Appendix G2 Water Quality Management Plan

Appendices

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WATER QUALITY MANAGEMENT PLAN (WQMP)

NEWPORT CROSSINGS

4251 Martingale Way, Newport Beach, California

Lot 1 and Lot 2 of Tract No. 7770 M.M. 299/15-16;
Parcels A, B and C
APN 427-172-02, 427-172-03, 427-172-05, 427-172-06

Prepared For

NEWPORT PLACE RESIDENTIAL, LLC
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Prepared By

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Project Manager:
Bryan Smith, PE

Date Prepared: May 31, 2017 Revised August , 2018
Job Number: 1618.001.01

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WATER QUALITY MANAGEMENT PLAN (WQMP)

NEWPORT CROSSINGS

May 31 2017

1618.001.00

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WATER QUALITY MANAGEMENT PLAN (WQMP)

NEWPORT CROSSINGS

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1618.001.00

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WATER QUALITY MANAGEMENT PLAN (WQMP)

NEWPORT CROSSINGS

May 31, 2017

1618.001.00

PRELIMINARY
WATER QUALITY MANAGEMENT PLAN (WQMP)

NEWPORT CROSSING

4251 Martingale Way, Newport Beach, County of Orange

LOT 1 AND LOT 2 OF TRACT NO. 7770 M.M. 299/15-16; PARCELS A, B AND C
APN 427-172-02, 427-172-03, 427-172-05, 427-172-06

Prepared for:

STARBOARD REALTY PARTNERS, LLC
1301 Dove Street, Suite 1080
Newport Beach, CA 92660
949.851.2020

Prepared by:

FUSCOE ENGINEERING, INC.
16795 Von Karman, Suite 100
Irvine, CA 92618
949.474.1960
Bryan Smith, PE

Date Prepared: May 31, 2017
Revised August 2018

PROJECT OWNER'S CERTIFICATION			
Permit/Application No.:	Pending	**Grading Permit No.:**	Pending
Tract/Parcel Map and Lot(s)No.:	Lot 1 and Lot 2 of Tract No. 7770 M.M. 299/15-16; Parcels A, B and C	**Building Permit No.:**	Pending
Address of Project Site and APN:	4251 Martingale Way, Newport Beach, 92660 APN 427-172-02, 427-172-03, 427-172-05, 427-172-06		

This Water Quality Management Plan (WQMP) has been prepared for OWNER by FUSCOE ENGINEERING, INC. The WQMP is intended to comply with the requirements of the County of Orange NPDES Stormwater Program requiring the preparation of the plan.

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

OWNER:			
Name:	Dan Vittone		
Title:	Principal		
Company:	Starbord Realty Partners, LLC		
Address:	1301 Dove Street, Suite 1080, Newport Beach, CA 92660		
Email:	dan@starboardrp.com		
Telephone #:	949.851.2020		
I understand my responsibility to implement the provisions of this WQMP including the ongoing operation and maintenance of the best management practices (BMPs) described herein.			
Owner Signature:		**Date:**	

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EXHIBITS & BMP DETAILS (INCLUDED IN SECTION VI)

- Vicinity Map
- Site Plan
- WQMP Exhibit
- Typical Cross Sections

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- The Ocean Begins at Your Front Door
- Homeowner's Guide for Sustainable Water Use
- Household Tips to Water Use
- Household Hazardous Waste
- Recycle Waste Oil in North OC
- Responsible Pest Control
- Sewer Spill Control
- Tips for Landscaping and Gardening
- Tips for Pet Care
- Tips for Protecting your Watershed
- Proper Maintenance Practices for your Business
- Tips for the Food Service Industry
- DF-1 Drainage System Maintenance
- R3 Automobile Parking
- R7 Household Waste
- SD-10 Site Design & Landscape Planning

- SD-11Roof Runoff Control
- SD-12 Efficient Irrigation
- SD-13 Storm Drain Signage
- SD-32 Trash Storage Areas

SECTION I DISCRETIONARY PERMITS AND WATER QUALITY CONDITIONS

PROJECT INFORMATION			
Permit/Application No.:	Pending	**Grading or Building Permit No.:**	Pending
Address of Project Site (or Tract Map and Lot Number if no address) and APN:	4251 Martingale Way, Newport Beach, 92660 APN 427-172-02, 427-172-03, 427-172-05, 427-172-06		
WATER QUALITY CONDITIONS OF APPROVAL OR ISSUANCE			
Discretionary Permit(s):	Pending – to be provided in Final WQMP		
Water Quality Conditions of Approval or Issuance applied to this project: **(Please list verbatim.)**	Pending – to be provided in Final WQMP		
CONCEPTUAL WQMP			
Was a Conceptual Water Quality Management Plan previously approved for this project?	None		
WATERSHED-BASED PLAN CONDITIONS			
Applicable conditions from watershed - based plans including WIHMPs and TMDLs:	Metals, Nutrients, Toxic Organic Chemicals, Pesticides, Pathogens, and Sediment		

SECTION II PROJECT DESCRIPTION

II.1 PROJECT DESCRIPTION

The proposed Newport Crossings project site encompasses approximately 5.69 acres in the City of Newport Beach. The project site is bounded by Dove St to the south, Scott Dr. to the west, Corinthian Way to the north, and Martingale Way to the west. A Vicinity Map is included in Section VI.

Under existing conditions, the project site is primarily built out with several low rise commercial buildings and small businesses as well as surface parking. Landscaping areas with trees surround the site. Adjacent land uses include other commercial businesses such as Staples, a Radisson Hotel, Jamba Juice, and a car wash.

The table below summarizes the proposed project.

DESCRIPTION OF PROPOSED PROJECT				
Development Category (Model WQMP, Table 7.11-2; or 7.11-3):	8. All significant redevelopment projects, where significant redevelopment is defined as the addition or replacement of 5,000 or more square feet of impervious surface on an already developed site. Redevelopment does not include routine maintenance activities that are conducted to maintain original line and grade, hydraulic capacity, original purpose of the facility, or emergency redevelopment activity required to protect public health and safety. If the redevelopment results in the addition or replacement of less than 50 percent of the impervious area on-site and the existing development was not subject to WQMP requirement, the numeric sizing criteria discussed in Section 7.II-2.0 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.			
Project Area (ft^2):	226,076.4 ft^2 (5.69 acres)			
# of Dwelling Units:	350			
SIC Code:	5812 – Eating places 5999 – Miscellaneous retail stores 8811 – Private households			
Narrative Project Description:	The proposed project includes the development of a 350 unit residential project consisting of four (4) 5-story Type III-A residential buildings surrounding a 5-story (6 level) Type I-A parking structure with amenity deck and 7,500 sf of retail space.			
Project Area:	**Pervious Area**	**Pervious Area Percentage**	**Impervious Area**	**Impervious Area Percentage**
Pre-Project Conditions:	.57 ac	10%	5.12 ac	90%

DESCRIPTION OF PROPOSED PROJECT				
Post-Project Conditions:	1.31 ac	23%	4.38 ac	77%
Drainage Patterns/ Connections:	Under existing conditions, drainage typically sheet flows southward off-site into catch basins, which tie into a City of Newport Beach 54" storm drain line in Dove St. Stormwater then generally flows southeast connecting into the San Diego Creek Channel, before ultimately discharging into Upper Newport Bay. Under proposed conditions, drainage patterns will largely be maintained with stormwater flowing to the southern end of the property. Stormwater will be routed through biotreatment BMPs prior to discharging offsite into the City of Newport Beach 54" storm drain lines in Dove St. Stormwater will continue to flow southeast into the San Diego Creek Channel and ultimately discharging into the Upper Newport Bay.			

PROJECT FEATURES			
Building Summary:	Land Use Type	Number of Units	Total Net Square Footage
	Studio Apartment	29	17,608
	One-bedroom Apartment	200	149,244
	Two-Bedroom Apartment	121	129,335
	Restaurant	--	2,000
	General Retail	--	5,500
Amenities:	Amenities will include a variety of clubhouses and fitness centers, rooftop decks, retail plaza, leasing office, a pool and spa and courtyards.		
Landscaped Areas:	Landscaping will be provided throughout the proposed property. Approximately 34,600 sf of landscaping will be provided throughout the common areas. There will also be approximately 21,459 sf of area available for private landscaping associated with the residential units.		

PROJECT FEATURES

Parking Facilities:

Residential

Land Use Type	Number of Units	Required Parking	Stalls Required
Studio Apartment	29	1	29
One-bedroom Apartment	200	1	197
Two-Bedroom Apartment	121	2	248
Guest	--	0.5	175
Total Residential Parking Required			*649*

Retail

Land Use Type	Square Footage	Required Parking	Stalls Required
Restaurant	2,000	0.025	50
General Retail	5,500	0.004	22
Total Retail Parking Required			*72*

As shown above, a total of 721 parking stalls are required to support the proposed development. The proposed parking structure will include 754 parking stalls thereby satisfying parking requirements.

Other Project Features:

The residential portion of the project has two trash rooms per level located in the parking structure adjacent to the residential corridors. Trash collection will be via two trash chutes in each trash room, a chute for solid waste and a chute for recyclable items. Each trash room will also contain trash carts for organic waste. The rooftop decks, mail room, leasing areas, fitness center, club room and other resident amenities will have designated trash collection areas for solid waste, recyclable items and organic wastes. All trash areas are either indoors or will be covered to preclude precipitation and runoff consistent with local design standards. The site will not have any outdoor storage areas, vehicle/ community car wash racks, vehicle/equipment wash areas, or commercial kitchens/food preparation areas.

Outdoor Activities:

Outdoor areas throughout the residential portion of the site will be used for recreational and open space purposes. The central recreation area will include a pool, spa, rooftop decks, fitness centers and open lawn areas. All other outdoor areas will be used for walkways, common areas and landscaping, and other recreational purposes. Outdoor activities associated with the retail area are anticipated with passive uses in the common landscaped areas surrounding the retail. All vehicular parking will be located in the parking structure. No outdoor storage of materials is anticipated.

PROJECT FEATURES	
Materials Stored:	Materials anticipated to be stored on-site include those associated with mixed land uses including residential and retail (i.e. cleaning products, pool materials, storage, etc.); however, no hazardous wastes will be stored on-site. No outdoor storage of materials is anticipated (materials will be stored indoors).
Wastes Generated:	The project is not anticipated to generate any wastes other than landscape clippings, typical trash, debris and refuse from the tenants. Outdoor trash receptacles will be provided throughout the common areas of the site for the tenants to dispose of their refuse in a proper manner, and property maintenance will provide trash and waste material removal to maintain a trash-free property. All wastes shall be collected and properly disposed of off-site.

II.2 POTENTIAL STORM WATER POLLUTANTS

The table below, derived from Table 2 of the Countywide Model WQMP Technical Guidance Document (May 2011), summarizes the categories of land use or project features of concern and the general pollutant categories associated with them.

ANTICIPATED & POTENTIAL POLLUTANTS GENERATED BY LAND USE TYPE								
Priority Project Categories and/or Project Features	General Pollutant Categories							
	Suspended Solid/ Sediments	Nutrients	Heavy Metals	Pathogens (Bacteria/ Virus)	Pesticides	Oil & Grease	Toxic Organic Compounds	Trash & Debris
Detached Residential Development	E	E	N	E	E	E	N	E
Attached Residential Development	E	E	N	E	E	E[2]	N	E
Commercial/Industrial Development	E[1]	E[1]	E[5]	E[3]	E[1]	E	E	E
Automotive Repair Shops	N	N	E	N	N	E	E	E
Restaurants	E[1][2]	E[1]	E[2]	E	E[1]	E	N	E
Hillside Development >5,000 ft^2	E	E	N	E	E	E	N	E
Parking Lots	E	E[1]	E	E[4]	E[1]	E	E	E
Streets, Highways, & Freeways	E	E[1]	E	E[4]	E[1]	E	E	E
Retail Gasoline Outlets	N	N	E	N	N	E	E	E

ANTICIPATED & POTENTIAL POLLUTANTS GENERATED BY LAND USE TYPE								
Priority Project Categories and/or Project Features	General Pollutant Categories							
	Suspended Solid/ Sediments	Nutrients	Heavy Metals	Pathogens (Bacteria/ Virus)	Pesticides	Oil & Grease	Toxic Organic Compounds	Trash & Debris

Notes:
E = expected to be of concern N = not expected to be of concern
(1) Expected pollutant if landscaping exists on-site, otherwise not expected.
(2) Expected pollutant if the project includes uncovered parking areas, otherwise not expected.
(3) Expected pollutant if land use involves food or animal waste products, otherwise not expected.
(4) Bacterial indicators are routinely detected in pavement runoff.
(5) Expected if outdoor storage or metal roofs, otherwise not expected.
Source: County of Orange. (2011, May 19). Technical Guidance Document for the Preparation of Conceptual/ Preliminary and/or Project Water Quality Management Plans (WQMPs). Table 2.1.

Priority Project Categories and/or Features: Attached Residential, Commercial development, and Restaurant

POLLUTANTS OF CONCERN		
Pollutant	E = Expected to be of concern N =Not Expected to be of concern	Additional Information and Comments
Suspended Solid/ Sediment	E	TMDL and 303(d) List until 2099
Nutrients	E	TMDL and 303(d) List until 2099
Heavy Metals	E	TMDL and 303(d) List
Pathogens (Bacteria/Virus)	E	TMDL and 303(d) List until 2019
Pesticides	E	TMDL and 303(d)
Oil & Grease	E	
Toxic Organic Compounds	E	TMDL and 303(d) List
Trash & Debris	E	

II.3 HYDROLOGIC CONDITIONS OF CONCERN

The purpose of this section is to identify any hydrologic conditions of concern (HCOC) with respect to downstream flooding, erosion potential of natural channels downstream, impacts of increased flows on natural habitat, etc. As specified in Section 2.3.3 of the 2011 Model WQMP, projects must identify and mitigate any HCOCs. A HCOC is a combination of upland hydrologic conditions and stream biological and physical conditions that presents a condition of concern for physical and/or biological degradation of streams.

In the North Orange County permit area, HCOCs are considered to exist if any streams located downstream from the project are determined to be potentially susceptible to hydromodification impacts and either of the following conditions exists:

- Post-development runoff volume for the 2-yr, 24-hr storm exceeds the pre-development runoff volume for the 2-yr, 24-hr storm by more than 5 percent

or

- Time of concentration (Tc) of post-development runoff for the 2-yr, 24-hr storm event exceeds the time of concentration of the pre-development condition for the 2-yr, 24-hr storm event by more than 5 percent.

If these conditions do not exist or streams are not potentially susceptible to hydromodification impacts, an HCOC does not exist and hydromodification does not need to be considered further. In the North Orange County permit area, downstream channels are considered not susceptible to hydromodification, and therefore do not have the potential for a HCOC, if all downstream conveyance channels that will receive runoff from the project are engineered, hardened, and regularly maintained to ensure design flow capacity, and no sensitive habitat areas will be affected.

Is the proposed project potentially susceptible to hydromodification impacts?

☒ **Yes** ☐ **No (show map)**

According to Figure XVI-3a within the Technical Guidance Document, the proposed project falls within an area susceptible to hydromodification impacts. All runoff from the site ultimately drains to the Upper Newport Bay which is susceptible to hydromodification impacts. A copy of Figure XVI-3a is included in Appendix A.

2-YEAR, 24-HOUR STORM SUMMARY				
Condition	**Acreage**	**Tc**	**Peak Runoff**	**Volume**
Pre-development	5.7	11.66 min	6.72 cfs	34,412 ft^3
Proposed	5.7	12.70 min	6.70 cfs	33,977 ft^3
Difference	**0**	**+1.04 min**	**-0.02 cfs**	**-435 ft^3**

2-YEAR, 24-HOUR STORM SUMMARY				
Condition	Acreage	Tc	Peak Runoff	Volume
% Change		+8%	0%	less than 1%

Because the proposed project includes landscaped park areas to the south, the imperviousness will decreased compared to existing conditions. As a result, 2-year volumes and peak runoff rates will decrease compared to existing conditions. The results indicate the 2-year time of concentration (Tc) increases by 8% compared to existing conditions.

As depicted in the table above, the post-condition runoff volumes decrease by less than 1%, while peak runoff flows remain the same. Therefore, because proposed conditions are equivalent to pre-development conditions, the project is not subject to hydromodification.

II.4 POST DEVELOPMENT DRAINAGE CHARACTERISTICS

Under proposed conditions, drainage patterns will largely be maintained with stormwater flowing to the southern end of the property. Stormwater will be routed through biotreatment BMPs prior to discharging offsite into the City of Newport Beach 54" storm drain lines in Dove St. Stormwater will continue to flow southeast into the San Diego Creek Channel and ultimately discharging into the Upper Newport Bay.

II.5 PROPERTY OWNERSHIP/MANAGEMENT

PROPERTY OWNERSHIP/MANAGEMENT	
Public Streets:	City of Newport Beach
Private Streets:	Starboard Realty Partners, LLC
Landscaped Areas:	Starboard Realty Partners, LLC
Open Space:	Starboard Realty Partners, LLC
Easements:	N/A
Parks:	City of Newport Beach
Buildings:	Starboard Realty Partners, LLC
Structural BMPs:	Starboard Realty Partners, LLC

A Home Owners Association (HOA) will be formed upon project completion. The HOA will be responsible for inspecting and maintaining all BMPs prescribed for Newport Crossings. Until a HOA is formally established, Starboard Realty Partners, LLC shall assume all BMP maintenance and inspection responsibilities for the proposed project. Inspection and maintenance responsibilities are outlined in Section V of this report. Property ownership of the public park will be transferred to the City of Newport, who will be responsible for management of the park.

SECTION III SITE DESCRIPTION

III.1 PHYSICAL SETTING

Planning Area/ Community Name:	Newport Crossings
Address:	4251 Martingale Way, Newport Beach, 92660
Project Area Description:	The project covers a hexagonal area comprised of three parcels bounded between Corinthian Way to the north, Scott Dr. to the west, Dove Street to the south, an adjacent parking lot to the southeast, and a Martingale Way to the west.
Land Use:	CO-G General Commercial Office
Zoning:	SP-7 Santa Ana Heights
Acreage:	5.69 acres
Predominant Soil Type:	D
Impervious Conditions:	Existing Impervious: 90% (10% Pervious) Proposed Impervious: 77% (23% Pervious)

III.2 SITE CHARACTERISTICS

Precipitation Zone:	0.75
Topography:	The project site is relatively flat (approx. 0.5% grade), and generally drains towards the southwestern side of the property.
Existing Drainage Patterns/ Connections:	Under existing conditions, drainage typically sheet flows southward off-site into catch basins, which ties into a 48" storm drain line in Dove St. This storm drain line flows east, connecting with the San Diego Creek Channel, shortly before exiting into Upper Newport Bay.
Proposed Drainage Patterns/ Connections:	Under proposed conditions, drainage patterns will largely be maintained with stormwater flowing to the southern end of the property. Stormwater will be routed through biotreatment BMPs prior to discharging offsite into the City of Newport Beach 54" storm drain lines in Dove St. Stormwater will continue to flow southeast into the San Diego Creek Channel and ultimately discharging into the Upper Newport Bay.

Soil Type, Geology, and Infiltration Properties:	A geotechnical investigation was performed by GEOCON West, Inc. in 2014 (see Appendix F). Based on our field investigation and published geologic maps, the site is underlain by artificial fill over Pleistocene age marine terrace deposits approximately 100 feet thick. These marine terrace deposits are composed mainly of silt, with some sand and clay. Based on these soil conditions and the percolation test performed at the site, it was determined that the soils are considered impermeable and are not conducive for infiltration of stormwater.
Hydrogeologic (Groundwater) Conditions:	The historically highest groundwater level in the area is reported to be at a depth of approximately 10 feet beneath the existing ground surface (California Division of Mines and Geology, 2001). During geotechnical investigations, groundwater was encountered in boring B1 at a depth of 30 feet below the existing ground surface.
Geotechnical Conditions (relevant to infiltration):	During the geotechnical investigation, boring B2 was utilized to perform percolation testing. The boring was advanced to a depth of 10 feet below the existing ground surface. After a 24-hour pre-soak period, water was still present in the boring. Therefore, it was determined that the soils are considered impermeable and are not conducive for infiltration of stormwater.
Off-Site Drainage:	The project site does not receive any off-site storm water flows onto the property.
Utility and Infrastructure Information:	Dry and wet utilities will be incorporated into the proposed project and will tie into existing facilities associated with the existing development.

III.3 WATERSHED DESCRIPTION

Receiving Waters:	San Diego Creek Channel, Upper Newport Bay, Lower Newport Bay		
303(d) Listed Impairments:	Fecal Coliform, Nutrients, Pesticides, Metals, Sediment, Toxic Organic Chemicals		
Applicable TMDLs:	San Diego Creek, Reach 1: • Pesticides • Selenium	Newport Bay, Upper • Copper • Indicator Bacteria • Pesticides	Newport Bay,Lower • Copper • Indicator Bacteria • Pesticides
Pollutants of Concern for the Project:	Sediment, Metals, Nutrients, Pesticides, Pathogens, Oils & Grease, Toxic Organic Compounds, and Trash and Debris,		
Hydrologic Conditions of Concern (HCOCs):	The project site is not subject to hydromodification. Refer to Section II.3 for further information.		
Environmentally Sensitive and Special Biological Significant Areas:	None		

SECTION IV BEST MANAGEMENT PRACTICES (BMPs)

IV.1 PROJECT PERFORMANCE CRITERIA

Is there an approved WIHMP or equivalent for the project area that includes more stringent LID feasibility criteria or if there are opportunities identified for implementing LID on regional or sub-regional basis?

☐ Yes ☒ No

PROJECT PERFORMANCE CRITERIA	
Hydromodification Control Performance Criteria: (Model WQMP Section 7.II-2.4.2.2)	If a hydrologic condition of concern (HCOC) exists, priority projects shall implement onsite or regional hydromodification controls such that: ▪ Post-development runoff volume for the two-year frequency storm does not exceed that of the predevelopment condition by more than five percent, and ▪ Time of concentration of post-development runoff for the two-year storm event is not less than that for the predevelopment condition by more than five percent. Where the Project WQMP documents that excess runoff volume from the two-year runoff event cannot feasibly be retained and where in-stream controls cannot be used to otherwise mitigate HCOCs, the project shall implement on-site or regional hydromodification controls to: ▪ Retain the excess volume from the two-year runoff event to the MEP, and ▪ Implement on-site or regional hydromodification controls such that the post-development runoff two-year peak flow rate is no greater than 110 percent of the predevelopment runoff two-year peak flow rate.
LID Performance Criteria: (Model WQMP Section 7.II-2.4.3)	Infiltrate, harvest and use, evapotranspire, or biotreat/biofilter, the 85th percentile, 24-hour storm event (Design Capture Volume). LID BMPs must be designed to retain, on-site, (infiltrate, harvest and use, or evapotranspire) storm water runoff up to 80 percent average annual capture efficiency.
Treatment Control BMP Performance Criteria: (Model WQMP Section 7.II-3.2.2)	If it is not feasible to meet LID performance criteria through retention and/or biotreatment provided on-site or at a sub-regional/regional scale, then treatment control BMPs shall be provided on-site or offsite prior to discharge to waters of the US. Sizing of treatment control BMP(s) shall be based on either the unmet volume after claiming applicable water quality credits, if appropriate.

PROJECT PERFORMANCE CRITERIA	
LID Design Storm Capture Volume:	DCV = C × d × A × 43560 sf/ac × 1/12 in/ft Where: DCV = design storm capture volume, cu-ft C = runoff coefficient = (0.75 × imp + 0.15) Imp = impervious fraction of drainage area (ranges from 0 to 1) d = storm depth (inches) A = tributary area (acres) Imp = 77% d = 0.75 inches A = 5.69 acres *DCV* = *(0.75 x* 0.77 *+0.15) x* 0.75 *inches x* 5.69 *ac x 43560 sf/ac x 1/12 in/ft* = 11,285 *Refer to Section IV.2.2 for specific Drainage Manage Area (DMA) breakdown and Appendix A for detailed calculations (Worksheet B).*

IV.2 SITE DESIGN AND DRAINAGE PLAN

The following section describes the site design BMPs used in this project and the methods used to incorporate them. Careful consideration of site design is a critical first step in storm water pollution prevention from new developments and redevelopments.

IV.2.1 Site Design BMPs

Minimize Impervious Area

Impervious surfaces have been minimized by incorporating landscaped areas throughout the site surrounding the proposed building. Landscaping will be provided throughout the site within the common areas as well as around the perimeter of the building.

Maximize Natural Infiltration Capacity

Infiltration is not recommended for the project site due to impermeable soils. Refer to Section IV.3.2 for details.

Preserve Existing Drainage Patterns and Time of Concentration

Runoff from the site will continue to flow similar to existing conditions. Low-flows and first-flush runoff will drain to modular wetland systems for water quality treatment via bio-filtration.

Disconnect Impervious Areas

Landscaping will be provided adjacent to sidewalks and between the proposed buildings. Low-flows and first-flush runoff will drain to modular wetland systems for water quality treatment via bio-filtration. Refer to Section IV.3.4 for further details.

Protect Existing Vegetation and Sensitive Areas, and Revegetate Disturbed Areas

There are no existing vegetated or sensitive areas to preserve on the project site. All disturbed areas will either be paved or landscaped.

Xeriscape Landscaping

Xeriscape landscaping is not proposed for the project. However, native and/or tolerant landscaping will be incorporated into the site design consistent with City guidelines.

IV.2.2 Drainage Management Areas

In accordance with the MS4 permit and the 2011 Model WQMP, the project site has been divided into Drainage Management Areas (DMAs) to be utilized for defining drainage areas and sizing LID and other treatment control BMPs. DMAs have been delineated based on the proposed site grading patterns, drainage patterns, storm drain and catch basin locations.

The design capture volumes (DCV) and treatment flow rates (Q_{Design}) for each DMA are summarized in the table below. These have been derived utilizing the "Simple Method" in accordance with the TGD Section III.1.1. Actual BMP sizing requirements, including 80 percent capture design volumes, flow rates, depths, and other design details for the specific BMPs proposed are provided in Section IV.3.4 below. Locations of DMAs and associated LID and treatment BMPs are identified on the exhibits in Section VI. Additional calculations and TGD Worksheets are provided in Appendix A.

DRAINAGE MANAGEMENT AREAS (DMAs)								
DMA/ Drainage Area ID[1]	Tributary Drainage Area (ft^2)	Tributary Drainage Area (ac)	% Imp.	Design Storm Depth[2] (in)	Estimated Tc (min)	Rainfall Intensity[3] (in/hr)	Simple Method DCV[4] (ft^3)	Q_{Design} [5] (cfs)
DMA 1	221,284.8	5.08	80%	0.75	5	0.26	10,341.6	0.988
DMA 2	26,571.6	0.61	56%	0.75	5	0.26	942.9	0.090
Total	247,929.0	5.692	77%	0.75	5	0.26	11,285	1.08

Notes:
1. Refer to exhibits in Section VI for locations of each DMA.
2. Per Figure XVI-1 of the Technical Guidance Document, dated May 19, 2011. See also Appendix A.
3. Per Figure III.4 of the Technical Guidance Document, dated May 19, 2011. See also Appendix A.
4. Per Section III.1.1 of the Technical Guidance Document.
5. Per Section III.3.3 and Worksheet D of the Technical Guidance Document.

IV.3 LID BMP SELECTION AND PROJECT CONFORMANCE ANALYSIS

Low Impact Development (LID) BMPs are required in addition to site design measures and source controls to reduce pollutants in storm water discharges. LID BMPs are engineered facilities that are designed to retain or biotreat runoff on the project site. The 4th Term MS4 Storm Water Permit (Order R8-2009-0030) requires the evaluation and use of LID features using the following hierarchy of treatment: infiltration, evapotranspiration, harvest/reuse, and biotreatment. The following sections summarize the LID BMPs proposed for the project in accordance with the permit hierarchy and performance criteria outlined in Section IV.1.

IV.3.1 Hydrologic Source Controls (HSCs)

Hydrologic source controls (HSCs) can be considered to be a hybrid between site design practices and LID BMPs. HSCs are distinguished from site design BMPs in that they do not reduce the tributary area or reduce the imperviousness of a drainage area; rather they reduce the runoff volume that would result from a drainage area with a given imperviousness compared to what would result if HSCs were not used.

HYDROLOGIC SOURCE CONTROLS		
ID	**Name**	**Included?**
HSC-1	Localized on-lot infiltration	☐
HSC-2	Impervious area dispersion (e.g. roof top disconnection)	☐
HSC-3	Street trees (canopy interception)	☐
HSC-4	Residential rain barrels (not actively managed)	☐
HSC-5	Green roofs/Brown roofs	☐
HSC-6	Blue roofs	☐
HSC-7	Impervious area reduction (e.g. permeable pavers, site design)	☐

HSCs were not incorporated into the project's design at this stage in the project's development. Any HSCs will be accounted for during final design and the cumulative volume of the HSCs will be subtracted from the required treatment volume in the Final WQMP.

IV.3.2 Infiltration BMPs

Infiltration BMPs are LID BMPs that capture, store and infiltrate storm water runoff. These BMPs are engineered to store a specified volume of water and have no design surface discharge (underdrain or outlet structure) until this volume is exceeded. Examples of infiltration BMPs include infiltration trenches, bioretention without underdrains, drywells, permeable pavement, and underground infiltration galleries.

INFILTRATION		
ID	**Name**	**Included?**
INF-3 INF-4	Bioretention Without Underdrains	☐
	Rain Gardens	☐
	Porous Landscaping	☐
	Infiltration Planters	☐
	Retention Swales	☐
INF-2	Infiltration Trenches	☐
INF-1	Infiltration Basins	☐
INF-5	Drywells	☐
INF-7	Subsurface Infiltration Galleries	☐
--	French Drains	☐
INF-6	Permeable Asphalt	☐
	Permeable Concrete	☐
	Permeable Concrete Pavers	☐
	Other:	☐

No infiltration BMPs are proposed within the redevelopment project. As discussed in Section III.2, the geotechnical investigation determined that the underlying soils are impermeable and not suitable for infiltration. Therefore, direct or concentrated infiltration of runoff is not considered feasible for the project. See also Appendices A and F for further details.

IV.3.3 Evapotranspiration & Rainwater Harvesting BMPs

Evapotranspiration (ET) BMPs are a class of retention BMPs that discharges stored volume predominately to ET, though some infiltration may occur. ET includes both evaporation and transpiration, and ET BMPs may incorporate one or more of these processes. BMPs must be designed to achieve the maximum feasible ET, where required to demonstrate that the maximum amount of water has been retained on-site. Since ET is not the sole process in these BMPs, specific design and sizing criteria have not been developed for ET-based BMPs.

EVAPOTRANSPIRATION		
ID	**Name**	**Included?**
--	HSCs, *see Section IV.3.1*	☐
--	Surface-based infiltration BMPs	☐
--	Biotreatment BMPs, see *Section VI.3.4*	☐
	Other:	☐

No ET BMPs are proposed. Harvest and use (aka. Rainwater Harvesting) BMPs are LID BMPs that capture and store storm water runoff for later use. These BMPs are engineered to store a specified volume of water and have no design surface discharge until this volume is exceeded. Harvest and use BMPs include both above-ground and below-ground cisterns. Examples of uses for harvested water include irrigation, toilet and urinal flushing, vehicle washing, evaporative cooling, industrial processes and other non-potable uses.

HARVEST & REUSE / RAINWATER HARVESTING		
ID	**Name**	**Included?**
HU-1	Above-ground cisterns and basins	☐
HU-2	Underground detention	☒
--	Other:	☐

In order to quantify harvested water demand for the common areas of the project, the Modified Estimated Applied Water Use (EAWU) method was used, consistent with Appendix X of the Model WQMP's Technical Guidance Document (TGD), dated May 19, 2011.

The Modified EAWU method is modified from the OC Irrigation Code (County Ordinance No. 09-010) to account for the wet season demand and storm events (assuming that no irrigation would be applied for approximately 30% of the days in the wet season).

The equation used to calculate the Modified EAWU is:

$$Modified\ EAWU = \frac{(ETo_{wet} \times K_L \times LA \times 0.015)}{IE}$$

Where:

$Modified\ EAWU$ = estimated daily average water use during wet season
ETo_{wet} = average reference ET from November through April (inches per month) per Table X.2 of the TGD
K_L = landscape coefficient (Table X.4 of the TGD)
LA = landscape area irrigated with harvested water (square feet)
IE = irrigation efficiency (assumed at 90%)

Note: In the equation, the coefficient (0.015) accounts for unit conversions and shut down of irrigation during and for three days following a significant precipitation event.

For a system to be considered "feasible", the system must be designed with a storage volume equal to the DCV from the tributary area and achieve more than 40% capture. The system must also be able to drawdown in 30 days to meet the 40% capture value. In addition, Table X.6 of the Technical Guidance Document sets forth the demand thresholds for minimum partial capture.

TABLE X.6: HARVESTED WATER DEMAND THRESHOLDS FOR MINIMUM PARTIAL CAPTURE

Design Capture Storm Depth, inches	Wet Season Demand Required for Minimum Partial Capture, gpd per impervious acre
0.60	490
0.65	530
0.70	570
0.75	610
0.80	650
0.85	690
0.90	730
0.95	770
1.00	810

ESTIMATED APPLIED WATER USE (EAWU) FOR PROJECT SITE

DMA	Total Area (ac)	% Impervious	Impervious Tributary (ac)	Irrigated LS Area (ac)	ETo_{Wet} [1] (in/mo)	K_L [2]	Modified EAWU (gpd)[3]	Modified EAWU per impervious acre (gpd/ac)	Minimum Capture Threshold [4] (gpd/ac)
Total Site	5.69	77%	4.39	1.30	3	0.55	1,561	356	610

ESTIMATED APPLIED WATER USE (EAWU) FOR PROJECT SITE									
DMA	Total Area (ac)	% Impervious	Impervious Tributary (ac)	Irrigated LS Area (ac)	ETo_{Wet} [1] (in/mo)	K_L [2]	Modified EAWU (gpd)[3]	Modified EAWU per impervious acre (gpd/ac)	Minimum Capture Threshold [4] (gpd/ac)
Design Capture Volume (gal)				84,414	Drawdown (days)				54

Notes:

1 Per Table X.2 for Santa Ana Region (similar climate type), Model WQMP Technical Guidance Document, dated December 2013.
2 Per Table X.4 of the Model WQMP Technical Guidance Document, dated December 2013.
3 Modified EAWU has been calculated based on combined total of landscape architect's average daily irrigation use estimate (890 gpd)and toilet demand use (2,320 gpd) (see calculations above)
4 Per Table X.6 of Model WQMP Technical Guidance Document, dated December 2013

As shown above, the project site does not have sufficient water demand during the wet season to support harvest and reuse. The project does not meet the minimum capture threshold of 610 gallons per day/acre with its Modified EAWU or estimated daily average water usage during the wet season. Therefore the DCV will not be fully utilized and emptied for the next storm event. Drawdown of the DCV is anticipated to take approximately 54 days by the landscape's water demand usage, which is greater than the maximum drawdown time of 30 days.

Though harvest and reuse is infeasible for the entire site, it may potentially be feasible for the proposed park area of the project site in DMA 2 should the City decide to consider this approach in runoff treatment. This can be considered in the Final WQMP at the City's request.

IV.3.4 Biotreatment BMPs

Biotreatment BMPs are a broad class of LID BMPs that reduce storm water volume to the maximum extent practicable, treat storm water using a suite of treatment mechanisms characteristic of biologically active systems, and discharge water to the downstream storm drain system or directly to receiving waters. Treatment mechanisms include media filtration (though biologically-active media), vegetative filtration (straining, sedimentation, interception, and stabilization of particles resulting from shallow flow through vegetation), general sorption processes (i.e., absorption, adsorption, ion-exchange, precipitation, surface complexation), biologically-mediated transformations, and other processes to address both suspended and dissolved constituents. Examples of biotreatment BMPs include bioretention with underdrains, vegetated swales, constructed wetlands, and proprietary biotreatment systems.

BIOTREATMENT		
ID	Name	Included?
BIO-1	Bioretention with underdrains	☐
	Storm Water planter boxes with underdrains	☐
	Rain gardens with underdrains	☐
BIO-5	Constructed wetlands	☐

BIOTREATMENT		
ID	**Name**	**Included?**
BIO-2	Vegetated swales	☐
BIO-3	Vegetated filter strips	☐
BIO-7	Proprietary vegetated biotreatment systems	☒
BIO-4	Wet extended detention basin	☐
BIO-6	Dry extended detention basins	☐
--	Other:	☐

Since infiltration and harvest and reuse are considered infeasible, Modular Wetland System (MWS) biotreatment BMPs will be utilized for the remaining on-site portions for water quality treatment. These biotreatment systems were selected based on their ability to treat the project's pollutants of concerns to a medium or high effectiveness, in accordance with the Model WQMP and TGD requirements. The table below summarizes the overall treatment effectiveness for Modular Wetland Systems, derived from Table 4.2 of the Technical Guidance Document and testing data provided by the manufacturer. Additional details on the proposed BMPs are included in Section VI of this WQMP.

POLLUTANTS OF CONCERN AND PERFORMANCE RATINGS	
Pollutant of Concern [1]	**Treatment Effectiveness**
	Modular Wetlands Proprietary Bioretention Units [2]
Suspended Solids/Sediments	High
Nutrients	Medium-High
Metals	Medium
Pathogens/Bacteria	Medium-High
Pesticides	N/A
Oil & Grease	High
Toxic Organic Compounds	N/A[4]
Trash & Debris	High

Notes:
1 See Section II.2 of this WQMP.
2 Based on Washington State University Technology Assessment Protocol – Ecology (TAPE) third-party independent field tests for a high-flow biotreatment system with raised under drain (Modular Wetland System-Linear). Refer to manufacturer documentation (attached) for specific removal efficiencies and source references.
Field and Lab Testing demonstrates 75-83% removal rates of Chemical Oxygen Demand (COD), a measure of the amount of organic pollutants commonly found in surface water. COD removals of this range would fall within the Medium-High effectiveness category.

Modular Wetland Systems

Modular Wetlands by Modular Wetlands Systems, Inc. are proprietary biotreatment systems that utilize multi-stage treatment processes including screening media filtration, settling, and biofiltration. The pre-treatment chamber contains the first three stages of treatment, and includes a catch basin inlet filter to capture trash, debris, gross solids and sediments, a settling chamber for separating out larger solids, and a media filter cartridge for capturing fine TSS, metals, nutrients, and bacteria. Runoff then flows through the wetland chamber where treatment is achieved through a variety of physical, chemical, and biological processes. As storm water passes down through the planting soil, pollutants are filtered, adsorbed, biodegraded and sequestered by the soil and plants, functioning similar to bioretention systems. The discharge chamber at the end of the unit collects treated flows and discharges back into the storm drain system.

Two Modular Wetland Systems will be installed within DMA 1. Runoff from this area will drain in a southwesterly direction into the MWS unit, where low flows will be treated. One MWS unit will be installed at the southwestern corner of the project site to treat runoff from DMA 2. Treated runoff will the flow through the MWS unit to a proposed pipe connecting to existing public storm drain lines while all high flows will bypass treatment in the MWS units and flow directly into the existing storm drain.

In accordance with the Model WQMP and TGD, the bioretention/biotreatment BMPs will be sized to treat runoff from the Design Capture Storm (85th percentile, 24-hour). Since Modular Wetlands are sized based on flow rate, they were sized utilizing the methodology for flow based BMPs (TGD Section III.1.2 and Worksheet D). Locations and tributary drainage areas are shown on the WQMP Exhibit included in Section VI. BMP details are also included in Section VI. Detailed calculations and associated TGD Worksheets are included in Appendix A. Operation and maintenance details are included in Section V and Appendix D (O&M Plan).

MODULAR WETLAND SYSTEM DESIGN SUMMARY

DMA ID[1]	Area (ac)	% Imp.	Tc (min)	Rainfall Intensity (in/hr)	Q_{Design}[3] (cfs)	Size / Model[4]	Combined Treatment Capacity [5] (cfs)
DMA 1	5.08	80%	5	0.26	0.988	(2) MWS-L-8-20	1.15
DMA 2	0.61	56%	5	0.26	0.09	(1) MWS-L-4-8	0.115

Notes:
(1) See also Section IV.2.2.
(2) Refer to WQMP Exhibit in Section VI for locations of each drainage area and BMP.
(3) Detailed calculations and worksheets are included in Appendix A.
(4) Unit details and specifications are included in Section VI.
(5) Treatment capacities of each unit are based on wetland media design loading rate (controlled by downstream orifice) and perimeter surface area of wetland media provided. Individual unit sizing calculations provided by the manufacturer are included on each cut sheet/detail included in Section VI.

IV.3.5 Hydromodification Control BMPs

Not applicable. Refer to Section II.3 for further information.

IV.3.6 Regional/Sub-Regional LID BMPs

Not applicable. LID BMPs (biofiltration) will be utilized for water quality treatment on-site in accordance with the MS4 Permit hierarchy identified at the beginning of this Section.

IV.3.7 Treatment Control BMPs

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

Not applicable. LID BMPs (biofiltration) will be utilized for water quality treatment on-site in accordance with the MS4 Permit hierarchy identified at the beginning of this Section.

IV.3.8 Non-Structural Source Control BMPs

The table below indicates all BMPs to be incorporated in the project. For those designated as not applicable (N/A), a brief explanation why is provided.

NON-STRUCTURAL SOURCE CONTROL BMPs				
ID	Name	Included?	Not Applicable?	If Not Applicable, Provide Brief Reason
N1	Education for Property Owners, Tenants and Occupants	☒	☐	
N2	Activity Restrictions	☒	☐	
N3	Common Area Landscape Management	☒	☐	
N4	BMP Maintenance	☒	☐	
N5	Title 22 CCR Compliance (How development will comply)	☐	☒	
N6	Local Water Quality Permit Compliance	☐	☒	The City of Newport Beach does not issue water quality permits.
N7	Spill Contingency Plan	☐	☒	
N8	Underground Storage Tank Compliance	☐	☒	
N9	Hazardous Materials Disclosure Compliance	☐	☒	
N10	Uniform Fire Code Implementation	☐	☒	
N11	Common Area Litter Control	☒	☐	
N12	Employee Training	☒	☐	

NON-STRUCTURAL SOURCE CONTROL BMPs				
ID	Name	Included?	Not Applicable?	If Not Applicable, Provide Brief Reason
N13	Housekeeping of Loading Docks	☐	☒	
N14	Common Area Catch Basin Inspection	☒	☐	
N15	Street Sweeping Private Streets and Parking Lots	☒	☐	
N16	Retail Gasoline Outlets	☐	☒	

N1, Education for Property Owners, Tenants and Occupants

Educational materials will be provided to tenants, including brochures and restrictions to reduce pollutants from reaching the storm drain system. Examples include tips for pet care, household tips, and proper household hazardous waste disposal. Tenants will be provided with these materials by the property management prior to occupancy, and periodically thereafter. Refer to Section VII for a list of materials available and attached to this WQMP. Additional materials are available through the County of Orange Stormwater Program website (http://ocwatersheds.com/PublicEd/) and the California Stormwater Quality Association's (CASQA) BMP Handbooks (http://www.cabmphandbooks.com/).

N2, Activity Restrictions

The HOA shall develop ongoing activity restrictions that include those that have the potential to create adverse impacts on water quality. Activities include, but are not limited to: handling and disposal of contaminants, fertilizer and pesticide application restrictions, litter control and pick-up, as well as any other activities that may potentially contribute to water pollution.

N3, Common Area Landscape Management

Management programs will be designed and implemented by the HOA to maintain all the common areas within the project site. These programs will cover how to reduce the potential pollutant sources of fertilizer and pesticide uses, utilization of water-efficient landscaping practices and proper disposal of landscape wastes by the owner/developer and/or contractors.

N4, BMP Maintenance

The HOA will be responsible for the implementation and maintenance of each applicable non-structural BMP, as well as scheduling inspections and maintenance of all applicable structural BMP facilities through its staff, landscape contractor, and/or any other necessary maintenance contractors. Details on BMP maintenance are provided in Section V of this WQMP, and the O&M Plan is included in Appendix D.

N11, Common Area Litter Control

The HOA will be responsible for performing trash pickup and sweeping of littered common areas on a weekly basis or whenever necessary. Responsibilities will also include noting improper disposal materials by the public and reporting such violations for investigation.

N12, Employee Training

All employees of the HOA and any contractors will require training to ensure that employees are aware of maintenance activities that may result in pollutants reaching the storm drain. Training will include, but not be limited to, spill cleanup procedures, proper waste disposal, housekeeping practices, etc.

N14, Common Area Catch Basin Inspection

All on-site catch basin inlets and drainage facilities shall be inspected and maintained by the HOA at least once a year, prior to the rainy season, no later than October 1st of each year. The City of Newport Beach shall maintain all catch basin inlets and drainage facilities within the proposed public park area.

N15, Street Sweeping Private Streets and Parking Lots

The HOA shall be responsible for sweeping all on-site drive aisles within the project on a quarterly basis.

IV.3.9 Structural Source Control BMPs

The table below indicates all BMPs to be incorporated in the project. For those designated as not applicable (N/A), a brief explanation why is provided.

STRUCTURAL SOURCE CONTROL BMPs				
ID	Name	Included?	Not Applicable?	If Not Applicable, Provide Brief Reason
S1 SD-13	Provide storm drain system stenciling and signage	☒	☐	
S2 SD-34	Design and construct outdoor material storage areas to reduce pollution introduction	☐	☒	All materials will be stored indoors or in the covered parking garage.
S3 SD-32	Design and construct trash and waste storage areas to reduce pollution introduction	☒	☐	
S4 SD-12	Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control	☒	☐	
S5	Protect slopes and channels and provide energy dissipation	☐	☒	No slopes or channels are associated with the project.
S6 SD-31	Properly Design: Dock areas	☐	☒	No dock areas proposed.

STRUCTURAL SOURCE CONTROL BMPs				
ID	Name	Included?	Not Applicable?	If Not Applicable, Provide Brief Reason
S7 SD-31	Properly Design: Maintenance bays	☐	☒	No maintenance bays proposed.
S8 SD-33	Properly Design: Vehicle wash areas	☐	☒	No vehicle wash areas proposed.
S9 SD-36	Properly Design: Outdoor processing areas	☐	☒	No outdoor processing areas proposed.
S10	Properly Design: Equipment wash areas	☐	☒	No equipment wash areas proposed.
S11 SD-30	Properly Design: Fueling areas	☐	☒	No fueling areas are proposed.
S12 SD-10	Properly Design: Hillside landscaping	☐	☒	No hillside landscaping proposed.
S13	Properly Design: Wash water control for food preparation areas	☒	☐	
S14	Properly Design: Community car wash racks	☐	☒	No community wash racks proposed.

S1/SD-13, Provide storm drain system stenciling and signage

The phrase "NO DUMPING! DRAINS TO OCEAN", or an equally effective phrase approved by the City, will be stenciled on all major storm drain inlets within the project site to alert the public to the destination of pollutants discharged into storm water. Stencils shall be in place prior to release of certificate of occupancy. Stencils shall be inspected for legibility on an annual basis and re-stenciled as necessary.

S3/SD-32, Design and construct trash and waste storage areas to reduce pollution introduction

All trash and waste shall be stored in containers that have lids or tarps to minimize direct precipitation into the containers. Several trash enclosures will be located throughout the property. The trash storage areas will be designed to City standards, and will be walled, roofed, have gates and proper drainage per City standards.

S4/SD-12, Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control

The HOA will be responsible for the installation and maintenance of all common landscape areas utilizing similar planting materials with similar water requirements to reduce excess irrigation runoff. The HOA will be responsible for implementing all efficient irrigation systems for common area landscaping including, but not limited to, provisions for water sensors and programmable irrigation cycles. This includes smart timers, rain sensors, and moisture shut-off valves. The irrigation systems shall be in

conformance with water efficiency guidelines. Systems shall be tested twice per year, and water used during testing/flushing shall not be discharged to the storm drain system.

S13, Properly Design: Wash water control for food preparation areas

All wash water from food prep areas will be controlled and proper staff training conducted by the site operator. Food preparation facilities shall meet all health and safety, building and safety and any other applicable regulations, codes requirements, including installation of a grease interceptor where required. Sinks shall be contained with sanitary sewer connections for disposal of wash waters containing kitchen and food wastes.

IV.4 ALTERNATIVE COMPLIANCE PLAN

IV.4.1 Water Quality Credits

Local jurisdictions may develop a water quality credit program that applies to certain types of development projects after they first evaluate the feasibility of meeting LID requirements on-site. If it is not feasible to meet the requirements for on-site LID, project proponents for specific project types can apply credits that would reduce project obligations for selecting and sizing other treatment BMPs or participating in other alternative programs.

WATER QUALITY CREDITS	
Credit	**Applicable?**
Redevelopment projects that reduce the overall impervious footprint of the project site.	☐
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 water quality if not redeveloped.	☐
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)	☐
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).	☐
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	☐

WATER QUALITY CREDITS	
Credit	**Applicable?**
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).	☐
Developments with dedication of undeveloped portions to parks, preservation areas and other pervious uses.	☐
Developments in a city center area.	☐
Developments in historic districts or historic preservation areas.	☐
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.	☐
In-fill projects, the conversion of empty lots and other underused spaces into more beneficially used spaces, such as residential or commercial areas.	☐

Not applicable. Water quality credits will not be applied for the project. LID BMPs will be utilized for water quality treatment on-site in accordance with the MS4 Permit hierarchy identified at the beginning of this Section.

IV.4.2 Alternative Compliance Plan Information

Not applicable. LID BMPs (biotreatment) will be utilized for water quality treatment on-site in accordance with the MS4 Permit hierarchy identified at the beginning of this Section.

SECTION V INSPECTION/MAINTENANCE RESPONSIBILITY FOR BMPs

It has been determined that Starboard Realty Partners, LLC shall assume all BMP inspection and maintenance responsibilities for Newport Crossings project.

Contact Name:	Dan Vittone
Title:	Principal
Company:	Starboard Realty Partners, LLC
Address:	1301 Dove Street, Suite 1080, Newport Beach, CA 92660
Phone:	949.851.2020
Fax:	949.851.5854
Email:	dan@starboardrp.com

Should the maintenance responsibility be transferred at any time during the operational life of THE RESIDENCES AT NEWPORT PLACE, such as when an HOA or POA is formed for a project, a formal notice of transfer shall be submitted to the City of Newport Beach at the time responsibility of the property subject to this WQMP is transferred. The transfer of responsibility shall be incorporated into this WQMP as an amendment.

The Owner shall verify BMP implementation and upon completion of the development, shall transfer responsibilities of the apartment management to the HOA for ongoing maintenance through inspection, self-certification, survey, or other equally effective measure. Upon completion of the project site, the development of the park shall be transferred to the City of Newport Beach that will be responsible for ongoing maintenance through inspection, self-certification, survey, or other equally effective measure. The certification shall verify that, at a minimum, the inspection and maintenance of all structural BMPs including inspection and performance of any required maintenance in the late summer / early fall, prior to the start of the rainy season. A form that may be used to record implementation, maintenance, and inspection of BMPs is included in Appendix D.

The City of Newport Beach may conduct verifications to assure that implementation and appropriate maintenance of structural and non-structural BMPs prescribed within this WQMP is taking place at the project site. The HOA shall retain operations, inspections and maintenance records of these BMPs and they will be made available to the City or County upon request. All records must be maintained for at least five (5) years after the recorded inspection date for the lifetime of the project.

Long-term funding for BMP maintenance of the apartments will be provided by Starboard Realty Partners, LLC while funding for park BMP maintenance will be provided by the City of Newport Beach.

The Operations and Maintenance (O&M) Plan can be found in Appendix D.

BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX				
	BMP	**Inspection/Maintenance Activities**	**Minimum Frequency**	**Responsible Party**
BIOTREATMENT BMPs				
BIO-7	Proprietary Biotreatment: 3 Modular Wetland Systems (MWS)	The Modular Wetland units shall be maintained in accordance with manufacturer's specifications. The system shall be inspected at a minimum of once every six months, prior to the start of the rainy season (October 1) each year, and after major storm events. Typical maintenance includes: ▪ Removing trash & debris from the catch basin screening filter (by hand). ▪ Removal of sediment and solids in the settlement chamber (vacuum truck). ▪ Replacement of the BioMediaGREEN™ filter cartridge and drain-down filter (if equipped) ▪ Trim plants within the wetland chamber as needed in conjunction with routine landscape maintenance activities. No fertilizer shall be used. Wetland chamber should be inspected during rain events to verify flow through the system. If little to no flow is observed from the lower valve or orifice plate, the wetland media may require replacement.	2x per year	Starboard Realty Partners, LLC, City of Newport Beach
NON-STRUCTURAL SOURCE CONTROL BMPs				
N1	Education for Property Owners, Tenants and Occupants	Educational materials will be provided to tenants annually. Materials to be distributed are found in Appendix C. Tenants will be provided these materials by the Owner prior to occupancy and periodically thereafter.	Annually	Starboard Realty Partners, LLC

BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX				
	BMP	**Inspection/Maintenance Activities**	**Minimum Frequency**	**Responsible Party**
N2	Activity Restrictions	The Owner will prescribe activity restrictions to protect surface water quality, through lease terms or other equally effective measure, for the property. Restrictions include, but are not limited to, prohibiting vehicle maintenance or vehicle washing.	Ongoing	Starboard Realty Partners, LLC, City of Newport Beach
N3	Common Area Landscape Management	Maintenance shall be consistent with City requirements. Fertilizer and/or pesticide usage shall be consistent with County Management Guidelines for Use of Fertilizers (OC DAMP Section 5.5) as well as local requirements. Maintenance includes mowing, weeding, and debris removal on a weekly basis. Trimming, replanting, and replacement of mulch shall be performed on an as-needed basis to prevent exposure of erodible surfaces. Trimmings, clippings, and other landscape wastes shall be properly disposed of in accordance with local regulations. Materials temporarily stockpiled during maintenance activities shall be placed away from water courses and storm drain inlets.	Monthly	Starboard Realty Partners, LLC, City of Newport Beach
N4	BMP Maintenance	Maintenance of structural BMPs implemented at the project site shall be performed at the frequency prescribed in this WQMP (Appendix D). Records of inspections and BMP maintenance shall be kept by the Owner and shall be available for review upon request.	Ongoing	Starboard Realty Partners, LLC, City of Newport Beach
N11	Common Area Litter Control	Litter patrol, violations investigations, reporting and other litter control activities shall be performed on a weekly basis and in conjunction with routine maintenance activities.	Weekly	Starboard Realty Partners, LLC, City of Newport Beach

BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX				
	BMP	**Inspection/Maintenance Activities**	**Minimum Frequency**	**Responsible Party**
N12	Employee Training	Educate all new employees/ managers on storm water pollution prevention, particularly good housekeeping practices, prior to the start of the rainy season (October 1). Refresher courses shall be conducted on an as needed basis.	Annually	Starboard Realty Partners, LLC, City of Newport Beach
N14	Common Area Catch Basin Inspection	Catch basin inlets and other drainage facilities shall be inspected after each storm event and once per year. Inlets and other facilities shall be cleaned prior to the rainy season, by October 1 each year.	Annually	Starboard Realty Partners, LLC, City of Newport Beach
N15	Street Sweeping Private Streets and Parking Lots	Drive aisles & parking areas must be swept at least quarterly (every 3 months), including prior to the start of the rainy season (October 1).	Quarterly	Starboard Realty Partners, LLC, City of Newport Beach
STRUCTURAL SOURCE CONTROL BMPs				
S1 SD-13	Provide storm drain system stenciling and signage	Storm drain stencils shall be inspected for legibility, at minimum, once prior to the storm season, no later than October 1 each year. Those determined to be illegible will be re-stenciled as soon as possible.	Annually	Starboard Realty Partners, LLC, City of Newport Beach
S3 SD-32	Design and construct trash and waste storage areas to reduce pollution introduction	Sweep trash area at least once per week and before October 1st each year. Maintain area clean of trash and debris at all times.	Weekly	Starboard Realty Partners, LLC

BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX				
	BMP	Inspection/Maintenance Activities	Minimum Frequency	Responsible Party
S4 SD-12	Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control	In conjunction with routine maintenance activities, verify that landscape design continues to function properly by adjusting 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. System testing shall occur twice per year. Water from testing/flushing shall be collected and properly disposed to the sewer system and shall not discharge to the storm drain system.	2x per year	Starboard Realty Partners, LLC, City of Newport Beach
S13	Properly Design: Wash water control for food preparation areas	All wash water from food prep areas will be controlled and proper staff training conducted by the site operator. Food preparation facilities shall meet all health and safety, building and safety and any other applicable regulations, codes requirements, including installation of a grease interceptor where required. Sinks shall be contained with sanitary sewer connections for disposal of wash waters containing kitchen and food wastes.	Weekly	Starboard Realty Partners, LLC

Any waste generated from maintenance activities will be disposed of properly. Wash water and other waste from maintenance activities is not to be discharged or disposed of into the storm drain system. Clippings from landscape maintenance (i.e. prunings) will be collected and disposed of properly off-site, and will not be washed into the streets, local area drains/conveyances, or catch basin inlets.

SECTION VI SITE PLAN AND DRAINAGE PLAN

The exhibits provided in this section are to illustrate the post construction BMPs prescribed within this WQMP. Drainage flow information of the proposed project, such as general surface flow lines, concrete or other surface drainage conveyances, and storm drain facilities are also depicted. All structural source control and treatment control BMPs are shown as well.

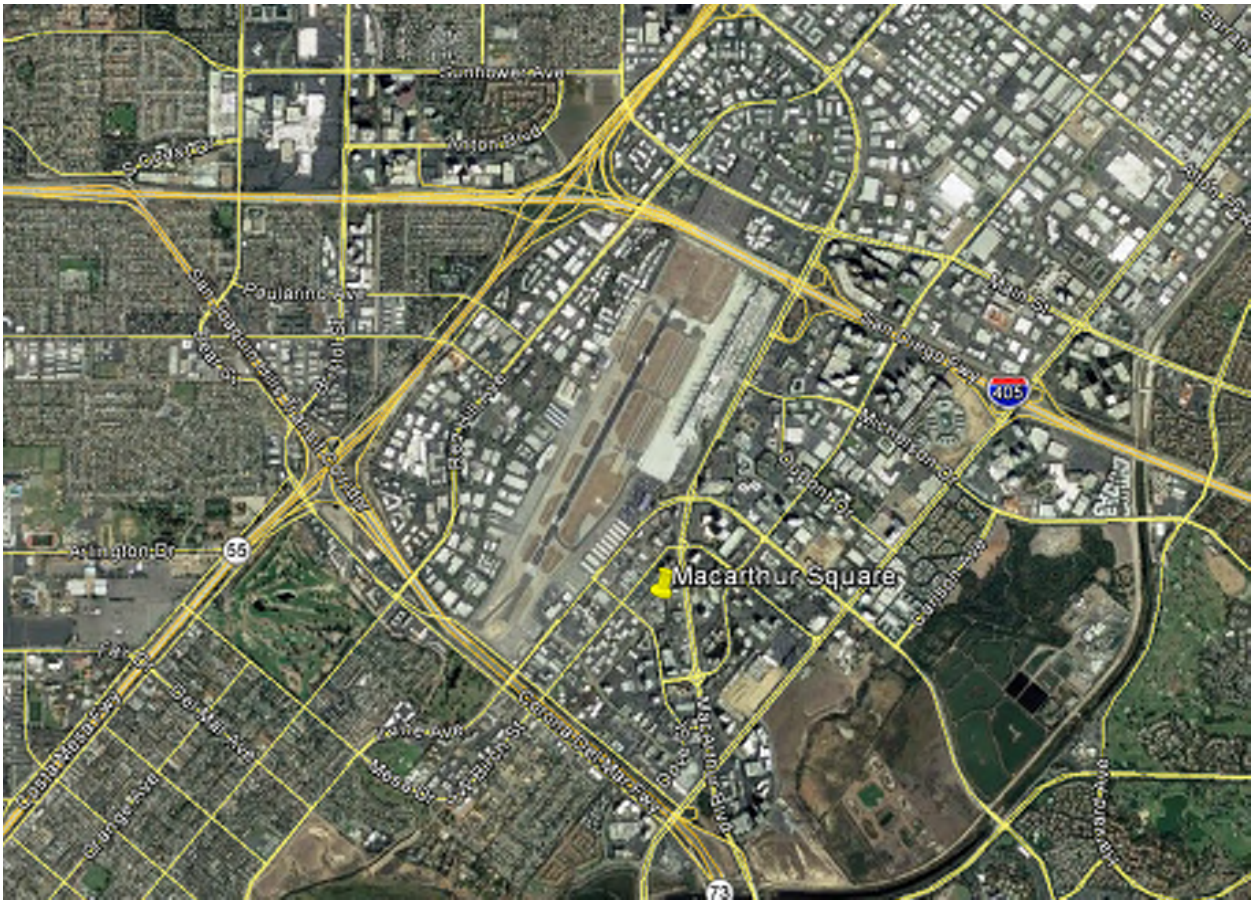
EXHIBITS

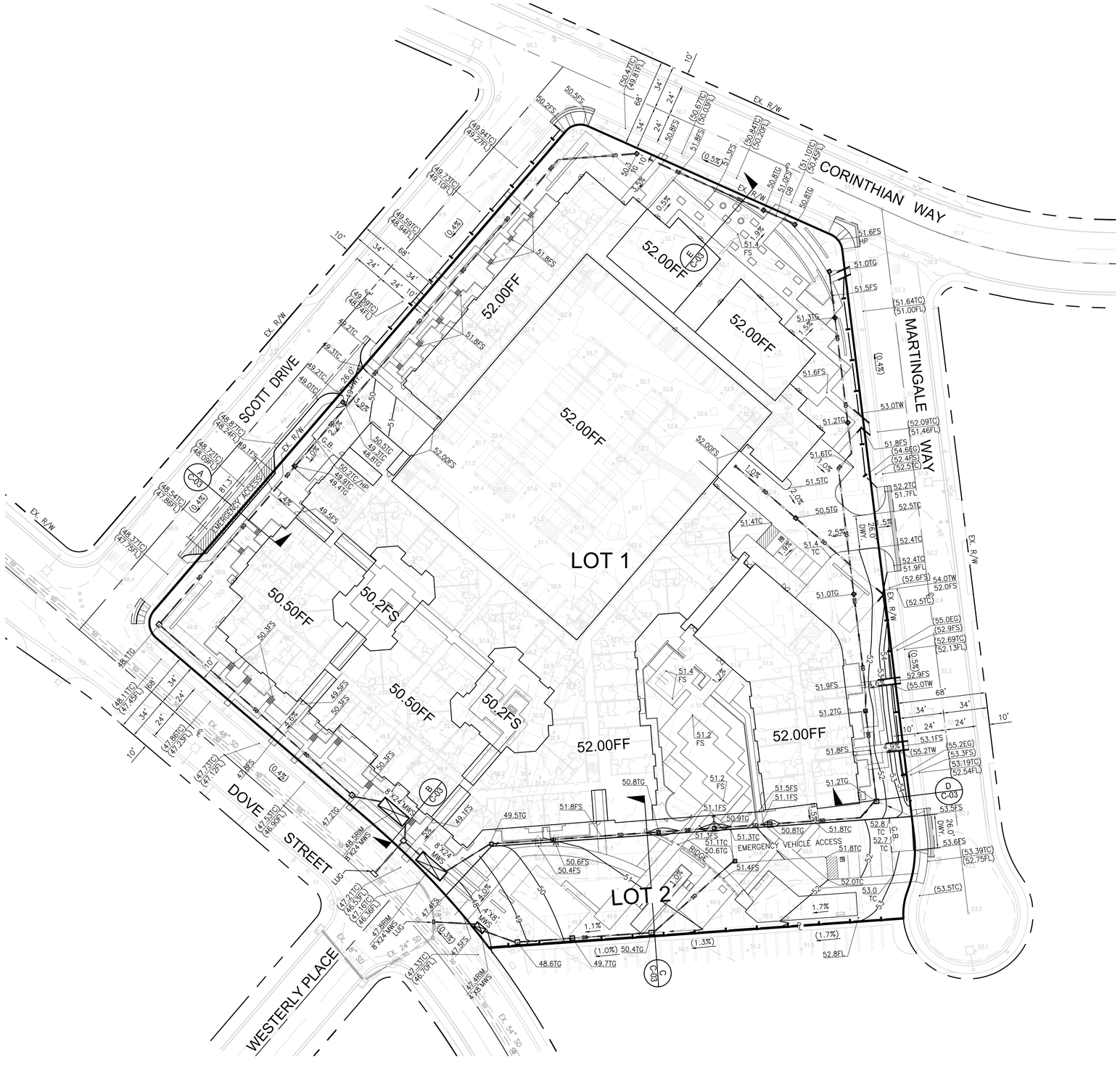
- Vicinity Map
- Site Plan
- WQMP Exhibit
- Typical Cross Sections

BMP DETAILS & FACT SHEETS

- Modular Wetland System Details

VICINITY MAP





SITE ADDRESS

4220 SCOTT DRIVE
NEWPORT BEACH, CA 92660

LEGAL DESCRIPTION

LOT 1 AS SHOWN ON A MAP RECORDED IN BOOK 299, PAGES 15 AND 16 OF MISCELLANEOUS MAPS, RECORDS OF ORANGE COUNTY, CALIFORNIA.

PARCEL 1 AND 2 AS SHOWN ON A MAP FILED IN BOOK 53, PAGE 13 OF PARCEL MAPS, IN THE OFFICE OF THE COUNTY RECORDER OF ORANGE COUNTY, CALIFORNIA.

EXCEPT ALL MINERALS, PETROLEUM GAS AND OTHER HYDROCARBON SUBSTANCES EXISTING BELOW 500 FEET FROM THE SURFACE OF SAID REAL PROPERTY DESCRIBED ABOVE; PROVIDED, HOWEVER, THAT GRANTOR HEREBY EXPRESSLY WAIVES THE RIGHT TO ENTER UPON THE SURFACE OF SAID REAL PROPERTY FOR THE PURPOSE OF EXPLORING FOR OR PRODUCING THE MINERALS, PETROLEUM, GAS AND OTHER HYDROCARBONS SUBSTANCES SO RESERVED, AS RESERVED IN AN INSTRUMENT RECORDED SEPTEMBER 8, 1972 IN BOOK 10316, PAGE 114 OF OFFICIAL RECORDS AND AS RESERVED BY DEED RECORDED MARCH 1, 1974 IN BOOK 11086, PAGE 2 OF OFFICIAL RECORDS.

APN: 427—172—02, 427—172—03, 427—172—05, 427—172—06

BASIS OF BEARINGS

THE BEARINGS SHOWN HEREON ARE BASED ON THE CENTERLINE BEARING OF DOVE STREET SHOWN AS N6°59'14"W, ON PARCEL MAP NO. 2007—241 FILED IN BOOK 368 PAGES 23 AND 24 OF PARCEL MAPS, IN THE OFFICE OF COUNTY RECORDER OF ORANGE COUNTY.

BENCH MARK

BENCHMARK DESIGNATION: 3S—34—77 DATED: APRIL 7, 2004

ELEVATION: 45.510 FEET (NAVD88, YEAR LEVELED 2003)

DESCRIPTION : DESCRIBED BY OCS 2001 — FOUND 3 3/4" OCS ALUMINUM BENCHMARK DISK STAMPED "3S—34—77", SET IN NORHTEAST CORNER OF A 4.5 FT. BY 8.4 FT. CONCRETE CATCH BASIN. MONUMENT IS LOCATED ALONG THE WESTERLY SIDE OF MACARTHUR BOULEVARD, 362 FT. NORTHERLY OF THE CENTERLINE OF NEWPORT PLACE AND 58 FT. WESTERLY OF THE CENTERLINE OF MACARTHUR BOULEVARD. MONUMENT IS SET LEVEL WITH THE SIDEWALK.

EARTHWORK

CUT = 7,300 CY
FILL = 2,600 CY
EXPORT = 4,700 CY
REMEDIAL = 23,000 CY

NOTE:
THE GRADING QUANTITIES SHOWN ABOVE ARE FOR BONDING PURPOSES ONLY AND DO NOT ACCOUNT FOR VARIATIONS DUE TO LOSS FROM CLEARING AND GRUBBING, STRIPPING, SHRINKAGE, SWELL, OR UNSUITABLE MATERIALS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR DETERMINING THEIR OWN INDEPENDENT QUANTITY AND MATERIAL TAKE—OFFS TO CONSTRUCT THE DESIGN AS INDICATED ON THESE DRAWINGS AND IN CONFORMANCE WITH THE PROJECT'S GEOTECHNICAL REPORT.

CIVIL ENGINEER

BRYAN D. SMITH, P.E.
FUSCOE ENGINEERING, INC.
6390 GREENWICH DR, SUITE 170
SAN DIEGO , CA 92122
PHONE: (858) 554—1500
FAX: (858) 597—0335

REGISTERED PROFESSIONAL ENGINEER — BRYAN D. SMITH — NO. 75622 — EXP. 06—30—18 — CIVIL — STATE OF CALIFORNIA

LEGEND

- PROPERTY LINE
- RIGHT—OF—WAY
- CENTER LINE
- 55 PROPOSED CONTOUR
- 55 EXISTING CONTOUR
- PROPOSED SWALE FLOWLINE
- PROPOSED RETAINING WALL
- SD EXISTING STORM DRAIN
- EXISTING STORM DRAIN CURB INLETS
- SD PROPOSED STORM DRAIN
- PROPOSED STORM DRAIN CATCH BASIN
- PROPOSED STORM DRAIN CLEANOUT
- PROPOSED MODULAR WETLAND BMPS

ABBREVIATIONS

CB	CATCH BASIN
FF	FINISH FLOOR ELEVATION
FL	FLOWLINE ELEVATION
FS	FINISH SURFACE ELEVATION
HP	HIGH POINT ELEVATION
P/L	PROPERTY LINE
RIM	TOP OF RIM ELEVATION
R/W	RIGHT OF WAY
SDMH	STORM DRAIN MANHOLE
TC	TOP OF CURB ELEVATION
TG	TOP OF GRATE ELEVATION
TW	TOP OF WALL ELEVATION

40' 0' 20' 40'
SCALE: 1" = 40'

C-01

NEWPORT CROSSINGS - NEWPORT BEACH, CA

CONCEPTUAL GRADING

JOB NO: 1618-001 DATE: 05-30-17

FUSCOE ENGINEERING — full circle thinking

STARBOARD REALTY PARTNERS, LLC

1301 Dove Street Suite1080 Newport Beach, CA (949) 851-2020

ARCHITECTS ORANGE

144 NORTH ORANGE ST. ORANGE, CA 92866 (714) 639-9860

LEGEND

- PROPERTY LINE
- EXISTING STORM DRAIN
- PROPOSED STORM DRAIN
- BMP DRAINAGE AREA BOUNDARY
- PROPOSED POOL AREA
- PROPOSED COMMON AREA LANDSCAPING
- PROPOSED BUILDING
- STREET SWEEPING PRIVATE STREETS & PARKING LOTS
- CATCH BASIN STENCILING & MAINTENANCE
- PROPOSED MODULAR WETLAND SYSTEM
- DIRECTION OF FLOW

80' 0' 40' 80'

SCALE: 1" = 80'

FUSCOE ENGINEERING
16795 Von Karman, Suite 100
Irvine, California 92606
tel 949.474.1960 • fax 949.474.5315
www.fuscoe.com

N

Scale: 1" = 80'

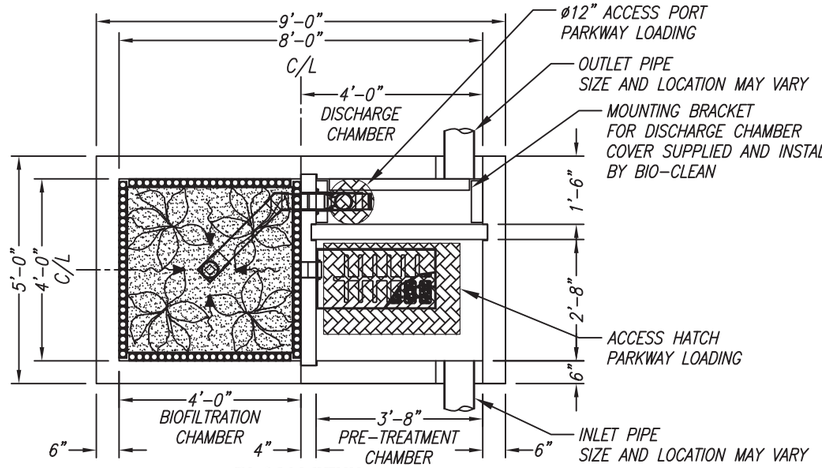
Exhibit Date: 05/19/2016

WATER QUALITY MANAGEMENT PLAN
NEWPORT CROSSING
NEWPORT BEACH, CA

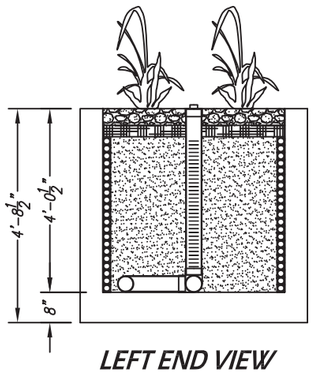
MODULAR WETLAND SYSTEMS - LINEAR 2.0
4-8 VAULT TYPE

FLOW RATES
PEAK TREATMENT FLOW RATE = .116 CFS OR 52.0 GPM
PEAK BYPASS FLOW RATE = OPTIONAL
SPECIFICATIONS
INSTALL AT SURFACE
O.D. DIMENSIONS = 9' X 5' X 4.7'
TOP OF VAULT TO INVERT OUT = 4.13'
SEDIMENT STORAGE CAPACITY = 1000 LBS OR 23.5 CF

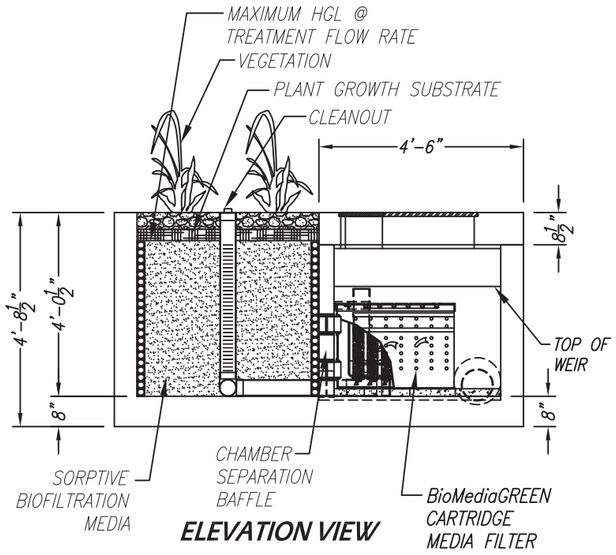
***NOTE:**
MWS UNIT CAN BE CONSTRUCTED WITH INLET ON EITHER SIDE. FOR INLET ON OPPOSITE SIDE ENTIRE UNIT WILL BE MIRRORED.



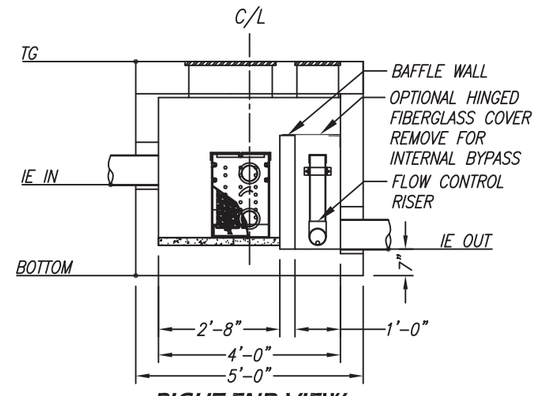
PLAN VIEW



LEFT END VIEW
BIOFILTRATION CHAMBER



ELEVATION VIEW



RIGHT END VIEW
PRETREATMENT/DISCHARGE CHAMBER

BIOFILTRATION CHAMBER SURFACE AREA CALCS
SIDES = 2
3.7' L x 3.4' H = 12.6 SF
SIDE SURFACE AREA = 25.2 SF
ENDS = 2
3.7' L x 3.4' H = 12.6 SF
END SURFACE AREA = 25.2 SF
TOTAL WETLAND MEDIA SURFACE AREA **= 50.4 SF**
WETLAND MEDIA LOADING RATE 52.0 GPM / 50.4 SF **= 1.03 GPM/SF**
PRETREATMENT FILTER SURFACE AREA CALCS
SIDES = 2
0.50' L x 1.67' H = 0.84 SF
SIDE SURFACE AREA = 1.68 SF
ENDS = 2
0.25' L x 1.67' H = 0.42 SF
END SURFACE AREA = 0.84 SF
TOTAL PRETREATMENT SURFACE AREA 2.52 SF x 14 FILTERS **= 35.28 SF**
PRETREATMENT FILTER LOADING RATE 52.0 GPM / 35.28 SF **= 1.47 GPM/SF**

LEGEND

- 2" DRAIN CELL PERIMETER INLET WATER TRANSFER SYSTEM
- WETLAND MEDIA
- PLANT/ROOT MOISTURE RETENTION LAYER
- MANHOLE / ACCESS HATCH

INSTALLATION NOTES:

1. INSTALL UNIT ON LEVEL BED OF GRAVEL OF AT LEAST 6" IN DEPTH.
2. CONCRETE 28 DAY COMPRESSIVE STRENGTH fc=5,000 PSI.
3. REINFORCING: ASTM A-615, GRADE 60.
4. RATED FOR PARKWAY LOADING 300 PSF.
5. JOINT SEALANT: BUTYL RUBBER SS-S-00210
6. PLANTING SUPPLIED AND INSTALLED BY CONTRACTOR PER MANUFACTURES RECOMMENDATIONS UNLESS OTHER WISE STATED ON CONTRACT.

MODULAR WETLAND SYSTEMS INC.
P.O. BOX 869
OCEANSIDE, CA 92049
www.ModularWetlands.com

	NAME	DATE
DRAWN	jrh	1/9/13
REVIEWED		

COMMENTS:

TITLE: MWS LINEAR 2.0 VAULT TYPE

SIZE	DWG. NO.	REV
	MWS-L-4-8-V	

SCALE 1:40 | UNITS = INCHES | SHEET 1 OF 1

SITE SPECIFIC DATA*	
PROJECT NAME	
PROJECT LOCATION	
STRUCTURE ID	

PERFORMANCE DATA	
TREATMENT FLOW (CFS)	
TREATMENT HGL (FT)	3.4
BYPASS FLOW RATE (CFS)	

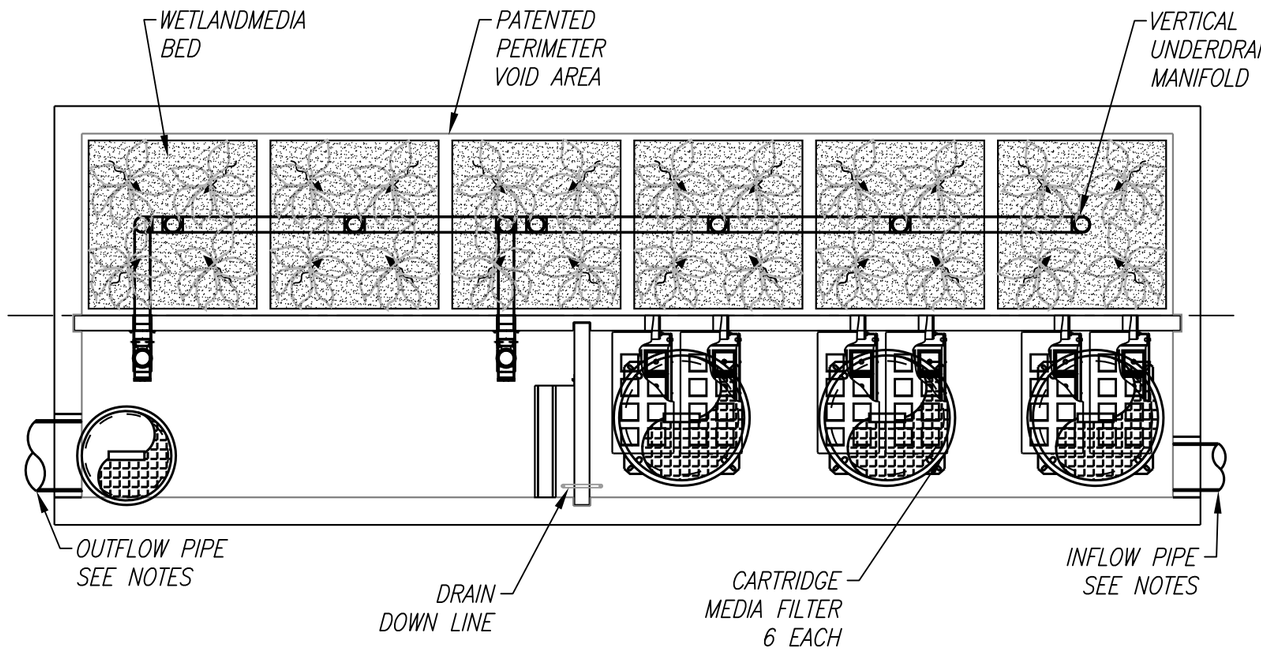
PROJECT PARAMETERS			
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1		PVC	
OUTLET PIPE 1		PVC	
RIM ELEVATION			
SURFACE LOADING REQUIREMENT		PARKWAY	

FRAME & COVER	PRETREATMENT	BIOFILTRATION	DISCHARGE
	30"		24"

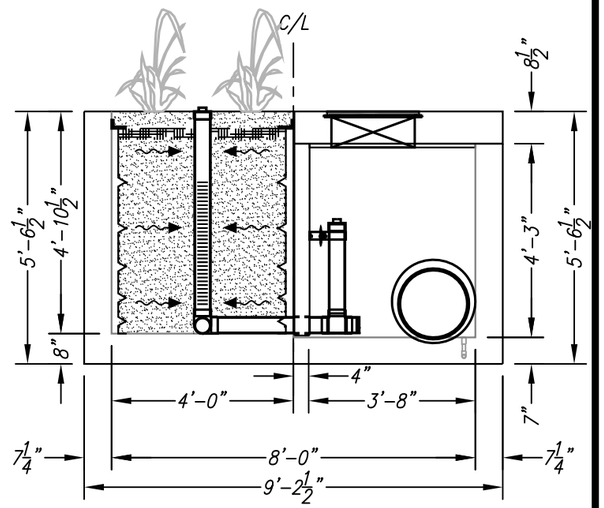
WETLANDMEDIA VOLUME (CY)	
MEDIA DELIVERED	
ORIFICE SIZE (DIA)	
MAX PICK WEIGHT (LBS)	

NOTES:

*PER ENGINEER OF RECORD



PLAN VIEW



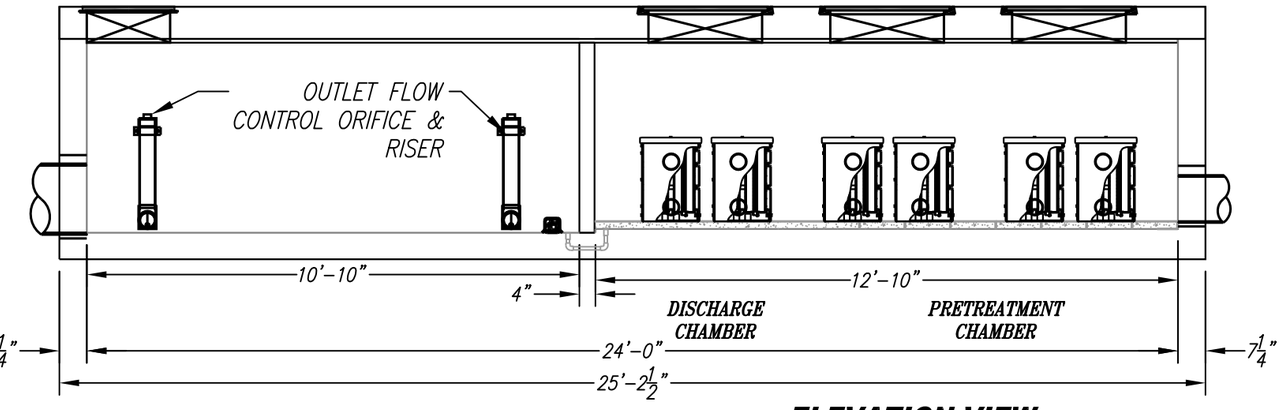
LEFT END VIEW

INSTALLATION NOTES

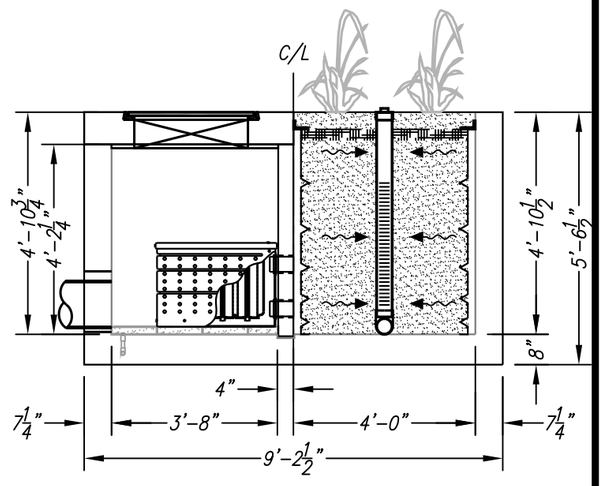
1. CONTRACTOR TO PROVIDE ALL LABOR, EQUIPMENT, MATERIALS AND INCIDENTALS REQUIRED TO OFFLOAD AND INSTALL THE SYSTEM AND APPURTENANCES IN ACCORDANCE WITH THIS DRAWING AND THE MANUFACTURERS SPECIFICATIONS, UNLESS OTHERWISE STATED IN MANUFACTURERS CONTRACT.
2. MANUFACTURER RECOMMENDS A MINIMUM 6"LEVEL ROCK BASE UNLESS SPECIFIED BY THE PROJECT ENGINEER. CONTRACTOR IS RESPONSIBLE TO VERIFY PROJECT ENGINEERS RECOMMENDED BASE SPECIFICATIONS.
3. ALL PIPES MUST BE FLUSH WITH INSIDE SURFACE OF CONCRETE. (PIPES CANNOT INTRUDE BEYOND FLUSH).
4. INVERT OF OUTFLOW PIPE MUST BE FLUSH WITH DISCHARGE CHAMBER FLOOR.
5. ALL GAPS AROUND PIPES SHALL BE SEALED WATER TIGHT WITH A NON-SHRINK GROUT PER MANUFACTURERS STANDARD CONNECTION DETAIL AND SHALL MEET OR EXCEED REGIONAL PIPE CONNECTION STANDARDS.
6. CONTRACTOR RESPONSIBLE FOR INSTALLATION OF ALL RISERS, MANHOLES, AND HATCHES. CONTRACTOR TO GROUT ALL MANHOLES AND HATCHES TO MATCH FINISHED SURFACE UNLESS SPECIFIED OTHERWISE.

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 MANUFACTURER.



ELEVATION VIEW



RIGHT END VIEW

MWS UNIT DESIGN DATA	
TREATMENT CAPACITY (CFS)	0.693
OPERATING HEAD (FT)	3.4
PRETREATMENT LOADING RATE (GPM/SF)	2.0
WETLAND LOADING RATE (GPM/SF)	1.0

MODULAR WETLANDS

MWS-L-8-24-V
STORMWATER BIOFILTRATION SYSTEM STANDARD DETAIL

4/8/15/JUSTIN

SECTION VII EDUCATIONAL MATERIALS

The educational materials included in this WQMP are provided to inform people involved in future uses, activities, or ownership of the site about the potential pitfalls associated with careless storm water management. "The Ocean Begins at Your Front Door" provides users with information about storm water that is/will be generated on site, what happens when water enters a storm drain, and its ultimate fate, discharging into the ocean. Also included are activities guidelines to educate anyone who is or will be associated with activities that have a potential to impact storm water runoff quality, and provide a menu of BMPs to effectively reduce the generation of storm water runoff pollutants from a variety of activities. The educational materials that may be used for the proposed project are included in Appendix C of this WQMP and are listed below.

EDUCATION MATERIALS			
Residential Materials (http://www.ocwatersheds.com)	**Check If Attached**	**Business Materials (http://www.ocwatersheds.com)**	**Check If Attached**
The Ocean Begins at Your Front Door	☒	Tips for the Automotive Industry	☐
Tips for Car Wash Fund-raisers	☐	Tips for Using Concrete and Mortar	☐
Tips for the Home Mechanic	☐	Tips for the Food Service Industry	☒
Homeowners Guide for Sustainable Water Use	☒	Proper Maintenance Practices for Your Business	☒
Household Tips	☒	**Other Materials (http://www.ocwatersheds.com) (https://www.casqa.org/resources/bmp-handbooks)**	**Check If Attached**
Proper Disposal of Household Hazardous Waste	☒		
Recycle at Your Local Used Oil Collection Center (North County)	☒	DF-1 Drainage System Operation & Maintenance	☒
Recycle at Your Local Used Oil Collection Center (Central County)	☐	R-1 Automobile Repair & Maintenance	☐
Recycle at Your Local Used Oil Collection Center (South County)	☐	R-2 Automobile Washing	☐
Tips for Maintaining Septic Tank Systems	☐	R-3 Automobile Parking	☒
Responsible Pest Control	☒	R-4 Home & Garden Care Activities	☐
Sewer Spill	☒	R-5 Disposal of Pet Waste	☐
Tips for the Home Improvement Projects	☐	R-6 Disposal of Green Waste	☒
Tips for Horse Care	☐	R-7 Household Hazardous Waste	☒
Tips for Landscaping and Gardening	☒	R-8 Water Conservation	☐
Tips for Pet Care	☒	SD-10 Site Design & Landscape Planning	☒
Tips for Pool Maintenance	☐	SD-11 Roof Runoff Controls	☒
Tips for Residential Pool, Landscape and Hardscape Drains	☐	SD-12 Efficient Irrigation	☒
Tips for Projects Using Paint	☐	SD-13 Storm Drain Signage	☒
Tips for Protecting Your Watershed	☒	SD-31 Maintenance Bays & Docs	☐
Other: Children's Brochure	☐	SD-32 Trash Storage Areas	☒

APPENDICES

APPENDIX A

SUPPORTING CALCULATIONS

Table 2.7: Infiltration BMP Feasibility Worksheet

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

Table 2.7: Infiltration BMP Feasibility Worksheet (continued)

	Partial Infeasibility Criteria	***Yes***	***No***
4	Is proposed infiltration facility **located on HSG D soils** or the site geotechnical investigation identifies presence of soil characteristics which support categorization as D soils?	X	
Provide basis: Summarize findings of studies provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
5	Is **measured infiltration rate below proposed facility less than 0.3 inches per hour**? This calculation shall be based on the methods described in Appendix VII.	X	
Provide basis: Summarize findings of studies provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
6	Would **reduction of over predeveloped conditions cause impairments to downstream beneficial uses, such as change of seasonality of ephemeral washes or increased discharge of contaminated groundwater to surface waters?**		X
Provide citation to applicable study and summarize findings relative to the amount of infiltration that is permissible: Summarize findings of studies provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
7	Would **an increase in infiltration over predeveloped conditions cause impairments to downstream beneficial uses, such as change of seasonality of ephemeral washes or increased discharge of contaminated groundwater to surface waters?**		X
Provide citation to applicable study and summarize findings relative to the amount of infiltration that is permissible: Summarize findings of studies provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			

Table 2.7: Infiltration BMP Feasibility Worksheet (continued)

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

Harvest & Reuse Irrigation Demand Calculations

[date]

Storm Water Design Caputre Volume (SQDV)

Drainage Area / Land Use Type	Impervious Area (ac)	Irrigated Area (ac)	% impervious	Runoff Coefficient	Design Storm Depth (in)	Drainage Area (acres)	DCV (ft^3)	DCV (gal)
Total Site	4.39	1.30	77%	0.7283	0.75	5.692	**11,285.3**	**84,414**
1	4.05	1.03	80%	0.7478	0.75	5.080	**10,341.6**	**77,355**
2	0.34	0.27	56%	0.5678	0.75	0.610	**942.9**	**7,053**
				0.1500			**0.0**	**0**
				0.1500			**0.0**	**0**
				0.1500			**0.0**	**0**

	Eto
Irvine	3.00
Laguna Beach	2.75
Santa Ana	2.93

Modified EAWU = $\frac{(Eto \times KL \times LA \times 0.015)}{IE}$

EIATA = $\frac{LA \times KL}{(IE \times Tributary\ Imp.\ Area)}$

Blend of High-Use and Low-Use Landscaping

Drainage Area / Land Use Type	Total Area (ac)	Total Area (sf)	% Impervious	Impervious (sf)	Pervious / LA (sf)	Eto	KL	Modified EAWU	EAWU/ Impervious Acre	Minimum EAWU/ Impervious Acre (Table X.6)	Feasible?	EIATA	Minimum EIATA (interpo-lated)	Drawdown (days)	Drawdown (hours)
Total Site	5.692	247,944	77%	191,164	56,779	3	0.55	1,561.42	355.80			0.18		54.1	1,297

TABLE X.6: HARVESTED WATER DEMAND THRESHOLDS FOR MINIMUM PARTIAL CAPTURE

Design Capture Storm Depth, inches	Wet Season Demand Required for Minimum Partial Capture, gpd per impervious acre
0.60	490
0.65	530
0.70	570
0.75	610
0.80	650
0.85	690
0.90	730
0.95	770
1.00	810

TABLE X.8: MINIMUM IRRIGATED AREA FOR POTENTIAL PARTIAL CAPTURE FEASIBILITY

General Landscape Type	Conservation Design: KL = 0.35			Active Turf Areas: KL = 0.7		
Closest ET Station	Irvine	Santa Ana	Laguna	Irvine	Santa Ana	Laguna
Design Capture Storm Depth, inches	Minimum Required Irrigated Area per Tributary Impervious Acre for Potential Partial Capture, ac/ac					
0.60	0.66	0.68	0.72	0.33	0.34	0.36
0.65	0.72	0.73	0.78	0.36	0.37	0.39
0.70	0.77	0.79	0.84	0.39	0.39	0.42
0.75	0.83	0.84	0.9	0.41	0.42	0.45
0.80	0.88	0.9	0.96	0.44	0.45	0.48
0.85	0.93	0.95	1.02	0.47	0.48	0.51
0.90	0.99	1.01	1.08	0.49	0.51	0.54
0.95	1.04	1.07	1.14	0.52	0.53	0.57
1.00	1.1	1.12	1.2	0.55	0.56	0.6

Source: Technical Guidance Document for the Preparation of Conceptual/Preliminary and/or Project Water Quality Management Plans (WQMPs). March 22, 2011. Appendix X.

Worksheet B: Simple Design Capture Volume Sizing Method

Project:

Date:

			Total Site	1	2	
Step 1: Determine the design capture storm depth used for calculating volume						
1	Enter design capture storm depth from Figure III.1, *d* (inches)	d=	0.75	0.75	0.75	inches
2	Enter the effect of provided HSCs, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	0	0	0	inches
3	Calculate the remainder of the design capture storm depth, $d_{remainder}$ (inches) (Line 1 – Line 2)	$d_{remainder}$=	0.75	0.75	0.75	inches
Step 2: Calculate the DCV						
1	Enter Project area tributary to BMP (s), *A* (acres)	A=	5.6920	5.0800	0.6100	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	77.1%	79.7%	55.7%	%
3	Calculate runoff coefficient, *C= (0.75 x imp) + 0.15*	C=	0.7283	0.7478	0.5678	
4	Calculate runoff volume, $V_{design} = (C \times d_{remainder} \times A \times 43560 \times (1/12))$	V_{design}=	11,285.3	10,341.6	942.9	cu-ft
Step 3: Design BMPs to ensure full retention of the DCV						
Step 3a: Determine design infiltration rate						
1	Enter measured infiltration rate, $K_{measured}$ (in/hr) (Appendix VII)	$K_{measured}$=	*Not applicable. Refer to Worksheet D*			in/hr
2	Enter combined safety factor from Worksheet H, S_{final} (unitless)	S_{final}=				
3	Calculate design infiltration rate, $K_{design} = K_{measured} / S_{final}$	K_{design}=				in/hr
Step 3b: Determine minimum BMP footprint						
4	Enter drawdown time, *T* (max 48 hours)	T=	*Not applicable. Refer to Worksheet D*			hours
5	Calculate max retention depth that can be drawn down within the drawdown time (feet), $D_{max} = K_{design} \times T \times (1/12)$	D_{max}=				feet
6	Calculate minimum area required for BMP (sq-ft), $A_{min} = V_{design} / d_{max}$	A_{min}=				sq-ft

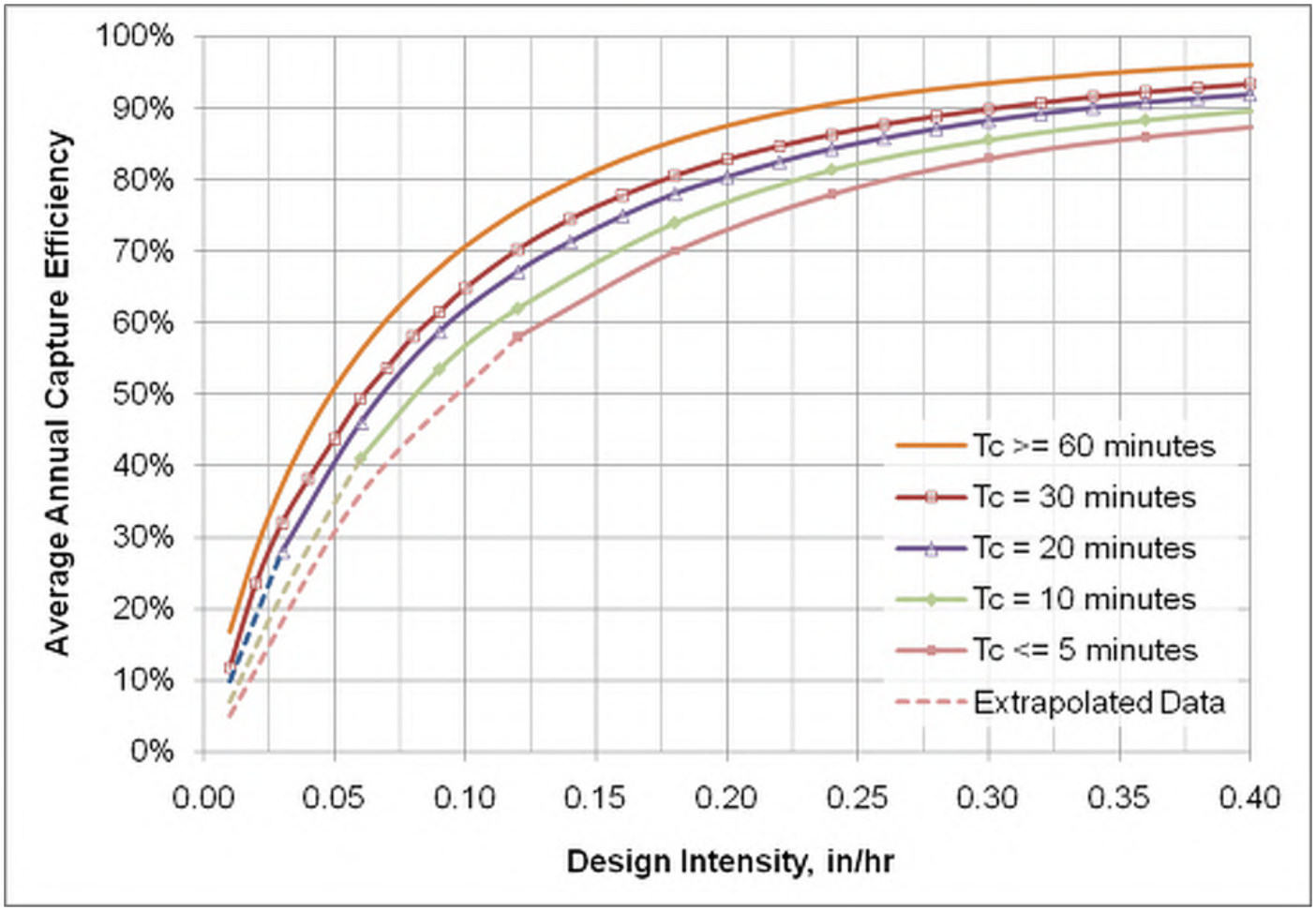
Worksheet D: Capture Efficiency Method for Flow-Based BMPs

Project:

Date:

			1	2	
Step 1: Determine the design capture storm depth used for calculating volume					
1	Enter the time of concentration, T_c (min) (See Appendix IV.2)	T_c=	5.0	5.0	min
2	Using Figure III.4, determine the design intensity at which the estimated time of concentration (T_c) achieves 80% capture efficiency, I_1	I_1=	0.260	0.260	in/hr
3	Enter the effect depth of provided HSCs upstream, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	0	0	inches
4	Enter capture efficiency corresponding to d_{HSC}, Y_2 (Worksheet A)	Y_2=	0%	42%	%
5	Using Figure III.4, determine the design intensity at which the time of concentration (T_c) achieves the upstream capture efficiency (Y_2), I_2	I_2=	0	0.100	in/hr
6	Determine the design intensity that must be provided by BMP, $I_{design} = I_1 - I_2$	I_{design}=	0.260	0.160	in/hr
Step 2: Calculate the design flowrate					
1	Enter Project area tributary to BMP(s), A (acres)	A=	5.080	0.610	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	79.7%	55.7%	%
3	Calculate runoff coefficient, $C = (0.75 \times imp) + 0.15$	C=	0.748	0.568	
4	Calculate design flowrate, $Q_{design} = (C \times i_{design} \times A)$	Q_{design}=	0.988	0.055	cfs
Supporting Calculations					
Describe System:					
prietary BioTreatment (BIO-7): Modular Wetland Systems (MWS)					
		Unit Size / Model =	*MWS-L-8-20*	*MWS-L-4-8*	
		Unit Size / Model Treatment Capacity =	*0.577*	*0.115*	cfs
		Number of Units Needed =	*2*	*1*	
		Total Bio-treatment Provided =	*1.150*	*0.115*	cfs
Provide time of concentration assumptions:					
					min

Figure III.4. Capture Efficiency Nomograph for Off-line Flow-based Systems in Orange County



SUBJECT TO FURTHER REVISION

LOS ANGELES COUNTY
ORANGE COUNTY
SAN BERNARDINO COUNTY
RIVERSIDE COUNTY

0.9
0.9
0.95
0.7
0.7
0.75
0.65
0.7
0.75
0.8
0.85
0.9
0.95
1
1.05

Project Site

LEGEND

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

Rainfall Zones

Design Capture Storm Depth (inches)

- 0.65"
- 0.7
- 0.75
- 0.80
- 0.85
- 0.90
- 0.95
- 1.00
- 1.10"

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

0 3 6 12 Kilometers
0 1.8 3.6 7.2 Miles

Pacific Ocean

TITLE: RAINFALL ZONES

JOB: ORANGE COUNTY TECHNICAL GUIDANCE DOCUMENT — ORANGE CO. — CA

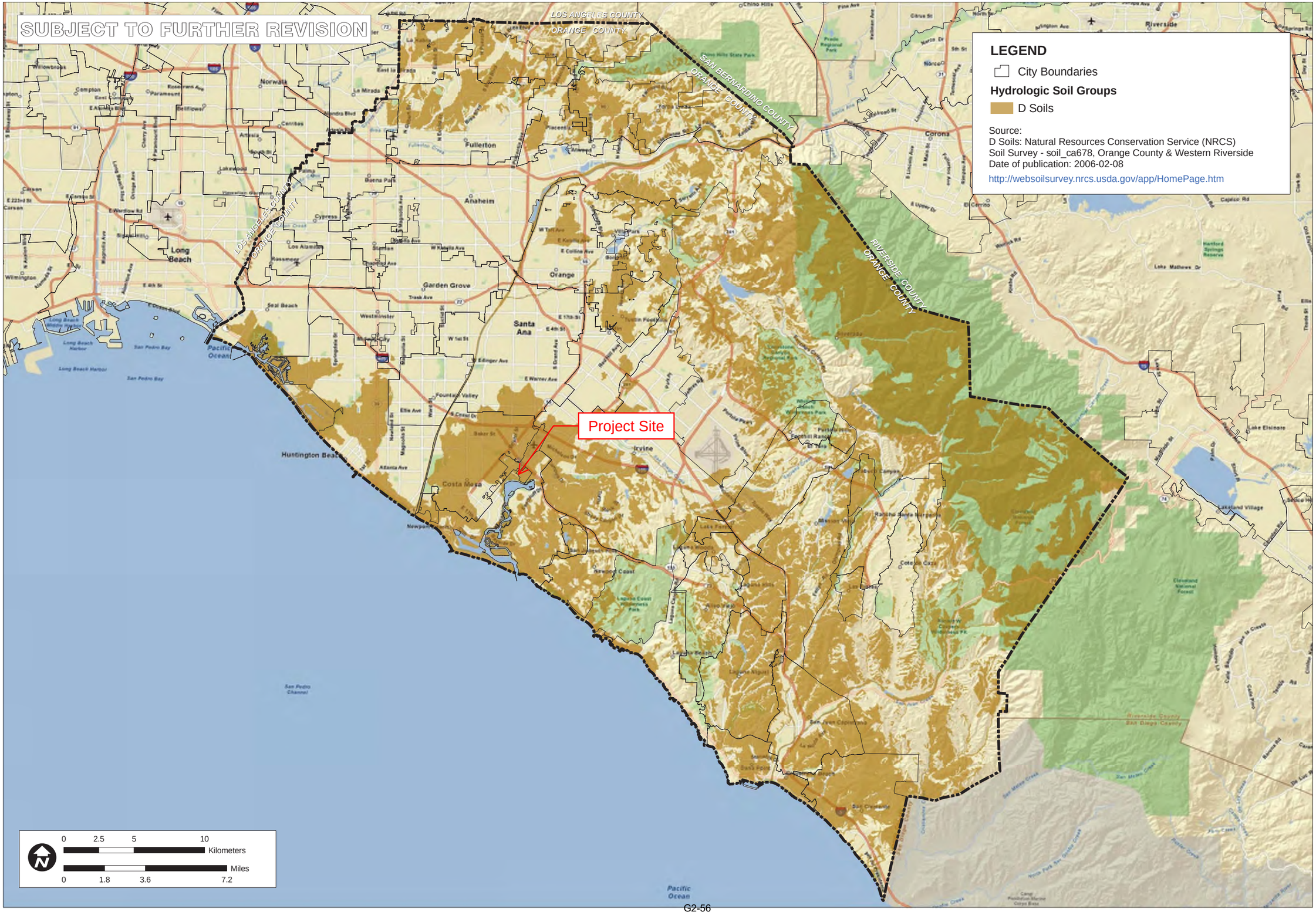
SCALE	1" = 1.8 miles
DESIGNED	TH
DRAWING	TH
CHECKED	BMP
DATE	04/22/10
JOB NO.	9526-E

PACE Advanced Water Engineering

FIGURE XVI-1

P:\9526E\16-GIS\Mxds\Reports\InfiltrationFeasability_20110215\9526E_FigureXVI-1_RainfallZones_20110215.mxd

SUBJECT TO FURTHER REVISION



LEGEND

City Boundaries

Hydrologic Soil Groups

D Soils

Source:
D Soils: Natural Resources Conservation Service (NRCS)
Soil Survey - soil_ca678, Orange County & Western Riverside
Date of publication: 2006-02-08

http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm

0 2.5 5 10 Kilometers

0 1.8 3.6 7.2 Miles

TITLE
HYDROLOGIC SOIL GROUP
TYPE D NRCS SOIL SURVEY

JOB
ORANGE COUNTY
INFILTRATION STUDY
ORANGE CO. CA

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

PACE
Advanced Water Engineering

FIGURE
XVI-2b

P:\9526E\6-GIS\Mxds\Reports\InfiltrationFeasability_20110215\9526E_FigureXVI-2b_D-Soils_20110215.mxd

Susceptibility

Potential Areas of Erosion, Habitat, & Physical Structure Susceptibility

Channel Type

- Earth (Unstable)
- Earth (Stabilized)
- Stabilized

Tidel Influence

- <= Mean High Water Line (4.28')

Water Body

- Basin
- Dam
- Lake
- Reservoir

Other Lands

- Airport/Military

AnaheimBay-HuntingtonHarbor Watershed

Santa Ana River Watershed

Santa Ana River Watershed

South Orange County

El Modena-Irvine Retarding Basin

Lower Peters Canyon Retarding Basin

Eastfoot Retarding Basin

Orchard Estates Retention Basin

Hicks Canyon Retarding Basin

Rattlesnake Reservoir

East Hicks Canyon Retarding Basin

Siphon Reservoir

Bee Canyon Retarding Basin

Round Canyon Retarding Basin

Trabuco Retarding Basin

Marshburn Retarding Basin

Agua Chinon Retarding Basin

John Wayne Airport

Project Site

North Lake

South Lake

Basin Number 2

Basin Number 1

Sand Canyon Reservoir

Laguna Reservoir

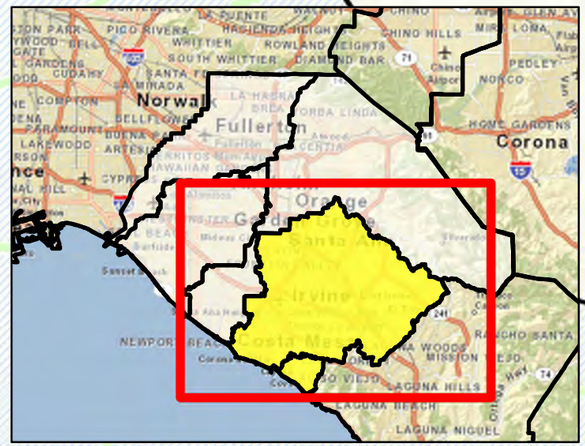
Bonita Canyon Reservoir

San Joaquin Reservoir

Big Canyon Reservoir

Harbor View Dam

Village Pond Park



0 9,000 18,000 Feet

TITLE: SUSCEPTIBILITY ANALYIS NEWPORT BAY-NEWPORT COASTAL STREAMS

JOB: ORANGE COUNTY WATERSHED MASTER PLANNING

ORANGE CO. CA

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

PACE Advanced Water Engineering

FIGURE 4

P:\9526E\6-GIS\Mxds\SuceptabilityMaps_20100505\9526E_NewportBaySusceptibility_20100430.mxd

APPENDIX B

NOTICE OF TRANSFER OF RESPONSIBILITY

NOTICE OF TRANSFER OF RESPONSIBILITY

WATER QUALITY MANAGEMENT PLAN

Newport Crossings
APN 427-172-02, 427-172-03, 427-172-05, 427-172-06

Submission of this Notice Of Transfer of Responsibility constitutes notice to the City of NEWPORT BEACH that responsibility for the Water Quality Management Plan ("WQMP") for the subject property identified below, and implementation of that plan, is being transferred from the Previous Owner (and his/her agent) of the site (or a portion thereof) to the New Owner, as further described below.

