Appendix F

Project Specific Water Quality Management Plan

Cal Land Engineering, Inc

April 25, 2022

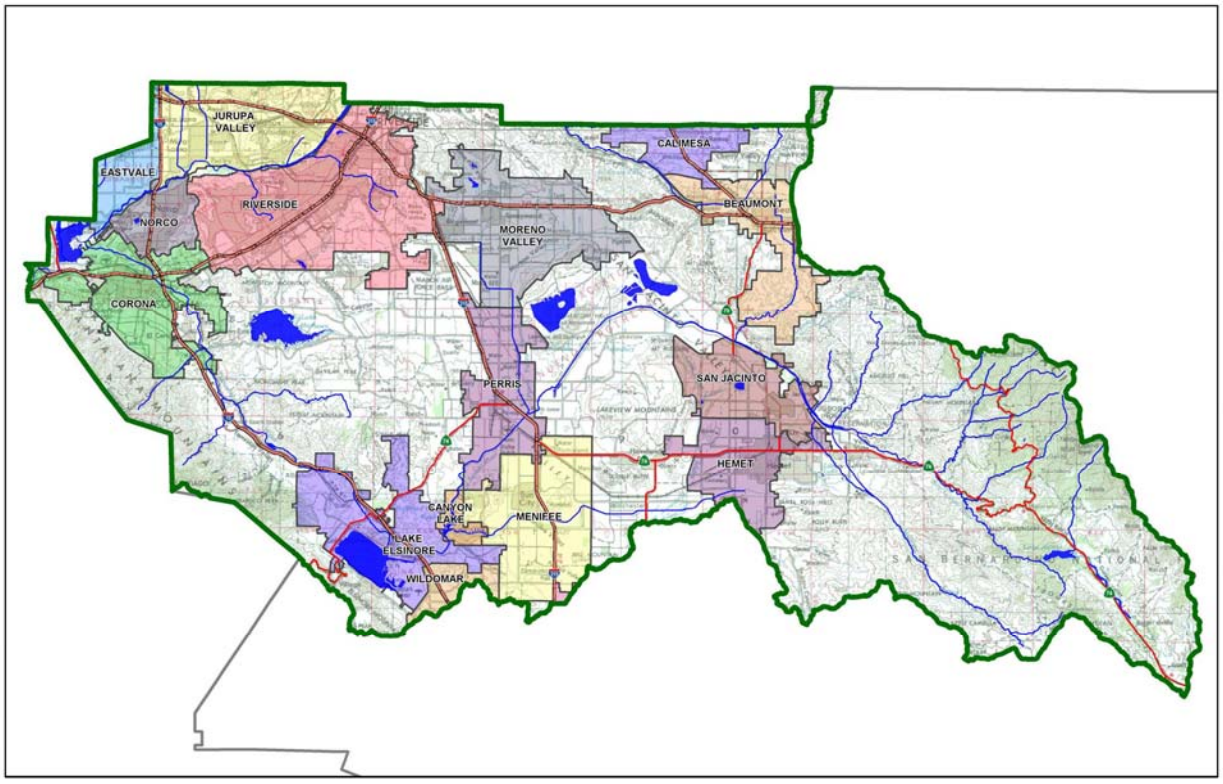
Project Specific Water Quality Management Plan

*A Template for Projects located within the **Santa Ana Watershed** Region of Riverside County*

Project Title: Commercial

Development No:

Design Review/Case No:



☒ **Preliminary**
☐ **Final**

Original Date Prepared: 04/25/2022

Revision Date(s):

Prepared for Compliance with
Regional Board Order No. **R8-2010-0033**
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OWNER'S CERTIFICATION

This Project-Specific Water Quality Management Plan (WQMP) has been prepared for T.J. Build by Cal Land Engineering, Inc. for the Commercial project.

This WQMP is intended to comply with the requirements of City of Perris for <Insert Ordinance No.> which includes the requirement for the preparation and implementation of a Project-Specific WQMP.

The undersigned, while owning the property/project described in the preceding paragraph, shall be responsible for the implementation and funding of this WQMP and will ensure that this WQMP is amended as appropriate to reflect up-to-date conditions on the site. In addition, the property owner accepts responsibility for interim operation and maintenance of Stormwater BMPs until such time as this responsibility is formally transferred to a subsequent owner. This WQMP will be reviewed with the facility operator, facility supervisors, employees, tenants, maintenance and service contractors, or any other party (or parties) having responsibility for implementing portions of this WQMP. At least one copy of this WQMP will be maintained at the project site or project office in perpetuity. The undersigned is authorized to certify and to approve implementation of this WQMP. The undersigned is aware that implementation of this WQMP is enforceable under City of Perris Water Quality Ordinance (Municipal Code Section).

"I, the undersigned, certify under penalty of law that the provisions of this WQMP have been reviewed and accepted and that the WQMP will be transferred to future successors in interest."

	04/25/2022
Owner's Signature	Date
T.J. Build	Owner
Owner's Printed Name	Owner's Title/Position

PREPARER'S CERTIFICATION

"The selection, sizing and design of stormwater treatment and other stormwater quality and quantity control measures in this plan meet the requirements of Regional Water Quality Control Board Order No. **R8-2010-0033** and any subsequent amendments thereto."

	04/25/2022
Preparer's Signature	Date
Jack Lee	Engineer
Preparer's Printed Name	Preparer's Title/Position

Preparer's Licensure: 40870

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Section A: Project and Site Information

PROJECT INFORMATION		
Type of Project:	Commercial	
Planning Area:		
Community Name:		
Development Name:		
PROJECT LOCATION		
Latitude & Longitude (DMS): 33.758054, -117.226345		
Project Watershed and Sub-Watershed: Santa Ana Watershed		
Gross Acres: 1.08 (Disturbed)		
APN(s): 330-080-006		
Map Book and Page No.: Portion of the Southerly 25 Acres of the Southeast quarter of the southeast quarter of section 6. Township 5 South, Range 3 West, San Bernardino Base and Meridian		
PROJECT CHARACTERISTICS		
Proposed or Potential Land Use(s)	Commercial	
Proposed or Potential SIC Code(s)		
Area of Impervious Project Footprint (SF)	41,253.56	
Total Area of proposed Impervious Surfaces within the Project Footprint (SF)/or Replacement	41,253.56	
Does the project consist of offsite road improvements?	☐ Y	☒ N
Does the project propose to construct unpaved roads?	☐ Y	☒ N
Is the project part of a larger common plan of development (phased project)?	☐ Y	☒ N
EXISTING SITE CHARACTERISTICS		
Total area of existing Impervious Surfaces within the Project limits Footprint (SF)	0	
Is the project located within any MSHCP Criteria Cell?	☐ Y	☐ N
If so, identify the Cell number:		
Are there any natural hydrologic features on the project site?	☐ Y	☒ N
Is a Geotechnical Report attached?	☐ Y	☒ N
If no Geotech. Report, list the NRCS soils type(s) present on the site (A, B, C and/or D)	C	
What is the Water Quality Design Storm Depth for the project?	0.60	

A.1 Maps and Site Plans

When completing your Project-Specific WQMP, include a map of the local vicinity and existing site. In addition, include all grading, drainage, landscape/plant palette and other pertinent construction plans in Appendix 2. At a **minimum**, your WQMP Site Plan should include the following:

- Drainage Management Areas
- Proposed Structural BMPs
- Drainage Path
- Drainage Infrastructure, Inlets, Overflows
- Source Control BMPs
- Buildings, Roof Lines, Downspouts
- Impervious Surfaces
- Standard Labeling
- BMP Locations (Lat/Long)

A.2 Identify Receiving Waters

Using Table A.1 below, list in order of upstream to downstream, the receiving waters that the project site is tributary to. Continue to fill each row with the Receiving Water's 303(d) listed impairments (if any), designated beneficial uses, and proximity, if any, to a RARE beneficial use. Include a map of the receiving waters in Appendix 1.

Table A.1 Identification of Receiving Waters

Receiving Waters	EPA Approved 303(d) List Impairments	Designated Beneficial Uses	Proximity to RARE Beneficial Use
San Jacinto River Reach 3 (Canyon Lake (Railroad Canyon Reservoir) to Nuevo)	N/A	WARM and COLD	9.6 miles
canyon lake (railroad canyon reservoir)	Nutrients	WARM	453 Acres
San Jacinto River, Reach 1 (Lake Elsinore to Canyon Lake (Railroad Canyon Reservoir)	N/A	WARM	5.1 Miles
Elsinore, Lake	DDT (Dichlorodiphenyltrichloroethane), Nutrients, Organic Enrichment/Low Dissolved Oxygen, PCBs (Polychlorinated biphenyls), Toxicity	WARM and COMM	2431 Acres

A.3 Additional Permits/Approvals required for the Project:

Table A.2 Other Applicable Permits

Agency	Permit Required	
State Department of Fish and Game, 1602 Streambed Alteration Agreement	☐ Y	☒ N
State Water Resources Control Board, Clean Water Act (CWA) Section 401 Water Quality Cert.	☐ Y	☒ N
US Army Corps of Engineers, CWA Section 404 Permit	☐ Y	☒ N
US Fish and Wildlife, Endangered Species Act Section 7 Biological Opinion	☐ Y	☒ N
Statewide Construction General Permit Coverage	☐ Y	☒ N
Statewide Industrial General Permit Coverage	☐ Y	☒ N
Western Riverside MSHCP Consistency Approval (e.g., JPR, DBESP)	☐ Y	☒ N
Other *(please list in the space below as required)*	☐ Y	☒ N

Section B: Optimize Site Utilization (LID Principles)

Review of the information collected in Section 'A' will aid in identifying the principal constraints on site design and selection of LID BMPs as well as opportunities to reduce imperviousness and incorporate LID Principles into the site and landscape design. For example, constraints might include impermeable soils, high groundwater, groundwater pollution or contaminated soils, steep slopes, geotechnical instability, high-intensity land use, heavy pedestrian or vehicular traffic, utility locations or safety concerns. Opportunities might include existing natural areas, low areas, oddly configured or otherwise unbuildable parcels, easements and landscape amenities including open space and buffers (which can double as locations for bioretention BMPs), and differences in elevation (which can provide hydraulic head). Prepare a brief narrative for each of the site optimization strategies described below. This narrative will help you as you proceed with your LID design and explain your design decisions to others.

The 2010 Santa Ana MS4 Permit further requires that LID Retention BMPs (Infiltration Only or Harvest and Use) be used unless it can be shown that those BMPs are infeasible. Therefore, it is important that your narrative identify and justify if there are any constraints that would prevent the use of those categories of LID BMPs. Similarly, you should also note opportunities that exist which will be utilized during project design. Upon completion of identifying Constraints and Opportunities, include these on your WQMP Site plan in Appendix 1.

Consideration of "highest and best use" of the discharge should also be considered. For example, Lake Elsinore is evaporating faster than runoff from natural precipitation can recharge it. Requiring infiltration of 85% of runoff events for projects tributary to Lake Elsinore would only exacerbate current water quality problems associated with Pollutant concentration due to lake water evaporation. In cases where rainfall events have low potential to recharge Lake Elsinore (i.e. no hydraulic connection between groundwater to Lake Elsinore, or other factors), requiring infiltration of Urban Runoff from projects is counterproductive to the overall watershed goals. Project proponents, in these cases, would be allowed to discharge Urban Runoff, provided they used equally effective filtration-based BMPs.

Site Optimization

The following questions are based upon Section 3.2 of the WQMP Guidance Document. Review of the WQMP Guidance Document will help you determine how best to optimize your site and subsequently identify opportunities and/or constraints, and document compliance.

Did you identify and preserve existing drainage patterns? If so, how? If not, why?

Natural drainage pattern is identified by the existing contour lines showing a sheet flow flowing to the north east of property or to the adjacent lot. Natural drainage was preserve and Infiltration Trench was proposed on site. Stormwater will go through the proposed Infiltration Trench, before it goes to the street and to the adjacent lot.

Did you identify and protect existing vegetation? If so, how? If not, why?

There is no establish natural vegetation on the project site. This project will introduce and maintain drought tolerant plants and grass on all open pervious areas on the project site.

Did you identify and preserve natural infiltration capacity? If so, how? If not, why?

Not applicable, no existing natural infiltration area on-site

Did you identify and minimize impervious area? If so, how? If not, why?

Yes, Parkways and parking lot aisles are design to the minimum requirement of the City and no decorative paving will be proposed on the landscape design.

Did you identify and disperse runoff to adjacent pervious areas? If so, how? If not, why?

Yes, most of the storm water will be stored and percolate to the proposed Infiltration Trench that is located at the north and east of the property.

Section C: Delineate Drainage Management Areas (DMAs)

Utilizing the procedure in Section 3.3 of the WQMP Guidance Document which discusses the methods of delineating and mapping your project site into individual DMAs, complete Table C.1 below to appropriately categorize the types of classification (e.g., Type A, Type B, etc.) per DMA for your project site. Upon completion of this table, this information will then be used to populate and tabulate the corresponding tables for their respective DMA classifications.

Table C.1 DMA Classifications

DMA Name or ID	Surface Type(s)[1][2]	Area (Sq. Ft.)	DMA Type
A1	Landscape	26,387.96	Type A
D1	Driveway, Parking and Building to Infiltration Trench	41,253.56	Type B

[1]Reference Table 2-1 in the WQMP Guidance Document to populate this column
[2]If multi-surface provide back-up

Table C.2 Type 'A', Self-Treating Areas

DMA Name or ID	Area (Sq. Ft.)	Stabilization Type	Irrigation Type (if any)
A1	Landscape	26,387.96	Type A

Table C.3 Type 'B', Self-Retaining Areas

Self-Retaining Area				**Type 'C' DMAs that are draining to the Self-Retaining Area**		
DMA Name/ ID	Post-project surface type	Area (square feet) [A]	Storm Depth (inches) [B]	DMA Name / ID	[C] from Table C.4 = [C]	Required Retention Depth (inches) [D]

$$[D] = [B] + \frac{[B] \cdot [C]}{[A]}$$

Table C.4 Type 'C', Areas that Drain to Self-Retaining Areas

DMA					Receiving Self-Retaining DMA		
DMA Name/ ID	Area (square feet)	Post-project surface type	Impervious fraction	Product		Area (square feet)	Ratio
	[A]		[B]	[C] = [A] x [B]	DMA name /ID	[D]	[C]/[D]

Table C.5 Type 'D', Areas Draining to BMPs

DMA Name or ID	BMP Name or ID
D1	Infiltration Trench

Note: More than one drainage management area can drain to a single LID BMP, however, one drainage management area may not drain to more than one BMP.

Section D: Implement LID BMPs

D.1 Infiltration Applicability

Is there an approved downstream 'Highest and Best Use' for stormwater runoff (see discussion in Chapter 2.4.4 of the WQMP Guidance Document for further details)? ☐ Y ☒ N

If yes has been checked, Infiltration BMPs shall not be used for the site; proceed to section D.3

If no, continue working through this section to implement your LID BMPs. It is recommended that you contact your Co-Permittee to verify whether or not your project discharges to an approved downstream 'Highest and Best Use' feature.

Geotechnical Report

A Geotechnical Report or Phase I Environmental Site Assessment may be required by the Copermittee to confirm present and past site characteristics that may affect the use of Infiltration BMPs. In addition, the Co-Permittee, at their discretion, may not require a geotechnical report for small projects as described in Chapter 2 of the WQMP Guidance Document. If a geotechnical report has been prepared, include it in Appendix 3. In addition, if a Phase I Environmental Site Assessment has been prepared, include it in Appendix 4.

Is this project classified as a small project consistent with the requirements of Chapter 2 of the WQMP Guidance Document? ☒ Y ☐ N

Infiltration Feasibility

Table D.1 below is meant to provide a simple means of assessing which DMAs on your site support Infiltration BMPs and is discussed in the WQMP Guidance Document in Chapter 2.4.5. Check the appropriate box for each question and then list affected DMAs as applicable. If additional space is needed, add a row below the corresponding answer.

Table D.1 Infiltration Feasibility

Does the project site…	YES	NO
…have any DMAs with a seasonal high groundwater mark shallower than 10 feet?		
If Yes, list affected DMAs:		X
…have any DMAs located within 100 feet of a water supply well?		
If Yes, list affected DMAs:		X
…have any areas identified by the geotechnical report as posing a public safety risk where infiltration of stormwater could have a negative impact?		
If Yes, list affected DMAs:		X
…have measured in-situ infiltration rates of less than 1.6 inches / hour?		
If Yes, list affected DMAs:		X
…have significant cut and/or fill conditions that would preclude in-situ testing of infiltration rates at the final infiltration surface?		
If Yes, list affected DMAs:		X
…geotechnical report identify other site-specific factors that would preclude effective and safe infiltration?		
Describe here:		X

If you answered "Yes" to any of the questions above for any DMA, Infiltration BMPs should not be used for those DMAs and you should proceed to the assessment for Harvest and Use below.

D.2 Harvest and Use Assessment

Please check what applies*:*

☐ Reclaimed water will be used for the non-potable water demands for the project.

☐Downstream water rights may be impacted by Harvest and Use as approved by the Regional Board (verify with the Copermittee).

☒The Design Capture Volume will be addressed using Infiltration Only BMPs. In such a case, Harvest and Use BMPs are still encouraged, but it would not be required if the Design Capture Volume will be infiltrated or evapotranspired.

If any of the above boxes have been checked, Harvest and Use BMPs need not be assessed for the site. If none of the above criteria applies, follow the steps below to assess the feasibility of irrigation use, toilet use and other non-potable uses (e.g., industrial use).

Irrigation Use Feasibility

Complete the following steps to determine the feasibility of harvesting stormwater runoff for Irrigation Use BMPs on your site:

Step 1: Identify the total area of irrigated landscape on the site, and the type of landscaping used.

Total Area of Irrigated Landscape: Insert Area (Acres)

Type of Landscaping (Conservation Design or Active Turf): List Landscaping Type

Step 2: Identify the planned total of all impervious areas on the proposed project from which runoff might be feasibly captured and stored for irrigation use. Depending on the configuration of buildings and other impervious areas on the site, you may consider the site as a whole, or parts of the site, to evaluate reasonable scenarios for capturing and storing runoff and directing the stored runoff to the potential use(s) identified in Step 1 above.

Total Area of Impervious Surfaces: 41,253.56 SF. = 0.95 Acres

Step 3: Cross reference the Design Storm depth for the project site (see Exhibit A of the WQMP Guidance Document) with the left column of Table 2-3 in Chapter 2 to determine the minimum area of Effective Irrigated Area per Tributary Impervious Area (EIATIA).

Enter your EIATIA factor: EIATIA Factor

Step 4: Multiply the unit value obtained from Step 3 by the total of impervious areas from Step 2 to develop the minimum irrigated area that would be required.

Minimum required irrigated area: Insert Area (Acres)

Step 5: Determine if harvesting stormwater runoff for irrigation use is feasible for the project by comparing the total area of irrigated landscape (Step 1) to the minimum required irrigated area (Step 4).

Minimum required irrigated area (Step 4)	Available Irrigated Landscape (Step 1)
Insert Area (Acres)	Insert Area (Acres)

Toilet Use Feasibility

Complete the following steps to determine the feasibility of harvesting stormwater runoff for toilet flushing uses on your site:

Step 1: Identify the projected total number of daily toilet users during the wet season, and account for any periodic shut downs or other lapses in occupancy:

Projected Number of Daily Toilet Users: Number of daily Toilet Users

Project Type: Enter 'Residential', 'Commercial', 'Industrial' or 'Schools'

Step 2: Identify the planned total of all impervious areas on the proposed project from which runoff might be feasibly captured and stored for toilet use. Depending on the configuration of buildings and other impervious areas on the site, you may consider the site as a whole, or parts of the site, to evaluate reasonable scenarios for capturing and storing runoff and directing the stored runoff to the potential use(s) identified in Step 1 above.

Total Area of Impervious Surfaces: Insert Area (Acres)

Step 3: Enter the Design Storm depth for the project site (see Exhibit A) into the left column of Table 2-2 in Chapter 2 to determine the minimum number or toilet users per tributary impervious acre (TUTIA).

Enter your TUTIA factor: TUTIA Factor

Step 4: Multiply the unit value obtained from Step 3 by the total of impervious areas from Step 2 to develop the minimum number of toilet users that would be required.

Minimum number of toilet users: Required number of toilet users

Step 5: Determine if harvesting stormwater runoff for toilet flushing use is feasible for the project by comparing the Number of Daily Toilet Users (Step 1) to the minimum required number of toilet users (Step 4).

Minimum required Toilet Users (Step 4)	**Projected number of toilet users (Step 1)**
Insert Area (Acres)	Insert Area (Acres)

Other Non-Potable Use Feasibility

Are there other non-potable uses for stormwater runoff on the site (e.g. industrial use)? See Chapter 2 of the Guidance for further information. If yes, describe below. If no, write N/A.

Insert narrative description here.

