Preliminary Water Quality Management Plan (PWQMP)

Project Name:

Oakbrook Plaza

Permit No. 0166-2023

Prepared for:

Matthew Haugen

3501 Jamboree Rd, Suite 4200

Newport Beach, CA 92660

949-721-1414

Prepared by:

Fuscoe Engineering, Inc

Engineer: Victor Pham

Registration No.

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Engineer's Seal

Revised on:

7/11/2025

Project Owner's Certification			
Permit/Application No.	0166-2023	Grading Permit No.	0166-2023
Tract/Parcel Map No.	TBD	Building Permit No.	TBD
CUP, SUP, and/or APN (Specify Lot Numbers if Portions of Tract)			

This Water Quality Management Plan (WQMP) has been prepared for Buchanan Street partners by Fuscoe Engineering. The WQMP is intended to comply with the requirements of the local NPDES Stormwater Program requiring the preparation of the plan.

The undersigned, while it owns the subject property, is responsible for the implementation of the provisions of this plan and will ensure that this plan is amended as appropriate to reflect up-to-date conditions on the site consistent with the current Orange County Drainage Area Management Plan (DAMP) and the intent of the non-point source NPDES Permit for Waste Discharge Requirements for the County of Orange, Orange County Flood Control District and the incorporated Cities of Orange County within the San Diego Region (South Orange County). 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: Mathew Haugen			
Title	Buchanan Street Partners		
Company	Buchanan Street Partners		
Address	3501 Jamboree Rd, Suite 4200, Newport Beach, CA 92660		
Email	mhaugen@buchananstreet.com		
Telephone #	949-721-1414		
Signature		Date	

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Section 1 Discretionary Permit(s) and Water Quality Conditions

Project Infomation			
Permit/Application No.	TBD	Site Address or Tract/Parcel Map No.	24422 Avenida De La Carlota, Laguna Hills, CA 92653
Additional Information/ Comments:	None		
Water Quality Conditions			
Water Quality Conditions from prior approvals or applicable watershed-based plans	**None**		

Section 2 Project Description

2.1 General Description

Description of Proposed Project				
Site Location	24422 Avenida De La Carlota, Laguna Hills, CA 92653.			
Project Area (ft^2): 135,189	Number of Dwelling Units: 240		SIC Code: 6513	
Narrative Project Description:	The existing site is located at 24422 Avenida De La Carlota in the City of Laguna Hills within County of Orange and is part of an existing office plaza that consists of an office building and a surface parking lot. The property is approximately 8.43 acres, of which 3.10 acres of the southerly parking lot is being developed, and is bounded by Los Alisos Blvd to the southeast, Freeway 5 to the northeast, and Avenida De La Carlota to the west. The existing southerly parking lot is proposed to be redeveloped to 7 story apartment building with 3 stories of parking garage and 4 stories of apartment units (240 total units). The building will also have one partial subterranean parking level.			
Project Area	Pervious		Impervious	
	Area (acres or sq ft)	Percentage	Area (acres or sq ft)	Percentage
Pre-Project Conditions	0.31 ac	10%	2.79 ac	90%
Post-Project Conditions	0.31 ac	10%	2.79 ac	90%

2.2 Post Development Drainage Characteristics

The drainage areas within the proposed project area will generally follow existing drainage patterns. Flows from the building, parking lot, and drive aisle will be treated by Modular Wetland Systems (MWS) located along the private drive aisle for water quality treatment. The treated flows then are directed to the onsite detention system for hydromodification flowrate mitigation. The flows will then be pumped to the existing an existing 24' catch basin on Avenida De La Carlota, before draining to Aliso Creek and ultimately, the Pacific Ocean.

The frontage of the project along Los Alisos will remain mostly vegetated and slopes towards the building. Flows will be collected in a proposed v-gutter and directed to inlets that send flows to the existing 10' catch basin along Los Alisos Boulevard. The frontage of the project along Avenida De La Carlota will continue to remain mostly vegetated and maintains the existing drainage pattern of draining to the street. The frontage areas are mostly vegetated, and impervious areas flow to pervious areas so Hydrologic Source Controls are implemented for treatment of these areas.

LID BMPs are implemented to the maximum extent possible for runoff dispersion. Permeable pavers were added to feasible locations, including loading parking stalls in DMA A4, a driveway in DMA A4, and driveways in DMA A2 and A1. Disconnected roof downspouts are proposed to outlet to landscaped planter areas in DMAs A1, A2, and A3.

Off-site run-on coming from the existing building and parking area to the north will be picked up by a proposed v-gutter that keeps offsite flows from comingling with onsite flows.

2.3 Property Ownership/Management

Property management/owner, Buchanan Street Partners, will maintain the property and all the facilities noted above. Buchanan Street Partners shall oversee all BMP maintenance and inspection responsibilities for the proposed project in the short-term. No on-site infrastructure will be transferred or maintained by the City of Laguna Hills.

Section 3 Site & Watershed Characterization

3.1 Site Conditions

3.1.1 Existing Site Conditions

The existing site is located at 24422 Avenida De La Carlota in the City of Laguna Hills within County of Orange and is part of an existing office plaza that consists of an office building and a surface parking lot. The property is approximately 8.43 acres, of which 3.10 acres of the southerly parking lot is being developed, and is bounded by Los Alisos Blvd to the southeast, Freeway 5 to the northeast, and Avenida De La Carlota to the west.

Existing Land Use Types

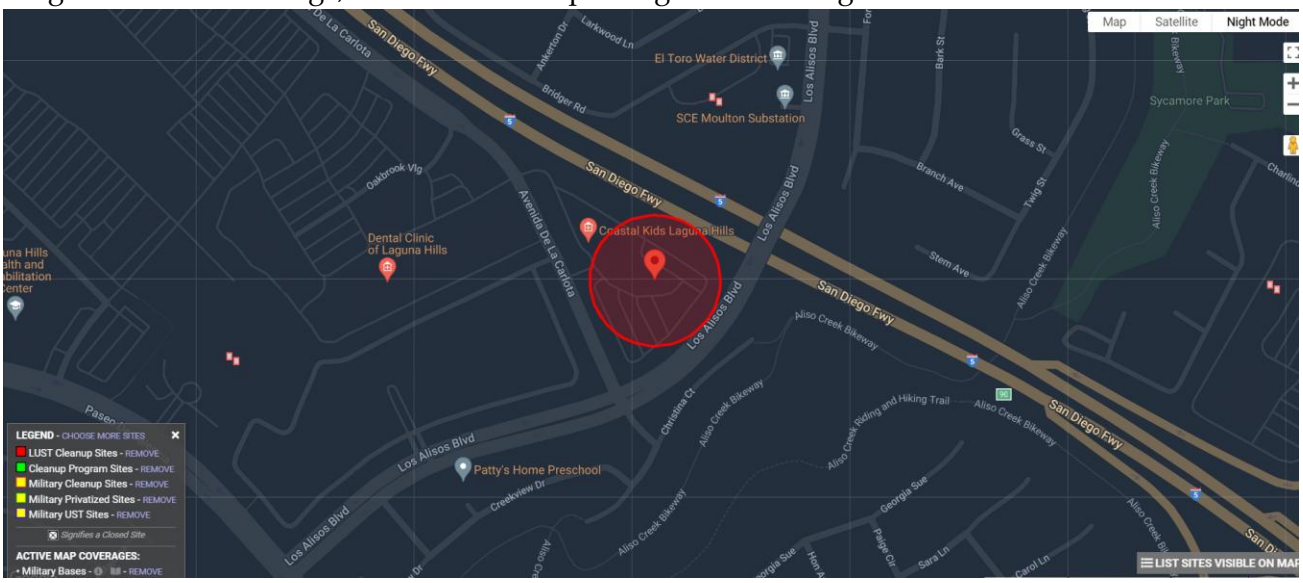
Land Use Description	Total Area (acres)	Impervious Area (acres)	Pervious Area (acres)	Imperviousness (%)
Commercial Parking Lot	3.10	2.79 ac	0.31 ac	90%
Total	**3.10**	**2.79 ac**	**0.31 ac**	**90%**

