

Preliminary Water Quality Management Plan (PWQMP)

Project Name:

Talbert Residential
8572 Talbert Avenue
Fountain Valley, California

Prepared for:

BONANNI DEVELOPMENT, INC.
5500 Bolsa Avenue, Suite 120
Huntington Beach, CA 92649

Prepared by:

Walden & Associates

Engineer Marcos F. Padilla Registration No. 80426
2552 White Road, Suite B
Irvine, CA 92614-6236
(949) 660-0110
JN: 2086-948-001

Date: November 3, 2022

Project Owner's Certification

Permit/ Application No.		Grading Permit No.	
Tract/Parcel Map No.		Building Permit No.	
CUP, SUP, and/or APN (Specify Lot Numbers if Portions of Tract)			APN: 112-781-73 and 74

This Preliminary Water Quality Management Plan (PWQMP) has been prepared for Talbert Residential by Walden & Associates. The WQMP is intended to comply with the requirements of the local 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 and will ensure that this plan is amended as appropriate to reflect up-to-date conditions on the site consistent with the current Orange County Drainage Area Management Plan (DAMP) and the intent of the non-point source NPDES Permit for Waste Discharge Requirements for the County of Orange, Orange County Flood Control District and the incorporated Cities of Orange County within the Santa Ana Region. Once the undersigned transfers its interest in the property, its successors-in-interest shall bear the aforementioned responsibility to implement and amend the WQMP. An appropriate number of approved and signed copies of this document shall be available on the subject site in perpetuity.

Owner: Ed Bonanni			
Title			
Company	Bonanni Development Inc,		
Address	5500 Bolsa Avenue, Suite 120		
Email			
Telephone #			
Signature		Date	

Engineer's Certification

Preparer (Engineer): Mr. Marcos F. Padilla			
Title	Civil Engineer	PE Registration #	80426
Company	Walden & Associates		
Address	2552 White Road, Suite B, Irvine, CA 92614		
Email	mpadilla@waldenassociates.net		
Telephone #	949-660-0110		
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	
Place Stamp Here			

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Place Stamp Here			

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Section I Discretionary Permit(s) and Water Quality Conditions

Project Information	
Permit/ Application No.	Tract/Parcel Map No.
Additional Information/ Comments:	None
Water Quality Conditions	
Water Quality Conditions (list verbatim)	Pending
Watershed-Based Plan Conditions	
Provide applicable conditions from watershed - based plans including WIHMPs and TMDLS.	Santa Ana River Reach 1:Enterococcus Indicator bacteria, PCBs

Section II Project Description

II.1 Project Description

Description of Proposed Project		
Development Category (Verbatim from WQMP):	<p>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.</p> <p>If the redevelopment results in the addition or replacement of less than 50 percent of the impervious area on-site and the existing development was not subject to WQMP requirements, the numeric sizing criteria only applies to the addition or replacement area. If the addition or replacement accounts for 50 percent or more of the impervious area, the Project WQMP requirements apply to the entire development.</p>	
Project Area (ac): 1.38	Number of Dwelling Units: 15	SIC Code: Residential
Narrative Project Description:	<p>The proposed development is a residential project located at 8572 Talbert Avenue in the City of Fountain Valley. The site is currently a developed property located near the southwest corner of Talbert Avenue and Newland Street. The site is currently graded and surface drains onto Talbert Avenue in an easterly direction. The project proposes to construct 15 two story dwelling units varying in size from 2,000 SF to 2,400 SF, two private streets and shared open spaces. The proposed landscaping consists of drought tolerant material, some of which will be native. Yard drains and perimeter drains are located throughout the site. A Geotechnical letter conducted by Delta indicates infiltration feasibility is not recommended. Therefore HSC and Infiltration BMPs are not suitable for this site.</p> <p>Project features include grading, paving, utilities, hardscaping, and landscaping. Landscaping is proposed along the perimeter of the site and scattered throughout each unit. Currently the site is approximately 20% impervious. At project completion the site will comprise of approximately 67% impervious surfaces. The major source of pollutants is rooftops and parking areas. The project does not include any food</p>	

	<p>preparation, cooking or eating areas. There will be no below grade loading docks. There will be no outdoor storage of any materials with the exception of a common waste bin. There will be no outdoor activities routinely conducted except for vehicular parking and foot traffic into each unit. There will be no activities associated with equipment or vehicle maintenance and repair, including washing or cleaning, or any material processing. There will be no service bays, fuelling islands, or fuel pumps. The remainder of the site is mainly covered with asphaltic and concrete pavement and landscaping. The general location of the site is illustrated on the Vicinity Map.</p>			
<p>Project Area: 1.38 acres</p>	<p>Pervious</p>		<p>Impervious</p>	
	<p>Area (acres)</p>	<p>Percentage</p>	<p>Area (acres)</p>	<p>Percentage</p>
<p>Pre-Project Conditions</p>	<p>1.10</p>	<p>80</p>	<p>0.28</p>	<p>20</p>
<p>Post-Project Conditions</p>	<p>0.45</p>	<p>33</p>	<p>0.93</p>	<p>67</p>
<p>Drainage Patterns/Connections</p>	<p>The majority of the existing storm runoff surface flows in a west to east direction and sheets flow onto an existing concrete curb and gutter along the northerly property line on the south side of Lambert. The flow then continues easterly and enters the existing Talbert Channel (D02) and then is conveyed in a southerly direction and ultimately the Pacific Ocean.</p> <p>The drainage pattern will generally remain the same. The proposed improvements to the site will convey flow throughout the site into a proposed private on-site storm drain system, conveying surface runoff and roof drainage to the proposed underground biofiltration systems for treatment. The drainage areas within the site will bisect into two west and east areas. Surface drainage will sheet flow to grated inlets (catch basins) which connect to the onsite private storm drain system. The on-site storm drain connects to the underground biofiltration systems via a catch basin that will direct low flows to the biofiltration systems and allow all other flows to escape onto the existing concrete curb and gutter as stated above. The biofiltration systems will be located in the northerly portion of the site within the landscape area. The proposed low flows will be pump and discharged through the curb and gutter as stated above. This will be separated from the on-site system.</p>			

II.2 Potential Stormwater Pollutants

Pollutants of Concern			
Pollutant	Circle One: E=Expected to be of concern N=Not Expected to be of concern		Additional Information and Comments
Suspended-Solid/ Sediment	<input checked="" type="radio"/> E	<input type="radio"/> N	Driveways, rooftops and sidewalks
Nutrients	<input checked="" type="radio"/> E	<input type="radio"/> N	Fertilizers, Food waste
Heavy Metals	<input checked="" type="radio"/> E	<input type="radio"/> N	Cars
Pathogens (Bacteria/Virus)	<input checked="" type="radio"/> E	<input type="radio"/> N	Wild bird and pet waste, garbage
Pesticides	<input checked="" type="radio"/> E	<input type="radio"/> N	Landscape Areas
Oil and Grease	<input checked="" type="radio"/> E	<input type="radio"/> N	Leaking vehicles
Toxic Organic Compounds	<input checked="" type="radio"/> E	<input type="radio"/> N	Cars, Fertilizers
Trash and Debris	<input checked="" type="radio"/> E	<input type="radio"/> N	Poorly managed trash container and parking lot

II.3 Hydrologic Conditions of Concern

☒ No – Show map

☐ Yes – Describe applicable hydrologic conditions of concern below.

See Attached map of Susceptibility Analysis for the Santa Ana River Watershed (Figure XVI-3b of OC TGD).

II.4 Post Development Drainage Characteristics

At project completion the surface drainage will sheet flow to a v-gutter flowing to grated inlets which connect to the onsite storm drain system. The onsite storm drain leaves the site at a location north of the dwellings, and will be treated by a sub-surface biofiltration system (Bioclean Modular Wetland) prior to being pumped thru the existing curb and gutter along Talbert Avenue. The flow will discharge into the public right-of-way and continues easterly into a public catch basin along Talbert Avenue. The runoff is conveyed southeasterly to Talbert Channel and ultimately to the Pacific Ocean.

II.5 Property Ownership/Management

Ownership of the project will be held with BONANNI DEVELOPMENT, INC. Long term maintenance will be the responsibility of the owner.

BONANNI DEVELOPMENT, INC.

5500 Bolsa Avenue, Suite 120
Huntington Beach, CA 92649
Ed Bonanni

Section III Site Description

III.1 Physical Setting

Planning Area/ Community Name	South Gateway
Location/Address	8572 Talbert Avenue
	Fountain Valley, CA
Land Use	Low Medium Residential
Zoning	CP-HO1 Commercial, Administrative, Professional Office
Acreage	1.38
Predominant Soil Type	Soil Type D

III.2 Site Characteristics

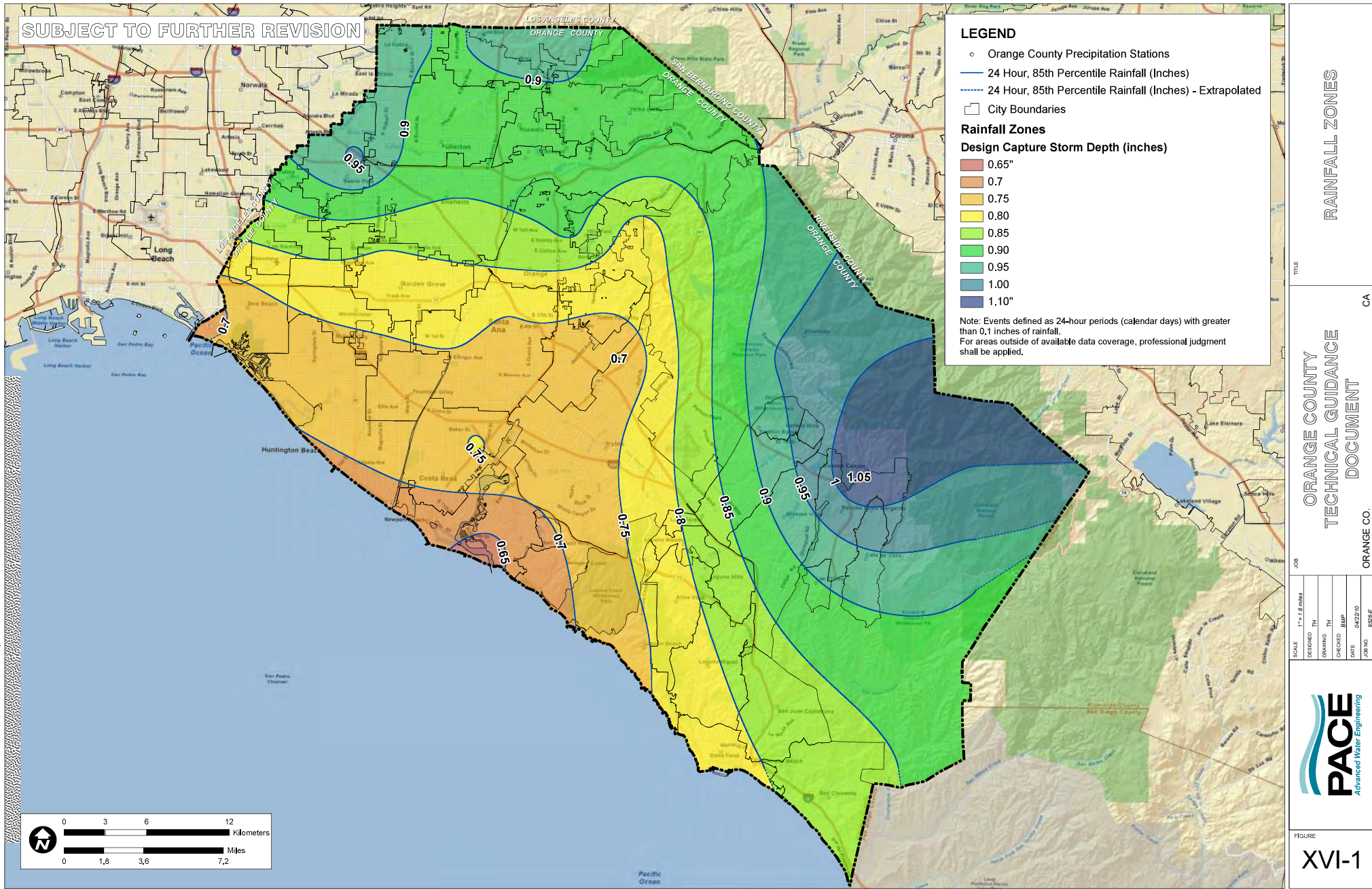
Precipitation Zone	0.73"
Topography	Developed site with an approximate 24" elevation difference across the site from west to east.
Drainage Patterns/Connections	Runoff sheet flows from the site is collected by the private storm drain system. The site is designed to treat the first flush runoff and direct all flows to the existing curb and gutter to Talbert Avenue
Soil Type, Geology, and Infiltration Properties	Class D Soil Type. The project is located in an area of shallow groundwater (5'-10') according to the map in the TGD. Groundwater was encounter at 35' below existing ground surface. The historical groundwater depth is at 30' below existing ground surface. Infiltration rate was conducted at depths of 5'-10', with measured rates less than 0.3 inchers per hour. Geotechnical report does not recommend infiltration for the site.

Site Characteristics (continued)

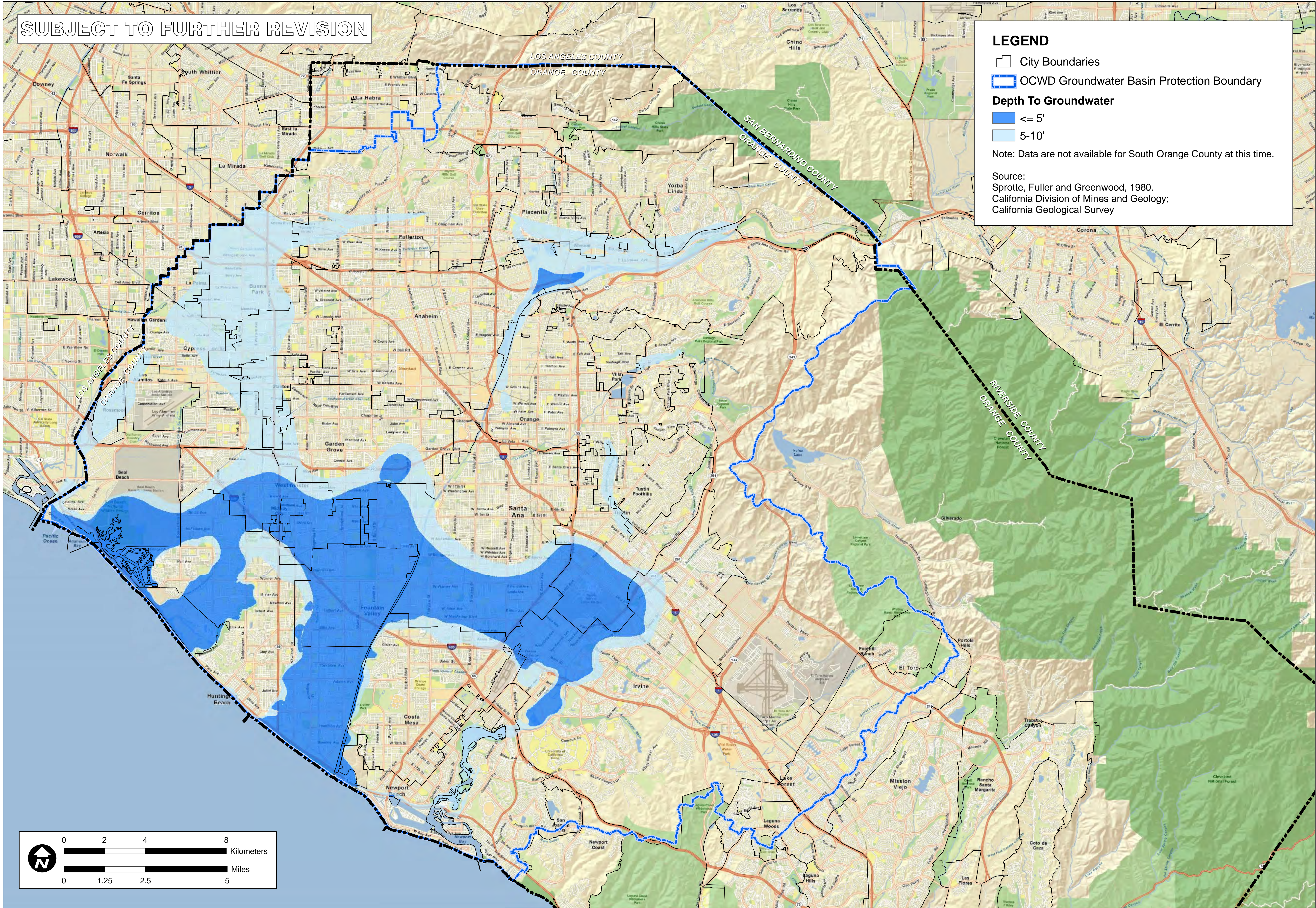
Hydrogeologic (Groundwater) Conditions	See language provided above
Geotechnical Conditions (relevant to infiltration)	Type D Soil, Shallow groundwater, setback foundation limitations
Off-Site Drainage	None
Utility and Infrastructure Information	None

III.3 Watershed Description

Receiving Waters	Talbert Channel (DO2)
303(d) Listed Impairments	Talbert Channel: Toxicity Santa Ana River : Cadmium, Copper, Lead
Applicable TMDLs	Santa Ana River Reach 1: Enterococcus Indicator bacteria, PCBs
Pollutants of Concern for the Project	Suspended-Solid/ Sediment, Nutrients, Heavy Metals, Pathogens (Bacteria/Virus), Pesticides, Oil and Grease, Toxic Organic, Compounds, Trash and Debris
Environmentally Sensitive and Special Biological Significant Areas	Not Applicable.



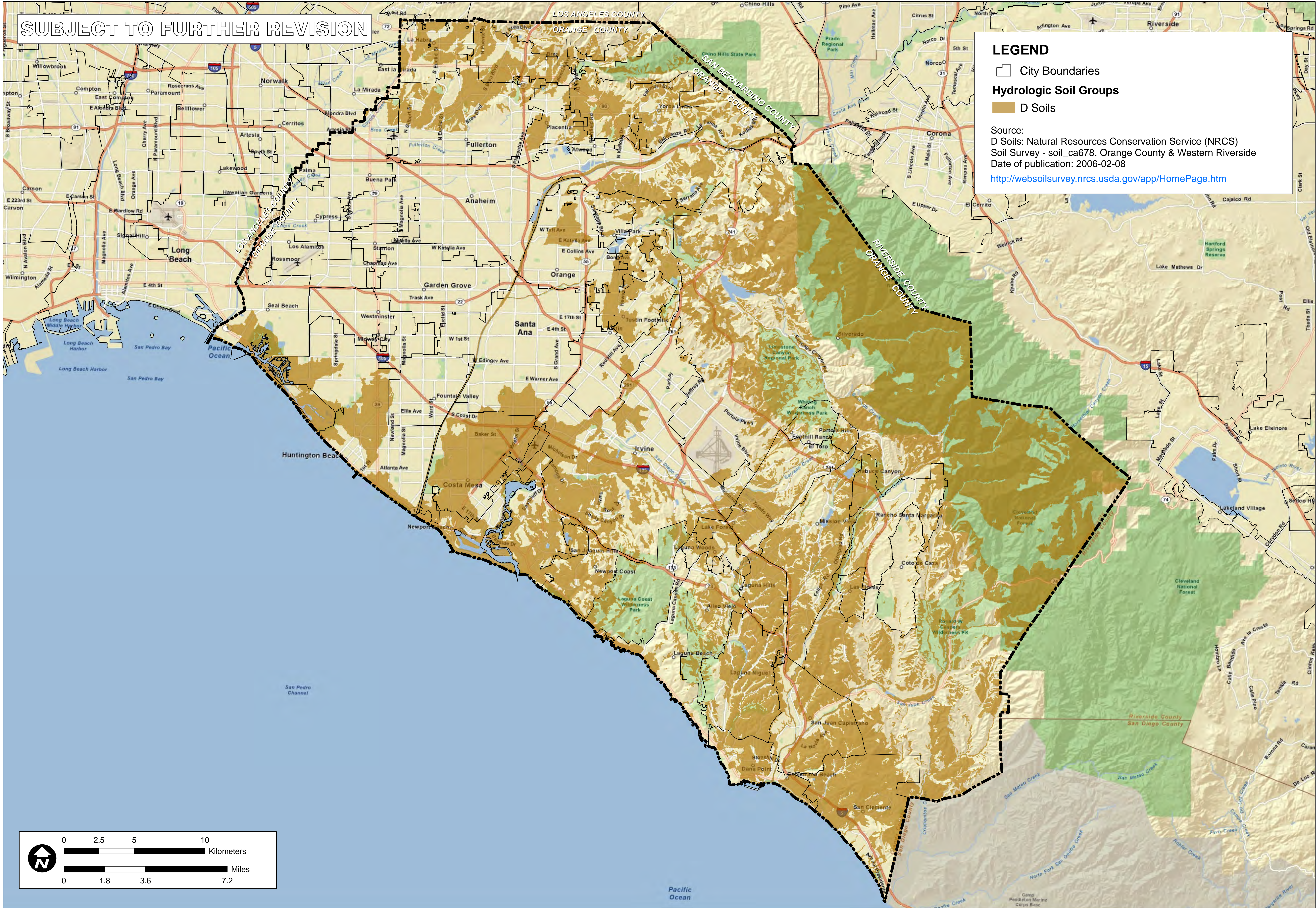
P:\9526\6-GIS\Mxd\Reports\InfiltrationFeasibility_20110215\9526\6_FigureXVI-2e_DepthToGroundwater15ft_20110215.mxd



NORTH ORANGE COUNTY MAPPED SHALLOW GROUNDWATER		TITLE	
ORANGE COUNTY INFILTRATION STUDY		CA	
ORANGE CO.		JOB	
SCALE	1" = 1.25 miles	DESIGNED	TH
DRAWING	TH	CHECKED	BMP
DATE	02/09/11	JOB NO.	9526-E
FIGURE		XVI-2e	

PACE
Advanced Water Engineering

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HYDROLOGIC SOIL GROUP TYPE D NRCS SOIL SURVEY		TITLE	
ORANGE COUNTY INFILTRATION STUDY		CA	
ORANGE CO.		JOB	
SCALE	1" = 1.8 miles	DESIGNED	TH
DRAWING	TH	CHECKED	BMP
DATE	02/09/11	JOB NO.	9526-E
FIGURE XVI-2b			

Section IV Best Management Practices (BMPs)

IV. 1 Project Performance Criteria

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

Project Performance Criteria (continued)	
If HCOC exists, list applicable hydromodification control performance criteria	Not Applicable
List applicable LID performance criteria	<p>1) Priority Projects must infiltrate, harvest and use, evapotranspire, or biotreat/biofilter, the 85th percentile, 24-hour storm event (Design Capture Volume).</p> <p>2) A properly designed biotreatment system may only be considered if infiltration, harvest and use, and evapotranspiration (ET) cannot be feasibly implemented for the full design capture volume. In this case, infiltration, harvest and use, and ET practices must be implemented to the greatest extent feasible and biotreatment may be provided for the remaining design capture volume.</p>
List applicable treatment control BMP performance criteria	The site will use the modular wetlands system. Since infiltration is not feasible, biofiltration with underdrains will be the stormwater BMPs used on this project.
Calculate LID design storm capture volume for Project.	<p>Area = 1.38 acres</p> <p>Impervious Area percentage = 67%</p> <p>$C = (0.75 \times \text{imp}) + 0.15 = 0.653$</p> <p>$I = 0.73$ (Figure III.1)</p> <p>$V_b = C * I * A * (1\text{ft}/12\text{in}) * (43,560 \text{ ft}^2/\text{acre}) = 2,388 \text{ ft}^3$</p>

Bioretention with Underdrains (Area A)

The selected biofiltration is a Modular Wetland as manufactured by Bioclean. For T_c refer to attached Time of Concentration nomograph from Orange County Hydrology Manual. $T_c=5.0$ mins.

$$Q = C * i * A$$

$$C = (0.75 * \text{Imp } \%) + 0.15 = (0.75 * 0.67) + 0.15 = 0.653$$

$$i = 0.26 \text{ (From Worksheet D, see below)}$$

$$Q = 0.671 * 0.26 * 0.653$$

$$Q = 0.114 \text{ cfs}$$

2- Calculate the required footprint

Using Bioclean sizing chart (see section VIII)

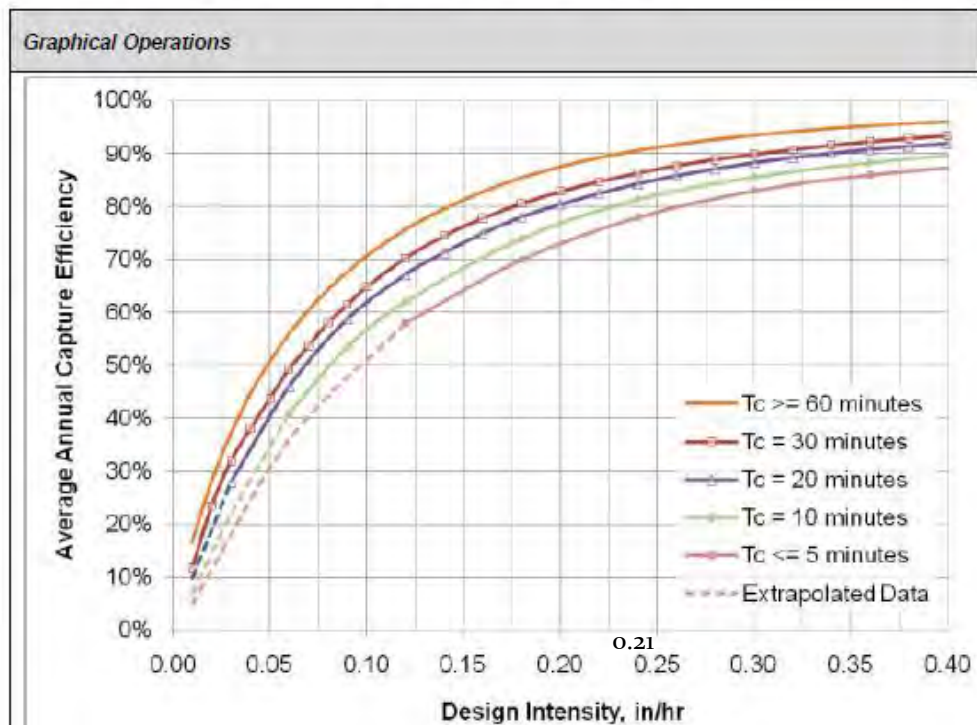
4'x8' = 0.114 < 0.115 cfs. Or 2-4'x4' on each side.

Area B

$$Q = 0.711 * 0.26 * 0.653$$

$$Q = 0.121 \text{ cfs Use 4'x8' or (2)-4'x4'}$$

Worksheet D: Capture Efficiency Method for Flow-Based BMPs



IV.2. SITE DESIGN AND DRAINAGE PLAN

Biotreatment BMP

Modular wetland system (MWS) had been proposed with an internal bypass. The system will pump the low flows while the high flows are bypassed and will overflow from the sump pump and into the public right of way.

Minimize Impervious Area

Infiltration is not be feasible at the site as such, modular wetland system (MWS) had been proposed.

Preserve Existing Drainage Patterns

Existing drainage patterns will be preserved as indicated. The site will drain similarly to existing conditions.

Disconnect Impervious Areas

Buildings will drain into landscaping with yard drains. Impervious surfaces will ultimately drain to the MWS. This is qualitative and will not be used for a volume credit in the HSC.

Landscape Design

Drought tolerant plants have been utilized in the project's landscape design. The landscape plan has been submitted to the City, under separate review and approval. This is qualitative and will not be used for a volume credit in the HSC.

Drainage Management Areas

The project site drainage will be delineated into one Drainage Management Areas (DMAs).

Right of Way Improvements

There are no public right of way improvements for this project.

IV.3 LID BMP SELECTION AND PROJECT CONFORMANCE ANALYSIS

IV.3.1 Hydrologic Source Controls

Name	Included?
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"/>
Other:	<input type="checkbox"/>
Other:	<input type="checkbox"/>
Other:	<input type="checkbox"/>
Other:	<input type="checkbox"/>
Other:	<input type="checkbox"/>
Other:	<input type="checkbox"/>
Other:	<input type="checkbox"/>

Not applicable.

IV.3.2 Infiltration BMPs

Name	Included?
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"/>
Sub-surface retention system	<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"/>

Infiltration rates less than allowable 0.3 in/hr. The TGD also shows the site to be within shallow groundwater (5'-10') and soils report within 5'-8'.

IV.3.3 Evapotranspiration, Rainwater Harvesting BMPs

Name	Included?
All HSCs; <i>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"/>

Full Design Capture Volume met. Harvest and reuse is not feasible due to the cost of implementing the system. The project does not propose the use of harvesting BMPs, as the project has selected the use of Biotreatment BMP to address project runoff. Instead, the site roof and areas drain into a bioretention with underdrains, where drainage will be treated and retained.

IV.3.4 Biotreatment BMPs

Name	Included?
Bioretention with underdrains	<input checked="" type="checkbox"/>
Stormwater planter boxes with underdrains	<input type="checkbox"/>

Bioretention with Underdrains (Area A)

The selected biofiltration is a Modular Wetland as manufactured by Bioclean. Chart provided in Section IV.

$$Q = C * i * A$$

$$C = (0.75 * \text{Imp } \%) + 0.15 = (0.75 * 0.67) + 0.15 = 0.653$$

$$i = 0.26 \text{ (From Worksheet D, see below)}$$

$$Q = 0.671 * 0.26 * 0.653$$

$$Q = 0.114 \text{ cfs}$$

2- Calculate the required footprint

Using Bioclean sizing chart (see section VIII)

$$4' \times 8' = 0.114 < 0.115 \text{ cfs. Or } 2-4' \times 4' \text{ on each side.}$$

Area B

$$Q = 0.711 * 0.26 * 0.653$$

$$Q = 0.121 \text{ cfs Use } 4' \times 8' \text{ or } (2)-4' \times 4'$$

IV.3.5 Hydromodification Control BMPs

BMP Name	BMP Description

IV.3.6 Regional/Sub-Regional LID BMPs

Regional/Sub-Regional LID BMPs
<p>Not applicable.</p>

IV.3.7 Treatment Control BMPs

Treatment Control BMPs			
BMP Name	Treatment Capacity	BMP Description	G.I.S. Coordinates

Full Design Capture Volume met.

IV.3.8 Non-structural Source Control BMPs

Non-Structural Source Control BMPs				
Identifier	Name	Check One		If not applicable, state brief reason
		Included	Not Applicable	
N1	Education for Property Owners, Tenants and Occupants	<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"/>	No Hazardous Materials
N6	Local Industrial Permit Compliance	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No Industrial Permit
N7	Spill Contingency Plan	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No Hazardous Materials
N8	Underground Storage Tank Compliance	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No Underground Tanks
N9	Hazardous Materials Disclosure Compliance	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No Hazardous Materials
N10	Uniform Fire Code Implementation	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No Hazardous Materials
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
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

N1 - Education for Property Owners, Tenants and Occupants

BONANNI DEVELOPMENT, INC. will provide information contained within this report to educate its employees of general good housekeeping practices that contribute to the protection of storm water quality. See all attachments.

N2- Activity Restrictions

BONANNI DEVELOPMENT, INC. will be responsible for setting up a Home Owners Association HOA.

N3 - Common Area Landscape Management

BONANNI DEVELOPMENT, INC. will be responsible for ongoing landscape maintenance of the Project consistent with the County Management Guidelines for Use of Fertilizers and Pesticides (see Attachment B) and County Ordinance No. 0-97-3987, Water Management and Urban Runoff.

N4 - BMP Maintenance

BONANNI DEVELOPMENT, INC. will be responsible for implementation of each non-structural BMP and scheduled cleaning of all structural BMP facilities. See Table 1.

N11 - Common Area Litter Control

BONANNI DEVELOPMENT, INC. will implement trash management and litter control procedures aimed at reducing off-site migration of trash and pollution of drainage water. BONANNI DEVELOPMENT, INC. may contract with landscape maintenance firms to provide this service during regularly scheduled maintenance, which should consist of litter patrol and emptying of trash receptacles.

N12 - Employee Training

BONANNI DEVELOPMENT, INC. will train its employees in the methods of storm water protection and public information. This will include the use of the materials contained within this WQMP.

N14 - Common Area Catch Basin Inspection

BONANNI DEVELOPMENT, INC. will be responsible for having the catch basins inspected and cleaned after major rain events and immediately prior to October 1st of each year.

N15 - Private Street Sweeping

BONANNI DEVELOPMENT, INC. will be responsible for having the driveways and parking areas swept immediately prior to October 1st of each year and on a regular basis (monthly at minimum).

IV.3.9 Structural Source Control BMPs

Structural Source Control BMPs				
Identifier	Name	Check One		If not applicable, state brief reason
		Included	Not Applicable	
S1	Provide storm drain system stenciling and signage	<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 Storage
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
	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
S7	Maintenance bays	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No Maintenance bays
S8	Vehicle wash areas	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No vehicle wash areas
S9	Outdoor processing areas	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No outdoor processing areas
S10	Equipment wash areas	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No equipment wash areas
S11	Fueling areas	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No fueling areas
S12	Hillside landscaping	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No Hillside landscaping
S13	Wash water control for food preparation areas	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No food preparation areas
S14	Community car wash racks	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No community car wash racks

S1 - Provide Storm Drain System Stenciling and Signage

Storm drain stencils are highly visible source control messages, typically placed directly adjacent to storm drain inlets. The stencils contain a brief statement that prohibits the dumping of improper materials into the storm drain system. Graphical icons, either illustrating anti-dumping symbols or images of receiving water fauna, are effective supplements to the anti-dumping message. Stencils and signs alert the public to the destination of pollutants discharged into storm water. The following requirements shall be included in the project design and shown on the project plans:

1. Provide stenciling or labeling of all storm drain inlets and catch basins, constructed or modified, within the project area with prohibitive language (such as: "NO DUMPING-DRAINS TO OCEAN") and /or graphical icons to discourage illegal dumping.
2. Post signs and prohibitive language and/or graphical icons which prohibit illegal dumping at public access points along channels and creeks within the project area.
3. Maintain legibility of stencils and signs.

S3 - Design and Construct Trash and Waste Storage Areas to Reduce Pollution Introduction

The trash enclosure is designed to have drainage diverted around the area, not through the area. The trash bins will have rain tight lids installed.

S4 - Use Efficient Irrigation Systems and Landscape Design

The irrigation system will comply with the City and County requirements with respect to water conservation and programmable timers. The landscape areas will comply with the City approved landscape plans and maintenance will comply with the County Management Guidelines on Fertilizers and Pesticides.

IV.4 ALTERNATIVE COMPLIANCE PLAN (IF APPLICABLE)

IV.4.1 Water Quality Credits

Description of Proposed Project				
Project Types that Qualify for Water Quality Credits (Select all that apply):				
<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 pervious 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)	Not applicable			

Section V Inspection/Maintenance Responsibility for BMPs

BMP Inspection/Maintenance			
BMP	Reponsible Party(s)	Inspection/Maintenance Activities Required	Minimum Frequency of Activities
Education for Property Owners, Tenants and Occupants	BONANNI DEVELOPMENT, INC.	Provide education information to new owners, Tenants and occupants as needed	Continuous
Common Area Landscape Management	Construction Superintendent during construction; BONANNI DEVELOPMENT, INC. during post-construction	Manage landscaping in accordance with County of Orange Water Conservation Ordinance No. 3802 and with Management Guidelines for Use of Fertilizers and Pesticides	Monthly during regular maintenance
BMP Maintenance.	BONANNI DEVELOPMENT, INC.	N/A	BMP table
Common Area Litter Control.	Construction Superintendent during construction; BONANNI DEVELOPMENT, INC. during post-construction.	Litter Maintenance	Continuous

Preliminary Water Quality Management Plan (PWQMP)
Talbert Residential

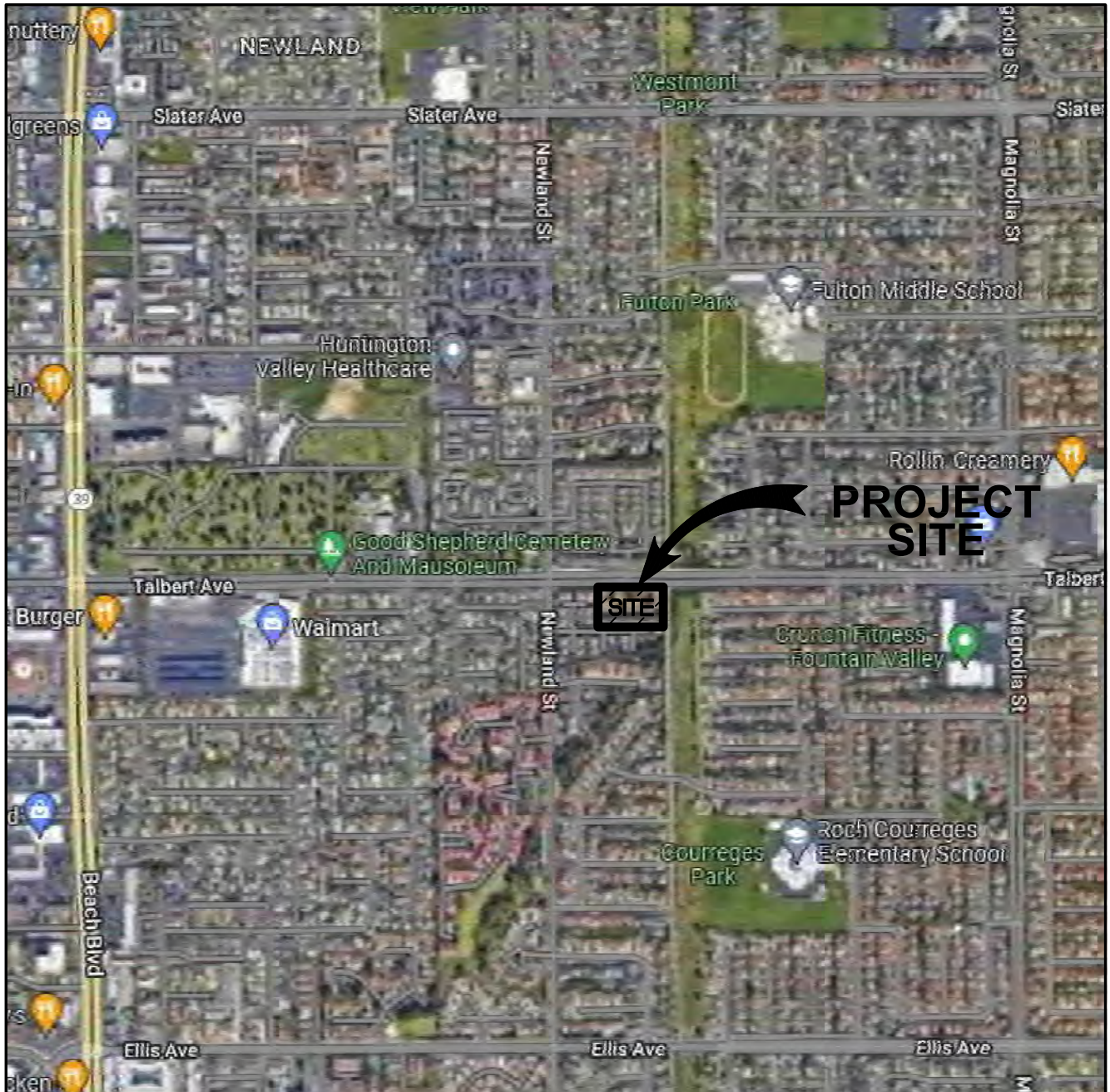
Employee Training.	BONANNI DEVELOPMENT, INC.	Include the education materials contained in the approved Water Quality Management Plan.	Monthly for construction maintenance personnel and employees
Catch Basin Inspection	BONANNI DEVELOPMENT, INC.	Inspection	Catch Basins will be inspected after major rain events and immediately prior to the start of the rainy season on October 1st.
Street Sweeping Private Street and Parking Lot.	BONANNI DEVELOPMENT, INC.	Sweeping	Parking lot will be swept monthly at a minimum and immediately prior to the start of the rainy season on October 1st.
Storm Drain System Stenciling	BONANNI DEVELOPMENT, INC.	Repaint as necessary.	Annually
Trash and Waste Storage Areas	Construction Superintendent during construction; BONANNI DEVELOPMENT, INC. during post- construction.	Clean trash container area to prevent buildup of excess trash in area.	Monthly
Efficient Irrigation and Landscape Design	BONANNI DEVELOPMENT, INC.	Verify that runoff minimizing landscape design continues to function by checking that water sensors are functioning properly, that irrigation heads are adjusted properly to eliminate overspray to hardscape areas, and to verify that irrigation timing and cycle lengths	Once a week, in conjunction with maintenance activities.

		are adjusted in accordance with water demands, given time of year, weather and day or night time temperatures. Verify that plants continue to be grouped according to similar water requirements in order to reduce excess irrigation runoff.	
Bioclean Modular Wetland Device	BONANNI DEVELOPMENT, INC.	Inspection and minor maintenance procedures include inspection of the vault itself and removal of vegetation and trash and debris. major maintenance activities include cartridge replacement and sediment removal. Refer to Contech Storm Filter Operation and Maintenance specifications for details.	Inspected at least twice a year and after major storm events.

