Appendix P

Project Specific Water Quality Management Plan- Perris Industrial

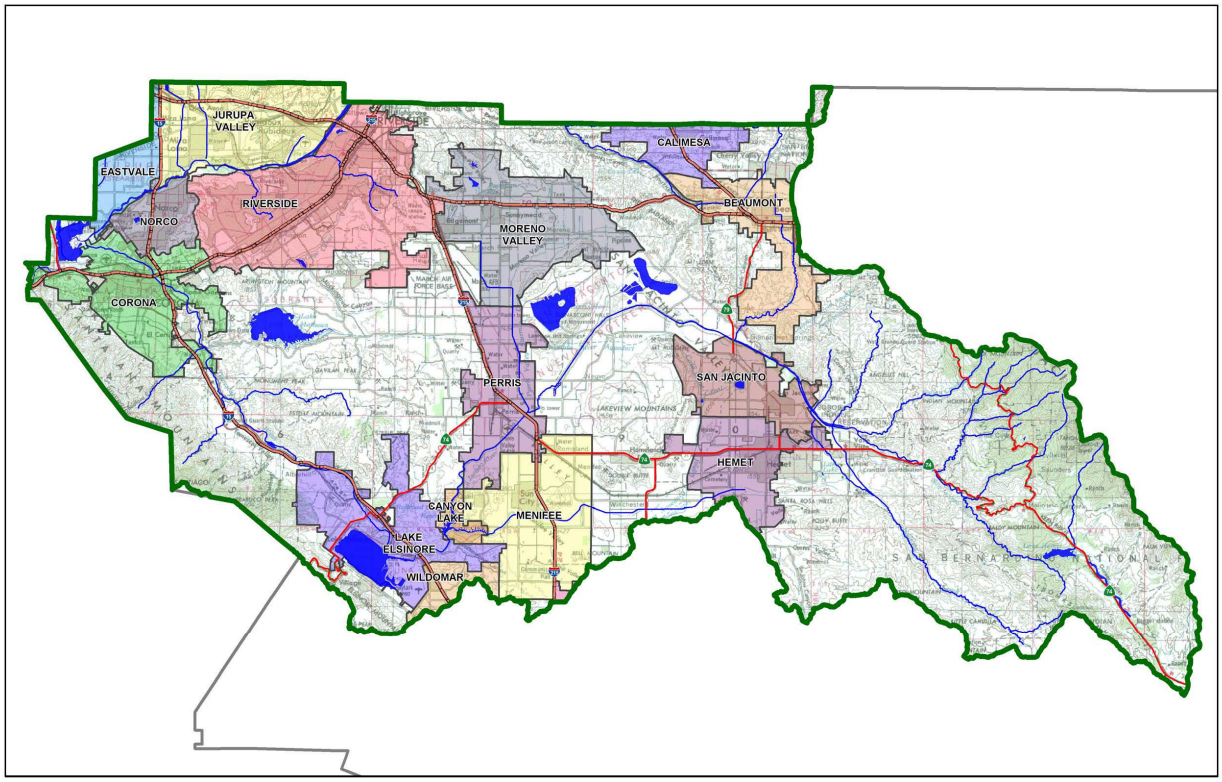
Project Specific Water Quality Management Plan

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

Project Title: OLC3 – Perris Industrial

Development No: NEC Ramona & Perris

Design Review/Case No: #DPR 22-00006 / SPA 22-05047



☒ **Preliminary**
☐ **Final**

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

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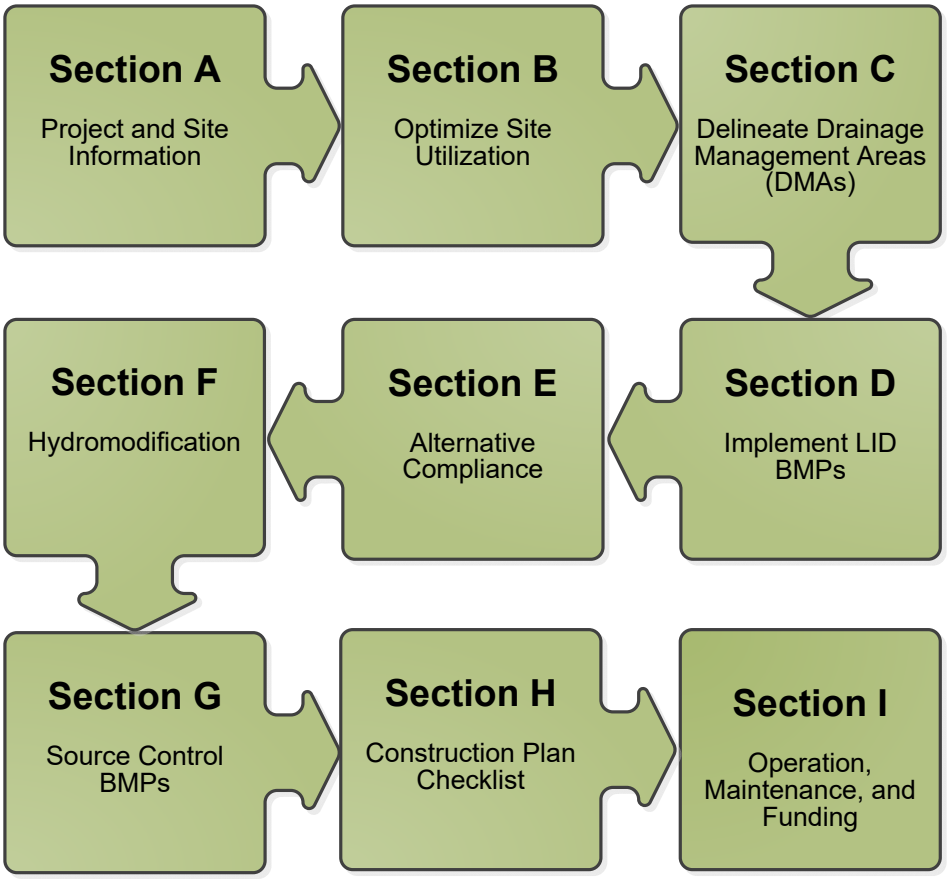
A Brief Introduction

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



OWNER'S CERTIFICATION

This Project-Specific Water Quality Management Plan (WQMP) has been prepared for Optimus Building Corp. by United Engineering Group CA, Inc. for the NEC Ramona & Perris OLC3 Industrial Project DPR 22-00006.

This WQMP is intended to comply with the requirements of City of Perris for Ordinance 1194 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 the City of Perris Water Quality Ordinance (Municipal Code Section 1194).

"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	1-25-23 Date
Christopher F Lenz Preparer's Printed Name	PE/Principal Preparer's Title/Position

Preparer's Licensure: CA 63001

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Section A: Project and Site Information

PROJECT INFORMATION	
Type of Project:	Development Plan Review – 774k sf Industrial Warehouse & 4.8 Acre Commercial Parcel
Planning Area:	PVCC
Community Name:	N/A
Development Name:	NEC Ramona & Perris Industrial Project

PROJECT LOCATION

Latitude & Longitude (DMS): 33d50'47"N, 117d13'20"W

Project Watershed and Sub-Watershed: Santa Ana, San Jacinto River, Canyon Lake

APN(s): 302-130-002, 008, 018, 021, 022, 023, 024, & 027.

Project Acreage: 43.5 acres (gross acreage includes street right of way) 40.8 acres net.

Map Book and Page No.:

PROJECT CHARACTERISTICS	
Proposed or Potential Land Use(s)	Warehouse
Proposed or Potential SIC Code(s)	4225
Area of Impervious Project Footprint (SF)	1,421,711*
Total Area of proposed Impervious Surfaces within the Project Limits (SF)/or Replacement	1,421,711*
Does the project consist of offsite road improvements?	☐ Y ☒ N
Does the project propose to construct unpaved roads?	☐ Y ☒ N
Is the project part of a larger common plan of development (phased project)?	☐ Y ☒ N
EXISTING SITE CHARACTERISTICS	
Total area of existing Impervious Surfaces within the project limits (SF)	None
Is the project located within any MSHCP Criteria Cell?	☐ Y ☒ N
If so, identify the Cell number:	Insert text here.
Are there any natural hydrologic features on the project site?	☐ Y ☒ N
Is a Geotechnical Report attached?	☒ Y ☐ N
If no Geotech. Report, list the NRCS soils type(s) present on the site (A, B, C and/or D)	C
What is the Water Quality Design Storm Depth for the project?	0.58"

Project Description:

The 43.5 gross acre (includes street right of way), 40.8 acre net, property is a proposed 4.8 acre commercial parcel and a 36.0 acre industrial parcel. The commercial area will be covered under a separate PWQMP in anticipation of future property split. There is no co-mingling of flows, or any sharing of treatment BMP's. The projects are independently designed and operated. The Industrial Portion of the site (area covered under this PWQMP) is 36.0 acres. That includes 17.8 acres of building, 15.0 acres of hardscape (drive aisles, sidewalk, etc.), and 3.3 acres of landscaping. There are no offsite flows that impact the property, with only the Line E Master Plan flows proposed to be routed along the south side of the project. Onsite flows are divided into 8 DMA's with four (DMA A-D) routed through underground storage and grassed swales. Three are self-retaining (DMA E-G). There is one area (DMA H) at the northeast corner that cannot be accepted into the project's water quality treatment due to design grades. The use of swales is chosen due to the proximity of the project to the airport and the risk of bird strike from any surface ponding (no bio-retention allowed). The site has no infiltration potential but does have subsurface storage proposed (and required due to the sub grade loading bays). It is proposed that the underground detention be pumped to the

surface bio-swales for WQMP treatment. Pumps and piping for this system will be designed at FWQMP stage.

The underground storage facilities will be Contech CMP detention systems and will hold the Vbmp for the DMA's prior to pumping to the swales for Qbmp treatment per the below table.

DMA	BMP for Qbmp Treatment	Detention System for Vbmp storage	Required Vbmp [cf]	*Provided Vbmp [cf]
A	BMP 1B	BMP 1A	22,559	67,339
B	BMP 2B	BMP 2A	9,035	32,176
C	BMP 3B	BMP 3A	7,115	24,895
D	BMP 4B	BMP 4A	27,410	84,863

Notes:
*Vbmp provided will greatly exceed Vbmp required as underground systems are designed to meet RCFCWCD requirement to detain 10yr-24hr + 2yr-24hr storm runoff for peak mitigation. Detention system details contained in Appendix 6.

DMA	AREA [AC]	2YR 24HR FLOW [CFS] Q_{BMP}	BMP
A	12.01	2.1	1B
B	4.81	0.9	2B
C	3.79	0.7	3B
D	14.60	0.40	4B
H	0.08	0.20	NONE
DMA		DESIGN STORM [CF] V_{BMP}	
E	0.40	92.3	SELF
F	0.22	50.9	SELF
G	1.06	247.2	SELF

BMP	LENGTH [FT]	BOTTOM WIDTH [FT]
1B	557	2
2B	337	6.7
3B	229	6.7
4B	320	6.7

SIZING SUMMARY:

DMA	Q_{BMP} REQ. [CFS]	BMP	Q_{BMP} PROV. [CFS]
A	2.1	1B	3.00
B	0.9	2B	1.75
C	0.7	3B	0.65*
D	2.6	4B	1.60*
H	0.0	NONE	N/A

*Note:
Final Q_{BMP} from pumping will be designed with the final WQMP to meet the 2yr 24hr Q_{BMP} flows, and to match the treatment capacity of the final design swales.

A.1 Maps and Site Plans

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

- Drainage Management Areas
- Proposed Structural BMPs
- Drainage Path
- Drainage Infrastructure, Inlets, Overflows
- Source Control BMPs
- Buildings, Roof Lines, Downspouts
- Impervious Surfaces
- Standard Labeling

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

A.2 Identify Receiving Waters

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

Table A.1 Identification of Receiving Waters

Receiving Waters	EPA Approved 303(d) List Impairments	Designated Beneficial Uses	Proximity to RARE Beneficial Use
San Jacinto River Reach 3 HU #802.11	None	AGR,GWR, REC1, REC2, WARM, WILD	Not designated as RARE
Canyon Lake HU #802.11 & 12	Nutrients & Pathogens	MUN, AGR, GWR, REC1, REC2, WARM, WILD	Not designated as RARE
San Jacinto River Reach 1 HU #801.32 & #802.31	None	MUN, AGR, GWR, REC1, REC2, WARM, WILD	Not designated as RARE
Lake Elsinore HU #802.31	Nutrients, Organics, PCB's-Sediment Toxicity, Unknown Toxicity	REC1, REC2, 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(Tennent Dependent)	☒ 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.

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?

Yes. In the developed project, flows are directed in the general direction of existing patterns.

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

No, the site has been graded.

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

No, infiltration rates were tested to be too low for effective infiltration (below county 1.6 in/hr req). Per infiltration testing avg infiltration rates were 0.89 in/hr.

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

Impervious areas (17.8 acre building and 15.0 acre paving) are proposed as just what is needed for safe travel and parking. The site plan also provides open space areas of 3.3 ac.

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

No, with no infiltration potential, and requirement to reduce surface ponding, the most effective design is to route runoff with the paving areas, and to collect runoff into a system of stormdrain.

During construction care should be made to not compact the areas of the bioswale BMP's.

Section C: Delineate Drainage Management Areas (DMAs)

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

Table C.1 DMA Classifications

DMA Name or ID	Surface Type(s)[1]	Area (AC.)	DMA Type
DMA A	Roof, Conc, & Asphalt	12.01	Type D
DMA B	Roof, Conc, & Asphalt	4.81	Type D
DMA C	Roof, Conc, & Asphalt	3.79	Type D
DMA D	Roof, Conc, & Asphalt	14.60	Type D
DMA E	Ornamental Landscape	0.40	Type B
DMA F	Ornamental Landscape	0.22	Type B
DMA G	Ornamental Landscape	1.06	Type B
DMA H	Concrete and Asphalt	0.08	No LID

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

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

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

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

Self-Retaining Area				**Type 'C' DMAs that are draining to the Self-Retaining Area**		
DMA Name/ ID	Post-project surface type	Area (square feet) [A]	Storm Depth (inches) [B]	DMA Name / ID	[C] from Table C.4 = [C]	Required Retention Depth (inches) [D]
DMA E	Landscape	17,295	0.58			
DMA F	Landscape	9,531	0.58			
DMA G	Landscape	46,304	0.58			

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

DMA					Receiving Self-Retaining DMA		
DMA Name/ ID	Area (square feet)	Post-project surface type	Runoff factor	Product	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 A	BMP 1A & 1B
DMA B	BMP 2A & 2B
DMA C	BMP 3A & 3B
DMA D	BMP 4A & 4B

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

Section D: Implement LID BMPs

D.1 Infiltration Applicability

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

If yes has been checked, Infiltration BMPs shall not be used for the site. If no, continue working through this section to implement your LID BMPs. It is recommended that you contact your Co-Permittee to verify whether or not your project discharges to an approved downstream 'Highest and Best Use' feature.

Geotechnical Report

A Geotechnical Report or Phase I Environmental Site Assessment may be required by the Co-Permittee 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: **All, see attached infiltration report**		
…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: All, in order to raise site out of flood plain significant fill will be required. Refer to the attached letter from ALTA Geotechnical (Appendix 3 and 5).		
…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 Co-Permittee).

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

If any of the above boxes have been checked, Harvest and Use BMPs need not be assessed for the site. If neither of the above criteria applies, follow the steps below to assess the feasibility of irrigation use, toilet use and other non-potable uses (e.g., industrial use).

Irrigation Use Feasibility

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

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

Total Area of Irrigated Landscape: 4.1 ac

Type of Landscaping (Conservation Design or Active Turf): Ornimental Landscaping, Swales

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: 36.7 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

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: 29.0 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)
29.0 ac	4.1 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: 840gal/day (120 employees x 7gal/employee/day)

Project Type: Commercial

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: 36.7 ac

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

Enter your TUTIA factor: 132

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: 4844

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)
4844	840

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 2-3 in Chapter 2 to determine the minimum demand for non-potable uses per tributary impervious acre.

Enter the factor from Table 2-3: Enter Value

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

Minimum required use: Minimum use required (gpd)

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

Minimum required non-potable use (Step 4)	**Projected average daily use (Step 1)**
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, unless a site-specific analysis has been completed that demonstrates technical infeasibility as noted in D.3 below.

D.3 Bioretention and Biotreatment Assessment

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

Select one of the following:

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

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

D.4 Feasibility Assessment Summaries

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

Table D.2 LID Prioritization Summary Matrix

DMA Name/ID	LID BMP Hierarchy				No LID (Alternative Compliance)
	1. Infiltration	2. Harvest and use	3. Bioretention	4. Biotreatment	
DMA A	☐	☐	☐	☒	☐
DMA B	☐	☐	☐	☒	☐
DMA C	☐	☐	☐	☒	☐
DMA D	☐	☐	☐	☒	☐
DMA E	☐	☐	☒	☐	☐
DMA F	☐	☐	☒	☐	☐
DMA G	☐	☐	☒	☐	☐
DMA H	☐	☐	☐	☐	☒

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

The design of the site does not afford an opportunity to accept the flows from Perry Street (DMA H). The road will continue to drain east in Perry Street.

Due to proximity to the airport, the site should not have surface ponding for fear of nesting areas that may lead to bird strike. Therefore, bio-retention was not a treatment option. As such, swales have been chosen to treat the site runoff. See appendix 5 for detail.

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 Co-Permittee. Utilize the worksheets found in the LID BMP Design Handbook or consult with your Co-Permittee 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 Imperious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	***Underground Storage 1A pumped to BMP 1B***		
	[A]		[B]	[C]	[A] x [C]			
A	*523,239*	*Concrete and Roof*	*1*	*0.89*	*466729*	*Design Storm Depth (in)*	*Design Capture Volume,* V_{BMP} *(cubic feet)*	*Proposed Volume on Plans (cubic feet)*
	$A_T = \Sigma[A]$				$\Sigma = [D]$	0.58	22559	***67339***

[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

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	***Underground Storage 2A pumped to BMP 2B***		
	[A]		[B]	[C]	[A] x [C]			
B	*209555*	*Concrete and Roof*	*1*	*.89*	*186923*	*Design Storm Depth (in)*	*Design Capture Volume,* V_{BMP} *(cubic feet)*	*Proposed Volume on Plans (cubic feet)*
	$A_T = \Sigma[A]$				$\Sigma = [D]$	0.58	9035	***32176***

Design of the site is not based on Vbmp but will provide treatment through swales. Thus, Qbmp is the design factor used. Refer to Appendix 6 for calculations.

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Underground Storage 3A pumped to BMP 3B*		
	[A]		[B]	[C]	[A] x [C]			
C	*165,035*	*Mixed*	*1*	*.89*	*147211*	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
	A_T = Σ[A]				Σ= [D]	0.58	7,115	***24895***

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Underground Storage 4A pumped to BMP 4B*		
	[A]		[B]	[C]	[A] x [C]			
D	*635768*	*Mixed*	*1*	*.89*	*567105*	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
	A_T = Σ[A]				Σ= [D]	0.58	27410	***84863***

Design of the site is not based on Vbmp but will provide treatment through swales. Thus, Qbmp is the design factor used. Refer to Appendix 6 for calculations.

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 Co-Permittee). 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.

A portion of Perris Blvd (DMA K) and Perry Street (DMA J)

The design/grading of the site does not afford an opportunity to accept all of the flows from the perimeter roads Perris and Perry (DMA K and J). The areas will continue to drain along the roads per the existing grades.

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)*
	A_T = Σ[A]				Σ= [D]	[E]			[I]

[B], [C] is obtained as described in Section 2.3.1 from the WQMP Guidance Document
[E] is obtained from Exhibit A in the WQMP Guidance Document
[G] is for Flow-Based Treatment Control BMPs [G] = 43,560, for Volume-Based Control Treatment BMPs, [G] = 12
[H] is from the Total Credit Percentage as Calculated from Table E.2 above
[I] as obtained from a design procedure sheet from the BMP manufacturer and should be included in Appendix 6

E.4 Treatment Control BMP Selection

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

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

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

Table E.4 Treatment Control BMP Selection

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

[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 Co-Permittee has the discretion to require a Project-Specific WQMP to address HCOCs on projects less than one acre on a case by case basis. The disturbed area calculation should include all disturbances associated with larger common plans of development.

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

If Yes, HCOC criteria do not apply.

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

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

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

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

Table F.1 Hydrologic Conditions of Concern Summary

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

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

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

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

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

INSERT TEXT HERE

F.2 HCOC Mitigation

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

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

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

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

Note: This project is located within the Riverside County HCOC Exemption area as presented in the Riverside Co Geodatabse approved April 20, 2017. See Map 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. Co-Permittee 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
A. On site storm drain inlets	Mark all inlets with "Only Rain Down the Storm Drain".	Maintain markings and provide info to owners. Add Language to lease agreements to prevent tenants from allowing discharges to storm drain.
B. Interior Floor Drains	To be connected to Sewer	Inspect and maintain drains
D2. Landscaping	Preserve existing native trees, shrubs, and ground cover to the maximum extent possible. Design landscaping to minimize irrigation and runoff, to promote	Maintain landscaping using minimum or no pesticides. See applicable operational BMPs in "What you should know for…..Landscape and Gardening"

	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.	at http://rcflood.org/stormwater/ Provide IPM information to new owners, lessees and operators.
G. Refuse Area	Trash enclosures to be built per City of Perris Standards with Signs noting "Do not dump Hazardous Materials"	Trash enclosures to be built per City of Perris Standards. A regular inspection and maintenance program to be required by tenants/owner.
P. 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.

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)

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.

To be completed as part of Final WQMP.

Section I: Operation, Maintenance and Funding

The Co-Permittee will periodically verify that Stormwater BMPs on your site are maintained and continue to operate as designed. To make this possible, your Co-Permittee 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: Property Owners Association

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

☒ Y ☐ N

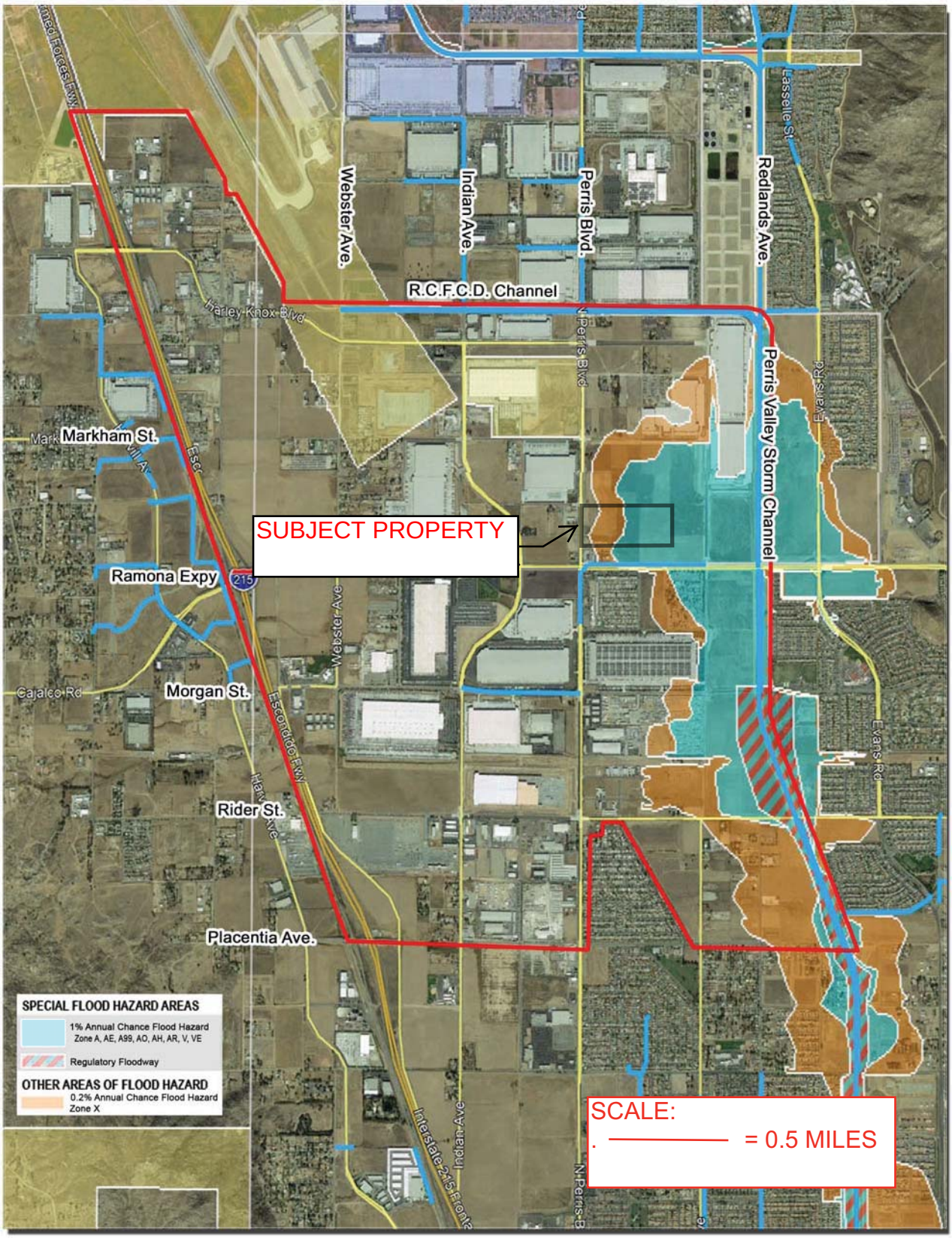
Include your Operation and Maintenance Plan and Maintenance Mechanism in Appendix 9. Additionally, include all pertinent forms of educational materials for those personnel that will be maintaining the proposed BMPs within this Project-Specific WQMP in Appendix 10.

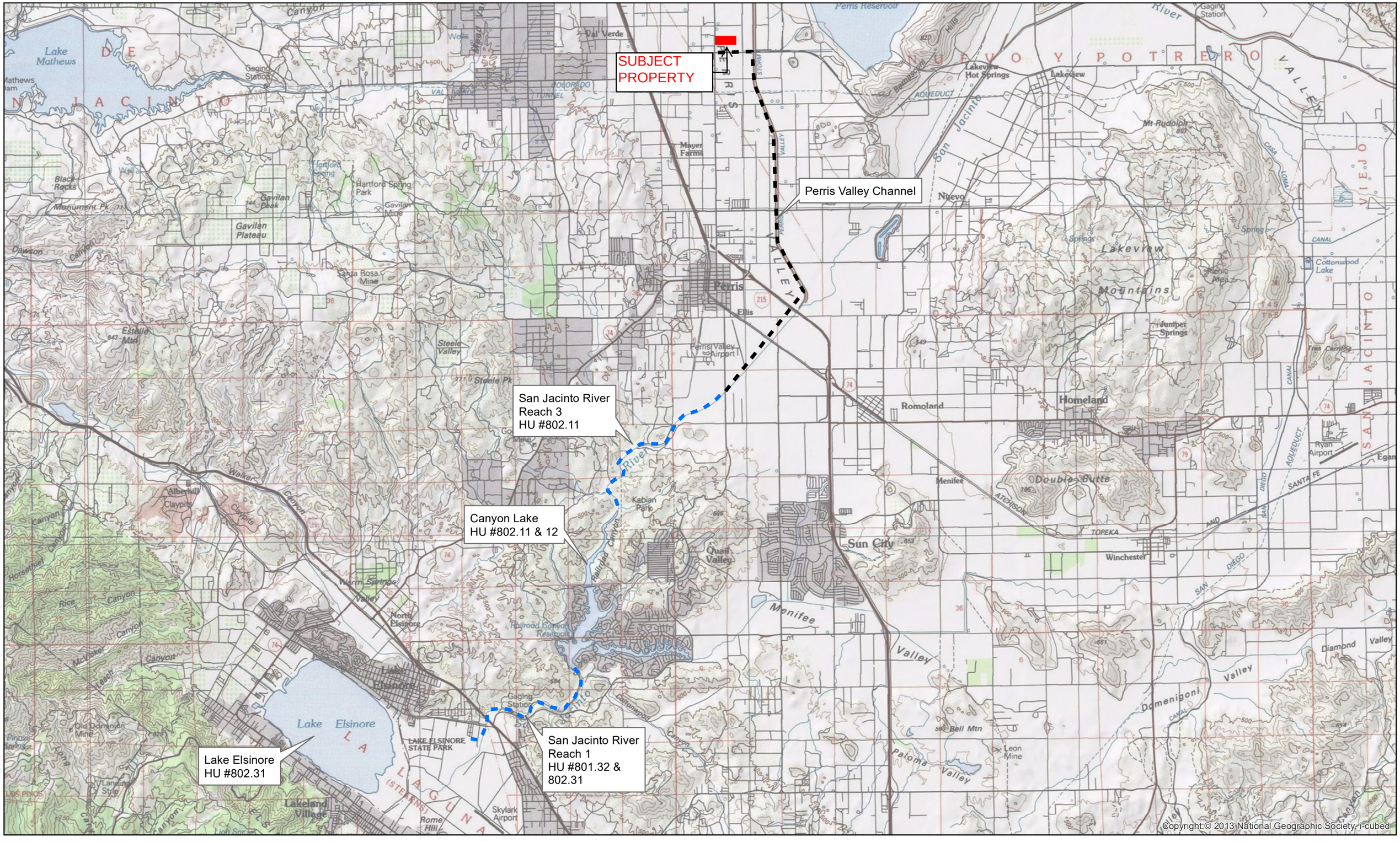
To be provided at FWQMP

Appendix 1: Maps and Site Plans

Location Map, WQMP Site Plan and Receiving Waters Map

NEC RAMONA AND PERRIS WQMP
VICINITY MAP





NEC RAMONA AND PERRIS

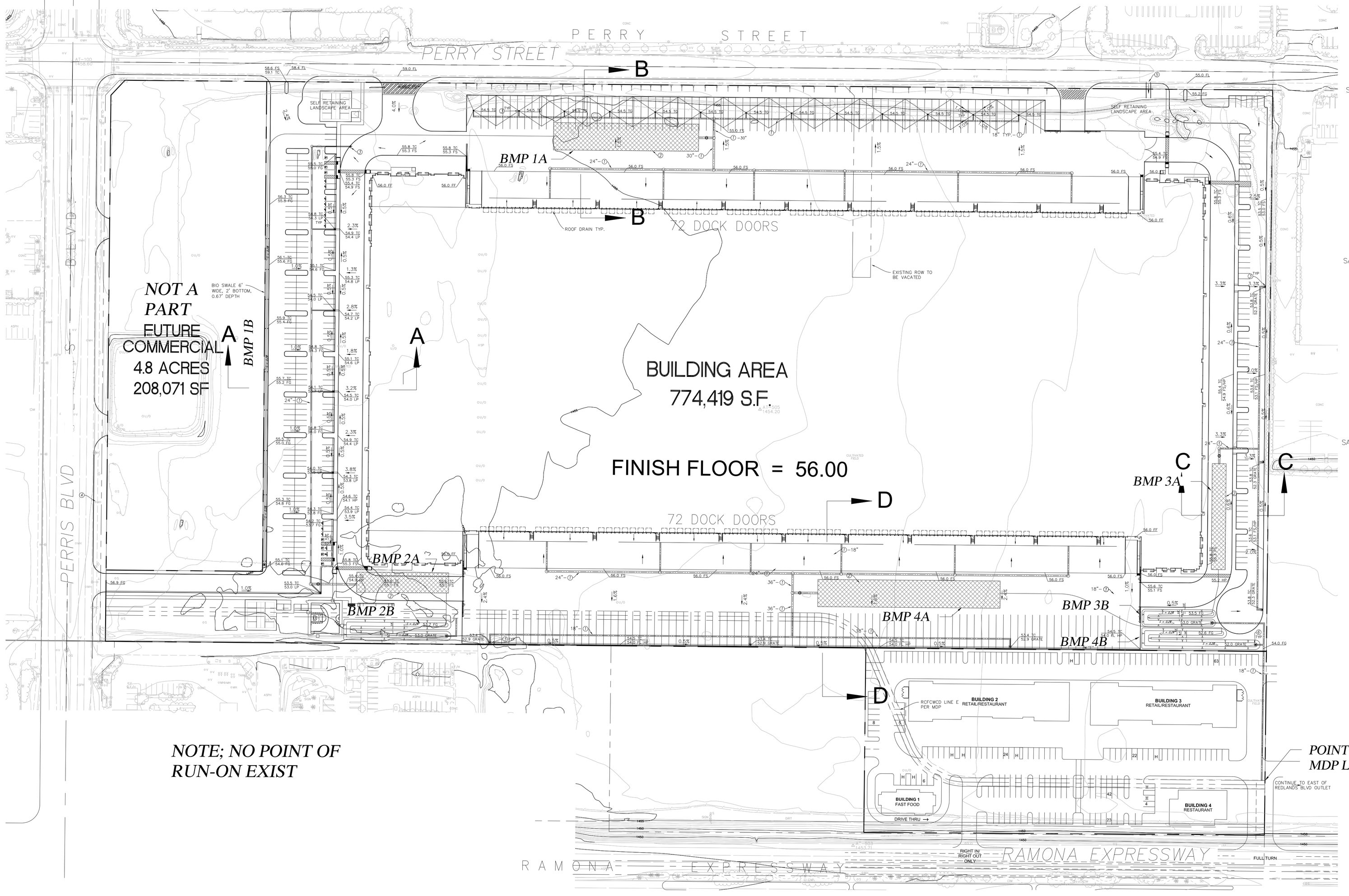
Perris, California

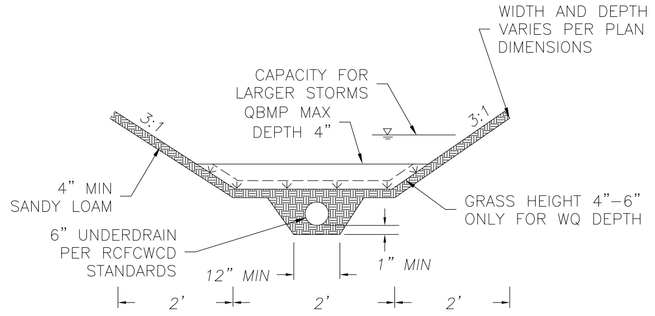
0 1.5 Miles

N

united engineering group

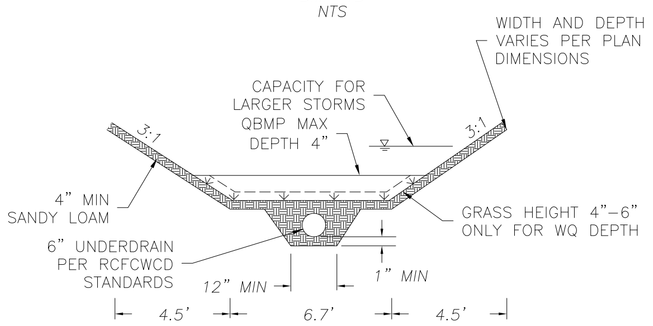
Vicinity Map / Receiving Waters Map





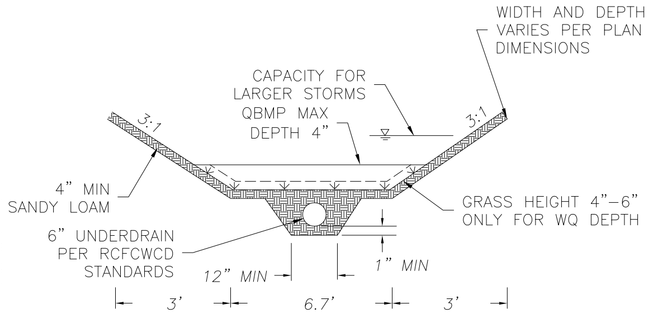
BIO-SWALE SECTION

BMP 1B
NTS



BIO-SWALE SECTION

BMP 2B AND 4B
NTS



BIO-SWALE SECTION

BMP 3B
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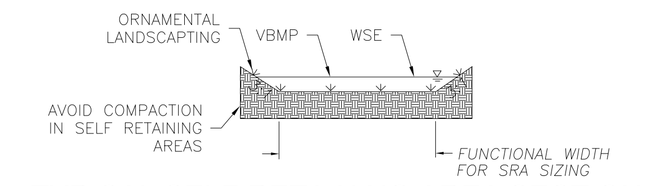


TYPICAL SELF RETAINING AREA SECTION

N.T.S.

80' 40' 0' 80'

GRAPHIC SCALE: 1"=80'

DUMP NO WASTE
DRAINS TO RIVER

"ONLY RAIN IN DRAIN" STENCIL

BGR NO. XXXXXX WDID: XXXXXX

SEAL–ENGINEER

REGISTERED PROFESSIONAL ENGINEER
CHRISTOPHER F. LENZ
NO. 63001
EXP. 6/30/24
CIVIL
STATE OF CALIFORNIA

ueg
united engineering group
8885 Haven Avenue - Suite 195
Rancho Cucamonga, CA 91730
Phone: 909.466.9240
www.unitedeng.com

PREPARED UNDER THE DIRECTION OF:

CHRISTOPHER F. LENZ 63001

DATE: _____ REGISTRATION EXPIRES 6–30–24

BENCH MARK:

BOLT AND WASHER ILLEGIBLE, AT THE CENTERLINE INTERSECTION OF MARKHAM STREET AND PERRIS BOULEVARD. RIVERSIDE COUNTY BENCHMARK NUMBER BM–CSA4 AND RCM81.

