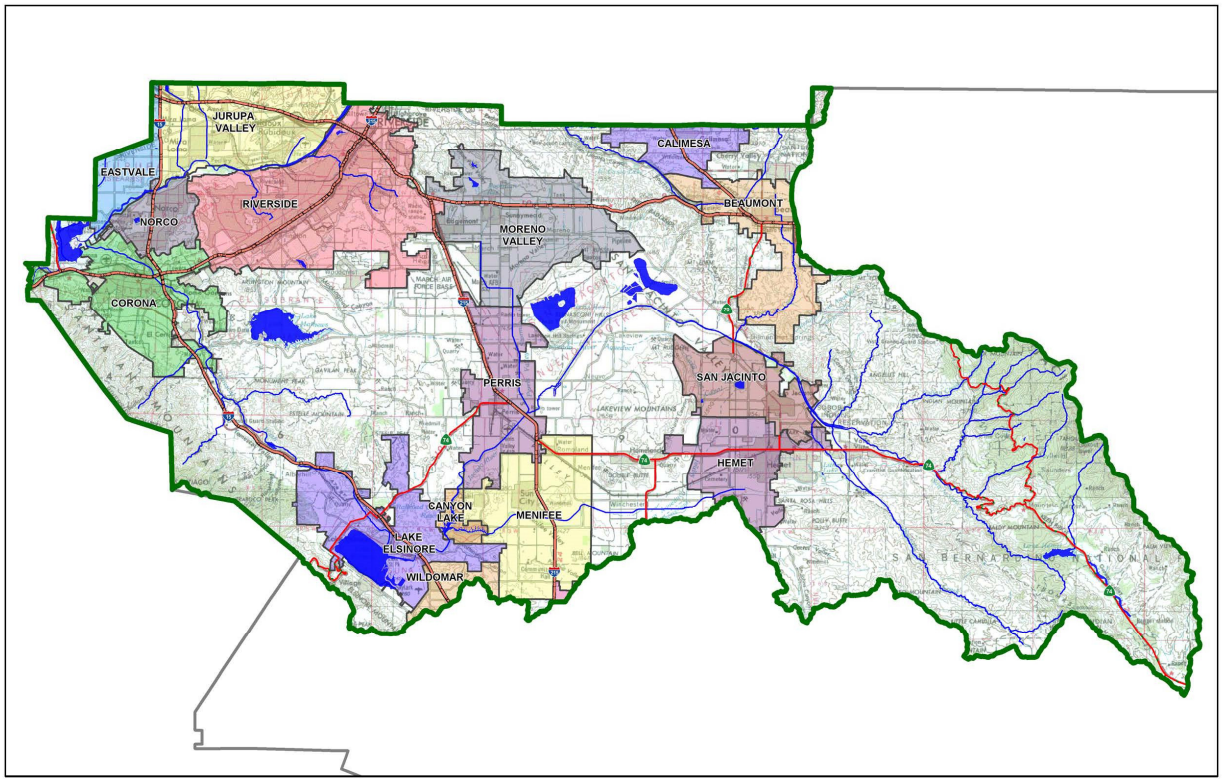
Project Specific Water Quality Management Plan

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

Project Title: BRADLEY GARDENS EXPANSION (980 W. 7th Ave.)

980 W. 7TH ST San Jacinto, CA

Design Review/Case No: PWQMP26-0025 (PROJ25-0178/PWQMP26-0025)



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☒ **Preliminary**
☐ **Final**

Original Date Prepared: 3/16/2026

Revision Date(s): TBD

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

OWNER'S CERTIFICATION

This Project-Specific Water Quality Management Plan (WQMP) has been prepared for Generations Healthcare by GUIDE-ENGINEER, (JARED BROWN) for the BRADLEY GARDENS ADDITION project.(PROJ25-018/PWQMP26-0026)

This WQMP is intended to comply with the requirements of the City of San Jacinto Ordinance No. 13. 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 San Jacinto Water Quality Ordinance (Municipal Code Section 14.12.315).

"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	3/16/2026 Date
Jared Brown Preparer's Printed Name	Principle Preparer's Title/Position

Preparer's Licensure: PE: # C65430

Table of Contents

Section A: Project and Site Information 5

A.1 Maps and Site Plans 6
A.2 Receiving Waters 6
A.3 Additional Permits/Approvals required for the Project: 7

Section B: Optimize Site Utilization (LID Principles) 8

Section C: Delineate Drainage Management Areas (DMAs) 9

Section D: Implement LID BMPs 11

D.1 Infiltration Applicability 11
D.2 Harvest and Use Assessment 12
D.3 Bioretention and Biotreatment Assessment 14
D.4 Feasibility Assessment Summaries 15
D.5 LID BMP Sizing 16

Section E: Alternative Compliance (LID Waiver Program) 17

E.1 Pollutants of Concern 18
E.2 Stormwater Credits 19
E.3 Sizing Criteria 19
E.4 Treatment Control BMP Selection 20

Section F: Hydromodification 21

F.1 Hydrologic Conditions of Concern (HCOC) Analysis 21
F.2 HCOC Mitigation 22

Section G: Source Control BMPs 23

Section H: Construction Plan Checklist 25

Section I: Operation, Maintenance and Funding 26

List of Tables

Table A.1 Identification of Receiving Waters 6
Table A.2 Other Applicable Permits 7
Table C.1 DMA Classifications 9
Table C.2 Type 'A', Self-Treating Areas 9
Table C.3 Type 'B', Self-Retaining Areas 9
Table C.4 Type 'C', Areas that Drain to Self-Retaining Areas 10
Table C.5 Type 'D', Areas Draining to BMPs 10
Table D.1 Infiltration Feasibility 11
Table D.2 LID Prioritization Summary Matrix 15
Table D.3 DCV Calculations for LID BMPs 16
Table E.1 Potential Pollutants by Land Use Type 18
Table E.2 Water Quality Credits 19
Table E.3 Treatment Control BMP Sizing 19
Table E.4 Treatment Control BMP Selection 20
Table F.1 Hydrologic Conditions of Concern Summary 21
Table G.1 Permanent and Operational Source Control Measures 23
Table H.1 Construction Plan Cross-reference 25

List of Appendices

Appendix 1: Maps and Site Plans 27
Appendix 2: Construction Plans 29
Appendix 3: Soils Information 30
Appendix 4: Historical Site Conditions 31
Appendix 5: LID Infeasibility 32
Appendix 6: BMP Design Details 33
Appendix 7: Hydromodification 34
Appendix 8: Source Control 35
Appendix 9: O&M ..... - 36 -
Appendix 10: Educational Materials ..... - 37 -

Section A: Project and Site Information

The project is Bradley Gardens Addition, on approximately 2.9 acre location at the southeast corner of S. Grand Avenue and W. 7th Street in San Jacinto, CA. The development includes building an addition to existing care facility and parking lot. There are three existing buildings on the site these buildings will remain with an addition to the large central building. The parking lot along 7th street will be renovated and repaved. This parking lot area along with a portion of the building is DMA-1 and will have 1093 sf of pervious concrete that this drainage area will drain into. This DMA-1 area is a total of 41,010 sf it will have 8,059 SF of new constructed surface with 426 sf of new lancscaping, 2,235 sf of new building area and 9,370 sf of concrete or pavement. The total area of DMA-1 is 41,010 sf with a total of 13,345 new developed surface. DMA-2 is on the south this area includes additional building expansion and a fire access road along the south and east side of the property and associated landscaping between building and new fire access. The south area is very flat with the buildings sitting slightly higher than the fire lane within the fire lane there will be 3,000 sf of pervious concrete this section of pervious concrete will support the 80,000 lb fire truck load. DMA-2 has 15,129 sf of new building area, 14,228 sf of concrete or pavement, and 6,624 sf of landscaping. This DMA-2 area is a total of 85,512 sf with 38,981 sf of new developed area. The entire area of the project is 126,522 sf with a total of 52,326 sf of new development with a total developed area of 41%. The project site has been evaluated and tested by the project Geotech who has determined the design infiltration rate of 1.97 in/hr. This exceeds the required 1.6 in/hr.

There is a trash enclosure at the northeast corner of the site close to W. 7th Street, this trash enclosure is covered. The landscaping to the south and west is already in place this landscaping includes a basketball court, courtyards, walking paths, grass, and other vegetations this area will not be modified. There will be adjustments to the parking area which include curbs gutters and accessible sidewalks with new storm drain system. There is an existing kitchen that will continue to provide food for the patients and there will be an additional kitchen and dining area. There will be no additional biological waste due to the addition. The site will have no medical Waste Containers.

PROJECT INFORMATION	
Type of Project:	INSTITUTIONAL (SENIOR CARE FACILITY)
Watershed Area:	Watershed – San Jacinto
Community Name:	San Jacinto
Development Name:	Bradley Gardens Addition
PROJECT LOCATION	
Latitude & Longitude (DMS): 33D47’00” N, 116D58’00” W	
Project Watershed and Sub-Watershed: Santa Ana; Santa Ana River, San Jacinto Valley	
APN(s): 435-330-003	
Total Acres=2.96 Acres	
Map Book and Page No.: BK 8, PG 357	
PROJECT CHARACTERISTICS	
Proposed or Potential Land Use(s)	Skilled Nursing Facility

Proposed or Potential SIC Code(s)	8051
Area of Impervious Project Footprint (SF)	91,824
Total Area of proposed Impervious Surfaces within the Project Limits (SF)/or Replacement	91,824
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)	Insert text here.
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)	N/a
What is the Water Quality Design Storm Depth for the project?	0.70 INCHES

A.1 Maps and Site Plans

Appendix 1 includes a map of the local vicinity and existing site. In addition, WQMP Site Plan, located in Appendix 1, includes 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

A.2 Receiving Waters

In order of upstream to downstream, the receiving waters that the project site is tributary to are as follows. A map of the receiving waters is included in Appendix 1.

Table A.1 Identification of Receiving Waters

Receiving Waters	Hydrologic Unit	EPA Approved 303(d) List Impairments	Designated Beneficial Uses	Proximity to RARE Beneficial Use
San Jacinto River	801.21	Nutrients, Aluminum, (limited Reaches) Pathogens (potential)	AGR, GWR, REC1, REC2, WARM, WILD	N/A
Canyon Lake	801.27	Nutrients (Nitrogen, Phosphorus), Organic Enrichment/ Low DO	AGR. GWR. REC1, REC2, WARM, WILD	N/A
Lake Elsinore	801.27	Nutrients (Nitrogen, Phosphorus), Pathogens, Organic Enrichment/ Low DO, Sedimentation/ Siltation	MUN, AGR, GWR, REC1, REC2, WARM, WILD	N/A

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

Table A.2 Other Applicable Permits

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

Section B: Optimize Site Utilization (LID Principles)

Site Optimization

Does the project identify and preserve existing drainage patterns? If so, how? If not, why?

This project will continue to drain towards the north and east. The frontage of the property currently drains in a ditch this will be replaced with a storm drain pipe system.

Does the project identify and protect existing vegetation? If so, how? If not, why?

The project frontage will be expanded this will remove existing landscaping in addtion the east side of the facility will be expanded and the parking lot will be updated. The landscaping at the rear of the facility and in the center of the facility remain

Does the project identify and preserve natural infiltration capacity? If so, how? If not, why?

The proposed site includes a fire access that is on the east and the south of the project. This access will be provided with pervious concrete. The Parking lot will include pervious concrete. The Soils report indicates an infiltration rate of at least 1.98 – 5.95 inches per hour to . (in a 24 hour event the site can drain up to 12 inches of runoff). Per the attached GSI Supplemental Infiltration Feasibility Testing the design infiltration rate is 1.97 in/hr which includes the factor of safety of 3.0.

Does the project identify and minimize impervious area? If so, how? If not, why?

The project will include pervious concrete to allow for infiltration. The project will also include disconected downspouts that will release runnof into the landscaping for infiltration.

Does the project identify and disperse runoff to adjacent pervious areas? If so, how? If not, why?

The front parking lot drains into a concrete pavement area at the north side of the parking lot. The project will also release roof drainage into landcaping.

Section C: Delineate Drainage Management Areas (DMAs)

Table C.1 DMA Classifications

DMA Name or ID	Surface Type(s)	Area (Sq. Ft.)	DMA Type
DMA 1	Build, AC, CONC.	11,605 SF	Infiltration Pervious Concrete
	Pervious Conc.	1093 SF	Infiltration
DMA 2	Build, AC, CONC.	29,357 SF	Infiltration Pervious Concrete
	Pervious Conc.	3,000 SF	Infiltration Pervious Pavement

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

DMA Name or ID	Area (Sq. Ft.)	Stabilization Type	Irrigation Type (if any)
DMA 1	426 SF		
DMA 2	6,296 SF		

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

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

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

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

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

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

DMA Name or ID	BMP Name or ID
DMA-1	DMA-1 North Area total of 41,010 SF
DMA-2	DMA-2 South Area total of 85,522 SF

Section D: Implement LID BMPs

D.1 Infiltration Applicability

Is there an approved downstream 'Highest and Best Use' for stormwater runoff (ref: Chapter 2.4.4 of the WQMP Guidance Document)? ☐ Y ☒ N

Geotechnical Report

A Geotechnical Report is required by the City of Riverside to confirm present and past site characteristics that may affect the use of Infiltration BMPs, see Appendix 3.

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 Infiltration Feasibility

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

D.2 Harvest and Use Assessment

The following conditions apply*:*

☐ 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 (verified with the City of Riverside).

☐ The Design Capture Volume will be addressed using Infiltration Only BMPs. (Harvest and Use BMPs are still encouraged, but are not required as the Design Capture Volume will be infiltrated or evapotranspired).

☐ None of the above.

Irrigation Use Feasibility

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

Total Area of Irrigated Landscape: 0.47 acres

Type of Landscaping (Conservation Design or Active Turf): Grass, bushes, tees

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: 0.80 Acres

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

The project EIATIA factor: Enter your EIATIA Factor

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

Minimum required irrigated area: Insert Area (Acres)

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

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

Toilet Use Feasibility

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

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

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

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

Total Area of Impervious Surfaces: Insert Area (Acres)

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

The project TUTIA factor: Enter your TUTIA Factor

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

Minimum number of toilet users: Required number of toilet users

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

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

Other Non-Potable Use Feasibility

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

Insert narrative description here.

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

Average Daily Demand: Projected Average Daily Use (gpd)

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

Total Area of Impervious Surfaces: Insert Area (Acres)

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

The project factor: Enter Value from Table 2-3

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 Average Daily non-potable demand (Step 1) to the minimum required non-potable use (Step 4).

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

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.

For the project, the following applies:

☐ 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.

☐ None of the above.

D.4 Feasibility Assessment Summaries

Table D.2 LID Prioritization Summary Matrix

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

For those DMAs where LID BMPs are not feasible, provide a brief narrative below summarizing why they are not feasible, with technical infeasibility criteria included in Appendix 5, and Alternative Compliance measures for those DMAs documented in Section E. (REMOVE INSTRUCTIONS)

Note: DMA 1 utilizing 1,525 sf pervious concrete area at the north side of the parking lot where the entire paking lot and roof area within the DMA area will flow to. DMA 2 will use pervious concrete at the south side of the project were 3,855 sf of imp

D.5 LID BMP Sizing

Table D.3 DCV Calculations for LID BMPs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*INFILTRATON AREA BMP-1*		
	[A]		[B]	[C]	[A] x [C]			
DMA 1	*11,605 SF*	*Pervious Concrete*	*1.0*	*0.90*	*10,445 SF*	*Design Storm Depth (in)*	*Design Capture Volume,* $\mathbf{V_{BMP}}$ *(cubic feet)*	*Proposed Volume on Plans (cubic feet)*
	A_T= Σ[A]= 11,605				Σ= [D]10,445	[E] O.70	$[F] = \frac{[D]x[E]}{12} = 609.29$	[G] 1523

[B], [C] are obtained from Section 2.3.1 of the WQMP Guidance Document

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

[G] is obtained from LID BMP design procedure sheet, placed in Appendix 6

LID BMP Sizing

Table D.4 DCV Calculations for LID BMPs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*INFILTRATION AREA BMP-2*		
	[A]		[B]	[C]	[A] x [C]			
DMA 2	*29,357 SF*	*Pervious Concrete*	*1.0*	*0.90*	*26,421*	*Design Storm Depth (in)*	*Design Capture Volume,* $\mathbf{V_{BMP}}$ *(cubic feet)*	*Proposed Volume on Plans (cubic feet)*
	A_T= Σ[A]=29,357				Σ= [D] 26,421	[E] O.70	$[F] = \frac{[D]x[E]}{12} = 1{,}541$	[G] =3,853

[B], [C] are obtained from Section 2.3.1 of the WQMP Guidance Document

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

[G] is obtained from LID BMP design procedure sheet, placed in Appendix 6

Section E: Alternative Compliance (LID Waiver Program)

LID BMPs are expected to be feasible on virtually all projects. Where LID BMPs have been demonstrated to be infeasible as documented in Section D, other Treatment Control BMPs must be used (subject to confirmation of LID waiver approval by the Regional Board). For the project, the following applies:

☒ 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 Regional Board 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 alternative compliance measures on the following pages are being implemented to ensure that any pollutant loads expected to be discharged by not incorporating LID BMPs, are fully mitigated.

E.1 Pollutants of Concern

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

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

Table E.3 Treatment Control BMP Sizing

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

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

[E] is 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

Table E.4 Treatment Control BMP Selection

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

[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 Referenced from Table E.1 above.

[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

The project does not create a Hydrologic Condition of Concern, meeting the criteria for HCOC Exemption as shown below:

HCOC EXEMPTION 1: The Priority Development Project disturbs less than one acre. The City of Riverside 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

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 City of Riverside

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

Results included in Table F.1 below and hydrologic analysis included in Appendix 7.

Table F.1 Hydrologic Conditions of Concern Summary

	2 year – 24 hour		
	Pre-condition	**Post-condition**	**% Difference**
Time of Concentration	12:10	12:05	-0.69%
Flow (CFS)	2.1 CFS	2.28 CFS	8.2%
Volume (Cubic Feet)	5149 CF	4393 CF	-15.8%

[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 (Prado Dam, Santa Ana River) 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

F.2 HCOC Mitigation

As an alternative to the HCOC Exemption Criteria above, HCOC criteria is considered mitigated if the project meets one of the following conditions, as indicated:

☐ 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.

☒ d. None of the above.

Section G: Source Control BMPs

The following table identifies the potential sources of runoff pollutants for this project and specifies how they are addressed through permanent controls and operational BMPs:

Table G.1 Permanent and Operational Source Control Measures

Potential Sources of Runoff pollutants	Permanent Structural Source Control BMPs	Operational Source Control BMPs
On-site storm drain inlets	Mark all inlets with words "Only Rain Down the Storm Drain" or similar. Catch Basin Markers may be available from Riverside County Flood Control and Water Conservation District, call 951-955-1200 to verify.	Maintain and periodically repaint or replace inlet markings. Provide stormwater pollution prevention information to new site owners, lessees, or operators. See applicable operational BMPs in Fact Sheet SC-44, "Drainage System Maintenance
Interior Storm Drains	Interior floor drains shall be plumbed to sanitary sewer.	Inspect and Maintain drains to prevent blockages and overflow.
Need for future indoor & structural pest control	Building design features including sealants barriers and fully closing windows and doors have been included to discourage entry of pests.	Integrated Pest management(IPM) information to be provided to owners, lessees, and operators.
Landscape/outdoor pesticide use	Final Landscape Plans will accomplish the following: Preserve existing native trees, shrubs, and ground cover to the maximum extent possible. Design landscaping to minimize irrigation and runoff, to promote surface infiltration where appropriate, and to minimize the use of fertilizers and pesticides that can contribute to stormwater pollution. Where landscaped areas are used to retain or detain stormwater, specify plants that are tolerant of saturated soil conditions. Consider using pest-resistant plants, especially adjacent to hardscape. To insure successful establishment, select plants appropriate to site soils, slopes, climate, sun, wind, rain, land use, air movement, ecological consistency, and plant interactions.	Maintain landscaping using minimum or no pesticides. Prevent erosion of slopes by planting fast-growing, dense ground covering plants. Plant native begetation to reduce the amount of water fertilizers, and pesticides applied to the landscape. Do not overwater. Use irrigation practices such as drip irrigation, soaker hoses or micro-spray systems. Periodically inspect and fix leaks and misdirected sprinklers. Do not rake or blow leaves, clippings, or pruning waste into the street, gutter, or storm drain. Instead, dispose of green waste by composting, hauling it to a permitted landfill, or recycling through your city's program. Integrated Pest Management (IPM) information to be provided to owners, lessees, and operators.

Refuse Areas	Site design features dumpster enclosures. Signs will be posted on or near dumpsters with the words “Do not dump hazardous materials here” or similar.	Periodic inspections for leaky, overfilled, uncovered, or other problematic conditions will occur. Corrective action will be made upon detection, as circumstances permit. Dumping of liquid or hazardous wastes will be prohibited. Spill control materials will be available on-site. All wastes to properly stored and disposed of in accordance with all applicable Local, State and Federal regulations
Building Downspouts	Downspouts shall be disconnected with splash pads.	Annually clean rain gutters and clean downspouts prior to fall season or first rain event.
Pervious Concrete	Remove any debris from concrete surface and remove any soil debris or weed vegetation.	Keep concrete aera clean swept and free of any fine particles that can clog or fill concrete pores. Pressure wash surfaces every year prior to first flush event.

Section H: Construction Plan Checklist

Table H.1 Construction Plan Cross-reference

BMP No. or ID	BMP Identifier and Description	Plan Sheet Number(s)	Latitude / Longitude
BMP-1	Pervious Concrete BMP	Precise Grading Plan (Sheet #'s to be determined at the time of FWQMP).	33°46'48.10" N 116°58'39.33" W
BMP-2	Disconected Downspouts BMP	Precise Grading Plan (Sheet #'s to be determined at the time of FWQMP).	33°46'45.59" N 116°58'39.47" W

TO BE COMPLETED AT TIME OF FINAL WQMP

Section I: Operation, Maintenance and Funding

As required by the City of Riverside, the following Operation, Maintenance and Funding details are provided as summarized:

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.
3. An outline of general maintenance requirements for the Stormwater BMPs 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.
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.

See Appendix 9 for a detailed Stormwater BMP Operation and Maintenance Plan that sets forth a maintenance schedule for each of the Stormwater BMPs built on site, and an agreement assigning responsibility for maintenance and providing for inspections and certification.

Maintenance Mechanism: See Appendix 9

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

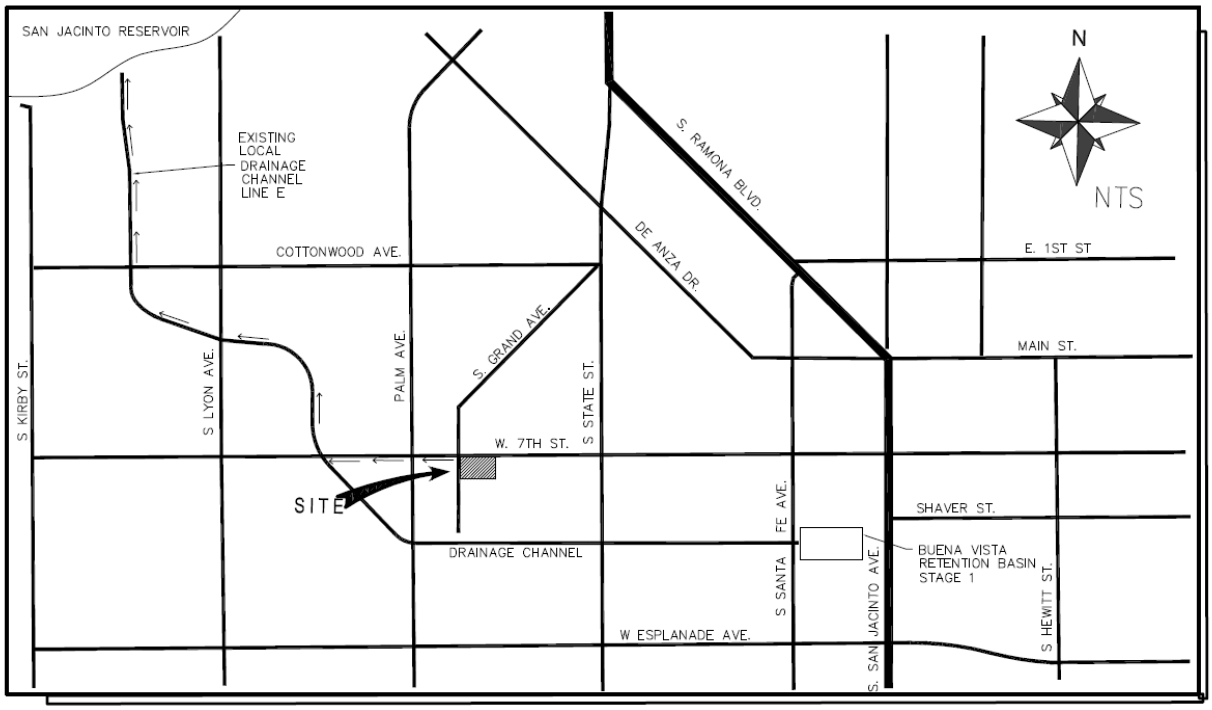
☐ Y ☒ N

Operation and Maintenance Plan and Maintenance Mechanism is included in Appendix 9. Educational materials for those personnel that will be maintaining the proposed BMPs within this Project-Specific WQMP are included in Appendix 10.

Note: To be completed at the time of the FWQMP.

Appendix 1: Maps and Site Plans

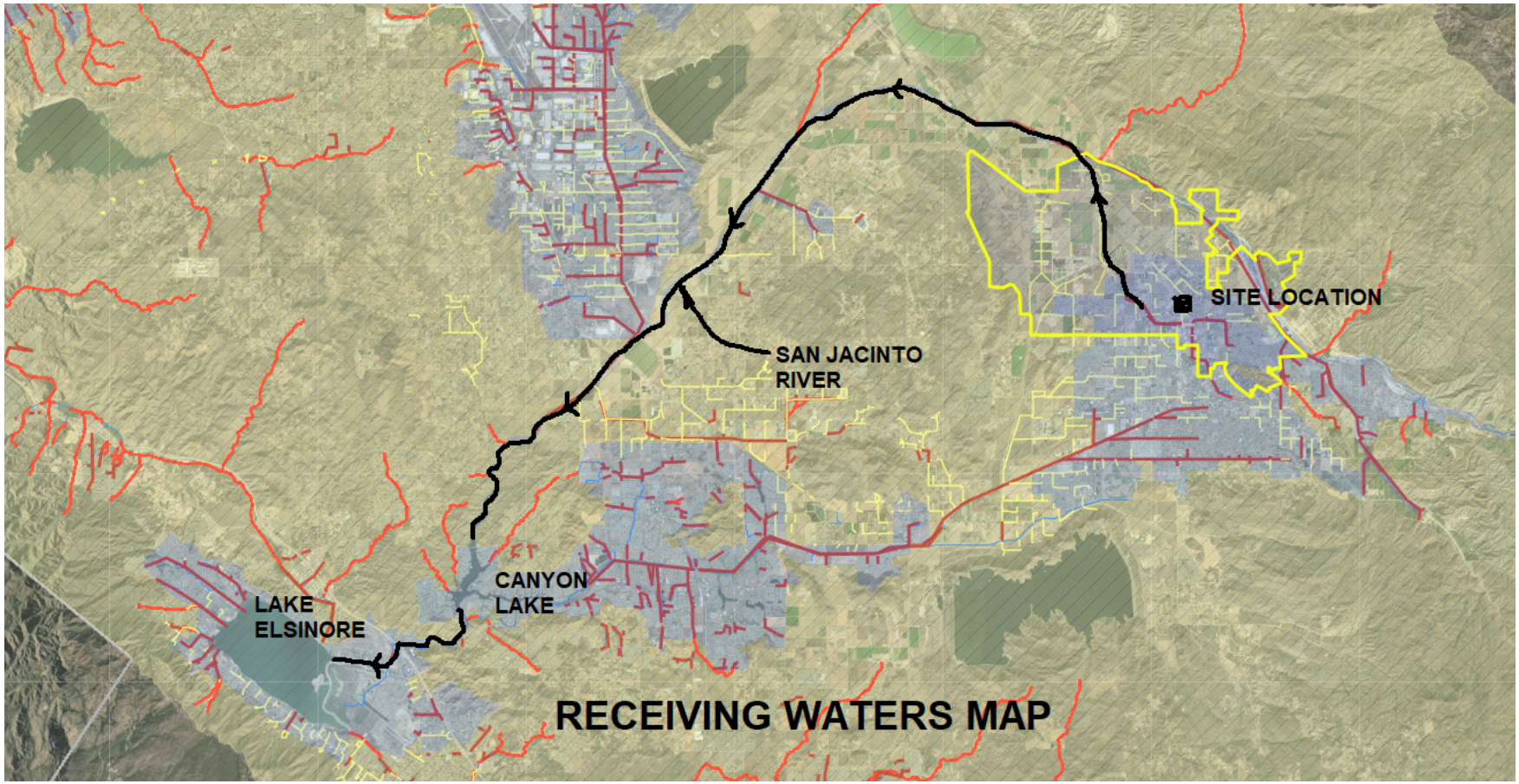
Location Map, WQMP Site Plan and Receiving Waters Map

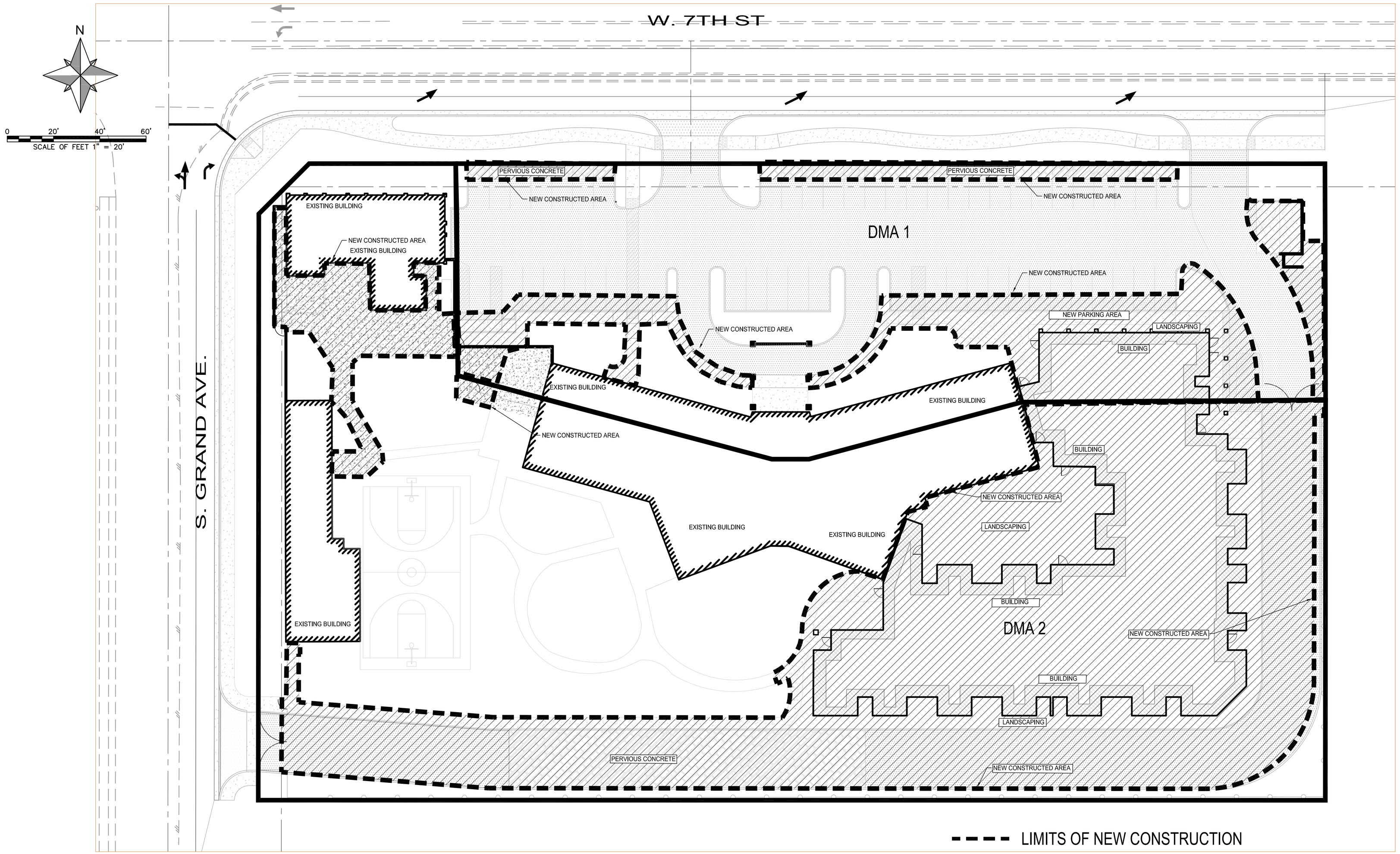


VICINITY MAP

NOT TO SCALE

THE PROPERTY IS LOCATED ON 7TH ST. (SOUTH SIDE OF W. 7TH ST.) IN SAN JACINTO, CA


SITE LOCATION
SAN JACINTO
RIVER
CANYON
LAKE
LAKE
ELSINORE
RECEIVING WATERS MAP



AREA CALCULATION

TOTAL AREA = 126,522 SF
TOTAL DISTURBED AREA = 52,326 SF
TOTAL NEW LANDSCAPING = 7,271 SF
TOTAL NEW CONCRETE OR ASPHALT = 23,598 SF
TOTAL NEW BUILDING = 17,364 SF
PERCENT OF NEW AREA DEVELOPED = 39.1%

DMA 1

DMA AREA = 41,010 SF
TOTAL NEW AREA = 13,345 SF
TOTAL NEW LANDSCAPING = 647 SF
TOTAL NEW PERVIOUS = 1,525 SF
TOTAL NEW IMPERVIOUS = 11,605 SF
MINIMUM PERVIOUS AREA = 1,523 SF
DEPTH OF IMPERVIOUS = 12 INCH
PERCENT ACHIEVED =100%

DMA 2

DMA AREA = 85,512 SF
TOTAL NEW AREA = 38,981 SF
TOTAL NEW LANDSCAPING = 6,624 SF
TOTAL NEW PERVIOUS = 3,854 SF
TOTAL NEW IMPERVIOUS = 29,357 SF
MINIMUM PERVIOUS AREA = 3,853 SF
DEPTH OF IMPERVIOUS = 12 INCH
PERCENT ACHIEVED = 100%

- LIMITS OF NEW CONSTRUCTION
- DMA AREA
- NEW CONSTRUCTION AREA
- PAVEMENT AREA
- PERVIOUS CONCRETE AREA
- CONCRETE SURFACE AREA

NO.	REVISION	APPROVED BY	DATE

DATE: AUG. 2026
SCALE:
DRAWN BY: S.A. & R.S.
DESIGNED BY: J.B. & R.S.
CHECKED BY: J.B. & R.S.

Guide ENGINEERING
LAND ENGINEERING AND PLANNING
5930 GRANITE LAKE DR. #150
GRANITE BAY, CA 95746
PHONE: 916-797-0248
projects@guide-engineering

980 W. 7TH ST
DRAINAGE MANAGEMENT AREA MAP
SAN JACINTO, RIVERSIDE COUNTY, CALIFORNIA

PREPARED UNDER THE DIRECTION OF:

REGISTERED PROFESSIONAL ENGINEER
JARED BROWN
LIC. No. C85430
Exp. 09/30/27
CIVIL
STATE OF CALIFORNIA

NOT APPROVED FOR CONSTRUCTION UNLESS SIGNED BY THE ENGINEER

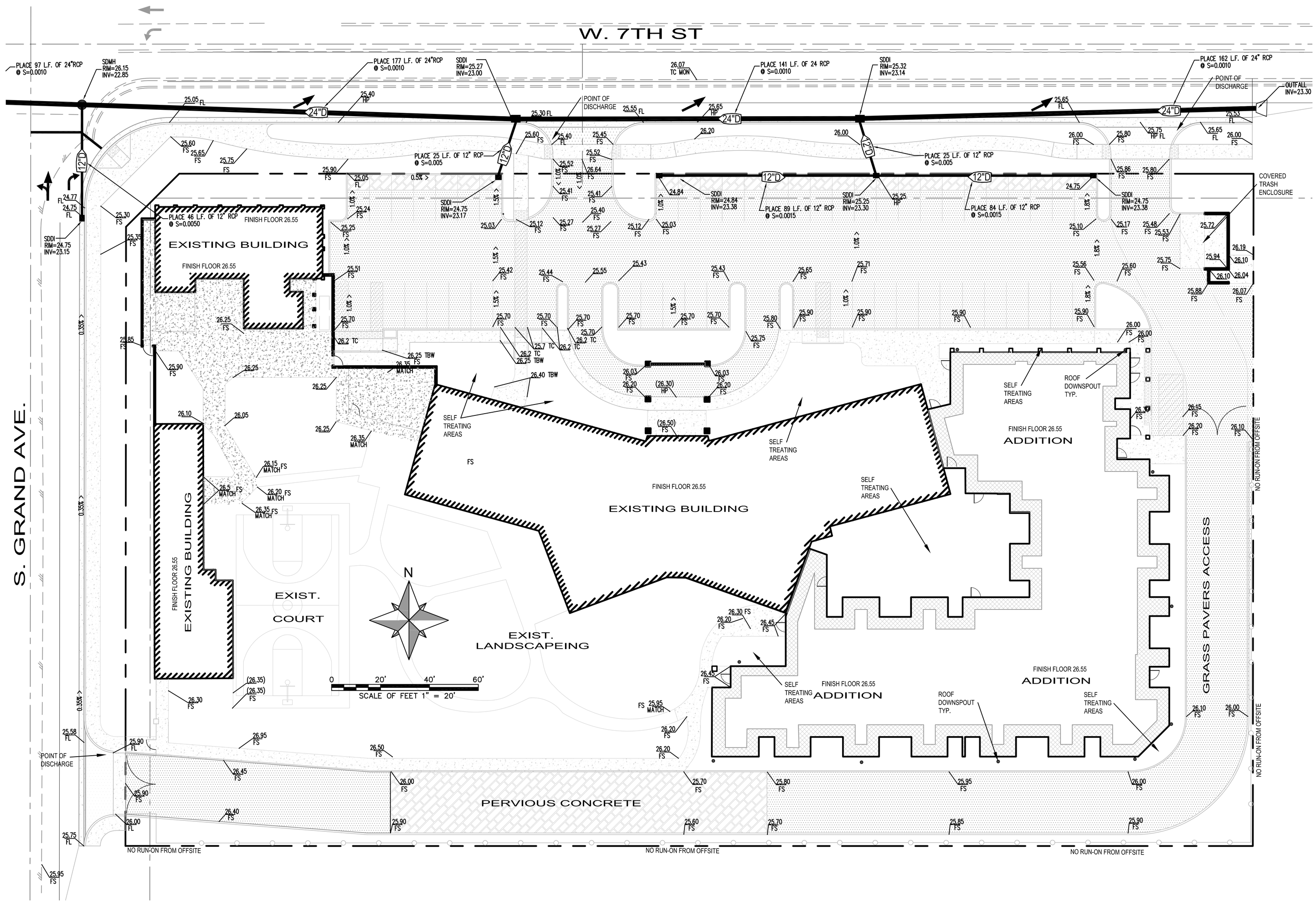
PROJECT NUMBER:

SHEET OF

GUIDE ENGINEERING

LEGEND

- BOUNDARY LINE
- PROPOSED RIGHT-OF-WAY(R/W)
- EXISTING RIGHT-OF-WAY
- PROPOSED PROPERTY LINE
- EXISTING PROPERTY LINE
- CENTERLINE
- ARCHITECTURAL FENCING
- 132.44 — PROPOSED SPOT ELEVATION
- (132.44) — EXISTING SPOT ELEVATION
- DITCH FLOWLINE and DIRECTION
- 132.44 FL — PROPOSED DITCH FLOWLINE (FL)
- (132.44) — EXISTING DITCH FLOWLINE (FL)
- 24"D — PROPOSED PIPE
- PROPOSED STORM DRAIN MANHOLE
- PROPOSED DRAIN INLET



NO.	REVISION	APPROVED BY	DATE

DATE: MAY 2026
SCALE: 1" = 20'
DRAWN BY: S.A. & R.S.
DESIGNED BY: J.B. & R.S.
CHECKED BY: J.B. & R.S.

Guide ENGINEERING
LAND ENGINEERING AND PLANNING
5930 GRANITE LAKE DR. #150
GRANITE BAY, CA 95746
PHONE: 916-797-0248
projects@guide-engineering

BRADLEY GARDENS EXPANSION (PROJ24-0178)
980 W. 7TH ST
POST CONSTRUCTION BMP SITE PLAN
SAN JACINTO, RIVERSIDE COUNTY, CALIFORNIA

PREPARED UNDER THE DIRECTION OF:

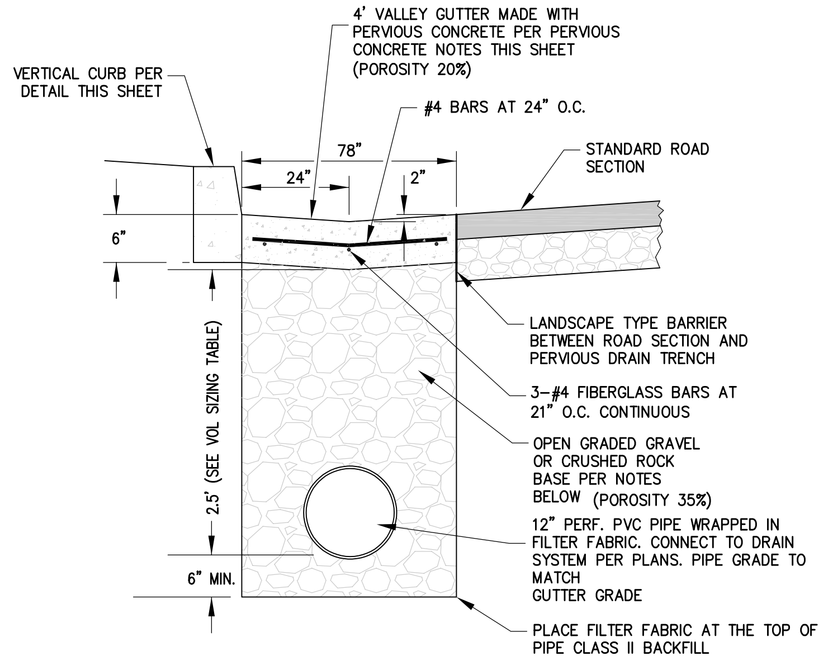
REGISTERED PROFESSIONAL ENGINEER
JARED BROWN
LIC. No. C85430
Exp. 09/30/27
CIVIL
STATE OF CALIFORNIA

NOT APPROVED FOR CONSTRUCTION UNLESS SIGNED BY THE ENGINEER

PROJECT NUMBER:

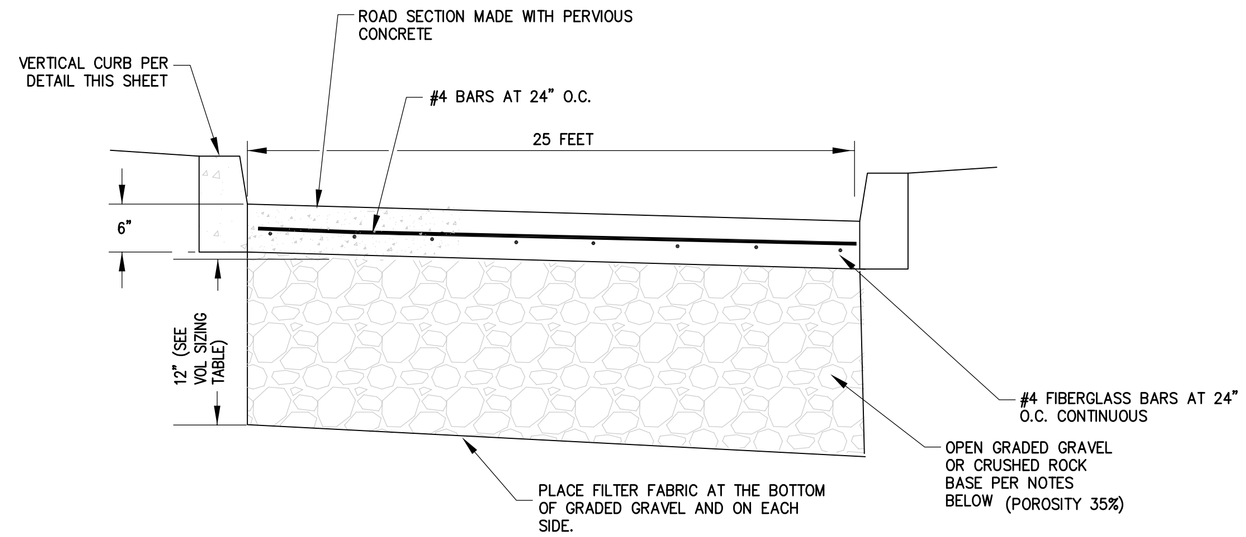
SHEET OF

GUIDE ENGINEERING + PLANNING



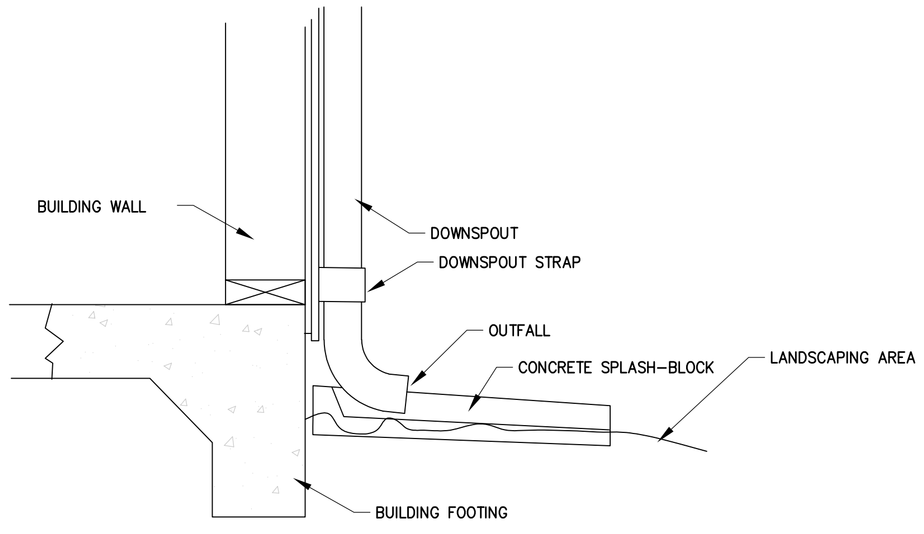
1 PERVIOUS CONCRETE PARKING DETAIL

N.T.S.



2 PERVIOUS CONCRETE DRIVE ISLE DETAIL

N.T.S.



3 DISCONNECTED DOWNSPOUT SPASH BLOCK DETAIL

N.T.S.

NO.	REVISION	APPROVED BY	DATE

DATE: MAY 2026
SCALE: 1" = 20'
DRAWN BY: S.A. & R.S.
DESIGNED BY: J.B. & R.S.
CHECKED BY: J.B. & R.S.

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BRADLEY GARDENS EXPANSION (PROJ24-0178)

980 W. 7TH ST

POST CONSTRUCTION BMP DETAILS

SAN JACINTO, RIVERSIDE COUNTY, CALIFORNIA

PREPARED UNDER THE DIRECTION OF:

REGISTERED PROFESSIONAL ENGINEER
JARED BROWN
LIC. No. C65430
Exp. 09/30/27
CIVIL
STATE OF CALIFORNIA

NOT APPROVED FOR CONSTRUCTION UNLESS SIGNED BY THE ENGINEER

PROJECT NUMBER:

SHEET OF

GUIDE ENGINEERING

Appendix 2: Construction Plans

Grading and Drainage Plans

Appendix 3: Soils Information

Geotechnical Study and Other Infiltration Testing Data

PRELIMINARY GEOTECHNICAL INVESTIGATION
PROPOSED BRADLEY GARDENS SKILLED NURSING FACILITY
BUILDING ADDITION, 980 W. 7TH STREET
CITY OF SAN JACINTO, RIVERSIDE COUNTY
CALIFORNIA 92582 (APN 435-330-003)

FOR

CORCORAN CONSTRUCTION, INC.
26590 MADISON AVENUE
MURRIETA, CALIFORNIA 92562

W.O. 9071-A-IE DECEMBER 19, 2025

GeoSoils, Inc.

GeoSoils, Inc.
Geotechnical • Geologic • Coastal • Environmental
18451 Collier Avenue, Suite A, Lake Elsinore, California 92530
TEL: (951) 471-0700 - FAX: (951) 471-0702
www.geosoils.com

December 19, 2025

W.O. 9071-A-IE

Corcoran Construction, Inc.
26590 Madison Avenue
Murrieta, California 92562

Attention: Ms. Kim Corcoran

Subject: Preliminary Geotechnical Investigation, Proposed Bradley Gardens Skilled Nursing Facility Building Addition, 980 W. 7th Street, City of San Jacinto, Riverside County, California 92582 (APN 435-330-003)

Dear Ms. Corcoran:

In accordance with your request and authorization, GeoSoils, Inc. (GSI), has performed a preliminary geotechnical investigation of the subject site. The purpose of our study was to evaluate the general geologic and geotechnical conditions at the existing skilled nursing facility, relative to the currently proposed development thereon, and to present preliminary recommendations for grading and the design, and construction of foundations, earth retaining structures, pavements, and hardscape from a geotechnical viewpoint.

Our evaluation primarily focuses on the proposed 43-bed skilled nursing facility (Building A1) depicted on the overall site plan, dated September 18, 2025, prepared by Gregg Maedo & Associates ([GMA], 2025 [see Appendix A]). It is our understanding that the existing office building renovation into a 16-bed facility (Building C) is still being contemplated, and based on the type of construction (building renovation) is not specifically addressed herein. If necessary, geotechnical recommendations for the proposed building renovation can be provided, once the planning for the proposed renovation is better understood.

Proposed Building A1 on the east side of the existing facility will be constructed in the open area, and will include demolition of a building in the southeast corner of the site. The need for retaining walls is unknown at this time; however, GSI has included recommendations for conventional retaining walls herein, if needed.

EXECUTIVE SUMMARY

Based on our review of the available data (see Appendix A), field exploration, laboratory testing, geologic and geotechnical engineering analyses, as well as our past experience on nearby sites, the proposed development of the skilled nursing facility building addition appears to be feasible from a geotechnical viewpoint, provided the recommendations presented in the

text of this report are properly incorporated into the design and construction of the project. Based on the existing body of geotechnical data accumulated during our recent subsurface exploration and laboratory testing, and from previous geotechnical work on nearby projects, the most significant elements of this study are summarized below:

- The subsurface data obtained, and regional geologic mapping by Dibblee (2003) indicate that the site is mantled by a thin layer of topsoil and disturbed fill, which is underlain by Holocene- to late Pleistocene-age alluvial sand and clay of valley areas (Qa). The topsoil and disturbed fill thickness was relatively thin (approximately 2 to 3 feet). Underlying the topsoil and disturbed fill, Quaternary-age (Holocene- to late Pleistocene-age) alluvial sand and clay of valley areas extend to the depths explored (between 30 and 60 feet below existing grades), although no significant clay layers were encountered during our subsurface investigation. Provided that the recommended remedial earthwork techniques are incorporated into the proposed development plans, the support of new fills and settlement-sensitive improvements by the onsite earth materials is considered feasible. However, proposed settlement-sensitive improvements that do not receive mitigation in the form of remedial earthwork may be subject to ground deformations and associated distress.

- No groundwater was encountered during our site exploration to a depth in excess of 60 feet below the ground surface (bgs). Based on our review of the California Department of Water Resources Water Data Library (CDWR; 2025), nearby well measurements reviewed appear to be regional groundwater measurements at depths of approximately 170 and 155 feet (State Well No. 04S01W27P005S [March 7, 1991], and Site Code No. 337748N1169760W001 [December 6, 2011], respectively) at sites with similar ground surface elevations. However, our review of historic groundwater measurements in the San Jacinto and Temecula basins (U.S. Geological Survey, 1919, Water Supply Paper 429) indicates groundwater in the basin may have been as shallow as 40 feet bgs. Groundwater conditions are subject to change as a result of climatic variations, rainfall, up-gradient irrigation practices, broken or damaged underground utilities.

- While site soils are potentially erodible, based on the flat laying nature of the site the presence of landslide deposits, slumps, or other significant forms of mass wasting were not observed within the proposed development area during fieldwork nor during our geologic map reviews.

- The site is situated in an area of active faults. The nearby San Jacinto and Casa Loma fault zones are considered active and are included within Alquist-Priolo Earthquake Fault Zones. Our review of published data indicates that there are no known active faults crossing the site (Jennings and Bryant, 2010), and the site is not located within an Alquist-Priolo Earthquake Fault Zone (California Geological Survey [CGS], 2018). In

addition, our review of the Riverside County Information Technology (RCIT) Map My County website (2025) indicates no County faults are mapped onsite and site is not located within a County fault zone. Therefore, surface fault rupture to adversely affect the proposed development is considered low. Due to the proximity of regional faults with documented Holocene movement, the proposed development could experience moderate to strong ground motions over its design life, as with all development in southern California. Therefore, the seismic ground motion values and design parameters provided herein should be incorporated into project planning. Further discussions of our fault activity review and photolineament analysis are presented herein.

- Our review indicates that the subject site is susceptible to secondary seismic hazards, including ground deformations from seismically-induced liquefaction or densification. Our review of the RCIT (2025) Map My County website indicates the site is mapped within an area designated as having a "moderate" potential for liquefaction, and is located in a zone of "Active" subsidence (RCIT, 2025). As such, liquefaction and settlement analyses were conducted, and are further discussed herein. However, these secondary seismic hazards can be mitigated to acceptable levels through the proposed site earthwork and foundation design recommended herein.

- Site soils are considered to exhibit a very low expansion potential (Expansion Index [E.I.] ranging between 0 and 20). The design of building foundations and other proposed site improvements should consider these expansive characteristics of the onsite soils.

- GSI conducted sampling of the near-surface onsite earth materials for general soil corrosivity testing. The corrosivity testing included the evaluation of pH, soluble sulfates, chlorides, and saturated resistivity. The test results indicate that the tested sample is moderately alkaline with respect to soil acidity or alkalinity, are is moderately corrosive to ferrous metals when saturated, presents negligible sulfate exposure to concrete (Exposure Class "S0" per Table 19.3.1.1 of American Concrete Institute [ACI] 318-14), and exhibits relatively low concentrations of soluble chlorides. On a preliminary basis, reinforced concrete mix design should minimally conform to Exposure Classes "S0," "C1," and "W0" outlined in Table 19.3.2.1 of ACI 318-14, as the foundations would likely be exposed to moisture. It should be noted that GSI does not practice in the field of corrosion engineering. Therefore, additional recommendations may be obtained from a qualified corrosion engineer should corrosion mitigation be necessary, as determined by the project architect, civil engineer, or structural engineer, as warranted.

- The underlying alluvium has some potential to consolidate due to foundation and fill loading during a seismic event based on historic groundwater levels. Our evaluation of settlement potential (both static and seismic), has considered settlement due to structural loads on footings, subsurface geometry, and historic groundwater levels.

- The minimum depth of remedial earthwork excavations across the area of proposed development are anticipated to be on the order of 5 to 7 feet. The actual depth of remedial grading excavations would be based on the conditions exposed inside the excavation during remedial grading. In areas to receive proposed ancillary surface improvements, such as pavements and flatwork, a minimum 2-foot thick layer of recompacted fill should be provided beneath these improvements. In addition, all footings should be supported by at least 3 feet of recompacted fill, which can be further evaluated once the proposed structural loads are provided for GSI's review.

- Assuming wall loads of 1 to 3 kips/foot, and column loads of 20 to 100 kips, the use of a structural mat foundation, or other foundation designed to tolerate the site's soil conditions and seismic settlement potential may be used. These assumptions should be revisited once the final plans and structural loads are made available to GSI.

- Recommendations for Portland cement concrete (PCC) and asphaltic concrete (AC) pavements are provided herein. Due to the relatively sandy nature of the near-surface soils onsite , pavement subgrades composed of these earth materials are anticipated to perform adequately under anticipated traffic loads.

- Temporary slopes for excavations less than 10 feet deep should not be constructed steeper than a 1:1 horizontal to vertical (h:v) gradient, provided that running sands or groundwater seepage are not present. Based on the proximity of existing building improvements, which will remain in-service adjacent to recommended remedial grading, the use of slot-cutting techniques or localized shoring may be necessary. All temporary slopes should be observed by GSI prior to workers entering excavations.

- The recommendations presented herein should be incorporated into the design and construction considerations of the project.

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

Respectfully submitted,

GeoSoils, Inc.





Todd A. Greer
Engineering Geologist, CEG 2377

Jorge F. Meneses, PhD, PE, GE, BC. GE, F.ASCE
Geotechnical Engineer, GE 3041

TAG/JFM/ek

Distribution: (1) Addressee (email PDF)

TABLE OF CONTENTS

SCOPE OF SERVICES 1
SITE DESCRIPTION AND PROPOSED DEVELOPMENT 1
BACKGROUND 3
SITE EXPLORATION 3
GEOLOGY 4
Regional Geologic Setting 4
Site Geology 4
Topsoil and Disturbed Fill (Not Mapped) 4
Quaternary-Age Alluvial Sand and Clay of Valley Areas (Map Symbol - Qa) 6
GROUNDWATER 6
FAULTING AND REGIONAL SEISMICITY 7
Fault Activity Review (Alquist-Priolo Fault Zones) 7
Aerial-photographic Lineament Analysis 10
Regional Seismicity 10
General 10
Historical Site Earthquake Records 10
Seismic Ground Motion Values 10
LIQUEFACTION POTENTIAL 14
General 14
Liquefaction 16
Seismic Densification 16
Lateral Spreading 17
SUBSIDENCE POTENTIAL 17
Subsidence and Ground Fissures 17
OTHER SECONDARY SEISMIC HAZARDS 18
Other Geologic Hazard Considerations 19
Conditional Geologic Assessment 19
LABORATORY TESTING 20
General 20
Classification 20
Moisture-Density Relations 20
Laboratory Standard 20
Expansion Potential 20
Direct Shear Tests 21
Saturated Resistivity, pH, and Soluble Sulfates 21
Resistance Value (R-Value) 22
Conformance Testing for Expansion, Corrosion and Concrete Mix Design 22
PRELIMINARY CONCLUSIONS AND RECOMMENDATIONS 22
General 22
EARTHWORK CONSTRUCTION RECOMMENDATIONS 24
General 24
Site Preparation 25
Treatment of Existing Ground 25

Fill Placement 26
Temporary Slopes 26
Slot-Cut Grading 26
TEMPORARY SHORING RECOMMENDATIONS 27
Lateral Earth Pressures for Temporary Shoring Design 27
Shoring Construction Recommendations 29
Excavation Observation and Monitoring 29
Embankment Factors and Rippability 30
Rippability 31
PRELIMINARY RECOMMENDATIONS - FOUNDATIONS 31
General 31
Structural Mat Foundations - Proposed Health Care Building 31
PRELIMINARY SETTLEMENT EVALUATION 32
Static Settlement 32
Seismic Settlement 33
SOIL MOISTURE CONSIDERATIONS 33
PRELIMINARY RETAINING WALL DESIGN PARAMETERS 34
General 34
Conventional Retaining Walls 35
Preliminary Retaining Wall Foundation Design 35
Restrained Walls 36
Cantilevered Walls 36
Seismic Surcharge 36
Retaining Wall Backfill and Drainage 37
Wall and Retaining Wall Footing Transitions 41
STORM WATER INFILTRATION KSAT RATE EVALUATION AND DISCUSSION 41
U.S. Department of Agricultural (USDA) Review 41
Infiltration Basin Siting Requirements 42
Onsite Storm Water Quality Best Management Practice (BMP) Systems 42
PRELIMINARY PAVEMENT DESIGN RECOMMENDATIONS 45
General 45
Asphaltic Concrete (AC) Pavements 45
Portland Concrete Cement (PCC) Pavement 46
Weakened Plane Joints 46
Expansion Joints and Contact Joints 46
Slab Reinforcement 47
PAVEMENT GRADING RECOMMENDATIONS 47
General 47
Subgrade 47
Crushed Aggregate Base Rock 47
Paving 48
Drainage 48
Additional Considerations 48

DRIVEWAY, CONCRETE APRONS, FLATWORK, AND OTHER IMPROVEMENTS 49
General 49
DEVELOPMENT CRITERIA 50
Drainage 50
Erosion Control 51
Landscape Maintenance 51
Site Improvements 51
Tile Flooring 52
Additional Grading 52
Footing Trench Excavations 52
Underground Utility Trench Backfill 52
SUMMARY OF RECOMMENDATIONS REGARDING 53
GEOTECHNICAL OBSERVATION AND TESTING 53
OTHER DESIGN PROFESSIONALS AND CONSULTANTS 54
PLAN REVIEW 54
LIMITATIONS 55

FIGURES:

Figure 1 - Site Location Map 2
Figure 2 - Regional Geologic Map 5
Figure 3 - Regional Fault Map 8
Figure 4 – Riverside County Fault Map 9
Figure 5 - Alquist-Priolo - Earthquake Zones of Required Investigation 11
Figure 6 – Nearby Alquist-Priolo - Site Investigation Reports 12
Figure 7 – Historical Earthquake Epicenter Map 13
Figure 8 - Riverside County Liquefaction and Subsidence Maps 15
Figure 9 - Temporary Shoring Lateral Earth Pressure 28
Detail 1 - Typical Retaining Wall Backfill and Drainage Detail 38
Detail 2 - Retaining Wall Backfill and Subdrain Detail Geotextile Drain 39
Detail 3 - Retaining Wall and Subdrain Detail Clean Sand Backfill 40

ATTACHMENTS:

Plate 1 - Geotechnical Map Rear of Text
Plate 2 - Geologic Cross Sections A-A', B-B' Rear of Text
Appendix A - References Rear of Text
Appendix B - Boring and CPT Logs Rear of Text
Appendix C – Seismic Hazard Rear of Text
Appendix D - Laboratory Data Rear of Text
Appendix E – Seismic Settlement Analysis Rear of Text
Appendix F - General Earthwork and Grading Guidelines Rear of Text

PRELIMINARY GEOTECHNICAL INVESTIGATION
PROPOSED BRADLEY GARDENS SKILLED NURSING FACILITY
BUILDING ADDITION, 980 W. 7TH STREET
CITY OF SAN JACINTO, RIVERSIDE COUNTY
CALIFORNIA 92582 (APN 435-330-003)

SCOPE OF SERVICES

The scope of our services has included the following:

1. Review of in-house geologic and geotechnical literature, maps, and aerial photos of the site and vicinity (text and Appendix A).

2. Geologic reconnaissance mapping and subsurface exploration consisting of the advancement of four (4) exploratory hollow-stem auger borings (B-1 through B-4), with a truck-mounted drill rig, and four (4) Cone Penetration Test (CPT) soundings (CPT-1 through CPT-4), for geotechnical logging and soil sampling (text and Appendix B).

3. Evaluation of geologic, seismic hazards and regional seismicity (text and Appendix C).

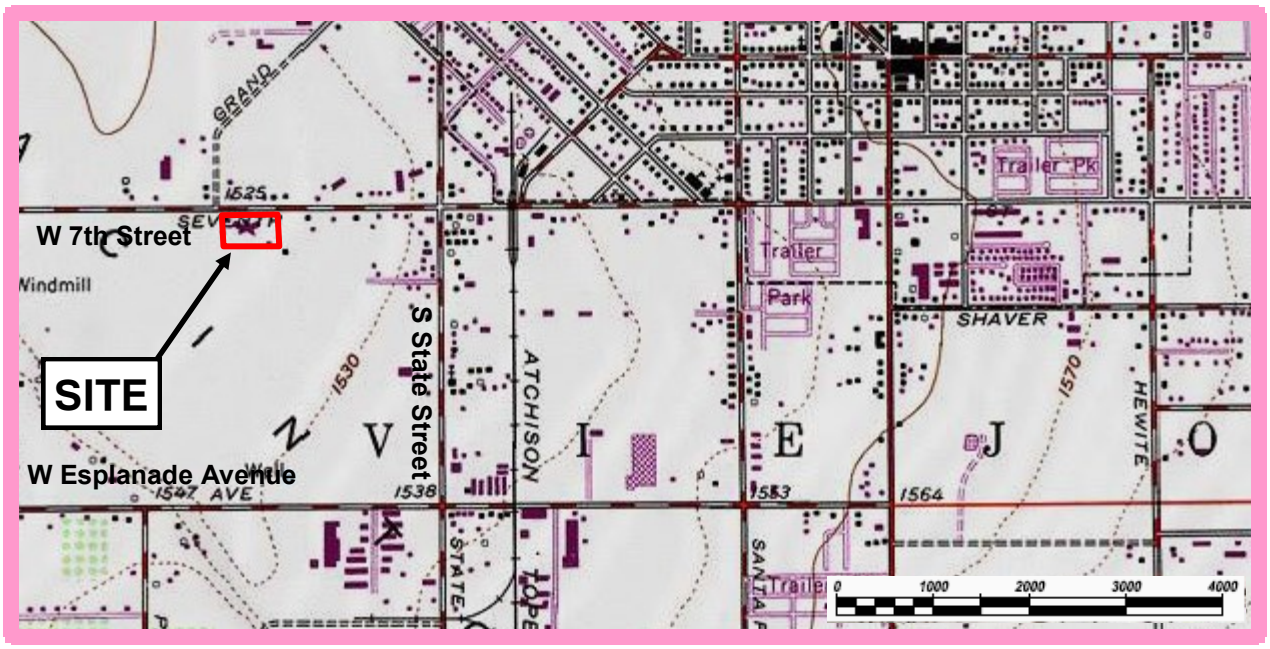
4. Appropriate laboratory testing of representative bulk and relatively undisturbed soil samples collected during our subsurface exploration program (text and Appendix D).

5. Engineering and geologic analyses of data collected (text and Appendix E).

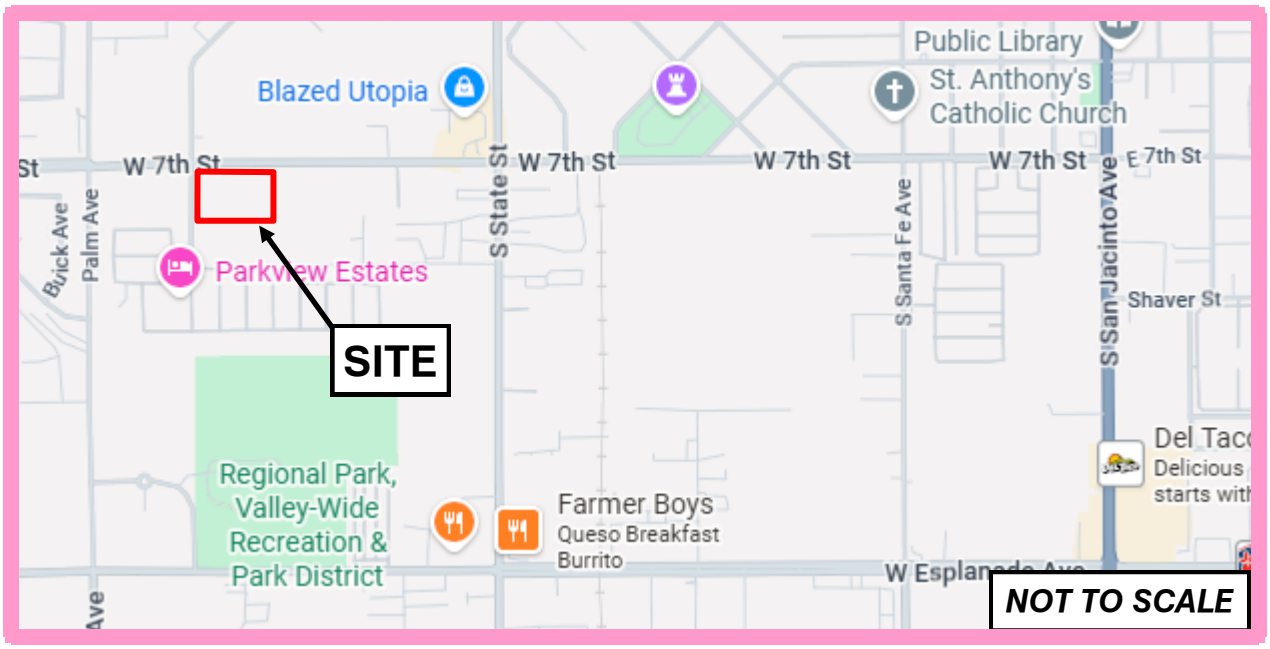
6. Preparation of this geotechnical report, accompaniments, and general grading guidelines (text and Appendix F).

SITE DESCRIPTION AND PROPOSED DEVELOPMENT

The overall site consists of an approximately 2.98-acre, rectangular-shaped area of developed land. The proposed Building A1 is located on the east side of the existing health care facility. The site is located on the southeast corner of the intersection of W 7th Street and S. Grand Avenue, in the City of San Jacinto, Riverside County, California (see Figure 1 - Site Location Map). The physical address of the existing facility is 980 W. 7th Street, City of San Jacinto, Riverside County, California 92582. As discussed herein, the overall care facility is referred to as site, project site, or property.



Base Map: TOPO! Copyright 2003 National Geographic, USGS San Jacinto Quadrangle, 7.5 Minute, Riverside Co., California -- dated 1953, photo-revised 1972.



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SITE LOCATION MAP

Figure 1

The geographic coordinates of the approximate centroid of Building A1 is at a latitude of 33.77956 degrees and a longitude of -116.97718 degrees. The property is bounded by undeveloped land on the south, east and west, by residential development to the southwest, and commercial development to the north, across W 7th Street. In general, the site is flat-lying to very gently sloping in a southeasterly direction. According to Google Earth Pro (GEP, 2025), site elevations vary between approximately 1,527 and 1,525 feet Mean Sea Level (MSL), for an overall relief of about 2 feet. The site is sparsely vegetated and has shrubs and trees surrounding the existing facility. Within the proposed building footprint, the western margin is currently used for an exercise yard by the patients. Elsewhere, it is earthen or covered with gravel (driveway area).

Existing site improvements primarily consist of several single-story buildings with an asphaltic concrete (AC) parking lot to the north. A U-shaped drive aisle exists near the entrance to the site from W 7th Street. Existing underground utilities are present beneath the pavements. There are also improvements in the area of the proposed building which consist of various sidewalks, a basketball court, and exercise yard fences. The proposed development (Building A1) is planned to be a single-story health care building with an improved fire access lane and small parking lot. Building loads are assumed to be typical for these types of structures. Sewage disposal is proposed to tie into the regional municipal system.

BACKGROUND

The facility was first approved to provide Medicare and Medicaid services on May 29, 1968 (Nursing Home Report, 2025). Existing onsite buildings appear to be primarily wood-frame construction and stucco exteriors, with shallow concrete slabs and foundations. The exercise yard area was added sometime between 2011 and 2012. Since that time, the site has been maintained and slightly modified to its current configuration. Construction records of the existing facility were not available at the time of this report and it is believed that most of the single-story facility buildings were constructed upon relatively shallow fill soils (less than 3 feet in thickness). Records of the initial grading on this site were not available for GSI's review. Given the age of the existing development (circa 1968), it is unlikely that a geotechnical report for the development of this site is currently available.

SITE EXPLORATION

Surface observations and subsurface explorations were performed by GSI representatives on November 26, 2025. Near-surface soil and geologic conditions were explored with four (4) exploratory hollow-stem auger borings (B-1 through B-4), advanced with a truck-mounted drill rig. In addition, four (4) supplemental Cone Penetration Test (CPT) soundings (CPT-1 through CPT-4) were also advanced in the footprint of Building A1. The borings and CPT soundings were logged or observed by a geologist from this office who also

collected representative bulk and relatively undisturbed soil samples for appropriate laboratory testing. Logs of the borings and CPT soundings are presented in Appendix B. The approximate locations of the borings and CPT soundings are shown on the attached Geotechnical Map (see Plate 1), which uses the overall site plan by GMA (2025) as a base.

GEOLOGY

Regional Geologic Setting

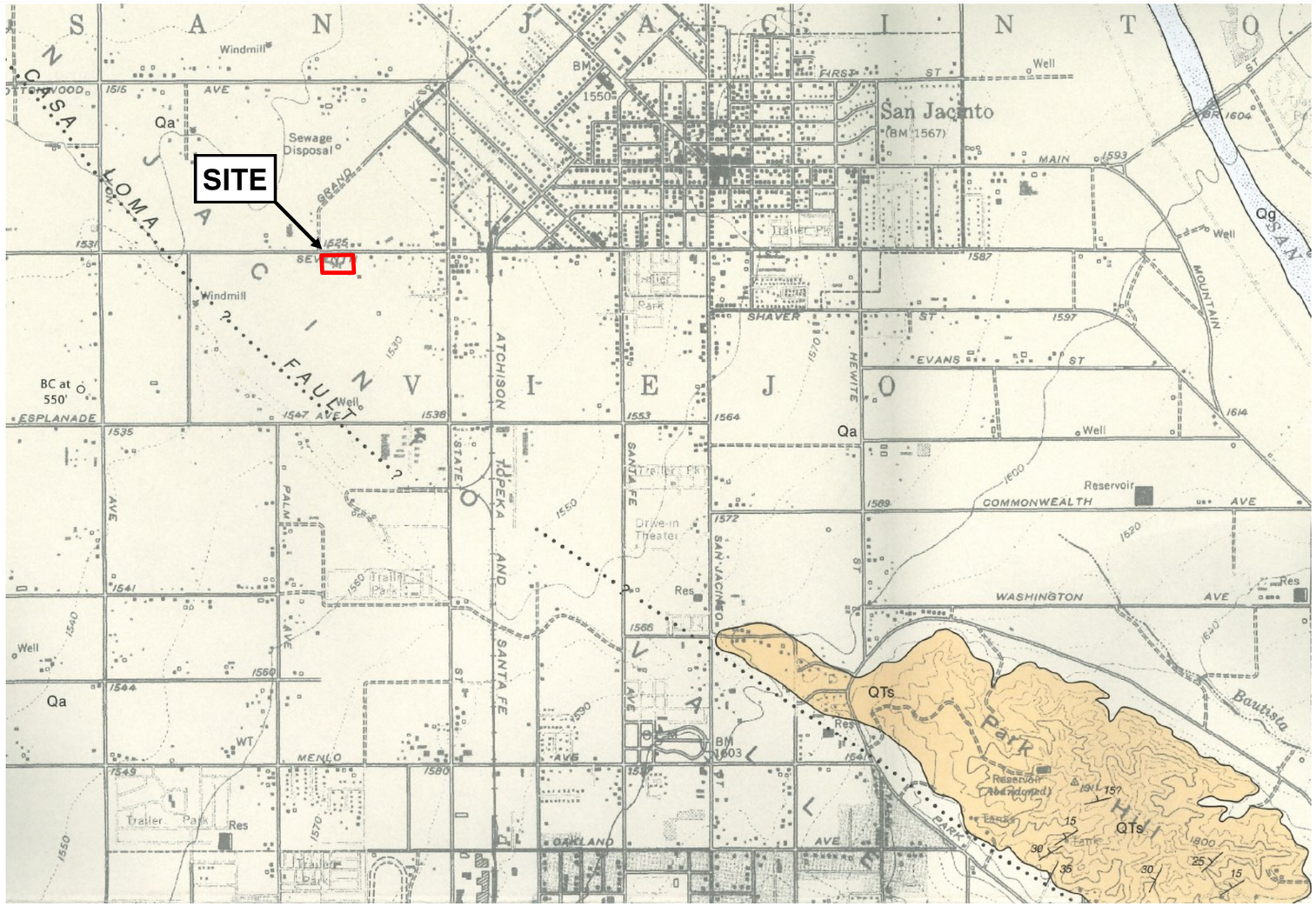
The property is situated near the northeastern margin of the Perris Block, a portion of a prominent natural geomorphic province in southwestern California known as the Peninsular Ranges. The Peninsular Ranges are characterized by steep, elongated ranges and valleys that trend northwesterly. The Peninsular Ranges extend north to the base of the San Gabriel Mountains and south into Baja California, Mexico. The Perris Block is a stable structural block bounded on the west by the Elsinore fault zone and on the east by the San Jacinto fault zone. The province is bounded on the north and northeast by the Transverse Ranges, on the south and southeast by the Colorado Desert geomorphic province. This province is typified by plutonic and metamorphic rocks (bedrock) which comprise the majority of the mountain masses, with relatively thin volcanic and sedimentary deposits discontinuously overlying the bedrock, and with Plio/Pleistocene-age (Quaternary-age) alluvial fan deposits filling in the valleys and younger alluvium filling in the incised drainages. The alluvial deposits are derived from the waterborne deposition of the products of weathering and erosion of the bedrock. Regional geologic mapping by Dibblee (2003) indicates the site is underlain by Holocene- to late Pleistocene-age alluvial sand and clay of valley areas (Qa), although no significant clay layers were encountered during our subsurface investigation. The regional geology of the site and near-vicinity is shown on Figure 2, which uses Dibblee (2003) as a base.