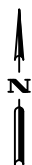
Note: Ownership of the project will be held with BONANNI DEVELOPMENT, INC. Long term operation and maintenance, including funding, will be the responsibility of the HOA.

BONANNI DEVELOPMENT, INC.

Section VI Site Plan and Drainage Plan



NOTE: PROJECT IS IN GRID C2 OF
MAP 858 OF THE THOMAS GUIDE



NO SCALE



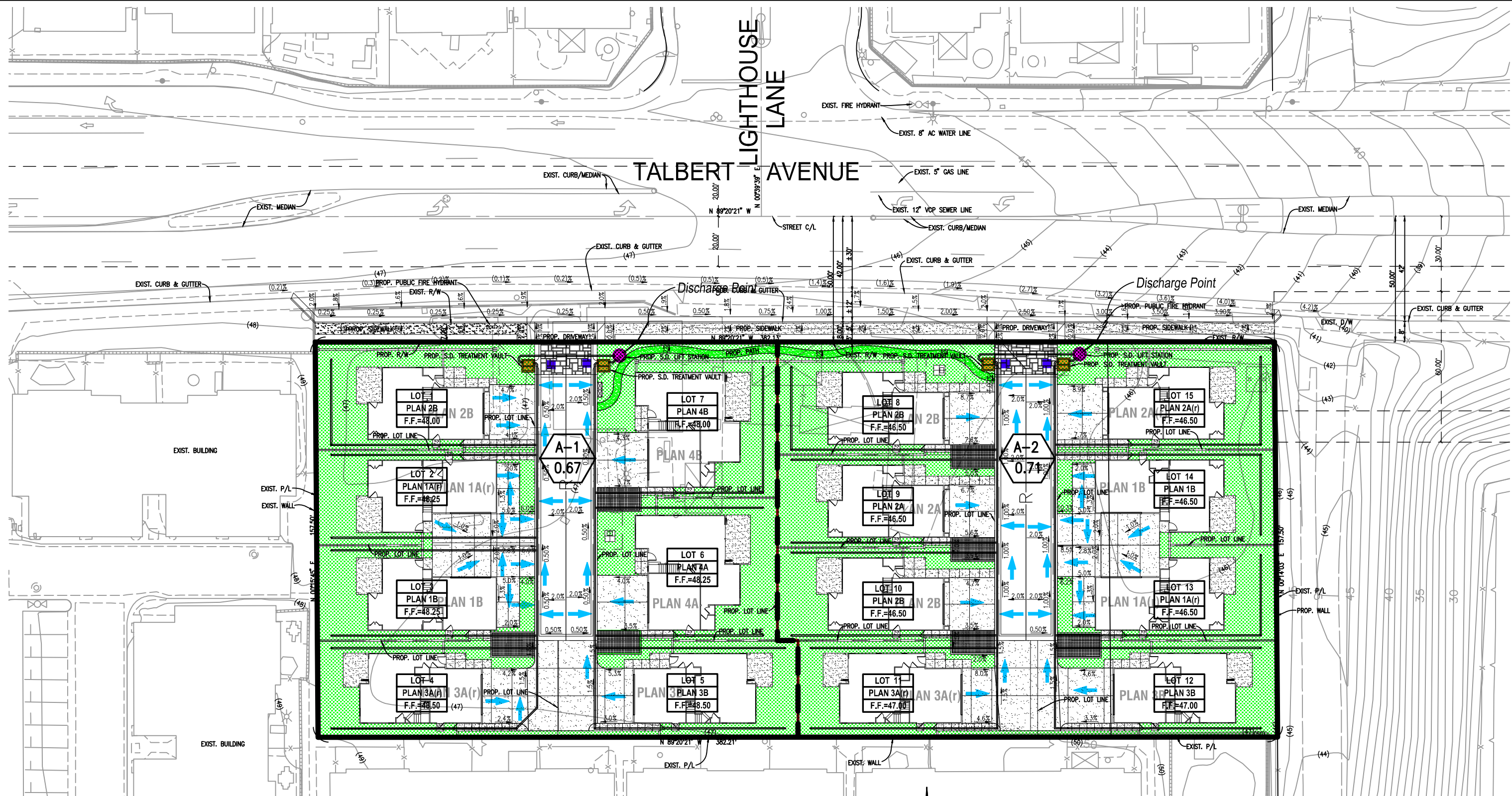
**ALDEN &
SSOCIATES**

CIVIL ENGINEERS - LAND SURVEYORS - PLANNERS
2552 WHITE ROAD, SUITE B • IRVINE, CA 92614-6236
(949) 660-0110 FAX: 660-0418







LOCATION MAP TALBERT RESIDENTIAL FOUNTAIN VALLEY, CA

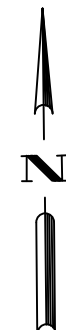
W.O. No. 2089-948-001
Engr. SK Chk'd. MV

Date 6/2022
Sheet 1 of 1



LEGEND

-  Catch Basin Stenciling
-  Area Contributing to BMP
-  Drainage Pattern
-  Sump Pump
-  Modular Wetland Unit
-  Denotes Drainage Area Designation
Denotes Drainage Area in Acres



SCALE: 1"=60'

SITE PLAN
VI. - FIGURE 2

Talbert Residential
8527 Talbert Avenue
Fountain Valley, CA

Section VII Educational Materials

Education Materials			
Residential Material (http://www.ocwatersheds.com)	Check If Applicable	Business Material (http://www.ocwatersheds.com)	Check If Applicable
The Ocean Begins at Your Front Door	<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 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 type="checkbox"/>
Household Tips	<input checked="" type="checkbox"/>	Other Material	Check If Attached
Proper Disposal of Household Hazardous Waste	<input checked="" type="checkbox"/>		
Recycle at Your Local Used Oil Collection Center (North County)	<input checked="" type="checkbox"/>	BIO-7 Proprietary Biotreatment	<input checked="" 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 checked="" 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 checked="" 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 checked="" type="checkbox"/>		<input type="checkbox"/>

The Ocean Begins at Your Front Door



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.oclandfills.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.

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.oclandfills.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.

The Ocean Begins at Your Front Door



Never allow pollutants to enter the street, gutter or storm drain!

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

California Environmental Protection Agency

www.calepa.ca.gov

- **Air Resources Board**
www.arb.ca.gov
- **Department of Pesticide Regulation**
www.cdpr.ca.gov
- **Department of Toxic Substances Control**
www.dtsc.ca.gov
- **Integrated Waste Management Board**
www.ciwmb.ca.gov
- **Office of Environmental Health Hazard Assessment**
www.oehha.ca.gov
- **State Water Resources Control Board**
www.waterboards.ca.gov

Earth 911 - Community-Specific Environmental Information 1-800-cleanup or visit www.1800cleanup.org

Health Care Agency's Ocean and Bay Water Closure and Posting Hotline
(714) 433-6400 or visit www.ocbeachinfo.com

Integrated Waste Management Dept. of Orange County (714) 834-6752 or visit www.oclandfills.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

Stormwater Best Management Practice Handbook
Visit www.cabmphandbooks.com

UC Master Gardener Hotline
(714) 708-1646 or visit 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

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



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.

DID YOU KNOW?

Did you know that most of the pollution found in our waterways is not from a single source, but from a "non-point" source meaning the accumulation of pollution from residents and businesses throughout the community

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.

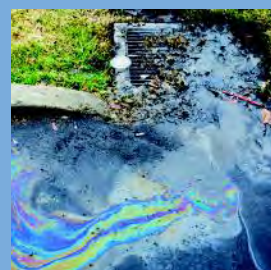


- **Solution:** Don't litter and make sure trash containers are properly covered. It is far more expensive to clean up the litter and trash that ends up in our waterways than it is to prevent it in the first place. Come out to one of Orange County's many locations for Coastal and Inner-Coastal Cleanup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

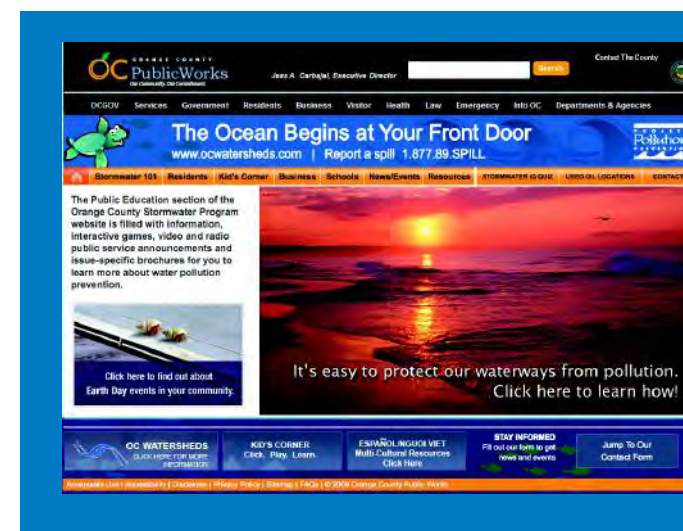
Low Impact Development (LID) and sustainable water use prevents water pollution and conserves water for drinking and reuse. Reducing your water use and the amount of water flowing from your home protects the environment and saves you money.

Thank you for making water protection a priority!

For more information, please visit www.ocwatersheds.com/publiced/

www.mwdoc.com

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

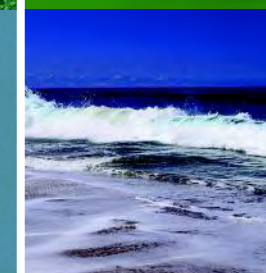


Homeowners Guide for Sustainable Water Use

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 at least 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.



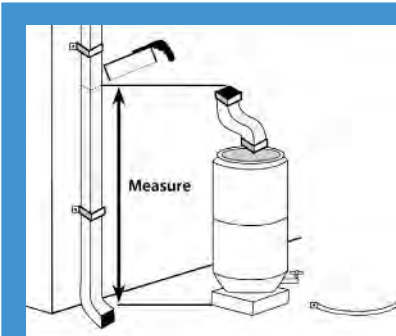
Permeable pavement allows water runoff to infiltrate through the soil and prevents most pollutants from reaching the storm drain system.

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.

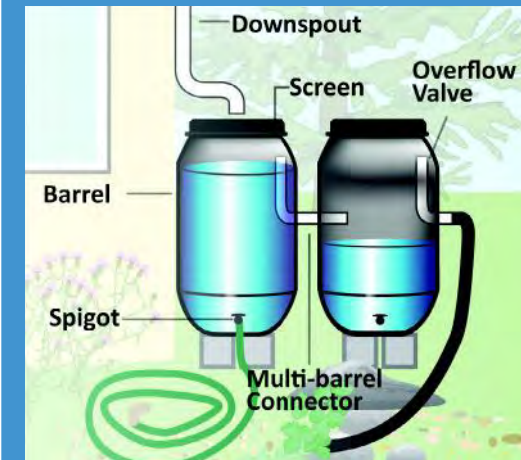
Downspout Disconnection/Redirection

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.

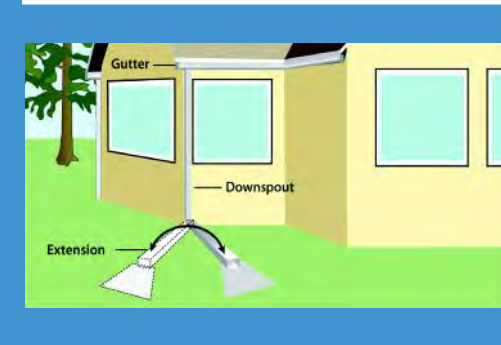


Mosquito growth prevention is very important when installing a rain barrel. The best way to prevent mosquito breeding is to eliminate entry points by ensuring all openings are sealed tightly. If these methods are unsuccessful, products are available to kill mosquito larvae, but that are harmless to animals 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.

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.



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/

OTHER WATER CONSERVATION AND POLLUTION PREVENTION TECHNIQUES

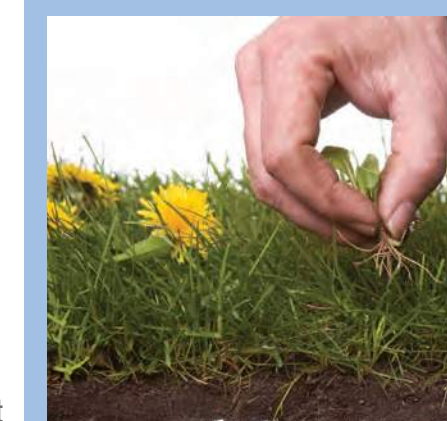
Native Vegetation and Maintenance

"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.

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 blooms 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.

Help Prevent Ocean Pollution:

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, many common household activities can lead to water pollution if you're not careful.

Litter, oil, chemicals and other substances that are left on your yard or driveway can be blown or washed into storm drains that flow to the ocean. Over-watering your lawn and washing your car can also flush materials into the storm

drains. Unlike water in sanitary sewers (from sinks and toilets), water in storm drains is not treated.

You would never pour soap, fertilizers or oil into the ocean, so don't let them enter streets, gutters or storm drains. Follow the easy tips in this brochure to help prevent water pollution.

**REMEMBER THE
WATER IN YOUR
STORM DRAIN
IS NOT TREATED
BEFORE
IT ENTERS OUR
WATERWAYS**

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

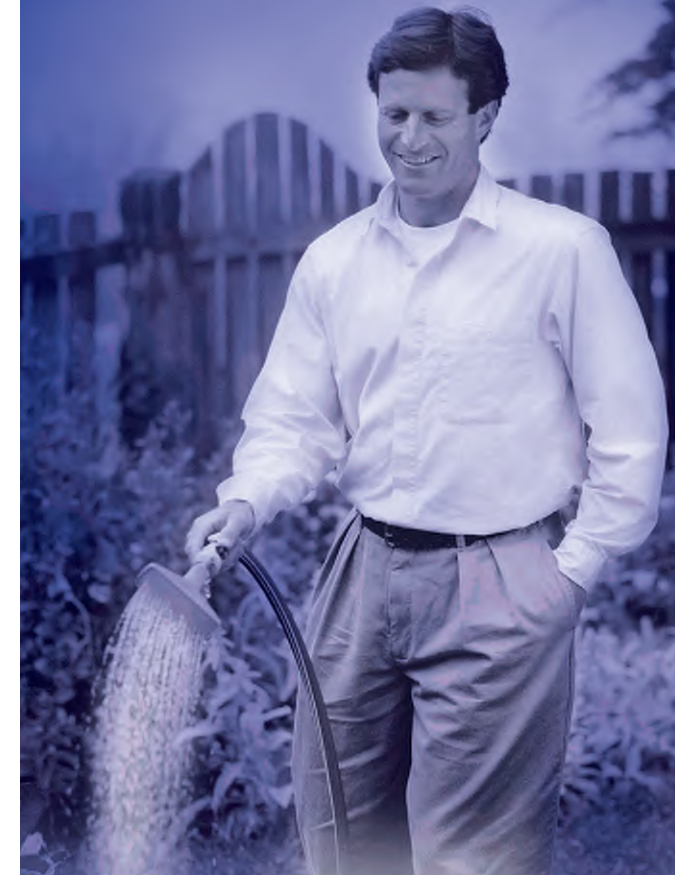
To report a spill,
call the
**Orange County 24-Hour
Water Pollution Problem
Reporting Hotline**
1-877-89-SPILL (1-877-897-7455).

For emergencies, dial 911.

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



Household Tips



The Ocean Begins at Your Front Door



Pollution Prevention

Household Activities

- **Do not rinse spills with water!** Sweep outdoor spills and dispose of in the trash. For wet spills like oil, apply cat litter or another absorbent material, then sweep and bring to a household hazardous waste collection center (HHWCC).
- Securely cover trash cans.
- Take household hazardous waste to a household hazardous waste collection center.
- Store household hazardous waste in closed, labeled containers inside or under a cover.
- Do not hose down your driveway, sidewalk or patio. Sweep up debris and dispose of in trash.
- Always pick up after your pet. Flush waste down the toilet or dispose of in the trash.
- Bathe pets indoors or have them professionally groomed.

Household Hazardous Wastes include:

- ▲ Batteries
- ▲ Paint thinners, paint strippers and removers
- ▲ Adhesives
- ▲ Drain openers
- ▲ Oven cleaners
- ▲ Wood and metal cleaners and polishes
- ▲ Herbicides and pesticides
- ▲ Fungicides/wood preservatives
- ▲ Automotive fluids and products
- ▲ Grease and rust solvents
- ▲ Thermometers and other products containing mercury
- ▲ Fluorescent lamps
- ▲ Cathode ray tubes, e.g. TVs, computer monitors
- ▲ Pool and spa chemicals

Gardening Activities

- Follow directions on pesticides and fertilizers, (measure, do not estimate amounts) and do not use if rain is predicted within 48 hours.
- Water your lawn and garden by hand to control the amount of water you use. Set irrigation systems to reflect seasonal water needs. If water flows off your yard and onto your driveway or sidewalk, your system is over-watering.
- Mulch clippings or leave them on the lawn. If necessary, dispose in a green waste container.
- Cultivate your garden often to control weeds.

Washing and Maintaining Your Car

- Take your car to a commercial car wash whenever possible.
- Choose soaps, cleaners, or detergents labeled “non-toxic,” “phosphate free” or “biodegradable.” Vegetable and citrus-based products are typically safest for the environment, **but even these should not be allowed into the storm drain.**
- Shake floor mats into a trash can or vacuum to clean.

- Do not use acid-based wheel cleaners and “hose off” engine degreasers at home. They can be used at a commercial facility, which can properly process the wastewater.
- **Do not dump washwater onto your driveway, sidewalk, street, gutter or storm drain.** Excess washwater should be disposed of in the sanitary sewers (through a sink, or toilet) or onto an absorbent surface like your lawn.
- Use a nozzle to turn off water when not actively washing down automobile.
- Monitor vehicles for leaks and place pans under leaks. Keep your car well maintained to stop and prevent leaks.
- Use cat litter or other absorbents and sweep to remove any materials deposited by vehicles. Contain sweepings and dispose of at a HHWCC.
- Perform automobile repair and maintenance under a covered area and use drip pans or plastic sheeting to keep spills and waste material from reaching storm drains.
- **Never pour oil or antifreeze in the street, gutter or storm drains.** Recycle these substances at a service station, HHWCC, or used oil recycling center. For the nearest Used Oil Collection Center call 1-800-CLEANUP or visit www.ciwmb.ca.gov/UsedOil.

For locations and hours of Household Hazardous Waste Collection Centers in Anaheim, Huntington Beach, Irvine and San Juan Capistrano, call (714)834-6752 or visit www.oclandfills.com.

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.



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Help Prevent Ocean Pollution:

Proper Disposal of Household Hazardous Waste



**The Ocean Begins at
Your Front Door**



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.

Common household hazardous wastes

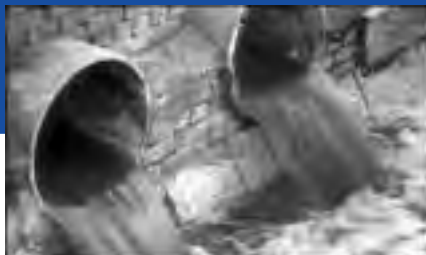
- Batteries
- Paint and paint products
- Adhesives
- Drain openers
- Household cleaning products
- Wood and metal cleaners and polishes
- Pesticides
- Fungicides/wood preservatives
- Automotive products (antifreeze, motor oil, fluids)
- Grease and rust solvents
- Fluorescent lamps
- Mercury (thermometers & 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.





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.oclandfills.com.

Please do not mix your oil with other substances!

For more information, please call the Orange County Stormwater Program at (714) 567-6363 or visit 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.oclandfills.com.



For additional information about the nearest oil recycling center, call the Used Oil Program at 1-800-CLEANUP or visit www.cleanup.org.

Help Prevent Ocean Pollution:

Recycle at Your Local Used Oil Collection Center



The Ocean Begins at Your Front Door



SOUTH COUNTY

Used Oil Collection Centers

ALISO VIEJO

Big O Tires
27812 Aliso Creek Rd, Suite E-100
(949) 362-4225

Econo Lube N' Tune
22932 Glenwood Dr. (949) 643-9667

Jiffy Lube
27832 Aliso Creek Road (949) 362-0005

Pep Boys
26881 Aliso Creek Road (949) 362-9254

DANA POINT

Dana Point Fuel Dock
34661 Puerto Pl. (949) 496-6113

EZ Lube Inc.
34242 Doheny Park Rd. (949) 477-1223

LAGUNA BEACH

USA Express Tire & Service Inc.
350 Broadway (949) 494-7111

LAKE FOREST

Big O Tires
20742 Lake Forest Dr. (949) 443-4155

EZ Lube
26731 Rancho Parkway (949) 465-9912

Firestone Store
24421 Rockfield Blvd. (949) 581-2660

Jiffy Lube
20781 Lake Forest Dr. (949) 583-0470

Kragen Auto Parts
24601 Raymond Way (949) 829-8292

Pep Boys
22671 Lake Forest Dr. (949) 855-9593

Ryan's Foothill Ranch Transmission
20622 Pascal Way (949) 770-6888

USA Express Tire & Service
24561 Trabuco Rd (949) 454-8001

LAGUNA NIGUEL

Econo Lube N Tune
27912 Forbes Rd. (949) 364-5833

Laguna Niguel Auto Center
26042 Cape Dr. #12 (949) 582-2191

LAGUNA HILLS

David J Phillips Buick
24888 Alicia Pkwy. (949) 831-0434

EZ Lube
24281 Moulton Pkwy. (949) 830-9840

EZ Lube
26921 Moulton Pkwy (949) 751-3436

Kragen Auto Parts
26562 Moulton Ave. (949) 831-0434

Firestone Store
24196 Laguna Hills Mall
(949) 581-4700

MISSION VIEJO

AAA Complete Auto Care & Tire
27913 Center Street (949) 347-8200

Autobahn West
25800 Jeronimo Rd. Suite 401
(949) 770-2312

Auto Zone
22942 Los Alisos (949) 830-8181

Econo Lube & Tune
25902 El Paseo (949) 582-5483

Jiffy Lube
27240 La Paz Rd. (949) 455-0470

Kragen Auto Parts
24510 Alicia Pkwy. (949) 951-9175

Mission Viejo Chevron
27742 Crown Vly. Pkwy.
(949) 364-0137

Oilmax 10 Minute Lube
25800 Jeronimo Rd. #300
(949) 859-9271

Ramona Auto Service
27210 La Paz Rd. (949) 583-1233

RANCHO SANTA MARGARITA

Jiffy Lube
23401 Antonio Parkway
(949) 589-7447

SAN CLEMENTE

EZ Lube
525 Avenida Pico (949) 940-1850

Kragen Auto Parts
1113 S. El Camino Real
(949) 492-9850

Kragen Auto Parts
400 Camino de Estrella
(949) 240-9195

San Clemente Car Wash & Oil
1731 N. El Camino Real
(949) 847-4924

SAN JUAN CAPISTRANO

Saturn of San Juan Capistrano
33033 Camino Capistrano
(949) 248-5411

Texaco Xpress Lube
27201 Ortega Hwy. (949) 489-8008



Clean 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
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

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:
Cheryl Wilen, Area IPM Advisor; Darren Haver,
Watershed Management Advisor; Mary
Louise Flint, IPM Education and Publication
Director; Pamela M. Geisel, Environmental
Horticulture Advisor; Carolyn L. Unruh,
University of California Cooperative
Extension staff writer. Photos courtesy of
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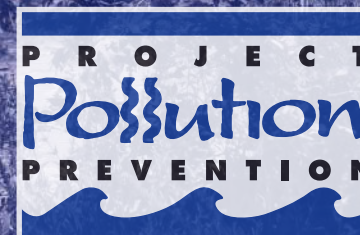


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Help Prevent Ocean Pollution:

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.

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.

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.oclandfills.com



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 (OCSd).
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

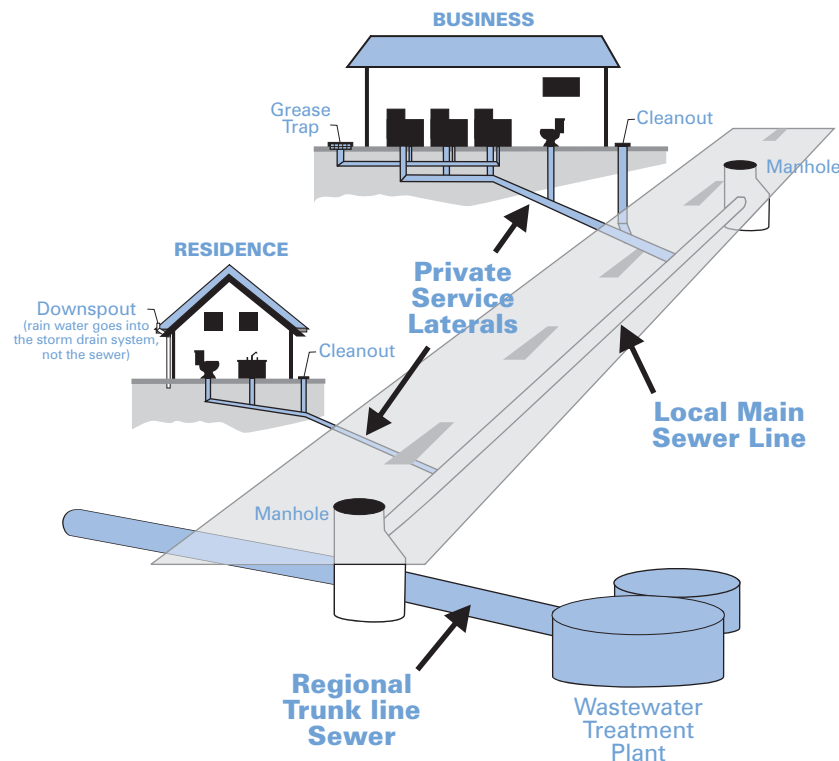
Keep people and pets away from the affected area. Untreated sewage has high levels of disease-causing viruses and bacteria. Call your local health care agency listed on the back for more information.

**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.



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.**



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.

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



Clean 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

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

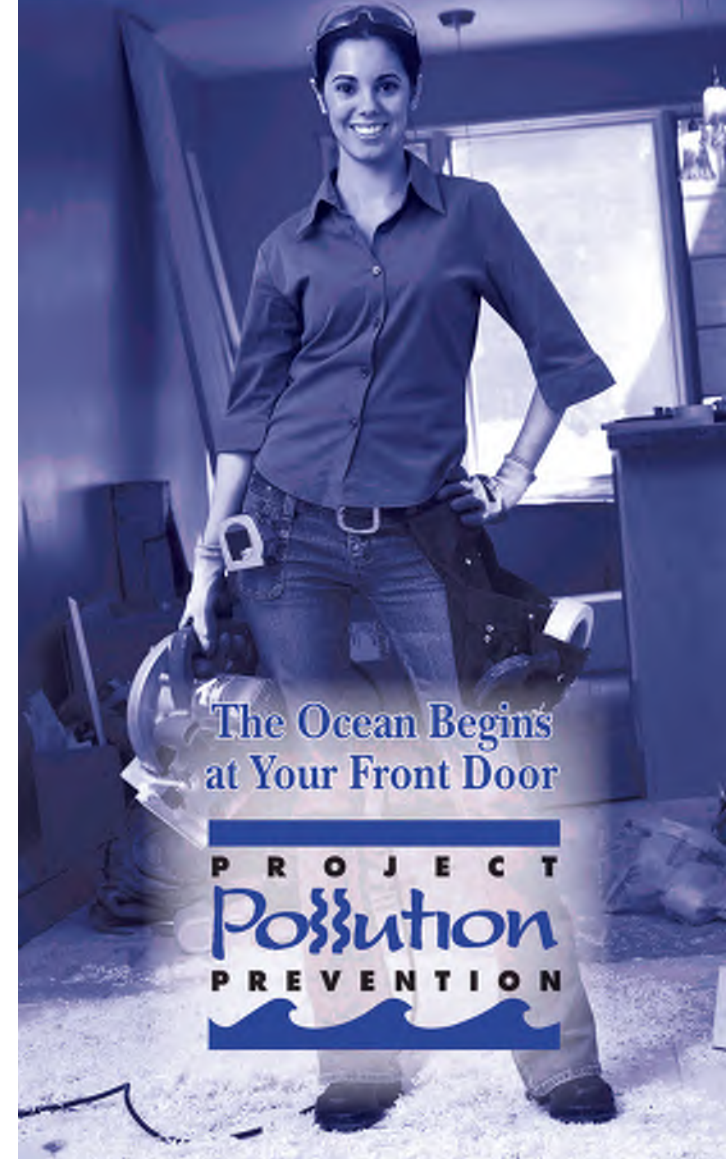
For emergencies, dial 911.

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

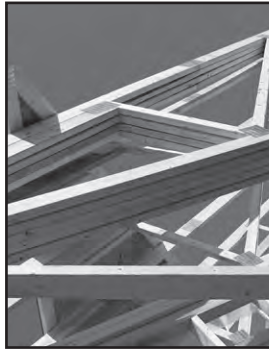


Tips for Home Improvement Projects

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.

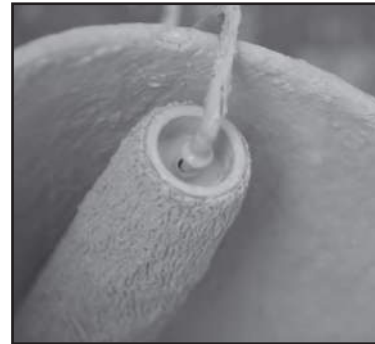


Building Materials

- 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.



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.
- 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.



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 to fill out an incident reporting form.



Clean 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

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.
- 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.oclandfills.com



Clean 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.

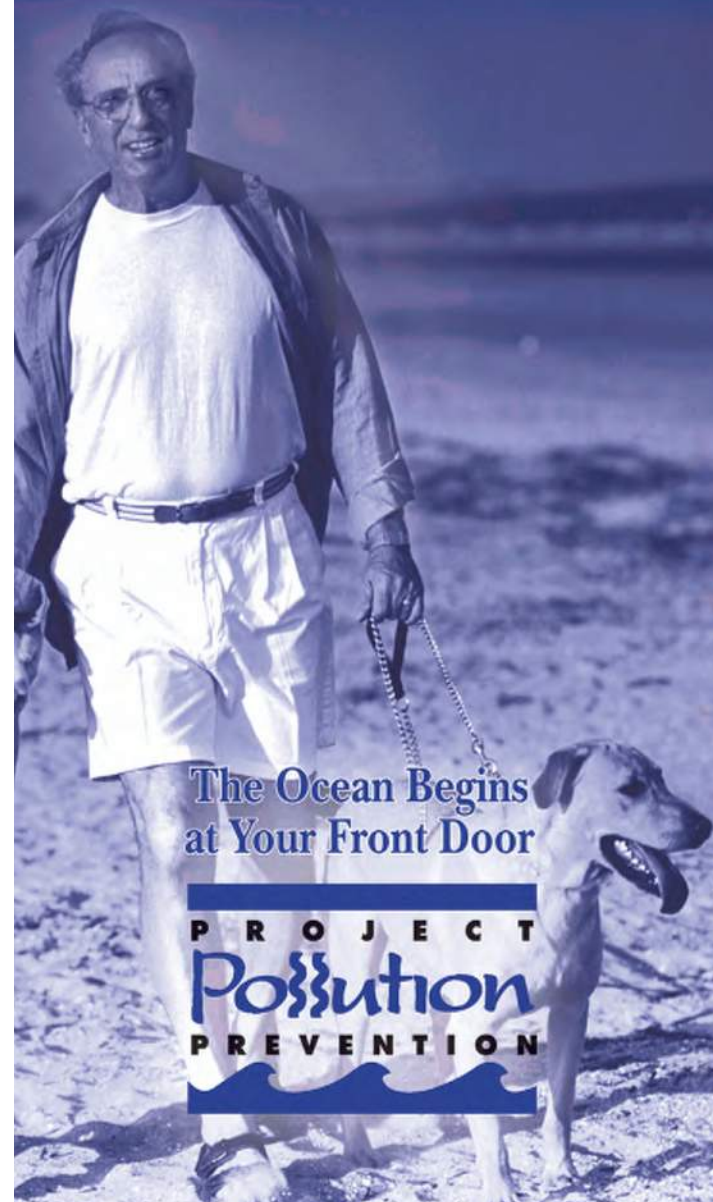
The tips contained in this brochure provide useful information to help prevent water pollution while caring for your pet. If you have other suggestions, please contact your city's stormwater representatives or call the Orange County Stormwater Program.



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Help Prevent Ocean Pollution:

Tips for Pet Care



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

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.



Clean 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

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



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.oclandfills.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.

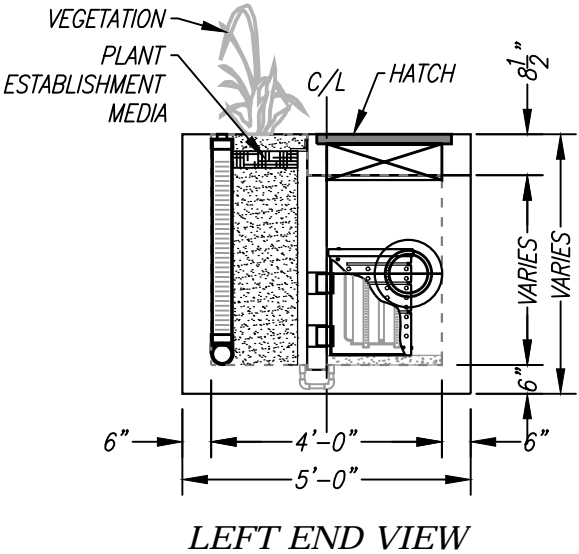
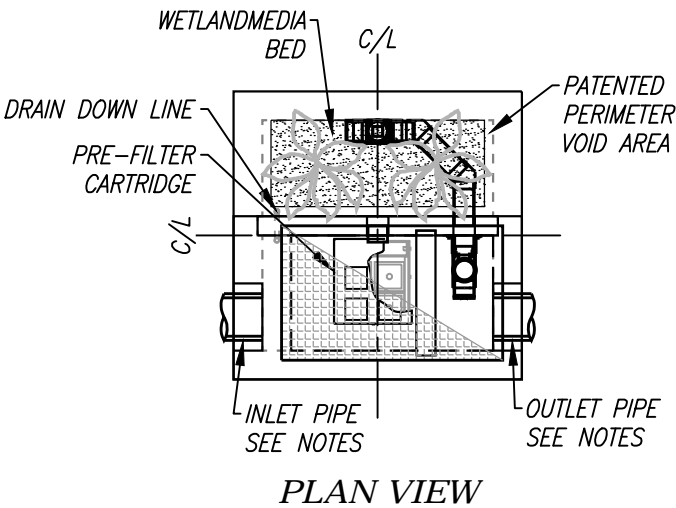
Spills

- 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 to fill out an incident reporting form.

Section VIII BMP Design Information & Operation / Maintenance Requirements

SITE SPECIFIC DATA			
PROJECT NUMBER			
PROJECT NAME			
PROJECT LOCATION			
STRUCTURE ID			
TREATMENT REQUIRED			
VOLUME BASED (CF)		FLOW BASED (CFS)	
N/A		0.052	
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			OFFLINE
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1			
INLET PIPE 2	N/A	N/A	N/A
OUTLET PIPE			
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION			
SURFACE LOAD	PEDESTRIAN		
FRAME & COVER	24" X 42"	OPEN PLANTER	N/A
NOTES:			

* PRELIMINARY NOT FOR CONSTRUCTION

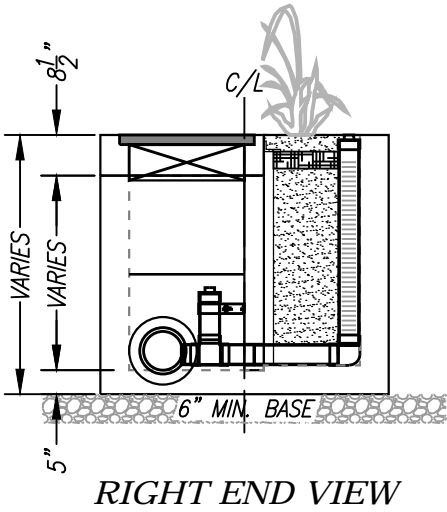
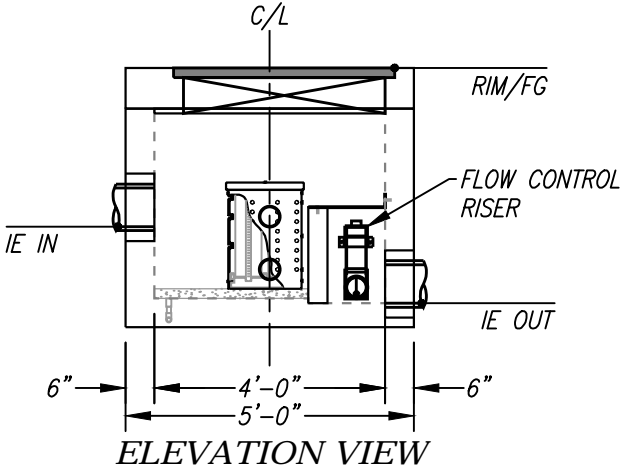


INSTALLATION NOTES

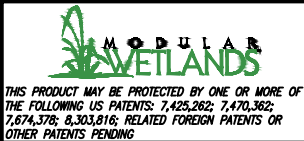
1. CONTRACTOR TO PROVIDE ALL LABOR, EQUIPMENT, MATERIALS AND INCIDENTALS REQUIRED TO OFFLOAD AND INSTALL THE SYSTEM AND APPURTENANCES IN ACCORDANCE WITH THIS DRAWING AND THE MANUFACTURERS SPECIFICATIONS, UNLESS OTHERWISE STATED IN MANUFACTURERS CONTRACT.
2. UNIT MUST BE INSTALLED ON LEVEL BASE. MANUFACTURER RECOMMENDS A MINIMUM 6" LEVEL ROCK BASE UNLESS SPECIFIED BY THE PROJECT ENGINEER. CONTRACTOR IS RESPONSIBLE TO VERIFY PROJECT ENGINEERS RECOMMENDED BASE SPECIFICATIONS.
4. 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 MANUFACTURERS STANDARD CONNECTION DETAIL.
5. CONTRACTOR RESPONSIBLE FOR INSTALLATION OF ALL RISERS, MANHOLES, AND HATCHES. CONTRACTOR TO GROUT ALL MANHOLES AND HATCHES TO MATCH FINISHED SURFACE UNLESS SPECIFIED OTHERWISE.
6. VEGETATION SUPPLIED AND INSTALLED BY OTHERS. ALL UNITS WITH VEGETATION MUST HAVE DRIP OR SPRAY IRRIGATION SUPPLIED AND INSTALLED BY OTHERS.
7. CONTRACTOR RESPONSIBLE FOR CONTACTING BIO CLEAN FOR ACTIVATION OF UNIT. MANUFACTURERS WARRANTY IS VOID WITH OUT PROPER ACTIVATION BY A BIO CLEAN REPRESENTATIVE.