Step 1: Identify the projected average daily non-potable demand, in gallons per day, during the wet season and accounting for any periodic shut downs or other lapses in occupancy or operation.

Average Daily Demand: Projected Average Daily Use (gpd)

Step 2: Identify the planned total of all impervious areas on the proposed project from which runoff might be feasibly captured and stored for the identified non-potable use. Depending on the configuration of buildings and other impervious areas on the site, you may consider the site as a whole, or parts of the site, to evaluate reasonable scenarios for capturing and storing runoff and directing the stored runoff to the potential use(s) identified in Step 1 above.

Total Area of Impervious Surfaces: Insert Area (Acres)

Step 3: Enter the Design Storm depth for the project site (see Exhibit A) into the left column of Table 2-4 in Chapter 2 to determine the minimum demand for non-potable uses per tributary impervious acre.

Enter the factor from Table 2-4: Enter Value

Step 4: Multiply the unit value obtained from Step 3 by the total of impervious areas from Step 2 to develop the minimum number of gallons per day of non-potable use that would be required.

Minimum required use: Minimum use required (gpd)

Step 5: Determine if harvesting stormwater runoff for other non-potable use is feasible for the project by comparing the projected average daily use (Step 1) to the minimum required non-potable use (Step 4).

Minimum required non-potable use (Step 4)	**Projected average daily use (Step 1)**
Minimum use required (gpd)	Projected Average Daily Use (gpd)

If Irrigation, Toilet and Other Use feasibility anticipated demands are less than the applicable minimum values, Harvest and Use BMPs are not required and you should proceed to utilize LID Bioretention and Biotreatment per Section 3.4.2 of the WQMP Guidance Document.

D.3 Bioretention and Biotreatment Assessment

Other LID Bioretention and Biotreatment BMPs as described in Chapter 2.4.7 of the WQMP Guidance Document are feasible on nearly all development sites with sufficient advance planning.

Select one of the following:

☐ LID Bioretention/Biotreatment BMPs will be used for some or all DMAs of the project as noted below in Section D.4 (note the requirements of Section 3.4.2 in the WQMP Guidance Document).

☐ A site-specific analysis demonstrating the technical infeasibility of all LID BMPs has been performed and is included in Appendix 5. If you plan to submit an analysis demonstrating the technical infeasibility of LID BMPs, request a pre-submittal meeting with the Copermittee to discuss this option. Proceed to Section E to document your alternative compliance measures.

☒ None of the above.

D.4 Feasibility Assessment Summaries

From the Infiltration, Harvest and Use, Bioretention and Biotreatment Sections above, complete Table D.2 below to summarize which LID BMPs are technically feasible, and which are not, based upon the established hierarchy.

Table D.2 LID Prioritization Summary Matrix

DMA Name/ID	LID BMP Hierarchy				No LID (Alternative Compliance)
	1. Infiltration	2. Harvest and use	3. Bioretention	4. Biotreatment	
A1	☒	☐	☐	☐	☐
D1	☒	☐	☐	☐	☐
	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐

For those DMAs where LID BMPs are not feasible, provide a brief narrative below summarizing why they are not feasible, include your technical infeasibility criteria in Appendix 5, and proceed to Section E below to document Alternative Compliance measures for those DMAs. Recall that each proposed DMA must pass through the LID BMP hierarchy before alternative compliance measures may be considered.

Most of the Stormwater will drain to proposed Infiltration Trench

D.5 LID BMP Sizing

Each LID BMP must be designed to ensure that the Design Capture Volume will be addressed by the selected BMPs. First**,** calculate the Design Capture Volume for each LID BMP using the V_{BMP} worksheet in Appendix F of the LID BMP Design Handbook. Second**,** design the LID BMP to meet the required V_{BMP} using a method approved by the Copermittee. Utilize the worksheets found in the LID BMP Design Handbook or consult with your Copermittee to assist you in correctly sizing your LID BMPs. Complete Table D.3 below to document the Design Capture Volume and the Proposed Volume for each LID BMP. Provide the completed design procedure sheets for each LID BMP in Appendix 6. You may add additional rows to the table below as needed.

Table D.3 DCV Calculations for LID BMPs

DMA Type/ID	**DMA Area (square feet)**	**Post-Project Surface Type**	**Effective Impervious Fraction, I_f**	**DMA Runoff Factor**	**DMA Areas x Runoff Factor**	***Enter BMP Name / Identifier Here***		
	[A]		[B]	[C]	[A] x [C]			
A1	*26,387.96*	*Landscape*	*0.1*	*0.11*	*2,914.8*			
D1	*41,253.56*	*Driveway, Parking and Building*	*1*	*0.89*	*36,798.2*			
						Design Storm Depth (in)	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
	A_T = Σ[A]				Σ= [D] 39,713	[E]=0.60	[F] = 1,985.7	[G] = 93,412.50

Design Capture Volume = [F]

$$[F] = \frac{[D]x[E]}{12}$$

[B], [C] is obtained as described in Section 2.3.1 of the WQMP Guidance Document
[E] is obtained from Exhibit A in the WQMP Guidance Document
[G] is obtained from a design procedure sheet, such as in LID BMP Design Handbook and placed in Appendix 6

Section E: Alternative Compliance (LID Waiver Program)

LID BMPs are expected to be feasible on virtually all projects. Where LID BMPs have been demonstrated to be infeasible as documented in Section D, other Treatment Control BMPs must be used (subject to LID waiver approval by the Copermittee). Check one of the following Boxes:

☒ LID Principles and LID BMPs have been incorporated into the site design to fully address all Drainage Management Areas. No alternative compliance measures are required for this project and thus this Section is not required to be completed.

- *Or* -

☐ The following Drainage Management Areas are unable to be addressed using LID BMPs. A site-specific analysis demonstrating technical infeasibility of LID BMPs has been approved by the Co-Permittee and included in Appendix 5. Additionally, no downstream regional and/or sub-regional LID BMPs exist or are available for use by the project. The following alternative compliance measures on the following pages are being implemented to ensure that any pollutant loads expected to be discharged by not incorporating LID BMPs, are fully mitigated.

List DMAs here.

E.1 Identify Pollutants of Concern

Utilizing Table A.1 from Section A above which noted your project's receiving waters and their associated EPA approved 303(d) listed impairments, cross reference this information with that of your selected Priority Development Project Category in Table E.1 below. If the identified General Pollutant Categories are the same as those listed for your receiving waters, then these will be your Pollutants of Concern and the appropriate box or boxes will be checked on the last row. The purpose of this is to document compliance and to help you appropriately plan for mitigating your Pollutants of Concern in lieu of implementing LID BMPs.

Table E.1 Potential Pollutants by Land Use Type

Priority Development Project Categories and/or Project Features (check those that apply)	General Pollutant Categories							
	Bacterial Indicators	Metals	Nutrients	Pesticides	Toxic Organic Compounds	Sediments	Trash & Debris	Oil & Grease
☐ Detached Residential Development	P	N	P	P	N	P	P	P
☐ Attached Residential Development	P	N	P	P	N	P	P	P(2)
☒ Commercial/Industrial Development	P(3)	P	P(1)	P(1)	P(5)	P(1)	P	P
☐ Automotive Repair Shops	N	P	N	N	P(4, 5)	N	P	P
☐ Restaurants (>5,000 ft^2)	P	N	N	N	N	N	P	P
☐ Hillside Development (>5,000 ft^2)	P	N	P	P	N	P	P	P
☐ Parking Lots (>5,000 ft^2)	P(6)	P	P(1)	P(1)	P(4)	P(1)	P	P
☐ Retail Gasoline Outlets	N	P	N	N	P	N	P	P
Project Priority Pollutant(s) of Concern	☐	☐	☐	☐	☐	☐	☐	☐

P = Potential

N = Not Potential

(1) A potential Pollutant if non-native landscaping exists or is proposed onsite; otherwise not expected

(2) A potential Pollutant if the project includes uncovered parking areas; otherwise not expected

(3) A potential Pollutant is land use involving animal waste

(4) Specifically petroleum hydrocarbons

(5) Specifically solvents

(6) Bacterial indicators are routinely detected in pavement runoff

E.2 Stormwater Credits

Projects that cannot implement LID BMPs but nevertheless implement smart growth principles are potentially eligible for Stormwater Credits. Utilize Table 3-8 within the WQMP Guidance Document to identify your Project Category and its associated Water Quality Credit. If not applicable, write N/A.

Table E.2 Water Quality Credits

Qualifying Project Categories	Credit Percentage[2]
Total Credit Percentage[1]	

[1]Cannot Exceed 50%

[2]Obtain corresponding data from Table 3-8 in the WQMP Guidance Document

E.3 Sizing Criteria

After you appropriately considered Stormwater Credits for your project, utilize Table E.3 below to appropriately size them to the DCV, or Design Flow Rate, as applicable. Please reference Chapter 3.5.2 of the WQMP Guidance Document for further information.

Table E.3 Treatment Control BMP Sizing

DMA Type/ID	**DMA Area (square feet)**	**Post-Project Surface Type**	**Effective Impervious Fraction, I_f**	**DMA Runoff Factor**	**DMA Area x Runoff Factor**		***Enter BMP Name / Identifier Here***		
	[A]		[B]	[C]	[A] x [C]				
						Design Storm Depth (in)	*Minimum Design Capture Volume or Design Flow Rate (cubic feet or cfs)*	*Total Storm Water Credit % Reduction*	*Proposed Volume or Flow on Plans (cubic feet or cfs)*
	A_T = Σ[A]				Σ= [D]	[E]	$[F] = \frac{[D]x[E]}{[G]}$	[F] X (1-[H])	[I]

[B], [C] is obtained as described in Section 2.3.1 from the WQMP Guidance Document

[E] is for Flow-Based Treatment Control BMPs [E] = .2, for Volume-Based Control Treatment BMPs, [E] obtained from Exhibit A in the WQMP Guidance Document

[G] is for Flow-Based Treatment Control BMPs [G] = 43,560, for Volume-Based Control Treatment BMPs, [G] = 12

[H] is from the Total Credit Percentage as Calculated from Table E.2 above

[I] as obtained from a design procedure sheet from the BMP manufacturer and should be included in Appendix 6

E.4 Treatment Control BMP Selection

Treatment Control BMPs typically provide proprietary treatment mechanisms to treat potential pollutants in runoff, but do not sustain significant biological processes. Treatment Control BMPs must have a removal efficiency of a medium or high effectiveness as quantified below:

- **High**: equal to or greater than 80% removal efficiency
- **Medium**: between 40% and 80% removal efficiency

Such removal efficiency documentation (e.g., studies, reports, etc.) as further discussed in Chapter 3.5.2 of the WQMP Guidance Document, must be included in Appendix 6. In addition, ensure that proposed Treatment Control BMPs are properly identified on the WQMP Site Plan in Appendix 1.

Table E.4 Treatment Control BMP Selection

Selected Treatment Control BMP Name or ID[1]	Priority Pollutant(s) of Concern to Mitigate[2]	Removal Efficiency Percentage[3]

[1] Treatment Control BMPs must not be constructed within Receiving Waters. In addition, a proposed Treatment Control BMP may be listed more than once if they possess more than one qualifying pollutant removal efficiency.
[2] Cross Reference Table E.1 above to populate this column.
[3] As documented in a Co-Permittee Approved Study and provided in Appendix 6.

Section F: Hydromodification

F.1 Hydrologic Conditions of Concern (HCOC) Analysis

Once you have determined that the LID design is adequate to address water quality requirements, you will need to assess if the proposed LID Design may still create a HCOC. Review Chapters 2 and 3 (including Figure 3-7) of the WQMP Guidance Document to determine if your project must mitigate for Hydromodification impacts. If your project meets one of the following criteria which will be indicated by the check boxes below, you do not need to address Hydromodification at this time. However, if the project does not qualify for Exemptions 1, 2 or 3, then additional measures must be added to the design to comply with HCOC criteria. This is discussed in further detail below in Section F.2.

HCOC EXEMPTION 1: The Priority Development Project disturbs less than one acre. The Copermittee has the discretion to require a Project-Specific WQMP to address HCOCs on projects less than one acre on a case by case basis. The disturbed area calculation should include all disturbances associated with larger common plans of development.

Does the project qualify for this HCOC Exemption? ☐ Y ☒ N

If Yes, HCOC criteria do not apply.

HCOC EXEMPTION 2: The volume and time of concentration[1] of storm water runoff for the post-development condition is not significantly different from the pre-development condition for a 2-year return frequency storm (a difference of 5% or less is considered insignificant) using one of the following methods to calculate:

- Riverside County Hydrology Manual
- Technical Release 55 (TR-55): Urban Hydrology for Small Watersheds (NRCS 1986), or derivatives thereof, such as the Santa Barbara Urban Hydrograph Method
- Other methods acceptable to the Co-Permittee

Does the project qualify for this HCOC Exemption? ☐ Y ☐ N

If Yes, report results in Table F.1 below and provide your substantiated hydrologic analysis in Appendix 7.

Table F.1 Hydrologic Conditions of Concern Summary

	2 year – 24 hour		
	Pre-condition	**Post-condition**	**% Difference**
Time of Concentration	INSERT VALUE	INSERT VALUE	INSERT VALUE
Volume (Cubic Feet)	INSERT VALUE	INSERT VALUE	INSERT VALUE

[1] Time of concentration is defined as the time after the beginning of the rainfall when all portions of the drainage basin are contributing to flow at the outlet.

HCOC EXEMPTION 3: All downstream conveyance channels to an adequate sump (for example, Prado Dam, Lake Elsinore, Canyon Lake, Santa Ana River, or other lake, reservoir or naturally erosion resistant feature) that will receive runoff from the project are engineered and regularly maintained to ensure design flow capacity; no sensitive stream habitat areas will be adversely affected; or are not identified on the Co-Permittees Hydromodification Susceptibility Maps.

Does the project qualify for this HCOC Exemption? ☐ Y ☒ N

If Yes, HCOC criteria do not apply and note below which adequate sump applies to this HCOC qualifier:

INSERT TEXT HERE

F.2 HCOC Mitigation

If none of the above HCOC Exemption Criteria are applicable, HCOC criteria is considered mitigated if they meet one of the following conditions:

a. Additional LID BMPS are implemented onsite or offsite to mitigate potential erosion or habitat impacts as a result of HCOCs. This can be conducted by an evaluation of site-specific conditions utilizing accepted professional methodologies published by entities such as the California Stormwater Quality Association (CASQA), the Southern California Coastal Water Research Project (SCCRWP), or other Co-Permittee approved methodologies for site-specific HCOC analysis.

b. The project is developed consistent with an approved Watershed Action Plan that addresses HCOC in Receiving Waters.

c. Mimicking the pre-development hydrograph with the post-development hydrograph, for a 2-year return frequency storm. Generally, the hydrologic conditions of concern are not significant, if the post-development hydrograph is no more than 10% greater than pre-development hydrograph. In cases where excess volume cannot be infiltrated or captured and reused, discharge from the site must be limited to a flow rate no greater than 110% of the pre-development 2-year peak flow.

Be sure to include all pertinent documentation used in your analysis of the items a, b or c in Appendix 7.

Section G: Source Control BMPs

Source control BMPs include permanent, structural features that may be required in your project plans — such as roofs over and berms around trash and recycling areas — and Operational BMPs, such as regular sweeping and "housekeeping", that must be implemented by the site's occupant or user. The MEP standard typically requires both types of BMPs. In general, Operational BMPs cannot be substituted for a feasible and effective permanent BMP. Using the Pollutant Sources/Source Control Checklist in Appendix 8, review the following procedure to specify Source Control BMPs for your site:

1. ***Identify Pollutant Sources*:** Review Column 1 in the Pollutant Sources/Source Control Checklist. Check off the potential sources of Pollutants that apply to your site.

2. ***Note Locations on Project-Specific WQMP Exhibit*:** Note the corresponding requirements listed in Column 2 of the Pollutant Sources/Source Control Checklist. Show the location of each Pollutant source and each permanent Source Control BMP in your Project-Specific WQMP Exhibit located in Appendix 1.

3. ***Prepare a Table and Narrative*:** Check off the corresponding requirements listed in Column 3 in the Pollutant Sources/Source Control Checklist. In the left column of Table G.1 below, list each potential source of runoff Pollutants on your site (from those that you checked in the Pollutant Sources/Source Control Checklist). In the middle column, list the corresponding permanent, Structural Source Control BMPs (from Columns 2 and 3 of the Pollutant Sources/Source Control Checklist) used to prevent Pollutants from entering runoff. **Add additional narrative** in this column that explains any special features, materials or methods of construction that will be used to implement these permanent, Structural Source Control BMPs.

4. ***Identify Operational Source Control BMPs:*** To complete your table, refer once again to the Pollutant Sources/Source Control Checklist. List in the right column of your table the Operational BMPs that should be implemented as long as the anticipated activities continue at the site. Copermittee stormwater ordinances require that applicable Source Control BMPs be implemented; the same BMPs may also be required as a condition of a use permit or other revocable Discretionary Approval for use of the site.

Table G.1 Permanent and Operational Source Control Measures

Potential Sources of Runoff pollutants	Permanent Structural Source Control BMPs	Operational Source Control BMPs
D1. Need for future indoor and structural pest control	Note building design features that discourage entry of pests.	Provide Integrated Pest Management information to owners, lessees, and operators.
D2. Landscape / Outdoor Pesticide Use	Preserve existing native trees, shrubs, and ground cover to the maximum extent possible. Design landscaping to minimize irrigation and runoff, to promote surface infiltration where appropriate, and to minimize the use of fertilizers and pesticides	Maintain landscaping using minimum or no pesticides. See applicable operational BPMs in "What you should know for…..Landscape and Gardening" at http://rcflood.org/stormwater

	that can contribute to stormwater pollution. Consider using pest-resistant plants, especially adjacent to hardscape. To insure successful establishment, select plants appropriate to site soils, slopes, climate, sun, wind, rain, land use, air movement, ecological consistency, and plant interactions.	Provide IPM information to new owners, lessees and operators.
O. Miscellaneous Drain or Wash Water or other Sources. Rooftop equipment Roofing, gutters, and trim.	Rooftop equipment with potential to produce pollutants shall be roofed and / or have secondary containment. Avoid roofing, gutters, and trim made of copper or other unprotected metals that may leach into runoff.	
P. Plazas, sidewalks, and parking lots.		Sweep plazas, sidewalks, and parking lots regularly to prevent accumulation of litter and debris. Collect debris from pressure washing to prevent entry into the storm drain system. Collect washwater containing any cleaning agent or degreaser and discharge to the sanitary sewer no to s storm drain.

Section H: Construction Plan Checklist

Populate Table H.1 below to assist the plan checker in an expeditious review of your project. The first two columns will contain information that was prepared in previous steps, while the last column will be populated with the corresponding plan sheets. This table is to be completed with the submittal of your final Project-Specific WQMP.

Table H.1 Construction Plan Cross-reference

BMP No. or ID	BMP Identifier and Description	Corresponding Plan Sheet(s)	BMP Location (Lat/Long)
D1	Infiltration Trench on the north and east side of property.	Sheet 1 of Preliminary Grading Plan	33.758054, -117.226345

Note that the updated table — or Construction Plan WQMP Checklist — is **only a reference tool** to facilitate an easy comparison of the construction plans to your Project-Specific WQMP. Co-Permittee staff can advise you regarding the process required to propose changes to the approved Project-Specific WQMP.

Section I: Operation, Maintenance and Funding

The Copermittee will periodically verify that Stormwater BMPs on your site are maintained and continue to operate as designed. To make this possible, your Copermittee will require that you include in Appendix 9 of this Project-Specific WQMP:

1. A means to finance and implement facility maintenance in perpetuity, including replacement cost.
2. Acceptance of responsibility for maintenance from the time the BMPs are constructed until responsibility for operation and maintenance is legally transferred. A warranty covering a period following construction may also be required.
3. An outline of general maintenance requirements for the Stormwater BMPs you have selected.
4. Figures delineating and designating pervious and impervious areas, location, and type of Stormwater BMP, and tables of pervious and impervious areas served by each facility. Geo-locating the BMPs using a coordinate system of latitude and longitude is recommended to help facilitate a future statewide database system.
5. A separate list and location of self-retaining areas or areas addressed by LID Principles that do not require specialized O&M or inspections but will require typical landscape maintenance as noted in Chapter 5, pages 85-86, in the WQMP Guidance. Include a brief description of typical landscape maintenance for these areas.

Your local Co-Permittee will also require that you prepare and submit a detailed Stormwater BMP Operation and Maintenance Plan that sets forth a maintenance schedule for each of the Stormwater BMPs built on your site. An agreement assigning responsibility for maintenance and providing for inspections and certification may also be required.

Details of these requirements and instructions for preparing a Stormwater BMP Operation and Maintenance Plan are in Chapter 5 of the WQMP Guidance Document.

