ 0-5.0 ft	401	819	111	7.2
B-4 @ 0-5.0 ft	1381	90	88	7.7

1 – As identified in Kleinfelder Geotechnical report

Overall, the soil data are indicative of relatively non-aggressive soils. The majority of the soluble salt concentrations are relatively low and the pH readings indicate neutral conditions. It is noted that the resistivity of soil sample B-2 falls within the “Very Corrosive” category and the corresponding chloride concentration is above 300 ppm. While these two data points are important, they alone do not warrant the application of supplemental corrosion protection on the buried yard piping and steel transmission main (i.e. cathodic protection).

Stray Current Interference

Stray current interference may also cause premature corrosion to occur on metallic structures. Metallic structures, which are exposed to DC potential earth gradients, can pick up a significant magnitude of interference current. Cathodic protection rectifiers are one of the most common sources of DC earth gradients and stray current interference. Other sources of stray current interference include high-voltage overhead power lines, transit systems, welding shops, and other industrial and manufacturing areas.

RFYeager Engineering contacted local pipeline operators including SoCal Gas and Questar Gas. Two (2) cathodic protection rectifiers were found within one mile of the project site on Moreno Beach Blvd. The outputs of the rectifiers are shown below. Given the moderate current output level of the Questar rectifier, there is a slight risk that this foreign CP system will produce a stray current interference condition on the project steel transmission pipeline. For this reason, it is recommended that the initial potential survey of the new project pipeline include interference testing to determine the extent of influence from this rectifier.

Rectifiers Within One Mile of Pettit Water Tank Expansion and Transmission PL Prepared by RFYeager Engineering				
Owner/Operator	Rectifier ID	Voltage	Current	Location
Questar Gas	90-25	70	13.28	Located on Moreno Beach Blvd.
SoCal Gas	N/A	5.0	0.5	Located on Cottonwood Dr.

Buried Piping Corrosion Control Considerations

The proposed materials of construction for the Pettit Reservoir yard piping and transmission main is CML&C. This material is an appropriate choice based on the Project soil corrosivity conditions. Long-term, corrosion-free performance of steel piping is often achieved in low to moderately corrosive soils with the use of a high quality mortar coating and without the application of cathodic protection. The highly alkaline environment that the mortar provides at the steel surface passivates the steel such that little or no corrosion occurs.

In order to ensure that the protective levels on the buried piping are maintained, it is important that a monitoring program be implemented shortly after the Canyon Cove Reservoir project is complete. Only through routine monitoring and assessment of the data, can any changes in the soil corrosivity be identified. Pipe-to-soil potentials should be monitored just after initial installation, after six months of operation and then at one year intervals. Potential survey results should be evaluated by a qualified corrosion engineer.

Thank you for this opportunity to provide these corrosion engineering services. Please call if you have any questions.

With best regards,

Aaron M. Hazard
NACE Int'l – Cathodic Protection Technician No.19352
NACE Int'l – Certified Coating Inspector, Level III No. 24687
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Randy J. Geving, PE
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RGeving@RFyeager.com, 760.715.2358

Figure 1 – Soil Test locations

PO Box 734 or 9562 Winter Gardens Suite D151-Lakeside, California 92040 Ph:760.715.2358 Fx:619.561.0031 RGeving@RFYeager.com

APPENDIX K
TANK STRUCTURAL FREEBOARD CALCULATIONS

KLEINFELDER
Bright People. Right Solutions.
550 West C Street, Suite #1200
San Diego, CA 92101
Phone # : (619) 831-4600
Fax # : (619) 232-1039

JOB # : 2016-4763
PROJECT : Pettit Potable Water Storage Tank
DESCRIPTION : Tank Design - Footing and Sloshing Check
DATE : 04/26/17
DESIGNED : CN
CHECKED :

MECHANICALLY-ANCHORED FLAT-BOTTOM WATER TANK PROPERTIES

Design Standard: AWWA D100-11 Welded Carbon Steel Tanks for Water Storage

Material Properties

Density of Water, g_w =	0.0624	kcf
Specific Gravity, G =	1.00	
Density of Concrete, g_c =	0.144	kcf
Density of Steel, g_s =	0.490	kcf

Shell Weight

Tank Inside Diameter, D =	130.00	ft					
Height of Tank Shell, H_t =	52.15	ft	(see calcs below)				
C.G. of Tank Shell, $X_s = Y_{cg}$ =	26.08	ft					
Weight of Tank Shell, W_s =	217.42	+	0%	=	217.4	kips	

Ring #	Height (ft)	Circumference (ft)	Min Plate Thickness (in) [Based on Eqn 3-40]	PL Thickness (in)	Weight (kips)	Y_{cg} (ft)	Weight x Y_{cg} (K.ft)	F_y (ksi)	F_u (ksi)
7	7.45	408.41	-0.0981	0.2500	31.06	48.43	1504.1	34	58
6	7.45	408.41	0.0994	0.2500	31.06	40.98	1272.7	34	58
5	7.45	408.41	0.2969	0.2500	31.06	33.53	1041.3	34	58
4	7.45	408.41	0.4944	0.2500	31.06	26.08	809.9	34	58
3	7.45	408.41	0.6919	0.2500	31.06	18.63	578.5	34	58
2	7.45	408.41	0.8894	0.2500	31.06	11.18	347.1	34	58
1	7.45	408.41	1.0869	0.2500	31.06	3.73	115.7	34	58
S wall hgt =	52.15	ft		S wall wgt =	217.42	kips	5669.3 k-ft		

Roof Weight

Roof Height, h_r (knuckle + slope roof)=		2.50	ft
Roof PL thickness, t_r =		0.188	in
Equiv. roof diameter, $D_{EQ} = (D^2 + 4\ h_r^2)^{0.5}$ =		130.10	ft
Roof Tributary Width, D_{Tr} =		130.1	ft (If no interior supports set to D_{EQ})
Additional Weight for Roof Framing (DL_s) =		5.0	psf
Roof Load Acting on the Shell			
$W_{rs} = (\pi/4)\ (D_{EQ}^2 - (D_{EQ} - D_{Tr})^2)\ (t_r/12)\ g_s$ +	0% '=	102.0	kips
Total Weight of the Tank Roof			
$W_r = (\pi/4)\ D_{EQ}^2\ [\ (t_r/12)\ g_s + DL_s\ ]$ =		107.0	kips
X_r = Tank Shell hgt + h_r / 3 =		52.98	ft

Floor Weight

Plate thickness, t_b =	0.2500	in
Diameter of floor plate, D_s =	130.0	ft
$W_f = (\pi/_4)\ D_s^2\ t_s\ g_s$ =	135.5	K

Water Weight

High water depth, H =	41.00	ft
Water Vol., $V_w = (\pi/4)\ D^2\ H$ =	544202.4	ft^3
$W_T = G\ V_w\ g_w$ =	33958	K
D / H =	3.171	

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PROJECT : Pettit Potable Water Storage Tank
DESCRIPTION : Tank Design - Footing and Sloshing Check
DATE : 04/26/17
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SEISMIC EVALUATION OF GROUND-SUPPORTED MECHANICALLY-ANCHORED FLAT-BOTTOM WATER TANKS

Seismic Design and Evaluation Basis: ANSI/AWWA D100-11, Section 13 - General Design Procedure

Seismic Use Group:	III	(Types I thru III)	[Sec 13.2]
Seismic Importance Factor, I_E =	1.50		[Table 24]
Soil Site Class:	C	(Types A thru F, Default = D)	[Table 25]

MCE Spectral Response Acceleration:

At short periods, S_S =	2.070	[ASCE 7-10 MCE Maps]	Site Coefficient, F_a = 1.00	[Table 26]
At period of 1-sec, S_1 =	0.932	[ASCE 7-10 MCE Maps]	Site Coefficient, F_v = 1.30	[Table 27]
At short periods, $S_{MS} = F_aS_s$ =	2.07	[Eqn 13-5]		
At period of 1-sec, $S_{M1} = F_vS_1$ =	1.21	[Eqn 13-6]		

Design Spectral Response Acceleration:

$S_{DS} = 2/3S_{MS}$ =	1.380	[Eqn 13-7]
$S_{D1} = 2/3S_{M1}$ =	0.808	[Eqn 13-8]

Impulsive Component (5% damping)

Response Modification Factor:

R_i = 3.0 [Table 28]

Natural Period of Structure:

For general procedure, the impulsive design acceleration, A_i, is independent of T_i, the natural period of the structure. [Sec 13.2.9.2]

Design Spectral Response Acceleration for the Impulsive Component:

$S_{ai} = S_{DS}$ = 1.38 [Sec 13.2.9.2]

Impulsive Design Acceleration:

$$A_i = \frac{S_{ai} I_E}{1.4 R_i} \geq \frac{0.36 S_1 I_E}{R_i} = \quad 0.493 \text{ g}$$ [Eqn 13-17]

Effective Impulsive Weight and Centroid Height

For D/H ≥ 1.333:

$$W_i = \frac{\tanh\left(0.866\frac{D}{H}\right)}{0.866\frac{D}{H}} W_T$$ [Eqn 13-24]

$$X_i = 0.375H$$ [Eqn 13-28]

For D/H < 1.333:

$$W_i = \left[1.0 - 0.218\frac{D}{H}\right] W_T$$ [Eqn 13-25]

$$X_i = \left[0.5 - 0.094\frac{D}{H}\right] H$$ [Eqn 13-29]

D/H = 3.171
W_i = 12266 kips
X_i = 15.375 ft

Convective Component (0.5% damping)

Response Modification Factor:

R_c = 1.5 [Table 28]

First Mode Sloshing Period:

$$T_c = 2\pi\sqrt{\frac{D}{3.68 g \tanh\left(\frac{3.68H}{D}\right)}} = \quad 7.26 \text{ sec}$$ [Eqn 13-22]

Region dependent transition period for longer period ground motion:

T_L = 8 sec [Fig 19]

Design Spectral Response Acceleration for the Convective Component:

For $T_c \leq T_L$: $$S_{ac} = \frac{KS_{D1}}{T_c} \leq S_{DS}$$ [Eqn 13-12]

For $T_c > T_L$: $$S_{ac} = \frac{KT_L S_{D1}}{T_c^2}$$ [Eqn 13-13]

S_{ac} = 0.167

Damping Scaling Factor, K = 1.5 [Sec 13.2.7.3.2]

Convective Design Acceleration:

$$A_c = \frac{S_{ac} I_E}{1.4 R_c} = \quad 0.119 \text{ g}$$ [Eqn 13-18]

Effective Convective Weight and Centroid Height

$$W_c = 0.230\frac{D}{H}\tanh\left(\frac{3.67H}{D}\right) W_T = \quad 20312 \text{ kips}$$ [Eqn 13-26]

$$X_c = \left[1.0 - \frac{\cosh\left(\frac{3.67H}{D}\right) - 1}{\frac{3.67H}{D}\sinh\left(\frac{3.67H}{D}\right)}\right] H = \quad 22.5 \text{ ft}$$ [Eqn 13-30]

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DATE : 04/26/17
DESIGNED : CN
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SEISMIC EVALUATION OF GROUND-SUPPORTED MECHANICALLY-ANCHORED FLAT-BOTTOM WATER TANKS

Base Shear Evaluation

Design Shear, V_f:

$$V_f = \sqrt{\left[A_i\left(W_s + W_r + W_f + W_i\right)\right]^2 + \left[A_c W_c\right]^2} =$$ **6,722.8 kips** [Eqn 13-31]

Vertical Design Acceleration

$A_v = 0.14\ S_{DS} =$ 0.19 [Sec 13.5.4.3]

Check Sliding -- Allowable Lateral Shear

$$V_{ALLOW} = \tan 30\left[W_s + W_r + W_i + W_c\right]\left(1 - 0.4 A_v\right) =$$ 17,525.5 kips > V_f Sliding is OK [Eqn 13-57]

Design Overturning Moment at Bottom of Tank Shell

$$M_s = \sqrt{\left[A_i\left(W_s X_s + W_r H_t + W_i X_i\right)\right]^2 + \left[A_c W_c X_c\right]^2} =$$ **112,567.9 k-ft** [Eqn 13-23]

Check Sloshing / Freeboard

Convective Design Acceleration for Sloshing:

For Seismic Use Groups I or II:

For $T_c \le 4$: $A_f = \dfrac{K S_{D1} I_E}{T_c}$ [Eqn 13-53]

For $T_c > 4$: $A_f = \dfrac{4 K S_{D1} I_E}{T_c^2}$ [Eqn 13-54]

For Seismic Use Group III:

For $T_c \le T_L$: $A_f = \dfrac{K S_{D1}}{T_c}$ [Eqn 13-55]

For $T_c > T_L$: $A_f = \dfrac{K S_{D1} T_L}{T_c^2}$ [Eqn 13-56]

$A_f =$ 0.167 g

Sloshing Wave Height

$d = 0.5\ D\ A_f =$ 10.84 ft [Eqn 13-52]

Minimum Required Freeboard [Table 29]

$S_{DS} =$ 1.38 g > 0.33 g

Minimum Freeboard = 10.84 ft

Available Freeboard: 11.15 ft

(0.97)

Uplift Evaluation [Sec 13.5.4.2]

Tank Weight (shell wgt + roof trib) = $W_s + W_r =$ 324.5 kips

w_t = Tank Weight / πD = 0.794 kips / ft

Uplift = $\dfrac{1.273 M_s}{D^2} - \left(1 - 0.4 A_v\right) w_t =$ **7.75 kips/ft on Anchors**

Appendix TRIBAL
Native American Consultation

ESA

Eastern Municipal Water District
2270 Trumble Road
P.O. Box 8300
Perris, CA 92572-8300

Initiation of AB 52 Tribal Consultation

Date:	November 15, 2022
To:	Katie Croft
Tribe:	Agua Caliente Band of Cahuilla Indians
Subject:	Notification for Early Tribal Consultation
Project Name:	Pettit Water Storage Tank Expansion and Transmission Pipeline Project
Lead Agency:	Eastern Municipal Water District
Consultation Coordinator:	Helen Stratton

Introduction:

Pursuant to California Assembly Bill (AB) 52 (Public Resources Code Section 21010.3.1), the Eastern Municipal Water District (EMWD) is providing you with formal notification of the Pettit Water Storage Tank Expansion and Transmission Pipeline Project (proposed project).

Overview of the Proposed Project:

The proposed project would involve the installation of two new 4.5 million-gallon (MG) water storage tanks and demolition of an existing 2MG storage tank. The new tanks would be fed by approximately 4,000 linear feet of proposed transmission pipeline to connect to the Cactus II Feeder. The proposed project would be implemented in phases: the first phase would involve construction and operation of one 4.5 MG storage tank and associated pipeline; the second phase would involve demolition of the existing 2 MG storage tank and installation of a second 4.5 MG storage tank in its place. The proposed project would support planned development in east Moreno Valley. Please see Attachment A of the enclosed Notice of Preparation of an Environmental Impact Report (NOP) for a brief discussion of potential environmental impacts.

The proposed water storage tanks would be constructed on parcels owned by EMWD, located on the western side of Moreno Beach Drive in Moreno Valley. Appurtenant facilities would be installed just east of Moreno Beach Drive within the roadway right-of-way. The proposed pipeline would be installed within rights-of-way within Moreno Beach Drive and Alessandro Boulevard. Proposed project facilities are shown on Figure 1 in the enclosed NOP.

Consultation Request:

To request formal consultation pursuant to AB 52, please provide a written response, either electronically or by mail, to the contact person below, within 30 days of receipt of this notice.

Eastern Municipal Water District
Helen Stratton, Water Resources Specialist II
P.O. Box 8300
Perris, CA 92572-8300
Email: strattonh@emwd.org
(951) 928-3777 ext. 4525

Eastern Municipal Water District
2270 Trumble Road
P.O. Box 8300
Perris, CA 92572-8300

Initiation of AB 52 Tribal Consultation

Date:	November 15, 2022
To:	Travis Armstrong
Tribe:	Morongo Band of Mission Indians
Subject:	Notification for Early Tribal Consultation
Project Name:	Pettit Water Storage Tank Expansion and Transmission Pipeline Project
Lead Agency:	Eastern Municipal Water District
Consultation Coordinator:	Helen Stratton

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Eastern Municipal Water District
2270 Trumble Road
P.O. Box 8300
Perris, CA 92572-8300

Initiation of AB 52 Tribal Consultation

Date:	November 15, 2022
To:	Ebru Ozdil
Tribe:	Pechanga Band of Luiseńo Mission Indians
Subject:	Notification for Early Tribal Consultation
Project Name:	Pettit Water Storage Tank Expansion and Transmission Pipeline Project
Lead Agency:	Eastern Municipal Water District
Consultation Coordinator:	Helen Stratton

Introduction:

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Perris, CA 92572-8300
Email: strattonh@emwd.org
(951) 928-3777 ext. 4525

Eastern Municipal Water District
2270 Trumble Road
P.O. Box 8300
Perris, CA 92572-8300

Initiation of AB 52 Tribal Consultation

Date:	November 15, 2022
To:	Cheryl Madrigal
Tribe:	Rincon Band of Luiseńo Indians
Subject:	Notification for Early Tribal Consultation
Project Name:	Pettit Water Storage Tank Expansion and Transmission Pipeline Project
Lead Agency:	Eastern Municipal Water District
Consultation Coordinator:	Helen Stratton

Introduction:

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P.O. Box 8300
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Email: strattonh@emwd.org
(951) 928-3777 ext. 4525

Eastern Municipal Water District
2270 Trumble Road
P.O. Box 8300
Perris, CA 92572-8300

Initiation of AB 52 Tribal Consultation

Date:	November 15, 2022
To:	Jessica Mauck
Tribe:	San Manuel Band of Mission Indians
Subject:	Notification for Early Tribal Consultation
Project Name:	Pettit Water Storage Tank Expansion and Transmission Pipeline Project
Lead Agency:	Eastern Municipal Water District
Consultation Coordinator:	Helen Stratton

Introduction:

Pursuant to California Assembly Bill (AB) 52 (Public Resources Code Section 21010.3.1), the Eastern Municipal Water District (EMWD) is providing you with formal notification of the Pettit Water Storage Tank Expansion and Transmission Pipeline Project (proposed project).

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(951) 928-3777 ext. 4525

Eastern Municipal Water District
2270 Trumble Road
P.O. Box 8300
Perris, CA 92572-8300

Initiation of AB 52 Tribal Consultation

Date:	November 15, 2022
To:	Joseph Ontiveros
Tribe:	Soboba Band of Luiseño Indians
Subject:	Notification for Early Tribal Consultation
Project Name:	Pettit Water Storage Tank Expansion and Transmission Pipeline Project
Lead Agency:	Eastern Municipal Water District
Consultation Coordinator:	Helen Stratton

Introduction:

Pursuant to California Assembly Bill (AB) 52 (Public Resources Code Section 21010.3.1), the Eastern Municipal Water District (EMWD) is providing you with formal notification of the Pettit Water Storage Tank Expansion and Transmission Pipeline Project (proposed project).

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Perris, CA 92572-8300
Email: strattonh@emwd.org
(951) 928-3777 ext. 4525

NOTICE OF PREPARATION
OF AN ENVIRONMENTAL IMPACT REPORT

DATE: November 21, 2022

TO: Responsible Agencies, Trustee Agencies, Interested Parties

LEAD AGENCY: Eastern Municipal Water District

PROJECT TITLE: Pettit Water Storage Tank Expansion and Transmission Pipeline Project

PUBLIC REVIEW PERIOD: November 21, 2022 through December 21, 2022

PROJECT DESCRIPTION: This Notice of Preparation (NOP) has been prepared to notify agencies and interested parties that Eastern Municipal Water District (EMWD), as the lead agency pursuant to the California Environmental Quality Act (CEQA), is preparing an Environmental Impact Report (EIR) for the Pettit Water Storage Tank Expansion and Transmission Pipeline Project (proposed project). The proposed project would involve installation of two new 4.5 million-gallon (MG) storage tanks on the project site and demolition of an existing 2 MG storage tank. The new tanks would be fed by approximately 4,000 linear feet of proposed transmission pipeline to connect to the Cactus II Feeder. The proposed project would be implemented in phases: the first phase would involve construction and operation of one 4.5 MG storage tank and associated pipeline; the second phase would involve demolition of the existing 2 MG storage tank and installation of a second 4.5 MG storage tank in its place. The proposed project would support planned development in east Moreno Valley. A brief, initial discussion of potential environmental impacts is included in **Attachment A** to this NOP.

PROJECT LOCATION: The proposed water storage tanks would be constructed on parcels owned by EMWD located on the western side of Moreno Beach Drive in Moreno Valley. Appurtenant facilities would be installed just east of Moreno Beach Drive within the roadway right-of-way. The pipeline would be installed within rights-of-way within Moreno Beach Drive and Alessandro Boulevard. Proposed project facilities are shown on **Figure 1**.

PUBLIC REVIEW AND COMMENTS: EMWD is soliciting comments from responsible and trustee agencies as well as interested parties as to the scope and content of the environmental information to be included in the EIR. In accordance with CEQA, agencies are requested to review the project description provided in this NOP and provide comments on environmental issues related to the statutory responsibilities of the agency. The EIR will be used by EMWD when considering approval of the proposed project as well as any related discretionary approvals. All comments to the NOP are due no later than **4:00 p.m.** on **December 21, 2022**. Please send your comments to the mailing address or email address shown below. Include a return address or email address and a contact name for your agency or party with your comments.

