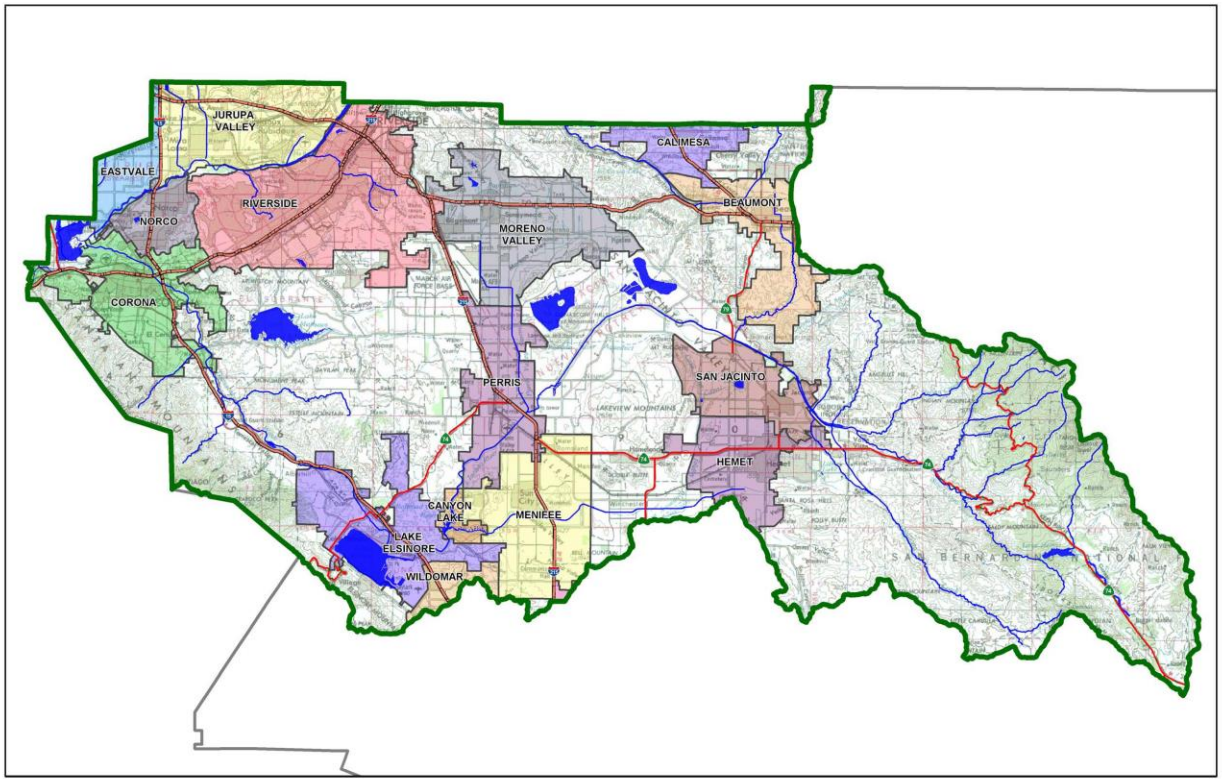
Project Specific Water Quality Management Plan

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

Project Title: LDC - HARVILL

Development No:

Design Review/Case No: PPT220026



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☒ **Preliminary**
☐ **Final**

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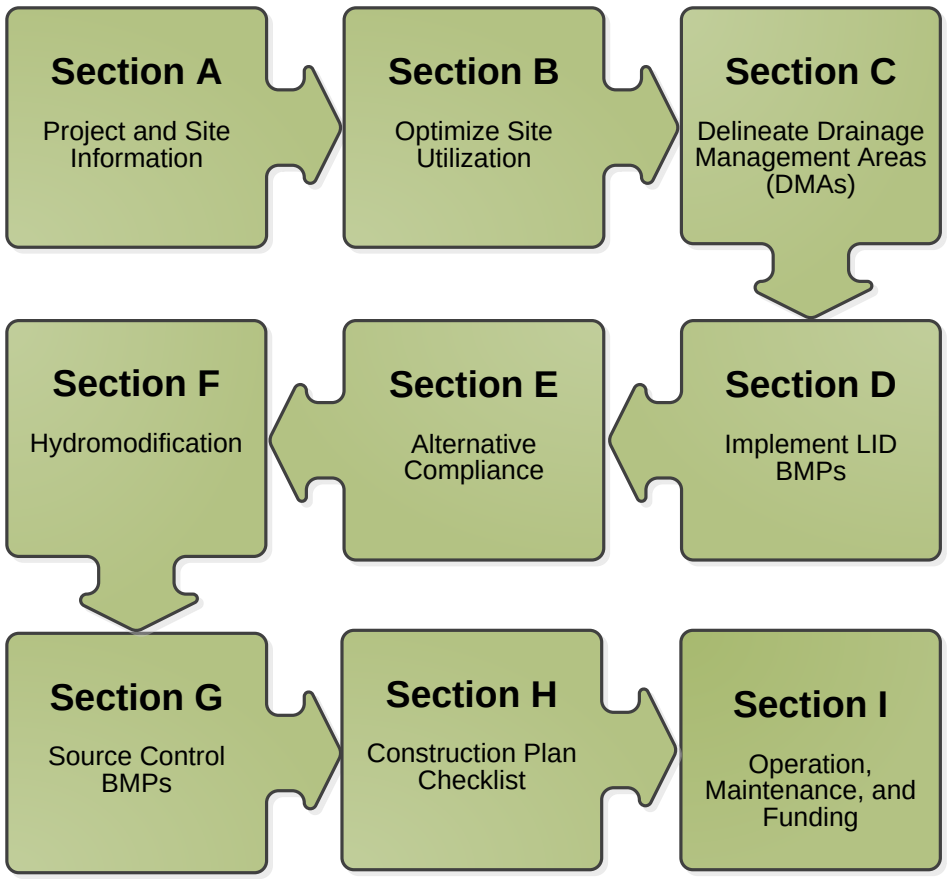
Prepared for Compliance with
Regional Board Order No. **R8-2010-0033**
Template revised June 30, 2016

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 LDC Industrial Realty, LLC by Kimley-Horn for the LDC-Harvill project.

This WQMP is intended to comply with the requirements of County of Riverside for R-8-2010-0033 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 County of Riverside Water Quality Ordinance (Municipal Code SectionR8-2010-0033).

"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	01/18/2024 Date
Joshua Bielik, PE 92259 Preparer's Printed Name	Project Manager Preparer's Title/Position



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Section A: Project and Site Information

PROJECT INFORMATION	
Type of Project:	Industrial Warehouse with associated parking lot, sidewalks, and landscaping.
Planning Area:	Vacant Land (VAC)
Community Name:	TBD
Development Name:	Harvill
PROJECT LOCATION	
Latitude & Longitude (DMS): 33° 50' 0.24" N, 117° 15' 3.6" W	
Project Watershed and Sub-Watershed: Santa Ana River Watershed (801), San Jacinto Valley Hydrologic Unit (802.00)	
Gross Acres: 4.79 AC	
APN(s): Insert text here	
Map Book and Page No.: The Thomas Guide California Road Atlas (2002) – Page 285, Grid A-6	
PROJECT CHARACTERISTICS	
Proposed or Potential Land Use(s)	Industrial Warehouse
Proposed or Potential SIC Code(s)	Insert text here
Area of Impervious Project Footprint (SF)	164,762
Total Area of proposed Impervious Surfaces within the Project Footprint (SF)/or Replacement	208,532
Does the project consist of offsite road improvements?	☐ Y ☒ N
Does the project propose to construct unpaved roads?	☐ Y ☒ N
Is the project part of a larger common plan of development (phased project)?	☐ Y ☒ N
EXISTING SITE CHARACTERISTICS	
Total area of existing Impervious Surfaces within the Project limits Footprint (SF)	0 SF
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)	N/A
What is the Water Quality Design Storm Depth for the project?	0.6

A.1 Maps and Site Plans

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

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

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.

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
Canyon Lake	Nutrients and Pathogens	MUN, AGR, GWR, REC1, REC2, WARM, WILD	Not Designated As Rare
Perris Valley Storm Drain	None Listed	None Listed	Not Designated As Rare
San Jacinto River Reach 3 (H.U. No. 802.11)	None Listed	AGR, GWR, REC1, REC2, WARM, WILD	Not Designated As Rare
Canyon Lake (H. U. No. 802.11 (802.12))	Nutrients and Pathogens	MUN, AGR, GWR, REC1, REC 2, WARM, WILD	Not Designated AS Rare
San Jacinto River Reach 1 (H.U. No. 802.32)	None Listed	MUN, AGR, GWR, REC1, REC2, WARM, WILD	Not Designated AS Rare
Lake Elsinore (H.U. No. 802.31)	Nutrients, Organic Enrichment/Low Dissolved Oxygen, Polychlorinated Biphenyls (PCBs) Sediment Toxicity and Unknown Toxicity	REC 1, REC 2, WARM, WILD	Not Designated AS Rare

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

Table A.2 Other Applicable Permits

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

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.

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

Site Optimization

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

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

The project area is part of a primarily urban watershed that drains to the San Jacinto River and eventually to Lake Elsinore. The project site is an undeveloped vacant lot with elevations ranging from 1513' to 1520' with slopes varying from 2% to 7%. The site does not receive any offsite runoff. The northern side of the site slopes northeast toward Harvill Avenue. Overland flow from this portion of the site is collected within the public right of way of Harvill Avenue gutter and conveyed north to an existing storm drain inlet at the southwest corner of the Harvell Avenue and Cajalco Road intersection, which connects to RCFC&WCD line E-8. The southern side of the site slopes to the east toward Harvill Avenue and to the west toward Patterson Avenue. Overland flow from the southeast portion of the site is collected within the public right of way of Harvill Avenue gutter and conveyed roughly 1700' south to an existing ditch that flows east alongside the AT&SF railroad. Overland flow from the southwest portion of the site slopes southwest toward the east side of Patterson Avenue. Runoff is collected in an existing ditch on the east side of Patterson Avenue and is conveyed south to an existing low spot north of the railroad. This low spot is the historical discharge

point for stormwater runoff from Patterson Avenue. The site is designed such that post development peak flows will not exceed pre-development peak flow rates. The Perris Valley Master Drainage Plan (PVMDP) shows runoff from 3.60 acres of project area being conveyed to Line E-8. The project development proposes to convey runoff from an additional 1.19 acres to Line E-8 that was previously planned for conveyance to Line G-1 in the PVMDP. This increase in the tributary area for POC EX1 will result in an increase in both the peak flow and the runoff volume that is discharging to Line E-8 in the post-development condition when compared to the pre-development condition. The proposed on-site BMP is sized to adequately detain the net increase in site runoff volume. The required storage volume provided by the BMP area was determined using the RCFC Unit Hydrograph Method in CivilD software. Post-development flows were compared against pre-development flows, and a net runoff volume was calculated. The resulting total required storage volume for the post-developed condition is 15,895CF. The BMP has an outlet control structure that will limit 100-year flows from the project site not to exceed the allowable 3.33 cfs. Refer to the Preliminary Drainage Report for additional information.

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

The site is an undeveloped vacant lot and has limited vegetation which will not be preserved as part of the development.

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

No – according to the Geotechnical Report and Infiltration testing by Southern California Geotechnical dated October 29, 2021 infiltration is not considered feasible for this site. Although an infiltration rate of 1.0 inch per hour was calculated, these areas are likely to be underlain by much less permeable, denser alluvium which was encountered at infiltration testing location.

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

Yes – impervious areas (including number of parking spaces, width of parking spaces, width of drive aisles, building size, etc.) have been minimized as much as possible while still meeting the needs of the proposed site usage and maintaining compliance with the City of Perris design requirements.

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

Yes – the site has been designed to maximize the square footage of permeable BMPs providing stormwater treatment. Runoff from a portion of the site drains to a bioretention basin at the southeast size of the project site. Runoff from the remaining untreated site area drains to a propriety biotreatment modular wetland structure at the northeast corner of the site. This modular wetland system has been oversized - the system will capture and treat a larger design flow than required in order to account for offsite improvements, which are not being physically captured onsite.

Section C: Delineate Drainage Management Areas (DMAs)

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

Table C.1 DMA Classifications

DMA Name or ID	Surface Type(s)[1][2]	Area (Sq. Ft.)	DMA Type
DMA-1	Concrete, asphalt, landscaping	80,125	Type D (Area Draining to BMP)
DMA-2	Roofs, concrete, asphalt, landscaping	121,216	Type D (Area Draining to BMP)
DMA-3 – Offsite	Concrete, asphalt, landscaping	25,852	Type D (Area Draining to BMP)
DMA-4 – Offsite	Concrete, asphalt, landscaping	15,493	Type D (Area Draining to BMP)

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

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

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

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

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

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

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

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

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

DMA Name or ID	BMP Name or ID
DMA-1	BMP 1 (Bioretention Basin)
DMA-2	BMP 2 (Proprietary Biotreatment)
DMA-3	BMP 2 (Proprietary Biotreatment – Overtreatment)
DMA-4	BMP 2 (Proprietary Biotreatment – Overtreatment)

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

Section D: Implement LID BMPs

D.1 Infiltration Applicability

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

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

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

Geotechnical Report

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

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

Infiltration Feasibility

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

Table D.1 Infiltration Feasibility

Does the project site…	YES	NO
…have any DMAs with a seasonal high groundwater mark shallower than 10 feet?		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 1		
…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 none of the above criteria applies, follow the steps below to assess the feasibility of irrigation use, toilet use and other non-potable uses (e.g., industrial use).

Irrigation Use Feasibility

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

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

Total Area of Irrigated Landscape: 1.0 AC

Type of Landscaping (Conservation Design or Active Turf): Native/Drought Tolerant 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: 3.79 AC

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: 0.79 AC/AC

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: 2.99 AC

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)
2.99 AC	1.0 AC

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: TBD – assumed to be 50 Users (exact value dependent upon future occupant us)

Project Type: Industrial

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: 3.79 AC

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

Enter your TUTIA factor: 172 TU/AC

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: 652 Users

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

Minimum required Toilet Users (Step 4)	**Projected number of toilet users (Step 1)**
652 Users	50 Users

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: Projected Average Daily Use (gpd)

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

Total Area of Impervious Surfaces: Insert Area (Acres)

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

Enter the factor from Table 2-4: Enter Value

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

Minimum required use: Minimum use required (gpd)

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

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

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

D.3 Bioretention and Biotreatment Assessment

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

Select one of the following:

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

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

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	
DMA-1	☐	☐	☒	☐	☐
DMA-2	☐	☐	☐	☒	☐
DMA-3	☐	☐	☐	☒	☐
DMA-4	☐	☐	☐	☒	☐
	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐

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.

DMA 1 – Shall drain to and be treated by a traditional bioretention basin (BMP-1). Runoff from the site shall drain to the proposed BMP via overland flow, concrete gutters, and a storm drain system. DMA 1 will be treated and detained onsite to discharge no greater than the existing 100yr flows of the originally planned area.

DMA 2, DMA 3, DMA 4 - Shall be treated by a proprietary biotreatment Modular Wetland System (BMP-1). Runoff from DMA 2 shall drain to the proposed BMP via overland flow, concrete gutters, and a storm drain system. Runoff from DMA 3 and DMA 4 will not be captured onsite - the modular wetland system has been oversized to capture and treat a larger design capture volume than required to account for DMA 3 and 4. Runoff from DMA 2, 3, and 4 will ultimately discharge into BMP 1 in order to detain flows and discharge no greater than the existing 100yr flows of the originally planned area.

D.5 LID BMP Sizing

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

Table D.3 DCV Calculations for LID BMPs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*BMP 1*		
	[A]		[B]	[C]	[A] x [C]			
DMA 1	*48,555*	*Concrete or Asphalt*	*1*	*0.89*	*43,311.1*	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
DMA 1	*31,570*	*Landscaping*	*0.1*	*0.11*	*3,487.2*			
	80,125				*46,798.3*	0.60	2,339.9	***7,594.5***

Table D.4 DCV Calculations for LID BMPs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*BMP 2*		
	[A]		[B]	[C]	[A] x [C]			
DMA 2	*116,456*	*Concrete or Asphalt*	*1*	*0.89*	*103,878.8*	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
DMA 2	*4,760*	*Landscaping*	*0.1*	*0.11*	*525.8*			
DMA 3	*22,524*	*Concrete or Asphalt*	*1*	*0.89*	*20,091.4*			
DMA 3	*3,328*	*Landscaping*	*0.1*	*0.11*	*367.6*			
DMA 4	*9,964*	*Concrete or Asphalt*	*1*	*0.89*	*8,887.9*			
DMA 4	*5,529*	*Landscaping*	*0.1*	*0.11*	*610.7*			
	177,810				*134,362.2*	0.60	6,718.1	***6,718.1***

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

[E] is obtained from Exhibit A in the WQMP Guidance Document

[G] is obtained from a design procedure sheet, such as in LID BMP Design Handbook and placed in Appendix 6

Section E: Alternative Compliance (LID Waiver Program)

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

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

- *Or* -

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

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	
Total Credit Percentage[1]	

[1]*Cannot Exceed 50%*

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

E.3 Sizing Criteria

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

Table E.3 Treatment Control BMP Sizing

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Area x Runoff Factor		*Enter BMP Name / Identifier Here*		
	[A]		[B]	[C]	[A] x [C]				
						Design Storm Depth (in)	*Minimum Design Capture Volume or Design Flow Rate (cubic feet or cfs)*	*Total Storm Water Credit % Reduction*	*Proposed Volume or Flow on Plans (cubic feet or cfs)*
	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 for Flow-Based Treatment Control BMPs [E] = .2, for Volume-Based Control Treatment BMPs, [E] obtained from Exhibit A in the WQMP Guidance Document

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

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

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

E.4 Treatment Control BMP Selection

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

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

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

Table E.4 Treatment Control BMP Selection

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

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

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

Per the HCOC Applicability Map the project site is located within the "Mitigation Not Required" area. A copy of this map has been included in Appendix 7.

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 storm drain inlets	*Mark all inlets with the words "Only Rain Down for 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 drain."*
Interior floor drains	*Interior floor drains shall be plumbed to sanitary sewer.*	*Inspect and maintain drains to prevent blockages and overflow.*
Need for future indoor & structural pest control	*Building design features including sealants barriers and fully closing windows and doors have been included to discourage entry of pests.*	*Integrated Pest Management information to be provided to owners, lessees, and operators.*
Landscape/outdoor pesticide use	*Final Landscape Plans will accomplish 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 of 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*	*Maintain landscaping using minimum or no pesticides.* *Prevent erosion of slopes by planting fast-growing, dense ground covering plants.* *Plant native vegetation to reduce the amount of water, fertilizers, and pesticides applied to the landscape.* *Do not overwater. Use irrigation practices such as drip irrigation, soaker hoses or micro-spray systems. Periodically inspect and fix leaks and misdirected sprinklers.* *Do not rake or blow leaves, clippings, or pruning waste into the street, gutter, or storm drain. Instead, dispose of green waste by composting, hauling it to a permitted landfill, or recycling it through your City's program.* *Integrated Pest Management*

	consistency, and plant interactions.	*information to be provided to owners, lessees, and operators.*
Refuse areas	*Site design features dumpster enclosures.* *Signs will be posted on or near dumpsters with the words "Do not dump hazardous materials here" or similar.*	*Periodic inspections for leaky, overfilled, uncovered, or other problematic conditions will occur. Corrective action will be made upon detection, as circumstances permit.* *Dumping of liquid or hazardous wastes will be prohibited.* *Spill control materials will be available on-site.* *All wastes to properly stored and disposed of in accordance with all applicable Local, State and Federal regulations*
Industrial Processes	*All process activities to be performed indoors. No processes to drain to exterior or to storm drain system.*	*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/*
Loading Docks	*Maintain in a clean and orderly fashion*	*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*
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
Plazas, Sidewalks, and Parking Lots	*Maintain in a clean and orderly fashion*	*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 the storm drain.*

Section H: Construction Plan Checklist

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

Table H.1 Construction Plan Cross-reference

BMP No. or ID	BMP Identifier and Description	Corresponding Plan Sheet(s)	BMP Location (Lat/Long)
BMP 1	Bioretention basin located in southeast corner of site.	Grading Plan sheet 2	
BMP 2	Modular Wetland System (Proprietary biotreatment) located near northeast corner of site.	Grading Plan sheet 2	

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: Insert text here.

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

☐ Y ☒ N

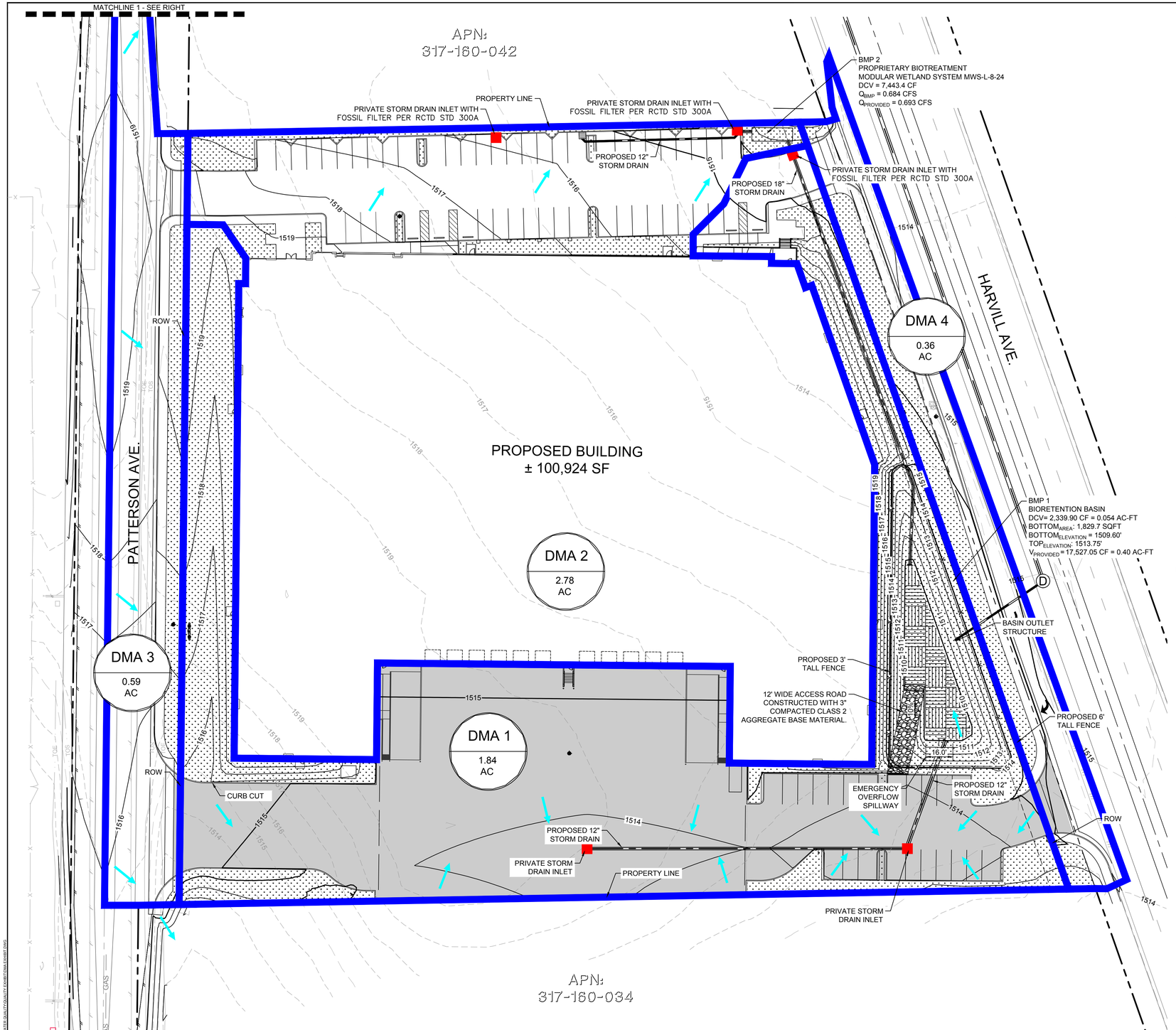
Include your Operation and Maintenance Plan and Maintenance Mechanism in Appendix 9. Additionally, include all pertinent forms of educational materials for those personnel that will be maintaining the proposed BMPs within this Project-Specific WQMP in Appendix 10.

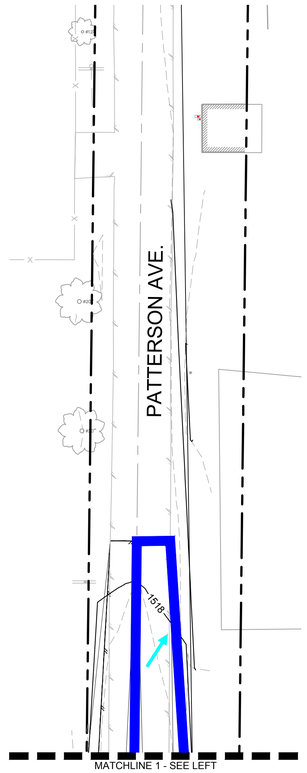
Appendix 1: Maps and Site Plans

Location Map, WQMP Site Plan and Receiving Waters Map



Source: Google Earth





PROJECT SOURCE CONTROL BMPS

POTENTIAL SOURCE OF RUNOFF POLLUTANTS	PERMANENT SOURCE CONTROL BMPS	OPERATIONAL SOURCE CONTROL BMPS
ON-SITE STORM DRAIN INLETS	INLETS MARKED "DRAINS TO RIVER"	MAINTAIN AND PERIODICALLY REPAINT OR REPLACE INLET MARKINGS
LANDSCAPE	LANDSCAPE IS DESIGNED TO MINIMIZE IRRIGATION AND RUNOFF AND TO MINIMIZE THE USE OF FERTILIZERS AND PESTICIDES	MAINTAIN LANDSCAPING USING MINIMUM OR NO PESTICIDES
REFUSE AREA	INLETS MARKED "DO NOT DUMP HAZARDOUS MATERIALS HERE"; SOLID ROOF, CONCRETE SLAB, AND WALL ENCLOSURE; TRASH BINS SHALL BE LEAK PROOF	INSPECT RECEPTACLES REGULARLY, REPLACE LEAKY RECEPTACLES; LIQUIDS MUST BE CLEANED UP PROPERLY
PARKING LOT SWEEPING		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.

DMA SUMMARY

DMA	IMP. AREA (SF)	PERV. AREA (SF)	TOTAL AREA (SF)	BMP TYPE
DMA 1	± 48,555	± 31,570	± 80,125	BIORETENTION
DMA 2	± 116,456	± 4,760	± 121,216	PROPRIETARY BIOFILTRATION
DMA 3 - OFFSITE	± 22,524	± 3,328	± 25,852	PROPRIETARY BIOFILTRATION - OVERTREATMENT
DMA 4 - OFFSITE	± 9,964	± 5,529	± 15,493	PROPRIETARY BIOFILTRATION - OVERTREATMENT

LEGEND

MAJOR DMA BOUNDARY

FLOW DIRECTION

Kimley»Horn
401 B STREET, SUITE 600,
SAN DIEGO, CA 92101
PHONE: 619-234-9411
WWW.KIMLEY-HORN.COM

LDC HARVILL

EXHIBIT:

DMA EXHIBIT

NORTH

GRAPHIC SCALE IN FEET
0 15 30 60

JOB NO.: 194404001

DATE: 11/28/2023

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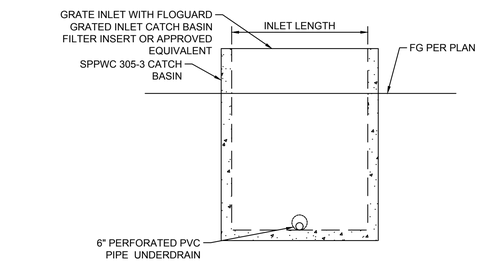
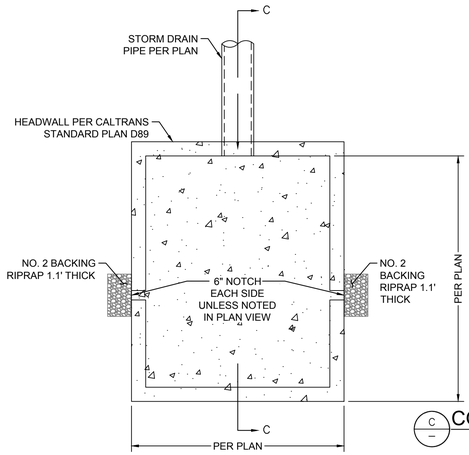
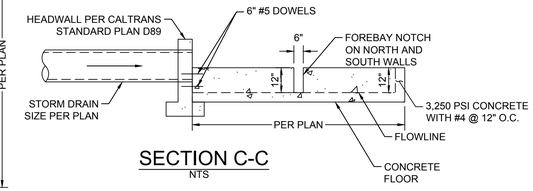


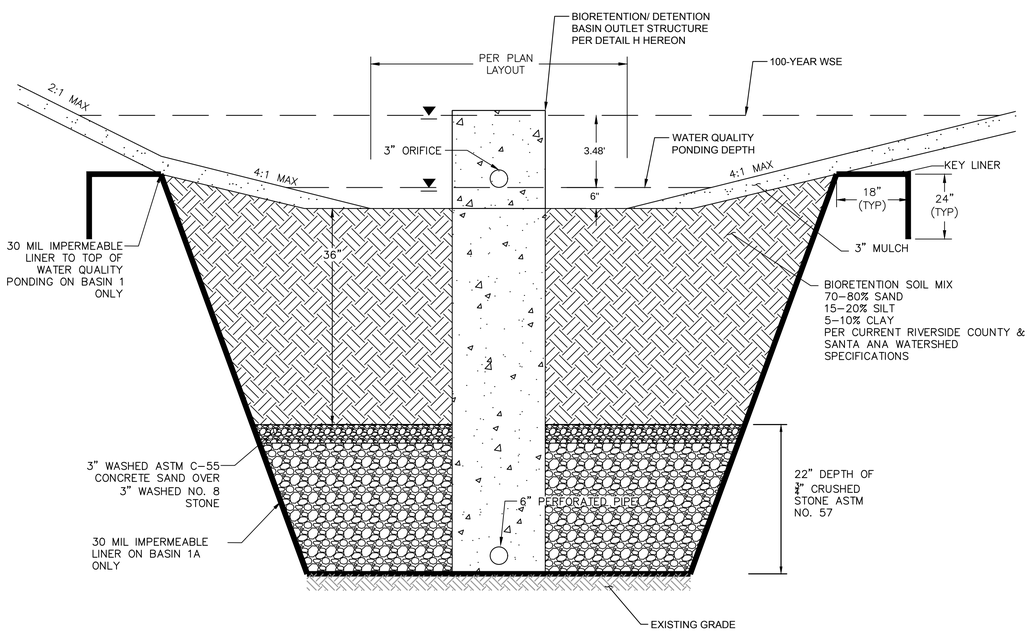
A — BIORETENTION/ DETENTION BASIN OUTLET STRUCTURE
NTS



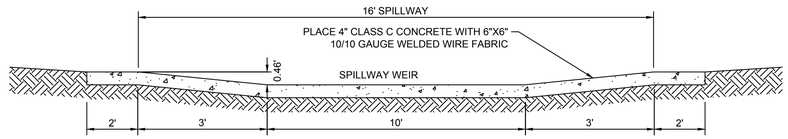
C — CONCRETE FOREBAY
NTS



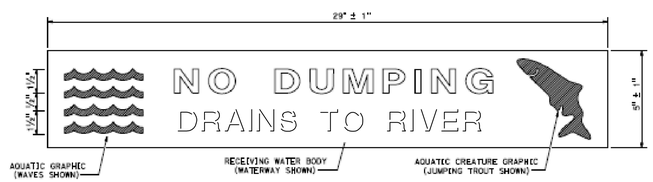
SECTION C-C
NTS



B — TYPICAL BIORETENTION/ DETENTION BASIN
NTS



D — EMERGENCY OVERFLOW SPILLWAY
NTS



PLAN
DRAINAGE INLET MARKER
(PREFABRICATED THERMOPLASTIC)

E — INLET STENCIL
NTS

Kimley»Horn
401 B STREET, SUITE 600,
SAN DIEGO, CA 92101
PHONE: 619-234-9411
WWW.KIMLEY-HORN.COM

LDC HARVILL

EXHIBIT:

DMA EXHIBIT

NORTH

GRAPHIC SCALE IN FEET
0 15 30 60

JOB NO.: 194404001
DATE: 11/13/2023

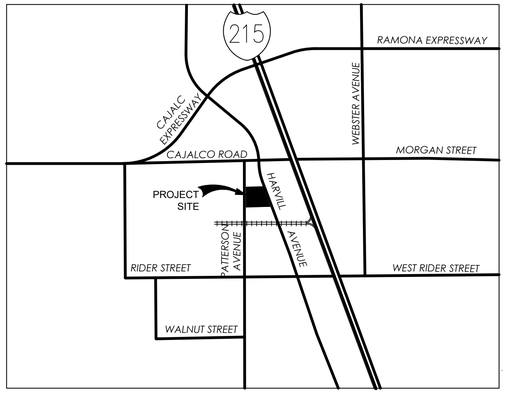
2 OF 2

K:\SND_LDC\194404001 - LDC HARVILL\DRAINAGE\WATER QUALITY\QUALITY EXHIBIT\DMA EXHIBIT.DWG

THE DOCUMENT, TOGETHER WITH THE CONCEPTS AND DESIGNS PRESENTED HEREIN, AS AN INSTRUMENT OF SERVICE, IS INTENDED ONLY FOR THE SPECIFIC PURPOSE AND CLIENT FOR WHICH IT WAS PREPARED. REUSE OF AND IMPROPER RELIANCE ON THIS DOCUMENT WITHOUT WRITTEN AUTHORIZATION AND ADAPTATION BY KIMLEY-HORN AND ASSOCIATES, INC. SHALL BE WITHOUT LIABILITY TO KIMLEY-HORN AND ASSOCIATES, INC. COPYRIGHT KIMLEY-HORN AND ASSOCIATES, INC., 2023

Appendix 2: Construction Plans

Grading and Drainage Plans

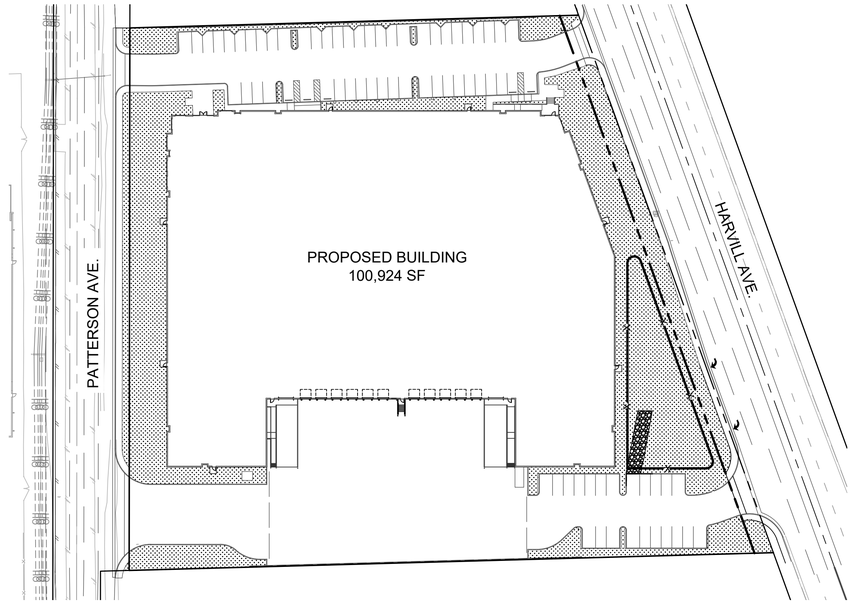


VICINITY MAP
NOT TO SCALE

NORTH

IN THE COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

PLOT PLAN
PRELIMINARY GRADING PLAN - PPT 220026
HARVILL LDC INDUSTRIAL REALTY



LEGEND

	PROPERTY LINE
S S	EXISTING SANITARY SEWER LINE
S S	PROPOSED SANITARY SEWER LINE
W W	EXISTING WATER LINE
W W	PROPOSED WATER LINE
FW FW	PROPOSED FIRE LINE
FW FW	EXISTING FIRE LINE
	PROPOSED FIRE HYDRANT
	PROPOSED FIRE BACKFLOW PREVENTOR
SD SD	PROPOSED STORM DRAIN LINE
SD SD	EXISTING STORM DRAIN LINE
	PROPOSED RETAINING WALL
	CENTERLINE
XXXX	EXISTING CONTOUR
XXXX	PROPOSED CONTOUR
	FLOW LINE
SD	PROPOSED STORM DRAIN MANHOLE
	PROPOSED STORM DRAIN GRATED INLET
	CONCRETE PAVEMENT

ABBREVIATIONS:

BEG	BEGIN
BOT	BOTTOM
CI	CURB INLET
C&G	CURB AND GUTTER
CO	CLEANOUT
CY	CUBIC YARDS
EA	EACH
ESMT	EASEMENT
EX	EXISTING
FF	FINISHED FLOOR
FG	FINISHED GROUND
FL	FLOW LINE
FS	FINISHED SURFACE
GI	GRATE INLET
HMA	HOT MIX ASPHALT
INV	INVERT
LF	LINEAR FEET
ME	MATCH EXISTING
MEP	MECHANICAL ELECTRICAL PLUMBING
MH	MANHOLE
MIN	MINIMUM
NO	NUMBER
NTS	NOT TO SCALE
OC	ON CENTER
PCC	PORTLAND CEMENT CONCRETE
P/L	PROPERTY LINE
PROP	PROPOSED
PT	POINT
R/W	RIGHT-OF-WAY
STD	STANDARD
TC	TOP OF CURB
TG	TOP OF GRATE
TP	TOP OF PAVEMENT
TW	TOP OF WALL
TYP	TYPICAL

OWNER
HARVILL LLC
ONE LINCOLN CENTRE
18W140 BUTTERFIELD ROAD, SUITE 750
OAKBROOK TERRACE, IL 60181
(630)-576-1105

DEVELOPER/APPLICANT
LDC INDUSTRIAL REALITY
555 N EL CAIMNO REAL, #A456
SAN CLEMENTE, CA 92672
LARRY D. COCHRUN
(949) 226 - 4601

ENGINEER
KIMLEY-HORN AND ASSOCIATES, INC.
401 B STREET, SUITE 600
SAN DIEGO, CA 92101
TEL (619) 272 - 7118
CONTACT: JOSHUA BIELIK

ARCHITECT
HPA, INC
18831 BARDEEN AVENUE, STE. #100
IRVINE, CA 92612
(949) 863 - 1770

GEOTECHNICAL ENGINEER
SOUTHERN CALIFORNIA GEOTECHNICAL
22885 SAVI RANCH PKWY #E
YORBA LINDA, CA, 92887
(714) 685 - 1115
CONTACT: ROBERT TRAZO, GE

ASSESSORS PARCEL NUMBER
317-160-037

UTILITY PURVEYORS
CABLE: SPECTRUM (833) 267-6094
TELEPHONE: SPECTRUM (833) 267-6094
ELECTRIC: SOUTHERN CALIFORNIA EDISON COMPANY (800) 655-4555
GAS: SOUTHERN CALIFORNIA GAS COMPANY: (800) 427-2200
WATER: EASTERN MUNICIPAL WATER DISTRICT (800) 426-3693
SEWER: EASTERN MUNICIPAL WATER DISTRICT (800) 426-3693

PROPERTY ADDRESS
PATTERSON AVENUE AND HARVILL AVENUE
RIVERSIDE COUNTY, CA

ZONING AND LAND USE
GENERAL PLAN LAND USE DESIGNATION: LIGHT INDUSTRIAL
ZONING CLASSIFICATION: MANUFACTURING-SERVICE COMMERCIAL (M-SC)
SPECIFIC LAND USE PLAN: "A" STREET SP100

FEMA FLOOD ZONE DESIGNATION
BY GRAPHIC PLOTTING ONLY, THIS PROPERTY APPEARS TO BE ALL WITHIN THE UNHATCHED AREA OF ZONE X OF THE FLOOD INSURANCE RATE MAP, MAP NUMBER 06065C1430H, DATED AUGUST 18, 2014
THE DESIGNATION OF ZONE X INDICATES AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN.