GENERAL NOTES

1. MANUFACTURER TO PROVIDE ALL MATERIALS UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS, ELEVATIONS, SPECIFICATIONS AND CAPACITIES ARE SUBJECT TO CHANGE. FOR PROJECT SPECIFIC DRAWINGS DETAILING EXACT DIMENSIONS, WEIGHTS AND ACCESSORIES PLEASE CONTACT BIO CLEAN.



TREATMENT FLOW (CFS)	0.052
OPERATING HEAD (FT)	3.4
PRETREATMENT LOADING RATE (GPM/SF)	1.0
WETLAND MEDIA LOADING RATE (GPM/SF)	1.0



PROPRIETARY AND CONFIDENTIAL:

THE INFORMATION CONTAINED IN THIS DOCUMENT IS THE SOLE PROPERTY OF FORTERRA AND ITS COMPANIES. THIS DOCUMENT, NOR ANY PART THEREOF, MAY BE USED, REPRODUCED OR MODIFIED IN ANY MANNER WITH OUT THE WRITTEN CONSENT OF FORTERRA.



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



Section [] Modular Subsurface Flow Wetland System

PART 1 – GENERAL

01.01.00 Purpose

The purpose of this specification is to establish generally acceptable criteria for Modular Subsurface Flow Wetland Systems used for biofiltration of stormwater runoff including dry weather flows and other contaminated water sources. It is intended to serve as a guide to producers, distributors, architects, engineers, contractors, plumbers, installers, inspectors, agencies and users; to promote understanding regarding materials, manufacture and installation; and to provide for identification of devices complying with this specification.

01.02.00 Description

Modular Subsurface Flow Wetland Systems (MSFWS) are used for filtration of stormwater runoff including dry weather flows. The MSFWS is a pre-engineered biofiltration system composed of a pretreatment chamber containing filtration cartridges, a horizontal flow biofiltration chamber with a peripheral void area and a centralized and vertically extending underdrain, the biofiltration chamber containing a sorptive media mix which does not contain any organic material and a layer of plant establishment media, and a discharge chamber containing an orifice control structure. Treated water flows horizontally in series through the pretreatment chamber cartridges, biofiltration chamber and orifice control structure.

01.03.00 Manufacturer

The manufacturer of the MSFWS shall be one that is regularly engaged in the engineering design and production of systems developed for the treatment of stormwater runoff for at least (10) years, and which have a history of successful production, acceptable to the engineer of work. In accordance with the drawings, the MSFWS(s) shall be a filter device Manufactured by Bio Clean Environmental Services, Inc., or Modular Wetland Systems, Inc., or assigned distributors or licensees. Bio Clean Environmental Services Inc., and Modular Wetland Systems, Inc., can be reached at:

Corporate Headquarters:
Bio Clean Environmental Service, Inc.
2972 San Luis Rey Road
Oceanside, CA 92058
Phone: (760) 433-7640
Fax: (760) 433-3176
www.biocleanenvironmental.net

Corporate Headquarters:
Modular Wetland Systems, Inc.
P.O. Box 869
Oceanside, CA 92049
Phone: (760) 433-7650
www.modularwetlands.net



01.04.00 Submittals

- 01.04.01 Shop drawings are to be submitted with each order to the contractor and consulting engineer.
- 01.04.02 Shop drawings are to detail the MSFWS and all components required and the sequence for installation, including:
 - System configuration with primary dimensions
 - Interior components
 - Any accessory equipment called out on shop drawings
- 01.04.03 Inspection and maintenance documentation submitted upon request.

01.05.00 Work Included

- 01.05.01 Specification requirements for installation of MSFWS.
- 01.05.02 Manufacturer to supply components of the MSFWS(s):
 - Pretreatment chamber components (pre-assembled)
 - Concrete Structure(s)
 - Biofiltration chamber components (pre-assembled)
 - Flow control discharge structure (pre-assembled)

01.06.00 Reference Standards

ASTM C 29	Standard Test Method for Unit Weight and Voids in Aggregate
ASTM C 88	C 88 Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM C131	C 131 Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregates by Abrasion and Impact in the Los Angeles Machine
ASTM C 136	C 136 Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
ASTM C 330	C 330 Standard Specification for Lightweight Aggregate for Structural Concrete
ASTM D 698	Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft.-lb/ft ³ (600 kN-m/m ³))
ASTM D 1621	10 Standard Test Method for Compressive Properties Of Rigid Cellular Plastics
ASTM D 1777	ASTM D1777 - 96(2007) Standard Test Method for Thickness of Textile Materials
ASTM D 4716	Standard Test Method for Determining the (In-plane) Flow Rate per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head
AASHTO T 99-01	Standard Method of Test for Moisture-Density Relations of Soils Using a 2.5-kg (5.5-lb) Rammer and a 305-mm (12-in) Drop
AASHTO T 104	Standard Method of Test for Soundness of Aggregate by Use of Sodium Sulfate or Magnesium Sulfate
AASHTO T 260	Standard Method of Test for Sampling and Testing for Chloride Ion in Concrete and Concrete Raw Materials.
AASHTO T 288	Standard Method of Test for Determining Minimum Laboratory Soil Resistivity
AASHTO T 289	Standard Method of Test for Determining pH of Soil for Use in Corrosion Testing
AASHTO T 291	Standard Method of Test for Determining Water Soluble Chloride Ion Content in Soil
AASHTO T 290	T 290 Standard Method of Test for Determining Water Soluble Sulfate Ion Content in Soil



PART 2 – COMPONENTS

The Modular Subsurface Flow Wetland Systems (MSFWS) and all of its components shall be self-contained within a concrete structure constructed of concrete with a minimum 28 day compressive strength of 5,000 psi, with reinforcing per ASTM A 615, Grade 60, and supports and H₂O loading as indicated by AASHTO. Each Chamber shall have appropriate access hatches for easy maintenance and sized to allow removal of all internal components without disassembly. All water transfer system components shall conform with the following;

- Filter netting shall be 100% Polyester with a number 16 sieve size, and strength tested per ASTM D 3787.
- Drainage cells shall be manufactured of lightweight injection-molded plastic and have a minimum compressive strength test of 6,000 psi and a void area along the surface making contact with the filter media of 75% or greater. The cells shall be at least 2" in thickness and allow water to freely flow in all four directions.

02.01.00 Pretreatment Chamber Components

- 02.01.01 Filter Cartridges shall operate at a loading rate not to exceed 3 gallons per minute per square foot surface area.
- 02.01.02 Drain Down System shall include a pervious floor that allows water to drain into the underdrain pipe that is connected to the discharge chamber.

02.02.00 Biofiltration Chamber Components

- 02.02.01 Media shall consist of ceramic material produced by expanding and vitrifying select material in a rotary kiln. Media must be produced to meet the requirements of ASTM C330, ASTM C331, and AASHTO M195. Aggregates must have a minimum 24-hour water absorption of 10.5% mass. Media shall not contain any organic material. Flow through media shall be horizontal from the outer perimeter of the chamber toward the centralized and vertically extending underdrain. The retention time in the media shall be at least 3 minutes. Downward flow filters are not acceptable alternatives. The thickness of the media shall be at least 19" from influent end to effluent end. The loading rate on the media shall not exceed 1.1 gallons per minute per square foot surface area. Media must be contained within structure that spaces the surface of the media at least 2" from all vertically extending walls of the concrete structure.
- 02.02.02 Planting shall be native, drought tolerant species recommend by manufacturer and/or landscape architect.
- 02.02.03 Plant Support Media shall be made of a 3" thick moisture retention cell that is inert and contains no chemicals or fertilizers, is not made of organic material and has an internal void percentage of 80%.

02.03.00 Discharge Chamber

The discharge device shall house a flow control orifice plate that restricts flows greater than designed treatment flow rate. All piping components shall be made of a high-density polyethylene. The discharge chamber shall also contain a drain down filter if specified on the drawing.



PART 3 – PERFORMANCE

03.01.00 General

03.01.01

Function - The MSFWS has no moving internal components and functions based on gravity flow, unless otherwise specified. The MSFWS is composed of a pretreatment chamber, a biofiltration chamber and a discharge chamber. The pretreatment device houses cartridge media filters, which consist of filter media housed in a perforated enclosure. The untreated runoff flows into the system via subsurface piping and or surface inlet. Water entering the system is forced through the filter cartridge enclosures by gravity flow. Then the flow contacts the filter media. The flow through the media is horizontal toward the center of each individual media filter. In the center of the media shall be a round slotted PVC pipe of no greater than 1.5" in diameter. The slotted PVC pipe shall extend downward into the water transfer cavity of the cartridge. The slotted PVC pipe shall be threaded on the bottom to connect to the water transfer cavity. After pollutants have been removed by the filter media the water discharges the pretreatment chamber and flows into the water transfer system and is conveyed to the biofiltration chamber. Once runoff has been filtered by the biofiltration chamber it is collected by the vertical underdrain and conveyed to a discharge chamber equipped with a flow control orifice plate. Finally the treated flow exits the system.

03.01.02

Pollutants - The MSFWS will remove and retain debris, sediments, TSS, dissolved and particulate metals and nutrients including nitrogen and phosphorus species, bacteria, BOD, oxygen demanding substances, organic compounds and hydrocarbons entering the filter during frequent storm events and continuous dry weather flows.

03.01.03

Treatment Flow Rate and Bypass - The MSFWS operates in-line. The MSFWS will treat 100% of the required water quality treatment flow based on a minimum filtration capacities listed in section 03.02.00. The size of the system must match those provided on the drawing to ensure proper performance and hydraulic residence time.

Minimum Treatment Capabilities

- System must be capable of treating flows to the specified treatment flow rate on the drawings. The flow rate shall be controlled by an orifice plate.

PART 4 - EXECUTION

04.01.00 General

The installation of the MSFWS shall conform to all applicable national, state, state highway, municipal and local specifications.

04.02.00 Installation

The Contractor shall furnish all labor, equipment, materials and incidentals required to install the (MSFWS) device(s) and appurtenances in accordance with the drawings and these specifications.



- 04.02.01 Grading and Excavation site shall be properly surveyed by a registered professional surveyor, and clearly marked with excavation limits and elevations. After site is marked it is the responsibility of the contractor to contact local utility companies and/or DigAlert to check for underground utilities. All grading permits shall be approved by governing agencies before commencement of grading and excavation. Soil conditions shall be tested in accordance with the governing agencies requirements. All earth removed shall be transported, disposed, stored, and handled per governing agencies standards. It is the responsibility of the contractor to install and maintain proper erosion control measures during grading and excavation operations.
- 04.02.02 Compaction – All soil shall be compacted per registered professional soils engineer's recommendations prior to installation of MSFWS components.
- 04.02.03 Backfill shall be placed according to a registered professional soils engineer's recommendations, and with a minimum of 6" of gravel under all concrete structures.
- 04.02.04 Concrete Structures – After backfill has been inspected by the governing agency and approved the concrete structures shall be lifted and placed in proper position per plans.
- 04.02.05 Subsurface Flow Wetland Media shall be carefully loaded into area so not to damage the Wetland Liner or Water Transfer Systems. The entire wetland area shall be filled to a level 9 inches below finished surface.
- 04.02.06 Planting layer shall be installed per manufacturer's drawings and consist of a minimum 3" grow enhancement media that ensures greater than 95% plant survival rate, and 6" of wetland media. Planting shall consist of native plants recommended by manufacturer and/or landscape architect. Planting shall be drip irrigated for at least the first 3 months to insure long term plant growth. No chemical herbicides, pesticides, or fertilizers shall be used in the planting or care and maintenance of the planted area.

04.03.00 Shipping, Storage and Handling

- 04.03.01 Shipping – MSFWS shall be shipped to the contractor's address or job site, and is the responsibility of the contractor to offload the unit(s) and place in the exact site of installation.
- 04.03.02 Storage and Handling– The contractor shall exercise care in the storage and handling of the MSFWS and all components prior to and during installation. Any repair or replacement costs associated with events occurring after delivery is accepted and unloading has commenced shall be born by the contractor. The MSFWS(s) and all components shall always be stored indoors and transported inside the original shipping container until the unit(s) are ready to be installed. The MSFWS shall always be handled with care and lifted according to OSHA and NIOSA lifting recommendations and/or contractor's workplace safety professional recommendations.

04.04.00 Maintenance and Inspection

- 04.04.01 Inspection – After installation, the contractor shall demonstrate that the MSFWS has been properly installed at the correct location(s), elevations, and with appropriate components. All components associated with the MSFWS and its installation shall be subject to inspection by the engineer at the place of installation. In addition, the contractor shall demonstrate that the MSFWS has been installed per the manufacturer's specifications and recommendations. All



- components shall be inspected by a qualified person once a year and results of inspection shall be kept in an inspection log.
- 04.04.02 Maintenance – The manufacturer recommends cleaning and debris removal maintenance of once a year and replacement of the Cartridge Filters as needed. The maintenance shall be performed by someone qualified. A Maintenance Manual is available upon request from the manufacturer. The manual has detailed information regarding the maintenance of the MSFWS. A Maintenance/Inspection record shall be kept by the maintenance operator. The record shall include any maintenance activities performed, amount and description of debris collected, and the condition of the filter.
- 04.04.03 Material Disposal - All debris, trash, organics, and sediments captured by the MSFWS shall be transported and disposed of at an approved facility for disposal in accordance with local and state requirements. Please refer to state and local regulations for the proper disposal of toxic and non-toxic material.

PART 5 – QUALITY ASSURANCE

05.01.00 Warranty

The Manufacturer shall guarantee the MSFWS against all manufacturing defects in materials and workmanship for a period of (5) years from the date of delivery to the _____. The manufacturer shall be notified of repair or replacement issues in writing within the warranty period. The MSFWS is limited to recommended application for which it was designed.

05.02.00 Performance Certification

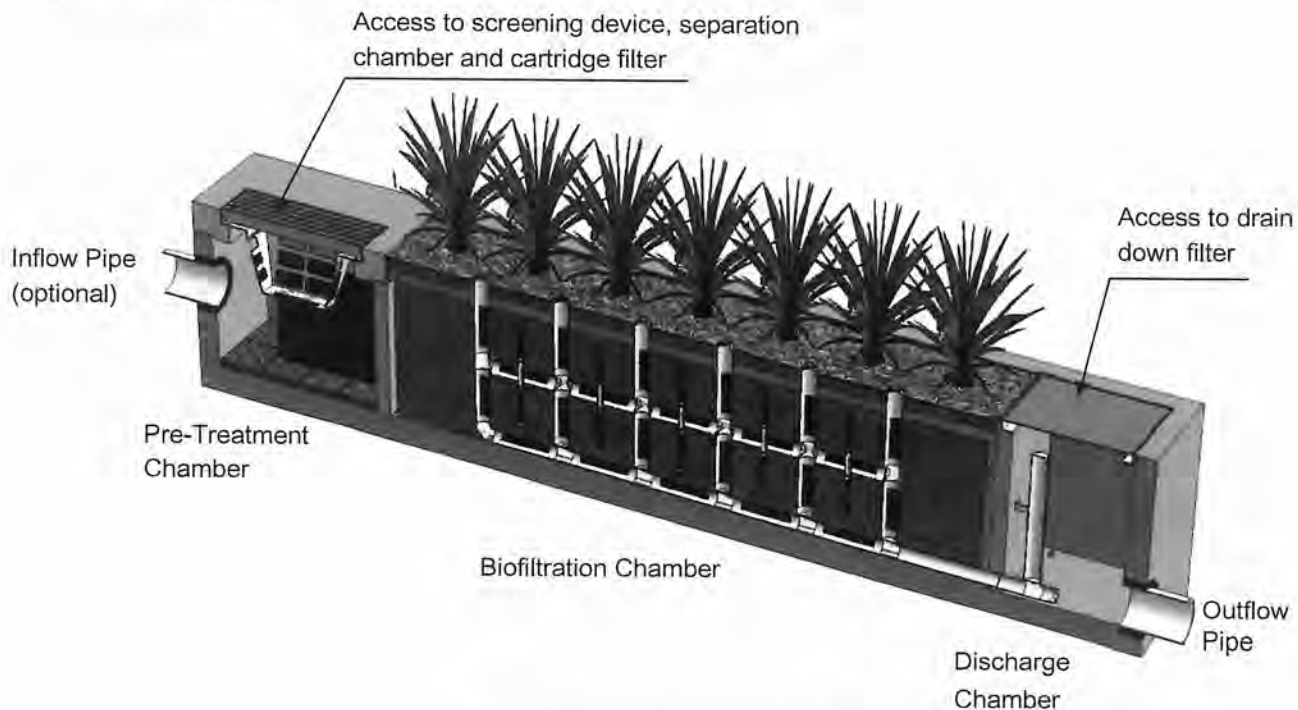
The MSFWS manufacturer shall submit to the Engineer of Record a "Manufacturer's Performance Certificate" certifying the MSFWS is capable of achieving the specified removal efficiency for suspended solids, phosphorous and dissolved metals.

Maintenance Guidelines for Modular Wetland System - Linear

Maintenance Summary

- Remove Trash from Screening Device – average maintenance interval is 6 to 12 months.
 - (5 minute average service time).
- Remove Sediment from Separation Chamber – average maintenance interval is 12 to 24 months.
 - (10 minute average service time).
- Replace Cartridge Filter Media – average maintenance interval 12 to 24 months.
 - (10-15 minute per cartridge average service time).
- Replace Drain Down Filter Media – average maintenance interval is 12 to 24 months.
 - (5 minute average service time).
- Trim Vegetation – average maintenance interval is 6 to 12 months.
 - (Service time varies).

System Diagram



Maintenance Procedures

Screening Device

1. Remove grate or manhole cover to gain access to the screening device in the Pre-Treatment Chamber. Vault type units do not have screening device. Maintenance can be performed without entry.
2. Remove all pollutants collected by the screening device. Removal can be done manually or with the use of a vacuum truck. The hose of the vacuum truck will not damage the screening device.
3. Screening device can easily be removed from the Pre-Treatment Chamber to gain access to separation chamber and media filters below. Replace grate or manhole cover when completed.

Separation Chamber

1. Perform maintenance procedures of screening device listed above before maintaining the separation chamber.
2. With a pressure washer spray down pollutants accumulated on walls and cartridge filters.
3. Vacuum out Separation Chamber and remove all accumulated pollutants. Replace screening device, grate or manhole cover when completed.

Cartridge Filters

1. Perform maintenance procedures on screening device and separation chamber before maintaining cartridge filters.
2. Enter separation chamber.
3. Unscrew the two bolts holding the lid on each cartridge filter and remove lid.
4. Remove each of 4 to 8 media cages holding the media in place.
5. Spray down the cartridge filter to remove any accumulated pollutants.
6. Vacuum out old media and accumulated pollutants.
7. Reinstall media cages and fill with new media from manufacturer or outside supplier. Manufacturer will provide specification of media and sources to purchase.
8. Replace the lid and tighten down bolts. Replace screening device, grate or manhole cover when completed.

Drain Down Filter

1. Remove hatch or manhole cover over discharge chamber and enter chamber.
2. Unlock and lift drain down filter housing and remove old media block. Replace with new media block. Lower drain down filter housing and lock into place.
3. Exit chamber and replace hatch or manhole cover.



Maintenance Notes

1. Following maintenance and/or inspection, it is recommended the maintenance operator prepare a maintenance/inspection record. The record should include any maintenance activities performed, amount and description of debris collected, and condition of the system and its various filter mechanisms.
2. The owner should keep maintenance/inspection record(s) for a minimum of five years from the date of maintenance. These records should be made available to the governing municipality for inspection upon request at any time.
3. Transport all debris, trash, organics and sediments to approved facility for disposal in accordance with local and state requirements.
4. Entry into chambers may require confined space training based on state and local regulations.
5. No fertilizer shall be used in the Biofiltration Chamber.
6. Irrigation should be provided as recommended by manufacturer and/or landscape architect. Amount of irrigation required is dependent on plant species. Some plants may require irrigation.

Maintenance Procedure Illustration

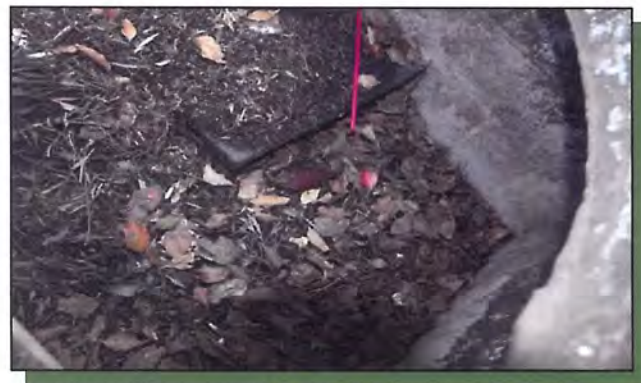
Screening Device

The screening device is located directly under the manhole or grate over the Pre-Treatment Chamber. It's mounted directly underneath for easy access and cleaning. Device can be cleaned by hand or with a vacuum truck.



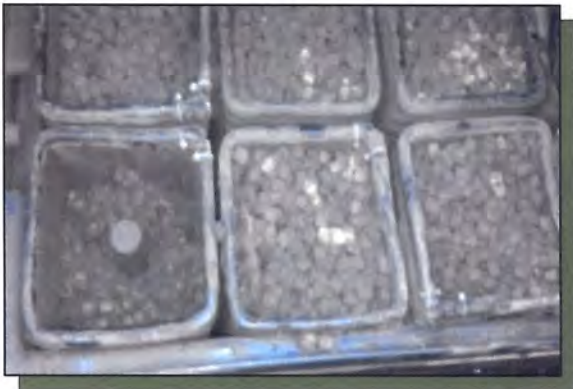
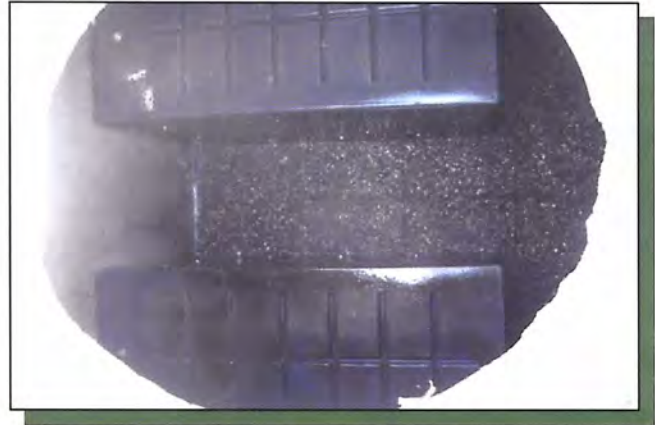
Separation Chamber

The separation chamber is located directly beneath the screening device. It can be quickly cleaned using a vacuum truck or by hand. A pressure washer is useful to assist in the cleaning process.



Cartridge Filters

The cartridge filters are located in the Pre-Treatment chamber connected to the wall adjacent to the biofiltration chamber. The cartridges have removable tops to access the individual media filters. Once the cartridge is open media can be easily removed and replaced by hand or a vacuum truck.



Drain Down Filter

The drain down filter is located in the Discharge Chamber. The drain filter unlocks from the wall mount and hinges up. Remove filter block and replace with new block.



Trim Vegetation

Vegetation should be maintained in the same manner as surrounding vegetation and trimmed as needed. No fertilizer shall be used on the plants. Irrigation per the recommendation of the manufacturer and or landscape architect. Different types of vegetation requires different amounts of irrigation.





Inspection Form



Modular Wetland System, Inc.

P. 760.433-7640

F. 760-433-3176

E. Info@modularwetlands.com

www.modularwetlands.com



Inspection Report Modular Wetlands System



Project Name _____		For Office Use Only (Reviewed By) _____ (Date) _____ Office personnel to complete section to the left.
Project Address _____ <div style="text-align: right; font-size: small;">(city) (Zip Code)</div>		
Owner / Management Company _____		
Contact _____	Phone () - _____	
Inspector Name _____	Date ____ / ____ / ____	Time _____ AM / PM
Type of Inspection <input type="checkbox"/> Routine <input type="checkbox"/> Follow Up <input type="checkbox"/> Complaint <input type="checkbox"/> Storm Storm Event in Last 72-hours? <input type="checkbox"/> No <input type="checkbox"/> Yes		
Weather Condition _____		Additional Notes _____

Inspection Checklist

Modular Wetland System Type (Curb, Grate or UG Vault): _____ Size (22', 14' or etc.): _____

Structural Integrity:	Yes	No	Comments
Damage to pre-treatment access cover (manhole cover/grate) or cannot be opened using normal lifting pressure?			
Damage to discharge chamber access cover (manhole cover/grate) or cannot be opened using normal lifting pressure?			
Does the MWS unit show signs of structural deterioration (cracks in the wall, damage to frame)?			
Is the inlet/outlet pipe or drain down pipe damaged or otherwise not functioning properly?			
Working Condition:			
Is there evidence of illicit discharge or excessive oil, grease, or other automobile fluids entering and clogging the unit?			
Is there standing water in inappropriate areas after a dry period?			
Is the filter insert (if applicable) at capacity and/or is there an accumulation of debris/trash on the shelf system?			
Does the depth of sediment/trash/debris suggest a blockage of the inflow pipe, bypass or cartridge filter? If yes specify which one in the comments section. Note depth of accumulation in in pre-treatment chamber.			Depth: _____
Does the cartridge filter media need replacement in pre-treatment chamber and/or discharge chamber?			Chamber _____
Any signs of improper functioning in the discharge chamber? Note issues in comments section.			
Other Inspection Items:			
Is there an accumulation of sediment/trash/debris in the wetland media (if applicable)?			
Is it evident that the plants are alive and healthy (if applicable)? Please note Plant Information below.			
Is there a septic or foul odor coming from inside the system?			

Waste:	Yes	No
Sediment / Silt / Clay		
Trash / Bags / Bottles		
Green Waste / Leaves / Foliage		

Recommended Maintenance	
No Cleaning Needed	
Schedule Maintenance as Planned	
Needs Immediate Maintenance	

Plant Information	
Damage to Plants	
Plant Replacement	
Plant Trimming	

Additional Notes: _____



Maintenance Report



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F. 760-433-3176

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www.modularwetlands.com



Cleaning and Maintenance Report Modular Wetlands System



Project Name _____

Project Address _____

(city) (Zip Code)

Owner / Management Company _____

Contact _____

Phone () - - -

Inspector Name _____

Date ____ / ____ / ____ Time ____ AM / PM

Type of Inspection ☐ Routine ☐ Follow Up ☐ Complaint

☐ Storm Storm Event in Last 72-hours? ☐ No ☐ Yes

Weather Condition _____

Additional Notes _____

For Office Use Only

(Reviewed By)

(Date)

Office personnel to complete section to the left.

Site Map #	GPS Coordinates of Insert	Manufacturer / Description / Sizing	Trash Accumulation	Foliage Accumulation	Sediment Accumulation	Total Debris Accumulation	Condition of Media 25/50/75/100 (will be changed @ 75%)	Operational Per Manufactures' Specifications (If not, why?)
	Lat: _____	MWS Catch Basins						
	Long: _____							
		MWS Sedimentation Basin						
		Media Filter Condition						
		Plant Condition						
		Drain Down Media Condition						
		Discharge Chamber Condition						
		Drain Down Pipe Condition						
		Inlet and Outlet Pipe Condition						

Comments:

BIO-7: Proprietary Biotreatment

Proprietary biotreatment devices are devices that are manufactured to mimic natural systems such as bioretention areas by incorporating plants, soil, and microbes engineered to provide treatment at higher flow rates or volumes and with smaller footprints than their natural counterparts. Incoming flows are typically filtered through a planting media (mulch, compost, soil, plants, microbes, etc.) and either infiltrated or collected by an underdrain and delivered to the storm water conveyance system. Tree box filters are an increasingly common type of proprietary biotreatment device that are installed at curb level and filled with a bioretention type soil. For low to moderate flows they operate similarly to bioretention systems and are bypassed during high flows. Tree box filters are highly adaptable solutions that can be used in all types of development and in all types of soils but are especially applicable to dense urban parking lots, street, and roadways.

Also known as:

- Catch basin planter box
- Bioretention vault
- Tree box filter



Proprietary biotreatment

Source:

<http://www.americastusa.com/index.php/filterra/>

Feasibility Screening Considerations

- Proprietary biotreatment devices that are unlined may cause incidental infiltration. Therefore, an evaluation of site conditions should be conducted to evaluate whether the BMP should include an impermeable liner to avoid infiltration into the subsurface.

Opportunity Criteria

- Drainage areas of 0.25 to 1.0 acres.
- Land use may include commercial, residential, mixed use, institutional, and subdivisions. Proprietary biotreatment facilities may also be applied in parking lot islands, traffic circles, road shoulders, and road medians.
- Must not adversely affect the level of flood protection provided by the drainage system.

OC-Specific Design Criteria and Considerations

- ☒ Frequent maintenance and the use of screens and grates to keep trash out may decrease the likelihood of clogging and prevent obstruction and bypass of incoming flows.
- ☒ Consult proprietors for specific criteria concerning the design and performance.
- ☒ Proprietary biotreatment may include specific media to address pollutants of concern. However, for proprietary device to be considered a biotreatment device the media must be capable of supporting rigorous growth of vegetation.
- ☒ Proprietary systems must be acceptable to the reviewing agency. Reviewing agencies shall have the discretion to request performance information. Reviewing agencies shall have the discretion to deny the use of a proprietary BMP on the grounds of performance, maintenance considerations, or other relevant factors.



In right of way areas, plant selection should not impair traffic lines of site. Local jurisdictions may also limit plant selection in keeping with landscaping themes.

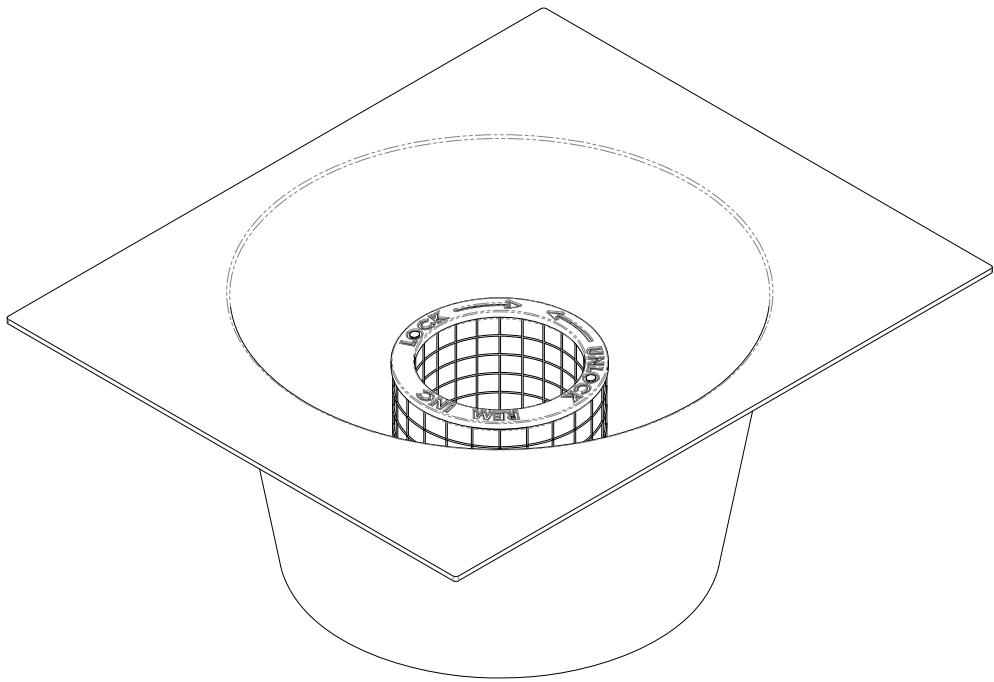
Computing Sizing Criteria for Proprietary Biotreatment Device

- Proprietary biotreatment devices can be volume based or flow-based BMPs.
- Volume-based proprietary devices should be sized using the Simple Design Capture Volume Sizing Method described in [Appendix III.3.1](#) or the Capture Efficiency Method for Volume-Based, Constant Drawdown BMPs described in [Appendix III.3.2](#).
- The required design flowrate for flow-based proprietary devices should be computed using the Capture Efficiency Method for Flow-based BMPs described in [Appendix III.3.3](#).

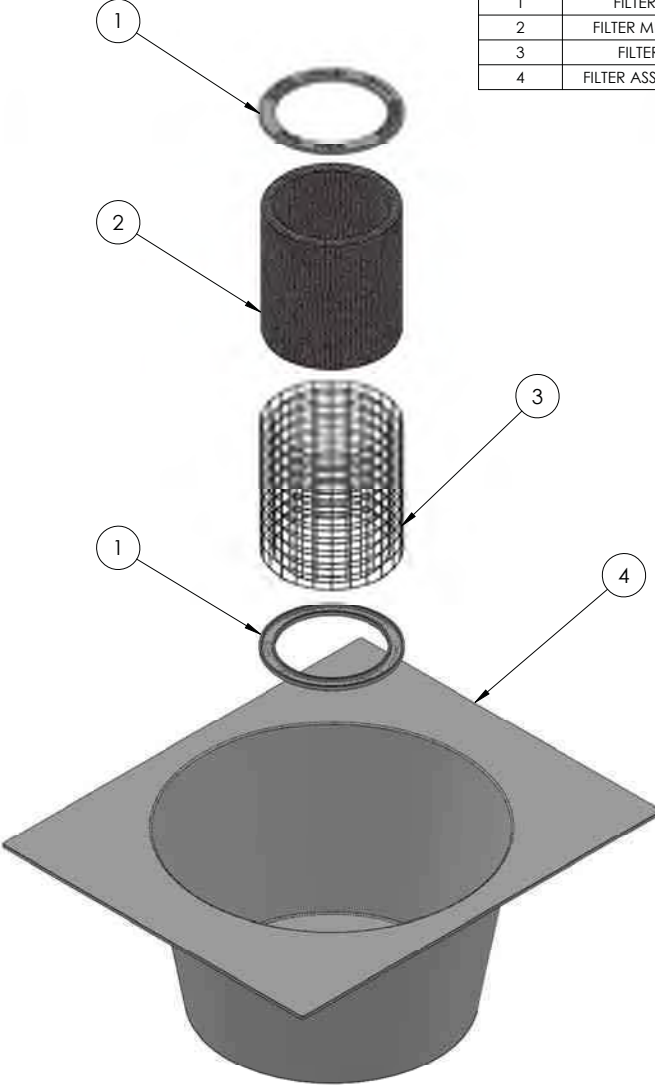
Additional References for Design Guidance

- Los Angeles Unified School District (LAUSD) Stormwater Technical Manual, Chapter 4:
http://www.laschools.org/employee/design/fs-studies-and-reports/download/white_paper_report_material/Storm_Water_Technical_Manual_2009-opt-red.pdf?version_id=76975850
- Los Angeles County Stormwater BMP Design and Maintenance Manual, Chapter 9:
http://dpw.lacounty.gov/DES/design_manuals/StormwaterBMPDesignandMaintenance.pdf
- Santa Barbara BMP Guidance Manual, Chapter 6:
http://www.santabarbaraca.gov/NR/rdonlyres/91D1FA75-C185-491E-A882-49EE17789DF8/0/Manual_071008_Final.pdf

1. All dimensions are in inches, unless otherwise noted.
2. The TRITON - TR Series Drop Inlet Filters can be sized to fit most industry standard catch basins. REM also designs custom filters for unique storm water infrastructures and applications.
3. Filter bodies are constructed using non-reactive high density polyethylene plastic (HDPE) with added U.V. inhibitors.
4. Filter cartridge housings are constructed utilizing Type 304 Stainless Steel, with 2" welded square openings.
5. Removable cartridge tops are constructed utilizing over 40% recycled Non-reactive High Density Polystyrene Plastic with added U.V. inhibitors.
6. REM TRITON replacement Filter Media Packs are charged with REM FOG media an expanded volcanic ash medium treated to be highly hydrophobic housed in a durable geo-textile perforated polypropylene woven fabric. REM FOG media effectively encapsulates liquefied petroleum hydrocarbons (Fats, Oils & Grease including animal fats). The media's hydrophobic characteristic allows for greater polishing of flow resulting in the reduction of Total Suspended Solids (TSS). Suspended solid reduction includes but is not limited to debris, trash, silt sediment and agglomerated heavy metals. (Additional media options are available including mixed blends of granulated carbon [AC] and Zeolite [ZEO]). For trash/debris capturing only, Bioflex Media (BFTG) should be chosen.
7. REM TRITON filter cartridges are removable for ease of cleaning and maintenance.
8. The TRITON filter design requires water flows to filter through media, preventing low flow bypass.
9. Filter designs include a high flow overflow bypass to eliminate pooling or flooding during heavy rain events.
10. See REM Specifier Sheets for size, model and flow rate information.
11. REM TRITON filters shall be installed and maintained in accordance with manufacturer recommendations.
12. Maintenance information and replacement REM Media Packs are available upon request by contacting REM at sales@remfilters.com or (888) 526-4736.
13. U.S. Patent Number: 6,217,757 B1
14. Made in the USA.