CONTACT PERSON: Eastern Municipal Water District
2270 Trumble Road or P.O. Box 8300
Perris, CA 92572-8300
Attn: Joe Broadhead, Principal Water Resources Specialist
broadhej@emwd.org
Phone: 951-928-3777 ext. 4545

DOCUMENT AVAILABILITY: Copies of the NOP are available at EMWD's office, located at 2270 Trumble Road, Perris, CA 92570, as well as at the Moreno Valley Public Library located at 25480 Alessandro Boulevard, Moreno Valley, CA 92553. The NOP is also available online at the EMWD Web Site (https://www.emwd.org/public-notices).

SOURCE: ESA (2022)

EMWD Pettit

Figure 1
Project Location

ESA

ATTACHMENT A

Potential Environmental Impacts

The EIR will assess and disclose the reasonably foreseeable direct, indirect, and cumulative impacts that would likely result from the construction and operation of the proposed project. Potential impacts to resources listed in Appendix G of the CEQA Guidelines are summarized below. The EIR will identify mitigation measures if necessary to avoid, minimize, and offset potentially significant impacts of the project. The EIR also will evaluate alternatives to the proposed project that would avoid, minimize, and offset potentially significant impacts of the project while attempting to meet the objectives of the proposed project.

Aesthetics

Views in the project area consist mainly of residential land uses and open space with distant mountain vistas in the background. There are no officially designated California State Scenic Highways within the project area and local roadways are not considered scenic. Implementation of the proposed project would require demolition of an existing storage tank and construction and operation of two 4.5 MG storage tanks, along with an underground 4,000 linear foot transmission pipeline. The EIR will evaluate the potential for construction and operation of the proposed project to affect aesthetic resources, including potential impacts to scenic vistas and views, impacts to the visual character and public views of the project area, and potential impacts related to new light or glare sources.

Agriculture and Forestry Resources

The proposed project area includes lands primarily classified as "urban and built-up land," and land designated as "other" by the California Department of Conservation. There are no active Williamson Act Contracts, forestland, or timberland within the project area. The EIR will evaluate whether the proposed project would impact Farmland Mapping and Monitoring Program-designated farmland, or whether any agricultural or forestry land would be converted to non-agricultural or non-forestry uses.

Air Quality

Construction and operation of the proposed project could create air emissions that would result from construction equipment exhaust, ground disturbance during construction, material hauling, construction employee-commute travel, vehicle operational maintenance trips, and vehicle trips associated with any increases in employment. The EIR will estimate pollutant emissions from construction and operational activities.

Biological Resources

The proposed project could result in changes to wildlife habitat and disturbance of sensitive species during construction and operation. Site grading and introduction of new storage and transmission facilities could impact existing floral and faunal species or their habitats. The EIR will discuss local ordinances and state and federal regulations governing biological resources, and will evaluate the potential for construction and operation of the proposed project to affect special-status species, riparian habitat or sensitive natural communities, wetlands, wildlife movement corridors, plans or ordinances, and conservation plans.

Cultural Resources

The proposed project would require ground disturbing activities during construction that could unearth known or unknown archeological and historic sites, as well as human remains. Additionally, operation of project facilities could affect the integrity of historical or archaeological resources. The EIR will assess the potential effects of the proposed project on cultural resources during construction and operation.

Energy

The proposed project could require generation of energy during construction and operation of the proposed project. The EIR will evaluate energy demand from construction equipment, haul trucks, vendor trucks, and construction workers, and will assess the project's anticipated operational energy needs. The EIR will assess the potential effects of consumption of energy resources during project implementation as well as any conflicts the project may have with existing energy efficiency policies.

Geology and Soils

The proposed project is located in Riverside County, which is a seismically active region in California. The construction of new facilities could be subject to potential seismic hazards including ground shaking. In addition, construction activities could expose soils to storm water erosion. The EIR will evaluate geologic hazards in the region and in the project area, such as the potential for ground shaking, liquefaction, expansive soils, soil erosion and landslides, as well as the likelihood that the project would destroy a unique paleontological resource or unique geologic feature.

Greenhouse Gas Emissions

Implementation of the proposed project would result in the generation of greenhouse gas (GHG) emissions associated with construction and operation. The EIR will estimate construction-related emissions and long-term operational emissions, including total CO2-equivalent emissions for evaluating the effects of GHGs. The EIR will examine the project's effects on global climate change and evaluate consistency of the project with the State's GHG emissions reduction goals.

Hazards and Hazardous Materials

Excavation activities during construction of the proposed storage tanks and transmission pipeline could uncover contaminated soils or hazardous substances that pose a substantial hazard to human health or the environment. The EIR will assess the potential for the public or the environment to be affected by routine use and accidental release of hazardous materials due to project construction and operation. Additionally, the EIR will assess the potential for the project area to be located within a hazardous material site, the potential for the project to result in safety hazards associated with a nearby airport or school, interference with an emergency response plan, or exposure of people or structures to an increased wildfire risk.

Hydrology and Water Quality

Construction and operation of the proposed project could affect water quality and drainage patterns, particularly if excavation activities result in sediment or spills runoff. The EIR will identify all impacts to water quality, erosion, drainage patterns, surface runoff, groundwater resources, and flood zone impacts as a result of project implementation, and will assess the project's compliance with water quality control or sustainable groundwater management plans.

Land Use and Planning

The proposed project would construct facilities within the City of Moreno Valley in a rural residential area zoned as Residential Agriculture 2 DU/AC (RA2). The project's infrastructure would be installed within public rights-of-way or on property owned by EMWD. The EIR will evaluate the compatibility of the proposed projects with surrounding land use, and will assess whether the proposed project will divide an established community.

Mineral Resources

The proposed project would involve ground-disturbing activities that could impact the availability of known mineral resources. A majority of the project area is within Mineral Resources Zone 3, where the significance of mineral deposits is undetermined or within "Urban Areas." There are isolated areas designated as Mineral Resource Zone 2 throughout the City of Moreno Valley, which are areas underlain by mineral deposits where geologic information indicates that significant inferred resources are present. The EIR will identify if impacts to mineral resources or mineral resource recovery sites would result from implementation of the proposed project.

Noise

Implementation of the proposed project would require construction and operation of project elements that would generate noise and vibration. Construction activities that could be a significant source of noise and vibration include trucking operations and use of heavy construction equipment (e.g., graders, cranes, frontend loaders, and blasting equipment). During project operation, it is unlikely that project facilities could generate permanent sources of noise. The EIR will describe the City of Moreno Valley noise policies and ordinances, and assess potential noise and vibration impacts associated with an increase in ambient noise or vibration levels, and excessive noise generated near airports.

Population and Housing/Growth

Implementation of the proposed project would expand EMWD's potable water system and accommodate planned growth in the area. The proposed project would not build new housing or otherwise have a direct impact on population growth in the project area, nor would it require displacement of existing residents. The EIR will evaluate the potential for the proposed project to indirectly induce growth and result in secondary environmental effects associated with growth.

Public Services

Implementation of the proposed project is unlikely to affect demand for public services, or require new or expanded facilities for public service providers. The EIR will include an assessment of the project's potential to affect existing police and fire protection services, schools, parks, or other facilities during construction and operational activities.

Recreation

The EIR will identify existing recreational areas within the project area and will analyze potential effects to existing local recreational resources or the need to construct/expand additional recreational resources.

Transportation

Construction of the proposed project could affect traffic on local roadways as a result of hauling of material and equipment, road detours, and an increase in traffic hazards caused by construction activities. Additionally, the construction of the proposed transmission pipeline would occur within the established right-of-way of Moreno Beach Drive, which could impact local circulation patterns in the City of Moreno Valley. It is not anticipated that operation of the project would result in significant traffic impacts once all facilities are installed. The EIR will evaluate whether the project conflicts with applicable circulation system plans and policies, be inconsistent with regulations related to vehicle miles traveled, substantially increase geometric design-related hazards, or result in inadequate emergency access the project area.

Tribal Cultural Resources

Pursuant to AB 52, EMWD will conduct consultation with Native American Tribes who have requested to be informed of activities initiated by EMWD. There is a potential for the proposed project to affect tribal cultural resources during ground-disturbing activities associated with construction of the proposed project. The EIR will evaluate potential impacts to tribal cultural resources and incorporate the results of AB 52 consultations into the analysis.

Utilities and Service Systems

The proposed project could result in the relocation or temporary disruption of existing water, wastewater, stormwater, electricity, telecommunications, gas utilities, and solid waste facilities serving the project's local community. Existing and projected regional utility supplies, demands, and facilities will be described along with any constraints or service deficiencies in the region. The EIR will evaluate the project's potential to affect these utilities and service systems in the project area.

Wildfire

The project site is located within rural residential area in the City of Moreno Valley. The project site is located within a Local Responsibility Area and within a Very High Fire Hazard Severity Zone. During construction, equipment and on-site diesel fuel could pose a risk to wildfire with possible ignition sources such as internal combustion engines, gasoline-powered tools, and equipment that could produce a spark, fire, or flame. The use of spark-producing construction machinery within fire risk areas such as the project area could expose temporary project workers and contractors to pollutant concentrations from a wildfire or the uncontrolled spread of wildfire. The EIR will evaluate potential impacts of wildfires due to implementation of the proposed project.

Appendix WATER

Aquatic Resources Delineation Report

Draft

PETTIT WATER STORAGE TANK EXPANSION & TRANSMISSION PIPELINE PROJECT

Aquatic Resources Delineation Report

Prepared for

August 2023

Joe Broadhead
Principal Water Resource Specialist
Eastern Municipal Water District (EMWD)
2270 Trumble Road, P.O. Box 8300
Perris, CA 92572-8300
(951) 928-3777 ext. 4545

ESA

Draft

PETTIT WATER STORAGE TANK EXPANSION & TRANSMISSION PIPELINE PROJECT

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August 2023

ESA

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Pettit Water Storage Tank Expansion and Transmission Pipeline Project

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EXECUTIVE SUMMARY

At the request of the Eastern Municipal Water District (EMWD), Environmental Science Associates (ESA) conducted a site investigation for the Pettit Water Storage Tank Expansion and Transmission Pipeline Project (project) located in the City of Moreno Valley, Riverside County, California. The purpose of the site investigation was to identify and delineate potential wetlands and other waters of the U.S and State, as well as potential jurisdiction under Section 1600 et seq. of the Fish and Game Code (FGC), on the project to support any necessary permits from the regulatory agencies.

Based on the results of the aquatic resources delineation, four drainages were delineated within the 20.65-acre aquatic resources survey area (survey area). These drainages are presumed to be under the jurisdiction of the Regional Water Quality Control Board (RWQCB) and California Department of Fish and Wildlife (CDFW). Potential non-wetland waters of the State within the water tank expansion survey area total 0.056 acre (761.7 linear feet) and total 0.200 acre (2,274.7 linear feet) for the entire BSA and are also potentially jurisdictional under Section 1600 et seq. of the FGC. No waters of the U.S. were observed within the survey area.

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CHAPTER 1
Introduction

This aquatic resources delineation report was prepared in accordance with the U.S. Army Corps of Engineers' (USACE's) *1987 Wetland Delineation Manual* (Lichvar et al. 1987) *2008 Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region* (USACE 2008b), *A Field Guide to the Identification of the Ordinary High Water Mark (OHWM) in the Arid West Region of the Western United States* (Lichvar and McColley 2008) and Minimum Standards for Acceptance of Aquatic Resources Delineation Reports (USACE 2017).

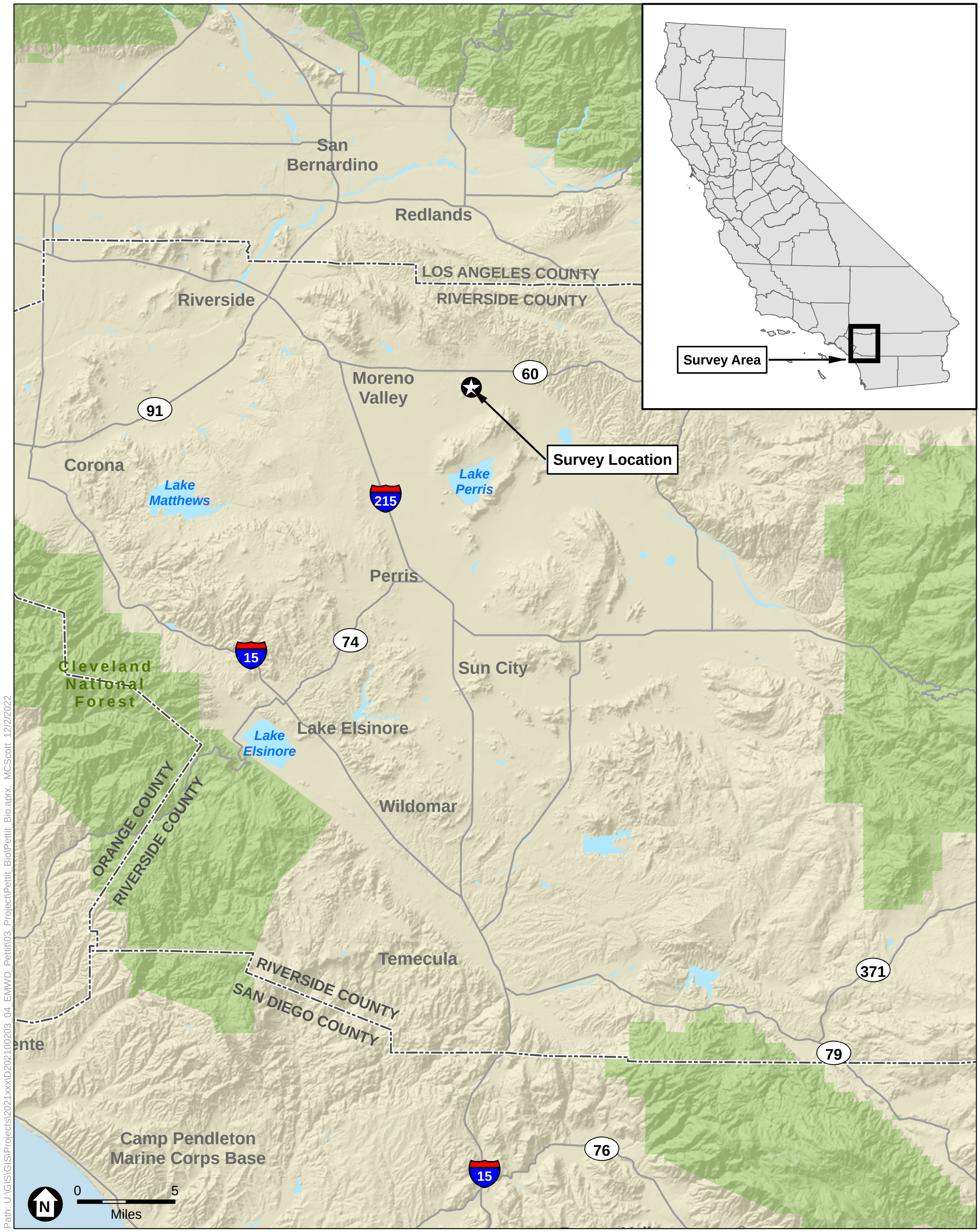
This report describes the methods and results of an aquatic resources delineation conducted by an ESA qualified delineator on November 7, 2022. The purpose of this report is to identify and describe aquatic resources in the survey area.

1.1 Survey Location

The 20.65-acre survey area for the project is located at 13325 Moreno Beach Drive in the City of Moreno Valley, Riverside County, California (**Figure 1– Regional Map).** The proposed water storage tanks would be constructed on three parcels totaling 4.37 acres owned by EMWD located on the western side of Moreno Beach Drive in Moreno Valley (APN 488-170-004; APN 477-310-011). Appurtenant facilities (such as a headwall and energy dissipater with riprap) will be installed east of Moreno Beach Drive within the right-of-way. The pipeline would be installed within the rights-of-way within Moreno Beach Drive and Alessandro Boulevard. Project facilities are shown on **Figure 2 – Project Location**. The topography of the survey area varies from rugged and sloping from west to east near the water storage tank expansion area, and relatively flat and sloping from north to south along the transmission pipeline area. The elevation ranges between approximately 1,759 to 1,595 feet above mean sea level (AMSL). The project is within Section 10, Township 3 South and Range 3 West, in the Sunnymead, California, 7.5-minute U.S. Geological Survey (USGS) quadrangle as depicted in **Figure 3 – USGS Topographic Map**.

1.1.1 Directions to the Survey Area

From the USACE Riverside Regulatory Field Office (1451 Research Park Drive, Suite 100, Riverside, CA 92507-2154), get on CA-60 E/I-215 S from Columbia Avenue and Iowa Avenue. Continue on CA-60 E for 6.5 miles. Take exit 65 for Moreno Beach Drive. Turn right onto Moreno Beach Drive for 0.9 miles, then turn right onto the project site (13325 Moreno Beach Drive, Moreno Valley, CA 92555; latitude: 33.927149°, longitude: -117.174280°).

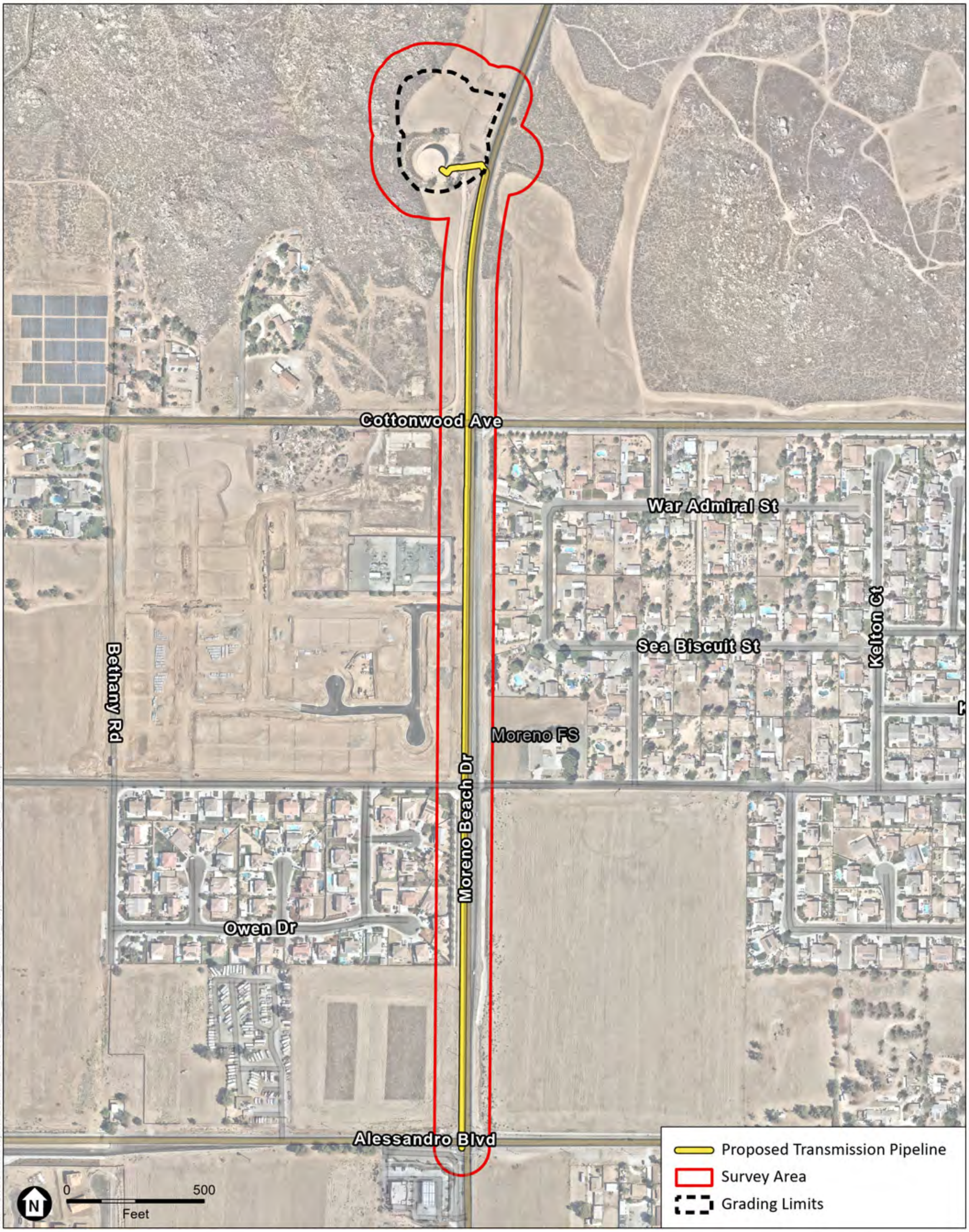


SOURCE: ESRI; ESA (2022)