3.1.2 Infiltration-Related Characteristics

The project site is in an area characterized by Hydrologic Soil Group C soils. Based on preliminary correspondence with the geotechnical engineer, perched groundwater is approximately 30 ft bgs at the project site. Three infiltration tests were performed to a depth of 10 feet below existing ground surface and resulted in infiltration rates that ranged from 0.01 inch/hour to 0.04 inch/hour without a factor of safety. This results in infiltration rates well below the required 0.3 inch/hour minimum rate accepted. Therefore, **the site is not considered acceptable for infiltration** by the geotechnical engineer. Please see the infiltration test results in Attachment G for more details.

3.1.2.1 Hydrogeologic Conditions

There are no open Geotracker sites within 250 ft of the project site and no groundwater contamination concerns (i.e. plumes). The site is also not known to be hydrogeologically significant for groundwater recharge, as the site was a parking lot in existing conditions.



3.1.2.2 Soil and Geologic Infiltration Characteristics

According to the Natural Resources Conservation Service Web Soil Survey, the Soil Type is C, which is characterized as soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

3.1.2.3 Geotechnical Conditions

Seismic hazard at this site is currently unknown at this stage in the project's development. Hazard potential for liquefaction and land sliding are very low and unlikely, according to the OC Stormwater Program Land Development Tool. The majority of the site has low susceptibility to rill and sheet erosion, while a small portion of the southeast corner of the site is highly susceptible. A more thorough analysis will be provided regarding geotechnical conditions, such as expansive soil and liquefaction, when the geotechnical report for the project is available.

There are existing slopes along the project's perimeter, mainly along Avenida De La Carlota and a small section along Los Alisos Blvd. near the northeast intersection of the two streets. The project is higher in elevation than the street grade by approximately 5 feet in these locations.

3.1.2.4 Summary of Infiltration Opportunities and Constraints of Existing Site

The project site is in an area characterized by Hydrologic Soil Group C soils. Based on preliminary correspondence with the geotechnical engineer, perched groundwater is approximately 30 ft bgs at the project site. Three infiltration tests were performed to a depth of 10 feet below existing ground surface and resulted in infiltration rates that ranged from 0.01 inch/hour to 0.04 inch/hour without a factor of safety. This results in infiltration rates well below the required 0.3 inch/hour minimum rate accepted. Therefore, **the site is not considered acceptable for infiltration** by the geotechnical engineer. Please see the infiltration test results in Attachment G for more details.

The frontage areas of the project are mostly vegetated, and impervious areas flow to pervious areas, so Hydrologic Source Controls are implemented for treatment.

LID BMPs are implemented to the maximum extent possible for runoff dispersion. Permeable pavers were added to feasible locations, including loading parking stalls in DMA A4, a driveway in DMA A4, and driveways in DMA A2 and A1. Disconnected roof downspouts are proposed to outlet to landscaped planter areas in DMAs A1, A2, and A3.

3.2 Proposed Site Development Activities

3.2.1 Overview of Site Development Activities

The 4-story apartments are L-shaped. There will be a clubroom and leasing offices on the south side of the apartments and break rooms in the north of the building. There is partial subterranean parking (level B1 and B2) with more parking on P1 (ground) and P2 (1 level above ground).

3.2.2 Project Attributes Influencing Stormwater Management

The proposed site will be a newly developed residential complex with partially subterranean parking. A swimming pool will be within the residential apartment complex. There will be no storage of hazardous materials on site, fuelling areas, vehicle cleaning or maintenance or other pollutants of concern. There are no proposed trash enclosures as the trash rooms are within the building.

Flows from the building, parking lot, and drive aisle will be treated by Modular Wetland Systems (MWS) located along the private drive aisle for water quality treatment. The treated flows then are directed to the onsite detention system for hydromodification flowrate mitigation. The flows will then be pumped to the existing an existing 24' catch basin on Avenida De La Carlota, before draining to Aliso Creek and ultimately, the Pacific Ocean

The frontage of the project along Los Alisos will remain mostly vegetated and slopes towards the building. Flows will be collected in a proposed v-gutter and directed to inlets that send flows to the existing 10' catch basin along Los Alisos Boulevard. The frontage of the project along Avenida De La Carlota will continue to remain mostly vegetated and maintains the existing drainage pattern of draining to the street. The frontage areas are mostly vegetated, and impervious areas flow to pervious areas so Hydrologic Source Controls are implemented for treatment of these areas.

LID BMPs are implemented to the maximum extent possible for runoff dispersion. Permeable pavers were added to feasible locations, including loading parking stalls in DMA A4, a driveway in DMA A4, and driveways in DMA A2 and A1. Disconnected roof downspouts are proposed to outlet to landscaped planter areas in DMAs A1, A2, and A3.

Off-site run-on coming from the existing building and parking area to the north will be picked up by a proposed v-gutter that keeps offsite flows from comingling with onsite flows

Associated environmentally sensitive features were not identified. Offsite run-on from the existing building and northern area of lot that will comingle with project flows have been accounted for in the project's DCV and this WQMP.