Maintenance Mechanism: WQMP Maintenance Agreement

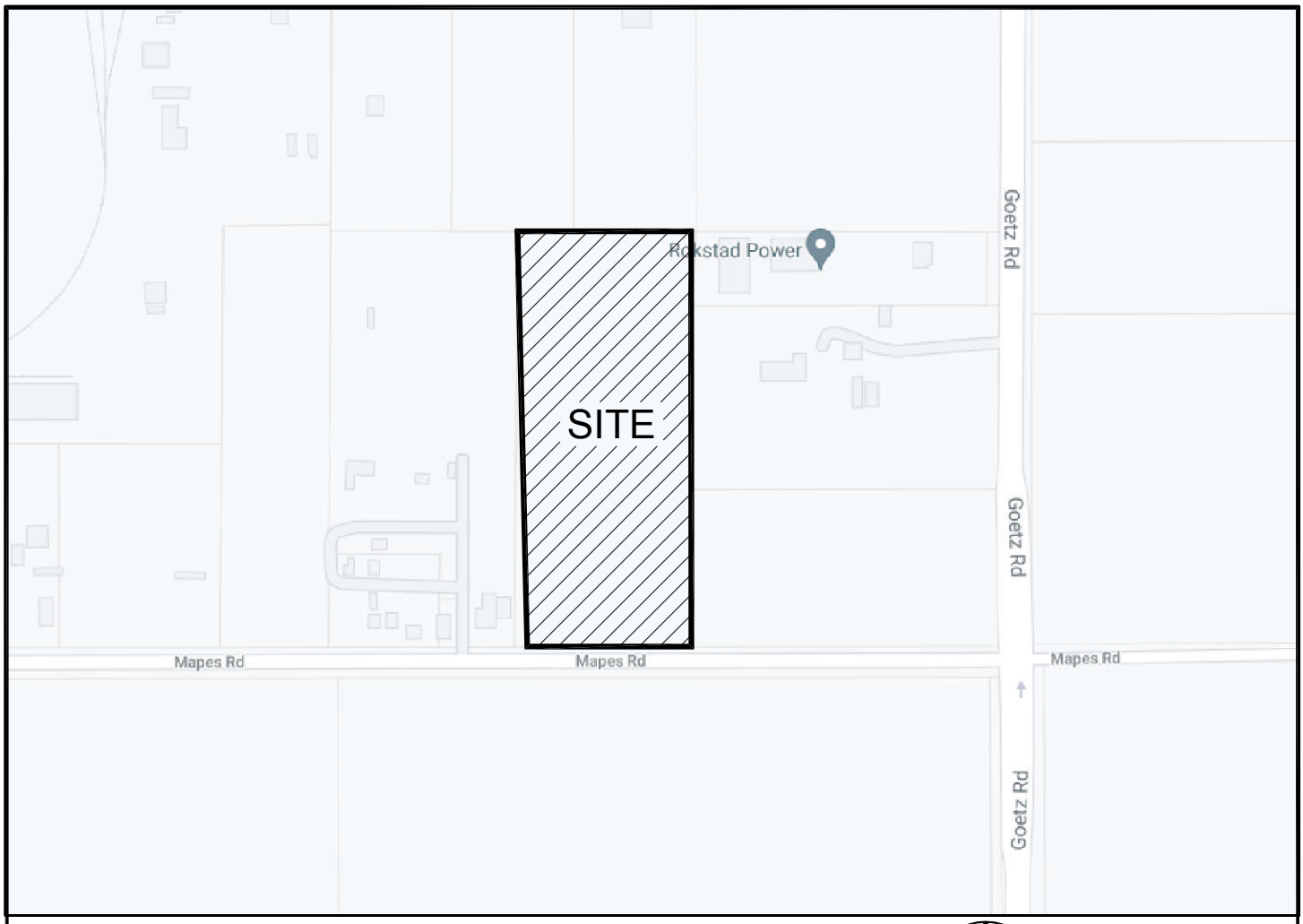
Will the proposed BMPs be maintained by a Home Owners' Association (HOA) or Property Owners Association (POA)?

☐ Y ☒ N

Include your Operation and Maintenance Plan and Maintenance Mechanism in Appendix 9. Additionally, include all pertinent forms of educational materials for those personnel that will be maintaining the proposed BMPs within this Project-Specific WQMP in Appendix 10.

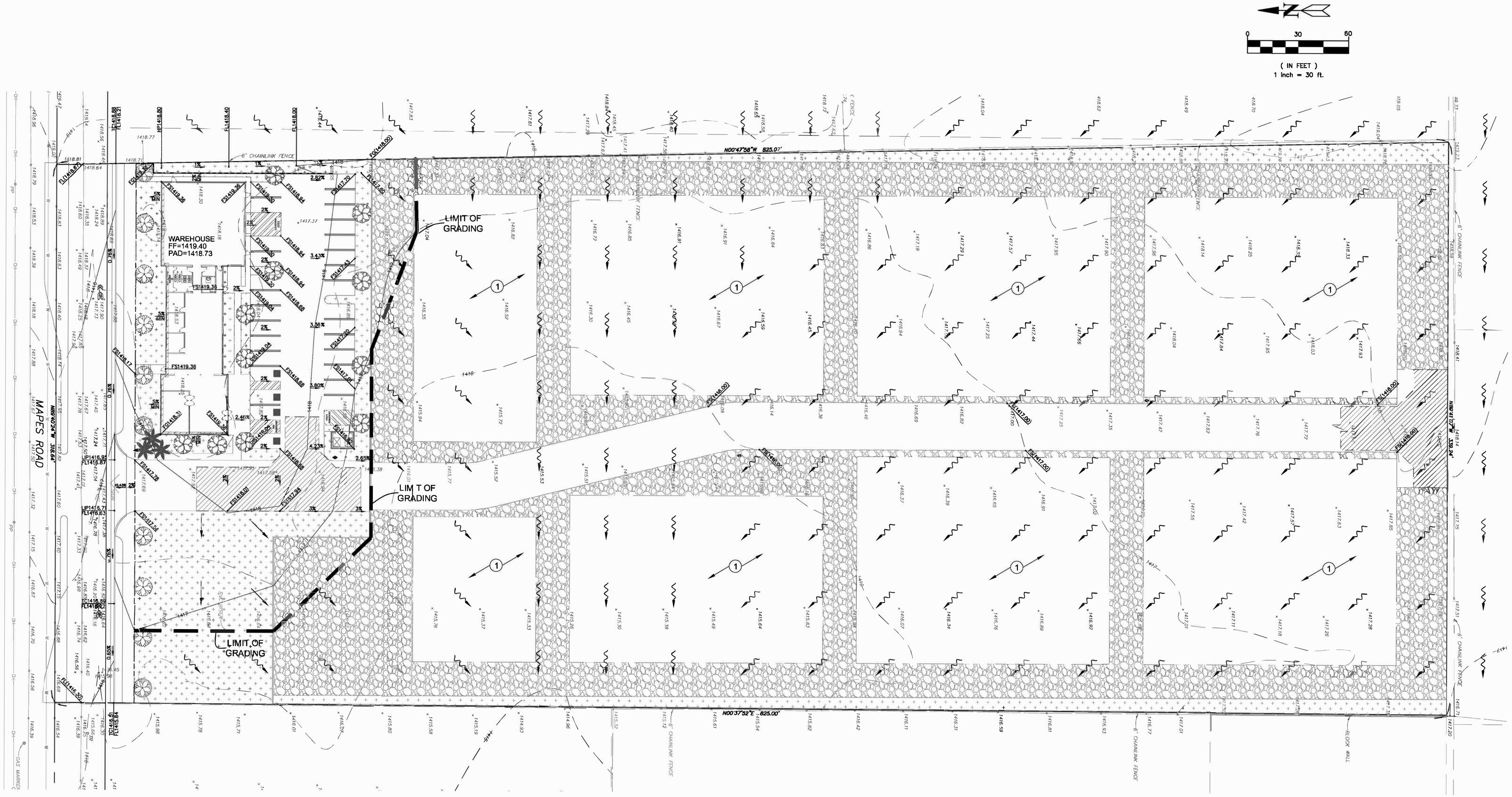
Appendix 1: Maps and Site Plans

Location Map, WQMP Site Plan and Receiving Waters Map



VICINITY MAP

WQMP SITE PLAN



A1 = 26,387.96 S.F.
D1 = 41,253.56 S.F.

CONSTRUCTION NOTES:

① INFILTRATION TRENCH

LEGEND:

....LANDSCAPE AREA

....INFILTRATION TRENCH

....EXISTING DRAINAGE FLOW

REGISTERED PROFESSIONAL ENGINEER
JACK C. S. LEE
40870
Exp. 3-31-23
CIVIL
STATE OF CALIFORNIA

CALLAND ENGINEERING, INC.
dba QUARTECH CONSULTANTS
576 E. LAMBERT ROAD, BREA, CA 92821
TEL: (714) 671-1050 FAX: (714) 671-1090

PROJECT LOCATION:
APN: 330-080-006
MAPES ROAD,
PERRIS, CA 92570

DRAWN: PS
CHECKED:
DATE: 04/25/2022
JOB. NO.: 21-188-001
SCALE: 1" = 30'
FILE NAME:

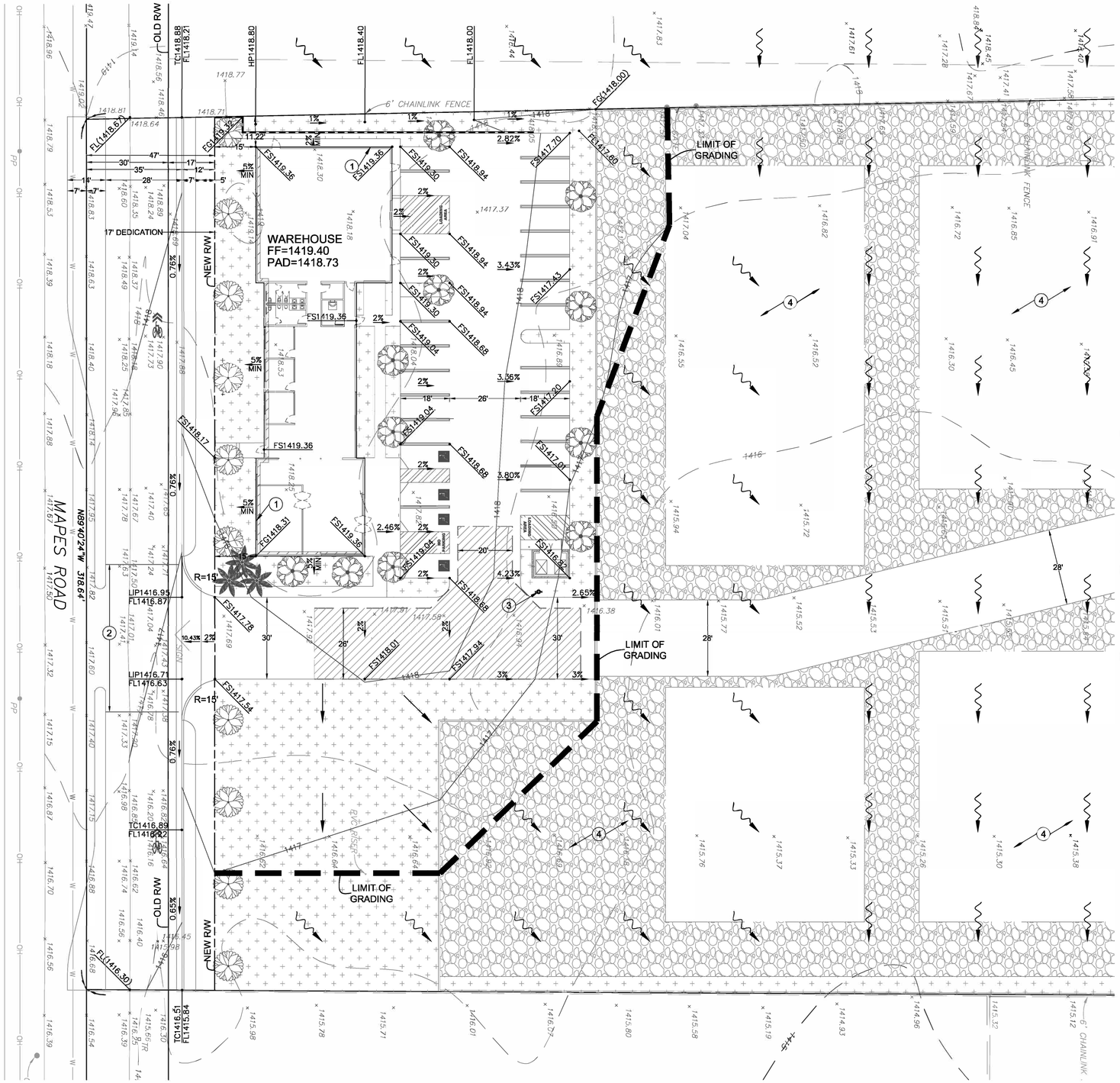
W-1

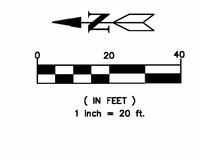
SHEET 1 OF 1

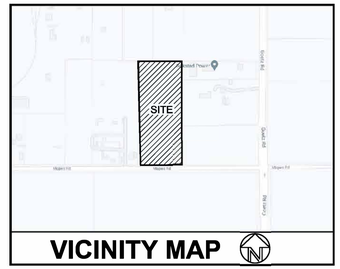
Appendix 2: Construction Plans

Grading and Drainage Plans

PRELIMINARY GRADING PLAN







LEGAL DESCRIPTION:

THAT PORTION OF THE SOUTHERLY 25 ACRES OF THE SOUTHEAST QUARTER OF THE SOUTHEAST QUARTER OF SECTION 6, TOWNSHIP 5 SOUTH, RANGE 3 WEST, SAN BERNARDINO BASE AND MERIDIAN, IN THE CITY OF PERRIS, COUNTY OF RIVERSIDE, STATE OF CALIFORNIA, LYING EAST OF THE FOLLOWING DESCRIBED LAND.

BEGINNING AT A POINT IN THE SOUTH LINE OF SECTION 6K, DISTANT 379.3 FEET EASTERLY FROM THE SOUTHWEST CORNER OF THE ABOVE DESCRIBED SOUTHERLY 25 ACRES; THENCE NORTHERLY IN A STRAIGHT LINE TO A POINT IN THE NORTHERLY LINE OF SAID SOUTHERLY 25 ACRES DISTANT 357 FEET EAST FROM THE NORTHWEST CORNER OF SAID SOUTHERLY 25 ACRES.

EXCEPTING THEREFROM THE EASTERLY 622.9 FEET THEREOF.

BENCHMARK:

THE BENCHMARK FOR THIS SURVEY IS THE COUNTY OF RIVERSIDE STANDARD BRASS DISK STAMPED"600-31-68" LOCATED 2 MILES NORTH ON MURRIETA ROAD FROM CATHOLIC CHURCH IN SUN CITY, 700 FT NORTH OF INTERSECTION OF MURRIETA ROAD AND ETHANAC ROAD, 40 FT WEST OF MURRIETA ROAD LEVEL WITH THE ROAD, 3 FT NORTHEAST OF THE SOUTH EAST CORNER OF 8 FT CHAIN LINK FENCE OF E.M.W.D. MURRIETA PUMPING STATION, 2 FT NORTH OF MARKER POST, BRASS DISK IS SET IN THE TOP OF A CONCRETE POST;

ELEVATION = 1414.416, NGVD29 UPDATED 05/85.

EARTHWORK QUANTITY:

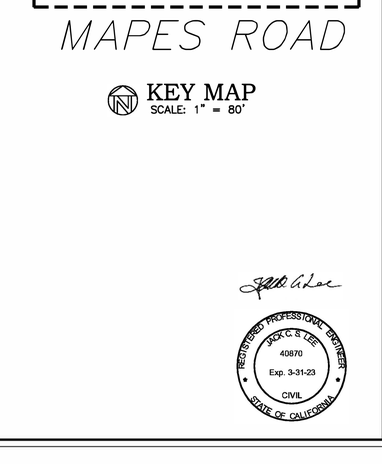
CUT: 68 CU.YD. EXPORT DIRT: 18 CU.YD.
FILL: 86 CU.YD.

NOTE:
THE YARDAGE SHOWN HEREON IS FOR PERMIT AND BONDING PURPOSES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING OF THE QUANTITIES.

PROPOSED NOTES:

1. PROPOSED NEW BUILDING PER ARCHITECTURAL PLAN
2. PROPOSED NEW DRIVEWAY APPROACH
3. PROPOSED FIRE HYDRANT
4. INFILTRATION TRENCH

TOTAL AREA	261,792.10 SF	6.01 ACRES
TOTAL AREA AFTER DEDICATION	256,358.80 SF	5.88 ACRES
LIMIT OF GRADING	39,410.38 SF	0.90 ACRES
IMPERVIOUS AREA	41,253.56 SF	0.95 ACRES



KEY MAP
SCALE: 1" = 80'

LEGEND:

....LANDSCAPE AREA

....INFILTRATION TRENCH

....EXISTING DRAINAGE FLOW

CALLAND ENGINEERING INC.
dba QUARTECH CONSULT
576 E. LAMBERT ROAD, BREA, CA 92821
TEL: (714) 671-1050 FAX: (714) 671-1090

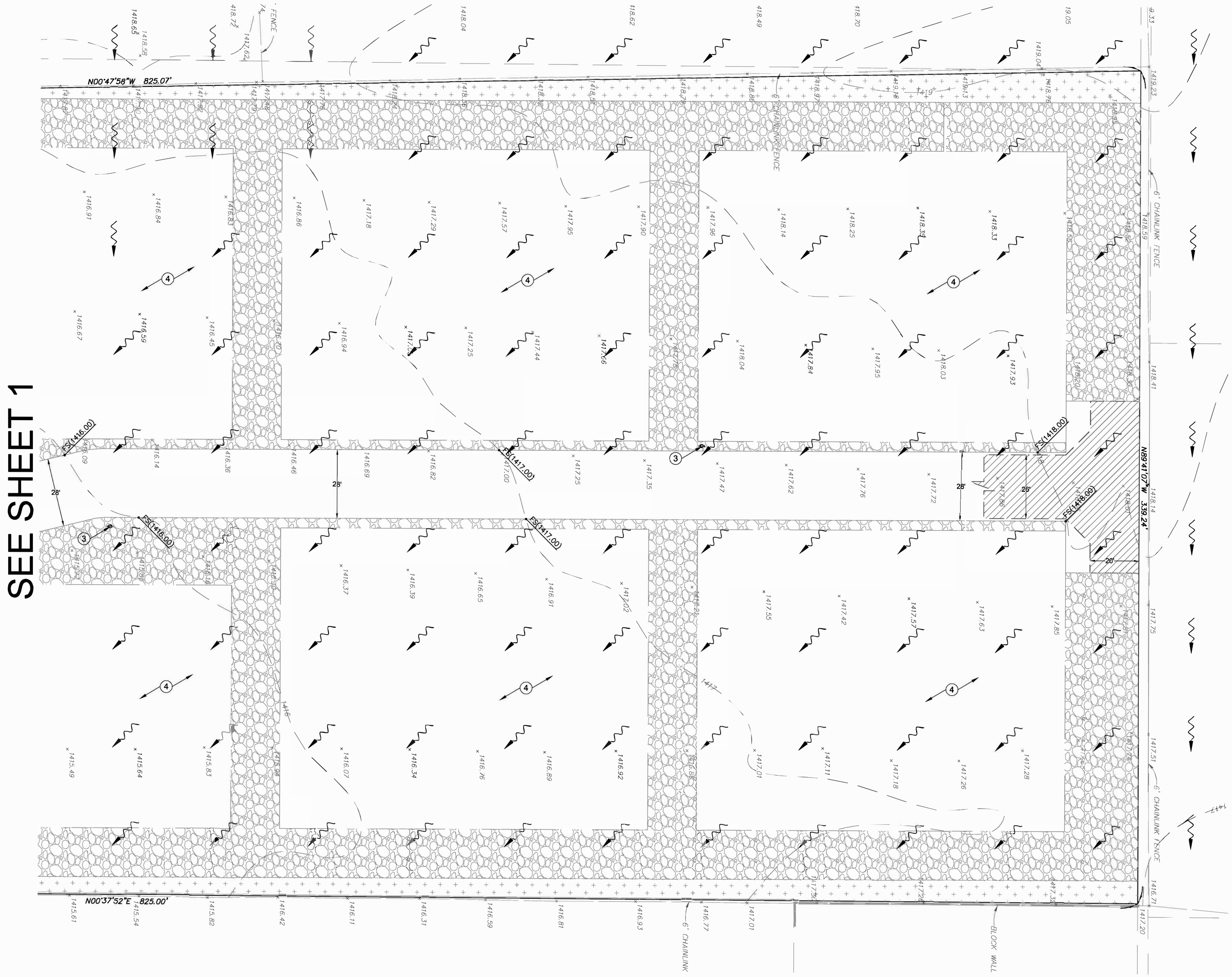
PROJECT LOCATION:
APN: 330-080-006
MAPES ROAD,
PERRIS, CA 92570

DRAWN:	PS
CHECKED:	
DATE:	04/25/2022
JOB. NO.:	21-188-001
SCALE:	1" = 20'
FILE NAME:	

C-1

SHEET 1 OF 2

PRELIMINARY GRADING PLAN



0 20 40

(IN FEET)
1 Inch = 20 ft.

