Appendix 5B

WQMP Report

Sunset Crossings Residential Project

Initial Study

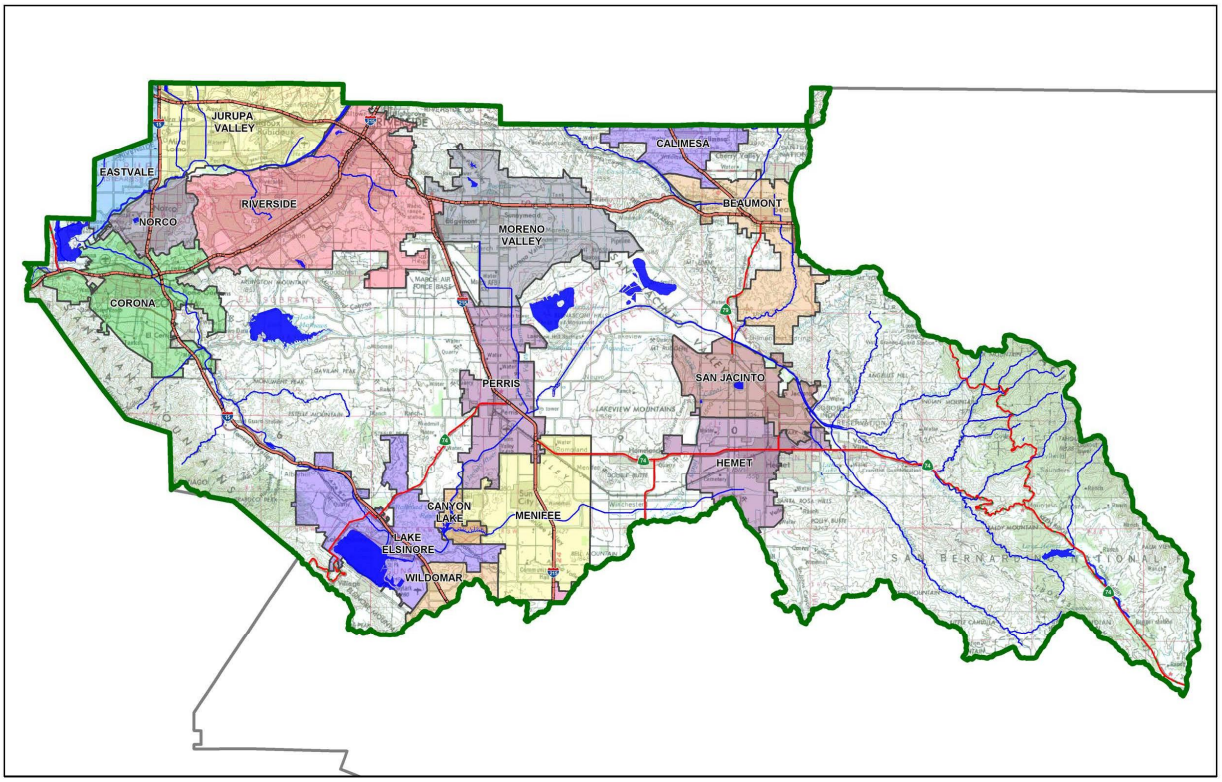
Project Specific Water Quality Management Plan

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

Project Title: Sunset Crossings

Development No: TBD

Design Review/Case No: LWWQ22-0029



☒ Preliminary
☐ Final

Original Date Prepared: 5/19/22

Revision Date(s): 8/30/22

Prepared for Compliance with
Regional Board Order No. R8-2010-0033

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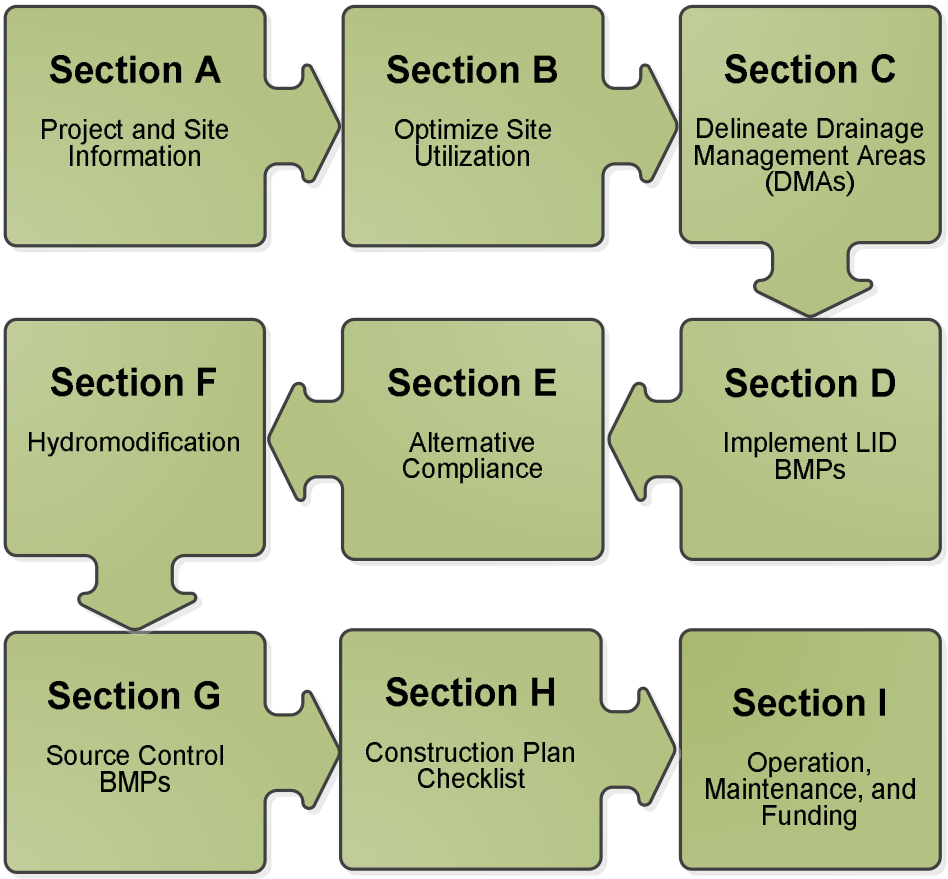
A Brief Introduction

This Project-Specific WQMP Template for the Santa Ana Region has been prepared to help guide you in documenting compliance for your project. Because this document has been designed to specifically document compliance, you will need to utilize the WQMP Guidance Document as your "how-to" manual to help guide you through this process. Both the Template and Guidance Document go hand-in-hand, and will help facilitate a well prepared Project-Specific WQMP. Below is a flowchart for the layout of this Template that will provide the steps required to document compliance.



OWNER'S CERTIFICATION

This Project-Specific Water Quality Management Plan (WQMP) has been prepared for Highpointe Communities by Proactive Engineering Consultants, Inc. for the Sunset Crossings project.

This WQMP is intended to comply with the requirements of The City of Moreno Valley for Ordinance 827 § 2.1, 2011 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 Lake Elsinore Water Quality Ordinance (Municipal Code Section Chapter 8.10).

"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."

Owner's Signature	Date
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."

Preparer's Signature	Date
Preparer's Printed Name	Preparer's Title/Position

Preparer's Licensure:

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Section A: Project and Site Information

PROJECT INFORMATION	
Type of Project:	Residential
Planning Area:	R3
Community Name:	TBD
Development Name:	TBD
PROJECT LOCATION	
Latitude & Longitude (DMS): 33°55'19.0" N 117°11'14.0"W	
Project Watershed and Sub-Watershed: Santa Ana Watershed	
APN(s): 488-190-027; 488-190-005; 488-190-028; 488-210-006, 488-210-020	
Map Book and Page No.: Map Book 11, Page 10	
PROJECT CHARACTERISTICS	
Proposed or Potential Land Use(s)	Detached Residential
Proposed or Potential SIC Code(s)	1521
Area of Impervious Project Footprint (SF)	2,141,868
Total Area of proposed Impervious Surfaces within the Project Limits (SF)/or Replacement	1,158,505
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 (SF)	4,800
Is the project located within any MSHCP Criteria Cell?	☐ Y ☒ N
If so, identify the Cell number:	N/A
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)	B
What is the Water Quality Design Storm Depth for the project?	0.68

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

Use your discretion on whether or not you may need to create multiple sheets or can appropriately accommodate these features on one or two sheets. Keep in mind that the Co-Permittee plan reviewer must be able to easily analyze your project utilizing this template and its associated site plans and maps.

Project Description

The proposed project boundary encompasses approximately 50 acres. There is an existing house located along the northern project boundary, located south of Cottonwood Avenue. There are 3 houses located south of Martha Crawford Street. All these residential buildings will be removed. The rest of the project site is undeveloped land, and the existing land cover consists of natural native grass based on aerial photography.

The proposed development will build 241 single family homes, sidewalks, streets, open space areas, two Detention/Extended Detention Basins, and a storm drain network system to convey offsite and onsite runoff. A proposed onsite storm drain pipe network will convey onsite runoff to the proposed Detention/Extended Detention basins. The proposed Detention/Extended Detention basins will treat and detain runoff, outlet structures will convey treated runoff to the proposed storm drain, LINE H, in Street A.

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	N/A	AGR, GWR, WILD, MUN, REC1, REC2, WARM, WILD	No RARE beneficial use within receiving water body
san jacinto river reach 2	Nutrients	AGR, GWR, WILD, MUN, REC1, REC2, WARM	No RARE beneficial use within receiving water body
San Jacinto River Reach 1	N/A	AGR, GWR, WILD, MUN, REC1, REC2, WARM, WILD	No RARE beneficial use within receiving water body
Lake Elsinore	Nutrients Organic Enrichment/Low Dissolved Oxygen PCBs; Sediment Toxicity Unknown Toxicity, DDT	REC1, REC2, WARM, WILD	No RARE beneficial use within receiving water body
Temescal Creek Reach 6	Indicator Bacteria	INTERMITTENT - GWR, REC1, REC2, WARM, WILD	No RARE beneficial use within receiving water body
Temescal Creek Reach 5	N/A	AGR, GWR, REC1, REC2, WARM, WILD, RARE	19.8 miles
Temescal Creek Reach 4	N/A	AGR, GWR, REC1, REC2, WARM, WILD, RARE	20.7 miles
Temescal Creek Reach 3	N/A	AGR, IND, GWR, REC1, REC2, WARM, WILD	No RARE beneficial use within receiving water body

Temescal Creek Reach 2	N/A	AGR, IND, GWR, REC1, REC2, WARM, WILD	No RARE beneficial use within receiving water body
Temescal Creek Reach 1a	pH	REC2, WARM, WILD	No RARE beneficial use within receiving water body
Temescal Creek Reach 1b	pH	REC2, WARM, WILD	No RARE beneficial use within receiving water body
Prado Park Lake	Nutrients, Pathogens,	REC1, REC2, COMM, WARM, WILD	No RARE beneficial use within receiving water body
Santa Ana River Reach 3	Copper, Lead, Pathogens	AGR, GWR, REC1, REC2, WARM, WILD, RARE, SPWN	No RARE beneficial use within receiving water body
Santa Ana River Reach 2	Indicator Bacteria	AGR, GWR, REC1, REC2, WARM, WILD, RARE, SPWN	44.7 miles
Santa Ana River Reach 1	N/A	REC1, REC2, WARM, WILD	No RARE beneficial use within receiving water body
Lee Lake	N/A	AGR, IND, GWR, REC1, REC2, WARM, WILD	No RARE beneficial use within receiving water body

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)* City of Moreno Valley Permits	☒ Y	☐ N

If yes is answered to any of the questions above, the Co-Permittee may require proof of approval/coverage from those agencies as applicable including documentation of any associated requirements that may affect this Project-Specific WQMP.

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.

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?

Existing drainage patterns are preserved. In its current condition, storm water runoff from the site sheet flows south towards Alessandro Boulevard. In the proposed condition, storm water runoff will be routed through a proposed RCP storm drain master plan facility. The proposed RCP storm drain master plan facility will operated by Riverside County Flood Control & Water Conservation District.

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

Based on field visits, the vegetation on the site consists of native grass. Grading and site preparation and preservation will be prepared per Geotechnical report.

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

Infiltration capacity has been identified through infiltration tests within the project site. Runoff is routed to pervious surfaces to maximize infiltration capacity within the site.

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

Impervious areas minimized by providing landscape areas within lots, park/open recreational areas and two extended detention basins.

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

Runoff from roofs will be diverted to landscape areas through the use of splash blocks, runoff from streets will be conveyed to two extended detention basins.

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]	Area (Sq. Ft.)	DMA Type
DMA A/1	Mixed Surface Types	1,225,051	Type 'D'
DMA A/2	Natural (B Soil)	84,971	Type 'D'
DMA B/2	Mixed Surface Types	748,996	Type 'D'
DMA A/2	Natural (B Soil)	82,850	Type 'D'

[1]*Reference Table 2-1 in the WQMP Guidance Document to populate this column*

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

DMA Name or ID	Area (Sq. Ft.)	Stabilization Type	Irrigation Type (if any)

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	Runoff factor	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
DMA A/1	Extended Detention Basin No 1.
DMA A/2	Extended Detention Basin No 1.
DMA B/2	Extended Detention Basin No 2.
DMA B/2	Extended Detention Basin No 2.

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. 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?		X
If Yes, list affected DMAs:		
…have any DMAs located within 100 feet of a water supply well?		X
If Yes, list affected DMAs:		
…have any areas identified by the geotechnical report as posing a public safety risk where infiltration of stormwater could have a negative impact?		X
If Yes, list affected DMAs:		
…have measured in-situ infiltration rates of less than 1.6 inches / hour?	X	
If Yes, list affected DMAs: DMA A-2 & DMA B-2		
…have significant cut and/or fill conditions that would preclude in-situ testing of infiltration rates at the final infiltration surface?		X
If Yes, list affected DMAs:		
…geotechnical report identify other site-specific factors that would preclude effective and safe infiltration?		X
Describe here:		

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 neither 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: 2.81 Acres

Type of Landscaping (Conservation Design or Active Turf): Conservation Design consisting of native vegetation.

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: 11.8 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: 1.19 (By interpolating values in Table 2-3)

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: 14.04 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)
14.04 Acres	2.81 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: 1,241 (5 users per home dwelling unit)

Project Type: Residential

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: 11.8 Acres

Step 3: Enter the Design Storm depth for the project site (see Exhibit A) into the left column of Table 2-1 in Chapter 2 to determine the minimum number or toilet users per tributary impervious acre (TUTIA).

Enter your TUTIA factor: 112 tu/ac (By interpolating Values)

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: 1,322

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)
1,322	1,241

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.

N/A

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: N/A

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: N/A

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

Enter the factor from Table 2-3: N/A

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

Minimum required use: N/A

Step 5: Determine if harvesting stormwater runoff for other non-potable 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 non-potable use (Step 4)	Projected average daily use (Step 1)
N/A	N/A

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, unless a site-specific analysis has been completed that demonstrates technical infeasibility as noted in D.3 below.

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:

X 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.

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	
A	☐	☐	☐	☒	☐
B	☐	☐	☐	☒	☐
	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐

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.

The infiltration rate throughout the project site is poor. The infiltration rates after applying a safety factor of 3.0 are 0.4 inch/hr (1.29 in/hr unfactored) for DMA A and 0.02 in/hr (0.08 inch/hr unfactored) for DMA B which are well below than 1.6 in/hr threshold. See attached soils report in Appendix 3.

Based on the LID BMP Prioritization and Feasibility Flow Chart, two Extended Detention basins were selected as an appropriate treatment BMPs for DMA A and DMA B.

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) [A]	Post-Project Surface Type	Effective Impervious Fraction, I_f [B]	**DMA Runoff Factor** [C]	DMA Areas x Runoff Factor [A] x [C]	*Extended Detention Basin 1*		
A-1	*1225051*	*Mixed Surface Types*	*0.65*	*0.45*	*550,266*			
A-2	*84971*	*Open Space*	*0.15*	*0.14*	*12,019*			
						Design Storm Depth (in)	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
	1,310,022				*562,285*	*0.68*	*31,863*	*45,166*

BASIN NO 1

EXTENDED DETENTION BASIN SIZING CALCULATIONS

STAGE VS. VOLUME

ELEVATION	DETENTION BASIN DEPTH (ft)	CONTOUR AREA (sf)	AVG. AREA (sf)	VOLUME (cu. ft.)	TOTAL VOLUME (cu - ft.)
1597.50	0.00	6,828	0	0	0
1597.83	0.33	7,211	7,020	841	841
1598.17	0.67	7,603	7,407	887	1,728
1598.50	1.00	8,002	7,803	934	2,662
1598.83	1.33	8,411	8,207	2,735	5,397
1599.17	1.67	8,827	8,619	2,873	8,270
1599.50	2.00	9,252	9,040	3,013	11,284
1599.83	2.33	9,685	9,469	3,156	14,440
1600.17	2.67	10,126	9,906	3,302	17,742
1600.50	3.00	10,576	10,351	3,450	21,192
1600.83	3.33	11,033	10,805	3,601	24,793
1601.17	3.67	11,500	11,267	3,755	28,549
1601.50	4.00	11,974	11,737	3,912	32,461
1601.83	4.33	12,457	12,216	4,072	36,533
1602.17	4.67	12,947	12,702	4,234	40,767
1602.50	5.00	13,447	13,197	4,399	45,166

DMA Type/ID	DMA Area (square feet) [A]	Post-Project Surface Type	Effective Impervious Fraction, I_f [B]	**DMA Runoff Factor** [C]	DMA Areas x Runoff Factor [A] x [C]	*Extended Detention Basin 2*		
B-1	*788,606*	*Mixed Surface Types*	*0.65*	*0.45*	*354,225*			
B-2	*82,850*	*Open Space*	*0.15*	*0.14*	*11,718*			
						Design Storm Depth (in)	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
	871,456				365,944	0.68	20,737	*26,171*

BASIN NO 2

EXTENDED DETENTION BASIN SIZING CALCULATIONS

STAGE VS. VOLUME

ELEVATION	DETENTION BASIN DEPTH (ft)	CONTOUR AREA (sf)	AVG. AREA (sf)	VOLUME (cu. ft.)	TOTAL VOLUME (cu - ft.)
1576.00	0.00	5,220	0	0	0
1576.33	0.33	5,568	5,394	650	650
1576.67	0.67	5,924	5,746	691	1,341
1577.00	1.00	6,287	6,106	733	2,074
1577.33	1.33	6,657	6,472	2,157	4,232
1577.67	1.67	7,034	6,846	2,282	6,513
1578.00	2.00	7,418	7,226	2,409	8,922
1578.33	2.33	7,809	7,614	2,538	11,460
1578.67	2.67	8,209	8,009	2,670	14,130
1579.00	3.00	8,613	8,411	2,804	16,933
1579.33	3.33	9,026	8,820	2,940	19,873
1579.67	3.67	9,445	9,236	3,078	22,952
1580.00	4.00	9,872	9,659	3,219	26,171

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:

X 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.

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]
N/A	N/A
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) [A]	Post-Project Surface Type	Effective Impervious Fraction, I_f [B]	DMA Runoff Factor [C]	DMA Area x Runoff Factor [A] x [C]		*Enter BMP Name / Identifier Here*		
N/A	N/A	N/A	N/A	N/A	N/A	*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)*
	N/A				N/A	N/A	N/A	N/A	N/A

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

[E] is 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]
N/A	N/A	N/A

[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	N/A	N/A	N/A
Volume (Cubic Feet)	N/A	N/A	N/A

[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 Sensitivity 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:

Project drains to Lake Elsinore, map has been added in this report to demonstrate this project is HCOC exempt.

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
On-Site Strom Drain Inlets	Mark all inlets with the words "Only Rain Down the Storm Drain" or similar. Catch Basin Markers may be available from the Riverside County Flood Control and Water Conservation District, call 951.955.1200 to verify.	• Maintain and periodically repaint or replace inlet markings • Provide Stormwater pollution prevention information to new site owners, lessees, or operators. • See applicable optional BMPs in Fact Sheet SC-44, "Drainage System Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com

		Include the following in lease agreements: "Tenant shall not allow anyone to discharge anything to storm drains or to store or deposit materials so as to create a potential discharge to storm drains."
Landscape/ Outdoor Pesticide Use	State that final landscape plans will accomplish all of the following. • 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 that can contribute to stormwater pollution. • Where landscaped areas are used to retain or detain stormwater, specify plants that are tolerant to saturated soil conditions. • 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.	• Maintain landscaping using minimum or no pesticides. • See applicable operational BMPs in "What you should know for…. Landscape and Gardening" at http://rcflood.org/stormwater/ Provide IPM information to new owners, lessees, and operators.
Pools, Spas, Ponds, Decorative Fountains, and other water features	If the Co-Permittee requires pools to be plumbed to the sanitary sewer, place a note on the plans and state in the narrative that this connection will be made according to local requirements.	See applicable operational BMPs in "Guidelines for Maintaining Your Swimming Pool, Jacuzzi and Garden Fountain" at http://rcflood.org/stormwater/
Roofing, gutters, and trim	Avoid roofing, gutters, and trim made of copper or other unprotected metals that may leach into runoff.	
Plazas, Sidewalks, and Parking Lots, Streets		• HOA will set a sweeping schedule for, 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 wash water containing any cleansing agent or degreaser and discharge to the sanitary sewer not to a storm drain. Street Sweeping (N5)
Man-made & irrigated slopes and landscaped areas	• Protect slopes and channels (S5) • Hillside Landscaping (S12)	• Irrigation System and Landscape Management (N3)

	• Irrigation systems and landscape design should follow as a guide the specifications and recommendations of the Water Conservation Act of 2006, AB1881 (Laird) and conform to the standards and requirements of the City' landscape requirements. Irrigation systems shall employ control systems and be designed to conserve water. The landscape design shall incorporate native and drought tolerant vegetation with low irrigation requirements. See CASQA SD-10 and SD-12 BMP Fact Sheets in and other landscape literature in WQMP for additional information. Irrigation and landscape maintenance should be performed on a regular basis throughout the year. See CASQA SC-41 or SD-10 and SD-12BMP Fact Sheets in WQMP for additional information	• Inspect landscape areas twice annually (before and after the rainy season) and the irrigation system quarterly for proper functioning. • Maintenance should be performed every 2 weeks or as needed. • Landscape maintenance should include mowing, weeding, trimming, removal of trash & debris, repair of erosion, re-vegetation, and removal of cut & dead vegetation. • Irrigation maintenance should include the repair of leaky or broken sprinkler heads, the maintaining of timing apparatus accuracy, and the maintaining of shut off valves in
Park Site	• Efficient Irrigation (S4)	• Common Area Litter Control (N4)

Extended Detention Basins	• Inspect landscape areas twice annually (before and after the rainy season) and the irrigation system quarterly for proper functioning.
	• Maintenance should be performed every 2 weeks or as needed. Landscape maintenance should include mowing, weeding, trimming, removal of trash & debris, repair of erosion, re-vegetation, and removal of cut & dead vegetation.
	  • Irrigation maintenance should include the repair of leaky or broken sprinkler heads, the maintaining of timing apparatus accuracy, and the maintaining of shut off valves in control basins shall be inspected and maintained on a regular basis to insure their operational adequacy. See CASQA SC-44 BMP Fact Sheet in WQMP for additional information.
		• before the onset of the rainy season (Oct 1 to May 1), once during the rainy season, and once after the rainy season.
		• Maintenance should include removal of trash, debris, & sediment and the repair of any deficiencies or damage that may impact water quality.
		  • The property owner will assume the responsibility for all on-site drainage facility inspection, maintenance, and funding.

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)
DMA A	EXTENDED DETENTION BASIN NO 1	SEE ATTACHED TENTATIVE MAP
DMA B	EXTENDED DETENTION BASIN NO 2	SEE ATTACHED TENTATIVE MAP

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: Home Owners' Association (HOA)

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

☒ Y ☐ N

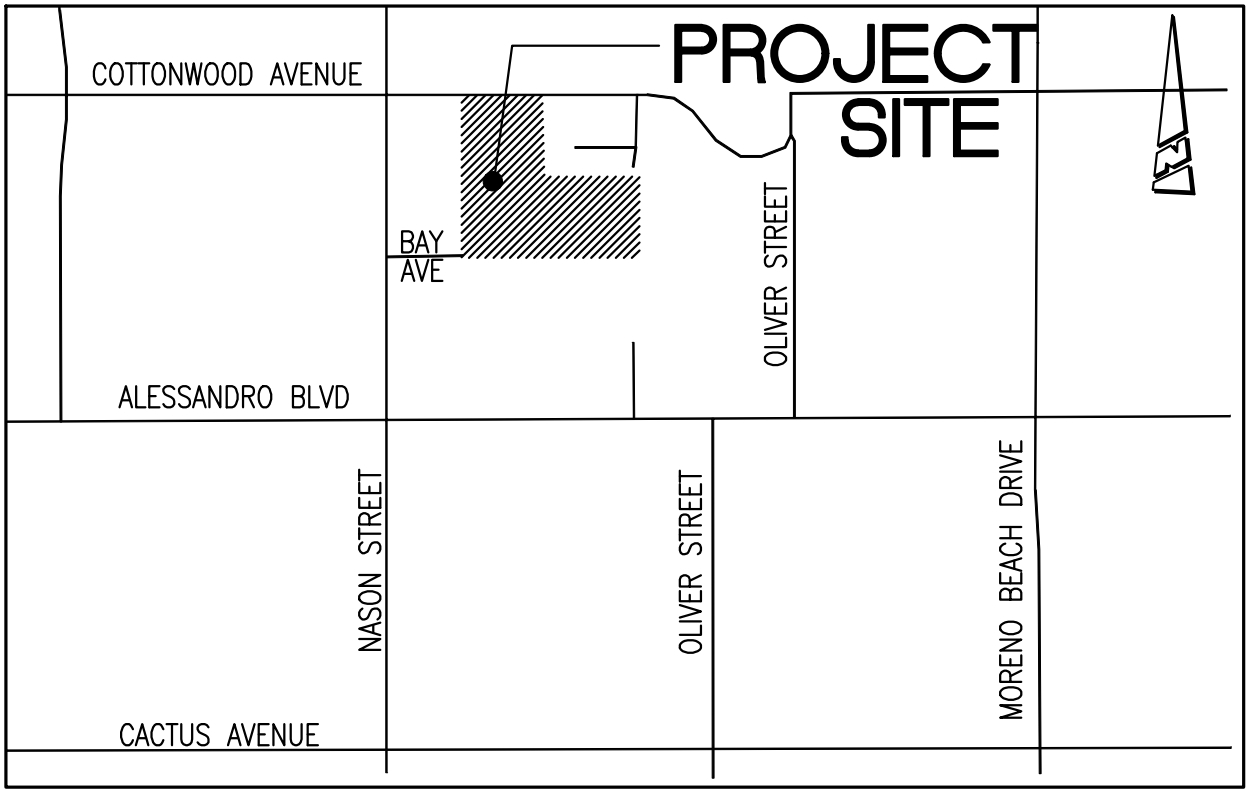
Include your Operation and Maintenance Plan and Maintenance Mechanism in Appendix 9. Additionally, include all pertinent forms of educational materials for those personnel that will be maintaining the proposed BMPs within this Project-Specific WQMP in Appendix 10.

Operation, maintenance and funding Mechanism to be determined during final engineering.

Appendix 1: Maps and Site Plans

Location Map, WQMP Site Plan and Receiving Waters Map

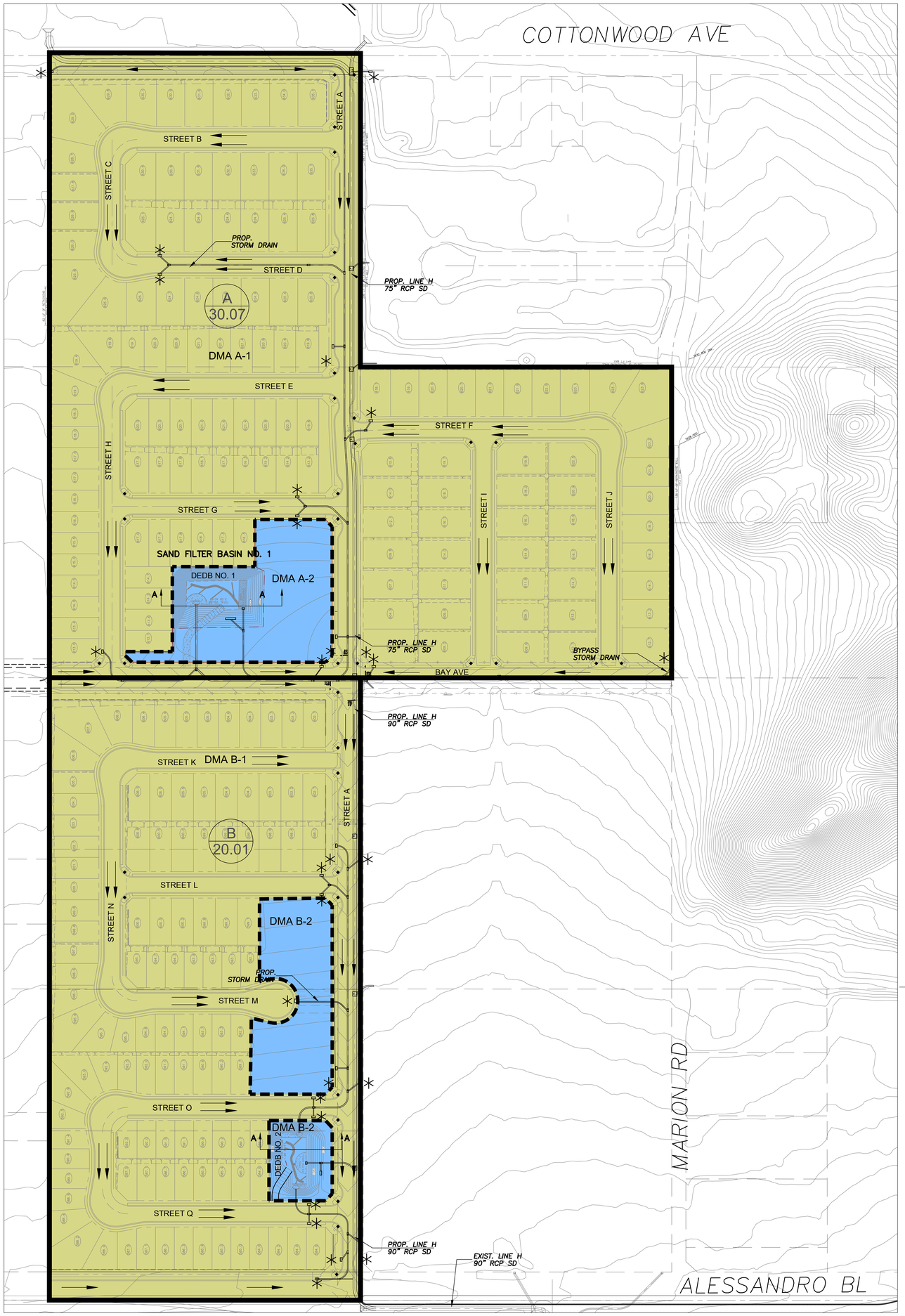
LOCATION MAP



LOCATION MAP

N.T.S.

WQMP SITE PLAN



SOURCE CONTROL

- LOCATION OF INLETS/STENCILING
- LANDSCAPE/OUTDOOR PESTICIDE USE AREAS
- MAN-MADE & IRRIGATED SLOPES AND LANDSCAPE AREAS & EFFICIENT IRRIGATION AREAS

DRAINAGE AREA A

DMA ID	AREA (SQ-FT)
A-1	1,225,051
A-2	84,791

DRAINAGE AREA B

DMA ID	AREA (SQ-FT)
B-1	788,606
B-2	82,850

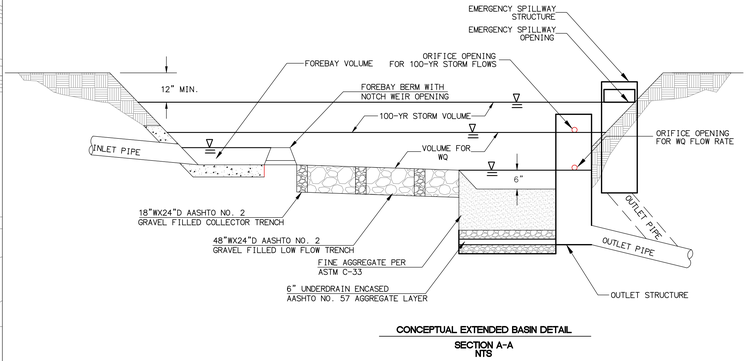
SCALE 1"=80'

80 40 0 80 160 240

SCALE: 1"=80'

LEGEND

- A / 0.9 — DRAINAGE AREA ID / AREA – Acre
- DMA A-1 — DRAINAGE MANAGEMENT AREA ID
- (32) — NODE NO. & ELEVATION
- FLOW LINE
- DRAINAGE AREA (DA) BOUNDARY
- DRAINAGE MANAGEMENT AREA (DMA) BOUNDARY
- RESIDENTIAL AREA
- OPEN SPACE AREA
- DEDB NO. 1 — DETENTION/EXTENDED DETENTION BASIN ID (STORMWATER TREATMENT BMP)
- SURFACE FLOW DIRECTION



CONCEPTUAL EXTENDED BASIN DETAIL

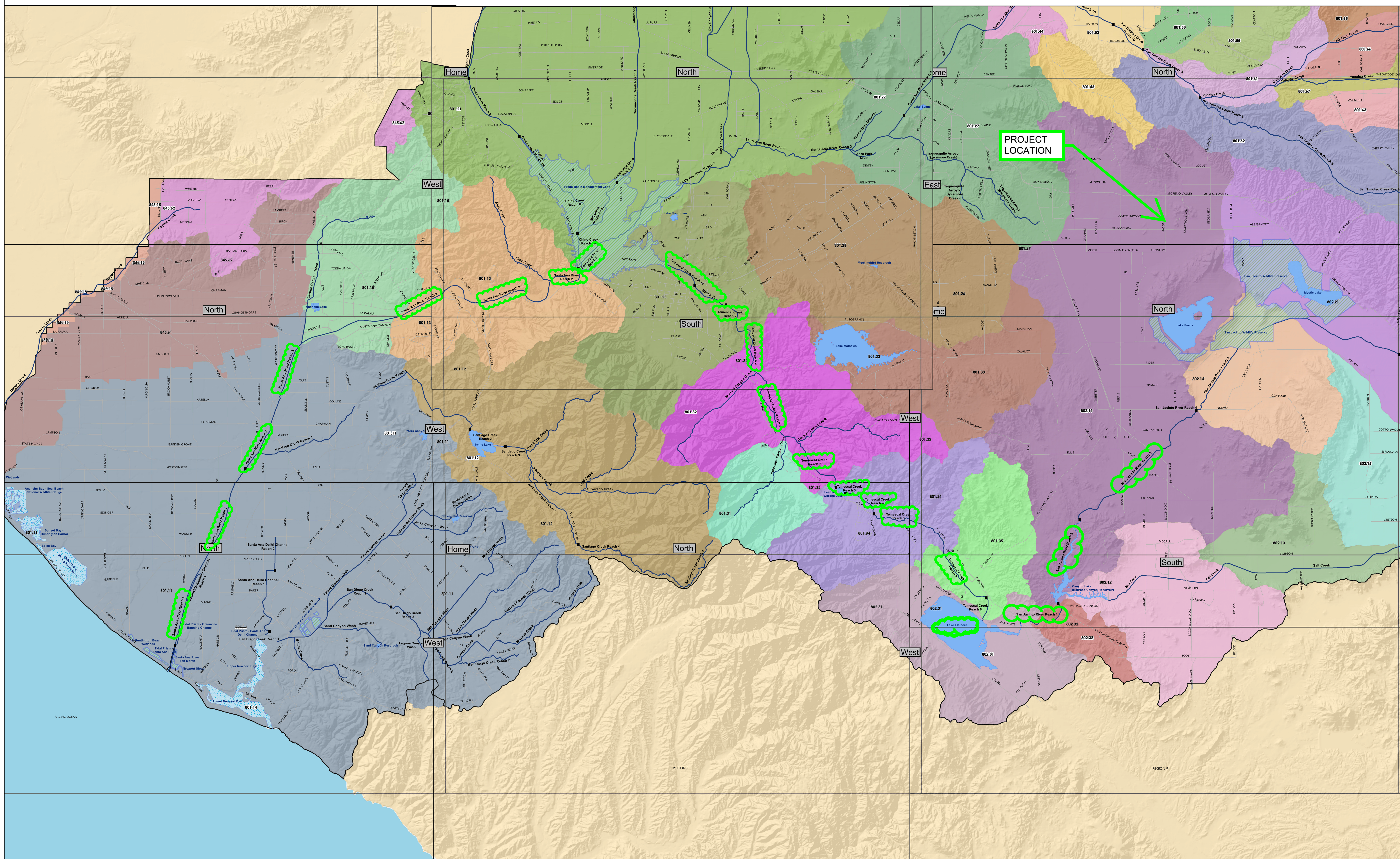
SECTION A-A
NTS

SUNSET CROSSINGS WQMP SITE PLAN

PROACTIVE ENGINEERING CONSULTANTS

8/31/2022

RECEIVING WATERS MAP



6000 3000 0 6000 12000 18000

SCALE: 1"=6000'

SUNSET CROSSINGS RECEIVING WATERS MAP

PROACTIVE
ENGINEERING CONSULTANTS

8/30/2022

Appendix 2: Construction Plans

Grading and Drainage Plans

TENTATIVE TRACT MAP NO. 38442

IN THE CITY OF MORENO VALLEY, COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

APPLICANT / OWNER

HIGHPOINTE MV, LLC
530 TECHNOLOGY, SUITE 100
IRVINE, CA 92618
ROSS YAMAGUCHI | 949.472.0800

TOPO SOURCE:

DON READ CORPORATION
501 MERCURY LANE
BREA, CA 92821
(714) 529-9599
JUNE 25, 2021

ENGINEER

PROACTIVE ENGINEERING
200 S. MAIN STREET, STE 300
CORONA, CA 92882
DILLON STRAND | 951.280.3319

SOILS ENGINEER

LEIGHTON GROUP
17781 COWAN
IRVINE, CA 92614
JEFF L. HULL | 949.681.4265

UTILITIES

WATER _____ EASTERN MUNICIPAL WATER DISTRICT
SEWER _____ EASTERN MUNICIPAL WATER DISTRICT
ELECTRIC _____ SOUTHERN CALIFORNIA EDISON COMPANY
GAS _____ SOUTHERN CALIFORNIA GAS COMPANY
TELEPHONE _____ VERIZON
TELEVISION _____ COMCAST

ASSESSOR'S PARCEL NO'S

488-210-006 & 488-210-020

LAND USE

TOTAL AREA GROSS:	19.1 AC
TOTAL AREA NET:	15.1 AC
DENSITY (DU/AC NET):	7.15
EXISTING LAND USE:	VACANT
PROPOSED LAND USE:	SINGLE FAMILY REIDENTIAL
EXISTING ZONING:	DOWNTOWN CENTER
PROPOSED ZONING:	DOWNTOWN CENTER
EXISTING GENERAL PLAN:	DOWNTOWN CENTER
PROPOSED GENERAL PLAN:	DOWNTOWN CENTER

NOTES

1. THIS AREA IS WITHIN THE MORENO VALLEY UNIFIED SCHOOL DISTRICT.
2. PROJECT SITE IS LOCATED WITHIN ZONE X, AREA OF MINIMAL FLOODING, PER FLOOD INSURANCE RATE MAP COMMUNITY PANEL NUMBER 065074 0765 DATED AUGUST 28, 2008 (RIVERSIDE COUNTY - PANEL 765 OF 3805).
3. ALL GRADING AND DRAINAGE SHALL BE CONSISTENT WITH THE REQUIREMENTS OF THE CITY OF MORENO VALLEY.
4. IMPROVEMENTS SHALL BE PER THE CITY OF MORENO VALLEY.
5. NO KNOWN EXISTING WATER WELLS ARE ON THE PROPERTY, OR WITHIN 200 FEET OF THE PROPERTY BOUNDARY.
6. THIS TRACT CONSISTS OF 108 SINGLE-FAMILY LOTS WITH TWO DIFFERENT LOT SIZES, 64 UNITS WITH A MINIMUM SIZE OF 3200 SF AND 44 UNITS WITH A MINIMUM SIZE OF 4500 SF, LOT AREAS SHOWN IN THE TABLE ON THE RIGHT.
7. THIS TRACT IS LOCATED IN A NON-VHFHSZ ZONE, IN A STATE OR FEDERAL RESPONSIBILITY AREA.
8. THE TENTATIVE MAP INCLUDES THE ENTIRE CONTIGUOUS OWNERSHIP OF THE LAND.
9. THE ONGOING MAINTENANCE OF ANY WATER QUALITY BMP CONSTRUCTED IN THE PUBLIC RIGHT OF WAY SHALL BE THE RESPONSIBILITY OF A PROPERTY OWNER ASSOCIATION OR THE PROPERTY OWNER.
10. ALL ADJACENT BUILDINGS AND STRUCTURES ARE TO REMAIN IN PLACE.
11. ALL EXISTING DWELLINGS WITHIN THE SUBJECT PROPERTY ARE TO BE REMOVED.
12. POWER POLES TO BE UNDERGROUNDED ALONG ALESSANDRO BLVD.

BENCHMARK

RIVERSIDE COUNTY BENCHMARK: (M-40-4 RESET)
AT THE SOUTHEAST CORNER OF NASON STREET AND ALESSANDRO BOULEVARD; 56.0 FEET EAST IF CENTERLINE OF NASON STREET; 48 FEET SOUTH OF ALESSANDRO BOULEVARD; 3' WEST OF PG,E #GT-70306, 1.0 FEET NORTH OF A 4"X4" MARKER POST; A BRASS DISK SET IN TOP OF A CONCRETE POST AND MARKED M-40-4 RESET 1976.
ELEVATION (FEET): 1588.42 (NGVD29)

BASIS OF BEARINGS

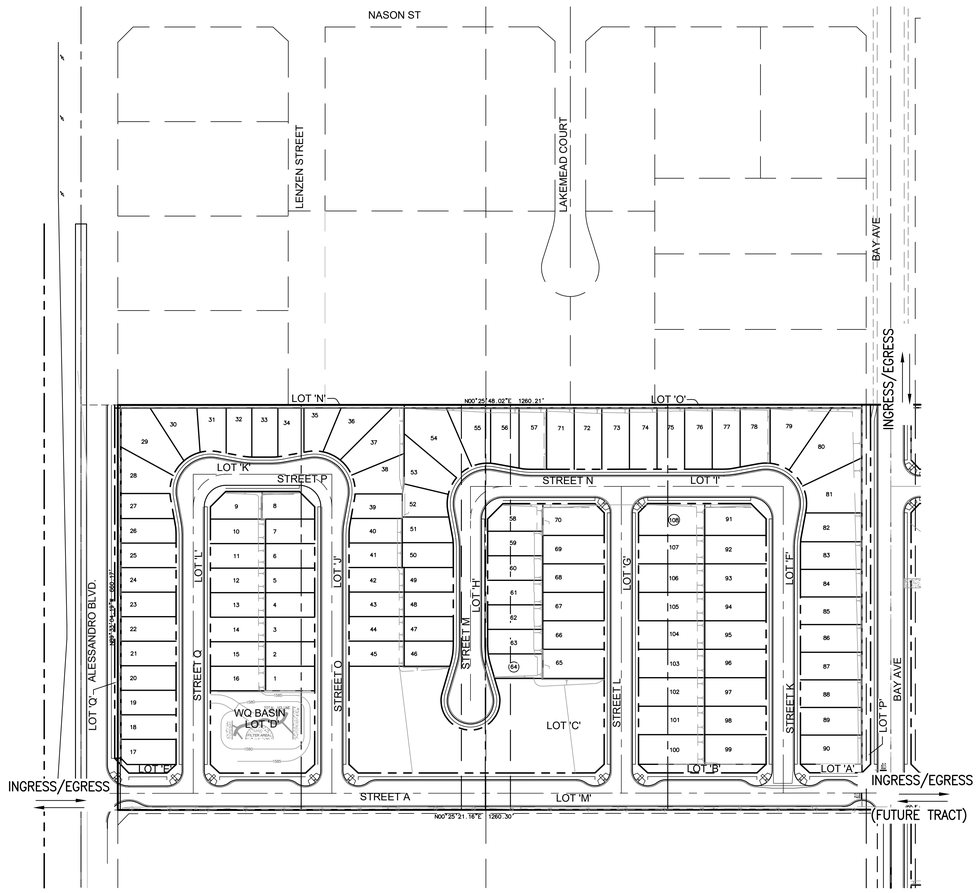
THE BASIS OF BEARINGS FOR THIS SURVEY IS THE CALIFORNIA STATE PLANE COORDINATE SYSTEM CS83, ZONE VU BASED LOCALLY ON CONTROL STATIONS "MAT2", "MLFP" & "PPBE" NAD83 (NSRS2011) EPOCH 2010.00, RECORDS OF THE RIVERSIDE COUNTY SURVEYOR. ALL BEARING SHOWN ON THIS MAP ARE GRID. QUOTED BEARINGS AD DISTANCE FROM REFERENCE MAPS OR DEEDS ARE AS SHOWN PER THAT RECORD REFERENCE. ALL DISTANCES SHOWN ARE ROUND DISTANCES UNLESS SPECIFIED OTHERWISE. GRID DISTANCES, MAY BE OBTAINED BY MULTIPLYING THE GROUND DISTANCE BY A COMBINATION FACTOR OF .999946285

LEGAL DESCRIPTION

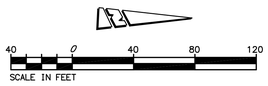
LOTS 3 AND 6, BLOCK 105 OF BEAR VALLEY AND ALESSANDRO DEVELOPMENT COMPANY'S SUBDIVISION, IN THE CITY OF MORENO VALLEY, COUNTY OF RIVERSIDE, STATE OF CALIFORNIA, AS SHOWN BY MAP ON FILE IN BOOK 11, PAGE 10 OF MAPS, RECORDS OF SAN BERNARDINO COUNTY

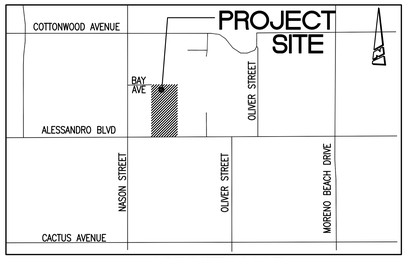
GEOTECHNICAL NOTES

1. THIS SITE IS LOCATED WITHIN A LOW TO MODERATE LIQUEFACTION SUSCEPTIBILITY ZONE.
2. THERE ARE NO FAULT LINES RUNNING THROUGH OR NEAR THIS SITE.
3. THIS SITE IS NOT LOCATED IN A FLOOD HAZARD ZONE.
4. THIS SITE IS LOCATED IN A SUBSIDENCE SUSCEPTIBLE ZONE.
5. SEE GEOTECHNICAL REPORT FOR MORE DETAILS



INDEX MAP





VICINITY MAP
N.T.S.

PROPOSED LOT SUMMARY TABLE

3200 SF MIN LOTS				4500 SF MIN LOTS			
LOT#	AREA	LOT#	AREA	LOT#	AREA	LOT#	AREA
1	3200 SF	33	3398 SF	65	4760 SF	97	4640 SF
2	3200 SF	34	3227 SF	66	4640 SF	98	4640 SF
3	3200 SF	35	3253 SF	67	4640 SF	99	4829 SF
4	3200 SF	36	4692 SF	68	4640 SF	100	5221 SF
5	3200 SF	37	6038 SF	69	4640 SF	101	5011 SF
6	3200 SF	38	3988 SF	70	5073 SF	102	5011 SF
7	3200 SF	39	3204 SF	71	4500 SF	103	5011 SF
8	3483 SF	40	3443 SF	72	4500 SF	104	5011 SF
9	3548 SF	41	3472 SF	73	4500 SF	105	5011 SF
10	3600 SF	42	3600 SF	74	4500 SF	106	5011 SF
11	3600 SF	43	3600 SF	75	4500 SF	107	5011 SF
12	3600 SF	44	3600 SF	76	4500 SF	108	5496 SF
13	3600 SF	45	3690 SF	77	4515 SF		
14	3600 SF	46	3216 SF	78	4531 SF		
15	3600 SF	47	3200 SF	79	6437 SF		
16	3600 SF	48	3200 SF	80	9046 SF		
17	3691 SF	49	3200 SF	81	6261 SF		
18	3600 SF	50	3369 SF	82	4250 SF		
19	3600 SF	51	3336 SF	83	4510 SF		
20	3600 SF	52	3381 SF	84	4511 SF		
21	3600 SF	53	4549 SF	85	4511 SF		
22	3600 SF	54	7188 SF	86	4511 SF		
23	3600 SF	55	4812 SF	87	4512 SF		
24	3600 SF	56	4355 SF	88	4512 SF		
25	3600 SF	57	4488 SF	89	4512 SF		
26	3571 SF	58	3740 SF	90	4775 SF		
27	3404 SF	59	3600 SF	91	4881 SF		
28	4375 SF	60	3200 SF	92	4640 SF		
29	6707 SF	61	3200 SF	93	4640 SF		
30	4236 SF	62	3200 SF	94	4640 SF		
31	3204 SF	63	3200 SF	95	4640 SF		
32	3236 SF	64	3200 SF	96	4640 SF		

PARKS/LANDSCAPE AREAS			
LOT#	AREA	OWNERSHIP	PURPOSE
A	0.03 AC	HOA	LANDSCAPE
B	0.06 AC	HOA	LANDSCAPE
C	1.38 AC	HOA	RECREATION
D	0.52 AC	HOA	BASIN
E	0.03 AC	HOA	LANDSCAPE
F	0.31 AC	CITY OF MORENO VALLEY	STREET
G	0.34 AC	CITY OF MORENO VALLEY	STREET
H	0.32 AC	CITY OF MORENO VALLEY	STREET
I	0.63 AC	CITY OF MORENO VALLEY	STREET
J	0.33 AC	CITY OF MORENO VALLEY	STREET
K	0.37 AC	CITY OF MORENO VALLEY	STREET
L	0.33 AC	CITY OF MORENO VALLEY	STREET
M	1.40 AC	CITY OF MORENO VALLEY	STREET
N	0.05 AC	HOA	DRAINAGE
O	0.09 AC	HOA	DRAINAGE
P	0.19 AC	CITY OF MORENO VALLEY	LANDSCAPE
Q	0.13 AC	CITY OF MORENO VALLEY	LANDSCAPE

LEGEND

DOMESTIC WATER LINE (PROP)	DW	PAD LINE	
RECLAIMED WATER LINE (PROP)	RW	CURB & GUTTER (PROP)	
SANITARY SEWER LINE (PROP)	S	TRACT BOUNDARY	
STORM DRAIN LINE (PROP)	SD	EXISTING CONTOUR	205
DOMESTIC WATER LINE (EXIST)	DW	PROPOSED STREET GRADE	2.0%
RECLAIMED WATER LINE (EXIST)	RW	PROPOSED LOT No./LETTERED	LOT 1 or LOT A
SANITARY SEWER LINE (EXIST)	S	EXISTING LOT LINE	
STORM DRAIN LINE (EXIST)	SD	RETAINING WALL (PROP)	
STREET CENTER LINE		COMMUNITY WALL	
LOT LINE (PROP)		UNIT NUMBER	52
FIRE HYDRANT	FH	PRODUCT TYPE	PT-A
CATCH BASIN (PROP)		PLAN TYPE	PL-1
CATCH BASIN (EXIST)		PUBLIC UTILITY EASEMENT	P.U.E.
STREET LIGHT			
EASEMENT		RESTRICTED USE AREA	LINE OF SIGHT
PARKING SPACE			

EASEMENT LIST	DISPOSITION
(3) THE FOLLOWING MATTERS SHOWN OR DISCLOSED BY THE FILED OR RECORDED MAP REFERRED TO IN TE LEGAL DESCRIPTION: A STRIP OF LAND 80 FEET WIDE RUNNING THROUGH THE CENTER OF BLOCKS 99,100,101,102,103,104,105,106,107,108,109,110,111 112, 239, AND 240 IS RESERVED FOR RAIL ROAD PURPOSES	QUITCLAIM
(4) PUBLIC UTILITES AND INCIDENTAL PURPOSES (NON-PLOTTABLE) , BOOK 277, PAGE 343 IN FAVOR OF: MORENO WATER COMPANY	QUITCLAIM
(5) UTILITIES AND INCIDENTAL PURPOSES BOOK 854, PAGE 212 IN FAVOR OF: SOUTHERN SIERRAS POWER COMPANY, A CORPORATION	QUITCLAIM
(6) UTILITIES AND INCIDENTAL PURPOSES INSTRUMENT NO. 19492346 IN FAVOR OF: CALIFORNIA ELECTRIC POWER COMPANY	QUITCLAIM
(7) UTILITIES AND INCIDENTAL PURPOSES INSTRUMENT NO.1956-81375 IN FAVOR OF: CALIFORNIA ELECTRIC POWER COMPANY	QUITCLAIM
(8) PIPELINES AND APPUTRENANCES INSTRUMENT NO.1969-115832 IN FAVOR OF: EASTERN MUNICIPAL WATER DISTRICT LOCATION OF THE EASEMENT CANNOT BE DETERMINED FROM RECORD INFORMATION.	QUITCLAIM
(9) DRAINAGE DITCH AND INCIDENTAL PURPOSES INSTRUMENT NO.1978-15781 IN FAVOR OF: COUNTY OF RIVERSIDE LOCATION OF THE EASEMENT CANNOT BE DETERMINED FROM RECORD INFORMATION.	QUITCLAIM

PEN22-0131

REVISION	DATE	DESCRIPTION

PREPARED BY:
PROACTIVE ENGINEERING CONSULTANTS
200 South Main Street, Suite 300
Corona, CA 92882 (951) 280-3300

DILLON M. STRAND RCE #91273 DATE

ENGINEER SEAL: REGISTERED PROFESSIONAL ENGINEER · DILLON M. STRAND · NO. 91273 · CIVIL · STATE OF CALIFORNIA

TENTATIVE TRACT MAP
38442
TITLE SHEET
MAY 2022

SHEET 1 OF 3

TENTATIVE TRACT MAP NO. 38442

IN THE CITY OF MORENO VALLEY, COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

NASON ST

CONNECT TO EXISTING 10" SEWER

BEGIN TRANSITION OF 2 LANES TO 1 LANE

EX 8" DW

CONNECT TO EX 8" DW

EX R/W

PR UNDER SIDEWALK DRAIN

PR R/W

POWER POLE

488-210-019

EXISTING RESIDENTIAL

488-210-031

SOUTHWEST BIBLE COLLEGE

488-210-012

EXISTING RESIDENTIAL

488-210-010

EXISTING RESIDENTIAL

488-210-005

IN MORENO VALLEY CHURCH

LOT 'N'

TRACT BOUNDARY

N00°25'48.02"E 1260.21'

LOT 'O'

CONNECT TO EX 18" SD

CONNECT TO EX 8" DW

14' LANDSCAPE LOT

7' R/W VACATION

5' R/W VACATION

LOT 'K'

STREET P

N00°25'48.02"E 226.00'

STREET N

N00°25'47.76"E 510.00'

LOT 'I'

COMMUNITY WALL & PL

POWER POLE

PR MEDIAN

PR EP, 1' HORIZONTAL FOR EVERY 50' VERTICAL

ALESSANDRO BLVD.

N89°33'04.19"W 660.17'

N89°33'04.19"W 520.16'

LOT 'L'

LOT 'J'

LOT 'H'

LOT 'G'

LOT 'F'

STREET Q

STREET O

STREET M

STREET L

STREET K

BAY AVE

LOT 'P'

LOT 'Q'

LOT 'E'

LOT 'D'

WQ BASIN

TOTAL VOLUME

SAND FILTER AREA

FOREBAY

LOT 'C'

RAIL ROAD ESMT

20' CITY ESMT

47' PR EMWD ESMT

LINE OF SIGHT (TYP)

LOT 'B'

LOT 'A'

STREET A

N00°25'21.16"E 1320.30'

LOT 'M'

N00°25'21.16"E 1260.30'

CONNECT TO IMPROVEMENTS PER TR 38236

FUTURE OFFSITE R/W DEDICATION

EX PL

PR CURB

6' FUTURE PKWY DEDICATION

488-210-021

HSUN DA YANG

488-210-007

HSUN DA YANG

PR 8" SS

PR 8" DW

PR RCFCD SD

EX R/W

PR EP

FUTURE CURB

FUTURE IMPROVEMENTS PER TRACT 38443

SCALE IN FEET

40 0 40 80 120

N'LY EX R/W — 60' C/L — S'LY R/W; 5' R/W TO BE VACATED; N'LY PR R/W; 55'; 10' LNSCP ESMT; 5.5'; 6.5'; 34'; 9'; 9'; 14'; PR EP; 2% 2.0% 2.0%; 6" CURB & GUTTER; RAISED MEDIAN STD. MVSI-141

ALESSANDRO BLVD

STD. MVSI-103A-O (MINIMUM T.I. = 10)

PUBLIC STREET

N.T.S.

R/W — 56' — R/W; 28' C/L 28'; 10' 18' 18' 10'; 5' 5' 5' 5'; 2% 2.0% 2.0% 2%; 6" CURB & GUTTER 6" CURB & GUTTER

STREET K,L,M,N,O,P,Q

STD. MVSI-107A-O (MODIFIED) (MINIMUM T.I. = 6)

PUBLIC STREET / 30 MPH DESIGN

N.T.S.