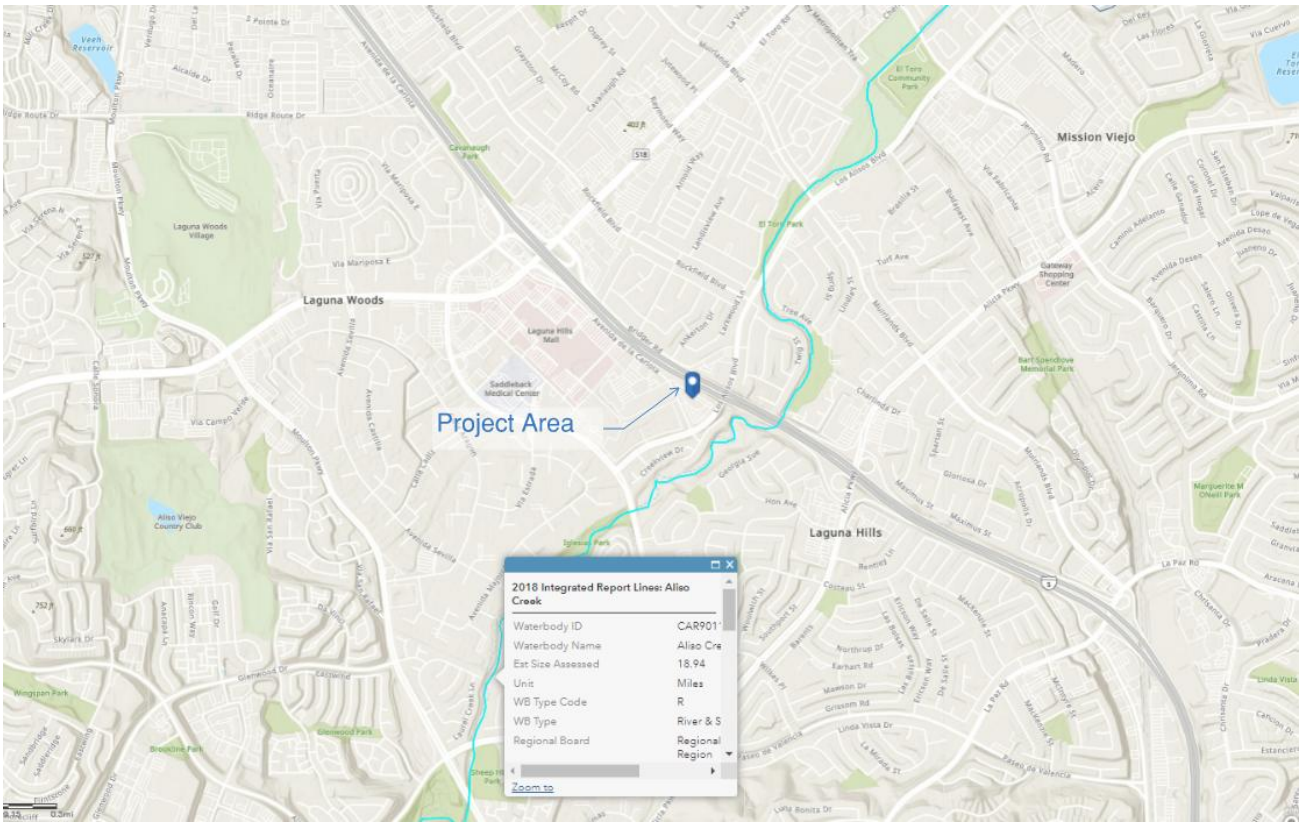
Proposed Land Uses				
Land Use Description	Total Area (acres)	Impervious Area (acres)	Pervious Area (acres)	Imperviousness (%)
Apartment Building Parking, and Drive Aisle	3.10	2.79	0.31	90
Total	**3.10**	**2.79**	**0.31**	**90**

3.2.3 Effects on Infiltration and Harvest and Use Feasibility

Due to poor infiltration rates, potential conflicts with existing utilities and setback requirements for building structures and slopes, infiltration is determined to be infeasible. Harvest and Reuse is considered infeasible as well due to limited landscaping and therefore limited irrigation demand. The DCV of the project cannot be used within 48 hours of the end of a storm event.

3.3 Receiving Waterbodies

The eastern part of the project will ultimately discharge east to an existing catch basin on Los Alisos Boulevard. The northwestern portion of the project area will ultimately discharge to an existing catch basin on Avenida De La Carlota. Through the MS4 system, water will drain southeast approximately 500 feet to Aliso Creek and ultimately the Pacific Ocean. 303(d) pollutant of concern for Aliso Creek includes Indicator Bacteria. There are no Environmentally Sensitive Areas downstream of the project.


Project Area
Laguna Woods
Laguna Hills
Mission Viejo
2018 Integrated Report Lines: Aliso Creek
Waterbody ID
CAR901
Waterbody Name
Aliso Cre
Est Size Assessed
18.94
Unit
Miles
WB Type Code
R
WB Type
River & S
Regional Board
Regional Region
Zoom to

3.4 Stormwater Pollutants or Conditions of Concern

Pollutants or Conditions of Concern				
Pollutant	Expected from Proposed Land Uses/Activities (Yes or No)	Receiving Waterbody Impaired (Yes or No)	Priority Pollutant from WQIP or other Water Quality Condition? (Yes or No)	**Pollutant of Concern (Primary, Other, or No)**
Suspended-Solids	Yes	No	Yes	Primary
Nutrients	Yes	Yes	Yes	Primary
Heavy Metals	No	Yes	No	No
Bacteria/Virus/Pathogens	Yes	Yes	Yes	Primary
Pesticides	Yes	No	No	Other
Oil and Grease	No	No	No	No
Toxic Organic Compounds	No	Yes	No	No
Trash and Debris	Yes	No	No	Other
Dry Weather Runoff	Yes	No	Yes	Primary

Per the 2020-2022 Section 303(d) list, Aliso Creek is listed as impaired for the following:[1]

Benthic Community Effects

- Indicator Bacteria
- Malathion
- Nitrogen
- Phosphorus
- Selenium
- Toxicity

In addition, TMDLs have been established for the following:

- Indicator Bacteria

[1]Source: State Water Resources Control Board (SWRCB). 2020-2022 California Integrated Report Clean Water Act Sections 303(d) and 305(b). Final Staff Report. Released February 16, 2022, approved by the US EPA May 11, 2021.

The Water Quality Improvement Plan (WQIP) for South Orange County identifies the following Highest Priority Water Quality Conditions:

- Pathogens
- Dry Weather Flows

3.5 Hydrologic Conditions of Concern

Does a hydrologic condition of concern exist for this project?

☐ No – An HCOC does not exist for this receiving water because:

☐ Project discharges directly to a protected conveyance (bed and bank are concrete lined the entire way from the point(s) of discharge to a receiving lake, reservoir, embayment, or the Ocean

☐ Project discharges directly to storm drains which discharge directly to a reservoir, lake, embayment, ocean or protected conveyance (as described above)

☐ The project discharges to an area identified in the WMAA as exempt from hydromodification concerns

☒ Yes – An HCOC does exist for this receiving water because none of the above are applicable.

3.6 Critical Course Sediment Yield Areas

Not Applicable. The project is not within a critical course sediment yield area, as indicated in the image below.

Section 4 Site Plan and Drainage Plan

4.1 Drainage Management Area Delineation

The proposed BMPs have been selected for the project based on the feasibility criteria as defined in the OC TGD, as well as the project's Pollutants off Concern, the BMP's ability to effectively treat those pollutants, specific site conditions (such as presence of low-infiltrating soil layers), setback requirements from building foundations, existing retaining wall footings and existing utilities (see sections above for additional discussion of site constraints). Four proprietary flow-based compact Modular Wetlands Linear biofiltration BMPs were selected for treating runoff from the project area. HSCs are used throughout the project for runoff dispersion in the form of impervious area dispersion, permeable pavers, and disconnected roof downspouts.

4.2 Overall Site Design BMPs

Minimize Impervious Area - Overall impervious areas will decrease slightly as compared to existing conditions.

Maximize Natural Infiltration Capacity – There is very limited landscaped or pervious areas within the project site to incorporate this site design measure to any appreciable level.

Preserve Existing Drainage Patterns and Time of Concentration- General drainage patterns will remain similar to existing conditions, with water discharging south to Avenida De La Carlota and east to Los Alisos Blvd.

Disconnect Impervious Areas – The majority of the project site is comprised of the proposed building footprint, so there is limited opportunity to disconnect impervious area to any appreciable degree.

Protect Existing Vegetation and Sensitive Areas - Areas of existing vegetation around the perimeter of the site will remain landscaped under proposed conditions.

Revegetate Disturbed Areas - There are no disturbed areas to revegetate.

Soil Stockpiling and Site Generated Organics - Topsoil stockpiles will not be generated and there are limited areas with which to use these materials.

Firescaping - No significant landscaping proposed in which to implement this site design measure. The project is in a highly urbanized area that is not considered a high risk wildfire zone.

Water Efficient Landscaping - Water efficient landscaping will be utilized in the vegetation within the project area.

Slopes and Channel Buffers - No major slopes or channels exist on the property.

4.3 DMA Characteristics and Site Design BMPs

The project will drain and is delineated as five major DMAs, with flows being conveyed and tied into the back of two public catch basins and ultimately to the City's MS4 under Avenida De La Carlota.

