

Appendix F  
Preliminary Water Quality Management Plan

**WQ XX-XXXX**

**Priority Project  
Water Quality Management Plan  
(WQMP)**

**MAGNOLIA AND WARNER  
16800 MAGNOLIA ST. AND 9025 RECREATION CIR.  
FOUNTAIN VALLEY, CA 92708  
APN: 143-301-31; 143-301-32; 143-294-02; 143-294-01**

**Prepared for:  
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**Prepared by:  
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**18 November, 2024**

**Revised 17 February, 2025**

**Priority Project Water Quality Management Plan (WQMP)**  
**Magnolia and Warner**

<b>Project Owner's Certification</b>			
Planning Application No. (If applicable)	Precise Plan 580	Grading Permit No.	N/A
Tract/Parcel Map and Lot(s) No.	P.M. 82/19 Lots 1, 2, 3, and 4	Building Permit No.	N/A
Address of Project Site and APN (If no address, specify Tract/Parcel Map and Lot Numbers)		16800 Magnolia St and 9025 Recreation Cir., Fountain Valley, CA 92708  143-301-31; 143-301-32; 143-294-02; 143-294-01	

This Water Quality Management Plan (WQMP) has been prepared for Holland Acquisition Co., LLC by Labib Funk + Associates. 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.

<b>Owner: George J. Elum</b>			
Title	Managing Director		
Company	Holland Acquisition Co., LLC		
Address	5000 E. Spring St., Suite 500, Long Beach, CA 90815		
Email	<a href="mailto:gelum@hollandprtnergrou.com">gelum@hollandprtnergrou.com</a>		
Telephone #	562-235-5326		
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	

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<b>Preparer (Engineer):</b>			
Title	Frank LaRocca	PE Registration #	C75121
Company	Labib Funk + Associates		
Address	319 Main St., El Segundo, CA 90245		
Email	<a href="mailto:Frank.larocca@labibfunk.com">Frank.larocca@labibfunk.com</a>		
Telephone #	(213) 239-9700		
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	19 Feb. 2025
Place Stamp Here			

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## Attachments

<b>Appendix A.....</b>	<b>Educational Materials</b>
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## **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).

<b>Project Information</b>	
Permit/ Application No. (If applicable)	Precise Plan 580
Grading or Building Permit No. (If applicable)	N/A
Address of Project Site (or Tract Map and Lot Number if no address) and APN	16800 Magnolia St and 9025 Recreation Cir. Fountain Valley, CA 92708 APN: 143-301-31; 143-301-32; 143-294-02; 143-294-01
<b>Water Quality Conditions of Approval or Issuance</b>	
Water Quality Conditions of Approval or Issuance applied to this project. (Please list verbatim.)	N/A
<b>Conceptual WQMP</b>	
Was a Conceptual Water Quality Management Plan previously approved for this project?	N/A

**Watershed-Based Plan Conditions**

Provide applicable conditions from watershed - based plans including WIHMPs and TMDLS.

East-Garden Grove Wintersburg Channel; Bolsa Bay March; Huntington Harbor; Anaheim Bay; Pacific Ocean

## **Section II Project Description**

### **II.1 Project Description**

Provide a detailed project description including:

- Project areas;
- Land uses;
- Land cover;
- Design elements;
- A general description not broken down by drainage management areas (DMAs).

Include attributes relevant to determining applicable source controls. *Refer to Section 2.2 in the Technical Guidance Document (TGD) for information that must be included in the project description.*

<b>Description of Proposed Project</b>				
Development Category (From Model WQMP, Table 7.11-2; or -3):	8. 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.			
Project Area (ft <sup>2</sup> ): 299,117	Number of Dwelling Units: 657		SIC Code: 1522	
Project Area	Pervious		Impervious	
	Area (acres or sq ft)	Percentage	Area (acres or sq ft)	Percentage
Pre-Project Conditions	51,612 sq ft	17.3%	247,505 sq ft	82.7%
Post-Project Conditions	42,298 sq ft	14.1%	256,819 sq ft	85.9%
Drainage Patterns/Connections	Runoff generated from existing hardscape sheetflows along existing contours and existing ribbon gutters before entering private storm drain catch basins.			

<p>Narrative Project Description: (Use as much space as necessary.)</p>	<p>Redevelopment of existing lots to two, seven story mixed use structures with at-grade parking. Existing lots were previously developed as an amusement park and mini golf course. The project proposes new landscape, asphalt, and concrete at grade. Project improvements are proposed on entirety of site, at 299,117 sq ft. Typical construction materials and wastes are expected during the construction phase, and typical residential and retail wastes are expected to be generated after the project is completed. Construction materials will be stored on site during construction. The project proposes Contech Modular Wetland units to treat DCV generated onsite.</p>
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## II.2 Potential Stormwater Pollutants

Determine and list expected stormwater pollutants based on land uses and site activities. *Refer to Section 2.2.2 and Table 2.1 in the Technical Guidance Document (TGD) for guidance.*

<b>Pollutants of Concern</b>			
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 <input checked="" type="checkbox"/>	N <input type="checkbox"/>	Expected per TGD Table 2.1
Nutrients	E <input checked="" type="checkbox"/>	N <input type="checkbox"/>	Expected in landscaping areas per TGD Table 2.1
Heavy Metals	E <input type="checkbox"/>	N <input checked="" type="checkbox"/>	Not expected
Pathogens (Bacteria/Virus)	E <input checked="" type="checkbox"/>	N <input type="checkbox"/>	Expected per TGD Table 2.1
Pesticides	E <input checked="" type="checkbox"/>	N <input type="checkbox"/>	Expected in landscaping areas per TGD Table 2.1
Oil and Grease	E <input checked="" type="checkbox"/>	N <input type="checkbox"/>	Expected in parking areas per TGD Table 2.1
Toxic Organic Compounds	E <input type="checkbox"/>	N <input checked="" type="checkbox"/>	Not expected.
Trash and Debris	E <input checked="" type="checkbox"/>	N <input type="checkbox"/>	Expected per TGD Table 2.1

### **II.3 Hydrologic Conditions of Concern**

Determine if streams located downstream from the project area are potentially susceptible to hydromodification impacts. *Refer to Section 2.2.3.1 in the Technical Guidance Document (TGD) for North Orange County or Section 2.2.3.2 for South Orange County.*

No - Show map

Yes - Describe applicable hydrologic conditions of concern below. *Refer to Section 2.2.3 in the Technical Guidance Document (TGD).*

See map in Appendix B.

## **II.4 Post Development Drainage Characteristics**

Describe post development drainage characteristics. *Refer to Section 2.2.4 in the Technical Guidance Document (TGD).*

Stormwater that falls on the project site will be routed via downspouts and on-site storm drain network to modular wetland units for WQMP compliance, and any overflow will be discharged to an on-site storm drain overflow system. This overflow will connect to the existing Orange County Flood Control District double box culvert that is currently running through the project site. This existing public culvert is a part of the Anaheim Bay-Huntington Harbor Watershed and connects to the Ocean View Channel, before entering the Wintersburg Channel and discharging to the Pacific Ocean via Bolsa Bay Marsh, Huntington Harbor, and Anaheim Bay.

## **II.5 Property Ownership/Management**

Describe property ownership/management. *Refer to Section 2.2.5 in the Technical Guidance Document (TGD).*

Project is owned and operated by private owners, who will be responsible for the long term maintenance of the project's stormwater facilities.

## **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)	
Location/Address	16800 Magnolia St. and 9025 Recreation Cir.
	Fountain Valley, CA 92708
General Plan Land Use Designation	General Commercial
Zoning	C-2 General Commercial
Acreage of Project Site	Total Site Area = 6.87 ac
Predominant Soil Type	B

### **III.2 Site Characteristics**

Fill out table with relevant information and include information regarding BMP sizing, suitability, and feasibility, as applicable. *Refer to Section 2.3.2 in the Technical Guidance Document (TGD).*

<b>Site Characteristics</b>	
Precipitation Zone	The rainfall zone for the site has a design capture storm depth of 0.75" based on the Rainfall Zones map in the TGD on Figure XVI-1 and included in Appendix B.
Topography	The site ranges from 45' to 28' above sea level, generally sloping to the south.

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<p>Drainage Patterns/Connections</p>	<p>Currently the site has two drainage areas, roughly dividing the project site into thirds. The northern two-thirds of the site drain towards existing concrete swales which direct flows towards on-site catch basins connected to the existing OCFC storm drain box culvert that runs through the site. The southern third of the site drains toward curb and gutter on Recreation Circle, which then directs runoff to an existing curb inlet catch basin on Magnolia Ave. The catch basin is then connected to the existing OCFC storm drain box culvert within public right of way.</p> <p>The proposed site will be divided into six drainage areas, each draining to a modular wetland system. The overflow from the northern 4 drainage areas discharge into a direct connection to the existing OCFC storm drain, while the overflow from the southern 2 drainage areas will connect to an existing catch basin on Magnolia Ave.</p>
<p>Soil Type, Geology, and Infiltration Properties</p>	<p>Soil Type B</p>
<p>Hydrogeologic (Groundwater) Conditions</p>	<p>Groundwater encountered in borings at 9-10'. Historic high groundwater reported at 5' below grade.</p>
<p>Geotechnical Conditions (relevant to infiltration)</p>	<p>Soils on site exhibit potential for liquefaction between depths of 5' to 25'</p>
<p>Off-Site Drainage</p>	<p>No anticipated sources of run-on to the proposed site.</p>
<p>Utility and Infrastructure Information</p>	<p>Existing subsurface utilities are shown on the WQMP site plan as per available as-built records.</p>

**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).*

<p>Receiving Waters</p>	<p>East Garden Grove Wintersburg Channel          Bolsa Bay Marsh          Huntington Harbor</p>
<p>303(d) Listed Impairments</p>	<p>Ammonia, Unionized (East Garden Grove Wintersburg Channel)          Toxicity (Bolsa Bay Marsh)</p>

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	Lead, Toxicity, Chlordane, Indicator Bacteria, Copper, PCBs (Huntington Harbor)
Applicable TMDLs	No TMDL data have been recorded for this waterbody
Pollutants of Concern for the Project	Pathogens are expected to be generated by this project site
Environmentally Sensitive and Special Biological Significant Areas	None known at this time

## Section IV Best Management Practices (BMPs)

### IV. 1 Project Performance Criteria

Describe project performance criteria. Several steps must be followed in order to determine what performance criteria will apply to a project. These steps include:

- If the project has an approved WIHMP or equivalent, then any watershed specific criteria must be used and the project can evaluate participation in the approved regional or sub-regional opportunities. (Please ask your assigned planner or plan checker regarding whether your project is part of an approved WIHMP or equivalent.)
- Determine applicable hydromodification control performance criteria. *Refer to Section 7.II-2.4.2.2 of the Model WQMP.*
- Determine applicable LID performance criteria. *Refer to Section 7.II-2.4.3 of the Model WQMP.*
- Determine applicable treatment control BMP performance criteria. *Refer to Section 7.II-3.2.2 of the Model WQMP.*
- Calculate the LID design storm capture volume for the project. *Refer to Section 7.II-2.4.3 of the Model WQMP.*

<p>(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?</p>	<p>YES <input type="checkbox"/></p>	<p>NO <input checked="" type="checkbox"/></p>
<p>If yes, describe WIHMP feasibility criteria or regional/sub-regional LID opportunities.</p>		

<b>Project Performance Criteria</b>	
<p>If HCOC exists, list applicable hydromodification control performance criteria (Section 7.II-2.4.2.2 in MWQMP)</p>	
<p>List applicable LID performance criteria (Section 7.II-2.4.3 from MWQMP)</p>	<p>Priority Projects must infiltrate, harvest and use, evapotranspire, or biotreat/biofilter the 85<sup>th</sup> percentile, 24-hour storm event (DCV). LID BMPs must be designed to retain, onsite, (infiltrate, harvest and use, or evapotranspire) stormwater runoff up to 80% average annual capture efficiency. LID BMPs must fulfill alternative compliance obligations for runoff volume not retained or biotreated up to 80% average annual capture efficiency using treatment controls or other alternative approaches.</p>
<p>List applicable treatment control BMP performance criteria (Section 7.II-3.2.2 from MWQMP)</p>	<p>If treatment control BMPs can treat all of the remaining unmet volume and have a medium to high effectiveness for reducing the primary PCs, the project is considered to be in compliance.</p>
<p>Calculate LID design storm capture volume for Project.</p>	<p>DCV = 11,813 CF                      See Appendix C for calculation</p>

## IV.2. Site Design and Drainage

Describe site design and drainage including

- A narrative of site design practices utilized or rationale for not using practices;
- A narrative of how site is designed to allow BMPs to be incorporated to the MEP
- A table of DMA characteristics and list of LID BMPs proposed in each DMA.
- Reference to the WQMP “BMP Exhibit.”
- Calculation of Design Capture Volume (DCV) for each drainage area.
- A listing of GIS coordinates for LID and Treatment Control BMPs.

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

See Attachment B for calculations

DMA ID	Drainage Area (ft <sup>2</sup> )	% Imp	Design Storm Depth (in)	Estimated Tc (min)	Rainfall Intensity (in/hr)	DCV (ft <sup>3</sup> )	Design Flow Rate (CFS)	BMP Type	Max BMP Capacity
DMA 1	51,596	93.3%	0.75	6.9	1.5	2,065	0.25	Contech flow based Modular Wetlands MWS-L-8-8-V	0.408 CFS
DMA 2	49,045	94.2%	0.75	7.1	1.5	1,976	0.237	Contech flow based Modular Wetlands MWS-L-8-12-V	0.611 CFS
DMA 3	23,360	91.7%	0.75	6.5	1.5	945	0.113	Contech flow based Modular Wetlands MWS-L-4-8-V	0.204 CFS
DMA 4	41,726	94.5%	0.75	8.0	1.5	1,617	0.189	Contech flow based Modular Wetlands MWS-L-8-8-V	0.408 CFS
DMA 5	53,211	93.4%	0.75	9.8	1.5	2,080	0.23	Contech flow based Modular Wetlands MWS-L-8-8-V	0.408 CFS
DMA 6	80,258	76.6%	0.75	9.3	1.5	3,130	0.31	Contech flow based Modular Wetlands MWS-L-8-12-V	0.611 CFS

### **IV.3 LID BMP Selection and Project Conformance Analysis**

Each sub-section below documents that the proposed design features conform to the applicable project performance criteria via check boxes, tables, calculations, narratives, and/or references to worksheets. Refer to Section 2.4.2.3 in the Technical Guidance Document (TGD) for selecting LID BMPs and Section 2.4.3 in the Technical Guidance Document (TGD) for conducting conformance analysis with project performance criteria.

#### **IV.3.1 Hydrologic Source Controls (HSCs)**

If required HSCs are included, fill out applicable check box forms. If the retention criteria are otherwise met with other LID BMPs, include a statement indicating HSCs not required.

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



### **IV.3.2 Infiltration BMPs**

Identify infiltration BMPs to be used in project. If design volume cannot be met, state why.

<b>Name</b>	<b>Included?</b>
Bioretention without underdrains	<input type="checkbox"/>
Rain gardens	<input type="checkbox"/>
Porous landscaping	<input type="checkbox"/>
Infiltration planters	<input type="checkbox"/>
Retention swales	<input type="checkbox"/>
Infiltration trenches	<input type="checkbox"/>
Infiltration basins	<input type="checkbox"/>
Drywells	<input type="checkbox"/>
Subsurface infiltration galleries	<input type="checkbox"/>
French drains	<input type="checkbox"/>
Permeable asphalt	<input type="checkbox"/>
Permeable concrete	<input type="checkbox"/>
Permeable concrete pavers	<input type="checkbox"/>
Other:	<input type="checkbox"/>
Other:	<input type="checkbox"/>

Show calculations below to demonstrate if the LID Design Storm Capture Volume can be met with infiltration BMPs. If not, document how much can be met with infiltration and document why it is not feasible to meet the full volume with infiltration BMPs.

Infiltration not deemed feasible due to site soil's poor infiltration capacity, presence of groundwater at shallow depths below grade, and liquefaction potential for site soil.

**IV.3.3 Evapotranspiration, Rainwater Harvesting BMPs**

If the full Design Storm Capture Volume cannot be met with infiltration BMPs, describe any evapotranspiration and/or rainwater harvesting BMPs included.

Name	Included?
<i>All HSCs; See Section IV.3.1</i>	<input type="checkbox"/>
Surface-based infiltration BMPs	<input type="checkbox"/>
Biotreatment BMPs	<input type="checkbox"/>
Above-ground cisterns and basins	<input type="checkbox"/>
Underground detention	<input type="checkbox"/>
Other:	<input type="checkbox"/>
Other:	<input type="checkbox"/>
Other:	<input type="checkbox"/>

Show calculations below to demonstrate if the LID Design Storm Capture Volume can be met with evapotranspiration and/or rainwater harvesting BMPs in combination with infiltration BMPs. If not, document below how much can be met with either infiltration BMPs, evapotranspiration, rainwater harvesting BMPs, or a combination, and document why it is not feasible to meet the full volume with these BMP categories.

Proposed planted area not sufficient for evapotranspiration/rainwater harvesting BMPs.

**IV.3.4 Biotreatment BMPs**

If the full Design Storm Capture Volume cannot be met with infiltration BMPs, and/or evapotranspiration and rainwater harvesting BMPs, describe biotreatment BMPs included. Include sections for selection, suitability, sizing, and infeasibility, as applicable.

Name	Included?
Bioretention with underdrains	<input type="checkbox"/>
Stormwater planter boxes with underdrains	<input type="checkbox"/>
Rain gardens with underdrains	<input type="checkbox"/>
Constructed wetlands	<input type="checkbox"/>
Vegetated swales	<input type="checkbox"/>
Vegetated filter strips	<input type="checkbox"/>
Proprietary vegetated biotreatment systems	<input checked="" type="checkbox"/>
Wet extended detention basin	<input type="checkbox"/>
Dry extended detention basins	<input type="checkbox"/>
Other:	<input type="checkbox"/>
Other:	<input type="checkbox"/>

Show calculations below to demonstrate if the LID Design Storm Capture Volume can be met with infiltration, evapotranspiration, rainwater harvesting and/or biotreatment BMPs. If not, document how much can be met with either infiltration BMPs, evapotranspiration, rainwater harvesting BMPs, or a combination, and document why it is not feasible to meet the full volume with these BMP categories.

Contech Flow Based Modular Wetland Units will be utilized for WQMP compliance on site. Units will be sized to treat the DCV generated by their respective tributary area. The sum total of the treated area equals the total area of the project site.

### IV.3.5 Hydromodification Control BMPs

Describe hydromodification control BMPs. *See Section 5 of the Technical Guidance Document (TGD).* Include sections for selection, suitability, sizing, and infeasibility, as applicable. Detail compliance with Prior Conditions of Approval (if applicable).

Hydromodification Control BMPs	
BMP Name	BMP Description

### IV.3.6 Regional/Sub-Regional LID BMPs

Describe regional/sub-regional LID BMPs in which the project will participate. *Refer to Section 7.II-2.4.3.2 of the Model WQMP.*

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. Describe treatment control BMPs including sections for selection, sizing, and infeasibility, as applicable.

<b>Treatment Control BMPs</b>	
<b>BMP Name</b>	<b>BMP Description</b>

### 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.

<b>Non-Structural Source Control BMPs</b>				
<b>Identifier</b>	<b>Name</b>	<b>Check One</b>		<b>If not applicable, state brief reason</b>
		<b>Included</b>	<b>Not Applicable</b>	
N1	Education for Property Owners, Tenants and Occupants	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
N2	Activity Restrictions	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
N3	Common Area Landscape Management	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
N4	BMP Maintenance	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
N5	Title 22 CCR Compliance (How development will comply)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Hazardous wastes not expected on site
N6	Local Industrial Permit Compliance	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Project is not an industrial site
N7	Spill Contingency Plan	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
N8	Underground Storage Tank Compliance	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No underground storage tanks are proposed
N9	Hazardous Materials Disclosure Compliance	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No hazardous material expected on proposed site
N10	Uniform Fire Code Implementation	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
N11	Common Area Litter Control	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
N12	Employee Training	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
N13	Housekeeping of Loading Docks	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No loading docks proposed
N14	Common Area Catch Basin Inspection	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
N15	Street Sweeping Private Streets and Parking Lots	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
N16	Retail Gasoline Outlets	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No retail gasoline outlets proposed

### 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.

<b>Structural Source Control BMPs</b>				
<b>Identifier</b>	<b>Name</b>	<b>Check One</b>		<b>If not applicable, state brief reason</b>
		<b>Included</b>	<b>Not Applicable</b>	
S1	Provide storm drain system stenciling and signage	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
S2	Design and construct outdoor material storage areas to reduce pollution introduction	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No outdoor material storage areas proposed
S3	Design and construct trash and waste storage areas to reduce pollution introduction	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
S4	Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
S5	Protect slopes and channels and provide energy dissipation	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No slopes or channels proposed
	Incorporate requirements applicable to individual priority project categories (from SDRWQCB NPDES Permit)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
S6	Dock areas	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No dock areas proposed
S7	Maintenance bays	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No maintenance bays proposed
S8	Vehicle wash areas	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No vehicles wash areas proposed
S9	Outdoor processing areas	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No outdoor processing areas proposed
S10	Equipment wash areas	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No equipment wash areas proposed
S11	Fueling areas	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No fueling areas proposed
S12	Hillside landscaping	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No hillside landscaping proposed
S13	Wash water control for food preparation areas	<input type="checkbox"/>	<input type="checkbox"/>	
S14	Community car wash racks	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No community car wash racks proposed

#### **IV.4 Alternative Compliance Plan (If Applicable)**

Describe an alternative compliance plan (if applicable). Include alternative compliance obligations (i.e., gallons, pounds) and describe proposed alternative compliance measures. *Refer to Section 7.II 3.0 in the WQMP.*

##### **IV.4.1 Water Quality Credits**

Determine if water quality credits are applicable for the project. *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.*

<b>Description of Proposed Project</b>				
<b>Project Types that Qualify for Water Quality Credits (Select all that apply):</b>				
<input type="checkbox"/> Redevelopment projects that reduce the overall impervious footprint of the project site.	<input type="checkbox"/> 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.	<input type="checkbox"/> 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).		
<input type="checkbox"/> 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).	<input type="checkbox"/> 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		<input type="checkbox"/> 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).	
<input type="checkbox"/> Developments with dedication of undeveloped portions to parks, preservation areas and other previous uses.	<input type="checkbox"/> Developments in a city center area.	<input type="checkbox"/> Developments in historic districts or historic preservation areas.	<input type="checkbox"/> 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.	<input type="checkbox"/> In-fill projects, the conversion of empty lots and other underused spaces into more beneficially used spaces, such as residential or commercial areas.

Calculation of Water Quality Credits (if applicable)	N/A
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**IV.4.2 Alternative Compliance Plan Information**

Describe an alternative compliance plan (if applicable). Include alternative compliance obligations (i.e., gallons, pounds) and describe proposed alternative compliance measures. *Refer to Section 7.II 3.0 in the Model WQMP.*

N/A
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## Section V Inspection/Maintenance Responsibility for BMPs

Fill out information in table below. Prepare and attach an Operation and Maintenance Plan. Identify the funding mechanism through which BMPs will be maintained. Inspection and maintenance records must be kept for a minimum of five years for inspection by the regulatory agencies. Refer to Section 7.II 4.0 in the Model WQMP.

<b>BMP Inspection/Maintenance</b>			
<b>BMP</b>	<b>Reponsible Party(s)</b>	<b>Inspection/Maintenance Activities Required</b>	<b>Minimum Frequency of Activities</b>
Modular Wetlands	Ownership	Inspection of biofiltration media, removal and replacement of dead or diseased vegetation, removal of trash and debris from prefilter cartridges, clearing of any obstructions in system	Frequent-Regular
Education for Property Owners, Tenants, and Occupants	Ownership	Provide practical information materials to tenants on general housekeeping practices that contribute to the protection of stormwater quality	As-Needed
Employee Training	Ownership	Education program as it would apply to future employees of individual businesses	As-Needed

**Priority Project Water Quality Management Plan (WQMP)**  
**Magnolia and Warner**

Common Area Catch Basin Inspection	Ownership	At least 80% of drainage facilities should be inspected, cleaned, and maintained on an annual basis with 100% of the facilities included in a 2-year period	Annually
Spill Contingency	Ownership	If spill occurs, evacuate and remove contaminated dirt. Appropriately dispose of spilled materials and absorbents	As-Needed
Landscape management	Ownership	Maintenance of site vegetation	Regular
Common Area Litter Control	Ownership	Implement trash management and litter control procedures in common areas aimed at reducing pollution of drainage water	Frequent
Surface Repair	Ownership	Apply concrete, asphalt, and seal coat during dry weather to prevent contamination from contacting stormwater runoff	As-Needed

## **Section VI BMP Exhibit (Site Plan)**

### **VI.1 BMP Exhibit (Site Plan)**

Include a BMP Exhibit (Site Plan), at a size no less than 24" by 36," which includes the following minimum information:

- Insert in the title block (lower right hand corner) of BMP Exhibit: the WQMP Number (assigned by staff) and the grading/building or Planning Application permit numbers
- Project location (address, tract/lot number(s), etc.)
- Site boundary
- Land uses and land covers, as applicable
- Suitability/feasibility constraints
- Structural BMP locations
- Drainage delineations and flow information
- Delineate the area being treated by each structural BMP
- GIS coordinates for LID and Treatment Control BMPs
- Drainage connections
- BMP details
- Preparer name and stamp

Please do not include any areas outside of the project area or any information not related to drainage or water quality. The approved BMP Exhibit (Site Plan) shall be submitted as a plan sheet on all grading and building plan sets submitted for plan check review and approval. The BMP Exhibit shall be at the same size as the rest of the plan sheets in the submittal and shall have an approval stamp and signature prior to plan check submittal.

### **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](http://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.

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

**APPENDIX A**  
**Educational Materials**



**C**lean beaches and healthy creeks, rivers, bays and ocean are important to Orange County. However, many common activities such as painting can lead to water pollution if you're not careful. Paint must be used, stored and disposed of properly to ensure that it does not enter the street, gutter or storm drain. Unlike water in sanitary sewers (from sinks and toilets), water in storm drains is not treated before entering our waterways.

You would never dump paint into the ocean, so don't let it enter the storm drains. Follow these easy tips to help prevent water pollution.

For more information, please call the **Orange County Stormwater Program** at **1-877-89-SPILL** (1-877-897-7455) or visit [www.ocwatersheds.com](http://www.ocwatersheds.com)

To report a spill, call the **Orange County 24-Hour Water Pollution Problem Reporting Hotline** at **1-877-89-SPILL** (1-877-897-7455).

**For emergencies, dial 911.**

The tips contained in this brochure provide useful information to help prevent water pollution while using, storing and disposing of paint. If you have other suggestions, please contact your city's stormwater representatives or call the Orange County Stormwater Program.



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Help Prevent Ocean Pollution:

## Tips for Projects Using Paint



The Ocean Begins at Your Front Door

PROJECT  
**Pollution**  
PREVENTION

# Tips for Projects Using Paint

Paint can cause significant damage to our environment. Whether you hire a contractor or do it yourself, it is important to follow these simple tips when purchasing, using, cleaning, storing and disposing of paint.

## Purchasing Paint

- Measure the room or object to be painted, then buy only the amount needed.
- Whenever possible, use water-based paint since it usually does not require hazardous solvents such as paint thinner for cleanup.

## Painting

- Use only one brush or roller per color of paint to reduce the amount of water needed for cleaning.
- Place open paint containers or trays on a stable surface and in a position that is unlikely to spill.
- Always use a tarp under the area or object being painted to collect paint drips and contain spills.

## Cleaning

- Never clean brushes or rinse paint containers in the street, gutter or storm drain.
- For oil-based products, use as much of the paint on the brushes as possible. Clean brushes with thinner. To reuse thinner, pour it through a fine filter (e.g. nylon, metal gauze or filter paper) to remove solids such as leftover traces of paint.
- For water-based products, use as much of the paint on the brushes as possible, then rinse in the sink.
- Collect all paint chips and dust. Chips and dust from marine paints or paints containing lead, mercury or tributyl tin are hazardous waste. Sweep up and dispose of at a Household Hazardous Waste Collection Center (HHWCC).

## Storing Paint

- Store paint in a dry location away from the elements.
- Store leftover water-based paint, oil-based paint and solvents separately in original or clearly marked containers.
- Avoid storing paint cans directly on cement floors. The bottom of the can will rust much faster on cement.
- Place the lid on firmly and store the paint can upside-down to prevent air from entering. This will keep the paint usable longer. Oil-based paint is usable for up to 15 years. Water-based paint remains usable for up to 10 years.

## Alternatives to Disposal

- Use excess paint to apply another coat, for touch-ups, or to paint a closet, garage, basement or attic.
- Give extra paint to friends or family. Extra paint can also be donated to a local theatre group, low-income housing program or school.
- Take extra paint to an exchange program such as the “**Stop & Swap**” that allows you to drop off or pick up partially used home care products free of charge. “**Stop & Swap**” programs are available at most HHWCCs.
- For HHWCC locations and hours, call (714) 834-6752 or visit [www.oilandfills.com](http://www.oilandfills.com).



## Disposing of Paint

- Never put wet paint in the trash.

### For water-based paint:

- If possible, brush the leftover paint on cardboard or newspaper. Otherwise, allow the paint to dry in the can with the lid off in a well-ventilated area protected from the elements, children and pets. Stirring the paint every few days will speed up the drying.
- Large quantities of extra paint should be taken to a HHWCC.
- Once dried, paint and painted surfaces may be disposed of in the trash. When setting a dried paint can out for trash collection, leave the lid off so the collector will see that the paint has dried.

### For oil-based paint:

- Oil-based paint is a household hazardous waste. All leftover paint should be taken to a HHWCC.

### Aerosol paint:

- Dispose of aerosol paint cans at a HHWCC.

## Spills

- Never hose down pavement or other impermeable surfaces where paint has spilled.
- Clean up spills immediately by using an absorbent material such as cat litter. Cat litter used to clean water-based paint spills can be disposed of in the trash. When cleaning oil-based paint spills with cat litter, it must be taken to a HHWCC.
- Immediately report spills that have entered the street, gutter or storm drain to the County's 24-Hour Water Pollution Problem Reporting Hotline at (714) 567-6363 or visit [www.ocwatersheds.com](http://www.ocwatersheds.com) to fill out an incident reporting form.

# The Pollution Solution

Several residential activities can result in water pollution. Among these activities are car washing and hosing off driveways and sidewalks. Both activities can waste water and result in excess runoff. Water conservation methods described in this pamphlet can prevent considerable amounts of runoff and conserve water. By taking your car to a commercial car wash and by sweeping driveways and sidewalks, you can further prevent the transport of pollutants to Orange County waterways. Here are some of the common pollutants for which you can be part of the solution:

## 1 Pesticides and Fertilizer

**Pollution:** The same pesticides that are designed to be toxic to pests can have an equally lethal impact on our marine life. The same fertilizer that promotes plant growth in lawns and gardens can also create nuisance algae blooms, which remove oxygen from the water and clog waterways when it decomposes.



**Solution:** Never use pesticides or fertilizer within 48 hours of an anticipated rainstorm. Use only as much as is directed on the label and keep it off driveways and sidewalks.

## 2 Dirt and Sediment

**Pollution:** Dirt or sediment can impede the flow of the stormwater and negatively impact stream habitat as it travels through waterways and deposits downstream. Pollutants can attach to sediment, which can then be transported through our waterways.

**Solution:** Protect dirt stockpiles by covering them with tarps or secure plastic sheets to prevent wind or rain from allowing dirt or sediment to enter the storm drain system.

## 3 Metals

**Pollution:** Metals and other toxins present in car wash water can harm important plankton, which forms the base of the aquatic food chain.

**Solution:** Take your car to a commercial car wash where the wash water is captured and treated at a local wastewater treatment plant.

## 4 Pet Waste

**Pollution:** Pet waste carries bacteria through our watersheds and eventually will be washed out to the ocean. This can pose a health risk to swimmers and surfers.

**Solution:** Pick up after your pets!

## 5 Trash and Debris

**Pollution:** Trash and debris can enter waterways by wind, littering and careless maintenance of trash receptacles. Street sweeping collects some of this trash; however, much of what isn't captured ends up in our storm drain system where it flows untreated out to the ocean.



**Solution:** Don't litter and make sure trash containers are properly covered. It is far more expensive to clean up the litter and trash that ends up in our waterways than it is to prevent it in the first place. Come out to one of Orange County's many locations for Coastal and Inner-Coastal Cleanup Day, which is held in September.

## 6 Motor Oil / Vehicle Fluids

**Pollution:** Oil and petroleum products from our vehicles are toxic to people, wildlife and plants.

**Solution:** Fix any leaks from your vehicle and keep the maintenance up on your car. Use absorbent material such as cat litter on oil spills, then sweep it up and dispose of it in the trash. Recycle used motor oil at a local Household Hazardous Waste Collection Center.



## A TEAM EFFORT

The Orange County Stormwater Program has teamed with the Municipal Water District of Orange County (MWDOC) and the University of California Cooperative Extension Program (UCCE) to develop this pamphlet.

Low Impact Development (LID) and sustainable water use prevents water pollution and conserves water for drinking and reuse. Reducing your water use and the amount of water flowing from your home protects the environment and saves you money.

## Thank you for making water protection a priority!

For more information, please visit [www.ocwatersheds.com/publiced/](http://www.ocwatersheds.com/publiced/)

[www.mwdoc.com](http://www.mwdoc.com)

[www.uccemg.com](http://www.uccemg.com)



To report a spill, call the Orange County 24-Hour Water Pollution Prevention Reporting Hotline at 1-877-89-SPILL \ (1-877-897-7455)

### Special Thanks to

The City of Los Angeles Stormwater Program for the use of its artwork

The Metropolitan Water District of Southern California for the use of the California-Friendly Plant and Native Habitat photos



## Homeowners Guide for Sustainable Water Use

Low Impact Development, Water Conservation & Pollution Prevention



## The Ocean Begins at Your Front Door



# RUNOFF, RAINWATER AND REUSE

## Where Does Water Runoff Go?

Stormwater, or water from rainfall events, and runoff from outdoor water use such as sprinklers and hoses flows from homes directly into catch basins and the storm drain system. After entering the storm drain, the water flows untreated into streams, rivers, bays and ultimately the Pacific Ocean. Runoff can come from lawns, gardens, driveways, sidewalks and roofs. As it flows over hard, impervious surfaces, it picks up pollutants. Some pollutants carried by the water runoff include trash, pet waste, pesticides, fertilizer, motor oil and more.

## Water Conservation

Pollution not only impairs the water quality for habitat and recreation, it can also reduce the water available for reuse. Runoff allowed to soak into the ground is cleaned as it percolates through the soil, replenishing depleted groundwater supplies. Groundwater provides approximately 50% of the total water for drinking and other indoor household activities in north and central Orange County. When land is covered with roads, parking lots, homes, etc., there is less land to take in the water and more hard surfaces over which the water can flow.

In Orange County, 60-70% of water used by residents and businesses goes to irrigation and other outdoor uses. Reusing rainwater to irrigate our lawn not only reduces the impact of water pollution from runoff, but it also is a great way to conserve our precious water resources and replenish our groundwater basin.

## What is Low Impact Development (LID)?

Low Impact Development (LID) is a method of development that seeks to maintain the natural hydrologic character of an area. LID provides a more sustainable and pollution-preventative approach to water management.

New water quality regulations require implementation of LID in larger new developments and encourage implementation of LID and other sustainable practices in existing residential areas. Implementing modifications to your lawn or garden can reduce pollution in our environment, conserve water and reduce your water bill.



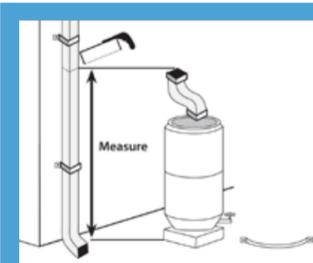
Permeable pavement allows water runoff to infiltrate through the soil and prevents most pollutants from reaching the storm drain system.

## OPTIONS FOR RAINWATER HARVESTING AND REUSE

Rainwater harvesting is a great way to save money, prevent pollution and reduce potable water use. To harvest your rainwater, simply redirect the runoff from roofs and downspouts to rain barrels. Rain gardens are another option; these reduce runoff as well as encourage infiltration.

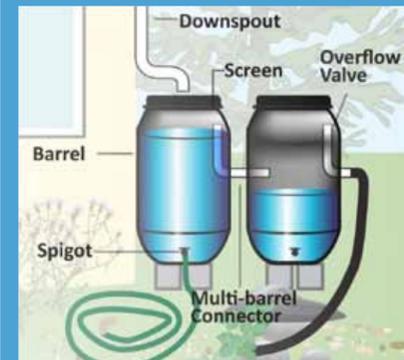
### Downspout Disconnection/Redirection

Disconnecting downspouts from pipes running to the gutter prevents runoff from transporting pollutants to the storm drain. Once disconnected, downspouts can be redirected to rain gardens or other vegetated areas, or be connected to a rain barrel.



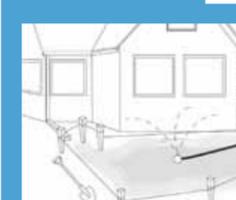
### Rain Barrels

Rain barrels capture rainwater flow from roofs for reuse in landscape irrigation. Capacity of rain barrels needed for your home will depend on the amount of roof area and rainfall received. When purchasing your rain barrel, make sure it includes a screen, a spigot to siphon water for use, an overflow tube to allow for excess water to run out and a connector if you wish to connect multiple barrels to add capacity of water storage.



Mosquito growth prevention is very important when installing a rain barrel. The best way to prevent mosquito breeding is to eliminate entry points by ensuring all openings are sealed tightly. If these methods are unsuccessful, products are available to kill mosquito larvae, but that are harmless to animals and humans. Regular application of these products is essential. Please visit the Orange County Vector Control website for more information at [www.ocvcd.org/mosquitoes3.php](http://www.ocvcd.org/mosquitoes3.php).

For information on how to disconnect a downspout or to install and maintain a rain barrel or rain garden at your home, please see the Los Angeles Rainwater Harvesting Program, A Homeowner's "How-To" Guide, November 2009 at [www.larainwaterharvesting.org/](http://www.larainwaterharvesting.org/)



### Rain Gardens

Rain gardens allow runoff to be directed from your roof downspout into a landscaped area. Vegetation and rocks in the garden will slow the flow of water to allow for infiltration into the soil. Plants and soil particles will absorb pollutants from the roof runoff. By utilizing a native plant palette, rain gardens can be maintained all year with minimal additional irrigation. These plants are adapted to the semi-arid climate of Southern California, require less water and can reduce your water bill.

Before modifying your yard to install a rain garden, please consult your local building and/or planning departments to ensure your garden plan follows pertinent building codes and ordinances. Besides codes and ordinances, some home owner associations also have guidelines for yard modifications. If your property is in hill areas or includes engineered slopes, please seek professional advice before proceeding with changes.

## OTHER WATER CONSERVATION AND POLLUTION PREVENTION TECHNIQUES

### Native Vegetation and Maintenance

"California Friendly" plants or native vegetation can significantly reduce water use. These plants often require far less fertilizers and pesticides, which are two significant pollutants found in Orange County waterways. Replacing water "thirsty" plants and grass types with water efficient natives is a great way to save water and reduce the need for potentially harmful pesticides and fertilizer.

Please see the California Friendly Garden Guide produced by the Metropolitan Water District of Southern California and associated Southern California Water Agencies for a catalog of California friendly plants and other garden resources at [www.bewaterwise.com/Gardensoft](http://www.bewaterwise.com/Gardensoft).

### Weed Free Yards

Weeds are water thieves. They often reproduce quickly and rob your yard of both water and nutrients. Weed your yard by hand if possible. If you use herbicides to control the weeds, use only the amount recommended on the label and never use it if rain is forecast within the next 48 hours.



### Soil Amendments

Soil amendments such as green waste (e.g. grass clippings, compost, etc.) can be a significant source of nutrients and can help keep the soil near the roots of plants moist. However, they can cause algal booms if they get into our waterways, which reduces the amount of oxygen in the water and impacts most aquatic organisms. It is important to apply soil amendments more than 48 hours prior to predicted rainfall.

## IRRIGATE EFFICIENTLY

### Smart Irrigation Controllers

Smart Irrigation Controllers have internal clocks as well as sensors that will turn off the sprinklers in response to environmental changes. If it is raining, too windy or too cold, the smart irrigation control sprinklers will automatically shut off.

Check with your local water agency for available rebates on irrigation controllers and smart timers.

- Aim your sprinklers at your lawn, not the sidewalk – By simply adjusting the direction of your sprinklers you can save water, prevent water pollution from runoff, keep your lawn healthy and save money.
- Set a timer for your sprinklers – lawns absorb the water they need to stay healthy within a few minutes of turning on the sprinklers. Time your sprinklers; when water begins running off your lawn, you can turn them off. Your timer can be set to water your lawn for this duration every time.
- Water at Sunrise – Watering early in the morning will reduce water loss due to evaporation. Additionally, winds tend to die down in the early morning so the water will get to the lawn as intended.
- Water by hand – Instead of using sprinklers, consider watering your yard by hand. Hand-watering ensures that all plants get the proper amount of water and you will prevent any water runoff, which wastes water and carries pollutants into our waterways.
- Fix leaks - Nationwide, households waste one trillion gallons of water a year to leaks – that is enough water to serve the entire state of Texas for a year. If your garden hose is leaking, replace the nylon or rubber hose washer and ensure a tight connection. Fix broken sprinklers immediately.

Water runoff from sprinklers left on too long will carry pollutants into our waterways.





*Do your part to prevent water pollution in our creeks, rivers, bays and ocean.*

Clean beaches and healthy creeks, rivers, bays and ocean are important to Orange County. However, not properly disposing of household hazardous waste can lead to water pollution. Batteries, electronics, paint, oil, gardening chemicals, cleaners and other hazardous materials cannot be thrown in the trash. They also must never be poured or thrown into yards, sidewalks, driveways, gutters or streets. Rain or other water could wash the materials into the storm drain and eventually into our waterways and the ocean. In addition, hazardous waste must not be poured in the sanitary sewers (sinks and toilets).

***NEVER DISPOSE  
OF HOUSEHOLD  
HAZARDOUS  
WASTE IN THE  
TRASH, STREET,  
GUTTER,  
STORM DRAIN  
OR SEWER.***

For more information,  
please call the  
**Orange County Stormwater Program**  
at **1-877-89-SPILL** (1-877-897-7455)  
or visit  
**www.ocwatersheds.com**

**To Report Illegal Dumping of  
Household Hazardous Waste  
call 1-800-69-TOXIC**

To report a spill,  
call the  
**Orange County 24-Hour  
Water Pollution Problem  
Reporting Hotline**  
**1-877-89-SPILL** (1-877-897-7455).

**For emergencies, dial 911.**



RECYCLE  
USED OIL



Printed on Recycled Paper

Help Prevent Ocean Pollution:

# Proper Disposal of Household Hazardous Waste



**The Ocean Begins at  
Your Front Door**

**P R O J E C T**  
**Pollution**  
**P R E V E N T I O N**

**ORANGE COUNTY**

# Pollution Prevention

Leftover household products that contain corrosive, toxic, ignitable, or reactive ingredients are considered to be “household hazardous waste” or “HHW.” HHW can be found throughout your home, including the bathroom, kitchen, laundry room and garage.

*WHEN POSSIBLE,  
USE  
NON-HAZARDOUS  
OR  
LESS-HAZARDOUS  
PRODUCTS.*

Disposal of HHW down the drain, on the ground, into storm drains, or in the trash is illegal and unsafe.

Proper disposal of HHW is actually easy. Simply drop them off at a Household Hazardous Waste Collection Center (HHWCC) for free disposal and recycling. Many materials including anti-freeze, latex-based paint, motor oil and batteries can be recycled. Some centers have a “Stop & Swap” program that lets you take partially used home, garden, and automobile products free of charge. There are four HHWCCs in Orange County:

**Anaheim:**.....1071 N. Blue Gum St  
**Huntington Beach:** ..... 17121 Nichols St  
**Irvine:**..... 6411 Oak Canyon  
**San Juan Capistrano:**.... 32250 La Pata Ave

Centers are open Tuesday-Saturday, 9 a.m.-3 p.m. Centers are closed on rainy days and major holidays. For more information, call (714) 834-6752 or visit [www.oclandfills.com](http://www.oclandfills.com).

## *Common household hazardous wastes*

- Batteries
- Paint and paint products
- Adhesives
- Drain openers
- Household cleaning products
- Wood and metal cleaners and polishes
- Pesticides
- Fungicides/wood preservatives
- Automotive products (antifreeze, motor oil, fluids)
- Grease and rust solvents
- Fluorescent lamps
- Mercury (thermometers & thermostats)
- All forms of electronic waste including computers and microwaves
- Pool & spa chemicals
- Cleaners
- Medications
- Propane (camping & BBQ)
- Mercury-containing lamps

- Television & monitors (CRTs, flatscreens)

## *Tips for household hazardous waste*

- Never dispose of HHW in the trash, street, gutter, storm drain or sewer.
- Keep these materials in closed, labeled containers and store materials indoors or under a cover.
- When possible, use non-hazardous products.
- Reuse products whenever possible or share with family and friends.
- Purchase only as much of a product as you’ll need. Empty containers may be disposed of in the trash.
- HHW can be harmful to humans, pets and the environment. Report emergencies to 911.





***Preventing water pollution at your commercial/industrial site***

Clean beaches and healthy creeks, rivers, bays and ocean are important to Orange County. However, many landscape and building maintenance activities can lead to water pollution if you're not careful. Paint, chemicals, plant clippings and other materials can be blown or washed into storm drains that flow to the ocean. Unlike water in sanitary sewers (from sinks and toilets), water in storm drains is not treated before entering our waterways.

You would never pour soap or fertilizers into the ocean, so why would you let them enter the storm drains? Follow these easy tips to help prevent water pollution.

Some types of industrial facilities are required to obtain coverage under the State General Industrial Permit. For more information visit: [www.swrcb.ca.gov/stormwater/industrial.html](http://www.swrcb.ca.gov/stormwater/industrial.html)

For more information, please call the **Orange County Stormwater Program** at **1-877-89-SPILL** (1-877-897-7455) or visit [www.ocwatersheds.com](http://www.ocwatersheds.com)

To report a spill, call the **Orange County 24-Hour Water Pollution Problem Reporting Hotline** at **1-877-89-SPILL** (1-877-897-7455).