Pettit Water Storage Tank Expansion and Transmission Pipeline Project

Figure 1
Regional Map

ESA

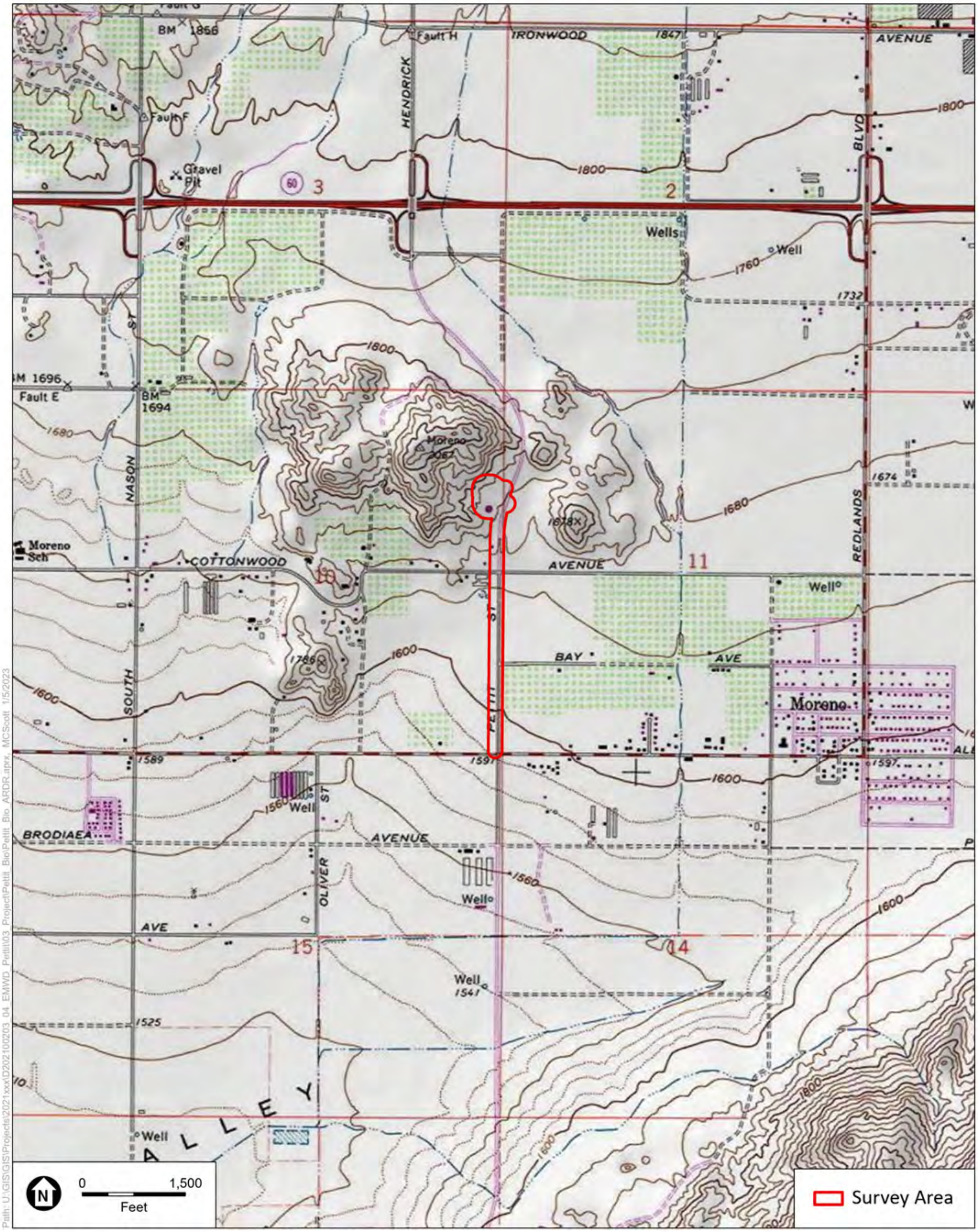


SOURCE: Mapbox (2022); ESA (2022)

Pettit Water Storage Tank Expansion and Transmission Pipeline Project

Figure 2
Project Location

ESA



SOURCE: Nearmap (2022), ESA (2022)

Pettit Water Storage Tank Expansion and Transmission Pipeline Project

Figure 3
USGS Topographic Map

ESA

1.2 Contact Information

1.2.1 Applicant

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CHAPTER 2
Existing Conditions

The project occurs within a relatively disturbed area subject to on-going and historic disturbances associated with agricultural activities, road construction, brush clearing activities, and the construction of the existing Pettit Water Storage Tank 51 years ago.

2.1 Aquatic Resources Delineation Survey Area

The 20.65-acre aquatic resources delineation survey area (survey area) encompasses the project, an approximately 4,000-linear foot proposed transmission pipeline, as well as a 100-foot buffer of the project. The project intersects two parcels: 488-170-004 and 477-310-011. The proposed transmission pipeline is located within the road right-of-way of Moreno Beach Drive. Representative photographs taken in the field during the aquatic resources delineation are provided in **Appendix A, Site Photographs** and includes a photo point figure with location and direction of each photo.

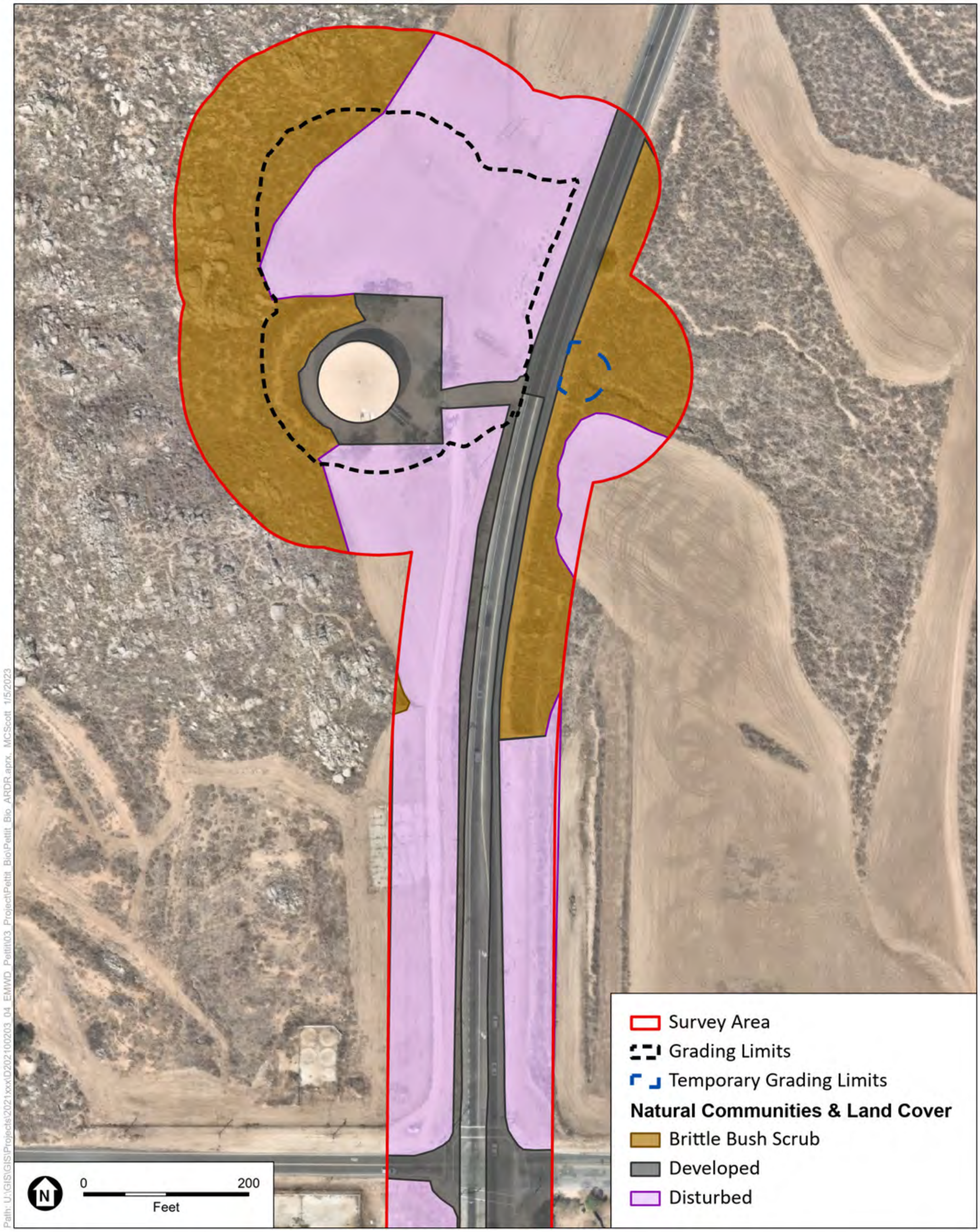
2.2 Natural Communities and Land Cover Types

The natural communities and land cover types located within the survey area were characterized and mapped during the biological resources assessment and are depicted in **Figures 4a through 4c – Natural Communities and Land Uses**. Each natural community and land cover type is described in detail below. A complete list of plant species observed during the site assessment is provided in **Appendix B – Floral Compendium**. A summary of acreages within the project and a 100-foot buffer are presented in **Table 1 – Natural Communities and Land Cover Types within the Survey Area**, below.

TABLE 1
NATURAL COMMUNITIES AND LAND COVER TYPES WITHIN THE SURVEY AREA

Natural Community/Land Cover Type[1]	Project Site (acres)	100-foot Buffer (acres)	Survey Area Total (acres)
Uplands			
Brittle bush scrub (*Encelia farinosa* Shrubland Alliance)	0.56	2.86	3.42
Developed/Disturbed Land Cover Types			
Developed	0.49	7.22	7.71
Disturbed	1.81	7.71	9.51
TOTAL	**2.85**	**17.79**	**20.65**

[1] Natural communities were characterized in the field in accordance with A Manual of California Vegetation, Online (CNPS. 2022).
SOURCE: ESA, 2022

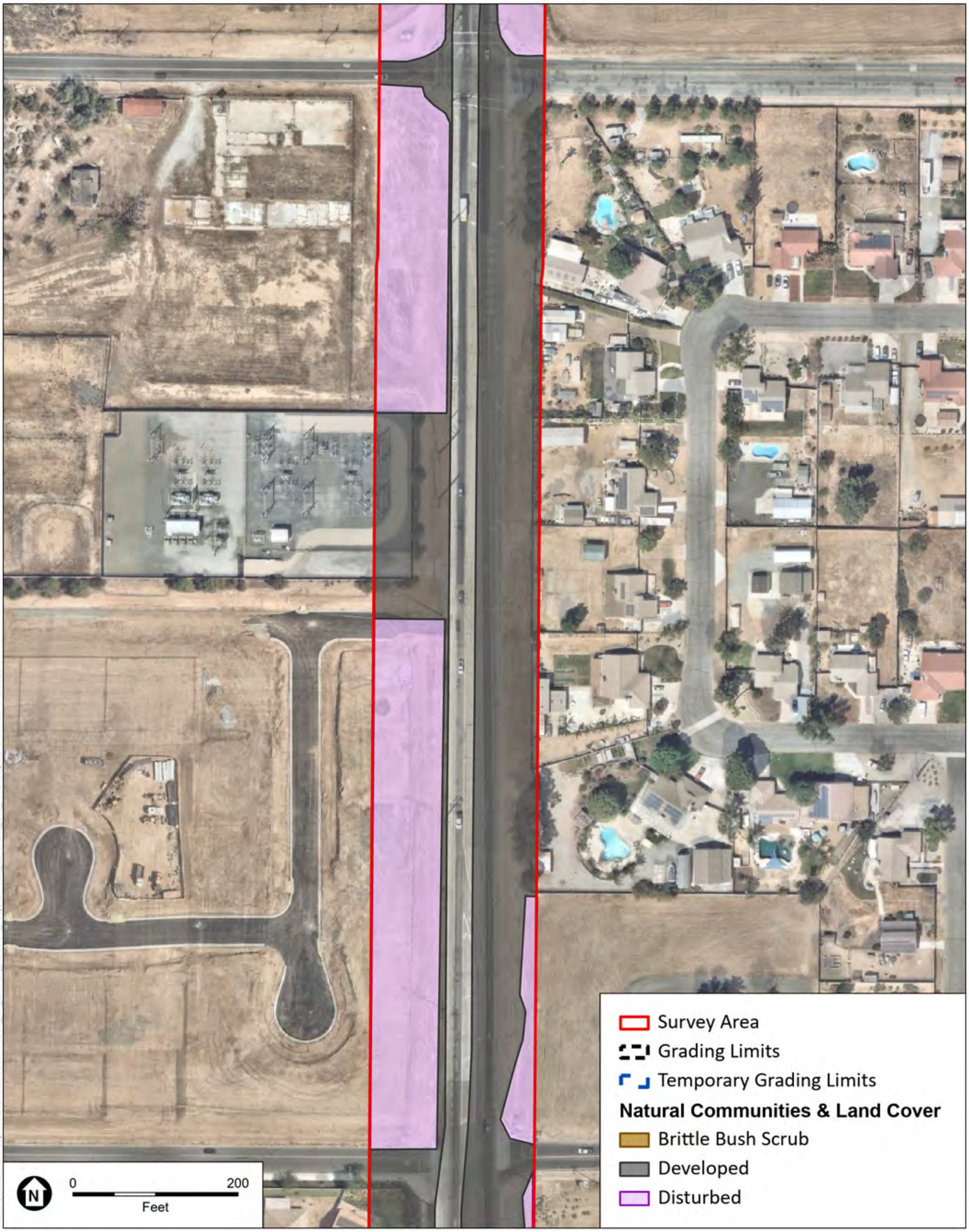


SOURCE: Nearmap (2022), ESA (2022)

Pettit Water Storage Tank Expansion and Transmission Pipeline Project

Figure 4a
Natural Communities and Land Uses

ESA

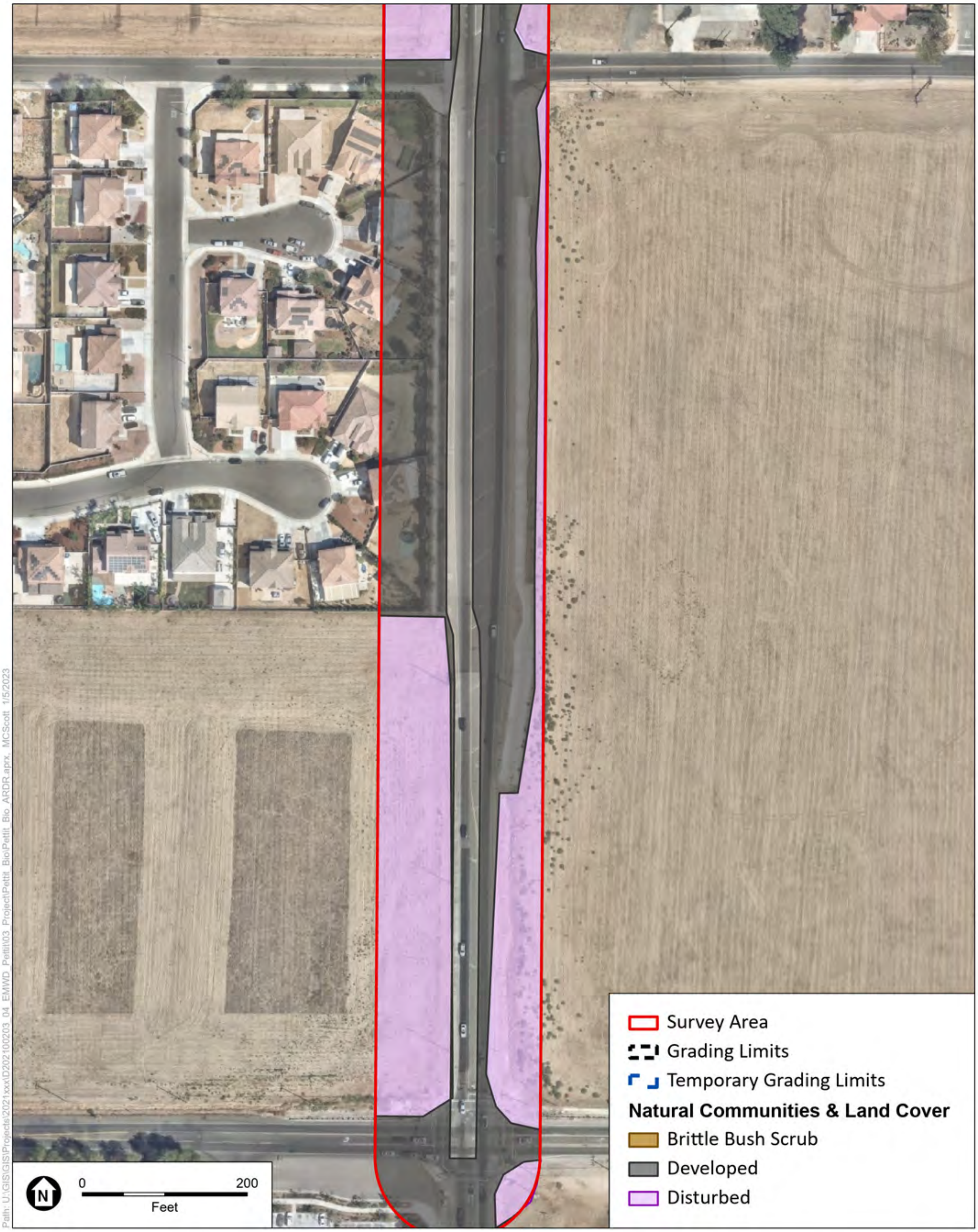


SOURCE: Nearmap (2022), ESA (2022)

Pettit Water Storage Tank Expansion and Transmission Pipeline Project

Figure 4b
Natural Communities and Land Uses

ESA



SOURCE: Nearmap (2022), ESA (2022)

Pettit Water Storage Tank Expansion and Transmission Pipeline Project

Figure 4c
Natural Communities and Land Uses

ESA

2.2.1 Brittle Bush Scrub

Brittle bush scrub (*Encelia farinosa* Shrubland Alliance) was mapped within the northern and western portion of the survey area in areas associated with the water storage tank expansion areas. This upland community is characterized by a shrub canopy dominated by brittlebush (*Encelia farinosa*), interspersed with various other native species such as orange bush monkeyflower (*Diplacus aurantiacus*), California sagebrush (*Artemisia californica*), and wishbone bush (*Mirabilis laevis* var. *crassifolius*). Brittle bush scrub typically occurs on steep, rocky sites, especially south-facing slopes.

2.2.2 Disturbed

Disturbed land use was mapped throughout the majority of the eastern and southern portions of the survey area, within the grading limits associated with the water storage tank expansion and portions of the transmission pipeline sections of the project. This community supports mostly barren soils with small amounts of non-native vegetative growth and no native species. Species include Russian thistle (*Salsola tragus*), shortpod mustard (*Hirschfeldia incana*), tumbling pigweed (*Amaranthus albus*) and red-stem filaree (*Erodium cicutarium*).

2.2.3 Developed

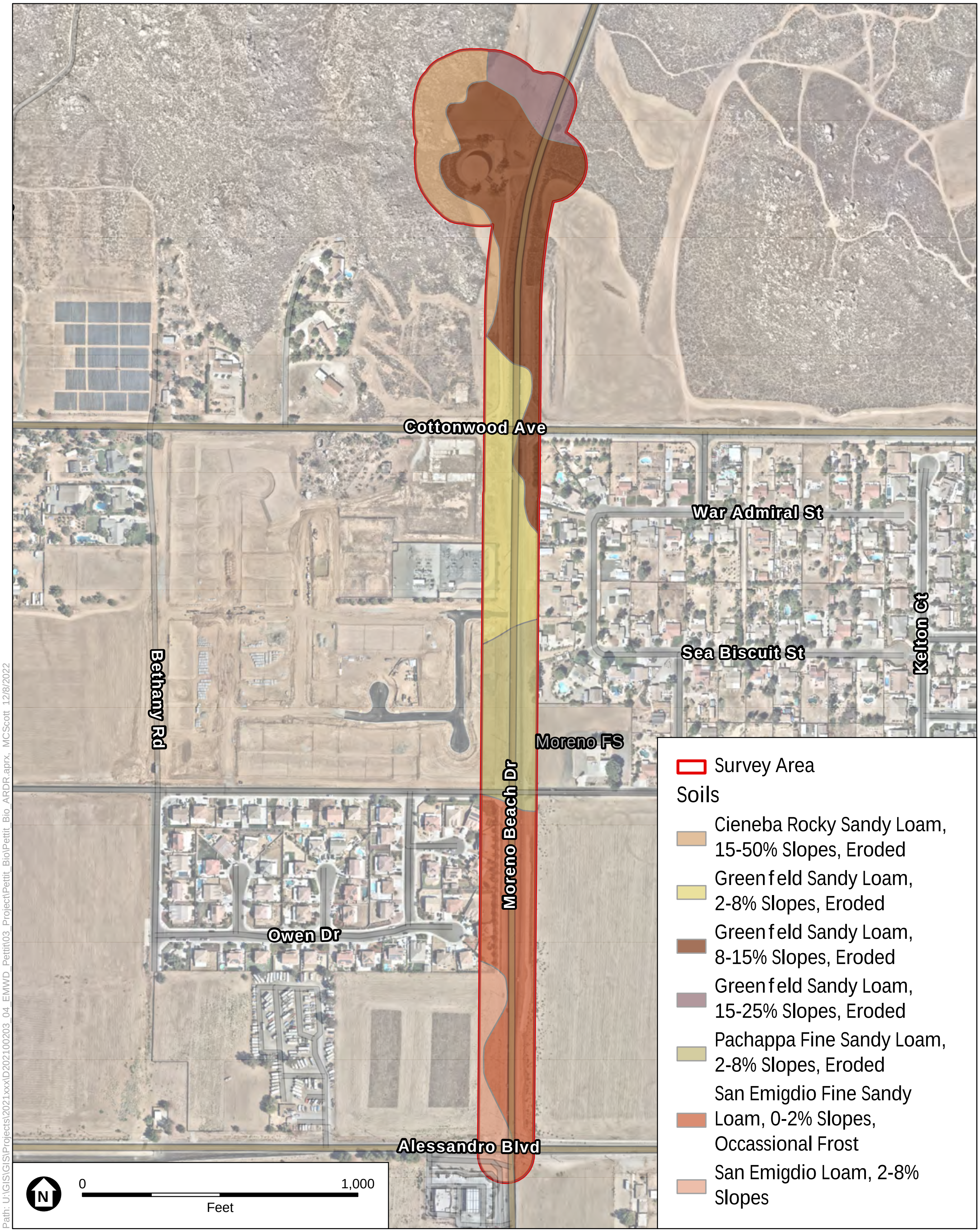
The developed areas in the survey area included Moreno Beach Drive and Alessandro Boulevard. It also includes the existing water storage tank site, and residential and commercial developments along Moreno Beach Drive. Developed land use makes up the entirety of the transmission pipeline work areas.