I. Previous Owner/ Previous Responsible Party Information

Company/ Individual Name:		Contact Person:	
Street Address:		Title:	
City:	State:	ZIP:	Phone:

II. Information about Site Transferred

Name of Project (if applicable):	
Title of WQMP Applicable to site:	
Street Address of Site (if applicable):	
Planning Area (PA) and/ or Tract Number(s) for Site:	Lot Numbers (if Site is a portion of a tract):
Date WQMP Prepared (and revised if applicable):	

III. New Owner/ New Responsible Party Information

Company/ Individual Name:		Contact Person:	
Street Address:		Title:	
City:	State:	ZIP:	Phone:

IV. Ownership Transfer Information

General Description of Site Transferred to New Owner:	General Description of Portion of Project/ Parcel Subject to WQMP Retained by Owner (if any):

Lot/ Tract Numbers of Site Transferred to New Owner:
Remaining Lot/ Tract Numbers Subject to WQMP Still Held by Owner (if any):
Date of Ownership Transfer:

Note: When the Previous Owner is transferring a Site that is a portion of a larger project/ parcel addressed by the WQMP, as opposed to the entire project/parcel addressed by the WQMP, the General Description of the Site transferred and the remainder of the project/ parcel no transferred shall be set forth as maps attached to this notice. These maps shall show those portions of a project/ parcel addressed by the WQMP that are transferred to the New Owner (the Transferred Site), those portions retained by the Previous Owner, and those portions previously transferred by Previous Owner. Those portions retained by Previous Owner shall be labeled as "Previously Transferred".

V. Purpose of Notice of Transfer

The purposes of this Notice of Transfer of Responsibility are: 1) to track transfer of responsibility for implementation and amendment of the WQMP when property to which the WQMP is transferred from the Previous Owner to the New Owner, and 2) to facilitate notification to a transferee of property subject to a WQMP that such New Order is now the Responsible Party of record for the WQMP for those portions of the site that it owns.

VI. Certifications

A. Previous Owner

I certify under penalty of law that I am no longer the owner of the Transferred Site as described in Section II above. I have provided the New Owner with a copy of the WQMP applicable to the Transferred Site that the New Owner is acquiring from the Previous Owner.

Printed Name of Previous Owner Representative:	Title:
Signature of Previous Owner Representative:	Date:

B. New Owner

I certify under penalty of law that I am the owner of the Transferred Site, as described in Section II above, that I have been provided a copy of the WQMP, and that I have informed myself and understand the New Owner's responsibilities related to the WQMP, its implementation, and Best Management Practices associated with it. I understand that by signing this notice, the New Owner is accepting all ongoing responsibilities for implementation and amendment of the WQMP for the Transferred Site, which the New Owner has acquired from the Previous Owner.

Printed Name of New Owner Representative:	Title:
Signature:	Date:

APPENDIX C

EDUCATIONAL MATERIALS

The Ocean Begins at Your Front Door

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

Did You Know?

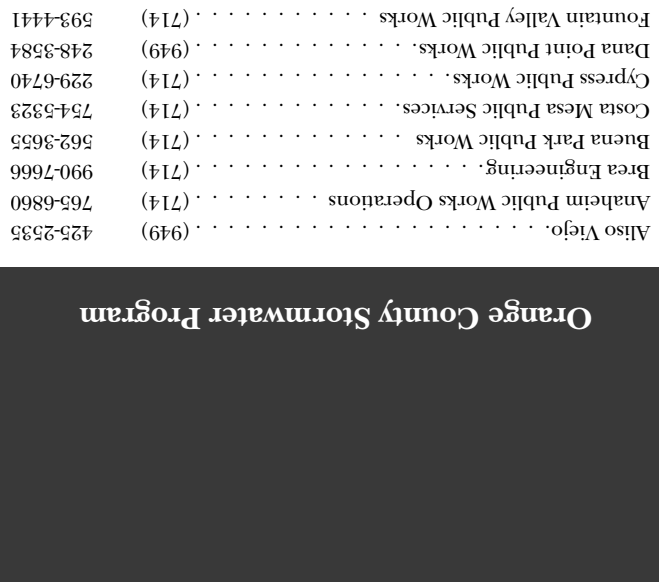
- Most people believe that the largest source of water pollution in urban areas comes from specific sources such as factories and sewage treatment plants. In fact, the largest source of water pollution comes from city streets, neighborhoods, construction sites and parking lots. This type of pollution 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?

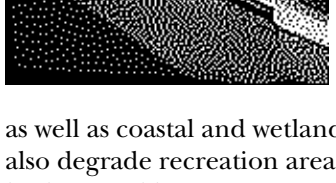
- Anything we use outside homes, vehicles and businesses – like motor oil, paint, pesticides, fertilizers and cleaners – can be blown or washed into storm drains.
- A little water from a garden hose or rain can also send materials into storm drains.
- Storm drains are separate from our sanitary sewer 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.

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

Orange County Stormwater Program

For More Information

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

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

California Environmental Protection Agency
www.calepa.ca.gov

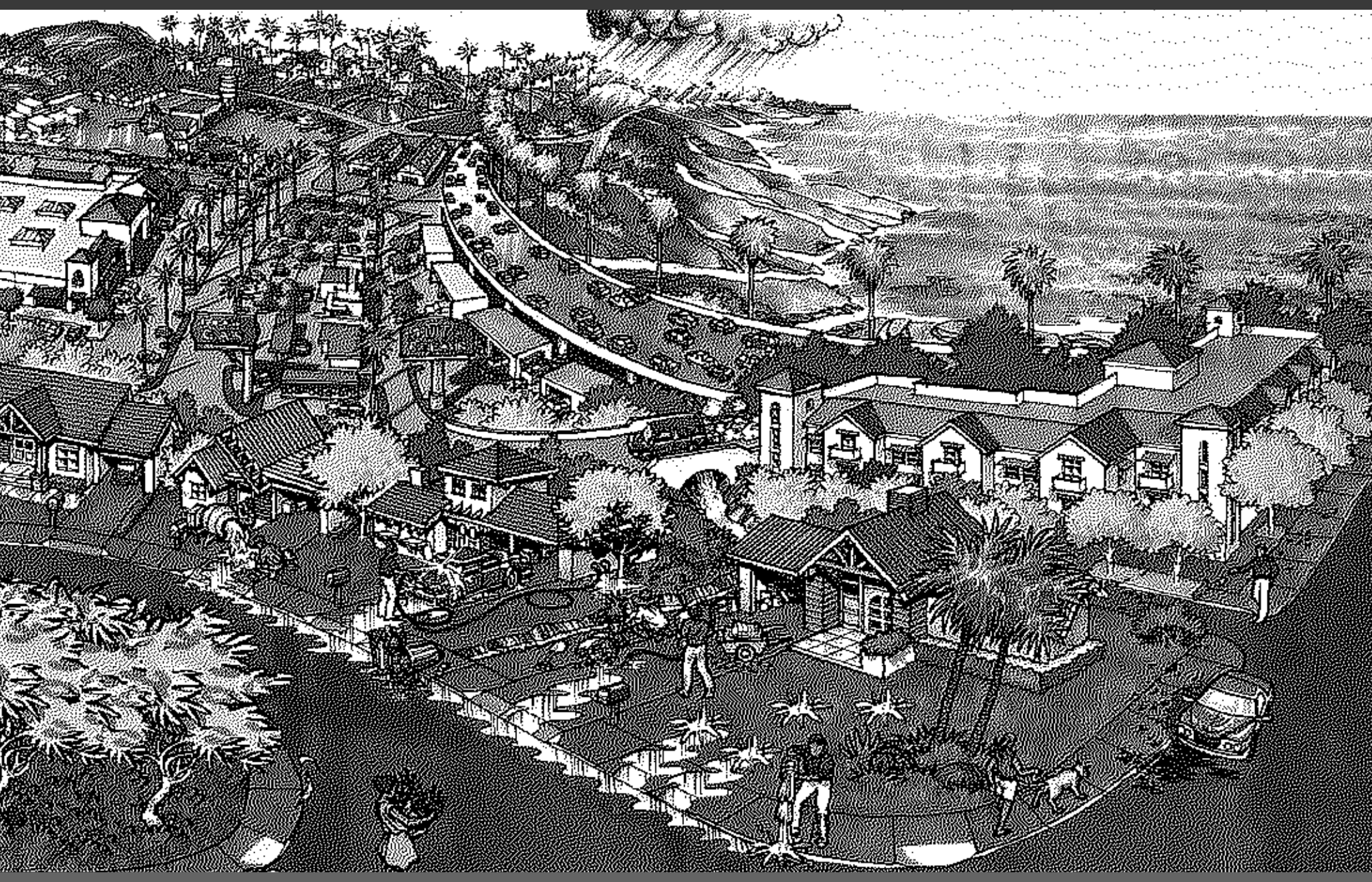
- **Air Resources Board**
  www.arb.ca.gov
- **Department of Pesticide Regulation**
  www.cdpr.ca.gov
- **Department of Toxic Substances Control**
  www.dtsc.ca.gov
- **Integrated Waste Management Board**
  www.ciwmb.ca.gov
- **Office of Environmental Health Hazard Assessment**
  www.oehha.ca.gov
- **State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

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 Nigel 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 Capisrano 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 Ocean Begins at Your Front Door



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

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.

Common Pollutants

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

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

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

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/

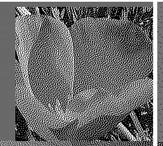
www.mwdoc.com

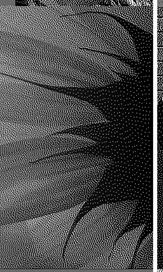
www.uccemg.com

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.

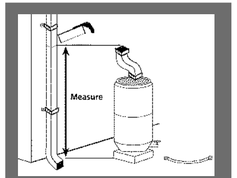
Rain Barrels

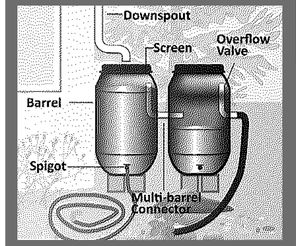
Rain barrels capture rainwater flow from roofs for reuse in landscape irrigation. Capacity of rain barrels needed for your home will depend on the amount of roof area and rainfall received. When purchasing your rain barrel, make sure it includes a screen, a spigot to siphon water for use, an overflow 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.

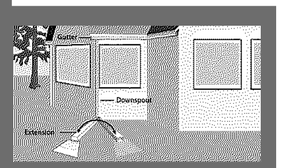
Mosquito growth prevention is very important when installing a rain barrel. The best way to prevent mosquito breeding is to eliminate entry points by ensuring all openings are sealed tightly. If these methods are unsuccessful, products are available to kill mosquito larvae, but that are harmless to animals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

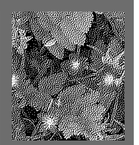
Rain Gardens

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 palate, 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 booms if they get into our waterways, which reduces the amount of oxygen in the water and impacts most aquatic organisms. It is important to apply soil amendments more than 48 hours prior to predicted rainfall.

IRRIGATE EFFICIENTLY

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

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.

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.

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

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.

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.

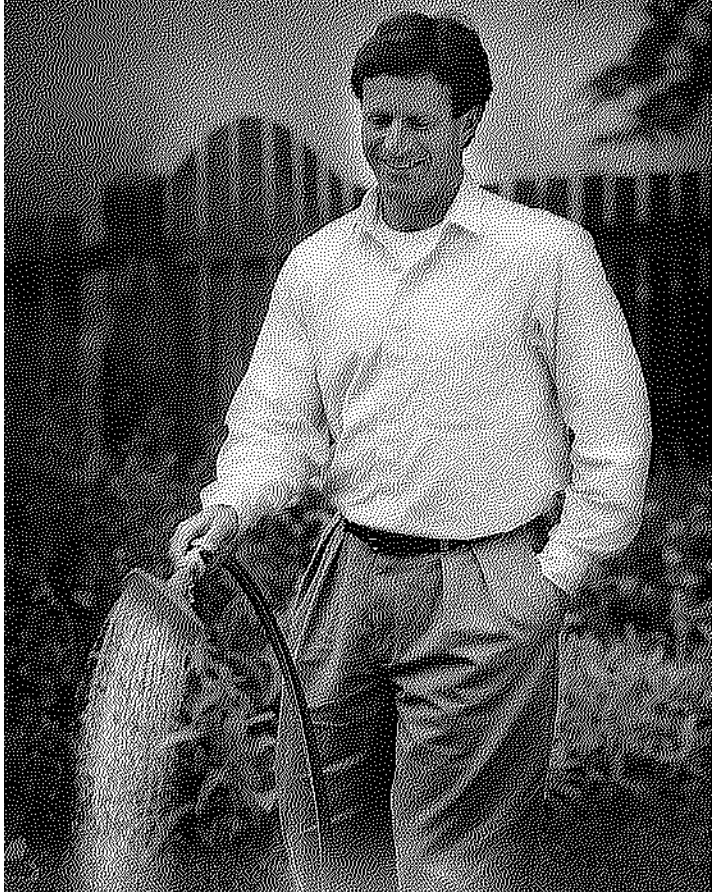
The tips contained in this brochure provide useful information to help prevent water pollution while performing everyday household activities. If you have other suggestions, please contact your city's stormwater representatives or call the Orange County Stormwater Program.

GENUINE RECYCLED PAPER
50% PRE-CONSUMER AND 15% POST-CONSUMER

RECYCLE USED OIL

Help Prevent Ocean Pollution:

Household Tips



The Ocean Begins at Your Front Door.

PROJECT Pollution PREVENTION

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 washwater.
- **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.

RECYCLE USED OIL

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Help Prevent Ocean Pollution:

Proper Disposal of Household Hazardous Waste

The Ocean Begins at Your Front Door

PROJECT Pollution PREVENTION

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

RECYCLE USED OIL

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

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Help Prevent Ocean Pollution:

Recycle at Your Local Used Oil Collection Center

The Ocean Begins at Your Front Door

PROJECT Pollution PREVENTION

NORTH COUNTY

Used Oil Collection Centers

Anaheim

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Anaheim Hills

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

Brea

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

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

Buena Park

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

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

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

Cypress

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

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

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

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

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

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

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

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

Fullerton

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

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

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

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

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

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

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

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

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

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

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

Garden Grove

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

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

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

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

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

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

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

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

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

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

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

La Habra

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

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

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

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

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

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

Los Alamitos

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

Midway City

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

Placentia

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

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

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

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

Seal Beach

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

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

Stanton

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

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

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

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

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

Westminster

AutoZone #5543
6611 Westminster Blvd., Westminster, CA 92683
(714)898-2898( )
CIWMB#: 30-C-04964

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

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

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

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

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

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

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

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

Yorba Linda

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

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

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

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

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

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

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

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 the UC Statewide IPM Program and Darren Haver.

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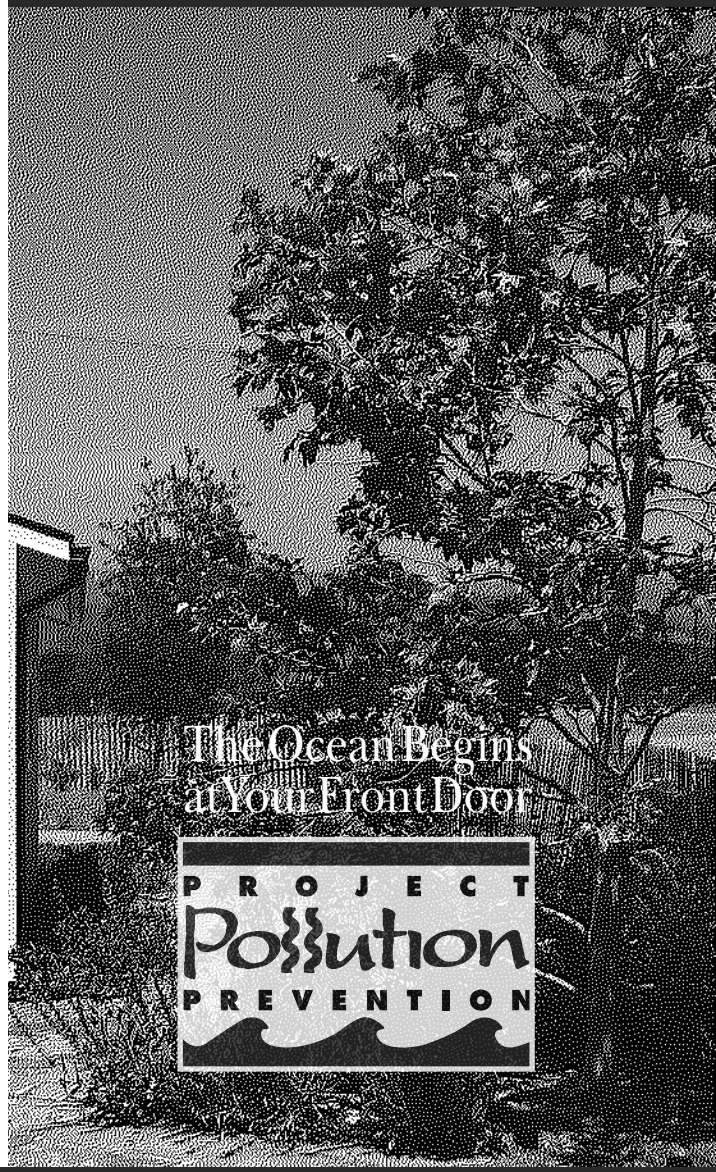
Help Prevent Ocean Pollution:

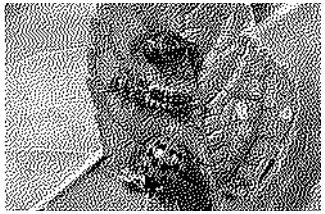
Responsible Pest Control



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.**



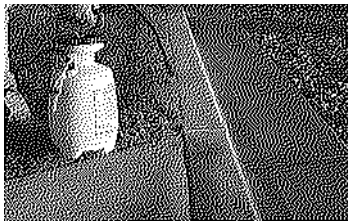
Three life stages of the common lady beetle, a beneficial insect.

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.

UC CE University of California Cooperative Extension

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).

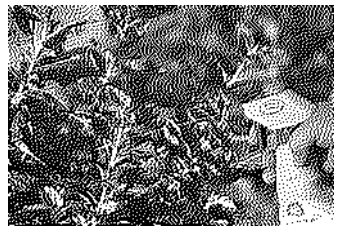
For general questions you may also visit www.calpoison.org.

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

PROJECT Pollution PREVENTION

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 (951) 782-4130
San Diego Region (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.

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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

PROJECT Pollution PREVENTION
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

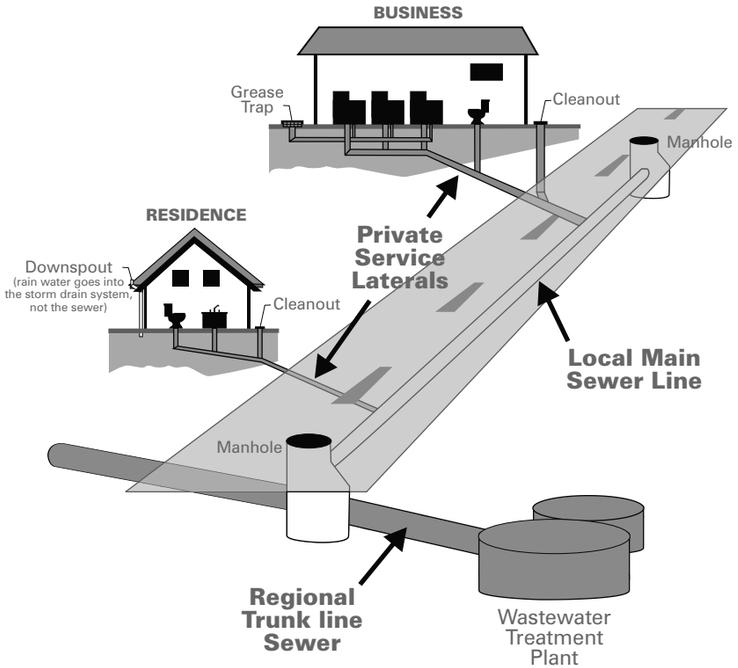
Keep people and pets away from the affected area. Untreated sewage has high levels of disease-causing viruses and bacteria. Call your local health care agency listed on the back for more information.

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 Responsibilites

- **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. 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.

The tips contained in this brochure provide useful information to help prevent water pollution while landscaping or gardening.

Additional detailed information is available from the
UCCE Master Gardener Hotline:
(714) 708-1646

To report a spill during normal business hours, please call the
City of Orange
Public Works Department
at **(714) 532-6480**
or visit
www.cityoforange.org.

To report a spill after normal business hours,
or on weekends, please call the
City of Orange 24-Hour Water Pollution Problem Reporting Hotline at
(714) 538-1961.

For emergencies, dial 911.

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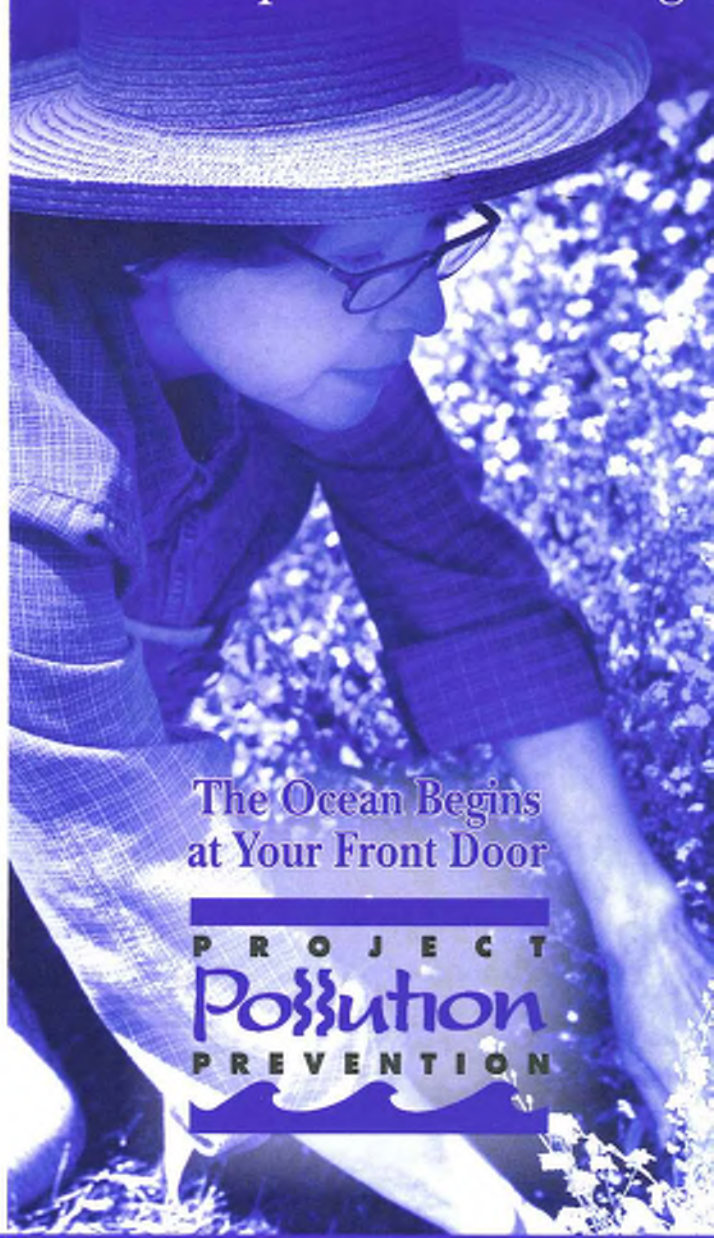
Help Prevent Ocean Pollution:

Tips for Landscape & Gardening



The Ocean Begins at Your Front Door

PROJECT Pollution PREVENTION

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.

- 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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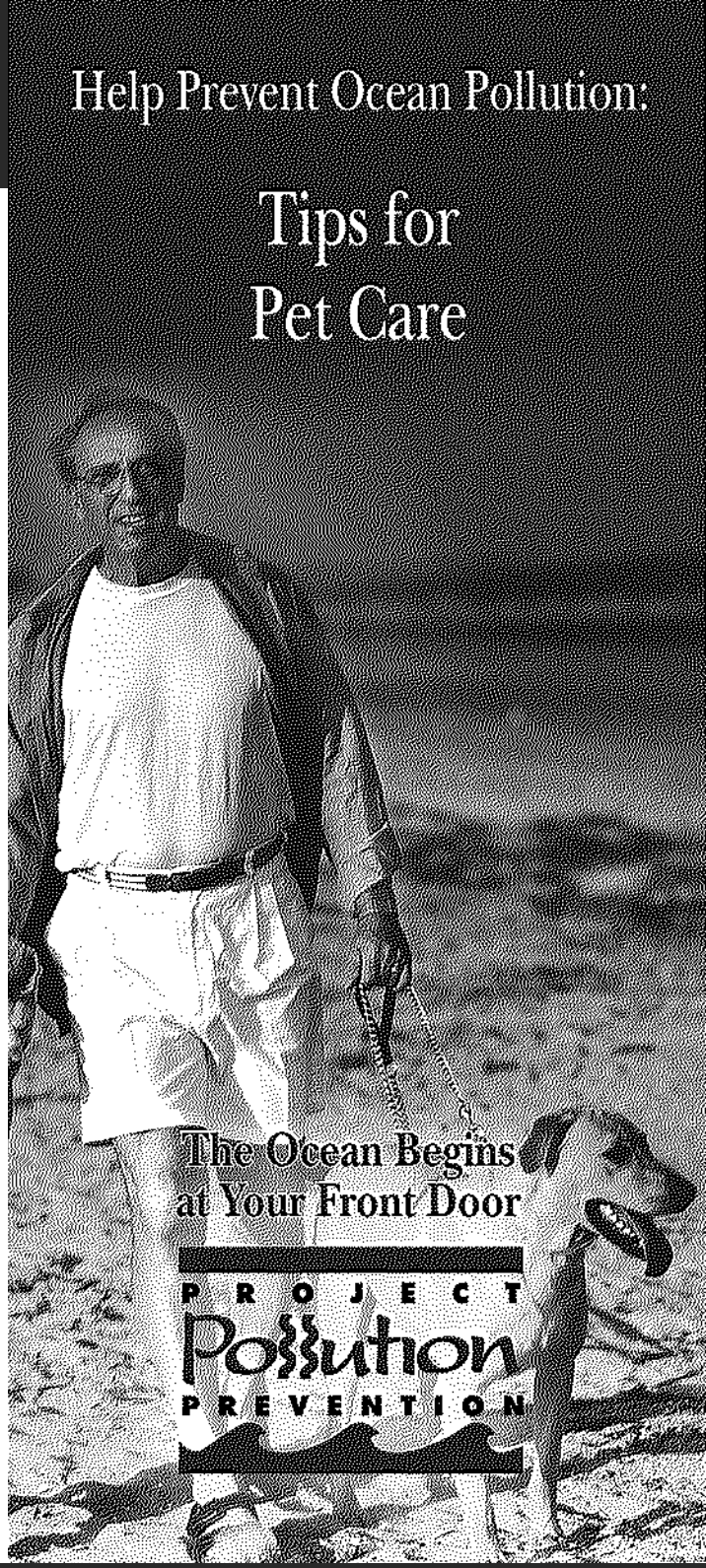
Help Prevent Ocean Pollution:

Tips for Pet Care



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.

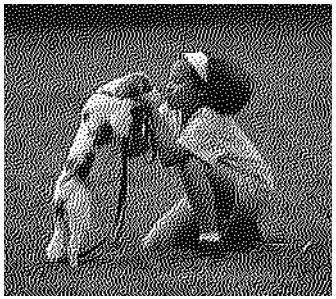
- If possible, bathe your pets indoors using less-toxic shampoos or have your pet professionally groomed. Follow instructions on the products and clean up spills.

- 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.

PROJECT Pollution PREVENTION

Clean beaches and healthy creeks, rivers, bays and ocean are important to Orange County. However, if we are not careful, our daily activities can lead directly to water pollution problems. Water that drains through your watershed can pick up pollutants which are then transported to our waterways and beautiful ocean.

You can prevent water pollution by taking personal action and by working with members of your watershed community to prevent urban runoff from entering your waterway.

For more information, please call the **Orange County Stormwater Program** at **1.877.89.SPILL** 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**.

For emergencies, dial 911.

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

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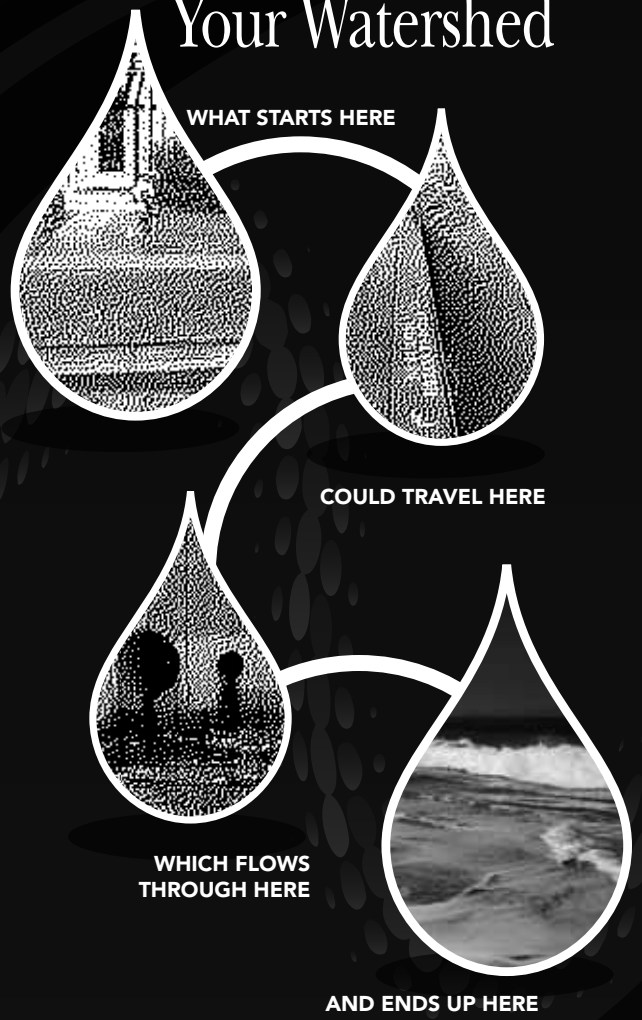
Help Prevent Ocean Pollution: Tips For Protecting Your Watershed



The Ocean Begins at Your Front Door

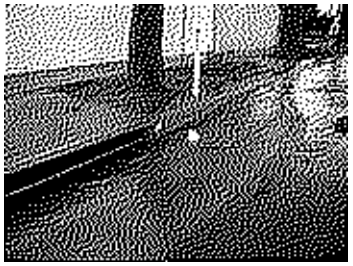
PROJECT Pollution PREVENTION

Tips for Protecting Your Watershed

My Watershed. Our Ocean.

Water + shed, *noun: A region of land within which water flows down into a specified water body, such as a river, lake, sea, or ocean; a drainage basin or catchment basin.*

Orange County is comprised of 11 major watersheds into which most of our water flows, connecting all of Orange County to the Pacific Ocean.



As water from rain (stormwater) or sprinklers and hoses (urban runoff) runs down your driveway and into your neighborhood streets, sidewalks and gutters, it flows into storm drains that lead to waterways within your watershed. The waterways from other cities merge as they make their way through our watersheds until all the runoff water in Orange County meets at the Pacific Ocean. The water that reaches our ocean is not pure. As it flows through the watershed, it picks up pollutants such as litter, cigarette butts, fertilizer, pesticides, pet waste, motor oil and lawn clippings. Unlike water that enters the sewer (from sinks and toilets), water that enters the storm drain is not treated before it flows, ultimately, to the ocean.

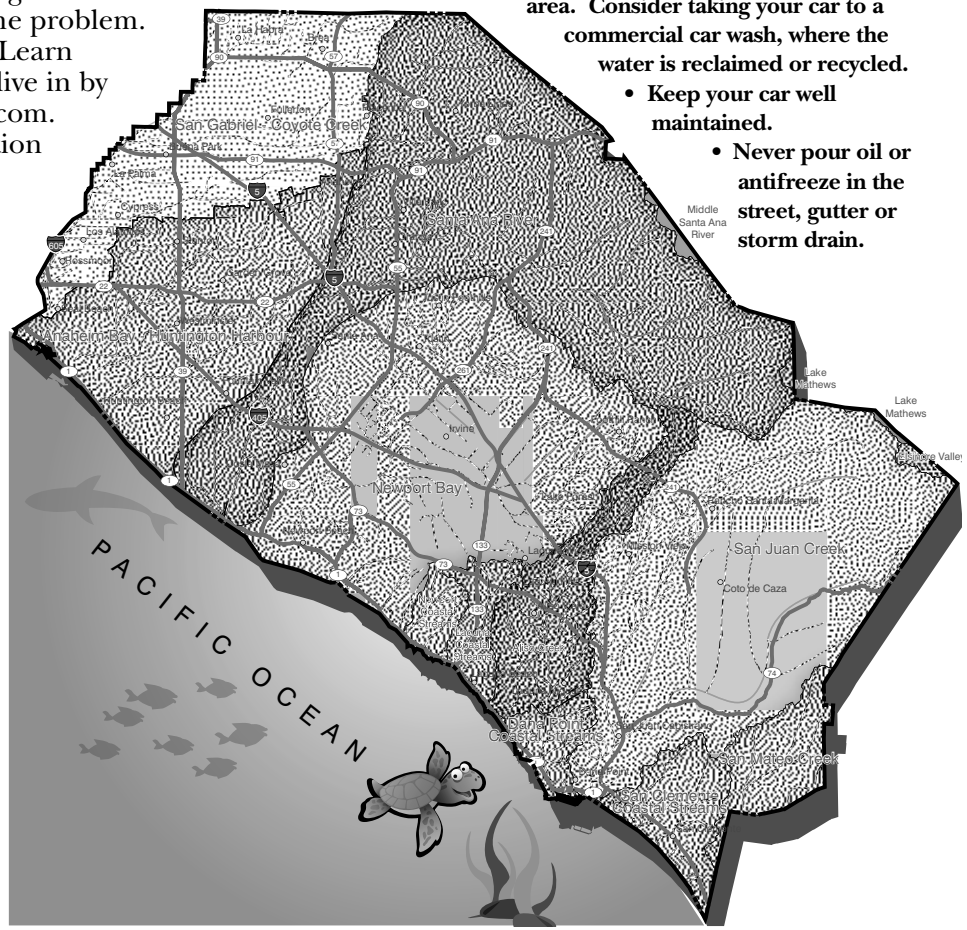
Water quality can be improved by "Adopting Your Watershed." Through this effort, we are challenging citizens and organizations to join the Orange County Stormwater Program and others who are working to protect and restore our creeks, rivers, bays and ocean.

There are many opportunities to get involved:

- Appreciate your watershed - explore the creeks, trails and ocean and make observations about its conditions. If you see anything abnormal (such as dead fish, oil spills, leaking barrels, and other pollution) contact the Orange County 24-hour water pollution problem reporting hotline at 1.877.89.SPILL to report the problem.
- Research your watershed. Learn about what watershed you live in by visiting www.ocwatersheds.com.
- Find a watershed organization in your community and volunteer to help. If there are no active groups, consider starting your own.
- Visit EPA's Adopt Your Watershed's Catalog of Watershed Groups at www.epa.gov/adopt to locate groups in your community.
- Organize or join in a creek, river, bay or ocean cleanup event such as Coastal & Inner Coastal Cleanup Day that takes place the 3rd Saturday of every September. For more information visit www.coast4u.org.

Follow these simple tips to protect the water quality of your watershed:

- **Sweep up debris and dispose of it in the trash. Do not hose down driveways or sidewalks into the street or gutter.**
- **Use dry cleanup methods such as cat litter to absorb spills and sweep up residue.**
- **Set your irrigation systems to reflect seasonal water needs or use weather-based controllers. Inspect for runoff regularly.**
- **Cover trashcans securely.**
- **Take hazardous waste to a household hazardous waste collection center. (For example, paint, batteries and petroleum products)**
- **Pick up after your pet.**
- **Follow application and disposal directions for pesticides and fertilizers.**
- **If you wash your car at home, wash it on your lawn or divert the runoff onto a landscaped area. Consider taking your car to a commercial car wash, where the water is reclaimed or recycled.**
- **Keep your car well maintained.**
- **Never pour oil or antifreeze in the street, gutter or storm drain.**



Preventing water pollution at your commercial/industrial site

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

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

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

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.

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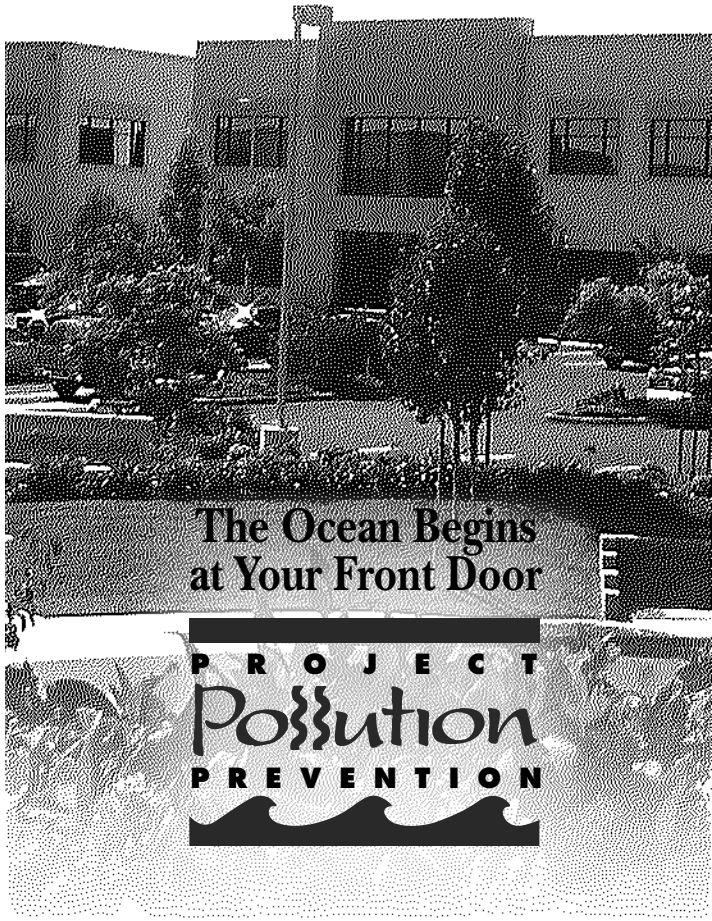
Help Prevent Ocean Pollution:

Proper Maintenance Practices for Your Business



Proper Maintenance Practices for your Business

Landscape Maintenance

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

Building Maintenance

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

NEVER DISPOSE OF ANYTHING IN THE STORM DRAIN.

- Recycle paints, solvents and other materials. For more information about recycling and collection centers, visit **www.oclandfills.com**.
- Store materials indoors or under cover and away from storm drains.
- Use a construction and demolition recycling company to recycle lumber, paper, cardboard, metals, masonry, carpet, plastic, pipes, drywall, rocks, dirt, and green waste. For a listing of construction and demolition recycling locations in your area, visit **www.ciwmb.ca.gov/recycle.**
- Properly label materials. Familiarize employees with Material Safety Data Sheets.

PROJECT Pollution PREVENTION

IC22. EATING AND DRINKING ESTABLISHMENTS

Best Management Practices (BMPs)

A BMP is a technique, measure or structural control that is used for a given set of conditions to improve the quality of the stormwater runoff in a cost effective manner[1]. The minimum required BMPs for this activity are outlined in the box to the right. Implementation of pollution prevention/good housekeeping measures may reduce or eliminate the need to implement other more costly or complicated procedures. Proper employee training is key to the success of BMP implementation.

MINIMUM BEST MANAGEMENT PRACTICES

Pollution Prevention/Good Housekeeping

- Use dry cleaning methods instead of water
- Clean equipment (floor mats, grease filters, grills, garbage cans, etc.) indoors or in a covered outdoor wash area that is plumbed to the sanitary sewer or in an area that will contain the wash water (Refer to fact sheet *IC24 Wastewater Disposal* for guidance on appropriate methods for disposal of wash water to the sanitary sewer).
- Recycle and/or properly dispose of grease and oil.
- Block the storm drain when hosing or steam/pressure washing outside dumpster areas, sidewalks, and common areas.

Stencil storm drains

Training

- Train employees on these BMPs, storm water discharge prohibitions, and wastewater discharge requirements.

The BMPs outlined in this fact sheet target the following pollutants:

Targeted Constituents	
Sediment	
Nutrients	x
Floatable Materials	x
Metals	
Bacteria	x
Oil & Grease	x
Organics & Toxicants	x
Pesticides	x
Oxygen Demanding	x

Provided below are specific procedures associated with each of the minimum BMPs along with procedures for additional BMPs that should be considered if this activity takes place at a facility located near a sensitive waterbody. In order to meet the requirements for medium and high priority facilities, the owners/operators must select, install and maintain appropriate BMPs on site. Since the selection of the appropriate BMPs is a site-specific process, the types and numbers of additional BMPs will vary for each facility.

1. Practice good housekeeping.
    - Conduct regular sweeping or vacuuming of outdoor areas: Dry sweep pavement areas including "drive-thru" areas, parking lots, sidewalks, outdoor eating areas and dumpster storage areas frequently.
    - Keep outside areas free of trash & debris.
    - Do not hose out dumpsters or fill them with liquid waste.
    - Regularly inspect, repair, and/or replace dumpsters.
2. Clean equipment (floor mats, grease filters, grills, garbage cans, etc.) indoors or in a covered outdoor wash area that is plumbed to the sanitary sewer.
    - Clean equipment in a mop sink if possible (never in a food preparation sink). If there is no mop sink, dedicate an indoor cleaning area where a drain is plumbed to the sanitary sewer.
    - Dispose mop water from cleaning floors in a mop sink, toilet or other drain that is plumbed to the sanitary sewer. Refer to fact sheet *IC24 Wastewater Disposal* for guidance on appropriate methods for disposal of wash water to the sanitary sewer.
    - Do not pour wash water outside or into a street, gutter, or storm drain.

[1] EPA " *Preliminary Data Summary of Urban Stormwater Best Management Practices"*

- Dispose of all wastewater containing oil and grease in a grease trap or interceptor.

3. Recycle and/or properly dispose of grease and oil. Collect and dispose of concentrated waste oil and grease and disposed of by a certified waste grease hauler. NEVER pour grease or oil into a sink, floor drain, storm drain or dumpster.
4. Block storm drain(s) when cleaning (hosing or steam/pressure washing) outside dumpster areas, sidewalks, and common areas with hot water, soap, or other cleaning agent. Collect water/waste and discharge to the sanitary sewer (with approval of the local sanitation district).

Training

1. Train employees on these BMPs, storm water discharge prohibitions, and wastewater discharge requirements.
2. Train employees on proper spill containment and cleanup.
    - Establish training that provides employees with the proper tools and knowledge to immediately begin cleaning up a spill.
    - Ensure that employees are familiar with the site's spill control plan and/or proper spill cleanup procedures.
    - Fact sheet IC17 discusses Spill Prevention and Control in detail.
3. Establish a regular training schedule, train all new employees, and conduct annual refresher training.
4. Use a training log or similar method to document training.

Stencil storm drains

Storm drain system signs act as highly visible source controls that are typically stenciled directly adjacent to storm drain inlets. Stencils should read "No Dumping Drains to Ocean".

References

California Storm Water Best Management Practice Handbook. Industrial and Commercial. 2003. www.cabmphandbooks.com

Carlsbad Jurisdictional Urban Runoff Management Plan. Best Management Practices for Restaurants. City of Carlsbad. February 2002. On-line: http://www.ci.carlsbad.ca.us/cserv/jurmp.html

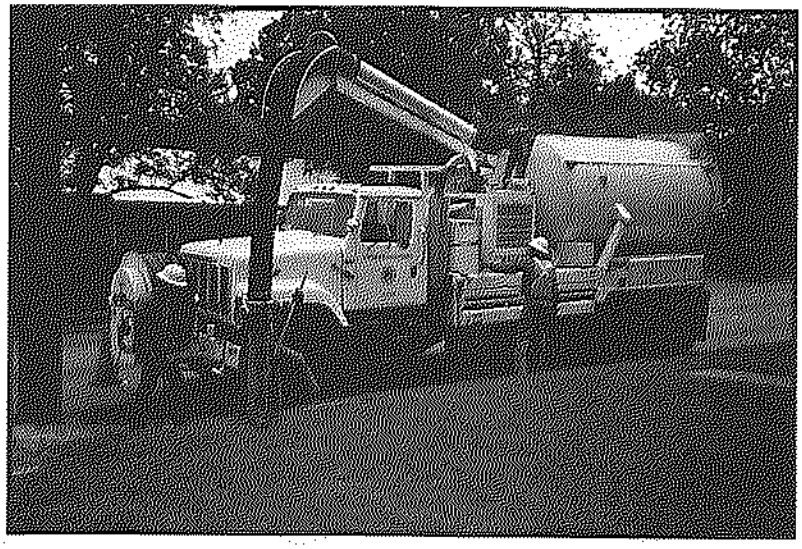
Orange County Stormwater Program. 2001. Water Quality Guidelines for Exterior Restaurant Cleaning Operations. Brochure. June.

Orange County Stormwater Program. Good Cleaning Practices Food & Restaurant Industry. Poster. Courtesy of the City and County of LA.

For additional information contact:

County of Orange/ OC Watersheds
Main: (714) 955-0600
24 hr Water Pollution Hotline: 1-877-89-SPILL
or visit our website at www.ocwatersheds.com

Drainage System Maintenance SC-44



Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize

Description

As a consequence of its function, the stormwater conveyance system collects and transports urban runoff and stormwater that may contain certain pollutants. The protocols in this fact sheet are intended to reduce pollutants reaching receiving waters through proper conveyance system operation and maintenance.

Targeted Constituents

Sediment	✓
Nutrients	
Trash	✓
Metals	
Bacteria	✓
Oil and Grease	
Organics	

Approach

Pollution Prevention

Maintain catch basins, stormwater inlets, and other stormwater conveyance structures on a regular basis to remove pollutants, reduce high pollutant concentrations during the first flush of storms, prevent clogging of the downstream conveyance system, restore catch basins' sediment trapping capacity, and ensure the system functions properly hydraulically to avoid flooding.

Suggested Protocols

Catch Basins/Inlet Structures

- Staff should regularly inspect facilities to ensure compliance with the following:
  - Immediate repair of any deterioration threatening structural integrity.
  - Cleaning before the sump is 40% full. Catch basins should be cleaned as frequently as needed to meet this standard.
  - Stenciling of catch basins and inlets (see SC34 Waste Handling and Disposal).

CASQA California Stormwater Quality Association

- Clean catch basins, storm drain inlets, and other conveyance structures before the wet season to remove sediments and debris accumulated during the summer.
- Conduct inspections more frequently during the wet season for problem areas where sediment or trash accumulates more often. Clean and repair as needed.
- Keep accurate logs of the number of catch basins cleaned.
- Store wastes collected from cleaning activities of the drainage system in appropriate containers or temporary storage sites in a manner that prevents discharge to the storm drain.
- Dewater the wastes if necessary with outflow into the sanitary sewer if permitted. Water should be treated with an appropriate filtering device prior to discharge to the sanitary sewer. If discharge to the sanitary sewer is not allowed, water should be pumped or vacuumed to a tank and properly disposed. Do not dewater near a storm drain or stream.

Storm Drain Conveyance System

- Locate reaches of storm drain with deposit problems and develop a flushing schedule that keeps the pipe clear of excessive buildup.
- Collect and pump flushed effluent to the sanitary sewer for treatment whenever possible.

