COUNTY OF ORANGE CALIFORNIA

WQ XX-XXXX

Preliminary Water Quality Management Plan (WQMP)

Project Name:
Newport Beach Junior Lifeguard
50 Main Street
Newport Beach, CA 92661

Prepared for:
City of Newport Beach
100 Civic Center Dr.
Newport Beach, CA 92660

Prepared by:
BKF Engineers
4675 MacArthur Court, Suite 400
Newport Beach, CA 92660
(949) 526-8460

Preliminary WQMP Prepared: February 4, 2021

Project Owner's Certification

Planning Application No. (If applicable)	TBD	Grading Permit No.	TBD
Tract/Parcel Map and Lot(s) No.		Building Permit No.	TBD
Address of Project Site and APN (If no address, specify Tract/Parcel Map and Lot Numbers)			

This Water Quality Management Plan (WQMP) has been prepared for the City of Newport Beach by BKF Engineers. The WQMP is intended to comply with the requirements of the County of Orange NPDES Stormwater Program requiring the preparation of the plan.

The undersigned, while it owns the subject property, is responsible for the implementation of the provisions of this plan , including the ongoing operation and maintenance of all best management practices (BMPs), and will ensure that this plan is amended as appropriate to reflect up-to-date conditions on the site consistent with the current Orange County Drainage Area Management Plan (DAMP) and the intent of the non-point source NPDES Permit for Waste Discharge Requirements for the County of Orange, Orange County Flood Control District and the incorporated Cities of Orange County within the Santa Ana Region. Once the undersigned transfers its interest in the property, its successors-in-interest shall bear the aforementioned responsibility to implement and amend the WQMP. An appropriate number of approved and signed copies of this document shall be available on the subject site in perpetuity.

Owner:			
Title	Owner		
Company	City of Newport Beach		
Address			
Email			
Telephone #			
I understand my responsibility to implement the provisions of this WQMP including the ongoing operation and maintenance of the best management practices (BMPs) described herein.			
Owner Signature		Date	

Preparer (Engineer): Bruce Kirby, P.E.			
Title	Project Manager	PE Registration #	42393
Company	BKF Engineers		
Address	4675 MacArthur Court, Suite 400 Newport Beach, CA 92660		
Email	bkirby@bkf.com		
Telephone #	(949) 526-8460		
I hereby certify that this Water Quality Management Plan is in compliance with, and meets the requirements set forth in, Order No. R8-2009-0030/NPDES No. CAS618030, of the Santa Ana Regional Water Quality Control Board.			
Preparer Signature		Date	2/4/21
Place Stamp Here	REGISTERED PROFESSIONAL ENGINEER BRUCE W. KIRBY No. C 42393 CIVIL STATE OF CALIFORNIA		

Contents

Appendices

Section I Permit(s) and Water Quality Conditions of Approval or Issuance

Provide discretionary or grading/building permit information and water quality conditions of approval, or permit issuance, applied to the project. If conditions are unknown, please request applicable conditions from staff. *Refer to Section 2.1 in the Technical Guidance Document (TGD) available on the OC Planning website (ocplanning.net).*

Project Infomation			
Permit/Application No. (If applicable)	TBD	Grading or Building Permit No. (If applicable)	TBD
Address of Project Site (or Tract Map and Lot Number if no address) and APN	50 Main Street Newport Beach, CA 92661		

Water Quality Conditions of Approval or Issuance	
Water Quality Conditions of Approval or Issuance applied to this project. (Please list verbatim.)	[WQ01] Prior to the issuance of any grading or building permits, the applicant shall submit for review and approval by the Manager, Permit Services, a Water Quality Management Plan (WQMP) specifically identifying Best Management Practices (BMPs) that will be used onsite to control predictable pollutant runoff. The applicant shall utilize the Orange County Drainage Area Management Plan (DAMP), Model WQMP, and Technical Guidance Manual for reference, and the County's WQMP template for submittal. This WQMP shall include the following: - Detailed site and project description - Potential stormwater pollutants - Post-development drainage characteristics - Low Impact Development (LID) BMP selection and analysis - Structural and Non-Structural source control BMPs - Site design and drainage plan (BMP Exhibit) - GIS coordinates for all LID and Treatment Control BMPs - Operation and Maintenance (O&M) Plan that (1) describes the long-term operation and maintenance requirements for BMPs identified in the BMP Exhibit; (2) identifies the entity that will be responsible for long-term operation and maintenance of the referenced BMPs; and (3) describes the mechanism for

	funding the long-term operation and maintenance of the referenced BMPs The BMP Exhibit from the approved WQMP shall be included as a sheet in all plan sets submitted for plan check and all BMPs shall be depicted on these plans. Grading and building plans must be consistent with the approved BMP exhibit.

Conceptual WQMP

Was a Conceptual Water Quality Management Plan previously approved for this project?	No conceptual Water Quality Management Plan was previously approved for this project.

Watershed-Based Plan Conditions

Provide applicable conditions from watershed - based plans including WIHMPs and TMDLS.	WIHMP for Newport Bay has not been approved at this time.

Section II Project Description

II.1 Project Description

<table>
<tr><th colspan="5">Description of Proposed Project</th></tr>
<tr><td>Development Category (From Model WQMP, Table 7.11-2; or -3):</td><td colspan="4">The proposed Junior Lifeguard Building Project, hereon referred to as “Project”, is considered a Priority Development Project. The following conditions have triggered the WQMP for the North Orange County Permit Area for Priority Projects:
• New development projects that create 10,000 square feet or more of impervious surface. This category includes commercial, industrial, residential housing subdivisions, mixed-use, and public projects on private or public property that falls under the planning and building authority.
• Parking lots 5,000 square feet or more including associated drive aisle, and potentially exposed to urban stormwater runoff.
See Appendix A for more information</td></tr>
<tr><td>Project Area (ft^2): 36,872</td><td colspan="2">Number of Dwelling Units: N/A</td><td colspan="2">SIC Code: __________</td></tr>
<tr><td rowspan="2">Project Area</td><td colspan="2">Pervious</td><td colspan="2">Impervious</td></tr>
<tr><td>Area (acres or sq ft)</td><td>Percentage</td><td>Area (acres or sq ft)</td><td>Percentage</td></tr>
<tr><td>Pre-Project Conditions</td><td>10,376 sq ft</td><td>28%</td><td>26,496 sq ft</td><td>72%</td></tr>
<tr><td>Post-Project Conditions</td><td>4,097 sq ft</td><td>11%</td><td>32,775 sq ft</td><td>89%</td></tr>
<tr><td>Drainage Patterns/Connections</td><td colspan="4">Existing Conditions:
The Project’s existing drainage pattern is handled via sheet flow. A portion of the site drains south over the parking lot surface and discharges over a curb cut onto the sand of the adjacent beach area. The remaining portion drains to the north onto A St and is eventually captured into the nearest catch basin.
Proposed Conditions:
The Project’s proposed drainage pattern is designed to convey flows similar to the existing conditions. Stormwater on the south side will drain toward the south and collect into a grate inlet catch basin. The remaining portion of the site will drain away from the proposed building and surface flow to the north along a valley gutter located at the center of the drive aisle. Several grate inlets will be installed along the valley gutter to capture the runoff underground and divert them it a treatment BMP. The runoff will be treated for the stormwater volume</td></tr>
</table>

	prior to discharge from the project site.
Narrative Project Description: (Use as much space as necessary.)	The Project is a proposed 0.85-acre site for a Junior Lifeguard building and modifications to an existing parking lot (Parking Lot A). The existing parking lot is bounded by the Newport Balboa Bike Trail and residential structures to the north, a grass field park to the east, the beach and ocean to the south, and Balboa Pier to the west. The existing parking lot contains 81 parking stalls. The proposed Junior Lifeguard building will occupy the south-west corner of the project site. Construction of the proposed building, ramps, stairs and landscaping will require the removal of parking stalls on the south-west corner of the site. The drive aisle will be re-aligned to wrap around the west side of the building. Additional parking stalls will be installed by expanding the parking lot to the west.

II.2 Potential Stormwater Pollutants

Urban runoff from a developed site and stormwater pollution associated with the runoff has the potential to contribute pollutants to the municipal storm drain system and ultimately to the tributary receiving waters. Pollutants that are commonly associated with urban development include suspended solids/ sediment, nutrients, metals, microbial pathogens, oil and grease, toxic organic compounds, and trash and debris. The pollutants of concern for a specific project are based upon the pollutants identified by regulatory agencies as impairing receiving waters, and pollutants that are anticipated or potentially could be generated by the project based on the proposed land uses.

Pollutants of Concern

Pollutant	Check One for each: E=Expected to be of concern N=Not Expected to be of concern		Additional Information and Comments
Suspended-Solid/ Sediment	E ☒	N ☐	
Nutrients	E ☒	N ☐	
Heavy Metals	E ☒	N ☐	
Pathogens (Bacteria/Virus)	E ☒	N ☐	
Pesticides	E ☒	N ☐	
Oil and Grease	E ☒	N ☐	
Toxic Organic Compounds	E ☒	N ☐	
Trash and Debris	E ☒	N ☐	

II.3 Hyrologic Conditions of Concern

A Hydrologic Conditions of Concern (HCOC) is a combination of upland hydrologic conditions and stream biological and physical conditions that presents a condition of concern for physical and/or biological degradation of streams.

☒ No

☐ Yes

According to Figure 4 in Appendix D, the project site is not located in a potential area of erosion, habitat, and physical structure susceptibility.

Therefore, HCOCs are not considered to exist and the downstream conveyance is not susceptible to hydromodification impacts.

See Appendix D for Susceptibility Map.

II.4 Post Development Drainage Characteristics

The Project's proposed drainage pattern is designed to convey flows similar to the existing conditions. Stormwater on the south side will drain toward the south and collect into a grate inlet catch basin. The remaining portion of the site will drain away from the proposed building and surface flow to the north along a valley gutter located at the center of the drive aisle. Several grate inlets will be installed along the valley gutter to capture the runoff underground and divert it into a treatment BMP. The runoff will be treated for the stormwater volume prior to discharge from the project site. The discharged storm water will ultimately discharge into the Newport Bay.

II.5 Property Ownership/Management

The property ownership/management for this project is the City of Newport Beach.

Section III Site Description

III.1 Physical Setting

Fill out table with relevant information. *Refer to Section 2.3.1 in the Technical Guidance Document (TGD).*

Name of Planned Community/Planning Area (if applicable)	Junior Lifeguard Building
Location/Address	50 Main Street Newport, CA 92661
General Plan Land Use Designation	Existing Land Use: Parking Lot Proposed Land Use: Parking lot and Junior Lifeguard Building
Zoning	Existing Zone: Public Facilities (PF) Proposed Zone: Public Facilities (PF)
Acreage of Project Site	0.85 Acres
Predominant Soil Type	Hydrologic Soil Group D

III.2 Site Characteristics

Site Characteristics	
Precipitation Zone	24 Hour, 85th Percentile Rainfall Storm Depth = 0.65 inches *See Appendix C for additional information*
Topography	The site topography is relatively flat, ranging from 1% to 2%. The existing site consists of a parking lot and adjacent sidewalk and landscape.
Drainage Patterns/Connections	Existing Conditions: The Project's existing drainage pattern is handled via sheet flow. A portion of the site drains south over the parking lot surface and discharges over a curb cut onto the sand of the adjacent beach area. The remaining portion drains to the north onto A St and is eventually captured into the nearest catch basin. Proposed Conditions: The Project's proposed drainage pattern is designed to convey flows similar to the existing conditions. Stormwater on the south side will drain toward the south and collect into a grate inlet catch basin. The remaining portion of the site will drain away from the proposed building and surface flow to the north along a valley gutter located at the center of the drive aisle. Several grate inlets will be installed along the valley gutter to capture the runoff underground and divert it into a treatment BMP. The runoff will be treated for the stormwater volume prior to discharge from the project site.
Soil Type, Geology, and Infiltration Properties	The underlying soil on site is predominantly Soil Group D. Based on the geotechnical field investigation and published geologic maps of the area, the site is underlain by artificial fill and Holocene age beach deposits that are in turn underland by Pleistocene age marine deposits. *See Appendix L for additional information.*
Hydrogeologic (Groundwater) Conditions	Review of the Seismic Hazard Zone Report for the Newport Beach Quadrangle indicates that the historically highest groundwater level in the area is less than 10 feet beneath the ground surface. During the Geotechnical Investigation, groundwater was encountered in borings B1 and B2 at depths of 7 and 6 feet below the existing ground surface, respectively. *See Appendix L for additional information.*
Geotechnical Conditions (relevant to infiltration)	During the Geotechnical Investigation, groundwater was encountered in borings B1 and B2 at depths of 7 and 6 feet below the existing ground surface, respectively.

	See Appendix L for additional information.
Off-Site Drainage	N/A
Utility and Infrastructure Information	The Project will connect to existing sewer and water lines in main street, from the south-west corner of the project site.

III.3 Watershed Description

Fill out table with relevant information and include information regarding BMP sizing, suitability, and feasibility, as applicable. *Refer to Section 2.3.3 in the Technical Guidance Document (TGD).*

Receiving Waters	Drainage from the Project discharges into Newport Bay.
303(d) Listed Impairments	Newport Bay has the following 303(d) listed impairments: • Toxicity • Other Organics
Applicable TMDLs	Applicable TMDLs for this Project are: • Bacteria Indicators/ Pathogens (Implementation Phase) • Metals (Technical TMDLs) • Nutrients (Implementation Phase) • Pesticides (Technical TMDLs and Implementation Phase) • Turbidity/Siltation (Implementation Phase)
Pollutants of Concern for the Project	Based on the proposed Project land use and anticipated operations may lead to the anticipated pollutants of concern: • Suspended-Solid/ Sediment • Nutrients • Heavy Metals • Pathogens (Bacteria/Virus) • Pesticides • Oil and Grease • Toxic Organic Compounds

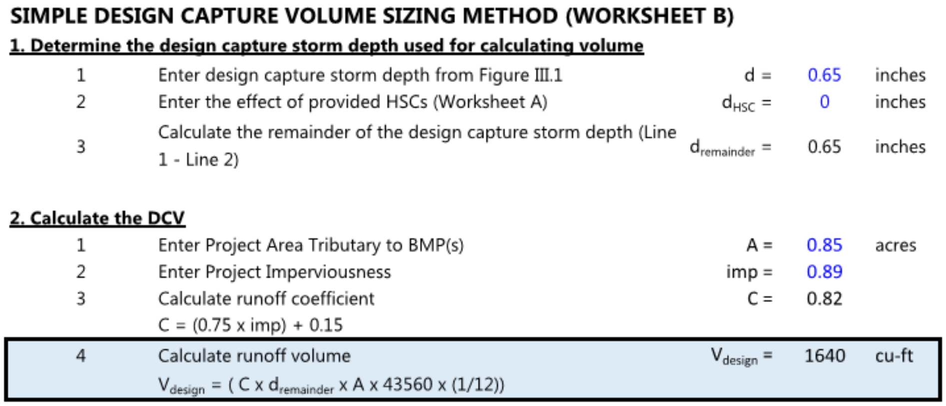
	- Trash and Debris
Environmentally Sensitive and Special Biological Significant Areas	The Project is not located within an environmentally sensitive and special biological significant area. *See Appendix D for additional information.*

Section IV Best Management Practices (BMPs)

IV. 1 Project Performance Criteria

(NOC Permit Area only) Is there an approved WIHMP or equivalent for the project area that includes more stringent LID feasibility criteria or if there are opportunities identified for implementing LID on regional or sub-regional basis?	YES ☐	NO ☒
If yes, describe WIHMP feasibility criteria or regional/sub-regional LID opportunities.		

Project Performance Criteria	
If HCOC exists, list applicable hydromodification control performance criteria (Section 7.II-2.4.2.2 in MWQMP)	Based on the susceptibility map from Figure XVI-3d of the TGD, the *See Appendix D for Susceptibility Map.*
List applicable LID performance criteria (Section 7.II-2.4.3 from MWQMP)	Based on the Model WQMP Section 7.II-2.4.3, the following performance criteria for LID implementation have been established for the North Orange County Permit. Priority Projects must infiltrate, harvest and use, evapotranspire, or biotreat/biofilter the 85th Percentile, 24-Hour storm event (Design Capture Volume). For the proposed Project, the **85th Percentile, 24-Hr design storm depth is 0.65 inches.** Per the Geotechnical Report, groundwater was encountered at depths of 6 and 7 feet below existing ground surface at the boring locations. At the time of this report, a percolation test has not been performed. Due to the groundwater constraints, it is anticipated that infiltration is not feasible. Therefore, the proposed Project will utilize a Biotreatment BMP. To implement the Biotreatment BMP, the proposed Project will utilize a bioretention basin, sized for treatment of the 85th Percentile, 24-Hr storm event.

List applicable treatment control BMP performance criteria (Section 7.II-3.2.2 from MWQMP)	Biotreatment BMP utilized: • Bioretention Basin
Calculate LID design storm capture volume for Project.	 **SIMPLE DESIGN CAPTURE VOLUME SIZING METHOD (WORKSHEET B)** **1. Determine the design capture storm depth used for calculating volume** 1 Enter design capture storm depth from Figure III.1 d = 0.65 inches 2 Enter the effect of provided HSCs (Worksheet A) d_{HSC} = 0 inches 3 Calculate the remainder of the design capture storm depth (Line 1 - Line 2) $d_{remainder}$ = 0.65 inches **2. Calculate the DCV** 1 Enter Project Area Tributary to BMP(s) A = 0.85 acres 2 Enter Project Imperviousness imp = 0.89 3 Calculate runoff coefficient C = 0.82 C = (0.75 x imp) + 0.15 4 Calculate runoff volume V_{design} = 1640 cu-ft V_{design} = (C x $d_{remainder}$ x A x 43560 x (1/12)) *See Appendix G for LID Calculations*

IV.2. Site Design and Drainage

Refer to Section 2.4.2 in the Technical Guidance Document (TGD).

Site Design Practices:

The Project utilizes the following BMPs:

- Bioretention

The project site is approximately 0.85 Acres. Due to the configuration on this project, there are little opportunities to implement other site design practices.

BMP Incorporation:

The site is designed to incorporate BMPs by utilizing on-site storm drainage systems to convey impervious areas (i.e. AC pavement, concrete, roof, etc.) into a biofiltration BMP that treats the 85th Percentile storm. Excess storm water discharges through an overflow into the existing street adjacent to the project.

DMA Characteristics:

Drainage Management Area	Area (Acres)	LID BMP Used	DCV (cu-ft)	GIS Coordinates
DMA 1	0.85	Bioretention	cu-ft	Lat: 33.60108° Long: -117.8991°

See Appendix H for additional information.

IV.3 LID BMP Selection and Project Conformance Analysis

IV.3.1 Hydrologic Source Controls (HSCs)

Hydrologic Source Controls on the project were incorporated at the schematic design level to reduce the amount of stormwater runoff from the development.

Name	Included?
Localized on-lot infiltration	☐
Impervious area dispersion (e.g. roof top disconnection)	☐
Street trees (canopy interception)	☐
Residential rain barrels (not actively managed)	☐
Green roofs/Brown roofs	☐
Blue roofs	☐
Impervious area reduction (e.g. permeable pavers, site design)	☐
Other:	☐
Other:	☐
Other:	☐
Other:	☐
Other:	☐
Other:	☐
Other:	☐
Other:	☐

IV.3.2 Infiltration BMPs

Infiltration refers to the physical process of percolation, or downward seepage, of water through a soil's pore space. As water infiltrates, the natural filtration, adsorption, and biological decomposition properties of soils, plant roots, and micro-organisms work to remove pollutants prior to the water recharging the underlying groundwater.

Infiltration can provide multiple benefits, including pollutant removal, peak flow control, groundwater recharging, and flood control.

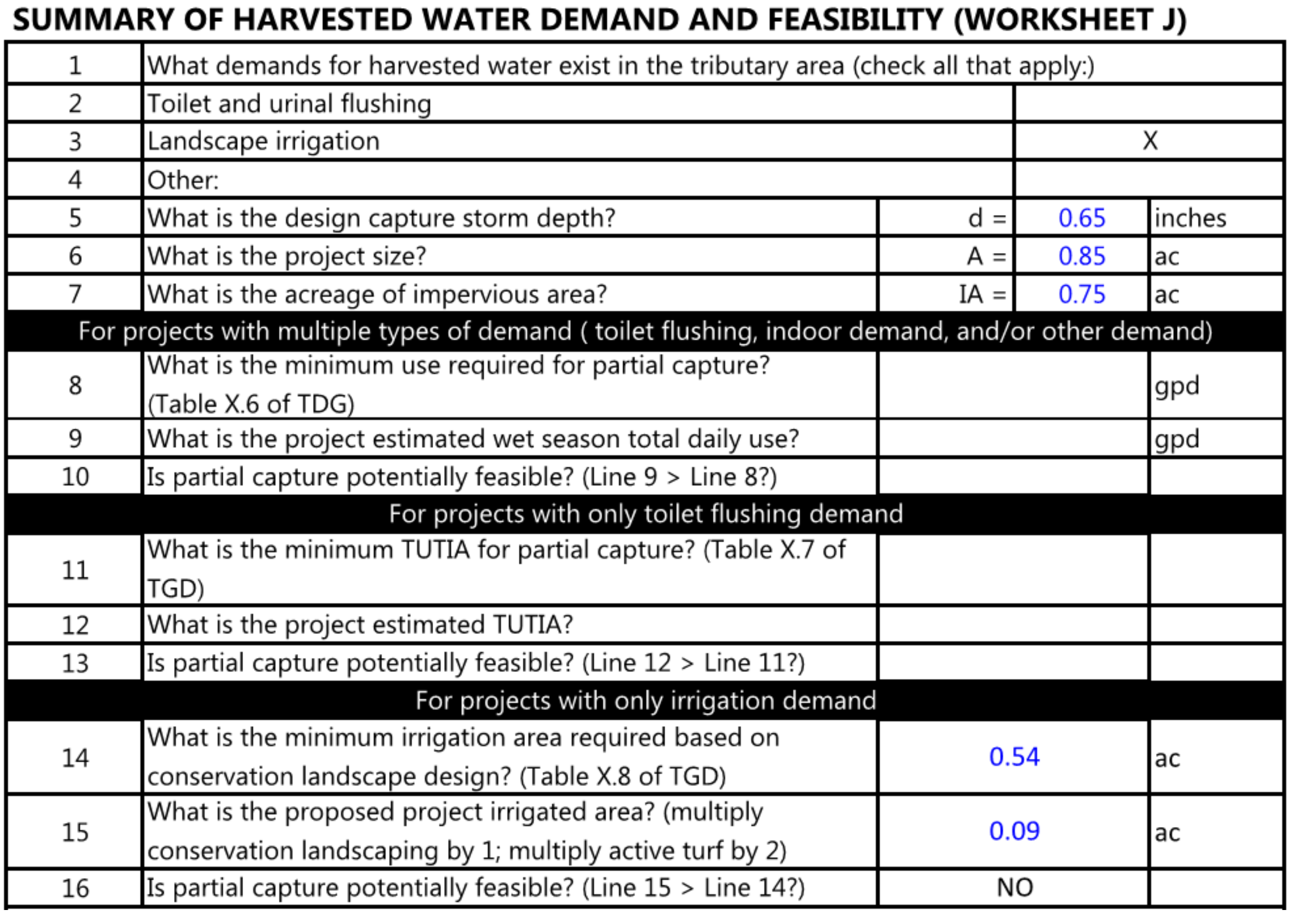
Name	**Included?**
Bioretention without underdrains	☐
Rain gardens	☐
Porous landscaping	☐
Infiltration planters	☐
Retention swales	☐
Infiltration trenches	☐
Infiltration basins	☐
Drywells	☐
Subsurface infiltration galleries	☐
French drains	☐
Permeable asphalt	☐
Permeable concrete	☐
Permeable concrete pavers	☐
Other:	☐
Other:	☐

Based on the Geotechnical Report, groundwater was encountered at depths of 6 and 7 feet at the boring locations. Therefore, infiltration is not feasible.

IV.3.3 Evapotranspiration, Rainwater Harvesting BMPs

Harvest and Use BMPs are LID BMPs that capture and store stormwater runoff for later use. These BMPs are engineered to store a specified volume of water and have no design surface discharge until this volume is exceeded. The utilization of capture water used should comply with codes and regulations and should not result in runoff to storm drains or receiving waters. Potential uses of captured water may include irrigation demand, indoor non-potable demand, industrial process water demand, or other demands.

Name	Included?
All HSCs; *See Section IV.3.1*	☐
Surface-based infiltration BMPs	☐
Biotreatment BMPs	☐
Above-ground cisterns and basins	☐
Underground detention	☐
Other:	☐
Other:	☐
Other:	☐



SUMMARY OF HARVESTED WATER DEMAND AND FEASIBILITY (WORKSHEET J)

1	What demands for harvested water exist in the tributary area (check all that apply:)			
2	Toilet and urinal flushing			
3	Landscape irrigation		X	
4	Other:			
5	What is the design capture storm depth?	d =	0.65	inches
6	What is the project size?	A =	0.85	ac
7	What is the acreage of impervious area?	IA =	0.75	ac
For projects with multiple types of demand (toilet flushing, indoor demand, and/or other demand)				
8	What is the minimum use required for partial capture? (Table X.6 of TDG)			gpd
9	What is the project estimated wet season total daily use?			gpd
10	Is partial capture potentially feasible? (Line 9 > Line 8?)			
For projects with only toilet flushing demand				
11	What is the minimum TUTIA for partial capture? (Table X.7 of TGD)			
12	What is the project estimated TUTIA?			
13	Is partial capture potentially feasible? (Line 12 > Line 11?)			
For projects with only irrigation demand				
14	What is the minimum irrigation area required based on conservation landscape design? (Table X.8 of TGD)	0.54		ac
15	What is the proposed project irrigated area? (multiply conservation landscaping by 1; multiply active turf by 2)	0.09		ac
16	Is partial capture potentially feasible? (Line 15 > Line 14?)	NO		

Based on the Summary of Harvested Water Demand Feasibility worksheet, Evapotranspiration/rainwater harvesting is **infeasible**.

IV.3.4 Biotreatment BMPs

Biotreatment BMPs are a broad class of LID BMPs that reduce stormwater volume to the maximum extent practicable, treat stormwater using a suite of treatment mechanicsms characteristic of biologically active systems, and discharge water to the downstream storm drain system or directly to receiving waters.

Name	**Included?**
Bioretention with underdrains	☒
Stormwater planter boxes with underdrains	☐
Rain gardens with underdrains	☐
Constructed wetlands	☐
Vegetated swales	☐
Vegetated filter strips	☐
Proprietary vegetated biotreatment systems	☐
Wet extended detention basin	☐
Dry extended detention basins	☐
Other: Cartridge Media Filter	☐
Other:	☐

IV.3.5 Hydromodification Control BMPs

See Section 5 of the Technical Guidance Document (TGD).

Hydromodification Control BMPs

BMP Name	BMP Description

IV.3.6 Regional/Sub-Regional LID BMPs

Regional/Sub-Regional LID BMPs

Low Impact Design has been incorporated in the project design to mitigate the effects of the development prior to discharging from the site. As a result, the proposed Project will not require treatment through the Regional/Sub-Regional LID BMPs.

IV.3.7 Treatment Control BMPs

Treatment control BMPs can only be considered if the project conformance analysis indicates that it is not feasible to retain the full design capture volume with LID BMPs.

Treatment Control BMPs	
BMP Name	**BMP Description**

IV.3.8 Non-structural Source Control BMPs

Fill out non-structural source control check box forms or provide a brief narrative explaining if non-structural source controls were not used.

Non-Structural Source Control BMPs				
Identifier	**Name**	**Check One**		**If not applicable, state brief reason**
		Included	**Not Applicable**	
N1	Education for Property Owners, Tenants and Occupants	☒	☐	
N2	Activity Restrictions	☒	☐	
N3	Common Area Landscape Management	☒	☐	
N4	BMP Maintenance	☒	☐	
N5	Title 22 CCR Compliance (How development will comply)	☒	☐	
N6	Local Industrial Permit Compliance	☐	☒	Project does not discharge any fuel and other areas of concern to public properties
N7	Spill Contingency Plan	☒	☐	
N8	Underground Storage Tank Compliance	☐	☒	Project does not propose any underground storage tanks that will store hazardous materials
N9	Hazardous Materials Disclosure Compliance	☒	☐	
N10	Uniform Fire Code Implementation	☒	☐	
N11	Common Area Litter Control	☒	☐	
N12	Employee Training	☒	☐	
N13	Housekeeping of Loading Docks	☐	☒	Project does not propose any loading docks
N14	Common Area Catch Basin Inspection	☒	☐	
N15	Street Sweeping Private Streets and Parking Lots	☒	☐	
N16	Retail Gasoline Outlets	☐	☒	Project does not propose any gasoline facilities or outlets

IV.3.9 Structural Source Control BMPs

Fill out structural source control check box forms or provide a brief narrative explaining if structural source controls were not used.

Structural Source Control BMPs

Identifier	Name	Check One		If not applicable, state brief reason
		Included	Not Applicable	
S1	Provide storm drain system stenciling and signage	☒	☐	
S2	Design and construct outdoor material storage areas to reduce pollution introduction	☒	☐	
S3	Design and construct trash and waste storage areas to reduce pollution introduction	☒	☐	
S4	Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control	☒	☐	
S5	Protect slopes and channels and provide energy dissipation	☒	☐	
	Incorporate requirements applicable to individual priority project categories (from SDRWQCB NPDES Permit)	☒	☐	
S6	Dock areas	☐	☒	Project does not propose dock areas
S7	Maintenance bays	☐	☒	Project does not propose maintenance bays
S8	Vehicle wash areas	☐	☒	Project does not propose vehicle wash areas
S9	Outdoor processing areas	☐	☒	Project does not propose an outdoor processing areas
S10	Equipment wash areas	☐	☒	Project does not propose equipment wash areas
S11	Fueling areas	☐	☒	Project does not propose a fueling area
S12	Hillside landscaping	☐	☒	Project is not on a hillside
S13	Wash water control for food preparation areas	☐	☒	Project does not propose a food preparation area
S14	Community car wash racks	☐	☒	Project does not propose a community car wash

IV.4 Alternative Compliance Plan (If Applicable)

Refer to Section 7.II 3.0 in the WQMP.

IV.4.1 Water Quality Credits

Refer to Section 3.1 of the Model WQMP for description of credits and Appendix VI of the Technical Guidance Document (TGD) for calculation methods for applying water quality credits.

<table>
<tr><th colspan="6">Description of Proposed Project</th></tr>
<tr><td colspan="6">Project Types that Qualify for Water Quality Credits (Select all that apply):</td></tr>
<tr><td>☐Redevelopment projects that reduce the overall impervious footprint of the project site.</td><td colspan="3">☐Brownfield redevelopment, meaning redevelopment, expansion, or reuse of real property which may be complicated by the presence or potential presence of hazardous substances, pollutants or contaminants, and which have the potential to contribute to adverse ground or surface WQ if not redeveloped.</td><td colspan="2">☐ Higher density development projects which include two distinct categories (credits can only be taken for one category): those with more than seven units per acre of development (lower credit allowance); vertical density developments, for example, those with a Floor to Area Ratio (FAR) of 2 or those having more than 18 units per acre (greater credit allowance).</td></tr>
<tr><td colspan="2">☐ Mixed use development, such as a combination of residential, commercial, industrial, office, institutional, or other land uses which incorporate design principles that can demonstrate environmental benefits that would not be realized through single use projects (e.g. reduced vehicle trip traffic with the potential to reduce sources of water or air pollution).</td><td colspan="3">☐ Transit-oriented developments, such as a mixed use residential or commercial area designed to maximize access to public transportation; similar to above criterion, but where the development center is within one half mile of a mass transit center (e.g. bus, rail, light rail or commuter train station). Such projects would not be able to take credit for both categories, but may have greater credit assigned</td><td>☐ Redevelopment projects in an established historic district, historic preservation area, or similar significant city area including core City Center areas (to be defined through mapping).</td></tr>
<tr><td>☐Developments with dedication of undeveloped portions to parks, preservation areas and other pervious uses.</td><td>☐ Developments in a city center area.</td><td>☐ Developments in historic districts or historic preservation areas.</td><td colspan="2">☐ Live-work developments, a variety of developments designed to support residential and vocational needs together – similar to criteria to mixed use development; would not be able to take credit for both categories.</td><td>☐In-fill projects, the conversion of empty lots and other underused spaces into more beneficially used spaces, such as residential or commercial areas.</td></tr>
</table>

Calculation of Water Quality Credits (if applicable)	N/A

IV.4.2 Alternative Compliance Plan Information

Refer to Section 7.II 3.0 in the Model WQMP.

This project **does not require** the use of alternative compliance methods for the treatment of stormwater runoff.

Section V Inspection/Maintenance Responsibility for BMPs

Refer to Section 7.II 4.0 in the Model WQMP.

BMP Inspection/Maintenance			
BMP	**Reponsible Party(s)**	**Inspection/ Maintenance Activities Required**	**Minimum Frequency of Activities**
N1. Education for Property Owners, Tenants, and Occupants	City of Newport Beach	Provide training to key staff; Provide education material to occupants.	Provide minimum training upon initial hiring; Yearly updates of educational materials
N2. Activity Restrictions	City of Newport Beach	Restrict certain activities during inclement weather or increased risk of pollution	As required by inclement weather of changes to site conditions
N3. Common Area Landscape Management	City of Newport Beach	Routine landscape maintenance; tree-trimming; weed-abatement; addition of fertilizer; routine irrigation	Provide landscape maintenance at a minimum of once per week or as-needed. Tree-trimming and addition of fertilizer at a minimum of once per year; Provide as-needed maintenance and repair of irrigation system.
N4. BMP Maintenance	City of Newport Beach	Provide inspections of all structural and permanent BMPs on the project site; Make repairs as-needed	Inspect on-site BMPs at a minimum of once per year; Repair or provide maintenance prior to each rainy season

N5. Title 22 CCR Compliance	City of Newport Beach	Training of staff and routine updates to compliance plan	Provide training to all new employees; Minimum of biannual updates to compliance plans and procedures
N7. Spill Contingency Plan	City of Newport Beach	Prepare a Spill Contingency Plan	Prepare a Spill Contingency Plan of how occupants will prepare for and respond to spills of hazardous materials
N9. Hazardous Materials Disclosure Compliance	City of Newport Beach	Provide disclosure and training for hazardous materials	Provide documentation and training to comply with hazardous materials procedures.
N10. Uniform Fire Code Implementation	City of Newport Beach	Initial building design per OCFA regulations; Provide routine inspections of fire protection systems; Training to all staff	Provide training on fire protection and emergency procedures to all new staff. Minimum of once yearly inspections of fire protection systems or as-needed per OCFA codes
N11. Common Area Litter Control	City of Newport Beach	Provide routine trash pickup; regular inspections of facility for litter. Provide sufficient waste receptacles for the property of occupancy	Provide regular trash pickup by waste management contractor at a minimum of once per week. Daily inspections and clean-up maintenance staff
N12. Employee Training	City of Newport Beach	Provide initial training to all new staff. Provide refresher training to existing staff	Provide initial training upon hiring to all new staff. Minimum of once yearly refreshers to existing staff. As-

			needed updates to training for key personnel
N14. Common Area Catch Basin Inspection	City of Newport Beach	Conduct inspections on catch basins and storm drain inlets within the property	Provide minimum of once yearly inspections and cleaning of catch basins and storm drain inlets
N15. Street Sweeping Private Streets and Parking Lots.	City of Newport Beach	Provide sweeping as necessary to remove accumulated sediment and litter from parking lot area	Inspect parking lot areas at a minimum of once per week for accumulated sediment or trash. Conduct sweeping as necessary but at a minimum of once per week to remove sediment and debris
S1. Provide storm drain system stencilling and signage	City of Newport Beach	Provide stencilling at all direct inlets to the storm drain system with the phrase “No Dumping, Drains to Ocean”	During project construction. Stencils will be re-stencilled as necessary to maintain legibility but at a minimum of once every five years
S2. Design and construct outdoor material storage areas to reduce pollution introduction	City of Newport Beach	Provide transfer areas where incidental spills may occur. This includes but not limited enclosing the area, providing secondary containment structure, not discharge into storm drain or street, preventative measures	There is possibility for oil leakage from the outdoor Transformers. A containment structure is proposed to capture the oil and stormwater in this area and will be maintained and discharged by a maintenance truck to prevent cross contamination into both sewer and

			storm drain. Conduct maintenance of containment structure monthly and after every rainstorm event.
S3. Design and construct trash and waste storage areas to reduce pollution introduction	City of Newport Beach	Clean and remove trash from waste storage area	Provide regular trash pickup by waste management contractor at a minimum of one per week. Daily inspections and clean-up by maintenance staff
S4. Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control	City of Newport Beach	Provide connection to recycled water irrigation system; Repair irrigation system as-needed	Inspect irrigation system during regular weekly landscaping maintenance; Repair immediately to prevent over irrigation or runoff
S5. Protect slopes and channels and provide energy dissipation	City of Newport Beach	Provide routine inspections of sloped channel areas for trash and debris	Inspect all areas of swale channels
Bioretention with underdrains	City of Newport Beach	Routine inspection of the bioretention basin for excessive sedimentation and debris	Inspect the underground detention basin quarterly and following significant rain events for debris, sediments, and interior of structure conditions.