2.3 Soils

Topography within the survey area generally slopes in a west-east orientation, ranging between an elevation of 1,758 feet above mean sea level (amsl) and 1711 feet amsl. Topography within the transmission pipeline portion of the survey area slopes in a north-south orientation, ranging between an elevation of 1,732 amsl and 1,594 amsl. A total of seven soil types were mapped within the survey area (see **Figure 5 – Soils Map**), including Cieneba rocky sandy loam, 15 to 50 percent slopes, eroded; Greenfield sandy loam, 2 to 8 percent slopes, eroded; Greenfield sandy loam, 8 to 15 percent slopes, eroded; Greenfield sandy loam, 15 to 25 percent slopes, eroded; Panchappa fine sandy loam, 2 to 8 percent slopes, eroded; San Emigdio fine sandy loam, 0 to 2 percent slopes, occasional frost; and San Emigdio fine sandy loam, 2 to 8 percent slopes (NRCS 2022). Within the Western Riverside Area soil survey area (CA679), these soils are not considered hydric (NRCS 2022). A brief description of each soil type is provided below:

Cieneba rocky sandy loam, 15 to 50 percent slopes, eroded

This soil type was mapped in the northwest corner of the survey area. It consists of somewhat excessively drained soils consisting of residuum weathered from igneous rock. The depth to restrictive feature is approximately 14–22 inches, and the typical soil profile consists of sandy loam 0–14 inches, and weathered bedrock 14–22 inches.



SOURCE: Web Soil Survey, 2022; Nearmap (2022), ESA (2022)

Pettit Water Storage Tank Expansion and Transmission Pipeline Project

Figure 5
Soils Map

ESA

Greenfield sandy loam, 2 to 8 percent slopes, eroded

This soil type was mapped in the center of the survey area, associated with the transmission pipeline. It consists of well drained soils consisting of alluvium derived from granite. The depth to restrictive feature is more than 80 inches, and the typical soil profile consists of fine sandy loam 0–26 inches, fine sandy loam 26–43 inches, loam 43–60 inches and stratified loamy sand to sandy loam 60–72 inches.

Greenfield sandy loam, 8 to 15 percent slopes, eroded

This soil type was mapped in the northern portion of the survey area, associated with the water storage tank expansion area and transmission pipeline. It consists of well drained soils consisting of alluvium derived from granite. The depth to restrictive feature is more than 80 inches, and the typical soil profile consists of sandy loam 0–26 inches, fine sandy loam 26–43 inches, and loam 43–60.

Greenfield sandy loam, 15 to 25 percent slopes, eroded

This soil type was mapped in the northern portion of the survey area, associated with the water storage tank expansion area grading limits. It consists of well drained soils consisting of alluvium derived from granite. The depth to restrictive feature is more than 80 inches, and the typical soil profile consists of sandy loam 0–26 inches, fine sandy loam 26–43 inches, and loam 43–60.

Panchappa fine sandy loam, 2 to 8 percent slopes, eroded

This soil type was mapped in the center of the survey area, associated with the transmission pipeline. It consists of well drained soils consisting of alluvium derived from granite. The depth to restrictive feature is more than 80 inches, and the typical soil profile consists of fine sandy loam 0–20 inches, loam 20–40 inches, and fine sandy loam 40–63 inches.

San Emigdio fine sandy loam, 0 to 2 percent slopes, occasional frost

This soil type was mapped in the southern portion of the survey area, associated with the transmission pipeline. It consists of well drained soils consisting of residuum weathered from sedimentary rock. The depth to restrictive feature is more than 80 inches, and the typical soil profile consists of fine sandy loam 0–8 inches, fine sandy loam 8–40 inches, and stratified fine sandy loam to silt loam 40–60 inches.

San Emigdio fine sandy loam, 2 to 8 percent slopes

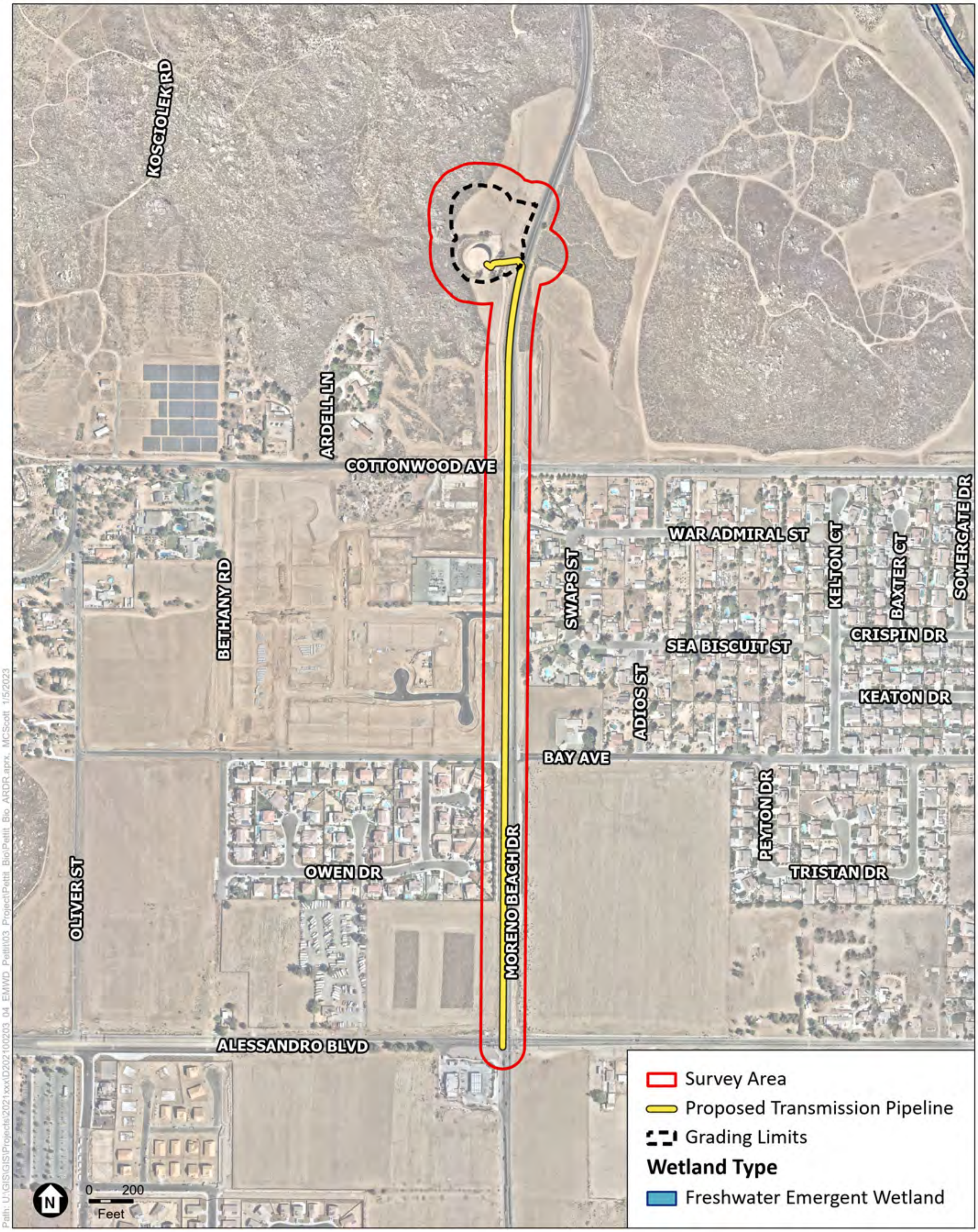
This soil type was mapped in the southwest portion of the survey area, associated with the transmission pipeline. It consists of well drained soils consisting of residuum weathered from sedimentary rock. The depth to restrictive feature is more than 80 inches, and the typical soil profile consists of loam 0–8 inches, fine sandy loam 8–40 inches, and stratified sandy loam to silt loam 40–60 inches.

2.4 Hydrology

The survey area is identified by USGS as being located within the San Jacinto watershed (USGS Hydrologic Unit Code 18070202). Overall site hydrology drains towards the east and south across the survey area. None of the drainages found within the survey area are identified in the National Wetlands Inventory (NWI) (USFWS 2022) (**Figure 6 – National Wetlands Inventory**) or National Hydrography Dataset (NHD) (USGS 2022) (**Figure 7 – National Hydrology Dataset**). Within the survey area, surface flows enter three unnamed ephemeral drainages (Drainages 1, 2, and 3) as depicted below in **Figure 8 – Aquatic Resources within the Survey Area - Waters of the State (Potentially Jurisdictional)**. Drainages 1, 2, and 3 convey flows beneath Moreno Beach Drive to the southeast. Drainages 2 and 3 converge to become Drainage 4, which conveys flows for another 650 linear feet southeast before its convergence with Drainage 1. Flows within Drainage 4 continue beyond of the survey area beneath Cottonwood Avenue, beneath War Admiral Street and emerge from another culvert beneath Sea Biscuit Street. At that point, a concrete-lined channel conveys flows into a concrete inlet structure with a 42-inch diameter reinforced concrete pipe (RCP), beyond the survey area and under Sea Biscuit Street for 800 feet to the west, where it reemerges from a culvert along the east side of Moreno Beach Drive. Flow then exits the 42-inch RCP, which then conveys flows south, parallel with Moreno Beach Drive. Flows continue south in a 6-foot-wide channel with concrete-lined bed and banks for 396 feet into an 8-foot-wide triple box culvert beneath Bay Avenue. Flows then exit the box culvert approximately 170 feet south of Bay Avenue, where Drainage 4 continues for 466 feet as a 2-foot-wide channel with an earthen bank of the eastern (left) side of the channel and concrete-lined bank on the west (right). Drainage 4 then becomes a 5-foot-wide concrete-lined channel that continues south for 237 feet, where it transitions into a 2-foot wide ungrouted riprap channel. The ungrouted riprap portion of Drainage 4 conveys flows south approximately 400 feet along the east side or Moreno Beach Drive, where it meets the intersection of Moreno Beach Drive and Alessandro Boulevard. Drainage 4 then conveys flows into two 36-inch metal corrugated culverts beneath the intersection where flows continue into Line H, as identified within the Moreno Valley Master Drainage Plan (RCFCWCD 2015), which directs flows south towards Perris Valley Channel and beyond the survey area. The Perris Valley Channel eventually converges with the San Jacinto River located 9 river miles downstream, which conveys flows into Canyon Lake, 5.8 river miles downstream. Flows continue a further 3.5 river miles downstream west towards Lake Elsinore. Stream hydrology in the survey area was determined to be ephemeral as evidenced by the absence of hydrophytic species throughout the stream courses (see Appendix B – Floral Compendium) and the absence of hydric soils within the survey area (see Section 2.3 above).

2.5 Climate

The regional vicinity is described as having a Mediterranean climate characterized by warm, dry summers and cool winters with relatively low rainfall. Average highs for the region range between 69º Fahrenheit (F) in the winter (December and January) and 100º F in the summer (July and August), while average lows range between 34º–35º F in in the winter and 58º–59º F in the summer (World Climate 2022).

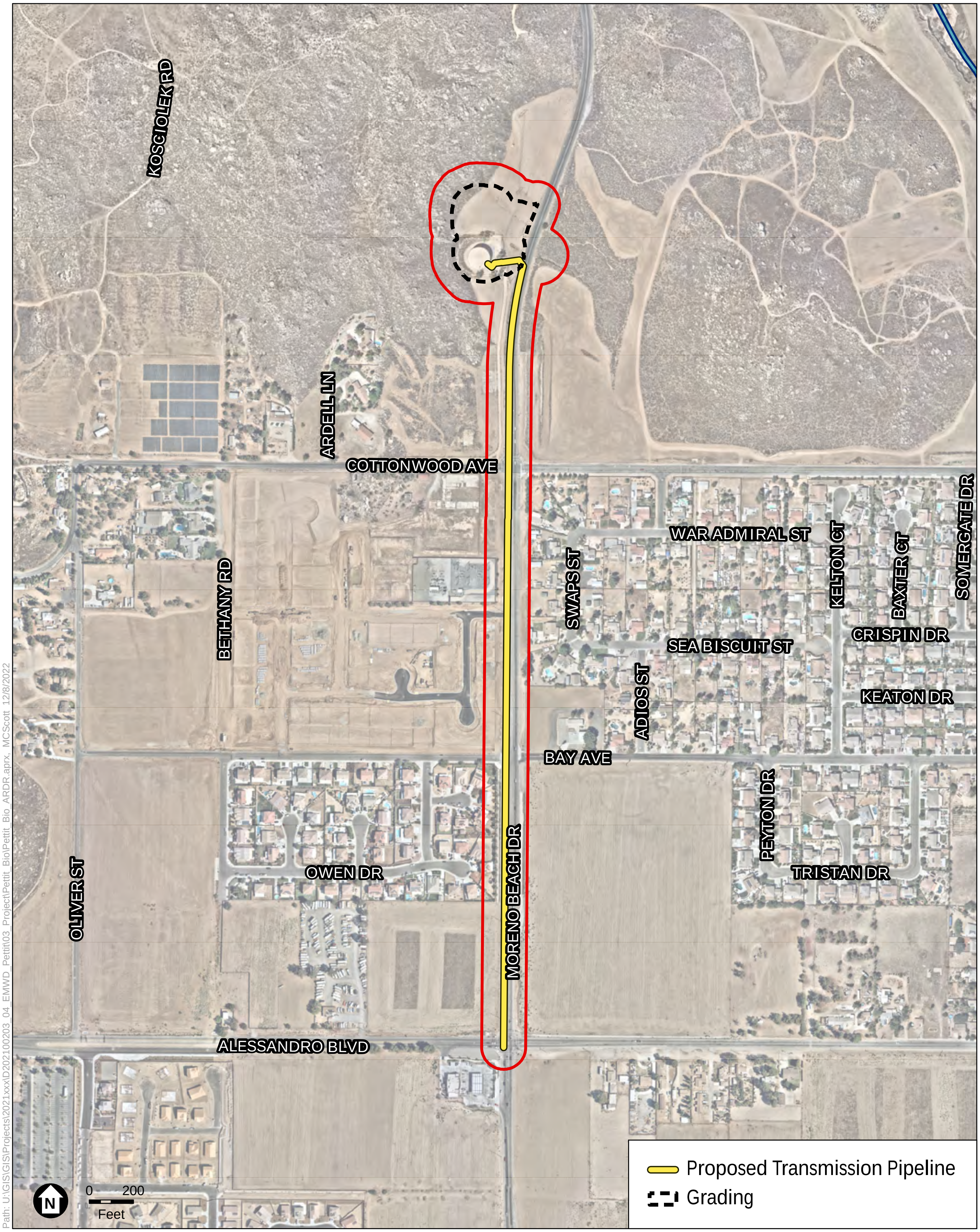


SOURCE: Nearmap (2022); NWI (2022); ESA (2022)

Pettit Water Storage Tank Expansion and Transmission Pipeline Project

Figure 6
National Wetlands Inventory

ESA

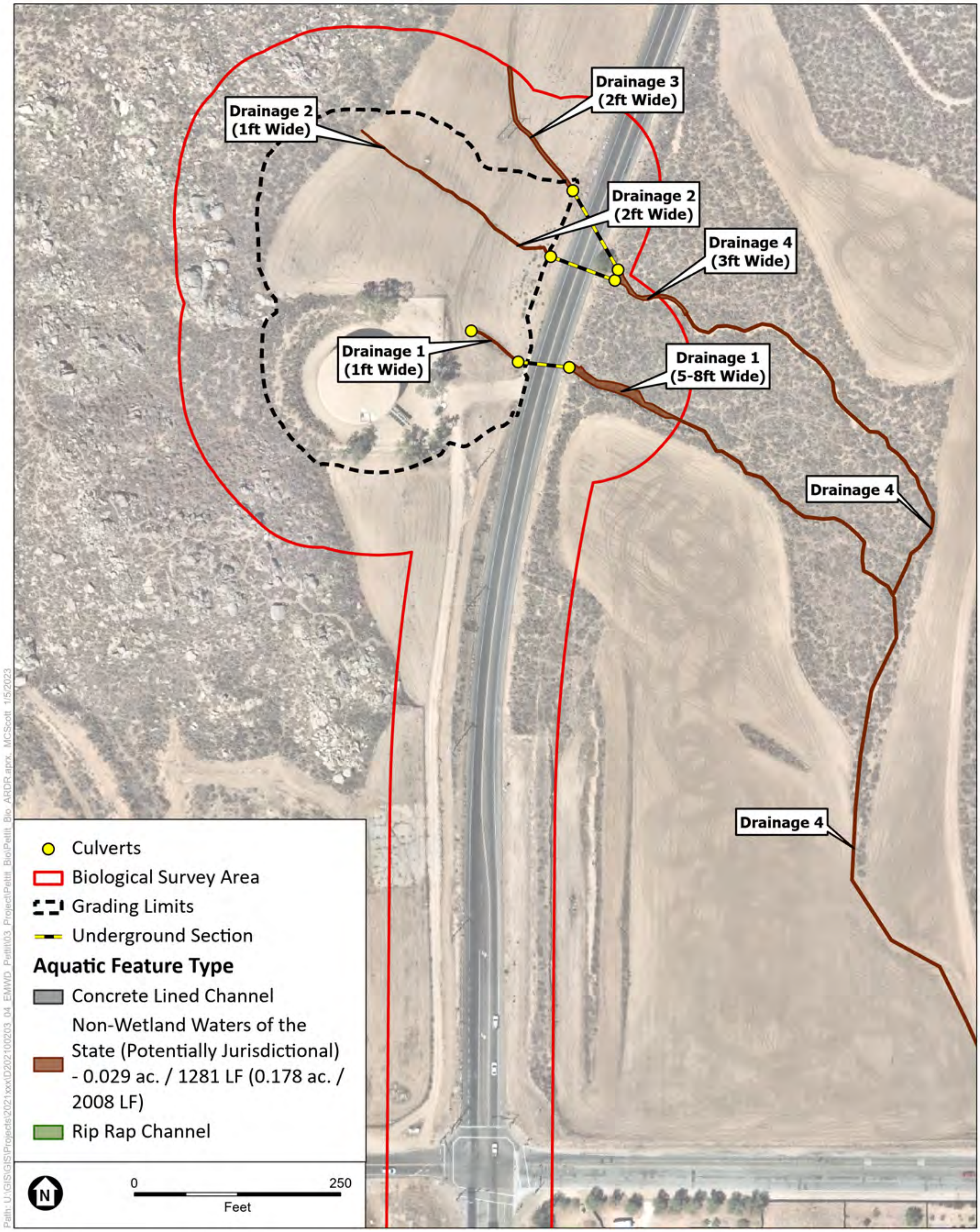


SOURCE: Nearmap (2022); NHD (2022); ESA (2022)