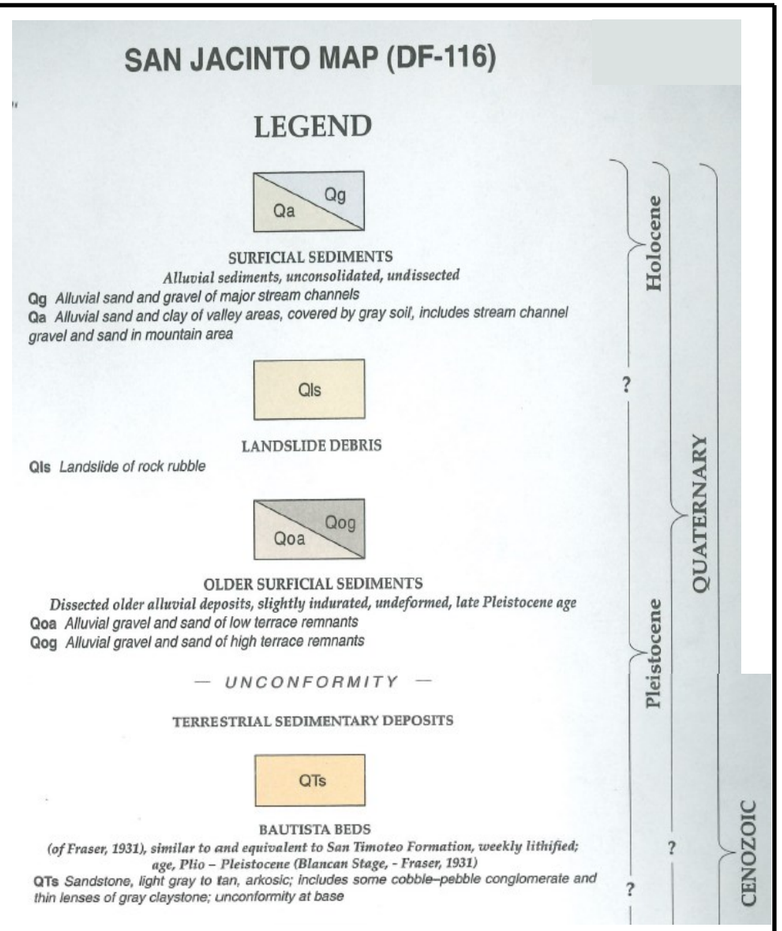
Site Geology

The site geologic units encountered or observed during our subsurface investigation and site reconnaissance included near surface topsoil and disturbed fill, underlain by Holocene- to late Pleistocene-age alluvial sand and clay of valley areas at depth. The earth materials are generally described below from the youngest to the oldest. The distribution of these materials is shown on Plate 1. The relationship of the geological units is shown in profile on Geologic Cross Sections A-A' and B-B' (Plate 2).

Topsoil and Disturbed Fill (Not Mapped)

Topsoil and disturbed fill were encountered in all the borings advanced onsite. The topsoil and disturbed fill generally consist of brown, moist, loose to medium dense silty sands with some occasional roots and rootlets. Based on the available data, the thickness of the topsoil and disturbed fill was relatively thin (approximately 2 to 3 feet). Due to the low relative densities





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SCALE 1:24000

1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 KILOMETER

SAN JACINTO QUADRANGLE
CONTOUR INTERVAL 40 FEET
DOTTED LINES REPRESENT 10-FOOT CONTOURS
DATUM IS MEAN SEA LEVEL

Figure Adapted from:

GEOLOGIC MAP OF THE
SAN JACINTO QUADRANGLE
RIVERSIDE COUNTY, CALIFORNIA

BY THOMAS W. DIBBLEE, JR., 2003
EDITED BY JOHN A. MINCH

GSI GeoSoils, Inc.

Figure 2

REGIONAL GEOLOGIC MAP

W.O. 9071-A-IE	DATE: 12/25	SCALE: 1"=2,000'

and potential for adverse settlements, all of the existing topsoil and disturbed fill should be removed and recompacted during site grading activities. The removed topsoil and disturbed fill may be reused for compacted fills, provided it has been cleansed of deleterious materials (e.g., weeds, grasses, and concentrations of organic matter) prior to placement onsite as engineered fill.

Quaternary-Age Alluvial Sand and Clay of Valley Areas (Map Symbol - Qa)

In general, the topsoil and disturbed fill is underlain by relatively young (Holocene- to late Pleistocene-age) alluvial deposits, described by Dibblee (2003) as alluvial sand and clay of valley areas. However, as encountered during our subsurface investigation the site soils were generally sandy with minor silt layers encountered at depth. The alluvial deposits generally consist of light brown and dark gray, grayish brown, and light gray, medium dense, silty sand and silt with a few minor sandy layers. The alluvium is generally damp to moist and locally wet to saturated. The observed alluvial deposits extend to depths beyond 60 feet, and are estimated to be hundreds of feet in thickness based on the data reviewed. The near surface alluvial deposits (upper 5 to 7 feet) should be removed and recompacted during site grading. In-place low density alluvial deposits should be removed to competent materials (e.g., greater than or equal to 105 pcf or greater than or equal to 85 percent compaction). The removed alluvial deposits may be reused for compacted fills, provided that they have been cleansed of deleterious materials prior to placement onsite as engineered fill.

GROUNDWATER

No groundwater or seepage were encountered during our field exploration in Borings B-1 through B-4 nor CPTs 1 through 4, at depths ranging between approximately 30 and 60 feet bgs. As such, groundwater is not expected to be a factor during construction of the proposed project. Based on our review of the California Department of Water Resources Water Data Library (CDWR; 2025), nearby well measurements reviewed appear to be regional groundwater measurements at depths of approximately 170 and 155 feet (State Well No. 04S01W27P005S [March 7, 1991], and Site Code No. 337748N1169760W001 [December 6, 2011], respectively) at sites with similar ground surface elevations. However, our review of historic groundwater measurements in the San Jacinto and Temecula basins (U.S. Geological Survey, 1919, Water Supply Paper 429) indicates groundwater near the center of the basin may have been as shallow as 40 feet bgs. However, in California, the legislature passed the Sustainable Groundwater Management Act (SGMA), creating a statewide framework for groundwater regulation. The Eastern Municipal Water District (EMWD), and several other water purveyors, have been actively managing the San Jacinto basin as part of a voluntary Assembly Bill 3030 effort passed in 1992. As such, it is unlikely the groundwater will reach historic levels as the basin is now adjudicated.

However, there is a potential for perched water to occur both during and following site development along zones of contrasting permeability (e.g., fill lifts, sandy and clayey bedding, or discontinuities). Sources of perched water may include infiltrated rain water, over-irrigation, or damaged underground utilities. These observations reflect site conditions at the time of our investigation and do not preclude future changes in local groundwater conditions that were not obvious at the time of our investigation.

FAULTING AND REGIONAL SEISMICITY

Our review indicates that there are no known active faults crossing this site (Jennings and Bryant, 2010), and the site is not within an Alquist-Priolo Earthquake Fault Zone (California Geological Survey [CGS], 2018). In addition, our review of the RCIT Map My County website (2025) indicates no County faults are mapped onsite and site is not located within a County fault zone. However, the site is situated in a region of active faulting, as is all of southern California. These faults include, but are not limited to: the San Andreas fault; the San Jacinto fault; and the Elsinore fault zone.

The closest known active fault is the San Jacinto fault, located at an approximate distance of 2.0 miles (3.2 kilometers) to the east-northeast. However, the nearby San Andreas fault, and design fault for the subject site, is located at an approximate distance of 17.1 miles (27.5 kilometers) to the northeast.

Portions of the San Jacinto and San Andreas faults have demonstrated movement in the Holocene Epoch (last 11,700 years); and therefore, are considered active and located within Alquist-Priolo Earthquake Fault Zones (CGS, 2018). Cao, et al. (2003) indicates that the San Andreas fault is an "A" fault with a slip rate of 24.0 ($\pm$6.0) millimeters per year, and is capable of producing a maximum magnitude (M_w) 7.5 earthquake. The location of the San Andreas and San Jacinto faults, and other major faults that could have an effect on the site in the form of moderate to strong ground motions, are shown on the Regional Fault Map (see Figure 3). In addition, the Riverside County Information Technology (RCIT) fault hazard mapping in the site vicinity is shown on the County Fault Map (see Figure 4).

Fault Activity Review (Alquist-Priolo Fault Zones)

Based on our review of available fault hazard mapping (CGS, 2025 and 2018 and RCIT, 2025) a small splay of the San Jacinto fault projects towards the subject property. This fault trace is described as the "Casa Loma" segment of the San Jacinto fault zone.

Our fault activity review included reviews of previous fault-finding and geotechnical investigations by Gary S. Rasmussen & Associates (GR&A, 1986, County Geo. No. 409), Lewis S. Lohr & Associates (LSL&A, 1991, County Geo. No. 790) and by Leighton & Associates (L&A, 2003, County Geo. No. 1189). These previous investigations, just northwest of the site, found no evidence of offsets or active faulting within the trench exposures evaluated. As such, it appears the small fault splay dies-out before reaching the

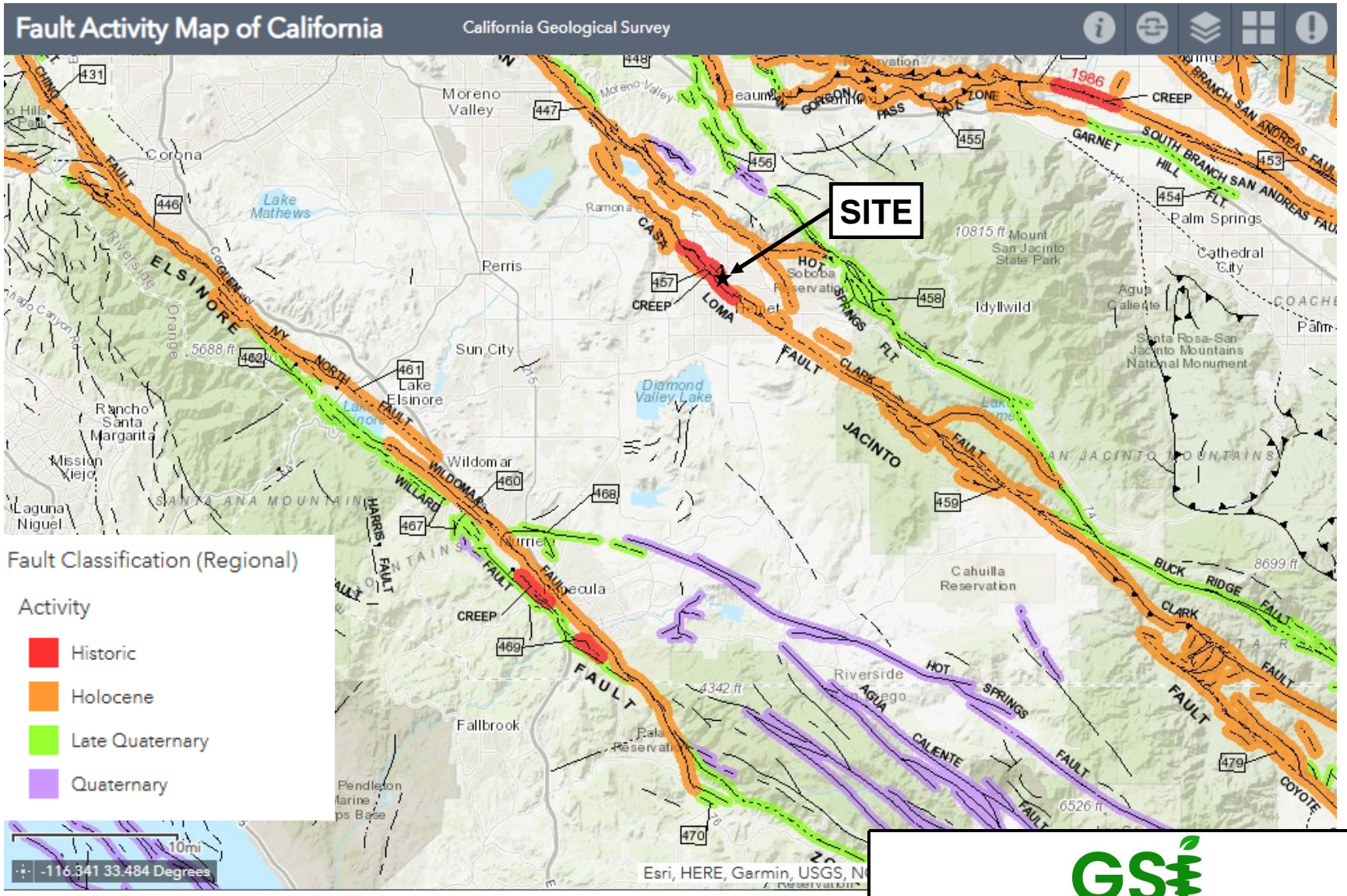

Figure Adapted from: Fault Activity Map of California, by the California Geological Survey, 2025

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Figure 3

REGIONAL FAULT MAP

W.O. 9071-A-IE	DATE: 12/25	SCALE: See Bar Scale

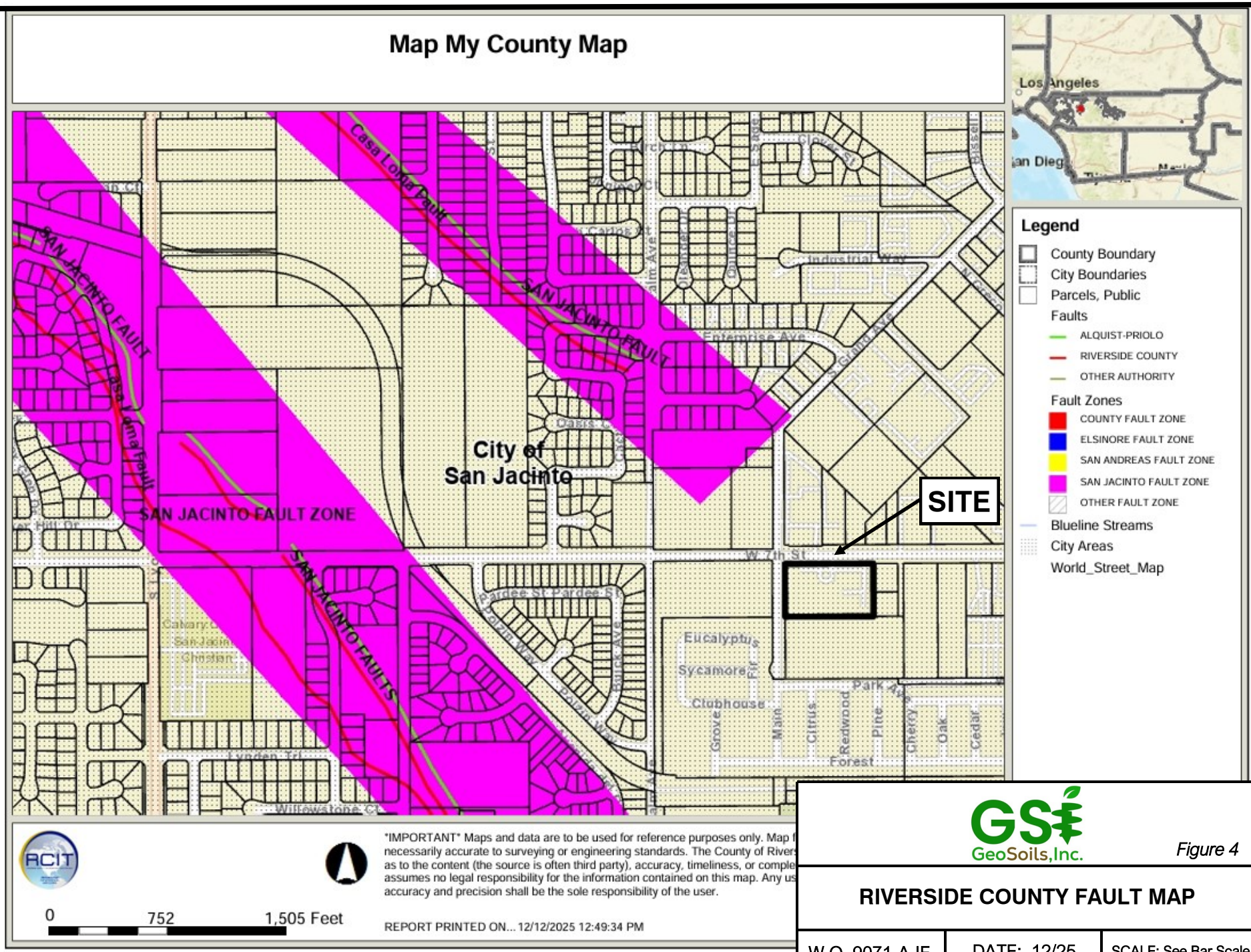

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Figure 4

RIVERSIDE COUNTY FAULT MAP

W.O. 9071-A-IE	DATE: 12/25	SCALE: See Bar Scale

Figure Adapted from: Riverside County Information Technology (RCIT), Map My County Website, 2025

site proximity. A map showing the Alquist-Priolo earthquake zones of required investigation (CGS, 2025) is provided on Figure 5. A map showing the nearby Alquist-Priolo site investigation reports reviewed (GR&A, 1986, LSL&A, 1991, and L&A, 2003) is provided on Figure 6.

Aerial-photographic Lineament Analysis

In order to identify possible unmapped faults and to evaluate topographic expressions of published fault traces in the proximity, a lineament analysis was performed using stereoscopic black-and-white aerial photographs (United States Department of Agriculture [USDA], 1980). Lineaments were generally classified as strong, moderate, or weak. A strong lineament is a well-defined feature that can be continuously traced several hundred feet to a few thousand feet. A moderate lineament is less well-defined, somewhat discontinuous, and can be traced for only a few hundred feet. A weak lineament is discontinuous, poorly defined, and can be traced for a few hundred feet or less. Based on our review and analysis, a moderate photolineament was noted west- northwest of the site, and correlates well with the mapped location of the Casa Loma segment of the San Jacinto fault zone. No lineaments specifically cross or project toward the project site. Furthermore, the site is not transected by geomorphic features indicative of active faulting.

Regional Seismicity

General

The subject site is located within a seismically active region, subject to moderate to strong earthquakes occurring along many active fault splays. The possibility of ground motions at the site, may be considered as approximately similar to the southern California region as a whole.

Historical Site Earthquake Records

Historical site seismicity was evaluated with the USGS website application "Search Earthquake Catalog" (https://earthquake.usgs.gov/earthquakes/search/). This program performs a search of the historical earthquake records for magnitude 5.0 to greater than 7.0 seismic events within a search area, between the years of January, 1800 through December, 2025. A historical earthquake epicenter map is generated from the historical data, and is presented on Figure 7. Our research of regional geologic and seismic data did not reveal any known instances of ground failure within the site associated with regional seismic activity.

Seismic Ground Motion Values

Using a latitude of 33.77956 degrees and a longitude of -116.97718, a Risk Category of III (provided by the architect) and based on the site conditions, the following table summarizes the design criteria obtained from the 2022 CBC, Chapter 16 Structural Design, Section 1613, Earthquake Loads. The ASCE Hazard Tool (ASCE Hazard Tool) has been used to aid in

Department of Conservation
California Geological Survey

Earthquake Zones of Required Investigation

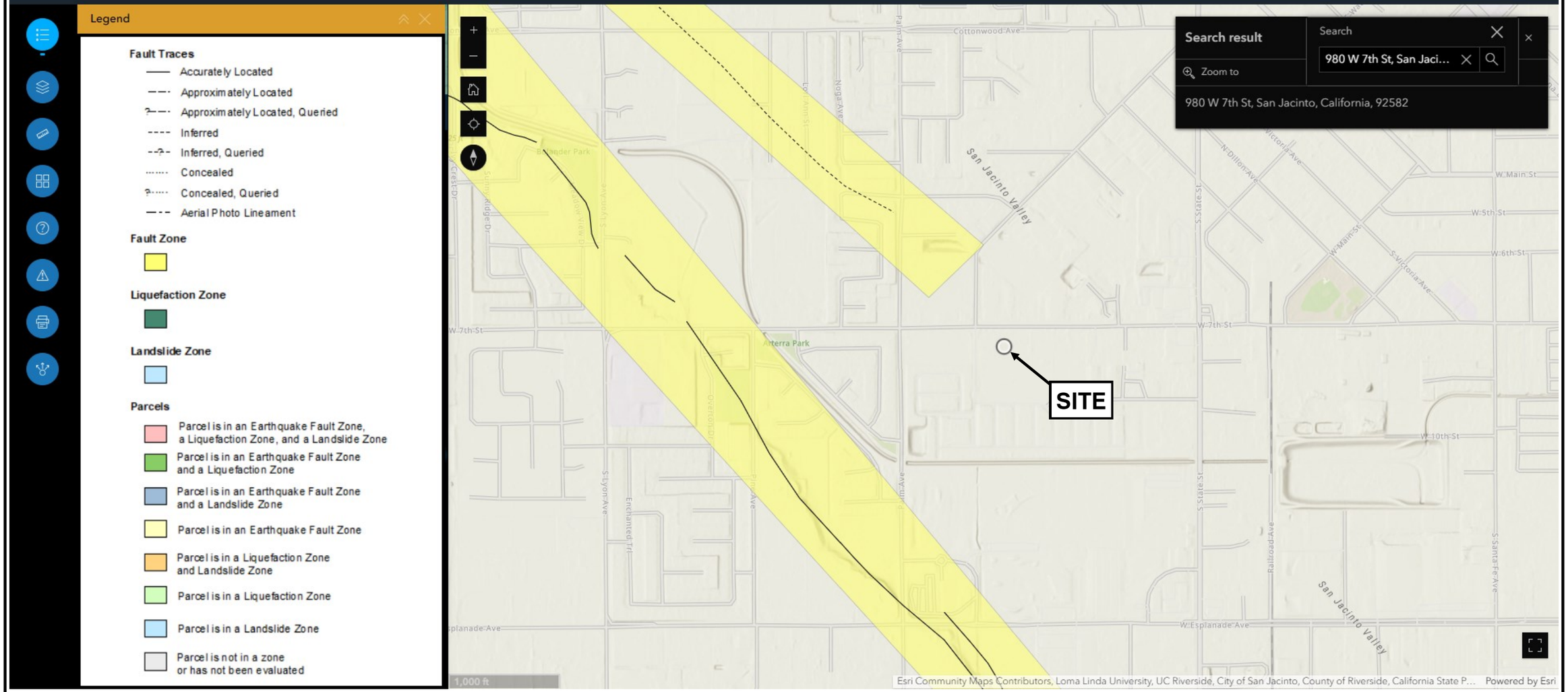

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Figure 5

ALQUIST-PRIOLO - EARTHQUAKE ZONES OF REQUIRED INVESTIGATION

W.O. 9071-A-IE	DATE: 12/25	SCALE: See Bar Scale

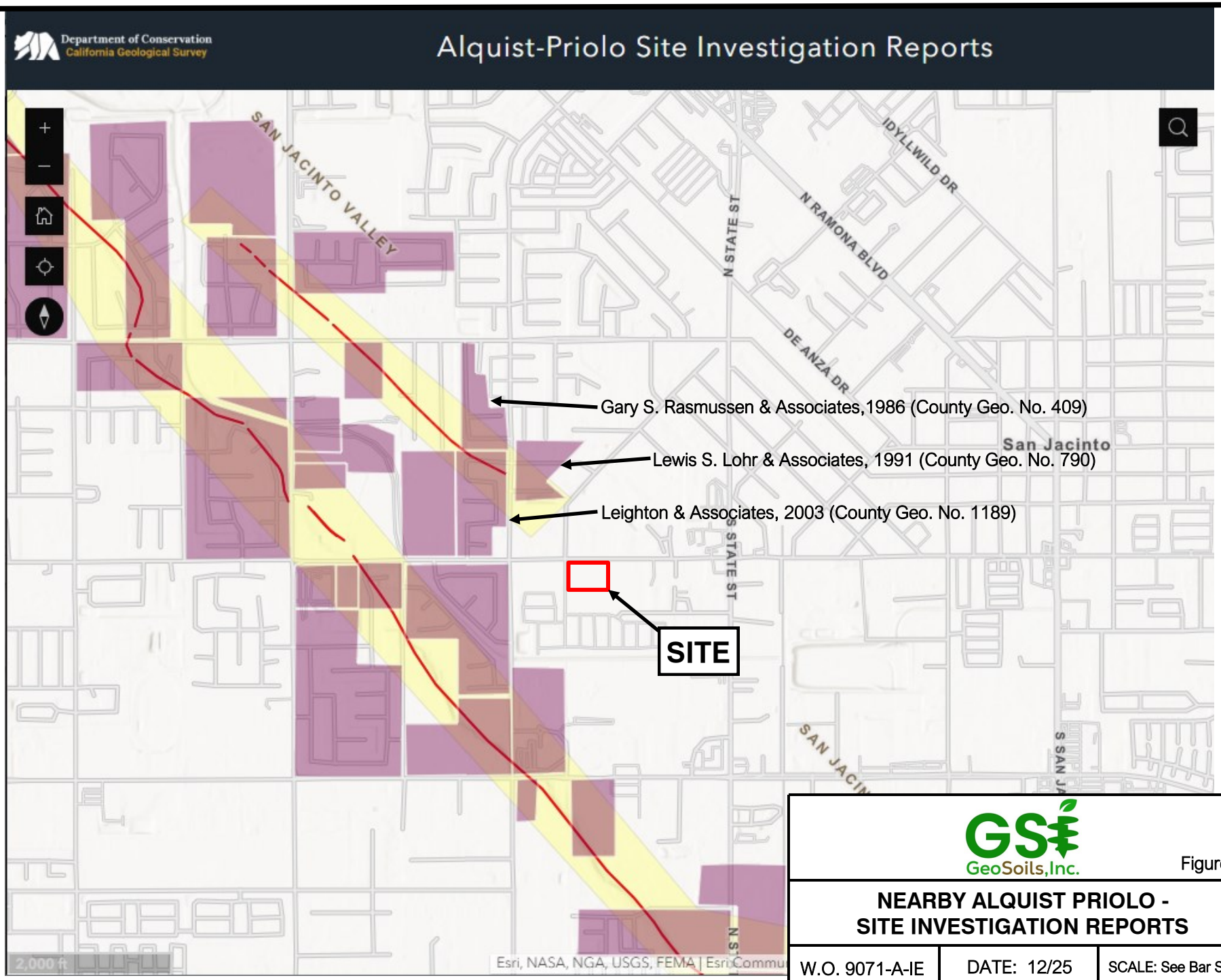

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Figure 6

NEARBY ALQUIST PRIOLO - SITE INVESTIGATION REPORTS

W.O. 9071-A-IE	DATE: 12/25	SCALE: See Bar Scale

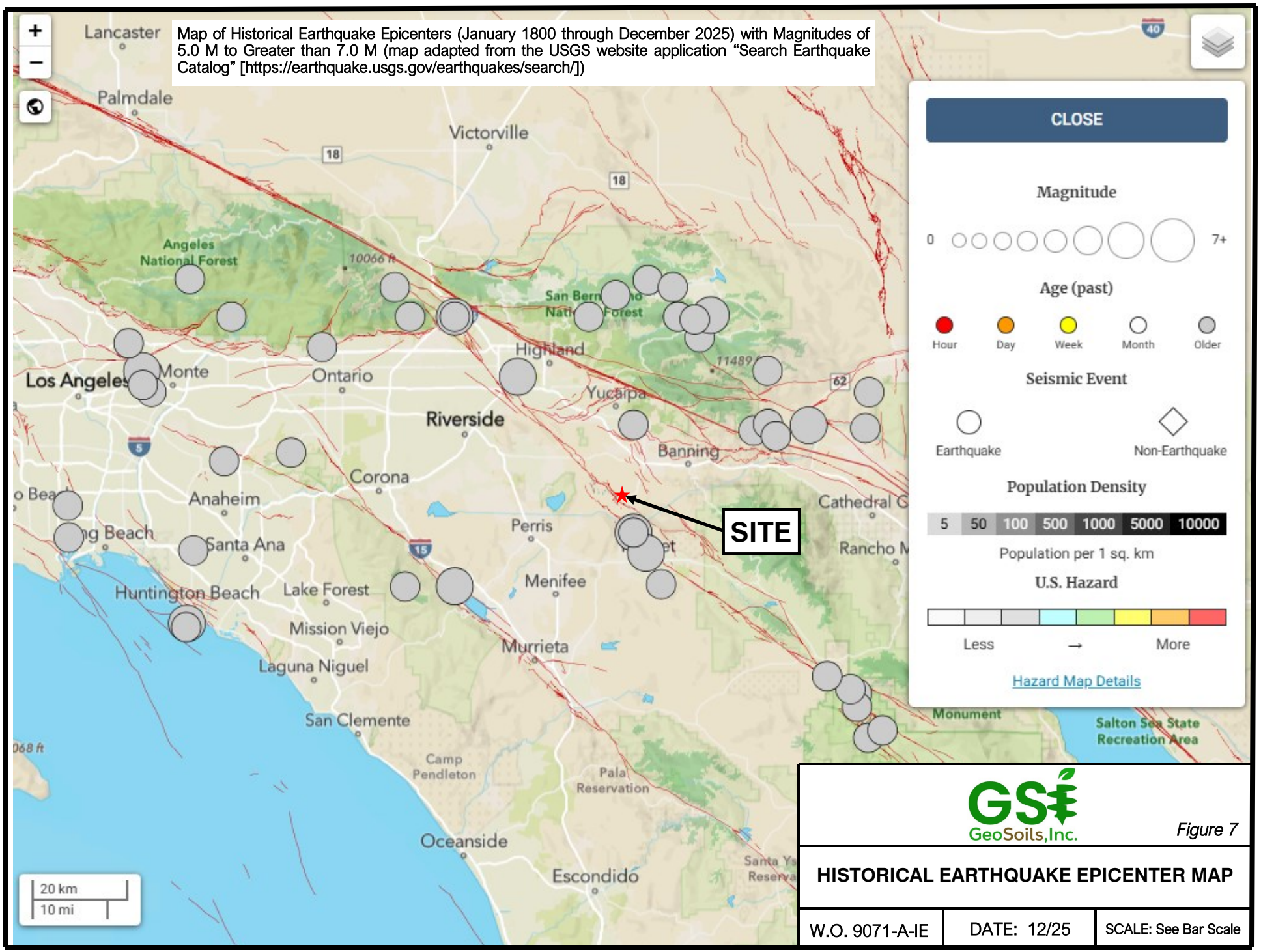

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Figure 7

HISTORICAL EARTHQUAKE EPICENTER MAP

W.O. 9071-A-IE	DATE: 12/25	SCALE: See Bar Scale

design. As the site is potentially liquefiable, the site may be classified as Site Class F. However, as we assume that the fundamental period of the proposed structure is less than 0.5 seconds, the site is classified as D (Appendix C). Since site class is D, a site-specific procedure would be required, but it is not performed as we follow the Exception of Section 11.4.8.1, ASCE 7-16, Supplement 3. A printout of the ASCE Design Hazards Report is presented in Appendix C.

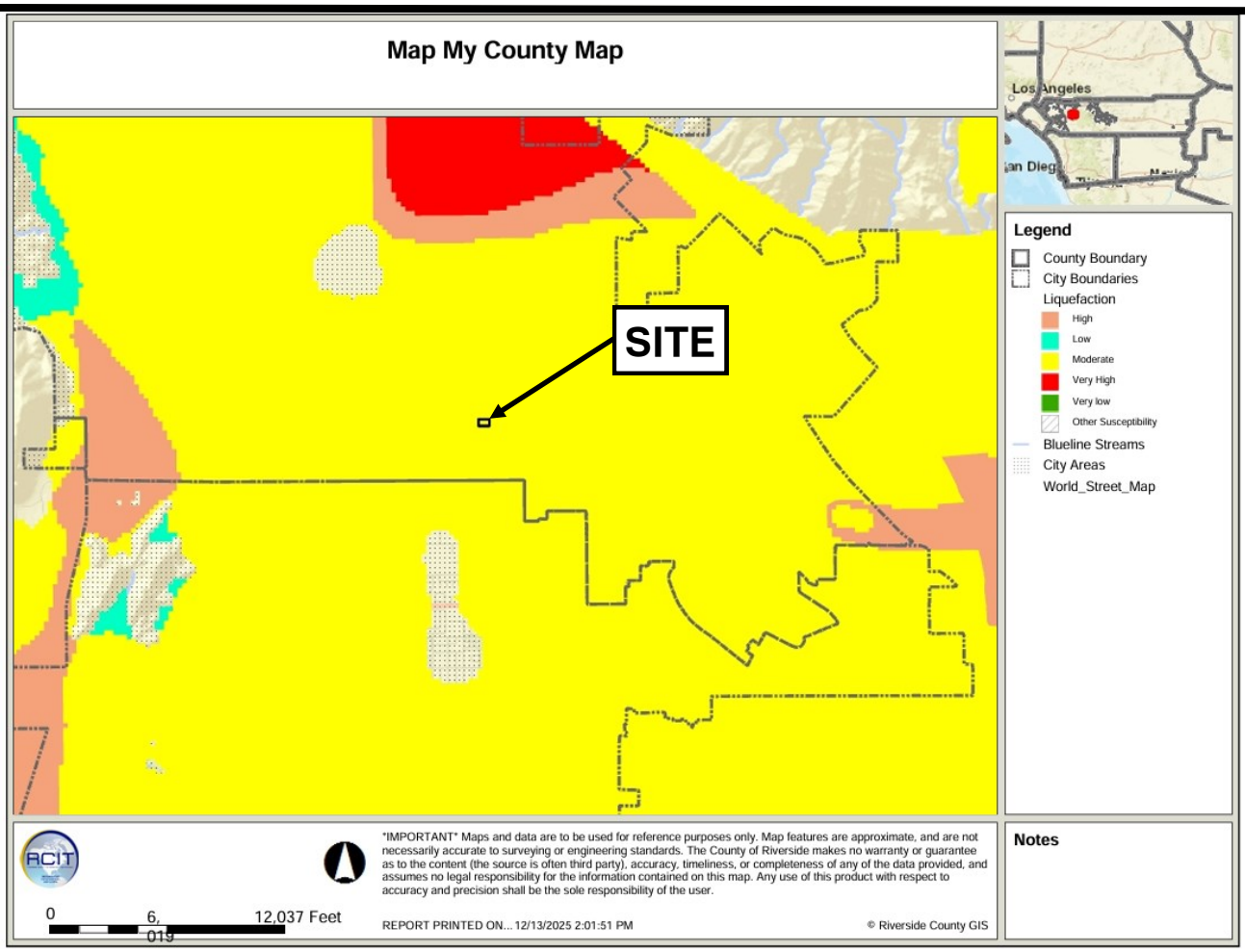
2022 CBC SEISMIC GROUND MOTIONS		
PARAMETER	VALUE	2022 CBC OR REFERENCE
Risk Category	III	Table 1604.5
Site Class	D	Chapter 20, ASCE 7-16
MCE_R spectral acceleration - (0.2 sec), S_s	2.161 g	Section 1613.2.1
MCE_R spectral acceleration - (1.0 sec), S_1	0.875 g	Section 1613.2.1
Site Coefficient, F_a	1.0	ASCE 7-16, Supplement 3
Site Coefficient, F_v	1.7	ASCE 7-16, Supplement 3
MCE_R spectral acceleration (0.2 sec), S_{MS}	2.161 g	Section 1613.2.3
MCE_R spectral acceleration (1.0 sec), S_{M1}	2.231 g	ASCE 7-16, Supplement 3
Design spectral acceleration (0.2 sec), S_{DS}	1.441 g	Section 1613.2.4
Design spectral acceleration (1.0 sec), S_{D1}	1.488 g	ASCE 7-16, Supplement 3
PGA_M	1.074 g	ASCE 7-16, Section 11.8.3
Seismic Design Category	E	Section 1613.2.5

Conformance to the criteria above for seismic design does not constitute any kind of guarantee or assurance that significant structural damage or ground failure will not occur in the event of a large earthquake. The primary goal of seismic design is to protect life, not to eliminate all damage, since such design may be economically prohibitive. Cumulative effects of seismic events are not addressed in the 2022 CBC (CBSC, 2022) and regular maintenance and repair following locally significant seismic events will likely be necessary, as is the case in all southern California.

LIQUEFACTION POTENTIAL

General

Based on our review, the CGS has not prepared Seismic Hazard Mapping for the San Jacinto Quadrangle. However, our review of the RCIT (2025) Map My County website indicates the site is mapped within an area designated as having a "moderate" potential for liquefaction (RCIT, 2025 [see Figure 8, Riverside County Liquefaction and Subsidence Maps]). As such, liquefaction and seismic settlement analyses were conducted, and are discussed below.



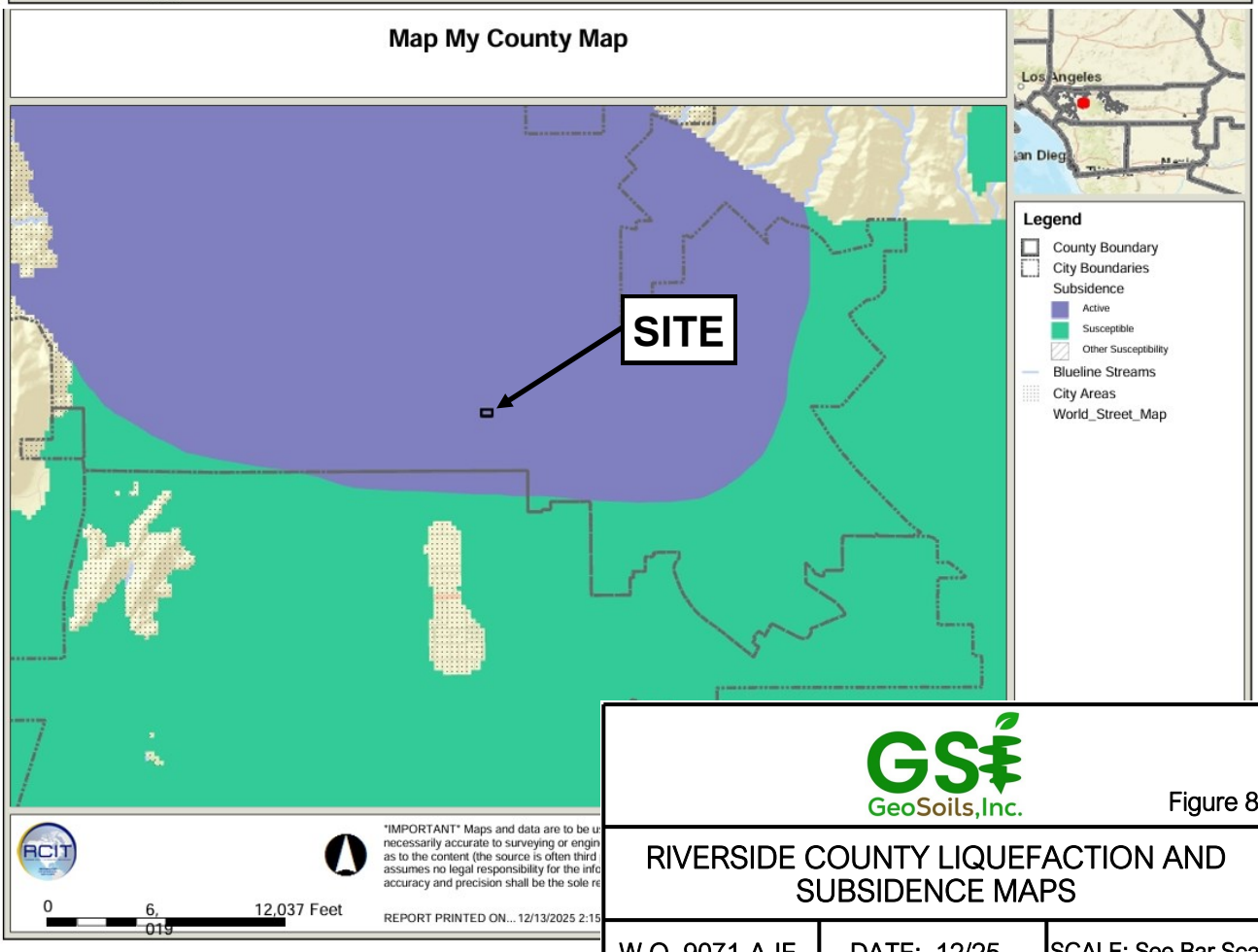


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Figure 8

RIVERSIDE COUNTY LIQUEFACTION AND SUBSIDENCE MAPS

W.O. 9071-A-IE	DATE: 12/25	SCALE: See Bar Scale

Figures Adapted from: Riverside County Information Technology (RCIT), Map My County Website, 2025

Liquefaction

Liquefaction is a phenomenon where earthquake- induced ground motions increase the pore pressure in saturated, sand-like soils until it is equal to the overburden pressure. When this occurs, the soil can completely lose its shear strength and enter a liquefied state. The possibility of liquefaction is dependent upon grain size, relative density, fines consistency, confining pressure, saturation of the soils, and intensity and duration of seismic ground motions. In order for liquefaction to occur, three criteria must be met: underlying loose, sand-like soils, a groundwater depth of less than about 50 feet, and a potential for seismic ground motions from nearby large-magnitude earthquakes.

Following a review of the subsurface borings, CPT data and laboratory testing, the CPT data was evaluated for liquefaction potential within the site. For the analyses, GSI used a groundwater depth of 40 feet below the existing grade to account for potential historic groundwater levels, although unlikely, at the time of the seismic event for the currently planned development.

The liquefaction analysis was performed, based on the CPT data obtained (CPT-1 through CPT-4) and was conducted using the commercially available CPT liquefaction assessment software, CLiq v.3.5.4.2 (Geologismiki, 2025). We used the soil information from the CPT data, and seismic parameters PGA_M = 1.074g and magnitude M= 8.1 earthquake. This magnitude was calculated from deaggregation analysis using the USGS Tool interactive website (Appendix C). Calculations of liquefaction potential indicate that sandy layers below the ground water table could be potentially liquefiable. No bearing capacity failure, sand boils, or lateral spreading are anticipated, based on the available data. Computer printouts from the analysis are presented in Appendix E.

Seismic Densification

Seismic densification is a phenomenon that typically occurs in low relative density granular soils (e.g., USCS classified as SP, SW, and SM) that are above the groundwater table and are significantly dry of optimum moisture content. During the seismic-induced ground shaking, these natural sediments deform under loading and volumetrically strain, resulting in ground surface settlements. These unsaturated granular soils are susceptible if left in their original density (unmitigated), and are significantly drier than the optimum water content (as defined by the ASTM D 1557). Seismic densification phenomenon has a low, to perhaps moderate potential to affect planned site improvements; however, will be mitigated by recommended remedial grading and appropriate foundation design. Calculations of seismically induced settlements are presented in Appendix E.

We estimate approximately 3-inch of total seismically induced ground settlement may occur at the site. The seismic total settlements at each of the CPT locations, including dry (above GWT) and wet (below GWT) are presented in the Table below.

CPT No.	Dry settlement (in)	Wet settlement (in)	Total Settlement (in)
1	0.62	1.12	1.74
2	1.05	1	2.05
3	3.14	1.21	4.35
4	3.16	0.75	3.91
		Average =	3.01

The differential settlements were calculated using the total settlement at each CPT location and the horizontal distances between them. The angular distortions (Δ/L) are consistent with ASCE 7-16, Chapter 12.13.9. These calculations are presented in the Table below.

CPT No.		Differential Settlement, Δ (in.)	Distance, L (ft)	Δ/L
1	2	0.31	50	0.001
1	3	2.61	87	0.003
1	4	2.17	119	0.002
2	3	2.3	109	0.002
2	4	1.86	152	0.001
3	4	0.44	55	0.001

Lateral Spreading

Lateral spread phenomenon is described as the lateral movement of stiff, surficial, mostly intact blocks of sediment or compacted fill displaced downslope towards a free face along a shear zone that has formed within the liquefied sediment. The resulting ground deformation typically has extensional fissures at the head of the failure, shear deformations along the side margins, and compression or buckling of the soil at the toe. Given, the location and flat laying nature of the site, the potential for lateral spreading to directly affect the site is considered low, based on the available data.

SUBSIDENCE POTENTIAL

Subsidence and Ground Fissures

Our review of the RCIT (2025) Map My County website indicates the site is located in a zone of "Active" subsidence (RCIT, 2025 [see Figure 8, Riverside County Liquefaction and Subsidence Maps]). The effects of areal subsidence and ground fissures generally occur at the transition or boundaries between low-lying areas and adjacent hillside terrain, where materials of substantially different engineering properties (e.g., alluvium vs. bedrock) are present.

Subsidence and ground fissures may also occur due to groundwater or fluid withdrawal and regional tectonics. Documented subsidence within the basin roughly corresponds to the limits of the bounding Casa Loma and San Jacinto fault zones (Lofgren, 1976). There is historical evidence that subsidence has occurred within the San Jacinto basin and the site area, including as much as 0.26 feet (Lofgren, 1976), occurring north of the site during the period of 1964 to 1973. Thus, the subsidence has been attributed to withdrawal of groundwater and regional tectonics along bounding fault zones. However, subsidence has eased appreciably, as a result of the groundwater basin being adjudicated.

The most significant ground fissures are located in the northwestern part of the valley adjacent to and immediately west of the Casa Loma fault, north and northwest of Lakeview (Morton, 1994). Ground fissures in the immediate site vicinity have not been documented.

As such, subsidence and ground fissures at the subject site due to groundwater withdrawal and regional tectonics should be no greater than other nearby already developed areas. As discussed previously, California regulations have been enacted by the Sustainable Groundwater Management Act (SGMA) to mitigate the subsidence potential from the withdraw of groundwater. Provided the SGMA guidelines are properly implemented, the potential for areal subsidence or ground fissures from subsidence owing to groundwater withdrawal, is considered low, but may not be entirely precluded.

OTHER SECONDARY SEISMIC HAZARDS

The following list includes other secondary seismic related hazards that have been considered during our evaluation of the site. The hazards listed are considered negligible or mitigated as a result of site location, soil characteristics, and typical site development procedures indicated herein:

- Lateral spreads
- Ground Lurching or Shallow Ground Rupture
- Tsunami
- Seiche and Dam Inundation

Following implementation of remedial earthwork and design of foundations described herein, this potential would be no greater than that for other existing structures and improvements in the immediate vicinity that comply with current and adopted building standards. Other geologic hazard considerations are addressed below.

Other Geologic Hazard Considerations

The California Geological Survey Note 48 (2022) identifies a number of exceptional geologic hazards that can occur at individual sites, but do not occur statewide. An evaluation of these exceptional conditions is referred to as a Conditional Geologic Assessment by Note 48. Specific assessment items listed in Note 48 are addressed in the table below.

Conditional Geologic Assessment

HAZARD	ASSESSMENT	REFERENCE
Methane Gas, Hydrogen-Sulfide Gas, or Tar Seeps	Not applicable, site is not located with an identified oil field.	California Geological Energy Management Division (CalGEM) Well Finder Program, and DOGGR Online Mapping System (DOMS, 2025).
Volcanic Eruption	Not applicable, site is not in a known hazard area for volcanic eruptions.	U.S. Geological Survey Bulletin 1847 and Geologic mapping by Dibblee (2003).
Flooding and Dam Inundation	The proposed project is located within FEMA Flood Zone X, not located within a County Flood zone, and not located within a dam inundation area.	FEMA Flood Maps, Map My County Website, and Division of Safety of Dams (DSOD).
Tsunami and Seiche Inundation	Not Applicable	See above Sections.
Radon-222 Gas	Not Applicable, typically a concern in the California Coast Ranges.	California Radon Survey (1990) and Nagda (1994).
Naturally Occurring Asbestos	Not Applicable, site is not within an area more likely to contain naturally occurring asbestos.	Churchill and Hill, 2000 (Open-File Report OFR-2000-19)
Hydrocollapse Due to Anthropic Use of Water	Drilling, CPT, and groundwater data indicate that soils are not likely to experience hydrocollapse.	See Groundwater Section.
Regional Subsidence	Our review of Lofgren (1976) and the Map My County Website indicates the site is located within an “Active” zone of subsidence.	Lofgren (1976) and Map My County Website. See above Sections.
Clays and Cyclic Softening	Soils underlying the site are predominately granular. No plastic clays encountered onsite.	See Appendix B and below sections.

LABORATORY TESTING

General

Laboratory testing was performed on representative onsite earth materials in order to evaluate their physical characteristics. The test procedures used and laboratory results obtained are presented below.

Classification

Soils were classified visually according to the Unified Soils Classification System (per ASTM D 2488). The soil classifications are shown on the Boring Logs in Appendix B.

Moisture-Density Relations

The field moisture contents and dry unit weights were measured for relatively undisturbed samples in the laboratory in general accordance with ASTM D 2937 and ASTM D 2216. The dry unit weight was calculated in pounds per cubic foot (pcf), and the field moisture content was calculated as a percentage of the dry unit weight. The results of these tests are indicated on the Boring Logs in Appendix B.

Laboratory Standard

The maximum dry density and optimum moisture content were evaluated for a representative bulk sample of the near-surface soil. The laboratory standard used was ASTM D 1557. The moisture-density relationship obtained for this soil is shown below:

SAMPLE LOCATION AND DEPTH (FT)	SOIL TYPE	MAXIMUM DRY DENSITY (PCF)	OPTIMUM MOISTURE CONTENT (%)
B-2 @ 0-5'	Silty Sand (SM)	113.6	13.1

Expansion Potential

A representative bulk sample of the near-surface soil was evaluated for expansion potential. The Expansion Index (E.I.) test was performed in accordance with ASTM Standard D 4829. The results of the expansion testing are presented in the following table.

SAMPLE LOCATION AND DEPTH (FT)	LABORATORY EXPANSION INDEX (E.I.)	EXPANSION POTENTIAL*
B-1 @ 0-5'	7	Very Low

Direct Shear Tests

Shear testing was performed on relatively undisturbed samples of site soil encountered in the borings. Shear tests were performed in general accordance with ASTM Test Method D 3080 in a Direct Shear Machine of the strain control type. The shear test results are presented in Appendix D, and summarized in the following table:

SAMPLE LOCATION AND DEPTH (FT)	PEAK		RESIDUAL	
	COHESION (PSF)	FRICTION ANGLE (DEGREES)	COHESION (PSF)	FRICTION ANGLE (DEGREES)
B-1 @ 7.5 (undisturbed)	38	36	22	33
B-4 @ 15 (undisturbed)	224	37	87	34

Saturated Resistivity, pH, and Soluble Sulfates

GSI conducted sampling of onsite earth materials for general soil corrosivity testing. The testing included evaluation of soil pH, soluble sulfates, soluble chlorides, and saturated resistivity. These preliminary data should be used by the project structural engineer (or corrosion engineer) in their evaluation of site corrosivity mitigation measures. The soluble sulfate and corrosion potential results are shown as follows, and are presented in Appendix D:

LOCATION AND DEPTH (FT)	SOLUBLE SULFATES PERCENTAGE BY WEIGHT	pH	CHLORIDE (mg/kg)	RESITIVITY (OHMS-CM)
B-1 @ 0-5	0.005	8.0	21	3,500

For preliminary planning purposes, and based upon the soluble sulfate test results and the American Concrete Institute (ACI, 2014), the soluble sulfate content is listed as Exposure Class “S0” (<0.10 Water-Soluble Sulfate in soil, percentage by weight), per the ACI, 2014 (Table 19.3.1.1). Based on the results of the resistivity and pH testing, the onsite soils are

generally considered moderately alkaline (a pH of 7.9 to 8.4 is considered moderately alkaline), and are considered moderately corrosive to ferrous metals in a saturated state (2,000 to 10,000 ohm-cm is considered moderately corrosive). Chlorides are generally low and below action levels.

Although the site soils are categorized as being moderately corrosive to ferrous metals in a saturated state, it is our understanding that ferrous metals embedded in properly poured and formed concrete with the proper mix should be adequately protected from these conditions. As stated above, the soluble sulfate content is listed as Exposure Class "S0" (ACI, 2014). However, reinforced concrete mix design for foundations, slab-on-grade floors, and pavements should also conform to Exposure Classes "S0," "W0," and "C1" in Table 19.3.1.1 of ACI 318-14, as concrete would likely be exposed to moisture. Based upon the laboratory test results obtained, a consulting corrosion engineer may be retained to provide specific recommendations for foundations, utility piping, or other subsurface structures, as warranted.

Resistance Value (R-Value)

Resistance value, or R-Value testing, was performed on a representative soil sample in accordance with CalTrans Test Method 301, and yielded a test result of R=31. The results of R-Value testing are presented in Appendix D. Based on the testing results obtained, preliminary pavement design recommendations are presented herein.

Conformance Testing for Expansion, Corrosion and Concrete Mix Design

Upon completion of grading, additional laboratory testing should be performed on representative samples of soil exposed near pad grade to evaluate its corrosive effects on concrete and steel, and expansion characteristics. Additional comments may be obtained from a qualified corrosion engineer at that time based on the level of corrosion protection required by the project architect, structural engineer, or civil engineer. It is assumed that the need for corrosion protection of steel reinforcement will be further evaluated by the project structural engineer or project architect.

PRELIMINARY CONCLUSIONS AND RECOMMENDATIONS

General

Based on our review of the existing body of near-site geotechnical data, and our field exploration, laboratory testing, and geotechnical engineering analysis, it is our opinion that the project site appears suitable to receive the proposed development from a geotechnical engineering and geologic viewpoint, provided that the recommendations presented in the following sections are incorporated into the design and construction phases of site development. The primary geotechnical concerns with respect to the proposed development are:

1. The presence of existing near-surface topsoil and disturbed fills, and the presence of underlying near-surface loose to medium dense sandy to silty young alluvial deposits.

2. The static and seismic settlement potential of underlying alluvial soils.

3. The depth to competent bearing material below existing grades.

4. The corrosion potential of onsite soils.

5. Regional seismic activity.

The recommendations presented herein consider these as well as other aspects of the site. The engineering analyses, performed, concerning site preparation and the recommendations presented herein have been completed using the information provided and obtained during our field work. In the event that any significant changes are made to proposed site development, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and the recommendations of this report are evaluated or modified in writing by this office. Foundation design parameters are considered preliminary until the foundation design, layout, and structural loads are provided to this office for review.

1. Owing to the presence of potentially compressible existing topsoil and disturbed fill, and near-surface alluvial deposits there will be a potential for distress to settlement-sensitive improvements, absent mitigation. Thus, the near-surface layers of existing topsoil and disturbed fill, and near-surface alluvial deposits should be removed and recompacted to current industry standards and Code as recommended herein within the building footprint. Remedial removals should be conducted to approximately 5 to 7 feet below existing grades. Proposed parking areas and fire access lanes should be graded and recompacted within the upper 2 feet of the existing finish surface.

2. Geotechnical engineering, observation, and testing services should be provided by GSI during grading to aid the contractor in removing unsuitable soils and in their effort to compact the fill. Geologic observations should also be performed during grading to observe and further evaluate site geologic conditions. Although unlikely, if adverse geologic features are encountered, supplemental recommendations and earthwork may be warranted.

3. The near-surface existing topsoil and disturbed fill, and near-surface alluvial deposits (Qa) is considered potentially compressible; and therefore, unsuitable for the support of settlement-sensitive improvements in its present condition, based on current industry standards. In order to reduce the effects of settlement, remedial earthwork should be performed within the areas of proposed development. Remedial grading should be performed to at least 5 feet outside the proposed building footprint, where

feasible. Removals on the order of 2 feet are recommended for other areas supporting settlement-sensitive improvements (e.g., parking lot and fire access lane).

4. Our expansion index test indicates very low expansive soils underlie the site in the near-surface. Preliminary foundation design and construction recommendations are provided herein for these soil conditions.

5. Building foundations will need to be designed to tolerate the soil conditions, and the potential settlements discussed herein. Based on the potential for seismic settlement, the use of a conventional foundation system (e.g., shallow spread and continuous footings) does not appear practical for the proposed building. As such, recommendations for building foundations, including mat slabs, are provided herein.

6. The seismic ground motion values provided herein should be considered during the design and construction of the proposed development.

7. General Earthwork and Grading Guidelines are provided at the end of this report as Appendix F. Specific recommendations are provided in the following sections.

EARTHWORK CONSTRUCTION RECOMMENDATIONS

General

All earthwork should conform to the guidelines presented in the 2022 CBC (CBSC, 2022), the requirements of the City of San Jacinto or County of Riverside, and the General Earthwork and Grading Guidelines presented in Appendix F, except where specifically superseded in the text of this report. Prior to earthwork, a GSI representative should be present at the preconstruction meeting to provide additional earthwork guidelines, if needed, and review the earthwork schedule. GSI should be notified in advance of any fill placement, supplemental regrading of the site, or backfilling underground utility trenches and retaining walls after rough earthwork has been completed. This includes grading for driveway approaches, driveways, and exterior hardscape.

During earthwork construction, all site preparation and the general grading procedures of the contractor should be observed and the fill selectively tested by a representative(s) of GSI. If unusual or unexpected conditions are exposed in the field, they should be reviewed by GSI and, if warranted, modified or additional recommendations will be offered. All applicable requirements of local and national construction and general industry safety orders, the Occupational Safety and Health Act (OSHA), and the Construction Safety Act should be met. It is the onsite general contractor's and individual subcontractors' responsibility to provide a safe working environment for our field staff who are onsite. GSI does not consult in the area of safety engineering.

Site Preparation

All existing improvements (e.g., underground utilities or foundations, if present), vegetation and deleterious debris should be removed from the site prior to the start of construction.

Treatment of Existing Ground

1. Removal of all topsoil and disturbed fill, and near surface weathered alluvial deposits will be necessary prior to fill placement, in areas proposed for settlement-sensitive improvements. The near surface deposits should be removed to competent materials (e.g., greater than or equal to 85 percent compaction, or greater than or equal to 105 pcf for in-place native materials, as evaluated by a GSI representative), if not removed by proposed excavation within areas proposed for settlement-sensitive improvements. For preliminary planning purposes, these depths are estimated to be on the order of 5 to 7 feet across the majority of the site. Variations from these thicknesses should be anticipated. A minimum of 3 feet of 90 percent compaction fill should underlie the proposed foundation. The foundation area shall be defined as the area extending from the edge of the mat for a distance of 5 feet. Actual depths of removals will be evaluated in the field during grading by GSI.

2. After the above removals, the upper 6 inches of the exposed subsoils should be scarified, brought to at least optimum moisture content, and recompacted to a minimum relative compaction of 90 percent of the laboratory standard

3. The existing onsite soils may be reused as compacted fill provided that any significant concentrations of vegetation and miscellaneous trash and debris are removed prior to or during fill placement.

4. Localized deeper removal may be necessary due to buried drainage channel meanders or dry porous materials. The project geotechnical consultant or geologist should observe all removal areas during the grading.

Fill Placement

1. Fill materials should be cleansed of major vegetation and debris prior to placement.

2. Fill materials should be brought to at least optimum moisture, placed in thin 6- to 8-inch lifts and mechanically compacted to obtain a minimum relative compaction of 90 percent of the laboratory standard (ASTM D 1557).

3. Any import materials should be observed and evaluated suitable by GSI prior to placement on the site. Foundation designs may be altered if import materials have a greater sulfate or expansion values than the onsite materials encountered during our preliminary investigation.

Temporary Slopes

Temporary slopes may be constructed at a gradient of 1:1 (h:v) of flatter (Cal-OSHA Type "B" soil), up to 15 feet in height, provided no seepage, groundwater, or running sands are encountered, and no equipment or stockpiles are located within a distance of "H" from the top of the temporary slope, where "H" is the height of the slope. All temporary slopes should be observed by GSI prior to the entry of unprotected workers, as needed. Although not anticipated, should any adverse conditions be exposed, temporary slopes may need to be inclined to flatter gradients or receive shoring. Shored excavations would be recommended if property lines or existing improvements that need to remain in serviceable use do not allow for the temporary slope gradient recommended herein.

Slot-Cut Grading

Due to the necessity for completing removals immediately adjacent to existing foundations that will remain in place, remedial earthwork adjacent to the existing health care facility may need to use "alternating slot" excavation methodology, also referred to as the "A-B-C" slot-cutting method, so that the existing foundation system is not adversely undermined and exposed to an elevated potential for distress. On a preliminary basis, slot widths should not exceed 5 to 6 linear feet. Consultation with the structural engineer is recommended prior to implementing slot excavations near the existing structure, that are above a 1:1 (h:v) projection from the outboard limits of remedial grading excavations. The structural engineer should evaluate if the recommended width of the slots will adversely affect bearing support of the existing improvements. The width of the slots may need to be reduced based on the results of the structural engineer's evaluation. Pre-construction surveys and survey monitoring should be performed in conjunction with site grading and shoring (if used), as necessary. If considered necessary, recommendations for temporary shoring are provided below.

TEMPORARY SHORING RECOMMENDATIONS

If needed, based on the anticipated remedial grading, the following temporary shoring recommendations are provided.

Lateral Earth Pressures for Temporary Shoring Design

1. Pressure diagrams showing the recommended application of active and passive earth pressures, and uniform and live load surcharges on temporary shoring systems are illustrated in Figure 9.

2. The active pressure to be used for temporary shoring design may be computed by the triangular pressure distribution shown in Figure 9.

3. Passive pressure for the design of temporary shoring may be computed as an equivalent fluid as shown in Figure 9.

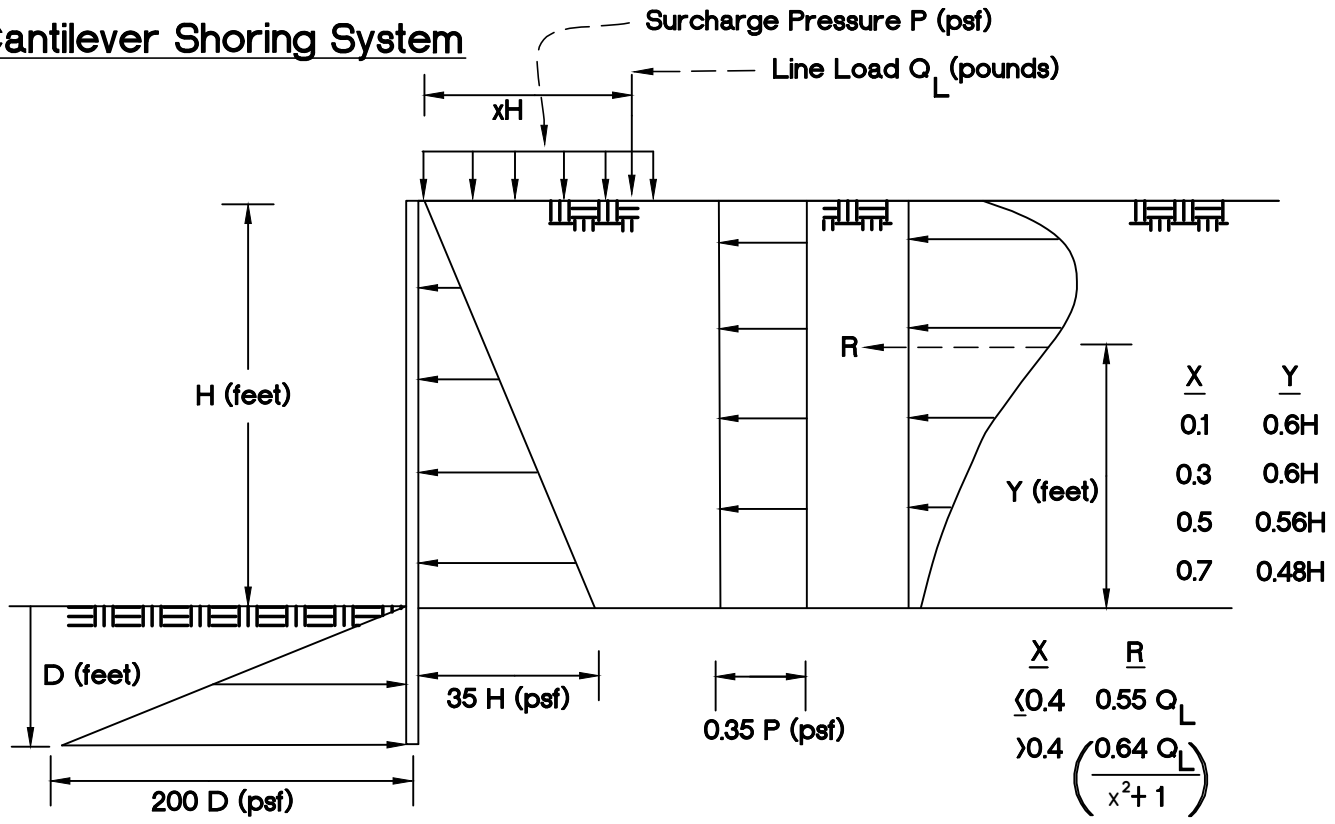
4. The above criteria assume the absence of soils with an E.I. > 20 behind the shoring and that hydrostatic pressure is not allowed to accumulate behind the shoring.

5. These recommendations are for a temporary shoring system with retained soil heights up to approximately 15 feet. Restraining elements, bracing, or the use of walers or rakers would likely be necessary for shoring of greater heights. The use of lateral resisting elements such as tiebacks or soil nails may be infeasible.

6. An empirical equivalent fluid pressure approach may be used to compute the horizontal pressure against the shoring. Appropriate fluid unit weights are provided for specific slope gradients of the retained material (see Figure 9). These do not include other superimposed loading imparted by traffic, structures, earthquakes, or adverse geologic conditions. Traffic surcharge for shoring should be modeled as a minimum 100 psf/ft load for light passenger vehicle traffic and at least 300 psf/ft for heavy (HS20) axle loads in the upper 5 feet of the shoring. These surcharges would apply if traffic will occur within "H" of the back of the shoring (where "H" equals the height of the retained earth). It is not recommended to allow sloping surcharge (other than level backfill) within a distance of "H" behind the shoring system from either stockpiled soils, stockpiled building materials, or temporary or permanent graded slopes, where "H" equals the height of the retained earth. Steeper slope gradients (more than level) will increase the equivalent fluid pressure for shoring design, significantly, and increase shoring costs. Regrading, if possible, is recommended prior to shoring installation to reduce the potential for sloping surcharge.

7. The shoring system should be designed such that the maximum lateral deformation at the top or bottom of the soldier pile does not exceed the value recommended by the shoring designer.

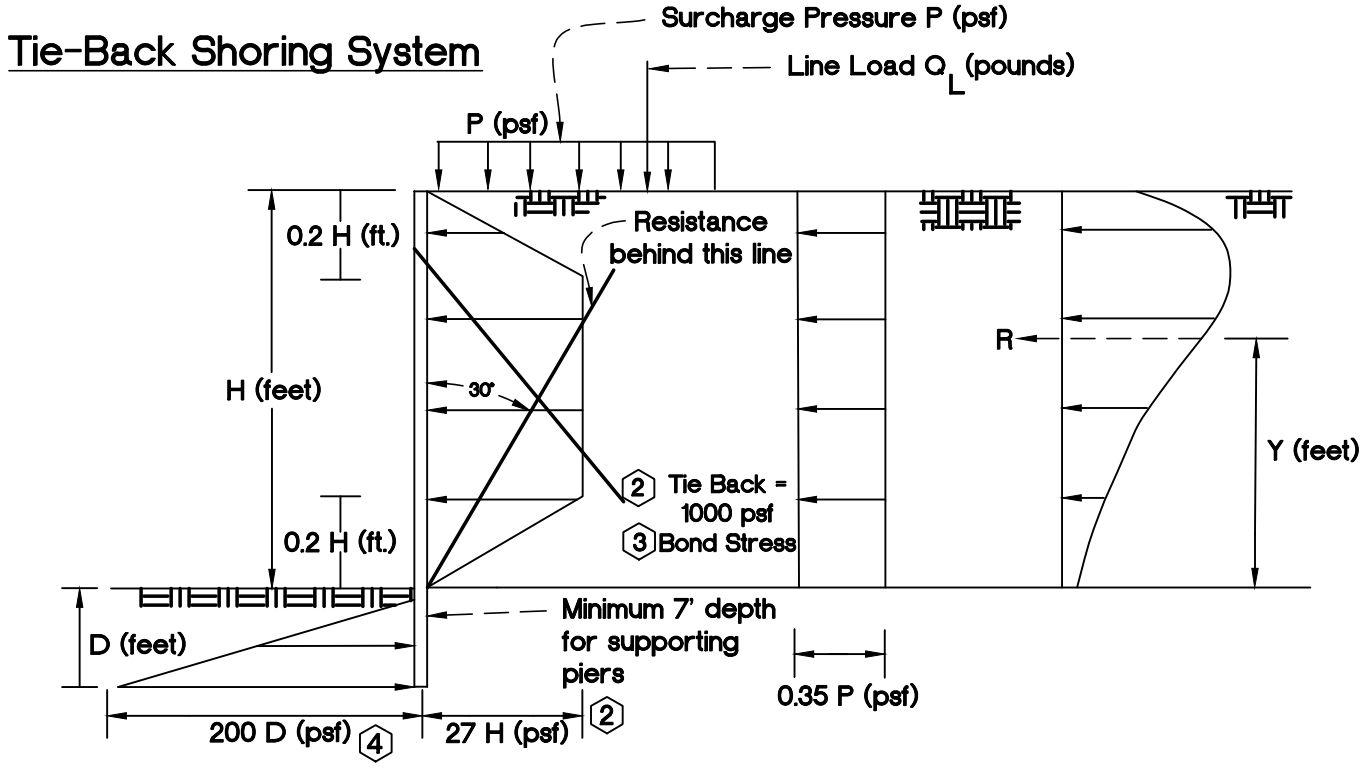
Cantilever Shoring System



X	Y
0.1	0.6H
0.3	0.6H
0.5	0.56H
0.7	0.48H

X	R
<0.4	$0.55\ Q_L$
>0.4	$\left(\frac{0.64\ Q_L}{x^2+1}\right)$

Tie-Back Shoring System



NOTES

1. Include groundwater effects below groundwater level.
2. Include water effects below groundwater level.
3. Grouted length greater than 7 feet; field test anchor strength.
4. Neglect passive pressure below base of excavation to a depth of one pier diameter.

GeoSoils, Inc.

Figure 9

LATERAL EARTH PRESSURES FOR TEMPORARY SHORING SYSTEMS

W.O. 9071-A-IE	DATE: 12/25	SCALE: None

8. The design of restraining elements, walers, bracing, and rakers should be provided by the project structural consultant or shoring designer, if necessary.

Shoring Construction Recommendations

1. The excavation and installation of the soldier piles should be observed and documented by the project geotechnical consultant to further evaluate the geologic conditions within the influence of the shoring and to ensure the soldier pile construction conforms to the requirements of the shoring plan.

2. Drilled excavations for soldier piles should be straight and plumb. The contractor should periodically recheck the drilled excavation for plumbness, especially when oversized rock constituents and debris are encountered.

3. Although not anticipated based on the available subsurface data, casing should be provided in drilled excavations if excessive groundwater or caving conditions are encountered. The bottom of the casing should be at least 4 feet below the top of the concrete as the concrete is placed and the casing is withdrawn. This should be considered during project planning. The exact tip elevation of the soldier piles should be clearly indicated on the shoring plans.

4. All concrete should be delivered through a tremie immediately after the approval of the drilled excavation and steel placement. Care should be taken to prevent striking the walls of the excavations with the tremie during concrete placement. Concrete should not be allowed to free fall more than 5 feet. “Tailgating” concrete is not recommended.

5. The height of exposed soils during vertical excavation should not exceed 4 feet. The entire excavation should receive lagging prior to the end of each workday. Alternatively, loose soil may be used as a temporary buttress located below a 1:1 (h:v) plane projected down and toward the excavation from the top of the unsupported soils. No excavation should be left unsupported overnight.

6. A complete and accurate record of all soldier pile locations, depths, concrete, strengths, quantity of concrete per pile, and other information should be maintained by the special inspector and geotechnical consultant. The shoring design engineer should be notified of any unusual conditions encountered during installation.

Excavation Observation and Monitoring

When excavations are made adjacent to an existing structure (e.g., building or underground utilities) there is a risk of some damage to that improvement, even if a well-designed system of excavation or shoring (if used), is planned and installed. Therefore, we recommend that a

systematic program of observations be made before, during, and after construction to evaluate the effects (if any) of construction on the existing structures.

Monitoring should include the measurement of any horizontal and vertical movements of both the existing structures and any shoring or bracing (if used). If shoring will be included in the proposed development, as determined by the designer, the locations and the type of the monitoring devices should be selected as soon as the total shoring system is designed and approved.

Reference points on the existing structures or improvements should be placed as low as possible on the exterior walls of buildings, adjacent to the excavation. Exact locations may be dictated by critical points within the structure, such as bearing walls or columns for buildings; and surface points on roadways and sidewalks near the top of the excavation. The points on a shoring system (if used) should be placed under or very near the points on the structures.

For a survey monitoring system, an accuracy of a least 0.01 foot should be required. Reference points should be installed and read initially prior to grading or excavation. The readings should continue until all construction below ground has been completed and the backfill has been brought up to final grade.

The frequency of readings will depend upon the results of previous readings and the rate of grading. Weekly readings could be assumed throughout the duration of grading with daily readings during rapid excavation near the bottom and at critical times during slot-cutting or installation of shoring for support. The reading should be plotted by the Surveyor and then reviewed by the Geotechnical Engineer and shoring designer (if used). Video or photographic documentation should be taken, where necessary.

Embankment Factors and Rippability

Embankment factors (shrinkage or bulking) for the site have been estimated based upon our experience with other sites in the general vicinity, and review of laboratory density testing of near-surface soils. It is apparent that shrinkage would vary with depth and with areal extent over the site, based on previous site use and the loose to medium dense nature of the existing topsoil and disturbed fill and native alluvial deposits. Variables include previous vegetation, weed control, discing, and previous filling or exporting. However, all these factors are difficult to define in a three-dimensional fashion, and the contractor's compaction efforts may also contribute some variance. Therefore, the information presented below represents average shrinkage and bulking values, using the following assumptions.

Undocumented Artificial Fill (Afu) ..... 10% to 15% shrinkage
Alluvium Deposits (Qoa) ..... 7% to 10% shrinkage

Rippability

All site soil is anticipated to be readily removed and re-graded with well-working earth moving equipment suitable for the scope of grading.

PRELIMINARY RECOMMENDATIONS - FOUNDATIONS

General

Preliminary recommendations for foundation design and construction are provided in the following sections. These preliminary recommendations have been developed from our understanding of the currently planned site development, site observations, subsurface exploration, laboratory testing, and engineering analyses. Foundation design should be re-evaluated at the conclusion of site grading or remedial earthwork for the as-graded soil conditions. Although not anticipated, revisions to these recommendations may be necessary. In the event that the information concerning the proposed development plan is not correct, or any changes in the design, location or loading conditions of the proposed buildings are made, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and conclusions of this report are modified or approved in writing by this office. We anticipate that the wall loads of 1 to 3 kips/foot, and column loads of 20 to 100 kips will be used. Based on the loads and subgrade conditions, we recommend the use of a structural mat foundation, or other stiffened foundation system designed to tolerate the onsite alluvial deposits and estimated settlement deformations. These assumptions should be revisited once the final plans and structural design are provided for GSI review.

The information and recommendations presented in this section are not meant to supersede design by the project structural engineer or civil engineer specializing in structural design. Upon request, GSI could provide additional input or consultation regarding soil parameters, as related to foundation design. From a geotechnical viewpoint, foundation design and construction should minimally conform to the following:

Structural Mat Foundations - Proposed Health Care Building

A structural mat-type foundation may be considered for the proposed healthcare building, considering the anticipated seismic settlement potential, and the underlying soil conditions.