Pump Stations

- Clean all storm drain pump stations prior to the wet season to remove silt and trash.
- Do not allow discharge to reach the storm drain system when cleaning a storm drain pump station or other facility.
- Conduct routine maintenance at each pump station.
- Inspect, clean, and repair as necessary all outlet structures prior to the wet season.

Open Channel

- Modify storm channel characteristics to improve channel hydraulics, increase pollutant removals, and enhance channel/creek aesthetic and habitat value.
- Conduct channel modification/improvement in accordance with existing laws. Any person, government agency, or public utility proposing an activity that will change the natural (emphasis added) state of any river, stream, or lake in California, must enter into a Steam or Lake Alteration Agreement with the Department of Fish and Game. The developer-applicant should also contact local governments (city, county, special districts), other state agencies (SWRCB, RWQCB, Department of Forestry, Department of Water Resources), and Federal Corps of Engineers and USFWS.

Illicit Connections and Discharges

- Look for evidence of illegal discharges or illicit connections during routine maintenance of conveyance system and drainage structures:
  - Is there evidence of spills such as paints, discoloring, etc?

- Are there any odors associated with the drainage system?
- Record locations of apparent illegal discharges/illicit connections?
- Track flows back to potential dischargers and conduct aboveground inspections. This can be done through visual inspection of upgradient manholes or alternate techniques including zinc chloride smoke testing, fluorometric dye testing, physical inspection testing, or television camera inspection.
- Eliminate the discharge once the origin of flow is established.

- Stencil or demarcate storm drains, where applicable, to prevent illegal disposal of pollutants. Storm drain inlets should have messages such as "Dump No Waste Drains to Stream" stenciled next to them to warn against ignorant or intentional dumping of pollutants into the storm drainage system.
- Refer to fact sheet SC-10 Non-Stormwater Discharges.

Illegal Dumping

- Inspect and clean up hot spots and other storm drainage areas regularly where illegal dumping and disposal occurs.
- Establish a system for tracking incidents. The system should be designed to identify the following:
  - Illegal dumping hot spots
  - Types and quantities (in some cases) of wastes
  - Patterns in time of occurrence (time of day/night, month, or year)
  - Mode of dumping (abandoned containers, "midnight dumping" from moving vehicles, direct dumping of materials, accidents/spills)
  - Responsible parties
- Post "No Dumping" signs in problem areas with a phone number for reporting dumping and disposal. Signs should also indicate fines and penalties for illegal dumping.
- Refer to fact sheet SC-10 Non-Stormwater Discharges.

Training

- Train crews in proper maintenance activities, including record keeping and disposal.
- Allow only properly trained individuals to handle hazardous materials/wastes.
- Have staff involved in detection and removal of illicit connections trained in the following:
  - OSHA-required Health and Safety Training (29 CFR 1910.120) plus annual refresher training (as needed).

- OSHA Confined Space Entry training (Cal-OSHA Confined Space, Title 8 and Federal OSHA 29 CFR 1910.146).
- Procedural training (field screening, sampling, smoke/dye testing, TV inspection).

Spill Response and Prevention

- Investigate all reports of spills, leaks, and/or illegal dumping promptly.
- Clean up all spills and leaks using "dry" methods (with absorbent materials and/or rags) or dig up, remove, and properly dispose of contaminated soil.
- Refer to fact sheet SC-11 Spill Prevention, Control, and Cleanup.

Other Considerations (Limitations and Regulations)

- Clean-up activities may create a slight disturbance for local aquatic species. Access to items and material on private property may be limited. Trade-offs may exist between channel hydraulics and water quality/riparian habitat. If storm channels or basins are recognized as wetlands, many activities, including maintenance, may be subject to regulation and permitting.
- Storm drain flushing is most effective in small diameter pipes (36-inch diameter pipe or less, depending on water supply and sediment collection capacity). Other considerations associated with storm drain flushing may include the availability of a water source, finding a downstream area to collect sediments, liquid/sediment disposal, and prohibition against disposal of flushed effluent to sanitary sewer in some areas.
- Regulations may include adoption of substantial penalties for illegal dumping and disposal.
- Local municipal codes may include sections prohibiting discharge of soil, debris, refuse, hazardous wastes, and other pollutants into the storm drain system.

Requirements

Costs

- An aggressive catch basin cleaning program could require a significant capital and O&M budget.
- The elimination of illegal dumping is dependent on the availability, convenience, and cost of alternative means of disposal. The primary cost is for staff time. Cost depends on how aggressively a program is implemented. Other cost considerations for an illegal dumping program include:
  - Purchase and installation of signs.
  - Rental of vehicle(s) to haul illegally-disposed items and material to landfills.
  - Rental of heavy equipment to remove larger items (e.g., car bodies) from channels.
  - Purchase of landfill space to dispose of illegally-dumped items and material.

- Methods used for illicit connection detection (smoke testing, dye testing, visual inspection, and flow monitoring) can be costly and time-consuming. Site-specific factors, such as the level of impervious area, the density and ages of buildings, and type of land use will determine the level of investigation necessary.

Maintenance

- Two-person teams may be required to clean catch basins with vactor trucks.
- Teams of at least two people plus administrative personnel are required to identify illicit discharges, depending on the complexity of the storm sewer system.
- Arrangements must be made for proper disposal of collected wastes.
- Technical staff are required to detect and investigate illegal dumping violations.

Supplemental Information

Further Detail of the BMP

Storm Drain Flushing

Flushing is a common maintenance activity used to improve pipe hydraulics and to remove pollutants in storm drainage systems. Flushing may be designed to hydraulically convey accumulated material to strategic locations, such as an open channel, another point where flushing will be initiated, or the sanitary sewer and the treatment facilities, thus preventing resuspension and overflow of a portion of the solids during storm events. Flushing prevents "plug flow" discharges of concentrated pollutant loadings and sediments. Deposits can hinder the designed conveyance capacity of the storm drain system and potentially cause backwater conditions in severe cases of clogging.

Storm drain flushing usually takes place along segments of pipe with grades that are too flat to maintain adequate velocity to keep particles in suspension. An upstream manhole is selected to place an inflatable device that temporarily plugs the pipe. Further upstream, water is pumped into the line to create a flushing wave. When the upstream reach of pipe is sufficiently full to cause a flushing wave, the inflated device is rapidly deflated with the assistance of a vacuum pump, thereby releasing the backed up water and resulting in the cleaning of the storm drain segment.

To further reduce impacts of stormwater pollution, a second inflatable device placed well downstream may be used to recollect the water after the force of the flushing wave has dissipated. A pump may then be used to transfer the water and accumulated material to the sanitary sewer for treatment. In some cases, an interceptor structure may be more practical or required to recollect the flushed waters.

It has been found that cleansing efficiency of periodic flush waves is dependent upon flush volume, flush discharge rate, sewer slope, sewer length, sewer flow rate, sewer diameter, and population density. As a rule of thumb, the length of line to be flushed should not exceed 700 feet. At this maximum recommended length, the percent removal efficiency ranges between 65-75% for organics and 55-65% for dry weather grit/inorganic material. The percent removal efficiency drops rapidly beyond that. Water is commonly supplied by a water truck, but fire hydrants can also supply water. To make the best use of water, it is recommended that reclaimed water be used or that fire hydrant line flushing coincide with storm sewer flushing.

References and Resources

California's Nonpoint Source Program Plan http://www.swrcb.ca.gov/nps/index.html

Clark County Storm Water Pollution Control Manual
http://www.co.clark.wa.us/pubworks/bmpman.pdf

Ferguson, B.K. 1991. Urban Stream Reclamation, p. 324-322, Journal of Soil and Water Conservation.

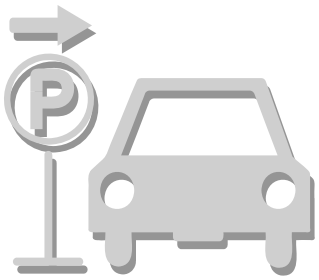
King County Storm Water Pollution Control Manual http://dnr.metrokc.gov/wlr/dss/spcm.htm

Oregon Association of Clean Water Agencies. Oregon Municipal Stormwater Toolbox for Maintenance Practices. June 1998.

Santa Clara Valley Urban Runoff Pollution Prevention Program http://www.scvurppp.org

The Storm Water Managers Resource Center http://www.stormwatercenter.net

United States Environmental Protection Agency (USEPA). 2002. Pollution Prevention/Good Housekeeping for Municipal Operations Storm Drain System Cleaning. On line:
http://www.epa.gov/npdes/menuofbmps/poll_16.htm



R-3
AUTOMOBILE PARKING

Parked automobiles may contribute pollutants to the storm drain because poorly maintained vehicles may leak fluids containing hydrocarbons, metals, and other pollutants. In addition, heavily soiled automobiles may drop clods of dirt onto the parking surface, contributing to the sediment load when runoff is present. During rain events, or wash-down activities, the pollutants may be carried into the storm drain system. The pollution prevention activities outlined in this fact sheets are used to prevent the discharge of pollutants to the storm drain system.

The activities outlined in this fact sheet target the following pollutants:	
Sediment	x
Nutrients	
Bacteria	
Foaming Agents	
Metals	X
Hydrocarbons	X
Hazardous Materials	x
Pesticides and Herbicides	
Other	

Think before parking your car. Remember - The ocean starts at your front door.

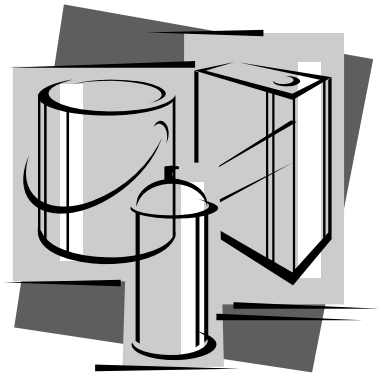
Required Activities

- If required, vehicles have to be removed from the street during designated street sweeping/cleaning times.
- If the automobile is leaking, place a pan or similar collection device under the automobile, until such time as the leak may be repaired.
- Use dry cleaning methods to remove any materials deposited by vehicles (e.g. adsorbents for fluid leaks, sweeping for soil clod deposits).

Recommended Activities

- Park automobiles over permeable surfaces (e.g. gravel, or porous cement).
- Limit vehicle parking to covered areas.
- Perform routine maintenance to minimize fluid leaks, and maximize fuel efficiency.

For additional information contact:
County of Orange, OC Watershed
Main: (714) 955-0600/ 24hr Water Pollution Discharge Hotline 1-877-89-SPILL
or visit our website at: www.ocwatersheds.com



R-7
HOUSEHOLD HAZARDOUS WASTE

Household hazardous wastes (HHW) are defined as waste materials which are typically found in homes or similar sources, which exhibit characteristics such as: corrosivity, ignitability, reactivity, and/or toxicity, or are listed as hazardous materials by EPA.

The activities outlined in this fact sheet target the following pollutants:	
Sediment	
Nutrients	
Bacteria	
Foaming Agents	x
Metals	x
Hydrocarbons	x
Hazardous Materials	x
Pesticides and Herbicides	x
Other	x

List of most common HHW products:
- Drain openers
- Oven cleaners
- Wood and metal cleaners and polishes
- Automotive oil and fuel additives
- Grease and rust solvents
- Carburetor and fuel injection cleaners
- Starter fluids
- Batteries
- Paint Thinners
- Paint strippers and removers
- Adhesives
- Herbicides
- Pesticides
- Fungicides/wood preservatives

Many types of waste can be recycled, however options for each waste type are limited. Recycling is always preferable to disposal of unwanted materials. All gasoline, antifreeze, waste oil, and lead-acid batteries can be recycled. Latex and oil-based paint can be reused, as well as recycled. Materials that cannot be reused or recycled should be disposed of at a properly permitted landfill.

Think before disposing of any household hazardous waste. Remember - The ocean starts at your front door.

RECYCLE USED OIL

Required Activities

- Dispose of HHW at a local collection facility. Call (714) 834-6752 for the household hazardous waste center closest to your area.
- Household hazardous materials must be stored indoors or under cover, and in closed and labeled containers.
- If safe, contain, clean up, and properly dispose all household hazardous waste spills. If an unsafe condition exists, call 911 to activate the proper response team.

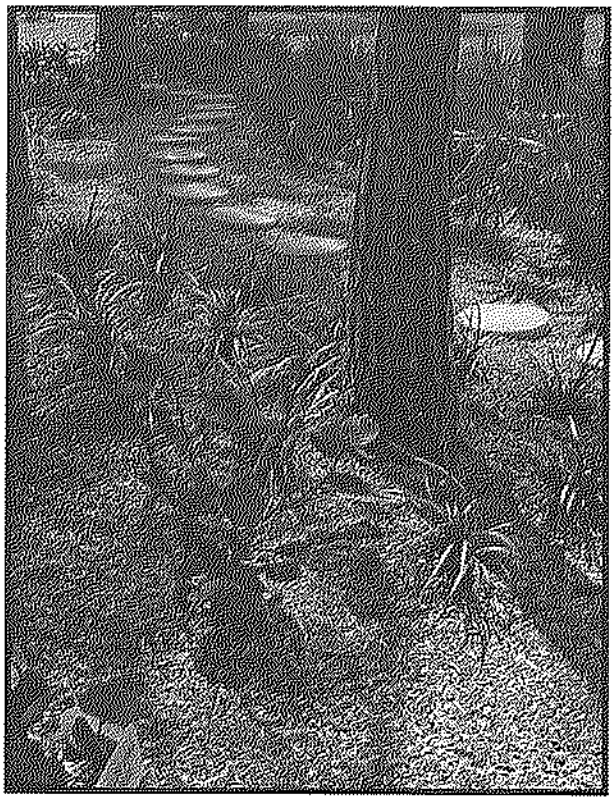
Recommended Activities

- Use non-hazardous or less-hazardous products.
- Participate in HHW reuse and recycling. Call (714) 834-6752 for the participating household hazardous waste centers.

The California Integrated Waste Management Board has a Recycling Hotline (800) 553-2962, that provides information and recycling locations for used oil.

For additional information contact:
County of Orange, OC Watershed
Main: (714) 955-0600/ 24hr Water Pollution Discharge Hotline 1-877-89-SPILL
or visit our website at: www.ocwatersheds.com

Site Design & Landscape Planning SD-10



Design Objectives

- ☑ Maximize Infiltration
- ☑ Provide Retention
- ☑ Slow Runoff
- ☑ Minimize Impervious Land Coverage
- Prohibit Dumping of Improper Materials
- Contain Pollutants
- Collect and Convey

Description

Each project site possesses unique topographic, hydrologic, and vegetative features, some of which are more suitable for development than others. Integrating and incorporating appropriate landscape planning methodologies into the project design is the most effective action that can be done to minimize surface and groundwater contamination from stormwater.

Approach

Landscape planning should couple consideration of land suitability for urban uses with consideration of community goals and projected growth. Project plan designs should conserve natural areas to the extent possible, maximize natural water storage and infiltration opportunities, and protect slopes and channels.

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment.

Design Considerations

Design requirements for site design and landscapes planning should conform to applicable standards and specifications of agencies with jurisdiction and be consistent with applicable General Plan and Local Area Plan policies.

Designing New Installations

Begin the development of a plan for the landscape unit with attention to the following general principles:

- Formulate the plan on the basis of clearly articulated community goals. Carefully identify conflicts and choices between retaining and protecting desired resources and community growth.
- Map and assess land suitability for urban uses. Include the following landscape features in the assessment: wooded land, open unwooded land, steep slopes, erosion-prone soils, foundation suitability, soil suitability for waste disposal, aquifers, aquifer recharge areas, wetlands, floodplains, surface waters, agricultural lands, and various categories of urban land use. When appropriate, the assessment can highlight outstanding local or regional resources that the community determines should be protected (e.g., a scenic area, recreational area, threatened species habitat, farmland, fish run). Mapping and assessment should recognize not only these resources but also additional areas needed for their sustenance.

Project plan designs should conserve natural areas to the extent possible, maximize natural water storage and infiltration opportunities, and protect slopes and channels.

Conserve Natural Areas during Landscape Planning

If applicable, the following items are required and must be implemented in the site layout during the subdivision design and approval process, consistent with applicable General Plan and Local Area Plan policies:

- Cluster development on least-sensitive portions of a site while leaving the remaining land in a natural undisturbed condition.
- Limit clearing and grading of native vegetation at a site to the minimum amount needed to build lots, allow access, and provide fire protection.
- Maximize trees and other vegetation at each site by planting additional vegetation, clustering tree areas, and promoting the use of native and/or drought tolerant plants.
- Promote natural vegetation by using parking lot islands and other landscaped areas.
- Preserve riparian areas and wetlands.

Maximize Natural Water Storage and Infiltration Opportunities Within the Landscape Unit

- Promote the conservation of forest cover. Building on land that is already deforested affects basin hydrology to a lesser extent than converting forested land. Loss of forest cover reduces interception storage, detention in the organic forest floor layer, and water losses by evapotranspiration, resulting in large peak runoff increases and either their negative effects or the expense of countering them with structural solutions.
- Maintain natural storage reservoirs and drainage corridors, including depressions, areas of permeable soils, swales, and intermittent streams. Develop and implement policies and

regulations to discourage the clearing, filling, and channelization of these features. Utilize them in drainage networks in preference to pipes, culverts, and engineered ditches.

- Evaluating infiltration opportunities by referring to the stormwater management manual for the jurisdiction and pay particular attention to the selection criteria for avoiding groundwater contamination, poor soils, and hydrogeological conditions that cause these facilities to fail. If necessary, locate developments with large amounts of impervious surfaces or a potential to produce relatively contaminated runoff away from groundwater recharge areas.

Protection of Slopes and Channels during Landscape Design

- Convey runoff safely from the tops of slopes.
- Avoid disturbing steep or unstable slopes.
- Avoid disturbing natural channels.
- Stabilize disturbed slopes as quickly as possible.
- Vegetate slopes with native or drought tolerant vegetation.
- Control and treat flows in landscaping and/or other controls prior to reaching existing natural drainage systems.
- Stabilize temporary and permanent channel crossings as quickly as possible, and ensure that increases in run-off velocity and frequency caused by the project do not erode the channel.
- Install energy dissipaters, such as riprap, at the outlets of new storm drains, culverts, conduits, or channels that enter unlined channels in accordance with applicable specifications to minimize erosion. Energy dissipaters shall be installed in such a way as to minimize impacts to receiving waters.
- Line on-site conveyance channels where appropriate, to reduce erosion caused by increased flow velocity due to increases in tributary impervious area. The first choice for linings should be grass or some other vegetative surface, since these materials not only reduce runoff velocities, but also provide water quality benefits from filtration and infiltration. If velocities in the channel are high enough to erode grass or other vegetative linings, riprap, concrete, soil cement, or geo-grid stabilization are other alternatives.
- Consider other design principles that are comparable and equally effective.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of " redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

Redevelopment may present significant opportunity to add features which had not previously been implemented. Examples include incorporation of depressions, areas of permeable soils, and swales in newly redeveloped areas. While some site constraints may exist due to the status of already existing infrastructure, opportunities should not be missed to maximize infiltration, slow runoff, reduce impervious areas, disconnect directly connected impervious areas.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

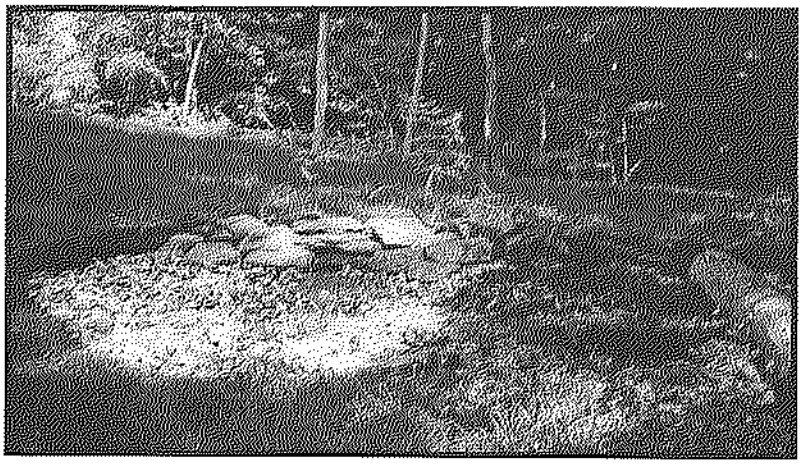
Stormwater Management Manual for Western Washington, Washington State Department of Ecology, August 2001.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Roof Runoff Controls SD-11



Rain Garden

Design Objectives

- ☑ Maximize Infiltration
- ☑ Provide Retention
- ☑ Slow Runoff
- Minimize Impervious Land Coverage
- Prohibit Dumping of Improper Materials
- ☑ Contain Pollutants
- Collect and Convey

Description

Various roof runoff controls are available to address stormwater that drains off rooftops. The objective is to reduce the total volume and rate of runoff from individual lots, and retain the pollutants on site that may be picked up from roofing materials and atmospheric deposition. Roof runoff controls consist of directing the roof runoff away from paved areas and mitigating flow to the storm drain system through one of several general approaches: cisterns or rain barrels; dry wells or infiltration trenches; pop-up emitters, and foundation planting. The first three approaches require the roof runoff to be contained in a gutter and downspout system. Foundation planting provides a vegetated strip under the drip line of the roof.

Approach

Design of individual lots for single-family homes as well as lots for higher density residential and commercial structures should consider site design provisions for containing and infiltrating roof runoff or directing roof runoff to vegetative swales or buffer areas. Retained water can be reused for watering gardens, lawns, and trees. Benefits to the environment include reduced demand for potable water used for irrigation, improved stormwater quality, increased groundwater recharge, decreased runoff volume and peak flows, and decreased flooding potential.

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment.

Design Considerations

Designing New Installations

Cisterns or Rain Barrels

One method of addressing roof runoff is to direct roof downspouts to cisterns or rain barrels. A cistern is an above ground storage vessel with either a manually operated valve or a permanently open outlet. Roof runoff is temporarily stored and then released for irrigation or infiltration between storms. The number of rain

barrels needed is a function of the rooftop area. Some low impact developers recommend that every house have at least 2 rain barrels, with a minimum storage capacity of 1000 liters. Roof barrels serve several purposes including mitigating the first flush from the roof which has a high volume, amount of contaminants, and thermal load. Several types of rain barrels are commercially available. Consideration must be given to selecting rain barrels that are vector proof and childproof. In addition, some barrels are designed with a bypass valve that filters out grit and other contaminants and routes overflow to a soak-away pit or rain garden.

If the cistern has an operable valve, the valve can be closed to store stormwater for irrigation or infiltration between storms. This system requires continual monitoring by the resident or grounds crews, but provides greater flexibility in water storage and metering. If a cistern is provided with an operable valve and water is stored inside for long periods, the cistern must be covered to prevent mosquitoes from breeding.

A cistern system with a permanently open outlet can also provide for metering stormwater runoff. If the cistern outlet is significantly smaller than the size of the downspout inlet (say ¼ to ½ inch diameter), runoff will build up inside the cistern during storms, and will empty out slowly after peak intensities subside. This is a feasible way to mitigate the peak flow increases caused by rooftop impervious land coverage, especially for the frequent, small storms.

Dry wells and Infiltration Trenches

Roof downspouts can be directed to dry wells or infiltration trenches. A dry well is constructed by excavating a hole in the ground and filling it with an open graded aggregate, and allowing the water to fill the dry well and infiltrate after the storm event. An underground connection from the downspout conveys water into the dry well, allowing it to be stored in the voids. To minimize sedimentation from lateral soil movement, the sides and top of the stone storage matrix can be wrapped in a permeable filter fabric, though the bottom may remain open. A perforated observation pipe can be inserted vertically into the dry well to allow for inspection and maintenance.

In practice, dry wells receiving runoff from single roof downspouts have been successful over long periods because they contain very little sediment. They must be sized according to the amount of rooftop runoff received, but are typically 4 to 5 feet square, and 2 to 3 feet deep, with a minimum of 1-foot soil cover over the top (maximum depth of 10 feet).

To protect the foundation, dry wells must be set away from the building at least 10 feet. They must be installed in solids that accommodate infiltration. In poorly drained soils, dry wells have very limited feasibility.

Infiltration trenches function in a similar manner and would be particularly effective for larger roof areas. An infiltration trench is a long, narrow, rock-filled trench with no outlet that receives stormwater runoff. These are described under Treatment Controls.

Pop-up Drainage Emitter

Roof downspouts can be directed to an underground pipe that daylights some distance from the building foundation, releasing the roof runoff through a pop-up emitter. Similar to a pop-up irrigation head, the emitter only opens when there is flow from the roof. The emitter remains flush to the ground during dry periods, for ease of lawn or landscape maintenance.

Foundation Planting

Landscape planting can be provided around the base to allow increased opportunities for stormwater infiltration and protect the soil from erosion caused by concentrated sheet flow coming off the roof. Foundation plantings can reduce the physical impact of water on the soil and provide a subsurface matrix of roots that encourage infiltration. These plantings must be sturdy enough to tolerate the heavy runoff sheet flows, and periodic soil saturation.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of " redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

Supplemental Information

Examples

- City of Ottawa's Water Links Surface –Water Quality Protection Program
- City of Toronto Downspout Disconnection Program
- City of Boston, MA, Rain Barrel Demonstration Program

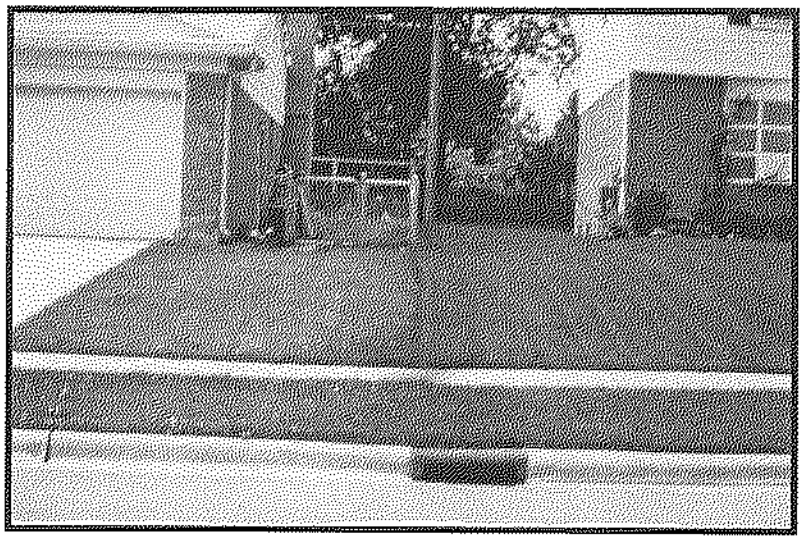
Other Resources

Hager, Marty Catherine, Stormwater, "Low-Impact Development", January/February 2003. www.stormh2o.com

Low Impact Urban Design Tools, Low Impact Development Design Center, Beltsville, MD. www.lid-stormwater.net

Start at the Source, Bay Area Stormwater Management Agencies Association, 1999 Edition

Efficient Irrigation SD-12



Design Objectives

- ☑ Maximize Infiltration
- ☑ Provide Retention
- ☑ Slow Runoff
- Minimize Impervious Land Coverage
- Prohibit Dumping of Improper Materials
- Contain Pollutants
- Collect and Convey

Description

Irrigation water provided to landscaped areas may result in excess irrigation water being conveyed into stormwater drainage systems.

Approach

Project plan designs for development and redevelopment should include application methods of irrigation water that minimize runoff of excess irrigation water into the stormwater conveyance system.

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment. (Detached residential single-family homes are typically excluded from this requirement.)

Design Considerations

Designing New Installations

The following methods to reduce excessive irrigation runoff should be considered, and incorporated and implemented where determined applicable and feasible by the Permittee:

- Employ rain-triggered shutoff devices to prevent irrigation after precipitation.
- Design irrigation systems to each landscape area's specific water requirements.
- Include design featuring flow reducers or shutoff valves triggered by a pressure drop to control water loss in the event of broken sprinkler heads or lines.
- Implement landscape plans consistent with County or City water conservation resolutions, which may include provision of water sensors, programmable irrigation times (for short cycles), etc.

- Design timing and application methods of irrigation water to minimize the runoff of excess irrigation water into the storm water drainage system.
- Group plants with similar water requirements in order to reduce excess irrigation runoff and promote surface filtration. Choose plants with low irrigation requirements (for example, native or drought tolerant species). Consider design features such as:
  - Using mulches (such as wood chips or bar) in planter areas without ground cover to minimize sediment in runoff
  - Installing appropriate plant materials for the location, in accordance with amount of sunlight and climate, and use native plant materials where possible and/or as recommended by the landscape architect
  - Leaving a vegetative barrier along the property boundary and interior watercourses, to act as a pollutant filter, where appropriate and feasible
  - Choosing plants that minimize or eliminate the use of fertilizer or pesticides to sustain growth
- Employ other comparable, equally effective methods to reduce irrigation water runoff.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of " redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

Other Resources

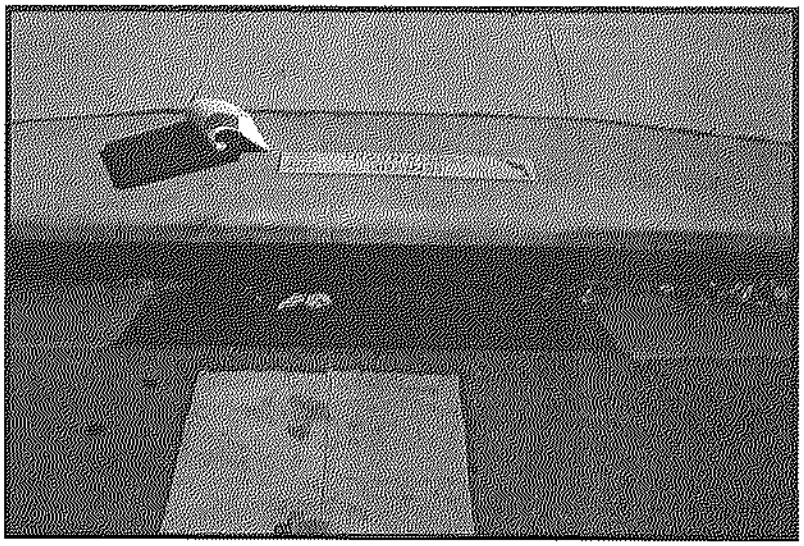
A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Storm Drain Signage SD-13



Design Objectives

- Maximize Infiltration
- Provide Retention
- Slow Runoff
- Minimize Impervious Land Coverage
- ☑ Prohibit Dumping of Improper Materials
- Contain Pollutants
- Collect and Convey

Description

Waste materials dumped into storm drain inlets can have severe impacts on receiving and ground waters. Posting notices regarding discharge prohibitions at storm drain inlets can prevent waste dumping. Storm drain signs and stencils are highly visible source controls that are typically placed directly adjacent to storm drain inlets.

Approach

The stencil or affixed sign contains a brief statement that prohibits dumping of improper materials into the urban runoff conveyance system. Storm drain messages have become a popular method of alerting the public about the effects of and the prohibitions against waste disposal.

Suitable Applications

Stencils and signs alert the public to the destination of pollutants discharged to the storm drain. Signs are appropriate in residential, commercial, and industrial areas, as well as any other area where contributions or dumping to storm drains is likely.

Design Considerations

Storm drain message markers or placards are recommended at all storm drain inlets within the boundary of a development project. The marker should be placed in clear sight facing toward anyone approaching the inlet from either side. All storm drain inlet locations should be identified on the development site map.

Designing New Installations

The following methods should be considered for inclusion in the project design and show on project plans:

- Provide stenciling or labeling of all storm drain inlets and catch basins, constructed or modified, within the project area with prohibitive language. Examples include "NO DUMPING

– DRAINS TO OCEAN" and/or other graphical icons to discourage illegal dumping.

- Post signs with prohibitive language and/or graphical icons, which prohibit illegal dumping at public access points along channels and creeks within the project area.

Note - Some local agencies have approved specific signage and/or storm drain message placards for use. Consult local agency stormwater staff to determine specific requirements for placard types and methods of application.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. If the project meets the definition of "redevelopment", then the requirements stated under " designing new installations" above should be included in all project design plans.

Additional Information

Maintenance Considerations

- Legibility of markers and signs should be maintained. If required by the agency with jurisdiction over the project, the owner/operator or homeowner's association should enter into a maintenance agreement with the agency or record a deed restriction upon the property title to maintain the legibility of placards or signs.

Placement

- Signage on top of curbs tends to weather and fade.

- Signage on face of curbs tends to be worn by contact with vehicle tires and sweeper brooms.

Supplemental Information

Examples

- Most MS4 programs have storm drain signage programs. Some MS4 programs will provide stencils, or arrange for volunteers to stencil storm drains as part of their outreach program.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Trash Storage Areas SD-32

Description

Trash storage areas are areas where a trash receptacle (s) are located for use as a repository for solid wastes. Stormwater runoff from areas where trash is stored or disposed of can be polluted. In addition, loose trash and debris can be easily transported by water or wind into nearby storm drain inlets, channels, and/or creeks. Waste handling operations that may be sources of stormwater pollution include dumpsters, litter control, and waste piles.

Approach

This fact sheet contains details on the specific measures required to prevent or reduce pollutants in stormwater runoff associated with trash storage and handling. Preventative measures including enclosures, containment structures, and impervious pavements to mitigate spills, should be used to reduce the likelihood of contamination.

Design Objectives

- Maximize Infiltration
- Provide Retention
- Slow Runoff
- Minimize Impervious Land Coverage
- Prohibit Dumping of Improper Materials
- ☑ Contain Pollutants
- Collect and Convey

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment. (Detached residential single-family homes are typically excluded from this requirement.)

Design Considerations

Design requirements for waste handling areas are governed by Building and Fire Codes, and by current local agency ordinances and zoning requirements. The design criteria described in this fact sheet are meant to enhance and be consistent with these code and ordinance requirements. Hazardous waste should be handled in accordance with legal requirements established in Title 22, California Code of Regulation.

Wastes from commercial and industrial sites are typically hauled by either public or commercial carriers that may have design or access requirements for waste storage areas. The design criteria in this fact sheet are recommendations and are not intended to be in conflict with requirements established by the waste hauler. The waste hauler should be contacted prior to the design of your site trash collection areas. Conflicts or issues should be discussed with the local agency.

Designing New Installations

Trash storage areas should be designed to consider the following structural or treatment control BMPs:

- Design trash container areas so that drainage from adjoining roofs and pavement is diverted around the area(s) to avoid run-on. This might include berming or grading the waste handling area to prevent run-on of stormwater.
- Make sure trash container areas are screened or walled to prevent off-site transport of trash.

- Use lined bins or dumpsters to reduce leaking of liquid waste.
- Provide roofs, awnings, or attached lids on all trash containers to minimize direct precipitation and prevent rainfall from entering containers.
- Pave trash storage areas with an impervious surface to mitigate spills.
- Do not locate storm drains in immediate vicinity of the trash storage area.
- Post signs on all dumpsters informing users that hazardous materials are not to be disposed of therein.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of " redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

Additional Information

Maintenance Considerations

The integrity of structural elements that are subject to damage (i.e., screens, covers, and signs) must be maintained by the owner/operator. Maintenance agreements between the local agency and the owner/operator may be required. Some agencies will require maintenance deed restrictions to be recorded of the property title. If required by the local agency, maintenance agreements or deed restrictions must be executed by the owner/operator before improvement plans are approved.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

APPENDIX D

BMP MAINTENANCE SUPPLEMENT / O&M PLAN

OPERATIONS AND MAINTENANCE (O&M) PLAN

Water Quality Management Plan

For

Newport Crossings

4251 Martingale Way, Newport Beach, 92660

APN 427-172-02, 427-172-03, 427-172-05, 427-172-06

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BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX			
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			
Yes	**N1. Education for Property Owners, Tenants and Occupants** Educational materials will be provided to tenants, including brochures and restrictions to reduce pollutants from reaching the storm drain system. Examples include tips for pet care, household tips, and proper household hazardous waste disposal. Tenants will be provided with these materials by the property management prior to occupancy, and periodically thereafter.	Educational materials will be provided to tenants annually. Materials to be distributed are found in Appendix B. Tenants will be provided these materials by the Owner prior to occupancy and periodically thereafter. Frequency: Annually	Starboard Realty Partners, LLC, City of Newport Beach
Yes	**N2. Activity Restrictions** The Owner shall develop ongoing activity restrictions that include those that have the potential to create adverse impacts on water quality. Activities include, but are not limited to: handling and disposal of contaminants, fertilizer and pesticide application restrictions, litter control and pick-up, as well as any other activities that may potentially contribute to water pollution.	The Owner will prescribe activity restrictions to protect surface water quality, through lease terms or other equally effective measure, for the property. Restrictions include, but are not limited to, prohibiting vehicle maintenance or vehicle washing. Frequency: Ongoing	Starboard Realty Partners, LLC, City of Newport Beach

BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX			
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**
Yes	**N3. Common Area Landscape Management** Management programs will be designed and implemented by the Owner to maintain all the common areas within the project site. These programs will cover how to reduce the potential pollutant sources of fertilizer and pesticide uses, utilization of water-efficient landscaping practices and proper disposal of landscape wastes by the owner/developer and/or contractors.	Maintenance shall be consistent with City requirements. Fertilizer and/or pesticide usage shall be consistent with County Management Guidelines for Use of Fertilizers (OC DAMP Section 5.5) as well as local requirements. Maintenance includes mowing, weeding, and debris removal on a weekly basis. Trimming, replanting, and replacement of mulch shall be performed on an as-needed basis to prevent exposure of erodible surfaces. Trimmings, clippings, and other landscape wastes shall be properly disposed of in accordance with local regulations. Materials temporarily stockpiled during maintenance activities shall be placed away from water courses and storm drain inlets. Frequency: Monthly	Starboard Realty Partners, LLC, City of Newport Beach
Yes	**N4. BMP Maintenance** The Owner will be responsible for the implementation and maintenance of each applicable non-structural BMP, as well as scheduling inspections and maintenance of all applicable structural BMP facilities through its staff, landscape contractor, and/or any other necessary maintenance contractors.	Maintenance of structural BMPs implemented at the project site shall be performed at the frequency prescribed in this WQMP (Appendix D). Records of inspections and BMP maintenance shall be kept by the Owner and shall be available for review upon request. Frequency: Ongoing	Starboard Realty Partners, LLC, City of Newport Beach

BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX			
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**
Yes	**N11. Common Area Litter Control** The Owner will be responsible for performing trash pickup and sweeping of littered common areas on a weekly basis or whenever necessary. Responsibilities will also include noting improper disposal materials by the public and reporting such violations for investigation.	Litter patrol, violations investigations, reporting and other litter control activities shall be performed on a weekly basis and in conjunction with routine maintenance activities. Frequency: Weekly	Starboard Realty Partners, LLC, City of Newport Beach
Yes	**N12. Employee Training** All employees of the Owner and any contractors will require training to ensure that employees are aware of maintenance activities that may result in pollutants reaching the storm drain. Training will include, but not be limited to, spill cleanup procedures, proper waste disposal, housekeeping practices, etc.	Educate all new employees/ managers on storm water pollution prevention, particularly good housekeeping practices, prior to the start of the rainy season (October 1). Refresher courses shall be conducted on an as needed basis. Frequency: Annually	Starboard Realty Partners, LLC, City of Newport Beach
Yes	**N14. Common Area Catch Basin Inspection** All on-site catch basin inlets and drainage facilities shall be inspected and maintained by the Owner at least once a year, prior to the rainy season, no later than October 1st of each year.	Maintenance of structural BMPs implemented at the project site shall be performed at the frequency prescribed in this WQMP (Appendix D). Records of inspections and BMP maintenance shall be kept by the Owner and shall be available for review upon request. Frequency: Ongoing	Starboard Realty Partners, LLC, City of Newport Beach

BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX			
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**
Yes	**N15. Street Sweeping Private Streets and Parking Lots** The Owner shall be responsible for sweeping all on-site uncovered parking places within the project on a quarterly basis. The surrounding streets will be maintained and cleaned by the respective public ownership.	Drive aisles & any exposed parking areas must be swept at least weekly, including prior to the start of the rainy season (October 1). Frequency: Weekly	Starboard Realty Partners, LLC, City of Newport Beach
STRUCTURAL SOURCE CONTROL BMPs			
Yes	**S1. Provide storm drain system stenciling and signage** The phrase "NO DUMPING! DRAINS TO OCEAN", or an equally effective phrase approved by the City, will be stenciled on all major storm drain inlets within the project site to alert the public to the destination of pollutants discharged into storm water. Stencils shall be in place prior to release of certificate of occupancy.	Storm drain stencils shall be inspected for legibility, at minimum, once prior to the storm season, no later than October 1 each year. Those determined to be illegible will be re-stenciled as soon as possible. Frequency: Annually	Starboard Realty Partners, LLC, City of Newport Beach

BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX			
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**
Yes	**S3. Design and construct trash and waste storage areas to reduce pollution introduction** All trash and waste shall be stored in containers that have lids or tarps to minimize direct precipitation into the containers. Two trash enclosures will be located along the easterly property boundary adjacent to the existing public alleyway. The trash storage areas will be designed to City standards, and will be walled, roofed, have gates and proper drainage per City standards.	Sweep trash area at least once per week and before October 1st each year. Maintain area clean of trash and debris at all times. Frequency: Weekly	Starboard Realty Partners, LLC
Yes	**S4. Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control** The Owner will be responsible for the installation and maintenance of all common landscape areas utilizing similar planting materials with similar water requirements to reduce excess irrigation runoff. The Owner will be responsible for implementing all efficient irrigation systems for common area landscaping including, but not limited to, provisions for water sensors and programmable irrigation cycles. This includes smart timers, rain sensors, and moisture shut-off valves. The irrigation systems shall be in conformance with water efficiency guidelines.	Inspect, test and adjust irrigation system to eliminate overspray to hardscape areas, ensure timing and cycle lengths are correct. Frequency: Ongoing	Starboard Realty Partners, LLC, City of Newport Beach

BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX			
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
Yes	S13. Wash water control for food preparation areas Educational and training measures will be employed to generate proper washing practices in commercial kitchens so as to avoid unnecessary and excess discharges of biological as well as phosphate and surfactant contaminants.	Follow appropriate practices to ensure wash water from food preparation areas does not enter into the storm drain. Frequency: Ongoing	Starboard Realty Partners, LLC

BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX		
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		
BIO-7: Modular Wetland System	The Modular Wetland units shall be maintained in accordance with manufacturer's specifications. The system shall be inspected at a minimum of once every six months, prior to the start of the rainy season (October 1) each year, and after major storm events. Typical maintenance includes: ▪ Removing trash & debris from the catch basin screening filter (by hand). ▪ Removal of sediment and solids in the settlement chamber (vacuum truck). ▪ Replacement of the BioMediaGREEN™ filter cartridge and drain-down filter (if equipped) ▪ Trim plants within the wetland chamber as needed in conjunction with routine landscape maintenance activities. No fertilizer shall be used. Wetland chamber should be inspected during rain events to verify flow through the system. If little to no flow is observed from the lower valve or orifice plate, the wetland media may require replacement. Frequency: 2x per year	Starboard Realty Partners, LLC, City of Newport Beach

Required Permits

Permits are not required for the implementation, operation, and maintenance of the BMPs.

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.

Waste Management

Any waste generated from maintenance activities will be disposed of properly. Wash water and other waste from maintenance activities is not to be discharged or disposed of into the storm drain system. Clippings from landscape maintenance (i.e. prunings) will be collected and disposed of properly off-site, and will not be washed into the streets, local area drains/conveyances, or catch basin inlets.

RECORD OF BMP IMPLEMENTATION, MAINTENANCE, AND INSPECTION

Today's Date: _____

Name of Person Performing Activity (Printed): _____

Signature: _____

BMP Name (As Shown in O&M Plan)	Brief Description of Implementation, Maintenance, and Inspection Activity Performed

RECORD OF BMP IMPLEMENTATION, MAINTENANCE, AND INSPECTION

Today's Date: _____

Name of Person Performing Activity (Printed): _____

Signature: _____

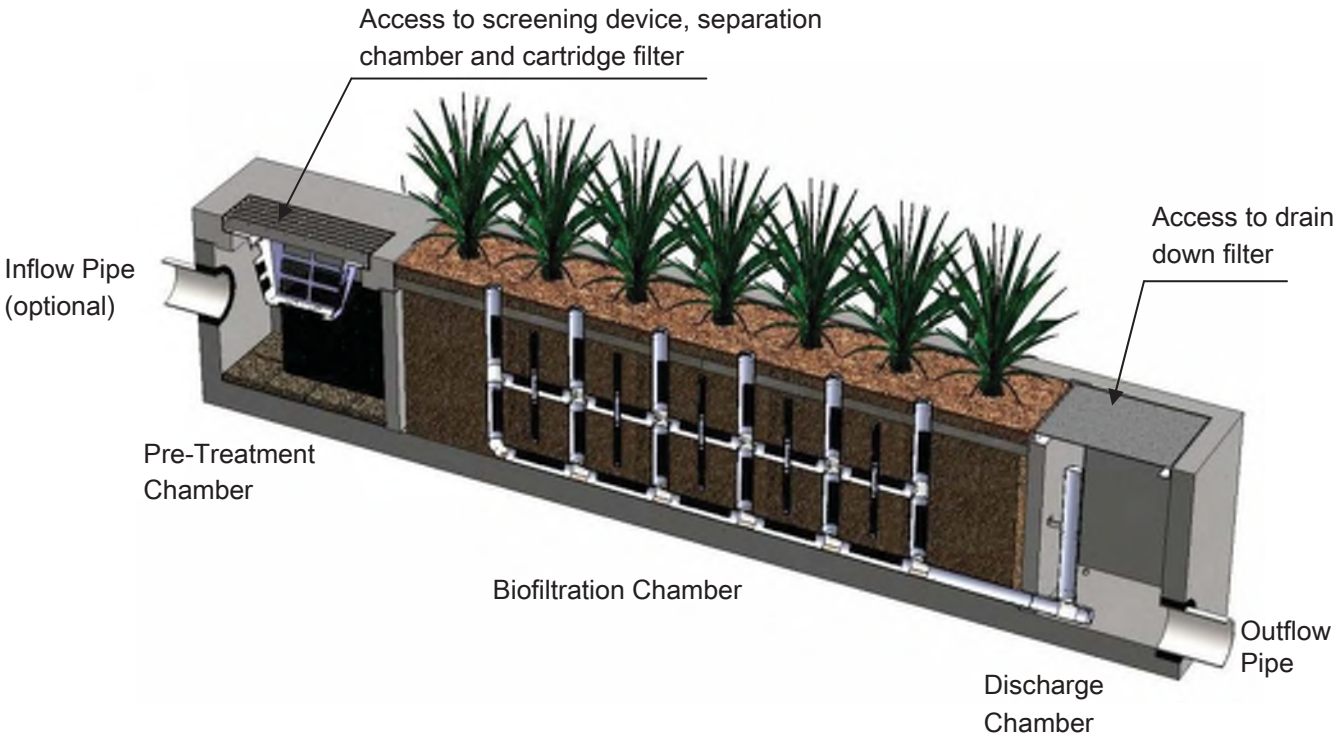
BMP Name (As Shown in O&M Plan)	Brief Description of Implementation, Maintenance, and Inspection Activity Performed

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.

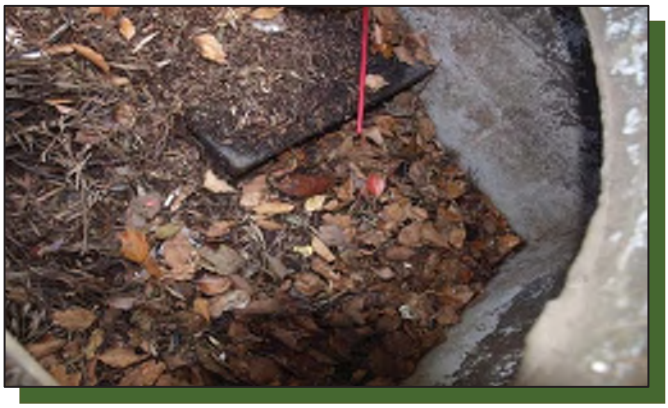
Maintenance Procedure Illustration

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.

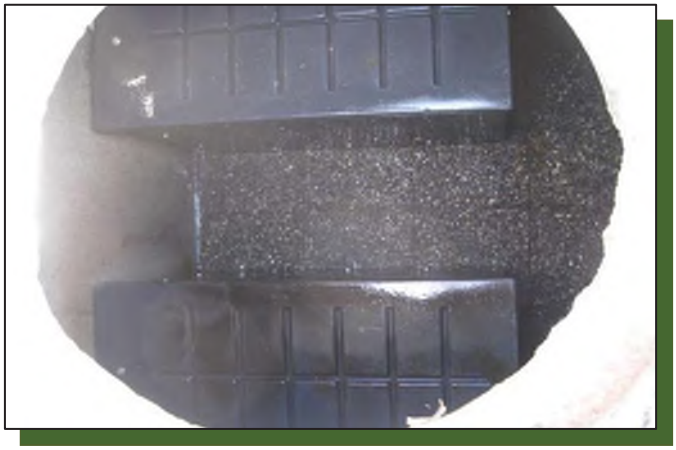
Separation Chamber

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 _____

Project Address _____
(city) (Zip Code)

Owner / Management Company _____

Contact _____ Phone ( ) –

Inspector Name _____ Date ___/___/___ Time _____ AM / PM

For Office Use Only
(Reviewed By)
(Date)
Office personnel to complete section to the left.

Type of Inspection ☐ Routine ☐ Follow Up ☐ Complaint ☐ Storm Storm Event in Last 72-hours? ☐ No ☐ 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: _____

2972 San Luis Rey Road, Oceanside, CA 92058 P (760) 433-7640 F (760) 433-3176

Maintenance Report

Modular Wetland System, Inc.
P. 760.433-7640
F. 760-433-3176
E. Info@modularwetlands.com

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: Long:	MWS Catch Basins						
		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:

2972 San Luis Rey Road, Oceanside, CA 92058 P. 760.433.7640 F. 760.433.3176

APPENDIX E

CONDITIONS OF APPROVAL

APPENDIX F

INFILTRATION TEST RESULTS

GEOTECHNICAL INVESTIGATION

PROPOSED MIXED-USE MULTI-FAMILY RESIDENTIAL DEVELOPMENT 5.6 ACRE AREA BOUNDED BY DOVE STREET, SCOTT DRIVE, CORINTHIAN WAY, AND MARTINGALE WAY NEWPORT BEACH, CALIFORNIA

GEOCON
WEST, INC.
GEOTECHNICAL
ENVIRONMENTAL
MATERIALS

PREPARED FOR

MACARTHUR SQUARE
A CALIFORNIA GENERAL PARTNERSHIP
IRVINE, CALIFORNIA

PROJECT NO. A9138-06-01

JUNE 12, 2014

Project No. A9138-06-01
June 12, 2014

MacArthur Square, a California General Partnership
17631 Fitch
Irvine, CA 92614

Attention: Mr. Lester C. Smull

Subject: GEOTECHNICAL INVESTIGATION
PROPOSED MIXED-USE MULTI-FAMILY RESIDENTIAL DEVELOPMENT
5.6 ACRE AREA BOUNDED BY DOVE STREET, SCOTT DRIVE,
CORINTHIAN WAY AND MARTINGALE WAY
NEWPORT BEACH, CALIFORNIA

Dear Mr. Smull:

In accordance with your authorization of our proposal dated February 24, 2014, we have prepared this geotechnical investigation report for the proposed mixed-use, multi-family residential development to be located at the 5.6 acre area bounded by Dove Street, Scott Drive, Corinthian Way, and Martingale Way in Newport Beach, California. The accompanying report presents the findings of our study, and our conclusions and recommendations pertaining to the geotechnical aspects of proposed design and construction. Based on the results of our investigation, it is our opinion that the site can be developed as proposed provided the recommendations in this report are followed and implemented during design and construction. If you have any questions regarding this report, or if we may be of further service, please contact the undersigned.

Very truly yours,

GEOCON WEST, INC.

Petrina Zen
Staff Engineer

Susan Kirkgard
CEG 1754

Jelisa M. Thomas
PE 74946

(4+EMAIL) Addressee

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

GEOTECHNICAL INVESTIGATION

1. PURPOSE AND SCOPE

This report presents the results of a geotechnical investigation for the proposed mixed-use, multi-family residential development located at the 5.6 acre area bounded by Dove Street, Scott Drive, Corinthian Way, and Martingale Way in Newport Beach, California (Vicinity Map, Figure 1). The purpose of this investigation was to evaluate the subsurface soil and geologic conditions underlying the property and, based on conditions encountered, to provide conclusions and recommendations pertaining to the geotechnical aspects of proposed design and construction.

The scope of this investigation included a site reconnaissance, field exploration, laboratory testing, engineering analysis, and the preparation of this report. The site was explored on May 15, 2014 by drilling four 8-inch diameter borings utilizing a truck-mounted hollow-stem auger drilling machine and advancing two cone penetrometer tests (CPTs). The borings were drilled to depths between 10½ and 30½ feet below the existing ground surface. The CPTs were advanced to depths of 50½ feet below existing ground surface. The approximate locations of the exploratory borings and CPTs are depicted on the Site Plan (Figure 2). A detailed discussion of the field investigation, including boring logs and CPT logs, is presented in Appendix A.