**For emergencies, dial 911.**



RECYCLE  
USED OIL



Printed on Recycled Paper

Help Prevent Ocean Pollution:

**Proper Maintenance Practices for Your Business**



**The Ocean Begins at Your Front Door**



# Proper Maintenance Practices for your Business

## *Landscape Maintenance*

- Compost grass clippings, leaves, sticks and other vegetation, or dispose of it at a permitted landfill or in green waste containers. Do not dispose of these materials in the street, gutter or storm drain.
- Irrigate slowly and inspect the system for leaks, overspraying and runoff. Adjust automatic timers to avoid overwatering.
- Follow label directions for the use and disposal of fertilizers and pesticides.
- Do not apply pesticides or fertilizers if rain is expected within 48 hours or if wind speeds are above 5 mph.
- Do not spray pesticides within 100 feet of waterways.
- Fertilizers should be worked into the soil rather than dumped onto the surface.
- If fertilizer is spilled on the pavement or sidewalk, sweep it up immediately and place it back in the container.

## *Building Maintenance*

- Never allow washwater, sweepings or sediment to enter the storm drain.
- Sweep up dry spills and use cat litter, towels or similar materials to absorb wet spills. Dispose of it in the trash.
- If you wash your building, sidewalk or parking lot, you **must** contain the water. Use a shop vac to collect the water and contact your city or sanitation agency for proper disposal information. Do not let water enter the street, gutter or storm drain.
- Use drop cloths underneath outdoor painting, scraping, and sandblasting work, and properly dispose of materials in the trash.
- Use a ground cloth or oversized tub for mixing paint and cleaning tools.
- Use a damp mop or broom to clean floors.
- Cover dumpsters to keep insects, animals, rainwater and sand from entering. Keep the area around the dumpster clear of trash and debris. Do not overfill the dumpster.

- Call your trash hauler to replace leaking dumpsters.
- Do not dump any toxic substance or liquid waste on the pavement, the ground, or near a storm drain. Even materials that seem harmless such as latex paint or biodegradable cleaners can damage the environment.
- Recycle paints, solvents and other materials. For more information about recycling and collection centers, visit [www.oclandfills.com](http://www.oclandfills.com).
- Store materials indoors or under cover and away from storm drains.
- Use a construction and demolition recycling company to recycle lumber, paper, cardboard, metals, masonry, carpet, plastic, pipes, drywall, rocks, dirt, and green waste. For a listing of construction and demolition recycling locations in your area, visit [www.ciwmb.ca.gov/recycle](http://www.ciwmb.ca.gov/recycle).
- Properly label materials. Familiarize employees with Material Safety Data Sheets.

NEVER DISPOSE  
OF ANYTHING  
IN THE STORM  
DRAIN.

# HOMEOWNER TIPS PROTECTING WATER

## Before Buying Pest Control Products

- Identify the pest.
- Decide if pest control products are the best control measure or if there are alternatives available.
- Are integrated pest management guidelines available for this pest?
- Read the product label:
  - Is the pest listed on the label?
  - Is it the best product for the pest?

## Before Mixing Your Sprayer

- Read the label carefully.
- Buy only enough pesticide to treat the area affected by the pest.
- Check the weather and don't apply if it's windy or about to rain
- Measure the area you're treating.
- Calculate how much spray to mix.
- Wear long sleeve shirt, long pants, shoes and any other protective equipment listed on the label and follow all the label precautions.
- Be prepared for spills and know how to clean them up.



## When You're Ready To Spray

- Mix and load spray in an area where any spilled pesticide will not be able to drain or be washed away into storm drains, ditches, streams, ponds or other bodies of water.
- Mix sprayer on grass, not the sidewalk or driveway.
- Mix only as much as needed.

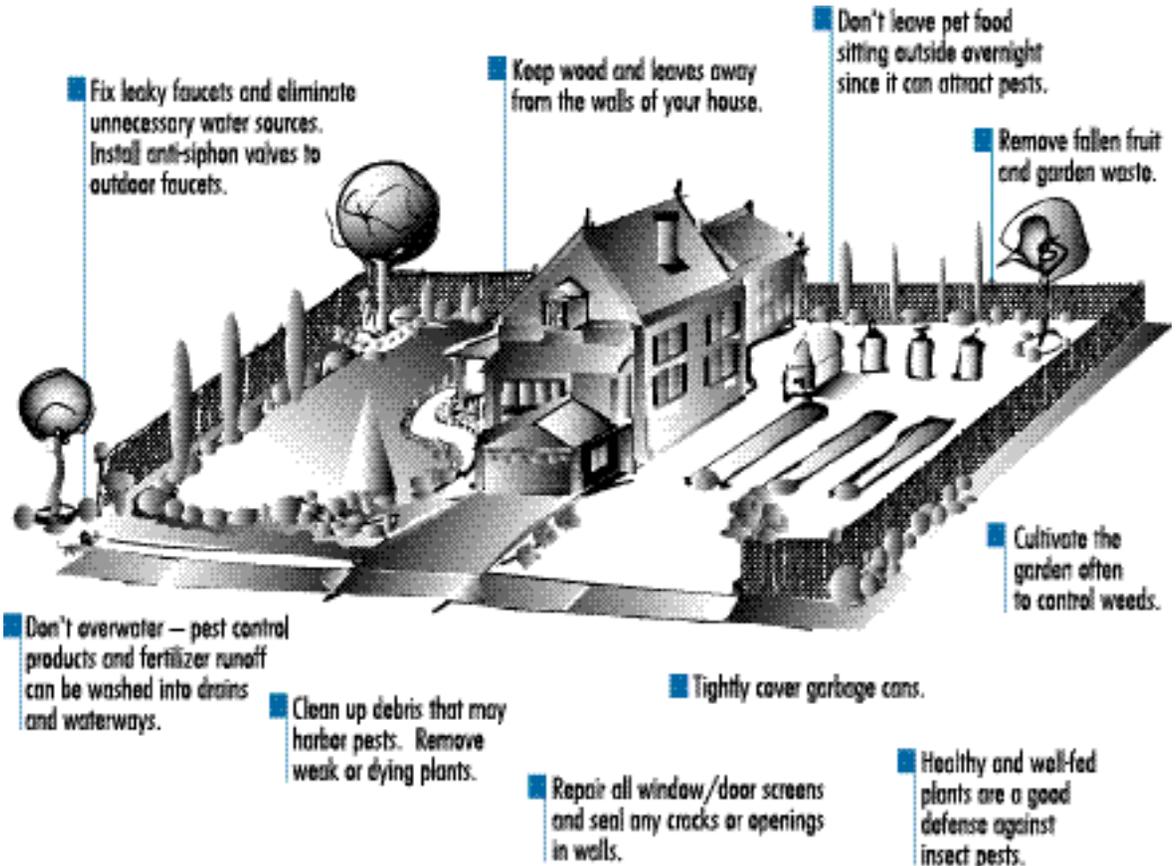
## When You're Spraying

- AVOID spraying in or near storm drains, ditches, streams, and ponds!
- Leave an untreated strip around these areas to protect the water.

## When You're done

- Never dump leftovers down any drain; Save for a future application.
- Triple-rinse sprayer and apply rinsewater to treated area.
- Take any old or unwanted pesticides to a Household Hazardous Waste Collection Center (714) 834-6752.

Using Pest Control Products.  
It's Your Responsibility To Do It Right!



## IPM... OUTSMARTING PESTS WHILE PROTECTING WATER

With Integrated Pest Management (IPM), homeowners use common sense and nature to make it difficult for pests to survive. IPM techniques include cultural practices (such as mulching to prevent weeds), encouraging natural enemies (good bugs), and judicious use of pest control products.

- First, identify your pest problem. To find the best solution, you need to pin down the problem. Consult gardening books, your county cooperative extension office or your local nursery.
- Decide how much pest control is necessary. If you can live with some pest damage, you can avoid intensive pest control product treatments.

- Choose an effective option. Try various types of controls first: washing bugs off plants, pruning diseased parts of plants. If you need to use pest control products, choose one that targets the problem and poses the least hazard.
- Finally, it's easier to prevent pests than to control them.

**Think ahead.**



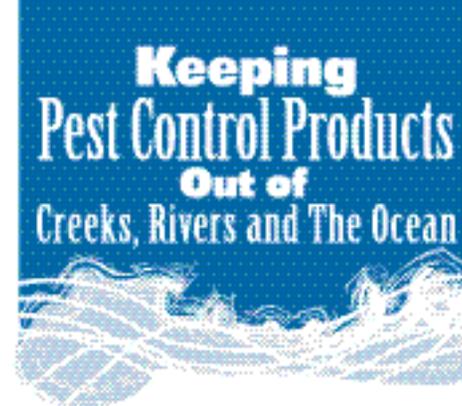
This brochure is being distributed in order to reduce the impacts of pesticides on water quality. It was produced with support from the Orange County Storm Water Program, the Coalition for Urban/Rural Environmental Stewardship (CURES) and a 319(h) grant from the State Water Resources Control Board.



**Orange County Storm Water Program Participants:**

- Anaheim Public Works/Engineering ..... (714) 765-5176
- Brea Engineering ..... (714) 990-7666
- Buena Park Public Works ..... (714) 562-3655
- Costa Mesa Public Services ..... (714) 754-5248
- Cypress Engineering ..... (714) 229-6752
- Dana Point Public Works ..... (949) 248-3562
- Fountain Valley Public Works ..... (714) 593-4400 x347
- Fullerton Engineering Dept ..... (714) 738-6853
- Garden Grove Development Services ..... (714) 741-5554
- Huntington Beach Public Works ..... (714) 536-5432
- Irvine Public Works ..... (949)724-6515
- La Habra Public Services ..... (562) 905-9792
- La Palma Public Works ..... (714) 523-1140 x102
- Laguna Beach Municipal Services ..... (949) 497-0711
- Laguna Hills Engineering ..... (949) 707-2600
- Laguna Niguel Public Works ..... (949) 362-4337
- Lake Forest Public Works ..... (949) 461-3480
- Los Alamitos Community Dev ..... (562) 431-3538 x301
- Mission Viejo Public Works ..... (949) 470-3095
- Newport Beach Public works ..... (949) 644-3311
- Orange Public Works ..... (714) 744-5551
- Placentia Engineering ..... (714) 993-8131
- San Clemente Engineering ..... (949) 361-6100
- San Juan Capistrano Engineering ..... (949) 493-1171
- Santa Ana Public Works ..... (714) 647-3380
- Seal Beach Engineering ..... (562) 431-2527 x318
- Stanton Public Works ..... (714) 379-9222 x204
- Tustin Public Works Engineering ..... (714) 573-3150
- Villa Park Engineering ..... (714) 998-1500
- Westminster Public Works Eng. .... (714) 898-3311 x215
- Yorba Linda Engineering ..... (714) 961-7170 x174
- O.C. Storm Water Program ..... 1-877-89-SPILL (1-877-897-7455)
- 24 Hour Water Pollution Hotline ..... (714) 567-6363 or  
ashbyk@pfrd.co.orange.ca.us
- Chemical and Hazardous Material Spill Emergencies ..... 911
- Other Important Phone Numbers:
- For Additional Brochures ..... 1-877-89-SPILL (1-877-897-7455)
- UC Masters & Coop Extension ..... (714) 708-1646  
ucmastergardeners@yahoo.com
- O.C. Household Hazardous Waste Information ..... (714) 834-6752  
or www.oc.ca.gov/IWMD
- Information on agriculture chemicals, pesticides and possible  
alternatives, O.C. Agriculture Commissioner ..... (714) 447-7115

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Coalition For Urban/Rural Environmental Stewardship (CURES)  
Western Crop Protection Association (WCPA)  
Responsible Industry for a Sound Environment (RISE)





**C**lean beaches and healthy creeks, rivers, bays and ocean are important to Orange County. However, many common activities such as pest control can lead to water pollution if you're not careful. Pesticide treatments must be planned and applied properly to ensure that pesticides do not enter the street, gutter or storm drain. Unlike water in sanitary sewers (from sinks and toilets), water in storm drains is not treated before entering our waterways.

You would never dump pesticides into the ocean, so don't let it enter the storm drains. Pesticides can cause significant damage to our environment if used improperly. If you are thinking of using a pesticide to control a pest, there are some important things to consider.

For more information,  
please call  
University of California Cooperative  
Extension Master Gardeners at  
(714) 708-1646  
or visit these Web sites:  
[www.uccemg.org](http://www.uccemg.org)  
[www.ipm.ucdavis.edu](http://www.ipm.ucdavis.edu)

For instructions on collecting a specimen  
sample visit the Orange County  
Agriculture Commissioner's website at:  
[http://www.ocagcomm.com/ser\\_lab.asp](http://www.ocagcomm.com/ser_lab.asp)

To report a spill, call the  
**Orange County 24-Hour  
Water Pollution Problem  
Reporting Hotline**  
at 1-877-89-SPILL (1-877-897-7455).

**For emergencies, dial 911.**

Information From:  
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Extension staff writer. Photos courtesy of  
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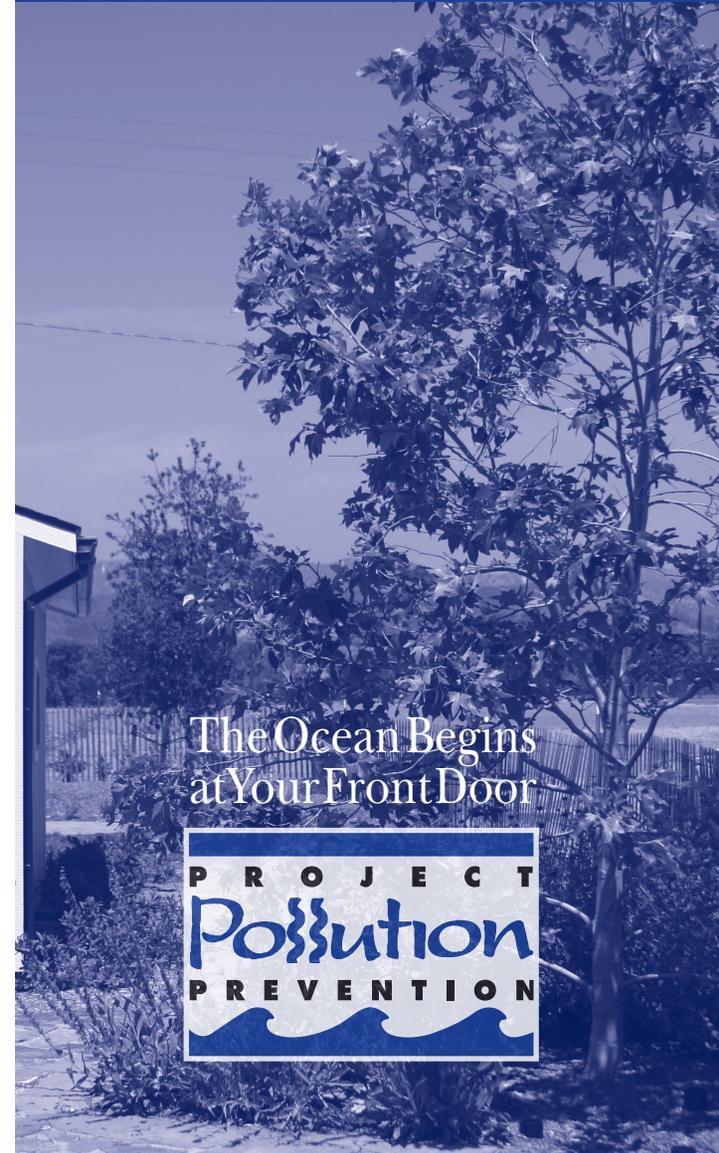
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Help Prevent Ocean Pollution:

## Responsible Pest Control



The Ocean Begins  
at Your Front Door



# Tips for Pest Control

## Key Steps to Follow:

**Step 1:** Correctly identify the pest (insect, weed, rodent, or disease) and verify that it is actually causing the problem.



This is important because beneficial insects are often mistaken for pests and sprayed with pesticides needlessly.

Consult with a Certified Nursery Professional at a local nursery or garden center or send a sample of the pest to the Orange County Agricultural Commissioner's Office.

Determine if the pest is still present – even though you see damage, the pest may have left.

**Step 2:** Determine how many pests are present and causing damage.



Small pest populations may be controlled more safely using non-pesticide techniques. These include removing food sources, washing off leaves with a strong stream of water, blocking entry into the home using caulking and replacing problem plants with ones less susceptible to pests.

Integrated Pest Management (IPM) usually combines several least toxic pest control methods for long-term prevention and management of pest problems without harming you, your family, or the environment.



**Step 3:** If a pesticide must be used, choose the least toxic chemical.

Obtain information on the least toxic pesticides that are effective at controlling the target pest from the UC Statewide Integrated Pest Management (IPM) Program's Web site at [www.ipm.ucdavis.edu](http://www.ipm.ucdavis.edu).

Seek out the assistance of a Certified Nursery Professional at a local nursery or garden center when selecting a pesticide. Purchase the smallest amount of pesticide available.

Apply the pesticide to the pest during its most vulnerable life stage. This information can be found on the pesticide label.

**Step 4:** Wear appropriate protective clothing.

Follow pesticide labels regarding specific types of protective equipment you should wear. Protective clothing should always be washed separately from other clothing.

**Step 5:** Continuously monitor external conditions when applying pesticides such as weather, irrigation, and the presence of children and animals.

Never apply pesticides when rain is predicted within the next 48 hours. Also, do not water after applying pesticides unless the directions say it is necessary.

Apply pesticides when the air is still; breezy conditions may cause the spray or dust to drift away from your targeted area.

In case of an emergency call 911 and/or the regional poison control number at (714) 634-5988 or (800) 544-4404 (CA only).

For general questions you may also visit [www.calpoison.org](http://www.calpoison.org).

**Step 6:** In the event of accidental spills, sweep up or use an absorbent agent to remove any excess pesticides. Avoid the use of water.

Be prepared. Have a broom, dust pan, or dry absorbent material, such as cat litter, newspapers or paper towels, ready to assist in cleaning up spills.

Contain and clean up the spill right away. Place contaminated materials in a doubled plastic bag. All materials used to clean up the spill should be properly disposed of according to your local Household Hazardous Waste Disposal site.

**Step 7:** Properly store and dispose of unused pesticides.

Purchase Ready-To-Use (RTU) products to avoid storing large concentrated quantities of pesticides.



Store unused chemicals in a locked cabinet.

Unused pesticide chemicals may be disposed of at a Household Hazardous Waste Collection Center.

Empty pesticide containers should be triple rinsed prior to disposing of them in the trash.

Household Hazardous Waste  
Collection Center  
(714) 834-6752  
[www.oilandfills.com](http://www.oilandfills.com)





***Did you know that just one quart of oil can pollute 250,000 gallons of water?***

A clean ocean and healthy creeks, rivers, bays and beaches are important to Orange County. However, not properly disposing of used oil can lead to water pollution. If you pour or drain oil onto driveways, sidewalks or streets, it can be washed into the storm drain. Unlike water in sanitary sewers (from sinks and toilets), water in storm drains is not treated before entering the ocean. Help prevent water pollution by taking your used oil to a used oil collection center.

Included in this brochure is a list of locations that will accept up to five gallons of used motor oil at no cost. Many also accept used oil filters. Please contact the facility before delivering your used oil. This listing of companies is for your reference and does not constitute a recommendation or endorsement of the company.

Please note that used oil filters may not be disposed of with regular household trash. They must be taken to a household hazardous waste collection or recycling center in Anaheim, Huntington Beach, Irvine or San Juan Capistrano. For information about these centers, visit [www.oilandfills.com](http://www.oilandfills.com).

Please do not mix your oil with other substances!

For more information, please call the Orange County Stormwater Program at 1-877-89-SPILL (1-877-897-7455) or visit [www.watersheds.com](http://www.watersheds.com).

For information about the proper disposal of household hazardous waste, call the Household Waste Hotline at (714) 834-6752 or visit [www.oilandfills.com](http://www.oilandfills.com).



For additional information about the nearest oil recycling center, call the Used Oil Program at 1-800-CLEANUP or visit [www.cleanup.org](http://www.cleanup.org).

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# Help Prevent Ocean Pollution:

## Recycle at Your Local Used Oil Collection Center



### The Ocean Begins at Your Front Door



# NORTH COUNTY

# Used Oil Collection Centers

## *Anaheim*

**All Seasons Tire and Auto Center, Inc.**  
817 S Brookhurst St., Anaheim, CA 92804  
(714)772-6090( )  
CIWMB#: 30-C-03177

**AutoZone #3317**  
423 N Anaheim Blvd., Anaheim, CA 92805  
(714)776-0787( )  
CIWMB#: 30-C-05263

**AutoZone #5226**  
2145 W Lincoln Ave., Anaheim, CA 92801  
(714)533-6599( )  
CIWMB#: 30-C-04604

**Bedard Automotive**  
3601 E Miraloma Ave., Anaheim, CA 92806  
(714)528-1380( )  
CIWMB#: 30-C-02205

**Classic Chevrolet**  
1001 Weir Canyon Rd., Anaheim, CA 92807  
(714)283-5400( )  
CIWMB#: 30-C-05223

**Econo Lube N' Tune #4**  
3201 W Lincoln Ave., Anaheim, CA 92801  
(714)821-0128( )  
CIWMB#: 30-C-01485

**EZ Lube Inc - Savi Ranch #43**  
985 N Weir Canyon Rd., Anaheim, CA 92807  
(714)556-1312( )  
CIWMB#: 30-C-06011

**Firestone Store #71C7**  
1200 S Magnolia Ave., Anaheim, CA 92804  
(949)598-5520( )  
CIWMB#: 30-C-05743

**Great Western Lube Express**  
125 N Brookhurst St., Anaheim, CA 92801  
(714)254-1300( )  
CIWMB#: 30-C-05542

**HR Pro Auto Service Center**  
3180 W Lincoln Ave., Anaheim, CA 92801  
(714)761-4343( )  
CIWMB#: 30-C-05927

**Ira Newman Automotive Services**  
1507 N State College Blvd., Anaheim, CA 92806  
(714)635-2392( )  
CIWMB#: 30-C-01482

**Jiffy Lube #1028**  
2400 W Ball Rd., Anaheim, CA 92804  
(714)761-5211( )  
CIWMB#: 30-C-00870

**Jiffy Lube #1903**  
2505 E Lincoln Ave., Anaheim, CA 92806  
(714)772-4000( )  
CIWMB#: 30-C-05511

**Jiffy Lube #2340**  
2181 W Lincoln Ave., Anaheim, CA 92801  
(714)533-1000( )  
CIWMB#: 30-C-04647

**Kragen Auto Parts #1303**  
1088 N State College Blvd., Anaheim, CA 92806  
(714)956-7351( )  
CIWMB#: 30-C-03438

**Kragen Auto Parts #1399**  
2245 W Ball Rd., Anaheim, CA 92804  
(714)490-1274( )  
CIWMB#: 30-C-04094

**Kragen Auto Parts #1565**  
2072 Lincoln Ave., Anaheim, CA 92806  
(714)502-6992( )  
CIWMB#: 30-C-04078

**Kragen Auto Parts #1582**  
3420 W Lincoln Ave., Anaheim, CA 92801  
(714)828-7977( )  
CIWMB#: 30-C-04103

**Pep Boys #613**  
10912 Katella Ave., Anaheim, CA 92804  
(714)638-0863( )  
CIWMB#: 30-C-01756

**Pep Boys #663**  
3030 W Lincoln Anaheim, CA 92801  
(714)826-4810( )  
CIWMB#: 30-C-03417

**Pep Boys #809**  
8205 E Santa Ana Cyn Rd., Anaheim, CA 92808  
(714)974-0105( )  
CIWMB#: 30-C-03443

**Pick Your Part**  
1235 S Beach Blvd., Anaheim, CA 92804  
(714)527-1645( )  
CIWMB#: 30-C-03744

**PK Auto Performance**  
3106 W. Lincoln Ave., Anaheim, CA 92801  
(714)826-2141( )  
CIWMB#: 30-C-05628

**Quick Change Lube and Oil**  
2731 W Lincoln Ave., Anaheim, CA 92801  
(714)821-4464( )  
CIWMB#: 30-C-04363

**Saturn of Anaheim**  
1380 S Auto Center Dr., Anaheim, CA 92806  
(714)648-2444( )  
CIWMB#: 30-C-06332

**Sun Tech Auto Service**  
105 S State College Blvd., Anaheim, CA 92806  
(714)956-1389( )  
CIWMB#: 30-C-06455

**Uonic Truck Services**  
515 S Rose St., Anaheim, CA 92805  
(714)533-3333( )  
CIWMB#: 30-C-01142

**Anaheim Hills**  
**Anaheim Hills Car Wash & Lube**  
5810 E La Palma Ave., Anaheim Hills, CA 92807  
(714)777-6605( )  
CIWMB#: 30-C-01387

## *Brea*

**Firestone Store #27A9**  
891 E Imperial Hwy., Brea, CA 92821  
(714)529-8404( )  
CIWMB#: 30-C-01221

**Oil Can Henry's**  
230 N Brea Blvd., Brea, CA 92821  
(714)990-1900( )  
CIWMB#: 30-C-04273

## *Buena Park*

**Firestone Store #71F7**  
6011 Orangetherpe Buena Park, CA 90620  
(714)670-7912( )  
CIWMB#: 30-C-01218

**Firestone Store #71T8**  
8600 Beach Blvd., Buena Park, CA 90620  
(714)827-5300( )  
CIWMB#: 30-C-02121

**Kragen Auto Parts #1204**  
5303 Beach Blvd., Buena Park, CA 90621  
(714)994-1320( )  
CIWMB#: 30-C-02623

## *Cypress*

**AutoZone #5521**  
5471 Lincoln Ave., Cypress, CA 90630  
(714)995-4644( )  
CIWMB#: 30-C-00836

**Big O Tires**  
6052 Cerritos Ave., Cypress, CA 90630  
(714)826-6334( )  
CIWMB#: 30-C-04245

**Econo Lube N' Tune #213**  
5497 Cerritos Ave., Cypress, CA 90630  
(714)761-0456( )  
CIWMB#: 30-C-06240

**Jiffy Lube #851**  
4942 Lincoln Ave., Cypress, CA 90630  
(626)965-9689( )  
CIWMB#: 30-C-06182

**M & N Coastline Auto & Tire Service**  
4005 Ball Rd., Cypress, CA 90630  
(714)826-1001( )  
CIWMB#: 30-C-04387

**Masterlube #103**  
5904 Lincoln Cypress, CA 90630  
(714)826-2323( )  
CIWMB#: 30-C-01071

**Masterlube #104**  
5971 Ball Rd., Cypress, CA 90630  
(714)220-1555( )  
CIWMB#: 30-C-04682

**Metric Motors of Cypress**  
6042 Cerritos Ave., Cypress, CA 90630  
(714)821-4702( )  
CIWMB#: 30-C-05157

## *Fullerton*

**AutoZone #2898**  
146 N. Raymond Ave., Fullerton, CA 92831  
(714)870-9772( )  
CIWMB#: 30-C-04488

**AutoZone #5522**  
1801 Orangetherpe W. Fullerton, CA 92833  
(714)870-8286( )  
CIWMB#: 30-C-06062

**AutoZone #5523**  
102 N Euclid Fullerton, CA 92832  
(714)870-8286( )  
CIWMB#: 30-C-04755

**EZ Lube #17**  
4002 N Harbor Blvd., Fullerton, CA 92835  
(714)871-9980( )  
CIWMB#: 30-C-03741

**Firestone Store #27EH**  
1933 N Placentia Ave., Fullerton, CA 92831  
(714)993-7100( )  
CIWMB#: 30-C-02122

**Fox Service Center**  
1018 W Orangetherpe Fullerton, CA 92833  
(714)879-1430( )  
CIWMB#: 30-C-02318

**Fullerton College Automotive Technology**  
321 E Chapman Ave., Fullerton, CA 92832  
(714)992-7275( )  
CIWMB#: 30-C-03165

**Kragen Auto Parts #0731**  
2978 Yorba Linda Fullerton, CA 92831  
(714)996-4780( )  
CIWMB#: 30-C-02628

**Kragen Auto Parts #4133**  
904 W Orangetherpe Ave., Fullerton, CA 92832  
(714)526-3570( )  
CIWMB#: 30-C-06256

**Pep Boys #642**  
1530 S Harbor Blvd., Fullerton, CA 92832  
(714)870-0700( )  
CIWMB#: 30-C-01755

**Sunnyside 76 Car Care Center**  
2701 N Brea Blvd., Fullerton, CA 92835  
(714)256-0773( )  
CIWMB#: 30-C-01381

## *Garden Grove*

**76 Pro Lube Plus**  
9001 Trask Ave., Garden Grove, CA 92844  
(714)393-0590( )  
CIWMB#: 30-C-05276

**AutoZone #5527**  
13190 Harbor Blvd., Garden Grove, CA 92843  
(714)636-5665( )  
CIWMB#: 30-C-04760

**David Murray Shell**  
12571 Vly View St., Garden Grove, CA 92845  
(714)898-0170( )  
CIWMB#: 30-C-00547

**Express Lube & Wash**  
8100 Lampson Ave., Garden Grove, CA 92841  
(909)316-8261( )  
CIWMB#: 30-C-06544

**Firestone Store #7180**  
10081 Chapman Ave., Garden Grove, CA 92840  
(714)530-4630( )  
CIWMB#: 30-C-01224

**Firestone Store #71W3**  
13961 Brookhurst St., Garden Grove, CA 92843  
(714)590-2741( )  
CIWMB#: 30-C-03690

**Jiffy Lube #1991**  
13970 Harbor Blvd., Garden Grove, CA 92843  
(714)554-0610( )  
CIWMB#: 30-C-05400

**Kragen Auto Parts #1251**  
13933 N Harbor Blvd., Garden Grove, CA 92843  
(714)554-3780( )  
CIWMB#: 30-C-02663

**Kragen Auto Parts #1555**  
9851 Chapman Ave., Garden Grove, CA 92841  
(714)741-8030( )  
CIWMB#: 30-C-04079

**Nissan of Garden Grove**  
9670 Trask Ave., Garden Grove, CA 92884  
(714)537-0900( )  
CIWMB#: 30-C-06553

**Toyota of Garden Grove**  
9444 Trask Ave., Garden Grove, CA 92844  
(714)895-5595( )  
CIWMB#: 30-C-06555

## *La Habra*

**AutoZone #5532**  
1200 W Imperial Hwy., La Habra, CA 90631  
(562)694-5337( )  
CIWMB#: 30-C-04784

**Burch Ford**  
201 N Harbor Blvd., La Habra, CA 90631  
(562)691-3225( )  
CIWMB#: 30-C-05179

**Firestone Store #2736**  
1071 S Beach Blvd., La Habra, CA 90631  
(562)691-1731( )  
CIWMB#: 30-C-01169

**Kragen Auto Parts #1569**  
1621 W Whittier Blvd., La Habra, CA 90631  
(562)905-2538( )  
CIWMB#: 30-C-04076

**Pep Boys #997**  
125 W Imperial Hwy., La Habra, CA 90631  
(714)447-0601( )  
CIWMB#: 30-C-04026

**SpeedDee Oil Change & Tune-Up**  
1580 W Imperial Hwy., La Habra, CA 90631  
(562)697-3513( )

## *Los Alamitos*

**Jiffy Lube #1740**  
3311 Katella Ave., Los Alamitos, CA 90720  
(562)596-1827( )  
CIWMB#: 30-C-03529

## *Midway City*

**Bolsa Transmission**  
8331 Bolsa Ave., Midway City, CA 92655  
(714)799-6158( )  
CIWMB#: 30-C-05768

## *Placentia*

**Advanced Auto & Diesel**  
144 S Bradford Placentia, CA 92870  
(714)996-8222( )  
CIWMB#: 30-C-06242

**Castner's Auto Service**  
214 S. Bradford Ave., Placentia, CA 92870  
(714)528-1311( )  
CIWMB#: 30-C-06452

**Econo Lube N' Tune**  
100 W Chapman Ave., Placentia, CA 92870  
(714)524-0424( )  
CIWMB#: 30-C-06454

**Fairway Ford**  
1350 E Yorba Linda Blvd., Placentia, CA 92870  
(714)524-1200( )  
CIWMB#: 30-C-01863

## *Seal Beach*

**M & N Coastline Auto & Tire Service**  
12239 Seal Beach Blvd., Seal Beach, CA 90740  
(714)826-1001( )  
CIWMB#: 30-C-04433

**Seal Beach Chevron**  
12541 Seal Beach Blvd., Seal Beach, CA 90740  
(949)495-0774(14 )  
CIWMB#: 30-C-06425

## *Stanton*

**AutoZone #2806**  
11320 Beach Blvd., Stanton, CA 90680  
(714)895-7665( )  
CIWMB#: 30-C-04563

**Joe's Auto Clinic**  
11763 Beach Blvd., Stanton, CA 90680  
(714)891-7715( )  
CIWMB#: 30-C-03253

**Kragen Auto Parts #1742**  
11951 Beach Blvd., Stanton, CA 90680  
(714)799-7574( )  
CIWMB#: 30-C-05231

**Scher Tire #20**  
7000 Katella Ave., Stanton, CA 90680  
(714)892-9924( )  
CIWMB#: 30-C-05907

**USA 10 Minute Oil Change**  
8100 Lampson Ave., Stanton, CA 92841  
(714)373-4432( )  
CIWMB#: 30-C-05909

## *Westminster*

**AutoZone #5543**  
6611 Westminster Blvd., Westminster, CA 92683  
(714)893-2898( )  
CIWMB#: 30-C-04964

**AutoZone #5544**  
8481 Westminster Blvd., Westminster, CA 92683  
(714)891-3511( )  
CIWMB#: 30-C-04966

**City of Westminster Corporate Yard**  
14381 Olive St., Westminster, CA 92683  
(714)895-2876(292 )  
CIWMB#: 30-C-02008

**Honda World**  
13600 Beach Blvd., Westminster, CA 92683  
(714)890-8900( )  
CIWMB#: 30-C-03639

**Jiffy Lube #1579**  
6011 Westminster Blvd., Westminster, CA 92683  
(714)899-2727( )  
CIWMB#: 30-C-02745

**John's Brake & Auto Repair**  
13050 Hoover St., Westminster, CA 92683  
(714)379-2088( )  
CIWMB#: 30-C-05617

**Kragen Auto Parts #0762**  
6562 Westminster Blvd., Westminster, CA 92683  
(714)898-0810( )  
CIWMB#: 30-C-02590

**Midway City Sanitary District**  
14451 Cedarwood St., Westminster, CA 92683  
(714)893-3553( )  
CIWMB#: 30-C-01626

**Pep Boys #653**  
15221 Beach Blvd., Westminster, CA 92683  
(714)893-8544( )  
CIWMB#: 30-C-03415

## *Yorba Linda*

**AutoZone #5545**  
18528 Yorba Linda Blvd., Yorba Linda, CA 92886  
(714)970-8933( )  
CIWMB#: 30-C-04971

**Econo Lube N' Tune**  
22270 La Palma Ave., Yorba Linda, CA 92887  
(714)692-8394( )  
CIWMB#: 30-C-06513

**EZ Lube Inc. #41**  
17511 Yorba Linda Blvd., Yorba Linda, CA 92886  
(714)556-1312( )  
CIWMB#: 30-C-05739

**Firestone Store #27T3**  
18500 Yorba Linda Blvd., Yorba Linda, CA 92886  
(714)779-1966( )  
CIWMB#: 30-C-01222

**Jiffy Lube #1532**  
16751 Yorba Linda Blvd., Yorba Linda, CA 92886  
(714)528-2800( )  
CIWMB#: 30-C-03777

**Mike Schultz Import Service**  
4832 Eureka Ave., Yorba Linda, CA 92886  
(714)528-4411( )  
CIWMB#: 30-C-04313

*This information was provided by the County of Orange Integrated Waste Management Department and the California Integrated Waste Management Board (CIWMB).*

# Sewage Spill Regulatory Requirements

Allowing sewage to discharge to a gutter or storm drain may subject you to penalties and/or out-of-pocket costs to reimburse cities or public agencies for clean-up efforts.

Here are the pertinent codes, fines, and agency contact information that apply.

## Orange County Stormwater Program

24 Hour Water Pollution Reporting Hotline

1-877-89-SPILL (1-877-897-7455)

- County and city water quality ordinances prohibit discharges containing pollutants.

## Orange County Health Care Agency Environmental Health

(714) 433-6419

California Health and Safety Code, Sections 5410-5416

- No person shall discharge raw or treated sewage or other waste in a manner that results in contamination, pollution or a nuisance.
- Any person who causes or permits a sewage discharge to any state waters:
  - must immediately notify the local health agency of the discharge.
  - shall reimburse the local health agency for services that protect the public's health and safety (water-contact receiving waters).
  - who fails to provide the required notice to the local health agency is guilty of a misdemeanor and shall be punished by a fine (between \$500-\$1,000) and/or imprisonment for less than one year.

## Regional Water Quality Control Board

Santa Ana Region San Diego Region

(951) 782-4130

(858) 467-2952

- Requires the prevention, mitigation, response to and reporting of sewage spills.

## California Office of Emergency Services

(800) 852-7550

California Water Code, Article 4, Chapter 4, Sections 13268-13271  
California Code of Regulations, Title 23, Division 3, Chapter 9.2, Article 2, Sections 2250-2260

- Any person who causes or permits sewage in excess of 1,000 gallons to be discharged to state waters shall immediately notify the Office of Emergency Services.
- Any person who fails to provide the notice required by this section is guilty of a misdemeanor and shall be punished by a fine (less than \$20,000) and/or imprisonment for not more than one year.

# Sewage Spill Reference Guide

## Your Responsibilities as a Private Property Owner

Residences  
Businesses  
Homeowner/Condominium Associations  
Federal and State Complexes  
Military Facilities



Orange County  
Sanitation District



Health Care Agency  
Environmental Health



www.ocwatersheds.com

This brochure was designed courtesy of the Orange County Sanitation District (OCS D).  
For additional information, call (714) 962-2411, or visit their website at www.ocsd.com

# What is a Sewage Spill?

Sewage spills occur when the wastewater being transported via underground pipes overflows through a manhole, cleanout or broken pipe. Sewage spills can cause health hazards, damage to homes and businesses, and threaten the environment, local waterways and beaches.

## Common Causes of Sewage Spills

**Grease** builds up inside and eventually blocks sewer pipes. Grease gets into the sewer from food establishments, household drains, as well as from poorly maintained commercial grease traps and interceptors.

**Structure problems** caused by tree roots in the lines, broken/cracked pipes, missing or broken cleanout caps or undersized sewers can cause blockages.

**Infiltration and inflow (I/I)** impacts pipe capacity and is caused when groundwater or rainwater enters the sewer system through pipe defects and illegal connections.

## You Are Responsible for a Sewage Spill Caused by a Blockage or Break in Your Sewer Lines!

Time is of the essence in dealing with sewage spills. You are required to **immediately**:

**Control and minimize the spill.** Keep spills contained on private property and out of gutters, storm drains and public waterways by shutting off or not using the water.

**Use sandbags, dirt and/or plastic sheeting** to prevent sewage from entering the storm drain system.

**Clear the sewer blockage.** Always wear gloves and wash your hands. It is recommended that a plumbing professional be called for clearing blockages and making necessary repairs.

**Always notify your city sewer/public works department or public sewer district of sewage spills.** If the spill enters the storm drains also notify the Health Care Agency. In addition, if it exceeds 1,000 gallons notify the Office of Emergency Services. Refer to the numbers listed in this brochure.

Overflowing  
cleanout pipe  
located on  
private property



## You Could Be Liable

Allowing sewage from your home, business or property to discharge to a gutter or storm drain may subject you to penalties and/or out-of-pocket costs to reimburse cities or public agencies for clean-up and enforcement efforts. See Regulatory Codes & Fines section for pertinent codes and fines that apply.

## What to Look For

Sewage spills can be a very noticeable gushing of water from a manhole or a slow water leak that may take time to be noticed. Don't dismiss unaccounted-for wet areas.

Look for:

- Drain backups inside the building.
- Wet ground and water leaking around manhole lids onto your street.
- Leaking water from cleanouts or outside drains.
- Unusual odorous wet areas: sidewalks, external walls or ground/landscape around a building.

## Caution

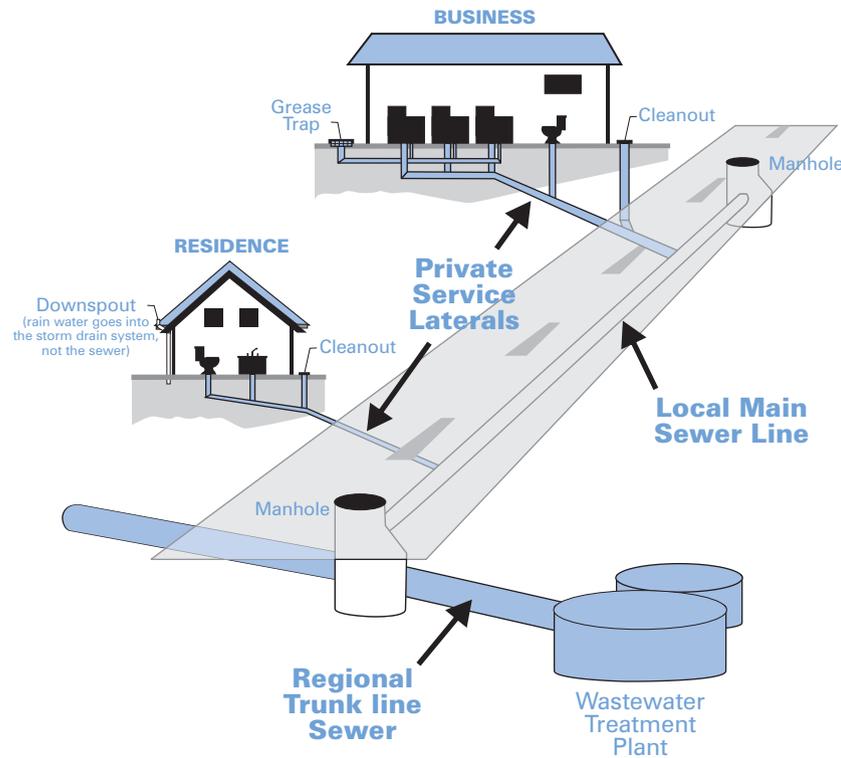
Keep people and pets away from the affected area. Untreated sewage has high levels of disease-causing viruses and bacteria. Call your local health care agency listed on the back for more information.

**If You See a Sewage Spill Occurring,  
Notify Your City Sewer/Public Works  
Department or Public Sewer District  
IMMEDIATELY!**

## How a Sewer System Works

A property owner's sewer pipes are called service laterals and are connected to larger local main and regional trunk lines. Service laterals run from the connection at the home to the connection with the public sewer (including the area under the street). These laterals are the responsibility of the property owner and must be maintained by the property owner. Many city agencies have adopted ordinances requiring maintenance of service laterals. Check with your city sewer/local public works department for more information.

Operation and maintenance of **local and regional sewer lines** are the responsibility of the city sewer/public works departments and public sewer districts.



## Preventing Grease Blockages

The drain is not a dump! Recycle or dispose of grease properly and never pour grease down the drain.

Homeowners should mix fats, oils and grease with absorbent waste materials such as paper, coffee grounds, or kitty litter and place it in the trash. Wipe food scraps from plates and pans and dump them in the trash.

Restaurants and commercial food service establishments should always use "Kitchen Best Management Practices." These include:

- Collecting all cooking grease and liquid oil from pots, pans and fryers in covered grease containers for recycling.
- Scraping or dry-wiping excess food and grease from dishes, pots, pans and fryers into the trash.
- Installing drain screens on all kitchen drains.
- Having spill kits readily available for cleaning up spills.
- Properly maintaining grease traps or interceptors by having them serviced regularly. Check your local city codes.

### How You Can Prevent Sewage Spills

- 1 Never put grease down garbage disposals, drains or toilets.**
- 2 Perform periodic cleaning to eliminate grease, debris and roots in your service laterals.**
- 3 Repair any structural problems in your sewer system and eliminate any rainwater infiltration/inflow leaks into your service laterals.**



## Orange County Agency Responsibilities

- **City Sewer/Public Works Departments**— Responsible for protecting city property and streets, the local storm drain system, sewage collection system and other public areas.
- **Public Sewer/Sanitation District**— Responsible for collecting, treating and disposing of wastewater.
- **County of Orange Health Care Agency**— Responsible for protecting public health by closing ocean/bay waters and may close food-service businesses if a spill poses a threat to public health.
- **Regional Water Quality Control Boards**— Responsible for protecting State waters.
- **Orange County Stormwater Program**— Responsible for preventing harmful pollutants from being discharged or washed by stormwater runoff into the municipal storm drain system, creeks, bays and the ocean.

### You Could Be Liable for Not Protecting the Environment

Local and state agencies have legal jurisdiction and enforcement authority to ensure that sewage spills are remedied.

They may respond and assist with containment, relieving pipe blockages, and/or clean-up of the sewage spill, especially if the spill is flowing into storm drains or onto public property.