PROPOSED NOTES:

③ PROPOSED FIRE HYDRANT
④ INFILTRATION TRENCH

LEGEND:

....LANDSCAPE AREA
....INFILTRATION TRENCH
....EXISTING DRAINAGE FLOW

REGISTERED PROFESSIONAL ENGINEER
JACK C. S. LEE
40870
Exp. 3-31-23
CIVIL
STATE OF CALIFORNIA

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PROJECT LOCATION:
APN: 330-080-006
MAPES ROAD,
PERRIS, CA 92570

DRAWN:	PS
CHECKED:	
DATE:	04/25/2022
JOB. NO.:	21-188-001
SCALE:	1" = 20'
FILE NAME:	

C-2

SHEET 2 OF 2

Appendix 3: Soils Information

Geotechnical Study and Other Infiltration Testing Data

Cal Land Engineering, Inc.
dba Quartech Consultants
Geotechnical, Environmental, and Civil Engineering

July 20, 2021

Mr. Jimmy Lee
13841 Roswell Ave, Suite A,
Chino, CA 91710-5467

Subject: Report of Geotechnical Engineering Investigation, Proposed Industrial Facility Development, Vacant 5.97-Acre Lot (Adjacent East of 150 Mapes Road), APN 330-080-006, Perris, California. QCI Project No.: 21-188-001 GE

Gentlemen:

In accordance with your request, Quartech Consultants (QCI) is pleased to submit this Geotechnical Engineering Report for the subject site. The purpose of this report was to evaluate the subsurface conditions and provide recommendations for foundation designs and other relevant parameters of the proposed construction.

Based on the findings and observations during our investigation, the proposed construction of the subject site for the intended use is considered feasible from the geotechnical engineering viewpoints, provided that specific recommendations set forth herein are followed.

This opportunity to be of service is sincerely appreciated. If you have any questions pertaining to this report, please call the undersigned.

Respectfully submitted,
Cal Land Engineering, Inc. (CLE)
dba Quartech Consultants (QCI)

Jack C. Lee, GE 2153
Principal Engineer

John Tran
Project Engineer

Abe Kazemzadeh
Project Engineer

Dist: (4) Addressee

REPORT OF GEOTECHNICAL ENGINEERING INVESTIGATION

Proposed Industrial Facility Development

At

Vacant 5.97-Acre Lot (Adjacent East of 190 Mapes Road),

APN 330-080-006,

Perris, California

Prepared by

QUARTECH CONSULTANTS (QCI)

Project No.: 21-188-001GE

July 20, 2021

TABLE OF CONTENTS

1.0 INTRODUCTION

1.1 Purpose

This report presents a summary of our geotechnical engineering investigation for the proposed construction at the subject site. The purposes of this investigation were to evaluate the subsurface conditions at the area of proposed construction and to provide recommendations pertinent to grading, foundation design and other relevant parameters of the development.

1.2 Scope of Services

Our scope of services included:

- Review of available soil engineering data of the area.
- Subsurface exploration consisting of logging and sampling of three 8-inch diameter hollow stem auger borings to a maximum depth of 21.5 feet below the existing grade at the subject site. The exploration was logged by a QCI engineer. Boring logs are presented in Appendix A.
- Laboratory testing of representative samples to establish engineering characteristics of the on-site soil. The laboratory test results are presented in Appendices A and B.
- Engineering analyses of the geotechnical data obtained from our background studies, field investigation, and laboratory testing.
- Preparation of this report presenting our findings, conclusions, and recommendations for the proposed construction.

1.3 Proposed Construction

The subject site would be used for industrial facility constructions and associated improvements. The proposed buildings are anticipated to be storage of mobile offices one-story structure with concrete slab-on-grade. Column loads are unknown at this time, but are expected to be light to medium. Minor cut and fill grading operation is anticipated to reach the desired grades.

1.4 Site Location

The project site is located on the north side of Mapes Road, a relatively short distance west of Goetz Road, in the city of Perris, California. The approximate location of the site is presented in the attached Site Location Map (Figure 1). The site is currently vacant and is relatively flat. The site is approximately 5.97 acres. No major surface erosions were observed during our subsurface investigation.

2.0 SUBSURFACE EXPLORATION AND LABORATORY TESTING

2.1 Subsurface Exploration

Our subsurface exploration consisted of drilling three 8-inch diameter hollow stem auger borings to a maximum depth of 21.5 feet at the locations shown on the attached Site Plan, Figure 2. The excavation of the boring was supervised and logged by a QCI engineer. Relatively undisturbed and bulk samples were collected for laboratory testing. Boring logs are presented in Appendix A.

2.2 Laboratory Testing

Representative samples were tested for the following parameters: in-situ moisture content and density, consolidation, direct shear strength, percent fines, expansion, and corrosion potential. Results of our laboratory testing along with a summary of the testing procedures are presented in Appendix B. In-situ moisture and density test results are presented on the boring logs in Appendix A.

3.0 SUMMARY OF GEOTECHNICAL CONDITIONS

3.1 Soil Conditions

The onsite near surface soils consist predominantly of fine grained silty sand (SM). In general, these soils exist in medium dense to dense and slightly moist conditions. Underlying the surface soils, fine to medium grained clayey sand (SC), medium grained silty sand (SM) and sandy clay (CL) were disclosed in the borings to the depths explored (21.5 feet below the existing ground surface). These soils exist in the medium dense to very dense and very stiff and slightly moist to very moist conditions. Generally, soils become denser as depth increases.

3.2 Groundwater

No groundwater or seepage was encountered in the test borings to the depths explored. Groundwater is not expected during the proposed construction.

4.0 SEISMICITY

4.1 Faulting

Based on our study, there are no known active faults crossing the property. The nearest known active regional fault is Elsinore;W+GI Fault zones located approximately 9 miles from the site.

4.2 Seismicity

The subject site is located in Southern California, which is a tectonically active area. The type and magnitude of seismic hazards affecting the site depend on the distance to causative faults, the intensity, and the magnitude of the seismic event. Table 1 indicates the distance of the fault zones and the associated maximum magnitude earthquake that can be produced by nearby seismic events. As indicated in Table 1, the Elsinore;W+GI fault zones are considered to have the most significant effect to the site from a design standpoint.

TABLE 1

Characteristics and Estimated Earthquakes for Regional Faults

Fault Name	Approximate Distance to Site (mile)	Maximum Magnitude Earthquake (Mw)
Elsinore;W+GI	9.0	7.3
Elsinore;GI+T+J	9.5	7.6
Elsinore;T+J+CM	10.1	7.6
San Jacinto;A+CC+B+SM	11.2	7.6
San Jacinto;SJV+A+CC+B	12.6	7.7
San Jacinto;SBV+SJV	12.8	7.4
San Jacinto;SBV	17.9	7.1

Reference: 2008 National Seismic Hazard Maps - Source Parameters

4.3 Estimated Earthquake Ground Motions

In order to estimate the seismic ground motions at the subject site, QCI has utilized the seismic hazard map published by California Geological Survey. According to this report, the peak ground Alluvium acceleration at the subject site for a 2% and 10% probability of exceedance in 50 years is about 0.669g and 0.435g respectively (USGS, 2008 Deaggregation of Seismic Hazards). Site modified peak ground acceleration (PGA_M), corresponding to USGS Design Map Summary Report, ASCE 7-16 Standard, is 0.600g.

5.0 CONCLUSIONS

Based on our subsurface investigation, it is our opinion that the proposed construction is feasible from a geotechnical standpoint, provided the recommendations contained herein are incorporated in the design and construction. The following is a summary of the geotechnical design and construction factors that may affect the development of the site:

5.1 Seismicity and Seismic Induced Hazard

The site is located in a seismically active region and is subject to seismically induced ground shaking from nearby and distant faults, which is a characteristic of all Southern California.

5.2 Seismic Induced Hazards

Based on our review of the County of Riverside GIS map and Riverside county parcel report, it is concluded that the site is mapped in the low liquefaction potential areas.

5.3 Excavatability

Based on our subsurface investigation, excavation of the subsurface materials should be accomplished with conventional earthwork equipment.

5.4 Surficial Soil Removal and Recompaction

Based on our investigation, it is concluded that the existing surficial soils may not be suitable for structure support as they presently exist and will require remedial grading as discussed herein.

5.5 Groundwater

Groundwater was not encountered during our field exploration. Groundwater is not anticipated to be encountered during the near surface construction.

6.0 RECOMMENDATIONS

6.1 Site Grading

6.1.1 Site Preparation

Prior to initiating grading operations, any existing vegetation, trash, debris, over-sized materials (greater than 8 inches), and other deleterious materials within construction areas should be removed from the subject site.

6.1.2 Surficial Soil Removals

Based on our field exploration and laboratory data obtained to date, it is recommended that the existing surficial soils be removed to a minimum depth of 4 feet below the existing grade or two feet below the bottom of the footing, whichever is deeper to provide a uniform support for the foundation and concrete slab. The recommended removal should be extended at least 4 feet beyond building lines or to the limit of the existing building. The existing near surface soils should also be removed to a depth of about 18 inches within the proposed driveway and concrete flatwork areas. Locally deeper removals may be necessary to expose competent natural uniform ground. The actual removal depths should be determined in the field as conditions are exposed. Visual inspection and/or testing may be used to define removal requirements.

6.1.3 Treatment of Removal Bottoms

Soils exposed within areas approved for fill placement should be scarified to a depth of 6 inches, conditioned to near optimum moisture content, then compacted in-place to minimum project standards.

6.1.4 Structural Backfill

The onsite soils may be used as compacted fill provided they are free of organic materials and debris. Fills should be placed in relatively thin lifts (6 to 8 inches), brought to near optimum moisture content, then compacted to at least 90 percent relative compaction based on laboratory standard ASTM D-1557-12.

6.2 Foundation Design

6.2.1 Bearing Value

An allowable bearing value of 2000 pounds per square foot may be used for evaluation of existing shallow continuous footings 12 inches wide and 24 inches deep, and shallow pad footings at least 24 square inches and 24 inches deep, below the lowest adjacent grade. This value may be increased by 200 pounds per square foot for each additional foot of depth or width to a maximum value of 2500 pounds per square foot. This value may be increased by one-third when considering short duration seismic or wind loads.

6.2.2 Settlement

Settlement of the footings placed as recommended, and subject to no more than allowable loads is not expected to exceed 1/2 inch. Differential settlement between adjacent columns is not anticipated to exceed 1/4 inch for the adjacent column spaced at a distance of about 30 feet.

6.2.3 Lateral Resistance

Passive earth pressure may be computed as an equivalent fluid pressure of 300 pounds per cubic foot, with a maximum earth pressure of 2000 pounds per square foot. An allowable coefficient of friction between soil and concrete of 0.30 may be used with the dead load forces. When combining passive pressure and frictional resistance, the passive pressure component should be reduced by one-third.

6.2.4 Foundation Construction

It is anticipated that the entire structure will be underlain by onsite soils of very low expansion potential. All footings should be founded at a minimum depth of 24 inches below the lowest adjacent ground. All continuous footings should have at least two No. 4 reinforcing bars placed both at the top and two No. 4 reinforcing bars placed at the bottom of the footings.

6.2.5 Concrete Slab and Flatwork

Concrete slabs and flatworks should be a minimum of 4 inches thick and reinforced with a minimum of No. 3 reinforcing bar spaced 16-inch each way or its equivalent. All slab reinforcement should be supported to ensure proper positioning during placement of concrete.

In order to comply with the requirements of the 2019 CalGreen Section 4.505.2.1 within the moisture sensitive concrete slabs, a minimum of 4-inch thick base of ½ inch or larger clean aggregate should be provided with a vapor barrier in direct contact with concrete. A 10-mil Polyethylene vapor retarder, with joints lapped not less than 6 inches, should be placed above the aggregate and in direct contact with the concrete slab. As an alternate method, 2 inches of sand then 10-mil polyethylene membrane and another 2 inches of sand over the membrane and under the concrete may be used, provided this request for an alternative method is approved by City or County Building Officials.

6.3 Temporary Trench Excavation and Backfill

All trench excavations should conform to CAL-OSHA and local safety codes. All utility trenches backfill should be brought to near optimum moisture content and then compacted to obtain a minimum relative compaction of 90 percent of ASTM D-1557-12.

7.0 INSPECTION

As a necessary requisite to the use of this report, the following inspection is recommended:

- Temporary excavations.
- Removal of surficial and unsuitable soils.
- Backfill placement and compaction.
- Utility trench backfill.

The geotechnical engineer should be notified at least 1 day in advance of the start of construction. A joint meeting between the client, the contractor, and the geotechnical engineer is recommended prior to the start of construction to discuss specific procedures and scheduling.

8.0 CORROSION POTENTIAL

Chemical laboratory tests were conducted on the existing onsite near surface materials sampled during QCI's field investigation to aid in evaluation of soil corrosion potential and the attack on concrete by sulfate soils. The testing results are presented in Appendix B.

According to 2019 CBC and ACI 318-19, a "negligible" exposure to sulfate can be expected for concrete placed in contact with the onsite soils. Therefore, Type II cement or its equivalent may be used for this project. Based on the resistivity test results, it is estimated that the subsurface soils are moderately corrosive to buried metal pipe. It is recommended that any underground steel utilities be blasted and given protective coating. Should additional protective measures be warranted, a corrosion specialist should be consulted.

9.0 SEISMIC DESIGN

Based on our studies on seismicity, there are no known active faults crossing the property. However, the subject site is located in Southern California, which is a tectonically active area. Based on ASCE 7-16 Standard, CBC 2019, the following seismic related values may be used:

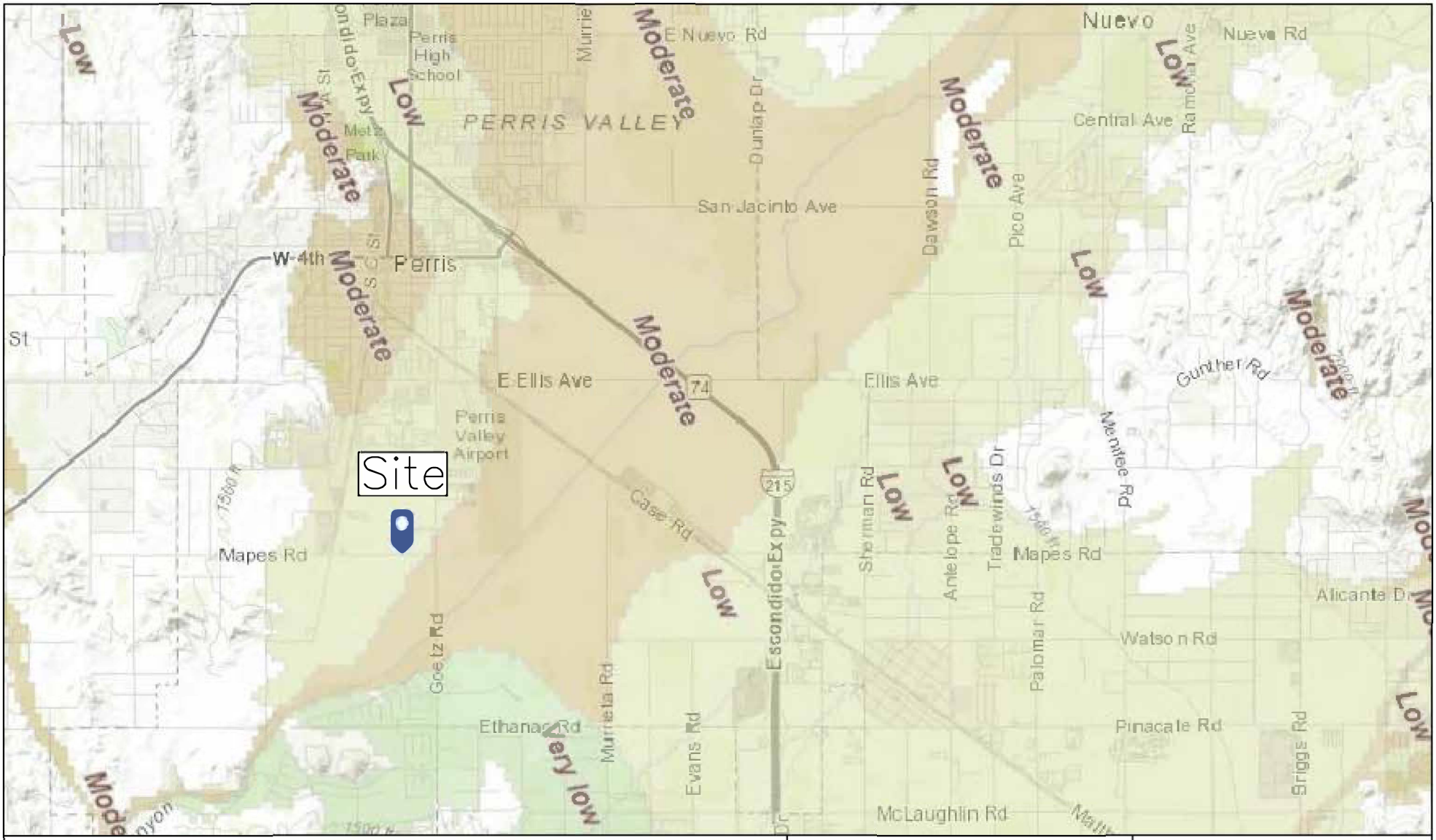
Seismic Parameters (Latitude: 33.7577993, Longitude: -117.2269393)	Site Class "D"
Mapped 0.2 Sec Period Spectral Acceleration, S_S	1.441g
Mapped 1.0 Sec Period Spectral Acceleration, S_1	0.531g
Site Coefficient for Site Class "D", F_a	1.2
Site Coefficient for Site Class "D", F_v	1.7
Maximum Considered Earthquake Spectral Response Acceleration Parameter at 0.2 Second, S_{MS}	1.730g
Maximum Considered Earthquake Spectral Response Acceleration Parameter at 1.0 Second, S_{M1}	0.903g
Design Spectral Response Acceleration Parameters for 0.2 sec, S_{DS}	1.153g
Design Spectral Response Acceleration Parameters for 1.0 Sec, S_{D1}	0.602g

The Project Structural Engineer should be aware of the information provided above to determine if any additional structural strengthening is warranted.

10.0 REMARKS

The conclusions and recommendations contained herein are based on the findings and observations at the exploratory locations. However, soil materials may vary in characteristics between locations of the exploratory locations. If conditions are encountered during construction, which appear to be different from those disclosed by the exploratory work, this office should be notified so as to recommend the need for modifications.

This report has been prepared in accordance with generally accepted professional engineering principles and practice. No warranty is expressed or implied. This report is subject to review by controlling public agencies having jurisdiction.