Section VI BMP Exhibit (Site Plan)

VI.1 BMP Exhibit (Site Plan)

See Appendix H for BMP Exhibit (Site Plan)

VI.2 Submittal and Recordation of Water Quality Management Plan

Following approval of the Final Project-Specific WQMP, three copies of the approved WQMP (including BMP Exhibit, Operations and Maintenance (O&M) Plan, and Appendices) shall be submitted. In addition, these documents shall be submitted in a PDF format.

Each approved WQMP (including BMP Exhibit, Operations and Maintenance (O&M) Plan, and Appendices) shall be recorded in the Orange County Clerk-Recorder's Office, prior to close-out of grading and/or building permit. Educational Materials are not required to be included.

Section VII Educational Materials

Refer to the Orange County Stormwater Program (ocwatersheds.com) for a library of materials available. Please only attach the educational materials specifically applicable to this project. Other materials specific to the project may be included as well and must be attached.

Education Materials

Residential Material (http://www.ocwatersheds.com)	**Check If Applicable**	**Business Material (http://www.ocwatersheds.com)**	**Check If Applicable**
The Ocean Begins at Your Front Door	☒	Tips for the Automotive Industry	☐
Tips for Car Wash Fund-raisers	☐	Tips for Using Concrete and Mortar	☐
Tips for the Home Mechanic	☐	Tips for the Food Service Industry	☐
Homeowners Guide for Sustainable Water Use	☐	Proper Maintenance Practices for Your Business	☒
Household Tips	☐	**Other Material**	**Check If Attached**
Proper Disposal of Household Hazardous Waste	☐		
Recycle at Your Local Used Oil Collection Center (North County)	☐		☐
Recycle at Your Local Used Oil Collection Center (Central County)	☐		☐
Recycle at Your Local Used Oil Collection Center (South County)	☐		☐
Tips for Maintaining a Septic Tank System	☐		☐
Responsible Pest Control	☒		☐
Sewer Spill	☐		☐
Tips for the Home Improvement Projects	☐		☐
Tips for Horse Care	☐		☐
Tips for Landscaping and Gardening	☒		☐
Tips for Pet Care	☐		☐
Tips for Pool Maintenance	☐		☐
Tips for Residential Pool, Landscape and Hardscape Drains	☐		☐
Tips for Projects Using Paint	☐		☐

APPENDIX A

Checklist for Categorizing Development and Significant Redevelopment Projects As "Priority" or "Non-Priority"

OC PLANNING
A DIVISION OF OC PUBLIC WORKS

Checklist for Categorizing Development and Significant Redevelopment Projects As “Priority” or “Non-Priority”

County of Orange

300 N. Flower Street
Santa Ana, CA 92703
☎ 714.667.8888
714.667.8885

MODEL WATER QUALITY MANAGEMENT PLAN (MODEL WQMP) PRIORITY PROJECT CATEGORIES **(Unless otherwise indicated, these requirements apply to both the Santa Ana and San Diego Regions.)**	**Yes**	**No**
1. *Both Permit Areas* –New development projects that create 10,000 square feet or more of impervious surface (collectively over the entire project site). This category includes commercial, industrial, residential, mixed-use, and public projects on private, or public, property that falls under the planning and building authority of the Permittees. *San Diego Region only* – All pollutant generating development or redevelopment projects that result in the disturbance of one acre or more of land will be considered Priority Projects starting December 16, 2012.	X	
2. Automotive repair shops. This applies to facilities that are categorized in any one of the following Standard Industrial Classification (SIC) codes 5013, 5014, 5541, 7532-7534, and 7536-7539.		X
3. *Both Permit Areas* – Restaurants where the land area of development is 5,000 square feet or more including parking area. This category is defined as facilities that sell prepared foods and drinks for consumption, including stationary lunch counters and refreshment stands selling prepared foods and drinks for immediate consumption (SIC code 5812), where the land area for development is greater than 5,000 square feet. *San Diego Region only* – Restaurants where land development is less than 5,000 square feet shall meet all WQMP requirements except for structural treatment control BMP/LID, and hydromodification.		X
4. Hillside development that creates greater than 5,000 square feet of impervious surface. Hillside development is defined as any development which is located in an area with known erosive soil conditions or where the development will grade on any natural slope that is twenty-five (25) percent or greater.		X
5. *Both Permit Areas* – Impervious surface of 2,500 square feet or more located within, directly adjacent to (within 200 feet), or discharging directly into receiving waters within Environmentally Sensitive Areas. *San Diego Region only* – or a project with an increase in impervious area by10% or more of its naturally occurring condition located within, directly adjacent to (within 200 feet), or discharging directly to receiving waters within Environmentally Sensitive Areas.		
6. *Both Permit Areas* – Parking lots 5,000 square feet or more including associated drive aisle, and potentially exposed to urban stormwater runoff. A parking lot is defined as a land area or facility for the temporary parking or storage of motor vehicles used personally, for business, or for commerce. *San Diego Region only* – or parking lots with 15 parking spaces or more and potentially exposed to runoff.	X	
7. *Streets, roads, highways, and freeways* - This category includes any paved surface that is 5,000 square feet or greater used for the transportation of automobiles, trucks, motorcycles, and other vehicles.		X

8.	*Significant Redevelopment. See definitions below*.		
9.	*Retail Gasoline Outlets (RGOs)*- This category includes RGOs that meet the following criteria: (a) 5,000 square feet or more, or (b) a projected Average Daily Traffic (ADT) of 100 or more vehicles per day.		

Determination:

Priority Project: Any question answered "Yes"
Non-Priority Project: All questions are answered "No"

Note:

BMPs – Best Management Practices
LID – Low Impact Development
WQMP – Water Quality Management Plan

Definitions of "Significant Redevelopment"

Santa Ana Region definition of "Significant Redevelopment" (Model WQMP, Section 7.11-1.2):

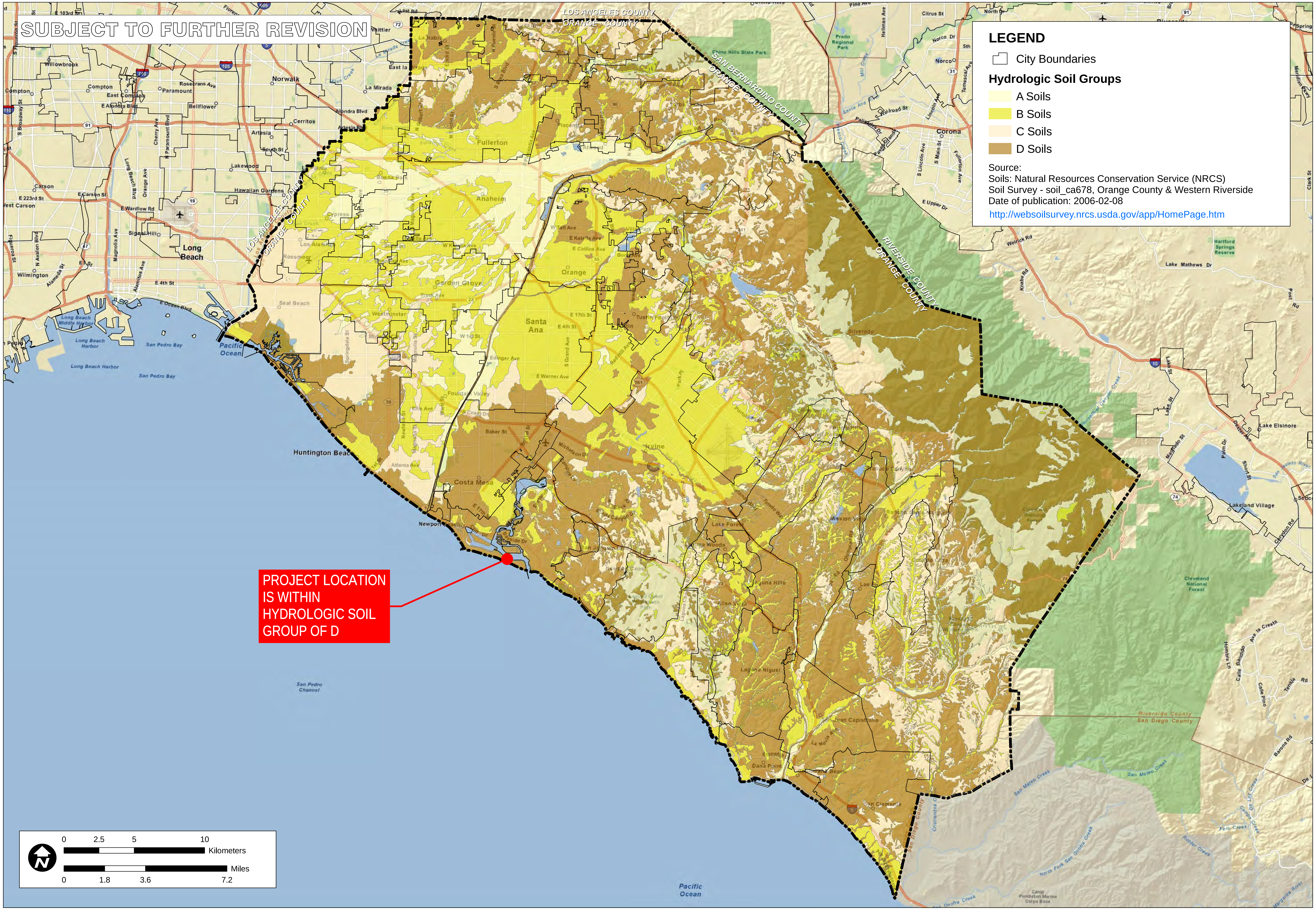
> All significant redevelopment projects, where significant redevelopment is defined as the addition or replacement of 5,000 or more square feet of impervious surface on an already developed site. Redevelopment does not include routine maintenance activities that are conducted to maintain original line and grade, hydraulic capacity, original purpose of the facility, or emergency redevelopment activity required to protect public health and safety. If the redevelopment results in the addition or replacement of less than 50 percent of the impervious area on-site and the existing development was not subject to WQMP requirement, the numeric sizing criteria (see Section 7.II-2.0 of Model WQMP**)** only applies to the addition or replacement area. If the addition or replacement accounts for 50 percent or more of the impervious area, the Project WQMP requirements apply to the entire development.

San Diego Region definition of "Significant Redevelopment" (Order No. R9-2009-0002, Section F.1d):

> Those redevelopment projects that create, add, or replace at least 5,000 square feet of impervious surface on an already developed site and the existing development and/or the project falls under the project categories or locations listed in the table above. Where redevelopment results in an increase of less than fifty percent of the impervious surfaces of a previously existing development, and the existing development was not subject to WQMP requirements, the numeric sizing criteria (see Section 7.II-2.0 of Model WQMP**)** applies only to the addition or replacement, and not the entire development. Where redevelopment results in an increase of more than fifty percent of the impervious surfaces of a previously existing development, the numeric sizing criteria applies to the entire development.
>
> > Definition of Redevelopment (Order No. R9-2009-0002, Attachment C, Definitions):
> >
> > The creation, addition, and or replacement of impervious surface on an already developed site. Examples include the expansion of a building footprint, road widening, the addition to or replacement of a structure, and creation or addition of impervious surfaces. Replacement of impervious surfaces includes any activity that is not part of a routine maintenance activity where impervious material(s) are removed, exposing underlying soil during construction. Redevelopment does not include trenching and resurfacing associated with utility work; resurfacing existing roadways; new sidewalk construction, pedestrian ramps, or bike lane on existing roads; and routine replacement of damaged pavement, such as pothole repair.

APPENDIX B

Technical Guidance Document (TGD)
NRCS Hydrologic Soils Group Map



LEGEND

▭ City Boundaries

Hydrologic Soil Groups

- A Soils
- B Soils
- C Soils
- D Soils

Source:
Soils: Natural Resources Conservation Service (NRCS)
Soil Survey - soil_ca678, Orange County & Western Riverside
Date of publication: 2006-02-08
http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm

PROJECT LOCATION IS WITHIN HYDROLOGIC SOIL GROUP OF D

P:\9526E\6-GIS\Mxds\Reports\InfiltrationFeasability_20110215\9526E_FigureXVI-2a_HydroSoils_20110215.mxd

TITLE
NRCS HYDROLOGIC SOILS GROUPS

JOB
ORANGE COUNTY INFILTRATION STUDY
ORANGE CO.
CA

SCALE	1" = 1.8 miles
DESIGNED	TH
DRAWING	TH
CHECKED	BMP
DATE	02/09/11
JOB NO.	9526-E

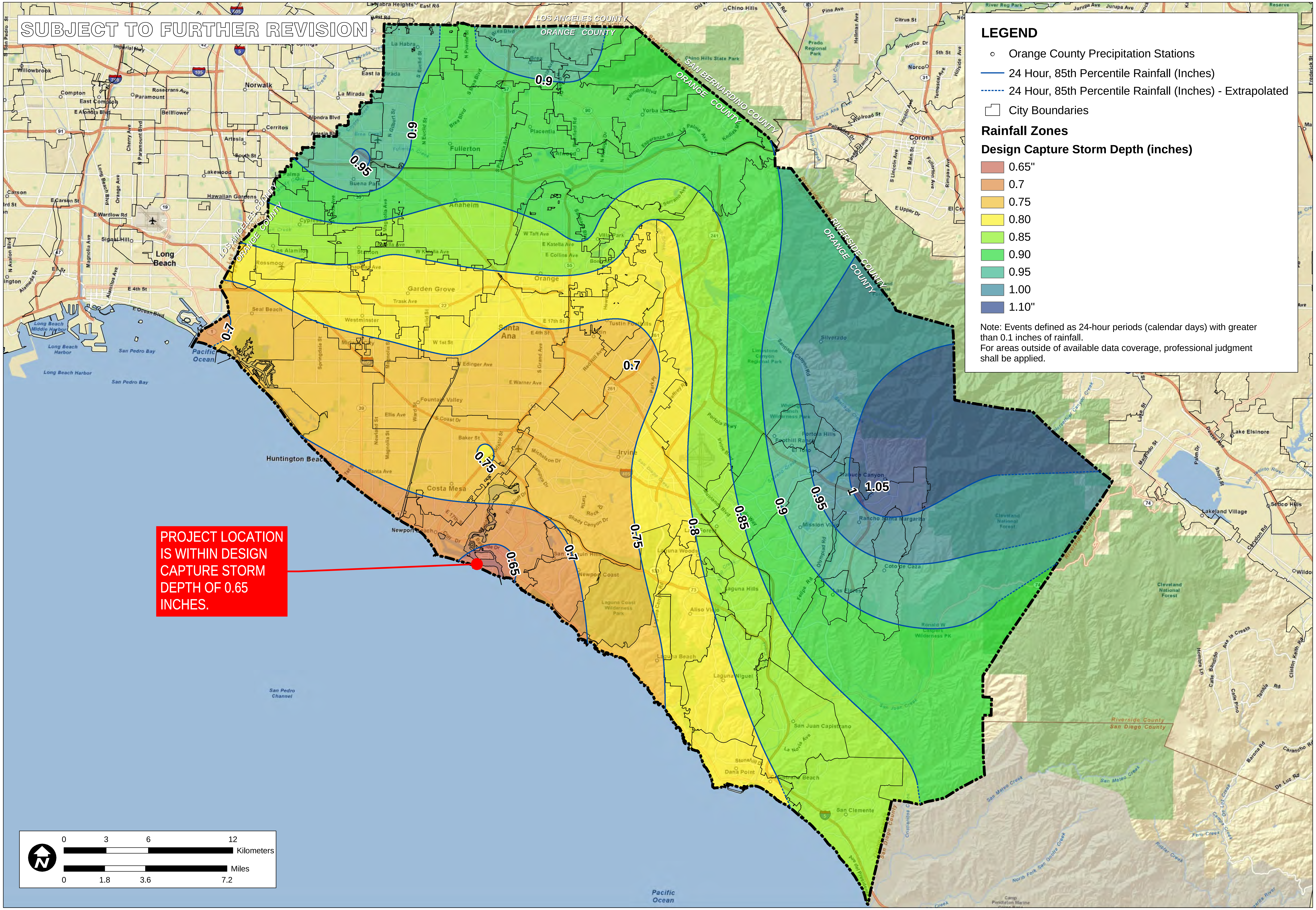
PACE
Advanced Water Engineering

FIGURE
XVI-2a

APPENDIX C

Technical Guidance Document (TGD)
Rainfall Zones Map

SUBJECT TO FURTHER REVISION



PROJECT LOCATION IS WITHIN DESIGN CAPTURE STORM DEPTH OF 0.65 INCHES.

LEGEND

○ Orange County Precipitation Stations

— 24 Hour, 85th Percentile Rainfall (Inches)

- - - 24 Hour, 85th Percentile Rainfall (Inches) - Extrapolated

☐ City Boundaries

Rainfall Zones

Design Capture Storm Depth (inches)

🟥	0.65"
🟧	0.7
🟧	0.75
🟨	0.80
🟩	0.85
🟩	0.90
🟩	0.95
🟦	1.00
🟦	1.10"

Note: Events defined as 24-hour periods (calendar days) with greater than 0.1 inches of rainfall.
For areas outside of available data coverage, professional judgment shall be applied.

TITLE
RAINFALL ZONES

JOB
ORANGE COUNTY
TECHNICAL GUIDANCE
DOCUMENT

ORANGE CO.
CA

SCALE	1" = 1.8 miles
DESIGNED	TH
DRAWING	TH
CHECKED	BMP
DATE	04/22/10
JOB NO.	9526-E

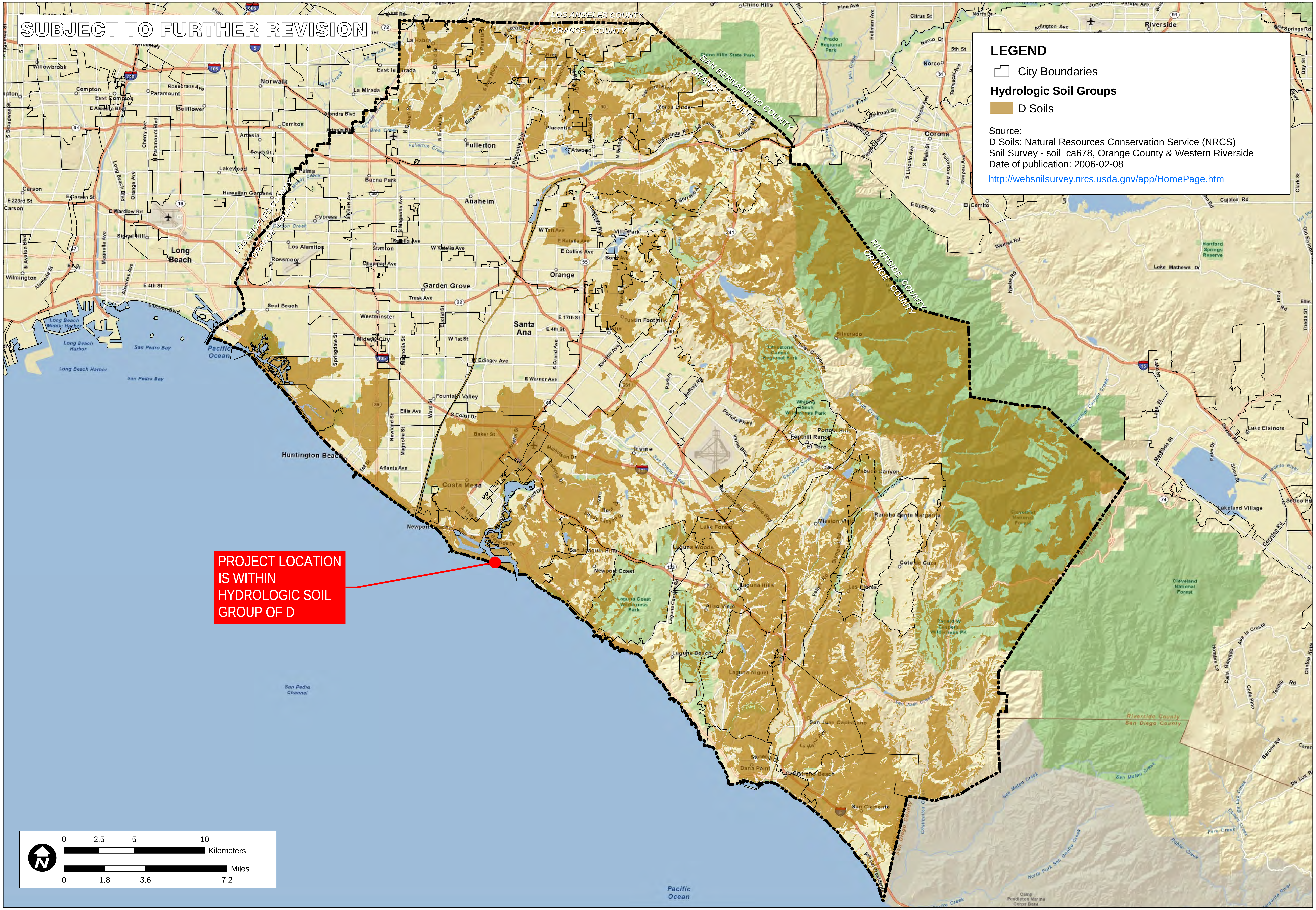
PACE
Advanced Water Engineering

FIGURE
XVI-1

P:\9526E\6-GIS\Mxds\Reports\InfiltrationFeasability_20110215\9526E_FigureXVI-1_RainfallZones_20110215.mxd

APPENDIX D

Technical Guidance Document (TGD)
Geotechnical Hazards Maps



LEGEND

☐ City Boundaries

Hydrologic Soil Groups

🟫 D Soils

Source:
D Soils: Natural Resources Conservation Service (NRCS)
Soil Survey - soil_ca678, Orange County & Western Riverside
Date of publication: 2006-02-08
http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm

PROJECT LOCATION IS WITHIN HYDROLOGIC SOIL GROUP OF D

TITLE

HYDROLOGIC SOIL GROUP TYPE D NRCS SOIL SURVEY

JOB

ORANGE COUNTY INFILTRATION STUDY

ORANGE CO. CA

SCALE 1" = 1.8 miles
DESIGNED TH
DRAWING TH
CHECKED BMP
DATE 02/09/11
JOB NO. 9526-E

PACE Advanced Water Engineering

FIGURE

XVI-2b

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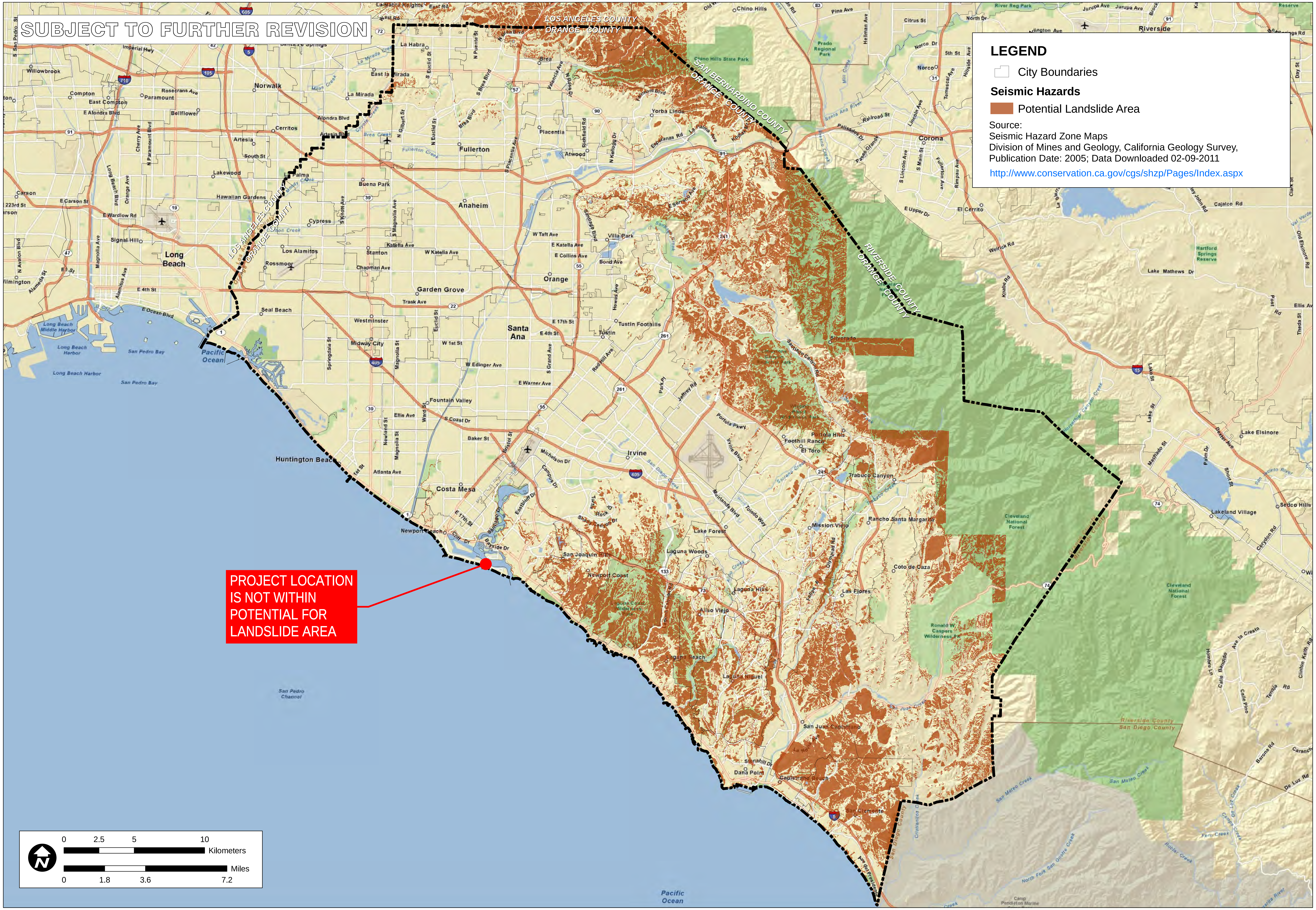

SUBJECT TO FURTHER REVISION

LEGEND

☐ City Boundaries

Seismic Hazards

🟫 Potential Landslide Area

Source:
Seismic Hazard Zone Maps
Division of Mines and Geology, California Geology Survey,
Publication Date: 2005; Data Downloaded 02-09-2011
http://www.conservation.ca.gov/cgs/shzp/Pages/Index.aspx

PROJECT LOCATION IS NOT WITHIN POTENTIAL FOR LANDSLIDE AREA

TITLE
HYDROLOGIC SOIL GROUP
TYPE D NRCS SOIL SURVEY

JOB
ORANGE COUNTY
INFILTRATION STUDY

ORANGE CO. CA

SCALE	1" = 1.25 miles
DESIGNED	TH
DRAWING	TH
CHECKED	BMP
DATE	02/09/11
JOB NO.	9526-E

PACE
Advanced Water Engineering

FIGURE
XVI-2c

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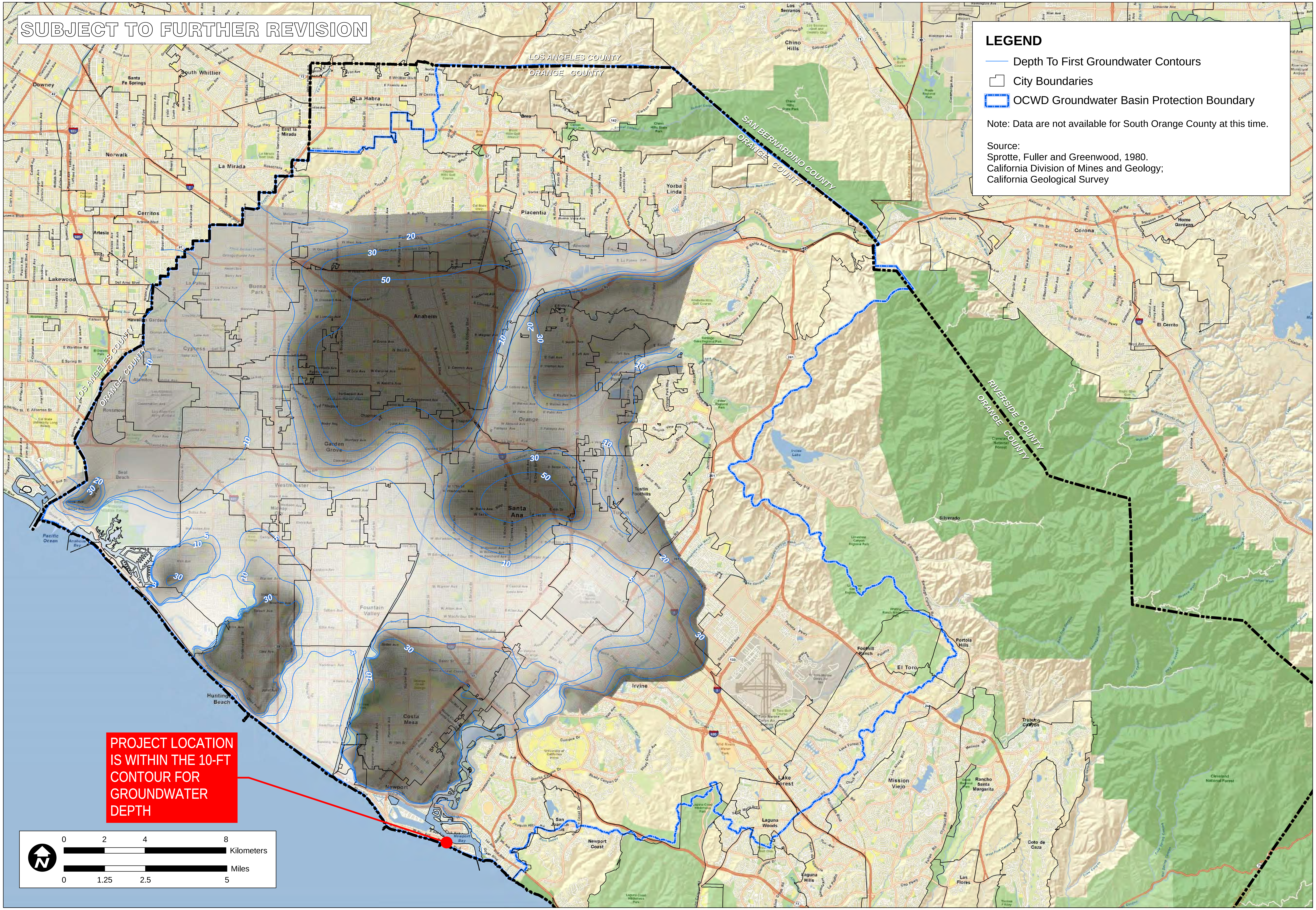
SUBJECT TO FURTHER REVISION



LEGEND

- Depth To First Groundwater Contours
- City Boundaries
- OCWD Groundwater Basin Protection Boundary

Note: Data are not available for South Orange County at this time.

Source:
Sprotte, Fuller and Greenwood, 1980.
California Division of Mines and Geology;
California Geological Survey

PROJECT LOCATION IS WITHIN THE 10-FT CONTOUR FOR GROUNDWATER DEPTH

0 2 4 8 Kilometers

0 1.25 2.5 5 Miles

P:\9526E\6-GIS\Mxds\Reports\InfiltrationFeasability_20110215\9526E_FigureXVI-2d_DepthToGroundwaterOverview_20110215.mxd

TITLE

NORTH ORANGE COUNTY MAPPED DEPTH TO FIRST GROUNDWATER

JOB

ORANGE COUNTY INFILTRATION STUDY

ORANGE CO. CA

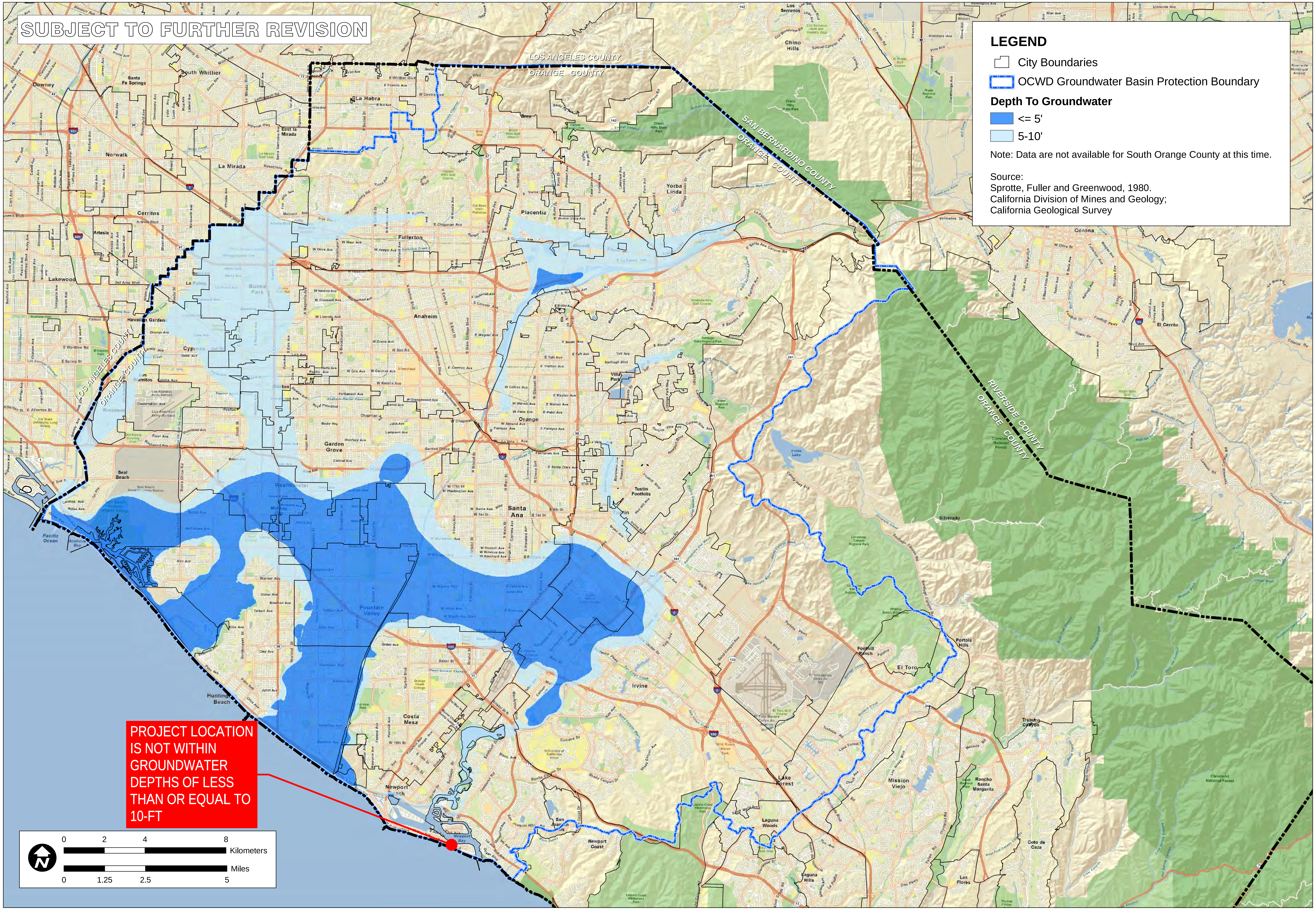
SCALE	1" = 1.25 miles
DESIGNED	TH
DRAWING	TH
CHECKED	BMP
DATE	02/09/11
JOB NO.	9526-E

PACE Advanced Water Engineering

FIGURE

XVI-2d

SUBJECT TO FURTHER REVISION



LEGEND

☐ City Boundaries

▭ OCWD Groundwater Basin Protection Boundary

Depth To Groundwater

🟦 <= 5'

▭ 5-10'

Note: Data are not available for South Orange County at this time.