**A property owner may be charged for costs incurred by these agencies responding to spills from private properties.**



## Report Sewage Spills!

### City Sewer/Public Works Departments

Aliso Viejo	(949) 425-2500
Anaheim	(714) 765-6860
Brea	(714) 990-7691
Buena Park	(714) 562-3655
Costa Mesa	(949) 645-8400
Cypress	(714) 229-6760
Dana Point	(949) 248-3562
Fountain Valley	(714) 593-4600
Fullerton	(714) 738-6897
Garden Grove	(714) 741-5375
Huntington Beach	(714) 536-5921
Irvine	(949) 453-5300
Laguna Beach	(949) 497-0765
Laguna Hills	(949) 707-2650
Laguna Niguel	(949) 362-4337
Laguna Woods	(949) 639-0500
La Habra	(562) 905-9792
Lake Forest	(949) 461-3480
La Palma	(714) 690-3310
Los Alamitos	(562) 431-3538
Mission Viejo	(949) 831-2500
Newport Beach	(949) 644-3011
Orange	(714) 532-6480
Orange County	(714) 567-6363
Placentia	(714) 993-8245
Rancho Santa Margarita	(949) 635-1800
San Clemente	(949) 366-1553
San Juan Capistrano	(949) 443-6363
Santa Ana	(714) 647-3380
Seal Beach	(562) 431-2527
Stanton	(714) 379-9222
Tustin	(714) 962-2411
Villa Park	(714) 998-1500
Westminster	(714) 893-3553
Yorba Linda	(714) 961-7170

### Public Sewer/Water Districts

Costa Mesa Sanitary District	(714) 393-4433/ (949) 645-8400
El Toro Water District	(949) 837-0660
Emerald Bay Service District	(949) 494-8571
Garden Grove Sanitary District	(714) 741-5375
Irvine Ranch Water District	(949) 453-5300
Los Alamitos/Rossmoor Sewer District	(562) 431-2223
Midway City Sanitary District (Westminster)	(714) 893-3553
Moulton Niguel Water District	(949) 831-2500
Orange County Sanitation District	(714) 962-2411
Santa Margarita Water District	(949) 459-6420
South Coast Water District	(949) 499-4555
South Orange County Wastewater Authority	(949) 234-5400
Sunset Beach Sanitary District	(562) 493-9932
Trabuco Canyon Sanitary District	(949) 858-0277
Yorba Linda Water District	(714) 777-3018

### Other Agencies

Orange County Health Care Agency	(714) 433-6419
Office of Emergency Services	(800) 852-7550



**C**lean beaches and healthy creeks, rivers, bays and ocean are important to Orange County. However, many common activities can lead to water pollution if you're not careful. Home improvement projects and work sites must be maintained to ensure that building materials do not enter the street, gutter or storm drain. Unlike water in sanitary sewers (from sinks and toilets), water in storm drains is not treated before entering our waterways.

You would never dump building materials into the ocean, so don't let them enter the storm drains. Follow these tips to help prevent water pollution.

For more information, please call the **Orange County Stormwater Program** at **1-877-89-SPILL** (1-877-897-7455) or visit [www.ocwatersheds.com](http://www.ocwatersheds.com)

To report a spill, call the **Orange County 24-Hour Water Pollution Problem Reporting Hotline** at **1-877-89-SPILL** (1-877-897-7455).

**For emergencies, dial 911.**

The tips contained in this brochure provide useful information to help prevent water pollution while performing home improvement projects. If you have other suggestions, please contact your city's stormwater representatives or call the Orange County Stormwater Program.



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## Help Prevent Ocean Pollution: Tips for Home Improvement Projects



**The Ocean Begins  
at Your Front Door**

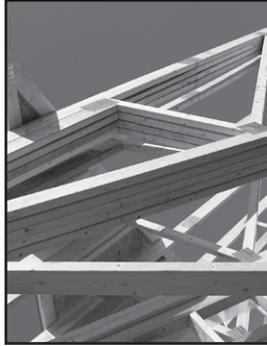
**P R O J E C T  
P o l l u t i o n  
P R E V E N T I O N**

# Tips for Home Improvement Projects

Home improvement projects can cause significant damage to the environment. Whether you hire a contractor or work on the house yourself, it is important to follow these simple tips while renovating, remodeling or improving your home:

## General Construction

- Schedule projects for dry weather.
- Keep all construction debris away from the street, gutter and storm drain.
- Store materials under cover with temporary roofs or plastic sheets to eliminate or reduce the possibility that rainfall, runoff or wind will carry materials from the project site to the street, storm drain or adjacent properties.

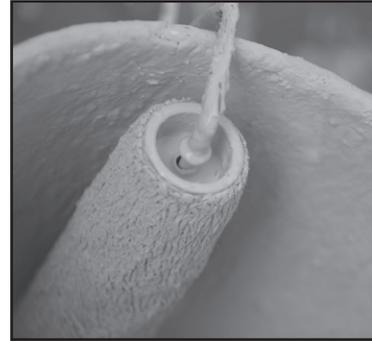


## Building Materials

- Never hose materials into a street, gutter or storm drain.
- Exposed piles of construction material should not be stored on the street or sidewalk.
- Minimize waste by ordering only the amount of materials needed to complete the job.
- Do not mix more fresh concrete than is needed for each project.
- Wash concrete mixers and equipment in a designated washout area where the water can flow into a containment area or onto dirt.
- Dispose of small amounts of dry excess materials in the trash. Powdery waste, such as dry concrete, must be properly contained within a box or bag prior to disposal. Call your local trash hauler for weight and size limits.

## Paint

- Measure the room or object to be painted, then buy only the amount needed.
- Place the lid on firmly and store the paint can upside-down in a dry location away from the elements.
- Tools such as brushes, buckets and rags should never be washed where excess water can drain into the street, gutter or storm drain. All tools should be rinsed in a sink connected to the sanitary sewer.
- When disposing of paint, never put wet paint in the trash.
- Dispose of water-based paint by removing the lid and letting it dry in the can. Large amounts must be taken to a Household Hazardous Waste Collection Center (HHWCC).
- Oil-based paint is a household hazardous waste. All leftover paint should be taken to a HHWCC.
- For HHWCC locations and hours, call (714) 834-6752 or visit [www.oilandfills.com](http://www.oilandfills.com).



## Erosion Control

- Schedule grading and excavation projects for dry weather.
- When temporarily removing soil, pile it in a contained, covered area where it cannot spill into the street, or obtain the required temporary encroachment or street closure permit and follow the conditions instructed by the permit.

- When permanently removing large quantities of soil, a disposal location must be found prior to excavation. Numerous businesses are available to handle disposal needs. For disposal options, visit [www.ciwmb.ca.gov/SWIS](http://www.ciwmb.ca.gov/SWIS).
- Prevent erosion by planting fast-growing annual and perennial grasses. They will shield and bind the soil.

## Recycle

- Use a construction and demolition recycling company to recycle lumber, paper, cardboard, metals, masonry (bricks, concrete, etc.), carpet, plastic, pipes (plastic, metal and clay), drywall, rocks, dirt and green waste.
- For a listing of construction and demolition recycling locations in your area, visit [www.ciwmb.ca.gov/recycle](http://www.ciwmb.ca.gov/recycle).



## Spills

- Clean up spills immediately by using an absorbent material such as cat litter, then sweep it up and dispose of it in the trash.
- Immediately report spills that have entered the street, gutter or storm drain to the County's 24-Hour Water Pollution Problem Reporting Hotline at (714) 567-6363 or visit [www.ocwatersheds.com](http://www.ocwatersheds.com) to fill out an incident reporting form.



**C**lean beaches and healthy creeks, rivers, bays and ocean are important to Orange County. However, many common activities can lead to water pollution if you're not careful. Fertilizers, pesticides and other chemicals that are left on yards or driveways can be blown or washed into storm drains that flow to the ocean. Overwatering lawns can also send materials into storm drains. Unlike water in sanitary sewers (from sinks and toilets), water in storm drains is not treated before entering our waterways.

You would never pour gardening products into the ocean, so don't let them enter the storm drains. Follow these easy tips to help prevent water pollution.

For more information, please call the **Orange County Stormwater Program** at **1-877-89-SPILL** (1-877-897-7455) or visit [www.ocwatersheds.com](http://www.ocwatersheds.com)

**UCCE Master Gardener Hotline:**  
**(714) 708-1646**

To report a spill, call the **Orange County 24-Hour Water Pollution Problem Reporting Hotline** **1-877-89-SPILL** (1-877-897-7455).

**For emergencies, dial 911.**

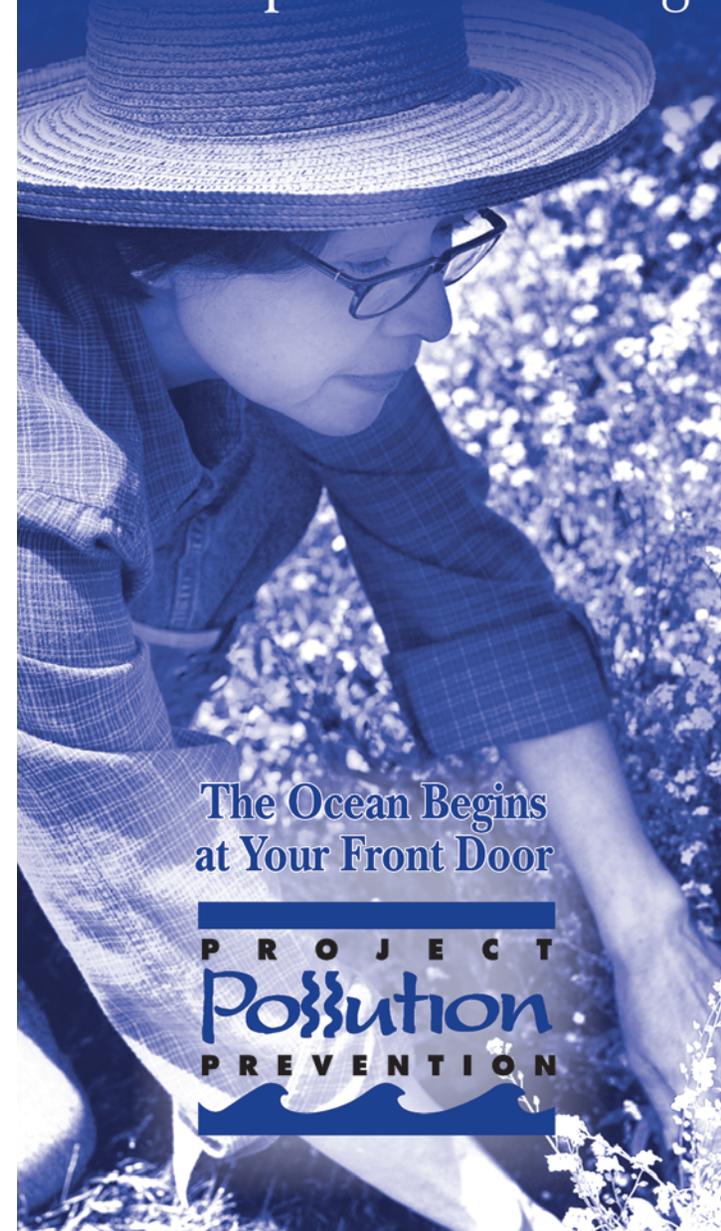
The tips contained in this brochure provide useful information to help prevent water pollution while landscaping or gardening. If you have other suggestions, please contact your city's stormwater representatives or call the Orange County Stormwater Program.



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Help Prevent Ocean Pollution:

## Tips for Landscape & Gardening



The Ocean Begins  
at Your Front Door



# Tips for Landscape & Gardening

Never allow gardening products or polluted water to enter the street, gutter or storm drain.

## General Landscaping Tips

- Protect stockpiles and materials from wind and rain by storing them under tarps or secured plastic sheeting.
- Prevent erosion of slopes by planting fast-growing, dense ground covering plants. These will shield and bind the soil.
- Plant native vegetation to reduce the amount of water, fertilizers, and pesticide applied to the landscape.
- Never apply pesticides or fertilizers when rain is predicted within the next 48 hours.



## Garden & Lawn Maintenance

- Do not overwater. Use irrigation practices such as drip irrigation, soaker hoses or micro spray systems. Periodically inspect and fix leaks and misdirected sprinklers.

- Do not rake or blow leaves, clippings or pruning waste into the street, gutter or storm drain. Instead, dispose of green waste by composting, hauling it to a permitted landfill, or recycling it through your city's program.



- Use slow-release fertilizers to minimize leaching, and use organic fertilizers.
- Read labels and use only as directed. Do not over-apply pesticides or fertilizers. Apply to spots as needed, rather than blanketing an entire area.
- Store pesticides, fertilizers and other chemicals in a dry covered area to prevent exposure that may result in the deterioration of containers and packaging.
- Rinse empty pesticide containers and re-use rinse water as you would use the



product. Do not dump rinse water down storm drains. Dispose of empty containers in the trash.

- When available, use non-toxic alternatives to traditional pesticides, and use pesticides specifically designed to control the pest you are targeting. For more information, visit [www.ipm.ucdavis.edu](http://www.ipm.ucdavis.edu).
- If fertilizer is spilled, sweep up the spill before irrigating. If the spill is liquid, apply an absorbent material such as cat litter, and then sweep it up and dispose of it in the trash.
- Take unwanted pesticides to a Household Hazardous Waste Collection Center to be recycled. Locations are provided below.

## Household Hazardous Waste Collection Centers

Anaheim:	1071 N. Blue Gum St.
Huntington Beach:	17121 Nichols St.
Irvine:	6411 Oak Canyon
San Juan Capistrano:	32250 La Pata Ave.

For more information, call (714) 834-6752 or visit [www.oilandfills.com](http://www.oilandfills.com)



**C**lean beaches and healthy creeks, rivers, bays and ocean are important to Orange County. However, many common activities can lead to water pollution if you're not careful. Pet waste and pet care products can be washed into the storm drains that flow to the ocean. Unlike water in sanitary sewers (from sinks and toilets), water in storm drains is not treated before entering our waterways.

You would never put pet waste or pet care products into the ocean, so don't let them enter the storm drains. Follow these easy tips to help prevent water pollution.

For more information, please call the **Orange County Stormwater Program** at **1-877-89-SPILL** (1-877-897-7455) or visit **www.ocwatersheds.com**

To report a spill, call the **Orange County 24-Hour Water Pollution Problem Reporting Hotline** **1-877-89-SPILL** (1-877-897-7455).

**For emergencies, dial 911.**

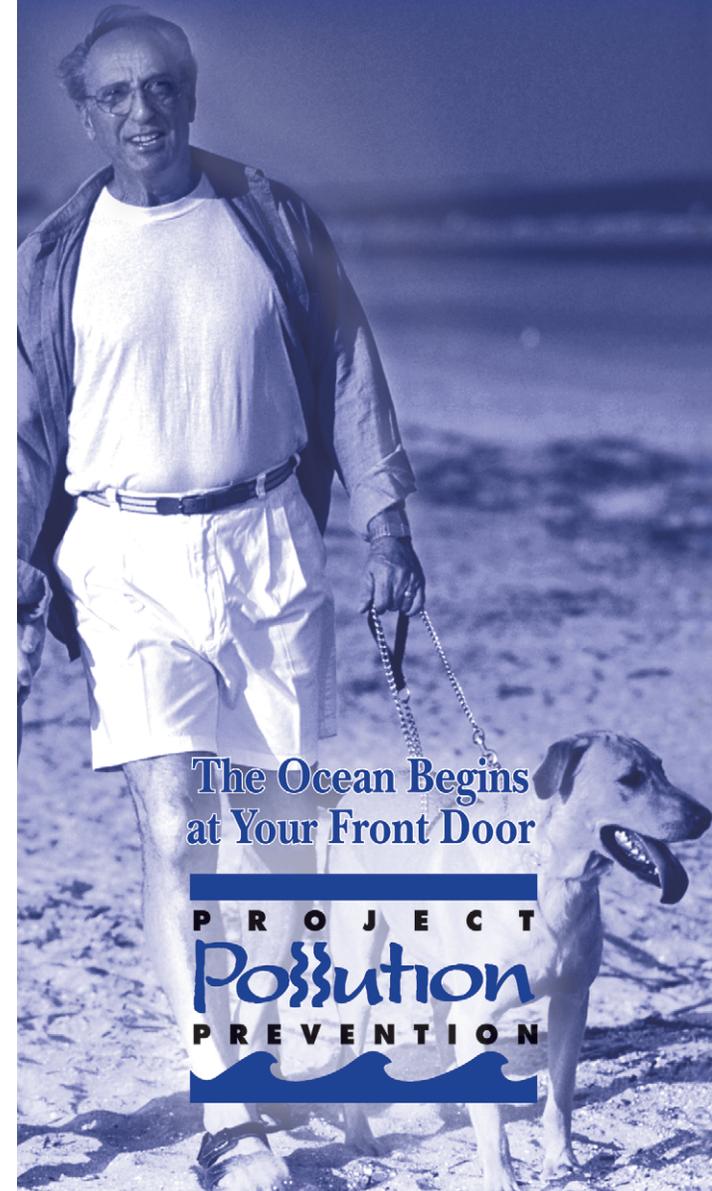
The tips contained in this brochure provide useful information to help prevent water pollution while caring for your pet. If you have other suggestions, please contact your city's stormwater representatives or call the Orange County Stormwater Program.



Printed on Recycled Paper

Help Prevent Ocean Pollution:

## Tips for Pet Care



# Tips for Pet Care

Never let any pet care products or washwater run off your yard and into the street, gutter or storm drain.

## *Washing Your Pets*

Even biodegradable soaps and shampoos can be harmful to marine life and the environment.

- If possible, bathe your pets indoors using less-toxic shampoos or have your pet professionally groomed. Follow instructions on the products and clean up spills.
- If you bathe your pet outside, wash it on your lawn or another absorbent/permeable surface to keep the washwater from running into the street, gutter or storm drain.



## *Flea Control*

- Consider using oral or topical flea control products.
- If you use flea control products such as shampoos, sprays or collars, make sure to dispose of any unused products at a Household Hazardous Waste Collection Center. For location information, call (714) 834-6752.



## *Why You Should Pick Up After Your Pet*

It's the law! Every city has an ordinance requiring you to pick up after your pet. Besides being a nuisance, pet



waste can lead to water pollution, even if you live inland. During rainfall, pet waste left outdoors can wash into storm drains. This waste flows directly into our waterways and the ocean where it can harm human health, marine life and the environment.

As it decomposes, pet waste demands a high level of oxygen from water. This decomposition can contribute to killing marine life by reducing the amount of dissolved oxygen available to them.

Have fun with your pets, but please be a responsible pet owner by taking care of them and the environment.

- Take a bag with you on walks to pick up after your pet.
- Dispose of the waste in the trash or in a toilet.



# The Ocean Begins at Your Front Door



*Never allow pollutants to enter the*

Follow these simple steps to help reduce water pollution:

### ***Household Activities***

- Do not rinse spills with water. Use dry cleanup methods such as applying cat litter or another absorbent material, sweep and dispose of in the trash. Take items such as used or excess batteries, oven cleaners, automotive fluids, painting products and cathode ray tubes, like TVs and computer monitors, to a Household Hazardous Waste Collection Center (HHWCC).
- For a HHWCC near you call (714) 834-6752 or visit [www.oilandfills.com](http://www.oilandfills.com).
- Do not hose down your driveway, sidewalk or patio to the street, gutter or storm drain. Sweep up debris and dispose of it in the trash.

### ***Automotive***

- Take your vehicle to a commercial car wash whenever possible. If you wash your vehicle at home, choose soaps, cleaners, or detergents labeled non-toxic, phosphate-free or biodegradable. Vegetable and citrus-based products are typically safest for the environment.
- Do not allow washwater from vehicle washing to drain into the street, gutter or storm drain. Excess washwater should be disposed of in the sanitary sewer (through a sink or toilet) or onto an absorbent surface like your lawn.
- Monitor your vehicles for leaks and place a pan under leaks. Keep your vehicles well maintained to stop and prevent leaks.
- Never pour oil or antifreeze in the street, gutter or storm drain. Recycle these substances at a service station, a waste oil collection center or used oil recycling center. For the nearest Used Oil Collection Center call 1-800-CLEANUP or visit [www.1800cleanup.org](http://www.1800cleanup.org).

### ***Pool Maintenance***

- Pool and spa water must be dechlorinated and free of excess acid, alkali or color to be allowed in the street, gutter or storm drain.
- When it is not raining, drain dechlorinated pool and spa water directly into the sanitary sewer.
- Some cities may have ordinances that do not allow pool water to be disposed of in the storm drain. Check with your city.

### ***Landscape and Gardening***

- Do not over-water. Water your lawn and garden by hand to control the amount of water you use or set irrigation systems to reflect seasonal water needs. If water flows off your yard onto your driveway or sidewalk, your system is over-watering. Periodically inspect and fix leaks and misdirected sprinklers.
- Do not rake or blow leaves, clippings or pruning waste into the street, gutter or storm drain. Instead, dispose of waste by composting, hauling it to a permitted landfill, or as green waste through your city's recycling program.
- Follow directions on pesticides and fertilizer, (measure, do not estimate amounts) and do not use if rain is predicted within 48 hours.
- Take unwanted pesticides to a HHWCC to be recycled. For locations and hours of HHWCC, call (714) 834-6752 or visit [www.oilandfills.com](http://www.oilandfills.com).

### ***Trash***

- Place trash and litter that cannot be recycled in securely covered trash cans.
- Whenever possible, buy recycled products.
- Remember: Reduce, Reuse, Recycle.

### ***Pet Care***

- Always pick up after your pet. Flush waste down the toilet or dispose of it in the trash. Pet waste, if left outdoors, can wash into the street, gutter or storm drain.
- If possible, bathe your pets indoors. If you must bathe your pet outside, wash it on your lawn or another absorbent/permeable surface to keep the washwater from entering the street, gutter or storm drain.
- Follow directions for use of pet care products and dispose of any unused products at a HHWCC.

## ***Common Pollutants***

### ***Home Maintenance***

- Detergents, cleaners and solvents
- Oil and latex paint
- Swimming pool chemicals
- Outdoor trash and litter

### ***Lawn and Garden***

- Pet and animal waste
- Pesticides
- Clippings, leaves and soil
- Fertilizer

### ***Automobile***

- Oil and grease
- Radiator fluids and antifreeze
- Cleaning chemicals
- Brake pad dust

*Even if you live miles from the Pacific Ocean, you may be unknowingly polluting it.*

*Dumping one quart of motor oil into a storm drain can contaminate 250,000 gallons of water.*

### *Did You Know?*

- Most people believe that the largest source of water pollution in urban areas comes from specific sources such as factories and sewage treatment plants. In fact, the largest source of water pollution comes from city streets, neighborhoods, construction sites and parking lots. This type of pollution is sometimes called “non-point source” pollution.
- There are two types of non-point source pollution: stormwater and urban runoff pollution.
- Stormwater runoff results from rainfall. When rainstorms cause large volumes of water to rinse the urban landscape, picking up pollutants along the way.
- Urban runoff can happen any time of the year when excessive water use from irrigation, vehicle washing and other sources carries trash, lawn clippings and other urban pollutants into storm drains.

### *Where Does It Go?*

- Anything we use outside homes, vehicles and businesses – like motor oil, paint, pesticides, fertilizers and cleaners – can be blown or washed into storm drains.
- A little water from a garden hose or rain can also send materials into storm drains.
- Storm drains are separate from our sanitary sewer systems; unlike water in sanitary sewers (from sinks or toilets), water in storm drains is not treated before entering our waterways.

### *Sources of Non-Point Source Pollution*

- Automotive leaks and spills.
- Improper disposal of used oil and other engine fluids.
- Metals found in vehicle exhaust, weathered paint, rust, metal plating and tires.
- Pesticides and fertilizers from lawns, gardens and farms.
- Improper disposal of cleaners, paint and paint removers.
- Soil erosion and dust debris from landscape and construction activities.
- Litter, lawn clippings, animal waste, and other organic matter.
- Oil stains on parking lots and paved surfaces.



### *The Effect on the Ocean*



Non-point source pollution can have a serious impact on water quality in Orange County. Pollutants from the storm drain system can harm marine life

as well as coastal and wetland habitats. They can also degrade recreation areas such as beaches, harbors and bays.

Stormwater quality management programs have been developed throughout Orange County to educate and encourage the public to protect water quality, monitor runoff in the storm drain system, investigate illegal dumping and maintain storm drains.

Support from Orange County residents and businesses is needed to improve water quality and reduce urban runoff pollution. Proper use and disposal of materials will help stop pollution before it reaches the storm drain and the ocean.



# For More Information

## Orange County Stormwater Program

# The Ocean Begins at Your Front Door

### California Environmental Protection Agency

[www.calepa.ca.gov](http://www.calepa.ca.gov)

- **Air Resources Board**

[www.arb.ca.gov](http://www.arb.ca.gov)

- **Department of Pesticide Regulation**

[www.cdpr.ca.gov](http://www.cdpr.ca.gov)

- **Department of Toxic Substances Control**

[www.dtsc.ca.gov](http://www.dtsc.ca.gov)

- **Integrated Waste Management Board**

[www.ciwmb.ca.gov](http://www.ciwmb.ca.gov)

- **Office of Environmental Health Hazard Assessment**

[www.oehha.ca.gov](http://www.oehha.ca.gov)

- **State Water Resources Control Board**

[www.waterboards.ca.gov](http://www.waterboards.ca.gov)

**Earth 911** - Community-Specific Environmental Information 1-800-cleanup or visit [www.1800cleanup.org](http://www.1800cleanup.org)

### Health Care Agency's Ocean and Bay Water Closure and Posting Hotline

(714) 433-6400 or visit [www.ocbeachinfo.com](http://www.ocbeachinfo.com)

### Integrated Waste Management Dept. of Orange County

(714) 834-6752 or visit [www.oilandfills.com](http://www.oilandfills.com) for information on household hazardous waste collection centers, recycling centers and solid waste collection

### O.C. Agriculture Commissioner

(714) 447-7100 or visit [www.ocagcomm.com](http://www.ocagcomm.com)

### Stormwater Best Management Practice Handbook

Visit [www.cabmphandbooks.com](http://www.cabmphandbooks.com)

### UC Master Gardener Hotline

(714) 708-1646 or visit [www.uccemg.com](http://www.uccemg.com)

The Orange County Stormwater Program has created and moderates an electronic mailing list to facilitate communications, take questions and exchange ideas among its users about issues and topics related to stormwater and urban runoff and the implementation of program elements.

To join the list, please send an email to [ocstormwaterinfo-join@list.ocwatersheds.com](mailto:ocstormwaterinfo-join@list.ocwatersheds.com)

Aliso Viejo . . . . .	(949)	425-2535
Anaheim Public Works Operations . . . . .	(714)	765-6860
Brea Engineering . . . . .	(714)	990-7666
Buena Park Public Works . . . . .	(714)	562-3655
Costa Mesa Public Services . . . . .	(714)	754-5323
Cypress Public Works . . . . .	(714)	229-6740
Dana Point Public Works . . . . .	(949)	248-3584
Fountain Valley Public Works . . . . .	(714)	593-4441
Fullerton Engineering Dept. . . . .	(714)	738-6853
Garden Grove Public Works . . . . .	(714)	741-5956
Huntington Beach Public Works . . . . .	(714)	536-5431
Irvine Public Works . . . . .	(949)	724-6315
La Habra Public Services . . . . .	(562)	905-9792
La Palma Public Works . . . . .	(714)	690-3310
Laguna Beach Water Quality . . . . .	(949)	497-0378
Laguna Hills Public Services . . . . .	(949)	707-2650
Laguna Niguel Public Works . . . . .	(949)	362-4337
Laguna Woods Public Works . . . . .	(949)	639-0500
Lake Forest Public Works . . . . .	(949)	461-3480
Los Alamitos Community Dev. . . . .	(562)	431-3538
Mission Viejo Public Works . . . . .	(949)	470-3056
Newport Beach, Code & Water		
Quality Enforcement . . . . .	(949)	644-3215
Orange Public Works . . . . .	(714)	532-6480
Placentia Public Works . . . . .	(714)	993-8245
Rancho Santa Margarita . . . . .	(949)	635-1800
San Clemente Environmental Programs . . . . .	(949)	361-6143
San Juan Capistrano Engineering . . . . .	(949)	234-4413
Santa Ana Public Works . . . . .	(714)	647-3380
Seal Beach Engineering . . . . .	(562)	431-2527 x317
Stanton Public Works . . . . .	(714)	379-9222 x204
Tustin Public Works/Engineering . . . . .	(714)	573-3150
Villa Park Engineering . . . . .	(714)	998-1500
Westminster Public Works/Engineering . . . . .	(714)	898-3311 x446
Yorba Linda Engineering . . . . .	(714)	961-7138
Orange County Stormwater Program . . . . .	(877)	897-7455
Orange County 24-Hour		
Water Pollution Problem Reporting Hotline		
1-877-89-SPILL (1-877-897-7455)		

On-line Water Pollution Problem Reporting Form

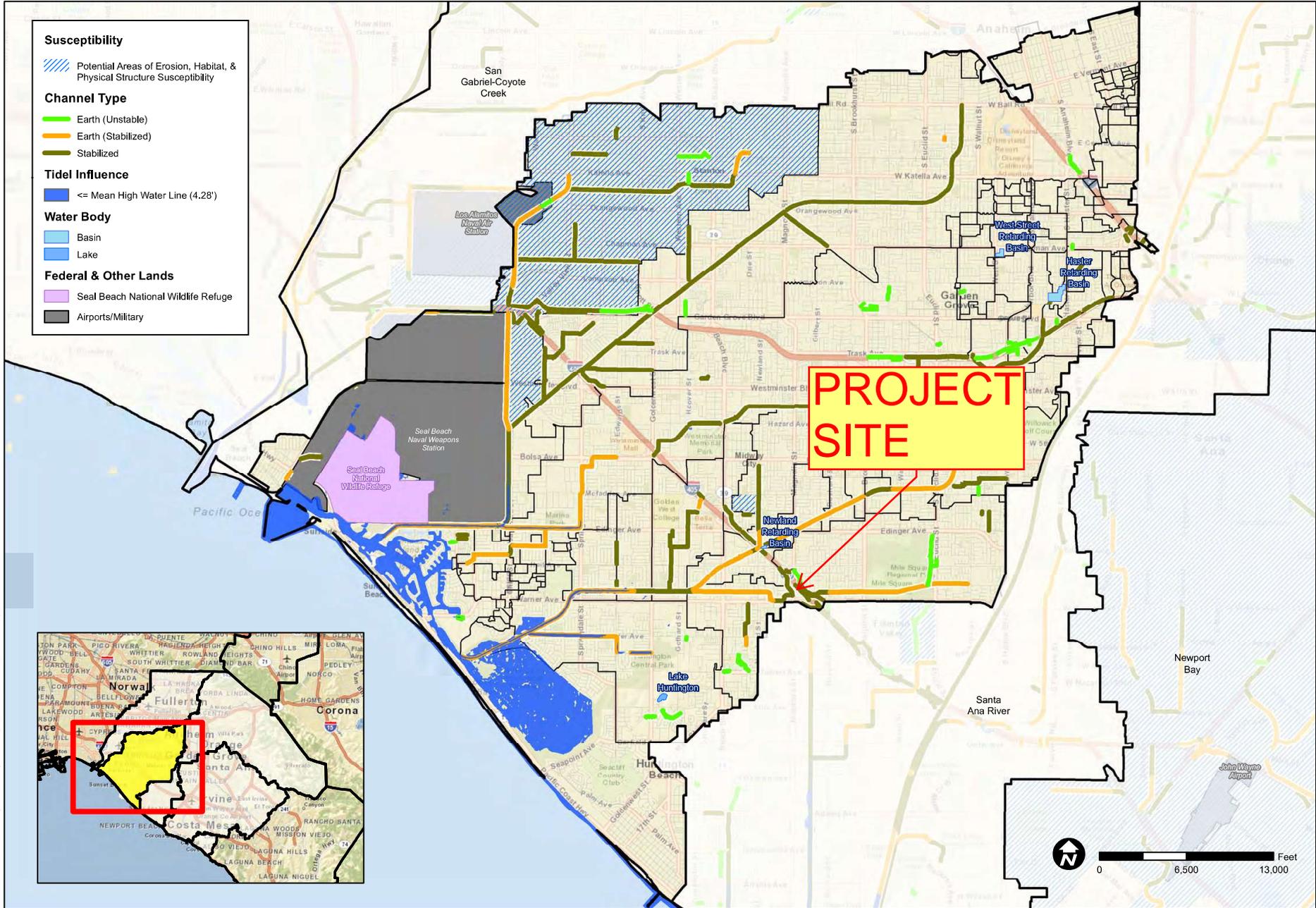
[www.ocwatersheds.com](http://www.ocwatersheds.com)



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**APPENDIX B**  
**Technical Guidance Documents Exhibits**



SUSCEPTIBILITY ANALYSIS  
ANAHEIM BAY-  
HUNTINGTON HARBOR

ORANGE COUNTY  
WATERSHED  
MASTER PLANNING

ORANGE CO.

SCALE	1" = 650'
DESIGNED	TH
DRAWING	TH
CHECKED	BMP
DATE	02/22/12
DRAWING NO.	6224-E

FIGURE  
2

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SUBJECT TO FURTHER REVISION

**PROJECT SITE**

**LEGEND**

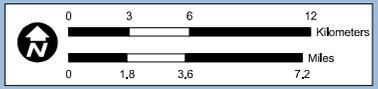
- Orange County Precipitation Stations
- 24 Hour, 85th Percentile Rainfall (Inches)
- ⋯ 24 Hour, 85th Percentile Rainfall (Inches) - Extrapolated
- City Boundaries

**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.



RAINFALL ZONES

ORANGE COUNTY TECHNICAL GUIDANCE DOCUMENT

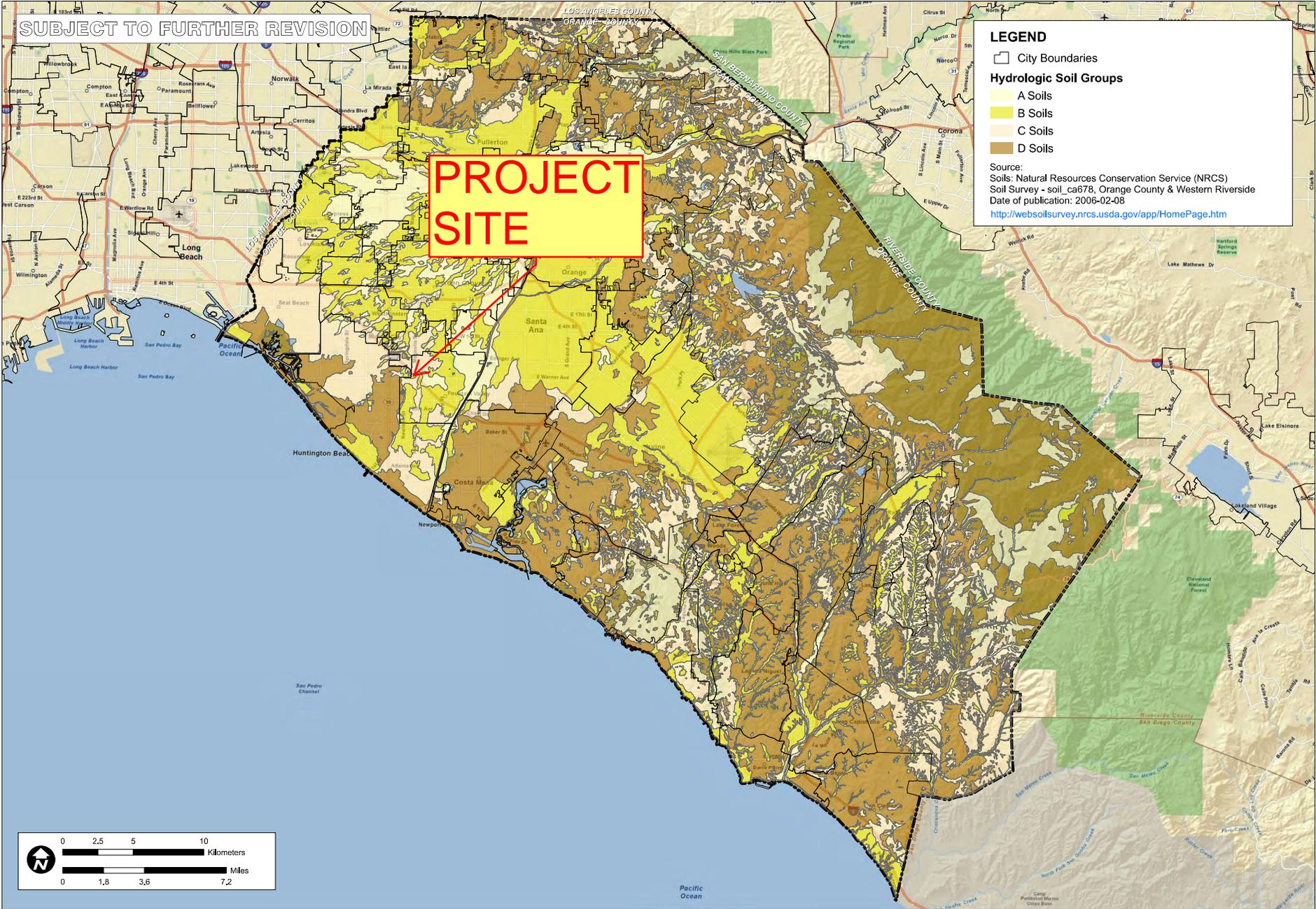
ORANGE CO. CA

SCALE	1" = 1.8 miles
DESIGNED BY	
DRAWN BY	
CHECKED BY	
DATE	02/22/10
JOB NO.	9554E

FIGURE XVI-1

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PA\9524E\C-CIS Maps\Reports\InfiltrationFeasibility\_20110215\9524E\_Figures\VI-2a\_HydroSoils\_20110215.mxd



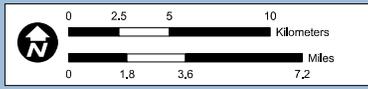
SUBJECT TO FURTHER REVISION

PROJECT SITE

**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://websolssurvey.nrcs.usda.gov/app/HomePage.htm>



NRCS HYDROLOGIC SOILS GROUPS

ORANGE COUNTY INFILTRATION STUDY

ORANGE CO. CA

SCALE	1" = 1.8 miles
DESIGNED	TH
DRAWING	TH
CHECKED	RMP
DATE	02/09/11
JOB NO.	9524E

FIGURE XVI-2a



SUBJECT TO FURTHER REVISION

PROJECT SITE

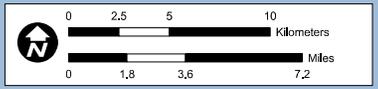
LEGEND

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>



TITLE  
HYDROLOGIC SOIL GROUP  
TYPE D NRCS SOIL SURVEY

ORANGE COUNTY  
INFILTRATION STUDY

CA

ORANGE CO.

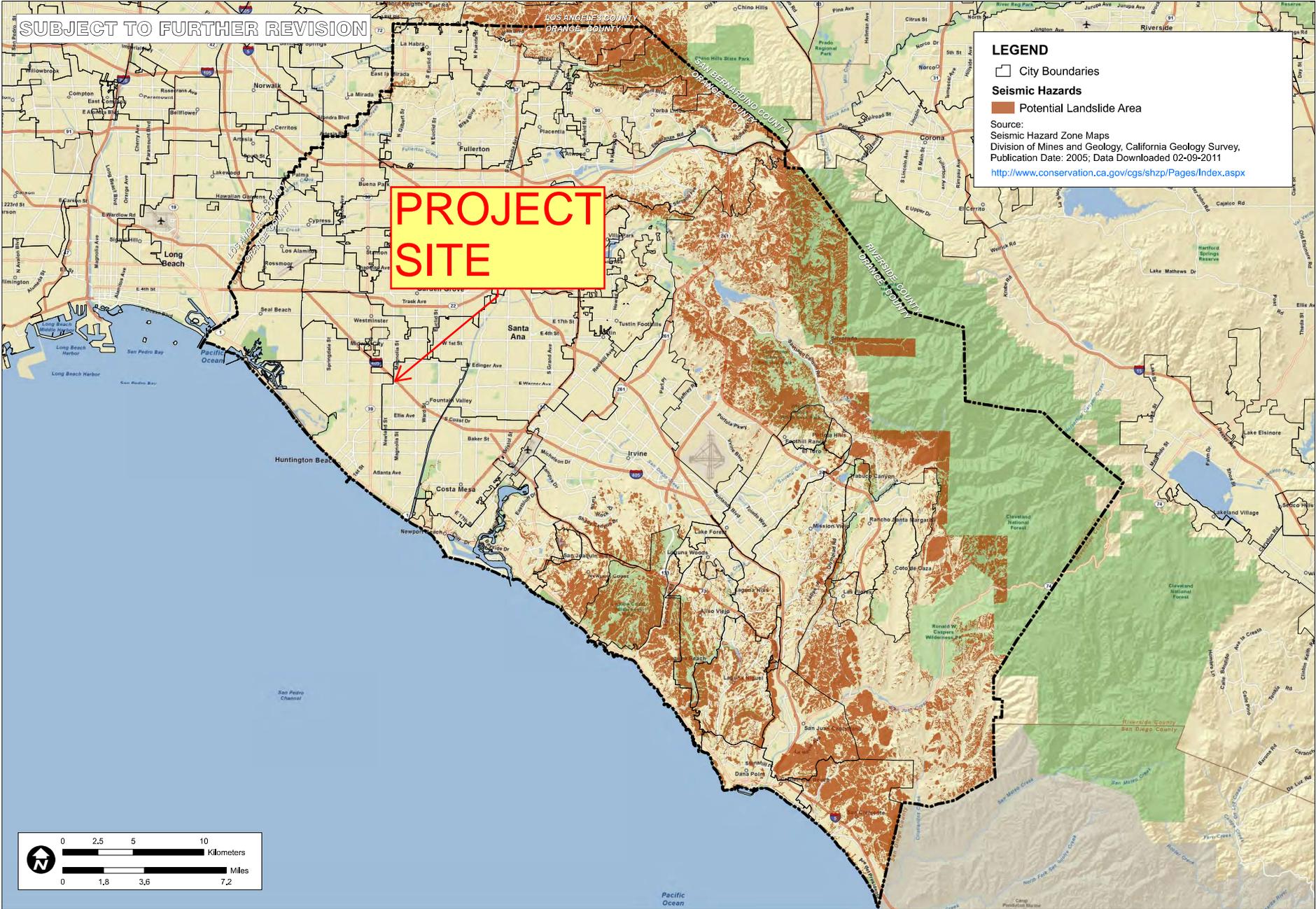
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DRAWN	TH
CHECKED	RMP
DATE	02/09/11
JOB NO.	9554E



FIGURE

XVI-2b

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SUBJECT TO FURTHER REVISION

**PROJECT SITE**

**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>



TITLE: HYDROLOGIC SOIL GROUP TYPE D NRCS SOIL SURVEY

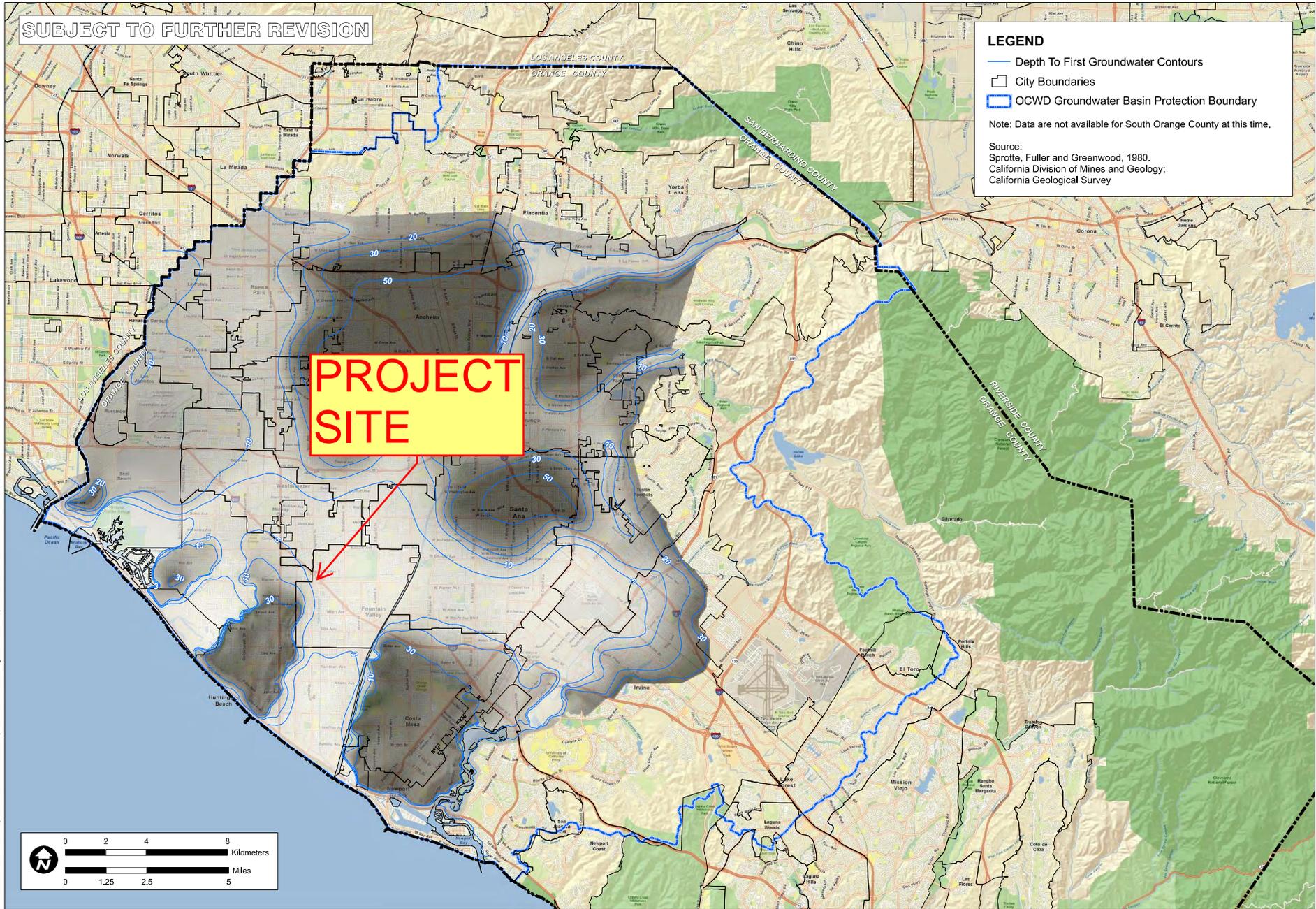
ORANGE COUNTY INFILTRATION STUDY

ORANGE CO. CA

SCALE	1" = 1.25 miles
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CHECKED BY	
DATE	02/09/11
JOB NO.	9524E