ELEVATION 1455.224

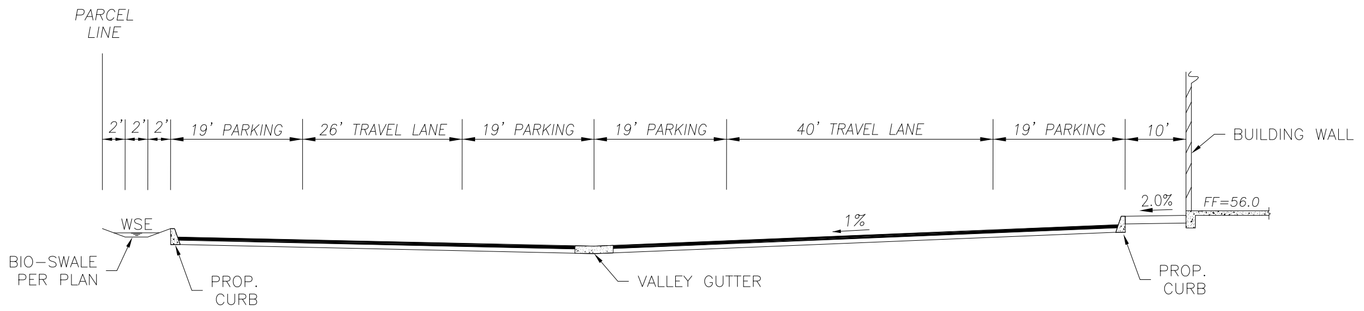
ZONING CASE #DPR 22–00006 SPA 22–05047

PERRIS CA, 92571

POST CONSTRUCTION BMP SITE PLAN NEC RAMONA EXPWY & PERRIS BLVD DPR 22-00006

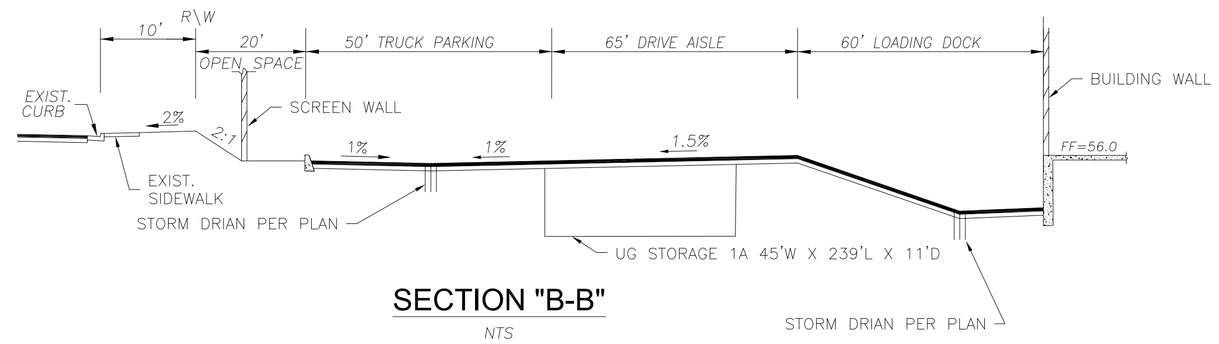
SHEET NO. 1 OF 3 SHEETS

FOR: OPTIMUS BUILDING CORPORATION | W.O. | CITY FILE NO. *DPR 22–00006*



SECTION "A-A"

NTS



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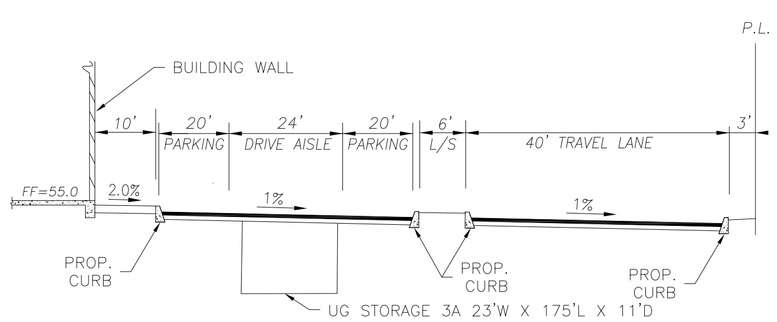

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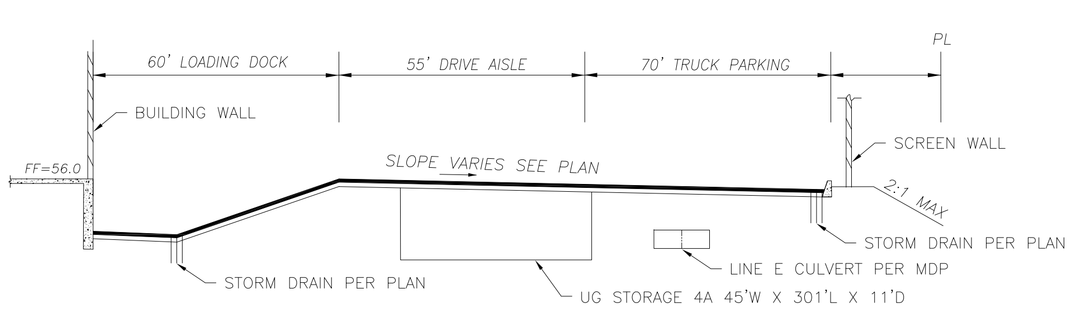
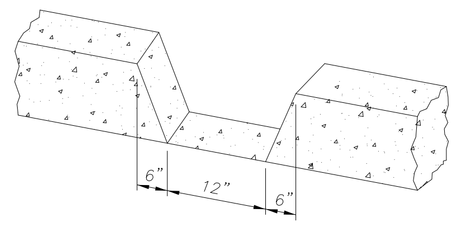


SECTION "D-D"

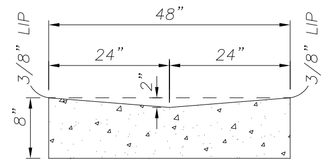
NTS

NOTE: UG STORAGE 2A IS WEST OF SECTION DD AND IS 34'W X 152'L X 11' D



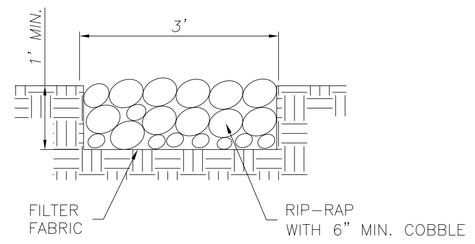
DETAIL "A" - CURB FACE OPENING

NTS



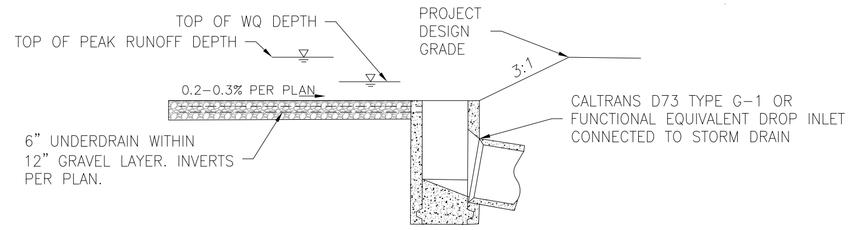
DETAIL "B" - VALLEY GUTTER

NTS



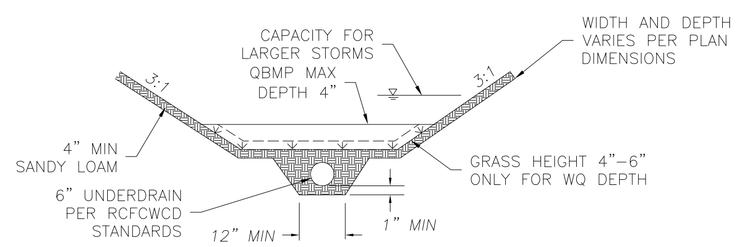
DETAIL "C" - RIP-RAP PAD

NTS



BIO-SWALE END DRAIN DETAIL

NTS



BIO-SWALE SECTION

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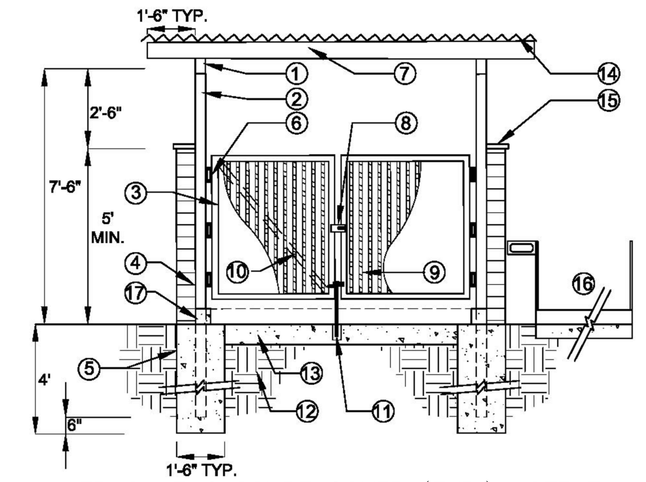

TRASH ENCLOSURE COVER (TYP.) NOTE 7

N.T.S.

TRASH ENCLOSRE COVER NOTES:

1. 4-INCH X 6-INCH METAL BEAM POWDER COATED
2. 4-INCH X 4-INCH TUBULAR STEEL POST. SET POST FLUSH TO WALL. GROUT FILL POST SOLID. PAINT WITH 2 COATS ZINC PRIMER & 2 COATS SATIN FINISH PAINT.
3. GATE FRAME CONTINUOUS, ATTACH GATE FRAME TO STEEL POST WITH 3 HEAVY DUTY HINGES. CONTRACTOR SHALL SUPPLY SHOP DRAWINGS FOR APPROVAL PRIOR TO CONSTRUCTION.
4. CMU WALL / REFER TO STRUCTURAL ENGINEERS SPECIFICATIONS FOR REINFORCEMENT.
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10. 9-INCH X 1/2-INCH GALVANIZED STEEL DIAGONAL CROSS BRACE / FILLET WELD TO FRAME AND SPOT WELD TO MINI-V-BEAM (AT BACK OF GATE).
11. HEAVY DUTY DROP CRANE BOLT. ATTACH TO GATE FRAME. SET 1-6 INCHES LONG X 1-INCH O.D. GALVANIZED PIPE SLEEVE TO ACCEPT BOLT. 'STANLY' CD 10009-18 INCHES OR APPROVED EQUAL.
12. COMPACTED SUBGRADE PER GEOTECHNICAL REPORT.
13. 6-INCH THICK PCC CONCRETE PAD WITH 6 X 6 X 10 WWM.
14. METAL ROOF; CORRUGATED STEEL - BERRIDGE LEAD-COPE STRAIGHT S-DECK / INSTALL PER MANUFACTURERS SPECIFICATIONS.
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16. DISABLED ACCESSIBLE RAMP AND HANDRAIL IF REQUIRED.
17. CONCRETE CURB

NOTES

A. CONCRETE FOOTING TO ACHIEVE 4300 PSI @ 28 DAYS.
B. TRASH BINS - SIZE AND NUMBER AS REQUIRED BY CITY.

BGR NO. XXXXXX WDID: XXXXXX

SEAL-ENGINEER

REGISTERED PROFESSIONAL ENGINEER CHRISTOPHER F. LENZ NO. 63001 EXP. 6/30/24 CIVIL STATE OF CALIFORNIA

ueg united engineering group
8885 Haven Avenue - Suite 195
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Phone: 909.466.9240
www.unitedeng.com

PREPARED UNDER THE DIRECTION OF:

CHRISTOPHER F. LENZ 63001

DATE: _____ REGISTRATION EXPIRES 6-30-24

BENCH MARK:
BOLT AND WASHER ILLEGIBLE, AT THE CENTERLINE INTERSECTION OF MARKHAM STREET AND PERRIS BOULEVARD. RIVERSIDE COUNTY BENCHMARK NUMBER BM-CSA4 AND RCM81.

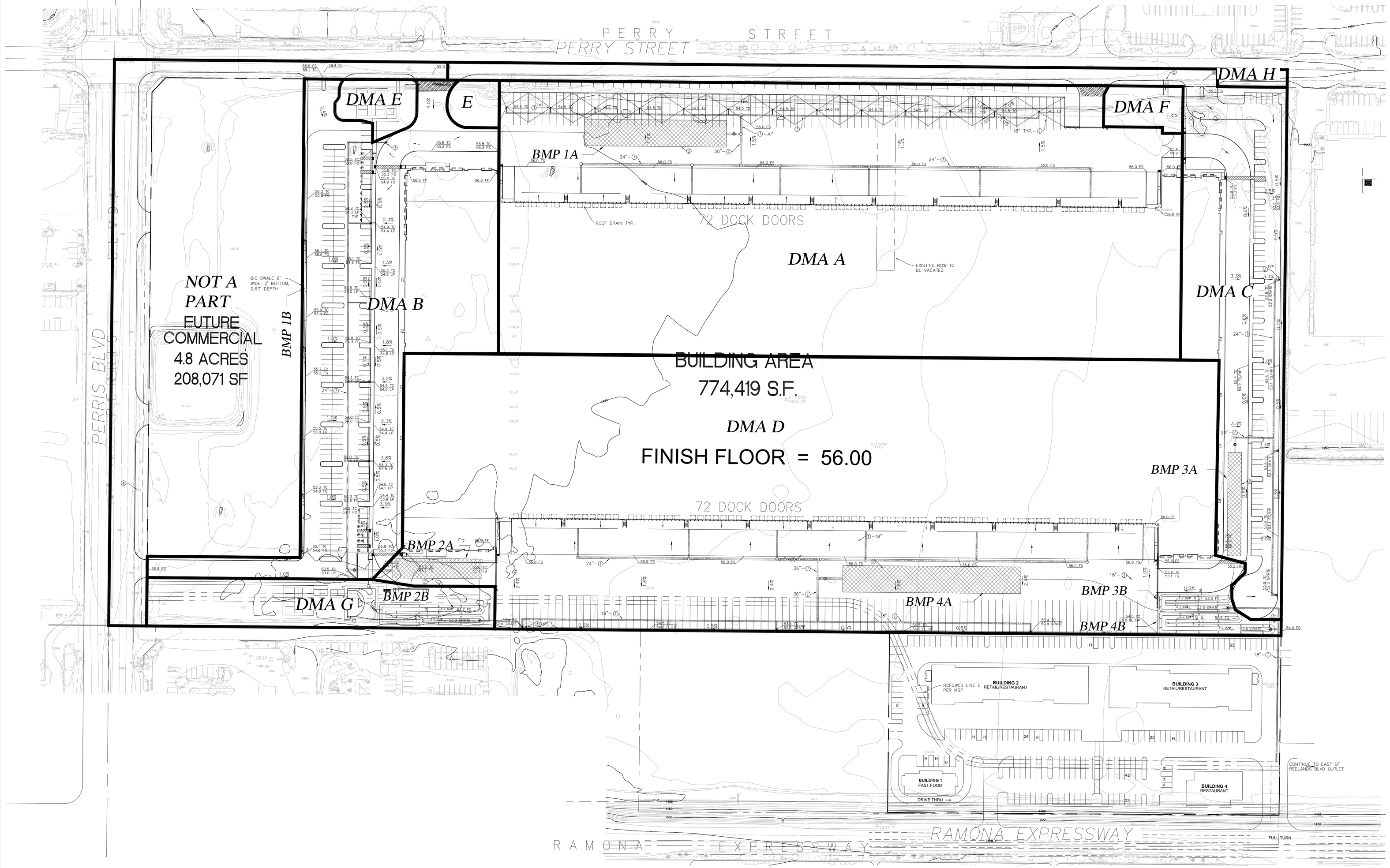
ELEVATION 1455.224

ZONING CASE #DPR 22-00006 SPA 22-05047
PERRIS, CA, 92571

POST CONSTRUCTION BMP SITE PLAN
NEC RAMONA EXPWY & PERRIS BLVD
DPR 22-00006
DETAILS AND SECTIONS

SHEET NO. 2 OF 3 SHEETS

FOR: OPTIMUS BUILDING CORPORATION | W.O. | CITY FILE NO. DPR 22-00006



BGR NO. XXXXXX WDID: XXXXXX

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ELEVATION 1455.224

ZONING CASE #DPR 22–00006 SPA 22–05047
PERRIS CA, 92571

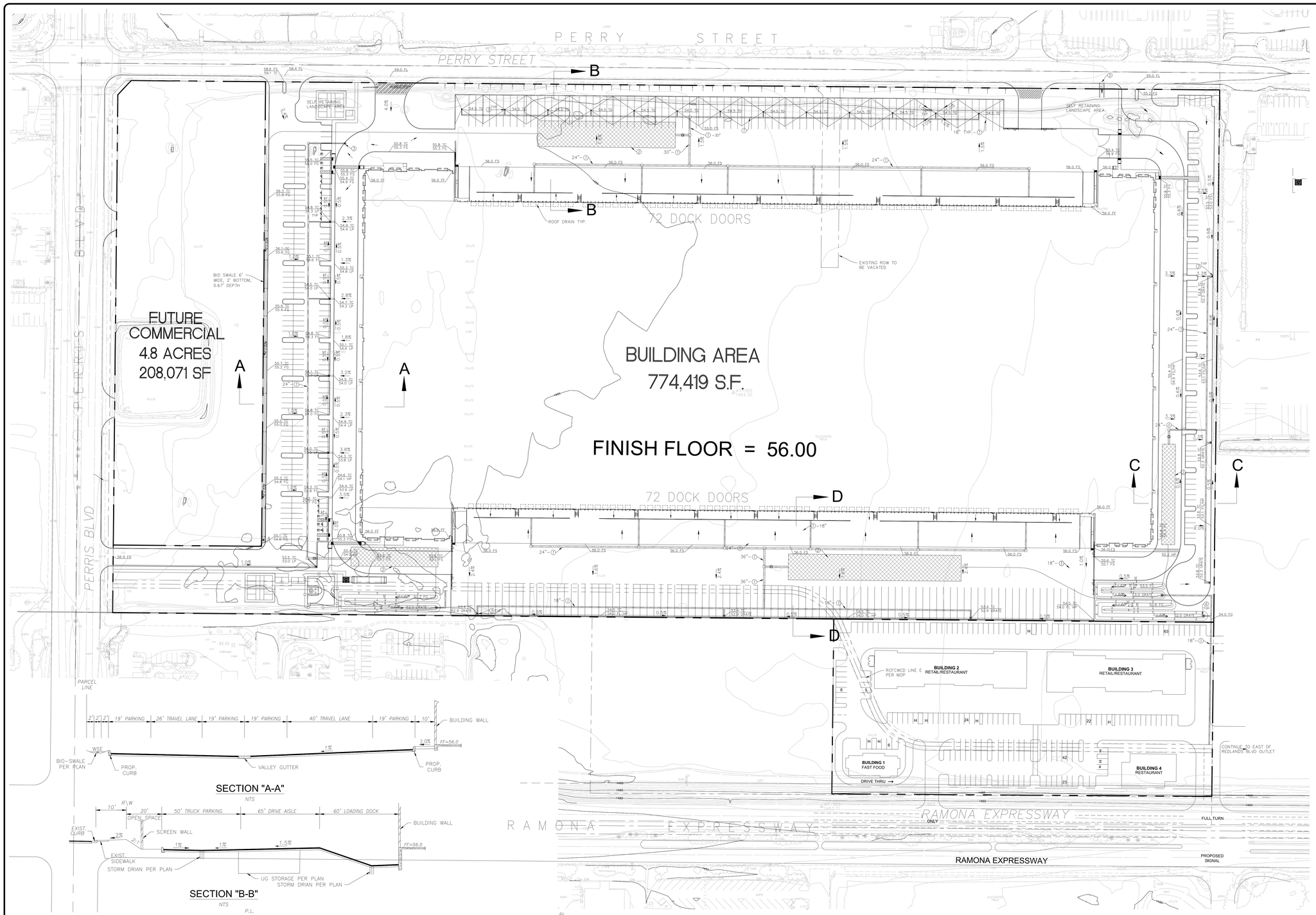
POST CONSTRUCTION BMP SITE PLAN NEC RAMONA EXPWY & PERRIS BLVD DPR 22-00006 DMA BMP MAP

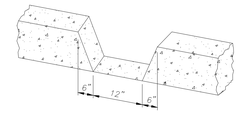
SHEET NO. 3 OF 3 SHEETS

FOR: OPTIMUS BUILDING CORPORATION | W.O. | CITY FILE NO. DPR 22–00006

Appendix 2: Construction Plans

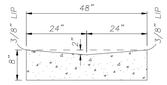
Grading and Drainage Plans





DETAIL "A" - CURB FACE OPENING

NTS



DETAIL "B" - VALLEY GUTTER

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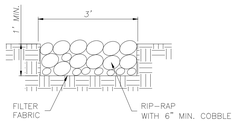

DETAIL "C" - RIP-RAP PAD

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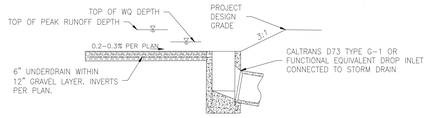

BIO-SWALE END DRAIN DETAIL

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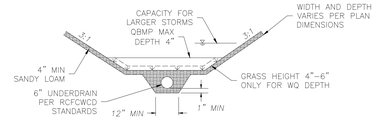

BIO-SWALE SECTION

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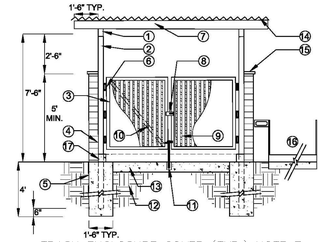

TRASH ENCLOSURE COVER (TYP.) NOTE 7

N.T.S.

TRASH ENCLOSRE COVER NOTES:
1. 4-INCH X 6-INCH METAL BEAM POWDER COATED
2. 4-INCH X 4-INCH TUBULAR STEEL POST, SET POST FLUSH TO WALL. GROUT FILL POST SOLID. PAINT WITH 2 COATS ZINC PRIMER & 2 COATS SATIN FINISH PAINT.
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NOTES
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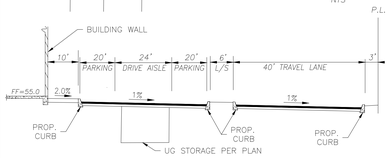
B. TRASH BINS - SIZE AND NUMBER AS REQUIRED BY CITY.

SECTION "A-A"

NTS

SECTION "B-B"

NTS



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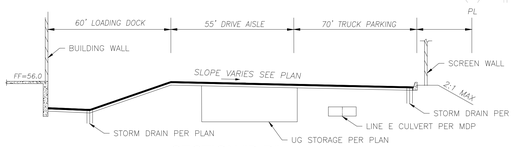

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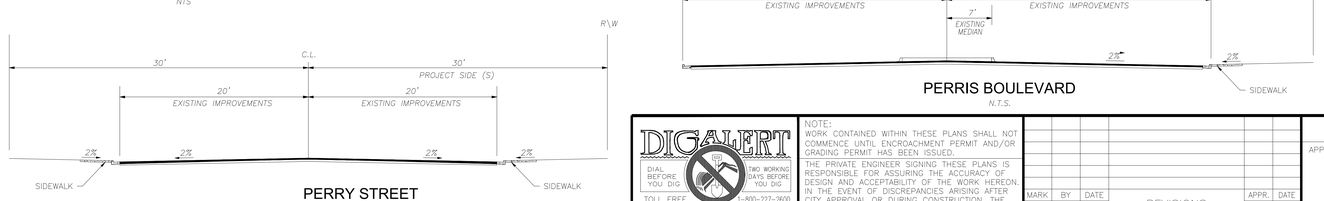
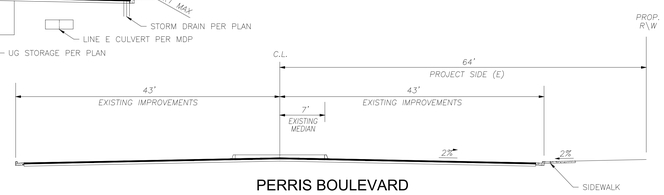


PERRY STREET

N.T.S.



PERRIS BOULEVARD

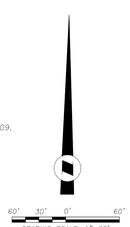
N.T.S.

LEGEND/ABBREVIATION

CF	CURB FACE	TC	TOP OF CURB		
FG	FINISH GRADE	TG	TOP OF GRATE		
FF	FINISHED FLOOR	SD	STORM DRAIN		
FL	FLOW LINE	P	PROPERTY LINE		
GB	GRADE BREAK	PED.	PEDESTRIAN		
HP	HIGH POINT	TYP.	TYPICAL		
INV	INVERT		EXISTING FIRE HYDRANT		
LP	LOW POINT		WATER VALVE		
R/W	RIGHT-OF-WAY		WATER METER		
P=XX.X	PAD ELEVATION		STREET LIGHT		
FF=XX.X	FINISH FLOOR ELEVATION		PROPOSED STORM DRAIN LINE		
2%	DIRECTION OF DRAINAGE/GRADE	1425	EXISTING CONTOUR		

CONSTRUCTION NOTES:

1. CONSTRUCT STORM DRAIN AND FITTINGS AT SIZES SHOWN.
2. CONSTRUCT CONTECH TYPE OR EQUIVALENT UNDERGROUND STORAGE SYSTEM PER PLAN.
3. CONSTRUCT GRATE INLET PER PLAN SIZING AND DETAIL PER GRADING PLAN
4. CONNECT EXISTING CATCH BASIN TO UNDERGOUND STORAGE VIA NEW SD LINES PER PLAN.
5. CONSTRUCT INVERTED UNDER SIDEWALK DRAIN CAST IN PLACE PER COUNTY OF RIVERSIDE STD. NO. 309.
6. INSTALL JENSEN PRECAST DROP INLET DI363636, WITH PEDESTRIAN GRATE.
7. INSTALL TRASH ENCLOSURE PER LANDSCAPE ARCHITECT PLAN.
8. INSTALL JENSEN PRECAST DROP INLET DI484848, WITH PEDESTRIAN GRATE.
9. INSTALL VALLEY GUTTER AT 0.5% SLOPE PER DETAIL B.



BGR NO. _____ WDID:

DIGALERT — DIAL BEFORE YOU DIG — TOLL FREE 1-800-227-2600 — A PUBLIC SERVICE BY UNDERGROUND SERVICE ALERT — TWO WORKING DAYS BEFORE YOU DIG

NOTE:
WORK CONTAINED WITHIN THESE PLANS SHALL NOT COMMENCE UNTIL ENCROACHMENT PERMIT AND/OR GRADING PERMIT HAS BEEN ISSUED.
THE PRIVATE ENGINEER SIGNING THESE PLANS IS RESPONSIBLE FOR ASSURING THE ACCURACY OF DESIGN AND ACCEPTABILITY OF THE WORK HEREON. IN THE EVENT OF DISCREPANCIES ARISING AFTER CITY APPROVAL OR DURING CONSTRUCTION, THE PRIVATE ENGINEER SHALL BE RESPONSIBLE DETERMINING AN ACCEPTABLE SOLUTION AND REVISING THE PLANS FOR APPROVAL BY CITY.

MARK	BY	DATE	REVISIONS	APPR.	DATE
				ENGINEER	CITY

DESIGN BY: DRAWN BY: CHECKED BY:

CITY OF PERRIS

APPROVED BY:

CITY ENGINEER DATE

SEAL—ENGINEER

REGISTERED PROFESSIONAL ENGINEER — CHRISTOPHER F. LENZ — NO. 63001 EXP. 6/30/24 — CIVIL — STATE OF CALIFORNIA

ueg — united engineering group
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Rancho Cucamonga, CA 91730
Phone: 909.466.9240
www.unitedeng.com

PREPARED UNDER THE DIRECTION OF:

CHRISTOPHER F. LENZ 63001

DATE: _____ REGISTRATION EXPIRES 6-30-24

BENCH MARK:
METRO WATER DISTRICT SO. CALIFORNIA DISC SET ON EAST SIDE OF BASE OF STEEL TRAFFIC SIGNAL LIGHT AT THE SOUTHWEST CORNER OF INTERSECTION OF PERRIS BVLD AND RIDER STREET. RIVERSIDE COUNTY BENCHMARK NUMBER BM-432 - DX5439

ELEVATION = 1455.11' NAVD 88

SCALE 1"=60'
FIELD BOOK
DESIGN
DRAWN
CHECKED

ZONING CASE #DPR 22-00006 SPA 22-05047
PERRIS, CA, 92571
COUNTY OF RIVERSIDE

PRELIMINARY GRADING & DRAINAGE PLAN NEC RAMONA & PERRIS PRELIMINARY DESIGN PLAN

FOR: OPTIMUS BUILDING CORP. W.O. CITY FILE NO. DPR 22-00006

SHEET NO. 1 OF 1 SHEETS

Appendix 3: Soils Information

Geotechnical Study and Other Infiltration Testing Data

Earth Strata Geotechnical Services, Inc.
Geotechnical, Environmental and Materials Testing Consultants

December 9, 2021 Project No. 213885-12A

Optimus Building Corp.
c/o Mr. Michael Naggar at
Mike Naggar & Associates, Inc
445 S. D St.
Perris, CA 92570

Subject: **Infiltration Testing for Water Quality Treatment Areas, Proposed Commercial Warehouse, Assessor's Parcel Number 302-130-002, 302-130-008, 302-130-018, 302-130-021 through 302-130-024, and 302-130-027, Located on Ramona Expressway and Perris Boulevard, City of Perris, Riverside County, California**

INTRODUCTION

Earth Strata Geotechnical Services is pleased to present this infiltration feasibility report for the proposed commercial warehouse, Assessor Parcel Numbers 302-130-002, 302-130-008, 302-130-018, 302-130-021 through 302-130-024, and 302-130-027, located on the northeast corner of Ramona Expressway and Perris Boulevard, in the City of Perris, Riverside County, California. The purpose of our study was to determine the infiltration rates and physical characteristics of the subsurface earth materials at the approximate depth of the proposed WQMP area within the proposed development. This feasibility report provides the infiltration rates to be used for the design and the development of the water quality management plan, where applicable.

PROPERTY DESCRIPTION

The subject property is located on the northeast corner of Ramona Expressway and Perris Boulevard in the City of Perris, Riverside County, California. The approximate location of the site is shown on the Vicinity Map, Figure 1.

The subject property is comprised of approximately 48.41 acres of undeveloped land. The site has not been graded. Topographic relief at the subject property is relatively low with the terrain being generally flat. Elevations at the site range from approximately 1,450 to 1,460 feet above mean sea level (msl), for a difference of about 10± feet across the entire site. Drainage within the subject property generally flows to the southeast.

The site is currently bordered by commercial retail and commercial/industrial. Most of the vegetation on the site consists of moderate amounts of annual weeds/grasses.

PROPOSED CONSTRUCTION

Based on plans provided, the proposed development as illustrated on the conceptual grading plans will consist of a commercial warehouse development complete with utilities, driveways, and parking.

SUBSURFACE EXPLORATION

Subsurface Exploration

Subsurface exploration within the subject site was performed on December 8, 2021, for the exploratory excavations. A truck mounted hollow-stem-auger drill rig was utilized to drill five (5) borings throughout the site to a maximum depth of 16.5 feet. The exploratory holes were excavated for geotechnical evaluation purposes with respect to the proposed developments and to interpret whether groundwater or impermeable soil layers were present. An underground utilities clearance was obtained from Underground Service Alert of Southern California, prior to the subsurface exploration. The approximate locations of the exploratory excavations are shown on the attached Infiltration Location Map, Plate 1 and descriptive logs are presented in Appendix A.

Earth materials encountered during exploration were classified and logged in general accordance with the Standard Practice for Description and Identification of Soils (Visual-Manual Procedure) of ASTM D 2488. Upon completion of laboratory testing, exploratory logs and sample descriptions may have been reconciled to reflect laboratory test results with regard to ASTM D 2487.

Earth Materials

A general description of the earth materials observed on site is provided below.

- Topsoil (no map symbol): Residual topsoil, encountered in the upper 1 to 2 feet, blankets the site and underlying bedrock. These materials were noted to be generally light brown, silty sand which were very porous, dry and in a medium dense state.

- Quaternary Very Old Fan Deposits (map symbol Qvof): Quaternary very old fan deposits were encountered to the full depth of our exploration. The very old fan deposits consist predominately of light to dark brown to reddish brown, clayey sand and silty sand. These deposits were generally noted to be in a dry to moist, medium dense to very dense state.

INFILTRATION TESTING

The double ring infiltrometer test method was utilized to perform a total of four (4) infiltration tests on November 15, 2021, to evaluate near surface infiltration rates in order to estimate the amount of storm water runoff that can infiltrate into the onsite water quality treatment plan areas. The infiltration tests were performed in general accordance with the requirements of double ring infiltration testing, ASTM D3385 and Appendix A of the Riverside County Flood Control and Water Conservation District.

The infiltration tests were performed using double ring infiltrometer and Mariotte tubes at a depth of 5 feet below existing grades. The locations of the infiltration tests are indicated on the attached infiltration Location Map, Plate 1. The double ring infiltrometer tests were located by property boundary measurement on the site plan and by using geographic features. Infiltration test data recorded in the field are summarized in the following table and is included within Appendix B including the graph of Infiltration Rate versus Elapsed Time.

Infiltration Test Summary

TEST NUMBER	INFILTRATION HOLE DEPTH (ft.)	INFILTRATION RATE (in/hr)	DESCRIPTION
DR-1	5	0.79	Silty SAND
DR-2	5	0.92	Silty SAND
DR-3	5	1.00	Silty SAND
DR-4	5	0.83	Silty SAND

The infiltration test rates ranged from 0.79 to 1.00 inches per hour (in/hr).

CONCLUSIONS AND RECOMMENDATIONS

General

From geotechnical and engineering geologic points of view, the proposed WQMP areas, where tested, is considered suitable for infiltration for the proposed development, provided the following conclusions and recommendations are incorporated into the plans and are implemented during construction.

Groundwater

Groundwater was not observed during our subsurface exploration to a total depth of 16.5 feet. Potential groundwater impact is considered very low. Local well data indicates regional groundwater highs approximately 55 feet below existing surface, which meets the minimum separation of >10 feet from the bottom of infiltration facility to the groundwater mark.

Geologic/ Geotechnical Screening

The proposed structures will be supported by compacted fill and competent earth materials, with groundwater at a depth of approximately 55 feet. According to the County of Riverside reports, the subject site is located in an area where liquefaction potential is considered low to high. As such, the potential for earthquake induced liquefaction and lateral spreading beneath the proposed structures is considered low due to the recommended compacted fill, relatively low groundwater level, and the dense nature of the deeper onsite earth materials.

Preliminary laboratory test results indicate onsite earth materials exhibit an expansion potential of ***VERY LOW** as classified in accordance with 2019 CBC Section 1803.5.3 and ASTM D4829.

Therefore, infiltration within the proposed WQMP areas will not encroach on any proposed structures and will not increase the risk of geologic hazards.

Recommended Factor of Safety

The recommended factor of safety for the infiltration design is 3.

Based on the data presented in this report and the recommendations set forth herein, it is the opinion of Earth Strata Geotechnical Services that the WQMP area can be designed for an infiltration rate of 0.26 inches per hour (in/hr) in the vicinity of DR-1, 0.31 in/hr in the vicinity of DR-2, 0.33 in/hr in the vicinity of DR-3, and 0.28 in/hr in the vicinity of DR-4.

GRADING PLAN REVIEW AND CONSTRUCTION SERVICES

This report has been prepared for the exclusive use of **OPTIMUS BUILDING CORP.** and their authorized representative. It likely does not contain sufficient information for other parties or other uses. Earth Strata should be engaged to review the final design plans and specifications prior to construction. This is to verify that the recommendations contained in this report have been properly incorporated into the project plans and specifications. Should Earth Strata not be accorded the opportunity to review the project plans and specifications, we are not responsibility for misinterpretation of our recommendations.

Earth Strata should be retained to provide observations during construction to validate this report. In order to allow for design changes in the event that the subsurface conditions differ from those anticipated prior to construction.

Earth Strata should review any changes in the project and modify and approve in writing the conclusions and recommendations of this report. This report and the drawings contained within are intended for design input purposes only and are not intended to act as construction drawings or specifications. In the event that conditions encountered during grading or construction operations appear to be different than those indicated in this report, this office should be notified immediately, as revisions may be required.

REPORT LIMITATIONS

Our services were performed using the degree of care and skill ordinarily exercised, under similar circumstances, by reputable soils engineers and geologists, practicing at the time and location this report was prepared. No other warranty, expressed or implied, is made as to the conclusions and professional advice included in this report.

Earth materials vary in type, strength, and other geotechnical properties between points of observation and exploration. Groundwater and moisture conditions can also vary due to natural processes or the works of man on this or adjacent properties. As a result, we do not and cannot have complete knowledge of the subsurface conditions beneath the subject property. No practical study can completely eliminate uncertainty with regard to the anticipated geotechnical conditions in connection with a subject property.

The conclusions and recommendations within this report are based upon the findings at the points of observation and are subject to confirmation by Earth Strata during construction. This report is considered valid for a period of one year from the time the report was issued.

This report was prepared with the understanding that it is the responsibility of the owner or their representative, to ensure that the conclusions and recommendations contained herein are brought to the attention of the other project consultants and are incorporated into the plans and specifications. The owners' contractor should properly implement the conclusions and recommendations during grading and construction, and notify the owner if they consider any of the recommendations presented herein to be unsafe or unsuitable.