Pettit Water Storage Tank Expansion and Transmission Pipeline Project

Figure 7
National Hydrography Dataset

ESA

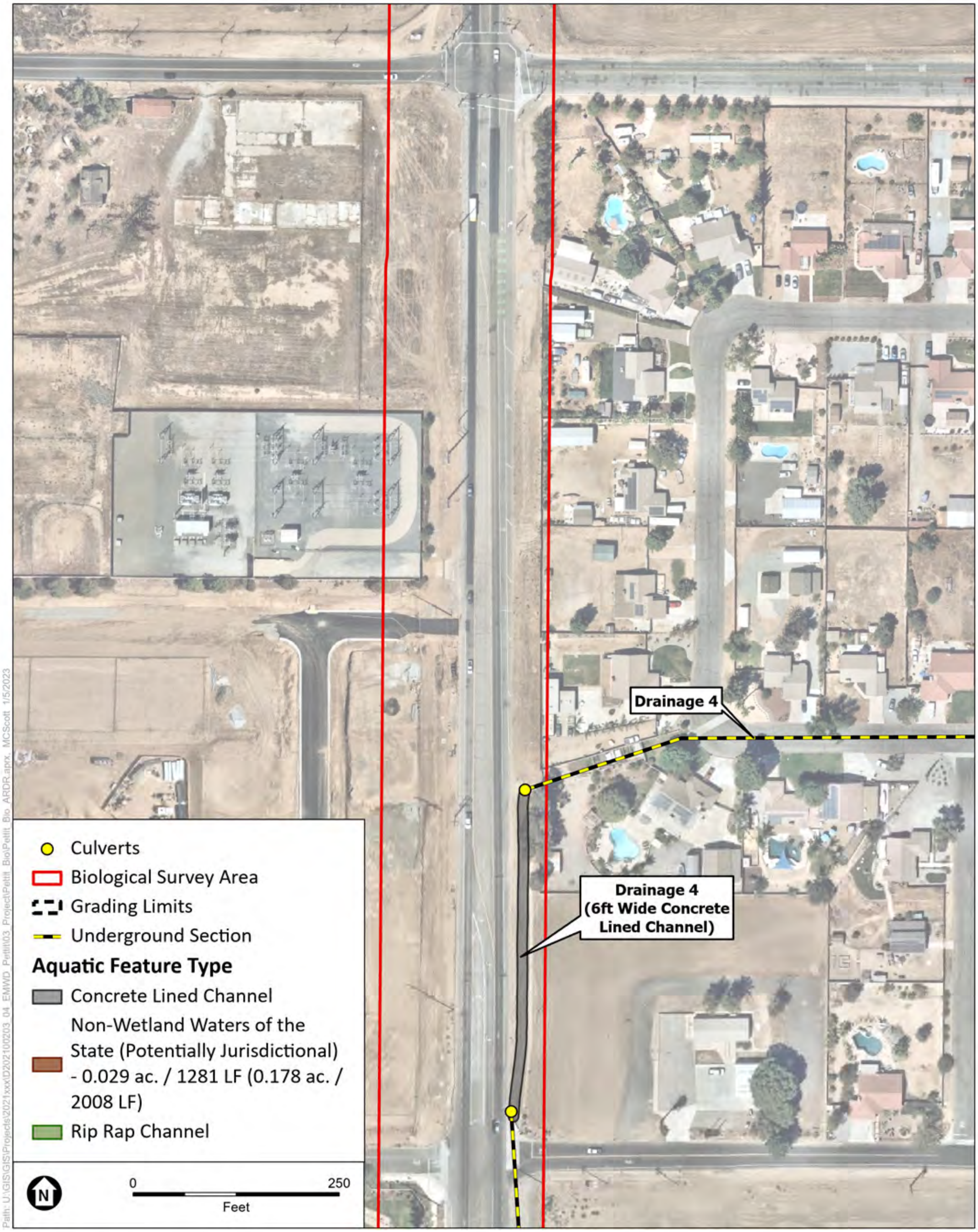


SOURCE: Nearmap (2022), ESA (2022)

Pettit Water Storage Tank Expansion and Transmission Pipeline Project

Figure 8a
Aquatic Resources within the Survey Area
- Waters of the State (Potentially Jurisdictional)

ESA

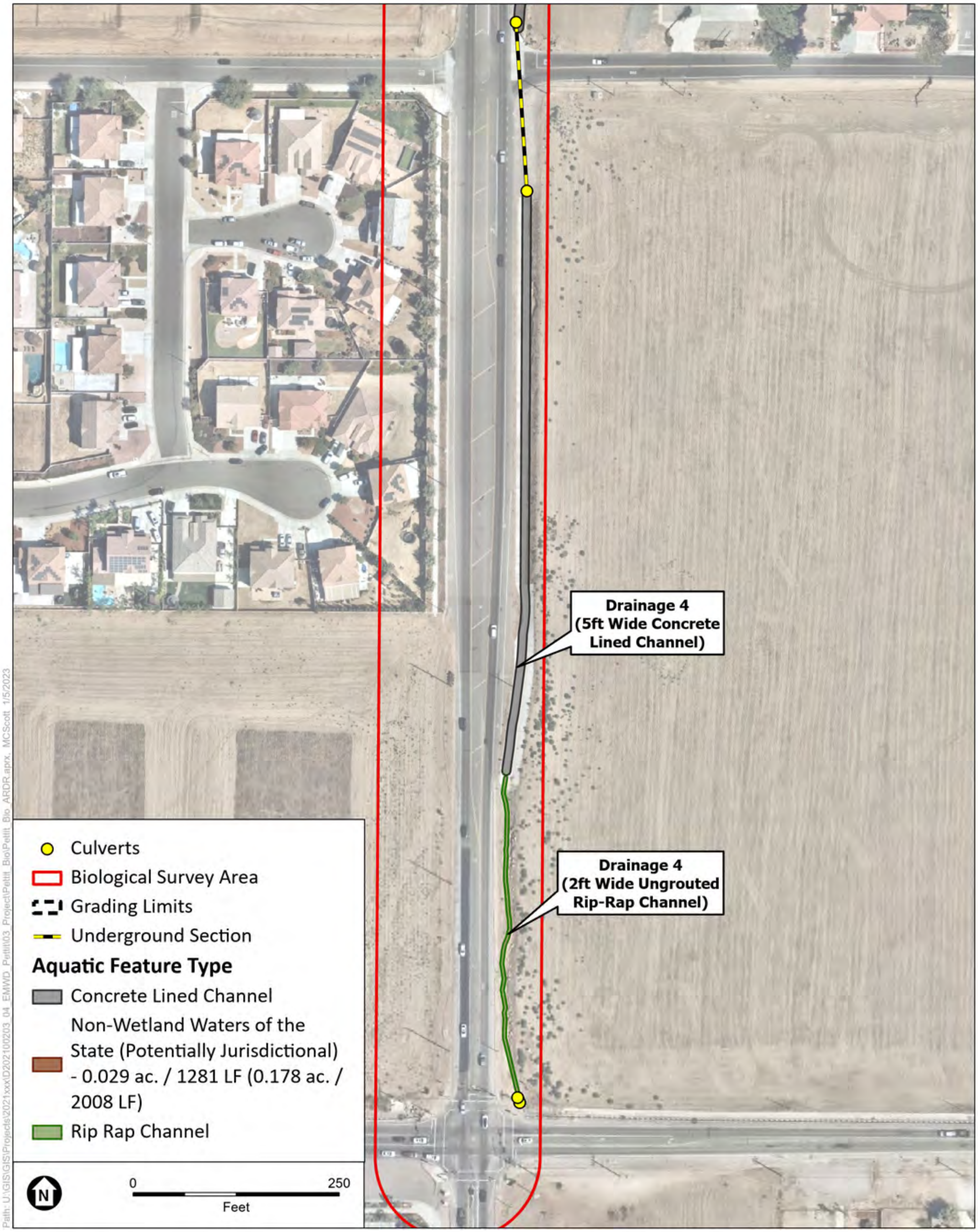


SOURCE: Nearmap (2022), ESA (2022)

Pettit Water Storage Tank Expansion and Transmission Pipeline Project

Figure 8b
Aquatic Resources within the Survey Area
- Waters of the State (Potentially Jurisdictional)

ESA



SOURCE: Nearmap (2022), ESA (2022)

Pettit Water Storage Tank Expansion and Transmission Pipeline Project

Figure 8c
Aquatic Resources within the Survey Area
- Waters of the State (Potentially Jurisdictional)

ESA

2.5.1 Agricultural Applied Climate Information System Wetlands Climate Table

The Agricultural Applied Climate Information System (AgACIS) Wetlands (WETS) climate table for March Air Force Base, California is included below in **Table 2 – Wets Table: Monthly Total Precipitation for March Air Force Base (AFB), CA,** for 2011 through 2023 (also see **Appendix C, Climatological Data**). The aquatic resources delineation for the survey area occurred on November 07, 2022, and historically (over a 10-year sampling period), the month of November has experienced 0.63 inches (in) mean rainfall levels and the preceding month of October has experienced 0.28 in mean rainfall levels (NOAA 2022). During November 2022, 1.32 inches of precipitation were recorded in the region (NOAA 2022), well above the annual mean.

TABLE 2
WETS TABLE: MONTHLY TOTAL PRECIPITATION FOR MARCH AIR FORCE BASE (AFB), CA

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2010	5.78	1.95	0.16	0.39	0.02	0	T	T	0.06	0.61	0.53	M7.70	17.2
2011	0.33	2.6	1.51	0.37	0.26	0	0.19	0.01	0.03	0.15	1.29	0.34	7.08
2012	0.31	0.46	0.95	0.79	0.01	0	0.07	2.32	0.1	0.03	0.26	1.99	7.29
2013	0.57	0.78	0.72	T	0.28	0	0.02	0.4	T	0.43	0.46	0.36	4.02
2014	T	1.19	0.68	0.49	0	0	T	0.57	0.05	T	0.18	2.91	6.07
2015	0.6	0.33	0.13	0.14	0.61	T	1.39	T	0.45	0.31	M0.05	0.3	4.31
2016	2.24	0.12	0.56	0.96	0.28	T	T	0	0.06	0.32	0.7	3.11	8.35
2017	3.78	1.91	0.01	T	0.02	T	0.01	0.59	T	T	T	T	6.32
2018	1.44	M0.23	M0.37	T	0.08	0	T	0	M0.00	M0.98	M0.82	1.25	5.17
2019	2.52	3.3	M1.96	0.23	1.08	0	T	0	T	0	2.38	2.56	14.03
2020	M0.10	0.41	4.15	3.69	T	0.05	0	0	0	T	0.15	1.08	9.63
2021	1.35	0.01	1.44	T	T	0.06	0.08	0	0.11	0.4	T	2.88	6.33
2022	0.01	0.27	0.60	0.11	T	T	0.00	0.01	0.98	0.42	1.32	1.00	4.72
Mean (2010-2022)	1.46	1.04	1.02	0.55	0.20	0.01	0.14	0.30	0.14	0.28	0.63	2.04	7.66
2023 (*current year*)	M3.15	-	-	-	-	-	-	-	-	-	-	-	-

NOTE:
1 M = missing, and is used when more than one day of data is missing for a month.
2 T = indicates a trace of precipitation.
3 Data missing for all days in a month or year is blank

SOURCE: NOAA, 2023.

Additionally, the total precipitation for the previous month of October (0.42 in) was above the historic annual mean reported for that month and September rainfall (0.98 in) was also above the historic annual mean reported for that month (0.14 in). Based on site conditions and review of the AgACIS data provided in **Table 2**, it appears conditions at the time of the delineation were wetter than normal, and conditions for the months leading up to the aquatic resources delineation (September and October) were wetter than normal. Light precipitation was occurring throughout the survey conducted in November 2022.

The Antecedent Precipitation Tool (APT; Version 1.0.20) was also used to evaluate climatic conditions at the survey area. The APT Watershed Sampling Summary provided in Appendix C summarizes precipitation and climatic data for the survey area for the 3 months prior to the delineation field work start date of November 07, 2022, and are included in **Table 3**, below. These data show the survey area exhibited precipitation and climate within the normal range of conditions. The Antecedent Precipitation Score (derived from the Antecedent Condition Calculation of the three prior months) of 14 indicates that climatic conditions were normal despite the corresponding drought index (PDSI) indication of extreme drought. In contrast, rainfall in the 30-day period ending on September 9 was within the normal precipitation amount for September but wet for the 30-day period ending on October 8, according to the APT results (Appendix C).

TABLE 3
ANTECEDENT PRECIPITATION TOOL RESULTS FOR PROJECT SITE ON NOVEMBER 07, 2022

No. of Sampling Points	PDSI Class	Season	Antecedent Precipitation Score	Antecedent Precipitation Condition
1	Extreme Drought	Dry Season	14	Normal

SOURCE: Antecedent Precipitation Tool (v.1.0.19), generated on 12/01/2022 for 33.927534, -117.174554

CHAPTER 3
Regulatory Framework

3.1 Waters of the U.S.

3.1.1 Clean Water Act

The Clean Water Act (CWA) establishes the basic structure for regulating discharges of pollutants into the waters of the United States and regulating quality standards for surface waters. The basis of the CWA was enacted in 1948 and was called the Federal Water Pollution Control Act, but the Act was significantly reorganized and expanded in 1972. “Clean Water Act” became the Act's common name with amendments in 1972.

In 1986, the term “waters of the United States” was defined as follows (33 CFR 328.3[a]):

> *(1) All waters which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide;*
>
> *(2) All interstate waters including interstate wetlands;*
>
> *(3) All other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the use, degradation or destruction of which could affect interstate or foreign commerce including any such waters:*
>
> > *(i) Which are or could be used by interstate or foreign travelers for recreational or other purposes; or*
> >
> > *(ii) From which fish or shellfish are or could be taken and sold in interstate or foreign commerce; or*
> >
> > *(iii) Which are used or could be used for industrial purpose by industries in interstate commerce;*
>
> *(4) All impoundments of waters otherwise defined as waters of the United States under the definition;*
>
> *(5) Tributaries of waters identified in paragraphs (a)(1) through (4) of this section;*
>
> *(6) The territorial seas; and*

> (7) *Wetlands adjacent to waters (other than waters that are themselves wetlands) identified in paragraphs (a)(1) through (6) of this section.*
>
> (8) *Waters of the United States do not include prior converted cropland. Notwithstanding the determination of an area's status as prior converted cropland by any other Federal agency, for the purposes of the Clean Water Act, the final authority regarding Clean Water Act jurisdiction remains with EPA.*

Waste treatment systems, including treatment ponds or lagoons designed to meet the requirements of CWA (other than cooling ponds as defined in 40 CFR 423.11(m) which also meet the criteria of this definition) are not waters of the United States

Wetlands (including swamps, bogs, seasonal wetlands, seeps, marshes, and similar areas) are also considered waters of the U.S. (subject to the significant nexus test), and are defined by USACE as "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions" (33 CFR 328.3[b]; 40 CFR 230.3[t]). Indicators of three wetland parameters (i.e., hydric soils, hydrophytic vegetation, and wetlands hydrology), as determined by field investigation, must be present for a site to be classified as a wetland by USACE (Environmental Laboratory 1987).

Section 401 of the CWA gives the state authority to grant, deny, or waive certification of proposed federally licensed or permitted activities resulting in discharge to waters of the U.S. The State Water Resources Control Board (State Water Board) directly regulates multi-regional projects and supports the Section 401 certification and wetlands program statewide. The Regional Water Quality Control Board (RWQCB) regulates activities pursuant to Section 401(a)(1) of the federal CWA, which specifies that certification from the State is required for any applicant requesting a federal license or permit to conduct any activity including but not limited to the construction or operation of facilities that may result in any discharge into navigable waters. The certification shall originate from the State or appropriate interstate water pollution control agency in/where the discharge originates or will originate. Any such discharge will comply with the applicable provisions of Sections 301, 302, 303, 306, and 307 of the CWA.

3.1.1.1 Rapanos v. United States & Carabell v. United States

The USACE and the Environmental Protection Agency (EPA) have issued a set of guidance documents detailing the process for determining CWA jurisdiction (waters of the U.S.) following the 2008 Rapanos decision. The EPA and USACE issued a summary memorandum of the guidance for implementing the Supreme Court's decision in Rapanos that addresses the jurisdiction over waters of the U.S. under the CWA. The complete set of guidance documents, summarized as key points below, were used to collect relevant data for evaluation by the EPA and the USACE to determine CWA jurisdiction over the project and to complete the "significant nexus test" as detailed in the guidelines.

Summary of Key Points

The agencies will assert jurisdiction over the following waters:

- Traditional navigable waters
- Wetlands adjacent to traditional navigable waters
- Non-navigable tributaries of traditional navigable waters that are relatively permanent where the tributaries typically flow year-round or have continuous flow at least seasonally (e.g., typically three months)
- Wetlands that directly abut such tributaries

The agencies will decide jurisdiction over the following waters based on a fact-specific analysis to determine whether they have a significant nexus with a traditional navigable water:

- Non-navigable tributaries that are not relatively permanent
- Wetlands adjacent to non-navigable tributaries that are not relatively permanent
- Wetlands adjacent to but that do not directly abut a relatively permanent nonnavigable tributary

The agencies generally will not assert jurisdiction over the following features:

- Swales or erosional features (e.g., gullies, small washes characterized by low volume, infrequent, or short duration flow)
- Ditches (including roadside ditches) excavated wholly in and draining only uplands and that do not carry a relatively permanent flow of water

The agencies will apply the significant nexus standard as follows:

- A significant nexus analysis will assess the flow characteristics and functions of the tributary itself and the functions performed by all wetlands adjacent to the tributary to determine if they significantly affect the chemical, physical and biological integrity of downstream traditional navigable waters
- Significant nexus includes consideration of hydrologic and ecologic factors

The significant nexus test includes consideration of hydrologic and ecologic factors. For circumstances such as those described in the Rapanos Guidance Key Points Summary below, the significant nexus test would take into account physical indicators of flow (evidence of an OHWM), if a hydrologic connection to a Traditionally Navigable Water (TNW) exists, and if the aquatic functions of the water body have a significant effect (more than speculative or insubstantial) on the chemical, physical, and biological integrity of a TNW. The USACE and EPA will apply the significant nexus standard to assess the flow characteristics and functions of a potential water of the U.S. to determine if it significantly affects the chemical, physical, and biological integrity of the downstream TNW.

3.2 Waters of the State

Most projects involving water bodies or drainages are regulated by the RWQCB, the principal State agency overseeing water quality of the State at the local/regional level. The survey area is located within the jurisdiction of the Santa Ana RWQCB (Region 8). Where waters of the State overlap with waters of the U.S., pending verification from the USACE, those waters would be regulated under Section 401 of the CWA, which is described in Chapter 3, Regulatory Framework in Section 3.1.

In the absence of waters of the U.S., waters may be regulated under the Porter-Cologne Water Quality Control Act if project activities, discharges, or proposed activities or discharges could affect California's surface, coastal, or ground waters. The permit submitted by the applicant and issued by RWQCB is either a Water Quality Certification in the presence of waters of the U.S. or a Waste Discharge Requirement (WDR) in the absence of waters of the U.S.

The State Wetland Definition and Procedures for Discharges of Dredged or Fill Material to Waters of the State (procedures), as prepared by the State Water Resources Control Board, was implemented on May 28, 2020. The procedures include a definition for wetland waters of the state that include (1) all wetland waters of the U.S.; and (2) aquatic resources that meet both the soils and hydrology criteria for wetland waters of the U.S. but lack vegetation.[1]

3.3 Rivers, Streams, and Lakes

Pursuant to Division 2, Chapter 6, Section 1600 et seq. of the FGC, California Department of Fish and Wildlife (CDFW) regulates all diversions, obstructions, or changes to the natural flow or bed, channel or bank of any river, stream, or lake which supports fish or wildlife. A notification of a Lake or Streambed Alteration Agreement must be submitted to CDFW for "any activity that may substantially change the bed, channel, or bank of any river, stream, or lake." In addition, CDFW has authority under FGC over wetland and riparian habitats associated with lakes and streams. The CDFW reviews proposed actions, and if necessary, submits to the applicant a proposal that includes measures to protect affected fish and wildlife resources. The final proposal that is mutually agreed upon by CDFW and the applicant is the Lake or Streambed Alteration Agreement (LSAA).

3.4 Local Aquatic Resource Regulations/Policies

Pursuant to Western Riverside County Multiple Species Habitat Conservation Plan (MSHCP) Section 6.1.2, Protection of Species Associated with Riparian/Riverine Areas and Vernal Pools, the potential effect of proposed project activities occurring within the MSHCP must be assessed regarding any and all impacts to riparian/riverine areas. Riparian/riverine areas include "those that contain habitat dominated by trees, shrubs, persistent emergent plants, or emergent mosses and lichens, which occur close to or depend upon soil moisture from a nearby water source; or areas with fresh water flow during all or a portion of the year" (Dudek 2003). However, as EMWD is not signatory to the MSHCP, MSHCP jurisdiction is not discussed further.

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1 Less than 5 percent areal coverage at the peak of the growing season.

CHAPTER 4
Methodology

4.1 Pre-Field Review

Prior to completing the aquatic resources delineation, ESA conducted a review of available background information pertaining to the survey area. The following resources were reviewed:

- United States Department of Agriculture Natural Resources Conservation Service (NRCS) Web Soil Survey (NRCS 2022)
- USGS 7.5-minute topographic quadrangle map: Sunnymead (USGS 2018)
- Current aerial imagery (Google Earth 2022)
- Precipitation data from the Applied Climate Information System (NOAA 2022)
- The National Wetlands Inventory (NWI) (USFWS 2022)
- National Hydrography Dataset (NHD) (USGS 2022)

The results of the NWI and NHD database queries are provided in **Figures 6** and **7,** which show none of the drainages found within the survey area are mapped by NWI or NHD.

4.2 Field Survey Methods

A delineation of aquatic resources within the survey area was conducted on November 7, 2022, by ESA Biologist Douglas Gordon-Blackwood. Field data were collected using an EOS Arrow 100 Global Navigation Satellite System receiver, which provides Satellite-based Augmentation System corrections processing in the field and can provide 60 cm real-time horizontal accuracy.

The delineation was conducted by walking throughout the survey area to selected areas where potential jurisdictional features were identified during the literature review. Features that were identified as potentially jurisdictional included, but were not limited to, drainages that had an OHWM and defined channels with bed and bank. Additional data, such as landforms, vegetation, hydrology, and soils, were noted where these characteristics were pertinent to identification of features.