TOPOGRAPHY SOURCE
FIELD SURVEY PERFORMED BY KIMLEY-HORN CONSULTANTS ON MARCH 7, 2022.

EARTHWORK
CUT: 15,100 C.Y.
FILL: 10,300 C.Y.
NET: 4,800 C.Y. (CUT)

PROJECT DATA

SITE AREA:	4.79 AC
NET AREA:	4.79 AC
BUILDING AREA:	100,924 SF
SITE:	"A" ST. SPECIFIC PLAN NO. 100

LEGAL DESCRIPTION
FILE NO: NCS-1088580-ONT1

THE LAND REFERRED TO HEREIN IS SITUATED IN THE UNINCORPORATED AREA OF THE COUNTY OF RIVERSIDE, STATE OF CALIFORNIA, AND IS DESCRIBED AS FOLLOWS:

PARCEL 3 AS SHOWN BY PARCEL MAP 6372 ON FILE IN BOOK 17 PAGE 42 OF PARCEL MAPS, RECORDS OF RIVERSIDE COUNTY, CALIFORNIA.

EXCEPTING THEREFROM THAT PORTION OF LAND CONVEYED TO THE COUNTY OF RIVERSIDE IN DECLARATION OF DEDICATION RECORDED MARCH 18, 1992 AS INSTRUMENT NO. 92-94009 OF OFFICIAL RECORDS.

ALSO EXCEPTING THEREFROM THAT PORTION OF LAND CONVEYED TO THE REDEVELOPMENT AGENCY FOR THE COUNTY OF RIVERSIDE, A PUBLIC BODY, CORPORATE AND POLITIC, ORGANIZED AND EXISTING UNDER, AND BY VIRTUE OF THE STATE OF CALIFORNIA IN GRANT DEED RECORDED JUNE 14, 2002 AS INSTRUMENT NO. 02-329451 OF OFFICAIL RECORDS.

BENCHMARK
NGS BENCHMARK IS DESIGNATED AS DX5442 BEING A STANDARD 3-1/4 INCH ALUMINUM DISK SET FLUSH IN TOP OF CURB, LOCATED 1300 FEET WEST OF ATSF RAILROAD ALONG RIDER STREET, ON TOP OF NORTH CURB FACE OF RIDER STREET 28 FEET NORTH OF RIDER STREET.

ELEV: 1515.12 FEET NAVD88

SHEET INDEX

COVER SHEET	1
PRELIMINARY GRADING PLAN	2
OFFSITE UTILITY PLAN	3
DETAILS	4
TRUCK STACKING PLAN - INBOUND	5
TRUCK STACKING PLAN - OUTBOUND	6
STREET IMPROVEMENT PLAN	7

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NOTE:
WORK CONTAINED WITHIN THESE PLANS SHALL NOT COMMENCE UNTIL AN ENCROACHMENT PERMIT AND/OR A GRADING PERMIT HAS BEEN ISSUED.

The private engineer signing these plans is responsible for assuring the accuracy and acceptability of the design hereon. In the event of discrepancies arising after county approval or during construction, the private engineer shall be responsible for determining an acceptable solution and revising the plans for approval by the county.

MARK	BY	DATE	REVISIONS	APPR.	DATE
KHA	JB	11/13/23	PPT SUBMITTAL 5		

ENGINEER | COUNTY

SEAL—ENGINEER
REGISTERED PROFESSIONAL ENGINEER JOSHUA R. BIELIK C92259 CIVIL STATE OF CALIFORNIA

ENGINEERING COMPANY
Kimley»Horn
401 B. STREET, SUITE 600
SAN DIEGO, CA 92101
619-234-9411

PREPARED BY: JOSHUA BIELIK
R.C.E. NO. C92259
DATE 3/14/2024

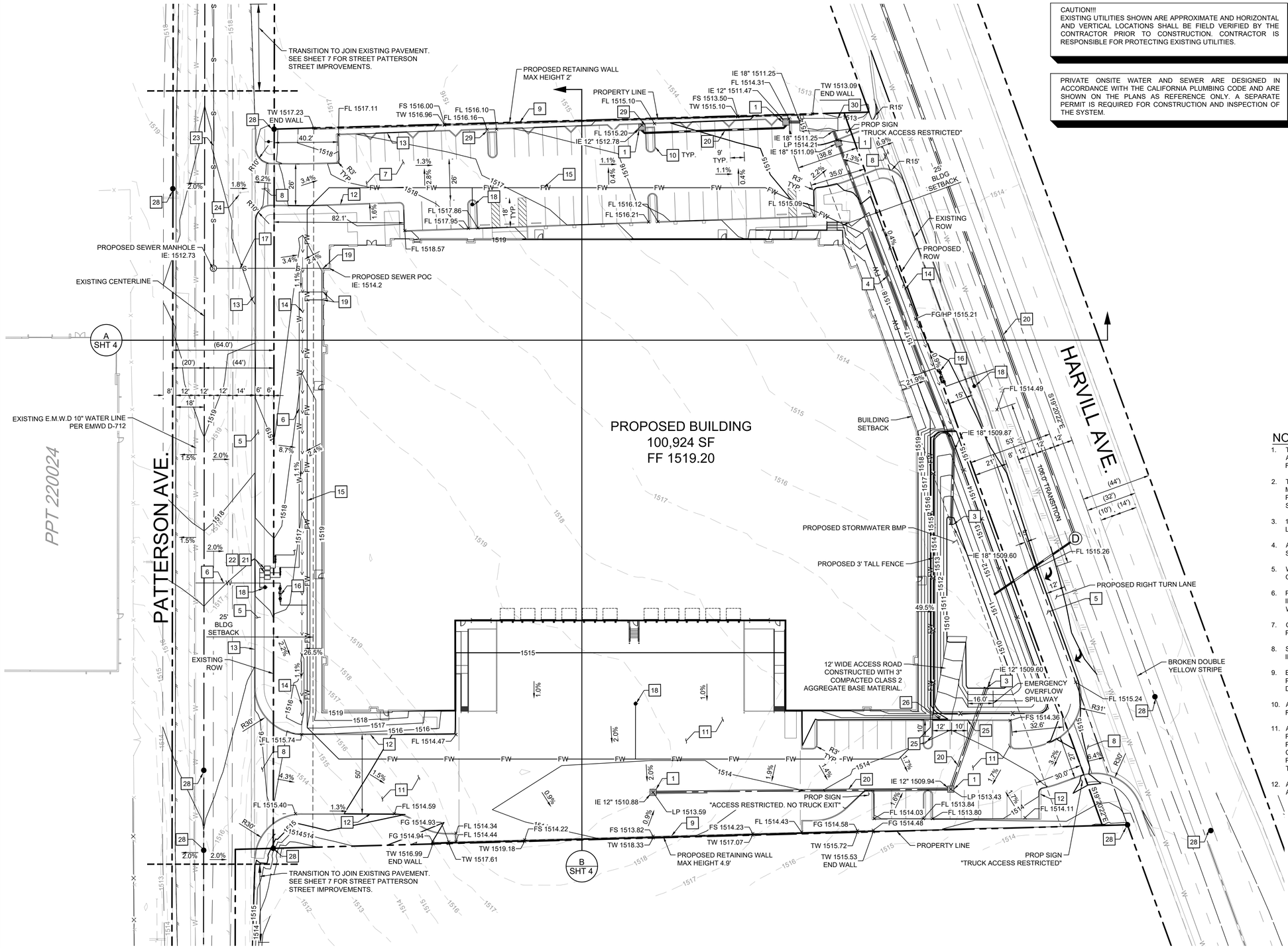
BENCHMARK:

SCALE:
H:_____ V:_____

LDC INDUSTRIAL REALTY, LLC
PLOT PLAN
PATTERSON AND HARVILL
PPT 220026
COVER SHEET

SHEET NO. 1
1 OF 7 SHTS

FOR:
W.O.
COUNTY FILE NO.



CAUTION!!!
EXISTING UTILITIES SHOWN ARE APPROXIMATE AND HORIZONTAL AND VERTICAL LOCATIONS SHALL BE FIELD VERIFIED BY THE CONTRACTOR PRIOR TO CONSTRUCTION. CONTRACTOR IS RESPONSIBLE FOR PROTECTING EXISTING UTILITIES.

PRIVATE ONSITE WATER AND SEWER ARE DESIGNED IN ACCORDANCE WITH THE CALIFORNIA PLUMBING CODE AND ARE SHOWN ON THE PLANS AS REFERENCE ONLY. A SEPARATE PERMIT IS REQUIRED FOR CONSTRUCTION AND INSPECTION OF THE SYSTEM.

CONSTRUCTION NOTES

1. PROPOSED GRATE INLET
3. PROPOSED BMP HEADWALL
4. PROPOSED 18" HDPE STORM LINE
5. CONSTRUCT 4" P.C.C. SIDEWALK
6. PROPOSED 3" WATER LINE
7. 3" A.C. DRIVE AISLE AND PARKING AREA
8. CONSTRUCT COMMERCIAL DRIVEWAY APPROACH PER RIVERSIDE COUNTY STD. 207A.
9. PROPOSED RETAINING WALL.
10. PROPOSED LANDSCAPE ISLAND.
11. CONSTRUCT 8" P.C.C. TRUCK COURT
12. CONSTRUCT 6" CURB ONLY (ONSITE)
13. CONSTRUCT 6" CURB AND GUTTER
14. PROPOSED EARTHEN SWALE
15. PROPOSED 10" FIRELINE
16. PROPOSED FIRE BACKFLOW PREVENTER
17. PROPOSED 6" PVC SEWER
18. PROPOSED FIRE HYDRANT
19. PROPOSED BUILDING POINT OF CONNECTION. CONTINUATION PER PLUMBING PLANS
20. PROPOSED 12" HDPE STORM LINE. LOCATION PER RIVERSIDE COUNTY STD. 817.
21. PROPOSED DOMESTIC METER AND BACKFLOW
22. PROPOESD IRRIGATION METER AND BACKFLOW
23. PROPOSED 8" PVC SEWER
24. EXISTING POWER POLE TO BE RELOCATED
25. TRANSITION FROM 6" CURB TO ROLLED CURB
26. ROLLED CURB
28. SURVEY MONUMENT TO BE PROTECTED IN PLACE. IF DISTURBED DURING CONSTRUCTION CONTRACTOR TO REPLACE AND RESET. CONSTRUCTION CORNER RECORD REQUIRED PRIOR TO START OF CONSTRUCTION.
29. CONSTRUCT 2' CURB OPENING
30. PROPOSED MWS-L-8-24 MODULAR WETLAND SYSTEM BMP

NOTES:

1. THE PRIVATE WATER SYSTEM IS DESIGNED IN ACCORDANCE WITH THE CALIFORNIA PLUMBING CODE AND IS SHOWN ON THESE PLANS AS 'INFORMATION ONLY.' A SEPARATE PLUMBING PERMIT IS REQUIRED FOR CONSTRUCTION AND INSPECTION OF THE SYSTEM.
2. THE PRIVATE ON-SITE SEWER SYSTEM WITH WELDED JOINTS AND CLEANOUTS SHALL BE DESIGNED TO MEET THE STANDARDS OF THE CALIFORNIA PLUMBING CODE. PRIVATE MAINS WITH MANHOLES AND PUSH-ON JOINTS SHALL BE DESIGNED PER THE SEWER DESIGN GUIDE AND WILL MEET STATE SEPARATION REQUIREMENT.
3. 10' MINIMUM HORIZONTAL SEPARATION BETWEEN PROPOSED DOMESTIC WATER AND SANITARY SEWER LINES.
4. ALL WATER CROSSINGS SHOULD HAVE A MINIMUM CLEARANCE OF 12" FROM ANY SEWER OR STORMDRAIN CROSSING.
5. WATER AND FIRE MAINS SHALL BE INSTALLED WITH A MINIMUM 3' VERTICAL CLEARANCE FROM THE TOP OF FINISHED GRADE TO THE TOP OF THE PIPE.
6. PRIOR TO CONNECTING TO ANY EXISTING SEWER LATERAL, IT SHALL BE CLOSED CIRCUIT TELEVISION INSPECTED BY A CALIFORNIA LICENSED PLUMBING CONTRACTOR TO VERIFY LATERAL IS IN GOOD WORKING CONDITION AND FREE OF ALL DEBRIS.
7. ON-SITE ELECTRIC AND COMMUNICATION LINES SERVING THE SITE TO BE PROPOSED BY ELECTRICAL PER SEPARATE PERMIT.
8. STUB POINT OF CONNECTION 5' FROM BUILDING. REFER TO MEP PLANS PER SEPARATE PERMIT FOR INVERT ELEVATION AND CONTINUATION TO BUILDING.
9. EXCAVATION FOR UTILITY TRENCHES TO BE 2' BELOW DEEPEST UTILITY FLOW LINE/INVERT ELEVATION PER GEOTECHNICAL RECOMMENDATIONS. CONTRACTOR/DEVELOPER TO DETERMINE APPROPRIATE DEPTH OF TRENCH FOR SHALLOW UTILITIES ADJACENT TO DEEP UTILITIES.
10. ALL EXISTING UTILITIES SHOWN BASED ON AS-BUILT INFORMATION. CONTRACTOR TO COORDINATE REMOVAL OF ANY EXISTING WET UTILITIES FOUND DURING CONSTRUCTION.
11. ALL PLANS FOR PRIVATE FIRE SERVICE MAINS AND PRIVATE FIRE HYDRANTS ARE SHOWN FOR REFERENCE ONLY AND MUST BE SUBMITTED SEPARATELY FOR APPROVAL PRIOR TO INSTALLATION. ALL PRIVATE FIRE SYSTEMS WILL BE DEFINED IN ACCORDANCE WITH CALIFORNIA BUILDING CODE; CALIFORNIA FIRE CODE; AND NFPA 24. PRIVATE FIRE SERVICE MAINS AND THEIR APPURTENANCES. PLANS SHALL BE SINGLE FIRE LINE DRAWINGS SHOWING ALL OF THE APPLICABLE REQUIREMENTS OF THE CODES SPECIFIED ABOVE.
12. ALL DRY UTILITIES SHOWN FOR REFERENCE ONLY AND MUST BE SUBMITTED SEPARATELY FOR APPROVAL PRIOR TO INSTALLATION.

GRAPHIC SCALE IN FEET
0 15 30 60

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BMP NOTES:

1. ALL ROCK OR SAND TO BE PLACED IN POST-CONSTRUCTION BMPS SHALL BE CLEAN-WASHED ROCK TO THE SATISFACTION OF THE GRADING INSPECTOR.
2. IMMEDIATELY BELOW THE SOIL MEDIA (BSM) INCLUDE A SECTION OF 3" SAND, THEN 3" PEA GRAVEL. ALL SUBDRAINS SHALL BE SCH. 40 WITH A MINIMUM SLOPE OF 0.5%.

NOTE: WORK CONTAINED WITHIN THESE PLANS SHALL NOT COMMENCE UNTIL AN ENCROACHMENT PERMIT AND/OR A GRADING PERMIT HAS BEEN ISSUED.

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MARK	BY	DATE	REVISIONS	APPR.	DATE
	KHA	JB 11/13/23	PPT SUBMITTAL 5		

ENGINEER — COUNTY

SEAL – ENGINEER

REGISTERED PROFESSIONAL ENGINEER JOSHUA R. BIELIK C92259 CIVIL STATE OF CALIFORNIA

ENGINEERING COMPANY

Kimley»Horn
401 B. STREET, SUITE 600
SAN DIEGO, CA 92101
619-234-9411

PREPARED BY: JOSHUA BIELIK
R.C.E. NO. C92259
DATE 3/14/2024

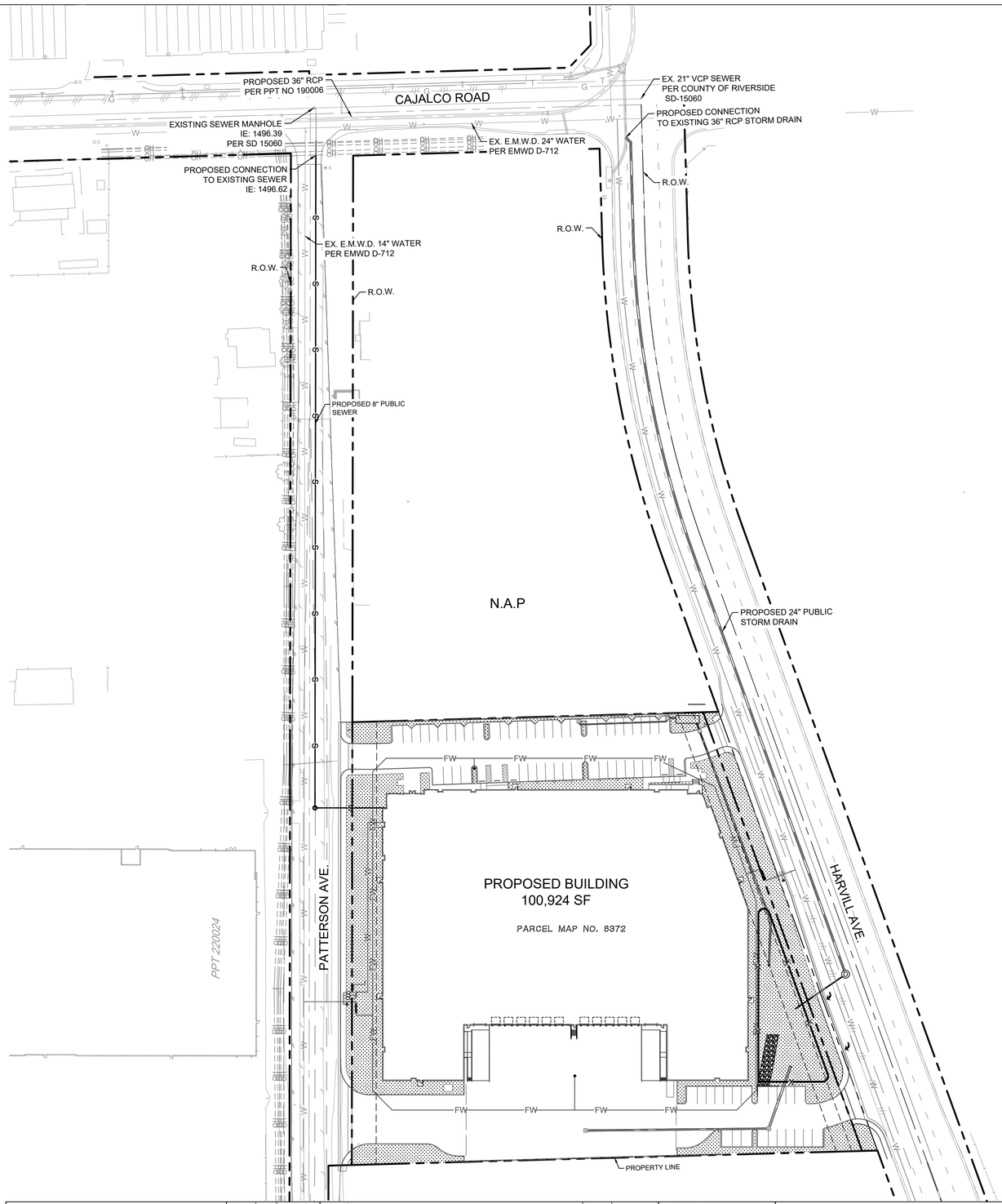
BENCHMARK:

SCALE: H:_____ V:_____

LDC INDUSTRIAL REALTY, LLC
PLOT PLAN
PATTERSON AND HARVILL
PPT 220026
PRELIMINARY GRADING PLAN

FOR: | W.O. | COUNTY FILE NO.

SHEET NO. 2
2 OF 5 SHTS



NOTES:

1. 10' MINIMUM HORIZONTAL SEPARATION BETWEEN PROPOSED DOMESTIC WATER AND SANITARY SEWER LINES.
2. ALL WATER CROSSINGS SHOULD HAVE A MINIMUM CLEARANCE OF 12" FROM ANY SEWER OR STORMDRAIN CROSSING.
3. PRIOR TO CONNECTING TO ANY EXISTING SEWER LATERAL, IT SHALL BE CLOSED CIRCUIT TELEVISION INSPECTED BY A CALIFORNIA LICENSED PLUMBING CONTRACTOR TO VERIFY LATERAL IS IN GOOD WORKING CONDITION AND FREE OF ALL DEBRIS.
4. EXCAVATION FOR UTILITY TRENCHES TO BE 2' BELOW DEEPEST UTILITY FLOW LINE/INVERT ELEVATION PER GEOTECHNICAL RECOMMENDATIONS. CONTRACTOR/DEVELOPER TO DETERMINE APPROPRIATE DEPTH OF TRENCH FOR SHALLOW UTILITIES ADJACENT TO DEEP UTILITIES.
5. ALL EXISTING UTILITIES SHOWN BASED ON AS-BUILT INFORMATION. CONTRACTOR TO COORDINATE REMOVAL OF ANY EXISTING WET UTILITIES FOUND DURING CONSTRUCTION.
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NORTH

GRAPHIC SCALE IN FEET
0 30 60 120

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A PUBLIC SERVICE BY UNDERGROUND SERVICE ALERT

NOTE:
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MARK	BY	DATE	REVISIONS	APPR.	DATE
KHA	JB	11/13/23	PPT SUBMITTAL 5		

ENGINEER — COUNTY

SEAL–ENGINEER

REGISTERED PROFESSIONAL ENGINEER
JOSHUA R. BIELIK
C92259
CIVIL
STATE OF CALIFORNIA

ENGINEERING COMPANY

Kimley»Horn
401 B. STREET, SUITE 600
SAN DIEGO, CA 92101
619-234-9411

PREPARED BY: JOSHUA BIELIK
R.C.E. NO. C92259
DATE 3/14/2024

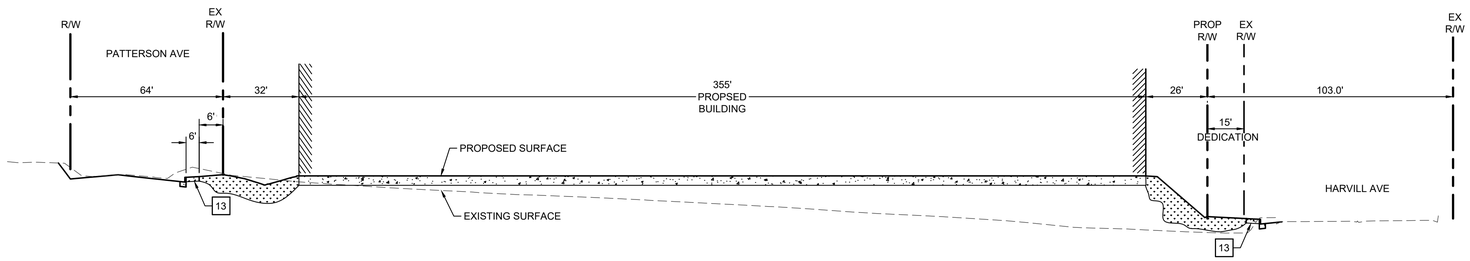
BENCHMARK:

SCALE: H:_____ V:_____

LDC INDUSTRIAL REALTY, LLC
PLOT PLAN
PATTERSON AND HARVILL
PPT 220026
OFFSITE UTILITY PLAN

FOR: | *W.O.* | *COUNTY FILE NO.*

SHEET NO. 3
3 OF 7 SHTS

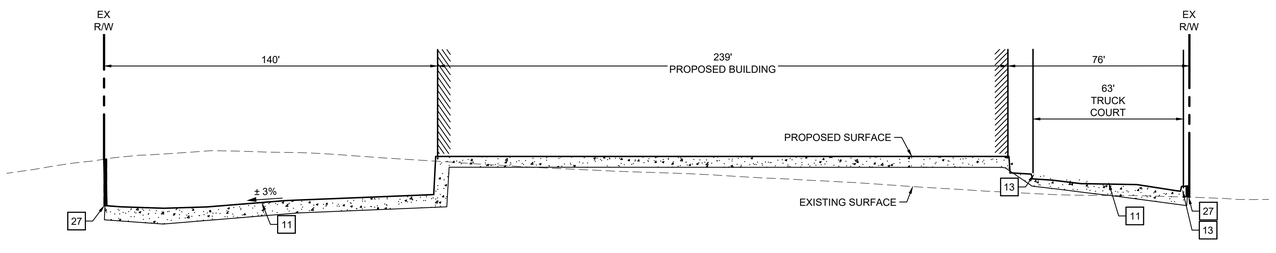


SITE SECTION A

HORIZ: 1" = 40'
VERT: 1" = 10'

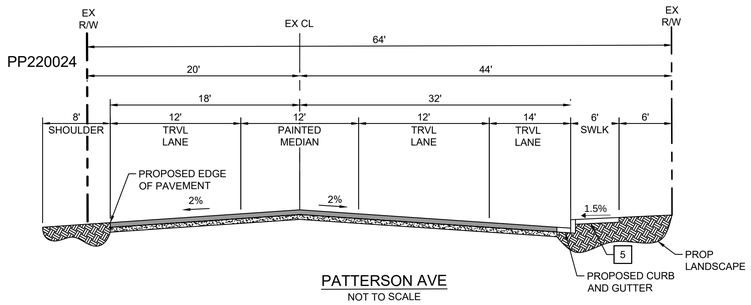
CONSTRUCTION NOTES

5	CONSTRUCT 4" P.C.C. SIDEWALK
11	CONSTRUCT 8" P.C.C. TRUCK COURT
13	CONSTRUCT 6" CURB AND GUTTER
27	PROPOSED RETAINING WALL



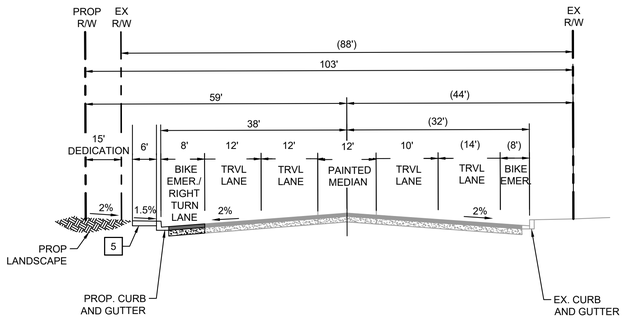
SITE SECTION B

HORIZ: 1" = 40'
VERT: 1" = 10'



PATTERSON AVE

NOT TO SCALE



HARVILL AVE

NOT TO SCALE

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MARK	BY	DATE	REVISIONS	APPR.	DATE
KHA	JB	11/13/23	PPT SUBMITTAL 5		

ENGINEER | COUNTY

SEAL—ENGINEER

REGISTERED PROFESSIONAL ENGINEER JOSHUA R. BIELIK C92259 CIVIL STATE OF CALIFORNIA

ENGINEERING COMPANY
Kimley»Horn
401 B. STREET, SUITE 600
SAN DIEGO, CA 92101
619-234-9411

PREPARED BY: JOSHUA BIELIK
R.C.E. NO. C92259
DATE 3/14/2024

BENCHMARK:

SCALE: H:_____ V:_____

LDC INDUSTRIAL REALTY, LLC
PLOT PLAN
PATTERSON AND HARVILL
PPT 220026
DETAILS

FOR: | W.O. | COUNTY FILE NO.

SHEET NO. 4

4 OF 7 SHTS

PROPERTY LINE

N88°56'57"E

EXISTING ROW

PROPOSED ROW

EXISTING ROW

PROPOSED BUILDING
±100,924 SF

PATTERSON AVE.

HARVILL AVE.

PPT 220024

S18°49'22"E

27'

50'

S89°00'07"W

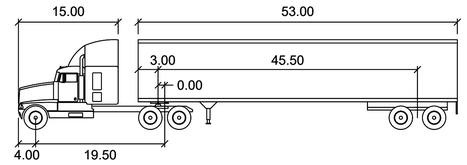
PROPERTY LINE

EXISTING ROW

WB-67 AASHTO 2005 (US)

LEGEND

INBOUND TRUCK MOVEMENT



WB-67

feet

Tractor Width	: 8.00	Lock to Lock Time	: 6.0
Trailer Width	: 8.50	Steering Angle	: 28.4
Tractor Track	: 8.00	Articulating Angle	: 75.0
Trailer Track	: 8.50		

NORTH

GRAPHIC SCALE IN FEET
0 15 30 60

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MARK	BY	DATE	REVISIONS	APPR.	DATE
	KHA	11/13/23	PPT SUBMITTAL 5		

ENGINEER — COUNTY

SEAL—ENGINEER

REGISTERED PROFESSIONAL ENGINEER
JOSHUA R. BIELIK
C92259
CIVIL
STATE OF CALIFORNIA

ENGINEERING COMPANY
Kimley»Horn
401 B. STREET, SUITE 600
SAN DIEGO, CA 92101
619-234-9411

PREPARED BY: JOSHUA BIELIK
R.C.E. NO. C92259
DATE 3/14/2024

BENCHMARK:

SCALE:
H:_____ V:_____

LDC INDUSTRIAL REALTY, LLC
PLOT PLAN
PATTERSON AND HARVILL
PPT 220026
TRUCK STACKING PLAN - INBOUND

SHEET NO. 5
5 OF 7 SHTS

FOR:
W.O.
COUNTY FILE NO.

PROPERTY LINE

N88°56'57"E

EXISTING ROW

PROPOSED ROW

EXISTING ROW

PROPOSED BUILDING
±100,924 SF

S18°02'22"E

HARVILL AVE.

PATTERSON AVE.

PPT 220024

WB-67
AASHTO 2014 (US)

70'

50'

27'

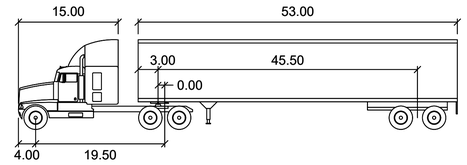
S89°00'07"W

PROPERTY LINE

EXISTING ROW

LEGEND

OUTBOUND TRUCK MOVEMENT



WB-67

feet

Tractor Width	: 8.00	Lock to Lock Time	: 6.0
Trailer Width	: 8.50	Steering Angle	: 28.4
Tractor Track	: 8.00	Articulating Angle	: 75.0
Trailer Track	: 8.50		

NORTH

GRAPHIC SCALE IN FEET
0 15 30 60

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The private engineer signing these plans is responsible for assuring the accuracy and acceptability of the design hereon. In the event of discrepancies arising after county approval or during construction, the private engineer shall be responsible for determining an acceptable solution and revising the plans for approval by the county.

MARK	BY	DATE	REVISIONS	APPR.	DATE
KHA	JB	11/13/23	PPT SUBMITTAL 5		

ENGINEER | COUNTY

SEAL—ENGINEER

REGISTERED PROFESSIONAL ENGINEER
JOSHUA R. BIELIK
C92259
CIVIL
STATE OF CALIFORNIA

ENGINEERING COMPANY

Kimley»Horn

401 B. STREET, SUITE 600
SAN DIEGO, CA 92101
619-234-9411

PREPARED BY: JOSHUA BIELIK

R.C.E. NO. C92259

DATE 3/14/2024

BENCHMARK:

SCALE: H:_____ V:_____

LDC INDUSTRIAL REALTY, LLC
PLOT PLAN
PATTERSON AND HARVILL
PPT 220026
TRUCK STACKING PLAN - OUTBOUND

SHEET NO. 6

6 OF 7 SHTS

FOR: | W.O. | COUNTY FILE NO.