Respectfully submitted,

EARTH STRATA GEOTECHNICAL SERVICES

Stephen M. Poole, PE 40219
President
Principal Engineer

REGISTERED PROFESSIONAL ENGINEER
STEPHEN MICHAEL POOLE
No. 40219
CIVIL
STATE OF CALIFORNIA

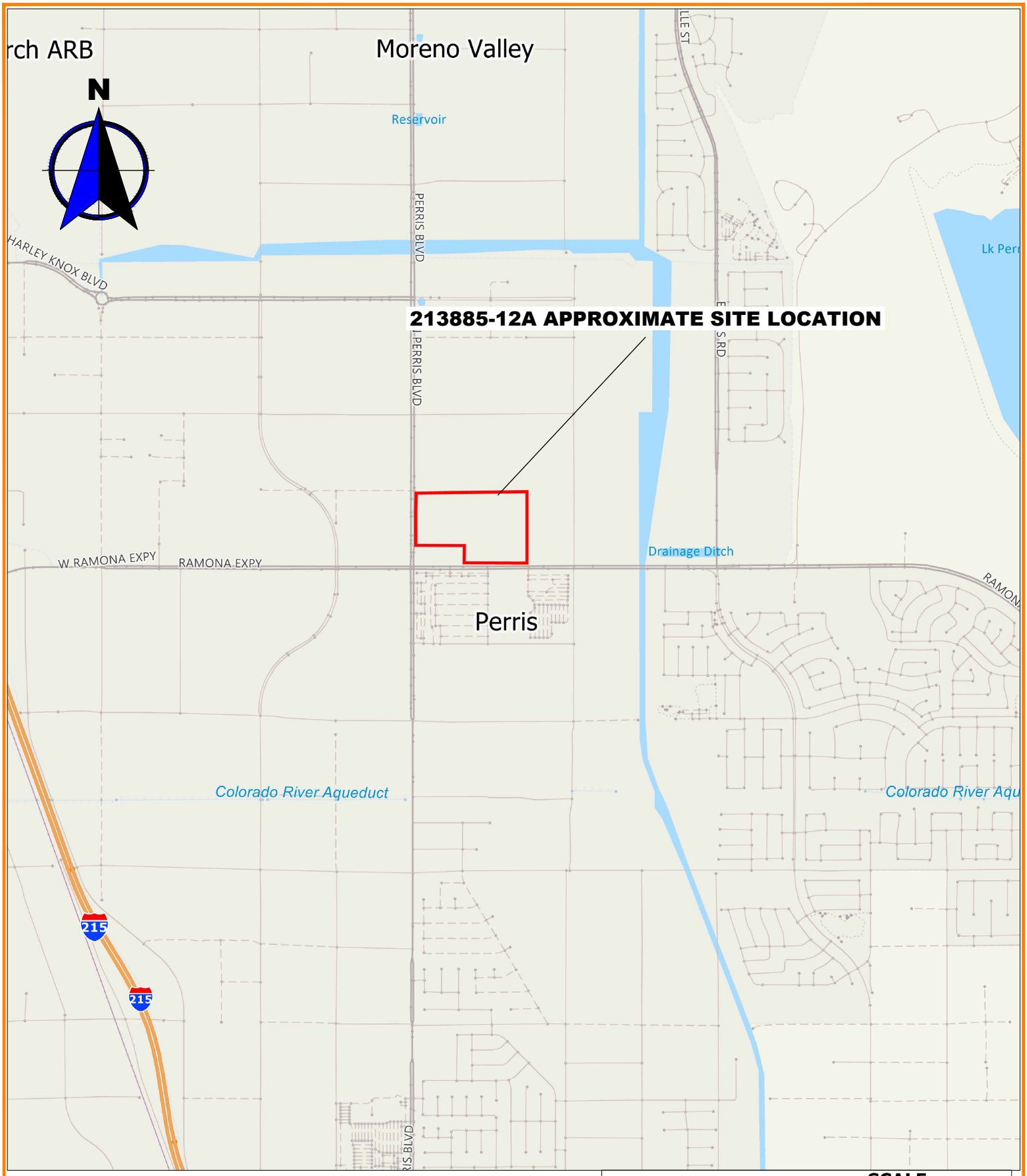
SMP/snj

Distribution: (1) Addressee

Attachments: Figure 1 – Vicinity Map *(Rear of Text)*
Appendix A – Exploratory Logs *(Rear of Text)*
Appendix B – Infiltration Test Sheets *(Rear of Text)*
Plate 1 – Infiltration Location Map *(Rear of Text)*

FIGURE 1

VICINITY MAP



Earth Strata Geotechnical Services, Inc.
Geotechnical, Environmental and Materials Testing Consultants
www.ESGSINC.com (951) 397-8315

PROPOSED COMMERCIAL WAREHOUSE	213885-12A
VICINITY MAP	SEE BAR SCALE
	NOV 2021 / FIGURE 1

APPENDIX A

EXPLORATORY LOGS

Test No.	DR-1	Location	See Map	Turf-Tec International - Record Chart for IN10-W - (12 & 24 Inch Infiltration Rings)

Earth Strata Geotechnical Services, Inc.
Geotechnical, Environmental and Materials Testing Consultants
www.ESGSINC.com (951) 397-8315

Project Identification:	213885-12A; Perris Boulevard, Perris			**Constants**	**Area cm2**	**Depth of Liquid (cm)**	**Liquid Container Number**		**Marriotte Tube Volume**	
Test Location:	DR-1			**Inner Ring**	729	10.0	1		3000	
Liquid Used:	TAP WATE	**pH:**	8.0	**Annular Ring**	2189	10.0	2		10000	
Tested By:	JMR2	**Date**	11/15/2021	**Liquid level maintained**	(X) Flow Valve	( ) Float Valve	( ) Mariotte Tubes			
Depth to water table:		**Depth of Test**	6'	**Penetration Depth of Outer Ring:**	9 cm	**Other**				

Trial #	Start / End	Date MM/DD/YY	Time HR:MIN	Time Increment /(Total)	Elapsed Time (Min)	Flow Readings: Inner Ring Reading cm	Inner Maroitte Tube Flow (ml)	Annular Space Reading cm	Annular Space Marriotte Tube Flow (ml)	Liquid Temp °F	Infiltration Rates: Inner Infiltration Rate cm/h	Inner Infiltration Rate In/h	Annular Infiltration Rate cm/h	Annular Infiltration Rate In/h	Ground Temperature: Ground Temp Depth (cm)	Temp at Depth (c)	Remarks: Weather conditions Etc...
1	Start Test	11/15/2021	11:30	0:30	30												
	End Test	11/15/2021	12:00	0:30		6.00	1620.8	6.00	3241.63		4.45	**1.75**	2.96	**1.17**			
2	Start Test	11/15/2021	12:02	0:30	60												
	End Test	11/15/2021	12:32	1:00		6.00	1620.8	6.00	2778.5		4.45	**1.75**	2.54	**1.00**			
3	Start Test	11/15/2021	12:34	0:30	90												
	End Test	11/15/2021	13:04	1:30		6.00	1389.27	6.00	2778.5		3.81	**1.50**	2.54	**1.00**			
4	Start Test	11/15/2021	13:05	0:30	120												
	End Test	11/15/2021	13:35	2:00		6.00	1157.7	6.00	2778.5		3.18	**1.25**	2.54	**1.00**			
5	Start Test	11/15/2021	13:37	0:30	150												
	End Test	11/5/2021	14:07	2:30		6.00	1157.7	6.00	2546.9		3.18	**1.25**	2.33	**0.92**			
6	Start Test	11/15/2021	14:08	0:30	180												
	End Test	11/15/2021	14:38	3:00		6.00	1577.7	6.00	2315.4		4.33	**1.70**	2.12	**0.83**			
7	Start Test	11/15/2021	14:41	0:30	210												
	End Test	11/15/2021	15:11	3:30		6.00	926.18	6.00	2315.4		2.54	**1.00**	2.12	**0.83**			
8	Start Test	11/15/2021	15:12	0:30	240												
	End Test	11/15/2021	15:42	4:00		6.00	926.18	6.00	2199.9		2.54096022	**1.00**	2.01	**0.79**			

Turf-Tec International

Project Identification:	213885-12A; Perris Boulevard, Perris		
Test Location:	DR-1		
Liquid Used:	TAP WATE	**pH:**	8.0
Tested By:	JMR2		
Depth to water table:	0		

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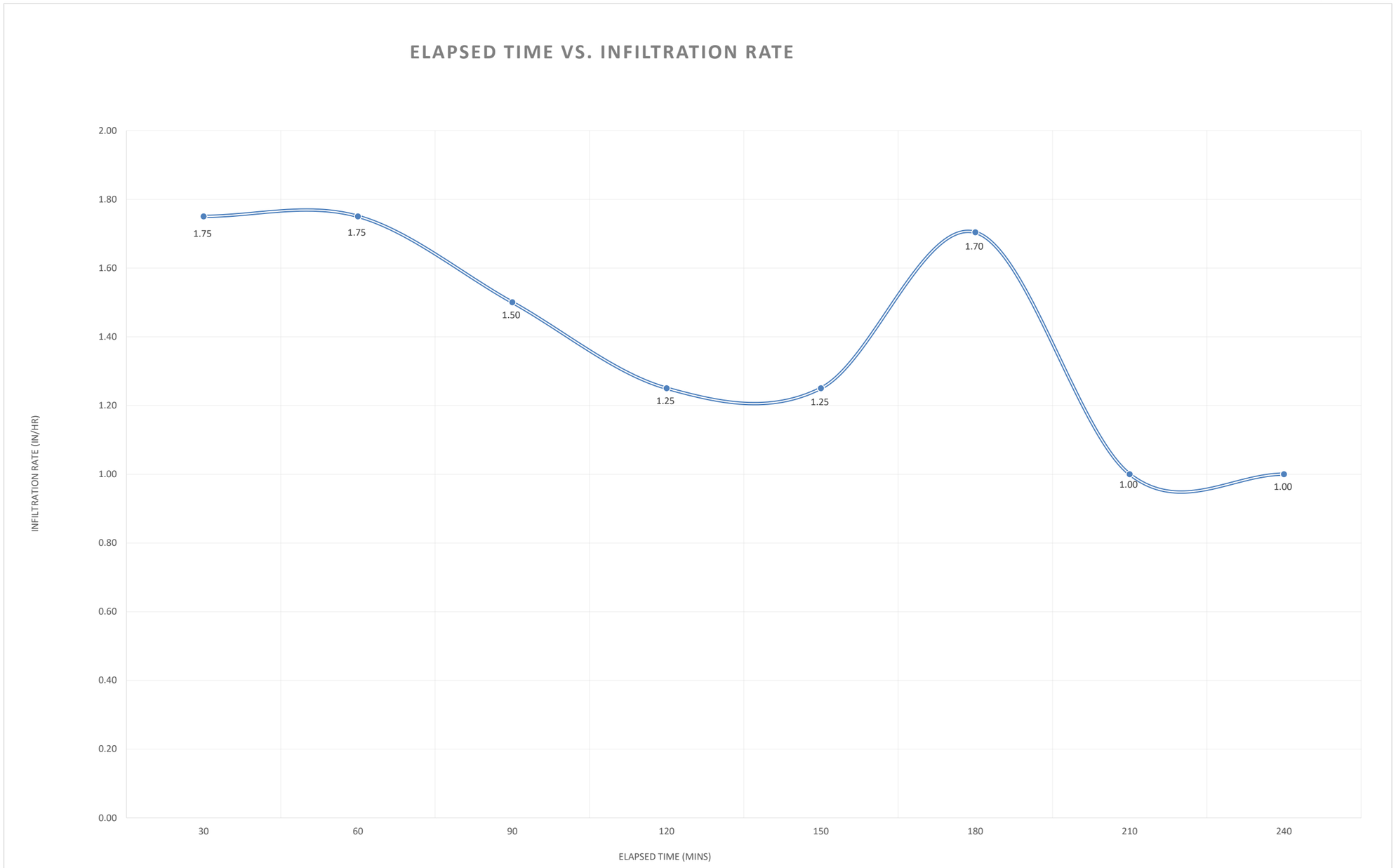

Test No.	DR-2	Location	See Map

Turf-Tec International - Record Chart for IN10-W - (12 & 24 Inch Infiltration Rings)

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				Constants	Area cm2	Depth of Liquid (cm)	Liquid Container Number	Marriotte Tube Volume
Project Identification:	213885-12A; Perris Boulevard, Perris							
Test Location:	DR-2			**Inner Ring**	729	10.0	1	3000
Liquid Used:	TAP WATE	**pH:**	8.0	**Annular Ring**	2189	10.0	2	10000
Tested By:	JMR2	**Date**	11/24/2021	**Liquid level maintained**	(X) Flow Valve ( ) Float Valve ( ) Mariotte Tubes			
Depth to water table:	> 30 Feet	**Depth of Test**	6'	**Penetration Depth of Outer Ring:**	9 cm	**Other**		

Trial #	Start / End	Date MM/DD/YY	Time HR:MIN	Time Increment /(Total)	Elapsed Time (Min)	Flow Readings: Inner Ring Reading cm	Inner Maroitte Tube Flow (ml)	Annular Space Reading cm	Annular Space Marriotte Tube Flow (ml)	Liquid Temp °F	Infiltration Rates: Inner Infiltration Rate cm/h	Inner Infiltration Rate In/h	Annular Infiltration Rate cm/h	Annular Infiltration Rate In/h	Ground Temperature: Ground Temp Depth (cm)	Temp at Depth (c)	Remarks: Weather conditions Etc...
	Start Test	11/15/2021	12:05	0:30	30	5.00		5.00									
1	End Test	11/15/2021	12:35	0:30		5.00	1389	5.00	3241.63		3.81	**1.50**	2.96	**1.17**			
	Start Test	11/15/2021	12:37	0:30	60	5.00		5.00									
2	End Test	11/15/2021	13:07	1:00		6.00	1389.27	5.00	3010.8		3.81	**1.50**	2.75	**1.08**			
	Start Test	11/15/2021	13:08	0:30	90	5.00		5.00									
3	End Test	11/15/2021	13:38	1:30		5.00	926.18	5.00	3010.8		2.54	**1.00**	2.75	**1.08**			
	Start Test	11/15/2021	13:39	0:30	120	5.00		5.00									
4	End Test	11/15/2021	14:09	2:00		5.00	926.18	5.00	2778.5		2.54	**1.00**	2.54	**1.00**			
	Start Test	11/15/2021	14:11	0:30	150	5.00		5.00									
5	End Test	11/5/2021	14:41	2:30		5.00	810.4	5.00	2778.5		2.22	**0.88**	2.54	**1.00**			
	Start Test	11/15/2021	14:42	0:30	180	5.00		5.00									
6	End Test	11/15/2021	15:12	3:00		5.00	694.63	5.00	2546.9		1.91	**0.75**	2.33	**0.92**			
	Start Test	11/15/2021	15:13	0:30	210	5.00		5.00									
7	End Test	11/15/2021	15:43	3:30		5.00	694.63	5.00	2662.76		1.91	**0.75**	2.43	**0.96**			
	Start Test	11/15/2021	15:44	0:30	240	5.00		5.00									
8	End Test	11/15/2021	16:14	4:00		5.00	694.63	5.00	2546.9		1.91	**0.75**	2.33	**0.92**			

Turf-Tec International

Project Identification:	213885-12A; Perris Boulevard, Perris		
Test Location:	DR-2		
Liquid Used:	TAP WATE	**pH:**	8.0
Tested By:	JMR2		
Depth to water table:	> 30 Feet		

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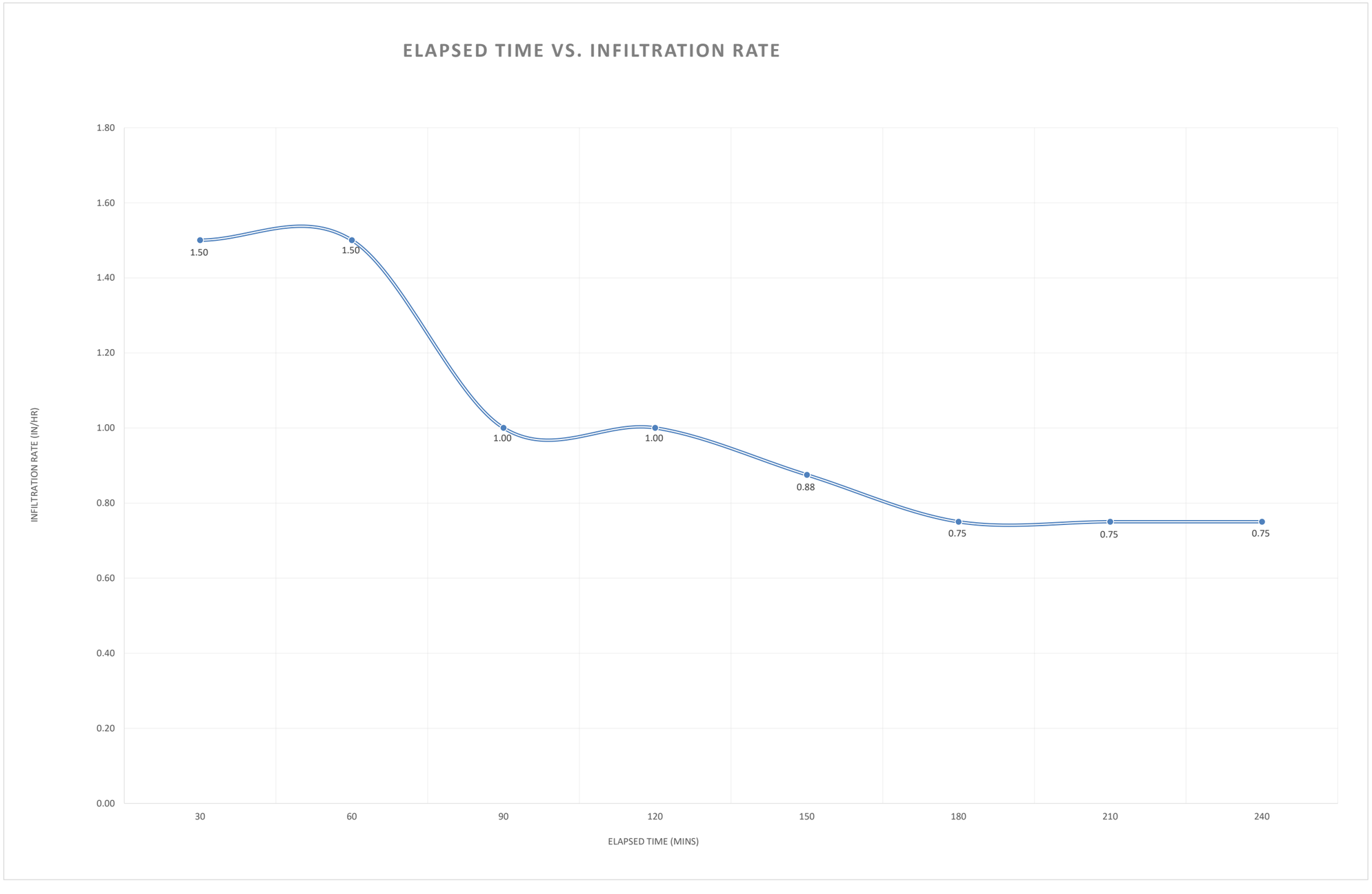

Turf-Tec International - Record Chart for IN10-W - (12 & 24 Inch Infiltration Rings)

Test No.	DR-3	Location	See Map

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				Constants	Area cm2	Depth of Liquid (cm)	Liquid Container Number	Marriotte Tube Volume
Project Identification:	213885-12A; Perris Boulevard, Perris							
Test Location:	DR-3			Inner Ring	729	10.0	1	3000
Liquid Used:	TAP WATE	pH:	8.0	Annular Ring	2189	10.0	2	10000
Tested By:	JMR2	Date	11/24/2021	Liquid level maintained	(X) Flow Valve ( ) Float Valve ( ) Mariotte Tubes			
Depth to water table:	> 30 Feet	Depth of Test	6'	Penetration Depth of Outer Ring:	9 cm			Other

Trial #	Start / End	Date MM/DD/YY	Time HR:MIN	Time Increment /(Total)	Elapsed Time (Min)	Flow Readings: Inner Ring Reading cm	Inner Maroitte Tube Flow (ml)	Annular Space Reading cm	Annular Space Marriotte Tube Flow (ml)	Liquid Temp ºF	Infiltration Rates: Inner Infiltration Rate cm/h	Inner Infiltration Rate In/h	Annular Infiltration Rate cm/h	Annular Infiltration Rate In/h	Ground Temperature: Ground Temp Depth (cm)	Temp at Depth (c)	Remarks: Weather conditions Etc...
1	Start Test	11/15/2021	11:00	0:30	30	5.00		5.00									
	End Test	11/15/2021	11:30	0:30		5.00	2083.9	5.00	3704.7		5.72	2.25	3.38	1.33			
2	Start Test	11/15/2021	11:32	0:30	60	5.00		5.00									
	End Test	11/15/2021	12:02	1:00		6.00	2083.9	5.00	3704.7		5.72	2.25	3.38	1.33			
3	Start Test	11/15/2021	12:04	0:30	90	5.00		5.00									
	End Test	11/15/2021	12:34	1:30		5.00	2083.9	5.00	3473.1		5.72	2.25	3.17	1.25			
4	Start Test	11/15/2021	12:36	0:30	120	5.00		5.00									
	End Test	11/15/2021	13:06	2:00		5.00	1736.5	5.00	3010.08		4.76	1.88	2.75	1.08			
5	Start Test	11/15/2021	13:08	0:30	150	5.00		5.00									
	End Test	11/5/2021	13:38	2:30		5.00	1620.8	5.00	3010.08		4.45	1.75	2.75	1.08			
6	Start Test	11/15/2021	13:39	0:30	180	5.00		5.00									
	End Test	11/15/2021	14:09	3:00		5.00	1620.8	5.00	3010.08		4.45	1.75	2.75	1.08			
7	Start Test	11/15/2021	14:11	0:30	210	5.00		5.00									
	End Test	11/15/2021	14:41	3:30		5.00	1620.8	5.00	2778.5		4.45	1.75	2.54	1.00			
8	Start Test	11/15/2021	14:42	0:30	240	5.00		5.00									
	End Test	11/15/2021	15:12	4:00		5.00	1620.8	5.00	2778.5		4.45	1.75	2.54	1.00			

Turf-Tec International

Project Identification:	213885-12A; Perris Boulevard, Perris		
Test Location:	DR-3		
Liquid Used:	TAP WATE	**pH:**	8.0
Tested By:	JMR2		
Depth to water table:	> 30 Feet		

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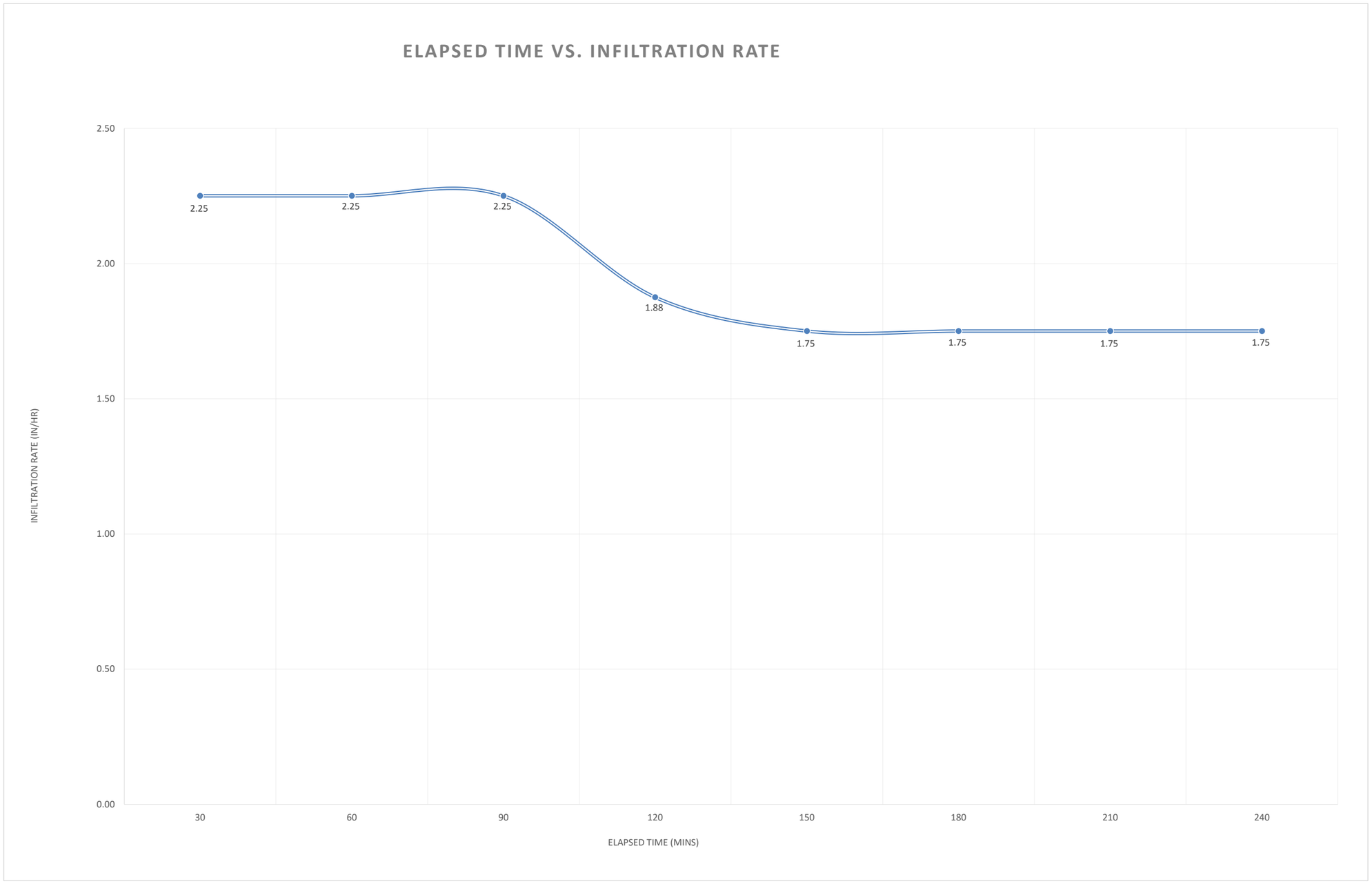

Test No.	DR-4	Location	See Map	Turf-Tec International - Record Chart for IN10-W - (12 & 24 Inch Infiltration Rings)

Project Identification:	213885-12A; Perris Boulevard, Perris			**Constants**	**Area cm2**	**Depth of Liquid (cm)**	**Liquid Container Number**		**Marriotte Tube Volume**	Earth Strata Geotechnical Services, Inc.
Test Location:	DR-4			**Inner Ring**	729	10.0	1		3000	Geotechnical, Environmental and Materials Testing Consultants
Liquid Used:	TAP WATE	**pH:**	8.0	**Annular Ring**	2189	10.0	2		10000	www.ESGSINC.com (951) 397-8315
Tested By:	JMR2	**Date**	11/24/2021	**Liquid level maintained**	(X) Flow Valve	( ) Float Valve	( ) Mariotte Tubes			
Depth to water table:	> 30 Feet	**Depth of Test**	6'	**Penetration Depth of Outer Ring:**	9 cm	**Other**				

Trial #	Start / End	Date MM/DD/YY	Time HR:MIN	Time Increment /(Total)	Elapsed Time (Min)	Flow Readings				Liquid Temp ºF	Infiltration Rates				Ground Temperature		Remarks
						Inner Ring Reading cm	Inner Maroitte Tube Flow (ml)	Annular Space Reading cm	Annular Space Marriotte Tube Flow (ml)		Inner Infiltration Rate cm/h	Inner Infiltration Rate In/h	Annular Infiltration Rate cm/h	Annular Infiltration Rate In/h	Ground Temp Depth (cm)	Temp at Depth (c)	Weather conditions Etc...
	Start Test	11/15/2021	11:25	0:30	30	5.00		5.00									
1	End Test	11/15/2021	11:55	0:30		5.00	1620.8	5.00	3704.72		4.45	**1.75**	3.38	**1.33**			
	Start Test	11/15/2021	11:57	0:30	60	5.00		5.00									
2	End Test	11/15/2021	12:27	1:00		6.00	1389.27	5.00	3125.8		3.81	**1.50**	2.86	**1.12**			
	Start Test	11/15/2021	12:29	0:30	90	5.00		5.00									
3	End Test	11/15/2021	12:59	1:30		5.00	1389.27	5.00	3010.01		3.81	**1.50**	2.75	**1.08**			
	Start Test	11/15/2021	13:00	0:30	120	5.00		5.00									
4	End Test	11/15/2021	13:30	2:00		5.00	1157.7	5.00	3010.01		3.18	**1.25**	2.75	**1.08**			
	Start Test	11/15/2021	13:32	0:30	150	5.00		5.00									
5	End Test	11/5/2021	14:02	2:30		5.00	926.18	5.00	2315.4		2.54	**1.00**	2.12	**0.83**			
	Start Test	11/15/2021	14:03	0:30	180	5.00		5.00									
6	End Test	11/15/2021	14:33	3:00		5.00	694.635	5.00	2315.4		1.91	**0.75**	2.12	**0.83**			
	Start Test	11/15/2021	14:34	0:30	210	5.00		5.00									
7	End Test	11/15/2021	15:04	3:30		5.00	694.635	5.00	2315.4		1.91	**0.75**	2.12	**0.83**			
	Start Test	11/15/2021	15:05	0:30	240	5.00		5.00									
8	End Test	11/15/2021	15:35	4:00		5.00	694.635	5.00	2315.4		1.91	**0.75**	2.12	**0.83**			

Turf-Tec International

Project Identification:	213885-12A; Perris Boulevard, Perris		
Test Location:	DR-4		
Liquid Used:	TAP WATE	**pH:**	8.0
Tested By:	JMR2		
Depth to water table:	> 30 Feet		

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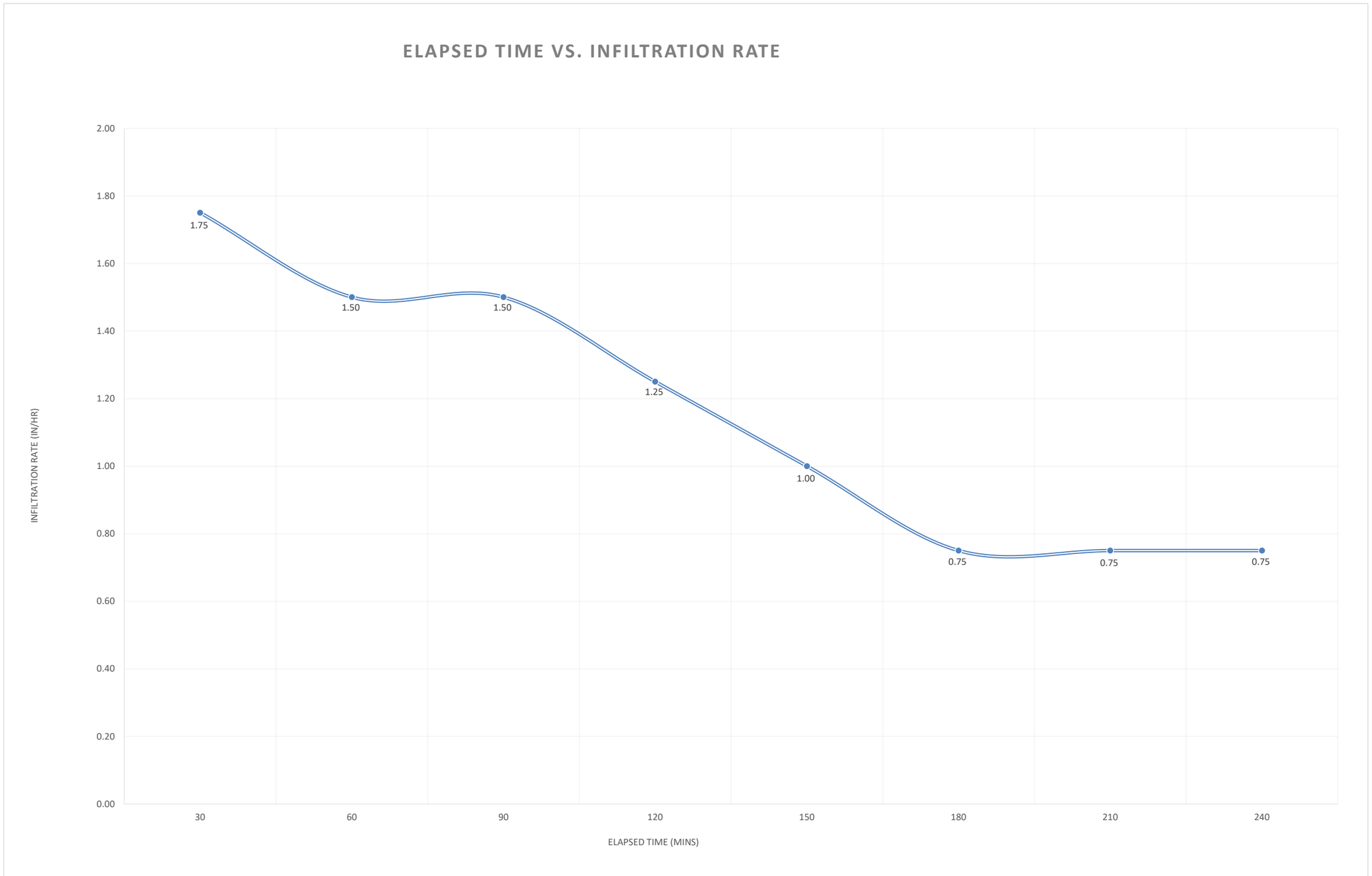

APPENDIX B

INFILTRATION TEST SHEETS

Geotechnical Boring Log B-1

Date: December 8, 2021	**Project Name: Perris Boulevard** **Page: 1 of 1**
Project Number: 213885-10A	**Logged By: JMR**
Drilling Company: Drilling It	**Type of Rig: AMS45**
Drive Weight (lbs): 140	**Drop (in): 30** **Hole Diameter (in): 8**
Top of Hole Elevation (ft): See Map	**Hole Location: See Geotechnical Map**

Depth (ft)	Blow Count Per Foot	Sample Depth	Dry Density (pcf)	Moisture (%)	Classification Symbol	MATERIAL DESCRIPTION
0						**Topsoil**
					SM	Silty SAND; light brown, dry, medium dense, fine to coarse sand
	16	2.5'				**Quaternary Very Old Fan Deposits (Qvof)**
					SM	Silty SAND; light brown, dry, medium dense, medium to coarse sand
5	24	5'			SC	Clayey SAND; dark brown, slightly moist, medium dense, fine to coarse sand
	36	7.5'				Becomes dense below 7 feet
10	43	10'				Moist below 10 feet
15	48	15'				
						Total Depth: 16.5 feet
						No Groundwater
20						
25						
30						

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Geotechnical Boring Log B-2

Date: December 8, 2021	**Project Name: Perris Boulevard** **Page: 1 of 1**
Project Number: 213885-10A	**Logged By: JMR**
Drilling Company: Drilling It	**Type of Rig: AMS45**
Drive Weight (lbs): 140	**Drop (in): 30** **Hole Diameter (in): 8**
Top of Hole Elevation (ft): See Map	**Hole Location: See Geotechnical Map**

Depth (ft)	Blow Count Per Foot	Sample Depth	Dry Density (pcf)	Moisture (%)	Classification Symbol	MATERIAL DESCRIPTION
0						**Topsoil**
					SM	Silty SAND; light brown, dry, medium dense, fine to coarse sand
	46	2.5'				**Quaternary Very Old Fan Deposits (Qvof)**
					SM	Silty SAND; reddish brown, dry, dense, fine to coarse sand
5						
	52	5'			SC	Clayey SAND; light brown, slightly moist, very dense, fine to coarse sand
	55	7.5'				Moist below 7 feet
10	88	10'				
						Total Depth: 11.5 feet
						No Groundwater
15						
20						
25						
30						

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Geotechnical Boring Log B-4

Date: December 8, 2021	**Project Name: Perris Boulevard** **Page: 1 of 1**
Project Number: 213885-10A	**Logged By: JMR**
Drilling Company: Drilling It	**Type of Rig: AMS45**
Drive Weight (lbs): 140	**Drop (in): 30** **Hole Diameter (in): 8**
Top of Hole Elevation (ft): See Map	**Hole Location: See Geotechnical Map**

Depth (ft)	Blow Count Per Foot	Sample Depth	Dry Density (pcf)	Moisture (%)	Classification Symbol	MATERIAL DESCRIPTION
0						**Topsoil**
					SM	Silty SAND; light brown, dry, medium dense, fine to coarse sand
	61	2.5'				**Quaternary Very Old Fan Deposits (Qvof)**
					SM	Silty SAND; light brown, dry, very dense, fine to medium sand with clay
5	47	5'				Slightly moist, dense 5 to 7 feet
	27	7.5'				Moist, medium dense 7 to 10 feet
10	58	10'			SC	Clayey SAND; light brown, moist, very dense, fine to coarse sand
						No Recovery at 10 feet
						Total Depth: 11.5 feet
						No Groundwater
15						
20						
25						
30						

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Geotechnical Boring Log B-4

Date: December 8, 2021	**Project Name: Perris Boulevard** **Page: 1 of 1**
Project Number: 213885-10A	**Logged By: JMR**
Drilling Company: Drilling It	**Type of Rig: AMS45**
Drive Weight (lbs): 140	**Drop (in): 30** **Hole Diameter (in): 8**
Top of Hole Elevation (ft): See Map	**Hole Location: See Geotechnical Map**

Depth (ft)	Blow Count Per Foot	Sample Depth	Dry Density (pcf)	Moisture (%)	Classification Symbol	MATERIAL DESCRIPTION
0						**Topsoil**
					SM	Silty SAND; light brown, dry, medium dense, fine to coarse sand
	32	2.5'				**Quaternary Very Old Fan Deposits (Qvof)**
					SM	Silty SAND; light brown, slightly moist, dense, fine to medium sand
5	44	5'				
	49	7.5'			SC	Clayey SAND; medium brown, slight moist, dense, fine to coarse sand
10	79	10'				Very dense below 10 feet
						Total Depth: 11.5 feet
						No Groundwater
15						
20						
25						
30						

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Geotechnical Boring Log B-5

Date: December 8, 2021	**Project Name: Perris Boulevard** **Page: 1 of 1**
Project Number: 213885-10A	**Logged By: JMR**
Drilling Company: Drilling It	**Type of Rig: AMS45**
Drive Weight (lbs): 140	**Drop (in): 30** **Hole Diameter (in): 8**
Top of Hole Elevation (ft): See Map	**Hole Location: See Geotechnical Map**

Depth (ft)	Blow Count Per Foot	Sample Depth	Dry Density (pcf)	Moisture (%)	Classification Symbol	MATERIAL DESCRIPTION
0						**Topsoil**
					SM	Silty SAND; light brown, dry, medium dense, fine to coarse sand
	88/11"	2.5'				**Quaternary Very Old Fan Deposits (Qvof)**
					SC	Clayey SAND; light to dark brown, moist, very dense, fine to medium sand
5						
	79	5'				Practical Refusal at 6 feet
						Total Depth: 6 feet
						No Groundwater
10						
15						
20						
25						
30						

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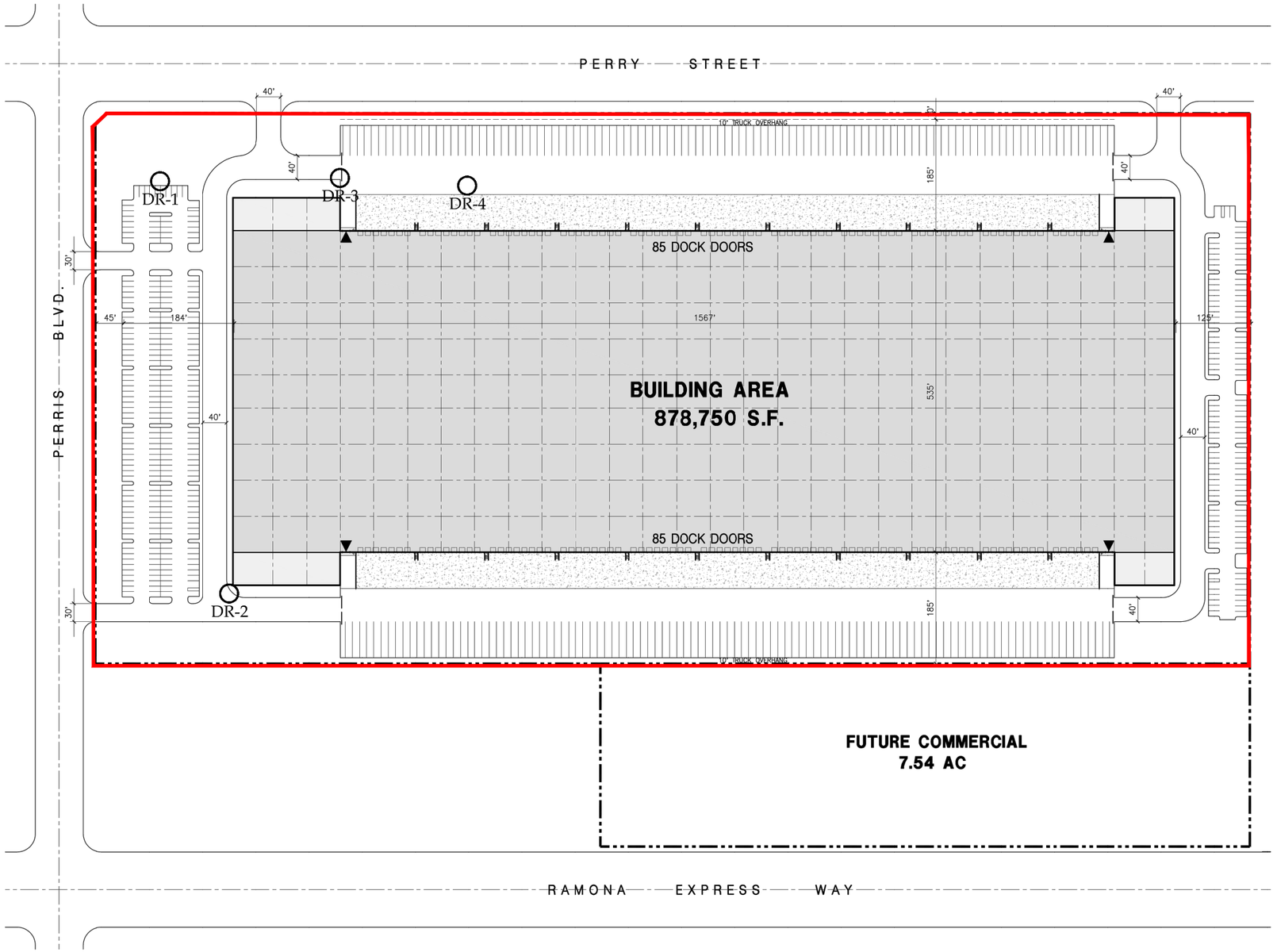

LEGEND

Locations are Approximate

Symbols

- Limits of Report

DR-4 - Percolation Test Location

NORTH

0 100 200 400

SCALE: 1" = 200'

INFILTRATION LOCATION MAP

LOCATED ON RAMONA EXPRESSWAY AND PERRIS BOULEVARD CITY OF PERRIS, RIVERSIDE COUNTY, CALIFORNIA

APN 302-130-002, 302-130-008, 302-130-018, 302-130-021 THROUGH 302-130-024, and 302-130-027

PROJECT	PROPOSED COMMERCIAL WAREHOUSE		
CLIENT	MR. MICHAEL NAGGAR		
PROJECT NO.	213885-12A		
DATE	DECEMBER 2021		
SCALE	1" = 200'		
DWG XREFS			
REVISION			
DRAWN BY	JDG	PLATE	1 OF 1

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December 13, 2021

Project No. 213885-10A

Optimus Building Corp.
c/o Mr. Michael Naggar at
Mike Naggar & Associates, Inc
445 S. D St.
Perris, CA 92570

Subject: **Preliminary Geotechnical Interpretive Report, Proposed Commercial Warehouse, Assessor's Parcel Number 302-130-002, 302-130-008, 302-130-018, 302-130-021 through 302-130-024, and 302-130-027, Located on Ramona Expressway and Perris Boulevard, City of Perris, Riverside County, California**

Earth Strata Geotechnical Services is pleased to present our preliminary geotechnical interpretive report for the proposed commercial warehouse, Assessor's Parcel Numbers 302-130-002, 302-130-008, 302-130-018, 302-130-021 through 302-130-024, and 302-130-027, located on the northeast corner of Ramona Expressway and Perris Boulevard in the City of Perris, Riverside County, California. This work was performed in accordance with the scope of work described in our proposal. The purpose of this study is to evaluate the nature, distribution, engineering properties, and geologic strata underlying the site with respect to the proposed development.