N'LY R/W — 66' — S'LY R/W; 33' C/L 33'; 5' 6' 22' 22' 6' 5'; EX R/W TO BE VACATED 7'; FUTURE IMPROVEMENTS PER TRACT 38443; 2% 2.0% 2.0% 2%; 6" CURB & GUTTER 6" CURB & GUTTER

BAY AVENUE

STD. MVSI-106B-O (MINIMUM T.I. = 7)

PUBLIC STREET / 35 MPH DESIGN

N.T.S.

R/W — 66' — R/W; 33' C/L 33' PL; 5' 6' 22' 22' 5' 6'; FUTURE R/W DEDICATION; 2% 2.0% 2.0%; 6" CURB & GUTTER 6" CURB & GUTTER

STREET A

STD. MVSI-106B-O (MINIMUM T.I.= 7)

PUBLIC STREET / 35 MPH DESIGN

N.T.S.

PEN22-0131

REVISION	DATE	DESCRIPTION

PREPARED BY:

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DILLON M. STRAND RCE #91273 DATE

ENGINEER SEAL: REGISTERED PROFESSIONAL ENGINEER — DILLON M. STRAND — NO. 91273 — CIVIL — STATE OF CALIFORNIA

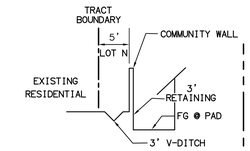
TENTATIVE TRACT MAP 38442

TENTATIVE MAP

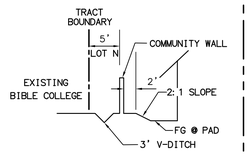
MAY 2022

SHEET 2 OF 3

PRELIMINARY GRADING AND UTILITY PLAN



SECTION A-A
N.T.S.



SECTION B-B
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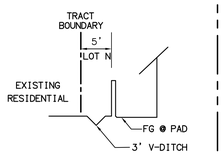
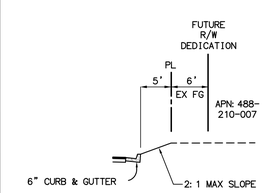
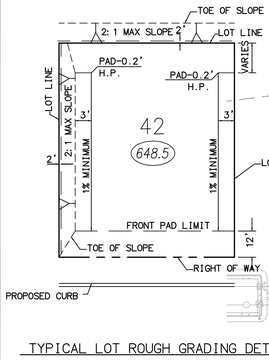


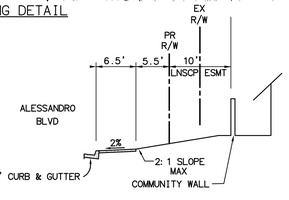
SECTION C-C
N.T.S.



SECTION E-E
N.T.S.



TYPICAL LOT ROUGH GRADING DETAIL
N.T.S.



SECTION G-G
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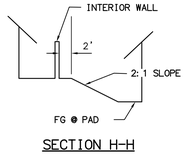

SECTION H-H
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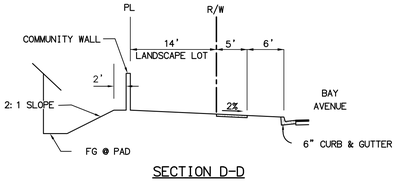

SECTION D-D
N.T.S.

60 0 60 120 180
SCALE IN FEET

REVISION	DATE	DESCRIPTION

PREPARED BY:
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DILLON M. STRAND RCE #91273 DATE

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REGISTERED PROFESSIONAL ENGINEER
DILLON M. STRAND
NO. 91273
CIVIL
STATE OF CALIFORNIA

TENTATIVE TRACT MAP
38442
PRELIMINARY GRADING AND UTILITY PLAN
MAY 2022

SHEET 3 OF 3

Appendix 3: Soils Information

Geotechnical Study and Other Infiltration Testing Data

SOILS REPORT

DESIGN-LEVEL GEOTECHNICAL EXPLORATION
PROPOSED 50-ACRE RESIDENTIAL DEVELOPMENT
SOUTH OF COTTONWOOD AVENUE
NORTH OF ALESSANDRO BOULEVARD
MORENO VALLEY, CALIFORNIA

Prepared For

HIGHPOINTE MV 1 LLC
530 TECHNOLOGY, SUITE 100
IRVINE, CALIFORNIA 92618

Prepared By

LEIGHTON AND ASSOCIATES, INC.
41715 ENTERPRISE CIRCLE, N SUITE103
TEMECULA, CALIFORNIA 92590

Project No. 13169.003

May 19, 2022

Leighton and Associates, Inc.
A Leighton Group Company

May 19, 2022

Project No. 13169.003

Highpointe MV 1 LLC
530 Technology, Suite 100
Irvine, California 92618

Attention: Mr. Ross Yamaguchi, Senior Project Manager

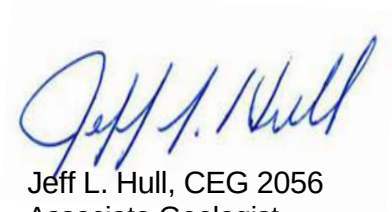
Subject: Design-Level Geotechnical Exploration
Proposed 50-Acre Residential Development
South of Cottonwood Avenue, North of Alessandro Boulevard
Moreno Valley, California

In accordance with your request and authorization, we provide this report documenting findings and conclusions of our site geotechnical exploration, pertinent to development of the subject property for residential use. Our study was undertaken to evaluate the general distribution and engineering characteristics of surface/subsurface earth units, and impacts of geologic hazards, and develop geotechnical recommendations for design and construction. A deposit of settlement-prone alluvium at the surface is considered the most significant geotechnical constraint due to its relatively high collapse potential, warranting over-excavation and recompaction to depths of 7 to 9 feet and 12 to 14 feet in north and south site areas, respectively. Provided recommendations presented herein are properly incorporated into project design and construction, the development project is considered suitable from a geotechnical perspective. Once final grading and foundation plans are available, our recommendations should be reviewed to verify conformance with those plans.

We appreciate the opportunity to work with you on this project. If you have any questions or if we can be of further service, please contact us at (866) LEIGHTON; or specifically at the telephone extensions or e-mail addresses listed below.

Respectfully submitted

LEIGHTON AND ASSOCIATES, INC.



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Distribution: (1) Addressee (PDF copy via email)

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Appendix C – Seismic Design Data and Settlement Analyses
Appendix D – General Earthwork and Grading Specifications for Rough Grading
Appendix E – Retaining Wall Backfill and Subdrain Detail
Appendix F – GBA Important Information About This Geotechnical Engineering Report

1.0 INTRODUCTION

1.1 Site Description and Proposed Development

The subject 50-acre property is located south of Cottonwood Avenue and North of Alessandro Boulevard in the City of Moreno Valley, California (N 33.9205, W -117.1871). The site location and surrounding areas are depicted on attached Figure 1, *Site Location Map*. The property is currently vacant except for a few existing private ranch-style residential structures located within the north and eastern portions of the site. Surface elevations (El.) range from approximately El. 1640 feet above mean sea level (msl) in the northeast to El. 1590 feet msl in the south, manifest in about 50 vertical feet of overall relief. Offsite areas to the west are lightly developed for commercial and single-family residential use.

Our understanding of the project is based on review of the Moreno Valley Site Plan Exhibit prepared by Proactive Engineering Consultants dated March 17, 2022. The site is currently proposed to be developed as a tract of single-family homes with 241 individual lots. We anticipate that the homes will consist of typical 1- to 2-story wood-framed structures supported by conventional reinforced concrete slab-on-grade floors and/or shallow spread and continuous footings (no subterranean elements). Vehicular access will be accommodated by a series of internal access roads. Appurtenant improvements include a network of underground utilities, two ten foot deep water quality management basins, and approximately 3 acres of park space.

1.2 Purpose and Scope

The purpose of this exploration was to evaluate the onsite surface and subsurface soils conditions, and provide geotechnical recommendations for design and construction of the proposed development. More specifically, our scope of our work included the following:

- *Literature Review* – Review of published geologic maps and reports, and historical aerial photographs and topographic maps readily available on-line or within our in-house technical library. A list of these documents is presented in Section 8.0, *References*.

- *Exploratory Borings and Test Pits* – Advanced four (4) hollow-stem borings (LB-1 through LB-4) on the site, on March 4, 2022, extending to depths between 31.5 feet to 51.5 feet below the existing ground surface (bgs). Approximate boring locations are shown on Figure 2, *Site Geotechnical Map*. Copies of boring logs are presented in Appendix A, *Boring / Test Pit / Infiltration Test Logs*.

Bulk and relatively undisturbed drive samples were collected during drilling for the purpose of field description and geotechnical laboratory testing. The driven samples were obtained using a Modified California Ring sampler conducted in accordance with ASTM Test Method D3550. The samplers were driven for a total penetration of 18 inches using a 140-pound automatic hammer allowed to fall freely from a height of 30 inches. The number of blows per 6 inches of penetration was recorded.

In addition, four (4) exploratory test pits (TP-1 through TP-3, and TP-5) were excavated, logged, and sampled on March 4, 2022 using a rubber-tire backhoe to a maximum depth of approximately 5 feet bgs. Trench logs are presented in Appendix B, *Boring / Test Pit / Infiltration Test Logs.*

Each boring and test pit was logged in the field by a member of our technical staff under the direct supervision of a State of California Certified Engineering Geologist (CEG). Soil samples were reviewed and described in the field in accordance with the Unified Soil Classification System (USCS). Upon completion, the excavations were backfilled with soil cuttings.

- *Infiltration Testing*: For the purpose of infiltration testing, two additional hollow-stem auger borings (LP-1 and LP-2) were advanced near the location of proposed bio-retention basins on March 4, 2022, each to a depth of approximately 13 feet bgs. Results of the percolation testing are presented in Appendix A.

- *Laboratory Testing*: Representative soil samples obtained from the subsurface exploration program were selected for testing. A brief description of laboratory testing procedures and laboratory test results are presented in Appendix B, Geotechnical Laboratory Testing. Moisture content and in-situ density are presented within our boring logs (see Appendix A).

- *Engineering Evaluation* – Data collected was reviewed and analyzed by a Geotechnical Engineer (GE) and a Certified Engineering Geologist (CEG).

- *Report Preparation* – This report was prepared to document findings and conclusions, and provide design-level geotechnical recommendations addressing the currently proposed development concept.

2.0 GEOTECHNICAL AND GEOLOGIC FINDINGS

2.1 Regional Geology

The site lies within a prominent natural geomorphic province of California, occupying the southwestern quadrant of the state, referred to as the Peninsular Ranges. This province is characterized by steep, elongated ranges and valleys trending northwestward in orientation. More specifically, the site is situated within the northern portion of the Perris Block, a structural block composed of uplifted Cretaceous and older crystalline bedrock. The Perris Block spans an area approximately 20 miles in width by 50 miles in length, bounded by the San Jacinto Fault Zone to the northeast, the Elsinore Fault Zone to the southwest, the Cucamonga Fault Zone to the northwest, and the Temecula Basin to the south.

The basement rock composing the Perris Block were solidified on the order of several thousand feet below their present near surface location, owing to an apparent uplift of similar magnitudes. The uplift is accommodated by relative displacement along the Elsinore and San Jacinto Fault Zones. The region is typically mantled by alluvial/fluvial clastic deposits of Quaternary age, infilling areas between bedrock highs (see Figure 3, *Regional Geology Map*).

The infilling soil units typically consist of alluvial fan deposits derived either from the erosion of nearby bedrock highs, or distal areas of the valley. The valley floor, and subject property, exhibit a gentle southwesterly sloping/descending profile mainly generated by erosion of the geologically elevated “Badlands” region. This region consists of an uplifted range of erodible bedrock along the San Jacinto Fault northeast of the site. The flat-lying valley surface is locally pierced by elevated conical shaped masses of weathered granitic basement rock. One such outcrop occurs just northeast of the subject property, with heights ascending up to approximately 186 feet above the flat-lying surrounding areas.

Moreno valley tends to be transected by various narrow streams entrenched into the fan surface. The stream paths are meandering with the valley plain, except where they encounter areas of hard rock outcrops, where they circumvent around outcrop margins. One such stream defines the northeast site boundary and periodically discharges sediments onto the site as flood deposits.

2.2 Site-Specific Geology

Our borings reveal the site is underlain by a thin mantle of tilled topsoil which is not mapped. Underlying this material are sedimentary units interpreted as young and very old Quaternary alluvial fan deposits. The deposits are typically composed of variable lenses of laterally discontinuous silty sands, sandy silts and interlayered poorly-graded sands and lessor fractions of silts and silty clay. Morton et al. (2006) subdivide the on-site alluvial fan deposits into two distinct units as follows:

- *Young Alluvial Fan Deposits (Qyf) – (Holocene to late Pleistocene)*: Based on exposures in our borings and test pits this unit underlies a majority of the property, varying from approximately 15 to 30 feet or greater in thickness. This unit is characterized as a yellow brown to brown silty sand that is loose to medium dense and unconsolidated to moderately consolidated in texture. It is variable in its distribution within the northern area of the site were we infer it as infilling areas of dissected older underlying units. The younger alluvial deposits are expected to possess very low expansion potential (EI<21). Based on our laboratory testing, these materials are expected to exhibit slight to moderate hydro-collapse potential (3 to 9 percent) in the upper 10 to 15 feet bgs.

- *Very Old Alluvial Fan Deposits (Qvof) – (middle to late Pleistocene)*: This unit underlies younger fan deposits to the maximum depth explored (51.5 feet bgs). It varies in depth across the site, encountered near the surface locally in the northern site areas and deeper within southern site areas. The unit consists of reddish brown silty sands to clayey sands with local gravel, which are loose to dense and is unconsolidated to moderately consolidated. Based on our laboratory testing, these deposits also exhibit a slight to moderate hydro-collapse potential (2 to 6 percent) within the upper 10 to 15 feet bgs. The locally increased clay content of this unit suggests it possesses a low expansion potential (EI<51).

Our detailed description of subsurface soil units, and depths to the contacts of these units, are presented within attached Appendix A, *Boring / Test Pit / Infiltration Test Logs*.

2.3 Groundwater Conditions

At the time of our exploration, no groundwater was encountered to the maximum depth explored (51.5 feet bgs). According to published groundwater studies encompassing the site area, the depth to groundwater beneath the site in circa 1971 was on the order of 190 feet bgs (USGS, SP 1781). The same publication noted the groundwater table rose to an elevation of around 1,450 feet msl by 2006, corresponding to a depth of approximately 140 feet bgs. Groundwater at this depth

is not anticipated to pose a constraint to proposed site grading. However, fluctuations in the depth of groundwater levels or soil moisture beneath the site, and/or the development of temporary perched water conditions, can occur seasonally as a result of storm events, storm water runoff, stormwater infiltration, or landscape irrigation.

2.4 Expansive Soils

As indicated above, the site near surface soils consist of silty sand of low plasticity and expected to possess very low expansion potential (EI<21). The expansion potential of the very old alluvial fan deposits may be higher where containing locally greater concentrations of clay (EI<51).

The inherent variability in alluvial sediment distribution is such that more or less clayey soils may be encountered on the site, in areas beyond the location of our exploration. The presence of disposition of any excessively clayey soils will be evaluated during grading. And conformance testing of as-graded pad surfaces performed to verify design parameters. Although not anticipated, the potential to encounter moderately expansive soils (EI<51) during grading, and inadequately mix or dispose of them such that higher concentrations result at finish pad grade, warranting use of post-tension slab systems, cannot be precluded.

2.5 Soil Sulfate Content

Based on our previous experience in the site area, we anticipate a negligible concentration of soluble sulfates in onsite soils. Additional corrosion testing should be performed on representative finish grade soils at the completion of rough grading.

A representative bulk sample of near surface soil collected from a depth between 0 and 5 feet bgs in boring LB-3, was tested to evaluate corrosion potential. Results of chemical analysis tests are attached in Appendix B, *Laboratory Test Results.* A summary of the test results is presented below in Table 1.

Table 1. Corrosivity Test Results

Test Parameter	Test Results (LB-3 @ 0-5')	General Classification of Hazard
Water-Soluble Sulfate-SO_4 in Soil (ppm)	140	Negligible sulfate exposure to buried concrete-S0 Exposure Class
Water-Soluble Chloride in Soil (ppm)	20	Non-corrosive to buried concrete (per Caltrans Specifications)
pH	7.40	Mildly alkaline
Minimum Resistivity (saturated ohm-cm)	2900	Moderately corrosive to buried ferrous pipes

2.6 Infiltration Testing

Two (2) field percolation tests were performed in the general location of planned bio-retention basin, at planned basin invert depths, within shallow in-situ sandy alluvial soils. The testing was performed in general accordance with the *Riverside County - Low Impact Development BMP Design Handbook (Riverside County Flood Control and Water Conservation District, 2011).*

Each well was constructed by installing two-inch-diameter PVC casing into the boreholes, screened within test zones and solid above perforated sections. Borehole annular spaces were infilled with clean sand (#3 Monterey Sand) to approximately 1-foot above the screen zone. The wells were then pre-soaked prior to the testing in an attempt to model the behavior of stormwater quality control devices during a design storm event. After the conclusion of the percolation testing, the well casings were removed and the test holes backfilled with naive soil tailings.

Based on the results of pre-soaking and initial readings, percolation testing in LP-1 and LP-2 was performed using the falling head test procedure, where the drop of water levels inside the well were recorded over the testing period. Measured percolation rates were calculated by dividing the rate of discharge (cubic inches per hour) by the infiltration surface area, or flow area (square inches). Discharge volume was calculated by adding the total volume of water that dropped within the PVC pipe and annulus incorporating a porosity reduction factor to account for the filter pack material. The flow area was based on the average water height within the slotted pipe section of the test well only.

The results of the percolation testing and resultant measured (un-factored) rates of infiltration obtained from the testing are presented below in Table 2. Detailed test data is presented in Appendix A, *Boring / Test Pit / Infiltration Test Logs*.

Table 2. Measured Infiltration Rate (Unfactored)

Percolation Test Boring/Well Designation	Percolation Test Method	Approximate Depth of Test Zone Below Ground Surface (feet)	Unfactored* Infiltration Rate (in/hr)
LP-1	Falling Head	10-13	1.29
LP-2	Falling Head	10-13	0.08

Note: The invert elevation of any stormwater infiltration shall be set back at least 15 feet, and outside a 1:1 plane drawn down and out from the bottom of adjacent foundations.

Measured (un-factored) rates of infiltration indicate that onsite infiltration at the specific location and depth of LP-1 is more favorable than the LP-2 location. The differences in rates as attributable to the deposits encountered within the test zones. The LP-1 test was performed in the young alluvial fan deposits, the LP-2 test was conducted in the very old alluvial fan deposit.

The infiltration rates are the product of small-scale test performed at specific locations and depths. Actual infiltration rates within the area of a proposed infiltration device can vary from that yielded by our testing. Therefore, care must be used in the selection of infiltration rate for use in design and the potential for variances in soil conditions (fines content) that could significantly affect long-term field performance. Infiltration rates can be expected to decline over time between maintenance cycles as BMP surface become occluded and particulates accumulate in the infiltrative layer of testing suggest some lateral variability in both infiltration rates and fines content.

3.0 GEOLOGIC AND SEISMIC HAZARD EVALUATION

3.1 Faulting

Known surface faults in the region are mapped on Figure 4, *Regional Fault Map*. Our review of available in-house literature indicates the mapped presence of no known active faults on or crossing the site, and the site is not located within a currently-designated Alquist-Priolo Earthquake Fault Zone (CGS, 1999; Bryant and Hart, 2007). A surface fault rupture hazard evaluation is, therefore, not mandated for this site. In addition, no currently known active faults have been mapped within the vicinity of the site having a potential for surface fault rupture. Given an absence of known faults, potential risk for surface fault rupture at this site is low.

3.2 Seismicity

Historically, the San Jacinto Fault Complex has produced earthquakes in the magnitude range of 6.0Mw to 7.6Mw (Moment magnitude). In roughly the last 100 years (1903 through 2020), 9 major quakes in the range of 6.0Mw to 7.6Mw have occurred within a 50-mile radius of the subject site. Each of these large quakes has produced moderate to severe damage to buildings and roads, and several have resulted in fatalities (USGS, 1971). The frequency and relatively short recurrence interval of surface rupture for the San Jacinto Fault has resulted in many events during Holocene time with at least 16 documented in the past 3,700 years (Onderdonk et al., 2018).

Common throughout most of Southern California is a potential for strong ground shaking generated by moderate to severe earthquakes. The intensity of ground shaking at a given location depends primarily upon earthquake magnitude, site distance from the source, and site response (soil type) characteristics. Seismic coefficients for the subject site were calculated utilizing an interactive program on current United States Geological Survey (USGS) website using ASCE 7-16 procedures. Based on the results of seismic profiling, the soil sediments underlying the site are classified as Site Class D. As such, the site-specific seismic coefficients are as presented below in Table 3. Copies of seismic analysis data are attached in Appendix C, *Seismic Design Data and Settlement Analyses.*

Table 3. 2019 CBC-Based Seismic Design Parameters

Categorization/Coefficient	Design Value
Site Latitude: 33.9205, Site Longitude: -117.1871	
Site Class: D	
Mapped Spectral Response Acceleration at Short Period (0.2 sec), S_S	1.92g
Mapped Spectral Response Acceleration at Long Period (1 sec), S_1	0.76g
Short Period (0.2 sec) Site Coefficient, F_a	1.0
Long Period (1 sec) Site Coefficient, F_v	1.7[1]
Adjusted Spectral Response Acceleration at Short Period (0.2 sec), S_{MS}	1.92g
Adjusted Spectral Response Acceleration at Long Period (1 sec), S_{M1}	1.29g[1]
Design Spectral Response Acceleration at Short Period (0.2 sec), S_{DS}	1.28g
Design Spectral Response Acceleration at Long Period (1 sec), S_{D1}	0.86g[1]
PGA adjusted for Site Class, $PGA_M = F_{PGA}$ *PGA	0.89g

g = Gravity acceleration
*Per Exception 2 in Section 11.4.8 of ASCE 7-16, seismic response coefficient CS to be determined by Eq. 12.8-2 for values of T < 1.5Ts and taken as equal to 1.5 times the value computed in accordance with either Eq. 12.8-3 for TL > T > 1.5Ts or Eq. 12.8-4 for T > TL

The project structural engineer should confirm if the above applies for the proposed structures, else a site–specific ground motion analysis may be required.

3.3 Other Geologic Hazards

Other site geologic hazards associated with this site are discussed in subsections below.

3.3.1 Liquefaction Potential

According to the Liquefaction Map published on the ESRI ArcGIS website the site is defined as having a low liquefaction susceptibility, see Figure 5, *Liquefaction Map*. This regional scale mapping represents only a general distribution of the liquefaction potential, and not a definitive indication that liquefaction can or will occur. It is intended to inform practitioners of its potential so that appropriate hazard analyses may be incorporated into a development project. The southern areas of the site correspond to mapped areas of Quaternary Young Alluvial Fan deposits. This unit is defined as having a moderate susceptibility to liquefaction. These younger alluvial fan deposits are underlain by Pleistocene age very old fan deposits that are generally not susceptible to liquefaction. Given an absence of groundwater encountered beneath the site at or above a depth of 50 feet bgs, the potential constraint to the proposed development due to liquefaction and related seismic-induced settlement is considered very low.

3.3.2 Seismically-Induced Settlement

During a strong seismic event, and in the absence of groundwater, seismically-induced settlement can still occur within loose to medium dense and dry or moist granular soils. Settlement caused by ground shaking is often non-uniformly distributed, which can result in differential settlement. Based on the design earthquake and a Peak Ground Acceleration (PGA) of 0.89g, the magnitude of dynamic dry settlement is estimated to be on the order of approximately 4.0 inches (see Appendix C), assuming remedial grading is performed in compliance with Section 5.1 of this report. Given the similar lithology of the onsite soil units and implementation of proposed remedial grading, anticipated dynamic settlement is expected to occur over a widespread area of the site. As such, the differential settlement is not expected to exceed 1-inch in a 30-foot horizontal distance.

3.3.3 Lateral Spreading

As the potential for liquefaction is expected to be very low, and the property is well constrained laterally, the potential for earthquake-induced lateral spreading at the site is considered negligible.

3.3.4 Slope Stability and Seismically Induced Landslides

The site is relatively flat in topographic relief and not designated on County of Riverside hazard maps as occurring within a landslide hazard zone. No slopes or other elevated areas of any significance exist on or adjacent to the property which could be potential source of landslides. Based on the above, the potential for slope instability or seismically induced landslides is considered negligible.

3.4 Earthquake-Induced Flooding

The potential for earthquake-induced flooding can relate to the failure of nearby dams or other water-retaining structures as a result of earthquakes. There are no nearby water retaining structures and the site is not located within a mapped Dam Inundation Risk zone. The potential for earthquake induced flooding to affect this site is considered negligible.

3.5 Flooding

Federal Emergency Management Agency (FEMA) flood insurance rate map Nos. 06065C0770G and 06065C0765G (FEMA, 2008), indicate the project site is located within Zone X, designated as “an area of minimal flood hazard.” As shown on Figure 6, *Flood Hazard Zone Map*, the site is **not** located within a flood hazard zone.

3.6 Land Subsidence

Land subsidence refers to the sinking or gradual downward settlement and compaction of soil deposits, commonly associated with the extraction of deep groundwater and/or petroleum resources from a region. Subsidence can be manifest at the surface by a broad lowering of topography in the form of depression(s), often recognized within sedimentary basins by the formation of arcuate tension cracking along basin margins, with little or no lateral movement. According to the County of Riverside, the site is mapped within a zone susceptible to subsidence, based only on the presence of geologic and/or hydrogeologic conditions similar to areas having experienced such hazards in the past. The mapped limits of this zone are shown on attached Figure 7, *Subsidence Map*. Given the site is not situated near any active faults or basin margin, the effects of any potential subsidence on the development is considered to be low.

4.0 SUMMARY OF FINDINGS AND CONCLUSIONS

A summary of our geologic and geotechnical findings and conclusions are presented below:

- The relatively loose near surface alluvial soils possess relatively significant degree of potential collapse (up to 9 percent). As such, over-excavation and recompaction to depths varying from 7 to 14 feet will be required to reduce potential differential settlement to tolerable limits. More specific grading recommendations are provided in Section 5.1.2 below.
- Groundwater was not encountered within the maximum depth of our exploration (51.5 feet bgs). Regional literature indicates groundwater occurs at depths of at least 140 feet bgs. Given the above, groundwater is expected to pose no constraint to site development.
- Results of shallow field percolation testing within the proposed central bio-retention basin, at the invert depth tested, is considered feasible for use as a part of on-site stormwater system design.
- Results of shallow field percolation testing within the bio-retention basin planned near the southern site margin is not considered suitable for infiltration at the invert depth tested.
- The site is not located within an Alquist-Priolo Earthquake Fault Zone, nor was any evidence of active faulting observed on or as projection towards the site. Surface fault rupture is not considered a site hazard.
- The close proximity of major faults and historical earthquakes indicate occurrence of strong ground shaking at the site is likely during its economic life-span.
- Deposits of young alluvial fan material are expected to possess a very low expansion potential (EI<21), and, very old alluvial fan materials are expected to possess a low expansion (EI<51).
- The potential exists to encounter very old alluvial sediments with locally higher clay concentrations.
- Materials generated by both the younger and very old geologic units on the site are expected to be suitable for use as compacted fill, provided it is relatively free of organic material and debris.
- The site soil units can be readily excavated, processed and compacted using a conventional grading equipment in good repair.
- Finish building pads, slope faces and other graded surfaces will be susceptible to erosion if left unprotected. This risk can be reduced through installation of certain control measures including but not limited to a jute net cover, erosion control blankets, straw wattles, or other similar methods of protection.
- Caving and raveling of soils in un-shored excavations should be expected.

5.0 RECOMMENDATIONS

The following geotechnical recommendations are provided for project site grading and construction.

5.1 General Earthwork Considerations

All site grading should be performed in accordance with applicable local regulatory codes, and project specifications prepared by applicable design professional. Detailed grading recommendations are attached herein as Appendix D, *General Earthwork and Grading Specifications for Rough Grading*.

5.1.1 Site Preparation

Prior to construction, the site should be cleared of any vegetation, trash, and/or debris within the area of proposed grading. These materials should be removed from the site. Any underground obstructions onsite should be removed. Existing utility lines will need to be removed and/or rerouted where interfering with the proposed construction. Any resulting excavation cavities should be properly backfilled and compacted. All unsuitable earth deposits should be excavated and removed from the footprints of proposed buildings/structures prior to fill placement. Any existing undocumented fill will need to be removed from areas of planned structural improvements.

5.1.2 Remedial Grading

The upper 7 to 9 feet of existing surficial soil in the northern portion of the site (north of projected Bay Avenue) should be removed/over-excavated and recompacted prior to foundation construction or placement of any additional fill. Similarly, the upper 12 to 14 feet of existing surficial soil in the southern portion of the site (south of Bay Avenue) should be removed/over-excavated and recompacted. The removal limits should be established via 1:1 (horizontal: vertical) projection from the edges of structural fills (soils supporting settlement-sensitive structures) downward and outward to competent material identified by the geotechnical consultant. Removal will also include benching into competent material as the fills rise. Areas adjacent to existing structures/roadways or property limits may require special considerations and monitoring. Deeper removals may be required in local areas based on prevailing soils conditions.

5.1.3 Fill Placement and Compaction

Fill soils should be placed in loose lifts not exceeding 8 inches, moisture-conditioned to within 2 percent of optimum moisture content for sandy soils and at least 4 percent above optimum moisture content for clayey soils (not

anticipated), and compacted to a minimum of 90 percent of the maximum dry density as determined by ASTM Test Method D 1557.

5.1.4 Shrinkage and Subsidence

The volume change of excavated onsite materials upon compaction is expected to vary with materials, volume of roots and deleterious materials, density, insitu moisture content, location, and compaction effort. The in-place and compacted densities of soil materials vary and accurate overall determination of shrinkage and bulking cannot be made. Therefore, we recommend site grading include, if possible, a balance area or ability to adjust import quantities to accommodate some variation. Based on our experience with similar materials, we anticipate 10 to 18 percent shrinkage in the upper 10 to 15 feet of alluvium. Subsidence due solely to scarification, moisture conditioning and recompaction of the exposed bottom of overexcavation, is expected to be on the order of 0.15 foot. This should be added to the above shrinkage value calculations for the recompacted fill zone.

5.1.5 Import Soils

Import soils and/or borrow sites, if needed, should be evaluated by the geotechnical consultant prior to import. Import soils should be uncontaminated, granular in nature, free of organic material (loss on ignition less-than 2 percent), have a very low expansion potential (with an Expansion Index less than 12) and have a low corrosion impact to the proposed improvements.

5.1.6 Utility Trenches

Utility trenches should be backfilled with compacted fill in accordance with Sections 306-1.2 and 306-1.3 of the Standard Specifications for Public Works Construction, (“Greenbook”), 2021 Edition (or most recent). Fill material above the pipe zone should be placed in lifts not exceeding 8 inches in uncompacted thickness and should be compacted to at least 90 percent relative compaction (ASTM D 1557) by mechanical means only. Site soils may generally be suitable as trench backfill provided these soils are screened of rocks over 1½ inches in diameter and organic matter. If imported sand is used as backfill, the upper 3 feet in building and pavement areas should be compacted to 95 percent. The upper 6 inches of backfill in all pavement areas should be compacted to at least 95 percent relative compaction.

Where granular backfill is used in utility trenches adjacent moisture sensitive subgrades and foundation soils, we recommend that a cut-off “plug” of impermeable material be placed in these trenches at the perimeter of buildings, and at pavement edges adjacent to irrigated landscaped areas. A “plug” can consist of a 5-foot long section of clayey soils with more than 35-percent passing the No. 200 sieve, or a Controlled Low Strength Material

(CLSM) consisting of one sack of Portland-cement plus one sack of bentonite per cubic-yard of sand. CLSM should generally conform to Section 201-6 of the "Greenbook". This is intended to reduce the likelihood of water permeating trenches from landscaped areas, then seeping along permeable trench backfill into the building and pavement subgrades, resulting in wetting of moisture sensitive subgrade earth materials under buildings and pavements.

Excavation of utility trenches should be performed in accordance with the project plans, specifications and the California Construction Safety Orders (current Edition). The contractor should be responsible for providing a "competent person" as defined in Article 6 of the California Construction Safety Orders. Contractors should be advised that sandy soils (such as fills generated from the onsite alluvium) could make excavations particularly unsafe if all safety precautions are not properly implemented. In addition, excavations at or near the toe of slopes and/or parallel to slopes may be highly unstable due to the increased driving force and load on the trench wall. Spoil piles from the excavation(s) and construction equipment should be kept away from the sides of the trenches. Leighton does not consult in the area of safety engineering.

5.1.7 Drainage

All drainage should be directed away from structures, slopes and pavements by means of approved permanent/temporary drainage devices. Adequate storm drainage of any proposed pad should be provided to avoid wetting of foundation soils. Irrigation adjacent to buildings should be avoided when possible. As an option, sealed-bottom planter boxes and/or drought resistant vegetation should be used within 5-feet of buildings.

5.1.8 Slope Design and Construction

Based on our understanding and for planning purposes, all fill and cut slopes will be designed and constructed at 2:1 (horizontal:vertical and expected to be less than 10 feet in height. These slopes are considered grossly stable for static and pseudostatic conditions. For planning purposes, cut slopes should be constructed as replacement fill slopes due to the highly erosive nature of site soils. Future grading plans should be subject to further review and evaluation.

The outer portion of fill slopes should be either overbuilt by 2 feet (minimum) and trimmed back to the finished slope configuration or compacted in vertical increments of 5 feet (maximum) by a weighted sheepsfoot roller as the fill is placed. The slope face should then be track-walked by dozers of appropriate weight to achieve the final slope configuration and compaction to the slope face.

Slope faces are inherently subject to erosion, particularly if exposed to wind, rainfall and irrigation. Landscaping and slope maintenance should be conducted as soon as possible in order to increase long-term surficial stability. Berms should be provided at the top of fill slopes. Drainage should be directed such that surface runoff on the slope face is minimized.

5.2 Foundation Design

Based on our analysis, and upon implementation of remedial grading measures recommendations herein, the use of shallow isolated and/or continuous footings will be suitable to support the proposed residential structures.

5.2.1 Bearing and Lateral Pressures

The proposed foundations and slabs should be designed in accordance with the structural consultants' design, the minimum recommendations presented herein, and the 2019 CBC. In utilizing the minimum geotechnical foundation recommendations, the structural consultant should design the foundation system to acceptable deflection criteria as determined by the architect. Foundation footings may be designed with the following geotechnical design parameters:

- ***Bearing Capacity***: A net allowable bearing capacity of 2,500 pounds per square foot (psf), or a modulus of subgrade reaction of 200 pci may be used for design of footings founded entirely into compacted fill. The footings should extend a minimum of 12 inches below lowest adjacent grade. A minimum base width of 18 inches for continuous footings and a minimum bearing area of 3 square feet (1.75 ft by 1.75 ft) for pad foundations should be used. Additionally, an increase of one-third may be applied when considering short-term live loads (e.g. seismic and wind).
- ***Passive Pressures***: The passive earth pressure may be computed as an equivalent fluid having a density of 300 psf per foot of depth, to a maximum earth pressure of 3,000 pounds per square foot. A coefficient of friction between soil and concrete of 0.35 may be used with dead load forces. When combining passive pressure and frictional resistance, the passive pressure component should be reduced by one-third

The footing width, depth, reinforcement, slab reinforcement, and the slab-on-grade thickness should be designed by the project structural consultant based on recommendations and soil characteristics indicated herein and the most recently adopted edition of the CBC.

5.2.2 Settlement

The project civil engineer, structural engineer, and architect should consider the potential effects of both static settlement and dynamic settlement presented below.

- ***Static Settlement*:** Most of the static settlement of onsite soils is expected to be immediate or within 30 days following fill placement/foundations. A differential static settlement of 0.5 inch over a 30-foot span may be considered for design purposes.
- **Dynamic Settlement**: Based on our analysis, we estimate total dynamic settlement is expected to be approximately 4 inches. Due to relatively uniform alluvium conditions, this settlement is expected to be global and differential settlement minimal or less than 1-inch over a 30-foot horizontal span.

5.2.3 Vapor Retarder

It has been a standard of care to install a moisture retarder underneath all slabs where moisture condensation is undesirable. Moisture vapor retarders may retard but not totally eliminate moisture vapor movement from the underlying soils up through the slabs. Moisture vapor transmission may be additionally reduced by use of concrete additives. Leighton does not practice in the field of moisture vapor transmission evaluation/mitigation. Therefore, we recommend that a qualified person/firm be engaged/consulted to evaluate the general and specific moisture vapor transmission pathways and any impacts to proposed construction elements. This person/firm should provide recommendations for mitigation of potential adverse impact of moisture vapor transmission on various components of the structure as deemed appropriate.

However, based on our experience, the standard of practice in Southern California has evolved over the last 15 to 20 years where an acceptable vapor retarder system includes a membrane (such as 10-mil thick or greater), underlain by a capillary break consisting of 4 inches of clean ½-inch-minimum gravel or 2-inch sand layer (SE>30). The structural engineer/architect or concrete contractor often require a sand layer be placed over the membrane (typically 2-inch thick layer) to help in curing and reduction of curling of concrete. If such sand layer is placed on top of the membrane, the contractor should not allow the sand to become wet prior to concrete placement (e.g., sand should not be placed if rain is expected).

In conclusion, construction of the vapor barrier/retarder system is dependent on several variables which cannot all be evaluated and/or tested from a geotechnical standpoint. As such, the design of this system should be a design team/owner decision taking into consideration finish flooring materials and manufacture's installation requirements of proposed membrane.

Moreover, we recommend that the design team also follow ACI Committee 302 publication for "Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials" (ACI 302.2R-06) which includes a flow chart that assists in determining if a vapor barrier /retarder is required and where it is to be placed.

5.3 Temporary Excavation and Shoring Design

All temporary excavations for utility trenches, retaining walls, and foundations should be performed in accordance with project plans, specifications, and all OSHA requirements. Excavations 5 feet or deeper should be laid back or shored in accordance with OSHA requirements before personnel are allowed to enter. Site soils should be considered as Type C Soil per OSHA guidelines.

No surcharge loads should be permitted within a horizontal distance equal to the height of cut or 5 feet, whichever is greater from the top of the cut, unless the cut is shored appropriately. Excavations that extend below an imaginary plane inclined at 45 degrees below the edge of any adjacent existing site foundation should be properly shored to maintain support of the adjacent structure.

5.4 Preliminary Pavement Design Parameters

Our laboratory testing of a bulk soil sample collected from a depth of 0 to 5 feet bgs, yielded an R-value of 25. Pavement section recommendations based on this test are presented below in Table 4. The recommendations are intended for planning purposes only and should not supersede minimum City or County requirements. For final pavement design, appropriate traffic indices should be selected by the project civil engineer or traffic engineering consultant. Additional testing should be performed to verify design parameters once samples representative of finish soil subgrade material are confirmed and collectible.

Table 4. Pavement Section Design

Street Type	Loading Conditions TI	*AC Pavement Section Thickness*	
		Asphaltic-Concrete (AC) Thickness (inch)	Aggregate Base (AB) Thickness (inch)
Alleys/Local Streets	5	3.0	6.0
Collector Street/ Truck Access	6	3.5	8.5
Perimeter Roadways	7	4.0	10.5

The upper 6 inches of subgrade soil should be properly compacted to at least 95 percent relative compaction (ASTM D1557) and should be moisture-conditioned to near optimum and kept in this condition until the pavement section is constructed. Proof-rolling subgrade to identify localized areas of yielding subgrade (if any) should be performed prior to placement of aggregate base and under the observation of the geotechnical consultant.

Minimum relative compaction requirements for aggregate base should be 95 percent of the maximum laboratory density as determined by ASTM D1557. Base rock should conform to the "Standard Specifications for Public Works Construction" (green book) current edition or Caltrans Class 2 aggregate base having a minimum R-value of 78. Asphaltic concrete should be placed on compacted aggregate base and compacted to minimum 95% relative compaction.

The pavement sections provided in this section are intended as minimum values. Should thinner or highly variable as-built pavement sections result from construction, increased maintenance and repair may be needed.

5.5 Retaining Walls

Retaining wall earth pressures are a function of the amount of wall yielding horizontally under load. If a wall can yield enough to mobilize full shear strength of backfill soils, then it can be designed for "active" pressure. If a wall cannot yield under the applied load, the shear strength of the soil cannot be mobilized and the earth pressure will be higher. Such walls should be designed for "at rest" conditions. If a structure moves toward the soils, the resulting resistance developed by the soil is the "passive" resistance. Retaining walls backfilled with non-expansive soils should be designed using the following equivalent fluid pressures:

Table 5. Retaining Wall Design Earth Pressures (Static, Drained)

Loading Conditions	Equivalent Fluid Density (pcf)	
	Level Backfill	2:1 Backfill
Active	33	50
At-Rest	50	80
Passive*	300	150 (2:1, sloping down)

*This assumes level condition in front of the wall will remain for the duration of the project, not to exceed 3,000 psf at depth. If sloping down (2:1) grades exist in front of walls, then they should be designed using passive values reduced to ½ of level backfill passive resistance values.

Unrestrained (yielding) cantilever walls should be designed for the active equivalent-fluid weight value provided above for very low to low expansive soils that are free draining. In the design of walls restrained from movement at the top (non-yielding) such as basement or elevator pit/utility vaults, the at-rest equivalent fluid weight value should be used. Total depth of retained earth for design of cantilever walls should be measured as the vertical distance below the ground surface measured at the wall face for stem design, or measured at the heel of the footing for overturning and sliding calculations. Should a sloping backfill other than a 2:1 (horizontal:vertical) be constructed above the wall (or a backfill is loaded by an adjacent surcharge load), the equivalent fluid weight values provided above should be re-evaluated on an individual case basis by us. Non-standard wall designs should also be reviewed by us prior to construction to check that the proper soil parameters have been incorporated into the wall design.

All retaining walls should be provided with appropriate drainage. The outlet pipe should be sloped to drain to a suitable outlet. Typical wall drainage design is illustrated in Appendix E, *Retaining Wall Backfill and Subdrain Detail*. Wall backfill should be non-expansive (EI $\leq$ 21) sands compacted by mechanical methods to a minimum of 90 percent relative compaction (ASTM D 1557). Clayey site soils should not be used as wall backfill. Walls should not be backfilled until wall concrete attains the 28-day compressive strength and/or as determined by the Structural Engineer that the wall is structurally capable of supporting backfill. Lightweight compaction equipment should be used, unless otherwise approved by the Structural Engineer.

5.6 Foundation Setback from Slopes

We recommend a minimum horizontal setback distance from the face of slopes for all structural footings (retaining and decorative walls, flatwork, building footings, pools, etc.). This distance is measured from the outside bottom edge of the footing horizontally to the slope face (or the face of a retaining wall) and should be a minimum of H/2, where H is the slope height (in feet).

Table 6. Footing Setbacks

Slope Height	Recommended Footing Setback
<5 feet	5 feet minimum
5 to 15 feet	7 feet minimum
>15 feet	H/2, where H is the slope height, not to exceed 10 feet to 2:1 slope face

*Per county minimum or as calculated

The soils within the structural setback area generally possess poor lateral stability and improvements (such as retaining walls, pools, sidewalks, fences, pavements, decorative flatwork, etc.) constructed within this setback area will be subject to lateral movement and/or differential settlement. Potential distress to such improvements may be mitigated by providing a deepened footing or a pier and grade-beam foundation system to support the improvement. The deepened footing should meet the setback described above. Modifications of slope inclinations near foundations may increase the setback and should be reviewed by the design team prior to completion of design or implementation.

5.7 Concrete Flatwork

Exterior concrete slabs-on-grade should have a minimum thickness of 4 inches. Common Type II cement should be adequate for concrete flatwork not exposed to recycled water. Type V cement and a water:cement ratio of 0.45 should be used for concrete exposed to recycled water.

Concrete flatwork should be placed on compacted fill. If this material has been disturbed or become dry or desiccated, the subgrade soil should be moisture conditioned to near optimum moisture content and recompacted to a minimum of 90 percent relative compaction to a depth of 12 inches. Moisture content should be checked 48 hours prior to placing concrete.

As discussed in conjunction with floor slabs, minor cracking of concrete after curing due to expansion, drying and shrinkage is normal and should be expected. However, cracking is often aggravated by a high water-to-cement ratio, high concrete temperature at the time of placement, small nominal aggregate size, and rapid moisture loss due to hot, dry, and/or windy weather conditions during placement and curing. Cracking due to temperature and moisture fluctuations can also be expected.

The use of low-slump concrete or low water/cement ratios can reduce the potential for shrinkage cracking. Inclusion of joints at frequent intervals and reinforcement will help control the locations of cracking, and improve aesthetics. Control joints should be spaced at regular intervals no greater than 6 feet on-center and have appropriate joints and saw cuts in accordance with either Portland Cement Association (PCA) or American Concrete Institute (ACI) guidelines. If cracking occurs, repairs may be needed to mitigate a trip hazard (should it develop) and/or improve the appearance.

Landscape areas must be separated from pavements with concrete curbs and/or edge drains. Excessive over-irrigation will have an adverse effect on adjacent pavements. Irrigation adjacent to pavements, without a deep curb or other cutoff to separate landscaping from paving will result in premature pavement distress.

6.0 GEOTECHNICAL CONSTRUCTION SERVICES

The long term integrity and performance of foundation and earthwork improvements for residential development projects is closely attributable to an adequate construction review process. Geotechnical review is of paramount importance as a part of this process. To verify that project grading and foundation plans conform to the recommendations of this report, we recommend Leighton professionals be retained to review these plan(s) once available.

Direct observation and testing by the geotechnical professional during remedial grading and foundation construction allows for an assessment of exposed soil conditions and verification of the geotechnical conclusions and recommendations presented herein. Our presence also affords opportunity to provide alterative recommendations where/if warranted to address unanticipated conditions in the field. We therefore recommend that Leighton be retained during rough and precise grading earthwork to provide these services. Our geotechnical observation and testing services are typically required by the city for the following:

- Following completion of site demolition and clearing;
- During ground preparation, subsurface excavation, and overexcavation of soils;
- During compaction of all fill materials;
- Following foundation excavation, prior to placement of any forms, steel or concrete;
- During slab-on-grade, driveway and flatwork subgrade preparation,
- During street, curb-gutter base placement and asphalt paving;
- During utility trench backfilling and compaction; and
- When any unusual conditions are encountered.

7.0 LIMITATIONS

Leighton and Associates, Inc.'s work was performed using the degree of care and skill ordinarily exercised, under similar circumstances, by reputable geotechnical consultants practicing in California at this time. No other warranty, express or implied, is made as to the conclusions and professional opinions included in this report.

This report is issued with the understanding that it is the responsibility of the owner or a duly authorized agent acting on behalf of the owner, to ensure that information and recommendations contained herein are brought to the attention of the necessary design consultants for this project and incorporated into plans and specifications.

The conclusions and preliminary recommendations in this report are based in part upon data that were obtained from a necessarily limited number of observations, site visits, excavations, samples and tests. Such information can be obtained only with respect to the specific locations explored, and therefore may not completely define all subsurface conditions throughout the site. The nature of many sites is that differing geotechnical and/or geological conditions can occur within small distances and under varying climatic conditions. Furthermore, changes in subsurface conditions can and do occur over time. Therefore, the findings, conclusions, and recommendations presented in this report should be considered preliminary if unanticipated conditions are encountered and additional explorations, testing and analyses may be necessary to develop alternative recommendations.

Any persons using this report for bidding or construction purposes should perform such independent investigations as they deem necessary to satisfy themselves as to the surface and/or subsurface conditions to be encountered and the procedures to be used in the performance of work on the subject site. For additional information about geotechnical engineering studies and this reports and its applicability, provided by the Geoprofessional Business Association (GBA), the client is referred to Appendix F, *GBA Important Information About This Geotechnical Engineering Report.*

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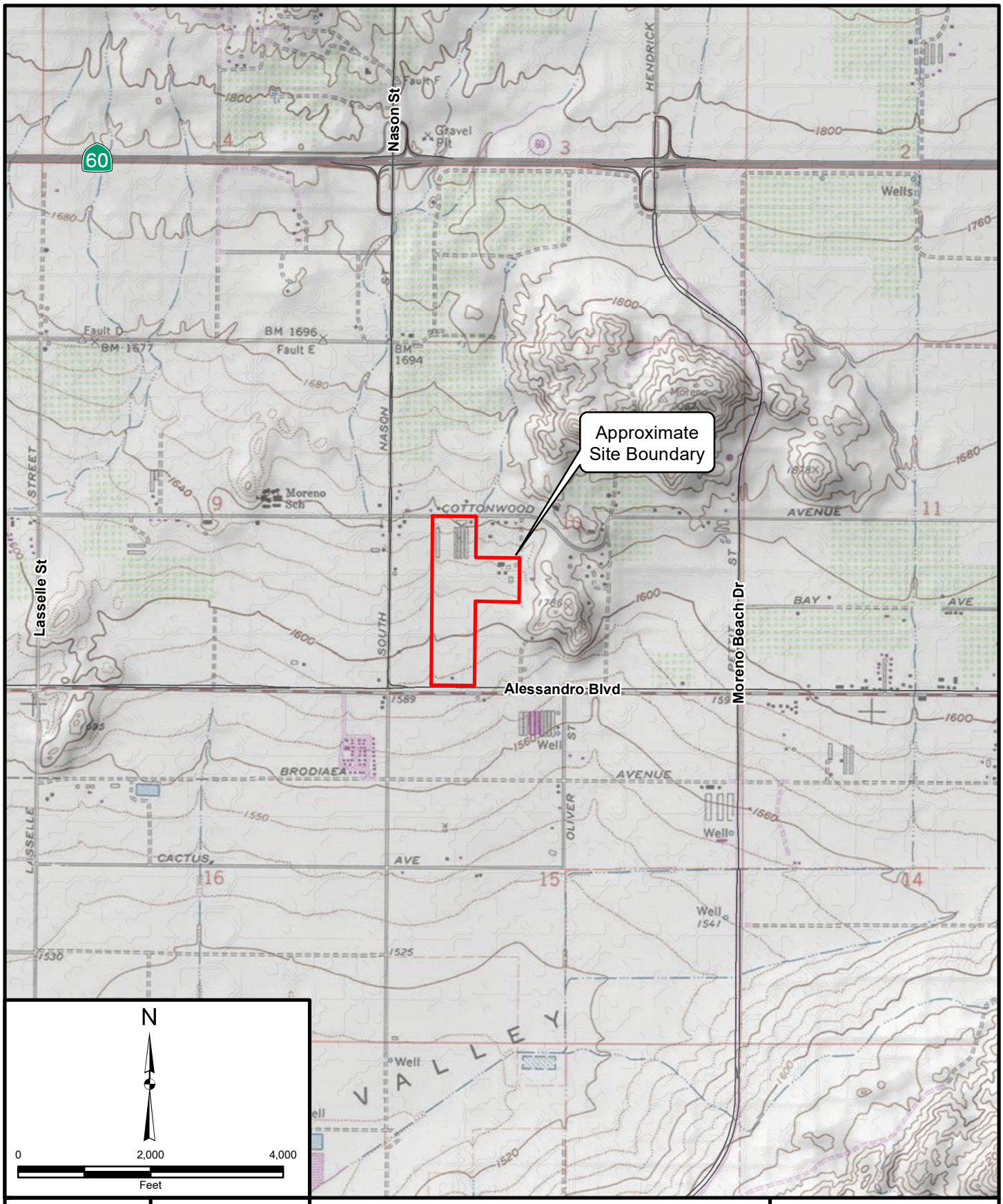

Project: 13169.003	Eng/Geol: JLH/SIS
Scale: 1 " = 2,000 '	Date: March 2022

Reference: Copyright:© 2013 National Geographic Society, i-cubed

SITE LOCATION MAP

50-Acre Residential Development Project
City of Moreno Valley
Riverside County, California

FIGURE 1

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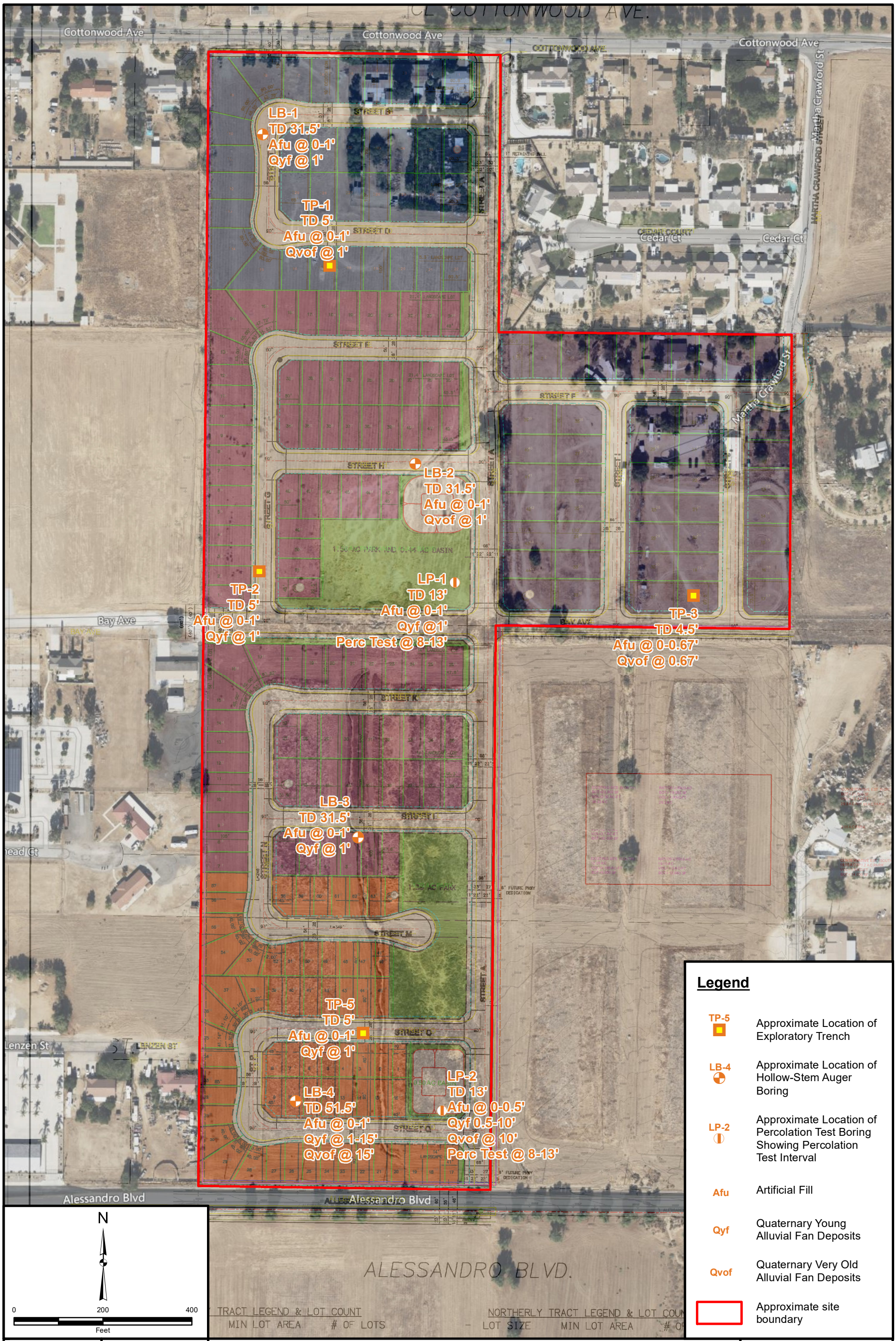

Legend

TP-5	Approximate Location of Exploratory Trench
LB-4	Approximate Location of Hollow-Stem Auger Boring
LP-2	Approximate Location of Percolation Test Boring Showing Percolation Test Interval
Afu	Artificial Fill
Qyf	Quaternary Young Alluvial Fan Deposits
Qvof	Quaternary Very Old Alluvial Fan Deposits
	Approximate site boundary

Project: 13169.003	Eng/Geol: JLH/SIS
Scale: 1 " = 200 '	Date: May 2022

GEOTECHNICAL MAP

50-Acre Residential Development Project
City of Moreno Valley
Riverside County, California