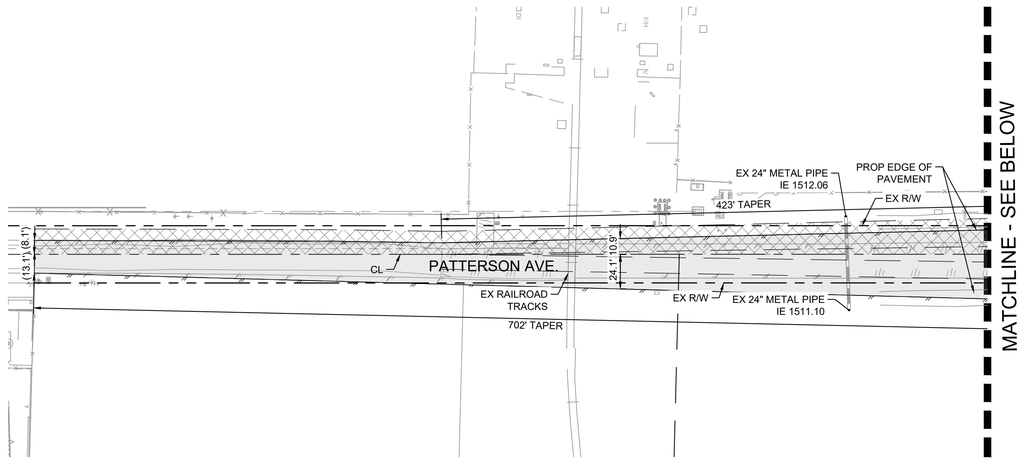
LEGEND

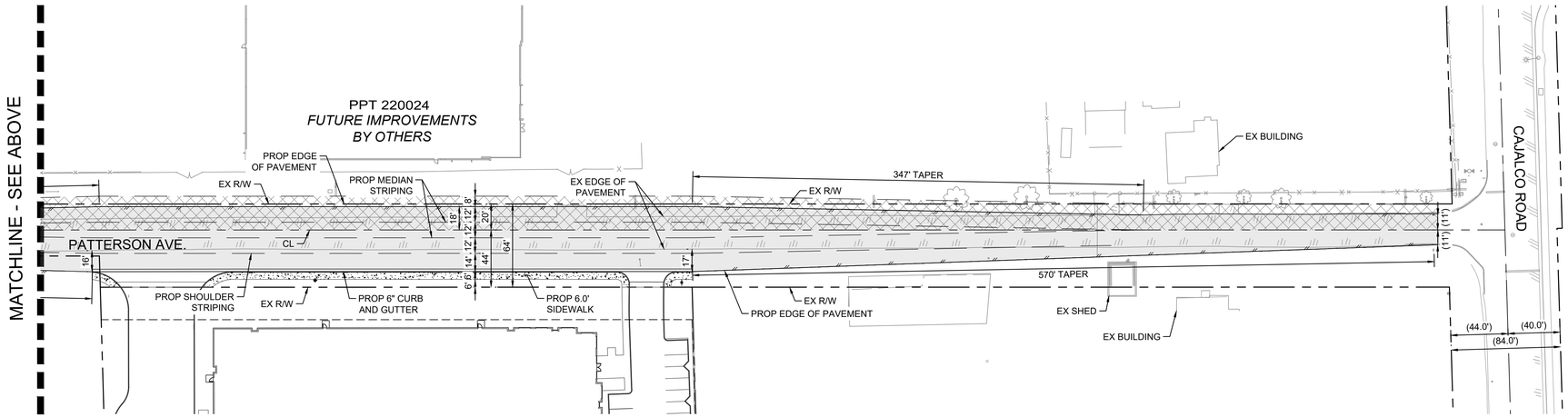
PROPOSED AC PAVEMENT

IF PPT220024 AND THIS DEVELOPMENT ARE CONSTRUCTED CONCURRENTLY, THIS DEVELOPMENT WILL NOT CONSTRUCT THE IMPROVEMENTS SHOWN IN THIS AREA. SEE NOTE 1.

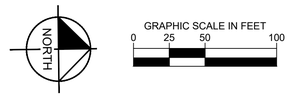
NOTES

1. IF PPT220024 IS UNDER CONSTRUCTION CONCURRENTLY WITH THIS DEVELOPMENT, THIS PROJECT WILL ONLY CONSTRUCT PATTERSON STREET IMPROVEMENTS TO THE EAST OF THE CENTERLINE FOR THE ENTIRE LENGTH OF PATTERSON SHOWN. PPT220024 WILL BE RESPONSIBLE FOR THE ULTIMATE PATTERSON STREET IMPROVEMENTS TO THE WEST OF THE CENTERLINE FOR THE ENTIRE LENGTH OF PATTERSON SHOWN.





STREET IMPROVEMENTS - PATTERSON AVENUE



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MARK	BY	DATE	REVISIONS	APPR.	DATE
	KHA	JB	11/13/23 PPT SUBMITTAL 5		

ENGINEER | COUNTY

SEAL – ENGINEER

REGISTERED PROFESSIONAL ENGINEER
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PREPARED BY: JOSHUA BIELIK
R.C.E. NO. C92259
DATE 3/14/2024

BENCHMARK:

SCALE: H:_____ V:_____

LDC INDUSTRIAL REALTY, LLC
PLOT PLAN
PATTERSON AND HARVILL
PPT 220026
STREET IMPROVEMENT PLAN

SHEET NO. 7
7 OF 7 SHTS

FOR: | W.O. | COUNTY FILE NO.

Appendix 3: Soils Information

Geotechnical Study and Other Infiltration Testing Data

GEOTECHNICAL INVESTIGATION
PROPOSED WAREHOUSE

Patterson Avenue, South of Cajalco Road
Riverside County (Perris), California
for
LDC Industrial Realty, LLC



SOUTHERN
CALIFORNIA
GEOTECHNICAL
A California Corporation

October 27, 2021

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

LDC Industrial Realty, LLC
555 N. El Camino Real, Suite A456
San Clemente, California 92672

Attention: Mr. Matthew Snyder

Project No.: **21G231-1**

Subject: **Geotechnical Investigation**
Proposed Warehouse
Patterson Avenue, South of Cajalco Road
Riverside County (Perris Area), California

Gentlemen:

In accordance with your request, we have conducted a geotechnical investigation at the subject site. We are pleased to present this report summarizing the conclusions and recommendations developed from our investigation.

We sincerely appreciate the opportunity to be of service on this project. We look forward to providing additional consulting services during the course of the project. If we may be of further assistance in any manner, please contact our office.

Respectfully Submitted,

SOUTHERN CALIFORNIA GEOTECHNICAL, INC.

Pablo Montes Jr.
Staff Engineer

Robert G. Trazo, GE 2655
Principal Engineer



Distribution: (1) Addressee

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A Plate 1: Site Location Map
Plate 2: Boring Location Plan
B Boring Logs
C Laboratory Test Results
D Grading Guide Specifications
E Seismic Design Parameters

1.0 EXECUTIVE SUMMARY

Presented below is a brief summary of the conclusions and recommendations of this investigation. Since this summary is not all inclusive, it should be read in complete context with the entire report.

Geotechnical Design Considerations

- Most of the boring locations encountered artificial fill materials, extending from the ground surface to depths of 2½ to 4½± feet. The fill soils possess varying strengths and densities, and are considered to represent undocumented fill. The near-surface alluvium possesses variable strengths and a minor potential for collapse when inundated with water. The artificial fill soils and the upper portion of the alluvium, in their present condition, are not considered suitable for support of the foundation loads of the new structure.

Site Preparation

- Remedial grading is recommended to be performed within the proposed building area in order to remove all of the undocumented fill soils in their entirety, the upper portion of the near-surface native alluvial soils, and any soils disturbed during the demolition process. The proposed building area should be overexcavated to a depth of at least 4 feet below existing grade and to a depth of 3 feet below proposed building pad subgrade elevation, whichever is greater. Within the foundation influence zones, the overexcavation should extend to a depth of at least 3 feet below proposed foundation bearing grade. The overexcavation should extend horizontally at least 5 feet beyond the building and foundation perimeters.
- After the overexcavation has been completed, the resulting subgrade soils should be evaluated by the geotechnical engineer to identify any additional soils that should be removed. The resulting subgrade should then be scarified to a depth of 12 inches and moisture conditioned (or air dried) to 2 to 4 percent above optimum. The previously excavated soils may then be replaced as compacted structural fill. All structural fill soils should be compacted to at least 90 percent of the ASTM D-1557 maximum dry density.
- The new pavement and flatwork subgrade soils are recommended to be scarified to a depth of 12± inches, thoroughly moisture conditioned and recompacted to at least 90 percent of the ASTM D-1557 maximum dry density.

Building Foundations

- Conventional shallow foundations, supported in newly placed compacted fill.
- 2,500 lbs/ft^2 maximum allowable soil bearing pressure.
- Reinforcement consisting of at least four (4) No. 5 rebars (2 top and 2 bottom) in strip footings. Additional reinforcement may be necessary for structural considerations.

Building Floor Slab

- Conventional Slab-on-Grade: minimum 6 inches thick.
- Modulus of Subgrade Reaction: k = 150 psi/in.
- Reinforcement is not expected to be necessary for geotechnical considerations. The actual thickness and reinforcement of the floor slab should be determined by the structural engineer.

Pavements Design Recommendations

ASPHALT PAVEMENTS (R = 30)					
Materials	**Thickness (inches)**				
	Auto Parking and Auto Drive Lanes (TI = 4.0 to 5.0)	Truck Traffic			
		TI = 6.0	TI = 7.0	TI = 8.0	TI = 9.0
Asphalt Concrete	3	3½	4	5	5½
Aggregate Base	6	8	10	11	13
Compacted Subgrade	12	12	12	12	12

PORTLAND CEMENT CONCRETE PAVEMENTS (R = 30)				
Materials	**Thickness (inches)**			
	Autos and Light Truck Traffic (TI = 5.0 to 6.0)	Truck Traffic		
		TI = 7.0	TI = 8.0	TI = 9.0
PCC	5	5½	6½	8
Compacted Subgrade (95% minimum compaction)	12	12	12	12

2.0 SCOPE OF SERVICES

The scope of services performed for this project was in accordance with our Proposal No. 21P415, dated September 16, 2021. The scope of services included a visual site reconnaissance, subsurface exploration, field and laboratory testing, and geotechnical engineering analysis to provide criteria for preparing the design of the building foundations, building floor slab, and parking lot pavements along with site preparation recommendations and construction considerations for the proposed development. The evaluation of the environmental aspects of this site was beyond the scope of services for this geotechnical investigation.

3.0 SITE AND PROJECT DESCRIPTION

3.1 Site Conditions

The site is located at the on the east side of Patterson Avenue, 610± feet south of Cajalco Road in an unincorporated portion of Riverside County near Perris, California. The site is bounded to the north by a vacant lot, to the west by Patterson Avenue, to the south by a vacant lot, and to the east by Harvill Avenue. The general location of the site is illustrated on the Site Location Map, included as Plate 1 of this report.

The site consists of a trapezoidal-shaped parcel, 4.79± acres in size. The site is presently vacant and undeveloped. The ground surface consists of exposed soils which appear to have been recently disced or tilled and stripped of any vegetation.

Detailed topographic information was not available at the time of this report. Based on our visual observations and topographic information obtained from Google Erath, the site topography appears to slope gently downward to the east at a gradient of approximately 1 percent.

3.2 Proposed Development

Based on the conceptual site plan (Scheme 1, dated September 1, 2021) prepared by HPA Architecture, the site will be developed with a new warehouse. The building will be 112,520± ft^2 in size, located in the central region of the property. Dock-high doors will be constructed along a portion of the southern building wall. The building is expected to be surrounded by asphaltic concrete in the automobile parking and driving lanes, with Portland cement concrete pavements in the truck court area, with limited areas of concrete flatwork and landscape planters.

Detailed structural information has not been provided. It is assumed that the new building will be a single-story structure of tilt-up concrete construction, supported on a conventional shallow foundation system with a concrete slab-on-grade floor. Based on the assumed construction, maximum column and wall loads are expected to be on the order of 100 kips and 4 to 7 kips per linear foot, respectively.

No significant amounts of below grade construction, such as basements or crawl spaces, are expected to be included in the proposed development. Based on the assumed topography, cuts and fills of up to 2 to 3± feet are expected to be necessary to achieve the proposed site grades.

4.0 SUBSURFACE EXPLORATION

4.1 Scope of Exploration/Sampling Methods

The subsurface exploration conducted for this project consisted of five (5) borings advanced to depths of 20 to 25± feet below the existing site grades. The borings were logged during drilling by a member of our staff.

The borings were advanced with hollow-stem augers, by a conventional truck-mounted drilling rig. Representative bulk and relatively undisturbed soil samples were taken during drilling. Relatively undisturbed soil samples were taken with a split barrel "California Sampler" containing a series of one inch long, 2.416± inch diameter brass rings. This sampling method is described in ASTM Test Method D-3550. In-situ samples were also taken using a 1.4± inch inside diameter split spoon sampler, in general accordance with ASTM D-1586. Both of these samplers are driven into the ground with successive blows of a 140-pound weight falling 30 inches. The blow counts obtained during driving are recorded for further analysis. Bulk samples were collected in plastic bags to retain their original moisture content. The relatively undisturbed ring samples were placed in molded plastic sleeves that were then sealed and transported to our laboratory.

The approximate locations of the borings are indicated on the Boring Location Plan, included as Plate 2 in Appendix A of this report. The Boring Logs, which illustrate the conditions encountered at the boring locations, as well as the results of some of the laboratory testing, are included in Appendix B.

4.2 Geotechnical Conditions

Artificial Fill

With the exception of Boring No. B-3, artificial fill soils were encountered at the ground surface at all of the boring locations, extending to depths of 2½ to 4½± feet below the existing site grades. The artificial fill soils consist of medium dense to very dense silty and clayey fine to coarse sands. These materials possess varying densities and a disturbed appearance (with some lamination), resulting in their classification as artificial fill.

Younger Alluvium

Native younger alluvium was encountered at the ground surface at Boring No. B-3, and beneath the artificial fill soils at Boring Nos. B-2 and B-4, extending to depths of 8 to 20± feet below the existing site grades. Boring No. B-2 was terminated within the younger alluvium at a depth of 20± feet. The younger alluvium generally consists of loose to dense silty sands and clayey sands. The younger alluvium possesses minor amounts of calcareous deposits.

Older Alluvium

With the exception of Boring No. B-2, older native alluvial soils were encountered beneath the artificial fill or beneath the younger alluvium at all of the boring locations, extending to at least the maximum depth explored of 25± feet below ground surface. The older alluvium generally consists of medium dense to dense silty fine sands, clayey fine sands, and fine sandy silts with varying medium to coarse sand.

Groundwater

Free water was not encountered during the drilling of any of the borings. Based on the moisture content of the recovered soil samples and the lack of free water in the borings, the static groundwater table is at a greater depth than 25± feet below existing site grades.

As part of our research, we reviewed available groundwater data in order to determine the historic high groundwater level for the site. The primary reference used to determine the groundwater depths in this area is the California Department of Water Resources website, http://www.water.ca.gov/waterdatalibrary/. One of the monitoring wells observed in the vicinity of the site is located 1.4 miles east of the subject site. Water level readings within this monitoring well indicates a high groundwater level of 79± feet below the ground surface in February 2015.

5.0 LABORATORY TESTING

The soil samples recovered from the subsurface exploration were returned to our laboratory for further testing to determine selected physical and engineering properties of the soils. The tests are briefly discussed below. It should be noted that the test results are specific to the actual samples tested, and variations could be expected at other locations and depths.

Classification

All recovered soil samples were classified using the Unified Soil Classification System (USCS), in accordance with ASTM D-2488. Field identifications were then supplemented with additional visual classifications and/or by laboratory testing. The USCS classifications are shown on the Boring Logs and are periodically referenced throughout this report.

Density and Moisture Content

The density has been determined for selected relatively undisturbed ring samples. These densities were determined in general accordance with the method presented in ASTM D-2937. The results are recorded as dry unit weight in pounds per cubic foot. The moisture contents are determined in accordance with ASTM D-2216, and are expressed as a percentage of the dry weight. These test results are presented on the Boring Logs.

Consolidation

Selected soil samples have been tested to determine their consolidation and collapse potential, in accordance with ASTM D-2435. The testing apparatus is designed to accept either natural or remolded samples in a one-inch high ring, approximately 2.416 inches in diameter. Each sample is then loaded incrementally in a geometric progression and the resulting deflection is recorded at selected time intervals. Porous stones are in contact with the top and bottom of the sample to permit the addition or release of pore water. The samples are typically inundated with water at an intermediate load to determine their potential for collapse or heave. The results of the consolidation testing are plotted on Plates C-1 through C-4 in Appendix C of this report.

Maximum Dry Density and Optimum Moisture Content

A representative bulk sample has been tested for its maximum dry density and optimum moisture content. The results have been obtained using the Modified Proctor procedure, per ASTM D-1557, and are presented on Plate C-5 in Appendix C of this report. These tests are generally used to with compare the dry densities of undisturbed field samples, and for later compaction testing. Additional testing of other soil types or soil mixes may be necessary at a later date.

Expansion Index

The expansion potential of the on-site soils was determined in general accordance with ASTM D-4829. The testing apparatus is designed to accept a 4-inch diameter, 1-in high, remolded sample. The sample is initially remolded to 50± 1 percent saturation and then loaded with a surcharge equivalent to 144 pounds per square foot. The sample is then inundated with water and allowed

to swell against the surcharge. The resultant swell or consolidation is recorded after a 24-hour period. The results of the EI testing are as follows:

Sample Identification	Expansion Index	Expansive Potential
B-4 @ 0 to 5 feet	31	Low

Soluble Sulfates

A representative sample of the near-surface soils was submitted to a subcontracted analytical laboratory for determination of soluble sulfate content. Soluble sulfates are naturally present in soils, and if the concentration is high enough, can result in degradation of concrete which comes into contact with these soils. The results of the soluble sulfate testing are presented below, and are discussed further in a subsequent section of this report.

Sample Identification	Soluble Sulfates (%)	Sulfate Classification
B-4 @ 0 to 5 feet	0.005	Not Applicable (S0)

Corrosivity Testing

One representative bulk sample of the near-surface soils was submitted to a subcontracted corrosion engineering laboratory to identify potentially corrosive characteristics with respect to common construction materials. The corrosivity testing included a determination of the electrical resistivity, pH, and chloride and nitrate concentrations of the soils, as well as other tests. The results of some of these tests are presented below.

Sample Identification	Saturated Resistivity (ohm-cm)	pH	Chlorides (mg/kg)	Nitrates (mg/kg)
B-4 @ 0 to 5 feet	3,720	7.7	9.5	3.3

6.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the results of our review, field exploration, laboratory testing and geotechnical analysis, the proposed development is considered feasible from a geotechnical standpoint. The recommendations contained in this report should be taken into the design, construction, and grading considerations.

The recommendations are contingent upon all grading and foundation construction activities being monitored by the geotechnical engineer of record. The recommendations are provided with the assumption that an adequate program of client consultation, construction monitoring, and testing will be performed during the final design and construction phases to verify compliance with these recommendations. Maintaining Southern California Geotechnical, Inc., (SCG) as the geotechnical consultant from the beginning to the end of the project will provide continuity of services. The geotechnical engineering firm providing testing and observation services shall assume the responsibility of Geotechnical Engineer of Record.

The Grading Guide Specifications, included as Appendix D, should be considered part of this report, and should be incorporated into the project specifications. The contractor and/or owner of the development should bring to the attention of the geotechnical engineer any conditions that differ from those stated in this report, or which may be detrimental for the development.

6.1 Seismic Design Considerations

The subject site is located in an area which is subject to strong ground motions due to earthquakes. The performance of a site-specific seismic hazards analysis was beyond the scope of this investigation. However, numerous faults capable of producing significant ground motions are located near the subject site. Due to economic considerations, it is not generally considered reasonable to design a structure that is not susceptible to earthquake damage. Therefore, significant damage to structures may be unavoidable during large earthquakes. The proposed structures should, however, be designed to resist structural collapse and thereby provide reasonable protection from serious injury, catastrophic property damage and loss of life.

Faulting and Seismicity

Research of available maps indicates that the subject site is not located within an Alquist-Priolo Earthquake Fault Zone. Furthermore, SCG did not identify any evidence of faulting during the geotechnical investigation. Therefore, the possibility of significant fault rupture on the site is considered to be low.

The potential for other geologic hazards such as seismically induced settlement, lateral spreading, tsunamis, inundation, seiches, flooding, and subsidence affecting the site is considered low.

Seismic Design Parameters

The 2019 California Building Code (CBC) provides procedures for earthquake resistant structural design that include considerations for on-site soil conditions, occupancy, and the configuration of

the structure including the structural system and height. The seismic design parameters presented below are based on the soil profile and the proximity of known faults with respect to the subject site.

Based on standards in place at the time of this report, the proposed development is expected to be designed in accordance with the requirements of the 2019 edition of the California Building Code (CBC), which was adopted on January 1, 2020.

The 2019 CBC Seismic Design Parameters have been generated using the SEAOC/OSHPD Seismic Design Maps Tool, a web-based software application available at the website www.seismicmaps.org. This software application calculates seismic design parameters in accordance with several building code reference documents, including ASCE 7-16, upon which the 2019 CBC is based. The application utilizes a database of risk-targeted maximum considered earthquake (MCE_R) site accelerations at 0.01-degree intervals for each of the code documents. The tables below were created using data obtained from the application. The output generated from this program is included as Plate E-1 in Appendix E of this report.

The 2019 CBC requires that a site-specific ground motion study be performed in accordance with Section 11.4.8 of ASCE 7-16 for Site Class D sites with a mapped S_1 value greater than 0.2. However, Section 11.4.8 of ASCE 7-16 also indicates an exception to the requirement for a site-specific ground motion hazard analysis for certain structures on Site Class D sites. The commentary for Section 11 of ASCE 7-16 (Page 534 of Section C11 of ASCE 7-16) indicates that "In general, this exception effectively limits the requirements for site-specific hazard analysis to very tall and or flexible structures at Site Class D sites." **Based on our understanding of the proposed development, the seismic design parameters presented below were calculated assuming that the exception in Section 11.4.8 applies to the proposed structure at this site. However, the structural engineer should verify that this exception is applicable to the proposed structure.** Based on the exception, the spectral response accelerations presented below were calculated using the site coefficients (F_a and F_v) from Tables 1613.2.3(1) and 1613.2.3(2) presented in Section 16.4.4 of the 2019 CBC.

2019 CBC SEISMIC DESIGN PARAMETERS

Parameter		Value
Mapped Spectral Acceleration at 0.2 sec Period	S_S	1.500
Mapped Spectral Acceleration at 1.0 sec Period	S_1	0.558
Site Class	---	D
Site Modified Spectral Acceleration at 0.2 sec Period	S_{MS}	1.500
Site Modified Spectral Acceleration at 1.0 sec Period	S_{M1}	0.972
Design Spectral Acceleration at 0.2 sec Period	S_{DS}	1.000
Design Spectral Acceleration at 1.0 sec Period	S_{D1}	0.648

It should be noted that the site coefficient F_v and the parameters S_{M1} and S_{D1} were not included in the SEAOC/OSHPD Seismic Design Maps Tool output for the 2019 CBC. We calculated these parameters-based on Table 1613.2.3(2) in Section 16.4.4 of the 2019 CBC using the value of S_1

obtained from the Seismic Design Maps Tool, assuming that a site-specific ground motion hazards analysis is not required for the proposed buildings at this site.

Liquefaction

Liquefaction is the loss of strength in generally cohesionless, saturated soils when the pore-water pressure induced in the soil by a seismic event becomes equal to or exceeds the overburden pressure. The primary factors which influence the potential for liquefaction include groundwater table elevation, soil type and plasticity characteristics, relative density of the soil, initial confining pressure, and intensity and duration of ground shaking. The depth within which the occurrence of liquefaction may impact surface improvements is generally identified as the upper 50 feet below the existing ground surface. Liquefaction potential is greater in saturated, loose, poorly graded fine sands with a mean (d_{50}) grain size in the range of 0.075 to 0.2 mm (Seed and Idriss, 1971). Non-sensitive clayey (cohesive) soils which possess a plasticity index of at least 18 (Bray and Sancio, 2006) are generally not considered to be susceptible to liquefaction, nor are those soils which are above the historic static groundwater table.

The Riverside County GIS website indicates that the subject site is located within a zone of low liquefaction susceptibility. In addition, the subsurface conditions encountered at the boring locations are not considered to be conducive to liquefaction. These conditions consist of moderate to high strength younger and older native alluvial soils and no evidence of a long-term groundwater table within the depths explored by the borings. Based on these considerations, liquefaction is not considered to be a design concern for this project.

6.2 Geotechnical Design Considerations

General

The proposed building area is underlain by artificial fill soils, extending to depths of 2½ to 4½± feet below the existing site grades. No documentation regarding the placement and compaction of these materials is expected to be available. Therefore, these materials are considered to represent undocumented fill soils. These soils, in their present condition, are not considered suitable for support of the foundation loads of the new structure. Therefore, remedial grading is considered warranted within the proposed building area in order to remove the artificial fill soils in their entirety, and replace these materials as compacted structural fill soils. In order to provide a layer of uniform support beneath the new structure, an overexcavation of the upper portion of the native alluvial soils is also considered necessary.

Settlement

The recommended remedial grading will remove the artificial fill soils in their entirety, as well as the upper portion of the near-surface native alluvium, and replace these soils as compacted structural fill. The native soils that will remain in place below the recommended depth of overexcavation will not be subject to significant load increases from the foundations of the new structure. Provided that the recommended remedial grading is completed, the post-construction static settlements of the proposed structure is expected to be within tolerable limits.

Expansion

Laboratory testing performed on a representative sample of the near surface soils indicates that these materials possess a low expansion potential (EI = 31). Based on the presence of expansive soils at this site, care should be given to proper moisture conditioning of all building pad subgrade soils to a moisture content of 2 to 4 percent above the ASTM D-1557 optimum during site grading. In addition to adequately moisture conditioning the subgrade soils and fill soils during grading, special care must be taken to maintaining moisture content of these soils at 2 to 4 percent above the optimum moisture content. This will require the contractor to frequently moisture condition these soils throughout the grading process, unless grading occurs during a period of relatively wet weather.

Soluble Sulfates

The results of the soluble sulfate testing indicated a sulfate concentration of approximately 0.005 percent for the selected sample of the near-surface soils. This concentration is considered to be "not applicable" (S0) with respect to the American Concrete Institute (ACI) Publication 318-14 Building Code Requirements for Structural Concrete and Commentary, Section 4.3. Therefore, specialized concrete mix designs are not considered to be necessary, with regard to sulfate protection purposes. It is, however, recommended that additional soluble sulfate testing be conducted at the completion of rough grading to verify the soluble sulfate concentrations of the soils which are present at pad grade within the building area.

Corrosion Potential

The results of laboratory testing indicate that the on-site soils possess a saturated resistivity of 3,720 ohm-cm, and a pH value of 7.7. These test results have been evaluated in accordance with guidelines published by the Ductile Iron Pipe Research Association (DIPRA). The DIPRA guidelines consist of a point system by which characteristics of the soils are used to quantify the corrosivity characteristics of the site. Resistivity and pH are two of the five factors that enter into the evaluation procedure. Redox potential, relative soil moisture content and sulfides are also included. Although sulfide testing was not part of the scope of services for this project, we have evaluated the corrosivity characteristics of the on-site soils using resistivity, pH and moisture content. Based on these factors, and utilizing the DIPRA procedure, the on-site soils are not considered to be corrosive to ductile iron pipe.

A relatively low concentration (9.5 mg/kg) of chlorides were detected in the sample submitted for corrosivity testing. In general, soils possessing chloride concentrations in excess of 500 parts per million (ppm) are considered to be corrosive with respect to steel reinforcement within reinforced concrete. Based on the lack of any significant chlorides in the tested sample, the site is considered to have a C1 chloride exposure in accordance with the American Concrete Institute (ACI) Publication 318 Building Code Requirements for Structural Concrete and Commentary. Therefore, a specialized concrete mix design for reinforced concrete for protection against chloride exposure is not considered warranted.

Nitrates present in soil can be corrosive to copper tubing at concentrations greater than 50 mg/kg. The tested sample possess a nitrate concentration of 3.3 mg/kg. Based on this test result, the on-site soils are not considered to be corrosive to copper pipe.

Since SCG does not practice in the area of corrosion engineering, we recommend that the client contact a corrosion engineer to provide a more thorough evaluation.

Shrinkage/Subsidence

Based on the results of the laboratory testing, removal and recompaction of the artificial fill and near-surface native alluvium will result in an average shrinkage of 0 to 5 percent. However, the estimated shrinkage of the individual soil layers at the site is highly variable, locally ranging from a minimum shrinkage value of 0 percent to a maximum shrinkage of 11 percent at varying sample depths and locations. It should be noted that the potential shrinkage estimate is based on dry density testing performed on small-diameter samples taken at the boring locations. If a more accurate and precise shrinkage estimate is desired, SCG can perform a shrinkage study involving several excavated test-pits where in-place densities are determined using in-situ testing methods instead of laboratory density testing on small-diameter samples. Please contact SCG for details and a cost estimate regarding a shrinkage study, if desired.

Minor ground subsidence is expected to occur in the soils below the zone of removal, due to settlement and machinery working. The subsidence is estimated to be 0.10 feet.

These estimates are based on previous experience and the subsurface conditions encountered at the boring locations. The actual amount of subsidence is expected to be variable and will be dependent on the type of machinery used, repetitions of use, and dynamic effects, all of which are difficult to assess precisely.

Grading and Foundation Plan Review

It is recommended that we be provided with copies of the finalized grading and foundation plans, when they become available, for review with regard to the conclusions, recommendations, and assumptions contained within this report.

6.3 Site Grading Recommendations

The grading recommendations presented below are based on the subsurface conditions encountered at the boring locations and our understanding of the proposed development. We recommend that all grading activities be completed in accordance with the Grading Guide Specifications included as Appendix D of this report, unless superseded by site-specific recommendations presented below.

Site Stripping

Initial site preparation should include stripping of any surficial vegetation and organic soils. Any organic topsoil and tree root masses should be removed during site stripping. Based on conditions encountered at the time of the subsurface exploration, removal of native grass and weed growth is not expected to be necessary based on the recent stripping at the site. The actual extent of site stripping should be determined in the field by the geotechnical engineer, based on the organic content and stability of the materials encountered.

Treatment of Existing Soils: Building Pad

Remedial grading should be performed within the proposed building pad area in order to remove the artificial fill soils in their entirety and the upper portion of the existing alluvial soils. At the boring locations the artificial fill soils extend to depths of 2½ to 4½± feet below the existing site grades. In order to provide a uniform layer of building support, it is recommended that the overexcavation extend to a depth of at least 4 feet below existing grade, and to a depth of at least 3 feet below proposed grade, whichever is greater. Within the influence zones of the new foundations, the overexcavation should extend to a depth of at least 3 feet below proposed foundation bearing grade.

The overexcavation areas should extend at least 5 feet beyond the building perimeters, and to an extent equal to the depth of fill below the new foundations. If the proposed structure incorporates any exterior columns (such as for a canopy or overhang) the area of overexcavation should also encompass these areas.

Following completion of the overexcavation, the subgrade soils within the overexcavation areas should be evaluated by the geotechnical engineer to verify their suitability to serve as the structural fill subgrade, as well as to support the foundation loads of the new structure. This evaluation should include proofrolling and probing to identify any soft, loose, or otherwise unstable soils that must be removed. Some localized areas of deeper excavation may be required if additional fill or loose, porous, or low-density native soils are encountered at the base of the overexcavation.

After a suitable overexcavation subgrade has been achieved, the exposed soils should be scarified to a depth of at least 12 inches and moisture conditioned or air dried to achieve a moisture content of 2 to 4 percent above optimum moisture content. The subgrade soils should then be recompacted to at least 90 percent of the ASTM D-1557 maximum dry density.

The building pad area may then be raised to grade with previously excavated soils or imported, very low expansive structural fill. All structural fill soils present within the proposed building area should be compacted to at least 90 percent of the ASTM D-1557 maximum dry density.

Treatment of Existing Soils: Retaining Walls and Site Walls

The existing soils within the areas of proposed retaining and non-retaining site walls should be overexcavated to a depth of at least 2 feet below foundation bearing grade and replaced as compacted structural fill. Subgrades for erection pads for concrete tilt-up walls are considered to be a part of the foundation system and should also be overexcavated. The overexcavation subgrade soils should be evaluated by the geotechnical engineer prior to scarifying, moisture conditioning and recompacting the upper 12 inches of exposed subgrade soils. The previously excavated soils may then be replaced as compacted structural fill.

If the full lateral extent of overexcavation is not achievable for the proposed walls, the foundations should be redesigned using a lower bearing pressure. The geotechnical engineer of record should be contacted for recommendations pertaining to this type of condition.

Treatment of Existing Soils: Parking and Drive Areas

Based on economic considerations, overexcavation of the existing soils in the new parking and drive areas is not considered warranted, with the exception of areas where lower strength, or unstable soils are identified by the geotechnical engineer during grading.

Subgrade preparation in the new parking and drive areas should initially consist of removal of all soils disturbed during stripping. The geotechnical engineer should then evaluate the subgrade to identify any areas of additional unsuitable soils. The subgrade soils should then be scarified to a depth of 12± inches, moisture conditioned to 2 to 4 percent above optimum, and recompacted to at least 90 percent of the ASTM D-1557 maximum dry density. Based on the presence of variable strength soils throughout the site, it is expected that some isolated areas of additional overexcavation may be required to remove zones of lower strength, unsuitable soils.

The grading recommendations presented above for the proposed parking and drive areas assume that the owner and/or developer can tolerate minor amounts of settlement within the proposed parking areas. The grading recommendations presented above do not completely mitigate the extent of existing undocumented fill soils and low strength younger alluvium in the parking areas. As such, settlement and associated pavement distress could occur. Typically, repair of such distressed areas involves significantly lower costs than completely mitigating these soils at the time of construction. If the owner cannot tolerate the risk of such settlements, the parking and drive areas should be overexcavated to a depth of 2 feet below proposed pavement subgrade elevation, with the resulting soils replaced as compacted structural fill.

Fill Placement

- Fill soils should be placed in thin (6± inches), near-horizontal lifts, moisture conditioned to 2 to 4 percent above the optimum moisture content, and compacted.
- On-site soils may be used for fill provided they are cleaned of any debris to the satisfaction of the geotechnical engineer.
- All grading and fill placement activities should be completed in accordance with the requirements of the 2019 CBC and the grading code of the city of Perris and/or the county of Riverside.
- All fill soils should be compacted to at least 90 percent of the ASTM D-1557 maximum dry density. Fill soils should be well mixed.
- Compaction tests should be performed periodically by the geotechnical engineer as random verification of compaction and moisture content. These tests are intended to aid the contractor. Since the tests are taken at discrete locations and depths, they may not be indicative of the entire fill and therefore should not relieve the contractor of his responsibility to meet the job specifications.

Imported Structural Fill

All imported structural fill should consist of very low expansive (EI < 20), well graded soils possessing at least 10 percent fines (that portion of the sample passing the No. 200 sieve). Additional specifications for structural fill are presented in the Grading Guide Specifications, included as Appendix D.

Utility Trench Backfill

In general, all utility trench backfill soils should be compacted to at least 90 percent of the ASTM D-1557 maximum dry density. As an alternative, a clean sand (minimum Sand Equivalent of 30) may be placed within trenches and compacted in place (jetting or flooding is not recommended). Compacted trench backfill should conform to the requirements of the local grading code, and more restrictive requirements may be indicated by the city of Perris and/or the county of Riverside. All utility trench backfills should be witnessed by the geotechnical engineer. The trench backfill soils should be compaction tested where possible; probed and visually evaluated elsewhere.