Source:
Sprotte, Fuller and Greenwood, 1980.
California Division of Mines and Geology;
California Geological Survey

PROJECT LOCATION IS NOT WITHIN GROUNDWATER DEPTHS OF LESS THAN OR EQUAL TO 10-FT

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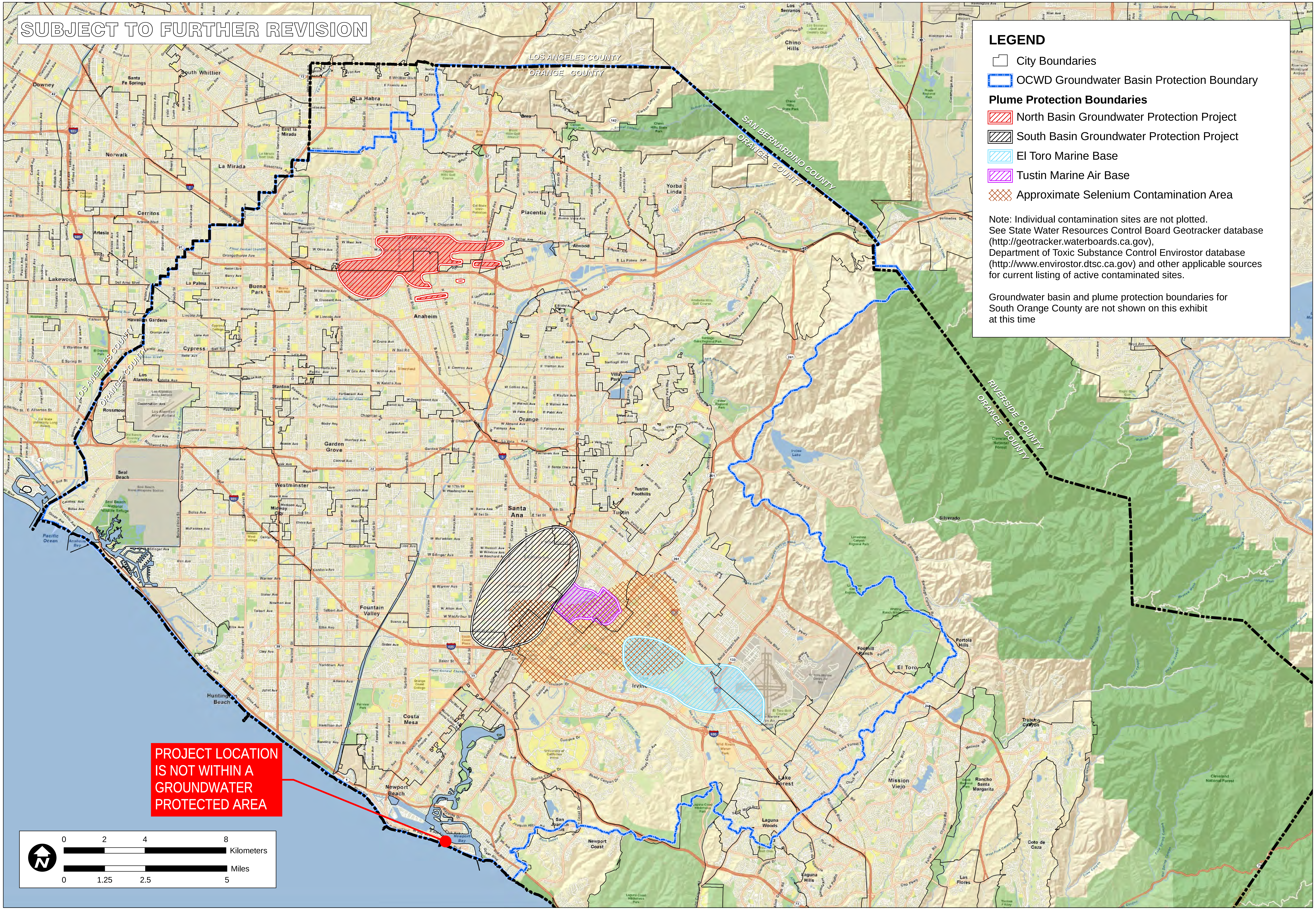
TITLE
NORTH ORANGE COUNTY
MAPPED SHALLOW GROUNDWATER

JOB
ORANGE COUNTY
INFILTRATION STUDY
ORANGE CO. CA

SCALE	1" = 1.25 miles
DESIGNED	TH
DRAWING	TH
CHECKED	BMP
DATE	02/09/11
JOB NO.	9526-E

PACE
Advanced Water Engineering

FIGURE
XVI-2e



LEGEND

- ☐ City Boundaries
- ▭ OCWD Groundwater Basin Protection Boundary

Plume Protection Boundaries

- ▨ North Basin Groundwater Protection Project
- ▨ South Basin Groundwater Protection Project
- ▨ El Toro Marine Base
- ▨ Tustin Marine Air Base
- ▨ Approximate Selenium Contamination Area

Note: Individual contamination sites are not plotted. See State Water Resources Control Board Geotracker database (http://geotracker.waterboards.ca.gov), Department of Toxic Substance Control Envirostor database (http://www.envirostor.dtsc.ca.gov) and other applicable sources for current listing of active contaminated sites.

Groundwater basin and plume protection boundaries for South Orange County are not shown on this exhibit at this time

TITLE

NORTH ORANGE COUNTY
GROUNDWATER PROTECTION
AREAS

JOB

ORANGE COUNTY
INFILTRATION STUDY

ORANGE CO. CA

SCALE	1" = 1.25 miles
DESIGNED	TH
DRAWING	TH
CHECKED	BMP
DATE	04/22/10
JOB NO.	9526-E

PACE
Advanced Water Engineering

FIGURE

XVI-2f

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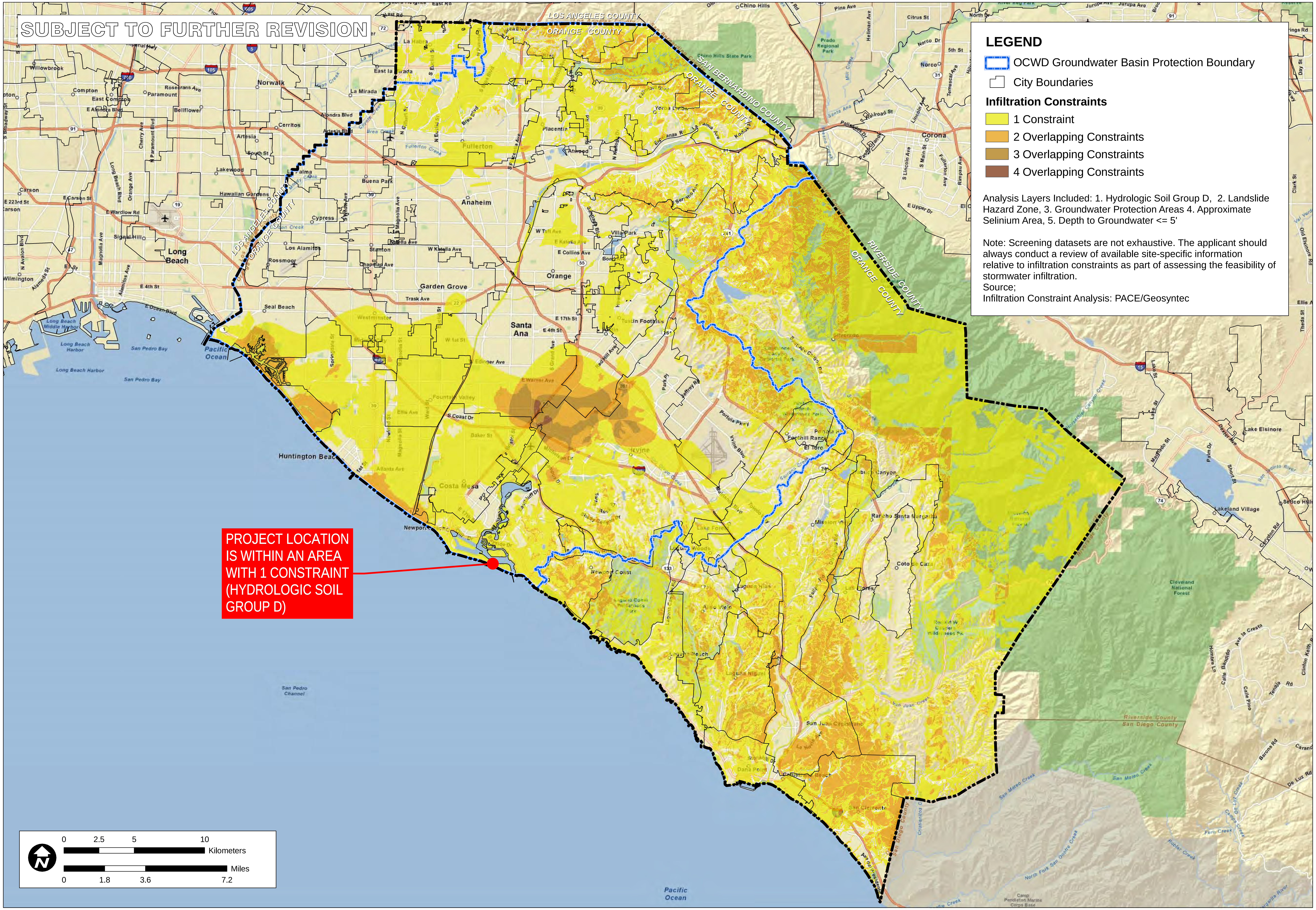
SUBJECT TO FURTHER REVISION



LEGEND

OCWD Groundwater Basin Protection Boundary

City Boundaries

Infiltration Constraints

🟨	1 Constraint
🟧	2 Overlapping Constraints
🟫	3 Overlapping Constraints
🟫	4 Overlapping Constraints

Analysis Layers Included: 1. Hydrologic Soil Group D, 2. Landslide Hazard Zone, 3. Groundwater Protection Areas 4. Approximate Selinium Area, 5. Depth to Groundwater <= 5'

Note: Screening datasets are not exhaustive. The applicant should always conduct a review of available site-specific information relative to infiltration constraints as part of assessing the feasibility of stormwater infiltration.
Source;
Infiltration Constraint Analysis: PACE/Geosyntec

PROJECT LOCATION IS WITHIN AN AREA WITH 1 CONSTRAINT (HYDROLOGIC SOIL GROUP D)

TITLE
INFILTRATION ANALYSIS
OVERLAPPING CONSTRAINT
LOCATIONS

ORANGE COUNTY
INFILTRATION STUDY

CA

JOB
ORANGE CO.

SCALE	1" = 1.8 miles
DESIGNED	TH
DRAWING	TH
CHECKED	BMP
DATE	04/22/10
JOB NO.	9526-E

PACE
Advanced Water Engineering

FIGURE
XVI-2g

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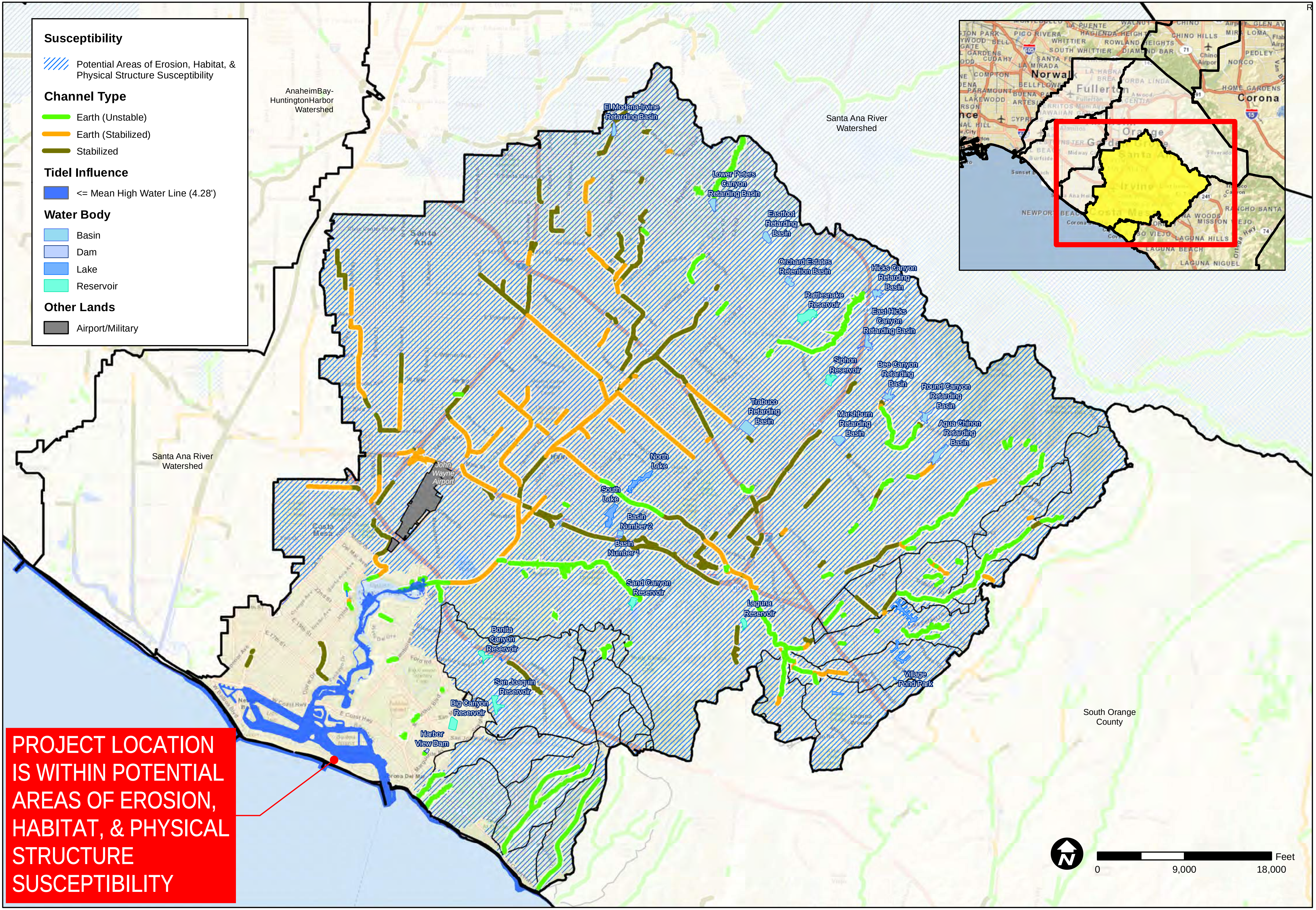
SUSCEPTIBILITY MAP UPATE (FEB 2013)



PROJECT LOCATION IS WITHIN POTENTIAL AREAS OF EROSION, HABITAT, & PHYSICAL STRUCTURE SUSCEPTIBILITY

P:\9526E\6-GIS\Mxds\SusceptabilityMaps_20100505\9526E_NewportBaySusceptibility_20100430.mxd

TITLE
SUSCEPTIBILITY ANALYSIS
NEWPORT BAY-
NEWPORT COASTAL STREAMS

JOB
ORANGE COUNTY
WATERSHED
MASTER PLANNING

ORANGE CO.
CA

SCALE	1" = 12000'
DESIGNED	TH
DRAWING	TH
CHECKED	BMP
DATE	04/30/10
JOB NO.	9526-E

PACE
Advanced Water Engineering

FIGURE
4

APPENDIX E

Infiltration Feasibility Checklist

Table 2.7: Infiltration BMP Feasibility Worksheet

<table>
<tr><th></th><th><i>Infeasibility Criteria</i></th><th><i>Yes</i></th><th><i>No</i></th></tr>
<tr><td>1</td><td>Would Infiltration BMPs pose significant risk for groundwater related concerns? Refer to Appendix VIII (Worksheet I) for guidance on groundwater-related infiltration feasibility criteria.</td><td>X</td><td></td></tr>
<tr><td colspan="4">Provide basis:
Based on the Geotechnical Report, groundwater was encountered at depths of 6 and 7 feet at the boring locations.
Summarize findings of studies provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</td></tr>
<tr><td>2</td><td>Would Infiltration BMPs pose significant risk of increasing risk of geotechnical hazards that cannot be mitigated to an acceptable level? (Yes if the answer to any of the following questions is yes, as established by a geotechnical expert):
• The BMP can only be located less than 50 feet away from slopes steeper than 15 percent
• The BMP can only be located less than eight feet from building foundations or an alternative setback.
• A study prepared by a geotechnical professional or an available watershed study substantiates that stormwater infiltration would potentially result in significantly increased risks of geotechnical hazards that cannot be mitigated to an acceptable level.</td><td></td><td>X</td></tr>
<tr><td colspan="4">Provide basis:
Summarize findings of studies provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</td></tr>
<tr><td>3</td><td>Would infiltration of the DCV from drainage area violate downstream water rights?</td><td></td><td>X</td></tr>
<tr><td colspan="4">Provide basis:
Summarize findings of studies provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</td></tr>
</table>

Table 2.7: Infiltration BMP Feasibility Worksheet (continued)

	Partial Infeasibility Criteria	***Yes***	***No***
4	Is proposed infiltration facility **located on HSG D soils** or the site geotechnical investigation identifies presence of soil characteristics which support categorization as D soils?	**X**	
Provide basis: Summarize findings of studies provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
5	Is **measured infiltration rate below proposed facility less than 0.3 inches per hour**? This calculation shall be based on the methods described in **Appendix VII**.	**X**	
Provide basis: At the time of this report, a percolation test has not been performed. Based on the mapped Hydrologic Soil Group D, it is anticipated that the infiltration rate will be less than 0.3 in/hr. Summarize findings of studies provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
6	Would **reduction of over predeveloped conditions cause impairments to downstream beneficial uses, such as change of seasonality of ephemeral washes or increased discharge of contaminated groundwater to surface waters?**		**X**
Provide citation to applicable study and summarize findings relative to the amount of infiltration that is permissible: Summarize findings of studies provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
7	Would **an increase in infiltration over predeveloped conditions cause impairments to downstream beneficial uses, such as change of seasonality of ephemeral washes or increased discharge of contaminated groundwater to surface waters?**		**X**
Provide citation to applicable study and summarize findings relative to the amount of infiltration that is permissible: Summarize findings of studies provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			

Table 2.7: Infiltration BMP Feasibility Worksheet (continued)

Infiltration Screening Results (check box corresponding to result):		
8	Is there substantial evidence that infiltration from the project would result in a significant increase in I&I to the sanitary sewer that cannot be sufficiently mitigated? (See **Appendix XVII**) Provide narrative discussion and supporting evidence: Summarize findings of studies provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.	
9	If any answer from row 1-3 is yes: infiltration of any volume is **not feasible** within the DMA or equivalent. Provide basis: Summarize findings of infeasibility screening	
10	If any answer from row 4-7 is yes, infiltration is **permissible but is not presumed to be feasible for the entire DCV.** Criteria for designing biotreatment BMPs to achieve the maximum feasible infiltration and ET shall apply. Provide basis: Due to high ground water, infiltration is not feasible Summarize findings of infeasibility screening	**X**
11	If all answers to rows 1 through 11 are no, infiltration of the full DCV is potentially feasible, BMPs must be designed to infiltrate the full DCV to the maximum extent practicable.	

Harvest and Use Infeasibility

Harvest and use infeasibility criteria include:

- If inadequate demand exists for the use of the harvested rainwater. See **Appendix X** for guidance on determining harvested water demand and applicable feasibility thresholds.
- If the use of harvested water for the type of demand on the project violates codes or ordinances most applicable to stormwater harvesting in effect at the time of project application and a waiver of these codes and/or ordinances cannot be obtained. It is noted that codes and ordinances most applicable to stormwater harvesting may change

HARVESTED WATER DEMAND AND FEASIBILITY

Date: 10/21/2019
Job No.: 20181708
Project: Newport Beach Jr Lifeguard Building

Description and Assumptions:

Based on:

Technical Guidance Document (TGD) for the Preparation of Conceptual/Preliminary and/or Project Water Quality Management Plans (WQMPs)

SUMMARY OF HARVESTED WATER DEMAND AND FEASIBILITY (WORKSHEET J)

1	What demands for harvested water exist in the tributary area (check all that apply:)			
2	Toilet and urinal flushing			
3	Landscape irrigation		X	
4	Other:			
5	What is the design capture storm depth?	d =	0.65	inches
6	What is the project size?	A =	0.85	ac
7	What is the acreage of impervious area?	IA =	0.75	ac
For projects with multiple types of demand (toilet flushing, indoor demand, and/or other demand)				
8	What is the minimum use required for partial capture? (Table X.6 of TDG)			gpd
9	What is the project estimated wet season total daily use?			gpd
10	Is partial capture potentially feasible? (Line 9 > Line 8?)			
For projects with only toilet flushing demand				
11	What is the minimum TUTIA for partial capture? (Table X.7 of TGD)			
12	What is the project estimated TUTIA?			
13	Is partial capture potentially feasible? (Line 12 > Line 11?)			
For projects with only irrigation demand				
14	What is the minimum irrigation area required based on conservation landscape design? (Table X.8 of TGD)		0.54	ac
15	What is the proposed project irrigated area? (multiply conservation landscaping by 1; multiply active turf by 2)		0.09	ac
16	Is partial capture potentially feasible? (Line 15 > Line 14?)		NO	
	Provide supporting assumptions and citations for controlling demand calculation:			

SUPPLEMENTAL DATA

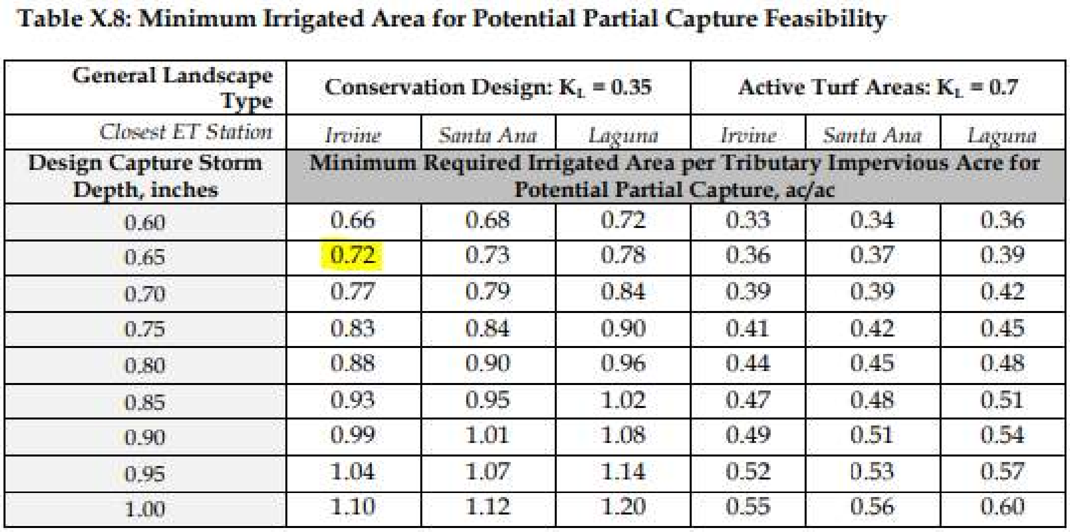


Table X.8: Minimum Irrigated Area for Potential Partial Capture Feasibility

General Landscape Type	**Conservation Design: K_L = 0.35**			**Active Turf Areas: K_L = 0.7**		
Closest ET Station	*Irvine*	*Santa Ana*	*Laguna*	*Irvine*	*Santa Ana*	*Laguna*
Design Capture Storm Depth, inches	**Minimum Required Irrigated Area per Tributary Impervious Acre for Potential Partial Capture, ac/ac**					
0.60	0.66	0.68	0.72	0.33	0.34	0.36
0.65	0.72	0.73	0.78	0.36	0.37	0.39
0.70	0.77	0.79	0.84	0.39	0.39	0.42
0.75	0.83	0.84	0.90	0.41	0.42	0.45
0.80	0.88	0.90	0.96	0.44	0.45	0.48
0.85	0.93	0.95	1.02	0.47	0.48	0.51
0.90	0.99	1.01	1.08	0.49	0.51	0.54
0.95	1.04	1.07	1.14	0.52	0.53	0.57
1.00	1.10	1.12	1.20	0.55	0.56	0.60

APPENDIX F

Percolation Test

(Pending)

APPENDIX G

Low Impact Development (LID) Sizing Calculations

Stormwater Quality Design Measure Calculations

Date: 2/5/2021
Job No.: 20181708
Project: Newport Beach Jr Lifeguard Building

Description and Assumptions:

Based on:

Technical Guidance Document (TGD) for the Preparation of Conceptual/Preliminary and/or Project Water Quality Management Plans (WQMPs). BMP Design per Fact Sheet BIO-1: Bioretention with underdrains

SIMPLE DESIGN CAPTURE VOLUME SIZING METHOD (WORKSHEET B)

1. Determine the design capture storm depth used for calculating volume

1	Enter design capture storm depth from Figure III.1	d =	0.65	inches
2	Enter the effect of provided HSCs (Worksheet A)	d_{HSC} =	0	inches
3	Calculate the remainder of the design capture storm depth (Line 1 - Line 2)	$d_{remainder}$ =	0.65	inches

2. Calculate the DCV

1	Enter Project Area Tributary to BMP(s)	A =	0.85	acres
2	Enter Project Imperviousness	imp =	0.89	
3	Calculate runoff coefficient	C =	0.82	
	C = (0.75 x imp) + 0.15			
4	Calculate runoff volume	V_{design} =	1640	cu-ft
	V_{design} = (C x $d_{remainder}$ x A x 43560 x (1/12))			

2. Verify that the Ponding Depth will Draw Down within 48 Hours

1	Enter media infiltration rate	K=	5	in/hr
2	Enter Factor of Safety	FS=	2	
3	Determine design media infiltration rate	K_{media} =	2.5	in/hr
4	Enter depth of ponding above bioretention area	d_p=	1.5	ft
5	Determine ponding area drawdown time	DD_p=	7.2	hrs
	DD_p = (d_p/K_{media}) x 12 in/ft			

4. Determine the Depth of Water Filtered During Design Capture Storm

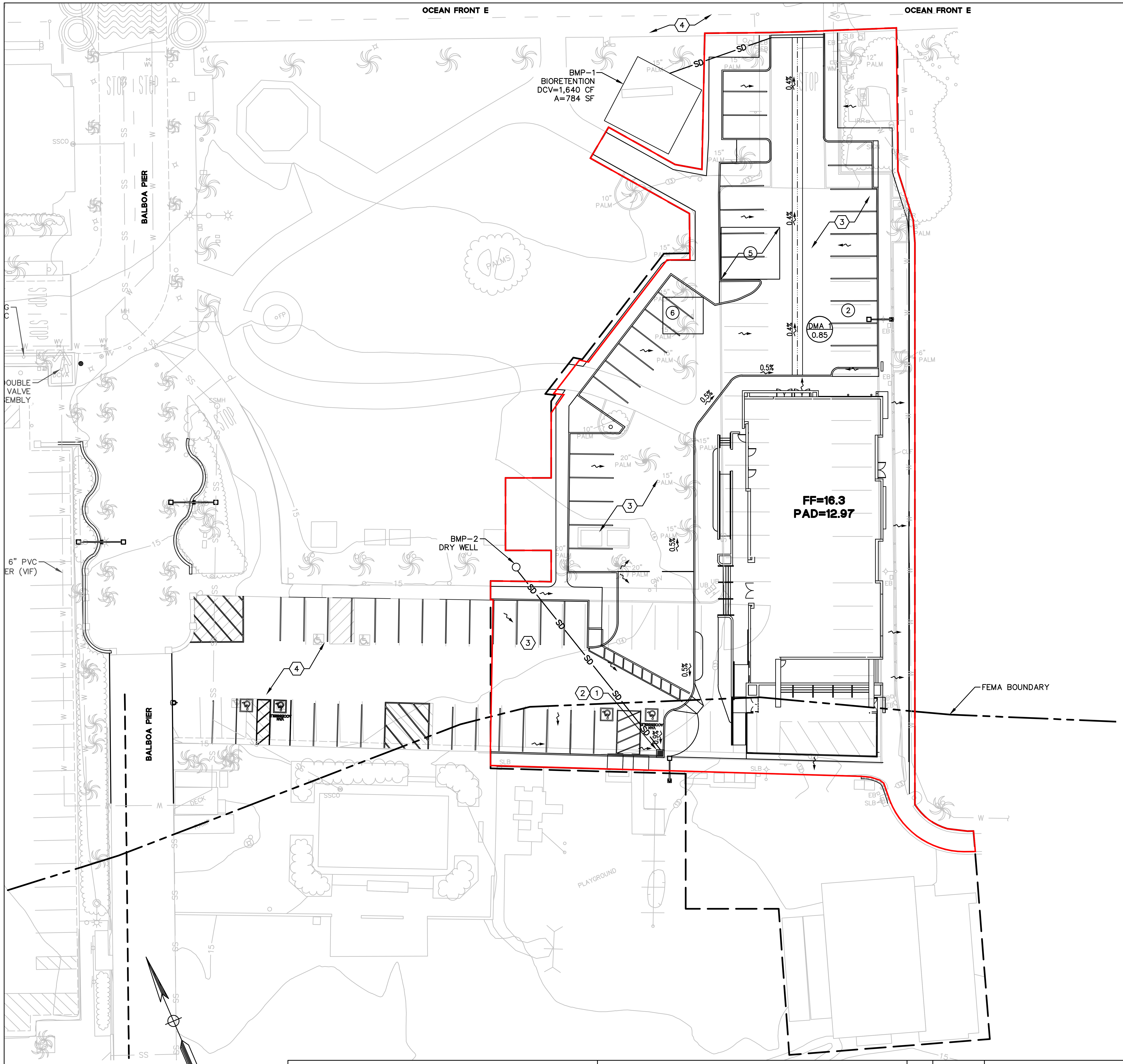
1	Enter $T_{routing}$	$T_{routing}$ =	3	ft
2	Determine depth of water filtered	$d_{filtered}$=	0.63	ft
	$d_{filtered}$ = Minimum [((K_{media} x $T_{routing}$)/12), d_p]			

5. Determine the Facility Surface Area

1	Determine Minimum BMP Area	A=	772	sf
	A = DCV/ (d_p +$d_{filtered}$)			

APPENDIX H

BMP Exhibit (Site Plan)



NON-STRUCTURAL BMP'S:

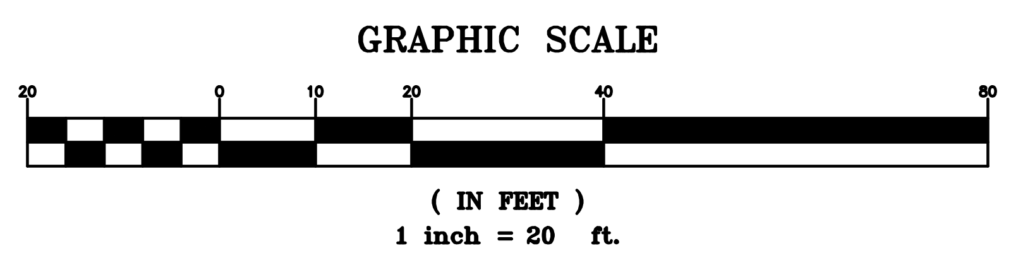
- ⟨1⟩ N3 – COMMON AREA LANDSCAPE MANAGEMENT
- ⟨2⟩ N14 – COMMON AREA CATCH BASIN INSPECTION
- ⟨3⟩ N11 – COMMON AREA LITTER CONTROL
- ⟨4⟩ N15 – STREET SWEEPING OF PUBLIC STREETS & PARKING LOTS

STRUCTURAL BMP'S:

- ① S1 – PROVIDE STORM DRAIN STENCILING & SIGNAGE
- ② S2 – DESIGN AND CONSTRUCT OUTDOOR MATERIAL STORAGE AREAS TO REDUCE POLLUTION INTRODUCTION
- ③ S3 – DESIGN AND CONSTRUCT TRASH AND WASTE STORAGE AREAS TO REDUCE POLLUTION
- ④ S4 – USE EFFICIENT IRRIGATION SYSTEMS AND LANDSCAPE DESIGN, WATER CONSERVATION, SMART CONTROLLERS, AND SOURCE CONTROL
- ⑤ S9 – OUTDOOR PROCESSING AREAS
- ⑥ S10 – EQUIPMENT WASH AREAS

LEGEND:

🟥	DMA BOUNDARY
▬ ▪ ▪ ▬	PROPERTY LINE
▬	CMU SCREEN WALL
— SD — SD — SD —	STORM DRAIN PIPING
➤	FLOW ARROWS
▨	CONCRETE PAVEMENT
▨	LANDSCAPING
X / X	DRAINAGE SUB–AREA LABEL DRAINAGE SUB–AREA SIZE (ACRES)
▦	12X12 STORM DRAIN INLET



BASIS OF BEARINGS:

THE BASIS OF BEARINGS FOR THIS SURVEY IS THE CALIFORNIA COORDINATE SYSTEM, CCS83, ZONE VI, 2017.50 DATUM ADJUSTMENT. GPS DERIVED BETWEEN OCS POINTS 6093R1 AND 6183R1.

BENCHMARK:

Designation: 1E–116–99
FOUND 3 3/4" OCS ALUMINUM BENCHMARK DISK STAMPED "1E–116–99", SET IN THE NORTHWEST CORNER OF A 5.0 FT. BY 5.0 FT. CONCRETE CATCH BASIN. MONUMENT IS LOCATED ALONG THE WESTERLY SIDE OF PALM STREET, 110 FT. NORTHERLY OF THE CENTERLINE OF BAY AVENUE AND 21 FT. WEST OF THE CENTERLINE OF PALM STREET. MONUMENT IS SET LEVEL WITH THE SIDEWALK.
ELEVATION = 7.587 FEET, NAVD88, LEVELED 2015.