Earth Strata Geotechnical Services appreciates the opportunity to offer our consultation and advice on this project. In the event that you have any questions, please do not hesitate to contact the undersigned at your earliest convenience.

Respectfully submitted,

EARTH STRATA GEOTECHNICAL SERVICES

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SMP/snj

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INTRODUCTION

Earth Strata Geotechnical Services is pleased to present our preliminary geotechnical interpretive report for the proposed development. The purpose of this study was to evaluate the nature, distribution, engineering properties, and geologic strata underlying the site with respect to the proposed development, and then provide preliminary grading and foundation design recommendations based on the plans you provided. The general location of the subject property is indicated on the Vicinity Map, Figure 1. The plans you provided were used as the base map to show geologic conditions within the subject site, see Geotechnical Map, Plate 1.

SITE DESCRIPTION

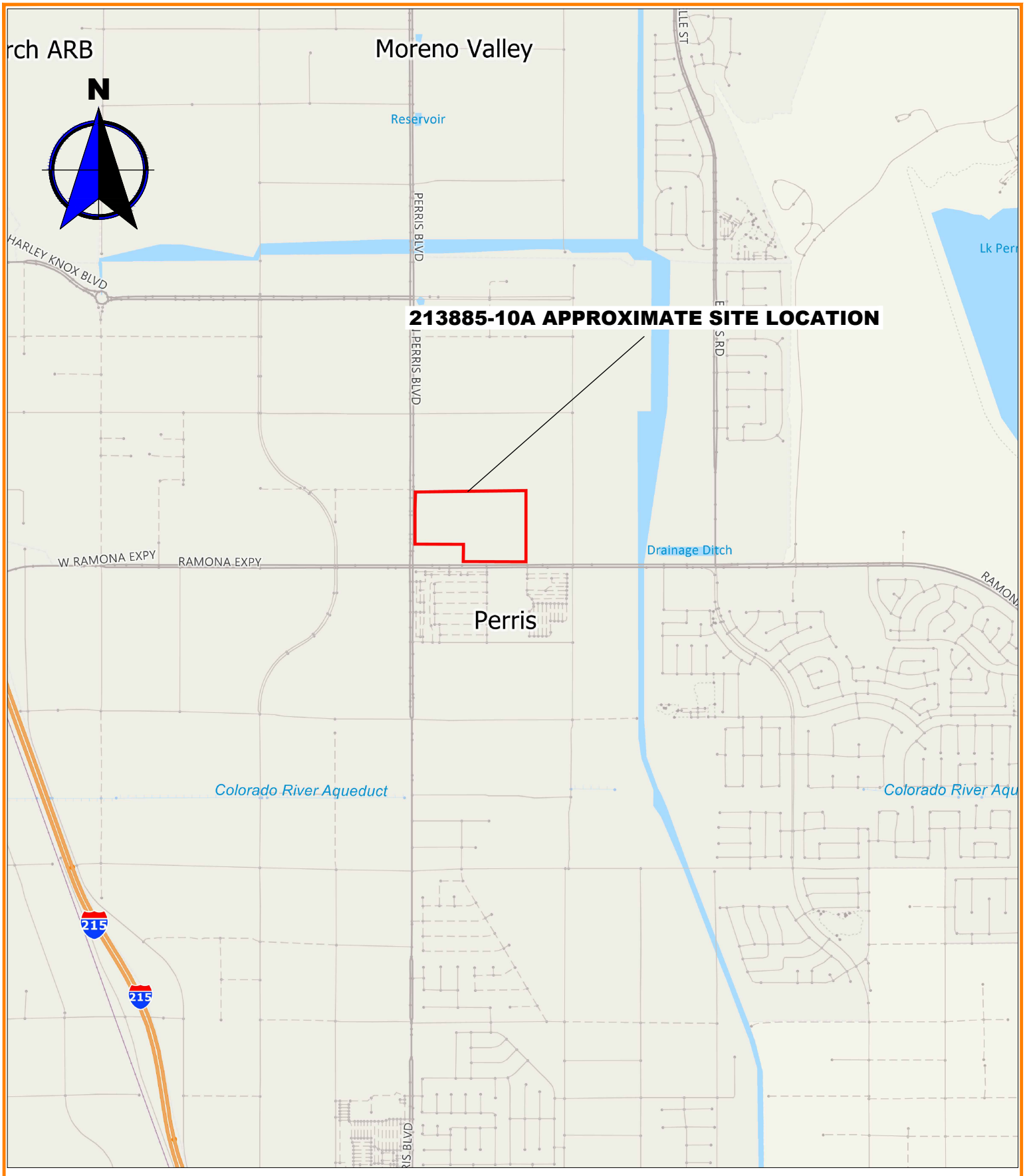
The subject property is located on the northeast corner of Ramona Expressway and Perris Boulevard in the City of Perris, Riverside County, California. The approximate location of the site is shown on the Vicinity Map, Figure 1.

The subject property is comprised of approximately 29.69 acres of undeveloped land. The site has not been graded. Topographic relief at the subject property is relatively low with the terrain being generally flat. Elevations at the site range from approximately 1,450 to 1,460 feet above mean sea level (msl), for a difference of about 10± feet across the entire site. Drainage within the subject property generally flows to the southeast.

The site is currently bordered by commercial retail and commercial/industrial. Most of the vegetation on the site consists of moderate amounts of annual weeds/grasses.

PROPOSED DEVELOPMENT AND GRADING

The proposed commercial development is expected to consist of concrete, wood or steel framed one- and/or two-story structures utilizing slab on grade construction with associated streets, landscape areas, and utilities. The current development plans include one (1) building pad positioned in the center of the site. The plans provided by you were utilized in our exploration and form the base for our Geotechnical Map, Plate 1.



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PROPOSED COMMERCIAL DEVELOPMENT	213885-10A
VICINITY MAP	SEE BAR SCALE
	DEC 2021 / FIGURE 1

FIELD EXPLORATION AND LABORATORY TESTING

Field Exploration

Subsurface exploration within the subject site was performed on December 8, 2021 for the exploratory excavations. A truck mounted hollow-stem-auger drill rig was utilized to drill five (5) borings throughout the site to a maximum depth of 16.5 feet. An underground utilities clearance was obtained from Underground Service Alert of Southern California, prior to the subsurface exploration.

Earth materials encountered during exploration were classified and logged in general accordance with the Standard Practice for Description and Identification of Soils (Visual-Manual Procedure) of ASTM D 2488. Upon completion of laboratory testing, exploratory logs and sample descriptions may have been reconciled to reflect laboratory test results with regard to ASTM D 2487.

Associated with the subsurface exploration was the collection of bulk (disturbed) samples and relatively undisturbed samples of earth materials for laboratory testing and analysis. The relatively undisturbed samples were obtained with a 3 inch outside diameter modified California split-spoon sampler lined with 1-inch-high brass rings. Samples obtained using a hollow stem auger drill rig, were mechanically driven with successive 30 inch drops of a 140-pound automatic trip safety hammer. The blow count per one-foot increment was recorded in the boring logs. The central portions of the driven samples were placed in sealed containers and transported to our laboratory for testing and analysis. The approximate exploratory locations are shown on Plate 1 and descriptive logs are presented in Appendix B.

Laboratory Testing

Maximum dry density/optimum moisture content, expansion potential, pH, resistivity, sulfate content, chloride content, and in-situ density/moisture content were determined for selected undisturbed and bulk samples of earth materials, considered representative of those encountered. An evaluation of the test data is reflected throughout the Conclusions and Recommendations section of this report. A brief description of laboratory test criteria and summaries of test data are presented in Appendix C.

FINDINGS

Regional Geology

Regionally, the site is located in the Peninsular Ranges Geomorphic Province of California. The Peninsular Ranges are characterized by northwest trending steep mountain ranges separated by sediment filled elongated valleys. The dominant structural geologic features reflect the northwest trend of the province. Associated with and subparallel to the San Andreas Fault are the San Jacinto Fault, Newport-Inglewood, and the Whittier-Elsinore Fault. The Santa Ana Mountains abut the west side of the Elsinore Fault while the Perris Block forms the other side of the fault zone to the east. The Perris Block is bounded to the east by the San Jacinto Fault. The northern perimeter of the Los Angeles basin forms part of a northerly dipping blind thrust fault at the boundary between the Peninsular Ranges Province and the Transverse Range Province.

The mountainous regions within the Peninsular Ranges Province are comprised of Pre-Cretaceous, metasedimentary, and metavolcanic rocks along with Cretaceous plutonic rocks of the Southern California

Batholith. The low lying areas are primarily comprised of Tertiary and Quaternary non-marine alluvial sediments consisting of alluvial deposits, sandstones, claystones, siltstones, conglomerates, and occasional volcanic units. A map illustrating the regional geology is presented on the Regional Geologic Map, Figure 2.

Local Geology

The earth materials on the site are primarily comprised of topsoil and Quaternary alluvial materials. A general description of the dominant earth materials observed on the site is provided below:

- Topsoil (no map symbol): Residual topsoil, encountered in the upper 1 to 2 feet, blankets the site and underlying bedrock. These materials were noted to be generally light brown, silty sand which were very porous, dry and in a medium dense state.

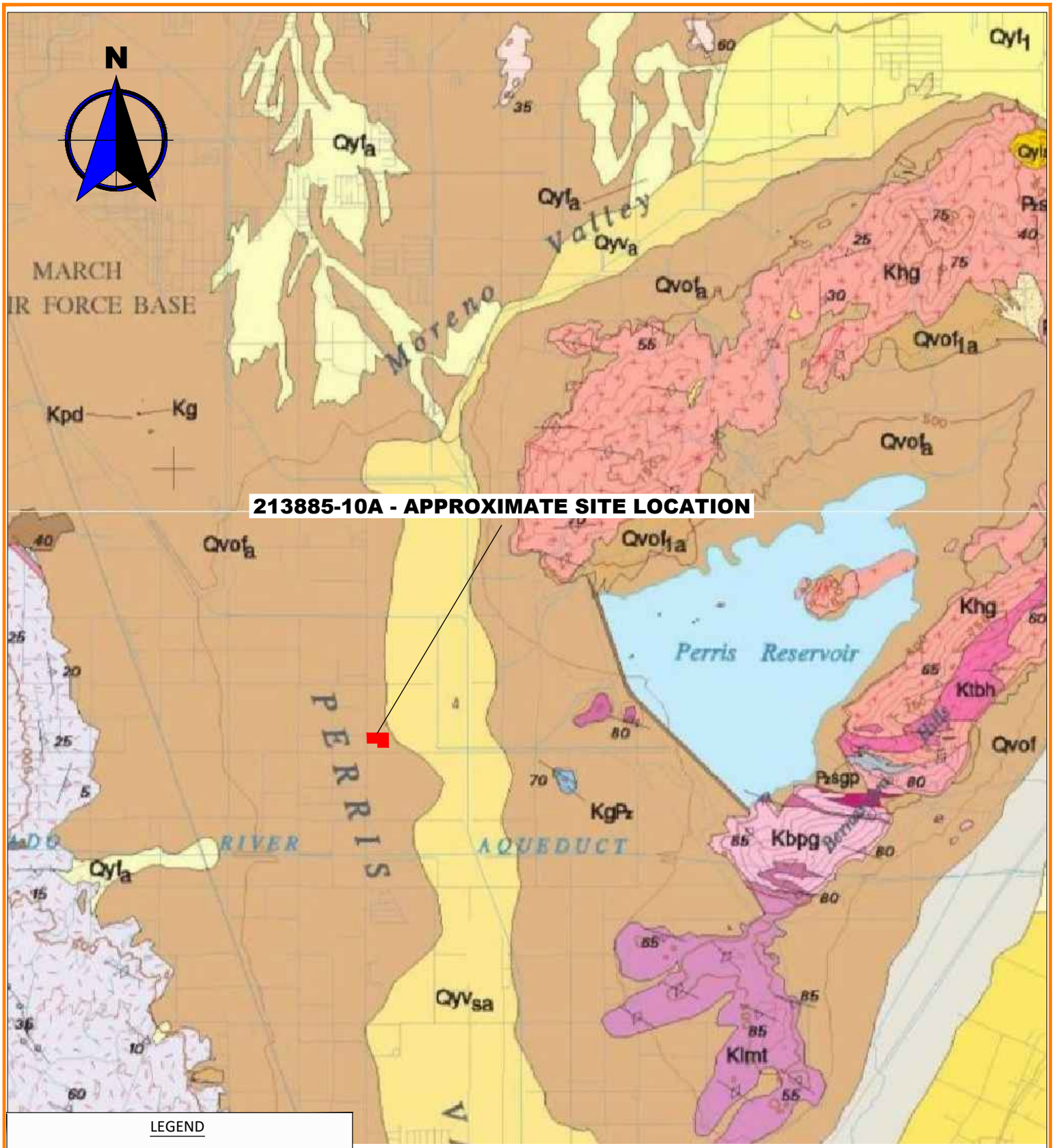
- Quaternary Very Old Alluvial-Fan Deposits (map symbol Qvof): Quaternary very alluvial old fan deposits were encountered to the full depth of our exploration. The very old fan deposits consist predominately of light to dark brown to reddish brown, clayey sand and silty sand. These deposits were generally noted to be in a dry to moist, medium dense to very dense state.

Faulting

The project is located in a seismically active region and as a result, significant ground shaking will likely impact the site within the design life of the proposed project. The geologic structure of the entire southern California area is dominated by northwest-trending faults associated with the San Andreas Fault system, which accommodates for most of the right lateral movement associated with the relative motion between the Pacific and North American tectonic plates. Known active faults within this system include the Newport-Inglewood, Whittier-Elsinore, San Jacinto and San Andreas Faults.

No active faults are known to project through the site and the site is not located within an Alquist-Priolo Earthquake Fault Zone, established by the State of California to restrict the construction of new habitable structures across identifiable traces of known active faults. An active fault is defined by the State of California as having surface displacement within the past 11,000 years or during the Holocene geologic time period. Based on our mapping of the subject site, review of current and historical aerial imagery, lack of lineaments indicative of active faulting, and the data compiled during the preparation of this report, it is our interpretation that the potential for surface rupture to adversely impact the proposed structures is very low to remote.

Based on our review of regional geologic maps and applicable computer programs (USGS Seismic Design Maps, Caltrans ARS online, and USGS Earthquake Hazard Programs), the San Jacinto Fault with an approximate source to site distance of 11.52 kilometers is the closest known active fault anticipated to produce the highest ground accelerations, with an anticipated maximum modal magnitude of **. A list of faults as well as a list of significant historical seismic events within a 100km radius of the subject site are included in Appendix D.



LEGEND

Qvof - Quaternary Very Old Alluvial-Fan Deposits

REFERNCES: Morton, D.M. and Miller, F.K., 2006, Geologic map of the San Bernardino and Santa Ana 30' x 60' quadrangles, California, U.S. Geological Survey, Open-File Report OF-2006-1217, 1:100,000.

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PROPOSED COMMERCIAL DEVELOPMENT		213885-10A
REGIONAL GEOLOGIC MAP	SCALE 1:72,224	
	DEC 2021	FIGURE 2

Landslides

Landslide debris was not observed during our subsurface exploration and no ancient landslides are known to exist on the site. No landslides are known to exist, or have been mapped, in the vicinity of the site. Geologic mapping of the site conducted during our investigation, and review of aerial imagery of the site, reveal no geomorphic expressions indicative of landsliding.

CONCLUSIONS AND RECOMMENDATIONS

General

From geotechnical and engineering geologic points of view, the subject property is considered suitable for the proposed development, provided the following conclusions and recommendations are incorporated into the plans and are implemented during construction.

Earthwork

Earthwork and Grading

The provisions of the 2019 California Building Code (CBC), including the General Earthwork and Grading Specifications in the last Appendix of this report, should be applied to all earthwork and grading operations, as well as in accordance with all applicable grading codes and requirements of the appropriate reviewing agency. Unless specifically revised or amended herein, grading operations should also be performed in accordance with applicable provisions of our General Earthwork and Grading Specifications within the last appendix of this report.

Clearing and Grubbing

Vegetation including trees, grasses, weeds, brush, shrubs, or any other debris should be stripped from the areas to be graded and properly disposed of offsite. In addition, laborers should be utilized to remove any roots, branches, or other deleterious materials during grading operations.

Earth Strata Geotechnical Services should be notified at the appropriate times to provide observation and testing services during Clearing and Grubbing operations. Any buried structures or unanticipated conditions should be brought to our immediate attention.

Excavation Characteristics

Based on the results of our exploration and experience with similar projects in similar settings, the near surface earth materials, will be readily excavated with conventional earth moving equipment.

Groundwater

Groundwater was not observed during our subsurface exploration and is not expected to be encountered during grading operations.

Ground Preparation for Fill Areas

For each area to receive compacted fill, the removal of low density, compressible earth materials, such as *topsoil, *upper alluvial materials, and undocumented artificial fill, should continue until firm competent *alluvium *bedrock is encountered. Removal excavations are subject to verification by the project engineer, geologist or their representative. Prior to placing compacted fills, the exposed bottom in each removal area should be scarified to a depth of 6 inches or more, watered or air dried as necessary to achieve near optimum moisture conditions and then compacted to a minimum of 90 percent of the maximum dry density determined by ASTM D 1557.

The intent of remedial grading is to diminish the potential for hydro-consolidation, slope instability, and/or settlement. Remedial grading should extend beyond the perimeter of the proposed structures a horizontal distance equal to the depth of excavation or a minimum of 5 feet, whichever is greater. For cursory purposes the anticipated removal depths are shown on the enclosed Geotechnical Map, Plate 1. In general, the anticipated removal depths should vary from 4 to 6 feet below existing grade.

Wet Removals

Wet alluvial materials will probably not be encountered within the low lying areas of the site. If removals of wet alluvial materials are required, special grading equipment and procedures can greatly reduce overall costs. Careful planning by an experienced grading contractor can reduce the need for special equipment, such as swamp cats, draglines, excavators, pumps, and top loading earthmovers. Possible solutions may include the placement of imported angular rock and/or geotextile ground reinforcement. More specific recommendations can be provided based on the actual conditions encountered. Drying or mixing of wet materials with dry materials will be needed to bring the wet materials to near optimum moisture prior to placing wet materials into compacted fills.

Oversize Rock

Oversize rock is not expected to be encountered during grading. Oversize rock that is encountered (i.e., rock exceeding a maximum dimension of 12 inches) should be disposed of offsite or stockpiled onsite and crushed for future use. The disposal of oversize rock is discussed in greater detail in General Earthwork and Grading Specifications within the last appendix of this report.

Compacted Fill Placement

Compacted fill materials should be placed in 6 to 8 inch maximum (uncompacted) lifts, watered or air dried as necessary to achieve uniform near optimum moisture content and then compacted to a minimum of 90 percent of the maximum dry density determined by ASTM D 1557.

Import Earth Materials

Should import earth materials be needed to achieve final design grades, all potential import materials should be free of deleterious/oversize materials, non-expansive, and approved by the project geotechnical consultant prior to delivery onsite.

Fill Slopes

When properly constructed, fill slopes up to 10 feet high with inclinations of 2:1 (h:v) or flatter are considered to be grossly stable. Keyways are required at the toe of all fill slopes higher than 5 feet and steeper than 5:1 (h:v). Keyways should be a minimum of 10 feet wide and 2 feet into competent earth materials, as measured on the downhill side. In order to establish keyway removals, backcuts should be cut no steeper than 1:1 or as recommended by the geotechnical engineer or engineering geologist. Compacted fill should be benched into competent earth materials.

Cut Slopes

When properly constructed, cut slopes into older alluvium up to 10 feet high with inclinations of 2:1 (h:v) or flatter are considered grossly stable. Cut slopes should be observed by the engineering geologist or his representative during grading, but are anticipated to be stable.

Stabilization Fills

Currently, stabilization fills will not be required for cut slopes in the alluvium. Our engineering geologist or his representative should be called to evaluate all slopes during grading. In the event that unfavorable geologic conditions are encountered, recommendations for stabilization fills or flatter slopes will be provided.

Fill Over Cut Slopes

The fill portion of fill over cut slopes should not be constructed until the cut portion of the slope has been cut to finish grade. The earth materials and geologic structure exposed along the cut slope should be evaluated with regard to suitability for compacted fills or foundations and for stability. If the cut materials are determined to be competent, then the construction of the keyway and subdrain system may commence or additional remedial recommendations will be provided.

Temporary Backcuts

It is the responsibility of the grading contractor to follow all Cal-OSHA requirements with regard to excavation safety. Where existing developments are upslope, adequate slope stability to protect those developments must be maintained. Temporary backcuts will be required to accomplish removals of unsuitable materials and possibly, to perform canyon removals, stabilization fills, and/or keyways. Backcuts should be excavated at a gradient of 1:1 (h:v) or flatter. Flatter backcuts may be required where geologic structure or earth materials are unfavorable. It is imperative that grading schedules minimize the exposure time of the unsupported excavations. All excavations should be stabilized within 30 days of initial excavation.

Cut/Fill Transitions

Cut/fill transitions should be eliminated from all building areas where the depth of fill placed within the "fill" portion exceeds proposed footing depths. This is to diminish distress to structures resulting from excessive differential settlement. The entire foundation of each structure should be founded on a uniform bearing material. This should be accomplished by overexcavating the "cut"

portion and replacing the excavated materials as properly compacted fill. Refer to the following table for recommended depths of overexcavation.

DEPTH OF FILL ("fill" portion)	DEPTH OF OVEREXCAVATION ("cut" portion)
Up to 5 feet	Equal Depth
5 to 10 feet	5 feet
Greater than 10 feet	One-half the thickness of fill placed on the "fill" portion (10 feet maximum)

Overexcavation of the "cut" portion should extend beyond the building perimeter a horizontal distance equal to the depth of overexcavation or a minimum of 5 feet, whichever is greater.

Cut Areas

In cut areas, an area a minimum of 5 feet beyond the footprint of the proposed structures should overexcavated until; competent bottoms are achieved; to a minimum 3 feet below the proposed foundations; or per the Overexcavation Table above; (whichever is greater) and replaced with compacted fill. Final determination of areas that require overexcavation should be determined in the field by a representative of Earth Strata Geotechnical Services.

Shrinkage, Bulking and Subsidence

Volumetric changes in earth material quantities will occur when poorly consolidated earth materials are replaced with properly compacted fill. Estimates of the percent shrinkage/bulking factors for the various geologic units observed on the subject property are based on in-place densities and on the estimated average percent of relative compaction achieved during grading.

GEOLOGIC UNIT	SHRINKAGE (%)
Topsoil	15 to 20
Quaternary Very Old Fan Deposits	5 to 10

Subsidence from scarification and recompaction of exposed bottom surfaces is expected to be negligible to approximately 0.01 foot.

The estimates of shrinkage/bulking and subsidence are intended as an aid for project engineers in determining earthwork quantities. Since many variables can affect the accuracy of these estimates, they should be used with caution and contingency plans should be in place for balancing the project.

Geotechnical Observations

Clearing operations, removal of unsuitable materials, and general grading procedures should be observed by the project geotechnical consultant or his representative. No compacted fill should be placed without observations by the geotechnical consultant or his representative to verify the adequacy of the removals.

The project geotechnical consultant or his representative should be present to observe grading operations and to check that minimum compaction requirements and proper lift thicknesses are being met, as well as to verify compliance with the other recommendations presented herein.

Post Grading Considerations

Slope Landscaping and Maintenance

Adequate slope and building pad drainage is essential for the long term performance of the subject site. The gross stability of graded slopes should not be adversely affected, provided all drainage provisions are properly constructed and maintained. Engineered slopes should be landscaped with deep rooted, drought tolerant maintenance free plant species, as recommended by the project landscape architect.

Site Drainage

Control of site drainage is important for the performance of the proposed project. Roof gutters are recommended for the proposed structures. Pad and roof drainage should be collected and transferred to driveways, adjacent streets, storm-drain facilities, or other locations approved by the building official in non-erosive drainage devices. Drainage should not be allowed to pond on the pad or against any foundation or retaining wall. Drainage should not be allowed to flow uncontrolled over any descending slope. Planters located within retaining wall backfill should be sealed to prevent moisture intrusion into the backfill. Planters located next to structures should be sealed to the depth of the footings. Drainage control devices require periodic cleaning, testing and maintenance to remain effective.

At a minimum, pad drainage should be designed at the minimum gradients required by the CBC. To divert water away from foundations, the ground surface adjacent to foundations should also be graded at the minimum gradients required per the CBC.

Utility Trenches

All utility trench backfill should be compacted at near optimum moisture to a minimum of 90 percent of the maximum dry density determined by ASTM D 1557. For utility trench backfill within pavement areas the upper 6 inches of subgrade materials should be compacted to 95 percent of the maximum dry density determined by ASTM D 1557. This includes within the street right-of-ways, utility easements, under footings, sidewalks, driveways and building floor slabs, as well as within or adjacent to any slopes. Backfill should be placed in approximately 6 to 8 inch maximum loose lifts and then mechanically compacted with a hydro-hammer, rolling with a sheepsfoot, pneumatic tampers, or similar equipment. The utility trenches should be tested by the project geotechnical engineer or their representative to verify minimum compaction requirements are obtained.

In order to minimize the penetration of moisture below building slabs, all utility trenches should be backfilled with compacted fill, lean concrete or concrete slurry where they undercut the perimeter foundation. Utility trenches that are proposed parallel to any building footings (interior and/or exterior trenches), should not be located within a 1:1 (h:v) plane projected downward from the outside bottom edge of the footing.

SEISMIC DESIGN CONSIDERATIONS

Ground Motions

Structures are required to be designed and constructed to resist the effects of seismic ground motions as provided in the 2019 California Building Code Section 1613. The design is dependent on the site class, occupancy category I, II, III, or IV, mapped spectral accelerations for short periods (S_s), and mapped spectral acceleration for a 1-second period (S_1).

In order for structural design to comply with the 2019 CBC, the USGS "US Seismic Design Maps" online tool was used to compile spectral accelerations for the subject property based on data and maps jointly compiled by the United States Geological Survey (USGS) and the California Geological Survey (CGS). The data found in the following table is based on the Maximum Considered Earthquake (MCE) with 5% damped ground motions having a 2% probability of being exceeded in 50 years (2,475 year return period).

The seismic design coefficients were determined by a combination of the site class, mapped spectral accelerations, and occupancy category. The following seismic design coefficients should be implemented during design of the proposed structures. Summaries of the Seismic Hazard Deaggregation graphs and test data are presented in Appendix D.

2019 CBC	FACTOR (ASCE 7-16)
Site Location	Latitude: 33.846497° (North) Longitude: -117.221751°(West)
Site Class	D – Default
Mapped Spectral Accelerations for short periods, S_s	1.5
Mapped Spectral Accelerations for 1-Second Period, S_1	0.586
Maximum Considered Earthquake Spectral Response Acceleration for Short Periods, S_{ms}	1.8
Maximum Considered Earthquake Spectral Response Acceleration for 1-Second Period, S_{m1}	Null – See Section 11.4.8*
Design Spectral Response Acceleration for Short Periods, S_{DS}	1.2
Design Spectral Response Acceleration for 1-Second Period, S_{D1}	Null – See Section 11.4.8*
Seismic Design Category	D
Importance Factor Based on Occupancy Category	II

*2019 CBC

We performed the probabilistic seismic hazard assessment for the site in accordance with the 2019 CBC, Section 1803.5.11 and 1803.5.12. The probabilistic seismic hazard maps and data files were jointly prepared by the United States Geological Survey (USGS) and the California Geological Survey (CGS) and can be found at the CGS Probabilistic Seismic Hazards Mapping Ground Motion Page. Actual ground shaking intensities at the site may be substantially higher or lower based on complex variables such as the near source directivity effects, depth and consistency of earth materials, topography, geologic structure, direction of fault rupture, and seismic wave reflection, refraction, and attenuation rates. The mean peak ground acceleration was calculated to be 0.616g.

Secondary Seismic Hazards

Secondary effects of seismic shaking considered as potential hazards include several types of ground failure as well as induced flooding. Different types of ground failure, which could occur as a consequence of severe ground shaking at the site, include landslides, ground lurching, shallow ground rupture, and liquefaction/lateral spreading. The probability of occurrence of each type of ground failure depends on the severity of the earthquake, distance from faults, topography, the state of subsurface earth materials, groundwater conditions, and other factors. Based on our experience, subsurface exploration, and laboratory testing, all of the above secondary effects of seismic activity are considered unlikely.

Seismically induced flooding is normally a consequence of a tsunami (seismic sea wave), a seiche (i.e., a wave-like oscillation of surface water in an enclosed basin that may be initiated by a strong earthquake) or failure of a major reservoir or retention system up gradient of the site. Since the site is at an elevation of more than 1,400 feet above mean sea level and is located more than 20 miles inland from the nearest coastline of the Pacific Ocean, the potential for seismically induced flooding due to a tsunami is considered nonexistent. Since no enclosed bodies of water lie adjacent to or up gradient of the site, the likelihood for induced flooding due to a dam failure or a seiche overcoming the dam's freeboard is considered nonexistent.

Liquefaction and Lateral Spreading

Liquefaction occurs as a result of a substantial loss of shear strength or shearing resistance in loose, saturated, cohesionless earth materials subjected to earthquake induced ground shaking. Potential impacts from liquefaction include loss of bearing capacity, liquefaction related settlement, lateral movements, and surface manifestation such as sand boils. Seismically induced settlement occurs when loose sandy soils become denser when subjected to shaking during an earthquake. The three factors determining whether a site is likely to be subject to liquefaction include seismic shaking, type and consistency of earth materials, and groundwater level. The proposed structures will be supported by compacted fill and competent alluvium, with groundwater at a depth of greater than 15 feet. As such, the potential for earthquake induced liquefaction and lateral spreading beneath the proposed structures is considered very low to remote due to the recommended compacted fill, relatively low groundwater level, and the dense nature of the deeper onsite earth materials.

TENTATIVE FOUNDATION DESIGN RECOMMENDATIONS

General

Provided grading is performed in accordance with the recommendations of this report, shallow foundations are considered feasible for support of the proposed structures. Tentative foundation recommendations are provided herein and graphic presentations of relevant recommendations may also be included on the enclosed map.

Allowable Bearing Values

An allowable bearing value of 3,000 pounds per square foot (psf) is recommended for design of 24-inch square pad footings and 18-inch-wide continuous footings founded at a minimum depth of 18 inches below the lowest adjacent final grade. This value may be increased by 20 percent for each additional 1-foot of

width and/or depth to a maximum value of 3,500 psf. Recommended allowable bearing values include both dead and frequently applied live loads and may be increased by one third when designing for short duration wind or seismic forces.

Settlement

Based on the settlement characteristics of the earth materials that underlie the building sites and the anticipated loading, we estimate that the maximum total settlement of the footings will be less than approximately ¾ inch. Differential settlement is expected to be about ½ inch over a horizontal distance of approximately 20 feet, for an angular distortion ratio of 1:480. It is anticipated that the majority of the settlement will occur during construction or shortly after the initial application of loading.

The above settlement estimates are based on the assumption that the grading and construction are performed in accordance with the recommendations presented in this report and that the project geotechnical consultant will observe or test the earth material conditions in the footing excavations.

Lateral Resistance

Passive earth pressure of 250 psf per foot of depth to a maximum value of 2,500 psf may be used to establish lateral bearing resistance for footings. For areas coved with hardscape, passive earth pressure may be taken from the surface. For areas without hardscape, the 12 inches of the soil profile must be neglected when calculating passive earth pressure. A coefficient of friction of 0.36 times the dead load forces may be used between concrete and the supporting earth materials to determine lateral sliding resistance. The above values may be increased by one-third when designing for short duration wind or seismic forces. When combining passive and friction for lateral resistance, the passive component should be reduced by one third. In no case shall the lateral sliding resistance exceed one-half the dead load for clay, sandy clay, sandy silty clay, silty clay, and clayey silt.

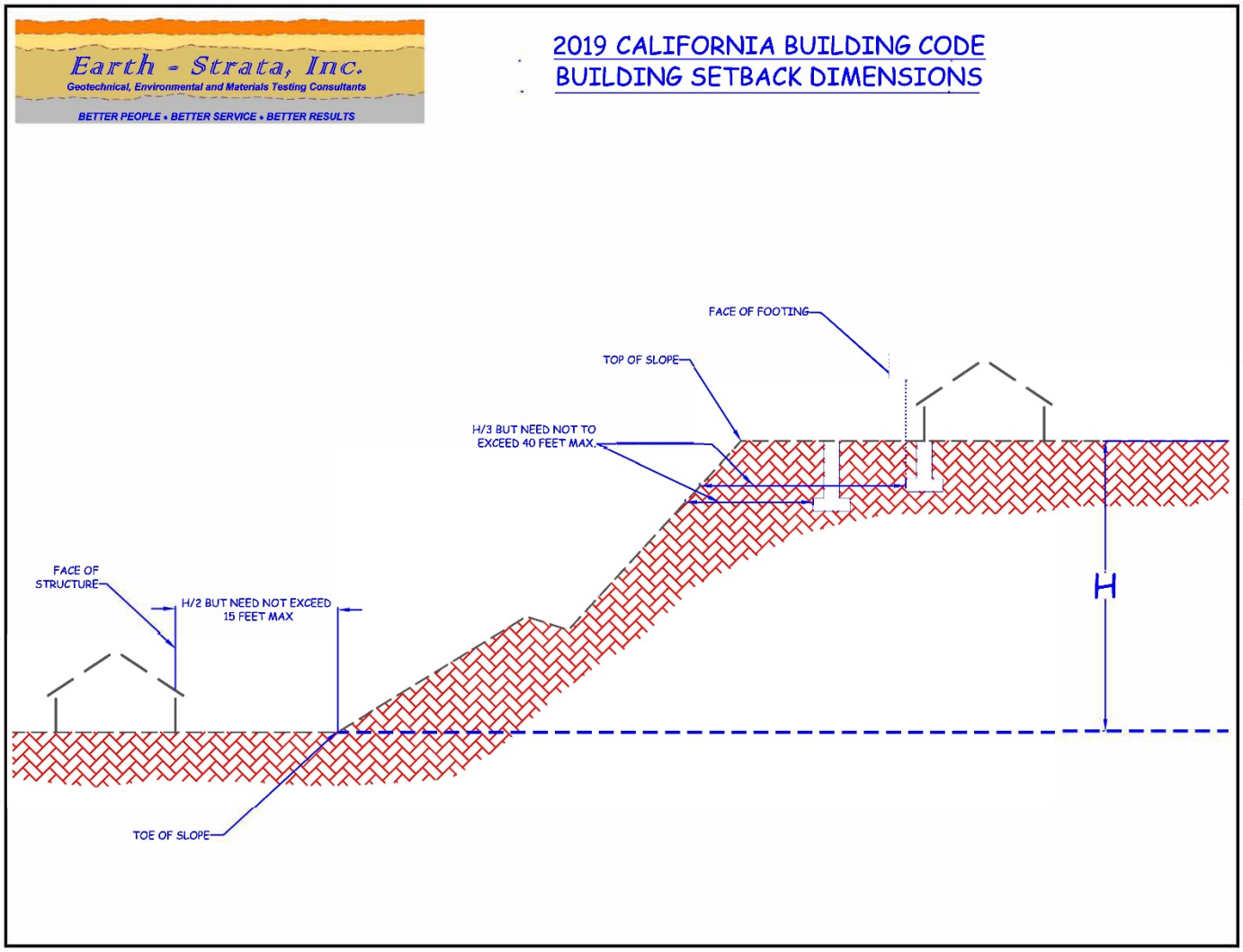
The above lateral resistance values are based on footings for an entire structure being placed directly against compacted fill.

Structural Setbacks and Building Clearance

Structural setbacks are required per the 2019 California Building Code (CBC). Additional structural setbacks are not required due to geologic or geotechnical conditions within the site. Improvements constructed in close proximity to natural or properly engineered and compacted slopes can, over time, be affected by natural processes including gravity forces, weathering, and long term secondary settlement. As a result, the CBC requires that buildings and structures be setback or footings deepened to resist the influence of these processes.

For structures that are planned near ascending and descending slopes, the footings should be embedded to satisfy the requirements presented in the CBC, Section 1808.7 as illustrated in the following Foundation Clearances from Slopes diagram.

FOUNDATION CLEARANCES FROM SLOPES



When determining the required clearance from ascending slopes with a retaining wall at the toe, the height of the slope shall be measured from the top of the wall to the top of the slope.

Foundation Observations

In accordance with the 2019 CBC and prior to the placement of forms, concrete, or steel, all foundation excavations should be observed by the geologist, engineer, or his representative to verify that they have been excavated into competent bearing materials. The excavations should be per the approved plans, moistened, cleaned of all loose materials, trimmed neat, level, and square. Any moisture softened earth materials should be removed prior to steel or concrete placement.

Earth materials from foundation excavations should not be placed in slab on grade areas unless the materials are tested for expansion potential and compacted to a minimum of 90 percent of the maximum dry density.

Expansive Soil Considerations

Preliminary laboratory test results indicate onsite earth materials exhibit an expansion potential of **LOW** as classified in accordance with 2019 CBC Section 1803.5.3 and ASTM D 4829. Additional, testing for expansive soil conditions should be conducted upon completion of rough grading. The following recommendations should be considered the very minimum requirements, for the earth materials tested. It is common practice for the project architect or structural engineer to require additional slab thickness, footing sizes, and/or reinforcement.