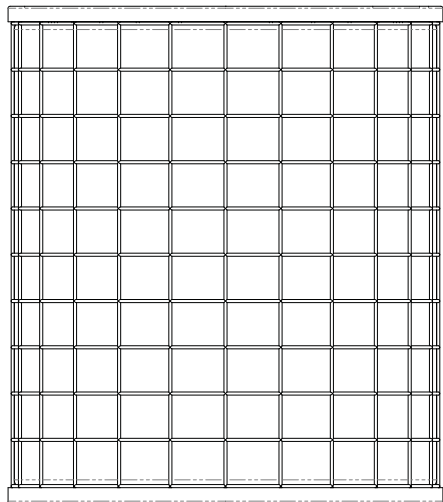
ITEM NO.	DESCRIPTION	QTY.
1	FILTER COVER	2
2	FILTER MEDIA PACK	1
3	FILTER CAGE	1
4	FILTER ASSEMBLY BASE	1



PROPERTY AND CONFIDENTIAL THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF REM. IT IS TO BE USED FOR THE PROJECT AND NOT BE REPRODUCED OR COPIED IN ANY MANNER WITHOUT THE WRITTEN PERMISSION OF REM. COMPANY NAME HERE IS PROHIBITED.		DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONS & DECIMALS ONE PLACE DECIMAL > 0.5 TWO PLACE DECIMAL < 0.5		UNLESS OTHERWISE SPECIFIED: DRAWN: A.C. CHECKED: TYPED: A.P.P. DATE: 2/25/14	DATE: 2/25/14	REVISIONS REV. NO. 01-005 DATE 2/25/14 BY A	REVISIONS REV. NO. 01-005 DATE 2/25/14 BY A
NEXT STEP		USED ON		FISH		G.I.A.	
APPLICATION		USED ON		FISH		COMMENTS	

REM Environmental Manufacturing Inc.
10000 Highway 100, Suite 100
Houston, Texas 77036
Tel: 281-410-1000
Fax: 281-410-1001
Email: sales@remfilters.com
Website: www.remfilters.com

TITLE: DROP INLET FILTER
SIZE: DWG. NO. 01-005
SCALE: 1:4 WEIGHT: SHEET 1 OF 4



SPECIFIER CHART		INLET INSIDE DIMENSION (IN)
TRITON DROP INLET FILTERS		
MODEL		(Inch x Inch)
TR12RD Configured with:		
Cartridge: TR7-CART (4") § (Standard)		12" Dia. RD.
Cartridge: TR7-CART (8")		
Cartridge: TR7-CART (16")		
TR1212 Configured with:		
Cartridge: TR7-CART (4") § (Standard)		12" X 12"
Cartridge: TR7-CART (8")		
Cartridge: TR7-CART (16")		
TR16RD Configured with:		
Cartridge: TR7-CART (4") § (Shallow)		16" Dia. RD.
Cartridge: TR7-CART (8") § (Standard)		
Cartridge: TR7-CART (16")	(Deep)	
TR1616 Configured with:		
Cartridge: TR7-CART (4")		16" X 16"
Cartridge: TR7-CART (8") § (Standard)		
Cartridge: TR7-CART (16")		
TR18RD Configured with:		
Cartridge: TR10-CART (4")		18" Dia. RD.
Cartridge: TR10-CART (8") § (Standard)		
Cartridge: TR10-CART (16")		
TR1818 Configured with:		
Cartridge: TR10-CART (4")		18" X 18"
Cartridge: TR10-CART (8") § (Standard)		
Cartridge: TR10-CART (16")		
TR1824 Configured with:		
Cartridge: TR10-CART (8") § (Standard)		18" X 24"
Cartridge: TR10-CART (16")		
Cartridge: TR10-CART (32")		
TR2024 Configured with:		
Cartridge: TR10-CART (8") § (Standard)		20" X 24"
Cartridge: TR10-CART (16")		
Cartridge: TR10-CART (32")		
TR2424 Configured with:		
Cartridge: TR14-CART (8") § (Standard)		24" X 24"
Cartridge: TR14-CART (16")		
Cartridge: TR14-CART (32")		
TR24RD Configured with:		
Cartridge: TR14-CART (8") § (Standard)		24" Dia. RD.
Cartridge: TR14-CART (16")		
Cartridge: TR14-CART (32")		
TR2436 Configured with:		
Cartridge: TR10-CART (8") (Qty 2) § (Standard)		24" X 36"
Cartridge: TR10-CART (16") (Qty 2)		
Cartridge: TR10-CART (32") (Qty 2)		
TR30RD Configured with:		
Cartridge: TR14-CART (8")		30" Dia. RD.
Cartridge: TR14-CART (16") § (Standard)		
Cartridge: TR14-CART (32")		
TR3030 Configured with:		
Cartridge: TR14-CART (8")		30" X 30"
Cartridge: TR14-CART (16") § (Standard)		
Cartridge: TR14-CART (32")		
TR2448 Configured with:		
Cartridge: TR14-CART (8") (Qty 2) § (Standard)		24" X 48"
Cartridge: TR14-CART (16") (Qty 2)		
Cartridge: TR14-CART (32") (Qty 2)		
TR3636 Configured with:		
Cartridge: TR14-CART (8")		36" X 36"
Cartridge: TR14-CART (16") § (Standard)		
Cartridge: TR14-CART (32")		
TR36RD Configured with:		
Cartridge: TR14-CART (8")		36" Dia. RD.
Cartridge: TR14-CART (16") § (Standard)		
Cartridge: TR14-CART (32")		
TR42RD Configured with:		
Cartridge: TR14-CART (8")		42" Dia. RD.
Cartridge: TR14-CART (16") § (Standard)		
Cartridge: TR14-CART (32")		
TR4848 Configured with:		
Cartridge: TR24-CART (8")		48" X 48"
Cartridge: TR24-CART (16") § (Standard)		
Cartridge: TR24-CART (34")		
TR48RD Configured with:		
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Cartridge: TR24-CART (16") § (Standard)		
Cartridge: TR24-CART (34")		

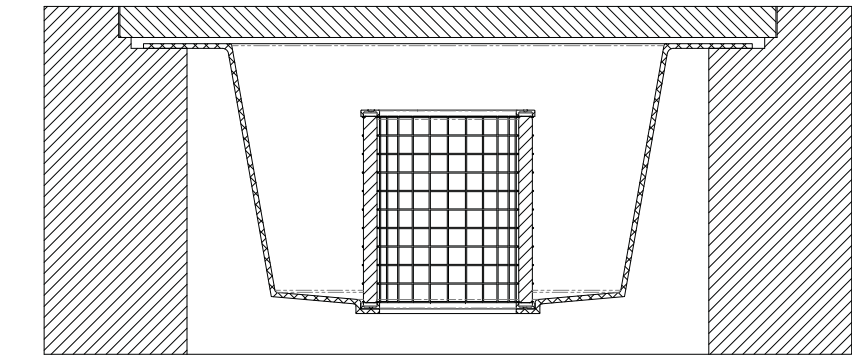
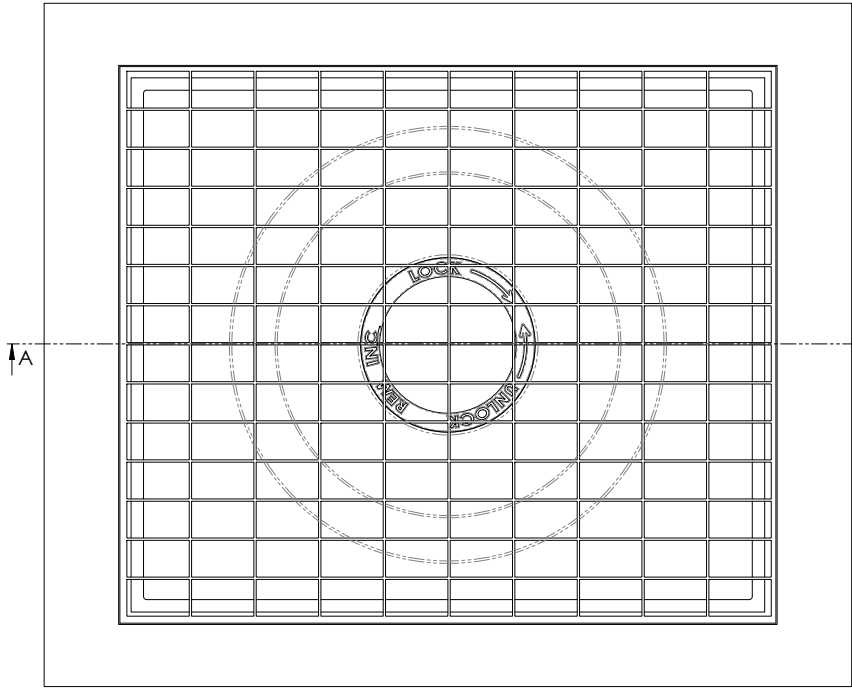


DATE	2/25/14
A.C.	
DESIGN	
CHECKED	
TRG APPR	
WFC APPR	
G.A.	
COMMENTS	

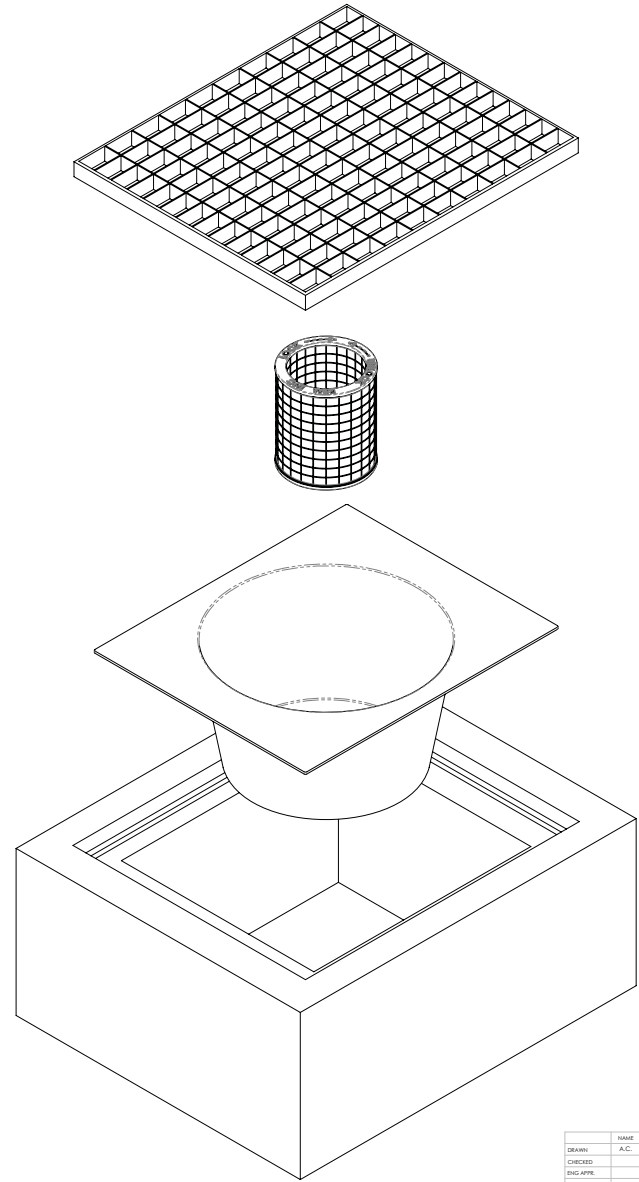


REM
TITLE: DROP INLET FILTER
SIZE: D
DWG. NO.: 01-005
SCALE: 1:2
WEIGHT: 1
REV: A
SHEET 2 OF 4

Revel Environmental Manufacturing Inc.
10100-45th St. N.E.
Bellevue, WA 98006
Phone: 206.461.1000
Fax: 206.461.1001
Email: sales@revel.com
Website: www.revel.com

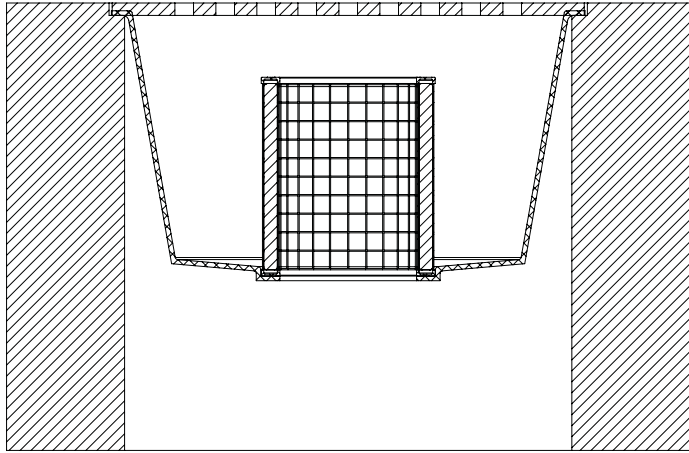
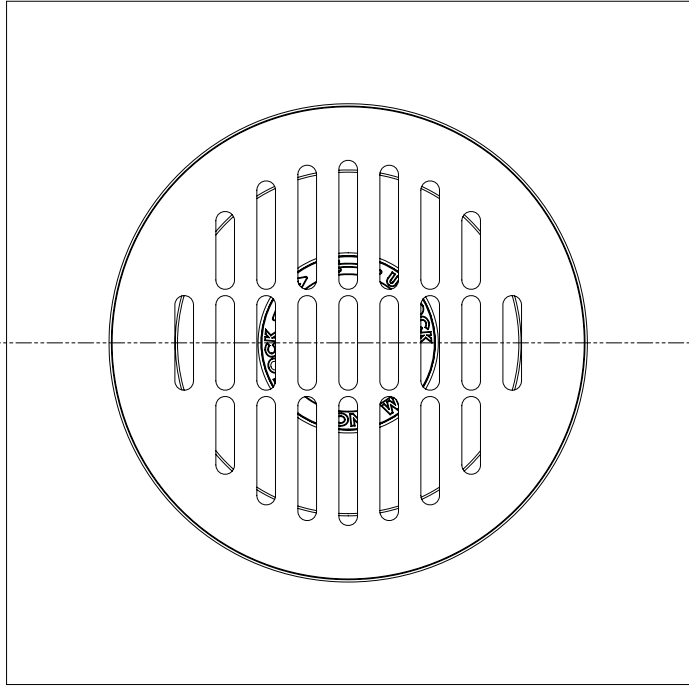


SECTION A-A

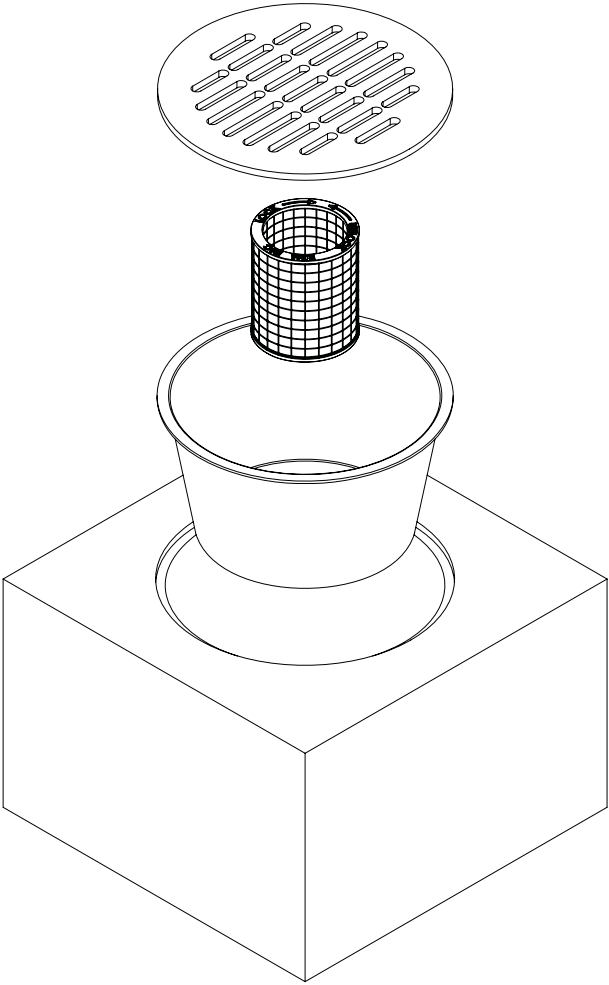


DESIGN	NAME	DATE
CHECKED	A.C.	2/6/14
ENG. APPRO.		
MAN. APPRO.		
G.A.		
COMMENTS		

 REM REM Environmental Manufacturing Inc. 1000 E. 10th St., Suite 100 Fort Collins, CO 80501 Phone: 970.221.1111 Fax: 970.221.1112 Email: info@rem.com	TITLE: DROP INLET FILTER SIZE: D DWG. NO.: 01-005 SCALE: 1:5 WEIGHT:	REV A SHEET 3 OF 4
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SECTION B-B



DESIGN	A.C.	2/25/14	DATE	2/25/14
CHECKED				
INSP. APPRO.				
SEC. APPRO.				
G.A.				
COMMENTS				



REM
Rural Environmental Manufacturing Inc.
1000 S. 10th St., Suite 100
P.O. Box 1000, Rapid City, SD 57701
760-222-1111

Drop Inlet Filter
1000 S. 10th St., Suite 100
P.O. Box 1000, Rapid City, SD 57701
760-222-1111

TITLE		DROP INLET FILTER	
SIZE	DWG. NO.	REV	
D	01-005	A	
SCALE: 1:5		WEIGHT:	SHEET 4 OF 4

**Revel Environmental Manufacturing Inc.**

sales@remfilters.com

(888) 526-4736

Lic. No. 857410

Northern California
960-B Detroit Avenue
Concord, California 94518
P: (925) 676-4736
F: (925) 676-8676

Southern California
2110 South Grand Avenue
Santa Ana, California 92705
P: (714) 557-2676
F: (714) 557-2679

**Operation & Maintenance (O&M)
and Procedures****REM TRITON Filter Recommended Maintenance Procedures:****Maintenance and Inspections:**

In order to ensure proper operation, REM (Revel Environmental Manufacturing, Inc.) recommends that REM Stormwater filters be serviced and maintained when debris and pollutant accumulations exceed no more than 80% of the filter's capacity. REM recommends that the filters are inspected and serviced at a minimum of three times (3X's) per seasonal cycle year. The frequency and length of duration between inspections and maintenance may fluctuate based on specific site conditions such as local weather conditions, site use, and pollutant type and loading volume.

Filter Media Replacement:

In order to ensure proper operation, REM recommends that the FOG Media, or other specified media (such as Activated Carbon, and/or Zeolite) be replaced when the outer surface of media is no more than 50% coated with contaminants. (The surface area of REM's standard FOG media is stark white in color. The media will blacken with encapsulated contaminants over time.) It is recommended that REM media packs and Bioflex be replaced a minimum of one time (1X) per seasonal cycle year. Sites with higher pollutant loading concentrations may require more frequent service and media replacement. Purchase replacement media packs from REM at (888) 526-4736 or sales@remfilters.com. Custom media configurations are available upon.

Disposal:

Captured pollutant debris and spent media must be disposed of in accordance with all Federal, State, and Local Laws and Regulations.

On-site Procedures for Triton Catch Basin Filter Inserts:

1. Secure area (proceed with traffic and pedestrian control plan).
2. Clean surface area immediately around each storm drain utilizing a stiff bristled push-broom, flat shovel or industrial vacuum.
3. Proceed with confined space procedures as necessary.
4. Remove grate or manhole cover and set aside.
5. Inspect perimeter filter flange gasket. Confirm media cartridge is secure in the filter basin.
6. Remove debris trapped in grate slot openings.
7. Utilize an industrial vacuum to remove debris from within filter basin.
8. Pressure wash media pack through the stainless steel cartridge. (Avoid discharge by utilizing an industrial vacuum to remove excess water while pressure washing).
9. Inspect media housed inside stainless steel cartridge. REM recommends replacing the filter media a minimum of once a year (see *Filter Media Replacement* above).
10. Place grate or manhole cover back on catch basin grate frame.
11. Secure dated service lock-out tag on grate lid.
12. Identify catch basin on site map for tracking and reporting.
13. Note observations, concerns or recommendation regarding specific filter on maintenance report.
14. Remove pedestrian and/or traffic control barricades.

Section IX O & M Plan

Operations and Maintenance (O&M) Plan

Water Quality Management Plan for

Talbert Residential

Fountain Valley, CA

Section IX, Operations and Maintenance Plan

BMP Applicable? Yes/No	BMP Name and BMP Implementation, Maintenance and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
Non-Structural Source Control BMPs			
Y	N1. Education for Property Owners, Tenants and Occupants Practical information materials will be provided to the first residents/occupants/tenants on general housekeeping practices that contribute to the protection of stormwater quality. These materials will be initially developed and provided to first residents/occupants/tenants by the developer. Thereafter such materials will be available through the Permittees' education program. Different materials for residential, office commercial, retail commercial, vehicle-related commercial and industrial uses will be developed.	Provide education information to new owners, Tenants and occupants as needed	BONANNI DEVELOPMENT, INC.
Y	N2. Activity Restrictions	HOA	BONANNI DEVELOPMENT, INC.
Y	N3. Common Area Landscape Management Identify on-going landscape maintenance requirements that are consistent with those in the County Water Conservation Resolution (or city equivalent) that include fertilizer and/or pesticide usage consistent with Management Guidelines for Use of Fertilizers. Statements regarding the specific applicable guidelines must be included.	Manage landscaping in accordance with County of Orange Water Conservation Ordinance No. 3802 and with Management Guidelines for Use of Fertilizers and Pesticides	Construction Superintendent during construction; BONANNI DEVELOPMENT, INC. during post-construction.
Y	N4. BMP Maintenance The Project WQMP shall identify responsibility for implementation of each non-structural BMP and scheduled cleaning and/or maintenance of all structural BMP facilities.	N/A. BMP table.	BONANNI DEVELOPMENT, INC.
N	N5. Title 22 CCR Compliance		
N	N6. Local Water Quality Permit Compliance		

Section IX, Operations and Maintenance Plan
Page 2 of 9

BMP Applicable? Yes/No	BMP Name and BMP Implementation, Maintenance and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
N	N7. Spill Contingency Plan		
N	N8. Underground Storage Tank Compliance		
N	N9. Hazardous Materials Disclosure Compliance		
N	N10. Uniform Fire Code Implementation		
Y	N11. Common Area Litter Control For industrial/commercial developments, the owner should be required to implement trash management and litter control procedures in the common areas aimed at reducing pollution of drainage water. The owner may contract with their landscape maintenance firms to provide this service during regularly scheduled maintenance, which should consist of litter patrol, emptying of trash receptacles in common areas, and noting trash disposal violations by tenants or businesses and reporting the violations to the owner for investigation.	Litter Maintenance. Daily.	Construction Superintendent during construction; BONANNI DEVELOPMENT, INC. during post-construction.
Y	N12. Employee Training Education program (see N1) as it would apply to future employees of individual businesses. Developer either prepares manuals for initial purchasers of business site or for development that is constructed for an unspecified use makes commitment of future business owner to prepare. An example would be training on the proper storage and use of fertilizers and pesticides, or training on the implementation of hazardous spill contingency plans.	Include the education materials contained in the approved Water Quality Management Plan. Monthly for construction maintenance personnel and employees.	BONANNI DEVELOPMENT, INC.
N	N13. Housekeeping of Loading Docks		

Section IX, Operations and Maintenance Plan
Page 3 of 9

BMP Applicable? Yes/No	BMP Name and BMP Implementation, Maintenance and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
Y	N14. Common Area Catch Basin Inspection For industrial/commercial developments and for developments with privately maintained drainage systems, the owner is required to have at least 80 percent of drainage facilities inspected, cleaned and maintained on an annual basis with 100 percent of the facilities included in a two-year period. Cleaning should take place in the late summer/early fall prior to the start of the rainy season. Drainage facilities include catch basins, open drainage channels and lift stations. Records should be kept to document the annual maintenance.	Catch Basins will be inspected and cleaned after major rain events and immediately prior to the start of the rainy season on October 1st.	BONANNI DEVELOPMENT, INC.
Y	N15. Street Sweeping Private Streets and Parking Lots Streets and parking lots are required to be swept prior to the storm season, in late summer or early fall, prior to the start of the rainy season or equivalent as required by the governing jurisdiction.	Parking lot will be swept monthly at a minimum and immediately prior to the start of the rainy season on October 1st.	BONANNI DEVELOPMENT, INC.

BMP Applicable? Yes/No	BMP Name and BMP Implementation, Maintenance and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
Structural Source Control BMPs			
Y	<p>S1. Provide Storm Drain System Stenciling and Signage</p> <p>Storm drain stencils are highly visible source control messages, typically placed directly adjacent to storm drain inlets. The stencils contain a brief statement that prohibits the dumping of improper materials into the municipal storm drain system. Graphical icons, either illustrating anti-dumping symbols or images of receiving water fauna, are effective supplements to the anti-dumping message. Stencils and signs alert the public to the destination of pollutants discharged into stormwater. The following requirements should be included in the project design and shown on the project plans:</p> <ol style="list-style-type: none"> 1. Provide stenciling or labeling of all storm drain inlets and catch basins, constructed or modified, within the project area with prohibitive language (such as: "NO DUMPING – DRAINS TO OCEAN") and/or graphical icons to discourage illegal dumping. 2. Post signs and prohibitive language and/or graphical icons, which prohibit illegal dumping at public access points along channels and creeks within the project area. 3. Maintain legibility of stencils and signs. 	Repaint as necessary but at minimum once every five years. Annually	BONANNI DEVELOPMENT, INC.
N	S2. Design Outdoor Hazardous Material Storage Areas to Reduce Pollutant Introduction		

Section IX, Operations and Maintenance Plan
Page 5 of 9

BMP Applicable? Yes/No	BMP Name and BMP Implementation, Maintenance and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
Y	<p>S3. Design Trash Enclosures to Reduce Pollutant Introduction</p> <p>Design trash storage areas to reduce pollutant introduction. All trash container areas shall meet the following requirements:</p> <ol style="list-style-type: none"> 1. Paved with an impervious surface, designed not to allow run-on from adjoining areas, designed to divert drainage from adjoining roofs and pavements diverted around the area, screened or walled to prevent off-site transport of trash; and 2. Provide solid roof or awning to prevent direct precipitation. <p>Connection of trash area drains to the municipal storm drain system is prohibited.</p> <p>Potential conflicts with fire code and garbage hauling activities should be considered in implementing this source control.</p>	Clean trash container area to prevent buildup of excess trash in area. Daily	Construction Superintendent during construction; BONANNI DEVELOPMENT, INC. during post-construction.
Y	<p>S4. Use Efficient Irrigation Systems and Landscape Design</p> <p>Projects shall design the timing and application methods of irrigation water to minimize the runoff of excess irrigation water into the municipal storm drain system. The following methods to reduce excessive irrigation runoff shall be considered, and incorporated on common areas of development and other areas where determined applicable and feasible by the Permittee:</p> <ol style="list-style-type: none"> 1. Employing rain shutoff devices to prevent irrigation after precipitation. 2. Designing irrigation systems to each landscape area's specific water requirements. 	Verify that runoff minimizing landscape design continues to function by checking that water sensors are functioning properly, that irrigation heads are adjusted properly to eliminate overspray to hardscape areas, and to verify that irrigation timing and cycle lengths are adjusted in accordance with water demands, given time of year, weather and day or night time temperatures. Verify that plants continue to be grouped according to similar water requirements in order to reduce excess irrigation runoff. Once a week, in conjunction with maintenance activities.	BONANNI DEVELOPMENT, INC.

BMP Applicable? Yes/No	BMP Name and BMP Implementation, Maintenance and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
	<p>S4. Use Efficient Irrigation Systems and Landscape Design</p> <ol style="list-style-type: none"> 3. Using flow reducers or shutoff valves triggered by a pressure drop to control water loss in the event of broken sprinkler heads or lines. 4. Implementing landscape plan consistent with County Water Conservation Resolution or city equivalent, which may include provision of water sensors, programmable irrigation times (for short cycles), etc. 5. The timing and application methods of irrigation water shall be designed to minimize the runoff of excess irrigation water into the municipal storm drain system. 6. Employing other comparable, equally effective, methods to reduce irrigation water runoff. 7. Group plants with similar water requirements in order to reduce excess irrigation runoff and promote surface filtration. Choose plants with low irrigation requirements. Consider other design features, such as: <ul style="list-style-type: none"> • Use mulches (such as wood chips or shredded wood products) in planter areas without ground cover to minimize sediment in runoff. • Install appropriate plant materials for the location, in accordance with amount of sunlight and climate, and use native plant material where possible and/or as recommended by the landscape architect. 		

Section IX, Operations and Maintenance Plan
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BMP Applicable? Yes/No	BMP Name and BMP Implementation, Maintenance and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
	<ul style="list-style-type: none"> Leave a vegetative barrier along the property boundary and interior watercourses, to act as a pollutant filter, where appropriate and feasible. Choose plants that minimize or eliminate the use of fertilizer or pesticides to sustain growth. 		
N	S5. Protect Slopes and Channels		
N	S6. Loading Dock Areas		
N	S7. Maintenance Bays and Docks		
N	S8. Vehicle Wash Areas		
N	S9. Outdoor Processing Areas		
N	S10. Equipment Wash Areas		
N	S11. Fueling Areas		
N	S12. Site Design and Landscape Planning		
N	S13. Wash Water Controls for Food Preparation Areas		
N	S14. Community Car Wash Racks		

Section IX, Operations and Maintenance Plan
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BMP Name and BMP Implementation, Maintenance and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
Low Impact Development BMPs		
Hydrologic Source Control BMP # 1		
Hydrologic Source Control BMP # 2		
Miscellaneous BMP # 1		
Infiltration BMP # 1		
Infiltration BMP # 2		
Harvest and use BMP # 1		
Harvest and use BMP # 2		

Section IX, Operations and Maintenance Plan
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BMP Name and BMP Implementation, Maintenance and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
Biotreatment BMP # 1	Regular inspection and maintenance are essential to assure a properly functioning stormwater system. A system should initially be inspected immediately after completion of the site's construction, and prior to passing responsibility over to the site's owner. Refer to Bioclean Guide for technical maintenance and operation details.	BONANNI DEVELOPMENT, INC.
Biotreatment BMP # 2		
Treatment Control BMPs		
Treatment Control BMP #1		
Pre-Treatment/Gross Solids Removal BMPs		
Pre-Treatment BMP # 1		

Section X, Operations and Maintenance Plan

Required Permits

No permits are required for the implementation, operation, and maintenance of the BMPs.

If no permits are required, a statement to that effect should be made.

Forms to Record BMP Implementation, Maintenance, and Inspection

The form that will be used to record implementation, maintenance, and inspection of BMPs is attached.

Recordkeeping

All records must be maintained for at least five (5) years and must be made available for review upon request.

RECORD OF BMP IMPLEMENTATION, MAINTENANCE, AND INSPECTION

Today's Date:

**Name of Person Performing Activity
(Printed):**

Signature:

[illegible]

Section X Geotechnical Report

GROUP



**GEOTECHNICAL DESIGN REPORT
FOR THE PROPOSED RESIDENTIAL DEVELOPMENT AT
8572 Talbert Avenue
Fountain Valley, California**

Prepared for

BONANNI DEVELOPMENT
5500 Bolsa Avenue, Suite 120
Huntington Beach, CA 92649

Prepared by

GROUP DELTA CONSULTANTS, INC.
32 Mauchly, Suite B
Irvine, California 92618

Group Delta Project No. IR780
December 7, 2021



GROUP DELTA

December 7, 2021

BONANNI DEVELOPMENT

5500 Bolsa Avenue, Suite 120
Huntington Beach, CA 92649

Attention: Chris Segesman

Subject: Geotechnical Design Report
Proposed Residential Development
8572 Talbert Avenue
Fountain Valley, California
Group Delta Project No. IR780

Dear Mr. Segesman:

Group Delta Consultants, Inc. (Group Delta) is pleased to submit this geotechnical design report for the proposed residential development at 8572 Talbert Avenue in Fountain Valley, California. Our scope of work was performed in general accordance with our proposal dated October 15, 2021, which was authorized on October 18, 2021. The geotechnical investigation represents the current subsurface ground conditions at the site and has been used to develop geotechnical recommendations.

We appreciate the opportunity to provide geotechnical services for this project. If you have any questions about this report, or if we can be of further service, please do not hesitate to contact us.

Sincerely,

GROUP DELTA CONSULTANTS, INC.



Asheesh Pradhan, Ph.D., P.E.
Staff Engineer

Ethan Tsai, G.E.
Associate Engineer



Distribution: Addressee (PDF file)

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Appendix B	Laboratory Testing
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**GEOTECHNICAL DESIGN REPORT
FOR RESIDENTIAL DEVELOPMENT AT
8572 TALBERT AVENUE, FOUNTAIN VALLEY, CALIFORNIA**

1.0 INTRODUCTION

This report presents our recommendations for the foundation design and construction of the proposed residential development located at 8572 Talbert Avenue in Fountain Valley, California.

1.1 Background

The Site is approximately 1.4 acres, located about 250 feet east of the intersection of Newland Street and Talbert Avenue at 8572 Talbert Avenue as shown in Figure 1. The Site is bounded by Talbert Avenue on the north, residential establishments on the west and south, greenbelt area on the east. The site is currently occupied by Courreges Ranch and has few existing single-story residential buildings.

1.2 Project Description

We understand based on a conceptual project layout developed by WHA Architects, the proposed development will consist of demolition of the existing structures and construction of new 15 units of two-story dwellings. The proposed buildings are planned to be at-grade structures. A proposed conceptual site plan is shown in the exploration plan in Figure 2.

1.3 Scope of Work

The objective of this report is to provide foundation recommendations for the design and construction of the proposed residential development at the site. Our scope of work for the site included the following tasks:

- Review of relevant United States Geological Survey (USGS) and California Geological Survey (CGS) maps and reports for the site and surrounding area as well as other geotechnical reports in the vicinity area performed by Group Delta.
- Perform a geotechnical investigation to evaluate subsurface conditions, which includes three (3) Cone Penetration Tests (CPTs) to the depths of about 50 feet below existing ground surface (bgs) and three Hollow Stem Auger (HSA) borings to depths of between 21 feet to 51 feet bgs.
- Perform laboratory testing program on selected soil samples to evaluate characteristics of the soils encountered during our field exploration
- Evaluate limited geologic and seismic hazards including surface fault rupture, liquefaction, and seismically induced landslide.

- Perform engineering analyses and provide geotechnical recommendations for excavations, placement of fill, foundation design, floor slab supports, and any construction-related issues
- Prepare this geotechnical design report

2.0 FIELD INVESTIGATION AND LABORATORY TESTING PROGRAM

Field investigation for the site was performed by Group Delta on October 28, 2021. Laboratory tests were conducted on selected and representative soil samples obtained during our field investigation. A brief description of the field investigation and laboratory testing is provided below and in Appendix A and B respectively.

2.1 Field Exploration

Before beginning the field investigation, well permits were obtained from the city of Fountain Valley. Underground Service Alert (USA) was notified of each exploration location for identifying possible subsurface utilities.

A field investigation was performed at the project site that consisted of three (3) HSA exploratory borings drilled to depths of between 21 and 51 feet bgs and three (3) CPTs advanced to a depth of about 50 feet bgs. The explorations were performed under the direct supervision of a Group Delta's field engineer, who maintained logs of the soils encountered, visually classified the material, and assisted in obtaining soil samples. Bulk samples of soil cuttings from the drilling were collected to depths of about 5 feet bgs. Relatively undisturbed ring samples were retrieved from the borings at about 5 feet depth intervals thereafter.

The locations of our field exploratory borings and CPTs are shown in Figure 2. A brief detail of the field exploration program, the logs of the borings, and CPT plots are presented in Appendix A.

2.2 Laboratory Testing

Laboratory testing was performed on selected soil samples collected from the borings to characterize the subsurface materials and to evaluate their index and engineering properties. The laboratory testing program consisted of the following.

- Soil classification
- Moisture content and dry unit weight
- Atterberg limits
- Direct shear
- Proctor Compaction Test
- Expansion Index
- Soil Corrosivity

The performed tests are identified on the boring logs in Appendix A and laboratory test results are presented in Appendix B.

3.0 SITE AND SUBSURFACE CONDITIONS

3.1 Surface Conditions

The Site is generally flat and has an approximate elevation of 44 to 46 feet. The site is currently occupied by Courreges Ranch and has few existing single-story residential buildings with paved driveways, concrete walkways, and mostly unpaved areas with trees and plantations.

3.2 Subsurface Conditions

The field explorations performed at the site indicate about 2 feet of existing fill. Native soils consist of medium dense to dense silty sand, and sand to a depth of about 18 feet. From the depth of about 18 feet to 25 feet, the soil is mostly interbeddings of very stiff to hard clay, sandy clay, silt, and medium dense to dense silty sand and sand. Below 25 feet to the explored depth of about 51 feet, the soil is predominantly dense to very dense sandy soils with occasional thin layers of clay.

3.3 Groundwater

Groundwater was measured at a depth of 35 feet in the boring B-1, CPT-1 and CPT-3 which is consistent with the mapped historic high groundwater level, as shown in Figure 3, that is about 30 feet bgs (CGS, 1997). Accordingly, the design groundwater level is assumed to be at a depth of 30 feet bgs.

4.0 LIMITED GEOLOGIC AND SEISMIC HAZARDS EVALUATION

4.1 Ground Surface Rupture

The potential hazard for ground rupture is evaluated through consideration of distance to active earthquake faults. The project site is not located within a State-identified Earthquake Fault Zone of Required Investigation (CGS, 1977). The closest active fault is the San Joaquin Hills located about 0.75 miles (1.2 kilometers) southwest of the site, as shown in Figure 4. Therefore, the potential hazard of ground surface rupture at the site is considered low.

4.2 Landslides

The site is not located within an area known for landslide hazards (CGS, 1997). Permanent cut slopes are not anticipated for the proposed improvements. The topography of the site is level. Therefore, the potential of seismically induced landslides is considered low.

4.3 Liquefaction and Seismic Settlement

Liquefaction involves the sudden loss in strength of a saturated, cohesionless soil (sand and non-plastic silts) caused by the build-up of pore water pressure during cyclic loadings, such as those produced by an earthquake. This increase in pore water pressure can temporarily transform the soil into a fluid mass, resulting in a vertical settlement, and can also cause lateral ground deformations. Typically, liquefaction occurs in areas where there are loose to medium dense sands and silts, and where the depth to groundwater is less than 50 feet from the surface.

The site is not located in a mapped liquefaction hazard zone on the California Seismic Hazard Zone Map for Newport Beach 7.5 Minute Quadrangles (CGS, 1999), as shown in Figure 5. However, the site is located adjacent to the border of mapped liquefaction hazard zone.

Liquefaction triggering analyses was performed using simplified procedures recommended by NCEER (Youd and Idriss, 1997, 2001) for CPTs. A peak ground acceleration value for the 2,475-year return period earthquake (PGA_M) based on ASCE 7-16 of 0.72g. Moment median magnitude of 7.68 is used in evaluated based on the USGS based on the Dynamic U.S. 2014 (v4.2) deaggregation tool (<https://earthquake.usgs.gov/hazards/interactive/>). The historical highest groundwater of 30 feet was used in the analyses.

CPT soundings provide a more continuous measurement of the soil profile compared to the coarser sampling intervals in the boring records. We assessed the liquefaction potential using the computer program CLiq (GeoLogismiki, 2015). For estimating the resulting ground settlements, we used the method proposed by Zhang et al (2002 and 2004).

Total liquefaction-induced settlement is estimated to be about 0.6 inches or less. The differential settlement may be assumed to be 0.3 inches over a horizontal distance of about 30 feet.

Liquefaction triggering and liquefaction-induced settlement calculations are provided in Appendix C.

4.4 Lateral Spreading

Under cyclic loading, lateral spreading can occur on gently sloping ground or horizontal ground adjacent to bodies of water or slopes. Since the site is relatively flat and not adjacent to bodies of water or slope, lateral spreading is not a design concern.

5.0 DISCUSSIONS AND RECOMMENDATIONS

5.1 General

Based on the findings from our field explorations and engineering analyses, it is our opinion that the proposed project is feasible from a geotechnical standpoint. Following proper site grading recommendations, the structure can be supported on conventional spread footings with slab-on-grade or mat foundation.

5.2 Demolition

Before the start of earthwork, the existing site improvements will require demolition and removal, including the existing structures and foundations, slabs, hardscapes, utilities, trees, and plantations. The civil engineer should identify the presence and location of all existing utilities on and adjacent to the site. Precautions will be required to remove, relocate or protect existing utilities, as appropriate.

5.3 Removal

Fill soils were encountered at the site to the depth of about 2 feet. Deeper fills could be present anywhere within the site and could locally extend deeper. Any existing fill should be considered uncertified and should be removed and recompacted. In addition, soil loosened or disturbed during the demolition should be removed and recompacted.

To provide uniform support, the building area should be over-excavated and recompacted as structural fill to a minimum depth of 4 feet below existing ground surface to form a pad. All removals should extend a minimum of 4 feet outside the pad or a distance equal to the depth of the excavation, whichever is greater. The actual limits for removals should be determined by the project geotechnical engineer during grading based on the actual conditions encountered.

In non-structural areas such as pavements, concrete walkways, and hardscapes, the area should be over-excavated and recompacted to a minimum depth of 2 feet. The removal should extend a minimum of 2 feet from the edge of the pavements and hardscapes.

5.4 Earthwork

All grading should conform to the requirements of the 2019 California Building Code, and the general grading recommendations outlined below.

1. The grading contractor is responsible for notifying the project geotechnical engineer of a pre-grading meeting prior to the start of excavation/grading operations and any time that the operations are resumed after an interruption.
2. Prior to the start of earthwork, the project civil engineer should locate any existing utilities in the area. Existing utilities should be removed, relocated, or protected, as appropriate.
3. The bottoms of excavations should be proof rolled with heavy equipment. Any areas of loose or pumping soils should be over excavated at the direction of the project geotechnical engineer. For the areas receiving structural fill, after the proof-rolling, the native sandy soils should be scarified, brought to optimum moisture content, and compacted to at least 95 % relative compaction per the maximum dry density determined by ASTM D-1557.

4. Structural fill soil should be compacted to at least 95 % of the maximum dry density determined by ASTM D1557. Fill placed in non-structural areas such as pavements and hardscapes should be compacted to at least 90 % of the maximum dry density.
5. The on-site soils, less any debris or organic matter, may be used in required fills. All structural fill soils should be sandy soils, free of highly expansive clay, organics, debris, rocks greater than 3 inches in any dimension, and other deleterious material. All fill soils shall be approved by the project geotechnical engineer.
6. Any required import material should consist of relatively non-expansive soils with an expansion index of less than 30. The imported materials should contain sufficient fines (binder material) to be relatively impermeable and result in a stable subgrade when compacted. Import soils should be approved before being brought to the site.
7. All earthwork and grading should be performed under the observation of a Group Delta representative. Compaction testing of the fill soils shall be performed at the discretion of Group Delta and per local requirements. If specified compaction is not achieved, additional compaction effort, moisture conditioning of the fill soils, and/or removal and compaction of the below-minimum-compaction soils will be required.
8. Compaction testing of the fill soils shall be performed at the discretion of the project geotechnical engineer. Testing should be performed for approximately every 2 feet of fill thickness, or every 500 cubic yards of fill placed, whichever occurs first. If specified compaction is not achieved, additional compaction effort, moisture conditioning, and/or removal and compaction of the fill soils will be required.
9. All materials used for asphalt concrete and aggregate base shall conform to the 2018 "Green Book" or the equivalent and shall be compacted to at least 95 % relative compaction.