4.3.1 DMA A1

DMA A1 is comprised of 0.28 acres of parking lot improvements, drive aisle improvements, and landscaping. Flows will be conveyed south in a proposed v-gutter that is then intercepted by a curb opening Modular Wetland unit, BMP #1, that treats the water quality flowrate and sends flows to the underground detention system for hydromodification mitigation. Disconnected roof downspouts and permeable pavers are also implemented in this DMA.

4.3.2 DMA A2

DMA A2 is comprised of 0.49 acres of proposed building, drive aisle improvements, and landscaping. Flows will be conveyed south in a proposed v-gutter that is then intercepted by a catch basin with a DVERT sending low flows south to a vault type Modular Wetland unit, BMP #2, and high flows to the hydromodification detention system. The MWS treats the water quality flowrate and sends flows to the underground detention system for hydromodification mitigation. Disconnected roof downspouts and permeable pavers are also implemented in this DMA.

4.3.3 DMA A3

DMA A3 is comprised of 0.98 acres of proposed building, drive aisle improvements, and landscaping. Flows will be conveyed south in a proposed v-gutter that is then intercepted by a catch basin with a DVERT sending low flows south to a vault type Modular Wetland unit, BMP #3, and high flows to the hydromodification detention system. The MWS treats the water quality flowrate and sends flows to the underground detention system for hydromodification mitigation. Disconnected roof downspouts are also implemented in this DMA.

4.3.4 DMA A4

DMA A4 is comprised of 0.73 acres of proposed building, drive aisle improvements, and landscaping. Flows will be conveyed southwest in a proposed v-gutter that is then intercepted by a catch basin with a DVERT sending low flows south to a vault type Modular Wetland unit, BMP #4, and high flows to the hydromodification detention system. The MWS treats the water quality flowrate and sends flows to the underground detention system for hydromodification mitigation

Flows from DMAs A1-A4 are tributary to the hydromodification detention system. After flows are mitigated in the underground vault, they are pumped up to connect to the back of the existing catch basin in Avenida De La Carlota. Disconnected roof downspouts and permeable pavers are also implemented in this DMA.

4.3.5 DMA A5

DMA A5 is comprised of existing sloped vegetated areas. The existing slope on the east side of the property flows to the proposed building so a v-gutter will collect flows and connect them to the back of the existing catch basin on Los Alisos Boulevard. The landscaped area along the south side of the property will maintain the existing condition flow pattern and will flow out to Avenida De La Carlota. HSC-2, impervious area dispersion is utilized for these areas due to the impervious areas being tributary to pervious areas.

See Attachment 1 for WQMP exhibit.

4.3.4 DMA Summary

Drainage Management Areas				
DMA (Number/Description)	Total Area (acres)	Imperviousness (%)	Infiltration Feasibility Category (Full, Partial, or No Infiltration)	Hydrologic Source Controls Used
DMA A1	0.28	90	No Infiltration	None
DMA A2	0.49	90	No Infiltration	None
DMA A3	0.98	90	No Infiltration	None
DMA A4	0.73	90	No Infiltration	None
DMA A5	0.63	10	No Infiltration	HSC-2

4.4 Source Control BMPs

Non-Structural Source Control BMPs				
Identifier	**Name**	**Check One**		**Reason Source Control is Not Applicable**
		Included	**Not Applicable**	
N1	Education for Property Owners, Tenants and Occupants	☒	☐	
N2	Activity Restrictions	☒	☐	
N3	Common Area Landscape Management	☒	☐	
N4	BMP Maintenance	☒	☐	
N5	Title 22 CCR Compliance (How development will comply)	☐	☒	No hazardous materials use proposed.
N6	Local Industrial Permit Compliance	☐	☒	No applicable permits.
N7	Spill Contingency Plan	☐	☒	No hazardous materials use proposed.
N8	Underground Storage Tank Compliance	☐	☒	No USTs proposed.
N9	Hazardous Materials Disclosure Compliance	☐	☒	No hazardous materials proposed.

Non-Structural Source Control BMPs

N10	Uniform Fire Code Implementation	☐	☒	No hazardous materials proposed.
N11	Common Area Litter Control	☒	☐	
N12	Employee Training	☒	☐	
N13	Housekeeping of Loading Docks	☐	☒	No loading docks on-site.
N14	Common Area Catch Basin Inspection	☒	☐	
N15	Street Sweeping Private Streets and Parking Lots	☒	☐	
N16	Retail Gasoline Outlets	☐	☒	No RGOs proposed.

Structural Source Control BMPs

Identifier	Name	Check One		Reason Source Control is Not Applicable
		Included	Not Applicable	
S1	Provide storm drain system stenciling and signage	☒	☐	
S2	Design and construct outdoor material storage areas to reduce pollution introduction	☐	☒	None proposed.
S3	Design and construct trash and waste storage areas to reduce pollution introduction	☐	☒	None proposed.
S4	Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control	☒	☐	
S5	Protect slopes and channels and provide energy dissipation	☒	☐	
	Incorporate requirements applicable to individual priority project categories (from SDRWQCB NPDES Permit)	☒	☐	
S6	Dock areas	☐	☒	No dock areas are proposed
S7	Maintenance bays	☐	☒	No maintenance bays are proposed
S8	Vehicle wash areas	☐	☒	No vehicle wash areas are proposed

Structural Source Control BMPs				
S9	Outdoor processing areas	☐	☒	No outdoor processing areas are proposed
S10	Equipment wash areas	☐	☒	No equipment wash areas are proposed
S11	Fueling areas	☐	☒	No fueling areas are proposed
S12	Hillside landscaping	☐	☒	Project is not a hillside development.
S13	Wash water control for food preparation areas	☐	☒	No preparation areas are proposed
S14	Community car wash racks	☐	☒	No community car was racks are proposed

Section 5 Low Impact Development BMPs

5.1 LID BMPs in DMA A

5.1.1 Hydrologic Source Controls for DMA A5

Hydrologic Source Controls (HSC) are utilized at DMA A5. The frontage of the project along Los Alisos will remain mostly vegetated and slopes towards the building. Flows will be collected in a proposed v-gutter and directed to inlets that send flows to the existing 10′ catch basin along Los Alisos Boulevard. The frontage of the project along Avenida De La Carlota will continue to remain mostly vegetated and maintains the existing drainage pattern of draining to the street. The frontage areas are mostly vegetated, and impervious areas flow to pervious areas so Hydrologic Source Controls are implemented for treatment of these areas.

HSC-2: Impervious Area Dispersion

	Drainage area ID	**See Below**		
	Total drainage area	0.630	acres	
	Total drainage area Impervious Area (IA_{total})	0.063	acres	
HSC ID	HSC Type/ Description/ Reference BMP Fact Sheet	Effect of individual HSC_i per BMP Fact Sheets (XIV.1) (d_{HSCi})[1]	Impervious Area Tributary to HSC_i (IA_i)	$d_i \times IA_i$
DMA A5	HSC-2: Impervious Area Dispersion, Ratio = 9.0	0.90"	0.0627	0.0564
	Box 1:		$\sum d_i \times Iai$ =	0.0564
	Box 2:		IA_{total} =	0.063
	[Box 1]/[Box 2]:		$d_{HSC\ total}$ =	0.900

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Area	***Impervious Area (SF)***	***Pervious Area (SF)***	***Total Area (SF)***	***Ratio***	***Required Ratio***
DMA A5	*2,729*	*24,563*	*27,292*	*9.0*	*1.8*

The DCV for the other DMAs are addressed through a structural LID BMP (BIO-7: Proprietary Biotreatment).