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

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

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

2. SITE CONDITIONS & PROJECT DESCRIPTION

The subject property is an approximately 5.6 acre parcel located in Newport Beach, California (see Vicinity Map, Figure 1). The property is bounded by Corinthian Way to the north, by Martingale Way to the east, by Scott Drive and Dove Street to the west, and by a multi-story commercial structure and paved parking to the south. The property is currently occupied by on-grade single-story commercial structures and paved parking. The site slopes gently to the west with approximately 3 feet of vertical relief and no pronounced highs or lows. Surface water drainage at the site appears to be by sheet flow along the ground surface to area drains and the city streets. Vegetation on site consists of bushes, plants, grass, and trees located in isolated planter areas.

Information concerning the proposed project was furnished by the client. It is our understanding that the proposed development will consist of four three- to four-story mixed-use, multi-family residential structures underlain by one- to two-levels of parking. The parking levels will extend horizontally throughout the entire footprint of these proposed structures. The finished floor elevation of the subterranean parking is anticipated to be approximately 5 feet the existing ground surface at the west side of the site, near the intersection of Dove Street and Scott Road; and is anticipated to be approximately 8½ feet below the existing ground surface at the east side of the site, along Martingale Way. In addition, a two-story on-grade structure is proposed at the west corner of the site. The proposed site development is depicted on the Site Plan (see Figure 2).

Due to the preliminary nature of the design at this time, wall and column loads were not made available. It is estimated that column loads for the proposed structures will be up to 600 kips and wall loads will be up to 6 kips per linear foot.

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

3. GEOLOGIC SETTING

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

4. SOIL AND GEOLOGIC CONDITIONS

Based on our field investigation and published geologic maps, the site is underlain by artificial fill over Pleistocene age marine terrace deposits approximately 100 feet thick (Sprotte et al., 1980). These marine terrace deposits are composed mainly of silt, with some sand and clay (Sprotte et al., 1980; California Division of Mines and Geology, 1981). Detailed stratigraphic profiles are provided on the boring logs in Appendix A.

4.1 Artificial Fill

Artificial fill were encountered to a maximum depth of 4 feet in boring B1. The artificial fill generally consists of olive brown to dark reddish brown clayey sand, silty sand, and sandy silt. The artificial fill is characterized as slightly moist and medium dense or firm, with varying amounts of trace fine gravel. Deeper fill may occur between borings and on other parts of the site that were not directly explored.

4.2 Marine Terrace Deposits

The artificial fill is underlain by Pleistocene age marine terrace deposits which generally consist of yellowish brown to olive brown silty sand to sandy silt, silt and clay. The terrace deposits are predominantly slightly moist to moist and firm to stiff or loose to medium dense.

5. GROUNDWATER

The historically highest groundwater level in the area is reported to be at a depth of approximately 10 feet beneath the existing ground surface (California Division of Mines and Geology, 2001). Groundwater information presented in this document is generated from data collected in the early 1900's to the late 1990s.

Groundwater was encountered in boring B1 at a depth of 30 feet below the existing ground surface. Based on the depth of groundwater encountered in our borings, groundwater is not expected to be encountered during construction.

Based on current groundwater basin management practices, it is unlikely that groundwater levels will ever exceed the historic high levels. However, it is not uncommon for groundwater levels to vary seasonally or for groundwater seepage conditions to develop where none previously existed, especially in impermeable fine-grained soils which are heavily irrigated or after seasonal rainfall. In addition, recent requirements for stormwater infiltration could result in shallower seepage conditions in the immediate site vicinity. Proper surface drainage of irrigation and precipitation will be critical for future performance of the project. Recommendations for drainage are provided in the S*urface Drainage* section of this report (see Section 7.24).

6. GEOLOGIC HAZARDS

6.1 Surface Fault Rupture

The numerous faults in Southern California include active, potentially active, and inactive faults. The criteria for these major groups are based on criteria developed by the California Geological Survey (formerly known as California Division of Mines and Geology [CDMG]) for the Alquist-Priolo Earthquake Fault Zone Program (Bryant and Hart, 2007). By definition, an active fault is one that has had surface displacement within Holocene time (about the last 11,000 years). A potentially active fault has demonstrated surface displacement during Quaternary time (approximately the last 1.6 million years), but has had no known Holocene movement. Faults that have not moved in the last 1.6 million years are considered inactive.

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

The closest surface trace of an active fault to the site is the Newport-Inglewood Fault Zone located approximately 6.5 miles to the south-southwest (Ziony and Jones, 1989). Other nearby active faults are the Palos Verdes Fault Zone (offshore segment), the Whittier Fault, and the Elsinore Fault located approximately 16 miles southwest, 16½ miles north-northeast, and 17 miles northeast of the site, respectively (Ziony and Jones, 1989). The active San Andreas Fault Zone is located approximately 46 miles northeast of the site (Ziony and Jones, 1989).

The closest potentially active fault to the site is the Pelican Hill Fault located approximately 2.3 miles to the south-southwest (Ziony and Jones, 1989). Other nearby potentially active faults are the El Modeno Fault, Peralta Hills Fault, and the Los Alamitos Fault located approximately 11 miles north, 11 miles north-northeast, and 14½ miles northwest, respectively (Ziony and Jones, 1989).

The site is located within the vertical projection of the San Joaquin Hills Blind Thrust Fault. The San Joaquin Hills Blind Thrust Fault is a deep thrust fault underlying the San Joaquin Hills at the southern portion of the Orange County coastal plain. The San Joaquin Hills Blind Thrust Fault extends to within 2 km of the surface east of the San Joaquin Hills, dips between 20° and 30° to the west underneath the San Joaquin Hills, and extends to the base of the seismogenic crust at 17 km along the coast (Grant, et. al., 1999). Deformation related to an earthquake event originating along this blind thrust fault is limited to compressional folding at depth and do not present a potential surface fault rupture hazard. However, these active features are capable of generating future earthquakes.

6.2 Seismicity

As with all of Southern California, the site has experienced historic earthquakes from various regional faults. The seismicity of the region surrounding the site was formulated based on research of an electronic database of earthquake data. The epicenters of recorded earthquakes with magnitudes equal to or greater than 4.0 within a radius of 60 miles of the site are depicted on Figure 4 (Regional Seismicity Map). A partial list of earthquakes of moderate to major magnitude that have occurred in the Southern California area within the last 100 years is included in the following table.

LIST OF HISTORIC EARTHQUAKES

Earthquake (Oldest to Youngest)	Date of Earthquake	Magnitude	Distance to Epicenter (Miles)	Direction to Epicenter
San Jacinto-Hemet area	April 21, 1918	6.8	50	E
Near Redlands	July 23, 1923	6.3	42	ENE
Long Beach	March 10, 1933	6.4	7	SSW
Tehachapi	July 21, 1952	7.5	113	NW
San Fernando	February 9, 1971	6.6	60	NW
Whittier Narrows	October 1, 1987	5.9	30	NNW
Sierra Madre	June 28, 1991	5.8	42	N
Landers	June 28, 1992	7.3	90	NE
Big Bear	June 28, 1992	6.4	70	NE
Northridge	January 17, 1994	6.7	54	NW

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

6.3 Estimation of Peak Ground Accelerations

The seismic exposure of the site may be investigated in two ways. The deterministic approach recognizes the Maximum Earthquake, which is the theoretical maximum event that could occur along a fault. The deterministic method assigns a maximum earthquake to a fault derived from formulas that correlate the length and other characteristics of the fault trace to the theoretical maximum magnitude earthquake. The probabilistic method considers the probability of exceedance of various levels of ground motion and is calculated by consideration of risk contributions from regional faults.

6.3.1 Deterministic Analysis

Table 1 provides a list of known faults within a 60 mile radius of the site. The maximum earthquake magnitude is indicated for each fault. In order to measure the distance of known faults to the site, the computer program *EQFAULT*, (Blake, 2000), was utilized.

Principal references used within *EQFAULT* in selecting faults to be included are Jennings (1994), Anderson (1984) and Wesnousky (1986). For this investigation, the ground motion generated by maximum earthquakes on each of the faults is assumed to attenuate to the site per the attenuation relation by Sadigh et al. (1997) modeling the soil underlying the site as Site Class "D". The Site Class determination is based on the discussion in Section 1613.3.2 of the 2013 CBC and Table 20.3-1 of ASCE 7-10. The resulting calculated peak horizontal accelerations at the site are indicated on Table 1. These values are one standard deviation above the mean.

Using this methodology, the maximum earthquake resulting in the highest peak horizontal accelerations at the site would be a magnitude 6.6 event on the San Joaquin Hills Blind Thrust. Such an event would be expected to generate peak horizontal accelerations at the site of 0.934g.

While listing of peak accelerations is useful for comparison of potential effects of fault activity in a region, other considerations are important in seismic design, including the frequency and duration of motion and the soil conditions underlying the site.

The site could be subjected to moderate to severe ground shaking in the event of a major earthquake on any of the faults referenced above or other faults in Southern California. With respect to seismic shaking, the site is considered comparable to the surrounding developed area.

6.3.2 Probabilistic Analysis

The computer program *FRISKSP* (Blake, 2000) was used to perform a site-specific probabilistic seismic hazard analysis. The program is a modified version of FRISK (McGuire, 1978) that models faults as lines to evaluate site-specific probabilities of exceedance for given horizontal accelerations for each line source. Geologic parameters not included in the deterministic analysis are included in this analysis. The program operates under the assumption that the occurrence rate of earthquakes on each mapped Quaternary fault is proportional to the faults' slip rate. The program accounts for fault rupture length as a function of earthquake magnitude, and site acceleration estimates are made using the earthquake magnitude and closest distance from the site to the rupture zone.

Uncertainty in each of following are accounted for: (1) earthquake magnitude, (2) rupture length for a given magnitude, (3) location of the rupture zone, (4) maximum magnitude of a given earthquake, and (5) acceleration at the site from a given earthquake along each fault. After calculating the expected accelerations from all earthquake sources, the program then calculates the total average annual expected number of occurrences of the site acceleration greater than a specified value. Attenuation relationships suggested by Sadigh et al. (1997) were utilized in the analysis.

The Maximum Considered Earthquake (MCE) Ground Motion is the level of ground motion that has a 2 percent chance of exceedance in 50 years, with a statistical return period of 2,500 years. According to the 2013 California Building Code and ASCE 7-10, the MCE is to be utilized for the design of critical structures such as schools and hospitals. The Design Earthquake (DE) Ground Motion is the level of ground motion that has a 10 percent chance of exceedance in 50 years, with a statistical return period of 475 years. The DE is typically used for the design of non-critical structures.

Based on the computer program *FRISKSP* (Blake, 2000), the MCE and DE is expected to generate ground motions at the site of approximately 0.65g and 0.34g, respectively. Graphical representation of the analysis is presented on Figure 5 (Probability of Exceedance).

6.4 Seismic Design Criteria

The following table summarizes summarizes site-specific design criteria obtained from the 2013 California Building Code (CBC; Based on the 2012 International Building Code [IBC] and ASCE 7-10), Chapter 16 Structural Design, Section 1613 Earthquake Loads. The data was calculated using the computer program *U.S. Seismic Design Maps*, provided by the USGS. The short spectral response uses a period of 0.2 second. The values presented below are for the risk-targeted maximum considered earthquake (MCE_R).

2013 CBC SEISMIC DESIGN PARAMETERS

Parameter	Value	2013 CBC Reference
Site Class	D	Table 1613.3.2
MCE_R Ground Motion Spectral Response Acceleration – Class B (short), S_S	1.582g	Figure 1613.3.1(1)
MCE_R Ground Motion Spectral Response Acceleration – Class B (1 sec), S_1	0.580g	Figure 1613.3.1(2)
Site Coefficient, F_A	1.0	Table 1613.3.3(1)
Site Coefficient, F_V	1.5	Table 1613.3.3(2)
Site Class Modified MCE_R Spectral Response Acceleration (short), S_{MS}	1.582g	Section 1613.3.3 (Eqn 16-37)
Site Class Modified MCE_R Spectral Response Acceleration – (1 sec), S_{M1}	0.870g	Section 1613.3.3 (Eqn 16-38)
5% Damped Design Spectral Response Acceleration (short), S_{DS}	1.055g	Section 1613.3.4 (Eqn 16-39)
5% Damped Design Spectral Response Acceleration (1 sec), S_{D1}	0.580g	Section 1613.3.4 (Eqn 16-40)

The table below presents the mapped maximum considered geometric mean (MCE_G) seismic design parameters for projects located in Seismic Design Categories of D through F in accordance with ASCE 7-10.

ASCE 7-10 PEAK GROUND ACCELERATION

Parameter	Value	ASCE 7-10 Reference
Mapped MCE_G Peak Ground Acceleration, PGA	0.617g	Figure 22-7
Site Coefficient, F_{PGA}	1.0	Table 11.8-1
Site Class Modified MCE_G Peak Ground Acceleration, PGA_M	0.617g	Section 11.8.3 (Eqn 11.8-1)

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

6.5 Liquefaction Potential

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

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

The State of California Seismic Hazard Zone Map for the Tustin Quadrangle (CDMG, 2001) indicates that the site is not located in an area designated as "liquefiable". The Orange County General Plan (2004) and the Newport Beach General Plan (2006) also indicate that site is not located within an area identified as having a potential for liquefaction. As stated previously, the soils encountered during exploration are generally composed of well consolidated Pleistocene age fine-grained soils. Based on these considerations it is our opinion that the site is not susceptible to liquefaction.

7.6 Slope Stability

The topography at the site is relatively level and the site is not located within an area identified as having a potential for slope instability (CDMG, 2001; City of Newport Beach, 2006). There are no known landslides near the site, nor is the site in the path of any known or potential landslides. Therefore, the potential for slope stability hazards to adversely affect the proposed development is considered low.

7.7 Earthquake-Induced Flooding

Earthquake-induced flooding is inundation caused by failure of dams or other water-retaining structures due to earthquakes. Review of the Orange County Safety Element (2004) indicates that the site is located within the inundation boundary of the Prado Dam. However, this dam, as well as others in California, are continually monitored by various governmental agencies (such as the State of California Division of Safety of Dams and the U.S. Army Corps of Engineers) to guard against the threat of dam failure. Current design, construction practices, and ongoing programs of review, modification, or total reconstruction of existing dams are intended to ensure that all dams are capable of withstanding the maximum considered earthquake (MCE) for the site. Therefore, the potential for inundation at the site as a result of an earthquake-induced dam failure is considered low.

7.8 Tsunamis, Seiches, and Flooding

The site is located approximately 5 miles from the Pacific Ocean. According to the City of Newport Beach General Plan (2006), the site is not within a tsunami inundation hazard zone. Therefore, tsunamis are not anticipated to adversely impact the site.

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

The site is within an area of minimal flooding (Zone X) as defined by the Federal Emergency Management Agency (FEMA, 2009, City of Newport Beach, 2006).

7.9 Oil Fields & Methane Potential

Based on a review of the California Division of Oil, Gas and Geothermal Resources (DOGGR) Oil and Gas Well Location Map W1-6, the site is not located within the limits of an oilfield. No oil wells are located within the immediate vicinity of the site. However, due to the voluntary nature of record reporting by the oil well drilling companies, wells may be improperly located or not shown on the location map. Undocumented wells could be encountered during construction. Any wells encountered will need to be properly abandoned in accordance with the current requirements of the DOGGR.

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

7.10 Subsidence

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

7. CONCLUSIONS AND RECOMMENDATIONS

7.1 General

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

7.1.2 Up to 4 feet of existing artificial fill was encountered during site exploration. The existing fill encountered is believed to be the result of past grading and construction activities at the site. Deeper fill may exist between borings and in other areas of the site that were not directly explored. Future demolition of the existing structures and improvements which occupy the site will likely disturb the upper few feet of existing site soils. It is our opinion that the existing fill, in its present condition, is not suitable for direct support of proposed foundations or slabs. The existing fill and site soils are suitable for re-use as engineered fill provided the recommendations in the *Grading* section of this report are followed (see Section 7.4).

7.1.3 Excavations for subterranean level are anticipated to penetrate through the existing artificial fill and expose competent alluvial soils throughout the excavation bottom.

7.1.4 Based on these considerations, the proposed structures may be supported on conventional foundation systems. At the subterranean levels, the conventional foundation system may derive support in the undisturbed alluvial soils at or below a depth of 5 feet. For the on-grade portion of the development, the conventional foundation system may derive support in newly placed engineered fill. All foundation excavations must be observed and approved in writing by the Geotechnical Engineer prior to placement of steel or concrete. Recommendations for the design of a conventional foundation system are provided in Section 7.6.

7.1.5 As a minimum, the upper 4 feet of existing site soils within the proposed on-grade footprint areas should be excavated and properly compacted for foundation and slab support. Excavation should be conducted as necessary to completely remove all artificial fill and any soft, unsuitable alluvium at the direction of the Geotechnical Engineer (a representative of Geocon). The excavation should extend laterally a minimum distance of three feet beyond the building footprint area or a distance equal to the depth of fill below the foundation, whichever is greater. Recommendations for earthwork are provided in the *Grading* section of this report (see Section 7.4).

7.1.6 The concrete slabs-on-grade and ramps for subterranean levels may derive support directly on the undisturbed alluvial soils at or below a depth of 5 feet. Any soils that are disturbed should be properly compacted for slab and ramp support. Where necessary, the existing artificial fill and alluvial soils are suitable for re-use as an engineered fill provided the procedures outlined in the Grading section of this report are followed (see Section 7.4).

7.1.7 Excavations of up to 12 feet in vertical height are anticipated for construction of subterranean level. Due to the depth of the excavation and the proximity to the property lines, city streets and adjacent offsite structures, excavation of the proposed subterranean levels will require sloping and/or shoring measures in order to provide a stable excavation. Where shoring is required it is recommended that a soldier pile shoring system be utilized. In addition, where the proposed excavation will be deeper than and adjacent to an offsite structure, the proposed shoring should be designed to resist the surcharge imposed by the adjacent offsite structure. Recommendations for shoring are provided in Section 7.18.

7.1.8 Due to the nature of the proposed design for subterranean levels, waterproofing of subterranean walls and slabs is suggested. Particular care should be taken in the design and installation of waterproofing to avoid moisture problems, or actual water seepage into the structure through any normal shrinkage cracks which may develop in the concrete walls, floor slab, foundations and/or construction joints. The design and inspection of the waterproofing is not the responsibility of the geotechnical engineer. A waterproofing consultant should be retained in order to recommend a product or method, which would provide protection to subterranean walls, floor slabs and foundations.

7.1.9 Foundations for small outlying structures, such as block walls up to 6 feet high, planter walls or trash enclosures, which will not be tied to the proposed structure, may be supported on conventional foundations bearing on a minimum of 12 inches of newly placed engineered fill. Where excavation and compaction cannot be performed, such as adjacent to property lines, foundations may bear in the undisturbed alluvial soils found at or below a depth of 2 feet. If the soils exposed in the excavation bottom are soft, compaction of the soft soils will be required prior to placing steel or concrete. Compaction of the foundation excavation bottom is typically accomplished with a compaction wheel or mechanical whacker and must be observed and approved by a Geocon representative.

7.1.10 Where new paving is to be placed, it is recommended that all existing fill and soft alluvial soils be excavated and properly recompacted for paving support. The client should be aware that removal and recompaction of all existing fill and soft alluvial soils in the area of new paving is not required, however, paving constructed over existing uncertified fill or unsuitable soils may experience increased settlement and/or cracking, and may therefore have a shorter design life and increased maintenance costs. As a minimum, the upper twelve inches of soil should be scarified and properly compacted for paving support. Paving recommendations are provided in the *Preliminary Pavement Recommendations* section of this report (see Section 7.11).

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

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

7.2 Soil and Excavation Characteristics

7.2.1 The in-situ soils can be excavated with moderate effort using conventional excavation equipment. Minor caving should be anticipated in vertical excavations, especially where granular soils are encountered.

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

7.2.3 All onsite excavations must be conducted in such a manner that potential surcharges from existing structures, construction equipment, and vehicle loads are resisted. The surcharge area may be defined by a 1:1 projection down and away from the bottom of an existing foundation or vehicle load. Penetrations below this 1:1 projection will require special excavation measures such as sloping and possibly shoring. Excavation recommendations are provided in the *Temporary Excavations* section of this report (see Section 7.17).

7.2.4 The upper few feet of soils encountered during the investigation are considered to have a "moderate" (EI=51) expansive potential and are classified as "expansive" based on the 2013 California Building Code (CBC) Section 1803.5.3. Recommendations presented herein assume that the building foundations and slabs will derive support in these materials.

7.3 Minimum Resistivity, pH and Water-Soluble Sulfate

7.3.1 Potential of Hydrogen (pH) and resistivity testing, as well as chloride content testing, were performed on representative samples of on-site soil to generally evaluate the corrosion potential to surface utilities. The tests were performed in accordance with California Test Method Nos. 643 and 422 and indicate that the soils are considered "corrosive" with respect to corrosion of buried ferrous metals on site. The results are presented in Appendix B (Figure B10) and should be considered for design of underground structures.

7.3.2 Laboratory tests were performed on representative samples of the on-site soil to measure the percentage of water-soluble sulfate content. Results from the laboratory water-soluble sulfate tests are presented in Appendix B (Figure B10) and indicate that the on-site soil possess a "negligible" sulfate exposure to concrete structures as defined by 2013 CBC Section 1904 and ACI 318-11 Section 4.2 and 4.3.

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

7.4 Grading

7.4.1 Grading is anticipated to include excavation and compaction of the upper site soils, excavation of site soils for the proposed subterranean level, foundations, and utility trenches, as well as placement of backfill for walls, ramps, and trenches.

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

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

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

7.4.5 As a minimum, it is recommended that the upper four feet of existing site soils within the proposed on-grade footprint areas be excavated and properly compacted for foundation and slab support. Deeper excavation should be conducted as necessary to completely remove all existing artificial fill or soft soil at the direction of the Geotechnical Engineer (a representative of Geocon). The limits of existing fill and/or soft soil removal will be verified by the Geocon representative during site grading activities. The engineered fill blanket should extend at least three feet beyond the edge of foundations or for a distance equal to the depth of fill below the foundations, whichever is greater.

7.4.6 All excavations must be observed and approved in writing by the Geotechnical Engineer (a representative of Geocon), prior to placing fill. If determined to be excessively soft, additional removals or stabilization of the excavation bottom may be required in order to provide a firm working surface upon which engineered fill can be placed and heavy equipment can operate. If required, recommendations for stabilization measures can be provided under separate cover.

7.4.7 The concrete slab-on-grade at the subterranean level may derive support directly on the undisturbed alluvial soils found at the excavation bottom. Any disturbed soils should be properly compacted for slab support. The concrete slab-on-grade for the ramp should derive support on a minimum of 12 inches of properly compacted fill.

7.4.8 All fill and backfill soils should be placed in horizontal loose layers approximately 6 to 8 inches thick, moisture conditioned to 2 percent above optimum moisture content, and properly compacted to a minimum 90 percent of the maximum dry density in accordance with ASTM D 1557 (latest edition).

7.4.9. Where new paving is to be placed, it is recommended that all existing fill and soft alluvium be excavated and properly compacted for paving support. As a minimum, the upper twelve inches of soil should be scarified, moisture conditioned to 2 percent above optimum moisture content, and compacted to at least 92 percent relative compaction, as determined by ASTM Test Method D 1557 (latest edition). Paving recommendations are provided in *Preliminary Pavement Recommendations* section of this report (see Section 7.11).

7.4.10 Foundations for small outlying structures, such as block walls up to 6 feet high, planter walls or trash enclosures, which will not be tied to the proposed structure, may be supported on conventional foundations bearing on a minimum of 12 inches of newly placed engineered fill which extends laterally at least 12 inches beyond the foundation area. Where excavation and proper compaction cannot be performed or is undesirable, foundations may derive support directly in the undisturbed alluvial soils found at or below a depth of 2 feet below the existing ground surface, and should be deepened as necessary to maintain a minimum 12 inch embedment into undisturbed alluvium. If the alluvial soils exposed in the excavation bottom are loose or disturbed, compaction of the soils will be required prior to placing steel or concrete. Compaction of the foundation excavation bottom is typically accomplished with a compaction wheel or mechanical whacker and must be observed and approved by a Geocon representative.

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

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

7.5 Shrinkage

7.5.1 Shrinkage results when a volume of material removed at one density is compacted to a higher density. A shrinkage factor of between 5 and 10 percent should be anticipated when excavating and compacting the existing fill and alluvium on site to an average relative compaction of 92 percent.

7.6 Conventional Foundation Design

7.6.1 It is recommended that a conventional foundation system be utilized for support of the proposed structures. At the subterranean levels, the conventional foundation system may derive support in the undisturbed alluvial soils found at or below a depth of 5 feet. Foundations for the proposed on-grade structure may derive support in newly placed engineered fill. Any exposed soft soils should be compacted to a dense state or penetrated by proposed foundations at the direction of the Geotechnical Engineer (a representative of Geocon).

7.6.2 Continuous footings deriving support in the recommended bearing materials may be designed for an allowable bearing capacity of 2,500 pounds per square foot, and should be a minimum of 12 inches in width, 24 inches in depth below the lowest adjacent grade, and 12 inches into the recommended bearing materials.

7.6.3 Isolated spread foundations deriving support in the recommended bearing materials may be designed for an allowable bearing capacity of 2,700 pounds per square foot, and should be a minimum of 24 inches in width, 24 inches in depth below the lowest adjacent grade, and 12 inches into the recommended bearing materials.

7.6.4 The soil bearing pressure above may be increased by 100 psf and 400 psf for each additional foot of foundation width and depth, respectively, up to a maximum allowable soil bearing value of 3,500 pounds per square foot.

7.6.5 The allowable bearing pressure may be increased by up to one-third for transient loads due to wind or seismic forces.

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

7.6.7 If depth increases are utilized for the exterior wall footings, this office should be provided a copy of the final construction plans so that the excavation recommendations presented herein could be properly reviewed and revised if necessary.

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

7.6.9 Due to the expansion potential of the site soils, the moisture content in the slab and foundation subgrade should be maintained subsequent to grading and as necessary until concrete placement.

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

7.6.11 This office should be provided a copy of the final construction plans so that the excavation recommendations presented herein could be properly reviewed and revised if necessary.

7.7 Miscellaneous Foundations

7.7.1 Foundations for small outlying structures, such as block walls, planter walls or trash enclosures, which will not be tied to the proposed structures, may be supported on conventional foundations bearing on a minimum of 12 inches of newly placed engineered fill which extends laterally at least 12 inches beyond the foundation area. Where excavation and compaction cannot be performed, such as adjacent to property lines, foundations may derive support in the undisturbed alluvium found at or below a depth of 24 inches, and should be deepened as necessary to maintain a 12 inch embedment in to the recommended bearing materials.

7.7.2 If the soils exposed in the excavation bottom are soft, compaction of the soft soils will be required prior to placing steel or concrete. Compaction of the foundation excavation bottom is typically accomplished with a compaction wheel or mechanical whacker and must be observed and approved in writing by a Geocon representative. Miscellaneous foundations may be designed for a bearing value of 1,500 pounds per square foot, and should be a minimum of 12 inches in width, 24 inches in depth below the lowest adjacent grade and 12 inches into the recommended bearing material. The allowable bearing pressure may be increased by up to one-third for transient loads due to wind or seismic forces.

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

7.8 Foundation Settlement

7.8.1 The maximum expected total settlement for a structure supported on a conventional foundation system designed with the maximum allowable bearing value of 3,500 psf and deriving support in the recommended bearing materials is estimated to be approximately 1½ inch and occur below the heaviest loaded structural element. A majority of the settlement of the foundation system is expected to occur on initial application of loading; however, minor additional settlements are expected within the first 12 months. Differential settlement is expected to be less than ¾ inch over a distance of twenty feet.

7.8.2 If structural connections are planned between the on-grade structure and the main structure, differential settlements across the connections will need to be carefully designed for. As the project progresses, Geocon should work closely with the project structural engineer to confirm the foundation loading configuration and anticipated total and differential settlement.

7.8.3 Once the design and foundation loading configurations for the proposed structures proceeds to a more finalized plan, the estimated settlements presented in this report should be reviewed and revised, if necessary. If the final foundation loading configurations are different than the assumed loading conditions the potential for settlement should be reevaluated by this office.

7.9 Lateral Design

7.9.1 Resistance to lateral loading may be provided by friction acting at the base of foundations and by passive earth pressure. An allowable coefficient of friction of 0.30 may be used with the dead load forces in the newly placed engineered fill and competent, undisturbed alluvium.

7.9.2 Passive earth pressure for the sides of foundations and slabs poured against the newly placed engineered fill and competent undisturbed alluvium may be computed as an equivalent fluid having a density of 200 pcf with a maximum earth pressure of 2,000 pcf. When combining passive and friction for lateral resistance, the passive component should be reduced by one-third.

7.10 Concrete Slabs-on-Grade

7.10.1 Exterior concrete slabs-on-grade at the ground surface subject to vehicle loading should be designed in accordance with the recommendations in the *Preliminary Pavement Recommendations* section of this report (Section 7.11).

7.10.2 Subsequent to the recommended grading, the concrete slab-on-grade for the on-grade structure, deriving support in either engineered fill and not subject to vehicle loading, should be a minimum of 4-inches thick and minimum slab reinforcement should consist of No. 4 steel reinforcing bars placed 16 inches on center in both horizontal directions. Steel reinforcing should be positioned vertically near the slab midpoint.

7.10.3 Unless specifically designed and evaluated by the project structural engineer, the slab-on-grade at the subterranean level subject to vehicle loading should be a minimum of 5 inches thick and reinforced with No. 4 steel reinforcing bars placed 16 inches on center in both horizontal directions. The recommended slab thickness and reinforcement is in conformance with the *WRI/CRSI Design of Slab-on-Ground Foundations,* based on an effective plasticity index of 26 and assuming either Grade 40 or 60 steel. The concrete slab-on-grade may bear directly on the undisturbed alluvial soils found at the excavation bottom. Any disturbed soils should be properly compacted for slab support. The ramp may derive support in the undisturbed alluvial soils and/or engineered fill and the upper 12 inches of subgrade soils directly beneath the ramp should be moisture conditioned to two percent above

optimum moisture and properly compacted to at least 92 percent relative compaction, as determined by ASTM Test Method D 1557 (latest edition) for ramp support.

7.10.4 Slabs-on-grade at the ground surface that may receive moisture-sensitive floor coverings or may be used to store moisture-sensitive materials should be underlain by a vapor retarder placed directly beneath the slab. The vapor retarder and acceptable permeance should be specified by the project architect or developer based on the type of floor covering that will be installed. The vapor retarder design should be consistent with the guidelines presented in Section 9.3 of the American Concrete Institute's (ACI) *Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials* (ACI 302.2R-06) and should be installed in general conformance with ASTM E 1643-11 and the manufacturer's recommendations. A minimum thickness of 15 mils and a permeance of less than 0.01 perms is recommended. The vapor retarder should be installed in direct contact with the concrete slab with proper perimeter seal. If the California Green Building Code requirements apply to this project, the vapor retarder should be underlain by 4 inches of clean aggregate. It is important that the vapor retarder be puncture resistant since it will be in direct contact with angular gravel. As an alternative to the clean aggregate suggested in the California Green Building Code, it is our opinion that the concrete slab-on-grade may be underlain by a vapor retarder over 4-inches of clean sand (sand equivalent greater than 30), since the sand will serve a capillary break and will minimize the potential for punctures and damage to the vapor barrier.

7.10.5 Due to the nature of a subterranean level, waterproofing of subterranean walls and slabs is suggested. Particular care should be taken in the design and installation of waterproofing to avoid moisture problems, or actual water seepage into the structure through any normal shrinkage cracks which may develop in the concrete walls, floor slab, foundations and/or construction joints. The design and inspection of the waterproofing is not the responsibility of the geotechnical engineer. A waterproofing consultant should be retained in order to recommend a product or method, which would provide protection to subterranean walls, floor slabs and foundations.

7.10.6 For seismic design purposes, a coefficient of friction of 0.30 may be utilized between concrete slabs and subgrade soils without a moisture barrier, and 0.15 for slabs underlain by a moisture barrier.

7.10.7 Exterior slabs, not subject to traffic loads, should be at least 4 inches thick and reinforced with No. 3 steel reinforcing bars placed 18 inches on center in both horizontal directions, positioned near the slab midpoint. Prior to construction of slabs, the upper 12 inches of subgrade should be moistened to 2 percent above optimum moisture content and properly compacted to at least 92 percent relative compaction, as determined by ASTM Test Method D 1557 (latest edition).

7.10.8 Crack control joints should be spaced at intervals not greater than 10 feet and should be constructed using saw-cuts or other methods as soon as practical following concrete placement. Crack control joints should extend a minimum depth of one-fourth the slab thickness. Construction joints should be designed by the project structural engineer.

7.10.9 Due to the expansive potential of the anticipated subgrade soils, the moisture content of the slab subgrade should be maintained and sprinkled as necessary to maintain a moist condition as would be expected in any concrete placement. In addition, consideration should be given to doweling slabs into adjacent curbs and foundations to minimize movements and offsets which could lead to a potential tripping hazard.

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

7.11 Preliminary Pavement Recommendations

7.11.1 Where new paving is to be placed, it is recommended that all existing fill and soft or unsuitable alluvial soils be excavated and properly compacted for paving support. The client should be aware that excavation and compaction of all soft or unsuitable soils in the area of new paving is not required, however, paving constructed over existing unsuitable soils may experience increased settlement and/or cracking, and may therefore have a shorter design life and increased maintenance costs. As a minimum, the upper twelve inches of paving subgrade should be scarified, moisture conditioned to 2 percent above optimum moisture content, and properly compacted to at least 92 percent relative compaction, as determined by ASTM Test Method D 1557 (latest edition).

7.11.2 The following pavement sections are based on an assumed R-Value of 20. Once site grading activities are complete, it is recommended that laboratory testing confirm the properties of the soils serving as paving subgrade prior to placing pavement.

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

PRELIMINARY PAVEMENT DESIGN SECTIONS

Location	Estimated Traffic Index (TI)	Asphalt Concrete (inches)	Class 2 Aggregate Base (inches)
Automobile Traffic & Driveway	5	3	7
Trash Truck & Fire Lanes	7	4	12½

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

7.11.5 Unless specifically designed and evaluated by the project structural engineer, where exterior concrete paving will be utilized for support of vehicles, it is recommended that the concrete be a minimum of 6 inches of concrete reinforced with No. 3 steel reinforcing bars placed 18 inches on center in both horizontal directions. Concrete paving supporting vehicular traffic should be underlain by a minimum of 4 inches of aggregate base and a properly compacted subgrade.

7.11.6 The paving subgrade material should be moisture conditioned to 2 percent above optimum moisture content and compacted to at least 92 percent relative compaction, as determined by ASTM Test Method D 1557 (latest edition). Base material should be compacted to at least 95 percent relative compaction, as determined by ASTM Test Method D 1557 (latest edition).

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

7.12 Retaining Walls

7.12.1 The recommendations presented below are generally applicable to the design of rigid concrete or masonry retaining walls having a maximum height of 12 feet. In the event that walls higher than 12 feet are planned, Geocon should be contacted for additional recommendations.

7.12.2 Retaining wall foundations may be designed in accordance with the recommendations provided in the *Foundation Design* sections of this report (see Section 7.6).

7.12.3 Retaining walls with a level backfill surface that are not restrained at the top should be designed utilizing a triangular distribution of pressure (active pressure) of 30 pcf. Calculation of the recommended retaining wall pressures is provided in Figure 6.

7.12.4 Restrained walls are those that are not allowed to rotate more than 0.001H (where H equals the height of the retaining portion of the wall in feet) at the top of the wall. Where walls are restrained from movement at the top, walls may be designed utilizing a triangular distribution of pressure (at-rest pressure) of 50 pcf. Calculation of the recommended retaining wall pressures is provided in Figure 6.

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

7.12.6 The wall pressures provided above assume that the proposed retaining walls will support relatively undisturbed alluvial soils. If sloping techniques are to be utilized for construction of proposed walls, which would result in a wedge of engineered fill behind the retaining walls, revised earth pressures may be required to account for the expansive potential of the soil placed as engineered fill. This should be evaluated once the use of sloping measures is established and once the geotechnical characteristics of the engineered backfill soils can be further evaluated.

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

7.12.8 It is recommended that line-load surcharges from adjacent wall footings, use horizontal pressures generated from NAV-FAC DM 7.2. The governing equations are:

$$For \quad x/H \le 0.4$$

$$\sigma_H(z) = \frac{0.20\left(\frac{z}{H}\right)}{\left[0.16+\left(\frac{z}{H}\right)^2\right]^2}\frac{Q_L}{H}$$

and

$$For \quad x/H > 0.4$$

$$\sigma_H(x,z) = \frac{1.26\left(\frac{x}{H}\right)^2\left(\frac{z}{H}\right)}{\left[\left(\frac{x}{H}\right)^2+\left(\frac{z}{H}\right)^2\right]^2}\frac{Q_L}{H}$$

where x is the distance from the face of the excavation to the vertical line-load, H is the distance from the bottom of the footing to the bottom of excavation, z is the depth at which the horizontal pressure is desired, Q_L is the vertical line-load and σH is the horizontal pressure at depth z.

7.12.9 It is recommended that vertical point-loads, from construction equipment outriggers or adjacent building columns use horizontal pressures generated from NAV-FAC DM 7.2. The governing equations are:

$$For \quad x/H \le 0.4$$

$$\sigma(z) = \frac{0.28 \times \left(\frac{z}{H}\right)^2}{\left[0.16 + \left(\frac{z}{H}\right)^2\right]^3} \times \frac{Q_p}{H^2}$$

and

$$For \quad x/H > 0.4$$

$$\sigma(z) = \frac{1.77 \times \left(\frac{x}{H}\right)^2 \times \left(\frac{z}{H}\right)^2}{\left[\left(\frac{x}{H}\right)^2 + \left(\frac{z}{H}\right)^2\right]^3} \times \frac{Q_p}{H^2}$$

then

$$\sigma_H^{'}(z) = \sigma_H(z)\cos^2(1.1\theta)$$

where x is the distance from the face of the excavation to the vertical point-load, H is distance from the outrigger/bottom of column footing to the bottom of excavation, z is the depth at which the horizontal pressure is desired, Q_p is the vertical point-load, σ is the vertical pressure at depth z, Θ is the angle between a line perpendicular to the bulkhead and a line from the point-load to half the pile spacing at the bulkhead, and σ_H is the horizontal pressure at depth z.

7.12.10 In addition to the recommended earth pressure, the upper ten feet of the shoring adjacent to the street or driveway areas should be designed to resist a uniform lateral pressure of 100 psf, acting as a result of an assumed 300 psf surcharge behind the shoring due to normal street traffic. If the traffic is kept back at least ten feet from the shoring, the traffic surcharge may be neglected.

7.12.11 Seismic lateral forces should be incorporated into the design as necessary, and recommendations for seismic lateral forces are presented below.

7.13 Dynamic (Seismic) Lateral Forces

7.13.1 The structural engineer should determine the seismic design category for the project in accordance with Section 1613 of the CBC. If the project possesses a seismic design category of D, E, or F, proposed retaining walls in excess of 6 feet in height should be designed with seismic lateral pressure (Section 1803.5.12 of the 2013 CBC).

7.13.2 A seismic load of 23 pcf should be used for design of walls that support more than 6 feet of backfill in accordance with Section 1803.5.12 of the 2013 CBC. The seismic load is applied as an equivalent fluid pressure along the height of the wall and the calculated loads result in a maximum load exerted at the base of the wall and zero at the top of the wall. This seismic load should be applied in addition to the active earth pressure. We used the peak site acceleration, PGA_M, of 0.617g calculated from ASCE 7-10 Section 11.8.3 and applied a pseudo-static coefficient of 0.3.

7.14 Retaining Wall Drainage

7.14.1 Retaining walls should be provided with a drainage system extended at least two-thirds the height of the wall. At the base of the drain system, a subdrain covered with a minimum of 12 inches of gravel should be installed, and a compacted fill blanket or other seal placed at the surface (see Figure 7). The clean bottom and subdrain pipe, behind a retaining wall, should be observed by the Geotechnical Engineer (a representative of Geocon), prior to placement of gravel or compacting backfill.

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

7.14.3 Subdrainage pipes at the base of the retaining wall drainage system should outlet to an acceptable location via controlled drainage structures.

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

7.15 Elevator Pit Design

7.15.1 The elevator pit slab and retaining wall should be designed by the project structural engineer. As a minimum the slab-on-grade for the elevator pit bottom should be at least 4 inches thick and reinforced with No. 3 steel reinforcing bars placed 18 inches on center in both horizontal directions, positioned near the slab midpoint. Elevator pit walls may be designed in accordance with the recommendations in the *Foundation Design and Retaining Wall Design* section of this report (see Sections 7.6 and 7.12).

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

7.15.3 If retaining wall drainage is to be provided, the drainage system should be designed in accordance with the *Retaining Wall Drainage* section of this report (see Section 7.14).

7.15.4 It is suggested that the exterior walls and slab be waterproofed to prevent excessive moisture inside of the elevator pit. Waterproofing design and installation is not the responsibility of the geotechnical engineer.

7.16 Elevator Piston

7.16.1 If a plunger-type elevator piston is installed for this project, a deep drilled excavation will be required. It is important to verify that the drilled excavation is not situated immediately adjacent to a foundation or shoring pile, or the drilled excavation could compromise the existing foundation or pile support, especially if the drilling is performed subsequent to the foundation or pile construction.

7.16.2 Casing may be required if caving is experienced in the drilled excavation. The contractor should be prepared to use casing and should have it readily available at the commencement of drilling activities. The contractor should also be prepared to mitigate buoyant forces during installation of the piston casing. Continuous observation of the drilling and installation of the elevator piston by the Geotechnical Engineer (a representative of Geocon West, Inc.) is required.

7.16.3 The annular space between the piston casing and drilled excavation wall should be filled with a minimum of 1½-sack slurry pumped from the bottom up. As an alternative, pea gravel may be utilized. The use of soil to backfill the annular space is not acceptable.

7.17 Temporary Excavations

7.17.1 Excavations on the order of 12 feet in height may be required for excavation and construction of the proposed subterranean level and foundations. The excavations are expected to expose artificial fill and alluvial soils, which are suitable for vertical excavations up to 5 feet in height where loose soils or caving sands are not present, and where not surcharged by adjacent traffic or structures.

7.17.2 Vertical excavations greater than five feet will require sloping and/or shoring measures in order to provide a stable excavation. Where sufficient space is available, temporary unsurcharged embankments up to 12 feet high could be sloped back at a uniform 1:1 slope gradient or flatter. A uniform slope does not have a vertical portion. Where space is limited, shoring measures will be required. *Shoring* data is provided in Section 7.18 of this report.

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

7.18 Shoring – Soldier Pile Design and Installation

7.18.1 The following information on the design and installation of shoring is preliminary. Review of the final shoring plans and specifications should be made by this office prior to bidding or negotiating with a shoring contractor.

7.18.2 One method of shoring would consist of steel soldier piles, placed in drilled holes and backfilled with concrete. Where maximum excavation heights are less than 12 feet the soldier piles are typically designed as cantilevers. Where excavations exceed 12 feet or are surcharged, soldier piles may require lateral bracing utilizing drilled tie-back anchors or raker braces to maintain an economical steel beam size and prevent excessive deflection. The size of the steel beam, the need for lateral bracing, and the acceptable shoring deflection should be determined by the project shoring engineer.

7.18.3 The design embedment of the shoring pile toes must be maintained during excavation activities. The toes of the perimeter shoring piles should be deepened to take into account any required excavations necessary for grading activities, foundations, and/or adjacent drainage systems.

7.18.4 The proposed soldier piles may also be designed as permanent piles. The required pile depth, dimension, spacing should be determined and designed by the project structural and shoring engineers. All piles utilized for shoring can also be incorporated into a permanent retaining wall system (shotcrete wall) and should be designed in accordance with the earth pressure provided in the *Retaining Walls* section of this report (see Section 7.12).

7.18.5 Drilled cast-in-place soldier piles should be placed no closer than 2 diameters on center. The minimum diameter of the piles is 18 inches. Structural concrete should be used for the soldier piles below the excavation; lean-mix concrete may be employed above that level. As an alternative, lean-

mix concrete may be used throughout the pile where the reinforcing consists of a wideflange section. The slurry must be of sufficient strength to impart the lateral bearing pressure developed by the wideflange section to the soil. For design purposes, an allowable passive value for the soils below the bottom plane of excavation may be assumed to be 240 pounds per square foot per foot where in contact with alluvial soils. The allowable passive value may be doubled for isolated piles, spaced a minimum of three times the pile diameter. To develop the full lateral value, provisions should be implemented to assure firm contact between the soldier piles and the undisturbed alluvium.

7.18.6 If a vibratory method of solider pile installation is utilized, predrilling may be performed prior to installation of the steel beams. If predrilling is performed, it is recommended that the bore diameter be at least 2 inches smaller than the largest dimension of the pile to prevent excessive loss in the frictional component of the pile capacity. Predrilling should not be conducted below the proposed excavation bottom.

7.18.7 If a vibratory method is utilized, the owner should be aware of the potential risks associated with vibratory efforts, which typically involve inducing settlement within the vicinity of the pile which could result in a potential for damage to existing improvements in the area.

7.18.8 The level of vibration that results from the installation of the piles should not exceed a threshold where occupants of nearby structures are disturbed, despite higher vibration tolerances that a building may endure without deformation or damage. The main parameter used for vibration assessment is peak particle velocity in units of inch per second (in/sec). The acceptable range of peak particle velocity should be evaluated based on the age and condition of adjacent structures, as well as the tolerance of human response to vibration. Based on Table 19 of the *Transportation and Construction Induced Vibration Guidance Manual* (Caltrans 2004), a continuous source of vibrations (ex. vibratory pile driving) which generates a maximum peak particle velocity of 0.5 in/sec is considered tolerable for modern industrial / commercial buildings and new residential structures. The Client should be aware that a lower value may be necessary if older or fragile structures are in the immediate vicinity of the site.

7.18.9 Vibrations should be monitored and record with seismographs during pile installation to detect the magnitude of vibration and oscillation experienced by adjacent structures. If the vibrations exceed the acceptable range during installation, the shoring contractor should modify the installation procedure to reduce the values to within the acceptable range. Vibration monitoring is not the responsibility of the Geotechnical Engineer. Geocon does not practice in the field of vibration monitoring. If construction techniques will be implemented, it is recommended that qualified consultant be retained to provide site specific recommendations for vibration thresholds and monitoring.

7.18.10 Casing may be required since caving may occur in granular soils. If casing is used, extreme care should be employed so that the pile is not pulled apart as the casing is withdrawn. At no time should the distance between the surface of the concrete and the bottom of the casing be less than five feet. Continuous observation of the drilling and pouring of the piles by the Geotechnical Engineer (a representative of Geocon West, Inc.), is required.

7.18.11 Groundwater was encountered at 30 feet below ground surface during site exploration and the contractor should be prepared for groundwater during pile installation should the need arise. Piles placed below the water level require the use of a tremie to place the concrete into the bottom of the hole. A tremie should consist of a rigid, water-tight tube having a diameter of not less than 6 inches with a hopper at the top. The tube should be equipped with a device that will close the discharge end and prevent water from entering the tube while it is being charged with concrete. The tremie should be supported so as to permit free movement of the discharge end over the entire top surface of the work and to permit rapid lowering when necessary to retard or stop the flow of concrete. The discharge end should be closed at the start of the work to prevent water entering the tube and should be entirely sealed at all times, except when the concrete is being placed. The tremie tube should be kept full of concrete. The flow should be continuous until the work is completed and the resulting concrete seal should be monolithic and homogeneous. The tip of the tremie tube should always be kept about 5 feet below the surface of the concrete and definite steps and safeguards should be taken to insure that the tip of the tremie tube is never raised above the surface of the concrete.

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

7.18.13 The frictional resistance between the soldier piles and retained soil may be used to resist the vertical component of the load. The coefficient of friction may be taken as 0.30 based on uniform contact between the steel beam and lean-mix concrete and alluvium. The portion of soldier piles below the plane of excavation may also be employed to resist the downward loads. The downward capacity may be determined using a frictional resistance of 500 pounds per square foot.

7.18.14 Due to the nature of the site soils, it is expected that continuous lagging between soldier piles will be required. However, it is recommended that the exposed soils be observed by the Geotechnical Engineer (a representative of Geocon West, Inc.), to verify the presence of any cohesive soils and the areas where lagging may be omitted.

7.18.15 The time between lagging excavation and lagging placement should be as short as possible. Soldier piles should be designed for the full-anticipated pressures. Due to arching in the soils, the pressure on the lagging will be less. It is recommended that the lagging be designed for the full design pressure but be limited to a maximum of 400 pounds per square foot.

7.18.16 For design of shoring, it is recommended that an equivalent fluid pressure based on the following table, be utilized for design.

HEIGHT OF SHORING (FEET)	EQUIVALENT FLUID PRESSURE (Pounds Per Cubic Foot) (ACTIVE PRESSURE)	EQUIVALENT FLUID PRESSURE (Pounds Per Cubic Foot) (AT-REST PRESSURE)
Up to 12	25	45

7.18.17 It is very important to note that active pressures can only be achieved when movement in the soil (earth wall) occurs. If movement in the soil is not acceptable, such as adjacent to an existing structure, or the pile is restrained from movement by bracing or a tie back anchor, the at-rest pressure should be considered for design purposes.

7.18.18 Where a combination of sloped embankment and shoring is utilized, the pressure will be greater and must be determined for each combination. Additional active pressure should be added for a surcharge condition due to sloping ground, vehicular traffic, or adjacent structures and must be determined for each combination.

7.18.19 It is recommended that line-load surcharges from adjacent wall footings, use horizontal pressures generated from NAV-FAC DM 7.2. The governing equations are:

$$For \quad x/H \le 0.4$$

$$\sigma_H(z) = \frac{0.20\left(\frac{z}{H}\right)}{\left[0.16+\left(\frac{z}{H}\right)^2\right]^2}\frac{Q_L}{H}$$

and

$$For \quad x/H > 0.4$$

$$\sigma_H(x,z) = \frac{1.26\left(\frac{x}{H}\right)^2\left(\frac{z}{H}\right)}{\left[\left(\frac{x}{H}\right)^2+\left(\frac{z}{H}\right)^2\right]^2}\frac{Q_L}{H}$$

where x is the distance from the face of the excavation to the vertical line-load, H is the distance from the bottom of the footing to the bottom of excavation, z is the depth at which the horizontal pressure is desired, Q_L is the vertical line-load and σH is the horizontal pressure at depth z.

7.18.20 It is recommended that vertical point-loads, from construction equipment outriggers or adjacent building columns use horizontal pressures generated from NAV-FAC DM 7.2. The governing equations are:

$$For \quad x/H \le 0.4$$

$$\sigma(z) = \frac{0.28 \times \left(\frac{z}{H}\right)^2}{\left[0.16 + \left(\frac{z}{H}\right)^2\right]^3} \times \frac{Q_p}{H^2}$$

and

$$For \quad x/H > 0.4$$

$$\sigma(z) = \frac{1.77 \times \left(\frac{x}{H}\right)^2 \times \left(\frac{z}{H}\right)^2}{\left[\left(\frac{x}{H}\right)^2 + \left(\frac{z}{H}\right)^2\right]^3} \times \frac{Q_p}{H^2}$$

then

$$\sigma_H'(z) = \sigma_H(z)\cos^2(1.1\theta)$$

where x is the distance from the face of the excavation to the vertical point-load, H is distance from the outrigger/bottom of column footing to the bottom of excavation, z is the depth at which the horizontal pressure is desired, Q_p is the vertical point-load, σ is the vertical pressure at depth z, Θ is the angle between a line perpendicular to the bulkhead and a line from the point-load to half the pile spacing at the bulkhead, and σ_H is the horizontal pressure at depth z.

7.18.21 In addition to the recommended earth pressure, the upper ten feet of the shoring adjacent to the street or driveway areas should be designed to resist a uniform lateral pressure of 100 psf, acting as a result of an assumed 300 psf surcharge behind the shoring due to normal street traffic. If the traffic is kept back at least ten feet from the shoring, the traffic surcharge may be neglected.

7.18.22 It is difficult to accurately predict the amount of deflection of a shored embankment. It should be realized that some deflection will occur. It is recommended that the deflection be minimized to prevent damage to existing structures and adjacent improvements. Where public right-of-ways are present or adjacent offsite structures do not surcharge the shoring excavation, the shoring deflection should be limited to less than 1 inch at the top of the shored embankment. Where offsite structures are within the shoring surcharge area it is recommended that the beam deflection be limited to less than ½ inch at the elevation of the adjacent offsite foundation, and no deflection at all if deflections will damage existing structures. The allowable deflection is dependent on many factors, such as the

presence of structures and utilities near the top of the embankment, and will be assessed and designed by the project shoring engineer.