FIGURE 2

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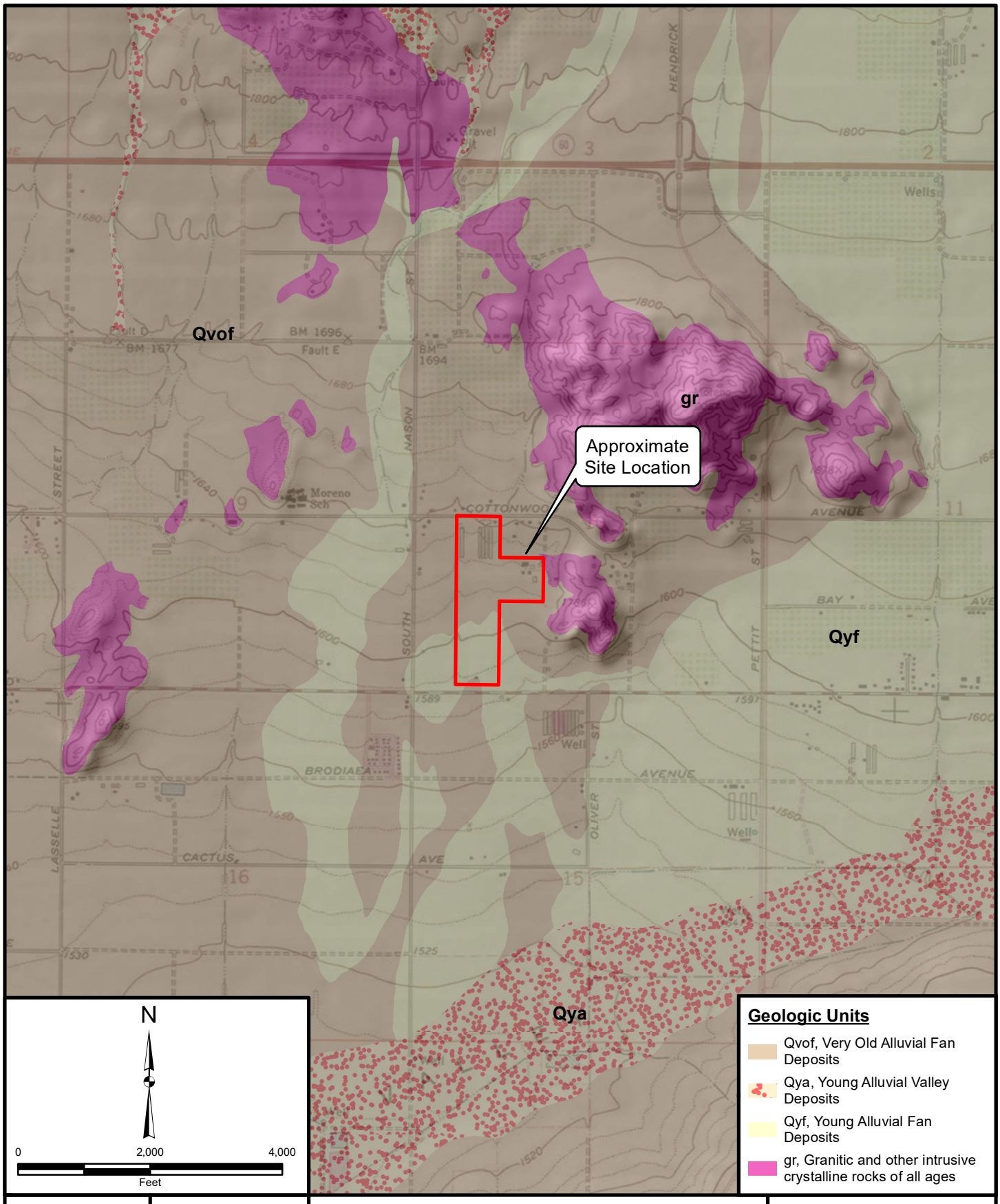

Project: 13169.003	Eng/Geol: JLH/SIS
Scale: 1 " = 2,000 '	Date: March 2022

Reference: Copyright:© 2013 National Geographic Society, i-cubed
Geology: Southern California Preliminary Geology by

REGIONAL GEOLOGY MAP

50-Acre Residential Development Project
City of Moreno Valley
Riverside County, California

FIGURE 3

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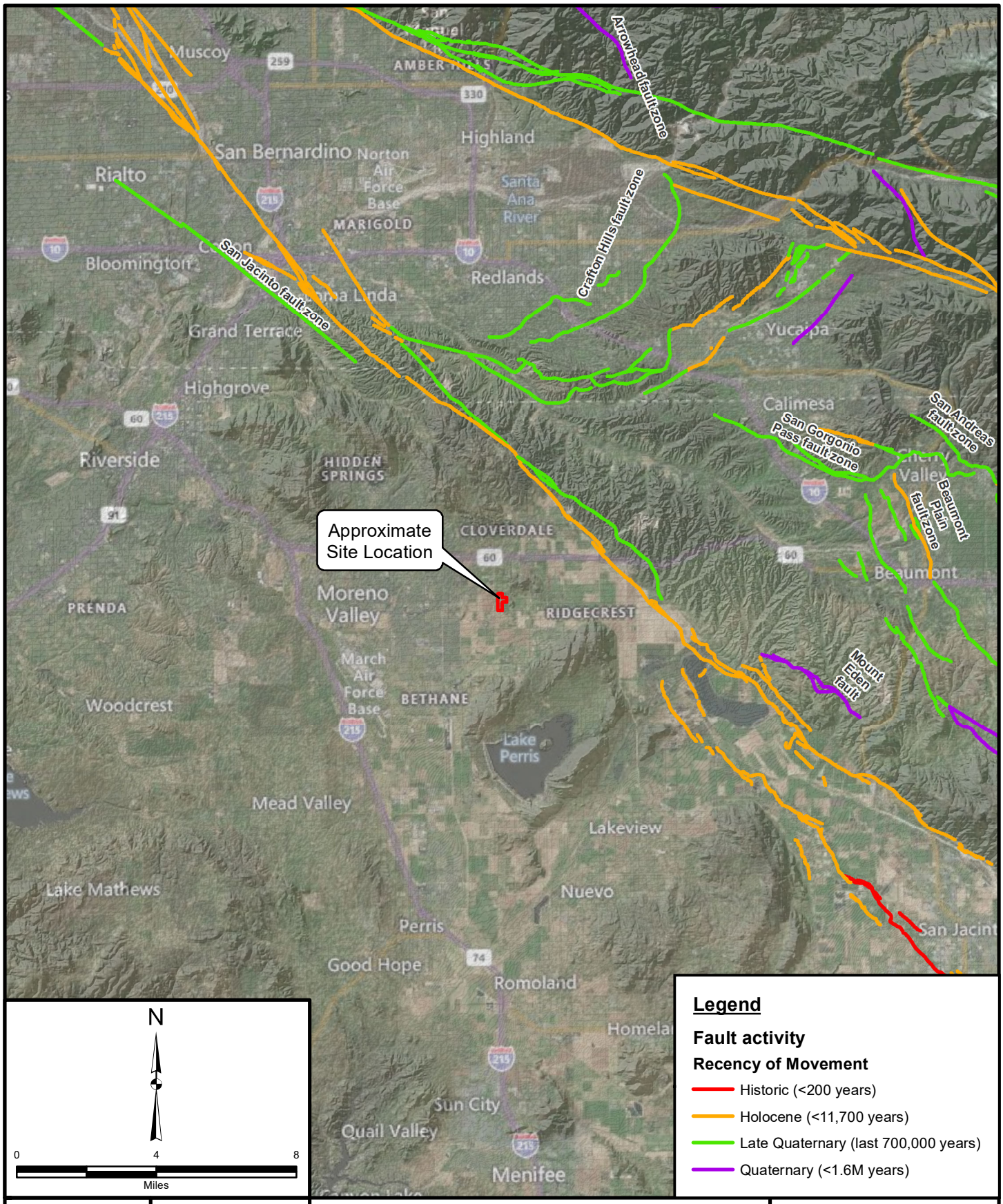

Project: 13169.003	Eng/Geol: JLH/SIS
Scale: 1 " = 4 miles	Date: March 2022

Basemap Reference: © 2022 Microsoft Corporation
Earthstar Geographics SIO © 2022 TomTom
Seismicity Data Reference: maps.conservation.ca.gov

REGIONAL FAULT MAP

50-Acre Residential Development Project
City of Moreno Valley
Riverside County, California

FIGURE 4

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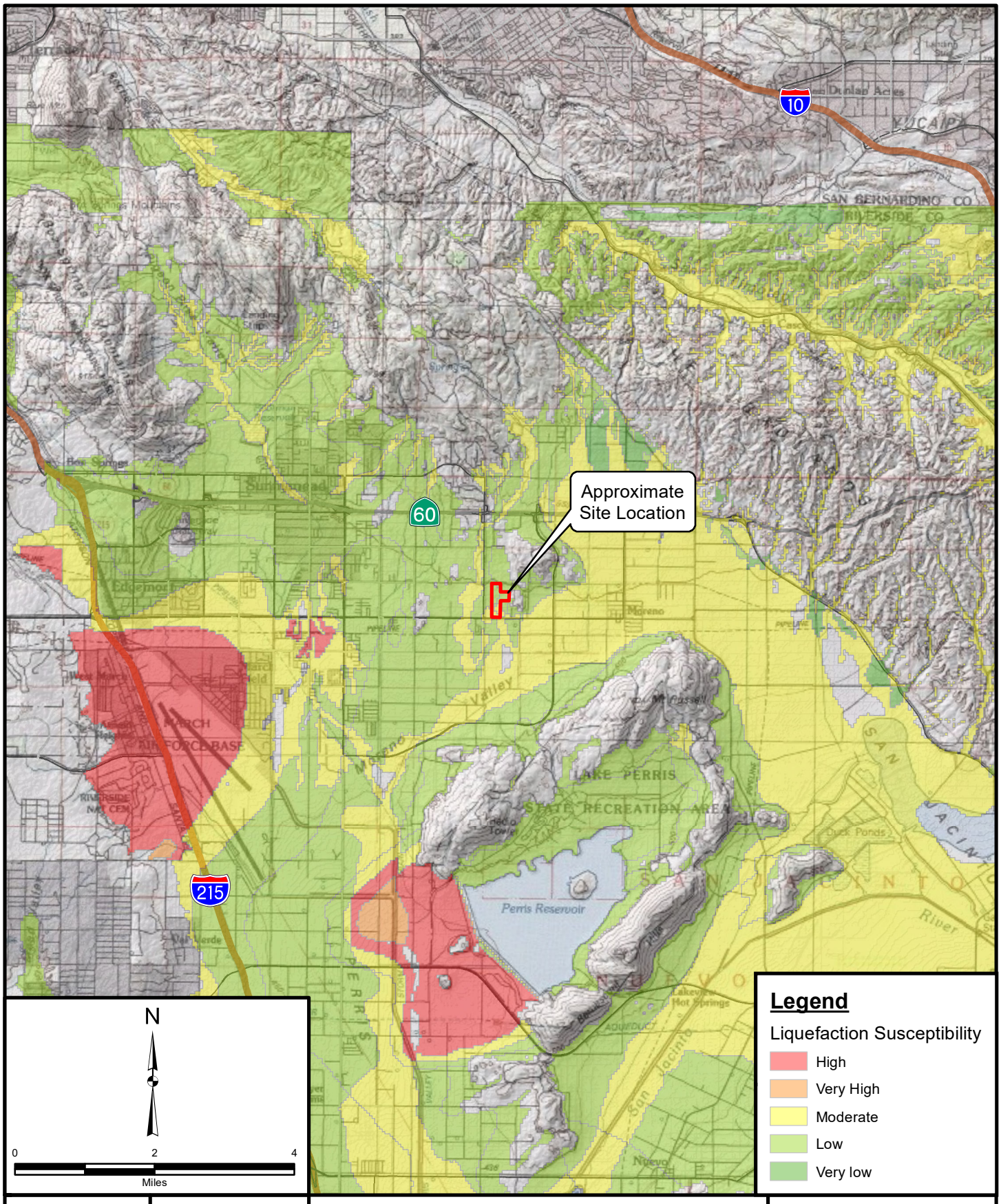

Project: 13169.003	Eng/Geol: JLH
Scale: 1 " = 2 miles	Date: March 2022

Reference: Copyright:© 2013 National Geographic Society, i-cubed
Liquefaction: Riverside County

LIQUEFACTION MAP

50-Acre Residential Development Project
City of Moreno Valley
Riverside County, California

FIGURE 5

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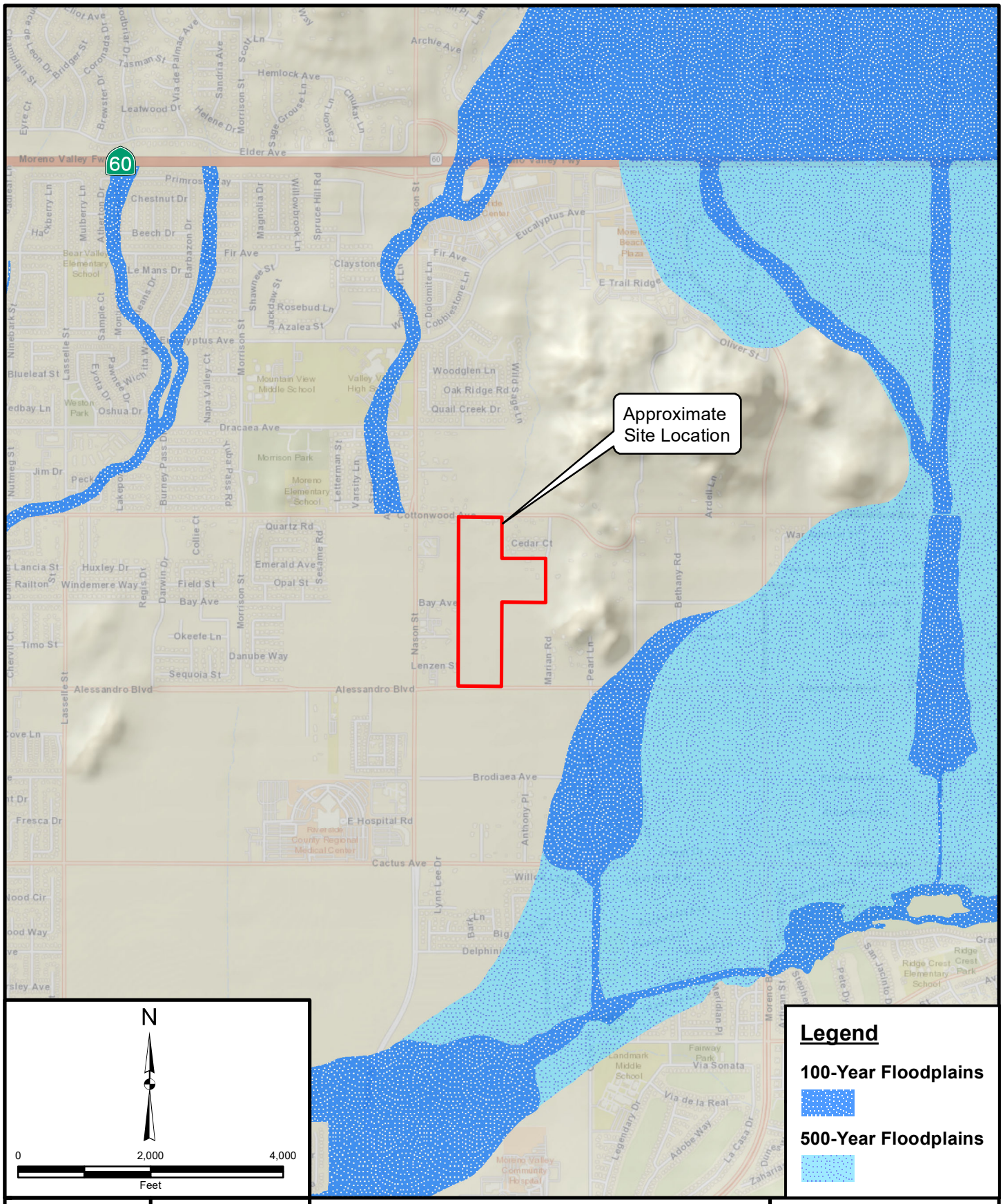

Project: 13169.003	Eng/Geol: JHL/SIS
Scale: 1 " = 2,000 '	Date: March 2022

Reference: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
FEMA (http://www.fema.gov/index.shtm), DWR (http://www.dwr.ca.gov)

FLOOD HAZARD ZONE MAP

50-Acre Residential Development Project
City of Moreno Valley
Riverside County, California

FIGURE 6

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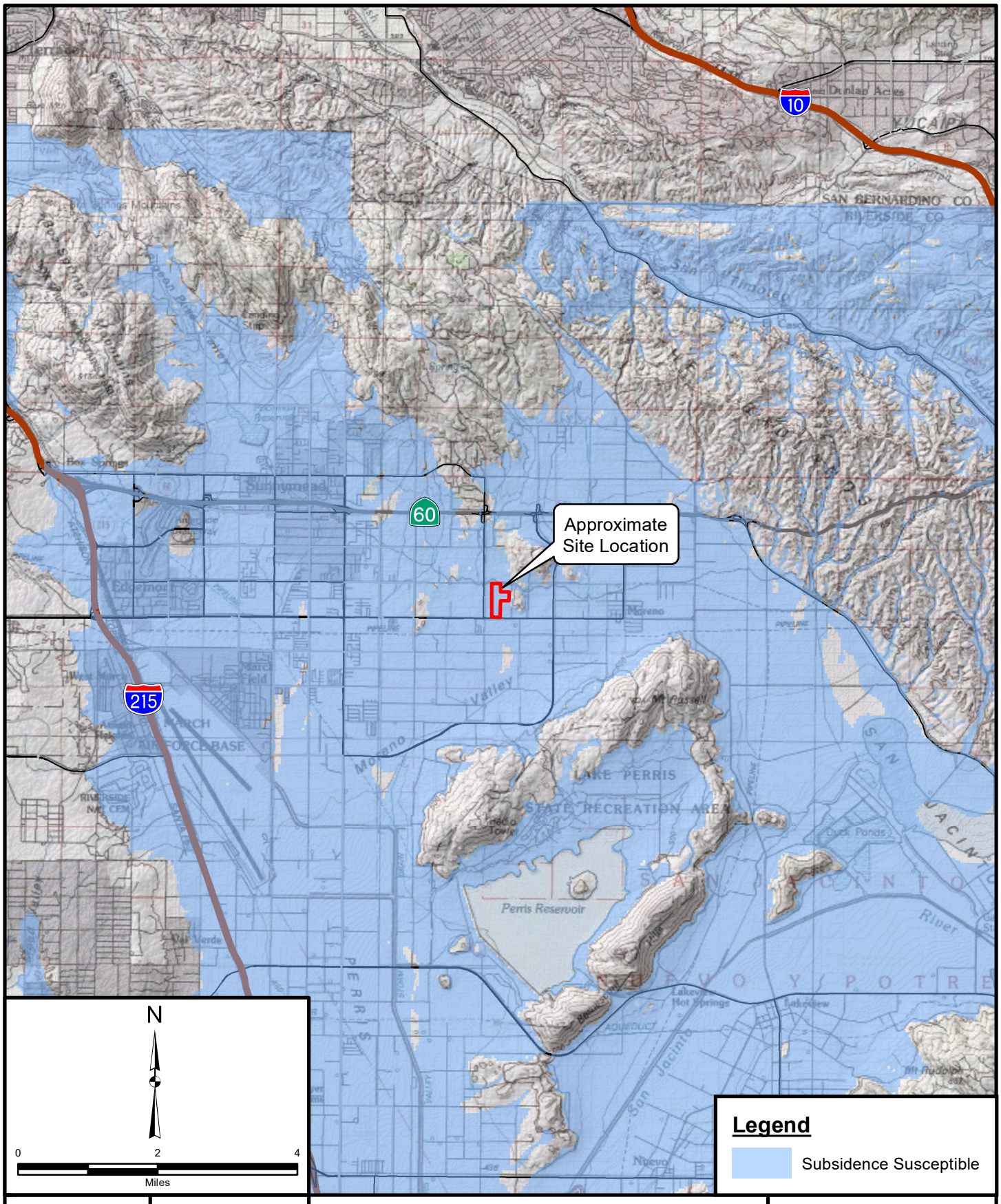

Project: 13169.003	Eng/Geol: JLH/SIS
Scale: 1 " = 2 miles	Date: March 2022

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Subsidence Data: Riverside County

SUBSIDENCE MAP

50-Acre Residential Development Project
City of Moreno Valley
Riverside County, California

FIGURE 7

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APPENDIX A

BORING / TEST PIT / INFILTRATION TEST LOGS

GEOTECHNICAL BORING LOG LB-1

Project No.	13169.003	**Date Drilled**	3-4-22
Project	Highpointe MV 1	**Logged By**	LFO
Drilling Co.	Martini Drilling	**Hole Diameter**	8"
Drilling Method	CME-75 HSA Truck - 140lb - Autohammer - 30" Drop	**Ground Elevation**	1630'
Location	See Figure 2 - Geotechnical Map	**Sampled By**	LFO/YTN

Elevation Feet	Depth Feet	Graphic Log (N / S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
1630	0			B-1					**Undocumented Artificial Fill (Afu)** @0': Vegetation overlying tilled topsoil Silty SAND with Gravel, yellow brown, predomantly fine-to-coarse sand, subrounded gravels, slightly moist	
				R-1	4 3 3	112	4		**Quaternary Young Alluvial Fan Deposits (Qya)** @2.5': Silty SAND, brown, loose, predominantly fine to medium sand, trace coarse sand, micaceous, slightly moist	
1625	5			R-2	2 2 3	108	5	SM	@5': Silty SAND, brown, loose, predominantly fine sand, trace medium to coarse sand, trace gravel, subrounded gravels up to 0.5 inch diameter, micaceous, slightly moist (CO = 6.2%)	CO
				R-3	3 7 13	122	10		@7.5': Silty SAND, brown, medium dense, predominantly fine to medium sand, few subangular gravels, trace clay, micaceous	
1620	10			R-4	9 12 14			SP-SM	@10': Poorly-graded SAND, yellow brown, medium dense, predominantly fine and medium sand, some coarse sand, trace subrounded gravel, friable, micaceous, moist	
1615	15			S-5	4 5 6			SM	@15': Silty SAND, yellow brown, medium dense, predominantly fine sand, trace coarse sand, trace clay, friable, very moist	
1610	20			S-6	5 10 11				@20': Poorly-graded SAND, yellow brown, medium dense, predominantly fine to medium sand, trace coarse sand, moist	
								SM	@21': Silty SAND, yellow brown, dense, predominantly fine sand, trace coarse sand, trace clay, friable, very moist	
1605	25			S-7	3 4 5			SP-SM	@25': Poorly-graded SAND, yellow brown, medium dense, predominantly fine sand, some medium sand, trace coarse sand, trace rounded gravels, micaceous, moist	
1600	30									

SAMPLE TYPES:

B	BULK SAMPLE
C	CORE SAMPLE
G	GRAB SAMPLE
R	RING SAMPLE
S	SPLIT SPOON SAMPLE
T	TUBE SAMPLE

TYPE OF TESTS:

-200	% FINES PASSING	DS	DIRECT SHEAR	SA	SIEVE ANALYSIS
AL	ATTERBERG LIMITS	EI	EXPANSION INDEX	SE	SAND EQUIVALENT
CN	CONSOLIDATION	H	HYDROMETER	SG	SPECIFIC GRAVITY
CO	COLLAPSE	MD	MAXIMUM DENSITY	UC	UNCONFINED COMPRESSIVE STRENGTH
CR	CORROSION	PP	POCKET PENETROMETER		
CU	UNDRAINED TRIAXIAL	RV	R VALUE		

Leighton

GEOTECHNICAL BORING LOG LB-1

Project No.	13169.003	**Date Drilled**	3-4-22
Project	Highpointe MV 1	**Logged By**	LFO
Drilling Co.	Martini Drilling	**Hole Diameter**	8"
Drilling Method	CME-75 HSA Truck - 140lb - Autohammer - 30" Drop	**Ground Elevation**	1630'
Location	See Figure 2 - Geotechnical Map	**Sampled By**	LFO/YTN

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
1600	30			S-8	3 5 4				@30': Poorly-graded SAND, yellow brown, medium dense, predominantly fine sand, some medium sand, trace coarse sand, trace rounded gravels, micaceous, very moist	
									Total Depth: 31.5 feet bgs **No groundwater encountered during drilling** **Boring backfilled with soil tailings**	
1595	35									
1590	40									
1585	45									
1580	50									
1575	55									
1570	60									

SAMPLE TYPES:

- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:

- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

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GEOTECHNICAL BORING LOG LB-2

Project No.	13169.003	**Date Drilled**	3-4-22
Project	Highpointe MV 1	**Logged By**	LFO
Drilling Co.	Martini Drilling	**Hole Diameter**	8"
Drilling Method	CME-75 HSA Truck - 140lb - Autohammer - 30" Drop	**Ground Elevation**	1617'
Location	See Figure 2 - Geotechnical Map	**Sampled By**	LFO/YTN

Elevation Feet	Depth Feet	Graphic Log (N / S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
	0			B-1					**Undocumented Artificial Fill (Afu)** @0': Vegetation overlying tilled topsoil Silty SAND with Gravel, yellow brown, predominantly medium to coarse sand, slightly moist	-200, RV
1615				R-1	7 11 15	117	4	SM	**Quaternary Very Old Alluvial Fan Deposits (Qvof)** @2.5': Silty SAND, yellow brown, medium dense, predominantly fine to medium sand, some coarse sand, trace granite gravels, slightly moist	
	5			R-2	14 16 22	123	6		@5': Silty SAND, brown, dense, predominantly fine to medium sand, some coarse sand, trace granite gravels, slightly micaceous, moist	
1610				R-3	12 13 15	120	7		@7.5': Silty SAND, yellow brown, medium dense, predominantly fine to medium sand, some coarse sand, slightly micaceous, moist	
	10			R-4	8 13 12	120	7		@10': Silty SAND, yellow brown, medium dense, predominantly fine to medium sand, some coarse sand, trace subrounded gravel, micaceous, moist	
1605										
	15			R-5	5 8 10	110	11		@15': Silty SAND, yellow brown, medium dense, predominantly fine sand, some medium sand, micaceous, moist (CO = 2.2%)	CO
1600										
	20			S-6	5 5 6				@20': Silty SAND, yellow brown with gray mottling, medium dense, predominantly fine to medium sand, some coarse sand, subrounded, micaceous, moist	-200
1595										
	25			S-7	4 5 6				@25': SAND with Silt, yellow brown, medium dense, predominantly fine to medium sand, some coarse sand, slightly micaceous, moist to very moist	
1590										
	30									

SOIL DESCRIPTION: This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

SAMPLE TYPES:

B	BULK SAMPLE
C	CORE SAMPLE
G	GRAB SAMPLE
R	RING SAMPLE
S	SPLIT SPOON SAMPLE
T	TUBE SAMPLE

TYPE OF TESTS:

-200	% FINES PASSING	DS	DIRECT SHEAR	SA	SIEVE ANALYSIS
AL	ATTERBERG LIMITS	EI	EXPANSION INDEX	SE	SAND EQUIVALENT
CN	CONSOLIDATION	H	HYDROMETER	SG	SPECIFIC GRAVITY
CO	COLLAPSE	MD	MAXIMUM DENSITY	UC	UNCONFINED COMPRESSIVE STRENGTH
CR	CORROSION	PP	POCKET PENETROMETER		
CU	UNDRAINED TRIAXIAL	RV	R VALUE		

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GEOTECHNICAL BORING LOG LB-2

Project No.	13169.003	**Date Drilled**	3-4-22
Project	Highpointe MV 1	**Logged By**	LFO
Drilling Co.	Martini Drilling	**Hole Diameter**	8"
Drilling Method	CME-75 HSA Truck - 140lb - Autohammer - 30" Drop	**Ground Elevation**	1617'
Location	See Figure 2 - Geotechnical Map	**Sampled By**	LFO/YTN

Elevation Feet	Depth Feet	Graphic Log (N / S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
	30			S-8	3 3 5			SP-SM	@30': SAND with Silt, yellow brown, medium dense, predominantly fine to medium sand, some coarse sand, slightly micaceous, moist to very moist	
1585									**Total Depth: 31.5 feet bgs** **No groundwater encountered during drilling** **Boring backfilled with soil tailings**	
	35									
1580										
	40									
1575										
	45									
1570										
	50									
1565										
	55									
1560										
	60									

SAMPLE TYPES:

- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:

- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

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GEOTECHNICAL BORING LOG LB-3

Project No.	13169.003	**Date Drilled**	3-4-22
Project	Highpointe MV 1	**Logged By**	LFO
Drilling Co.	Martini Drilling	**Hole Diameter**	8"
Drilling Method	CME-75 HSA Truck - 140lb - Autohammer - 30" Drop	**Ground Elevation**	1599'
Location	See Figure 2 - Geotechnical Map	**Sampled By**	LFO/YTN

Elevation Feet	Depth Feet	Graphic Log (N / S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
	0			B-1					**Undocumented Artificial Fill (Afu)** @0': Vegetation overlying tilled topsoil Silty SAND with Gravel, brown, predominantly fine to medium sand, some coarse sand, subrounded granitic gravel, slightly moist	CR, MD, SA
1595				R-1	3 3 4	103	4	SM	**Quaternary Young Alluvial Fan Deposits (Qyf)** @2.5': Silty SAND, brown, loose, predominantly fine to medium sand, some coarse sand, trace subrounded gravel, slightly micaceous, slightly moist (MD = 133.2 @ 8.2%)	
	5			R-2	4 3 4	102	4		@5': Silty SAND, brown, loose, predominantly fine to medium sand, some coarse sand, trace subrounded gravel, slightly micaceous, moist	
1590				R-3	6 6 7				@7.5': Silty SAND, brown, medium dense, predominantly fine to medium sand, trace coarse sand, moist (CO = 3.8%)	CO
	10			R-4	3 6 9	109	6		@10': Silty SAND, brown, medium dense, predominantly fine to medium sand, trace coarse sand, micaceous, moist (CO = 4.6%)	CO
1585										
	15			S-5	2 4 4				@15': Silty SAND, brown, medium dense, predominantly fine to medium sand, trace coarse sand, micaceous, moist	
1580										
	20			S-6	9 8 10			SP-SM	@20': SAND with Silt, brown, medium dense, predominantly fine to medium sand, some coarse sand, slightly micaceous, moist to very moist	
1575										
	25			S-7	4 9 10				@25': SAND with Silt, brown, medium dense, predominantly fine to medium sand, some coarse sand, micaceous, moist to very moist	
1570										
	30									

SAMPLE TYPES:

B	BULK SAMPLE
C	CORE SAMPLE
G	GRAB SAMPLE
R	RING SAMPLE
S	SPLIT SPOON SAMPLE
T	TUBE SAMPLE

TYPE OF TESTS:

-200	% FINES PASSING	DS	DIRECT SHEAR	SA	SIEVE ANALYSIS
AL	ATTERBERG LIMITS	EI	EXPANSION INDEX	SE	SAND EQUIVALENT
CN	CONSOLIDATION	H	HYDROMETER	SG	SPECIFIC GRAVITY
CO	COLLAPSE	MD	MAXIMUM DENSITY	UC	UNCONFINED COMPRESSIVE STRENGTH
CR	CORROSION	PP	POCKET PENETROMETER		
CU	UNDRAINED TRIAXIAL	RV	R VALUE		

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GEOTECHNICAL BORING LOG LB-3

Project No.	13169.003	**Date Drilled**	3-4-22
Project	Highpointe MV 1	**Logged By**	LFO
Drilling Co.	Martini Drilling	**Hole Diameter**	8"
Drilling Method	CME-75 HSA Truck - 140lb - Autohammer - 30" Drop	**Ground Elevation**	1599'
Location	See Figure 2 - Geotechnical Map	**Sampled By**	LFO/YTN

Elevation Feet	Depth Feet	Graphic Log (N / S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
	30			S-8	4 6 6			SM	@30': Silty SAND, brown, medium dense, predominantly fine to medium sand, some coarse sand, trace clay, trace subrounded gravel, moist	
									Total Depth: 31.5 feet bgs **No groundwater encountered during drilling** **Boring backfilled with soil tailings**	
1565	35									
1560	40									
1555	45									
1550	50									
1545	55									
1540	60									

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

SAMPLE TYPES:

- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:

- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

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GEOTECHNICAL BORING LOG LB-4

Project No.	13169.003	**Date Drilled**	3-4-22
Project	Highpointe MV 1	**Logged By**	LFO
Drilling Co.	Martini Drilling	**Hole Diameter**	8"
Drilling Method	CME-75 HSA Truck - 140lb - Autohammer - 30" Drop	**Ground Elevation**	1593'
Location	See Figure 2 - Geotechnical Map	**Sampled By**	LFO/YTN

Elevation Feet	Depth Feet	Graphic Log (N / S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
	0			B-1					**Undocumented Artificial Fill (Afu)** @0': Vegetation overlying tilled topsoil Silty SAND, light yellow brown, predominantly fine to medium sand, trace coarse sand, trace subangular gravel, slightly moist	MD, SA
1590				R-1	7 11 13	106	5		**Quaternary Young Alluvial Fan Deposits (Qyf)** @2.5': Silty SAND, yellow brown, medium dense, predominantly fine sand, trace medium to coarse sand, slightly moist (MD = 130 @ 8.5%)	
	5			R-2	6 8 11	106	5	SM	@5': Silty SAND, yellow brown, medium dense, predominantly fine sand, trace medium to coarse sand, trace organic material, slightly micaceous, slightly moist	
1585				R-3	4 5 6				@7.5': Silty SAND, brown, loose, predominantly fine sand, trace medium to coarse sand, trace organic material, trace subrounded gravel, slightly micaceous, moist	CO
	10			R-4	3 4 7	103	8		@10': Silty SAND, brown, loose, predominantly fine to medium sand, some coarse sand, trace subangular gravel, trace clay, slightly micaceous, moist	-200
1580										
	15			R-5	8 12 20			SC-SM	**Quaternary Very Old Alluvial Fan Deposits (Qvof)** @15': Silty Clayey SAND, reddish brown, dense, predominantly fine sand, trace gravel up to 1 inch diameter, low plasticity, moist	
1575										
	20			S-6	6 5 9			SP-SM	@20': Poorly-graded SAND with Silt, orange brown, medium dense, predominantly fine to medium sand, trace coarse sand, trace subangular gravel, micaceous, slightly moist	
1570										
	25			R-7	15 27 19				@25': Poorly-graded SAND with Silt, reddish brown, dense, predominantly fine to medium sand, some coarse sand, some subangular gravel, moist	
1565										
	30									

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

SAMPLE TYPES:

B	BULK SAMPLE
C	CORE SAMPLE
G	GRAB SAMPLE
R	RING SAMPLE
S	SPLIT SPOON SAMPLE
T	TUBE SAMPLE

TYPE OF TESTS:

-200	% FINES PASSING	DS	DIRECT SHEAR	SA	SIEVE ANALYSIS
AL	ATTERBERG LIMITS	EI	EXPANSION INDEX	SE	SAND EQUIVALENT
CN	CONSOLIDATION	H	HYDROMETER	SG	SPECIFIC GRAVITY
CO	COLLAPSE	MD	MAXIMUM DENSITY	UC	UNCONFINED COMPRESSIVE STRENGTH
CR	CORROSION	PP	POCKET PENETROMETER		
CU	UNDRAINED TRIAXIAL	RV	R VALUE		

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GEOTECHNICAL BORING LOG LB-4

Project No.	13169.003	**Date Drilled**	3-4-22
Project	Highpointe MV 1	**Logged By**	LFO
Drilling Co.	Martini Drilling	**Hole Diameter**	8"
Drilling Method	CME-75 HSA Truck - 140lb - Autohammer - 30" Drop	**Ground Elevation**	1593'
Location	See Figure 2 - Geotechnical Map	**Sampled By**	LFO/YTN

Elevation Feet	Depth Feet	Graphic Log (N / S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
	30			S-8	5 9 7			SM	@30': Silty SAND, reddish brown, medium dense, predominantly fine sand, trace medium to coarse sand, trace clay, trace subangular gravel, micaceous, moist	
1560										
	35			S-9	4 7 10				@35': Silty SAND, reddish brown, medium dense, predominantly fine sand, trace medium to coarse sand, trace clay, trace subangular gravel, micaceous, moist	
1555										
	40			S-10	6 9 8				@40': Silty SAND, reddish brown, medium dense, predominantly fine sand, trace medium to coarse sand, trace clay, trace subangular gravel, micaceous, moist @40.5': Pocket of gravel within Silty SAND	
1550										
	45			S-11	14 17 11			SP-SM	@45': Poorly-graded SAND, gray brown, dense, predominantly fine sand, some medium sand, trace coarse sand, trace clay, trace gravel, moist	
1545										
	50			S-12	8 12 9			SM	@50': Silty SAND, reddish orange brown, dense, predominantly fine sand, some medium to coarse sand, micaceous, moist	
1540									**Total Depth: 51.5 feet bgs** **No groundwater encountered during drilling** **Boring backfilled with soil tailings**	
	55									
1535										
	60									

SAMPLE TYPES:

- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:

- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

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GEOTECHNICAL BORING LOG LP-1

Project No.	13169.003	**Date Drilled**	3-4-22
Project	Highpointe MV 1	**Logged By**	LFO
Drilling Co.	Martini Drilling	**Hole Diameter**	8"
Drilling Method	CME-75 HSA Truck - 140lb - Autohammer - 30" Drop	**Ground Elevation**	1614'
Location	See Figure 2 - Geotechnical Map	**Sampled By**	LFO/YTN

Elevation Feet	Depth Feet	Graphic Log (N / S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
	0								**Undocumented Artificial Fill (Afu)** @0': Vegetation overlying tilled topsoil SAND with Silt, yellowbrown, predominantly fine to medium sand, some subangular gravel, organic material, slightly moist **Quaternary Young Alluvial Fan Deposits (Qya)**	
1610	5			R-1	6 9 11			SM	@5': Silty SAND, brown, medium dense, predominantly fine sand, trace medium to coarse sand, slightly micaceous, slightly moist	
1605	10			R-2 B-1	5 6 8				@10': Silty SAND, brown, medium dense, predominantly fine sand, trace coarse sand, moist (CO = 2.7%) @12': Grades to Silty SAND with Gravel, reddish brown, predominantly fine sand, moist	CO -200
1600	15								**Total Depth: 13 feet bgs** **No groundwater encountered during drilling** **Boring converted to percolation test well with 0.020 slotted screen from 8 to 13 feet bgs**	
1595	20									
1590	25									
1585	30									

SAMPLE TYPES:

B	BULK SAMPLE
C	CORE SAMPLE
G	GRAB SAMPLE
R	RING SAMPLE
S	SPLIT SPOON SAMPLE
T	TUBE SAMPLE

TYPE OF TESTS:

-200	% FINES PASSING	DS	DIRECT SHEAR	SA	SIEVE ANALYSIS
AL	ATTERBERG LIMITS	EI	EXPANSION INDEX	SE	SAND EQUIVALENT
CN	CONSOLIDATION	H	HYDROMETER	SG	SPECIFIC GRAVITY
CO	COLLAPSE	MD	MAXIMUM DENSITY	UC	UNCONFINED COMPRESSIVE STRENGTH
CR	CORROSION	PP	POCKET PENETROMETER		
CU	UNDRAINED TRIAXIAL	RV	R VALUE		

Leighton

GEOTECHNICAL BORING LOG LP-2

Project No.	13169.003	**Date Drilled**	3-4-22
Project	Highpointe MV 1	**Logged By**	LFO
Drilling Co.	Martini Drilling	**Hole Diameter**	8"
Drilling Method	CME-75 HSA Truck - 140lb - Autohammer - 30" Drop	**Ground Elevation**	1589'
Location	See Figure 2 - Geotechnical Map	**Sampled By**	LFO/YTN

Elevation Feet	Depth Feet	Graphic Log	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
		N S							*This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	
	0			B-1					**Undocumented Artificial Fill (Afu)** @0': Vegetation overlying tilled topsoil Silty SAND, dark brown, predominantly fine sand, trace medium sand, slightly moist	
									Quaternary Young Alluvial Fan Deposits (Qyf) @0.5': Silty SAND, brown, predominantly fine sand, moist	
1585	5			R-1	4 5 8			SM	@5': Silty SAND, brown, medium dense, predominantly fine sand, trace coarse sand, trace rootlets, pinhole pores, slightly moist (CO = 9.3%)	CO
1580	10			B-1 R-2	7 14 18	126	10	SC-SM	**Quaternary Very Old Alluvial Fan Deposits (Qvof)** @10': CLAY with Sand, reddish brown, medium dense, predominantly fine sand, trace CaCO3 encrustation, slightly micaceous, low plasticity, moist @11.5': Grades to Silty SAND with Gravel, brown, predominantly fine sand, trace coarse sand, rounded fine gravels, moist	-200
1575	15								**Total Depth: 13 feet bgs** **No groundwater encountered during drilling** **Boring converted to percolation test well with 0.020 slotted screen from 8 to 13 feet bgs**	
1570	20									
1565	25									
1560	30									

SAMPLE TYPES:

B	BULK SAMPLE
C	CORE SAMPLE
G	GRAB SAMPLE
R	RING SAMPLE
S	SPLIT SPOON SAMPLE
T	TUBE SAMPLE

TYPE OF TESTS:

-200	% FINES PASSING	DS	DIRECT SHEAR	SA	SIEVE ANALYSIS
AL	ATTERBERG LIMITS	EI	EXPANSION INDEX	SE	SAND EQUIVALENT
CN	CONSOLIDATION	H	HYDROMETER	SG	SPECIFIC GRAVITY
CO	COLLAPSE	MD	MAXIMUM DENSITY	UC	UNCONFINED COMPRESSIVE STRENGTH
CR	CORROSION	PP	POCKET PENETROMETER		
CU	UNDRAINED TRIAXIAL	RV	R VALUE		

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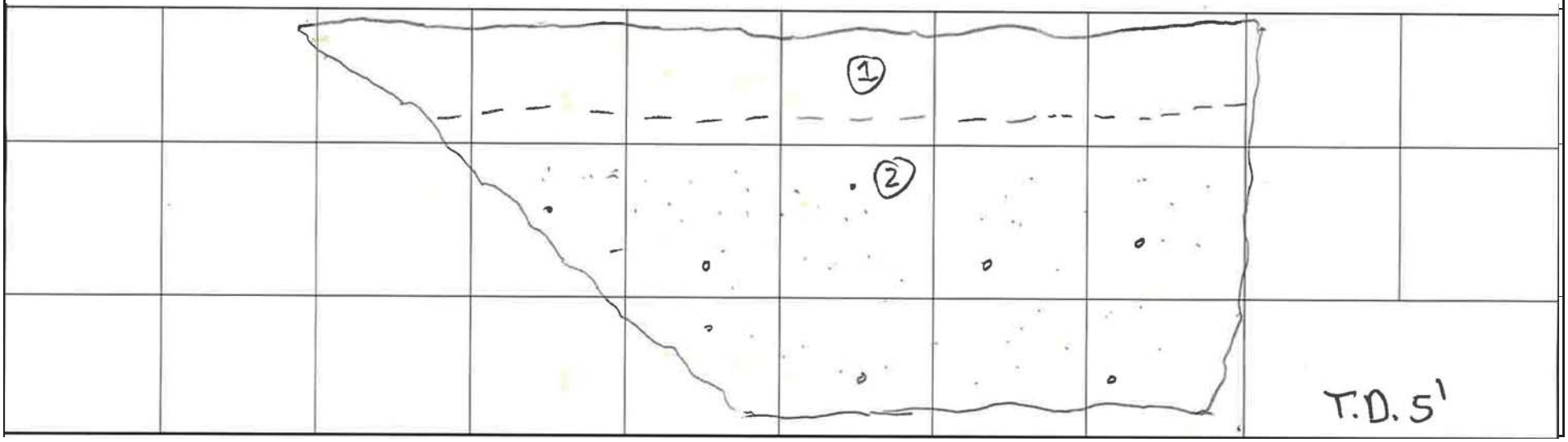
LOG OF TRENCH: TP-1

Project Name:	Highpointe MV 50	Logged by:	EMH
Project Number:	13169.003	Elevation:	Approx. 1625 ft
Equipment:	Backhoe	Location/Grid:	See Figure 2 - Geotechnical Map

GEOLOGIC ATTITUDES	DATE: 03.04.2022 DESCRIPTION:	GEOLOGIC UNIT	FIELD ENGINEERING PROPERTIES: USCS	In-Situ Density Test No.	Depth/ Moisture (%)/ Dry Density	Lab Tests
	1) 0'-1': Tilled material/ surficial soil. Sandy SILT (ML), light brown, slightly moist, fine sand, abundant rootlets	Afu	ML			
	2) 1'-5': Silty Clayey SAND w/ Gravel (SC), reddish brown, moist, hard, fine to medium sand w/ occasional coarse sand and sporadic fine gravel, massive, debris flow, low to medium plasticity. Backhoe operator indicates hard digging.	Qvof	SC			BB-1 (1'-5')

GRAPHICAL REPRESENTATION: South Wall SCALE: 1 inch = 2 feet SURFACE SLOPE: TREND: East-West



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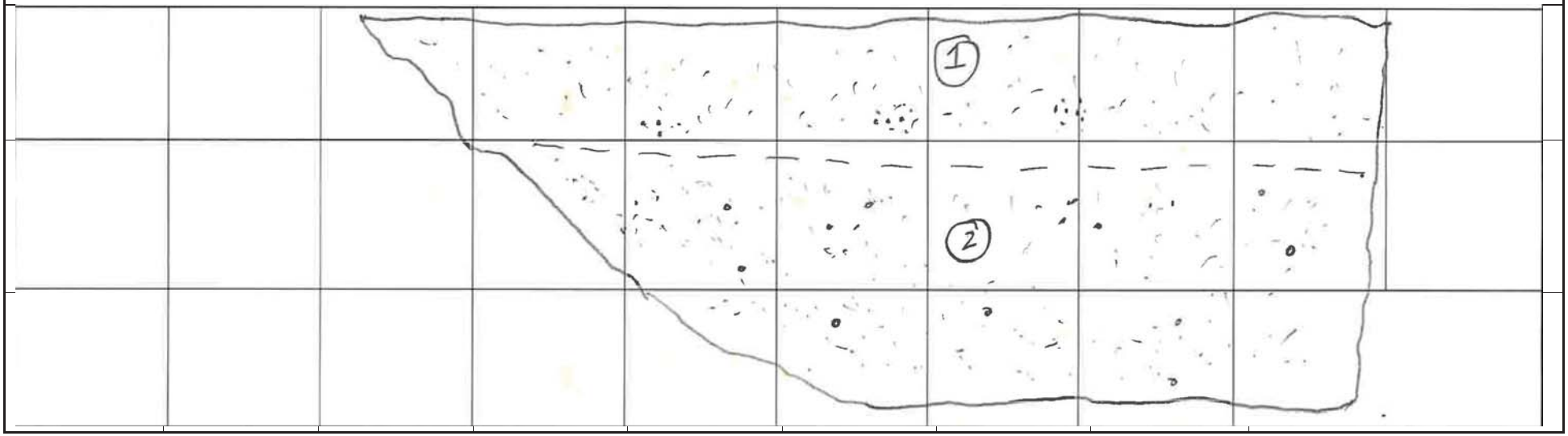
LOG OF TRENCH: TP-2

Project Name:	Highpointe MV 50	Logged by:	EMH
Project Number:	13169.003	Elevation:	Approx. 1624 ft
Equipment:	Backhoe	Location/Grid:	See Figure 2 - Geotechnical Map

GEOLOGIC ATTITUDES	DATE: 03.04.2022 DESCRIPTION:	GEOLOGIC UNIT	FIELD ENGINEERING PROPERTIES: USCS	In-Situ Density Test No.	Depth/ Moisture (%)/ Dry Density	Lab Tests
	1) 0'-2': Tilled/ Loose Surficial Material: Silty SAND (SM), light brown, slightly moist, fine to medium sand w/ pockets of fine to coarse sand and fine gravel	Afu	SM			
	2) 2'-5': Silty SAND (SM), light brown to light reddish brown, slightly moist, mostly fine to medium sand, few coarse sand and sporadic fine gravel, reverse graded, little clay	Qyf	SM			BB-1 (2'-5')

GRAPHICAL REPRESENTATION: East Wall SCALE: 1 inch = 2 feet SURFACE SLOPE: TREND: North-South



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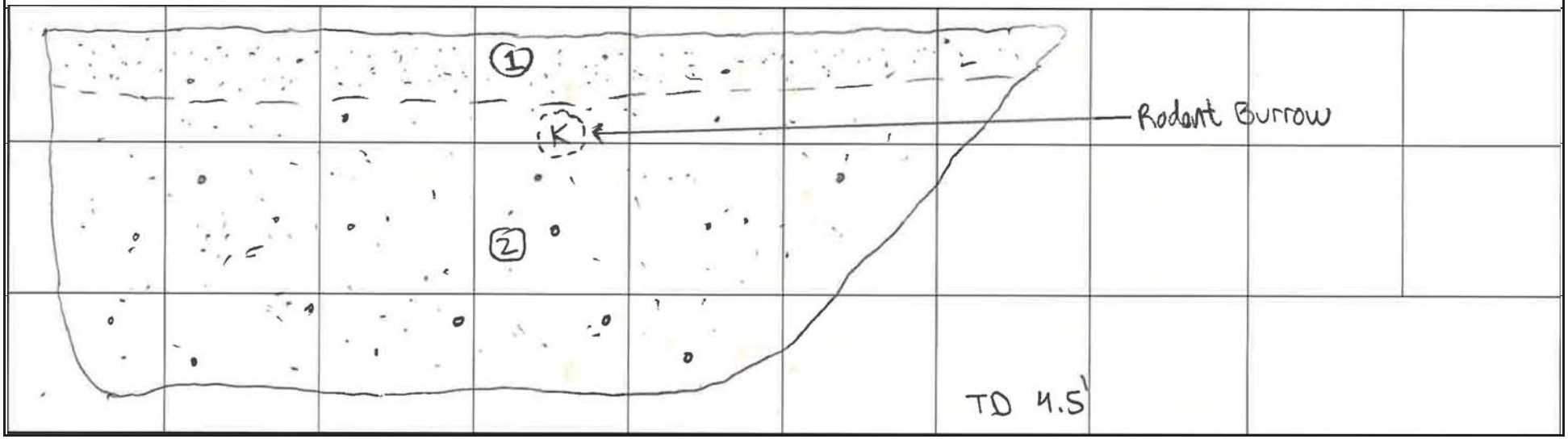
LOG OF TRENCH: TP-3

Project Name:	Highpointe MV 50	Logged by:	EMH
Project Number:	13169.003	Elevation:	Approx. 1609 ft
Equipment:	Backhoe	Location/Grid:	See Figure 2 - Geotechnical Map

GEOLOGIC ATTITUDES	DATE: 03.04.2022 DESCRIPTION:	GEOLOGIC UNIT	FIELD ENGINEERING PROPERTIES: USCS	In-Situ Density Test No.	Depth/ Moisture (%)/ Dry Density	Lab Tests
	1) 0'-8": Loose Surficial Soil: Silty SAND (SM), light brown, slightly moist, fine to medium sand, trace coarse sand and fine gravel, abundant rootlets	Afu	SM			
	2) 8"-4.5': Clayey Sandy SILT (ML), reddish brown, slightly moist, fine to coarse sand w/ occasional fine gravel, massive, debris flow chaotic assemblage, low plasticity	Qyf	ML			BB-1 (1'-4.5')

GRAPHICAL REPRESENTATION: South Wall SCALE: 1 inch = 2 feet SURFACE SLOPE: TREND: East-West



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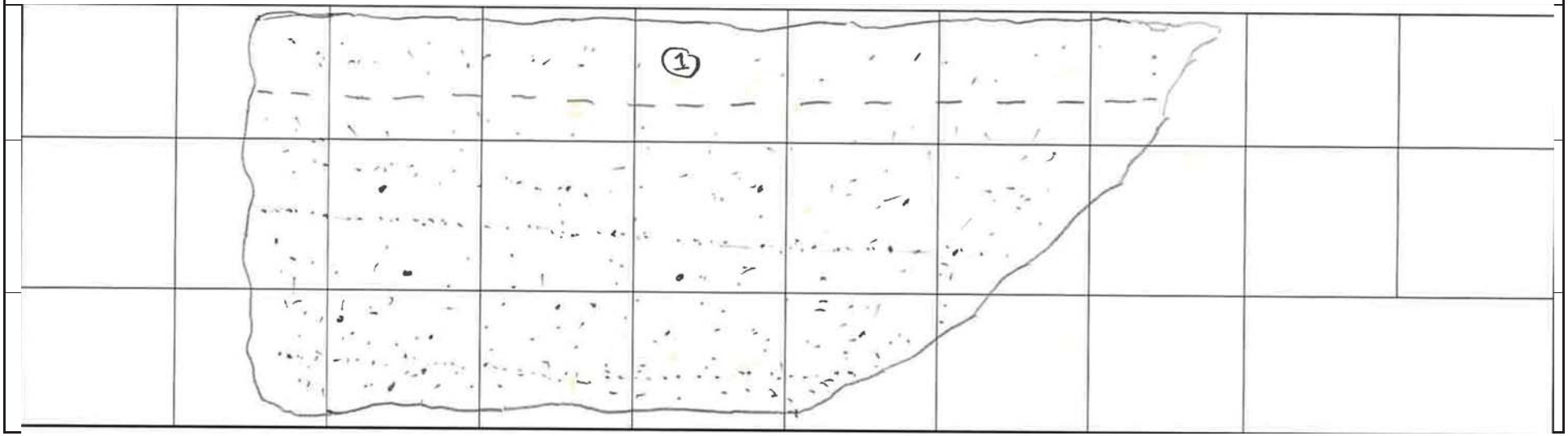
LOG OF TRENCH: TP-5

Project Name:	Highpointe MV 50	Logged by:	EMH
Project Number:	13169.003	Elevation:	Approx. 1595 ft
Equipment:	Backhoe	Location/Grid:	See Figure 2 - Geotechnical Map

GEOLOGIC ATTITUDES	DATE: 03.04.2022 DESCRIPTION:	GEOLOGIC UNIT	FIELD ENGINEERING PROPERTIES: USCS	In-Situ Density Test No.	Depth/ Moisture (%)/ Dry Density	Lab Tests
	1) 0'-1': Tilled Material: Silty SAND (SM), light brown, slightly moist, fine to medium sand, trace coarse sand and gravel	Afu	SM			
	2) 1'-5': Silty SAND (SM), light brown to light reddish brown, slightly moist to moist, mostly fine to medium sand, with coarse sand and fine gravel, mostly massive w/ occasional faint laminations, trace clay binder	Qyf	SM			BB-1 (3'-5')

GRAPHICAL REPRESENTATION: East Wall SCALE: 1 inch = 2 feet SURFACE SLOPE: TREND: North-South



Boring Percolation Test Data Sheet

Project Number:	13169.003	**Test Hole Number:**	LP-1
Project Name:	Highpoint MV 50	**Date Excavated:**	3/14/2021
Earth Description:	Alluvium	**Date Tested:**	3/15/2021
Liquid Description:	Tap water	**Depth of boring (ft):**	13
Tested By:	LFO	**Radius of boring (in):**	4
Time Interval Standard		**Radius of casing (in):**	1
Start Time for Pre-Soak:	11:15 AM	**Length of slotted of casing (ft):**	5
Start Time for Standard:	11:15 AM	**Depth to Initial Water Depth (ft):**	8
Standard Time Interval	25 mins	**Porosity of Annulus Material, *n* :**	0.35
Between Readings, mins:	10	**Bentonite Plug at Bottom:**	No

Field Percolation Data - Falling Head Test

Reading	Time	Time Interval, Δt (min.)	Initial/Final Depth to Water (ft.)	Initial/Final Water Height, H_0/H_f (in.)	Total Water Drop, Δd (in.)	Infiltration Rate (in./hr.)
P1	11:17	25	9.25	45.0	24.6	1.33
	11:42		11.30	20.4		
P2	11:51	25	9.85	37.8	19.9	1.25
	12:16		11.51	17.9		
1	12:44	10	10.00	36.0	9.0	1.26
	12:54		10.75	27.0		
2	12:55	10	9.81	38.3	8.6	1.13
	13:05		10.53	29.6		
3	13:06	10	10.05	35.4	10.8	1.58
	13:16		10.95	24.6		
4	13:20	10	9.95	36.6	8.4	1.14
	13:30		10.65	28.2		
5	13:32	12	10.07	35.2	11.0	1.36
	13:44		10.99	24.1		
6	13:50	10	9.95	36.6	9.7	1.35
	14:00		10.76	26.9		

Infiltration Rate (I) = Discharge Volume/Surface Area of Test Section/Time Interval

Measured Infiltration Rate, I (Average of Last 3 Readings) = **1.29** **in./hr.**

Boring Percolation Test Data Sheet

Project Number:	13169.003	**Test Hole Number:**	LP-2
Project Name:	Highpoint MV 50	**Date Excavated:**	3/14/2021
Earth Description:	Alluvium	**Date Tested:**	3/15/2021
Liquid Description:	Tap water	**Depth of boring (ft):**	13
Tested By:	LFO	**Radius of boring (in):**	4
Time Interval Standard		**Radius of casing (in):**	1
Start Time for Pre-Soak:	10:21 AM	**Length of slotted of casing (ft):**	5
Start Time for Standard:	10:21 AM	**Depth to Initial Water Depth (ft):**	8
Standard Time Interval	25 mins	**Porosity of Annulus Material, *n* :**	0.35
Between Readings, mins:	30	**Bentonite Plug at Bottom:**	No

Field Percolation Data - Falling Head Test

Reading	Time	Time Interval, Δt (min.)	Initial/Final Depth to Water (ft.)	Initial/Final Water Height, H_0/H_f (in.)	Total Water Drop, Δd (in.)	Infiltration Rate (in./hr.)
P1	10:21	25	10.01	35.9	2.8	0.14
	10:46		10.24	33.1		
P2	10:48	25	9.72	39.4	1.0	0.04
	11:12		9.80	38.4		
1	11:27	30	9.90	37.2	1.0	0.04
	11:57		9.98	36.2		
2	12:02	30	9.90	37.2	1.3	0.05
	12:32		10.01	35.9		
3	12:33	30	10.01	35.9	3.4	0.15
	13:03		10.29	32.5		
4	13:08	30	9.96	36.5	2.8	0.12
	13:38		10.19	33.7		
5	13:40	30	9.96	36.5	1.8	0.07
	14:10		10.11	34.7		
6	14:13	30	10.01	35.9	1.7	0.07
	14:43		10.15	34.2		
7	14:45	30	10.00	36.0	2.0	0.09
	15:15		10.17	34.0		
8	15:17	30	9.99	36.1	2.0	0.09
	15:47		10.16	34.1		
9	15:49	30	9.98	36.2	1.8	0.08
	16:19		10.13	34.4		
10	16:20	30	10.00	36.0	1.9	0.08
	16:50		10.16	34.1		
11	16:51	30	10.00	36.0	1.8	0.08
	17:21		10.15	34.2		
12	17:22	30	9.99	36.1	1.9	0.08
	17:52		10.15	34.2		

Infiltration Rate (I) = Discharge Volume/Surface Area of Test Section/Time Interval

Measured Infiltration Rate, I (Average of Last 3 Readings) = **0.08** **in./hr.**

APPENDIX B

LABORATORY TEST RESULTS

Boring No.	LB-2	LB-2	LB-4	LP-1	LP-2			
Sample No.	B-1	S-6	S-10	B-1	B-2			
Depth (ft.)	0 - 5.0	20.0	40.0	10.0 - 13.0	10.0 - 13.0			
Sample Type	Bulk	SPT	SPT	Bulk	Bulk			
Soil Classification	SM	SM	SM	SM	SM			
Soak Time (min)	10	10	10	10	10			
Moisture Correction								
Wet Weight of Soil + Container (gm.)	595.4	524.9	543.2	528.1	539.9			
Dry Weight of Soil + Container (gm.)	579.6	511.1	529.9	518.0	531.9			
Weight of Container (gm)	277.3	329.2	332.7	327.9	420.9			
Moisture Content (%)	5.2	7.6	6.7	5.3	7.2			
Container No.:	A	W	A1	F	S			
Sample Dry Weight Determination								
Weight of Sample + Container (gm.)	579.6	511.1	529.9	518.0	531.9			
Weight of Container (gm.)	277.3	329.2	332.7	327.9	420.9			
Weight of Dry Sample (gm.)	302.3	181.9	197.2	190.1	111.0			
Container No.:	A	W	A1	F	S			
After Wash								
Dry Weight of Sample + Container (gm)	484.5	466.9	476.3	445.1	486.9			
Weight of Container (gm)	277.3	329.2	332.7	327.9	420.9			
Dry Weight of Sample (gm)	207.2	137.7	143.6	117.2	66.0			
% Passing No. 200 Sieve	**31**	**24**	**27**	**38**	**41**			
% Retained No. 200 Sieve	69	76	73	62	59			

Leighton

PERCENT PASSING
No. 200 SIEVE
ASTM D 1140

Project Name: Highpointe MV 1 Geo
Project No.: 13169.003
Client Name: Highpointe Communities
Tested By: M. Vinet Date: 03/22/22

One-Dimensional Swell or Settlement Potential of Cohesive Soils

(ASTM D 4546) -- Method 'B'

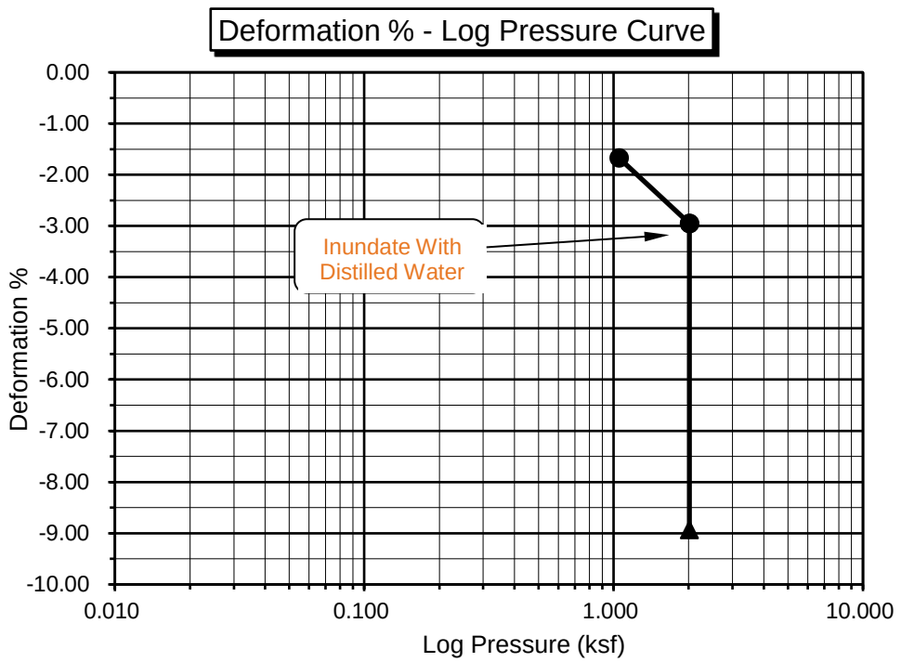
Project Name: Highpointe MV 1 Geo — Tested By: M. Vinet — Date: 3/21/22
Project No.: 13169.003 — Checked By: M. Vinet — Date: 3/23/22
Boring No.: LB-1 — Sample Type: IN SITU
Sample No.: R-2 — Depth (ft.) 5.0
Sample Description: Silty Sand (SM), Brown.
Source and Type of Water Used for Inundation: Arrowhead (Distilled)
** Note: Loading After Wetting (Inundation) not Performed Using this Test Method.