If in the opinion of the geotechnical engineer, contractor, or owner, an unsafe condition is created or encountered during grading, all work in the area shall be stopped until measures can be taken to mitigate the unsafe condition. An unsafe condition shall be considered any condition that creates a danger to workers, on-site structures, on-site construction, or any off-site properties or persons.

5.5 Temporary Excavations

Based on our investigation, we anticipate the excavations will be made in generally sandy materials and should be readily accomplished using conventional heavy construction equipment. The sandy soils on site are generally classified as CAL/OSHA Type C soils.

If the excavation is exposed during periods of rainfall, provisions for the collection of the runoff should be made. All surface drainage should be controlled and prevented from running down into the excavation. Ponding water should not be allowed within the excavation.

All excavation slopes and shoring systems should meet minimum requirements of the Occupational Safety and Health (OSHA) Standards. Maintaining safe and stable slopes on excavations is the responsibility of the contractor and will depend on the nature of the soils and groundwater conditions encountered and his method of excavation. Excavations during construction should be carried out in such a manner that failure or ground movement will not occur. The short-term stability of excavation depends on many factors, including slope angle, engineering characteristics of the subsurface materials, height of the excavation, and length of time the excavation remains unsupported and exposed to equipment vibrations, rainfall, and desiccation. The contractor should perform any additional studies deemed necessary to supplement the information contained in this report for the purpose of planning and executing his excavation plan. Recommendations regarding sloped temporary excavations are provided in the sections below.

Temporary excavations up to 4 feet deep may stand in vertical cuts. Deeper temporary excavations should be sloped at 1 (horizontal) to 1 (vertical), or flatter.

Surcharge loads from equipment or stockpiled material should be kept behind the top of the temporary excavations a horizontal distance of at least twice the depth of the excavation. Surface drainage should be controlled and prevented from running down the slope face. Ponding water should not be allowed within the excavation. Even with the implementation of the above recommendations, some sloughing of slopes and unstable soil zones may still occur within temporary excavations, and workmen should be adequately protected. Construction equipment and foot traffic should be kept off excavation slopes to minimize disturbance/sloughing.

5.6 Foundations Recommendations

5.6.1 Spread Footings

5.6.1.1 Bearing Capacity

Following proper site grading, the new building may be supported on shallow foundations placed in the new structural fill. Spread footings extending at least 2 feet below the floor slab or lowest adjacent grade, may be designed to impose a net dead-plus-live load pressure of 3,000 pounds per square foot. The allowable bearing pressure can be increased by one-third for temporary

loads associated with wind and seismic loading. The recommended bearing value is a net value, and the weight of concrete in the footings can be taken as 50 pounds per cubic foot; the weight of soil backfill can be neglected when determining the downward loads.

All foundation excavations should be observed by the project geotechnical engineer before the placement of reinforcing steel. Any loose or soft soil found should be excavated and replaced with structural fill.

5.6.1.2 Settlement

We estimate the static settlement of the structure supported on spread footings in the manner recommended is expected to be less than ½ inch. As discussed in Section 4.3 of this report, the seismic-induced settlement is estimated to be 0.6 inches or less. Therefore, the total settlement is estimated to be 1.1 inches or less, The differential settlement is estimated to be ½ inch over a horizontal distance of 30 feet.

5.6.1.3 Lateral Resistance

Resistance to lateral loads can be provided by friction developed between the bottom of the footings and the supporting soil, and by the passive soil pressure developed on the face of the footing. For design purposes, an allowable coefficient of friction of 0.4 may be used. The allowable passive pressure for compacted structural fill may be taken as an equivalent fluid pressure of 300 pcf.

The recommended lateral load design values stated above are for use with loadings determined by a conventional working stress design. When considering an ultimate design approach, the recommended design values may be multiplied by a factor of 1.5. In addition, the passive pressure and coefficient of friction may be used in combination without reduction.

5.6.2 Slab on Grade

On-grade building slabs should be supported by compacted fill having an EI of 30 or less. Slabs should be designed for the anticipated loading. Slab thickness, control joints, and reinforcement should be designed by the project structural engineer and should conform to the requirements of the 2019 CBC and with the recommendations of the American Concrete Institute.

American Concrete Institute (2004) provides detailed recommendations regarding moisture protection systems. The project architect should review ACI 302.1R-04 along with the moisture requirements of the proposed flooring system and specify an appropriate moisture protection system based on the allowable moisture transmission rate of the flooring to be used. The vapor membrane should conform to ASTM E 1745 guidelines. According to ACI 302-1R-04, moisture protection may consist of 10 to 15 mil polyethylene plastic sheeting over the compacted subgrade. If necessary, 2 inches of a granular base material may be placed beneath the polyethylene plastic sheeting to provide a level surface. The granular base material should be a

clean, finely graded material with at least 10 to 30 percent passing the No. 100 sieve but not contaminated with clay, silt, or organic material. The granular material should be compacted before the placement of the vapor membrane. The vapor membrane should be protected from puncture and if damaged be repaired per the manufacturer's recommendations.

5.7 Seismic Design Parameters per CBC 2019/ASCE 7-16

Seismic design acceleration parameters were developed per the 2019 California Building Code (CBC) and ASCE 7-16 (ASCE/SEI 7-16) for the proposed project using the webtool provided by the Office of Statewide Health Planning and Development (OSHPD, 2021) and are presented in Table 1. Based on the underlying geology, subsurface exploration data, and shear wave velocity estimates from the CPTs, the site classification for seismic design is Site Class D per Chapter 20 of ASCE 7-16. The site coordinates used in our seismic hazard analysis are -117.98362 (Longitude) and 33.855614 (Latitude).

Table 1: Mapped Seismic Design Acceleration Parameters

Design Parameters	General Seismic Design Parameter (ASCE 7-16 Section 11.4)
S_s (g)	1.391
S_1 (g)	0.504
Site Class	D
F_a	1.0
F_v	1.796
S_{MS} (g)	1.391
S_{M1} (g)	0.905
S_{DS} (g)	0.927
S_{D1} (g)	0.603

Based on Section 11.4.8 of ASCE 7-16, if desired, these values may only be used if Exception 2 is met:

- If $T \leq 1.5 T_S$: The value of the seismic response coefficient C_S is determined by Eq. (12.8-2), i.e., S_{DS} is used to obtain C_S
- If $T \geq 1.5 T_S$: The value of seismic response coefficient C_S is taken as **1.5 times** the value computed in Eq. (12.8-3), i.e., **1.5*** S_{D1} is used to obtain C_S , or
- If $T > T_L$: The value of seismic response coefficient C_S is taken as **1.5 times** the value computed in Eq. (12.8-4), i.e., **1.5*** S_{D1} is used to obtain C_S .

5.8 Utility Trenches

Excavations for utility trenches should be readily accomplished with conventional excavating equipment. All shoring and excavation should comply with current OSHA regulations and be observed by the designated competent person on site.

The bedding for any new sewer and water service pipelines should be a minimum of 4 inches thick and should consist of clean sand, No. 4 concrete aggregate or gravel, and should have a sand equivalent of not less than 30. The pipe zone material, which extends to a level 12 inches above the pipe should consist of sand and should have a sand equivalent of no less than 30, and a maximum rock size of 1 inch. All imported materials should be approved by the project geotechnical engineer before being brought on site.

Trench zone backfill extends from a level 12 inches above the pipe to the finished subgrade. In general, on-site excavated materials are suitable as backfill. Any boulders or cobbles larger than 3 inches in any dimensions, or any organics or other deleterious materials, should be removed before backfilling. We recommend that all backfill should be placed in lifts not exceeding six to eight inches in thickness and be compacted to at least 90 % of relative compaction as determined by the ASTM D1557. Mechanical compaction will be required to accomplish compaction above the bedding along the entire pipeline alignments. Jetting or flooding of backfill should not be permitted.

In backfill areas, where mechanical compaction of soil backfill is impractical due to space constraints, 2-sack slurry (CLSM) may be substituted for compacted backfill.

5.9 Expansive Soils

Laboratory testing was performed on a representative sample of the near-surface material collected to the depth of 5 feet below the existing ground surface from boring B-1. The test result indicates low expansion potential, and the test result is presented in Appendix B.

5.10 Soil Corrosion Potential

A representative sample of the near-surface material collected to the depth of 5 feet below the existing ground surface from boring B-3 was tested for evaluating corrosion characteristics. The results indicate the test sample had a pH of 8.3; a water-soluble sulfate content of less than 0.01%, and a soluble chloride content of less than 0.01%. The sulfate results indicate that sulfate exposure to Portland cement is negligible.

The test sample was also found to have a minimum measured electrical resistivity of 6,800 Ohm-cm. The following correlation can generally be used between electrical resistivity and corrosion potential:

<u>Electrical Resistivity (Ohm-Cm)</u>	<u>Corrosion Potential</u>
Less than 1,000	Severe
1,000 to 2,000	Corrosive
2,000 to 10,000	Moderate
Greater than 10,000	Mild

Based on the laboratory test results, the test sample is classified as moderately corrosive to buried metals. Further evaluation/testing and recommendations for corrosion protection should be provided by a corrosion consultant.

5.11 Site Drainage

Surface drainage during construction should be controlled and directed to appropriate drainage facilities. All surface drainage should be prevented from running down along the face of the excavation. Ponding water should not be allowed within the excavation.

5.12 Pavement Design

Parking and parking access pavements may be supported on compacted fill following proper grading recommendations in Sections 5.3 and 5.4. Any loose soils should be removed and recompacted. The actual limits for subgrade preparation, removals, or compaction should be determined by the project geotechnical engineer during grading, based on the actual conditions encountered.

The preparation of the paving area subgrade should be done immediately before the placement of the base course. Proper drainage of the paved areas should be provided since this will reduce moisture infiltration into the subgrade and increase the life of the paving.

The paving thicknesses are based on our observations of the on-site soils conditions. An R-value of 30 was assumed for design. The R-value should be confirmed during grading.

5.12.1 Flexible Asphalt Concrete Pavement

Asphalt Concrete (AC) pavement recommendations for a 20-year design life per the Caltrans Highway Design Manual (Caltrans 2020) for Traffic Index (TI) values of 4, 5, and 6 are provided in Table 2.

Table 2. Asphalt Concrete Pavement Sections

Traffic Index	AC Pavement Thickness (inches)	Class II Aggregate Base Thickness (inches)
4	3	4
5	3.5	4.5
6	4	6.5

We recommend that the Civil Engineer select an appropriate design TI based on anticipated vehicular loading.

5.12.2 Rigid Concrete Pavement

Rigid concrete pavement thickness recommendation is based on a 20-year design life per Portland Cement Association (PCA). The required concrete pavement thickness will depend on the expected wheel loads and volume of traffic. The pavement sections were determined for the axle-load category of 1 for residential streets for sandy subgrade soils providing medium support. Assuming the modulus of rupture of 600 pounds per square inch (psi) and that the paving subgrade will consist of the on-site or comparable soils compacted to at least 90 % as recommended, the minimum recommended concrete thicknesses are presented in Table 3 below. The base thickness should be a minimum of 4 inches.

Table 3. Rigid Concrete Pavement Sections

Traffic Index	Concrete (inches)
4	5.5
5	5.5
6	6.0

For concrete entrance driveways, we recommend a pavement section of 6 inches of PCC over 6 inches of aggregate base (CAB or CMB).

Crack control joints should be constructed for all PCC slabs on a maximum spacing of 12 feet, each way.

5.12.3 Concrete Walkway and Hardscape

Concrete slabs for walkways and hardscapes can be supported on the compacted subgrade soil following recommendations in Section 5.4. Slabs should be designed for the anticipated loading. We recommend that such slabs be at least 4 inches thick and reinforced with at least 6-inch by 6-inch, W2.9 by W2.9 welded wire fabric placed at slab mid-height with crack control joints with a maximum spacing of 5-foot centers each way for sidewalks and 10-foot centers each way for

slabs. Actual crack control joint spacing should be designed by the project structural engineer or architect in conformance with the requirements of the 2019 CBC and the PCA Engineering Bulletin for Concrete Floors on Ground.

6.0 STORMWATER INFILTRATION

The design groundwater table is at depth of 30 feet below the existing ground surface. Since the invert of the new stormwater infiltration facility must be at least 10 feet above the design groundwater, the target layer for stormwater infiltration at the site is between depths of 0 and 20 feet below existing ground.

Infiltrate rates of the onsite soils were estimated based on laboratory grain size analyses. Details of test procedures and recommended infiltration rate for design are provided below.

6.1 Laboratory Grain Size Analyses

Laboratory grain size analyses have been used to evaluate infiltration rate for the property as it is not larger than 50,000 square feet. We performed laboratory grain size tests on three selected samples. The results of the laboratory tests are presented in Appendix B.

Infiltration rate may be estimated based on the hydraulic conductivity of the soils. We have estimated the soil hydraulic conductivity using Hazen equation as shown below:

$$K = C \times (D_{10})^2$$

Where K = Hydraulic Conductivity in cm/s
C = 1, Hazen's Empirical Coefficient
D₁₀ = Grain Diameter in mm Corresponding to 10% Passing

The computed hydraulic conductivity may then be assumed to be the infiltration rate of the soils.

The design infiltration rate can be determined by the computed percolation rate divided by a reduction factor (RF_t). We recommend that the following RF_t may be used for design infiltration rate:

- Laboratory Grain Size Analyses: RF_t = 2
- Site variability, number of tests, and thoroughness of subsurface investigation: RF_t = 2
- Long-term siltation, plugging, and maintenance: RF_t = 2

Accordingly, we recommend that a reduction of 6 may be used in design. A The infiltration rate based on grain-size analyses are shown in Table 4.

Table 4. Infiltration Rate based on Laboratory Grain Size Analyses

Sample No.	Soil Type	D ₁₀ (mm)	Computed Infiltration Rate (inch/hour)	Design Infiltration Rate (inch/hour)
B-1@5'	Sandy Silt	0.002	<0.1	<0.1
B-1@10'	Poorly Graded Sand	0.19	0.5	<0.1
B-2@10'	Silty Sand	0.002	<0.1	<0.1

Since the design infiltration rate is less than 0.3 inch per hour, therefore, we recommend that the site soils are not suitable for stormwater infiltration.

7.0 LIMITATIONS

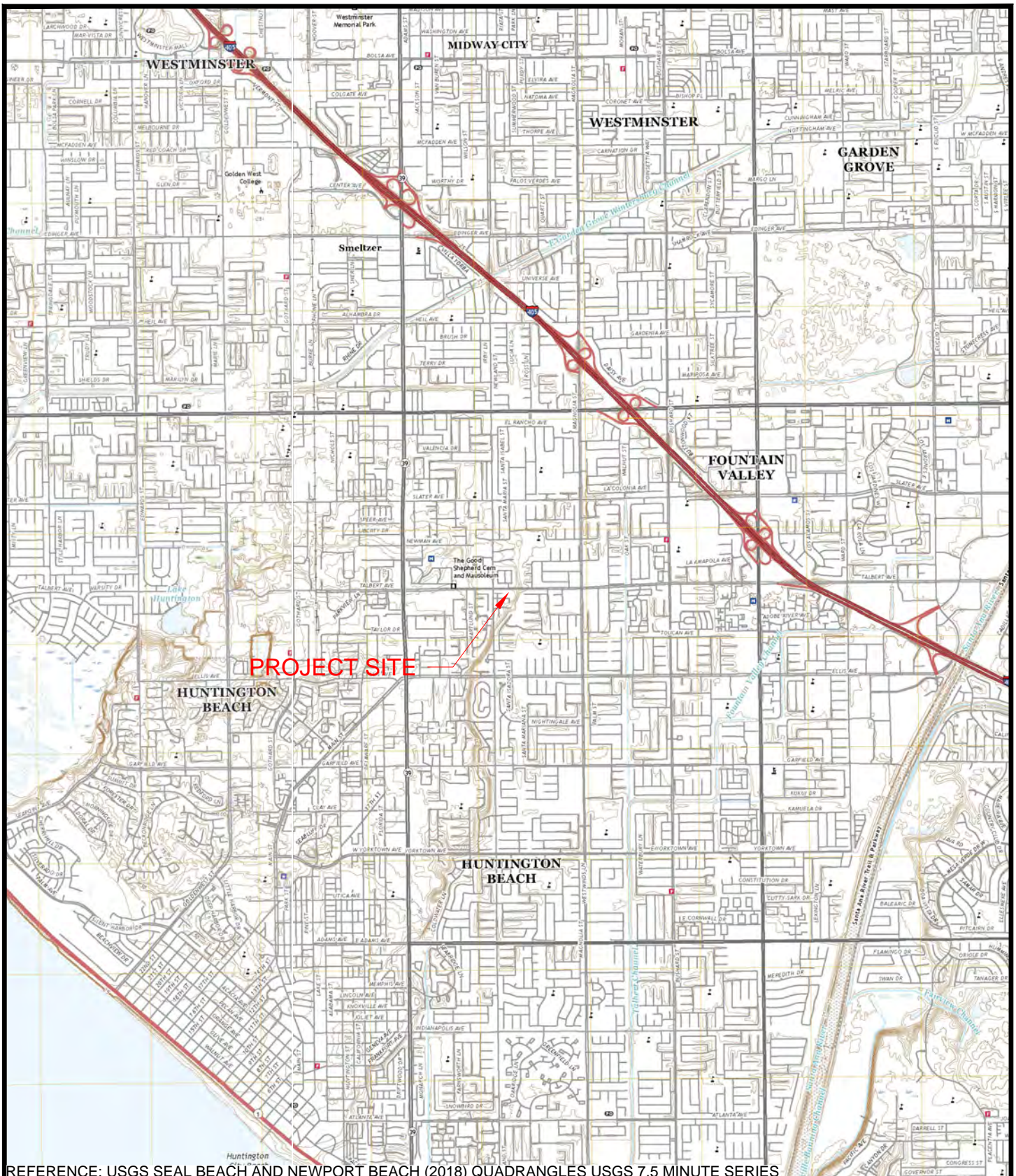
This investigation was performed per generally accepted Geotechnical Engineering principles and practice. The professional engineering work and judgments presented in this report meet the standard of care of our profession at this time. No other warranty, expressed or implied, is made. This report has been prepared for the Bonanni Development and their design consultants. It may not contain sufficient information for other parties or other purposes and should not be used for other projects or other purposes without review and approval by Group Delta.

The recommendations for this project, to a high degree, are dependent upon proper quality control of site grading, fill and backfill placement, and pile foundation installation. The recommendations are made contingent on the opportunity for Group Delta to observe the earthwork operations. This firm should be notified of any pertinent changes in the project, or if conditions are encountered in the field, which differs from those described herein. If parties other than Group Delta are engaged to provide such services, they must be notified that they will be required to assume complete responsibility for the geotechnical phase of the project and must either concur with the recommendations in this report or provide alternate recommendations.

8.0 REFERENCES

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- Zhang, G., Robertson, P.K., Brachman, R., 2002, Estimating Liquefaction Induced Ground Settlements from the CPT, Canadian Geotechnical Journal, 39: pp 1168-1180.

FIGURES



REFERENCE: USGS SEAL BEACH AND NEWPORT BEACH (2018) QUADRANGLES USGS 7.5 MINUTE SERIES



0 4000' 8000'



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FIGURE NUMBER:
1

PREPARED BY:
JMT

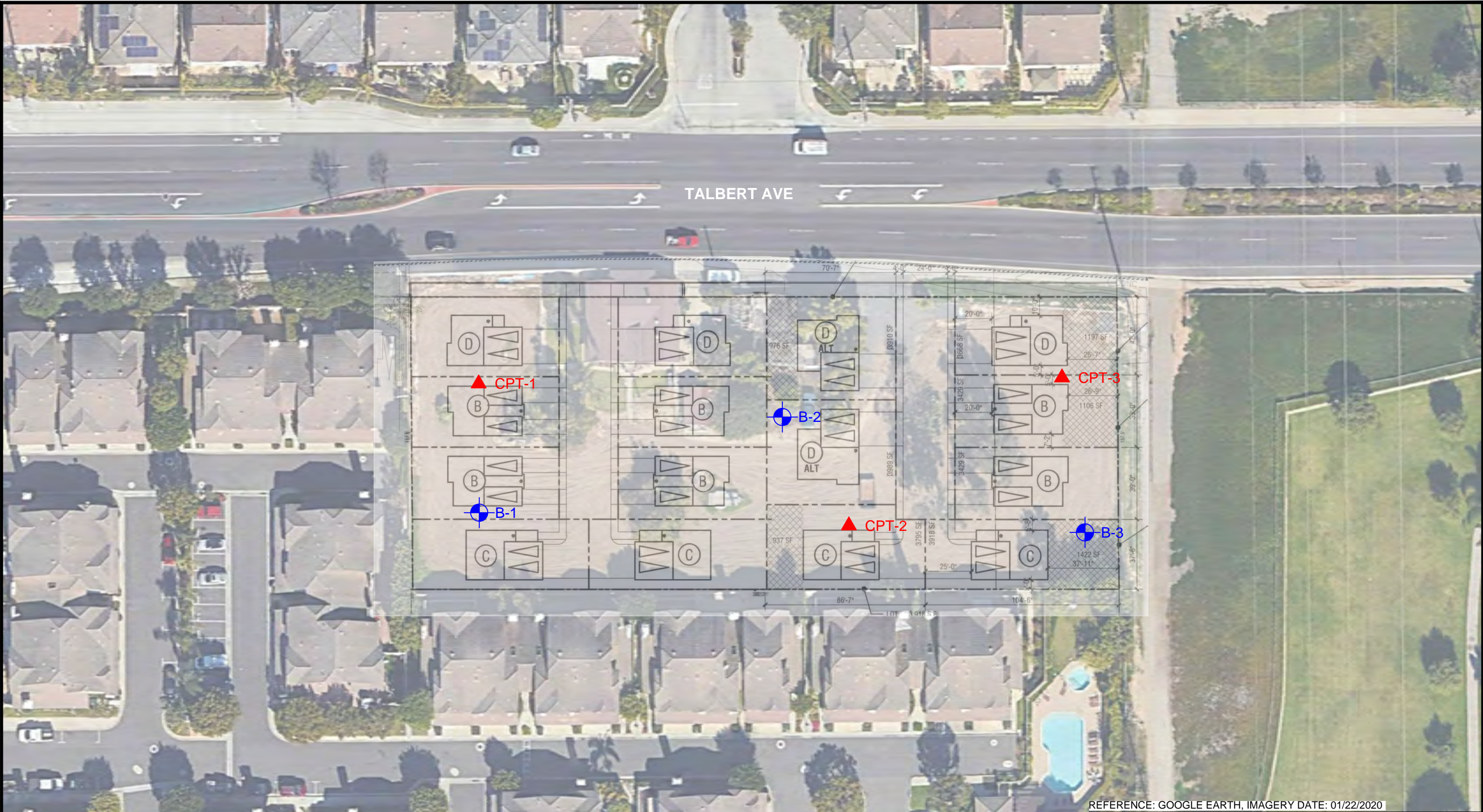
PROJECT NAME:
8572 TALBERT AVE.
FOUNTAIN VALLEY, CA

PROJECT NUMBER:
IR780


REVIEWED BY:
AP


SITE VICINITY MAP

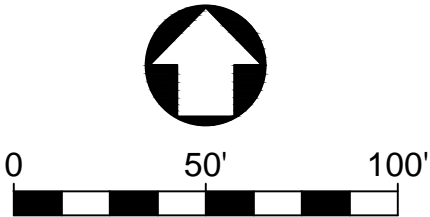
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LEGEND:

 APPROXIMATE BORING LOCATION

 APPROXIMATE CPT LOCATION



REFERENCE: GOOGLE EARTH, IMAGERY DATE: 01/22/2020		
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	PREPARED BY: JMT	FIGURE NUMBER: 2
	REVIEWED BY: AP	PROJECT NUMBER: IR780
EXPLORATION LOCATION PLAN		

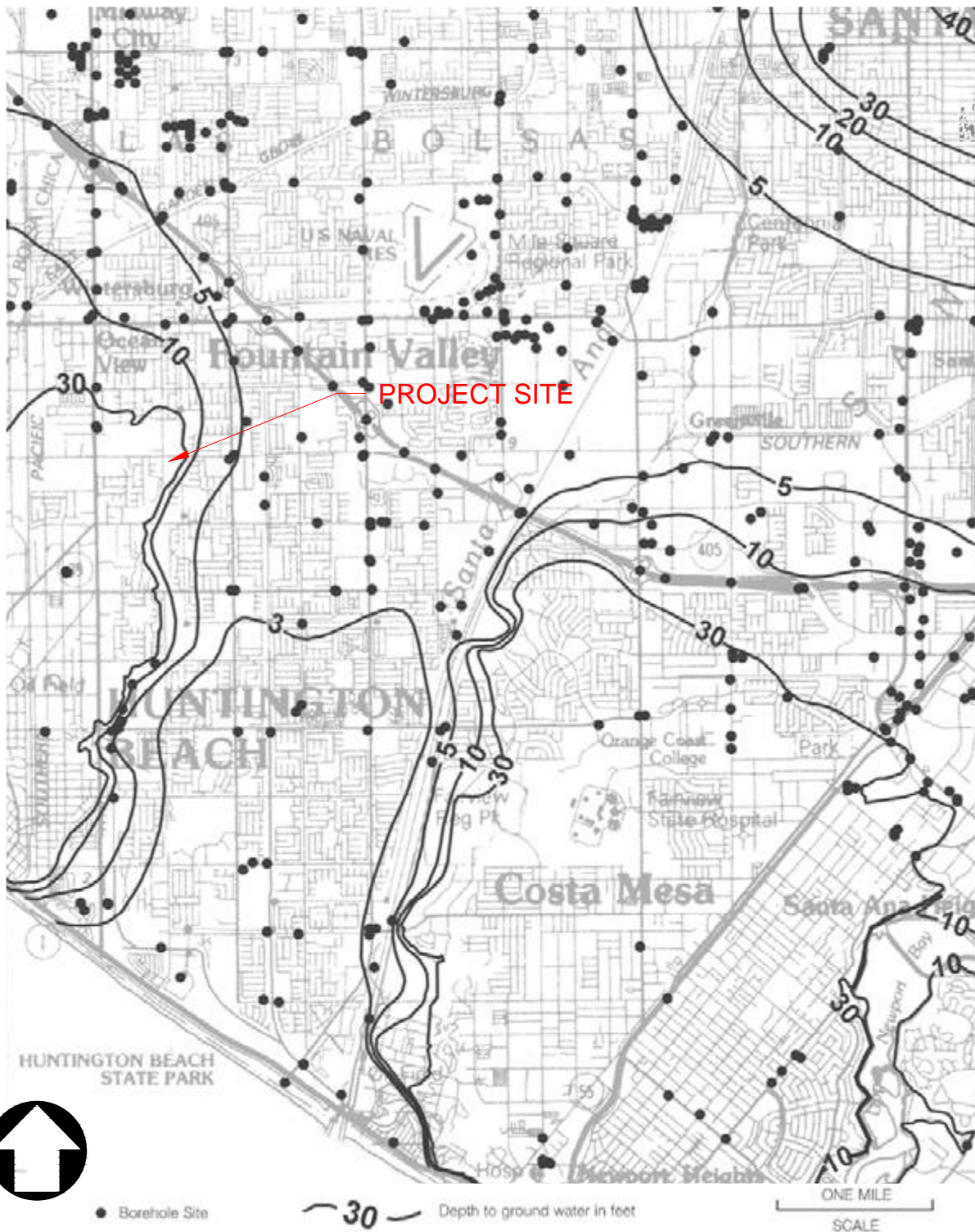
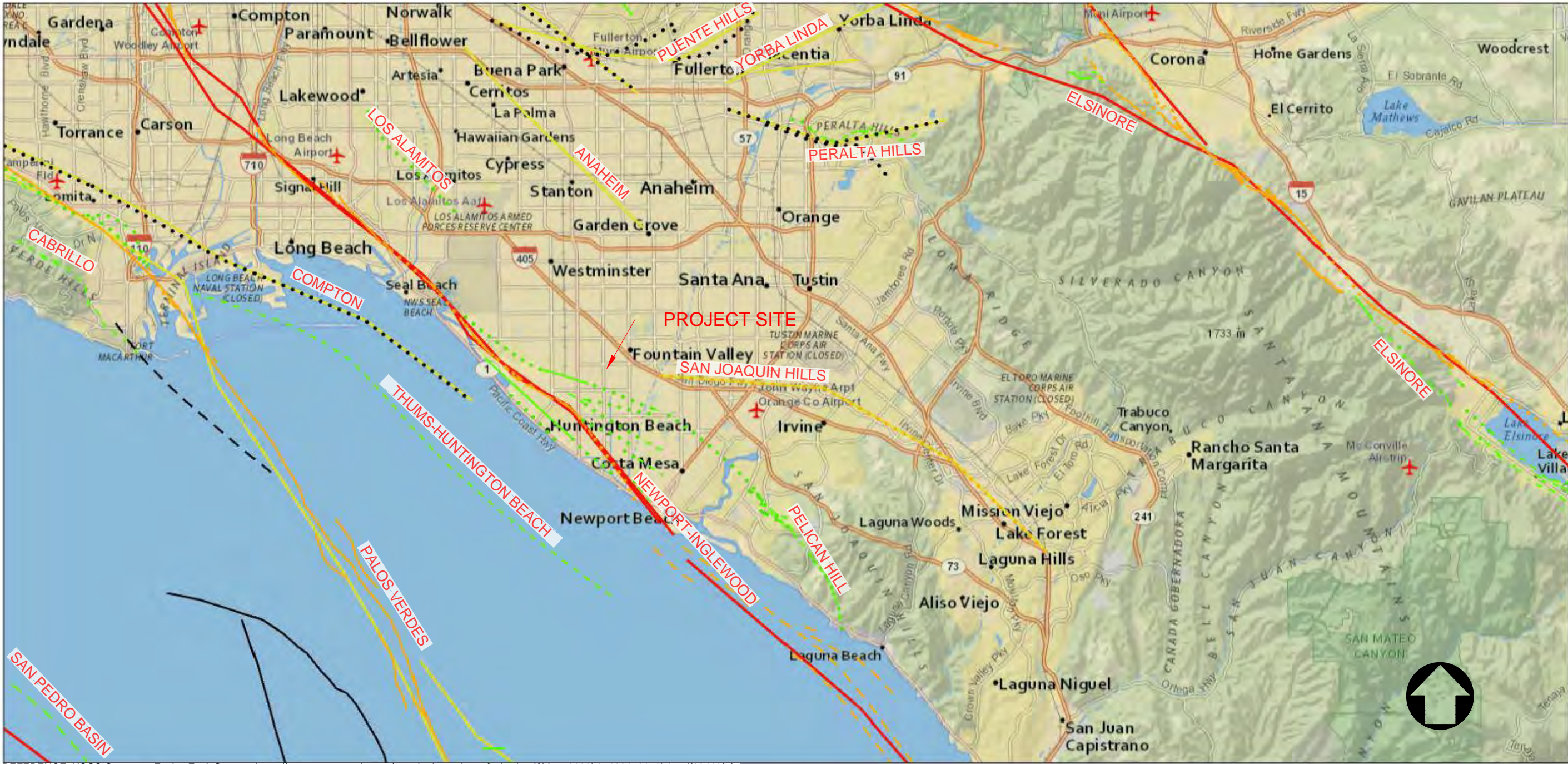


Plate 1.2 Historically Highest Ground Water Contours and Borehole Log Data Locations, Newport Beach Quadrangle.

REFERENCE: CGS, 1998, SEISMIC HAZARD ZONE REPORT, PLATE 1.2 GROUND WATER, FOR ANAHEIM AND NEWPORT BEACH (SHZR 003) 7.5-MINUTE QUADRANGLE, LOS ANGELES, CALIFORNIA.



GROUP DELTA CONSULTANTS, INC. ENGINEERS AND GEOLOGISTS 32 MAUCHLY, SUITE B IRVINE, CALIFORNIA (949) 450-2100		FIGURE NUMBER: 3
PREPARED BY: JMT	PROJECT NAME: 8572 TALBERT AVE. FOUNTAIN VALLEY, CA	PROJECT NUMBER: IR780
REVIEWED BY: AP	HISTORICALLY HIGHEST GROUNDWATER MAP	



REFERENCE: USGS Quaternary Faults, Fault Sources <https://usgs.maps.arcgis.com/apps/webappviewer/index.html?id=5a6038b3a1684561a9b0aadf88412fcf>

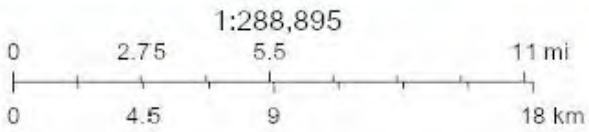
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- Fault Areas

 - Class B
 - historic
 - late Quaternary
 - latest Quaternary
 - middle and late Quaternary

National Database

 - Historic (< 150 years), well constrained location
- Historic (< 150 years), moderately constrained location
 - Historic (< 150 years), inferred location
 - Latest Quaternary (<15,000 years), well constrained location
 - Latest Quaternary (<15,000 years), moderately constrained location
 - Latest Quaternary (<15,000 years), inferred location
 - Late Quaternary (< 130,000 years), well constrained location
 - Late Quaternary (< 130,000 years), moderately constrained location
- Late Quaternary (< 130,000 years), inferred location
 - Middle and late Quaternary (< 750,000 years), well constrained location
 - Middle and late Quaternary (< 750,000 years), moderately constrained location
 - Middle and late Quaternary (< 750,000 years), inferred location
 - Undifferentiated Quaternary (< 1.6 million years), well constrained location
 - Undifferentiated Quaternary (< 1.6 million years), moderately constrained location
 - Undifferentiated Quaternary (< 1.6 million years), inferred location



USGS, National Geographic, Esri, Garmin, HERE, UNEP-WCMC, USGS, NASA, ESA, METI, NRCAN, GEBCO, NOAA, increment P Corp.

	GROUP DELTA CONSULTANTS, INC. ENGINEERS AND GEOLOGISTS 32 MAUCHLY, SUITE B IRVINE, CALIFORNIA (949) 450-2100		FIGURE NUMBER: 4
	PREPARED BY: JMT	PROJECT NAME: 8572 TALBERT AVE. FOUNTAIN VALLEY, CA	PROJECT NUMBER: IR780
	REVIEWED BY: AP	REGIONAL FAULT MAP	

MAP EXPLANATION

EARTHQUAKE FAULT ZONES

Earthquake Fault Zones

Zone boundaries are delineated by straight-line segments; the boundaries define the zone encompassing active faults that constitute a potential hazard to structures from surface faulting or fault creep such that avoidance as described in Public Resources Code Section 2621.5(a) would be required.

Active Fault Traces

Faults considered to have been active during Holocene time and to have potential for surface rupture: Solid Line in Black or Red where Accurately Located; Long Dash in Black or Solid Line in Purple where Approximately Located; Short Dash in Black or Solid Line in Orange where Inferred; Dotted Line in Black or Solid Line in Rose where Concealed; Query (?) Indicates additional uncertainty. Evidence of historic offset indicated by year of earthquake-associated event or C for displacement caused by fault creep.

SEISMIC HAZARD ZONES

Liquefaction Zones

Areas where historical occurrence of liquefaction, or local geological, geotechnical and ground water conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resources Code Section 2693(c) would be required.

Earthquake-Induced Landslide Zones

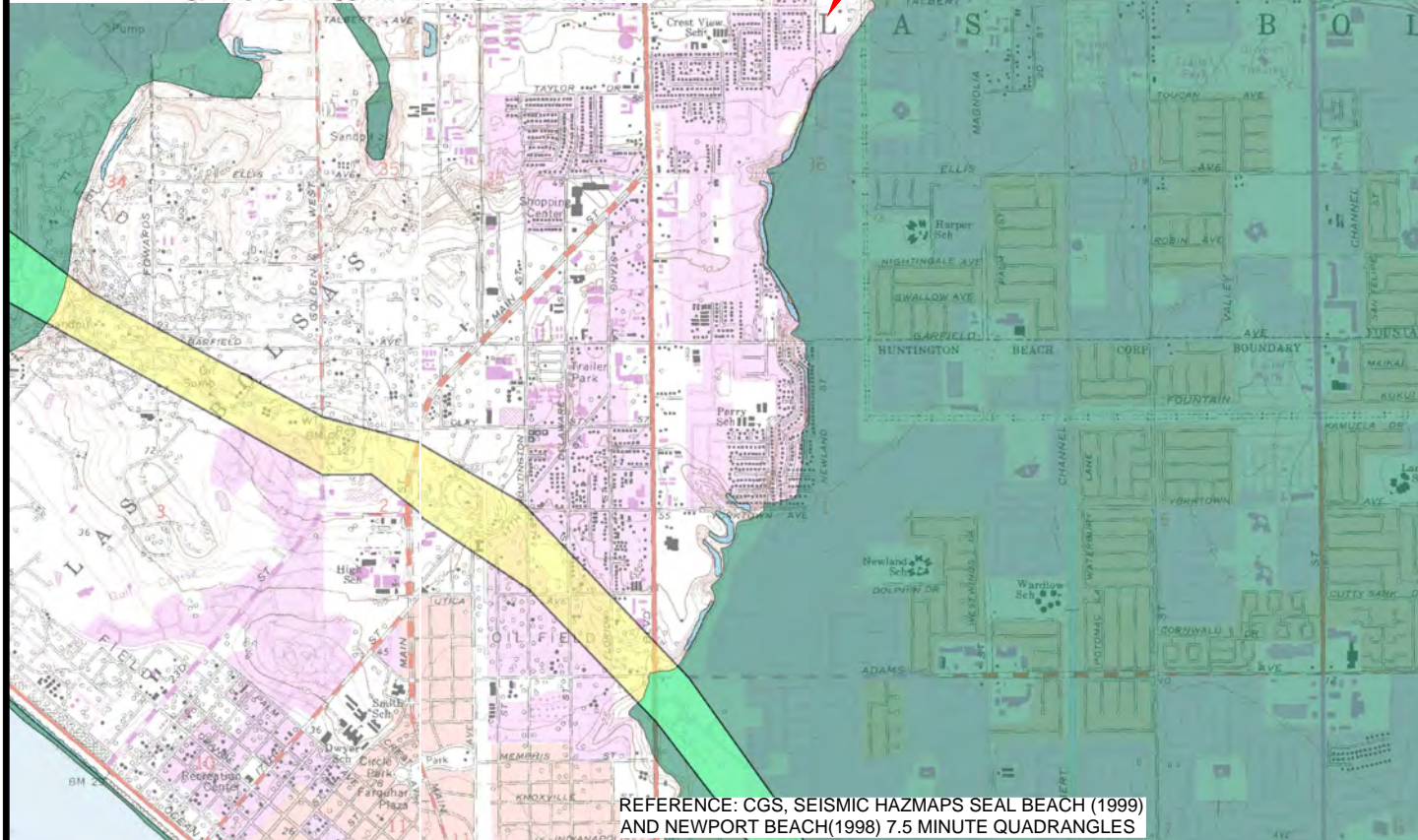
Areas where previous occurrence of landslide movement, or local topographic, geological, geotechnical and subsurface water conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resources Code Section 2693(c) would be required.

OVERLAPPING EARTHQUAKE FAULT AND SEISMIC HAZARD ZONES

Overlap of Earthquake Fault Zone and Liquefaction Zone

Areas that are covered by both Earthquake Fault Zone and Liquefaction Zone.