7.18.23 Because of the depth of the excavation, some means of monitoring the performance of the shoring system is suggested. The monitoring should consist of periodic surveying of the lateral and vertical locations of the tops of all soldier piles and the lateral movement along the entire lengths of selected soldier piles.

7.19 Tie-Back Anchors

7.19.1 Tie-back anchors may be used to resist lateral loads. Friction anchors are recommended. For design purposes, it may be assumed that the active wedge adjacent to the shoring is defined by a plane drawn 35 degrees with the vertical through the bottom plane of the excavation. Friction anchors should extend a minimum of 20 feet beyond the potentially active wedge and to greater lengths if necessary to develop the desired capacities. The locations and depths of all offsite utilities should be thoroughly checked and incorporated into the drilling angle design for the tie-back anchors.

7.19.2 The capacities of the anchors should be determined by testing of the initial anchors as outlined in a following section. Only the frictional resistance developed beyond the active wedge would be effective in resisting lateral loads. Anchors should be placed at least 6 feet on center to be considered isolated. For preliminary design purposes, it is estimated that drilled friction anchors constructed without utilizing post-grouting techniques will develop average skin frictions as follows:

- Up to 5 feet below the top of the excavation – 825 pounds per square foot

7.19.3 An allowable friction capacity of 2 kips per linear foot may be utilized for anchors constructed with post-grouting techniques and a 20 foot length beyond the active wedge. Additional tieback length will yield higher capacity. The maximum allowable friction capacity is 3 kips per linear foot. Only the frictional resistance developed beyond the active wedge should be utilized in resisting lateral loads.

7.20 Anchor Installation

7.20.1 Tied-back anchors are typically installed between 20 and 40 degrees below the horizontal; however, occasionally alternative angles are necessary to avoid existing improvements and utilities. The locations and depths of all offsite utilities should be thoroughly checked prior to design and installation of the tie-back anchors. Caving of the anchor shafts, particularly within sand and gravel deposits or seepage zones, should be anticipated during installation and provisions should be implemented in order to minimize such caving. It is suggested that hollow-stem auger drilling equipment be used to install the anchors. The anchor shafts should be filled with concrete by pumping from the tip out, and the concrete should extend from the tip of the anchor to the active wedge. In

order to minimize the chances of caving, it is recommended that the portion of the anchor shaft within the active wedge be backfilled with sand before testing the anchor. This portion of the shaft should be filled tightly and flush with the face of the excavation. The sand backfill should be placed by pumping; the sand may contain a small amount of cement to facilitate pumping.

7.21 Anchor Testing

7.21.1 All of the anchors should be tested to at least 150 percent of design load. The total deflection during this test should not exceed 12 inches. The rate of creep under the 150 percent test load should not exceed 0.1 inch over a 15-minute period in order for the anchor to be approved for the design loading.

7.21.2 At least ten percent of the anchors should be selected for "quick" 200 percent tests and three additional anchors should be selected for 24-hour 200 percent tests. The purpose of the 200 percent tests is to verify the friction value assumed in design. The anchors should be tested to develop twice the assumed friction value. These tests should be performed prior to installation of additional tiebacks. Where satisfactory tests are not achieved on the initial anchors, the anchor diameter and/or length should be increased until satisfactory test results are obtained.

7.21.3 The total deflection during the 24-hour 200 percent test should not exceed 12 inches. During the 24-hour tests, the anchor deflection should not exceed 0.75 inches measured after the 200 percent test load is applied.

7.21.4 For the "quick" 200 percent tests, the 200 percent test load should be maintained for 30 minutes. The total deflection of the anchor during the 200 percent quick tests should not exceed 12 inches; the deflection after the 200 percent load has been applied should not exceed 0.25 inch during the 30-minute period.

7.21.5 After a satisfactory test, each anchor should be locked-off at the design load. This should be verified by rechecking the load in the anchor. The load should be within 10 percent of the design load. A representative of this firm should observe the installation and testing of the anchors.

7.22 Internal Bracing

7.22.1 Rakers may be utilized to brace the soldier piles in lieu of tieback anchors. The raker bracing could be supported laterally by temporary concrete footings (deadmen) or by the permanent, interior footings. For design of such temporary footings or deadmen, poured with the bearing surface normal to rakers inclined at 45 degrees, a bearing value of 1,500 pounds per square foot in competent alluvial soil, provided the shallowest point of the footing is at least one foot below the lowest adjacent grade. The client should be aware that the utilization of rakers could significantly impact the construction schedule do to their intrusion into the construction site and potential interference with equipment.

7.23 Stormwater Infiltration

7.23.1 During the May 15, 2014 site exploration, boring B2 was utilized to perform percolation testing. The boring was advanced to a depth of 10 feet below the existing ground surface. Slotted casing was placed in the boring, and the annular space between the casing and excavation were filled with filter pack. The boring was then filled with water to pre-saturate the soils to a depth of approximately 3 feet below ground surface.

7.23.2 On May 16, 2014, upon returning to the site after the 24 hour pre-soak period, water was still present in the boring. The water depth was measured as 5 feet below the ground surface. Geocon remained onsite for an additional hour, and no further dissipation of the water was observed. Based on these considerations, these soils are considered impermeable and are not conducive for infiltration of stormwater. It is recommended that stormwater be retained, filtered, and discharged in accordance with the requirements of the local governing agency.

7.24 Surface Drainage

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

7.24.2 All site drainage should be collected and controlled in non-erosive drainage devices. Drainage should not be allowed to pond anywhere on the site, and especially not against any foundation or retaining wall. The site should be graded and maintained such that surface drainage is directed away from structures in accordance with 2013 CBC 1804.3 or other applicable standards. In addition, drainage should not be allowed to flow uncontrolled over any descending slope. Discharge from downspouts, roof drains and scuppers are not recommended onto unprotected soils within five feet of the building perimeter. Planters which are located adjacent to foundations should be sealed to prevent moisture intrusion into the soils providing foundation support. Landscape irrigation is not recommended within five feet of the building perimeter footings except when enclosed in protected planters.

7.24.3 Positive site drainage should be provided away from structures, pavement, and the tops of slopes to swales or other controlled drainage structures. The building pad and pavement areas should be fine graded such that water is not allowed to pond.

7.24.4 Landscaping planters immediately adjacent to paved areas are not recommended due to the potential for surface or irrigation water to infiltrate the pavement's subgrade and base course. Either a subdrain, which collects excess irrigation water and transmits it to drainage structures, or an impervious above-grade planter boxes should be used. In addition, where landscaping is planned adjacent to the

pavement, it is recommended that consideration be given to providing a cutoff wall along the edge of the pavement that extends at least 12 inches below the base material.

7.25 Plan Review

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

LIMITATIONS AND UNIFORMITY OF CONDITIONS

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

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

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

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

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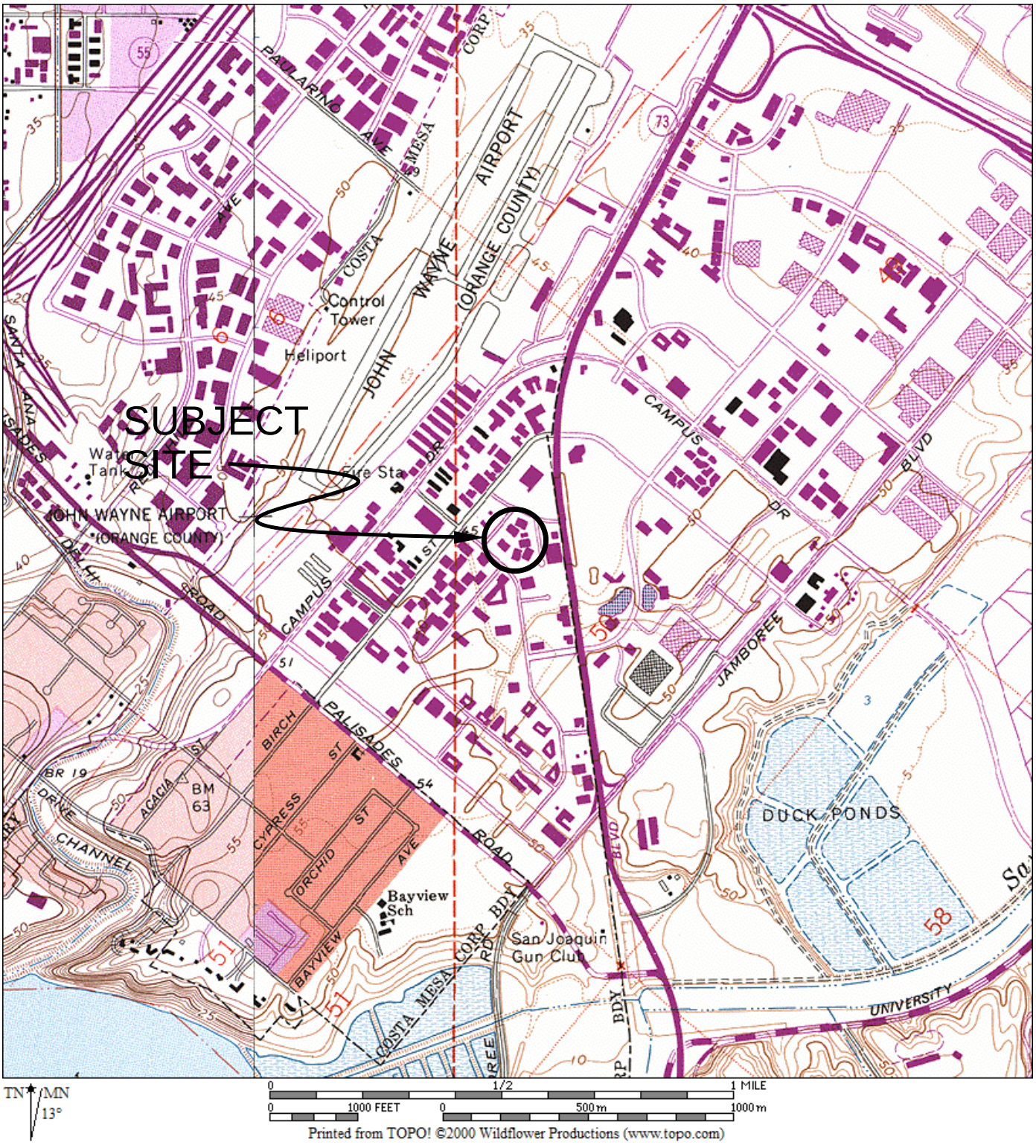

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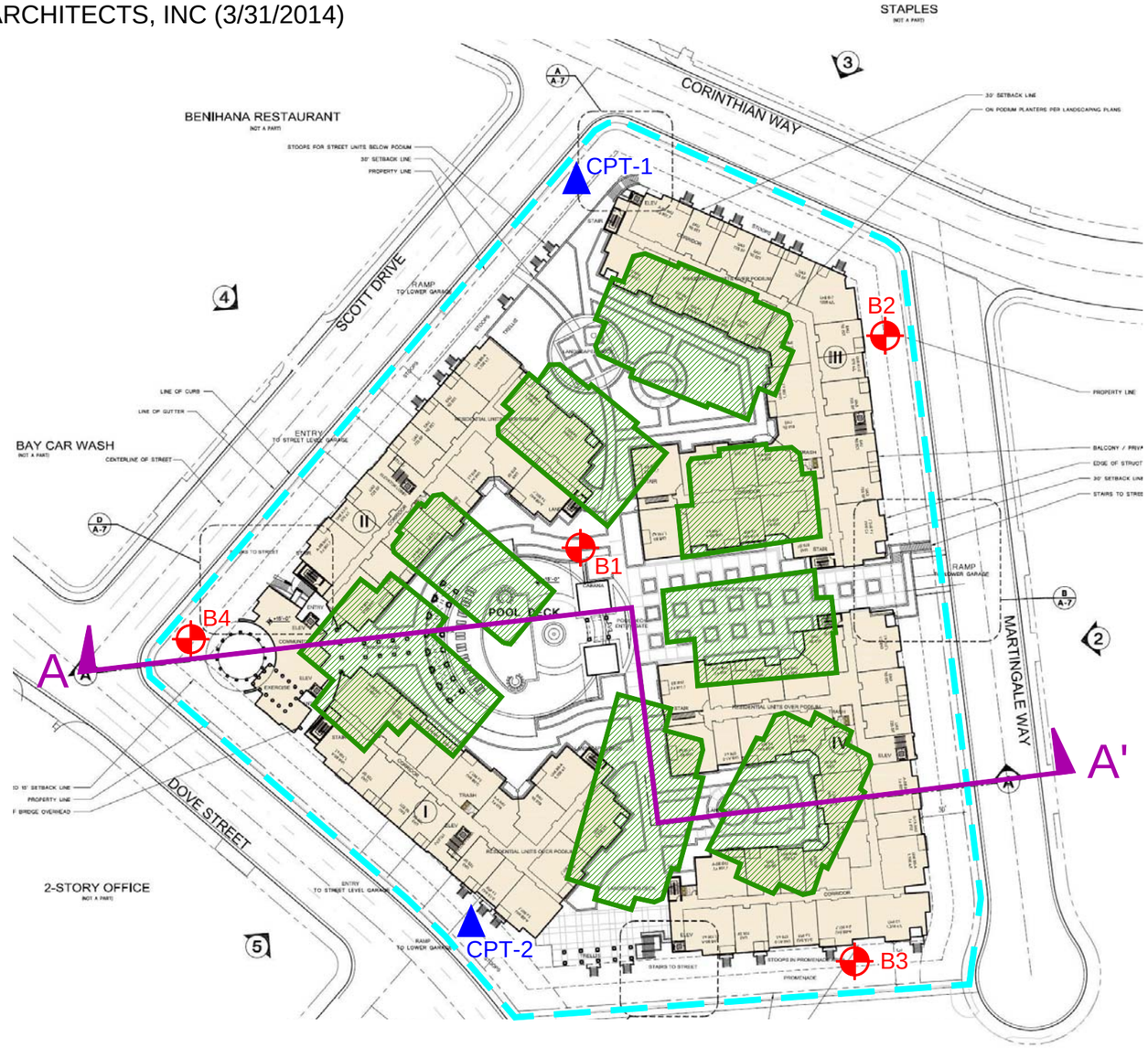
VICINITY MAP

MAC ARTHUR SQUARE

5.6 ACRE AREA BOUNDED BY DOVE STREET,
SCOTT DRIVE, CORINTHIAN WAY, AND MARTINGALE WAY
NEWPORT BEACH, CALIFORNIA

JUNE 12, 2014	PROJECT NO. A9138-06-01	FIG. 1

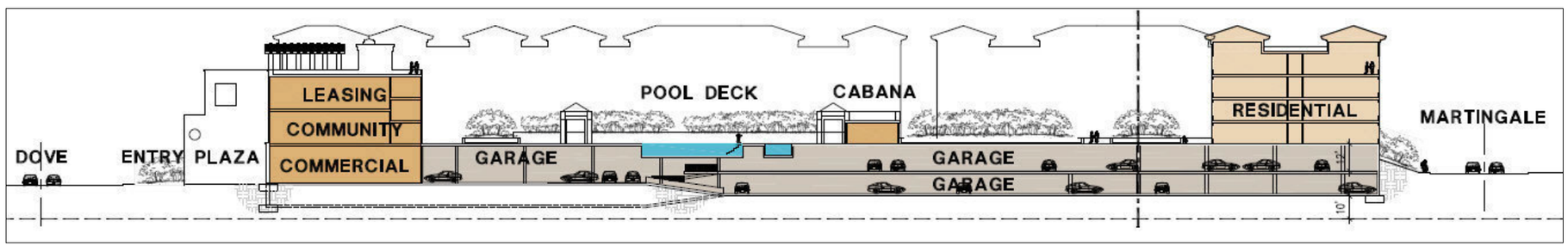
PLAN BY: ARK ARCHITECTS, INC (3/31/2014)



LEGEND

- B4 — Approximate Location of Boring
- CPT-2 — Approximate Location of CPT
- Approximate Limits of Proposed Development
- Approximate Location of Existing Structures

0 100' 200'



SECTION A-A'

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SITE PLAN

MAC ARTHUR SQUARE

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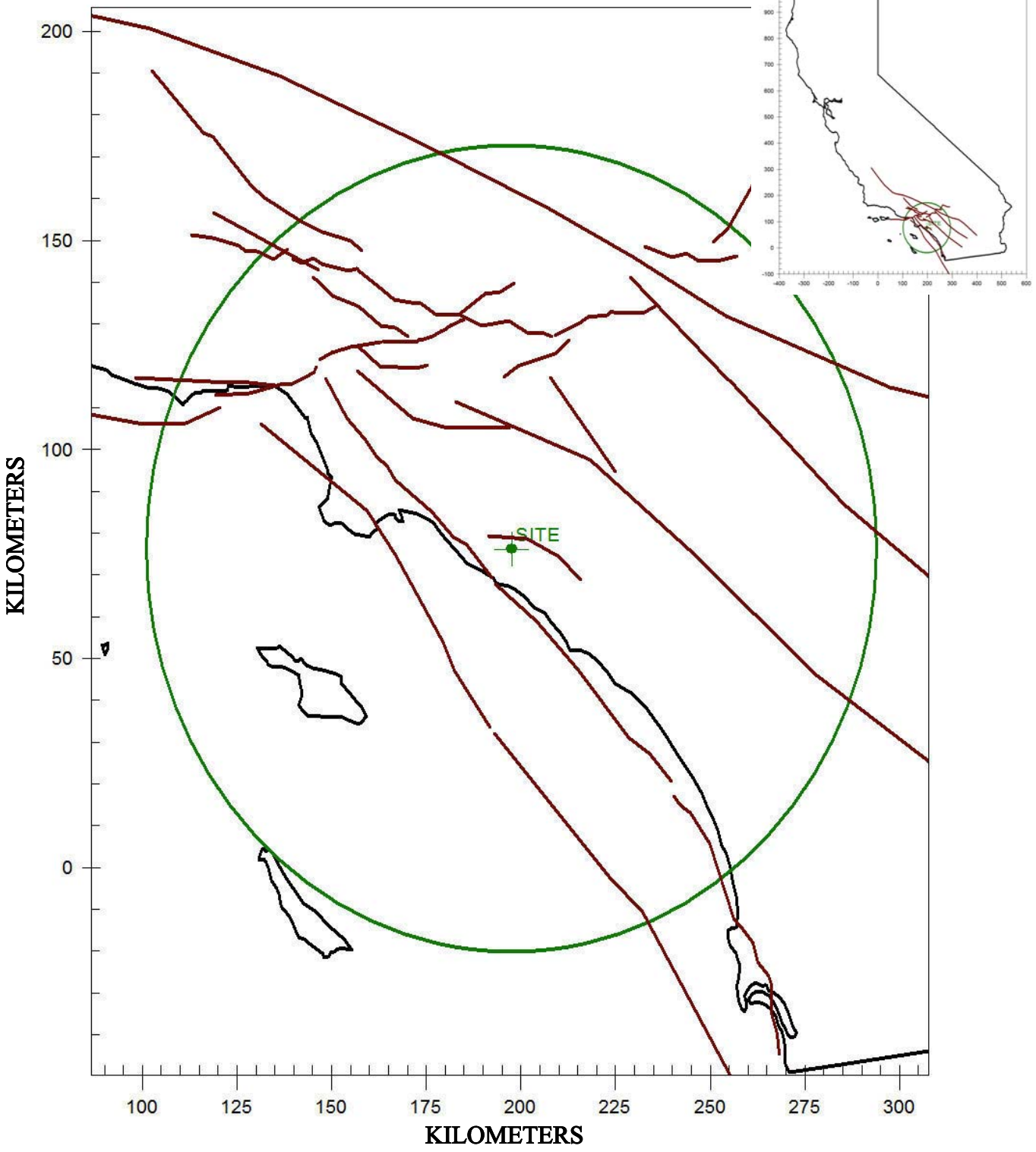
SCOTT DRIVE, CORINTHIAN WAY, AND MARTINGALE WAY
NEWPORT BEACH, CALIFORNIA

JUNE 12, 2014	PROJECT NO. A9138-06-01	FIG. 2

SITE LATITUDE: 33.6660
SITE LONGITUDE: -117.8660



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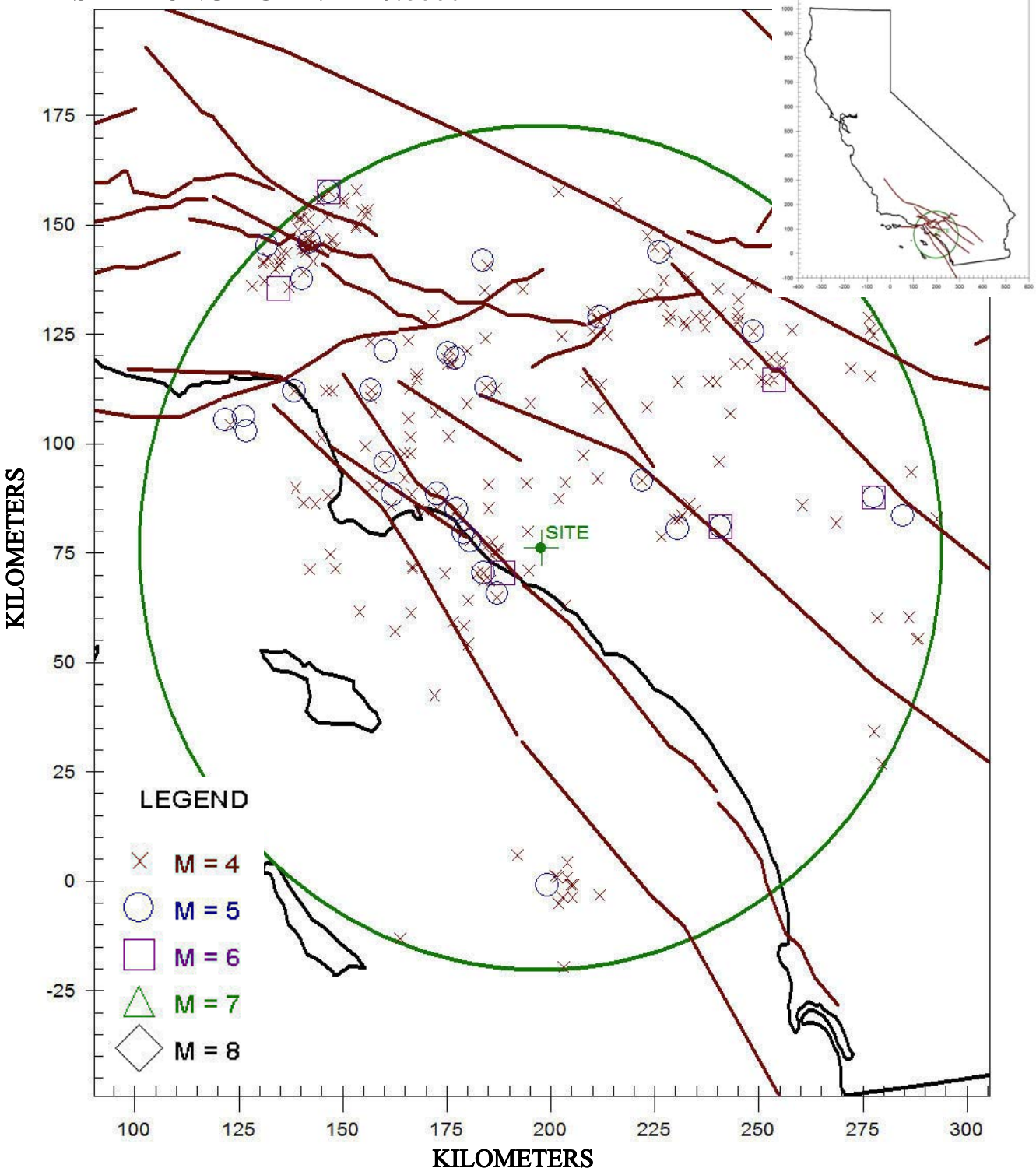
REGIONAL FAULT MAP

MAC ARTHUR SQUARE

5.6 ACRE AREA BOUNDED BY DOVE STREET,
SCOTT DRIVE, CORINTHIAN WAY, AND MARTINGALE WAY
NEWPORT BEACH, CALIFORNIA

JUNE 12, 2014	PROJECT NO. A9138-06-01	FIG. 3

SITE LATITUDE: 33.6660
SITE LONGITUDE: -117.8660



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REGIONAL SEISMICITY MAP

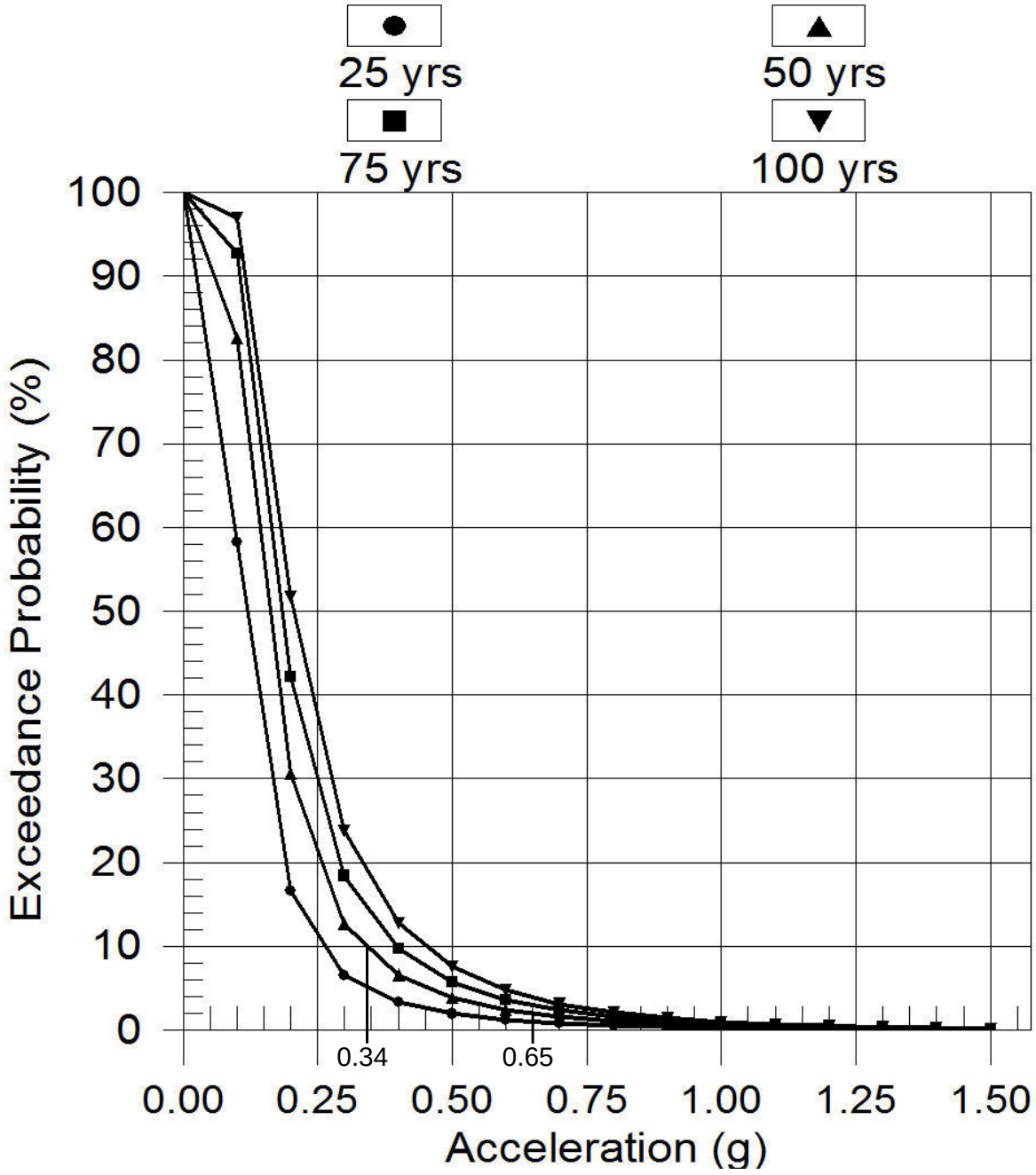
MAC ARTHUR SQUARE

5.6 ACRE AREA BOUNDED BY DOVE STREET,
SCOTT DRIVE, CORINTHIAN WAY, AND MARTINGALE WAY
NEWPORT BEACH, CALIFORNIA

JUNE 12, 2014	PROJECT NO. A9138-06-01	FIG. 4

PROBABILITY OF EXCEEDANCE

SADIGH ET AL. (1997) DEEP SOIL 1



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PROBABILITY OF EXCEEDANCE

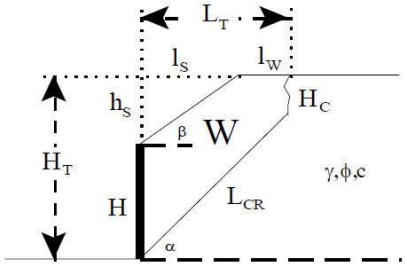
MAC ARTHUR SQUARE
5.6 ACRE AREA BOUNDED BY DOVE STREET,
SCOTT DRIVE, CORINTHIAN WAY, AND MARTINGALE WAY
NEWPORT BEACH, CALIFORNIA

JUNE 12, 2014	PROJECT NO. A9138-06-01	FIG. 5

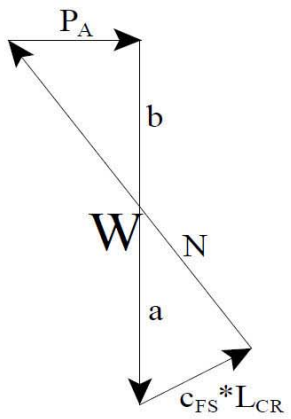
Retaining Wall Design with Transitioned Backfill
(Vector Analysis)

Input:

Retaining Wall Height	(H)	12.00 feet
Slope Angle of Backfill	(β)	0.0 degrees
Height of Slope above Wall	(h_s)	0.0 feet
Horizontal Length of Slope	(l_s)	0.0 feet
Total Height (Wall + Slope)	(H_T)	12.0 feet
Unit Weight of Retained Soils	(γ)	125.0 pcf
Friction Angle of Retained Soils	(ϕ)	27.0 degrees
Cohesion of Retained Soils	(c)	830.0 psf
Factor of Safety	(FS)	1.50
Factored Parameters:	(ϕ_{FS})	18.8 degrees
	(c_{FS})	553.3 psf



Failure Angle (α) degrees	Height of Tension Crack (H_C) feet	Area of Wedge (A) $feet^2$	Weight of Wedge (W) lbs/lineal foot	Length of Failure Plane (L_{CR}) feet	a lbs/lineal foot	b lbs/lineal foot	Active Pressure (P_A) lbs/lineal foot
45	13.4	-18	-2220.4	-2.0	-2342.5	122.1	60.2
46	13.2	-14	-1783.9	-1.6	-1867.0	83.1	42.8
47	13.0	-11	-1427.2	-1.3	-1483.1	55.9	30.0
48	12.8	-9	-1138.3	-1.1	-1175.7	37.3	20.9
49	12.7	-7	-907.6	-0.9	-932.5	24.9	14.5
50	12.6	-6	-726.9	-0.7	-743.6	16.7	10.1
51	12.5	-5	-589.5	-0.6	-601.0	11.4	7.2
52	12.4	-4	-489.9	-0.5	-498.2	8.2	5.4
53	12.4	-3	-423.5	-0.5	-429.9	6.4	4.4
54	12.4	-3	-386.3	-0.4	-391.8	5.5	3.9
55	12.4	-3	-375.2	-0.4	-380.6	5.4	4.0
56	12.4	-3	-387.4	-0.5	-393.4	6.0	4.5
57	12.4	-3	-420.7	-0.5	-428.0	7.3	5.8
58	12.5	-4	-473.3	-0.6	-482.9	9.5	7.8
59	12.6	-4	-543.7	-0.7	-556.7	13.0	11.0
60	12.7	-5	-630.8	-0.8	-648.8	18.0	15.8
61	12.9	-6	-733.5	-1.0	-758.6	25.1	22.8
62	13.0	-7	-851.3	-1.2	-886.1	34.8	32.7
63	13.2	-8	-983.8	-1.4	-1031.5	47.7	46.4
64	13.5	-9	-1130.7	-1.6	-1195.4	64.6	65.2
65	13.7	-10	-1292.2	-1.9	-1378.7	86.5	90.3
66	14.0	-12	-1468.5	-2.2	-1582.7	114.2	123.5
67	14.4	-13	-1660.2	-2.6	-1809.3	149.2	167.1
68	14.8	-15	-1868.1	-3.0	-2060.8	192.7	223.5
69	15.2	-17	-2093.4	-3.4	-2339.9	246.4	296.2
70	15.7	-19	-2337.7	-3.9	-2650.3	312.5	389.2



Design Equations (Vector Analysis):

$a = c_{FS}*L_{CR}*\sin(90+\phi_{FS})/\sin(\alpha-\phi_{FS})$

$b = W-a$

$P_A = b*\tan(\alpha-\phi_{FS})$

$EFP = 2*P_A/H^2$

Maximum Active Pressure Resultant

$P_{A,\,max}$ 389.21 lbs/lineal foot

Equivalent Fluid Pressure (per lineal foot of wall)

$EFP = 2*P_A/H^2$

EFP	5.4 pcf	20.7 pcf
Design Wall for an Equivalent Fluid Pressure:	**30 pcf**	**50 pcf**
	Active	At-Rest

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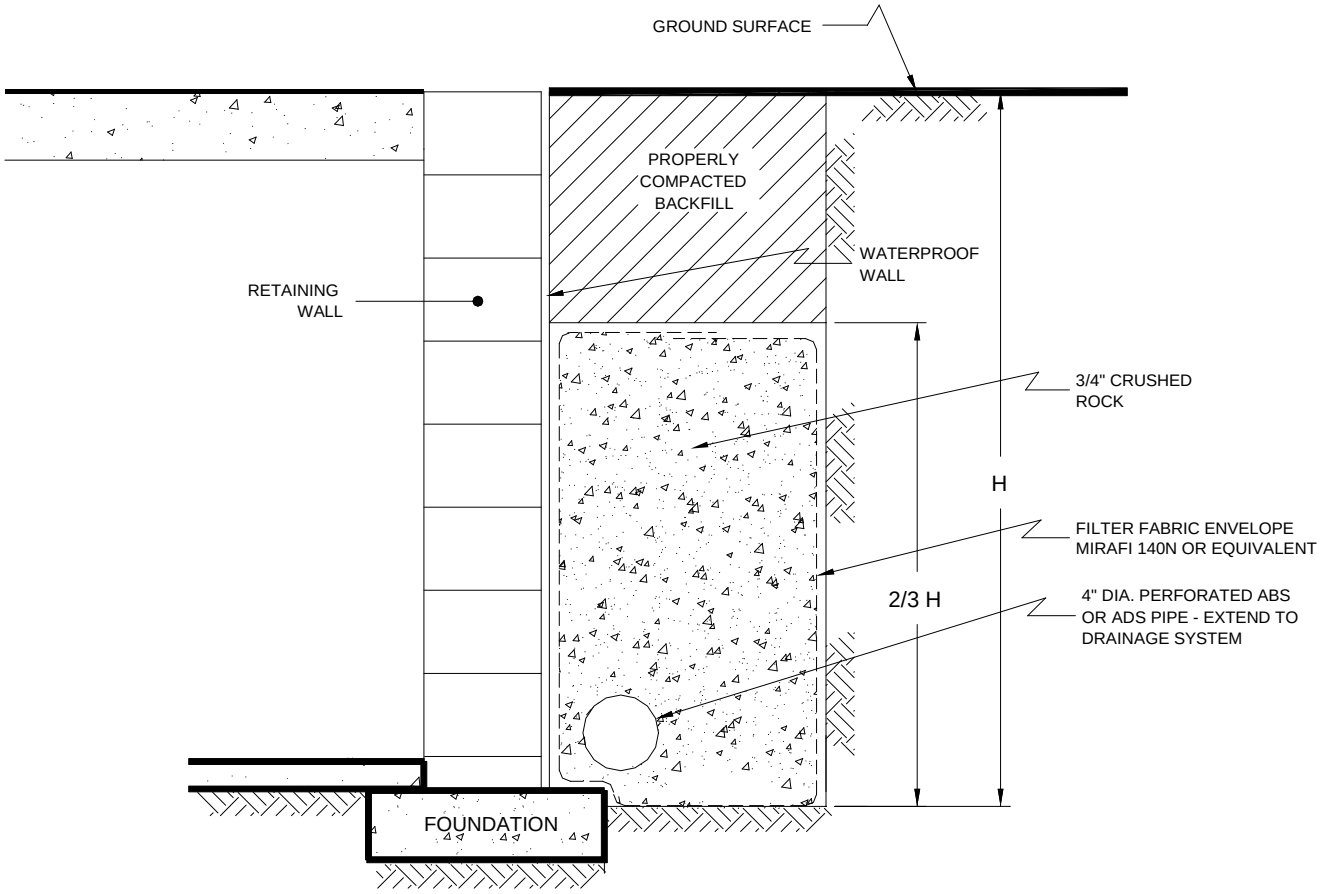
RETAINING WALL PRESSURE CALCULATION

MAC ARTHUR SQUARE
5.6 ACRE AREA BOUNDED BY DOVE STREET,
SCOTT DRIVE, CORINTHIAN WAY, AND MARTINGALE WAY
NEWPORT BEACH, CALIFORNIA

JUNE 12, 2014	PROJECT NO. A9138-06-01	FIG. 6



NO SCALE

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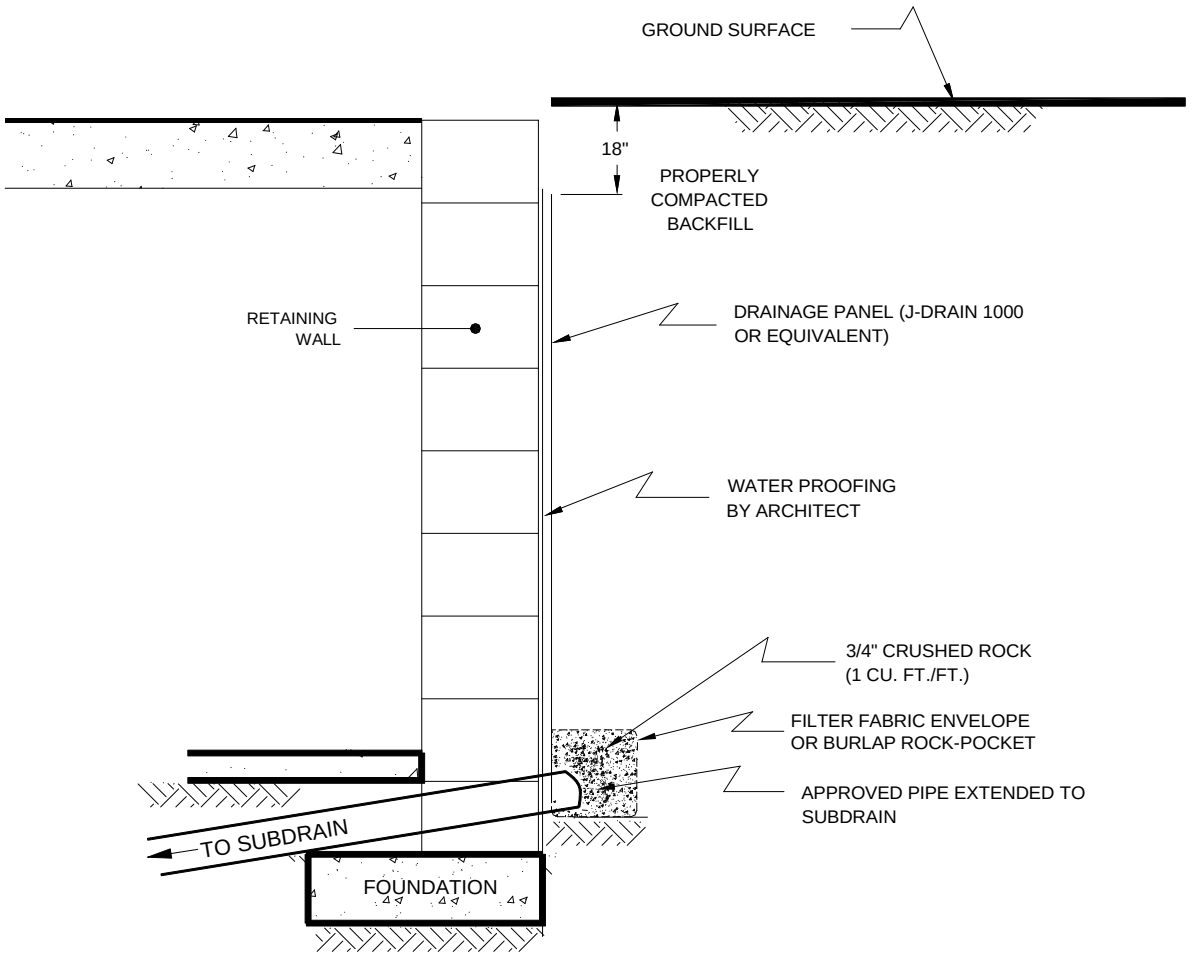
RETAINING WALL DRAIN DETAIL

MAC ARTHUR SQUARE

5.6 ACRE AREA BOUNDED BY DOVE STREET,
SCOTT DRIVE, CORINTHIAN WAY, AND MARTINGALE WAY
NEWPORT BEACH, CALIFORNIA

JUNE 12, 2014	PROJECT NO. A9138-06-01	FIG. 7



NO SCALE

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RETAINING WALL DRAIN DETAIL

MAC ARTHUR SQUARE

5.6 ACRE AREA BOUNDED BY DOVE STREET,
SCOTT DRIVE, CORINTHIAN WAY, AND MARTINGALE WAY
NEWPORT BEACH, CALIFORNIA

JUNE 12, 2014	PROJECT NO. A9138-06-01	FIG. 8

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TABLE 1

FAULTS WITHIN 60 MILES OF THE SITE

DETERMINISTIC SITE PARAMETERS

ABBREVIATED FAULT NAME	APPROXIMATE DISTANCE mi (km)	ESTIMATED MAX. EARTHQUAKE EVENT MAXIMUM EARTHQUAKE MAG.(Mw)	PEAK SITE ACCEL. g	EST. SITE INTENSITY MOD.MERC.
SAN JOAQUIN HILLS	1.8(2.9)	6.6	0.934	XI
NEWPORT-INGLEWOOD (L.A.Basin)	5.2(8.4)	7.1	0.533	X
NEWPORT-INGLEWOOD (Offshore)	5.9(9.5)	7.1	0.504	X
PALOS VERDES	16.8(27.1)	7.3	0.276	IX
WHITTIER	17.0(27.4)	6.8	0.217	VIII
PUENTE HILLS BLIND THRUST	18.3(29.4)	7.1	0.298	IX
ELSINORE (GLEN IVY)	18.5(29.8)	6.8	0.200	VIII
CHINO-CENTRAL AVE. (Elsinore)	18.5(29.8)	6.7	0.245	IX
SAN JOSE	25.8(41.5)	6.4	0.144	VIII
CORONADO BANK	27.7(44.6)	7.6	0.207	VIII
ELSINORE (TEMECULA)	29.8(48.0)	6.8	0.118	VII
UPPER ELYSIAN PARK BLIND THRUST	30.9(49.8)	6.4	0.115	VII
SIERRA MADRE	32.2(51.9)	7.2	0.177	VIII
CUCAMONGA	32.7(52.6)	6.9	0.144	VIII
RAYMOND	34.3(55.2)	6.5	0.108	VII
VERDUGO	36.2(58.2)	6.9	0.127	VIII
CLAMSHELL-SAWPIT	36.2(58.2)	6.5	0.101	VII
HOLLYWOOD	37.7(60.6)	6.4	0.089	VII
SANTA MONICA	41.9(67.5)	6.6	0.088	VII
SAN JACINTO-SAN BERNARDINO	42.8(68.8)	6.7	0.071	VI
SAN JACINTO-SAN JACINTO VALLEY	43.7(70.4)	6.9	0.078	VII
ROSE CANYON	45.4(73.0)	7.2	0.092	VII
MALIBU COAST	45.9(73.8)	6.7	0.083	VII
SAN ANDREAS - SB-Coach. M-2b	47.7(76.8)	7.7	0.123	VII
SAN ANDREAS - SB-Coach. M-1b-2	47.7(76.8)	7.7	0.123	VII
SAN ANDREAS - San Bernardino M-1	47.7(76.8)	7.5	0.107	VII
SAN ANDREAS - Whole M-1a	47.7(76.8)	8.0	0.150	VIII
SAN ANDREAS - Mojave M-1c-3	48.0(77.2)	7.4	0.099	VII
SAN ANDREAS - Cho-Moj M-1b-1	48.0(77.2)	7.8	0.131	VIII
SAN ANDREAS - 1857 Rupture M-2a	48.0(77.2)	7.8	0.131	VIII
SIERRA MADRE (San Fernando)	49.0(78.8)	6.7	0.076	VII
CLEGHORN	50.2(80.8)	6.5	0.050	VI
NORTHRIDGE (E. Oak Ridge)	50.4(81.1)	7.0	0.088	VII
SAN GABRIEL	51.0(82.0)	7.2	0.079	VII
ANACAPA-DUME	52.5(84.5)	7.5	0.122	VII
ELSINORE (JULIAN)	52.9(85.2)	7.1	0.070	VI
SAN JACINTO-ANZA	54.8(88.2)	7.2	0.072	VI
NORTH FRONTAL FAULT ZONE (West)	55.7(89.7)	7.2	0.090	VII
SANTA SUSANA	58.1(93.5)	6.7	0.060	VI

39 FAULTS FOUND WITHIN THE SPECIFIED SEARCH RADIUS.

THE SAN JOAQUIN HILLS FAULT IS CLOSEST TO THE SITE.
IT IS ABOUT 1.8 MILES (2.9 km) AWAY.

LARGEST MAXIMUM-EARTHQUAKE SITE ACCELERATION: 0.9336 g

APPENDIX A

FIELD INVESTIGATION

The site was explored on May 15, 2014 by drilling four 8-inch diameter borings utilizing a truck-mounted hollow-stem auger drilling machine. The borings were drilled to depths between 10½ and 30½ feet below the existing ground surface. The approximate locations of the explorations are depicted on the Site Plans (see Figure 2).

The soil conditions encountered in the boring were visually examined, classified and logged in general accordance with the Unified Soil Classification System (USCS). The logs of the borings are presented on Figures A1 through A4. The logs depict the soil and geologic conditions encountered and the depth at which samples were obtained.

In addition, two Cone Penetrometer Tests (CPT) were advanced by Kehoe Testing and Engineering to depths of 50½ feet below the existing ground surface. Logs of the CPT soundings are presented as Figures A5 and A6.

PROJECT NO.

BORING 1

ELEV. (MSL.) - - DATE COMPLETED **5/15/14**

EQUIPMENT **HOLLOW STEM AUGER** BY: **PZ**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT)*	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0								
2	B1@2'				**ASPHALT: 3" BASE: 4"** **ARTIFICIAL FILL** Silty Sand/Sandy Silt, medium dense to stiff, slightly moist, reddish brown, fine- to medium-grained, trace fine gravel, some clay	35	125.3	6.5
4								
6	B1@5'				**MARINE TERRACE DEPOSITS** Sandy Silt, stiff, slightly moist, yellowish brown, fine- to medium-grained, some clay	27	121.7	8.4
				ML	-Loose, increase in medium-grained with some coarse-grained, decrease in silt content			
8	B1@7'					11	103.7	2.4
10	B1@10'				Silt with Sand, stiff, slightly moist, yellowish brown, very fine- to fine-grained	24	115.1	8.9
12	BULK 10-15'							
	B1@12'					25	115.7	9.4
14				ML				
16	B1@15'				-Slightly porous	35	115.2	11.2
18	B1@18'				Clay with Sand, stiff, slightly moist, olive brown with oxidation mottles, very fine- to fine-grained, some silt, trace fine gravel, moderate plasticity	25	111.3	10.5
20	B1@20'					39	111.4	12.2
				CL				
22	B1@22'					27	107.2	13.7
24					-Increase in silt content			
	B1@25'					23	108.0	13.6
26					Sandy Silt, stiff, moist, olive brown with oxidation mottles, very fine- to fine-grained			
	B1@27'			ML		33	111.6	14.2
28					-Increase in sand content			
			▼	SP-SM	Sand with Silt, poorly graded, medium dense, wet, olive brown to yellowish			

A9138-06-01 BORING LOGS.GPJ

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

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

⊠ ... DISTURBED OR BAG SAMPLE ◥ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO.

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**BORING 1** ELEV. (MSL.) - - DATE COMPLETED **5/15/14** EQUIPMENT **HOLLOW STEM AUGER** BY: **PZ**	PENETRATION RESISTANCE (BLOWS/FT)*	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
30	B1@30'				brown, fine- to medium-grained	27	104.2	11.8
					Total depth of boring: 30.5 feet. Fill to 4 feet. Groundwater encountered at 30 feet. Backfilled with soil cuttings and tamped. Asphalt patched. *Penetration resistance for 140 pound hammer falling 30 inches by auto hammer.			

A9138-06-01 BORING LOGS.GPJ

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

SAMPLE SYMBOLS

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

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

GEOCON

PROJECT NO.

BORING 2

ELEV. (MSL.) - - DATE COMPLETED **5/15/14**

EQUIPMENT **HOLLOW STEM AUGER** BY: **PZ**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT)*	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0	BULK 0-5				**ASPHALT: 4" BASE: 3"** **ARTIFICIAL FILL** Clayey Sand/Sandy Clay, firm, slightly moist, dark brown, fine-grained, moderate plasticity			
2	B2@2'					27	119.9	5.9
4	B2@4'			ML	**MARINE TERRACE DEPOSITS** Sandy Silt, firm, slight moist, reddish brown, fine-grained with trace coarse-grained, slighty porous, trace clay -Increase in silt content, stiff -Yellowish brown, very fine- to fine-grained, trace clay	23	120.8	7.2
6	B2@6'					19	124.0	8.9
8	B2@8'			SM	Silty Sand, loose, slightly moist, yellowish brown, fine- to medium-grained with trace coarse-grained -Decrease in silt content	12	102.0	3.3
10	B2@10'				Total depth of boring: 10.5 feet. Fill to 1.5 feet. Fabric material encountered within asphalt. No groundwater encountered. Percolation testing performed. Backfilled with soil cuttings and tamped. Asphalt patched.	17	103.0	2.2

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

A9138-06-01 BORING LOGS.GPJ

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

SAMPLE SYMBOLS

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

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

GEOCON

PROJECT NO.

BORING 3

ELEV. (MSL.) - - DATE COMPLETED **5/15/14**

EQUIPMENT **HOLLOW STEM AUGER** BY: **PZ**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT)*	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**ASPHALT: 4" BASE: 6"**			
					ARTIFICIAL FILL			
2					Clayey Sand, firm, slightly moist, olive brown, fine- to medium-grained			
				ML	**MARINE TERRACE DEPOSITS**			
					Sandy Silt, firm, slightly moist, yellowish brown, fine-grained			
4					-Decrease in silt content			
				SM	Silty Sand, loose, slightly moist, yellowish brown, very fine- to fine-grained			
	B3@5'					10	100.5	2.7
6					Silt with Sand, firm, slightly moist, olive brown, very fine- to fine-grained			
8					-Increase in sand content, stiff			
10	B3@10'			ML		29	114.5	6.0
	BULK 10-15'				-Decrease in sand content			
12	B3@12'				-Slightly porous, trace clay, oxidation mottles	26	111.2	12.8
14								
	B3@15'				-Trace fine gravel, stiff	32	106.6	15.4
16								
					Clay with Sand, firm, slightly moist, olive brown, very fine- to fine-grained, some silt, moderate plasticity			
18	B3@18'					19	115.4	9.3
20	B3@20'				-Trace fine gravel	22	108.8	13.9
					-Decrease in sand content			
22	B3@22'					25	100.9	16.3
				CL				
24								
	B3@25'				-Moderate to high plasticity	21	103.7	15.0
26								
	B3@27'				-Increase in silt content, firm	16	107.8	15.4
28								

A9138-06-01 BORING LOGS.GPJ

Figure A3,
Log of Boring 3, Page 1 of 2

SAMPLE SYMBOLS

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

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

GEOCON

PROJECT NO.

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**BORING 3** ELEV. (MSL.) - - DATE COMPLETED **5/15/14** EQUIPMENT **HOLLOW STEM AUGER** BY: **PZ**	PENETRATION RESISTANCE (BLOWS/FT)*	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
30	B3@30'					20	103.6	16.3

Total depth of boring: 30.5 feet.
Fill to 1.5 feet.
No groundwater encountered.
Backfilled with soil cuttings and tamped.
Asphalt patched.

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

A9138-06-01 BORING LOGS.GPJ

Figure A3,
Log of Boring 3, Page 2 of 2

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◥ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

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

GEOCON

PROJECT NO.