Initial Dry Density (pcf):	99.6
Initial Moisture (%):	6.9
Initial Height (in.):	1.0000
Initial Dial Reading (in):	0.0000
Inside Diameter of Ring (in):	2.416

Final Dry Density (pcf):	109.3
Final Moisture (%) :	14.9
Initial Void ratio:	0.6932
Specific Gravity (assumed):	2.70
Initial Degree of Saturation (%):	27.0

Pressure (p) (ksf)	Final Reading (in)	Apparent Thickness (in)	Load Compliance (%)	Swell (+) Settlement (-) % of Sample Thickness	Void Ratio	Corrected Deformation (%)
1.050	0.0167	0.9833	0.00	-1.67	0.6649	-1.67
2.013	0.0295	0.9705	0.00	-2.95	0.6432	-2.95
H2O	0.0893	0.9107	0.00	-8.93	0.5420	-8.93

Percent Swell / Settlement After Inundation = -6.16



One-Dimensional Swell or Settlement Potential of Cohesive Soils

(ASTM D 4546) -- Method 'B'

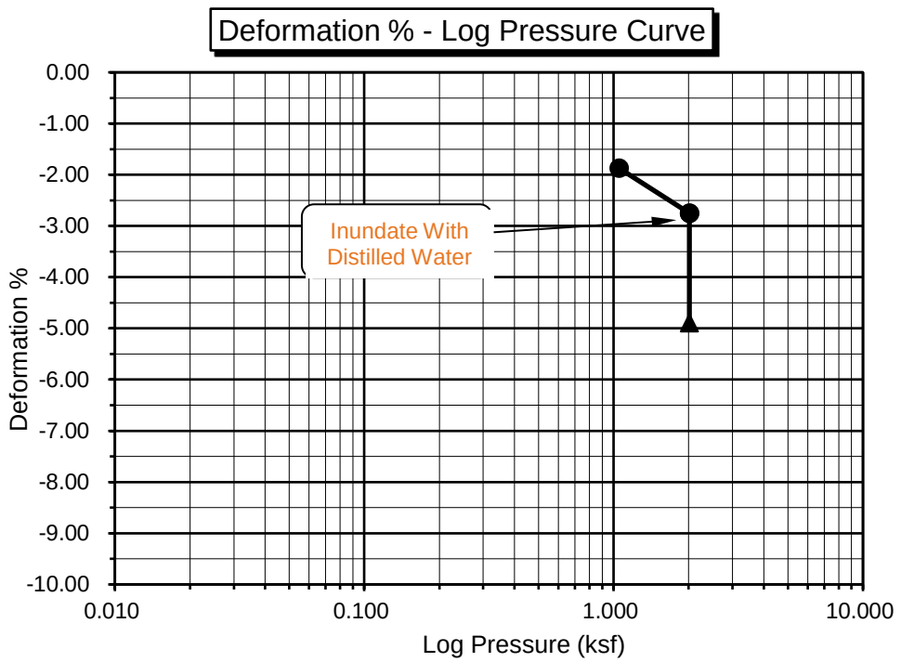
Project Name: Highpointe MV 1 Geo — Tested By: M. Vinet — Date: 3/21/22
Project No.: 13169.003 — Checked By: M. Vinet — Date: 3/23/22
Boring No.: LB-2 — Sample Type: IN SITU
Sample No.: R-5 — Depth (ft.) 15.0
Sample Description: Silty Sand (SM), Brown.
Source and Type of Water Used for Inundation: Arrowhead (Distilled)
** Note: Loading After Wetting (Inundation) not Performed Using this Test Method.

Initial Dry Density (pcf):	105.7
Initial Moisture (%):	10.3
Initial Height (in.):	1.0000
Initial Dial Reading (in):	0.0000
Inside Diameter of Ring (in):	2.416

Final Dry Density (pcf):	111.1
Final Moisture (%) :	16.0
Initial Void ratio:	0.5952
Specific Gravity (assumed):	2.70
Initial Degree of Saturation (%):	46.5

Pressure (p) (ksf)	Final Reading (in)	Apparent Thickness (in)	Load Compliance (%)	Swell (+) Settlement (-) % of Sample Thickness	Void Ratio	Corrected Deformation (%)
1.050	0.0187	0.9813	0.00	-1.87	0.5653	-1.87
2.013	0.0275	0.9725	0.00	-2.75	0.5513	-2.75
H2O	0.0489	0.9511	0.00	-4.89	0.5172	-4.89

Percent Swell / Settlement After Inundation = **-2.20**



One-Dimensional Swell or Settlement Potential of Cohesive Soils

(ASTM D 4546) -- Method 'B'

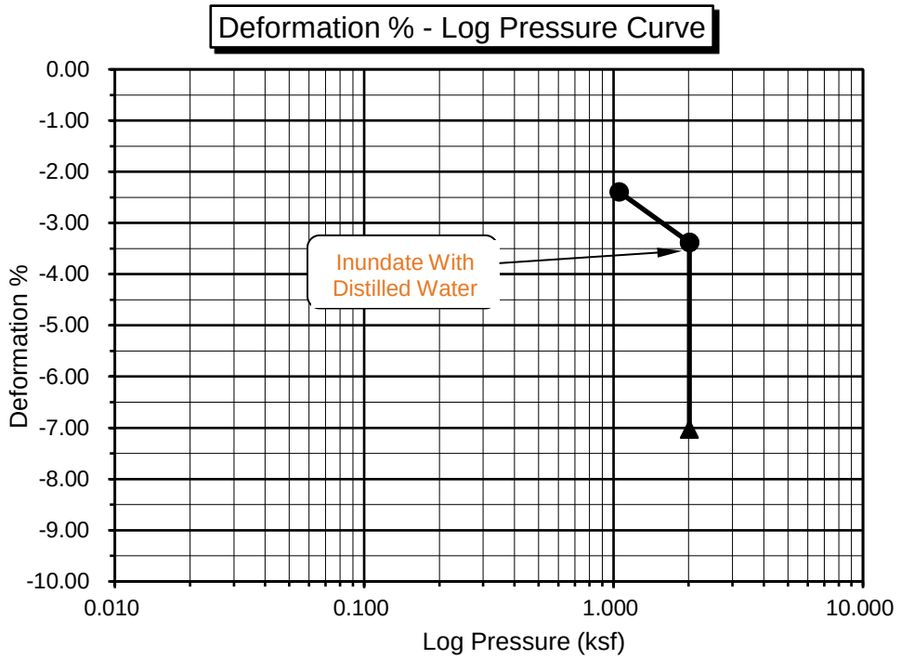
Project Name: Highpointe MV 1 Geo — Tested By: M. Vinet — Date: 3/21/22
Project No.: 13169.003 — Checked By: M. Vinet — Date: 3/23/22
Boring No.: LB-3 — Sample Type: IN SITU
Sample No.: R-3 — Depth (ft.) 7.5
Sample Description: Silty Sand (SM), Brown.
Source and Type of Water Used for Inundation: Arrowhead (Distilled)
** Note: Loading After Wetting (Inundation) not Performed Using this Test Method.

Initial Dry Density (pcf):	99.3
Initial Moisture (%):	8.9
Initial Height (in.):	1.0000
Initial Dial Reading (in):	0.0000
Inside Diameter of Ring (in):	2.416

Final Dry Density (pcf):	106.8
Final Moisture (%) :	17.6
Initial Void ratio:	0.6978
Specific Gravity (assumed):	2.70
Initial Degree of Saturation (%):	34.4

Pressure (p) (ksf)	Final Reading (in)	Apparent Thickness (in)	Load Compliance (%)	Swell (+) Settlement (-) % of Sample Thickness	Void Ratio	Corrected Deformation (%)
1.050	0.0239	0.9761	0.00	-2.39	0.6573	-2.39
2.013	0.0338	0.9662	0.00	-3.38	0.6405	-3.38
H2O	0.0703	0.9297	0.00	-7.03	0.5785	-7.03

Percent Swell / Settlement After Inundation = -3.78



One-Dimensional Swell or Settlement Potential of Cohesive Soils

(ASTM D 4546) -- Method 'B'

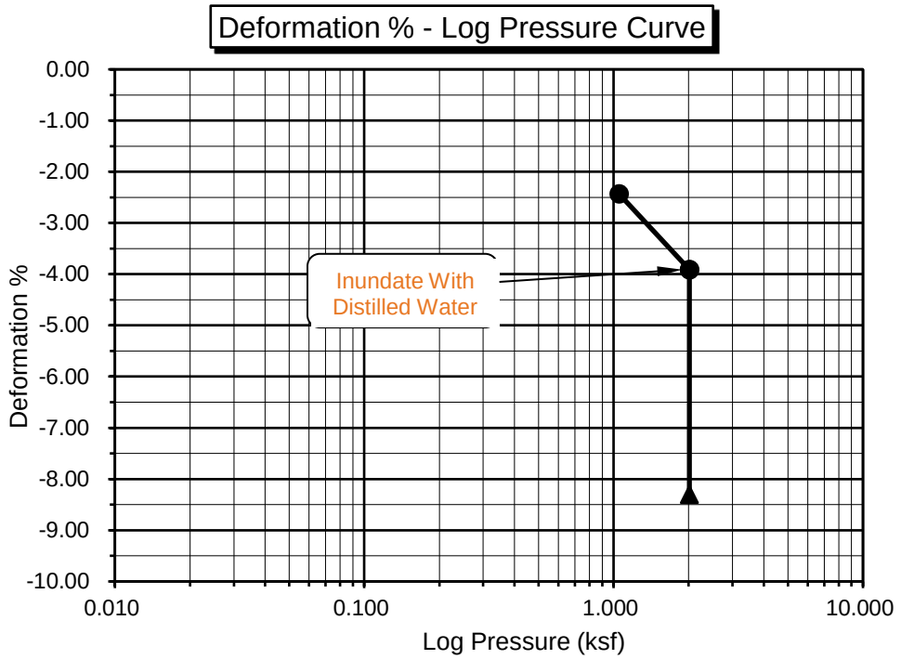
Project Name: Highpointe MV 1 Geo — Tested By: M. Vinet — Date: 3/21/22
Project No.: 13169.003 — Checked By: M. Vinet — Date: 3/23/22
Boring No.: LB-3 — Sample Type: IN SITU
Sample No.: R-4 — Depth (ft.) 10.0
Sample Description: Silty Sand (SM), Brown.
Source and Type of Water Used for Inundation: Arrowhead (Distilled)
** Note: Loading After Wetting (Inundation) not Performed Using this Test Method.

Initial Dry Density (pcf):	100.1
Initial Moisture (%):	5.4
Initial Height (in.):	1.0000
Initial Dial Reading (in):	0.0000
Inside Diameter of Ring (in):	2.416

Final Dry Density (pcf):	109.1
Final Moisture (%) :	16.1
Initial Void ratio:	0.6846
Specific Gravity (assumed):	2.70
Initial Degree of Saturation (%):	21.3

Pressure (p) (ksf)	Final Reading (in)	Apparent Thickness (in)	Load Compliance (%)	Swell (+) Settlement (-) % of Sample Thickness	Void Ratio	Corrected Deformation (%)
1.050	0.0243	0.9757	0.00	-2.43	0.6437	-2.43
2.013	0.0391	0.9609	0.00	-3.91	0.6187	-3.91
H2O	0.0830	0.9170	0.00	-8.30	0.5448	-8.30

Percent Swell / Settlement After Inundation = **-4.57**



One-Dimensional Swell or Settlement Potential of Cohesive Soils

(ASTM D 4546) -- Method 'B'

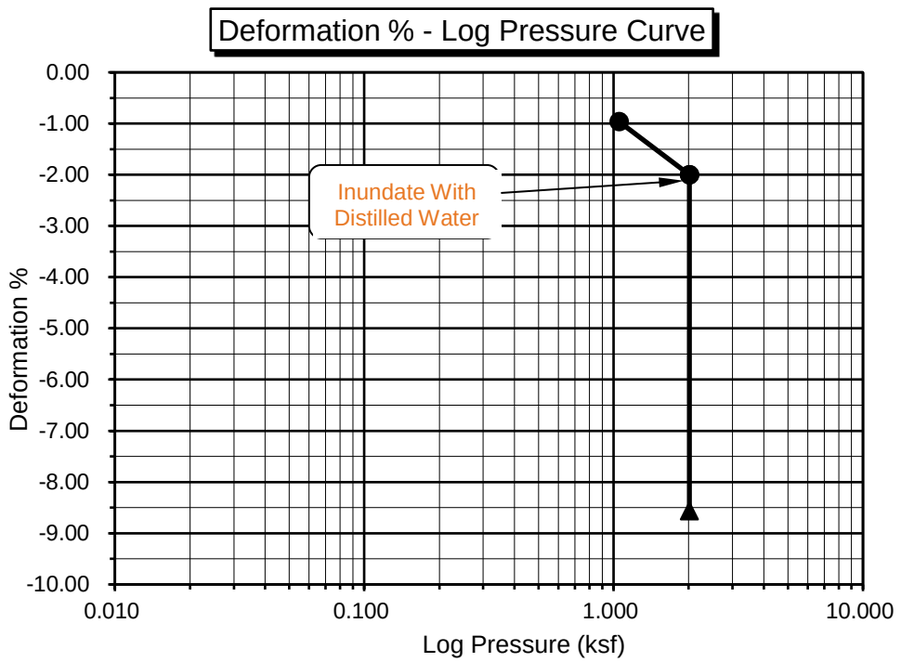
Project Name: Highpointe MV 1 Geo — Tested By: M. Vinet — Date: 3/22/22
Project No.: 13169.003 — Checked By: M. Vinet — Date: 3/23/22
Boring No.: LB-4 — Sample Type: IN SITU
Sample No.: R-3 — Depth (ft.) 7.5
Sample Description: Silty Sand (SM), Brown.
Source and Type of Water Used for Inundation: Arrowhead (Distilled)
** Note: Loading After Wetting (Inundation) not Performed Using this Test Method.

Initial Dry Density (pcf):	87.3
Initial Moisture (%):	7.4
Initial Height (in.):	1.0000
Initial Dial Reading (in):	0.0000
Inside Diameter of Ring (in):	2.416

Final Dry Density (pcf):	95.4
Final Moisture (%) :	25.4
Initial Void ratio:	0.9318
Specific Gravity (assumed):	2.70
Initial Degree of Saturation (%):	21.5

Pressure (p) (ksf)	Final Reading (in)	Apparent Thickness (in)	Load Compliance (%)	Swell (+) Settlement (-) % of Sample Thickness	Void Ratio	Corrected Deformation (%)
1.050	0.0096	0.9904	0.00	-0.96	0.9133	-0.96
2.013	0.0200	0.9800	0.00	-2.00	0.8932	-2.00
H2O	0.0856	0.9144	0.00	-8.56	0.7665	-8.56

Percent Swell / Settlement After Inundation = **-6.69**



One-Dimensional Swell or Settlement Potential of Cohesive Soils

(ASTM D 4546) -- Method 'B'

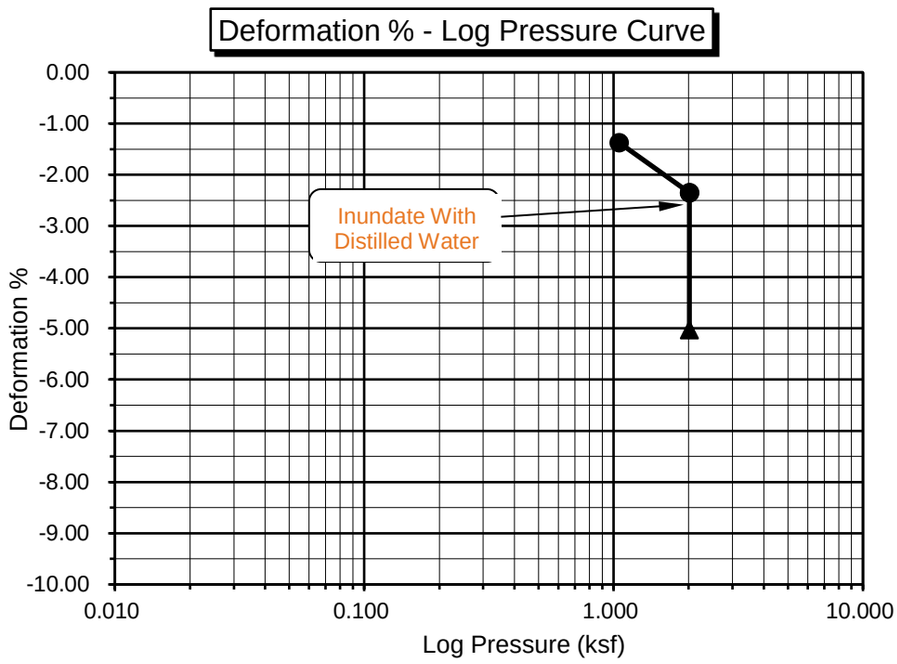
Project Name: Highpointe MV 1 Geo — Tested By: M. Vinet — Date: 3/22/22
Project No.: 13169.003 — Checked By: M. Vinet — Date: 3/23/22
Boring No.: LP-1 — Sample Type: IN SITU
Sample No.: R-2 — Depth (ft.) 10.0
Sample Description: Silty Sand (SM), Brown.
Source and Type of Water Used for Inundation: Arrowhead (Distilled)
** Note: Loading After Wetting (Inundation) not Performed Using this Test Method.

Initial Dry Density (pcf):	100.6
Initial Moisture (%):	9.3
Initial Height (in.):	1.0000
Initial Dial Reading (in):	0.0000
Inside Diameter of Ring (in):	2.416

Final Dry Density (pcf):	106.0
Final Moisture (%) :	19.1
Initial Void ratio:	0.6750
Specific Gravity (assumed):	2.70
Initial Degree of Saturation (%):	37.3

Pressure (p) (ksf)	Final Reading (in)	Apparent Thickness (in)	Load Compliance (%)	Swell (+) Settlement (-) % of Sample Thickness	Void Ratio	Corrected Deformation (%)
1.050	0.0137	0.9863	0.00	-1.37	0.6520	-1.37
2.013	0.0235	0.9765	0.00	-2.35	0.6356	-2.35
H2O	0.0503	0.9497	0.00	-5.03	0.5907	-5.03

Percent Swell / Settlement After Inundation = **-2.74**



One-Dimensional Swell or Settlement Potential of Cohesive Soils

(ASTM D 4546) -- Method 'B'

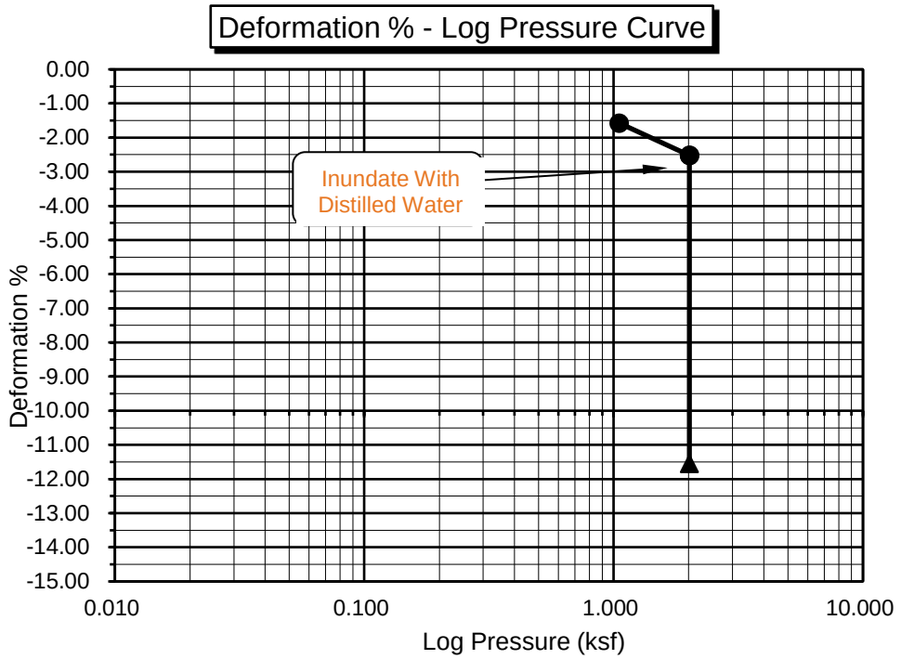
Project Name: Highpointe MV 1 Geo — Tested By: M. Vinet — Date: 3/22/22
Project No.: 13169.003 — Checked By: M. Vinet — Date: 3/23/22
Boring No.: LP-2 — Sample Type: IN SITU
Sample No.: R-1 — Depth (ft.) 5.0
Sample Description: Silty Sand (SM), Brown.
Source and Type of Water Used for Inundation: Arrowhead (Distilled)
** Note: Loading After Wetting (Inundation) not Performed Using this Test Method.

Initial Dry Density (pcf):	97.4
Initial Moisture (%):	5.5
Initial Height (in.):	1.0000
Initial Dial Reading (in):	0.0000
Inside Diameter of Ring (in):	2.416

Final Dry Density (pcf):	110.1
Final Moisture (%) :	16.8
Initial Void ratio:	0.7307
Specific Gravity (assumed):	2.70
Initial Degree of Saturation (%):	20.5

Pressure (p) (ksf)	Final Reading (in)	Apparent Thickness (in)	Load Compliance (%)	Swell (+) Settlement (-) % of Sample Thickness	Void Ratio	Corrected Deformation (%)
1.050	0.0157	0.9843	0.00	-1.57	0.7036	-1.57
2.013	0.0252	0.9748	0.00	-2.52	0.6871	-2.52
H2O	0.1155	0.8845	0.00	-11.55	0.5308	-11.55

Percent Swell / Settlement After Inundation = **-9.26**



MODIFIED PROCTOR COMPACTION TEST

ASTM D 1557

Project Name:	Highpointe MV 1 Geo	Tested By:	F. Mina	Date:	03/22/22
Project No.:	13169.003	Input By:	M. Vinet	Date:	03/23/22
Boring No.:	LB-3	Depth (ft.):	0 - 5.0		
Sample No.:	B-1				
Soil Identification:	Silty Sand (SM), Brown.				

Preparation Method: [X] Moist [ ] Dry

[X] Mechanical Ram [ ] Manual Ram

Mold Volume (ft³) 0.03340

Ram Weight = 10 lb.; Drop = 18 in.

TEST NO.	1	2	3	4	5	6
Wt. Compacted Soil + Mold (g)	5523	5643	5722	5670		
Weight of Mold (g)	3539	3539	3539	3539		
Net Weight of Soil (g)	1984	2104	2183	2131		
Wet Weight of Soil + Cont. (g)	2129.7	1522.3	1602.7	1422.8		
Dry Weight of Soil + Cont. (g)	2071.9	1448.4	1502.7	1316.2		
Weight of Container (g)	716.2	277.4	280.3	276.2		
Moisture Content (%)	4.3	6.3	8.2	10.3		
Wet Density (pcf)	131.0	138.9	144.1	140.7		
Dry Density (pcf)	125.6	130.6	133.2	127.6		

Maximum Dry Density (pcf) 133.2 **Optimum Moisture Content (%)** 8.2

PROCEDURE USED

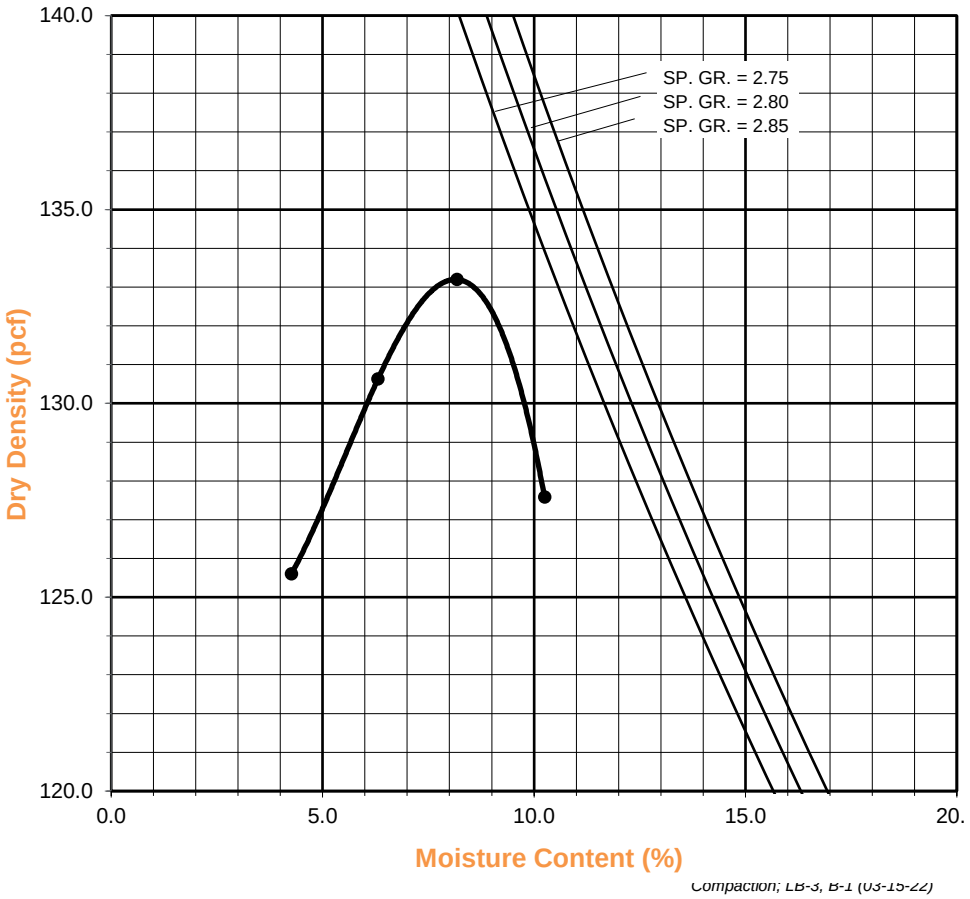
[X] **Procedure A**
Soil Passing No. 4 (4.75 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
May be used if +#4 is 20% or less

[ ] **Procedure B**
Soil Passing 3/8 in. (9.5 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
Use if +#4 is >20% and +3/8 in. is 20% or less

[ ] **Procedure C**
Soil Passing 3/4 in. (19.0 mm) Sieve
Mold : 6 in. (152.4 mm) diameter
Layers : 5 (Five)
Blows per layer : 56 (fifty-six)
Use if +3/8 in. is >20% and +¾ in. is <30%

Particle-Size Distribution:
3:65:32
GR:SA:FI

Atterberg Limits:
LL,PL,PI



MODIFIED PROCTOR COMPACTION TEST

ASTM D 1557

Project Name:	Highpointe MV 1 Geo	Tested By:	F. Mina	Date:	03/22/22
Project No.:	13169.003	Input By:	M. Vinet	Date:	03/23/22
Boring No.:	LB-4	Depth (ft.):	0 - 5.0		
Sample No.:	B-1				
Soil Identification:	Silty Sand (SM), Brown.				

Preparation Method: [X] Moist [ ] Dry

[X] Mechanical Ram [ ] Manual Ram

Mold Volume (ft³) 0.03340 *Ram Weight = 10 lb.; Drop = 18 in.*

TEST NO.	1	2	3	4	5	6
Wt. Compacted Soil + Mold (g)	5576	5663	5684	5600		
Weight of Mold (g)	3539	3539	3539	3539		
Net Weight of Soil (g)	2037	2124	2145	2061		
Wet Weight of Soil + Cont. (g)	1289.2	1352.4	1399.2	1236.2		
Dry Weight of Soil + Cont. (g)	1231.3	1272.4	1296.4	1133.7		
Weight of Container (g)	280.1	277.8	277.0	276.4		
Moisture Content (%)	6.1	8.0	10.1	12.0		
Wet Density (pcf)	134.5	140.2	141.6	136.0		
Dry Density (pcf)	126.7	129.8	128.6	121.5		

Maximum Dry Density (pcf) 130.0 **Optimum Moisture Content (%)** 8.5

PROCEDURE USED

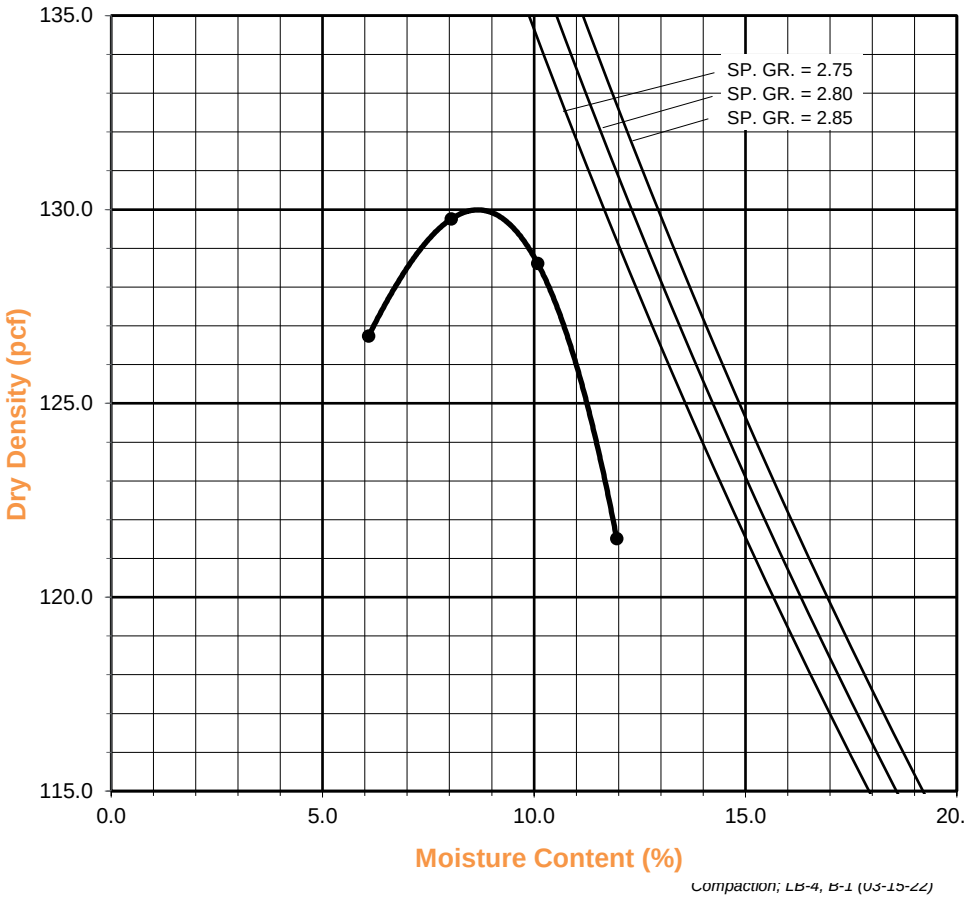
[X] **Procedure A**
Soil Passing No. 4 (4.75 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
May be used if +#4 is 20% or less

[ ] **Procedure B**
Soil Passing 3/8 in. (9.5 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
Use if +#4 is >20% and +3/8 in. is 20% or less

[ ] **Procedure C**
Soil Passing 3/4 in. (19.0 mm) Sieve
Mold : 6 in. (152.4 mm) diameter
Layers : 5 (Five)
Blows per layer : 56 (fifty-six)
Use if +3/8 in. is >20% and +¾ in. is <30%

Particle-Size Distribution:
2:52:46
GR:SA:FI

Atterberg Limits:
LL,PL,PI



TESTS for SULFATE CONTENT
CHLORIDE CONTENT and pH of SOILS

Project Name: Highpointe MV 1 Geo Tested By : M. Vinet Date: 03/23/22

Project No. : 13169.003 Data Input By: M. Vinet Date: 03/23/22

Boring No.	LB-3			
Sample No.	B-1			
Sample Depth (ft)	0 - 5.0			
Soil Identification:	Silty Sand (SM)			
Wet Weight of Soil + Container (g)	100.00			
Dry Weight of Soil + Container (g)	100.00			
Weight of Container (g)	0.00			
Moisture Content (%)	0.00			
Weight of Soaked Soil (g)	100.00			

SULFATE CONTENT, DOT California Test 417, Part II

Beaker No.	1			
Crucible No.	1			
Furnace Temperature (°C)	850			
Time In / Time Out	Timer			
Duration of Combustion (min)	45			
Wt. of Crucible + Residue (g)	25.0362			
Wt. of Crucible (g)	25.0328			
Wt. of Residue (g) (A)	0.0034			
PPM of Sulfate (A) x 41150	139.91			
PPM of Sulfate, Dry Weight Basis	**140**			

CHLORIDE CONTENT, DOT California Test 422

ml of Extract For Titration (B)	30			
ml of AgNO3 Soln. Used in Titration (C)	0.4			
PPM of Chloride (C -0.2) * 100 * 30 / B	20			
PPM of Chloride, Dry Wt. Basis	**20**			

pH TEST, DOT California Test 643

pH Value	**7.40**			
Temperature °C	21.0			

SOIL RESISTIVITY TEST

DOT CA TEST 643

Project Name:	Highpointe MV 1 Geo		Tested By :	M. Vinet	Date: 03/23/22
Project No. :	13169.003		Data Input By:	M. Vinet	Date: 03/23/22
Boring No.:	LB-3		Depth (ft.) :	0 - 5.0	
Sample No. :	B-1				

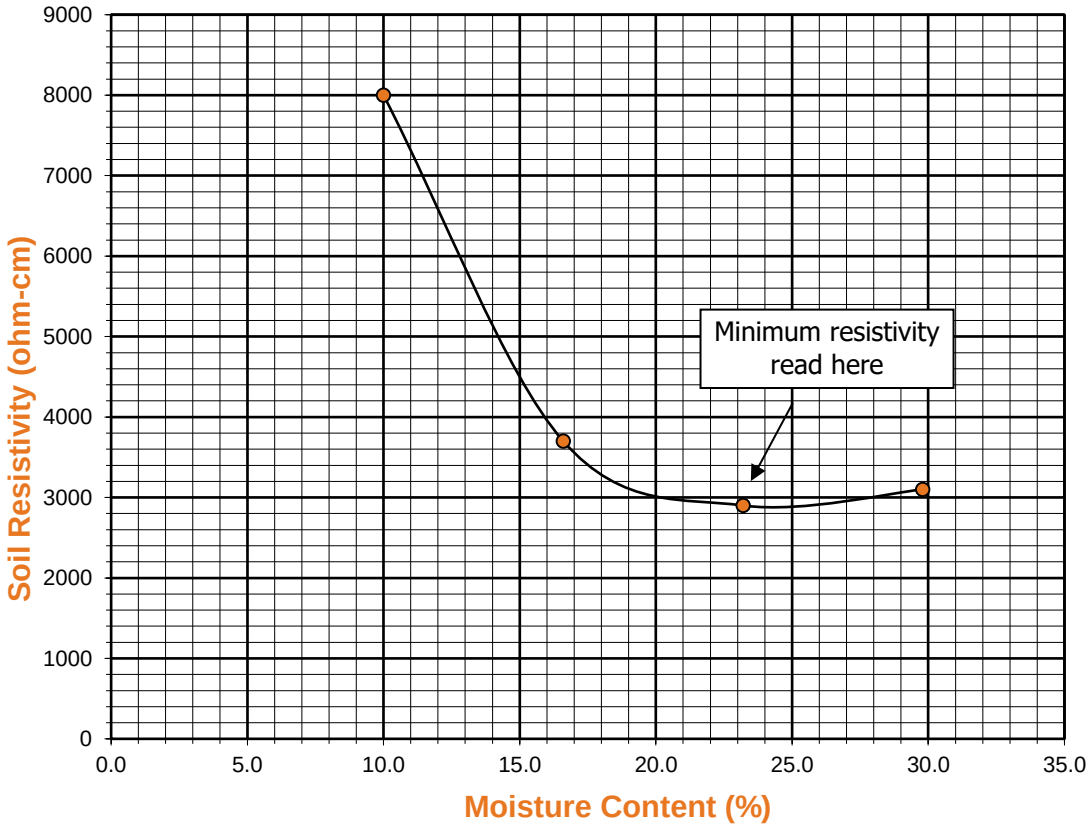
Soil Identification:* Silty Sand (SM)

*California Test 643 requires soil specimens to consist only of portions of samples passing through the No. 8 US Standard Sieve before resistivity testing. Therefore, this test method may not be representative for coarser materials.

Specimen No.	Water Added (ml) (Wa)	Adjusted Moisture Content (MC)	Resistance Reading (ohm)	Soil Resistivity (ohm-cm)
1	50	10.00	8000	8000
2	83	16.60	3700	3700
3	116	23.20	2900	2900
4	149	29.80	3100	3100
5				

Moisture Content (%) (MCi)	0.00
Wet Wt. of Soil + Cont. (g)	100.00
Dry Wt. of Soil + Cont. (g)	100.00
Wt. of Container (g)	0.00
Container No.	A
Initial Soil Wt. (g) (Wt)	500.00
Box Constant	1.000
MC =(((1+Mci/100)x(Wa/Wt+1))-1)x100	

Min. Resistivity (ohm-cm)	Moisture Content (%)	Sulfate Content (ppm)	Chloride Content (ppm)	Soil pH	
				pH	Temp. (°C)
DOT CA Test 643		DOT CA Test 417 Part II	DOT CA Test 422	DOT CA Test 643	
2900	**23.2**	**140**	**20**	**7.40**	**21.0**



R-VALUE TEST RESULTS

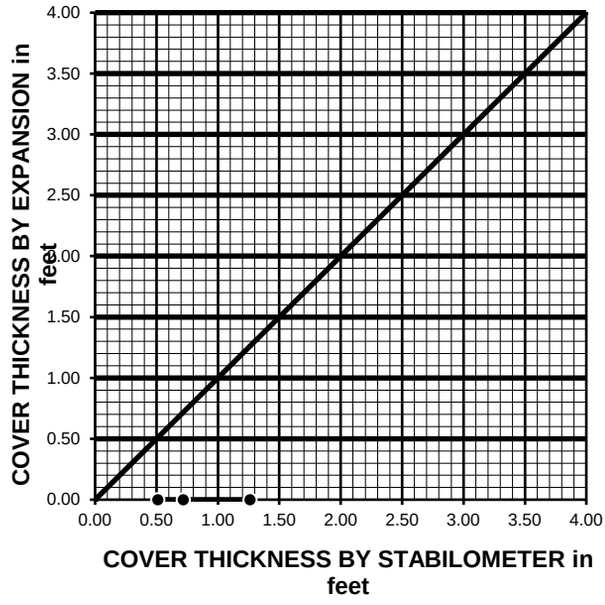
ASTM D 2844

Project Name:	Highpointe MV 1 Geo	Date:	3/22/22
Project Number:	13169.003	Technician:	F. Mina
Boring Number:	LB-2	Depth (ft.):	0 - 5.0
Sample Number:	B-1	Sample Location:	N/A
Sample Description:	Silty Sand (SM), Brown.		

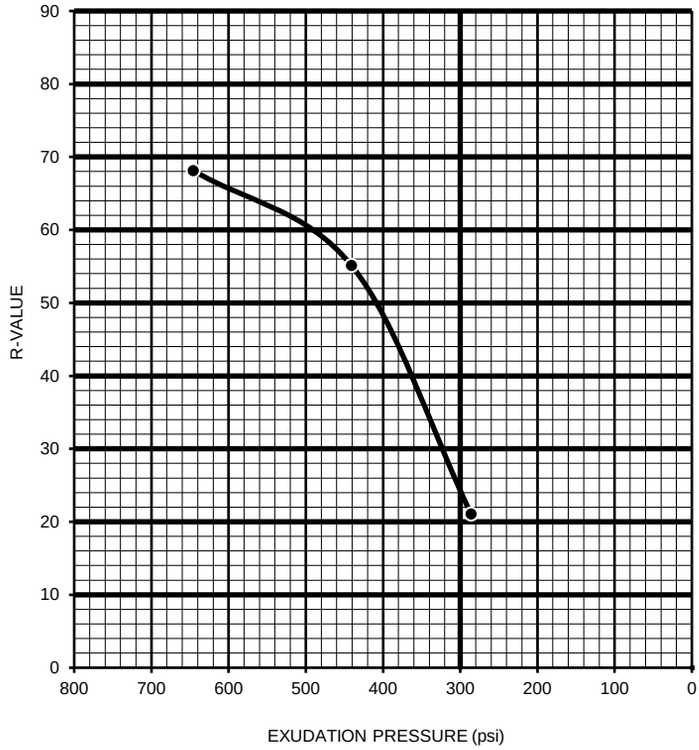
TEST SPECIMEN	A	B	C
MOISTURE AT COMPACTION %	7.9	8.4	9.4
HEIGHT OF SAMPLE, Inches	2.48	2.48	2.55
DRY DENSITY, pcf	122.3	121.3	120.2
COMPACTOR AIR PRESSURE, psi	215	200	175
EXUDATION PRESSURE, psi	646	441	286
EXPANSION, Inches x 10exp-4	0	0	0
STABILITY Ph 2,000 lbs (160 psi)	33	48	105
TURNS DISPLACEMENT	4.50	4.75	4.90
R-VALUE UNCORRECTED	68	55	21
R-VALUE CORRECTED	68	55	21

DESIGN CALCULATION DATA	a	b	c
GRAVEL EQUIVALENT FACTOR	1.0	1.0	1.0
TRAFFIC INDEX	5.0	5.0	5.0
STABILOMETER THICKNESS, ft.	0.51	0.72	1.26
EXPANSION PRESSURE THICKNESS, ft.	0.00	0.00	0.00

EXPANSION PRESSURE CHART



EXUDATION PRESSURE CHART



R-VALUE BY EXPANSION:	N/A
R-VALUE BY EXUDATION:	25
EQUILIBRIUM R-VALUE:	25

Leighton

PARTICLE-SIZE DISTRIBUTION (GRADATION) of SOILS USING SIEVE ANALYSIS

ASTM D 6913

Project Name: Highpointe MV 1 Geo
Project No.: 13169.003
Boring No.: LB-3
Sample No.: B-1
Soil Identification: Silty Sand (SM), Brown.

Tested By: MRV Date: 03/23/22
Checked By: MRV Date: 03/23/22
Depth (feet): 0 - 5.0

Calculation of Dry Weights	Whole Sample	Sample Passing #4	Moisture Contents	Whole Sample	Sample passing #4
Container No.:	P	P	Wt. of Air-Dry Soil + Cont.(g)	2129.7	1020.5
Wt. Air-Dried Soil + Cont.(g)	2189.7	1020.5	Wt. of Dry Soil + Cont. (g)	2071.9	1020.5
Wt. of Container (g)	716.2	716.2	Wt. of Container No._____(g)	716.2	716.2
Dry Wt. of Soil (g)	1412.8	304.3	Moisture Content (%)	4.3	0.0

Passing #4 Material After Wet Sieve		
	Container No.	P
	Wt. of Dry Soil + Container (g)	930.2
	Wt. of Container (g)	716.2
	Dry Wt. of Soil Retained on # 200 Sieve (g)	214.0

U. S. Sieve Size		Cumulative Weight of Dry Soil Retained (g)		Percent Passing (%)
	(mm.)	Whole Sample	Sample Passing #4	
1 1/2"	37.500			100.0
1"	25.000			100.0
3/4"	19.000			100.0
1/2"	12.500	0.0		100.0
3/8"	9.500	12.7		99.1
#4	4.750	39.3		97.2
#8	2.360		16.6	91.9
#16	1.180		44.1	83.1
#30	0.600		74.0	73.6
#50	0.300		114.2	60.7
#100	0.150		162.6	45.3
#200	0.075		204.6	31.8
PAN				

GRAVEL: **3 %**
SAND: **65 %**
FINES: **32 %**
GROUP SYMBOL: **SM**

Cu = D60/D10 = N/A
Cc = $(D30)^2/(D60*D10)$ = N/A

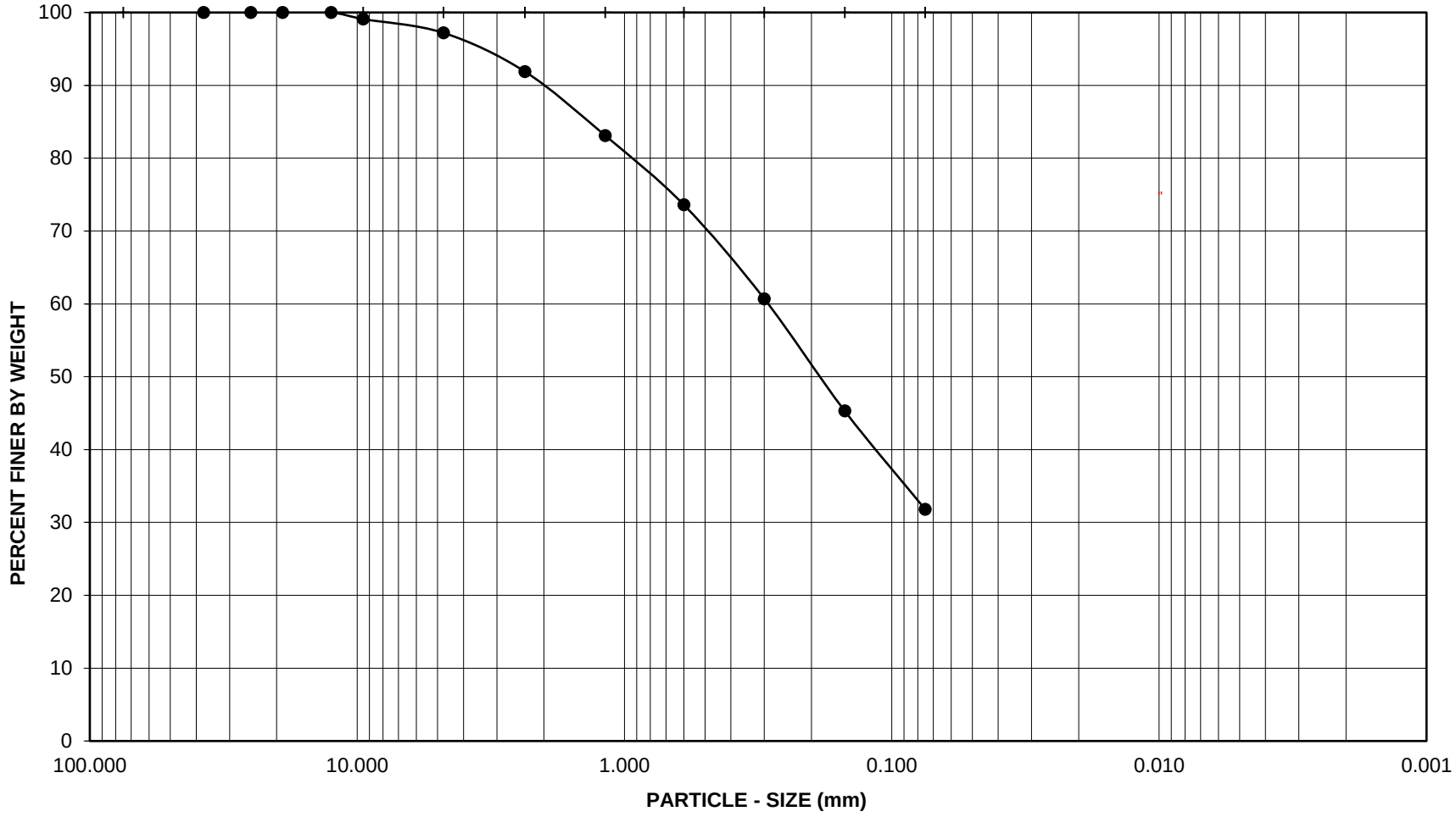
Remarks:

GRAVEL		SAND			FINES	
COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY

U.S. STANDARD SIEVE OPENING: 3.0" 1 1/2" 3/4" 3/8"

U.S. STANDARD SIEVE NUMBER: #4 #8 #16 #30 #50 #100 #200

HYDROMETER



Project Name: Highpointe MV 1 Geo

Project No.: 13169.003

Boring No.: LB-3 Sample No.: B-1

Depth (feet): 0 - 5.0 Soil Type : SM

Soil Identification: Silty Sand (SM), Brown.

GR:SA:FI : (%) 3 : 65 : 32

Leighton

PARTICLE - SIZE DISTRIBUTION ASTM D 6913

Mar-22

PARTICLE-SIZE DISTRIBUTION (GRADATION) of SOILS USING SIEVE ANALYSIS

ASTM D 6913

Project Name:	Highpointe MV 1 Geo		Tested By:	MRV	Date: 03/23/22
Project No.:	13169.003		Checked By:	MRV	Date: 03/23/22
Boring No.:	LB-4		Depth (feet):	0 - 5.0	
Sample No.:	B-1				
Soil Identification:	Silty Sand (SM), Brown.				

		Moisture Content of Total Air - Dry Soil	
Container No.:	B	Wt. of Air-Dry Soil + Cont. (g)	1107.5
Wt. of Air-Dried Soil + Cont.(g)	1107.5	Wt. of Dry Soil + Cont. (g)	1090.5
Wt. of Container (g)	673.2	Wt. of Container No._____ (g)	673.2
Dry Wt. of Soil (g)	417.3	Moisture Content (%)	4.1

After Wet Sieve	Container No.	B
	Wt. of Dry Soil + Container (g)	916.5
	Wt. of Container (g)	673.2
	Dry Wt. of Soil Retained on # 200 Sieve (g)	243.3

U. S. Sieve Size (in.)	U. S. Sieve Size (mm.)	Cumulative Weight Dry Soil Retained (g)	Percent Passing (%)
3"	75.000		100.0
1"	25.000		100.0
3/4"	19.000		100.0
1/2"	12.500		100.0
3/8"	9.500	0.0	100.0
#4	4.750	9.2	97.8
#8	2.360	22.3	94.7
#16	1.180	51.9	87.6
#30	0.600	82.5	80.2
#50	0.300	122.5	70.6
#100	0.150	173.5	58.4
#200	0.075	226.6	45.7
PAN			

GRAVEL: **2 %**

SAND: **52 %**

FINES: **46 %**

GROUP SYMBOL: **SM**

Cu = D60/D10 = N/A

Cc = $(D30)^2/(D60*D10)$ = N/A

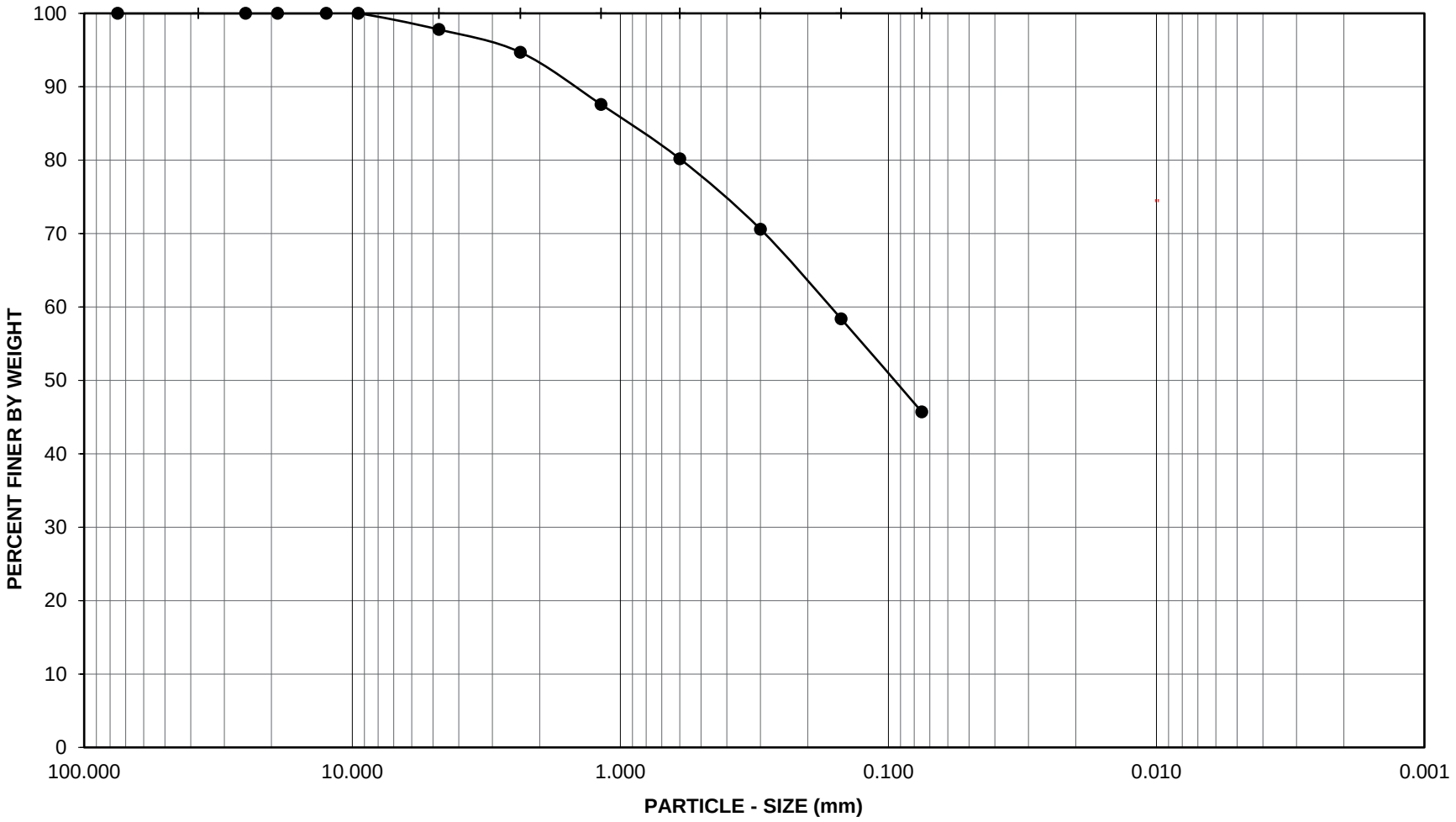
Remarks:

GRAVEL		SAND			FINES	
COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY

U.S. STANDARD SIEVE OPENING: 3.0" 1 1/2" 3/4" 3/8"

U.S. STANDARD SIEVE NUMBER: #4 #8 #16 #30 #50 #100 #200

HYDROMETER



Project Name: Highpointe MV 1 Geo

Project No.: 13169.003

Boring No.: LB-4 Sample No.: B-1

Depth (feet): 0 - 5.0 Soil Type : SM

Soil Identification: Silty Sand (SM), Brown.