5.2 Structural LID BMP for DMA A1

As discussed previously under Section 4.1, a proprietary biotreatment BMP (Modular Wetland System (MWS)) will be located at the downstream end of DMA A. The system has been sized as a flow-based compact biofiltration BMP with no supplemental retention, as feasibility results indicate no infiltration for this DMA.

- Modular Wetlands are a proprietary biotreatment device approved through the Washington State University TAPE (Technology Assessment Protocol – Ecology) program for basic storm water treatment and enhanced treatment including sediment, nutrients and heavy metals (all proposed pollutants of concern for the project and for downstream watersheds). TAPE approval is based on a series of independent field studies using strict sampling criteria to validate vendor's claims. TAPE approval is considered one of the most stringent and most reliable in the Country.

- Modular Wetlands have a pre-treatment chamber that is specifically designed to capture fine sediments and particulates through a series of filters which prohibit the fines and particulates from entering the bioretention chamber and accelerating potential clogging of the bioretention soil. Modular Wetland systems are specifically designed for higher flow through treatment rates as compared to traditional bioretention cells which reduces the potential for nutrient and copper leaching under more stagnant conditions (a common occurrence with planters that are left unmaintained).

- Modular Wetlands Systems 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.

STRUCTURAL LID BMP FOR DMA A1	
Infiltration Feasibility	*Not feasible. See Section 3.1.2*
Harvest and Use Feasibility	*Not feasible. See Section 3.2.3*

Selected BMP	BIO-7: Proprietary Biotreatment
Selected BMP Sizing Method	Flow-Based Compact Biofiltration Method
Flow Required (cfs) Q_{design} = C x i_{design} x A x 150% Where: Q_{design} = design flowrate, cfs C = runoff coefficient = (0.75 x imp + 0.15) Imp = impervious fraction of drainage area (ranges from 0 to 1) I_{design} = design intensity, inches/hour A = tributary area, acres Imp = 90% I_{design} = 0.26 inches/hour A = 0.28 acres **Q_{design}** = (0.75 x 0.9 + 0.15) x 0.26 in/hr x 0.28 ac x 150% **= 0.089 cfs** *Refer to Attachment D for detailed calculations (Worksheet 9)*	
Q Provided (cfs)	DMA A1; One (1) MWS-L-4-8 MWS = 0.115 cfs *Refer to Attachment D for detailed calculations.*

5.3 Structural LID BMPs in DMA A2

As discussed previously in Section 4.3.2, a proprietary biotreatment BMP (Modular Wetland System (MWS)) will be located in the downstream end of DMA B. The system has been sized as a flow-based compact biofiltration BMP with no supplemental retention, as feasibility results indicate no infiltration for this DMA.

STRUCTURAL LID BMP FOR DMA A2	
Infiltration Feasibility	*Not feasible. See Section 3.1.2*
Harvest and Use Feasibility	*Not feasible. See Section 3.2.3*
Selected BMP	BIO-7: Proprietary Biotreatment

Selected BMP Sizing Method	Flow-Based Compact Biofiltration Method
Flow Required (cfs) Q_{design} = C x i_{design} x A x 150% Where: Q_{design} = design flowrate, cfs C = runoff coefficient = (0.75 x imp + 0.15) Imp = impervious fraction of drainage area (ranges from 0 to 1) I_{design} = design intensity, inches/hour A = tributary area, acres Imp = 90% I_{design} = 0.26 inches/hour A = 0.49 acres **Q_{design}** = (0.75 x 0.9 + 0.15) x 0.26 in/hr x 0.49 ac x 150% **= 0.156 cfs** *Refer to Attachment D for detailed calculations (Worksheet 9)*	
=Q Provided (cfs)	DMA A2; One (1) MWS-L-4-15 Unit MWS = 0.175 cfs *Refer to Attachment D for detailed calculations.*

5.4 Structural LID BMP for DMA A3

As discussed previously under Section 4.1, a proprietary biotreatment BMP (Modular Wetland System (MWS)) will be located at the downstream end of DMA A. The system has been sized as a flow-based compact biofiltration BMP with no supplemental retention, as feasibility results indicate no infiltration for this DMA.

- Modular Wetlands are a proprietary biotreatment device approved through the Washington State University TAPE (Technology Assessment Protocol – Ecology) program for basic storm water treatment and enhanced treatment including sediment, nutrients and heavy metals (all proposed pollutants of concern for the project and for downstream watersheds). TAPE approval is based on a series of independent field studies using strict sampling criteria to validate vendor's claims. TAPE approval is considered one of the most stringent and most reliable in the Country.

- Modular Wetlands have a pre-treatment chamber that is specifically designed to capture fine sediments and particulates through a series of filters which prohibit the fines and particulates from entering the bioretention chamber and accelerating potential clogging of the bioretention soil. Modular Wetland systems are specifically designed for higher flow through treatment rates as compared to traditional bioretention cells which reduces the potential for nutrient and copper leaching under more stagnant conditions (a common occurrence with planters that are left unmaintained).

- Modular Wetlands Systems 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.

STRUCTURAL LID BMP FOR DMA A3	
Infiltration Feasibility	*Not feasible. See Section 3.1.2*
Harvest and Use Feasibility	*Not feasible. See Section 3.2.3*
Selected BMP	BIO-7: Proprietary Biotreatment
Selected BMP Sizing Method	Flow-Based Compact Biofiltration Method

Flow Required (cfs) Q_{design} = C x i_{design} x A x 150% Where: Q_{design} = design flowrate, cfs C = runoff coefficient = (0.75 x imp + 0.15) Imp = impervious fraction of drainage area (ranges from 0 to 1) I_{design} = design intensity, inches/hour A = tributary area, acres Imp = 90% I_{design} = 0.26 inches/hour A = 0.98 acres **Q_{design}** = (0.75 x 0.9 + 0.15) x 0.26 in/hr x 0.98 ac x 150% **= 0.316 cfs** *Refer to Attachment D for detailed calculations (Worksheet 9)*	
Q Provided (cfs)	DMA A3; One (1) MWS-L-8-12 MWS = 0.346 cfs *Refer to Attachment D for detailed calculations.*

5.5 Structural LID BMP for DMA A4

As discussed previously under Section 4.1, a proprietary biotreatment BMP (Modular Wetland System (MWS)) will be located at the downstream end of DMA A. The system has been sized as a flow-based compact biofiltration BMP with no supplemental retention, as feasibility results indicate no infiltration for this DMA.

- Modular Wetlands are a proprietary biotreatment device approved through the Washington State University TAPE (Technology Assessment Protocol – Ecology) program for basic storm water treatment and enhanced treatment including sediment, nutrients and heavy metals (all proposed pollutants of concern for the project and for downstream watersheds). TAPE approval is based on a series of independent field studies using strict sampling criteria to validate vendor's claims. TAPE approval is considered one of the most stringent and most reliable in the Country.

- Modular Wetlands have a pre-treatment chamber that is specifically designed to capture fine sediments and particulates through a series of filters which prohibit the fines and particulates from entering the bioretention chamber and accelerating potential clogging of

the bioretention soil. Modular Wetland systems are specifically designed for higher flow through treatment rates as compared to traditional bioretention cells which reduces the potential for nutrient and copper leaching under more stagnant conditions (a common occurrence with planters that are left unmaintained).

- Modular Wetlands Systems 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.