NO.	DATE	DESCRIPTION OF REVISIONS

BRUCE W. KIRBY
No. C 42393
CIVIL

REVIEWED:

BRUCE KIRBY, RCE 42393
SENIOR PROJECT MANAGER

DESIGNED: XX
DRAWN: CC
CHECKED: XX
DATE: 10/16/19

C-XXXX

WQMP SITE PLAN
JUNIOR LIFEGUARD BUILDING PROJECT

CITY OF NEWPORT BEACH
PUBLIC WORKS DEPARTMENT

X-XXXX-X
SHEET 1 OF 1

APPENDIX I

BMP Manufacturer Brochures

XIV.5. Biotreatment BMP Fact Sheets (BIO)

Conceptual criteria for biotreatment BMP selection, design, and maintenance are contained in **Appendix XII**. These criteria are generally applicable to the design of biotreatment BMPs in Orange County and BMP-specific guidance is provided in the following fact sheets.

*Note: Biotreatment BMPs shall be designed to provide the maximum feasible infiltration and ET based on criteria contained in **Appendix** XI.2.*

BIO-1: Bioretention with Underdrains

Bioretention stormwater treatment facilities are landscaped shallow depressions that capture and filter stormwater runoff. These facilities function as a soil and plant-based filtration device that removes pollutants through a variety of physical, biological, and chemical treatment processes. The facilities normally consist of a ponding area, mulch layer, planting soils, and plants. As stormwater passes down through the planting soil, pollutants are filtered, adsorbed, biodegraded, and sequestered by the soil and plants. Bioretention with an underdrain are utilized for areas with low permeability native soils or steep slopes where the underdrain system that routes the treated runoff to the storm drain system rather than depending entirely on infiltration. Bioretention must be designed without an underdrain in areas of high soil permeability.

Also known as:

- *Rain gardens with underdrains*
- *Vegetated media filter*
- *Downspout planter boxes*

Bioretention
Source: Geosyntec Consultants

Feasibility Screening Considerations

- If there are no hazards associated with infiltration (such as groundwater concerns, contaminant plumes or geotechnical concerns), bioinfiltration facilities, which achieve partial infiltration, should be used to maximize infiltration.
- Bioretention with underdrain facilities should be lined if contaminant plumes or geotechnical concerns exist. If high groundwater is the reason for infiltration infeasibility, bioretention facilities with underdrains do not need to be lined.

Opportunity Criteria

- Land use may include commercial, residential, mixed use, institutional, and subdivisions. Bioretention may also be applied in parking lot islands, cul-de-sacs, traffic circles, road shoulders, road medians, and next to buildings in planter boxes.
- Drainage area is ≤ 5 acres.
- Area is available for infiltration.

- Site must have adequate relief between land surface and the stormwater conveyance system to permit vertical percolation through the soil media and collection and conveyance in underdrain to stormwater conveyance system.

OC-Specific Design Criteria and Considerations

☐ Ponding depth should not exceed 18 inches; fencing may be required if ponding depth is greater than 6 inches to mitigate drowning.

☐ The minimum soil depth is 2 feet (3 feet is preferred).

☐ The maximum drawdown time of the bioretention ponding area is 48 hours. The maximum drawdown time of the planting media and gravel drainage layer is 96 hours, if applicable.

☐ Infiltration pathways may need to be restricted due to the close proximity of roads, foundations, or other infrastructure. A geomembrane liner, or other equivalent water proofing, may be placed along the vertical walls to reduce lateral flows. This liner should have a minimum thickness of 30 mils.

☐ If infiltration in bioretention location is hazardous due to groundwater or geotechnical concerns, a geomembrane liner must be installed at the base of the bioretention facility. This liner should have a minimum thickness of 30 mils.

☐ The planting media placed in the cell shall be designed per the recommendations contained in MISC-1: Planting/Storage Media

☐ Plant materials should be tolerant of summer drought, ponding fluctuations, and saturated soil conditions for 48 hours; native place species and/or hardy cultivars that are not invasive and do not require chemical inputs should be used to the maximum extent feasible

☐ The bioretention area should be covered with 2-4 inches (average 3 inches) or mulch at the start and an additional placement of 1-2 inches of mulch should be added annually.

☐ Underdrain should be sized with a 6 inch minimum diameter and have a 0.5% minimum slope. Underdrain should be slotted polyvinyl chloride (PVC) pipe; underdrain pipe should be more than 5 feet from tree locations (if space allows).

☐ A gravel blanket or bedding is required for the underdrain pipe(s). At least 0.5 feet of washed aggregate must be placed below, to the top, and to the sides of the underdrain pipe(s).

☐ An overflow device is required at the top of the bioretention area ponding depth.

☐ Dispersed flow or energy dissipation (i.e. splash rocks) for piped inlets should be provided at basin inlet to prevent erosion.

☐ Ponding area side slopes shall be no steeper than 3:1 (H:V) unless designed as a planter box BMP with appropriate consideration for trip and fall hazards.

Simple Sizing Method for Bioretention with Underdrain

If the Simple Design Capture Volume Sizing Method described in **Appendix** III.3.1 is used to size a bioretention with underdrain facility, the user selects the basin depth and then determines the appropriate surface area to capture the DCV. The sizing steps are as follows:

Step 1: Determine DCV

Calculate the DCV using the Simple Design Capture Volume Sizing Method described in **Appendix** III.3.1.

Step 2: Verify that the Ponding Depth will Draw Down within 48 Hours

The ponding area drawdown time can be calculated using the following equation:

$DD_P = (d_P / K_{MEDIA}) \times 12$ in/ft

Where:

DD_P = time to drain ponded water, hours

d_P = depth of ponding above bioretention area, ft (not to exceed 1.5 ft)

K_{MEDIA} = media design infiltration rate, in/hr (equivalent to the media hydraulic conductivity with a factor of safety of 2; K_{MEDIA} of 2.5 in/hr should be used unless other information is available)

If the drawdown time exceeds 48 hours, adjust ponding depth and/or media infiltration rate until 48 hour drawdown time is achieved.

Step 3: Determine the Depth of Water Filtered During Design Capture Storm

The depth of water filtered during the design capture storm can be estimated as the amount routed through the media during the storm, or the ponding depth, whichever is smaller.

$d_{FILTERED}$ = Minimum [(($K_{MEDIA} \times T_{ROUTING}$)/12), d_P]

Where:

$d_{FILTERED}$ = depth of water that may be considered to be filtered during the design storm event, ft

K_{MEDIA} = media design infiltration rate, in/hr (equivalent to the media hydraulic conductivity with a factor of safety of 2; K_{MEDIA} of 2.5 in/hr should be used unless other information is available)

$T_{ROUTING}$ = storm duration that may be assumed for routing calculations; this should be assumed to be no greater than 3 hours. If the designer desires to account for further routing effects, the Capture Efficiency Method for Volume-Based, Constant Drawdown BMPs (See **Appendix III.3.2**) should be used.

d_P = depth of ponding above bioretention area, ft (not to exceed 1.5 ft)

Step 4: Determine the Facility Surface Area

$A = DCV / (d_P + d_{FILTERED})$

Where:

A = required area of bioretention facility, sq-ft

DCV = design capture volume, cu-ft

$d_{FILTERED}$ = depth of water that may be considered to be filtered during the design storm event, ft

d_P = depth of ponding above bioretention area, ft (not to exceed 1.5 ft)

Capture Efficiency Method for Bioretention with Underdrains

If the bioretention geometry has already been defined and the user wishes to account more explicitly for routing, the user can determine the required footprint area using the Capture Efficiency Method for Volume-Based, Constant Drawdown BMPs (See **Appendix III.3.2**) to determine the fraction of the DCV that must be provided to manage 80 percent of average annual runoff volume. This method accounts for drawdown time different than 48 hours.

Step 1: Determine the drawdown time associated with the selected basin geometry

$DD = (d_p / K_{DESIGN}) \times 12$ in/ft

Where:

DD = time to completely drain infiltration basin ponding depth, hours

d_P = bioretention ponding depth, ft (should be less than or equal to 1.5 ft)

K_{DESIGN} = design media infiltration rate, in/hr (assume 2.5 inches per hour unless otherwise proposed)

If drawdown is less than 3 hours, the drawdown time should be rounded to 3 hours or the Capture Efficiency Method for Flow-based BMPs (See Appendix III.3.3) shall be used.

Step 2: Determine the Required Adjusted DCV for this Drawdown Time

Use the Capture Efficiency Method for Volume-Based, Constant Drawdown BMPs (See Appendix III.3.2) to calculate the fraction of the DCV the basin must hold to achieve 80 percent capture of average annual stormwater runoff volume based on the basin drawdown time calculated above.

Step 3: Determine the Basin Infiltrating Area Needed

The required infiltrating area (i.e. the surface area of the top of the media layer) can be calculated using the following equation:

$A = \text{Design Volume} / d_p$

Where:

A = required infiltrating area, sq-ft (measured at the media surface)

Design Volume = fraction of DCV, adjusted for drawdown, cu-ft (see Step 2)

d_p = ponding depth of water stored in bioretention area, ft (from Step 1)

This does not include the side slopes, access roads, etc. which would increase bioretention footprint. If the area required is greater than the selected basin area, adjust surface area or adjust ponding depth and recalculate required area until the required area is achieved.

Configuration for Use in a Treatment Train

- Bioretention areas may be preceeded in a treatment train by HSCs in the drainage area, which would reduce the required design volume of the bioretention cell. For example, bioretention could be used to manage overflow from a cistern.
- Bioretention areas can be used to provide pretreatment for underground infiltration systems.

Additional References for Design Guidance

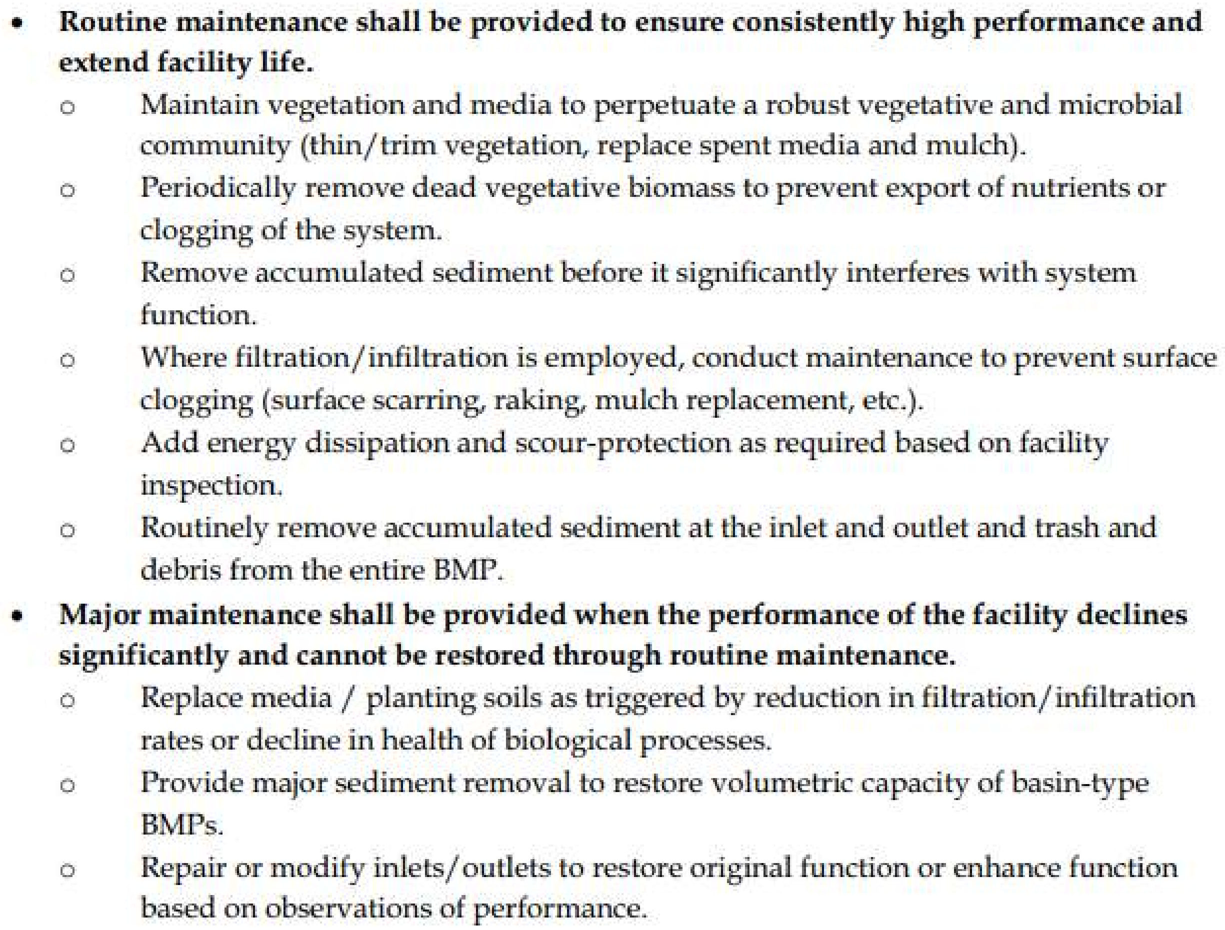
- CASQA BMP Handbook for New and Redevelopment: http://www.cabmphandbooks.com/Documents/Development/TC-32.pdf
- SMC LID Manual (pp 68): http://www.lowimpactdevelopment.org/guest75/pub/All_Projects/SoCal_LID_Manual/SoCalLID_Manual_FINAL_040910.pdf
- Los Angeles County Stormwater BMP Design and Maintenance Manual, Chapter 5: http://dpw.lacounty.gov/DES/design_manuals/StormwaterBMPDesignandMaintenance.pdf
- San Diego County LID Handbook Appendix 4 (Factsheet 7): http://www.sdcounty.ca.gov/dplu/docs/LID-Appendices.pdf

  Los Angeles Unified School District (LAUSD) Stormwater Technical Manual, Chapter 4: http://www.laschools.org/employee/design/fs-studies-and-reports/download/white_paper_report_material/Storm_Water_Technical_Manual_2009-opt-red.pdf?version_id=76975850
- County of Los Angeles Low Impact Development Standards Manual, Chapter 5: http://dpw.lacounty.gov/wmd/LA_County_LID_Manual.pdf

APPENDIX J

BMP Operations and Maintenance (O&M) Plan

Bioretention Basin Maintenance



- **Routine maintenance shall be provided to ensure consistently high performance and extend facility life.**
    - Maintain vegetation and media to perpetuate a robust vegetative and microbial community (thin/trim vegetation, replace spent media and mulch).
    - Periodically remove dead vegetative biomass to prevent export of nutrients or clogging of the system.
    - Remove accumulated sediment before it significantly interferes with system function.
    - Where filtration/infiltration is employed, conduct maintenance to prevent surface clogging (surface scarring, raking, mulch replacement, etc.).
    - Add energy dissipation and scour-protection as required based on facility inspection.
    - Routinely remove accumulated sediment at the inlet and outlet and trash and debris from the entire BMP.
- **Major maintenance shall be provided when the performance of the facility declines significantly and cannot be restored through routine maintenance.**
    - Replace media / planting soils as triggered by reduction in filtration/infiltration rates or decline in health of biological processes.
    - Provide major sediment removal to restore volumetric capacity of basin-type BMPs.
    - Repair or modify inlets/outlets to restore original function or enhance function based on observations of performance.

APPENDIX L

Geotechnical Report (For Reference Only)

GEOCON
WEST, INC.

GEOTECHNICAL
ENVIRONMENTAL
MATERIALS

GEOTECHNICAL INVESTIGATION

PROPOSED JUNIOR LIFEGUARD FACILITY
50 MAIN STREET
NEWPORT BEACH, CALIFORNIA

PREPARED FOR

JEFF KATZ ARCHITECTURE
NEWPORT BEACH, CALIFORNIA

PROJECT NO. W1033-88-01

SEPTEMBER 5, 2019

GEOCON
WEST, INC.
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS

Project No. W1033-88-01
September 5, 2019

Mr. Jeff Katz
Jeff Katz Architecture
6353 Del Cerro Boulevard
San Diego, California 92120

Subject: GEOTECHNICAL INVESTIGATION
PROPOSED JUNIOR LIFEGUARD FACILITY
50 MAIN STREET, NEWPORT BEACH, CALIFORNIA

Dear Mr. Katz:

In accordance with your authorization of our proposal dated July 9, 2019, we have prepared this geotechnical investigation report for the proposed junior lifeguard facility to be located within Parking Lot A at the subject site. The accompanying report presents the findings of our study, and our conclusions and recommendations pertaining to the geotechnical aspects of proposed design and construction. Based on the results of our investigation, it is our opinion that the project can be developed as proposed provided the recommendations in this report are followed and implemented during design and construction. If you have any questions regarding this report, or if we may be of further service, please contact the undersigned.

Very truly yours,

GEOCON WEST, INC.

PETRINA ZEN
C87489

SUSAN FRANZEN KIRKGARD
No. 1754

JELISA THOMAS ADAMS
GE3092

Petrina Zen

Petrina Zen
PE 87489

Susan Kirkgard
CEG 1754

Jelisa Thomas Adams
GE 3092

(EMAIL) Addressee

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GEOTECHNICAL INVESTIGATION

1. PURPOSE AND SCOPE

This report presents the results of a geotechnical investigation for the proposed junior lifeguard facility located within Parking Lot A at the subject site (Vicinity Map, Figure 1). The purpose of this investigation was to evaluate the subsurface soil and geologic conditions underlying the area of proposed construction and, based on conditions encountered, to provide conclusions and recommendations pertaining to the geotechnical aspects of proposed design and construction.

The scope of this investigation included a site reconnaissance, field exploration, laboratory testing, engineering analysis, and the preparation of this report. The site was explored on August 5, 2019 by excavating two 8-inch diameter borings to depths of approximately 20½ feet and 50½ feet below the existing ground surface using a truck-mounted mud-rotary drilling machine. The approximate locations of the exploratory borings are depicted on the Site Plan (see Figure 2). A detailed discussion of the field investigation, including boring logs, is presented in Appendix A.

Laboratory tests were performed on selected soil samples obtained during the investigation to determine pertinent physical and chemical soil properties. Appendix B presents a summary of the laboratory test results.

The recommendations presented herein are based on analysis of the data obtained during the investigation and our experience with similar soil and geologic conditions. References reviewed to prepare this report are provided in the *List of References* section.

If project details vary significantly from those described herein, Geocon should be contacted to determine the necessity for review and possible revision of this report.

2. SITE CONDITIONS & PROJECT DESCRIPTION

The subject site is located at 50 Main Street in the City of Newport Beach, California. The existing parking lot (Parking Lot A) is bounded by the Newport Balboa Bike Trail and residential structures to the north, by a grass field park to the east, by the beach and ocean to the south, and by Balboa Pier to the west. The area of the proposed construction is currently an asphalt paved parking lot. Surface water drainage at the site appears to be by sheet flow along the ground surface to area drains and the city streets. Vegetation onsite consists of grass and trees.

Information concerning the proposed project was furnished by the client. It is our understanding that the proposed development will consist of a new 4,000 square-foot Junior Lifeguard Facility, as well as miscellaneous paving and utility improvements. We assume that the proposed structure will be single-story. It is our further understanding that the proposed structure will be elevated approximately 10 feet above the existing ground surface due to flooding and sea level rise issues, in accordance with FEMA V21 regulations. Due to the preliminary nature of the project, formal plans depicting the proposed development are not available for inclusion in this report. The existing site conditions are depicted on the Site Plan (see Figure 2).

Based on the preliminary nature of the design at this time, wall and column loads were not available. It is anticipated that column loads for the proposed structure will be up to 100 kips, and wall loads will be up to 2 kips per linear foot.

Once the design phase proceeds to a more finalized plan, the recommendations within this report should be reviewed and revised, if necessary. Geocon should be contacted to determine the necessity for review and possible revision of this report.

3. GEOLOGIC SETTING

The subject site is located on Balboa Peninsula, a narrow strip of land at the southern edge of the Orange County Coastal Plain, bound by Newport Harbor to the north and the Pacific Ocean to the south. The Coastal Plain is a relatively flat-lying alluviated surface with an average slope of less than 20 feet per mile. The lowland surface is bounded by hills and mountains on the north and east and by the Pacific Ocean to the south and southwest (Department of Water Resources, 1967). Prominent structural features within the Orange County Coastal Plain include the central lowland plain, the northwest trending line of low hills and mesas near the coast underlain by the Newport-Inglewood Fault Zone (Newport Mesa, Huntington Beach Mesa, Bolsa Chica Mesa, and Landing Hill), and the San Joaquin Hills to the southeast (Department of Water Resources, 1967).

4. SOIL AND GEOLOGIC CONDITIONS

Based on our field investigation and published geologic maps of the area, the site is underlain by artificial fill and Holocene age beach deposits that are in turn underlain by Pleistocene age marine deposits (CDMG, 1981; CGS, 2012). Detailed stratigraphic profiles of the materials encountered at the site are provided on the boring logs in Appendix A.

4.1 Artificial Fill

Artificial fill was encountered in our field explorations to a maximum depth of 1½ feet below existing ground surface. The artificial fill generally consists of light brown poorly graded sand with some shell fragments. The artificial fill is characterized as moist and medium dense. The fill is likely the result of past grading or construction activities at the site. Deeper fill may exist between excavations and in other portions of the site that were not directly explored.

4.2 Beach Deposits

The artificial fill is underlain by Holocene age unconsolidated beach deposits consisting of light brown fine- to medium-grained sand. The beach deposits extend to depths of approximately 9½ to 11 feet beneath the existing ground surface and are characterized as loose to medium dense and moist to wet.

4.3 Old Marine Deposits

Pleistocene age marine deposits were encountered beneath the younger beach deposits and consist primarily of light brown to brown, gray to olive gray, or olive brown poorly-graded sand and silty sand with varying amounts of shell fragments. The marine deposits are primarily moist to wet and medium dense to very dense.

5. GROUNDWATER

Review of the Seismic Hazard Zone Report for the Newport Beach Quadrangle (California Division of Mines and Geology [CDMG], 1997a) indicates that the historically highest groundwater level in the area is less than 10 feet beneath the ground surface. Groundwater information presented in this document is generated from data collected in the early 1900's to the late 1990s. Based on current groundwater basin management practices, it is unlikely that groundwater levels will ever exceed the historic high levels.

Groundwater was encountered in borings B1 and B2 at depths of 7 and 6 feet below the existing ground surface, respectively. Given the proximity of the site to the coastline, the depth to groundwater is likely influenced by tidal fluctuations. Based on these considerations, groundwater may be encountered during construction. Also, it is not uncommon for groundwater levels to vary seasonally or for groundwater seepage conditions to develop where none previously existed, especially in impermeable fine-grained soils which are heavily irrigated or after seasonal rainfall. In addition, recent requirements for stormwater infiltration could result in shallower seepage conditions in the immediate site vicinity. Proper surface drainage of irrigation and precipitation will be critical for future performance of the project. Recommendations for drainage are provided in the S*urface Drainage* section of this report (see Section 7.14).

6. GEOLOGIC HAZARDS

6.1 Surface Fault Rupture

The numerous faults in Southern California include active, potentially active, and inactive faults. The criteria for these major groups are based on criteria developed by the California Geological Survey (CGS, formerly known as CDMG) for the Alquist-Priolo Earthquake Fault Zone Program (CGS, 2018). By definition, an active fault is one that has had surface displacement within Holocene time (about the last 11,700 years). A potentially active fault has demonstrated surface displacement during Quaternary time (approximately the last 1.6 million years), but has had no known Holocene movement. Faults that have not moved in the last 1.6 million years are considered inactive.

The site is not within a state-designated Alquist-Priolo Earthquake Fault Zone (CGS, 2019a and 2019b;) for surface fault rupture hazards. No active or potentially active faults with the potential for surface fault rupture are known to pass directly beneath the site. Therefore, the potential for surface rupture due to faulting occurring beneath the site during the design life of the proposed development is considered low. However, the site is located in the seismically active Southern California region, and could be subjected to moderate to strong ground shaking in the event of an earthquake on one of the many active Southern California faults. The faults in the vicinity of the site are shown in Figure 3, Regional Fault Map.

The closest surface trace of an active fault to the site is the Newport-Inglewood Fault Zone located approximately 0.6 mile to the south-southwest (Ziony and Jones, 1989). Other nearby active faults are the Palos Verdes Fault Zone (offshore segment), the Whittier Fault, and the Elsinore Fault located approximately 12.5 miles southwest, 22.5 miles north-northeast, and 23.5 miles northeast of the site, respectively (Ziony and Jones, 1989). The active San Andreas Fault Zone is located approximately 54 miles northeast of the site (Ziony and Jones, 1989).

Several buried thrust faults, commonly referred to as blind thrusts, underlie the Los Angeles Basin and the Orange County Coastal Plain at depth. These faults are not exposed at the ground surface and are typically identified at depths greater than 3.0 kilometers. The October 1, 1987, M_w 5.9 Whittier Narrows earthquake and the January 17, 1994, M_w 6.7 Northridge earthquake were a result of movement on the Puente Hills Blind Thrust and the Northridge Thrust, respectively. These thrust faults and others in the greater Los Angeles area are not exposed at the surface and do not present a potential surface fault rupture hazard at the site; however, these deep thrust faults are considered active features capable of generating future earthquakes that could result in moderate to significant ground shaking at the site.

6.2 Seismicity

As with all of Southern California, the site has experienced historic earthquakes from various regional faults. The seismicity of the region surrounding the site was formulated based on research of an electronic database of earthquake data. The epicenters of recorded earthquakes with magnitudes equal to or greater than 5.0 in the site vicinity are depicted on Figure 4, Regional Seismicity Map. A partial list of moderate to major magnitude earthquakes that have occurred in the Southern California area within the last 100 years is included in the following table.

LIST OF HISTORIC EARTHQUAKES

Earthquake (Oldest to Youngest)	Date of Earthquake	Magnitude	Distance to Epicenter (Miles)	Direction to Epicenter
Near Redlands	July 23, 1923	6.3	46	NE
Long Beach	March 10, 1933	6.4	4	WNW
Tehachapi	July 21, 1952	7.5	116	NW
San Fernando	February 9, 1971	6.6	63	NW
Whittier Narrows	October 1, 1987	5.9	33	NNW
Sierra Madre	June 28, 1991	5.8	46	N
Landers	June 28, 1992	7.3	93	ENE
Big Bear	June 28, 1992	6.4	74	ENE
Northridge	January 17, 1994	6.7	56	NW
Hector Mine	October 16, 1999	7.1	116	NE
Ridgecrest	July 5, 2019	7.1	150	N

The site could be subjected to strong ground shaking in the event of an earthquake. However, this hazard is common in Southern California and the effects of ground shaking can be mitigated if the proposed structures are designed and constructed in conformance with current building codes and engineering practices.

6.3 Seismic Design Criteria

The following table summarizes summarizes site-specific design criteria obtained from the 2019 California Building Code (CBC; Based on the 2018 International Building Code [IBC] and ASCE 7-16), Chapter 16 Structural Design, Section 1613 Earthquake Loads. The data was calculated using the online application *Seismic Design Maps*, provided by OSHPD. The short spectral response uses a period of 0.2 second. We evaluated the Site Class based on the discussion in Section 1613.2.2 of the 2019 CBC and Table 20.3-1 of ASCE 7-16. The values presented below are for the risk-targeted maximum considered earthquake (MCE_R).

2019 CBC SEISMIC DESIGN PARAMETERS

Parameter	Value	2019 CBC Reference
Site Class	D	Section 1613.2.2
MCE_R Ground Motion Spectral Response Acceleration – Class B (short), S_S	1.397g	Figure 1613.2.1(1)
MCE_R Ground Motion Spectral Response Acceleration – Class B (1 sec), S_1	0.496g	Figure 1613.2.1(2)
Site Coefficient, F_A	1.0	Table 1613.2.3(1)
Site Coefficient, F_V	1.804*	Table 1613.2.3(2)
Site Class Modified MCE_R Spectral Response Acceleration (short), S_{MS}	1.397g	Section 1613.2.3 (Eqn 16-36)
Site Class Modified MCE_R Spectral Response Acceleration – (1 sec), S_{M1}	0.894g*	Section 1613.2.3 (Eqn 16-37)
5% Damped Design Spectral Response Acceleration (short), S_{DS}	0.931g	Section 1613.2.4 (Eqn 16-38)
5% Damped Design Spectral Response Acceleration (1 sec), S_{D1}	0.596g*	Section 1613.2.4 (Eqn 16-39)

Note:

*Per Section 11.4.8 of ASCE/SEI 7-16, a ground motion hazard analysis shall be performed for projects for Site Class “E” sites with Ss greater than or equal to 1.0g, and for Site Class “D” and “E” sites with S1 greater than 0.2g. Section 11.4.8 also provides exceptions which indicates that the ground motion hazard analysis may be waived provided the exceptions are followed. Using the code based values presented in the table above, in lieu of a performing a ground motion hazard analysis, requires the exceptions outlined in ASCE 7-16 Section 11.4.8 be followed.

The table below presents the mapped maximum considered geometric mean (MCE_G) seismic design parameters for projects located in Seismic Design Categories of D through F in accordance with ASCE 7-16.

ASCE 7-16 PEAK GROUND ACCELERATION

Parameter	Value	ASCE 7-16 Reference
Mapped MCE_G Peak Ground Acceleration, PGA	0.613g	Figure 22-7
Site Coefficient, F_{PGA}	1.1	Table 11.8-1
Site Class Modified MCE_G Peak Ground Acceleration, PGA_M	0.674g	Section 11.8.3 (Eqn 11.8-1)

The Maximum Considered Earthquake Ground Motion (MCE) is the level of ground motion that has a 2 percent chance of exceedance in 50 years, with a statistical return period of 2,475 years. According to the 2019 California Building Code and ASCE 7-16, the MCE is to be utilized for the evaluation of liquefaction, lateral spreading, seismic settlements, and it is our understanding that the intent of the Building code is to maintain "Life Safety" during a MCE event. The Design Earthquake Ground Motion (DE) is the level of ground motion that has a 10 percent chance of exceedance in 50 years, with a statistical return period of 475 years.

Deaggregation of the MCE peak ground acceleration was performed using the USGS online Unified Hazard Tool, 2008 Conterminous U.S. Dynamic Edition. The result of the deaggregation analysis indicates that the predominant earthquake contributing to the MCE peak ground acceleration is characterized as a 6.78 magnitude event occurring at a hypocentral distance of 5.66 kilometers from the site.

Deaggregation was also performed for the Design Earthquake (DE) peak ground acceleration, and the result of the analysis indicates that the predominant earthquake contributing to the DE peak ground acceleration is characterized as a 6.68 magnitude occurring at a hypocentral distance of 14.49 kilometers from the site.

Conformance to the criteria in the above tables for seismic design does not constitute any kind of guarantee or assurance that significant structural damage or ground failure will not occur if a large earthquake occurs. The primary goal of seismic design is to protect life, not to avoid all damage, since such design may be economically prohibitive.

6.4 Liquefaction Potential

Liquefaction is a phenomenon in which loose, saturated, relatively cohesionless soil deposits lose shear strength during strong ground motions. Primary factors controlling liquefaction include intensity and duration of ground motion, gradation characteristics of the subsurface soils, in-situ stress conditions, and the depth to groundwater. Liquefaction is typified by a loss of shear strength in the liquefied layers due to rapid increases in pore water pressure generated by earthquake accelerations.

The current standard of practice, as outlined in the "Recommended Procedures for Implementation of DMG Special Publication 117, Guidelines for Analyzing and Mitigating Liquefaction in California" and "Special Publication 117A, Guidelines for Evaluating and Mitigating Seismic Hazards in California" requires liquefaction analysis to a depth of 50 feet below the lowest portion of the proposed structure. Liquefaction typically occurs in areas where the soils below the water table are composed of poorly consolidated, fine to medium-grained, primarily sandy soil. In addition to the requisite soil conditions, the ground acceleration and duration of the earthquake must also be of a sufficient level to induce liquefaction.

The State of California Seismic Hazard Zone Map for the Newport Beach Quadrangle (1997b) indicates that the site is located in an area designated as having a potential for liquefaction. In addition, the City of Newport Beach (2006) indicates that the site is located within an area identified as having a potential for liquefaction.

Liquefaction analysis of the soils underlying the site was performed using an updated version of the spreadsheet template LIQ2_30.WQ1 developed by Thomas F. Blake (1996). This program utilizes the 1996 NCEER method of analysis. This semi-empirical method is based on a correlation between values of Standard Penetration Test (SPT) resistance and field performance data.

The liquefaction analysis was performed for a Design Earthquake level by using a high groundwater table of 5 feet below the ground surface, a magnitude 6.68 earthquake, and a peak horizontal acceleration of 0.490g (⅔PGA_M). The enclosed liquefaction analysis, included herein for boring B1, indicates that the alluvial soils below the historic high groundwater level could be susceptible to approximately 1.1 inches of total settlement during Design Earthquake ground motion (see enclosed calculation sheets, Figures 5 and 6).

It is our understanding that the intent of the Building Code is to maintain “Life Safety” during Maximum Considered Earthquake level events. Therefore, additional analysis was performed to evaluate the potential for liquefaction during a MCE event. The structural engineer should evaluate the proposed structure for the anticipated MCE liquefaction induced settlements and verify that anticipated deformations would not cause the foundation system to lose the ability to support the gravity loads and/or cause collapse of the structure.

The liquefaction analysis was also performed for the Maximum Considered Earthquake level by using a high groundwater table of 5 feet below the ground surface, a magnitude 6.78 earthquake, and a peak horizontal acceleration of 0.734g (PGA_M). The enclosed liquefaction analysis, included herein for boring B1, indicates that the alluvial soils below the historic high groundwater level could be susceptible to approximately 1.1 inches of total settlement during Maximum Considered Earthquake ground motion (see enclosed calculation sheets, Figures 7 and 8).

6.5 Lateral Spreading

Lateral spread occurs as a result of liquefaction induced lateral ground movement and typically occurs due to the presence of liquefiable soils over a gently sloping ground surface or sloping geologic contact. For the purposes of this report, we have assumed that the marine terrace deposits underlying the potentially liquefiable soils may be sloping away from the site at a gradient of 0.5 percent.

Analysis of the potential for lateral spread was performed using the method proposed by Zhang et. al. (2004) to evaluate the potential for lateral spread and the resulting lateral displacements. The analyses of lateral spread were performed by assuming a high groundwater table of 5 feet below the surface, a magnitude 6.67 earthquake, a peak horizontal acceleration of 0.734g (PGA_M), and a ground slope of 0.5 percent. Based on the results of the analyses, it is anticipated that lateral displacements of 1.5 feet could occur at the ground surface (see enclosed calculation sheet, Figure 8).

The foundation design recommendations presented in this report are intended to minimize the effects of lateral spread on the proposed improvements.

6.6 Slope Stability

The topography at the site is relatively level and the site is not located within an area identified as having a potential for slope instability (CDMG, 1997b; City of Newport Beach, 2006). There are no known landslides near the site, nor is the site in the path of any known or potential landslides. Therefore, the potential for slope stability hazards to adversely affect the proposed development is considered low.

6.7 Earthquake-Induced Flooding

Earthquake-induced flooding is inundation caused by failure of dams or other water-retaining structures due to earthquakes. Based on a review of the City of Newport Beach (2006) and the Orange County Safety Element (2004), the site is not located within a potential inundation area for an earthquake-induced dam failure. Therefore, the probability of earthquake-induced flooding is considered very low.