GR:SA:FI : (%) 2 : 52 : 46

Leighton

PARTICLE - SIZE DISTRIBUTION ASTM D 6913

Mar-22

APPENDIX C

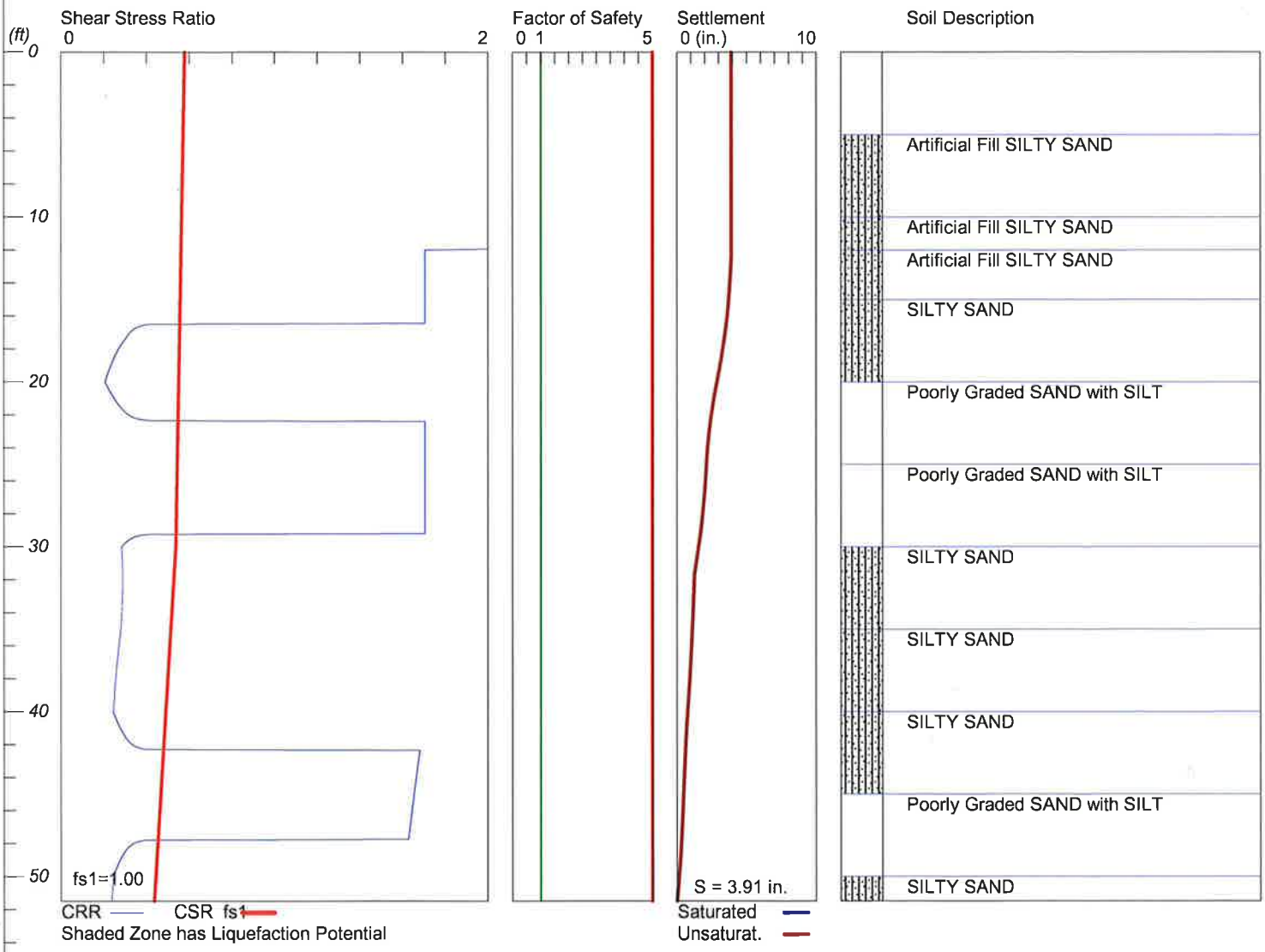
SEISMIC DESIGN DATA AND SETTLEMENT ANALYSES

DRY SETTLEMENT ANALYSIS

Highpointe MV 1

Hole No.=LB-4 Water Depth=1493 ft Surface Elev.=1593

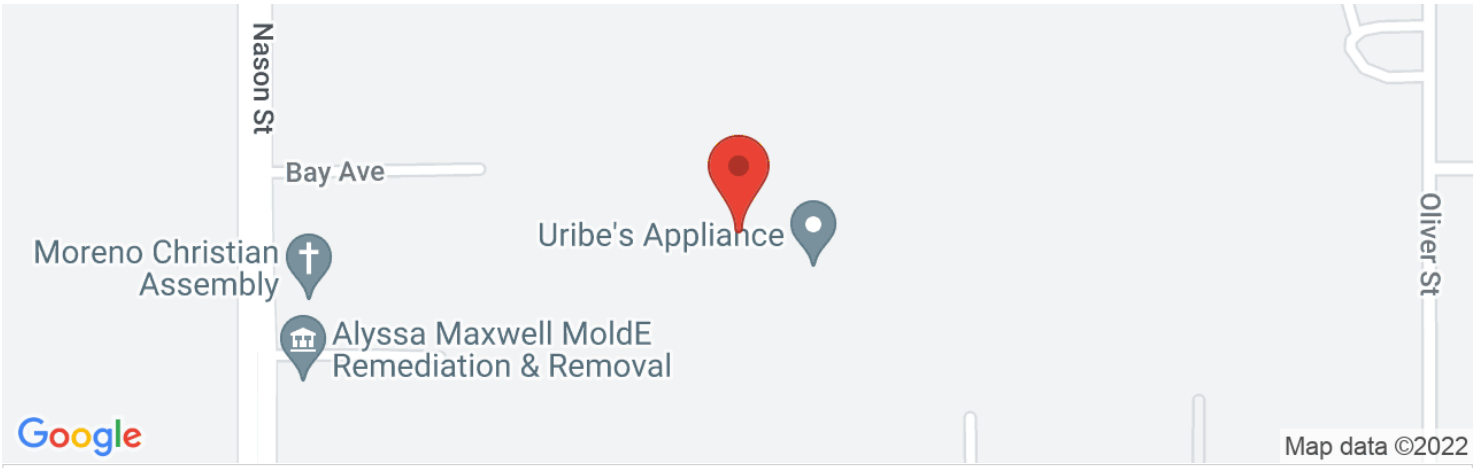
Magnitude=7.98
Acceleration=0.89g



OSHPD

MV-1

Latitude, Longitude: 33.9205, -117.1871



Date	5/13/2022, 12:24:08 PM
Design Code Reference Document	ASCE7-16
Risk Category	II
Site Class	D - Stiff Soil

Type	Value	Description
S_S	1.921	MCE_R ground motion. (for 0.2 second period)
S_1	0.758	MCE_R ground motion. (for 1.0s period)
S_{MS}	1.921	Site-modified spectral acceleration value
S_{M1}	null -See Section 11.4.8	Site-modified spectral acceleration value
S_{DS}	1.281	Numeric seismic design value at 0.2 second SA
S_{D1}	null -See Section 11.4.8	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	null -See Section 11.4.8	Seismic design category
F_a	1	Site amplification factor at 0.2 second
F_v	null -See Section 11.4.8	Site amplification factor at 1.0 second
PGA	0.811	MCE_G peak ground acceleration
F_{PGA}	1.1	Site amplification factor at PGA
PGA_M	0.892	Site modified peak ground acceleration
T_L	8	Long-period transition period in seconds
SsRT	1.99	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	2.187	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	1.921	Factored deterministic acceleration value. (0.2 second)
S1RT	0.788	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	0.886	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	0.758	Factored deterministic acceleration value. (1.0 second)
PGAd	0.811	Factored deterministic acceleration value. (Peak Ground Acceleration)
C_{RS}	0.91	Mapped value of the risk coefficient at short periods
C_{R1}	0.889	Mapped value of the risk coefficient at a period of 1 s

U.S. Geological Survey - Earthquake Hazards Program

Unified Hazard Tool

Please do not use this tool to obtain ground motion parameter values for the design code reference documents covered by the U.S. Seismic Design Maps web tools (e.g., the International Building Code and the ASCE 7 or 41 Standard). The values returned by the two applications are not identical.

Input

Edition

Dynamic: Conterminous U.S. 2014 (update) (v4.2.0)

Spectral Period

Peak Ground Acceleration

Latitude

Decimal degrees

33.9205

Time Horizon

Return period in years

2475

Longitude

Decimal degrees, negative values for western longitudes

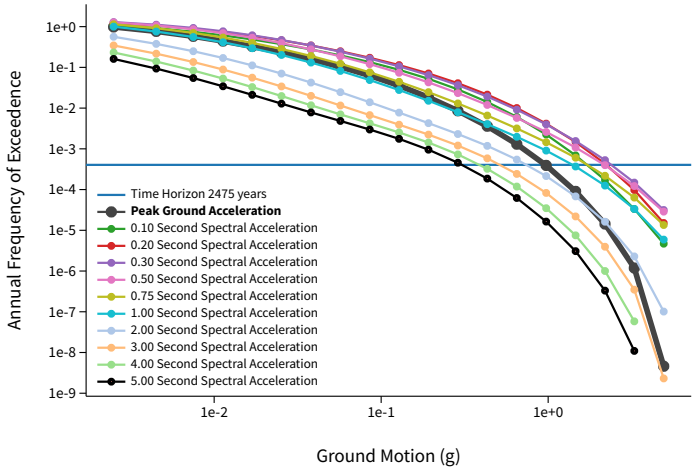
-117.1871

Site Class

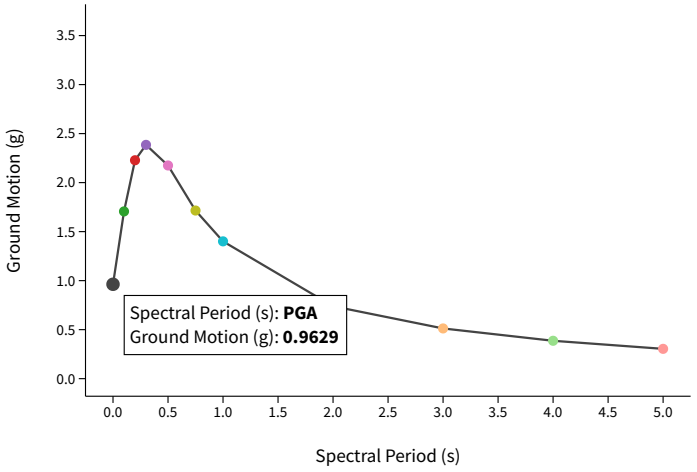
360 m/s (C/D boundary)

Hazard Curve

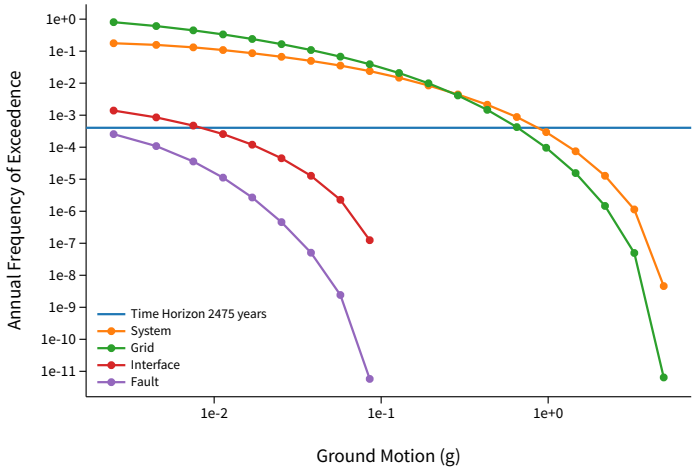
Hazard Curves



Uniform Hazard Response Spectrum



Component Curves for Peak Ground Acceleration

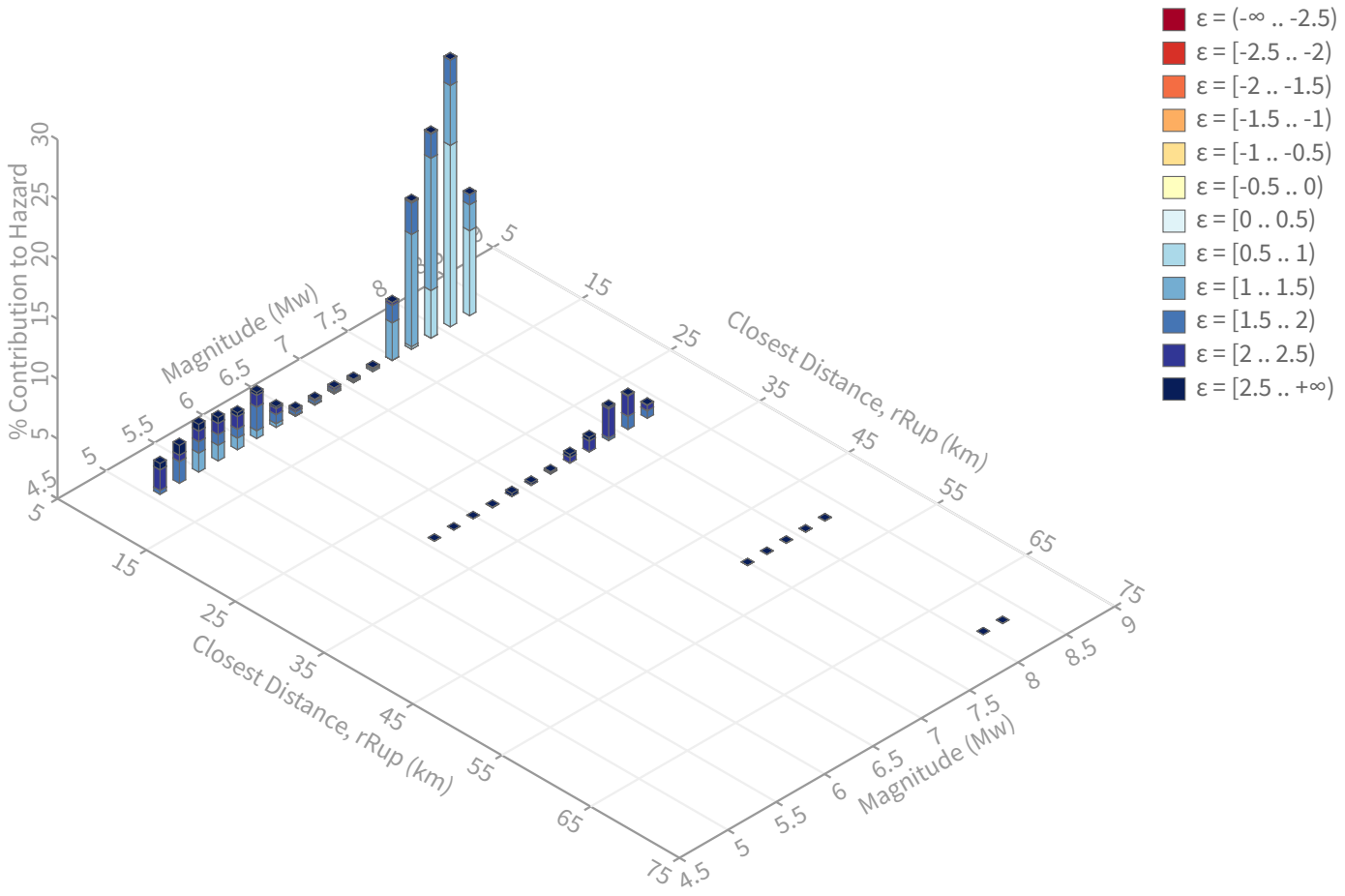


View Raw Data

Deaggregation

Component

Total



Summary statistics for, Deaggregation: Total

Deaggregation targets

Return period: 2475 yrs
Exceedance rate: 0.0004040404 yr^{-1}
PGA ground motion: 0.96286405 g

Recovered targets

Return period: 3094.6329 yrs
Exceedance rate: 0.00032314011 yr^{-1}

Totals

Binned: 100 %
Residual: 0 %
Trace: 0.06 %

Mean (over all sources)

m: 7.43
r: 7.54 km
ε₀ 1.43 σ

Mode (largest m–r bin)

m: 8.1
r: 4.93 km
ε₀ 1.09 σ
Contribution: 22.3 %

Mode (largest m–r–ε_0 bin)

m: 8.1
r: 4.86 km
ε₀ 0.96 σ
Contribution: 15.15 %

Discretization

r: min = 0.0, max = 1000.0, Δ = 20.0 km
m: min = 4.4, max = 9.4, Δ = 0.2
ε: min = -3.0, max = 3.0, Δ = 0.5 σ

Epsilon keys

ε0: [-∞ .. -2.5)
ε1: [-2.5 .. -2.0)
ε2: [-2.0 .. -1.5)
ε3: [-1.5 .. -1.0)
ε4: [-1.0 .. -0.5)
ε5: [-0.5 .. 0.0)
ε6: [0.0 .. 0.5)
ε7: [0.5 .. 1.0)
ε8: [1.0 .. 1.5)
ε9: [1.5 .. 2.0)
ε10: [2.0 .. 2.5)
ε11: [2.5 .. +∞)

Deaggregation Contributors

Source Set ↳ Source	Type	r	m	ε_0	lon	lat	az	%
UC33brAvg_FM31	System							38.31
San Jacinto (San Jacinto Valley) rev [1]		4.86	7.98	1.11	117.152°W	33.953°N	41.48	31.54
San Andreas (San Bernardino S) [2]		22.02	7.90	2.18	117.090°W	34.101°N	23.94	3.31
San Gorgonio Pass [2]		14.12	7.65	1.91	117.064°W	33.995°N	53.94	1.05
UC33brAvg_FM32	System							38.25
San Jacinto (San Jacinto Valley) rev [1]		4.86	7.97	1.11	117.152°W	33.953°N	41.48	31.50
San Andreas (San Bernardino S) [2]		22.02	7.90	2.18	117.090°W	34.101°N	23.94	3.34
UC33brAvg_FM31 (opt)	Grid							11.72
PointSourceFinite: -117.187, 33.943		5.75	5.58	1.69	117.187°W	33.943°N	0.00	3.23
PointSourceFinite: -117.187, 33.943		5.75	5.58	1.69	117.187°W	33.943°N	0.00	3.23
PointSourceFinite: -117.187, 33.997		9.48	5.75	2.23	117.187°W	33.997°N	0.00	1.51
PointSourceFinite: -117.187, 33.997		9.48	5.75	2.23	117.187°W	33.997°N	0.00	1.51
UC33brAvg_FM32 (opt)	Grid							11.72
PointSourceFinite: -117.187, 33.943		5.75	5.58	1.69	117.187°W	33.943°N	0.00	3.23
PointSourceFinite: -117.187, 33.943		5.75	5.58	1.69	117.187°W	33.943°N	0.00	3.23
PointSourceFinite: -117.187, 33.997		9.48	5.75	2.23	117.187°W	33.997°N	0.00	1.51
PointSourceFinite: -117.187, 33.997		9.48	5.75	2.23	117.187°W	33.997°N	0.00	1.51

APPENDIX D

GENERAL EARTHWORK AND GRADING SPECIFICATIONS FOR ROUGH GRADING

APPENDIX D
LEIGHTON AND ASSOCIATES, INC.
GENERAL EARTHWORK AND GRADING SPECIFICATIONS FOR ROUGH GRADING

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Attachments - Standard Details

A - Keying and Benching	Rear of Text
B - Oversize Rock Disposal	Rear of Text
C - Canyon Subdrains	Rear of Text
D - Buttress or Replacement Fill Subdrains	Rear of Text
E - Transition Lot Fills and Side Hill Fills	Rear of Text

1.0 GENERAL

1.1 Intent

These General Earthwork and Grading Specifications are for the grading and earthwork shown on the approved grading plan(s) and/or indicated in the geotechnical report(s). These Specifications are a part of the recommendations contained in the geotechnical report(s). In case of conflict, the specific recommendations in the geotechnical report shall supersede these more general Specifications. Observations of the earthwork by the project Geotechnical Consultant during the course of grading may result in new or revised recommendations that could supersede these specifications or the recommendations in the geotechnical report(s).

1.2 The Geotechnical Consultant of Record

Prior to commencement of work, the owner shall employ the Geotechnical Consultant of Record (Geotechnical Consultant). The Geotechnical Consultants shall be responsible for reviewing the approved geotechnical report(s) and accepting the adequacy of the preliminary geotechnical findings, conclusions, and recommendations prior to the commencement of the grading.

Prior to commencement of grading, the Geotechnical Consultant shall review the "work plan" prepared by the Earthwork Contractor (Contractor) and schedule sufficient personnel to perform the appropriate level of observation, mapping, and compaction testing.

During the grading and earthwork operations, the Geotechnical Consultant shall observe, map, and document the subsurface exposures to verify the geotechnical design assumptions. If the observed conditions are found to be significantly different than the interpreted assumptions during the design phase, the Geotechnical Consultant shall inform the owner, recommend appropriate changes in design to accommodate the observed conditions, and notify the review agency where required. Subsurface areas to be geotechnically observed, mapped, elevations recorded, and/or tested include natural ground after it has been cleared for receiving fill but before fill is placed, bottoms of all "remedial removal" areas, all key bottoms, and benches made on sloping ground to receive fill.

The Geotechnical Consultant shall observe the moisture-conditioning and processing of the subgrade and fill materials and perform relative compaction testing of fill to determine the attained level of compaction.

The Geotechnical Consultant shall provide the test results to the owner and the Contractor on a routine and frequent basis.

1.3 The Earthwork Contractor

The Earthwork Contractor (Contractor) shall be qualified, experienced, and knowledgeable in earthwork logistics, preparation and processing of ground to receive fill, moisture-conditioning and processing of fill, and compacting fill. The Contractor shall review and accept the plans, geotechnical report(s), and these Specifications prior to commencement of grading. The Contractor shall be solely responsible for performing the grading in accordance with the plans and specifications.

The Contractor shall prepare and submit to the owner and the Geotechnical Consultant a work plan that indicates the sequence of earthwork grading, the number of "spreads" of work and the estimated quantities of daily earthwork contemplated for the site prior to commencement of grading. The Contractor shall inform the owner and the Geotechnical Consultant of changes in work schedules and updates to the work plan at least 24 hours in advance of such changes so that appropriate observations and tests can be planned and accomplished. The Contractor shall not assume that the Geotechnical Consultant is aware of all grading operations.

The Contractor shall have the sole responsibility to provide adequate equipment and methods to accomplish the earthwork in accordance with the applicable grading codes and agency ordinances, these Specifications, and the recommendations in the approved geotechnical report(s) and grading plan(s). If, in the opinion of the Geotechnical Consultant, unsatisfactory conditions, such as unsuitable soil, improper moisture condition, inadequate compaction, insufficient buttress key size, adverse weather, etc., are resulting in a quality of work less than required in these specifications, the Geotechnical Consultant shall reject the work and may recommend to the owner that construction be stopped until the conditions are rectified.

2.0 PREPARATION OF AREAS TO BE FILLED

2.1 Clearing and Grubbing

Vegetation, such as brush, grass, roots, and other deleterious material shall be sufficiently removed and properly disposed of in a method acceptable to the owner, governing agencies, and the Geotechnical Consultant.

The Geotechnical Consultant shall evaluate the extent of these removals depending on specific site conditions. Earth fill material shall not contain more than 1 percent of organic materials (by volume). No fill lift shall contain more than 5 percent of organic matter. Nesting of the organic materials shall not be allowed.

If potentially hazardous materials are encountered, the Contractor shall stop work in the affected area, and a hazardous material specialist shall be informed immediately for proper evaluation and handling of these materials prior to continuing to work in that area.

As presently defined by the State of California, most refined petroleum products (gasoline, diesel fuel, motor oil, grease, coolant, etc.) have chemical constituents that are considered to be hazardous waste. As such, the indiscriminate dumping or spillage of these fluids onto the ground may constitute a misdemeanor, punishable by fines and/or imprisonment, and shall not be allowed.

2.2 Processing

Existing ground that has been declared satisfactory for support of fill by the Geotechnical Consultant shall be scarified to a minimum depth of 6 inches. Existing ground that is not satisfactory shall be overexcavated as specified in the following section. Scarification shall continue until soils are broken down and free of large clay lumps or clods and the working surface is reasonably uniform, flat, and free of uneven features that would inhibit uniform compaction.

2.3 Overexcavation

In addition to removals and overexcavations recommended in the approved geotechnical report(s) and the grading plan, soft, loose, dry, saturated, spongy, organic-rich, highly fractured or otherwise unsuitable ground shall be overexcavated to competent ground as evaluated by the Geotechnical Consultant during grading.

2.4 Benching

Where fills are to be placed on ground with slopes steeper than 5:1 (horizontal to vertical units), the ground shall be stepped or benched. Please see the Standard Details for a graphic illustration. The lowest bench or key shall be a minimum of 15 feet wide and at least 2 feet deep, into competent material as evaluated by the Geotechnical Consultant. Other benches shall be excavated a minimum height of 4 feet into competent material or as otherwise recommended by the Geotechnical

Consultant. Fill placed on ground sloping flatter than 5:1 shall also be benched or otherwise overexcavated to provide a flat subgrade for the fill.

2.5 Evaluation/Acceptance of Fill Areas

All areas to receive fill, including removal and processed areas, key bottoms, and benches, shall be observed, mapped, elevations recorded, and/or tested prior to being accepted by the Geotechnical Consultant as suitable to receive fill. The Contractor shall obtain a written acceptance from the Geotechnical Consultant prior to fill placement. A licensed surveyor shall provide the survey control for determining elevations of processed areas, keys, and benches.

3.0 FILL MATERIAL

3.1 General

Material to be used as fill shall be essentially free of organic matter and other deleterious substances evaluated and accepted by the Geotechnical Consultant prior to placement. Soils of poor quality, such as those with unacceptable gradation, high expansion potential, or low strength shall be placed in areas acceptable to the Geotechnical Consultant or mixed with other soils to achieve satisfactory fill material.

3.2 Oversize

Oversize material defined as rock, or other irreducible material with a maximum dimension greater than 8 inches, shall not be buried or placed in fill unless location, materials, and placement methods are specifically accepted by the Geotechnical Consultant. Placement operations shall be such that nesting of oversized material does not occur and such that oversize material is completely surrounded by compacted or densified fill. Oversize material shall not be placed within 10 vertical feet of finish grade or within 2 feet of future utilities or underground construction.

3.3 Import

If importing of fill material is required for grading, proposed import material shall meet the requirements of Section 3.1. The potential import source shall be given to the Geotechnical Consultant at least 48 hours (2 working days) before importing begins so that its suitability can be determined and appropriate tests performed.

4.0 FILL PLACEMENT AND COMPACTION

4.1 Fill Layers

Approved fill material shall be placed in areas prepared to receive fill (per Section 3.0) in near-horizontal layers not exceeding 8 inches in loose thickness. The Geotechnical Consultant may accept thicker layers if testing indicates the grading procedures can adequately compact the thicker layers. Each layer shall be spread evenly and mixed thoroughly to attain relative uniformity of material and moisture throughout.

4.2 Fill Moisture Conditioning

Fill soils shall be watered, dried back, blended, and/or mixed, as necessary to attain a relatively uniform moisture content at or slightly over optimum. Maximum density and optimum soil moisture content tests shall be performed in accordance with the American Society of Testing and Materials (ASTM Test Method D1557).

4.3 Compaction of Fill

After each layer has been moisture-conditioned, mixed, and evenly spread, it shall be uniformly compacted to not less than 90 percent of maximum dry density (ASTM Test Method D1557). Compaction equipment shall be adequately sized and be either specifically designed for soil compaction or of proven reliability to efficiently achieve the specified level of compaction with uniformity.

4.4 Compaction of Fill Slopes

In addition to normal compaction procedures specified above, compaction of slopes shall be accomplished by backrolling of slopes with sheepsfoot rollers at increments of 3 to 4 feet in fill elevation, or by other methods producing satisfactory results acceptable to the Geotechnical Consultant. Upon completion of grading, relative compaction of the fill, out to the slope face, shall be at least 90 percent of maximum density per ASTM Test Method D1557.

4.5 Compaction Testing

Field-tests for moisture content and relative compaction of the fill soils shall be performed by the Geotechnical Consultant. Location and frequency of tests shall be at the Consultant's discretion based on field conditions encountered. Compaction test locations will not necessarily be selected on a random basis. Test locations shall be selected to verify adequacy of compaction levels in areas that are judged to be prone to

inadequate compaction (such as close to slope faces and at the fill/bedrock benches).

4.6 Frequency of Compaction Testing

Tests shall be taken at intervals not exceeding 2 feet in vertical rise and/or 1,000 cubic yards of compacted fill soils embankment. In addition, as a guideline, at least one test shall be taken on slope faces for each 5,000 square feet of slope face and/or each 10 feet of vertical height of slope. The Contractor shall assure that fill construction is such that the testing schedule can be accomplished by the Geotechnical Consultant. The Contractor shall stop or slow down the earthwork construction if these minimum standards are not met.

4.7 Compaction Test Locations

The Geotechnical Consultant shall document the approximate elevation and horizontal coordinates of each test location. The Contractor shall coordinate with the project surveyor to assure that sufficient grade stakes are established so that the Geotechnical Consultant can determine the test locations with sufficient accuracy. At a minimum, two grade stakes within a horizontal distance of 100 feet and vertically less than 5 feet apart from potential test locations shall be provided.

5.0 SUBDRAIN INSTALLATION

Subdrain systems shall be installed in accordance with the approved geotechnical report(s), the grading plan, and the Standard Details. The Geotechnical Consultant may recommend additional subdrains and/or changes in subdrain extent, location, grade, or material depending on conditions encountered during grading. All subdrains shall be surveyed by a land surveyor/civil engineer for line and grade after installation and prior to burial. Sufficient time should be allowed by the Contractor for these surveys.

6.0 EXCAVATION

Excavations, as well as over-excavation for remedial purposes, shall be evaluated by the Geotechnical Consultant during grading. Remedial removal depths shown on geotechnical plans are estimates only. The actual extent of removal shall be determined by the Geotechnical Consultant based on the field evaluation of exposed conditions during grading. Where fill-over-cut slopes are to be graded, the cut portion of the slope shall be made, evaluated, and accepted by the Geotechnical Consultant prior to placement of materials for construction of the fill portion of the slope, unless otherwise recommended by the Geotechnical Consultant.

7.0 TRENCH BACKFILLS

7.1 Safety

The Contractor shall follow all OSHA and Cal/OSHA requirements for safety of trench excavations.

7.2 Bedding and Backfill

All bedding and backfill of utility trenches shall be performed in accordance with the applicable provisions of Standard Specifications of Public Works Construction. Bedding material shall have a Sand Equivalent greater than 30 (SE>30). The bedding shall be placed to 1 foot over the top of the conduit and densified by jetting. Backfill shall be placed and densified to a minimum of 90 percent of relative compaction from 1 foot above the top of the conduit to the surface.

The Geotechnical Consultant shall test the trench backfill for relative compaction. At least one test should be made for every 300 feet of trench and 2 feet of fill.

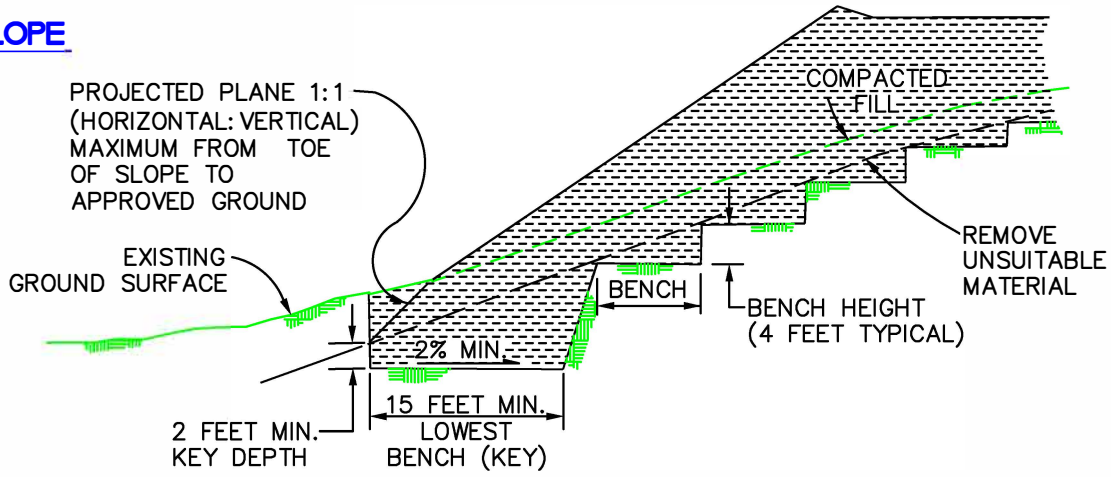
7.3 Lift Thickness

Lift thickness of trench backfill shall not exceed those allowed in the Standard Specifications of Public Works Construction unless the Contractor can demonstrate to the Geotechnical Consultant that the fill lift can be compacted to the minimum relative compaction by his alternative equipment and method.

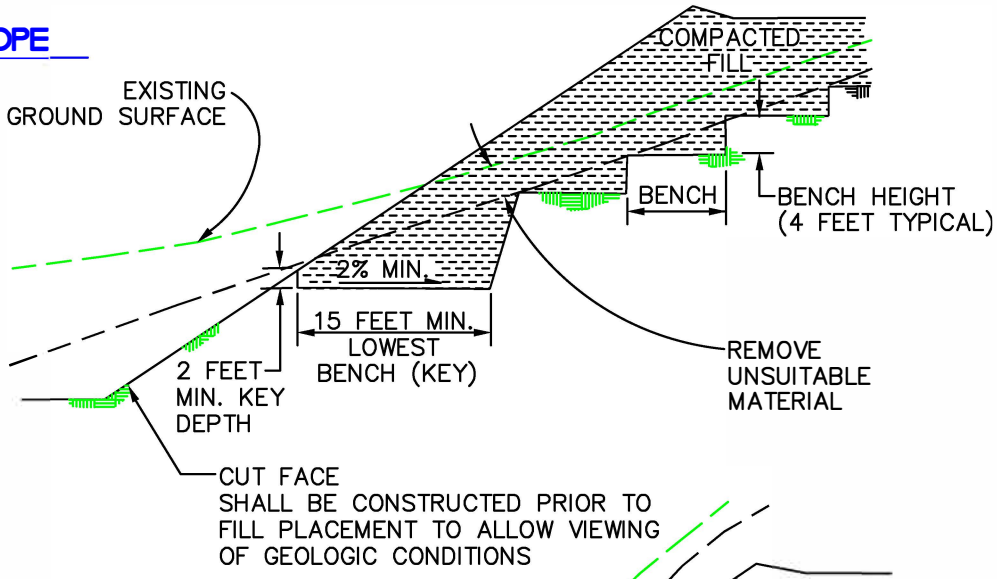
7.4 Observation and Testing

The jetting of the bedding around the conduits shall be observed by the Geotechnical Consultant.

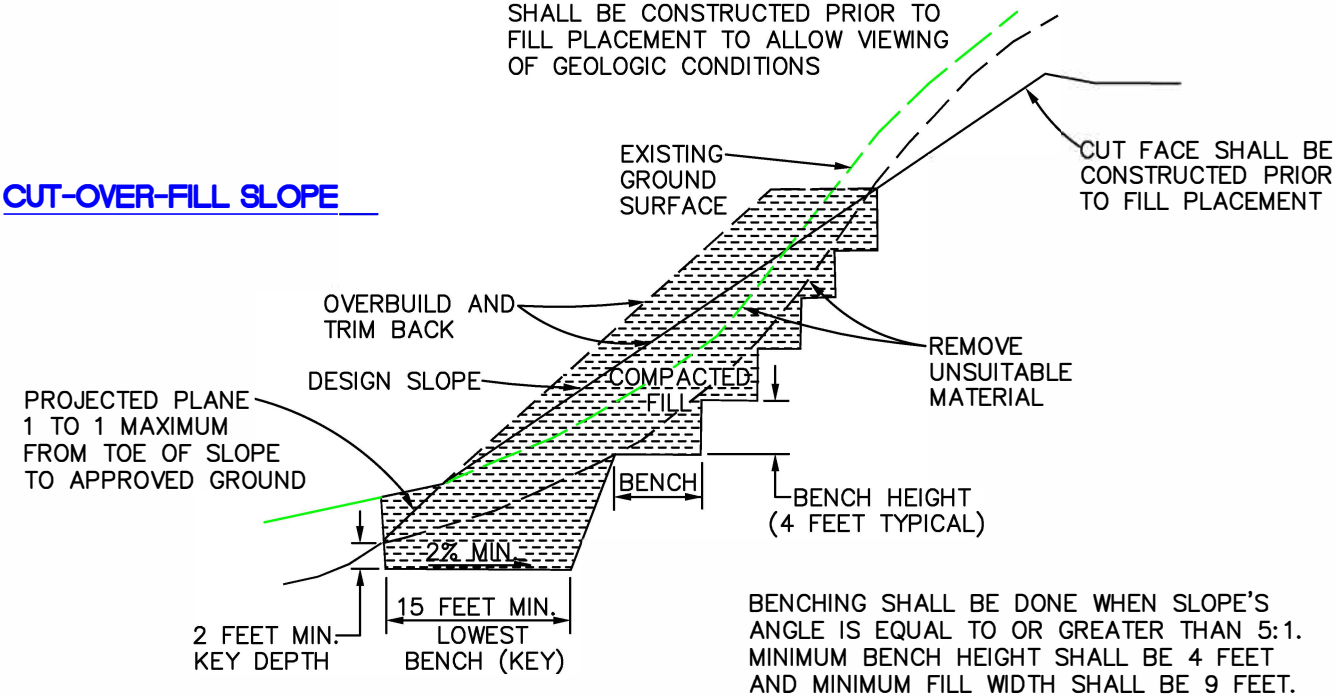
FILL SLOPE



FILL-OVER-CUT SLOPE

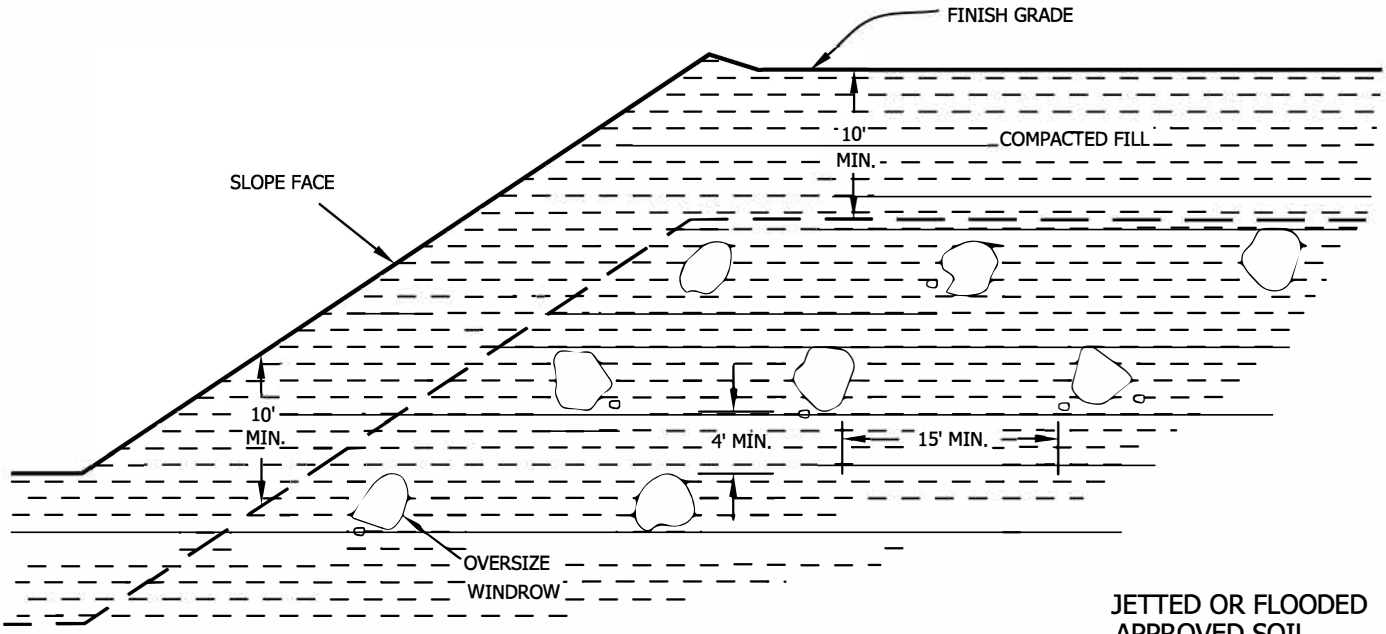


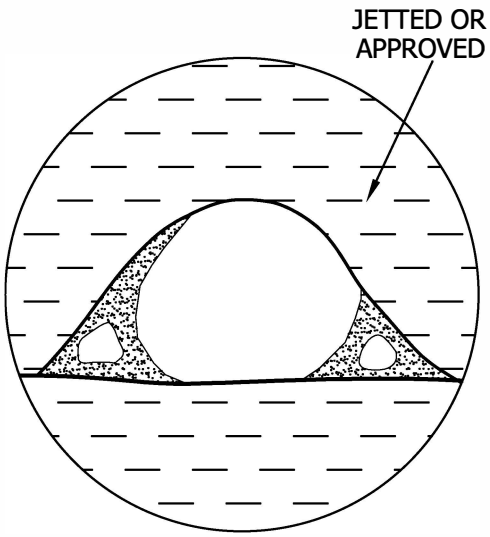
CUT-OVER-FILL SLOPE



BENCHING SHALL BE DONE WHEN SLOPE'S ANGLE IS EQUAL TO OR GREATER THAN 5:1. MINIMUM BENCH HEIGHT SHALL BE 4 FEET AND MINIMUM FILL WIDTH SHALL BE 9 FEET.

KEYING AND BENCHING	GENERAL EARTHWORK AND GRADING SPECIFICATIONS STANDARD DETAILS A	Leighton

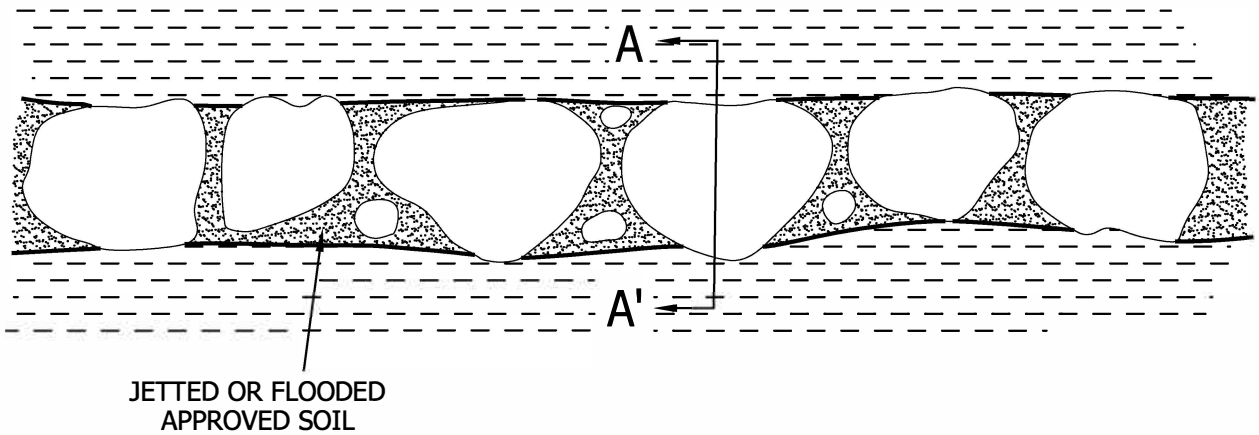




SECTION A-A'

- Oversize rock is larger than 8 inches in largest dimension.
- Backfill with approved soil jetted or flooded in place to fill all the voids.
- Do not bury rock within 10 feet of finish grade.
- Windrow of buried rock shall be parallel to the finished slope face.

PROFILE ALONG WINDROW



OVERSIZE ROCK DISPOSAL

GENERAL EARTHWORK AND GRADING SPECIFICATIONS
STANDARD DETAILS B

Leighton

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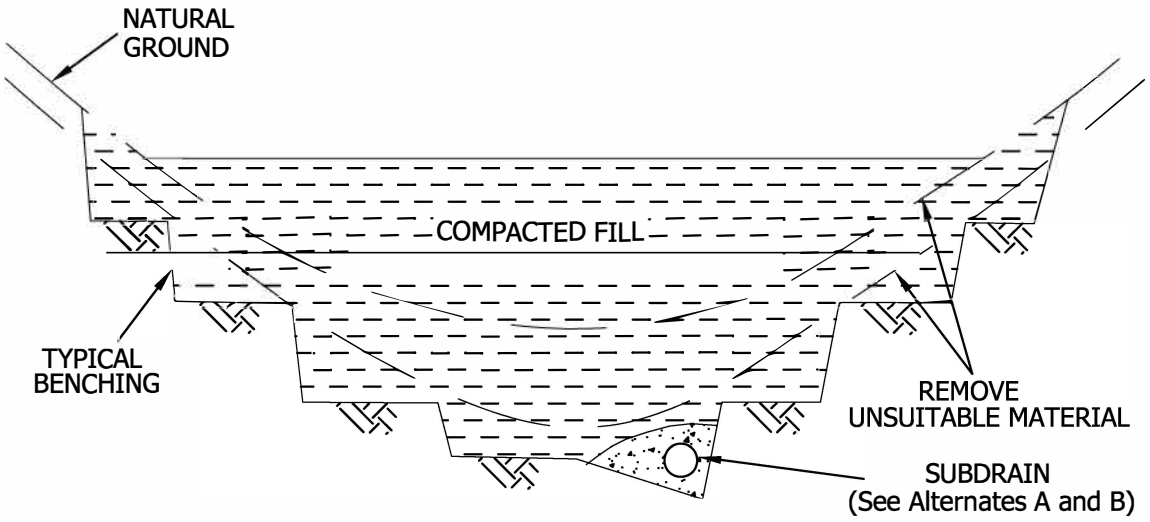
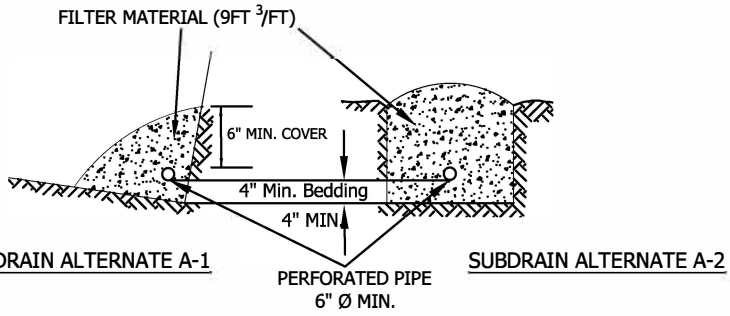


SUBDRAIN ALTERNATE A

PERFORATED PIPE SURROUNDED WITH FILTER MATERIAL

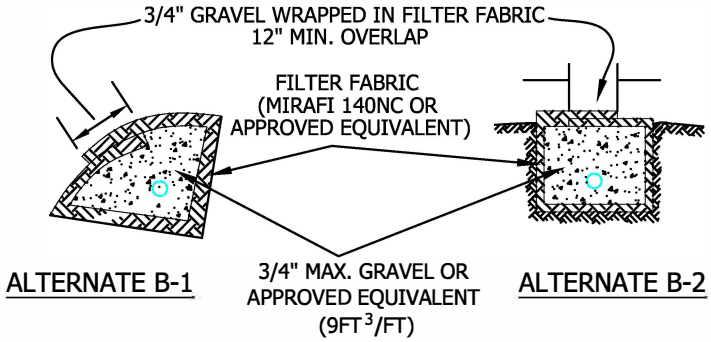


FILTER MATERIAL

FILTER MATERIAL SHALL BE CLASS 2 PERMEABLE MATERIAL PER STATE OF CALIFORNIA STANDARD SPECIFICATION, OR APPROVED ALTERNATE. CLASS 2 GRADING AS FOLLOWS:

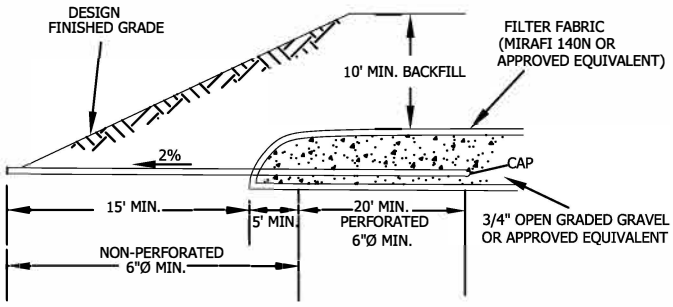
Sieve Size	Percent Passing
1"	100
3/4"	90-100
3/8"	40-100
No. 4	25-40
No. 8	18-33
No. 30	5-15
No. 50	0-7
No. 200	0-3

SUBDRAIN ALTERNATE B



○ PERFORATED PIPE IS OPTIONAL PER GOVERNING AGENCY'S REQUIREMENTS

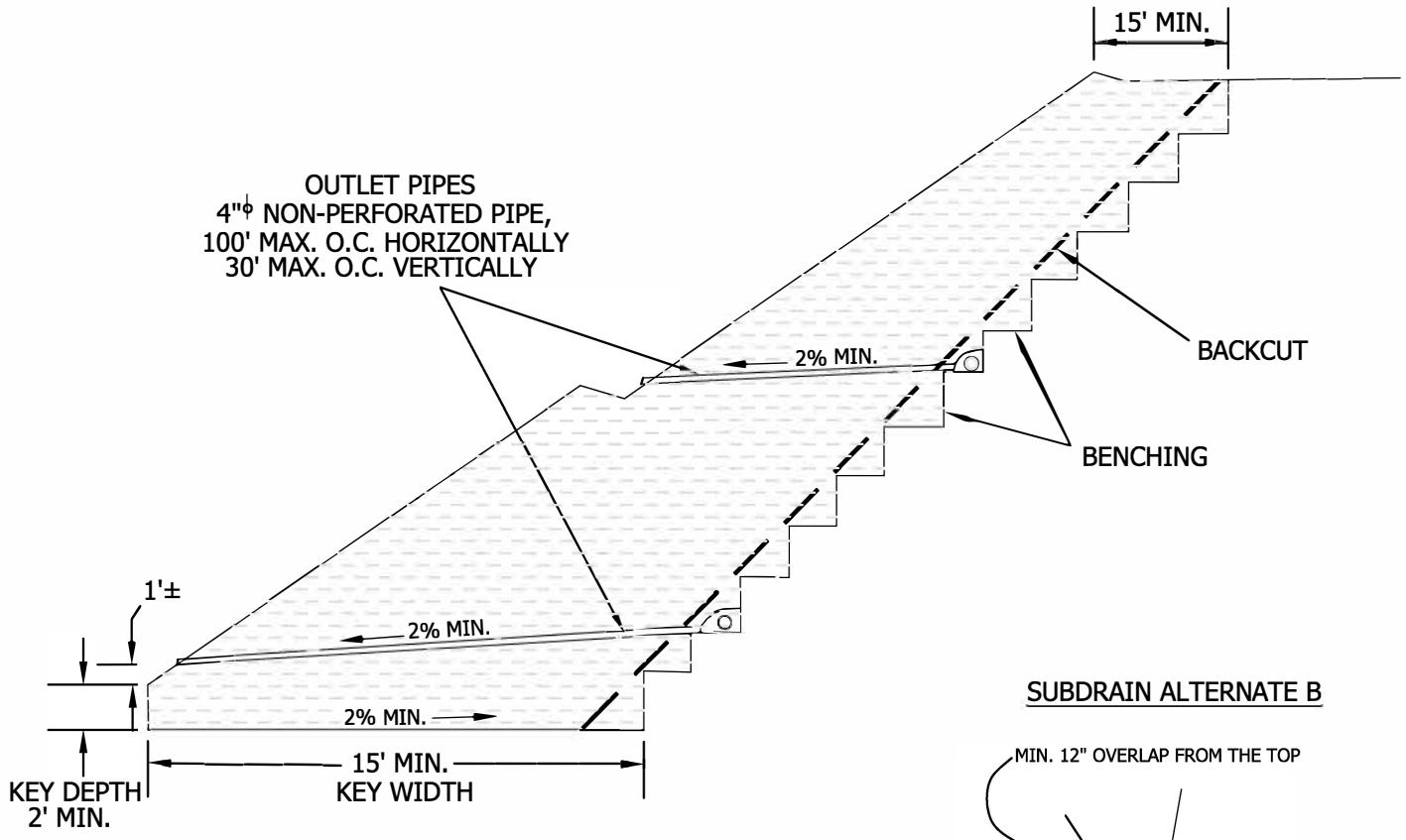
DETAIL OF CANYON SUBDRAIN TERMINAL



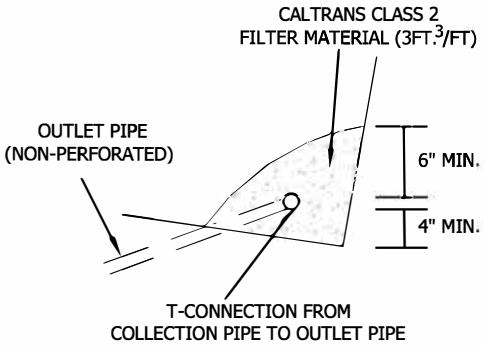
CANYON SUBDRAIN

GENERAL EARTHWORK AND GRADING SPECIFICATIONS STANDARD DETAILS C

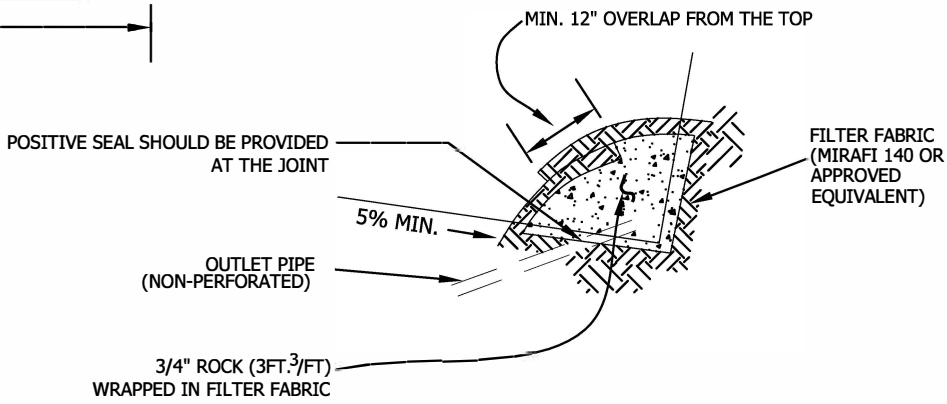
Leighton



SUBDRAIN ALTERNATE A



SUBDRAIN ALTERNATE B



- SUBDRAIN INSTALLATION - Subdrain collector pipe shall be installed with perforations down or, unless otherwise designated by the geotechnical consultant. Outlet pipes shall be non-perforated pipe. The subdrain pipe shall have at least 8 perforations uniformly spaced per foot. Perforation shall be 1/4" to 1/2" if drilled holes are used. All subdrain pipes shall have a gradient at least 2% towards the outlet.
- SUBDRAIN PIPE - Subdrain pipe shall be ASTM D2751, ASTM D1527 (Schedule 40) or SDR 23.5 ABS pipe or ASTM D3034 (Schedule 40) or SDR 23.5 PVC pipe.
- All outlet pipe shall be placed in a trench and, after fill is placed above it, rodded to verify integrity.