Potential jurisdictional features were identified and delineated following current federal and state methodology and guidelines, including waters of the U.S., waters of the State and FGC Section 1600 resources.

4.2.1 Waters of the U.S.

This ARDR was prepared in accordance with *USACE Los Angeles District Minimum Standards for Acceptance of Aquatic Resources Delineation Reports* (USACE 2017), *Updated Map and Drawing Standards for the South Pacific Division Regulatory Program* (USACE 2016), and *Aquatic Resource Delineation Report Submittal Workshop* (USACE 2019).

4.2.1.1 Wetlands

The delineation used the "Routine Determination Method" as described in the *1987 Corps of Engineers Wetland Delineation Manual* (Environmental Laboratory 1987), hereafter called the "1987 Manual." The 1987 Manual was used in conjunction with the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (Version 2.0)* (USACE 2008), hereafter called the "Arid West Supplement." For areas where the 1987 Manual and the Arid West Supplement differ, the Arid West Supplement was followed. Wetlands and waters were classified using commonly accepted habitat types; however, the Cowardin classification (Cowardin et al. 1979) of each feature type is noted in the discussion in Chapter 5.

To determine the extent of potential jurisdictional wetlands in a survey area, three positive wetland parameters must normally be present for an area to be considered a wetland: (1) a dominance of wetland vegetation, (2) presence of hydric soils, and (3) presence of wetland hydrology. Presence or absence of positive indicators for wetland vegetation, soils and hydrology was assessed per the 1987 Manual and Arid West Supplement guidelines.

At each location, a visual assessment of the dominant plant species within the vegetation community was made. Dominant species were assessed using the recommended "50/20" rule per the Arid West Supplement. Plants were identified to species using the *The Jepson Manual: Vascular Plants of California, Second Edition* (Baldwin et al. 2012). The *Arid West 2016 Regional Wetland Plant List* (Lichvar et al. 2016) was used to determine the wetland indicator status of all plants.

Hydric soils were identified using soil indicators presented in the *Regional Supplement to the* Arid West Supplement and the *Field Indicators of Hydric Soils in the United States*, Version 7.0, 2010 (NRCS 2010). Soils at each data point were characterized by color, texture, organic matter accumulation, and the presence or absence of hydric soil indicators. The coloration of the soil samples, matrix, and mottles is assessed using the *Munsell Soil Color Charts* (Munsell 2000).

Presence of wetland hydrology was determined at each location by presence of one or more of the primary and/or secondary indicators, per guidance of the Arid West Supplement. If one of the three wetland parameters (i.e., dominance of hydrophytic vegetation) was not observed, no Wetland Determination Data Forms were completed and potential aquatic resources were evaluated for presence of an OHWM, as described below.

4.2.1.2 Other Waters of the U.S.

Federal jurisdiction over non-wetland waters of the U.S. extends to the OHWM, defined in 33 CFR 328.3 as the line on the shore established by fluctuations of water and indicated by physical characteristics such as a clear, natural line impressed on the bank, shelving, changes in the character of the soil, destruction of terrestrial vegetation, or the presence of litter and debris. In the Arid West region of the United States, waters are variable and include ephemeral, intermittent and perennial channel forms. The most problematic ordinary high-water delineations are associated with the commonly occurring ephemeral and intermittent channel forms that dominate the Arid West landscape. Delineation methods were completed in accordance with *A Field Guide to the Identification of the Ordinary High Water Mark in the Arid West Region of the Western United States* (USACE, 2008b) and *Updated Datasheet for the Identification of the Ordinary High Water Mark (OHWM) in the Arid West Region of the Western United States* (Curtis and Lichvar 2010).

Significant Nexus Determination

As stated above in Section 3.1, requirements for determination of whether aquatic features with an intermittent or ephemeral flow regime have a significant nexus with a TNW include an assessment of the flow characteristics and functions of the tributary itself, as well as the functions performed by all wetlands adjacent to the tributary, to determine if, in combination, they significantly affect the chemical, physical and biological integrity of the downstream TNW. A significant nexus determination was completed for Drainage 4, which is an ephemeral tributary (not a relatively permanent water[2]). The significant nexus determination was made for Drainage 4, as Drainages 1, 2, and 3 are headwaters of Drainage 4. The determination was made by weighing the following factors:

- General: Distance to nearest TNW, areal extent of drainage area
- Physical: Quantitative estimate of flow (Q) using the Rational Method
- Chemical: identification of any pollutant sources that may contribute to downstream impaired water bodies
- Biological: Observations of habitat supporting plant and/or animal species

The Rational Method determination was made using the following values:

- Runoff coefficient based on land use/land cover (C = 0.21 for smaller events; C=0.25 for larger events)
- Rainfall intensity based on isopluvial mapping
- Storm duration and return interval

The significant nexus determination was made by assessing the above information such that if the drainage was found to have a more than insignificant effect on at least one of the three factors (physical, chemical, or biological), a positive determination was made. The significant nexus determination result is located in Section 5.2.1, Clean Water Act Analysis, below.

2 Relatively permanent waters, which exhibit surface flows at least three months annually, do not require a significant nexus determination, and are considered waters of the U.S. as long as they connect downstream to a TNW

4.2.2 Waters of the State

Waters of the State outside of CWA Section 401 jurisdiction and subject to Porter-Cologne Water Quality Cologne Act were delineated to also include aquatic features up to the top of bank per the delineation guidance provided by the San Diego RWQCB.

4.2.3 Rivers, Streams, and Lakes

Fish and Game Code Section 2875 defines riparian habitat as "lands which contain habitat which grows close to and depends upon soil moisture from a nearby freshwater source." Additionally, the CDFW Notification Instructions and Process guide characterizes the riparian zone as "the area that surrounds a channel or lake and supports (or can support) vegetation that is dependent on surface or subsurface flow." Furthermore, this CDFW guide calls for the analysis of impacts to the riparian zone up to the outer landward edge of the drip line of riparian vegetation.

FGC Section 1600 resources were delineated to include streambanks up to the top of bank, and/or associated wetlands and riparian vegetation to the outer drip line, whichever is wider.

CHAPTER 5
Results

5.1 Aquatic Resources

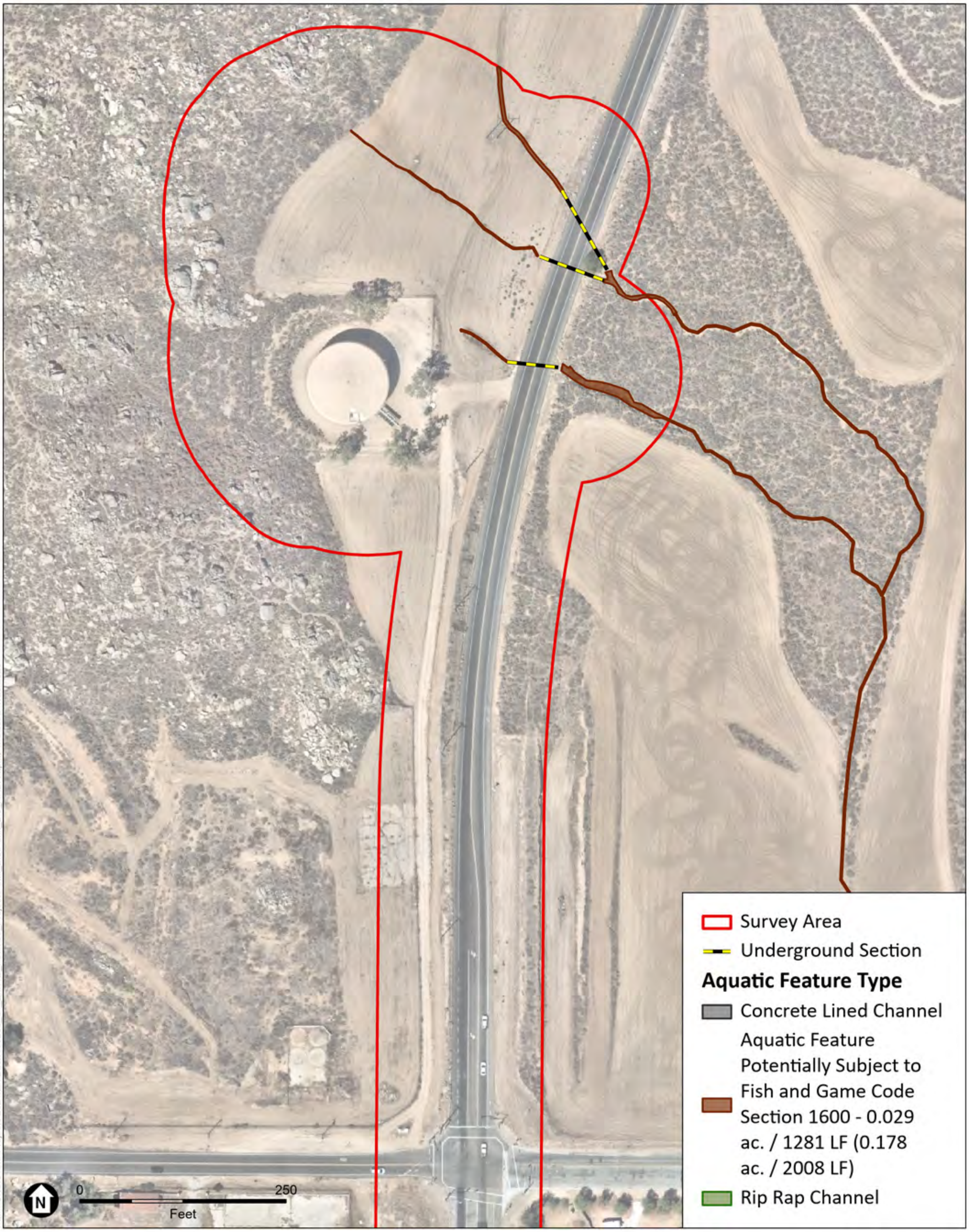
All aquatic features within the survey area were analyzed in the field to determine whether each may be considered wetland or non-wetland ("other") waters of the U.S., waters of the State, and/or FGC Section 1600 resources.

Aquatic resources delineated within the survey area include four ephemeral drainages (**Table 4**), which are described below and depicted in Figure 8, above, and **Figure 9 – Features Potentially Subject to Fish and Game Code Section 1600.**

TABLE 4
AQUATIC RESOURCES WITHIN THE SURVEY AREA

Aquatic Feature	Cowardin Type	Dominant Vegetation/Land Cover Type	Feature Width (feet)	Linear Feet	Acres (Square Feet)
Drainage 1	Riverine (ephemeral)	Largely devoid of vegetation/annual forbs	1-8	219.0	0.029 (1,273.13)
Drainage 2	Riverine (ephemeral)	Largely devoid of vegetation/annual forbs	1-2	303.0	0.011 (471.98)
Drainage 3	Riverine (ephemeral)	Largely devoid of vegetation/annual forbs	2	173.7	0.008 (378.86)
Drainage 4	Riverine (ephemeral)	Brittle Bush Scrub	4-7	66 [1579][1]	0.008 (356.15) [0.15 (6,747.1)][1]
			Total Aquatic Features	**761.7 [2,274.7]**	**0.056 (2,480.12) [0.20 (8,871.07)]**

[1] Measurements shown for portion of Drainage 4 associated with water tank expansion survey area, and also includes total area within entire survey Area (which includes the transmission pipeline work areas) in brackets.



SOURCE: Nearmap (2022), ESA (2022)

Pettit Water Storage Tank Expansion and Transmission Pipeline Project

Figure 9a
Features Potentially Subject to Fish and Game Code Section 1600

ESA

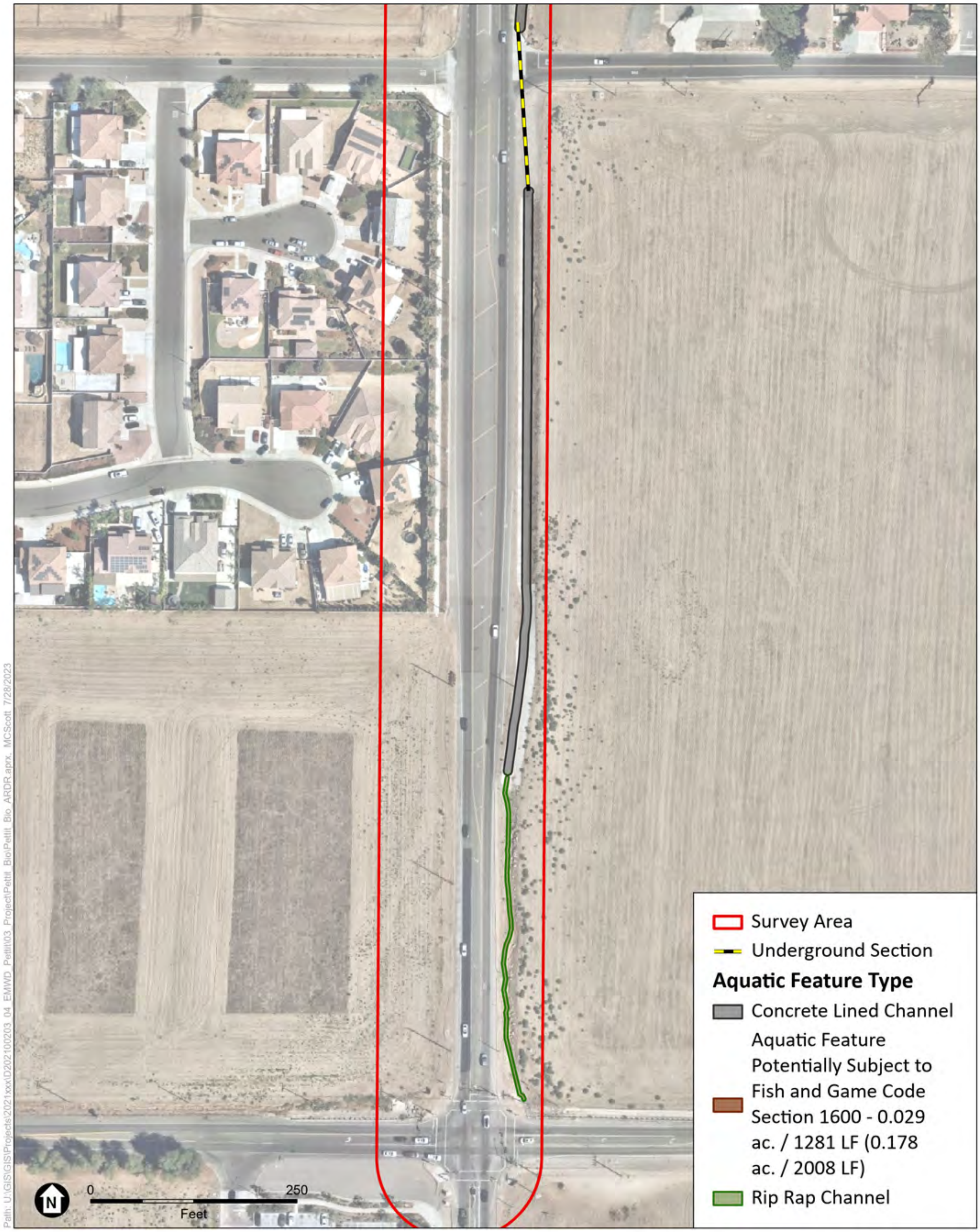
Path: U:\GIS\GIS\Projects\2021xxx\D202100203_04_EMWD_Pettit\03_Project\Pettit_Bio\Pettit_Bio_ARDR.aprx, MCScott 7/28/2023

SOURCE: Nearmap (2022), ESA (2022)

Pettit Water Storage Tank Expansion and Transmission Pipeline Project

Figure 9b
Features Potentially Subject to
Fish and Game Code Section 1600

ESA



SOURCE: Nearmap (2022), ESA (2022)

Pettit Water Storage Tank Expansion and Transmission Pipeline Project

Figure 9c
Features Potentially Subject to
Fish and Game Code Section 1600

ESA

5.2 Waters of the U.S.

5.2.1 Clean Water Act Analysis

5.2.1.1 Significant Nexus Determination

Requirements for determination of whether aquatic features with an intermittent and/or ephemeral flow regime have a significant nexus with a TNW are summarized above in Sections 3.1.2 and 4.2.1. Drainages 1, 2, 3, and 4 are headwaters which connect approximately 25 river miles downstream to Lake Elsinore, the nearest downstream Traditional Navigable Water (TNW)[3]. Approximately 90% of the drainage area consists of natural land cover with 10% being bare disturbed soils. Mean annual precipitation in the area is 7.6 inches.

A surface hydrologic connection is present between Drainages 1, 2, 3, and 4 with Lake Elsinore, a TNW. The tributaries have the capacity to carry pollutants and flood waters to Lake Elsinore or potentially reduce the amount of those flood waters.

Rational method analysis was conducted for Drainage 4, which is inclusive of Drainages 1, 2 and 3, as they are tributaries of Drainage 4. Rational method analysis for Drainage 4 includes rainfall intensity data provided in the Riverside County Flood Control & Water District Hydrology Manual (RCFCWCD 1978), an approximately 30-acre drainage area of the Bernasconi Hills, runoff coefficients of 0.21 (for smaller events) and 0.25 (for larger events), and rainfall intensities ranging from 0.45 inches per hour for a 2 year storm to a 1.2 inches per hour for a 100 year storm, a 50-percent (i.e., a 2-year recurrence interval) flood event would convey 2.6 cubic feet per second (cfs), and a 1-percent (i.e., a 100-year recurrence interval) flood event would convey 6.3 cfs. Even for 100-year events, peak flow measurements would remain well under 10 cfs, and would not be considered as providing significant flood waters to Lake Elsinore. In addition to these expected stormflows, Drainage 4 is not likely to contribute substantially to chemical pollution of the downstream TNW due to the small amount of urban land cover within the drainage area which likely generates minimal nutrient input (for example, phosphorus and nitrogen from fertilizer use) into the watershed.

While these ephemeral drainages themselves are not listed as impaired waterbodies, Lake Elsinore is listed as being impaired for multiple parameters, including low oxygen, nitrogen and/or phosphorus, polychlorinated biphenyls (PCBs), pesticides, and total toxic chemicals (EPA 2022). While Drainages 1, 2, 3, and 4 may contribute marginal amounts of these materials, Lake Elsinore is not listed as impaired for parameters most often associated with the parameters observed in the area such as metal from road runoff and sediment runoff from disturbed lands. Finally, Drainages 1, 2, 3, and 4 do not contain riparian or sensitive biological habitat. Based on the above, Drainages 1, 2, 3, and 4 are not expected to convey a high volume of flow during storm events and therefore contribute an insignificant amount of physical flow to the downstream TNW. In addition, these unnamed tributaries are likely to have an insignificant effect on the chemical and biological characteristics of Lake Elsinore. Therefore, Drainages 1, 2, 3, and 4 do

[3] Declaration of Lake Elsinore as a Traditional Navigable Water (SPL-2007-1295-DPS), 2008 <https://www.spl.usace.army.mil/Portals/17/docs/regulatory/JD/NavigableWater/CA_TNW_Det/Lake%20Elsinore_TNW.pdf?ver=F83awBgD8diuGcIH_lGwdg%3d%3d>

not have a significant nexus with its downstream TNW and are not a potential other (non-wetland) waters of the U.S.

5.2.2 Potential Wetland Waters of the U.S.

No wetland features meeting the USACE's three-parameter wetland definition were identified within the survey area.

5.2.3 Potential Other Waters of the U.S.

Four ephemeral drainages were considered for their potential to be other (non-wetland) waters of the U.S within the survey area.

Drainage 1

Drainage 1 is an ephemeral drainage which lacks riparian vegetation and contains ruderal nonnative vegetation such as red brome (*Bromus rubens*), shortpod mustard (*Hirschfeldia incana*), and Russian thistle (*Salsola tragus*). The drainage is 1-foot-wide upstream from Moreno Beach Drive and varies from 5-8 feet wide downstream from Moreno Beach Drive. The drainage has an average depth of 1 foot upstream from the culvert beneath Moreno Beach Drive and becomes deeply incised to a depth of between 5-8 feet downstream from the culvert beneath Moreno Beach Drive. A portion of Drainage 1 upstream from Moreno Beach Drive has been subject to regular and frequent disturbance in the form of site grading and discing, and lacks a defined OHWM or bed and bank as a result of the disturbance, which results in an atypical situation for the purposes of delineating. Despite the lack of a defined OHWM, based on aerial imagery (Google Earth), conditions prior to disturbance are consistent with an ephemeral drainage. Drainage 1 originates at an 18-inch-wide metal culvert, located 40 feet east of the fence line for the existing Pettit Water Storage Tank. No upslope inlet for the culvert was observed within the survey area. The culvert likely once conveyed stormwater runoff from the area surrounding the existing Pettit Water Storage Tank, however the culvert has since become inundated by sediment from previous storm events and is not capable of efficiently draining stormwater runoff from the area. Drainage 1 conveys flows southwest for approximately 69 feet towards the west side of Moreno Beach Drive, where it enters an 18-inch corrugated metal culvert beneath Moreno Beach Drive. Flows continue southeast from a headwall structure on the east side of Moreno Beach Drive (within the road right-of-way), where the drainage becomes a deeply incised. Drainage 1 continues to convey flows outside of the survey area to the southwest where it eventually converges with Drainage 4.