6.8 Tsunamis, Seiches, and Flooding

The site is located approximately 250 feet from the Pacific Ocean. According to the City of Newport Beach General Plan (2006) and the State of California (CGS, 2009), the site is located within a tsunami inundation hazard zone. Therefore, there is a potential for tsunamis to adversely impact the site.

Seiches are large waves generated in enclosed bodies of water in response to ground shaking. No major water-retaining structures are located immediately up gradient from the project site. Flooding from a seismically-induced seiche is considered unlikely.

The site is within an area of minimal flooding (Zone X) as defined by the Federal Emergency Management Agency (FEMA, 2019, City of Newport Beach, 2006).

6.9 Oil Fields & Methane Potential

Based on a review of the California Division of Oil, Gas and Geothermal Resources (DOGGR) Well Finder Website (DOGGR, 2019), the site is not located within the limits of an oilfield and oil or gas wells are not located in the immediate site vicinity. However, due to the voluntary nature of record reporting by the oil well drilling companies, wells may be improperly located or not shown on the location map and undocumented wells could be encountered during construction. Any wells encountered during construction will need to be properly abandoned in accordance with the current requirements of the DOGGR.

As previously indicated, the site is not located within an oilfield. Therefore, the potential for methane at the site is considered very low. Should it be determined that a methane study is required for the proposed development it is recommended that a qualified methane consultant be retained to perform the study and provide mitigation measures as necessary.

6.10 Subsidence

Subsidence occurs when a large portion of land is displaced vertically, usually due to the withdrawal of groundwater, oil, or natural gas. Soils that are particularly subject to subsidence include those with high silt or clay content. The site is not located within an area of known ground subsidence (Orange County, 2004). No large-scale extraction of groundwater, gas, oil, or geothermal energy is occurring or planned at the site or in the general site vicinity. There appears to be little or no potential for ground subsidence due to withdrawal of fluids or gases at the site.

7. CONCLUSIONS AND RECOMMENDATIONS

7.1 General

7.1.1 It is our opinion that neither soil nor geologic conditions were encountered during the investigation that would preclude the construction of the proposed project provided the recommendations presented herein are followed and implemented during design and construction.

7.1.2 Up to 1½ feet of existing artificial fill was encountered during the site investigation. The existing fill encountered is believed to be the result of past grading and construction activities at the site. Deeper fill may exist in other areas of the site that were not directly explored. It is our opinion that the existing fill, in its present condition, is not suitable for direct support of proposed foundations or slabs. The existing fill and site soils are suitable for re-use as engineered fill provided the recommendations in the Grading section of this report are followed (see Section 7.4).

7.1.3 The enclosed liquefaction settlement analyses indicates that the site soils could be susceptible to approximately 1.1 inches of total settlement as a result of the Design Earthquake peak ground acceleration (⅔PGA$_M$). Differential settlement at the foundation level is anticipated to be less than 0.7 inches over a distance of 30 feet. Furthermore, the analyses indicate that lateral displacements of 1.5 feet could affect the site. The foundation design recommendations presented herein are intended to minimize the effects of settlement on proposed improvements.

7.1.4 Potentially liquefiable soils were encountered between 5 and 11 feet below the ground surface. These materials are not considered suitable for direct support of the proposed structure. The potentially liquefiable soils must be excavated and replaced or penetrated through by foundation excavations.

7.1.5 The foundation system for the proposed structure must be able to provide sufficient support for the structure and minimize the effects of differential settlement resulting from a liquefaction event. Furthermore, it is our further understanding that the proposed structure will be elevated approximately 10 feet above the existing ground surface due to flooding and sea level rise issues. Based on these considerations, it is recommended that the proposed structure be supported on a deepened pile foundation system deriving support in undisturbed old marine deposits found at and below a depth of 11 feet. Recommendations for deepened pile foundations are provided in Section 7.5.

7.1.6 It is anticipated that the proposed pile foundation system for the structure will penetrate through the potentially liquefiable layers. Based on these considerations, seismic settlement of the proposed structure is anticipated to be minimal. However, proposed piles could be subject to lateral loads in the event of lateral spreading. Furthermore, the seismic settlements indicated herein should still be considered for the design of pavement, utilities, and miscellaneous improvements.

7.1.7 It should be noted that implementation of the recommendations presented herein is not intended to completely prevent damage to the structure during the occurrence of strong ground shaking as a result of nearby earthquakes. It is intended that the structure be designed in such a way that the amount of damage incurred as a result of strong ground shaking be minimized.

7.1.8 Groundwater was encountered a depths of 6 to 7 feet below existing ground surface. Given the proximity of the site to the coastline, the depth to groundwater is likely also influenced by tidal fluctuations. Furthermore, it is our understanding that future sea level rise is possible and future water levels should be considered for design. It is anticipated that groundwater will be encountered during foundation construction. Installation of deepened foundations below the groundwater table is discussed in Section 7.6.

7.1.9 It is recommended that flexible utility connections be utilized for all rigid utilities to minimize or prevent damage to utilities from minor differential movements.

7.1.10 Foundations for small outlying structures, such as block walls up to 6 feet high, planter walls or trash enclosures, which will not be tied to the proposed structure, may be supported on conventional foundations bearing on a minimum of 12 inches of newly placed engineered fill which extends laterally at least 12 inches beyond the foundation area. Where excavation and proper compaction cannot be performed or is undesirable, foundations may derive support directly in the undisturbed old marine deposits found at or below a depth of 18 inches below existing ground surface, and should be deepened as necessary to maintain a minimum 12-inch embedment into the recommended bearing materials. If the soils exposed in the excavation bottom are soft or loose, compaction of the soils will be required prior to placing steel or concrete. Compaction of the foundation excavation bottom is typically accomplished with a compaction wheel or mechanical whacker and must be observed and approved in writing by a Geocon representative.

7.1.11 Where new paving is to be placed, it is recommended that all existing fill soils and soft soils be excavated and properly compacted for paving support. The client should be aware that excavation and compaction of all existing fill in the area of new paving is not required, however, paving constructed over existing uncertified fill or unsuitable soils may experience increased settlement and/or cracking, and may therefore have a shorter design life and increased maintenance costs. As a minimum, the upper 12 inches of soil should be scarified and properly compacted. Paving recommendations are provided in the *Preliminary Pavement Recommendations* section of this report (see Section 7.10).

7.1.12 Once the design and foundation loading configuration for the proposed structure proceeds to a more finalized plan, the recommendations within this report should be reviewed and revised, if necessary. Based on the final foundation loading configurations, the potential for settlement should be reevaluated by this office.

7.1.13 Any changes in the design, location or elevation of improvements, as outlined in this report, should be reviewed by this office. Geocon should be contacted to determine the necessity for review and possible revision of this report.

7.2 Soil and Excavation Characteristics

7.2.1 The in-situ soils can be excavated with moderate effort using conventional excavation equipment. Caving should be anticipated in unshored excavations, especially where saturated and granular soils are encountered. The contractor should be aware that casing will likely be required during deep foundation construction and formwork may be required to prevent caving of shallow foundation excavations.

7.2.2 It is the responsibility of the contractor to ensure that all excavations and trenches are properly shored and maintained in accordance with applicable OSHA rules and regulations to maintain safety and maintain the stability of adjacent existing improvements.

7.2.3 All onsite excavations must be conducted in such a manner that potential surcharges from existing structures, construction equipment, and vehicle loads are resisted. The surcharge area may be defined by a 1:1 projection down and away from the bottom of an existing foundation or vehicle load. Penetrations below this 1:1 projection will require special excavation measures such as sloping and shoring. Excavation recommendations are provided in the *Temporary Excavations* section of this report (see Section 7.13).

7.2.4 The upper 5 feet of existing site soils encountered during this investigation are considered to have a “very low” expansive potential (EI = 0) and are classified as “non-expansive” in accordance with the 2016 California Building Code (CBC) Section 1803.5.3 (see Figure B11). The recommendations presented herein assume that proposed foundations and slabs will derive support in these materials.

7.3 Minimum Resistivity, pH, and Water-Soluble Sulfate

7.3.1 Potential of Hydrogen (pH) and resistivity testing as well as chloride content testing were performed on representative samples of soil to generally evaluate the corrosion potential to surface utilities. The tests were performed in accordance with California Test Method Nos. 643 and 422 and indicate that the soils are considered “moderately corrosive” with respect to corrosion of buried ferrous metals on site. The results are presented in Appendix B (Figure B13) and should be considered for design of underground structures.

7.3.2 Laboratory tests were performed on representative samples of the site materials to measure the percentage of water-soluble sulfate content. Results from the laboratory water-soluble sulfate tests are presented in Appendix B (Figure B13) and indicate that the on-site materials possess a sulfate exposure class of “S0” to concrete structures as defined by 2016 CBC Section 1904 and ACI 318-14 Table 19.3.1.1. However, concrete structures extending below a depth of 5 feet could be subject to seawater exposure and aggressive sulfate attack. ACI 318 requires a minimum of Type II cement or Type I plus a pozzolan to resist the moderate sulfate attack from seawater (ACI 318-14 Table 19.3.1.1).

7.3.3 Geocon West, Inc. does not practice in the field of corrosion engineering and mitigation. If corrosion sensitive improvements are planned, it is recommended that a corrosion engineer be retained to evaluate corrosion test results and incorporate the necessary precautions to avoid premature corrosion of buried metal pipes and concrete structures in direct contact with the soils.

7.4 Grading

7.4.1 A preconstruction conference should be held at the site prior to the beginning of grading operations with the owner, contractor, civil engineer and soil engineer in attendance. Special soil handling requirements can be discussed at that time.

7.4.2 Earthwork should be observed, and compacted fill tested by representatives of Geocon West, Inc. The existing fill and old marine deposits encountered during exploration are suitable for reuse as engineered fill, provided any encountered oversize material (greater than 6 inches) and any encountered deleterious debris is removed.

7.4.3 Grading should commence with the removal of all existing vegetation and existing improvements from the area to be graded. Deleterious debris such as wood and root structures should be exported from the site and should not be mixed with the fill soils. Asphalt and concrete should not be mixed with the fill soils unless approved by the Geotechnical Engineer. All existing underground improvements planned for removal should be completely excavated and the resulting depressions properly backfilled in accordance with the procedures described herein. Once a clean excavation bottom has been established it must be observed and approved in writing by the Geotechnical Engineer (a representative of Geocon West, Inc.).

7.4.4 It is recommended that the proposed structure be supported on deepened foundations deriving support in the competent, undisturbed marine terrace deposits generally found at or below a depth of 11 feet below the existing ground surface. Foundations should be deepened as necessary to extend into satisfactory soils and must be observed and approved in writing by the Geotechnical Engineer (a representative of Geocon West, Inc.).

7.4.5 All excavations must be observed and approved in writing by the Geotechnical Engineer (a representative of Geocon).

7.4.6 All fill and backfill soils should be placed in horizontal loose layers approximately 6 to 8 inches thick, moisture conditioned to optimum moisture content, and properly compacted to a minimum of 90 percent of the maximum dry density per ASTM D 1557 (latest edition).

7.4.7. Where new paving is to be placed, it is recommended that all existing fill and soft soils be excavated and properly compacted for paving support. As a minimum, the upper 12 inches of soil should be scarified, moisture conditioned to optimum moisture content, and compacted to at least 95 percent relative compaction, as determined by ASTM Test Method D 1557 (latest edition). Paving recommendations are provided in *Preliminary Pavement Recommendations* section of this report (see Section 7.10).

7.4.8 Foundations for small outlying structures, such as block walls up to 6 feet high, planter walls or trash enclosures, which will not be tied to the proposed structure, may be supported on conventional foundations bearing on a minimum of 12 inches of newly placed engineered fill which extends laterally at least 12 inches beyond the foundation area. Where excavation and proper compaction cannot be performed or is undesirable, foundations may derive support directly in the undisturbed old marine deposits found at or below a depth of 18 inches, and should be deepened as necessary to maintain a minimum 12-inch embedment into the recommended bearing materials. If the soils exposed in the excavation bottom are soft or loose, compaction of the soils will be required prior to placing steel or concrete. Compaction of the foundation excavation bottom is typically accomplished with a compaction wheel or mechanical whacker and must be observed and approved in writing by a Geocon representative.

7.4.9 Although not anticipated for this project, all imported fill shall be observed, tested, and approved by Geocon West, Inc. prior to bringing soil to the site. Rocks larger than 6 inches in diameter shall not be used in the fill. Import soils used as structural fill should have an expansion index less than 20 and corrosivity properties that are equally or less detrimental to that of the existing onsite soils (see Figure B13).

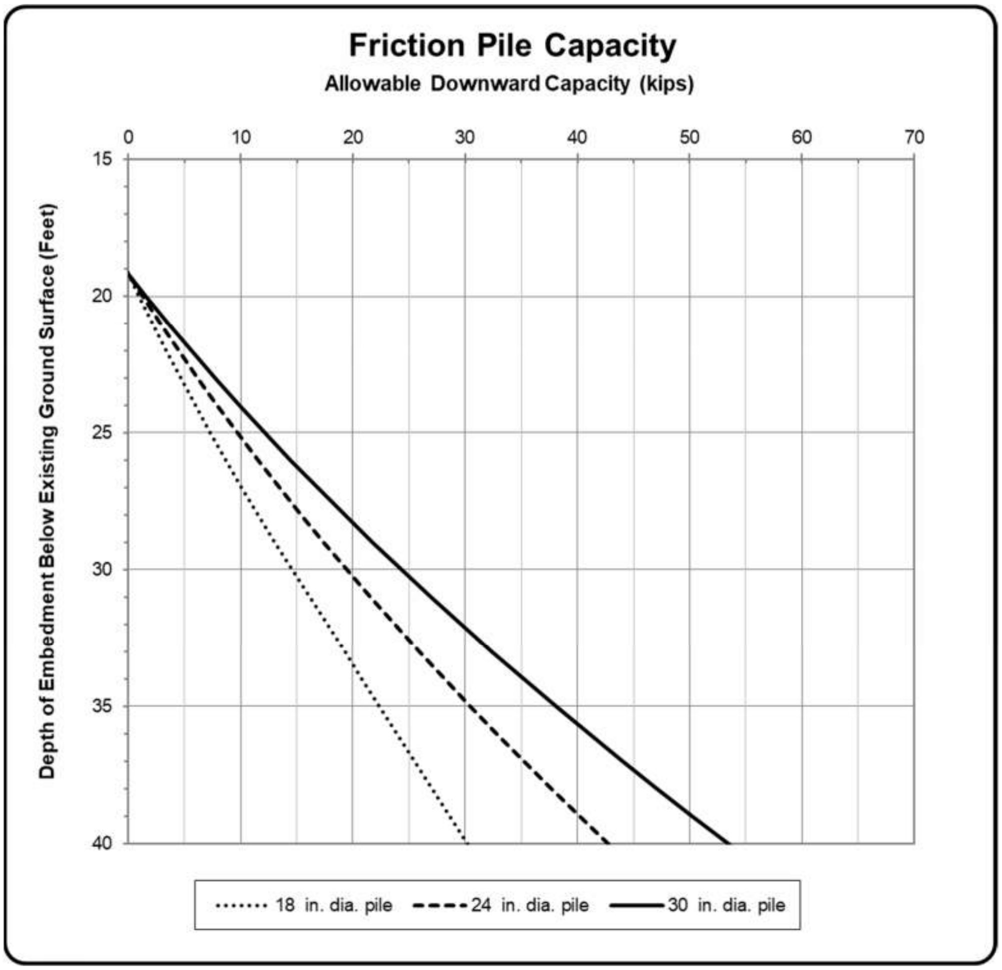
7.4.10 It is recommended that flexible utility connections be utilized for all rigid utilities to minimize or prevent damage to utilities from minor differential movements. Utility trenches should be properly backfilled in accordance with the requirements of the Green Book (latest edition).

The pipe should be bedded with clean sands (Sand Equivalent greater than 30) to a depth of at least 1 foot over the pipe, and the bedding material must be inspected and approved in writing by the Geotechnical Engineer (a representative of Geocon). The use of gravel is not acceptable unless used in conjunction with filter fabric to prevent the gravel from having direct contact with soil. The remainder of the trench backfill may be derived from onsite soil or approved import soil, compacted as necessary, until the required compaction is obtained. The use of minimum 2-sack slurry as backfill is also acceptable. Prior to placing any bedding materials or pipes, the trench excavation bottom must be observed and approved in writing by the Geotechnical Engineer (a representative of Geocon).

7.4.11 All trench and foundation excavation bottoms must be observed and approved in writing by the Geotechnical Engineer (a representative of Geocon), prior to placing bedding sands, fill, steel, gravel, or concrete.

7.5 Deepened Foundation Design

7.5.1 Deepened foundations consisting of drilled, cast-in-place piles should derive support in the undisturbed old marine deposits found at and below a depth of 11 feet. For preliminary design purposes 18-, 24-, and 30-inch-diameter drilled cast-in-place piles have been evaluated. The allowable axial capacities for embedment below the ground surface is provided in the chart below. The axial capacities include consideration of downdrag forces from liquefiable soils. Pile embedment should be extended as necessary to account for potential future scour associated with sea level rise; evaluation of the depth of scour is beyond the scope of this investigation.



7.5.2 All drilled pile excavations should be continuously observed by personnel of this firm to verify adequate penetration into the recommended bearing materials. The capacity presented is based on the strength of the soils. The compressive and tensile strength of the pile sections should be checked to verify the structural capacity of the piles.

7.5.3 Uplift capacity may be assumed to be ½ the allowable downward capaicty. The allowable axial compression and uplift capacities may be increased by one-third when considering transient wind or seismic loads.

7.5.4 The maximum expected static settlement for the structure supported on friction piles is estimated to be less than ½ inch. Differential settlement between adjacent pile foundations is not expected to exceed ¼ inch. The majority of the foundation settlement is expected to occur on initial application of loading and during construction.

7.5.5 If piles are spaced at least at least 3 diameters on center, no reduction in axial capacity is considered necessary for group effects. If pile spacing is closer than three pile diameters, an evaluation for group effects including appropriate reductions should be incorporated into the pile design based on pile dimension, spacing, and the direction of loading.

7.5.6 A continuous grade beam foundation and/or a structural slab may be placed across the top of the caisson foundations to tie the caissons in two directions, and the appropriate span between caissons should be determined by a qualified structural engineer.

7.5.7 Where not protected from erosion or disturbance, the upper 12 inches of soil should be ignored when calculating axial and lateral pile capacity.

7.6 Deepened Foundation Installation

7.6.1 Groundwater was encountered during site exploration and the contractor should be prepared for groundwater during construction. Piles placed below the water level require the use of a tremie to place the concrete into the bottom of the hole. A tremie shall consist of a water-tight tube having a diameter of not less than 6 inches with a hopper at the top. The tube shall be equipped with a device that will close the discharge end and prevent water from entering the tube while it is being charged with concrete. The tremie shall be supported so as to permit free movement of the discharge end over the entire top surface of the work and to permit rapid lowering when necessary to retard or stop the flow of concrete. The discharge end shall be closed at the start of the work to prevent water entering the tube and shall be entirely sealed at all times, except when the concrete is being placed. The tremie tube shall be kept full of concrete. The flow shall be continuous until the work is completed and the resulting concrete seal shall be monolithic and homogeneous. The tip of the tremie tube shall always be kept about five feet below the surface of the concrete and definite steps and safeguards should be taken to insure that the tip of the tremie tube is never raised above the surface of the concrete.

7.6.2 A special concrete mix should be used for concrete to be placed below water. The design shall provide for concrete with strength of 1,000 psi over the initial job specification. An admixture that reduces the problem of segregation of paste/aggregates and dilution of paste shall be included. The slump shall be commensurate to any research report for the admixture, provided that it shall also be the minimum for a reasonable consistency for placing when water is present.

7.6.3 Casing may be required if caving is experienced in the drilled excavation. The contractor should be prepared to use casing and should have casing available prior to commencement of drilling activities. When casing is used, extreme care should be employed so that the pile is not pulled apart as the casing is withdrawn. At no time should the distance between the surface of the concrete and the bottom of the casing be less than 5 feet. Continuous observation of the drilling and pouring of the piles by the Geotechnical Engineer (a representative of Geocon West, Inc.), is required.

7.6.4 Friction piles do not require the complete removal of all loose earth materials from the bottom of the excavation since the end-bearing capacity is not being considered for design. However, a cleanout of the excavation bottom will be required.

7.6.5 Closely spaced caissons should be drilled and filled alternately, with the concrete permitted to set at least eight hours before drilling an adjacent hole. Caisson excavations should be filled with concrete as soon after drilling and inspection as possible; the holes should not be left open overnight unless approved by the Geotechnical Engineer.

7.7 Miscellaneous Foundations

7.7.1 Foundations for small outlying structures, such as block walls up to 6 feet in height, planter walls or trash enclosures, which will not be structurally supported by the proposed building, may be supported on conventional foundations deriving support on a minimum of 12 inches of newly placed engineered fill which extends laterally at least 12 inches beyond the foundation area. Where excavation and compaction cannot be performed or is undesirable, such as adjacent to property lines, foundations may derive support in the undisturbed old marine deposits found at or below a depth of 18 inches, and should be deepened as necessary to maintain a minimum 12-inch embedment into the recommended bearing materials.

7.7.2 If the soils exposed in the excavation bottom are loose, compaction of the soils will be required prior to placing steel or concrete. Compaction of the foundation excavation bottom is typically accomplished with a compaction wheel or mechanical whacker and must be observed and approved by a Geocon representative. Miscellaneous foundations may be designed for a bearing value of 1,500 psf, and should be a minimum of 12 inches in width, 18 inches in depth below the lowest adjacent grade and 12 inches into the recommended bearing material. The allowable bearing pressure may be increased by up to one-third for transient loads due to wind or seismic forces.

7.7.3 Foundation excavations should be observed and approved in writing by the Geotechnical Engineer (a representative of Geocon West, Inc.), prior to the placement of reinforcing steel and concrete to verify that the excavations and exposed soil conditions are consistent with those anticipated.

7.8 Lateral Design

7.8.1 The liquefaction analysis indicates that lateral displacements of 1.5 feet could affect the site. Proposed pile foundations should be designed for the lateral loads associated with potential lateral spread. LPILE analyses will be required to evaluate the lateral load response of the proposed piles. Recommendations for lateral loads due to lateral spread can be provided under separate cover, subsequent to input from the project structural engineer.

7.8.2 Resistance to lateral loading may be provided by friction acting at the base of foundations, slabs and by passive earth pressure. An allowable coefficient of friction of 0.4 may be used with the dead load forces in the newly placed engineered fill and competent beach deposits or undisturbed old marine deposits.

7.8.3 Passive earth pressure for the sides of foundations and slabs poured against newly placed engineered fill or competent beach deposits above the groundwater table may be computed as an equivalent fluid having a density of 280 pcf with a maximum earth pressure of 2,800 psf. Passive earth pressure for the sides of foundations poured against undisturbed old marine deposits below the groundwater table may be computed as an equivalent fluid having a density of 140 pcf with a maximum earth pressure of 1,400 psf (values have been reduced for buoyancy). When combining passive and friction for lateral resistance, the passive component should be reduced by one-third. A one-third increase in the passive value may be used for wind or seismic loads. The allowable capacity may be doubled for isolated piles spaced more than three times the diameter.

7.8.4 If piles are spaced at least at least 8 diameters on-center when loaded in-line and at least 3 diameters on-center when loaded in parallel, no reduction in lateral capacity is considered necessary for group effects. If so spaced, piles may be considered isolated and the allowable passive pressure may be doubled based on isolated pile conditions. If pile spacing is closer, an evaluation for group effects including appropriate reductions should be incorporated into the pile design based on pile dimension, spacing, and the direction of loading.

7.9 Exterior Concrete Slabs-on-Grade

7.9.1 Exterior slabs, not subject to traffic loads, should be at least 4 inches thick and reinforced with No. 3 steel reinforcing bars placed 18 inches on center in both horizontal directions, positioned near the slab midpoint. Prior to construction of slabs, the upper 12 inches of subgrade should be moistened to optimum moisture content and properly compacted to at least 95 percent relative compaction, as determined by ASTM Test Method D 1557 (latest edition). Crack control joints should be spaced at intervals not greater than 10 feet and should be constructed using saw-cuts or other methods as soon as practical following concrete placement. Crack control joints should extend a minimum depth of one-fourth the slab thickness. The project structural engineer should design construction joints as necessary.

7.9.2 The moisture content of the slab subgrade should be maintained and sprinkled as necessary to maintain a moist condition as would be expected in any concrete placement.

7.9.3 The recommendations of this report are intended to reduce the potential for cracking of slabs due to settlement. However, even with the incorporation of the recommendations presented herein, foundations, stucco walls, and slabs-on-grade may exhibit some cracking due to minor soil movement and/or concrete shrinkage. The occurrence of concrete shrinkage cracks is independent of the supporting soil characteristics. Their occurrence may be reduced and/or controlled by limiting the slump of the concrete, proper concrete placement and curing, and by the placement of crack control joints at periodic intervals, in particular, where re-entrant slab corners occur.

7.10 Preliminary Pavement Recommendations

7.10.1 Where new paving is to be placed, it is recommended that all existing fill and soft materials be excavated and properly compacted for paving support. The client should be aware that excavation and compaction of all existing artificial fill and soft soils in the area of new paving is not required; however, paving constructed over existing uncertified fill or unsuitable material may experience increased settlement and/or cracking, and may therefore have a shorter design life and increased maintenance costs. As a minimum, the upper twelve inches of paving subgrade should be scarified, moisture conditioned to optimum moisture content, and properly compacted to at least 95 percent relative compaction, as determined by ASTM Test Method D 1557 (latest edition).

7.10.2 The following pavement sections are based on an assumed R-Value of 35. Once site grading activities are complete an R-Value should be obtained by laboratory testing to confirm the properties of the soils serving as paving subgrade, prior to placing pavement.

7.10.3 The Traffic Indices listed below are estimates. Geocon does not practice in the field of traffic engineering. The actual Traffic Index for each area should be determined by the project civil engineer. If pavement sections for Traffic Indices other than those listed below are required, Geocon should be contacted to provide additional recommendations. Pavement thicknesses were determined following procedures outlined in the *California Highway Design Manual* (Caltrans). It is anticipated that the majority of traffic will consist of automobile and large truck traffic.

PRELIMINARY PAVEMENT DESIGN SECTIONS

Location	Estimated Traffic Index (TI)	Asphalt Concrete (inches)	Class 2 Aggregate Base (inches)
Automobile Parking and Driveways	4.0	3.0	4.0
Trash Truck & Fire Lanes	7.0	4.0	9.0

7.10.4 Asphalt concrete should conform to Section 203-6 of the "*Standard Specifications for Public Works Construction*" (Green Book). Class 2 aggregate base materials should conform to Section 26-1.02A of the "*Standard Specifications of the State of California, Department of Transportation*" (Caltrans). The use of Crushed Miscellaneous Base (CMB) in lieu of Class 2 aggregate base is acceptable. Crushed Miscellaneous Base should conform to Section 200-2.4 of the "*Standard Specifications for Public Works Construction*" (Green Book).

7.10.5 Unless specifically designed and evaluated by the project structural engineer, where exterior concrete paving will be utilized for support of vehicles, it is recommended that the concrete be a minimum of 6 inches of concrete reinforced with No. 3 steel reinforcing bars placed 18 inches on center in both horizontal directions. Concrete paving supporting vehicular traffic should be underlain by a minimum of 4 inches of aggregate base and a properly compacted subgrade. The subgrade and base material should be compacted to 95 percent relative compaction, as determined by ASTM Test Method D 1557 (latest edition).

7.10.6 The performance of pavements is highly dependent upon providing positive surface drainage away from the edge of pavements. Ponding of water on or adjacent to the pavement will likely result in saturation of the subgrade materials and subsequent cracking, subsidence and pavement distress. If planters are planned adjacent to paving, it is recommended that the perimeter curb be extended at least 12 inches below the bottom of the aggregate base to minimize the introduction of water beneath the paving.

7.11 Retaining Wall Design

7.11.1 The recommendations presented below are generally applicable to the design of rigid concrete or masonry retaining walls having a maximum height of 5 feet. In the event that walls significantly higher than 5 feet are planned, Geocon should be contacted for additional recommendations.

7.11.2 Retaining walls with a level backfill surface that are not restrained at the top should be designed utilizing a triangular distribution of pressure (active pressure) of 30 pcf.

7.11.3 Restrained walls are those that are not allowed to rotate more than 0.001H (where H equals the height of the retaining portion of the wall in feet) at the top of the wall. Where walls are restrained from movement at the top, walls may be designed utilizing a triangular distribution of pressure (at-rest pressure) of 57 pcf.

7.11.4 The wall pressures provided above assume that the proposed retaining walls will support relatively undisturbed sand dune deposits or engineered fill derived from onsite soils. If import soil will be used to backfill proposed retaining walls, revised earth pressures may be required to account for the geotechnical properties of the import soil used as engineered fill. This should be evaluated once the use of import soil is established. All imported fill shall be observed, tested, and approved by Geocon West, Inc. prior to bringing soil to the site.

7.11.5 The wall pressures provided above assume that the retaining wall will be properly drained preventing the buildup of hydrostatic pressure. If retaining wall drainage is not implemented, the equivalent fluid pressure to be used in design of undrained walls is 90 pcf. The value includes hydrostatic pressures plus buoyant lateral earth pressures.

7.11.6 Additional active pressure should be added for a surcharge condition due to sloping ground, vehicular traffic or adjacent structures and should be designed for each condition as the project progresses.

7.11.7 Retaining wall foundations may be supported on conventional foundations deriving support in newly placed engineered fill.

7.11.8 Continuous footings may be designed for an allowable bearing capacity of 1,500 pounds per square foot (psf), and should be a minimum of 12 inches in width and 18 inches in depth below the lowest adjacent grade, and 12 inches into the recommended bearing material.

7.11.9 Isolated spread foundations may be designed for an allowable bearing capacity of 2,000 psf, and should be a minimum of 12 inches in width, 18 inches in depth below the lowest adjacent grade, and 12 inches into the recommended bearing material.

7.11.10 The soil bearing pressure above may be increased by 200 psf and 500 psf for each additional foot of foundation width and depth, respectively, up to a maximum allowable soil bearing pressure of 2,500 psf. The allowable bearing pressure may be increased by one-third for transient loads due to wind or seismic forces.

7.11.11 Continuous footings should be reinforced with a minimum of four No. 4 steel reinforcing bars, two placed near the top of the footing and two near the bottom. Reinforcement for spread footings should be designed by the project structural engineer.

7.11.12 The above foundation dimensions and minimum reinforcement recommendations are based on soil conditions and building code requirements only, and are not intended to be used in lieu of those required for structural purposes.

7.11.13 Foundation excavations should be observed and approved in writing by the Geotechnical Engineer (a representative of Geocon West, Inc.), prior to the placement of reinforcing steel and concrete to verify that the exposed soil conditions are consistent with those anticipated. If unanticipated soil conditions are encountered, foundation modifications may be required.

7.12 Retaining Wall Drainage

7.12.1 Retaining walls should be provided with a drainage system extended at least two-thirds the height of the wall. At the base of the drain system, a subdrain covered with a minimum of 12 inches of gravel should be installed, and a compacted fill blanket or other seal placed at the surface (see Figure 9). The clean bottom and subdrain pipe, behind a retaining wall, should be observed by the Geotechnical Engineer (a representative of Geocon), prior to placement of gravel or compacting backfill.

7.12.2 As an alternative, a plastic drainage composite such as Miradrain or equivalent may be installed in continuous, 4-foot-wide columns along the entire back face of the wall, at 8 feet on center. The top of these drainage composite columns should terminate approximately 18 inches below the ground surface, where either hardscape or a minimum of 18 inches of relatively cohesive material should be placed as a cap (see Figure 10). These vertical columns of drainage material would then be connected at the bottom of the wall to a collection panel or a 1-cubic-foot rock pocket drained by a 4-inch subdrain pipe.

7.12.3 Subdrainage pipes at the base of the retaining wall drainage system should outlet to an acceptable location via controlled drainage structures. Drainage should not be allowed to flow uncontrolled over descending slopes.

7.12.4 Moisture affecting below grade walls is one of the most common post-construction complaints. Poorly applied or omitted waterproofing can lead to efflorescence or standing water. Particular care should be taken in the design and installation of waterproofing to avoid moisture problems, or actual water seepage into the structure through any normal shrinkage cracks which may develop in the concrete walls, floor slab, foundations and/or construction joints. The design and inspection of the waterproofing is not the responsibility of the geotechnical engineer. A waterproofing consultant should be retained in order to recommend a product or method, which would provide protection to subterranean walls, floor slabs and foundations.

7.13 Temporary Excavations

7.13.1 Excavations up to 5 feet in height may be required during construction operations. The excavations are expected to expose artificial fill and beach deposits, which may be subject to excessive caving. Vertical excavations up to five feet in height may be attempted where not surcharged by adjacent traffic or structures; however, the contractor should be prepared for caving sands in open excavations.

7.13.2 Vertical excavations greater than five feet or where surcharged by existing structures will require sloping or shoring measures in order to provide a stable excavation. Where sufficient space is available, temporary unsurcharged embankments could be sloped back at a uniform 1:1 slope gradient or flatter, up to a maximum height of 6 feet. A uniform slope does not have a vertical portion.

7.13.3 If excavations in close proximity to an adjacent property line and/or structure are required, special excavation measures such as slot-cutting or shoring may be necessary in order to maintain lateral support of offsite improvements. Recommendations for alterative temporary excavation measures can be provided under separate cover, if needed.

7.13.4 Where sloped embankments are utilized, the top of the slope should be barricaded to prevent vehicles and storage loads at the top of the slope within a horizontal distance equal to the height of the slope. If the temporary construction embankments are to be maintained during the rainy season, berms are suggested along the tops of the slopes where necessary to prevent runoff water from entering the excavation and eroding the slope faces. Geocon personnel should inspect the soils exposed in the cut slopes during excavation so that modifications of the slopes can be made if variations in the soil conditions occur. All excavations should be stabilized within 30 days of initial excavation.

7.14 Surface Drainage

7.14.1 Proper surface drainage is critical to the future performance of the project. Uncontrolled infiltration of irrigation excess and storm runoff into the soils can adversely affect the performance of the planned improvements. Saturation of a soil can cause it to lose internal shear strength and increase its compressibility, resulting in a change in the original designed engineering properties. Proper drainage should be maintained at all times.

7.14.2 All site drainage should be collected and controlled in non-erosive drainage devices. Drainage should not be allowed to pond anywhere on the site, and especially not against any foundation or retaining wall. The site should be graded and maintained such that surface drainage is directed away from structures in accordance with 2016 CBC 1804.4 or other applicable standards. Positive site drainage should be provided away from structures, pavement, and the tops of slopes to swales or other controlled drainage structures. Pavement areas should be fine graded such that water is not allowed to pond.

7.14.3 Landscaping planters immediately adjacent to paved areas are not recommended due to the potential for surface or irrigation water to infiltrate the pavement's subgrade and base course. Either a subdrain, which collects excess irrigation water and transmits it to drainage structures, or an impervious above-grade planter boxes should be used. In addition, where landscaping is planned adjacent to the pavement, it is recommended that consideration be given to providing a cutoff wall along the edge of the pavement that extends at least 12 inches below the base material.

7.15 Plan Review

7.15.1 Grading and foundation plans should be reviewed by the Geotechnical Engineer (a representative of Geocon West, Inc.), prior to finalization to verify that the plans have been prepared in substantial conformance with the recommendations of this report and to provide additional analyses or recommendations.