For a mat foundation uniformly bearing on properly compacted engineered fill, a maximum allowable net bearing capacity of 2,000 psf and a minimum depth of 18 inches below the lowest adjacent grade may be used in the design. These values may be increased by one-third for short-term loads including wind or seismic. Mat-type slab foundations should be designed in accordance with 2022 CBC (CBSC, 2022) criteria for the soil conditions prevalent

onsite. Mat-type foundation may be either ribbed or uniform thickness (UTF) with a perimeter beam.

The passive earth pressure may be computed as an equivalent fluid having a density of 150 pcf, with a maximum earth pressure of 2,000 psf. The upper 6 inches of passive pressure should be neglected if not confined by slabs or pavement. For lateral sliding resistance, a 0.25 coefficient of friction may be utilized for concrete in contact with approved structural fill derived from the onsite soils, when multiplied by the dead load. When combining passive pressure and frictional resistance, the passive pressure component should be reduced by one-third.

A vertical modulus of subgrade reaction (K_s) of 100 pounds per cubic inch (pci) may be used in the design of mat foundations bearing on approved structural fill soils that are very low expansive. The modulus of subgrade reaction is a unit value for a 1-foot square footing and should be scaled in accordance with the following equation when used with the design of larger foundations. This assumes that the foundation and slab is underlain with properly compacted structural fill with an average relative compaction of 90 percent of the laboratory standard (per ASTM D 1557).

$$K_R = K_S \left[\frac{B+1}{2B} \right]^2$$

where: K_S = unit subgrade modulus
K_R = scaled subgrade modulus
B = foundation width (in feet)

Mat slabs may be uniform thickness foundations (UTF) or may incorporate the use of edge footings for moisture cut-off barriers. The recommendations for a mat type of foundation assume that the soils below the slab are compacted fill.

PRELIMINARY SETTLEMENT EVALUATION

GSI has estimated the potential magnitudes of seismic total settlement, differential settlement, and angular distortion for the project. The analyses were based on laboratory test results and subsurface data collected from borings and CPT completed in preparation of this study. Site specific conditions affecting the magnitude of settlement include earth material types, depth of remedial grading (e.g., thickness of planned fills), left-in-place compressible earth materials, moisture content, and density.

Static Settlement

The maximum expected static settlement is on the order of 1 inch with differential settlement on the order of ½ inch in a 30-foot span (e.g., angular distortion of approximately 1/720).

Assuming that remedial earthwork is completed in accordance with the recommendations provided herein, the majority of the foundation settlement on the underlying soils should occur at the end of construction.

Seismic Settlement

We calculated a total seismic settlement of 3 inch and a differential settlement of 0.003L. The seismic settlements have been discussed in the Liquefaction section of this report.

SOIL MOISTURE CONSIDERATIONS

GSI has evaluated the potential for vapor or water transmission through the concrete floor slabs, in light of typical floor coverings and improvements. Please note that slab moisture emission rates range from about 2 to 27 lbs/24 hours/1,000 square feet from a typical slab (Kanare, 2005), while floor covering manufacturers generally recommend about 3 lbs/24 hours as an upper limit. The recommendations in this section are not intended to preclude the transmission of water or vapor through the foundation or slabs.

Foundation systems and slabs shall not allow water or water vapor to enter into the structures so as to cause damage to another building component or to limit the installation of the type of flooring materials typically used for the particular application (State of California, 2025). These recommendations may be exceeded or supplemented by a "water proofing" specialist, the architect, or structural consultant. Thus, the Client or architect will need to evaluate the following in light of a cost vs. benefit analysis, along with disclosure to all interested or affected parties. It should also be noted that vapor transmission will occur in new slab-on-grade floors as a result of chemical reactions taking place within the curing concrete. Vapor transmission through concrete floor slabs as a result of concrete curing has the potential to adversely affect sensitive floor coverings depending on the thickness of the concrete floor slab, and the floor covering. It is possible that a slab moisture sealant may be needed prior to the placement of sensitive floor coverings if a thick mat slab is used and the time frame between concrete and floor covering placement is relatively short.

Considering the E.I. test results, anticipated typical water vapor transmission rates, and floor coverings and improvements (to be chosen by the client or architect) that can tolerate those rates without distress, the following alternatives are provided:

1. Concrete slab should be thicker.

2. Concrete slab underlayment should consist of a 15-mil vapor retarder, or equivalent, with all laps sealed per the 2022 CBC (CBSC, 2022) and the manufacturer's recommendation. The vapor retarder should comply with the ASTM E 1745 - Class A criteria, and be installed in accordance with ACI 302.1R-04, and ASTM D 1643.

3. The 15-mil vapor retarder (ASTM E 1745 - Class A) shall be installed per the recommendations of the manufacturer, including all penetrations (e.g., pipe, ducting, or rebar).

4. The vapor retarder should be underlain with 2 inches of sand (SE>30), and should be overlain by a 2-inch thick layer of sand (SE>30).

5. Concrete should have a maximum water/cement ratio of 0.50. This shall not supersede ACI 318-14 guidelines for corrosion or other corrosive requirements. Additional concrete mix design recommendations should be provided by the project structural consultant or waterproofing specialist. Concrete finishing and workability should be addressed by the project structural consultant and a waterproofing specialist.

6. Where floor slab water to cement ratios are as indicated above, or admixtures used, the Project Structural Consultant should also make changes to the concrete in the grade beams and footings in kind, so that the concrete used in the foundation and slabs are designed or treated for more uniform moisture protection.

7. The owner should be specifically advised which areas are suitable for tile flooring, wood flooring, or other types of water-vapor sensitive flooring.

8. Additional recommendations regarding water or vapor transmission should be provided by the structural engineer or foundation designer and should be consistent with the specified floor coverings indicated by the architect.

Regardless of the mitigation, some limited moisture or moisture vapor transmission through the foundation and floor slab should be anticipated, and areas potentially using moisture sensitive floor coverings or moisture sensitive storage, should be identified. construction crews may require special training for installation of certain product(s), as well as concrete finishing techniques. The use of specialized product(s) should be approved by the slab designer and water-proofing consultant.

PRELIMINARY RETAINING WALL DESIGN PARAMETERS

General

Recommendations for the design and construction of conventional masonry retaining walls are provided herein, if needed. Recommendations for specialty walls (e.g., crib, earthstone, or geogrid) can be provided upon request, and would be based on site specific conditions. If walls allow water to accumulate in the backfill, the water should be conveyed via a non-erosive device to an appropriate inlet, per the recommendations of the design civil engineer.

Conventional Retaining Walls

The design parameters provided below assume native onsite materials with an expansion index up to an E.I. of 20 are used to backfill any retaining wall. The type of backfill, should be specified by the wall designer, and clearly shown on the plans. Building walls, below grade, should be water-proofed. Waterproofing should also be provided for site retaining walls in order to reduce the potential for efflorescence staining.

Preliminary Retaining Wall Foundation Design

The preliminary foundation design for conventional retaining walls should incorporate the following recommendations:

Minimum Footing Embedment - 18 inches below the lowest adjacent grade (excluding landscape layer [upper 6 inches]).

Minimum Footing Width - 24 inches.

Allowable Bearing Pressure - An allowable vertical bearing pressure of 2,000 pcf may be used in the preliminary design of retaining wall foundations provided that the footing maintains a minimum width of 24 inches and extends at least 18 inches into approved engineered fill overlying dense formational materials. This pressure may be increased by one-third for short-term wind and seismic loads.

Passive Earth Pressure - A passive earth pressure of 150 pcf with a maximum earth pressure of 2,250 psf may be used in the preliminary design of retaining wall foundations provided the foundation is embedded into properly compacted silty to clayey sand fill.

Lateral Sliding Resistance - A 0.25 coefficient of friction may be used for a concrete to soil contact when multiplied by the dead load. When combining passive pressure and frictional resistance, the passive pressure component should be reduced by one-third.

Backfill Soil Density - A soil density of 120 to 130 pcf may be used in the design of retaining wall foundations. This assumes an average engineered fill compaction of at least 90 percent of the laboratory standard (ASTM D 1557).

Footing Setbacks - All retaining wall footing setbacks from slopes should comply with Figure 1808.7.1 of the 2022 CBC. GSI recommends a minimum horizontal setback distance of 7 feet, as measured from the bottom, outboard edge of the footing to the face to the 2:1 (h:v) slope face.

Any retaining wall footings near the perimeter of the site, or not within areas of placed compacted fills will likely need to be deepened into unweathered dense formational materials for adequate vertical and lateral bearing support.

Restrained Walls

Any retaining wall that will be restrained prior to placing and compacting backfill material or retaining walls that have re-entrant or male corners, should be designed for an at-rest equivalent fluid pressure (EFP) of 57 pcf. The design should include any applicable surcharge loading. For areas of male or re-entrant corners, the restrained wall design should extend a minimum distance of twice the height of the wall (2H) laterally from the corner.

Cantilevered Walls

The recommendations presented below are for cantilevered retaining walls with retained soil heights up to 10 feet. Design parameters for retaining walls less than 3 feet in height may be superseded by the Riverside County regional standard design. Active earth pressure may be used for retaining wall design, provided the top of the wall is not restrained from minor deflections. An equivalent fluid pressure approach may be used to compute the horizontal pressure against the wall. Appropriate fluid unit weights are given below for specific slope gradients of the retained material. These do not include other superimposed loading conditions due to traffic, structures, seismic events, or adverse geologic conditions. When wall configurations are finalized, the appropriate loading conditions for superimposed loads can be provided upon request.

For preliminary planning purposes, the structural consultant or wall designer should incorporate the surcharge of traffic on the back of retaining walls, if traffic will occur within a horizontal distance of "H" from the backside of the retaining walls, where "H" equals the retained soil height. The traffic surcharge may be taken as 100 psf/ft in the upper 5 feet of the wall for light passenger vehicle traffic (e.g., cars, vans, or pick-up trucks). This does not include the surcharge of parked vehicles which should be evaluated at a higher surcharge to account for the effects of seismic loading. Equivalent fluid pressures for the design of cantilevered retaining walls are provided in the following table:

SURFACE SLOPE OF RETAINED MATERIAL (HORIZONTAL:VERTICAL)	EQUIVALENT FLUID WEIGHT P.C.F.
Level	37
2:1 (h:v)	54

Seismic Surcharge

The Mononobe-Okabe method is commonly utilized for calculating seismically induced active and passive lateral earth pressures and is based on the limit equilibrium Coulomb theory for static stress conditions. This method entails three fundamental assumptions (e.g., Seed and Whitman, 1970): Wall movement is sufficient to ensure either active or passive conditions, the driving soil wedge inducing the lateral earth pressures is formed by a planar failure surface starting at the heel of the wall and extending to the free surface of the backfill, and the driving

soil wedge and the retaining structure act as rigid bodies, and therefore, experiences uniform accelerations throughout the respective bodies (U.S. Army Corps of Engineers, 2003, Engineering and Design - Stability Analysis of Concrete Structures).

- Seismic Lateral Earth Pressure = 39 pcf (equivalent fluid weight).

The seismic lateral earth pressure given above is a triangle increasing with depth, and the resultant of this pressure is an increment of force which should be applied to the back of the wall at 1/3 of the wall height from the wall base. The seismic increment of earth pressure should be added to the static active earth pressure. Even for the at-rest (Ko) condition, the seismic increment of earth pressure should be added to the static active earth pressure, not to the at-rest static earth pressure (SEAOC Seismology Committee, 2019).

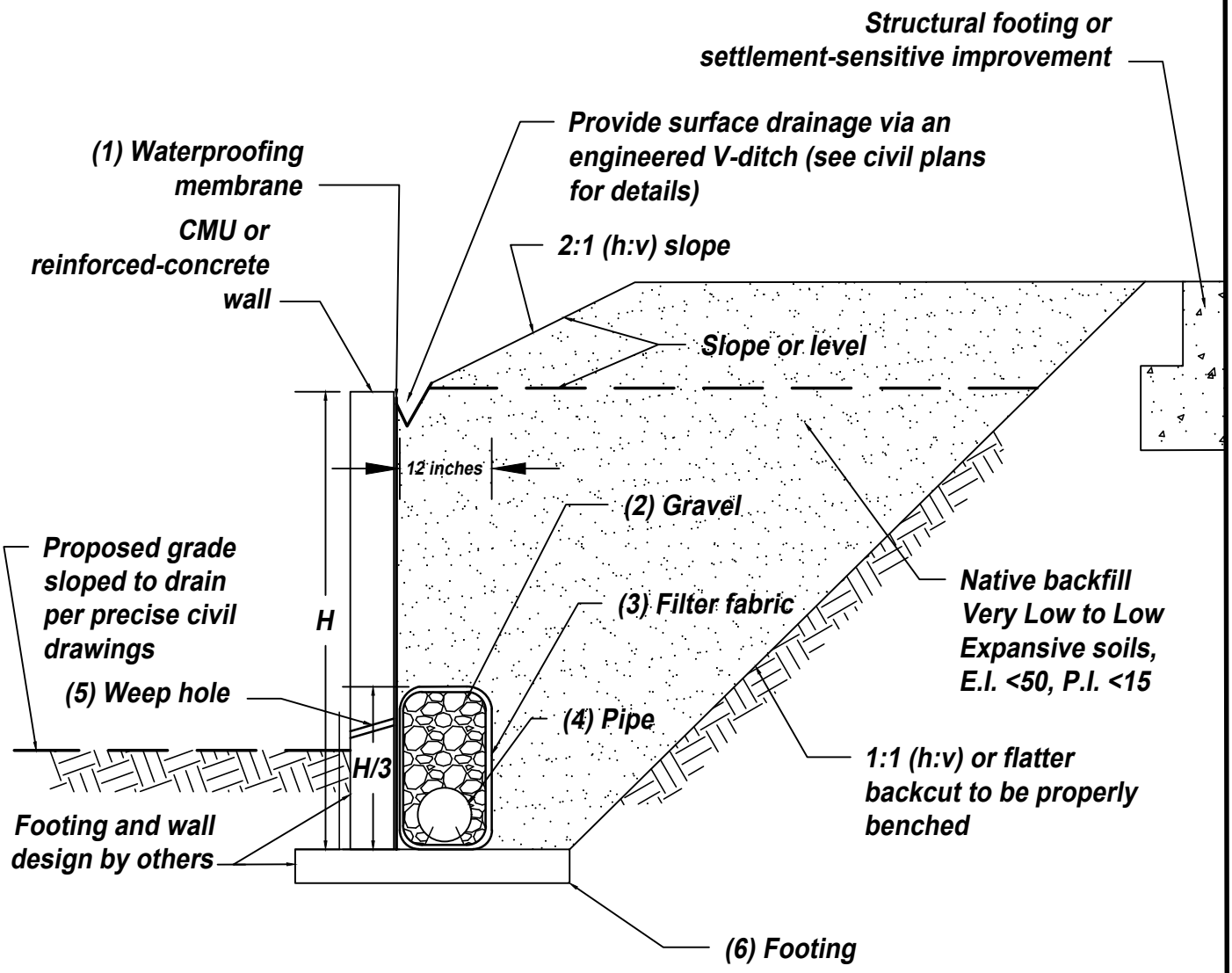
Per 2022 CBC Section 1803.5.12 dynamic seismic lateral earth pressures shall be applied to foundation walls and retaining walls supporting more than 6 feet of backfill. Dynamic seismic lateral earth pressures may also be applied to shorter walls at the discretion of the structural engineer.

Retaining Wall Backfill and Drainage

Positive drainage must be provided behind all retaining walls in the form of gravel wrapped in geofabric and outlets. A backdrain system is considered necessary for retaining walls that are 2 feet or greater in height. Details 1, 2, and 3, present the backdrainage options discussed below. Backdrains should consist of a 4-inch diameter perforated PVC or ABS pipe encased in either Class 2 permeable filter material or ¾-inch to 1½-inch gravel wrapped in approved filter fabric (Mirafi 140 or equivalent). The filter material should extend a minimum of 1 horizontal foot behind the base of the walls and upward at least 1 foot. For limited access and confined areas, (panel) drainage behind the wall may be constructed in accordance with Detail 2 (Retaining Wall Backfill and Subdrain Detail Geotextile Drain).

Materials with an expansion index (E.I.) potential of greater than 20 should not be used as backfill for retaining walls. Retaining wall backfill materials should be moisture conditioned and mixed to achieve the soil's optimum moisture content, placed in relatively thin lifts (6 to 8 inches) with relatively light equipment, and compacted to at least 90 percent relative compaction.

Outlets should consist of a 4-inch diameter solid PVC or ABS pipe spaced no greater than approximately 100 feet apart, with a minimum of two outlets, one on each end. The use of weep holes, only, in walls higher than 2 feet, is not recommended. The surface of the backfill should be sealed by pavement or the top 18 inches compacted with native soil (E.I. ≤ 20).



(1) Waterproofing membrane.

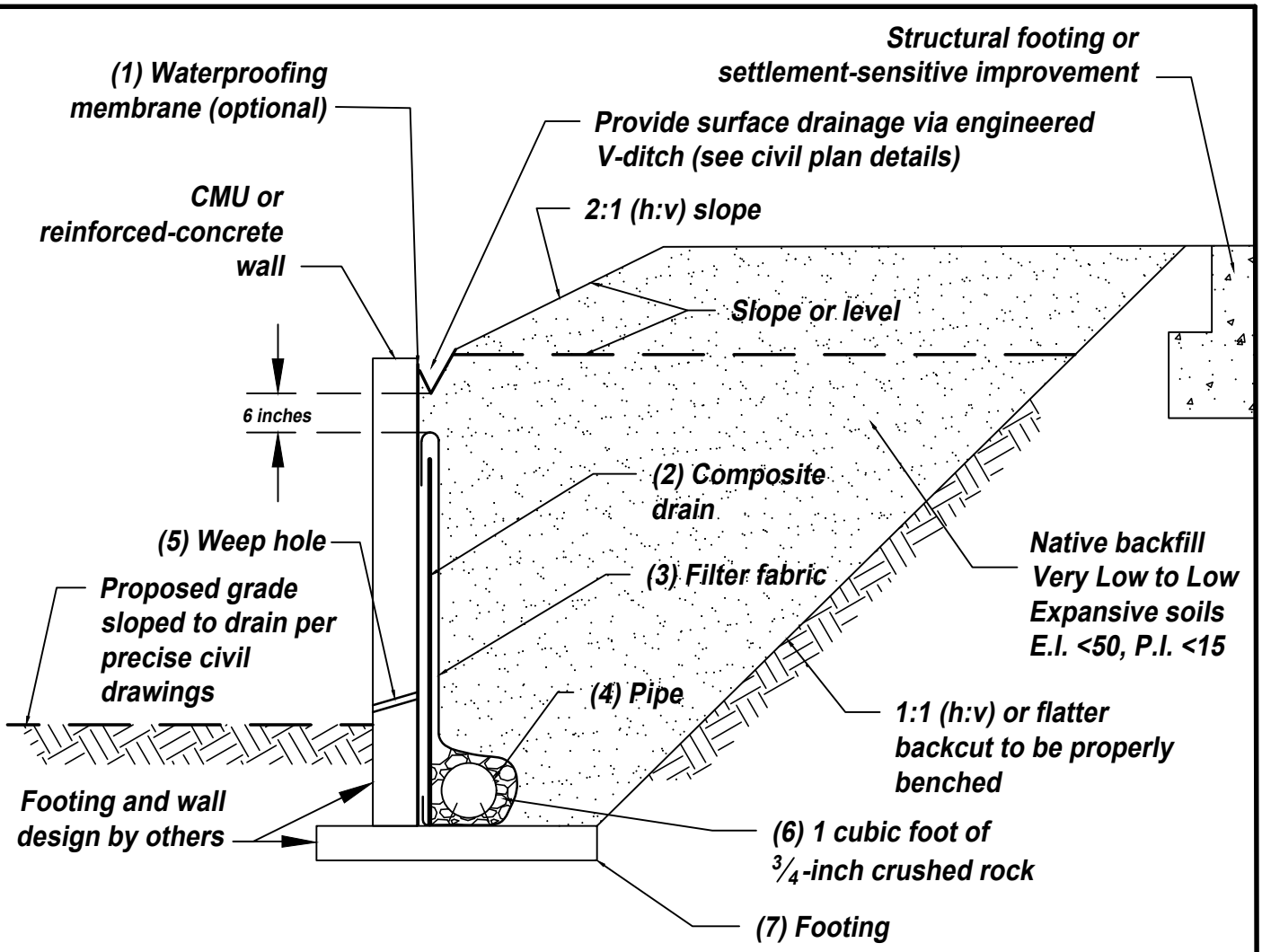
(2) Gravel: Clean, crushed, ¾ to 1½ inch.

(3) Filter fabric: Mirafi 140N or approved equivalent.

(4) Pipe: 4-inch-diameter perforated PVC, Schedule 40, or approved alternative with minimum of 1 percent gradient sloped to suitable, approved outlet point (perforations down).

(5) Weep holes: For CMU walls, Omit grout every other block, at or slightly above finished surface. For reinforced concrete walls, minimum 2-inch diameter weep holesspaced at 20 foot centers along the wall and placed 3 inches above finished surface. Design civil engineer to provide drainage at toe of wall. No weep holes for below-grade walls.

(6) Footing: If bench is created behind the footing greater than the footing width using level fill or cut natural earth materials, an additional "heel" drain will likely be required by geotechnical consultant.



(1) Waterproofing membrane (optional): Liquid boot or approved mastic equivalent.

(2) Drain: Miradrain 6000 or J-drain 200 or equivalent for non-waterproofed walls; Miradrain 6200 or J-drain 200 or equivalent for waterproofed walls (all perforations down).

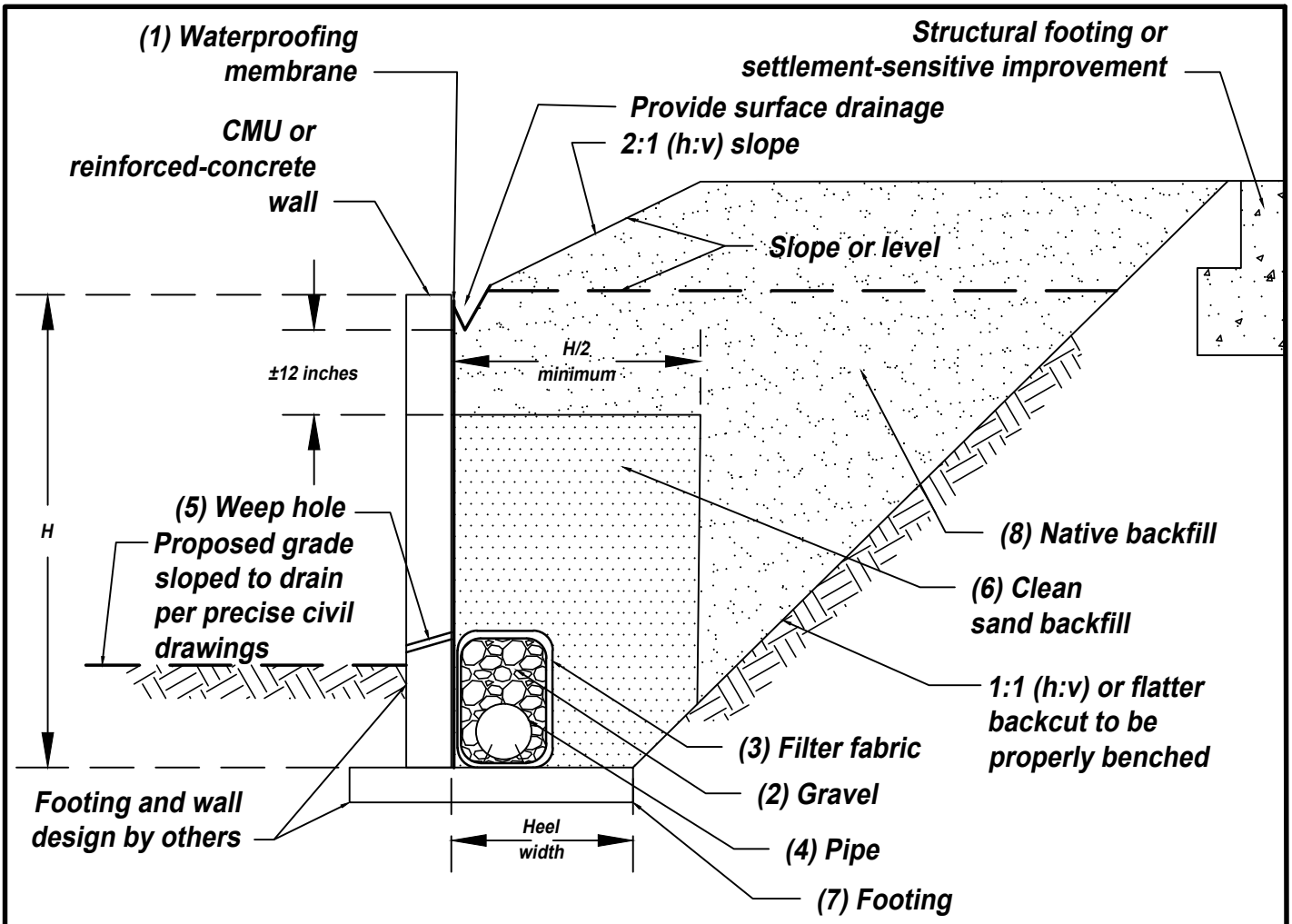
(3) Filter fabric: Mirafi 140N or approved equivalent; place fabric flap behind core.

(4) Pipe: 4-inch-diameter perforated PVC, Schedule 40, or approved alternative with minimum of 1 percent gradient to proper outlet point (perforations down).

(5) Weep holes: For CMU walls, Omit grout every other block, at or slightly above finished surface. For reinforced concrete walls, minimum 2-inch diameter weep holesspaced at 20 foot centers along the wall and placed 3 inches above finished surface. Design civil engineer to provide drainage at toe of wall. No weep holes for below-grade walls.

(6) Gravel: Clean, crushed, ¾ to 1½ inch.

(7) Footing: If bench is created behind the footing greater than the footing width using level fill or cut natural earth materials, an additional "heel" drain will likely be required by geotechnical consultant.



(1) Waterproofing membrane: Liquid boot or approved masticequivalent.

(2) Gravel: Clean, crushed, ¾ to 1½ inch.

(3) Filter fabric: Mirafi 140N or approved equivalent.

(4) Pipe: 4-inch-diameter perforated PVC, Schedule 40, or approved alternative with minimum of 1 percent gradient to proper outlet point (perforations down).

(5) Weep hole: For CMU walls, Omit grout every other block, at or slightly above finished surface. For reinforced concrete walls, minimum 2-inch diameter weep holesspaced at 20 foot centers along the wall and placed 3 inches above finished surface. Design civil engineer to provide drainage at toe of wall. No weep holes for below-grade walls.

(6) Clean sand backfill: Must have sand equivalent value (S.E.) of 35 or greater; can be densified by water jetting upon approval by geotechnical engineer.

(7) Footing: If bench is created behind the footing greater than the footing width using level fill or cut natural earth materials, an additional "heel" drain will likely be required by geotechnical consultant.

(8) Native backfill: If E.I. <21 and S.E. ≥35 then all sand requirements also may not be required and will be reviewed by the geotechnical consultant.

Proper surface drainage should also be provided. For additional mitigation, consideration should be given to applying a water-proof membrane to the back of all retaining structures. The use of a waterstop should be considered for all concrete and masonry joints.

Wall and Retaining Wall Footing Transitions

Site walls are anticipated to be founded on footings designed in accordance with the recommendations in this report. Should wall footings transition from cut to fill, the structural consultant or wall designer may specify either:

a) A minimum of a 2-foot overexcavation and recompaction of cut materials for a distance of 2H, from the point of transition, where "H" equals the wall height.

b) Increase the amount of reinforcing steel and wall detailing (e.g., expansion joints or crack control joints) such that an angular distortion of 1/360 for a distance of 2H on either side of the transition may be accommodated. Expansion joints should be placed no greater than 20 feet on-center, in accordance with the structural engineer's or wall designer's recommendations, regardless of whether or not a transition condition exists. Expansion joints should be sealed with a flexible, non-shrink grout.

c) Embed the footings entirely into suitable native formational material (e.g., deepened footings).

If transitions from cut to fill transect the wall footing alignment at an angle of less than 45 degrees (plan view), then the designer should follow recommendation "a" (above) and until such transition is between 45 and 90 degrees to the wall alignment.

STORM WATER INFILTRATION KSAT RATE EVALUATION AND DISCUSSION

U.S. Department of Agricultural (USDA) Review

A review of the United States Department of Agriculture database ([USDA]; 2025 and 1993) indicates that the surficial soils units mapped at the site consist of the Grangeville sandy loam, 0 to 5 percent slopes (GrB) and the Grangeville fine sandy loam, 0 to 5 percent slopes (GvB). The USDA (2025) indicates that the capacity of the most limiting layer to transmit water (Ksat) within the Grangeville sandy loam, is high (1.98 to 5.95 inches per hour [in/hr]) and falls into hydrologic soil groups (HSGs) "A/D." The USDA (2025) also indicates that capacity of most limiting layer to transmit water (Ksat) within the Grangeville fine sandy loam is moderately high to high (0.57 to 1.98 in/hr) and falls into hydrologic soil groups (HSGs) "B/D." Infiltration into HSG "D" soils are considered potentially feasible with some limitations. However, infiltration into HSG "A and B" soils is potentially feasible.

Infiltration Basin Siting Requirements

Our review of the general infiltration basin siting requirements and limitations (CASQA, 2003), indicates sites characterized as belonging to Hydrologic Soil Group "A," "B," and "C" may be suitable for infiltration, requiring a minimum soil infiltration rate of 0.5 inches/hour (CASQA, 2003). However, the County of Riverside water pollution prevention Water Quality Management Plan (WQMP, 2012), guidance document for the Santa Ana Region states: "the minimum long-term post-development infiltration rate must be at least 0.83 inches per hour."

The design engineer will need to review basin siting requirements by the WQMP (2012) and CASQA (2003) with respect to any proposed water quality BMP system. The recommendations proved herein are based on WQMP (2012), State criteria (CASQA, 2003), and our experience on nearby sites with similar geologic conditions. Based on our review of the USDA data and our subsurface explorations, similar conditions likely prevail throughout the site, including sandy fine-grained surficial soils.

Onsite Storm Water Quality Best Management Practice (BMP) Systems

Should onsite infiltration-systems be planned for Best Management Practices (BMP's) or Low Impact Development (LID) principles for the project, certain guidelines must be followed in the planning, design, and construction of such systems. Such systems, if improperly designed or implemented without consideration of the geotechnical aspects of site conditions, can contribute to flooding, saturation of bearing materials beneath site improvements, slope instability, and possible concentration and contribution of pollutants into the groundwater or storm drain or utility trench systems.

A key factor in these systems is the infiltration rate (often referred to as the percolation rate) which can be ascribed to, or determined for, the earth materials within which these systems are installed. Additionally, the infiltration rate of the designed system (which may include gravel, sand, mulch and topsoil, or other amendments) will need to be considered. Locally, relatively impermeable formations include: clayey surficial soils, igneous and metamorphic bedrock, as well as future fine grained fill soils.

Some of the methods which are used for onsite infiltration include percolation basins, dry wells, bio-swale or bio-retention, permeable pavers and pavement, infiltration trenches, filter boxes and subsurface infiltration galleries or chambers. Some of these systems are constructed using native and import soils, perforated piping, and filter fabrics while others employ structural components such as stormwater infiltration chambers and filters or separators. Every site will have characteristics which should lend themselves to one or more of these methods, but not every site is suitable for BMPs. In practice, BMPs are usually initially designed by the project design civil engineer. Applicable governing agency requirements should be reviewed and included in design considerations.

The following geotechnical guidelines should be considered when designing onsite BMP systems:

- It is not good engineering practice to allow water to saturate soils, especially near slopes or improvements; however, the controlling agency may now require the use of stormwater BMPs.

- Areas adjacent to, or within, the BMP that are subject to inundation should be properly protected against scouring, undermining, and erosion, in accordance with the recommendations of the design engineer.

- Where infiltration BMP systems are located near buildings or improvements, impermeable liners and subdrains should be used along the bottom or sides of bioretention swales or basins located within the influence of structures. Impermeable liners used in conjunction with BMP basins should consist of a 30-mil polyvinyl chloride (PVC) membrane that is covered by a minimum of 12 inches of clean soil, free from rocks and debris, with a maximum 4:1 (h:v) slope inclination, or flatter, and meets the following minimum specifications:

  Solid Soils Specific Gravity (ASTM D792): 1.2 (g/cc, min.); Tensile (ASTM D 882): 73 (lb/in-width, min); Elongation at Break (ASTM D882): 380 (%, min); Modulus (ASTM D882): 32 (lb/in-width, min.); and Tear Strength (ASTM D1004): 8 (lb/in, min); Seam Shear Strength (ASTM D882) 58.4 (lb/in, min); Seam Peel Strength (ASTM D882) 15 (lb/in, min).

- Subdrains should consist of at least 4-inch diameter Schedule 40 or SDR 35 drain pipe with perforations oriented down. The drain pipe should be sleeved with a filter sock.

- Storm drain, standpipes, and utilities that cross BMPs should be slurried with a 3-sack slurry mix, to 5 feet outside the structure.

- Infiltrations systems should not be installed within approximately 8 feet of building foundations utility trenches, and walls, or a 1:1 (horizontal to vertical [h:v]) slope (down and away) from the bottom elements of these improvements. Alternatively, deepened foundations may be used.
- Infiltration systems should not be installed adjacent to pavement or hardscape improvements. Alternatively, deepened or thickened edges and curbs or impermeable liners may be used in areas adjoining the BMP.

- As with any infiltration BMP, localized ponding and groundwater seepage should be anticipated. The potential for seepage or perched groundwater to occur after site development should be disclosed to all interested or affected parties.

- Installation of infiltration BMP systems should avoid expansive soils (Expansion Index [E.I.] ≥51) or soils with a relatively high plasticity index (P.I. > 20).

- Infiltration BMP systems should not be installed where the vertical separation of the groundwater level is less than approximately 10 feet from the base of the system.

- Infiltration BMP systems should be designed using a suitable factor of safety (FOS) to account for uncertainties in the known infiltration rates (as generally required by the controlling authorities), and reduction in performance over time.

- As with any infiltration system, proper care will need to provided. Best management practices should be followed at all times, especially during inclement weather. Provisions for the management of any siltation, debris within the BMP, or overgrown vegetation (including root systems) should be considered. An appropriate inspection schedule will need to adopted and provided to all interested or affected parties.

- Any designed system will require regular and periodic maintenance, which may include rehabilitation or complete replacement of the filter media (e.g., sand, gravel, filter fabrics, topsoil, or mulch) or other components used in construction, so that the design life exceeds 15 years. Due to the potential for piping and adverse seepage conditions, a burrowing rodent control program should also be implemented onsite.

- Newly established vegetation or landscaping (including phreatophytes) may have root systems that will influence the performance of the BMP or nearby LID systems.

- The potential for surface flooding, in the case of system blockage, should be evaluated by the design civil engineer.

- Any proposed utility backfill materials (e.g., inlet or outlet piping or other subsurface utilities) located within or near the proposed area of the BMP may become saturated. This is due to the potential for piping, water migration, and seepage along the utility trench line backfill. If utility trenches cross or are proposed near the BMP, cut-off walls or other water barriers will need to be installed to mitigate the potential for piping and excess water entering the utility backfill materials. Planned or existing utilities may also be subject to piping of fines into open-graded gravel backfill layers unless separated from overlying or adjoining BMP by geotextiles or slurry backfill.

PRELIMINARY PAVEMENT DESIGN RECOMMENDATIONS

General

The governing agency may retain the authority to approve the final structural design sections after subgrade elevations and actual resistance values (R-values) have been obtained at the conclusion of earthwork. Based on a general review of pavement designs for other nearby projects, and for estimation and bidding purposes, the pavement sections provided herein should be considered for preliminary design. Typically, actual pavement sections will likely vary, therefore final pavement sections should be based on actual R-value testing performed during, or shortly after, the access driveway and parking area grading, and for any proposed exterior street and improvements.

Asphaltic Concrete (AC) Pavements

The preliminary design for Asphaltic Concrete (AC) was evaluated based on an R-value of R=31, and the use of concrete shoulders (curb or gutter) at the edge of pavement. The preliminary pavement sections presented are also based on the traffic indices likely for the project (to be assigned by the project civil engineer), County of Riverside roadway design requirements (Standard Plan No. 114), and the guidelines presented in the latest revision to the California Department of Transportation "Highway Design Manual," seventh edition. Based on an R-value of 31, the following preliminary pavement design sections are presented.

STREET CLASSIFICATION	TRAFFIC INDEX (T.I.)[1]	STANDARD PAVEMENT DESIGNS		
		R-VALUE	AC INCHES	CLASS 2 BASE ROCK[2] INCHES
Access Road or Local Street	5.5	31	3.0**	7.0
Enhanced Local Street	6.5	31	3.6**	8.5
Collector (Road)	7.0	31	4.0**	9.0

[1] T.I.s are taken from the County of Riverside Department of Transportation, Standard Plan No. 114, "Roadway Design Requirements" (2022).
[2] Assumed R-values for base rock R=78 - Greenbook or Cal-Trans standard Class 2 base rock.
** County of Riverside minimum Class 2 base or asphaltic concrete

The preliminary pavement sections provided above are intended as a minimum guideline. If thinner or highly variable pavement sections are constructed, increased maintenance and repair could be expected. Consideration should be given to the increased potential for distress from overuse of paved street areas by heavy equipment and construction related heavy traffic (e.g., concrete trucks or loaded supply trucks), particularly when the final section is not in place (e.g., topcoat). Best management construction practices should be followed at all times, especially during inclement weather.

Portland Concrete Cement (PCC) Pavement

The preliminary design for Portland Cement Concrete Pavement (PCCP) was evaluated using a subgrade R-value of 31. The preliminary PCCP sections are provided in the following table.

PORTLAND CONCRETE CEMENT PAVEMENTS (PCCP)*					
TRAFFIC AREAS	CONCRETE TYPE	PCP THICKNESS (INCHES)	TRAFFIC AREAS	CONCRETE TYPE	PCCP THICKNESS (INCHES)
Light Vehicles	520-C-2500	6.0	Dumpster Aprons (Trash Service)	520-C-2500	7.0
	560-C-3250	5.0		560-C-3250	6.0
NOTE: All PCCP is designed as un-reinforced and bearing directly on compacted subgrade. However, a 4-inch thick leveling course of compacted aggregate base, or crushed rock may be considered to improve performance. All PCCP should be properly detailed (jointing) per the industry standard. Pavements may be additionally reinforced with #4 reinforcing bars, placed 18 inches on center, each way, for improved performance. * To be re-evaluated based on exposed field conditions and R-values obtained following rough grading.					

The transition of the pavement from parking to traffic lanes should be made over a distance of 24 inches, with crack control joints (weaken plane) or contact joints at the end of the transition. A minimum 4-inch layer of base rock, in traffic and dumpster areas, should be considered to improve traffic lane performance. Base rock may consist of either ¾-inch crushed rock or Caltrans Class 2 aggregate base. Crushed rock may be compacted by vibratory methods. Aggregate base should be compacted to a minimum relative compaction of 95 percent.

Weakened Plane Joints

Transverse and longitudinal weakened plane joints may be constructed in accordance with County standards. Transverse weakened plane joints should be spaced no farther than 15 feet apart, and no closer than 5 feet. Longitudinal weakened plane joints should be spaced no farther than 20 feet apart, and no less than 5 feet.

Expansion Joints and Contact Joints

Transverse expansion joints should be constructed at 120-foot spacings, or in accordance with County standards. Transverse and longitudinal contact joints should be constructed in accordance with the recommendations of the design engineer. Within large slab areas, joint spacings should be no greater than 20 feet.

Slab Reinforcement

The preliminary PCC Pavements for this project are designed as unreinforced and should perform adequately, assuming proper construction. If additional control of internal slab stresses (e.g., curing shrinkage, thermal expansion and contraction), then the use of No. 4 reinforcing bars, 18 inches on center each way, should be considered.

The upper 12 inches of subgrade should be compacted to a minimum relative compaction of 95 percent of the minimum dry density (ASTM D 1557). Aggregate base compaction should be 95 percent of the maximum dry density (ASTM D 1557). If adverse conditions (e.g., wet or saturated ground) are encountered during preparation of subgrade, special construction methods may need to be employed. R-value testing and pavement design analysis should be performed upon completion of grading for the project.

PAVEMENT GRADING RECOMMENDATIONS

General

All section changes should be properly transitioned. If adverse conditions are encountered during the preparation of subgrade materials, special construction methods may need to be employed. A GSI representative should be present for the preparation of subgrade, base rock, and asphalt concrete.

Subgrade

Within access lanes and parking areas, all surficial deposits of loose soil material should be removed and recompacted as recommended. After the loose soils are removed, the bottom is to be scarified to a depth of at least 6 inches, moisture conditioned as necessary and compacted to 95 percent of the maximum laboratory density or the Riverside County minimum, as determined by test designation ASTM D 1557.

Deleterious material, excessively wet or dry pockets, concentrated zones of oversized rock fragments, and any other unsuitable materials encountered during grading should be removed. The compacted fill material should then be brought to the elevation of the proposed subgrade for the pavement. The subgrade should be proof-rolled in order to promote a uniform firm and unyielding surface. All grading and fill placement should be observed by GSI.

Crushed Aggregate Base Rock

Compaction tests are required for the recommended base section. Minimum relative compaction required will be 95 percent of the laboratory maximum density as determined by ASTM test method D 1557 or Caltrans Test Method Number California 216.

Paving

Prime coat may be omitted if all of the following conditions are met:

1. The asphalt pavement layer is placed within two weeks of completion of base and subbase course.

2. Traffic is not routed over completed base before paving.

3. Construction is completed during the dry season of May through October.

4. The base is kept free of debris prior to placement of asphaltic concrete.

If construction is performed during the wet season of November through April, prime coat may be omitted if no rain occurs between completion of base course and paving and the time between completion of base and paving is reduced to three days, provided the base is free of loose soil or debris. Where prime coat has been omitted and rain occurs, traffic is routed over base course, or paving is delayed, measures shall be taken to restore base course, and subgrade to conditions that will meet specifications as directed by the geotechnical consultant.

Drainage

Positive drainage should be provided for all surface water to drain towards the area swale, curb and gutter, or to an approved drainage channel. Positive site drainage should be maintained at all times. Water should not be allowed to pond or seep into the ground, such as from behind unprotected curbs, both during and after grading. If planters or landscaping are adjacent to paved areas, measures should be taken to minimize the potential for water to enter the pavement section, such as thickened edges, or enclosed planters. Also, best management construction practices should be strictly adhered to at all times to minimize the potential for distress during construction and roadway improvements.

Additional Considerations

To mitigate perched groundwater, consideration should be given to installation of subgrade separators (cut-offs) between pavement subgrade and landscape areas, although this is not a requirement from a geotechnical standpoint. Cut-offs, if used, should be 6 inches wide and at least 12 inches below the pavement subgrade contact or 12 inches below the crushed aggregate base rock, if used.

DRIVEWAY, CONCRETE APRONS, FLATWORK, AND OTHER IMPROVEMENTS

General

The soil materials on site are anticipated to be very low expansive. A GSI representative should be present for the preparation of driveway, aprons, and flatwork subgrade materials. The following recommendations are presented for all exterior flatwork:

1. The subgrade area for concrete slabs should be compacted to achieve a minimum 90 percent relative compaction, and then be presoaked to optimum moisture content, or greater. The moisture content of the subgrade should be proof tested within 72 hours prior to concrete placement.

2. Exterior concrete slabs should be cast over a non-yielding surface, consisting of a 4-inch layer of Class 2 base, crushed rock, gravel, or clean sand (or County minimum, whichever is greater), that should be compacted and level prior to placement of concrete. If very low expansive soils are present, the base, rock, gravel, or sand may be deleted. The layer or subgrade should be wet-down completely prior to placement of concrete, to minimize loss of concrete moisture to the surrounding earth materials.

3. Exterior pedestrian slabs should be a minimum of 4 inches thick. Driveway slabs and approaches should be a minimum of 5 inches thick additionally have a thickened edge (12 inches) adjacent to all landscape areas, to help impede infiltration of landscape water under the slab. Trash disposal (dumpster) area aprons should be a minimum of 6 inches thick and meet minimum County standards, as necessary.

4. The use of transverse and longitudinal control joints is recommended to help control slab cracking due to concrete shrinkage or expansion. Two ways to mitigate such cracking are: a) add a sufficient amount of reinforcing steel, increasing tensile strength of the slab; and, b) provide an adequate amount of control and expansion joints to accommodate anticipated concrete shrinkage and expansion. The exterior slabs should be scored or saw cut, ½ to ⅜ inches deep, often enough so that no section is greater than 10 feet by 10 feet. For sidewalks or narrow slabs, control joints should be provided at intervals of every 6 feet. The slabs should be separated from the foundations and sidewalks with expansion joint filler material.

5. No traffic should be allowed upon the newly placed concrete slabs until they have been properly cured to within 75 percent of design strength. Concrete compression strength should be a minimum of 2,500 psi.

6. Driveways, sidewalks, and patio slabs adjacent to the structure should be separated from the structure with thick expansion joint filler material. In areas directly adjacent to a continuous source of moisture (e.g., irrigation or planters), all joints should be additionally sealed with flexible mastic.

7. Planters and walls (sound walls or retaining walls) should not be tied to the structure.

8. Overhang structures should be supported on the slabs, or structurally designed with continuous footings tied in at least two directions.

9. Any masonry landscape or sound walls that are to be constructed throughout the property should be grouted and articulated in segments no more than 20 feet long. These segments should be keyed or doweled together.

10. If settlement concerns or expansive soils are present, utilities may be enclosed within a closed utilidor (vault) or designed with flexible connections to accommodate differential settlement or expansive soil conditions (if present).

11. Positive site drainage should be maintained at all times. Finish grade on the building pad should provide a minimum of 1 to 2 percent fall to the street, as indicated herein. Drainage reversals could occur, including post-construction settlement, if relatively flat drainage gradients are not periodically maintained by the owner and interested or affected parties.

12. Air conditioning (A/C) units should be supported by slabs that are incorporated into the building foundation or constructed on a rigid slab with flexible couplings for plumbing and electrical lines. A/C waste water lines should be drained to a suitable non-erosive outlet.

13. Shrinkage cracks could become excessive if proper finishing and curing practices are not followed. Finishing and curing practices should be performed per the California Nevada Cement Association (CNCA) guidelines. Mix design should incorporate rate of curing for climate and time of year, sulfate content of soils, corrosion potential of soils, and fertilizers used on site.

DEVELOPMENT CRITERIA

Drainage

Adequate surface drainage is a very important factor in reducing the likelihood of adverse performance of improvements and slopes. Surface drainage should be sufficient to mitigate ponding of water anywhere in the project area, and especially near pavements, and the tops of descending slopes. Surface drainage should be carefully taken into consideration during fine grading, landscaping, and building construction. Future landscaping or construction activities should not create adverse drainage conditions. Positive site drainage within the project area should be provided and maintained at all times. Drainage should not flow uncontrolled down any descending slope. Water should be directed away from foundations, pavements, and tops

of slopes, and not allowed to pond or seep into the ground. In general, the area within 5 feet around the proposed building should slope away from the structure and conform to Section 1804.4 of the 2022 CBC. Whenever possible, surface drainage should be above adjacent paved areas. Consideration should be given to avoiding construction of planters adjacent to structures. Building pad drainage should be directed toward approved drainage facilities. Down spouts, or drainage devices should outlet a minimum of 5 feet from the structure or into a subsurface drainage system. Areas of seepage may develop due to irrigation or heavy rainfall, and should be anticipated. Minimizing irrigation will lessen this potential. If areas of seepage develop, recommendations for reducing this effect could be provided upon request.

Erosion Control

Graded pads and any slopes will be subject to surficial erosion during and after grading. Onsite earth materials have a moderate to high erosion potential. Consideration should be given to providing hay bales and silt fences for the temporary control of surface water, from a geotechnical viewpoint.

Landscape Maintenance

Over-watering the landscape areas will adversely affect the proposed site improvements. We recommend that any proposed open-bottom planters adjacent to structures be eliminated for a minimum distance of 10 feet. As an alternative, closed-bottom type planters could be used. An outlet placed in the bottom of the planter could be installed to direct drainage away from the structure or any exterior concrete flatwork. If planters are constructed adjacent to the structure, the sides and bottom of the planter should be provided with a moisture barrier to prevent infiltration of irrigation water into the subgrade. Provisions should be made to drain the excess irrigation water from the planters without saturating the subgrade below or adjacent to the planters. Consideration should be given to the type of vegetation chosen and their potential effect upon surface improvements (e.g., some trees will have an effect on concrete flatwork with their extensive root systems). From a geotechnical standpoint leaching is not recommended for establishing landscaping. If the surface soils are processed for the purpose of adding amendments, they should be recompacted to at least 90 percent relative density.

Site Improvements

If any additional improvements (e.g., buildings, building additions, walls, pavements, swimming pool, or spa) are planned for the site, recommendations concerning the geological or geotechnical aspects of design and construction of said improvements could be provided upon request. This office should be notified in advance of any fill placement, grading of the site, or trench backfilling after rough grading has been completed. This includes any grading, underground utility trench backfill, pavement or flatwork construction.

Tile Flooring

Tile flooring can crack, reflecting cracks in the concrete slab below the tile, although small cracks in a conventional slab may not be significant. Therefore, the designer should consider additional steel reinforcement for concrete slabs-on-grade where tile will be placed. The tile installer should consider installation methods that reduce possible cracking of the tile such as slipsheets. Slipsheets or a vinyl crack isolation membrane (approved by the Tile Council of America or Ceramic Tile Institute) are recommended between tile and concrete slabs-on-grade.

Additional Grading

This office should be notified in advance of any fill placement, supplemental regrading of the site, or trench backfilling after rough grading has been completed. This includes grading for vehicular and pedestrian pavements and underground utility trench backfill.

Footing Trench Excavations

All footing excavations should be observed by a representative of this firm subsequent to trenching and prior to concrete form and steel reinforcement placement. The purpose of the observations is to evaluate that the excavations have been made into the recommended bearing material and to the minimum widths and depths recommended for construction. If loose or compressible earth materials are exposed within the footing excavation, a deeper footing or the removal and recompaction of the subgrade materials would be recommended at that time.

Underground Utility Trench Backfill

1. All underground utility trench backfill, including under-slab utility trench backfill, should be uniformly moisture conditioned to at least optimum moisture content and then be compacted to obtain a minimum relative density of 90 percent of the laboratory standard (per ASTM D 1557). Observation, selective probing, and field density testing should be provided to evaluate the desired results.

2. Exterior trenches adjacent to, and within areas extending below a 1:1 (h:v) plane projected down and away from the outside, bottom edges of the footings, and all trenches beneath hardscape features and in slopes, should be compacted to a relative density of at least 90 percent of the laboratory standard (per ASTM D 1557). Sand backfill, unless excavated from the trench, should not be used in these backfill areas. Compaction testing and observations, along with selective probing, should be accomplished to evaluate the desired results.

3. All trench excavations should conform to CAL/OSHA, state, federal, and local safety codes.

4. Underground utilities crossing grade beams, perimeter beams, or footings should either pass below the footing or grade beam using a hardened collar or foam spacer, or pass through the footing or grade beam in accordance with the recommendations of the structural engineer.

SUMMARY OF RECOMMENDATIONS REGARDING GEOTECHNICAL OBSERVATION AND TESTING

We recommend that observation and testing be performed by GSI at each of the following construction stages:

- During grading or pad recertification.
- During excavation greater than 4 feet.
- After excavation of the building foundation, retaining wall footings, and any free-standing wall footings, prior to the placement of reinforcing steel or concrete.
- Prior to placement of any concrete slabs-on-grade or flatwork, after presoaking of building pad and other flatwork subgrade, before the placement of concrete, reinforcing steel, capillary break (e.g., sand, pea-gravel, or gravel), or vapor retarders.
- During placement of backfill for area drain, interior (under-slab) plumbing, and underground utility trenches.
- During retaining wall subdrain construction and backfill.
- During vehicular and pedestrian pavement construction.
- When any unusual soil conditions are encountered during any construction operations, subsequent to the issuance of this report.
- When any owner improvements, such as flatwork, walls, pavements, or retaining walls are constructed, prior to construction.
- A report of geotechnical observation and testing should be provided at the conclusion of each of the above stages, in order to provide concise and clear documentation of site work, and to comply with code requirements.

OTHER DESIGN PROFESSIONALS AND CONSULTANTS

The design civil engineer, structural engineer, post-tension designer, architect, landscape architect, or wall designer should review the recommendations provided herein, incorporate those recommendations into all their respective plans, and by explicit reference, make this report part of their project plans. This report presents minimum design criteria for the design of slabs, foundations and other elements possibly applicable to the project. These criteria should not be considered as substitutes for actual designs by the structural engineer or designer. The recommendations contained herein are not intended to preclude the transmission of water or vapor through the slab or foundation. The structural engineer or foundation and slab designer should provide recommendations to not allow water or vapor to enter into the structure so as to cause damage to another building component, or so as to limit the installation of the type of flooring materials typically used for the particular application.

The structural engineer or designer should analyze actual soil-structure interaction and consider, as needed, bearing, expansive soil influence, and strength, stiffness and deflections in the various slab, foundation, and other elements in order to develop appropriate, design-specific details. As conditions dictate, it is possible that other influences will also have to be considered. The structural engineer or designer should consider all applicable codes and authoritative sources where needed. If analyses by the structural engineer or designer result in less critical details than are provided herein as minimums, the minimums presented herein should be adopted. It is considered likely that some, more restrictive details will be required.

If the structural engineer or designer have any questions or requires further assistance, they should not hesitate to call or otherwise transmit their requests to GSI. In order to mitigate potential distress, the foundation and improvement's designer should confirm to GSI and the governing agency, in writing, that the proposed foundations and improvements can tolerate the amount of differential settlement and expansion characteristics, and other design criteria specified herein.

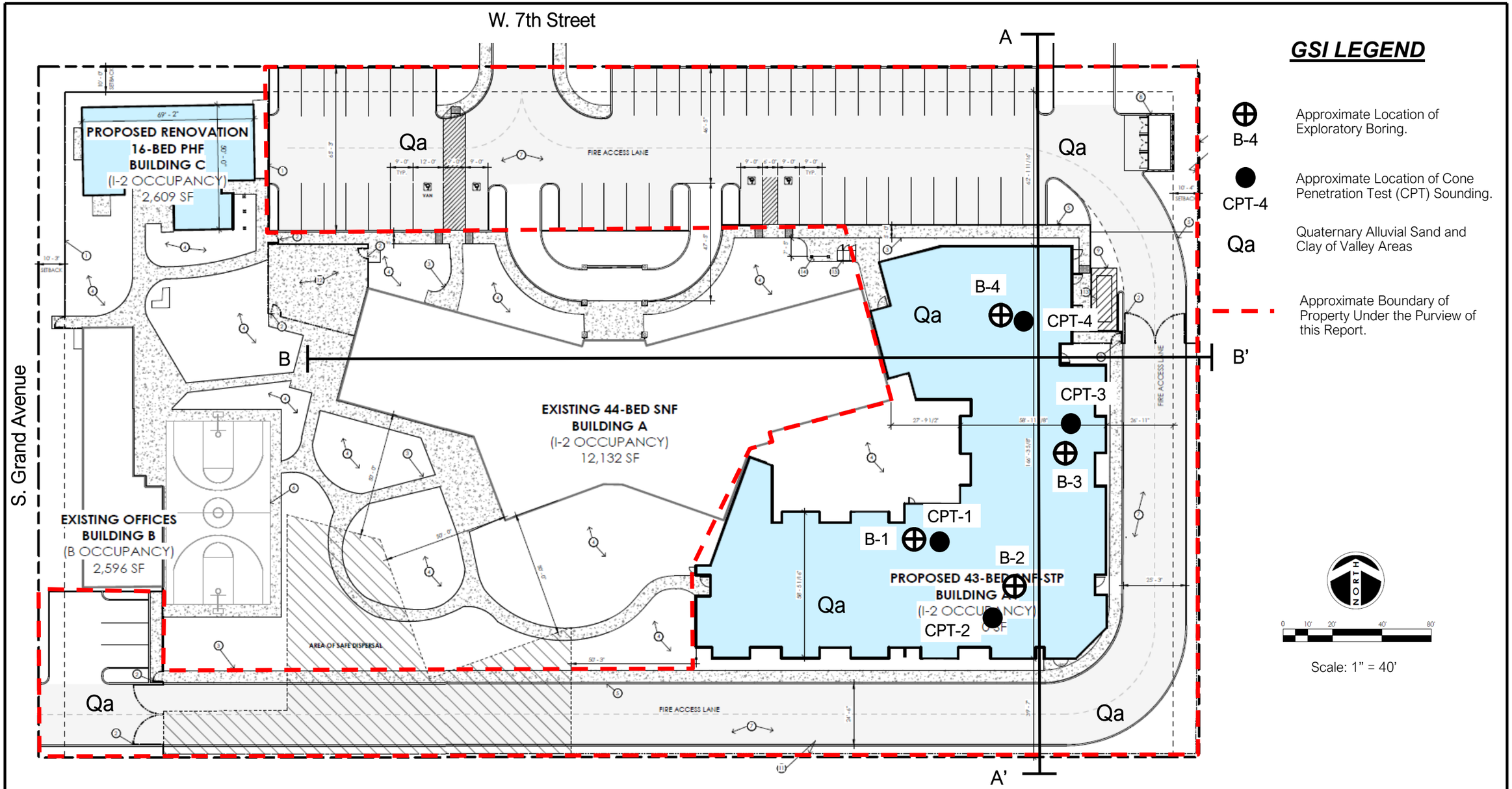
PLAN REVIEW

Final project plans (grading, precise grading, foundation, retaining wall or landscaping), should be reviewed by this office prior to construction, so that construction is in accordance with the conclusions and recommendations of this report. Based on our review, supplemental recommendations or further geotechnical studies may be warranted.

LIMITATIONS

The materials encountered on the project site and used for our analysis are believed representative of the area; however, soil and bedrock materials vary in character between excavations and natural outcrops or conditions exposed during mass grading. Site conditions may vary due to seasonal changes or other factors.

Inasmuch as our study is based upon our review and engineering analyses and laboratory data, the conclusions and recommendations are professional opinions. These opinions have been derived in accordance with current standards of practice, and no warranty, either express or implied, is given. Standards of practice are subject to change with time. GSI assumes no responsibility or liability for work or testing performed by others, or their inaction; or work performed when GSI is not requested to be onsite, to evaluate if our recommendations have been properly implemented. Use of this report constitutes an agreement and consent by the user to all the limitations outlined above, notwithstanding any other agreements that may be in place. In addition, this report may be subject to review by the controlling authorities. Thus, this report brings to completion our scope of services for this portion of the project. All samples will be disposed of after 30 days, unless specifically requested by the client, in writing.



ALL LOCATIONS ARE APPROXIMATE

This document or e-file is not part of the Construction Documents and should not be relied upon as being an accurate depiction of design.

Plate adapted from the Overall Site Plan by Gregg Maedo & Associates dated September 18, 2025.

OVERALL SITE PLAN

ARCHITECTURE + INTERIORS + PLANNING
321 NORTH RAMPART STREET, SUITE 101
ORANGE, CA 92868 . P: 714.937.1985
PROJECT#: 24060 . 18 SEPTEMBER 2025

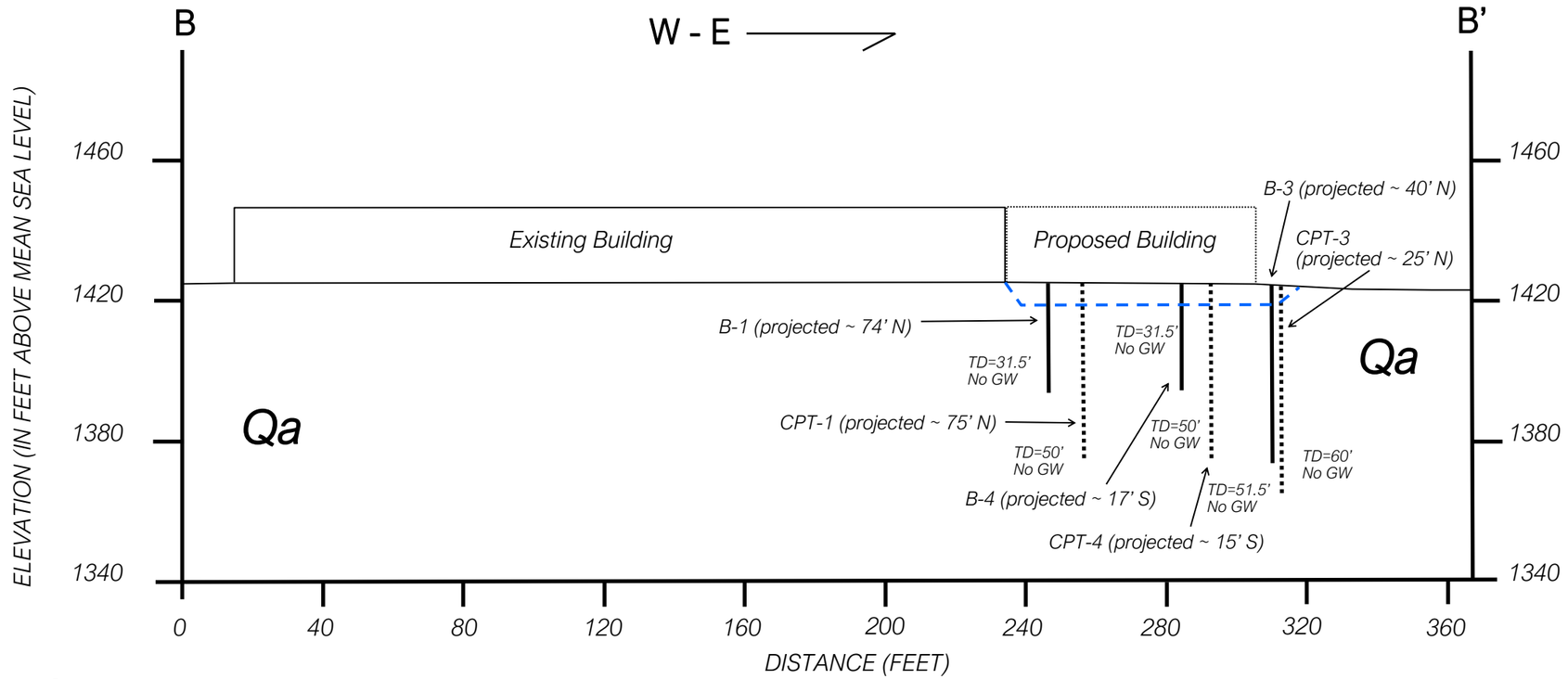
GREGG MAEDO + ASSOCIATES

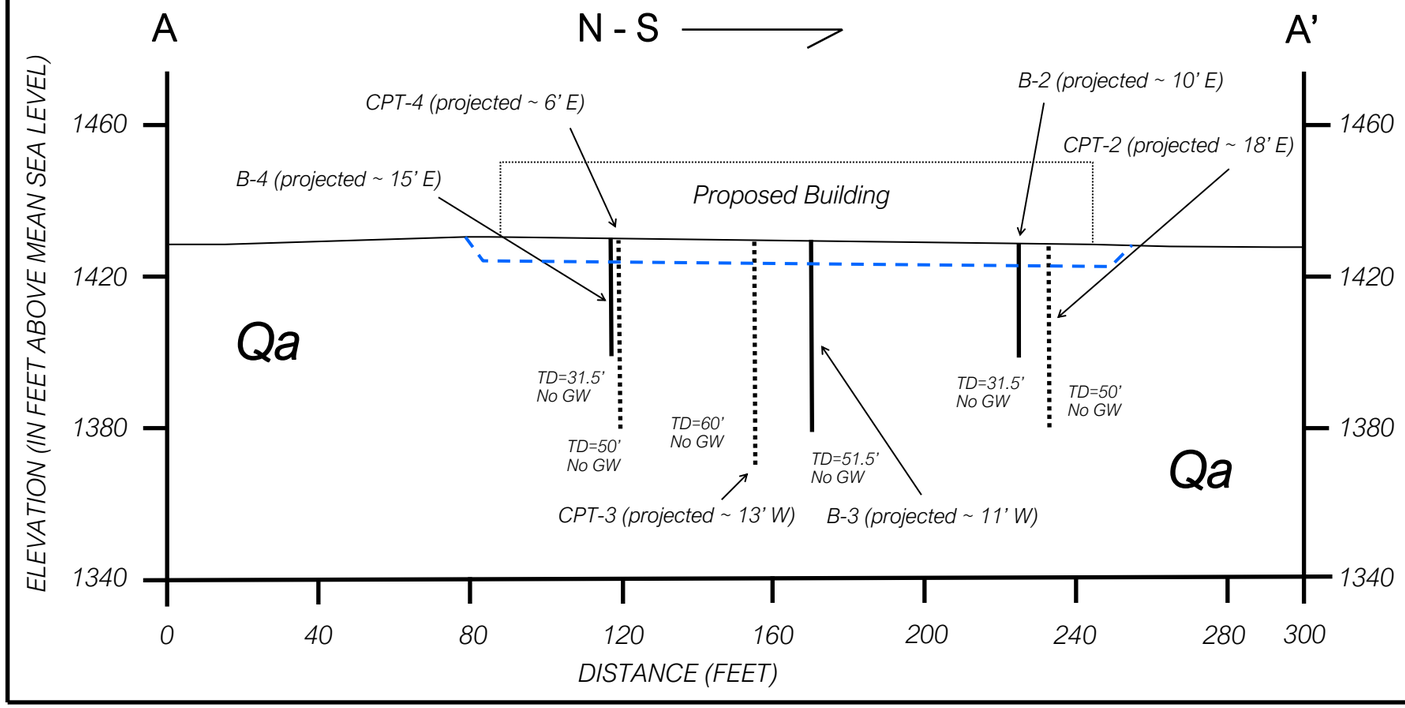
GSI GeoSoils,Inc.

Plate 1

GEOTECHNICAL MAP

W.O. 9071-A-IE	DATE: 12/25	SCALE: See Bar Scale





GSI LEGEND

Qa — Quaternary Alluvial Sand and Clay of Valley Areas.

Approximate Area of Remedial Removals (~5-7').

GeoSoils, Inc.

Plate 2

GEOLOGIC CROSS-SECTIONS

W.O. 9071-A-IE	DATE: 12/25	SCALE: 1"=40'

APPENDIX A

REFERENCES

APPENDIX A

REFERENCES

American Concrete Institute, 2022, Building code requirements for structural concrete (ACI 318-19[22]): reported by ACI Committee 318, reapproved September.

_____, 2014, Building code requirements for structural concrete (ACI 318-14), and commentary (ACI 318R-14): reported by ACI Committee 318, dated September.

American Society of Civil Engineers, 2025, ASCE Hazard Tool website (https://ascehazardtool.org/).

American Society of Civil Engineers, 2021, Supplement 3 Minimum Design Loads and Associated Criteria for Buildings and Other Structures (ASCE/SEI 7-16), effective November 5.

California Department of Conservation, California Geological Survey (CGS), 2025, Alquist-Priolo site investigation reports, interactive website (https://maps.conservation.ca.gov/cgs/informationwarehouse/apreports/).

_____, 2025, Potential hazards from future volcanic eruptions in California, Bulletin 1847.

_____, 2018, Earthquake fault zones, a guide for government agencies, property owners/developers, and geoscience practitioners for assessing fault rupture hazards in California: California Geological Survey Special Publication 42 (revised 2018), 93 p.

_____, 2008, Guidelines for evaluating and mitigating seismic hazards in California: California Geological Survey Special Publication 117A (revised 2008), 102 p.

_____, 2022, Note 48, checklist for the review of engineering geology and seismology reports for California public schools, hospitals, and essential services buildings, dated November.

California Building Standards Commission, 2022, California Building Code, California Code of Regulations, Title 24, Part 2, Volumes 1 and 2, based on the 2021 International Building Code, effective January 1, 2023.

California Department of Conservation, Division of Oil, Gas, and Geothermal Resources - Well Finder, 2025, DOGGR Online Mapping System (DOMS) https://maps.conservation.ca.gov/doggr/wellfinder/#close.

California Department of Water Resources, 2025, Division of Safety of Dams (DSOD), California Dam Breach Inundation Maps, interactive website (https://fmds.water.ca.gov/webgis/?appid=dam_prototype_v2).

_____, 2025, Water Data Library, interactive website, (http://wdl.water.ca.gov/waterdatalibrary/).

California Geological Energy Management Division (CalGEM), 2025, Well finder website (https://www.conservation.ca.gov/calgem/Pages/WellFinder.aspx).

California Geological Survey, 2025, Fault Activity Map of California, website (https://maps.conservation.ca.gov/cgs/fam/app/).

California Stormwater Quality Association (CASQA), 2003, Stormwater best management practice handbook, new development and redevelopment, dated January.

Cao, T., Bryant, W.A., Rowshandel, B., Branum, D., and Wills, C.J., 2003, The revised 2002 California probabilistic seismic hazard maps, dated June, https://www.conservation.ca.gov/cgs/Documents/PSHA/2002_CA_Hazard_Maps.pdf.

Churchill and Hill, 2000, A general location guide for ultramafic rocks in California - areas more likely to contain naturally occurring Asbestos, open-file report OFR-2000-19, dated August.

County of Riverside, 2012, Water Pollution Prevention, Water Quality Management Plan (WQMP), a guidance document for the Santa Ana Region of Riverside County, approved October 22.

County of Riverside Department of Transportation, 2022, Roadway design requirements, Standard No. 114, dated November 30.

Dibblee, T.W., Jr., 2003, Geologic map of the San Jacinto quadrangle, Riverside County, California, Dibblee Geology Center Map #DF-116, Santa Barbara Museum of Natural History.

Federal Emergency Management Agency (FEMA), 2025, FEMA flood map service center website, https://msc.fema.gov/portal/home.

Gary S. Rasmussen & Associates, 1986, Subsurface engineering geology investigation of Tentative Tract No. 21016, Lots 1-58, south of Cottonwood Avenue and West of Palm Avenue, San Jacinto, California, P.N. 2267, County geologic report No. 409, dated July 17.

Geologismiki (2025), CPT liquefaction assessment software, CLiq v.3.5.4.2 - CPT soil liquefaction computer program, https://geologismiki.gr/products/cliq/.

Google Earth Pro - v7.3.6, 2025, by Google, LLC, https://www.google.com/earth/about/versions/.

Gregg Maedo + Associates, 2024, 43-Bed building addition, skilled nursing facility, Bradley Gardens, 5 sheets, various scales, P.N. 24150, dated November 21.

Jennings, C.W., and Bryant, W.A., 2010, Fault activity map of California, scale 1:750,000, California Geological Survey, Geologic Data Map No. 6.

Kanare, Howard, M., 2005, Concrete Floors and Moisture, Engineering Bulletin 119, Portland Cement Association, pp. 35-42.

Nagda, Niren L., 1994, Radon: prevalence, measurements, health risks and control, ASTM manual series: MNL 15, ASTM publication code number (PCN) 28-015094-17.

Leighton and Associates, Inc., 2003, Supplemental geotechnical and fault investigation, Tentative Tract No. 29859, northwest corner of the intersection of Seventh Street and Palm Avenue, City of San Jacinto, Riverside County, California, P.N. 111023-001, dated October 31.

Lewis S. Lohr & Associates, 1990, Fault hazard investigation for: Tract No. 22347, land lying northwesterly of the angle point of Grand Ave., northerly of 7th Street, in the City of San Jacinto, Section 34, T.4S., R.1W., Riverside County, California, J.N. 215-91-01, dated January 24.

Lofgren, B. E., 1976, Land Subsidence and aquifer-system compaction in the San Jacinto Valley, Riverside County, California–a progress report: Journal Research, U.S. Geological Survey, vol. 3, no. 1.

Morton, D.M., 1994, Subsidence and ground fissures in the San Jacinto Basin area, southern California: U.S. Geological Survey Open File Report 94-532.

Nursing Home Report, 2025, The Bradley Gardens San Jacinto, California, website (https://nursinghomereport.org/the-bradley-gardens-055598/).

Riverside County Flood Control and Water Conservation District, 2016, Design handbook for low impact development best management practices, errata, posted June 30.

Riverside County Information Technology (RCIT), Graphic Information Services (GIS), 2025, Map my County, v10, website: https://gis1.countyofriverside.us/Html5Viewer/index.html?viewer=MMC_Public.

SEAOC Seismology Committee, 2019, "Seismically Induced Lateral Earth Pressures on Retaining Structures and Basement Walls," August 2019, *The SEAOC Blue Book: Seismic Design Recommendations*, Structural Engineers Association of California, Sacramento, CA.

Seed, H.B., Whitman, R.V., 1970, Design of earth retaining structures for dynamic loads, ASCE Specialty Conference, lateral stresses in the ground and design of earth retaining structures, Cornell Univ., Ithaca, New York, 103–147.

State of California, Department of Health Services, 1990, California statewide radon survey results, p. 9.

State of California, 2025, Civil Code, Sections 895 et seq.

United States Department of Agriculture (USDA), Natural Resources Conservation Services, 2025, Web soil survey, version 3.3.2, (website: https://websoilsurvey.sc.egov.usda.gov/App/HomePage.html).

_____, Soil Conservation Service, 1993, Soil Survey Manual, Handbook 18.

_____, 1980, Aerial photographs, project no. 615020, flight date August 14, flight line 280, photos nos. 184, 185 and 186, scale 1"=3,333'±.

U.S. Army Corps of Engineers, 2003, Engineering and Design - Stability Analysis of Concrete Structures, Publication CECW-E, Circular No. 1110-2-6058, Appendix G, http://www.usace.army.mil/publications/eng-circulars/ec1110-2-6058/

U.S. Geological Survey, 1919, Ground water in the San Jacinto and Temecula basins, California, Water Supply Paper 429, by Gerald A. Waring, 113 pgs., Washington government printing office. .

APPENDIX B

BORING AND CPT LOGS

UNIFIED SOIL CLASSIFICATION SYSTEM

Major Divisions			Group Symbols	Typical Names
Coarse-Grained Soils More than 50% retained on No. 200 sieve	Gravels 50% or more of coarse fraction retained on No. 4 sieve	Clean Gravels	GW	Well-graded gravels and gravel-sand mixtures, little or no fines
			GP	Poorly graded gravels and gravel-sand mixtures, little or no fines
		Gravel with	GM	Silty gravels gravel-sand-silt mixtures
			GC	Clayey gravels, gravel-sand-clay mixtures
	Sands more than 50% of coarse fraction passes No. 4 sieve	Clean Sands	SW	Well-graded sands and gravelly sands, little or no fines
			SP	Poorly graded sands and gravelly sands, little or no fines
		Sands with Fines	SM	Silty sands, sand-silt mixtures
			SC	Clayey sands, sand-clay mixtures
Fine-Grained Soils 50% or more passes No. 200 sieve	Silts and Clays Liquid limit 50% or less		ML	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
			OL	Organic silts and organic silty clays of low plasticity
	Silts and Clays Liquid limit greater than 50%		MH	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts
			CH	Inorganic clays of high plasticity, fat clays
			OH	Organic clays of medium to high plasticity
Highly Organic Soils			PT	Peat, mucic, and other highly organic soils

CONSISTENCY OR RELATIVE DENSITY

CRITERIA

Standard Penetration Test

Penetration Resistance N (blows/ft)	Relative Density
0 - 4	Very loose
4 - 10	Loose
10 - 30	Medium
30 - 50	Dense
> 50	Very dense

Standard Penetration Test

Penetration Resistance N (blows/ft)	Consistency	Unconfined Compressive Strength (tons/ft^2)
<2	Very Soft	<0.25
2 - 4	Soft	0.25 - .050
4 - 8	Medium	0.50 - 1.00
8 - 15	Stiff	1.00 - 2.00
15 - 30	Very Stiff	2.00 - 4.00
>30	Hard	>4.00

3" 3/4" #4 #10 #40 #200 U.S. Standard Sieve

Unified Soil Classification	Cobbles	Gravel		Sand			Silt or Clay
		coarse	fine	coarse	medium	fine	

MOISTURE CONDITIONS

Dry	Absence of moisture: dusty, dry to the touch
Slightly Moist	Below optimum moisture content for compaction
Moist	Near optimum moisture content
Very Moist	Above optimum moisture content
Wet	Visible free water; below water table

MATERIAL QUANTITY

trace	0 - 5 %
few	5 - 10 %
little	10 - 25 %
some	25 - 45 %

OTHER SYMBOLS

C Core Sample
S SPT Sample
B Bulk Sample
__ Groundwater
Qp Pocket Penetrometer

BASIC LOG FORMAT:
Group name, Group symbol, (grain size), color, moisture, consistency or relative density. Additional comments: odor, presence of roots, mica, gypsum, coarse grained particles, etc.