BORING 4

ELEV. (MSL.) - - DATE COMPLETED **5/15/14**

EQUIPMENT **HOLLOW STEM AUGER** BY: **PZ**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT)*	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0	BULK 0-5				**ASPHALT:3" BASE: 4"**			
					ARTIFICIAL FILL			
2	B4@2'			CL	Clayey Sand, medium dense, slightly moist, dark brown, fine- to medium-grained with trace coarse-grained, trace fine gravel	19	120.8	11.1
					MARINE TERRACE DEPOSITS			
4	B4@4'				Sandy Clay, firm, slightly moist, yellowish brown, fine-grained	18	112.3	10.6
					-Increase in sand content			
6	B4@6'			SM	Silty Sand, loose, slightly moist, yellowish brown, fine-grained	8	103.1	4.1
					-Increase in silt content			
8	B4@8'				Sandy Silt, firm, slightly moist, olive brown, very fine- to fine-grained	18	107.4	11.1
10	B4@10'				Silt with Sand, firm, slightly moist, yellowish brown, very fine- to fine-grained	14	104.4	11.6
12	B4@12'			ML	-Some clay	19	112.4	11.9
14								
	B4@15'					17	105.2	16.9
16								
18	B4@18'			CL	Clay with Sand, firm, slightly moist, olive brown, very fine- to fine-grained, moderate plasticity	16	101.5	22.3
20	B4@20'					20	107.6	20.1
					Total depth of boring: 20.5 feet. Fill to 1 foot. No groundwater encountered. Backfilled with soil cuttings and tamped. Asphalt patched. *Penetration resistance for 140 pound hammer falling 30 inches by auto hammer.			

A9138-06-01 BORING LOGS.GPJ

Figure A4,
Log of Boring 4, Page 1 of 1

SAMPLE SYMBOLS

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

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

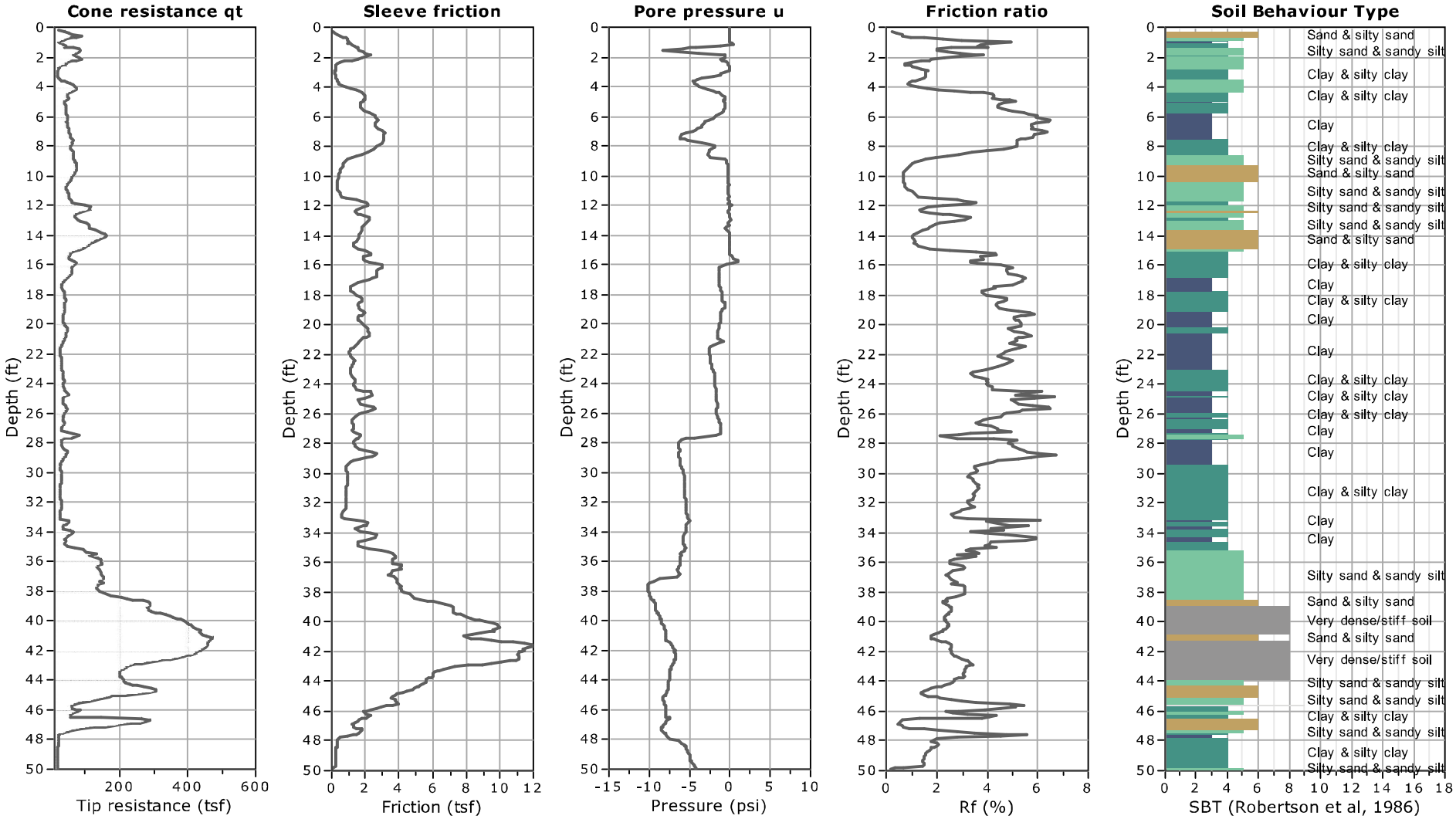
GEOCON

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

CPT: CPT-1

Project: **Geocon West, Inc.**
Location: **4200 Scott Dr. Newport Beach, CA**

Total depth: 50.10 ft, Date: 5/16/2014
Cone Type: Vertek



CPeT-IT v.1.7.6.33 - CPTU data presentation & interpretation software - Report created on: 5/20/2014, 11:44:52 AM
Project file: C:\GeoconNewportBch5-14\CPeT Data\Plot Data\Plots.cpt

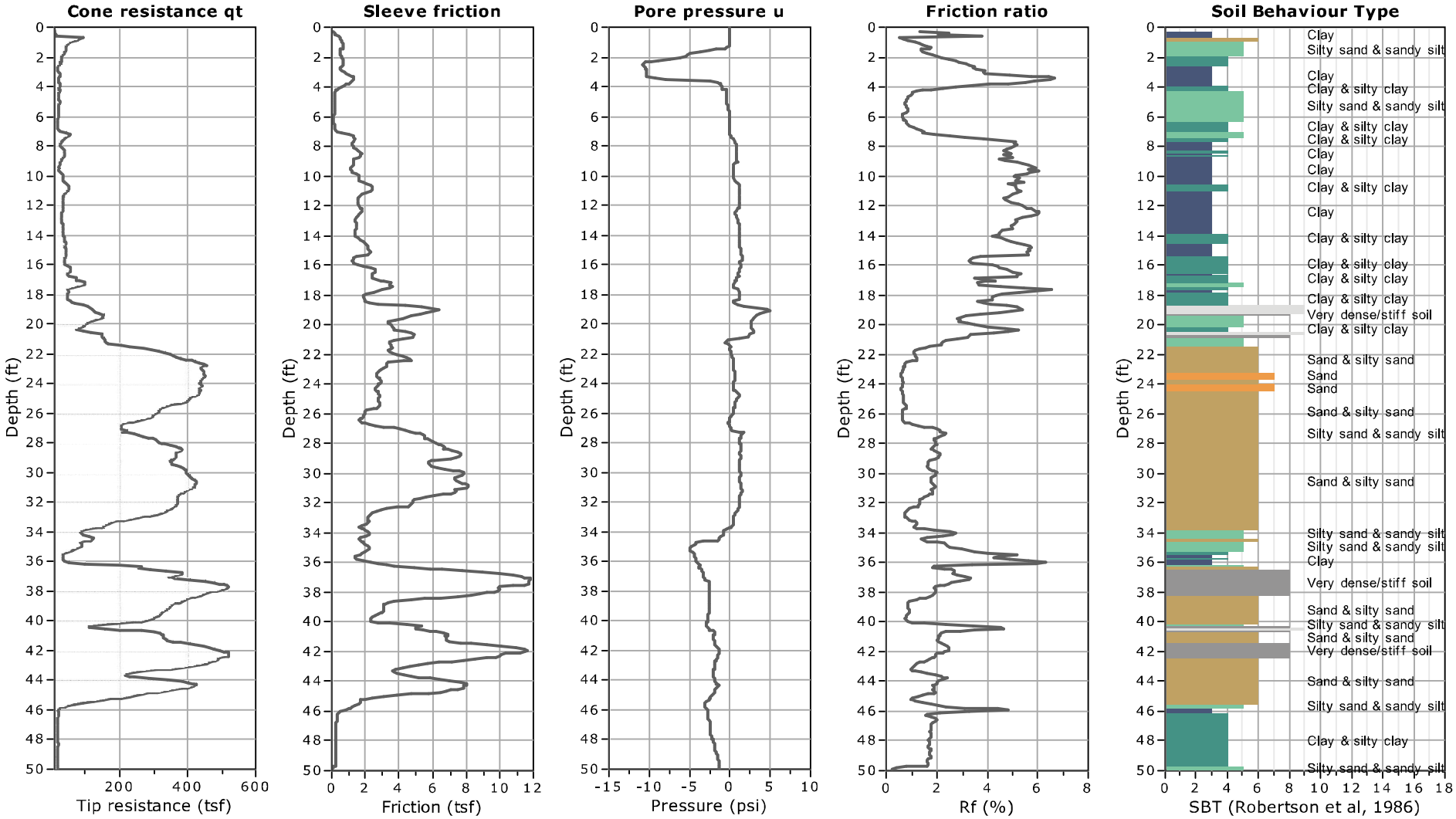
FIG. A5

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

CPT: CPT-2

Project: **Geocon West, Inc.**
Location: **4200 Scott Dr. Newport Beach, CA**

Total depth: 50.05 ft, Date: 5/16/2014
Cone Type: Vertek



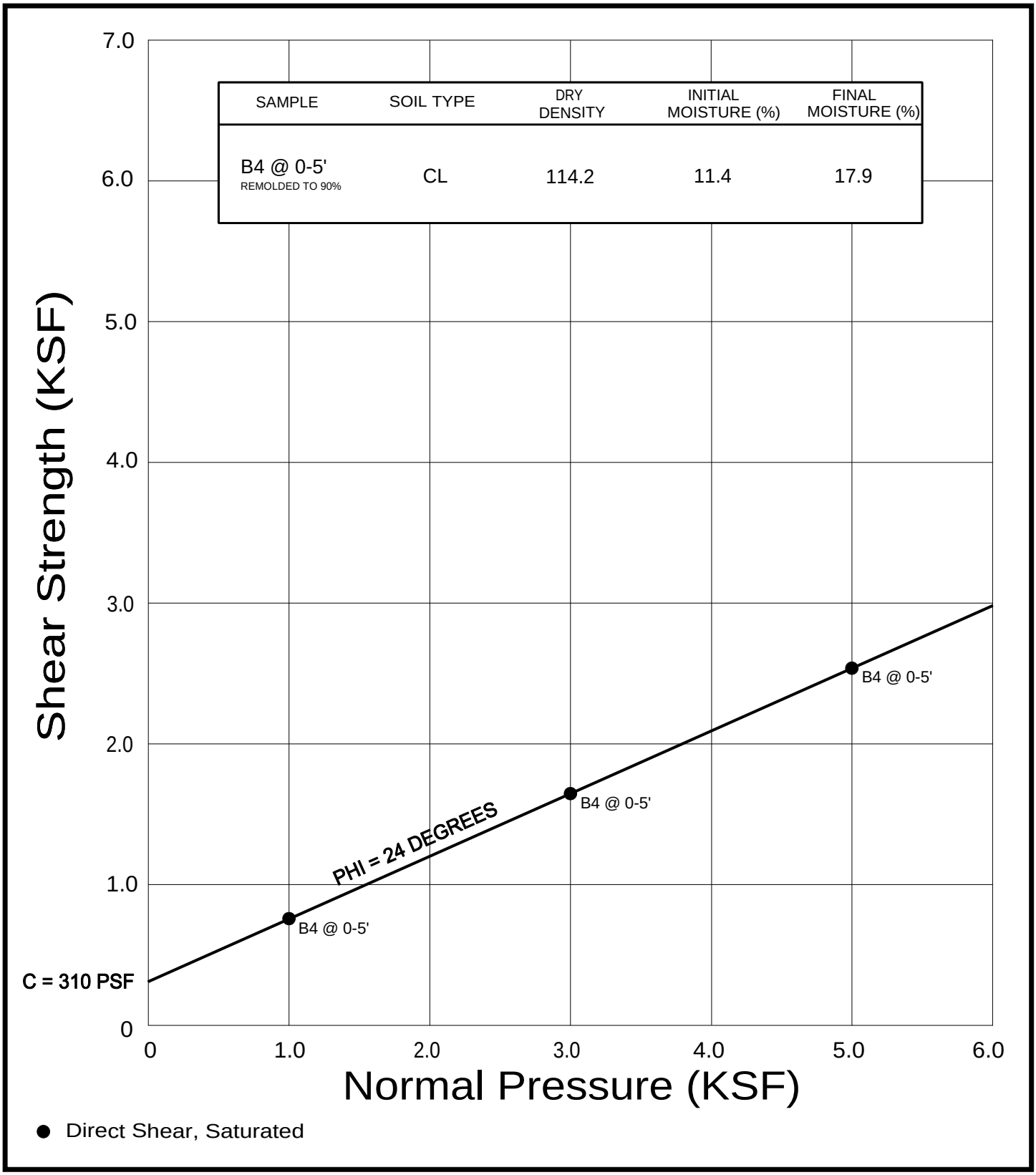
CPeT-IT v.1.7.6.33 - CPTU data presentation & interpretation software - Report created on: 5/20/2014, 11:43:52 AM
Project file: C:\GeoconNewportBch5-14\CPeT Data\Plot Data\Plots.cpt

FIG. A6

APPENDIX B

LABORATORY TESTING

Laboratory tests were performed in accordance with generally accepted test methods of the "American Society for Testing and Materials (ASTM)", or other suggested procedures. Selected samples were tested for direct shear strength, consolidation and expansion characteristics, moisture density relationships, corrosivity, plasticity indices, in-place dry density and moisture content. The results of the laboratory tests are summarized in Figures B1 through B10. The in-place dry density and moisture content of the samples tested are presented in the boring logs, Appendix A.



GEOCON WEST, INC.

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

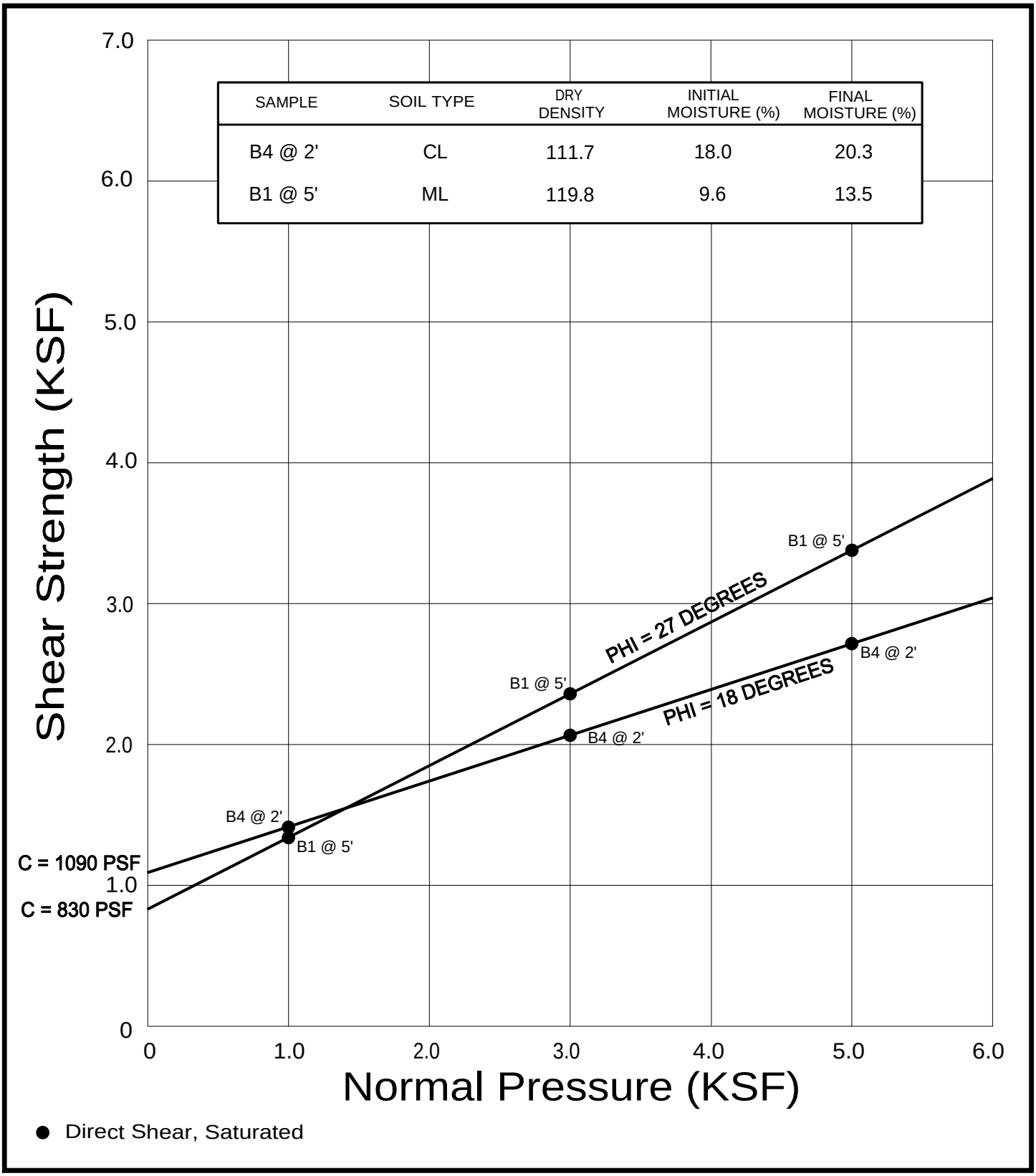
PZ		9000

DIRECT SHEAR TEST RESULTS

MAC ARTHUR SQUARE

5.6 ACRE AREA BOUNDED BY DOVE STREET,
SCOTT DRIVE, CORINTHIAN WAY, AND MARTINGALE WAY
NEWPORT BEACH, CALIFORNIA

JUNE 12, 2014	PROJECT NO. A9138-06-01	FIG. B1



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WEST, INC.

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

PZ		9000

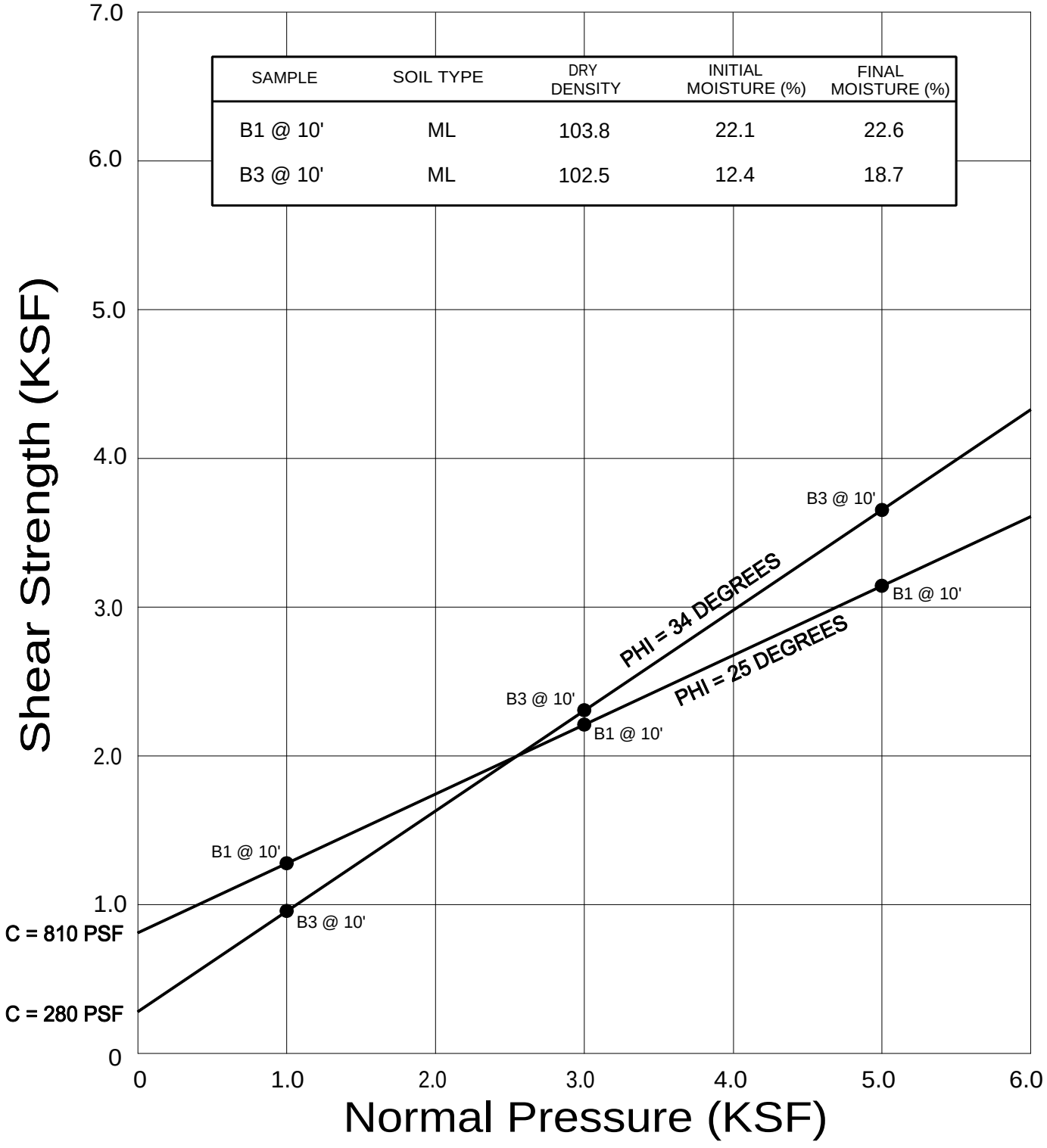
DIRECT SHEAR TEST RESULTS

MAC ARTHUR SQUARE

5.6 ACRE AREA BOUNDED BY DOVE STREET,
SCOTT DRIVE, CORINTHIAN WAY, AND MARTINGALE WAY
NEWPORT BEACH, CALIFORNIA

JUNE 12, 2014	PROJECT NO. A9138-06-01	FIG. B2

SAMPLE	SOIL TYPE	DRY DENSITY	INITIAL MOISTURE (%)	FINAL MOISTURE (%)
B1 @ 10'	ML	103.8	22.1	22.6
B3 @ 10'	ML	102.5	12.4	18.7



● Direct Shear, Saturated

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

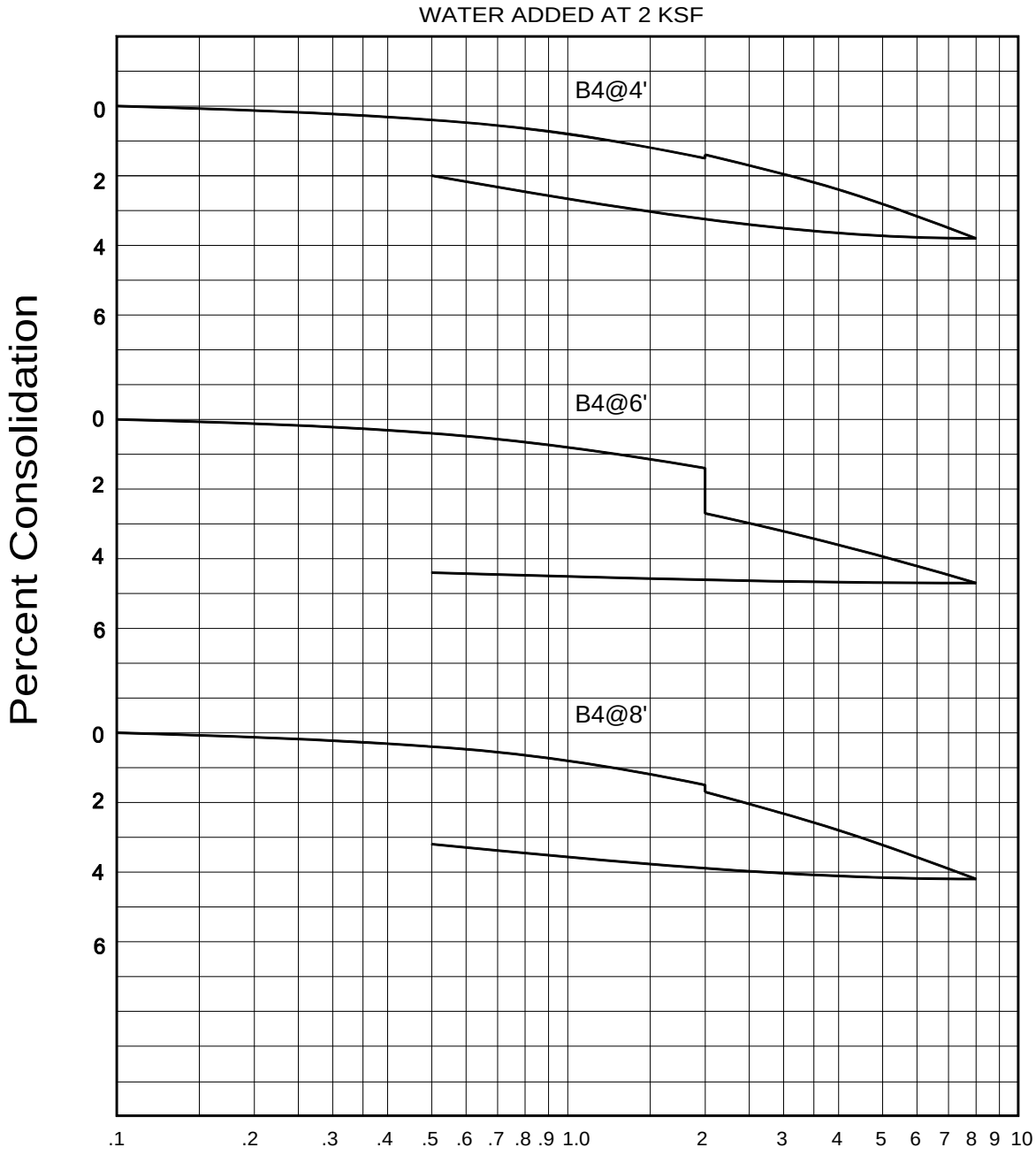
PZ		9000

DIRECT SHEAR TEST RESULTS

MAC ARTHUR SQUARE

5.6 ACRE AREA BOUNDED BY DOVE STREET,
SCOTT DRIVE, CORINTHIAN WAY, AND MARTINGALE WAY
NEWPORT BEACH, CALIFORNIA

JUNE 12, 2014	PROJECT NO. A9138-06-01	FIG. B3



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

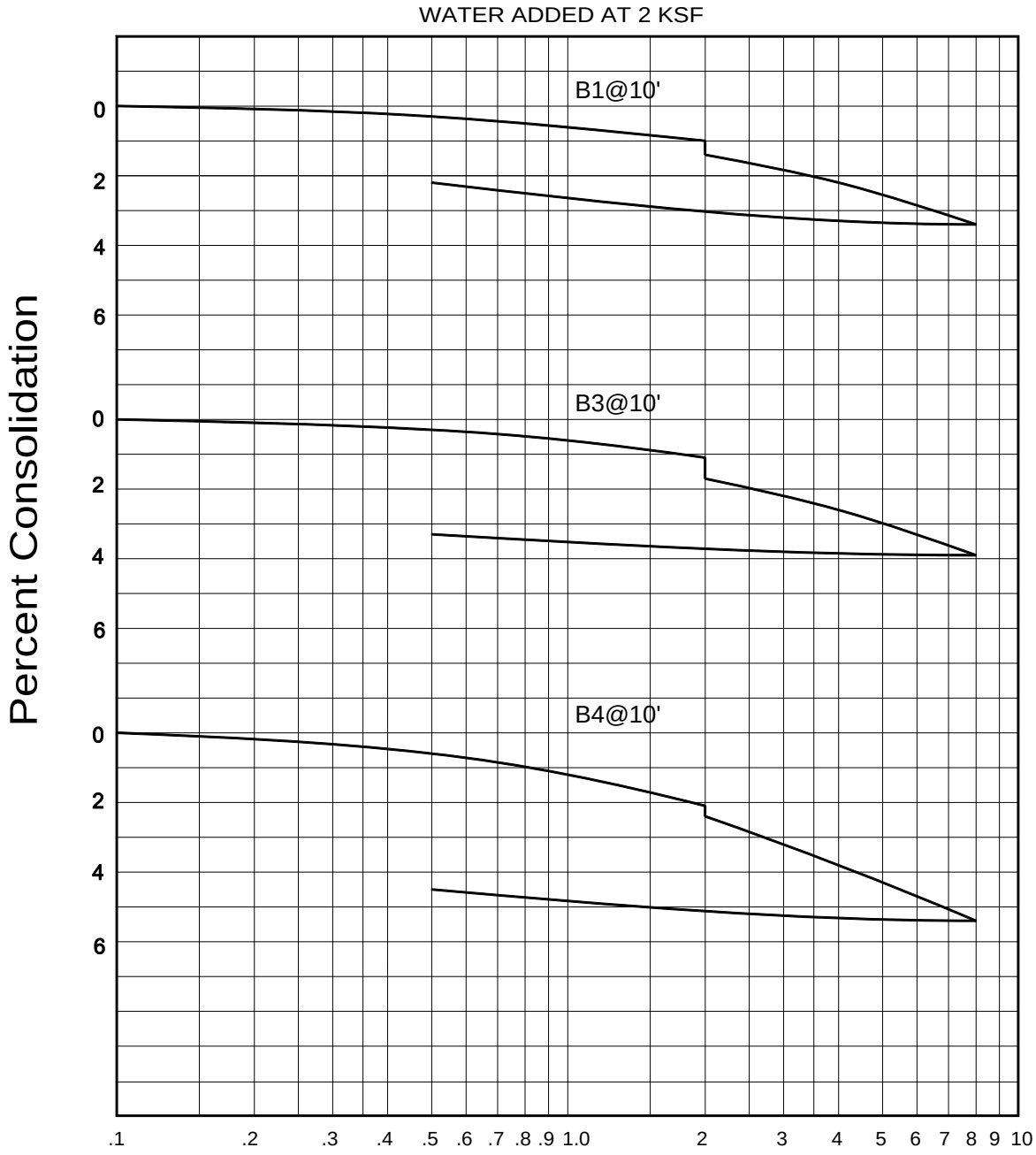
PZ		9000

CONSOLIDATION TEST RESULTS

MAC ARTHUR SQUARE

5.6 ACRE AREA BOUNDED BY DOVE STREET,
SCOTT DRIVE, CORINTHIAN WAY, AND MARTINGALE WAY
NEWPORT BEACH, CALIFORNIA

JUNE 12, 2014	PROJECT NO. A9138-06-01	FIG. B4



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WEST, INC.

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

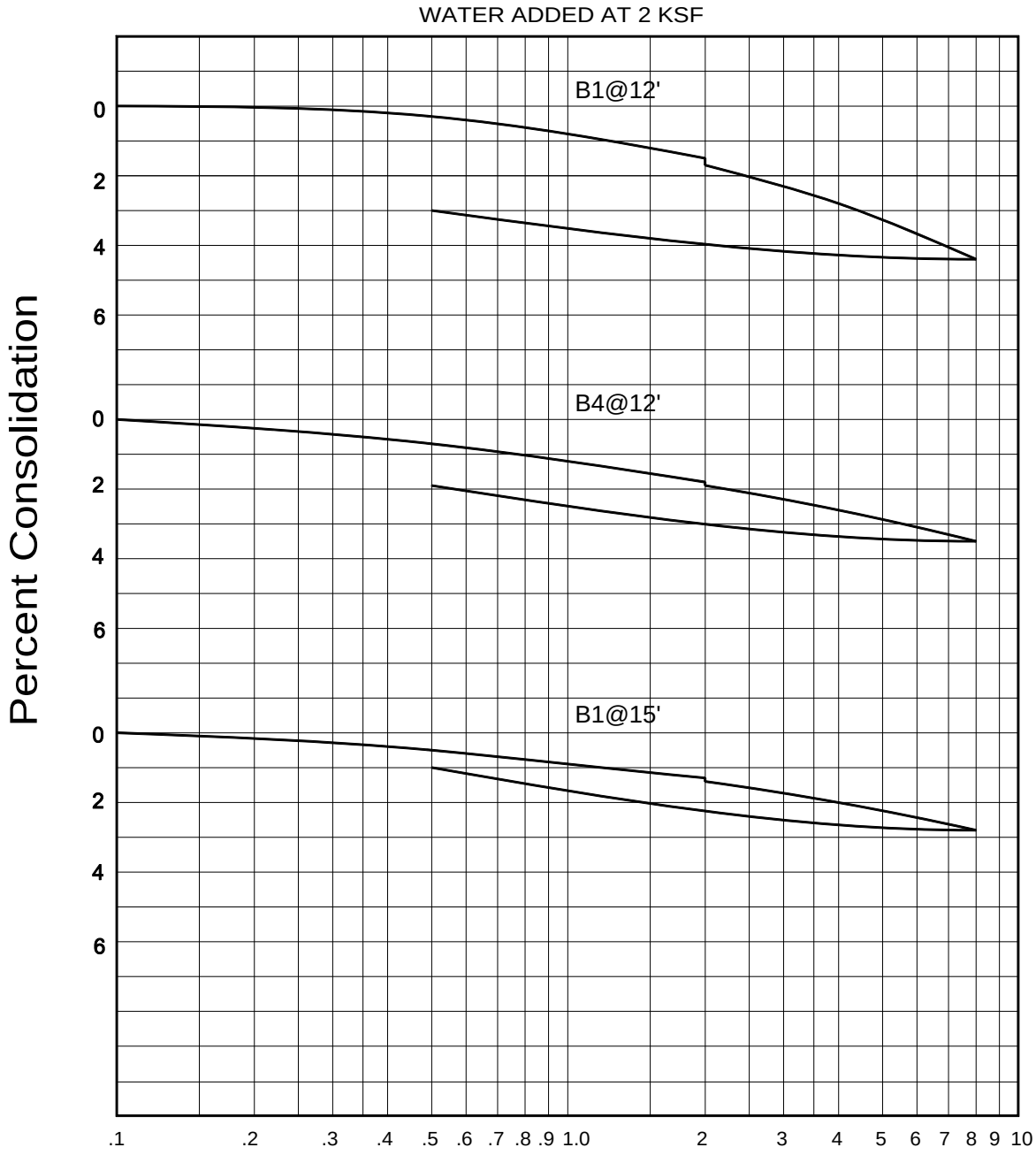
PZ		9000

CONSOLIDATION TEST RESULTS

MAC ARTHUR SQUARE

5.6 ACRE AREA BOUNDED BY DOVE STREET,
SCOTT DRIVE, CORINTHIAN WAY, AND MARTINGALE WAY
NEWPORT BEACH, CALIFORNIA

JUNE 12, 2014	PROJECT NO. A9138-06-01	FIG. B5



GEOCON
WEST, INC.

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

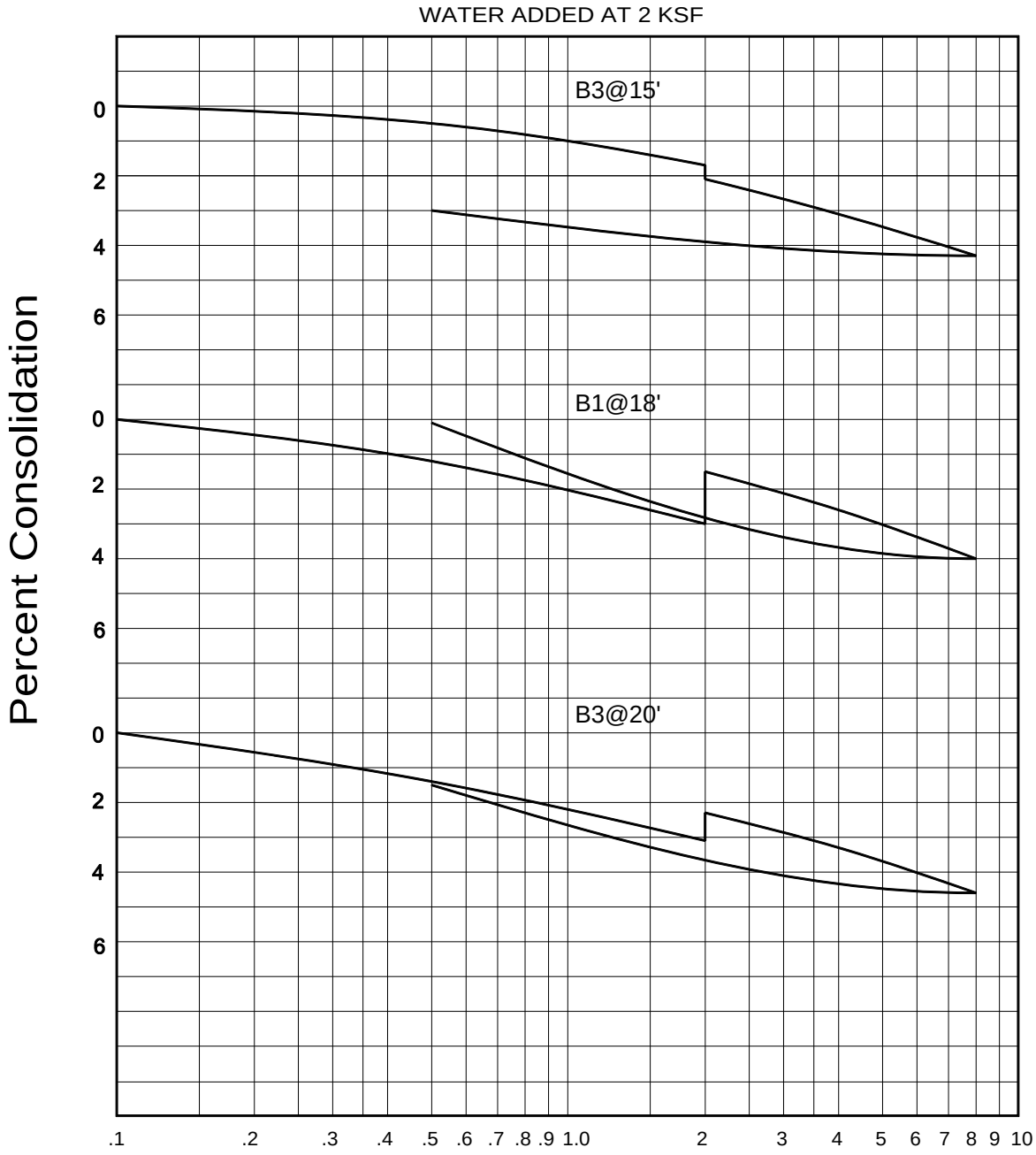
PZ		9000

CONSOLIDATION TEST RESULTS

MAC ARTHUR SQUARE

5.6 ACRE AREA BOUNDED BY DOVE STREET,
SCOTT DRIVE, CORINTHIAN WAY, AND MARTINGALE WAY
NEWPORT BEACH, CALIFORNIA

JUNE 12, 2014	PROJECT NO. A9138-06-01	FIG. B6



GEOCON
WEST, INC.

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

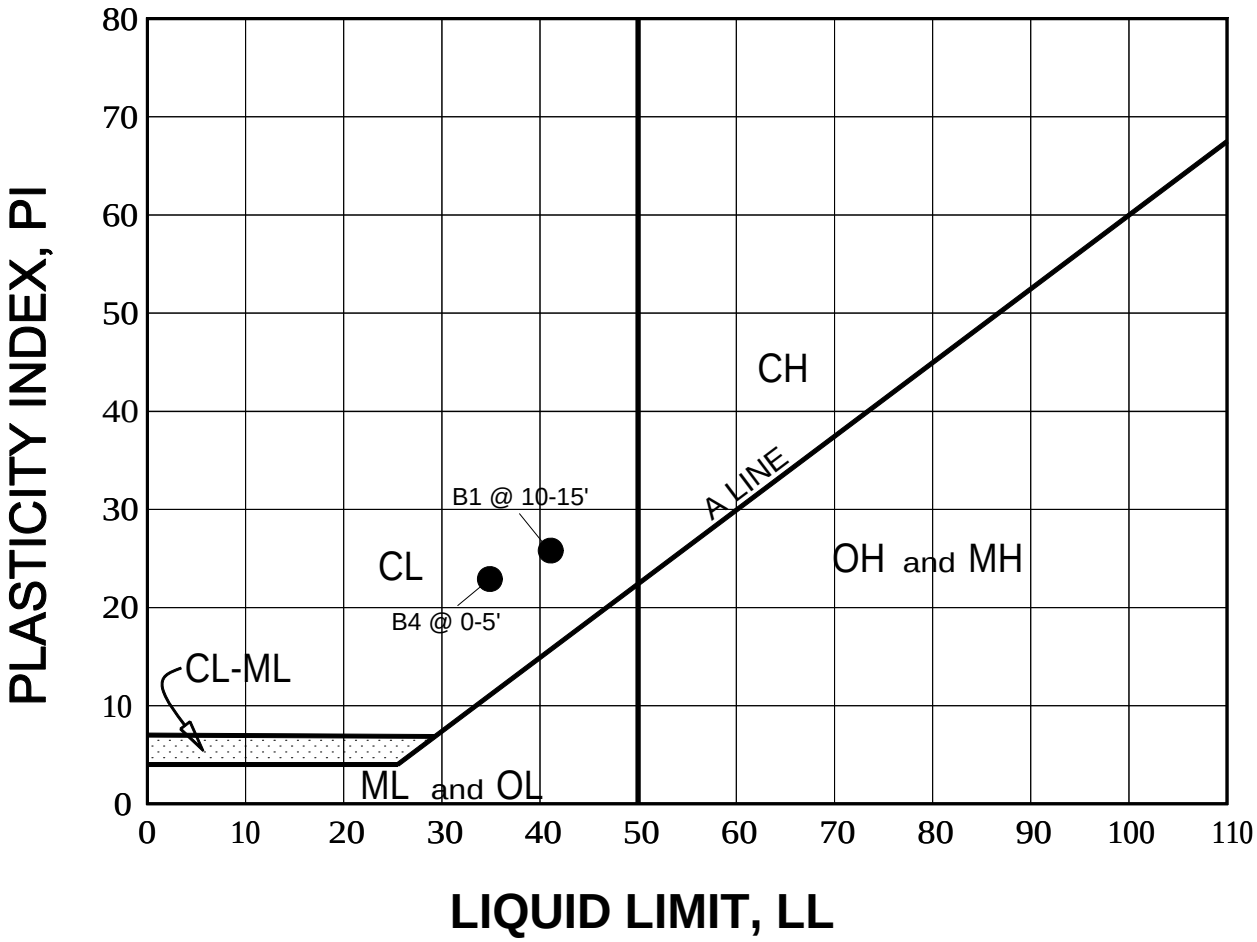
PZ		9000

CONSOLIDATION TEST RESULTS

MAC ARTHUR SQUARE

5.6 ACRE AREA BOUNDED BY DOVE STREET,
SCOTT DRIVE, CORINTHIAN WAY, AND MARTINGALE WAY
NEWPORT BEACH, CALIFORNIA

JUNE 12, 2014	PROJECT NO. A9138-06-01	FIG. B7



BORING NUMBER	DEPTH (FEET)	LL	PL	PI	SOIL BEHAVIOR
B4	0 - 5	34.9	11.9	22.9	CL
B1	10 - 15	41.1	15.3	25.8	CL
- -	- - -	- - -	- - -	- - -	- - -
- -	- - -	- - -	- - -	- - -	- - -
- -	- - -	- - -	- - -	- - -	- - -

*N/P indicates Non-Plastic

GEOCON WEST, INC.

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

PZ		9000

ATTERBERG LIMITS

MAC ARTHUR SQUARE

5.6 ACRE AREA BOUNDED BY DOVE STREET,
SCOTT DRIVE, CORINTHIAN WAY, AND MARTINGALE WAY
NEWPORT BEACH, CALIFORNIA

JUNE 12, 2014	PROJECT NO. A9138-06-01	FIG. B8

SUMMARY OF LABORATORY EXPANSION INDEX TEST RESULTS
ASTM D 4829-11

Sample No.	Moisture Content (%)		Dry Density (pcf)	Expansion Index	*UBC Classification	**CBC Classification
	Before	After				
B4 @ 0-5'	9.9	20.7	108.9	51	Moderate	Expansive

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

** Reference: 2013 California Building Code, Section 1803.5.3

SUMMARY OF LABORATORY MAXIMUM DENSITY AND AND OPTIMUM MOISTURE CONTENT TEST RESULTS
ASTM D 1557-12

Sample No.	Soil Description	Maximum Dry Density (pcf)	Optimum Moisture (%)
B4 @ 0-5'	Brown Sandy Clay	128.0	10.5

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PHONE (818) 841-8388 - FAX (818) 841-1704

PZ		9000

LABORATORY TEST RESULTS

MAC ARTHUR SQUARE
5.6 ACRE AREA BOUNDED BY DOVE STREET,
SCOTT DRIVE, CORINTHIAN WAY, AND MARTINGALE WAY
NEWPORT BEACH, CALIFORNIA

JUNE 12, 2014	PROJECT NO. A9138-06-01	FIG. B9

SUMMARY OF LABORATORY POTENTIAL OF HYDROGEN (pH) AND RESISTIVITY TEST RESULTS CALIFORNIA TEST NO. 643

Sample No.	pH	Resistivity (ohm centimeters)
B4 @ 0-3'	7.32	2200 (Moderately Corrosive)
B1 & B3 MIX @ 10-15'	7.51	710 (Severely Corrosive)

SUMMARY OF LABORATORY CHLORIDE CONTENT TEST RESULTS EPA NO. 325.3

Sample No.	Chloride Ion Content (%)
B4 @ 0-3'	0.003
B1 & B3 MIX @ 10-15'	0.016

SUMMARY OF LABORATORY WATER SOLUBLE SULFATE TEST RESULTS CALIFORNIA TEST NO. 417

Sample No.	Water Soluble Sulfate (% SO_4)	Sulfate Exposure*
B4 @ 0-3'	0.012	Negligible
B1 & B3 MIX @ 10-15'	0.089	Negligible

* Reference: 2013 California Building Code, Section 1904.3 and ACI 318-11 Section 4.3.