Low Expansion Potential (Expansion Index of 21 to 50)

Our laboratory test results indicate that the earth materials onsite exhibit a **LOW** expansion potential as classified in accordance with 2019 CBC Section 1803.5.3 and ASTM D 4829. Accordingly, the CBC specifies that slab on ground foundations (floor slabs) resting on earth materials with expansion indices greater than 20, require special design considerations in accordance with 2019 CBC Sections 1808.6.1 and 1808.6.2. The design procedures are based on the thickness and plasticity index of the various earth materials within the upper 15 feet of the proposed structure. For preliminary design purposes, we have assumed an effective plasticity index of 12.

Footings

- Exterior continuous footings may be founded at the minimum depths below the lowest adjacent final grade (i.e. 12-inch minimum depth for one-story, 18-inch minimum depth for two-story, and 24-inch minimum depth for three-story construction). Interior continuous footings for one-, two-, and three-story construction may be founded at a minimum depth of 12 inches below the lowest adjacent final grade. All continuous footings should have a minimum width of 12, 15, and 18 inches, for one-, two-, and three-story structures, respectively, and should be reinforced with a minimum of four (4) No. 4 bars, two (2) top and two (2) bottom.

- Exterior pad footings intended to support roof overhangs, such as second story decks, patio covers and similar construction should be a minimum of 24 inches square and founded at a minimum depth of 18 inches below the lowest adjacent final grade. The pad footings should be reinforced with a minimum of No. 4 bars spaced a maximum of 18 inches on center, each way, and should be placed near the bottom-third of the footings.

Building Floor Slabs

- The project architect or structural engineer should evaluate minimum floor slab thickness and reinforcement in accordance with 2019 CBC Section 1808.6.2 based on an assumed effective plasticity index of 12. Building floor slabs should be a minimum of 4 inches thick and reinforced with a minimum of No. 3 bars spaced a maximum of 18 inches on center, each way. All floor slab reinforcement should be supported on concrete chairs or bricks to ensure the desired placement at mid-depth.

- Interior floor slabs, within moisture sensitive areas, should be underlain by a minimum 10-mil thick moisture/vapor barrier to help reduce the upward migration of moisture from the underlying earth materials. The moisture/vapor barrier used should meet the performance

standards of an ASTM E 1745 Class A material, and be properly installed in accordance with ACI publication 318-05. It is the responsibility of the contractor to ensure that the moisture/vapor barriers are free of openings, rips, or punctures prior to placing concrete. As an option for additional moisture reduction, higher strength concrete, such as a minimum 28-day compressive strength of 5,000 pounds per square inch (psi) may be used. Ultimately, the design of the moisture/vapor barrier system and recommendations for concrete placement and curing are the purview of the foundation engineer, taking into consideration the project requirements provided by the architect and owner.

- Garage floor slabs should be a minimum of 5 inches thick and should be reinforced in a similar manner as living area floor slabs. Garage floor slabs should be placed separately from adjacent wall footings with a positive separation maintained with ⅜ inch minimum felt expansion joint materials and quartered with weakened plane joints. A 12-inch-wide turn down founded at the same depth as adjacent footings should be provided across garage entrances. The turn down should be reinforced with a minimum of four (4) No. 4 bars, two (2) top and two (2) bottom.

- The subgrade earth materials below all floor slabs should be pre-watered to achieve a moisture content that is at least equal or slightly greater than optimum moisture content, prior to placing concrete. This moisture content should penetrate a minimum depth of 12 inches into the subgrade earth materials. The pre-watering should be verified by Earth Strata Geotechnical Services during construction.

Corrosivity

Corrosion is defined by the National Association of Corrosion Engineers (NACE) as "a deterioration of a substance or its properties because of a reaction with its environment." From a geotechnical viewpoint, the "substances" are the reinforced concrete foundations or buried metallic elements (not surrounded by concrete) and the "environment" is the prevailing earth materials in contact with them. Many factors can contribute to corrosivity, including the presence of chlorides, sulfates, salts, organic materials, different oxygen levels, poor drainage, different soil types, and moisture content. It is not considered practical or realistic to test for all of the factors which may contribute to corrosivity.

The potential for concrete exposure to chlorides is based upon the recognized Caltrans reference standard "Bridge Design Specifications", under Subsection 8.22.1 of that document, Caltrans has determined that "Corrosive water or soil contains more than 500 parts per million (ppm) of chlorides". Based on limited preliminary laboratory testing, the onsite earth materials have chloride contents *less* than 500 ppm. As such, specific requirements resulting from elevated chloride contents are not required.

Specific guidelines for concrete mix design are provided in 2019 CBC Section 1904.1 and ACI 318, Section 4.3 Table 4.3.1 when the soluble sulfate content of earth materials exceeds 0.1 percent by weight. Based on limited preliminary laboratory testing, the onsite earth materials are classified in accordance with Table 4.3.1 as having a *negligible* sulfate exposure condition. Therefore, structural concrete in contact with onsite earth materials should utilize Type I or II.

Based on our laboratory testing of resistivity, the onsite earth materials in contact with buried steel should be considered *very corrosive*. Additionally, pH values below 5.6 and above 9.1 are recognized as being

corrosive to many common metallic components. The pH values for the earth materials tested were *higher* than 9.1 and *higher* than 5.6.

The preliminary test results for corrosivity are based on limited samples, and the initiation of grading may blend various earth materials together. This blending or imported material could alter and increase the detrimental properties of the onsite earth materials. Accordingly, additional testing for chlorides and sulfates along with testing for pH and resistivity should be performed upon completion of grading. Laboratory test results are presented in Appendix C.

RETAINING WALLS

Active and At-Rest Earth Pressures

Foundations may be designed in accordance with the recommendations provided in the Tentative Foundation Design Recommendation section of this report. The following table provides the minimum recommended equivalent fluid pressures for design of retaining walls a maximum of 8 feet high. The active earth pressure should be used for design of unrestrained retaining walls, which are free to tilt slightly. The at-rest earth pressure should be used for design of retaining walls that are restrained at the top, such as basement walls, curved walls with no joints, or walls restrained at corners. For curved walls, active pressure may be used if tilting is acceptable and construction joints are provided at each angle point and at a minimum of 15 foot intervals along the curved segments.

MINIMUM STATIC EQUIVALENT FLUID PRESSURES (pcf)		
PRESSURE TYPE	BACKSLOPE CONDITION	
	LEVEL	2:1 (h:v)
Active Earth Pressure	40	63
At-Rest Earth Pressure	60	95

The retaining wall parameters provided do not account for hydrostatic pressure behind the retaining walls. Therefore, the subdrain system is a very important part of the design. All retaining walls should be designed to resist surcharge loads imposed by other nearby walls, structures, or vehicles should be added to the above earth pressures, if the additional loads are being applied within a 1.5:1 (h:v) plane projected up from the heel of the retaining wall footing. As a way of minimizing surcharge loads and the settlement potential of nearby buildings, the footings for the building can be deepened below the 1.5:1 (h:v)plane projected up from the heel of the retaining wall footing.

Upon request and under a separate scope of work, more detailed analyses can be performed to address equivalent fluid pressures with regard to stepped retaining walls, actual retaining wall heights, actual backfill inclinations, specific backfill materials, higher retaining walls requiring earthquake design motions, etc.

Subdrain System

We recommend a perforated pipe and gravel subdrain system be provided behind all proposed retaining walls to prevent the buildup of hydrostatic pressure behind the proposed retaining walls. The perforated pipe should consist of 4-inch minimum diameter Schedule 40 PVC or ABS SDR-35, placed with the

perforations facing down. The pipe should be surrounded by 1 cubic foot per foot of ¾- or 1½ inch open graded gravel wrapped in filter fabric. The filter fabric should consist of Mirafi 140N or equivalent to prevent infiltration of fines and subsequent clogging of the subdrain system.

In lieu of a perforated pipe and gravel subdrain system, weep holes or open vertical masonry joints may be provided in the lowest row of block exposed to the air to prevent the buildup of hydrostatic pressure behind the proposed retaining walls. Weep holes should be a minimum of 3 inches in diameter and provided at intervals at least every 6 feet along the wall. Open vertical masonry joints should be provided at a minimum of 32 inch intervals. A continuous gravel fill, a minimum of 1 cubic foot per foot, should be placed behind the weep holes or open masonry joints. The gravel should be wrapped in filter fabric consisting of Mirafi 140N or equivalent.

The retaining walls should be adequately coated on the backfilled side of the walls with a proven waterproofing compound by an experienced professional to inhibit infiltration of moisture through the walls.

Temporary Excavations

All excavations should be made in accordance with Cal-OSHA requirements. Earth Strata Geotechnical Services is not responsible for job site safety.

Retaining Wall Backfill

Retaining wall backfill materials should be approved by the geotechnical engineer or his representative prior to placement as compacted fill. Retaining wall backfill should be placed in lifts no greater than 6 to 8 inches, watered or air dried as necessary to achieve near optimum moisture contents. All retaining wall backfill should be compacted to a minimum of 90 percent of the maximum dry density as determined by ASTM D 1557. Retaining wall backfill should be capped with a paved surface drain.

CONCRETE FLATWORK

Thickness and Joint Spacing

Concrete sidewalks and patio type slabs should be at least 4 inches thick and provided with construction or expansion joints every 6 feet or less, to reduce the potential for excessive cracking. Concrete driveway slabs should be at least 5 inches thick and provided with construction or expansion joints every 10 feet or less.

Subgrade Preparation

In order to reduce the potential for unsightly cracking, subgrade earth materials underlying concrete flatwork should be compacted at near optimum moisture to a minimum of 90 percent of the maximum dry density determined by ASTM D 1557 and then moistened to optimum or slightly above optimum moisture content. This moisture should extend to a depth of 12 inches below subgrade and be maintained prior to placement of concrete. Pre-watering of the earth materials prior to placing concrete will promote uniform curing of the concrete and minimize the development of shrinkage cracks. The project geotechnical

engineer or his representative should verify the density and moisture content of the earth materials and the depth of moisture penetration prior to placing concrete.

Cracking within concrete flatwork is often a result of factors such as the use of too high a water to cement ratio and/or inadequate steps taken to prevent moisture loss during the curing of the concrete. Concrete distress can be reduced by proper concrete mix design and proper placement and curing of the concrete. Minor cracking within concrete flatwork is normal and should be expected.

GRADING PLAN REVIEW AND CONSTRUCTION SERVICES

This report has been prepared for the exclusive use of **Optimus Building Corporation** and their authorized representative. It likely does not contain sufficient information for other parties or other uses. Earth Strata Geotechnical Services should be engaged to review the final design plans and specifications prior to construction. This is to verify that the recommendations contained in this report have been properly incorporated into the project plans and specifications. Should Earth Strata Geotechnical Services not be accorded the opportunity to review the project plans and specifications, we are not responsibility for misinterpretation of our recommendations.

We recommend that Earth Strata Geotechnical Services be retained to provide geologic and geotechnical engineering services during grading and foundation excavation phases of the work. In order to allow for design changes in the event that the subsurface conditions differ from those anticipated prior to construction.

Earth Strata Geotechnical Services should review any changes in the project and modify and approve in writing the conclusions and recommendations of this report. This report and the drawings contained within are intended for design input purposes only and are not intended to act as construction drawings or specifications. In the event that conditions encountered during grading or construction operations appear to be different than those indicated in this report, this office should be notified immediately, as revisions may be required.

REPORT LIMITATIONS

Our services were performed using the degree of care and skill ordinarily exercised, under similar circumstances, by reputable soils engineers and geologists, practicing at the time and location this report was prepared. No other warranty, expressed or implied, is made as to the conclusions and professional advice included in this report.

Earth materials vary in type, strength, and other geotechnical properties between points of observation and exploration. Groundwater and moisture conditions can also vary due to natural processes or the works of man on this or adjacent properties. As a result, we do not and cannot have complete knowledge of the subsurface conditions beneath the subject property. No practical study can completely eliminate uncertainty with regard to the anticipated geotechnical conditions in connection with a subject property. The conclusions and recommendations within this report are based upon the findings at the points of observation and are subject to confirmation by Earth Strata Geotechnical Services based on the conditions revealed during grading and construction.

This report was prepared with the understanding that it is the responsibility of the owner or their representative, to ensure that the conclusions and recommendations contained herein are brought to the attention of the other project consultants and are incorporated into the plans and specifications. The owners' contractor should properly implement the conclusions and recommendations during grading and construction, and notify the owner if they consider any of the recommendations presented herein to be unsafe or unsuitable.

APPENDIX A

REFERENCES

APPENDIX A

References

California Building Standards Commission, 2019, *2019 California Building Code, California Code of Regulations Title 24, Part 2, Volume 2 of 2,* Based on 2018 International Building Code.

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Kennedy, M.P., 1977, *Regency and Character of Faulting Along the Elsinore Fault Zone in Southern Riverside County, California*, California Division of Mines and Geology Special Report 131.

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National Association of Corrosion Engineers, 1984, *Corrosion Basics An Introduction*, page 191.

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APPENDIX B

EXPLORATORY LOGS

Geotechnical Boring Log B-1

Date: December 8, 2021	**Project Name: Perris Boulevard** **Page: 1 of 1**
Project Number: 213885-10A	**Logged By: JMR**
Drilling Company: Drilling It	**Type of Rig: AMS45**
Drive Weight (lbs): 140	**Drop (in): 30** **Hole Diameter (in): 8**
Top of Hole Elevation (ft): See Map	**Hole Location: See Geotechnical Map**

Depth (ft)	Blow Count Per Foot	Sample Depth	Dry Density (pcf)	Moisture (%)	Classification Symbol	MATERIAL DESCRIPTION
0						**Topsoil**
					SM	Silty SAND; light brown, dry, medium dense, fine to coarse sand
	16	2.5'	114.2	3.3		**Quaternary Very Old Alluvial Fan Deposits (Qvof)**
					SM	Silty SAND; light brown, dry, medium dense, medium to coarse sand
5						
	24	5'	112.2	5.8	SC	Clayey SAND; dark brown, slightly moist, medium dense, fine to coarse sand
	36	7.5'	123.4	7.7		Becomes dense below 7 feet
10	43	10'	112.2	15.6		Moist below 10 feet
15	48	15'	98.5	20.2		
						Total Depth: 16.5 feet
						No Groundwater
20						
25						
30						

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Geotechnical Boring Log B-2

Date: December 8, 2021	**Project Name: Perris Boulevard** **Page: 1 of 1**
Project Number: 213885-10A	**Logged By: JMR**
Drilling Company: Drilling It	**Type of Rig: AMS45**
Drive Weight (lbs): 140	**Drop (in): 30** **Hole Diameter (in): 8**
Top of Hole Elevation (ft): See Map	**Hole Location: See Geotechnical Map**

Depth (ft)	Blow Count Per Foot	Sample Depth	Dry Density (pcf)	Moisture (%)	Classification Symbol	MATERIAL DESCRIPTION
0						**Topsoil**
					SM	Silty SAND; light brown, dry, medium dense, fine to coarse sand
	46	2.5'	104.2	7.6		**Quaternary Very Old Alluvial Fan Deposits (Qvof)**
					SM	Silty SAND; reddish brown, dry, dense, fine to coarse sand
5						
	52	5'	100.7	12.6	SC	Clayey SAND; light brown, slightly moist, very dense, fine to coarse sand
	55	7.5'	116.6	12.3		Moist below 7 feet
10						
	88	10'	100.4	19.2		
						Total Depth: 11.5 feet
						No Groundwater
15						
20						
25						
30						

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Geotechnical Boring Log B-4

Date: December 8, 2021	**Project Name: Perris Boulevard** **Page: 1 of 1**
Project Number: 213885-10A	**Logged By: JMR**
Drilling Company: Drilling It	**Type of Rig: AMS45**
Drive Weight (lbs): 140	**Drop (in): 30** **Hole Diameter (in): 8**
Top of Hole Elevation (ft): See Map	**Hole Location: See Geotechnical Map**

Depth (ft)	Blow Count Per Foot	Sample Depth	Dry Density (pcf)	Moisture (%)	Classification Symbol	MATERIAL DESCRIPTION
0						**Topsoil**
					SM	Silty SAND; light brown, dry, medium dense, fine to coarse sand
	61	2.5'	103.6	10.4		**Quaternary Very Old Alluvial Fan Deposits (Qvof)**
					SM	Silty SAND; light brown, dry, very dense, fine to medium sand with clay
5	47	5'	106.0	17.0		Slightly moist, dense 5 to 7 feet
	27	7.5'	88.6	18.9		Moist, medium dense 7 to 10 feet
10	58	10'	-	-	SC	Clayey SAND; light brown, moist, very dense, fine to coarse sand
						No Recovery at 10 feet
						Total Depth: 11.5 feet
						No Groundwater
15						
20						
25						
30						

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Geotechnical Boring Log B-4

Date: December 8, 2021	**Project Name: Perris Boulevard** **Page: 1 of 1**
Project Number: 213885-10A	**Logged By: JMR**
Drilling Company: Drilling It	**Type of Rig: AMS45**
Drive Weight (lbs): 140	**Drop (in): 30** **Hole Diameter (in): 8**
Top of Hole Elevation (ft): See Map	**Hole Location: See Geotechnical Map**

Depth (ft)	Blow Count Per Foot	Sample Depth	Dry Density (pcf)	Moisture (%)	Classification Symbol	MATERIAL DESCRIPTION
0						**Topsoil**
					SM	Silty SAND; light brown, dry, medium dense, fine to coarse sand
	32	2.5'	96.3	20.6		**Quaternary Very Old Alluvial Fan Deposits (Qvof)**
					SM	Silty SAND; light brown, slightly moist, dense, fine to medium sand
5	44	5'	91.6	22.2		
	49	7.5'	109.9	14.7	SC	Clayey SAND; medium brown, slight moist, dense, fine to coarse sand
10	79	10'	94.2	25.3		Very dense below 10 feet
						Total Depth: 11.5 feet
						No Groundwater
15						
20						
25						
30						

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Geotechnical Boring Log B-5

Date: December 8, 2021	**Project Name: Perris Boulevard** **Page: 1 of 1**
Project Number: 213885-10A	**Logged By: JMR**
Drilling Company: Drilling It	**Type of Rig: AMS45**
Drive Weight (lbs): 140	**Drop (in): 30** **Hole Diameter (in): 8**
Top of Hole Elevation (ft): See Map	**Hole Location: See Geotechnical Map**

Depth (ft)	Blow Count Per Foot	Sample Depth	Dry Density (pcf)	Moisture (%)	Classification Symbol	MATERIAL DESCRIPTION
0		0-5'				**Topsoil**
					SM	Silty SAND; light brown, dry, medium dense, fine to coarse sand
	88/11"	2.5'	101.1	15.0		**Quaternary Very Old Alluvial Fan Deposits (Qvof)**
					SC	Clayey SAND; light to dark brown, moist, very dense, fine to medium sand
5						
	79	5'	115.0	9.8		Practical Refusal at 6 feet
						Total Depth: 6 feet
						No Groundwater
10						
15						
20						
25						
30						

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APPENDIX C

LABORATORY PROCEDURES AND TEST RESULTS

APPENDIX C

Laboratory Procedures and Test Results

Laboratory testing provided quantitative and qualitative data involving the relevant engineering properties of the representative earth materials selected for testing. The representative samples were tested in general accordance with American Society for Testing and Materials (ASTM) procedures and/or California Test Methods (CTM).

Soil Classification: Earth materials encountered during exploration were classified and logged in general accordance with the Standard Practice for Description and Identification of Soils (Visual-Manual Procedure) of ASTM D 2488. Upon completion of laboratory testing, exploratory logs and sample descriptions were reconciled to reflect laboratory test results with regard to ASTM D 2487.

Moisture and Density Tests: For select samples moisture content was determined using the guidelines of ASTM D 2216 and dry density determinations were made using the guidelines of ASTM D 2937. These tests were performed on relatively undisturbed samples and the test results are presented on the exploratory logs.

Maximum Density Tests: The maximum dry density and optimum moisture content of representative samples were determined using the guidelines of ASTM D 1557. The test results are presented in the table below.

SAMPLE LOCATION	MATERIAL DESCRIPTION	MAXIMUM DRY DENSITY (pcf)	OPTIMUM MOISTURE CONTENT (%)
B-5 @ 0-5 feet	Sandy SILT	132.0	8.5

Expansion Index: The expansion potential of representative samples was evaluated using the guidelines of ASTM D 4829. The test results are presented in the table below.

SAMPLE LOCATION	MATERIAL DESCRIPTION	EXPANSION INDEX	EXPANSION POTENTIAL
B-5 @ 0-5 feet	Sandy SILT	41	LOW

Minimum Resistivity and pH Tests: Minimum resistivity and pH Tests of select samples were performed using the guidelines of CTM 643. The test results are presented in the table below.

SAMPLE LOCATION	MATERIAL DESCRIPTION	pH	MINIMUM RESISTIVITY (ohm-cm)
B-5 @ 0-5 feet	Sandy SILT	9.9	1,200

Soluble Sulfate: The soluble sulfate content of select samples was determined using the guidelines of CTM 417. The test results are presented in the table below.

SAMPLE LOCATION	MATERIAL DESCRIPTION	SULFATE CONTENT (% by weight)	SULFATE EXPOSURE
B-5 @ 0-5 feet	Sandy SILT	0.001	Negligible

Chloride Content: Chloride content of select samples was determined using the guidelines of CTM 422. The test results are presented in the table below.

SAMPLE LOCATION	MATERIAL DESCRIPTION	CHLORIDE CONTENT (ppm)
B-5 @ 0-5 feet	Sandy SILT	40

APPENDIX D

SEISMICITY

ARS Online V3.0.2

Using the tool: Specify latitude and longitude in decimal degrees in the input boxes below. Alternatively, **Google Maps** can be used to find the site location. Specify the time-averaged shear-wave velocity in the upper 30m (Vs30) in the input box. After submitting the data, the USGS 2014 hazard data for a 975-year return period will be reported along with adjustment factors required by Caltrans Seismic Design Criteria (SDC) V2.0.

Latitude: 33.846497 **Longitude:** -117.221751 **Vs30 (m/s):** 270 Submit

Caltrans Design Spectrum (5% damping)

Period(s)	Sa_{2008}(g)	Sa_{2014}(g)	$Basin_{2008}$	$Basin_{2014}$	Near Fault Amp	Design Sa_{2008}(g)	Design Sa_{2014}(g)
PGA	0.61	0.58	1	1	1	0.61	0.58
0.10	1.07	1.02	1	1	1	1.07	1.02
0.20	1.32	1.36	1	1	1	1.32	1.36
0.30	1.32	1.48	1	1	1	1.32	1.48
0.50	1.17	1.35	1	1	1	1.17	1.35
0.75	1	1.06	1	1	1.05	1.05	1.12
1.0	0.83	0.86	1	1	1.11	0.91	0.95
2.0	0.49	0.46	1	1	1.11	0.54	0.51
3.0	0.33	0.31	1	1	1.11	0.36	0.34
4.0	0.24	0.23	1	1	1.11	0.26	0.25
5.0	0.2	0.18	1	1	1.11	0.22	0.2

Copy table

Deaggregation (based on 2014 hazard)

mean magnitude (for PGA)	6.98
mean site-source distance (km, for Sa at 1s)	19.7

Option: recalculate Near Fault amplification with user specified distance

Site-source distance (km): 19.7 Update

2008 National Seismic Hazard Maps - Source Parameters

New Search

Distance in Kilometers	Name	State	Pref Slip Rate (mm/yr)	Dip (degrees)	Dip Dir	Slip Sense	Rupture Top (km)	Rupture Bottom (km)	Length (km)
11.52	San Jacinto;A+CC+B+SM	CA	n/a	90	V	strike slip	0.1	15	178
11.52	San Jacinto;A	CA	9	90	V	strike slip	0	17	71
11.52	San Jacinto;A+C	CA	n/a	90	V	strike slip	0	17	118
11.52	San Jacinto;A+CC	CA	n/a	90	V	strike slip	0	16	118
11.52	San Jacinto;A+CC+B	CA	n/a	90	V	strike slip	0.1	15	152
12.97	San Jacinto;SBV+SJV+A	CA	n/a	90	V	strike slip	0	16	134
12.97	San Jacinto;SJV+A+CC+B+SM	CA	n/a	90	V	strike slip	0.1	15	196
12.97	San Jacinto;SJV+A+CC+B	CA	n/a	90	V	strike slip	0.1	15	170
12.97	San Jacinto;SJV+A+CC	CA	n/a	90	V	strike slip	0	16	136
12.97	San Jacinto;SJV+A+C	CA	n/a	90	V	strike slip	0	17	136
12.97	San Jacinto;SJV+A	CA	n/a	90	V	strike slip	0	17	89
12.97	San Jacinto;SJV	CA	18	90	V	strike slip	0	16	43
12.97	San Jacinto;SBV+SJV+A+CC+B+SM	CA	n/a	90	V	strike slip	0.1	15	241
12.97	San Jacinto;SBV+SJV+A+CC+B	CA	n/a	90	V	strike slip	0.1	15	215
12.97	San Jacinto;SBV+SJV+A+CC	CA	n/a	90	V	strike slip	0	16	181
12.97	San Jacinto;SBV+SJV+A+C	CA	n/a	90	V	strike slip	0	17	181
12.97	San Jacinto;SBV+SJV	CA	n/a	90	V	strike	0	16	88

						slip			
18.98	San Jacinto;SBV	CA	6	90	V	strike slip	0	16	45
22.72	Elsinore;GI	CA	5	90	V	strike slip	0	13	37
22.72	Elsinore;W+GI	CA	n/a	81	NE	strike slip	0	14	83
22.75	Elsinore;W+GI+T+J+CM	CA	n/a	84	NE	strike slip	0	16	241
22.75	Elsinore;GI+T	CA	5	90	V	strike slip	0	14	78
22.75	Elsinore;GI+T+J	CA	n/a	86	NE	strike slip	0	17	153
22.75	Elsinore;GI+T+J+CM	CA	n/a	86	NE	strike slip	0	16	195
22.75	Elsinore;W+GI+T	CA	n/a	84	NE	strike slip	0	14	124
22.75	Elsinore;W+GI+T+J	CA	n/a	84	NE	strike slip	0	16	199
25.01	Elsinore;T+J	CA	n/a	86	NE	strike slip	0	17	127
25.01	Elsinore;T+J+CM	CA	n/a	85	NE	strike slip	0	16	169
25.01	Elsinore;T	CA	5	90	V	strike slip	0	14	52
30.73	S. San Andreas;CH+CC+BB+NM+SM+NSB+SSB	CA	n/a	90	V	strike slip	0	14	384
30.73	S. San Andreas;CH+CC+BB+NM+SM+NSB+SSB+BG+CO	CA	n/a	86		strike slip	0.1	13	512
30.73	S. San Andreas;SSB+BG	CA	n/a	71		strike slip	0	13	101
30.73	S. San Andreas;NSB+SSB+BG+CO	CA	n/a	79		strike slip	0.2	12	206
30.73	S. San Andreas;CC+BB+NM+SM+NSB+SSB	CA	n/a	90	V	strike slip	0	14	322
30.73	S. San Andreas;CC+BB+NM+SM+NSB+SSB+BG	CA	n/a	85		strike slip	0	14	380
30.73	S. San Andreas;CC+BB+NM+SM+NSB+SSB+BG+CO	CA	n/a	86		strike slip	0.1	13	449
30.73	S. San Andreas;CH+CC+BB+NM+SM+NSB+SSB+BG	CA	n/a	86		strike slip	0	14	442

30.73	S. San Andreas;NM+SM+NSB+SSB	CA	n/a	90	V	strike slip	0	13	213
30.73	S. San Andreas;NM+SM+NSB+SSB+BG	CA	n/a	83		strike slip	0	14	271
30.73	S. San Andreas;NM+SM+NSB+SSB+BG+CO	CA	n/a	84		strike slip	0.1	13	340
30.73	S. San Andreas;NSB+SSB	CA	n/a	90	V	strike slip	0	13	79
30.73	S. San Andreas;NSB+SSB+BG	CA	n/a	75		strike slip	0	14	136
30.73	S. San Andreas;PK+CH+CC+BB+NM+SM+NSB+SSB	CA	n/a	90	V	strike slip	0.1	13	421
30.73	S. San Andreas;PK+CH+CC+BB+NM+SM+NSB+SSB+BG	CA	n/a	86		strike slip	0.1	13	479
30.73	S. San Andreas;PK+CH+CC+BB+NM+SM+NSB+SSB+BG+CO	CA	n/a	86		strike slip	0.1	13	548
30.73	S. San Andreas;SM+NSB+SSB	CA	n/a	90	V	strike slip	0	13	176
30.73	S. San Andreas;SM+NSB+SSB+BG	CA	n/a	81		strike slip	0	13	234
30.73	S. San Andreas;SM+NSB+SSB+BG+CO	CA	n/a	83		strike slip	0.1	13	303
30.73	S. San Andreas;SSB	CA	16	90	V	strike slip	0	13	43
30.73	S. San Andreas;SSB+BG+CO	CA	n/a	77		strike slip	0.2	12	170
30.73	S. San Andreas;BB+NM+SM+NSB+SSB	CA	n/a	90	V	strike slip	0	14	263
30.73	S. San Andreas;BB+NM+SM+NSB+SSB+BG	CA	n/a	84		strike slip	0	14	321
30.73	S. San Andreas;BB+NM+SM+NSB+SSB+BG+CO	CA	n/a	85		strike slip	0.1	13	390
32.01	Chino, alt 2	CA	1	65	SW	strike slip	0	14	29
33.68	S. San Andreas;NM+SM+NSB	CA	n/a	90	V	strike slip	0	13	170
33.68	S. San Andreas;SM+NSB	CA	n/a	90	V	strike slip	0	13	133
33.68	S. San Andreas;CH+CC+BB+NM+SM+NSB	CA	n/a	90	V	strike slip	0	14	341
33.68	S. San Andreas;BB+NM+SM+NSB	CA	n/a	90	V	strike slip	0	14	220

33.68	S. San Andreas;PK+CH+CC+BB+NM+SM+NSB	CA	n/a	90	V	strike slip	0.1	13	377
33.68	S. San Andreas;CC+BB+NM+SM+NSB	CA	n/a	90	V	strike slip	0	14	279
33.68	S. San Andreas;NSB	CA	22	90	V	strike slip	0	13	35
34.22	Elsinore;W	CA	2.5	75	NE	strike slip	0	14	46
34.81	Chino, alt 1	CA	1	50	SW	strike slip	0	9	24
40.57	S. San Andreas;BG+CO	CA	n/a	72		strike slip	0.3	12	125
40.57	S. San Andreas;BG	CA	n/a	58		strike slip	0	13	56
42.19	Cucamonga	CA	5	45	N	thrust	0	8	28
47.59	Cleghorn	CA	3	90	V	strike slip	0	16	25
50.29	San Joaquin Hills	CA	0.5	23	SW	thrust	2	13	27
51.72	Pinto Mtn	CA	2.5	90	V	strike slip	0	16	74
52.39	North Frontal (West)	CA	1	49	S	reverse	0	16	50
52.54	San Jose	CA	0.5	74	NW	strike slip	0	15	20
56.94	Sierra Madre	CA	2	53	N	reverse	0	14	57
56.94	Sierra Madre Connected	CA	2	51		reverse	0	14	76
59.45	Elsinore;J+CM	CA	3	84	NE	strike slip	0	17	118
59.45	Elsinore;J	CA	3	84	NE	strike slip	0	19	75
60.08	Puente Hills (Coyote Hills)	CA	0.7	26	N	thrust	2.8	15	17
60.27	S. San Andreas;PK+CH+CC+BB+NM+SM	CA	n/a	90	V	strike slip	0.1	13	342
60.27	S. San Andreas;SM	CA	29	90	V	strike slip	0	13	98
60.27	S. San Andreas;CC+BB+NM+SM	CA	n/a	90	V	strike slip	0	14	243
60.27	S. San Andreas;BB+NM+SM	CA	n/a	90	V	strike slip	0	14	184
60.27	S. San Andreas;CH+CC+BB+NM+SM	CA	n/a	90	V	strike slip	0	14	306

60.27	S. San Andreas;NM+SM	CA	n/a	90	V	strike slip	0	14	134
64.96	Helendale-So Lockhart	CA	0.6	90	V	strike slip	0	13	114
65.05	Newport Inglewood Connected alt 1	CA	1.3	89		strike slip	0	11	208
65.05	Newport Inglewood Connected alt 2	CA	1.3	90	V	strike slip	0	11	208
65.05	Newport-Inglewood (Offshore)	CA	1.5	90	V	strike slip	0	10	66
66.85	North Frontal (East)	CA	0.5	41	S	thrust	0	16	27
70.99	Newport-Inglewood, alt 1	CA	1	88		strike slip	0	15	65
72.37	Clamshell-Sawpit	CA	0.5	50	NW	reverse	0	14	16
74.32	Puente Hills (Santa Fe Springs)	CA	0.7	29	N	thrust	2.8	15	11
75.55	San Jacinto;CC+B	CA	n/a	90	V	strike slip	0.2	14	77
75.55	San Jacinto;CC	CA	4	90	V	strike slip	0	16	43
75.55	San Jacinto;CC+B+SM	CA	n/a	90	V	strike slip	0.2	14	103
76.63	San Jacinto;C	CA	14	90	V	strike slip	0	17	47
77.21	Lenwood-Lockhart-Old Woman Springs	CA	0.9	90	V	strike slip	0	13	145
77.44	Burnt Mtn	CA	0.6	67	W	strike slip	0	16	21
79.26	Raymond	CA	1.5	79	N	strike slip	0	16	22
82.06	Landers	CA	0.6	90	V	strike slip	0	15	95
82.26	Eureka Peak	CA	0.6	90	V	strike slip	0	15	19
82.45	Rose Canyon	CA	1.5	90	V	strike slip	0	8	70
84.80	Puente Hills (LA)	CA	0.7	27	N	thrust	2.1	15	22
84.89	Elysian Park (Upper)	CA	1.3	50	NE	reverse	3	15	20
87.39	Johnson Valley (No)	CA	0.6	90	V	strike slip	0	16	35
89.01	Palos Verdes	CA	3	90	V	strike	0	14	99

						slip			
89.01	Palos Verdes Connected	CA	3	90	V	strike slip	0	10	285
90.15	Coronado Bank	CA	3	90	V	strike slip	0	9	186
90.46	S. San Andreas;CO	CA	20	90	V	strike slip	0.6	11	69
91.78	Verdugo	CA	0.5	55	NE	reverse	0	15	29
94.54	Earthquake Valley	CA	2	90	V	strike slip	0	19	20
97.40	So Emerson-Copper Mtn	CA	0.6	90	V	strike slip	0	14	54
98.05	Hollywood	CA	1	70	N	strike slip	0	17	17

6.3	7km SSE of Big Bear City, CA 1992-06-28 15:05:30 (UTC)	3.6 km
7.3	Landers, California Earthquake 1992-06-28 11:57:34 (UTC)	-0.1 km
6.1	17km NNE of Thousand Pal... 1992-04-23 04:50:23 (UTC)	11.6 km
6.0	6km SSW of Morongo Valley, ... 1986-07-08 09:20:44 (UTC)	9.5 km
6.0	16km E of Desert Hot Spring... 1948-12-04 23:43:16 (UTC)	6.0 km
6.4	Long Beach, California Earth... 1933-03-11 01:54:09 (UTC)	6.0 km
6.8	2 km W of Hemet, California 1918-04-21 22:32:25 (UTC)	
6.7	Near San Jacinto, California 1899-12-25 12:25:00 (UTC)	
6.4	Cajon Pass area, northwest o... 1899-07-22 20:32:00 (UTC)	
6.2	Northwest of San Bernardino... 1894-07-30 05:12:00 (UTC)	
6.8	Northeastern San Diego Cou... 1890-02-09 12:06:00 (UTC)	
6.0	Near San Bernardino, Califor... 1858-12-16 10:00:00 (UTC)	
6.0	Near San Gabriel, California 1855-07-11 04:15:00 (UTC)	
7.5	Northwest of San Berna 1812-12-08 15:00:00 (UTC)	

Hazards by Location

Search Information

Coordinates: 33.846497, -117.221751

Elevation: 1451 ft

Timestamp: 2021-11-22T19:05:02.929Z

Hazard Type: Seismic

Reference Document: ASCE7-16

Risk Category: II

Site Class: D-default

Basic Parameters

Name	Value	Description
S_S	1.5	MCE_R ground motion (period=0.2s)
S_1	0.586	MCE_R ground motion (period=1.0s)
S_{MS}	1.8	Site-modified spectral acceleration value
S_{M1}	* null	Site-modified spectral acceleration value
S_{DS}	1.2	Numeric seismic design value at 0.2s SA
S_{D1}	* null	Numeric seismic design value at 1.0s SA

* See Section 11.4.8

Additional Information

Name	Value	Description
SDC	* null	Seismic design category
F_a	1.2	Site amplification factor at 0.2s
F_v	* null	Site amplification factor at 1.0s
CR_S	0.932	Coefficient of risk (0.2s)
CR_1	0.91	Coefficient of risk (1.0s)
PGA	0.514	MCE_G peak ground acceleration
F_{PGA}	1.2	Site amplification factor at PGA
PGA_M	0.616	Site modified peak ground acceleration
T_L	8	Long-period transition period (s)
SsRT	1.56	Probabilistic risk-targeted ground motion (0.2s)
SsUH	1.674	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)

SsD	1.5	Factored deterministic acceleration value (0.2s)
S1RT	0.586	Probabilistic risk-targeted ground motion (1.0s)
S1UH	0.644	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
S1D	0.6	Factored deterministic acceleration value (1.0s)
PGAd	0.514	Factored deterministic acceleration value (PGA)

* See Section 11.4.8

The results indicated here DO NOT reflect any state or local amendments to the values or any delineation lines made during the building code adoption process. Users should confirm any output obtained from this tool with the local Authority Having Jurisdiction before proceeding with design.

Disclaimer

Hazard loads are provided by the U.S. Geological Survey Seismic Design Web Services.

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APPENDIX E

GENERAL EARTHWORK AND GRADING SPECIFICATIONS

EARTH-STRATA

General Earthwork and Grading Specifications

General

Intent: These General Earthwork and Grading Specifications are intended to be the minimum requirements for the grading and earthwork shown on the approved grading plan(s) and/or indicated in the geotechnical report(s). These General Earthwork and Grading Specifications should be considered a part of the recommendations contained in the geotechnical report(s) and if they are in conflict with the geotechnical report(s), the specific recommendations in the geotechnical report shall supersede these more general specifications. Observations made during earthwork operations by the project Geotechnical Consultant may result in new or revised recommendations that may supersede these specifications and/or the recommendations in the geotechnical report(s).

The Geotechnical Consultant of Record: The Owner shall employ a qualified Geotechnical Consultant of Record (Geotechnical Consultant), prior to commencement of grading or construction. The Geotechnical Consultant shall be responsible for reviewing the approved geotechnical report(s) and accepting the adequacy of the preliminary geotechnical findings, conclusions, and recommendations prior to the commencement of the grading or construction.

Prior to commencement of grading or construction, the Owner shall coordinate with the Geotechnical Consultant, and Earthwork Contractor (Contractor) to schedule sufficient personnel for the appropriate level of observation, mapping, and compaction testing.