Utility trenches which parallel a footing, and extending below a 1h:1v plane projected from the outside edge of the footing should be backfilled with structural fill soils, compacted to at least 90 percent of the ASTM D-1557 standard. Pea gravel backfill should not be used for these trenches.

6.4 Construction Considerations

Excavation Considerations

The near-surface soils generally consist of moderate strength silty sands and clayey sands. These materials may be subject to minor to moderate caving within shallow excavations. Where caving does occur, flattened excavation slopes may be sufficient to provide excavation stability. On a preliminary basis, the inclination of temporary slopes should not exceed 1.5h:1v. Deeper excavations may require some form of external stabilization such as shoring or bracing. Maintaining adequate moisture content within the near-surface soils will improve excavation stability. All excavation activities on this site should be conducted in accordance with Cal-OSHA regulations.

Expansive Soils

Based on the results of laboratory testing, some of the near surface soils have been determined to possess a low potential for expansion. Therefore, care should be given to proper moisture conditioning of all building pad subgrade soils to a moisture content of 2 to 4 percent above the Modified Proctor optimum during site grading. All imported fill soils should have very low expansive characteristics. In addition to adequately moisture conditioning the subgrade soils and fill soils during grading, special care must be taken to maintain moisture content of these soils at 2 to 4 percent above the Modified Proctor optimum. This will require the contractor to frequently moisture condition these soils throughout the grading process, unless grading occurs during a period of relatively wet weather.

Other provisions, as determined by the landscape architect or civil engineer, may also be appropriate.

Moisture Sensitive Subgrade Soils

Most of the near surface soils possess appreciable silt and clay content and may become unstable if exposed to significant moisture infiltration or disturbance by construction traffic. In addition,

based on their granular content, some of the on-site soils will also be susceptible to erosion. The site should, therefore, be graded to prevent ponding of surface water and to prevent water from running into excavations.

Groundwater

The static groundwater table is considered to exist at a depth greater than 25± feet or more below existing grade. Therefore, groundwater is not expected to impact the grading or foundation construction activities.

6.5 Foundation Design and Construction

Based on the preceding grading recommendations, it is assumed that the new building pad will be underlain by newly placed structural fill soils extending to depths of at least 4 feet below foundation bearing grade. Based on this subsurface profile, the proposed structure may be supported on shallow foundations.

Foundation Design Parameters

New square and rectangular footings may be designed as follows:

- Maximum, net allowable soil bearing pressure: 2,500 lbs/ft^2.
- Minimum wall/column footing width: 14 inches/24 inches.
- Minimum longitudinal steel reinforcement within strip footings: Four (4) No. 5 rebars (2 top and 2 bottom). Due to the presence of expansive soils. Additional reinforcement may be necessary for structural considerations.
- Minimum foundation embedment: 12 inches into suitable structural fill soils, and at least 18 inches below adjacent exterior grade. Interior column footings may be placed immediately beneath the floor slab.
- It is recommended that the perimeter building foundations be continuous across all exterior doorways. Any flatwork adjacent to the exterior doors should be doweled into the perimeter foundations in a manner determined by the structural engineer.

The allowable bearing pressures presented above may be increased by 1/3 when considering short duration wind or seismic loads. The minimum steel reinforcement recommended above is based on standard geotechnical practice. Additional rigidity may be necessary for structural considerations. The actual design of the foundations should be determined by the structural engineer.

Foundation Construction

The foundation subgrade soils should be evaluated at the time of overexcavation, as discussed in Section 6.3 of this report. It is further recommended that the foundation subgrade soils be evaluated by the geotechnical engineer immediately prior to steel or concrete placement. Soils

suitable for direct foundation support should consist of newly placed structural fill compacted at least 90 percent of the ASTM D-1557 maximum dry density. Any unsuitable materials should be removed to a depth of suitable bearing compacted structural fill, with the resulting excavations backfilled with compacted fill soils. As an alternative, lean concrete slurry (500 to 1,500 psi) may be used to backfill such isolated overexcavations.

The foundation subgrade soils should also be properly moisture conditioned to 2 to 4 percent above the Modified Proctor optimum, to a depth of at least 12 inches below bearing grade. Since it is typically not feasible to increase the moisture content of the floor slab and foundation subgrade soils once rough grading has been completed, care should be taken to maintain the moisture content of the building pad subgrade soils throughout the construction process.

Estimated Foundation Settlements

Post-construction total and differential static settlements of shallow foundations designed and constructed in accordance with the previously presented recommendations are estimated to be less than 1.0 and 0.5 inches, respectively, under static conditions. Differential movements are expected to occur over a 50-foot span, thereby resulting in an angular distortion of less than 0.002 inches per inch.

Lateral Load Resistance

Lateral load resistance will be developed by a combination of friction acting at the base of foundations and slab and the passive earth pressure developed by footings below grade. The following friction and passive pressure may be used to resist lateral forces:

- Passive Earth Pressure: 300 lbs/ft^3
- Friction Coefficient: 0.30

These are allowable values, and include a factor of safety. When combining friction and passive resistance, the passive pressure component should be reduced by one-third. These values assume that footings will be poured directly against compacted structural fill soils. The maximum allowable passive pressure is 3,000 lbs/ft^2.

6.6 Floor Slab Design and Construction

Subgrades which will support new floor slab should be prepared in accordance with the recommendations contained in the ***Site Grading Recommendations*** section of this report. Based on the anticipated grading which will occur at this site, the floor of the proposed structure may be constructed as a conventional slab-on-grade, supported on newly placed structural fill (or densified existing soils), extending to a depth of at least 3 feet below finished pad grade. Based on geotechnical considerations, the floor slabs may be designed as follows:

- Minimum slab thickness: 6 inches.

- Modulus of Subgrade Reaction: 150 psi/in.

- Reinforcement is not expected to be required for geotechnical conditions. The actual floor slab reinforcement should be determined by the structural engineer, based upon the imposed loading.

- Slab underlayment: If moisture sensitive floor coverings will be used then minimum slab underlayment should consist of a moisture vapor barrier constructed below the entire slab area where such moisture sensitive floor coverings are expected. The moisture vapor barrier should meet or exceed the Class A rating as defined by ASTM E 1745-97 and have a permeance rating less than 0.01 perms as described in ASTM E 96-95 and ASTM E 154-88. A polyolefin material such as Stego® Wrap Vapor Barrier or equivalent will meet these specifications. The moisture vapor barrier should be properly constructed in accordance with all applicable manufacturer specifications. Given that a rock free subgrade is anticipated and that a capillary break is not required, sand below the barrier is not required. The need for sand and/or the amount of sand above the moisture vapor barrier should be specified by the structural engineer or concrete contractor. The selection of sand above the barrier is not a geotechnical engineering issue and hence outside our purview. Where moisture sensitive floor coverings are not anticipated, the vapor barrier may be eliminated.

- Moisture condition the floor slab subgrade soils to 2 to 4 percent above the Modified Proctor optimum moisture content, to a depth of 12 inches. The moisture content of the floor slab subgrade soils should be verified by the geotechnical engineer within 24 hours prior to concrete placement.

- Proper concrete curing techniques should be utilized to reduce the potential for slab curling or the formation of excessive shrinkage cracks.

The actual design of the floor slab should be completed by the structural engineer to verify adequate thickness and reinforcement.

6.7 Retaining Wall Design and Construction

Although not indicated on the site plan, some small (less than 6 feet in height) retaining walls may be required in truck court area and to facilitate the new site grades. The parameters recommended for use in the design of these walls are presented below.

Retaining Wall Design Parameters

Based on the soil conditions encountered at the boring locations, the following parameters may be used in the design of new retaining walls for this site. The following parameters assume that only the on-site soils will be utilized for retaining wall backfill. The near-surface soils generally consist of silty sands and clayey sands. Based on their classification, these materials are expected to possess a friction angle of at least 30 degrees when compacted to at least 90 percent of the ASTM D-1557 maximum dry density.

If desired, SCG could provide design parameters for an alternative select backfill material behind the retaining walls. The use of select backfill material could result in lower lateral earth pressures. In order to use the design parameters for the imported select fill, this material must be placed

within the entire active failure wedge. This wedge is defined as extending from the heel of the retaining wall upwards at an angle of approximately 60° from horizontal. If select backfill material behind the retaining wall is desired, SCG should be contacted for supplementary recommendations.

RETAINING WALL DESIGN PARAMETERS

Design Parameter		**Soil Type**
		On-Site Silty Sands and Clayey Sands
Internal Friction Angle (ϕ)		30°
Unit Weight		131 lbs/ft^3
Equivalent Fluid Pressure:	Active Condition (level backfill)	44 lbs/ft^3
	Active Condition (2h:1v backfill)	70 lbs/ft^3
	At-Rest Condition (level backfill)	66 lbs/ft^3

Regardless of the backfill type, the walls should be designed using a soil-footing coefficient of friction of 0.30 and an equivalent passive pressure of 300 lbs/ft^3. The structural engineer should incorporate appropriate factors of safety in the design of the retaining walls.

The active earth pressure may be used for the design of retaining walls that do not directly support structures or support soils that in turn support structures and which will be allowed to deflect. The at-rest earth pressure should be used for walls that will not be allowed to deflect such as those which will support foundation bearing soils, or which will support foundation loads directly.

Where the soils on the toe side of the retaining wall are not covered by a "hard" surface such as a structure or pavement, the upper 1 foot of soil should be neglected when calculating passive resistance due to the potential for the material to become disturbed or degraded during the life of the structure.

Seismic Lateral Earth Pressures

In accordance with the 2019 CBC, any retaining walls more than 6 feet in height must be designed for seismic lateral earth pressures. If walls 6 feet or more are required for this site, the geotechnical engineer should be contacted for supplementary seismic lateral earth pressure recommendations.

Retaining Wall Foundation Design

The retaining wall foundations should be supported within newly placed compacted structural fill, extending to a depth of at least 2 feet below proposed foundation bearing grade. Foundations to support new retaining walls should be designed in accordance with the general Foundation Design Parameters presented in a previous section of this report.

Backfill Material

On-site soils may be used to backfill the retaining walls. However, all backfill material placed within 3 feet of the back-wall face should have a particle size no greater than 3 inches. The retaining wall backfill materials should be well graded.

It is recommended that a properly installed prefabricated drainage composite such as the MiraDRAIN 6000XL (or approved equivalent), which is specifically designed for use behind retaining walls be used. If the drainage composite material is not covered by an impermeable surface, such as a structure or pavement, a 12-inch thick layer of a low permeability soil should be placed over the backfill to reduce surface water migration to the underlying soils. The drainage composite should be separated from the backfill soils by a suitable geotextile, approved by the geotechnical engineer.

All retaining wall backfill should be placed and compacted under engineering-controlled conditions in the necessary layer thicknesses to ensure an in-place density between 90 and 93 percent of the maximum dry density as determined by the Modified Proctor test (ASTM D1557). Care should be taken to avoid over-compaction of the soils behind the retaining walls, and the use of heavy compaction equipment should be avoided.

Subsurface Drainage

As previously indicated, the retaining wall design parameters are based upon drained backfill conditions. Consequently, some form of permanent drainage system will be necessary in conjunction with the appropriate backfill material. Subsurface drainage may consist of either:

- A weep hole drainage system typically consisting of a series of 2-inch diameter holes in the wall situated slightly above the ground surface elevation on the exposed side of the wall and at an approximate 10-foot on-center spacing. Alternatively, 4-inch diameter holes at an approximate 20-foot on-center spacing can be used for this type of drainage system. In addition, the weep holes should include a 2 cubic foot pocket of open graded gravel, surrounded by an approved geotextile fabric, at each weep hole location.

- A 4-inch diameter perforated pipe surrounded by 2 cubic feet of gravel per linear foot of drain placed behind the wall, above the retaining wall footing. The gravel layer should be wrapped in a suitable geotextile fabric to reduce the potential for migration of fines. The footing drain should be extended to daylight or tied into a storm drainage system. The actual design of this type of system should be determined by the civil engineer to verify that the drainage system possesses the adequate capacity and slope for its intended use.

6.8 Pavement Design Parameters

Site preparation in the pavement area should be completed as previously recommended in the ***Site Grading Recommendations*** section of this report. The subsequent pavement recommendations assume proper drainage and construction monitoring, and are based on either PCA or CALTRANS design parameters for a twenty (20) year design period. However, these designs also assume a routine pavement maintenance program to obtain the anticipated 20-year pavement service life.

Pavement Subgrades

It is anticipated that the new pavements will be primarily supported on a layer of compacted structural fill, consisting of scarified, thoroughly moisture conditioned and recompacted existing soils. The on-site soils generally consist of silty sands and clayey sands. These soils are generally considered to possess fair to good pavement support characteristics with estimated R-values of 30 to 40. Since R-value testing was outside the scope of services, the subsequent pavement design is therefore based upon an assumed R-value of 30. Any fill material imported to the site should have support characteristics equal to or greater than that of the on-site soils and be placed and compacted under engineering controlled conditions. It is recommended that R-value testing be performed after completion of rough grading. Depending upon the results of the R-value testing, it may be feasible to use thinner pavement sections in some areas of the site.

Asphaltic Concrete

Presented below are the recommended thicknesses for new flexible pavement structures consisting of asphaltic concrete over a granular base. The pavement designs are based on the traffic indices (TI's) indicated. The client and/or civil engineer should verify that these TI's are representative of the anticipated traffic volumes. If the client and/or civil engineer determine that the expected traffic volume will exceed the applicable traffic index, we should be contacted for supplementary recommendations. The design traffic indices equate to the following approximate daily traffic volumes over a 20 year design life, assuming six operational traffic days per week.

Traffic Index	No. of Heavy Trucks per Day
4.0	0
5.0	1
6.0	3
7.0	11
8.0	35
9.0	93

For the purpose of the traffic volumes indicated above, a truck is defined as a 5-axle tractor trailer unit with one 8-kip axle and two 32-kip tandem axles. All of the traffic indices allow for 1,000 automobiles per day.
automobiles per day.

ASPHALT PAVEMENTS (R=30)					
Materials	Thickness (inches)				
	Auto Parking and Auto Drive Lanes (TI = 4.0 to 5.0)	Truck Traffic			
		TI = 6.0	TI = 7.0	TI = 8.0	TI = 9.0
Asphalt Concrete	3	3½	4	5	5½
Aggregate Base	6	8	10	11	13
Compacted Subgrade	12	12	12	12	12

The aggregate base course should be compacted to at least 95 percent of the ASTM D-1557 maximum dry density. The asphaltic concrete should be compacted to at least 95 percent of the Marshall maximum density, as determined by ASTM D-2726. The aggregate base course may consist of crushed aggregate base (CAB) or crushed miscellaneous base (CMB), which is a recycled gravel, asphalt and concrete material. The gradation, R-Value, Sand Equivalent, and Percentage Wear of the CAB or CMB should comply with appropriate specifications contained in the current edition of the "Greenbook" Standard Specifications for Public Works Construction.

Portland Cement Concrete

The preparation of the subgrade soils within concrete pavement areas should be performed as previously described for proposed asphalt pavement areas. The minimum recommended thicknesses for the Portland Cement Concrete pavement sections are as follows:

PORTLAND CEMENT CONCRETE PAVEMENTS (R=30)				
Materials	**Thickness (inches)**			
	Autos and Light Truck Traffic (TI = 5.0 to 6.0)	Truck Traffic		
		TI = 7.0	TI = 8.0	TI = 9.0
PCC	5	5½	6½	8
Compacted Subgrade (95% minimum compaction)	12	12	12	12

The concrete should have a 28-day compressive strength of at least 3,000 psi. The maximum joint spacing within all of the PCC pavements is recommended to be equal to or less than 30 times the pavement thickness.

7.0 GENERAL COMMENTS

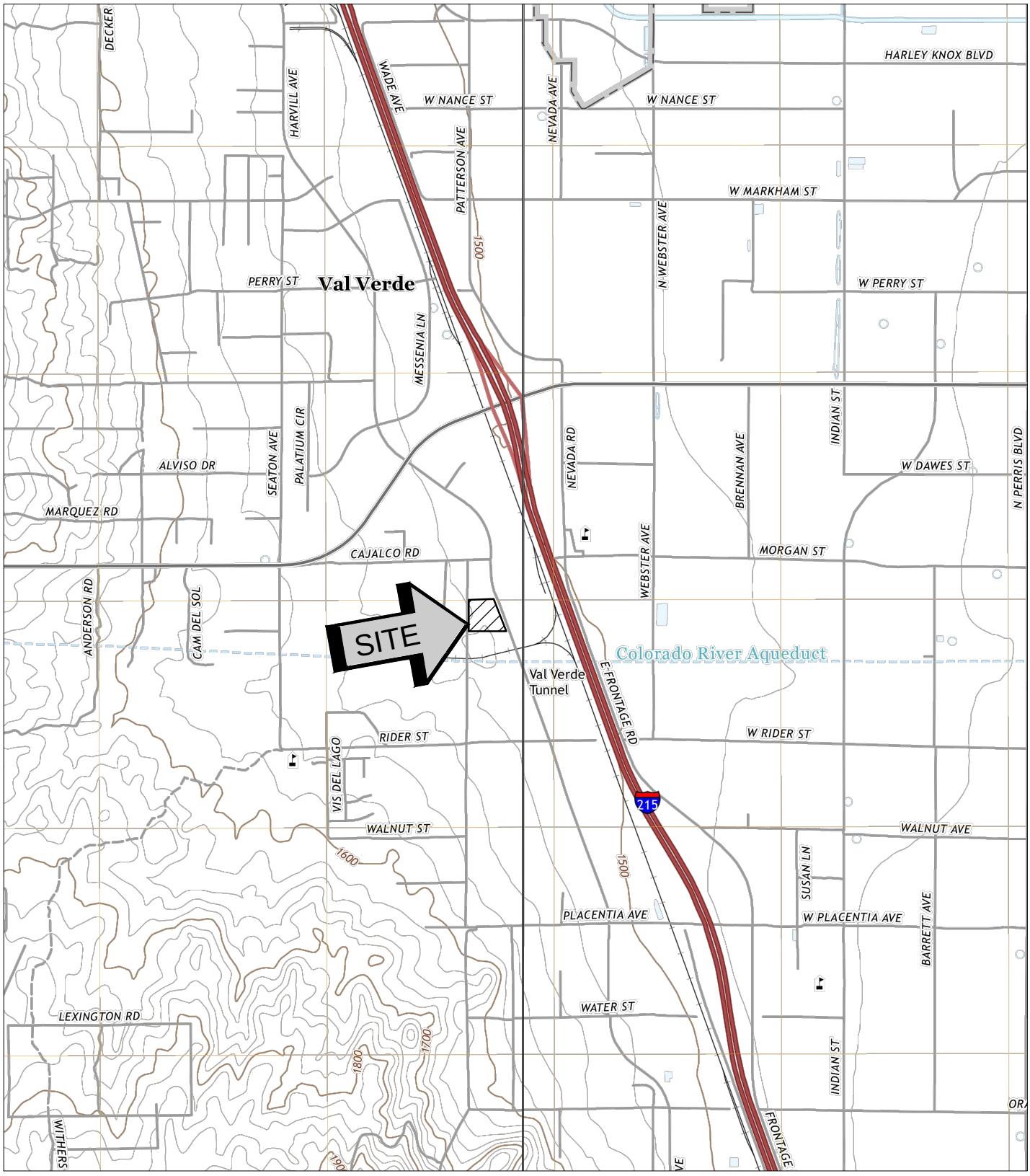
This report has been prepared as an instrument of service for use by the client, in order to aid in the evaluation of this property and to assist the architects and engineers in the design and preparation of the project plans and specifications. This report may be provided to the contractor(s) and other design consultants to disclose information relative to the project. However, this report is not intended to be utilized as a specification in and of itself, without appropriate interpretation by the project architect, civil engineer, and/or structural engineer. The reproduction and distribution of this report must be authorized by the client and Southern California Geotechnical, Inc. Furthermore, any reliance on this report by an unauthorized third party is at such party's sole risk, and we accept no responsibility for damage or loss which may occur. The client(s)' reliance upon this report is subject to the Engineering Services Agreement, incorporated into our proposal for this project.

The analysis of this site was based on a subsurface profile interpolated from limited discrete soil samples. While the materials encountered in the project area are considered to be representative of the total area, some variations should be expected between boring locations and sample depths. If the conditions encountered during construction vary significantly from those detailed herein, we should be contacted immediately to determine if the conditions alter the recommendations contained herein.

This report has been based on assumed or provided characteristics of the proposed development. It is recommended that the owner, client, architect, structural engineer, and civil engineer carefully review these assumptions to ensure that they are consistent with the characteristics of the proposed development. If discrepancies exist, they should be brought to our attention to verify that they do not affect the conclusions and recommendations contained herein. We also recommend that the project plans and specifications be submitted to our office for review to verify that our recommendations have been correctly interpreted.

The analysis, conclusions, and recommendations contained within this report have been promulgated in accordance with generally accepted professional geotechnical engineering practice. No other warranty is implied or expressed.

APPENDIX A



SOURCE: USGS TOPOGRAPHIC MAP OF STEELE PEAK AND PERRIS QUADRANGLES, RIVERSIDE COUNTY, CALIFORNIA, 2018.

SITE LOCATION MAP

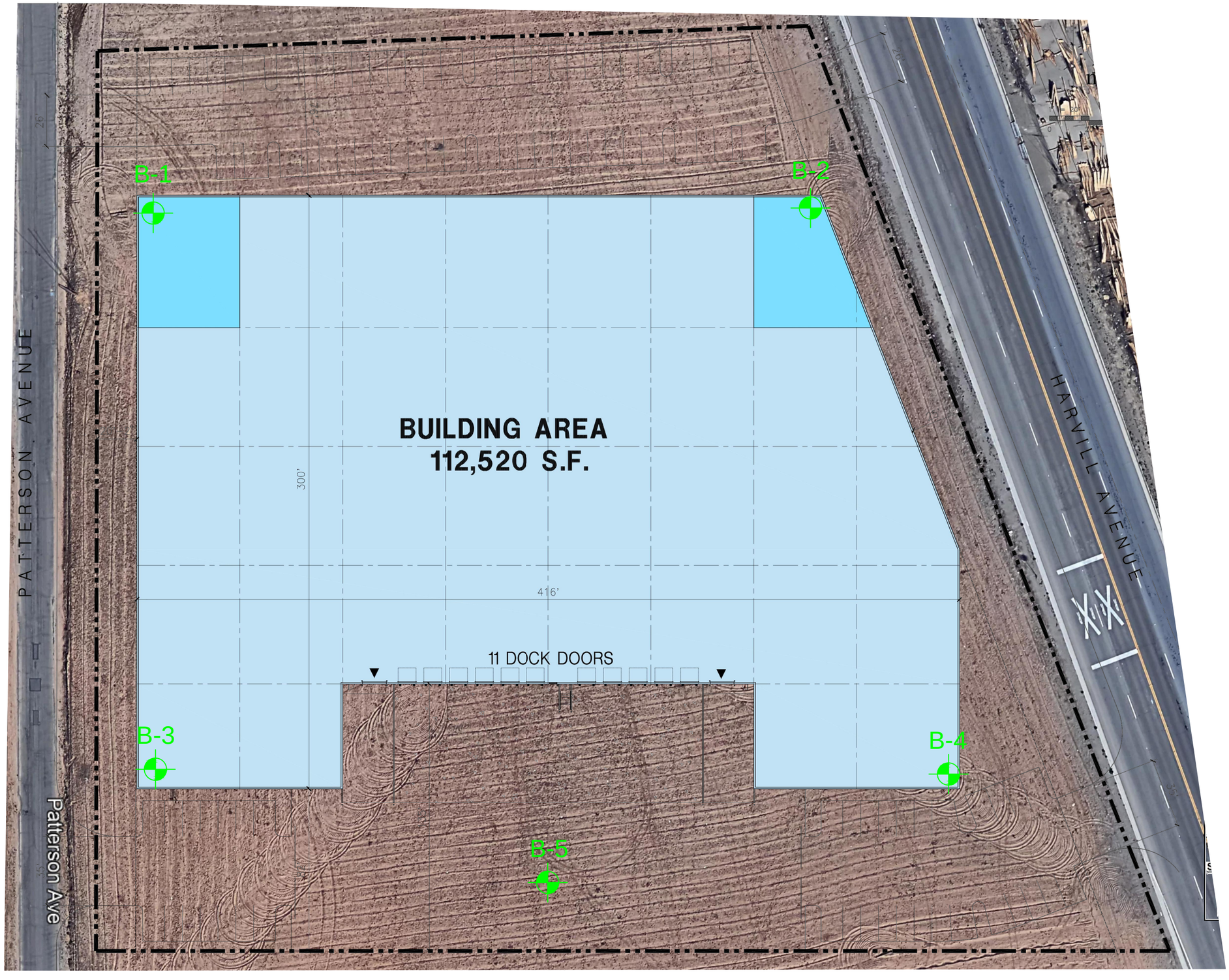
PROPOSED WAREHOUSE

RIVERSIDE COUNTY (PERRIS), CALIFORNIA

SCALE: 1" = 2000'	
DRAWN: PM CHKD: RGT	
SCG PROJECT 21G231-1	
PLATE 1	

SoCalGeo

SOUTHERN CALIFORNIA GEOTECHNICAL



GEOTECHNICAL LEGEND

PROPOSED BORING LOCATION

NOTE: CONCEPTUAL SITE PLAN (SCHEME 1) PREPARED BY HPA.
AERIAL PHOTOGRAPH OBTAINED FROM GOOGLE EARTH

%25,1* /2&$7,21 3/$1

PROPOSED WAREHOUSE

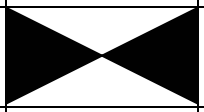
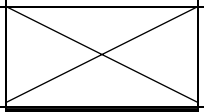
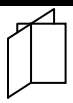
RIVERSIDE COUNTY (PERRIS), CALIFORNIA

SCALE: 1" = 50'	
DRAWN: PM CHKD: RGT	
SCG PROJECT 21G231-1	
3/$7(	

SOUTHERN CALIFORNIA GEOTECHNICAL

APPENDIX B

BORING LOG LEGEND

SAMPLE TYPE	GRAPHICAL SYMBOL	SAMPLE DESCRIPTION
AUGER		SAMPLE COLLECTED FROM AUGER CUTTINGS, NO FIELD MEASUREMENT OF SOIL STRENGTH. (DISTURBED)
CORE		ROCK CORE SAMPLE: TYPICALLY TAKEN WITH A DIAMOND-TIPPED CORE BARREL. TYPICALLY USED ONLY IN HIGHLY CONSOLIDATED BEDROCK.
GRAB		SOIL SAMPLE TAKEN WITH NO SPECIALIZED EQUIPMENT, SUCH AS FROM A STOCKPILE OR THE GROUND SURFACE. (DISTURBED)
CS		CALIFORNIA SAMPLER: 2-1/2 INCH I.D. SPLIT BARREL SAMPLER, LINED WITH 1-INCH HIGH BRASS RINGS. DRIVEN WITH SPT HAMMER. (RELATIVELY UNDISTURBED)
NSR		NO RECOVERY: THE SAMPLING ATTEMPT DID NOT RESULT IN RECOVERY OF ANY SIGNIFICANT SOIL OR ROCK MATERIAL.
SPT		STANDARD PENETRATION TEST: SAMPLER IS A 1.4 INCH INSIDE DIAMETER SPLIT BARREL, DRIVEN 18 INCHES WITH THE SPT HAMMER. (DISTURBED)
SH		SHELBY TUBE: TAKEN WITH A THIN WALL SAMPLE TUBE, PUSHED INTO THE SOIL AND THEN EXTRACTED. (UNDISTURBED)
VANE		VANE SHEAR TEST: SOIL STRENGTH OBTAINED USING A 4 BLADED SHEAR DEVICE. TYPICALLY USED IN SOFT CLAYS-NO SAMPLE RECOVERED.

COLUMN DESCRIPTIONS

DEPTH: Distance in feet below the ground surface.

SAMPLE: Sample Type as depicted above.

BLOW COUNT: Number of blows required to advance the sampler 12 inches using a 140 lb hammer with a 30-inch drop. 50/3" indicates penetration refusal (>50 blows) at 3 inches. WH indicates that the weight of the hammer was sufficient to push the sampler 6 inches or more.

POCKET PEN.: Approximate shear strength of a cohesive soil sample as measured by pocket penetrometer.

GRAPHIC LOG: Graphic Soil Symbol as depicted on the following page.

DRY DENSITY: Dry density of an undisturbed or relatively undisturbed sample in lbs/ft^3.

MOISTURE CONTENT: Moisture content of a soil sample, expressed as a percentage of the dry weight.

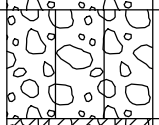
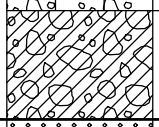
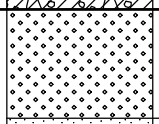
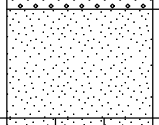
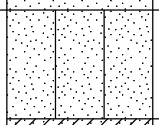
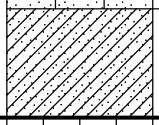
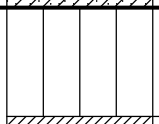
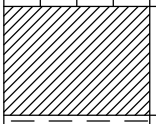
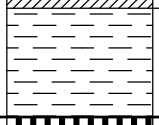
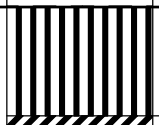
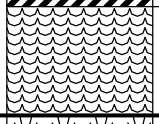
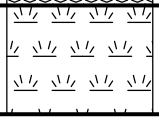
LIQUID LIMIT: The moisture content above which a soil behaves as a liquid.

PLASTIC LIMIT: The moisture content above which a soil behaves as a plastic.

PASSING #200 SIEVE: The percentage of the sample finer than the #200 standard sieve.

UNCONFINED SHEAR: The shear strength of a cohesive soil sample, as measured in the unconfined state.

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
			GRAPH	LETTER	
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-1

JOB NO.: 21G231-1
PROJECT: Proposed Warehouse
LOCATION: Riverside County (Perris), California
DRILLING DATE: 10/1/21
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Ryan Bremer
WATER DEPTH: Dry
CAVE DEPTH: 21 feet
READING TAKEN: At Completion

FIELD RESULTS					DESCRIPTION	LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
		52			FILL: Light Brown Silty fine to coarse Sand, trace Clay, slightly cemented, laminated, dense-damp	125	6					
		66				124	6					
5		61			OLDER ALLUVIUM: Brown Silty fine Sand, little medium to coarse Sand, trace Calcareous veining, dense-damp	121	5					
		40			Brown fine Sandy Silt, extensive Calcareous nodules, trace medium to coarse Sand, medium dense to dense-damp	116	6					
10		47			@ 9 feet, moist to very moist	114	16					
		18			Brown Silty fine to medium Sand, trace coarse Sand, medium dense-damp		5					
15												
		26			Brown fine Sandy Silt, trace medium to coarse Sand, medium dense-moist to very moist		14					
20												
		18			Brown Silty fine Sand, trace medium to coarse Sand, medium dense-damp		7					
25					Boring Terminated at 25'							

TBL 21G231-1.GPJ SOCALGEO.GDT 10/27/21

TEST BORING LOG

PLATE B-1

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-2

JOB NO.: 21G231-1
PROJECT: Proposed Warehouse
LOCATION: Riverside County (Perris), California

DRILLING DATE: 10/1/21
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Ryan Bremer

WATER DEPTH: Dry
CAVE DEPTH: 16 feet
READING TAKEN: At Completion

FIELD RESULTS					DESCRIPTION	LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
		22			FILL: Brown Clayey fine to medium Sand, little coarse Sand, little Silt, slightly cemented, medium dense-damp		6					
		9			ALLUVIUM: Brown Silty fine Sand, trace medium to coarse Sand, loose to medium dense-damp to moist		4					
5		19					7					
		28					9					
10												
		11			Brown Silty fine to medium Sand, trace coarse Sand, medium dense-damp		5					
15												
		34			@ 18½ feet, dense		7					
20					Boring Terminated at 20'							

TBL 21G231-1.GPJ SOCALGEO.GDT 10/27/21

TEST BORING LOG **PLATE B-2**

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-3

JOB NO.: 21G231-1
PROJECT: Proposed Warehouse
LOCATION: Riverside County (Perris), California

DRILLING DATE: 10/1/21
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Ryan Bremer

WATER DEPTH: Dry
CAVE DEPTH: 16 feet
READING TAKEN: At Completion

FIELD RESULTS					DESCRIPTION	LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
0					ALLUVIUM: Brown Silty fine to medium Sand, trace coarse Sand, trace Clay, medium dense to dense-damp							
		20					6					
		30					6					
5		14					7					
		33			OLDER ALLUVIUM: Brown Clayey fine Sand, dense-moist		8					
10												
		30			Brown SIlty fine to medium Sand, trace to little to coarse Sand, dense-moist		8					
15												
		68					8					
20					Boring Terminated at 20'							

TBL 21G231-1.GPJ SOCALGEO.GDT 10/27/21

TEST BORING LOG

PLATE B-3

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-4

JOB NO.: 21G231-1
PROJECT: Proposed Warehouse
LOCATION: Riverside County (Perris), California

DRILLING DATE: 10/1/21
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Ryan Bremer

WATER DEPTH: Dry
CAVE DEPTH: 19 feet
READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
		95/11'			FILL Light Red Brown Clayey fine to coarse Sand, very dense-damp	124	4					EI=31 @ 0-5'
		64			ALLUVIUM: Brown Silty fine to coarse Sand, trace Clay, little Calcareous veining, dense-damp	127	7					
5		57			Brown Clayey fine to coarse Sand, little to some Silt, dense-moist	120	8					
		13			Brown fine to coarse Sand, little Silt, loose-damp	108	3					
		31			OLDER ALLUVIUM: Brown Silty fine Sand, trace to little medium to coarse Sand, medium dense to dense-damp to moist	120	5					
10												
		58					10					
15												
		24					7					
20												
		24					8					
25					Boring Terminated at 25'							

TBL 21G231-1.GPJ SOCALGEO.GDT 10/27/21

TEST BORING LOG

PLATE B-4

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-5

JOB NO.: 21G231-1
PROJECT: Proposed Warehouse
LOCATION: Riverside County (Perris), California

DRILLING DATE: 10/1/21
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Ryan Bremer