A Beta Arid West Streamflow Duration Assessment Method (SDAM) was deemed unnecessary given Drainage 1 lacked hydric soils, riparian vegetation, and contained minimal evidence of hydrology (outside of sediment sorting). Based on the Significant Nexus analysis provided in Section 5.2.1, Drainage 1 would not be considered a potential other (non-wetland) waters of the U.S.

Drainage 2

Drainage 2 is a 1-foot-wide ephemeral drainage which lacks riparian vegetation and contains ruderal nonnative vegetation such as tumbling pigweed, shortpod mustard, and Russian thistle.

Drainage 2 lacks many recognizable features of a drainage due to frequent site disturbance in the form of site grading and discing. Drainage 2 is situated in a depression topographically, and stormwater runoff from the surrounding uplands drain to create Drainage 2. Drainage 2 conveys flows southeast towards Moreno Beach drive, where it enters a 24-inch metal corrugated culvert. Drainage 2 then conveys flows eastward where it meets Drainage 3, east of Moreno Beach Drive. Drainage 2 and Drainage 3 then converge to create a larger drainage, Drainage 4. Drainage 4 continues to convey flows outside of the survey area to the southwest, where it eventually converges with Drainage 1.

A SDAM was deemed unnecessary given Drainage 2 lacked hydric soils, riparian vegetation, and contained minimal evidence of hydrology (outside of minor sediment sorting). Based on the significant nexus determination provided in Section 5.2.1, Drainage 2 would not be considered a potential other (non-wetland) waters of the U.S.

Drainage 3

Drainage 3 is a 2-foot-wide ephemeral drainage with an average depth of 1 foot which lacks riparian vegetation, and contains ruderal nonnative vegetation such as tumbling pigweed, shortpod mustard, and Russian thistle. Drainage 3 lacks many recognizable features of a drainage due to frequent site disturbance in the form of site grading and discing. Drainage 3 is situated in a depression topographically, and stormwater runoff from the surrounding uplands drain into Drainage 3. Drainage 3 continues to convey flows southeast towards Moreno Beach drive, where it enters a 24-inch metal corrugated culvert. Drainage 3 continues to convey flows eastward where it confluences just east of the headwall structure east of Moreno Beach Drive with Drainage 2 to create a larger ephemeral drainage, Drainage 4. Drainage 4 continues to convey flows outside of the survey area to the southwest, where it eventually converges with Drainage 1.

A SDAM was deemed unnecessary given Drainage 3 lacked hydric soils, riparian vegetation, and contained minimal evidence of hydrology (outside of minor sediment sorting). Based on the significant nexus determination provided in Section 5.2.1, Drainage 3 would not be considered a potential other (non-wetland) waters of the U.S.

Drainage 4

Drainage 4 is an ephemeral drainage situated east of Moreno Beach Drive and is the result of the confluence of erosional features Drainage 2 and Drainage 3 conveying flows beneath Moreno Beach Drive. Drainage 4 lacks riparian vegetation and hydric soils, and its banks are dominated by brittle bush scrub, which is upland vegetation. Drainage 4 conveys flows southeast towards a double 18” metal culvert storm drain which is situated just north of Cottonwood Avenue. Drainage 4 continues beneath Cottonwood Avenue, exiting a single metal culver. Drainage 4 continues to convey flows southeast of the intersection of Cottonwood Avenue and Arcaro Street, where the drainage becomes a 3-foot-wide channel with concrete bed and banks. Drainage 4 continues south towards Sea Biscuit Street, where it enters a culvert that directs flows towards the west along Sea Biscuit Street, towards Moreno Beach Drive. Drainage 4 then exits a 36-inch concrete tube culvert which then conveys flows south, parallel with Moreno Beach Drive, within a 6-foot-wide channel with concrete-lined bed and banks. Drainage 4 continues into an 8-foot-wide box culvert beneath Bay Avenue. Flows within Drainage 4 exit the box culvert approximately 170 feet south of Bay Avenue, where they continue for 466 feet in a 2-foot-wide channel with an earthen bank of the eastern side of the channel and concrete-lined bank on the west. Drainage 4 then transitions to a 5-foot-wide concrete-lined channel that continues south for 237 feet, where it then transitions into a 2-foot wide ungrouted riprap channel. The ungrouted riprap portion of Drainage 4 continues for approximately 400 feet along the east side or Moreno Beach Drive, where it meets the intersection of Moreno Beach Drive and Alessandro Boulevard. Drainage 4 conveys flows into two 36-inch metal corrugated culverts beneath the intersection where flows are presumed continue south towards Lake Perris.

A SDAM was deemed unnecessary given Drainage 4 lacked hydric soils, riparian vegetation, and contained minimal evidence of hydrology (outside of minor sediment sorting). Based on the significant nexus determination provided in Section 5.2.1, Drainage 4 would not be considered a potential other (non-wetland) waters of the U.S.

5.3 Waters of the State

5.3.1 Waters of the State Analysis

Four drainage features were considered for their potential to be other (non-wetland) waters of the State within the survey area.

5.3.2 Potential Wetland Waters of the State

No potential wetland waters of the State were identified within the survey area.

5.3.3 Potential Non-Wetland Waters of the State

Drainages 1, 2, 3, and 4, despite not being considered as potential other (non-wetland) waters of the U.S. as described above, are considered potential non-wetland waters of the State and are included in **Table 5 – Aquatic Resources within the Survey Area - Potential Non-Wetland Waters of the State**. Drainages 1, 2, 3, and 4 would also fall under the jurisdiction of RWQCB.

TABLE 5
AQUATIC RESOURCES WITHIN THE SURVEY AREA – POTENTIAL NON-WETLAND WATERS OF THE STATE

Aquatic Feature	Cowardin Type	Dominant Vegetation/ Land Cover Type	Feature Width (feet)	Linear Feet	Acres (square feet)
Drainage 1	Riverine (Ephemeral)	Largely devoid of vegetation/annual forbs	1-8	219.0	0.029 (1,273.13)
Drainage 2	Riverine (Ephemeral)	Largely devoid of vegetation/annual forbs	1-2	303.0	0.011 (471.98)
Drainage 3	Riverine (Ephemeral)	Largely devoid of vegetation/annual forbs	2	173.7	0.008 (378.86)
Drainage 4	Riverine (Ephemeral)	Brittle Bush Scrub	4-7	66 (1579)[1]	0.008 (356.15) / 0.15 (6,747.1)[1]
			Totals:	**761.7 [2,274.7]**	**0.056 (2,480.12) [0.20 (8,871.07)]**

[1] Measurements shown for portion of Drainage 4 associated with water tank expansion survey area, and also includes total area within entire survey area (which includes the transmission pipeline work areas) in brackets.

5.4 Rivers, Streams, and Lakes

Areas potentially subject to regulation under FGC Section 1600 are shown in **Figure 9** and extend beyond the OHWM to the top of bank or outer extent of the riparian canopy (i.e., drip line). Potential CDFW resources include all waters of the State (see **Table 5**) described above. The total acreages potentially subject to CDFW jurisdiction are provided in **Table 6 – Features Potentially Subject to Section 1600 et seq. of the Fish and Game Code within the Survey Area,** below.

TABLE 6
FEATURES POTENTIALLY SUBJECT TO SECTION 1600 ET SEQ. OF THE FISH AND GAME CODE WITHIN THE SURVEY AREA

Aquatic Feature	Cowardin Type	Vegetated Streambed/ Pond/Lake (Acre)	Unvegetated Streambed/ Pond/Lake (Acre/Square feet))	Length (feet)	Feature Width (feet)	Vegetation/Land Cover Type	GPS Coordinates (decimal degrees)
Drainage 1	Riverine (Ephemeral)	-	0.029 (1,273.13)	219.0	1-8	Largely devoid of vegetation/annual forbs	33.927331°, -117.174158°
Drainage 2	Riverine (Ephemeral)	-	0.011 (471.98)	303.0	1-2	Largely devoid of vegetation/annual forbs	33.927755°, -117.174199°
Drainage 3	Riverine (Ephemeral)	-	0.008 (378.86)	173.7	2	Largely devoid of vegetation/annual forbs	33.927894°, -117.173902°
Drainage 4	Riverine (Ephemeral)	-	0.008 (356.15) [0.15 (6,747.1)]	66 [1,579][1]	4-7	Brittle Bush Scrub	33.927537°, -117.173625°
Totals:		**-**	**0.056 [0.20]**	**761.7 [2,274.7]**			

Aquatic Feature	Cowardin Type	Vegetated Streambed/ Pond/Lake (Acre)	Unvegetated Streambed/ Pond/Lake (Acre/Square feet))	Length (feet)	Feature Width (feet)	Vegetation/Land Cover Type	GPS Coordinates (decimal degrees)

[1] Measurements shown for portion of Drainage 4 associated with water tank expansion survey area, and also includes total area within entire survey area (which includes the transmission pipeline work areas) in brackets.

5.5 Conclusions

Based on the results of the aquatic resources delineation and the jurisdictional analysis, it is presumed that 0.056 acre (761.7 linear feet) of potential other (non-wetland) waters of the State occur within the Petit water storage tank expansion survey area and are potentially jurisdictional under Section 1600 et seq. of the FGC and the Porter-Cologne Water Quality Control Act. A total of 0.20 acre (2,274.7 linear feet) of potential other (non-wetland) waters of the State occur within the survey area surrounding the proposed transmission pipeline and are potentially jurisdictional under Section 1600 et seq. of the FGC and the Porter-Cologne Water Quality Control Act. This report documents the aquatic resources boundary delineation and best professional judgment of ESA investigators. All aquatic resources and extent of jurisdictional boundaries identified in this report are considered preliminary pending verification from the appropriate regulatory agencies.

CHAPTER 6
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Appendix A
Site Photographs

Photograph 1: View of Drainage 1, facing upstream and west from its intersection with Moreno Beach drive. Photo depicts the complete limits of Drainage 1 within the grading limits, and its upstream culvert.

Photograph 2: View of Drainage 1, facing downstream and southeast towards its intersection with a metal culvert beneath Moreno Beach Drive.

Photograph 3: View of Drainage 2 facing downstream and southeast from its northern terminus, towards its intersection with Moreno Beach Drive.

Photograph 4: View of Drainage 2 facing upstream and northwest from Moreno Beach Drive, towards its upland boundary.

Photograph 5: View of Drainage 3 facing downstream and southeast from its northern terminus, towards its intersection with Moreno Beach Drive.

Photograph 6: View of Drainage 3 facing upstream and northwest from the northern boundary of the grading limits.

Photograph 7: View of western upstream inlet of 30” culvert for Drainage 1 on the western side of Moreno Beach Drive, facing downstream and east. Culvert is proposed for complete removal, and an 18-inch storm drain is proposed to be installed immediately north of this location.

Photograph 8: View of eastern downstream outlet of Drainage 1 culvert, downstream and east of Moreno Beach Drive. Photo depicts existing 30” corrugated metal culvert which will be replaced with an appurtenant facility which includes an energy dissipater, headwall, rip-rap, 18-inch storm drain, and metal culvert.

Photograph 9: View of eastern downstream 30-inch Drainage 1 culvert on eastern side of Moreno Beach Drive, facing upstream and west. Culvert is proposed for complete removal, and an 18-inch storm drain to installed immediately north of this location.

Photograph 10: View of Drainage 1, facing downstream from its intersection with Moreno Beach Drive. Photo depicts drainage within upland brittle bush scrub vegetation.

Photograph 11: View upstream and west along Drainage 1 toward Moreno Beach Drive. Photo depicts a deeply incised channel surrounded by upland brittle bush scrub vegetation.

Photograph 12: View upstream towards two 30" culverts for Drainage 2 (left) and Drainage 3 (right), and their confluence just east of Moreno Beach Drive, facing west. Channel continues as a single drainage (Drainage 4) conveying flows to the east and southeast.

Photograph 13: View downstream and southeast of Drainage 4, from the confluence of Drainages 2 and 3, just east of Moreno Beach Drive.

Photograph 14: View downstream of Drainage 4 from concrete culvert into 5-foot wide concrete lined channel portion, facing south along Moreno Beach Drive.

Photograph 15: View downstream and south of concrete lined channel portion of Drainage 4 where it enters a box culvert beneath Bay Avenue.

Photograph 16: View of Drainage 4 downstream from Bay Avenue where it becomes a partially concrete lined channel, facing south and parallel with Moreno Beach Drive.

Photograph 17: View downstream and south of Drainage 4 south of Bay Avenue where the channel becomes a 5-foot wide concrete lined channel.

Photograph 18: View of Drainage 4 facing downstream and south, north of Alessandro Boulevard where Drainage 4 continues as an ungrouted rip rap channel.

Appendix B
Floral Compendium

APPENDIX B – PETTIT WATER STORAGE TANK EXPANSION & TRANSMISSION PIPELINE PROJECT

Floral Compendium

Family	Scientific Name	Common Name	Nativity	Wetland Indicator Status
EUDICOTS				
AMARANTHACEAE		**AMARANTH FAMILY**		
	Amaranthus albus	tumbling pigweed	Naturalized	FACU
ASTERACEAE		**SUNFLOWER FAMILY**		
	Artemisia californica	California sagebrush	Native	NA
	Brickellia californica	California brickellbush	Native	FACU
	Centaurea melitensis	tocalote	Naturalized	NA
	Corethrogyne filaginifolia	common sandaster	Native	NA
	Encelia farinosa	brittlebush	Native	NA
	Helianthus annuus	common sunflower	Native	FACU
	Oncosiphon piluliferum	stinknet	Native	FACU
	Pseudognaphalium biolettii	two-color rabbit-tobacco	Native	NA
	Pseudognaphalium californicum	ladies' tobacco	Native	FACU
	Sonchus asper ssp. *asper*	spiny sowthistle	Naturalized	FAC
BORAGINACEAE		**BORAGE FAMILY**		
	Amsinckia intermedia	common fiddleneck	Native	NA
BRASSICACEAE		**MUSTARD FAMILY**		
	Hirschfeldia incana	shortpodded mustard	Naturalized	NA
CHENOPODIACEAE		**GOOSEFOOT FAMILY**		
	Chenopodium album	lamb's quarters	Naturalized	FACU
	Chenopodium murale	nettle-leaved goosefoot	Naturalized	FACU

Dysphania pumilio	Tasmanian goosefoot	Naturalized	NA
Salsola tragus	prickly Russian thistle	Naturalized	FACU
CUCURBITACEAE	**GOURD FAMILY**		
Marah macrocarpus	Cucamonga manroot	Native	NA
EUPHORBIACEAE	**SPURGE FAMILY**		
Croton setiger	dove weed	Native	NA
Euphorbia maculata	spotted spurge	Naturalized	UPL
FABACEAE	**LEGUME FAMILY**		
Acmispon glaber	deerweed	Native	NA
Lupinus bicolor	miniature lupine	Native	NA
Parkinsonia florida	blue paloverde	Naturalized	NA
GERANIACEAE	**GERANIUM FAMILY**		
Erodium botrys	longbeak stork's bill	Naturalized	FACU
Erodium cicutarium	redstem filaree	Naturalized	NA
HYDROPHYLLACEAE	**WATERLEAF FAMILY**		
Phacelia ramosissima	branching phacelia	Native	FACU
MALVACEAE	**MALLOW FAMILY**		
Malva parviflora	cheeseweed	Naturalized	NA
MONTIACEAE	**PURSLANE FAMILY**		
Portulaca oleracea	common purslane	Naturalized	FAC
MYRTACEAE	**MYRTLE FAMILY**		
Eucalyptus camaldulensis	red gum	Naturalized	FAC
NYCTAGINACEAE	**FOUR O'CLOCK FAMILY**		
Mirabilis laevis var. *crassifolia*	wishbone bush	Native	NA
PHRYMACEAE	**LOPSEED FAMILY**		
Diplacus aurantiacus	orange bush monkeyflower	Native	FACU
RUBIACEAE	**MADDER FAMILY**		
Galium angustifolium ssp. *angustifolium*	narrow-leaved bedstraw	Native	NA
SCROPHULARIACEAE	**FIGWORT FAMILY**		
Scrophularia californica	California figwort	Native	FAC
SOLANACEAE	**NIGHTSHADE FAMILY**		

Datura wrightii	Jimsonweed	Native	UPL
ZYGOPHYLLACEAE	**CALTROP FAMILY**		
Tribulus terrestris	puncture vine	Naturalized	NA
MONOCOTS			
ARECACEAE	**PALM FAMILY**		
Washingtonia robusta	Mexican fan palm	Naturalized	FACW
POACEAE	**GRASS FAMILY**		
Avena barbata	slender wild oat	Naturalized	NA
Bromus rubens	foxtail chess	Naturalized	UPL
Cynodon dactylon	Bermuda grass	Naturalized	FACU
Digitaria sanguinalis	hairy crabgrass	Naturalized	FACU
Schismus barbatus	old han schismus	Naturalized	NA
Sorghum halepense	Johnsongrass	Naturalized	FACU

Wetland Indicator Status ratings based on ecological descriptions in US Army Corps of Engineers 2020 National Wetland Plant List – Arid West

OBL	*Obligate*	*Almost always is a hydrophyte, rarely in uplands*
FACW	*Facultative Wetland*	*Usually is a hydrophyte but occasionally found in uplands*
FAC	*Facultative*	*Commonly occurs as either a hydrophyte or nonhydrophyte*
FACU	*Facultative Upland*	*Occasionally is a hydrophyte, but usually occurs in uplands*
UPL	*Upland*	*Rarely is a hydrophyte, almost always in uplands*
NA	*Not Available*	*Wetland Indicator Status not available in USACE 2020 National Wetland Plant List or 2016 Arid West 2016 Regional Wetland Plant List*

Appendix C
Climatological Data

WETS Table

WETS Station: MARCH AFB, CA								
Requested years: 2000 - 2021								
Month	Avg Max Temp	Avg Min Temp	Avg Mean Temp	Avg Precip	30% chance precip less than	30% chance precip more than	Avg number days precip 0.10 or more	Avg Snowfall
Jan	-	-	-	-	-	-	-	-
Feb	-	-	-	-	-	-	-	-
Mar	-	-	-	-	-	-	-	-
Apr	-	-	-	-	-	-	-	-
May	-	-	-	-	-	-	-	-
Jun	-	-	-	-	-	-	-	-
Jul	-	-	-	-	-	-	-	-
Aug	-	-	-	-	-	-	-	-
Sep	-	-	-	-	-	-	-	-
Oct	-	-	-	-	-	-	-	-
Nov	-	-	-	-	-	-	-	-
Dec	-	-	-	-	-	-	-	-
Annual:					-	-		
Average	-	-	-	-	-	-	-	-
Total	-	-	-	-			-	-

GROWING SEASON DATES			
Years with missing data:	24 deg = 9	28 deg = 10	32 deg = 10
Years with no occurrence:	24 deg = 7	28 deg = 2	32 deg = 0
Data years used:	24 deg = 13	28 deg = 12	32 deg = 12
Probability	24 F or higher	28 F or higher	32 F or higher
50 percent *	Insufficient data	Insufficient data	Insufficient data
70 percent *	Insufficient data	Insufficient data	Insufficient data
* Percent chance of the growing season occurring between the Beginning and Ending dates.			