STRUCTURAL LID BMP FOR DMA A4	
Infiltration Feasibility	*Not feasible. See Section 3.1.2*
Harvest and Use Feasibility	*Not feasible. See Section 3.2.3*
Selected BMP	BIO-7: Proprietary Biotreatment
Selected BMP Sizing Method	Flow-Based Compact Biofiltration Method

Flow Required (cfs) Q_{design} = C x i_{design} x A x 150% Where: Q_{design} = design flowrate, cfs C = runoff coefficient = (0.75 x imp + 0.15) Imp = impervious fraction of drainage area (ranges from 0 to 1) I_{design} = design intensity, inches/hour A = tributary area, acres Imp = 90% I_{design} = 0.26 inches/hour A = 0.73 acres **Q_{design}** = (0.75 x 0.9 + 0.15) x 0.26 in/hr x 0.73 ac x 150% **= 0.236 cfs** *Refer to Attachment D for detailed calculations (Worksheet 9)*	
Q Provided (cfs)	DMA A4; One (1) MWS-L-8-12 MWS = 0.346 cfs *Refer to Attachment D for detailed calculations.*

5.6 Summary of LID BMPs

DMA	Total Drainage Area (ac)	% Imp.	Q_{design} (cfs)	Q_{design} x 150% (cfs)	Sizes / Models
DMA A1	0.28	90%	0.059	0.089	MWS-L-4-8 (0.115 cfs)
DMA A2	0.49	90%	0.104	0.156	MWS-L-4-15 (0.175 cfs)
DMA A3	0.98	90%	0.211	0.316	MWS-L-8-12 (0.346 cfs)
DMA A4	0.73	90%	0.157	0.236	MWS-L-8-12 (0.346 cfs)

DMA A5	0.63	10%	HSC-2 Ratio of Pervious to Impervious Area – 9.0 Required Ratio – 1.8

Section 6 Hydromodification BMPs

6.1 Points of Compliance

Hydromodification compliance requires that all discharge points containing impervious areas related to the development project that discharge to natural areas be accounted for. All flows from the impervious areas on the project site are routed into one detention facility and, as such, there is one Points of Compliance (POC 1) for this project site. Refer to the exhibits in Attachment C for the location of POC 1.

6.2 Pre-Development (Natural) Conditions

All pre-development conditions including exhibits and calculations are provided in Attachment E within this report. A brief summary of the existing conditions SOHM modeling results are provided below. Refer to Attachment E for more details.

PRE-DEVELOPMENT FLOW CONDITIONS	
Return Period	**Pre-Development Flow (cfs)**
2-year	1.73

6.3 Post-Development Conditions and Hydromodification BMPs

To mitigate the increased flows under post-development conditions, one detention vault has been proposed that will decrease post-development peak flows to be less than the pre-development flows for the 2-year up to the 10-year storm frequency events.

One underground detention system will be incorporated in the project site to provide flow duration control, located in the drive aisle. The detention vault with an approximate storage volume of 7,773 cubic feet will provide storage to mitigate the 2-year, 24-hour flow rate. Flows will be detained in the system consistent with the hydromodification requirements and will be controlled via pump to discharge.

6.4 Measures for Avoidance of Critical Coarse Sediment Yield Areas

Not applicable.

6.5 Hydrologic Modeling and Hydromodification Compliance

Hydromodification calculations for this project were performed using the South Orange County Hydrology Model (SOHM), March 2012 version, developed by Clear Creek Solutions, Inc. The results are summarized in the table below. Additional information on the SOHM methodology regarding this project and a copy of the SOHM Project Report output, which includes a schematic of the pre-developed area and proposed (mitigated) storm water flood routing system, is provided in Attachment E. Based on the results of the proposed hydromodification BMPs, the post-development discharges will be reduced to less than the existing pre-development discharges. The table below provides a summary of the proposed mitigated (post-developed) conditions based on the SOHM modeling results. The post-development peak flows will be

detained in an underground detention system to reduce the rate of discharge in the post-developed condition to be less than the pre-developed conditions, thereby mitigating hydrologic conditions of concern from the subject property. Additional details on the subsurface detention system BMP design are provided in Attachment E.

Return Period	Pre-Developed Flow (cfs)	BMP	Post-Developed (mitigated) Flow (cfs)	Percent Difference
2 year	1.73	Underground Detention	1.64	-5%

Section 7 Educational Materials Index

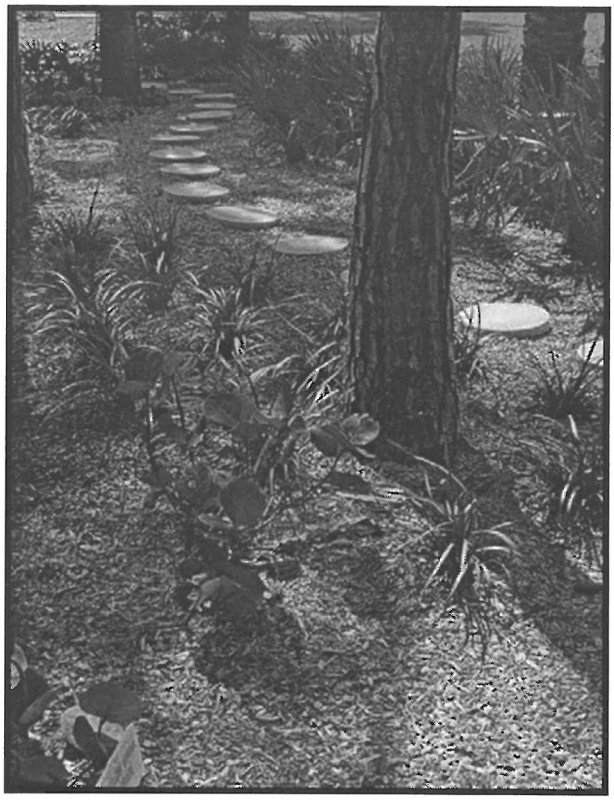
Educational Materials			
Residential Material (http://www.ocwatersheds.com)	**Check If Applicable**	**Business Material (http://www.ocwatersheds.com)**	**Check If Applicable**
The Ocean Begins at Your Front Door	☒	Tips for the Automotive Industry	☐
Tips for Car Wash Fund-raisers	☐	Tips for Using Concrete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

ATTACHMENTS

ATTACHMENT A

EDUCATION MATERIALS

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.

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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.

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.

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- 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

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– 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.

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?