BUTTRESS OR REPLACEMENT FILL SUBDRAINS	GENERAL EARTHWORK AND GRADING SPECIFICATIONS STANDARD DETAILS D	Leighton

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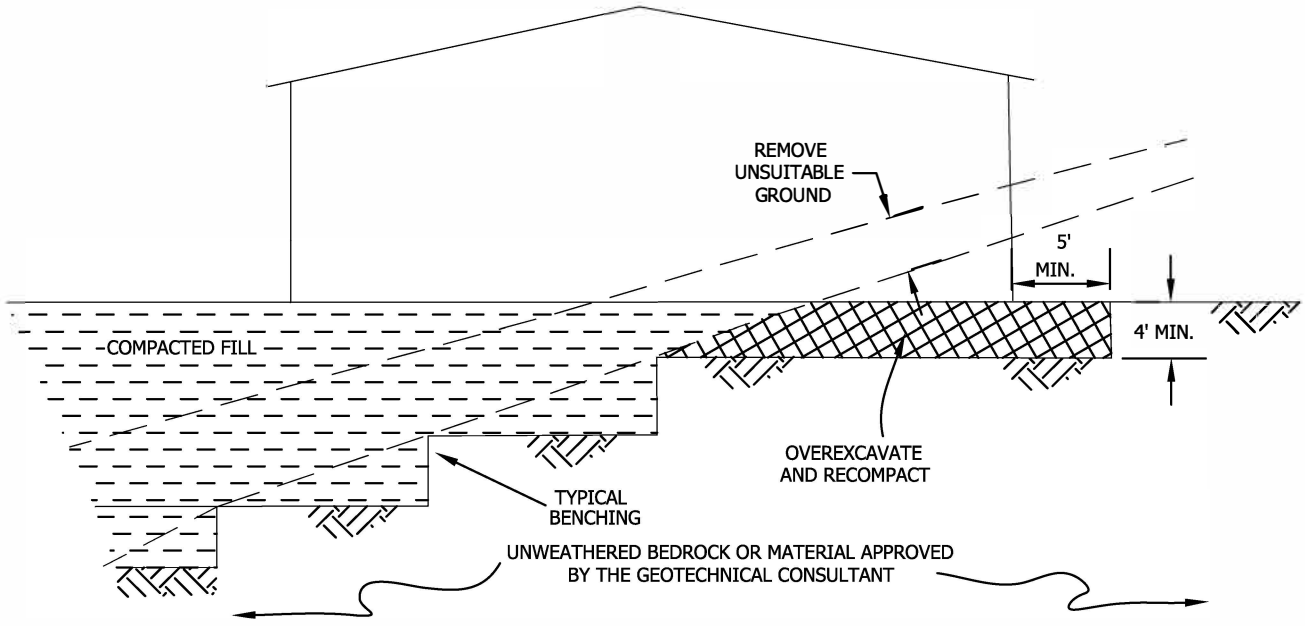
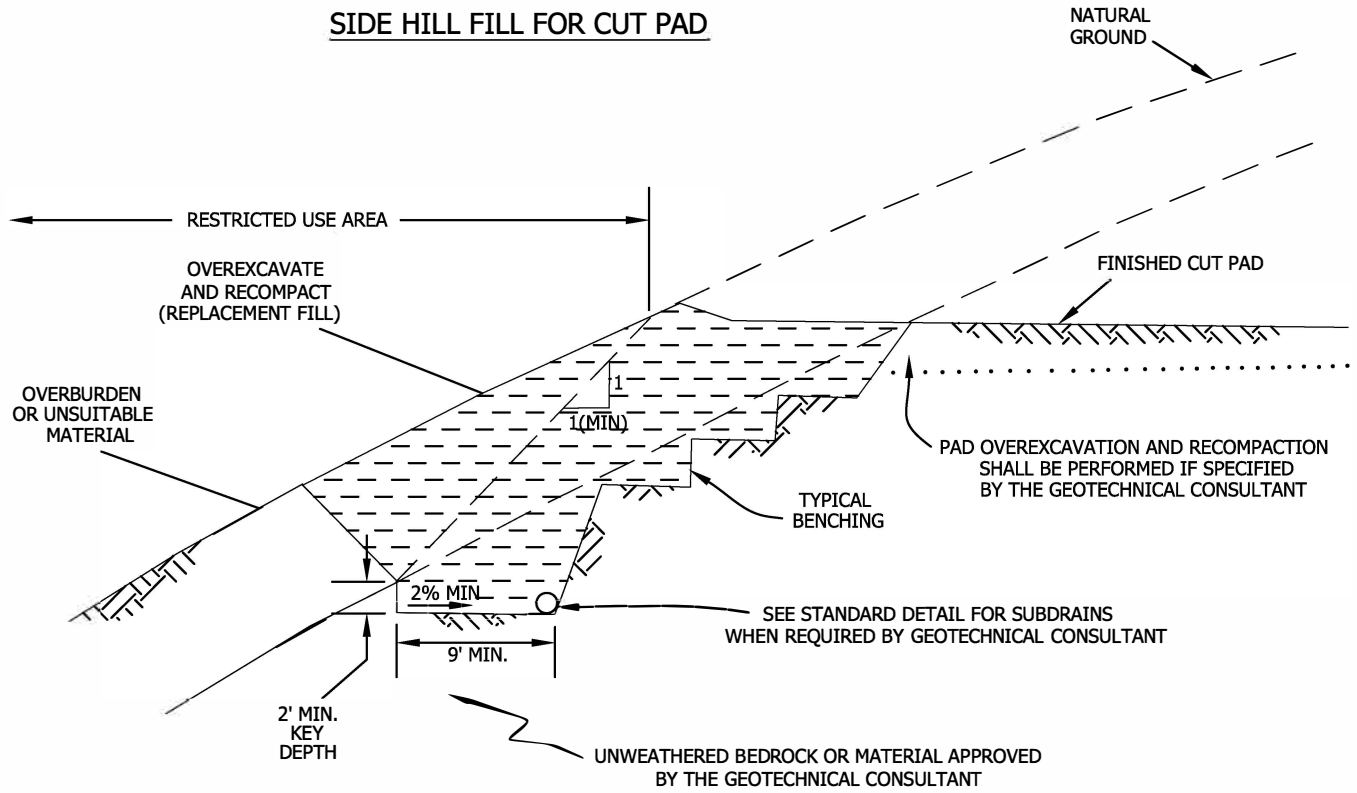
CUT-FILL TRANSITION LOT OVEREXCAVATION



SIDE HILL FILL FOR CUT PAD



TRANSITION LOT FILLS AND SIDE HILL FILLS

GENERAL EARTHWORK AND GRADING SPECIFICATIONS
STANDARD DETAILS E

Leighton

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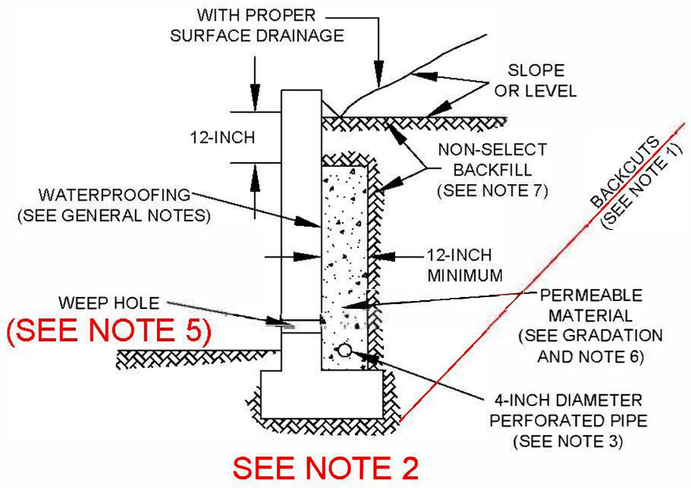
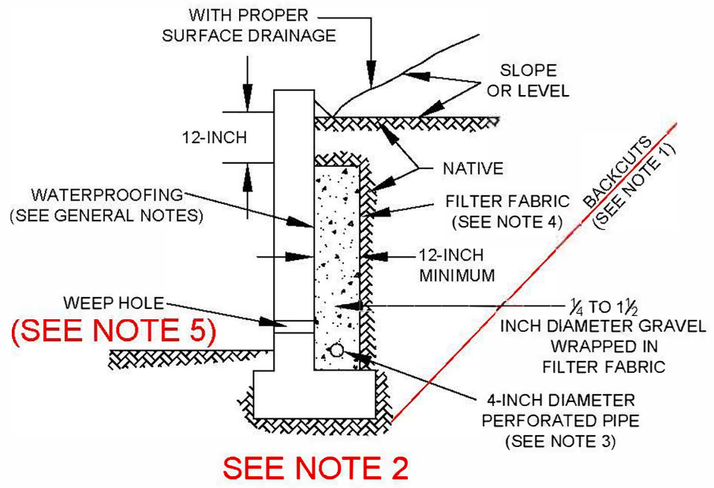
APPENDIX E

RETAINING WALL BACKFILL AND SUBDRAIN DETAIL



OR:



PERMEABLE MATERIAL GRADATION:

SIEVE SIZE	PERCENT PASSING
1-inch	100
3/4-inch	90-100
3/8-inch	40-100
No. 4	25-40
No. 8	18-33
No. 30	5-15
No. 50	0-7
No. 200	0-3

RETAINING WALL BACKFILL AND DRAINAGE NOTES:

- These are schematic sections, not to scale.
- Waterproofing should be provided where moisture passing through retaining walls is undesirable. Waterproofing is not observed nor inspected by Leighton Consulting, Inc.
- All subdrains should be installed with a drainage gradient of at least 1 percent.
- Outlet portion of subdrains should be solid pipe at least 4-inches in diameter, discharging into a suitable disposal area designed by the project Civil Engineer. Subdrain pipes should be accessible for maintenance (with cleanouts, etc.).

NUMBERED NOTES KEYED TO FIGURE:

1. **Backcuts**: Safe backcuts, in accordance with the current California Construction Safety Orders (Article 6) are required behind retaining walls to allow for Leighton Consulting, Inc. personnel to view drainage installation and to test backfill. Site safety is the responsibility of the Contractor.
2. **Foundation Bearing Surfaces**: Leighton Consulting, Inc. personnel should observe foundation bearing surfaces before reinforcing steel is placed.
3. **Perforated Pipes:** Perforated drainpipes should be either ASTM D 1527 Acrylonitrile Butadiene Styrene (ABS) or ASTM D 1785 Polyvinyl Chloride (PVC) Schedule 40 for backfill less than 15 feet deep and Schedule 80 for deeper backfill, or approved equivalent as promulgated by the project Civil Engineer. Pipe should be installed with perforations down. Perforations should be 3/8-inch diameter placed 120° radially in two-rows at 3-inch on center (staggered). Slotted pipe can be used when backfill over the pipe is less-than 15feet deep.
4. **Non-Woven Filter Fabric:** Filter fabric should be Mirafi 140NC or equivalent, conforming to Section 213-5 (Table 213-5.2 (A) 90N) of the Standard Specifications For Public Works Construction (Greenbook, 2015 Edition or more current).
5. **Weepholes:** Weephole should be at least 3-inches in diameter and spaced no more than 10-feet on-center horizontally, at the base of retaining walls where a perforated drainpipe with gravity discharge is not provided. If exposure is permitted, weepholes should be located 12 inches above finished grade. If exposure is not permitted such as for walls adjacent to sidewalks, then a pipe under the sidewalk discharged through the curb face, or equivalent, should be provided. For basements, watertight vaults and/or reservoir walls, a proper subdrain outlet system should be provided without weepholes.
6. **Permeable Material:** At least one cubic-foot of permeable material or crushed rock should be placed per each horizontal foot of wall. Crushed rock should be wrapped in filter fabric as discussed in Note 4 (Mirafi 140NC or equivalent), above.
7. **Backfill:** All retaining wall backfill soils should have an Expansion Index (EI) <50 and should be compacted to at least 90-percent of the ASTM D 1557 laboratory maximum density, with all backfill tested by Leighton Consulting, Inc.

Proj: 12622.002	Eng/Geol: JDH/GIM	**RETAINING WALL BACKFILL AND SUBDRAIN DETAIL**	Figure 2
Scale: NTS	Date: February, 2020	Tract 5989, Harvest at Limoneira Development City of Santa Paula, California	Leighton
Drafted By: MAM	Checked By:	V:\DRAFTING\t2622\0001\CAD\2019-12-02\t2622-001_F07_RW_2019-12-03.DWG (12-03-19 11:29:39AM) Plotted by: btran	

APPENDIX F

GBA IMPORTANT INFORMATION ABOUT THIS GEOTECHNICAL ENGINEERING REPORT

Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, you can benefit from a lowered exposure to problems associated with subsurface conditions at project sites and development of them that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed herein, contact your GBA-member geotechnical engineer. Active engagement in GBA exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Understand the Geotechnical-Engineering Services Provided for this Report

Geotechnical-engineering services typically include the planning, collection, interpretation, and analysis of exploratory data from widely spaced borings and/or test pits. Field data are combined with results from laboratory tests of soil and rock samples obtained from field exploration (if applicable), observations made during site reconnaissance, and historical information to form one or more models of the expected subsurface conditions beneath the site. Local geology and alterations of the site surface and subsurface by previous and proposed construction are also important considerations. Geotechnical engineers apply their engineering training, experience, and judgment to adapt the requirements of the prospective project to the subsurface model(s). Estimates are made of the subsurface conditions that will likely be exposed during construction as well as the expected performance of foundations and other structures being planned and/or affected by construction activities.

The culmination of these geotechnical-engineering services is typically a geotechnical-engineering report providing the data obtained, a discussion of the subsurface model(s), the engineering and geologic engineering assessments and analyses made, and the recommendations developed to satisfy the given requirements of the project. These reports may be titled investigations, explorations, studies, assessments, or evaluations. Regardless of the title used, the geotechnical-engineering report is an engineering interpretation of the subsurface conditions within the context of the project and does not represent a close examination, systematic inquiry, or thorough investigation of all site and subsurface conditions.

Geotechnical-Engineering Services are Performed for Specific Purposes, Persons, and Projects, and At Specific Times

Geotechnical engineers structure their services to meet the specific needs, goals, and risk management preferences of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client.

Likewise, geotechnical-engineering services are performed for a specific project and purpose. For example, it is unlikely that a geotechnical-engineering study for a refrigerated warehouse will be the same as one prepared for a parking garage; and a few borings drilled during a preliminary study to evaluate site feasibility will not be adequate to develop geotechnical design recommendations for the project.

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project or purpose;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, the reliability of a geotechnical-engineering report can be affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying the recommendations in it. A minor amount of additional testing or analysis after the passage of time – if any is required at all – could prevent major problems.

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read the report in its entirety. Do not rely on an executive summary. Do not read selective elements only. *Read and refer to the report in full.*

You Need to Inform Your Geotechnical Engineer About Change

Your geotechnical engineer considered unique, project-specific factors when developing the scope of study behind this report and developing the confirmation-dependent recommendations the report conveys. Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the elevation, configuration, location, orientation, function or weight of the proposed structure and the desired performance criteria;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project or site changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept*

responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface using various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing is performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgement to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team through project completion to obtain informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, they are not final, because the geotechnical engineer who developed them relied heavily on judgement and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* exposed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a continuing member of the design team, to:

- confer with other design-team members;
- help develop specifications;
- review pertinent elements of other design professionals' plans and specifications; and
- be available whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction-phase observations.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for information purposes only.* To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. This happens in part because soil and rock on project sites are typically heterogeneous and not manufactured materials with well-defined engineering properties like steel and concrete. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually provide environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures.* If you have not obtained your own environmental information about the project site, ask your geotechnical consultant for a recommendation on how to find environmental risk-management guidance.

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, the engineer's services were not designed, conducted, or intended to prevent migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, ***proper implementation of the geotechnical engineer's recommendations will not of itself be sufficient to prevent moisture infiltration. Confront the risk of moisture infiltration*** by including building-envelope or mold specialists on the design team. ***Geotechnical engineers are not building-envelope or mold specialists.***

GEOPROFESSIONAL BUSINESS ASSOCIATION

Telephone: 301/565-2733
e-mail: info@geoprofessional.org www.geoprofessional.org

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

Appendix 6: BMP Design Details

BMP Sizing, Design Details and other Supporting Documentation

DCV CALCULATIONS

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	PROACTIVE ENGINEERING CONSULTANTS	Date	4/5/2022
Designed by	SAM AGUILAR	Case No	
Company Project Number/Name	10.094		

BMP Identification

BMP NAME / ID: DMA A - EXTENDED DETENTION BASIN NO. 1

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}= 0.68 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)*
A-1	*1,225,051*	*Mixed Surface Types*	*0.65*	*0.45*	*550266.3*			
A-2	*84,971*	*Natural (B Soil)*	*0.15*	*0.14*	*12018.8*			
	1310022	*Total*			562285.1	0.68	*31862.8*	*45,166*

Notes:

65% Impervious has been assumed based on the Riverside County Flood Control % Water Conservation District Hydrology Manual. 65% imperviousness is based on condominium land use, which is a conservative approach for this preliminary study. See Impervious Cover Plate D-5.6 provided in this section.

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	PROACTIVE ENGINEERING CONSULTANTS	Date	4/5/2022
Designed by	SAM AGUILAR	Case No	
Company Project Number/Name	10.094		

BMP Identification

BMP NAME / ID: DMA B - EXTENDED DETENTION BASIN NO. 2

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}= 0.68 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)*
B-1	*788,606*	*Mixed Surface Types*	*0.65*	*0.45*	*354224.7*			
B-2	*82,850*	*Natural (B Soil)*	*0.15*	*0.14*	*11718.8*			
	871456	*Total*			365943.5	0.68	*20736.8*	*26171*

Notes:

65% Impervious has been assumed based on the Riverside County Flood Control % Water Conservation District Hydrology Manual. 65% imperviousness is based on condominium land use, which is a conservative approach for this preliminary study. See Impervious Cover Plate D-5.6 provided in this section.

ACTUAL IMPERVIOUS COVER

Land Use (1)	Range-Percent	Recommended Value For Average Conditions-Percent(2)
Natural or Agriculture	0 - 10	0
Single Family Residential: (3)		
40,000 S. F. (1 Acre) Lots	10 - 25	20
20,000 S. F. (½ Acre) Lots	30 - 45	40
7,200 - 10,000 S. F. Lots	45 - 55	50
Multiple Family Residential:		
Condominiums	45 - 70	65
Apartments	65 - 90	80
Mobile Home Park	60 - 85	75
Commercial, Downtown Business or Industrial	80 -100	90

Conservative assumption, since project is single family residential.

Notes:

1. Land use should be based on ultimate development of the watershed. Long range master plans for the County and incorporated cities should be reviewed to insure reasonable land use assumptions.

2. Recommended values are based on average conditions which may not apply to a particular study area. The percentage impervious may vary greatly even on comparable sized lots due to differences in dwelling size, improvements, etc. Landscape practices should also be considered as it is common in some areas to use ornamental gravels underlain by impervious plastic materials in place of lawns and shrubs. A field investigation of a study area should always be made, and a review of aerial photos, where available may assist in estimating the percentage of impervious cover in developed areas.

3. For typical horse ranch subdivisions increase impervious area 5 percent over the values recommended in the table above.

RCFC & WCD
HYDROLOGY MANUAL

IMPERVIOUS COVER FOR DEVELOPED AREAS

PLATE D-5.6

Effective Impervious Fraction

Developed Cover Types	Effective Impervious Fraction
Roofs	1.00
Concrete or Asphalt	1.00
Grouted or Gapless Paving Blocks	1.00
Compacted Soil (e.g. unpaved parking)	0.40
Decomposed Granite	0.40
Permeable Paving Blocks w/ Sand Filled Gap	0.25
Class 2 Base	0.30
Gravel or Class 2 Permeable Base	0.10
Pervious Concrete / Porous Asphalt	0.10
Open and Porous Pavers	0.10
Turf block	0.10
Ornamental Landscaping	0.10
Natural (A Soil)	0.03
Natural (B Soil)	0.15
Natural (C Soil)	0.30
Natural (D Soil)	0.40

Mixed Surface Types

Use this table to determine the effective impervious fraction for the V_{BMP} and Q_{BMP} calculation sheets

BMP SIZING CALCULATIONS

EXTENDED DETENTION BASIN NO. 1

Extended Detention Basin Design Procedure	BMP Subarea No.	Legend:	Required Entries / Calculated Cells

Company Name: | Date:

Designed by: | County/City Case No.:

Design Volume

Tributary Area (BMP Subarea) — A_T = 30.1 acres

Enter $V_{BMP,}$ determined from Section 2.1 of this Handbook — V_{BMP} = 31,863 ft^3

Basin Footprint

Overall Geometry

Length at Basin Bottom Surface — Length = 140 ft

Width at Basin Bottom Surface — Width = 59 ft

Meets 1.5 : 1 requirement? ✓

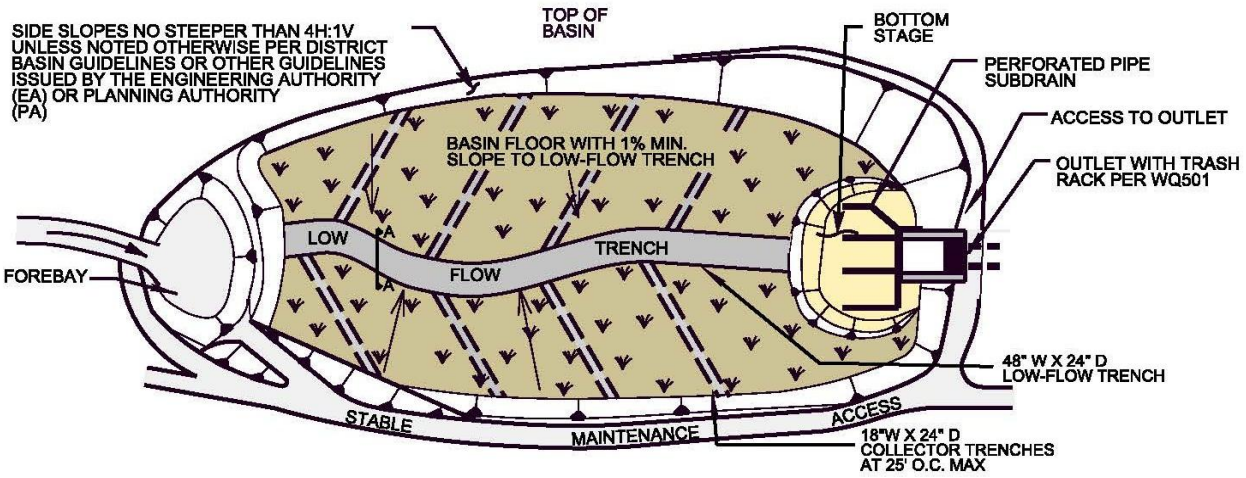
Side Slopes per "Basin Guidelines", Sect. 1.2 — z = 4 :1

Proposed Basin Depth (with no freeboard) — D_B = 5.00 ft

Depth of freeboard (if used) — D_{FB} = 0.00 ft

Minimum Required Allowance for Total Depth (including proposed basin depth, freeboard, minimum depth of bottom stage (D_{BS}=0.33') and minimum filter depth (D_{FD}=2.33')) — D_{REQ} = 7.7 ft

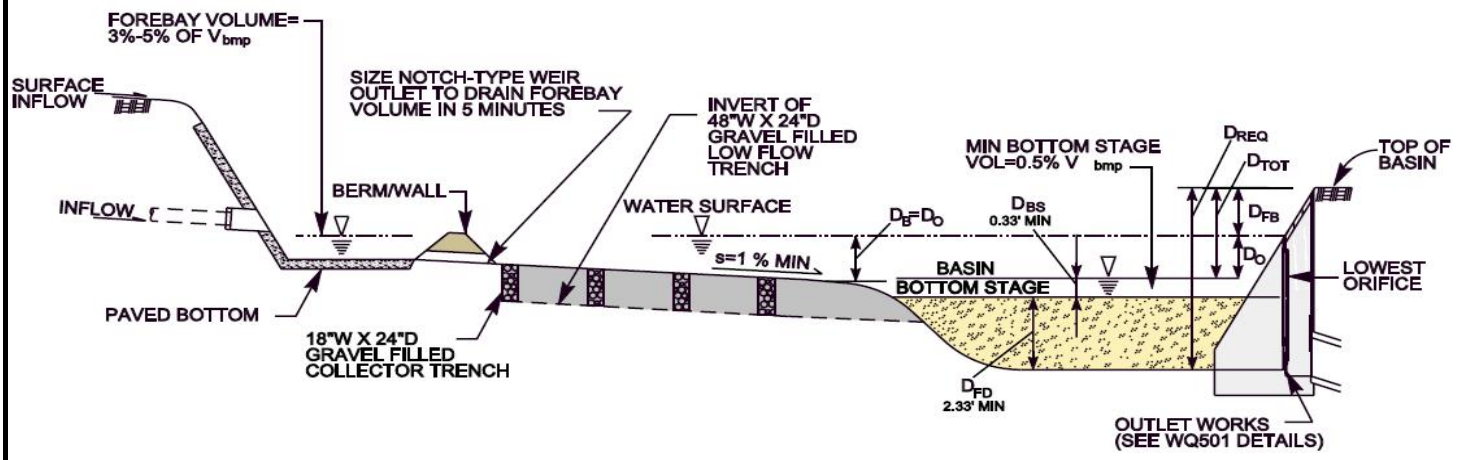
Depth from design water surface elevation to lowest orifice — D_O = 5.0 ft



Basin Design

Basin Design

Proposed Total Basin Depth (proposed depth plus freeboard)	D_{TOT} =	5.00	ft
Basin Invert Longitudinal Slope	Slope =	1.00	%
Basin Invert Transverse Slope (1% min)	Slope =	1	%
Basin Volume	V_{Basin} =	45166	ft^3



Forebay Design

Forebay Volume (3 - 5% V_{BMP})	V_{FB} =	956	ft^3
Forebay Depth (height of berm)	D_{FBY} =	0.67	ft
Minimum Forebay Surface Area	A_{FB} =	1427	ft^2
Rectangular weir (notch)	W =	2.00	in

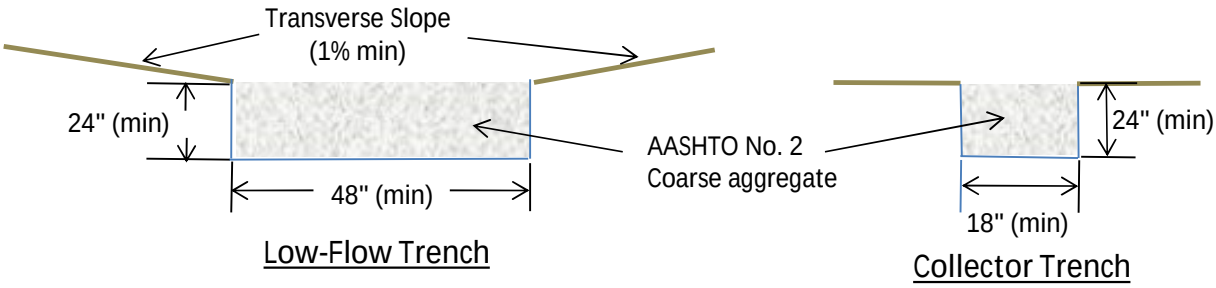
Dry Weather and Low-Flow Management

Low-Flow Trench (see graphic below)

Depth (24 inches minimum, gravel filled)	Depth =	24	inches
Width (48 inches minimum)	Width =	48	inches
Trench Invert Longitudinal Slope	Slope =	1	%

Collector Trenches (see graphic below)

Depth (24 inches minimum)	Depth =	24	inches
Width (18 inches minimum)	Width =	18	inches
Trench Invert Longitudinal Slope	Slope =	1	%
Spacing (25 feet on center maximum)	S =	25	feet



Low-Flow Trench

Collector Trench

Bottom Stage (Sand Filter) Design

Depth of the Bottom Stage (4" minimum ponding)	D_{BS} =	6	in
Surface Area of Bottom Stage	A_{BS} =	3500	ft^2
Dry Weather Ponded Volume (above sand layer)	V_{BS} =	1750	ft^3

Is V_{BS} no less than 0.5% V_{BMP}? OK

Depth of ASTM-C33 sand (18 inch minimum)

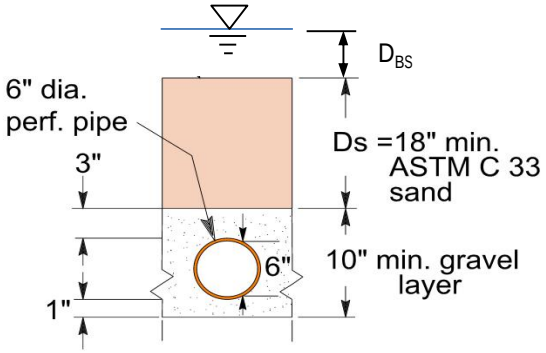
Ds = 18 inches

Diameter of Subdrains

ϕ = 6 in

Subdrain Spacing

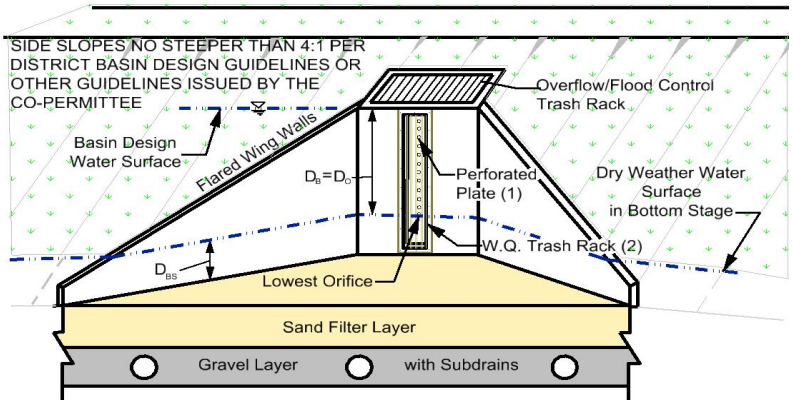
s = 10 ft. on center



Basin Outlet Design

Outlet Design

Assume an orifice area. Based on the information provided above, the spreadsheet provides discharge vs. stage data. Enter the volume vs. stage data for each interval. This information is used to route the volume through the basin. The size of the orifice is acceptable when the data shows that less than 50% of V_{BMP} has drained in 24 hours, and that 100% drawdown occurs within 72 hours.



Flow Rate, Q (cfs)

$$Q=CA[2g(H-H_o)]^{0.5}$$

Discharge Coefficient,

Default, C = 0.66

Other, C = 0.66

Orifice Area (ft^2)

Orifice Diameter, d; number of orifices per row, n; and number of orifice rows, N (from the bottom up).

d = 1.9 inches

n = 1 per row

N = 1 rows

Aeff = 0.020 ft^2 per row

or

Aeff = 2.834 in^2 per row

From outflow hydrograph, the time where 50% of V_{BMP} has drained from the basin (24 hour minimum):

Time (50%) = 24.57 hrs

OK

From outflow hydrograph, the time where 100% V_{BMP} has drained from the basin(within 72 hours):

Time (100 %) = 65.61 hrs

OK

Headwater Elev. / Stage (ft)	Discharge (cfs)	Volume (acre-ft)	Δt (hrs.)
0	0.0000	0.0000	
0.33	0.0601	0.019	7.64
0.67	0.0851	0.040	3.50
1.00	0.1042	0.061	2.68
1.33	0.1203	0.124	6.79
1.67	0.1346	0.190	6.27
2.00	0.1474	0.259	5.92
2.33	0.1592	0.331	5.68
2.67	0.1702	0.407	5.58
3.00	0.1805	0.486	5.45
3.33	0.1903	0.569	5.42
3.67	0.1996	0.655	5.34
4.00	0.2085	0.745	5.34
4.33	*0.2170*	*0.839*	
4.67	*0.2252*	*0.936*	
5.00	*0.2331*	*1.037*	
5.33			
5.67			
6.00			
6.33			
6.67			
7.00			
7.33			
7.67			
8.00			
8.33			
8.67			
9.00			
9.33			
9.67			
10.00			
		∑ =	65.61

Notes:

EXTENDED DETENTION BASIN NO. 2

Extended Detention Basin Design Procedure	BMP Subarea No.	Legend:	Required Entries / Calculated Cells

Company Name: Proactive Engineering Consultants — Date: 8/29/2022

Designed by: SA — County/City Case No.:

Design Volume

Tributary Area (BMP Subarea) — A_T = 20 acres

Enter $V_{BMP,}$ determined from Section 2.1 of this Handbook — V_{BMP} = 20,737 ft^3

Basin Footprint

Overall Geometry

Length at Basin Bottom Surface — Length = 101 ft

Width at Basin Bottom Surface — Width = 52 ft

Meets 1.5 : 1 requirement? ✓

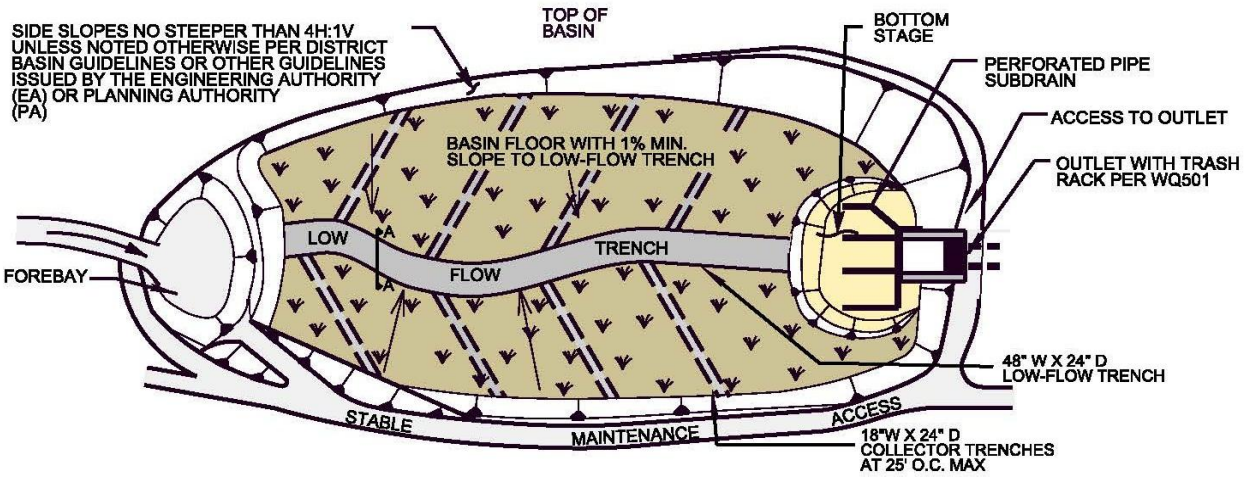
Side Slopes per "Basin Guidelines", Sect. 1.2 — z = 4 :1

Proposed Basin Depth (with no freeboard) — D_B = 4.00 ft

Depth of freeboard (if used) — D_{FB} = 0.00 ft

Minimum Required Allowance for Total Depth (including proposed basin depth, freeboard, minimum depth of bottom stage (D_{BS}=0.33') and minimum filter depth (D_{FD}=2.33')) — D_{REQ} = 6.7 ft

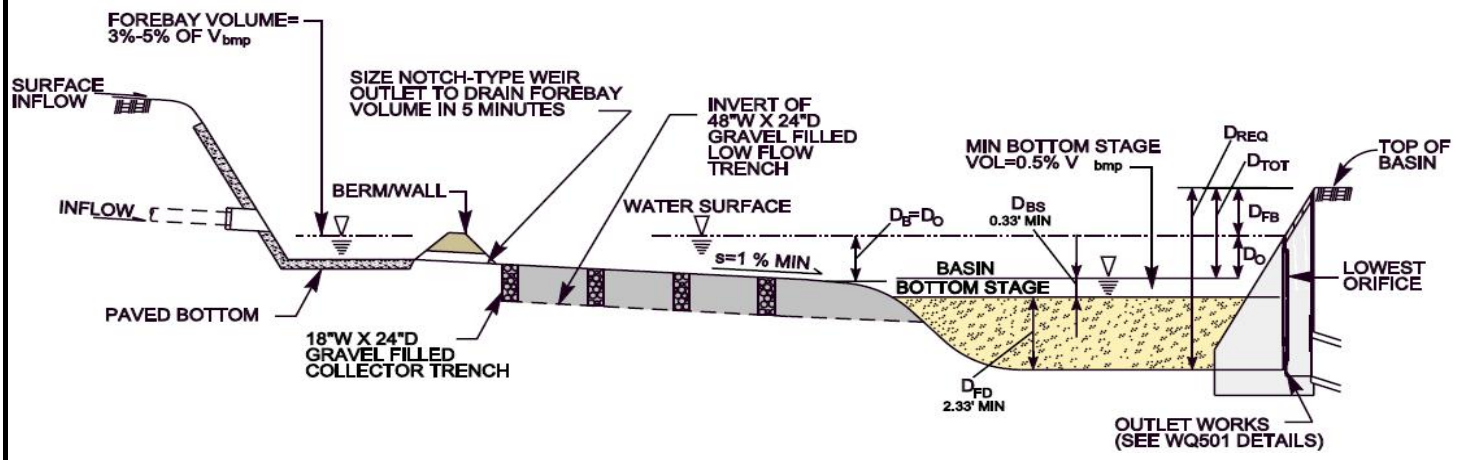
Depth from design water surface elevation to lowest orifice — D_O = 4.0 ft



Basin Design

Basin Design

Proposed Total Basin Depth (proposed depth plus freeboard)	D_{TOT} =	4.00	ft
Basin Invert Longitudinal Slope	Slope =	1.00	%
Basin Invert Transverse Slope (1% min)	Slope =	1	%
Basin Volume	V_{Basin} =	26171	ft^3



Forebay Design

Forebay Volume (3 - 5% V_{BMP})	V_{FB} =	623	ft^3
Forebay Depth (height of berm)	D_{FBY} =	0.67	ft
Minimum Forebay Surface Area	A_{FB} =	930	ft^2
Rectangular weir (notch)	W =	2.00	in

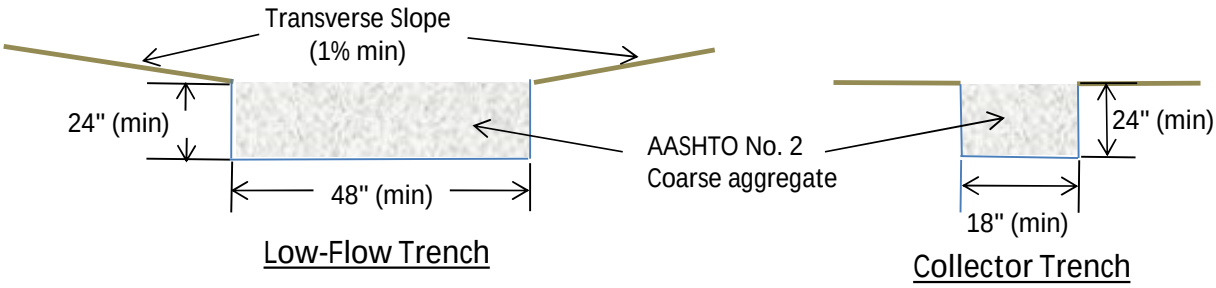
Dry Weather and Low-Flow Management

Low-Flow Trench (see graphic below)

Depth (24 inches minimum, gravel filled)	Depth =	24	inches
Width (48 inches minimum)	Width =	48	inches
Trench Invert Longitudinal Slope	Slope =	1	%

Collector Trenches (see graphic below)

Depth (24 inches minimum)	Depth =	24	inches
Width (18 inches minimum)	Width =	18	inches
Trench Invert Longitudinal Slope	Slope =	1	%
Spacing (25 feet on center maximum)	S =	25	feet



Low-Flow Trench

Collector Trench

Bottom Stage (Sand Filter) Design

Depth of the Bottom Stage (4" minimum ponding)	D_{BS} =	6	in
Surface Area of Bottom Stage	A_{BS} =	795	ft^2
Dry Weather Ponded Volume (above sand layer)	V_{BS} =	398	ft^3

Is V_{BS} no less than 0.5% V_{BMP}? OK

Depth of ASTM-C33 sand (18 inch minimum)

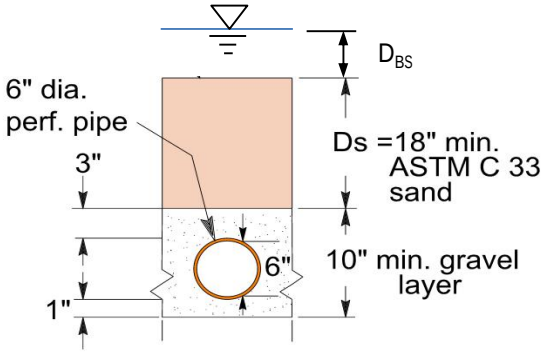
Ds = 18 inches

Diameter of Subdrains

ϕ = 6 in

Subdrain Spacing

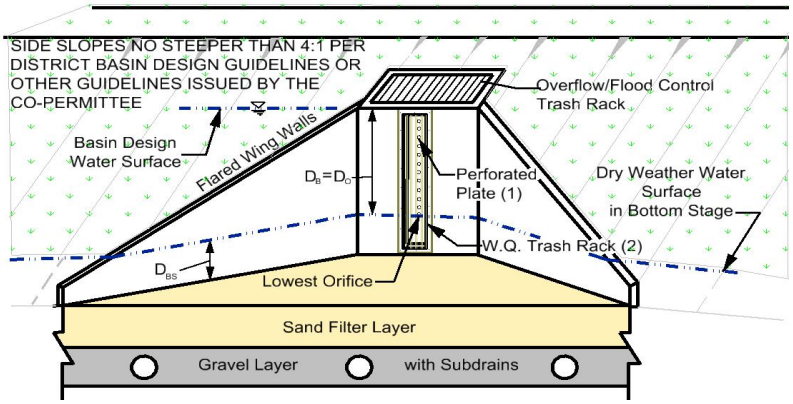
s = 10 ft. on center



Basin Outlet Design

Outlet Design

Assume an orifice area. Based on the information provided above, the spreadsheet provides discharge vs. stage data. Enter the volume vs. stage data for each interval. This information is used to route the volume through the basin. The size of the orifice is acceptable when the data shows that less than 50% of V_{BMP} has drained in 24 hours, and that 100% drawdown occurs within 72 hours.



Flow Rate, Q (cfs)

$$Q=CA[2g(H-H_o)]^{0.5}$$

Discharge Coefficient,

Default, C = 0.66

Other, C = 0.66

Orifice Area (ft^2)

Orifice Diameter, d; number of orifices per row, n; and number of orifice rows, N (from the bottom up).

d = 1.6 inches

n = 1 per row

N = 1 rows

Aeff = 0.014 ft^2 per row

or

Aeff = 2.010 in^2 per row

From outflow hydrograph, the time where 50% of V_{BMP} has drained from the basin (24 hour minimum):

Time (50%) = 27.80 hrs

OK

From outflow hydrograph, the time where 100% V_{BMP} has drained from the basin(within 72 hours):

Time (100 %) = 68.01 hrs

OK

Headwater Elev. / Stage (ft)	Discharge (cfs)	Volume (acre-ft)	Δt (hrs.)
0	0.0000	0.0000	
0.33	0.0427	0.015	8.51
0.67	0.0604	0.031	3.76
1.00	0.0739	0.048	3.06
1.33	0.0853	0.097	7.45
1.67	0.0954	0.150	7.10
2.00	0.1045	0.205	6.66
2.33	0.1129	0.263	6.46
2.67	0.1207	0.324	6.32
3.00	0.1280	0.389	6.32
3.33	0.1349	0.456	6.17
3.67	0.1415	0.527	6.21
4.00	*0.1478*	*0.601*	
4.33			
4.67			
5.00			
5.33			
5.67			
6.00			
6.33			
6.67			
7.00			
7.33			
7.67			
8.00			
8.33			
8.67			
9.00			
9.33			
9.67			
10.00			
		∑ =	68.01

Notes:

ISOHYETAL MAP

R 07 W | R 06 W | R 05 W | R 04 W | R 03 W | R 02 W | R 01 W | R 01 E | R 02 E | R 03 E | R 04 E | R 05 E

T 01 S
T 02 S
T 03 S
T 04 S
T 05 S
T 06 S
T 07 S
T 08 S

06	05	04	03	02	01
07	08	09	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

0.85 MiraLoma
0.61 RiversideNorth
0.54 RiversideSouth
0.68 PigeonPass
0.66 MorenoEast
0.85 Beaumont
0.88 PradoDam
0.51 Woodcrest
0.50 LakeMathews
0.68 PerrisReservoir
PROJECT LOCATION 0.68
0.87 VistaGrandeGS
0.70 SanJacintoNWS
1.18 Idyllwild
0.58 SunCity
0.68 Winchester
0.70 ElsinoreNWS
1.11 ElCarisoStation
0.90 HurkeyCreek
0.77 WildomarLaCresta
0.52 SkinnerLake
0.65 Anza
0.77 SantaRosaPlateau
1.00 TemeculaNWS
0.64 AguangaValley

Santa Ana River Watershed
Santa Margarita Watershed

JURUPA VALLEY | EASTVALE | NORCO | CORONA | RIVERSIDE | MORENO VALLEY | CALIMESA | BEAUMONT | SAN JACINTO | PERRIS | HEMET | CANYON LAKE | LAKE ELSINORE | MENIFEE | WILDOMAR | MURRIETA | TEMECULA

N

Rain Gage Locations

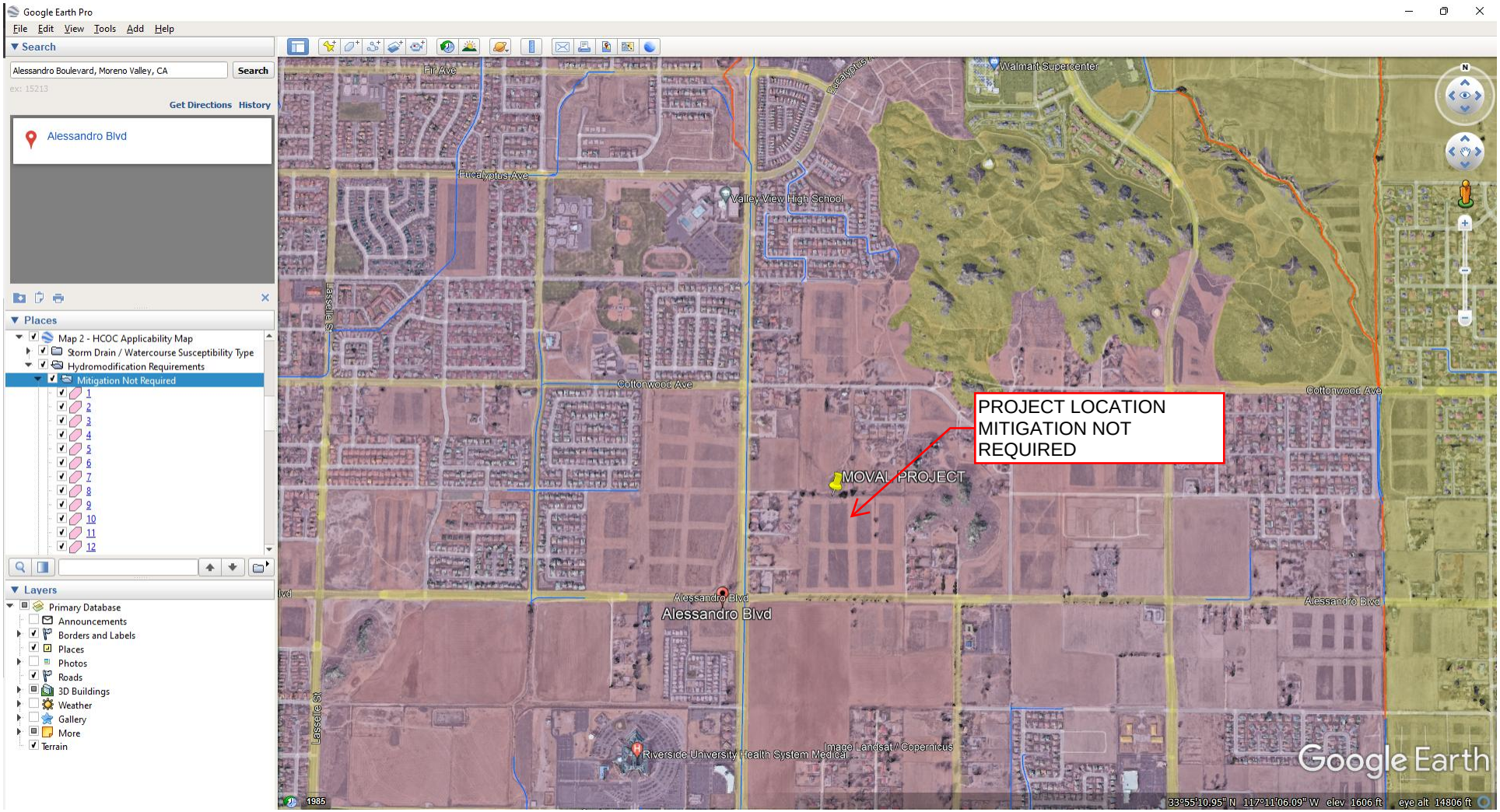
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

Isohyetal Map for the 85th Percentile 24 hour Storm Event

July 2011

Appendix 7: Hydromodification

Supporting Detail Relating to Hydrologic Conditions of Concern


Google Earth Pro
File Edit View Tools Add Help
Search
Alessandro Boulevard, Moreno Valley, CA
Search
Get Directions History
Alessandro Blvd
Places
Map 2 - HCOC Applicability Map
Storm Drain / Watercourse Susceptibility Type
Hydromodification Requirements
Mitigation Not Required
1
2
3
4
5
6
7
8
9
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Layers
Primary Database
Announcements
Borders and Labels
Places
Photos
Roads
3D Buildings
Weather
Gallery
More
Terrain
Fir Ave
Eucalyptus Ave
Walmart Supercenter
Valley View High School
Cottonwood Ave
PROJECT LOCATION
MITIGATION NOT
REQUIRED
MOVAL PROJECT
Alessandro Blvd
Riverside University Health System Medical ...
Image Landsat / Copernicus
Google Earth
1985
33°55'10.95" N 117°11'06.09" W elev 1606 ft eye alt 14806 ft

Appendix 8: Source Control

Pollutant Sources/Source Control Checklist

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

How to use this worksheet (also see instructions in Section G of the WQMP Template):

1. Review Column 1 and identify which of these potential sources of stormwater pollutants apply to your site. Check each box that applies.
2. Review Column 2 and incorporate all of the corresponding applicable BMPs in your WQMP Exhibit.
3. Review Columns 3 and 4 and incorporate all of the corresponding applicable permanent controls and operational BMPs in your WQMP. Use the format shown in Table G.1on page 23 of this WQMP Template. Describe your specific BMPs in an accompanying narrative, and explain any special conditions or situations that required omitting BMPs or substituting alternative BMPs for those shown here.

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	**... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE**		
1 **Potential Sources of Runoff Pollutants**	**2** **Permanent Controls—Show on WQMP Drawings**	**3** **Permanent Controls—List in WQMP Table and Narrative**	**4** **Operational BMPs—Include in WQMP Table and Narrative**
☒ **A.** On-site storm drain inlets	☒ Locations of inlets.	☒ Mark all inlets with the words "Only Rain Down the Storm Drain" or similar. Catch Basin Markers may be available from the Riverside County Flood Control and Water Conservation District, call 951.955.1200 to verify.	☒ Maintain and periodically repaint or replace inlet markings. ☒ Provide stormwater pollution prevention information to new site owners, lessees, or operators. ☐ See applicable operational BMPs in Fact Sheet SC-44, "Drainage System Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com ☒ Include the following in lease agreements: "Tenant shall not allow anyone to discharge anything to storm drains or to store or deposit materials so as to create a potential discharge to storm drains."
☐ **B.** Interior floor drains and elevator shaft sump pumps		☐ State that interior floor drains and elevator shaft sump pumps will be plumbed to sanitary sewer.	☐ Inspect and maintain drains to prevent blockages and overflow.
☐ **C.** Interior parking garages		☐ State that parking garage floor drains will be plumbed to the sanitary sewer.	☐ Inspect and maintain drains to prevent blockages and overflow.

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 **Potential Sources of Runoff Pollutants**	**2** **Permanent Controls—Show on WQMP Drawings**	**3** **Permanent Controls—List in WQMP Table and Narrative**	**4** **Operational BMPs—Include in WQMP Table and Narrative**
☐ **D1.** Need for future indoor & structural pest control		☐ Note building design features that discourage entry of pests.	☐ Provide Integrated Pest Management information to owners, lessees, and operators.
X **D2.** Landscape/ Outdoor Pesticide Use	☐ Show locations of native trees or areas of shrubs and ground cover to be undisturbed and retained. X Show self-retaining landscape areas, if any. ☐ Show stormwater treatment and hydrograph modification management BMPs. (See instructions in Chapter 3, Step 5 and guidance in Chapter 5.)	State that final landscape plans will accomplish all of the following. ☐ Preserve existing native trees, shrubs, and ground cover to the maximum extent possible. X Design landscaping to minimize irrigation and runoff, to promote surface infiltration where appropriate, and to minimize the use of fertilizers and pesticides that can contribute to stormwater pollution. ☐ Where landscaped areas are used to retain or detain stormwater, specify plants that are tolerant of saturated soil conditions. X 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.	X Maintain landscaping using minimum or no pesticides. ☐ See applicable operational BMPs in "What you should know for…..Landscape and Gardening" at http://rcflood.org/stormwater/Error! Hyperlink reference not valid. X Provide IPM information to new owners, lessees and operators.

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 **Potential Sources of Runoff Pollutants**	**2** **Permanent Controls—Show on WQMP Drawings**	**3** **Permanent Controls—List in WQMP Table and Narrative**	**4** **Operational BMPs—Include in WQMP Table and Narrative**
☒ **E.** Pools, spas, ponds, decorative fountains, and other water features.	☐ Show location of water feature and a sanitary sewer cleanout in an accessible area within 10 feet. (Exception: Public pools must be plumbed according to County Department of Environmental Health Guidelines.)	If the Co-Permittee requires pools to be plumbed to the sanitary sewer, place a note on the plans and state in the narrative that this connection will be made according to local requirements.	☐ See applicable operational BMPs in "Guidelines for Maintaining Your Swimming Pool, Jacuzzi and Garden Fountain" at http://rcflood.org/stormwater/
☐ **F.** Food service	☐ For restaurants, grocery stores, and other food service operations, show location (indoors or in a covered area outdoors) of a floor sink or other area for cleaning floor mats, containers, and equipment. ☐ On the drawing, show a note that this drain will be connected to a grease interceptor before discharging to the sanitary sewer.	☐ Describe the location and features of the designated cleaning area. ☐ Describe the items to be cleaned in this facility and how it has been sized to insure that the largest items can be accommodated.	☐ See the brochure, "The Food Service Industry Best Management Practices for: Restaurants, Grocery Stores, Delicatessens and Bakeries" at http://rcflood.org/stormwater/ Provide this brochure to new site owners, lessees, and operators.
☐ **G.** Refuse areas	☐ Show where site refuse and recycled materials will be handled and stored for pickup. See local municipal requirements for sizes and other details of refuse areas. ☐ If dumpsters or other receptacles are outdoors, show how the designated area will be covered, graded, and paved to prevent run-on and show locations of berms to prevent runoff from the area. ☐ Any drains from dumpsters, compactors, and tallow bin areas shall be connected to a grease removal device before discharge to sanitary sewer.	☐ State how site refuse will be handled and provide supporting detail to what is shown on plans. ☐ State that signs will be posted on or near dumpsters with the words "Do not dump hazardous materials here" or similar.	☐ State how the following will be implemented: Provide adequate number of receptacles. Inspect receptacles regularly; repair or replace leaky receptacles. Keep receptacles covered. Prohibit/prevent dumping of liquid or hazardous wastes. Post "no hazardous materials" signs. Inspect and pick up litter daily and clean up spills immediately. Keep spill control materials available on-site. See Fact Sheet SC-34, "Waste Handling and Disposal" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 **Potential Sources of Runoff Pollutants**	**2** **Permanent Controls—Show on WQMP Drawings**	**3** **Permanent Controls—List in WQMP Table and Narrative**	**4** **Operational BMPs—Include in WQMP Table and Narrative**
❑ **H.** Industrial processes.	❑ Show process area.	❑ If industrial processes are to be located on site, state: "All process activities to be performed indoors. No processes to drain to exterior or to storm drain system."	❑ See Fact Sheet SC-10, "Non-Stormwater Discharges" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com See the brochure "Industrial & Commercial Facilities Best Management Practices for: Industrial, Commercial Facilities" at http://rcflood.org/stormwater/

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 **Potential Sources of Runoff Pollutants**	**2** **Permanent Controls—Show on WQMP Drawings**	**3** **Permanent Controls—List in WQMP Table and Narrative**	**4** **Operational BMPs—Include in WQMP Table and Narrative**
❑ **I.** Outdoor storage of equipment or materials. (See rows J and K for source control measures for vehicle cleaning, repair, and maintenance.)	❑ Show any outdoor storage areas, including how materials will be covered. Show how areas will be graded and bermed to prevent run-on or run-off from area. ❑ Storage of non-hazardous liquids shall be covered by a roof and/or drain to the sanitary sewer system, and be contained by berms, dikes, liners, or vaults. ❑ Storage of hazardous materials and wastes must be in compliance with the local hazardous materials ordinance and a Hazardous Materials Management Plan for the site.	Include a detailed description of materials to be stored, storage areas, and structural features to prevent pollutants from entering storm drains. Where appropriate, reference documentation of compliance with the requirements of Hazardous Materials Programs for: ▪ Hazardous Waste Generation ▪ Hazardous Materials Release Response and Inventory ▪ California Accidental Release (CalARP) ▪ Aboveground Storage Tank ▪ Uniform Fire Code Article 80 Section 103(b) & (c) 1991 ▪ Underground Storage Tank www.cchealth.org/groups/hazmat/	❑ See the Fact Sheets SC-31, "Outdoor Liquid Container Storage" and SC-33, "Outdoor Storage of Raw Materials " in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 **Potential Sources of Runoff Pollutants**	**2** **Permanent Controls—Show on WQMP Drawings**	**3** **Permanent Controls—List in WQMP Table and Narrative**	**4** **Operational BMPs—Include in WQMP Table and Narrative**
❑ **J.** Vehicle and Equipment Cleaning	❑ Show on drawings as appropriate: (1) Commercial/industrial facilities having vehicle/equipment cleaning needs shall either provide a covered, bermed area for washing activities or discourage vehicle/equipment washing by removing hose bibs and installing signs prohibiting such uses. (2) Multi-dwelling complexes shall have a paved, bermed, and covered car wash area (unless car washing is prohibited on-site and hoses are provided with an automatic shut-off to discourage such use). (3) Washing areas for cars, vehicles, and equipment shall be paved, designed to prevent run-on to or runoff from the area, and plumbed to drain to the sanitary sewer. (4) Commercial car wash facilities shall be designed such that no runoff from the facility is discharged to the storm drain system. Wastewater from the facility shall discharge to the sanitary sewer, or a wastewater reclamation system shall be installed.	❑ If a car wash area is not provided, describe any measures taken to discourage on-site car washing and explain how these will be enforced.	Describe operational measures to implement the following (if applicable): ❑ Washwater from vehicle and equipment washing operations shall not be discharged to the storm drain system. Refer to "Outdoor Cleaning Activities and Professional Mobile Service Providers" for many of the Potential Sources of Runoff Pollutants categories below. Brochure can be found at http://rcflood.org/stormwater/ ❑Car dealerships and similar may rinse cars with water only.