WATER DEPTH: Dry
CAVE DEPTH: 25 feet
READING TAKEN: At Completion

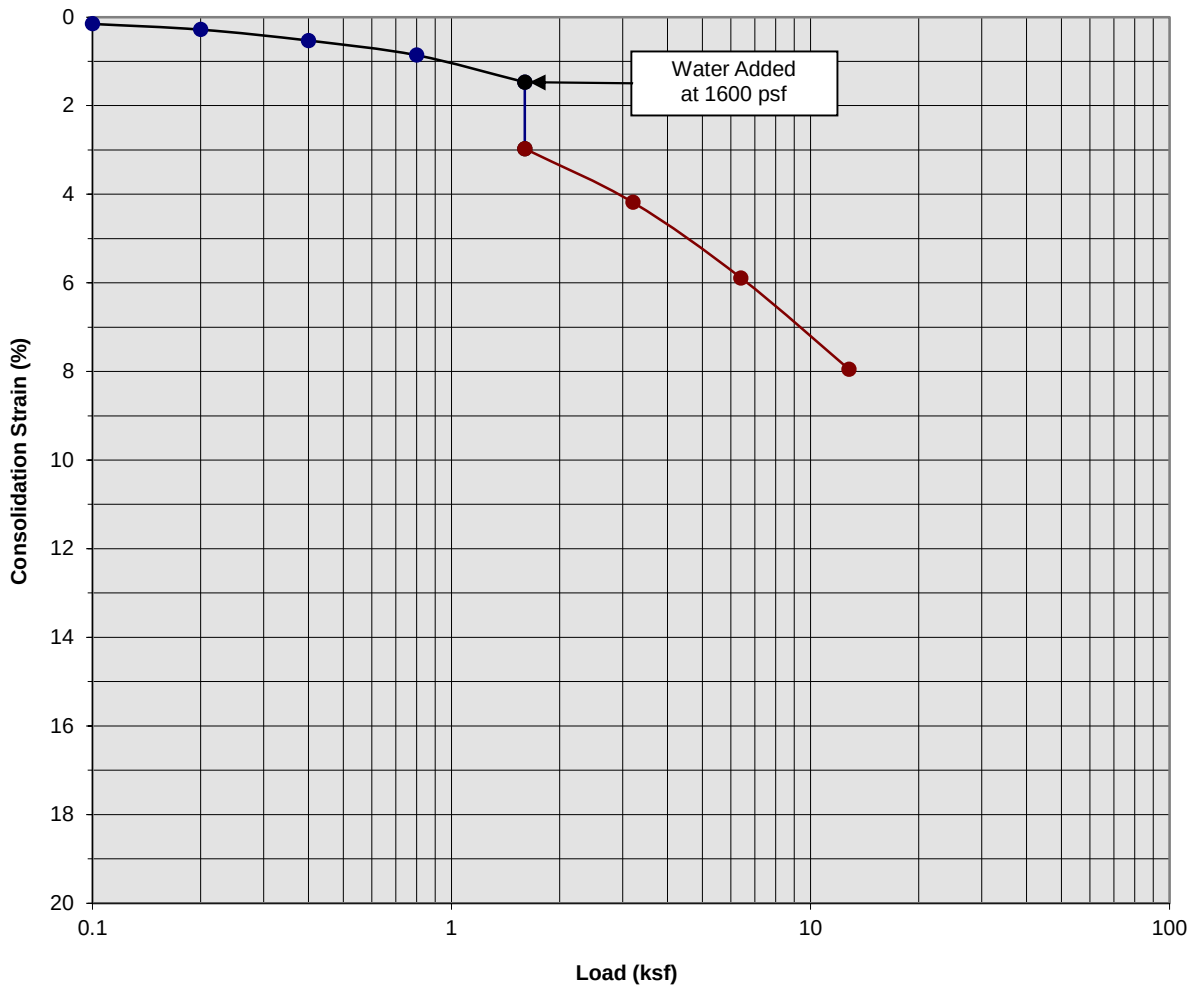
FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
		34			FILL: Brown Silty fine to medium Sand, trace coarse Sand, dense-damp		5					
		36			OLDER ALLUVIUM: Brown SIlty fine to coarse Sand, little Clay, dense-damp to moist		6					
5		31					4					
		43					7					
10												
		31					9					
15												
		36			Brown Silty fine Sand, trace medium to coarse Sand, trace Calcareous veining, dense-damp		7					
20					Boring Terminated at 20'							

TBL 21G231-1.GPJ SOCALGEO.GDT 10/27/21

TEST BORING LOG **PLATE B-5**

APPENDIX C

Consolidation/Collapse Test Results



Classification: Brown Silty fine to coarse Sand, trace Clay

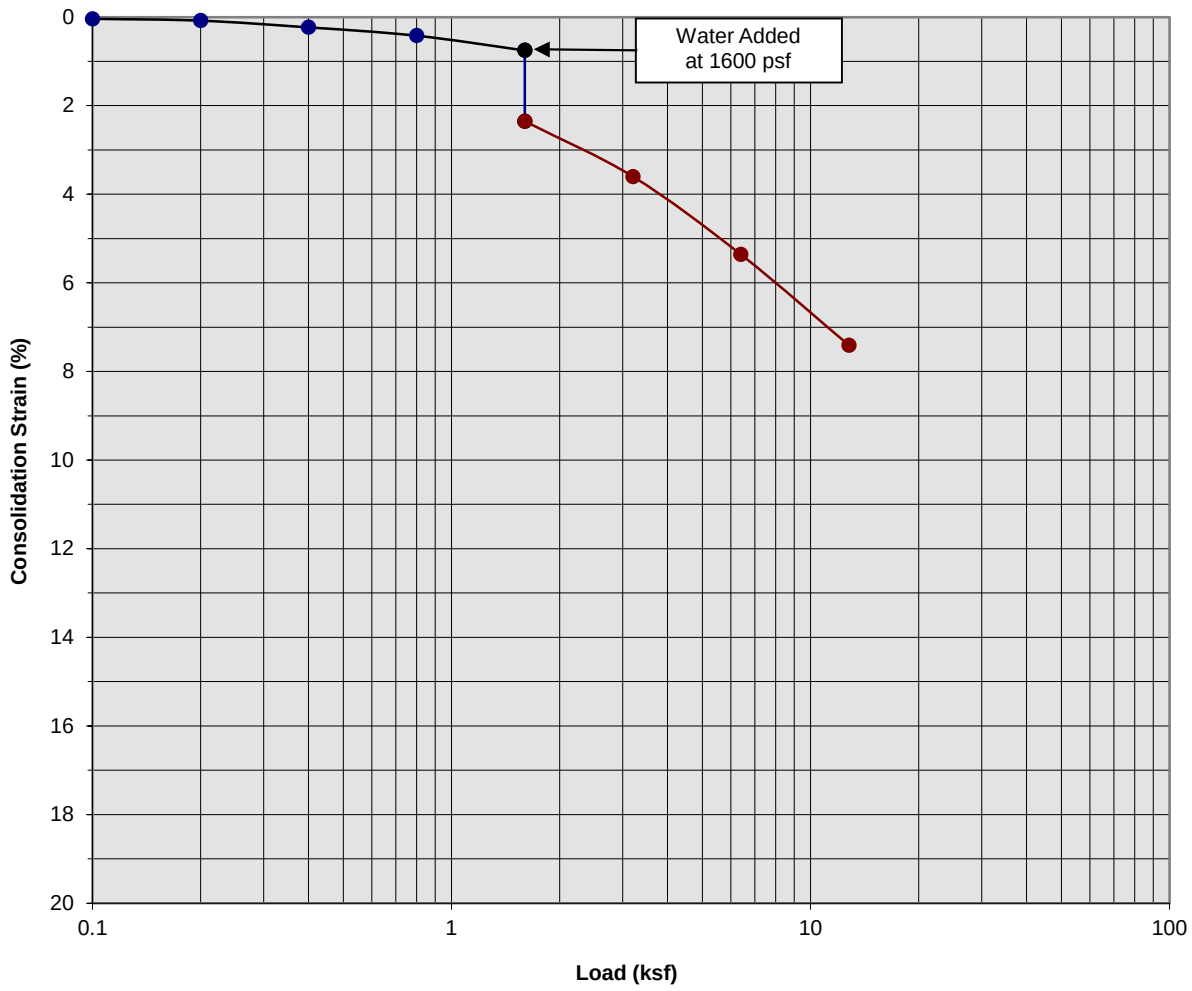
Boring Number:	B-4	Initial Moisture Content (%)	7
Sample Number:	---	Final Moisture Content (%)	12
Depth (ft)	3 to 4	Initial Dry Density (pcf)	127.0
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	137.6
Specimen Thickness (in)	1.0	Percent Collapse (%)	1.50

Proposed Warehouse
Riverside County (Perris), CA
Project No. 21G231-1

PLATE C- 1

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Consolidation/Collapse Test Results



Classification: Brown Clayey fine to coarse Sand, little to some Silt

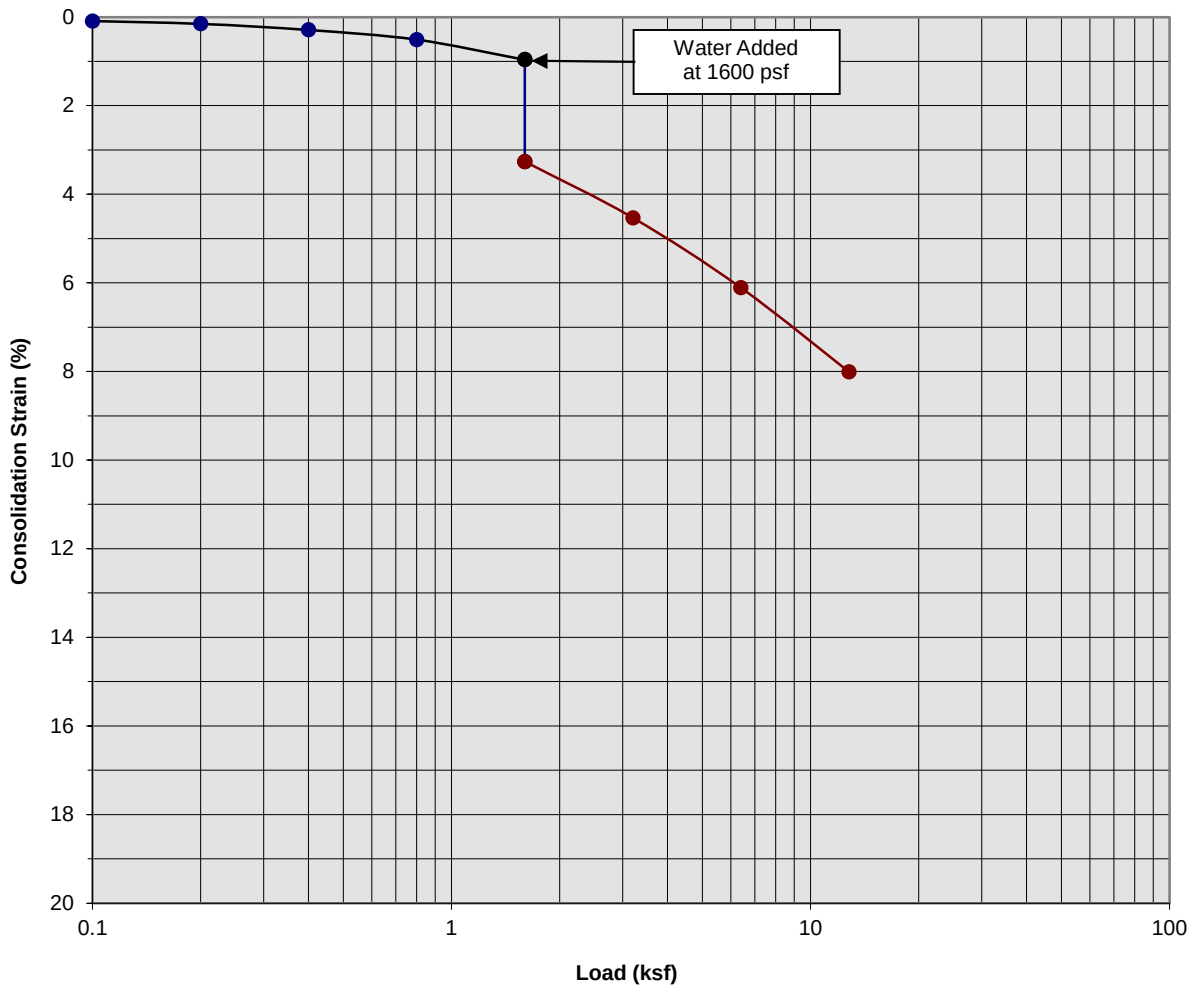
Boring Number:	B-4	Initial Moisture Content (%)	8
Sample Number:	---	Final Moisture Content (%)	14
Depth (ft)	4 to 5	Initial Dry Density (pcf)	120.0
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	129.4
Specimen Thickness (in)	1.0	Percent Collapse (%)	1.60

Proposed Warehouse
Riverside County (Perris), CA
Project No. 21G231-1

PLATE C- 2

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Consolidation/Collapse Test Results



Classification: Brown fine to coarse Sand, little Silt

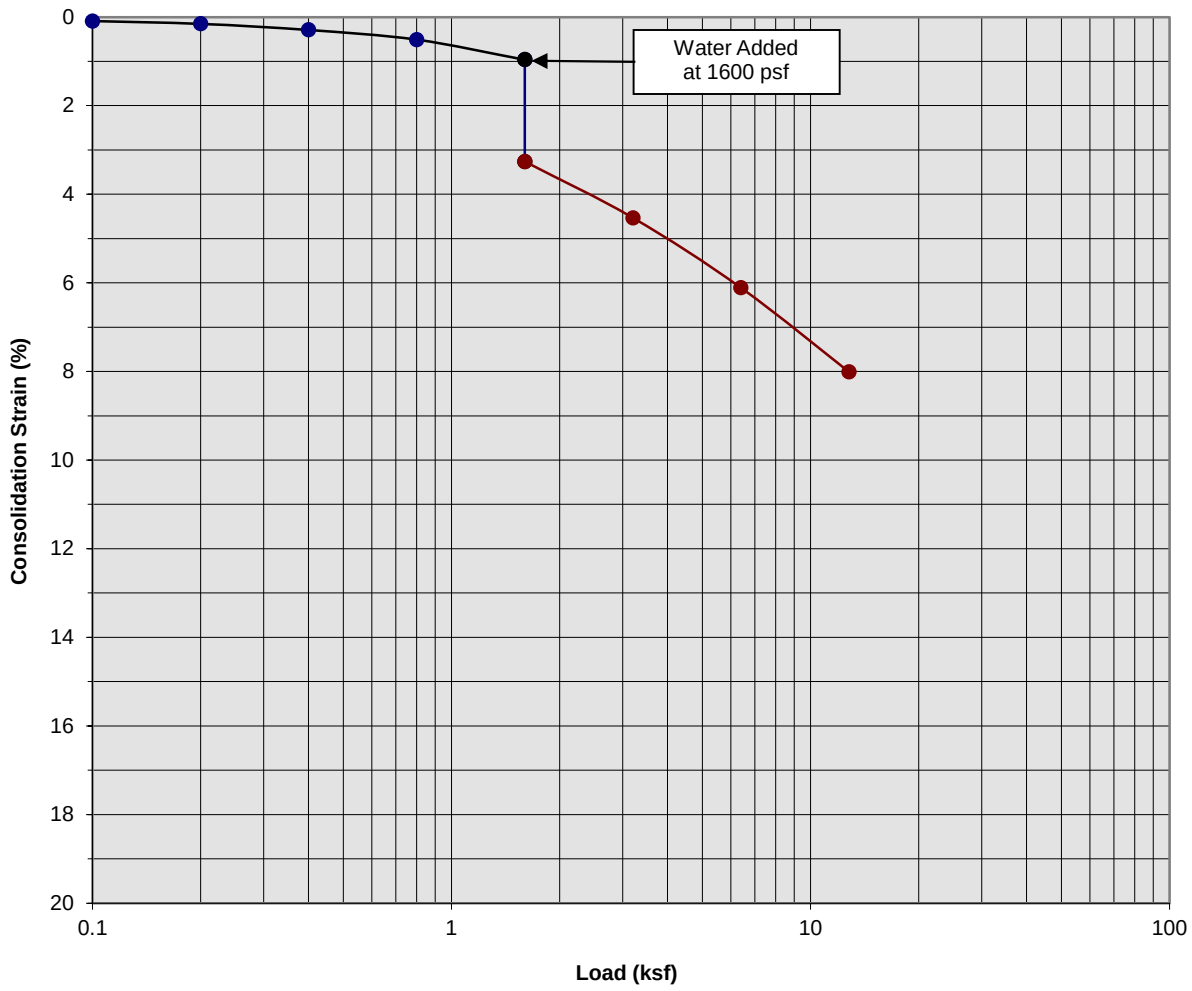
Boring Number:	B-4	Initial Moisture Content (%)	5
Sample Number:	---	Final Moisture Content (%)	16
Depth (ft)	7 to 8	Initial Dry Density (pcf)	108.0
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	117.2
Specimen Thickness (in)	1.0	Percent Collapse (%)	2.30

Proposed Warehouse
Riverside County (Perris), CA
Project No. 21G231-1

PLATE C- 3

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Consolidation/Collapse Test Results



Classification: Brown Silty fine Sand, trace to little medium to coarse Sand

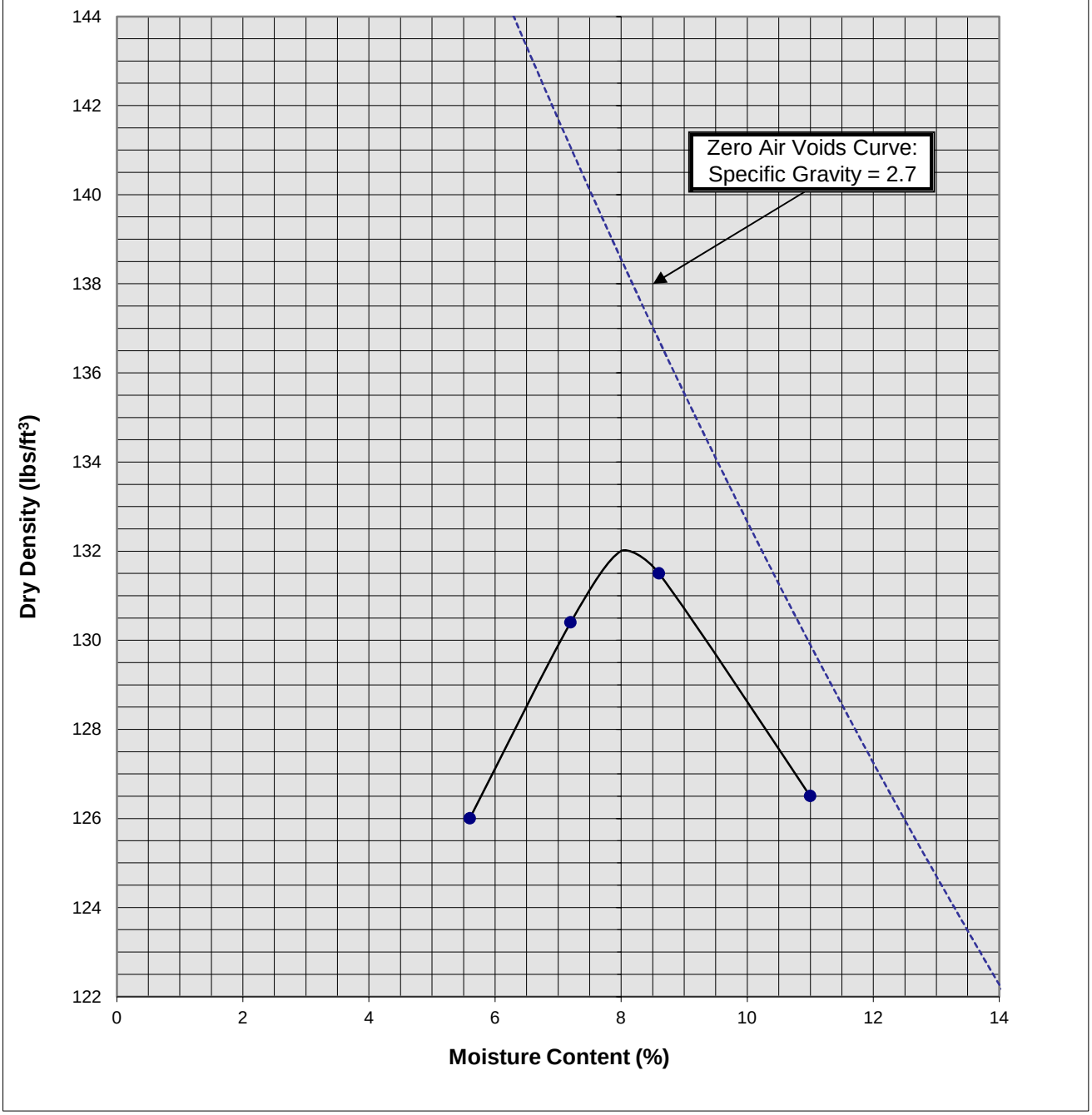
Boring Number:	B-4	Initial Moisture Content (%)	5
Sample Number:	---	Final Moisture Content (%)	16
Depth (ft)	9 to 10	Initial Dry Density (pcf)	120.0
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	129.8
Specimen Thickness (in)	1.0	Percent Collapse (%)	2.30

Proposed Warehouse
Riverside County (Perris), CA
Project No. 21G231-1

PLATE C- 4

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Moisture/Density Relationship
ASTM D-1557



Soil ID Number	B-4 @ 0-5'
Optimum Moisture (%)	8
Maximum Dry Density (pcf)	132
Soil Classification	Light Red Brown Clayey fine to coarse Sand, trace to little Silt

Proposed Warehouse
Riverside County (Perris), CA
Project No. 21G231-1

PLATE C-5

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

APPENDIX D

GRADING GUIDE SPECIFICATIONS

These grading guide specifications are intended to provide typical procedures for grading operations. They are intended to supplement the recommendations contained in the geotechnical investigation report for this project. Should the recommendations in the geotechnical investigation report conflict with the grading guide specifications, the more site specific recommendations in the geotechnical investigation report will govern.

General

- The Earthwork Contractor is responsible for the satisfactory completion of all earthwork in accordance with the plans and geotechnical reports, and in accordance with city, county, and applicable building codes.

- The Geotechnical Engineer is the representative of the Owner/Builder for the purpose of implementing the report recommendations and guidelines. These duties are not intended to relieve the Earthwork Contractor of any responsibility to perform in a workman-like manner, nor is the Geotechnical Engineer to direct the grading equipment or personnel employed by the Contractor.

- The Earthwork Contractor is required to notify the Geotechnical Engineer of the anticipated work and schedule so that testing and inspections can be provided. If necessary, work may be stopped and redone if personnel have not been scheduled in advance.

- The Earthwork Contractor is required to have suitable and sufficient equipment on the job-site to process, moisture condition, mix and compact the amount of fill being placed to the approved compaction. In addition, suitable support equipment should be available to conform with recommendations and guidelines in this report.

- Canyon cleanouts, overexcavation areas, processed ground to receive fill, key excavations, subdrains and benches should be observed by the Geotechnical Engineer prior to placement of any fill. It is the Earthwork Contractor's responsibility to notify the Geotechnical Engineer of areas that are ready for inspection.

- Excavation, filling, and subgrade preparation should be performed in a manner and sequence that will provide drainage at all times and proper control of erosion. Precipitation, springs, and seepage water encountered shall be pumped or drained to provide a suitable working surface. The Geotechnical Engineer must be informed of springs or water seepage encountered during grading or foundation construction for possible revision to the recommended construction procedures and/or installation of subdrains.

Site Preparation

- The Earthwork Contractor is responsible for all clearing, grubbing, stripping and site preparation for the project in accordance with the recommendations of the Geotechnical Engineer.

- If any materials or areas are encountered by the Earthwork Contractor which are suspected of having toxic or environmentally sensitive contamination, the Geotechnical Engineer and Owner/Builder should be notified immediately.

- Major vegetation should be stripped and disposed of off-site. This includes trees, brush, heavy grasses and any materials considered unsuitable by the Geotechnical Engineer.

- Underground structures such as basements, cesspools or septic disposal systems, mining shafts, tunnels, wells and pipelines should be removed under the inspection of the Geotechnical Engineer and recommendations provided by the Geotechnical Engineer and/or city, county or state agencies. If such structures are known or found, the Geotechnical Engineer should be notified as soon as possible so that recommendations can be formulated.

- Any topsoil, slopewash, colluvium, alluvium and rock materials which are considered unsuitable by the Geotechnical Engineer should be removed prior to fill placement.

- Remaining voids created during site clearing caused by removal of trees, foundations basements, irrigation facilities, etc., should be excavated and filled with compacted fill.

- Subsequent to clearing and removals, areas to receive fill should be scarified to a depth of 10 to 12 inches, moisture conditioned and compacted

- The moisture condition of the processed ground should be at or slightly above the optimum moisture content as determined by the Geotechnical Engineer. Depending upon field conditions, this may require air drying or watering together with mixing and/or discing.

Compacted Fills

- Soil materials imported to or excavated on the property may be utilized in the fill, provided each material has been determined to be suitable in the opinion of the Geotechnical Engineer. Unless otherwise approved by the Geotechnical Engineer, all fill materials shall be free of deleterious, organic, or frozen matter, shall contain no chemicals that may result in the material being classified as “contaminated,” and shall be very low to non-expansive with a maximum expansion index (EI) of 50. The top 12 inches of the compacted fill should have a maximum particle size of 3 inches, and all underlying compacted fill material a maximum 6-inch particle size, except as noted below.

- All soils should be evaluated and tested by the Geotechnical Engineer. Materials with high expansion potential, low strength, poor gradation or containing organic materials may require removal from the site or selective placement and/or mixing to the satisfaction of the Geotechnical Engineer.

- Rock fragments or rocks less than 6 inches in their largest dimensions, or as otherwise determined by the Geotechnical Engineer, may be used in compacted fill, provided the distribution and placement is satisfactory in the opinion of the Geotechnical Engineer.

- Rock fragments or rocks greater than 12 inches should be taken off-site or placed in accordance with recommendations and in areas designated as suitable by the Geotechnical Engineer. These materials should be placed in accordance with Plate D-8 of these Grading Guide Specifications and in accordance with the following recommendations:

    - Rocks 12 inches or more in diameter should be placed in rows at least 15 feet apart, 15 feet from the edge of the fill, and 10 feet or more below subgrade. Spaces should be left between each rock fragment to provide for placement and compaction of soil around the fragments.

    - Fill materials consisting of soil meeting the minimum moisture content requirements and free of oversize material should be placed between and over the rows of rock or

concrete. Ample water and compactive effort should be applied to the fill materials as they are placed in order that all of the voids between each of the fragments are filled and compacted to the specified density.

- Subsequent rows of rocks should be placed such that they are not directly above a row placed in the previous lift of fill. A minimum 5-foot offset between rows is recommended.

- To facilitate future trenching, oversized material should not be placed within the range of foundation excavations, future utilities or other underground construction unless specifically approved by the soil engineer and the developer/owner representative.

- Fill materials approved by the Geotechnical Engineer should be placed in areas previously prepared to receive fill and in evenly placed, near horizontal layers at about 6 to 8 inches in loose thickness, or as otherwise determined by the Geotechnical Engineer for the project.

- Each layer should be moisture conditioned to optimum moisture content, or slightly above, as directed by the Geotechnical Engineer. After proper mixing and/or drying, to evenly distribute the moisture, the layers should be compacted to at least 90 percent of the maximum dry density in compliance with ASTM D-1557-78 unless otherwise indicated.

- Density and moisture content testing should be performed by the Geotechnical Engineer at random intervals and locations as determined by the Geotechnical Engineer. These tests are intended as an aid to the Earthwork Contractor, so he can evaluate his workmanship, equipment effectiveness and site conditions. The Earthwork Contractor is responsible for compaction as required by the Geotechnical Report(s) and governmental agencies.

- Fill areas unused for a period of time may require moisture conditioning, processing and recompaction prior to the start of additional filling. The Earthwork Contractor should notify the Geotechnical Engineer of his intent so that an evaluation can be made.

- Fill placed on ground sloping at a 5-to-1 inclination (horizontal-to-vertical) or steeper should be benched into bedrock or other suitable materials, as directed by the Geotechnical Engineer. Typical details of benching are illustrated on Plates D-2, D-4, and D-5.

- Cut/fill transition lots should have the cut portion overexcavated to a depth of at least 3 feet and rebuilt with fill (see Plate D-1), as determined by the Geotechnical Engineer.

- All cut lots should be inspected by the Geotechnical Engineer for fracturing and other bedrock conditions. If necessary, the pads should be overexcavated to a depth of 3 feet and rebuilt with a uniform, more cohesive soil type to impede moisture penetration.

- Cut portions of pad areas above buttresses or stabilizations should be overexcavated to a depth of 3 feet and rebuilt with uniform, more cohesive compacted fill to impede moisture penetration.

- Non-structural fill adjacent to structural fill should typically be placed in unison to provide lateral support. Backfill along walls must be placed and compacted with care to ensure that excessive unbalanced lateral pressures do not develop. The type of fill material placed adjacent to below grade walls must be properly tested and approved by the Geotechnical Engineer with consideration of the lateral earth pressure used in the design.

Foundations

- The foundation influence zone is defined as extending one foot horizontally from the outside edge of a footing, and proceeding downward at a ½ horizontal to 1 vertical (0.5:1) inclination.

- Where overexcavation beneath a footing subgrade is necessary, it should be conducted so as to encompass the entire foundation influence zone, as described above.

- Compacted fill adjacent to exterior footings should extend at least 12 inches above foundation bearing grade. Compacted fill within the interior of structures should extend to the floor subgrade elevation.

Fill Slopes

- The placement and compaction of fill described above applies to all fill slopes. Slope compaction should be accomplished by overfilling the slope, adequately compacting the fill in even layers, including the overfilled zone and cutting the slope back to expose the compacted core

- Slope compaction may also be achieved by backrolling the slope adequately every 2 to 4 vertical feet during the filling process as well as requiring the earth moving and compaction equipment to work close to the top of the slope. Upon completion of slope construction, the slope face should be compacted with a sheepsfoot connected to a sideboom and then grid rolled. This method of slope compaction should only be used if approved by the Geotechnical Engineer.

- Sandy soils lacking in adequate cohesion may be unstable for a finished slope condition and therefore should not be placed within 15 horizontal feet of the slope face.

- All fill slopes should be keyed into bedrock or other suitable material. Fill keys should be at least 15 feet wide and inclined at 2 percent into the slope. For slopes higher than 30 feet, the fill key width should be equal to one-half the height of the slope (see Plate D-5).

- All fill keys should be cleared of loose slough material prior to geotechnical inspection and should be approved by the Geotechnical Engineer and governmental agencies prior to filling.

- The cut portion of fill over cut slopes should be made first and inspected by the Geotechnical Engineer for possible stabilization requirements. The fill portion should be adequately keyed through all surficial soils and into bedrock or suitable material. Soils should be removed from the transition zone between the cut and fill portions (see Plate D-2).

Cut Slopes

- All cut slopes should be inspected by the Geotechnical Engineer to determine the need for stabilization. The Earthwork Contractor should notify the Geotechnical Engineer when slope cutting is in progress at intervals of 10 vertical feet. Failure to notify may result in a delay in recommendations.

- Cut slopes exposing loose, cohesionless sands should be reported to the Geotechnical Engineer for possible stabilization recommendations.

- All stabilization excavations should be cleared of loose slough material prior to geotechnical inspection. Stakes should be provided by the Civil Engineer to verify the location and dimensions of the key. A typical stabilization fill detail is shown on Plate D-5.

- Stabilization key excavations should be provided with subdrains. Typical subdrain details are shown on Plates D-6.

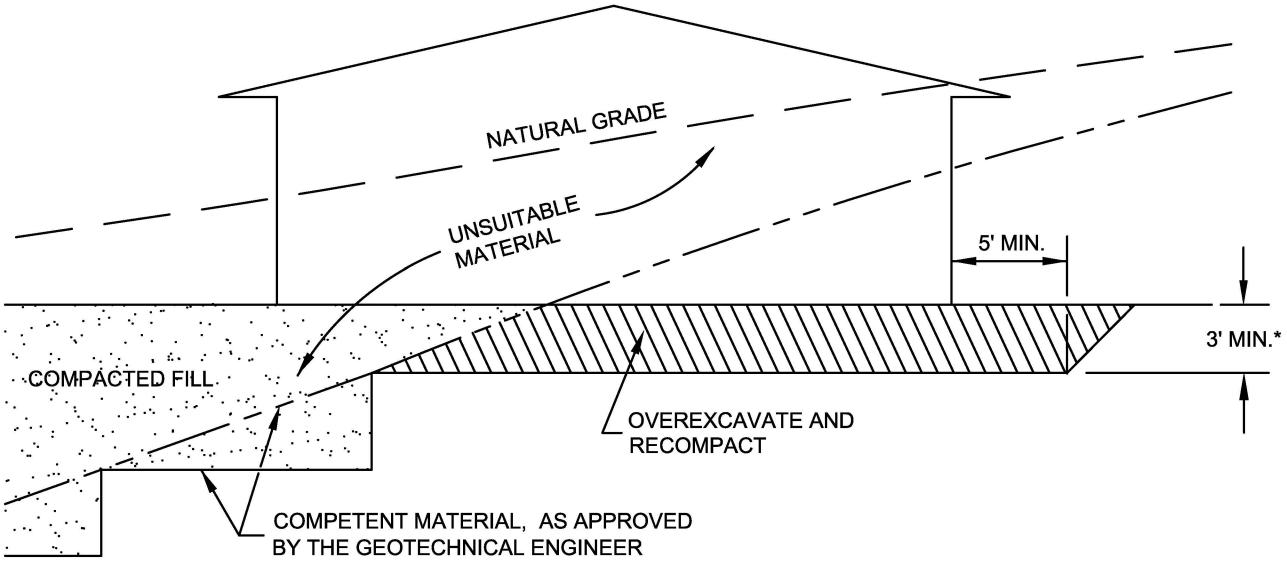
Subdrains

- Subdrains may be required in canyons and swales where fill placement is proposed. Typical subdrain details for canyons are shown on Plate D-3. Subdrains should be installed after approval of removals and before filling, as determined by the Soils Engineer.

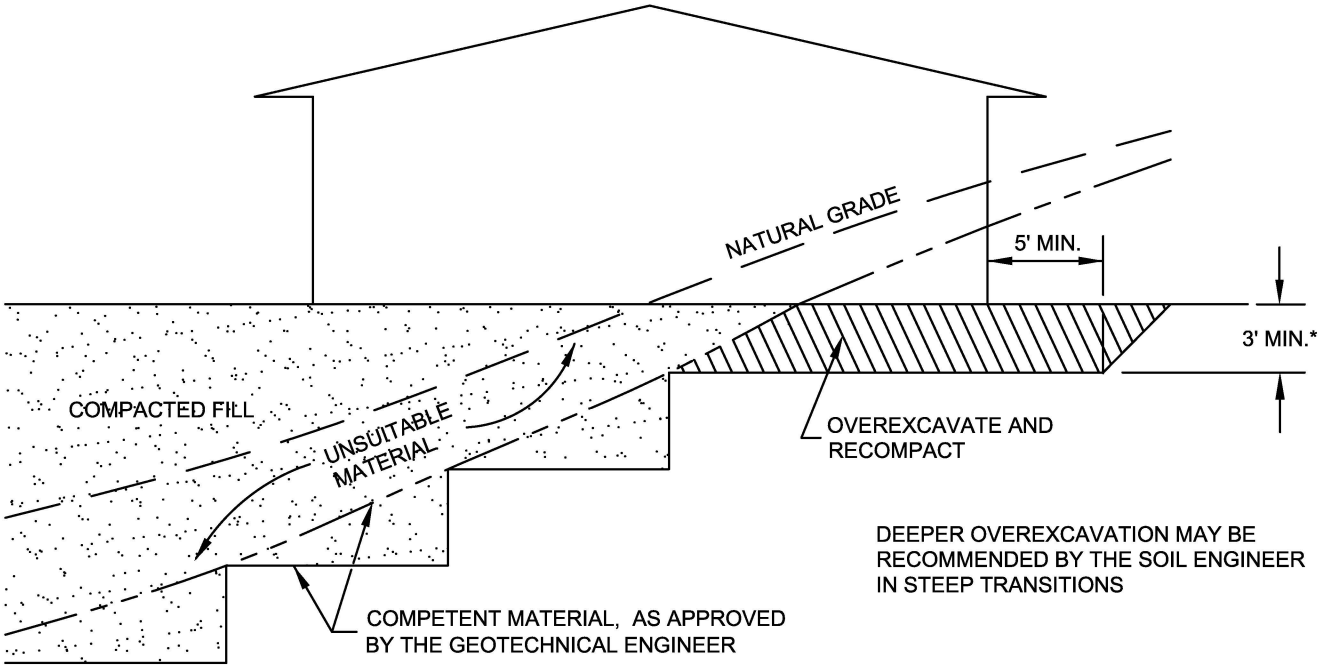
- Plastic pipe may be used for subdrains provided it is Schedule 40 or SDR 35 or equivalent. Pipe should be protected against breakage, typically by placement in a square-cut (backhoe) trench or as recommended by the manufacturer.