During earthwork and grading operations, the Geotechnical Consultant shall observe, map, and document the subsurface conditions to confirm assumptions made during the geotechnical design phase of the project. Should the observed conditions differ significantly from the interpretive assumptions made during the design phase, the Geotechnical Consultant shall recommend appropriate changes to accommodate the observed conditions, and notify the reviewing agency where required.

The Geotechnical Consultant shall observe the moisture conditioning and processing of the excavations and fill materials. The Geotechnical Consultant should perform periodic relative density testing of fill materials to verify that the attained level of compaction is being accomplished as specified.

The Earthwork Contractor: The Earthwork Contractor (Contractor) shall be qualified, experienced, and knowledgeable in earthwork logistics, preparation and processing of earth materials to receive compacted fill, moisture-conditioning and processing of fill, and compacting fill. The Contractor shall be provided with the approved grading plans and geotechnical report(s) for his review and acceptance of responsibilities, prior to commencement of grading. The Contractor shall be solely responsible for performing the grading in accordance with the approved grading plans and geotechnical report(s). Prior to commencement of grading, the Contractor shall prepare and submit to the Owner and the Geotechnical Consultant a work plan that indicates the sequence of earthwork grading, the number of "equipment" of work and the estimated quantities of daily earthwork contemplated for the site. The Contractor shall inform the Owner and the Geotechnical Consultant of work schedule changes and revisions to the work plan at least 24 hours in advance of such changes so that appropriate personnel will be available for observation and testing. No assumptions shall be made by the Contractor with regard to whether the Geotechnical Consultant is aware of all grading operations.

It is the sole responsibility of the Contractor to provide adequate equipment and methods to accomplish the earthwork operations in accordance with the applicable grading codes and agency ordinances, these specifications, and the recommendations in the approved geotechnical report(s) and grading plan(s). At the sole discretion of the Geotechnical Consultant, any unsatisfactory conditions, such as unsuitable earth materials, improper moisture conditioning, inadequate compaction, insufficient buttress keyway size, adverse weather conditions, etc., resulting in a quality of work less than required in the approved grading plans and geotechnical report(s), the Geotechnical Consultant shall reject the work and may recommend to the Owner that grading be stopped until conditions are corrected.

Preparation of Areas for Compacted Fill

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

The Geotechnical Consultant shall evaluate the extent of these removals on a site by site basis. Earth materials to be placed as compacted fill shall not contain more than 1 percent organic materials (by volume). No compacted fill lift shall contain more than 10 percent organic matter.

Should potentially hazardous materials be encountered, the Contractor shall stop work in the affected area, and a hazardous materials specialist shall immediately be consulted to evaluate the potentially hazardous materials, prior to continuing to work in that area.

It is our understanding that the State of California defines most refined petroleum products (gasoline, diesel fuel, motor oil, grease, coolant, etc.) as hazardous waste. As such, indiscriminate dumping or spillage of these fluids may constitute a misdemeanor, punishable by fines and/or imprisonment, and shall be prohibited. The contractor is responsible for all hazardous waste related to his operations. The Geotechnical Consultant does not have expertise in this area. If hazardous waste is a concern, then the Owner should contract the services of a qualified environmental assessor.

Processing: Exposed earth materials that have been observed to be satisfactory for support of compacted fill by the Geotechnical Consultant shall be scarified to a minimum depth of 6 inches. Exposed earth materials that are not observed to be satisfactory shall be removed or alternative recommendations may be provided by the Geotechnical Consultant. Scarification shall continue until the exposed earth materials are broken down and free of oversize material and the working surface is reasonably uniform, flat, and free of uneven features that would inhibit uniform compaction. The earth materials should be moistened or air dried to near optimum moisture content, prior to compaction.

Overexcavation: The Cut Lot Typical Detail and Cut/Fill Transition Lot Typical Detail, included herein provides a graphic illustration that depicts typical overexcavation recommendations made in the approved geotechnical report(s) and/or grading plan(s).

Keyways and Benching: Where fills are to be placed on slopes steeper than 5:1 (horizontal to vertical units), the ground shall be thoroughly benched as compacted fill is placed. Please see the three Keyway and Benching Typical Details with subtitles Cut Over Fill Slope, Fill Over Cut Slope, and Fill Slope for a graphic illustration. The lowest bench or smallest keyway shall be a minimum of 10 feet wide (or ½ the proposed slope height) and at least 2 feet into competent earth materials as advised by the Geotechnical Consultant. Typical benches shall be excavated a minimum height of 4 feet into competent earth materials or as recommended by the Geotechnical Consultant. Fill placed on slopes steeper than 5:1 should be thoroughly benched or otherwise excavated to provide a flat subgrade for the compacted fill.

Evaluation/Acceptance of Bottom Excavations: All areas to receive compacted fill (bottom excavations), including removal excavations, processed areas, keyways, and benching, shall be observed, mapped, general elevations recorded, and/or tested prior to being accepted by the Geotechnical Consultant as suitable to receive compacted fill. The Contractor shall obtain a written acceptance from the Geotechnical Consultant prior to placing compacted fill. A licensed surveyor shall provide the survey control for determining elevations of bottom excavations, processed areas, keyways, and

benching. The Geotechnical Consultant is not responsible for erroneously located, fills, subdrain systems, or excavations.

Fill Materials

General: Earth material to be used as compacted fill should to a large extent be free of organic matter and other deleterious substances as evaluated and accepted by the Geotechnical Consultant.

Oversize: Oversize material is rock that does not break down into smaller pieces and has a maximum diameter greater than 12 inches. Oversize rock shall not be included within compacted fill unless specific methods and guidelines acceptable to the Geotechnical Consultant are followed. For examples of methods and guidelines of oversize rock placement see the enclosed Oversize Rock Disposal Detail. The inclusion of oversize materials in the compacted fill shall only be acceptable if the oversize material is completely surrounded by compacted fill or thoroughly jetted granular materials. No oversize material shall be placed within 10 vertical feet of finish grade or within 2 feet of proposed utilities or underground improvements.

Import: Should imported earth materials be required, the proposed import materials shall meet the requirements of the Geotechnical Consultant. Well graded, very low expansion potential earth materials free of organic matter and other deleterious substances are usually sought after as import materials. However, it is generally in the Owners best interest that potential import earth materials are provided to the Geotechnical Consultant to determine their suitability for the intended purpose. At least 48 hours should be allotted for the appropriate laboratory testing to be performed, prior to starting the import operations.

Fill Placement and Compaction Procedures

Fill Layers: Fill materials shall be placed in areas prepared to receive fill in nearly horizontal layers not exceeding 8 inches in loose thickness. Thicker layers may be accepted by the Geotechnical Consultant, provided field density testing indicates that the grading procedures can adequately compact the thicker layers. Each layer of fill shall be spread evenly and thoroughly mixed to obtain uniformity within the earth materials and consistent moisture throughout the fill.

Moisture Conditioning of Fill: Earth materials to be placed as compacted fill shall be watered, dried, blended, and/or mixed, as needed to obtain relatively uniform moisture contents that are at or slightly above optimum. The maximum density and optimum moisture content tests should be performed in accordance with the American Society of Testing and Materials (ASTM test method D1557-00).

Compaction of Fill: After each layer has been moisture-conditioned, mixed, and evenly spread, it should be uniformly compacted to a minimum of 90 percent of maximum dry density as determined by ASTM test method D1557-00. Compaction equipment shall be adequately sized and be either specifically designed for compaction of earth materials or be proven to consistently achieve the required level of compaction.

Compaction of Fill Slopes: In addition to normal compaction procedures specified above, additional effort to obtain compaction on slopes is needed. This may be accomplished by backrolling of slopes with sheepsfoot rollers as the fill is being placed, by overbuilding the fill slopes, or by other methods producing results that are satisfactory to the Geotechnical Consultant. Upon completion of grading, relative compaction of the fill and the slope face shall be a minimum of 90 percent of maximum density per ASTM test method D1557-00.

Compaction Testing of Fill: Field tests for moisture content and relative density of the compacted fill earth materials shall be periodically performed by the Geotechnical Consultant. The location and frequency of tests shall be at the Geotechnical Consultant's discretion based on field observations. Compaction test locations will not necessarily be random. The test locations may or may not be selected to verify minimum compaction requirements in areas that are typically prone to inadequate compaction, such as close to slope faces and near benching.

Frequency of Compaction Testing: Compaction tests shall be taken at minimum intervals of every 2 vertical feet and/or per 1,000 cubic yards of compacted materials placed. Additionally, as a guideline, at least one (1) test shall be taken on slope faces for each 5,000 square feet of slope face and/or for each 10 vertical feet of slope. The Contractor shall assure that fill placement is such that the testing schedule described herein can be accomplished by the Geotechnical Consultant. The Contractor shall stop or slow down the earthwork operations to a safe level so that these minimum standards can be obtained.

Compaction Test Locations: The approximate elevation and horizontal coordinates of each test location shall be documented by the Geotechnical Consultant. The Contractor shall coordinate with the Surveyor to assure that sufficient grade stakes are established. This will provide the Geotechnical Consultant with sufficient accuracy to determine the approximate test locations and elevations. The Geotechnical Consultant can not be responsible for staking erroneously located by the Surveyor or Contractor. A minimum of two grade stakes should be provided at a maximum horizontal distance of 100 feet and vertical difference of less than 5 feet.

Subdrain System Installation

Subdrain systems shall be installed in accordance with the approved geotechnical report(s), the approved grading plan, and the typical details provided herein. The Geotechnical Consultant may recommend additional subdrain systems and/or changes to the subdrain systems described herein, with regard to the extent, location, grade, or material depending on conditions encountered during grading or other factors. All subdrain systems shall be surveyed by a licensed land surveyor (except for retaining wall subdrain systems) to verify line and grade after installation and prior to burial. Adequate time should be allowed by the Contractor to complete these surveys.

Excavation

All excavations and over-excavations for remedial purposes shall be evaluated by the Geotechnical Consultant during grading operations. Remedial removal depths indicated on the geotechnical plans are estimates only. The actual removal depths and extent shall be determined by the Geotechnical Consultant based on the field evaluation of exposed conditions during grading operations. Where fill over cut slopes are planned, the cut portion of the slope shall be excavated, evaluated, and accepted by the Geotechnical Consultant prior to placement of the fill portion of the proposed slope, unless specifically addressed by the Geotechnical Consultant. Typical details for cut over fill slopes and fill over cut slopes are provided herein.

Trench Backfill

1) The Contractor shall follow all OHSA and Cal/OSHA requirements for trench excavation safety.

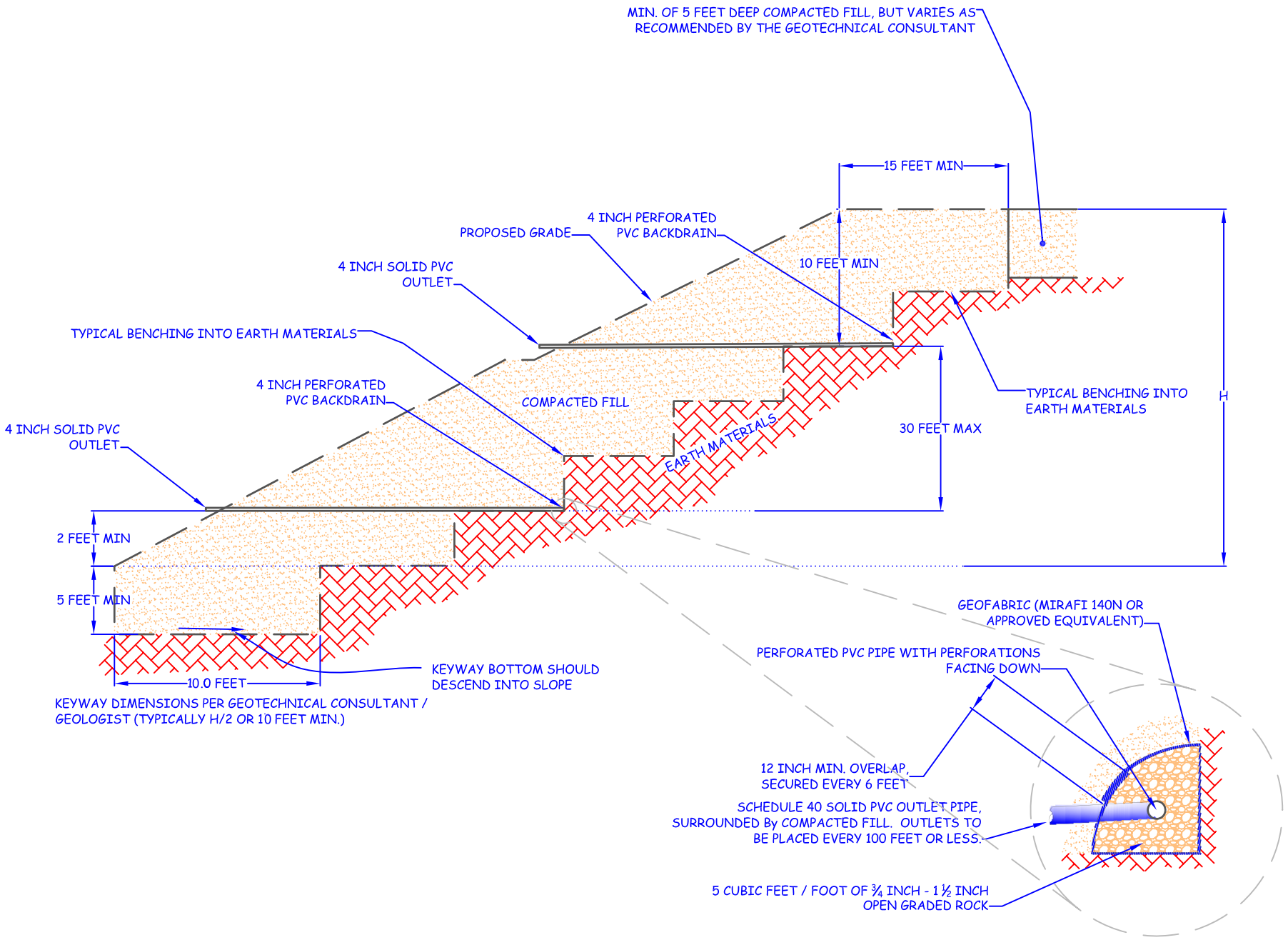
2) Bedding and backfill of utility trenches shall be done in accordance with the applicable provisions in the Standard Specifications of Public Works Construction. Bedding materials shall have a Sand Equivalency more than 30 (SE>30). The bedding shall be placed to 1 foot over the conduit and thoroughly jetting to provide densification. Backfill should be compacted to a minimum of 90 percent of maximum dry density, from 1 foot above the top of the conduit to the surface.

3) Jetting of the bedding materials around the conduits shall be observed by the Geotechnical Consultant.

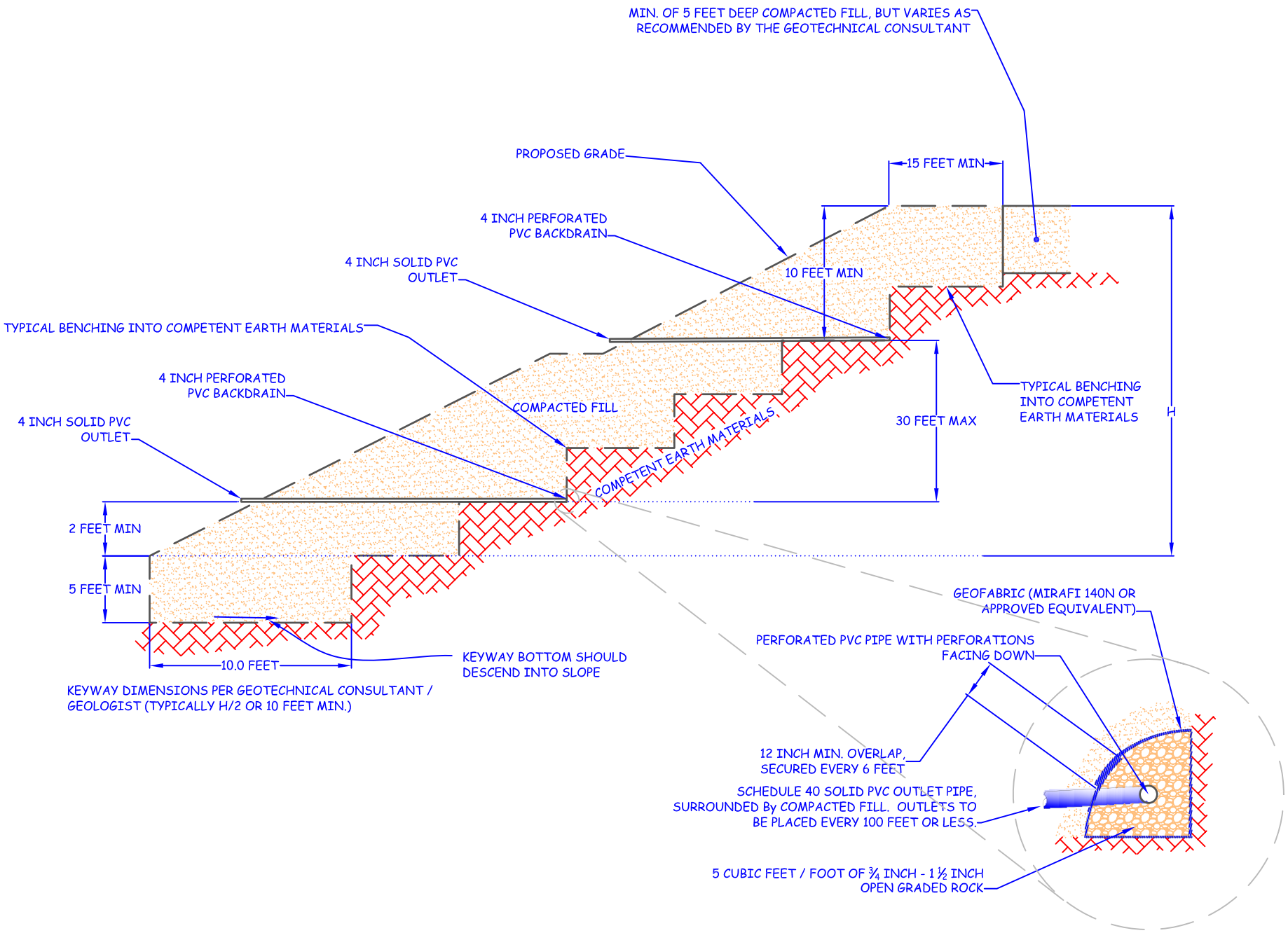
4) The Geotechnical Consultant shall test trench backfill for the minimum compaction requirements recommended herein. At least one test should be conducted for every 300 linear feet of trench and for each 2 vertical feet of backfill.

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

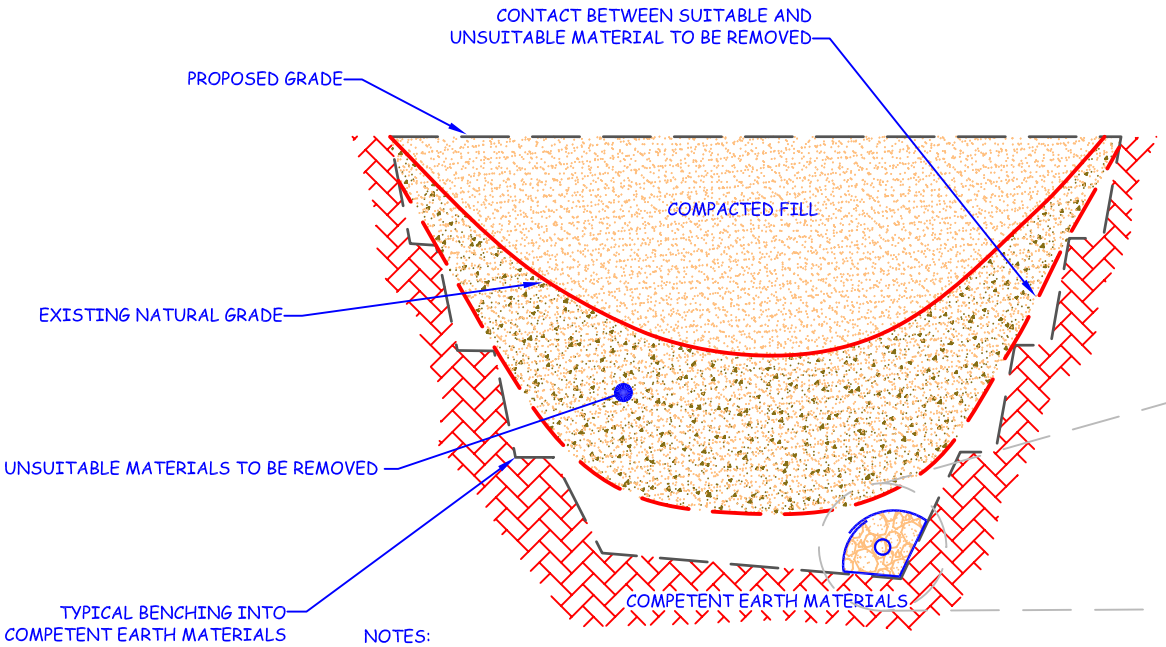
STABILIZATION FILL TYPICAL DETAIL

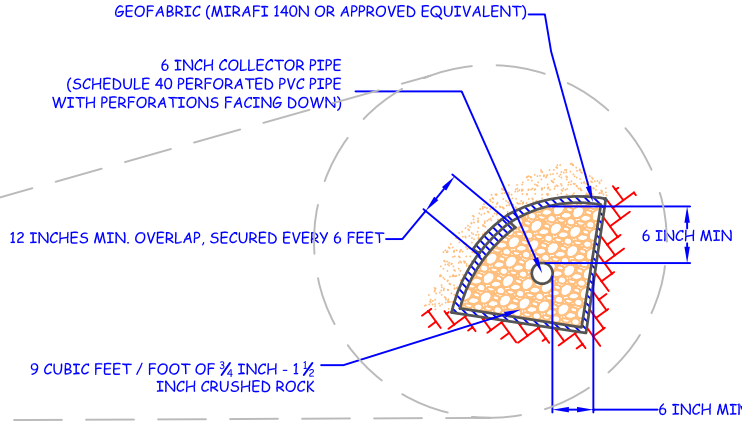


BUTTRESS TYPICAL DETAIL



CANYON SUBDRAIN SYSTEM TYPICAL DETAIL

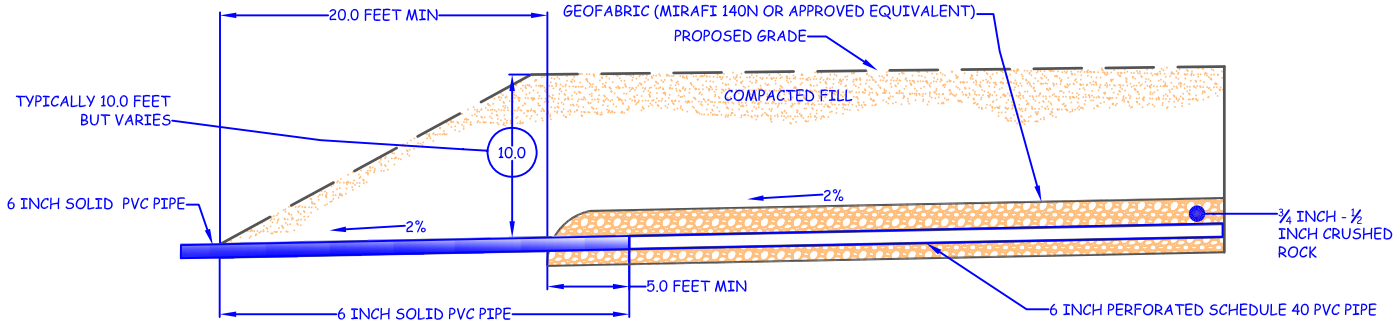




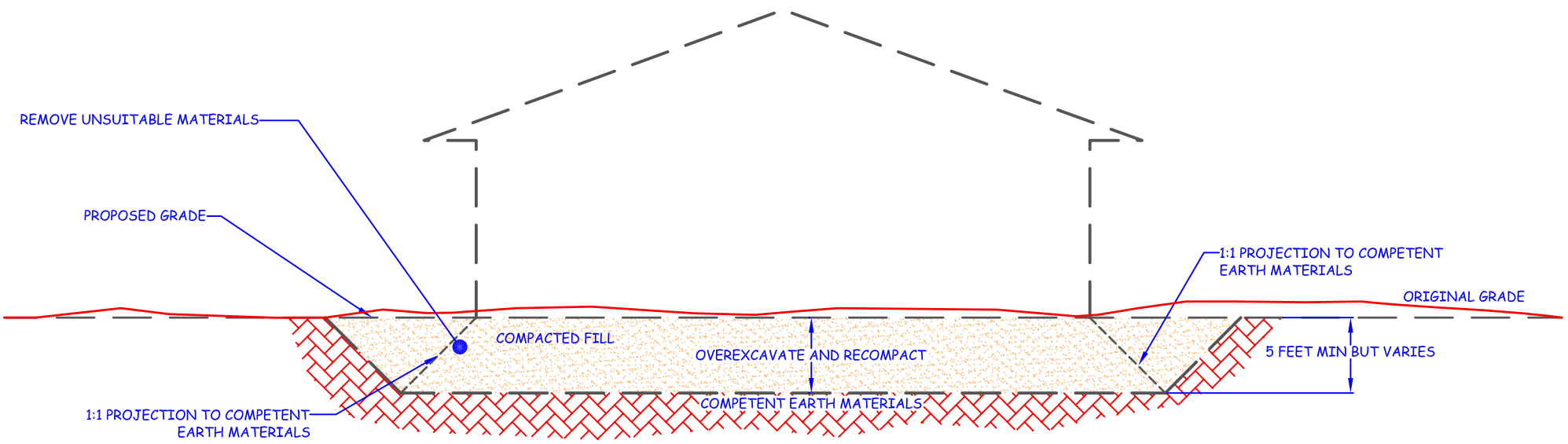
NOTES:
1 - CONTINUOUS RUNS IN EXCESS OF 500 FEET LONG WILL REQUIRE AN 8 INCH DIAMETER PIPE.

2 - FINAL 20 FEET OF PIPE AT OUTLET WILL BE SOLID AND BACKFILLED WITH COMPACTED FINE-GRAINED EARTH MATERIALS.

CANYON SUBDRAIN TYPICAL OUTLET



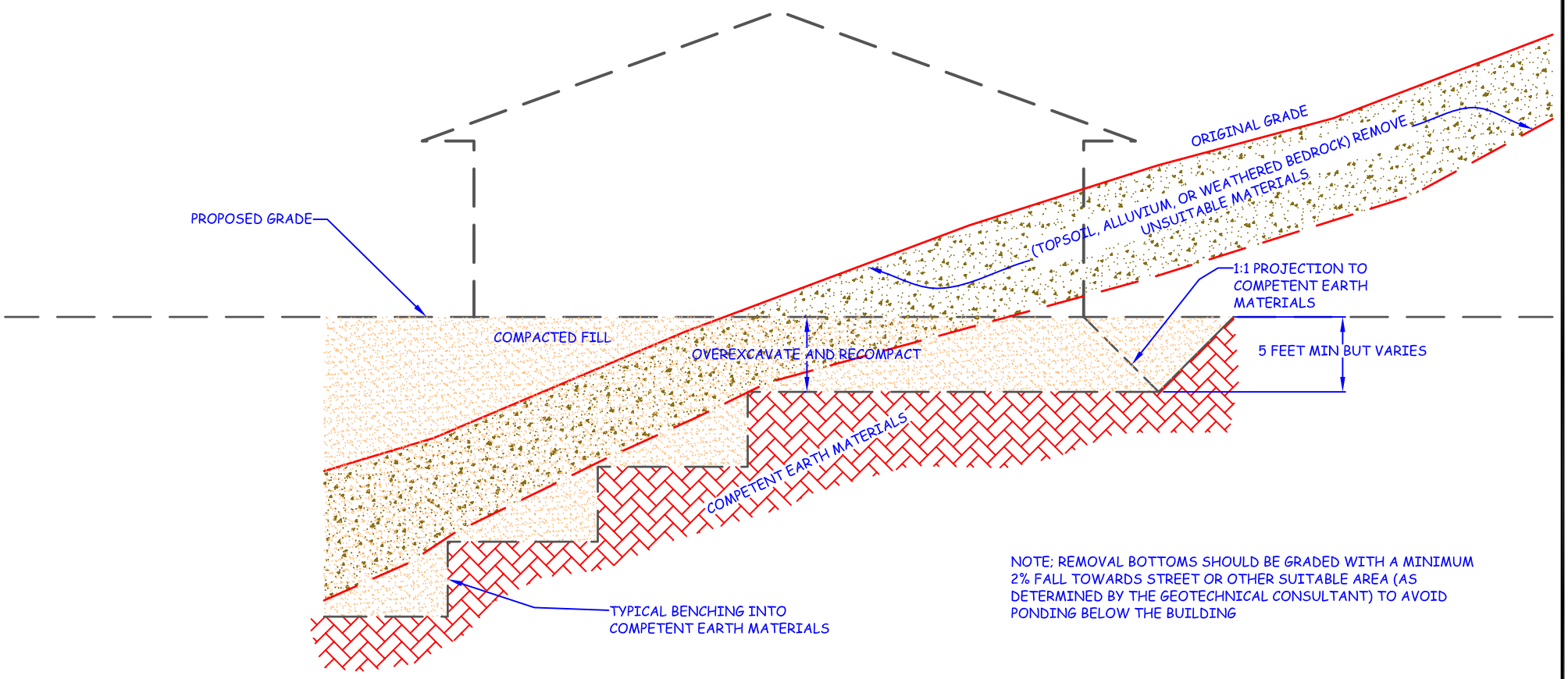
CUT LOT TYPICAL DETAIL



NOTE: REMOVAL BOTTOMS SHOULD BE GRADED WITH A MINIMUM 2% FALL TOWARDS STREET OR OTHER SUITABLE AREA (AS DETERMINED BY THE GEOTECHNICAL CONSULTANT) TO AVOID PONDING BELOW THE BUILDING

NOTE: WHERE DESIGN CUT LOTS ARE EXCAVATED ENTIRELY INTO COMPETENT EARTH MATERIALS, OVEREXCAVATION MAY STILL BY NEEDED FOR HARD-ROCK CONDITIONS OR MATERIALS WITH VARIABLE EXPANSION POTENTIALS

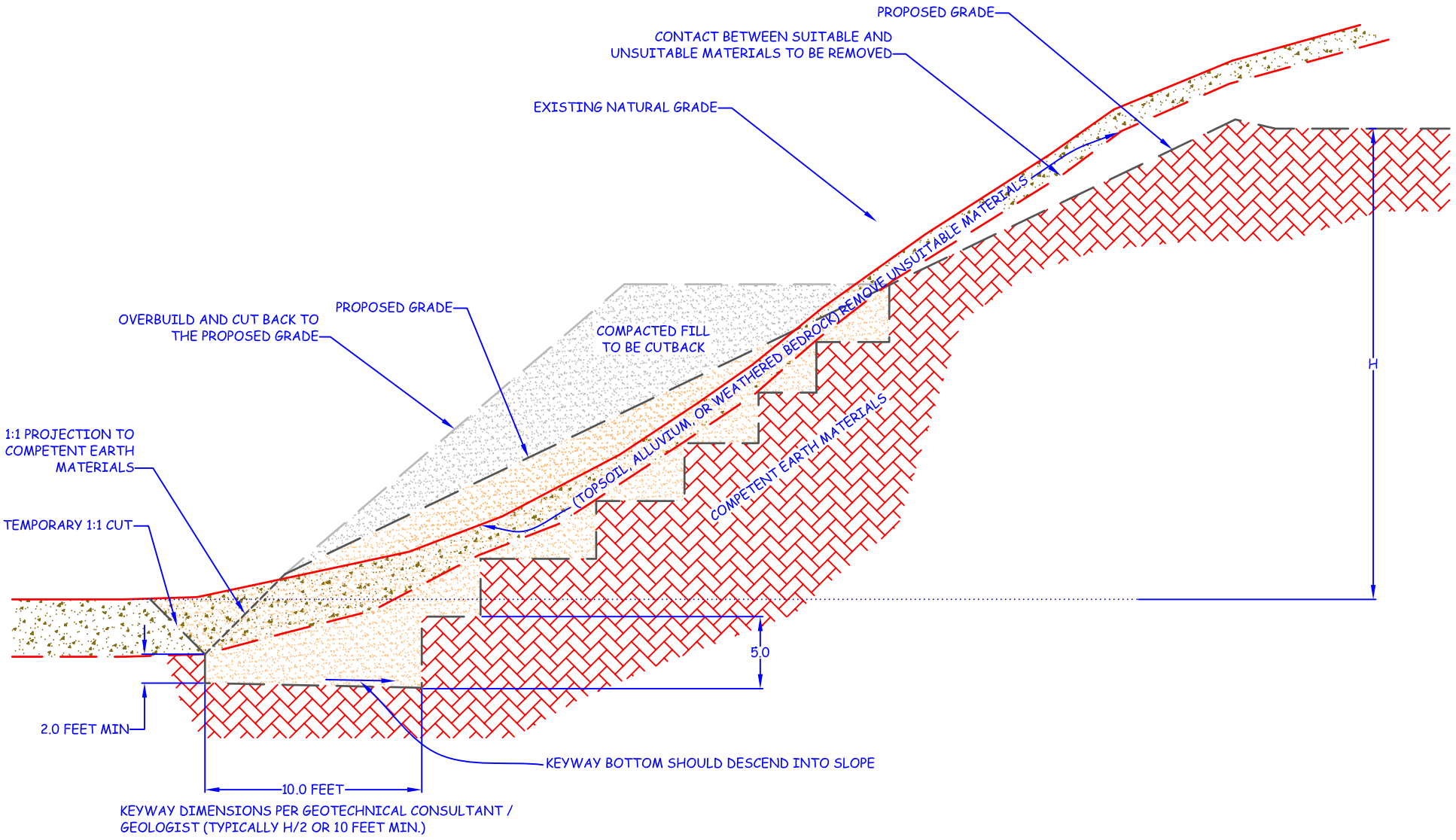
CUT / FILL TRANSITION LOT TYPICAL DETAIL



NOTE; REMOVAL BOTTOMS SHOULD BE GRADED WITH A MINIMUM 2% FALL TOWARDS STREET OR OTHER SUITABLE AREA (AS DETERMINED BY THE GEOTECHNICAL CONSULTANT) TO AVOID PONDING BELOW THE BUILDING

NOTE: WHERE DESIGN CUT LOTS ARE EXCAVATED ENTIRELY INTO COMPETENT EARTH MATERIALS, OVEREXCAVATION MAY STILL BY NEEDED FOR HARD-ROCK CONDITIONS OR MATERIALS WITH VARIABLE EXPANSION POTENTIALS

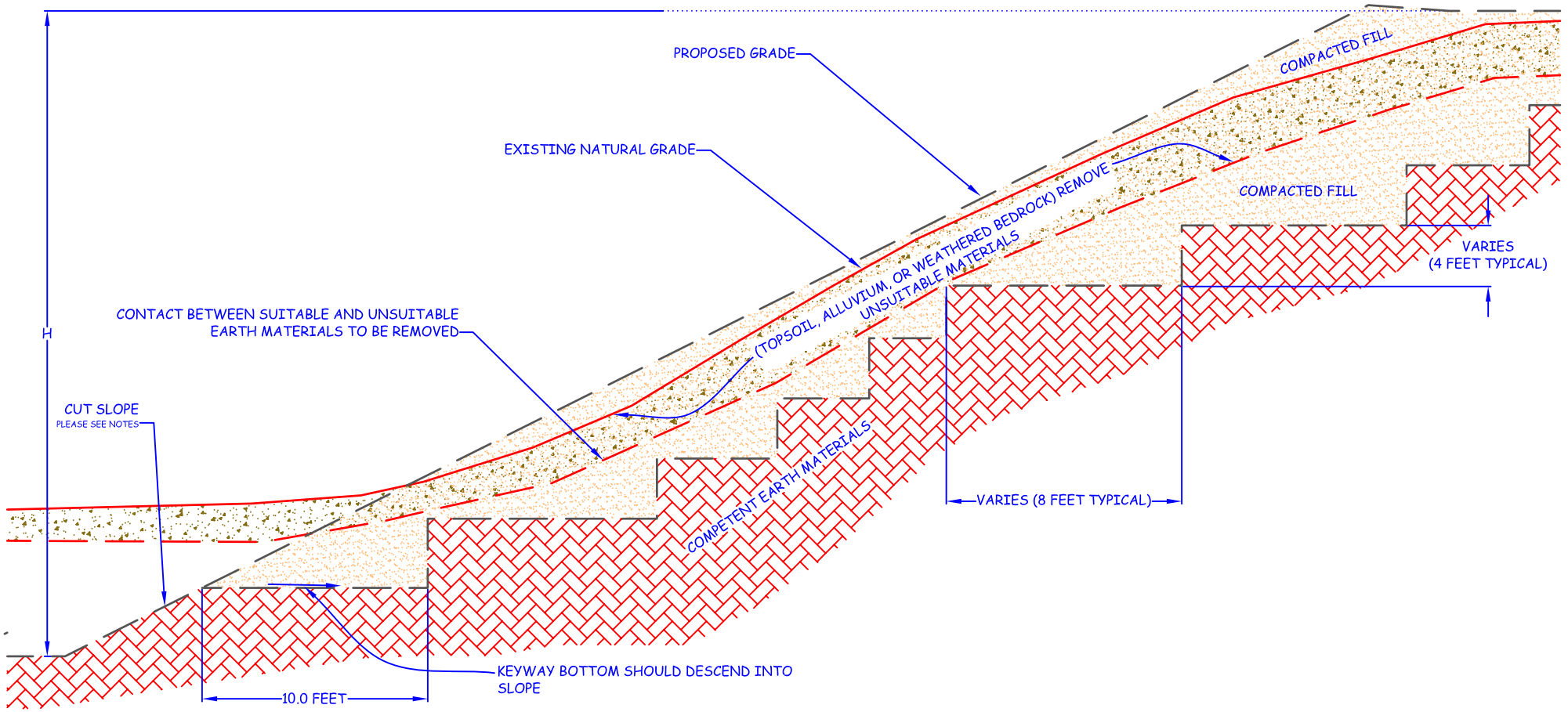
KEYWAY & BENCHING TYPICAL DETAILS
CUT OVER FILL SLOPE



NOTE:

NATURAL SLOPES STEEPER THAN 5:1 (H:V) MUST BE BENCHED INTO COMPETENT EARTH MATERIALS

KEYWAY & BENCHING TYPICAL DETAILS
FILL OVER CUT SLOPE



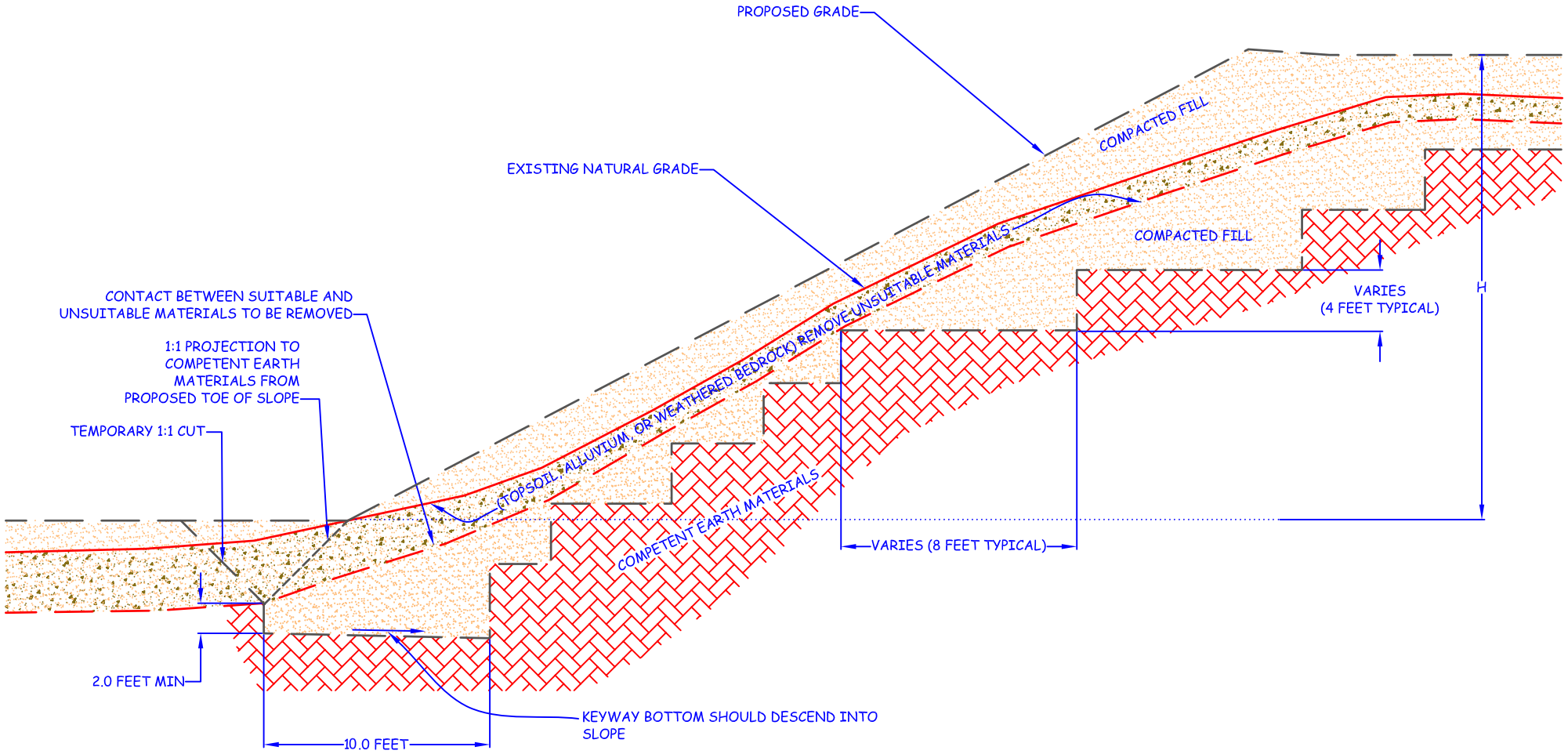
KEYWAY DIMENSIONS PER GEOTECHNICAL CONSULTANT / GEOLOGIST (TYPICALLY H/2 OR 10 FEET MIN.)