Note: Mitigation methods differ for each zone – AP Act only allows avoidance; Seismic Hazard Mapping Act allows mitigation by engineering/geotechnical design as well as avoidance.



REFERENCE: CGS, SEISMIC HAZMAPS SEAL BEACH (1999) AND NEWPORT BEACH (1998) 7.5 MINUTE QUADRANGLES



0 3000' 6000'



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FIGURE NUMBER:
5

PREPARED BY:
JMT

PROJECT NAME:
8572 TALBERT AVE.
FOUNTAIN VALLEY, CA

PROJECT NUMBER:
IR780

REVIEWED BY:
AP

EARTHQUAKES ZONES OF REQUIRED
INVESTIGATION MAP

APPENDIX A
FIELD INVESTIGATION

APPENDIX A FIELD INVESTIGATION

A.1 Introduction

The subsurface conditions at the site for the proposed residential development at 8572 Talbert Avenue in Fountain Valley, California were investigated by performing three hollow stem auger (HAS) borings and three Cone Penetration Tests (CPTs) on October 28 of 2021. The locations of the explorations are presented in Figure 2 of the main report. A summary of field explorations is presented in Table A-1.

Before beginning the exploration program, access permission and drilling permits were obtained as necessary from the city of Fountain Valley and property owners. Any available subsurface utility maps were reviewed before selecting locations for subsurface investigations. Underground Service Alert (USA) was notified and each exploration location was cleared for underground utilities. The exploration methods are described in the following sections.

A.2 Soil Drilling and Sampling

Drilling, Logging, and Soil Classification

HSA borings were performed by Group Delta's drilling subcontractor ABC Liovin Drilling under the continuous technical supervision of a Group Delta field engineer, who visually inspected the soil samples, measured groundwater levels, maintained detailed records of the borings, and visually / manually classified the soils per the ASTM D2488 and the Unified Soil Classification System (USCS). Logging and classification were performed in general accordance with Caltrans "Soil and Rock Logging, Classification, and Presentation Manual (2010 Edition)". A Boring Record Legend and Key for Soil Classification are presented in Figures A-1A through A-1E. The boring records are presented in Figures A-2 through Figure A-4.

Sampling

Bulk samples of soil cuttings were collected at depths of up to 5 feet and drive samples were collected at a typical interval of 5 feet from the borings. The sampling was performed using Standard Penetration Test (SPT) samplers per ASTM D1586 and Ring-Lined "California" Split Barrel samplers per ASTM D3550.

Bulk samples were collected from auger cuttings and placed in plastic bags. SPT drive samples were obtained using a 2-inch outside diameter and 1.375-inch inside diameter split-spoon sampler without lining. The soil recovered from the SPT sampling was sealed in plastic bags to preserve the natural moisture content.

Relatively undisturbed California drive samples were collected with a 3-inch outside diameter 2.5-inch inside diameter split barrel sampler with a 2.42-inch inside diameter cutting shoe.



The sampler barrel is lined with 18-inches of metal rings for sample collection and has an additional length of the waste barrel. Stainless steel or brass liner rings for sample collection are 1-inch high, 2.42-inch inside diameter, and 2.5-inch outside diameter. California samples were removed from the sampler, retained in the metal rings, and placed in sealed plastic canisters to prevent loss of moisture.

At each sampling interval, the drive samplers were fitted onto the sampling rod, lowered to the bottom of the boring, and driven 18 inches or to refusal (50 blows per 6 inches) with a 140-lb hammer free-falling a height of 30-inches using an automatic hammer.

Penetration Resistance

SPT blow counts adjusted to 60% hammer efficiency (N_{60}^*) are routinely used as an index of the relative density of coarse-grained soils and are sometimes used (but less reliable) to estimate the consistency of cohesive soils. For samples collected using non-SPT samplers, different hammer weight and drop height, and/or efficiency different than 60%, correction factors can be applied to estimate the equivalent SPT N_{60} value following the approach of Burmister (1948) as follows:

$$N_{60}^* = N_R * C_E * C_H * C_S$$

where

$$N_{60}^* = \text{equivalent SPT } N_{60}$$

$$N_R = \text{Raw Field Blowcount (blows per foot)}$$

$$C_E = \text{Hammer Efficiency Correction} = E_{ri} / 60\%$$

$$C_H = \text{Hammer Energy Correction} = (W * H) / (140 \text{ lb} * 30 \text{ in})$$

$$C_S = \text{Sampler Size Correction} = [(2.0 \text{ in})^2 - (1.375 \text{ in})^2] / [D_o^2 - D_i^2]$$

$$E_{ri} = \text{hammer efficiency, \%}$$

$$W = \text{actual drive hammer weight, lbs}$$

$$H = \text{actual drive hammer drop, inch}$$

$$D_o, D_i = \text{actual sampler outside and inside diameter, respectively, inches}$$

Burmister's correction assumes that penetration resistance (blowcount) is inversely proportional to the hammer energy. For a hammer other than a 140 lb hammer with 30" drop the hammer energy correction is equal to the ratio of the theoretical hammer energy (weight times drop) to the theoretical SPT hammer energy, or $C_H = (W * H) / (140 \text{ lb} * 30 \text{ in})$.



Burmister's correction assumes that penetration resistance (blowcount) is proportional to the annular end area of the drive sampler. For California drive samplers with $D_o=3$ inch and

$D_i=2.42$ inches, the sampler size correction factor is the ratio of the annular area of an SPT split spoon to that of the California Sampler, or $C_s=[2.0^2-1.375^2]/[3^2-2.42^2] = 0.67$.

To normalize the field SPT and California blowcounts to a hammer with 60% efficiency, energy correction factor equal to Hammer Efficiency (%) / 60% was applied to the field blowcounts. Hammer efficiency was determined by Pile Driving Analyzer (PDA) measurement.

The correction factors applied to obtain N^*_{60} are summarized in the following table:

Borings	Hammer Type	Hammer Weight and Drop	C_H	Hammer Efficiency (%)	C_E	Cal Sampler Dimensions	C_s	Combined Correction Factor SPT Samples	Combined Correction Factor CAL Samples
B-1; B-2; B-3	CME Auto	140# 30"	1.0	79.3	1.32	$D_o=3.0"$ $D_i=2.42"$	0.67	1.32	0.88

Corrected N^*_{60} are generally used, with due engineering judgment, only for qualitative assessment of in-place density or consistency and are not used for other more critical analyses such as liquefaction.

Relative Density and Consistency

Equivalent SPT N_{60} values were used as the basis for classifying the relative density of granular/cohesionless soils. Consistency classification of cohesive soils was based on undrained shear strength estimated by correlations to Equivalent SPT N_{60} . The correlations for consistency and relative density are shown in the Boring Record Legend in Figure A-1C. Drive sample field blow counts, SPT N^*_{60} values, and corresponding density/consistency classifications are presented on the boring records.

Borehole Abandonment

After the drilling, the borings were abandoned by backfilling the borehole with cement grout as indicated on the records. Excess cuttings were placed in 55-gallon drums, sampled and tested for contaminants, temporarily stored at an approved location, and legally disposed of off-site. Notes describing the borehole abandonment are presented at the bottom of the boring record.

Sample Handling and Transport



Geotechnical samples were sealed to prevent moisture loss, packed in appropriate protective containers, and transported to the geotechnical laboratory for further examination and geotechnical testing.

Laboratory Testing

The soils were further examined and tested in the laboratory and classified per the Unified Soil Classification System following ASTM D2487 and ASTM D2488. Field classifications presented on the records were modified where necessary based on the laboratory test results. Descriptions of the laboratory tests performed, and a summary of the results are presented in Appendix B.

A.3 Cone Penetration Tests

CPT Soundings

Kehoe Testing and Engineering performed three CPT soundings to depths of 50 feet below the existing ground surface. The CPTs were conducted per ASTM D5778 using an electronic piezocone penetrometer. The test consists of hydraulically pushing a conical pointed penetrometer with a cylindrical friction sleeve and a piezo-element located behind the conical point into subsurface soils at a slow, steady rate. Parameters electronically measured and recorded nearly continuously during the CPT are soil bearing resistance at the cone tip (q_c), soil frictional resistance along the cylindrical friction sleeve (f_s), and pore water pressure directly behind the cone tip (U). These measured values are then used to estimate the type and engineering properties of soils being penetrated using published correlations between q_c , f_s , and U .

The CPT data in graphical form and accompanying data interpretation are presented in Figures A-5 to A-7. After the sounding, the apparent groundwater depth and cave-in depth were measured with weighted tape and the CPT hole was abandoned by backfilling cement grout into the hole.

A.4 List of Attached Tables and Figures

The following tables and figures are attached and complete this appendix:

List of Tables

Table A-1	Summary of Field Explorations
-----------	-------------------------------

List of Figures

Figures A-1A through A-1C	Boring Record Legend
Figures A-1D and A-1E	Key for Soil Classification
Figures A-2 through A-4	Boring Record
Figures A-5 through A-7	CPT Records and Interpretations

Table A-1: Summary of Field Explorations

Exploration No.	Date	Type	Depth (feet)	Groundwater Depth (feet)
B-1	10/28/2021	HSA	51.5	35
B-2	10/28/2021	HSA	31.5	NE
B-3	10/28/2021	HSA	21.5	NE
CPT-1	10/28/2021	CPT	50.4	35
CPT-2	10/28/2021	CPT	50.1	Cave in at 32 feet dry
CPT-3	10/28/2021	CPT	50.2	35

SOIL IDENTIFICATION AND DESCRIPTION SEQUENCE

Sequence		Refer to Section		Required	Optional
		Field	Lab		
1	Group Name	2.5.2	3.2.2	●	
2	Group Symbol	2.5.2	3.2.2	●	
	Description Components				
3	Consistency of Cohesive Soil	2.5.3	3.2.3	●	
4	Apparent Density of Cohesionless Soil	2.5.4		●	
5	Color	2.5.5		●	
6	Moisture	2.5.6		●	
7	Percent or Proportion of Soil	2.5.7	3.2.4	●	●
	Particle Size	2.5.8	2.5.8	●	●
	Particle Angularity	2.5.9			○
	Particle Shape	2.5.10			○
8	Plasticity (for fine-grained soil)	2.5.11	3.2.5		○
9	Dry Strength (for fine-grained soil)	2.5.12			○
10	Dilatency (for fine-grained soil)	2.5.13			○
11	Toughness (for fine-grained soil)	2.5.14			○
12	Structure	2.5.15			○
13	Cementation	2.5.16		●	
14	Percent of Cobbles and Boulders	2.5.17		●	
	Description of Cobbles and Boulders	2.5.18		●	
15	Consistency Field Test Result	2.5.3		●	
16	Additional Comments	2.5.19			○

Describe the soil using descriptive terms in the order shown

Minimum Required Sequence:

USCS Group Name (Group Symbol); Consistency or Density; Color; Moisture; Percent or Proportion of Soil; Particle Size; Plasticity (optional).

● = optional for non-Caltrans projects

Where applicable:

Cementation; % cobbles & boulders;
Description of cobbles & boulders;
Consistency field test result

HOLE IDENTIFICATION

Holes are identified using the following convention:

H-YY-NNN

Where:

H: Hole Type Code

YY: 2-digit year

NNN: 3-digit number (001-999)

Hole Type Code	Description
A	Auger boring (hollow or solid stem, bucket)
R	Rotary drilled boring (conventional)
RC	Rotary core (self-cased wire-line, continuously-sampled)
RW	Rotary core (self-cased wire-line, not continuously sampled)
P	Rotary percussion boring (Air)
HD	Hand driven (1-inch soil tube)
HA	Hand auger
D	Driven (dynamic cone penetrometer)
CPT	Cone Penetration Test
O	Other (note on LOTB)

Description Sequence Examples:

SANDY lean CLAY (CL); very stiff; yellowish brown; moist; mostly fines; some SAND, from fine to medium; few gravels; medium plasticity; PP=2.75.

Well-graded SAND with SILT and GRAVEL and COBBLES (SW-SM); dense; brown; moist; mostly SAND, from fine to coarse; some fine GRAVEL; few fines; weak cementation; 10% GRANITE COBBLES; 3 to 6 inches; hard; subrounded.

Clayey SAND (SC); medium dense, light brown; wet; mostly fine sand; little fines; low plasticity.



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FIGURE NUMBER

A-1A

PROJECT NUMBER

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BORING RECORD LEGEND #1

GROUP SYMBOLS AND NAMES			
Graphic / Symbol	Group Names	Graphic / Symbol	Group Names
	GW Well-graded GRAVEL Well-graded GRAVEL with SAND		CL Lean CLAY Lean CLAY with SAND Lean CLAY with GRAVEL SANDY lean CLAY SANDY lean CLAY with GRAVEL GRAVELLY lean CLAY GRAVELLY lean CLAY with SAND
	GP Poorly graded GRAVEL Poorly graded GRAVEL with SAND		
	GW-GM Well-graded GRAVEL with SILT Well-graded GRAVEL with SILT and SAND		CL-ML SILTY CLAY SILTY CLAY with SAND SILTY CLAY with GRAVEL SANDY SILTY CLAY SANDY SILTY CLAY with GRAVEL GRAVELLY SILTY CLAY GRAVELLY SILTY CLAY with SAND
	GW-GC Well-graded GRAVEL with CLAY (or SILTY CLAY) Well-graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND)		
	GP-GM Poorly graded GRAVEL with SILT Poorly graded GRAVEL with SILT and SAND		ML SILT SILT with SAND SILT with GRAVEL SANDY SILT SANDY SILT with GRAVEL GRAVELLY SILT GRAVELLY SILT with SAND
	GP-GC Poorly graded GRAVEL with CLAY (or SILTY CLAY) Poorly graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND)		
	GM SILTY GRAVEL SILTY GRAVEL with SAND		OL ORGANIC lean CLAY ORGANIC lean CLAY with SAND ORGANIC lean CLAY with GRAVEL SANDY ORGANIC lean CLAY SANDY ORGANIC lean CLAY with GRAVEL GRAVELLY ORGANIC lean CLAY GRAVELLY ORGANIC lean CLAY with SAND
	GC CLAYEY GRAVEL CLAYEY GRAVEL with SAND		
	GC-GM SILTY, CLAYEY GRAVEL SILTY, CLAYEY GRAVEL with SAND		OL ORGANIC SILT ORGANIC SILT with SAND ORGANIC SILT with GRAVEL SANDY ORGANIC SILT SANDY ORGANIC SILT with GRAVEL GRAVELLY ORGANIC SILT GRAVELLY ORGANIC SILT with SAND
	SW Well-graded SAND Well-graded SAND with GRAVEL		
	SP Poorly graded SAND Poorly graded SAND with GRAVEL		CH Fat CLAY Fat CLAY with SAND Fat CLAY with GRAVEL SANDY fat CLAY SANDY fat CLAY with GRAVEL GRAVELLY fat CLAY GRAVELLY fat CLAY with SAND
	SW-SM Well-graded SAND with SILT Well-graded SAND with SILT and GRAVEL		
	SW-SC Well-graded SAND with CLAY (or SILTY CLAY) Well-graded SAND with CLAY and GRAVEL (or SILTY CLAY and GRAVEL)		MH Elastic SILT Elastic SILT with SAND Elastic SILT with GRAVEL SANDY elastic SILT SANDY elastic SILT with GRAVEL GRAVELLY elastic SILT GRAVELLY elastic SILT with SAND
	SP-SM Poorly graded SAND with SILT Poorly graded SAND with SILT and GRAVEL		
	SP-SC Poorly graded SAND with CLAY (or SILTY CLAY) Poorly graded SAND with CLAY and GRAVEL (or SILTY CLAY and GRAVEL)		OH ORGANIC fat CLAY ORGANIC fat CLAY with SAND ORGANIC fat CLAY with GRAVEL SANDY ORGANIC fat CLAY SANDY ORGANIC fat CLAY with GRAVEL GRAVELLY ORGANIC fat CLAY GRAVELLY ORGANIC fat CLAY with SAND
	SM SILTY SAND SILTY SAND with GRAVEL		
	SC CLAYEY SAND CLAYEY SAND with GRAVEL		OH ORGANIC elastic SILT ORGANIC elastic SILT with SAND ORGANIC elastic SILT with GRAVEL SANDY elastic ELASTIC SILT SANDY ORGANIC elastic SILT with GRAVEL GRAVELLY ORGANIC elastic SILT GRAVELLY ORGANIC elastic SILT with SAND
	SC-SM SILTY, CLAYEY SAND SILTY, CLAYEY SAND with GRAVEL		
	PT PEAT		OL/OH ORGANIC SOIL ORGANIC SOIL with SAND ORGANIC SOIL with GRAVEL SANDY ORGANIC SOIL SANDY ORGANIC SOIL with GRAVEL GRAVELLY ORGANIC SOIL GRAVELLY ORGANIC SOIL with SAND
	COBBLES COBBLES and BOULDERS BOULDERS		

DRILLING METHOD SYMBOLS

	Auger Drilling		Rotary Drilling		Dynamic Cone or Hand Driven		Diamond Core
--	----------------	--	-----------------	--	-----------------------------	--	--------------

DEFINITIONS FOR CHANGE IN MATERIAL

Term	Definition	Symbol
Material Change	Change in material is observed in the sample or core, and the location of change can be accurately measured.	_____
Estimated Material Change	Change in material cannot be accurately located because either the change is gradational or because of limitations in the drilling/sampling methods used.	-----
Soil/Rock Boundary	Material changes from soil characteristics to rock characteristics.	~~~~~

FIELD AND LABORATORY TESTS

C	Consolidation (ASTM D 2435-04)
CL	Collapse Potential (ASTM D 5333-03)
CP	Compaction Curve (CTM 216 - 06)
CR	Corrosion, Sulfates, Chlorides (CTM 643 - 99; CTM 417 - 06; CTM 422 - 06)
CU	Consolidated Undrained Triaxial (ASTM D 4767-02)
DS	Direct Shear (ASTM D 3080-04)
EI	Expansion Index (ASTM D 4829-03)
M	Moisture Content (ASTM D 2216-05)
OC	Organic Content (ASTM D 2974-07)
P	Permeability (CTM 220 - 05)
PA	Particle Size Analysis (ASTM D 422-63 [2002])
PI	Liquid Limit, Plastic Limit, Plasticity Index (AASHTO T 89-02, AASHTO T 90-00)
PL	Point Load Index (ASTM D 5731-05)
PM	Pressure Meter
PP	Pocket Penetrometer
R	R-Value (CTM 301 - 00)
SE	Sand Equivalent (CTM 217 - 99)
SG	Specific Gravity (AASHTO T 100-06)
SL	Shrinkage Limit (ASTM D 427-04)
SW	Swell Potential (ASTM D 4546-03)
TV	Pocket Torvane
UC	Unconfined Compression - Soil (ASTM D 2166-06)
UU	Unconsolidated Undrained Triaxial (ASTM D 2850-03)
UW	Unit Weight (ASTM D 4767-04)
VS	Vane Shear (AASHTO T 223-96 [2004])

SAMPLER GRAPHIC SYMBOLS

	Standard Penetration Test (SPT)
	Standard California Sampler
	Modified California Sampler
	Shelby Tube
	Piston Sampler
	NX Rock Core
	HQ Rock Core
	Bulk Sample
	Other (see remarks)

WATER LEVEL SYMBOLS

	First Water Level Reading (during drilling)
	Static Water Level Reading (after drilling, date)

Ref.: Caltrans Soil and Rock Logging Classification, and Presentation Manual (2010)



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BORING RECORD LEGEND #2

CONSISTENCY OF COHESIVE SOILS				
Descriptor	Shear Strength (tsf)	Pocket Penetrometer, PP Measurement (tsf)	Torvane, TV. Measurement (tsf)	Vane Shear, VS. Measurement (tsf)
Very Soft	< 0.12	< 0.25	< 0.12	< 0.12
Soft	0.12 - 0.25	0.25 - 0.50	0.12 - 0.25	0.12 - 0.25
Medium Stiff	0.25 - 0.50	0.50 - 1.0	0.25 - 0.50	0.25 - 0.50
Stiff	0.50 - 1.0	1.0 - 2.0	0.50 - 1.0	0.50 - 1.0
Very Stiff	1.0 - 2.0	2.0 - 4.0	1.0 - 2.0	1.0 - 2.0
Hard	> 2.0	> 4.0	> 2.0	> 2.0

APPARENT DENSITY OF COHESIONLESS SOILS	
Descriptor	SPT N_{60} - Value (blows / foot)
Very Loose	0 - 5
Loose	5 - 10
Medium Dense	10 - 30
Dense	30 - 50
Very Dense	> 50

MOISTURE	
Descriptor	Criteria
Dry	No discernable moisture
Moist	Moisture present, but no free water
Wet	Visible free water

PERCENT OR PROPORTION OF SOILS	
Descriptor	Criteria
Trace	Particles are present but estimated to be less than 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

PARTICLE SIZE		
Descriptor		Size (in)
Boulder		> 12
Cobble		3 - 12
Gravel	Coarse	3/4 - 3
	Fine	1/5 - 3/4
Sand	Coarse	1/16 - 1/5
	Medium	1/64 - 1/16
	Fine	1/300 - 1/64
Silt and Clay		< 1/300

PLASTICITY OF FINE-GRAINED SOILS	
Descriptor	Criteria
Nonplastic	A 1/8-inch thread cannot be rolled at any water content.
Low	The thread can barely be rolled, and the lump cannot be formed when drier than the plastic limit.
Medium	The thread is easy to roll, and not much time is required to reach the plastic limit; it cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.
High	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit.

CONSISTENCY OF COHESIVE SOILS VS. N_{60}	
Description	SPT N_{60} (blows / foot)
Very Soft	0 - 2
Soft	2 - 4
Medium Stiff	4 - 8
Stiff	8 - 15
Very Stiff	15 - 30
Hard	> 30

Ref: Peck, Hansen, and Thornburn, 1974, "Foundation Engineering", Second Edition

Note: Only to be used (with caution) when pocket penetrometer or other data on undrained shear strength are unavailable. Not allowed by Caltrans Soil and Rock Logging and Classification Manual, 2010

CEMENTATION	
Descriptor	Criteria
Weak	Crumbles or breaks with handling or little finger pressure.
Moderate	Crumbles or breaks with considerable finger pressure.
Strong	Will not crumble or break with finger pressure.

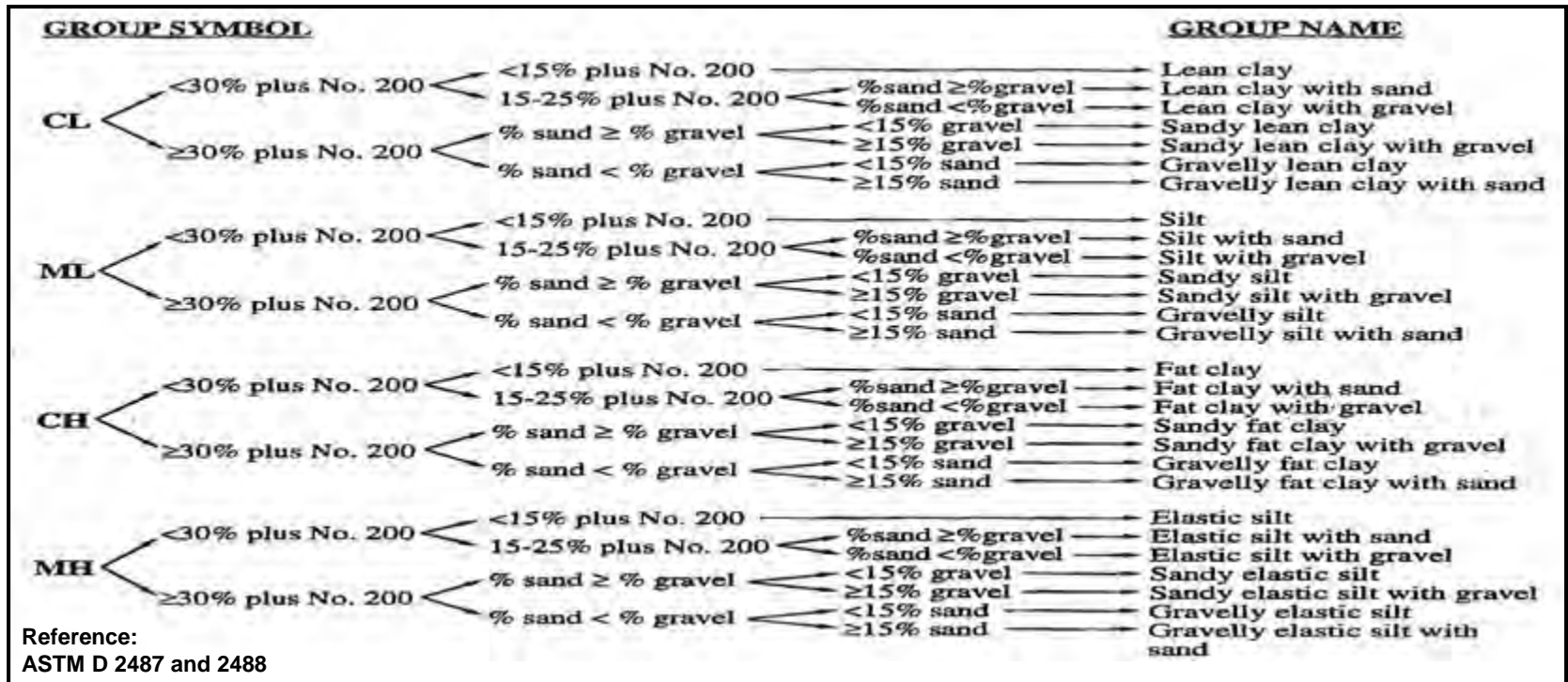
Ref.: Caltrans Soil and Rock Logging Classification, and Presentation Manual (2010), with the exception of consistency of cohesive soils vs. N_{60} .



GROUP DELTA CONSULTANTS, INC. GEOTECHNICAL ENGINEERS AND GEOLOGISTS		FIGURE NUMBER A-1C
PROJECT NAME Geotechnical Design Report 8572 Talbert Avenue, Fountain Valley, California		PROJECT NUMBER IR780

BORING RECORD LEGEND #3

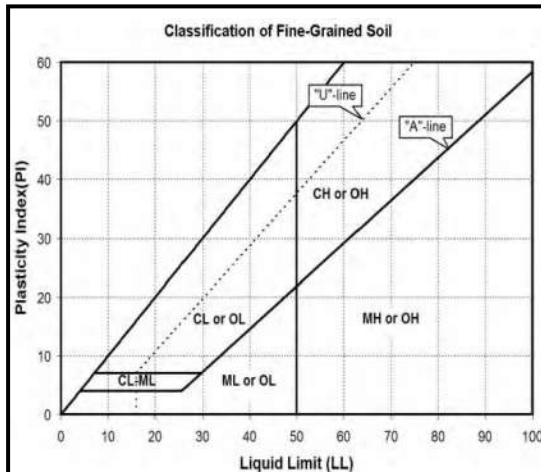
CLASSIFICATION OF INORGANIC FINE GRAINED SOILS (Soils with $\geq 50\%$ finer than No. 200 Sieve)



Reference:
ASTM D 2487 and 2488

Laboratory Classification of Clay and Silt

REFERENCE: Caltrans Soil and Rock Logging, Classification, and Presentation Manual (2010).



CL: LL < 50; above A-Line.

CH: LL \geq 50; above A-Line.

ML: LL < 50; below A-Line, or PI < 4, or Non-Plastic

MH: LL \geq 50; below A-Line.

CL-ML: above A-Line and PI = 4 to 7

CL/CH, ML/MH: at or near LL = 50

ML/CL, MH/CH: at or near the A-Line

Field Identification of Clays and Silts

Group Symbol	Dry Strength	Dilatancy	Toughness	Plasticity
ML	None to low	Slow to rapid	Low or thread cannot be formed	Low to nonplastic
CL	Medium to high	None to slow	Medium	Medium
MH	Low to medium	None to slow	Low to medium	Low to medium
CH	High to very high	None	High	High

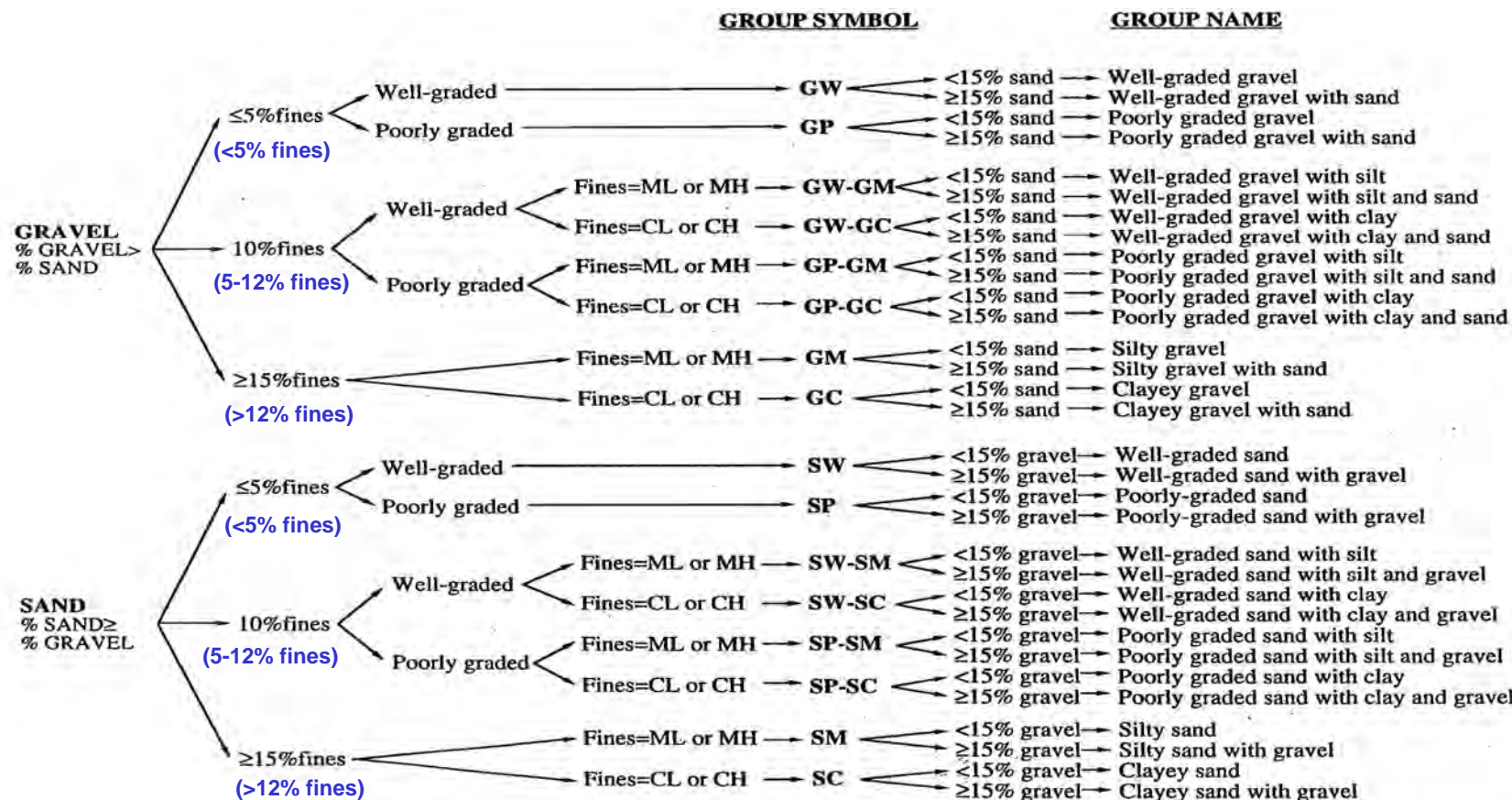


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KEY FOR SOIL CLASSIFICATION #1
Figure A-1D

CLASSIFICATION OF COARSE-GRAINED SOILS (Soils with <50% "fines" passing No. 200 Sieve)



Reference:

ASTM D 2487 and 2488

Note: Values estimated to nearest 5% to be used for visual identification, values in parentheses to be used for classification when based on laboratory grain size data.

Granular Soil Gradation Parameters

Coefficient of Uniformity: $C_u = D_{60}/D_{10}$

Coefficient of Curvature: $C_c = D_{30}^2 / (D_{60} \times D_{10})$

D_{10} = 10% of soil is finer than this diameter

D_{30} = 30% of soil is finer than this diameter

D_{60} = 60% of soil is finer than this diameter

Group

Symbol Gradation or Plasticity Requirement

SW..... $C_u > 6$ and $1 \leq C_c \leq 3$

GW $C_u > 4$ and $1 \leq C_c \leq 3$

GP or SP.....Clean gravel or sand not meeting requirement for SW or GW

SM or GM.....Non-plastic fines or below A-Line or $PI < 4$

SC or GC.....Plastic fines or above A-Line and $PI > 7$



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KEY FOR SOIL CLASSIFICATION #2

Figure A-1E

GDC_LOG_BORING_2016 IR780 - BONANNI - 8572 TALBERT AVE.GPJ GDC2013.GDT 11/29/21

BORING RECORD										PROJECT NAME Bonanni - 8572 Talbert Avenue		PROJECT NUMBER IR780		HOLE ID B-1	
SITE LOCATION 8572 Talbert Avenue, Fountain Valley, California										START 10/28/2021		FINISH 10/28/2021		SHEET NO. 1 of 2	
DRILLING COMPANY ABC Liovin			DRILL RIG CME 75			DRILLING METHOD Hollow Stem Auger			LOGGED BY G. Valdivia		CHECKED BY Ethan Tsai				
HAMMER TYPE (WEIGHT/DROP) Hammer: 140 lbs., Drop: 30 in.			HAMMER EFFICIENCY (Eri) 79.3			BORING DIA. (in) 8		TOTAL DEPTH (ft) 51.5		GROUND ELEV (ft) 46		DEPTH/ELEV. GW (ft) ▽ 35.0 / 11.0 DURING DRILLING			
DRIVE SAMPLER TYPE(S) & SIZE (ID) Bulk; SPT (1.4"); MC (2.4")						NOTES $N_{60} = 1.32 N_{SPT} = 0.88 N_{MC}$						AFTER DRILLING ▽ 35.0 / 11.0			
DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	SPT N_{60}	RECOVERY (%)	RQD (%)	MOISTURE (%)	DRY DENSITY (pcf)	ATTERBERG LIMITS (LL:PI)	OTHER TESTS	DRILLING METHOD	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
5	45		B-1									EI #200			FILL SANDY SILT (ML); soft; reddish brown; some fine SAND; trace GRAVEL. FINES 64 %; SAND 36 %. <hr style="border-top: 1px dashed black;"/> NATIVE SANDY SILT (ML); reddish brown; some fine SAND; trace GRAVEL.
	40		S-2	9 14 10	24	32									SILTY SAND (SM); dense; brown; dry; mostly fine SAND; some fines.
10	35		R-3	8 14 17	31	27			2.1	105.9					Poorly-graded SAND (SP); medium dense; reddish brown; moist; mostly fine; some medium to coarse.
15	30		S-4	8 6 7	13	17									SANDY SILT (ML); medium stiff to stiff; yellowish brown; moist; little fine SAND; low plasticity.
20	25		R-5	6 9 12	21	18			26.4	98.8		PI			SANDY lean CLAY (CL); hard; brown; moist; mostly fines; little fine SAND; medium plasticity.
25	20		S-6	8 11 17	28	37									CLAYEY SAND (SC) to SILTY SAND (SM); dense; brown; dry; mostly fine SAND; some fines.



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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 THE ACTUAL CONDITIONS ENCOUNTERED.

FIGURE
A-2 a

GDC_LOG_BORING_2016 IR780 - BONANNI - 8572 TALBERT AVE.GPJ GDC2013.GDT 11/29/21

BORING RECORD										PROJECT NAME			PROJECT NUMBER		HOLE ID	
										Bonanni - 8572 Talbert Avenue			IR780		B-1	
SITE LOCATION										START		FINISH		SHEET NO.		
8572 Talbert Avenue, Fountain Valley, California										10/28/2021		10/28/2021		2 of 2		
DRILLING COMPANY			DRILL RIG			DRILLING METHOD				LOGGED BY		CHECKED BY				
ABC Liovin			CME 75			Hollow Stem Auger				G. Valdivia		Ethan Tsai				
HAMMER TYPE (WEIGHT/DROP)			HAMMER EFFICIENCY (ERI)			BORING DIA. (in)		TOTAL DEPTH (ft)		GROUND ELEV (ft)		DEPTH/ELEV. GW (ft)				
Hammer: 140 lbs., Drop: 30 in.			79.3			8		51.5		46		▽ 35.0 / 11.0 DURING DRILLING				
DRIVE SAMPLER TYPE(S) & SIZE (ID)						NOTES						AFTER DRILLING				
Bulk; SPT (1.4"); MC (2.4")						$N_{60} = 1.32 N_{SPT} = 0.88 N_{MC}$						▽ 35.0 / 11.0				
DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	SPT N ₆₀	RECOVERY (%)	RQD (%)	MOISTURE (%)	DRY DENSITY (pcf)	ATTERBERG LIMITS (LL:PI)	OTHER TESTS	DRILLING METHOD	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	
	15	✖	R-7	13 26 29	55	48			7.7	103.8					SILTY SAND (SM); dense; brown; moist; mostly fine SAND.	
35	10	✕	S-8	6 7 6	13	17									SILTY SAND (SM); medium dense; brown; moist to wet; mostly fine SAND; some fines.	
40	5	✖	R-9	7 3 7	10	9			15.0	113.0					Poorly-graded SAND (SP); loose; brown; wet; mostly coarse.	
45	0	✕	S-10	9 23 50	73	96									Very dense.	
50	-5	✖	R-11	10 19 30	49	43			18.3	105.1					Dense.	
55	-10														Boring was terminated at 51.5 feet below the existing ground surface (bgs). Groundwater was encountered at 35 feet bgs. Backfilled with cement grout.	




GROUP DELTA CONSULTANTS
 32 Mauchly, Suite B
 Irvine, CA 92618


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 THE ACTUAL CONDITIONS ENCOUNTERED.