EXAMPLE:
Sand (SP), fine to medium grained, brown, moist, loose, trace silt, little fine gravel, few cobbles up to 4" in size, some hair roots and rootlets.

GeoSoils, Inc.

BORING LOG

PROJECT: Corcoran Construction, Inc.
980 West 7th Street, San Jacinto

W.O. 9071-A-IE *BORING* B-1 *SHEET* 1 *OF* 1

DATE EXCAVATED 11/26/25 *LOGGED BY:* DRE *APPROX. ELEV.:* 1,527

SAMPLE METHOD: CAL SAMPLER AND SPT, 140 LB HAMMER @ 30" DROP

Depth (ft.)	Sample: Bulk	Sample: Undisturbed	Sample: Blows/Ft.	USCS Symbol	Dry Unit Wt. (pcf)	Moisture (%)	Saturation (%)	Material Description
0				SM				**TOPSOIL AND DISTURBED FILL:** @ 0' SILTY SAND,brown, moist, loose; rootlets (topsoil), mica.
			33	SM	86.8	4.8	14.2	**QUATERNARY ALLUVIAL SAND AND CLAY OF VALLEY AREAS (Qa):** @ 2' Becomes medium dense to dense. @ 3' SILTY SAND,light brown to gray brown, dry, medium dense; medium to fine grained sands, some mica.
5			39		91.2	5.5	18.1	@ 5' As per 3'; dense; few roots.
			24		106.7	7.4	35.6	@ 7½' SILTY SAND, gray, damp, medium dense; some coarse grained sands, appear granitic.
10			38		111.4	10.2	55.9	@ 10' SILTY SAND, dark grayish brown, moist, dense; oxidation stains.
15			23					@ 15' SILTY SAND with SILT INTERBEDS, brownish gray to dark brownish gray, moist, medium dense.
20			37	SM/ ML	102.0	22.1	94.1	@ 20' SILTY SAND with SILT, dark gray, wet, dense; few oxidation stains, some mica, ½" low plasticity silt interbed.
25			10	ML				@ 25' SILT, gray to dark gray, moist, stiff; root traces, few interbeds, thin to medium laminated.
30			40	SM	114.0	8.5	50.2	@ 30' SILTY SAND, dark gray, damp, dense; coarse to fine grained sand.
								Total Depth = 31½' No seepage or caving Backfilled 11/26/25

▼ *Standard Penetration Test*
⌶ *Undisturbed, Ring Sample*
▽ *Groundwater*
♀ *Seepage*

GeoSoils, Inc.

PLATE B-2

GeoSoils, Inc.

BORING LOG

PROJECT: Corcoran Construction, Inc.
980 West 7th Street, San Jacinto

W.O. 9071-A-IE *BORING* B-2 *SHEET* 1 *OF* 1

DATE EXCAVATED 11/26/25 *LOGGED BY:* DRE *APPROX. ELEV.:* 1,526

SAMPLE METHOD: CAL SAMPLER AND SPT, 140 LB HAMMER @ 30" DROP

Depth (ft.)	Sample: Bulk	Sample: Undisturbed	Blows/Ft.	USCS Symbol	Dry Unit Wt. (pcf)	Moisture (%)	Saturation (%)	Material Description
0				SM				**TOPSOIL AND DISTURBED FILL:** @ 0' SILTY SAND, brown, wet, loose; few roots, some mica.
			12	SM	81.9	27.3	71.0	**QUATERNARY ALLUVIAL SAND AND CLAY OF VALLEY AREAS (Qa):** @ 3' SILTY SAND, light brownish gray, moist, medium dense; few coarse grained sands.
5			25		87.8	13.4	40.1	@ 5' SILTY SAND, brownish gray, damp, medium dense; few coarse grained sands.
			25		106.4	8.5	40.6	@ 7½' SILTY SAND, light gray and brownish gray, damp, medium dense; few sandy layers, few oxidation stains.
10			36		102.8	14.3	62.5	@ 10' SILTY SAND, brownish gray, moist, medium dense; some mica, few medium grained sands.
15			22					@ 15' SILTY SAND, light grayish brown, moist, medium dense.
20			41		112.7	9.3	52.6	@ 20' SILTY SAND, grayish brown, moist, dense; thickly bedded, some yellowish staining.
25			8	ML				@ 25' SILT, dark brownish gray, moist, medium stiff; calcified laminae.
30			27	SM	117.6	5.1	33.5	@ 30' SILTY SAND, dark brownish gray, damp, medium dense.
								Total Depth = 31½' No seepage or caving Backfilled 11/26/25

Standard Penetration Test
Undisturbed, Ring Sample
Groundwater
Seepage

GeoSoils, Inc.

PLATE B-3

GeoSoils, Inc.

BORING LOG

PROJECT: Corcoran Construction, Inc.
980 West 7th Street, San Jacinto

W.O. 9071-A-IE *BORING* B-3 *SHEET* 1 *OF* 2

DATE EXCAVATED 11/26/25 *LOGGED BY:* DRE *APPROX. ELEV.:* 1,526

SAMPLE METHOD: CAL SAMPLER AND SPT, 140 LB HAMMER @ 30" DROP

Depth (ft.)	Sample: Bulk	Sample: Undisturbed	Sample: Blows/Ft.	USCS Symbol	Dry Unit Wt. (pcf)	Moisture (%)	Saturation (%)	Material Description
0				SM				**TOPSOIL AND DISTURBED FILL:** @ 0' SILTY SAND, brown, moist, loose to medium dense.
			10	SM	99.7	15.4	61.8	**QUATERNARY ALLUVIAL SAND AND CLAY OF VALLEY AREAS (Qa):** @ 2½' SILTY SAND, grayish brown, moist, loose.
5			14		89.9	28.1	88.8	@ 5' As per 2½', wet, medium dense.
			23	SP-SM	105.2	2.1	9.6	@ 7½' SILTY SAND and SAND, grayish brown and light brownish gray, dry, medium dense.
10			33	SM	98.6	15.0	58.9	@ 10' SILTY SAND, grayish brown, moist, medium dense; fewer fine grained sands.
15			22	SP-SM				@ 15' SILTY SAND and SAND, dark gray, moist, medium dense.
20			28		110.6	3.1	16.7	@ 20' More medium to medium grained SAND; oxidation stains in root trace.
25			9	ML				@ 25' SANDY SILT, grayish brown, moist, medium stiff to stiff.
30			22	SM	101.0	18.2	75.9	@ 30' SILTY SAND, dark brownish gray to brownish gray, moist, medium dense; few oxidation stains along bedding laminae.

▼ *Standard Penetration Test*
⌶ *Undisturbed, Ring Sample*
▽ *Groundwater*
♀ *Seepage*

GeoSoils, Inc.

BORING LOG

PROJECT: Corcoran Construction, Inc.
980 West 7th Street, San Jacinto

W.O. 9071-A-IE *BORING* B-3 *SHEET* 2 *OF* 2

DATE EXCAVATED 11/26/25 *LOGGED BY:* DRE *APPROX. ELEV.:* 1,526

SAMPLE METHOD: CAL SAMPLER AND SPT, 140 LB HAMMER @ 30" DROP

Depth (ft.)	Sample: Bulk	Sample: Undisturbed	Sample: Blows/Ft.	USCS Symbol	Dry Unit Wt. (pcf)	Moisture (%)	Saturation (%)	Material Description
35			10	ML				@ 35' SILT with FINE SAND, dark brownish gray, moist, medium stiff.
40			30	SM	108.0	19.5	97.2	@ 40' SILTY SAND, dark gray, saturated, medium stiff.
45			17	SM				@ 45' SILTY SAND and SANDY SILT, brownish gray and dark brownish gray, moist, medium dense; sand layer at end of SPT 3", SILT with SAND has reddish yellow oxidation stains, slight mottling.
50			63		104.1	7.2	32.6	@ 50' SILTY SAND, gray to light gray, damp, dense.
								Total Depth = 51½' No seepage or caving Backfilled 11/26/25
55								
60								
65								

▼ *Standard Penetration Test*
⌶ *Undisturbed, Ring Sample*
▽ *Groundwater*
♀ *Seepage*

GeoSoils, Inc.

BORING LOG

PROJECT: Corcoran Construction, Inc.
980 West 7th Street, San Jacinto

W.O. 9071-A-IE *BORING* B-4 *SHEET* 1 *OF* 1

DATE EXCAVATED 11/26/25 *LOGGED BY:* DRE *APPROX. ELEV.:* 1,526

SAMPLE METHOD: CAL SAMPLER AND SPT, 140 LB HAMMER @ 30" DROP

Depth (ft.)	Sample: Bulk	Sample: Undisturbed	Sample: Blows/Ft.	USCS Symbol	Dry Unit Wt. (pcf)	Moisture (%)	Saturation (%)	Material Description
0				SM				**TOPSOIL AND DISTURBED FILL:** @ 0' SILTY SAND, brown, moist, loose; roots.
			13	SM	97.0	8.9	33.3	**QUATERNARY ALLUVIAL SAND AND CLAY OF VALLEY AREAS (Qa):** @ 3' SILTY SAND, dark grayish brown, damp, medium dense; few roots, mica, silty laminae horizontal beds.
5			25		114.4	6.0	35.7	@ 5' SILTY SAND, dark gray, damp, medium dense; few oxidation stains, fewer fines.
			15		87.2	23.2	68.8	@7½' SILTY SAND, becomes light brownish gray, moist, medium dense; sample disturbed.
10			14					@10' SILTY SAND, dark gray, moist, medium dense; few SILT interbeds.
15			22		115.0	11.7	71.0	@ 15' SILTY SAND, brown to brownish gray, moist, medium dense; few coarse grained sands, few oxidation stains.
20			20					@ 20' SILTY SAND, light gray to gray, moist, medium dense; few oxidation stains, gradational bedding, medium to fine graind sands.
25			22	SM/ ML	96.9	23.8	89.1	@ 25' SILT to SILTY SAND, dark gray to gray, wet, very stiff to medium dense; low plasticity SILT, 1cm-1mm laminae bedding, few oxidation stains.
30			21					@ 30' SILTY SAND, gray, moist, medium dense.
								Total Depth = 31½' No seepage or caving Backfilled 11/26/25

▼ *Standard Penetration Test*
⌶ *Undisturbed, Ring Sample*
▽ *Groundwater*
♀ *Seepage*

SUMMARY

OF

CONE PENETRATION TEST DATA

Project:

Bradley Gardens
980 W. 7th Street
San Jacinto, CA
November 26, 2025

Prepared for:

Mr. Ryan Boehmer
GeoSoils, Inc. (GSI)
5741 Palmer Way, Ste C & D
Carlsbad, CA 92010
Office (760) 438-3155 / Fax (760) 931-0915

Prepared by:

KEHOE TESTING & ENGINEERING
5415 Industrial Drive
Huntington Beach, CA 92649-1518
Office (714) 901-7270 / Fax (714) 901-7289
www.kehoetesting.com

TABLE OF CONTENTS

1. **INTRODUCTION**
2. **SUMMARY OF FIELD WORK**
3. **FIELD EQUIPMENT & PROCEDURES**
4. **CONE PENETRATION TEST DATA & INTERPRETATION**

APPENDIX

- CPT Plots
- CPT Classification/Soil Behavior Chart
- Summary of Shear Wave Velocities
- CPT Data Files (sent via email)

SUMMARY
OF
CONE PENETRATION TEST DATA

1. INTRODUCTION

This report presents the results of a Cone Penetration Test (CPT) program carried out for the Bradley Gardens project located at 980 W. 7th Street in San Jacinto, California. The work was performed by Kehoe Testing & Engineering (KTE) on November 26, 2025. The scope of work was performed as directed by GeoSoils, Inc. (GSI) personnel.

2. SUMMARY OF FIELD WORK

The fieldwork consisted of performing CPT soundings at four locations to determine the soil lithology. A summary is provided in **TABLE 2.1**.

LOCATION	DEPTH OF CPT (ft)	COMMENTS/NOTES:
CPT-1	50	
CPT-2	50	
CPT-3	60	
CPT-4	50	

TABLE 2.1 - Summary of CPT Soundings

3. FIELD EQUIPMENT & PROCEDURES

The CPT soundings were carried out by **KTE** using an integrated electronic cone system manufactured by Vertek. The CPT soundings were performed in accordance with ASTM standards (D5778). The cone penetrometers were pushed using a 30-ton CPT rig. The cone used during the program was a 15 cm^2 cone with a cone net area ratio of 0.83. The following parameters were recorded at approximately 2.5 cm depth intervals:

- Cone Resistance (qc)
- Sleeve Friction (fs)
- Dynamic Pore Pressure (u)
- Inclination
- Penetration Speed

At location CPT-3, shear wave measurements were obtained at approximately 10-foot intervals. The shear wave is generated using an air-actuated hammer, which is located inside the front jack of the CPT rig. The cone has a triaxial geophone, which recorded the shear wave signal generated by the air hammer.

The above parameters were recorded and viewed in real time using a laptop computer. Data is stored at the KTE office for up to 2 years for future analysis and reference. A complete set of baseline readings was taken prior to each sounding to determine temperature shifts and any zero load offsets. Monitoring base line readings ensures that the cone electronics are operating properly.

4. CONE PENETRATION TEST DATA & INTERPRETATION

The Cone Penetration Test data is presented in graphical form in the attached Appendix. These plots were generated using the CPeT-IT program. Penetration depths are referenced to ground surface. The soil behavior type on the CPT plots is derived from the attached CPT SBT plot (Robertson, "Interpretation of Cone Penetration Test…", 2009) and presents major soil lithologic changes. The stratigraphic interpretation is based on relationships between cone resistance (qc), sleeve friction (fs), and penetration pore pressure (u). The friction ratio (Rf), which is sleeve friction divided by cone resistance, is a calculated parameter that is used along with cone resistance to infer soil behavior type. Generally, cohesive soils (clays) have high friction ratios, low cone resistance and generate excess pore water pressures. Cohesionless soils (sands) have lower friction ratios, high cone bearing and generate little (or negative) excess pore water pressures.

The CPT data files have also been provided. These files can be imported in CPeT-IT (software by GeoLogismiki) and other programs to calculate various geotechnical parameters.

It should be noted that it is not always possible to clearly identify a soil type based on qc, fs and u. In these situations, experience, judgement and an assessment of the pore pressure data should be used to infer the soil behavior type.

If you have any questions regarding this information, please do not hesitate to call our office at (714) 901-7270.

Sincerely,

KEHOE TESTING & ENGINEERING



Steven P. Kehoe
President

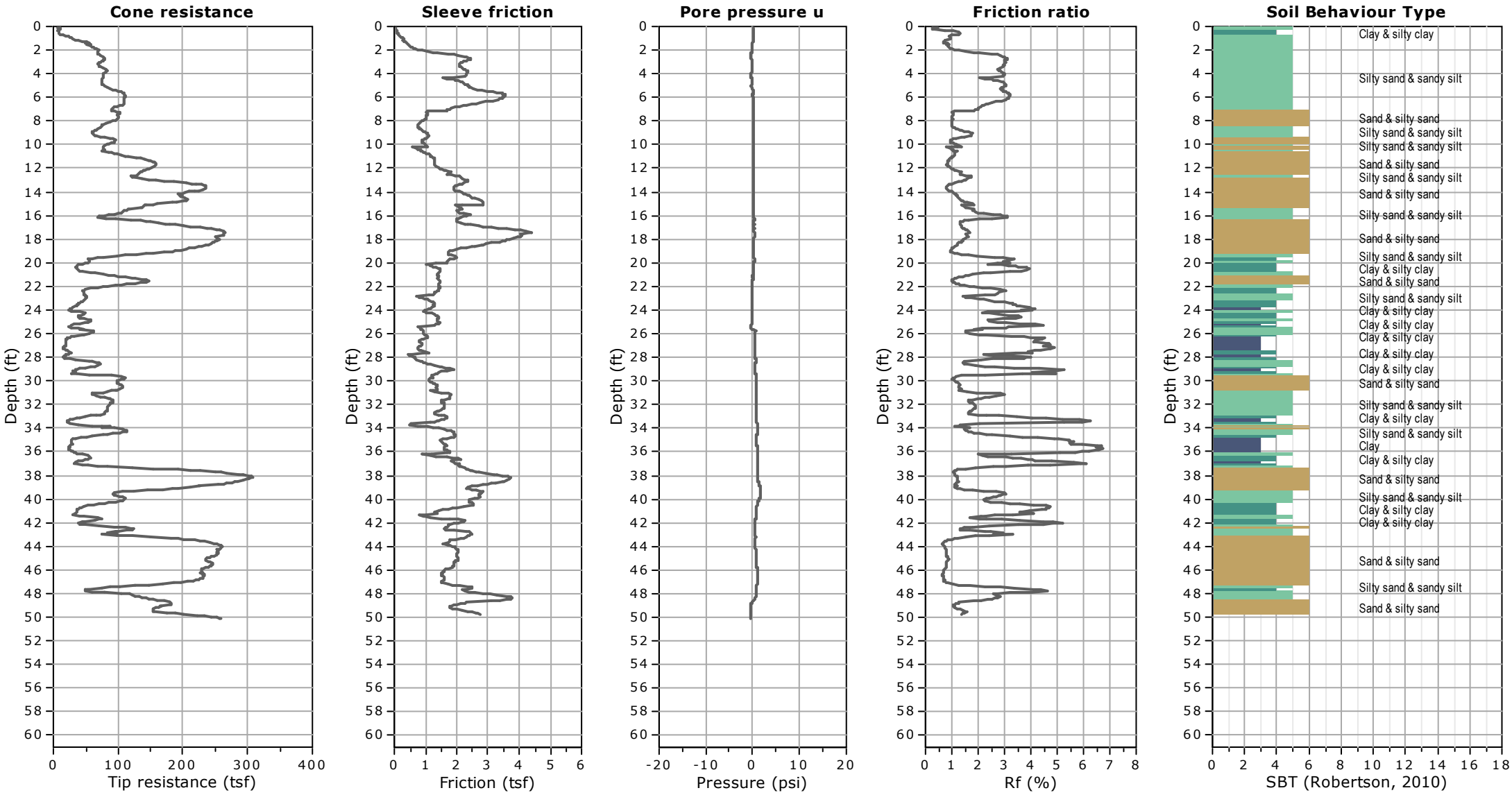
12/06/25-jg-8179

APPENDIX

Kehoe Testing and Engineering
714-901-7270
steve@kehoetesting.com
www.kehoetesting.com

Project: **GeoSoils / Bradley Gardens**
Location: **980 W. 7th St, San Jacinto, CA**

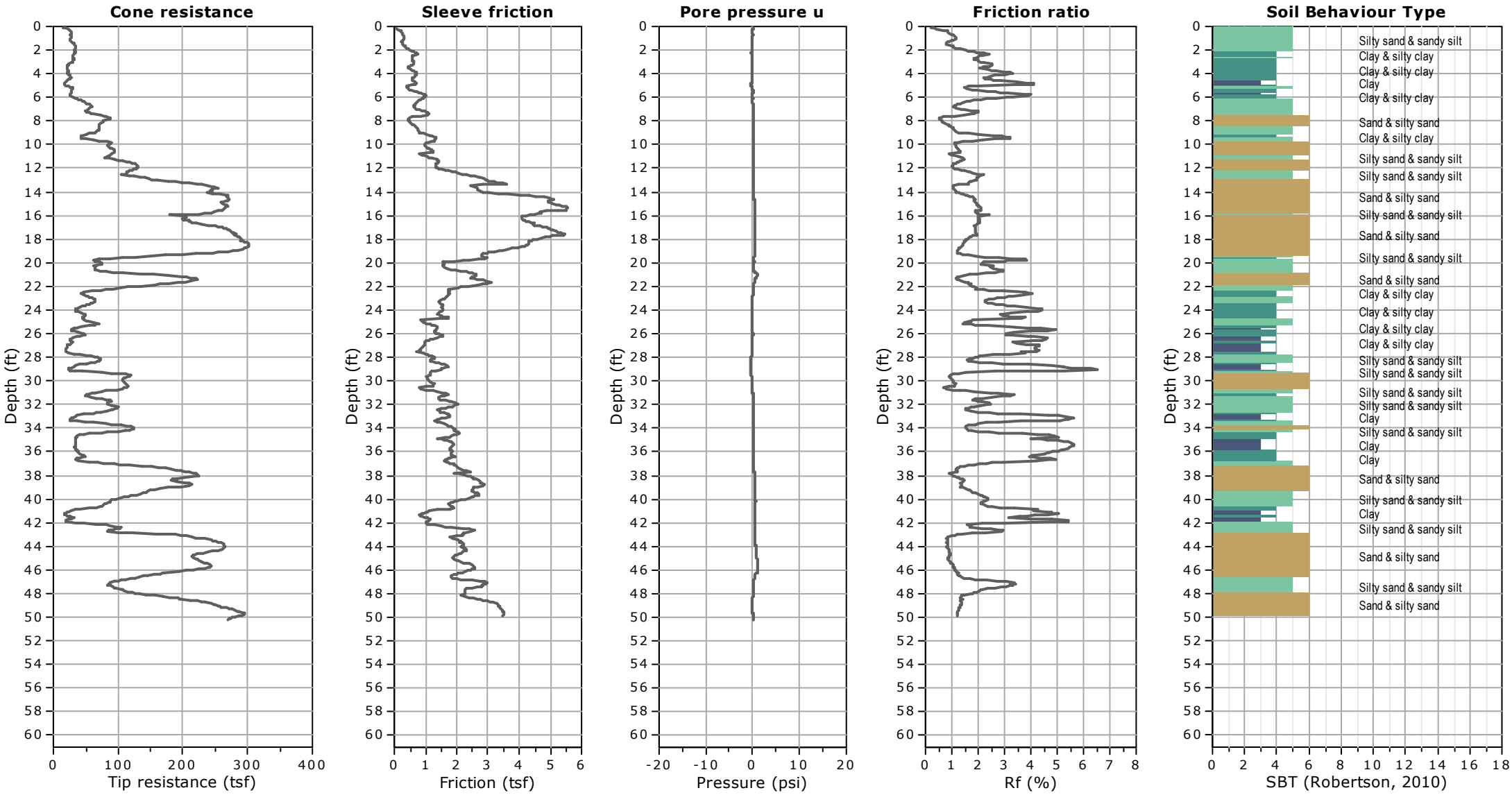
CPT-1
Total depth: 50.14 ft, Date: 11/26/2025



Kehoe Testing and Engineering
714-901-7270
steve@kehoetesting.com
www.kehoetesting.com

Project: GeoSoils / Bradley Gardens
Location: 980 W. 7th St, San Jacinto, CA

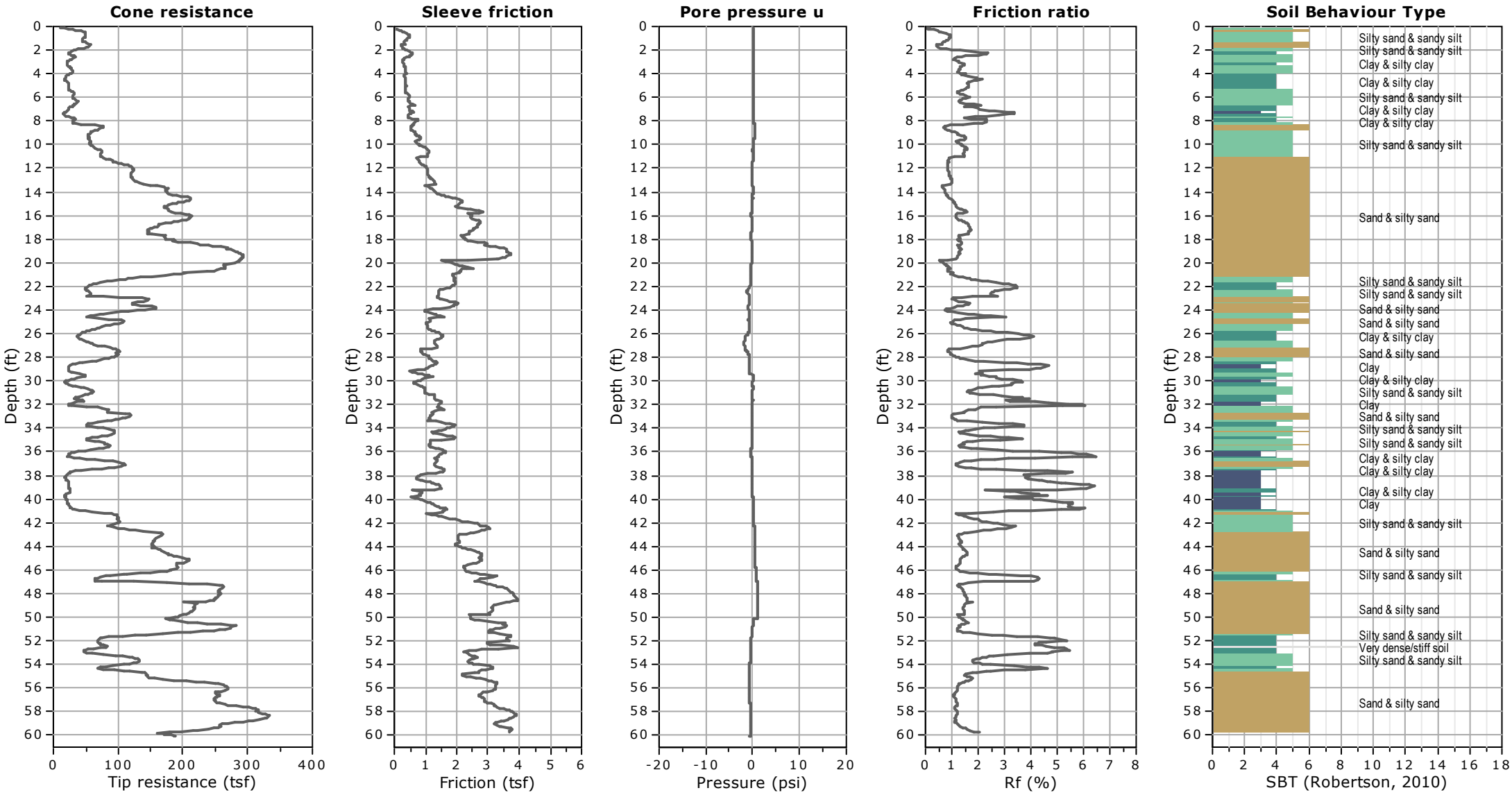
CPT-2
Total depth: 50.27 ft, Date: 11/26/2025



Kehoe Testing and Engineering
714-901-7270
steve@kehoetesting.com
www.kehoetesting.com

Project: **GeoSoils / Bradley Gardens**
Location: **980 W. 7th St, San Jacinto, CA**

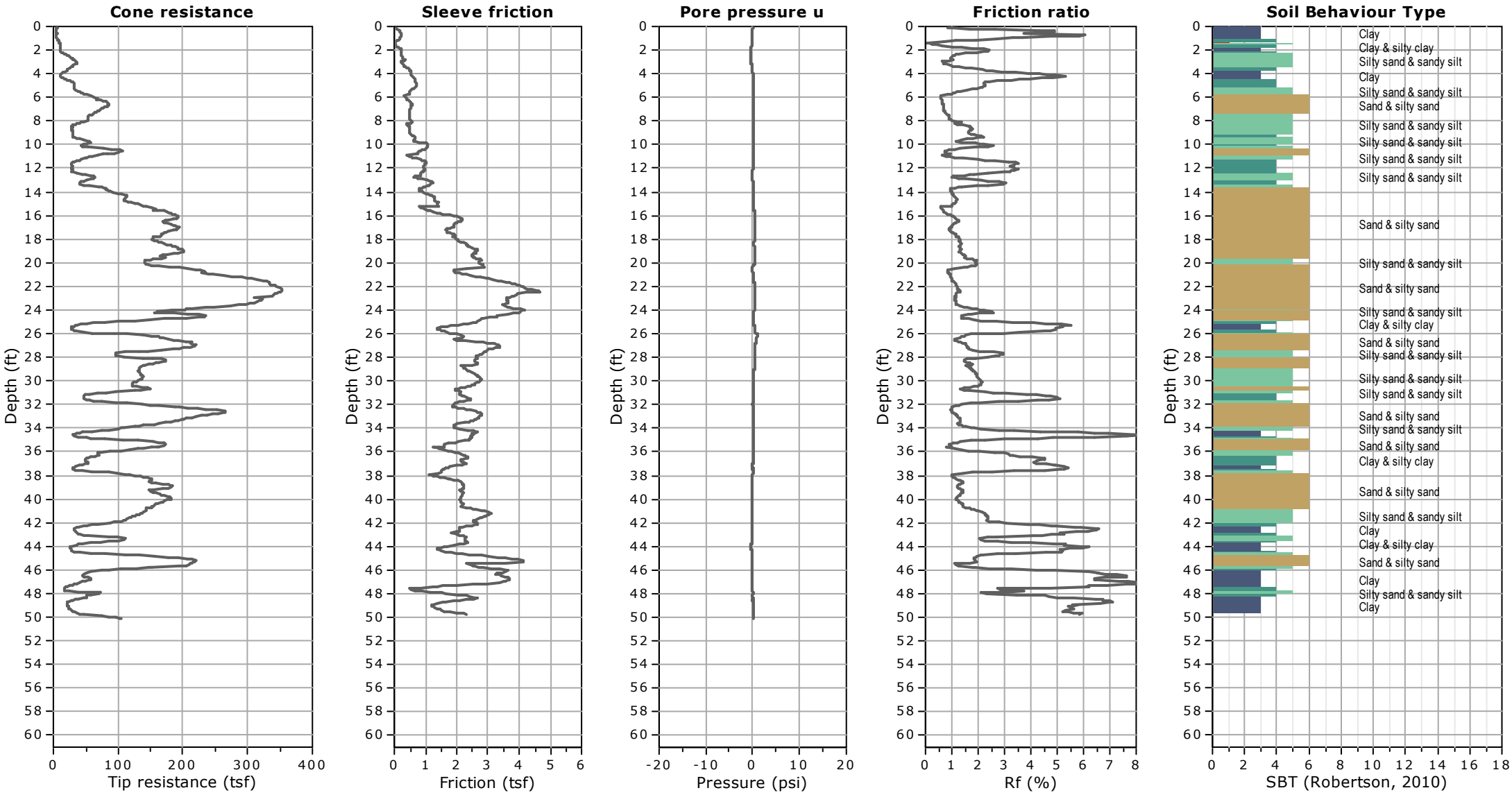
CPT-3
Total depth: 60.11 ft, Date: 11/26/2025



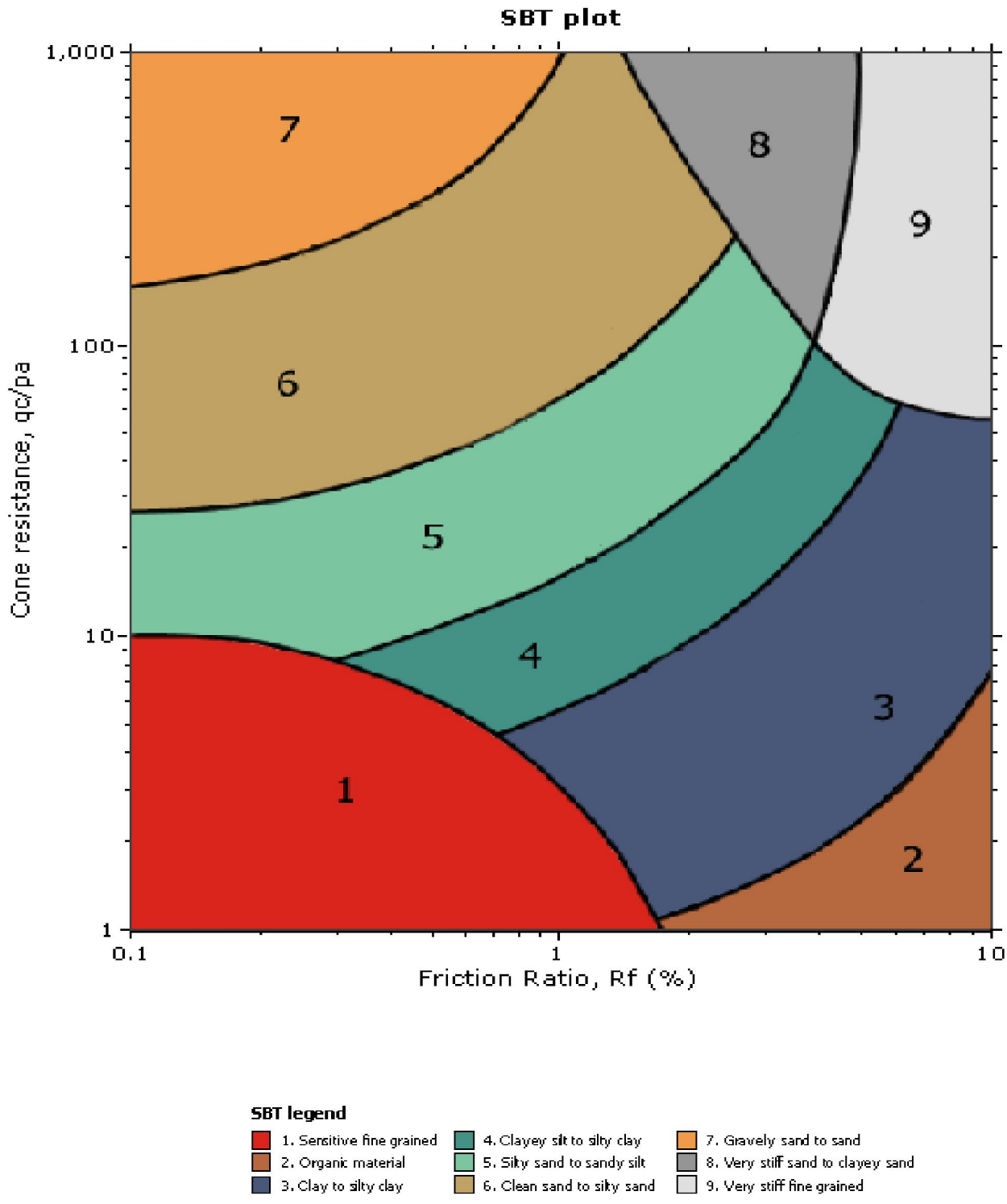
Kehoe Testing and Engineering
714-901-7270
steve@kehoetesting.com
www.kehoetesting.com

Project: **GeoSoils / Bradley Gardens**
Location: **980 W. 7th St, San Jacinto, CA**

CPT-4
Total depth: 50.14 ft, Date: 11/26/2025



Kehoe Testing and Engineering
714-901-7270
rich@kehoetesting.com
www.kehoetesting.com



GeoSoils
Bradley Gardens
San Jacinto, CA

CPT Shear Wave Measurements

Location	Tip Depth (ft)	Geophone Depth (ft)	Travel Distance (ft)	S-Wave Arrival (msec)	S-Wave Velocity from Surface (ft/sec)	Interval S-Wave Velocity (ft/sec)
CPT-3	10.01	9.01	9.23	14.56	634	
	20.05	19.05	19.15	25.24	759	929
	30.02	29.02	29.09	39.48	737	698
	40.06	39.06	39.11	52.76	741	755
	50.10	49.10	49.14	61.76	796	1114
	60.10	59.10	59.13	72.36	817	943

Shear Wave Source Offset - 2 ft

S-Wave Velocity from Surface = Travel Distance/S-Wave Arrival
Interval S-Wave Velocity = (Travel Dist2-Travel Dist1)/(Time2-Time1)

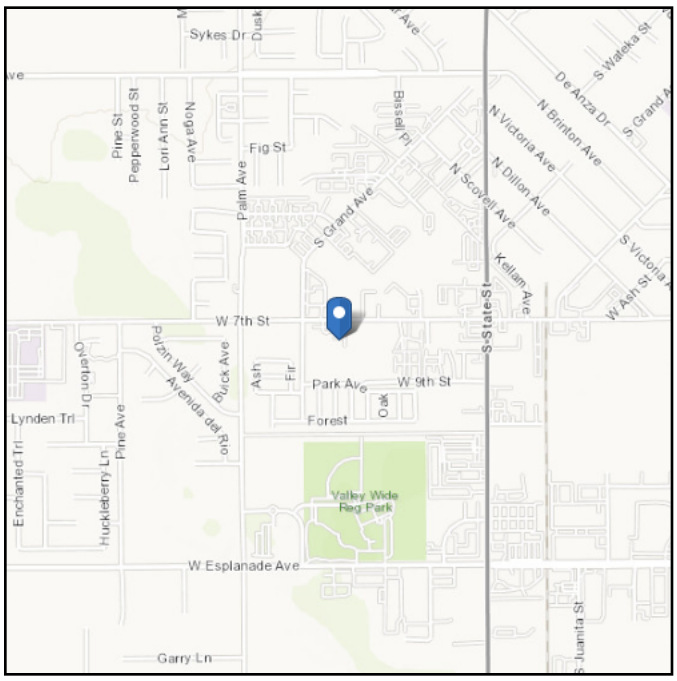
APPENDIX C

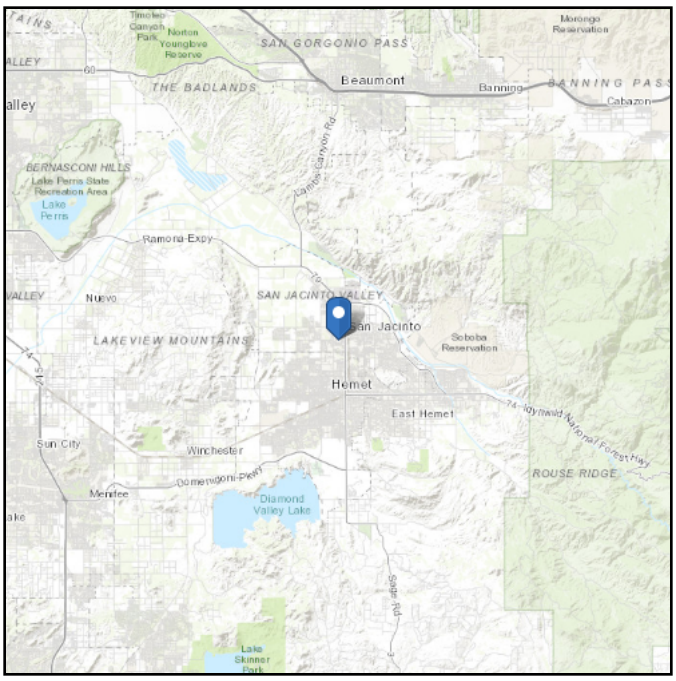
SEISMICITY DATA

ASCE Hazards Report

Address:
No Address at This Location

Standard:	ASCE/SEI 7-16	**Latitude:**	33.77956
Risk Category:	III	**Longitude:**	-116.97718
Soil Class:	D - Stiff Soil	**Elevation:**	1525.6020140554833 ft (NAVD 88)





W.O. 9071-A-IE
Plate C-1

Seismic

Site Soil Class: D - Stiff Soil

Results:

S_S :	2.161	S_{D1} :	N/A
S_1 :	0.875	T_L :	8
F_a :	1	PGA :	0.977
F_v :	N/A	PGA_M :	1.074
S_{MS} :	2.161	F_{PGA} :	1.1
S_{M1} :	N/A	I_e :	1.25
S_{DS} :	1.441	C_v :	1.5

Ground motion hazard analysis may be required. See ASCE/SEI 7-16 Section 11.4.8.

Data Accessed: Tue Dec 02 2025

Date Source: USGS Seismic Design Maps

W.O. 9071-A-IE
Plate C-2

The ASCE Hazard Tool is provided for your convenience, for informational purposes only, and is provided “as is” and without warranties of any kind. The location data included herein has been obtained from information developed, produced, and maintained by third party providers; or has been extrapolated from maps incorporated in the ASCE standard. While ASCE has made every effort to use data obtained from reliable sources or methodologies, ASCE does not make any representations or warranties as to the accuracy, completeness, reliability, currency, or quality of any data provided herein. Any third-party links provided by this Tool should not be construed as an endorsement, affiliation, relationship, or sponsorship of such third-party content by or from ASCE.

ASCE does not intend, nor should anyone interpret, the results provided by this Tool to replace the sound judgment of a competent professional, having knowledge and experience in the appropriate field(s) of practice, nor to substitute for the standard of care required of such professionals in interpreting and applying the contents of this Tool or the ASCE standard.

In using this Tool, you expressly assume all risks associated with your use. Under no circumstances shall ASCE or its officers, directors, employees, members, affiliates, or agents be liable to you or any other person for any direct, indirect, special, incidental, or consequential damages arising from or related to your use of, or reliance on, the Tool or any information obtained therein. To the fullest extent permitted by law, you agree to release and hold harmless ASCE from any and all liability of any nature arising out of or resulting from any use of data provided by the ASCE Hazard Tool.

W.O. 9071-A-IE
Plate C-3

U.S. Geological Survey - Earthquake Hazards Program

Unified Hazard Tool

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

Please also see the new USGS Earthquake Hazard Toolbox for access to the most recent NSHMs for the conterminous U.S. and Hawaii.

Input

Edition

Dynamic: Conterminous U.S. 2014 (u…

Spectral Period

Peak Ground Acceleration

Latitude

Decimal degrees

33.77956

Time Horizon

Return period in years

2475

Longitude

Decimal degrees, negative values for western longitudes

-116.97718

Site Class

259 m/s (Site class D)

W.O. 9071-A-IE
Plate C-4

Hazard Curve

Please select “Edition”, “Location” & “Site Class” above to compute a hazard curve.

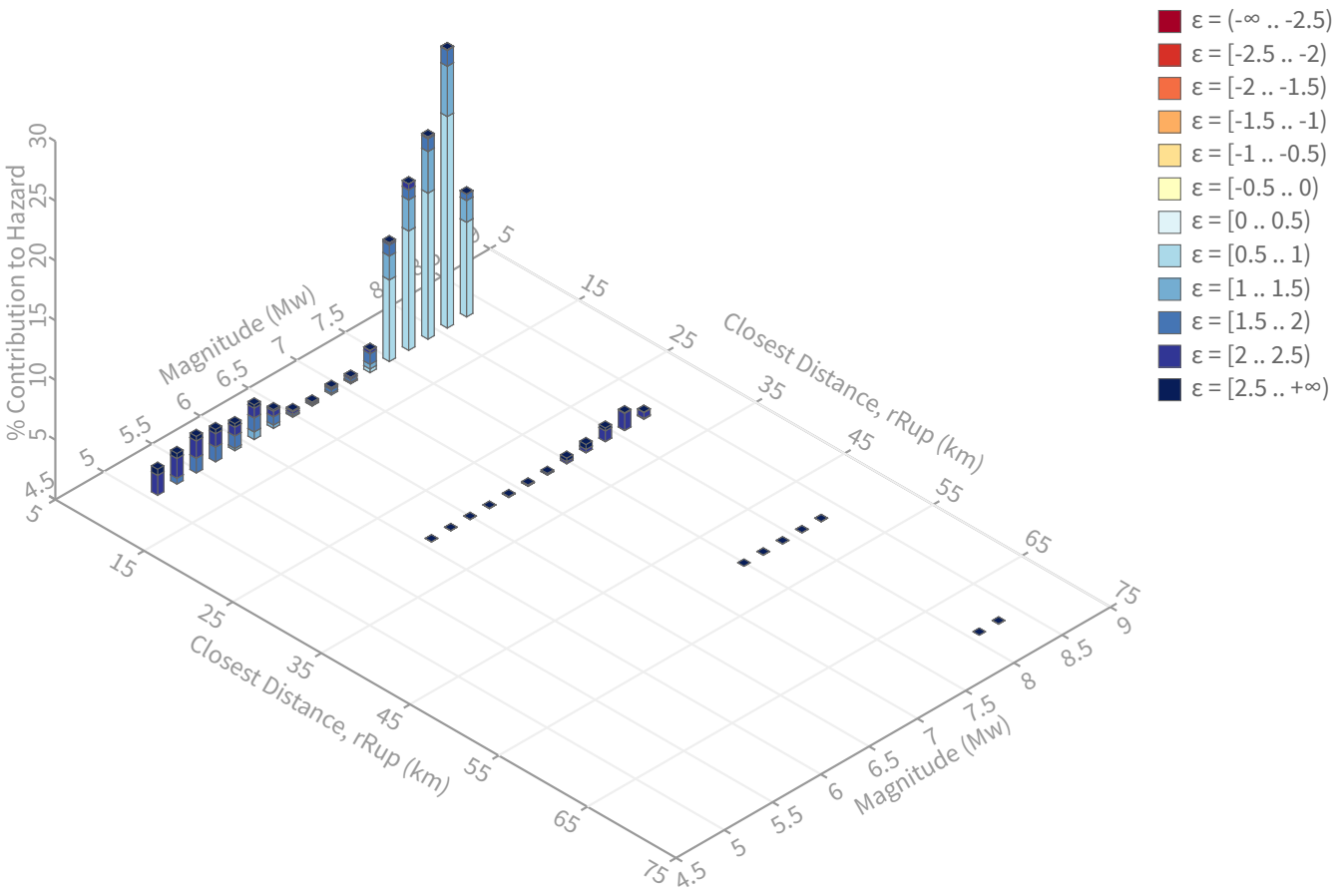
Compute Hazard Curve

W.O. 9071-A-IE
Plate C-5

Deaggregation

Component

Total



W.O. 9071-A-IE
Plate C-6

Summary statistics for, Deaggregation: Total

Deaggregation targets

Return period: 2475 yrs
Exceedance rate: 0.0004040404 yr^{-1}
PGA ground motion: 0.95359974 g

Recovered targets

Return period: 3108.4085 yrs
Exceedance rate: 0.00032170804 yr^{-1}

Totals

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

Mean (over all sources)

m: 7.5
r: 4.09 km
ε_0: 1.3 σ

Mode (largest m-r bin)

m: 8.1
r: 1.47 km
ε_0: 1 σ
Contribution: 23.29 %

Mode (largest m-r-ε_0 bin)

m: 8.1
r: 1.4 km
ε_0: 0.86 σ
Contribution: 17.71 %

Discretization

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

Epsilon keys

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

W.O. 9071-A-IE
Plate C-7

Deaggregation Contributors

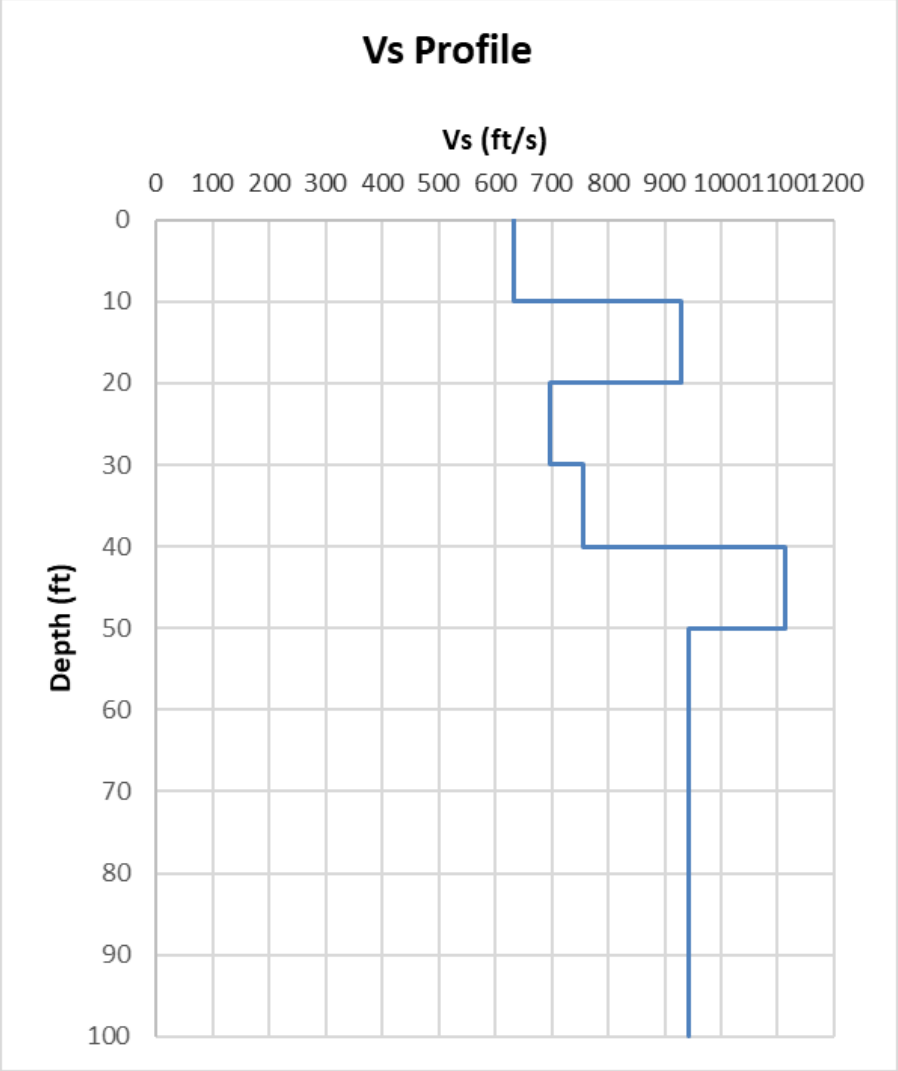
Source Set ↳ Source	Type	r	m	ε_0	lon	lat	az	%
UC33brAvg_FM31	System							40.90
San Jacinto (Stepovers Combined) [2]		1.40	7.92	1.02	116.964°W	33.784°N	65.28	36.90
San Andreas (San Bernardino S) [6]		24.73	7.92	2.32	116.820°W	33.959°N	36.00	1.68
UC33brAvg_FM32	System							40.81
San Jacinto (Stepovers Combined) [2]		1.40	7.92	1.02	116.964°W	33.784°N	65.28	36.78
San Andreas (San Bernardino S) [6]		24.73	7.92	2.32	116.820°W	33.959°N	36.00	1.69
UC33brAvg_FM31 (opt)	Grid							9.15
PointSourceFinite: -116.977, 33.811		6.29	5.59	1.86	116.977°W	33.811°N	0.00	2.58
PointSourceFinite: -116.977, 33.811		6.29	5.59	1.86	116.977°W	33.811°N	0.00	2.58
UC33brAvg_FM32 (opt)	Grid							9.14
PointSourceFinite: -116.977, 33.811		6.29	5.59	1.86	116.977°W	33.811°N	0.00	2.58
PointSourceFinite: -116.977, 33.811		6.29	5.59	1.86	116.977°W	33.811°N	0.00	2.58

W.O. 9071-A-IE
Plate C-8

Calculated V_{s30}

V_{s30} = 861.3 ft/s

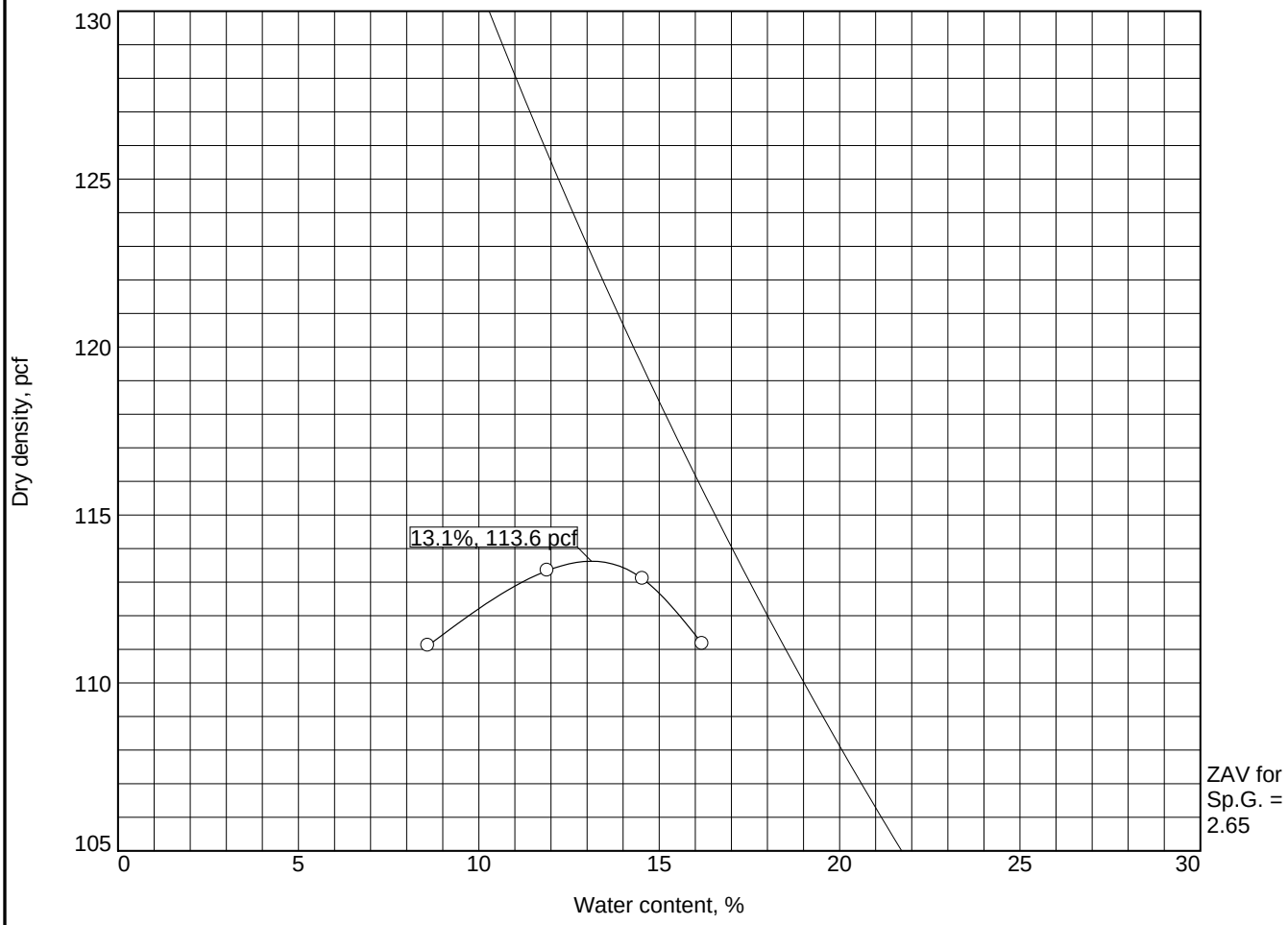
di	vsi	di/vsi
10	634	0.015773
10	929	0.010764
10	698	0.014327
10	755	0.013245
10	1114	0.008977
50	943	0.053022
100		**0.116108**



APPENDIX D

LABORATORY DATA

COMPACTION TEST REPORT For Curve No. B-2, 0-5ft



Test specification: ASTM D 1557-12 Method A Modified

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > #4	% < No.200
	USCS	AASHTO						
0-5ft	SM			2.65			1.0	

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 113.6 pcf Optimum moisture = 13.1 %	Olive Gray Silty Sand

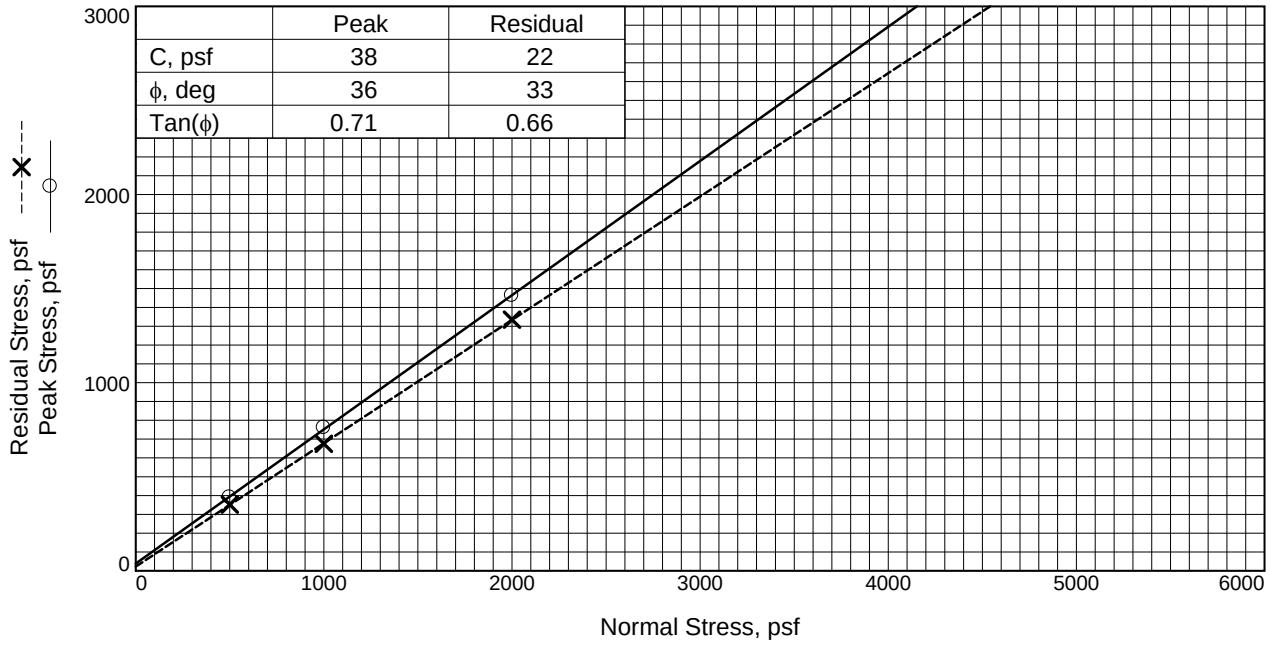
Project No. 9071-A-IE **Client:** Corcoran Construction, Inc.
Project: Bradley Gardens Skilled Nursing Facility
Date: 12-5-25
○ **Source of Sample:** B-2 **Sample Number:** B-2

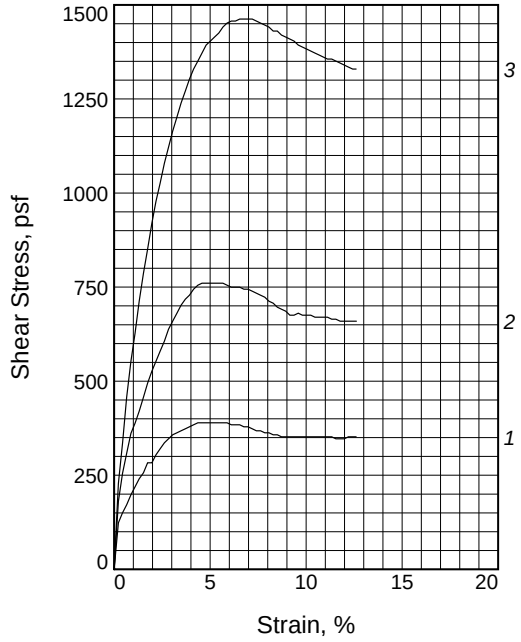
GeoSoils, Inc.

Remarks:

Plate D-1

Tested By: DG **Checked By:** TR





Sample No.		1	2	3
Initial	Water Content, %	7.4	7.4	7.4
	Dry Density, pcf	103.6	105.9	104.8
	Saturation, %	32.9	34.9	33.9
	Void Ratio	0.5967	0.5617	0.5784
	Diameter, in.	2.38	2.38	2.38
	Height, in.	1.00	1.00	1.00
At Test	Water Content, %	19.3	17.9	18.7
	Dry Density, pcf	104.7	107.4	108.7
	Saturation, %	88.2	88.0	95.0
	Void Ratio	0.5808	0.5399	0.5216
	Diameter, in.	2.38	2.38	2.38
	Height, in.	0.99	0.99	0.96
Normal Stress, psf		500	1000	2000
Peak Stress, psf		389	760	1462
Strain, %		5.0	5.2	6.8
Residual Stress, psf		352	675	1335
Strain, %		8.9	9.2	12.2
Strain rate, in./min.		0.008	0.008	0.008

Sample Type: In-Situ
Description: Gray Silty Sand

Specific Gravity= 2.65
Remarks:

Figure _____

Client: Corcoran Construction, Inc.

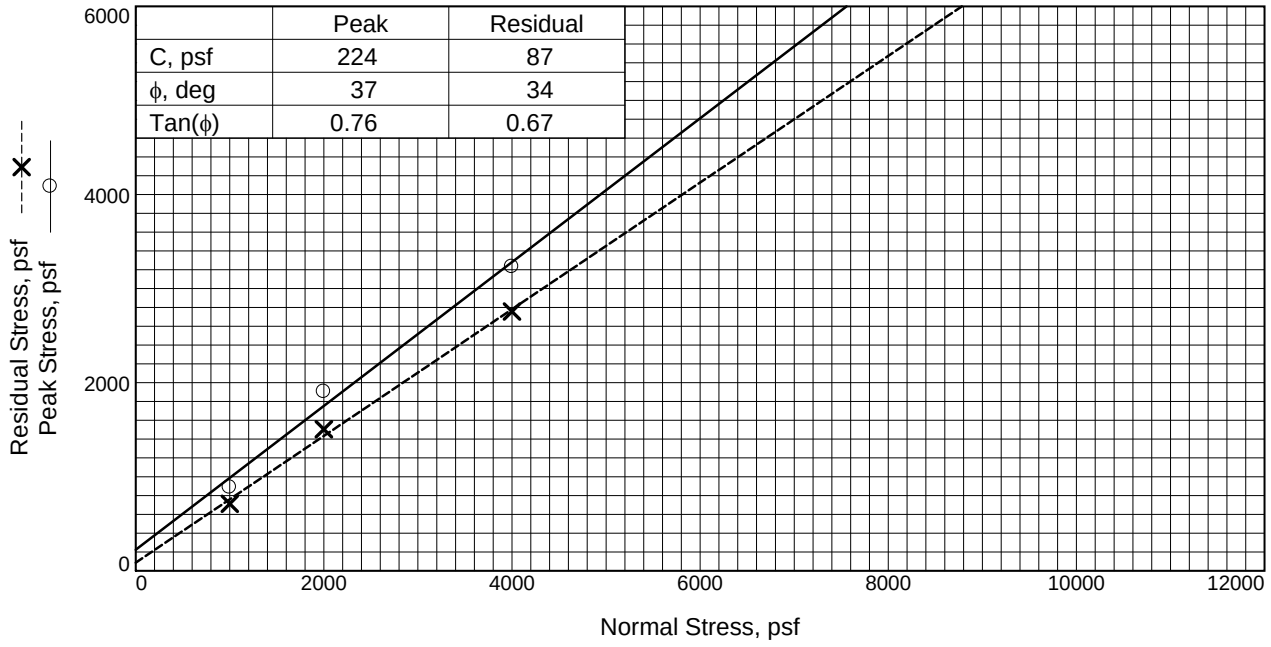
Project: Bradley Gardens Skilled Nursing Facility

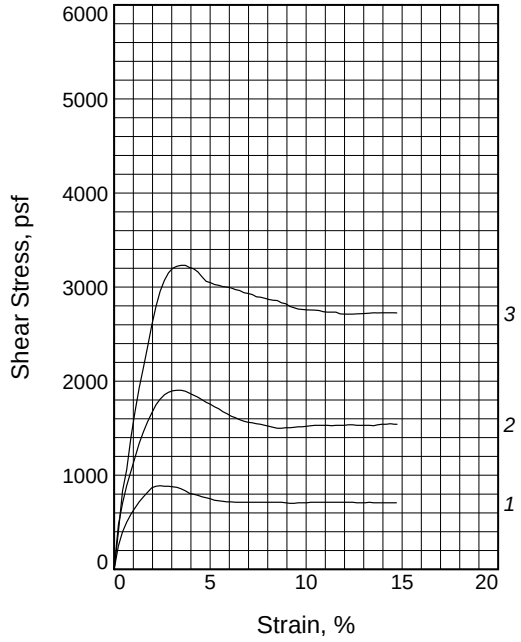
Source of Sample: B-1 **Depth:** 7.5ft
Sample Number: B-1
Proj. No.: 9071-A-IE

GeoSoils, Inc.

Tested By: TR **Checked By:** TR

Plate D-2





Sample No.		1	2	3
Initial	Water Content, %	11.7	11.7	11.7
	Dry Density, pcf	113.5	111.6	113.7
	Saturation, %	67.7	64.2	68.2
	Void Ratio	0.4579	0.4830	0.4549
	Diameter, in.	2.38	2.38	2.38
	Height, in.	1.00	1.00	1.00
At Test	Water Content, %	12.7	16.4	14.8
	Dry Density, pcf	114.5	112.8	116.4
	Saturation, %	75.5	93.2	93.1
	Void Ratio	0.4448	0.4667	0.4215
	Diameter, in.	2.38	2.38	2.38
	Height, in.	0.99	0.99	0.98
Normal Stress, psf		1000	2000	4000
Peak Stress, psf		888	1904	3232
Strain, %		2.4	3.3	3.5
Residual Stress, psf		713	1505	2756
Strain, %		6.3	8.9	10.2
Strain rate, in./min.		0.003	0.003	0.003

Sample Type: In-Situ
Description: Dark Gray Silty Sand

Specific Gravity= 2.65
Remarks:

Figure _____

Client: Corcoran Construction, Inc.

Project: Bradley Gardens Skilled Nursing Facility

Source of Sample: B-4 **Depth:** 15.0ft
Sample Number: B-4
Proj. No.: 9071-A-IE

GeoSoils, Inc.

Tested By: TR **Checked By:** TR

Plate D-3

GeoSoils, Inc.