NOTES:

NATURAL SLOPES STEEPER THAN 5:1 (H:V) MUST BE BENCHED INTO COMPETENT EARTH MATERIALS

THE CUT SLOPE MUST BE CONSTRUCTED FIRST

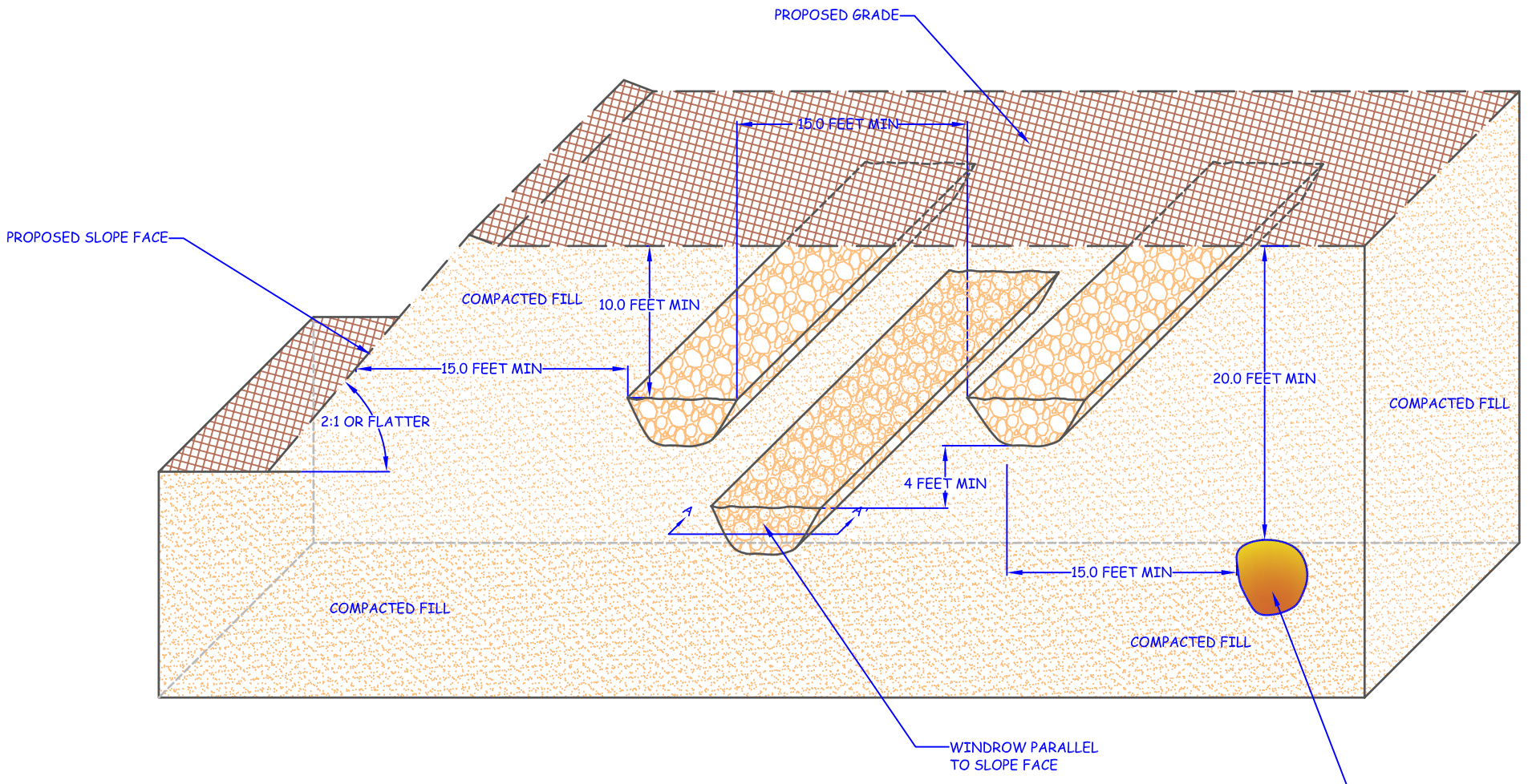
KEYWAY & BENCHING TYPICAL DETAILS
FILL SLOPE



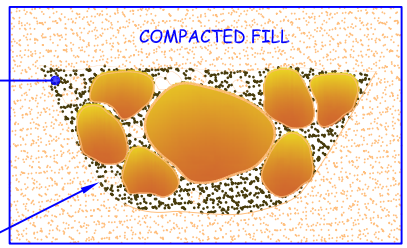
NOTES:

NATURAL SLOPES STEEPER THAN 5:1 (H:V) MUST BE BENCHED INTO COMPETENT EARTH MATERIALS

OVERSIZE ROCK TYPICAL DETAIL

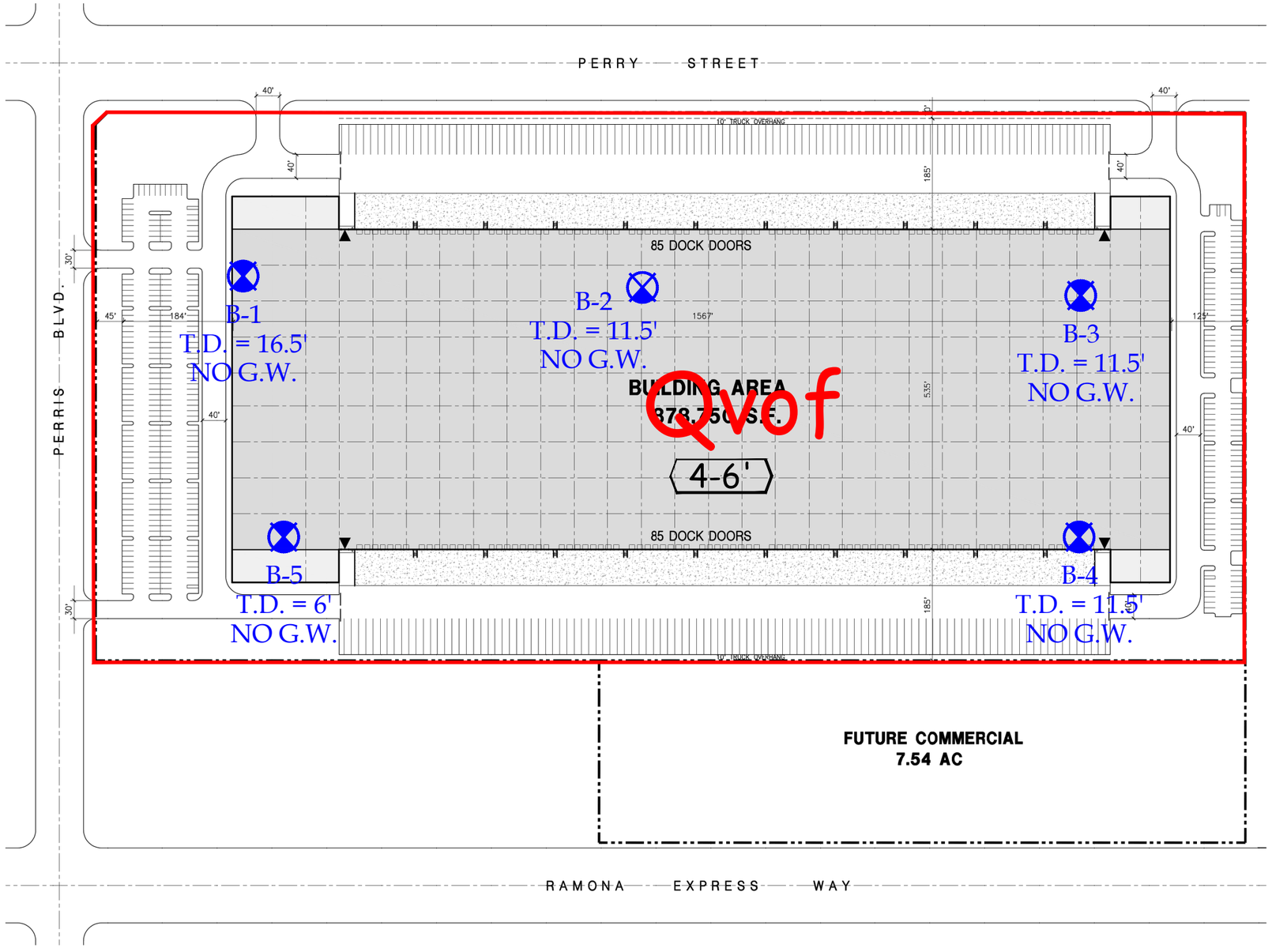


CROSS SECTION A-A'



NOTES:

OVERSIZE ROCK IS LARGER THAN
8 INCHES IN MAX DIAMETER



LEGEND

Locations are Approximate

Geologic Units

Qvof - Quaternary Very Old Alluvial-Fan Deposits

Symbols

- Limits of Report
- B-5 T.D. = 6' NO G.W. - Boring Location Including Total Depth and Depth to Groundwater
- 4-6' - Recommended Removal Depths

NORTH

0 100 200 400

SCALE: 1" = 200'

GEOTECHNICAL MAP

LOCATED ON RAMONA EXPRESSWAY AND PERRIS BOULEVARD

CITY OF PERRIS, RIVERSIDE COUNTY, CALIFORNIA. APN 302-130-002, 302-130-008, 302-130-018, 302-130-021 THROUGH 302-130-024, AND 302-130-027

PROJECT	PROPOSED COMMERCIAL WAREHOUSE		
CLIENT	MR. MICHAEL NAGGAR		
PROJECT NO.	213885-10A		
DATE	DECEMBER 2021		
SCALE	1" = 200'		
DWG XREFS			
REVISION			
DRAWN BY	JDG	PLATE	1 OF 1

Earth Strata Geotechnical Services, Inc.
Geotechnical, Environmental and Materials Testing Consultants
www.ESGSINC.com (951) 397-8315

Appendix 4: Historical Site Conditions

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

Earth Strata Geotechnical Services, Inc.

Geotechnical, Environmental and Materials Testing Consultants

PHASE I ENVIRONMENTAL SITE ASSESSMENT

Of

UNDEVELOPED VACANT PROPERTY
Assessor's Parcel Number 302-130-002,
302-130-008, 302-130-018,
302-130-021 through 302-130-024, and 302-130-027
PERRIS, CALIFORNIA 92571

Prepared for:

Mike Naggar and Associates
445 South D Street
Perris, California 92570

Prepared by:

Earth Strata Geotechnical Services
42184 Remington Avenue
Temecula, California 92590
(951) 461-4028
www.earth-strata.com
EGS Project #P213885-60A

Issue Date: September 2, 2021

TABLE OF CONTENTS

Appendix 5: LID Infeasibility

LID Technical Infeasibility Analysis

Low-Impact Development. In recent years, Riverside County has focused on Low-Impact Development (LID), which includes techniques to filter, store and retain runoff on-site. LID BMPs retain runoff to optimize infiltration/recharge, and many promote the use of vegetation to provide for the uptake of pollutants. Although LID BMPs can provide environmental, economic and community benefits, they can retain
N/A - site infiltration too low
attract hazardous wildlife
aircraft operations and must be considered with caution within the AIA.

Aviation-Specific Stor
N/A - site infiltration too low
edges that project-related
N/A - no demand
factors, such as soil types
structability, etc. United S
N/A - site infiltration too low
and FAA have identified
be considered during BMP design and incorporated to make most BMPs less attractive to wildlife (Table 2).

ADAPTIVE MEASURES

When open water detention ponds must be used within the AIA, the ponds may be equipped with bird balls, floating covers, nets, or overhead wires to cover open water and discourage use by hazardous wildlife. For example, concrete basins are unlikely to attract wildlife, and pond liners can prevent the development of hydrophytic vegetation. These technologies must be used with caution and only in areas
N/A - site infiltration too low

Infiltration trenches detain water for brief periods. This trench at Seattle-Tacoma Airport includes vegetation appropriate for an airport environment.

Bioretention facilities can provide food and shelter for potentially hazardous wildlife, but may be suitable with modification.

Table 1. Structural Best Management Practices (BMPs) and Compatibility in an Airport Influence Area (AIA)

BMP	Compatibility within the AIA
Infiltration trenches Recommended	■ Suitable because water accumulates below ground surface. ■ Vegetation must be selected and reviewed by a FAA-qualified Airport Wildlife Hazard Biologist (qualified biologist) to discourage wildlife.
Permeable Pavement Recommended	Does not include water storage. Appropriate for parking lots and other paved surfaces that are not high-traffic areas.
Harvest and Use (RWH) Recommended	Suitable as long as water is stored in enclosed areas.
Sand Filter Basins Recommended	Desirable because standing water is treated through an underdrain system.
Vegetated Filter Strips and Vegetated Swales Recommended	Desirable because neither BMP involves ponded water. However, vegetation must be selected to discourage hazardous wildlife and reviewed by a qualified biologist.
Water Quality Inlets Recommended	Desirable because they do not provide ponded water. Associated vegetation must be selected to discourage hazardous wildlife and reviewed by a qualified biologist.
Infiltration Basins Not recommended without Modification. Suitable only if design addresses wildlife hazards	■ Unsuitable in ALUCP Compatibility Zone A. ■ Suitable in Zones B and C with appropriate modifications, such as: Drawdown within 48 hours or manufactured cover to prevent view and availability of open water; and absence of landscape or landscaping approved by a qualified biologist. ■ Steep slopes (steeper than 3:1).
Bioretention Facilities Not Recommended without Modification (also known as rain gardens bioretention basins, infiltration basins, landscaped filter basins)	Although bioretention can mask open water, BMP is not recommended for airports based on its potential to provide food, water, and shelter for hazardous wildlife. ■ Unsuitable in Compatibility Zone A. ■ Potentially suitable in Zones B and C only when small in size (e.g., parking islands, site entrances, planter boxes, etc.) and when vegetation is selected to discourage hazardous wildlife and reviewed by a qualified biologist. ■ Potentially suitable in Zones D and E when basin is less than 30 feet in length/width; and vegetation is selected to discourage hazardous wildlife and reviewed by a qualified biologist.
Extended Detention Basin Not Recommended	■ Unsuitable in Zones A through C. ■ Should be avoided in Zones D and E. If necessary, modify detention period to provide no visible water within 48 hours, provide steep slopes (1:1), provide hardscape for walls and sides; and do not provide vegetation within or adjacent to the pond.

Small bioretention facilities that provide sparse vegetation may be suitable in an aviation environment.

Extended detention basins are frequently used to serve both water quality management and to provide amenities. These basins hold water and would not be appropriate within an AIA because of the open water.

Sand filter at the base of the bioswale promotes infiltration.

Porous pavements allow water to infiltrate to a soil layer below the surface.

Adaptive measures such as liners, a concrete basin, and overhead wire grid can make extended detention strategies less attractive to hazardous wildlife.

Infiltration basins with rock bottoms are less attractive to birds because they mask water and do not provide vegetation.

Vegetated bioswales improve water quality and prevent water accumulation. However, dense and tall vegetation may be attractive to hazardous wildlife.

STORMWATER BEST MANAGEMENT PRACTICES

Riverside County and its incorporated cities require water quality/stormwater management controls for development and redevelopment projects. The Riverside Conservation District has prepared a separate Water Quality Management Plan for each watershed in the County that identifies treatment control Best Management Practices (BMPs) for improving water quality and managing stormwater volumes/flows following the design storm (i.e., 24-hour storm). Structural BMPs identified in Riverside County guidance and their compatibility within the AIA are summarized in Table 1.

ADDITIONAL RESOURCES/MORE INFORMATION:

- Riverside County Flood Control and Water Conservation District, Water Quality Management Webpage. Available at: http://rcflood.org/npdes.
- FAA Advisory Circular 150/5200-33, "Wildlife Hazard Attractants On and Near Airports": https://www.faa.gov/documentLibrary/media/advisory_circular/150-5200-33B/150_5200_33b.pdf.
- Airport Cooperative Research Program, Balancing Airport Stormwater and Bird Hazard Management: https://www.nap.edu/login.php?action=guest&record_id=22216.

Mead & Hunt

Table 2. Recommended Measures to Reduce Wildlife Attraction Associated with Stormwater BMPs

BMP Characteristic	Recommended Design Measure
Exposed Surface Water • Especially attractive to waterfowl, shorebirds, and flocking birds. • Provides source for drinking and nest building. • More attractive when constructed near other open water features or ponds.	• Reduce availability by providing 48-hour drawdown following a design storm (i.e., 24-hour storm). • Cover using bird balls. • Consider earth-bottom culverts, French drains, trench covers, and underground storage options. • Avoid within 8 km (5 miles) of other open water features or facilities.
Vegetation and Landscaping • Provides food. • Tall vegetation provides shelter and nesting opportunities. • Diverse vegetation attracts more diverse wildlife.	• Eliminate vegetation (concrete banks, steep slopes, etc.). • If necessary, provide a monoculture or decreased diversity. • Never use species that provide a food source (seeds, berries, nuts, and drupes). • Provide regular maintenance to prevent seeding and shelter.
Aspect/Geometry • Slopes can provide opportunities for nesting and loafing.	Avoid or reduce available shoreline: • Implement narrow, linear trenches rather than open water or regular circles as pond shapes. • Create steep slopes (<3:1). • Avoid irregular shapes for basins. • Avoid vegetation.

WHAT YOU CAN DO:

Airport operators, developers and communities must work together to manage stormwater in the airport vicinity to reduce hazards to air travelers and the public while addressing site-specific challenges.

- Identify whether your project is near an airport and in an AIA or critical area. (http://www.rcaluc.org/Plans/New-Compatibility-Plan).
- Work with the airport operator, ALUC, and city/county staff to identify an acceptable water quality management strategy.
- Contact the applicable airport to review your stormwater plans or request plan review by a FAA-qualified wildlife biologist. The form is available at: http://www.rcaluc.org/Portals/0/PDFGeneral/form/Wildlife%20Attractants%20-%20FAA%20Review.pdf.

AIRPORTS, WILDLIFE AND STORMWATER MANAGEMENT

GUIDANCE FOR PROPOSED PROJECTS IN AN AIRPORT INFLUENCE AREA

Riverside County includes diverse topography and is home to three watersheds and a portion of the Salton Sea, an important stop along the Pacific Flyway for migrating bird species. The County's arid climate makes water quality management and water conservation paramount.

The County is also the home to Palm Springs International Airport, 12 public use general aviation airports, and the March Air Reserve Base, whose operations can be challenged by the presence of hazardous wildlife such as raptors, water-fowl, doves/pigeons, gulls, flocking birds, and mammals (coyote and deer). Since 1990, more than 150 wildlife strikes with aircraft have occurred in Riverside County, some of which have led to substantial aircraft damage. Most strikes occur at low altitude (less than 3,500 feet above runway height). Much of the geographic area associated with these altitudes coincides with an Airport Influence Area (AIA) as defined in the Riverside County Airport Land Use Compatibility Plan (ALUCP).

AIRPORTS, WILDLIFE AND STORMWATER MANAGEMENT

The Federal Aviation Administration (FAA) identifies stormwater management facilities on and near airports as one of the greatest attractants to hazardous wildlife. Many species are attracted to open water features and associated vegetation that offers water, food, and shelter. The FAA warns against the construction of new open water bodies or mitigation sites within 10,000 feet of aircraft movement areas and within 5 miles of approach/departure surfaces (FAA Advisory Circular 150/5200-33B).

Remains of an owl ingested by an aircraft engine.

Riverside County
Airport Land Use Commission

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 UEG — Date 1/25/2023

Designed by — Case No 22-00006

Company Project Number/Name NEC RAMONA AND PERRIS INDUSTRIAL

BMP Identification

BMP NAME / ID DMA A - Roof and parking area - BMP 1A

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}= 0.58 inches

Drainage Management Area Tabulation

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

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
A	*523239*	*Roofs*	*1*	*0.89*	*466729.2*			
	523239	**Total**			466729.2	0.58	*22558.6*	*67,339*

Notes:

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: UEG
Date: 1/25/2023
Designed by:
Case No: 22-00006
Company Project Number/Name: NEC RAMONA AND PERRIS INDUSTRIAL

BMP Identification

BMP NAME / ID: DMA B - Roof and parking area - BMP 2A

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}= 0.58 inches

Drainage Management Area Tabulation

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

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
B	*209555*	*Roofs*	*1*	*0.89*	*186923.1*			
	209555	***Total***			**186923.1**	**0.58**	***9034.6***	***32,176***

Notes:

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	UEG	Date	1/25/2023
Designed by		Case No	22-00006
Company Project Number/Name	NEC RAMONA AND PERRIS INDUSTRIAL		

BMP Identification

BMP NAME / ID DMA C - Roof and parking area - BMP 3A

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}= 0.58 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)*
C	*165035*	*Roofs*	*1*	*0.89*	*147211.2*			
	165035	***Total***			**147211.2**	**0.58**	***7115.2***	***24,895***

Notes:

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: UEG
Date: 1/25/2023
Designed by:
Case No: 22-00006
Company Project Number/Name: NEC RAMONA AND PERRIS INDUSTRIAL

BMP Identification

BMP NAME / ID: DMA D - Roof and parking area - BMP 4A

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}= 0.58 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)*
D	*635768*	*Roofs*	*1*	*0.89*	*567105.1*			
	635768	***Total***			**567105.1**	**0.58**	***27410.1***	***84,863***

Notes:

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: UEG
Date: 1/25/2023
Designed by:
Case No: 22-00006
Company Project Number/Name: NEC RAMONA AND PERRIS INDUSTRIAL

BMP Identification

BMP NAME / ID: DMA E - SELF RETAINING

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}= 0.58 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)*
E	*17295*	*Ornamental Landscaping*	*0.1*	*0.11*	*1910.4*			
	17295	***Total***			**1910.4**	**0.58**	***92.3***	***93***

Notes:

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: UEG
Date: 1/25/2023
Designed by:
Case No: 22-00006
Company Project Number/Name: NEC RAMONA AND PERRIS INDUSTRIAL

BMP Identification

BMP NAME / ID: Self Retaining Landscape Area F

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}= 0.58 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)*
F	*9531*	*Ornamental Landscaping*	*0.1*	*0.11*	*1052.8*			
	9531	***Total***			**1052.8**	**0.58**	***50.9***	***51***

Notes:

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: UEG
Date: 1/25/2023
Designed by:
Case No: 22-00006
Company Project Number/Name: NEC RAMONA AND PERRIS INDUSTRIAL

BMP Identification

BMP NAME / ID: Self Retaining Landscape Area G

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}= 0.58 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)*
G	*46304*	*Ornamental Landscaping*	*0.1*	*0.11*	*5114.6*			
	46304	***Total***			**5114.6**	**0.58**	***247.2***	***250***

Notes:

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: UEG
Date: 1/25/2023
Designed by:
Case No: 22-00006
Company Project Number/Name: NEC RAMONA AND PERRIS INDUSTRIAL

BMP Identification

BMP NAME / ID: DMA H - STREET RUNOFF

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}= 0.58 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)*
H	*3521*	*Concrete or Asphalt*	*1*	*0.89*	*3140.7*			
	3521		***Total***		**3140.7**	**0.58**	***151.8***	**0**

Proposed Volume must be greater than the Design Capture Volume

Notes:

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: UEG

Date: 1/25/2023

Designed by:

Case No: 22-00006

Company Project Number/Name: NEC RAMONA AND PERRIS INDUSTRIAL

BMP Identification

BMP NAME / ID: DMA A - Roof and parking area - BMP 1B

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)*	*Proposed Flow Rate (cfs)*
DMAs	*A*	*523239*	*Roofs*	*1*	*0.89*	*466729.2*			
		523239	***Total***			**466729.2**	**0.20**	***2.1***	**1.14**

Proposed Volume must be greater than the Design Capture Volume

Notes:

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: UEG
Designed by:
Company Project Number/Name: NEC RAMONA AND PERRIS INDUSTRIAL
Date: 1/25/2023
Case No: 22-00006

BMP Identification

BMP NAME / ID: DMA B - Roof and parking area - BMP 2B

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

DMAs

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)*	*Proposed Flow Rate (cfs)*
B	*209555*	*Roofs*	*1*	*0.89*	*186923.1*			
	209555		***Total***		**186923.1**	**0.20**	***0.9***	**0.89**

Proposed Volume must be greater than the Design Capture Volume

Notes:

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: UEG
Designed by:
Company Project Number/Name: NEC RAMONA AND PERRIS INDUSTRIAL
Date: 1/25/2023
Case No: 22-00006

BMP Identification

BMP NAME / ID: DMA C - Roof and parking area - BMP 3B

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

DMAs

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)*	*Proposed Flow Rate (cfs)*
C	*165035*	*Roofs*	*1*	*0.89*	*147211.2*			
	165035		***Total***		**147211.2**	**0.20**	***0.7***	**0.25**

Proposed Volume must be greater than the Design Capture Volume

Notes:

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: UEG — Date: 1/25/2023

Designed by: — Case No: 22-00006

Company Project Number/Name: NEC RAMONA AND PERRIS INDUSTRIAL

BMP Identification

BMP NAME / ID: DMA D - Roof and parking area - BMP 4B

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

DMAs

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)*	*Proposed Flow Rate (cfs)*
D	*635768*	*Roofs*	*1*	*0.89*	*567105.1*			
	635768		***Total***		**567105.1**	**0.20**	***2.6***	**0.75**

Proposed Volume must be greater than the Design Capture Volume

Notes:

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: UEG
Date: 1/25/2023
Designed by:
Case No: 22-00006
Company Project Number/Name: NEC RAMONA AND PERRIS INDUSTRIAL

BMP Identification

BMP NAME / ID: DMA H - STREET

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

Design Rainfall Intensity: I = 0.20 in/hr

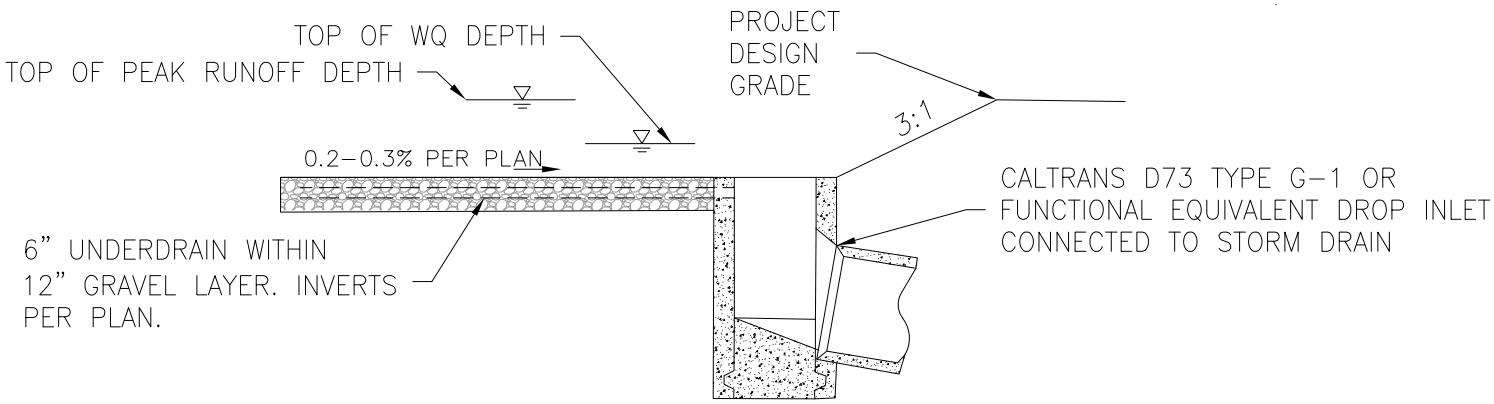
Drainage Management Area Tabulation

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

DMAs

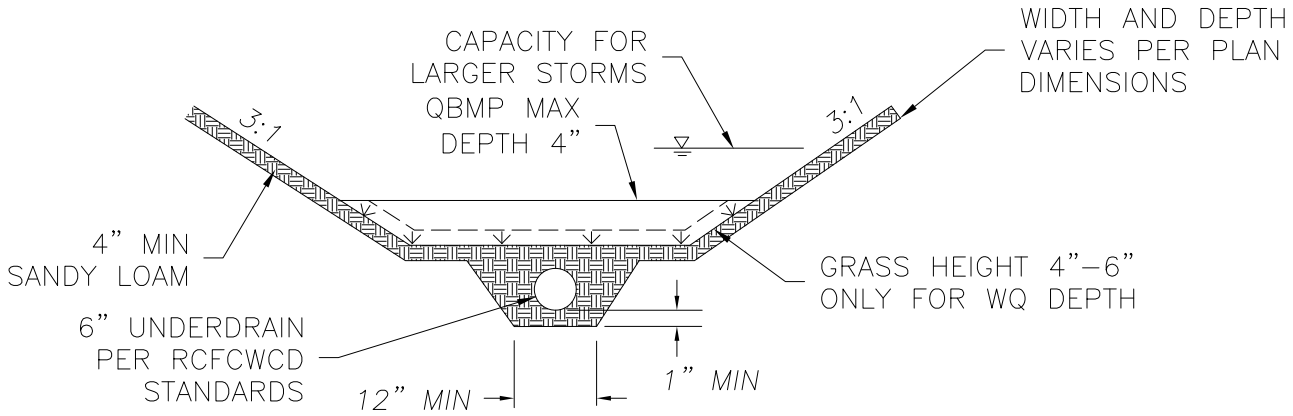
DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type (use pull-down menu)	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Rainfall Intensity (in/hr)*	*Design Flow Rate (cfs)*	*Proposed Flow Rate (cfs)*
H	*3521*	*Concrete or Asphalt*	*1*	*0.89*	*3140.7*			
	3521	***Total***			**3140.7**	**0.20**	**0**	**0**

Notes:



BIO-SWALE END DRAIN DETAIL

NTS



BIO-SWALE SECTION

NTS

Worksheet 9

Design Procedure Form for Grassed Swale

Designer: Christopher Morgan
Company: United Engineering Group
Date: 2-8-2022
Project: NEC Ramona & Perris Warehouse
Location: NEC Ramona & Perris

1. Determine Design Flow (Use Worksheet 2)	Q_{BMP} = Varies See Attached cfs
2. Swale Geometry a. Swale bottom width (b) b. Side slope (z) c. Flow direction slope (s)	 b = _____ ft z = _____ s = _____ %
3. Design flow velocity (Manning n = 0.2)	v = _____ ft/s
4. Depth of flow (D)	D = _____ ft
5. Design Length (L) L = (7 min) x (flow velocity, ft/sec) x 60	L = Varies See Attached ft
6. Vegetation (describe)	_____ _____
8. Outflow Collection (check type used or describe "other")	___ Grated Inlet' ___ Infiltration Trench ___ Underdrain ___ Other_____

Notes:
Pumping will be used to discharge stored WQMP volumes for treatment requirements. At final design pumping flows will match the design swale lengths.