FIGURE XVI-2c

SUBJECT TO FURTHER REVISION



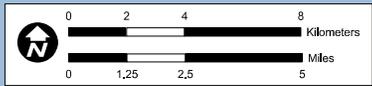
**LEGEND**

- 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

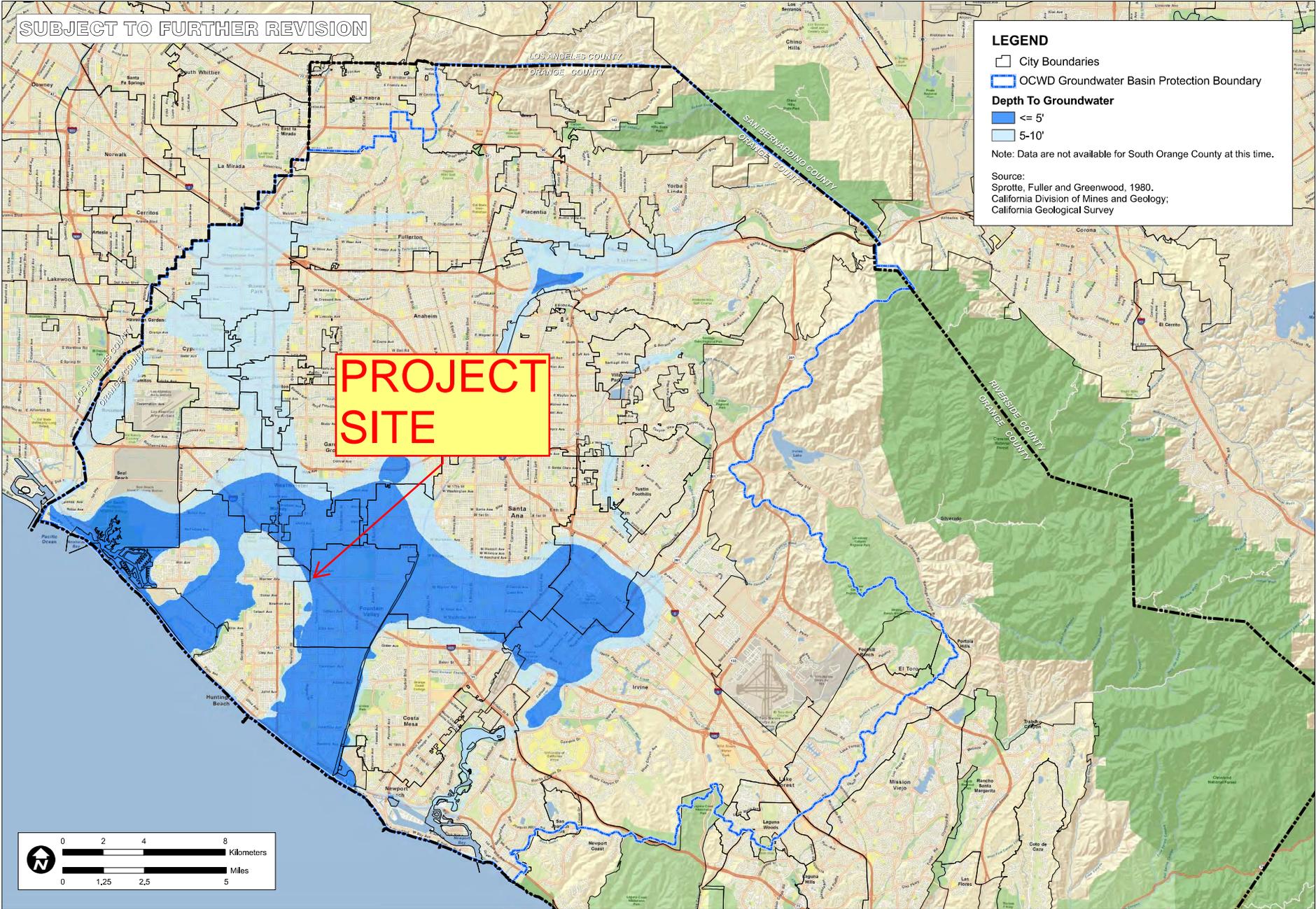
**PROJECT  
SITE**



<p><b>NORTH ORANGE COUNTY MAPPED DEPTH TO FIRST GROUNDWATER</b></p>	<p><b>ORANGE COUNTY INFILTRATION STUDY</b></p>
TITLE	CA
JOB	ORANGE CO.
SCALE: 1" = 1.25 miles	JOB NO.: 9554E
DESIGNED: JH	CHECKED: RMP
DRAWING: JH	DATE: 02/09/11
	
FIGURE	
<b>XVI-2d</b>	

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

**PROJECT SITE**



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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 BY:	
DRAWING BY:	
CHECKED BY:	RMP
DATE:	02/09/11
JOB NO.:	9524E

FIGURE: XVI-2e

SUBJECT TO FURTHER REVISION

PROJECT SITE

**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



P:\9524E\CIS Vexes Reports\InfiltrationFeasibility\_20110215\9524E\_Figures\VI-2f\_NorthOCGroundwaterProtectionAreasStreetMap\_20110215.mxd

NORTH ORANGE COUNTY GROUNDWATER PROTECTION AREAS

ORANGE COUNTY INFILTRATION STUDY

ORANGE CO. CA

JOB

SCALE	1" = 1.25 miles
DESIGNED BY	
DRAWN BY	
CHECKED BY	
DATE	02/27/10
JOB NO.	9524E

FIGURE

XVI-2f

SUBJECT TO FURTHER REVISION

**PROJECT SITE**

**LEGEND**

- OCWD Groundwater Basin Protection Boundary
- City Boundaries

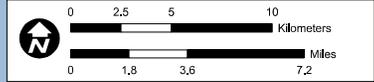
**Infiltration Constraints**

- 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 Selenium 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



INTEGRATED INFILTRATION ANALYSIS OVERLAPPING CONSTRAINT LOCATIONS

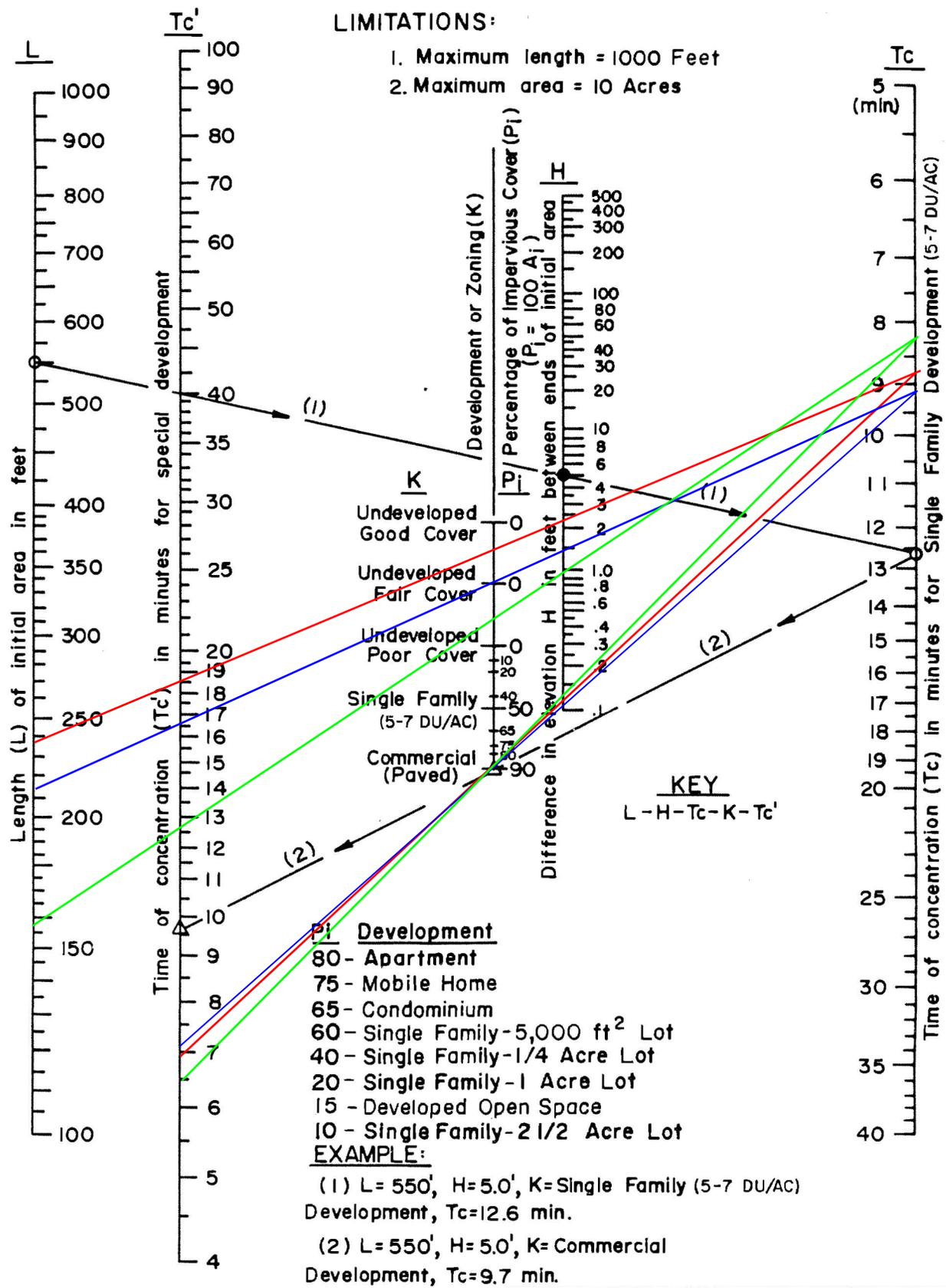
ORANGE COUNTY INFILTRATION STUDY

ORANGE CO. CA

SCALE	1" = 1.8 miles
DESIGNED BY	
DRAWN BY	
CHECKED BY	
DATE	06/22/10
JOB NO.	9554E

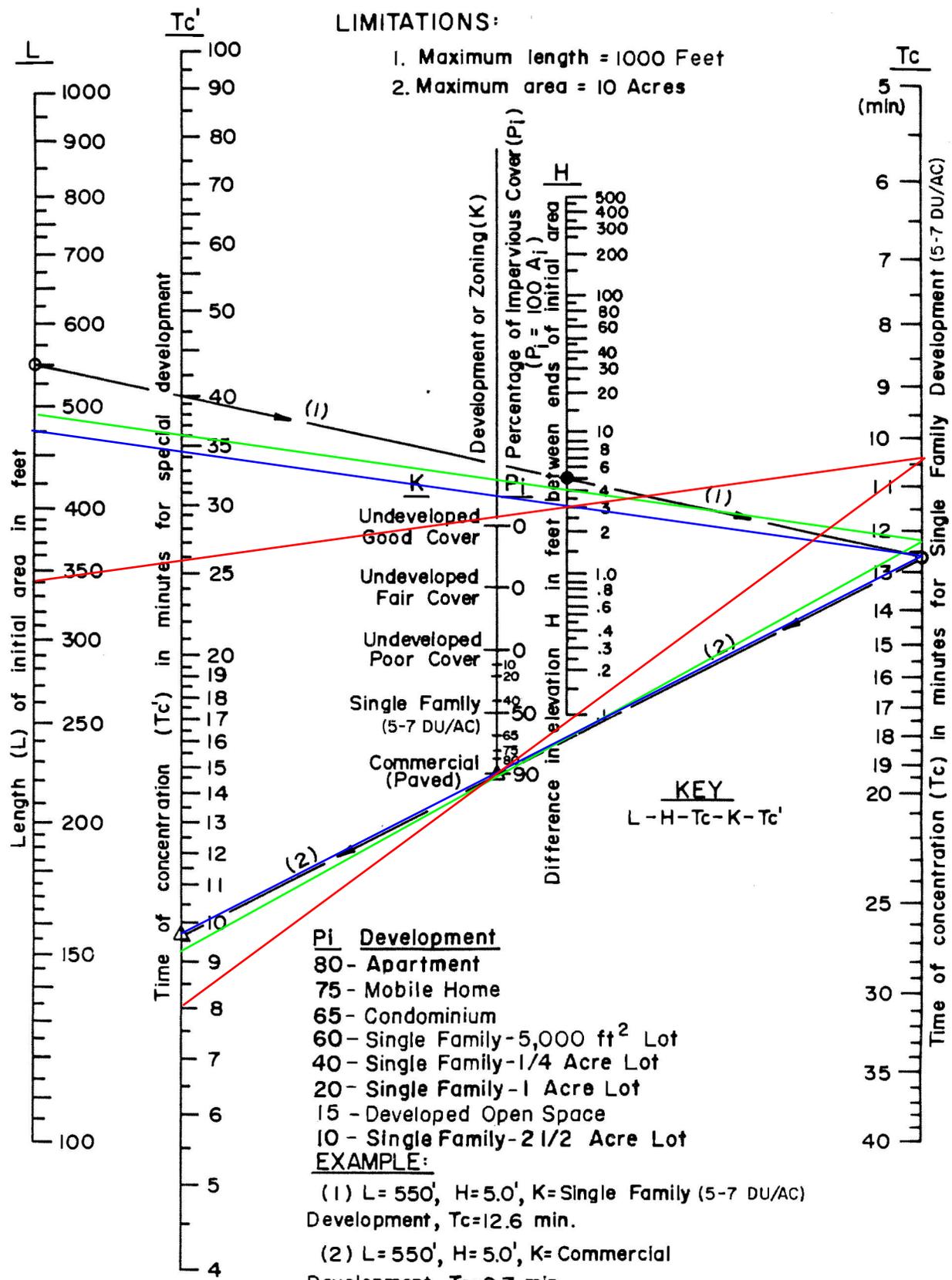
FIGURE XVI-2g

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**LIMITATIONS:**

1. Maximum length = 1000 Feet
2. Maximum area = 10 Acres



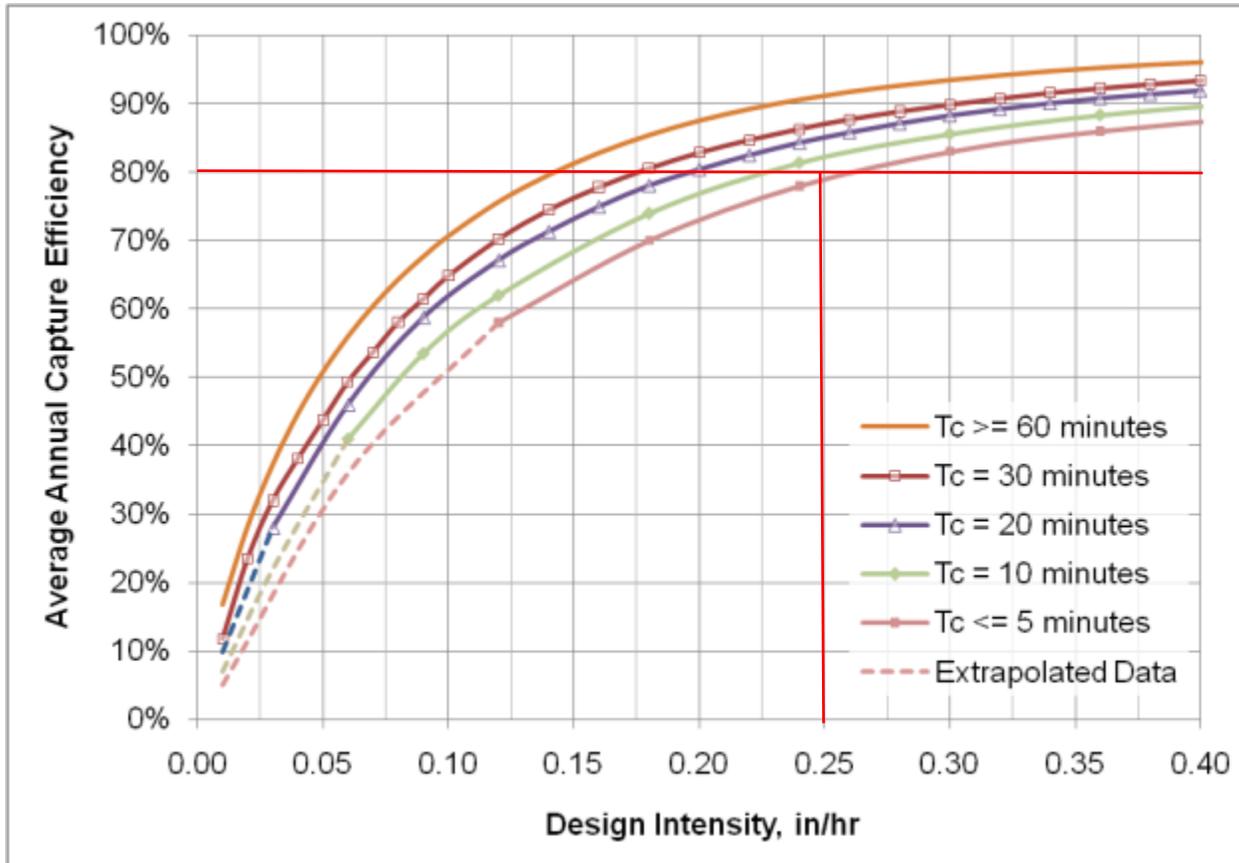
## TECHNICAL GUIDANCE DOCUMENT APPENDICES

## Worksheet D: Capture Efficiency Method for Flow-Based BMPs

<b>Step 1: Determine the design capture storm depth used for calculating volume</b>			
1	Enter the time of concentration, $T_c$ (min) (See <b>Appendix IV.2</b> )	$T_c =$	6.9
2	Using <b>Figure III.4</b> , determine the design intensity at which the estimated time of concentration ( $T_c$ ) achieves 80% capture efficiency, $I_1$	$I_1 =$	0.25 in/hr
3	Enter the effect depth of provided HSCs upstream, $d_{HSC}$ (inches) ( <b>Worksheet A</b> )	$d_{HSC} =$	0 inches
4	Enter capture efficiency corresponding to $d_{HSC}$ , $Y_2$ ( <b>Worksheet A</b> )	$Y_2 =$	%
5	Using <b>Figure III.4</b> , determine the design intensity at which the time of concentration ( $T_c$ ) achieves the upstream capture efficiency ( $Y_2$ ), $I_2$	$I_2 =$	
6	Determine the design intensity that must be provided by BMP, $I_{design} = I_1 - I_2$	$I_{design} =$	0.25
<b>Step 2: Calculate the design flowrate</b>			
1	Enter Project area tributary to BMP (s), $A$ (acres)	$A =$	1.18 acres
2	Enter Project Imperviousness, $imp$ (unitless)	$imp =$	0.933
3	Calculate runoff coefficient, $C = (0.75 \times imp) + 0.15$	$C =$	0.850
4	Calculate design flowrate, $Q_{design} = (C \times I_{design} \times A)$	$Q_{design} =$	0.25 cfs
<b>Supporting Calculations</b>			
Describe system:			
Provide time of concentration assumptions:			

Worksheet D: Capture Efficiency Method for Flow-Based BMPs

**Graphical Operations**



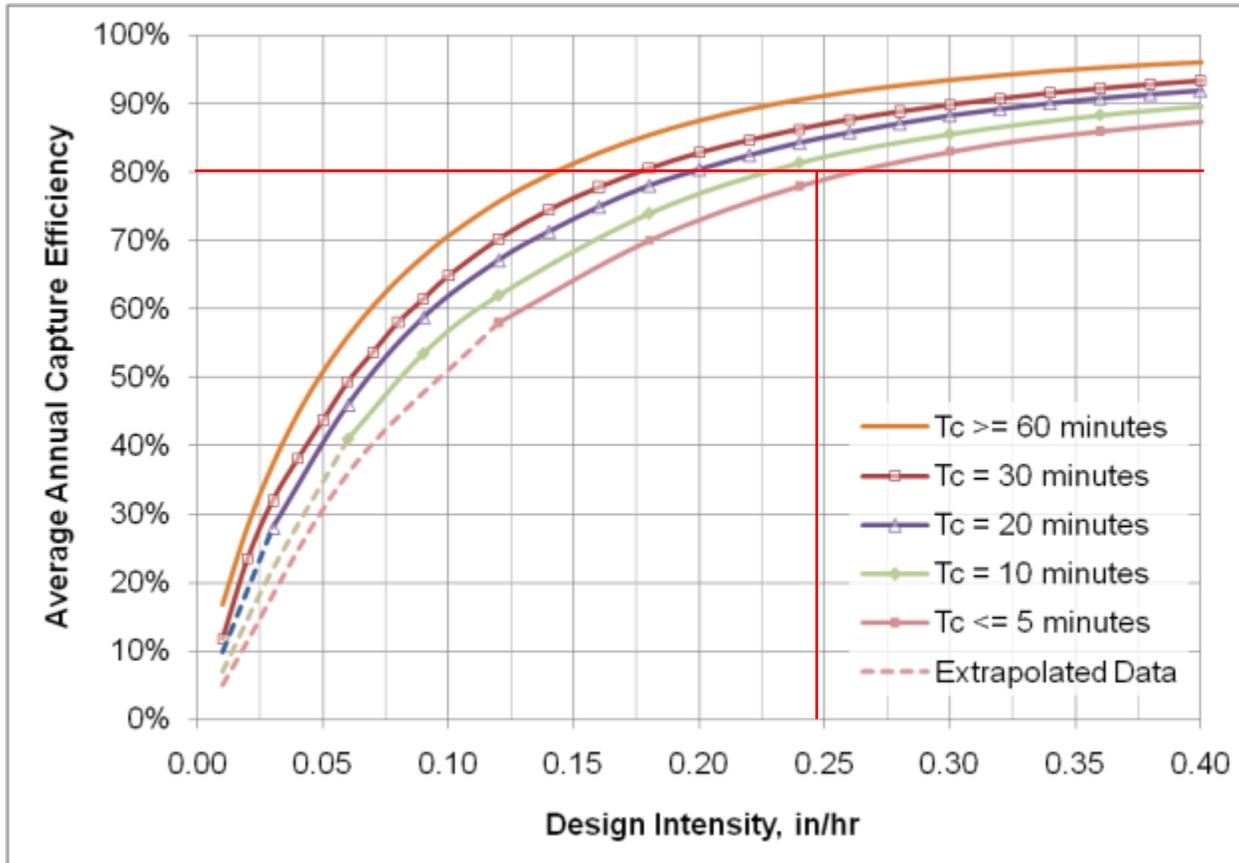
Provide supporting graphical operations. See Example III.7.

## Worksheet D: Capture Efficiency Method for Flow-Based BMPs

<b>Step 1: Determine the design capture storm depth used for calculating volume</b>			
1	Enter the time of concentration, $T_c$ (min) (See <b>Appendix IV.2</b> )	$T_c =$	7.1
2	Using <b>Figure III.4</b> , determine the design intensity at which the estimated time of concentration ( $T_c$ ) achieves 80% capture efficiency, $I_1$	$I_1 =$	0.245 in/hr
3	Enter the effect depth of provided HSCs upstream, $d_{HSC}$ (inches) ( <b>Worksheet A</b> )	$d_{HSC} =$	0 inches
4	Enter capture efficiency corresponding to $d_{HSC}$ , $Y_2$ ( <b>Worksheet A</b> )	$Y_2 =$	%
5	Using <b>Figure III.4</b> , determine the design intensity at which the time of concentration ( $T_c$ ) achieves the upstream capture efficiency ( $Y_2$ ), $I_2$	$I_2 =$	
6	Determine the design intensity that must be provided by BMP, $I_{design} = I_1 - I_2$	$I_{design} =$	0.245
<b>Step 2: Calculate the design flowrate</b>			
1	Enter Project area tributary to BMP (s), $A$ (acres)	$A =$	1.13 acres
2	Enter Project Imperviousness, $imp$ (unitless)	$imp =$	0.942
3	Calculate runoff coefficient, $C = (0.75 \times imp) + 0.15$	$C =$	0.857
4	Calculate design flowrate, $Q_{design} = (C \times I_{design} \times A)$	$Q_{design} =$	0.237 cfs
<b>Supporting Calculations</b>			
Describe system:			
Provide time of concentration assumptions:			

Worksheet D: Capture Efficiency Method for Flow-Based BMPs

**Graphical Operations**



Provide supporting graphical operations. See Example III.7.

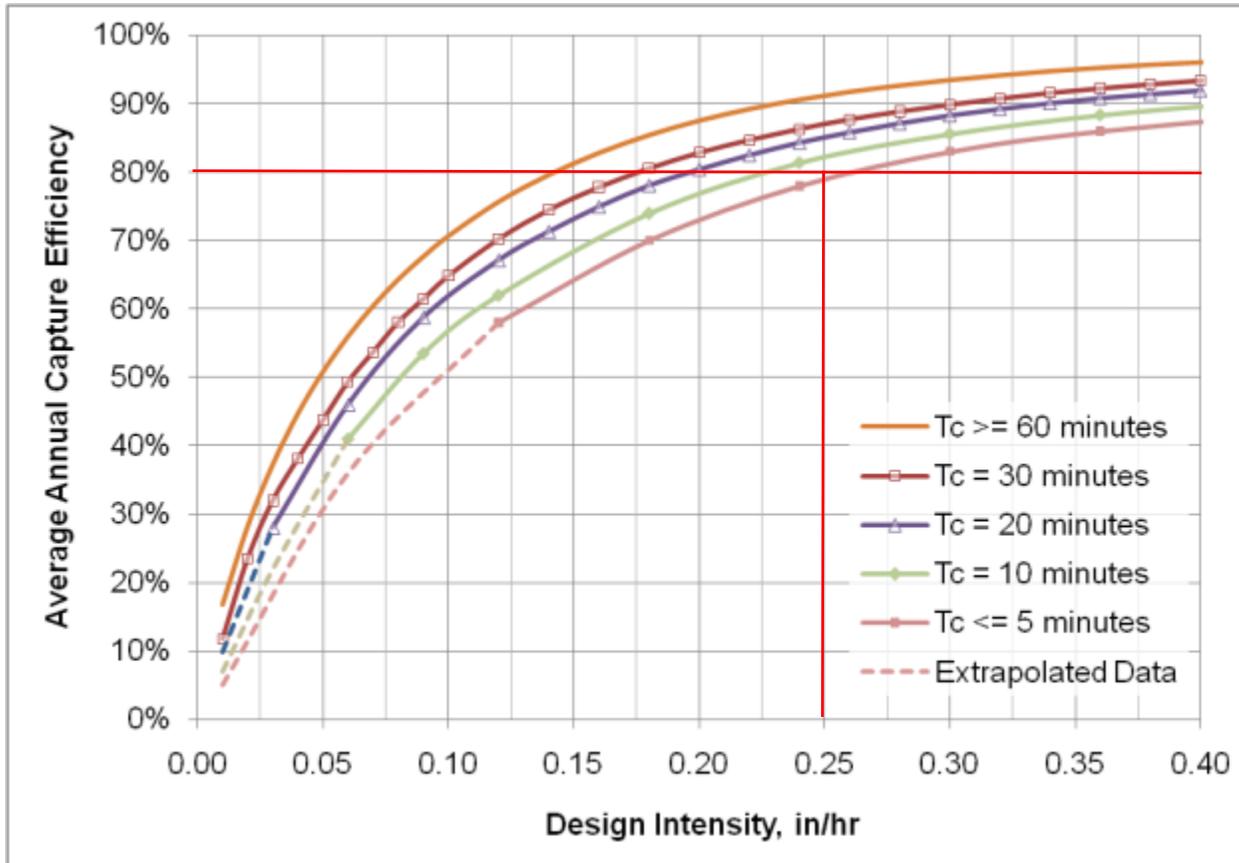
## TECHNICAL GUIDANCE DOCUMENT APPENDICES

## Worksheet D: Capture Efficiency Method for Flow-Based BMPs

<b>Step 1: Determine the design capture storm depth used for calculating volume</b>			
1	Enter the time of concentration, $T_c$ (min) (See <b>Appendix IV.2</b> )	$T_c =$	6.5
2	Using <b>Figure III.4</b> , determine the design intensity at which the estimated time of concentration ( $T_c$ ) achieves 80% capture efficiency, $I_1$	$I_1 =$	0.25 in/hr
3	Enter the effect depth of provided HSCs upstream, $d_{HSC}$ (inches) ( <b>Worksheet A</b> )	$d_{HSC} =$	0 inches
4	Enter capture efficiency corresponding to $d_{HSC}$ , $Y_2$ ( <b>Worksheet A</b> )	$Y_2 =$	%
5	Using <b>Figure III.4</b> , determine the design intensity at which the time of concentration ( $T_c$ ) achieves the upstream capture efficiency ( $Y_2$ ), $I_2$	$I_2 =$	
6	Determine the design intensity that must be provided by BMP, $I_{design} = I_1 - I_2$	$I_{design} =$	0.25
<b>Step 2: Calculate the design flowrate</b>			
1	Enter Project area tributary to BMP (s), $A$ (acres)	$A =$	0.536 acres
2	Enter Project Imperviousness, $imp$ (unitless)	$imp =$	0.917
3	Calculate runoff coefficient, $C = (0.75 \times imp) + 0.15$	$C =$	0.838
4	Calculate design flowrate, $Q_{design} = (C \times I_{design} \times A)$	$Q_{design} =$	0.113 cfs
<b>Supporting Calculations</b>			
Describe system:			
Provide time of concentration assumptions:			

Worksheet D: Capture Efficiency Method for Flow-Based BMPs

**Graphical Operations**



Provide supporting graphical operations. See Example III.7.

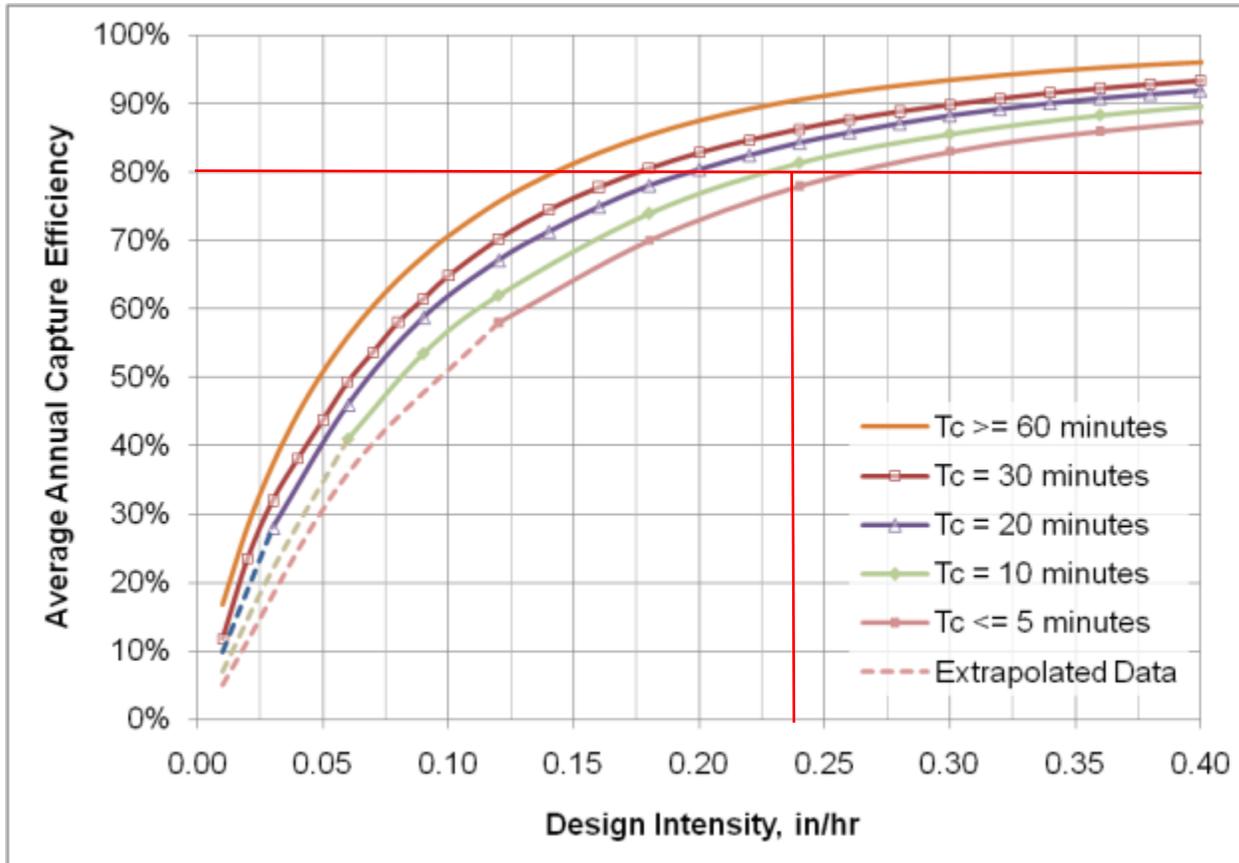
## TECHNICAL GUIDANCE DOCUMENT APPENDICES

## Worksheet D: Capture Efficiency Method for Flow-Based BMPs

<b>Step 1: Determine the design capture storm depth used for calculating volume</b>			
1	Enter the time of concentration, $T_c$ (min) (See <b>Appendix IV.2</b> )	$T_c =$	8.0
2	Using <b>Figure III.4</b> , determine the design intensity at which the estimated time of concentration ( $T_c$ ) achieves 80% capture efficiency, $I_1$	$I_1 =$	0.235 in/hr
3	Enter the effect depth of provided HSCs upstream, $d_{HSC}$ (inches) ( <b>Worksheet A</b> )	$d_{HSC} =$	0 inches
4	Enter capture efficiency corresponding to $d_{HSC}$ , $Y_2$ ( <b>Worksheet A</b> )	$Y_2 =$	%
5	Using <b>Figure III.4</b> , determine the design intensity at which the time of concentration ( $T_c$ ) achieves the upstream capture efficiency ( $Y_2$ ), $I_2$	$I_2 =$	
6	Determine the design intensity that must be provided by BMP, $I_{design} = I_1 - I_2$	$I_{design} =$	0.235
<b>Step 2: Calculate the design flowrate</b>			
1	Enter Project area tributary to BMP (s), $A$ (acres)	$A =$	0.958 acres
2	Enter Project Imperviousness, $imp$ (unitless)	$imp =$	0.917
3	Calculate runoff coefficient, $C = (0.75 \times imp) + 0.15$	$C =$	0.838
4	Calculate design flowrate, $Q_{design} = (C \times I_{design} \times A)$	$Q_{design} =$	0.189 cfs
<b>Supporting Calculations</b>			
Describe system:			
Provide time of concentration assumptions:			

Worksheet D: Capture Efficiency Method for Flow-Based BMPs

**Graphical Operations**



Provide supporting graphical operations. See Example III.7.

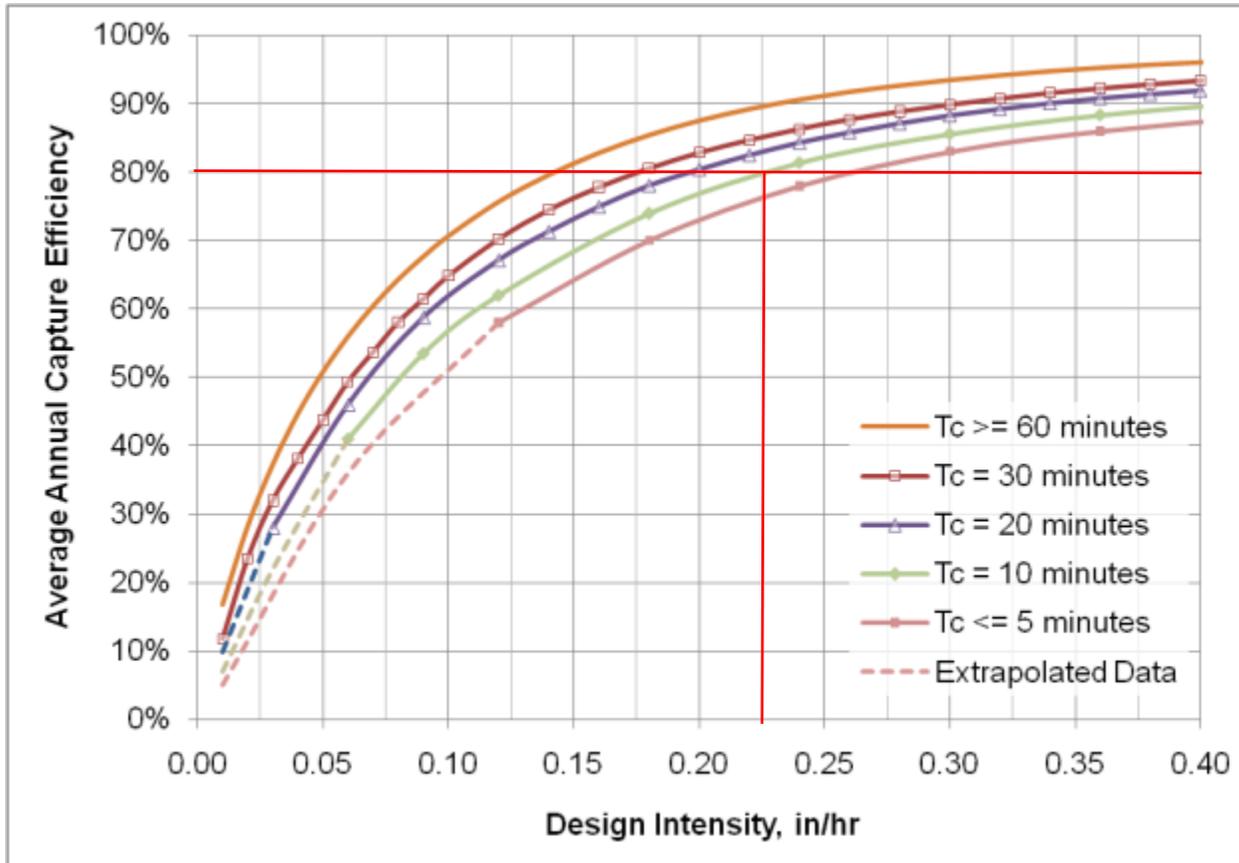
## TECHNICAL GUIDANCE DOCUMENT APPENDICES

## Worksheet D: Capture Efficiency Method for Flow-Based BMPs

<b>Step 1: Determine the design capture storm depth used for calculating volume</b>			
1	Enter the time of concentration, $T_c$ (min) (See <b>Appendix IV.2</b> )	$T_c =$	9.8
2	Using <b>Figure III.4</b> , determine the design intensity at which the estimated time of concentration ( $T_c$ ) achieves 80% capture efficiency, $I_1$	$I_1 =$	0.225 in/hr
3	Enter the effect depth of provided HSCs upstream, $d_{HSC}$ (inches) ( <b>Worksheet A</b> )	$d_{HSC} =$	0 inches
4	Enter capture efficiency corresponding to $d_{HSC}$ , $Y_2$ ( <b>Worksheet A</b> )	$Y_2 =$	%
5	Using <b>Figure III.4</b> , determine the design intensity at which the time of concentration ( $T_c$ ) achieves the upstream capture efficiency ( $Y_2$ ), $I_2$	$I_2 =$	
6	Determine the design intensity that must be provided by BMP, $I_{design} = I_1 - I_2$	$I_{design} =$	0.225
<b>Step 2: Calculate the design flowrate</b>			
1	Enter Project area tributary to BMP (s), $A$ (acres)	$A =$	1.22 acres
2	Enter Project Imperviousness, $imp$ (unitless)	$imp =$	0.934
3	Calculate runoff coefficient, $C = (0.75 \times imp) + 0.15$	$C =$	0.85
4	Calculate design flowrate, $Q_{design} = (C \times I_{design} \times A)$	$Q_{design} =$	0.23 cfs
<b>Supporting Calculations</b>			
Describe system:			
Provide time of concentration assumptions:			

Worksheet D: Capture Efficiency Method for Flow-Based BMPs

**Graphical Operations**



Provide supporting graphical operations. See Example III.7.

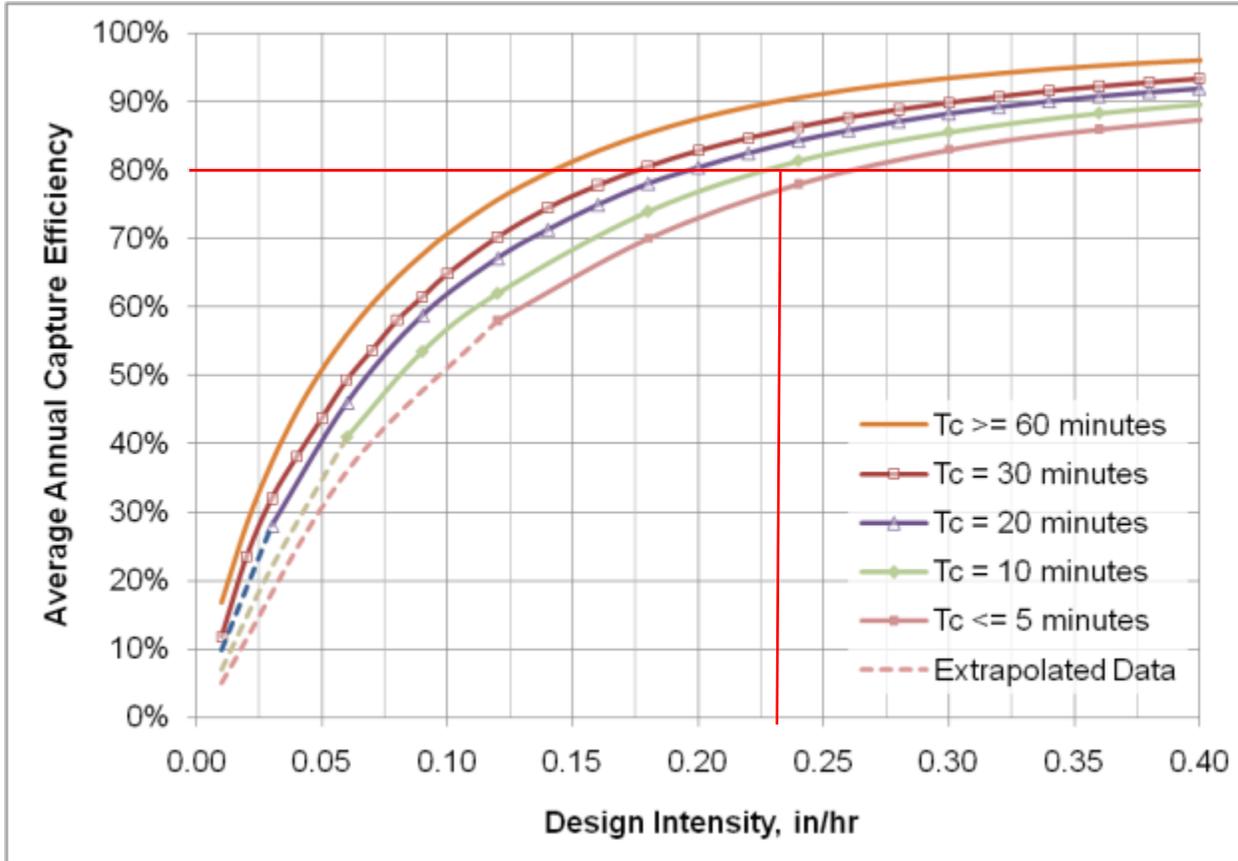
## TECHNICAL GUIDANCE DOCUMENT APPENDICES

## Worksheet D: Capture Efficiency Method for Flow-Based BMPs

<b>Step 1: Determine the design capture storm depth used for calculating volume</b>			
1	Enter the time of concentration, $T_c$ (min) (See <b>Appendix IV.2</b> )	$T_c =$	6.9
2	Using <b>Figure III.4</b> , determine the design intensity at which the estimated time of concentration ( $T_c$ ) achieves 80% capture efficiency, $I_1$	$I_1 =$	0.23 in/hr
3	Enter the effect depth of provided HSCs upstream, $d_{HSC}$ (inches) ( <b>Worksheet A</b> )	$d_{HSC} =$	0 inches
4	Enter capture efficiency corresponding to $d_{HSC}$ , $Y_2$ ( <b>Worksheet A</b> )	$Y_2 =$	%
5	Using <b>Figure III.4</b> , determine the design intensity at which the time of concentration ( $T_c$ ) achieves the upstream capture efficiency ( $Y_2$ ), $I_2$	$I_2 =$	
6	Determine the design intensity that must be provided by BMP, $I_{design} = I_1 - I_2$	$I_{design} =$	0.23
<b>Step 2: Calculate the design flowrate</b>			
1	Enter Project area tributary to BMP (s), $A$ (acres)	$A =$	1.84 acres
2	Enter Project Imperviousness, $imp$ (unitless)	$imp =$	0.766
3	Calculate runoff coefficient, $C = (0.75 \times imp) + 0.15$	$C =$	0.725
4	Calculate design flowrate, $Q_{design} = (C \times I_{design} \times A)$	$Q_{design} =$	0.31 cfs
<b>Supporting Calculations</b>			
Describe system:			
Provide time of concentration assumptions:			

Worksheet D: Capture Efficiency Method for Flow-Based BMPs

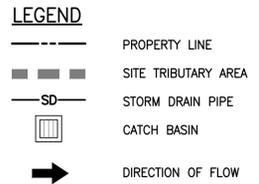
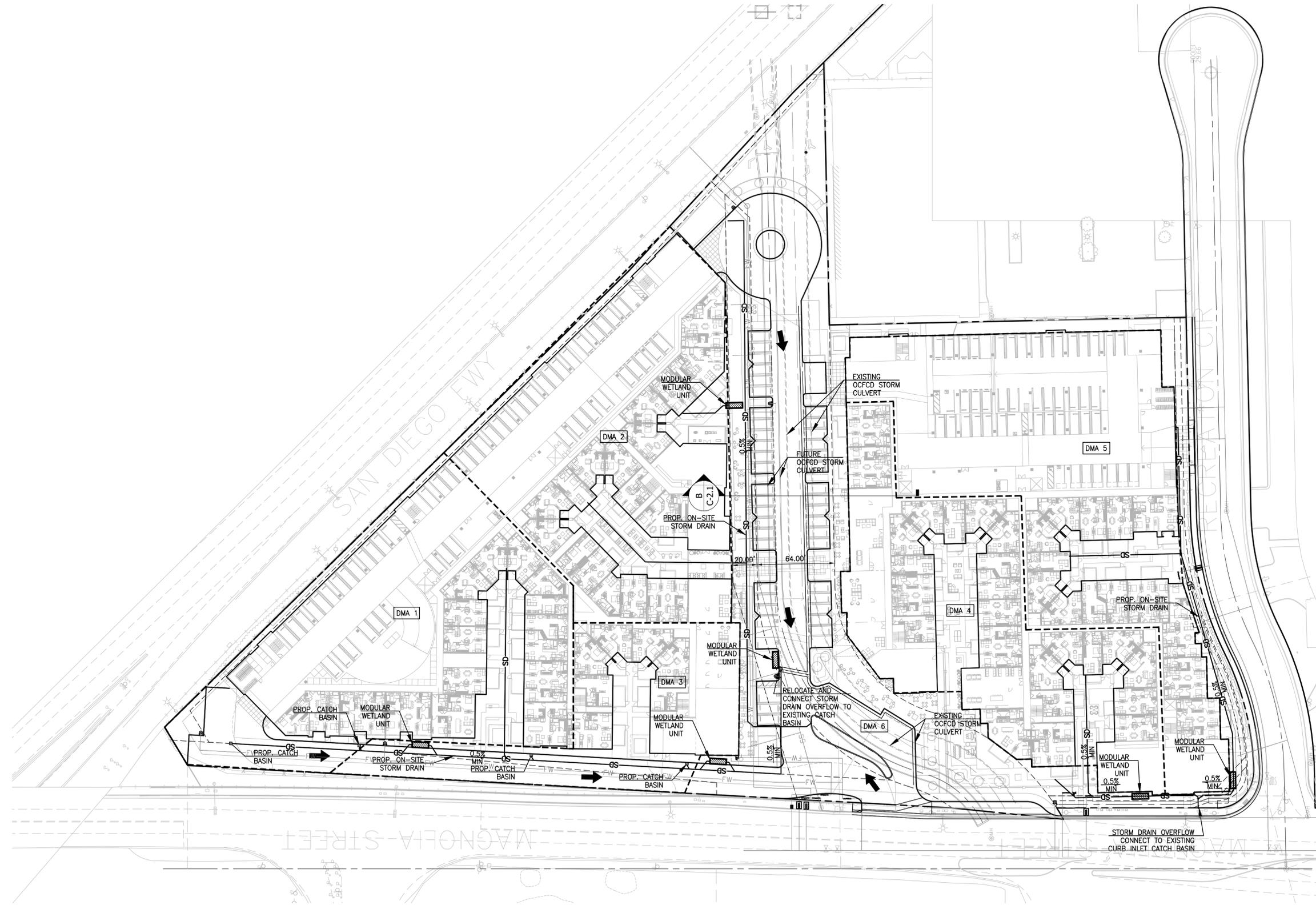
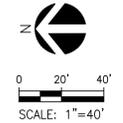
**Graphical Operations**



Provide supporting graphical operations. See Example III.7.