1817 Aston Ave., Suite 104, Carlsbad CA 92008
Phone (760) 438-3155

CORROSION REPORT SUMMARY

Project No: **9071-A-IE**
Project Name: **Corcoran Construction, Inc.**
Report Date: **December 9, 2025**

SAMPLE ID	pH (H+)	Minimum Resistivity (ohm/cm)	Sulfate Content (wt%)	Chloride Content (mg/kg)
B-1, 0-5ft	8.0	3500	0.005	21

Sample testing in accordance with: pH - CTM 643, Resistivity - CTM 643
Sulfate - CTM 417, Chloride - CTM 422

Remarks: _____

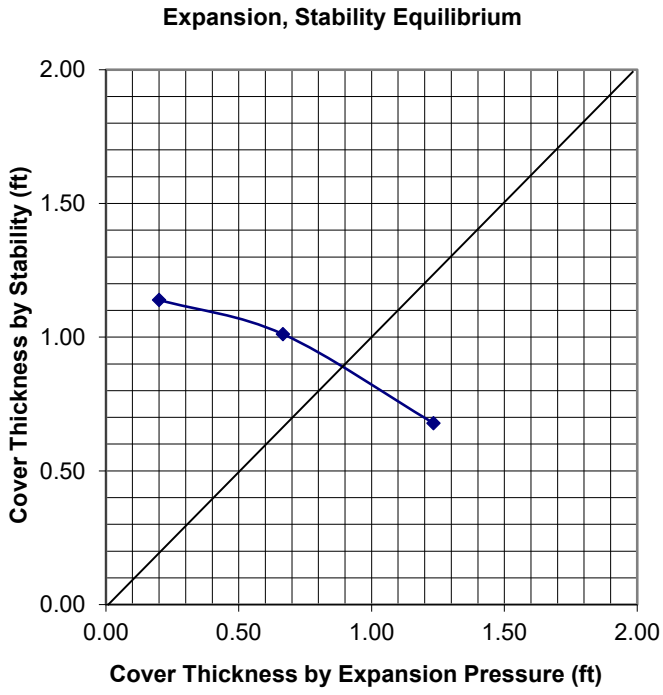
TEST SPECIMEN		A	B	C	D
Compactor air pressure	PSI	330	200	110	
Water added	%	3.3	5.6	7.9	
Moisture at compaction	%	15.6	17.9	20.2	
Height of sample	IN	2.42	2.52	2.55	
Dry density	PCF	112.6	107.0	103.8	
R-Value by exudation		47	21	11	
R-Value by exudation, corrected		44	21	11	
Exudation pressure	PSI	390	213	107	
Stability thickness	FT	0.68	1.01	1.14	
Expansion pressure thickness	FT	1.23	0.67	0.20	

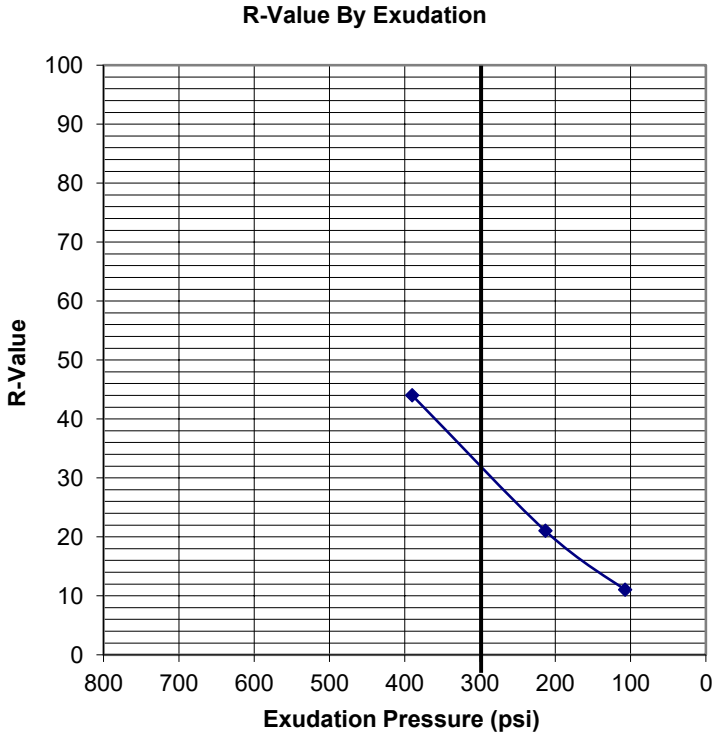
DESIGN CALCULATION DATA

Traffic index, assumed	5.0
Gravel equivalent factor, assumed	1.25
Expansion, stability equilibrium	0.88
R-Value by expansion	31
R-Value by exudation	32
R-Value at equilibrium	**31**

SAMPLE INFORMATION

Sample Location:	B-1, 0-5ft
Sample Description:	Gray Silty Sand
Notes:	-
	0% Retained on 3/4 inch sieve
Test Method:	Cal-Trans Test 301





GeoSoils, Inc.
1817 Aston Avenue, Suite 104
Carlsbad, CA 92008
Telephone: (760) 438-3155
Fax: (760) 931-0915

9/2/2010

R - VALUE TEST RESULTS

Project: Corcoran Construction

Number: 9071-A-IE

Date: December 2025 Plate: D-5

APPENDIX E

SEISMIC SETTLEMENT ANALYSIS

TABLE OF CONTENTS

CPT-1 results

Summary data report	1
Input field data	8
Cyclic stress resistance results	26
Cyclic resistance ratio results	44
Liquefaction potential index data	62
Vertical settlements summary report	71
Vertical settlements data report	72
Strength loss data report	87

CPT-2 results

Summary data report	106
Input field data	113
Cyclic stress resistance results	131
Cyclic resistance ratio results	149
Liquefaction potential index data	167
Vertical settlements summary report	176
Vertical settlements data report	177
Strength loss data report	192

CPT-3 results

Summary data report	211
Input field data	218
Cyclic stress resistance results	239
Cyclic resistance ratio results	260
Liquefaction potential index data	281
Vertical settlements summary report	291
Vertical settlements data report	292
Strength loss data report	309

CPT-4 results

Summary data report	331
Input field data	338
Cyclic stress resistance results	356
Cyclic resistance ratio results	374
Liquefaction potential index data	392
Vertical settlements summary report	401
Vertical settlements data report	402
Strength loss data report	417

Kehoe Testing and Engineering
714-901-7270
steve@kehoetesting.com
www.kehoetesting.com

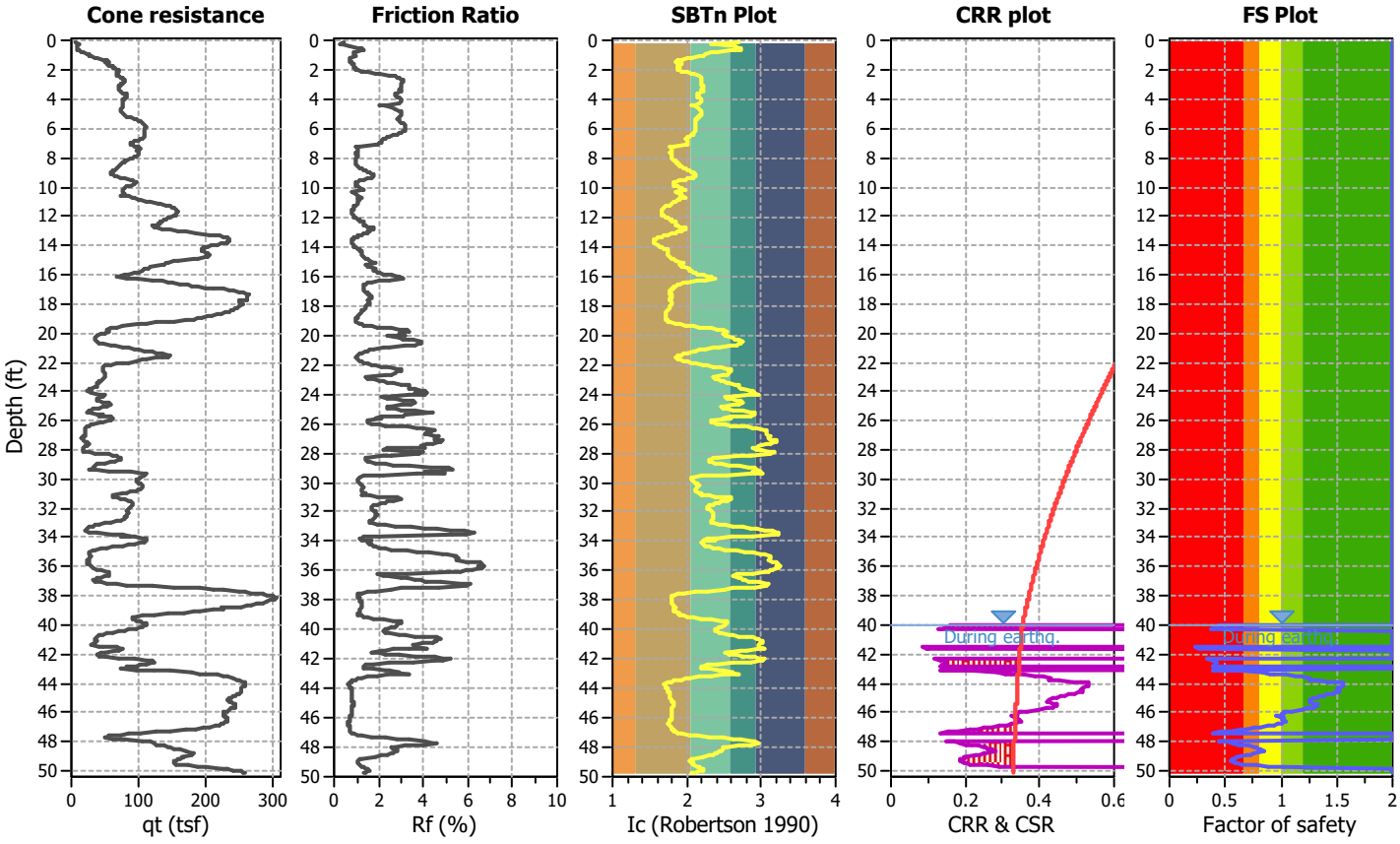
LIQUEFACTION ANALYSIS REPORT

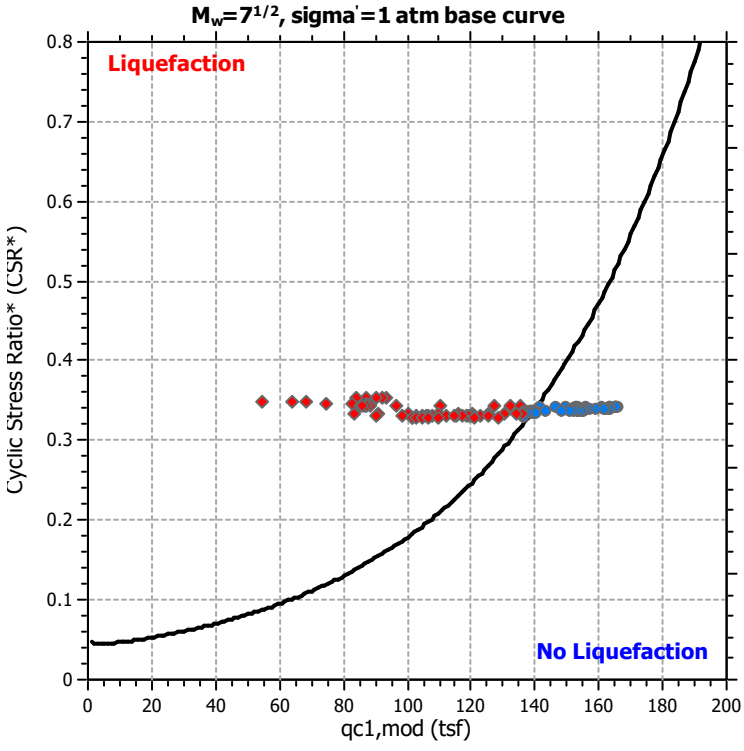
Project title : GeoSoils / Bradley Gardens **Location : 980 W. 7th St, San Jacinto, CA**

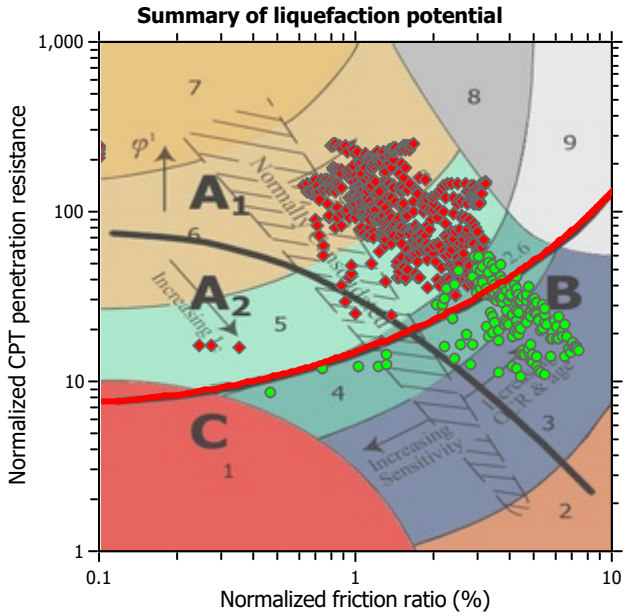
CPT file : CPT-1

Input parameters and analysis data

Analysis method:	Moss et al. (2006)	G.W.T. (in-situ):	100.00 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	Moss et al. (2006)	G.W.T. (earthq.):	40.00 ft	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	1	Fill weight:	N/A	Limit depth:	50.00 ft
Earthquake magnitude M_w:	8.10	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	1.07	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

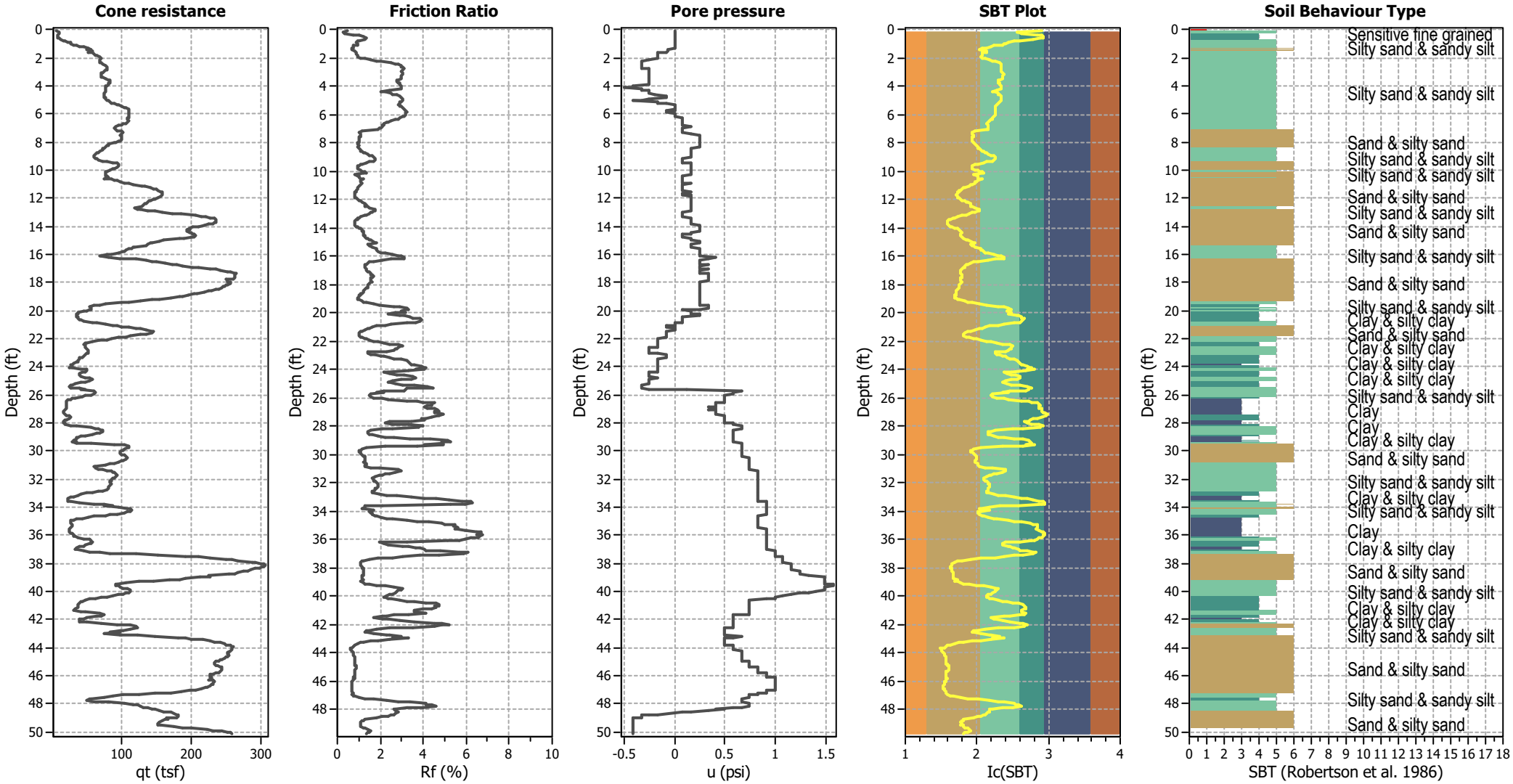






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



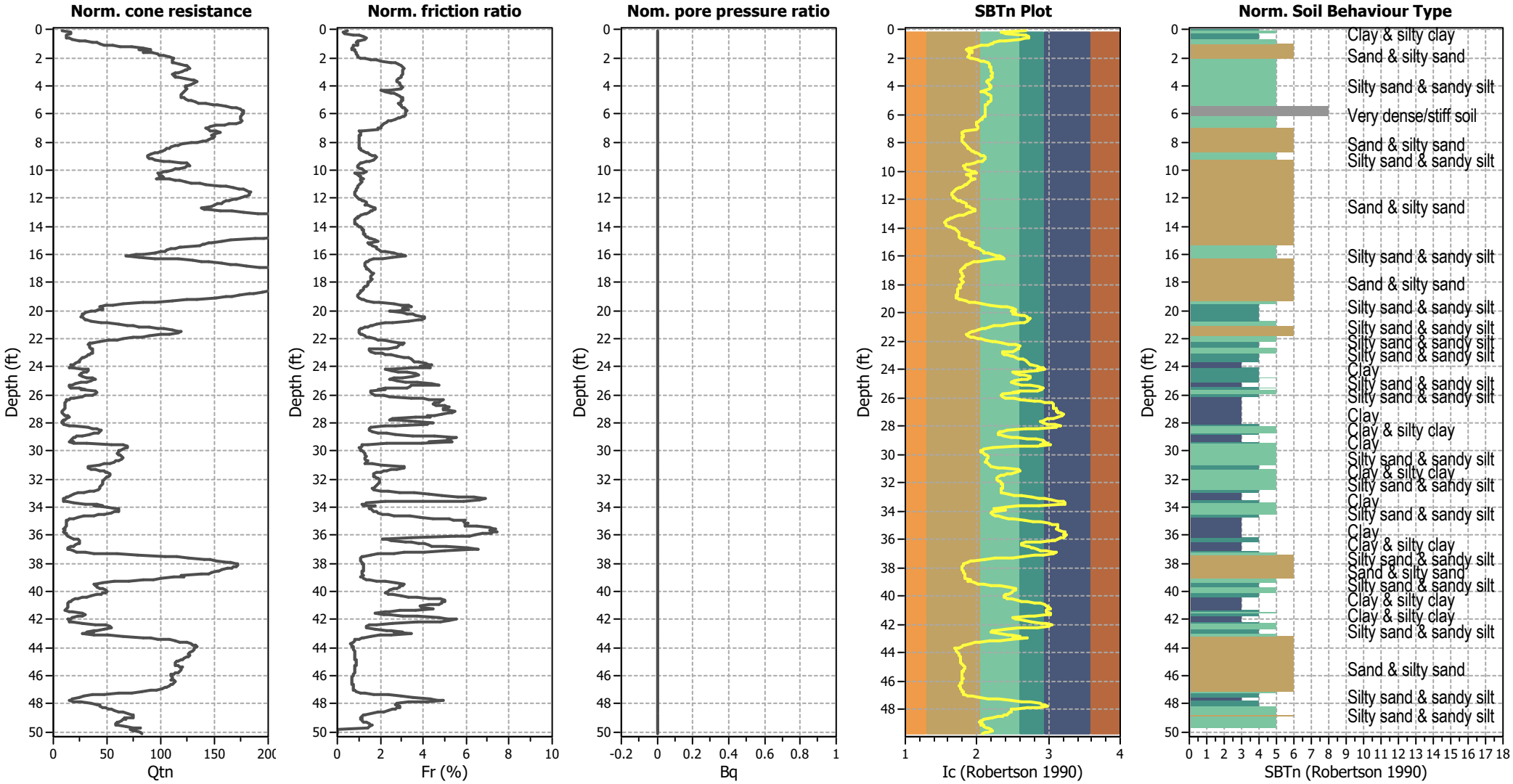
Input parameters and analysis data

Analysis method:	Moss et al. (2006)	Depth to water table (erthq.):	40.00 ft	Fill weight:	N/A
Fines correction method:	Moss et al. (2006)	Average results interval:	1	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	1.07	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	100.00 ft	Fill height:	N/A	Limit depth:	50.00 ft

SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

CPT basic interpretation plots (normalized)



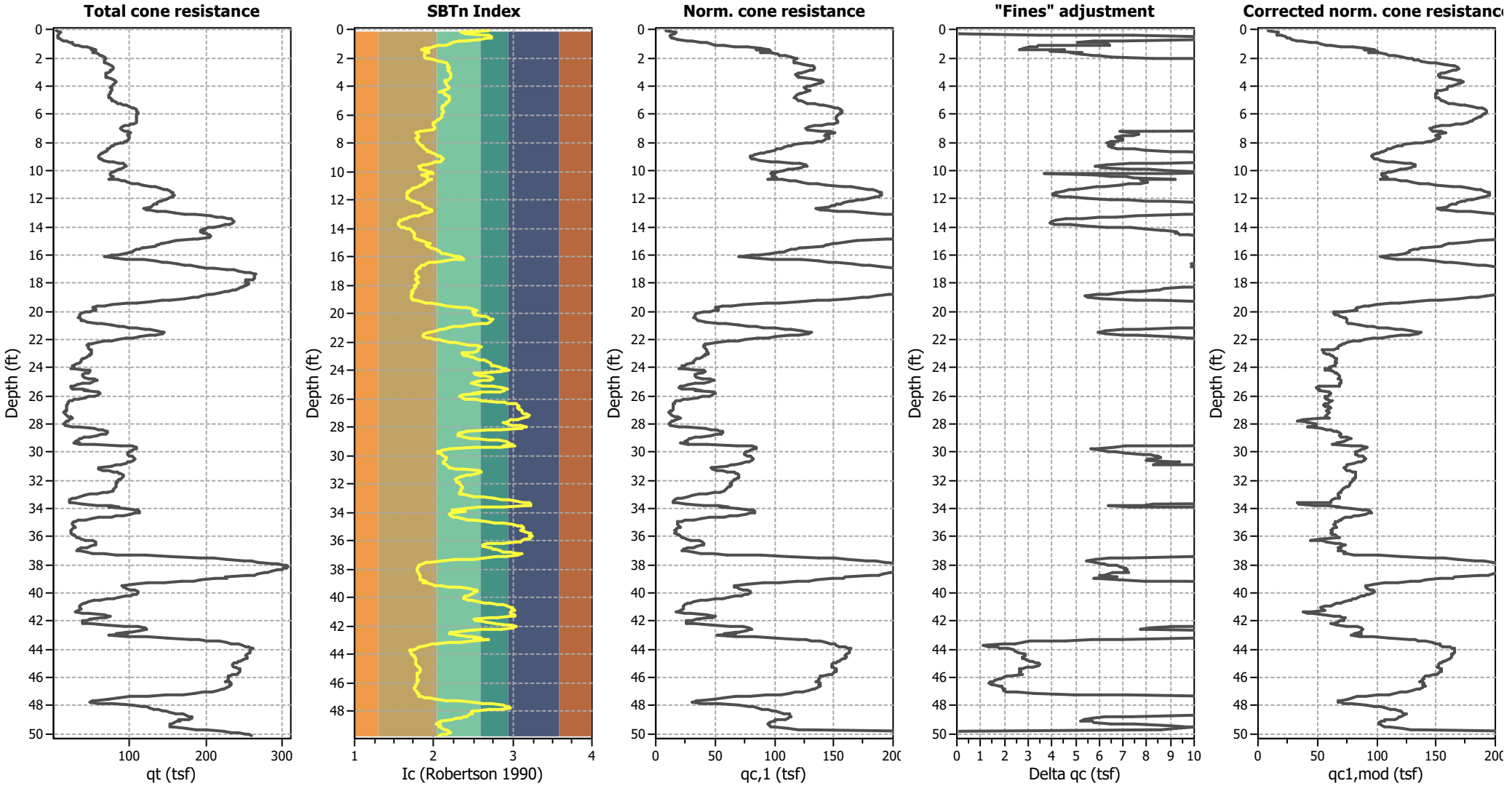
Input parameters and analysis data

Analysis method:	Moss et al. (2006)	Depth to water table (erthq.):	40.00 ft	Fill weight:	N/A
Fines correction method:	Moss et al. (2006)	Average results interval:	1	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	1.07	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	100.00 ft	Fill height:	N/A	Limit depth:	50.00 ft

SBTn legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

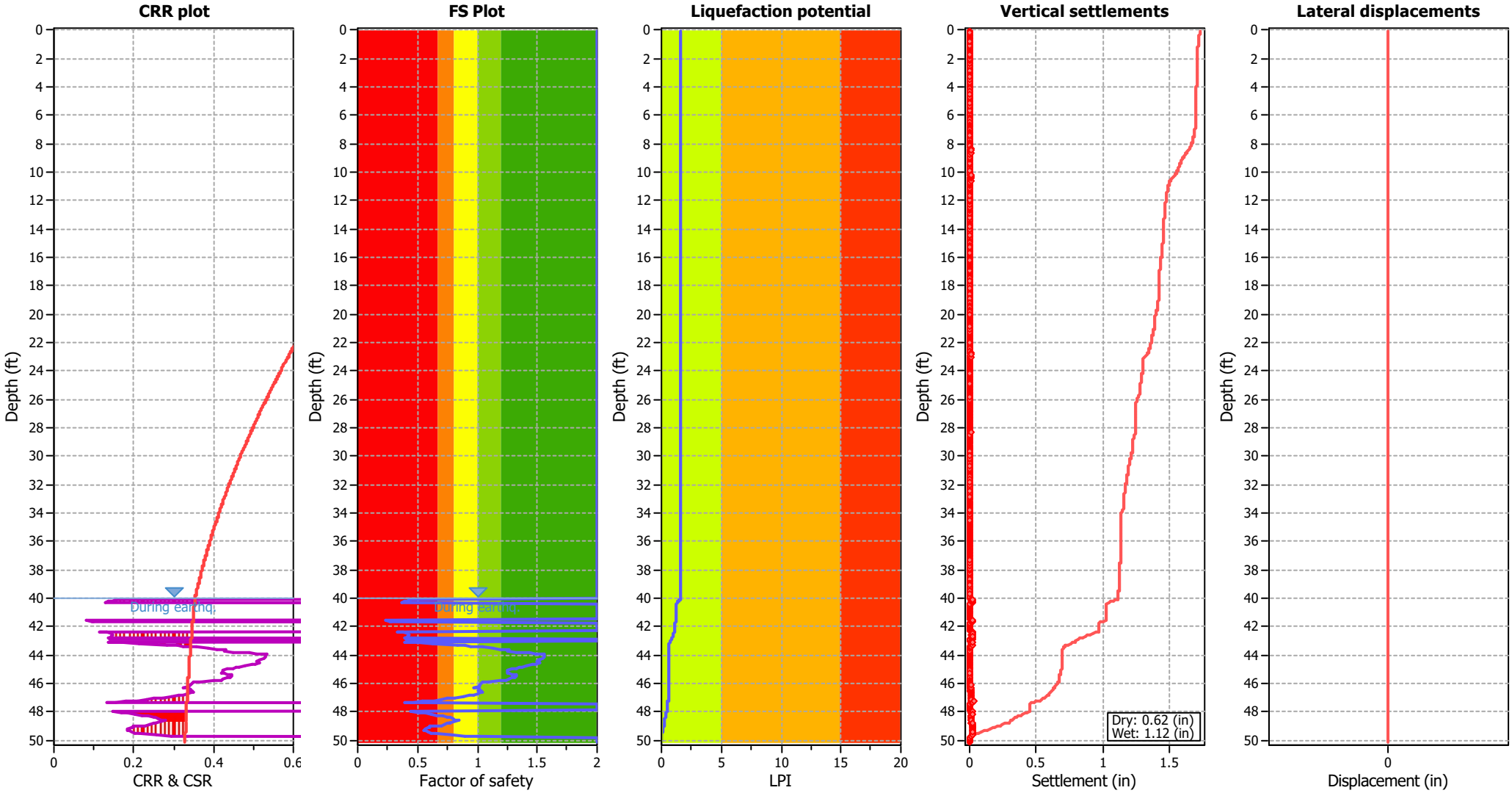
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	Moss et al. (2006)	Depth to water table (erthq.):	40.00 ft	Fill weight:	N/A
Fines correction method:	Moss et al. (2006)	Average results interval:	1	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	1.07	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	100.00 ft	Fill height:	N/A	Limit depth:	50.00 ft

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	Moss et al. (2006)	Depth to water table (erthq.):	40.00 ft	Fill weight:	N/A
Fines correction method:	Moss et al. (2006)	Average results interval:	1	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	1.07	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	100.00 ft	Fill height:	N/A	Limit depth:	50.00 ft

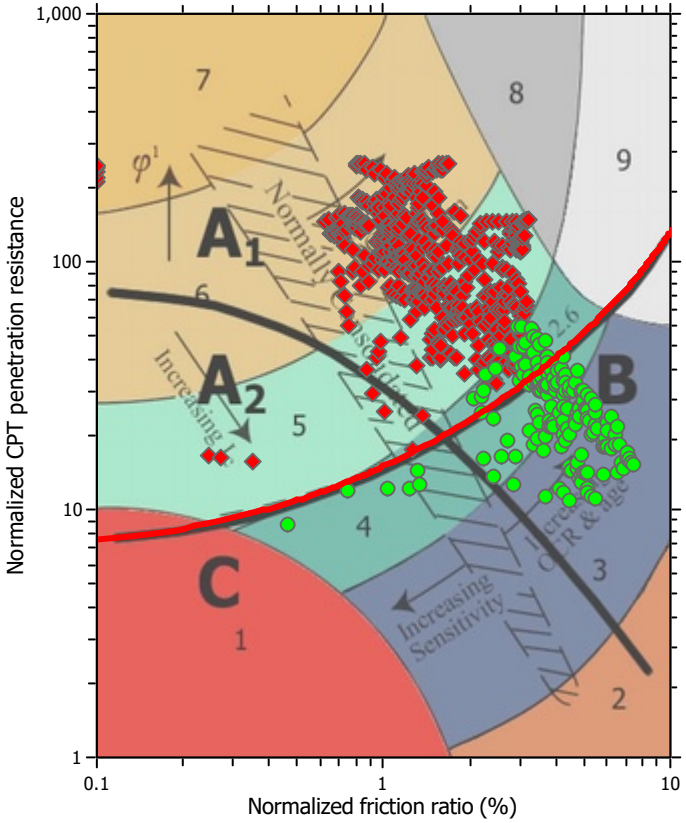
F.S. color scheme

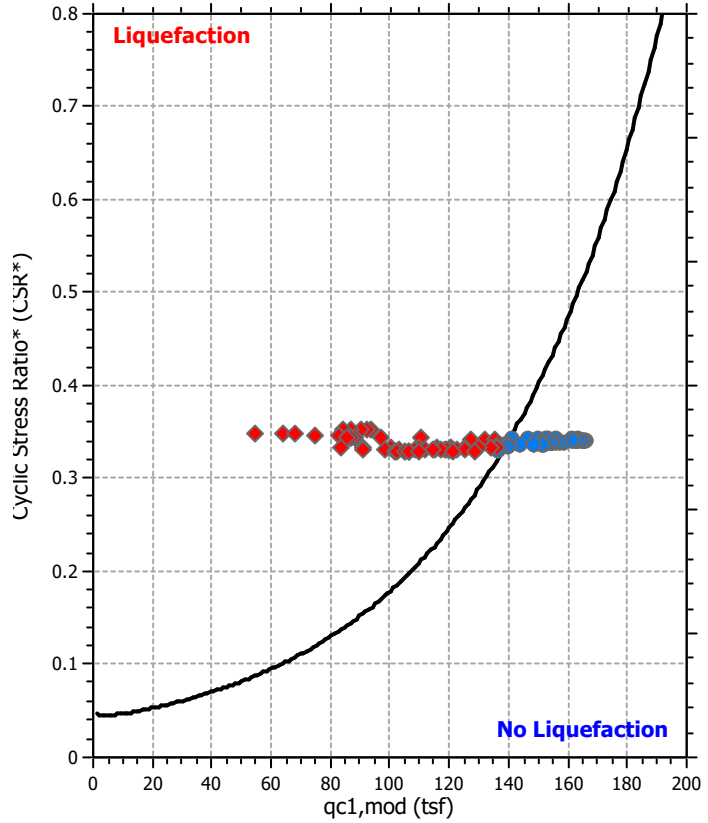
- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

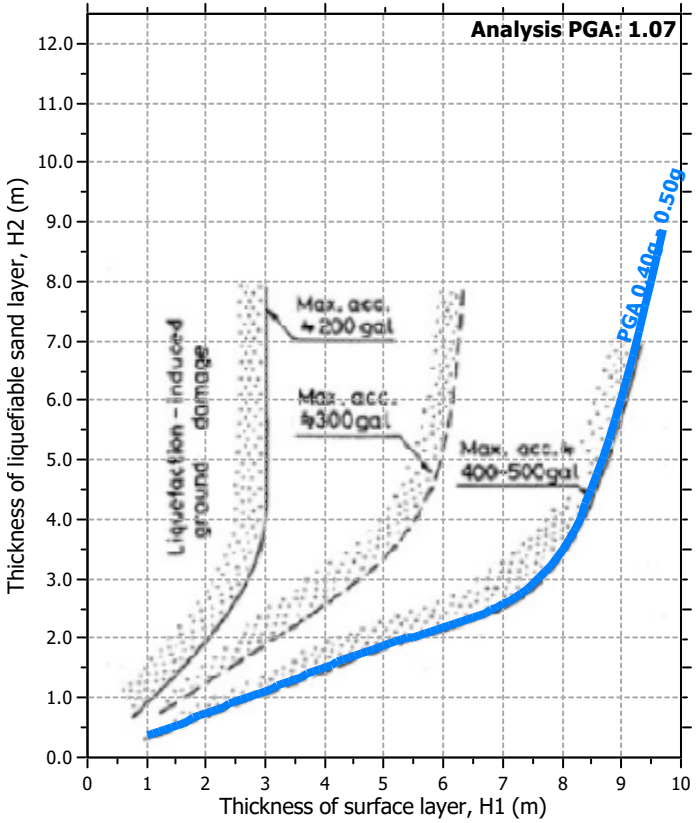
LPI color scheme

- Very high risk
- High risk
- Low risk

Liquefaction analysis summary plots



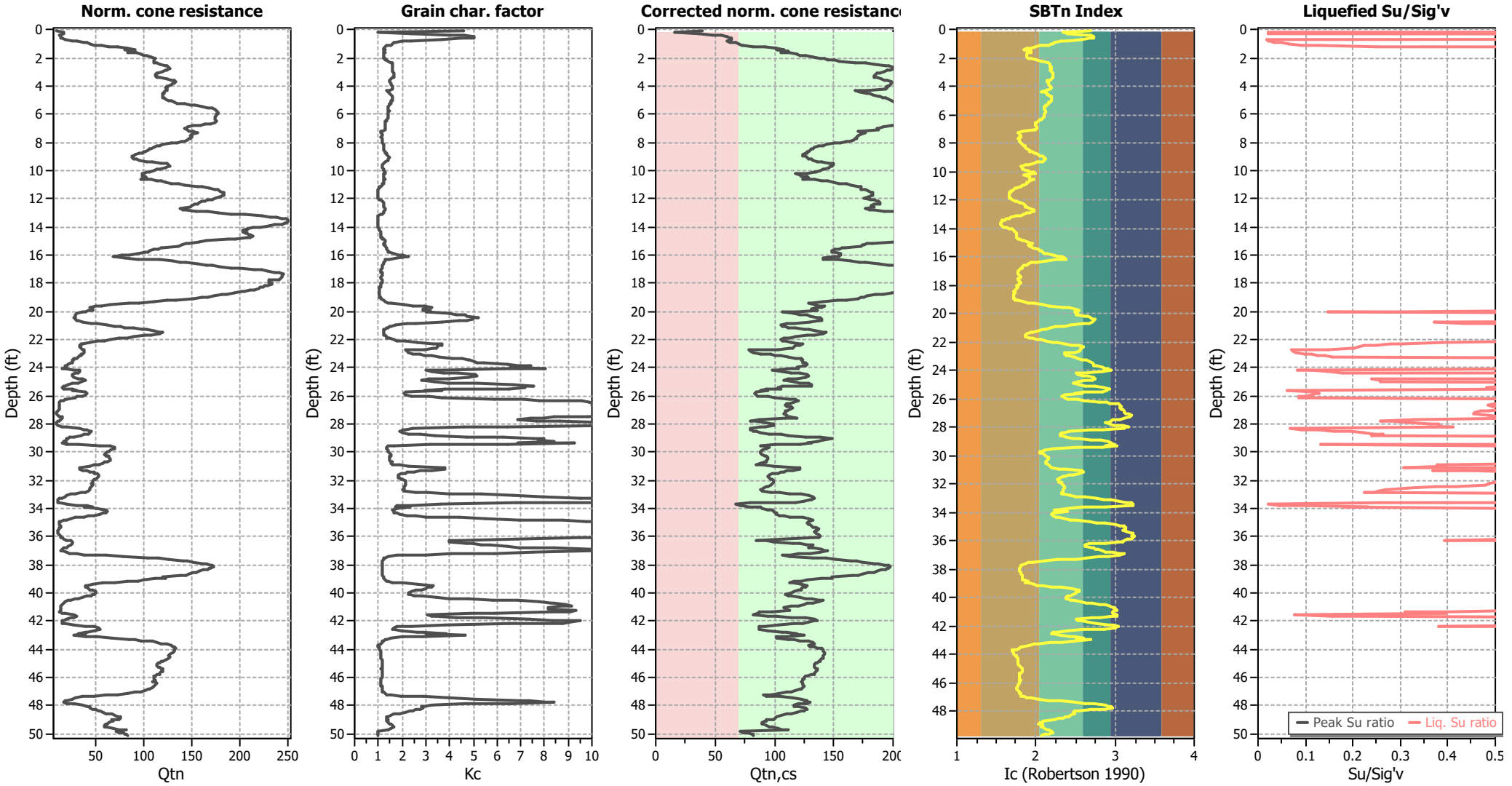




Input parameters and analysis data

Analysis method:	Moss et al. (2006)	Depth to water table (erthq.):	40.00 ft	Fill weight:	N/A
Fines correction method:	Moss et al. (2006)	Average results interval:	1	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	1.07	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	100.00 ft	Fill height:	N/A	Limit depth:	50.00 ft

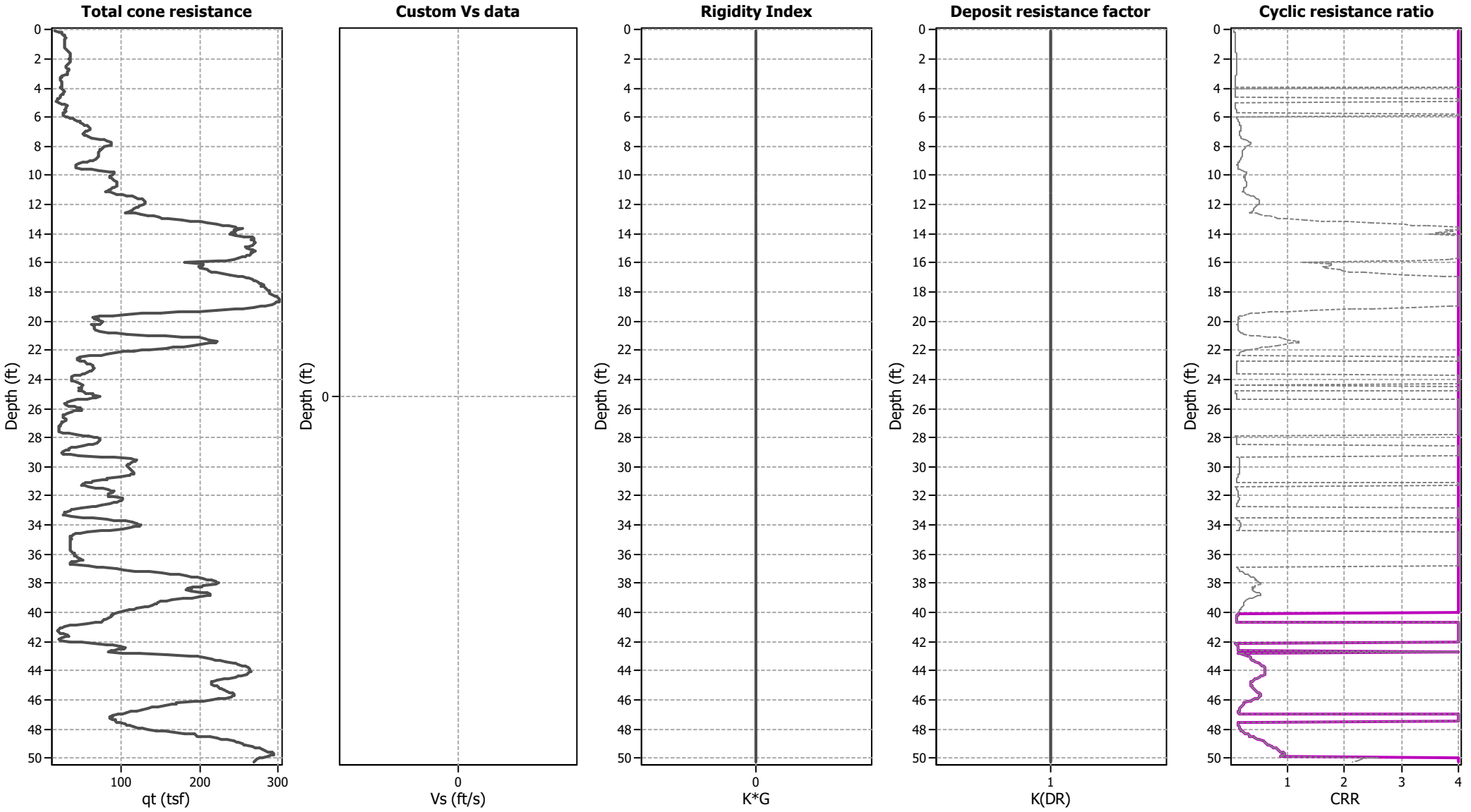
Check for strength loss plots (Robertson (2010))



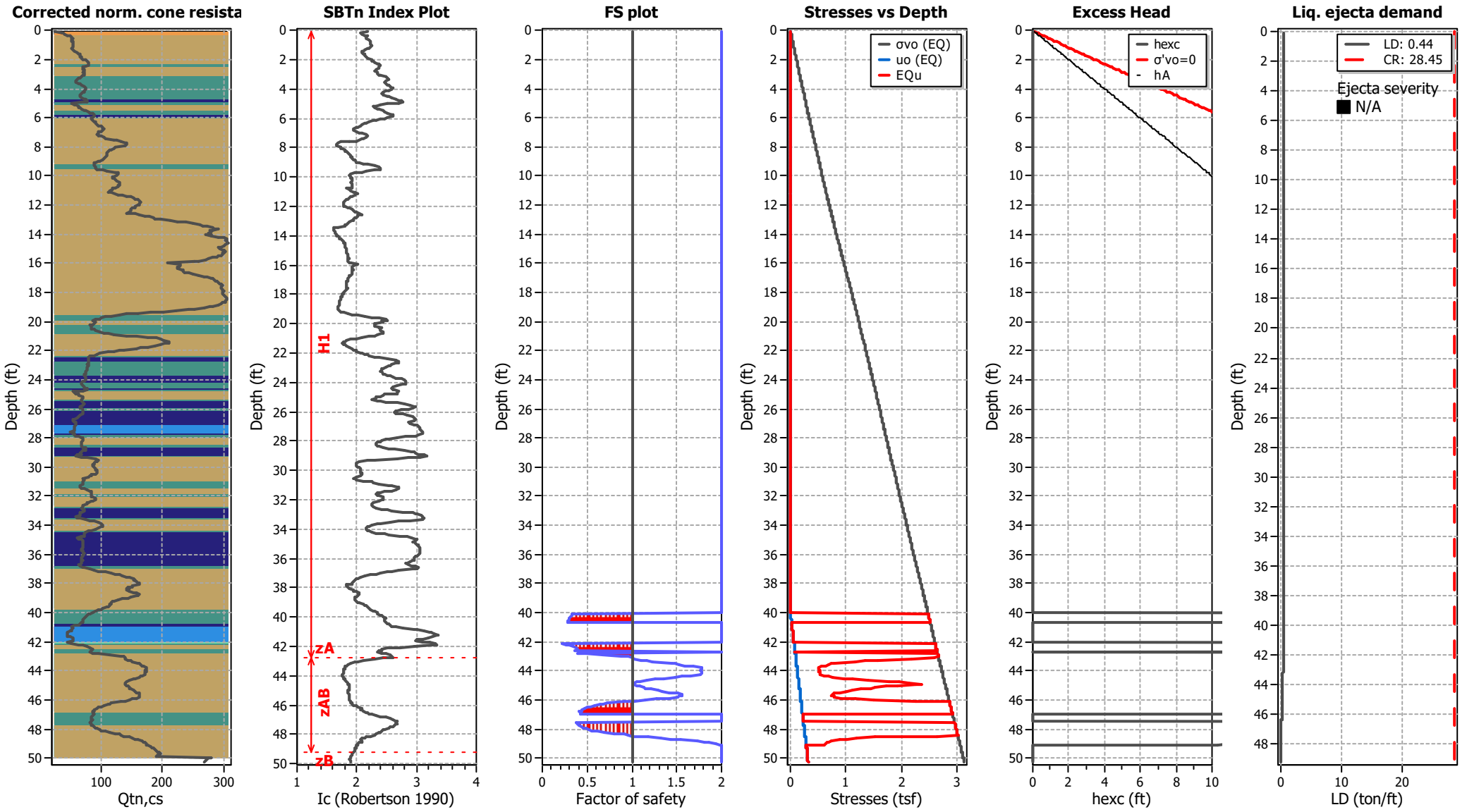
Input parameters and analysis data

Analysis method:	Moss et al. (2006)	Depth to water table (erthq.):	40.00 ft	Fill weight:	N/A
Fines correction method:	Moss et al. (2006)	Average results interval:	1	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	1.07	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	100.00 ft	Fill height:	N/A	Limit depth:	50.00 ft

Aging Calculation Estimation



Ejecta Severity Estimation



Kehoe Testing and Engineering
714-901-7270
steve@kehoetesting.com
www.kehoetesting.com

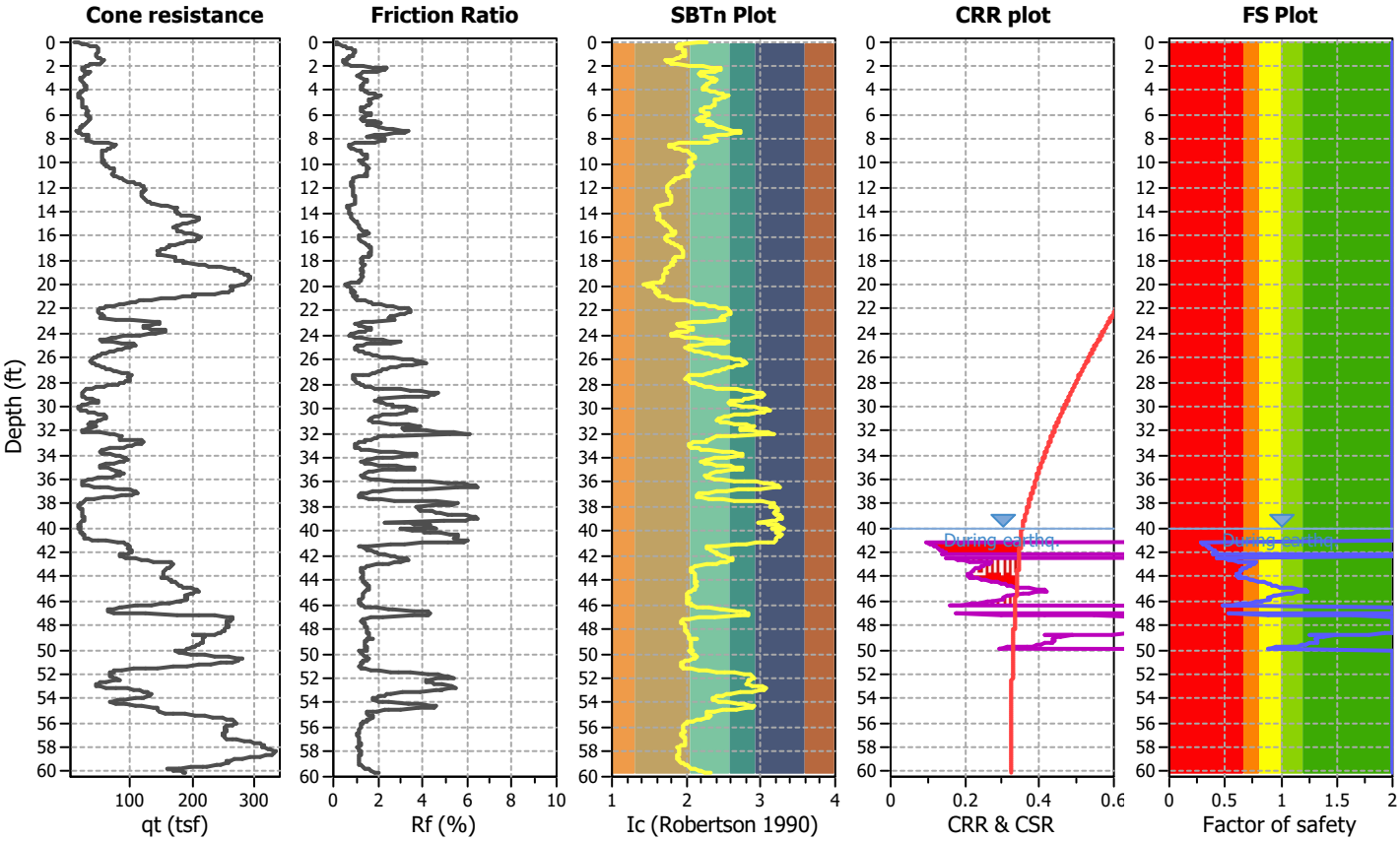
LIQUEFACTION ANALYSIS REPORT

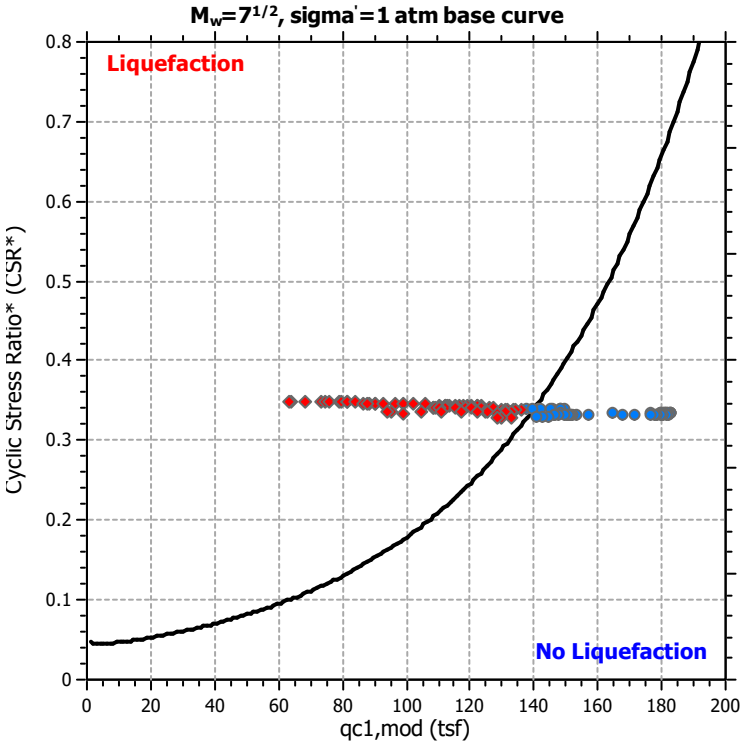
Project title : GeoSoils / Bradley Gardens **Location : 980 W. 7th St, San Jacinto, CA**

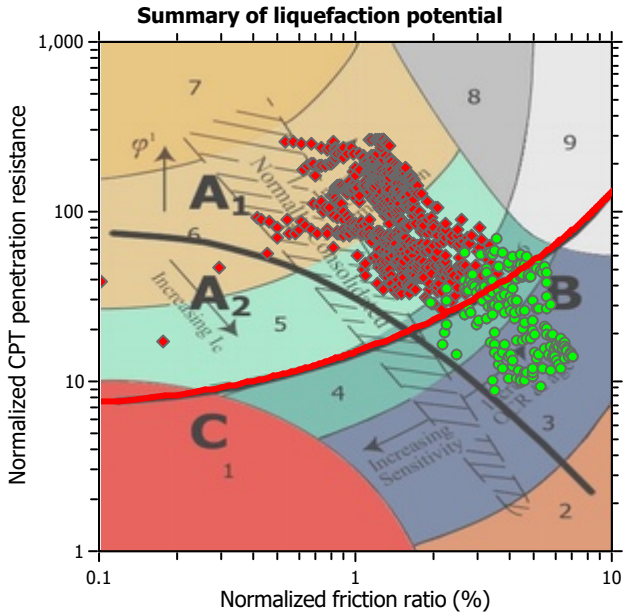
CPT file : CPT-3

Input parameters and analysis data

Analysis method:	Moss et al. (2006)	G.W.T. (in-situ):	100.00 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	Moss et al. (2006)	G.W.T. (earthq.):	40.00 ft	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	1	Fill weight:	N/A	Limit depth:	50.00 ft
Earthquake magnitude M_w:	8.10	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	1.07	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

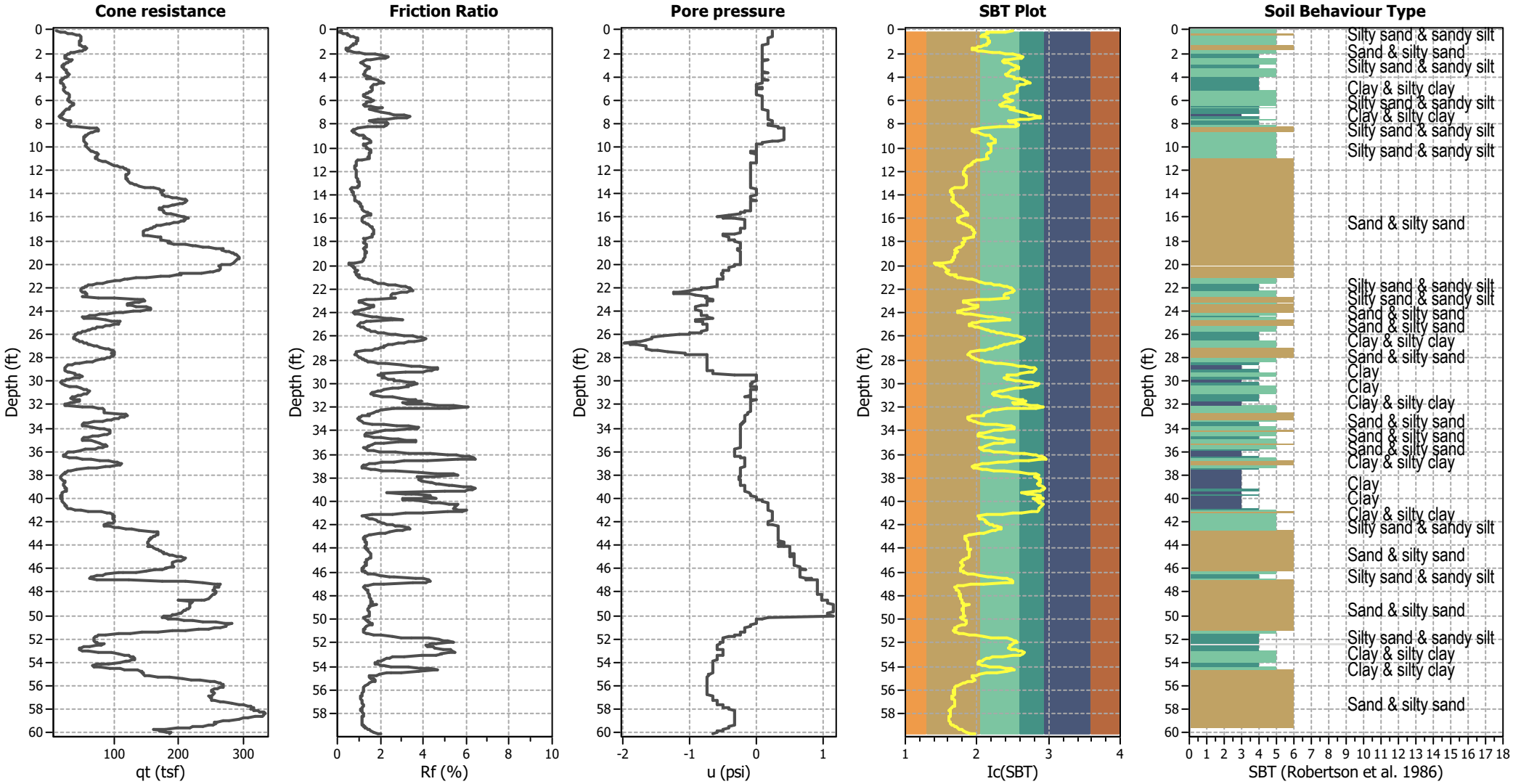






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



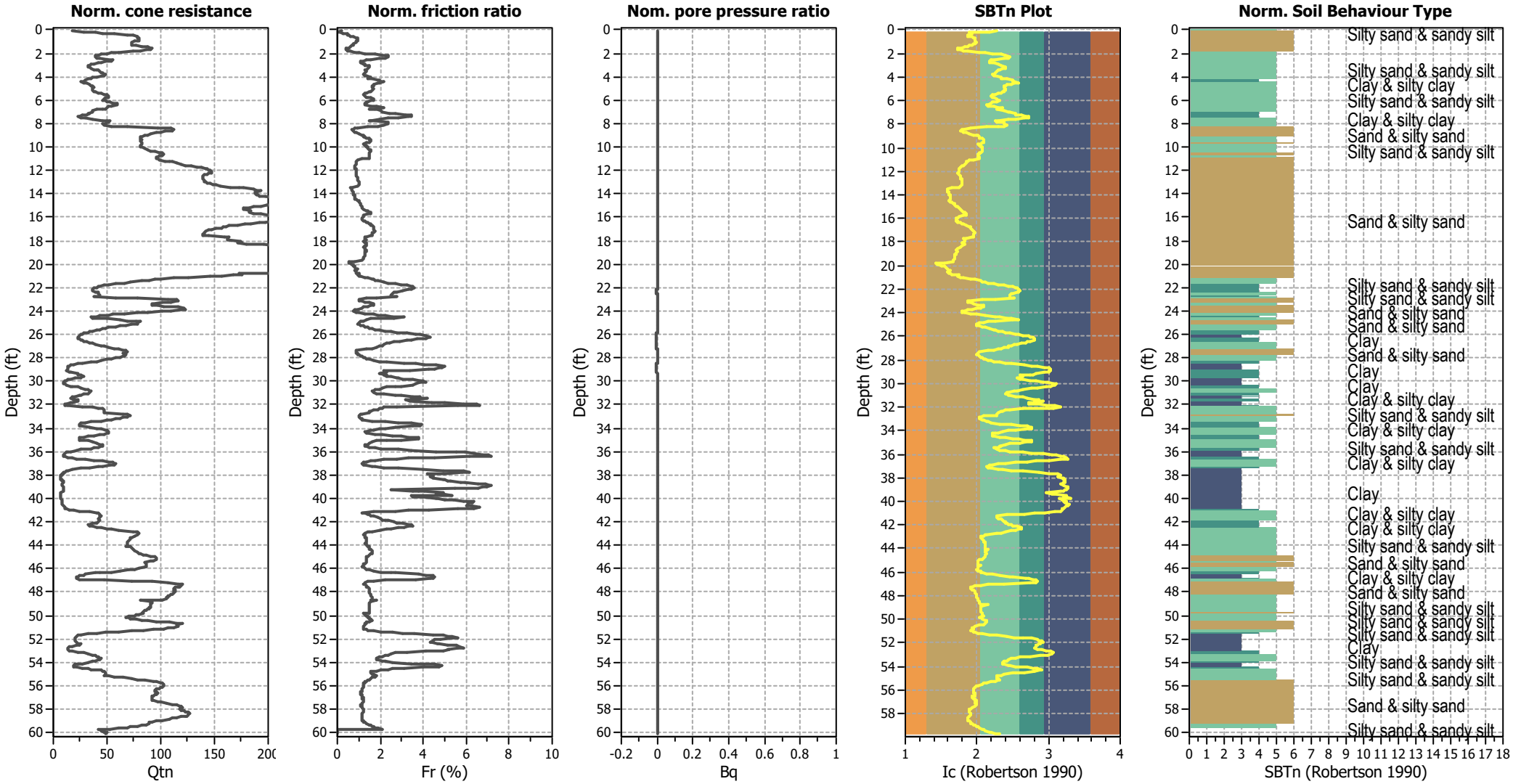
Input parameters and analysis data

Analysis method:	Moss et al. (2006)	Depth to water table (erthq.):	40.00 ft	Fill weight:	N/A
Fines correction method:	Moss et al. (2006)	Average results interval:	1	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	1.07	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	100.00 ft	Fill height:	N/A	Limit depth:	50.00 ft

SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

CPT basic interpretation plots (normalized)



Input parameters and analysis data

Analysis method:	Moss et al. (2006)	Depth to water table (erthq.):	40.00 ft	Fill weight:	N/A
Fines correction method:	Moss et al. (2006)	Average results interval:	1	Transition detect. applied:	No
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Peak ground acceleration:	1.07	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	100.00 ft	Fill height:	N/A	Limit depth:	50.00 ft

SBTn legend

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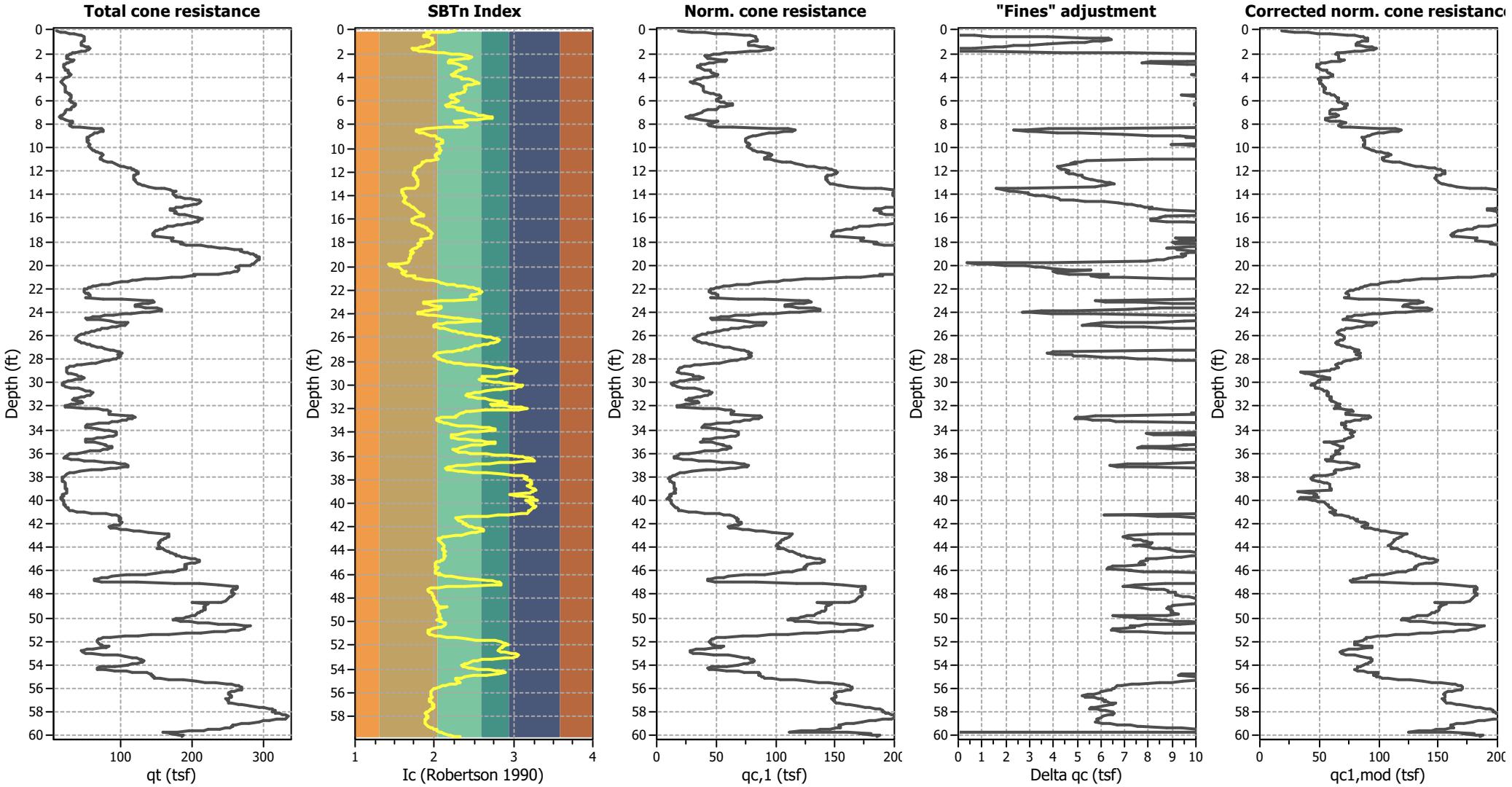
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

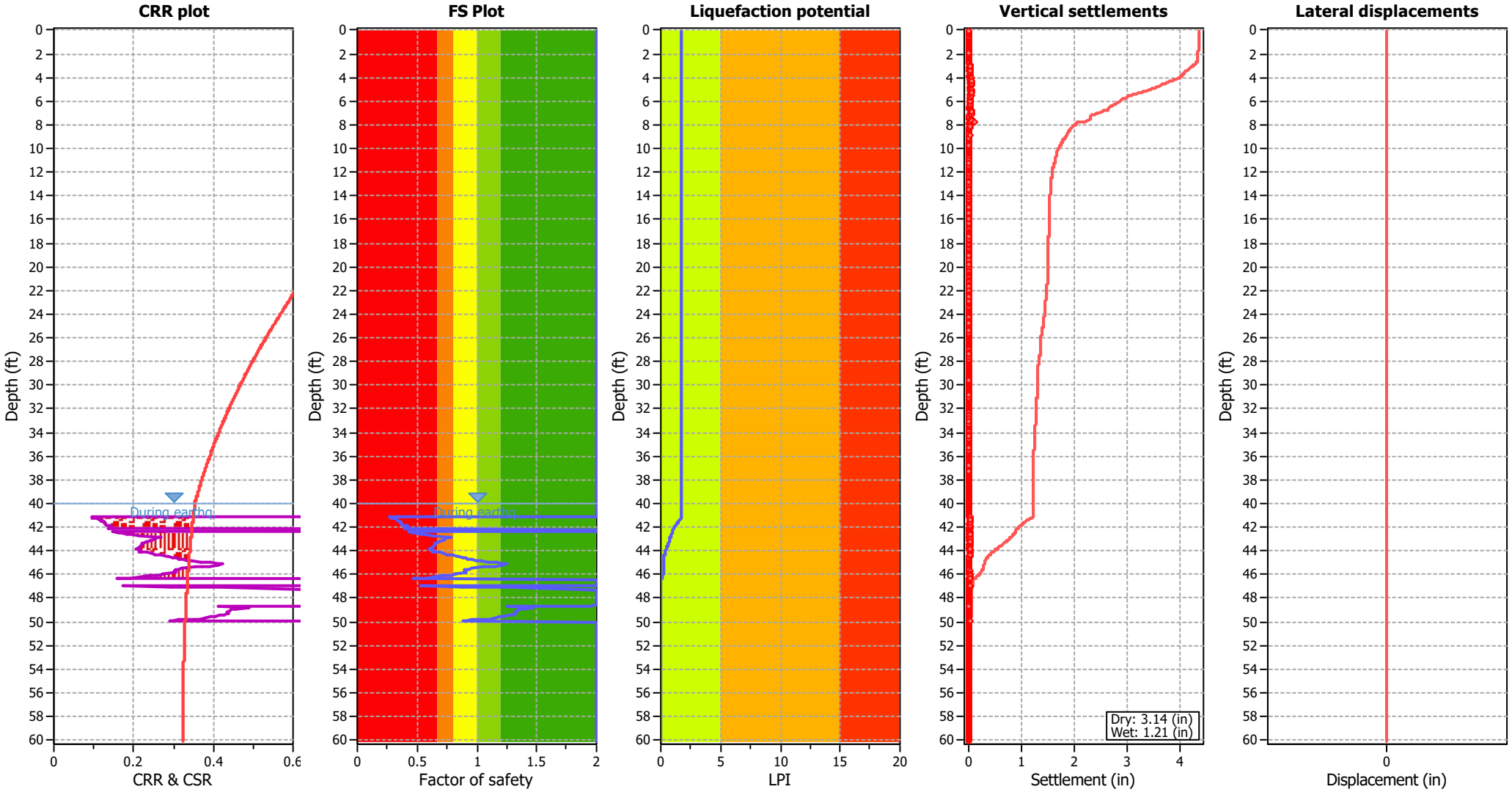
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	Moss et al. (2006)	Depth to water table (erthq.):	40.00 ft	Fill weight:	N/A
Fines correction method:	Moss et al. (2006)	Average results interval:	1	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	1.07	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	100.00 ft	Fill height:	N/A	Limit depth:	50.00 ft

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	Moss et al. (2006)	Depth to water table (erthq.):	40.00 ft	Fill weight:	N/A
Fines correction method:	Moss et al. (2006)	Average results interval:	1	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	1.07	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	100.00 ft	Fill height:	N/A	Limit depth:	50.00 ft

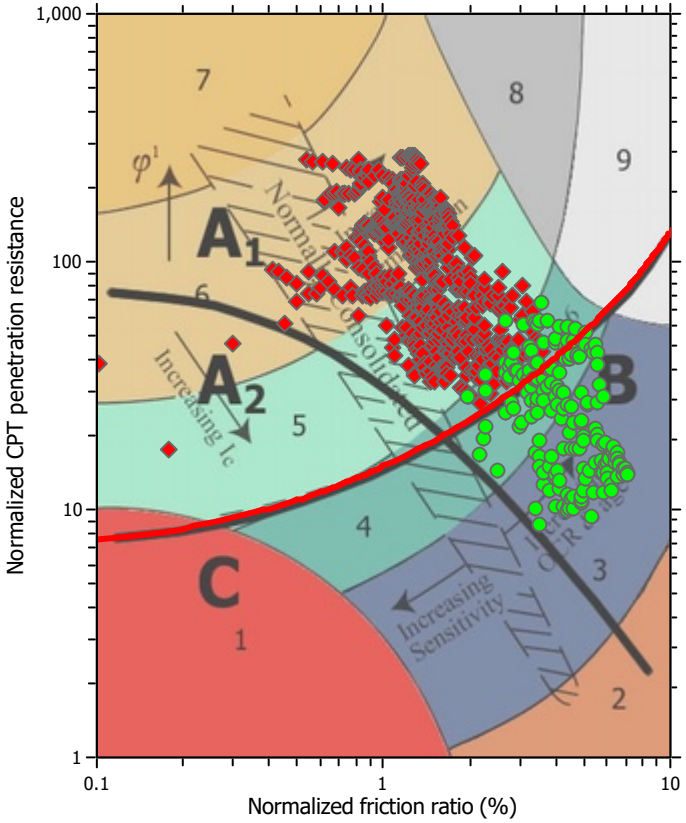
F.S. color scheme

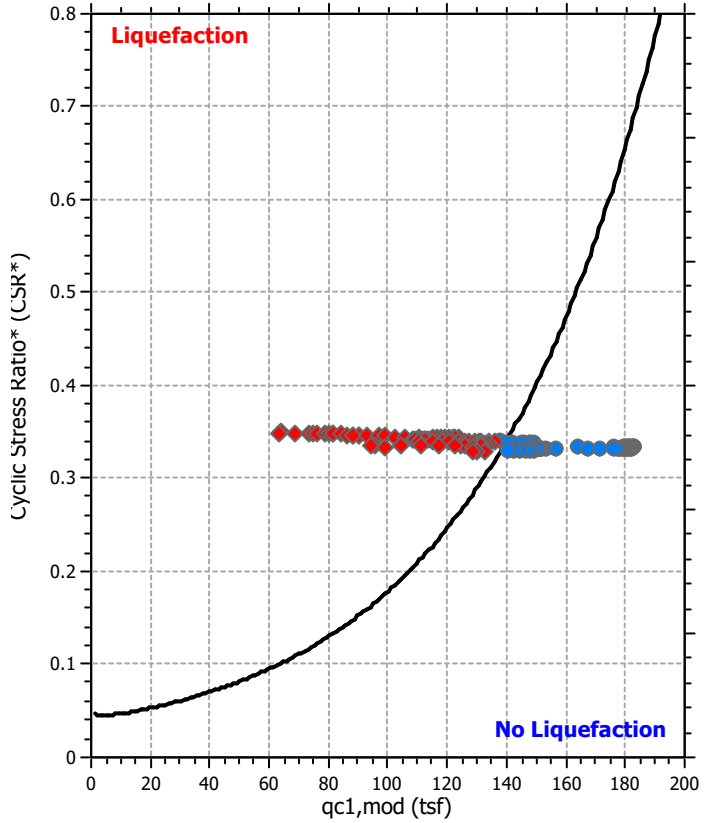
- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

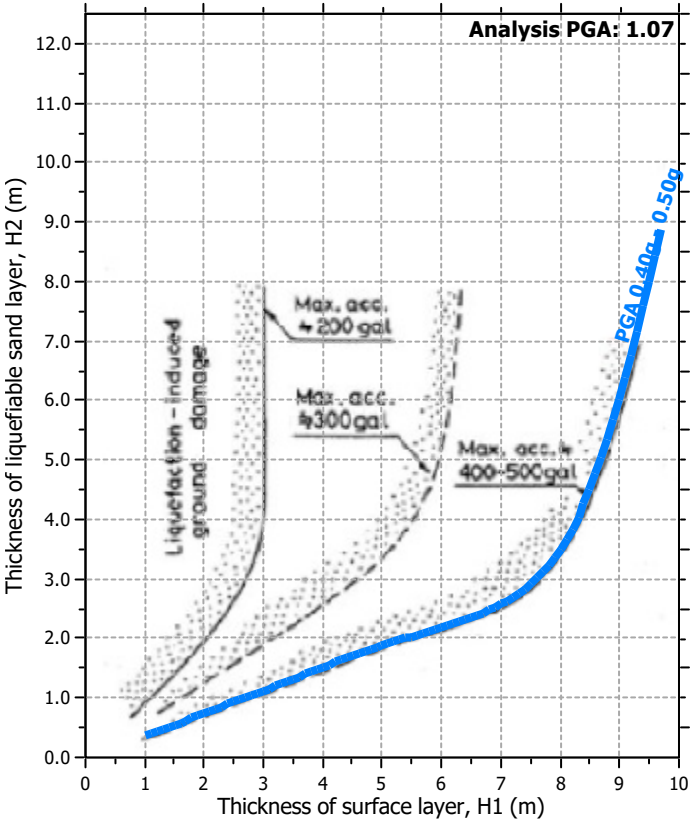
LPI color scheme

- Very high risk
- High risk
- Low risk

Liquefaction analysis summary plots







Input parameters and analysis data

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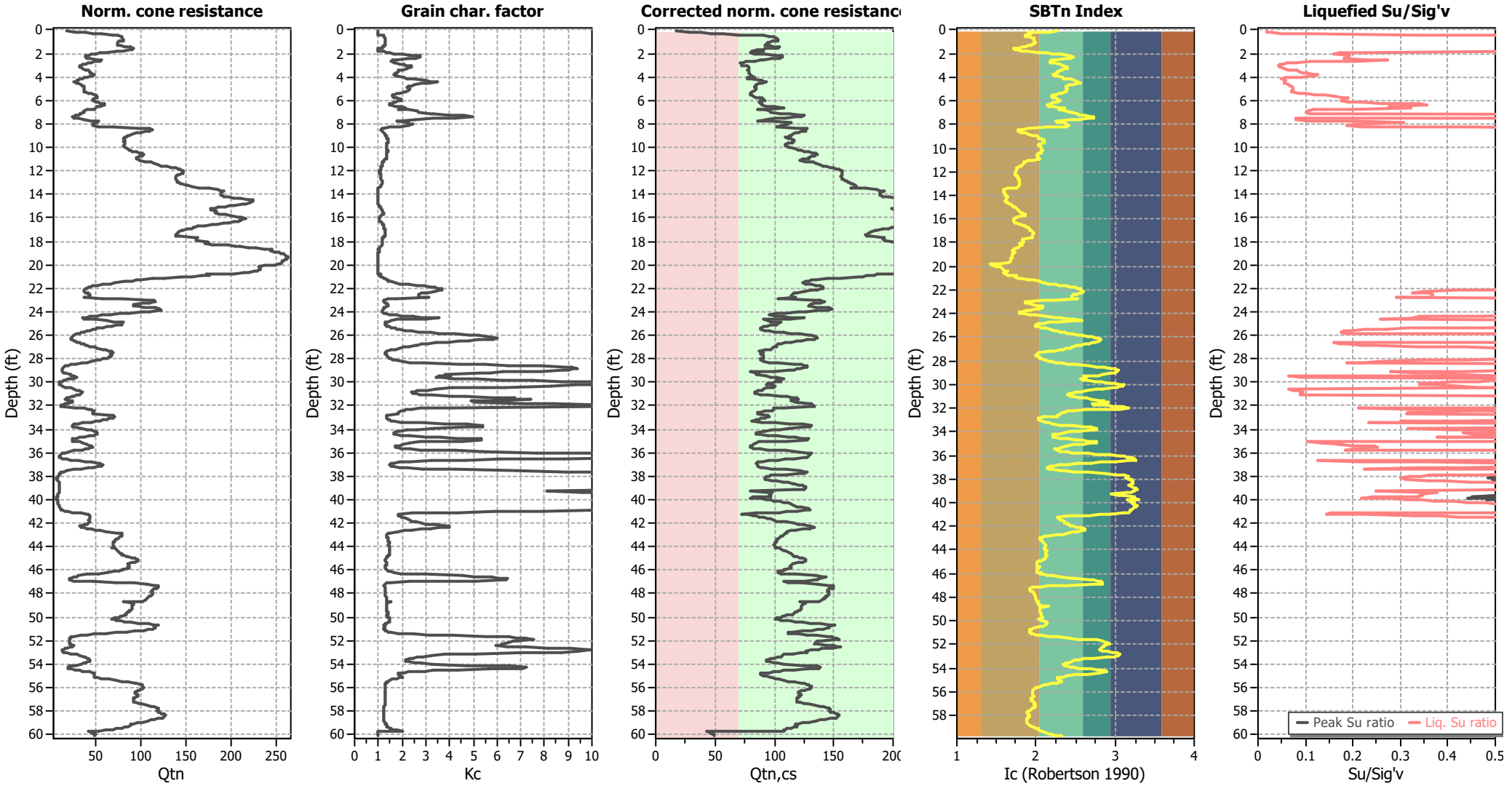
Fines correction method:	Moss et al. (2006)	Average results interval:	1	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	1.07	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	100.00 ft	Fill height:	N/A	Limit depth:	50.00 ft

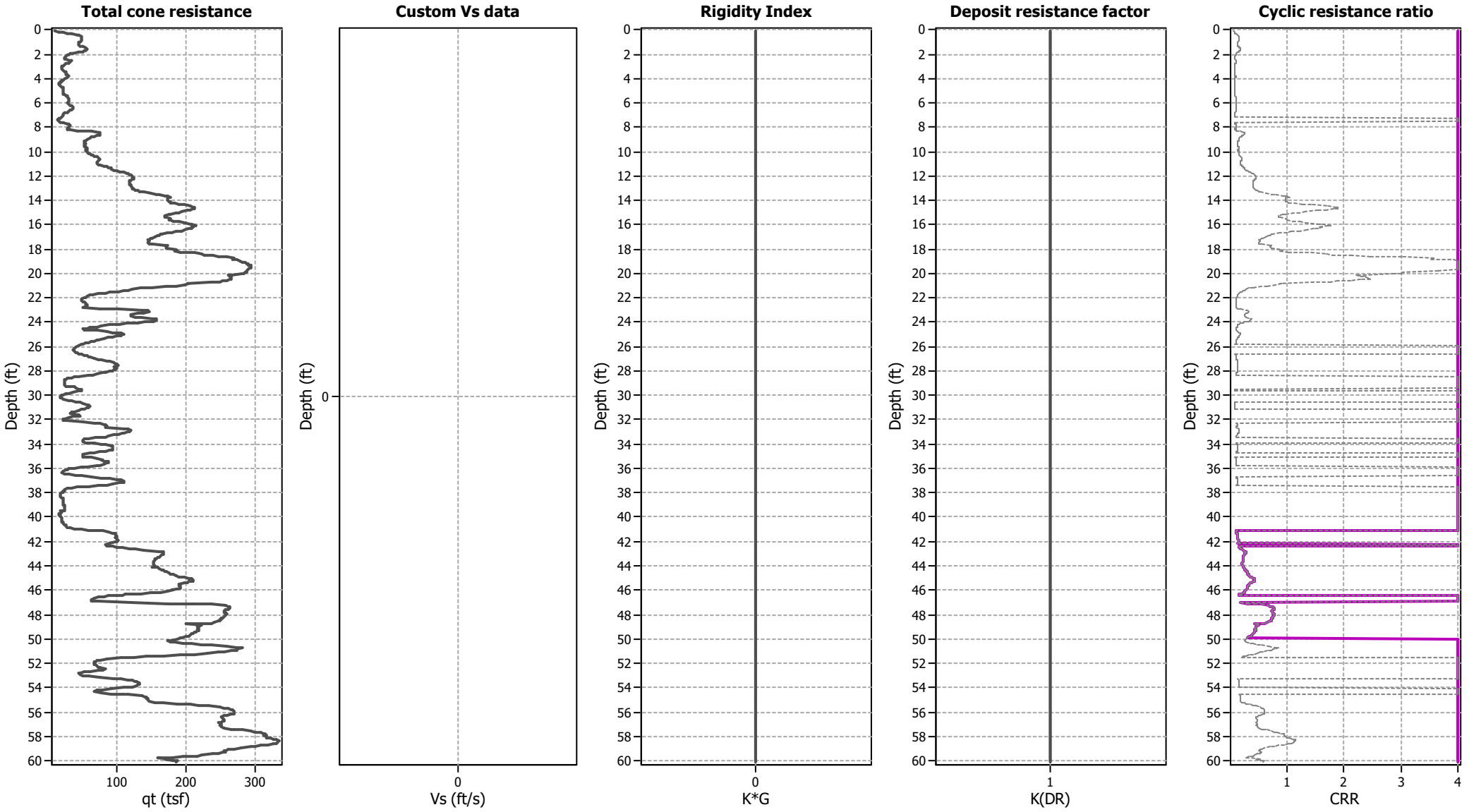
Check for strength loss plots (Robertson (2010))



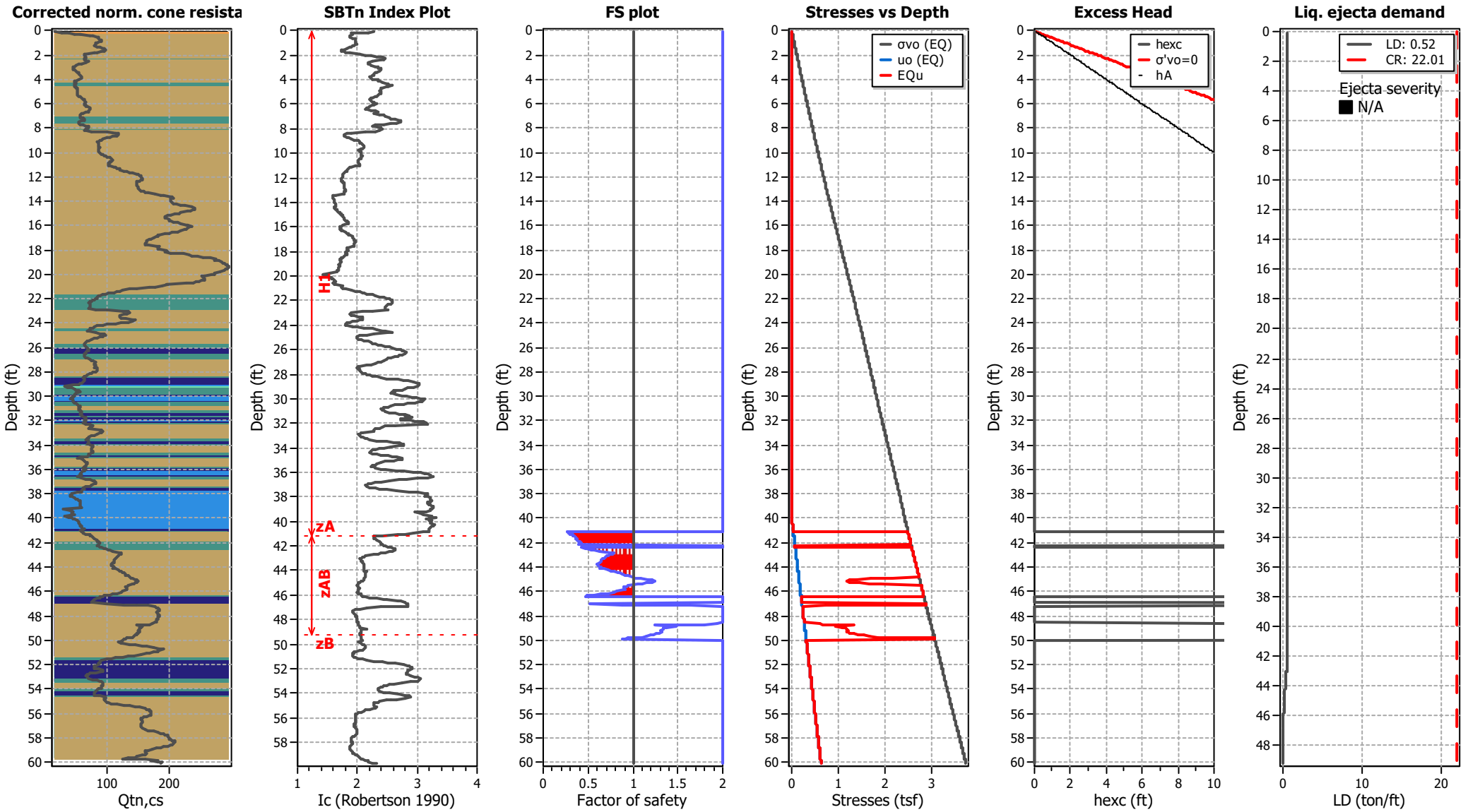
Input parameters and analysis data

Analysis method:	Moss et al. (2006)	Depth to water table (erthq.):	40.00 ft	Fill weight:	N/A
Fines correction method:	Moss et al. (2006)	Average results interval:	1	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	1.07	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	100.00 ft	Fill height:	N/A	Limit depth:	50.00 ft