LIMITATIONS AND UNIFORMITY OF CONDITIONS

1. The recommendations of this report pertain only to the site investigated and are based upon the assumption that the soil conditions do not deviate from those disclosed in the investigation. If any variations or undesirable conditions are encountered during construction, or if the proposed construction will differ from that anticipated herein, Geocon West, Inc. should be notified so that supplemental recommendations can be given. The evaluation or identification of the potential presence of hazardous or corrosive materials was not part of the scope of services provided by Geocon West, Inc.

2. This report is issued with the understanding that it is the responsibility of the owner, or of his representative, to ensure that the information and recommendations contained herein are brought to the attention of the architect and engineer for the project and incorporated into the plans, and the necessary steps are taken to see that the contractor and subcontractors carry out such recommendations in the field.

3. The findings of this report are valid as of the date of this report. However, changes in the conditions of a property can occur with the passage of time, whether they are due to natural processes or the works of man on this or adjacent properties. In addition, changes in applicable or appropriate standards may occur, whether they result from legislation or the broadening of knowledge. Accordingly, the findings of this report may be invalidated wholly or partially by changes outside our control. Therefore, this report is subject to review and should not be relied upon after a period of three years.

4. The firm that performed the geotechnical investigation for the project should be retained to provide testing and observation services during construction to provide continuity of geotechnical interpretation and to check that the recommendations presented for geotechnical aspects of site development are incorporated during site grading, construction of improvements, and excavation of foundations. If another geotechnical firm is selected to perform the testing and observation services during construction operations, that firm should prepare a letter indicating their intent to assume the responsibilities of project geotechnical engineer of record. A copy of the letter should be provided to the regulatory agency for their records. In addition, that firm should provide revised recommendations concerning the geotechnical aspects of the proposed development, or a written acknowledgement of their concurrence with the recommendations presented in our report. They should also perform additional analyses deemed necessary to assume the role of Geotechnical Engineer of Record.

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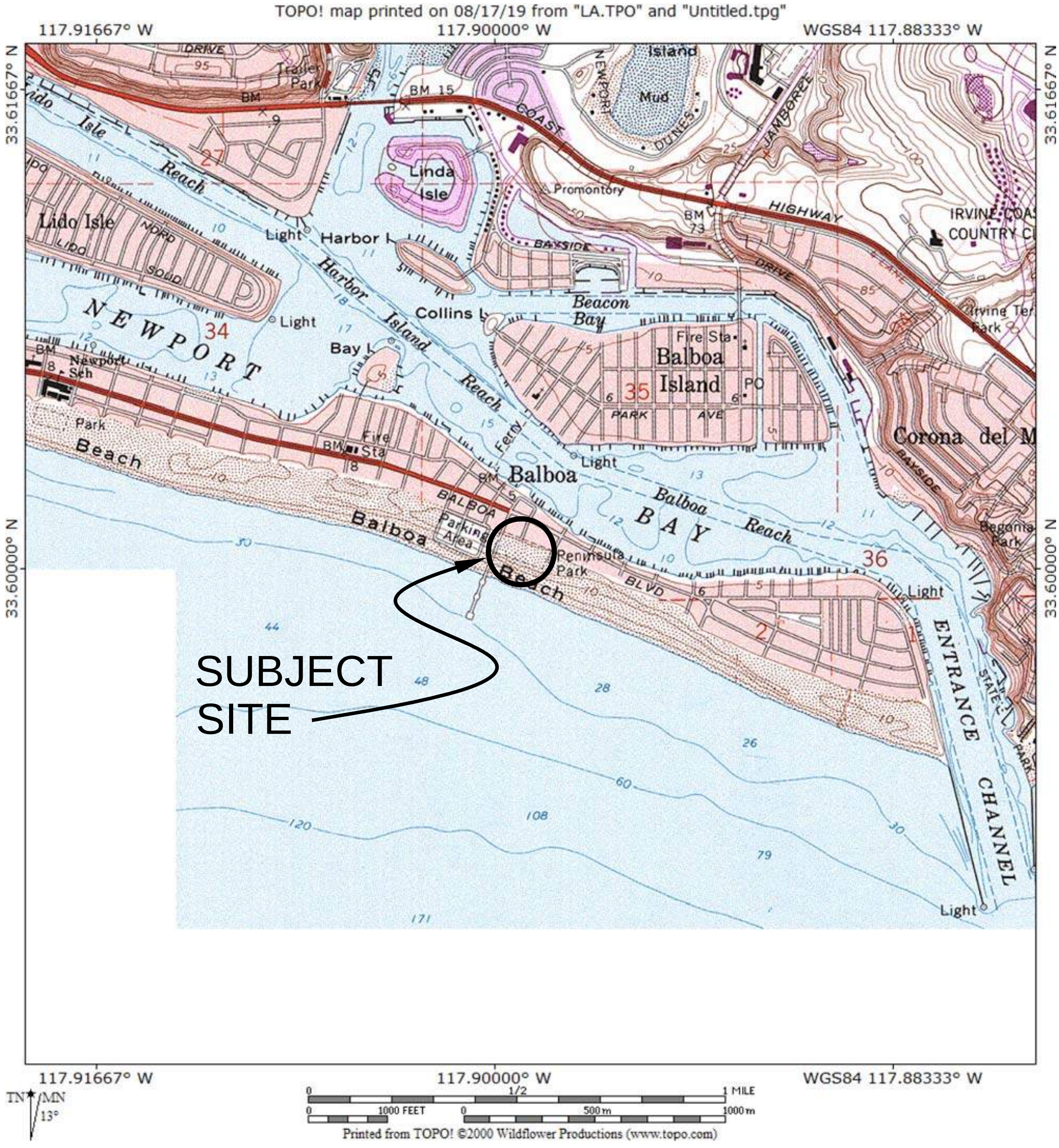

REFERENCE:U.S.G.S. TOPOGRAPHIC MAPS, 7.5 MINUTE SERIES, NEWPORT BEACH, CA QUADRANGLE

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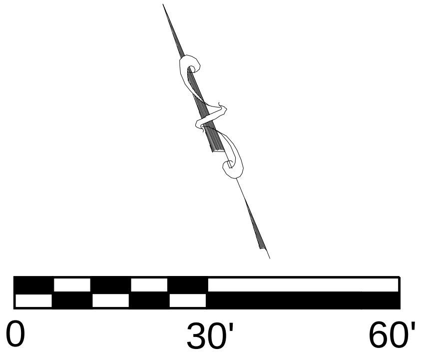
VICINITY MAP

50 MAIN STREET
NEWPORT BEACH, CALIFORNIA

SEPTEMBER 2019	PROJECT NO. W1033-88-01	FIG. 1

LEGEND

⌖ B2	Approximate Location of Boring
⬚	Approximate Location of Proposed Structure



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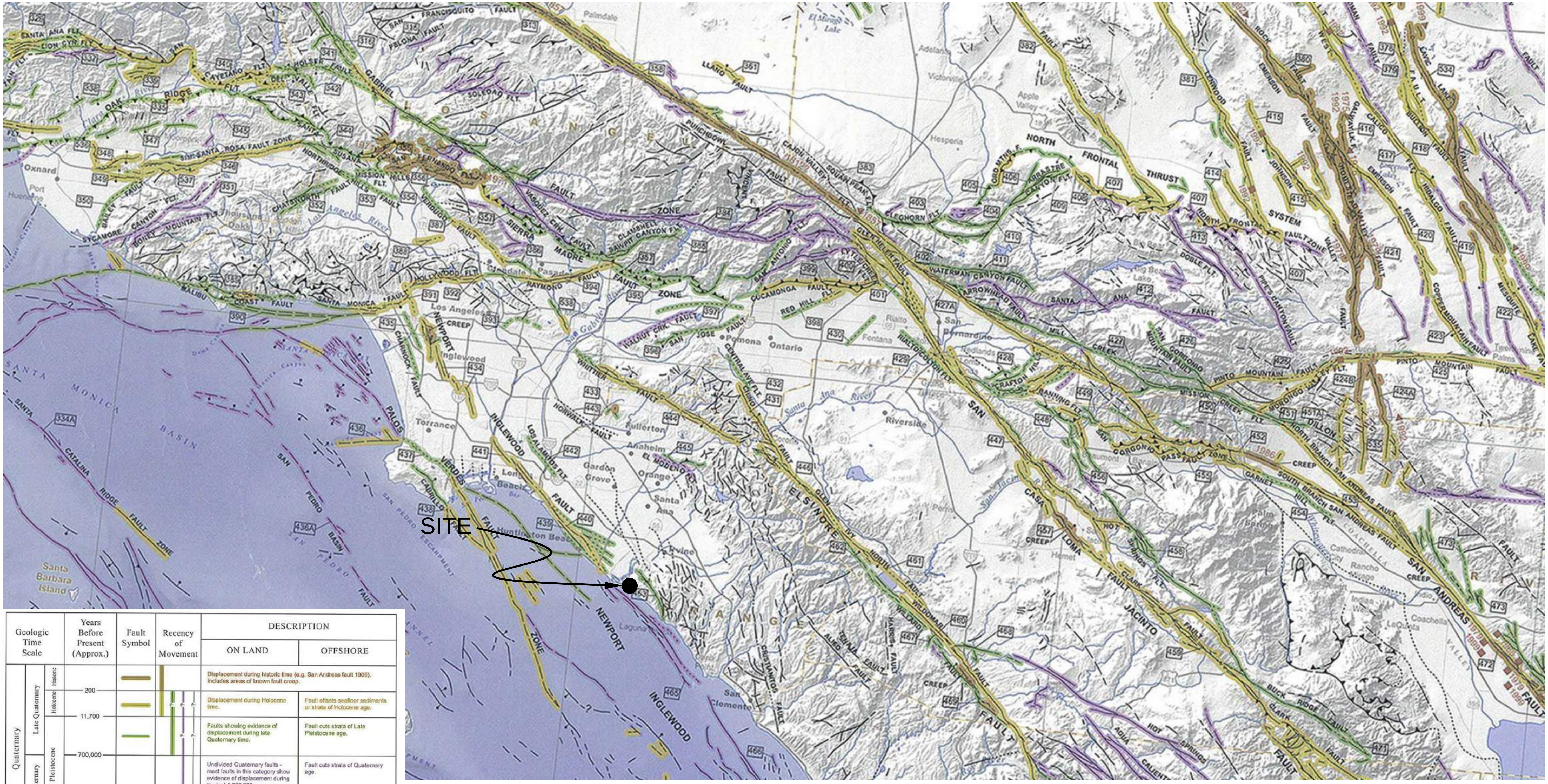
SITE PLAN

50 MAIN STREET
NEWPORT BEACH, CALIFORNIA

SEPT. 2019
PROJECT NO. W1033-88-01
FIG. 2

Reference: Jennings, C.W. and Bryant, W. A., 2010, Fault Activity Map of California, California Geological Survey Geologic Data Map No. 6.



Geologic Time Scale			Years Before Present (Approx.)	Fault Symbol	Recency of Movement	DESCRIPTION	
						ON LAND	OFFSHORE
Quaternary	Late Quaternary	Historic		▬		Displacement during historic time (e.g. San Andreas fault 1906). Includes areas of known fault creep.	
		Holocene	200	▬	? ? ?	Displacement during Holocene time.	Fault offsets seafloor sediments or strata of Holocene age.
		Pleistocene	11,700	▬	? ?	Faults showing evidence of displacement during late Quaternary time.	Fault cuts strata of Late Pleistocene age.
	Early Quaternary		700,000	▬	?	Undivided Quaternary faults - most faults in this category show evidence of displacement during the last 1,600,000 years; possible exceptions are faults which displace rocks of undifferentiated Plio-Pleistocene age.	Fault cuts strata of Quaternary age.
Pre-Quaternary			1,600,000* 4.5 billion (Age of Earth)	~		Faults without recognized Quaternary displacement or showing evidence of no displacement during Quaternary time. Not necessarily inactive.	Fault cuts strata of Pliocene or older age.

* Quaternary now recognized as extending to 2.6 Ma (Walker and Geissman, 2009). Quaternary faults in this map were established using the previous 1.6 Ma criterion.

0 12 24 Miles

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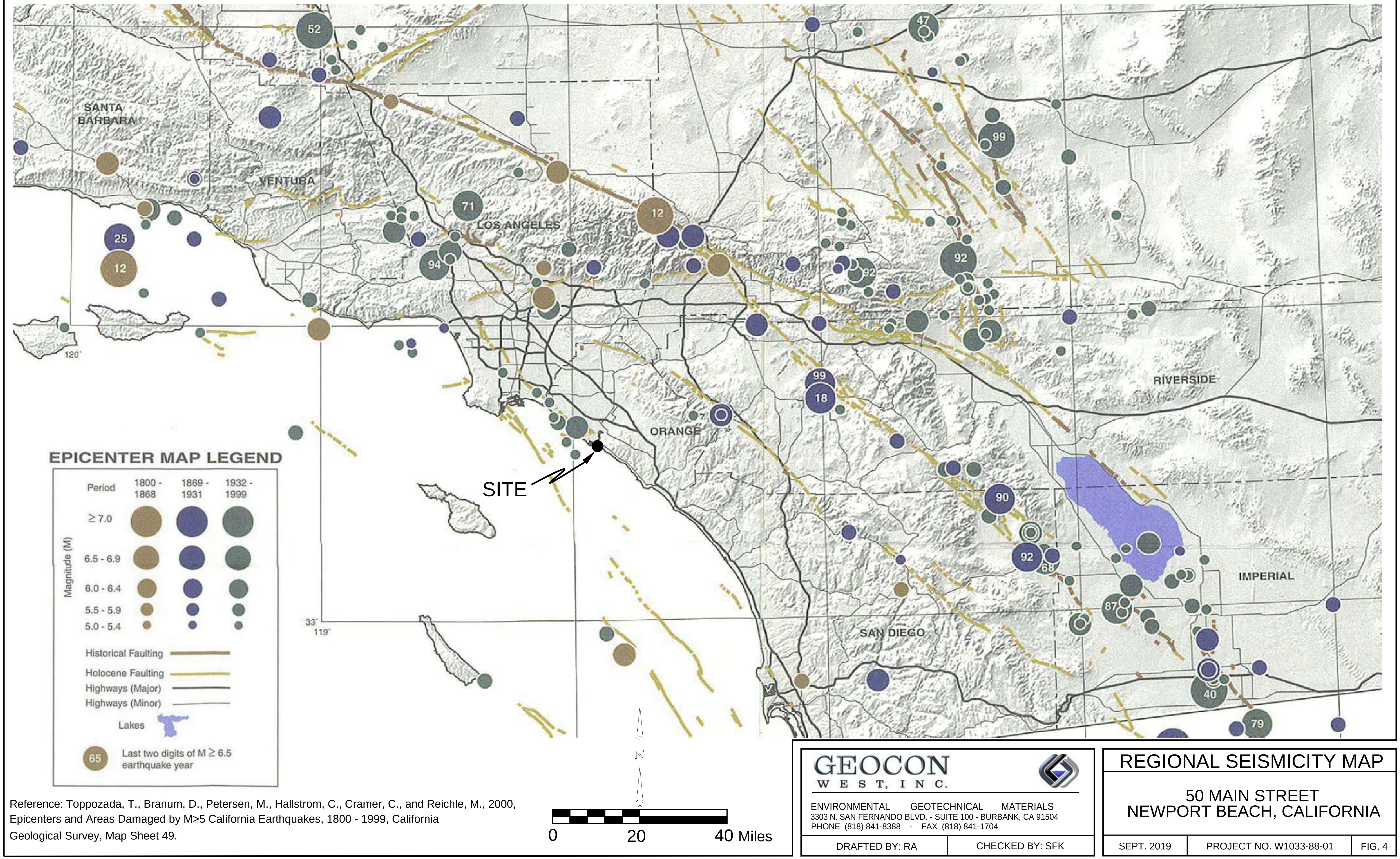
REGIONAL FAULT MAP

50 MAIN STREET
NEWPORT BEACH, CALIFORNIA

SEPT. 2019	PROJECT NO. W1033-88-01	FIG. 3



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REGIONAL SEISMICITY MAP

50 MAIN STREET
NEWPORT BEACH, CALIFORNIA

SEPT. 2019
PROJECT NO. W1033-88-01
FIG. 4

GEOCON

Client : 50 Main St, Newport Beach
File No. : W1033-88-01
Boring : 1

EMPIRICAL ESTIMATION OF LIQUEFACTION POTENTIAL
DESIGN EARTHQUAKE

NCEER (1996) METHOD

By Thomas F. Blake (1994-1996)

EARTHQUAKE INFORMATION:

Earthquake Magnitude:	6.68
Peak Horiz. Acceleration PGA$_M$ (g):	0.734
2/3 PGA$_M$ (g):	0.490
Calculated Mag.Wtg.Factor:	0.747
Historic High Groundwater:	5.0
Groundwater Depth During Exploration:	7.0

ENERGY & ROD CORRECTIONS:

Energy Correction (CE) for N60:	1.25
Rod Len.Corr.(CR)(0-no or 1-yes):	1.0
Bore Dia. Corr. (CB):	1.00
Sampler Corr. (CS):	1.20
Use Ksigma (0 or 1):	1.0

LIQUEFACTION CALCULATIONS:

Unit Wt. Water (pcf): 62.4

Depth to Base (ft)	Total Unit Wt. (pcf)	Water (0 or 1)	FIELD SPT (N)	Depth of SPT (ft)	Liq.Sus. (0 or 1)	-200 (%)	Est. Dr (%)	CN Factor	Corrected (N1)60	Eff. Unit Wt. (psf)	Resist. CRR	rd Factor	Induced CSR	Liquefac. Safe.Fact.
1.0	111.1	0	11.0	1.0	1	2	80	1.700	21.0	111.1	0.230	0.998	0.237	--
2.0	111.1	0	11.0	2.0	1	2	78	1.700	21.0	111.1	0.230	0.993	0.236	--
3.0	111.1	0	11.0	3.0	1	2	76	1.700	21.0	111.1	0.230	0.989	0.235	--
4.0	111.1	0	11.0	4.0	1	2	75	1.700	21.0	111.1	0.230	0.984	0.234	--
5.0	111.1	1	11.0	5.0	1	2	73	1.700	21.0	48.7	0.230	0.979	0.248	0.93
6.0	111.1	1	11.0	6.0	1	2	73	1.700	21.0	48.7	0.230	0.975	0.274	0.84
7.0	124.2	1	11.0	7.0	1	2	72	1.700	21.0	61.8	0.230	0.970	0.294	0.78
8.0	124.2	1	11.0	8.0	1	2	71	1.658	20.5	61.8	0.224	0.966	0.309	0.73
9.0	124.2	1	11.0	9.0	1	2	70	1.595	19.7	61.8	0.215	0.961	0.321	0.67
10.0	124.2	1	15.0	10.0	1	4	81	1.538	26.0	61.8	0.302	0.957	0.330	0.92
11.0	124.2	1	15.0	10.0	1	4	81	1.487	25.1	61.8	0.287	0.952	0.338	0.85
12.0	134.4	1	28.0	15.0	1		104	1.437	48.7	72.0	Infin.	0.947	0.344	Non-Liq.
13.0	134.4	1	28.0	15.0	1		104	1.388	47.0	72.0	Infin.	0.943	0.348	Non-Liq.
14.0	134.4	1	28.0	15.0	1		104	1.344	45.5	72.0	Infin.	0.938	0.351	Non-Liq.
15.0	134.4	1	28.0	15.0	1		104	1.304	44.2	72.0	Infin.	0.934	0.354	Non-Liq.
16.0	134.4	1	28.0	15.0	1		104	1.268	42.9	72.0	Infin.	0.929	0.356	Non-Liq.
17.0	134.4	1	37.0	17.5	1		116	1.234	58.6	72.0	Infin.	0.925	0.357	Non-Liq.
18.0	134.4	1	37.0	17.5	1		116	1.203	57.1	72.0	Infin.	0.920	0.358	Non-Liq.
19.0	134.4	1	37.0	17.5	1		116	1.174	55.7	72.0	Infin.	0.915	0.359	Non-Liq.
20.0	130.9	1	37.0	17.5	1		116	1.147	54.5	68.5	Infin.	0.911	0.360	Non-Liq.
21.0	130.9	1	37.0	17.5	1		116	1.123	53.3	68.5	Infin.	0.906	0.361	Non-Liq.
22.0	130.9	1	37.0	22.5	1		110	1.101	56.7	68.5	Infin.	0.902	0.361	Non-Liq.
23.0	130.9	1	37.0	22.5	1		110	1.080	55.6	68.5	Infin.	0.897	0.361	Non-Liq.
24.0	130.9	1	37.0	22.5	1		110	1.060	54.6	68.5	Infin.	0.893	0.361	Non-Liq.
25.0	125.2	1	37.0	22.5	1		110	1.041	53.6	62.8	Infin.	0.888	0.361	Non-Liq.
26.0	125.2	1	37.0	22.5	1		110	1.025	52.8	62.8	Infin.	0.883	0.361	Non-Liq.
27.0	125.2	1	37.0	27.5	1		106	1.009	54.8	62.8	Infin.	0.879	0.361	Non-Liq.
28.0	125.2	1	37.0	27.5	1		106	0.994	54.0	62.8	Infin.	0.874	0.361	Non-Liq.
29.0	125.2	1	37.0	27.5	1		106	0.979	53.2	62.8	Infin.	0.870	0.361	Non-Liq.
30.0	126.0	1	37.0	27.5	1		106	0.966	52.5	63.6	Infin.	0.865	0.360	Non-Liq.
31.0	126.0	1	37.0	27.5	1		106	0.952	51.7	63.6	Infin.	0.861	0.360	Non-Liq.
32.0	126.0	1	39.0	32.5	1		105	0.939	54.9	63.6	Infin.	0.856	0.359	Non-Liq.
33.5	126.0	1	39.0	32.5	1		105	0.924	54.0	63.6	Infin.	0.850	0.358	Non-Liq.
34.0	122.6	1	40.0	37.5	1		102	0.918	55.1	60.2	Infin.	0.846	0.357	Non-Liq.
35.0	122.6	1	40.0	37.5	1		102	0.904	54.3	60.2	Infin.	0.842	0.357	Non-Liq.
36.0	122.6	1	40.0	37.5	1		102	0.894	53.6	60.2	Infin.	0.838	0.356	Non-Liq.
37.0	122.6	1	40.0	37.5	1		102	0.884	53.0	60.2	Infin.	0.833	0.356	Non-Liq.
38.0	122.6	1	40.0	37.5	1		102	0.874	52.4	60.2	Infin.	0.829	0.355	Non-Liq.
39.0	122.6	1	40.0	37.5	1		102	0.865	51.9	60.2	Infin.	0.824	0.354	Non-Liq.
40.0	127.3	1	40.0	37.5	1		102	0.855	51.3	64.9	Infin.	0.819	0.353	Non-Liq.
41.0	127.3	1	40.0	37.5	1		102	0.845	50.7	64.9	Infin.	0.815	0.352	Non-Liq.
42.0	127.3	1	47.0	42.5	1		107	0.836	59.0	64.9	Infin.	0.810	0.350	Non-Liq.
43.0	127.3	1	47.0	42.5	1		107	0.827	58.3	64.9	Infin.	0.806	0.349	Non-Liq.
44.0	127.3	1	47.0	42.5	1		107	0.819	57.7	64.9	Infin.	0.801	0.347	Non-Liq.
45.0	125.2	1	47.0	42.5	1		107	0.810	57.1	62.8	Infin.	0.797	0.346	Non-Liq.
46.0	125.2	1	47.0	42.5	1		107	0.802	56.6	62.8	Infin.	0.792	0.345	Non-Liq.
47.0	125.2	1	57.0	47.5	1		115	0.795	68.0	62.8	Infin.	0.787	0.343	Non-Liq.
48.0	125.2	1	57.0	47.5	1		115	0.787	67.3	62.8	Infin.	0.783	0.342	Non-Liq.
49.0	125.2	1	57.0	47.5	1		115	0.780	66.7	62.8	Infin.	0.778	0.340	Non-Liq.
50.5	127.8	1	57.0	47.5	1		115	0.771	65.9	65.4	Infin.	0.773	0.339	Non-Liq.

Figure 5

GEOCON

Client : 50 Main St, Newport Beach
File No. : W1033-88-01
Boring : 1

LIQUEFACTION SETTLEMENT ANALYSIS
DESIGN EARTHQUAKE

(SATURATED SAND AT INITIAL LIQUEFACTION CONDITION)

NCEER (1996) METHOD
EARTHQUAKE INFORMATION:

Earthquake Magnitude:	6.68
PGAM (g):	0.734
2/3 PGAM (g):	0.49
Calculated Mag.Wtg.Factor:	0.747
Historic High Groundwater:	5.0
Groundwater @ Exploration:	7.0

DEPTH TO BASE	BLOW COUNT N	WET DENSITY (PCF)	TOTAL STRESS O (TSF)	EFFECT STRESS O' (TSF)	REL. DEN. Dr (%)	ADJUST BLOWS (N1)60	Tav/σ'_o	LIQUEFACTION SAFETY FACTOR	Volumetric Strain [e_{15}} (%)	EQ. SETTLE. Pe (in.)
1.0	11	111.11	0.028	0.028	80	21	0.318	--	0.00	0.00
2.0	11	111.11	0.083	0.083	78	21	0.318	--	0.00	0.00
3.0	11	111.11	0.139	0.139	76	21	0.318	--	0.00	0.00
4.0	11	111.11	0.194	0.194	75	21	0.318	--	0.00	0.00
5.0	11	111.11	0.250	0.234	73	21	0.339	0.93	1.30	0.16
6.0	11	111.11	0.306	0.259	73	21	0.376	0.84	1.40	0.17
7.0	11	124.1643	0.364	0.286	72	21	0.405	0.78	1.40	0.17
8.0	11	124.1643	0.426	0.317	71	21	0.428	0.73	1.40	0.17
9.0	11	124.1643	0.489	0.348	70	20	0.447	0.67	1.60	0.19
10.0	15	124.1643	0.551	0.379	81	26	0.462	0.92	1.10	0.13
11.0	15	124.1643	0.613	0.410	81	25	0.476	0.85	1.10	0.13
12.0	28	134.4156	0.677	0.443	104	49	0.486	Non-Liq.	0.00	0.00
13.0	28	134.4156	0.745	0.479	104	47	0.494	Non-Liq.	0.00	0.00
14.0	28	134.4156	0.812	0.515	104	46	0.501	Non-Liq.	0.00	0.00
15.0	28	134.4156	0.879	0.551	104	44	0.507	Non-Liq.	0.00	0.00
16.0	28	134.4156	0.946	0.587	104	43	0.513	Non-Liq.	0.00	0.00
17.0	37	134.4156	1.013	0.623	116	59	0.517	Non-Liq.	0.00	0.00
18.0	37	134.4156	1.081	0.659	116	57	0.521	Non-Liq.	0.00	0.00
19.0	37	134.4156	1.148	0.695	116	56	0.525	Non-Liq.	0.00	0.00
20.0	37	130.9091	1.214	0.731	116	54	0.529	Non-Liq.	0.00	0.00
21.0	37	130.9091	1.280	0.765	116	53	0.532	Non-Liq.	0.00	0.00
22.0	37	130.9091	1.345	0.799	110	57	0.536	Non-Liq.	0.00	0.00
23.0	37	130.9091	1.410	0.833	110	56	0.539	Non-Liq.	0.00	0.00
24.0	37	130.9091	1.476	0.868	110	55	0.541	Non-Liq.	0.00	0.00
25.0	37	125.1816	1.540	0.900	110	54	0.544	Non-Liq.	0.00	0.00
26.0	37	125.1816	1.603	0.932	110	53	0.547	Non-Liq.	0.00	0.00
27.0	37	125.1816	1.665	0.963	106	55	0.550	Non-Liq.	0.00	0.00
28.0	37	125.1816	1.728	0.995	106	54	0.553	Non-Liq.	0.00	0.00
29.0	37	125.1816	1.790	1.026	106	53	0.555	Non-Liq.	0.00	0.00
30.0	37	126.0126	1.853	1.058	106	52	0.558	Non-Liq.	0.00	0.00
31.0	37	126.0126	1.916	1.089	106	52	0.560	Non-Liq.	0.00	0.00
32.0	39	126.0126	1.979	1.121	105	55	0.562	Non-Liq.	0.00	0.00
33.5	39	126.0126	2.058	1.161	105	54	0.564	Non-Liq.	0.00	0.00
34.0	40	122.5588	2.089	1.176	102	55	0.565	Non-Liq.	0.00	0.00
35.0	40	122.5588	2.166	1.214	102	54	0.568	Non-Liq.	0.00	0.00
36.0	40	122.5588	2.227	1.244	102	54	0.570	Non-Liq.	0.00	0.00
37.0	40	122.5588	2.288	1.274	102	53	0.571	Non-Liq.	0.00	0.00
38.0	40	122.5588	2.349	1.304	102	52	0.573	Non-Liq.	0.00	0.00
39.0	40	122.5588	2.411	1.334	102	52	0.575	Non-Liq.	0.00	0.00
40.0	40	127.3266	2.473	1.366	102	51	0.576	Non-Liq.	0.00	0.00
41.0	40	127.3266	2.537	1.398	102	51	0.577	Non-Liq.	0.00	0.00
42.0	47	127.3266	2.600	1.430	107	59	0.579	Non-Liq.	0.00	0.00
43.0	47	127.3266	2.664	1.463	107	58	0.580	Non-Liq.	0.00	0.00
44.0	47	127.3266	2.728	1.495	107	58	0.580	Non-Liq.	0.00	0.00
45.0	47	125.154	2.791	1.527	107	57	0.582	Non-Liq.	0.00	0.00
46.0	47	125.154	2.854	1.559	107	57	0.583	Non-Liq.	0.00	0.00
47.0	57	125.154	2.916	1.590	115	68	0.584	Non-Liq.	0.00	0.00
48.0	57	125.154	2.979	1.621	115	67	0.585	Non-Liq.	0.00	0.00
49.0	57	125.154	3.041	1.653	115	67	0.586	Non-Liq.	0.00	0.00
50.5	57	127.8424	3.120	1.693	115	66	0.587	Non-Liq.	0.00	0.00

TOTAL SETTLEMENT = 1.1 INCHES

Figure 6

GEOCON

Client : 50 Main St, Newport Beach
File No. : W1033-88-01
Boring : 1

EMPIRICAL ESTIMATION OF LIQUEFACTION POTENTIAL
MAXIMUM CONSIDERED EARTHQUAKE

NCEER (1996) METHOD
EARTHQUAKE INFORMATION:

Earthquake Magnitude:	6.78
Peak Horiz. Acceleration PGA_M (g):	0.734
Calculated Mag.Wtg.Factor:	0.776
Historic High Groundwater:	5.0
Groundwater Depth During Exploration:	7.0

By Thomas F. Blake (1994-1996)
ENERGY & ROD CORRECTIONS:

Energy Correction (CE) for N60:	1.25
Rod Len.Corr.(CR)(0-no or 1-yes):	1.0
Bore Dia. Corr. (CB):	1.00
Sampler Corr. (CS):	1.20
Use Ksigma (0 or 1):	1.0

LIQUEFACTION CALCULATIONS:

Unit Wt. Water (pcf):	62.4

Depth to Base (ft)	Total Unit Wt. (pcf)	Water (0 or 1)	FIELD SPT (N)	Depth of SPT (ft)	Liq.Sus. (0 or 1)	-200 (%)	Est. Dr (%)	CN Factor	Corrected (N1)60	Eff. Unit Wt. (psf)	Resist. CRR	rd Factor	Induced CSR	Liquefac. Safe.Fact.
1.0	111.1	0	11.0	1.0	1	2	80	1.700	21.0	111.1	0.230	0.998	0.369	--
2.0	111.1	0	11.0	2.0	1	2	78	1.700	21.0	111.1	0.230	0.993	0.368	--
3.0	111.1	0	11.0	3.0	1	2	76	1.700	21.0	111.1	0.230	0.989	0.366	--
4.0	111.1	0	11.0	4.0	1	2	75	1.700	21.0	111.1	0.230	0.984	0.364	--
5.0	111.1	1	11.0	5.0	1	2	73	1.700	21.0	48.7	0.230	0.979	0.387	0.59
6.0	111.1	1	11.0	6.0	1	2	73	1.700	21.0	48.7	0.230	0.975	0.426	0.54
7.0	124.2	1	11.0	7.0	1	2	72	1.700	21.0	61.8	0.230	0.970	0.457	0.50
8.0	124.2	1	11.0	8.0	1	2	71	1.658	20.5	61.8	0.224	0.966	0.481	0.47
9.0	124.2	1	11.0	9.0	1	2	70	1.595	19.7	61.8	0.215	0.961	0.499	0.43
10.0	124.2	1	15.0	10.0	1	4	81	1.538	26.0	61.8	0.302	0.957	0.515	0.59
11.0	124.2	1	15.0	10.0	1	4	81	1.487	25.1	61.8	0.287	0.952	0.527	0.54
12.0	134.4	1	28.0	15.0	1		104	1.437	48.7	72.0	Infin.	0.947	0.536	Non-Liq.
13.0	134.4	1	28.0	15.0	1		104	1.388	47.0	72.0	Infin.	0.943	0.542	Non-Liq.
14.0	134.4	1	28.0	15.0	1		104	1.344	45.5	72.0	Infin.	0.938	0.547	Non-Liq.
15.0	134.4	1	28.0	15.0	1		104	1.304	44.2	72.0	Infin.	0.934	0.551	Non-Liq.
16.0	134.4	1	28.0	15.0	1		104	1.268	42.9	72.0	Infin.	0.929	0.554	Non-Liq.
17.0	134.4	1	37.0	17.5	1		116	1.234	58.6	72.0	Infin.	0.925	0.557	Non-Liq.
18.0	134.4	1	37.0	17.5	1		116	1.203	57.1	72.0	Infin.	0.920	0.558	Non-Liq.
19.0	134.4	1	37.0	17.5	1		116	1.174	55.7	72.0	Infin.	0.915	0.559	Non-Liq.
20.0	130.9	1	37.0	17.5	1		116	1.147	54.5	68.5	Infin.	0.911	0.561	Non-Liq.
21.0	130.9	1	37.0	17.5	1		116	1.123	53.3	68.5	Infin.	0.906	0.561	Non-Liq.
22.0	130.9	1	37.0	22.5	1		110	1.101	56.7	68.5	Infin.	0.902	0.562	Non-Liq.
23.0	130.9	1	37.0	22.5	1		110	1.080	55.6	68.5	Infin.	0.897	0.562	Non-Liq.
24.0	130.9	1	37.0	22.5	1		110	1.060	54.6	68.5	Infin.	0.893	0.562	Non-Liq.
25.0	125.2	1	37.0	22.5	1		110	1.041	53.6	62.8	Infin.	0.888	0.562	Non-Liq.
26.0	125.2	1	37.0	22.5	1		110	1.025	52.8	62.8	Infin.	0.883	0.563	Non-Liq.
27.0	125.2	1	37.0	27.5	1		106	1.009	54.8	62.8	Infin.	0.879	0.563	Non-Liq.
28.0	125.2	1	37.0	27.5	1		106	0.994	54.0	62.8	Infin.	0.874	0.562	Non-Liq.
29.0	125.2	1	37.0	27.5	1		106	0.979	53.2	62.8	Infin.	0.870	0.562	Non-Liq.
30.0	126.0	1	37.0	27.5	1		106	0.966	52.5	63.6	Infin.	0.865	0.561	Non-Liq.
31.0	126.0	1	37.0	27.5	1		106	0.952	51.7	63.6	Infin.	0.861	0.560	Non-Liq.
32.0	126.0	1	39.0	32.5	1		105	0.939	54.9	63.6	Infin.	0.856	0.559	Non-Liq.
33.5	126.0	1	39.0	32.5	1		105	0.924	54.0	63.6	Infin.	0.850	0.558	Non-Liq.
34.0	122.6	1	40.0	37.5	1		102	0.918	55.1	60.2	Infin.	0.846	0.556	Non-Liq.
35.0	122.6	1	40.0	37.5	1		102	0.904	54.3	60.2	Infin.	0.842	0.556	Non-Liq.
36.0	122.6	1	40.0	37.5	1		102	0.894	53.6	60.2	Infin.	0.838	0.555	Non-Liq.
37.0	122.6	1	40.0	37.5	1		102	0.884	53.0	60.2	Infin.	0.833	0.554	Non-Liq.
38.0	122.6	1	40.0	37.5	1		102	0.874	52.4	60.2	Infin.	0.829	0.553	Non-Liq.
39.0	122.6	1	40.0	37.5	1		102	0.865	51.9	60.2	Infin.	0.824	0.551	Non-Liq.
40.0	127.3	1	40.0	37.5	1		102	0.855	51.3	64.9	Infin.	0.819	0.549	Non-Liq.
41.0	127.3	1	40.0	37.5	1		102	0.845	50.7	64.9	Infin.	0.815	0.547	Non-Liq.
42.0	127.3	1	47.0	42.5	1		107	0.836	59.0	64.9	Infin.	0.810	0.545	Non-Liq.
43.0	127.3	1	47.0	42.5	1		107	0.827	58.3	64.9	Infin.	0.806	0.543	Non-Liq.
44.0	127.3	1	47.0	42.5	1		107	0.819	57.7	64.9	Infin.	0.801	0.541	Non-Liq.
45.0	125.2	1	47.0	42.5	1		107	0.810	57.1	62.8	Infin.	0.797	0.539	Non-Liq.
46.0	125.2	1	47.0	42.5	1		107	0.802	56.6	62.8	Infin.	0.792	0.537	Non-Liq.
47.0	125.2	1	57.0	47.5	1		115	0.795	68.0	62.8	Infin.	0.787	0.535	Non-Liq.
48.0	125.2	1	57.0	47.5	1		115	0.787	67.3	62.8	Infin.	0.783	0.532	Non-Liq.
49.0	125.2	1	57.0	47.5	1		115	0.780	66.7	62.8	Infin.	0.778	0.530	Non-Liq.
50.5	127.8	1	57.0	47.5	1		115	0.771	65.9	65.4	Infin.	0.773	0.527	Non-Liq.