**APPENDIX C**  
**WQMP BMP Details**

PRELIMINARY WQMP SUMMARY				
DMA	TREATMENT AREA (SQ. FT.)	TREATMENT METHOD	MODULAR WETLAND MODEL	BMP COORDINATES
1	51,596	MODULAR WETLAND	MWS-L-8-8-V	33.71855 -117.97159
2	49,045	MODULAR WETLAND	MWS-L-8-12-V	33.71785 -117.97058
3	23,360	MODULAR WETLAND	MWS-L-4-8-V	33.71788 -117.97162
4	41,726	MODULAR WETLAND	MWS-L-8-8-V	33.71692 -117.97169
5	53,211	MODULAR WETLAND	MWS-L-8-8-V	33.71671 -117.97164
6	80,258	MODULAR WETLAND	MWS-L-8-12-V	33.71778 -117.97111



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t: 213/ 239 9700 f: 213/ 239 9699  
LFA Job no. 24027

**MAGNOLIA & WARNER**  
FOUNTAIN VALLEY, CA



NOT FOR CONSTRUCTION

REVISIONS:	
CITY SUBMITTAL	06.11.2020
JOB NO.:	
DATE:	06.11.2020
SCALE:	AS NOTED
SHEET TITLE:	PRELIMINARY WQMP
SHEET NUMBER:	

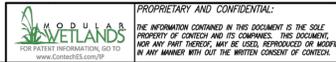
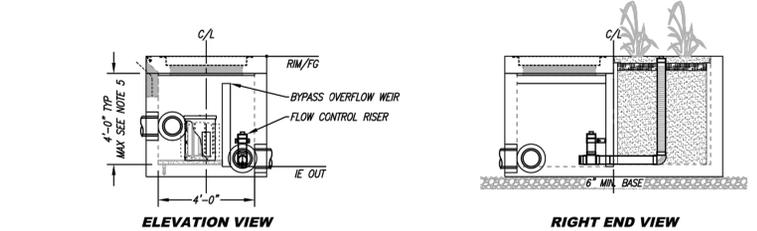
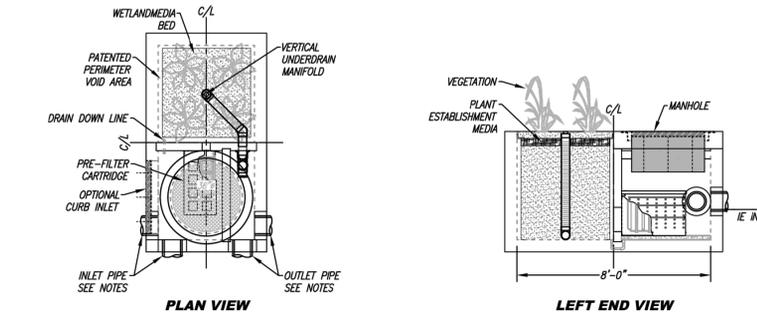
C-3

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

\* PRELIMINARY ONLY - NOT FOR CONSTRUCTION

**INSTALLATION NOTES**

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



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MWS-L-4-8-V  
STORMWATER BIOFILTRATION SYSTEM  
STANDARD DETAIL

**A MWS-L-4-8-V MODULAR WETLAND DETAIL**

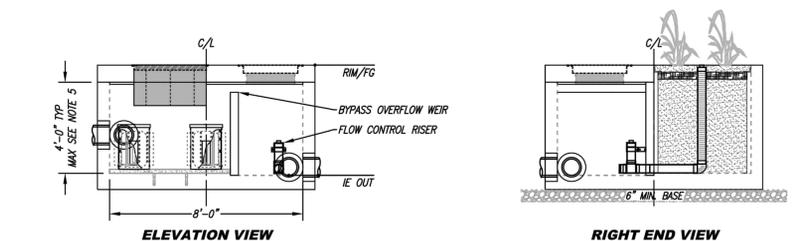
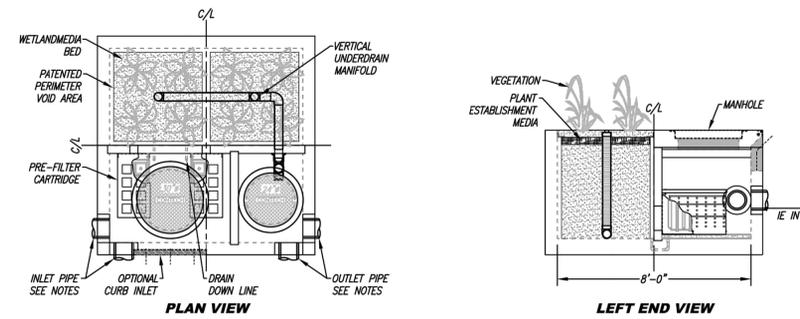
C-3.1 N.T.S.

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

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

**B MWS-L-8-8-V MODULAR WETLAND DETAIL**

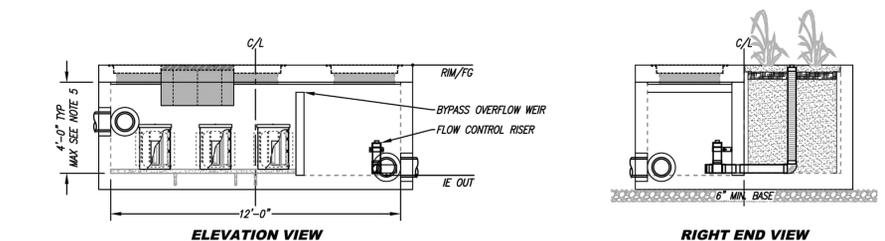
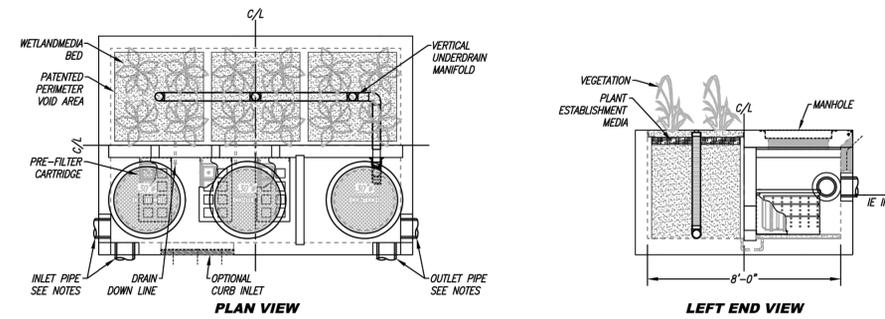
C-3.1 N.T.S.

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

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MWS-L-8-12-V  
STORMWATER BIOFILTRATION SYSTEM  
STANDARD DETAIL

**C MWS-L-8-12-V MODULAR WETLAND DETAIL**

C-3.1 N.T.S.



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LFA Job no. 24027

**MAGNOLIA & WARNER**  
FOUNTAIN VALLEY, CA



SIGN DATE: 02/19/2020

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JOB NO.:	
DATE:	06.11.2020
SCALE:	AS NOTED
SHEET TITLE:	PRELIMINARY WQMP DETAILS
SHEET NUMBER:	

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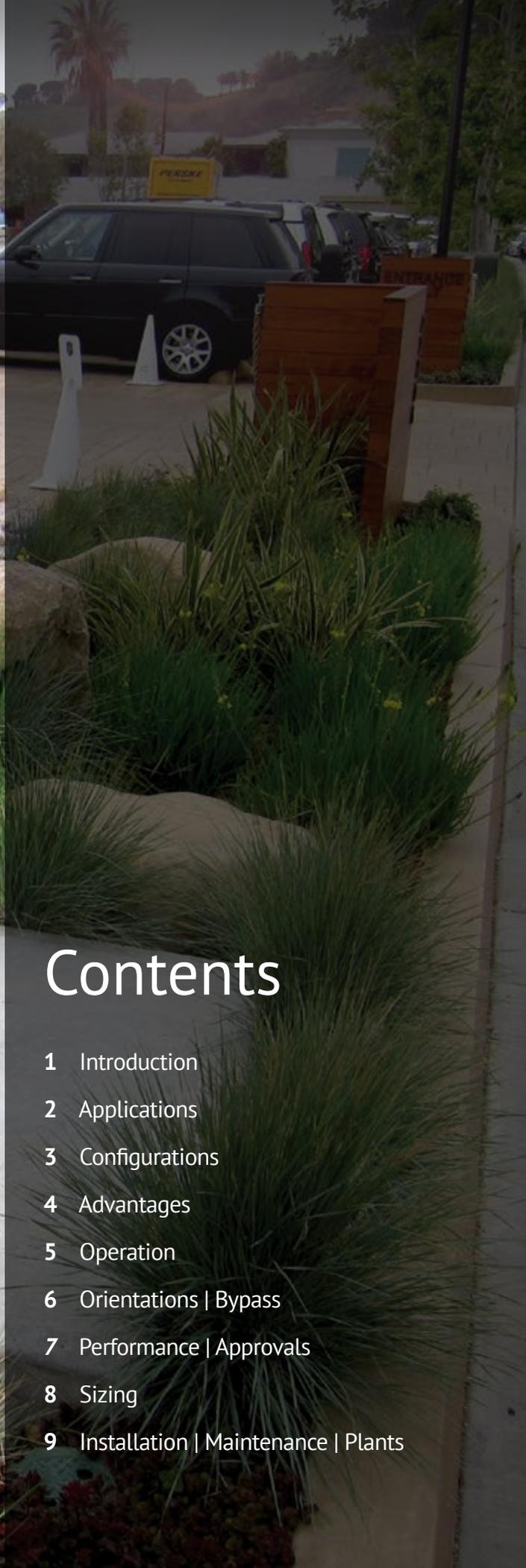


MODULAR  
WETLANDS™

*Advanced Stormwater Biofiltration*



**MWS Linear**



# Contents

- 1 Introduction
- 2 Applications
- 3 Configurations
- 4 Advantages
- 5 Operation
- 6 Orientations | Bypass
- 7 Performance | Approvals
- 8 Sizing
- 9 Installation | Maintenance | Plants

# The Urban Impact

For hundreds of years natural wetlands surrounding our shores have played an integral role as nature's stormwater treatment system. But as our cities grow and develop, these natural wetlands have perished under countless roads, rooftops, and parking lots.



## Plant A Wetland

Without natural wetlands our cities are deprived of water purification, flood control, and land stability. Modular Wetlands and the MWS Linear re-establish nature's presence and rejuvenate water ways in urban areas.



## MWS Linear

The Modular Wetland System Linear represents a pioneering breakthrough in stormwater technology as the only biofiltration system to utilize patented horizontal flow, allowing for a smaller footprint and higher treatment capacity. While most biofilters use little or no pre-treatment, the MWS Linear incorporates an advanced pre-treatment chamber that includes separation and pre-filter cartridges. In this chamber sediment and hydrocarbons are removed from runoff before it enters the biofiltration chamber, in turn reducing maintenance costs and improving performance.

# Applications

The MWS Linear has been successfully used on numerous new construction and retrofit projects. The system's superior versatility makes it beneficial for a wide range of stormwater and waste water applications - treating rooftops, streetscapes, parking lots, and industrial sites.



## Industrial

Many states enforce strict regulations for discharges from industrial sites. The MWS Linear has helped various sites meet difficult EPA mandated effluent limits for dissolved metals and other pollutants.



## Residential

Low to high density developments can benefit from the versatile design of the MWS Linear. The system can be used in both decentralized LID design and cost-effective end-of-the-line configurations.



## Streets

Street applications can be challenging due to limited space. The MWS Linear is very adaptable, and offers the smallest footprint to work around the constraints of existing utilities on retrofit projects.



## Parking Lots

Parking lots are designed to maximize space and the MWS Linear's 4 ft. standard planter width allows for easy integration into parking lot islands and other landscape medians.



## Commercial

Compared to bioretention systems, the MWS Linear can treat far more area in less space - meeting treatment and volume control requirements.



## Mixed Use

The MWS Linear can be installed as a raised planter to treat runoff from rooftops or patios, making it perfect for sustainable "live-work" spaces.

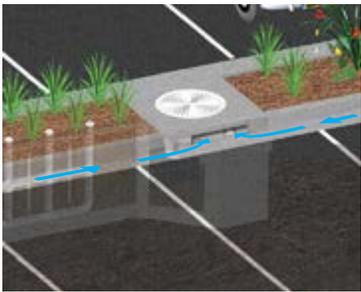
**More applications** are available on our website: [www.ModularWetlands.com/Applications](http://www.ModularWetlands.com/Applications)

- Agriculture
- Low Impact Development
- Reuse
- Waste Water



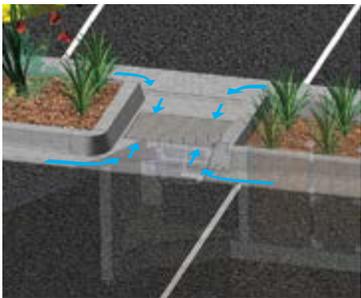
## Configurations

The MWS Linear is the preferred biofiltration system of Civil Engineers across the country due to its versatile design. This highly versatile system has available “pipe-in” options on most models, along with built-in curb or grated inlets for simple integration into your stormdrain design.



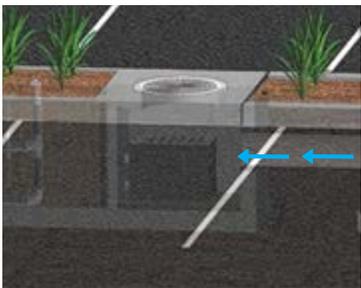
### Curb Type

The *Curb Type* configuration accepts sheet flow through a curb opening and is commonly used along road ways and parking lots. It can be used in sump or flow by conditions. Length of curb opening varies based on model and size.



### Grate Type

The *Grate Type* configuration offers the same features and benefits as the *Curb Type* but with a grated/drop inlet above the systems pre-treatment chamber. It has the added benefit of allowing for pedestrian access over the inlet. ADA compliant grates are available to assure easy and safe access. The *Grate Type* can also be used in scenarios where runoff needs to be intercepted on both sides of landscape islands.



### Vault Type

The system’s patented horizontal flow biofilter is able to accept inflow pipes directly into the pre-treatment chamber, meaning the MWS Linear can be used in end-of-the-line installations. This greatly improves feasibility over typical decentralized designs that are required with other biofiltration/bioretention systems. Another benefit of the “pipe in” design is the ability to install the system downstream of underground detention systems to meet water quality volume requirements.



### Downspout Type

The *Downspout Type* is a variation of the *Vault Type* and is designed to accept a vertical downspout pipe from roof top and podium areas. Some models have the option of utilizing an internal bypass, simplifying the overall design. The system can be installed as a raised planter and the exterior can be stuccoed or covered with other finishes to match the look of adjacent buildings.

# Advantages & Operation

The MWS Linear is the most efficient and versatile biofiltration system on the market, and the only system with horizontal flow which improves performance, reduces footprint, and minimizes maintenance. Figure-1 and Figure-2 illustrate the invaluable benefits of horizontal flow and the multiple treatment stages.

## Featured Advantages

- Horizontal Flow Biofiltration
- Greater Filter Surface Area
- Pre-Treatment Chamber
- Patented Perimeter Void Area
- Flow Control
- No Depressed Planter Area

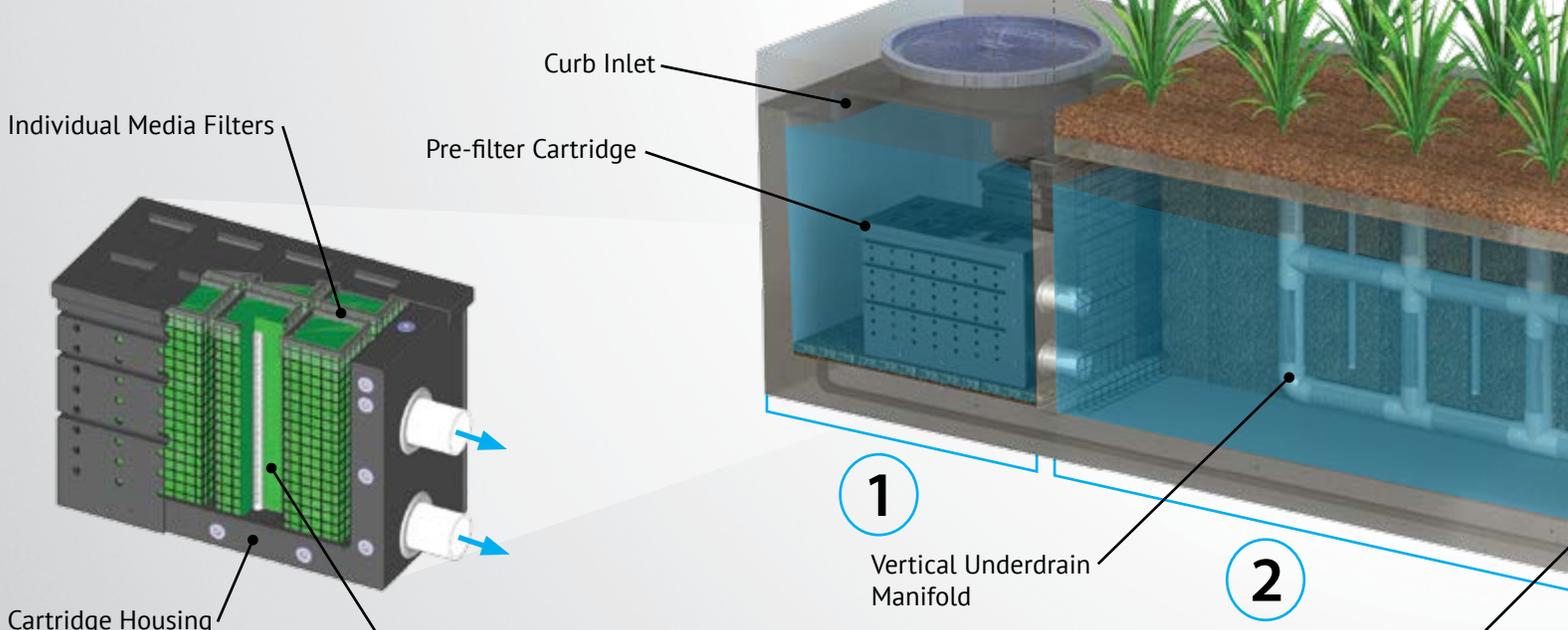
## 1 Pre-Treatment

### Separation

- Trash, sediment, and debris are separated before entering the pre-filter cartridges
- Designed for easy maintenance access

### Pre-Filter Cartridges

- Over 25 ft<sup>2</sup> of surface area per cartridge
- Utilizes BioMediaGREEN filter material
- Removes over 80% of TSS & 90% of hydrocarbons
- Prevents pollutants that cause clogging from migrating to the biofiltration chamber



BioMediaGREEN

Wetland MEDIA™

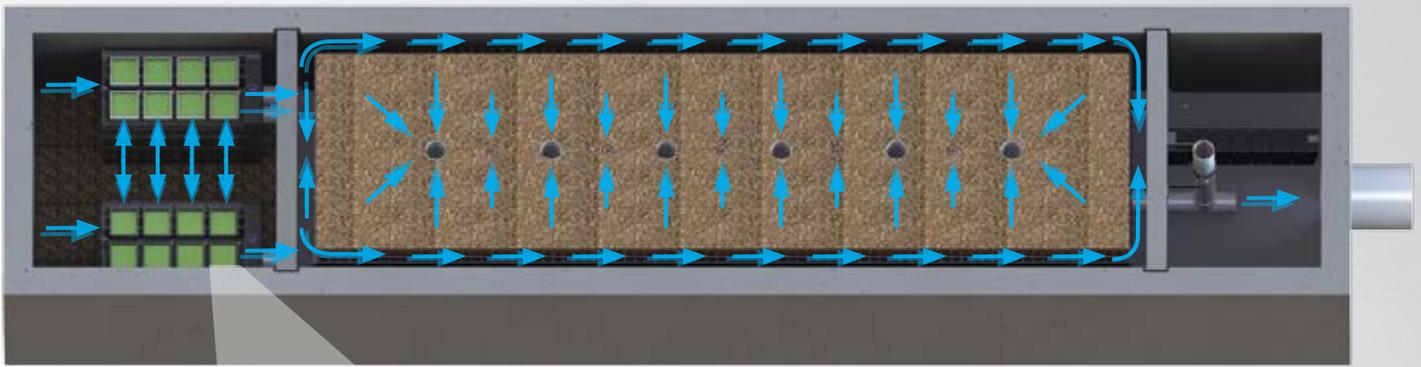


Fig. 2 - Top View

2x to 3x More Surface Area Than Traditional Downward Flow Bioretention Systems.

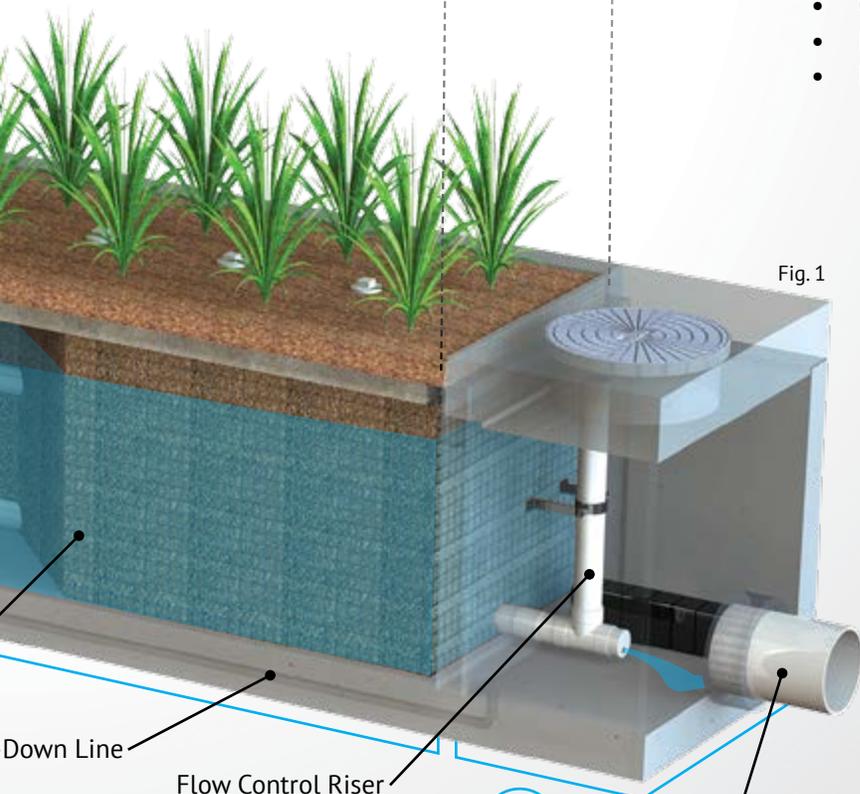
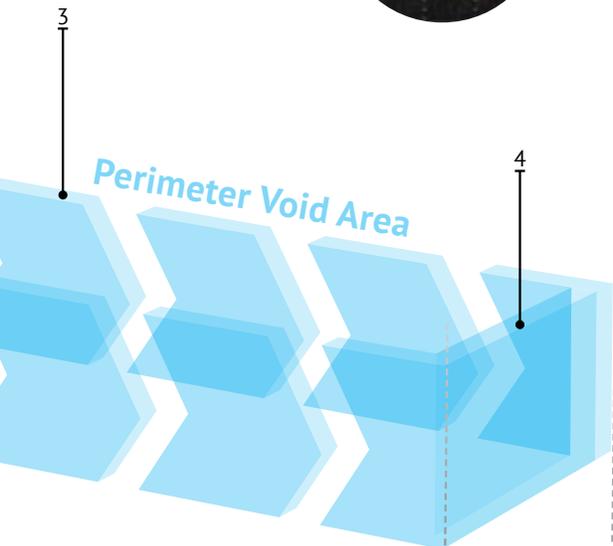
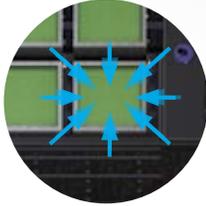


Fig. 1

## 2 Biofiltration

### Horizontal Flow

- Less clogging than downward flow biofilters
- Water flow is subsurface
- Improves biological filtration

### Patented Perimeter Void Area

- Vertically extends void area between the walls and the WetlandMEDIA on all four sides.
- Maximizes surface area of the media for higher treatment capacity

### WetlandMEDIA

- Contains no organics and removes phosphorus
- Greater surface area and 48% void space
- Maximum evapotranspiration
- High ion exchange capacity and light weight

## 3 Discharge

### Flow Control

- Orifice plate controls flow of water through WetlandMEDIA to a level lower than the media's capacity.
- Extends the life of the media and improves performance

### Drain-Down Filter

- The Drain-Down is an optional feature that completely drains the pre-treatment chamber
- Water that drains from the pre-treatment chamber between storm events will be treated

3

# Orientations



## Side-By-Side

The *Side-By-Side* orientation places the pre-treatment and discharge chamber adjacent to one another with the biofiltration chamber running parallel on either side. This minimizes the system length, providing a highly compact footprint. It has been proven useful in situations such as streets with directly adjacent sidewalks, as half of the system can be placed under that sidewalk. This orientation also offers internal bypass options as discussed below.



## End-To-End

The *End-To-End* orientation places the pre-treatment and discharge chambers on opposite ends of the biofiltration chamber therefore minimizing the width of the system to 5 ft (outside dimension). This orientation is perfect for linear projects and street retrofits where existing utilities and sidewalks limit the amount of space available for installation. One limitation of this orientation is bypass must be external.

# Bypass

## Internal Bypass Weir (Side-by-Side Only)

The *Side-By-Side* orientation places the pre-treatment and discharge chambers adjacent to one another allowing for integration of internal bypass. The wall between these chambers can act as a bypass weir when flows exceed the system's treatment capacity, thus allowing bypass from the pre-treatment chamber directly to the discharge chamber.

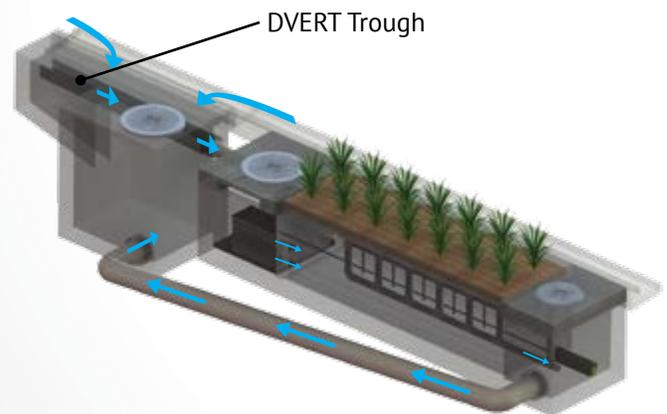
## External Diversion Weir Structure

This traditional offline diversion method can be used with the MWS Linear in scenarios where runoff is being piped to the system. These simple and effective structures are generally configured with two outflow pipes. The first is a smaller pipe on the upstream side of the diversion weir - to divert low flows over to the MWS Linear for treatment. The second is the main pipe that receives water once the system has exceeded treatment capacity and water flows over the weir.

## Flow By Design

This method is one in which the system is placed just upstream of a standard curb or grate inlet to intercept the first flush. Higher flows simply pass by the MWS Linear and into the standard inlet downstream.

## DVERT Low Flow Diversion



This simple yet innovative diversion trough can be installed in existing or new curb and grate inlets to divert the first flush to the MWS Linear via pipe. It works similar to a rain gutter and is installed just below the opening into the inlet. It captures the low flows and channels them over to a connecting pipe exiting out the wall of the inlet and leading to the MWS Linear. The DVERT is perfect for retrofit and green street applications that allows the MWS Linear to be installed anywhere space is available.

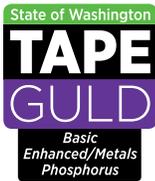


## Performance

The MWS Linear continues to outperform other treatment methods with superior pollutant removal for TSS, heavy metals, nutrients, hydrocarbons and bacteria. Since 2007 the MWS Linear has been field tested on numerous sites across the country. With its advanced pre-treatment chamber and innovative horizontal flow biofilter, the system is able to effectively remove pollutants through a combination of physical, chemical, and biological filtration processes. With the same biological processes found in natural wetlands, the MWS Linear harnesses nature's ability to process, transform, and remove even the most harmful pollutants.

## Approvals

The MWS Linear has successfully met years of challenging technical reviews and testing from some of the most prestigious and demanding agencies in the nation, and perhaps the world.



### Washington State TAPE Approved

The MWS Linear is approved for General Use Level Designation (GULD) for Basic, Enhanced, and Phosphorus treatment at 1 gpm/ft<sup>2</sup> loading rate. The highest performing BMP on the market for all main pollutant categories.

TSS	Total Phosphorus	Ortho Phosphorus	Nitrogen	Dissolved Zinc	Dissolved Copper	Total Zinc	Total Copper	Motor Oil
85%	64%	67%	45%	66%	38%	69%	50%	95%



### DEQ Assignment

The Virginia Department of Environmental Quality assigned the MWS Linear, the highest phosphorus removal rating for manufactured treatment devices to meet the new Virginia Stormwater Management Program (VSMP) Technical Criteria.



### Maryland Department Of The Environment Approved

Granted ESD (Environmental Site Design) status for new construction, redevelopment and retrofitting when designed in accordance with the Design Manual.



### MASTEP Evaluation

The University of Massachusetts at Amherst – Water Resources Research Center, issued a technical evaluation report noting removal rates up to 84% TSS, 70% Total Phosphorus, 68.5% Total Zinc, and more.



### Rhode Island DEM Approved

Approved as an authorized BMP and noted to achieve the following minimum removal efficiencies: 85% TSS, 60% Pathogens, 30% Total Phosphorus, and 30% Total Nitrogen.

# Flow Based Sizing

The MWS Linear can be used in stand alone applications to meet treatment flow requirements. Since the MWS Linear is the only biofiltration system that can accept inflow pipes several feet below the surface it can be used not only in decentralized design applications but also as a large central end-of-the-line application for maximum feasibility.



## Treatment Flow Sizing Table

Model #	Dimensions	WetlandMedia Surface Area	Treatment Flow Rate (cfs)
MWS-L-4-4	4' x 4'	23 ft <sup>2</sup>	0.052
MWS-L-4-6	4' x 6'	32 ft <sup>2</sup>	0.073
MWS-L-4-8	4' x 8'	50 ft <sup>2</sup>	0.115
MWS-L-4-13	4' x 13'	63 ft <sup>2</sup>	0.144
MWS-L-4-15	4' x 15'	76 ft <sup>2</sup>	0.175
MWS-L-4-17	4' x 17'	90 ft <sup>2</sup>	0.206
MWS-L-4-19	4' x 19'	103 ft <sup>2</sup>	0.237
MWS-L-4-21	4' x 21'	117 ft <sup>2</sup>	0.268
MWS-L-8-8	8' x 8'	100 ft <sup>2</sup>	0.230
MWS-L-8-12	8' x 12'	151 ft <sup>2</sup>	0.346
MWS-L-8-16	8' x 16'	201 ft <sup>2</sup>	0.462

# Volume Based Sizing

Many states require treatment of a water quality volume and do not offer the option of flow based design. The MWS Linear and its unique horizontal flow makes it the only biofilter that can be used in volume based design installed downstream of ponds, detention basins, and underground storage systems.



## Treatment Volume Sizing Table

Model #	Treatment Capacity (cu. ft.) @ 24-Hour Drain Down	Treatment Capacity (cu. ft.) @ 48-Hour Drain Down
MWS-L-4-4	1140	2280
MWS-L-4-6	1600	3200
MWS-L-4-8	2518	5036
MWS-L-4-13	3131	6261
MWS-L-4-15	3811	7623
MWS-L-4-17	4492	8984
MWS-L-4-19	5172	10345
MWS-L-4-21	5853	11706
MWS-L-8-8	5036	10072
MWS-L-8-12	7554	15109
MWS-L-8-16	10073	20145

# Installation

The MWS Linear is simple, easy to install, and has a space efficient design that offers lower excavation and installation costs compared to traditional tree-box type systems. The structure of the system resembles pre-cast catch basin or utility vaults and is installed in a similar fashion.

The system is delivered fully assembled for quick installation. Generally, the structure can be unloaded and set in place in 15 minutes. Our experienced team of field technicians are available to supervise installations and provide technical support.



# Maintenance

Reduce your maintenance costs, man hours, and materials with the MWS Linear. Unlike other biofiltration systems that provide no pre-treatment, the MWS Linear is a self-contained treatment train which incorporates simple and effective pre-treatment.

Maintenance requirements for the biofilter itself are almost completely eliminated, as the pre-treatment chamber removes and isolates trash, sediments, and hydrocarbons. What's left is the simple maintenance of an easily accessible pre-treatment chamber that can be cleaned by hand or with a standard vac truck. Only periodic replacement of low-cost media in the pre-filter cartridges is required for long term operation and there is absolutely no need to replace expensive biofiltration media.



# Plant Selection

Abundant plants, trees, and grasses bring value and an aesthetic benefit to any urban setting, but those in the MWS Linear do even more - they increase pollutant removal. What's not seen, but very important, is that below grade the stormwater runoff/flow is being subjected to nature's secret weapon: a dynamic physical, chemical, and biological process working to break down and remove non-point source pollutants. The flow rate is controlled in the MWS Linear, giving the plants more "contact time" so that pollutants are more successfully decomposed, volatilized and incorporated into the biomass of The MWS Linear's micro/macro flora and fauna.

A wide range of plants are suitable for use in the MWS Linear, but selections vary by location and climate. View suitable plants by selecting the list relative to your project location's hardy zone.

Please visit [www.ModularWetlands.com/Plants](http://www.ModularWetlands.com/Plants) for more information and various plant lists.



**APPENDIX D**  
**Geotechnical Report**

**GEOTECHNICAL INVESTIGATION  
PROPOSED MIXED-USE APARTMENT DEVELOPMENT  
16922 MAGNOLIA STREET  
FOUNTAIN VALLEY, CALIFORNIA**

Prepared for:  
**Holland Acquisition Co, LLC**  
5000 E. Spring St., Suite 500  
Long Beach, CA 90815

Prepared by:  
**Geotechnical Professionals Inc.**  
5736 Corporate Avenue  
Cypress, California 90630  
(714) 220-2211  
([info@gpi-ca.com](mailto:info@gpi-ca.com))

November 3, 2023

Holland Acquisition CO, LLC  
5000 E. Spring St., Suite 500  
Long Beach, CA 90815

Attention: Mr. Jacob Stone

Subject: Report of Geotechnical Investigation  
Mixed-Use Apartment Development  
16922 Magnolia Street  
Fountain Valley, California  
GPI Project Number: 3033.11

Dear Mr. Stone:

Transmitted herewith is one electronic copy of our report of geotechnical investigation for the subject project. The report presents our evaluation of the foundation conditions at the site and recommendations for design and construction.

We appreciate the opportunity of offering our services on this project and look forward to seeing the project through its successful completion. Feel free to contact us if you have any questions regarding our report or need further assistance.

Very truly yours,  
**Geotechnical Professionals Inc.**



James E. Harris V, P.E.  
Project Engineer



Donald A. Cords, G.E.  
Principal

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### APPENDIX A

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A-1	Cone Penetrometer Diagram
A-2 to A-7	Cone Penetration Test Results

### APPENDIX B

B-1 to B-5	Logs of Borings
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### APPENDIX C

C-1	Atterberg Limits Test Results
C-2 to C-4	Direct Shear Test Results
C-5 to C-8	Consolidation Test Results
Table 1	Corrosivity Test Results

## **1.0 INTRODUCTION**

### **1.1 GENERAL**

This report presents the results of a geotechnical investigation performed by Geotechnical Professionals Inc. (GPI) for the proposed mixed-use apartment development to be located at 16922 Magnolia Street in Fountain Valley, California. The general site location is shown on the Site Location Map, Figure 1.

### **1.2 PROJECT DESCRIPTION**

The proposed project will consist of a 2-parcel mixed-use apartment development, including 5-stories of wood framed apartments over 2 levels of concrete and 8 stories of concrete parking structures. Both parcels will include the structures as described above. The site location is shown on the Site Location Map, Figure 1.

Structural loads and specific building design details are not available at this time. Based on experience with similar projects, maximum column loads are expected to be approximately 1200 to 1800 kips for the parking structures and maximum wall loads are expected to be approximately 4 to 6 kips per lineal foot for the apartments.

We understand that there will be no subterranean structures associated with this project.

### **1.3 PURPOSE OF INVESTIGATION**

The primary purpose of this investigation and report is to provide an evaluation of the existing geotechnical conditions at the site as they relate to the design and construction of the proposed development. More specifically, this investigation was aimed at providing geotechnical recommendations for earthwork, and design of foundations.

## **2.0 SCOPE OF WORK**

Our scope of work for this investigation consisted of review of existing information, field exploration, laboratory testing, engineering analysis, and the preparation of this report.

Our field exploration consisted of six CPT's and five exploratory borings. The locations of the subsurface explorations are shown on the Site Plan, Figure 2.

Our CPT's were advanced to depths ranging from 86 to 100 feet below existing site grades. Detailed logs of the CPT's and a summary of the equipment used are presented in Appendix A. Our exploratory borings were drilled using truck-mounted hollow-stem auger drilling equipment to depths of 11 to 60 feet below existing site grades. Details of the drilling and Logs of Borings are presented in Appendix B.

Laboratory soil tests were performed on selected representative samples as an aid in soil classification and to evaluate the engineering properties of the soils. The geotechnical laboratory testing program included determinations of moisture content and dry density, Atterberg limits, fines content, shear strength, consolidation, expansion potential, maximum density/optimum moisture, and soil corrosivity. Laboratory testing procedures and results are summarized in Appendix C.

Soil corrosivity testing was performed by Project X Corrosion under subcontract to GPI.

Engineering evaluations were performed to provide earthwork criteria, foundation and slab design parameters and assessments of seismic hazards. The results of our evaluations are presented in the remainder of the report.

### **3.0 SITE CONDITIONS**

#### **3.1 SURFACE CONDITIONS**

The project site previously consisted of a family entertainment center. The previous development has since been demolished. The site is currently vacant with remaining asphalt concrete and concrete pavements along with landscape areas.

Historic aerial photographs ([historicaerials.com](http://historicaerials.com)) indicate that the family entertainment center was developed sometime between 1972 and 1987. Prior to the entertainment center, the site was undeveloped and appears to have been used for agriculture.

The site is bounded on the north by the San Diego Freeway, on the east by the San Diego Freeway and a roller-skating center, on the south by Recreation Circle, and on the west by Magnolia Street.

The ground surface at the site is relatively flat. Based on Google Earth, ground surface elevation at the north end of the site is approximately +31 feet with a gentle slope to the south to an elevation of approximately +28 feet.

#### **3.2 SUBSURFACE SOILS**

Our field investigation disclosed a subsurface profile consisting of undocumented fills overlying natural soils. Detailed descriptions of the subsurface conditions encountered in our explorations are provided in Appendix A and B. A brief summary of the subsurface conditions are provided below.

In general, we encountered undocumented fills in our explorations ranging from 2 to 5 feet of existing site grades. Deeper fills may be encountered in the footprints of the previous buildings. The fills consist of silty sands and sandy silts. The fill soils were generally moist to very moist, medium dense and very stiff based on field explorations and laboratory testing. Documentation regarding the placement and compaction of the fill soils was not provided.

The natural soils consist predominantly of moist to very moist, interbedded layers of sands, clays, silts, and their mixtures to a depth of approximately 60 feet. These soils are generally moist to wet. The sandy soils were medium dense to very dense while the fine-grained soils were firm to very stiff. From 60 feet to the 100-foot depth explored the soils consisted of dense to very dense silty sands and sands.

#### **3.3 GROUNDWATER AND CAVING**

Groundwater was measured at depths of approximately 9 to 10 feet in our borings. Historical high groundwater level in the site vicinity has been reported at about 5 feet below the existing grades (CDMG, 1997). Due to the methods of drilling, the potential for caving was very difficult to determine but sandy layers below groundwater can be anticipated to exhibit caving.

## 4.0 CONCLUSIONS AND RECOMMENDATIONS

### 4.1 GENERAL

Based on the results of our investigation, it is our opinion that from a geotechnical viewpoint it is feasible to develop the site as proposed, provided the following geotechnical issues are incorporated into the design and construction of the proposed structure:

- Prior to placement of fills or construction of the building foundations and floor slabs, undocumented fills and disturbed soils should be removed and replaced as properly compacted fill. The depth of removals and details regarding grading are provided in the “Earthwork” section of this report.
- The site is located in a Seismic Hazard Zone for liquefaction (CDMG, 1997). There is a potential for liquefaction induced seismic settlement to adversely impact the buildings. Layers of silty and sandy soil between depths of approximately 5 to 55 feet below existing grade exhibit a significant potential for liquefaction from a design earthquake. Should liquefaction of these layers occur, our estimate is that the magnitude of induced settlement at the ground surface is expected to be on the order of 1 to 2 inches.
- The natural clays in the upper 30 feet of the soil profile are highly compressible. The placement of structural loads from the parking structure and apartments will cause significant static settlement. Based on our analysis, the settlement will be greater than typically tolerable by shallow foundations without ground improvement.
- The apartment buildings may be supported on mat foundations or shallow spread footings with ground improvement to control static and liquefaction induced settlement. A slab supported by ground improvement with 12 inches of non-expansive fill or structural slab should also be utilized.
- Parking structure foundations may be supported ground improvement to control static and liquefaction induced settlement. If the potential of excessive settlement of the parking structure slab is not tolerable, the slab-on-grade should be a slab supported by ground improvement or structural slab.
- A portion of near surface silty soils have the potential to be expansive, which shrink and swell with changes in moisture content. Flatwork and slabs-on-grade should be placed non-expansive compacted fill. Granular soils are present at the site and should soils are separated during grading. Further testing should be done during grading to determine the expansion potential of localized soils.
- Excavations extending deeper than approximately 5 feet are expected to encounter moist to very moist and may encounter locally wet soil conditions. Stabilization of excavation bottoms and drying of soils may be required prior to

placement of fill. Heavy rubber-tire equipment could cause “pumping” and disturbance of the subgrade soils. The contractor should evaluate the in-place moisture conditions when planning the work to allow for moisture conditioning and reducing subgrade disturbance.

- Storm water infiltration is not to be feasible at the site. Guidelines for storm water infiltration by the County of Orange do not allow infiltration into potentially liquefiable soils.
- The on-site soils are corrosive for buried metals.

Our recommendations related to the geotechnical aspects of the development of the site are presented in the subsequent sections of this report.

## 4.2 SEISMIC CONSIDERATIONS

### 4.2.1 General

The site is located in a seismically active area of Southern California and is likely to be subjected to strong ground shaking due to earthquakes on nearby faults.

We assume the seismic design of the proposed development will be in accordance with the California Building Code (CBC) 2022 edition. For the 2022 CBC, a Site Class D may be used based on the results our shear wave measurements measured during our investigation. The weighted average velocity was calculated to be approximately 720 ft/sec in the upper 100 feet. Using the Site Class, which is dependent on geotechnical issues, and the appropriate seismic design maps, the corresponding seismic design parameters from the CBC are as follows:

$$\begin{array}{lll} S_S = 1.38g & S_{MS} = F_a * S_S = 1.38 g & S_{DS} = 2/3 * S_{MS} = 0.92g \\ S_1 = 0.50g & S_{M1} = F_V * S_1 = 0.90 g & S_{D1} = 2/3 * S_{M1} = 0.60g \end{array}$$

These above values for the seismic design parameters should be confirmed by the Project Structural Engineer prior to their use.

In accordance with the 2022 CBC, site-specific response spectra are required for structures located in a Site Class D (with  $S_1$  greater than or equal to 0.2) unless, per the exceptions detailed in Section 11.4.8 of ASCE 7-16, the structure is designed using seismic response coefficient ( $C_s$ ) determined by either:

- Equation 12.8-2 for values of  $T \leq 1.5 T_S$ ,
- 1.5 times the value computed by Equation 12.8-3 for values of  $T_L \geq T > 1.5 T_S$ , or
- 1.5 times the value computed by Equation 12.8-4 for values of  $T > T_L$ .

If this exception is not taken and the structure will still be designed in accordance with the 2022 CBC, GPI should be notified that site-specific response spectra is requested.

The Project Structural Engineer should determine the seismic design method.

## 4.2.2 Strong Ground Motion Potential

Based on published information (USGS, 2008), the most significant faults in the proximity of the site are the San Joaquin Hills and Newport Inglewood Faults, which are located about 3 miles from the site, respectively.