Aging Calculation Estimation



Ejecta Severity Estimation



Kehoe Testing and Engineering
714-901-7270
steve@kehoetesting.com
www.kehoetesting.com

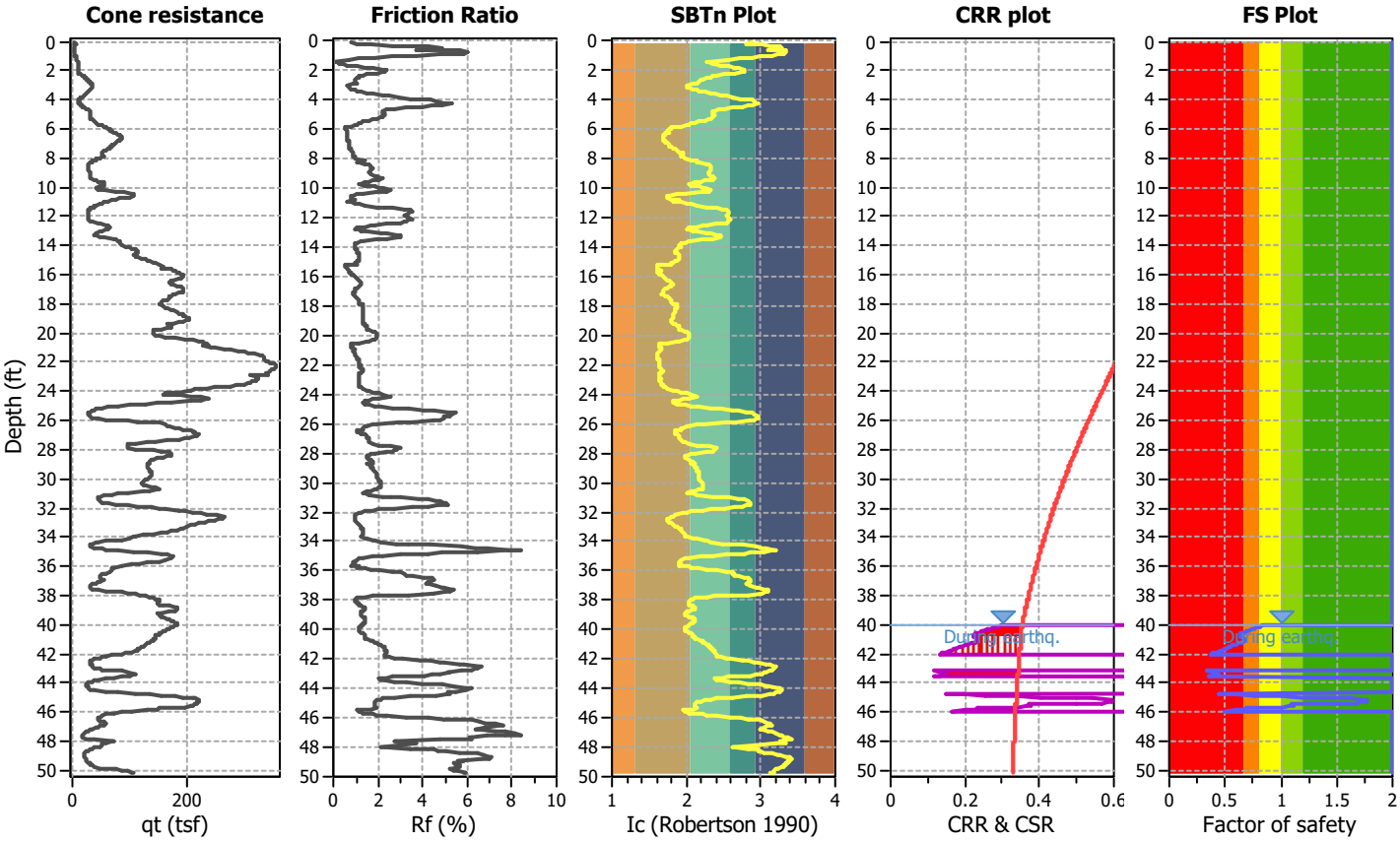
LIQUEFACTION ANALYSIS REPORT

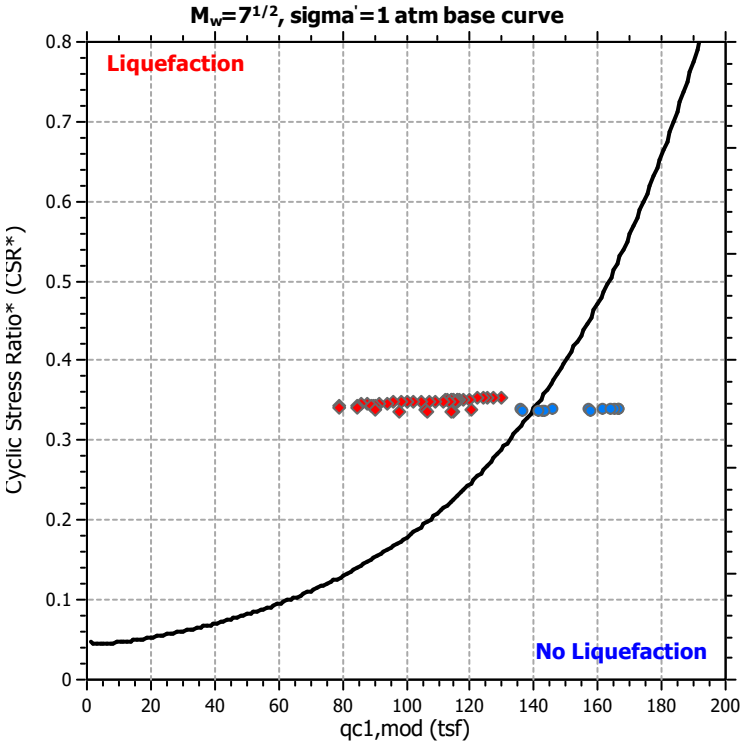
Project title : GeoSoils / Bradley Gardens **Location : 980 W. 7th St, San Jacinto, CA**

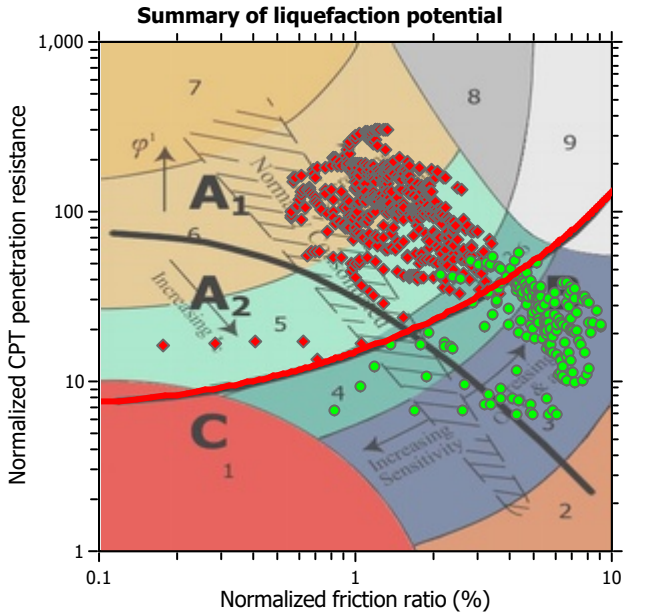
CPT file : CPT-4

Input parameters and analysis data

Analysis method:	Moss et al. (2006)	G.W.T. (in-situ):	100.00 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	Moss et al. (2006)	G.W.T. (earthq.):	40.00 ft	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	1	Fill weight:	N/A	Limit depth:	50.00 ft
Earthquake magnitude M_w:	8.10	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	1.07	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

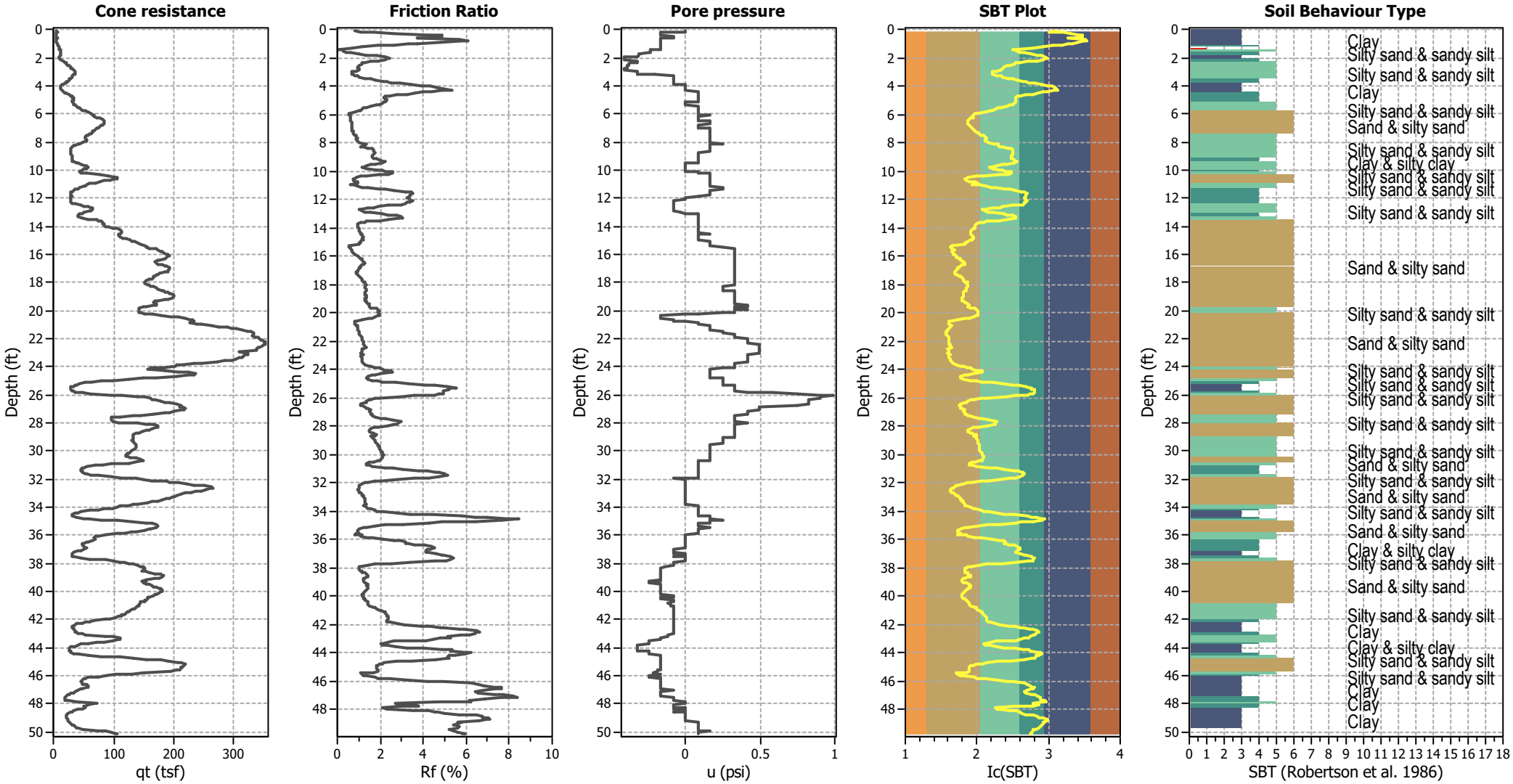






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



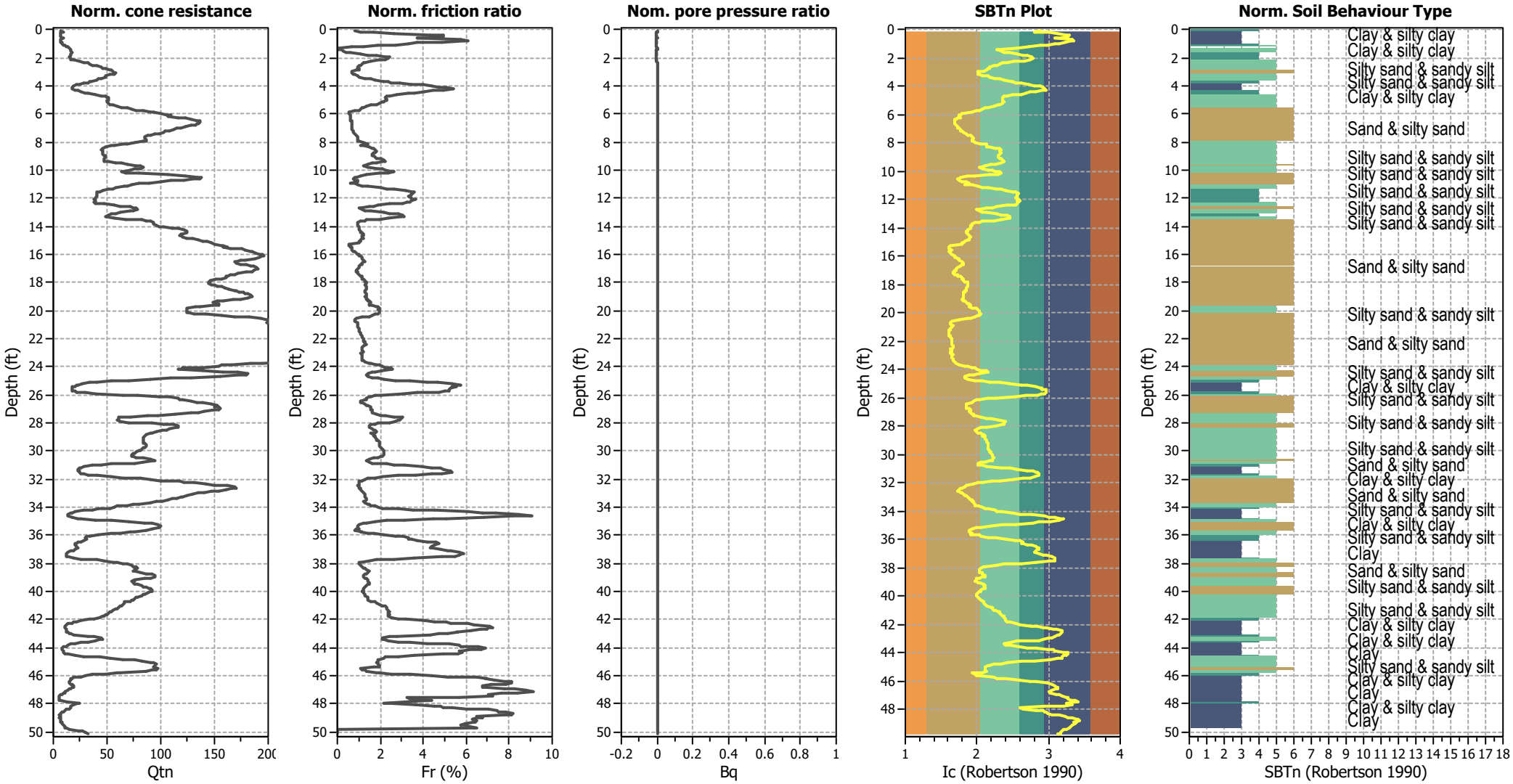
Input parameters and analysis data

Analysis method:	Moss et al. (2006)	Depth to water table (erthq.):	40.00 ft	Fill weight:	N/A
Fines correction method:	Moss et al. (2006)	Average results interval:	1	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	1.07	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	100.00 ft	Fill height:	N/A	Limit depth:	50.00 ft

SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

CPT basic interpretation plots (normalized)



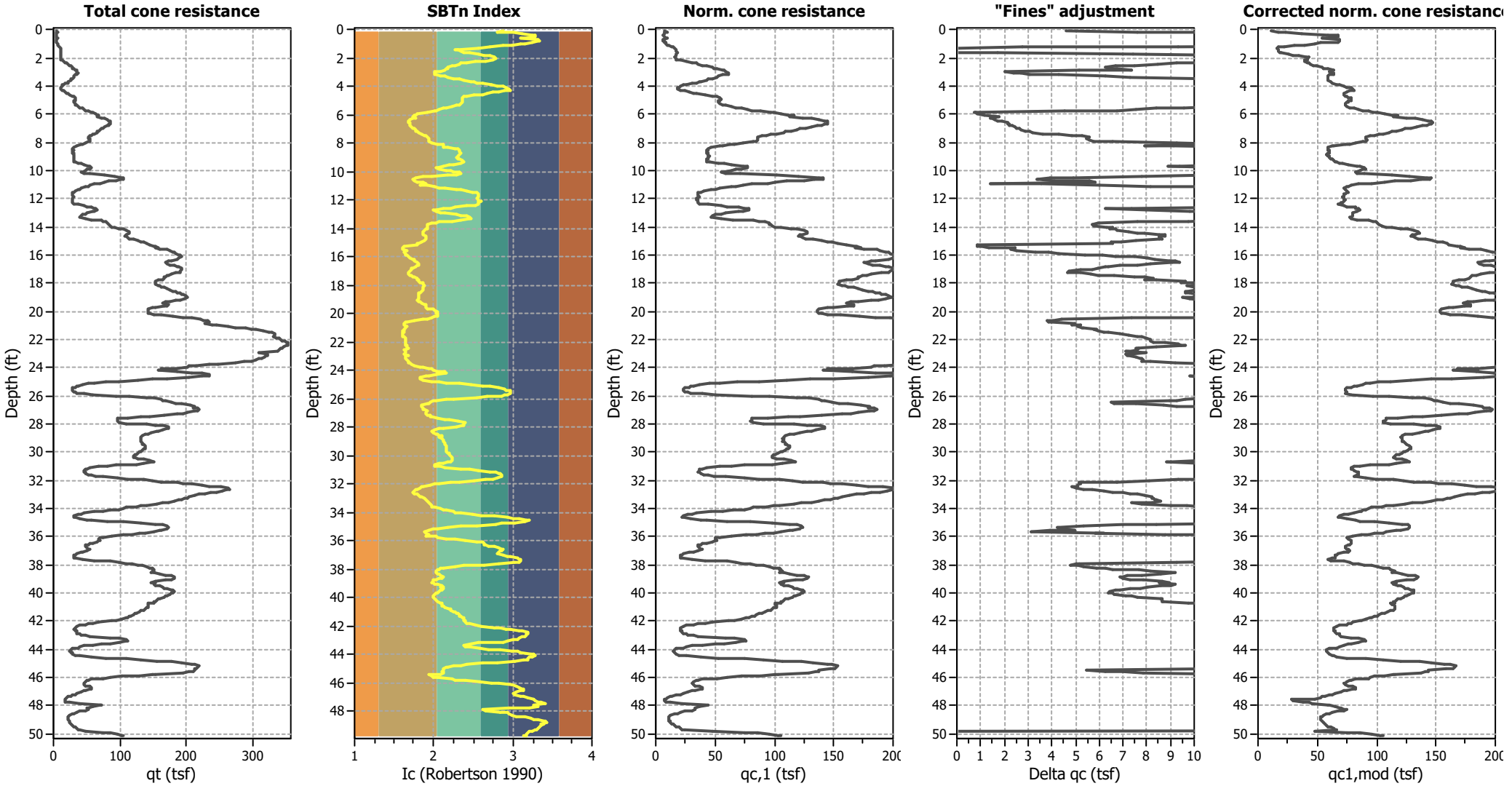
Input parameters and analysis data

Analysis method:	Moss et al. (2006)	Depth to water table (erthq.):	40.00 ft	Fill weight:	N/A
Fines correction method:	Moss et al. (2006)	Average results interval:	1	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	1.07	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	100.00 ft	Fill height:	N/A	Limit depth:	50.00 ft

SBTn legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	Moss et al. (2006)	Depth to water table (erthq.):	40.00 ft	Fill weight:	N/A
Fines correction method:	Moss et al. (2006)	Average results interval:	1	Transition detect. applied:	No
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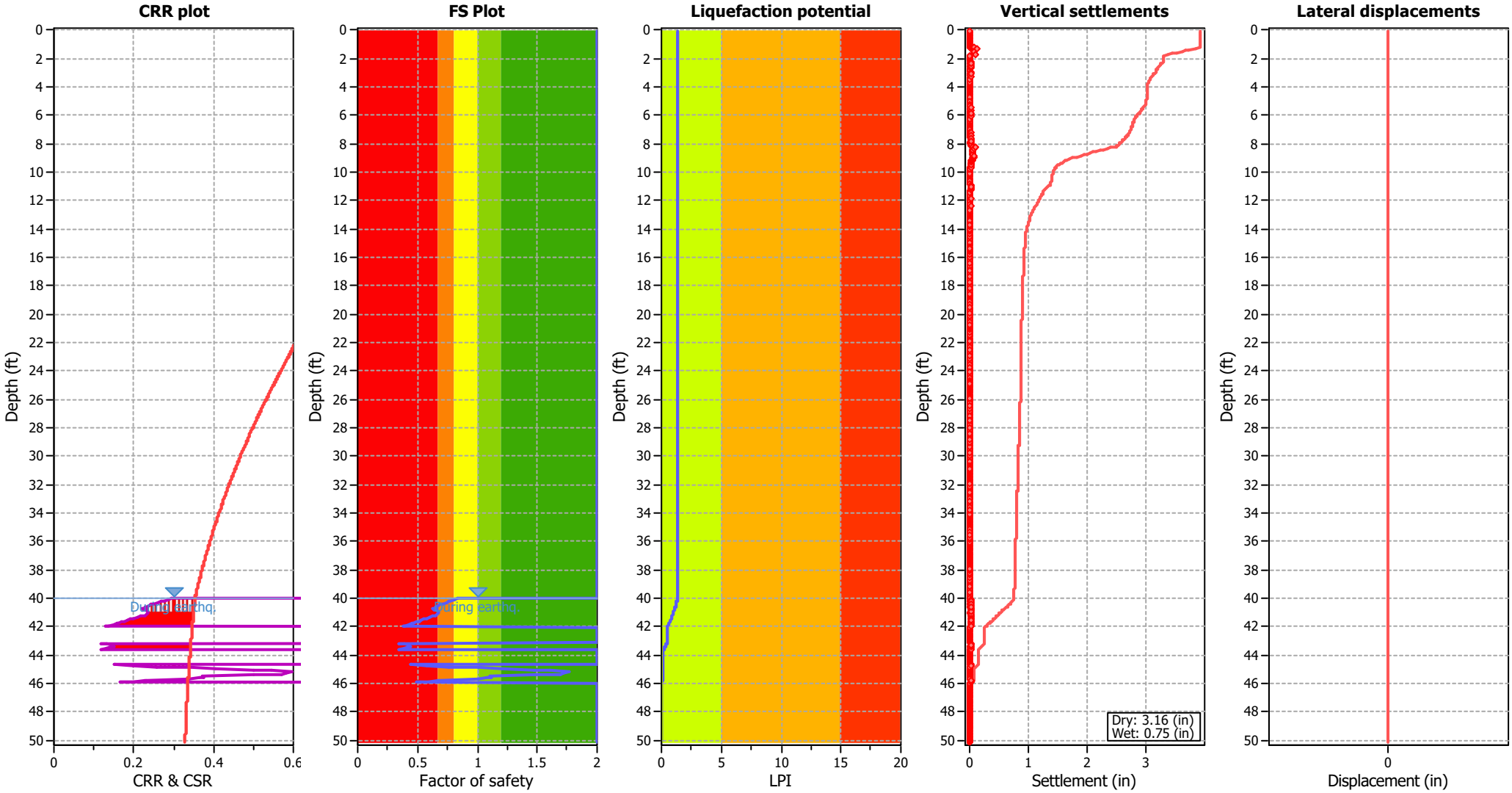
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	1.07	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	100.00 ft	Fill height:	N/A	Limit depth:	50.00 ft

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	Moss et al. (2006)	Depth to water table (erthq.):	40.00 ft	Fill weight:	N/A
Fines correction method:	Moss et al. (2006)	Average results interval:	1	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	1.07	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	100.00 ft	Fill height:	N/A	Limit depth:	50.00 ft

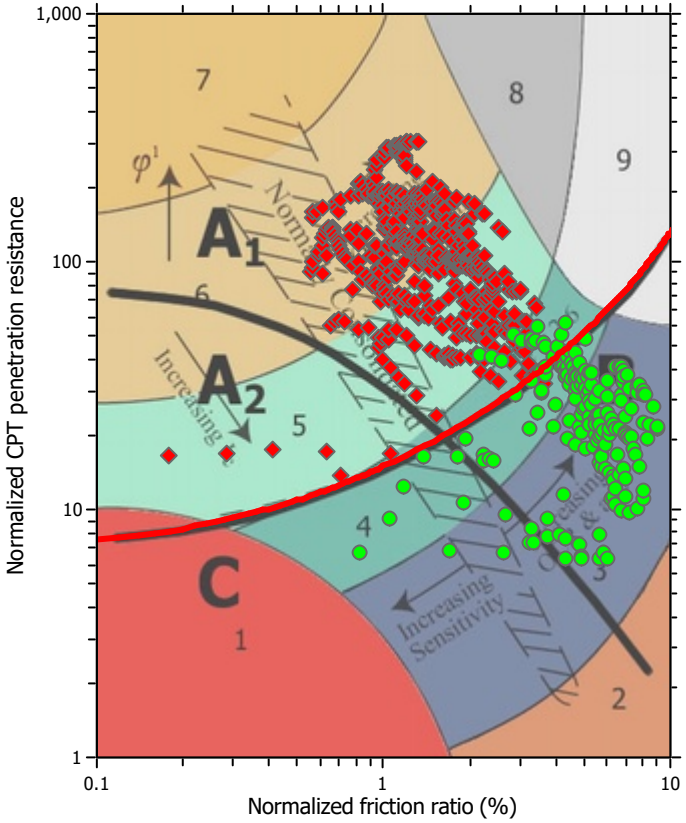
F.S. color scheme

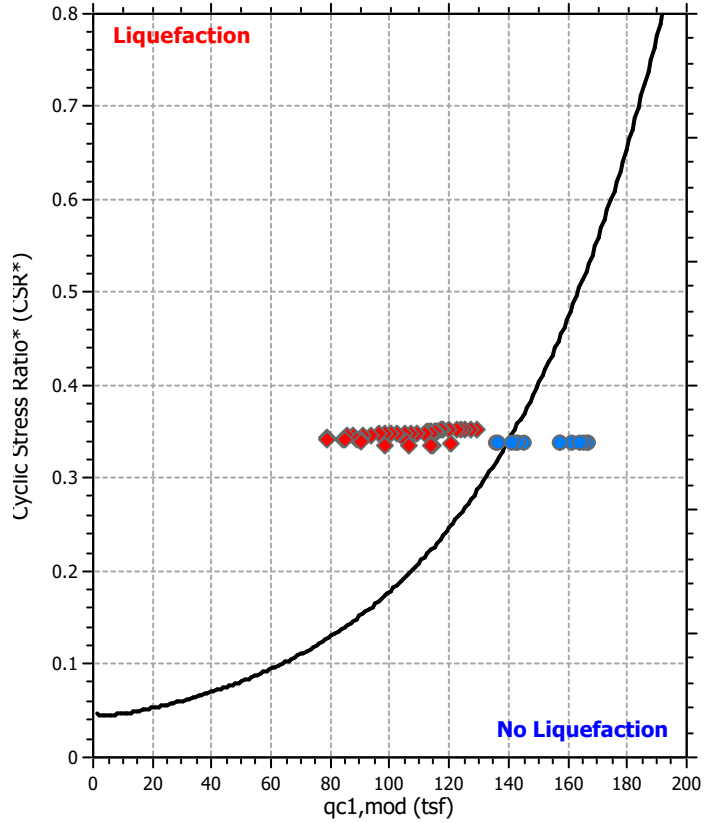
- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

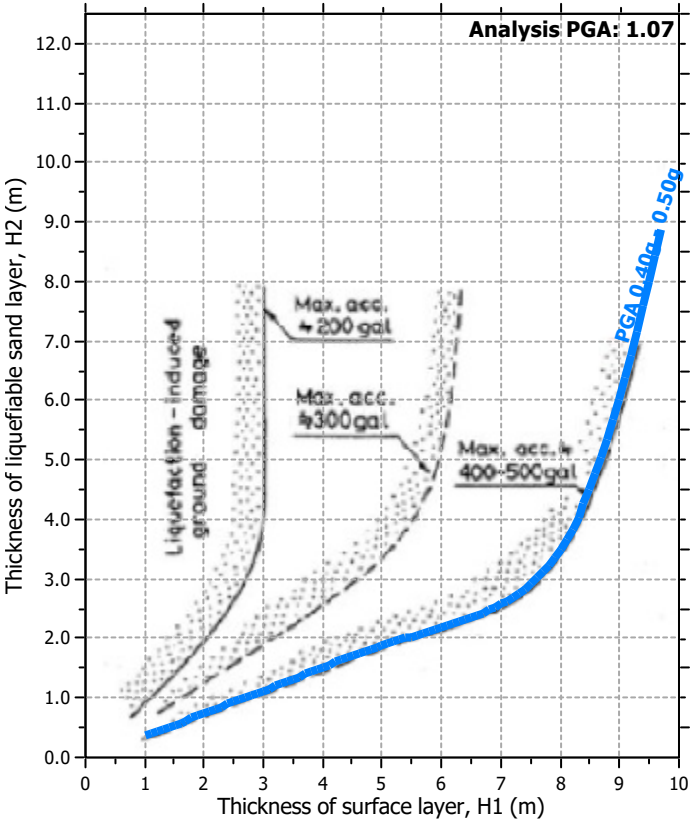
LPI color scheme

- Very high risk
- High risk
- Low risk

Liquefaction analysis summary plots







Input parameters and analysis data

Analysis method:	Moss et al. (2006)	Depth to water table (erthq.):	40.00 ft	Fill weight:	N/A
Fines correction method:	Moss et al. (2006)	Average results interval:	1	Transition detect. applied:	No
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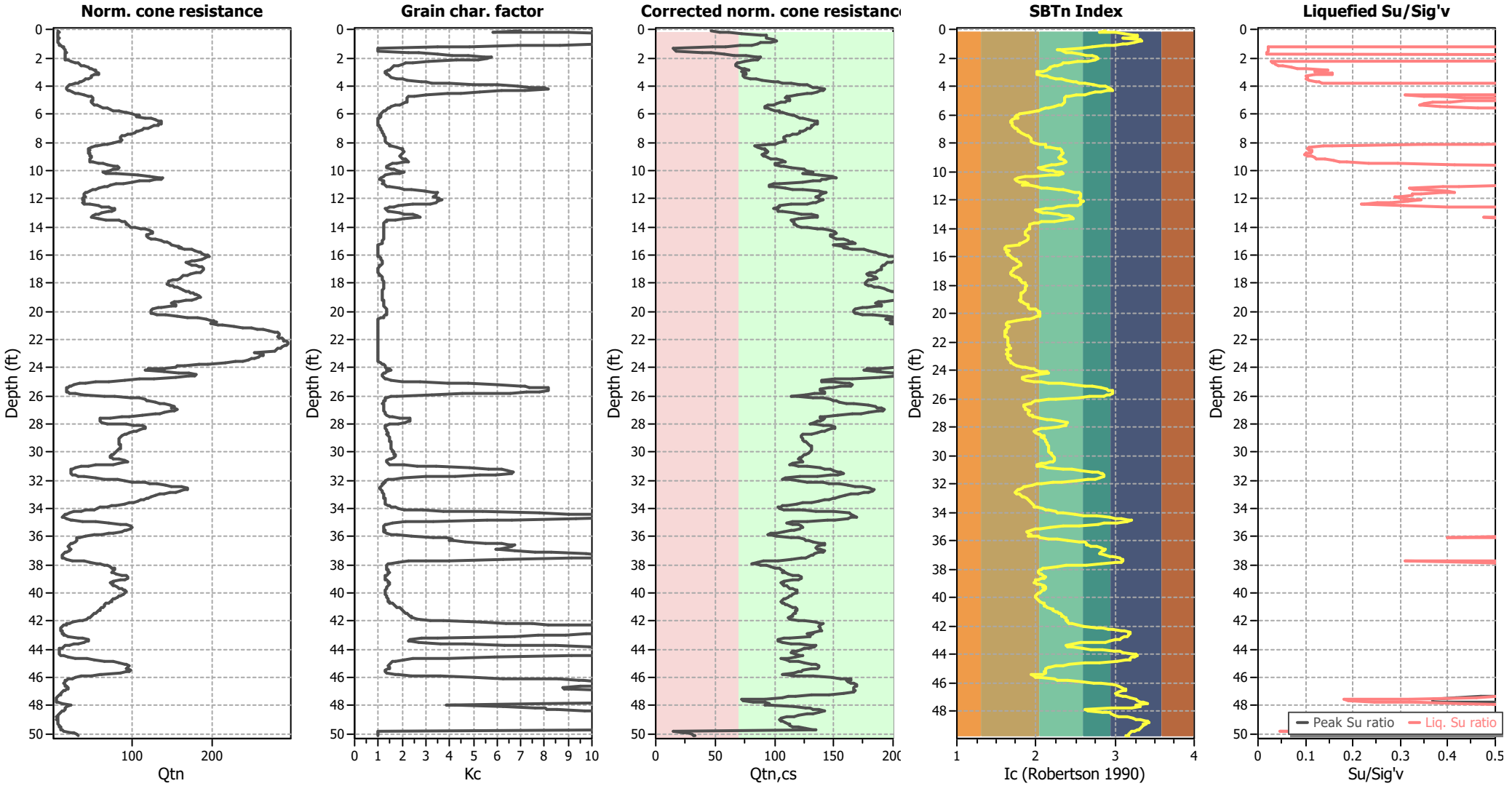
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	1.07	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	100.00 ft	Fill height:	N/A	Limit depth:	50.00 ft

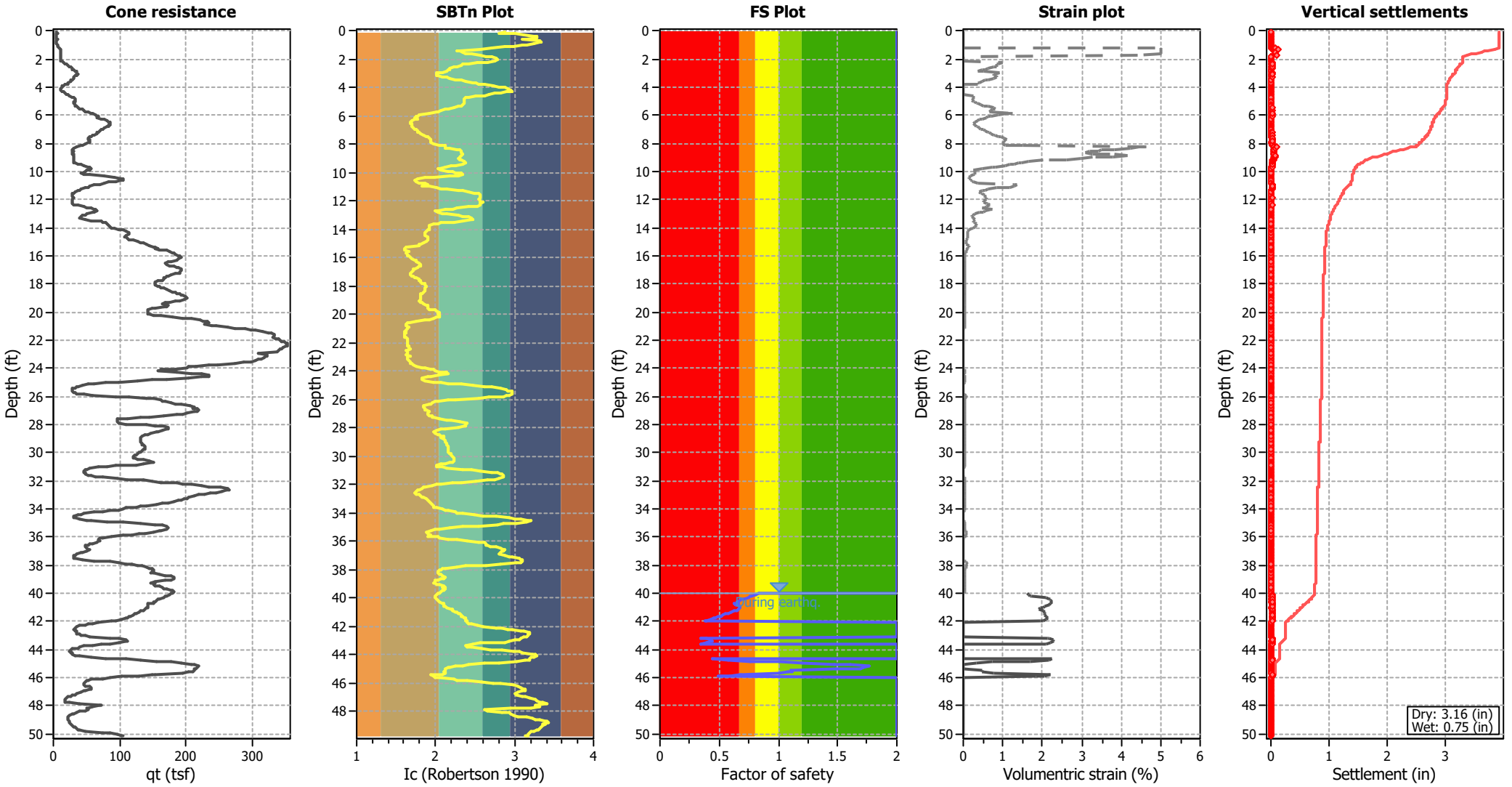
Check for strength loss plots (Robertson (2010))



Input parameters and analysis data

Analysis method:	Moss et al. (2006)	Depth to water table (erthq.):	40.00 ft	Fill weight:	N/A
Fines correction method:	Moss et al. (2006)	Average results interval:	1	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	8.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	1.07	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	100.00 ft	Fill height:	N/A	Limit depth:	50.00 ft

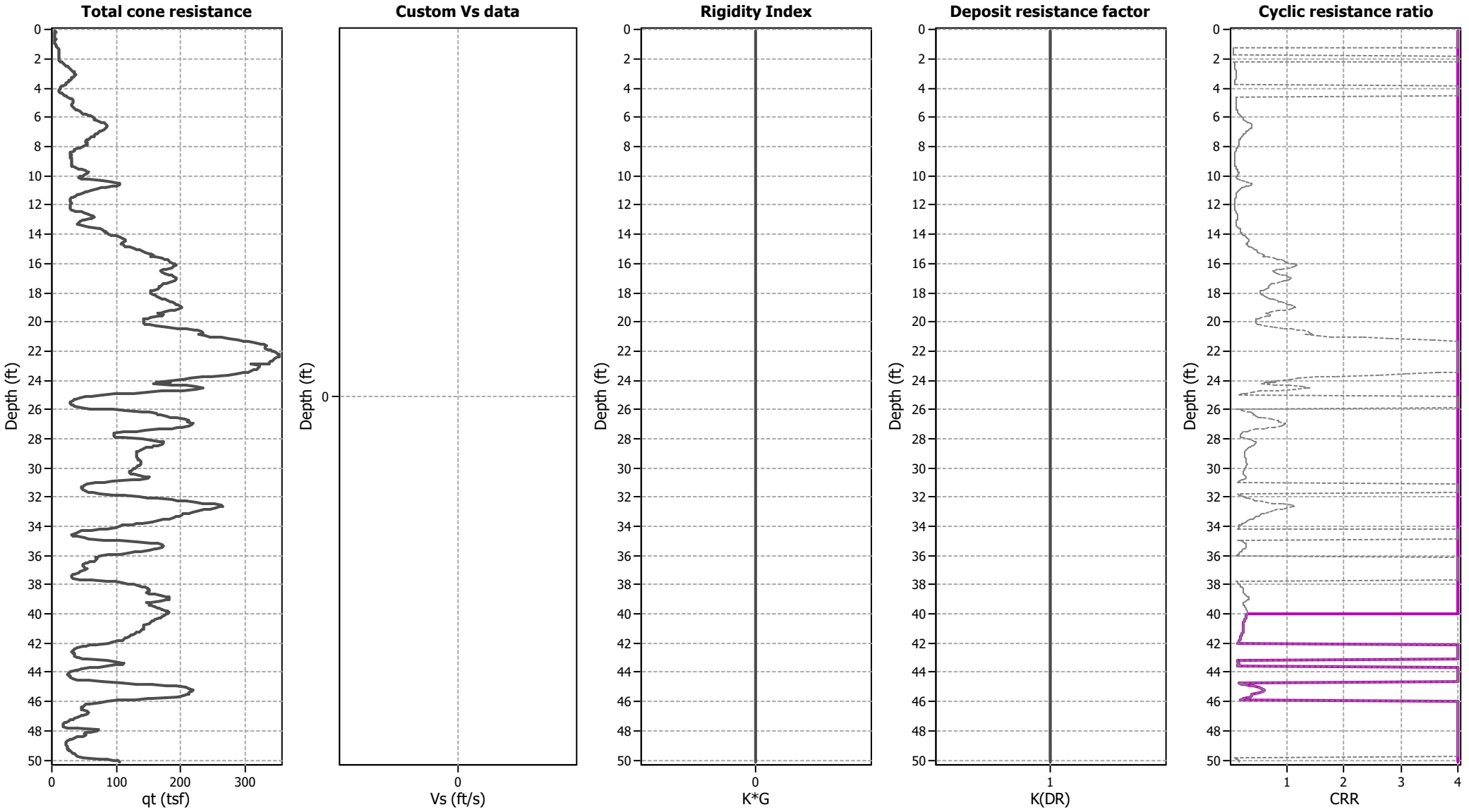
Estimation of post-earthquake settlements



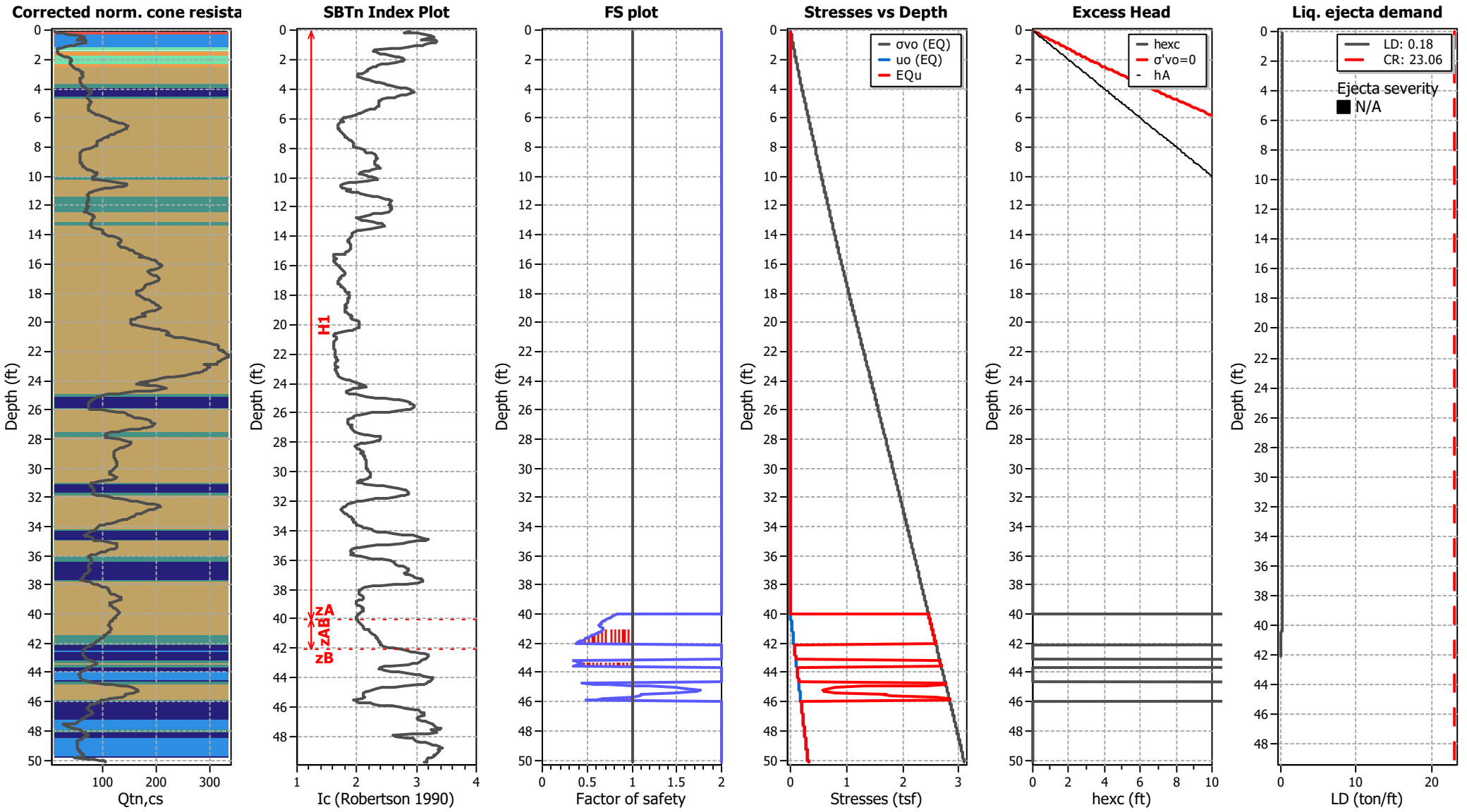
Abbreviations

q_t:	Total cone resistance (cone resistance q_c corrected for pore water effects)
I_c:	Soil Behaviour Type Index
FS:	Calculated Factor of Safety against liquefaction
Volumentric strain:	Post-liquefaction volumentric strain

Aging Calculation Estimation

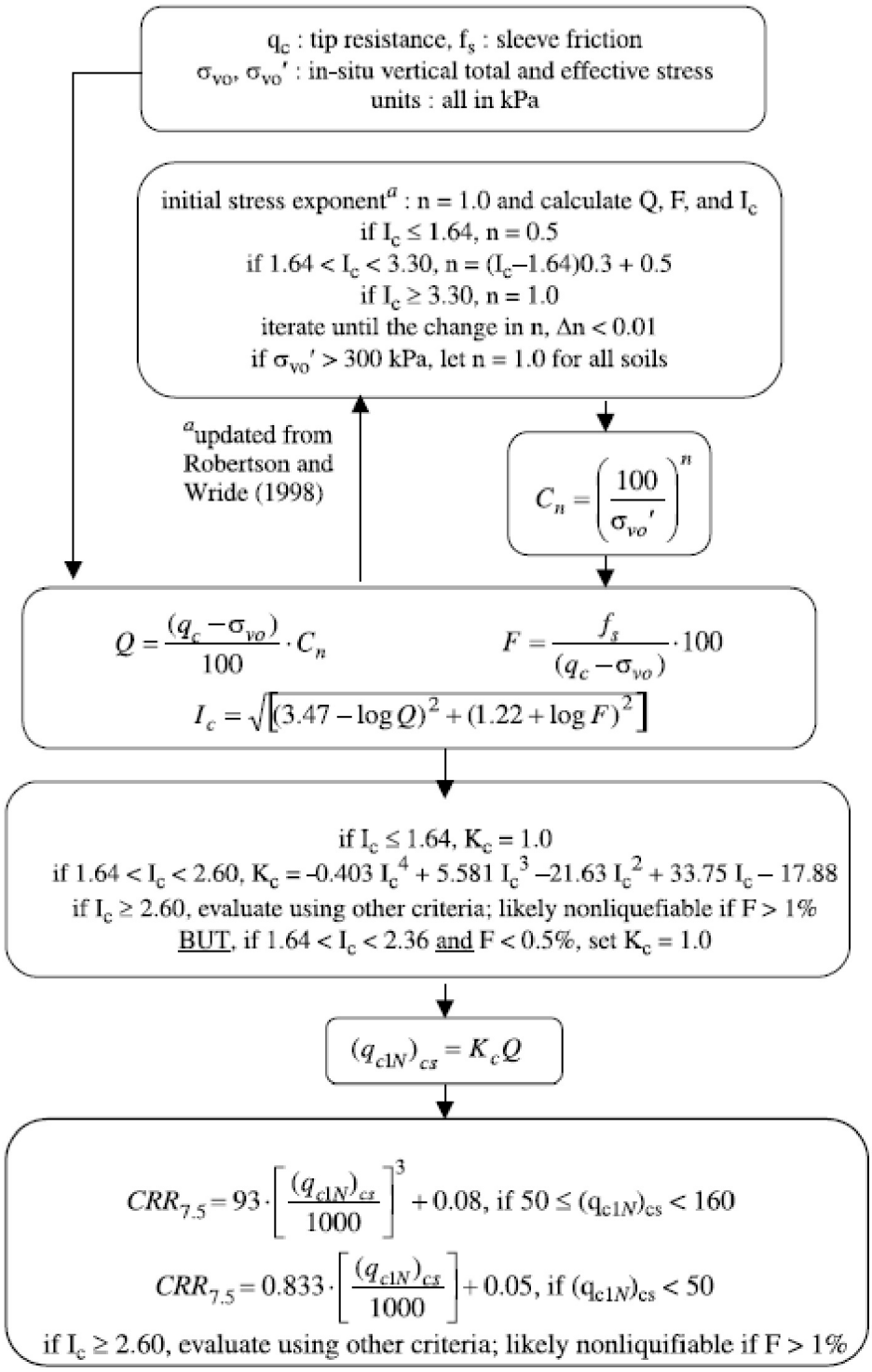


Ejecta Severity Estimation



Procedure for the evaluation of soil liquefaction resistance, NCEER (1998)

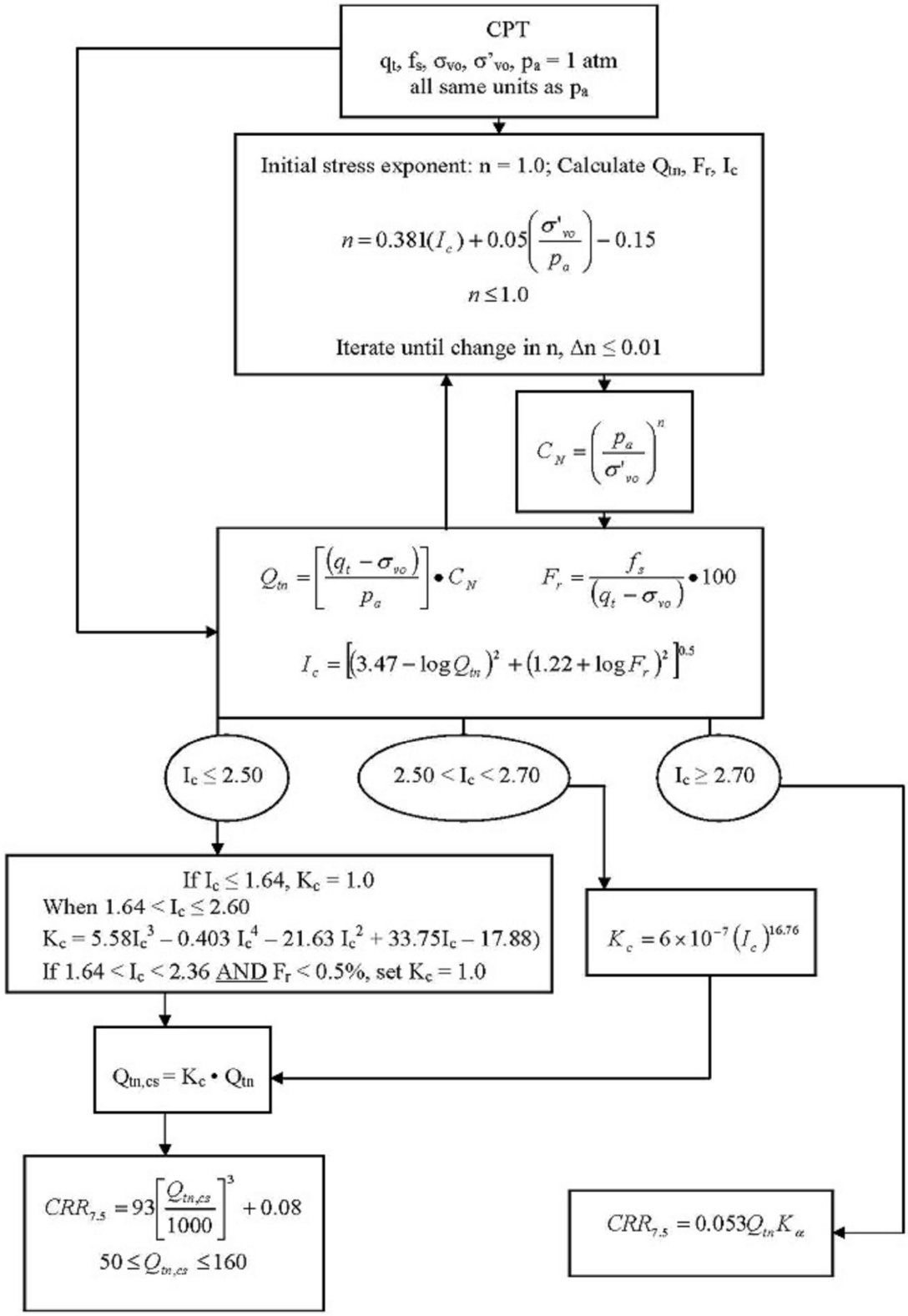
Calculation of soil resistance against liquefaction is performed according to the Robertson & Wride (1998) procedure. The procedure used in the software, slightly differs from the one originally published in NCEER-97-0022 (Proceedings of the NCEER Workshop on Evaluation of Liquefaction Resistance of Soils). The revised procedure is presented below in the form of a flowchart[1]:



[1] "Estimating liquefaction-induced ground settlements from CPT for level ground", G. Zhang, P.K. Robertson, and R.W.I. Brachman

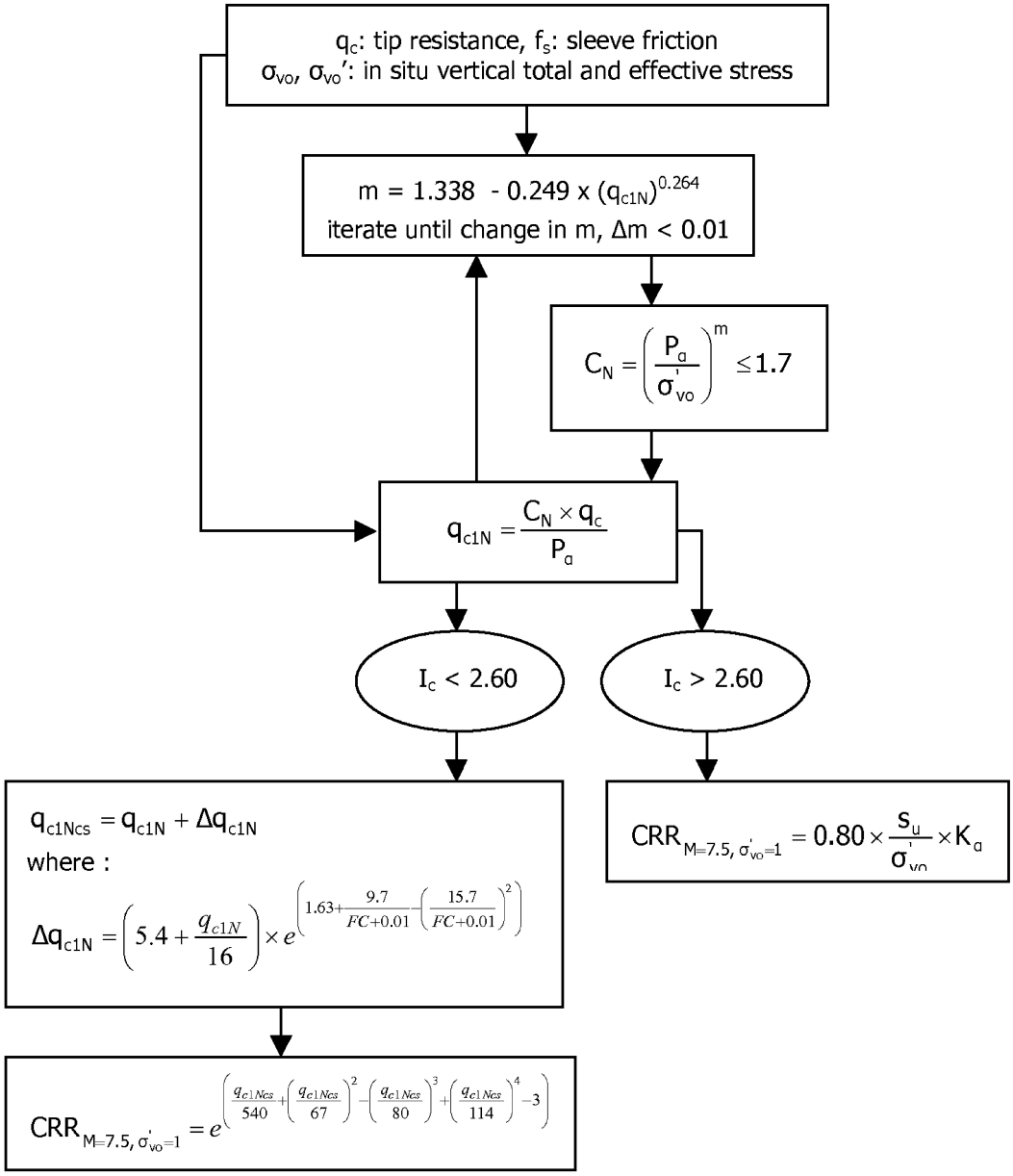
Procedure for the evaluation of soil liquefaction resistance (all soils), Robertson (2010)

Calculation of soil resistance against liquefaction is performed according to the Robertson & Wride (1998) procedure. This procedure used in the software, slightly differs from the one originally published in NCEER-97-0022 (Proceedings of the NCEER Workshop on Evaluation of Liquefaction Resistance of Soils). The revised procedure is presented below in the form of a flowchart[1]:

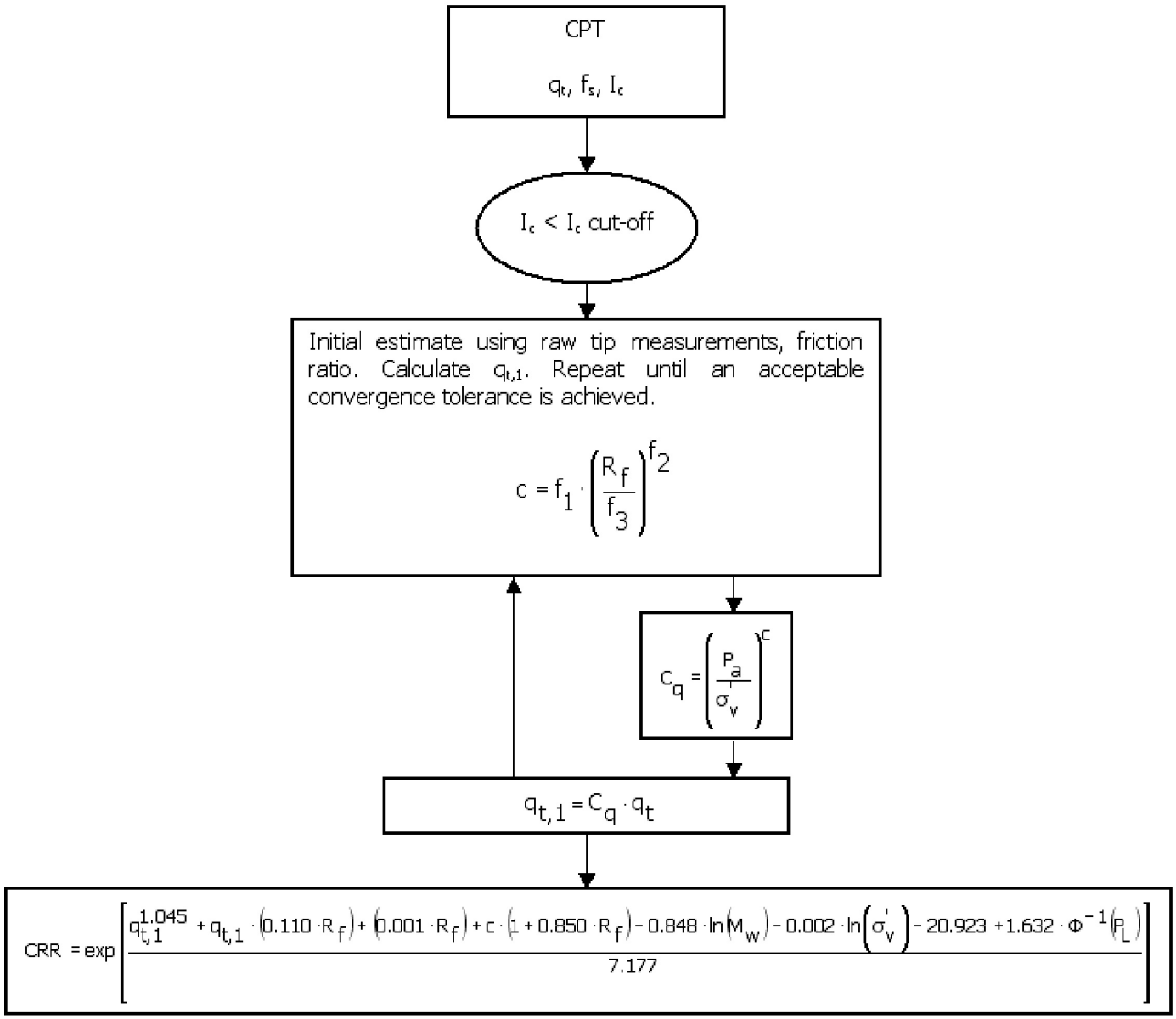


[1] P.K. Robertson, 2009. "Performance based earthquake design using the CPT", Keynote Lecture, International Conference on Performance-based Design in Earthquake Geotechnical Engineering – from case history to practice, IS-Tokyo, June 2009

Procedure for the evaluation of soil liquefaction resistance, Idriss & Boulanger (2008)



Procedure for the evaluation of soil liquefaction resistance (sandy soils), Moss et al. (2006)



Procedure for the evaluation of soil liquefaction resistance, Boulanger & Idriss(2014)

$$FS_{liq} = \frac{CRR_{M=7.5,\sigma'_v=1atm}}{CSR_{M=7.5,\sigma'_v=1atm}}$$

$$CSR_{M=7.5,\sigma'_v=1atm} = 0.65 \frac{\sigma_v}{\sigma'_v} \frac{a_{max}}{g} r_d \frac{1}{MSF} \frac{1}{K_\sigma}$$

$$r_d = \exp\left[\alpha(z) + \beta(z) \cdot M\right]$$

$$\alpha(z) = -1.012 - 1.126 \sin\left(\frac{z}{11.73} + 5.133\right)$$

$$\beta(z) = 0.106 + 0.118 \sin\left(\frac{z}{11.28} + 5.142\right)$$

$$K_\sigma = 1 - C_\sigma \ln\left(\frac{\sigma'_v}{P_a}\right) \leq 1.1$$

$$C_\sigma = \frac{1}{37.3 - 8.27\left(q_{c1Ncs}\right)^{0.264}} \leq 0.3$$

$$MSF = 1 + \left(MSF_{max} - 1\right)\left(8.64 \exp\left(\frac{-M}{4}\right) - 1.325\right)$$

$$MSF_{max} = 1.09 + \left(\frac{q_{c1Ncs}}{180}\right)^3 \leq 2.2$$

σ'_v *and* σ_v *at start of earthquake shaking*

$$CRR_{M=7.5,\sigma'_v=1atm} = \exp\left(\frac{q_{c1Ncs}}{113} + \left(\frac{q_{c1Ncs}}{1000}\right)^2 - \left(\frac{q_{c1Ncs}}{140}\right)^3 + \left(\frac{q_{c1Ncs}}{137}\right)^4 - 2.80\right)$$

$$q_{c1Ncs} = q_{c1N} + \Delta q_{c1N}$$

$$\Delta q_{c1N} = \left(11.9 + \frac{q_{c1N}}{14.6}\right) \exp\left(1.63 - \frac{9.7}{FC+2} - \left(\frac{15.7}{FC+2}\right)^2\right)$$

$$q_{c1N} = C_{Ne} \frac{q_c}{P_a}$$

$$C_{Ne} = \left(\frac{P_a}{\sigma'_v}\right)^m \leq 1.7$$

$$m = 1.338 - 0.249\left(q_{c1Ncs}\right)^{0.264} \quad with \quad 0.264 \leq m \leq 0.782$$

$$FC = 80\left(I_C + C_{FC}\right) - 137 \quad with \quad 0\% \leq FC \leq 100\%$$

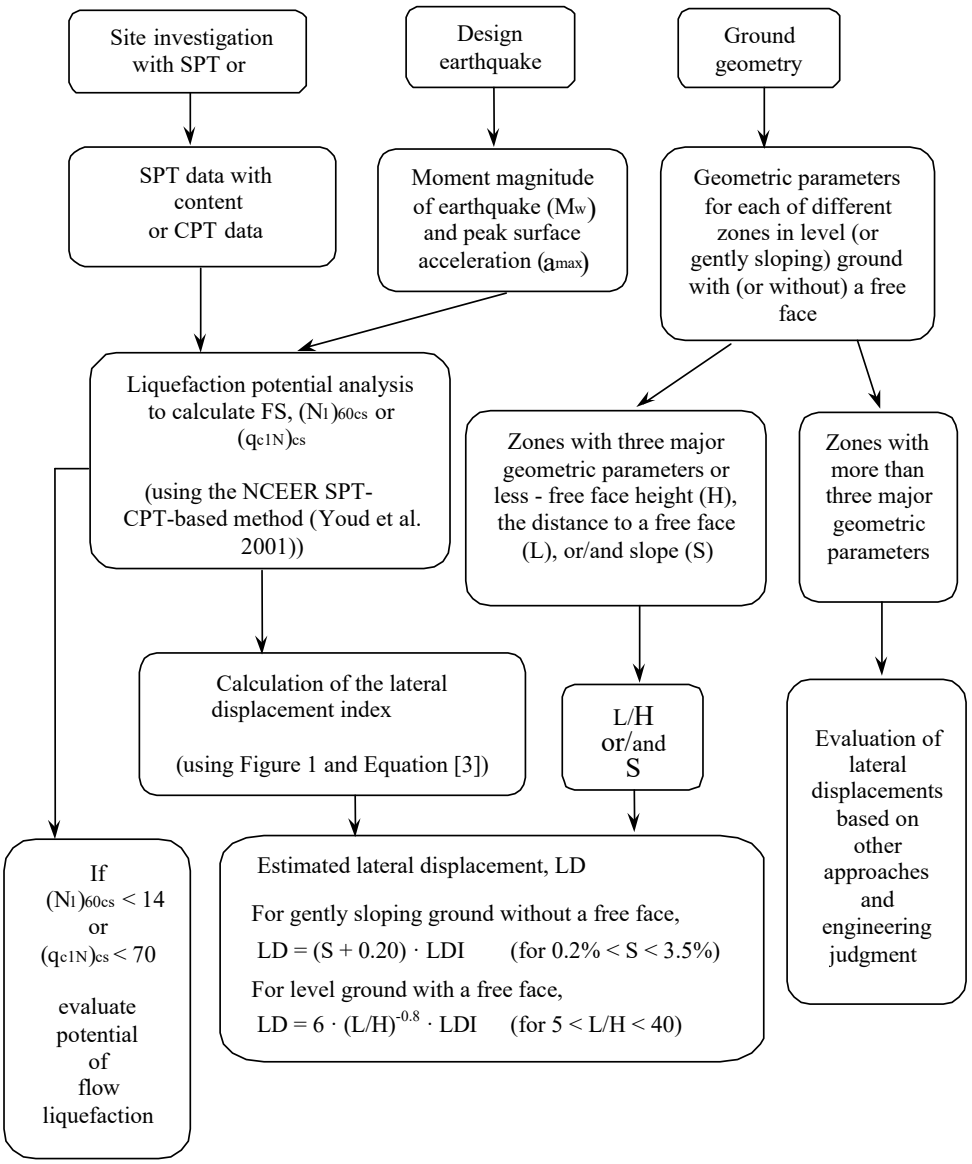
$$I_c = \left[\left(3.47 - \log\left(Q\right)\right)^2 + \left(1.22 + \log\left(F\right)\right)^2\right]^{0.5}$$

$$Q = \left(\frac{q_c - \sigma_{vc}}{P_a}\right)\left(\frac{P_a}{\sigma'_{vc}}\right)^n \; with \; 0.5 \leq n \leq 1.0 \; per \; Robertson \; \& \; Wride \; (1998)$$

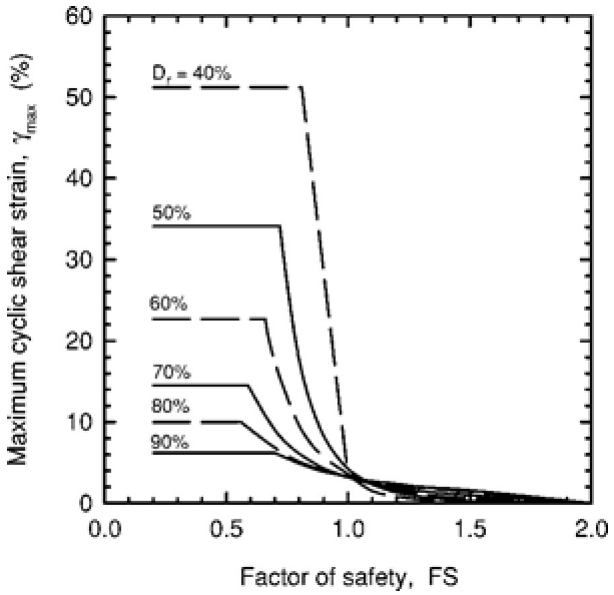
$$F = \left(\frac{f_s}{q_c - \sigma_{vc}}\right) \cdot 100\%$$

σ'_v *at time of CPT sounding*

Procedure for the evaluation of liquefaction-induced lateral spreading displacements



[1] Flow chart illustrating major steps in estimating liquefaction-induced lateral spreading displacements using the proposed approach



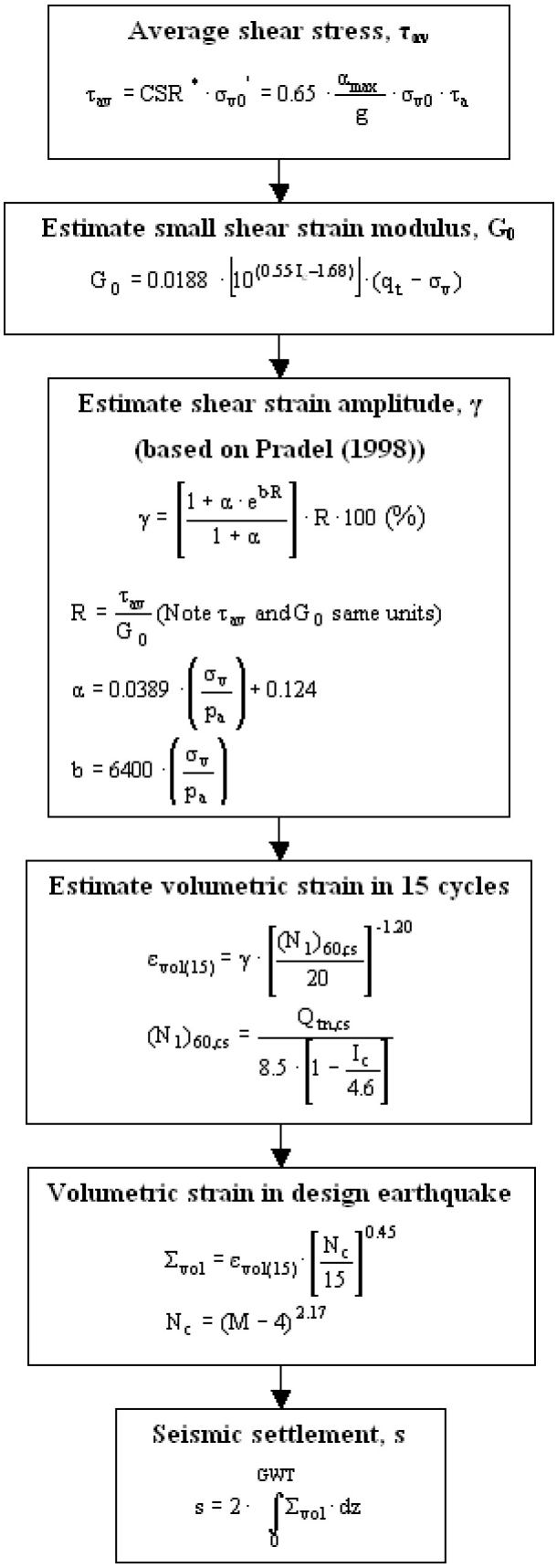
[1] Figure 1

$$LDI = \int_0^{z_{max}} \gamma_{max} dz$$

[1] Equation [3]

[1] "Estimating liquefaction-induced ground settlements from CPT for level ground", G. Zhang, P.K. Robertson, and R.W.I. Brachman

Procedure for the estimation of seismic induced settlements in dry sands



Robertson, P.K. and Lisheng, S., 2010, "Estimation of seismic compression in dry soils using the CPT" FIFTH INTERNATIONAL CONFERENCE ON RECENT ADVANCES IN GEOTECHNICAL EARTHQUAKE ENGINEERING AND SOIL DYNAMICS, Symposium in honor of professor I. M. Idriss, San Diego, CA

Liquefaction Potential Index (LPI) calculation procedure

Calculation of the Liquefaction Potential Index (LPI) is used to interpret the liquefaction assessment calculations in terms of severity over depth. The calculation procedure is based on the methology developed by Iwasaki (1982) and is adopted by AFPS.

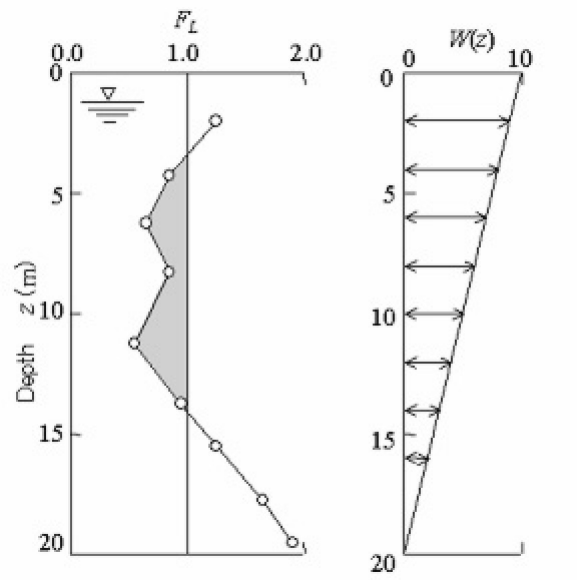
To estimate the severity of liquefaction extent at a given site, LPI is calculated based on the following equation:

$$\mathbf{LPI} = \int_0^{20} (10 - 0{,}5z) \times F_L \times dz$$

where:
F_L = 1 - F.S. when F.S. less than 1
F_L = 0 when F.S. greater than 1
z depth of measurment in meters

Values of LPI range between zero (0) when no test point is characterized as liquefiable and 100 when all points are characterized as susceptible to liquefaction. Iwasaki proposed four (4) discrete categories based on the numeric value of LPI:

- LPI = 0 : Liquefaction risk is very low
- 0 < LPI <= 5 : Liquefaction risk is low
- 5 < LPI <= 15 : Liquefaction risk is high
- LPI > 15 : Liquefaction risk is very high



Graphical presentation of the LPI calculation procedure

Shear-Induced Building Settlement (Ds) calculation procedure

The shear-induced building settlement (Ds) due to liquefaction below the building can be estimated using the relationship developed by Bray and Macedo (2017):

$$Ln(Ds) = c1 + c2 * LBS + 0.58 * Ln\left(Tanh\left(\frac{HL}{6}\right)\right) + 4.59 * Ln(Q) - 0.42 * Ln(Q)^2 - 0.02 * B + 0.84 * Ln(CAVdp) + 0.41 * Ln(Sa1) + \varepsilon$$

where Ds is in the units of mm, c1= -8.35 and c2= 0.072 for LBS ≤ 16, and c1= -7.48 and c2= 0.014 otherwise. Q is the building contact pressure in units of kPa, HL is the cumulative thickness of the liquefiable layers in the units of m, B is the building width in the units of m, CAVdp is a standardized version of the cumulative absolute velocity in the units of g-s, Sa1 is 5%-damped pseudo-acceleration response spectral value at a period of 1 s in the units of g, and ε is a normal random variable with zero mean and 0.50 standard deviation in Ln units. The liquefaction-induced building settlement index (LBS) is:

$$LBS = \sum W * \frac{\varepsilon_{shear}}{z} dz$$

where z (m) is the depth measured from the ground surface > 0, W is a foundation-weighting factor wherein W = 0.0 for z less than Df, which is the embedment depth of the foundation, and W = 1.0 otherwise. The shear strain parameter (ε_shear) is the liquefaction-induced free-field shear strain (in %) estimated using Zhang et al. (2004). It is calculated based on the estimated Dr of the liquefied soil layer and the calculated safety factor against liquefaction triggering (FSL).