- Filter material for subdrains should conform to CALTRANS Specification 68-1.025 or as approved by the Geotechnical Engineer for the specific site conditions. Clean ¾-inch crushed rock may be used provided it is wrapped in an acceptable filter cloth and approved by the Geotechnical Engineer. Pipe diameters should be 6 inches for runs up to 500 feet and 8 inches for the downstream continuations of longer runs. Four-inch diameter pipe may be used in buttress and stabilization fills.

CUT LOT



CUT/FILL LOT (TRANSITION)



*SEE TEXT OF REPORT FOR SPECIFIC RECOMMENDATION. ACTUAL DEPTH OF OVEREXCAVATION MAY BE GREATER.

TRANSITION LOT DETAIL

GRADING GUIDE SPECIFICATIONS

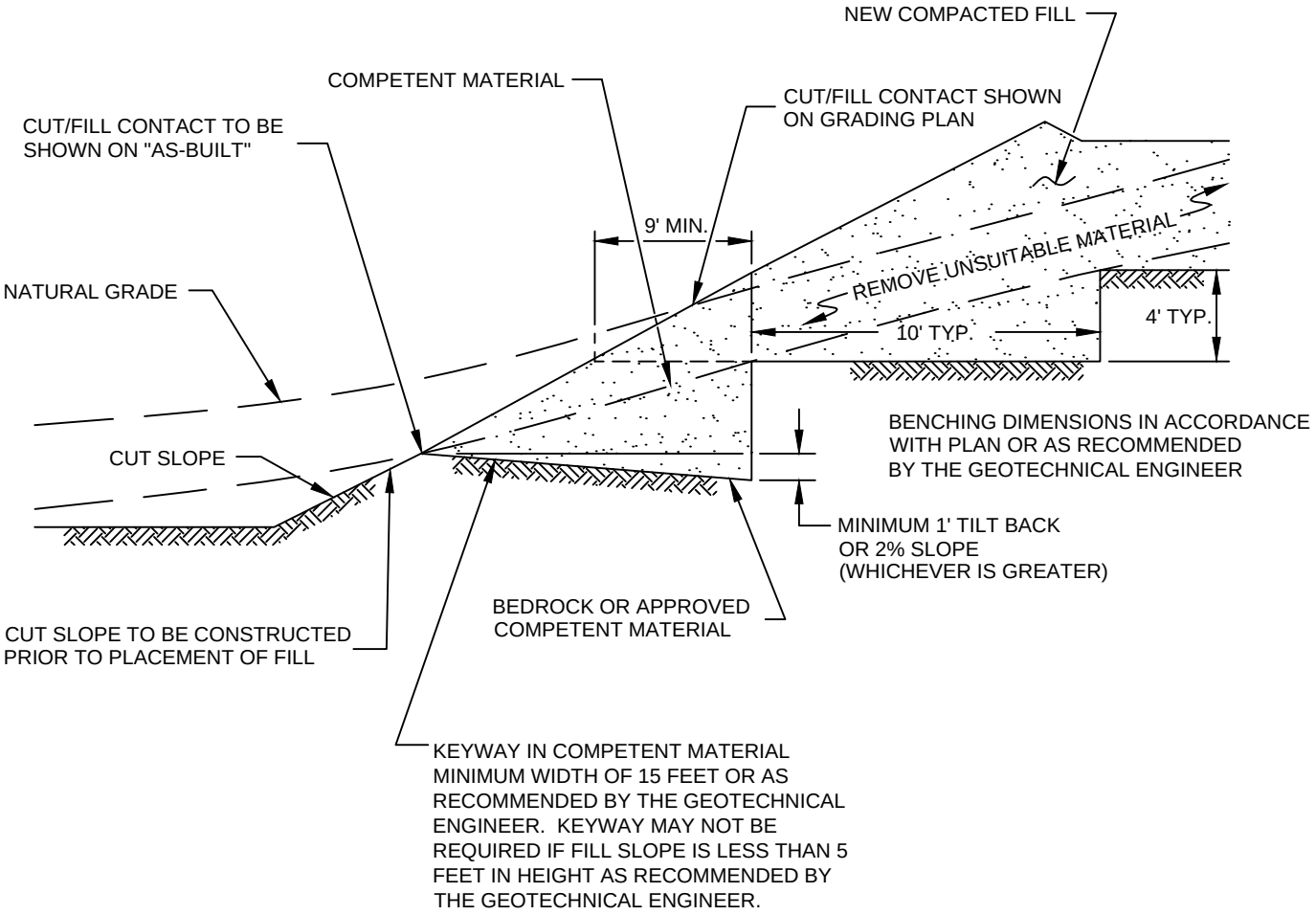
NOT TO SCALE

DRAWN: JAS
CHKD: GKM

PLATE D-1

SoCalGeo

SOUTHERN CALIFORNIA GEOTECHNICAL



FILL ABOVE CUT SLOPE DETAIL

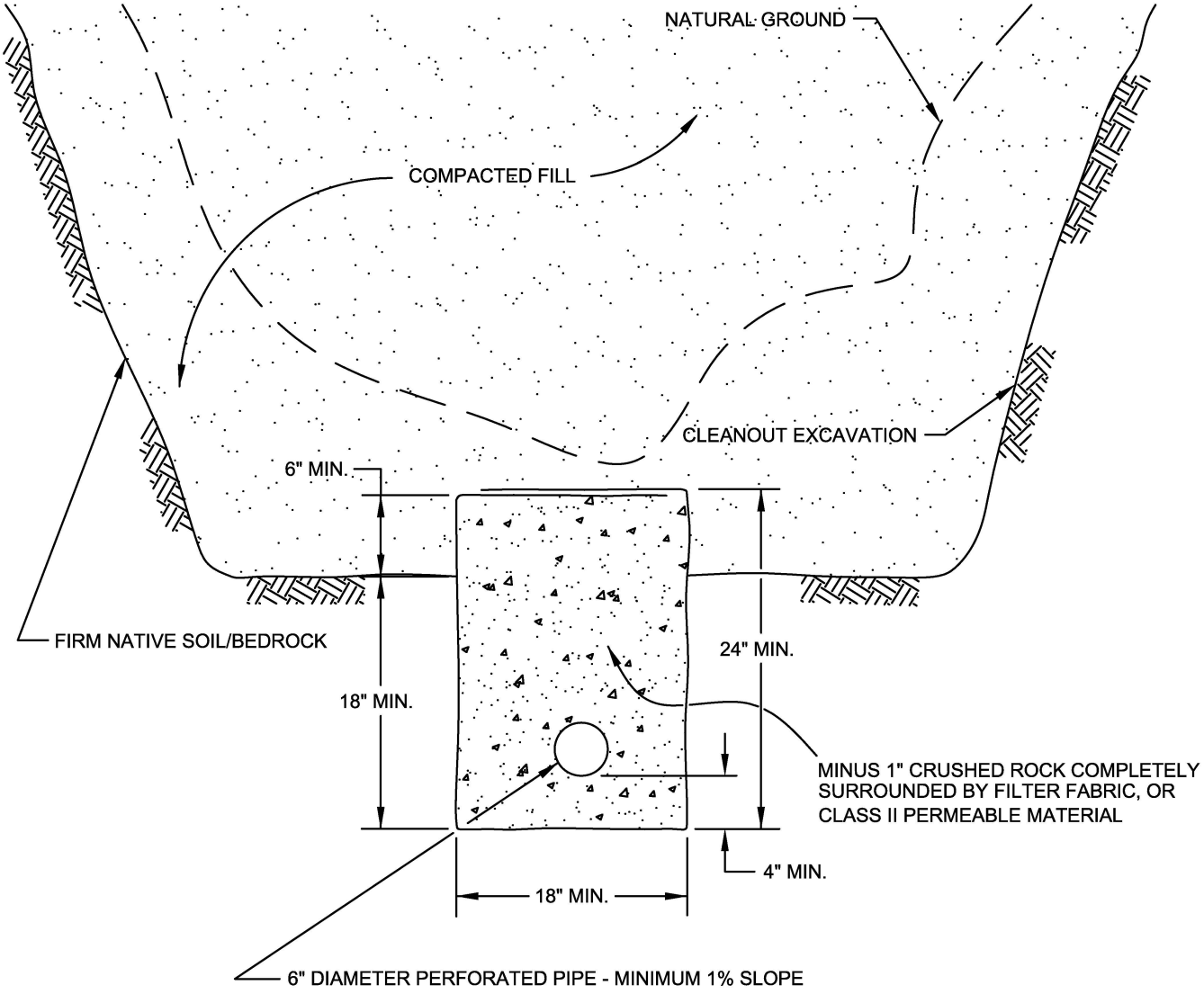
GRADING GUIDE SPECIFICATIONS

NOT TO SCALE

DRAWN: JAS
CHKD: GKM

PLATE D-2

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL



PIPE MATERIAL	DEPTH OF FILL OVER SUBDRAIN
ADS (CORRUGATED POLETHYLENE)	8
TRANSITE UNDERDRAIN	20
PVC OR ABS: SDR 35	35
SDR 21	100

SCHEMATIC ONLY
NOT TO SCALE

CANYON SUBDRAIN DETAIL

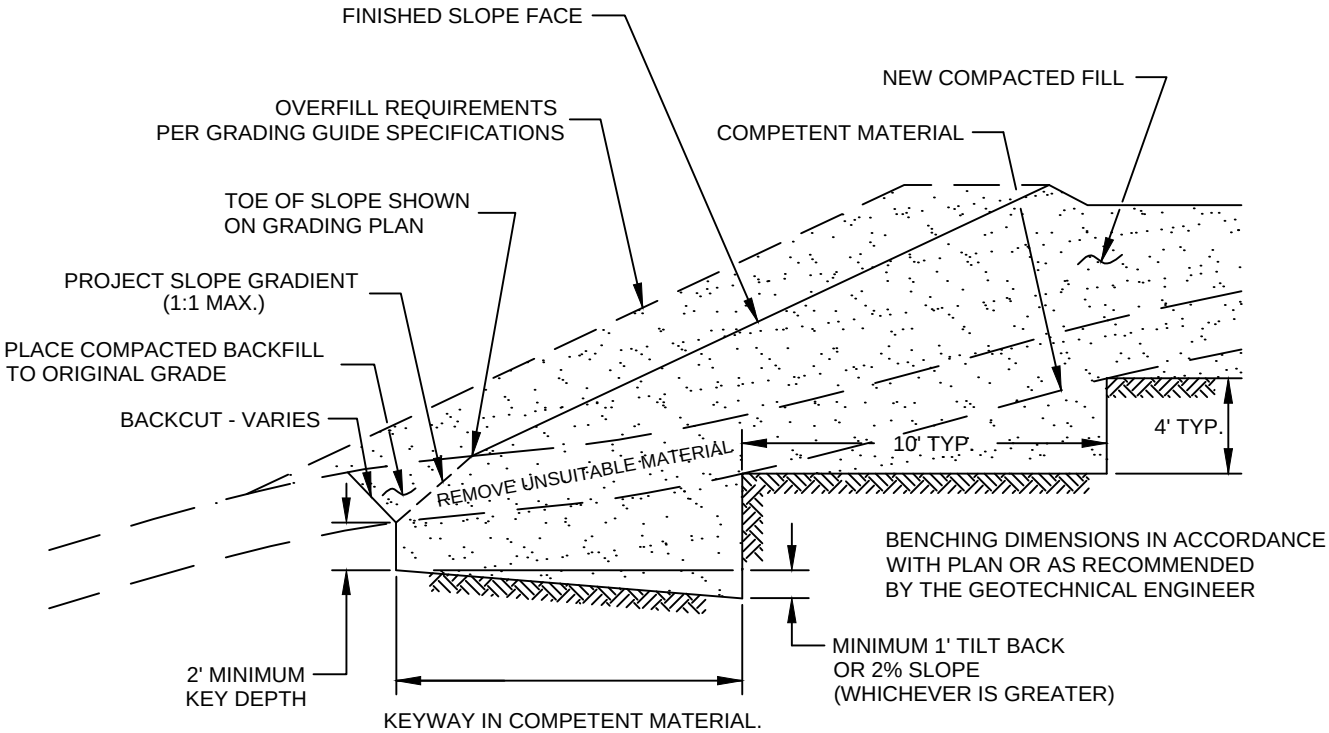
GRADING GUIDE SPECIFICATIONS

NOT TO SCALE

DRAWN: JAS
CHKD: GKM

PLATE D-3

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL



NOTE:
BENCHING SHALL BE REQUIRED WHEN NATURAL SLOPES ARE EQUAL TO OR STEEPER THAN 5:1 OR WHEN RECOMMENDED BY THE GEOTECHNICAL ENGINEER.

FILL ABOVE NATURAL SLOPE DETAIL

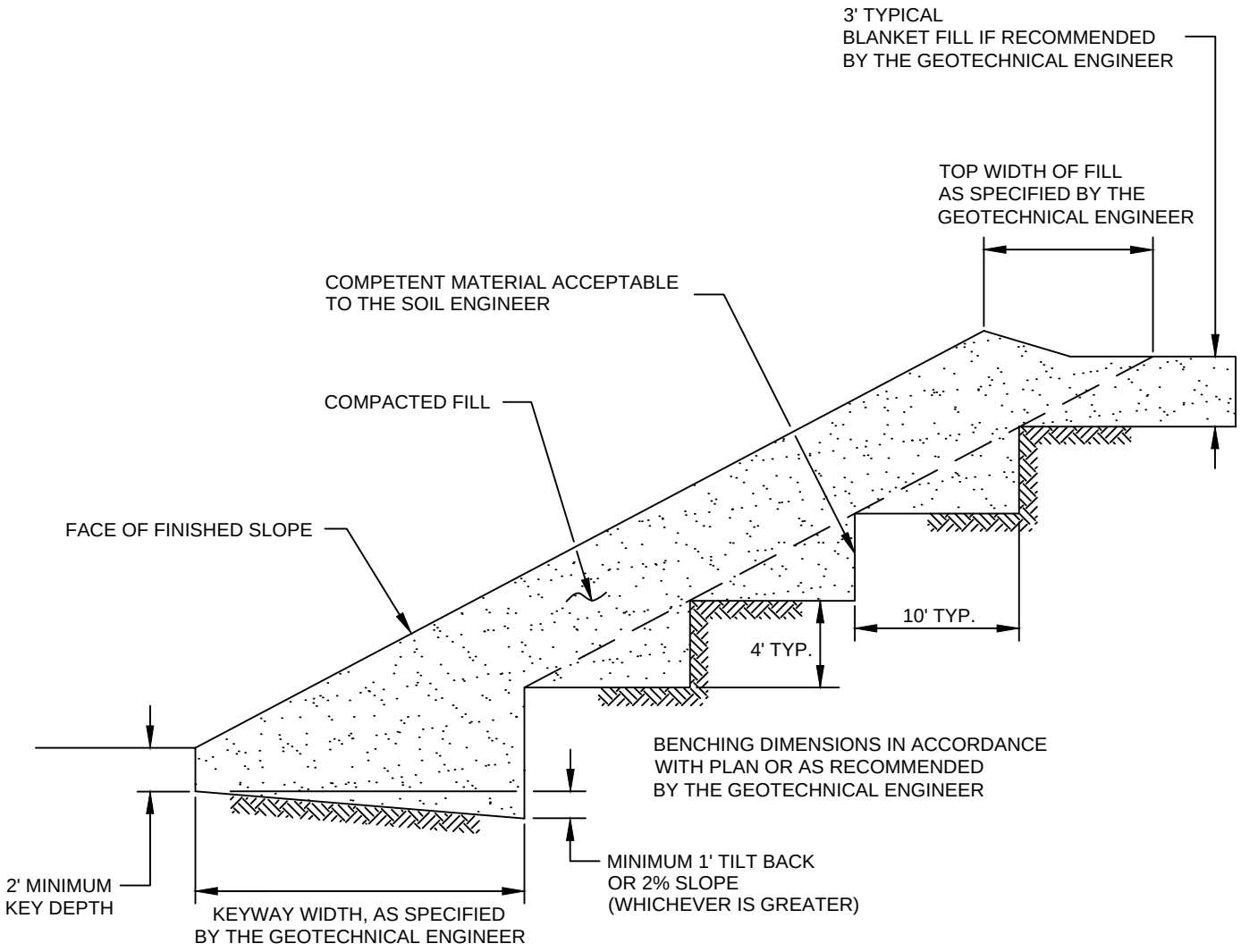
GRADING GUIDE SPECIFICATIONS

NOT TO SCALE

DRAWN: JAS
CHKD: GKM

PLATE D-4

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL



STABILIZATION FILL DETAIL

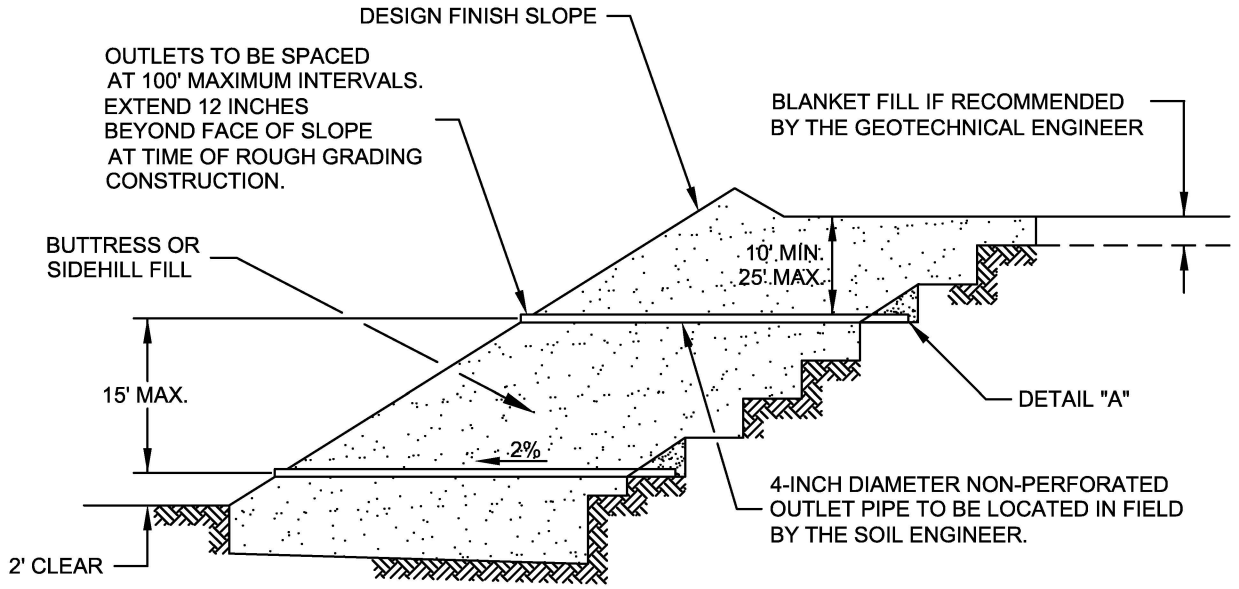
GRADING GUIDE SPECIFICATIONS

NOT TO SCALE

DRAWN: JAS
CHKD: GKM

PLATE D-5

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL



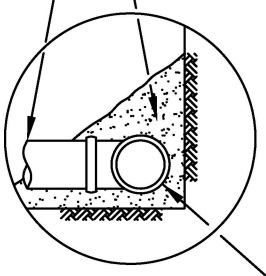
"FILTER MATERIAL" TO MEET FOLLOWING SPECIFICATION OR APPROVED EQUIVALENT: (CONFORMS TO EMA STD. PLAN 323)

SIEVE SIZE	PERCENTAGE 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

"GRAVEL" TO MEET FOLLOWING SPECIFICATION OR APPROVED EQUIVALENT:

SIEVE SIZE	MAXIMUM PERCENTAGE PASSING
1 1/2"	100
NO. 4	50
NO. 200	8

SAND EQUIVALENT = MINIMUM OF 50



DETAIL "A"

NOTES:
1. TRENCH FOR OUTLET PIPES TO BE BACKFILLED WITH ON-SITE SOIL.

SLOPE FILL SUBDRAINS

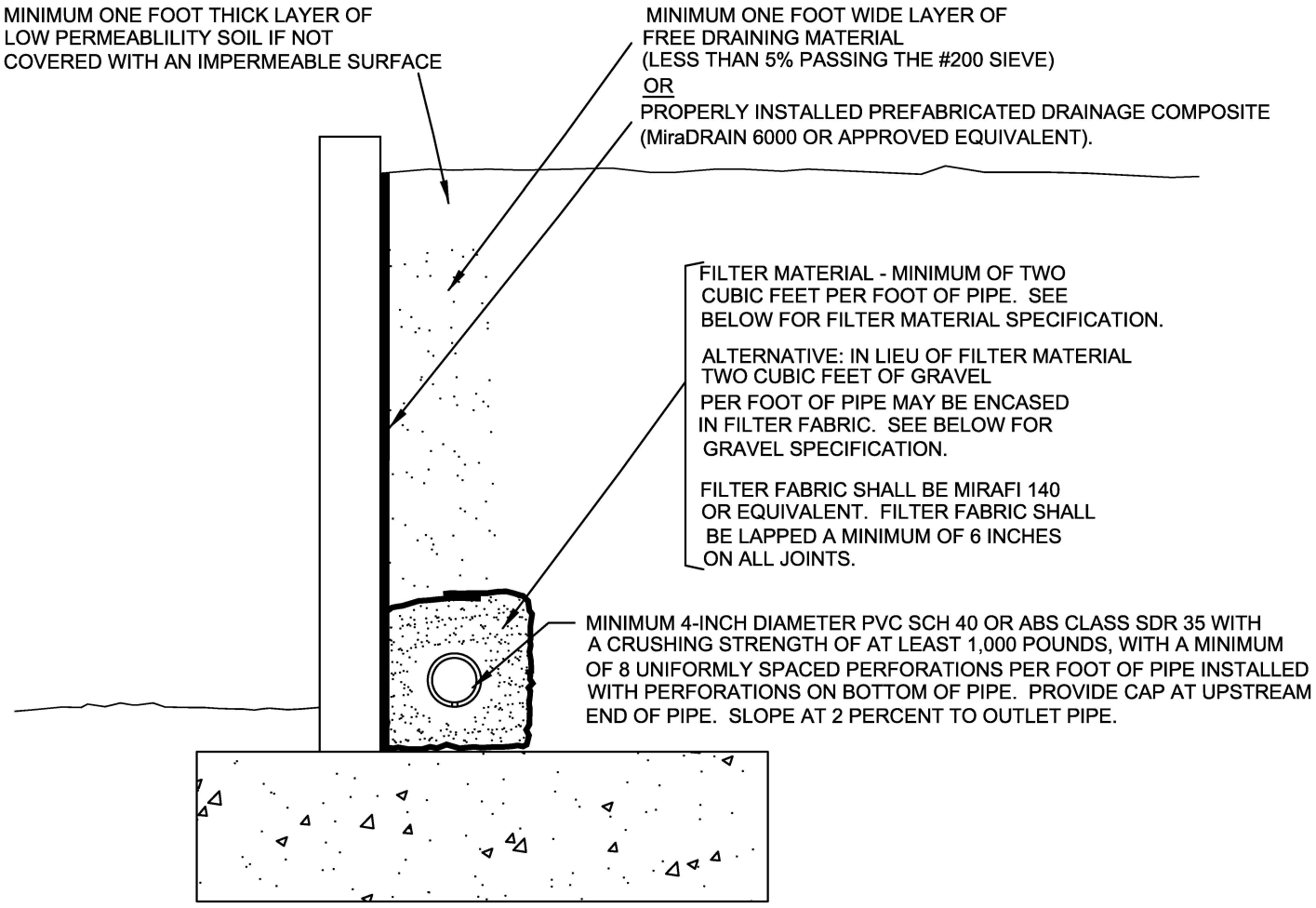
GRADING GUIDE SPECIFICATIONS

NOT TO SCALE

DRAWN: JAS
CHKD: GKM

PLATE D-6

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL



"FILTER MATERIAL" TO MEET FOLLOWING SPECIFICATION OR APPROVED EQUIVALENT: (CONFORMS TO EMA STD. PLAN 323)

SIEVE SIZE	PERCENTAGE 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

"GRAVEL" TO MEET FOLLOWING SPECIFICATION OR APPROVED EQUIVALENT:

SIEVE SIZE	MAXIMUM PERCENTAGE PASSING
1 1/2"	100
NO. 4	50
NO. 200	8

SAND EQUIVALENT = MINIMUM OF 50

RETAINING WALL BACKDRAINS

GRADING GUIDE SPECIFICATIONS

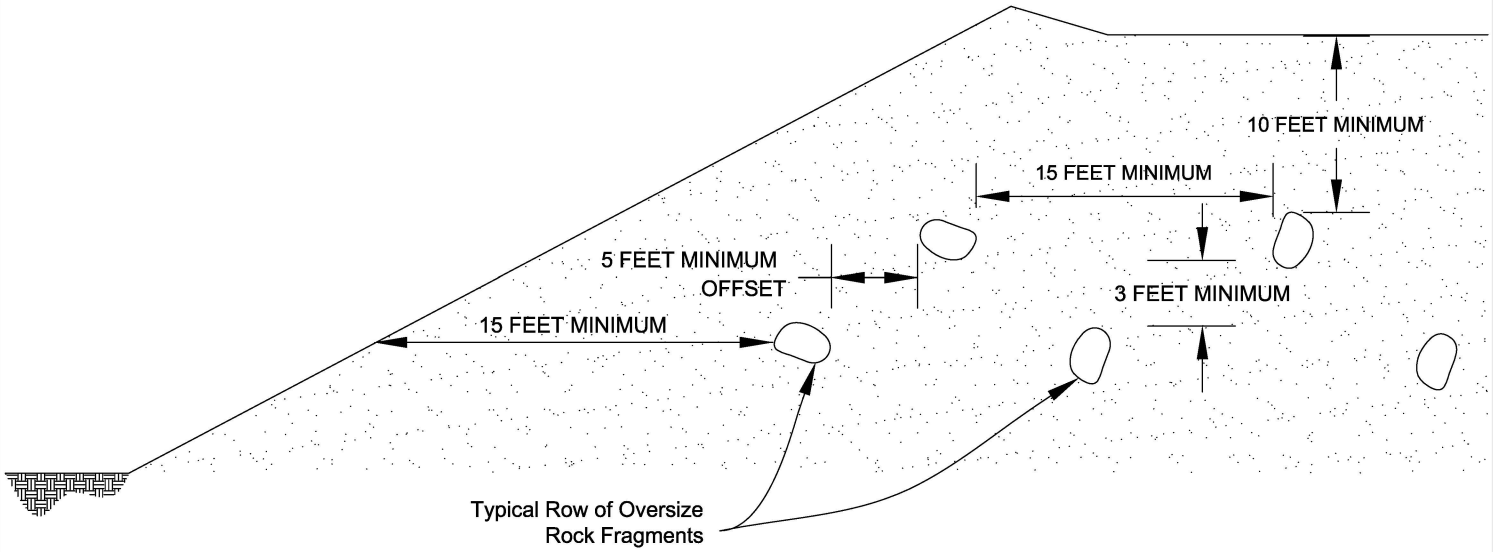
NOT TO SCALE

DRAWN: JAS
CHKD: GKM

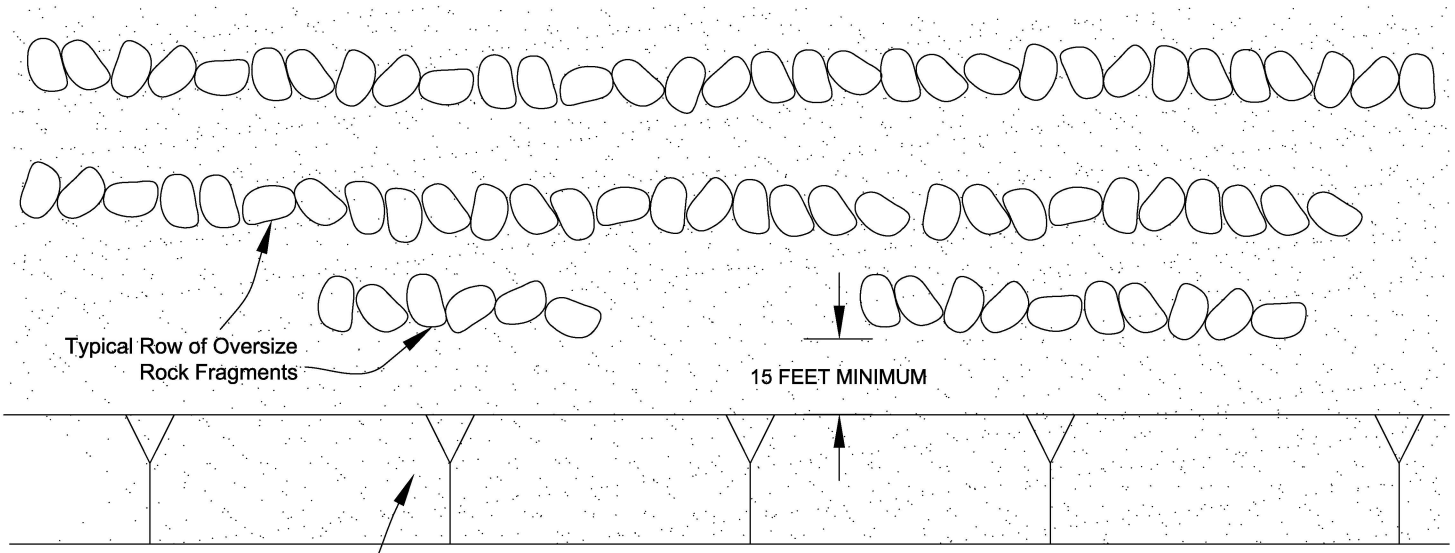
PLATE D-7

SoCalGeo

SOUTHERN CALIFORNIA GEOTECHNICAL



Section View



Plan View

PLACEMENT OF OVERSIZED MATERIAL

GRADING GUIDE SPECIFICATIONS

NOT TO SCALE

DRAWN: PM
CHKD: GKM

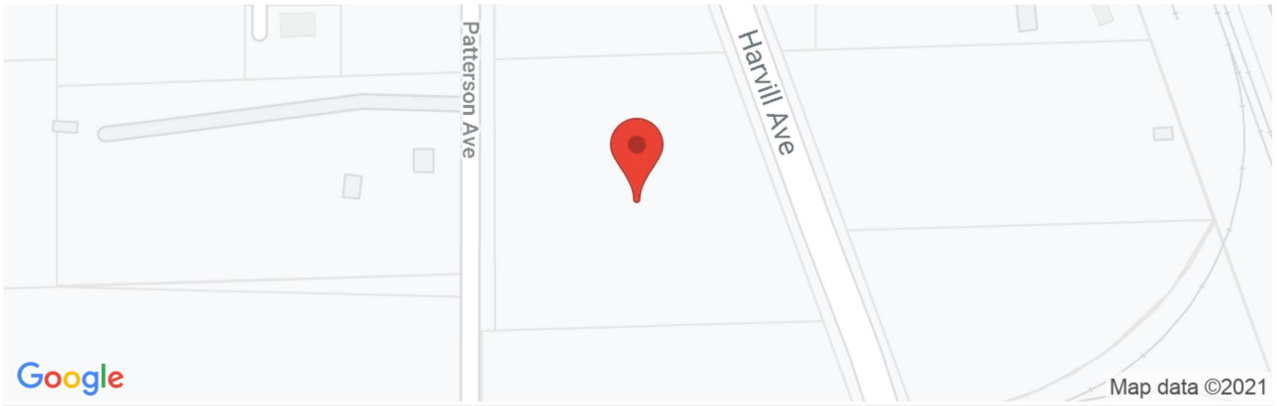
PLATE D-8

SoCalGeo

SOUTHERN CALIFORNIA GEOTECHNICAL

APPENDIX E

Latitude, Longitude: 33.83515719, -117.25178527



Date	10/14/2021, 1:45:20 PM
Design Code Reference Document	ASCE7-16
Risk Category	II
Site Class	D - Stiff Soil

Type	Value	Description
S_S	1.5	MCE_R ground motion. (for 0.2 second period)
S_1	0.558	MCE_R ground motion. (for 1.0s period)
S_{MS}	1.5	Site-modified spectral acceleration value
S_{M1}	null -See Section 11.4.8	Site-modified spectral acceleration value
S_{DS}	1	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	0.5	MCE_G peak ground acceleration
F_{PGA}	1.1	Site amplification factor at PGA
PGA_M	0.55	Site modified peak ground acceleration
T_L	8	Long-period transition period in seconds
SsRT	1.506	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	1.607	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	1.5	Factored deterministic acceleration value. (0.2 second)
S1RT	0.558	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	0.61	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	0.6	Factored deterministic acceleration value. (1.0 second)
PGAd	0.5	Factored deterministic acceleration value. (Peak Ground Acceleration)
C_{RS}	0.937	Mapped value of the risk coefficient at short periods
C_{R1}	0.916	Mapped value of the risk coefficient at a period of 1 s

SOURCE: SEAOC/OSHPD Seismic Design Maps Tool
<https://seismicmaps.org/>

SEISMIC DESIGN PARAMETERS - 2019 CBC

PROPOSED WAREHOUSE

RIVERSIDE COUNTY (PERRIS), CALIFORNIA

DRAWN: PM
CHKD: RGT

SCG PROJECT
21G231-1

PLATE E-1

SOUTHERN CALIFORNIA GEOTECHNICAL

October 29, 2021

LDC Industrial Realty, LLC
555 N. El Camino Real, Suite A456
San Clemente, California 92672

Attention: Mr. Matthew Snyder

Project No.: **21G231-2**

Subject: **Results of Infiltration Testing**
Proposed Warehouse
Patterson Avenue, South of Cajalco Road
Riverside County (Perris), California

Reference: Geotechnical Investigation, Proposed Warehouse, Patterson Avenue, South of Cajalco Road, Riverside County (Perris Area), California, prepared for LDC Industrial Realty, LLC, by Southern California Geotechnical, Inc. (SCG), SCG Project No. 21G231-1, dated October 27, 2021.

Mr. Snyder:

In accordance with your request, we have conducted infiltration testing at the subject site. We are pleased to present this report summarizing the results of the infiltration testing and our design recommendations.

Scope of Services

The scope of services performed for this project was in general accordance with our Proposal No. 21P415, dated September 16, 2021. The scope of services included site reconnaissance, subsurface exploration, field testing, and engineering analysis to determine the infiltration rates of the onsite soils. The infiltration testing was performed in general accordance with ASTM Test Method D-3385-03, Standard Test Method for Infiltration Rate of Soils in Field Using Double Ring Infiltrometer.

Site and Project Description

The site is located at the on the east side of Patterson Avenue, 610± feet south of Cajalco Road in an unincorporated portion of Riverside County near Perris, California. The site is bounded to the north by a vacant lot, to the west by Patterson Avenue, to the south by a vacant lot, and to the east by Harvill Avenue. The general location of the site is illustrated on the Site Location Map, included as Plate 1 of this report.

The site consists of a trapezoidal-shaped parcel, 4.79± acres in size. The site is presently vacant and undeveloped. The ground surface consists of exposed soils which appear to have been recently disced or tilled and stripped of any vegetation.

Detailed topographic information was not available at the time of this report. Based on our visual observations and topographic information obtained from Google Earth, the site

topography appears to slope gently downward to the east at a gradient of approximately 1 percent.

Proposed Development

Based on the conceptual site plan (Scheme 1, dated September 1, 2021) prepared by HPA Architecture, the site will be developed with a new warehouse. The building will be 112,520± ft^2 in size, located in the central region of the property. Dock-high doors will be constructed along a portion of the southern building wall. The building is expected to be surrounded by asphaltic concrete in the automobile parking and driving lanes, with Portland cement concrete pavements in the truck court area, with limited areas of concrete flatwork and landscape planters.

The proposed development will include on-site storm water infiltration. Based on conversations with the project civil engineer, we understand that the infiltration system will consist of three below-grade chamber systems. One of the below-grade chamber systems will be located in the southern area of the site, the second chamber will be located in the southeastern area of the site, and the third chamber will be located in the northeastern area of the site. The bottom of the infiltration systems will range from 10 to 12± feet below the existing site grades.