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 **Potential Sources of Runoff Pollutants**	**2** **Permanent Controls—Show on WQMP Drawings**	**3** **Permanent Controls—List in WQMP Table and Narrative**	**4** **Operational BMPs—Include in WQMP Table and Narrative**
❑ **K.** Vehicle/Equipment Repair and Maintenance	❑ Accommodate all vehicle equipment repair and maintenance indoors. Or designate an outdoor work area and design the area to prevent run-on and runoff of stormwater. ❑ Show secondary containment for exterior work areas where motor oil, brake fluid, gasoline, diesel fuel, radiator fluid, acid-containing batteries or other hazardous materials or hazardous wastes are used or stored. Drains shall not be installed within the secondary containment areas. ❑ Add a note on the plans that states either (1) there are no floor drains, or (2) floor drains are connected to wastewater pretreatment systems prior to discharge to the sanitary sewer and an industrial waste discharge permit will be obtained.	❑ State that no vehicle repair or maintenance will be done outdoors, or else describe the required features of the outdoor work area. ❑ State that there are no floor drains or if there are floor drains, note the agency from which an industrial waste discharge permit will be obtained and that the design meets that agency's requirements. ❑ State that there are no tanks, containers or sinks to be used for parts cleaning or rinsing or, if there are, note the agency from which an industrial waste discharge permit will be obtained and that the design meets that agency's requirements.	In the Stormwater Control Plan, note that all of the following restrictions apply to use the site: ❑ No person shall dispose of, nor permit the disposal, directly or indirectly of vehicle fluids, hazardous materials, or rinsewater from parts cleaning into storm drains. ❑ No vehicle fluid removal shall be performed outside a building, nor on asphalt or ground surfaces, whether inside or outside a building, except in such a manner as to ensure that any spilled fluid will be in an area of secondary containment. Leaking vehicle fluids shall be contained or drained from the vehicle immediately. ❑ No person shall leave unattended drip parts or other open containers containing vehicle fluid, unless such containers are in use or in an area of secondary containment. Refer to "Automotive Maintenance & Car Care Best Management Practices for Auto Body Shops, Auto Repair Shops, Car Dealerships, Gas Stations and Fleet Service Operations". Brochure can be found at http://rcflood.org/stormwater/ Refer to Outdoor Cleaning Activities and Professional Mobile Service Providers for many of the Potential Sources of Runoff Pollutants categories below. Brochure can be found at http://rcflood.org/stormwater/

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 **Potential Sources of Runoff Pollutants**	2 **Permanent Controls—Show on WQMP Drawings**	3 **Permanent Controls—List in WQMP Table and Narrative**	4 **Operational BMPs—Include in WQMP Table and Narrative**
❑ **L.** Fuel Dispensing Areas	❑ Fueling areas[6] shall have impermeable floors (i.e., portland cement concrete or equivalent smooth impervious surface) that are: a) graded at the minimum slope necessary to prevent ponding; and b) separated from the rest of the site by a grade break that prevents run-on of stormwater to the maximum extent practicable. ❑ Fueling areas shall be covered by a canopy that extends a minimum of ten feet in each direction from each pump. [Alternative: The fueling area must be covered and the cover's minimum dimensions must be equal to or greater than the area within the grade break or fuel dispensing area[1].] The canopy [or cover] shall not drain onto the fueling area.		❑ The property owner shall dry sweep the fueling area routinely. ❑ See the Fact Sheet SD-30 , "Fueling Areas" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com

[6] The fueling area shall be defined as the area extending a minimum of 6.5 feet from the corner of each fuel dispenser or the length at which the hose and nozzle assembly may be operated plus a minimum of one foot, whichever is greater.

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 **Potential Sources of Runoff Pollutants**	**2** **Permanent Controls—Show on WQMP Drawings**	**3** **Permanent Controls—List in WQMP Table and Narrative**	**4** **Operational BMPs—Include in WQMP Table and Narrative**
❑ **M.** Loading Docks	❑ Show a preliminary design for the loading dock area, including roofing and drainage. Loading docks shall be covered and/or graded to minimize run-on to and runoff from the loading area. Roof downspouts shall be positioned to direct stormwater away from the loading area. Water from loading dock areas shall be drained to the sanitary sewer, or diverted and collected for ultimate discharge to the sanitary sewer. ❑ Loading dock areas draining directly to the sanitary sewer shall be equipped with a spill control valve or equivalent device, which shall be kept closed during periods of operation. ❑ Provide a roof overhang over the loading area or install door skirts (cowling) at each bay that enclose the end of the trailer.		❑ Move loaded and unloaded items indoors as soon as possible. ❑ See Fact Sheet SC-30, "Outdoor Loading and Unloading," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 **Potential Sources of Runoff Pollutants**	**2** **Permanent Controls—Show on WQMP Drawings**	**3** **Permanent Controls—List in WQMP Table and Narrative**	**4** **Operational BMPs—Include in WQMP Table and Narrative**
☐ **N.** Fire Sprinkler Test Water		☐ Provide a means to drain fire sprinkler test water to the sanitary sewer.	☐ See the note in Fact Sheet SC-41, "Building and Grounds Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com
O. Miscellaneous Drain or Wash Water or Other Sources ☐ Boiler drain lines ☒ Condensate drain lines ☐ Rooftop equipment ☐ Drainage sumps ☒ Roofing, gutters, and trim. ☐ Other sources		☐ Boiler drain lines shall be directly or indirectly connected to the sanitary sewer system and may not discharge to the storm drain system. ☒ Condensate drain lines may discharge to landscaped areas if the flow is small enough that runoff will not occur. Condensate drain ☐ lines may not discharge to the storm drain system. Rooftop equipment with potential ☐ to produce pollutants shall be roofed and/or have secondary containment. Any drainage sumps on-site shall ☐ feature a sediment sump to reduce the quantity of sediment in pumped water. ☒ Avoid roofing, gutters, and trim made of copper or other unprotected metals that may leach into runoff. Include controls for other sources as specified by local reviewer.	

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 **Potential Sources of Runoff Pollutants**	2 **Permanent Controls—Show on WQMP Drawings**	3 **Permanent Controls—List in WQMP Table and Narrative**	4 **Operational BMPs—Include in WQMP Table and Narrative**
☒ **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 not to a storm drain.

Appendix 9: O&M

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

TO BE COMPLETED DURING FINAL ENGINEERING

Appendix 10: Educational Materials

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

BMP FACT SHEETS

3.6 Extended Detention Basin

Type of BMP	LID - Biotreatment
Treatment Mechanisms	Sedimentation, Infiltration, Biofiltration, Evapotranspiration, and Evaporation
Minimum Tributary Drainage Area	5 acres
Other Names	Enhanced Water Quality Basin

Overview

The Extended Detention Basin (EDB) is designed to detain the design volume of stormwater, V_{BMP}, and maximize opportunities for volume losses through infiltration, evaporation, evapotranspiration and surface wetting. Additional pollutant removal is provided through sedimentation, in which pollutants can attach to sediment accumulated in the basin through the process of settling. Stormwater enters the EDB through a *forebay* where any trash, debris, and sediment accumulate for easy removal. Flows from the forebay enter the basin which is vegetated with native grasses that enhance infiltration and evapotranspiration, and which is interspersed with gravel-filled trenches that help further enhance infiltration. Water that does not get infiltrated or evapotranspired is conveyed to the *bottom stage* of the basin. At the bottom stage of the basin, low or incidental dry weather flows will be treated through a sand filter and collected in a subdrain structure. Any additional flows will be detained in the basin for an extended period by incorporating an outlet structure that is more restrictive than a traditional detention basin outlet. The restrictive outlet structure extends the drawdown time of the basin which further allows particles and associated pollutants to settle out before exiting the basin, while maximizing opportunities for additional incidental volume losses.

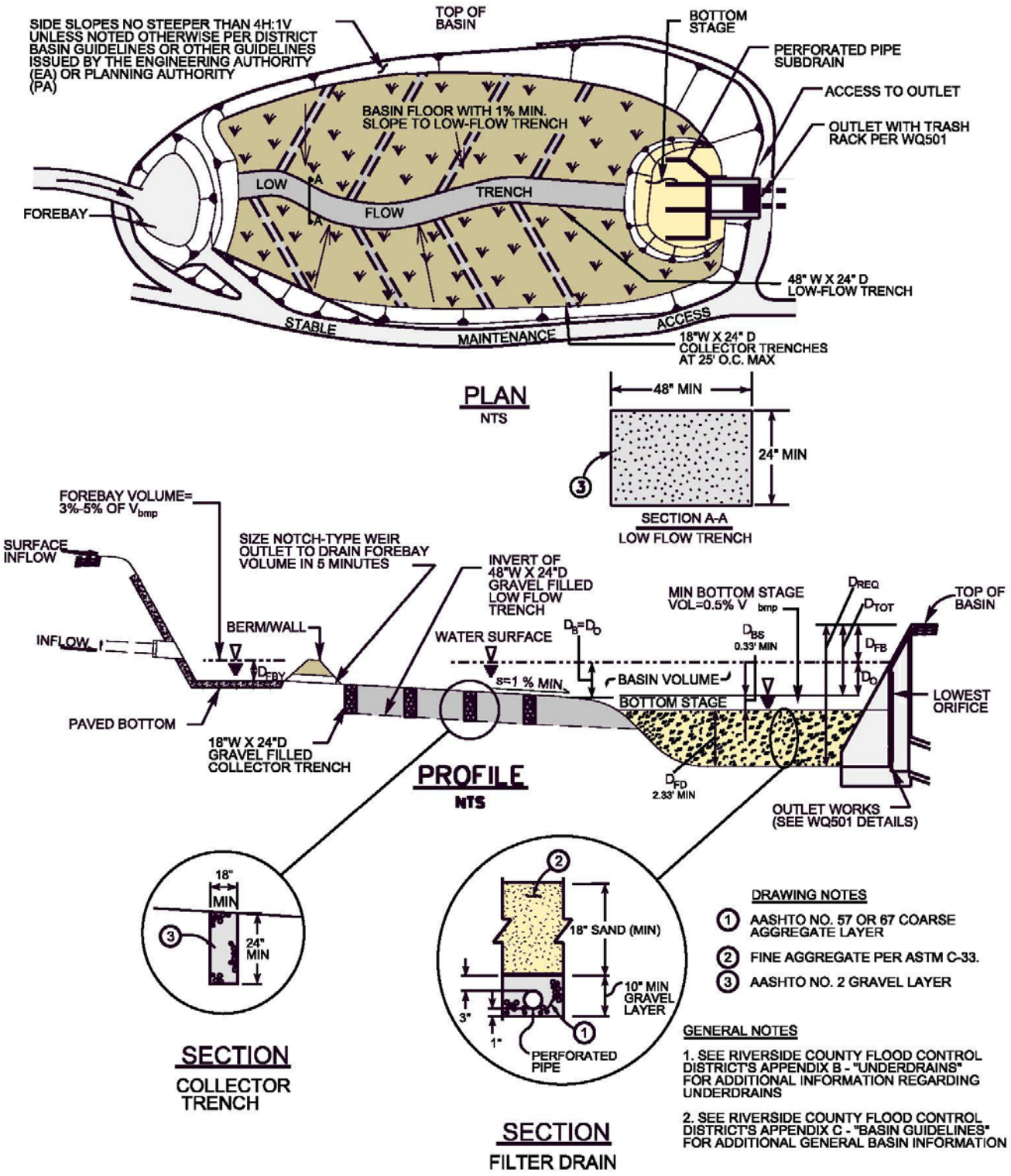


Figure 1 – Extended Detention Basin

Siting Considerations

Soils: EDBs can be used with almost all soils and geology. However, pollutant removal effectiveness is greatly improved when the underlying soil permits at least some infiltration.

Tributary Area: EDBs should only be used where the tributary drainage area is at least 5 acres, since meeting the draw-down requirements (discussed below) for smaller areas would result in very small outlet orifice diameters which would be prone to clogging.

Proximity to Receiving Waters: All site runoff must be treated to the MEP with appropriate BMPs *before* being discharged into Receiving Waters; as such the EDB cannot be constructed in-line within Receiving Waters.

Setbacks: Due to the infiltration characteristics incorporated into the EDB design, the lowest pervious point (beneath the filter drain) of the extended detention facility should be a minimum of 10' above the seasonal high groundwater table. All other setbacks shall be in accordance with applicable standards of the "Basin Guidelines" (Appendix C) or other guidelines issued by the Engineering Authority (EA).

Basin Guidelines: See Section 1 of the "Basin Guidelines" (Appendix C) for additional requirements (i.e., fencing, maintenance access, etc.) that may be required by the Engineering Authority (EA).

Landscaping Requirements

Basin vegetation provides erosion protection, enhances evapotranspiration and infiltration, and improves pollutant removal. The upper stage basin surface, berms and side slopes shall be planted with native grasses. Proper landscape management is also required to ensure that the vegetation does not contribute to water pollution through the use of pesticides, herbicides, or fertilizers. Landscaping shall be in accordance with applicable standards of the "Basin Guidelines" (Appendix C) or other guidelines issued by the EA.

Maintenance Guidelines

Schedule	Inspection and Maintenance Activity
During every scheduled maintenance check (per below), and *as needed* at other times	• Maintain vegetation as needed. Use of fertilizers, pesticides and herbicides should be strongly avoided to ensure they don't contribute to water pollution. If appropriate native plant selections and other IPM methods are used, such products shouldn't be needed. If such projects are used: o Care should be taken to avoid contact with the low-flow or other trenches, and the media filter in the bottom stage. o Products shall be applied in accordance with their labeling, especially in relation to application to water, and in areas subjected to flooding. o Fertilizers should not be applied within 15 days before, after, or during the rainy season. • No ponded water should be present for more than 72 hours to avoid nuisance or vector problems. No algae formation should be visible. Correct problems as needed.
Annually. If possible, schedule these inspections before the beginning of the rain season to allow for any repairs to occur before rains occur.	• Remove debris and litter from the entire basin • Inspect hydraulic and structural facilities. Examine the outlet for clogging, the embankment and spillway integrity, as well as damage to any structural element. • Check for erosion, slumping and overgrowth. Repair as needed. • Inspect sand media at the filter drain to verify it is allowing acceptable infiltration. **Scarify top 3 inches by raking the filter drain's sand surface annually.** • Check the media filter underdrains (via the cleanout) for damage or clogging. Repair as needed. • Remove accumulated sediment and debris from the forebay, and ensure that the notch weir is clear and will allow proper drainage. • Check gravel filled low flow and collector trenches for sediment buildup and repair as needed.
Every 5 years or sooner (depending on whether observed drain times to empty the basin are less than 72 hours).	• Remove the top 3 inches of sand from the filter drain and backfill with 3 inches of new sand to return the sand layer to its original depth. When scarification or removal of the top 3 inches of sand is no longer effective, remove and replace sand filter layer.
Whenever substantial sediment accumulation has occurred.	• Remove accumulated sediment from the bottom of the basin. Removal should extend to original basin depth.

EXTENDED DETENTION BASIN BMP FACT SHEET

Design Summary

Design Parameter	Extended Detention Basin
Drawdown time (total)	72 hours [2,3]
Minimum drawdown time for 50% V_{BMP}	24 hours [2]
Minimum tributary area	5 acres [2]
Outlet erosion control	Energy dissipaters to reduce velocities[1]
Forebay volume	3 to 5 % of V_{BMP} [3]
Basin Invert Longitudinal Slope (min.)	1%
Basin Invert Transverse (cross) Slope (min)	1%
Low-flow trench width (min.)	48 inches
Low-flow trench depth (min.)	24 inches
Slope of low-flow trench along bottom excavated Surface (max.)	1%
Slope of gravel collector trenches along bottom excavated surface (max.)	1 %
Length to width ratio (min.)	1.5:1
Basin depth (min.)	1 foot [3]
Bottom stage volume	0.5 % of V_{BMP} [3]
Bottom stage depth (min)	0.33 feet [3]
Filter drain depth (min)	2.33 feet [3]

1. **Ventura County's Technical Guidance Manual for Stormwater Quality Control Measures**
2. **CA Stormwater BMP Handbook for New Development and Significant Redevelopment**
3. **Denver, Colorado's UDFCD Drainage Criteria Manual, Volume 3**

Note: The information contained in this BMP Factsheet is intended to be a summary of design considerations and requirements. Additional information which applies to all detention basins may be found in the "Basin Guidelines" (Appendix C). In addition, information herein may be superseded by other guidelines issued by the Engineering Authority.

Design Procedure

These steps correspond to and provide a description of the information required in the EDB Design Worksheet.

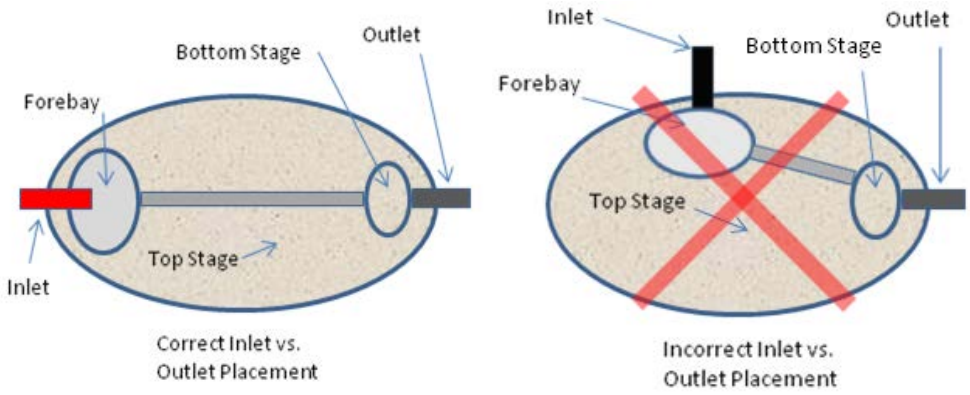
1. Find the Design Volume, V_{BMP}.

a) Enter the tributary area, A_T to the BMP. The minimum tributary area is 5 acres.

b) Enter the Design Volume, V_{BMP}, determined from Section 2.1 of this Handbook.

2. Basin Footprint

a) Enter the length and width of the EDB. The length shall be measured between the inlet to the basin and the outlet structure; and the width shall be measured at the widest point of the basin invert. The length to width ratio should be 1.5:1 or longer to prevent short-circuiting and increase the overall effectiveness of the BMP.



b) Enter the internal basin side slopes. See the "Basin Guidelines" (Appendix C) for side slope requirements. If variable internal side-slopes are used, enter the steepest slope that will be used.

c) Using Figure 1 as a guide, enter the proposed basin depth, D_B, and the freeboard depth, D_{FB}. Based on the information provided, the spreadsheet will calculate the minimum total depth required, D_{REQ}, for this BMP. D_{REQ} is the depth from the bottom of the underdrain layer in the bottom stage (see step 5c), to the top of the freeboard. This calculated minimum required depth can be used to determine if enough elevation difference is available within the design topography to allow for use of this BMP.

d) Additionally, the basin depth D_B is equal to $D_{O,}$ which is the depth from the design pond water surface elevation to the lowest orifice in the outlet structure. D_O is confirmed by the spreadsheet and is used in the Basin Outlet Design described in step 6 below. It should be noted that this lowest orifice is a critical elevation in the design of this BMP. The Volume of the Basin V_{Basin} described in step 3d) is the volume of water above this lowest orifice. This lowest-orifice also represents the dry weather ponded water surface discussed in step 5c below. Below this elevation there must be a minimum of a 4-inch drop down to the surface of the Sand Filter in the bottom stage.

3. Basin Design

a) The Total Basin Depth, D_{TOT}, is calculated automatically, and is the sum of the basin depth D_B plus the freeboard depth D_{FB}.

b) Enter the longitudinal slope of the basin invert. This slope must be at least 1% and is measured along the low flow trench between the forebay and the bottom stage. Note that the surface of the sand layer in the bottom stage must be level (see Figure 1).

c) Enter the transverse slope of the basin invert. This transverse (cross sectional) slope must be at least 1% sloped toward the low flow trench.

d) Enter the Volume of the Basin, V_{Basin}. This volume must be the actual volume of water held within the basin as substantiated by modeling or appropriate volumetric calculations, and must be equal to or greater than V_{BMP}. This volume must be held above the lowest orifice in the Basin Outlet Design described in step 6 below.

4. Forebay Design

All flows must enter the basin through the forebay. The forebay provides a location for the settlement and collection of larger particles, and any other trash or debris. A relatively smooth and level concrete bottom surface should be provided to facilitate mechanical removal of any accumulated sediment, trash and debris.

Figure 2: Forebay filled with storm water

a) Enter the Forebay Volume VFB. This volume must be from 3 to 5 percent of V_{BMP}.

b) A rock or concrete berm must be constructed to detain water before it drains into the basin. The top of the berm shall be set no higher than the invert of the inlet conveyance. Enter the Forebay Depth, D_{FBY}.

c) The spreadsheet will calculate the minimum surface area of the forebay, A_{FB}, based on the provided Forebay Volume and Depth. Ensure that the plans provide for a forbay area at least this large.

d) Although the forebay will be well submerged in the design event, a full height rectangular notch-type weir shall be constructed through the berm to prevent permanent ponding in the forebay, and allow water to slowly and fully drain to the main body of the basin. This notch should be offset from the inflow streamline to prevent low-flows from short circuiting. Enter the width, W, of this rectangular notch weir. The width shall not be less than 1.5 inches to prevent clogging. Additionally,

immediately outside the notch construct a minimum 1-foot by 1-foot gravel pad to prevent vegetative growth within the basin invert from blocking the notch.

5. Dry Weather and Low-Flow Management

The basin shall have both a low-flow gravel trench and a network of gravel collector trenches across the invert of the basin, as well as a bottom stage sand filter to treat low flows and dry weather flows (see Figure 1).

a) Low Flow Trench: The low-flow gravel trench conveys flow from the forebay to the bottom stage, while allowing for maximum incidental infiltration and volume loss. The trench shall be a minimum of 48 inches wide by 24 inches deep. This trench shall be unlined and backfilled with AASHTO No. 2 gravel (or similar) to the finished surface of the basin invert, and shall not use underdrains. The bottom excavated surface of the low-flow trench shall be 1 percent or flatter to promote infiltration.

Figure 3: Gravel filled low-flow trench

b) Collector Trenches: Gravel collector trenches beneath the top stage shall be arranged as illustrated in Figure 1 of Appendix C with minimal slope (1% maximum) along their bottom excavated surface to promote infiltration, and must extend from the low-flow trench to the toe of the basin side slopes. They shall be a minimum of 18-inches wide by 24-inches deep, unlined and backfilled with AASHTO No. 2 gravel (or similar) to the finished basin invert surface. The gravel collector trenches shall not use underdrains and shall be constructed with a maximum spacing of 25 feet, center to center. See Figure 1 of Appendix C.

c) Bottom Stage: A depressed sand filter drain area, referred to as the bottom stage, must be constructed adjacent to the outlet structure to treat any dry weather flows. To ensure that dry weather flows are treated through the sand filter and not discharged through the orifice plate, the top surface of the sand filter must be depressed at least 4 inches below the lowest orifice in the outlet structure. This depressed area will create a micro pool of water that is then filtered down through the sand filter and out through underdrains. Based on the minimum dimensions described below, the minimum depth of excavation below the lowest orifice in the outlet structure is 2.33 feet.

   i. Enter the Depth of the bottom stage, D_{BS}. As mentioned above, this depth must be at least 4 inches, and extend down below the lowest orifice in the outlet structure.

   ii. Enter the area of the bottom stage, A_{BS}.

iii. Based on the D_{BS} and A_{BS} entered, the spreadsheet will calculate V_{BS}. This volume is the volume of ponded water that will be held below the lowest orifice in the outlet structure, and above the surface of the sand filter. This volume must be at least 0.5% of V_{BMP}.

iv. Enter the thickness of the ASTM C-33 sand layer that will be provided, D_S. A minimum thickness of 18 inches is required.

v. Below the sand layer, a minimum 10-inch thick layer of gravel shall be installed with underdrains to drain the water that has been treated through the sand filter. The underdrains shall connect into the outlet structure. See Appendix B for standard underdrain construction. Enter the diameter of the underdrain pipe (minimum 6" dia.), and the spacing of the underdrains. The maximum spacing of the underdrains is 20 feet on center, however where the area of the bottom stage is particularly small (less than 500 square feet), the underdrain pipes shall be placed at no more than a 10-foot separation on center.

6. Basin Outlet Design

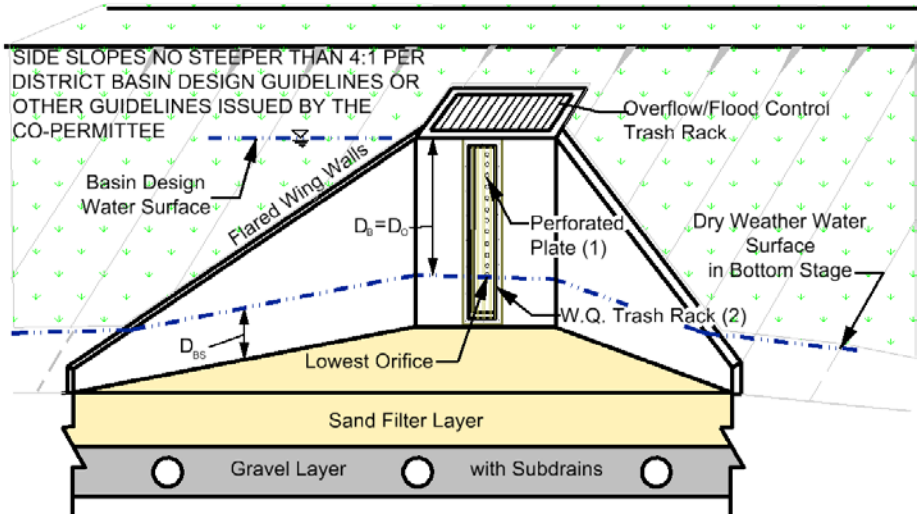


Figure 4: Basin Outlet Structure with Bottom Stage Shown

Outlet structures for publicly maintained basins shall conform to District Standard Drawings WQ501 unless approved in advance by the local Engineering Authority (EA). This standardization is to provide for efficient maintenance. The basin outlet should be sized to release the design volume, VBMP, within a 72-hour period but 50 percent of VBMP within 24 hours. This is an iterative design process where an appropriate control orifice can be selected using the following steps:

a. Develop a Stage vs. Discharge Curve for the Outlet Structure

Estimate the orifice size and outlet plate configuration (number per row, etc.). Based on D_O provided in the Basin Footprint section, the spreadsheet will automatically generate the stage vs. discharge relationship for this outlet:

$$Q = C*A*[2*g*(H-H_o)]^{0.5}$$

Where:

Q = discharge (ft^3/s)

C = orifice coefficient

A = area of the orifice (ft)

g = gravitational constant (32.2 ft2/s)

H = water surface elevation (ft)

H_o = orifice elevation (ft)

The lowest orifice shall be located with its centerline at the top of the bottom stage; at least 4 inches above the surface of the sand filter drain. To help avoid clogging, the minimum orifice diameter is limited to 3/8 inch. Since the 1/4 inch thickness of the orifice plate will be less than the orifice diameter, a value for C of 0.66 may be used. If another value for C is used, justification may be required.

b. Develop a Discharge/Volume vs. Stage Table for the Basin

Based on the shape and size of the basin, develop a relationship between the stage and the volume of water in the basin. Since the orifice spacing is 4 inches on center for the standard orifice plate, the stage intervals must also be 4 inches. Enter the basin volume at each interval starting at the centerline of the lowest orifice.

c. Route the Design Volume through the Basin

The spreadsheet assumes that the Design Volume, $V_{BMP,}$ enters the basin instantaneously and as such, no inflow/outflow hydrograph is necessary. The drawdown time for each stage becomes:

$$\Delta t = V_i/Q$$

Where:

Δt = drawdown time for each stage

V_i = the volume at each stage

Q = the flow rate corresponding to the headwater elevation at each stage.

The spreadsheet automatically determines the drawdown time from the sum of the Δt values for each stage. If the orifice size and plate configuration estimate meets the

hydraulic retention time requirements (50% of the volume empties in not less than 24 hours, 100% of the volume empties in no more than 72 hours), the outlet is correctly sized. If these requirements are not met, select a new orifice size or configuration and repeat the process starting at Step 6a.

7. Outlet Protection

To prevent the orifices from clogging, trash racks are required where perforated vertical outlet control plates are used. This allows for easier access to outlet orifices for inspection and cleaning. Trash racks shall be sized to prevent clogging of the primary water quality outlet without restricting the hydraulic capacity of the outlet control orifices. The orifice plate shall be protected with a trash rack conforming to Standard Drawing WQ501 (at end of this section) with at least six square feet of open surface area or 25 times the total orifice area, whichever is greater. The rack shall be adequately secured to prevent it from being removed or opened when maintenance is not occurring.

Overflow Structure Similar to Standard Drawing Number WQ 501
(Photo courtesy of Colorado Association of Stormwater Floodplain Managers)

Trash rack with screen

8. Overflow Outlet

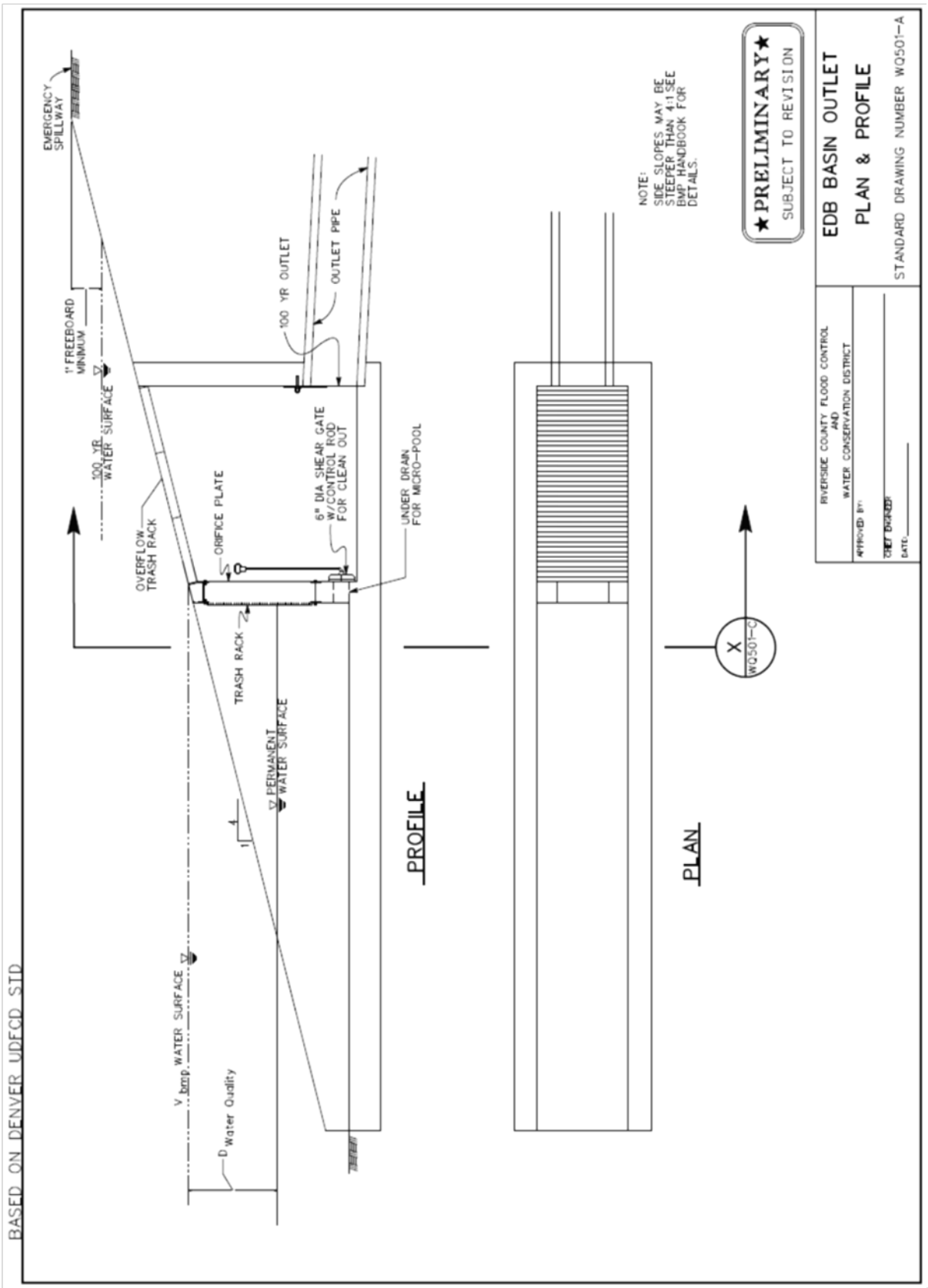
Overflow outlets for publicly maintained basins shall conform to Standard Drawing WQ501 (at end of this section) unless approved in advance by the Engineering Authority (EA).

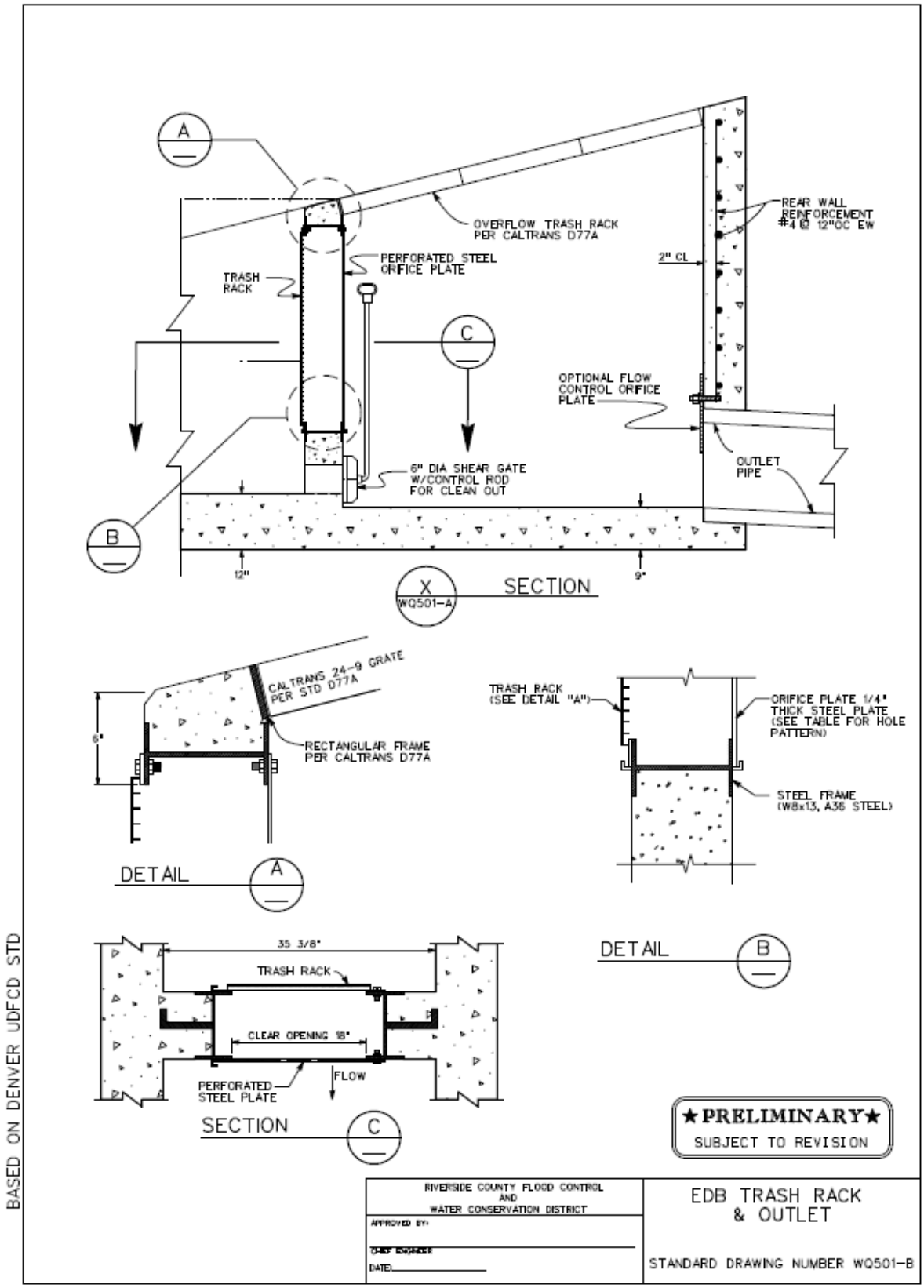
9. Embankment

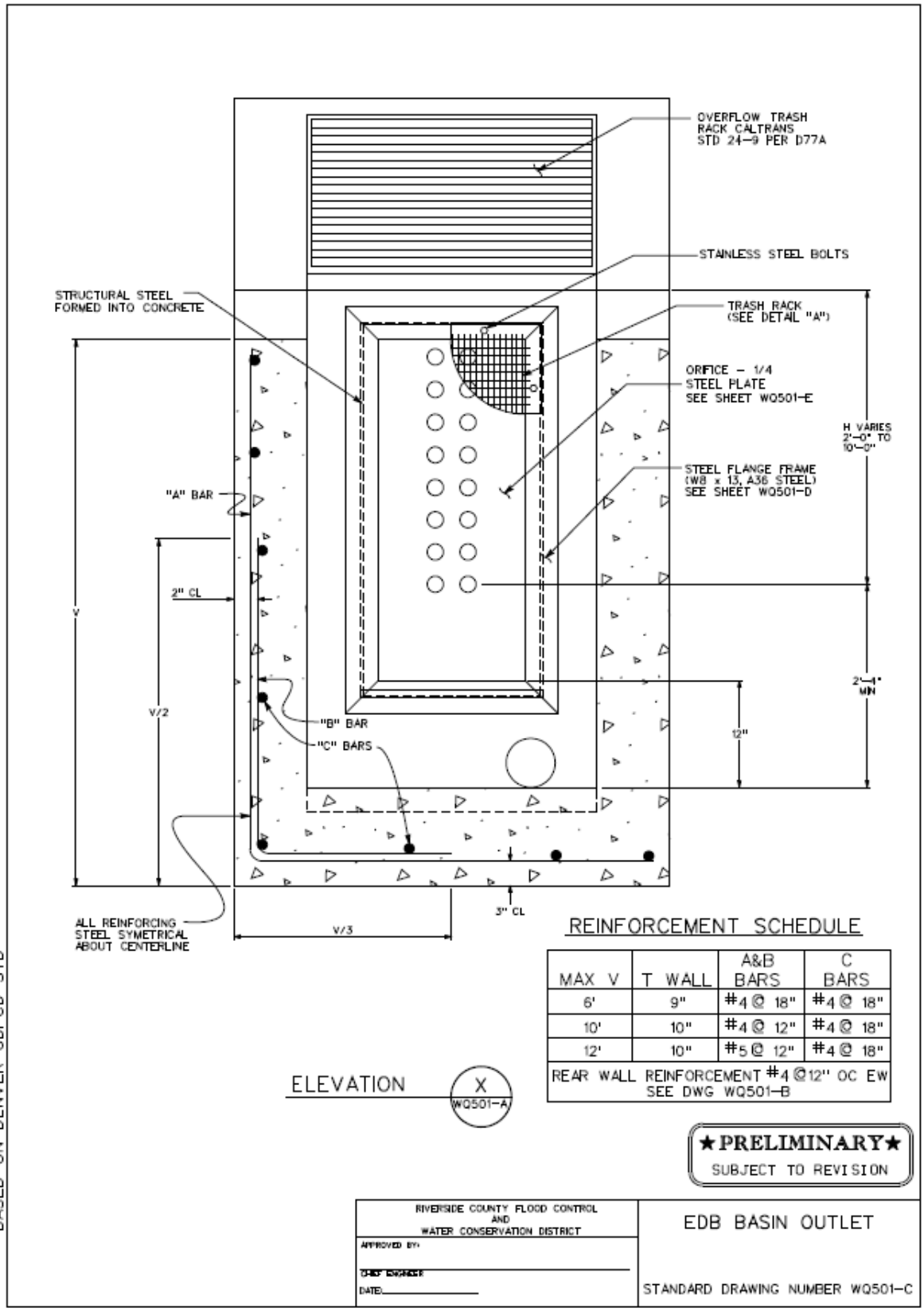
Embankments shall be designed in accordance with applicable standards of Riverside County Flood Control District's "Basin Guidelines" (Appendix C) or other guidelines issued by the Engineering Authority (EA). Where applicable, embankment designs must additionally conform to the requirements of the State of California Division of Safety of Dams.

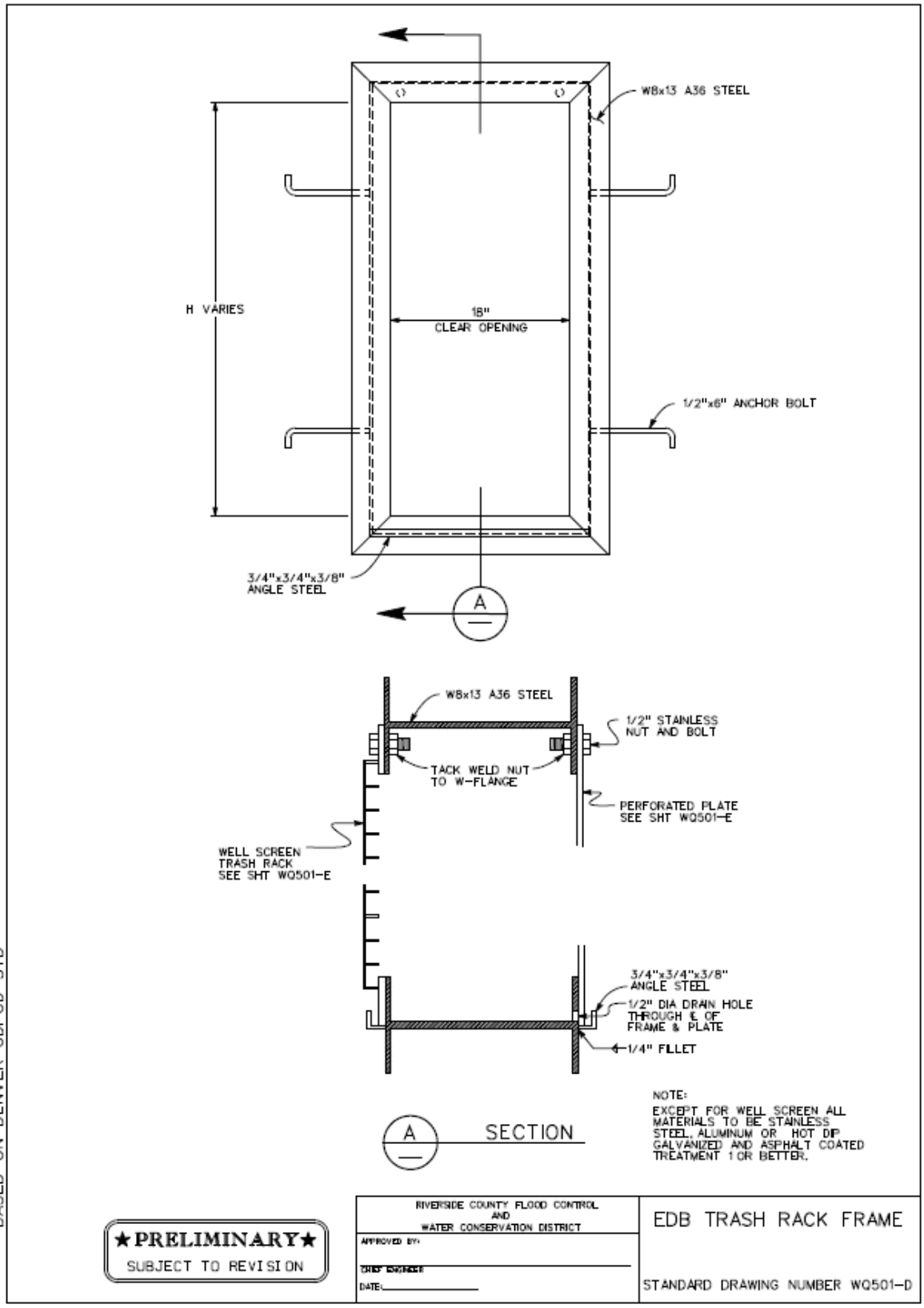
10. Spillway and Overflow Structures

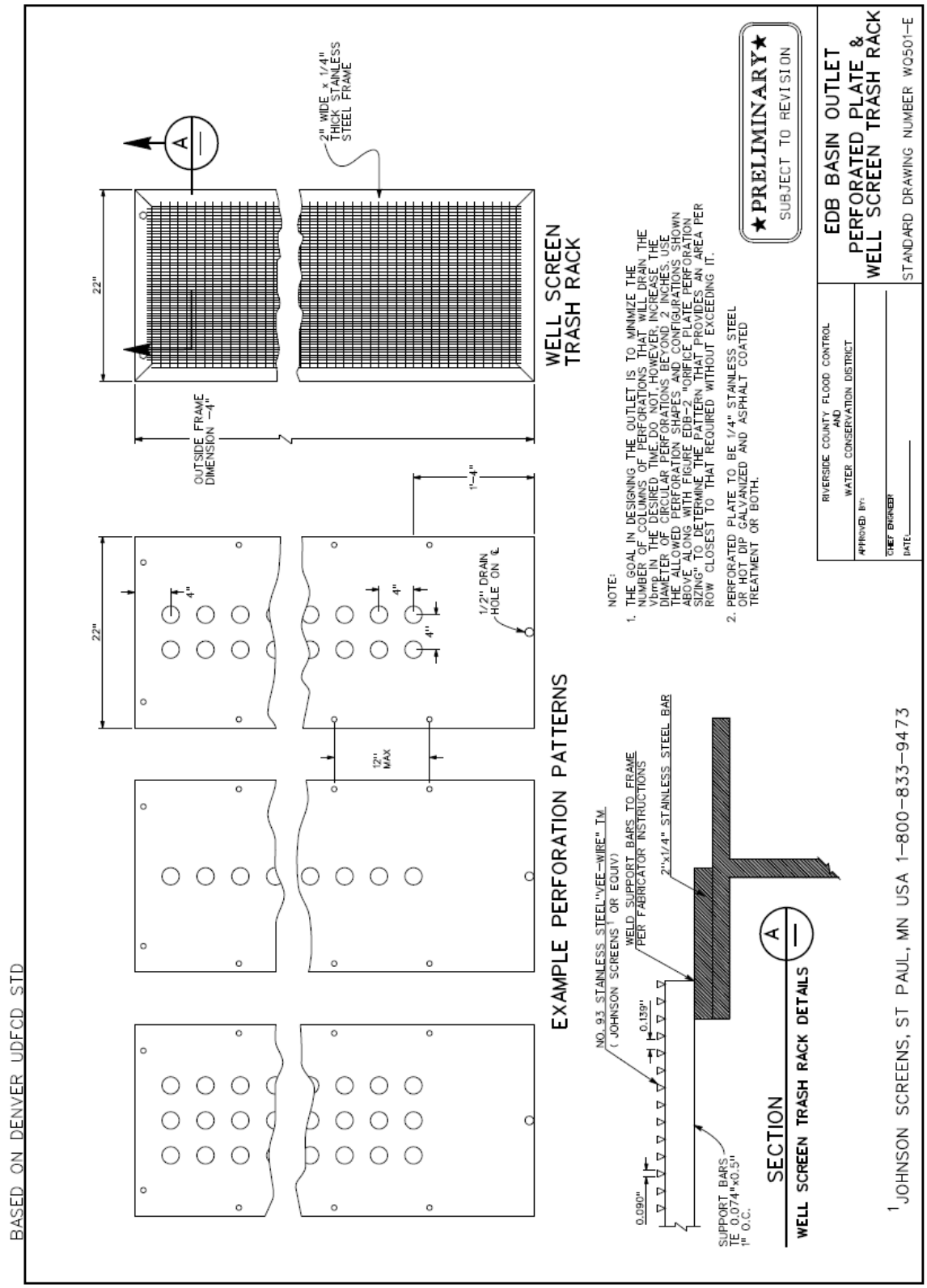
Spillway and overflow structures should be designed in accordance with applicable standards of the "Basin Guidelines" (Appendix C) or other guidelines issued by the Engineering Authority (EA).