References

- Lunne, T., Robertson, P.K., and Powell, J.J.M 1997. Cone penetration testing in geotechnical practice, E & FN Spon Routledge, 352 p, ISBN 0-7514-0393-8.
- Boulanger, R.W. and Idriss, I. M., 2007. Evaluation of Cyclic Softening in Silts and Clays. ASCE Journal of Geotechnical and Geoenvironmental Engineering June, Vol. 133, No. 6 pp 641-652
- Boulanger, R.W. and Idriss, I. M., 2014. CPT AND SPT BASED LIQUEFACTION TRIGGERING PROCEDURES. DEPARTMENT OF CIVIL & ENVIRONMENTAL ENGINEERING COLLEGE OF ENGINEERING UNIVERSITY OF CALIFORNIA AT DAVIS
- Robertson, P.K. and Cabal, K.L., 2007, Guide to Cone Penetration Testing for Geotechnical Engineering. Available at no cost at http://www.geologismiki.gr/
- Robertson, P.K. 1990. Soil classification using the cone penetration test. Canadian Geotechnical Journal, 27 (1), 151-8.
- Robertson, P.K. and Wride, C.E., 1998. Cyclic Liquefaction and its Evaluation based on the CPT Canadian Geotechnical Journal, 1998, Vol. 35, August.
- Youd, T.L., Idriss, I.M., Andrus, R.D., Arango, I., Castro, G., Christian, J.T., Dobry, R., Finn, W.D.L., Harder, L.F., Hynes, M.E., Ishihara, K., Koester, J., Liao, S., Marcuson III, W.F., Martin, G.R., Mitchell, J.K., Moriwaki, Y., Power, M.S., Robertson, P.K., Seed, R., and Stokoe, K.H., Liquefaction Resistance of Soils: Summary Report from the 1996 NCEER and 1998 NCEER/NSF Workshop on Evaluation of Liquefaction Resistance of Soils, ASCE, Journal of Geotechnical & Geoenvironmental Engineering, Vol. 127, October, pp 817-833
- Zhang, G., Robertson. P.K., Brachman, R., 2002, Estimating Liquefaction Induced Ground Settlements from the CPT, Canadian Geotechnical Journal, 39: pp 1168-1180
- Zhang, G., Robertson. P.K., Brachman, R., 2004, Estimating Liquefaction Induced Lateral Displacements using the SPT and CPT, ASCE, Journal of Geotechnical & Geoenvironmental Engineering, Vol. 130, No. 8, 861-871
- Pradel, D., 1998, Procedure to Evaluate Earthquake-Induced Settlements in Dry Sandy Soils, ASCE, Journal of Geotechnical & Geoenvironmental Engineering, Vol. 124, No. 4, 364-368
- Iwasaki, T., 1986, Soil liquefaction studies in Japan: state-of-the-art, Soil Dynamics and Earthquake Engineering, Vol. 5, No. 1, 2-70
- Papathanassiou G., 2008, LPI-based approach for calibrating the severity of liquefaction-induced failures and for assessing the probability of liquefaction surface evidence, Eng. Geol. 96:94–104
- P.K. Robertson, 2009, Interpretation of Cone Penetration Tests - a unified approach., Canadian Geotechnical Journal, Vol. 46, No. 11, pp 1337-1355
- P.K. Robertson, 2009. "Performance based earthquake design using the CPT", Keynote Lecture, International Conference on Performance-based Design in Earthquake Geotechnical Engineering - from case history to practice, IS-Tokyo, June 2009
- Robertson, P.K. and Lisheng, S., 2010, "Estimation of seismic compression in dry soils using the CPT" FIFTH INTERNATIONAL CONFERENCE ON RECENT ADVANCES IN GEOTECHNICAL EARTHQUAKE ENGINEERING AND SOIL DYNAMICS, *Symposium in honor of professor I. M. Idriss,* SAN diego, CA
- R. E. S. Moss, R. B. Seed, R. E. Kayen, J. P. Stewart, A. Der Kiureghian, K. O. Cetin, CPT-Based Probabilistic and Deterministic Assessment of In Situ Seismic Soil Liquefaction Potential, Journal of Geotechnical and Geoenvironmental Engineering, Vol. 132, No. 8, August 1, 2006
- I. M. Idriss and R. W. Boulanger, 2008. Soil liquefaction during earthquakes, Earthquake Engineering Research Institute MNO-12
- Jonathan D. Bray & Jorge Macedo, Department of Civil & Environmental Engineering, Univ. of California, Berkeley, CA, USA, Simplified procedure for estimating liquefaction-induced building settlement, *Proceedings of the 19th International Conference on Soil Mechanics and Geotechnical Engineering, Seoul 201*

APPENDIX F

GENERAL EARTHWORK AND GRADING GUIDELINES AND PRELIMINARY CRITERIA

GENERAL EARTHWORK, GRADING GUIDELINES, AND PRELIMINARY CRITERIA

General

These guidelines present general procedures and requirements for earthwork and grading as shown on the approved grading plans, including preparation of areas to be filled, placement of fill, installation of subdrains, excavations, and appurtenant structures or flatwork. The recommendations contained in the geotechnical report are part of these earthwork and grading guidelines and would supersede the provisions contained hereafter in the case of conflict. Evaluations performed by the consultant during the course of grading may result in new or revised recommendations which could supersede these guidelines or the recommendations contained in the geotechnical report. Generalized details follow this text.

The contractor is responsible for the satisfactory completion of all earthwork in accordance with provisions of the project plans and specifications and latest adopted Code. In the case of conflict, the most onerous provisions shall prevail. The project geotechnical engineer and engineering geologist (geotechnical consultant), or their representatives, should provide observation and testing services, and geotechnical consultation during the duration of the project.

EARTHWORK OBSERVATIONS AND TESTING

Geotechnical Consultant

Prior to the commencement of grading, a qualified geotechnical consultant (soil engineer and engineering geologist) should be employed for the purpose of observing earthwork procedures and testing the fills for general conformance with the recommendations of the geotechnical report(s), the approved grading plans, and applicable grading codes and ordinances.

The geotechnical consultant should provide testing and observation so that an evaluation may be made that the work is being accomplished as specified. It is the responsibility of the contractor to assist the consultants and keep them apprised of anticipated work schedules and changes, so that they may schedule their personnel accordingly.

All remedial removals, clean-outs, prepared ground to receive fill, key excavations, and subdrain installation should be observed and documented by the geotechnical consultant prior to placing any fill. It is the contractor's responsibility to notify the geotechnical consultant when such areas are ready for observation.

Laboratory and Field Tests

Maximum dry density tests to determine the degree of compaction should be performed in accordance with American Standard Testing Materials test method ASTM designation D-1557. Random or representative field compaction tests should be performed in accordance with test methods ASTM designation D-1556, D-2937 or D-2922, and D-3017, at intervals of approximately ±2 feet of fill height or approximately every 1,000 cubic yards placed. These criteria would vary depending on the soil conditions and the size of the project. The location and frequency of testing would be at the discretion of the geotechnical consultant.

Contractor's Responsibility

All clearing, site preparation, and earthwork performed on the project should be conducted by the contractor, with observation by a geotechnical consultant, and staged approval by the governing agencies, as applicable. It is the contractor's responsibility to prepare the ground surface to receive the fill, to the satisfaction of the geotechnical consultant, and to place, spread, moisture condition, mix, and compact the fill in accordance with the recommendations of the geotechnical consultant. The contractor should also remove all non-earth material considered unsatisfactory by the geotechnical consultant.

Notwithstanding the services provided by the geotechnical consultant, it is the sole responsibility of the contractor to provide adequate equipment and methods to accomplish the earthwork in strict accordance with applicable grading guidelines, latest adopted Code or agency ordinances, geotechnical report(s), and approved grading plans. Sufficient watering apparatus and compaction equipment should be provided by the contractor with due consideration for the fill material, rate of placement, and climatic conditions. If, in the opinion of the geotechnical consultant, unsatisfactory conditions such as questionable weather, excessive oversized rock or deleterious material, insufficient support equipment, etc., are resulting in a quality of work that is not acceptable, the consultant will inform the contractor, and the contractor is expected to rectify the conditions, and if necessary, stop work until conditions are satisfactory.

During construction, the contractor shall properly grade all surfaces to maintain good drainage and prevent ponding of water. The contractor shall take remedial measures to control surface water and to prevent erosion of graded areas until such time as permanent drainage and erosion control measures have been installed.

SITE PREPARATION

All major vegetation, including brush, trees, thick grasses, organic debris, and other deleterious material, should be removed and disposed of off-site. These removals must be concluded prior to placing fill. In-place existing fill, soil, alluvium, colluvium, or rock materials, as evaluated by the geotechnical consultant as being unsuitable, should be removed prior to any fill placement. Depending upon the soil conditions, these materials may be reused as

compacted fills. Any materials incorporated as part of the compacted fills should be approved by the geotechnical consultant.

Any underground structures such as cesspools, cisterns, mining shafts, tunnels, septic tanks, wells, pipelines, or other structures not located prior to grading, are to be removed or treated in a manner recommended by the geotechnical consultant. Soft, dry, spongy, highly fractured, or otherwise unsuitable ground, extending to such a depth that surface processing cannot adequately improve the condition, should be overexcavated down to firm ground and approved by the geotechnical consultant before compaction and filling operations continue. Overexcavated and processed soils, which have been properly mixed and moisture conditioned, should be re-compacted to the minimum relative compaction as specified in these guidelines.

Existing ground, which is determined to be satisfactory for support of the fills, should be scarified (ripped) to a minimum depth of 6 to 8 inches, or as directed by the geotechnical consultant. After the scarified ground is brought to optimum moisture content, or greater and mixed, the materials should be compacted as specified herein. If the scarified zone is greater than 6 to 8 inches in depth, it may be necessary to remove the excess and place the material in lifts restricted to about 6 to 8 inches in compacted thickness.

Existing ground which is not satisfactory to support compacted fill should be overexcavated as required in the geotechnical report, or by the on-site geotechnical consultant. Scarification, disc harrowing, or other acceptable forms of mixing should continue until the soils are broken down and free of large lumps or clods, until the working surface is reasonably uniform and free from ruts, hollows, hummocks, mounds, or other uneven features, which would inhibit compaction as described previously.

Where fills are to be placed on ground with slopes steeper than 5:1 (horizontal to vertical [h:v]), the ground should be stepped or benched. The lowest bench, which will act as a key, should be a minimum of 15 feet wide and should be at least 2 feet deep into firm material, and approved by the geotechnical consultant. In fill-over-cut slope conditions, the recommended minimum width of the lowest bench or key is also 15 feet, with the key founded on firm material, as designated by the geotechnical consultant. As a general rule, unless specifically recommended otherwise by the geotechnical consultant, the minimum width of fill keys should be equal to ½ the height of the slope.

Standard benching is generally 4 feet (minimum) vertically, exposing firm, acceptable material. Benching may be used to remove unsuitable materials, although it is understood that the vertical height of the bench may exceed 4 feet. Pre-stripping may be considered for unsuitable materials in excess of 4 feet in thickness.

All areas to receive fill, including processed areas, removal areas, and the toes of fill benches, should be observed and approved by the geotechnical consultant prior to placement of fill. Fills may then be properly placed and compacted until design grades (elevations) are attained.

COMPACTED FILLS

Any earth materials imported or excavated on the property may be utilized in the fill provided that each material has been evaluated to be suitable by the geotechnical consultant. These materials should be free of roots, tree branches, other organic matter, or other deleterious materials. All unsuitable materials should be removed from the fill as directed by the geotechnical consultant. Soils of poor gradation, undesirable expansion potential, or substandard strength characteristics may be designated by the consultant as unsuitable and may require blending with other soils to serve as a satisfactory fill material.

Fill materials derived from benching operations should be dispersed throughout the fill area and blended with other approved material. Benching operations should not result in the benched material being placed only within a single equipment width away from the fill/bedrock contact.

Oversized materials defined as rock, or other irreducible materials, with a maximum dimension greater than 12 inches, should not be buried or placed in fills unless the location of materials and disposal methods are specifically approved by the geotechnical consultant. Oversized material should be taken offsite, or placed in accordance with recommendations of the geotechnical consultant in areas designated as suitable for rock disposal. GSI anticipates that soils to be utilized as fill material for the subject project may contain some rock. Appropriately, the need for rock disposal may be necessary during grading operations on the site. From a geotechnical standpoint, the depth of any rocks, rock fills, or rock blankets, should be a sufficient distance from finish grade. This depth is generally the same as any overexcavation due to cut-fill transitions in hard rock areas, and generally facilitates the excavation of structural footings and substructures. Should deeper excavations be proposed (i.e., deepened footings, utility trenching, swimming pools, spas, etc.), the developer may consider increasing the hold-down depth of any rocky fills to be placed, as appropriate. In addition, some agencies/jurisdictions mandate a specific hold-down depth for oversize materials placed in fills. The hold-down depth, and potential to encounter oversize rock, both within fills, and occurring in cut or natural areas, would need to be disclosed to all interested/affected parties. Once approved by the governing agency, the hold-down depth for oversized rock (i.e., greater than 12 inches) in fills on this project is provided as 10 feet, unless specified differently in the text of this report. The governing agency may require that these materials need to be deeper, crushed, or reduced to less than 12 inches in maximum dimension, at their discretion.

To facilitate future trenching, rock (or oversized material), should not be placed within the hold-down depth feet from finish grade, the range of foundation excavations, future utilities, or underground construction unless specifically approved by the governing agency, the geotechnical consultant, or the developer's representative.

If import material is required for grading, representative samples of the materials to be utilized as compacted fill should be analyzed in the laboratory by the geotechnical consultant to evaluate it's physical properties and suitability for use onsite. Such testing should be performed three (3) days prior to importation. If any material other than that previously tested is encountered during grading, an appropriate analysis of this material should be conducted by the geotechnical consultant as soon as possible.

Approved fill material should be placed in areas prepared to receive fill in near horizontal layers, that when compacted, should not exceed about 6 to 8 inches in thickness. The geotechnical consultant may approve thick lifts if testing indicates the grading procedures are such that adequate compaction is being achieved with lifts of greater thickness. Each layer should be spread evenly and blended to attain uniformity of material and moisture suitable for compaction.

Fill layers at a moisture content less than optimum should be watered and mixed, and wet fill layers should be aerated by scarification, or should be blended with drier material. Moisture conditioning, blending, and mixing of the fill layer should continue until the fill materials have a uniform moisture content at, or above, optimum moisture.

After each layer has been evenly spread, moisture conditioned, and mixed, it should be uniformly compacted to a minimum of 90 percent of the maximum density as evaluated by ASTM test designation D 1557, or as otherwise recommended by the geotechnical consultant. Compaction equipment should be adequately sized and should be specifically designed for soil compaction, or of proven reliability to efficiently achieve the specified degree of compaction.

Where tests indicate that the density of any layer of fill, or portion thereof, is below the required relative compaction, or improper moisture is in evidence, the particular layer or portion shall be re-worked until the required density and moisture content has been attained. No additional fill shall be placed in an area until the last placed lift of fill has been tested and found to meet the density and moisture requirements, and is approved by the geotechnical consultant.

In general, per the latest adopted Code, fill slopes should be designed and constructed at a gradient of 2:1 (h:v), or flatter. Compaction of slopes should be accomplished by over-building a minimum of 3 feet horizontally, and subsequently trimming back to the design slope configuration. Testing shall be performed as the fill is elevated to evaluate compaction as the fill core is being developed. Special efforts may be necessary to attain the specified compaction in the fill slope zone. Final slope shaping should be performed by trimming and removing loose materials with appropriate equipment. A final evaluation of fill slope compaction should be based on observation or testing of the finished slope face. Where compacted fill slopes are designed steeper than 2:1 (h:v), prior approval from the governing agency, specific material types, a higher minimum relative compaction, special reinforcement, and special grading procedures will be recommended.

If an alternative to over-building and cutting back the compacted fill slopes is selected, then special effort should be made to achieve the required compaction in the outer 10 feet of each lift of fill by undertaking the following:

1. An extra piece of equipment consisting of a heavy, short-shanked sheepsfoot should be used to roll (horizontal) parallel to the slopes continuously as fill is placed. The sheepsfoot roller should also be used to roll perpendicular to the slopes, and extend out over the slope to provide adequate compaction to the face of the slope.

2. Loose fill should not be spilled out over the face of the slope as each lift is compacted. Any loose fill spilled over a previously completed slope face should be trimmed off or be subject to re-rolling.

3. Field compaction tests will be made in the outer (horizontal) ±2 to ±8 feet of the slope at appropriate vertical intervals, subsequent to compaction operations.

4. After completion of the slope, the slope face should be shaped with a small tractor and then re-rolled with a sheepsfoot to achieve compaction to near the slope face. Subsequent to testing to evaluate compaction, the slopes should be grid-rolled to achieve compaction to the slope face. Final testing should be used to evaluate compaction after grid rolling.

5. Where testing indicates less than adequate compaction, the contractor will be responsible to rip, water, mix, and recompact the slope material as necessary to achieve compaction. Additional testing should be performed to evaluate compaction.

SUBDRAIN INSTALLATION

Subdrains should be installed in approved ground in accordance with the approximate alignment and details indicated by the geotechnical consultant. Subdrain locations or materials should not be changed or modified without approval of the geotechnical consultant. The geotechnical consultant may recommend and direct changes in subdrain line, grade, and drain material in the field, pending exposed conditions. The location of constructed subdrains, especially the outlets, should be recorded/surveyed by the project civil engineer. Drainage at the subdrain outlets should be provided by the project civil engineer.

EXCAVATIONS

Excavations and cut slopes should be examined during grading by the geotechnical consultant. If directed by the geotechnical consultant, further excavations or overexcavation and refilling of cut areas should be performed, or remedial grading of cut slopes should be performed. When fill-over-cut slopes are to be graded, unless otherwise approved, the cut portion of the slope should be observed by the geotechnical consultant prior to placement of materials for construction of the fill portion of the slope. The geotechnical consultant should observe all cut slopes, and should be notified by the contractor when excavation of cut slopes commences.

If, during the course of grading, unforeseen adverse or potentially adverse geologic conditions are encountered, the geotechnical consultant should investigate, evaluate, and make appropriate recommendations for mitigation of these conditions. The need for cut slope buttressing or stabilizing should be based on in-grading evaluation by the geotechnical consultant, whether anticipated or not.

Unless otherwise specified in geotechnical and geological report(s), no cut slopes should be excavated higher or steeper than that allowed by the ordinances of controlling governmental agencies. Additionally, short-term stability of temporary cut slopes is the contractor's responsibility.

Erosion control and drainage devices should be designed by the project civil engineer and should be constructed in compliance with the ordinances of the controlling governmental agencies, or in accordance with the recommendations of the geotechnical consultant.

COMPLETION

Observation, testing, and consultation by the geotechnical consultant should be conducted during the grading operations in order to state an opinion that all cut and fill areas are graded in accordance with the approved project specifications. After completion of grading, and after the geotechnical consultant has finished observations of the work, final reports should be submitted, and may be subject to review by the controlling governmental agencies. No further excavation or filling should be undertaken without prior notification of the geotechnical consultant or approved plans.

All finished cut and fill slopes should be protected from erosion and be planted in accordance with the project specifications or as recommended by a landscape architect. Such protection and planning should be undertaken as soon as practical after completion of grading.

JOB SAFETY

General

At GSI, getting the job done safely is of primary concern. The following is the company's safety considerations for use by all employees on multi-employer construction sites. On-ground personnel are at highest risk of injury, and possible fatality, on grading and construction projects. GSI recognizes that construction activities will vary on each site, and that site safety is the prime responsibility of the contractor; however, everyone must be safety conscious and responsible at all times. To achieve our goal of avoiding accidents, cooperation between the client, the contractor, and GSI personnel must be maintained.

In an effort to minimize risks associated with geotechnical testing and observation, the following precautions are to be implemented for the safety of field personnel on grading and construction projects:

Safety Meetings: GSI field personnel are directed to attend contractor's regularly scheduled and documented safety meetings.

Safety Vests: Safety vests are provided for, and are to be worn by GSI personnel, at all times, when they are working in the field.

Safety Flags: Two safety flags are provided to GSI field technicians; one is to be affixed to the vehicle when on site, the other is to be placed atop the spoil pile on all test pits.

Flashing Lights: All vehicles stationary in the grading area shall use rotating or flashing amber beacons, or strobe lights, on the vehicle during all field testing. While operating a vehicle in the grading area, the emergency flasher on the vehicle shall be activated.

If the contractor's representative observes any of our personnel who do not follow the above, we request that it be brought to the attention of our office.

Test Pits Location, Orientation, and Clearance

The technician is responsible for selecting test pit locations. A primary concern should be the technician's safety. Efforts will be made to coordinate locations with the grading contractor's authorized representative, and to select locations following or behind the established traffic pattern, preferably outside of current traffic. The contractor's authorized representative (supervisor, grade checker, dump man, operator, etc.) should direct excavation of the pit and safety during the test period. Of paramount concern should be the soil technician's safety, and obtaining enough tests to represent the fill.

Test pits should be excavated so that the spoil pile is placed away from oncoming traffic, whenever possible. The technician's vehicle is to be placed next to the test pit, opposite the spoil pile. This necessitates the fill be maintained in a drivable condition. Alternatively, the contractor may wish to park a piece of equipment in front of the test holes, particularly in small fill areas or those with limited access.

A zone of non-encroachment should be established for all test pits. No grading equipment should enter this zone during the testing procedure. The zone should extend approximately 50 feet outward from the center of the test pit. This zone is established for safety and to avoid excessive ground vibration, which typically decreases test results.

When taking slope tests, the technician should park the vehicle directly above or below the test location. If this is not possible, a prominent flag should be placed at the top of the slope. The contractor's representative should effectively keep all equipment at a safe operational distance (e.g., 50 feet) away from the slope during this testing.

The technician is directed to withdraw from the active portion of the fill as soon as possible following testing. The technician's vehicle should be parked at the perimeter of the fill in a highly visible location, well away from the equipment traffic pattern. The contractor should inform our personnel of all changes to haul roads, cut and fill areas or other factors that may affect site access and site safety.

If the technician's safety is jeopardized or compromised because of the contractor's failure to comply with any of the above, the technician is required, by company policy, to immediately withdraw and notify his/her supervisor. The grading contractor's representative will be

contacted to affect a solution. However, in the interim, no further testing will be performed until the situation is rectified. Any fill placed can be considered unacceptable and subject to reprocessing, recompaction, or removal.

If the soil technician does not comply with the above or other established safety guidelines, we request that the contractor bring this to the technician's attention and notify this office. Effective communication and coordination between the contractor's representative and the soil technician is strongly encouraged to implement the above safety plan.

Trench and Vertical Excavation

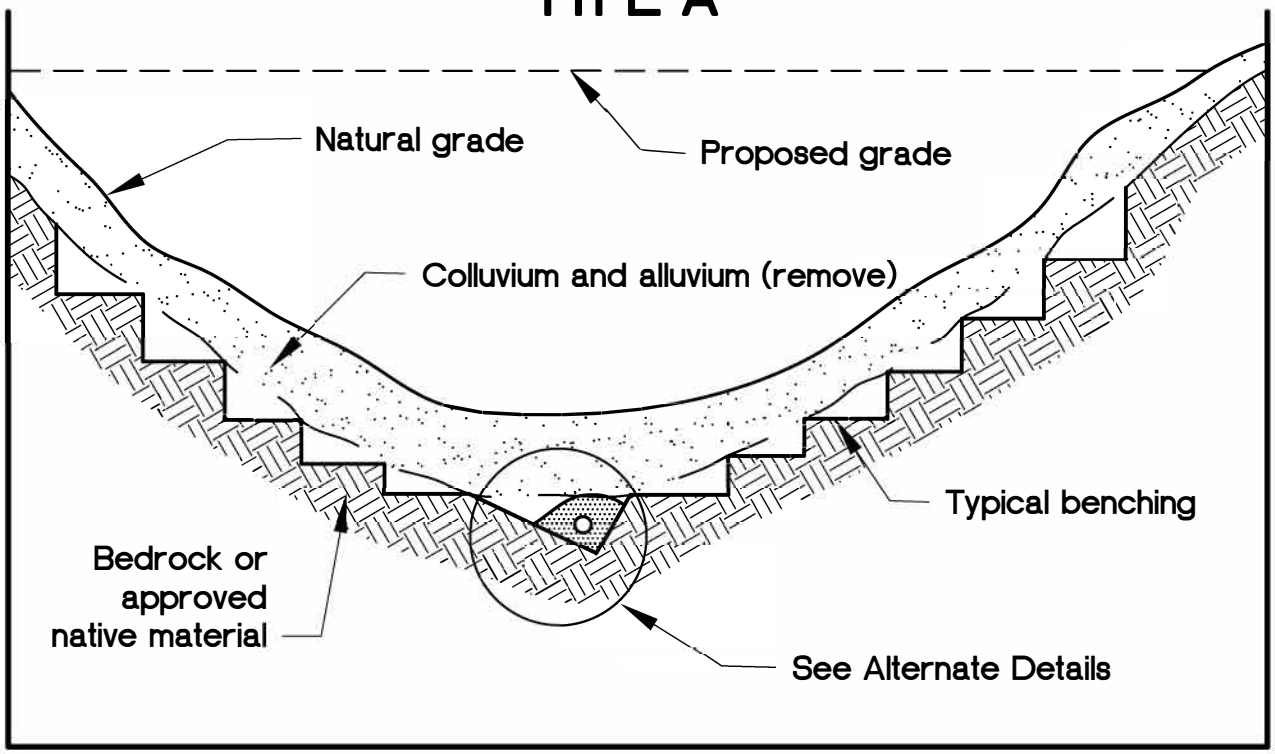
It is the contractor's responsibility to provide safe access into trenches where compaction testing is needed. Our personnel are directed not to enter any excavation or vertical cut which: 1) is 5 feet or deeper unless shored or laid back; 2) displays any evidence of instability, has any loose rock or other debris which could fall into the trench; or 3) displays any other evidence of any unsafe conditions regardless of depth.

All trench excavations or vertical cuts more than 5 feet deep, which any person enters, should be shored or laid back. Trench access should be provided in accordance with Cal/OSHA and/or state and local standards. Our personnel are directed not to enter any trench by being lowered or "riding down" on the equipment.

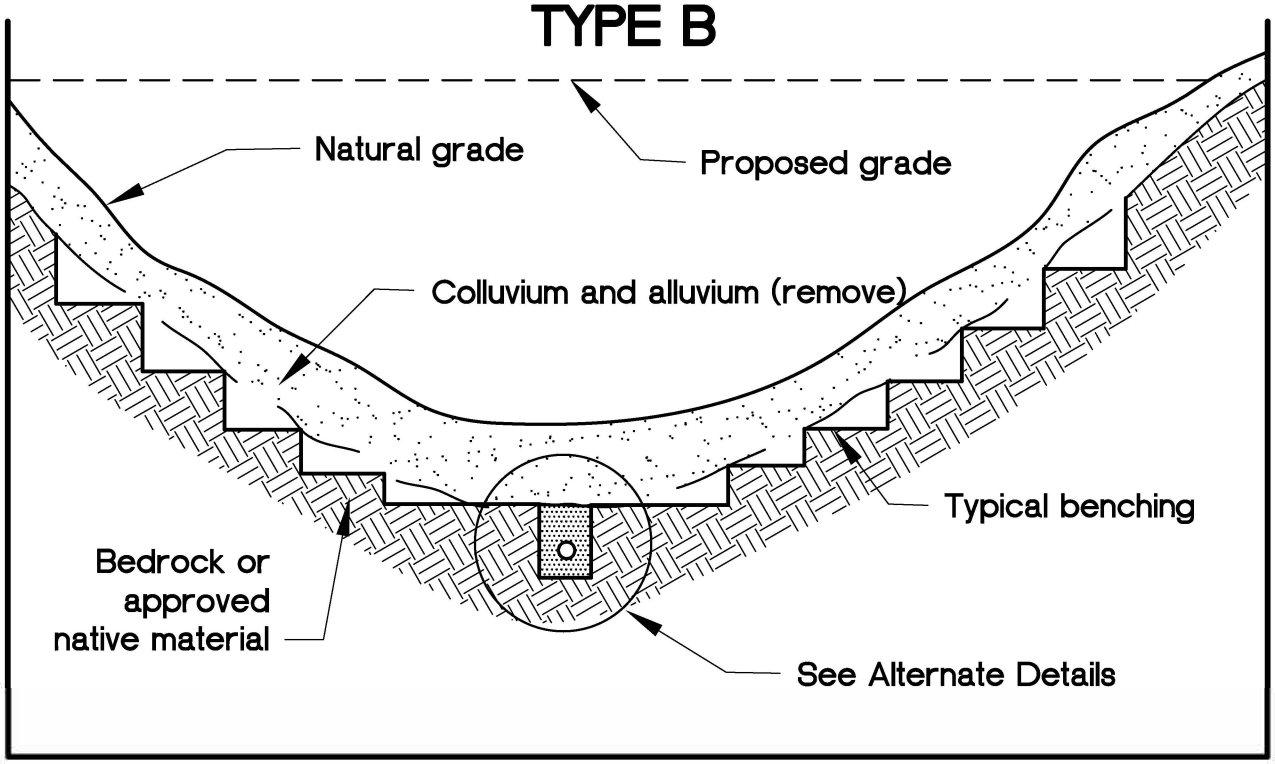
If the contractor fails to provide safe access to trenches for compaction testing, our company policy requires that the soil technician withdraw and notify his/her supervisor. The contractor's representative will be contacted to affect a solution. All backfill not tested due to safety concerns or other reasons could be subject to reprocessing and/or removal.

If GSI personnel become aware of anyone working beneath an unsafe trench wall or vertical excavation, we have a legal obligation to put the contractor and owner/developer on notice to immediately correct the situation. If corrective steps are not taken, GSI then has an obligation to notify Cal/OSHA and/or the proper controlling authorities.

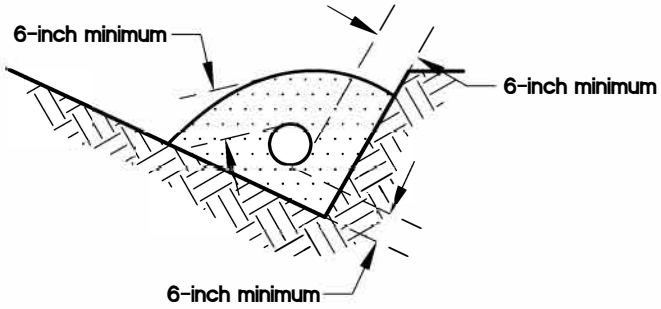
TYPE A



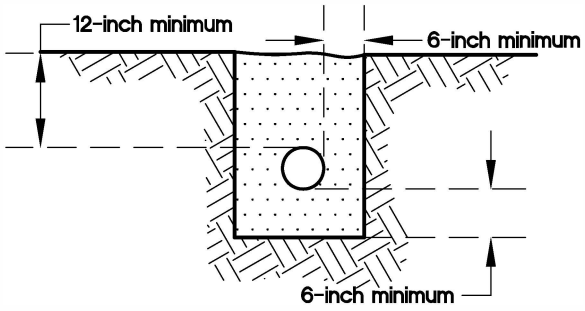
TYPE B



Selection of alternate subdrain details, location, and extent of subdrains should be evaluated by the geotechnical consultant during grading.



A-1



B-1

Filter material: Minimum volume of 9 cubic feet per lineal foot of pipe.

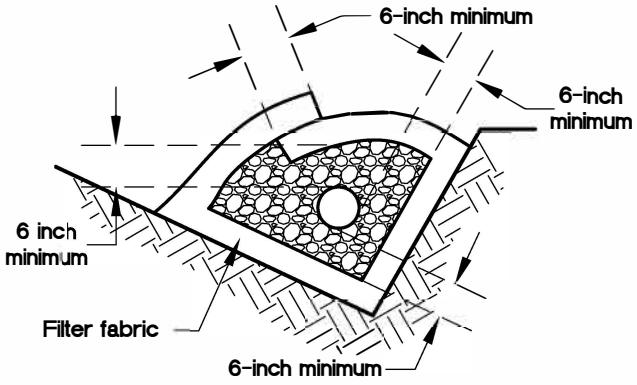
Perforated pipe: 6-inch-diameter ABS or PVC pipe or approved substitute with minimum 8 perforations (¼-inch diameter) per lineal foot in bottom half of pipe (ASTM D-2751, SDR-35, or ASTM D-1527, Schd. 40).

For continuous run in excess of 500 feet, use 8-inch-diameter pipe (ASTM D-3034, SDR-35, or ASTM D-1785, Schd. 40).

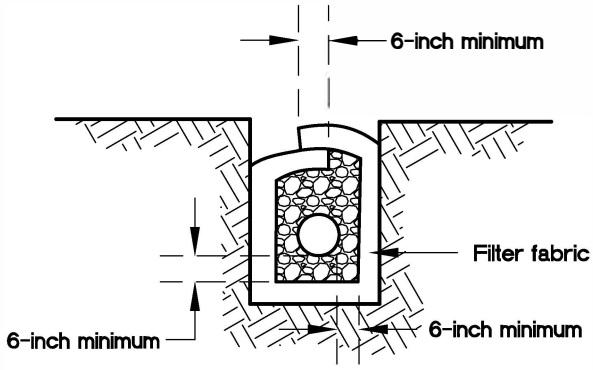
FILTER MATERIAL

Sieve Size	Percent Passing
1 inch	100
¾ inch	90-100
⅜ inch	40-100
No. 4	25-40
No. 8	18-33
No. 30	5-15
No. 50	0-7
No. 200	0-3

ALTERNATE 1: PERFORATED PIPE AND FILTER MATERIAL



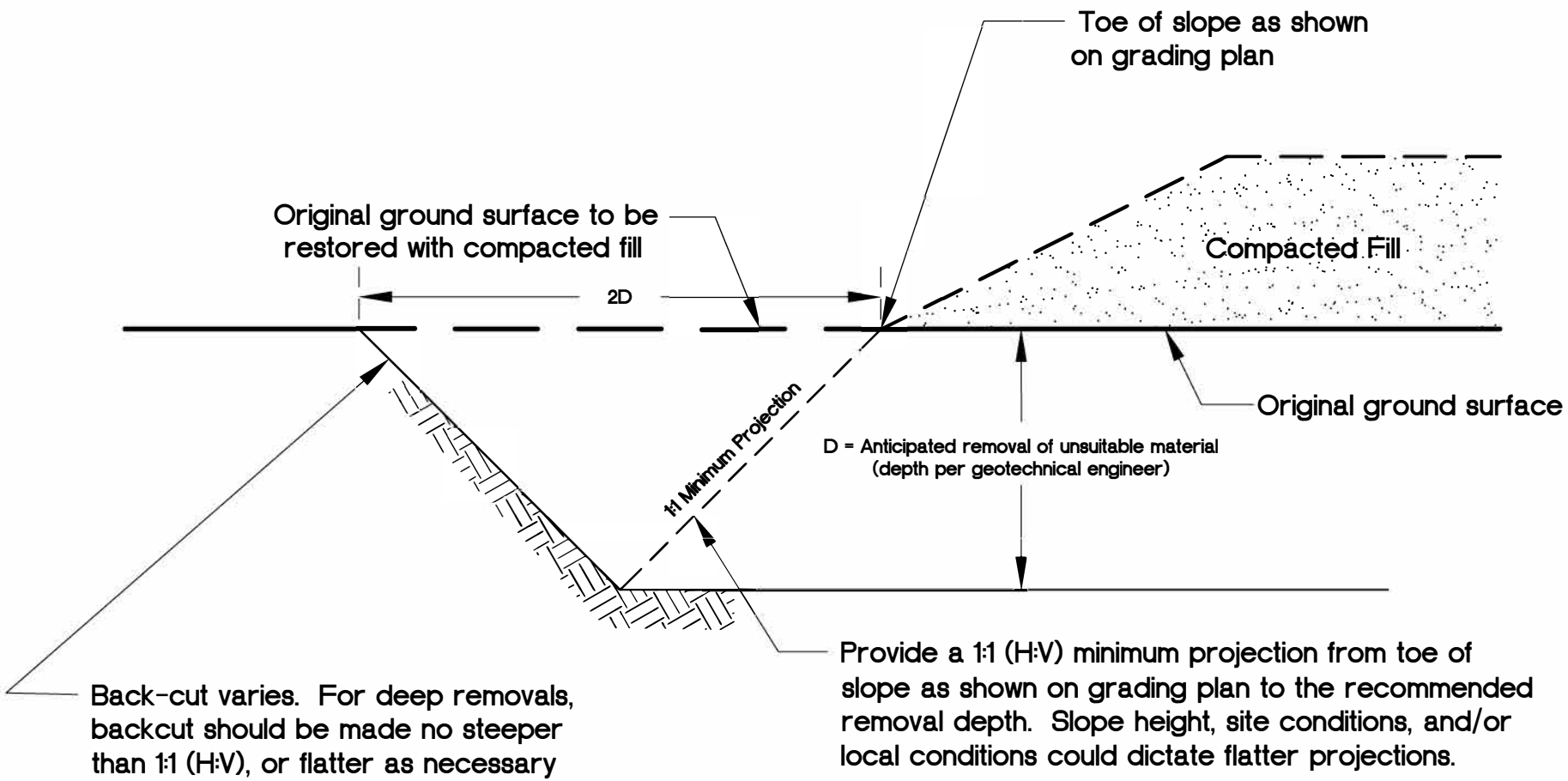
A-2



B-2

Gravel Material: 9 cubic feet per lineal foot.
Perforated Pipe: See Alternate 1
Gravel: Clean ¾-inch rock or approved substitute.
Filter Fabric: Mirafi 140 or approved substitute.

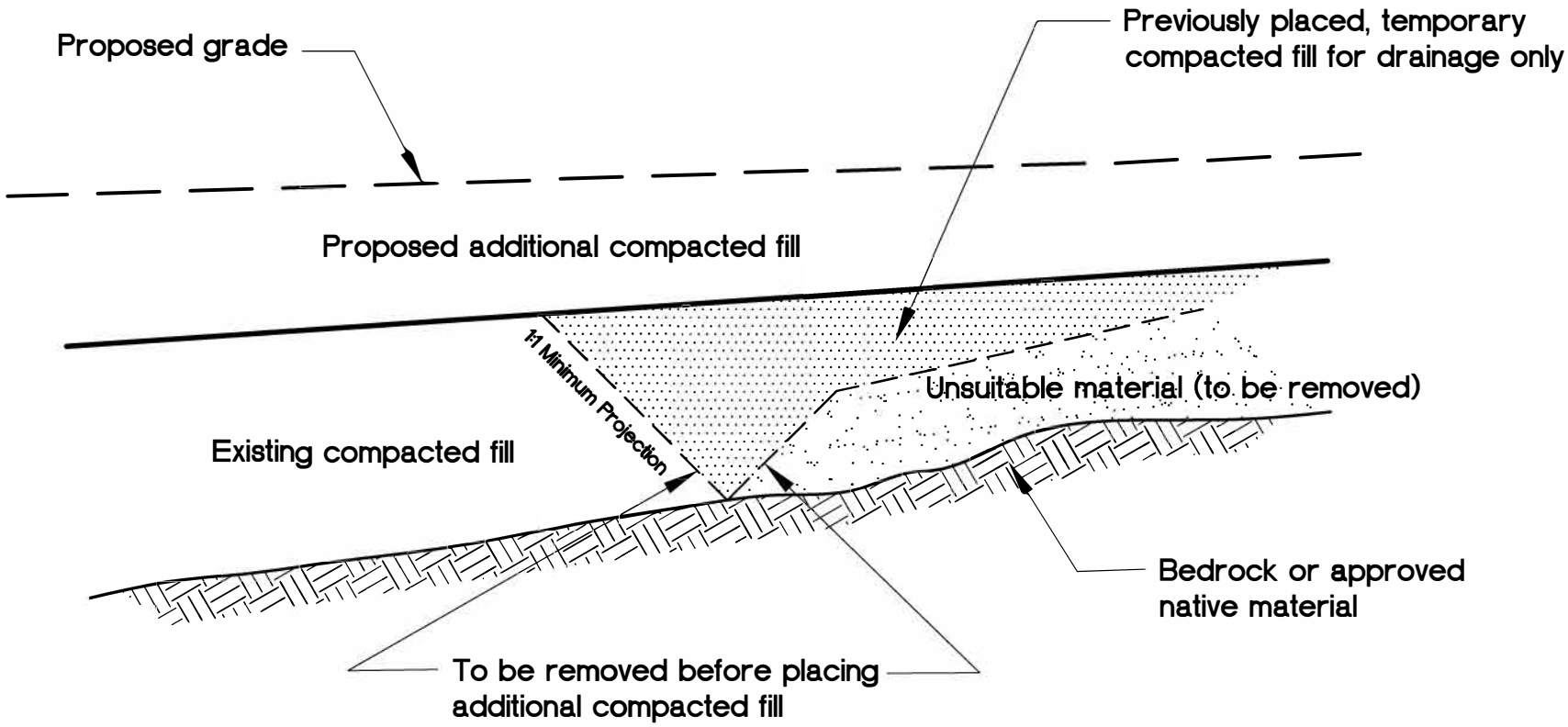
ALTERNATE 2: PERFORATED PIPE, GRAVEL, AND FILTER FABRIC



GSI GeoSoils, Inc.

FILL SLOPE TOEING OUT ON FLAT ALLUVIATED CANYON DETAIL

Plate F-3



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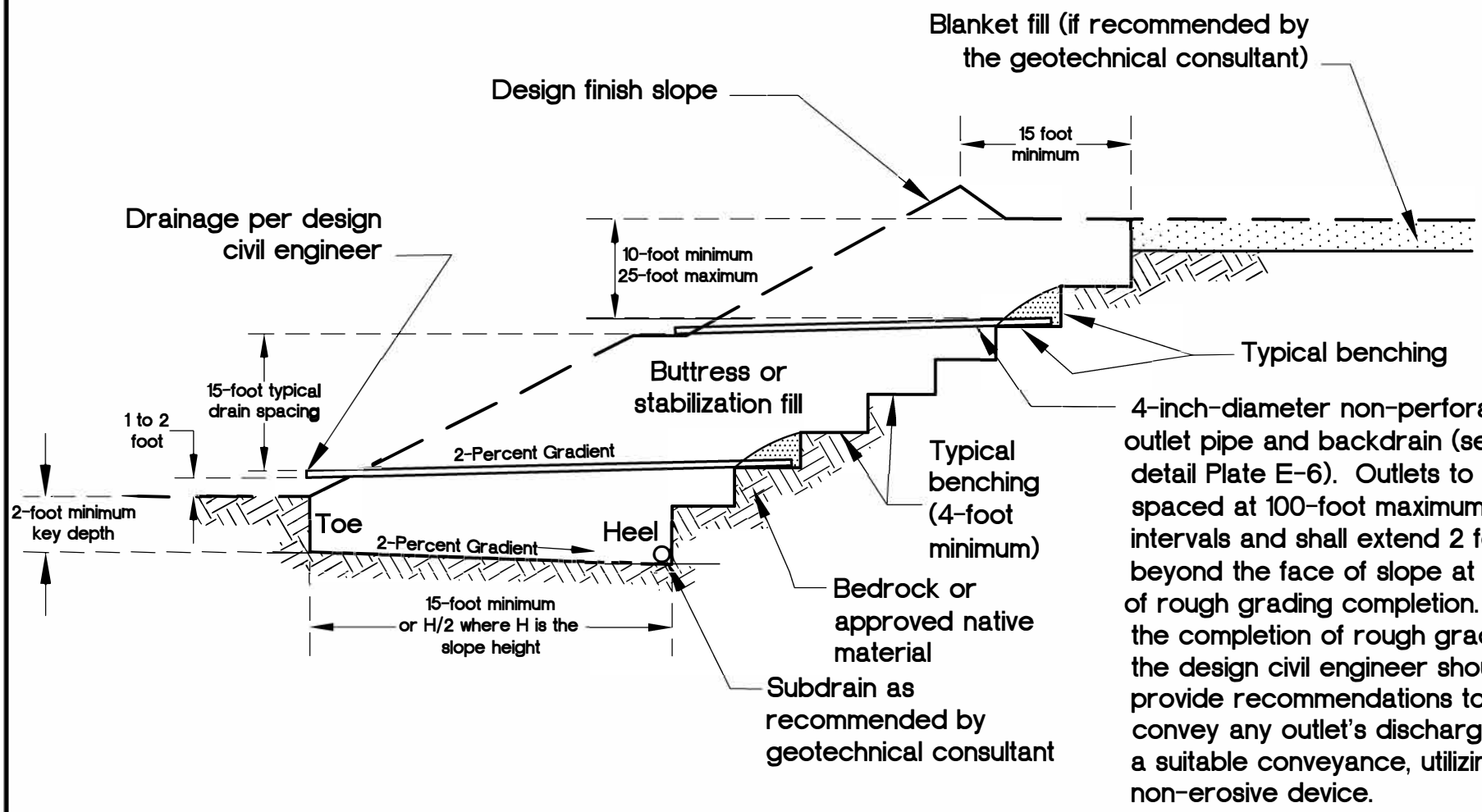
REMOVAL ADJACENT TO EXISTING FILL ADJOINING CANYON FILL DETAIL

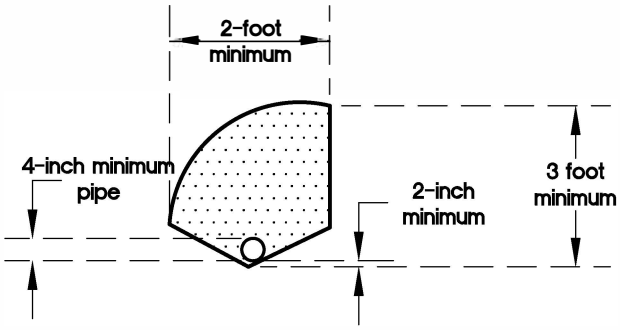
Plate F-4

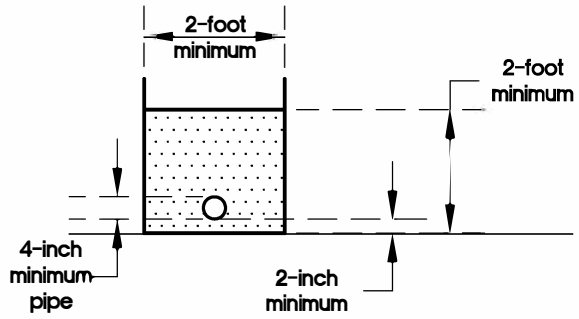


GeoSoils, Inc.

TYPICAL STABILIZATION / BUTTRESS FILL DETAIL

Plate F-5





Filter Material: Minimum of 5 cubic feet per lineal foot of pipe or 4 cubic feet per lineal feet of pipe when placed in square cut trench.

Alternative in Lieu of Filter Material: Gravel may be encased in approved filter fabric. Filter fabric shall be Mirafi 140 or equivalent. Filter fabric shall be lapped a minimum of 12 inches in all joints.

Minimum 4-Inch-Diameter Pipe: ABS-ASTM D-2751, SDR 35; or ASTM D-1527 Schedule 40, PVC-ASTM D-3034, SDR 35; or ASTM D-1785 Schedule 40 with a crushing strength of 1,000 pounds minimum, and a minimum of 8 uniformly-spaced perforations per foot of pipe. Must be installed with perforations down at bottom of pipe. Provide cap at upstream end of pipe. Slope at 2 percent to outlet pipe. Outlet pipe to be connected to subdrain pipe with tee or elbow.

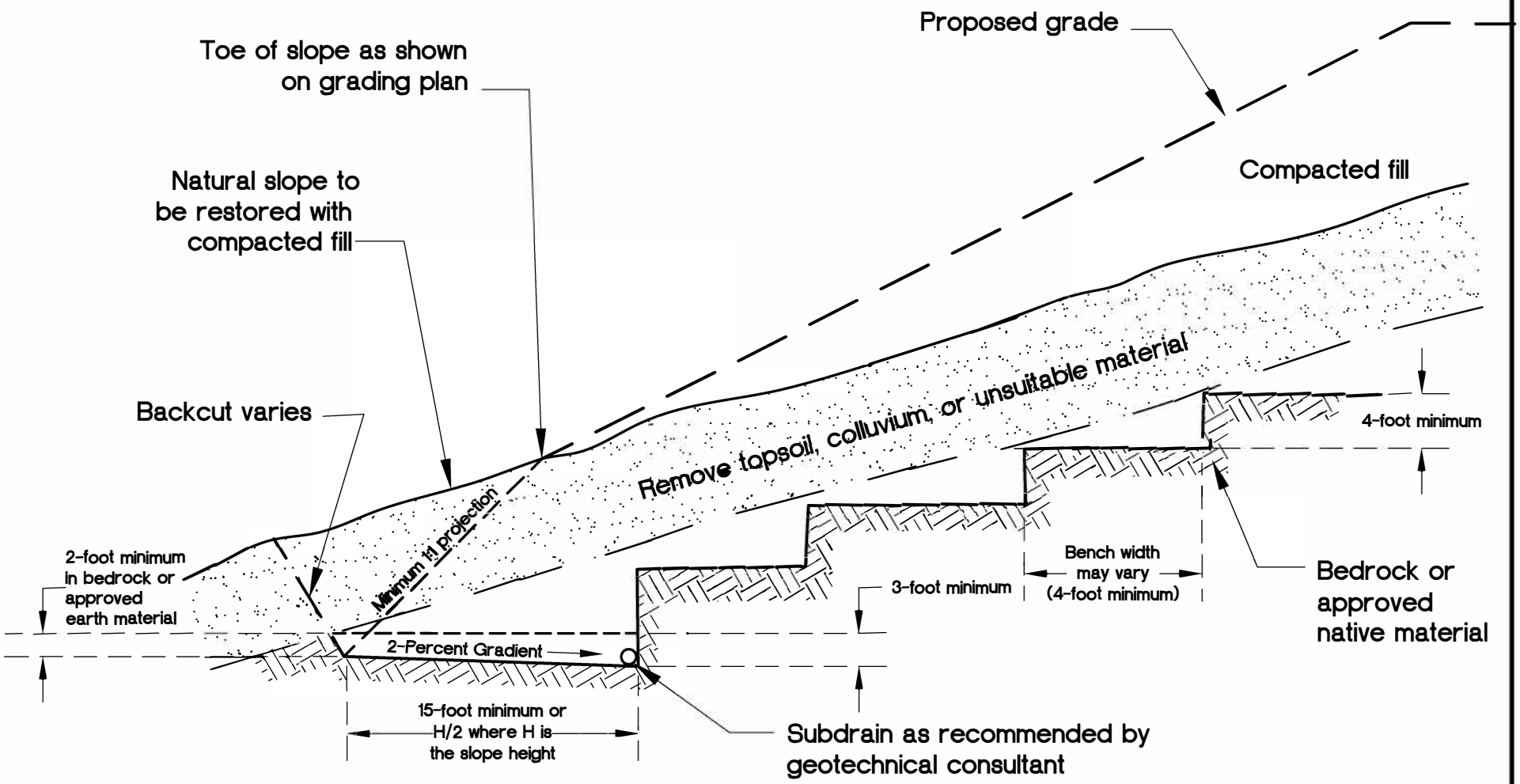
Notes:
1. Trench for outlet pipes to be backfilled and compacted with onsite soil.
2. Backdrains and lateral drains shall be located at elevation of every bench drain. First drain located at elevation just above lower lot grade. Additional drains may be required at the discretion of the geotechnical consultant.

Filter Material shall be of the following specification or an approved equivalent.

Sieve Size	Percent Passing
1 inch	100
¾ inch	90-100
⅜ inch	40-100
No. 4	25-40
No. 8	18-33
No. 30	5-15
No. 50	0-7
No. 200	0-3

Gravel shall be of the following specification or an approved equivalent.

Sieve Size	Percent Passing
1½ inch	100
No. 4	50
No. 200	8



NOTES:

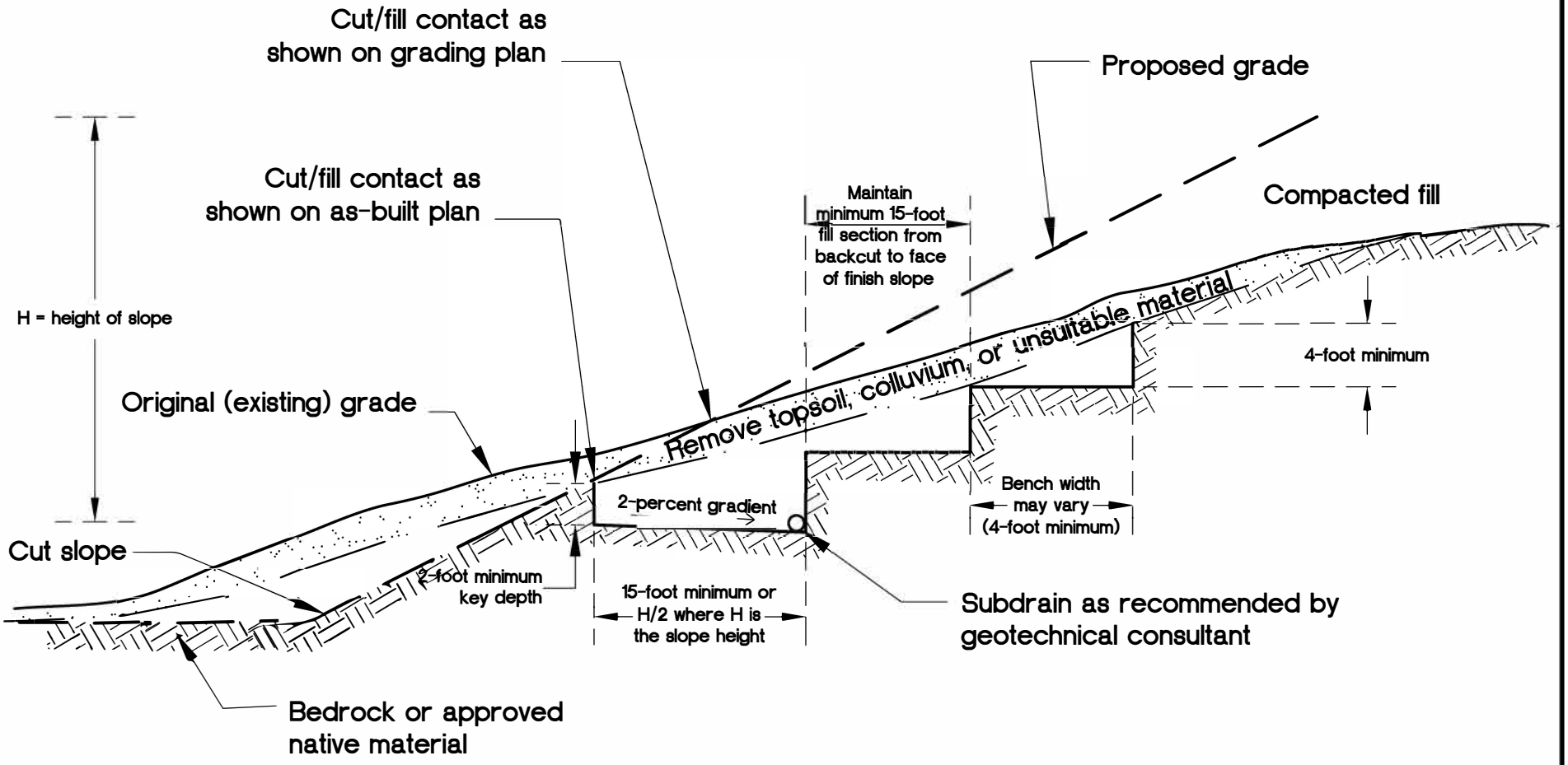
1. Where the natural slope approaches or exceeds the design slope ratio, special recommendations would be provided by the geotechnical consultant.

2. The need for and disposition of drains should be evaluated by the geotechnical consultant, based upon exposed conditions.

GeoSoils, Inc.

FILL OVER NATURAL (SIDEHILL FILL) DETAIL

Plate F-7



NOTE: The cut portion of the slope should be excavated and evaluated by the geotechnical consultant prior to construction of the fill portion.

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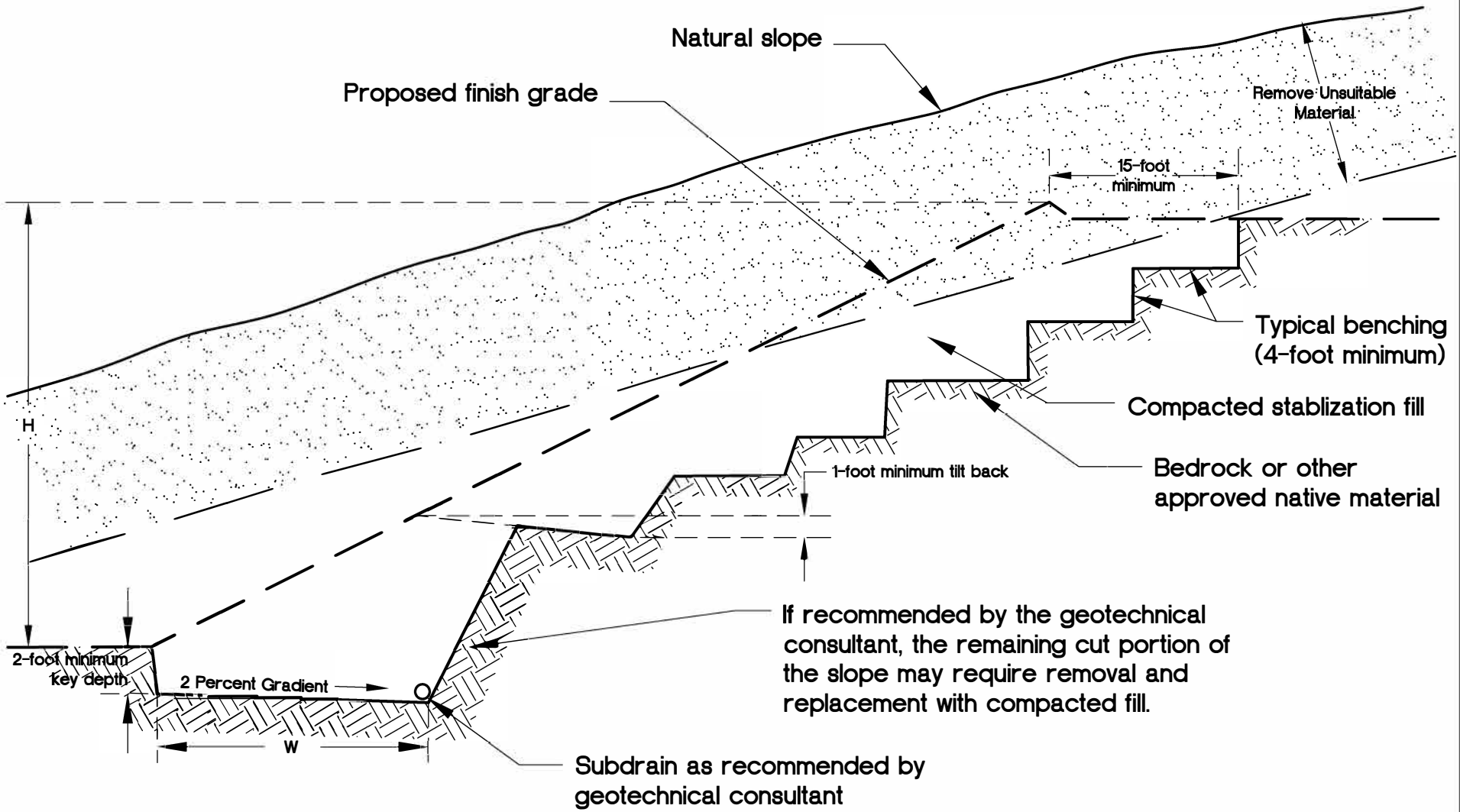
FILL OVER CUT DETAIL

Plate F-8

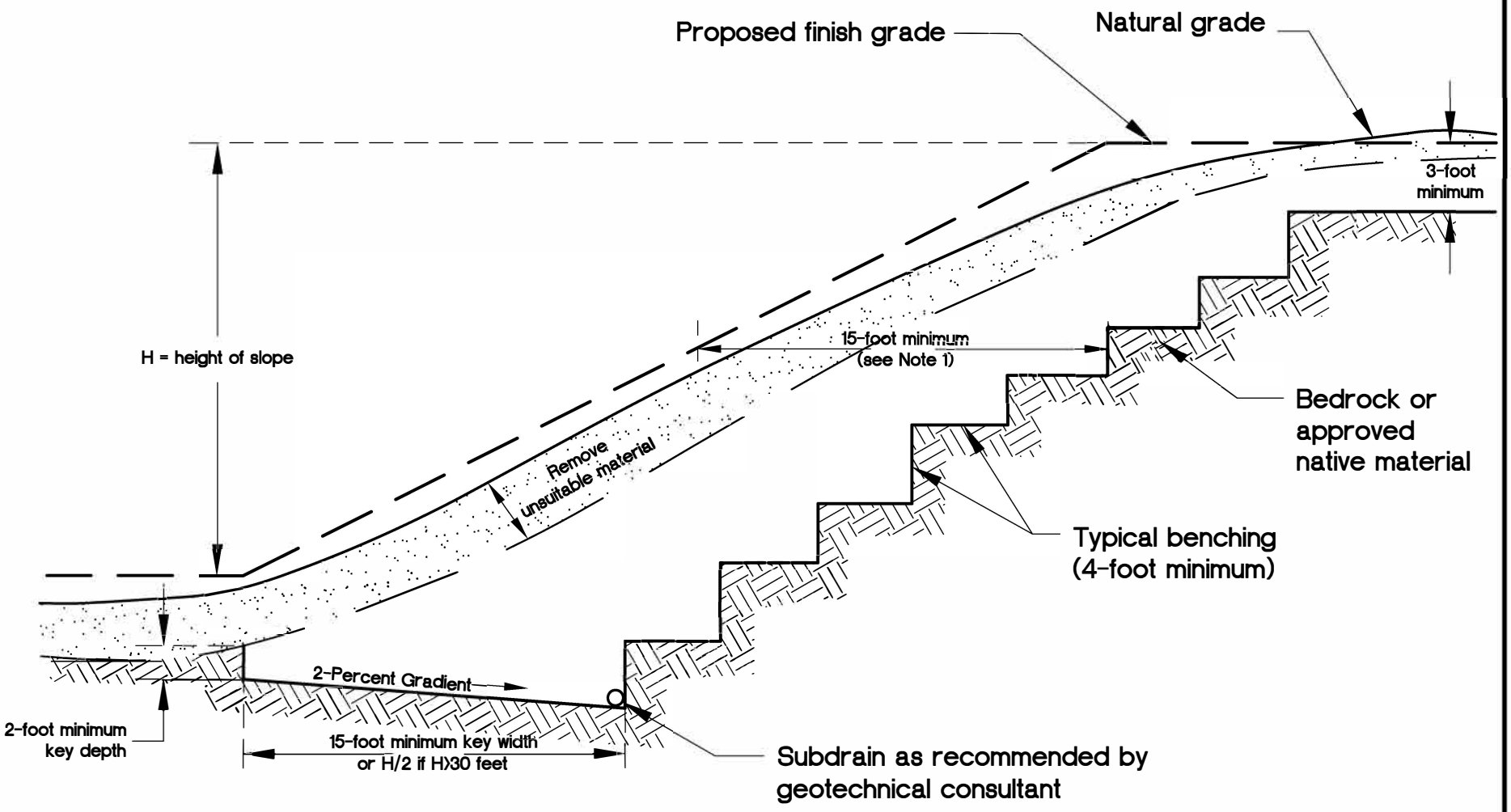


NOTES:

1. Subdrains may be required as specified by the geotechnical consultant.

2 W shall be equipment width (15 feet) for slope heights less than 25 feet. For slopes greater than 25 feet, W shall be evaluated by the geotechnical consultant. At no time, shall W be less than H/2, where H is the height of the slope.

GeoSoils, Inc.	STABLIZATION FILL FOR UNSTABLE MATERIAL EXPOSED IN CUT SLOPE DETAIL	Plate F-9



NOTES:

1. 15-foot minimum to be maintained from proposed finish slope face to backcut.
2. The need and disposition of drains will be evaluated by the geotechnical consultant based on field conditions.
3. Pad overexcavation and recompaction should be performed if evaluated to be necessary by the geotechnical consultant.

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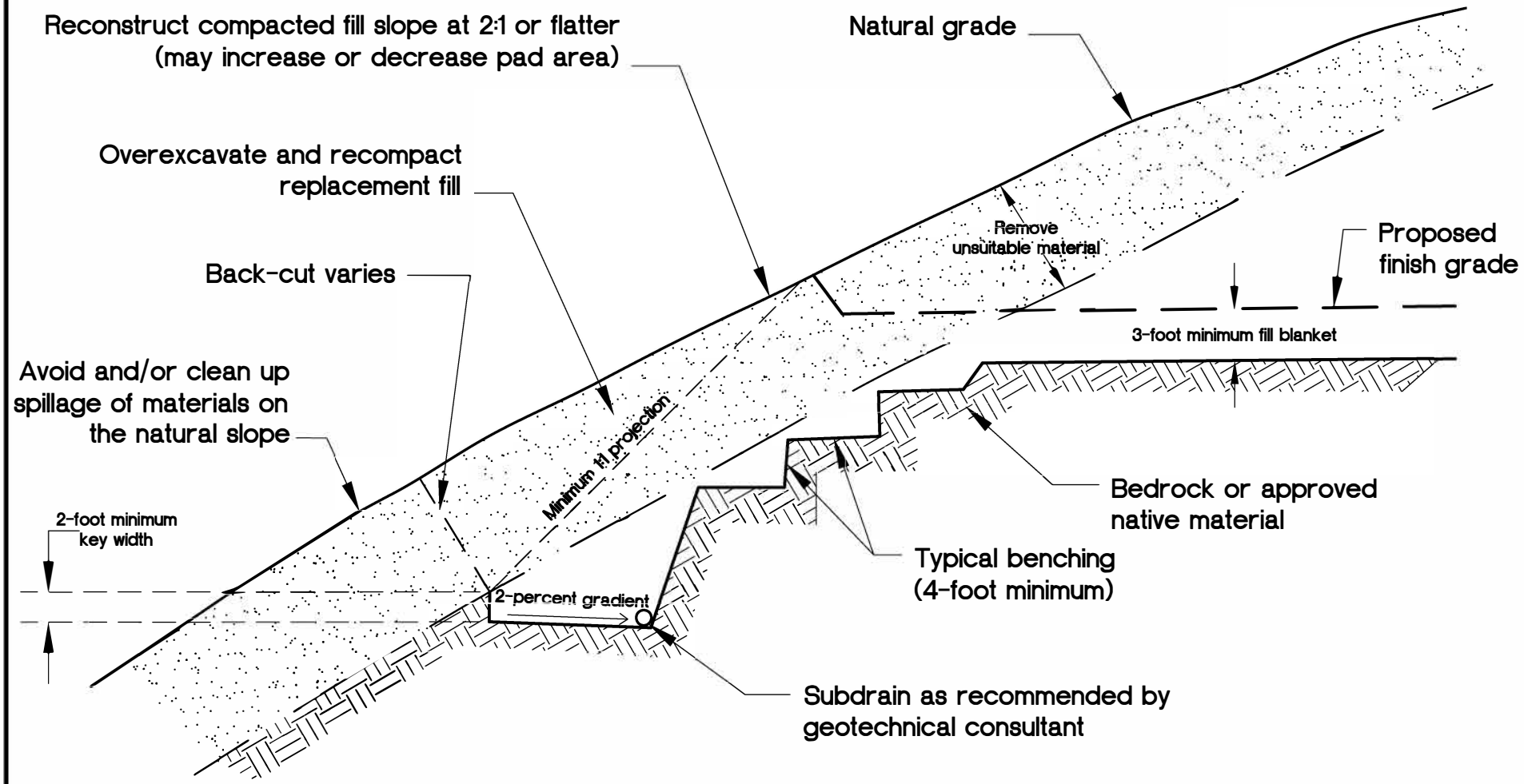
SKIN FILL OF NATURAL GROUND DETAIL

Plate F-10



NOTES:

1. Subdrain and key width requirements will be evaluated based on exposed subsurface conditions and thickness of overburden.

2. Pad overexcavation and recompaction should be performed if evaluated necessary by the geotechnical consultant.

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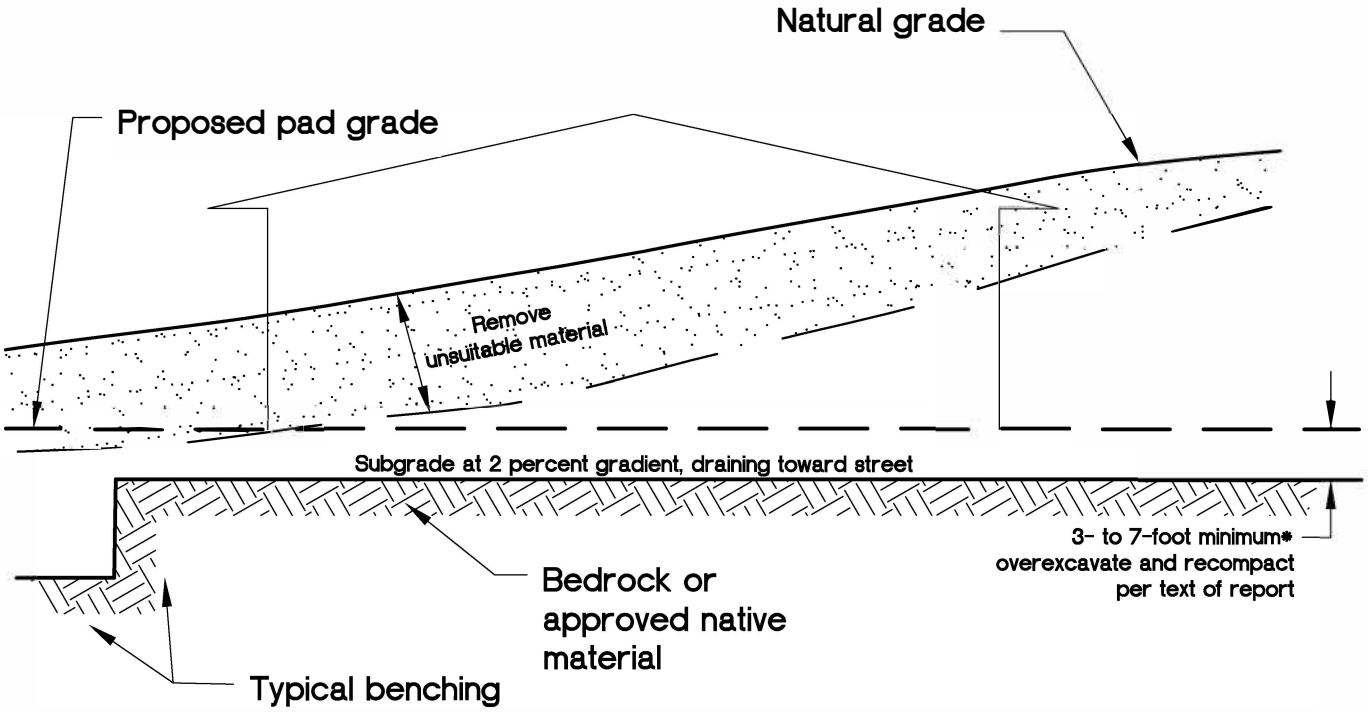
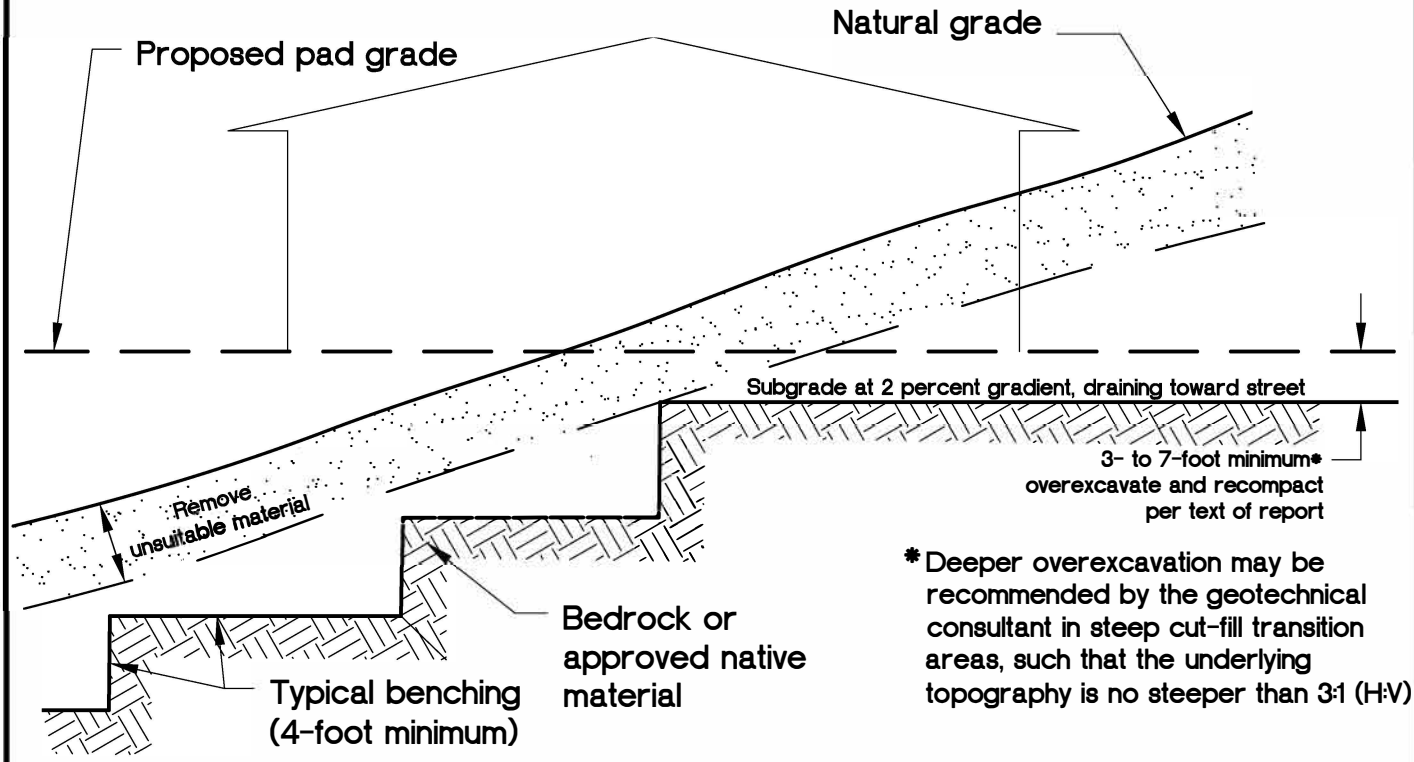
DAYLIGHT CUT LOT DETAIL

Plate F-11



CUT LOT OR MATERIAL-TYPE TRANSITION

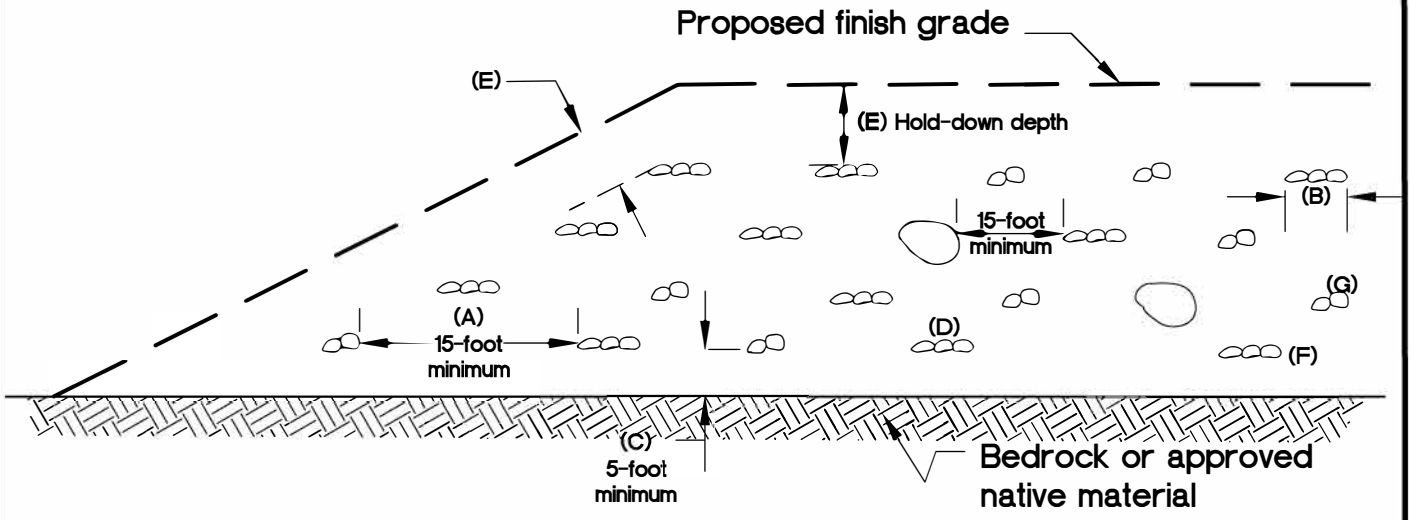


*Deeper overexcavation may be recommended by the geotechnical consultant in steep cut-fill transition areas, such that the underlying topography is no steeper than 3:1 (H:V)

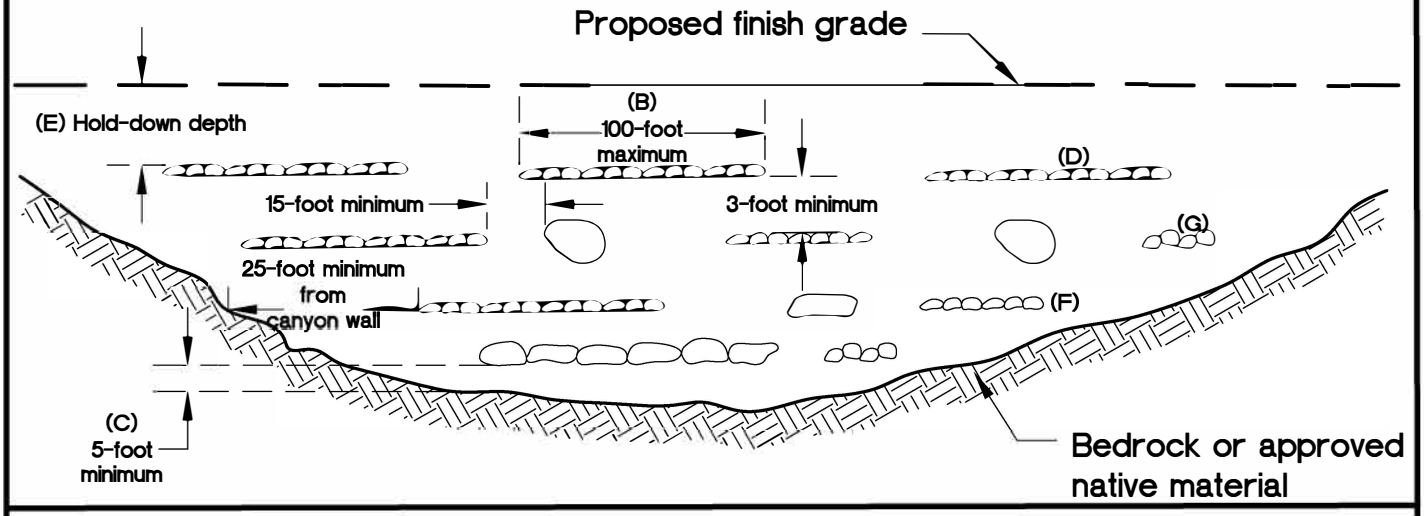
CUT-FILL LOT (DAYLIGHT TRANSITION)

GeoSoils, Inc.	TRANSITION LOT DETAILS	Plate F-12

VIEW NORMAL TO SLOPE FACE



VIEW PARALLEL TO SLOPE FACE



NOTES:

A. One equipment width or a minimum of 15 feet between rows (or windrows).
B. Height and width may vary depending on rock size and type of equipment. Length of windrow shall be no greater than 100 feet.
C. If approved by the geotechnical consultant, windrows may be placed direclty on competent material or bedrock, provided adequate space is available for compaction.
D. Orientation of windrows may vary but should be as recommended by the geotechnical engineer and/or engineering geologist. Staggering of windrows is not necessary unless recommended.
E. Clear area for utility trenches, foundations, and swimming pools; Hold-down depth as specified in text of report, subject to governing agency approval.
F. All fill over and around rock windrow shall be compacted to at least 90 percent relative compaction or as recommended.
G. After fill between windrows is placed and compacted, with the lift of fill covering windrow, windrow should be proof rolled with a D-9 dozer or equivalent.