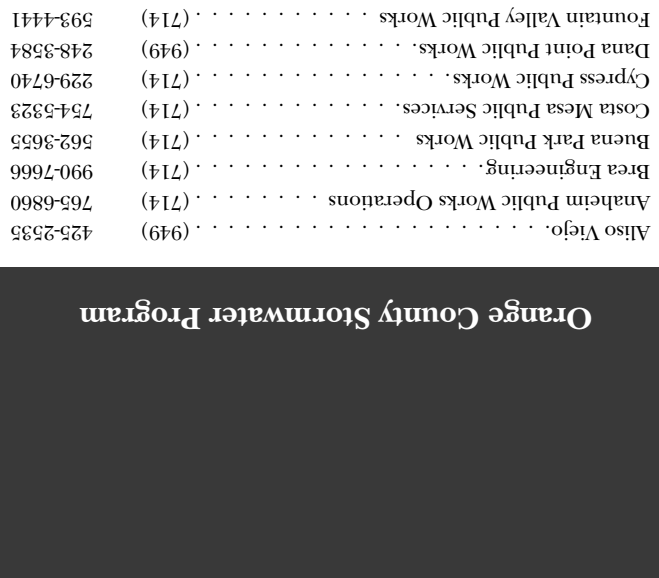
- Most people believe that the largest source of water pollution in urban areas comes from specific sources such as factories and sewage treatment plants. In fact, the largest source of water pollution comes from city streets, neighborhoods, construction sites and parking lots. This type of pollution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

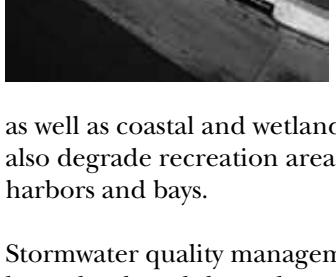
- Anything we use outside homes, vehicles and businesses – like motor oil, paint, pesticides, fertilizers and cleaners – can be blown or washed into storm drains.
- A little water from a garden hose or rain can also send materials into storm drains.
- Storm drains are separate from our sanitary sewer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

For More Information

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

Orange County Stormwater Program

California Environmental Protection Agency
www.calepa.ca.gov

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

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

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

Integrated Waste Management Dept. of Orange County (714) 834-6752 or visit www.oclandfills.com for information on household hazardous waste collection centers, recycling centers and solid waste collection

O.C. Agriculture Commissioner
(714) 447-7100 or visit www.ocagcomm.com

Stormwater Best Management Practice Handbook
Visit www.cabmphandbooks.com

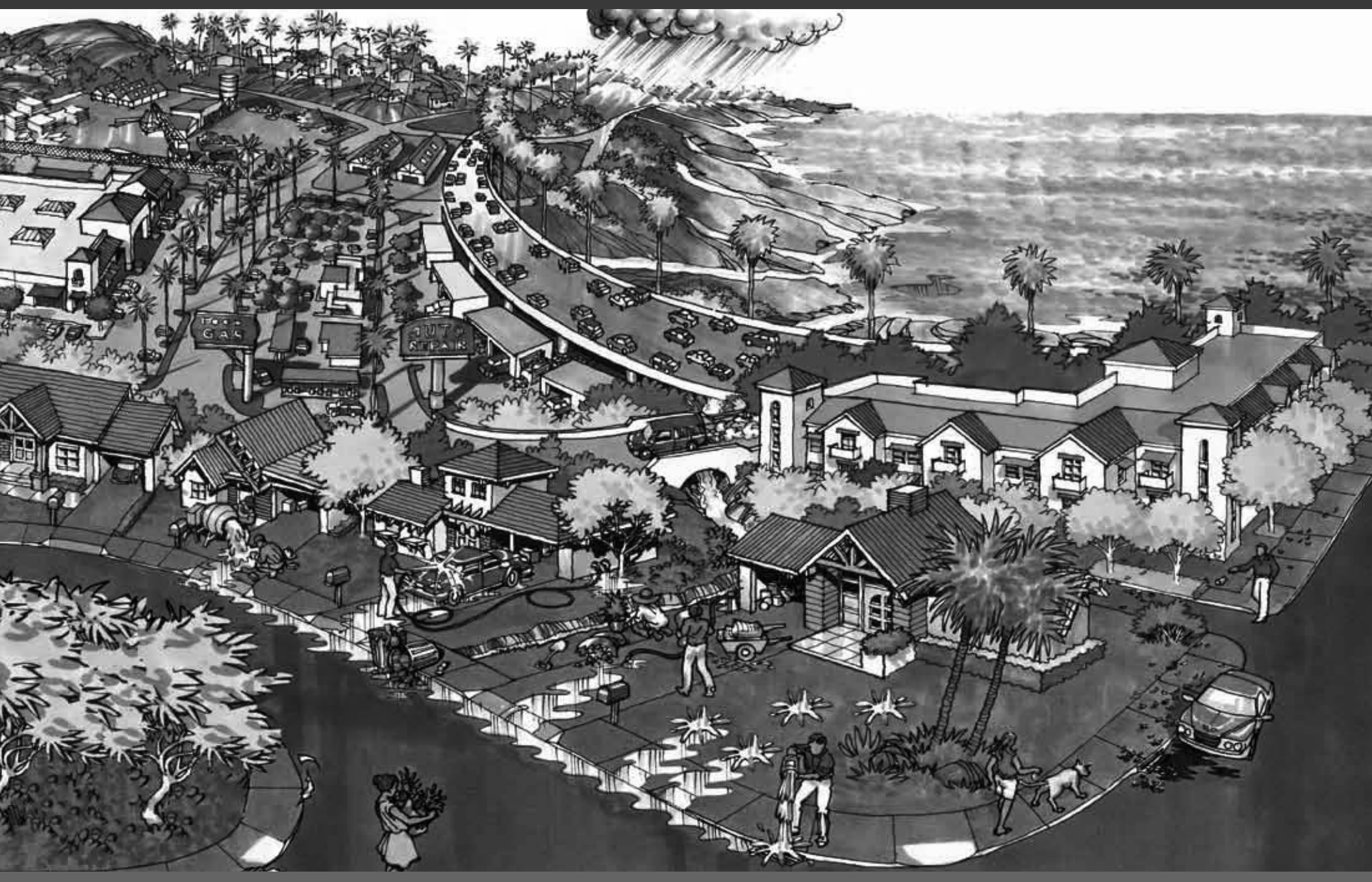
UC Master Gardener Hotline
(714) 708-1646 or visit www.uccemg.com

The Orange County Stormwater Program has created and moderates an electronic mailing list to facilitate communications, take questions and exchange ideas among its users about issues and topics related to stormwater and urban runoff and the implementation of program elements. To join the list, please send an email to ocstormwaterinfo-join@list.ocwatersheds.com

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

On-line Water Pollution Problem Reporting Form
www.ocwatersheds.com

The 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

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)**.**

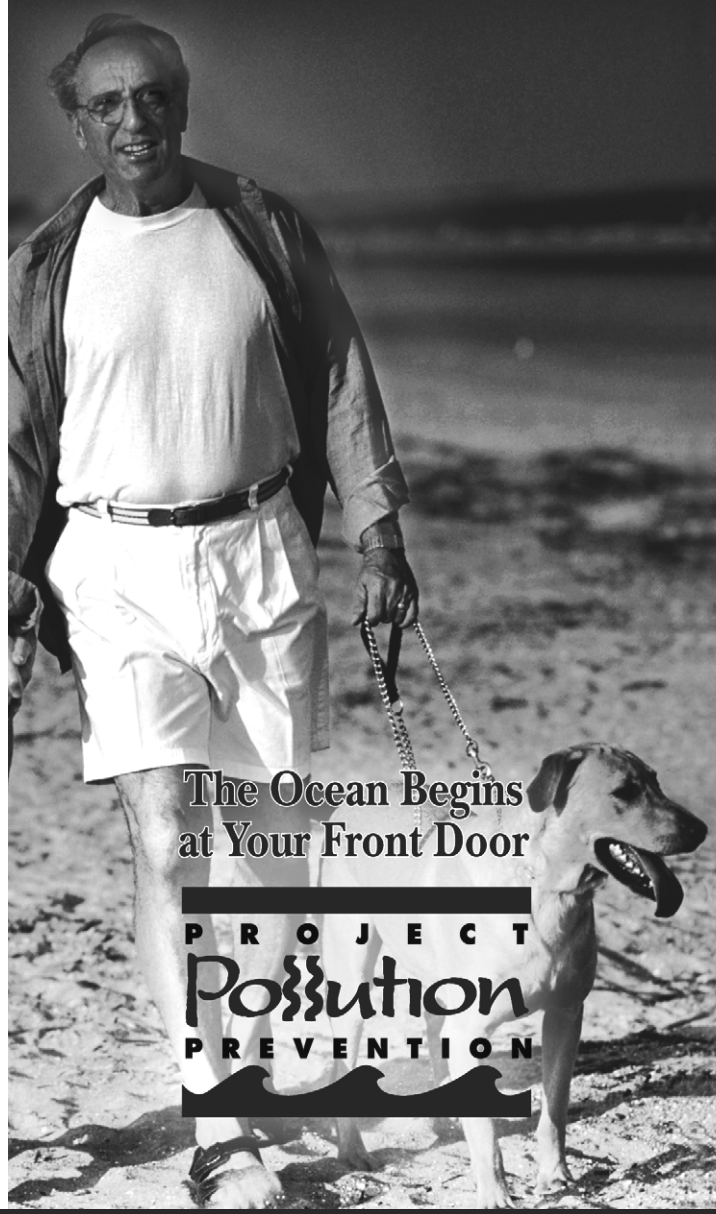
For emergencies, dial 911.