FIGURE
 A-2 b

[illegible]

GDC_LOG_BORING_2016 IR780 - BONANNI - 8572 TALBERT AVE.GPJ GDC2013.GDT 11/29/21

BORING RECORD										PROJECT NAME Bonanni - 8572 Talbert Avenue			PROJECT NUMBER IR780		HOLE ID B-2	
SITE LOCATION 8572 Talbert Avenue, Fountain Valley, California										START 10/28/2021		FINISH 10/28/2021		SHEET NO. 2 of 2		
DRILLING COMPANY ABC Liovin			DRILL RIG CME 75			DRILLING METHOD Hollow Stem Auger				LOGGED BY G. Valdivia		CHECKED BY Ethan Tsai				
HAMMER TYPE (WEIGHT/DROP) Hammer: 140 lbs., Drop: 30 in.			HAMMER EFFICIENCY (ERI) 79.3			BORING DIA. (in) 8		TOTAL DEPTH (ft) 31.5		GROUND ELEV (ft) 45		DEPTH/ELEV. GW (ft) NE / NE DURING DRILLING				
DRIVE SAMPLER TYPE(S) & SIZE (ID) Bulk; SPT (1.4"); MC (2.4")						NOTES $N_{60} = 1.32 N_{SPT} = 0.88 N_{MC}$						NE / NE AFTER DRILLING				
DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	SPT N_{60}	RECOVERY (%)	RQD (%)	MOISTURE (%)	DRY DENSITY (pcf)	ATTERBERG LIMITS (LL:PI)	OTHER TESTS	DRILLING METHOD	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	
			S-7	8 19 22	41	54									SILTY SAND (SM); very dense; brown; moist; mostly fine SAND; little fines.	
35	10														Boring was terminated at 31.5 feet below the existing ground surface (bgs). Groundwater was not encountered. Backfilled and tampered with soil cuttings.	
40	5															
45	0															
50	-5															
55	-10															

	GROUP DELTA CONSULTANTS 32 Mauchly, Suite B Irvine, CA 92618	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 THE ACTUAL CONDITIONS ENCOUNTERED.	FIGURE A-3 b
---	--	--	-----------------

GDC_LOG_BORING_2016 IR780 - BONANNI - 8572 TALBERT AVE.GPJ GDC2013.GDT 11/29/21

BORING RECORD										PROJECT NAME Bonanni - 8572 Talbert Avenue		PROJECT NUMBER IR780		HOLE ID B-3	
SITE LOCATION 8572 Talbert Avenue, Fountain Valley, California										START 10/28/2021		FINISH 10/28/2021		SHEET NO. 1 of 1	
DRILLING COMPANY ABC Liovin			DRILL RIG CME 75			DRILLING METHOD Hollow Stem Auger			LOGGED BY G. Valdivia			CHECKED BY Ethan Tsai			
HAMMER TYPE (WEIGHT/DROP) Hammer: 140 lbs., Drop: 30 in.			HAMMER EFFICIENCY (ERI) 79.3			BORING DIA. (in) 8		TOTAL DEPTH (ft) 21.5		GROUND ELEV (ft) 44		DEPTH/ELEV. GW (ft) ▽ NE / NE DURING DRILLING			
DRIVE SAMPLER TYPE(S) & SIZE (ID) Bulk; SPT (1.4"); MC (2.4")						NOTES $N_{60} = 1.32 N_{SPT} = 0.88 N_{MC}$						▽ NE / NE AFTER DRILLING			
DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	SPT N_{60}	RECOVERY (%)	RQD (%)	MOISTURE (%)	DRY DENSITY (pcf)	ATTERBERG LIMITS (LL:PI)	OTHER TESTS	DRILLING METHOD	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
5	40	B-1													FILL SANDY SILT (ML); soft; brown; dry; some fine SAND.
		R-2		4 21 27	48	42			8.1	114.3					NATIVE SANDY SILT (ML); brown; dry; some fine SAND.
		S-3		8 8 10	18	24									SILTY SAND (SM); dense; brown; moist; mostly fine SAND; some fines.
	10		S-3		8 8 10	18	24								Poorly-graded SAND (SP); medium dense; yellowish brown; moist; mostly medium to fine; few fines.
		R-4		12 19 20	39	34									Dense. No recovery.
		S-5		10 14 18	32	42									Dense; mostly coarse to medium.
20	25	S-6		6 9 13	22	29									SANDY SILT (ML); very stiff; light brown; moist; little fine SAND; low plasticity.
	20														Boring was terminated at 21.5 feet below the existing ground surface (bgs). Groundwater was not encountered. Backfilled and tampered with soil cuttings.
25															
	20														
	15														

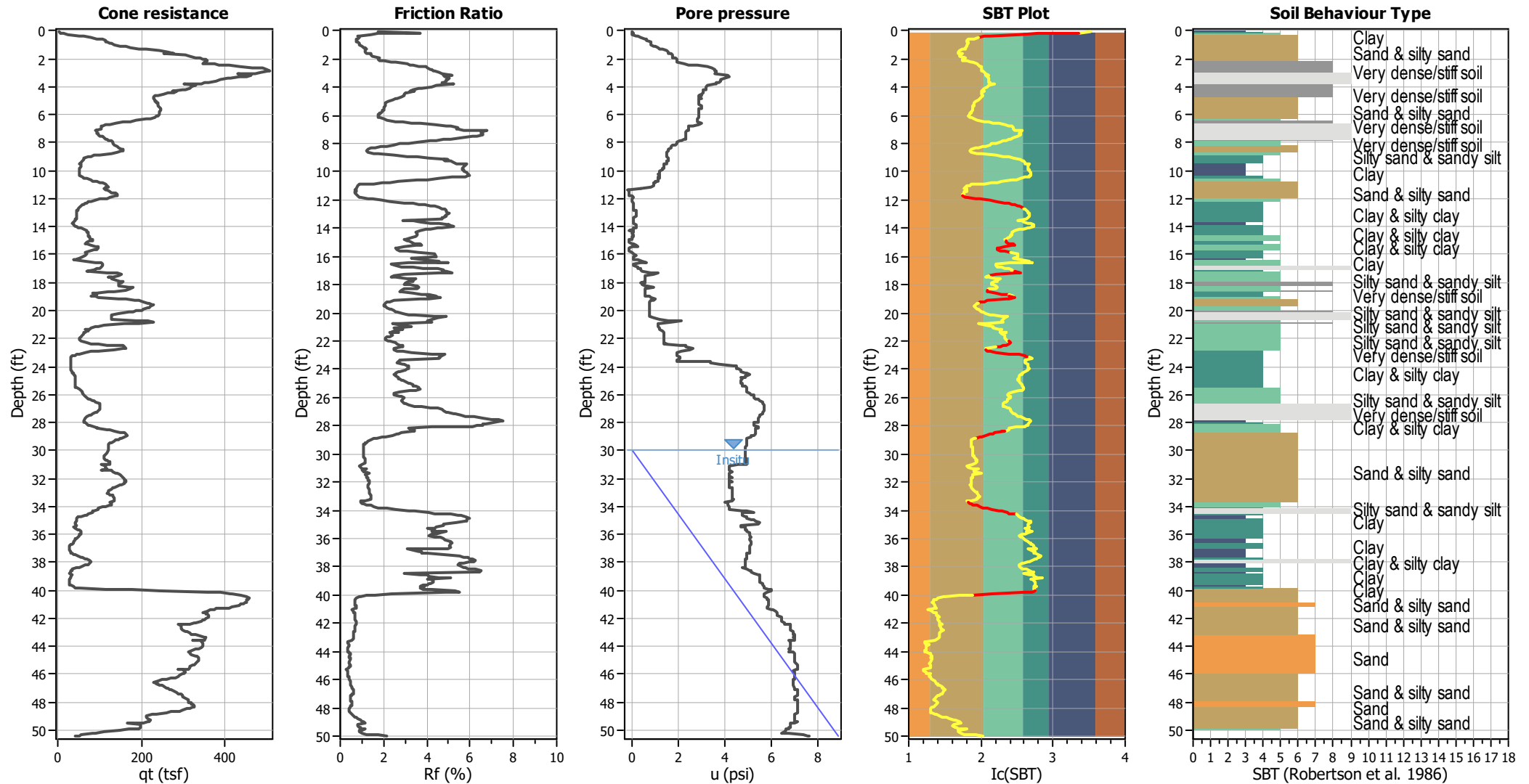


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FIGURE
A-4

CPT basic interpretation plots



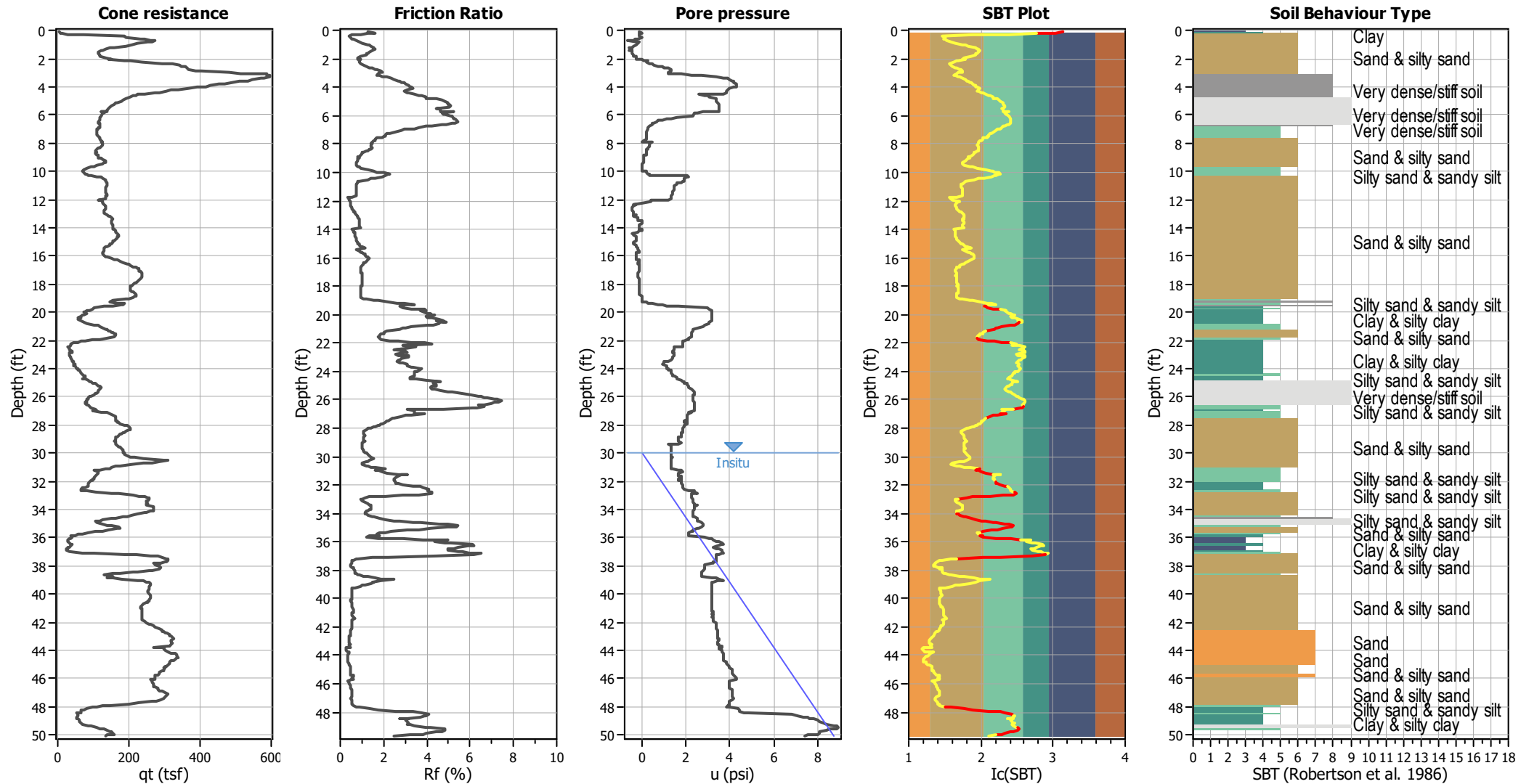
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	30.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	1	Transition detect. applied:	Yes
Points to test:	Based on I_c value	I_c cut-off value:	2.60	K_g applied:	Yes
Earthquake magnitude M_w :	7.68	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.72	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	30.00 ft	Fill height:	N/A	Limit depth:	N/A

SBT legend

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

CPT basic interpretation plots



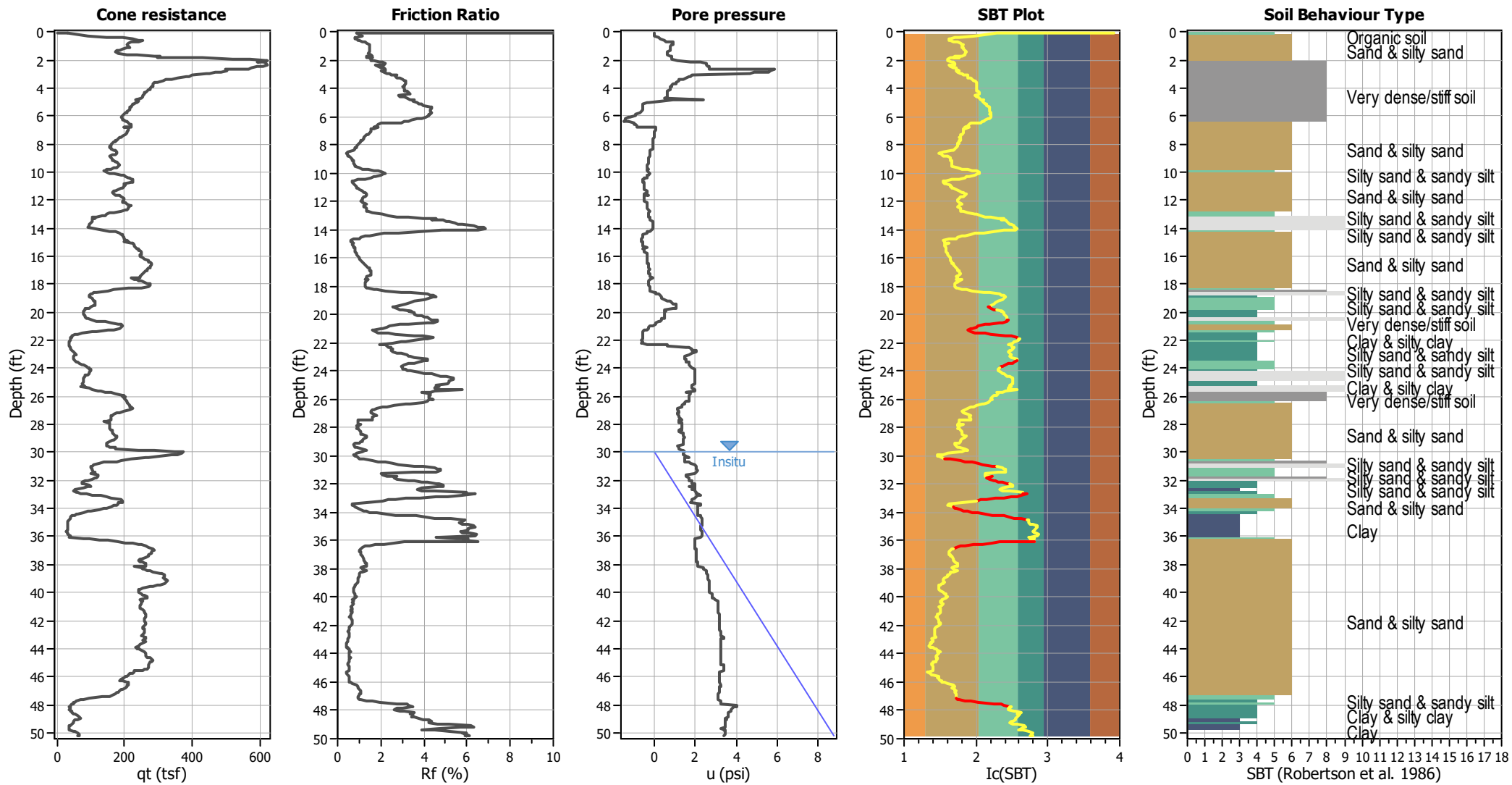
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	30.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	1	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K _g applied:	Yes
Earthquake magnitude M _w :	7.68	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.72	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	30.00 ft	Fill height:	N/A	Limit depth:	N/A

SBT legend

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

CPT basic interpretation plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	30.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	1	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K ₀ applied:	Yes
Earthquake magnitude M _w :	7.68	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.72	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	30.00 ft	Fill height:	N/A	Limit depth:	N/A

SBT legend

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

APPENDIX B
LABORATORY TESTING

APPENDIX B LABORATORY TESTING

B.1 General

The laboratory testing was performed using the appropriate American Society for Testing and Materials (ASTM) and Caltrans Test Methods (CTM).

Modified California drive samples, Standard Penetration Test (SPT) drive samples, and bulk samples collected during the field investigation were carefully sealed in the field to prevent moisture loss. The samples of earth materials were then transported to the laboratory for further examination and testing. Tests were performed on selected samples as an aid in classifying the earth materials and to evaluate their physical properties and engineering characteristics. Laboratory testing for this investigation included:

- Soil Classification: USCS (ASTM D2487) and Visual Manual (ASTM D2488)
- Moisture content (ASTM D2216) and Dry Unit Weight (ASTM D2937)
- Atterberg Limits (ASTM D4318)
- Direct Shear (ASTM D3080)
- Proctor Compaction Test (ASTM D1557)
- Expansion Index (ASTM D4829)
- Soil Corrosivity:
 - pH (ASTM G51)
 - Water-Soluble Sulfate (ASTM D4327)
 - Water-Soluble Chloride (ASTM D4327)
 - Minimum Electrical Resistivity (ASTM G187)

A summary of laboratory tests performed is presented in Table B-1. Brief descriptions of the laboratory testing program and test results are presented below.

B.2 Soil Classification

Earth materials recovered from subsurface explorations were classified in general accordance with Caltrans' "Soil and Rock Logging Classification Manual, 2010". The subsurface soils were classified visually / manually in the field per the Unified Soil Classification System (USCS) following ASTM D2488; soil classifications were modified as necessary based on testing in the laboratory per ASTM D2487. The details of the soil classification system and boring records presenting the classifications are presented in Appendix A.

B.3 Moisture Content and Dry Unit Weight



The in-situ moisture content of selected bulk, SPT, and Ring samples was determined by oven drying in general accordance with ASTM D2216. Selected California Ring samples were trimmed flush in the metal rings and wet weight was measured. After drying, the dry weight of each sample was measured, the volume and weight of the metal containers were measured, and moisture content and dry density were calculated in general accordance with ASTM D2216 and D2937. Results of these tests are presented on the boring records in Appendix A.

B.4 Atterberg Limits

Characterization of the fine-grained fractions of soils was evaluated using the Atterberg Limits. This test includes Liquid Limit and Plastic Limit tests to determine the Plasticity Index per ASTM D4318. Result of the test is presented on the boring records in Appendix A, and is plotted on plasticity chart in Figure B-1 of this Appendix.

B.5 Direct Shear

The direct shear test was as performed on a selected sample per ASTM D3080. After the initial weight and volume measurements were made, the sample was placed in a calibrated shear machine and a selected normal load was applied. The sample was then saturated and allowed to consolidate, and then was sheared under a constant strain to failure. Shear stress and sample deformations were monitored throughout the test. The test result is presented in Figure B-2.

B.6 Proctor Compaction Test

Proctor compaction test was performed on the selected sample per ASTM D1557. The sample was tested for dry density at different water content after compaction to obtain optimum moisture content that would result in maximum dry density with the standard compacting effort. The test result is presented in Figure B-3.

B.7 Expansion Index

The expansion potential of the site soil was estimated using the Expansion Index Test per ASTM D4829. The result of the test is presented in Figure B-4, and on the boring records in Appendix A.

B.8 Soil Corrosivity

Tests were performed to determine the corrosion potential of site soils on concrete and ferrous metals. Corrosivity testing included minimum electrical resistivity (ASTM G187), soil pH (ASTM G51), and water-soluble chlorides sulfates (ASTM D4327). The test results are

discussed in Section 5.10 of the main report and presented in Figures B-6a and B-6b of this appendix.

B.9 List of Attached Figures

The following table and figures are attached and complete this appendix:

List of Table

Table B-1	Summary of Laboratory Testing Performed
-----------	---

List of Figures

Figure B-1	Atterberg Limits Test Results
Figure B-2	Direct Shear Test Result
Figure B-3	Proctor Compaction Test Result
Figure B-4	Expansion Index Test Results
Figures B-5a and B-5b	Soil Corrosivity Test Results

Geotechnical Design Report
8572 Talbert Avenue, Fountain Valley, California
Group Delta Project No.
IR780

Table B-1: Summary of Laborator Testing Performed

Boring No.	Sample No.	Depth (feet)	Tests Performed							
			Moisture (M)	Unit Weight (UW)	Passing #200 (%)	Atterberg (PI)	Direct Shear (DS)	Expansion (EI)	Proctor Compaction (CP)	Corrosion (CR)
B-1	B-1	0-5			X			X		
	S-2	5								
	R-3	10	X	X						
	S-4	15								
	R-5	20	X	X		X				
	S-6	25								
	R-7	30	X	X						
	S-8	35								
	R-9	40	X	X						
	S-10	45								
	R-11	50	X	X						
B-2	B-1	0-5							X	
	R-2	5					X			
	S-3	10								
	R-4	15	X	X						
	S-5	20								
	R-6	25	X	X						
	S-7	30								
B-3	B-1	0-5								X
	R-2	5	X	X						
	S-3	10								
	R-4	15								
	S-5	17.5								
	S-6	20								

ATTERBERG LIMITS

ASTM D-4318 / AASHTO T-89 / CTM 204

Project Name: Bonnani - 8572 Talbert Avenue

Project No.: IR780

Boring No.: B-1

Sample No.: R-5

Initial Moisture: _____

Description.: Olive Brown Sandy Silty Clay - CL

Tested By: Eric Y.

Data Input By: Eric Y.

Checked By: Asheesh P.

Depth (ft.): 20

Container No.: AL-1

Date: 11/05/21

Date: 11/08/21

Date: _____

TEST NO.	PLASTIC LIMIT		LIQUID LIMIT			
	1	2	1	2	3	4
Number of Blows [N]			32	24	17	
Container No.	A	B	C	D	E	
Wet Wt. of Soil + Cont. (gm.)	22.57	22.26	27.78	28.64	29.31	
Dry Wt. of Soil + Cont. (gm.)	21.26	20.98	24.01	24.56	24.80	
Wt. of Container (gm.)	15.28	15.16	15.24	15.38	15.01	
Moisture Content (%) [Wn]	21.91	21.99	42.99	44.44	46.07	

LIQUID LIMIT
PLASTIC LIMIT
PLASTICITY INDEX

44

22

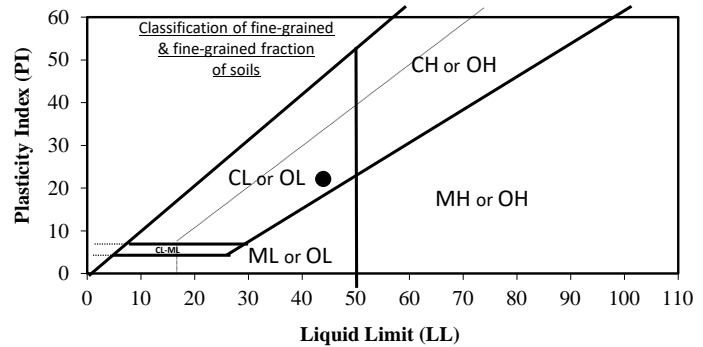
22

PI at "A" - Line = $0.73(LL-20)$ =

17.5

One - Point Liquid Limit Calculation

$$LL = W_n(N/25)^{0.121}$$



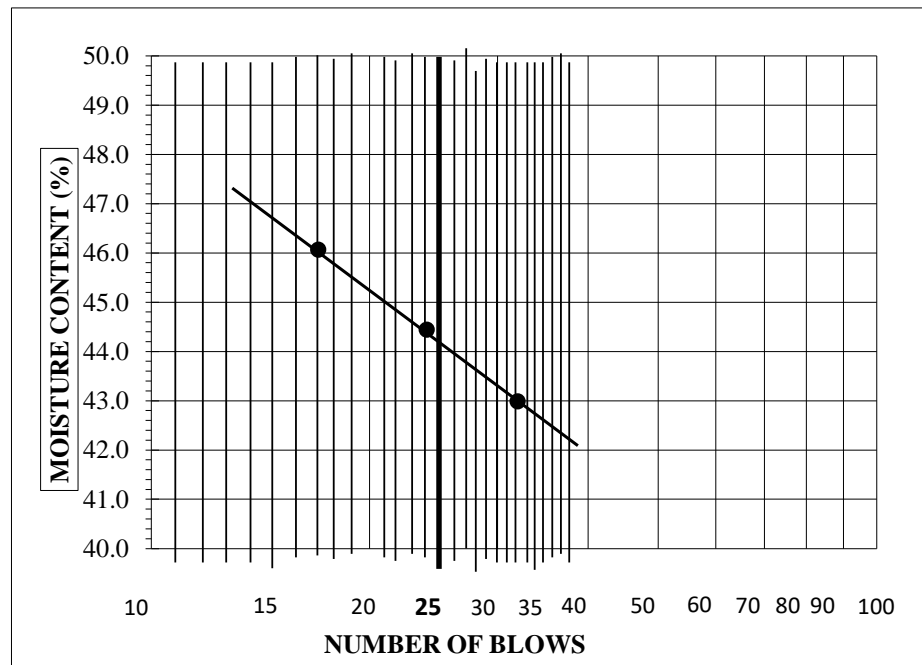
PROCEDURES USED

☐ Wet Preparation
Multipoint Wet Preparation

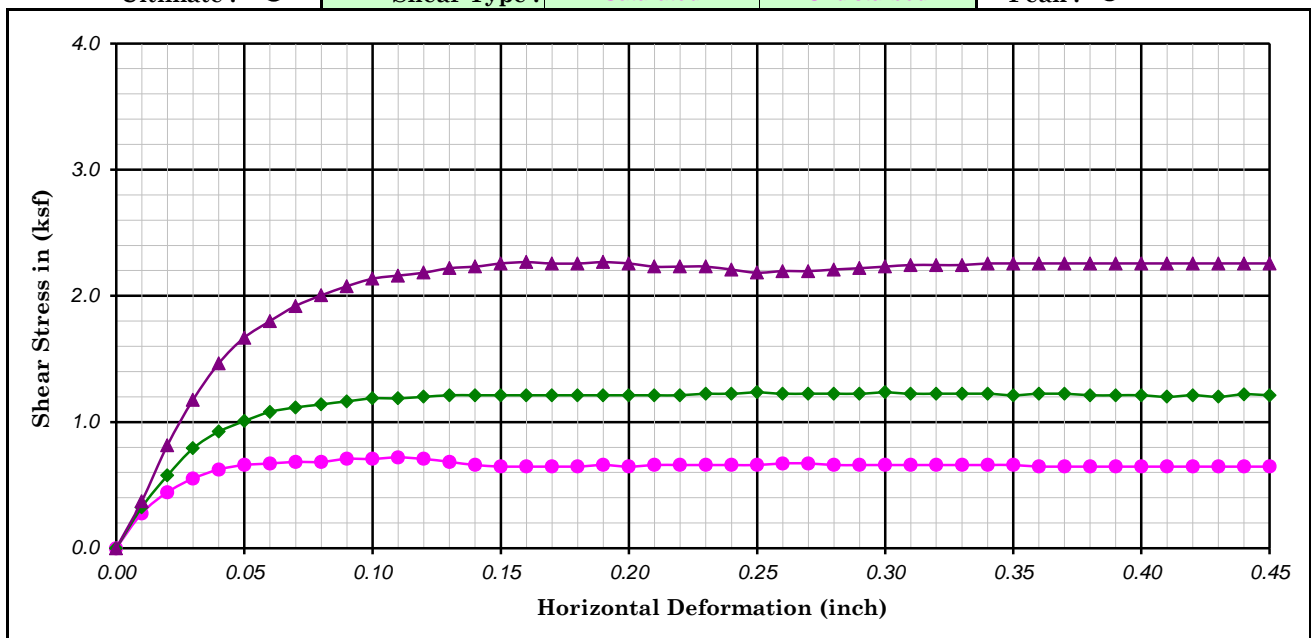
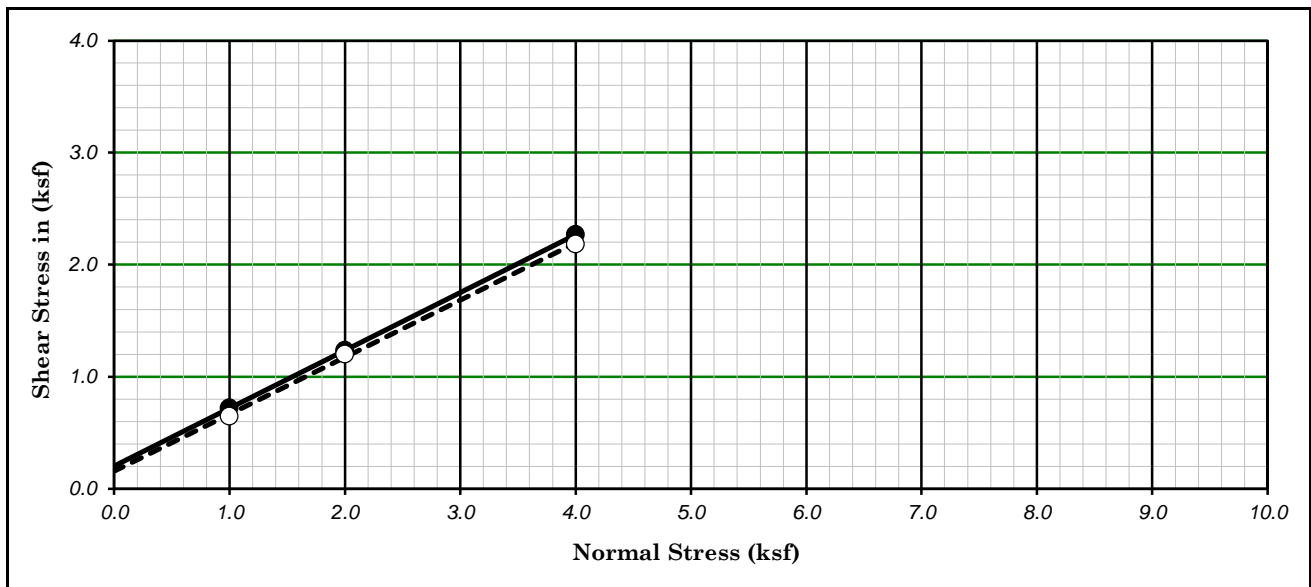
☒ Dry Preparation
Multipoint Dry Preparation




☒ Procedure A
Multipoint Test

☐ Procedure B
One-point Test



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1320 South Simpson Circle
Anaheim, CA 92806
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(714) 660-7550 fax



Boring No. : <i>B-2</i>			Strength Intercept (C) : <i>0.20</i> (ksf) <i>9.77</i> (kPa)			Peak	<i>0.16</i> (ksf)		Ultimate	
Sample No. : <i>R-2</i>							<i>7.47</i> (kPa)			
Depth (ft/m) : <i>5.0</i>		<i>1.53</i>	Friction Angle (ϕ) : <i>27.29</i> Degree				<i>26.98</i> Degree			
Description : <i>Brown Silty Sand / Sandy Silt</i>							Shear Rate (inch/minute) : <i>0.0004</i>			
SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY		VOID RATIO	NORMAL STRESS		PEAK STRESS		ULTIMATE STRESS	
		(pcf)	(kN/m ³)		(ksf)	(kPa)	(ksf)	(kPa)	(ksf)	(kPa)
	<i>16.48</i>	<i>115.96</i>	<i>18.25</i>	<i>0.45</i>	<i>1.00</i>	<i>47.88</i>	<i>0.72</i>	<i>34.47</i>	<i>0.65</i>	<i>31.03</i>
	<i>16.56</i>	<i>116.78</i>	<i>18.38</i>	<i>0.44</i>	<i>2.00</i>	<i>95.76</i>	<i>1.24</i>	<i>59.18</i>	<i>1.20</i>	<i>57.46</i>
	<i>16.62</i>	<i>119.14</i>	<i>18.75</i>	<i>0.41</i>	<i>4.00</i>	<i>191.52</i>	<i>2.27</i>	<i>108.59</i>	<i>2.18</i>	<i>104.57</i>



Bonnani - 8572 Talbert Avenue

Project No. : *IR780*

Date : *11/08/21*

DIRECT SHEAR TEST
(ASTM D -3080)

Figure No. :



GROUP DELTA CONSULTANTS, INC
ENGINEERS AND GEOLOGISTS
1320 S. SIMPSON CIRCLE
ANAHEIM, CA 92806

STANDARD TEST METHOD FOR MOISTURE - DENSITY RELATIONSHIP (ASTM D1557)

REV. 1, DATED 09/19/19

PROJECT: Bonnani - 8572 Talbert Avenue

SAMPLE ID: SO6250

PROJECT NO.: IR780

DATE: November 4, 2021

TESTED BY: Eric Y.

CHECKED BY: Asheesh P.

SAMPLE DESCRIPTION: Brown Sandy Silt with Sandstone/Siltstone

LOCATION: B-2 Bulk-1 @ 0 - 5'

Method: Mechanical ☒ Manual ☐

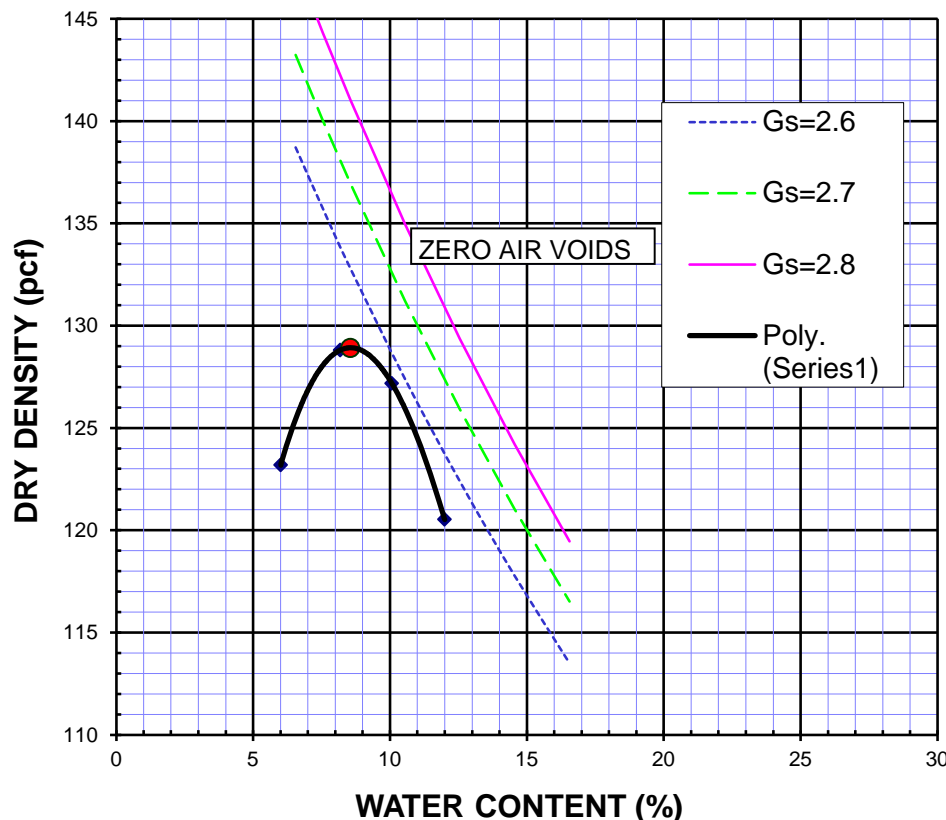
Hammer: 10lb. ☒ 5.5 lb. ☐

- A) WATER ADDED
- B) MOLD TARE WEIGHT
- C) WEIGHT OF WET SOIL AND MOLD
- D) WET SOIL WEIGHT (C - B)
- E) WET DENSITY (D / V)
- F) DRY DENSITY (E / [(L/100) + 1])

0	2	4	6			%
1931.0	1931.0	1931.0	1931.0			grams
3908.0	4040.6	4050.4	3974.6			grams
1977.0	2109.6	2119.4	2043.6			grams
130.6	139.3	140.0	135.0			pcf
123.2	128.8	127.2	120.5			pcf

- G) TARE WEIGHT
- H) WEIGHT OF WET SOIL AND TARE
- I) WEIGHT OF DRY SOIL AND TARE
- J) WEIGHT OF WATER (H - I)
- K) DRY WEIGHT OF SOIL (I - G)
- L) MOISTURE CONTENT (J / K) * 100)

235.5	225.2	233.7	229.5			grams
1178.0	1333.5	1340.2	1308.0			grams
1124.6	1249.7	1239.0	1192.5			grams
53.4	83.8	101.2	115.5			grams
889.1	1024.5	1005.3	963.0			grams
6.0	8.2	10.1	12.0			percent



4 inch: V= 15.14 pcf/gm
6 inch: V= 33.98 pcf/gm

A	METHOD USED (A,B or C)
---	---------------------------

4 inch	MOLD USED
15.14	MOLD VOLUME CORRECTION (V)
# 4	SIEVE NUMBER
0.04%	PERCENT RETAINED

WITH ROCK CORRECTION

	MAXIMUM DENSITY [PCF]
	OPTIMUM MOISTURE [%]

WITHOUT ROCK CORRECTION

128.9	MAXIMUM DENSITY [PCF]
8.6	OPTIMUM MOISTURE [%]



EXPANSION INDEX OF SOIL

ASTM D-4829-10 / UBC 29-2

Lab Number: **SO6250**

Project Name : Bonnani - 8572 Talbert Avenue
 Project No. : IR780
 Boring No. : B-1
 Sample No. : Bulk-1
 Depth (ft.) : 0 - 5
 Description : Brown Sandy Silt with Sandstone and traces of Gravel

Sampled By : G.V. Date : 10/28/2021
 Prepared By : Eric Y. Date : 11/3/2021
 Tested By : Eric Y. Date : 11/4/2021
 Calculated By : Eric Y. Date : 11/8/2021
 Checked By : Asheesh P Date :

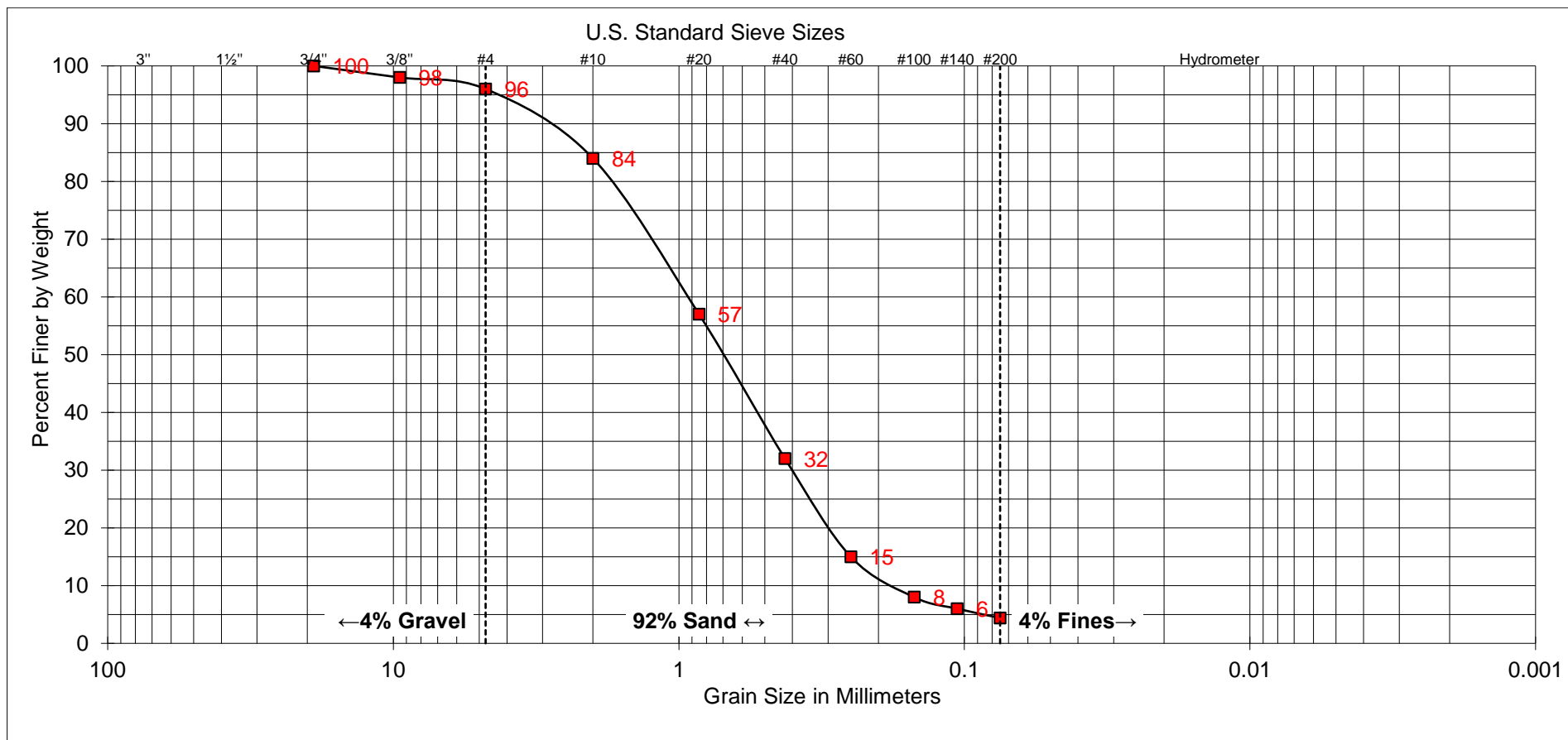
1 Sample Preparation 1									
Weight of Total Soil	3185.20	Weight of Soil Retained on No. 4 Sieve	5.00	% Passing No. 4 Sieve	99.84				
Trail	1	2	3	4	Tested	M & D After Test			
Container No.	SB-2					Container No.			
Weight of Wet Soil + Container (gm)	879.10					Wet Soil+Cont.+Ring			
Weight of Dry Soil + Container (gm)	828.60					Dry Soil+Cont.+Ring			
Weight of Container (gm)	228.60					Wt. of Container			
Moisture Content (%)	8.42				8.42	Moisture Content			
Weight of Wet Soil + Ring (gm)	616.05								
Weight of Ring (gm) No. 2.0	198.68				198.68				
Weight of Wet Soil (gm)	417.37								
Wet Density of Soil (pcf)	125.90					Wet Density (pcf)			
Dry Density of Soil (pcf)	116.12					Dry Density (pcf)			
Precent Saturation of Soil $S_{(Meas.)}$	50.32				50.32	(%) Saturation			