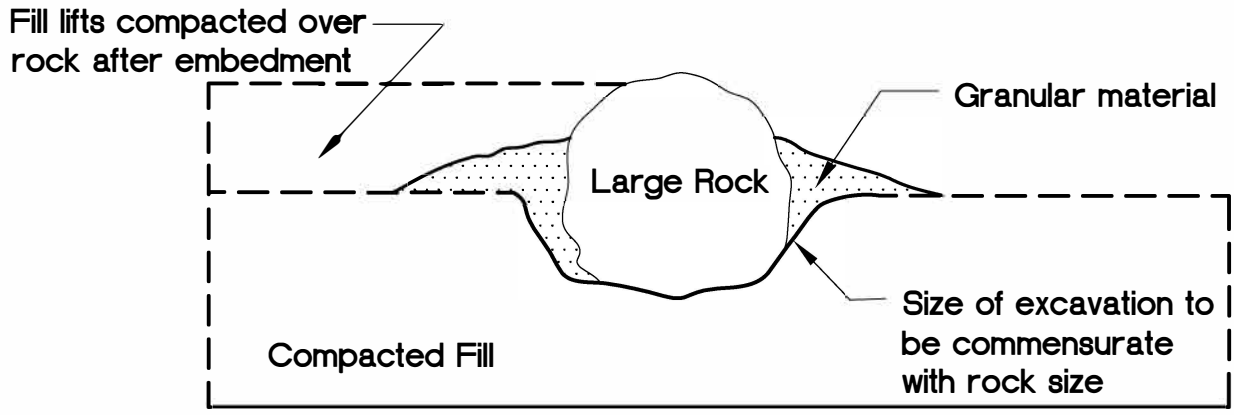
VIEWS ARE DIAGRAMMATIC ONLY AND MAY BE SUPERSEDED BY REPORT RECOMMENDATIONS OR CODE
ROCK SHOULD NOT TOUCH AND VOIDS SHOULD BE COMPLETELY FILLED

GeoSoils, Inc.

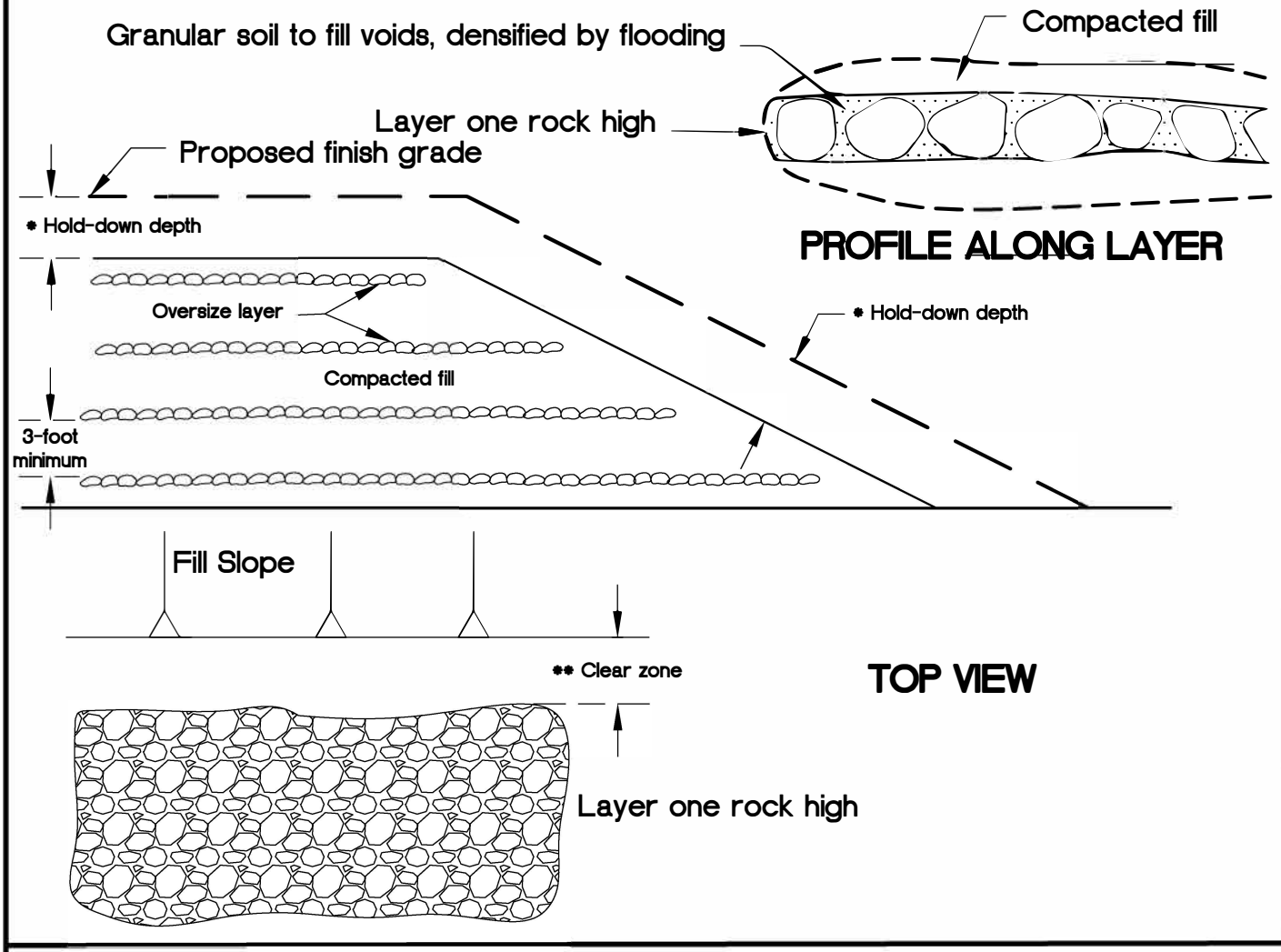
OVERSIZE ROCK DISPOSAL DETAIL

Plate F-13

ROCK DISPOSAL PITS



ROCK DISPOSAL LAYERS



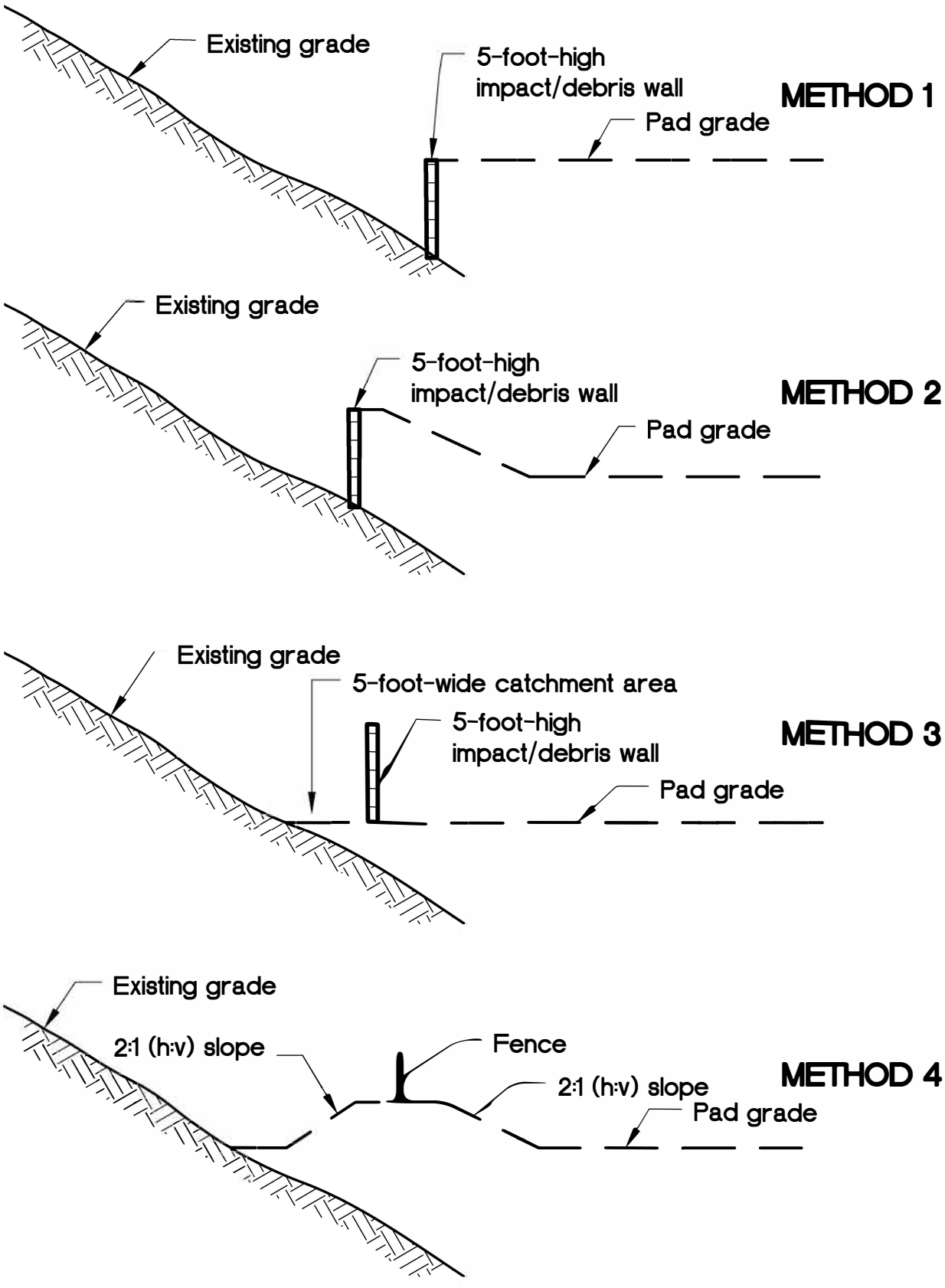
* Hold-down depth or below lowest utility as specified in text of report, subject to governing agency approval.

** Clear zone for utility trenches, foundations, and swimming pools, as specified in text of report.

VIEWS ARE DIAGRAMMATIC ONLY AND MAY BE SUPERSEDED BY REPORT RECOMMENDATIONS OR CODE

ROCK SHOULD NOT TOUCH AND VOIDS SHOULD BE COMPLETELY FILLED IN

GeoSoils,Inc.	ROCK DISPOSAL DETAIL	Plate F-14

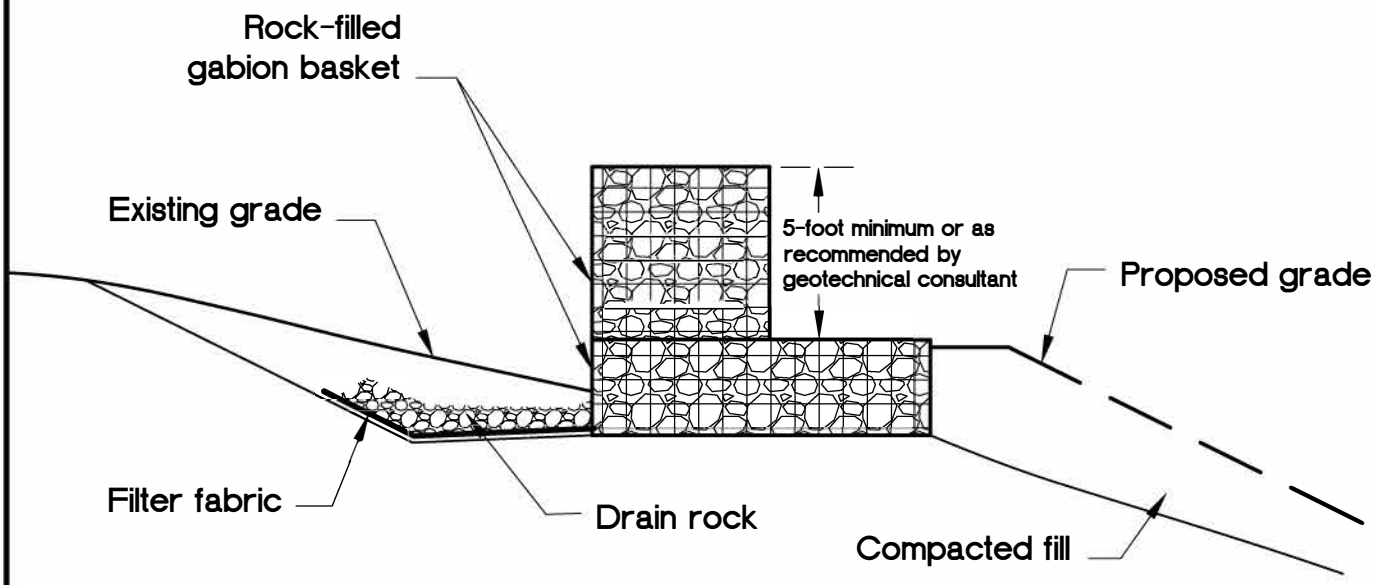


NOT TO SCALE

GSI GeoSoils,Inc.

DEBRIS DEVICE CONTROL METHODS DETAIL

Plate F-15



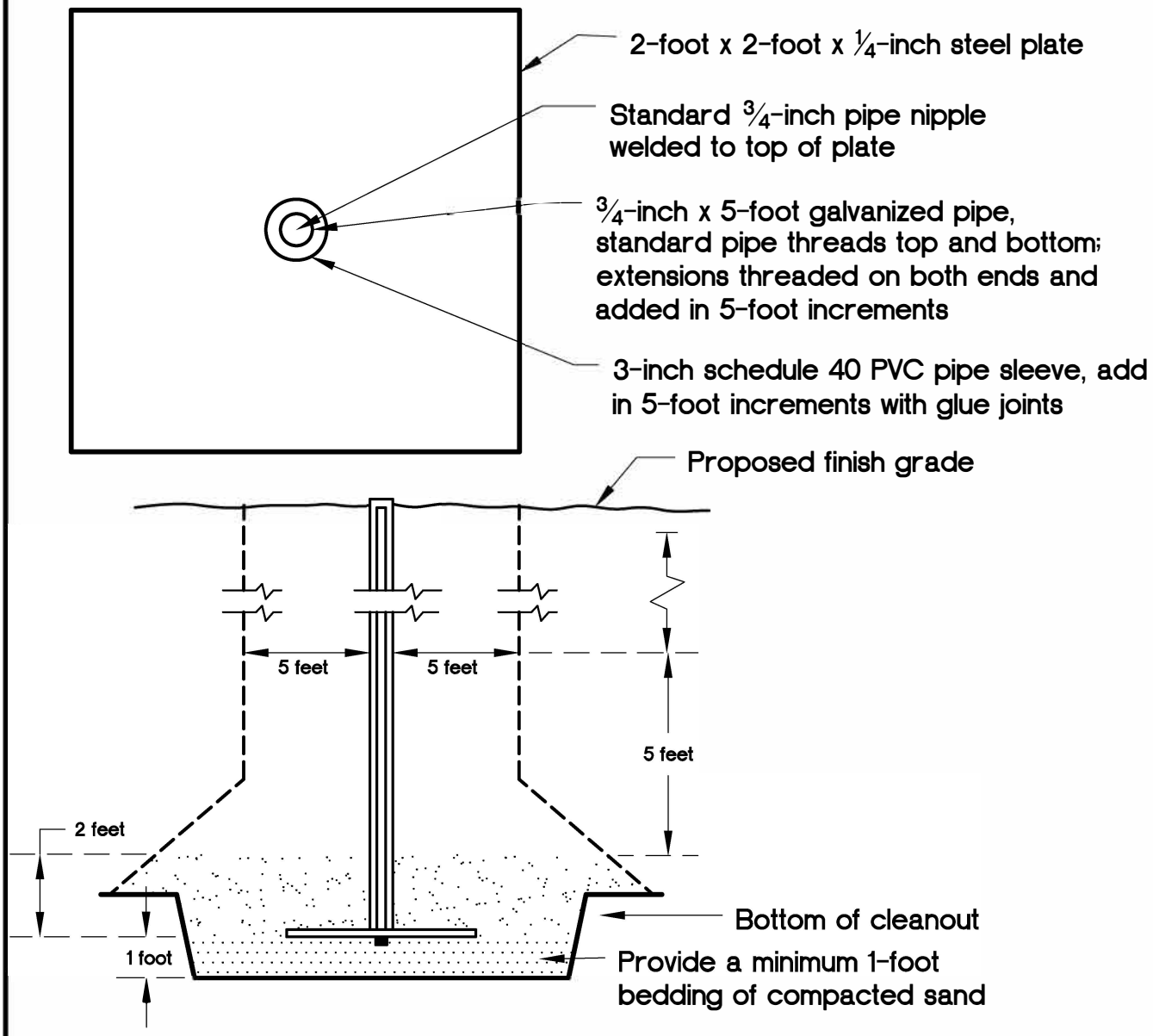
Gabion impact or diversion wall should be constructed at the base of the ascending slope subject to rock fall. Walls need to be constructed with high segments that sustain impact and mitigate potential for overtopping, and low segment that provides channelization of sediments and debris to desired depositional area for subsequent clean-out. Additional subdrain may be recommended by geotechnical consultant.

From GSA, 1987

GeoSoils,Inc.

ROCK FALL MITIGATION DETAIL

Plate F-16



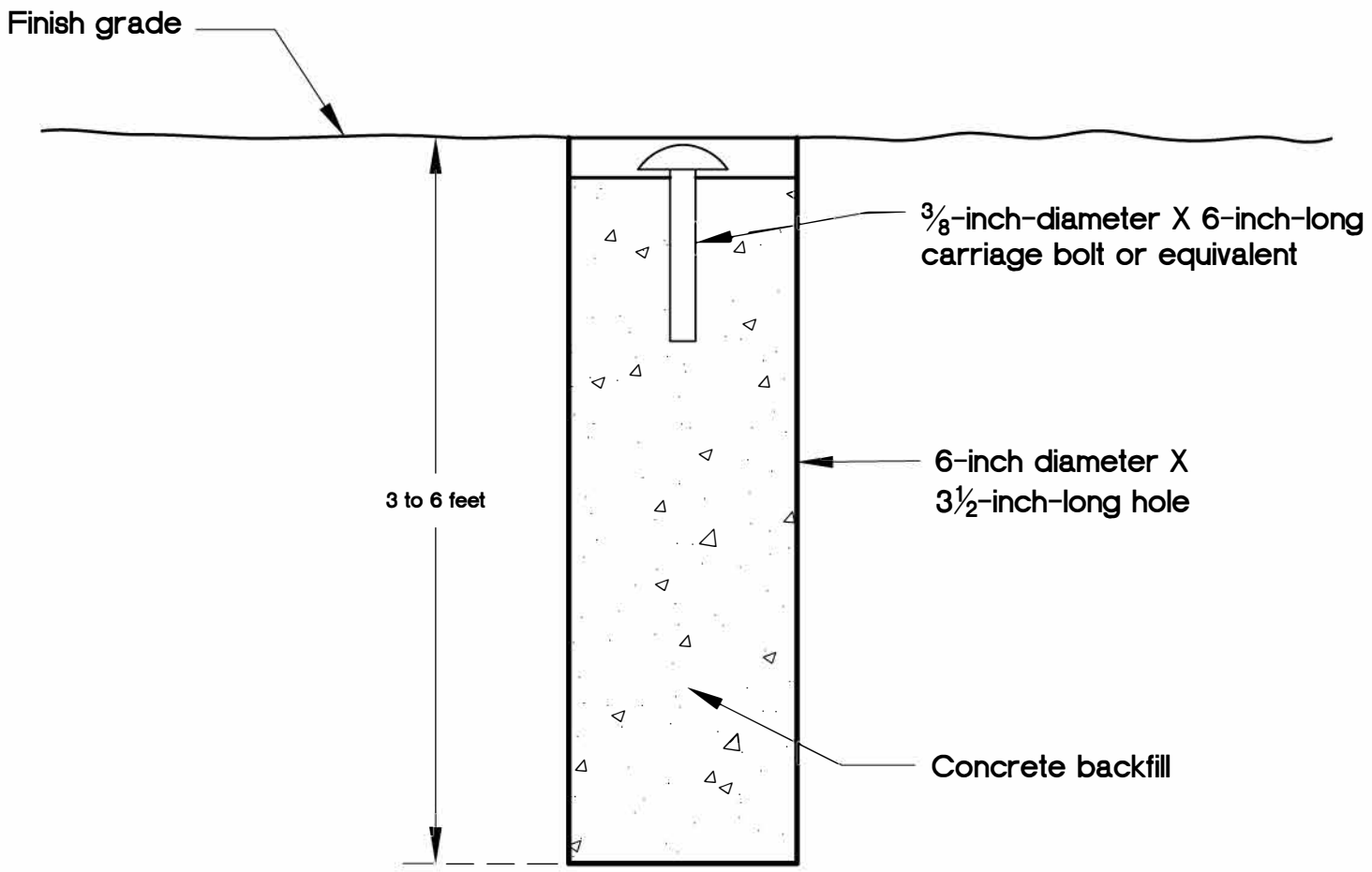
NOTES:

1. Locations of settlement plates should be clearly marked and readily visible (red flagged) to equipment operators.
2. Contractor should maintain clearance of a 5-foot radius of plate base and withiin 5 feet (vertical) for heavy equipment. Fill within clearance area should be hand compacted to project specifications or compacted by alternative approved method by the geotechnical consultant (in writing, prior to construction).
3. After 5 feet (vertical) of fill is in place, contractor should maintain a 5-foot radius equipment clearance from riser.
4. Place and mechanically hand compact initial 2 feet of fill prior to establishing the initial reading.
5. In the event of damage to the settlement plate or extension resulting from equipment operating within the specified clearance area, contractor should immediately notify the geotechnical consultant and should be responsible for restoring the settlement plates to working order.
6. An alternate design and method of installation may be provided at the discretion of the geotechnical consultant.

GeoSoils,Inc.

SETTLEMENT PLATE AND RISER DETAIL

Plate F-17

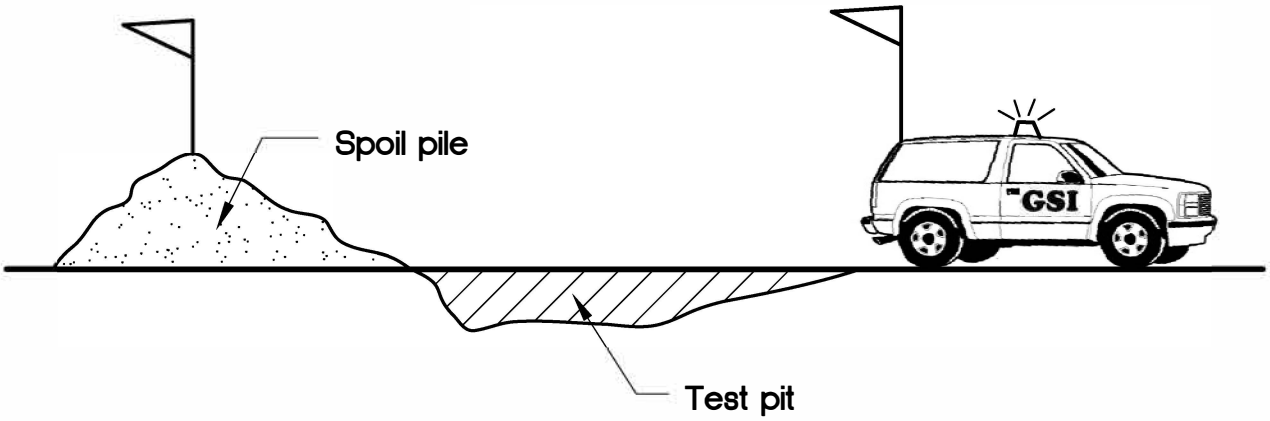


GSI GeoSoils, Inc.

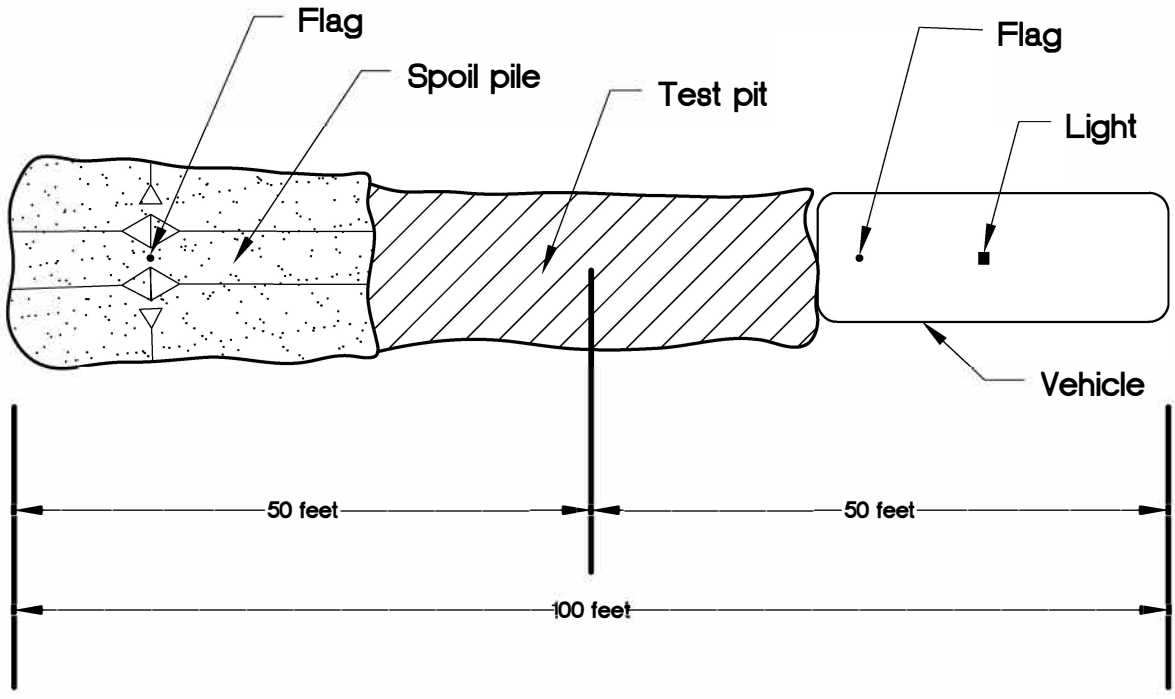
TYPICAL SURFACE SETTLEMENT MONUMENT

Plate F–18

SIDE VIEW



TOP VIEW



GeoSoils, Inc.

TEST PIT SAFETY DIAGRAM

Plate F-19

SUPPLEMENTAL INFILTRATION FEASIBILITY TESTING
PROPOSED BRADLEY GARDENS SKILLED NURSING FACILITY
BUILDING ADDITION, 980 W. 7TH STREET
CITY OF SAN JACINTO, RIVERSIDE COUNTY
CALIFORNIA 92582 (APN 435-330-003)

FOR

CORCORAN CONSTRUCTION, INC.
26590 MADISON AVENUE
MURRIETA, CALIFORNIA 92562

W.O. 9071-A1-IE AUGUST 14, 2026

GeoSoils, Inc.

GeoSoils, Inc.
Geotechnical · Geologic · Coastal · Environmental
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TEL: (951) 471-0700 - FAX: (951) 471-0702
www.geosoils.com

August 14, 2026

W.O. 9071-A1-IE

Corcoran Construction, Inc.
26590 Madison Avenue
Murrieta, California 92562

Attention: Ms. Kim Corcoran

Subject: Supplemental Infiltration Feasibility Testing, Proposed Bradley Gardens Skilled Nursing Facility Building Addition, 980 W. 7th Street, City of San Jacinto, Riverside County, California 92582 (APN 435-330-003)

Dear Ms. Corcoran:

In accordance with the City of San Jacinto review comments received, and your request and authorization, GeoSoils, Inc. (GSI) is presenting the results of our supplemental infiltration feasibility testing for the proposed Bradley Gardens skilled nursing facility in the City of San Jacinto, Riverside County, California. The purpose of this study was to further evaluate the onsite soils and geologic conditions and conduct feasibility infiltration testing within the areas of the proposed pervious paver access driveway onsite, for use in water quality Best Management Practice (BMP) design by the water quality engineer of record for the project.

The scope of our services has included a review of the referenced reports and documents (see Appendix A), the advancement of four (4) hand-excavated exploratory borings onsite, which were excavated to a depth of 2 feet below the existing surface (bgs), geologic logging (Appendix B), field infiltration testing (Appendix C), analysis of field test data obtained, and preparation of this summary infiltration feasibility testing report.

SITE DESCRIPTION AND CURRENT SITE CONDITIONS

The overall site consists of an approximately 2.98-acre, rectangular-shaped area of developed land. The site is located on the southeast corner of the intersection of W 7th Street and S. Grand Avenue, in the City of San Jacinto, Riverside County, California. The property is bounded by undeveloped land on the south, east and west, by residential development to the southwest, and commercial development to the north, across W 7th Street. In general, the site is flat-lying to very gently sloping in a southeasterly direction. According to Google Earth Pro (GEP, 2026), site elevations vary between approximately 1,527 and 1,525 feet Mean Sea Level (MSL), for an overall relief of about 2 feet. The site is sparsely vegetated and has localized shrubs and trees within and surrounding the existing facility.

PROPOSED DEVELOPMENT

Based on our review of the overall site plan, dated September 18, 2025, prepared by Gregg Maedo & Associates (GMA, 2025), we understand that continued development of the property would consist of the construction of a 43-bed skilled nursing facility (Building A1), as well as the installation of underground utility and roadway infrastructure. The newly provided storm water quality control plan by Guide Engineering (GE, 2026) indicates the development of a pervious paver access roadway on the east and south side of the project site. It is our understanding the pervious paver access roadway will be used as a relatively shallow water quality Best Management Practice (BMP) feature onsite.

SITE GEOLOGY

Based on our previous onsite preliminary geotechnical investigation (GSI, 2025) and published geologic mapping by Dibblee (2003), the site is underlain by Holocene- to late Pleistocene-age alluvial sand and clay of valley areas (Qa), although no significant clay layers were encountered during this, or our previous subsurface investigation (GSI, 2025). As encountered during our previous subsurface investigation the site soils were mostly sandy (e.g., silty sands) with minor silt layers encountered at depth. The observed alluvial deposits extend to depths beyond 60 feet, and are estimated to be hundreds of feet in thickness based on the data reviewed (GSI, 2025).

The near surface alluvial deposits encountered during this study generally consist of light brown silty sands that were generally loose to medium dense with depth, with the exception of hand auger P-4, near the dumpster area, which was medium dense to very dense with depth. The near surface soils were also found to be dry to damp, very fine to coarse grained sands, and somewhat to locally friable near the surface.

GROUNDWATER

Regional or perched groundwater was not encountered during this study or within the subsurface excavations (Borings and Cone Penetration Testing [CPT]), up to approximately 60 feet in depth, advanced during our previous field work (GSI, 2025). Likewise, seeps, springs, or other indications of a high groundwater level were not noted on the subject property during the time of this or our previous field investigation (GSI, 2025).

Based on our review of the California Department of Water Resources (CDWR) Water Data Library (2026), nearby well measurements reviewed appear to be regional groundwater measurements at depths of approximately 170 and 155 feet (State Well No. 04S01W27P005S [March 7, 1991], and Site Code No. 337748N1169760W001 [December 6, 2011], respectively) at sites with similar ground surface elevations. However,

our review of historic groundwater measurements in the San Jacinto and Temecula basins (U.S. Geological Survey, 1919, Water Supply Paper 429) indicates groundwater near the center of the basin may have been as shallow as 40 feet bgs. However, in California, the legislature passed the Sustainable Groundwater Management Act (SGMA), creating a statewide framework for groundwater regulation. The Eastern Municipal Water District (EMWD), and several other water purveyors, have been actively managing the San Jacinto basin as part of a voluntary Assembly Bill 3030 effort passed in 1992. As such, it is unlikely the groundwater will reach historic levels as the basin is now adjudicated. These observations reflect site conditions at the time of our field work and do not prevent future changes in local groundwater conditions from excessive irrigation, precipitation, or that were not evident at the time of this, or our original preliminary investigation (GSI, 2025).

INFILTRATION FEASIBILITY TESTING

In accordance with Riverside County Flood Control - Low Impact Development (LID) BMP Design Handbook (RCFC, 2011) guidelines for infiltration testing, four (4) tests were conducted within the proposed location of the pervious paver access driveway, as requested by the design engineer. The approximate locations of the infiltration tests for this study are provided on Figure 1 (Percolation-Infiltration Test Location Map). The infiltration testing was performed to further evaluate site conditions with respect to the proposed pervious paver BMP system that would retain and filter onsite storm water. The infiltration testing was performed in conformance with the RCFC (2011) design handbook for such testing. The infiltration testing was performed by a senior field technician under the direct supervision of a principal geologist from GSI. Logs of the borings advanced for this study are presented in Appendix B, and the Field Infiltration Data Sheets are presented in Appendix C. Procedures for testing are outlined briefly below:

Percolation Test Procedures

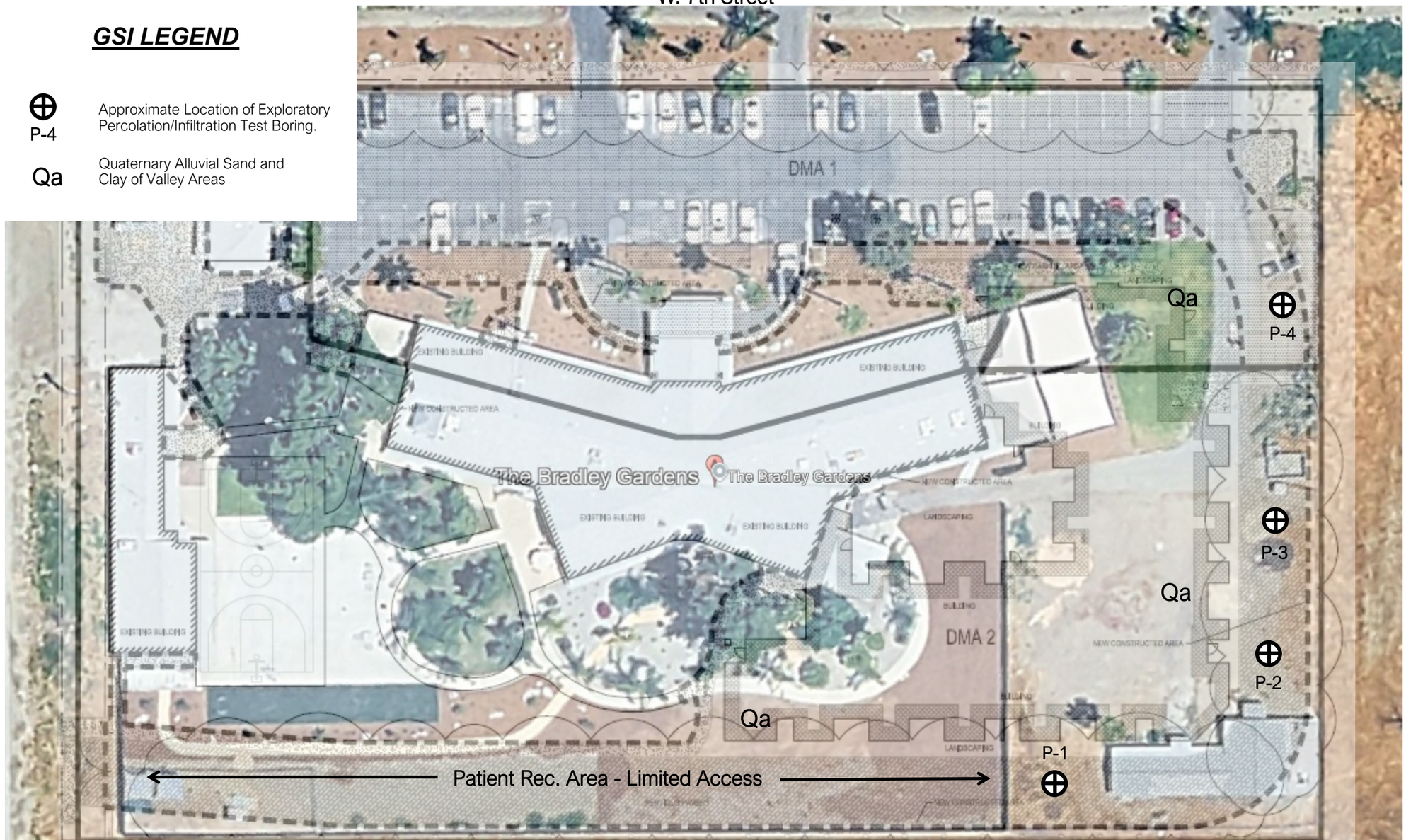
Test Borings:

1. Hand excavated to a depth of approximately 2 feet
2. Diameter - 8 inches.
3. After the removal of loose materials, 2 inches of gravel was placed on the bottom of each test boring.
4. A perforated pipe was then installed within each test boring to facilitate accurate field measurements and prevent caving during the pre-soak period and infiltration testing.

GSI LEGEND

⊕ P-4 — Approximate Location of Exploratory Percolation/Infiltration Test Boring.

Qa — Quaternary Alluvial Sand and Clay of Valley Areas



ALL LOCATIONS ARE APPROXIMATE

This document or e-file is not part of the Construction Documents and should not be relied upon as being an accurate depiction of design.

Figure adapted from the Storm Water Quality Control Plan by Guide Engineering (GE, 2026) and Google Earth Pro Aerial Imagery (GEP, 2026).

Guide ENGINEERING
LAND ENGINEERING AND PLANNING
5930 GRANITE LAKE DR, #150
GRANITE BAY, CA 95746
PHONE: 916-787-0248
projects@guide-engineering

GSI GeoSoils, Inc.

Figure 1

PERCOLATION/INFILTRATION TEST LOCATION MAP

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Pre-Soaking: After the installation of the perforated pipes, the boring was filled with a minimum of 5-gallons of clear water. The test period for the percolation testing commenced immediately, as all the water seeped away while the tester was present and sandy soils were known to exist onsite.

Sandy Soil Test: Following the pre-soak period, sandy soil criteria testing was conducted. Two (2) consecutive measurements were made at each test location at intervals of approximately 25 minutes. Greater than 6 inches of water seeped away during each of the two (2) test measurements at each location, therefore the testing began using the criteria for "sandy soils" testing at all locations.

Testing: After required pre-soak period and sandy soil test periods, infiltration testing started at all locations. A column of clear water was re-established within each of the test locations. The drop in water level was measured from a fixed reference point, refilling after each test measurement. Within the test locations, a series of test measurements were taken for an additional hour, at time intervals of 10 minutes.

Precision: All test measurements were read to the nearest ¼-inch.

Test Results: Calculations from our field testing indicate percolation rates between approximately 0.97 and 0.42 minutes/inch. Per the RCFC (2011) guidelines, the percolation rates obtained were then converted to infiltration rates using the "Porchet Method," to be used by the design engineer for appropriate sizing of the BMP systems (RCFC, 2011). The converted infiltration rates obtained varied between approximately 5.9 inches/hour and 11.1 inches/hour. Typically, the lowest infiltration rate obtained is applied to the design; therefore, an unfactored (no factor of safety applied) infiltration rate (UIR) of 5.9 inches/hour was obtained. Using an appropriate Factor of Safety (FOS) of 3, per the RCFC (2011) guidelines, a Design Infiltration Rate of 1.97 inches/hour may be used for design. The converted infiltration rates, along with the formulas used are presented in Figure 2 (Percolation Rate to Infiltration Rate Conversion).

USDA Site Soil Group, Soil Units, and Ksat Values

Our review of the United States Department of Agriculture (USDA, 2026) Web Soil Survey (https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm), indicates that two (2) major soil units underlie the site. The Grangeville sandy loam, 0 to 5 percent slopes (GrB) and the Grangeville fine sandy loam, 0 to 5 percent slopes (GvB) are mapped onsite (USDA, 2026). The USDA (2026) indicates that the capacity of the most limiting layer to transmit water

Percolation Rate to Infiltration Rate Conversion

* $$\text{Infiltration Rate } (I_t) = \frac{\Delta H\ \pi r^2\ 60}{t(\pi r^2 + 2\pi r H_{av}} = \frac{\Delta H\ 60\ r}{\Delta t(r+2H_{avg})}$$

Where:
- I_t = tested infiltration rate, inches/hour
- ΔH = change in head over the time interval, inches
- Δt = time interval, minutes
- r = effective radius of test hole
- H_{avg} = average head over the time interval, inches

		Δt	Init Level	Fnl Level	ΔH	H_{avg}	I_t	
Infiltration Test Numbers	P-1	10	24	24	24	24	11.08	
	P-2	10	24	9	15	16 1/2	9.73	High = 12.70
	P-3	10	24	6	18	15	12.71	Low = 5.90
	P-4	10	24	13 3/4	10 1/4	18 7/8	5.89	Average = 9.85
								**UIR = 5.90

* Conversion per the "Porchet Method" (RCFC, 2011)

**UIR = Unfactored Infiltration Rate (Inches/Hour)

Factor of Safety (FOS) = 3.0 = 5.9/3.0 = **1.97** = DIR**

**DIR = Design Infiltration Rate (Inches/Hour)

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Figure 2

(Ksat) within the Grangeville sandy loam, is high (1.98 to 5.95 inches per hour [in/hr]) and falls into hydrologic soil groups (HSGs) "A/D." The USDA (2026) also indicates that capacity of most limiting layer to transmit water (Ksat) within the Grangeville fine sandy loam is moderately high to high (0.57 to 1.98 in/hr) and falls into hydrologic soil groups (HSGs) "B/D." Based on our review, the results of our onsite infiltration feasibility testing appear to correlate well with the USDA (2026) Ksat values for the major soil units mapped onsite.

Infiltration Siting Requirements

Our review of the general infiltration siting requirements and limitations provided by the California Stormwater Quality Association (CASQA, 2003), indicates sites characterized as belonging to Hydrologic Soil Group "A," "B," and "C" may be suitable for infiltration, requiring a minimum soil infiltration rate of 0.5 inches/hour. However, the County of Riverside water pollution prevention Water Quality Management Plan (WQMP, 2012), guidance document for the Santa Ana Region states: "the minimum long-term post-development infiltration rate must be at least 0.83 inches per hour." Furthermore, based on our review of historic regional groundwater levels and our previous onsite subsurface investigation (GSI, 2025), a minimum 10-foot vertical separation from the bottom of the BMP systems to the top of historic high groundwater levels will be maintained.

The design engineer will need to review BMP requirements by the RCFC (2011) and the converted infiltration rates obtained during this study with respect to the proposed water quality BMP systems. An appropriate factor of safety (FOS), per the RCFC (2011) technical guidance document, has been applied herein. The design infiltration rates, general BMP design parameters, and recommendations provided herein are based on our experience with earth materials within the City of San Jacinto, RCFC (2011) and State criteria (CASQA, 2003), and our experience on adjacent sites with similar geologic conditions. Based on our review of the USDA data and our subsurface explorations, similar soil conditions prevail throughout the site, including sandy fine-grained surficial soils.

CONCLUSIONS AND RECOMMENDATIONS

Based on the onsite infiltration testing conducted, it is our opinion that the proposed commercial development and BMP development onsite is feasible from a geologic and geotechnical viewpoint, provided the recommendations presented herein, and within the previous report by GSI (2025) are properly implemented during project planning, design, and construction, as warranted. General recommendations for storm water quality BMP systems are presented in GSI (2025); however, for convenience are reiterated below.

Onsite Storm Water Quality Best Management Practice (BMP) Systems

Should onsite infiltration-systems be planned for Best Management Practices (BMP's) or Low Impact Development (LID) principles for the project, certain guidelines must be followed in the planning, design, and construction of such systems. Such systems, if improperly designed or implemented without consideration of the geotechnical aspects of site conditions, can contribute to flooding, saturation of bearing materials beneath site improvements, slope instability, and possible concentration and contribution of pollutants into the groundwater or storm drain or utility trench systems.

A key factor in these systems is the infiltration rate (often referred to as the percolation rate) which can be ascribed to, or determined for, the earth materials within which these systems are installed. Additionally, the infiltration rate of the designed system (which may include gravel, sand, mulch and topsoil, or other amendments) will need to be considered. Locally, relatively impermeable formations include: clayey surficial soils, igneous and metamorphic bedrock, as well as future fine grained fill soils.

Some of the methods which are used for onsite infiltration include percolation basins, dry wells, bio-swale or bio-retention, permeable pavers and pavement, infiltration trenches, filter boxes and subsurface infiltration galleries or chambers. Some of these systems are constructed using native and import soils, perforated piping, and filter fabrics while others employ structural components such as stormwater infiltration chambers and filters or separators. Every site will have characteristics which should lend themselves to one or more of these methods, but not every site is suitable for BMPs. In practice, BMPs are usually initially designed by the project design civil engineer. Applicable governing agency requirements should be reviewed and included in design considerations.

The following geotechnical guidelines should be considered when designing onsite BMP systems:

- It is not good engineering practice to allow water to saturate soils, especially near slopes or improvements; however, the controlling agency may now require the use of stormwater BMPs.

- Areas adjacent to, or within, the BMP that are subject to inundation should be properly protected against scouring, undermining, and erosion, in accordance with the recommendations of the design engineer.

- Where infiltration BMP systems are located near buildings or improvements, impermeable liners and subdrains should be used along the bottom or sides of bioretention swales or basins located within the influence of structures. Impermeable liners used in conjunction with BMP basins should consist of a 30-mil polyvinyl chloride (PVC) membrane that is covered by a minimum of 12 inches of clean soil, free from rocks and debris, with a maximum 4:1 (h:v) slope inclination, or flatter, and meets the following minimum specifications:

Solid Soils Specific Gravity (ASTM D792): 1.2 (g/cc, min.); Tensile (ASTM D 882): 73 (lb/in-width, min); Elongation at Break (ASTM D882): 380 (%, min); Modulus (ASTM D882): 32 (lb/in-width, min.); and Tear Strength (ASTM D1004): 8 (lb/in, min); Seam Shear Strength (ASTM D882) 58.4 (lb/in, min); Seam Peel Strength (ASTM D882) 15 (lb/in, min).

- Subdrains should consist of at least 4-inch diameter Schedule 40 or SDR 35 drain pipe with perforations oriented down. The drain pipe should be sleeved with a filter sock.

- Storm drain, standpipes, and utilities that cross BMPs should be slurried with a 3-sack slurry mix, to 5 feet outside the structure.

- Infiltrations systems should not be installed within approximately 8 feet of building foundations utility trenches, and walls, or a 1:1 (horizontal to vertical [h:v]) slope (down and away) from the bottom elements of these improvements. Alternatively, deepened foundations may be used.

- Infiltration systems should not be installed adjacent to rigid pavements or hardscape improvements. Alternatively, deepened or thickened edges and curbs or impermeable liners may be used in areas adjoining the BMP.

- As with any infiltration BMP, localized ponding and groundwater seepage should be anticipated. The potential for seepage or perched groundwater to occur after site development should be disclosed to all interested or affected parties.

- Installation of infiltration BMP systems should avoid expansive soils (Expansion Index [E.I.] ≥51) or soils with a relatively high plasticity index (P.I. > 20).

- Infiltration BMP systems should not be installed where the vertical separation of the groundwater level is less than approximately 10 feet from the base of the system.

- Infiltration BMP systems should be designed using a suitable factor of safety (FOS) to account for uncertainties in the known infiltration rates (as generally required by the controlling authorities), and reduction in performance over time.

- As with any infiltration system, proper care will need to be provided. Best management practices should be followed at all times, especially during inclement weather. Provisions for the management of any siltation, debris within the BMP, or overgrown vegetation (including root systems) should be considered. An appropriate inspection schedule will need to adopted and provided to all interested or affected parties.

- Any designed system will require regular and periodic maintenance, which may include rehabilitation or complete replacement of the filter media (e.g., sand, gravel, filter fabrics, topsoil, or mulch) or other components used in construction, so that the design life exceeds 15 years. Due to the potential for piping and adverse seepage conditions, a burrowing rodent control program should also be implemented onsite.

- Newly established vegetation or landscaping (including phreatophytes) may have root systems that will influence the performance of the BMP or nearby LID systems.

- The potential for surface flooding, in the case of system blockage, should be evaluated by the design civil engineer.

- Any proposed utility backfill materials (e.g., inlet or outlet piping or other subsurface utilities) located within or near the proposed area of the BMP may become saturated. This is due to the potential for piping, water migration, and seepage along the utility trench line backfill. If utility trenches cross or are proposed near the BMP, cut-off walls or other water barriers will need to be installed to mitigate the potential for piping and excess water entering the utility backfill materials. Planned or existing utilities may also be subject to piping of fines into open-graded gravel backfill layers unless separated from overlying or adjoining BMP by geotextiles or slurry backfill.

LIMITATIONS

The materials encountered on the project site and used for our analysis are believed representative of the area; however, soil and bedrock materials vary in character between excavations and natural outcrops or conditions exposed during mass grading. Site conditions may vary due to seasonal changes or other factors.

Inasmuch as our study is based upon our review and engineering analyses and field test data, the conclusions and recommendations are professional opinions. These opinions have been derived in accordance with current standards of practice, and no warranty, either express or implied, is given. Standards of practice are subject to change with time. GSI assumes no responsibility or liability for work or testing performed by others, or their inaction; or work performed when GSI is not requested to be onsite, to evaluate if our recommendations have been properly implemented. Use of this report constitutes an agreement and consent by the user to all the limitations outlined above, notwithstanding any other agreements that may be in place. In addition, this report may be subject to review by the controlling authorities. Thus, this report brings to completion our scope of services for this portion of the project.

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

Respectfully submitted,

GeoSoils, Inc.





Todd A. Greer
Engineering Geologist, CEG 2377

Jorge F. Meneses, PhD, PE, GE, BC. GE, F.ASCE
Geotechnical Engineer, GE 3041

TAG/JFM/ek

Enclosures: Appendix A - References
Appendix B - Hand Auger Boring Logs
Appendix C - Field Infiltration Data Sheets

Distribution: (1) Addressee (via email pdf)

APPENDIX A

REFERENCES

APPENDIX A

REFERENCES

California Department of Water Resources, 2026, Water Data Library, interactive website, (http://wdl.water.ca.gov/waterdatalibrary/).

California Stormwater Quality Association (CASQA), 2003, Stormwater best management practice handbook, new development and redevelopment, dated January.

County of Riverside, 2012, Water Pollution Prevention, Water Quality Management Plan (WQMP), a guidance document for the Santa Ana Region of Riverside County, approved October 22.

Dibblee, T.W., Jr., 2003, Geologic map of the San Jacinto quadrangle, Riverside County, California, Dibblee Geology Center Map #DF-116, Santa Barbara Museum of Natural History.

GeoSoils, Inc., 2025, Preliminary geotechnical investigation, proposed Bradley Gardens skilled nursing facility building addition, 980 W. 7th Street, City of San Jacinto, Riverside County, California 92582 (APN 435-330-003), W.O. 9071-A-IE, dated December 19.

Google Earth Pro - v7.3.6, 2026, by Google, LLC, https://www.google.com/earth/download/gep/agree.html.

Gregg Maedo + Associates, 2024, 43-Bed building addition, skilled nursing facility, Bradley Gardens, 5 sheets, various scales, P.N. 24150, dated November 21.

Guide Engineering, 2026, Design development plans 980 W. 7th St., storm water quality control plan, San Jacinto, Riverside County, California, 1 sheet, scale 1"=20', dated May.

Riverside County Flood Control and Water Conservation District, 2016, Design handbook for low impact development best management practices, errata, posted June 30.

_____, 2011, Design handbook for low impact development best management practices, dated September.

State of California, 2026, Civil Code, Sections 895 et seq.

United States Department of Agriculture, Natural Resources Conservation Services, 2026, Web soil survey, version 3.3.2, (website: https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm).

U.S. Geological Survey, 1919, Ground water in the San Jacinto and Temecula basins, California, Water Supply Paper 429, by Gerald A. Waring, 113 pgs., Washington government printing office.

APPENDIX B

HAND AUGER BORING LOGS

UNIFIED SOIL CLASSIFICATION SYSTEM

Major Divisions			Group Symbols	Typical Names
Coarse-Grained Soils More than 50% retained on No. 200 sieve	Gravels 50% or more of coarse fraction retained on No. 4 sieve	Clean Gravels	GW	Well-graded gravels and gravel-sand mixtures, little or no fines
			GP	Poorly graded gravels and gravel-sand mixtures, little or no fines
		Gravel with	GM	Silty gravels gravel-sand-silt mixtures
			GC	Clayey gravels, gravel-sand-clay mixtures
	Sands more than 50% of coarse fraction passes No. 4 sieve	Clean Sands	SW	Well-graded sands and gravelly sands, little or no fines
			SP	Poorly graded sands and gravelly sands, little or no fines
		Sands with Fines	SM	Silty sands, sand-silt mixtures
			SC	Clayey sands, sand-clay mixtures
Fine-Grained Soils 50% or more passes No. 200 sieve	Silts and Clays Liquid limit 50% or less		ML	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
			OL	Organic silts and organic silty clays of low plasticity
	Silts and Clays Liquid limit greater than 50%		MH	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts
			CH	Inorganic clays of high plasticity, fat clays
			OH	Organic clays of medium to high plasticity
Highly Organic Soils			PT	Peat, mucic, and other highly organic soils

CONSISTENCY OR RELATIVE DENSITY

CRITERIA

Standard Penetration Test

Penetration Resistance N (blows/ft)	Relative Density
0 - 4	Very loose
4 - 10	Loose
10 - 30	Medium
30 - 50	Dense
> 50	Very dense

Standard Penetration Test

Penetration Resistance N (blows/ft)	Consistency	Unconfined Compressive Strength (tons/ft^2)
<2	Very Soft	<0.25
2 - 4	Soft	0.25 - .050
4 - 8	Medium	0.50 - 1.00
8 - 15	Stiff	1.00 - 2.00
15 - 30	Very Stiff	2.00 - 4.00
>30	Hard	>4.00

3" 3/4" #4 #10 #40 #200 U.S. Standard Sieve

Unified Soil Classification	Cobbles	Gravel		Sand			Silt or Clay
		coarse	fine	coarse	medium	fine	

MOISTURE CONDITIONS

Dry	Absence of moisture: dusty, dry to the touch
Slightly Moist	Below optimum moisture content for compaction
Moist	Near optimum moisture content
Very Moist	Above optimum moisture content
Wet	Visible free water; below water table

MATERIAL QUANTITY

trace	0 - 5 %
few	5 - 10 %
little	10 - 25 %
some	25 - 45 %

OTHER SYMBOLS

C Core Sample
S SPT Sample
B Bulk Sample
__ Groundwater
Qp Pocket Penetrometer

BASIC LOG FORMAT:
Group name, Group symbol, (grain size), color, moisture, consistency or relative density. Additional comments: odor, presence of roots, mica, gypsum, coarse grained particles, etc.

EXAMPLE:
Sand (SP), fine to medium grained, brown, moist, loose, trace silt, little fine gravel, few cobbles up to 4" in size, some hair roots and rootlets.

GeoSoils,Inc.

W.O. 9071-A1-IE
Corcoran Construction, Inc.
Bradley Gardens, San Jacinto
Logged by: TAG
August 5, 2026

LOG OF EXPLORATORY HAND AUGER BORINGS

TEST PIT NO.	ELEV. (ft.)	DEPTH (ft.)	GROUP SYMBOL	SAMPLE DEPTH (ft.)	MOISTURE (%)	FIELD DRY DENSITY (pcf)	DESCRIPTION
P-1	1,527	0-2	SM				<u>QUATERNARY-AGE ALLUVIAL SAND OF VALLEY AREAS (Qa):</u> Silty SAND, light brown, dry to damp, loose to medium dense at depth; very fine to coarse grained sands.
							Total Depth = 2', no caving, no seepage. Backfilled on August 5th, 2026 after infiltration testing.
P-2	1,526	0-2	SM				<u>QUATERNARY-AGE ALLUVIAL SAND OF VALLEY AREAS (Qa):</u> Silty SAND, light brown, damp, loose to medium dense with depth; few rootlets, very fine to coarse grained sands; somewhat friable.
							Total Depth = 2', no caving, no seepage. Backfilled on August 5th, 2026 after infiltration testing.
P-3	1,526	0-2	SM				<u>QUATERNARY-AGE ALLUVIAL SAND OF VALLEY AREAS (Qa):</u> Silty SAND, very light brown, dry to damp, loose to medium dense at depth; friable near surface, few rodent burrows.
							Total Depth = 2', no caving, no seepage. Backfilled on August 5th, 2026 after infiltration testing.
P-4	1,526	0-2	SM				<u>QUATERNARY-AGE ALLUVIAL SAND OF VALLEY AREAS (Qa):</u> Silty SAND, light brown, damp, medium dense to very dense at depth (near dumpster); fine to coarse grained sands.
							Total Depth = 2', no caving, no seepage. Backfilled on August 5th, 2026 after infiltration testing.

APPENDIX C

FIELD INFILTRATION DATA SHEETS

P1

Leach Line Percolation Data Sheet

Project: Bradley Gardens, San Jacinto		W.O. Number: 9071-A1-IE	
Test Hole No.: P1		Date Excavated: Aug 5, 2026	
Depth of Test Hole: 2'		Soil Classification: SM	
Check for Sandy Soil Criteria Tested by: TAG/JVM		Date: Aug 5	Presoak: 8:49 aug5
Actual Percolation Tested by: JVM		Date: Aug. 5, 2026	

>5 gal used

Sandy Soil Criteria Test

Trial No.	Time	Time Interval (Min.)	Initial Water Level (Inches)	Final Water Level (Inches)	Δ in Water Level (Inches)
1	9:47	25	24"	0"	24" JVM
	10:12				
2	10:32	25	24"	0"	24" JVM
	10:57				

Use: Normal/Sandy (Circle One) Soil Criteria

Time	Time Interval (min)	Total Elapsed Time (Min.)	Initial Water Level (Inches)	Final Water Level (Inches)	Δ in Water Level (Inches)	Percolation Rate (min/inch)
12:54	10	10	24"	0	24	0.416
01:04						
01:06	10	10	24"	0	24	
01:16						
01:18	10	10	24"	0	24	
01:28						
1:30	10	10	24"	0	24	
1:40						
1:45	10	10	24"	0	24	
1:55						
1:58	10	10	24"	0	24	
2:08						

Plate No. C-1

Leach Line Percolation Data Sheet

P2

Project:	Bradley Gardens, San Jacinto	W.O. Number:	9071-A1-IE
Test Hole No.:	P2	Date Excavated:	Aug 5, 2026
Depth of Test Hole:	2'	Soil Classification:	SM
Check for Sandy Soil Criteria Tested by:	TAG / JVM	Date: Aug 5	Presoak: 8:43 Aug 5
Actual Percolation Tested by:	JVM	Date:	Aug. 5, 2025

>5 gal used

Sandy Soil Criteria Test

Trial No.	Time	Time Interval (Min.)	Initial Water Level (Inches)	Final Water Level (Inches)	Δ in Water Level (Inches)
1	9:38 10:03	25	24"	0"	24"
2	10:42 10:42	25	24	0"	24

Use: Normal Sandy (Circle One) Soil Criteria

Time	Time Interval (min)	Total Elapsed Time (Min.)	Initial Water Level (Inches)	Final Water Level (Inches)	Δ in Water Level (Inches)	Percolation Rate (min/inch)
JVM 10:14 JVM 10:24	10	10	24"	10"	14	0.71
JVM 10:28 JVM 10:38	10	10	24"	9"	15	0.67
11:42 11:52	10	10	24"	9.75"	14.25	0.70
11:55 12:05	10	10	24"	9.25"	14.75	0.68
12:09 12:19	10	10	24"	9.50"	14.5	0.69
12:22 12:32	10	10	24"	10.25"	13.75	0.73

Plate No. C-2

Leach Line Percolation Data Sheet

P3

Project:	Bradley Gardens, San Jacinto	W.O. Number:	9071-A6-SF
Test Hole No.:	P3	Date Excavated:	AUG 5, 2026
Depth of Test Hole:	2'	Soil Classification:	SM
Check for Sandy Soil Criteria Tested by:	25mm penetrometer	Date: Aug 5	Presoak: 8:17 Aug 5
Actual Percolation Tested by:	JVM TAG/JVM	Date: Aug. 5, 2026	

Sandy Soil Criteria Test

Trial No.	Time	Time Interval (Min.)	Initial Water Level (Inches)	Final Water Level (Inches)	Δ in Water Level (Inches)
1	9:33 9:58	25	24"	0"	24"
2	10:16 10:41	25	24"	0"	24"

Use: Normal Sandy (Circle One) Soil Criteria

Time	Time Interval (min)	Total Elapsed Time (Min.)	Initial Water Level (Inches)	Final Water Level (Inches)	Δ in Water Level (Inches)	Percolation Rate (min/inch)
JVM 10:16 JVM 10:26	10	10	24"	10	14	0.71
JVM 10:33 JVM 10:43	10	10	24"	5.25	18.75	0.53
JVM 11:55 12:05	10	10	24"	6.0	18	0.56
12:08 12:18	10	10	24"	6.75	17.25	0.58
12:20 12:30	10	10	24"	6.50	17.5	0.57
12:32 12:42	10	10	24	6.75	17.25	0.58

Plate No. C-3

P4

Leach Line Percolation Data Sheet

Project: Bradley Gardens, San Jacinto		W.O. Number: 9071-A1-IE	
Test Hole No.: P4		Date Excavated: AUG 5, 2026	
Depth of Test Hole: 2'		Soil Classification: SM	
Check for Sandy Soil Criteria Tested by: TAG/JVM		Date: Aug 5	Presoak: 9:28
Actual Percolation Tested by: JVM		Date: Aug. 5, 2026	

>5 gal used

Sandy Soil Criteria Test

Trial No.	Time	Time Interval (Min.)	Initial Water Level (Inches)	Final Water Level (Inches)	Δ in Water Level (Inches)
1	9:53 10:18	25	24"	0"	24"
2	10:20 10:53	25	24"	0"	24"

Use: Normal Sandy (Circle One) Soil Criteria

Time	Time Interval (min)	Total Elapsed Time (Min.)	Initial Water Level (Inches)	Final Water Level (Inches)	Δ in Water Level (Inches)	Percolation Rate (min/inch)
12:49 12:59	10	10	24"	10"	10	1
1:00 1:10	10	10	24"	11.5"	12.5	0.8
1:12 1:22	10	10	24"	12.0	12	0.83
1:25 1:35	10	10	24"	12.25	11.75	0.85
1:38 1:48	10	10	24"	13.25	10.75	0.93
1:51 2:01	10	10	24"	13.75	10.25	0.976

Plate No. C-4

Appendix 4: Historical Site Conditions

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

Appendix 5: LID Infeasibility

LID Technical Infeasibility Analysis

Appendix 6: BMP Design Details

BMP Sizing, Design Details and other Supporting Documentation

Santa Ana Watershed

V_{BMP} and Q_{BMP} worksheets

These worksheets are to be used to determine the required

Design Capture Volume (V_{BMP})
or the
Design Flow Rate (Q_{BMP})

for BMPs in the Santa Ana Watershed

To verify which watershed your project is located within, visit

www.rcflood.org/npdes

and use the 'Locate my Watershed' tool

If your project is not located in the Santa Ana Watershed,

Do not use these worksheets! Instead visit

www.rcflood.org/npdes/developers.aspx

To access worksheets applicable to your watershed

Use the tabs across the bottom
to access the worksheets for the Santa Ana Watershed

Permeable Pavement - Design Procedure	BMP ID	Legend:	Required Entries
	DMA 1		Calculated Cells

Company Name: Guide Engineering — Date: 8/19/2026

Designed by: Jared Brown — County/City Case No.:

Design Volume

Enter the area tributary to this feature — A_T= 41010 acres

Enter V_{BMP} determines from Section 2.1 of this Handbook — V_{BMP}= 609 ft^3

Permeable Pavement Surface Area

Reservoir Layer Depth, b_{TH} — b_{TH}= 12 inches

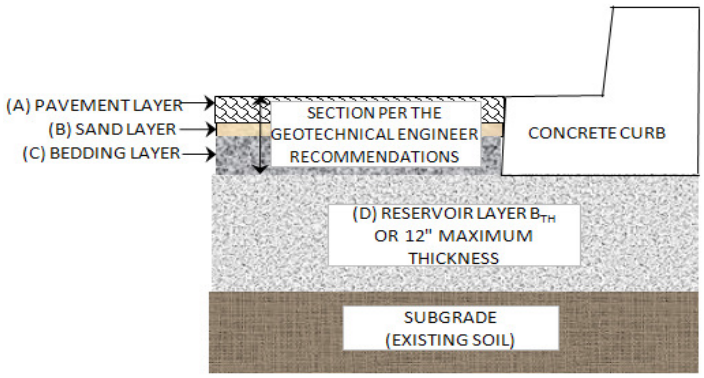
Minimum Surface Area Required, A_S

$$A_{S\,(ft)} = \frac{V_{BMP}\,(ft^3)}{(0.4 \times b_{TH}\,(in)) / 12(in/ft)}$$

A_S= 1,523 ft^2

Proposed Surface Area = 1,525 ft^2

Permeable Pavement Cross Section



Per the Geotechnical	(A)	4	in
Engineer's	(B)	4	in
Recommendations	(C)	4	in
Reservoir Layer	(D)	12	in
Total Permeable Pavement Section		24	in
Slope of Permeable Pavement		2	%

Sediment Control Provided? (Use pulldown) — Yes

Geotechnical report attached? (Use pulldown) — Yes

Describe Surrounding Vegetation: Grass in open areas and bush's and trees north area along frontage road 7th Street.

Notes:

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

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: Guide Engineering — Date: 8/19/2026

Designed by: Jared Brown — Case No: 1

Company Project Number/Name: 2026.015.032

BMP Identification

BMP NAME / ID: Pearmeable Pavement

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}= 0.70 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)*
		Natural (A Soil)						
DMA-1	*2,235*	*Roofs*	*1*	*0.89*	*1993.6*			
DMA-1	*9,370*	*Concrete or Asphalt*	*1*	*0.89*	*8358*			
DMA-1	*1,525*	*Pervious Concrete / Porous Asphalt*	*0.1*	*0.11*	*168.4*			
DMA-1	*647*	*Ornamental Landscaping*	*0.1*	*0.11*	*71.5*			
	13777	***Total***			**10591.5**	**0.70**	***617.8***	***1525***

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	Guide Engineering	Date	8/19/2026
Designed by	Jared Brown	Case No	1
Company Project Number/Name	2026.015.032		

BMP Identification

BMP NAME / ID: Permeable Pavement

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

Design Rainfall Intensity: I = 0.70 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)
		Natural (A Soil)						
DMA-1	2,235	Roofs	1	0.892	1993.6			
DMA-1	9,370	Concrete or Asphalt	1	0.892	8358			
DMA-1	1,525	Pervious Concrete / Porous Asphalt	0.1	0.110458	168.4			
DMA-1	647	Ornamental Landscaping	0.1	0.110458	71.5			
	13777	Total			10591.5	0.70	0.2	0.2

Notes:

Permeable Pavement - Design Procedure	BMP ID	Legend:	Required Entries
	DMA 2		Calculated Cells

Company Name:	Guide Engineering	Date:	8/19/2026
Designed by:	Jared Brown	County/City Case No.:	

Design Volume

Enter the area tributary to this feature — A_T= 85512 acres

Enter V_{BMP} determines from Section 2.1 of this Handbook — V_{BMP}= 1,541 ft^3

Permeable Pavement Surface Area

Reservoir Layer Depth, b_{TH} — b_{TH}= 12 inches

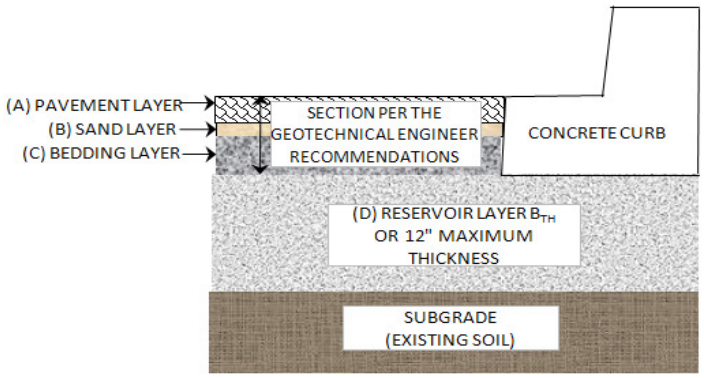
Minimum Surface Area Required, A_S

$$A_{S\,(ft)} = \frac{V_{BMP}\,(ft^3)}{(0.4 \times b_{TH}\,(in)) / 12(in/ft)}$$

A_S= 3,853 ft^2

Proposed Surface Area = 3,854 ft^2

Permeable Pavement Cross Section



Per the Geotechnical	(A)	4	in
Engineer's	(B)	4	in
Recommendations	(C)	4	in
Reservoir Layer	(D)	12	in
Total Permeable Pavement Section		24	in
Slope of Permeable Pavement		2	%

Sediment Control Provided? (Use pulldown) — Yes

Geotechnical report attached? (Use pulldown) — Yes

Describe Surrounding Vegetation: Grass in open areas and bush's and trees along property line and surounding and surrounding property lines.

Notes:

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

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: Guide Engineering — Date: 8/19/2026

Designed by: Jared Brown — Case No: 1

Company Project Number/Name: 2026.015.032

BMP Identification

BMP NAME / ID: Pearmeable Pavement

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}= 0.70 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)*
		Natural (A Soil)						
DMA-2	*15,129*	*Roofs*	*1*	*0.89*	*13495.1*			
DMA-2	*14,228*	*Concrete or Asphalt*	*1*	*0.89*	*12691.4*			
DMA-2	*3,854*	*Pervious Concrete / Porous Asphalt*	*0.1*	*0.11*	*425.7*			
DMA-2	*6,624*	*Ornamental Landscaping*	*0.1*	*0.11*	*731.7*			

Santa Ana Watershed - BMP Design Flow Rate, Q_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

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

Company Name	Guide Engineering	Date	8/19/2026
Designed by	Jared Brown	Case No	1
Company Project Number/Name	2026.015.032		

BMP Identification

BMP NAME / ID: Permeable Pavement

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

Design Rainfall Intensity: I = 0.70 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)*
		Natural (A Soil)						
DMA-2	*15,129*	*Roofs*	*1*	*0.892*	*13495.1*			
DMA-2	*14,228*	*Concrete or Asphalt*	*1*	*0.892*	*12691.4*			
DMA-2	*3,854*	*Pervious Concrete / Porous Asphalt*	*0.1*	*0.110458*	*425.7*			
DMA-2	*6,624*	*Ornamental Landscaping*	*0.1*	*0.110458*	*731.7*			
	39835	***Total***			***27343.9***	***0.70***	***0.4***	***0.4***

Notes:

Appendix 7: Hydromodification

Supporting Detail Relating to Hydrologic Conditions of Concern


Riverside County SWCT²
Stormwater & Water Conservation Tracking Tool
ONLY RAIN DOWN THE STORM DRAIN
Leaflet | Original Feature Class was created by the Riverside County Transportation Department (RCDT). State of California

Appendix 8: Source Control

Pollutant Sources/Source Control Checklist

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

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

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

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

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

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

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

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

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

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

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

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

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

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

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
☑ P. **Plazas, sidewalks, and parking lots.**			☑ **Sweep plazas, sidewalks, and parking lots regularly to prevent accumulation of litter and debris. Collect debris from pressure washing to prevent entry into the storm drain system. Collect washwater containing any cleaning agent or degreaser and discharge to the sanitary sewer not to a storm drain.**

Appendix 9: O&M

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

Appendix 10: Educational Materials

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