During the life of the project, the site will likely be subject to strong ground motions due to earthquakes on nearby faults. Based on the ASCE 7 website ([asce7hazardtool.online](http://asce7hazardtool.online)), we computed that the site could be subjected to a peak ground acceleration ( $PGA_M$ ) of 0.65 for a modal magnitude 6.8 earthquake. This acceleration has been computed using the mapped Maximum Considered Geometric Mean peak ground acceleration from the ASCE 7-16 (for 2022 CBC) and a site coefficient ( $F_{PGA}$ ) based on Site Class. The predominant earthquake magnitude was determined using a 2-percent probability of exceedance in a 50-year period, or an average return period of 2,475 years. The structural design will need to incorporate measures to mitigate the effects of strong ground motion.

## 4.2.3 Potential for Ground Rupture

There are no known active faults crossing or projecting through the site. The site is not located in an Alquist-Priolo Earthquake Fault Zone. Therefore, ground rupture due to faulting is considered unlikely at this site.

## 4.2.4 Liquefaction

Soil liquefaction is a phenomenon in which saturated cohesionless soils undergo a temporary loss of strength during severe ground shaking and acquire a degree of mobility sufficient to permit ground deformation. In extreme cases, the soil particles can become suspended in groundwater, resulting in the soil deposit becoming mobile and fluid-like. Liquefaction is generally considered to occur primarily in loose to medium dense deposits of saturated soils. Thus, three conditions are required for liquefaction to occur: (1) a cohesionless soil of loose to medium density; (2) a saturated condition; and (3) rapid large strain, cyclic loading, normally provided by earthquake motions.

The site is located within a zone identified as having a potential for liquefaction by the State (CDMG, 1997). We evaluated the potential for liquefaction using methods presented in Robertson, 2009 (CDMG, 1997) and modifications provided in Special Publication 117A (CDMG, 1997).

To evaluate the potential for liquefaction at the site, we considered recent and historic groundwater levels. Ground water levels were encountered at depths as shallow as 9 feet in our recent exploration by others. We used a groundwater depth of 5 feet, corresponding to historical high level for the State (CDMG, 1997) for our evaluation.

Based on our evaluation of the CPT data using computer software CLIQ (GeoLogismiki) should a design earthquake occur, the majority of the soils that exhibit a potential for liquefaction induced seismic settlement are present between the depths of approximately 5 to 25 feet. In general, the potentially liquefiable layers consist of medium dense silty sands and firm sandy silts. Laboratory testing was performed on representative samples

of the cohesive soil deposits to evaluate their susceptibility to liquefy. Total liquefaction-induced settlement is estimated to be on the order of 1 to 2 inches at the ground surface, with differential settlement of approximately ½ to 1-inch across a span of 40 feet.

Seismic ground subsidence, not related to liquefaction, occurs when loose, granular soils above the groundwater are densified during strong earthquake shaking. Seismic ground subsidence (not related to liquefaction induced settlements) occurs when strong earthquake shaking results in densification of loose to medium dense sandy soils above groundwater. Due to the shallow depths to groundwater used in our liquefaction analysis and the limited amount of sandy soils above this groundwater level that will not be densified during remedial earthwork, the potential for dry seismic to adversely affect the site is considered to be low. As such, we do not anticipate measurable seismic settlement of the soil above the groundwater.

### **4.3 MITIGATION OF SETTLEMENT**

Supporting the proposed parking structures and apartments on a reasonable layer of engineered fill over the natural soils will result in static foundation settlements well beyond the typical performance of a shallow foundation system. Static settlements along with the additional anticipated seismic settlement on the order of 1 to 2 inches, spread footings are not feasible for the buildings. Typically, total settlement (static and seismic) for spread footings is limited to 1½ inches or less. Based on the subsurface conditions and space constraints at the site, the option of mitigating these settlements by performing deeper remedial grading is not feasible.

Alternatives to limit the total settlement (static and seismic) to acceptable limits include ground improvement, proprietary foundation/ground improvement method such as rammed aggregate piers (such as Geopier), rammed aggregate piers supported mat foundations (for the apartments only), or deep foundations (piles).

Rammed aggregate piers consist of drilled holes that are filled with aggregate base or gravel that is mechanically compacted as it is placed. Rammed aggregate piers should be installed under foundations for the proposed parking structures. They should also be installed under the parking structure slabs-on-grade unless settlements up to 2 inches under the floor slab in the event of a design level earthquake is tolerable. Rammed aggregate piers should also be installed under mat foundations for the proposed apartments. If shallow foundations are constructed for the apartments, rammed aggregate piers should be installed under the slab-on-grade unless a structural floor slab is utilized. Because such systems are proprietary, the work is performed on a design-build basis by the specialty contractor. Our design review is typically limited to confirming that the soil parameters used are consistent with the data provided in this report.

In order to support the parking structures or apartments on spread footings and slab-on-grade floors, the ground improvement design will require reducing the static settlement under the footings to less than 1 inch. Based on our analysis we anticipate that the depth of rammed aggregate piers will be required to extend to at least 25 feet.

In order to support the apartments on mat foundations, the ground improvement design will require reducing the static settlement under the footings to less than 2 inches. Based

on our analysis we anticipate that the depth of rammed aggregate piers will be required to extend to at least 17 feet.

The design and construction of the rammed aggregate piers are the sole responsibility of the ground improvement designer. In addition, foundation design parameters, including estimated settlements of footings bearing on rammed aggregate piers, must be provided by the ground improvement designer.

A representative of GPI should observe the installation of the rammed aggregate piers, including confirmation of the diameter of the drilled hole, specified lift thickness and duration of compaction effort. The locations of the rammed aggregate piers should be confirmed by the project surveyor.

The placement of new fill over the existing grade with a thickness of greater than about 2 feet will cause long-term settlement of the underlying compressible soils. While grading at the site is not anticipated to raise grades by more than a couple feet, the earth-filled ramps within the lower level of the parking structures will be placed up to approximately 10 feet above pad grade. We anticipate the placement of new fill for the ramp will cause up to ¼-inch of settlement within the silts and clays for every 2 feet of fill placed over pad elevation for at-grade structures. Due to the interbedded sandy soils within the silts and clays, the settlement will likely occur over a period ranging from approximately 30 to 45 days. We recommend that the concrete slab at the ramp not be constructed for at least 45 days after completion of fill. As an alternative, the ramp fill could be monitored with survey points to determine when the underlying settlement has been substantially completed. The ramp fill should be surveyed on a weekly basis and data provided to GPI for review. When GPI determines that the settlement of the ramp has been substantially completed, the concrete slab may be poured. Other alternatives are to backfill the ramp with a lightweight fill, such as Geofoam, or to install rammed aggregate piers under the ramp footprint to reduce the anticipated settlement to less than ½-inch and the settlement time. The design of the depth and spacing of rammed aggregate piers under the ramp to achieve an acceptable settlement and waiting time should be performed by the ground improvement designer.

#### **4.4 EARTHWORK**

The earthwork anticipated at the project site will consist of clearing, overexcavation of undocumented fills, a portion of natural soils, and soils disturbed by demolition activities, subgrade preparation, and placement and compaction of fill.

##### **4.4.1 Clearing and Grubbing**

Prior to grading, the areas to be developed should be stripped of vegetation and cleared of debris and pavements. Buried obstructions, such as footings, utilities, and tree roots should be removed. Deleterious material generated during the clearing operation should be removed from the site. Inert demolition debris, such as concrete and asphalt may be crushed for reuse in engineered fills in accordance with the criteria presented in the “Materials for Fill” section of this report.

If pile foundations are encountered from the previous development, GPI should observe the demolition of the existing foundation elements. We recommend the concrete piles be removed to a depth of at least 5 feet below the proposed foundations for the parking structures and buildings and at least 2 feet below floor slabs. We recommend the location and depth of the piles be surveyed during demolition. The resulting excavation should be backfilled as recommended in the "Subgrade Preparation" and "Placement and Compaction of Fill" sections of this report. Excavation and complete removal of the piles should be avoided.

Although none were encountered, cesspools or septic systems encountered during grading should be removed in their entirety. The resulting excavation should be backfilled as recommended in the "Subgrade Preparation" and "Placement and Compaction of Fill" sections of this report. As an alternative, any cesspools can be backfilled with a lean sand-cement slurry. At the conclusion of the clearing operations, a GPI representative should observe and accept the site prior to any further grading.

#### **4.4.2 Excavations**

Prior to construction of foundation supported improvements and slabs-on-grade, undocumented fill soils or soils disturbed by demolition beneath the proposed building should be removed and replaced as properly compacted fill. For planning purposes, we recommend that the soils be removed to a minimum depth of 4 feet below the existing grade within the footprint of the structures to remove undocumented fill at the site and to provide a uniform working surface for ground improvement installation. Deeper removals may be required in the footprint of the existing buildings or other areas based on observations of undocumented fills during grading by GPI's field technician. The base of removals should extend laterally a minimum distance of 5 feet beyond the building lines.

Alternatively, if a structural slab is utilized for the parking structures or apartment buildings, the need for the removal of the undocumented fills may be waived for that structure.

In addition to the undocumented fills or disturbed soils in the building footprints, a portion of the upper natural soils should be removed and replaced as properly compacted fill prior to placing fills outside of the building. For planning purposes, if silts or clays are encountered where new hardscape/flatwork surrounding the proposed buildings, removals should extend at least 12 inches below the proposed subgrade and replaced with imported, non-expansive soils ( $E.I. \leq 20$ ).

The above recommendations assume that the footings for the proposed parking structures and will be supported on ground improvement to reduce static and seismic settlement and that the apartment buildings will be supported on mat foundation or shallow spread footings with a structural slab or ground improvement supported slab.

The footings for lightly loaded structures, trash enclosures, screen walls, and canopies should be supported on at least 2 feet of properly compacted fill.

The actual depths of removal should be determined in the field during grading by a representative of GPI.

Where not removed by the aforementioned excavations, existing utility trench backfill should be removed and replaced as properly compacted fill. This is especially important for deeper fills associated with existing sewers and storm drains. For planning purposes, removals over the utilities should extend to within 1-foot of the top of the pipe. For utilities, which are 5 feet or shallower, the removal should extend laterally 1-foot beyond both sides of the pipe. For deeper utilities, the removals should include a zone defined by a 1:1 projection upward (and away from the pipe) from each side of the pipe. The actual limits of removal will need to be confirmed in the field. We recommend that all known utilities be shown on the grading plan.

Temporary construction excavations may be made vertically without shoring to a depth of 5 feet below adjacent grade. For deeper cuts up to 10 feet, the slopes should be properly shored or sloped back at least 1:1 or flatter. For cuts deeper than 10 feet, the slopes should be properly shored or sloped back at least 1½:1 (h:v) or flatter. Groundwater should be anticipated in excavations approaching approximately 9 feet below existing grade. The Contractor should be responsible in properly controlling groundwater in deeper excavations. The exposed slope face should be kept moist (but not saturated) during construction to reduce local sloughing. No surcharge loads should be permitted within a horizontal distance equal to the height of cut from the top of the excavation or 5 feet from the top of the slopes, whichever is greater, unless the cut is properly shored. Excavations that extend below an imaginary plane, inclined at 45 degrees below the edge of adjacent existing site facilities, should be properly shored to maintain support of adjacent elements. Excavations and shoring systems should meet the minimum requirements given in the most current State of California Occupational Safety and Health Standards.

#### **4.4.3 Subgrade Preparation**

Prior to placing fills or construction of the proposed structures, the subgrade soils should be scarified to a depth of 8 inches, moisture-conditioned, and compacted to at least 90 percent of the maximum dry density in accordance with ASTM D 1557, and to a firm and unyielding condition. In areas to receive pavements (outside of the structures), the top 12 inches below the pavement base should be scarified, moisture-conditioned, and compacted to a minimum of 95 percent (90 percent for cohesive soils) of the maximum dry density. To reduce the potential for subgrade disturbance, subgrade processing requirements may be waived if wet subgrade conditions are encountered, as determined by GPI in the field during grading.

Where exposed, care should be taken to prevent the clayey subgrade soils from drying out during construction. Moisture conditioning should be performed on subgrade soils allowed to dry prior to placing overlying fill or improvements.

The subgrade soils at depths greater than about 5 feet may exhibit over-optimum conditions. Subjecting these materials to heavy rubber-tired equipment may induce pumping/rutting, possibly requiring stabilization with geogrid and aggregate base. It is our opinion that steel track/wheel equipment will minimize disturbance of these materials. The contractor should determine the appropriate type of equipment to minimize disturbance of the over optimum soils.

Stabilization of subgrade soils may be required to facilitate the support of heavy equipment and the compaction of fills. For cost estimating purposes, the stabilization can consist of 12 inches of aggregate base placed over a geogrid, such as Tensar BX1100, Tensar TX140, or equivalent. The recycled on-site concrete and asphalt can be used for stabilization if processed as discussed in the following report section. Based on the laboratory testing of near-surface soils, lime or cement treatment for stabilization is likely to be a feasible alternative for stabilization.

#### **4.4.4 Material for Fill**

The on-site soils are, in general, suitable for use as compacted fill under the structures. Silts and clays soils should not be used directly underneath slab-on-grade floors (including the parking structures) or exterior flatwork as described in the “Excavations” section of this report. Fine-grained soils are not suitable for use as ramp or retaining wall backfill unless the walls are specifically designed for increased pressure and the risk is acceptable to the Owner. Granular, non-expansive soils are limited at the site and may need to be imported.

Imported fill material should be predominately granular (containing no more than 40 percent fines - portion passing No. 200 sieve) and non-expansive (Expansion Index of 20 or less). GPI should be provided with a sample (at least 50 pounds) and notified of the location of soils proposed for import at least 72 hours in advance of importing. Each proposed import source should be sampled, tested and accepted for use prior to delivery of the soils to the site. Soils imported prior to acceptance by GPI may be rejected if not suitable.

Soils used for compacted fills should not contain particles greater than 6 inches in size.

When aggregate base is recommended in this report, the material may be crushed aggregate base or crushed miscellaneous base.

On-site inert demolition debris, such as concrete and asphalt, may be reused in the compacted fills provided approval is obtained from the reviewing regulatory agency and the Owner. The material should be crushed to the consistency of aggregate base and blended with the on-site or imported soils. The recycled material may be used for non-expansive fill or aggregate base under slab-on-grade floors and exterior flatwork. The recycled material may also be used for stabilization of soft and wet areas if encountered in the planned overexcavations.

#### **4.4.5 Placement and Compaction of Fills**

Fill soils should be placed in horizontal lifts, moisture-conditioned, and mechanically compacted to at least 90 percent of maximum dry density in accordance with ASTM D-1557. The optimum lift thickness will depend on the compaction equipment used and can best be determined in the field. The following uncompacted lift thickness can be used as preliminary guidelines.

Plate compactors	4-6 inches
Small vibratory or static rollers (5-ton±)	6-8 inches

## Scrapers and heavy loaders

8-12 inches

The maximum lift thickness should not be greater than 12 inches and each lift should be thoroughly compacted and accepted prior to placement of subsequent lifts.

The moisture content of the on-site clayey soils should be between 1 to 3 percent over the optimum moisture content to readily achieve the required degree of compaction. Fills consisting of the imported or on-site sandy soils, if encountered, should be placed at a moisture content of 0 to 2 percent over the optimum moisture content in order to achieve the required compaction and reduce the potential for future swelling.

The on-site soils are generally near or above the optimum moisture content such that a drying of the fill during grading may be required. The on-site soils are susceptible to easily becoming wet when exposed to rain and can be difficult to dry back to near optimum. In the event that the on-site soils are subjected to rain, a significant amount of drying, including discing, during grading will be required.

During backfill of excavations, the fill should be properly benched into the construction slopes as it is placed in lifts.

### **4.4.6 Shrinkage and Subsidence**

Shrinkage is the loss of soil volume caused by compaction of fills to a higher density than before grading. Subsidence is the settlement of in-place subgrade soils caused by loads generated by large earthmoving equipment. For earthwork volume estimating purposes related to shallow overexcavations for slab support and minor structures only, an average shrinkage value of 10 to 15 percent may be assumed for the surficial soils. Subsidence is expected to be less than 0.1 feet. These values are estimates only and exclude losses due to removal of vegetation or debris. Actual shrinkage and subsidence will depend on the types of earthmoving equipment used and should be determined during grading.

### **4.4.7 Trench/Wall Backfill**

Utility trench backfill consisting of the on-site materials or imported soil, or wall backfill consisting of granular material should be mechanically compacted in lifts. The on-site clays should not be placed as retaining wall backfill unless the walls are specifically designed for increased pressure and the risk is acceptable to the Owner. Lift thickness should not exceed those values given in the "Placement and Compaction of Fills" section of this report. Moisture conditioning (drying) of the on-site soils will be required prior to re-use as backfill. Jetting or flooding of backfill materials should not be permitted. A representative of GPI should observe and test trench and wall backfill as they are placed.

In backfill areas where mechanical compaction of soil backfill is impractical due to space constraints, sand-cement slurry may be substituted for compacted backfill. The slurry should contain two sacks of cement per cubic yard and have a maximum slump of 5 inches. When placed against retaining structures, the Project Structural Engineer should be consulted to determine the maximum lift height of the wet slurry.

If open-graded rock is used as backfill, the material should be placed in lifts and mechanically densified. Open-graded rock should be separated from the on-site soils by a suitable filter fabric (Mirafi 140N or equivalent).

#### **4.4.8 Observation and Testing**

A representative of GPI should observe excavations, subgrade preparation, and fill placement activities. Sufficient in-place field density tests should be performed during fill placement to evaluate the overall compaction of the soils. Soils that do not meet minimum compaction requirements should be reworked and tested prior to placement of additional fill.

### **4.5 FOUNDATIONS**

#### **4.5.1 Foundation Type**

The proposed parking structures may be supported on conventional isolated and/or continuous shallow spread footings with slab-on-grade floors subsequent to the installation of ground improvement under the footings to control static and seismic settlement.

The apartment buildings may be supported on spread footings or mat foundations subsequent to the installation of ground improvement to control seismic and static settlement. If shallow foundations are utilized, the design should include either a structural slab or ground improvement elements under the slab-on-grade. Isolated footings, not part of the mat foundations, associated with the apartment buildings, such as for entry features, should also be supported on ground improvement to control settlements.

Foundation design parameters should be provided by the design-build contractor constructing the ground improvement elements.

#### **4.5.2 Shallow Foundations**

Based on the shear strength and elastic settlement characteristics of the natural and recompacted on-site soils, static allowable net bearing pressures of up to 2,000 pounds per square foot (psf) may be used for both continuous footings and isolated column footings for minor structures.

These bearing pressures are for dead-load-plus-live-load, and may be increased one-third for short-term, transient, wind and seismic loading. The actual bearing pressure used may be less than the value presented above and can be based on economics and structural loads to determine the minimum width for footings as discussed below. The maximum edge pressures induced by eccentric loading or overturning moments should not be allowed to exceed these recommended values.

#### **Minimum Footing Width and Embedment**

For minor structures supported on properly compacted fill at-grade or competent natural soils, a static allowable net bearing pressure of 2,000 pounds per square foot may be

used. The footings should have a minimum width of 18 inches and be embedded at least 24 inches below lowest adjacent grade for compacted fill and at least 36 inches below grade for competent natural soils.

### Estimated Settlements

For minor structures supported at-grade on properly compacted fill, total static settlement of is expected to be less than  $\frac{3}{4}$ -inch. Maximum differential settlements between similarly loaded adjacent footings or along a 40-foot span are expected to be less than  $\frac{1}{2}$ -inch.

The above settlements should be included with the anticipated seismic settlement caused by liquefaction when evaluating the total settlement of the single-story buildings or other lightly loaded structures.

The above estimates are based on the assumption that the recommended earthwork will be performed and that the footings will be sized in accordance with our recommendations.

### **4.5.3 Lateral Load Resistance**

Soil resistance to lateral loads will be provided by a combination of frictional resistance between the bottom of footings and underlying soils and by passive soil pressures acting against the embedded sides of the footings. For frictional resistance, a coefficient of friction of 0.30 may be used for design for non-rammed aggregate pier supported footings (the ground improvement designer should provide the friction coefficient for the rammed aggregate pier supported footings). In addition, an allowable lateral bearing pressure equal to an equivalent fluid weight of 275 pounds per cubic foot may be used for footings. The allowable lateral bearing pressure values provided are based on the footings being poured tight against compacted fill soils or competent natural soils. The friction and lateral bearing values may be used in combination without reduction.

### **4.5.4 Foundation Concrete**

Laboratory testing by HDR (Appendix C) indicates that the near surface soils exhibit a soluble sulfate content ranging of 111 mg/kg (2.5 percent by weight). For the 2022 CBC, foundation concrete should conform to the requirements outlined in ACI 318, Section 4.3, for very severe levels of soluble sulfate exposure from the on-site soil (Category S3). Chloride levels in the sample of the upper soils tested were 86 mg/kg, which is considered to be low (Category C1).

### **4.5.5 Footing Excavation Observation**

Prior to placement of steel and concrete, a representative of GPI should observe and approve footing excavations including footings overlying ground improvement and mat foundations bottoms.

## **4.6 SLABS-ON-GRADE**

The slab-on-grade floors (including parking structures) should be supported on at least 12 inches of granular (sandy), non-expansive soils (Expansion Index less than 20). As

previously discussed in Section 4.4.2, if a structural slab or mat foundation is utilized for the building the need for non-expansive soils in the upper 12 inches may be waived.

The non-expansive granular fill should be compacted as discussed in the “Placement and Compaction of Fill” section. Based on our explorations, granular, non-expansive soils are limited on site and may need to be imported to the project site.

A vapor/moisture retarder should be placed under slabs that are to be covered with moisture-sensitive floor coverings (parquet, vinyl tile, etc.) or will be storing moisture sensitive supplies. Currently, common practice is to use a 15 mil polyolefin product such as Stego Wrap for this purpose. Whether to place the concrete slab directly on the vapor barrier or place a clean sand layer between the slab and vapor barrier is a decision for the Project Architect, as it is not a geotechnical issue. If covered by sand, the sand layer should be about 2 inches thick and contain less than 5 percent by weight passing the No. 200 sieve. Based on our explorations and laboratory testing, the soils at the site are not suitable for this purpose. This layer should be nominally compacted using light equipment. The sand placed over the vapor retarder should only be slightly moist. If the sand gets wet (for example as a result of rainfall or excessive moistening) it must be allowed to dry prior to placing concrete. Care should be taken to avoid infiltration of water into the sand layer after placement of the concrete slab, such as at slab cut-outs and other exposures. A sand layer is not required beneath the vapor retarder, but we take no exception if one is provided.

It should be noted that the material used as a vapor retarder is only one of several factors affecting the prevention of moisture accumulation under floor coverings. Other factors include maintaining a low water to cement ratio for the concrete used for the floor slab, effective sealing of joints and edges (particularly at pipe penetrations), as well as excess moisture in the concrete. The manufacturer of the floor coverings should be consulted for establishing acceptable criteria for the condition of floor surface prior to placing moisture-sensitive floor coverings.

#### **4.7 LATERAL EARTH PRESSURES**

We assume that retaining walls for the parking structure ramps are planned for the project. The following recommendations are provided for walls up to 12 feet in height.

We recommend that the walls be backfilled with imported non-expansive, granular (sandy) soils. The limits of select fill should extend 2 feet beyond bottom of wall and upwards to at a  $\frac{3}{4}$ :1 projection (horizontal:vertical). However, we understand that on-site soils are being considered for backfill of the ramp walls in the parking structure. If on-site soils are used, active earth pressures for these soils are provided below. The Owner should understand that besides greater earth pressures required in the design, the clayey soils have poor drainage characteristics. The ramp walls should be damp-proofed to help mitigate moisture and sulfates impacting the wall face unless the risk is acceptable to the Owner.

Active earth pressures can be used for designing walls that can yield at least 1-inch laterally in 10 feet of wall height under the imposed loads. For level backfill comprised of drained, imported granular soils (no more than 40 percent passing No. 200 U.S. standard

sieve), the magnitude of active pressures are equivalent to the pressures imposed by a fluid weighing 35 pounds per cubic foot (pcf). For level backfill comprised of drained, on-site clay soils, the magnitude of active pressures are equivalent to the pressures imposed by a fluid weighing 45 pcf.

At-rest pressures should be used for restrained walls that remain rigid enough to be essentially non-yielding. At-rest pressures for drained, imported granular soils are equivalent to the pressures imposed by a fluid weighing 55 pounds per cubic foot. At-rest pressures for drained, on-site clay soils are equivalent to the pressures imposed by a fluid weighing 65 pounds per cubic foot.

As outlined in the California Building Code, site retaining walls 6 feet or taller should be designed to resist seismic lateral earth pressures. A lateral pressure equivalent to a fluid with a unit weight of 25 pounds per cubic foot may be used. This pressure should be combined with the active earth pressure presented above. If the retaining walls are designed using the at-rest pressure provided above, only the difference between the active plus seismic pressures and the at-rest pressure needs to be included as the seismic pressure.

The recommended pressures are based on the assumption that the supported earth will be fully drained, preventing the build-up of hydrostatic pressures. For traditional backfilled retaining walls, a drain consisting of perforated pipe and gravel wrapped in filter fabric should be used. One cubic foot of rock should be used for each lineal foot of pipe. The fabric (non-woven filter fabric, Mirafi 140N or equivalent) should be lapped at the top. We prefer pipe and gravel drains to weep holes to avoid potential for constant flow of surface water in front of the wall. If acceptable to the Structural Engineer, drainage can be omitted for ramp walls within parking structure where the ramp walls are not exposed to the exterior of the parking structure.

Walls subject to surcharge loads should be designed for an additional uniform lateral pressure equal to one-third and one-half the anticipated surcharge pressure for unrestrained and restrained walls, respectively. In addition to the recommended earth pressure, the upper 10 feet of the walls adjacent to the traffic should be designed to resist a uniform lateral pressure of 100 pounds per square foot, acting as a result of an assumed 300 pound per square foot surcharge due to normal traffic. If traffic is kept at least 10 feet from the walls, the traffic surcharge may be neglected.

The Structural Engineer should indicate on the plans the type of wall backfill recommended based on the earth pressures used for the design. Light wall footings should be designed as discussed in the "Shallow Foundations" section.

#### **4.8 CORROSIVITY**

Resistivity testing (Appendix C) of representative samples of the on-site soils indicates that they are corrosive for buried metals. Should the use of buried metallic structures be proposed, a corrosion engineer such as Project X should be consulted to provide recommendations to protect these elements from corrosion. GPI does not practice corrosion engineering.

## **4.9 DRAINAGE**

Positive surface gradients should be provided adjacent to structures so as to direct surface water run-off and roof drainage away from foundations and slabs toward suitable discharge facilities. Long-term ponding of surface water should not be allowed on pavements or adjacent to buildings.

## **4.10 STORMWATER INFILTRATION**

Current regulations require that storm water be infiltrated in the site soils of new developments when possible. The soil types present at the site control the ability of water to infiltrate into the subgrade. Based upon our subsurface investigation and laboratory testing, the subsurface soils underlying the site consist predominantly of clays and silts which have poor infiltration characteristics and are not suitable to accept infiltration. In addition, groundwater was encountered in the upper 9 feet of the soil profile, historical high groundwater is a depth of 5 feet, and the site is located in a liquefaction zone. For the above reasons, we do not recommend stormwater infiltration for the subject site.

## **4.11 EXTERIOR CONCRETE AND MASONRY FLATWORK**

Exterior concrete and masonry flatwork should be supported on non-expansive, compacted granular fill (E.I.  $\leq 20$ ). We recommend 12 inches of non-expansive fill under the exterior concrete surrounding the building.

The use of the on-site fine-grained soils directly under the slab subgrade or lesser thicknesses of non-expansive material as discussed should not be permitted unless differential heave is tolerable. This includes areas such as exterior sidewalks, stamped concrete, non-traffic pavement, and pavers. There are ample amounts of non-expansive material available on-site. Testing during grading should be performed to ensure the expansion potential of the material is less than an EI of 20.

Prior to placement of the non-expansive material under the concrete, the subgrade should be prepared as recommended in the "Subgrade Preparation" section of this report. It is imperative that the on-site silts are not allowed to dry-out during construction.

## **4.12 PAVED AREAS**

Preliminary pavement design has been based on an R-value of 20 based upon laboratory testing of the near-surface soils at the site. The California Division of Highways Design Method was used for design of the recommended preliminary pavement sections. Final pavement design should be based on R-value testing performed near the conclusion of rough grading. The following pavement sections are recommended for planning purposes only.

**PAVEMENT SECTIONS**

PAVEMENT AREA	ASSUMED TRAFFIC INDEX	SECTION THICKNESS (inches)	
		Asphalt Concrete	Aggregate Base Course
Auto Parking	4	3	5
Circulation Drives (no trucks)	5	3	6
Truck Driveways	6	3	8
		Portland Cement Concrete	Aggregate Base Course
Auto Parking	4	6.0	----
Circulation Drives (no trucks)	5	6.0	----
Truck Driveways	6	6.5	----

If vehicular pavers are to be used for the project, the paver and leveling sand may be supported on the thickness of aggregate base shown for the appropriate traffic index. Pavers for vehicular traffic should be a minimum of 3 1/8 inches (80 mm) thick.

The pavement subgrade underlying the aggregate base should be properly prepared and compacted in accordance with the recommendations outlined under "Subgrade Preparation".

The portland cement concrete used for paving should have an approximate compressive strength of 3,500 psi at the time the pavement is subject to truck traffic.

The pavement base course should be compacted to at least 95 percent of the maximum dry density (ASTM D 1557). Aggregate base should conform to the requirements of Section 26 of the California Department of Transportation Standard Specifications for Class II aggregate base (three-quarter-inch maximum) or Section 200-2 of the Standard Specifications for Public Works Construction (Green Book) for untreated base materials (except Processed Miscellaneous Base).

The above recommendations are based on the assumption that the base course will be properly drained. The design of paved areas should incorporate measures to prevent moisture build-up within the base course and subgrade, which can otherwise lead to premature pavement failure. For example, curbing adjacent to landscaped areas should be deep enough to act as a barrier to infiltration of irrigation water into the adjacent base course.

**4.13 GEOTECHNICAL OBSERVATION AND TESTING**

We recommend that a representative of GPI observe earthwork during construction to confirm that the recommendations provided in our report are applicable during construction. The earthwork activities include grading, compaction of all fills and subgrade preparation, as well as foundation construction including Geopier installation. If conditions are different than expected, we should be afforded the opportunity to provide an alternate recommendation based on the actual conditions encountered.

## 5.0 LIMITATIONS

The report, exploration logs, and other materials resulting from GPI's efforts were prepared exclusively for use by Holland Acquisition Co., LLC and their consultants in designing the proposed development. The report is not intended to be suitable for reuse on extensions or modifications of the project or for use on any project other than the currently proposed development as it may not contain sufficient or appropriate information for such uses. If this report or portions of this report are provided to contractors or included in specifications, it should be understood that they are provided for information only. This report cannot be utilized by another entity without the express written permission of GPI. This report is an instrument of our services and remains the property of GPI.

Soil deposits may vary in type, strength, and many other important properties between points of exploration due to non-uniformity of the geologic formations or to man-made cut and fill operations. While we cannot evaluate the consistency of the properties of materials in areas not explored, the conclusions drawn in this report are based on the assumption that the data obtained in the field and laboratory are reasonably representative of field conditions and are conducive to interpolation and extrapolation.

Furthermore, our recommendations were developed with the assumption that a proper level of field observation and construction review will be provided during grading, excavation, and foundation construction by GPI. If field conditions during construction appear to be different than is indicated in this report, we should be notified immediately so that we may assess the impact of such conditions on our recommendations. If construction phase services are performed by others they must accept full responsibility (as Project Geotechnical Engineer) for all geotechnical aspects of the project including this report.

Our investigation and evaluations were performed using generally accepted engineering approaches and principles available at this time and the degree of care and skill ordinarily exercised under similar circumstances by reputable Geotechnical Engineers practicing in this area. No other representation, either express or implied, is included or intended in our report.

Respectfully submitted,  
**Geotechnical Professionals Inc.**

  
James E. Harris V, P.E.  
Project Engineer



  
Donald A. Cords, G.E.  
Principal



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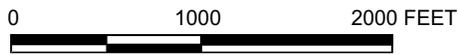
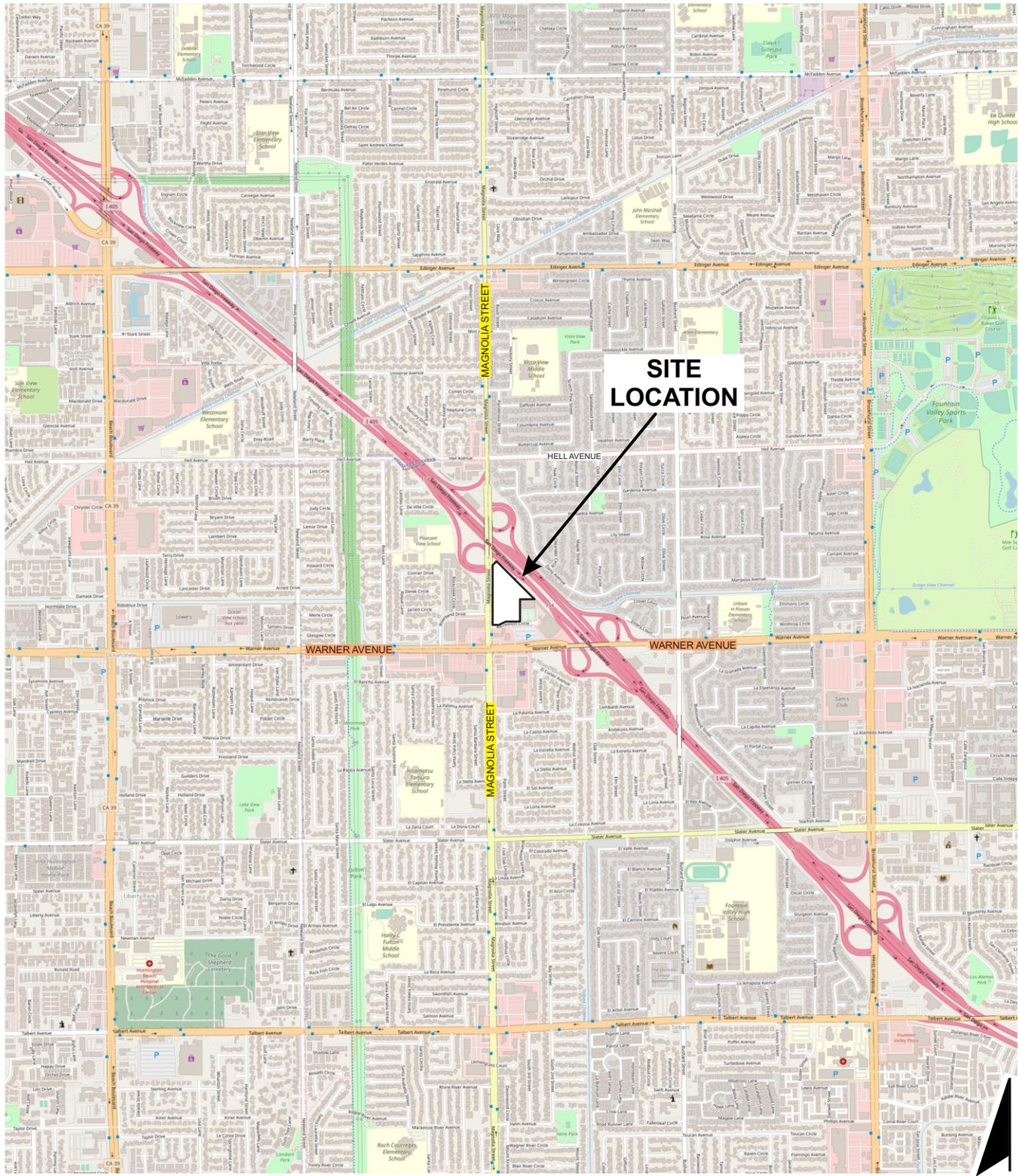
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BASE MAP REPRODUCED FROM CALTOPO © 2022



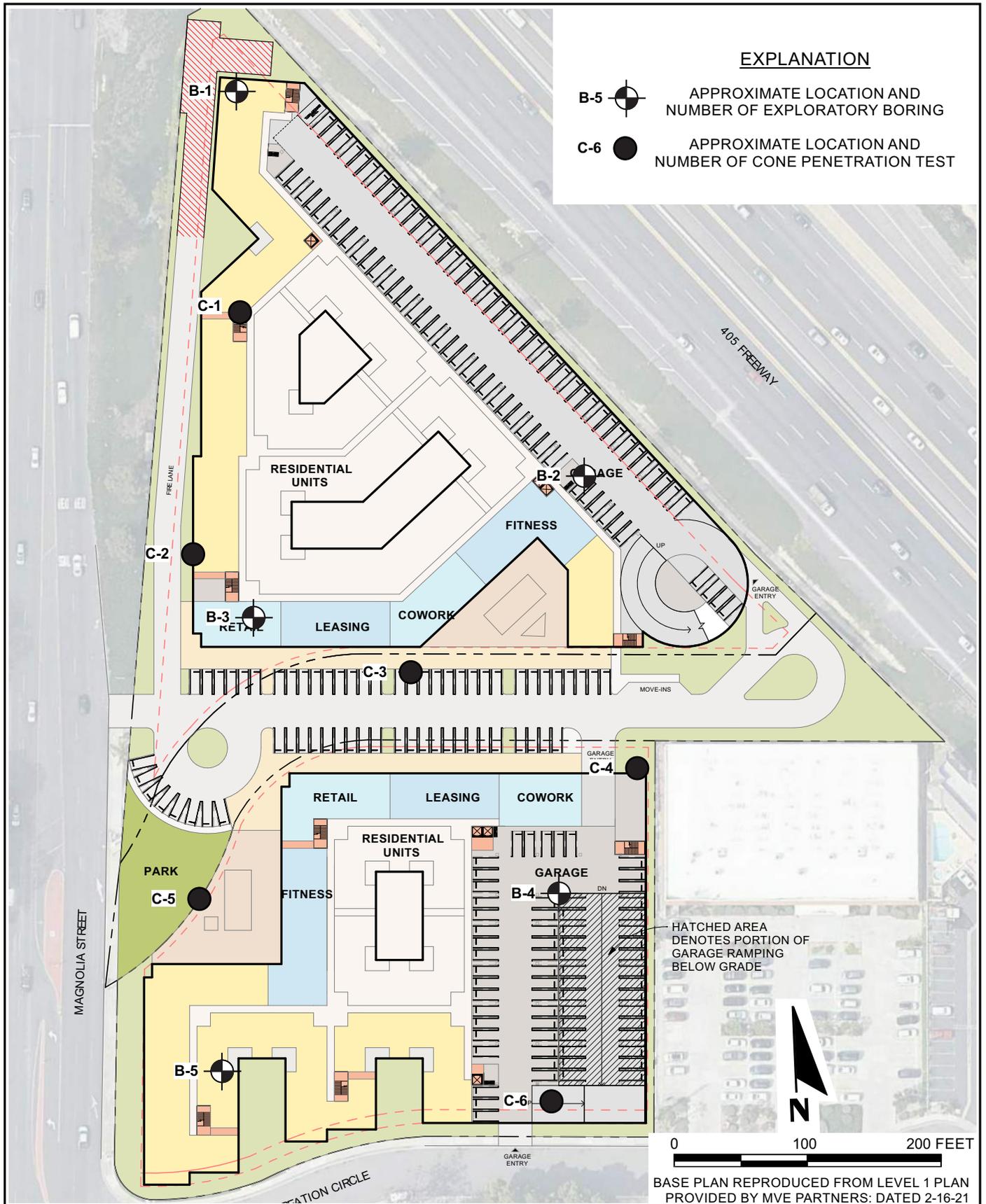
# SITE LOCATION MAP

HOLLAND MAGNOLIA

GPI PROJECT NO.: 3033.11

SCALE: 1" = 1000'

FIGURE 1



**GEOTECHNICAL PROFESSIONALS, INC.**

HOLLAND MAGNOLIA

GPI PROJECT NO.: 3033.11

SCALE: 1" = 100'

**SITE PLAN**

FIGURE 2

## ***APPENDIX A***

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## APPENDIX A

### CONE PENETRATION TESTS

The subsurface conditions were investigated by performing six Cone Penetration Tests (CPTs) at the site. The CPT's were advanced to depths ranging from 86 to 100 feet below existing grades. The locations of the CPTs are shown on the Site Plan, Figure 2.

The Cone Penetration Test consists of pushing a cone-tipped probe into the soil deposit while simultaneously recording the cone tip resistance and side friction resistance of the soil to penetration (refer to Figure A-1). The CPTs described in this report were conducted in general accordance with ASTM specifications (ASTM D5778) using an electric cone penetrometer.

The CPT equipment consists of a cone assembly mounted at the end of a series of hollow sounding rods. A set of hydraulic rams is used to push the cone and rods into the soil while a continuous record of cone and friction resistance versus depth is obtained in both analog and digital form at the ground surface. A specially designed truck is used to transport and house the test equipment and to provide a 30-ton reaction to the thrust of the hydraulic rams.

Standard data obtained during a CPT consists of continuous stratigraphic information with close vertical resolution. Stratigraphic interpretation is based on relationships between cone tip resistance and friction resistance. The calculated friction ratio (CPT friction sleeve resistance divided by cone tip resistance) is used as an indicator of soil type. Granular soils typically have low friction ratios and high cone resistance, while cohesive or organic soils have high friction ratios and low cone resistance. These stratigraphic material categories form the basis for all subsequent calculations which utilize the CPT data.

Computer plots of the reduced CPT data acquired for this investigation is presented in Figures A-2 to A-7 of this appendix. The field testing and computer processing was performed by Kehoe Testing and Engineering under subcontract to Geotechnical Professionals Inc. (GPI). The interpreted soils descriptions were prepared by GPI.

A seismic cone penetration test provided shear wave velocity measurements of the soil profile. A standard cone penetrometer is equipped with two sets of geophones located approximately 2 feet apart on the cone penetrometer. At 10-foot intervals, a shear wave source is activated at the ground surface using an air-actuated hammer. A seismograph measures the travel time of the shear wave detected at each set of geophones. The time difference provides the velocity of the shear wave in the layer between the two geophone sets.

Seismic cone penetration tests was performed at CPT C-2. The cone penetration test at location C-2 was performed to 100 feet below existing grade and the subsequent data was used in order to estimate the average shear wave velocity for the upper 100 feet of soil profile. Table A-1 provides the shear wave velocity from the surface and the interval of soil between the geophones.

The CPT locations were laid out in the field by measuring from existing site features. Upon completion, the un-caved portions of the CPT holes were backfilled with bentonite chips. Ground surface elevations at the exploration locations were estimated from google earth.