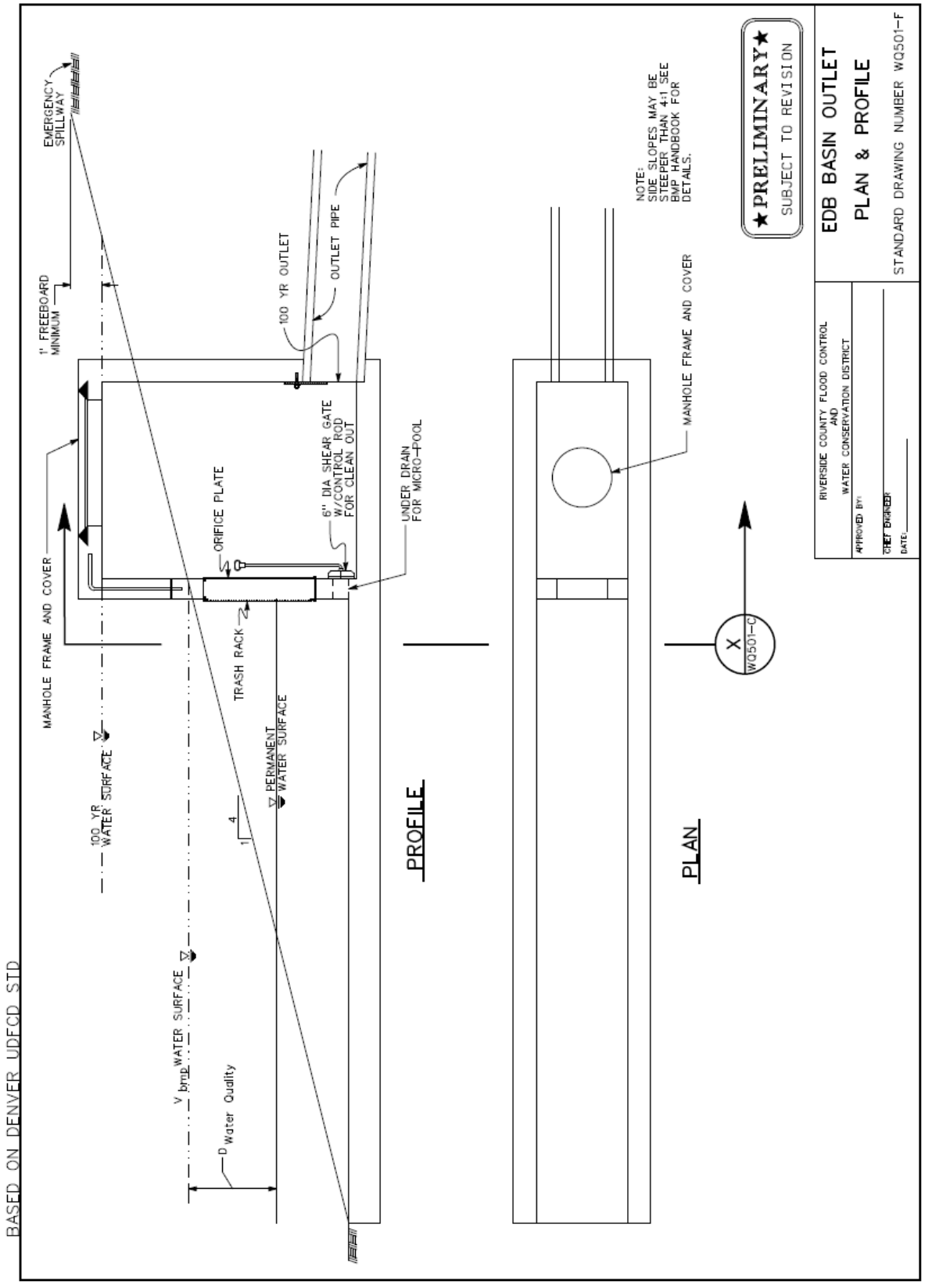

EDB BASIN OUTLET
PLAN & PROFILE
STANDARD DRAWING NUMBER WQ501-A
★PRELIMINARY★
SUBJECT TO REVISION
NOTE:
SIDE SLOPES MAY BE STEEPER THAN 4:1 SEE BMP HANDBOOK FOR DETAILS.
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
APPROVED BY:
CHIEF ENGINEER
DATE:
EMERGENCY SPILLWAY
1' FREEBOARD MINIMUM
100 YR WATER SURFACE
100 YR OUTLET
OUTLET PIPE
6" DIA SHEAR GATE W/CONTROL ROD FOR CLEAN OUT
UNDER DRAIN FOR MICRO-POOL
OVERFLOW TRASH RACK
ORIFICE PLATE
TRASH RACK
PERMANENT WATER SURFACE
WATER SURFACE
D Water Quality
PROFILE
PLAN
X
WQ501-C
BASED ON DENVER UDFCD STD

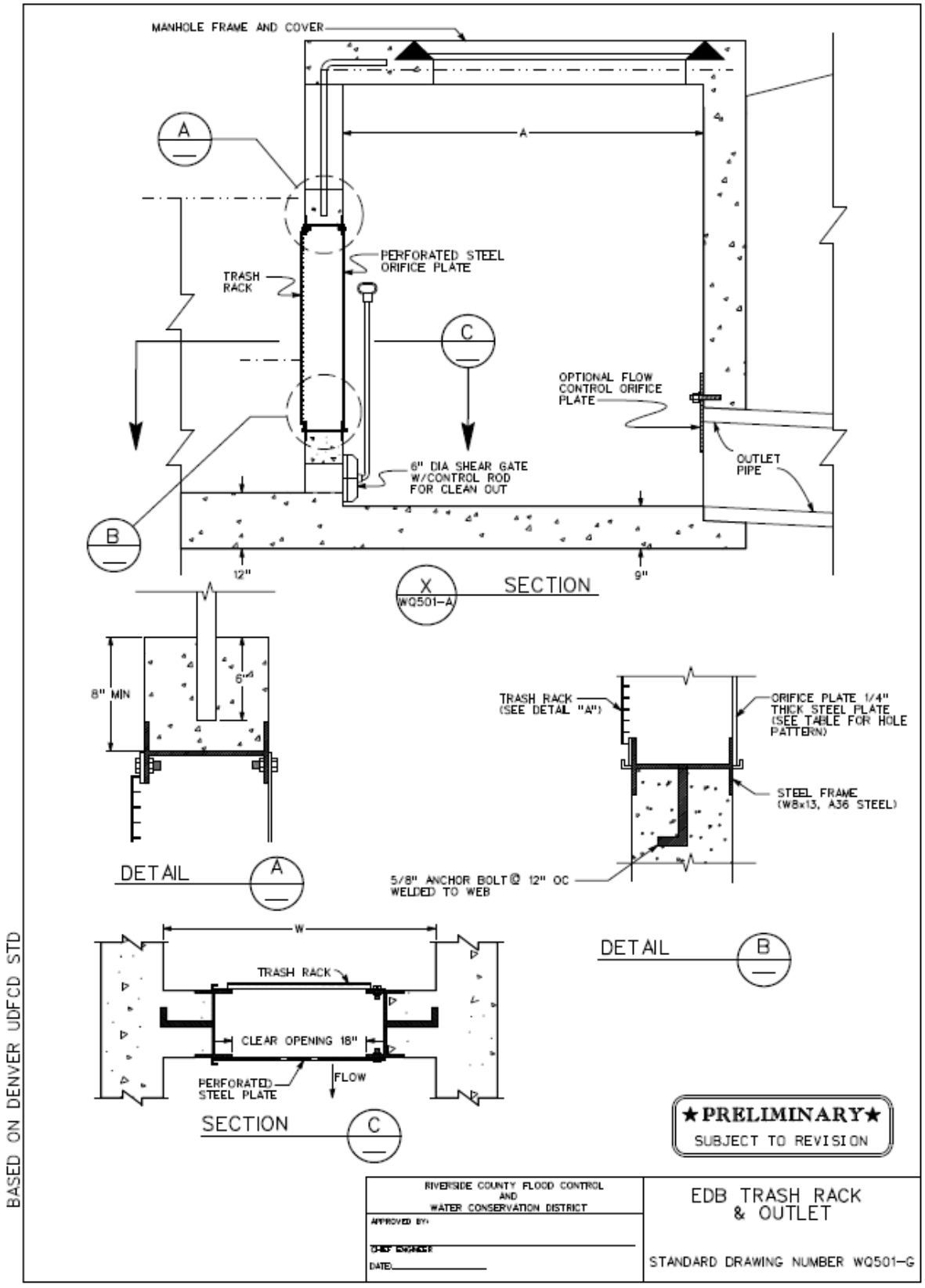

A
B
C
OVERFLOW TRASH RACK PER CALTRANS D77A
REAR WALL REINFORCEMENT #4 @ 12"OC EW
PERFORATED STEEL ORIFICE PLATE
TRASH RACK
2" CL
OPTIONAL FLOW CONTROL ORIFICE PLATE
6" DIA SHEAR GATE W/CONTROL ROD FOR CLEAN OUT
OUTLET PIPE
12"
9"
X
WQ501-A
SECTION
CALTRANS 24-9 GRATE PER STD D77A
6"
RECTANGULAR FRAME PER CALTRANS D77A
DETAIL A
TRASH RACK (SEE DETAIL "A")
ORIFICE PLATE 1/4" THICK STEEL PLATE (SEE TABLE FOR HOLE PATTERN)
STEEL FRAME (W8x13, A36 STEEL)
DETAIL B
35 3/8"
TRASH RACK
CLEAR OPENING 18"
FLOW
PERFORATED STEEL PLATE
SECTION C
★PRELIMINARY★
SUBJECT TO REVISION
BASED ON DENVER UDFCD STD
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
APPROVED BY:
DATE:
EDB TRASH RACK & OUTLET
STANDARD DRAWING NUMBER WQ501-B

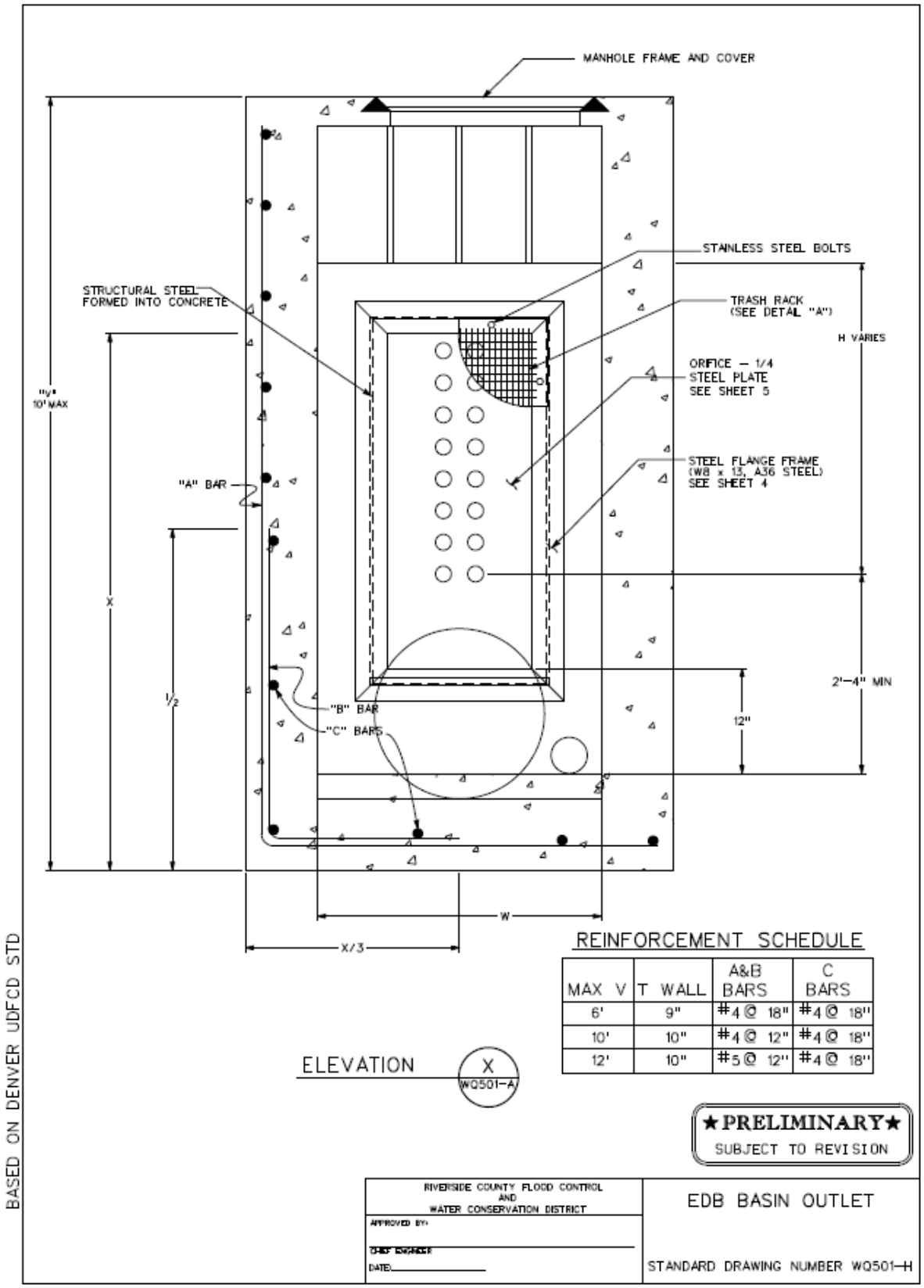

OVERFLOW TRASH RACK CALTRANS STD 24-9 PER D77A
STAINLESS STEEL BOLTS
STRUCTURAL STEEL FORMED INTO CONCRETE
TRASH RACK (SEE DETAIL "A")
ORIFICE - 1/4 STEEL PLATE SEE SHEET WQ501-E
H VARIES 2'-0" TO 10'-0"
STEEL FLANGE FRAME (W8 x 13, A36 STEEL) SEE SHEET WQ501-D
"A" BAR
2" CL
V
V/2
"B" BAR
"C" BARS
2'-4" MIN
12"
3" CL
ALL REINFORCING STEEL SYMETRICAL ABOUT CENTERLINE
V/3
BASED ON DENVER UDFCD STD
REINFORCEMENT SCHEDULE
MAX V | T WALL | A&B BARS | C BARS
6' | 9" | #4 @ 18" | #4 @ 18"
10' | 10" | #4 @ 12" | #4 @ 18"
12' | 10" | #5 @ 12" | #4 @ 18"
REAR WALL REINFORCEMENT #4 @12" OC EW SEE DWG WQ501-B
ELEVATION X WQ501-A
★PRELIMINARY★
SUBJECT TO REVISION
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
APPROVED BY:
CHIEF ENGINEER
DATE:
EDB BASIN OUTLET
STANDARD DRAWING NUMBER WQ501-C


W8x13 A36 STEEL
H VARIES
18"
CLEAR OPENING
1/2"x6" ANCHOR BOLT
3/4"x3/4"x3/8"
ANGLE STEEL
A
W8x13 A36 STEEL
1/2" STAINLESS
NUT AND BOLT
TACK WELD NUT
TO W-FLANGE
PERFORATED PLATE
SEE SHT WQ501-E
WELL SCREEN
TRASH RACK
SEE SHT WQ501-E
3/4"x3/4"x3/8"
ANGLE STEEL
1/2" DIA DRAIN HOLE
THROUGH ℄ OF
FRAME & PLATE
1/4" FILLET
A
SECTION
NOTE:
EXCEPT FOR WELL SCREEN ALL
MATERIALS TO BE STAINLESS
STEEL, ALUMINUM OR HOT DIP
GALVANIZED AND ASPHALT COATED
TREATMENT 1 OR BETTER.
BASED ON DENVER UDFCD STD
★PRELIMINARY★
SUBJECT TO REVISION
RIVERSIDE COUNTY FLOOD CONTROL
AND
WATER CONSERVATION DISTRICT
APPROVED BY:
CHIEF ENGINEER
DATE:
EDB TRASH RACK FRAME
STANDARD DRAWING NUMBER WQ501-D


BASED ON DENVER UDFCD STD
WELL SCREEN TRASH RACK
2" WIDE x 1/4" THICK STAINLESS STEEL FRAME
22"
OUTSIDE FRAME DIMENSION -4"
EXAMPLE PERFORATION PATTERNS
4"
1/2" DRAIN HOLE ON ℄
12" MAX
1'-4"
NOTE:
1. THE GOAL IN DESIGNING THE OUTLET IS TO MINIMIZE THE NUMBER OF COLUMNS OF PERFORATIONS THAT WILL DRAIN THE VOLUME WITHIN THE WQCV IN 40 HOURS. HOWEVER, INCREASING THE DIAMETER OF CIRCULAR PERFORATIONS BEYOND 2 INCHES, USE THE ALLOWED PERFORATION SHAPES AND CONFIGURATIONS SHOWN ABOVE ALONG WITH FIGURE EDB-2 "ORIFICE PLATE PERFORATION SIZING" TO DETERMINE THE PATTERN THAT PROVIDES AN AREA PER ROW CLOSEST TO THAT REQUIRED WITHOUT EXCEEDING IT.
2. PERFORATED PLATE TO BE 1/4" STAINLESS STEEL OR HOT DIP GALVANIZED AND ASPHALT COATED TREATMENT OR BOTH.
★PRELIMINARY★
SUBJECT TO REVISION
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
APPROVED BY:
CHIEF ENGINEER
DATE:
EDB BASIN OUTLET
PERFORATED PLATE & WELL SCREEN TRASH RACK
STANDARD DRAWING NUMBER WQ501-E
NO. 93 STAINLESS STEEL "VEE-WIRE" TM (JOHNSON SCREENS[1] OR EQUIV)
WELD SUPPORT BARS TO FRAME PER FABRICATOR INSTRUCTIONS
2"x1/4" STAINLESS STEEL BAR
0.139"
0.090"
SUPPORT BARS TE 0.074"x0.5" 1" O.C.
SECTION
WELL SCREEN TRASH RACK DETAILS
[1] JOHNSON SCREENS, ST PAUL, MN USA 1-800-833-9473


EDB BASIN OUTLET
PLAN & PROFILE
STANDARD DRAWING NUMBER WQ501-F
★PRELIMINARY★
SUBJECT TO REVISION
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
APPROVED BY:
CHIEF ENGINEER
DATE:
NOTE:
SIDE SLOPES MAY BE STEEPER THAN 4:1 SEE BMP HANDBOOK FOR DETAILS.
EMERGENCY SPILLWAY
1' FREEBOARD MINIMUM
100 YR OUTLET
OUTLET PIPE
6" DIA SHEAR GATE W/CONTROL ROD FOR CLEAN OUT
ORIFICE PLATE
UNDER DRAIN FOR MICRO-POOL
MANHOLE FRAME AND COVER
TRASH RACK
PERMANENT WATER SURFACE
100 YR WATER SURFACE
WATER SURFACE
V bmp
D Water Quality
4
1
PROFILE
PLAN
MANHOLE FRAME AND COVER
X
WQ501-C
BASED ON DENVER UDFCD STD


MANHOLE FRAME AND COVER
A
A
PERFORATED STEEL ORIFICE PLATE
TRASH RACK
C
OPTIONAL FLOW CONTROL ORIFICE PLATE
OUTLET PIPE
6" DIA SHEAR GATE W/CONTROL ROD FOR CLEAN OUT
B
12"
9"
X
WQ501-A
SECTION
8" MIN
6"
DETAIL A
TRASH RACK (SEE DETAIL "A")
ORIFICE PLATE 1/4" THICK STEEL PLATE (SEE TABLE FOR HOLE PATTERN)
STEEL FRAME (W8x13, A36 STEEL)
5/8" ANCHOR BOLT @ 12" OC WELDED TO WEB
DETAIL B
W
TRASH RACK
CLEAR OPENING 18"
PERFORATED STEEL PLATE
FLOW
SECTION C
★PRELIMINARY★
SUBJECT TO REVISION
BASED ON DENVER UDFCD STD
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
APPROVED BY:
DATE:
EDB TRASH RACK & OUTLET
STANDARD DRAWING NUMBER WQ501-G


MANHOLE FRAME AND COVER
STAINLESS STEEL BOLTS
STRUCTURAL STEEL FORMED INTO CONCRETE
TRASH RACK (SEE DETAIL "A")
H VARIES
ORIFICE – 1/4 STEEL PLATE SEE SHEET 5
"y" 10' MAX
STEEL FLANGE FRAME (W8 x 13, A36 STEEL) SEE SHEET 4
"A" BAR
X
1/2
"B" BAR
"C" BARS
2'–4" MIN
12"
W
X/3
BASED ON DENVER UDFCD STD
REINFORCEMENT SCHEDULE
MAX V
T WALL
A&B BARS
C BARS
6' 9" #4 @ 18" #4 @ 18"
10' 10" #4 @ 12" #4 @ 18"
12' 10" #5 @ 12" #4 @ 18"
ELEVATION X WQ501-A
★PRELIMINARY★
SUBJECT TO REVISION
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
APPROVED BY:
CHIEF ENGINEER
DATE:
EDB BASIN OUTLET
STANDARD DRAWING NUMBER WQ501–H

EDUCATIONAL MATERIAL

DURING CONSTRUCTION

Stormwater and the Construction Industry

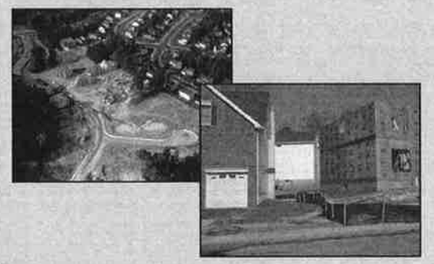
Protect Natural Features

Bad

Good

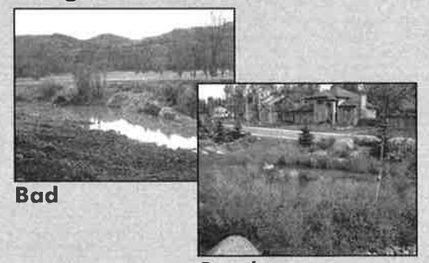
- Minimize clearing.
- Minimize the amount of exposed soil.
- Identify and protect areas where existing vegetation, such as trees, will not be disturbed by construction activity.
- Protect streams, stream buffers, wild woodlands, wetlands, or other sensitive areas from any disturbance or construction activity by fencing or otherwise clearly marking these areas.

Construction Phasing



- Sequence construction activities so that the soil is not exposed for long periods of time.
- Schedule or limit grading to small areas.
- Install key sediment control practices before site grading begins.
- Schedule site stabilization activities, such as landscaping, to be completed immediately after the land has been graded to its final contour.

Vegetative Buffers

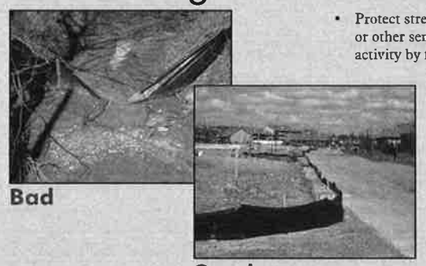


Bad

Good

- Protect and install vegetative buffers along waterbodies to slow and filter stormwater runoff.
- Maintain buffers by mowing or replanting periodically to ensure their effectiveness.

Silt Fencing



Bad

Good

- Inspect and maintain silt fences after each rainstorm.
- Make sure the bottom of the silt fence is buried in the ground.
- Securely attach the material to the stakes.
- Don't place silt fences in the middle of a waterway or use them as a check dam.
- Make sure stormwater is not flowing around the silt fence.

Maintain your BMPs!

IN RIVERSIDE COUNTY ....Call 1-800-506-2555
TO REPORT ILLEGAL STORMDRAIN DISPOSAL

E-mail: Flood.fcnpdes@co.riverside.ca.us
Visit our website: www.floodcontrol.co.riverside.ca.us

Brought to you by the Storm Water/Clean Water Pollution Protection Program.....
REMEMBER, ONLY RAIN IN THE STORMDRAIN!

Site Stabilization

Bad

Good

- Vegetate, mulch, or otherwise stabilize all exposed areas as soon as land alterations have been completed.

Construction Entrances

Bad

Good

- Remove mud and dirt from the tires of construction vehicles before they enter a paved roadway.
- Properly size entrance BMPs for all anticipated vehicles.
- Make sure that the construction entrance does not become buried in soil.

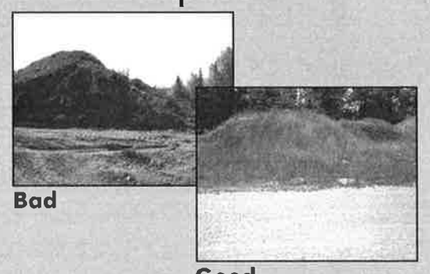
Slopes

Bad

Good

- Rough grade or terrace slopes.
- Break up long slopes with sediment barriers, or under drain, or divert stormwater away from slopes.

Dirt Stockpiles

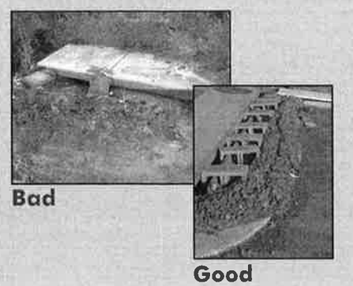


Bad

Good

- Cover or seed all dirt stockpiles.

Storm Drain Inlet Protection



Bad

Good

- Use rock or other appropriate material to cover the storm drain inlet to filter out trash and debris.
- Make sure the rock size is appropriate (usually 1 to 2 inches in diameter).
- If you use inlet filters, maintain them regularly.

www.epa.gov/npdes/menuofbmps

Stormwater and the Construction Industry

Planning and Implementing Erosion and Sediment Control Practices

The construction industry is a critical participant in the nation's efforts to protect streams, rivers, lakes, wetlands, and oceans. Through the use of best management practices (BMPs), construction site operators are the key defense against erosion and sedimentation.

As stormwater flows over a construction site, it picks up pollutants like sediment, debris, and chemicals. High volumes of stormwater can also cause stream bank erosion, and destroy downstream aquatic habitat. Preventing soil erosion and sedimentation is an important responsibility at all construction sites.

In addition to the environmental impact, uncontrolled erosion can have a significant financial impact on a construction project. It costs money and time to repair gullies, replace vegetation, clean sediment-clogged storm drains, replace poorly installed BMPs, and mitigate damage to other people's property or to natural resources.

Best Management Practice (BMP)
A BMP is a method used to prevent or control stormwater runoff and the discharge of pollutants, including sediment, into local waterbodies. Silt fences, inlet protection, and site-stabilization techniques are typical BMPs on a construction site.

Operator
An operator is someone who has control over and the ability to modify construction plans and specifications (e.g. owner, general contractor)

or

Someone who has control over the day-to-day operations at a site (e.g., owner, general contractor) that are necessary to ensure compliance with the permit requirements. It is the responsibility of a construction site owner or operator to contain stormwater runoff and prevent erosion during all stages of a project.

There may be more than one person at a site who meets these definitions and must apply for permit coverage. (States may have different definitions of the term "operator.")

So what's being done about polluted runoff?

The Clean Water Act includes the National Pollutant Discharge Elimination System (NPDES) permitting program. As of January 2003, 44 states and territories are authorized to issue NPDES stormwater permits. If your state isn't authorized to operate the NPDES stormwater permit program, EPA issues the permits. Permits vary from state to state, so contact your state or EPA for specific information. Your permitting authority has specific information on your state's NPDES stormwater permit program. In general, construction permits require construction operators to do all of the following:

- Develop and implement a stormwater pollution prevention plan
- Submit a permit application or notice of intent (NOI)
- Comply with the permit, including maintaining BMPs and inspecting the site

Under the NPDES program, construction activities that disturb 1 or more acres are required to obtain stormwater permit coverage. States have different names for the plans that construction operators must develop, such as

- Stormwater pollution prevention plan
- Erosion and sediment control plan
- Erosion control and stormwater management plan
- Stormwater management plan
- Water pollution control plan
- Pollution prevention plan

This document uses the term "*Plan*."

I think I need a permit... Where do I start?

All land-disturbing activities, including clearing, grading, and excavation, that disturb 1 **or more acres** are required to be covered under a state or EPA-issued NPDES construction stormwater permit **prior to land disturbance**. Permit requirements vary by state. Begin by researching the specific requirements in your state. You might already be subject to local erosion and sediment control requirements, but that doesn't release you from the requirements of the NPDES program at the state or EPA level. Although you must comply with both sets of requirements, in most cases they have been designed to be complementary. Contact your permitting authority to find out exactly what you need to do. A good place to start your search is the Construction Industry Compliance Assistance web site at http://www.envcap.org/cica.

The NPDES permit requirements include small construction activities that are part of a larger common plan of development or sale, such as a single lot within a larger subdivision. For developments with multiple operators, all operators must have permit coverage for their individual parts of the larger development, no matter how large or small each operation happens to be. When there are multiple operators at one site, they're encouraged to develop and share one comprehensive Plan and obtain permit coverage as co-permittees.

The **owner or operator** of the construction site is responsible for complying with the requirements of the permit. Responsibilities include developing a Plan, obtaining permit coverage, implementing BMPs, and stabilizing the site at the end of the construction activity.

Construction sites that discharge unpermitted stormwater are in violation of the Clean Water Act and may be subject to fines of up to $27,500 a day per violation.

Determine your eligibility

All construction activity that disturbs 1 or more acres of land, as well as activity that disturbs less than 1 acre but is part of a larger common plan of development, must obtain permit coverage.

Read and understand your stormwater permit requirements

Get a copy of the permit for construction activities and a permit application (or notice of intent form) from your state or EPA permitting authority.

Develop a Plan

Most states do not require you to submit your Plan. However, you do need to keep the Plan on site. If that's impractical, you may post a notice that tells where the Plan is kept so it can be accessed by the permitting authority and other interested parties.

You'll need to post a copy of your completed application on site. Put it in a place where the public can see it so they'll know your site is covered by an NPDES permit!

Apply for permit coverage

Once you understand your permit requirements and have developed a Plan, you can submit a stormwater permit application (or notice of intent) to your permitting authority. This must be done before beginning any land disturbance on the site. Some states require a few days of lead time, so check with your permitting authority. Once you've submitted the application, you must satisfy the conditions of the permit.

Implement the Plan

Be prepared to implement the BMPs in your Plan before construction begins. Ensure that BMPs are properly maintained, and upgrade and repair them as necessary.

Developing and Implementing a Plan

You must have a Plan that includes erosion and sediment control and pollution prevention BMPs. These Plans require

- Advance planning and training to ensure proper implementation of the BMPs
- Erosion and sediment control BMPs in place until the area is permanently stabilized
- Pollution prevention BMPs to keep the construction site "clean"
- Regular inspection of the construction site to ensure proper installation and maintenance of BMPs

Fortunately, the practices and measures that must be included in your Plan are already part of the standard operating procedures at many construction sites.

Six steps are associated with developing and implementing a stormwater Plan. There's a wealth of information available on developing pollution prevention plans. Please contact your permitting authority for help in finding additional guidance materials, or visit www.epa.gov/npdes/stormwater. A sample construction plan is available at www.epa.gov/npdes/pubs/sample_swppp.pdf.

1. Site Evaluation and Design Development

- **Collect site information**
- **Develop site plan design**
- **Prepare pollution prevention site map**

The first step in preparing a Plan is to define the characteristics of the site and the type of construction that will occur. This involves collecting site information, identifying natural features that should be protected, developing a site plan design, describing the nature of the construction activity, and preparing a pollution prevention site map.

2. Assessment

- **Measure the site area**
- **Determine the drainage areas**
- **Calculate the runoff coefficient**

The next step is assessing the impact the project will have on stormwater runoff. Determine the drainage areas and estimate the runoff amounts and velocities. For more information on calculating the runoff coefficient, go to www.epa.gov/npdes/pubs/chap02_conguide.pdf, page 11.

3. Control Selection and Plan Design

- **Review and incorporate state or local requirements**
- **Select erosion and sediment controls**
- **Select other controls**
- **Select stormwater management controls**
- **Indicate the location of controls on the site map**
- **Prepare an inspection and maintenance plan**
- **Coordinate controls with construction activity**
- **Prepare sequence of major activities**

In the third step you'll actually document your procedures to prevent and control polluted stormwater runoff. You must delineate areas that will not be disturbed, including critical natural areas like streamside areas, floodplains, and trees. You must also identify the measures (or BMPs) you'll use to protect these areas.

Phasing your project to minimize the amount of exposed soil at any given time is a highly effective way to prevent erosion. Erosion control measures designed to prevent soil from being mobilized include diversions to route stormwater away from exposed soils and stabilization with vegetation, mulch, and geotextiles. Sedimentation control measures designed to remove sediment from stormwater or prevent it from leaving the site include silt fences, sediment traps, and diversions.

You'll need to select erosion and sediment controls—including stabilization measures for protecting disturbed areas and structural controls for diverting runoff and removing sediment—that are appropriate for your particular site. The appropriateness of the control measures will depend on several factors, but will be influenced most directly by the site characteristics. Some stabilization measures you might consider are temporary seeding, permanent seeding, and mulching. Structural control measures include earth dikes, silt fences, and sediment traps. No single BMP will meet all of the erosion and sedimentation control needs of a construction site. A combination of BMPs is necessary. For more information on the types of BMPs appropriate for your construction site, see the BMP fact sheet series available at www.epa.gov/npdes/menuofbmps.

Soil erosion control tips...

- Design the site to infiltrate stormwater into the ground and to keep it out of storm drains. Eliminate or minimize the use of stormwater collection and conveyance systems while maximizing the use of stormwater infiltration and bioretention techniques.
- Minimize the amount of exposed soil on site
  - To the extent possible, plan the project in stages to minimize the amount of area that is bare and subject to erosion. The less soil exposed, the easier and cheaper it will be to control erosion.
  - Vegetate disturbed areas with permanent or temporary seeding immediately upon reaching final grade.
  - Vegetate or cover stockpiles that will not be used immediately.
- Reduce the velocity of stormwater both while and away from the project area.
  - Interceptors, diversions, vegetated buffers, and check dams are a few of the BMPs that can be used to slow down stormwater as it travels across and away from the project site.
  - Diversion measures can also be used to direct flow away from exposed areas toward stable portions of the site.
  - Silt fences and other types of perimeter filters should never be used to reduce the velocity of runoff.
- Protect defined channels immediately with measures adequate to handle the storm flows expected.
  - Sod, geotextile, natural fiber, riprap, or other stabilizing measures should be used to allow the channels to carry water without causing erosion. Use softer measures like geotextile or vegetation where possible to prevent downstream impacts.
- Keep sediment on site.
  - Place aggregate or stone at construction site vehicle exits to accommodate at least two tire revolutions of large construction vehicles. Much of the dirt on the tires will fall off before the vehicle gets to the street.
  - Regular street sweeping at the construction entrance will prevent dirt from entering storm drains. Do not hose paved areas.
  - Sediment traps and basins are temporary structures and should be used in conjunction with other measures to reduce the amount of erosion.
- Maintaining all BMPs is critical to ensure their effectiveness during the life of the project.
  - Regularly remove collected sediment from silt fences, berms, traps, and other BMPs.
  - Ensure that geotextiles and mulch remain in place until vegetation is well established.
  - Maintain fences that protect sensitive areas, silt fences, diversion structures, and other BMPs.

Other BMPs and Activities to Control Polluted Runoff

You'll need to select other controls to address potential pollutant sources on your site. Construction materials, debris, trash, fuel, paint, and stockpiles become pollution sources when it rains. Basic pollution prevention practices can significantly reduce the amount of pollution leaving construction sites. The following are some simple practices that should be included in the Plan and implemented on site:

- Keep potential sources of pollution out of the rain as practicable (e.g., inside a building, covered with plastic or tarps, or sealed tightly in a leak-proof container).
- Clearly identify a protected, lined area for concrete truck washouts. This area should be located away from streams, storm drain inlets, or ditches and should be cleaned out periodically.
- Park, refuel, and maintain vehicles and equipment in one area of the site to minimize the area exposed to possible spills and fuel storage. This area should be well away from streams, storm drain inlets, or ditches. Keep spill kits close by and clean up any spills or leaks immediately, including spills on pavement or earthen surfaces.
- Practice good housekeeping. Keep the construction site free of litter, construction debris, and leaking containers. Keep all waste in one area to minimize cleaning.
- Never hose down paved surfaces to clean dust, debris, or trash. This water could wash directly into storm drains or streams. Sweep up materials and dispose of them in the trash. Never bury trash or debris!
- Dispose of hazardous materials properly.

4. Certification and Notification

- **Certify the Plan**
- **Submit permit application or notice of intent**

Once the Plan has been developed, an authorized representative must sign it. Now is the time to submit the permit application or notice of intent. Your permit might require that the Plan be kept on site, so be sure to keep it available for the staff implementing the Plan.

Erosion and sedimentation control practices are only as good as their installation and maintenance.

5. Implementing and Maintaining a Plan

- **Implement controls**
- **Inspect and maintain controls**
- **Update/change the Plan**
- **Report releases of hazardous materials**

A Plan describes the practices and activities you'll use to prevent stormwater contamination and meet the NPDES permit requirements. Make sure that the Plan is implemented and that the Plan is updated as necessary to reflect changes on the site.

Erosion and sedimentation control practices are only as good as their installation and maintenance. Train the contractors that will install the BMPs and inspect immediately to ensure that the BMPs have been installed correctly.

Regularly inspect the BMPs (especially before and after rain events) and perform any necessary repairs or maintenance immediately. Many BMPs are designed to handle a limited amount of sediment. If not maintained, they'll become ineffective and a source of sediment pollution.

It's also important to keep records of BMP installation, implementation, and maintenance. Keep track of major grading activities that occur on the site, when construction activities cease (temporarily or permanently), and when a site is temporarily or permanently stabilized.

If construction plans change at any time, or if more appropriate BMPs are chosen for the site, update the Plan accordingly.

6. Completing the Project: Final Stabilization and Termination of the Permit

- **Final stabilization**
- **Notice of Termination**
- **Record retention**

Many states and EPA require a Notice of Termination (NOT) or other notification signifying that the construction activity is completed. An NOT is required when

- Final stabilization has been achieved on all portions of the site for which the permittee is responsible.
- Another operator has assumed control over all areas of the site that have not been finally stabilized. That operator would need to submit a new permit application to the permitting authority.
- For residential construction only, temporary stabilization of a lot has been completed prior to transference of ownership to the homeowner, with the homeowner being made aware of the need to perform final stabilization.

Permittees must keep a copy of their permit application and their Plan for at least 3 years following final stabilization. This period may be longer depending on state and local requirements.

Preconstruction Checklist

- A site description, including
  - Nature of the activity
  - Intended sequence of major construction activities
  - Total area of the site
  - Existing soil type and rainfall runoff data
  - A site map with:
    - Drainage patterns
    - Approximate slopes after major grading
    - Area of soil disturbance
    - Outline of areas which will not be disturbed
    - Location of major structural and nonstructural soil erosion controls
    - Areas where stabilization practices are expected to occur
    - Surface waters
    - Stormwater discharge locations
  - Name of the receiving water(s)
- A description of controls:
  - Erosion and sediment controls, including
    - Stabilization practices for all areas disturbed by construction
    - Structural practices for all drainage/discharge locations
  - Stormwater management controls, including
    - Measures used to control pollutants occurring in stormwater discharges after construction activities are complete
    - Velocity dissipation devices to provide nonerosive flow conditions from the discharge point along the length of any outfall channel
  - Other controls, including
    - Waste disposal practices that prevent discharge of solid materials
    - Measures to minimize offset tracking of sediments by construction vehicles
    - Measures to ensure compliance with state or local waste disposal, sanitary sewer, or septic system regulations
  - Description of the timing during the construction when measures will be implemented
- State or local requirements incorporated into the Plan
- Inspection and maintenance procedures for control measures identified in the Plan
- Contractor certification and Plan certification

Implementation Checklist

- Maintain records of construction activities, including
  - Dates when major grading activities occur
  - Dates when construction activities temporarily cease on the site or a portion of the site
  - Dates when construction activities permanently cease on the site or a portion of the site
  - Dates when stabilization measures are completed on the site
- Prepare inspection reports summarizing
  - Name of person conducting BMP inspections
  - Qualifications of person conducting BMP inspections
  - BMPs/areas inspected
  - Observed conditions
  - Necessary changes to the Plan
- Report releases of reportable quantities of oil or hazardous materials
  - Notify the National Response Center at 800-424-8802 immediately
  - Report releases to your permitting authority immediately, or as specified in your permit. You must also provide a written report within 14 days.
  - Modify the Plan to include
    - The date of release
    - Circumstances leading to the release
    - Steps taken to prevent reoccurrence of the release
- Modify Plan as necessary
  - Incorporate requests of the permitting authority to bring the Plan into compliance
  - Address changes in design, construction operation, or maintenance that affect the potential for discharge of pollutants

An ounce of prevention is worth a pound of cure! It's far more efficient and cost-effective to prevent pollution than it is to try to correct problems later. Installing and maintaining simple BMPs and pollution prevention techniques on site can greatly reduce the potential for stormwater pollution and can also save you money!

StormWater CleanWater PROTECTION PROGRAM

Visit www.epa.gov/npdes/stormwater for more information.

Stormwater Pollution from Construction Activities

The two most common sources of stormwater pollution problems associated with construction activities are *erosion* and *sedimentation*. Failure to maintain adequate erosion and sediment controls at construction sites often results in sediment discharges into the storm drain system, creating multiple problems once it enters local waterways.

Construction vehicles and heavy equipment can also track significant amounts of mud and sediment onto adjacent streets. Additionally, wind may transport construction materials and wastes into streets storm drains, or directly into our local waterways.

Resources

State Water Resources Control Board
Division of Water Quality
1001 I Street
Sacramento CA 95814
(916) 341-5455
www.swrcb.ca.gov/stormwtr/

Colorado River Basin Regional Water
Quality Control Board - Region 7
73-720 Fred Waring Drive, Suite 100
Palm Desert, CA 92260
(760) 346-7491
www.swrcb.ca.gov/~rwqcb7/

Santa Ana Regional Water
Quality Control Board - Region 8
3737 Main Street, Suite 500
Riverside, CA 92501-3348
(909) 782-4130
www.swrcb.ca.gov/~rwqcb8/

San Diego Regional Water
Quality Control Board - Region 9
9771 Clairemont Mesa Blvd., Suite A
San Diego, CA 92124
(858) 467-2952
www.swrcb.ca.gov/~rwqcb9/

StormWater Pollution . . . What You Should Know

Riverside County has two drainage systems - sewers and storm drains. The storm drain system was designed to reduce flooding by carrying excess rainwater away from streets and developed areas. Since the storm drain system does not provide for water treatment, it also serves the *unintended* function of transporting pollutants directly to our local waterways.

Unlike sanitary sewers, storm drains are not connected to a wastewater treatment plant – they flow directly to our local streams, rivers and lakes.

Stormwater runoff is a part of the natural hydrologic process. However, land development and construction activities can significantly alter natural drainage processes and introduce pollutants into stormwater runoff. Polluted stormwater runoff from construction sites has been identified as a major source of water pollution in California. It jeopardizes the quality of our local waterways and can pose a serious threat to the health of our aquatic ecosystems.

The Cities and County of Riverside StormWater/CleanWater Protection Program

Because preventing pollution is much easier and less costly than cleaning up "after the fact," the Cities and County of Riverside StormWater/CleanWater Protection Program informs residents and businesses on pollution prevention activities. This pamphlet describes various Best Management Practices (BMPs) that construction site operators can use to prevent stormwater pollution.

In accordance with applicable federal and state law, the Cities and County of Riverside have adopted ordinances for stormwater management and discharge control that **prohibit** the discharge of pollutants into the storm drain system or local surface waters. This includes discharges from construction sites containing sediment, concrete, mortar, paint, solvents, lubricants, vehicle fluids, fuel, pesticides, and construction debris.

PLEASE NOTE: The Federal, State and local regulations strictly prohibit the discharge of sediment and pollutants into the streets, the storm drain system or waterways. As an owner, operator or supervisor of a construction site, you may be held financially responsible for any environmental damage caused by your subcontractors or employees.

To report a hazardous materials spill, call:

Riverside County Hazardous Materials
Emergency Response Team
(909) 358-5055 8:00 a.m. – 5:00 p.m.
(909) 358-5245 after 5:00 p.m.

In an emergency call: 911

For recycling and hazardous waste disposal, call:

(909) 358-5055

To report an illegal dumping or a clogged storm drain, call:

1-800-506-2555

To order additional brochures or to obtain information on other pollution prevention activities, please call (909) 955-1200 or visit the StormWater/CleanWater Protection Program website at:
www.co.riverside.ca.us/depts/flood/waterquality/npdes.asp

StormWater CleanWater

PROTECTION PROGRAM

Best Management Practices (BMPs) for:

- Developers
- General Contractors
- Home Builders
- Construction Inspectors
- Anyone in the construction business

GENERAL CONSTRUCTION & SITE SUPERVISION

StormWater Pollution

What you should know for...

The StormWater/CleanWater Protection Program gratefully acknowledges the Santa Clara Valley Nonpoint Pollution Control Program, Alameda Countywide CleanWater Program and the City of Los Angeles Stormwater Management Division for information provided in the brochure.

What Should You Do?
Advance Planning to Prevent Pollution

- ❑ Remove existing vegetation only as needed.
- ❑ Schedule excavation, grading, and paving operations for dry weather periods, if possible.
- ❑ Designate a specific area of the construction site, well away from storm drain inlets or watercourses, for material storage and equipment maintenance.
- ❑ Develop and implement an effective combination of erosion and sediment controls for the construction site.
- ❑ Practice source reduction by ordering only the amount of materials that are needed to finish the project.
- ❑ Educate your employees and subcontractors about stormwater management requirements and their pollution prevention responsibilities.
- ❑ Control the amount of surface runoff at the construction site by impeding internally generated flows and using berms or drainage ditches to direct incoming offsite flows to go around the site. *Note: Consult local drainage policies for more information.*

Best Management Practices

The following Best Management Practices (BMPs) can significantly reduce pollutant discharges from your construction site. Compliance with stormwater regulations can be as simple as minimizing stormwater contact with potential pollutants by providing covers and secondary containment for construction materials, designating areas away from storm drain systems for storing equipment and materials and implementing good housekeeping practices at the construction site.

- ❑ Protect all storm drain inlets and streams located near the construction site to prevent sediment-laden water from entering the storm drain system.
- ❑ Limit access to and from the site. Stabilize construction entrances/exits to minimize the track out of dirt and mud onto adjacent streets. Conduct frequent street sweeping.
- ❑ Protect stockpiles and construction materials from winds and rain by storing them under a roof, secured impermeable tarp or plastic sheeting.
- ❑ Avoid storing or stockpiling materials near storm drain inlets, gullies or streams.
- ❑ Phase grading operations to limit disturbed areas and duration of exposure.
- ❑ Perform major maintenance and repairs of vehicles and equipment offsite.
- ❑ Wash out concrete mixers only in designated washout areas at the construction site.
- ❑ Set-up and operate small concrete mixers on tarps or heavy plastic drop cloths.
- ❑ Keep construction sites clean by removing trash, debris, wastes, etc. on a regular basis.
- ❑ Clean-up spills immediately using dry clean-up methods (e.g., absorbent materials such as cat litter, sand or rags for liquid spills; sweeping for dry spills such as cement, mortar or fertilizer) and by removing the contaminated soil from spills on dirt areas. .
- ❑ Prevent erosion by implementing any or a combination of soil stabilization practices such as mulching, surface roughening, permanent or temporary seeding.
- ❑ Maintain all vehicles and equipment in good working condition. Inspect frequently for leaks, and repair promptly.
- ❑ Practice proper waste disposal. Many construction materials and wastes, including solvents, water-based paint, vehicle fluids, broken asphalt and concrete, wood, and cleared vegetation can be recycled. Materials that cannot be recycled must be taken to an appropriate landfill or disposed of as hazardous waste.
- ❑ Cover open dumpsters with secured tarps or plastic sheeting. Never clean out a dumpster by washing it down on the construction site.
- ❑ Arrange for an adequate debris disposal schedule to insure that dumpsters do not overflow.

General Construction Activities Stormwater Permit

(Construction Activities General Permit)

The State Water Resources Control Board (SWRCB) adopted a new Construction Activities General Permit (WQ Order No. 99-08DWQ) on August 19, 1999, superseding the now expired SWRCB statewide General Permit (WQ Order No. 92-08DWQ). This permit is administered and enforced by the SWRCB and the local Regional Water Quality Control Boards (RWQCB). The updated Construction Activities General Permit establishes a number of new stormwater management requirements for construction site operator.

NOTE: Some construction activies stormwater permits are issued on a regional basis. Consult your local RWQCB to find out if your project requires coverage under any of these permits.

Frequently Asked Questions:

Does my construction site require coverage under the Construction Activities General Permit?

Yes, if construction activity results in the disturbance of five or more acres of total land area or is part of a common plan of development that results in the disturbance of five or more acres.

How do I obtain coverage under the Construction Activities General Permit?

Obtain the permit package and submit the completed Notice of Intent (NOI) form to the SWRCB prior to grading or disturbing soil at the construction site. For ongoing construction activity involving a change of ownership, the new owner must submit a new NOI within 30 days of the date of change of ownership. The completed NOI along with the required fee should be mailed to the SWRCB.

What must I do to comply with the requirements of the Construction Activities General Permit?

- Implement BMPs for non-stormwater discharges year-round.
- Prepare and implement a Stormwater Pollution Prevention Plan (SWPPP) prior to commencing construction activities.
- Keep a copy of the SWPPP at the construction site for the entire duration of the project.
- Calculate the anticipated stormwater run-off.
- Implement an effective combination of erosion and sediment control on all soil disturbed areas.
- Conduct site inspections prior to anticipated storm events, every 24-hours during extended storm events, and after actual storm event.
- Perform repair and maintenance of BMPs as soon as possible after storm events depending upon worker safety.
- Update the SWPPP as needed, to manage pollutants or reflect changes in site conditions.
- Include description of post construction BMPs at the construction site, including parties responsible for long-term maintenance.

NOTE: Please refer to the Construction Activities General Permit for detailed information. You may contact the SWRCB, your local RWQCB, or visit the SWRCB website at www.swrcb.ca.gov/stormwtr/ to obtain a State Construction Activities Stormwater General Permit packet.

How long is this Construction Activities General Permit in effect?

The Permit coverage stays in effect untilyou submit a Notice of Termination (NOT) to the SWRCB. For the purpose of submitting a NOT, all soil disturbing activities have to be completed and one of the three following criteria has to be met:

1. Change of ownership;
2. A uniform vegetative cover with 70 percent coverage has been established; or,
3. Equivalent stabilization measures such as the use of reinforced channel liners, soil cement, fiber matrices, geotextiles, etc., have been employed.

POST CONSTRUCTION

What is stormwater runoff?

Stormwater runoff occurs when precipitation from rain or snowmelt flows over the ground. Impervious surfaces like driveways, sidewalks, and streets prevent stormwater from naturally soaking into the ground.

Why is stormwater runoff a problem?

Stormwater can pick up debris, chemicals, dirt, and other pollutants and flow into a storm sewer system or directly to a lake, stream, river, wetland, or coastal water. Anything that enters a storm sewer system is discharged untreated into the waterbodies we use for swimming, fishing, and providing drinking water.

The effects of pollution

Polluted stormwater runoff can have many adverse effects on plants, fish, animals, and people.

- Sediment can cloud the water and make it difficult or impossible for aquatic plants to grow. Sediment also can destroy aquatic habitats.
- Excess nutrients can cause algae blooms. When algae die, they sink to the bottom and decompose in a process that removes oxygen from the water. Fish and other aquatic organisms can't exist in water with low dissolved oxygen levels.

- Bacteria and other pathogens can wash into swimming areas and create health hazards, often making beach closures necessary.
- Debris—plastic bags, six-pack rings, bottles, and cigarette butts—washed into waterbodies can choke, suffocate, or disable aquatic life like ducks, fish, turtles, and birds.
- Household hazardous wastes like insecticides, pesticides, paint, solvents, used motor oil, and other auto fluids can poison aquatic life. Land animals and people can become sick or die from eating diseased fish and shellfish or ingesting polluted water.

- Polluted stormwater often affects drinking water sources. This, in turn, can affect human health and increase drinking water treatment costs.

Stormwater Pollution Solutions

Recycle or properly dispose of household products that contain chemicals, such as insecticides, pesticides, paint, solvents, and used motor oil and other auto fluids. Don't pour them onto the ground or into storm drains.

Lawn care

Excess fertilizers and pesticides applied to lawns and gardens wash off and pollute streams. In addition, yard clippings and leaves can wash into storm drains and contribute nutrients and organic matter to streams.

- Don't overwater your lawn. Consider using a soaker hose instead of a sprinkler.
- Use pesticides and fertilizers sparingly. When use is necessary, use these chemicals in the recommended amounts. Use organic mulch or safer pest control methods whenever possible.
- Compost or mulch yard waste. Don't leave it in the street or sweep it into storm drains or streams.
- Cover piles of dirt or mulch being used in landscaping projects.

Auto care

Washing your car and degreasing auto parts at home can send detergents and other contaminants through the storm sewer system. Dumping automotive fluids into storm drains has the same result as dumping the materials directly into a waterbody.

- Use a commercial car wash that treats or recycles its wastewater, or wash your car on your yard so the water infiltrates into the ground.
- Repair leaks and dispose of used auto fluids and batteries at designated drop-off or recycling locations.

Septic systems

Leaking and poorly maintained septic systems release nutrients and pathogens (bacteria and viruses) that can be picked up by stormwater and discharged into nearby waterbodies. Pathogens can cause public health problems and environmental concerns.

- Inspect your system every 3 years and pump your tank as necessary (every 3 to 5 years).
- Don't dispose of household hazardous waste in sinks or toilets.

Pet waste

Pet waste can be a major source of bacteria and excess nutrients in local waters.

- When walking your pet, remember to pick up the waste and dispose of it properly. Flushing pet waste is the best disposal method. Leaving pet waste on the ground increases public health risks by allowing harmful bacteria and nutrients to wash into the storm drain and eventually into local waterbodies.

Education is essential to changing people's behavior. Signs and markers near storm drains warn residents that pollutants entering the drains will be carried untreated into a local waterbody.

Residential landscaping

Permeable Pavement—Traditional concrete and asphalt don't allow water to soak into the ground. Instead these surfaces rely on storm drains to divert unwanted water. Permeable pavement systems allow rain and snowmelt to soak through, decreasing stormwater runoff.

Rain Barrels—You can collect rainwater from rooftops in mosquito-proof containers. The water can be used later on lawn or garden areas.

Rain Gardens and Grassy Swales—Specially designed areas planted with native plants can provide natural places for rainwater to collect and soak into the ground. Rain from rooftop areas or paved areas can be diverted into these areas rather than into storm drains.

Vegetated Filter Strips—Filter strips are areas of native grass or plants created along roadways or streams. They trap the pollutants stormwater picks up as it flows across driveways and streets.

Dirt, oil, and debris that collect in parking lots and paved areas can be washed into the storm sewer system and eventually enter local waterbodies.

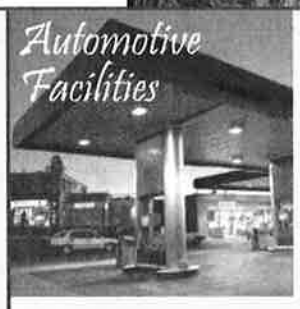
- Sweep up litter and debris from sidewalks, driveways and parking lots, especially around storm drains.
- Cover grease storage and dumpsters and keep them clean to avoid leaks.
- Report any chemical spill to the local hazardous waste cleanup team. They'll know the best way to keep spills from harming the environment.

Erosion controls that aren't maintained can cause excessive amounts of sediment and debris to be carried into the stormwater system. Construction vehicles can leak fuel, oil, and other harmful fluids that can be picked up by stormwater and deposited into local waterbodies.

- Divert stormwater away from disturbed or exposed areas of the construction site.
- Install silt fences, vehicle mud removal areas, vegetative cover, and other sediment and erosion controls and properly maintain them, especially after rainstorms.
- Prevent soil erosion by minimizing disturbed areas during construction projects, and seed and mulch bare areas as soon as possible.

Lack of vegetation on streambanks can lead to erosion. Overgrazed pastures can also contribute excessive amounts of sediment to local waterbodies. Excess fertilizers and pesticides can poison aquatic animals and lead to destructive algae blooms. Livestock in streams can contaminate waterways with bacteria, making them unsafe for human contact.

- Keep livestock away from streambanks and provide them a water source away from waterbodies.
- Store and apply manure away from waterbodies and in accordance with a nutrient management plan.
- Vegetate riparian areas along waterways.
- Rotate animal grazing to prevent soil erosion in fields.
- Apply fertilizers and pesticides according to label instructions to save money and minimize pollution.



Uncovered fueling stations allow spills to be washed into storm drains. Cars waiting to be repaired can leak fuel, oil, and other harmful fluids that can be picked up by stormwater.

- Clean up spills immediately and properly dispose of cleanup materials.
- Provide cover over fueling stations and design or retrofit facilities for spill containment.
- Properly maintain fleet vehicles to prevent oil, gas, and other discharges from being washed into local waterbodies.
- Install and maintain oil/water separators.

Improperly managed logging operations can result in erosion and sedimentation.

- Conduct preharvest planning to prevent erosion and lower costs.
- Use logging methods and equipment that minimize soil disturbance.
- Plan and design skid trails, yard areas, and truck access roads to minimize stream crossings and avoid disturbing the forest floor.
- Construct stream crossings so that they minimize erosion and physical changes to streams.
- Expedite revegetation of cleared areas.

Helpful telephone numbers and links:

Riverside County Stormwater Protection Partners

Flood Control District	(951) 955-1200
County of Riverside	(951) 955-1000
City of Banning	(951) 922-3105
City of Beaumont	(951) 769-8520
City of Calimesa	(909) 795-9801
City of Canyon Lake	(951) 244-2955
Cathedral City	(760) 770-0327
City of Coachella	(760) 398-4978
City of Corona	(951) 736-2447
City of Desert Hot Springs	(760) 329-6411
City of Eastvale	(951) 361-0900
City of Hemet	(951) 765-2300
City of Indian Wells	(760) 346-2489
City of Indio	(760) 391-4000
City of Lake Elsinore	(951) 674-3124
City of La Quinta	(760) 777-7000
City of Menifee	(951) 672-6777
City of Moreno Valley	(951) 413-3000
City of Murrieta	(951) 304-2489
City of Norco	(951) 270-5607
City of Palm Desert	(760) 346-0611
City of Palm Springs	(760) 323-8299
City of Perris	(951) 943-6100
City of Rancho Mirage	(760) 324-4511
City of Riverside	(951) 361-0900
City of San Jacinto	(951) 654-7337
City of Temecula	(951) 694-6444
City of Wildomar	(951) 677-7751

REPORT ILLEGAL STORM DRAIN DISPOSAL
1-800-506-2555 or e-mail us at
fcnpdes@rcflood.org

- Riverside County Flood Control and Water Conservation District
  www.rcflood.org

Online resources include:

- California Storm Water Quality Association
  www.casqa.org
- State Water Resources Control Board
  www.waterboards.ca.gov
- Power Washers of North America
  www.thepwna.org

Stormwater Pollution

What you should know for...

Outdoor Cleaning Activities and Professional Mobile Service Providers

Storm drain pollution prevention information for:

- Car Washing / Mobile Detailers
- Window and Carpet Cleaners
- Power Washers
- Waterproofers / Street Sweepers
- Equipment cleaners or degreasers and all mobile service providers

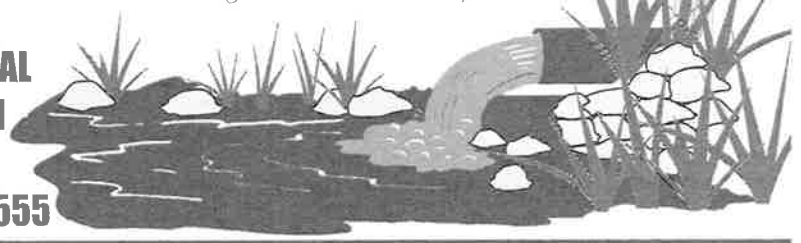
Do you know where street flows actually go?

Storm drains are NOT connected to sanitary sewer systems and treatment plants!

The primary purpose of storm drains is to carry rain water away from developed areas to prevent flooding. Pollutants discharged to storm drains are transported directly into rivers, lakes and streams. Soaps, degreasers, automotive fluids, litter and a host of materials are washed off buildings, sidewalks, plazas and parking areas. Vehicles and equipment must be properly managed to prevent the pollution of local waterways.

Unintentional spills by mobile service operators can flow into storm drains and pollute our waterways. **Avoid mishaps.** *Always* have a **Spill Response Kit** on hand to clean up unintentional spills. Only emergency **Mechanical** repairs should be done in City streets, using drip pans for spills. **Plumbing** should be done on private property. Always store chemicals in a leak-proof container and keep covered when not in use. **Window/Power Washing** waste water shouldn't be released into the streets, but should be disposed of in a sanitary sewer, landscaped area or in the soil. Soiled **Carpet Cleaning** wash water should be filtered before being discharged into the sanitary sewer. Dispose of all filter debris properly. **Car Washing/Detailing** operators should wash cars on private property and use a regulated hose nozzle for water flow control and runoff prevention. Capture and dispose of waste water and chemicals properly. Remember, storm drains are for receiving rain water runoff only.

REPORT ILLEGAL STORM DRAIN DISPOSAL 1-800-506-2555



Help Protect Our Waterways!

Use these guidelines for Outdoor Cleaning Activities and Wash Water Disposal

Did you know that disposing of pollutants into the street, gutter, storm drain or body of water is *PROHIBITED* by law and can result in stiff penalties?

Best Management Practices

Waste wash water from Mechanics, Plumbers, Window/Power Washers, Carpet Cleaners, Car Washing and Mobile Detailing activities may contain significant quantities of motor oil, grease, chemicals, dirt, detergents, brake pad dust, litter and other materials.

Best Management Practices, or BMPs as they are known, are guides to prevent pollutants from entering the storm drains. ***Each of us*** can do our part to keep stormwater clean by using the suggested BMPs below:

Simple solutions for both light and heavy duty jobs:

Do...consider dry cleaning methods first such as a mop, broom, rag or wire brush. Always keep a spill response kit on site.

Do...prepare the work area before power cleaning by using sand bags, rubber mats, vacuum booms, containment pads or temporary berms to keep wash water away from the gutters and storm drains.

Do...use vacuums or other machines to remove and collect loose debris or litter before applying water.

Do...obtain the property owner's permission to dispose of ***small amounts*** of power washing waste water on to landscaped, gravel or unpaved surfaces.

Do...check your local sanitary sewer agency's policies on wash water disposal regulations before disposing of wash water into the sewer. (See list on reverse side)

Do...be aware that if discharging to landscape areas, soapy wash water may damage landscaping. Residual wash water may remain on paved surfaces to evaporate. Sweep up solid residuals and dispose of properly. Vacuum booms are another option for capturing and collecting wash water.

Do...check to see if local ordinances prevent certain activities.

Do not let...wash or waste water from sidewalk, plaza or building cleaning go into a street or storm drain.

Report illegal storm drain disposal
Call Toll Free
1-800-506-2555

Using Cleaning Agents

Try using biodegradable/phosphate-free products. They are easier on the environment, but don't confuse them with being toxic free. Soapy water entering the storm drain system can impact the delicate aquatic environment.

When cleaning surfaces with a ***high-pressure washer*** or ***steam cleaner***, additional precautions should be taken to prevent the discharge of pollutants into the storm drain system. These two methods of surface cleaning can loosen additional material that can contaminate local waterways.

Think Water Conservation

Minimize water use by using high pressure, low volume nozzles. Be sure to check all hoses for leaks. Water is a precious resource, don't let it flow freely and be sure to shut it off in between uses.

Screening Wash Water

Conduct thorough dry cleanup before washing exterior surfaces, such as buildings and decks ***with loose paint***, sidewalks or plaza areas. Keep debris from entering the storm drain after cleaning by first passing the wash water through a "20 mesh" or finer screen to catch the solid materials, then dispose of the mesh in a refuse container. Do not let the remaining wash water enter a street, gutter or storm drain.

Drain Inlet Protection & Collection of Wash Water

- Prior to any washing, block all storm drains with an impervious barrier such as sandbags or berms, or seal the storm drain with plugs or other appropriate materials.
- Create a containment area with berms and traps or take advantage of a low spot to keep wash water contained.
- Wash vehicles and equipment on grassy or gravel areas so that the wash water can seep into the ground.
- Pump or vacuum up all wash water in the contained area.

Concrete/Coring/Saw Cutting and Drilling Projects

Protect any down-gradient inlets by using dry activity techniques whenever possible. If water is used, minimize the amount of water used during the coring/drilling or saw cutting process. Place a barrier of sandbags and/or absorbent berms to protect the storm drain inlet or watercourse. Use a shovel or wet vacuum to remove the residue from the pavement. Do not wash residue or particulate matter into a storm drain inlet or watercourse.