LIQUEFACTION

- VERY HIGH
- HIGH
- MODERATE
- LOW
- VERY LOW
- UNKNOWN

NOT TO SCALE

Map Modified from Esri, HERE, Garmin, FAO, NOAA, USGS, EPA, NPS | California Geological Survey, C.W. Jennings, W.A. Bryant | Seismic Hazards Program, California Geological Survey, California Department of Conservation

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Geotechnical, Environmental & Civil Engineering Services

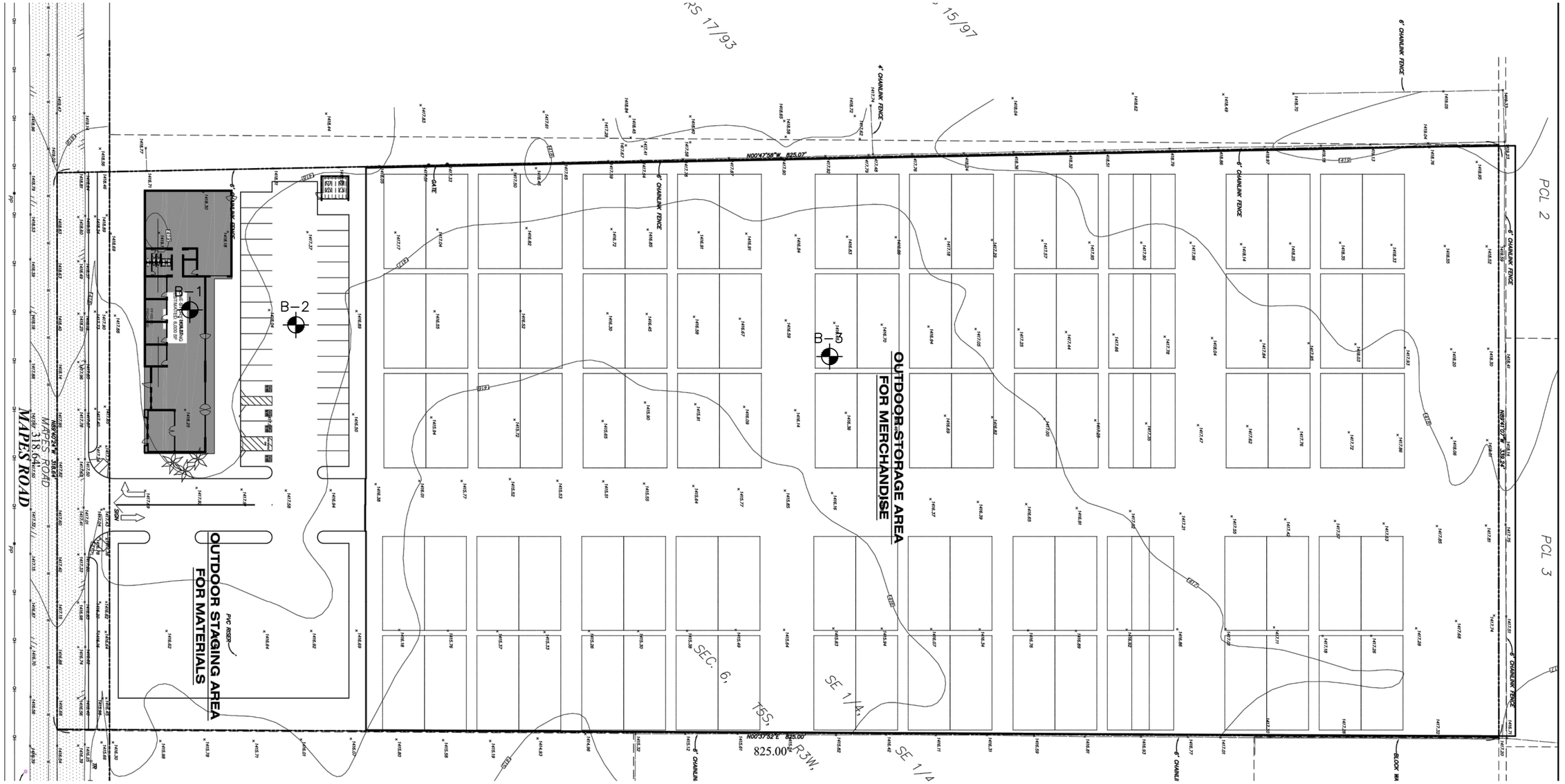
Project Address:

APN: 330-080-006
Vacant Lot, Adj East of 150 Mapples Road, Perris, CA

Site Location Map

06/21

FIGURE 1



LEGEND

B–1 Approximate boring location

N

SCALE: 1" = 60'

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SITE PLAN

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FIGURE 2

APPENDIX A
FIELD INVESTIGATION

Our subsurface investigation consisted of excavation of logging and sampling of three 8-inch diameter hollow stem auger boring to a maximum depth of 21.5 feet below the existing grade at the subject site at approximate locations shown on the enclosed Site Plan, Figure 2.

The drilling of the boring was supervised by a QCI's engineer, who continuously logged the borings and visually classified the soils in accordance with the Unified Soil Classification System. Ring and SPT samples were taken at frequent intervals. These samples were obtained by driving a sampler with successive blows of 140-pound hammer dropping from a height of 30 inches.

Representative undisturbed samples of the subsurface soils were retained in a series of brass rings, each having an inside diameter of 2.42 inches and a height of 1.00 inch. All ring samples were transported to our laboratory. Bulk surface soil samples were also collected for additional classification and testing.

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BORING LOG B-1

PROJECT LOCATION: Vacant Lot, E of 150 Mapes Road, Perris, CA
PROJECT NO.: 21-188-001

DATE DRILLED: 5/28/2021
SAMPLE METHOD: Hollow Stem
ELEVATION: N/A
LOGGED BY: JT

B: Bulk Bag
S: Standard Penetration Test
R: Ring Sample

Depth (ft)	Sample: Bulk	Sample: Undisturbed	Sample: Blows/6"	USCS Symbol	Dry Unit Wt. (pcf)	Moisture (%)	Description of Material
	B			SM		2.6	Silty sand, fine grained, tan brown, slightly moist, dense.
			32				Percent of Fines: 33.0
		R	50/5"	SM	122.8	6.3	Silty sand, fine grained, tan brown, slightly moist, dense.
5		R	8	SC	121.1	7.9	Clayey sand, fine grained, medium brown, slightly moist, dense.
			24				Percent of Fines: 38.3
			30				
			6				
10		R	27	SC	122.3	9.1	Clayey sand, medium grained, medium brown, slightly moist, dense.
			32				Percent of Fines: 37.1
			10				
15		R	17	SM	118.6	10.8	Silty sand, medium grained, medium brown, slightly moist, medium dense.
			21				Percent of Fines: 28.8
			2				
20		R	18	CL	107.0	20.3	Sandy clay, , light brown, very moist, very stiff.
			18				Percent of Fines: 27.5
25							Total Depth: 21.5 feet No Groundwater Hole Backfilled
30							Hammer Driving Weight: 140 lbs Hammer Driving Height: 30 inches
35							

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BORING LOG B-2

PROJECT LOCATION: Vacant Lot, E of 150 Mapes Road, Perris, CA
PROJECT NO.: 21-188-001

DATE DRILLED: 5/28/2021
SAMPLE METHOD: Hollow Stem
ELEVATION: N/A
LOGGED BY: JT

B: Bulk Bag
S: Standard Penetration Test
R: Ring Sample

Depth (ft)	Sample: Bulk	Sample: Undisturbed	Sample: Blows/6"	USCS Symbol	Dry Unit Wt. (pcf)	Moisture (%)	Description of Material
0		R	12 43 50/5"	SM	128.8	8.5	Silty sand, fine grained, tan brown, slightly moist, very dense
5		S	5 13 13	SC		8.3	Clayey sand, fine grained, medium brown, slightly moist, medium dense Percent of Fines: 31.8
10		R	1 11 49	SC	117.7	8.4	Clayey sand, fine grained, medium brown, slightly moist, dense Percent of Fines: 33.0
15							Total Depth: 11.5 feet No Groundwater Hole Backfilled Hammer Driving Weight: 140 lbs Hammer Driving Height: 30 inches
20							
25							
30							
35							

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BORING LOG B-3

PROJECT LOCATION: Vacant Lot, E of 150 Mapes Road, Perris, CA
PROJECT NO.: 21-188-001

DATE DRILLED: 5/28/2021
SAMPLE METHOD: Hollow Stem
ELEVATION: N/A
LOGGED BY: JT

B: Bulk Bag
S: Standard Penetration Test
R: Ring Sample

Depth (ft)	Sample: Bulk	Sample: Undisturbed	Sample: Blows/6"	USCS Symbol	Dry Unit Wt. (pcf)	Moisture (%)	Description of Material
0		R	12 16 22	SM	107.3	6.0	Silty sand, medium grained, medium brown, slightly moist, medium dense
5		R	15 21 33	SM	128.7	11.7	Silty sand, fine grained, medium brown, slightly moist, dense Percent of Fines: 43.6
10							Total Depth: 6.5 feet No Groundwater Hole Backfilled Hammer Driving Weight: 140 lbs Hammer Driving Height: 30 inches
15							
20							
25							
30							
35							

APPENDIX B
LABORATORY TESTING

During the subsurface exploration, QCI personnel collected relatively undisturbed ring samples and bulk samples. The following tests were performed on selected soil samples:

Moisture-Density

The moisture content and dry unit weight were determined for each relatively undisturbed soil sample obtained in the test borings in accordance with ASTM D2937 standard. The results of these tests are shown on the boring logs in Appendix A.

Shear Tests

Shear tests were performed in a direct shear machine of strain-control type in accordance with ASTM D3080 standard. The rate of deformation was 0.010 inch per minute. Selected samples were sheared under varying confining loads in order to determine the Coulomb shear strength parameters: internal friction angle and cohesion. The shear test results are presented in the attached plates.

Consolidation Tests

Consolidation tests were performed on selected undisturbed soil samples in accordance with ASTM D2435 standard. The consolidation apparatus is designed for a one-inch high soil filled brass ring. Loads are applied in several increments in a geometric progression and the resulting deformations are recorded at selected time intervals. Porous stones are placed in contact with the top and bottom of each specimen to permit addition and release of pore fluid. The samples were inundated with water at a load of two kilo-pounds (kips) per square foot, and the test results are shown on the attached Figures.

Expansion Index

Laboratory Expansion Index test was conducted on the existing onsite near surface materials sampled during QCI's field investigation to aid in evaluation of soil expansion potential. The test is performed in accordance with ASTM D-4829. The testing result is presented below:

Sample Location	Expansion Index	Expansion Potential
B-1 @ 0-4'	3	Very Low

Corrosion Potential

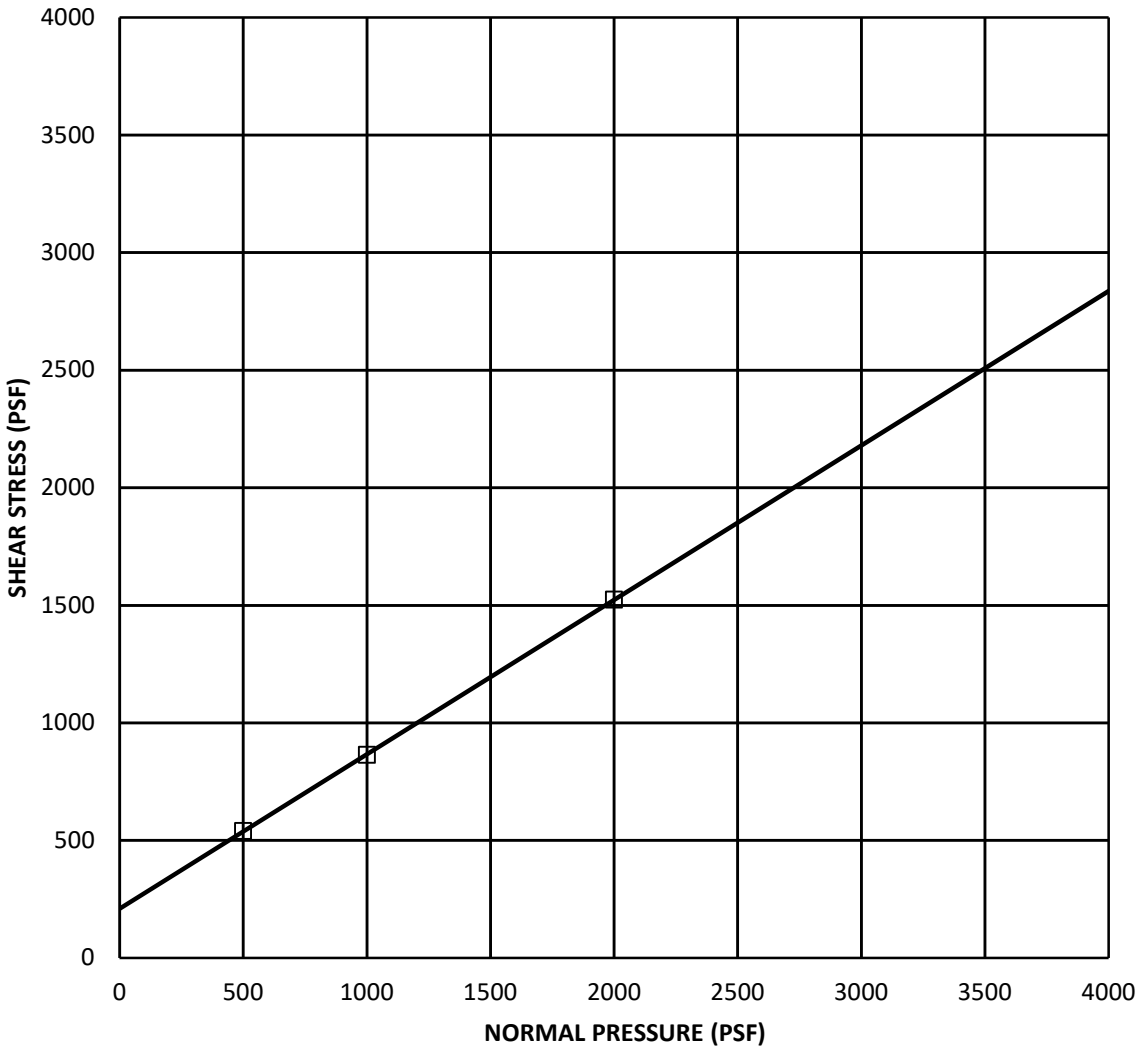
Chemical laboratory tests were conducted on the existing onsite near surface materials sampled during QCI's field investigation to aid in evaluation of soil corrosion potential and the attack on concrete by sulfate soils. These tests are performed in accordance with California Test Method 417, 422, 532, and 643. The testing results are presented below:

Sample Location	pH	Chloride (ppm)	Sulfate (% by weight)	Min. Resistivity (ohm-cm)
B-1 @ 0'-4'	8.40	80	0.0020	5,600

Percent Passing #200 Sieve

Percent of soil passing #200 sieve was determined for selected soil samples in accordance with ASTM D1140 standard. The test results are presented in the following table:

Sample Location	% Passing #200
B-1 @ 0-4'	33.0
B-1 @ 5'	38.3
B-1 @ 10'	37.1
B-1 @ 15'	28.8
B-1 @ 20'	27.5
B-2 @ 5'	31.8
B-2 @ 8'	33.0
B-3 @ 5'	43.6



SYMBOL	BORING NO.	SAMPLE NO.	DEPTH (FT)	SAMPLE TYPE	SOIL TYPE	COHESION (PSF)	FRICTION ANGLE (DEG)
□	B-1	N/A	2.0	RING	SM	210	33

Vertical Loads (PSF)	Moisture Content Before Test (%)	Moisture Content After Test (%)
500	6.3	13.6
1000	6.3	13.4
2000	6.3	13.1

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DIRECT SHEAR

(ASTM D3080)

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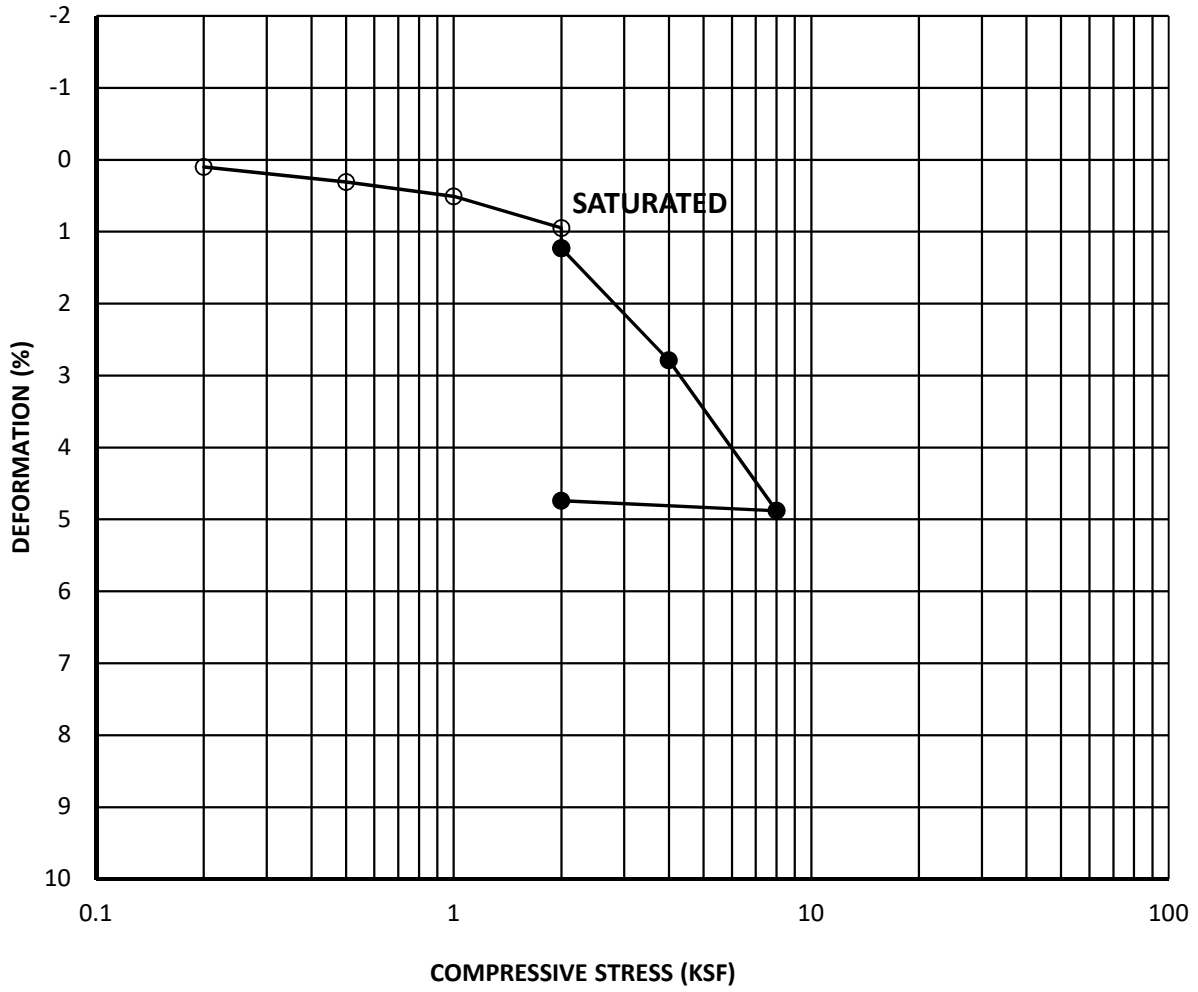
FIGURE 3



SYMBOL	BORING NO.	SAMPLE NO.	DEPTH (FT)	SOIL TYPE	INIT. MOISTURE CONTENT (%)	INIT. DRY DENSITY (PCF)	INIT. VOID RATIO
○	B-1	N/A	5	SC	7.9	121.1	0.391

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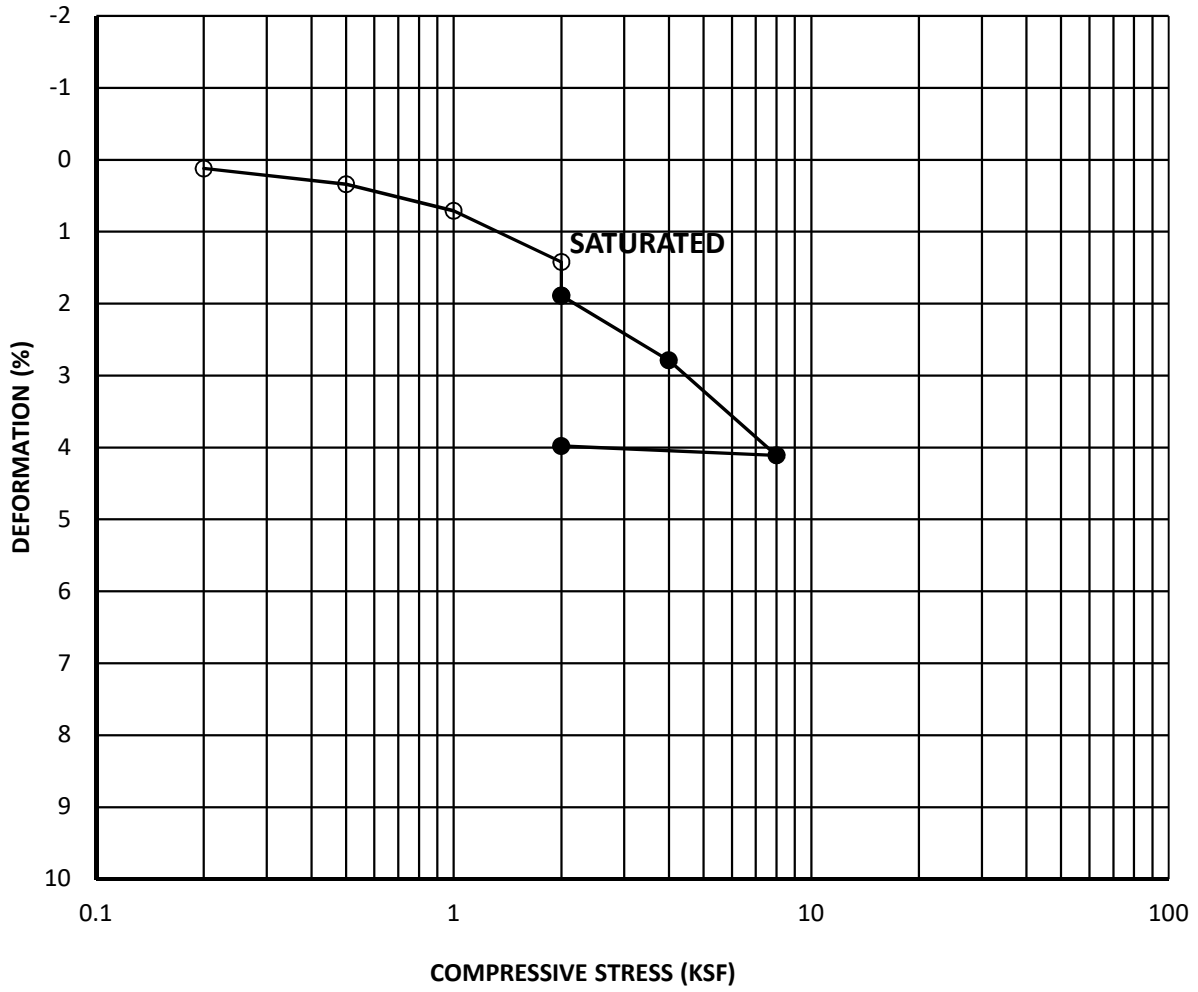
Vacant Lot, Adj East of 150 Mapes Rd, Perris, California