GEOCON

Client : 50 Main St, Newport Beach
File No. : W1033-88-01
Boring : 1

LIQUEFACTION SETTLEMENT ANALYSIS
MAXIMUM CONSIDERED EARTHQUAKE

(SATURATED SAND AT INITIAL LIQUEFACTION CONDITION)

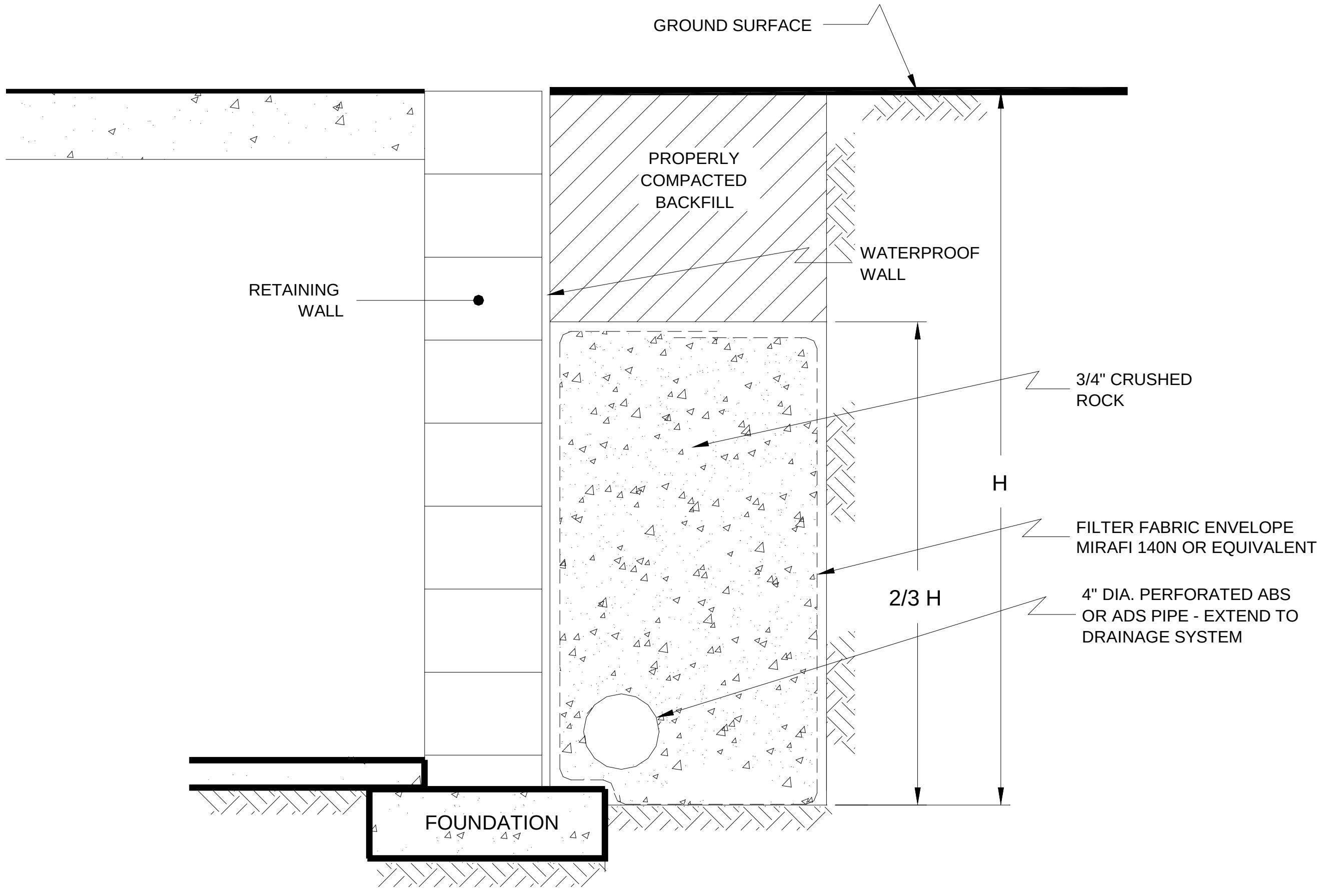
NCEER (1996) METHOD
EARTHQUAKE INFORMATION:

Earthquake Magnitude:	6.67
PGA$_M$ (g):	0.734
Calculated Mag.Wtg.Factor:	0.744
Historic High Groundwater:	5.0
Groundwater @ Exploration:	7.0

Slope, S	0.5
Height of Sloping Surface Below Ground Surface:	0
Distance to Face:	0

DEPTH TO BASE	BLOW COUNT N	WET DENSITY (PCF)	TOTAL STRESS O (TSF)	EFFECT STRESS O' (TSF)	REL. DEN. Dr (%)	ADJUST BLOWS (N1)60	T_{av}/σ'_o	LIQUEFACTION SAFETY FACTOR	Volumetric Strain [e_{15}} (%)	EQ. SETTLE. Pe (in.)	LAT. DISPLACE. LD (ft)
1	11	111.11	0.028	0.028	80	21	0.477	--	0.00	0.00	--
2	11	111.11	0.083	0.083	78	21	0.477	--	0.00	0.00	--
3	11	111.11	0.139	0.139	76	21	0.477	--	0.00	0.00	--
4	11	111.11	0.194	0.194	75	21	0.477	--	0.00	0.00	--
5	11	111.11	0.250	0.234	73	21	0.509	0.62	1.40	0.17	0.11
6	11	111.11	0.306	0.259	73	21	0.563	0.56	1.40	0.17	0.19
7	11	124.1643	0.364	0.286	72	21	0.607	0.52	1.40	0.17	0.31
8	11	124.1643	0.426	0.317	71	21	0.641	0.49	1.40	0.17	0.35
9	11	124.1643	0.489	0.348	70	20	0.670	0.45	1.60	0.19	0.35
10	15	124.1643	0.551	0.379	81	26	0.693	0.61	1.10	0.13	0.06
11	15	124.1643	0.613	0.410	81	25	0.713	0.57	1.10	0.13	0.08
12	28	134.4156	0.677	0.443	104	49	0.729	Non-Liq.	0.00	0.00	--
13	28	134.4156	0.745	0.479	104	47	0.741	Non-Liq.	0.00	0.00	--
14	28	134.4156	0.812	0.515	104	46	0.751	Non-Liq.	0.00	0.00	--
15	28	134.4156	0.879	0.551	104	44	0.761	Non-Liq.	0.00	0.00	--
16	28	134.4156	0.946	0.587	104	43	0.769	Non-Liq.	0.00	0.00	--
17	37	134.4156	1.013	0.623	116	59	0.776	Non-Liq.	0.00	0.00	--
18	37	134.4156	1.081	0.659	116	57	0.782	Non-Liq.	0.00	0.00	--
19	37	134.4156	1.148	0.695	116	56	0.787	Non-Liq.	0.00	0.00	--
20	37	130.9091	1.214	0.731	116	54	0.793	Non-Liq.	0.00	0.00	--
21	37	130.9091	1.280	0.765	116	53	0.798	Non-Liq.	0.00	0.00	--
22	37	130.9091	1.345	0.799	110	57	0.803	Non-Liq.	0.00	0.00	--
23	37	130.9091	1.410	0.833	110	56	0.808	Non-Liq.	0.00	0.00	--
24	37	130.9091	1.476	0.868	110	55	0.812	Non-Liq.	0.00	0.00	--
25	37	125.1816	1.540	0.900	110	54	0.816	Non-Liq.	0.00	0.00	--
26	37	125.1816	1.603	0.932	110	53	0.821	Non-Liq.	0.00	0.00	--
27	37	125.1816	1.665	0.963	106	55	0.825	Non-Liq.	0.00	0.00	--
28	37	125.1816	1.728	0.995	106	54	0.829	Non-Liq.	0.00	0.00	--
29	37	125.1816	1.790	1.026	106	53	0.833	Non-Liq.	0.00	0.00	--
30	37	126.0126	1.853	1.058	106	52	0.836	Non-Liq.	0.00	0.00	--
31	37	126.0126	1.916	1.089	106	52	0.839	Non-Liq.	0.00	0.00	--
32	39	126.0126	1.979	1.121	105	55	0.842	Non-Liq.	0.00	0.00	--
33	39	126.0126	2.042	1.153	105	54	0.845	Non-Liq.	0.00	0.00	--
34	40	122.5588	2.104	1.184	102	55	0.848	Non-Liq.	0.00	0.00	--
35	40	122.5588	2.166	1.214	102	54	0.851	Non-Liq.	0.00	0.00	--
36	40	122.5588	2.227	1.244	102	54	0.854	Non-Liq.	0.00	0.00	--
37	40	122.5588	2.288	1.274	102	53	0.857	Non-Liq.	0.00	0.00	--
38	40	122.5588	2.349	1.304	102	52	0.859	Non-Liq.	0.00	0.00	--
39	40	122.5588	2.411	1.334	102	52	0.862	Non-Liq.	0.00	0.00	--
40	40	127.3266	2.473	1.366	102	51	0.864	Non-Liq.	0.00	0.00	--
41	40	127.3266	2.537	1.398	102	51	0.866	Non-Liq.	0.00	0.00	--
42	47	127.3266	2.600	1.430	107	59	0.867	Non-Liq.	0.00	0.00	--
43	47	127.3266	2.664	1.463	107	58	0.869	Non-Liq.	0.00	0.00	--
44	47	127.3266	2.728	1.495	107	58	0.870	Non-Liq.	0.00	0.00	--
45	47	125.154	2.791	1.527	107	57	0.872	Non-Liq.	0.00	0.00	--
46	47	125.154	2.854	1.559	107	57	0.873	Non-Liq.	0.00	0.00	--
47	57	125.154	2.916	1.590	115	68	0.875	Non-Liq.	0.00	0.00	--
48	57	125.154	2.979	1.621	115	67	0.876	Non-Liq.	0.00	0.00	--
49	57	125.154	3.041	1.653	115	67	0.878	Non-Liq.	0.00	0.00	--
50	57	127.8424	3.104	1.685	115	66	0.879	Non-Liq.	0.00	0.00	--

TOTAL SETTLEMENT =	1.1	INCHES
TOTAL LATERAL DISPLACEMENT=	1.5	FEET



NO SCALE

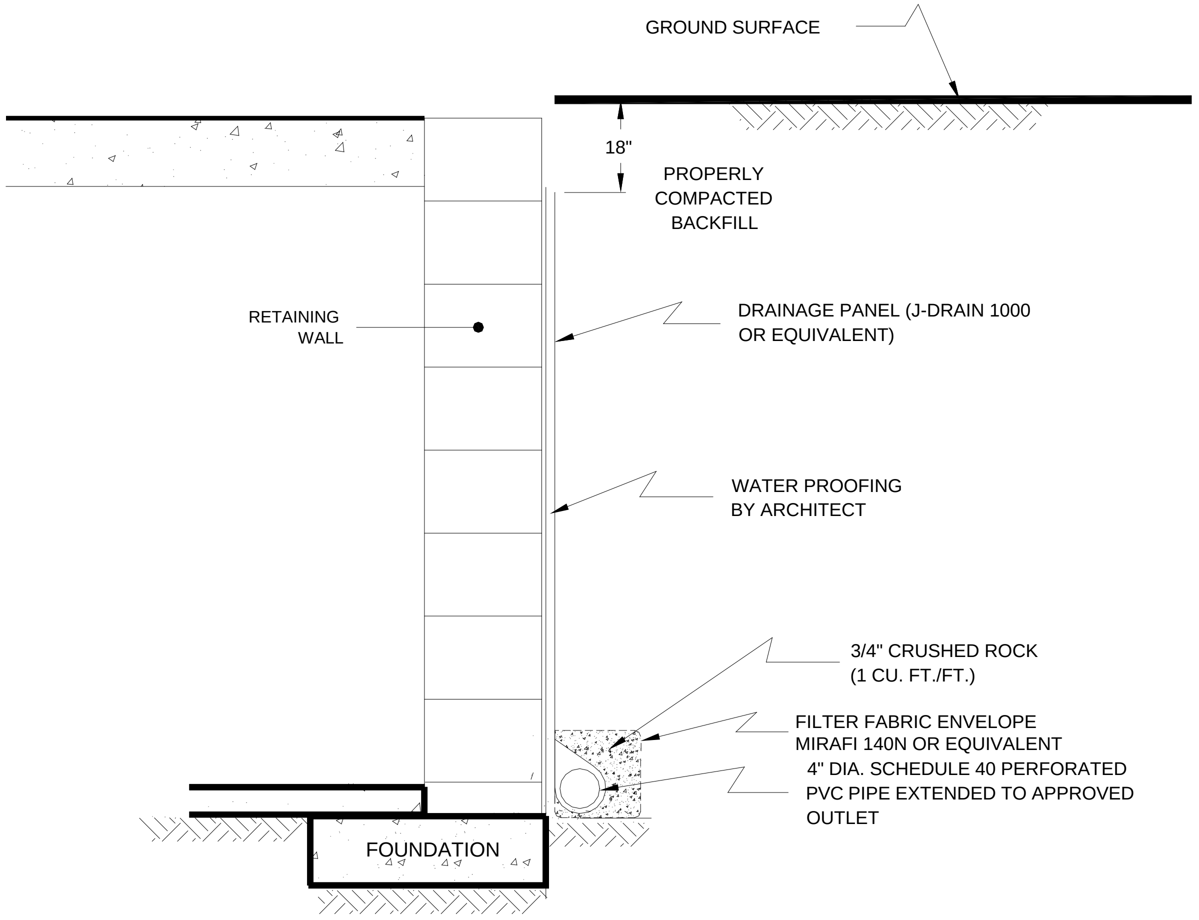
GEOCON
WEST, INC.

ENVIRONMENTAL GEOTECHNICAL MATERIALS
3303 N. SAN FERNANDO BLVD. - SUITE 100 - BURBANK, CA 91504
PHONE (818) 841-8388 - FAX (818) 841-1704

RETAINING WALL DRAIN DETAIL

50 MAIN STREET
NEWPORT BEACH, CALIFORNIA

DRAFTED BY: PZ	CHECKED BY: JTA	SEPT. 2019	PROJECT NO. W1033-88-01	FIG. 9



NO SCALE

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RETAINING WALL DRAIN DETAIL

50 MAIN STREET
NEWPORT BEACH, CALIFORNIA

DRAFTED BY: PZ	CHECKED BY: JTA	SEPT. 2019	PROJECT NO. W1033-88-01	FIG. 10

APPENDIX A

APPENDIX A

FIELD INVESTIGATION

The site was initially explored on August 5, 2019 by drilling two 8-inch diameter borings using a truck-mounted mud-rotary drilling machine. The borings were drilled to depths of 20½ and 50½ feet below the existing ground surface. Representative and relatively undisturbed samples were obtained by driving a 3 inch, O. D., California Modified Sampler into the "undisturbed" soil mass with blows from a 140-pound auto-hammer falling 30 inches. The California Modified Sampler was equipped with 1-inch high by 2³/₈-inch diameter brass sampler rings to facilitate soil removal and testing. Bulk samples were also obtained. Standard Penetration Tests were performed in boring B1.

The soil conditions encountered in the borings were visually examined, classified and logged in general accordance with the Unified Soil Classification System (USCS). The logs of the borings are presented on Figures A1 and A2. The logs depict the soil and geologic conditions encountered and the depth at which samples were obtained. The logs also include our interpretation of the conditions between sampling intervals. Therefore, the logs contain both observed and interpreted data. We determined the lines designating the interface between soil materials on the logs using visual observations, penetration rates, excavation characteristics and other factors. The transition between materials may be abrupt or gradual. Where applicable, the boring logs were revised based on subsequent laboratory testing. The locations of the borings are shown on Figure 2.

PROJECT NO. W1033-88-01

BORING 1

ELEV. (MSL.) -- DATE COMPLETED 08/05/2019

EQUIPMENT Mud Rotary BY: JS

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT)*	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**3" AC / 9" Base** **ARTIFICIAL FILL** Sand, poorly graded, medium dense, moist, light brown, fine-grained.			
2	■ B1@2.5'				**BEACH DEPOSITS** Sand, poorly graded, medium dense, moist, light brown, fine-grained.	20	102.5	8.4
4								
	◧ B1@5'			SP	- with brown mottles	11		14.9
6			▼					
8	■ B1@7.5'				- loose, brown, fine-grained with some medium-grained	12	102.7	20.9
10	◧ B1@10'				- medium dense, moist to wet, fine- to medium-grained, trace coarse-grained	15		21.5
12					**OLD MARINE DEPOSITS** Sand, medium dense, wet, brown, fine-grained.			
	■ B1@12.5'					47	112.2	19.8
14								
	◧ B1@15'				- fine-grained with some medium-grained	28		23.0
16					- dense			
18	◧ B1@17.5'			SP		37		23.5
20	■ B1@20'				- very dense	94	108.1	21.1
22					- moist, dense, olive brown, fine-grained			
	◧ B1@22.5'					37		27.0
24								
	■ B1@25'				- very dense	91	103.2	21.3
26					- dense, moist to wet			
28	◧ B1@27.5'					37		26.2

W1033-88-01 BORING LOGS.GPJ

Figure A1,
Log of Boring 1, Page 1 of 2

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. W1033-88-01

BORING 1

ELEV. (MSL.) -- DATE COMPLETED **08/05/2019**

EQUIPMENT **Mud Rotary** BY: **JS**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT)*	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30	B1@30' ■				- moist, olive gray, some silt	88	102.2	23.3
32				SP				
	B1@32.5' ◧					39		26.6
34					Silty Sand, dense, moist, gray, fine-grained.			
	B1@35' ■					64	96.2	27.4
36								
38	B1@37.5' ◧					40		25.2
40	B1@40' ■				- very dense	95	102.6	24.1
42				SM	- dense, trace shell fragments			
	B1@42.5' ◧					47		23.0
44								
	B1@45' ■				- fine-grained, decrease in shell fragments	50 (5")	102.0	22.7
46								
48	B1@47.5' ◧				- trace medium-grained	57		25.7
50	B1@50' ■					50 (5")	103.6	23.4

Total depth of boring: 50.5 feet.
Fill to 1.5 feet.
Groundwater encountered at 7 feet.
Backfilled with cement bentonite grout.
Surface restored.

*Penetration resistance for 140-pound hammer falling 30 inches by auto-hammer.

Figure A1,
Log of Boring 1, Page 2 of 2

SAMPLE SYMBOLS
☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
▨ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. W1033-88-01

BORING 2

ELEV. (MSL.) **--** DATE COMPLETED **08/05/2019**

EQUIPMENT **Mud Rotary** BY: **JS**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT)*	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0	BULK 0-5'				**5" AC / 9" Base** **ARTIFICIAL FILL** Sand, poorly graded, medium dense, moist, light brown, fine-grained with some medium-grained, some shell fragments.			
2	B2@2.5'				**BEACH DEPOSITS** Sand, poorly graded, medium dense, moist, light brown, fine- to medium-grained, trace shell fragments.	29	102.4	6.5
4	B2@5'			SP	- loose, moist to wet, olive brown, fine-grained, some fine gravel	11	89.7	22.2
6			▼					
8	B2@7.5'				- medium dense, wet, fine-grained with some medium-grained	27	103.8	18.9
10	B2@10'				**OLD MARINE DEPOSITS** Sand, dense, fine- to medium-grained, olive brown, trace fine shell fragments.	57	106.8	19.5
12	B2@12.5'				- increase in shell fragments, trace coarse-grained sand	68	108.5	18.9
14				SP				
16	B2@15'					62	107.8	18.8
18								
20	B2@20				- moist, decrease in coarse-grained sand and shell fragments	71	100.0	25.3

Total depth of boring: 20.5 feet.
Fill to 1.5 feet.
Groundwater encountered at 6 feet.
Backfilled with cement bentonite grout.
Surface restored.

*Penetration resistance for 140-pound hammer falling 30 inches by auto-hammer.

W1033-88-01 BORING LOGS.GPJ

Figure A2,
Log of Boring 2, Page 1 of 1

SAMPLE SYMBOLS
☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

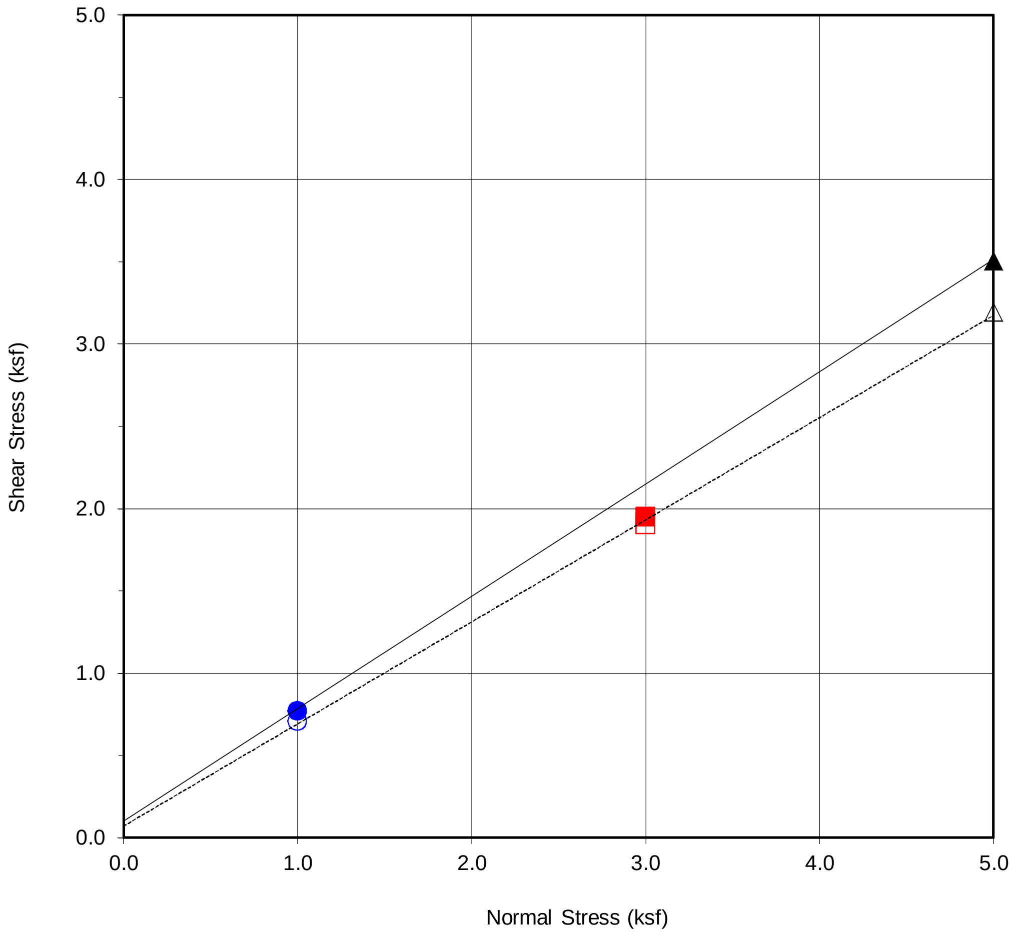
NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

APPENDIX B

APPENDIX B

LABORATORY TESTING

Laboratory tests were performed in accordance with generally accepted test methods of the “American Society for Testing and Materials (ASTM)”, or other suggested procedures. Selected samples were tested for direct shear strength, consolidation and expansion characteristics, moisture density relationships, grain-size, corrosivity, in-place dry density and moisture content. The results of the laboratory tests are summarized in Figures B1 through B13. The in-place dry density and moisture content of the samples tested are presented in the boring logs, Appendix A.



Boring No.	**B-2**
Sample No.	**B2@0-5**
Depth (ft)	**0-5**
Sample Type:	Ring

Soil Identification:

Light Brown Sand (SP)

Strength Parameters

	C (psf)	ϕ (°)
Peak	100	34.3
Ultimate	71	31.8

Normal Stress (kip/ft2)	1	3	5
Peak Shear Stress (kip/ft²)	● 0.77	■ 1.95	▲ 3.50
Shear Stress @ End of Test (ksf)	○ 0.71	□ 1.90	△ 3.19
Deformation Rate (in./min.)	0.005R	0.005R	0.005R
Initial Sample Height (in.)	1.0	1.0	1.0
Ring Inside Diameter (in.)	2.375	2.375	2.375
Initial Moisture Content (%)	13.4	12.9	10.2
Initial Dry Density (pcf)	89.6	90.0	92.2
Initial Degree of Saturation (%)	41.0	40.1	33.1
Soil Height Before Shearing (in.)	1.2	1.2	1.2
Final Moisture Content (%)	22.7	22.9	22.1

GEOCON

DIRECT SHEAR TEST RESULTS

Consolidated Drained ASTM D-3080

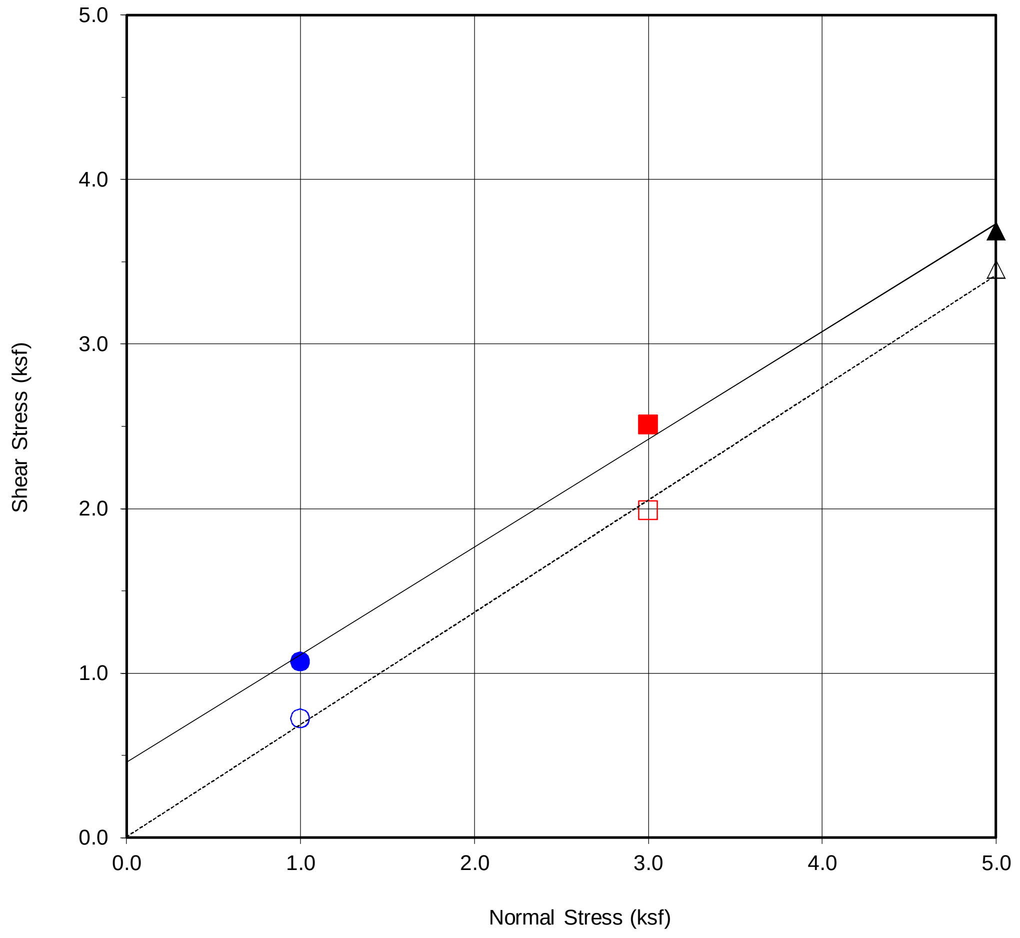
Checked by: PZ

Project No.: W1033-88-01

50 Main Street
Newport Beach, CA

Sept. 2019

Figure B1



Boring No.	**B-2**
Sample No.	**B2@2.5**
Depth (ft)	**2.5**
Sample Type:	Ring

Soil Identification:
Light Brown Sand (SP)

Strength Parameters

	C (psf)	ϕ (°)
Peak	457	33.2
Ultimate	5	34.3

Normal Stress (kip/ft2)	1	3	5
Peak Shear Stress (kip/ft²)	● 1.07	■ 2.51	▲ 3.69
Shear Stress @ End of Test (ksf)	○ 0.72	□ 1.99	△ 3.45
Deformation Rate (in./min.)	0.01	0.01	0.01
Initial Sample Height (in.)	1.0	1.0	1.0
Ring Inside Diameter (in.)	2.375	2.375	2.375
Initial Moisture Content (%)	15.1	9.0	10.0
Initial Dry Density (pcf)	97.6	98.2	101.1
Initial Degree of Saturation (%)	56.0	33.8	40.5
Soil Height Before Shearing (in.)	1.2	1.2	1.2
Final Moisture Content (%)	23.0	21.3	20.9

GEOCON

DIRECT SHEAR TEST RESULTS

Consolidated Drained ASTM D-3080

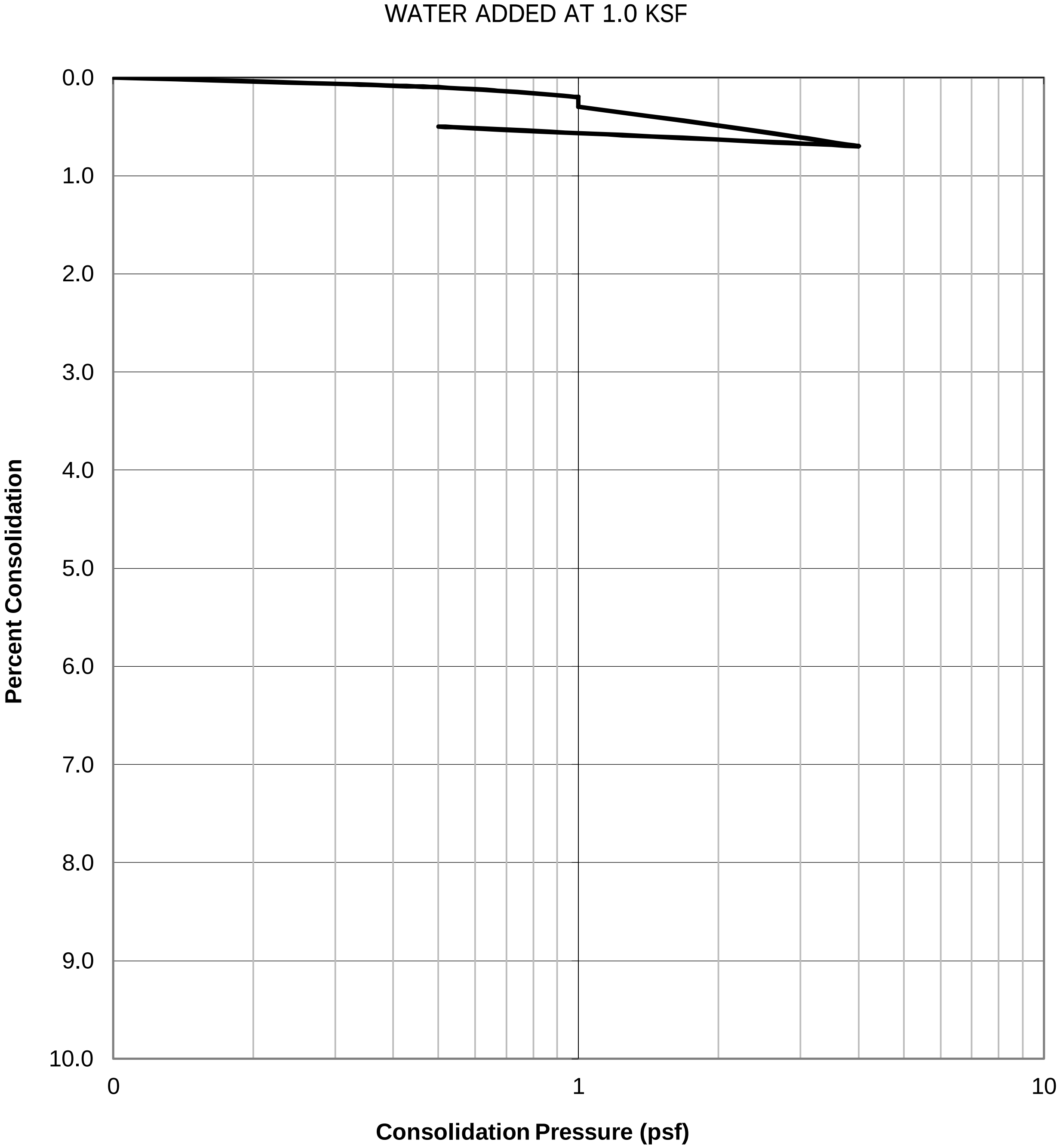
Checked by: PZ

Project No.: W1033-88-01

50 Main Street
Newport Beach, CA

Sept. 2019

Figure B2



SAMPLE ID.	SOIL TYPE	DRY DENSITY (PCF)	INITIAL MOISTURE (%)	FINAL MOISTURE (%)
B1@2.5	Light Brown Sand (SP)	99.1	15.1	19.7