Concurrent Study

SCG concurrently conducted a geotechnical investigation at the subject site, which is referenced above. As part of this study, five (5) borings were advanced to depths of 20 to 25± feet below existing site grades. With the exception of Boring No. B-3, artificial fill soils were encountered at the ground surface at all of the boring locations, extending to depths of 2½ to 4½± feet below the existing site grades. The artificial fill soils consist of medium dense to very dense silty and clayey fine to coarse sands. These materials possess varying densities and a disturbed appearance (with some lamination), resulting in their classification as artificial fill. Native younger alluvium was encountered at the ground surface at Boring No. B-3, and beneath the artificial fill soils at Boring Nos. B-2 and B-4, extending to depths of 8 to 20± feet below the existing site grades. Boring No. B-2 was terminated within the younger alluvium at a depth of 20± feet. The younger alluvium generally consists of loose to dense silty sands and clayey sands. The younger alluvium possesses minor amounts of calcareous deposits. With the exception of Boring No. B-2, older native alluvial soils were encountered beneath the artificial fill or beneath the younger alluvium at all of the boring locations, extending to at least the maximum depth explored of 25± feet below ground surface. The older alluvium generally consists of medium dense to dense silty fine sands, clayey fine sands, and fine sandy silts with varying medium to coarse sand.

Groundwater

Free water was not encountered during any of our subsurface explorations. Based on the lack of any water within the borings and the moisture contents of the recovered soil samples, the static groundwater table is considered to have existed at a depth in excess of 25± feet at the time of the subsurface exploration.

As part of our research, we reviewed available groundwater data in order to determine the historic high groundwater level for the site. The primary reference used to determine the

groundwater depths in this area is the California Department of Water Resources website, http://www.water.ca.gov/waterdatalibrary/. One of the monitoring wells observed in the vicinity of the site is located 1.4 miles east of the subject site. Water level readings within this monitoring well indicates a high groundwater level of 79± feet below the ground surface in February 2015.

Subsurface Exploration

Scope of Exploration

The subsurface exploration for the infiltration testing consisted of four (4) backhoe-excavated trenches, extending to a depth of 10± feet below existing site grades. The trenches were logged during excavation by a member of our staff. The approximate locations of the infiltration trenches (identified as I-1 through I-4) are indicated on the Infiltration Test Location Plan, enclosed as Plate 2 of this report.

Geotechnical Conditions

Artificial fill soils were encountered at the ground surface of all the trench locations, extending 2½ to 3½± feet below existing site grades. The artificial fill soils consist of medium dense to very dense silty and clayey fine to coarse sands. These materials possess varying densities and a disturbed appearance (with some lamination), resulting in their classification as artificial fill. Native alluvium was encountered beneath the artificial fill at two out of the four infiltration testing locations, extending to at least the maximum explored depth of 10± feet below existing site grades. The younger alluvium generally consists of dense silty sands with varying amounts of clays. With the exception of Trench Nos. B-3 and B-4, older native alluvial soils were encountered beneath the artificial fill or beneath the younger alluvium at all of the boring locations, extending to at least the maximum depth explored of 10± feet below ground surface. The older alluvium generally consists of dense to very dense silty fine sands, with varying medium to coarse sand. The Trench Logs, which illustrate the conditions encountered at the infiltration test locations, are presented in this report.

Infiltration Testing

We understand that the results of the testing will be used to prepare a preliminary design for the storm water infiltration system that will be used at the subject site. As previously mentioned, the infiltration testing was performed in general accordance with ASTM Test Method D-3385-03, Standard Test Method for Infiltration Rate of Soils in Field Using Double Ring Infiltrometer.

Two stainless steel infiltration rings were used for the infiltration testing. The outer infiltration ring is 2 feet in diameter and 20 inches in height. The inner infiltration ring is 1 foot in diameter and 20 inches in height. At the test locations, the outer ring was driven 3± inches into the soil at the base of each trench. The inner ring was centered inside the outer ring and subsequently driven 3± inches into the soil at the base of the trench. The rings were driven into the soil using a ten-pound sledge hammer. The soil surrounding the wall of the infiltration rings was only slightly disturbed during the driving process.

Infiltration Testing Procedure

Infiltration testing was performed at both of the trench locations. The infiltration testing consisted of filling the inner ring and the annular space (the space between the inner and outer rings) with water, approximately 3 to 4 inches above the soil. To prevent the flow of water from one ring to the other, the water level in both the inner ring and the annular space between the rings was maintained using constant-head float valves. The volume of water that was added to maintain a constant head in the inner ring and the annular space during each time interval was determined and recorded. A cap was placed over the rings to minimize the evaporation of water during the tests.

The schedule for readings was determined based on the observed soil type at the base of each backhoe-excavated trench. Based on the existing soils at the trench locations, the volumetric measurements were made at 20 and 30-minute increments. The water volume measurements are presented on the spreadsheets enclosed with this report. The infiltration rates for each of the timed intervals are also tabulated on these spreadsheets.

The infiltration rates for the infiltration tests are calculated in centimeters per hour and then converted to inches per hour. The rates are summarized below:

Infiltration Test No.	Depth (feet)	Soil Description	Infiltration Rate (inches/hour)
I-1	10	Brown to Dark Brown Silty fine to coarse Sand, trace Clay	0.0
I-2	10	Brown fine to coarse Sand, trace Silt, little Clay	1.0
I-3	10	Brown Silty fine to coarse Sand, trace Clay	1.0
I-4	10	Brown Silty fine to coarse Sand, trace Clay	0.0

Design Recommendations

Four (4) infiltration tests were performed at the subject site. As note above, the calculated infiltration rates at the infiltration test locations range from 0 to 1.0 inch per hour. The major factors affecting the lack of infiltration at these locations is the presence of dense to very dense older alluvium. **Based on the lack of infiltration at the depths tested, infiltration is not considered feasible for this site. Although an infiltration rate of 1.0 inch per hour was calculated, these areas are very likely to be underlain by much less permeable, denser older alluvium, which was encountered at the other boring and trench locations.**

Although infiltration is not considered feasible at the site, the client may desire to use storm water disposal systems that do not rely on infiltration at this site. The design of storm water disposal systems should be performed by the project civil engineer, in accordance with the City of Perris and/or County of Riverside guidelines. It is recommended any such systems be designed and constructed to facilitate removal of silt and clay, or other deleterious materials from any water that may enter the system. The presence of such materials would decrease the flow rates through the system. It should be noted that the recommended infiltration rates are

based on infiltration testing at four (4) discrete locations and that the overall infiltration rates of the proposed infiltration systems could vary considerably.

Location of Infiltration Systems

The use of on-site storm water infiltration systems carries a risk of creating adverse geotechnical conditions. Increasing the moisture content of the soil can cause the soil to lose internal shear strength and increase its compressibility, resulting in a change in the designed engineering properties. Overlying structures and pavements in the infiltration area could potentially be damaged due to saturation of the subgrade soils. **The proposed infiltration systems for this site should be located at least 25 feet away from any structures, including retaining walls.** Even with this provision of locating the infiltration system at least 25 feet from the building(s), it is possible that infiltrating water into the subsurface soils could have an adverse effect on the proposed or existing structures. It should also be noted that utility trenches which happen to collect storm water can also serve as conduits to transmit storm water toward the structure, depending on the slope of the utility trench. Therefore, consideration should also be given to the proposed locations of underground utilities which may pass near the proposed infiltration system.

The infiltration system designer should also give special consideration to the effect that the proposed infiltration systems may have on nearby subterranean structures, open excavations, or descending slopes. In particular, infiltration systems should not be located near the crest of descending slopes, particularly where the slopes are comprised of granular soils. Such systems will require specialized design and analysis to evaluate the potential for slope instability, piping failures and other phenomena that typically apply to earthen dam design. This type of analysis is beyond the scope of this infiltration test report, but these factors should be considered by the infiltration system designer when locating the infiltration systems.

General Comments

This report has been prepared as an instrument of service for use by the client in order to aid in the evaluation of this property and to assist the architects and engineers in the design and preparation of the project plans and specifications. This report may be provided to the contractor(s) and other design consultants to disclose information relative to the project. However, this report is not intended to be utilized as a specification in and of itself, without appropriate interpretation by the project architect, structural engineer, and/or civil engineer. The design of the proposed storm water infiltration system is the responsibility of the civil engineer. The role of the geotechnical engineer is limited to determination of infiltration rate only. By using the design infiltration rate contained herein, the civil engineer agrees to indemnify, defend, and hold harmless the geotechnical engineer for all aspects of the design and performance of the proposed storm water infiltration system. The reproduction and distribution of this report must be authorized by the client and Southern California Geotechnical, Inc. Furthermore, any reliance on this report by an unauthorized third party is at such party's sole risk, and we accept no responsibility for damage or loss which may occur.

The analysis of this site was based on a subsurface profile interpolated from limited discrete soil samples. While the materials encountered in the project area are considered to be

representative of the total area, some variations should be expected between boring locations and testing depths. If the conditions encountered during construction vary significantly from those detailed herein, we should be contacted immediately to determine if the conditions alter the recommendations contained herein.

This report has been based on assumed or provided characteristics of the proposed development. It is recommended that the owner, client, architect, structural engineer, and civil engineer carefully review these assumptions to ensure that they are consistent with the characteristics of the proposed development. If discrepancies exist, they should be brought to our attention to verify that they do not affect the conclusions and recommendations contained herein. We also recommend that the project plans and specifications be submitted to our office for review to verify that our recommendations have been correctly interpreted. The analysis, conclusions, and recommendations contained within this report have been promulgated in accordance with generally accepted professional geotechnical engineering practice. No other warranty is implied or expressed.

Closure

We sincerely appreciate the opportunity to be of service on this project. We look forward to providing additional consulting services during the course of the project. If we may be of further assistance in any manner, please contact our office.

Respectfully Submitted,

SOUTHERN CALIFORNIA GEOTECHNICAL, INC.

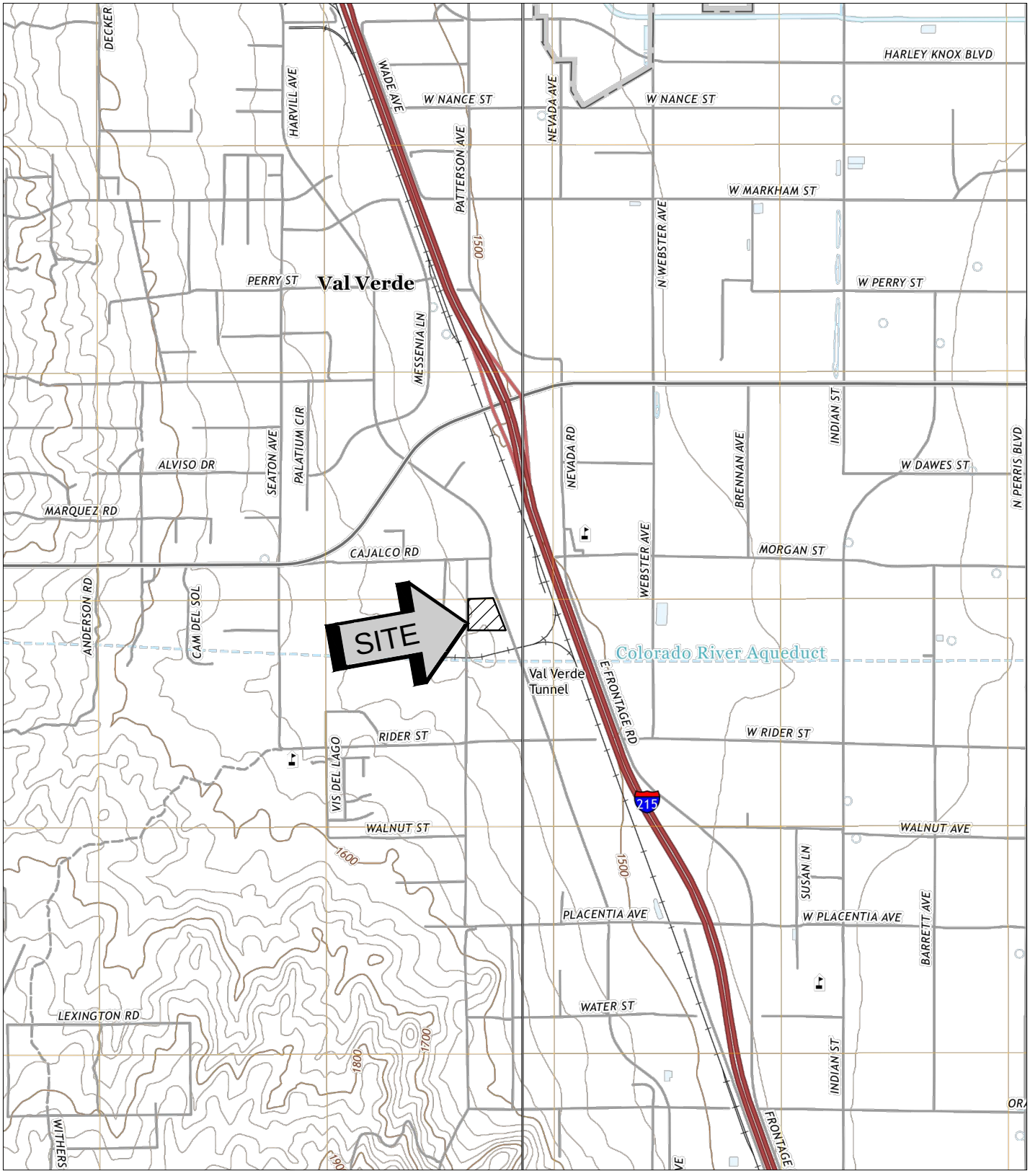
Oscar Sandoval
Staff Engineer

Robert G. Trazo, GE 2655
Principal Engineer



Distribution: (1) Addressee

Enclosures: Plate 1 - Site Location Map
Plate 2: Infiltration Test Location Plan
Trench Log Legend and Logs (6 pages)
Infiltration Test Results Spreadsheets (4 pages)
Grainsize Distribution Graphs (4 pages)



SOURCE: USGS TOPOGRAPHIC MAP OF STEELE PEAK AND PERRIS QUADRANGLES, RIVERSIDE COUNTY, CALIFORNIA, 2018.

SITE LOCATION MAP

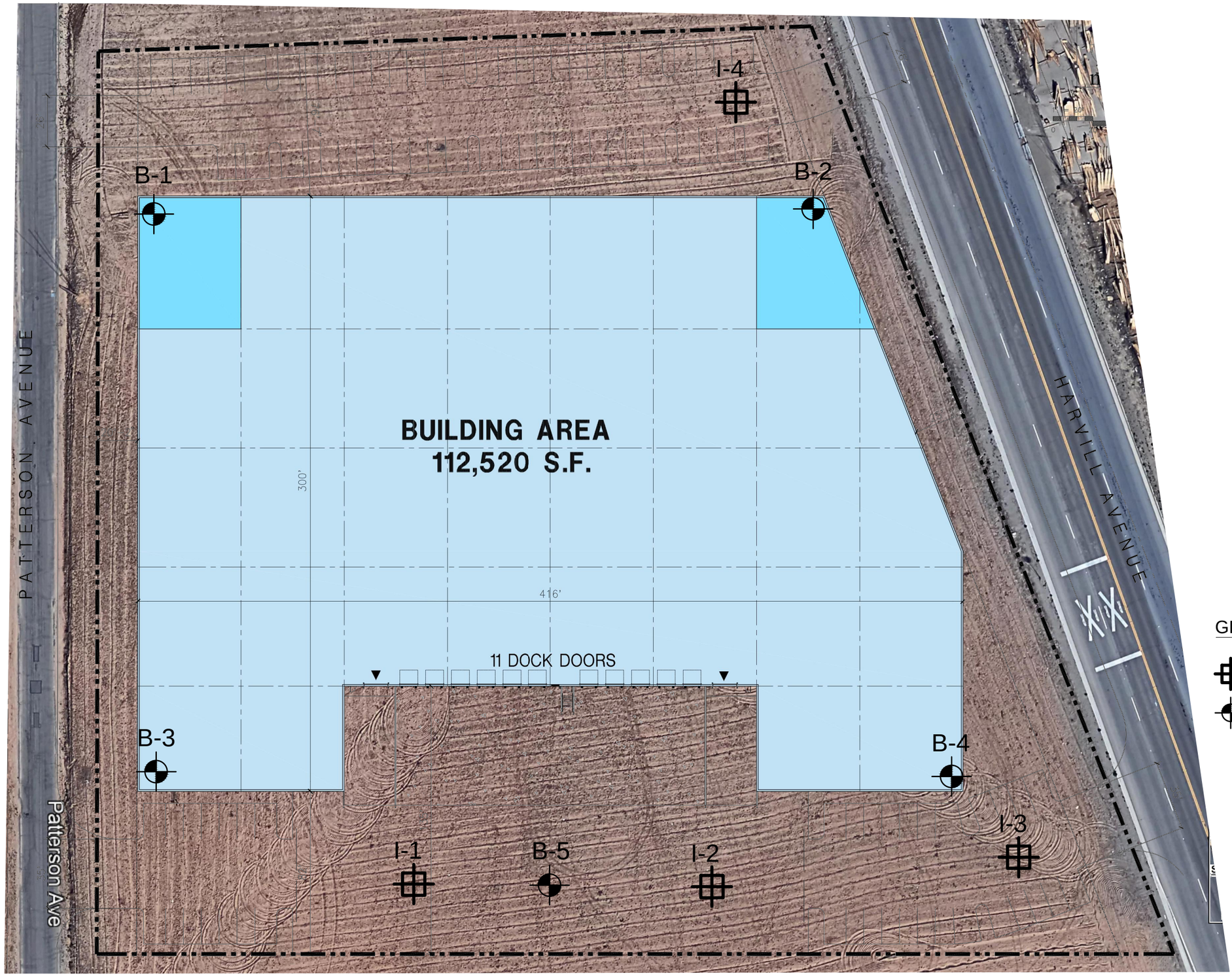
PROPOSED WAREHOUSE

RIVERSIDE COUNTY (PERRIS), CALIFORNIA

SCALE: 1" = 2000'	
DRAWN: PM CHKD: RGT	
SCG PROJECT 21G231-2	
PLATE 1	

SoCalGeo

SOUTHERN CALIFORNIA GEOTECHNICAL



GEOTECHNICAL LEGEND

- APPROXIMTE INFILTRATION LOCATION
- APPROXIMATE BORING LOCATION (SCG PROJECT NO 21G231-1)

NOTE: CONCEPTUAL SITE PLAN (SCHEME 1) PREPARED BY HPA.
AERIAL PHOTOGRAPH OBTAINED FROM GOOGLE EARTH

INFILTRATION TEST LOCATION PLAN

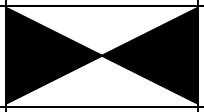
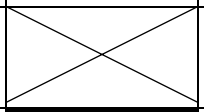
PROPOSED WAREHOUSE

RIVERSIDE COUNTY (PERRIS), CALIFORNIA

SCALE: 1" = 50'	
DRAWN: PM CHKD: RGT	
SCG PROJECT 21G231-1	
PLATE 2	

SOUTHERN CALIFORNIA GEOTECHNICAL

TRENCH LOG LEGEND

SAMPLE TYPE	GRAPHICAL SYMBOL	SAMPLE DESCRIPTION
AUGER		SAMPLE COLLECTED FROM AUGER CUTTINGS, NO FIELD MEASUREMENT OF SOIL STRENGTH. (DISTURBED)
CORE		ROCK CORE SAMPLE: TYPICALLY TAKEN WITH A DIAMOND-TIPPED CORE BARREL. TYPICALLY USED ONLY IN HIGHLY CONSOLIDATED BEDROCK.
GRAB		SOIL SAMPLE TAKEN WITH NO SPECIALIZED EQUIPMENT, SUCH AS FROM A STOCKPILE OR THE GROUND SURFACE. (DISTURBED)
CS		CALIFORNIA SAMPLER: 2-1/2 INCH I.D. SPLIT BARREL SAMPLER, LINED WITH 1-INCH HIGH BRASS RINGS. DRIVEN WITH SPT HAMMER. (RELATIVELY UNDISTURBED)
NSR		NO RECOVERY: THE SAMPLING ATTEMPT DID NOT RESULT IN RECOVERY OF ANY SIGNIFICANT SOIL OR ROCK MATERIAL.
SPT		STANDARD PENETRATION TEST: SAMPLER IS A 1.4 INCH INSIDE DIAMETER SPLIT BARREL, DRIVEN 18 INCHES WITH THE SPT HAMMER. (DISTURBED)
SH		SHELBY TUBE: TAKEN WITH A THIN WALL SAMPLE TUBE, PUSHED INTO THE SOIL AND THEN EXTRACTED. (UNDISTURBED)
VANE		VANE SHEAR TEST: SOIL STRENGTH OBTAINED USING A 4 BLADED SHEAR DEVICE. TYPICALLY USED IN SOFT CLAYS-NO SAMPLE RECOVERED.

COLUMN DESCRIPTIONS

DEPTH: Distance in feet below the ground surface.

SAMPLE: Sample Type as depicted above.

BLOW COUNT: Number of blows required to advance the sampler 12 inches using a 140 lb hammer with a 30-inch drop. 50/3" indicates penetration refusal (>50 blows) at 3 inches. WH indicates that the weight of the hammer was sufficient to push the sampler 6 inches or more.

POCKET PEN.: Approximate shear strength of a cohesive soil sample as measured by pocket penetrometer.

GRAPHIC LOG: Graphic Soil Symbol as depicted on the following page.

DRY DENSITY: Dry density of an undisturbed or relatively undisturbed sample in lbs/ft^3.

MOISTURE CONTENT: Moisture content of a soil sample, expressed as a percentage of the dry weight.

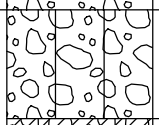
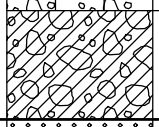
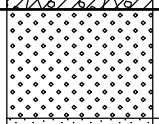
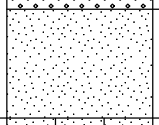
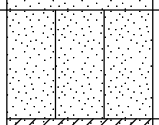
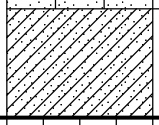
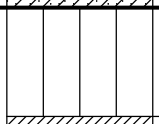
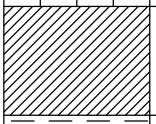
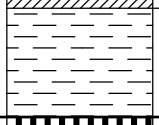
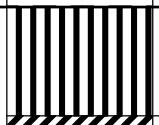
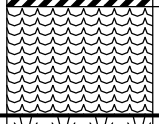
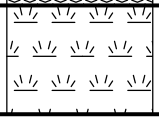
LIQUID LIMIT: The moisture content above which a soil behaves as a liquid.

PLASTIC LIMIT: The moisture content above which a soil behaves as a plastic.

PASSING #200 SIEVE: The percentage of the sample finer than the #200 standard sieve.

UNCONFINED SHEAR: The shear strength of a cohesive soil sample, as measured in the unconfined state.

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
			GRAPH	LETTER	
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

TRENCH NO. I-1

JOB NO.: 21G231-2
PROJECT: Proposed Warehouse
LOCATION: Riverside County (Perris), California
EXCAVATION DATE: 10/11/21
EXCAVATION METHOD: Backhoe
LOGGED BY: Oscar Sandoval
WATER DEPTH: Dry
CAVE DEPTH: ---
READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
					FILL: Brown Silty fine to medium Sand, trace fine root fibers, medium dense to dense-dry							
					OLDER ALLUVIUM: Brown to Dark Brown Silty fine to coarse Sand, trace Clay, dense to very dense-damp to moist							
5												
							9			37		
10					Trench Terminated at 10'							

TBL 21G231-2.GPJ SOCALGEO.GDT 10/29/21

TEST TRENCH LOG **PLATE B-1**

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

TRENCH NO. I-2

JOB NO.: 21G231-2
PROJECT: Proposed Warehouse
LOCATION: Riverside County (Perris), California
EXCAVATION DATE: 10/6/21
EXCAVATION METHOD: Backhoe
LOGGED BY: Oscar Sandoval
WATER DEPTH: Dry
CAVE DEPTH: ---
READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
					FILL: Brown Silty fine Sand, trace Clay, trace medium to coarse Sand, trace fine Gravel, very dense-dry							
5					OLDER ALLUVIUM: Brown fine to coarse Sand, trace Silt, little Clay, dense to very dense-dry							
							3			9		
10					Trench Terminated at 10'							

TBL 21G231-2.GPJ SOCALGEO.GDT 10/29/21

TEST TRENCH LOG **PLATE B-2**

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

TRENCH NO. I-3

JOB NO.: 21G231-2
PROJECT: Proposed Warehouse
LOCATION: Riverside County (Perris), California

EXCAVATION DATE: 10/6/21
EXCAVATION METHOD: Backhoe
LOGGED BY: Oscar Sandoval

WATER DEPTH: Dry
CAVE DEPTH: ---
READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
					FILL: Dark brown Clayey fine to coarse Sand, trace Silt, trace fine root fibers, porous, very dense-dry							
5					ALLUVIUM: Brown Silty fine Sand, trace medium to coarse Sand, dense-dry to damp							
					OLDER ALLUVIUM: Brown Silty fine to coarse Sand, trace Clay, dense to very dense-damp							
							6			26		
10					Boring Terminated at 10'							

TBL 21G231-2.GPJ SOCALGEO.GDT 10/29/21

TEST TRENCH LOG **PLATE B-3**

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

TRENCH NO. I-4

JOB NO.: 21G231-2
PROJECT: Proposed Warehouse
LOCATION: Riverside County (Perris), California

EXCAVATION DATE: 10/11/21
EXCAVATION METHOD: Backhoe
LOGGED BY: Oscar Sandoval

WATER DEPTH: Dry
CAVE DEPTH: ---
READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
					FILL Light Brown Clayey fine Sand, trace medium to coarse Sand, trace fine root fibers, dense-dry							
					ALLUVIUM: Brown Silty fine to coarse Sand, trace Clay, dense-moist							
5												
							11			43		
10					Boring Terminated at 10'							

TBL 21G231-2.GPJ SOCALGEO.GDT 10/29/21

TEST TRENCH LOG **PLATE B-4**

INFILTRATION CALCULATIONS

Project Name	Proposed Warehouse
Project Location	Riverside County (Perris), California
Project Number	21G231-2
Engineer	Oscar Sandoval

Infiltration Test No: I-1

Constants

	Diameter (ft)	Area (ft^2)	Area (cm^2)
Inner	1	0.79	730
Anlr. Spac	2	2.36	2189

*Note: The infiltration rate was calculated based on current time interval

Test Interval		Time (hr)	Interval **Elapsed** (min)	Flow Readings: Inner Ring (ml)	Flow Readings: Ring Flow (cm^3)	Flow Readings: Annular Ring (ml)	Flow Readings: Space Flow (cm^3)	Infiltration Rates: Inner Ring* (cm/hr)	Infiltration Rates: Annular Space* (cm/hr)	Infiltration Rates: Inner Ring* (in/hr)	Infiltration Rates: Annular Space* (in/hr)
1	Initial	9:25 AM	30	0	200	0	3600	0.55	3.29	0.22	1.30
	Final	9:55 AM	**30**	200		3600					
2	Initial	9:55 AM	30	0	0	0	2800	0.00	2.56	0.00	1.01
	Final	10:25 AM	**60**	0		2800					
3	Initial	10:25 AM	30	0	0	0	2700	0.00	2.47	0.00	0.97
	Final	10:55 AM	**90**	0		2700					
4	Initial	10:55 AM	30	0	0	0	2600	0.00	2.38	0.00	0.94
	Final	11:25 AM	**120**	0		2600					

INFILTRATION CALCULATIONS

Project Name	Proposed Warehouse
Project Location	Riverside County (Perris), California
Project Number	21G231-2
Engineer	Oscar Sandoval

Infiltration Test No: I-2

Constants

	Diameter (ft)	Area (ft^2)	Area (cm^2)
Inner	1	0.79	730
Anlr. Spac	2	2.36	2189

*Note: The infiltration rate was calculated based on current time interval

Test Interval		Time (hr)	Interval **Elapsed** (min)	Flow Readings: Inner Ring (ml)	Ring Flow (cm^3)	Annular Ring (ml)	Space Flow (cm^3)	Infiltration Rates: Inner Ring* (cm/hr)	Annular Space* (cm/hr)	Inner Ring* (in/hr)	Annular Space* (in/hr)
1	Initial	11:55 AM	20	0	900	0	3500	3.70	4.80	1.46	1.89
	Final	12:15 PM	**20**	900		3500					
2	Initial	12:15 PM	20	0	950	0	4000	3.91	5.48	1.54	2.16
	Final	12:35 PM	**40**	950		4000					
3	Initial	12:35 PM	20	8	692	0	3900	2.85	5.35	1.12	2.10
	Final	12:55 PM	**60**	700		3900					
4	Initial	12:55 PM	20	0	600	0	3700	2.47	5.07	0.97	2.00
	Final	1:15 PM	**80**	600		3700					
5	Initial	1:15 PM	20	0	600	0	3400	2.47	4.66	0.97	1.83
	Final	1:35 PM	**100**	600		3400					

INFILTRATION CALCULATIONS

Project Name	Proposed Warehouse
Project Location	Riverside County (Perris), California
Project Number	21G231-2
Engineer	Oscar Sandoval

Infiltration Test No: I-3

Constants

	Diameter (ft)	Area (ft^2)	Area (cm^2)
Inner	1	0.79	730
Anlr. Spac	2	2.36	2189

*Note: The infiltration rate was calculated based on current time interval

Test Interval		Time (hr)	Interval **Elapsed** (min)	Flow Readings: Inner Ring (ml)	Ring Flow (cm^3)	Annular Ring (ml)	Space Flow (cm^3)	Infiltration Rates: Inner Ring* (cm/hr)	Annular Space* (cm/hr)	Inner Ring* (in/hr)	Annular Space* (in/hr)
1	Initial	9:15 AM	20	0	850	0	3900	3.49	5.35	1.38	2.10
	Final	9:35 AM	**20**	850		3900					
2	Initial	9:35 AM	20	0	700	0	3700	2.88	5.07	1.13	2.00
	Final	9:55 AM	**40**	700		3700					
3	Initial	9:55 AM	20	8	642	0	3600	2.64	4.93	1.04	1.94
	Final	10:15 AM	**60**	650		3600					
4	Initial	10:15 AM	20	0	650	0	3400	2.67	4.66	1.05	1.83
	Final	10:35 AM	**80**	650		3400					
5	Initial	10:35 AM	20	0	650	0	3300	2.67	4.52	1.05	1.78
	Final	10:55 AM	**100**	650		3300					

INFILTRATION CALCULATIONS

Project Name	Proposed Warehouse
Project Location	Riverside County (Perris), California
Project Number	21G231-2
Engineer	Oscar Sandoval

Infiltration Test No: I-4

Constants

	Diameter (ft)	Area (ft^2)	Area (cm^2)
Inner	1	0.79	730
Anlr. Spac	2	2.36	2189

*Note: The infiltration rate was calculated based on current time interval

Test Interval		Time (hr)	Interval **Elapsed** (min)	Flow Readings: Inner Ring (ml)	Flow Readings: Ring Flow (cm^3)	Flow Readings: Annular Ring (ml)	Flow Readings: Space Flow (cm^3)	Infiltration Rates: Inner Ring* (cm/hr)	Infiltration Rates: Annular Space* (cm/hr)	Infiltration Rates: Inner Ring* (in/hr)	Infiltration Rates: Annular Space* (in/hr)
1	Initial	11:35 AM	20	0	0	0	4800	0.00	6.58	0.00	2.59
	Final	11:55 AM	**20**	0		4800					
2	Initial	11:55 AM	20	0	0	0	4600	0.00	6.30	0.00	2.48
	Final	12:15 PM	**40**	0		4600					
3	Initial	12:15 PM	20	0	0	0	4500	0.00	6.17	0.00	2.43
	Final	12:35 PM	**60**	0		4500					
4	Initial	12:35 PM	20	0	0	0	4100	0.00	5.62	0.00	2.21
	Final	12:55 PM	**80**	0		4100					

Grain Size Distribution



Sample Description	I-1 @ 9'
Soil Classification	Brown to Dark Brown Silty fine to coarse Sand, trace Clay

Proposed Warehouse
Riverside County (Perris), CA
Project No. 21G231-2
PLATE C- 1

SoCalGeo
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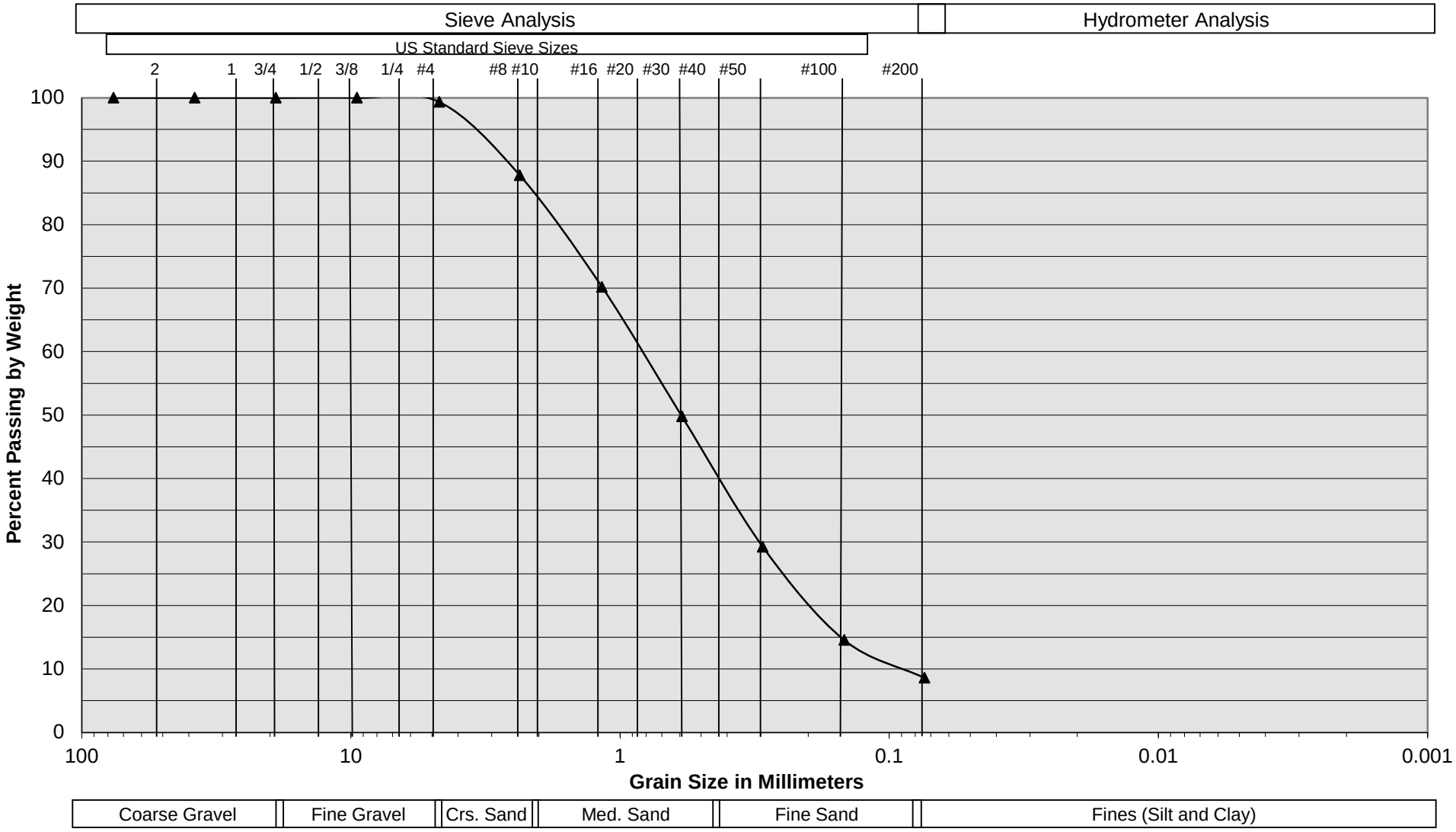
A California Corporation