STATS TABLE - total precipitation (inches)													
Yr	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annl
1949	2.30	0.66	0.34	T	0.23	T	T	0.00	T	0.01	0.73	1.16	5.43
1950	1.50	1.62	0.37	0.63	0.08	T	T	0.00	T	0.01	1.50	0.01	5.72
1951	0.94	0.35	0.54	1.26	0.06	MT	0.09	0.14	0.56	0.28	0.45	4.42	9.09
1952	5.38	0.22	4.67	1.27	T	T	T	0.00	1.15	T	3.18	2.75	18.62
1953	0.71	0.33	0.79	1.45	M0.03	T	0.02	M0.15	T	0.15	0.95	0.29	4.87
1954	4.21	1.45	3.28	0.20	T	T	0.20	0.12	0.00	T	1.72	0.52	11.70
1955	4.37	1.23	0.23	0.82	0.60	0.05	T	0.03	T	T	0.59	0.35	8.27
1956	3.33	0.41	0.01	1.76	0.10	T	0.08	T	0.00	0.04	0.00	0.16	5.89
1957	4.75	0.84	0.67	1.12	0.96	0.18	T	0.00	T	1.83	0.49	2.30	13.14
1958	0.89	4.07	3.02	2.44	0.36	T	0.00	0.47	0.14	0.24	0.29	T	11.92

1959	1.05	2.22	0.00	0.27	T	T	0.03	T	0.51	0.03	0.38	2.10	6.59
1960	2.35	1.78	0.22	0.94	0.02	T	0.02	0.00	0.07	0.38	0.83	0.01	6.62
1961	0.62	0.00	0.62	T	T	T	T	0.56	T	T	0.46	1.21	3.47
1962	1.85	2.69	0.74	T	0.31	0.01	T	T	T	T	0.02	0.05	5.67
1963	0.17	2.14	1.15	1.19	T	0.01	0.00	T	3.01	0.81	1.52	T	10.00
1964	1.26	0.84	1.23	0.71	0.23	T	T	T	0.06	0.11	1.19	0.82	6.45
1965	0.21	0.22	2.55	4.57	T	0.04	0.10	0.20	0.06	T	5.65	2.47	16.07
1966	0.71	1.16	0.23	T	T	T	T	T	0.09	0.39	0.96	3.95	7.49
1967	1.70	T	0.70	1.97	0.09	0.02	T	0.02	0.35	0.00	3.09	1.38	9.32
1968	0.59	0.23	1.60	0.54	0.27	T	1.46	0.08	T	0.12	0.47	0.70	6.06
1969	6.26	8.89	0.87	0.34	0.43	0.02	0.04	0.03	0.15	T	1.02	0.02	18.07
1970	0.88	2.25	1.57	0.15	T	T	T	0.16	0.00	0.04	1.76	2.17	8.98
1971													
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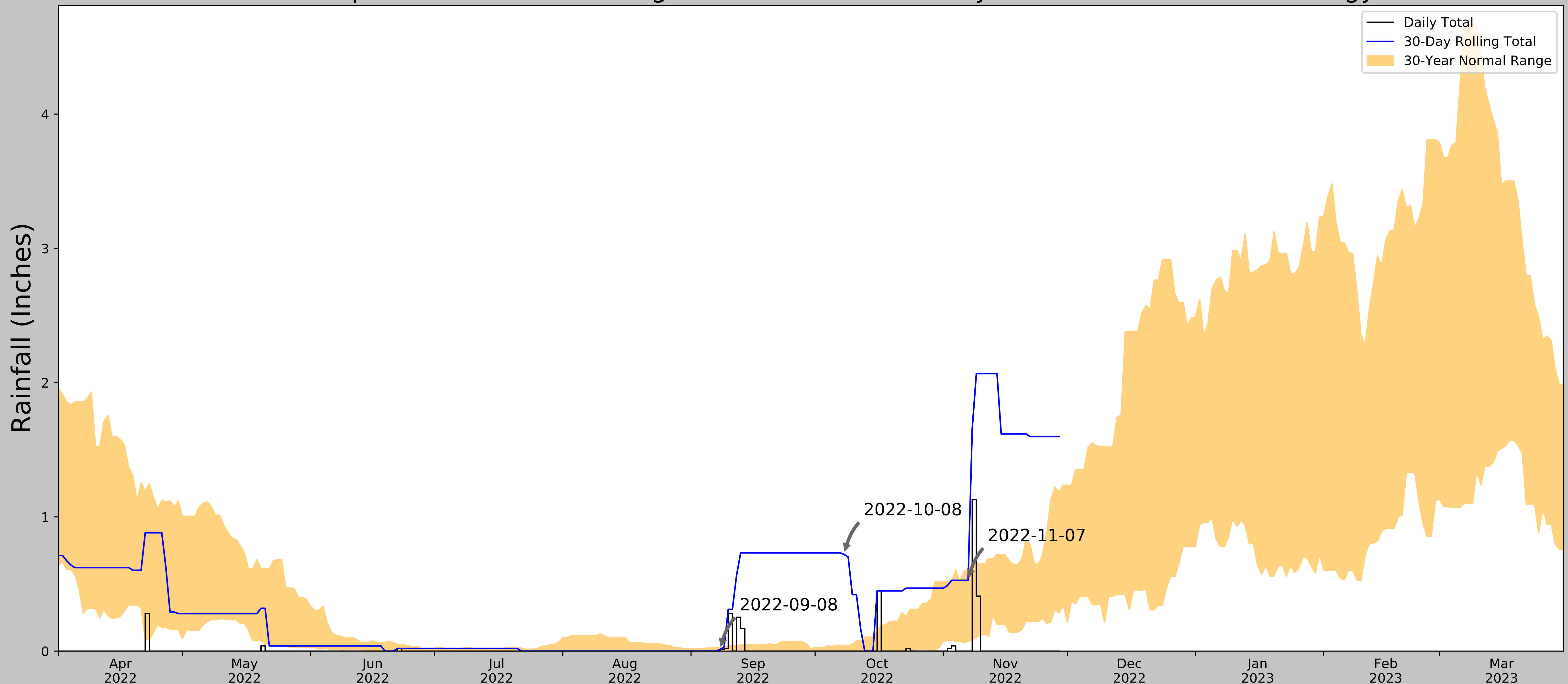
2004													
2005													
2006													
2007													

2008													
2009								T	0.42	T	0.07	1.43	1.92
2010	5.78	1.95	0.16	0.39	0.02	0.00	T	T	0.06	0.61	0.53	M7.70	17.20
2011	0.33	2.60	1.51	0.37	0.26	0.00	0.19	0.01	0.03	0.15	1.29	0.34	7.08
2012	0.31	0.46	0.95	0.79	0.01	0.00	0.07	2.32	0.10	0.03	0.26	1.99	7.29
2013	0.57	0.78	0.72	T	0.28	0.00	0.02	0.40	T	0.43	0.46	0.36	4.02
2014	T	1.19	0.68	0.49	0.00	0.00	T	0.57	0.05	T	0.18	2.91	6.07
2015	0.60	0.33	0.13	0.14	0.61	T	1.39	T	0.45	0.31	M0.05	0.30	4.31
2016	2.24	0.12	0.56	0.96	0.28	T	T	0.00	0.06	0.32	0.70	3.11	8.35
2017	3.78	1.91	0.01	T	0.02	T	0.01	0.59	T	T	T	T	6.32
2018	1.44	M0.23	M0.37	T	0.08	0.00	T	0.00	M0.00	M0.98	M0.82	1.25	5.17
2019	2.52	3.30	M1.96	0.23	1.08	0.00	T	0.00	T	0.00	2.38	2.56	14.03
2020	M0.10	0.41	4.15	3.69	T	0.05	0.00	0.00	0.00	T	0.15	1.08	9.63
2021	1.35	0.01	1.44	T	T	0.06	0.08	0.00	0.11	0.40	T	2.88	6.33
2022	0.01	0.27	0.60	0.11	T	T	0.00	0.01	0.98	0.42	M1.32		3.72
Notes: Data missing in any month have an "M" flag. A "T" indicates a trace of precipitation.													
Data missing for all days in a month or year is blank.													
Creation date: 2022-11-10													

Antecedent Precipitation vs Normal Range based on NOAA's Daily Global Historical Climatology Network



Coordinates	33.927534, -117.174554
Observation Date	2022-11-07
Elevation (ft)	1741.93
Drought Index (PDSI)	Extreme drought (2022-10)
WebWIMP H_2O Balance	Dry Season

30 Days Ending	30^{th} %ile (in)	70^{th} %ile (in)	Observed (in)	Wetness Condition	Condition Value	Month Weight	Product
2022-11-07	0.074016	0.6	0.527559	Normal	2	3	6
2022-10-08	0.0	0.03937	0.720472	Wet	3	2	6
2022-09-08	0.0	0.025591	0.011811	Normal	2	1	2
Result							Normal Conditions - 14

Figure and tables made by the
Antecedent Precipitation Tool
Version 1.0

Written by Jason Deters
U.S. Army Corps of Engineers

Weather Station Name	Coordinates	Elevation (ft)	Distance (mi)	Elevation Δ	Weighted Δ	Days Normal	Days Antecedent
REDLANDS	34.0369, -117.1947	1410.105	7.644	331.825	5.976	11220	84
HIGHLAND 1.8 ESE	34.1106, -117.1592	1410.105	5.483	0.0	2.467	0	6
RIVERSIDE 5.8 E	33.9406, -117.2964	1536.089	8.844	125.984	5.094	1	0
SAN BERNARDINO F S 226	34.1344, -117.2539	1140.092	7.54	270.013	5.429	39	0
RIVERSIDE CITRUS EXP	33.9669, -117.3614	985.892	10.704	424.213	9.358	93	0

NOAA Atlas 14, Volume 6, Version 2
Location name: Moreno Valley, California, USA*
Latitude: 33.9286°, Longitude: -117.1757°
Elevation: 1890.72 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inche

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	
5-min	**0.094** (0.078-0.113)	**0.127** (0.106-0.154)	**0.172** (0.143-0.209)	**0.208** (0.172-0.255)	**0.258** (0.205-0.328)	**0.297** (0.231-0.385)	**0.337** (0.256-0.448)	**0.378** (0.278-0.517)	**0.434** (0.307-0.620)	(0.:
10-min	**0.134** (0.112-0.162)	**0.182** (0.152-0.221)	**0.246** (0.205-0.299)	**0.298** (0.246-0.366)	**0.370** (0.295-0.470)	**0.426** (0.331-0.552)	**0.482** (0.366-0.642)	**0.541** (0.399-0.741)	**0.622** (0.439-0.889)	(0.
15-min	**0.162** (0.135-0.196)	**0.221** (0.184-0.267)	**0.298** (0.247-0.362)	**0.361** (0.297-0.443)	**0.448** (0.356-0.568)	**0.515** (0.401-0.668)	**0.583** (0.443-0.776)	**0.655** (0.483-0.896)	**0.752** (0.531-1.08)	(0.
30-min	**0.251** (0.209-0.303)	**0.341** (0.284-0.413)	**0.460** (0.382-0.559)	**0.558** (0.460-0.684)	**0.691** (0.550-0.878)	**0.795** (0.619-1.03)	**0.901** (0.684-1.20)	**1.01** (0.746-1.39)	**1.16** (0.821-1.66)	(0.
60-min	**0.363** (0.303-0.439)	**0.493** (0.411-0.598)	**0.666** (0.553-0.809)	**0.807** (0.665-0.990)	**1.00** (0.796-1.27)	**1.15** (0.896-1.49)	**1.30** (0.990-1.74)	**1.46** (1.08-2.00)	**1.68** (1.19-2.40)	(1
2-hr	**0.543** (0.453-0.658)	**0.715** (0.596-0.866)	**0.940** (0.781-1.14)	**1.12** (0.926-1.38)	**1.37** (1.09-1.74)	**1.57** (1.22-2.03)	**1.76** (1.34-2.35)	**1.97** (1.45-2.69)	**2.24** (1.58-3.21)	(1
3-hr	**0.679** (0.567-0.822)	**0.883** (0.736-1.07)	**1.15** (0.955-1.40)	**1.37** (1.13-1.68)	**1.66** (1.32-2.11)	**1.89** (1.47-2.45)	**2.12** (1.61-2.82)	**2.36** (1.74-3.23)	**2.68** (1.89-3.83)	(2
6-hr	**0.964** (0.804-1.17)	**1.24** (1.03-1.50)	**1.60** (1.33-1.94)	**1.89** (1.56-2.32)	**2.29** (1.82-2.91)	**2.59** (2.02-3.37)	**2.90** (2.20-3.86)	**3.22** (2.38-4.41)	**3.65** (2.58-5.22)	(2
12-hr	**1.25** (1.05-1.52)	**1.62** (1.35-1.97)	**2.10** (1.74-2.55)	**2.49** (2.05-3.05)	**3.01** (2.40-3.82)	**3.41** (2.66-4.43)	**3.82** (2.90-5.08)	**4.24** (3.13-5.80)	**4.80** (3.39-6.86)	(3
24-hr	**1.62** (1.43-1.87)	**2.12** (1.88-2.45)	**2.78** (2.45-3.22)	**3.32** (2.90-3.87)	**4.04** (3.42-4.86)	**4.59** (3.81-5.64)	**5.14** (4.17-6.48)	**5.72** (4.51-7.40)	**6.49** (4.91-8.74)	(5
2-day	**1.88** (1.67-2.17)	**2.51** (2.22-2.90)	**3.33** (2.94-3.86)	**4.00** (3.50-4.67)	**4.91** (4.16-5.92)	**5.61** (4.65-6.89)	**6.31** (5.11-7.95)	**7.04** (5.55-9.11)	**8.03** (6.08-10.8)	(6
3-day	**1.98** (1.75-2.28)	**2.67** (2.36-3.09)	**3.58** (3.16-4.15)	**4.33** (3.79-5.05)	**5.34** (4.53-6.44)	**6.13** (5.08-7.54)	**6.93** (5.61-8.73)	**7.75** (6.11-10.0)	**8.88** (6.72-12.0)	(7
4-day	**2.14** (1.90-2.47)	**2.92** (2.58-3.37)	**3.94** (3.47-4.56)	**4.78** (4.18-5.57)	**5.93** (5.02-7.14)	**6.82** (5.66-8.39)	**7.73** (6.26-9.74)	**8.68** (6.84-11.2)	**9.97** (7.55-13.4)	(8
7-day	**2.41** (2.13-2.78)	**3.34** (2.95-3.85)	**4.57** (4.03-5.29)	**5.59** (4.89-6.52)	**6.99** (5.92-8.42)	**8.08** (6.71-9.94)	**9.21** (7.46-11.6)	**10.4** (8.18-13.4)	**12.0** (9.08-16.2)	(9
10-day	**2.53** (2.24-2.92)	**3.54** (3.13-4.09)	**4.89** (4.31-5.66)	**6.01** (5.26-7.02)	**7.56** (6.41-9.12)	**8.78** (7.29-10.8)	**10.0** (8.13-12.6)	**11.3** (8.95-14.7)	**13.2** (9.97-17.7)	(1
20-day	**3.07** (2.71-3.54)	**4.33** (3.83-5.00)	**6.05** (5.34-7.00)	**7.49** (6.55-8.74)	**9.51** (8.06-11.5)	**11.1** (9.22-13.7)	**12.8** (10.4-16.1)	**14.6** (11.5-18.8)	**17.0** (12.9-22.9)	(1
30-day	**3.64** (3.23-4.20)	**5.13** (4.54-5.93)	**7.17** (6.32-8.29)	**8.88** (7.77-10.4)	**11.3** (9.58-13.6)	**13.3** (11.0-16.3)	**15.3** (12.4-19.3)	**17.5** (13.8-22.6)	**20.5** (15.6-27.7)	(1
45-day	**4.31** (3.82-4.97)	**6.00** (5.31-6.93)	**8.33** (7.34-9.64)	**10.3** (9.02-12.0)	**13.1** (11.1-15.8)	**15.4** (12.8-19.0)	**17.9** (14.5-22.5)	**20.5** (16.1-26.5)	**24.2** (18.3-32.6)	(1
60-day	**5.01** (4.43-5.78)	**6.86** (6.06-7.92)	**9.42** (8.31-10.9)	**11.6** (10.2-13.6)	**14.8** (12.5-17.8)	**17.4** (14.4-21.4)	**20.1** (16.3-25.4)	**23.1** (18.2-29.9)	**27.4** (20.8-36.9)	(2

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency est (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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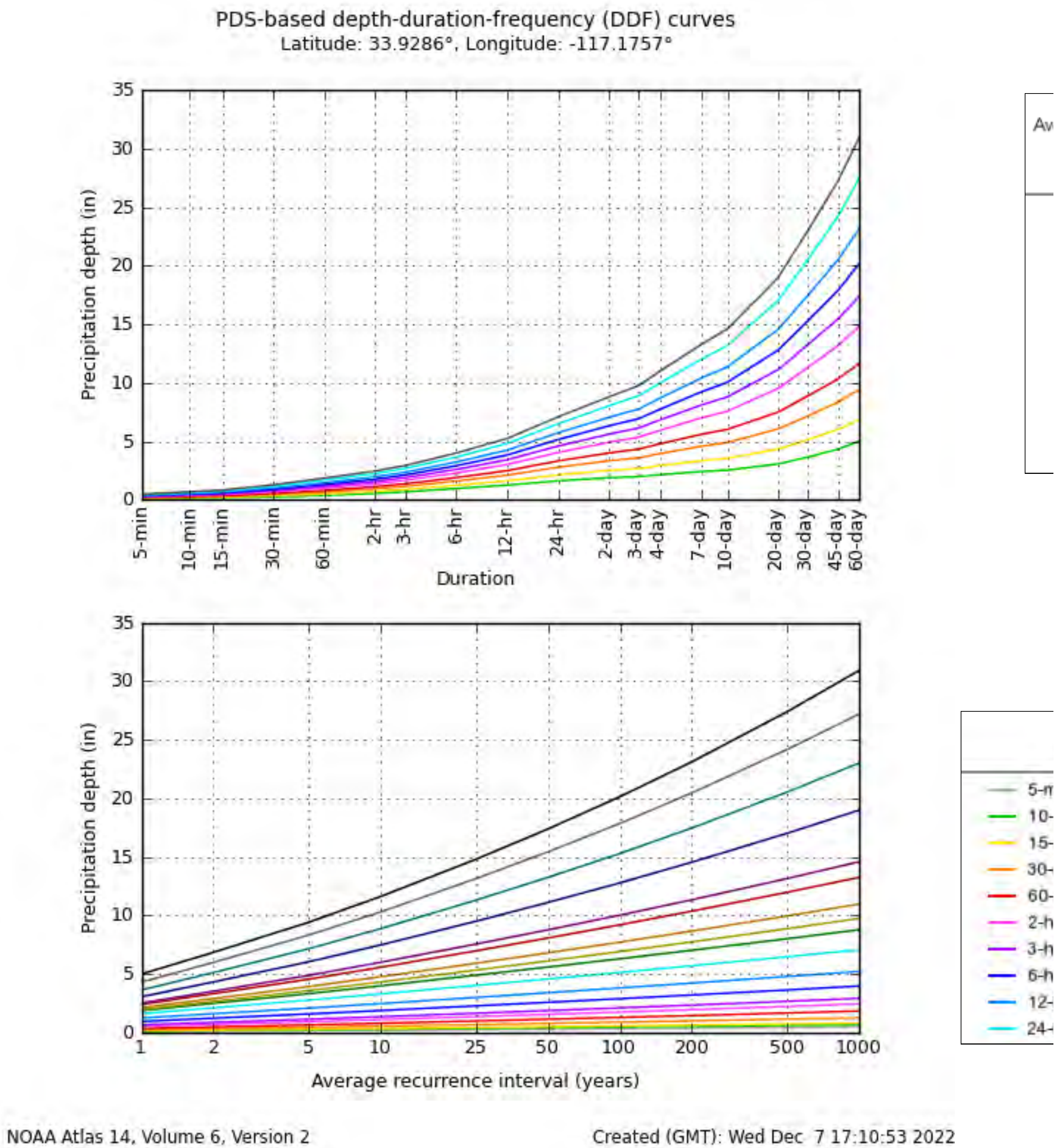
PF graphical



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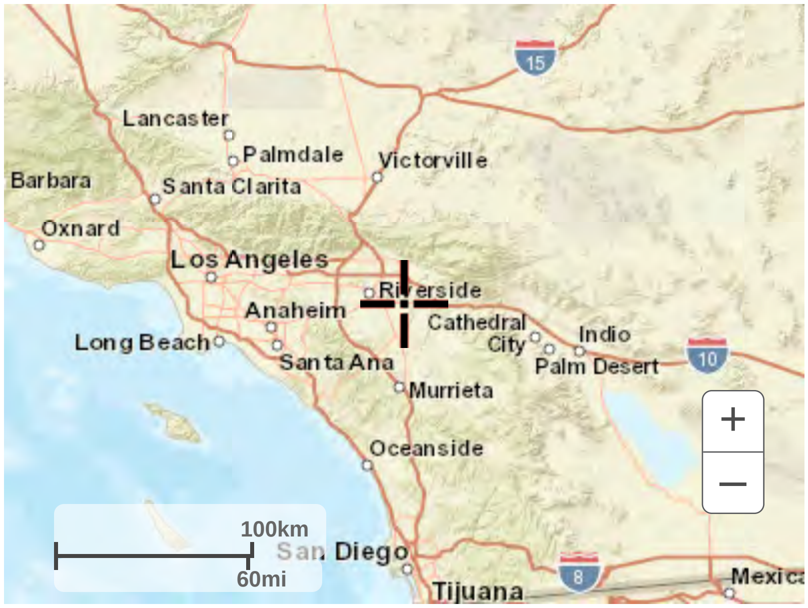
Maps & aerials

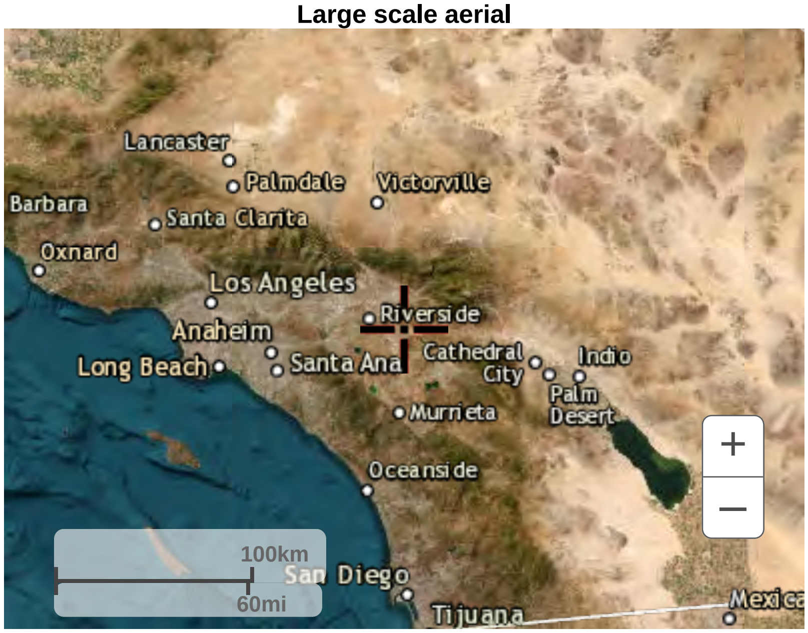
Small scale terrain

Large scale terrain

Large scale map



Large scale aerial



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