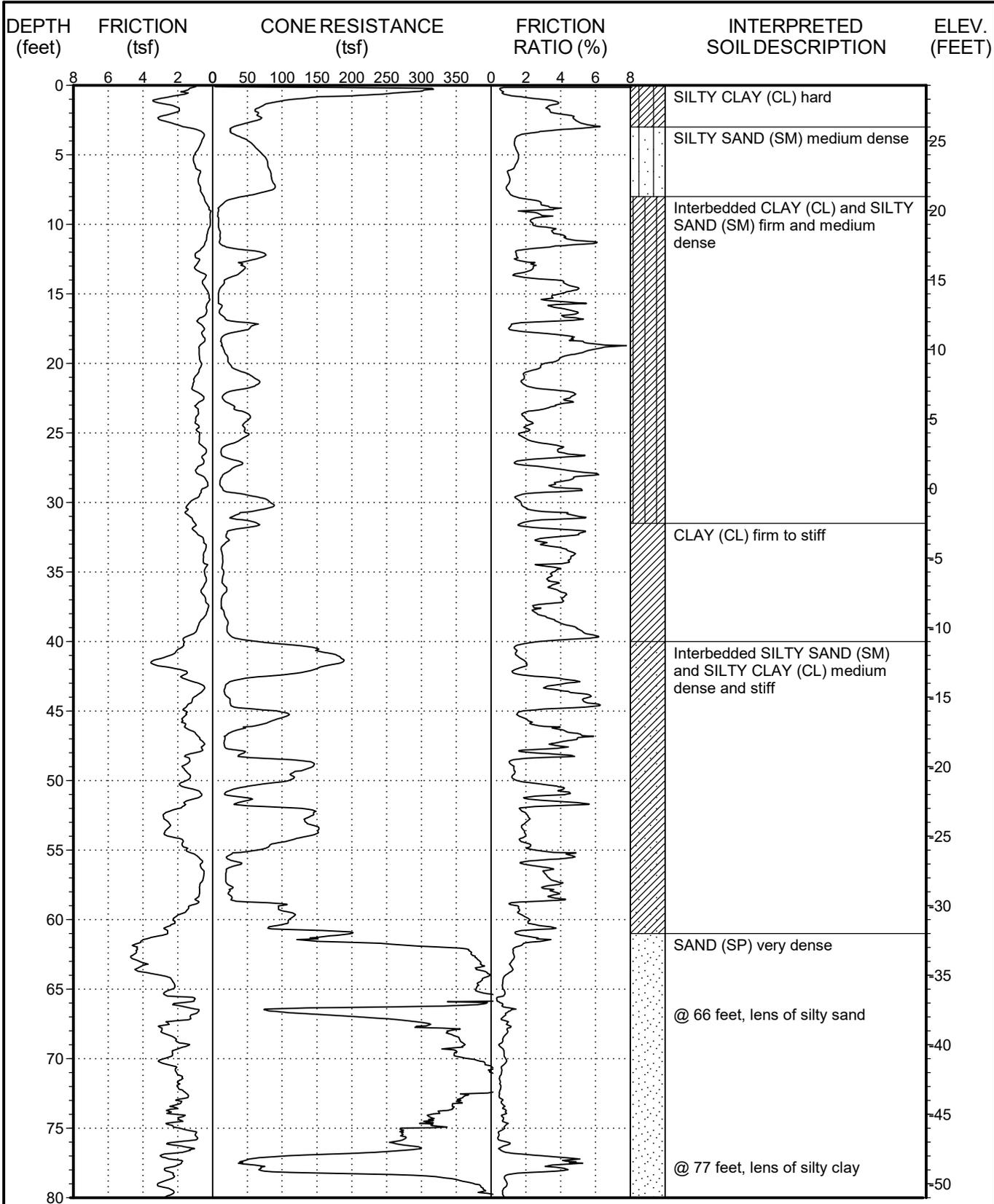
**TABLE A-1  
SEISMIC SHEAR WAVE VELOCITY MEASUREMENTS**

Geotechnical Professionals Inc.  
Holland Magnolia - Proposed Mixed Use Apartments  
Fountain Valley, CA

**CPT Shear Wave Measurements**

Location	Tip Depth (ft)	Geophone Depth (ft)	Travel Distance (ft)	S-Wave Arrival (msec)	S-Wave Velocity from Surface (ft/sec)	Interval S-Wave Velocity (ft/sec)
CPT C-2	10.01	9.01	9.01	16.60	543	
	20.08	19.08	19.08	36.06	529	517
	30.05	29.05	29.05	53.54	543	570
	39.99	38.99	38.99	69.60	560	619
	50.03	49.03	49.03	83.60	586	717
	60.01	59.01	59.01	97.54	605	716
	70.05	69.05	69.05	108.32	637	931
	79.99	78.99	78.99	119.68	660	875
	90.03	89.03	89.03	128.80	691	1101
	100.03	99.03	99.03	137.88	718	1101

**Average Shear Wave Velocity in Upper 100 feet:            716 ft/sec**



Date performed: 3-31-21

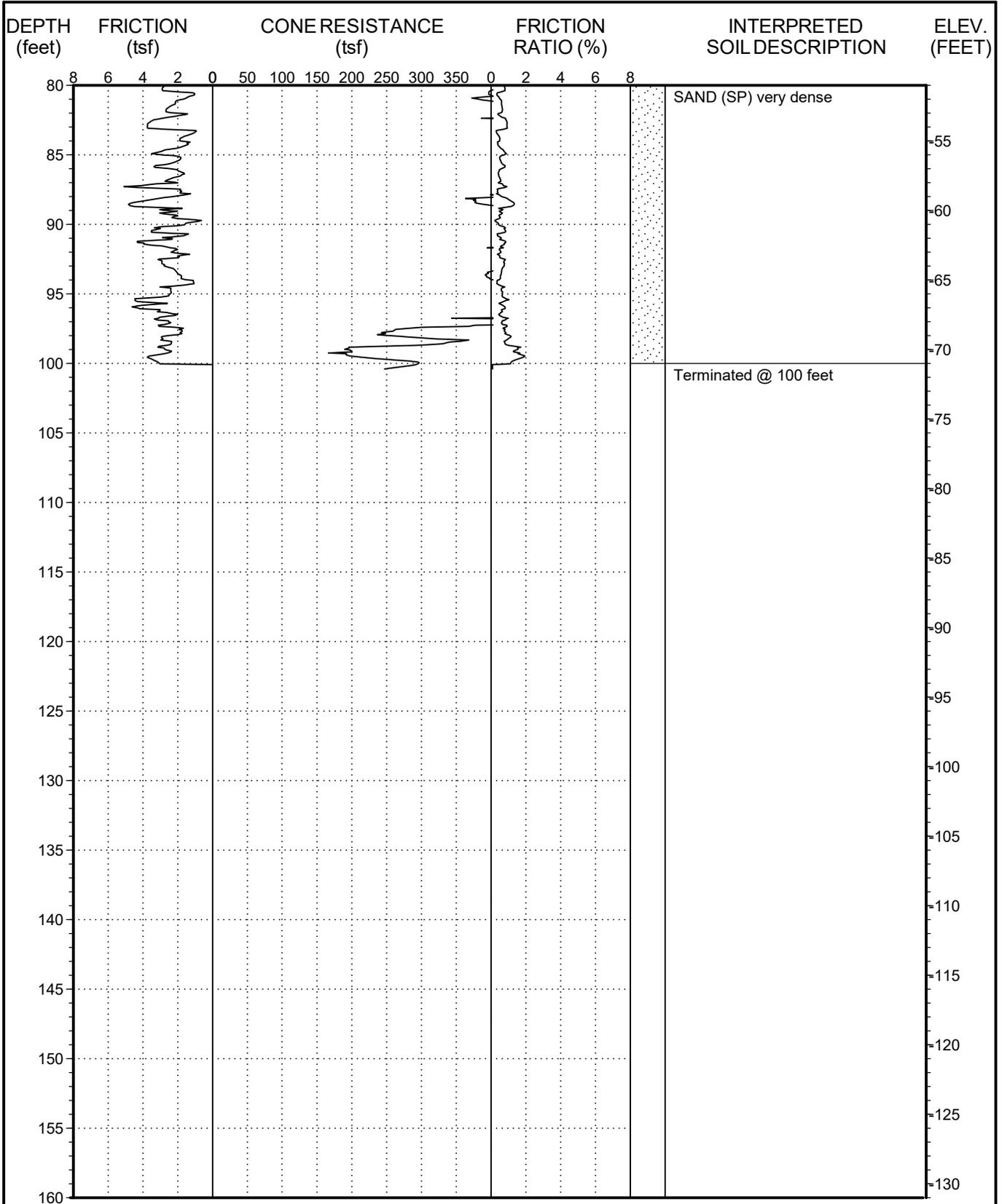
This summary applies only at the location of this cone penetration test and at the time of the exploration. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The interpreted soil description is derived from the friction ratio and cone resistance and is a simplification of actual conditions encountered.



PROJECT NO.: 3033.11  
HOLLAND MAGNOLIA

**LOG OF CPT NO. C-1**

FIGURE A-2



Date performed: 3-31-21

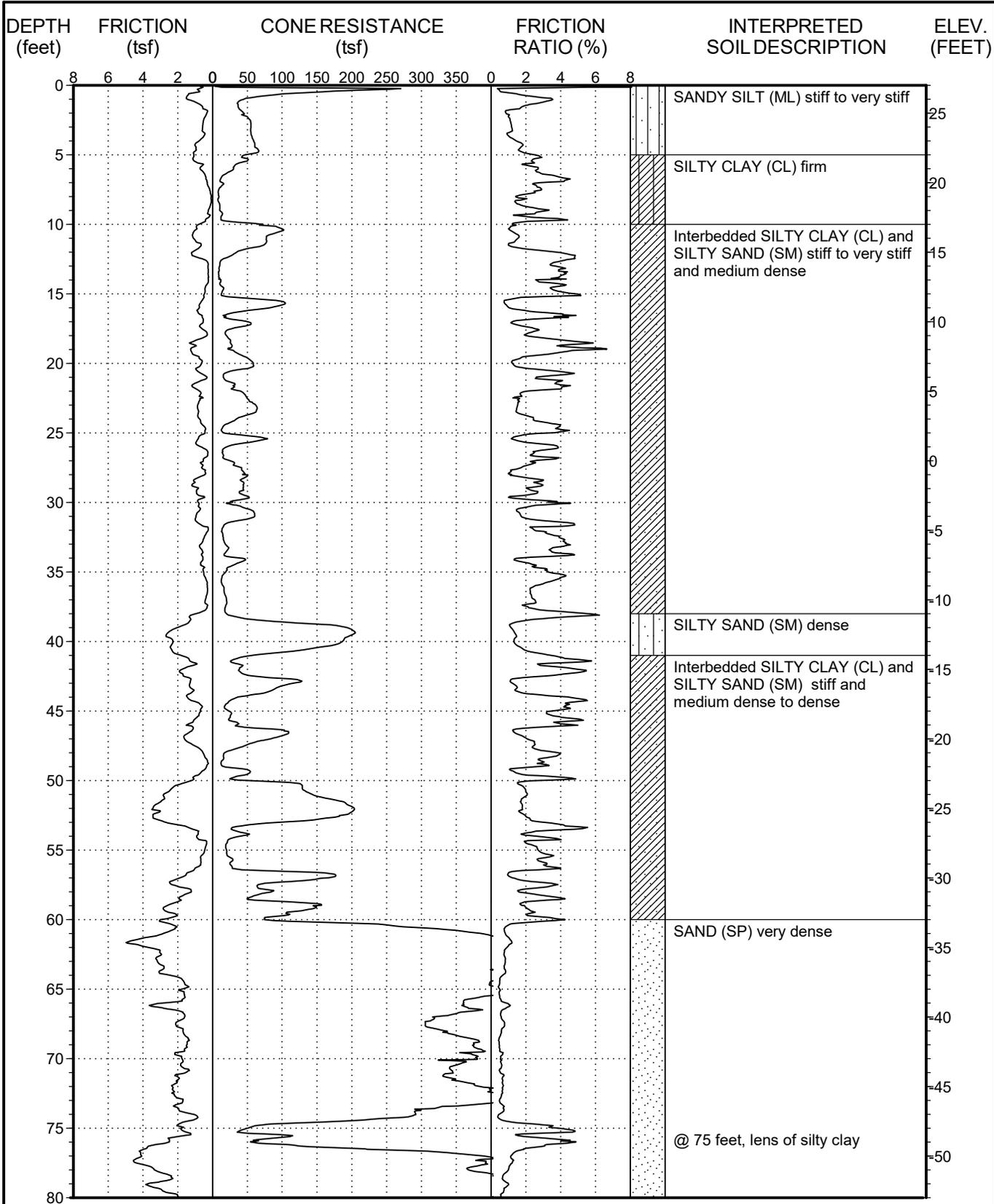
This summary applies only at the location of this cone penetration test and at the time of the exploration. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The interpreted soil description is derived from the friction ratio and cone resistance and is a simplification of actual conditions encountered.



PROJECT NO.: 3033.11  
HOLLAND MAGNOLIA

**LOG OF CPT NO. C-1**

FIGURE A-2



Date performed: 3-31-21

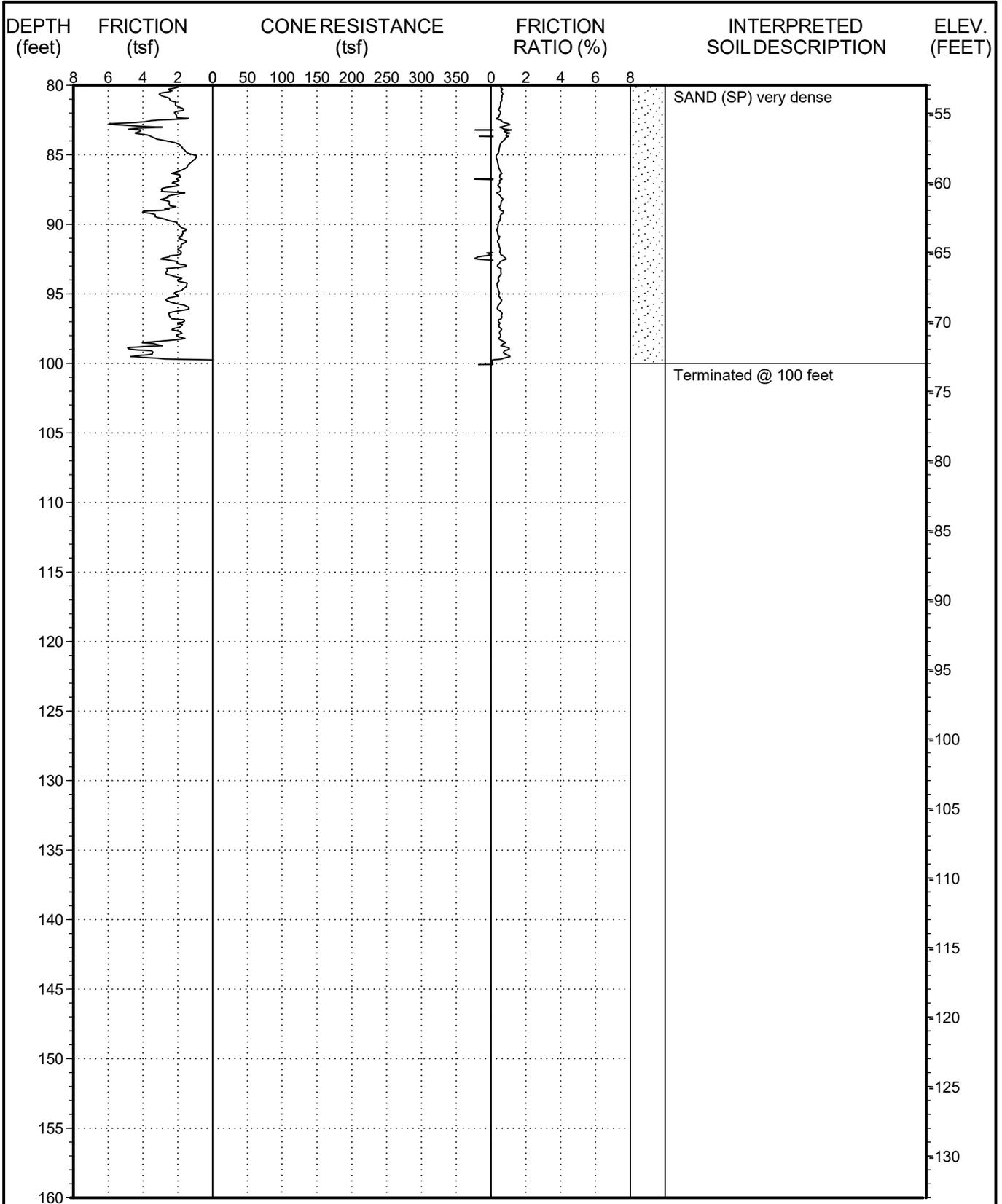
This summary applies only at the location of this cone penetration test and at the time of the exploration. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The interpreted soil description is derived from the friction ratio and cone resistance and is a simplification of actual conditions encountered.



PROJECT NO.: 3033.11  
HOLLAND MAGNOLIA

**LOG OF CPT NO. C-2**

FIGURE A-3



Date performed: 3-31-21

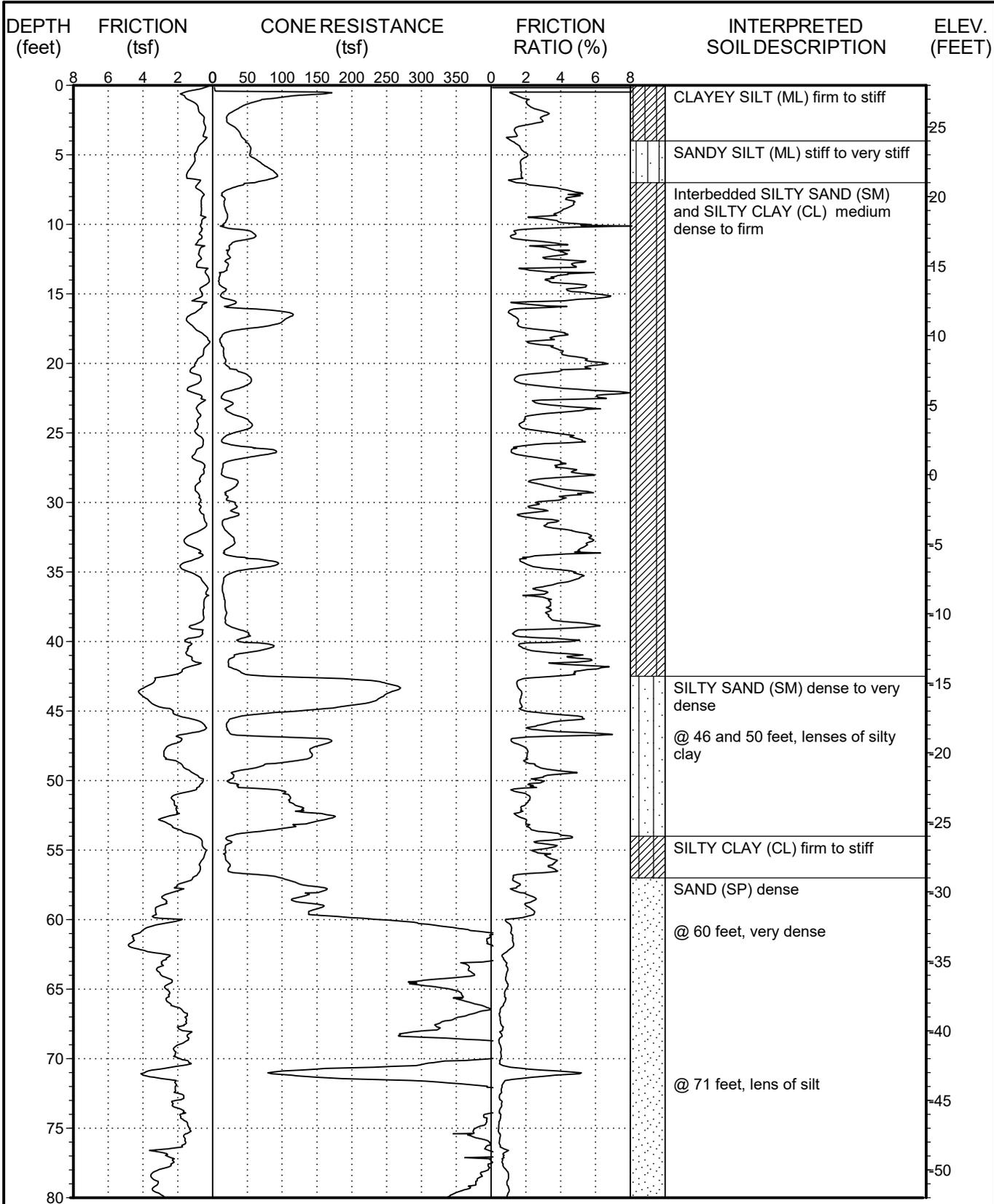
This summary applies only at the location of this cone penetration test and at the time of the exploration. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The interpreted soil description is derived from the friction ratio and cone resistance and is a simplification of actual conditions encountered.



PROJECT NO.: 3033.11  
HOLLAND MAGNOLIA

**LOG OF CPT NO. C-2**

FIGURE A-3



Date performed: 3-31-21

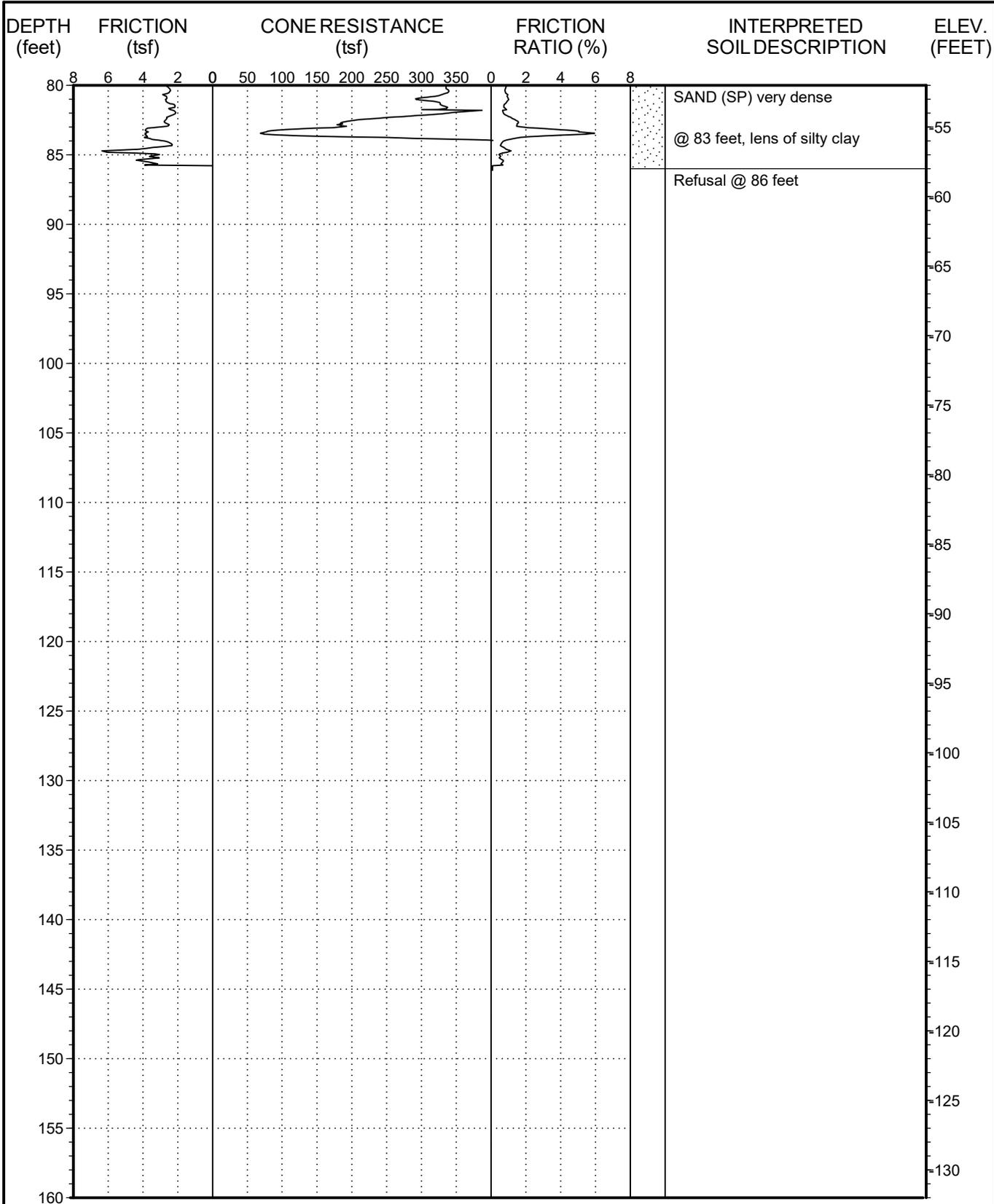
This summary applies only at the location of this cone penetration test and at the time of the exploration. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The interpreted soil description is derived from the friction ratio and cone resistance and is a simplification of actual conditions encountered.



PROJECT NO.: 3033.11  
HOLLAND MAGNOLIA

**LOG OF CPT NO. C-3**

FIGURE A-4



Date performed: 3-31-21

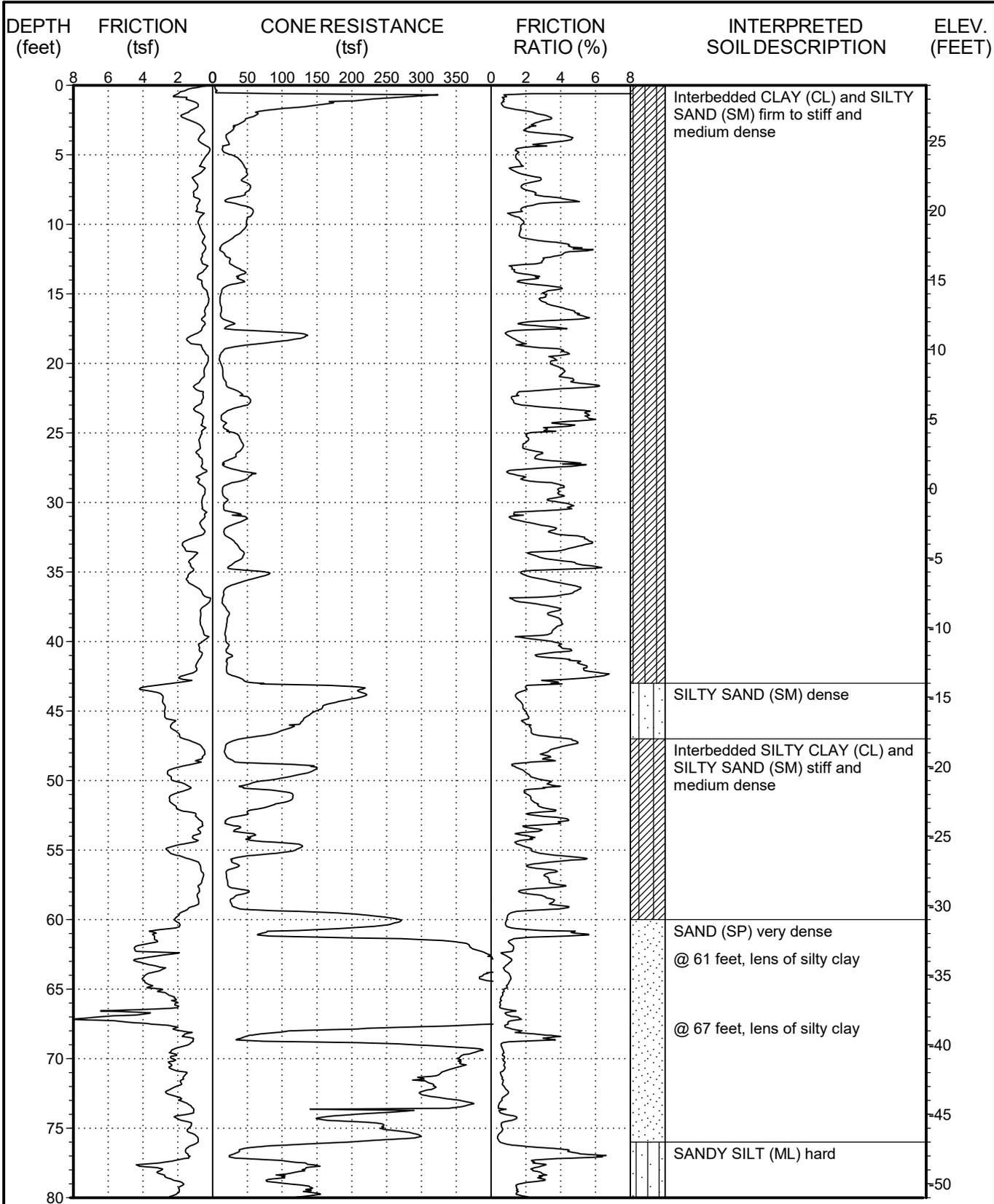
This summary applies only at the location of this cone penetration test and at the time of the exploration. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The interpreted soil description is derived from the friction ratio and cone resistance and is a simplification of actual conditions encountered.



PROJECT NO.: 3033.11  
HOLLAND MAGNOLIA

**LOG OF CPT NO. C-3**

FIGURE A-4



Date performed: 3-31-21

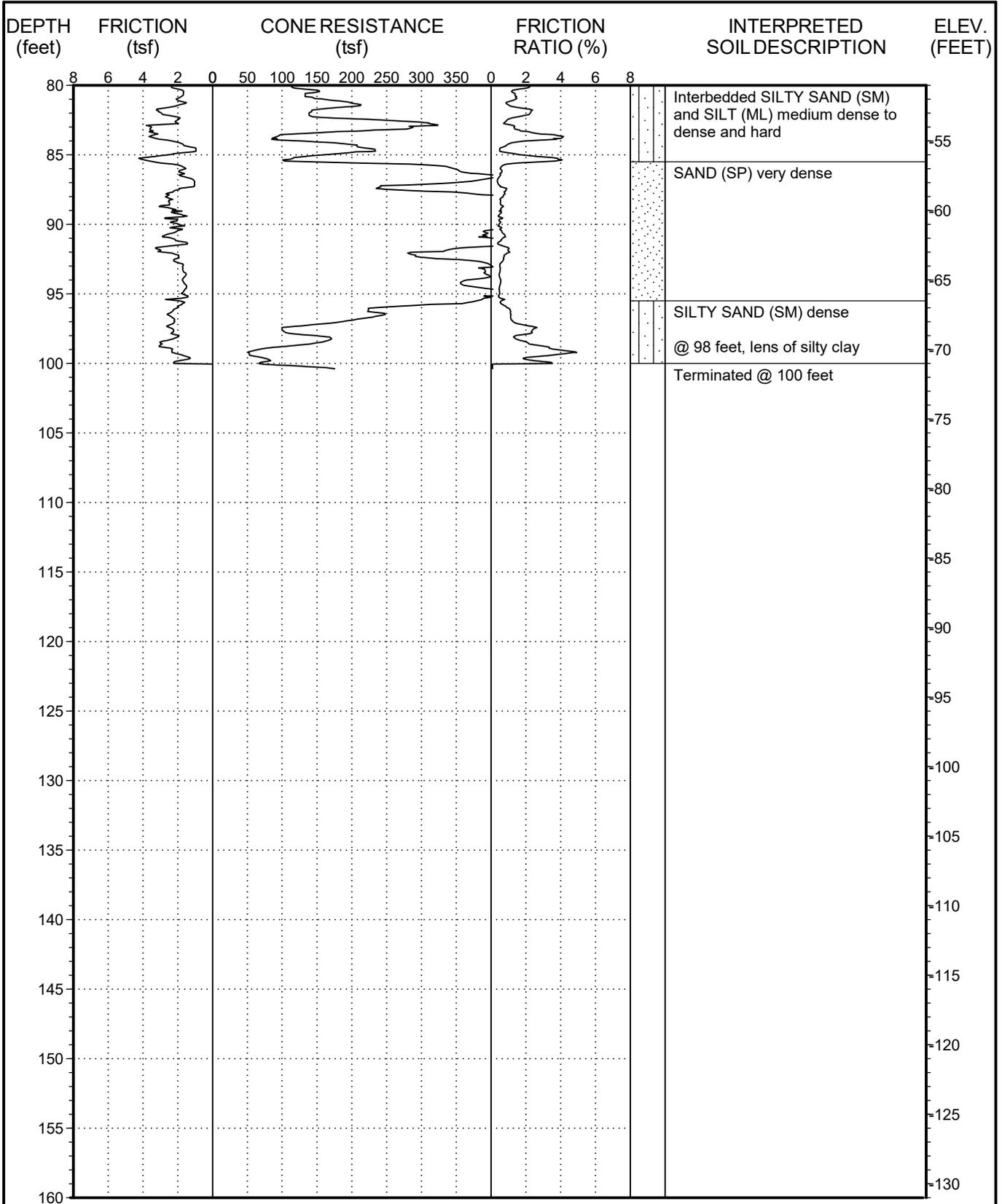
This summary applies only at the location of this cone penetration test and at the time of the exploration. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The interpreted soil description is derived from the friction ratio and cone resistance and is a simplification of actual conditions encountered.



PROJECT NO.: 3033.11  
HOLLAND MAGNOLIA

**LOG OF CPT NO. C-4**

FIGURE A-5



Date performed: 3-31-21

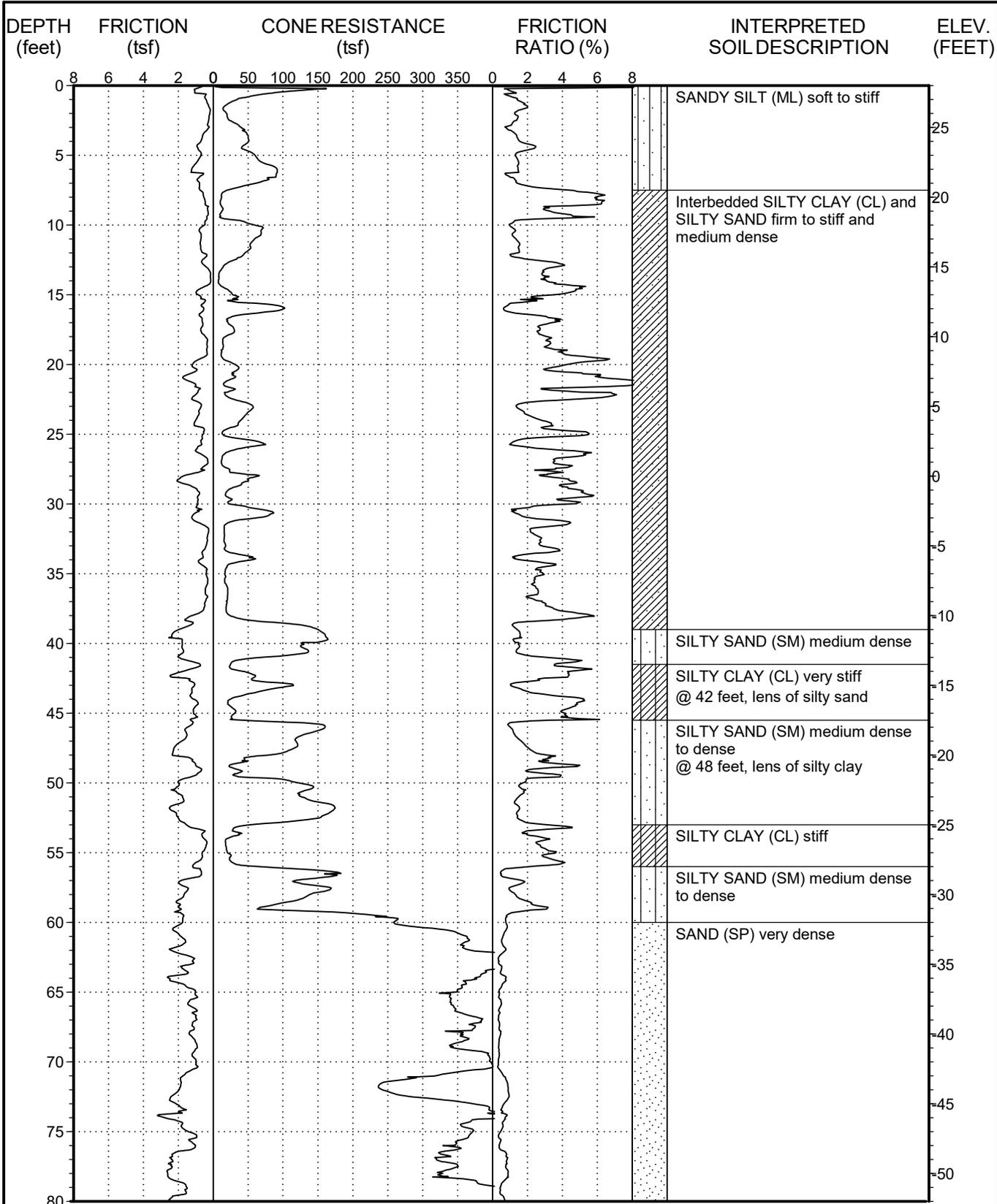
This summary applies only at the location of this cone penetration test and at the time of the exploration. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The interpreted soil description is derived from the friction ratio and cone resistance and is a simplification of actual conditions encountered.



PROJECT NO.: 3033.11  
HOLLAND MAGNOLIA

**LOG OF CPT NO. C-4**

FIGURE A-5



Date performed: 3-31-21

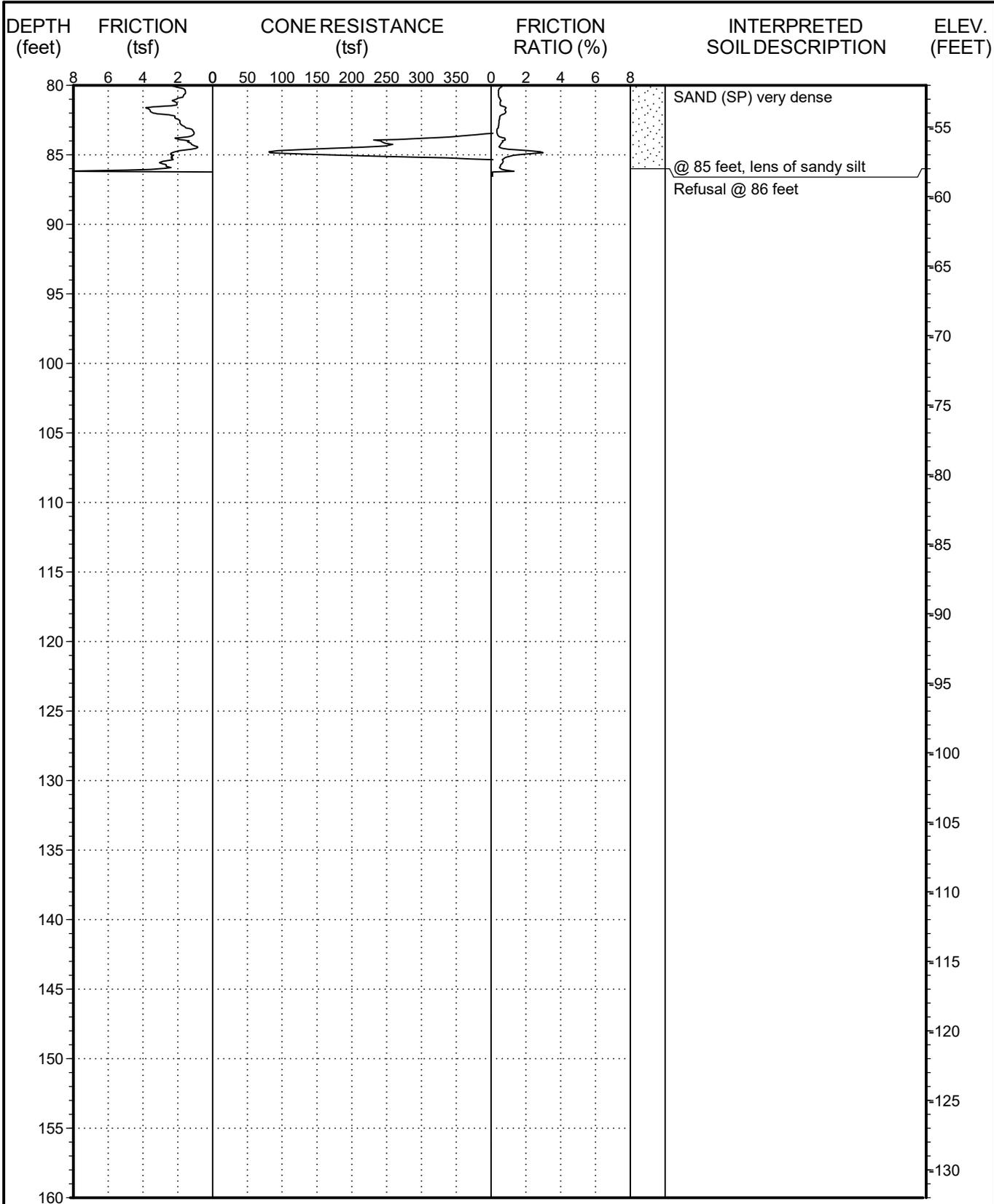
This summary applies only at the location of this cone penetration test and at the time of the exploration. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The interpreted soil description is derived from the friction ratio and cone resistance and is a simplification of actual conditions encountered.



PROJECT NO.: 3033.11  
HOLLAND MAGNOLIA

**LOG OF CPT NO. C-5**

FIGURE A-6



Date performed: 3-31-21

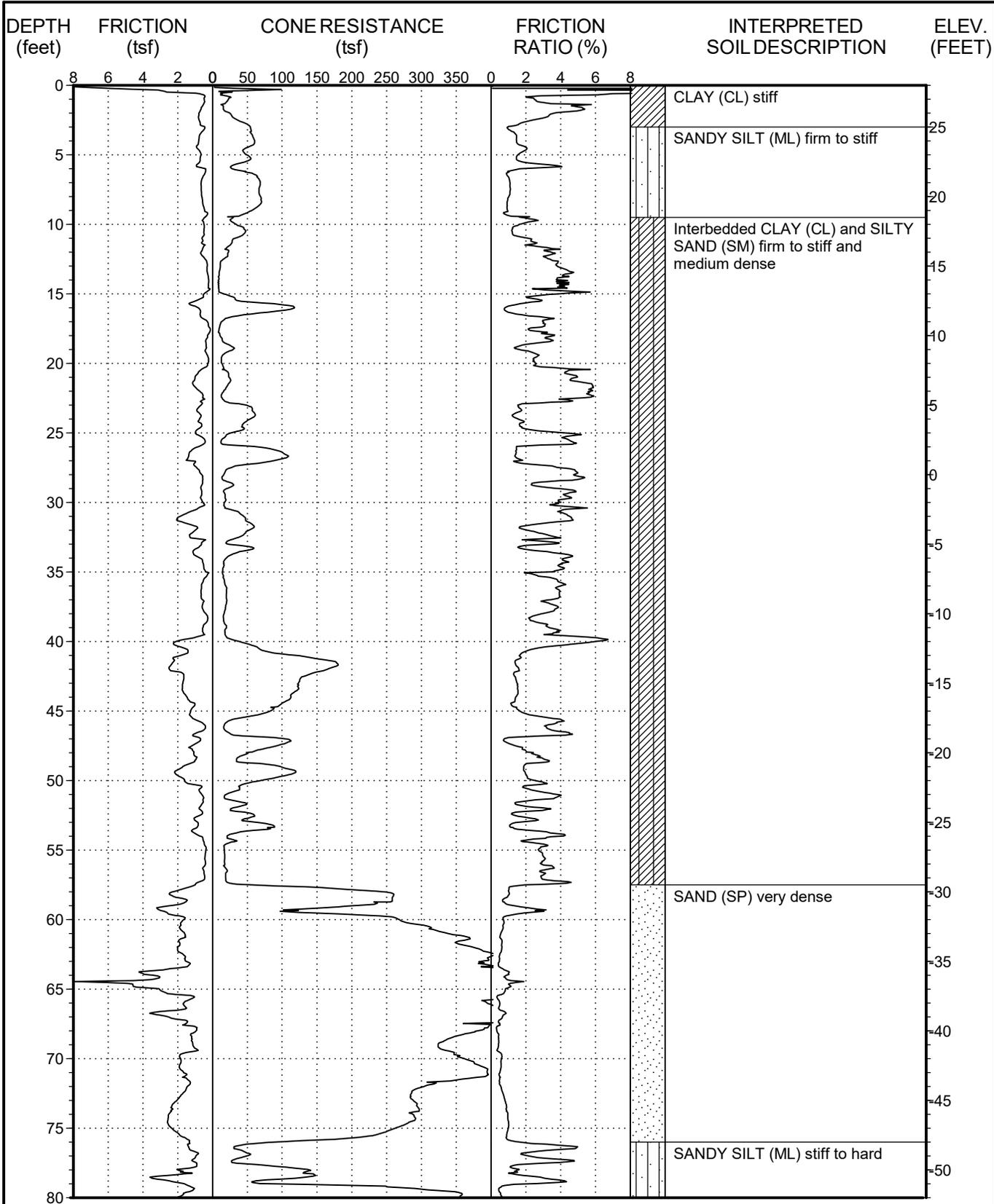
This summary applies only at the location of this cone penetration test and at the time of the exploration. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The interpreted soil description is derived from the friction ratio and cone resistance and is a simplification of actual conditions encountered.



PROJECT NO.: 3033.11  
HOLLAND MAGNOLIA

**LOG OF CPT NO. C-5**

FIGURE A-6



Date performed: 3-31-21

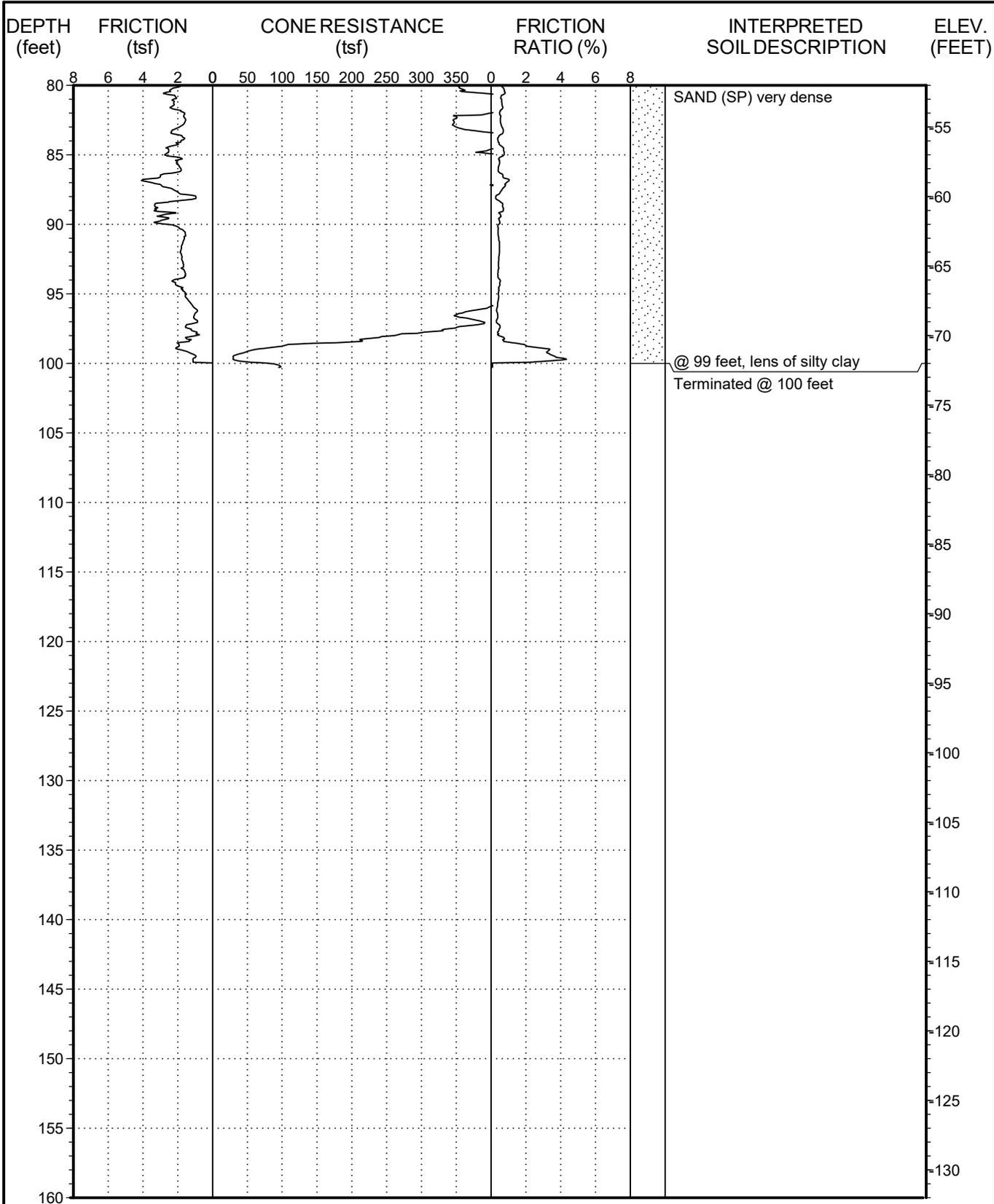
This summary applies only at the location of this cone penetration test and at the time of the exploration. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The interpreted soil description is derived from the friction ratio and cone resistance and is a simplification of actual conditions encountered.



PROJECT NO.: 3033.11  
HOLLAND MAGNOLIA

**LOG OF CPT NO. C-6**

FIGURE A-7



Date performed: 3-31-21

This summary applies only at the location of this cone penetration test and at the time of the exploration. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The interpreted soil description is derived from the friction ratio and cone resistance and is a simplification of actual conditions encountered.



PROJECT NO.: 3033.11  
HOLLAND MAGNOLIA

**LOG OF CPT NO. C-6**

FIGURE A-7

## ***APPENDIX B***

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## **APPENDIX B**

### **EXPLORATORY BORINGS**

The subsurface conditions at the site were investigated by drilling and sampling five exploratory borings. The borings were advanced to depths of 11 to 60 feet below the existing ground surface. The locations of the explorations are shown on the Site Plan, Figure 2.