Grain Size Distribution

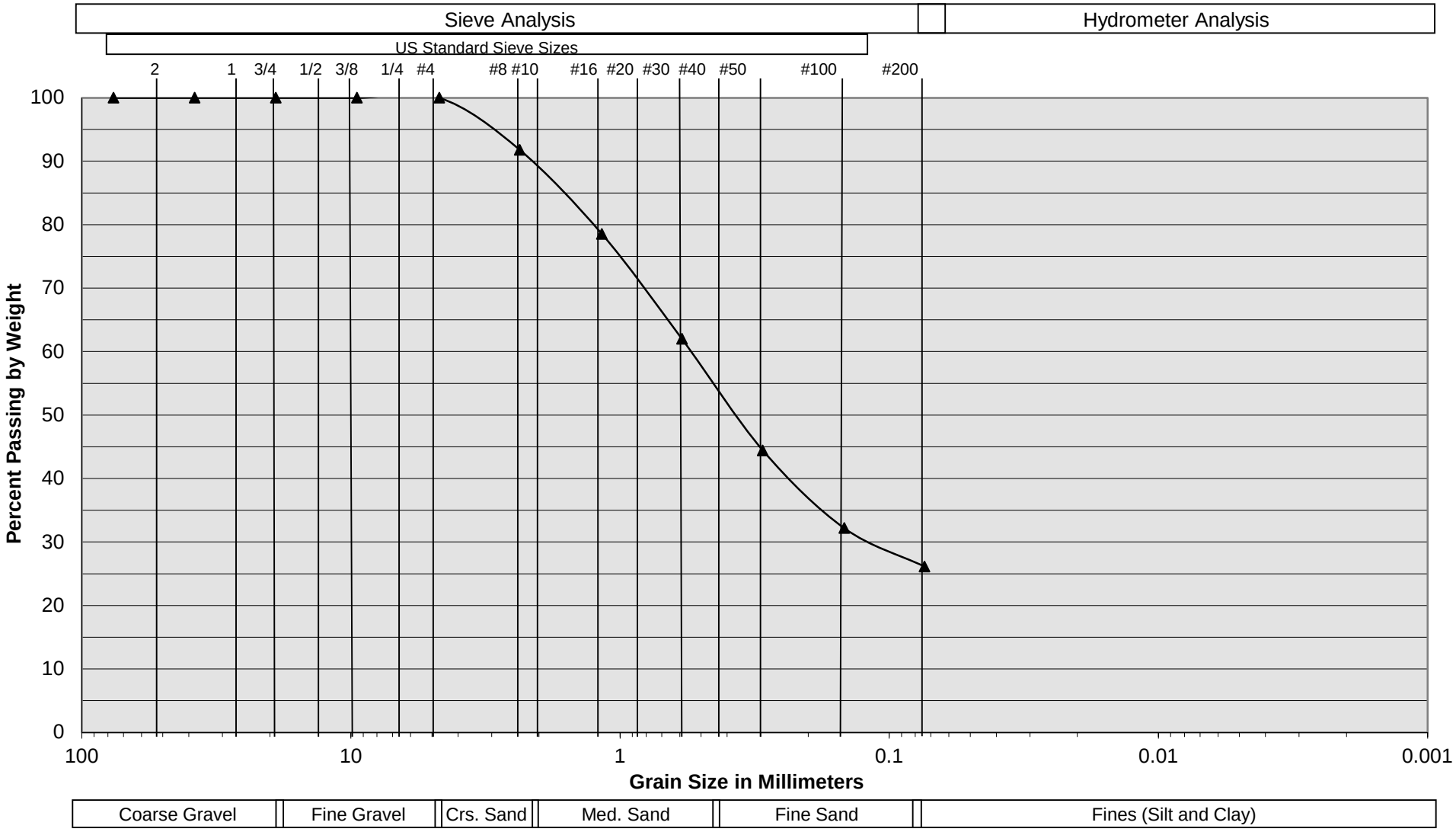


Sample Description	I-2 @ 9'
Soil Classification	Brown fine to coarse Sand, trace Silt, little Clay

Proposed Warehouse
Riverside County (Perris), CA
Project No. 21G231-2
PLATE C- 2

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Grain Size Distribution

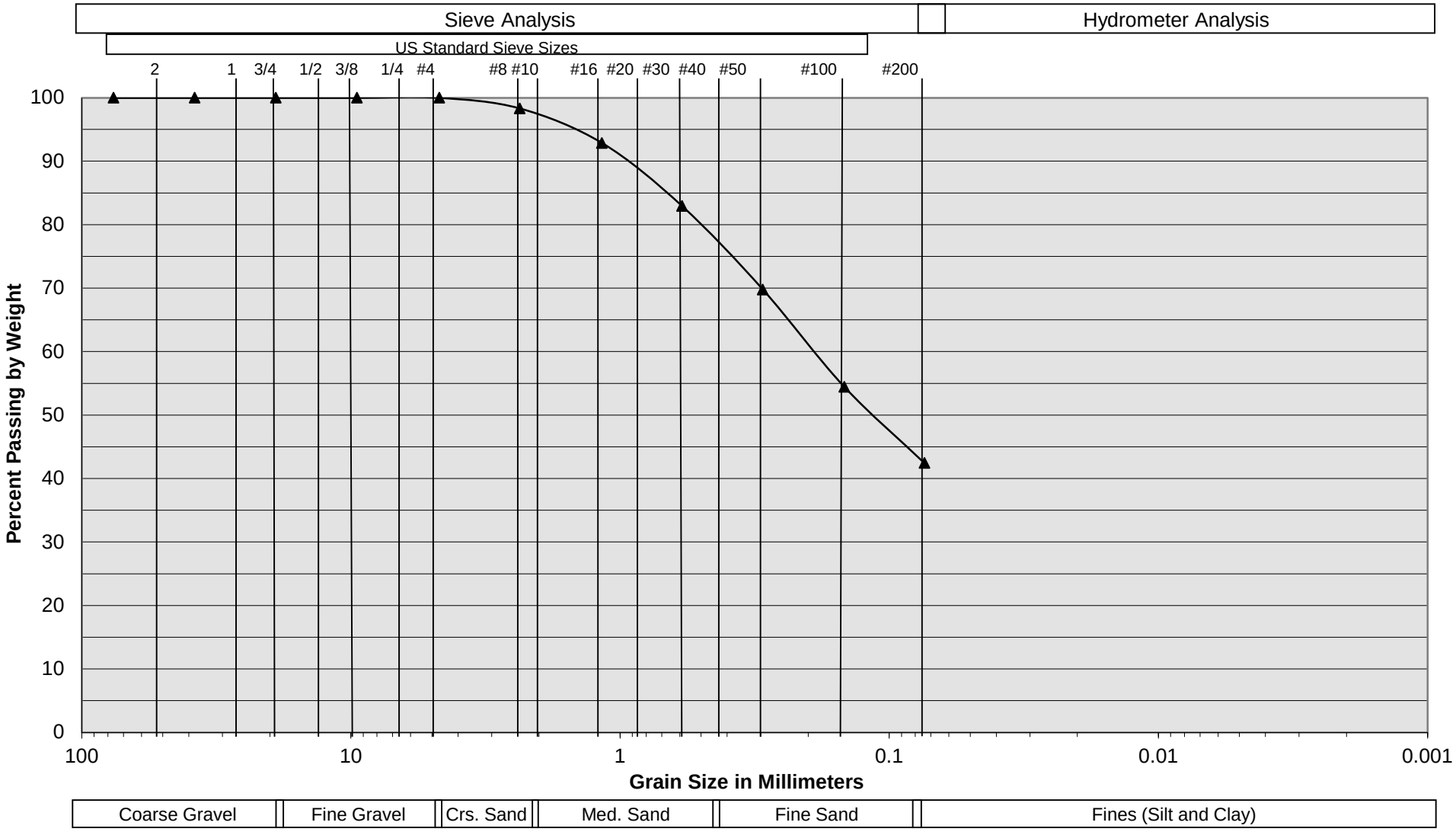


Sample Description	I-3 @ 9'
Soil Classification	Brown Silty fine to coarse Sand, trace Clay

Proposed Warehouse
Riverside County (Perris), CA
Project No. 21G231-2
PLATE C- 3

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Grain Size Distribution



Sample Description	I-4 @ 9'
Soil Classification	Brown Silty fine to coarse Sand, trace Clay

Proposed Warehouse
Riverside County (Perris), CA
Project No. 21G231-2
PLATE C- 4

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

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

N/A – Project proposes to treat stormwater runoff with LID BMPS

Appendix 6: BMP Design Details

BMP Sizing, Design Details and other Supporting Documentation

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

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

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

Company Name	Kimley-Horn	Date	11/13/2023
Designed by	Kimley-Horn	Case No	
Company Project Number/Name	195404001		

BMP Identification

BMP NAME / ID: BMP 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}= 0.60 inches

Drainage Management Area Tabulation

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

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	Design Storm Depth (in)	Design Capture Volume, V_{BMP} (cubic feet)	Proposed Volume on Plans (cubic feet)
DMA 1	48555	Concrete or Asphalt	1	0.89	43311.1			
DMA 1	31570	Ornamental Landscaping	0.1	0.11	3487.2			

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: Kimley-Horn | Date: 11/13/2023

Designed by: Kimley-Horn | Case No:

Company Project Number/Name: 195404001

BMP Identification

BMP NAME / ID: BMP 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}= 0.60 inches

Drainage Management Area Tabulation

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

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
DMA 2	*116456*	*Concrete or Asphalt*	*1*	*0.89*	*103878.8*			
DMA 2	*4760*	*Ornamental Landscaping*	*0.1*	*0.11*	*525.8*			
DMA 3	*22524*	*Concrete or Asphalt*	*1*	*0.89*	*20091.4*			
DMA 3	*3328*	*Ornamental Landscaping*	*0.1*	*0.11*	*367.6*			
DMA 4	*9964*	*Concrete or Asphalt*	*1*	*0.89*	*8887.9*			
DMA 4	*5529*	*Ornamental Landscaping*	*0.1*	*0.11*	*610.7*			

Santa Ana Watershed - BMP Design Flow Rate, Q_{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: Kimley-Horn | Date: 11/13/2023

Designed by: Kimley-Horn | Case No:

Company Project Number/Name:

BMP Identification

BMP NAME / ID: BMP 2

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

Design Rainfall Intensity: I = 0.20 in/hr

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 (use pull-down menu)	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Rainfall Intensity (in/hr)*	*Design Flow Rate (cfs)*	*Proprietary Treatment Flow Rate (cfs)*
DMAs	*DMA 2*	*116456*	*Concrete or Asphalt*	*1*	*0.89*	*103878.8*			
	DMA 2	*4760*	*Ornamental Landscaping*	*0.1*	*0.110458*	*525.8*			
	DMA 3	*22524*	*Concrete or Asphalt*	*1*	*0.892*	*20091.4*			
	DMA 3	*3328*	*Ornamental Landscaping*	*0.1*	*0.110458*	*367.6*			
	DMA 4	*9964*	*Concrete or Asphalt*	*1*	*0.892*	*8887.9*			
	DMA 4	*5529*	*Ornamental Landscaping*	*0.1*	*0.110458*	*610.7*			
		162561	***Total***			**134362.2**	**0.20**	***0.617***	***0.693***

Notes:

Bioretention Facility - Design Procedure	BMP ID 1	Legend:	Required Entries / Calculated Cells

Company Name:	Kimley-Horn	Date:	18-Jan
Designed by:	Kimley-Horn	County/City Case No.:	

Design Volume

Enter the area tributary to this feature	A_T=	1.84	acres
Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP}=	2,340	ft^3

Type of Bioretention Facility Design

- ○ Side slopes required (parallel to parking spaces or adjacent to walkways)
- ◉ No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer	d_S =	3.0	ft
Top Width of Bioretention Facility, excluding curb	w_T =	40.0	ft
Total Effective Depth, d_E			
$d_E = [(0.3) \times d_S + (0.4) \times 1] + 0.5$	d_E =	1.80	ft
Minimum Surface Area, A_m			
$A_M\,(ft^2) = \frac{V_{BMP}\,(ft^3)}{d_E\,(ft)}$	A_M =	1,300	ft^2
Proposed Surface Area	A=	1,830	ft^2
Minimum Required Length of Bioretention Facility, L	L =	32.5	ft

Bioretention Facility Properties

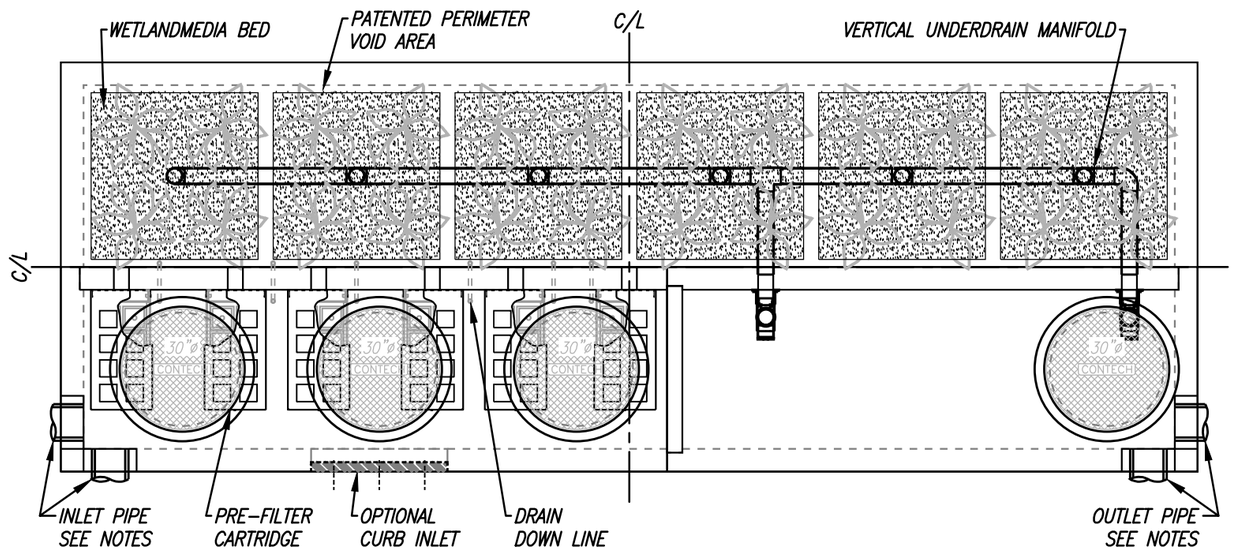
Side Slopes in Bioretention Facility	z =	4	:1
Diameter of Underdrain		6	inches
Longitudinal Slope of Site (3% maximum)		0.5	%
6" Check Dam Spacing		0	feet
Describe Vegetation:			

Notes:

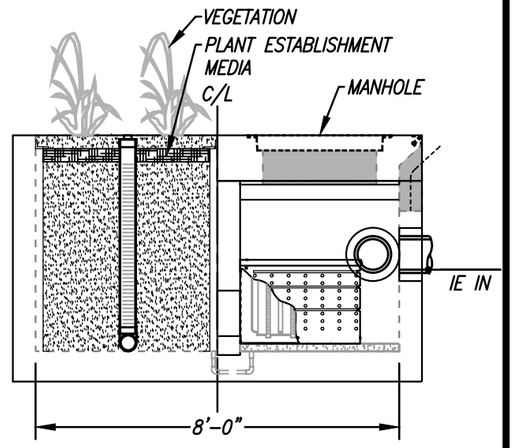
SITE SPECIFIC DATA			
PROJECT NUMBER			
PROJECT NAME			
PROJECT LOCATION			
STRUCTURE ID			
TREATMENT REQUIRED			
TREATMENT FLOW (CFS)			0.693
PRETREATMENT LOADING RATE (GPM/SF)			2.1 GPM/SF
WETLAND MEDIA LOADING RATE (GPM/SF)			1.0
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			_____ (CF
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1			
INLET PIPE 2			
OUTLET PIPE			
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION			
SURFACE LOAD	PEDESTRIAN		
NOTES:			

* PRELIMINARY ONLY - NOT FOR CONSTRUCTION

DCV/V_{BMP} = 6718.1 CF
Q_{BMP} = 0.617 CFS
$Q_{PROVIDED}$ = 0.693 CFS



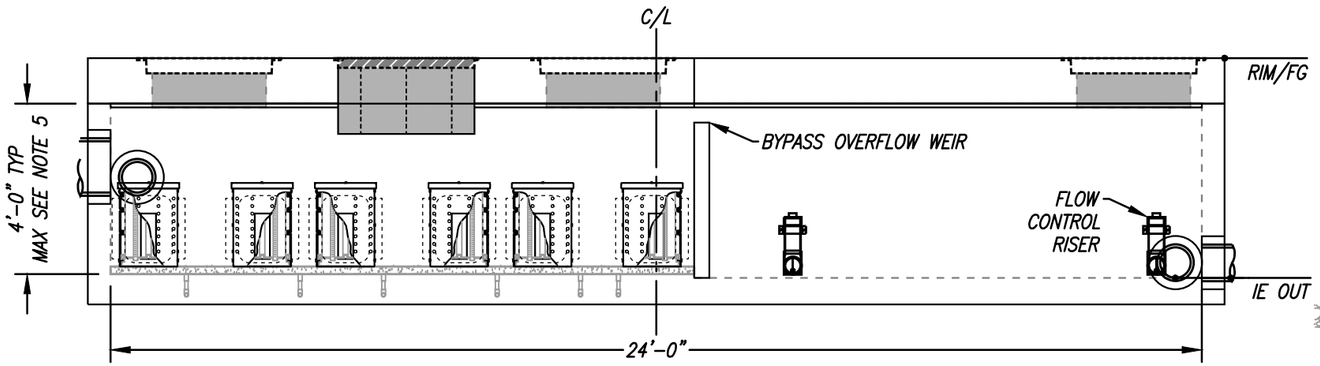
PLAN VIEW



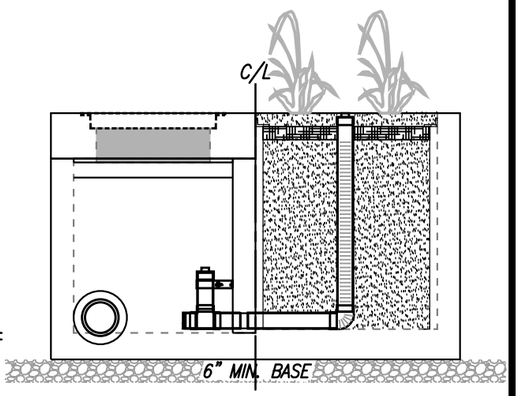
LEFT END VIEW

INSTALLATION NOTES

1. CONTRACTOR TO PROVIDE ALL LABOR, EQUIPMENT, MATERIALS AND INCIDENTALS REQUIRED TO OFFLOAD AND INSTALL THE SYSTEM AND APPURTENANCES IN ACCORDANCE WITH THIS DRAWING AND THE MANUFACTURER'S SPECIFICATIONS, UNLESS OTHERWISE STATED IN MANUFACTURER'S CONTRACT.
2. UNIT MUST BE INSTALLED ON LEVEL BASE. MANUFACTURER RECOMMENDS A MINIMUM 6" LEVEL ROCK BASE UNLESS SPECIFIED BY THE PROJECT ENGINEER. CONTRACTOR IS RESPONSIBLE FOR VERIFYING PROJECT ENGINEER'S RECOMMENDED BASE SPECIFICATIONS.
3. CONTRACTOR TO SUPPLY AND INSTALL ALL EXTERNAL CONNECTING PIPES. ALL PIPES MUST BE FLUSH WITH INSIDE SURFACE OF CONCRETE (PIPES CANNOT INTRUDE BEYOND FLUSH). INVERT OF OUTFLOW PIPE MUST BE FLUSH WITH DISCHARGE CHAMBER FLOOR. ALL PIPES SHALL BE SEALED WATERTIGHT PER MANUFACTURER'S STANDARD CONNECTION DETAIL.
4. CONTRACTOR RESPONSIBLE FOR CONTACTING CONTECH FOR ACTIVATION OF UNIT. MANUFACTURER'S WARRANTY IS VOID WITHOUT PROPER ACTIVATION BY A CONTECH REPRESENTATIVE.
5. VERTICAL HEIGHT VARIES BASED ON SITE SPECIFIC REQUIREMENTS.



ELEVATION VIEW



RIGHT END VIEW

8/14/23SCOTT.SERTICH

MODULAR WETLANDS
FOR PATENT INFORMATION, GO TO www.ContechES.com/IP

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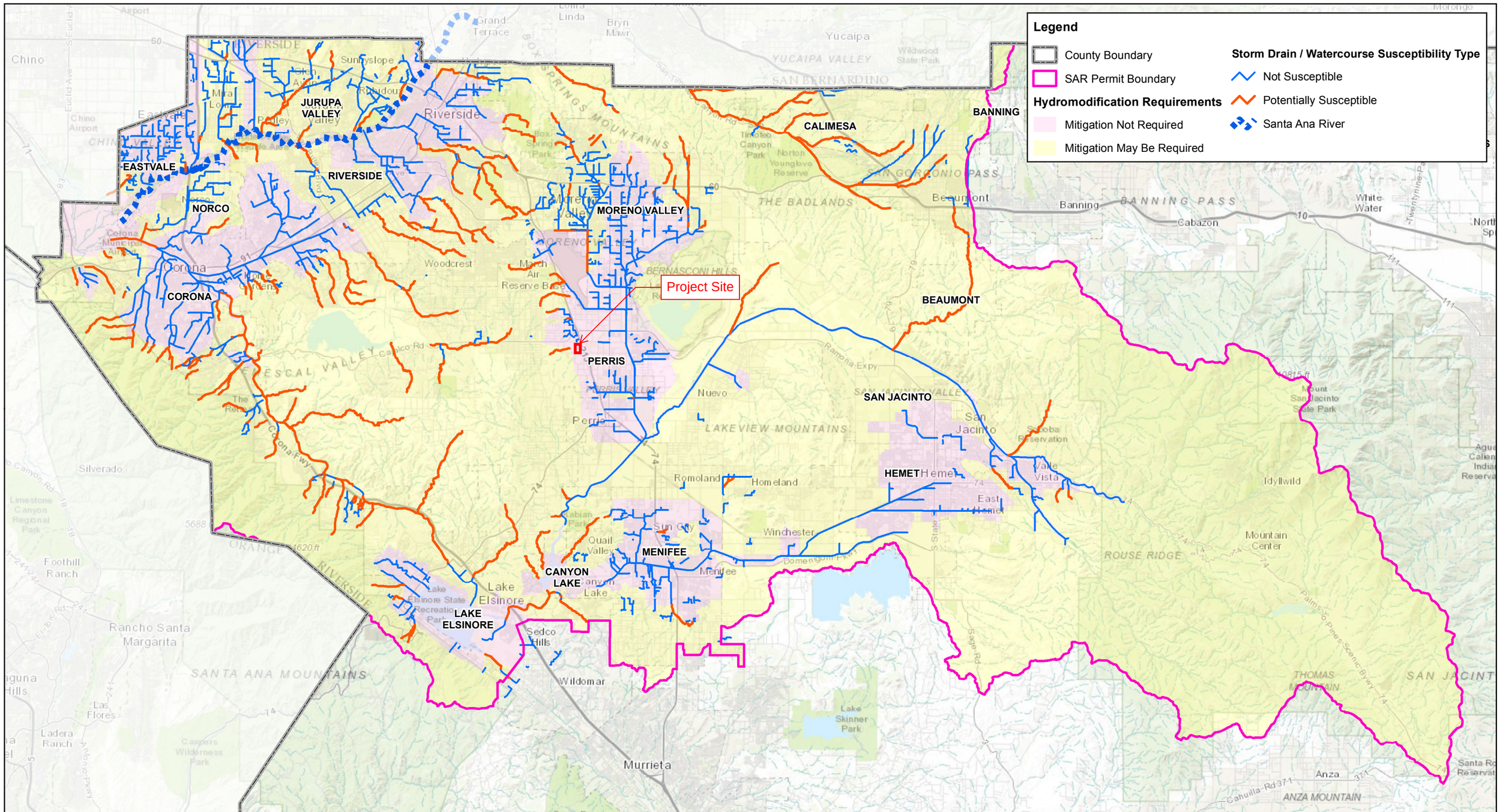
MWS-L-8-24-V
STORMWATER BIOFILTRATION SYSTEM STANDARD DETAIL

Appendix 7: Hydromodification

Supporting Detail Relating to Hydrologic Conditions of Concern



HCOC Applicability Map
SAR Permittees

Map 2

Appendix 8: Source Control

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.**

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.**
☒ D2. **Landscape/ Outdoor Pesticide Use**	☐ **Show locations of native trees or areas of shrubs and ground cover to be undisturbed and retained.** ☐ **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.** ☒ **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.** ☒ **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/**Error! Hyperlink reference not valid.** ☐ **Provide IPM information to new owners, lessees and operators.**

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/

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**

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.**

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/

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.**

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**

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

Underdrain Gravel and Pipes

An underdrain gravel layer and pipes shall be provided in accordance with Appendix B – Underdrains.



Figure 6: Incorrect Placement of an Overflow Inlet.

Inspection and Maintenance Schedule

The Bioretention Facility area shall be inspected for erosion, dead vegetation, soggy soils, or standing water. The use of fertilizers and pesticides on the plants inside the Bioretention Facility should be minimized.

Schedule	Activity
Ongoing	• Keep adjacent landscape areas maintained. Remove clippings from landscape maintenance activities. • Remove trash and debris • Replace damaged grass and/or plants • Replace surface mulch layer as needed to maintain a 2-3 inch soil cover.
After storm events	• Inspect areas for ponding
Annually	• Inspect/clean inlets and outlets

Appendix 10: Educational Materials

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

Engineered Soil Media Requirements

The engineered soil media shall be comprised of 85 percent mineral component and 15 percent organic component, by volume, drum mixed prior to placement. The mineral component shall be a Class A sandy loam topsoil that meets the range specified in Table 1 below. The organic component shall be nitrogen stabilized compost[1], such that nitrogen does not leach from the media.

Table 1: Mineral Component Range Requirements

Percent Range	Component
70-80	Sand
15-20	Silt
5-10	Clay

The trip ticket, or certificate of compliance, shall be made available to the inspector to prove the engineered mix meets this specification.

Vegetation Requirements

Vegetative cover is important to minimize erosion and ensure that treatment occurs in the Bioretention Facility. The area should be designed for at least 70 percent mature coverage throughout the Bioretention Facility. To prevent the BMP from being used as walkways, Bioretention Facilities shall be planted with a combination of small trees, densely planted shrubs, and natural grasses. Grasses shall be native or ornamental; preferably ones that do not need to be mowed. The application of fertilizers and pesticides should be minimal. To maintain oxygen levels for the vegetation and promote biodegradation, it is important that vegetation not be completely submerged for any extended period of time. Therefore, a maximum of 6 inches of ponded water shall be used in the design to ensure that plants within the Bioretention Facility remain healthy.

A 2 to 3-inch layer of standard shredded aged hardwood mulch shall be placed as the top layer inside the Bioretention Facility. The 6-inch ponding depth shown in Figure 1 above shall be measured from the top surface of the 2 to 3-inch mulch layer.

Curb Cuts

To allow water to flow into the Bioretention Facility, 1-foot-wide (minimum) curb cuts should be placed approximately every 10 feet around the perimeter of the Bioretention Facility. Figure 2 shows a curb cut in a Bioretention Facility. Curb cut flow lines must be at or above the V_{BMP} water surface level.

[1] For more information on compost, visit the US Composting Council website at: http://compostingcouncil.org/



Figure 2: Curb Cut located in a Bioretention Facility

To reduce erosion, a gravel pad shall be placed at each inlet point to the Bioretention Facility. The gravel should be 1- to 1.5-inch diameter in size. The gravel should overlap the curb cut opening a minimum of 6 inches. The gravel pad inside the Bioretention Facility should be flush with the finished surface at the curb cut and extend to the bottom of the slope.

In addition, place an apron of stone or concrete, a foot square or larger, inside each inlet to prevent vegetation from growing up and blocking the inlet. See Figure 3.

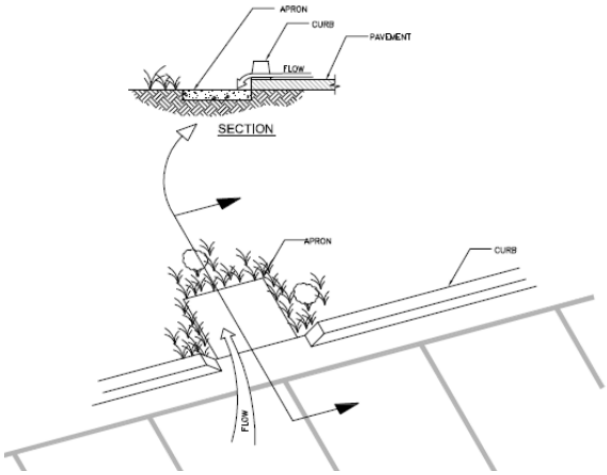


Figure 3: Apron located in a Bioretention Facility

Terracing the Landscaped Filter Basin

It is recommended that Bioretention Facilities be level. In the event the facility site slopes and lacks proper design, water would fill the lowest point of the BMP and then discharge from the basin without being treated. To ensure that the water will be held within the Bioretention Facility on sloped sites, the BMP must be terraced with nonporous check dams to provide the required storage and treatment capacity.

The terraced version of this BMP shall be used on non-flat sites with no more than a 3 percent slope. The surcharge depth cannot exceed 0.5 feet, and side slopes shall not exceed 4:1. Table 2 below shows the spacing of the check dams, and slopes shall be rounded up (i.e., 2.5 percent slope shall use 10' spacing for check dams).

Table 2: Check Dam Spacing

6" Check Dam Spacing	
Slope	**Spacing**
1%	*25'*
2%	*15'*
3%	*10'*

Roof Runoff

Roof downspouts may be directed towards Bioretention Facilities. However, the downspouts must discharge onto a concrete splash block to protect the Bioretention Facility from erosion.

Retaining Walls

It is recommended that Retaining Wall Type 1A, per Caltrans Standard B3-3 or equivalent, be constructed around the entire perimeter of the Bioretention Facility. This practice will protect the sides of the Bioretention Facility from collapsing during construction and maintenance or from high service loads adjacent to the BMP. Where such service loads would not exist adjacent to the BMP, an engineered alternative may be used if signed by a licensed civil engineer.

Side Slope Requirements

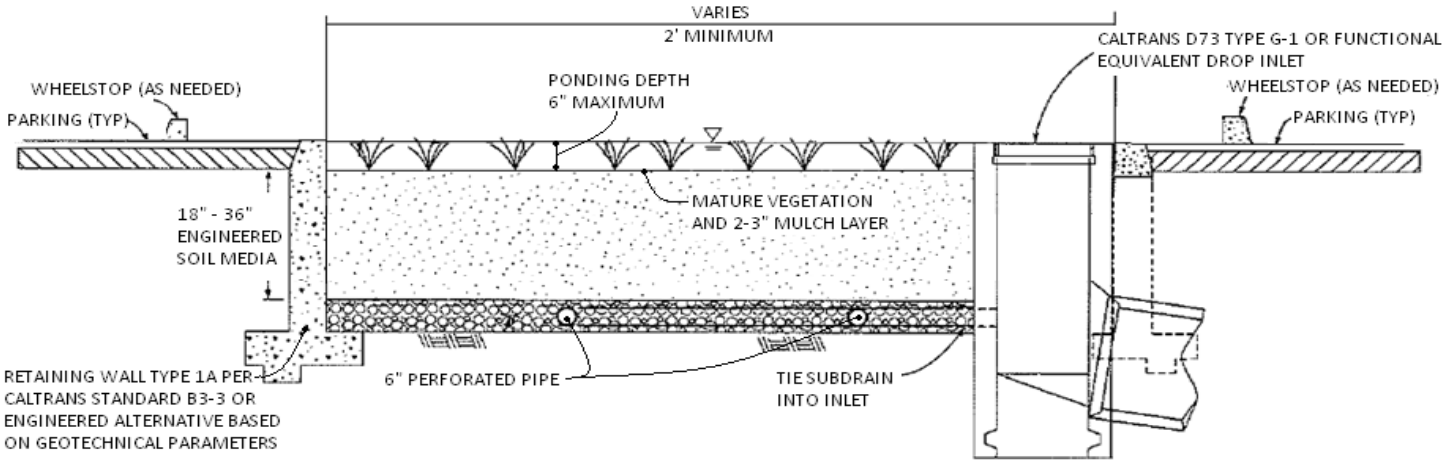
Bioretention Facilities Requiring Side Slopes

The design should assure that the Bioretention Facility does not present a tripping hazard. Bioretention Facilities proposed near pedestrian areas, such as areas parallel to parking spaces or along a walkway, must have a gentle slope to the bottom of the facility. Side slopes inside of a Bioretention Facility shall be 4:1. A typical cross section for the Bioretention Facility is shown in Figure 1.

Bioretention Facilities Not Requiring Side Slopes

Where cars park perpendicular to the Bioretention Facility, side slopes are not required. A 6-inch maximum drop may be used, and the Bioretention Facility must be planted with trees and shrubs to prevent pedestrian access. In this case, a curb is not placed around the Bioretention Facility,

but wheel stops shall be used to prevent vehicles from entering the Bioretention Facility, as shown in Figure 4.



Planter Boxes

Bioretention Facilities can also be placed above ground as planter boxes. Planter boxes must have a minimum width of 2 feet, a maximum surcharge depth of 6 inches, and no side slopes are necessary. Planter boxes must be constructed so as to ensure that the top surface of the engineered soil media will remain level. This option may be constructed of concrete, brick, stone or other stable materials that will not warp or bend. Chemically treated wood or galvanized steel, which has the ability to contaminate stormwater, should not be used. Planter boxes must be lined with an impermeable liner on all sides, including the bottom. Due to the impermeable liner, the inside bottom of the planter box shall be designed and constructed with a cross fall, directing treated flows within the subdrain layer toward the point where subdrain exits the planter box, and subdrains shall be oriented with drain holes oriented down. These provisions will help avoid excessive stagnant water within the gravel underdrain layer. Similar to the in-ground Bioretention Facility versions, this BMP benefits from healthy plants and biological activity in the root zone. Planter boxes should be planted with appropriately selected vegetation.



Figure 5: Planter Box
Source: LA Team Effort

Overflow

An overflow route is needed in the Bioretention Facility design to bypass stored runoff from storm events larger than V_{BMP} or in the event of facility or subdrain clogging. Overflow systems must connect to an acceptable discharge point, such as a downstream conveyance system as shown in Figure 1 and Figure 4. The inlet to the overflow structure shall be elevated inside the Bioretention Facility to be flush with the ponding surface for the design capture volume (V_{BMP}) as shown in Figure 4. This will allow the design capture volume to be fully treated by the Bioretention Facility, and for larger events to safely be conveyed to downstream systems. The overflow inlet shall **not** be located in the entrance of a Bioretention Facility, as shown in Figure 6.

Underdrain Gravel and Pipes

An underdrain gravel layer and pipes shall be provided in accordance with Appendix B – Underdrains.



Figure 6: Incorrect Placement of an Overflow Inlet.

Inspection and Maintenance Schedule

The Bioretention Facility area shall be inspected for erosion, dead vegetation, soggy soils, or standing water. The use of fertilizers and pesticides on the plants inside the Bioretention Facility should be minimized.

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After storm events	• Inspect areas for ponding
Annually	• Inspect/clean inlets and outlets