GEOCON

CONSOLIDATION TEST RESULTS

ASTM D-2435

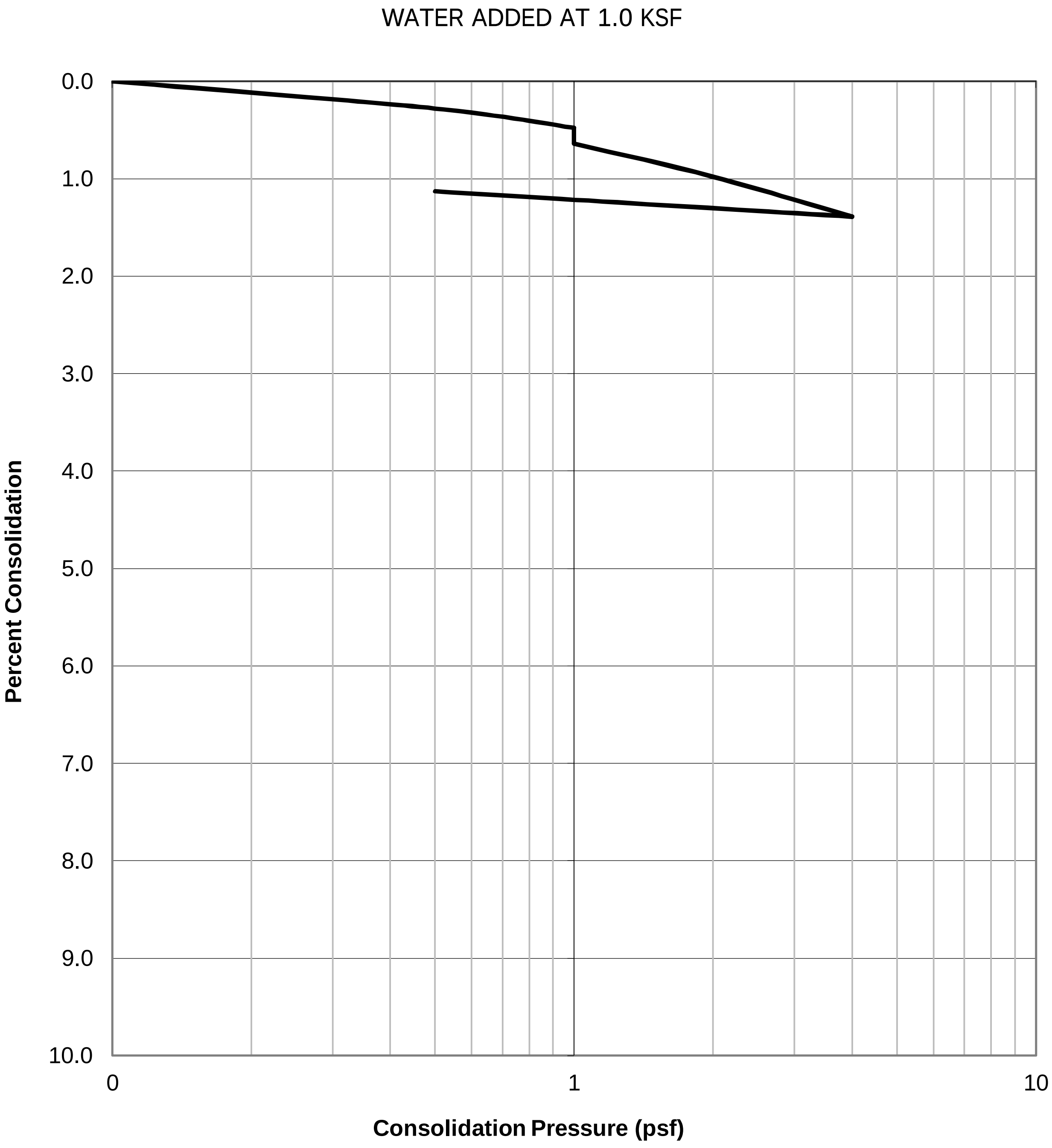
Checked by: PZ

Project No.: W1033-88-01

50 Main Street
Newport Beach, CA

Sept. 2019

Figure B3



SAMPLE ID.	SOIL TYPE	DRY DENSITY (PCF)	INITIAL MOISTURE (%)	FINAL MOISTURE (%)
B2@5	Olive Brown Sand (SP)	98.2	24.9	24.1

GEOCON

CONSOLIDATION TEST RESULTS

ASTM D-2435

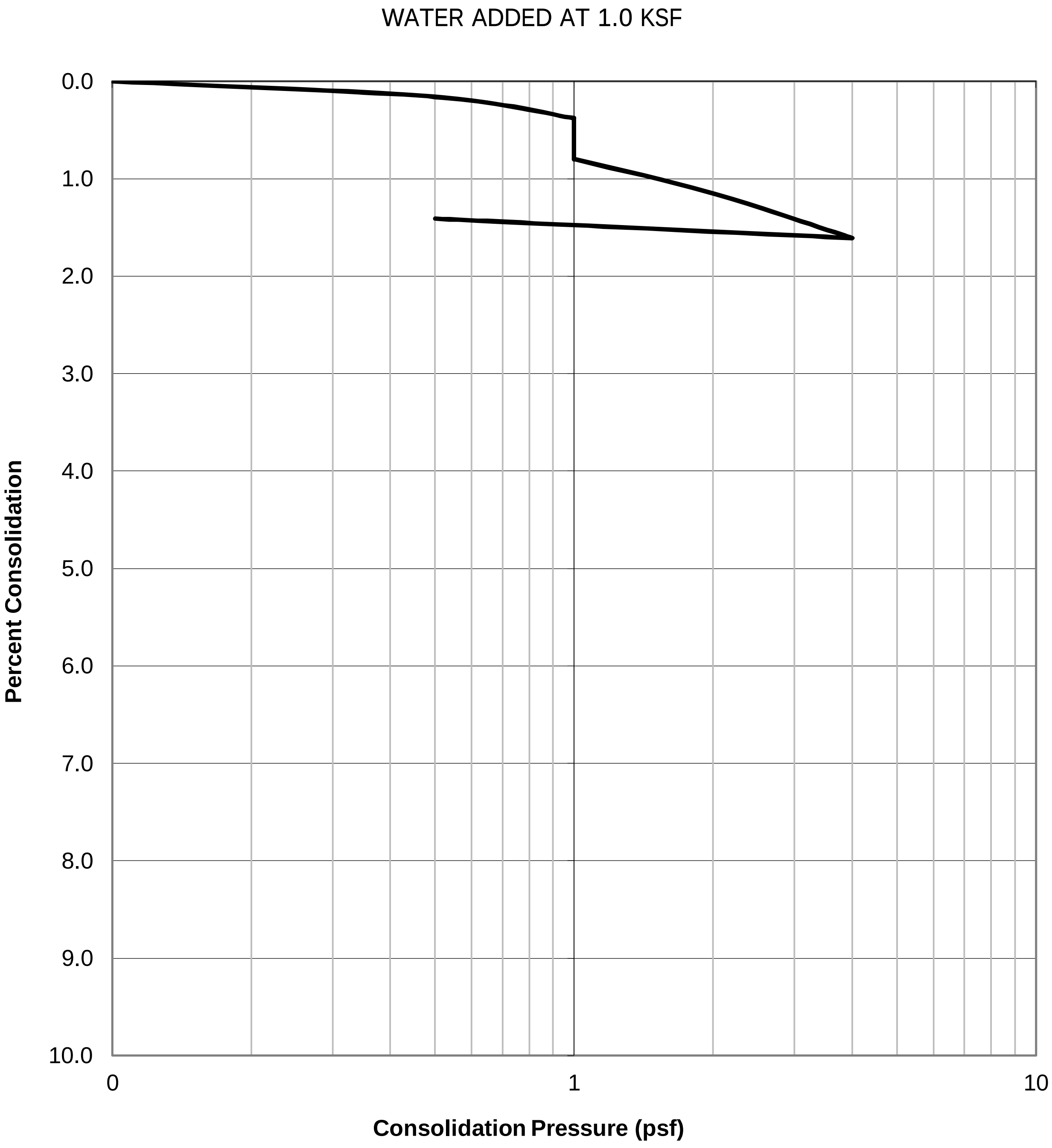
Checked by: PZ

Project No.: W1033-88-01

50 Main Street
Newport Beach, CA

Sept. 2019

Figure B4



SAMPLE ID.	SOIL TYPE	DRY DENSITY (PCF)	INITIAL MOISTURE (%)	FINAL MOISTURE (%)
B1@7.5	Brown Sand (SP)	99.9	18.7	20.8

GEOCON

CONSOLIDATION TEST RESULTS

ASTM D-2435

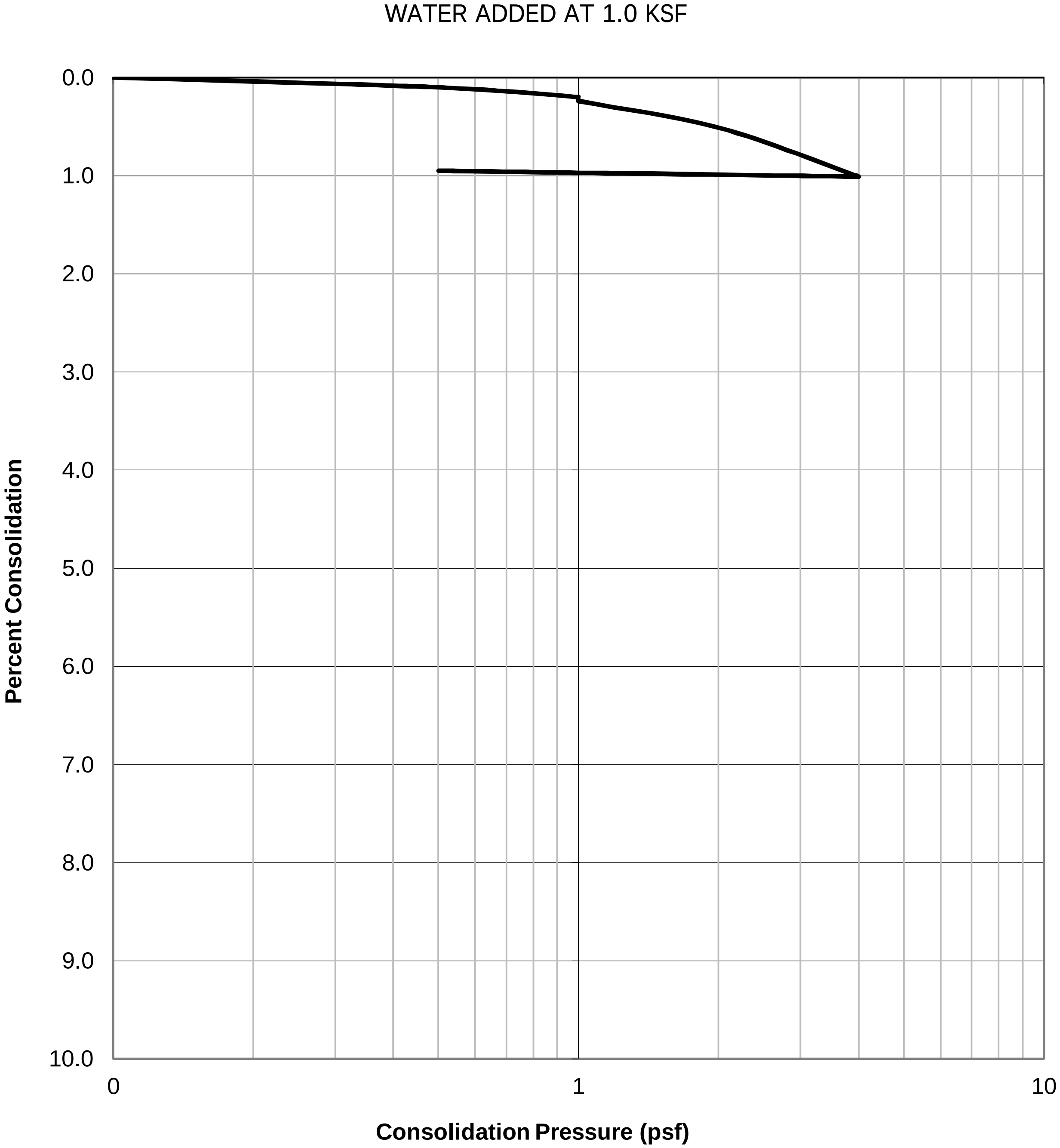
Checked by: PZ

Project No.: W1033-88-01

50 Main Street
Newport Beach, CA

Sept. 2019

Figure B5



SAMPLE ID.	SOIL TYPE	DRY DENSITY (PCF)	INITIAL MOISTURE (%)	FINAL MOISTURE (%)
B2@10	Olive Brown Sand (SP)	103.5	20.0	20.8

GEOCON

CONSOLIDATION TEST RESULTS

ASTM D-2435

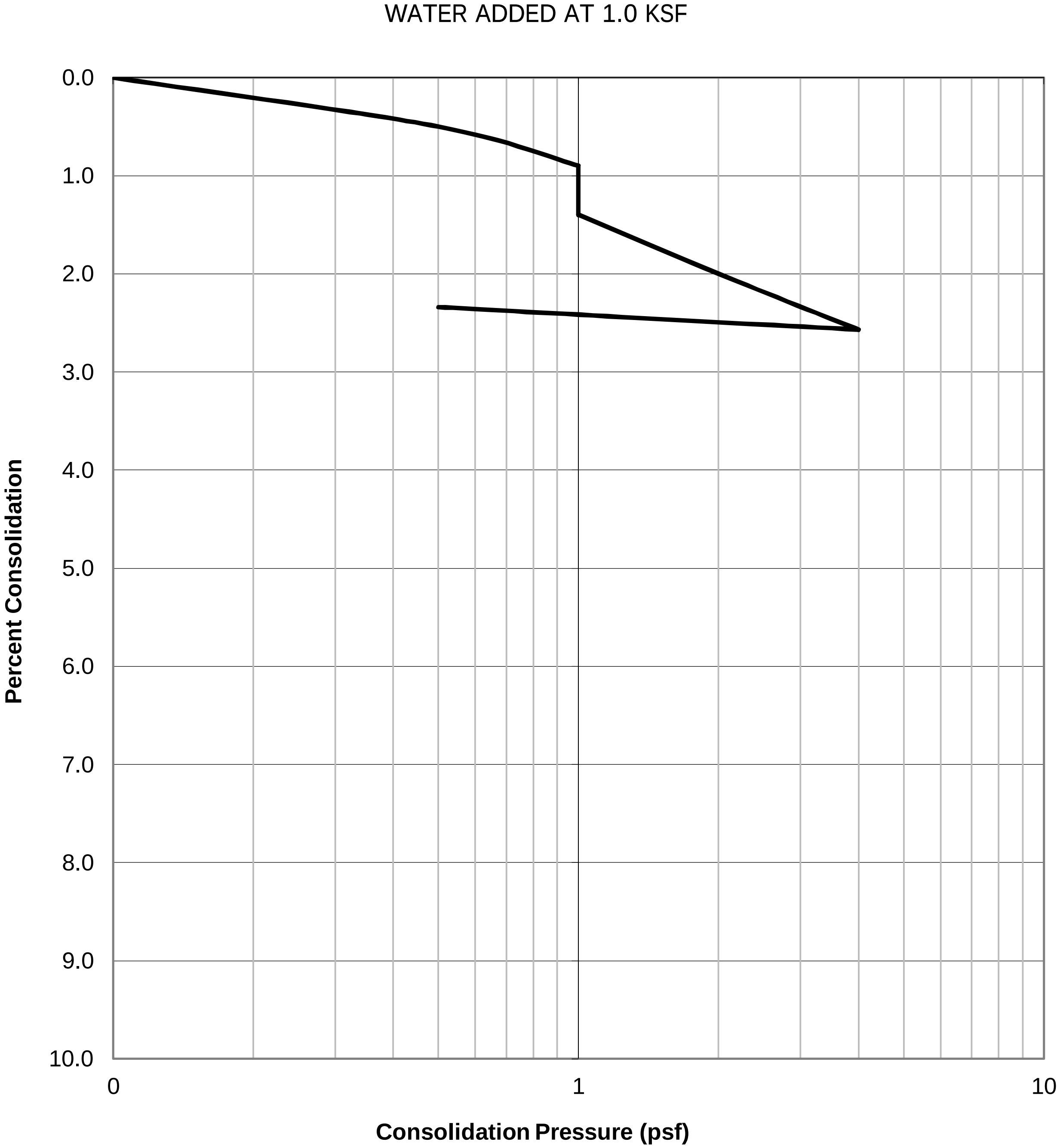
Checked by: PZ

Project No.: W1033-88-01

50 Main Street
Newport Beach, CA

Sept. 2019

Figure B6



SAMPLE ID.	SOIL TYPE	DRY DENSITY (PCF)	INITIAL MOISTURE (%)	FINAL MOISTURE (%)
B1@12.5	Brown Sand (SP)	107.9	20.7	21.6

GEOCON

CONSOLIDATION TEST RESULTS

ASTM D-2435

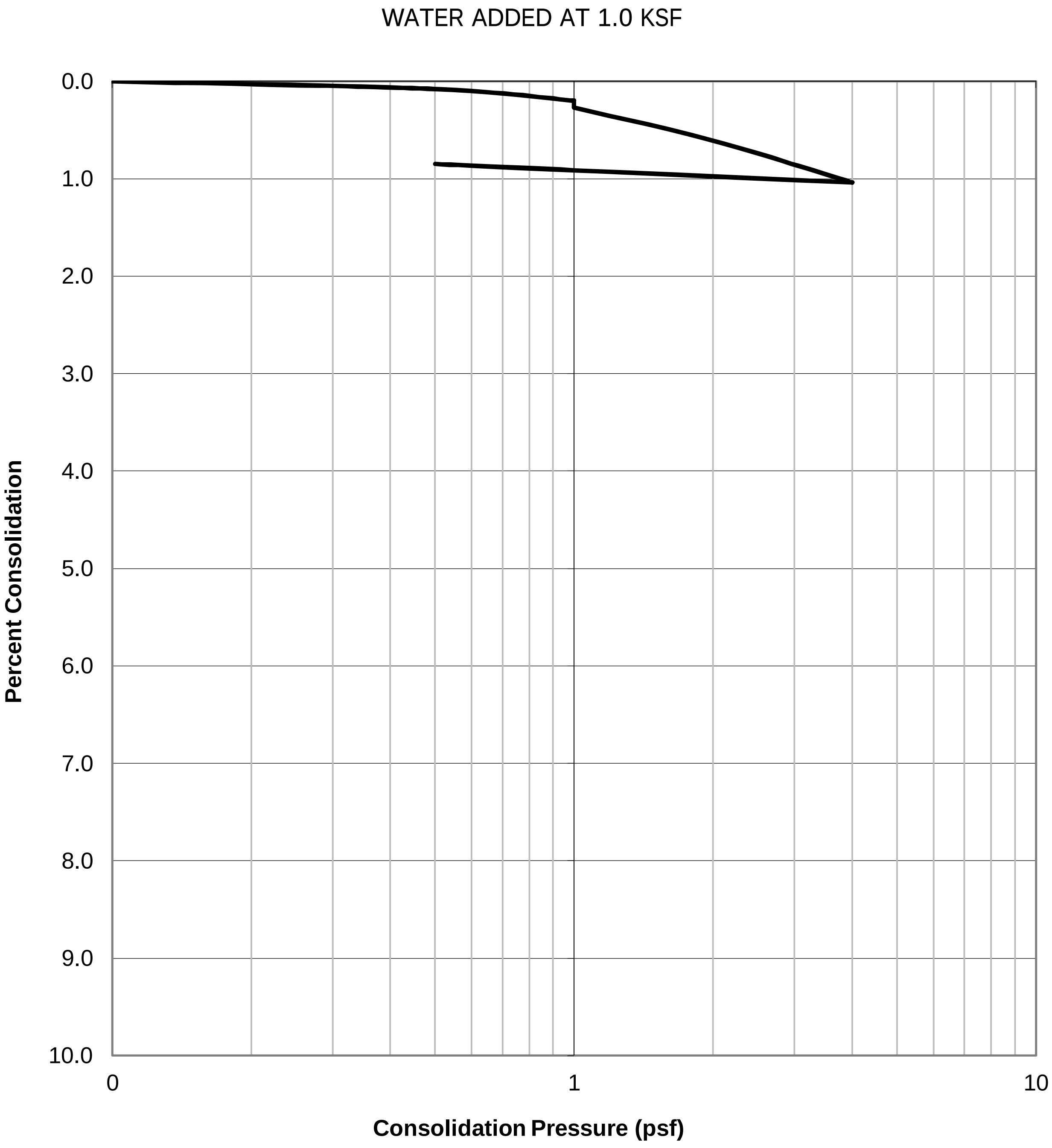
Checked by: PZ

Project No.: W1033-88-01

50 Main Street
Newport Beach, CA

Sept. 2019

Figure B7



SAMPLE ID.	SOIL TYPE	DRY DENSITY (PCF)	INITIAL MOISTURE (%)	FINAL MOISTURE (%)
B2@15	Olive Brown Sand (SP)	101.9	22.5	23.3

GEOCON

CONSOLIDATION TEST RESULTS

ASTM D-2435

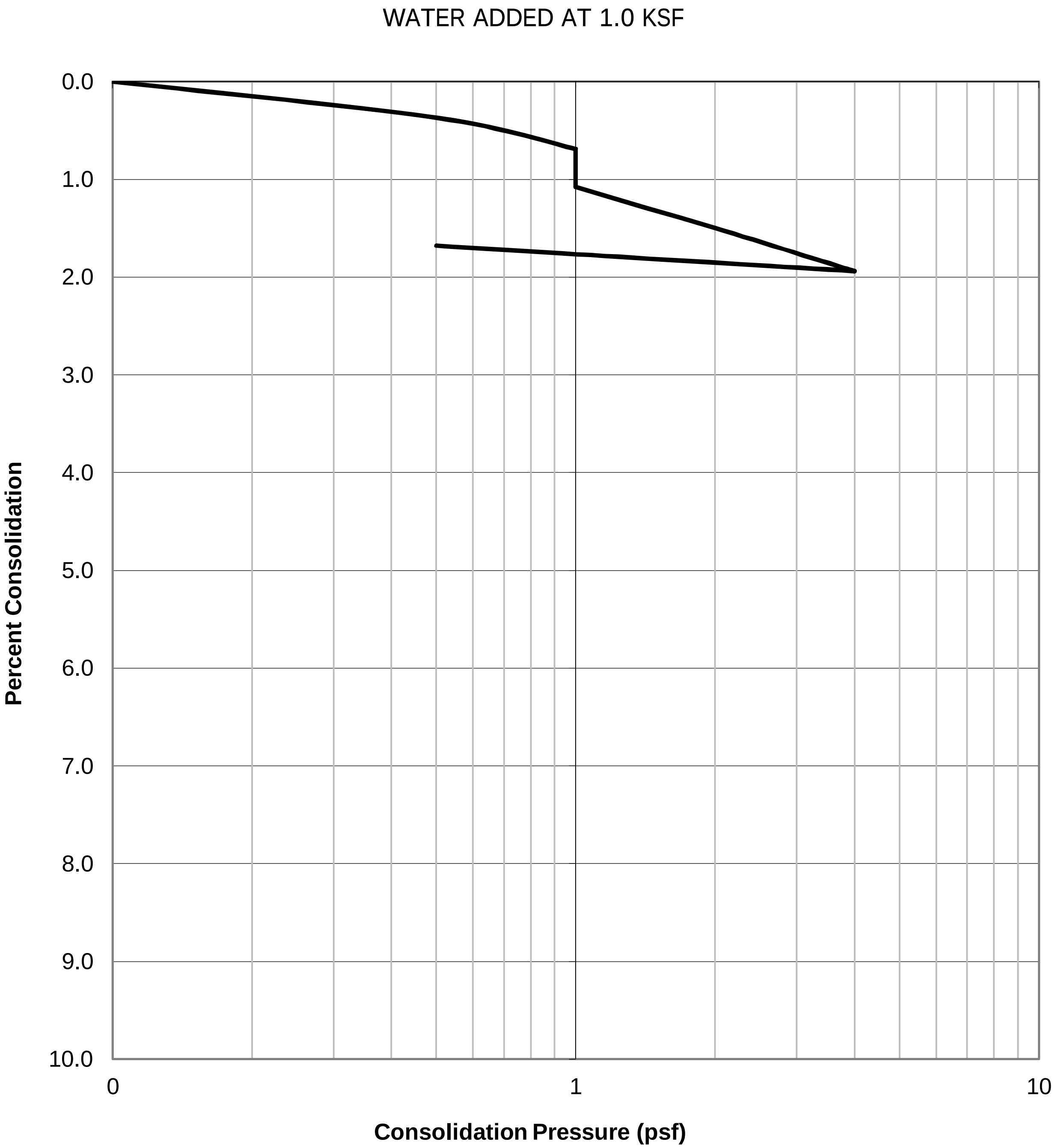
Checked by: PZ

Project No.: W1033-88-01

50 Main Street
Newport Beach, CA

Sept. 2019

Figure B8



SAMPLE ID.	SOIL TYPE	DRY DENSITY (PCF)	INITIAL MOISTURE (%)	FINAL MOISTURE (%)
B2@20	Olive Brown Sand (SP)	95.8	27.1	28.2

GEOCON

CONSOLIDATION TEST RESULTS

ASTM D-2435

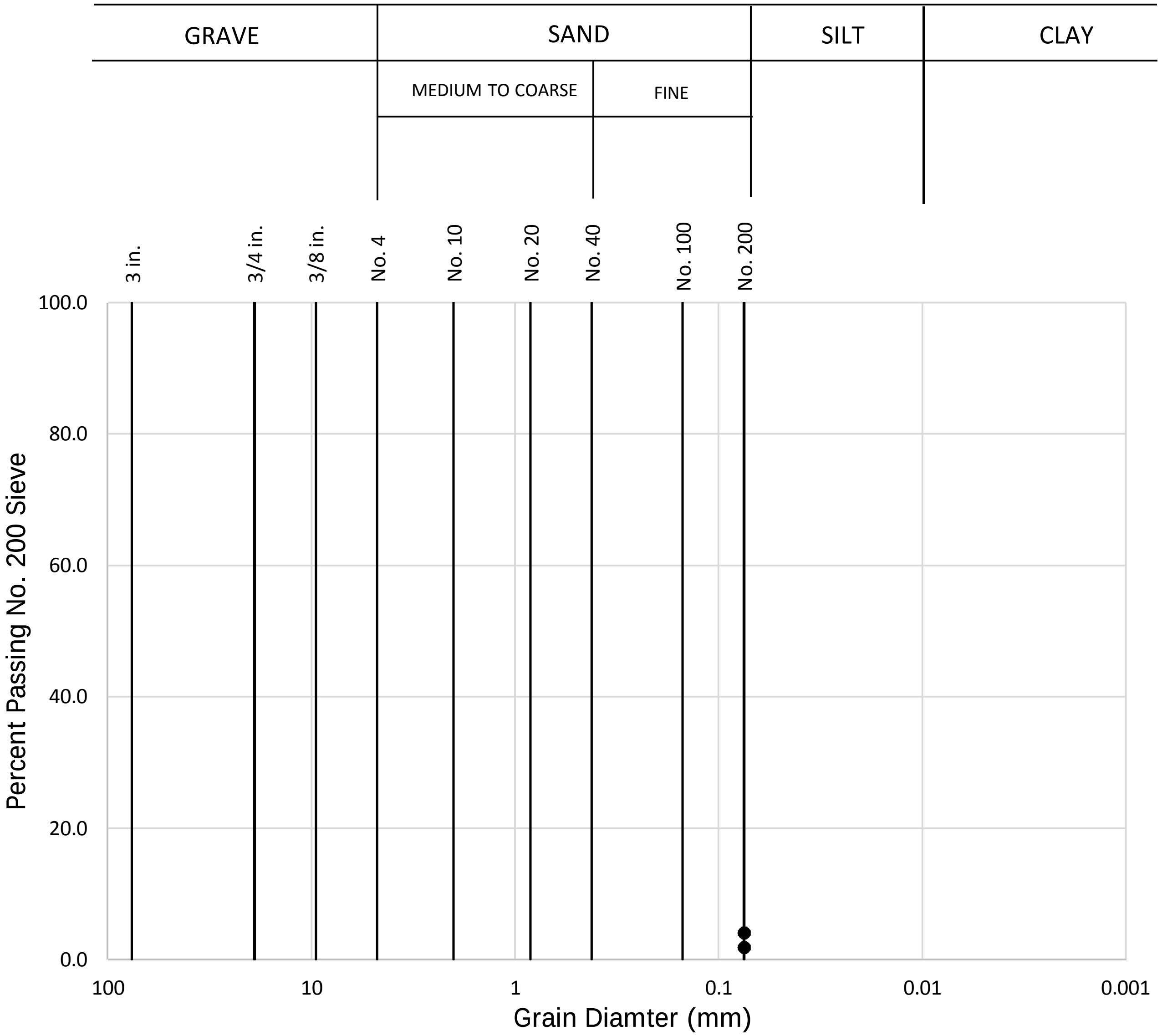
Checked by: PZ

Project No.: W1033-88-01

50 Main Street
Newport Beach, CA

Sept. 2019

Figure B9



Sample No.	Percent Passing No. 200 Sieve
B-1 @ 5'	1.8
B-1 @ 10'	4.0

GEOCON

GRAIN SIZE ANALYSIS

ASTM D-1140

Checked by: PZ

Project No.: W1033-88-01

50 Main Street
Newport Beach, CA

Sept. 2019

Figure B10

B2@0-5

MOLDED SPECIMEN		BEFORE TEST	AFTER TEST
Specimen Diameter	(in.)	4.0	4.0
Specimen Height	(in.)	1.0	1.0
Wt. Comp. Soil + Mold	(gm)	541.0	569.7
Wt. of Mold	(gm)	171.4	171.4
Specific Gravity	(Assumed)	2.7	2.7
Wet Wt. of Soil + Cont.	(gm)	677.4	569.7
Dry Wt. of Soil + Cont.	(gm)	662.7	351.5
Wt. of Container	(gm)	377.4	171.4
Moisture Content	(%)	5.2	13.3
Wet Density	(pcf)	111.5	120.0
Dry Density	(pcf)	106.0	105.9
Void Ratio		0.6	0.6
Total Porosity		0.4	0.4
Pore Volume	(cc)	76.8	75.3
Degree of Saturation	(%) [S_{meas}]	24.0	62.3

Date	Time	Pressure (psi)	Elapsed Time (min)	Dial Readings (in.)
8/13/2019	10:00	1.0	0	0.4051
8/13/2019	10:10	1.0	10	0.4053
Add Distilled Water to the Specimen				
8/14/2019	10:00	1.0	1430	0.3977
8/14/2019	11:00	1.0	1490	0.3977

Expansion Index (EI meas) =	-7.6
Expansion Index (Report) =	**0**

Expansion Index, EI_{50}	CBC CLASSIFICATION *	UBC CLASSIFICATION **
0-20	Non-Expansive	Very Low
21-50	Expansive	Low
51-90	Expansive	Medium
91-130	Expansive	High
>130	Expansive	Very High

* Reference: 2016 California Building Code, Section 1803.5.3

** Reference: 1997 Uniform Building Code, Table 18-I-B.

GEOCON

EXPANSION INDEX TEST RESULTS

ASTM D 4829

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Project No.: W1033-88-01

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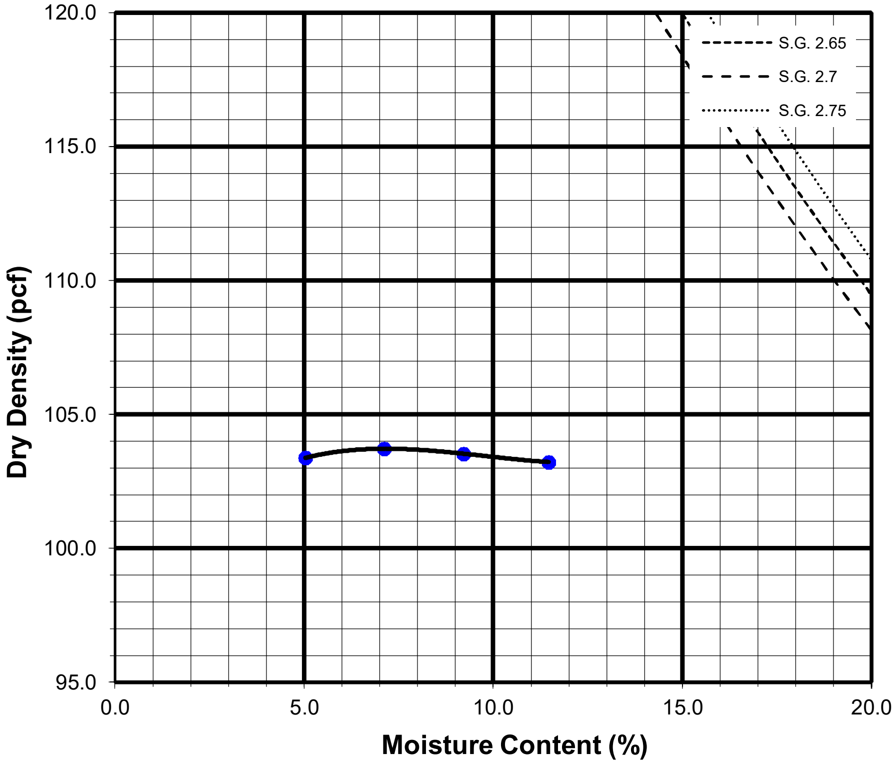
Figure B11

Sample No:

B2@0-5	Light Brown Sand (SP)

TEST NO.		1	2	3	4	5	6
Wt. Compacted Soil + Mold	(g)	5936	5974	6004	6034		
Weight of Mold	(g)	4296	4296	4296	4296		
Net Weight of Soil	(g)	1640	1678	1708	1738		
Wet Weight of Soil + Cont.	(g)	1914.3	1938.4	2053.0	2097.1		
Dry Weight of Soil + Cont.	(g)	1840.8	1834.9	1911.7	1920.1		
Weight of Container	(g)	378.5	378.7	378.7	377.1		
Moisture Content	(%)	5.0	7.1	9.2	11.5		
Wet Density	(pcf)	108.6	111.1	113.1	115.1		
Dry Density	(pcf)	103.4	103.7	103.5	103.2		

Maximum Dry Density (pcf)	**104.4**	**Optimum Moisture Content (%)**	**8.2**



Preparation Method: A

GEOCON

MODIFIED COMPACTION TEST OF SOILS

ASTM D-1557

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Project No.: W1033-88-01

50 Main Street
Newport Beach, CA

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Figure B12

SUMMARY OF LABORATORY POTENTIAL OF HYDROGEN (pH) AND RESISTIVITY TEST RESULTS

CALIFORNIA TEST NO. 643

Sample No.	**pH**	**Resistivity (ohm centimeters)**
B2 @ 0-5	8.9	7500 (Moderately Corrosive)

SUMMARY OF LABORATORY CHLORIDE CONTENT TEST RESULTS

EPA NO. 325.3

Sample No.	Chloride Ion Content (%)
B2 @ 0-5	0.108

SUMMARY OF LABORATORY WATER SOLUBLE SULFATE TEST RESULTS

CALIFORNIA TEST NO. 417

Sample No.	**Water Soluble Sulfate (% SQ_4)**	**Sulfate Exposure***
B2 @ 0-5	0.000	S0

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CORROSIVITY TEST RESULTS

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Figure B13