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, Jan 25 2023

BMP 1B - PEAK TREATMENT CPACITY - DEISGN LENGTH = V*60*7MIN = 470'

Trapezoidal

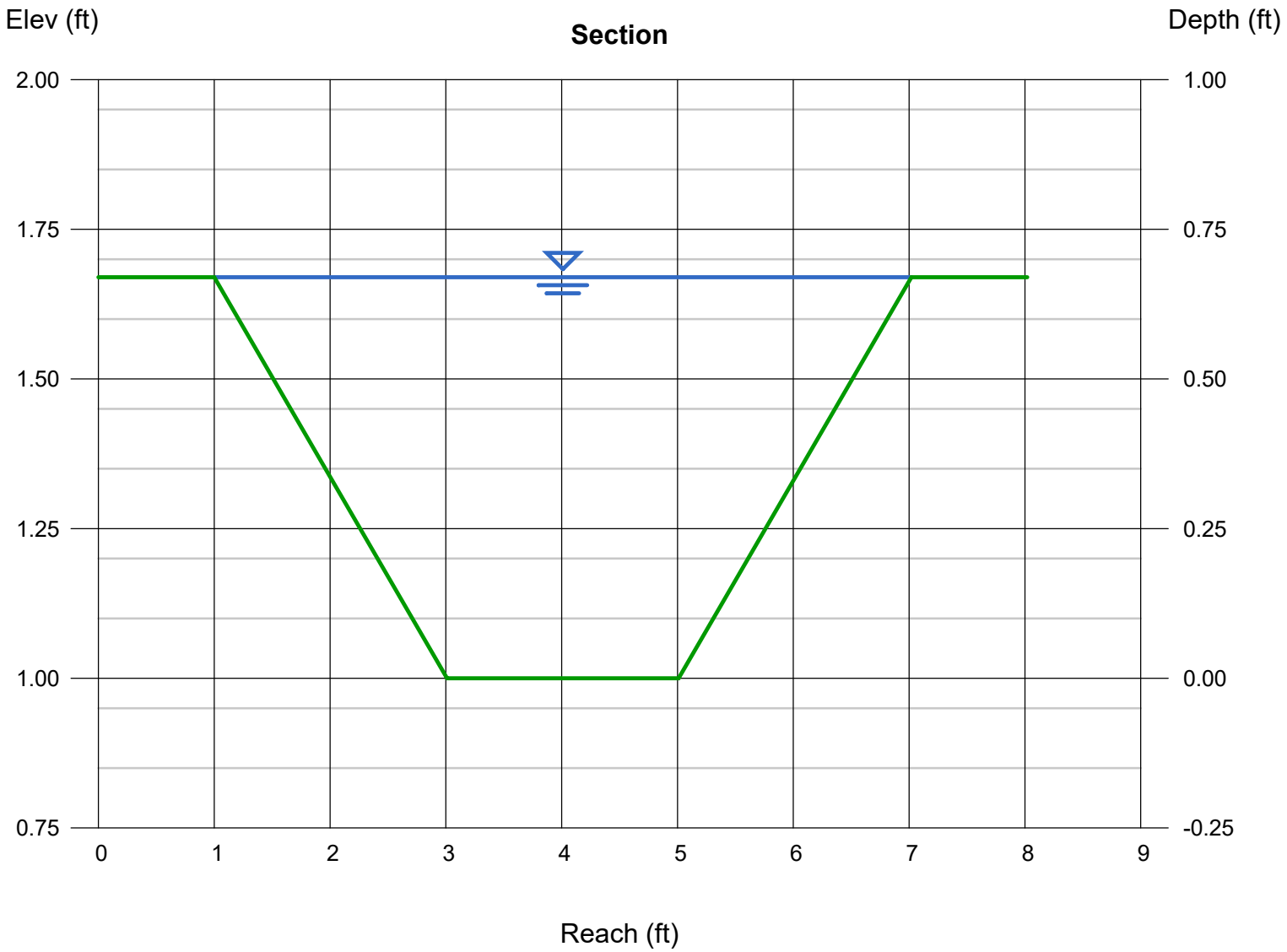
Bottom Width (ft)	= 2.00
Side Slopes (z:1)	= 3.00, 3.00
Total Depth (ft)	= 0.67
Invert Elev (ft)	= 1.00
Slope (%)	= 0.20
N-Value	= 0.033

Calculations

Compute by:	Known Q
Known Q (cfs)	= 3.00

Highlighted

Depth (ft)	= 0.67
Q (cfs)	= 3.000
Area (sqft)	= 2.69
Velocity (ft/s)	= 1.12
Wetted Perim (ft)	= 6.24
Crit Depth, Yc (ft)	= 0.35
Top Width (ft)	= 6.02
EGL (ft)	= 0.69



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, Jan 25 2023

BMP 2B - PEAK TREATMENT CAPACITY - DESIGN LENGTH = V*60*7MIN = 337'

Trapezoidal

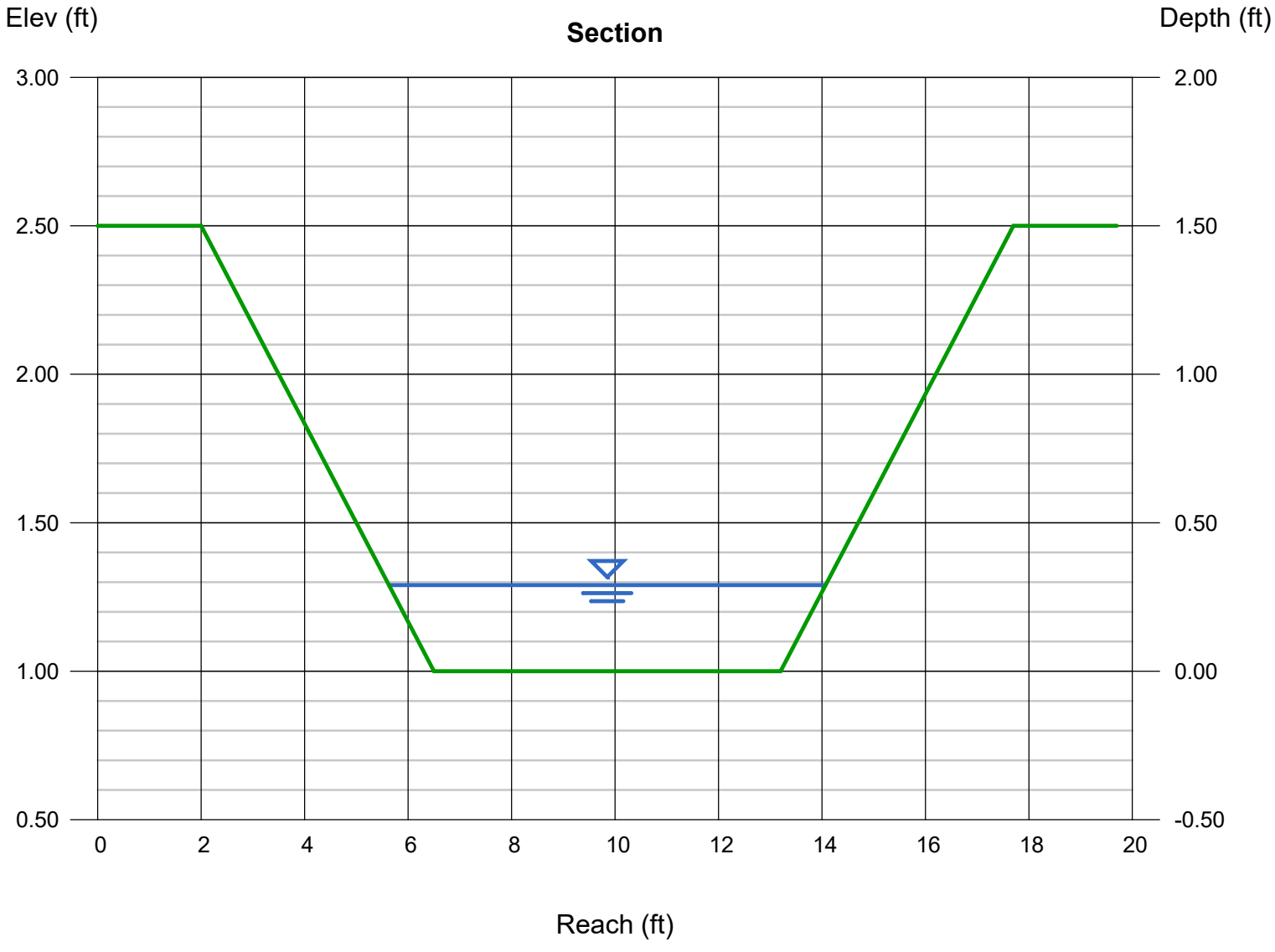
Bottom Width (ft)	= 6.70
Side Slopes (z:1)	= 3.00, 3.00
Total Depth (ft)	= 1.50
Invert Elev (ft)	= 1.00
Slope (%)	= 0.20
N-Value	= 0.033

Calculations

Compute by:	Known Q
Known Q (cfs)	= 1.75

Highlighted

Depth (ft)	= 0.29
Q (cfs)	= 1.750
Area (sqft)	= 2.20
Velocity (ft/s)	= 0.80
Wetted Perim (ft)	= 8.53
Crit Depth, Yc (ft)	= 0.13
Top Width (ft)	= 8.44
EGL (ft)	= 0.30



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, Jan 25 2023

BMP 3B - PEAK TREATMENT CAPACITY - DESIGN LENGTH = V*60*7MIN = 229'

Trapezoidal

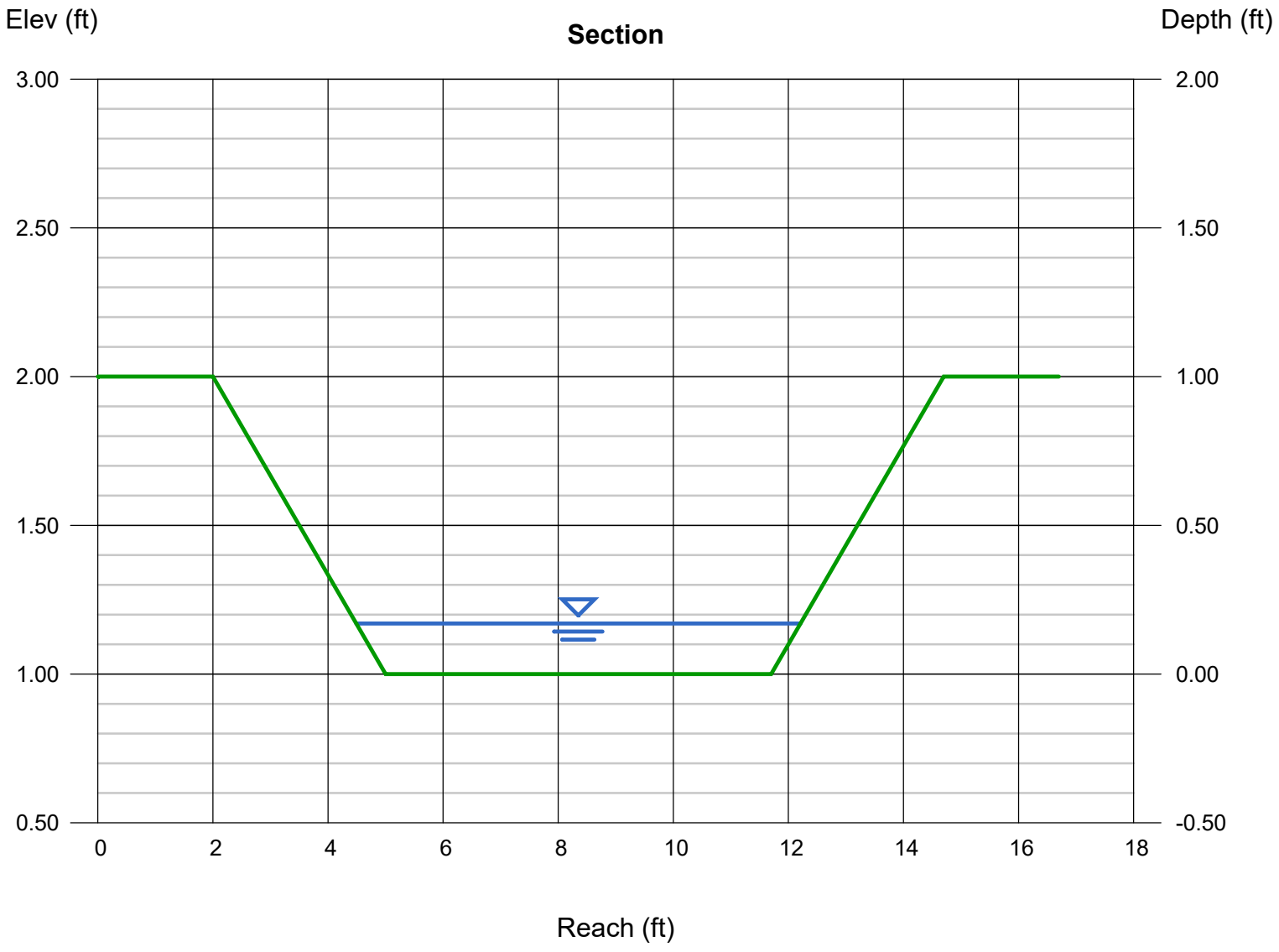
Bottom Width (ft)	= 6.70
Side Slopes (z:1)	= 3.00, 3.00
Total Depth (ft)	= 1.00
Invert Elev (ft)	= 1.00
Slope (%)	= 0.20
N-Value	= 0.033

Calculations

Compute by:	Known Q
Known Q (cfs)	= 0.65

Highlighted

Depth (ft)	= 0.17
Q (cfs)	= 0.650
Area (sqft)	= 1.23
Velocity (ft/s)	= 0.53
Wetted Perim (ft)	= 7.78
Crit Depth, Yc (ft)	= 0.07
Top Width (ft)	= 7.72
EGL (ft)	= 0.17



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, Jan 25 2023

BMP 4B - PEAK TREATMENT CAPACITY - DESIGN LENGTH = V*60*7MIN = 320'

Trapezoidal

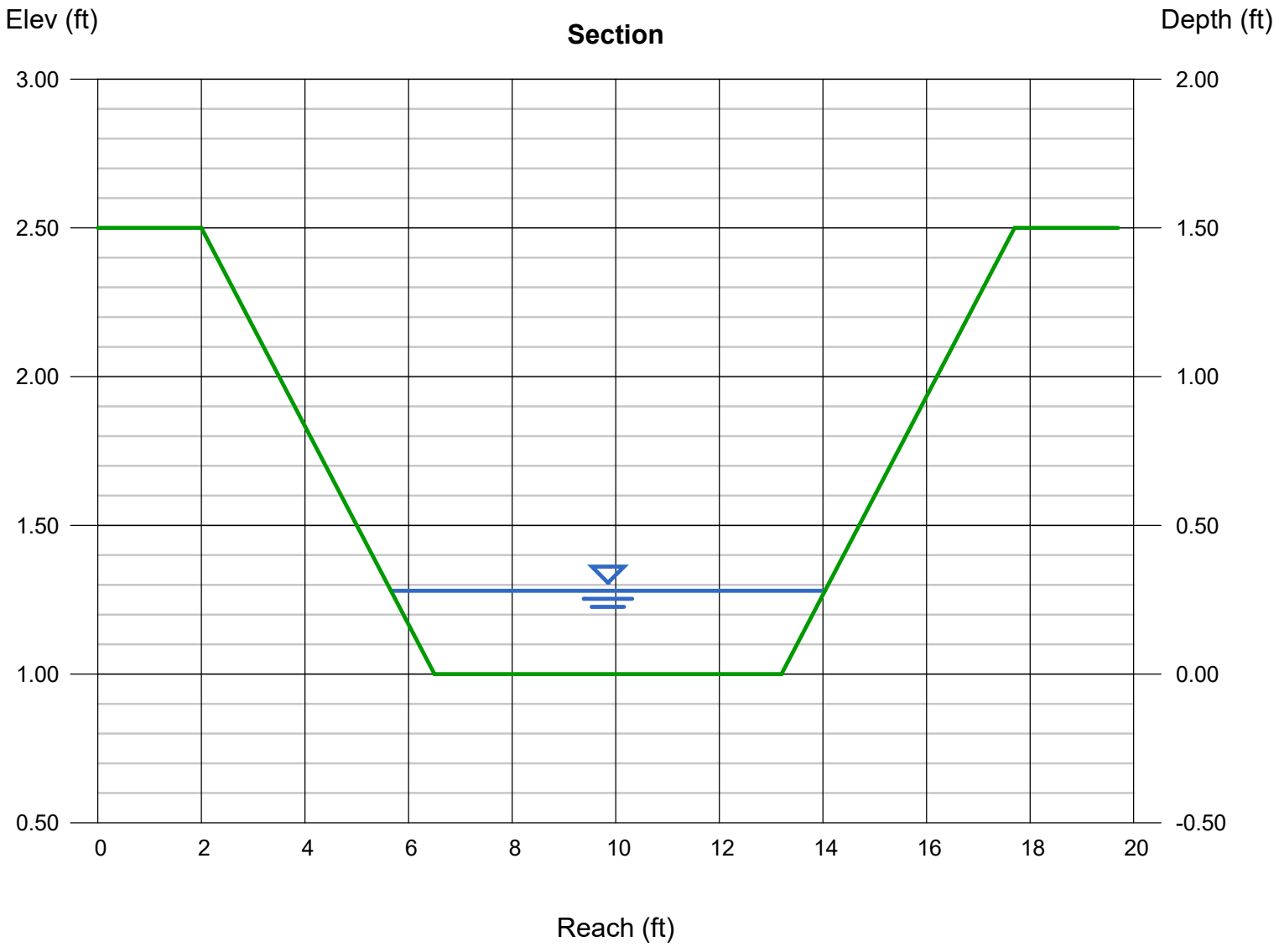
Bottom Width (ft)	= 6.70
Side Slopes (z:1)	= 3.00, 3.00
Total Depth (ft)	= 1.50
Invert Elev (ft)	= 1.00
Slope (%)	= 0.20
N-Value	= 0.033

Calculations

Compute by:	Known Q
Known Q (cfs)	= 1.60

Highlighted

Depth (ft)	= 0.28
Q (cfs)	= 1.600
Area (sqft)	= 2.11
Velocity (ft/s)	= 0.76
Wetted Perim (ft)	= 8.47
Crit Depth, Yc (ft)	= 0.12
Top Width (ft)	= 8.38
EGL (ft)	= 0.29



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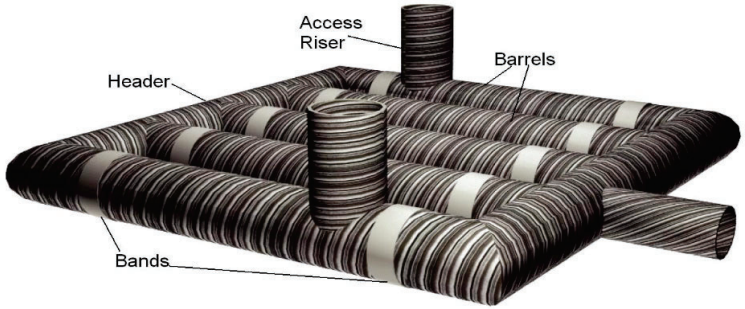
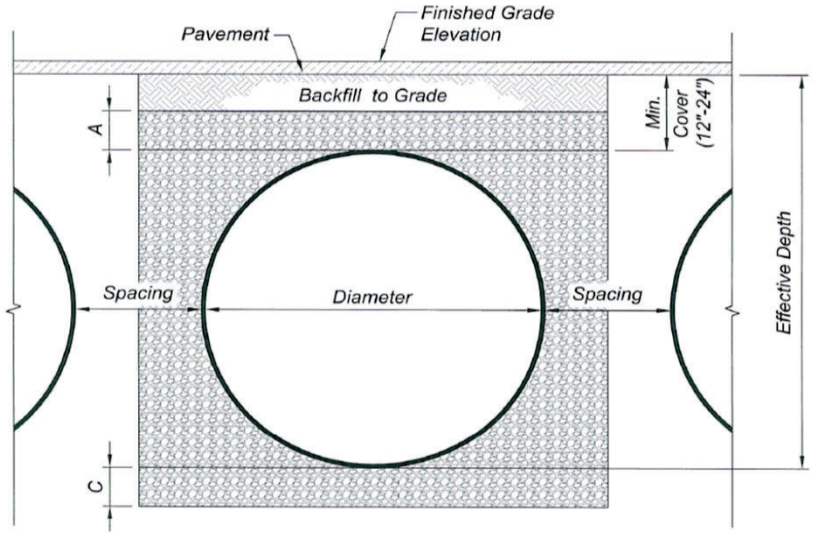


Project Summary

Date:	10/14/2022	
Project Name:	NEC Ramona & Perris BMP 2A	
City / County:	Perris	
State:	CA	
Designed By:	CM	
Company:	United Engineering	**Enter Information in Blue Cells**
Telephone:		

Corrugated Metal Pipe Calculator

Storage Volume Required (cf):	31,701	
Limiting Width (ft):	40.00	
Invert Depth Below Asphalt (ft):	10.50	
Solid or Perforated Pipe:	Perforated	
Shape Or Diameter (in):	96	50.27 ft^2 Pipe Area
Number Of Headers:	1	
Spacing between Barrels (ft):	3.00	
Stone Width Around Perimeter of System (ft):	2	
Depth A: Porous Stone Above Pipe (in):	6	
Depth C: Porous Stone Below Pipe (in):	6	
Stone Porosity (0 to 40%):	40	



System Sizing

Pipe Storage:	22,619	cf	
Porous Stone Storage:	9,557	cf	
Total Storage Provided:	32,176	cf	101.5% Of Required Storage
Number of Barrels:	3	barrels	
Length per Barrel:	140.0	ft	
Length Per Header:	30.0	ft	
Rectangular Footprint (W x L):	34. ft x 152. ft		

CONTECH Materials

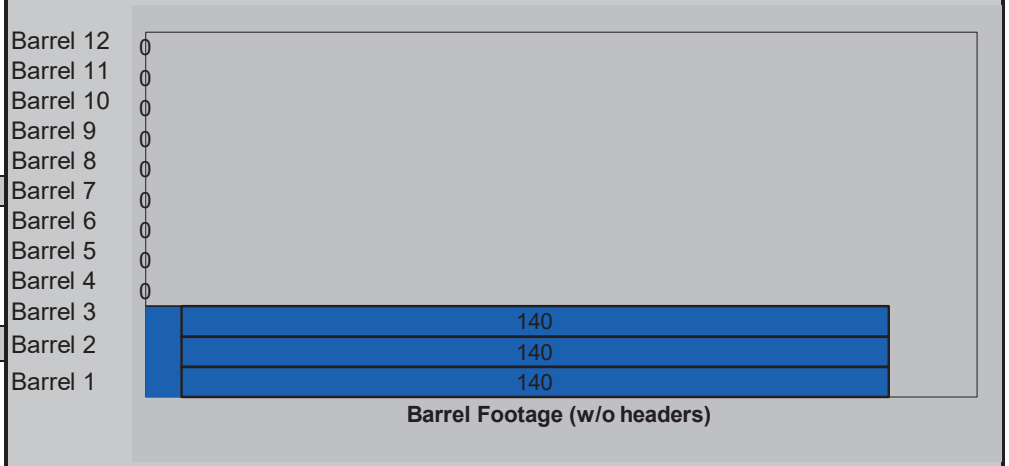
Total CMP Footage:	450	ft
Approximate Total Pieces:	20	pcs
Approximate Coupling Bands:	19	bands
Approximate Truckloads:	10	trucks

Construction Quantities**

Total Excavation:	2010	cy
Porous Stone Backfill For Storage:	885	cy stone
Backfill to Grade Excluding Stone:	287	cy fill

***Construction quantities are approximate and should be verified upon final design*

System Layout



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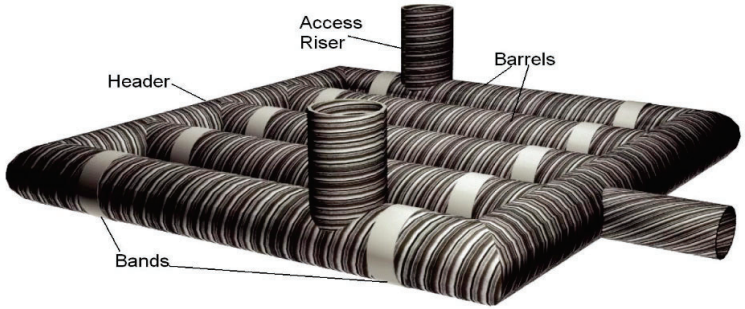
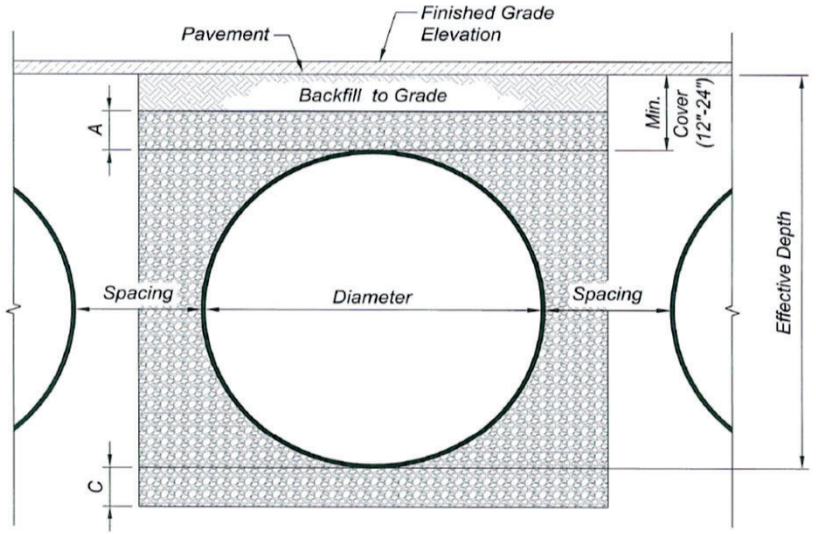


Project Summary

Date:	10/14/2022	
Project Name:	NEC Ramona & Perris BMP 1A	
City / County:	Perris	
State:	CA	
Designed By:	CM	
Company:	United Engineering	**Enter Information in Blue Cells**
Telephone:		

Corrugated Metal Pipe Calculator

Storage Volume Required (cf):	66,798	
Limiting Width (ft):	45.00	
Invert Depth Below Asphalt (ft):	10.50	
Solid or Perforated Pipe:	Perforated	
Shape Or Diameter (in):	96	50.27 ft^2 Pipe Area
Number Of Headers:	1	
Spacing between Barrels (ft):	3.00	
Stone Width Around Perimeter of System (ft):	2	
Depth A: Porous Stone Above Pipe (in):	6	
Depth C: Porous Stone Below Pipe (in):	6	
Stone Porosity (0 to 40%):	40	



System Sizing

Pipe Storage:	47,702	cf	
Porous Stone Storage:	19,637	cf	
Total Storage Provided:	67,339	cf	100.8% Of Required Storage
Number of Barrels:	4	barrels	
Length per Barrel:	227.0	ft	
Length Per Header:	41.0	ft	
Rectangular Footprint (W x L):	45. ft x 239. ft		

CONTECH Materials

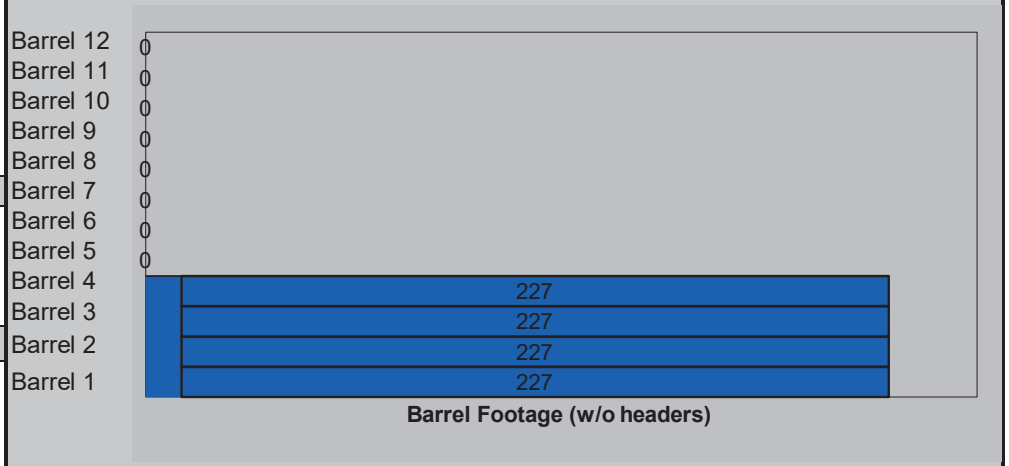
Total CMP Footage:	949	ft
Approximate Total Pieces:	42	pcs
Approximate Coupling Bands:	41	bands
Approximate Truckloads:	21	trucks

Construction Quantities**

Total Excavation:	4183	cy
Porous Stone Backfill For Storage:	1818	cy stone
Backfill to Grade Excluding Stone:	598	cy fill

***Construction quantities are approximate and should be verified upon final design*

System Layout



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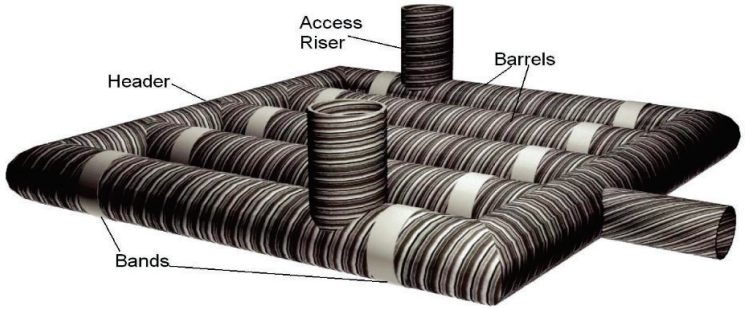
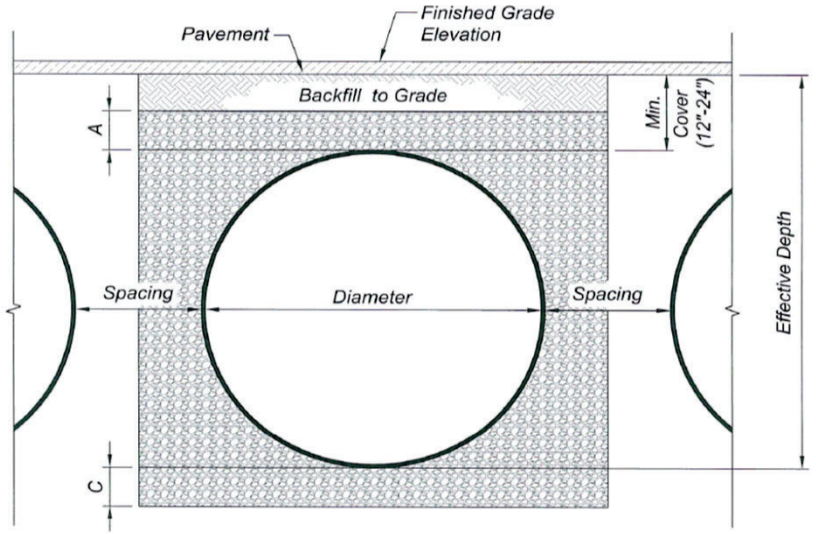


Project Summary

Date:	10/14/2022	
Project Name:	NEC Ramona & Perris BMP 4A	
City / County:	Perris	
State:	CA	
Designed By:	CM	
Company:	United Engineering	**Enter Information in Blue Cells**
Telephone:		

Corrugated Metal Pipe Calculator

Storage Volume Required (cf):	84,346	
Limiting Width (ft):	45.00	
Invert Depth Below Asphalt (ft):	10.50	
Solid or Perforated Pipe:	Perforated	
Shape Or Diameter (in):	96	50.27 ft^2 Pipe Area
Number Of Headers:	1	
Spacing between Barrels (ft):	3.00	
Stone Width Around Perimeter of System (ft):	2	
Depth A: Porous Stone Above Pipe (in):	6	
Depth C: Porous Stone Below Pipe (in):	6	
Stone Porosity (0 to 40%):	40	



System Sizing

Pipe Storage:	60,168	cf	
Porous Stone Storage:	24,695	cf	
Total Storage Provided:	84,863	cf	100.6% Of Required Storage
Number of Barrels:	4	barrels	
Length per Barrel:	289.0	ft	
Length Per Header:	41.0	ft	
Rectangular Footprint (W x L):	45. ft x 301. ft		

CONTECH Materials

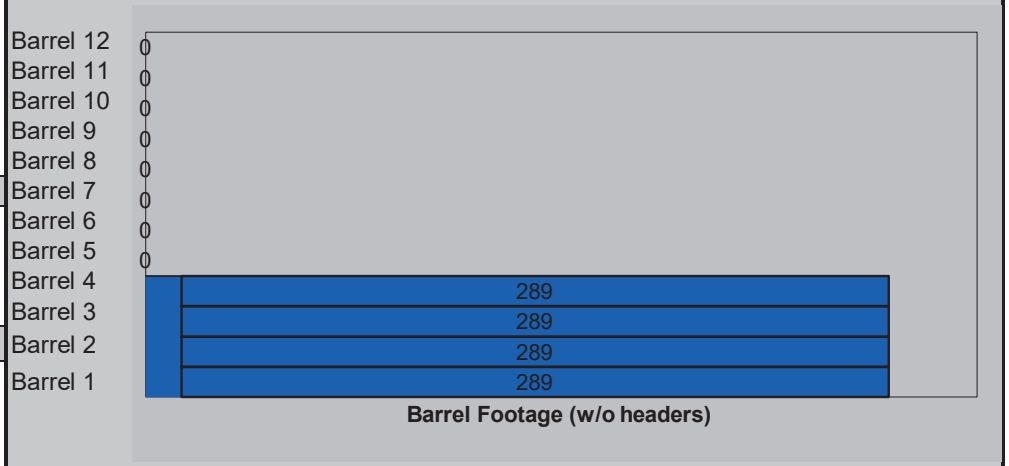
Total CMP Footage:	1,197	ft
Approximate Total Pieces:	54	pcs
Approximate Coupling Bands:	53	bands
Approximate Truckloads:	27	trucks

Construction Quantities**

Total Excavation:	5268	cy
Porous Stone Backfill For Storage:	2287	cy stone
Backfill to Grade Excluding Stone:	753	cy fill

***Construction quantities are approximate and should be verified upon final design*

System Layout



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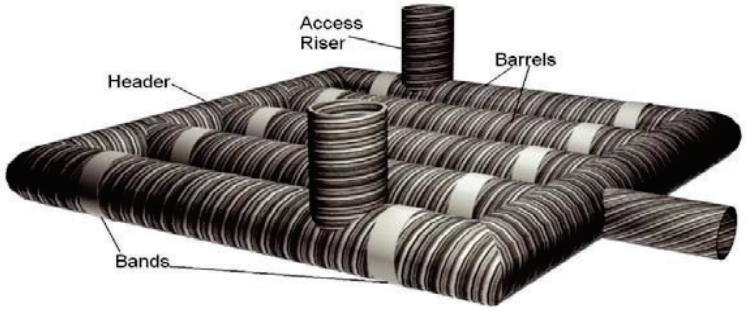


Project Summary

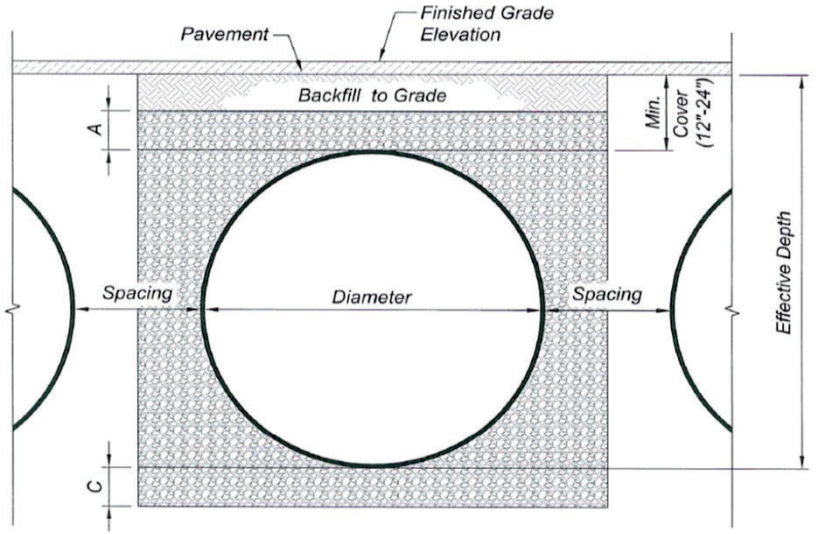
Date:	2/9/2022
Project Name:	NEC Ramona & Perris BMP 3A
City / County:	Perris
State:	CA
Designed By:	CM
Company:	United Engineering
Telephone:	

Enter Information in Blue Cells

Corrugated Metal Pipe Calculator

Storage Volume Required (cf):	24,619
Limiting Width (ft):	24.00
Invert Depth Below Asphalt (ft):	10.50
Solid or Perforated Pipe:	Perforated
Shape Or Diameter (in):	96
Number Of Headers:	1
Spacing between Barrels (ft):	3.00
Stone Width Around Perimeter of System (ft):	2
Depth A: Porous Stone Above Pipe (in):	6
Depth C: Porous Stone Below Pipe (in):	6
Stone Porosity (0 to 40%):	40

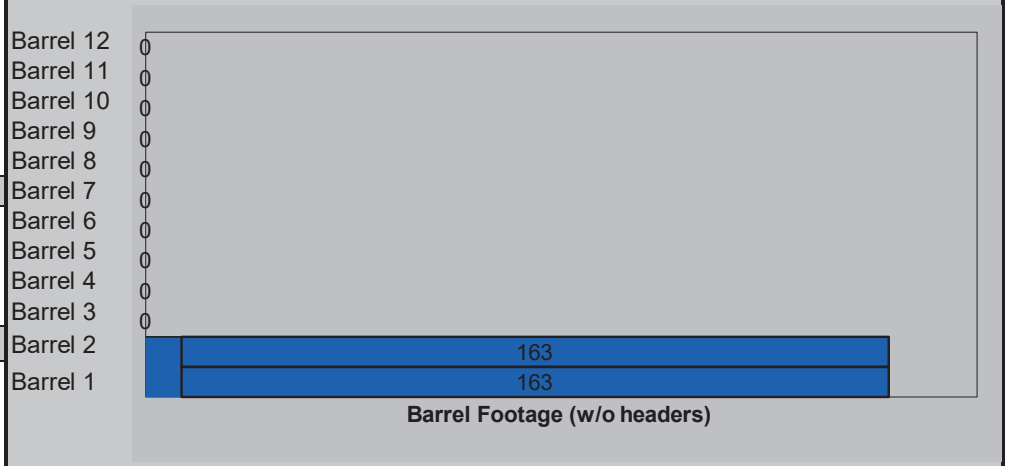
50.27 ft^2 Pipe Area



System Sizing

Pipe Storage:	17,342	cf	
Porous Stone Storage:	7,553	cf	
Total Storage Provided:	24,895	cf	101.1% Of Required Storage
Number of Barrels:	2	barrels	
Length per Barrel:	163.0	ft	
Length Per Header:	19.0	ft	
Rectangular Footprint (W x L):	23. ft x 175. ft		

System Layout



CONTECH Materials

Total CMP Footage:	345	ft
Approximate Total Pieces:	15	pcs
Approximate Coupling Bands:	14	bands
Approximate Truckloads:	8	trucks

Construction Quantities**

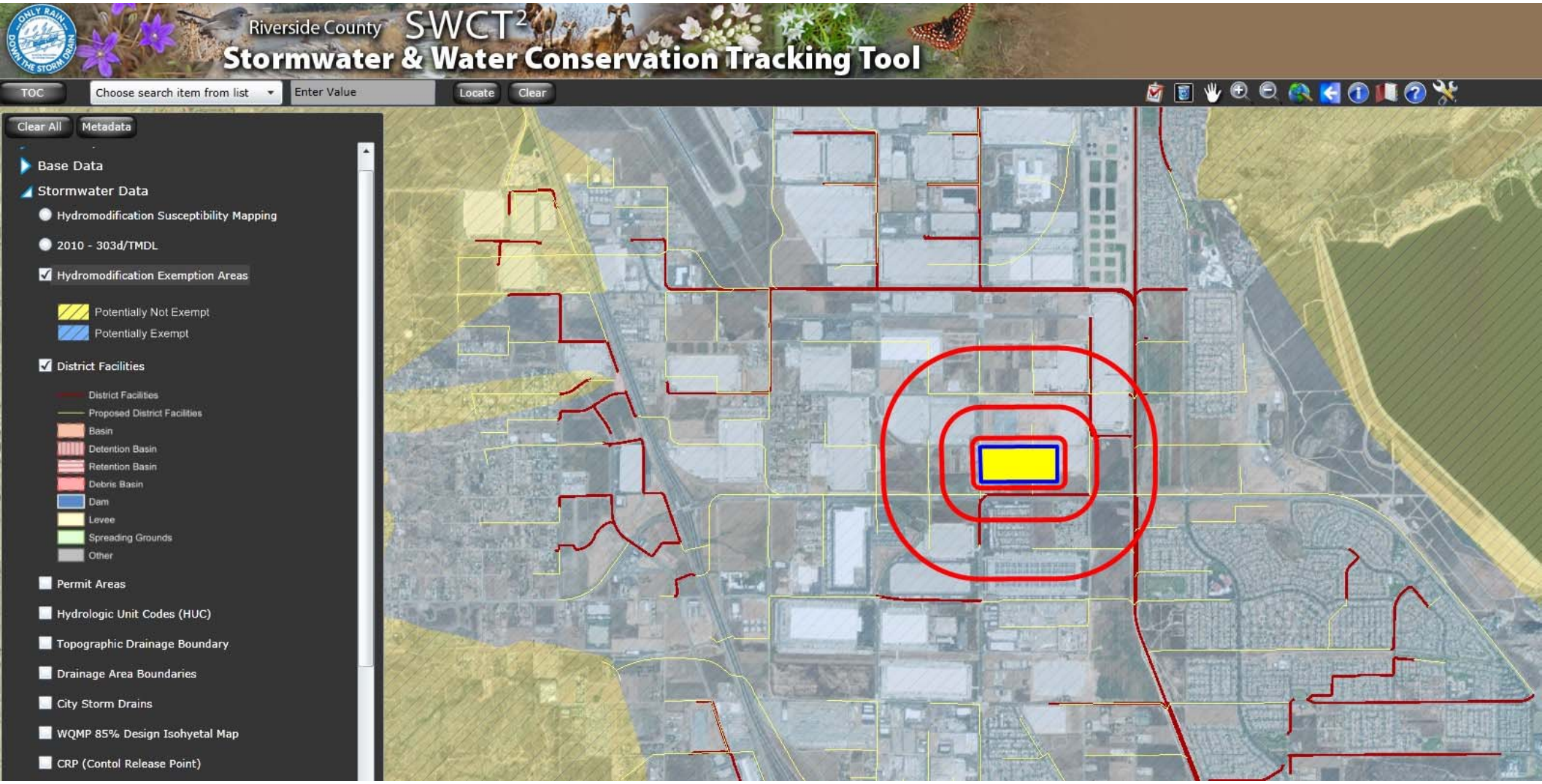
Total Excavation:	1566	cy
Porous Stone Backfill For Storage:	699	cy stone
Backfill to Grade Excluding Stone:	224	cy fill

***Construction quantities are approximate and should be verified upon final design*

Appendix 7: Hydromodification

Supporting Detail Relating to Hydrologic Conditions of Concern

NOT REQUIRED: SITE IS IN HCOC EXEMPTION AREA


Riverside County SWCT2
Stormwater & Water Conservation Tracking Tool
TOC
Choose search item from list
Enter Value
Locate
Clear
Clear All
Metadata
Base Data
Stormwater Data
Hydromodification Susceptibility Mapping
2010 - 303d/TMDL
Hydromodification Exemption Areas
Potentially Not Exempt
Potentially Exempt
District Facilities
District Facilities
Proposed District Facilities
Basin
Detention Basin
Retention Basin
Debris Basin
Dam
Levee
Spreading Grounds
Other
Permit Areas
Hydrologic Unit Codes (HUC)
Topographic Drainage Boundary
Drainage Area Boundaries
City Storm Drains
WQMP 85% Design Isohyetal Map
CRP (Contol Release Point)

Appendix 8: Source Control

Pollutant Sources/Source Control Checklist

To be provide with FWQMP

Appendix 9: O&M

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

To be provide with FWQMP

Appendix 10: Educational Materials

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

To be provide with FWQMP