Loading Machine No.		2		
Date	Reading Time	Elapsed Time	Dial Reading	Expansion
11/04/21	10:10:00	0:10:00		0.0000
11/04/21				
11/04/21	10:20:00	0:00:00	0.3000	0.0000
Add Distilled Water to Sample				
11/04/21	11:20:00	1:00:00	0.3195	0.0195
11/04/21	12:20:00	2:00:00	0.3203	0.0203
11/04/21	13:20:00	3:00:00	0.3205	0.0205
11/04/21	14:20:00	4:00:00	0.3026	0.0026
11/04/21	15:20:00	5:00:00	0.3207	0.0207
11/04/21	16:20:00	6:00:00	0.3208	0.0208
11/05/21	7:20:00	21:00:00	0.3213	0.0213
11/05/21	8:20:00	22:00:00	0.3213	0.0213
11/05/21	9:20:00	23:00:00	0.3213	0.0213
11/05/21	10:20:00	0:00:00	0.3213	0.0213
Remark :				

1. Screen sample through No. 4 Sieve			
2. Sample should be compacted into a metal ring of the Degree of Saturation of 50 +/- 2% (48 - 52) .			
3. Inundated sample in distilled water to 24 h, or until the rate of expansion > (0.0002 in./h), no less than 3 h.			
Volume of Mold (ft ³)	0.00731	Specific Gravity	2.70
Rammer Weight (lb.)	5.0	Blows/Layer	15
Vertical Confining Pressure	1.0 (lb/in ²) / 6.9 (kPa)		
$(\%) S = \frac{S.G. \times W \times Dd}{Wd \times S.G. - Dd}$		S.G.=Specific Gravity, W=Water Content Dd=Dry Soil Density, Wd=Unit Wt. of Water	
$E.I._{(meas)} = \frac{\text{Change in High}}{\text{Initial Thickness}} \times 1000 =$		21.30	

$\text{Expansion Index}_{(50)} = EI_{(meas.)} - (50 - S_{(meas.)}) \times \frac{65 + EI_{(meas.)}}{220 - S_{(meas.)}}$	
21	Low

Expansion Index	Potential Expansion
0 - 20	Very Low
21 - 50	Low
51 - 90	Medium
91 - 130	High
> 130	Very High



COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND CLAY
GRAVEL		SAND			

SAMPLE B-1
SAMPLE NUMBER: R-3
SAMPLE DEPTH: 10'

UNIFIED SOIL CLASSIFICATION:	SP
DESCRIPTION:	POORLY GRADED SAND

ATTERBERG LIMITS
LIQUID LIMIT: 0
PLASTIC LIMIT: 0
PLASTICITY INDEX: 0



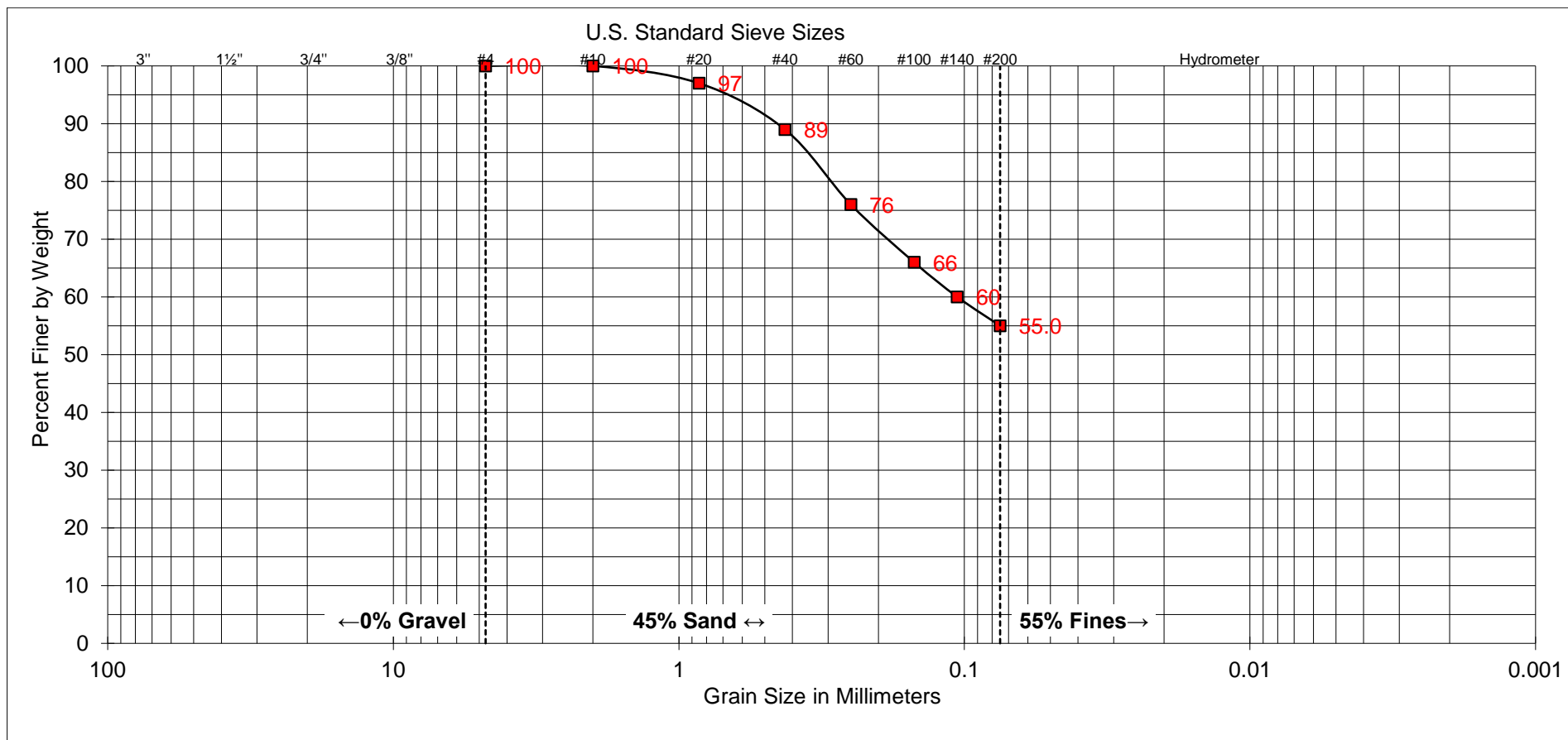
GROUP DELTA

SOIL CLASSIFICATION

Laboratory No. SO6250

Project No. IR780

FIGURE B-1.1



COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND CLAY
GRAVEL		SAND			

SAMPLE B-1
SAMPLE NUMBER: S-2
SAMPLE DEPTH: 5'

UNIFIED SOIL CLASSIFICATION: ML
DESCRIPTION: SANDY SILT

ATTERBERG LIMITS
LIQUID LIMIT: 0
PLASTIC LIMIT: 0
PLASTICITY INDEX: 0



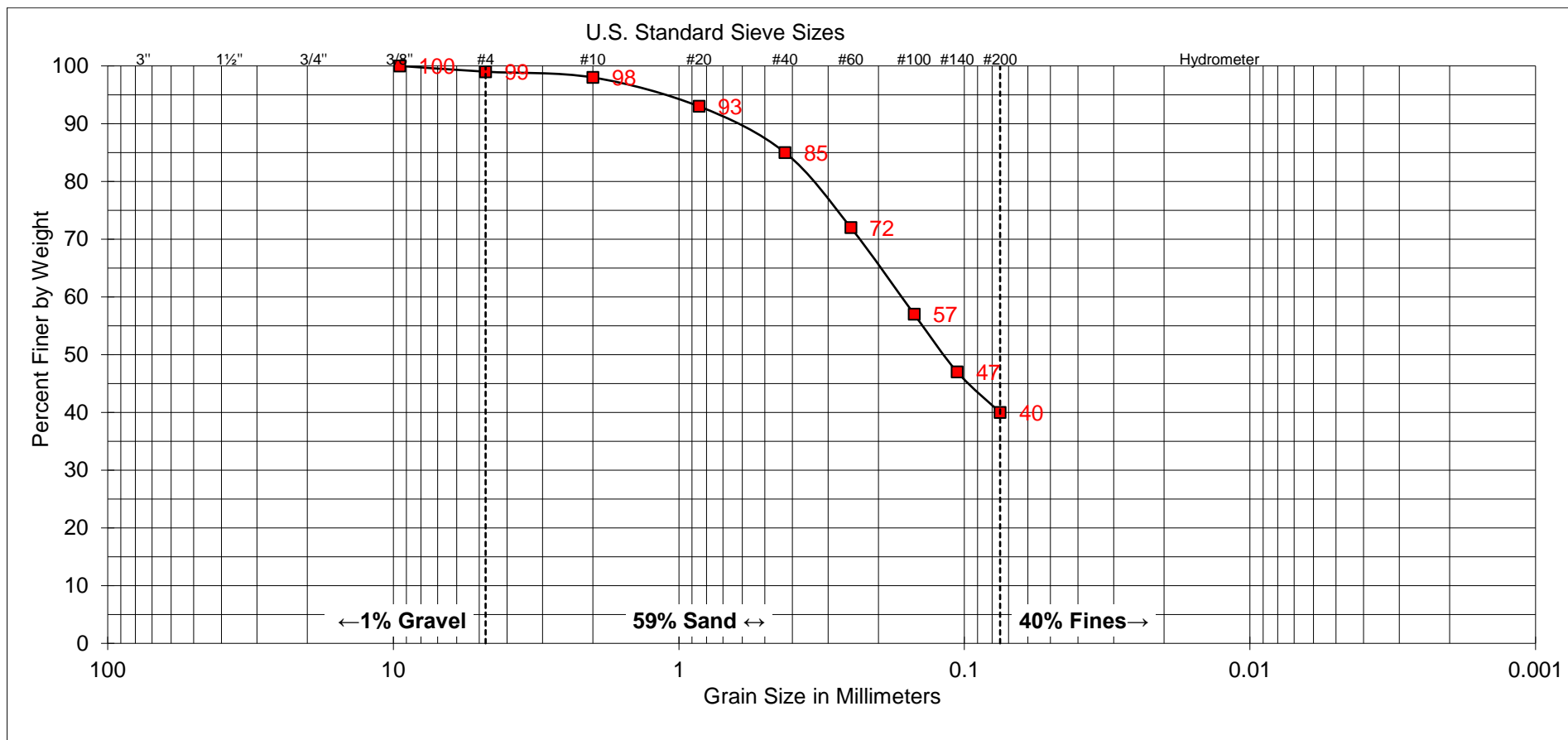
GROUP DELTA

SOIL CLASSIFICATION

Laboratory No. SO6250

Project No. IR780

FIGURE B-1.1



COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND CLAY
GRAVEL		SAND			

SAMPLE B-2
SAMPLE NUMBER: S-3
SAMPLE DEPTH: 10'

UNIFIED SOIL CLASSIFICATION: SM
DESCRIPTION: SILTY SAND

ATTERBERG LIMITS
LIQUID LIMIT: 0
PLASTIC LIMIT: 0
PLASTICITY INDEX: 0



GROUP DELTA

SOIL CLASSIFICATION

Laboratory No. SO6250

Project No. IR780

FIGURE B-1.1



TRANSMITTAL LETTER

DATE: November 9, 2021

ATTENTION: Asheesh Pradhan

TO: Group Delta Consultants
1320 South Simpson Circle
Anaheim, CA 92806

SUBJECT: Laboratory Test Data
Bonanni 8572 Talbert Avenue
Your #IR780, HDR Lab #21-1091LAB

COMMENTS: Enclosed are the results for the subject project.

A handwritten signature in black ink, appearing to read 'J. Keegan', written over a horizontal line.

James T. Keegan, MD
Corrosion and Lab Services Section Manager



Table 1 - Laboratory Tests on Soil Samples

Group Delta Consultants
Bonanni 8572 Talbert Avenue
Your #IR780, HDR Lab #21-1091LAB
9-Nov-21

Sample ID

B-3 0-5

Resistivity	Units	
as-received	ohm-cm	104,000
saturated	ohm-cm	6,800

pH 8.3

Electrical
Conductivity mS/cm 0.09

Chemical Analyses

Cations

calcium	Ca ²⁺	mg/kg	23
magnesium	Mg ²⁺	mg/kg	ND
sodium	Na ¹⁺	mg/kg	25
potassium	K ¹⁺	mg/kg	63
ammonium	NH ₄ ¹⁺	mg/kg	1.4

Anions

carbonate	CO ₃ ²⁻	mg/kg	57
bicarbonate	HCO ₃ ¹⁻	mg/kg	98
fluoride	F ¹⁻	mg/kg	4.3
chloride	Cl ¹⁻	mg/kg	ND
sulfate	SO ₄ ²⁻	mg/kg	11
nitrate	NO ₃ ¹⁻	mg/kg	2.6
phosphate	PO ₄ ³⁻	mg/kg	6.7

Other Tests

sulfide	S ²⁻	qual	na
Redox		mV	na

Resistivity per ASTM G187, pH per ASTM G51, Cations per ASTM D6919, Anions per ASTM D4327, and Alkalinity per APHA 2320-B.

Electrical conductivity in millisiemens/cm and chemical analyses were made on a 1:5 soil-to-water extract.

mg/kg = milligrams per kilogram (parts per million) of dry soil.

Redox = oxidation-reduction potential in millivolts

ND = not detected

na = not analyzed

APPENDIX C
LIQUEFACTION ANALYSES

LIQUEFACTION ANALYSIS REPORT

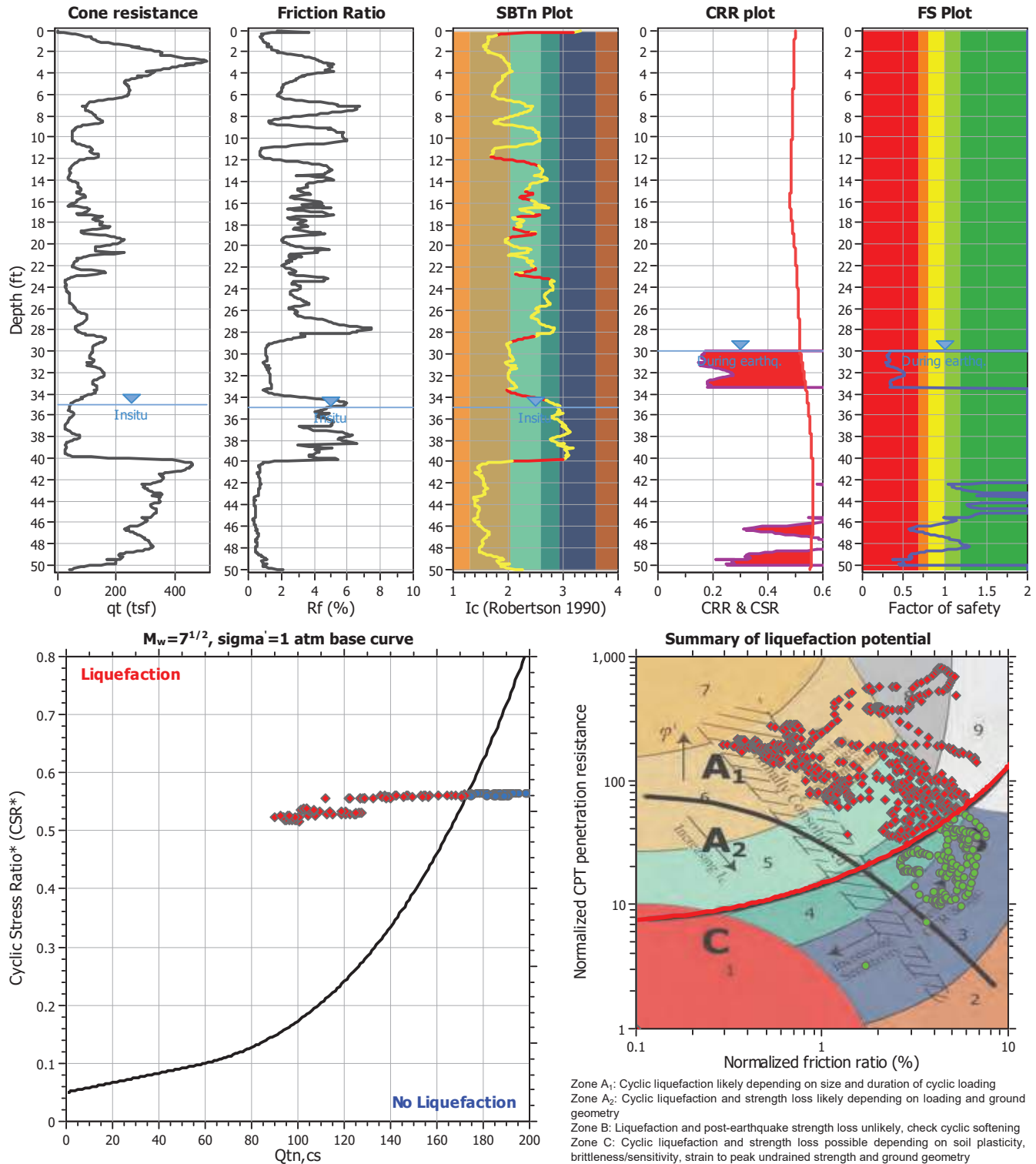
Project title : Group Delta Consultants

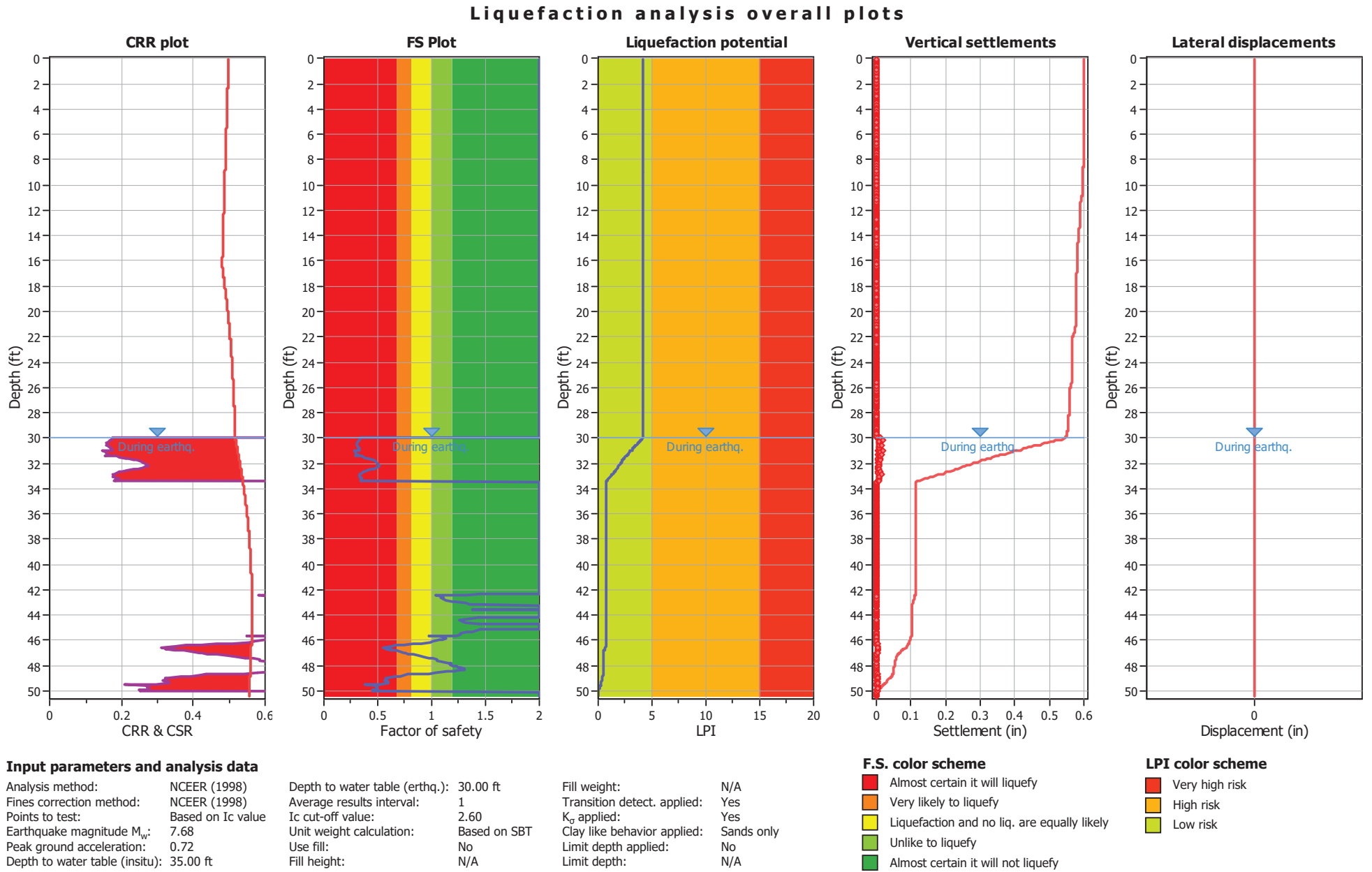
Location : 8572 Talbert Ave, Fountain Valley, CA

CPT file : CPT-1

Input parameters and analysis data

Analysis method:	NCEER (1998)	G.W.T. (in-situ):	35.00 ft	Use fill:	No	Clay like behavior	
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	30.00 ft	Fill height:	N/A	applied:	Sands only
Points to test:	Based on Ic value	Average results interval:	1	Fill weight:	N/A	Limit depth applied:	No
Earthquake magnitude M_w :	7.68	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	Limit depth:	N/A
Peak ground acceleration:	0.72	Unit weight calculation:	Based on SBT	K_0 applied:	Yes	MSF method:	Method based





LIQUEFACTION ANALYSIS REPORT

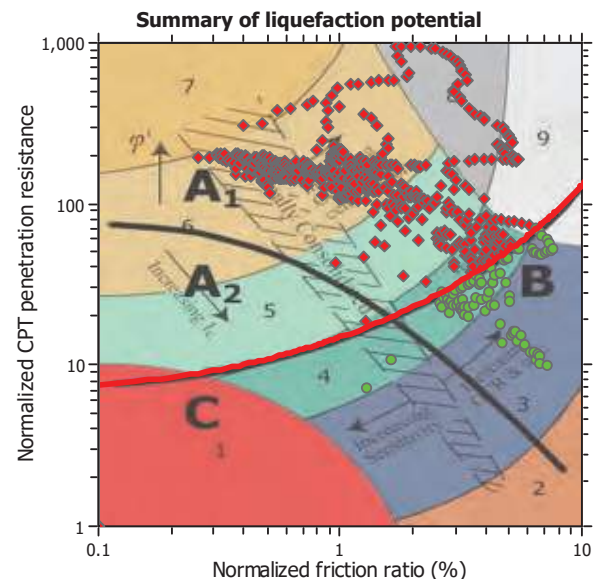
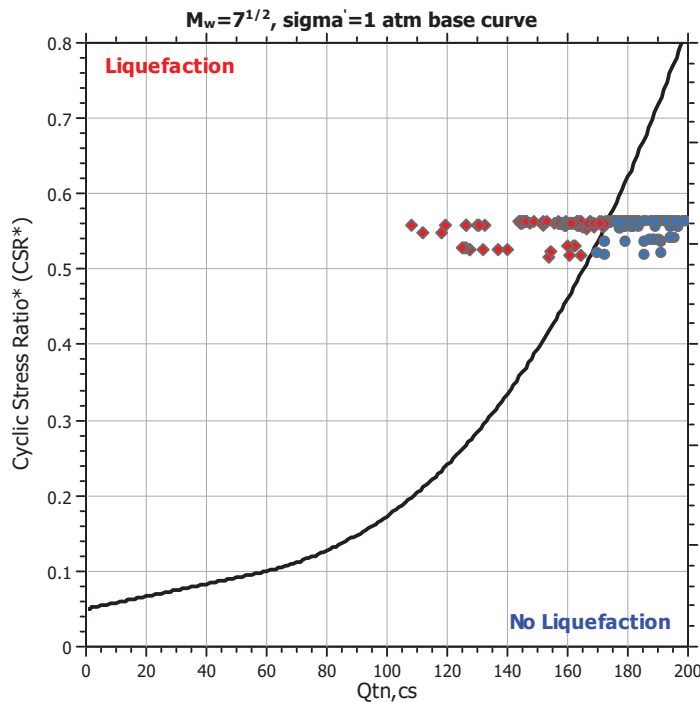
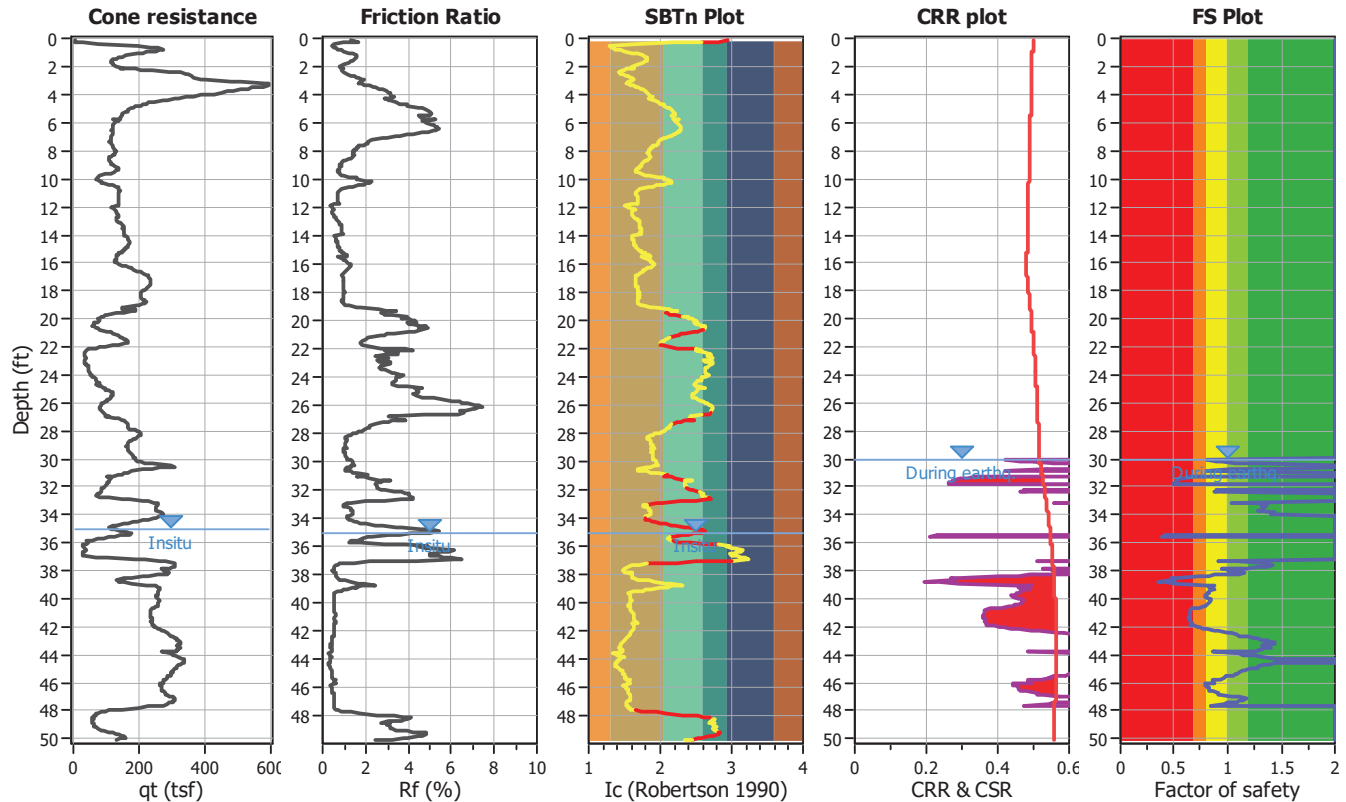
Project title : Group Delta Consultants

Location : 8572 Talbert Ave, Fountain Valley, CA

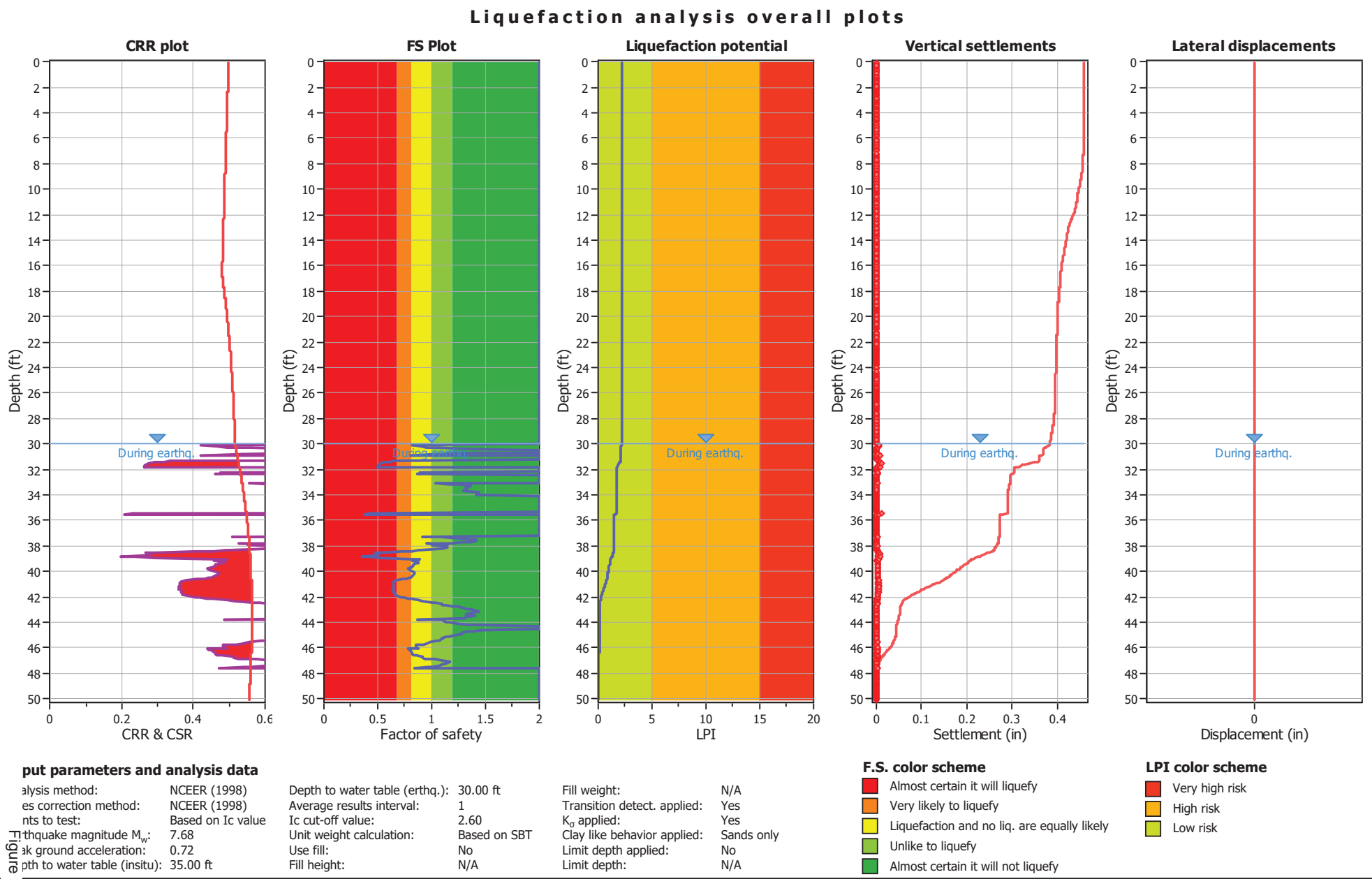
CPT file : CPT-2

Input parameters and analysis data

Analysis method:	NCEER (1998)	G.W.T. (in-situ):	35.00 ft	Use fill:	No	Clay like behavior	
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	30.00 ft	Fill height:	N/A	applied:	Sands only
Points to test:	Based on Ic value	Average results interval:	1	Fill weight:	N/A	Limit depth applied:	No
Earthquake magnitude M_w :	7.68	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	Limit depth:	N/A
Peak ground acceleration:	0.72	Unit weight calculation:	Based on SBT	K_0 applied:	Yes	MSF method:	Method based



Zone A₁: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A₂: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry



LIQUEFACTION ANALYSIS REPORT

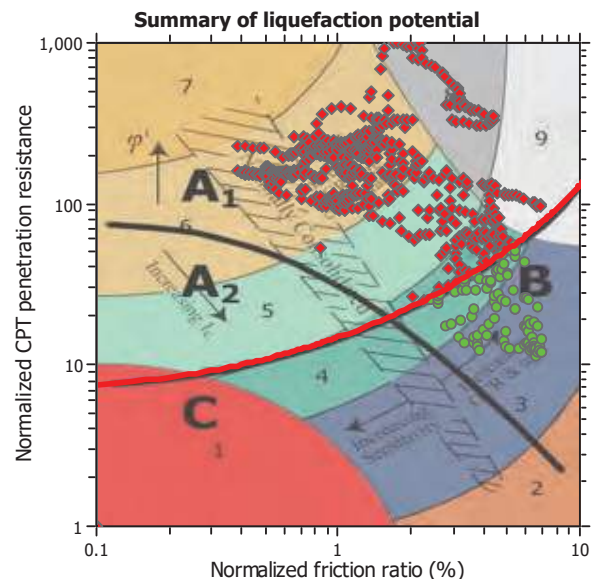
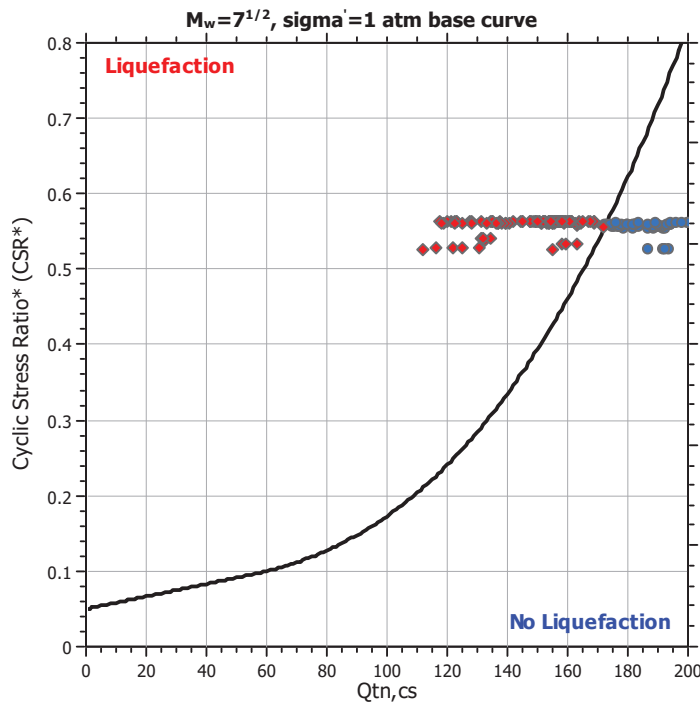
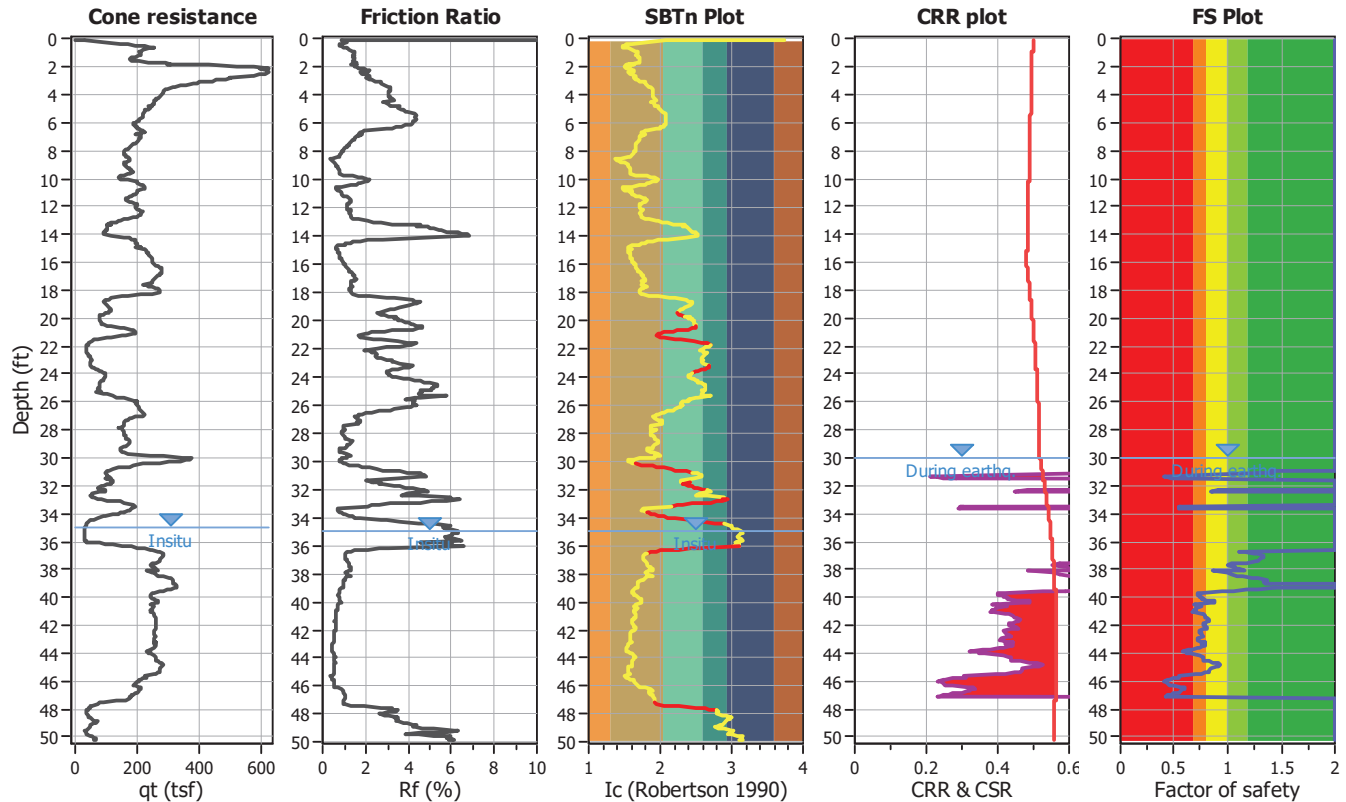
Project title : Group Delta Consultants

Location : 8572 Talbert Ave, Fountain Valley, CA

CPT file : CPT-3

Input parameters and analysis data

Analysis method:	NCEER (1998)	G.W.T. (in-situ):	35.00 ft	Use fill:	No	Clay like behavior	
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	30.00 ft	Fill height:	N/A	applied:	Sands only
Points to test:	Based on Ic value	Average results interval:	1	Fill weight:	N/A	Limit depth applied:	No
Earthquake magnitude M_w :	7.68	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	Limit depth:	N/A
Peak ground acceleration:	0.72	Unit weight calculation:	Based on SBT	K_0 applied:	Yes	MSF method:	Method based



Zone A₁: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A₂: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