CONSOLIDATION

(ASTM D2435)

06/21

FIGURE 4



SYMBOL	BORING NO.	SAMPLE NO.	DEPTH (FT)	SOIL TYPE	INIT. MOISTURE CONTENT (%)	INIT. DRY DENSITY (PCF)	INIT. VOID RATIO
○	B-1	N/A	10	SC	9.1	122.3	0.378

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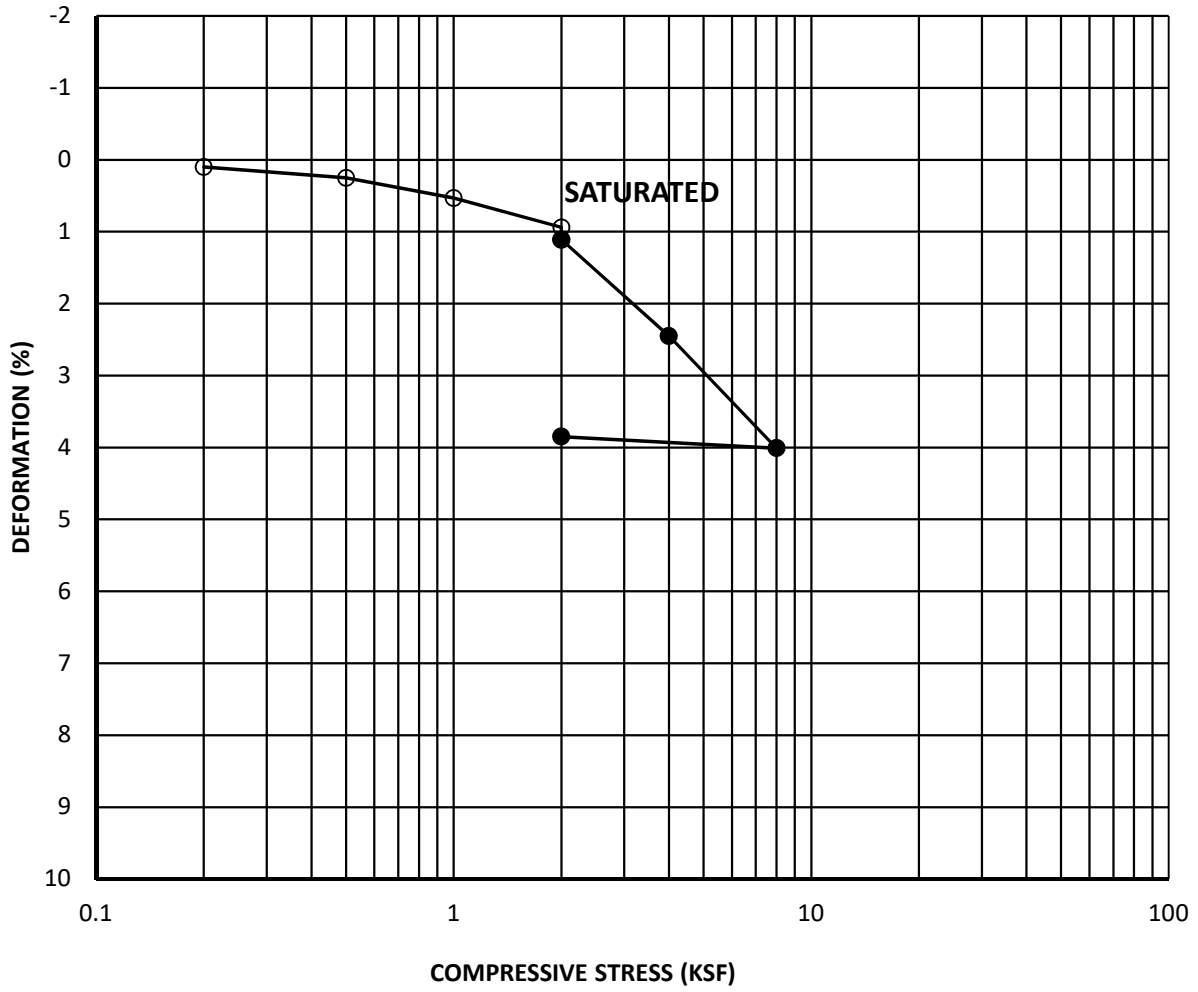
APN: 330-080-006
Vacant Lot, Adj East of 150 Mapes Rd, Perris, California

CONSOLIDATION

(ASTM D2435)

06/21

FIGURE 5



SYMBOL	BORING NO.	SAMPLE NO.	DEPTH (FT)	SOIL TYPE	INIT. MOISTURE CONTENT (%)	INIT. DRY DENSITY (PCF)	INIT. VOID RATIO
○	B-1	N/A	15	SM	10.8	118.6	0.421

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Project Address:
APN: 330-080-006
Vacant Lot, Adj East of 150 Mapes Rd, Perris, California

CONSOLIDATION

(ASTM D2435)

06/21

FIGURE 6

Appendix 4: Historical Site Conditions

Phase I Environmental Site Assessment or Other Information on Past Site Use

Appendix 5: LID Infeasibility

LID Technical Infeasibility Analysis

Cal Land Engineering, Inc.
dba Quartech Consultants
Geotechnical, Environmental, and Civil Engineering

July 20, 2021

Mr. Jimmy Lee
13841 Roswell Ave, Suite A,
Chino, CA 91710-5467

Subject: Percolation Feasibility Testing for the Proposed Infiltration System at Vacant 5.97-Acre Lot (Adjacent to East of 150 Mapes Road), APN 330-080-006, Perris, California.
QCI Project No.: 21-188-001 GE

Reference: "Technical Guidance Document Appendices, Appendix VII. Infiltration Rate Evaluation Protocol and Factor of Safety Recommendations", dated May 19, 2011

Gentlemen:

As requested and authorized, CalLand Engineering, Inc. (CLE) has performed a feasibility percolation evaluation for the above subject site located in Vacant 5.97-Acre Lot (Adjacent East of 150 Mapes Road), Perris, California

The purpose of this report is to aid in the design and construction of the required storm water infiltration system. The professional opinions and geotechnical information contained in this report are not intended to imply total performance of the project or guarantee that unusual or variable conditions will not be discovered during or after construction. The scope of our study is limited to the area explored, which is shown on Figure 2, (Boring Location Map).

SITE CONDITIONS

The project site is located on the north side of Mapes Road, a relatively short distance west of Goetz Road, in the city of Perris, California. The approximate location of the site is presented in the attached Site Location Map (Figure 1). The site is currently vacant and is relatively flat. The site is approximately 5.97 acres. No major surface erosions were observed during our subsurface investigation.

FIELD EXPLORATION

Field exploration for this investigation consisted of excavating one percolation borings P-1 to the depth of approximately 8.0 feet below existing site grade (depth corresponds to the bottom of the proposed infiltration system) and three additional test borings to the maximum depth of 21.5 feet below the existing grade. Approximate boring locations are presented on Figure 2, Site Plan.

Description of the soil materials encountered during drilling was entered into the boring logs in accordance with the Unified Soil Classification System (USCS). The boring logs are included in Appendix A.

SUBSURFACE CONDITION

The onsite near surface soils consist predominantly of fine grained silty sand (SM). In general, these soils exist in medium dense to dense and slightly moist conditions. Underlying the surface soils, fine to medium grained clayey sand (SC), medium grained silty sand (SM) and sandy clay (CL) were disclosed in the borings to the depths explored (21.5 feet below the existing ground surface). These soils exist in the medium dense to very dense and very stiff and slightly moist to very moist conditions. Generally, soils become denser as depth increases.

GROUNDWATER

Ground water or seepage was not encountered during subsurface investigation to the depth of 51.5 feet.

PERCOLATION RATE/ PERMEABILITY

Percolation rate and permeability of the subsurface material, encountered in Boring P-1 at the depth of 8 feet below existing grade were measured by performing infiltration test in accordance with Technical Guideline, Appendix VII, Riverside County and San Bernardino County, California. The borings were drilled by utilizing an 8" auger boring and additional 3 test borings to the maximum depth of 21.5 feet. The infiltration borings were drilled 8 feet below the existing surface then two inches of gravel placed at the bottom of holes prior to pre-soaking. Presoaking was performed and measurements showed less than 6 inches of water seeps away in 25 minutes for the tested boring; rate of surface water drop was measured every 30 minutes for a period of six hours or when stabilization with respect to water infiltration was reached. Upon completion of tests, the borings were backfilled with soil cuttings.

Boring P-1

Numerous measurements recorded within the test period indicated a represented percolation rate of 27.7 min/inch for the P-1 hole. The results of percolation test for Boring P-1 are provided in Appendix B.

Percolation Rate Conversion to Infiltration Rate (Porchet Method, aka Inverse Borehole Method):

Initial Depth to Water, D0 = 66.00 inches
Final Depth to Water, Df = 67.08 inches
Total Depth of Test Hole, DT = 96.00 inches
Test Hole Radius, r = 4.0 inches.
The conversion equation is used:
Ho is the initial height of water at the selected time interval.
Ho = DT - D0 = 96.00 – 66.00 = 30.00 inches
Hf is final height of water at the selected time interval.
Hf = DT - Df = 96.00 – 67.08 = 28.92 inches
ΔH is the change in height over the time interval.
ΔH = ΔD = Ho - Hf = 30.00 – 28.92 = 1.08 inches
Havg is the average head height over the time interval.
Havg = (Ho + Hf)/2 = (30+28.92)/2 = 29.46 inches
"It" is the tested infiltration rate.

$$It = \frac{\Delta H(60r)}{\Delta t(r + 2Havg)} = \frac{1.08(60 \times 4)}{30(4+2 \times 29.46)} = 259.2/1887.6 = 0.137 \text{ inch/hour}$$

Factor of Safety: 2.25; Design Infiltration Rate: 0.137/2.25 = 0.0613 **inch/hour Failing**

CONCLUSIONS AND RECOMMENDATIONS

Our analysis of collected data and percolation testing indicate that due to the dense soils the proposed infiltration rate of **0.061 inch per hour** for the area of P-1 is considered **failing** and does not meet the required County of Riverside minimum **0.3 inch/hour**. Based on Our testing and analysis of collected data, we conclude that the proposed onsite infiltration system **is not feasible** from a geotechnical viewpoint.

LIMITATIONS

Soil materials vary in character between excavations. Site conditions may vary due to seasonal changes or other factors. Therefore, we assume no responsibility or liability for work, testing or recommendations performed or provided by others. Site geotechnical or environmental factors, are not part of the scope of this work.

Since our study is based upon the site materials observed, engineering research and analyses, the conclusions and recommendations are professional opinions. These opinions have been derived in accordance with current standards of practice, and no warranty is expressed or implied. Standards of practice are subject to change with time.

The opportunity to be of service is sincerely appreciated. If you should have any questions, please do not hesitate to call our office.

Very truly yours,
CAL LAND ENGINEERING, INC.
dba QUARTECH CONSULTANTS

Jack C. Lee
Geotechnical Engineer GE 2153

REGISTERED PROFESSIONAL ENGINEER
JACK C. S. LEE
2153
Exp. 3-31-23
GEOTECHNICAL
STATE OF CALIFORNIA

John Tran
Project Engineer

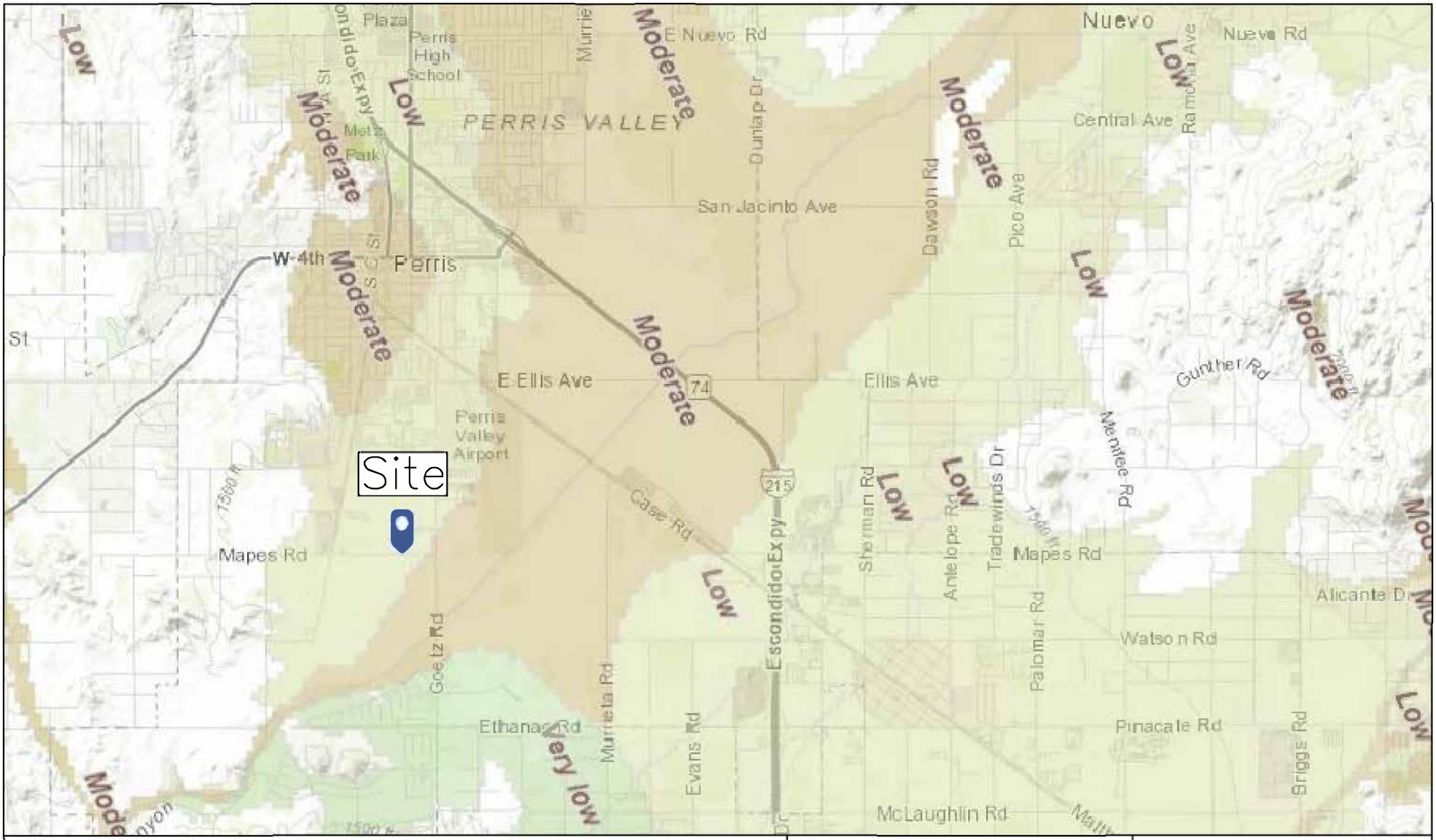
Abe Kazemzadeh
Project Engineer

Enclosures:

Figure 1 - Site Location Map
Figure 2 - Site Plan

Appendix A - Boring Logs
Appendix B - Percolation Test Results

Dist: (4) Addressee



LIQUEFACTION

- VERY HIGH
- HIGH
- MODERATE
- LOW
- VERY LOW
- UNKNOWN

NOT TO SCALE

Map Modified from Esri, HERE, Garmin, FAO, NOAA, USGS, EPA, NPS | California Geological Survey, C.W. Jennings, W.A. Bryant | Seismic Hazards Program, California Geological Survey, California Department of Conservation

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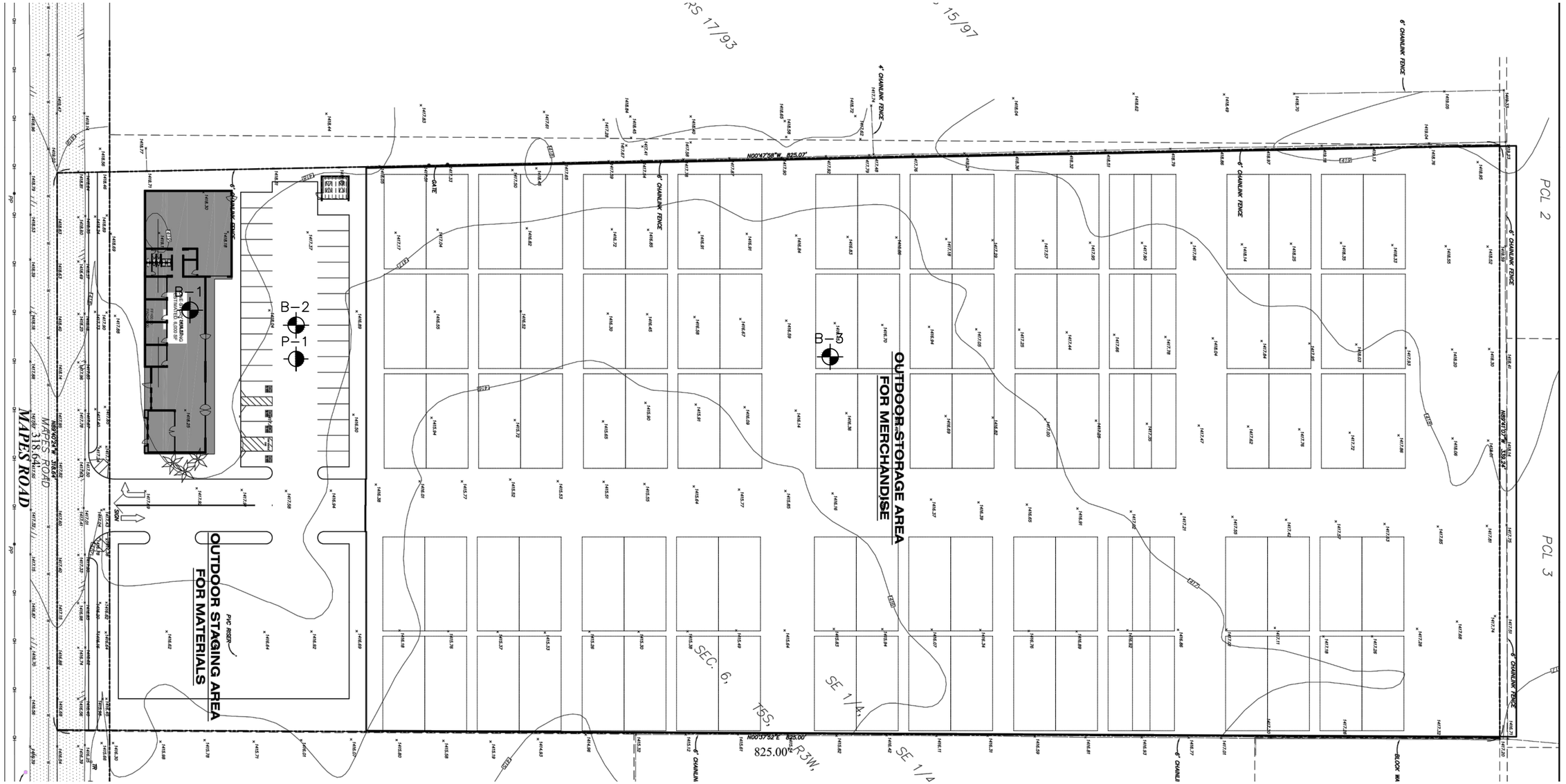
Project Address:

APN: 330-080-006
Vacant Lot, Adj East of 150 Mapples Road, Perris, CA

Site Location Map

06/21

FIGURE 1



LEGEND

B–1 — Approximate boring location

P–1 — Approximate percolation location

SCALE: 1" = 60'

CalLand Engineering, Inc. dba Quartech Consultants Geotechnical, Environmental & Civil Engineering Services	Project Address: APN: 330–080–006 Vacant Lot, Adj East of 150 Mapples Road, Perris, CA

SITE PLAN

6/21

FIGURE 2

Vacant Lot, East of 150 Mapes Road, Perris, CA

Factor Category		Factor Description	Assigned Weight	Factor Value (v)	Product (p) p=w x v
A	Suitability Assessment	Soil assessment methods	0.25	2	0.50
		Predominant soil texture	0.25	1	0.25
		Site soil variability	0.25	1	0.25
		Depth to groundwater/ impervious layer Suitability	0.25	2	0.50
		Assessment Safety Factor, $S_A=\Sigma p$			1.50
B	Design	Tributary area size	0.25	2	0.50
		Level of pretreatment/ expected sediment load	0.25	1	0.25
		Redundancy	0.25	2	0.50
		Compaction during construction	0.25	1	0.25
		Design Safety Factor, $S_B=\Sigma p$			1.50
Combined Safety Factor, $S_{TOT} = S_A \times S_B$					2.25
Measured Infiltration rate, inch/hr, K_M (Corrected for test-specific bias)					Ave. Inf.= 0.137 in/min
Design Infiltration Rate, in/hr, $K_{DESIGN} = K_M / S_{TOT}$					0.137/2.25 = 0.061 in/hr
Supporting Data					

Note: The minimum combined adjustment factor shall not be less than 2.0 and the maximum combined adjustment factor shall not exceed 9.0.