The exploratory borings were drilled using truck-mounted hollow-stem auger drill equipment. Relatively undisturbed samples were obtained using a brass-ring lined sampler (ASTM D 3550). The brass-rings have an inside diameter of 2.42 inches. The ring samples were driven into the soil by a 140-pound hammer dropping 30 inches. The number of blows needed to drive the sampler into the soil was recorded as the penetration resistance.

The field explorations for the investigation were performed under the continuous technical supervision of GPI's representative, who visually inspected the site, maintained detailed logs of the borings, classified the soils encountered, and obtained relatively undisturbed samples for examination and laboratory testing. The soils encountered in the borings were classified in the field and through further examination in the laboratory in accordance with the Unified Soils Classification System. Detailed logs of the borings are presented in Figures B-1 and B-5 in this appendix.

The boring locations were laid out in the field by measuring from existing site features. Ground surface elevations at the exploration locations were estimated using Google Earth.

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS		ELEVATION (FEET)
					This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.		
			B	0		Fill: <b>SILTY SAND (SM)</b> brown, moist	35
11.3	107	33	D			Natural: <b>SILTY SAND (SM)</b> brown, moist, medium dense	
13.7	106	13	D	5		<b>SANDY SILT (ML)</b> brown, moist, stiff	30
22.5	94	18	D			<b>SILTY SAND (SM)</b> brown, wet, stiff	
30.4	87	13	D	10		@ 10 feet, loose	25
28.1	93	16	D	15		@ 15 feet, medium dense	20
26.6	93	7	D	20		@ 20 feet, loose	15
37.7	85					<b>CLAY (CL)</b> brown, wet, firm	
46.2	78	10	D	25		<b>ELASTIC SILT (MH)</b> brown, wet, firm	10
28.5	89						
37.1	81	7	D	30			5
37.7	80	8	D	35		<b>CLAY (CL)</b> brown, wet, firm	0

**SAMPLE TYPES**

- C Rock Core
- S Standard Split Spoon
- D Drive Sample
- B Bulk Sample
- T Tube Sample

**DATE DRILLED:**

9-18-23

**EQUIPMENT USED:**

8 " Hollow Stem Auger

**GROUNDWATER LEVEL (ft):**

10



PROJECT NO.: 3033.11

HOLLAND MAGNOLIA

**LOG OF BORING NO. B-1**

FIGURE B-1

	MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS		ELEVATION (FEET)
						This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.		
	22.7	102	9	D	40		@ 40 feet, with sandy clay	-5
	25.9	97	13	D	45		<b>SANDY CLAY (CL)</b> brown, wet, stiff	-10
	29.7	94	38	D	50		@ 50 feet, no recovery	-15
	36.8	81	30	D	55		<b>SILTY SAND (SM)/ SANDY SILT (ML)</b> brown, wet, medium dense/ very stiff	-20
					60		<b>CLAY (CL)</b> brown, wet, very stiff	
							<b>SANDY CLAY (CL)</b> brown, wet, very stiff	
							Total Depth 60 feet	

**SAMPLE TYPES**

- C Rock Core
- S Standard Split Spoon
- D Drive Sample
- B Bulk Sample
- T Tube Sample

**DATE DRILLED:**

9-18-23

**EQUIPMENT USED:**

8" Hollow Stem Auger

**GROUNDWATER LEVEL (ft):**

10



PROJECT NO.: 3033.11

HOLLAND MAGNOLIA

**LOG OF BORING NO. B-1**

FIGURE B-1

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS		ELEVATION (FEET)
					This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.		
				0	0	Fill: <b>SILTY SAND (SM)</b> brown, moist  @ 2 feet, medium dense	35
9.8	101	16	D				
				5	5	Natural: <b>SILTY SAND (SM)</b> brown, moist, medium dense	30
12.2	95	18	D				
				10	10	<b>SANDY SILT (ML)</b> brown, very moist, soft to firm	
29.8	85	6	D				
				15	15	<b>CLAYEY SILT (ML)</b> brown, wet, firm	25
33.3	86	7	D				
				20	20	<b>CLAY (CL)</b> gray, very moist, soft	20
45.6	72	5	D				
				25	25	<b>SANDY CLAY (CL)</b> gray, wet, firm	15
27.4	93	7	D				
				30	30	<b>CLAYEY SILT (ML)</b> gray, wet, firm	10
34.4	84	10	D				
				35	35	<b>CLAY (CL)</b> gray, wet, firm to stiff	5
37.2	81	12	D				
				40	40	<b>CLAYEY SILT (ML)</b> gray, wet, stiff	0
32.3	86	14	D				

**SAMPLE TYPES**

- C Rock Core
- S Standard Split Spoon
- D Drive Sample
- B Bulk Sample
- T Tube Sample

**DATE DRILLED:**

9-18-23

**EQUIPMENT USED:**

8" Hollow Stem Auger

**GROUNDWATER LEVEL (ft):**

10



PROJECT NO.: 3033.11

HOLLAND MAGNOLIA

**LOG OF BORING NO. B-2**

FIGURE B-2

	MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS		ELEVATION (FEET)
						This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.		
	23.1	102	15	D	40		<b>SANDY SILT (ML)</b> gray, wet, stiff	-5
	28.2	91	20	D	45		<b>SILTY SAND (SM)</b> gray, wet, medium dense	-10
	35.4	83	13	D	50		<b>SANDY SILT (ML)</b> gray, wet, stiff <b>CLAYEY SILT (ML)</b> gray, wet, stiff	-15
	32.8	84	43	D	55		<b>SANDY SILT (ML)</b> gray, wet, very stiff <b>CLAY (CL)</b> gray, wet, very stiff	-20
	16.9	108	50/5"	D	60		<b>SILTY SAND (SM)</b> gray, wet, very dense	
						Total Depth 60 feet		

**SAMPLE TYPES**

- C** Rock Core
- S** Standard Split Spoon
- D** Drive Sample
- B** Bulk Sample
- T** Tube Sample

**DATE DRILLED:**

9-18-23

**EQUIPMENT USED:**

8" Hollow Stem Auger

**GROUNDWATER LEVEL (ft):**

10



PROJECT NO.: 3033.11

HOLLAND MAGNOLIA

**LOG OF BORING NO. B-2**

FIGURE B-2

	MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS		ELEVATION (FEET)
						This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.		
					0	2-Inch AC		
	14.4	102	28	D		Fill: <b>SILTY SAND (SM)</b> brown, moist, with gravel @ 2 feet, medium dense		25
						Natural: <b>SANDY SILT (ML)</b> brown, moist, very stiff		
	12.7	87	22	D	5	<b>SILTY SAND (SM)</b> brown, moist, medium dense		
	31.9	86	8	D		<b>CLAY (CL)</b> gray, wet, firm		20
	28.2	88				<b>SANDY SILT (ML)</b> gray, wet, firm		
			13	D	10	@ 10 feet, no recovery		
	42.5		7	D		<b>SILTY CLAY (CL)</b> gray, wet, firm, sample disturbed		15
					15			10
					20			5
					25			0
					30	Total Depth 30 feet		

**SAMPLE TYPES**

- C** Rock Core
- S** Standard Split Spoon
- D** Drive Sample
- B** Bulk Sample
- T** Tube Sample

**DATE DRILLED:**

9-18-23

**EQUIPMENT USED:**

8" Hollow Stem Auger

**GROUNDWATER LEVEL (ft):**

10



PROJECT NO.: 3033.11

HOLLAND MAGNOLIA

**LOG OF BORING NO. B-3**

FIGURE B-3

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS		ELEVATION (FEET)
					This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.		
16.1	96	17	B	0	5-Inch Concrete		25
			D		Fill: <b>SANDY SILT (ML)</b> brown, very moist		
			D		Natural: <b>SANDY SILT (ML)</b> brown, very moist, stiff		
			D	5	@ 5 feet, loose		
			D		@ 7 feet, wet		
17.9	89	13	D	5			
29.6	91	10	D				
30.4		8	D	10	<b>SILTY CLAY (CL)</b> brown, wet, firm		20
			D		<b>CLAYEY SILT (ML)</b> gray, wet, firm, sample disturbed		
					Total Depth 11 feet		

**SAMPLE TYPES**

- C Rock Core
- S Standard Split Spoon
- D Drive Sample
- B Bulk Sample
- T Tube Sample

**DATE DRILLED:**

9-18-23

**EQUIPMENT USED:**

8" Hollow Stem Auger

**GROUNDWATER LEVEL (ft):**

10



PROJECT NO.: 3033.11

HOLLAND MAGNOLIA

**LOG OF BORING NO. B-4**

FIGURE B-4

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS		ELEVATION (FEET)
					This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.		
			B	0	6-Inch Concrete		
17.1	109	30	D		Fill: <b>SANDY SILT (ML)</b> brown, very moist @ 2 feet, very stiff		30
					<b>SILTY SAND (SM)</b> brown, very moist, medium dense		
12.2	92	16	D	5	Natural: <b>SILTY SAND (SM)</b> brown, very moist, medium dense		25
37.7	84	6	D		<b>SILTY CLAY (CL)</b> brown, wet, soft to firm		
29.0	90	14	D	10	<b>CLAYEY SILT (ML)</b> brown, wet, stiff		20
					<b>SILTY SAND (SM)</b> brown, wet, loose		
33.8	85	11	D	15	<b>SILTY CLAY (CL)</b> brown, wet, firm		15
					<b>CLAYEY SILT (ML)</b> brown, wet, firm		
23.0	100	8	D	20	<b>CLAY (CL)</b> gray, wet, firm		10
					<b>SANDY CLAY (CL)</b> gray, wet, firm		
34.8	85	12	D	25	<b>CLAYEY SILT (ML)</b> gray, wet, firm to stiff		5
31.8	86	12	D	30	<b>SANDY SILT (ML)</b> gray, wet, firm to stiff		0
					<b>CLAYEY SILT (ML)</b> gray, wet, firm to stiff		
27.9	117	13	D	35	<b>SANDY SILT (ML)</b> gray, wet, stiff		-5
32.1	88				<b>CLAYEY SILT (ML)</b> gray, wet, stiff		

**SAMPLE TYPES**

- C** Rock Core
- S** Standard Split Spoon
- D** Drive Sample
- B** Bulk Sample
- T** Tube Sample

**DATE DRILLED:**

9-18-23

**EQUIPMENT USED:**

8" Hollow Stem Auger

**GROUNDWATER LEVEL (ft):**

10



PROJECT NO.: 3033.11

HOLLAND MAGNOLIA

**LOG OF BORING NO. B-5**

FIGURE B-5

	MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS		ELEVATION (FEET)
						This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.		
	27.3	95	30	D	40		<b>SILTY SAND (SM)</b> gray, wet, medium dense	-10
	30.4	86	11	D	45		<b>SANDY SILT (ML)</b> gray, wet, firm <b>SILTY CLAY (CL)</b> gray, wet, firm	-15
	52.7	74	12	D	50		<b>CLAY (CL)</b> gray, wet, firm to stiff	-20
	43.5	75	13	D	55	@ 55 feet, stiff	<b>CLAYEY SILT (ML)</b> gray, wet, stiff	-25
	35.5	86	20	D	60		<b>SILTY SAND (SM)</b> gray, wet, medium dense	
						Total Depth 60 feet		

**SAMPLE TYPES**

- C** Rock Core
- S** Standard Split Spoon
- D** Drive Sample
- B** Bulk Sample
- T** Tube Sample

**DATE DRILLED:**

9-18-23

**EQUIPMENT USED:**

8" Hollow Stem Auger

**GROUNDWATER LEVEL (ft):**

10



PROJECT NO.: 3033.11

HOLLAND MAGNOLIA

**LOG OF BORING NO. B-5**

FIGURE B-5

## ***APPENDIX C***

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## **APPENDIX C**

### **LABORATORY TESTS**

#### **INTRODUCTION**

Representative undisturbed soil samples and bulk samples were carefully packaged in the field and sealed to prevent moisture loss. The samples were then transported to our Cypress office for examination and testing assignments. Laboratory tests were performed on selected representative samples as an aid in classifying the soils and to evaluate the physical properties of the soils affecting foundation design and construction procedures. Detailed descriptions of the laboratory tests are presented below under the appropriate test headings. Test results are presented in the figures that follow.

#### **MOISTURE CONTENT AND DRY DENSITY**

Moisture content and dry density were determined from the ring samples. The samples were first trimmed to obtain volume and wet weight and then were dried in accordance with ASTM D 2216. After drying, the weight of each sample was measured, and moisture content and dry density were calculated. Moisture content and dry density values are presented on the boring logs in Appendix B.

#### **GRAIN SIZE DISTRIBUTION**

Selected soil samples were dried, weighed, soaked in water until individual soil particles were separated, and then washed on the No. 200 sieve. That portion of the material retained on the No. 200 sieve was oven-dried and weighed to determine the percentage of the material passing the No. 200 sieve.

<b>BORING NO.</b>	<b>DEPTH (ft)</b>	<b>SOIL DESCRIPTION</b>	<b>PERCENT PASSING No. 200 SIEVE</b>
B-1	10	Silty Sand (SM)	17
B-2	20	Sandy Clay (CL)	62
B-5	5	Silty Sand (SM)	34

#### **ATTERBERG LIMITS**

Liquid and plastic limits were determined for selected samples in accordance with ASTM D4318. Results of the Atterberg Limits test are summarized on Figure C-1.

#### **DIRECT SHEAR**

Direct shear tests were performed on undisturbed and remolded bulk samples in accordance with ASTM D 3080. The bulk samples were remolded to approximately 90 percent of the maximum dry density. The test specimens were placed in the shear machine, and a normal load comparable to the in-situ overburden stress was applied. The samples were inundated,

allowed to consolidate, and then were sheared to failure at a strain rate of 0.001 to 0.002 inches per minute. The tests were repeated on additional test specimens under increased normal loads. Shear stress and sample deformation were monitored throughout the tests. The results of the direct shear tests are presented in Figures C-2 to C-4.

### CONSOLIDATION

One-dimensional consolidation testing was performed on undisturbed samples in accordance with ASTM D 2435. After trimming the ends, the samples were placed in the consolidometer and loaded to 0.4 or 0.5 ksf. Thereafter, the samples were incrementally loaded to a maximum load of 25.6 or 32 ksf. The samples were inundated at 1.6 or 2 ksf. Sample deformation was measured to 0.0001 inch. Rebound behavior was investigated by unloading the samples back to 0.4 or 0.5 ksf. Results of the consolidation tests, in the form of percent consolidation versus log pressure, are presented in Figures C-5 to C-8.

### EXPANSION INDEX

An expansion index test was performed on a bulk sample. The test was performed in accordance with ASTM 4289 to assess the expansion potential of on-site soils. The results of the test are summarized below:

BORING NO.	DEPTH (ft)	SOIL DESCRIPTION	EXPANSION INDEX
B-4	0 - 5	Sandy Silt (ML)	30

### COMPACTION TEST

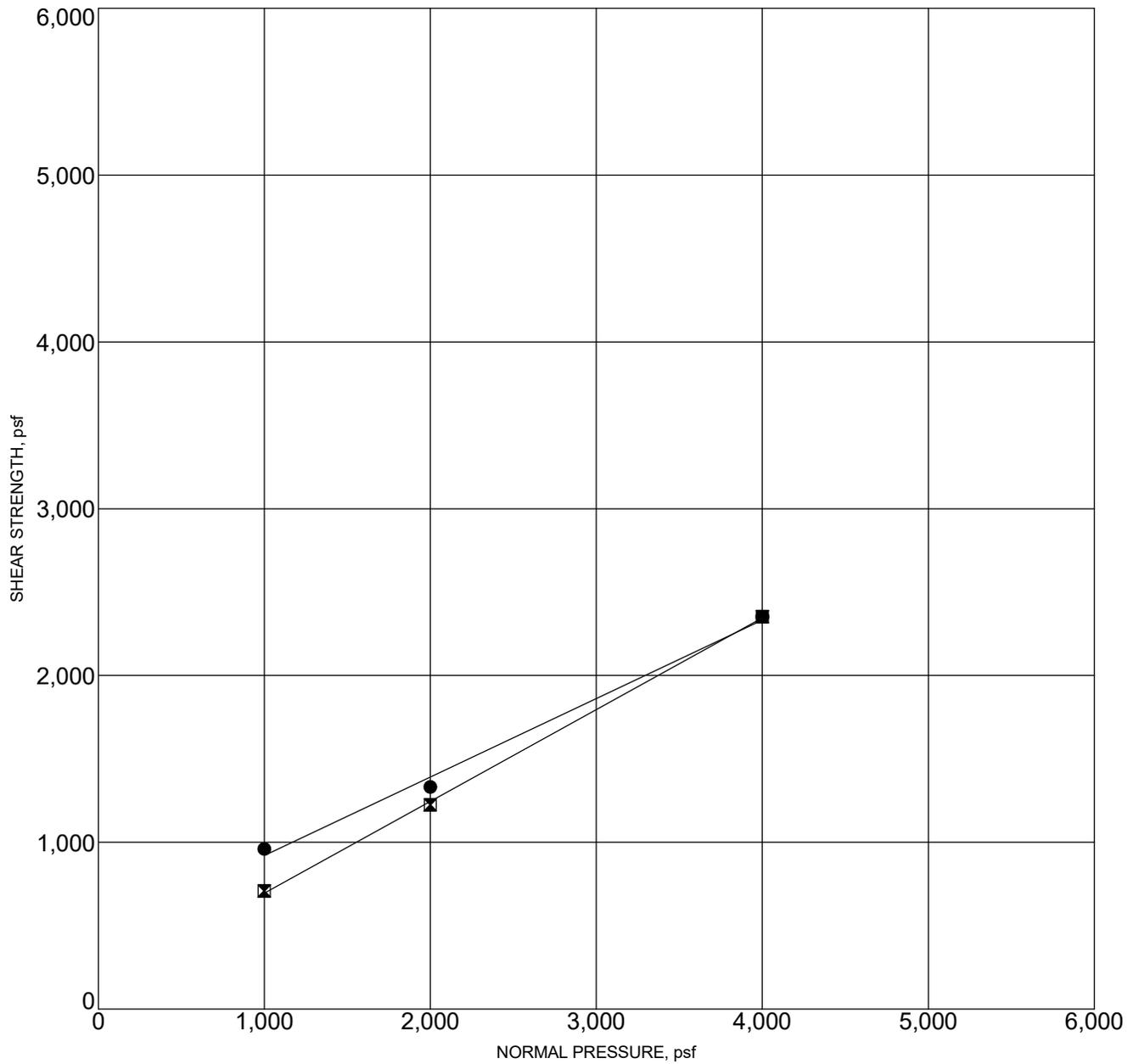
A maximum dry density/optimum moisture test was performed in accordance with ASTM D 1557 on a representative bulk sample of the site soils. The test are as follows:

BORING NO.	DEPTH (ft)	SOIL DESCRIPTION	MAXIMUM DRY DENSITY (pcf)	OPTIMUM MOISTURE (%)
B-4	0-5	Sandy Silt (ML)	118	8

### CORROSIVITY

Soil corrosivity testing was performed by Project X on a soil sample provided by GPI. The test results are summarized in Table 1 at the end of this Appendix.





● **PEAK STRENGTH**  
*Friction Angle= 25 degrees*  
*Cohesion= 450 psf*

⊠ **ULTIMATE STRENGTH**  
*Friction Angle= 29 degrees*  
*Cohesion= 144 psf*

Sample Location		Classification	DD,pcf	MC,%
B-1	5.0	SANDY SILT (ML)	106	13.7

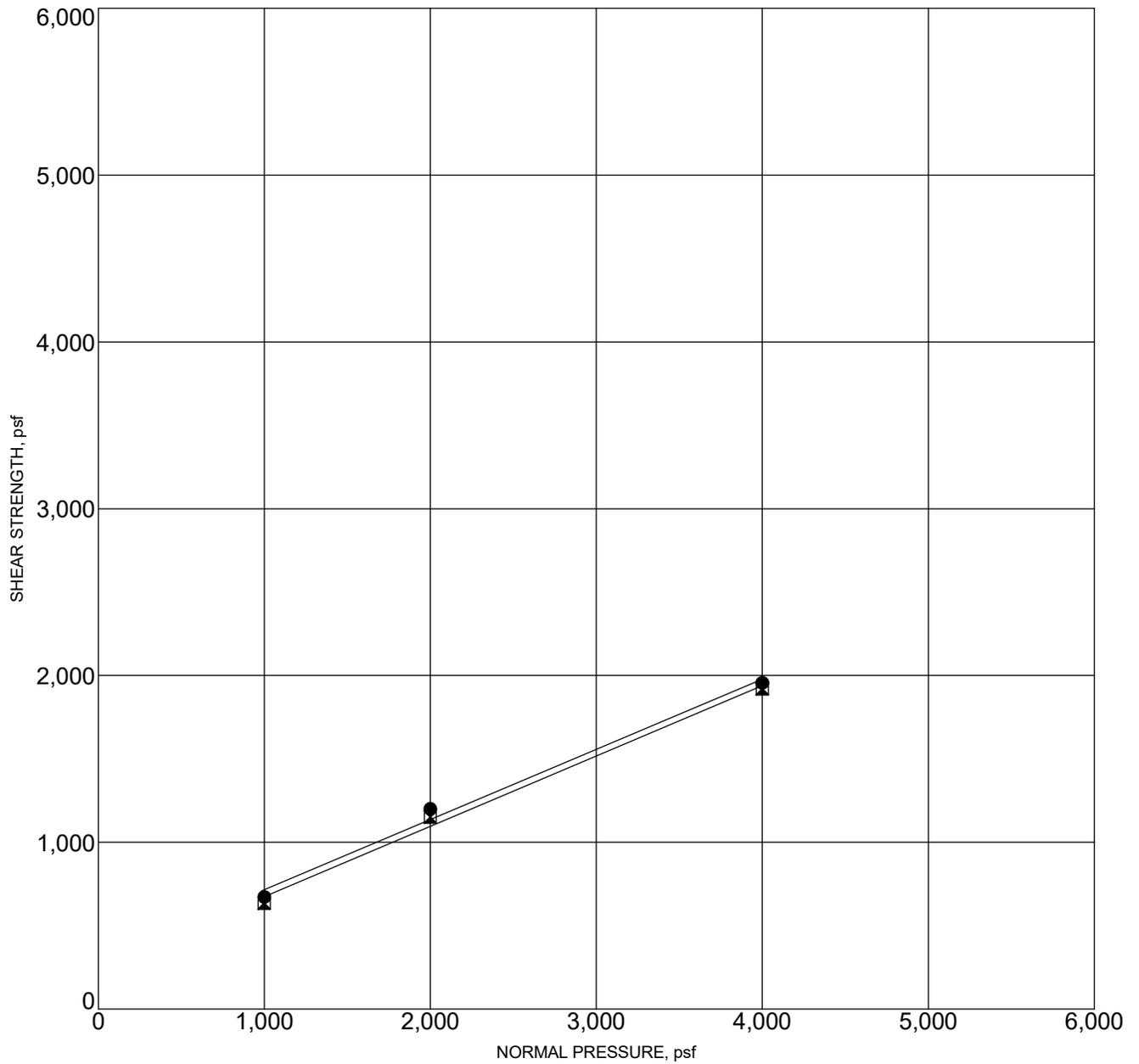
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**DIRECT SHEAR TEST RESULTS**

FIGURE C-2



● **PEAK STRENGTH**  
*Friction Angle= 23 degrees*  
*Cohesion= 294 psf*

⊠ **ULTIMATE STRENGTH**  
*Friction Angle= 23 degrees*  
*Cohesion= 252 psf*

Sample Location		Classification	DD,pcf	MC,%
B-5	7.0	SILTY CLAY (CL)	84	37.7

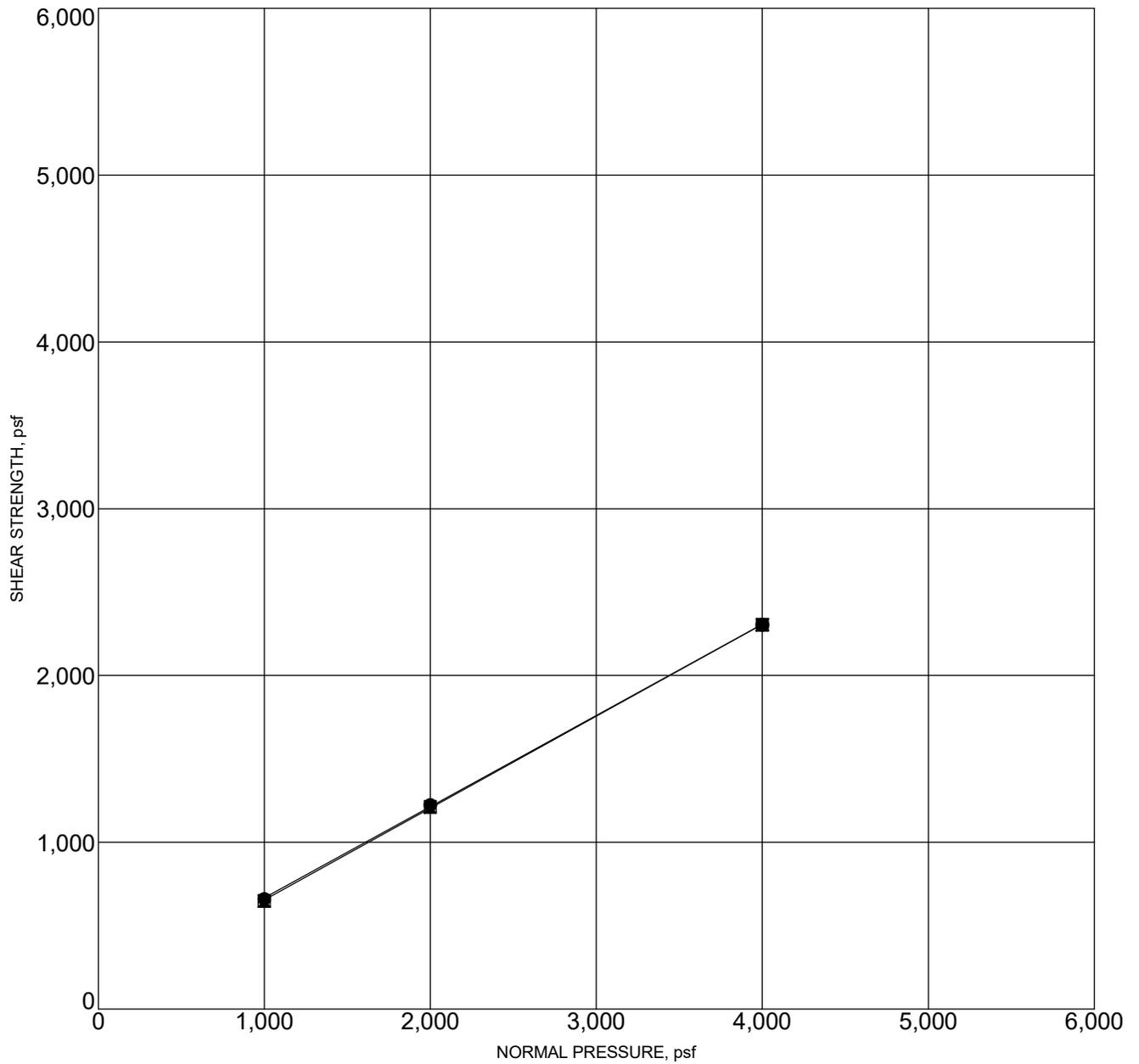
PROJECT: HOLLAND MAGNOLIA

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**DIRECT SHEAR TEST RESULTS**

FIGURE C-3



● **PEAK STRENGTH**  
*Friction Angle= 29 degrees*  
*Cohesion= 120 psf*

☒ **ULTIMATE STRENGTH**  
*Friction Angle= 29 degrees*  
*Cohesion= 102 psf*

*Note: Samples remolded to 90% of maximum dry density.*

Sample Location		Classification	DD,pcf	MC,%
B-4	0-5	SANDY SILT (ML)	106	8.0

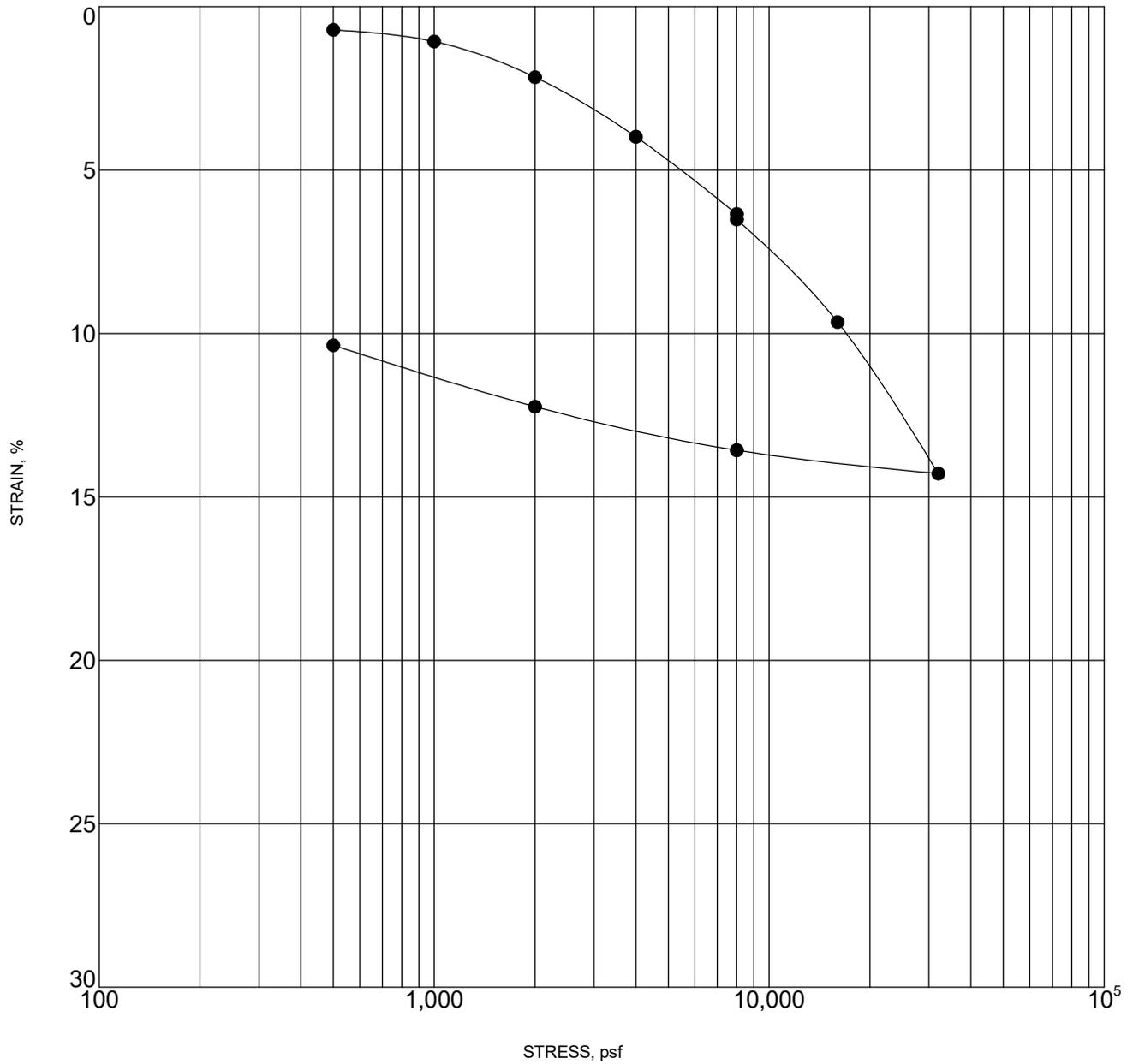
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**DIRECT SHEAR TEST RESULTS**

FIGURE C-4



Sample inundated at 8000 psf

	Sample Location		Classification	DD,pcf	MC,%
●	B-1	35.0	CLAY (CL)	80	37.7

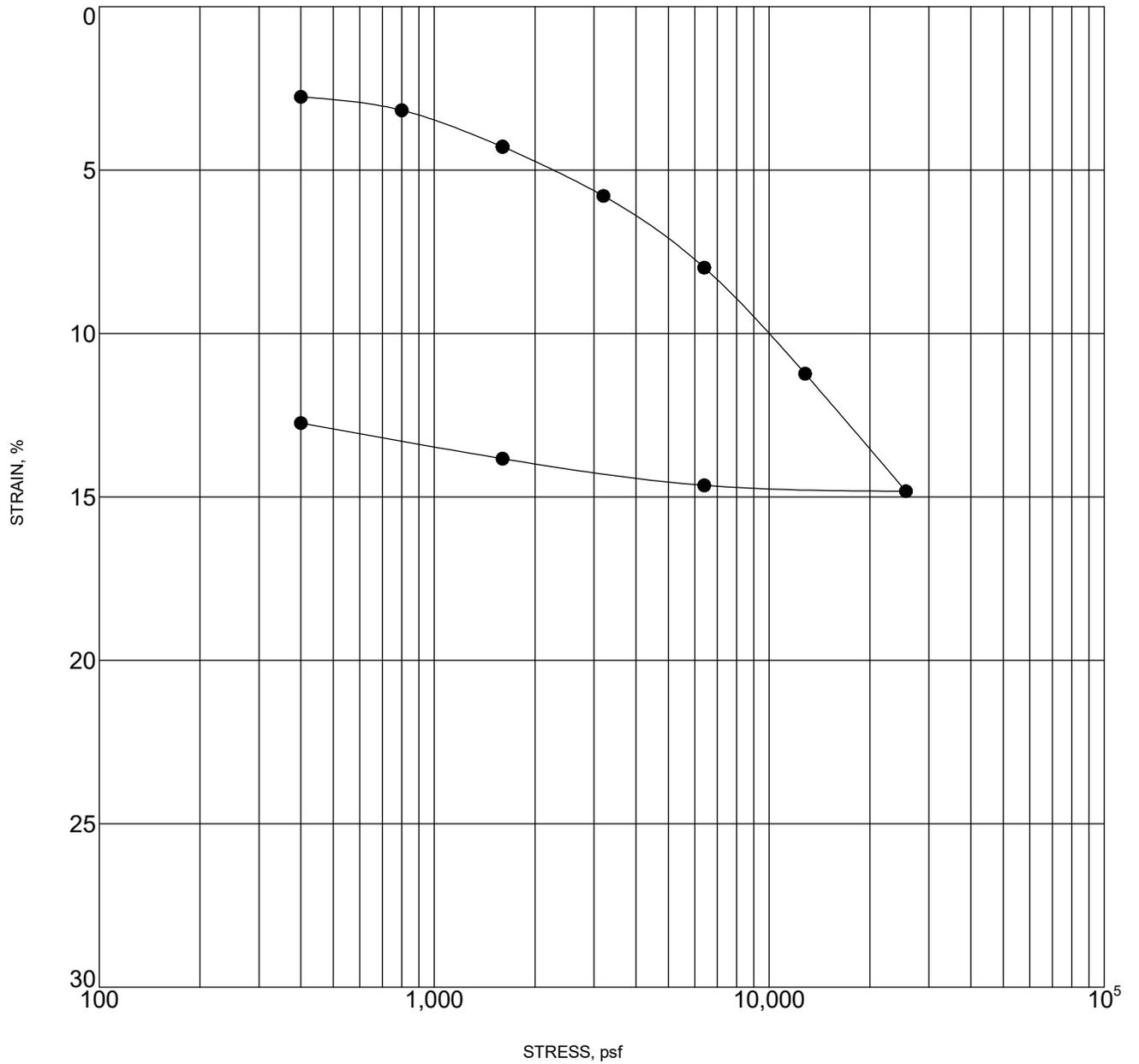
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### CONSOLIDATION TEST RESULTS

FIGURE C-5



Sample inundated at 1600 psf

Sample Location	Classification	DD,pcf	MC,%
● B-2 10.0	CLAYEY SILT (ML)	86	33.3

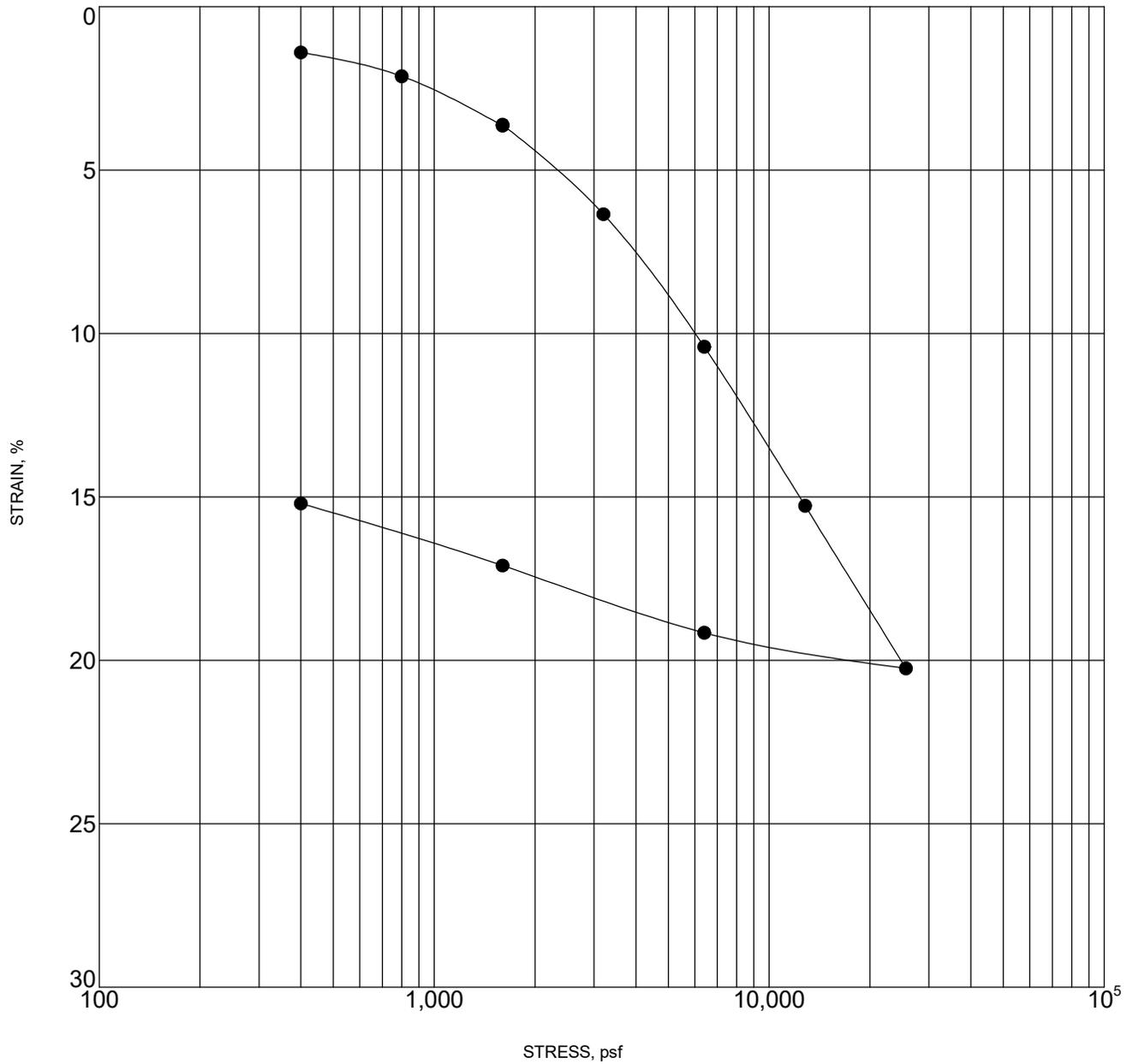
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**CONSOLIDATION TEST RESULTS**

FIGURE C-6



Sample inundated at 1600 psf

	Sample Location		Classification	DD,pcf	MC,%
●	B-2	15.0	CLAY (CL)	72	45.6

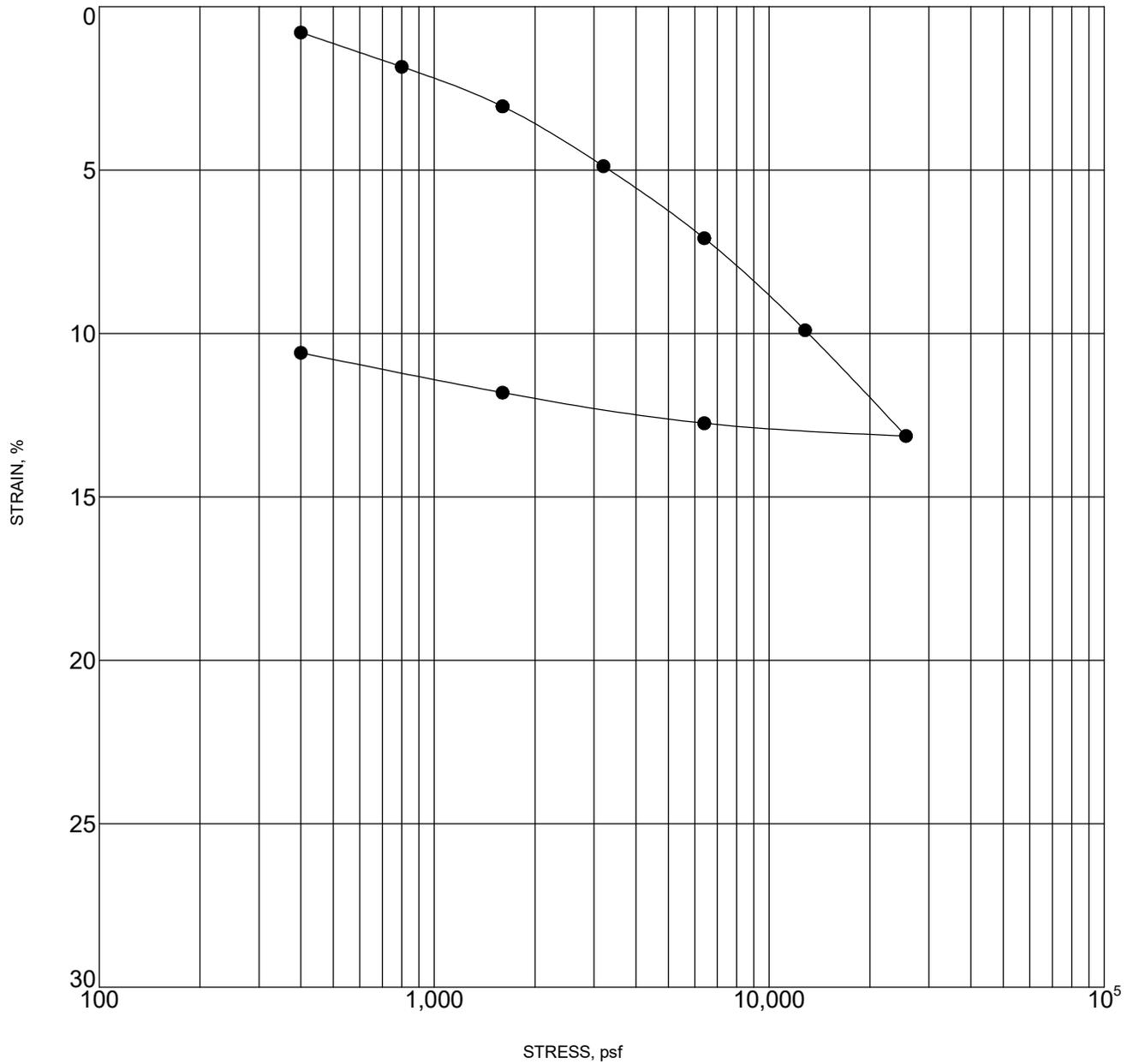
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PROJECT NO.: 3033.11



### CONSOLIDATION TEST RESULTS

FIGURE C-7



Sample inundated at 1600 psf

Sample Location		Classification	DD,pcf	MC,%
●	B-5      20.0	CLAY (CL)	100	23.0

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**CONSOLIDATION TEST RESULTS**

FIGURE C-8



**Soil Analysis Lab Results**

Client: Geotechnical Professionals Inc.  
Job Name: Holland Magnolia  
Client Job Number: 3033.1I  
Project X Job Number: S230927A  
September 28, 2023

Bore# / Description	Method	ASTM D4327		ASTM D4327		ASTM G187		ASTM G51	ASTM G200	SM 4500-D	ASTM D4327	ASTM D6919	ASTM D6919	ASTM D6919	ASTM D6919	ASTM D6919	ASTM D4327	ASTM D4327	
	Depth	Sulfates SO <sub>4</sub> <sup>2-</sup>		Chlorides Cl <sup>-</sup>		Resistivity As Rec'd   Minimum		pH	Redox	Sulfide S <sup>2-</sup>	Nitrate NO <sub>3</sub> <sup>-</sup>	Ammonium NH <sub>4</sub> <sup>+</sup>	Lithium Li <sup>+</sup>	Sodium Na <sup>+</sup>	Potassium K <sup>+</sup>	Magnesium Mg <sup>2+</sup>	Calcium Ca <sup>2+</sup>	Fluoride F <sub>2</sub> <sup>-</sup>	Phosphate PO <sub>4</sub> <sup>3-</sup>
	(ft)	(mg/kg)	(wt%)	(mg/kg)	(wt%)	(Ohm-cm)	(Ohm-cm)		(mV)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
B-4	0-5	110.6	0.0111	15.4	0.0015	3,618	1,809	7.4	150	0.2	101.0	7.0	ND	63.2	6.7	26.8	104.2	14.7	3.3

Cations and Anions, except Sulfide and Bicarbonate, tested with Ion Chromatography  
mg/kg = milligrams per kilogram (parts per million) of dry soil weight  
ND = 0 = Not Detected | NT = Not Tested | Unk = Unknown  
Chemical Analysis performed on 1:3 Soil-To-Water extract  
PPM = mg/kg (soil) = mg/L (Liquid)

**Note:** Sometimes a bad sulfate hit is a contaminated spot. Typical fertilizers are Potassium chloride, ammonium sulfate or ammonium sulfate nitrate (ASN). So this is another reason why testing full corrosion series is good because we then have the data to see if those other ingredients are present meaning the soil sample is just fertilizer-contaminated soil. This can happen often when the soil samples collected are simply surface scoops which is why it's best to dig in a foot, throw away the top and test the deeper stuff. Dairy farms are also notorious for these items.