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PHONE (818) 841-8388 - FAX (818) 841-1704

PZ		9000

CORROSIVITY TEST RESULTS

MAC ARTHUR SQUARE

5.6 ACRE AREA BOUNDED BY DOVE STREET,
SCOTT DRIVE, CORINTHIAN WAY, AND MARTINGALE WAY
NEWPORT BEACH, CALIFORNIA

JUNE 12, 2014	PROJECT NO. A9138-06-01	FIG. B10

APPENDIX G

HYDROMODIFICATION CALCULATIONS

FUSCOE ENGINEERING
6390 Greenwich Drive, Suite 170
San Diego, California 92122
tel 858.554.1500 ◦ fax 858.597.0335
www.fuscoe.com

Job Name: Newport Crossings Date: 8/28/2018

Job #: 1618-001 Run Name: 16181EX2

Description: Existing Onsite 2 year design storm

Node to Node		Code	Elev 1 (feet)	Elev 2 (feet)	Length (feet)	Runoff Coeff. (C)	Area (ac.)	Comments
107	106	2	52.9	52.6	55	D	0.10	INITIAL SUBAREA
106	105	5	52.6	48.3	980	D	2.52	OPEN FLOW
								ADD SUBAREA B1
105	105	1						CONFLUENCE 1 OF 2
107	108	2	52.9	52.6	55	D	0.10	INITIAL SUBAREA
108	105	5	52.6	48.3	610	D	1.74	OPEN FLOW
								ADD SUBAREA B2
105	105	1						CONFLUENCE 2 OF 2
105	105	8				D	1.23	ADDITION OF SUBAREA B3
105	104	5	48.3	46.6	30			OPEN FLOW
							5.69	

```
**************************************************************************
            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
          (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
        (c) Copyright 1983-2014 Advanced Engineering Software (aes)
            Ver. 21.0  Release Date: 06/01/2014  License ID 1355

                          Analysis prepared by:

                            Fuscoe Engineering
                           6390 Greenwich Drive
                                Suite 170
                           San Diego, CA 92122

 ************************* DESCRIPTION OF STUDY *************************
* NEWPORT CROSSINGS                                                     *
* EXISTING CONDITION                                                    *
* 2-YEAR STORM EVENT                                                    *
 ************************************************************************

  FILE NAME: 16181EX2.DAT
  TIME/DATE OF STUDY: 11:54 08/29/2018
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   6.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   24.0     18.0    0.180/0.180/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    107.00 TO NODE    106.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    55.00
  ELEVATION DATA: UPSTREAM(FEET) =     52.90  DOWNSTREAM(FEET) =     52.60

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.000
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  2.264
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 D        0.10      0.20     0.100    75    5.00
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      0.20
  TOTAL AREA(ACRES) =      0.10   PEAK FLOW RATE(CFS) =      0.20

****************************************************************************
  FLOW PROCESS FROM NODE    106.00 TO NODE    105.00 IS CODE =  54
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     52.60  DOWNSTREAM(FEET) =     48.30
  CHANNEL LENGTH THRU SUBAREA(FEET) =   980.00   CHANNEL SLOPE =  0.0044
  CHANNEL BASE(FEET) =    1.00   "Z" FACTOR =  50.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.12

         ==>>WARNING: FLOW IN CHANNEL EXCEEDS CHANNEL
             CAPACITY( NORMAL DEPTH EQUAL TO SPECIFIED MAXIMUM
             ALLOWABLE DEPTH).
             AS AN APPROXIMATION, FLOWDEPTH IS SET AT MAXIMUM
             ALLOWABLE DEPTH AND IS USED FOR TRAVELTIME CALCULATIONS.

  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.312
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 D        2.52      0.20     0.100    75
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.87
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.06
  AVERAGE FLOW DEPTH(FEET) =   0.12   TRAVEL TIME(MIN.) =   7.93
```

```
  Tc(MIN.) =   12.93
  SUBAREA AREA(ACRES) =     2.52       SUBAREA RUNOFF(CFS) =    2.93
  EFFECTIVE AREA(ACRES) =      2.62     AREA-AVERAGED Fm(INCH/HR) =   0.02
  AREA-AVERAGED Fp(INCH/HR) =   0.20  AREA-AVERAGED Ap =   0.10
  TOTAL AREA(ACRES) =        2.6         PEAK FLOW RATE(CFS) =       3.05

         ==>>WARNING: FLOW IN CHANNEL EXCEEDS CHANNEL
             CAPACITY( NORMAL DEPTH EQUAL TO SPECIFIED MAXIMUM
             ALLOWABLE DEPTH).
             AS AN APPROXIMATION, FLOWDEPTH IS SET AT MAXIMUM
             ALLOWABLE DEPTH AND IS USED FOR TRAVELTIME CALCULATIONS.

  *GIVEN HEIGHT(FEET) =   0.12   ESTIMATED CHANNEL BASE(FEET) =  11.87

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.12   FLOW VELOCITY(FEET/SEC.) =   1.35
  LONGEST FLOWPATH FROM NODE    107.00 TO NODE    105.00 =    1035.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    105.00 TO NODE    105.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   12.93
  RAINFALL INTENSITY(INCH/HR) =   1.31
  AREA-AVERAGED Fm(INCH/HR) =  0.02
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       2.62
  TOTAL STREAM AREA(ACRES) =       2.62
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       3.05

****************************************************************************
  FLOW PROCESS FROM NODE    107.00 TO NODE    108.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    55.00
  ELEVATION DATA: UPSTREAM(FEET) =     52.90  DOWNSTREAM(FEET) =     52.60

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.000
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  2.264
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
```

```
     LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                D        0.10      0.20     0.100    75    5.00
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      0.20
  TOTAL AREA(ACRES) =      0.10   PEAK FLOW RATE(CFS) =      0.20

****************************************************************************
  FLOW PROCESS FROM NODE    108.00 TO NODE    105.00 IS CODE =  54
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     52.60  DOWNSTREAM(FEET) =     48.30
  CHANNEL LENGTH THRU SUBAREA(FEET) =   610.00   CHANNEL SLOPE =  0.0070
  CHANNEL BASE(FEET) =    1.00   "Z" FACTOR =  50.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.12

         ==>>WARNING: FLOW IN CHANNEL EXCEEDS CHANNEL
             CAPACITY( NORMAL DEPTH EQUAL TO SPECIFIED MAXIMUM
             ALLOWABLE DEPTH).
             AS AN APPROXIMATION, FLOWDEPTH IS SET AT MAXIMUM
             ALLOWABLE DEPTH AND IS USED FOR TRAVELTIME CALCULATIONS.

  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.397
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                D        1.74      0.20     0.100    75
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.40
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.54
  AVERAGE FLOW DEPTH(FEET) =   0.12   TRAVEL TIME(MIN.) =   6.59
  Tc(MIN.) =   11.59
  SUBAREA AREA(ACRES) =     1.74       SUBAREA RUNOFF(CFS) =    2.16
  EFFECTIVE AREA(ACRES) =      1.84     AREA-AVERAGED Fm(INCH/HR) =   0.02
  AREA-AVERAGED Fp(INCH/HR) =   0.20  AREA-AVERAGED Ap =   0.10
  TOTAL AREA(ACRES) =        1.8         PEAK FLOW RATE(CFS) =       2.28

         ==>>WARNING: FLOW IN CHANNEL EXCEEDS CHANNEL
             CAPACITY( NORMAL DEPTH EQUAL TO SPECIFIED MAXIMUM
             ALLOWABLE DEPTH).
             AS AN APPROXIMATION, FLOWDEPTH IS SET AT MAXIMUM
             ALLOWABLE DEPTH AND IS USED FOR TRAVELTIME CALCULATIONS.

  *GIVEN HEIGHT(FEET) =   0.12   ESTIMATED CHANNEL BASE(FEET) =   5.43
```

```
 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.12   FLOW VELOCITY(FEET/SEC.) =   1.56
 LONGEST FLOWPATH FROM NODE    107.00 TO NODE    105.00 =     665.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    105.00 TO NODE    105.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =   11.59
 RAINFALL INTENSITY(INCH/HR) =   1.40
 AREA-AVERAGED Fm(INCH/HR) =  0.02
 AREA-AVERAGED Fp(INCH/HR) =  0.20
 AREA-AVERAGED Ap =  0.10
 EFFECTIVE STREAM AREA(ACRES) =       1.84
 TOTAL STREAM AREA(ACRES) =       1.84
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       2.28

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
     1        3.05   12.93    1.312  0.20( 0.02) 0.10       2.6     107.00
     2        2.28   11.59    1.397  0.20( 0.02) 0.10       1.8     107.00

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  2 STREAMS.

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
     1        5.19   11.59    1.397  0.20( 0.02) 0.10       4.2     107.00
     2        5.19   12.93    1.312  0.20( 0.02) 0.10       4.5     107.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =       5.19    Tc(MIN.) =    11.59
 EFFECTIVE AREA(ACRES) =       4.19   AREA-AVERAGED Fm(INCH/HR) =  0.02
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =        4.5
 LONGEST FLOWPATH FROM NODE    107.00 TO NODE    105.00 =    1035.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    105.00 TO NODE    105.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
```

```
 MAINLINE Tc(MIN.) =   11.59
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.397
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                 D        1.23      0.20     0.100    75
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA AREA(ACRES) =    1.23      SUBAREA RUNOFF(CFS) =    1.52
 EFFECTIVE AREA(ACRES) =      5.42   AREA-AVERAGED Fm(INCH/HR) =  0.02
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =        5.7       PEAK FLOW RATE(CFS) =       6.72

****************************************************************************
 FLOW PROCESS FROM NODE    105.00 TO NODE    104.00 IS CODE =  54
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =     48.30  DOWNSTREAM(FEET) =     46.60
 CHANNEL LENGTH THRU SUBAREA(FEET) =    30.00   CHANNEL SLOPE =  0.0567
 CHANNEL BASE(FEET) =    1.00   "Z" FACTOR =  50.000
 MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.12

        ==>>WARNING: FLOW IN CHANNEL EXCEEDS CHANNEL
            CAPACITY( NORMAL DEPTH EQUAL TO SPECIFIED MAXIMUM
            ALLOWABLE DEPTH).
            AS AN APPROXIMATION, FLOWDEPTH IS SET AT MAXIMUM
            ALLOWABLE DEPTH AND IS USED FOR TRAVELTIME CALCULATIONS.

 *GIVEN HEIGHT(FEET) =   0.12   ESTIMATED CHANNEL BASE(FEET) =   5.79
 CHANNEL FLOW THRU SUBAREA(CFS) =       6.72
 FLOW VELOCITY(FEET/SEC.) =   4.46   FLOW DEPTH(FEET) =   0.12
 TRAVEL TIME(MIN.) =   0.07   Tc(MIN.) =   11.66
 LONGEST FLOWPATH FROM NODE    107.00 TO NODE    104.00 =    1065.00 FEET.
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)     =        5.7  TC(MIN.) =     11.66
 EFFECTIVE AREA(ACRES) =      5.42  AREA-AVERAGED Fm(INCH/HR)=  0.02
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 0.100
 PEAK FLOW RATE(CFS)   =       6.72

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
     1        6.72   11.66    1.392  0.20( 0.02) 0.10       5.4     107.00
     2        6.62   13.00    1.308  0.20( 0.02) 0.10       5.7     107.00
============================================================================
```

==========

END OF RATIONAL METHOD ANALYSIS

A.E.S. Unit Hydrograph Calculations and Low Loss Fraction Estimations

```
******************************************************************************
          NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
                    AND LOW LOSS FRACTION ESTIMATIONS
==============================================================================
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                           Analysis prepared by:

                             Fuscoe Engineering
                             6390 Greenwhich Dr
                                 Suite 170
                            San Diego, CA 92122

******************************************************************************
------------------------------------------------------------------------------

 Problem Descriptions:
  NEWPORT CROSSINGS
  2-YEAR DESIGN STORM EXISTING CONDITIONS
  Y-BAR CALCULATION
==============================================================================
*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
    AND LOW LOSS FRACTION ESTIMATIONS FOR AMC II:

    TOTAL 24-HOUR DURATION RAINFALL DEPTH =     2.05 (inches)

    SOIL-COVER     AREA      PERCENT OF    SCS CURVE    LOSS RATE
       TYPE      (Acres)   PERVIOUS AREA     NUMBER    Fp(in./hr.)    YIELD
         1          5.69        0.10            75.       0.200       0.889

    TOTAL AREA (Acres) =      5.69

    AREA-AVERAGED LOSS RATE, Fm (in./hr.) =  0.000

    AREA-AVERAGED LOW LOSS FRACTION, Y = 0.111
==============================================================================
```

```
**************************************************************************
                    SMALL AREA UNIT HYDROGRAPH MODEL
==========================================================================
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             Ver. 21.0  Release Date: 06/01/2014  License ID 1355

                           Analysis prepared by:

                             Fuscoe Engineering
                            6390 Greenwich Drive
                                 Suite 170
                            San Diego, CA 92122

**************************************************************************
--------------------------------------------------------------------------

 Problem Descriptions:
  NEWPORT CROSSINGS
  2-YEAR DESIGN STORM EXISTING CONDITION
  HYDROGRAPH VOLUME CALCULATION
--------------------------------------------------------------------------


    RATIONAL METHOD CALIBRATION COEFFICIENT = 0.90
    TOTAL CATCHMENT AREA(ACRES) =    5.69
    SOIL-LOSS RATE, Fm,(INCH/HR) =  0.020
    LOW LOSS FRACTION = 0.111
    TIME OF CONCENTRATION(MIN.) = 11.66
    SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
    ORANGE COUNTY "VALLEY" RAINFALL VALUES ARE USED
    RETURN FREQUENCY(YEARS) =   2
       5-MINUTE POINT RAINFALL VALUE(INCHES) =  0.19
      30-MINUTE POINT RAINFALL VALUE(INCHES) =  0.40
       1-HOUR   POINT RAINFALL VALUE(INCHES) =  0.53
       3-HOUR   POINT RAINFALL VALUE(INCHES) =  0.89
       6-HOUR   POINT RAINFALL VALUE(INCHES) =  1.22
      24-HOUR   POINT RAINFALL VALUE(INCHES) =  2.05

--------------------------------------------------------------------------

    TOTAL CATCHMENT   RUNOFF  VOLUME(ACRE-FEET) =     0.79
    TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) =     0.18

**************************************************************************
  TIME     VOLUME       Q    0.        2.5       5.0       7.5      10.0
 (HOURS)    (AF)      (CFS)
--------------------------------------------------------------------------
```

0.06	0.0000	0.00	Q	.	.	.	.
0.26	0.0012	0.15	Q	.	.	.	.
0.45	0.0035	0.15	Q	.	.	.	.
0.65	0.0059	0.15	Q	.	.	.	.
0.84	0.0083	0.15	Q	.	.	.	.
1.04	0.0107	0.15	Q	.	.	.	.
1.23	0.0131	0.15	Q	.	.	.	.
1.43	0.0156	0.15	Q	.	.	.	.
1.62	0.0181	0.15	Q	.	.	.	.
1.81	0.0206	0.16	Q	.	.	.	.
2.01	0.0231	0.16	Q	.	.	.	.
2.20	0.0256	0.16	Q	.	.	.	.
2.40	0.0282	0.16	Q	.	.	.	.
2.59	0.0307	0.16	Q	.	.	.	.
2.79	0.0333	0.16	Q	.	.	.	.
2.98	0.0360	0.16	Q	.	.	.	.
3.17	0.0386	0.17	Q	.	.	.	.
3.37	0.0413	0.17	Q	.	.	.	.
3.56	0.0440	0.17	Q	.	.	.	.
3.76	0.0467	0.17	Q	.	.	.	.
3.95	0.0495	0.17	Q	.	.	.	.
4.15	0.0523	0.17	Q	.	.	.	.
4.34	0.0551	0.18	Q	.	.	.	.
4.53	0.0579	0.18	Q	.	.	.	.
4.73	0.0608	0.18	Q	.	.	.	.
4.92	0.0637	0.18	Q	.	.	.	.
5.12	0.0666	0.18	Q	.	.	.	.
5.31	0.0696	0.19	Q	.	.	.	.
5.51	0.0726	0.19	Q	.	.	.	.
5.70	0.0756	0.19	Q	.	.	.	.
5.89	0.0787	0.19	Q	.	.	.	.
6.09	0.0818	0.19	Q	.	.	.	.
6.28	0.0849	0.20	Q	.	.	.	.
6.48	0.0881	0.20	Q	.	.	.	.
6.67	0.0913	0.20	Q	.	.	.	.
6.87	0.0946	0.20	Q	.	.	.	.
7.06	0.0979	0.21	Q	.	.	.	.
7.26	0.1013	0.21	Q	.	.	.	.
7.45	0.1047	0.21	Q	.	.	.	.
7.64	0.1081	0.22	Q	.	.	.	.
7.84	0.1116	0.22	Q	.	.	.	.
8.03	0.1151	0.22	Q	.	.	.	.
8.23	0.1187	0.23	Q	.	.	.	.
8.42	0.1224	0.23	Q	.	.	.	.
8.62	0.1261	0.23	Q	.	.	.	.
8.81	0.1299	0.24	Q	.	.	.	.
9.00	0.1337	0.24	Q	.	.	.	.
9.20	0.1376	0.25	Q	.	.	.	.

9.39	0.1416	0.25	Q	.	.	.	.
9.59	0.1456	0.25	.Q	.	.	.	.
9.78	0.1497	0.26	.Q	.	.	.	.
9.98	0.1539	0.26	.Q	.	.	.	.
10.17	0.1582	0.27	.Q	.	.	.	.
10.36	0.1626	0.28	.Q	.	.	.	.
10.56	0.1670	0.28	.Q	.	.	.	.
10.75	0.1716	0.29	.Q	.	.	.	.
10.95	0.1763	0.29	.Q	.	.	.	.
11.14	0.1810	0.30	.Q	.	.	.	.
11.34	0.1859	0.31	.Q	.	.	.	.
11.53	0.1909	0.32	.Q	.	.	.	.
11.72	0.1961	0.32	.Q	.	.	.	.
11.92	0.2014	0.34	.Q	.	.	.	.
12.11	0.2068	0.34	.Q	.	.	.	.
12.31	0.2130	0.43	.Q	.	.	.	.
12.50	0.2200	0.44	.Q	.	.	.	.
12.70	0.2272	0.46	.Q	.	.	.	.
12.89	0.2347	0.47	.Q	.	.	.	.
13.09	0.2424	0.49	.Q	.	.	.	.
13.28	0.2503	0.50	. Q	.	.	.	.
13.47	0.2586	0.53	. Q	.	.	.	.
13.67	0.2671	0.54	. Q	.	.	.	.
13.86	0.2761	0.57	. Q	.	.	.	.
14.06	0.2854	0.59	. Q	.	.	.	.
14.25	0.2955	0.66	. Q	.	.	.	.
14.45	0.3063	0.68	. Q	.	.	.	.
14.64	0.3178	0.74	. Q	.	.	.	.
14.83	0.3300	0.78	. Q	.	.	.	.
15.03	0.3434	0.88	. Q	.	.	.	.
15.22	0.3580	0.95	. Q	.	.	.	.
15.42	0.3746	1.11	. Q	.	.	.	.
15.61	0.3922	1.09	. Q	.	.	.	.
15.81	0.4141	1.62	. Q	.	.	.	.
16.00	0.4453	2.27	. Q.	.	.	.	.
16.19	0.5199	7.02	. .	.	.	Q .	.
16.39	0.5866	1.29	. Q	.	.	.	.
16.58	0.6052	1.03	. Q	.	.	.	.
16.78	0.6201	0.82	. Q	.	.	.	.
16.97	0.6324	0.71	. Q	.	.	.	.
17.17	0.6432	0.62	. Q	.	.	.	.
17.36	0.6527	0.56	. Q	.	.	.	.
17.55	0.6612	0.51	. Q	.	.	.	.
17.75	0.6692	0.48	.Q	.	.	.	.
17.94	0.6766	0.45	.Q	.	.	.	.
18.14	0.6836	0.41	.Q	.	.	.	.
18.33	0.6895	0.33	.Q	.	.	.	.
18.53	0.6947	0.31	.Q	.	.	.	.

18.72	0.6996	0.30	.Q	.	.	.	.
18.92	0.7043	0.28	.Q	.	.	.	.
19.11	0.7087	0.27	.Q	.	.	.	.
19.30	0.7130	0.26	.Q	.	.	.	.
19.50	0.7171	0.25	.Q	.	.	.	.
19.69	0.7211	0.24	Q	.	.	.	.
19.89	0.7249	0.23	Q	.	.	.	.
20.08	0.7286	0.23	Q	.	.	.	.
20.28	0.7322	0.22	Q	.	.	.	.
20.47	0.7357	0.21	Q	.	.	.	.
20.66	0.7391	0.21	Q	.	.	.	.
20.86	0.7424	0.20	Q	.	.	.	.
21.05	0.7457	0.20	Q	.	.	.	.
21.25	0.7488	0.19	Q	.	.	.	.
21.44	0.7519	0.19	Q	.	.	.	.
21.64	0.7549	0.18	Q	.	.	.	.
21.83	0.7578	0.18	Q	.	.	.	.
22.02	0.7607	0.18	Q	.	.	.	.
22.22	0.7635	0.17	Q	.	.	.	.
22.41	0.7662	0.17	Q	.	.	.	.
22.61	0.7689	0.17	Q	.	.	.	.
22.80	0.7716	0.16	Q	.	.	.	.
23.00	0.7742	0.16	Q	.	.	.	.
23.19	0.7768	0.16	Q	.	.	.	.
23.38	0.7793	0.16	Q	.	.	.	.
23.58	0.7817	0.15	Q	.	.	.	.
23.77	0.7842	0.15	Q	.	.	.	.
23.97	0.7866	0.15	Q	.	.	.	.
24.16	0.7889	0.15	Q	.	.	.	.
24.36	0.7901	0.00	Q	.	.	.	.

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
(Note: 100% of Peak Flow Rate estimate assumed to have
an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
0%	1445.8
10%	151.6
20%	35.0
30%	23.3
40%	11.7
50%	11.7
60%	11.7
70%	11.7
80%	11.7

90% 11.7

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Job Name: Newport Crossings Date: 8/28/2018

Job #: 1618-001 Run Name: 16181PR2

Description: Proposed Onsite 2 year design storm

Node to Node		Code	Elev 1 (feet)	Elev 2 (feet)	Length (feet)	Runoff Coeff. (C)	Area (ac.)	Comments
306	305	2	124.2	123.5	65.0	D	0.10	INITIAL SUBAREA
305	304	5	52.0	50.8	60.0			SURFACE FLOW
304	304	8				D	0.59	ADDITION OF SUBAREA C1
304	303	3	46.8	45.0	445.0			PIPE FLOW
303	303	8				D	0.49	ADDITION OF SUBAREA C2
303	302	3	45.0	44.1	225.0			PIPE FLOW
302	302	8				D	1.50	ADDITION OF SUBAREA C3
302	301	3	44.1	43.0	250.0			PIPE FLOW
301	301	1						CONFLUENCE 1 OF 2
306	305	2	124.2	122.9	65.0	D	0.10	INITIAL SUBAREA
305	309	5	52.0	51.1	75.0			SURFACE FLOW
309	309	8				D	0.22	ADDITION OF SUBAREA C4
309	308	3	47.1	45.8	255.0			PIPE FLOW
308	308	8				D	0.51	ADDITION OF SUBAREA C5
308	307	3	45.8	44.1	335.0			PIPE FLOW
307	307	8				D	1.57	ADDITION OF SUBAREA C6
307	301	3	44.1	43.0	215.0			PIPE FLOW
301	301	1						CONFLUENCE 2 OF 2
301	300	3	39.8	39.7	35.0			PIPE FLOW

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Job Name: Newport Crossings Date: 8/28/2018

Job #: 1618-001 Run Name: 16181PR2

Description: Proposed Onsite 2 year design storm

Node to Node		Code	Elev 1 (feet)	Elev 2 (feet)	Length (feet)	Friction Coeff.	Area (ac.)	Comments
300	300	1						CONFLUENCE 1 OF 2
203	202	2	52.9	50.6	145.0	D	0.10	INITIAL SUBAREA
202	202	8				D	0.16	ADDITION OF SUBAREA B1
202	201	3	44.0	41.8	220.0			PIPE FLOW
201	201	8				D	0.35	ADDITION OF SUBAREA B2
201	300	3	41.8	39.7	40.0			PIPE FLOW
300	300	1						CONFLUENCE 2 OF 2

```
**************************************************************************
            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
          (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
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            Ver. 21.0  Release Date: 06/01/2014  License ID 1355

                          Analysis prepared by:

                            Fuscoe Engineering
                           6390 Greenwich Drive
                                Suite 170
                           San Diego, CA 92122

 ************************* DESCRIPTION OF STUDY *************************
* NEWPORT CROSSINGS                                                     *
* PROPOSED CONDITION                                                    *
* 2-YEAR STORM EVENT                                                    *
 ************************************************************************

  FILE NAME: 16181PR2.DAT
  TIME/DATE OF STUDY: 09:54 08/29/2018
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   6.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   24.0     18.0    0.180/0.180/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    306.00 TO NODE    305.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
  ELEVATION DATA: UPSTREAM(FEET) =    124.20  DOWNSTREAM(FEET) =    123.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.000
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  2.264
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  CONDOMINIUMS               D        0.10      0.20     0.350    75    5.00
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA RUNOFF(CFS) =      0.20
  TOTAL AREA(ACRES) =      0.10   PEAK FLOW RATE(CFS) =      0.20

****************************************************************************
  FLOW PROCESS FROM NODE    305.00 TO NODE    304.00 IS CODE =  54
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     52.00  DOWNSTREAM(FEET) =     50.80
  CHANNEL LENGTH THRU SUBAREA(FEET) =    60.00   CHANNEL SLOPE =  0.0200
  CHANNEL BASE(FEET) =  100.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
  CHANNEL FLOW THRU SUBAREA(CFS) =       0.20
  FLOW VELOCITY(FEET/SEC.) =   0.41   FLOW DEPTH(FEET) =   0.00
  TRAVEL TIME(MIN.) =   2.43   Tc(MIN.) =    7.43
  LONGEST FLOWPATH FROM NODE    306.00 TO NODE    304.00 =     125.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    304.00 TO NODE    304.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    7.43
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.804
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               D        0.59      0.20     0.350    75
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
```

```
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    0.59      SUBAREA RUNOFF(CFS) =    0.92
  EFFECTIVE AREA(ACRES) =      0.69   AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.35
  TOTAL AREA(ACRES) =        0.7       PEAK FLOW RATE(CFS) =       1.08

****************************************************************************
  FLOW PROCESS FROM NODE    304.00 TO NODE    303.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    46.80  DOWNSTREAM(FEET) =    45.00
  FLOW LENGTH(FEET) =   445.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   6.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   2.73
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.08
  PIPE TRAVEL TIME(MIN.) =   2.72    Tc(MIN.) =   10.14
  LONGEST FLOWPATH FROM NODE    306.00 TO NODE    303.00 =     570.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    303.00 TO NODE    303.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   10.14
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.508
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               D        0.49      0.20     0.350    75
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    0.49      SUBAREA RUNOFF(CFS) =    0.63
  EFFECTIVE AREA(ACRES) =      1.18   AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.35
  TOTAL AREA(ACRES) =        1.2       PEAK FLOW RATE(CFS) =       1.53

****************************************************************************
  FLOW PROCESS FROM NODE    303.00 TO NODE    302.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    45.00  DOWNSTREAM(FEET) =    44.10
  FLOW LENGTH(FEET) =   225.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   7.5 INCHES
```

```
  PIPE-FLOW VELOCITY(FEET/SEC.) =   2.96
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.53
  PIPE TRAVEL TIME(MIN.) =   1.27    Tc(MIN.) =   11.41
  LONGEST FLOWPATH FROM NODE    306.00 TO NODE    302.00 =     795.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    302.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   11.41
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.410
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               D        1.50      0.20     0.350    75
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    1.50      SUBAREA RUNOFF(CFS) =    1.81
  EFFECTIVE AREA(ACRES) =      2.68   AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.35
  TOTAL AREA(ACRES) =        2.7       PEAK FLOW RATE(CFS) =       3.23

****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    301.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    44.10  DOWNSTREAM(FEET) =    43.00
  FLOW LENGTH(FEET) =   250.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  15.0 INCH PIPE IS  10.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.68
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.23
  PIPE TRAVEL TIME(MIN.) =   1.13    Tc(MIN.) =   12.54
  LONGEST FLOWPATH FROM NODE    306.00 TO NODE    301.00 =    1045.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    301.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   12.54
  RAINFALL INTENSITY(INCH/HR) =   1.34
```

```
  AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.35
  EFFECTIVE STREAM AREA(ACRES) =       2.68
  TOTAL STREAM AREA(ACRES) =       2.68
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       3.23

****************************************************************************
  FLOW PROCESS FROM NODE    306.00 TO NODE    305.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
  ELEVATION DATA: UPSTREAM(FEET) =    124.20  DOWNSTREAM(FEET) =    122.90

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.000
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  2.264
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  CONDOMINIUMS               D        0.10      0.20     0.350    75    5.00
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA RUNOFF(CFS) =      0.20
  TOTAL AREA(ACRES) =      0.10   PEAK FLOW RATE(CFS) =      0.20

****************************************************************************
  FLOW PROCESS FROM NODE    305.00 TO NODE    309.00 IS CODE =  54
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     52.00  DOWNSTREAM(FEET) =     51.10
  CHANNEL LENGTH THRU SUBAREA(FEET) =    75.00   CHANNEL SLOPE =  0.0120
  CHANNEL BASE(FEET) =  100.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
  CHANNEL FLOW THRU SUBAREA(CFS) =       0.20
  FLOW VELOCITY(FEET/SEC.) =   0.41   FLOW DEPTH(FEET) =   0.00
  TRAVEL TIME(MIN.) =   3.03   Tc(MIN.) =    8.03
  LONGEST FLOWPATH FROM NODE    306.00 TO NODE    309.00 =     140.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    309.00 TO NODE    309.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
```

```
 MAINLINE Tc(MIN.) =    8.03
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.724
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 CONDOMINIUMS               D        0.22      0.20     0.350    75
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
 SUBAREA AREA(ACRES) =    0.22      SUBAREA RUNOFF(CFS) =    0.33
 EFFECTIVE AREA(ACRES) =      0.32   AREA-AVERAGED Fm(INCH/HR) =  0.07
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.35
 TOTAL AREA(ACRES) =        0.3       PEAK FLOW RATE(CFS) =       0.48

****************************************************************************
 FLOW PROCESS FROM NODE    309.00 TO NODE    308.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    47.10  DOWNSTREAM(FEET) =    45.80
 FLOW LENGTH(FEET) =   255.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN   9.0 INCH PIPE IS   4.1 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   2.42
 ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       0.48
 PIPE TRAVEL TIME(MIN.) =   1.76    Tc(MIN.) =    9.79
 LONGEST FLOWPATH FROM NODE    306.00 TO NODE    308.00 =     395.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    308.00 TO NODE    308.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    9.79
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.539
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 CONDOMINIUMS               D        0.51      0.20     0.350    75
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
 SUBAREA AREA(ACRES) =    0.51      SUBAREA RUNOFF(CFS) =    0.67
 EFFECTIVE AREA(ACRES) =      0.83   AREA-AVERAGED Fm(INCH/HR) =  0.07
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.35
 TOTAL AREA(ACRES) =        0.8       PEAK FLOW RATE(CFS) =       1.10

****************************************************************************
 FLOW PROCESS FROM NODE    308.00 TO NODE    307.00 IS CODE =  31
```

```
------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    45.80  DOWNSTREAM(FEET) =    44.10
  FLOW LENGTH(FEET) =   335.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   7.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   2.88
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.10
  PIPE TRAVEL TIME(MIN.) =   1.94    Tc(MIN.) =   11.73
  LONGEST FLOWPATH FROM NODE    306.00 TO NODE    307.00 =     730.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    307.00 TO NODE    307.00 IS CODE =  81
------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
========================================================================
  MAINLINE Tc(MIN.) =   11.73
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.387
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               D        1.57      0.20     0.350    75
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    1.57      SUBAREA RUNOFF(CFS) =    1.86
  EFFECTIVE AREA(ACRES) =      2.40   AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.35
  TOTAL AREA(ACRES) =        2.4       PEAK FLOW RATE(CFS) =       2.85

****************************************************************************
  FLOW PROCESS FROM NODE    307.00 TO NODE    301.00 IS CODE =  31
------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    44.10  DOWNSTREAM(FEET) =    43.00
  FLOW LENGTH(FEET) =   215.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  15.0 INCH PIPE IS   8.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.80
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.85
  PIPE TRAVEL TIME(MIN.) =   0.94    Tc(MIN.) =   12.67
  LONGEST FLOWPATH FROM NODE    306.00 TO NODE    301.00 =     945.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    301.00 IS CODE =   1
```

```
------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
========================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   12.67
  RAINFALL INTENSITY(INCH/HR) =   1.33
  AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.35
  EFFECTIVE STREAM AREA(ACRES) =       2.40
  TOTAL STREAM AREA(ACRES) =       2.40
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       2.85

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        3.23   12.54    1.335  0.20( 0.07) 0.35       2.7     306.00
      2        2.85   12.67    1.327  0.20( 0.07) 0.35       2.4     306.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        6.07   12.54    1.335  0.20( 0.07) 0.35       5.1     306.00
      2        6.06   12.67    1.327  0.20( 0.07) 0.35       5.1     306.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       6.07    Tc(MIN.) =    12.54
  EFFECTIVE AREA(ACRES) =       5.06   AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.35
  TOTAL AREA(ACRES) =        5.1
  LONGEST FLOWPATH FROM NODE    306.00 TO NODE    301.00 =    1045.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    300.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    39.80  DOWNSTREAM(FEET) =    39.70
  FLOW LENGTH(FEET) =    35.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  13.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.67
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
```

```
  PIPE-FLOW(CFS) =       6.07
  PIPE TRAVEL TIME(MIN.) =   0.16    Tc(MIN.) =   12.70
  LONGEST FLOWPATH FROM NODE    306.00 TO NODE    300.00 =    1080.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    300.00 TO NODE    300.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   12.70
  RAINFALL INTENSITY(INCH/HR) =   1.33
  AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.35
  EFFECTIVE STREAM AREA(ACRES) =       5.06
  TOTAL STREAM AREA(ACRES) =       5.08
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       6.07

****************************************************************************
  FLOW PROCESS FROM NODE    203.00 TO NODE    202.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   145.00
  ELEVATION DATA: UPSTREAM(FEET) =     52.90  DOWNSTREAM(FEET) =     50.60

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.099
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.716
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  PUBLIC PARK                D        0.10      0.20     0.850    75    8.10
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
  SUBAREA RUNOFF(CFS) =      0.14
  TOTAL AREA(ACRES) =      0.10   PEAK FLOW RATE(CFS) =      0.14

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    202.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    8.10
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.716
```

```
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  PUBLIC PARK                D        0.16      0.20     0.850    75
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
  SUBAREA AREA(ACRES) =    0.16      SUBAREA RUNOFF(CFS) =    0.22
  EFFECTIVE AREA(ACRES) =      0.26   AREA-AVERAGED Fm(INCH/HR) =  0.17
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.85
  TOTAL AREA(ACRES) =        0.3       PEAK FLOW RATE(CFS) =       0.36

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    201.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    44.00  DOWNSTREAM(FEET) =    41.80
  FLOW LENGTH(FEET) =   220.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   6.0 INCH PIPE IS   3.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   2.90
  ESTIMATED PIPE DIAMETER(INCH) =   6.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.36
  PIPE TRAVEL TIME(MIN.) =   1.26    Tc(MIN.) =    9.36
  LONGEST FLOWPATH FROM NODE    203.00 TO NODE    201.00 =     365.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    201.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    9.36
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.579
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  PUBLIC PARK                D        0.35      0.20     0.850    75
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
  SUBAREA AREA(ACRES) =    0.35      SUBAREA RUNOFF(CFS) =    0.44
  EFFECTIVE AREA(ACRES) =      0.61   AREA-AVERAGED Fm(INCH/HR) =  0.17
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.85
  TOTAL AREA(ACRES) =        0.6       PEAK FLOW RATE(CFS) =       0.77

****************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    300.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
```

```
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    41.80  DOWNSTREAM(FEET) =    39.70
  FLOW LENGTH(FEET) =    40.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   6.0 INCH PIPE IS   3.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.60
  ESTIMATED PIPE DIAMETER(INCH) =   6.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.77
  PIPE TRAVEL TIME(MIN.) =   0.10    Tc(MIN.) =    9.46
  LONGEST FLOWPATH FROM NODE    203.00 TO NODE    300.00 =     405.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    300.00 TO NODE    300.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    9.46
  RAINFALL INTENSITY(INCH/HR) =   1.57
  AREA-AVERAGED Fm(INCH/HR) =  0.17
  AREA-AVERAGED Fp(INCH/HR) =  0.20
  AREA-AVERAGED Ap =  0.85
  EFFECTIVE STREAM AREA(ACRES) =       0.61
  TOTAL STREAM AREA(ACRES) =       0.61
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       0.77

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        6.07   12.70    1.326  0.20( 0.07) 0.35       5.1     306.00
      1        6.06   12.83    1.318  0.20( 0.07) 0.35       5.1     306.00
      2        0.77    9.46    1.569  0.20( 0.17) 0.85       0.6     203.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        6.17    9.46    1.569  0.20( 0.08) 0.42       4.4     203.00
      2        6.70   12.70    1.326  0.20( 0.08) 0.40       5.7     306.00
      3        6.69   12.83    1.318  0.20( 0.08) 0.40       5.7     306.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       6.70    Tc(MIN.) =    12.70
  EFFECTIVE AREA(ACRES) =       5.67   AREA-AVERAGED Fm(INCH/HR) =  0.08
```

```
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.40
  TOTAL AREA(ACRES) =        5.7
  LONGEST FLOWPATH FROM NODE    306.00 TO NODE    300.00 =    1080.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        5.7  TC(MIN.) =     12.70
  EFFECTIVE AREA(ACRES) =      5.67  AREA-AVERAGED Fm(INCH/HR)=  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 0.404
  PEAK FLOW RATE(CFS)   =       6.70

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        6.17    9.46    1.569  0.20( 0.08) 0.42       4.4     203.00
      2        6.70   12.70    1.326  0.20( 0.08) 0.40       5.7     306.00
      3        6.69   12.83    1.318  0.20( 0.08) 0.40       5.7     306.00
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

A.E.S. Unit Hydrograph Calculations and Low Loss Fraction Estimations

```
**************************************************************************
          NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
                    AND LOW LOSS FRACTION ESTIMATIONS
==========================================================================
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                           Analysis prepared by:

                             Fuscoe Engineering
                             6390 Greenwhich Dr
                                 Suite 170
                            San Diego, CA 92122

**************************************************************************
--------------------------------------------------------------------------

 Problem Descriptions:
  NEWPORT CROSSINGS
  2-YEAR DESIGN STORM PROPOSED CONDITIONS
  Y-BAR CALCULATION
==========================================================================
*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
    AND LOW LOSS FRACTION ESTIMATIONS FOR AMC II:

    TOTAL 24-HOUR DURATION RAINFALL DEPTH =     2.05 (inches)

    SOIL-COVER     AREA      PERCENT OF    SCS CURVE    LOSS RATE
       TYPE      (Acres)   PERVIOUS AREA     NUMBER    Fp(in./hr.)    YIELD
         1          5.08        0.35            75.       0.200       0.887
         2          0.61        0.85            75.       0.200       0.884

    TOTAL AREA (Acres) =      5.69

                                _
    AREA-AVERAGED LOSS RATE, Fm (in./hr.) =  0.001

                                _
    AREA-AVERAGED LOW LOSS FRACTION, Y = 0.113
==========================================================================
```

```
**************************************************************************
                    SMALL AREA UNIT HYDROGRAPH MODEL
==========================================================================
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             Ver. 21.0  Release Date: 06/01/2014  License ID 1355

                           Analysis prepared by:

                             Fuscoe Engineering
                            6390 Greenwich Drive
                                 Suite 170
                            San Diego, CA 92122

**************************************************************************
--------------------------------------------------------------------------

 Problem Descriptions:
  NEWPORT CROSSINGS
  2-YEAR DESIGN STORM PROPOSED CONDITIONS
  HYDROGRAPH VOLUME CALCULATION
--------------------------------------------------------------------------


    RATIONAL METHOD CALIBRATION COEFFICIENT = 0.90
    TOTAL CATCHMENT AREA(ACRES) =    5.69
    SOIL-LOSS RATE, Fm,(INCH/HR) =  0.080
    LOW LOSS FRACTION = 0.113
    TIME OF CONCENTRATION(MIN.) = 12.72
    SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
    ORANGE COUNTY "VALLEY" RAINFALL VALUES ARE USED
    RETURN FREQUENCY(YEARS) =   2
       5-MINUTE POINT RAINFALL VALUE(INCHES) =  0.19
      30-MINUTE POINT RAINFALL VALUE(INCHES) =  0.40
       1-HOUR   POINT RAINFALL VALUE(INCHES) =  0.53
       3-HOUR   POINT RAINFALL VALUE(INCHES) =  0.89
       6-HOUR   POINT RAINFALL VALUE(INCHES) =  1.22
      24-HOUR   POINT RAINFALL VALUE(INCHES) =  2.05

--------------------------------------------------------------------------

    TOTAL CATCHMENT   RUNOFF  VOLUME(ACRE-FEET) =     0.78
    TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) =     0.19

**************************************************************************
  TIME     VOLUME       Q    0.        2.5       5.0       7.5      10.0
 (HOURS)    (AF)      (CFS)
--------------------------------------------------------------------------
```

0.10	0.0006	0.15	Q	.	.	.	.
0.31	0.0032	0.15	Q	.	.	.	.
0.52	0.0057	0.15	Q	.	.	.	.
0.74	0.0083	0.15	Q	.	.	.	.
0.95	0.0109	0.15	Q	.	.	.	.
1.16	0.0136	0.15	Q	.	.	.	.
1.37	0.0162	0.15	Q	.	.	.	.
1.58	0.0189	0.15	Q	.	.	.	.
1.80	0.0216	0.16	Q	.	.	.	.
2.01	0.0243	0.16	Q	.	.	.	.
2.22	0.0271	0.16	Q	.	.	.	.
2.43	0.0299	0.16	Q	.	.	.	.
2.64	0.0327	0.16	Q	.	.	.	.
2.86	0.0355	0.16	Q	.	.	.	.
3.07	0.0384	0.16	Q	.	.	.	.
3.28	0.0413	0.17	Q	.	.	.	.
3.49	0.0442	0.17	Q	.	.	.	.
3.70	0.0472	0.17	Q	.	.	.	.
3.92	0.0502	0.17	Q	.	.	.	.
4.13	0.0532	0.17	Q	.	.	.	.
4.34	0.0563	0.18	Q	.	.	.	.
4.55	0.0594	0.18	Q	.	.	.	.
4.76	0.0625	0.18	Q	.	.	.	.
4.98	0.0656	0.18	Q	.	.	.	.
5.19	0.0688	0.18	Q	.	.	.	.
5.40	0.0721	0.19	Q	.	.	.	.
5.61	0.0754	0.19	Q	.	.	.	.
5.82	0.0787	0.19	Q	.	.	.	.
6.04	0.0820	0.19	Q	.	.	.	.
6.25	0.0855	0.20	Q	.	.	.	.
6.46	0.0889	0.20	Q	.	.	.	.
6.67	0.0924	0.20	Q	.	.	.	.
6.88	0.0960	0.20	Q	.	.	.	.
7.10	0.0996	0.21	Q	.	.	.	.
7.31	0.1032	0.21	Q	.	.	.	.
7.52	0.1069	0.21	Q	.	.	.	.
7.73	0.1107	0.22	Q	.	.	.	.
7.94	0.1145	0.22	Q	.	.	.	.
8.16	0.1184	0.22	Q	.	.	.	.
8.37	0.1224	0.23	Q	.	.	.	.
8.58	0.1264	0.23	Q	.	.	.	.
8.79	0.1305	0.23	Q	.	.	.	.
9.00	0.1346	0.24	Q	.	.	.	.
9.22	0.1389	0.24	Q	.	.	.	.
9.43	0.1432	0.25	.Q	.	.	.	.
9.64	0.1476	0.25	.Q	.	.	.	.
9.85	0.1521	0.26	.Q	.	.	.	.
10.06	0.1567	0.26	.Q	.	.	.	.

10.28	0.1614	0.27	.Q	.	.	.	.
10.49	0.1662	0.28	.Q	.	.	.	.
10.70	0.1711	0.29	.Q	.	.	.	.
10.91	0.1762	0.29	.Q	.	.	.	.
11.12	0.1814	0.30	.Q	.	.	.	.
11.34	0.1867	0.31	.Q	.	.	.	.
11.55	0.1921	0.32	.Q	.	.	.	.
11.76	0.1977	0.32	.Q	.	.	.	.
11.97	0.2035	0.34	.Q	.	.	.	.
12.18	0.2097	0.37	.Q	.	.	.	.
12.40	0.2167	0.44	.Q	.	.	.	.
12.61	0.2244	0.44	.Q	.	.	.	.
12.82	0.2324	0.47	.Q	.	.	.	.
13.03	0.2406	0.48	.Q	.	.	.	.
13.24	0.2492	0.50	. Q	.	.	.	.
13.46	0.2581	0.51	. Q	.	.	.	.
13.67	0.2674	0.55	. Q	.	.	.	.
13.88	0.2771	0.56	. Q	.	.	.	.
14.09	0.2874	0.61	. Q	.	.	.	.
14.30	0.2984	0.65	. Q	.	.	.	.
14.52	0.3104	0.71	. Q	.	.	.	.
14.73	0.3231	0.74	. Q	.	.	.	.
14.94	0.3369	0.83	. Q	.	.	.	.
15.15	0.3520	0.89	. Q	.	.	.	.
15.36	0.3690	1.05	. Q	.	.	.	.
15.58	0.3874	1.05	. Q	.	.	.	.
15.79	0.4093	1.45	. Q	.	.	.	.
16.00	0.4395	2.00	. Q	.	.	.	.
16.21	0.5127	6.36	.	.	.	Q	.
16.42	0.5786	1.17	. Q	.	.	.	.
16.64	0.5973	0.96	. Q	.	.	.	.
16.85	0.6126	0.79	. Q	.	.	.	.
17.06	0.6254	0.68	. Q	.	.	.	.
17.27	0.6365	0.58	. Q	.	.	.	.
17.48	0.6462	0.53	. Q	.	.	.	.
17.70	0.6551	0.49	.Q	.	.	.	.
17.91	0.6634	0.45	.Q	.	.	.	.
18.12	0.6711	0.43	.Q	.	.	.	.
18.33	0.6777	0.33	.Q	.	.	.	.
18.54	0.6834	0.31	.Q	.	.	.	.
18.76	0.6887	0.29	.Q	.	.	.	.
18.97	0.6937	0.28	.Q	.	.	.	.
19.18	0.6985	0.27	.Q	.	.	.	.
19.39	0.7031	0.26	.Q	.	.	.	.
19.60	0.7075	0.25	Q	.	.	.	.
19.82	0.7118	0.24	Q	.	.	.	.
20.03	0.7159	0.23	Q	.	.	.	.
20.24	0.7198	0.22	Q	.	.	.	.

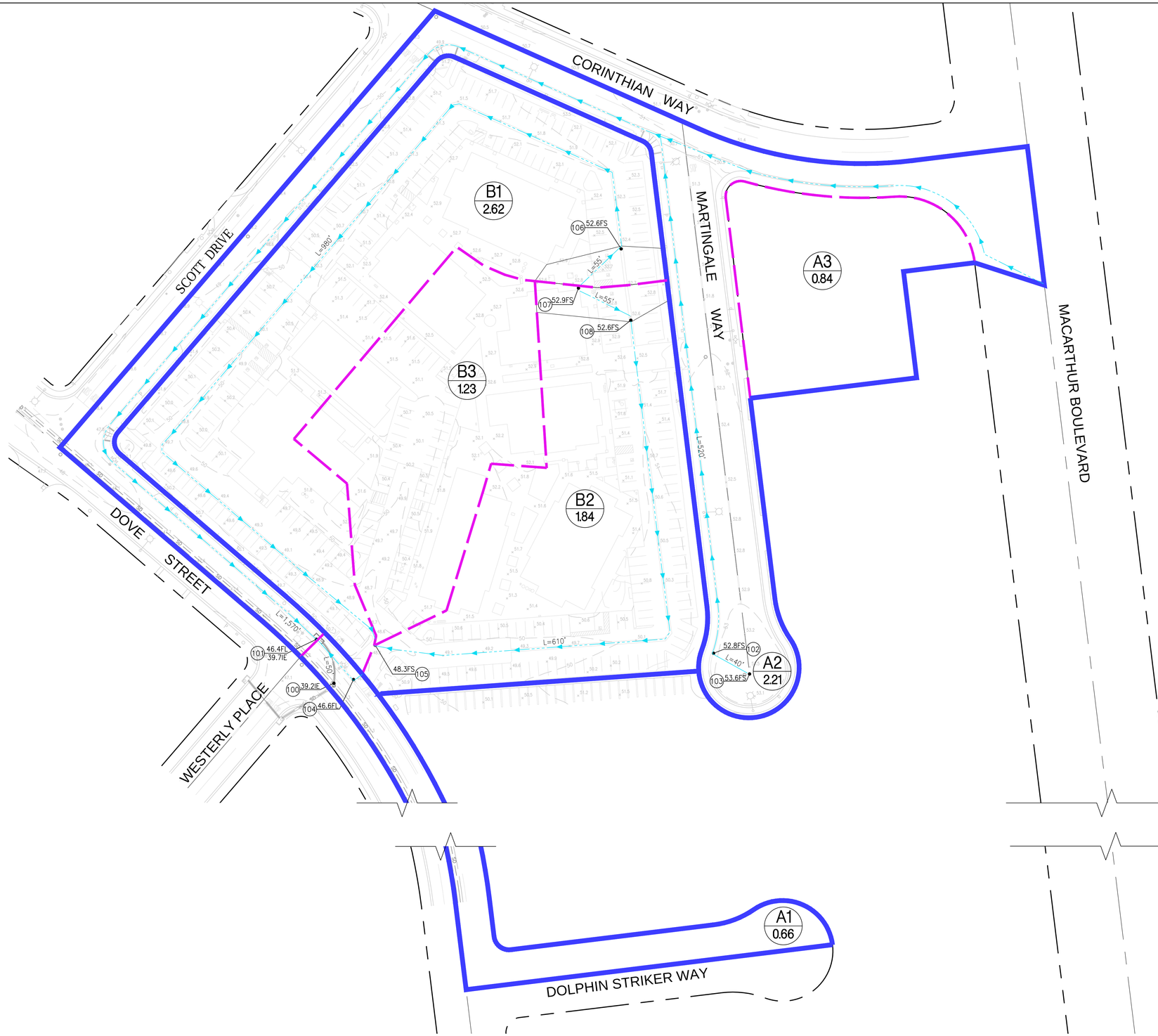
20.45	0.7237	0.21	Q	.	.	.	.
20.66	0.7274	0.21	Q	.	.	.	.
20.88	0.7310	0.20	Q	.	.	.	.
21.09	0.7345	0.20	Q	.	.	.	.
21.30	0.7379	0.19	Q	.	.	.	.
21.51	0.7412	0.19	Q	.	.	.	.
21.72	0.7444	0.18	Q	.	.	.	.
21.94	0.7476	0.18	Q	.	.	.	.
22.15	0.7507	0.17	Q	.	.	.	.
22.36	0.7537	0.17	Q	.	.	.	.
22.57	0.7567	0.17	Q	.	.	.	.
22.78	0.7596	0.16	Q	.	.	.	.
23.00	0.7624	0.16	Q	.	.	.	.
23.21	0.7652	0.16	Q	.	.	.	.
23.42	0.7679	0.15	Q	.	.	.	.
23.63	0.7706	0.15	Q	.	.	.	.
23.84	0.7733	0.15	Q	.	.	.	.
24.06	0.7758	0.15	Q	.	.	.	.
24.27	0.7771	0.00	Q	.	.	.	.

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
(Note: 100% of Peak Flow Rate estimate assumed to have
an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
0%	1450.1
10%	178.1
20%	38.2
30%	25.4
40%	12.7
50%	12.7
60%	12.7
70%	12.7
80%	12.7
90%	12.7

Existing and Proposed Condition

Hydrology Maps



LEGEND

- MAJOR BOUNDARY/MAJOR BOUNDARY
- SUB AREA BOUNDARY
- FLOW PATH
- A2 / 1.53 — DRAINAGE AREA DESIGNATION / ACRES
- 101 — HYDROLOGIC NODE

SUMMARY

EXISTING CONDITION 2-YEAR STORM/24 HR.				
DESCRIPTION	HYDROLOGIC NODE	TOTAL AREA (ACRE)	TOTAL FLOW (CFS)	Tc (Minutes)
ONSITE	104	5.69	6.72	11.66

EXISTING CONDITION 25-YEAR STORM/24 HR.				
DESCRIPTION	HYDROLOGIC NODE	TOTAL AREA (ACRE)	TOTAL FLOW (CFS)	Tc (Minutes)
ONSITE	104	5.69	15.09	10.68
PUBLIC SD	100	9.41	23.73	12.32

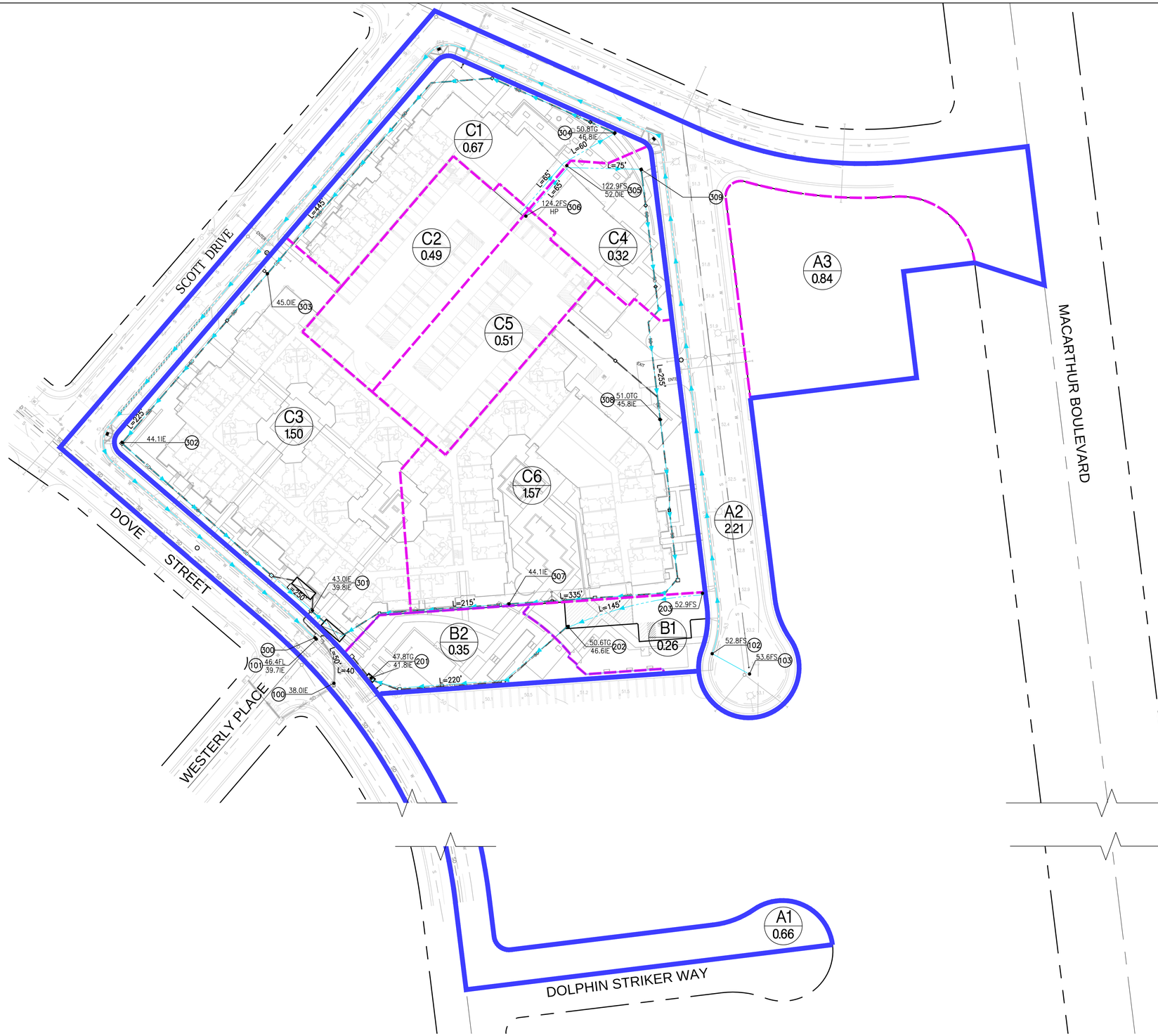
SOIL TYPE D
PROJECT BOUNDARY AREA = 5.69 AC
OFFSITE WATER SHED AREA = 3.72 AC
TOTAL = 9.41 AC

50' 0' 25' 50'
SCALE: 1" = 50'

EXISTING HYDROLOGY

NEWPORT CROSSINGS-NEWPORT BEACH

FUSCOE ENGINEERING
16795 Von Karman, Suite 100, Irvine, California 92606
tel 949.474.1960 ⋄ fax 949.474.5315 ⋄ www.fuscoe.com



LEGEND

- MAJOR BOUNDARY/MAJOR BOUNDARY
- SUB AREA BOUNDARY
- FLOW PATH
- A2 / 1.53 — DRAINAGE AREA DESIGNATION; ACRES
- (101) HYDROLOGIC NODE

SUMMARY

PROPOSED CONDITION - ONSITE 2-YEAR STORM/24 HR.				
DESCRIPTION	HYDROLOGIC NODE	TOTAL AREA (ACRE)	TOTAL FLOW (CFS)	Tc (Minutes)
ONSITE	300	5.69	6.70	12.70

PROPOSED CONDITION 25-YEAR STORM/24 HR.				
DESCRIPTION	HYDROLOGIC NODE	TOTAL AREA (ACRE)	TOTAL FLOW (CFS)	Tc (Minutes)
PUBLIC SD	100	9.41	23.53	11.88
PARK	201 TO 300	0.61	1.79	9.2
CONDOS	301 TO 300	5.08	13.80	11.81
CONDOS AND PARK	300	5.69	15.35	11.81

SOIL TYPE D
PROJECT BOUNDARY AREA = 5.69 AC
OFFSITE WATER SHED AREA = 3.72 AC
TOTAL = 9.41 AC

40' 0' 20' 40'
SCALE: 1" = 40'

PROPOSED HYDROLOGY

NEWPORT CROSSINGS-NEWPORT BEACH

FUSCOE ENGINEERING
16795 Von Karman, Suite 100, Irvine, California 92606
tel 949.474.1960 ∘ fax 949.474.5315 ∘ www.fuscoe.com