Appendix A

Boring Logs

CalLand Engineering, Inc
dba Quartech Cosultants

BORING LOG B-1

PROJECT LOCATION: Vacant Lot, E of 150 Mapes Road, Perris, CA
PROJECT NO.: 21-188-001

DATE DRILLED: 5/28/2021
SAMPLE METHOD: Hollow Stem
ELEVATION: N/A
LOGGED BY: JT

B: Bulk Bag
S: Standard Penetration Test
R: Ring Sample

Depth (ft)	Sample: Bulk	Sample: Undisturbed	Sample: Blows/6"	USCS Symbol	Dry Unit Wt. (pcf)	Moisture (%)	Description of Material
	B			SM		2.6	Silty sand, fine grained, tan brown, slightly moist, dense.
			32				Percent of Fines: 33.0
		R	50/5"	SM	122.8	6.3	Silty sand, fine grained, tan brown, slightly moist, dense.
5		R	8	SC	121.1	7.9	Clayey sand, fine grained, medium brown, slightly moist, dense.
			24				Percent of Fines: 38.3
			30				
			6				
10		R	27	SC	122.3	9.1	Clayey sand, medium grained, medium brown, slightly moist, dense.
			32				Percent of Fines: 37.1
			10				
15		R	17	SM	118.6	10.8	Silty sand, medium grained, medium brown, slightly moist, medium dense.
			21				Percent of Fines: 28.8
			2				
20		R	18	CL	107.0	20.3	Sandy clay, , light brown, very moist, very stiff.
			18				Percent of Fines: 27.5
25							Total Depth: 21.5 feet No Groundwater Hole Backfilled
30							Hammer Driving Weight: 140 lbs Hammer Driving Height: 30 inches
35							

CalLand Engineering, Inc
dba Quartech Cosultants

BORING LOG B-2

PROJECT LOCATION: Vacant Lot, E of 150 Mapes Road, Perris, CA
PROJECT NO.: 21-188-001

DATE DRILLED: 5/28/2021
SAMPLE METHOD: Hollow Stem
ELEVATION: N/A
LOGGED BY: JT

B: Bulk Bag
S: Standard Penetration Test
R: Ring Sample

Depth (ft)	Sample: Bulk	Sample: Undisturbed	Sample: Blows/6"	USCS Symbol	Dry Unit Wt. (pcf)	Moisture (%)	Description of Material
0		R	12 43 50/5"	SM	128.8	8.5	Silty sand, fine grained, tan brown, slightly moist, very dense
5		S	5 13 13	SC		8.3	Clayey sand, fine grained, medium brown, slightly moist, medium dense Percent of Fines: 31.8
10		R	1 11 49	SC	117.7	8.4	Clayey sand, fine grained, medium brown, slightly moist, dense Percent of Fines: 33.0
15							Total Depth: 11.5 feet No Groundwater Hole Backfilled Hammer Driving Weight: 140 lbs Hammer Driving Height: 30 inches
20							
25							
30							
35							

CalLand Engineering, Inc
dba Quartech Cosultants

BORING LOG B-3

PROJECT LOCATION: Vacant Lot, E of 150 Mapes Road, Perris, CA
PROJECT NO.: 21-188-001

DATE DRILLED: 5/28/2021
SAMPLE METHOD: Hollow Stem
ELEVATION: N/A
LOGGED BY: JT

B: Bulk Bag
S: Standard Penetration Test
R: Ring Sample

Depth (ft)	Sample: Bulk	Sample: Undisturbed	Sample: Blows/6"	USCS Symbol	Dry Unit Wt. (pcf)	Moisture (%)	Description of Material
0		R	12 16 22	SM	107.3	6.0	Silty sand, medium grained, medium brown, slightly moist, medium dense
5		R	15 21 33	SM	128.7	11.7	Silty sand, fine grained, medium brown, slightly moist, dense Percent of Fines: 43.6
10							Total Depth: 6.5 feet No Groundwater Hole Backfilled Hammer Driving Weight: 140 lbs Hammer Driving Height: 30 inches
15							
20							
25							
30							
35							

Appendix B

Percolation Test Results

Percolation Test Data Sheet

Project:	Vacant Lot, Perris, CA (APN: 330-080-006)	Project No:	21-188-001	Date:	5/29/2021
Test Hole No:	P-1	Tested By:	JT		
Depth of Test Hole, Dt:	8.0'	USCS Soil Classification:	Clayey Sand (SC)		
Test Hole Diminensions (inches)			Length	Width	
Diameter if round= 8"		Sides if Rectangular	N/A	N/A	

Sandy Soil Criteria Test*

Trial No	Start Time	Stop Time	Time Interval (min)	Initial Depth to Water (in)	Final Depth to Water (in)	Change in Water Level (in)	Greater than or Equal to 6" (y/n)
1	9:30 AM	9:55 AM	25	81.96	85.30	3.34	No
2	9:57 AM	10:22 AM	25	75.72	78.20	2.48	No

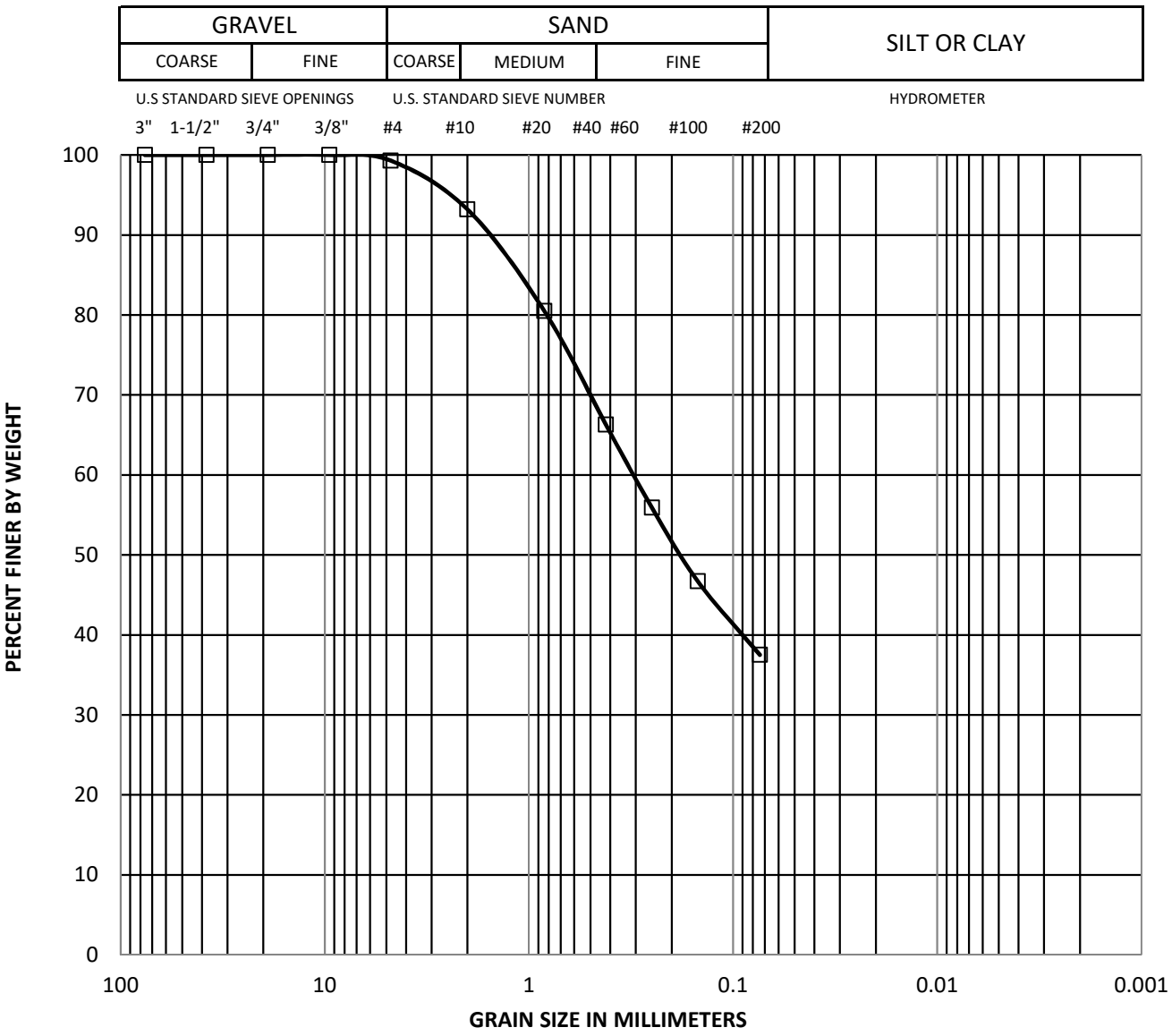
* If two consecutive measurements show that six inches of water seeps away in less that 25 minutes, the test shall be run for an additional hour with measurements taken every 10 minutes. Otherwise, presoak (fill) overnight. Obtain at least twelve measurements per hole over at least six hours (approximately 30 minute intervals) with a precision of 0.25".

Trial No	Start Time	Stop Time	Δt Initial Interval (min)	Do Initial Depth to Water (in)	Df Final Depth to Water (in)	ΔD Change in Water Level (in)	Percolation Rate (min/in)
1	10:27 AM	10:57 AM	30	65.50	67.80	2.30	13.043
2	10:59 AM	11:29 AM	30	65.40	67.50	2.10	14.286
3	11:31 AM	12:01 PM	30	65.30	67.40	2.10	14.286
4	12:03 PM	12:33 PM	30	65.20	66.80	1.60	18.750
5	12:35 PM	1:05 PM	30	65.30	66.90	1.60	18.750
6	1:07 PM	1:37 PM	30	65.10	66.70	1.60	18.750
7	1:39 PM	2:09 PM	30	65.20	66.50	1.30	23.077
8	2:11 PM	2:41 PM	30	65.60	66.80	1.20	25.000
9	2:43 PM	3:13 PM	30	65.40	66.50	1.10	27.273
10	3:15 PM	3:45 PM	30	61.80	62.90	1.10	27.273
11	3:47 PM	4:17 PM	30	64.92	66.00	1.08	27.778
12	4:19 PM	4:49 PM	30	66.00	67.08	1.08	27.778
13							
14							
15							

Comments:

Appendix C

SIEVE ANALYSIS



SYMBOL	SAMPLE ID	DEPTH (FT)	SAMPLE TPYE	SOIL TYPE	LIQUID LIMIT	PLASTICITY INDEX
□	P-1	8.0'	BULK	SC	N/A	N/A

CalLand Engineering, Inc
dba Quartech Consultants
Geotechnical, Environmental & Civil Engineering Services

Project Address:
APN: 330-080-006
Vacant Lot, Adj East of 150 Mapes Rd, Perris, California

GRAIN SIZE DISTRIBUTION CURVE

(ASTM D422)

6/21

FIGURE

Appendix 6: BMP Design Details

BMP Sizing, Design Details and other Supporting Documentation

Santa Ana Watershed - BMP Design Volume, V_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name: Cal Land Engineering, Inc. | Date: 4/25/2022

Designed by: PS | Case No:

Company Project Number/Name:

BMP Identification

BMP NAME / ID: Infiltration Trench

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

85th Percentile, 24-hour Rainfall Depth, from the Isohyetal Map in Handbook Appendix E

D_{85}= 0.60 inches

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	Design Storm Depth (in)	Design Capture Volume, V_{BMP} (cubic feet)	Proposed Volume on Plans (cubic feet)
A1	26,387.96	Ornamental Landscaping	0.1	0.11	2914.8			
D1	41,253.56	Concrete or Asphalt	1	0.89	36798.2			
	67641.52	Total			39713	0.60	1985.7	93,412.50

Notes:

Infiltration Trench - Design Procedure	BMP ID	Legend:	Required Entries
			Calculated Cells

Company Name:		Date:	
Designed by:		County/City Case No.:	

Design Volume

Enter the area tributary to this feature, Max = 10 acres	A_t=	6	acres
Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP}=	2,061	ft^3

Calculate Maximium Depth of the Reservoir Layer

Enter Infiltration rate	I =	0.9	in/hr
Enter Factor of Safety, FS (unitless)	FS =	3	

Obtain from Table 1, Appendix A: "Infiltration Testing" of this BMP Handbook

n = 40 %

Calculate D_1. $D_1 = \dfrac{I\ (in/hr) \times 72\ hrs}{12\ (in/ft) \times (n/100) \times FS}$ D_1 = 4.50 ft

Enter depth to historic high groundwater mark (measured from finished grade)	1364	ft
Enter depth to top of bedrock or impermeable layer (measured from finished grade)	1364	ft

D_2 is the smaller of:

Depth to groundwater - 11 ft; & Depth to impermeable layer - 6 ft	D_2 =	1353.0	ft
D_{MAX} is the smaller value of D_1 and D_2, must be less than or equal to 8 feet.	D_{MAX} =	4.5	ft

Trench Sizing

Enter proposed reservoir layer depth D_R, must be ≤ D_{MAX}	D_R =	0.50	ft

Calculate the design depth of water, d_W

Design d_W = $(D_R) \times (n/100)$ Design d_W= 0.20 ft

Minimum Surface Area, A_S $A_S = \dfrac{V_{BMP}}{d_W}$ A_S = 10,304 ft^2

Proposed Design Surface Area	A_D =	186,825	ft^2
Minimum Width = D_R + 1 foot pea gravel		1.50	ft

Sediment Control Provided? (Use pulldown)

Geotechnical report attached? (Use pulldown)

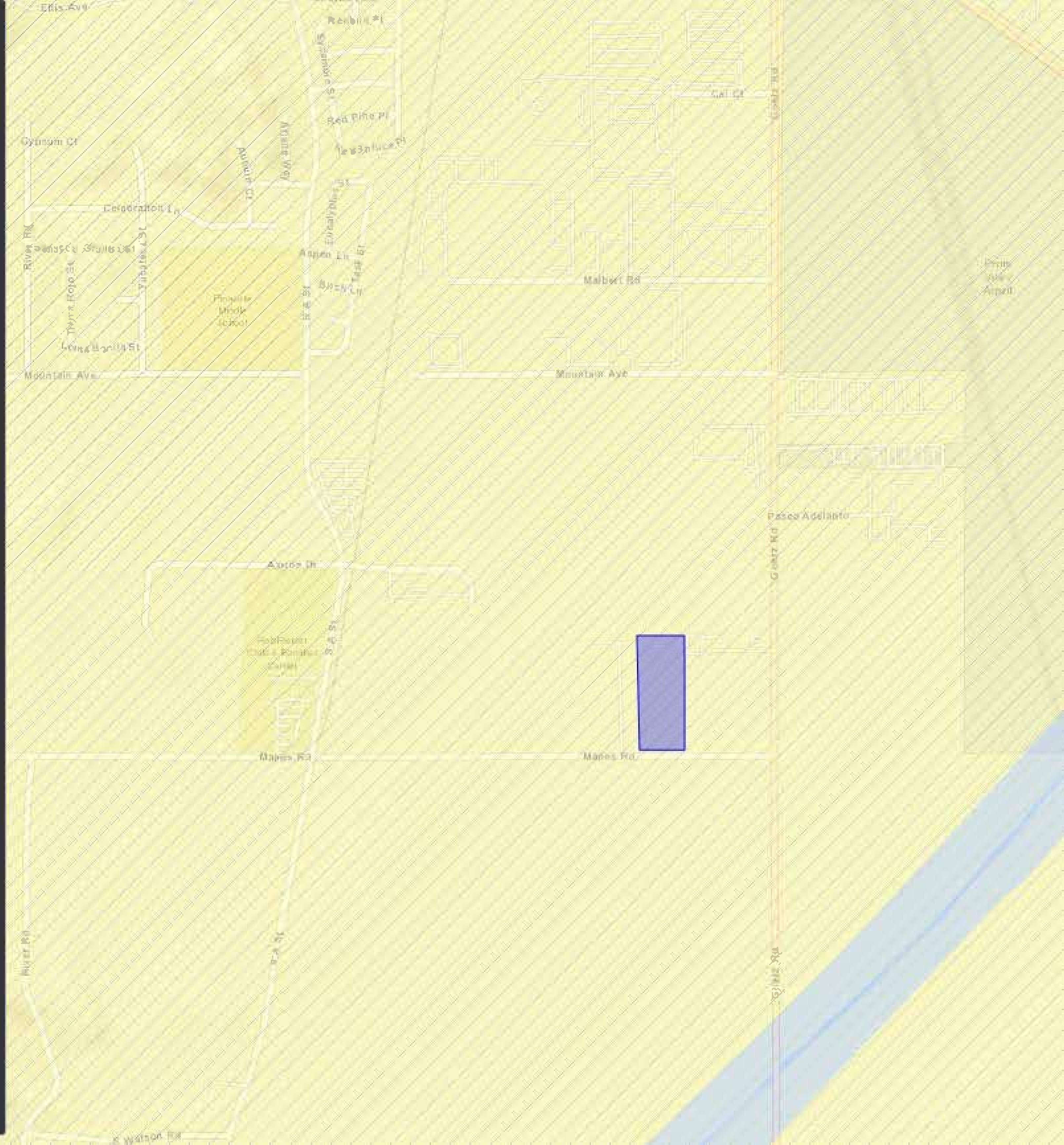
If the trench has been designed correctly, there should be no error messages on the spreadsheet.

Appendix 7: Hydromodification

Supporting Detail Relating to Hydrologic Conditions of Concern

Clear All Metadata

- Base Maps
- Base Data
- Stormwater Data
  - Hydromodification Susceptibility Mapping
    - Not Susceptible
    - Santa Ana River
    - Potentially Susceptible
  - 2010 - 303d/TMDL
  - Hydromodification Exemption Areas
    - Potentially Not Exempt
    - Potentially Exempt
  - District Facilities
  - Permit Areas
  - Hydrologic Unit Codes (HUC)
  - Topographic Drainage Boundary
  - Drainage Area Boundaries
  - City Storm Drains
  - WQMP 85% Design Isohyetal Map
  - CRP (Contol Release Point)
  - FEMA Flood Plain
  - Flood Plain - Other Special Studies
  - As-Built Plans
- Groundwater Data
- U.S. Fish and Wildlife Critical Habitat
- WRMSHCP Potential Survey Areas
- SKRHCP
- CVMSHCP Survey Data and Conservation Areas



Appendix 8: Source Control

Pollutant Sources/Source Control Checklist

Appendix 9: O&M

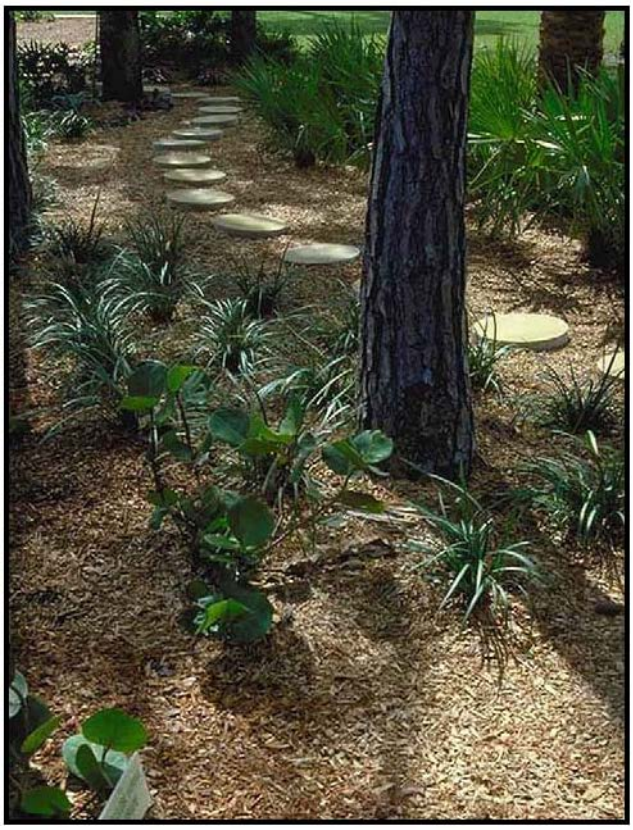
Operation and Maintenance Plan and Documentation of Finance, Maintenance and Recording Mechanisms

BMP I.D. No.	Description of BMP including dimensions, details, make & model, etc.	Maintenance Responsibility	Funding Source For O & M	Maintenance Schedule
SD-10	Site Design and Landscape Planning – Landscape planning should consider the land suitability. Project plan designs should conserve natural areas to the extent possible, maximize natural water storage and infiltration opportunities, and protect the slopes and channels.	Owner	Owner	Ongoing
SD-11	Roof Runoff Controls – site shall be designed to direct roof runoff to Landscape Area	Owner	Owner	Ongoing
SD-12	Efficient Irrigation – design should include application methods of irrigation water that minimize runoff of excess irrigation water into the stormwater conveyance system.	Owner	Owner	Ongoing
SD-13	Storm Drain Signage – Show signage at the top of parkway drain. "NO DUMPING - DRAINS TO OCEAN"	Owner	Owner	Ongoing
SD-20	Pervious Pavement – The maintenance requirements of a pervious surface should be reviewed at the time of design and should be clearly specified. Maintenance is required to prevent clogging of the pervious surface. The factors to be considered when defining maintenance requirements must include: -Type of use - Ownership - Level of trafficking - The local environment and any contributing catchments	Owner	Owner	Ongoing
SD-32	Trash Storage Areas - Trash container areas shall install permanent roof and shall be walled to prevent off-site transportation of trash. All stormwater runoff from the building and pavement shall be diverted away from the trash container areas.	Owner	Owner	Ongoing

Appendix 10: Educational Materials

BMP Fact Sheets, Maintenance Guidelines and Other End-User BMP Information

Site Design & Landscape Planning SD-10



Design Objectives

- ☑ Maximize Infiltration
- ☑ Provide Retention
- ☑ Slow Runoff
- ☑ Minimize Impervious Land Coverage
- Prohibit Dumping of Improper Materials
- Contain Pollutants
- Collect and Convey

Description

Each project site possesses unique topographic, hydrologic, and vegetative features, some of which are more suitable for development than others. Integrating and incorporating appropriate landscape planning methodologies into the project design is the most effective action that can be done to minimize surface and groundwater contamination from stormwater.

Approach

Landscape planning should couple consideration of land suitability for urban uses with consideration of community goals and projected growth. Project plan designs should conserve natural areas to the extent possible, maximize natural water storage and infiltration opportunities, and protect slopes and channels.

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment.

Design Considerations

Design requirements for site design and landscapes planning should conform to applicable standards and specifications of agencies with jurisdiction and be consistent with applicable General Plan and Local Area Plan policies.

Designing New Installations

Begin the development of a plan for the landscape unit with attention to the following general principles:

- Formulate the plan on the basis of clearly articulated community goals. Carefully identify conflicts and choices between retaining and protecting desired resources and community growth.
- Map and assess land suitability for urban uses. Include the following landscape features in the assessment: wooded land, open unwooded land, steep slopes, erosion-prone soils, foundation suitability, soil suitability for waste disposal, aquifers, aquifer recharge areas, wetlands, floodplains, surface waters, agricultural lands, and various categories of urban land use. When appropriate, the assessment can highlight outstanding local or regional resources that the community determines should be protected (e.g., a scenic area, recreational area, threatened species habitat, farmland, fish run). Mapping and assessment should recognize not only these resources but also additional areas needed for their sustenance.

Project plan designs should conserve natural areas to the extent possible, maximize natural water storage and infiltration opportunities, and protect slopes and channels.

Conserve Natural Areas during Landscape Planning

If applicable, the following items are required and must be implemented in the site layout during the subdivision design and approval process, consistent with applicable General Plan and Local Area Plan policies:

- Cluster development on least-sensitive portions of a site while leaving the remaining land in a natural undisturbed condition.
- Limit clearing and grading of native vegetation at a site to the minimum amount needed to build lots, allow access, and provide fire protection.
- Maximize trees and other vegetation at each site by planting additional vegetation, clustering tree areas, and promoting the use of native and/or drought tolerant plants.
- Promote natural vegetation by using parking lot islands and other landscaped areas.
- Preserve riparian areas and wetlands.

Maximize Natural Water Storage and Infiltration Opportunities Within the Landscape Unit

- Promote the conservation of forest cover. Building on land that is already deforested affects basin hydrology to a lesser extent than converting forested land. Loss of forest cover reduces interception storage, detention in the organic forest floor layer, and water losses by evapotranspiration, resulting in large peak runoff increases and either their negative effects or the expense of countering them with structural solutions.
- Maintain natural storage reservoirs and drainage corridors, including depressions, areas of permeable soils, swales, and intermittent streams. Develop and implement policies and

regulations to discourage the clearing, filling, and channelization of these features. Utilize them in drainage networks in preference to pipes, culverts, and engineered ditches.

- Evaluating infiltration opportunities by referring to the stormwater management manual for the jurisdiction and pay particular attention to the selection criteria for avoiding groundwater contamination, poor soils, and hydrogeological conditions that cause these facilities to fail. If necessary, locate developments with large amounts of impervious surfaces or a potential to produce relatively contaminated runoff away from groundwater recharge areas.

Protection of Slopes and Channels during Landscape Design

- Convey runoff safely from the tops of slopes.
- Avoid disturbing steep or unstable slopes.
- Avoid disturbing natural channels.
- Stabilize disturbed slopes as quickly as possible.
- Vegetate slopes with native or drought tolerant vegetation.
- Control and treat flows in landscaping and/or other controls prior to reaching existing natural drainage systems.
- Stabilize temporary and permanent channel crossings as quickly as possible, and ensure that increases in run-off velocity and frequency caused by the project do not erode the channel.
- Install energy dissipaters, such as riprap, at the outlets of new storm drains, culverts, conduits, or channels that enter unlined channels in accordance with applicable specifications to minimize erosion. Energy dissipaters shall be installed in such a way as to minimize impacts to receiving waters.
- Line on-site conveyance channels where appropriate, to reduce erosion caused by increased flow velocity due to increases in tributary impervious area. The first choice for linings should be grass or some other vegetative surface, since these materials not only reduce runoff velocities, but also provide water quality benefits from filtration and infiltration. If velocities in the channel are high enough to erode grass or other vegetative linings, riprap, concrete, soil cement, or geo-grid stabilization are other alternatives.
- Consider other design principles that are comparable and equally effective.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of " redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

Redevelopment may present significant opportunity to add features which had not previously been implemented. Examples include incorporation of depressions, areas of permeable soils, and swales in newly redeveloped areas. While some site constraints may exist due to the status of already existing infrastructure, opportunities should not be missed to maximize infiltration, slow runoff, reduce impervious areas, disconnect directly connected impervious areas.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Stormwater Management Manual for Western Washington, Washington State Department of Ecology, August 2001.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Roof Runoff Controls SD-11

Rain Garden

Design Objectives

- ☑ Maximize Infiltration
- ☑ Provide Retention
- ☑ Slow Runoff
- Minimize Impervious Land Coverage
- Prohibit Dumping of Improper Materials
- ☑ Contain Pollutants
- Collect and Convey

Description

Various roof runoff controls are available to address stormwater that drains off rooftops. The objective is to reduce the total volume and rate of runoff from individual lots, and retain the pollutants on site that may be picked up from roofing materials and atmospheric deposition. Roof runoff controls consist of directing the roof runoff away from paved areas and mitigating flow to the storm drain system through one of several general approaches: cisterns or rain barrels; dry wells or infiltration trenches; pop-up emitters, and foundation planting. The first three approaches require the roof runoff to be contained in a gutter and downspout system. Foundation planting provides a vegetated strip under the drip line of the roof.

Approach

Design of individual lots for single-family homes as well as lots for higher density residential and commercial structures should consider site design provisions for containing and infiltrating roof runoff or directing roof runoff to vegetative swales or buffer areas. Retained water can be reused for watering gardens, lawns, and trees. Benefits to the environment include reduced demand for potable water used for irrigation, improved stormwater quality, increased groundwater recharge, decreased runoff volume and peak flows, and decreased flooding potential.

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment.

Design Considerations

Designing New Installations

Cisterns or Rain Barrels

One method of addressing roof runoff is to direct roof downspouts to cisterns or rain barrels. A cistern is an above ground storage vessel with either a manually operated valve or a permanently open outlet. Roof runoff is temporarily stored and then released for irrigation or infiltration between storms. The number of rain

barrels needed is a function of the rooftop area. Some low impact developers recommend that every house have at least 2 rain barrels, with a minimum storage capacity of 1000 liters. Roof barrels serve several purposes including mitigating the first flush from the roof which has a high volume, amount of contaminants, and thermal load. Several types of rain barrels are commercially available. Consideration must be given to selecting rain barrels that are vector proof and childproof. In addition, some barrels are designed with a bypass valve that filters out grit and other contaminants and routes overflow to a soak-away pit or rain garden.

If the cistern has an operable valve, the valve can be closed to store stormwater for irrigation or infiltration between storms. This system requires continual monitoring by the resident or grounds crews, but provides greater flexibility in water storage and metering. If a cistern is provided with an operable valve and water is stored inside for long periods, the cistern must be covered to prevent mosquitoes from breeding.

A cistern system with a permanently open outlet can also provide for metering stormwater runoff. If the cistern outlet is significantly smaller than the size of the downspout inlet (say ¼ to ½ inch diameter), runoff will build up inside the cistern during storms, and will empty out slowly after peak intensities subside. This is a feasible way to mitigate the peak flow increases caused by rooftop impervious land coverage, especially for the frequent, small storms.

Dry wells and Infiltration Trenches

Roof downspouts can be directed to dry wells or infiltration trenches. A dry well is constructed by excavating a hole in the ground and filling it with an open graded aggregate, and allowing the water to fill the dry well and infiltrate after the storm event. An underground connection from the downspout conveys water into the dry well, allowing it to be stored in the voids. To minimize sedimentation from lateral soil movement, the sides and top of the stone storage matrix can be wrapped in a permeable filter fabric, though the bottom may remain open. A perforated observation pipe can be inserted vertically into the dry well to allow for inspection and maintenance.

In practice, dry wells receiving runoff from single roof downspouts have been successful over long periods because they contain very little sediment. They must be sized according to the amount of rooftop runoff received, but are typically 4 to 5 feet square, and 2 to 3 feet deep, with a minimum of 1-foot soil cover over the top (maximum depth of 10 feet).

To protect the foundation, dry wells must be set away from the building at least 10 feet. They must be installed in solids that accommodate infiltration. In poorly drained soils, dry wells have very limited feasibility.

Infiltration trenches function in a similar manner and would be particularly effective for larger roof areas. An infiltration trench is a long, narrow, rock-filled trench with no outlet that receives stormwater runoff. These are described under Treatment Controls.

Pop-up Drainage Emitter

Roof downspouts can be directed to an underground pipe that daylights some distance from the building foundation, releasing the roof runoff through a pop-up emitter. Similar to a pop-up irrigation head, the emitter only opens when there is flow from the roof. The emitter remains flush to the ground during dry periods, for ease of lawn or landscape maintenance.

Foundation Planting

Landscape planting can be provided around the base to allow increased opportunities for stormwater infiltration and protect the soil from erosion caused by concentrated sheet flow coming off the roof. Foundation plantings can reduce the physical impact of water on the soil and provide a subsurface matrix of roots that encourage infiltration. These plantings must be sturdy enough to tolerate the heavy runoff sheet flows, and periodic soil saturation.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of " redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

Supplemental Information

Examples

- City of Ottawa's Water Links Surface –Water Quality Protection Program
- City of Toronto Downspout Disconnection Program
- City of Boston, MA, Rain Barrel Demonstration Program

Other Resources

Hager, Marty Catherine, Stormwater, "Low-Impact Development", January/February 2003. www.stormh2o.com

Low Impact Urban Design Tools, Low Impact Development Design Center, Beltsville, MD. www.lid-stormwater.net

Start at the Source, Bay Area Stormwater Management Agencies Association, 1999 Edition

Efficient Irrigation SD-12

Design Objectives

- ☑ Maximize Infiltration
- ☑ Provide Retention
- ☑ Slow Runoff
- Minimize Impervious Land Coverage
- Prohibit Dumping of Improper Materials
- Contain Pollutants
- Collect and Convey

Description

Irrigation water provided to landscaped areas may result in excess irrigation water being conveyed into stormwater drainage systems.

Approach

Project plan designs for development and redevelopment should include application methods of irrigation water that minimize runoff of excess irrigation water into the stormwater conveyance system.

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment. (Detached residential single-family homes are typically excluded from this requirement.)

Design Considerations

Designing New Installations

The following methods to reduce excessive irrigation runoff should be considered, and incorporated and implemented where determined applicable and feasible by the Permittee:

- Employ rain-triggered shutoff devices to prevent irrigation after precipitation.
- Design irrigation systems to each landscape area's specific water requirements.
- Include design featuring flow reducers or shutoff valves triggered by a pressure drop to control water loss in the event of broken sprinkler heads or lines.
- Implement landscape plans consistent with County or City water conservation resolutions, which may include provision of water sensors, programmable irrigation times (for short cycles), etc.

CASQA
CALIFORNIA STORMWATER QUALITY ASSOCIATION

- Design timing and application methods of irrigation water to minimize the runoff of excess irrigation water into the storm water drainage system.
- Group plants with similar water requirements in order to reduce excess irrigation runoff and promote surface filtration. Choose plants with low irrigation requirements (for example, native or drought tolerant species). Consider design features such as:
  - Using mulches (such as wood chips or bar) in planter areas without ground cover to minimize sediment in runoff
  - Installing appropriate plant materials for the location, in accordance with amount of sunlight and climate, and use native plant materials where possible and/or as recommended by the landscape architect
  - Leaving a vegetative barrier along the property boundary and interior watercourses, to act as a pollutant filter, where appropriate and feasible
  - Choosing plants that minimize or eliminate the use of fertilizer or pesticides to sustain growth
- Employ other comparable, equally effective methods to reduce irrigation water runoff.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of " redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Storm Drain Signage SD-13

Design Objectives

- Maximize Infiltration
- Provide Retention
- Slow Runoff
- Minimize Impervious Land Coverage
- ☑ Prohibit Dumping of Improper Materials
- Contain Pollutants
- Collect and Convey

Description

Waste materials dumped into storm drain inlets can have severe impacts on receiving and ground waters. Posting notices regarding discharge prohibitions at storm drain inlets can prevent waste dumping. Storm drain signs and stencils are highly visible source controls that are typically placed directly adjacent to storm drain inlets.

Approach

The stencil or affixed sign contains a brief statement that prohibits dumping of improper materials into the urban runoff conveyance system. Storm drain messages have become a popular method of alerting the public about the effects of and the prohibitions against waste disposal.

Suitable Applications

Stencils and signs alertthe public to the destination of pollutants discharged to the storm drain. Signs are appropriate in residential, commercial, and industrial areas, as well as any other area where contributions or dumping to storm drains is likely.

Design Considerations

Storm drain message markers or placards are recommended at all storm drain inlets within the boundary of a development project. The marker should be placed in clear sight facing toward anyone approaching the inlet from either side. All storm drain inlet locations should be identified on the development site map.

Designing New Installations

The following methods should be considered for inclusion in the project design and show on project plans:

- Provide stenciling or labeling of all storm drain inlets and catch basins, constructed or modified, within the project area with prohibitive language. Examples include "NO DUMPING

– DRAINS TO OCEAN" and/or other graphical icons to discourage illegal dumping.

- Post signs with prohibitive language and/or graphical icons, which prohibit illegal dumping at public access points along channels and creeks within the project area.

Note - Some local agencies have approved specific signage and/or storm drain message placards for use. Consult local agency stormwater staff to determine specific requirements for placard types and methods of application.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. If the project meets the definition of "redevelopment", then the requirements stated under " designing new installations" above should be included in all project design plans.

Additional Information

Maintenance Considerations

- Legibility of markers and signs should be maintained. If required by the agency with jurisdiction over the project, the owner/operator or homeowner's association should enter into a maintenance agreement with the agency or record a deed restriction upon the property title to maintain the legibility of placards or signs.

Placement

- Signage on top of curbs tends to weather and fade.

- Signage on face of curbs tends to be worn by contact with vehicle tires and sweeper brooms.

Supplemental Information

Examples

- Most MS4 programs have storm drain signage programs. Some MS4 programs will provide stencils, or arrange for volunteers to stencil storm drains as part of their outreach program.

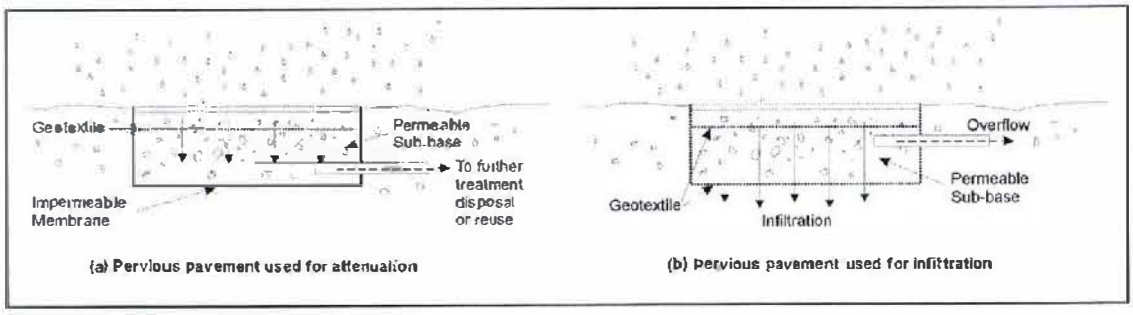
Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.



Schematics of a Pervious Pavement System

Trash Storage Areas SD-32

Description

Trash storage areas are areas where a trash receptacle (s) are located for use as a repository for solid wastes. Stormwater runoff from areas where trash is stored or disposed of can be polluted. In addition, loose trash and debris can be easily transported by water or wind into nearby storm drain inlets, channels, and/or creeks. Waste handling operations that may be sources of stormwater pollution include dumpsters, litter control, and waste piles.

Approach

This fact sheet contains details on the specific measures required to prevent or reduce pollutants in stormwater runoff associated with trash storage and handling. Preventative measures including enclosures, containment structures, and impervious pavements to mitigate spills, should be used to reduce the likelihood of contamination.

Design Objectives

- Maximize Infiltration
- Provide Retention
- Slow Runoff
- Minimize Impervious Land Coverage
- Prohibit Dumping of Improper Materials
- ☑ Contain Pollutants
- Collect and Convey

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment. (Detached residential single-family homes are typically excluded from this requirement.)

Design Considerations

Design requirements for waste handling areas are governed by Building and Fire Codes, and by current local agency ordinances and zoning requirements. The design criteria described in this fact sheet are meant to enhance and be consistent with these code and ordinance requirements. Hazardous waste should be handled in accordance with legal requirements established in Title 22, California Code of Regulation.

Wastes from commercial and industrial sites are typically hauled by either public or commercial carriers that may have design or access requirements for waste storage areas. The design criteria in this fact sheet are recommendations and are not intended to be in conflict with requirements established by the waste hauler. The waste hauler should be contacted prior to the design of your site trash collection areas. Conflicts or issues should be discussed with the local agency.

Designing New Installations

Trash storage areas should be designed to consider the following structural or treatment control BMPs:

- Design trash container areas so that drainage from adjoining roofs and pavement is diverted around the area(s) to avoid run-on. This might include berming or grading the waste handling area to prevent run-on of stormwater.
- Make sure trash container areas are screened or walled to prevent off-site transport of trash.

- Use lined bins or dumpsters to reduce leaking of liquid waste.
- Provide roofs, awnings, or attached lids on all trash containers to minimize direct precipitation and prevent rainfall from entering containers.
- Pave trash storage areas with an impervious surface to mitigate spills.
- Do not locate storm drains in immediate vicinity of the trash storage area.
- Post signs on all dumpsters informing users that hazardous materials are not to be disposed of therein.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of " redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

Additional Information

Maintenance Considerations

The integrity of structural elements that are subject to damage (i.e., screens, covers, and signs) must be maintained by the owner/operator. Maintenance agreements between the local agency and the owner/operator may be required. Some agencies will require maintenance deed restrictions to be recorded of the property title. If required by the local agency, maintenance agreements or deed restrictions must be executed by the owner/operator before improvement plans are approved.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

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