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.

Printed on Recycled Paper

Help Prevent Ocean Pollution:

Tips for Pet Care



Tips for Pet Care

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

Washing Your Pets

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

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

- If you bathe your pet outside, wash it on your lawn or another absorbent/ permeable surface to keep the washwater from running into the street, gutter or storm drain.

Flea Control

- Consider using oral or topical flea control products.

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

Why You Should Pick Up After Your Pet

It's the law! Every city has an ordinance requiring you to pick up after your pet. Besides being a nuisance, pet waste can lead to water pollution, even if you live inland. During rainfall, pet waste left outdoors can wash into storm drains. This waste flows directly into our waterways and the ocean where it can harm human health, marine life and the environment.

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

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

- Take a bag with you on walks to pick up after your pet.

- Dispose of the waste in the trash or in a toilet.

PROJECT Pollution PREVENTION

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.

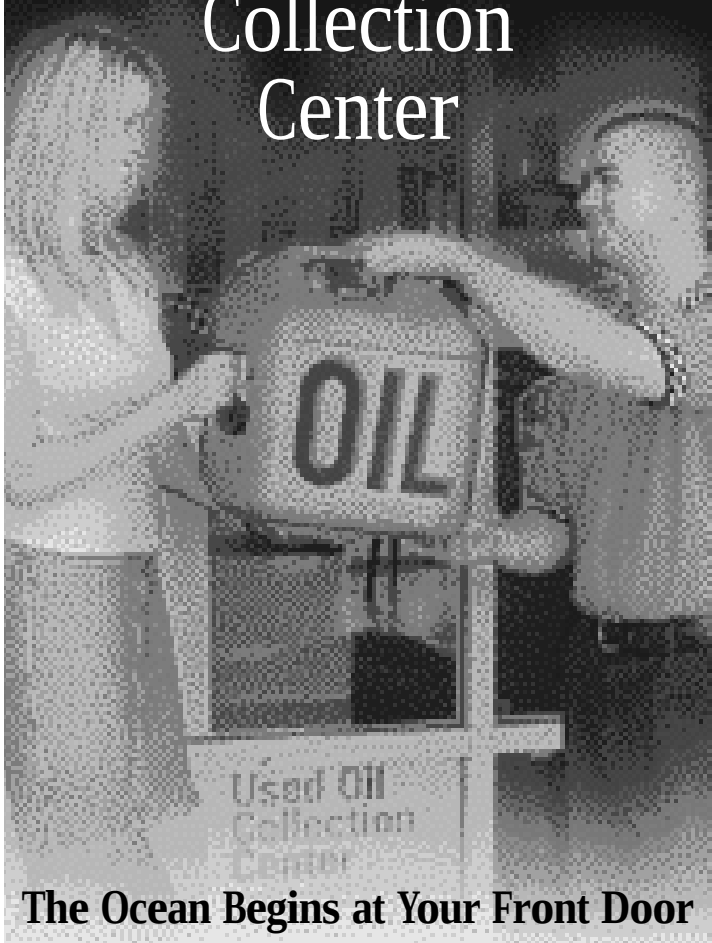
For information about the proper disposal of household hazardous waste, call the Household Waste Hotline at (714) 834-6752 or visit www.oclandfills.com.

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.

Help Prevent Ocean Pollution:

Recycle at Your Local Used Oil Collection Center



The Ocean Begins at Your Front Door

PROJECT Pollution PREVENTION

SOUTH COUNTY

Used Oil Collection Centers

ALISO VIEJO

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

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

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

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

DANA POINT

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

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

FOOTHILL RANCH

USA Express Tire & Service
26492 Town Center Dr.
(714) 826-1001

LAGUNA BEACH

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

LAKE FOREST

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

EZ Lube
26731 Rancho Parkway
(949) 465-9912

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

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

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

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

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

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

LAGUNA NIGUEL

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

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

LAGUNA HILLS

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

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

EZ Lube
26921 Moulton Pkwy.
(949) 751-3436

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

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

MISSION VIEJO

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

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

Auto Zone
22942 Los Alisos (949) 830-8181

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

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

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

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

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

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

RANCHO SANTA MARGARITA

Jiffy Lube
23401 Antonio Parkway
(949) 589-7447

SAN CLEMENTE

EZ Lube
525 Avenida Pico (949) 940-1850

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

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

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

SAN JUAN CAPISTRANO

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

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

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

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.

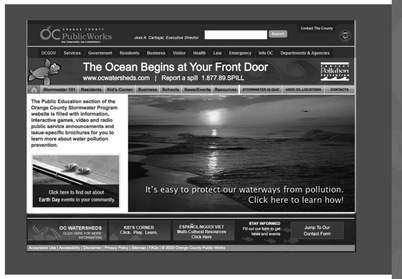
Low Impact Development (LID) and sustainable water use prevents water pollution and conserves water for drinking and reuse. Reducing your water use and the amount of water flowing from your home protects the environment and saves you money.

Thank you for making water protection a priority!

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

www.mwdoc.com

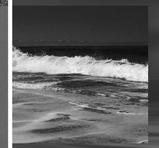
www.uccemg.com



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.

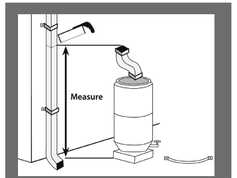
Permeable pavement allows water runoff to infiltrate through the soil and prevents most pollutants from reaching the storm drain system.

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.

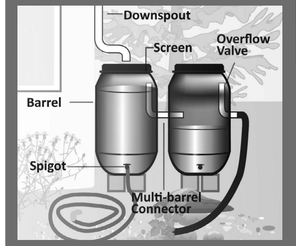
Downspout Disconnection/Redirection

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.

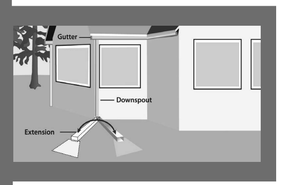


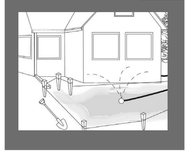
Mosquito growth prevention is very important when installing a rain barrel. The best way to prevent mosquito breeding is to eliminate entry points by ensuring all openings are sealed tightly. If these methods are unsuccessful, products are available to kill mosquito larvae, but that are harmless to animals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

Smart Irrigation Controllers

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

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.

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**.

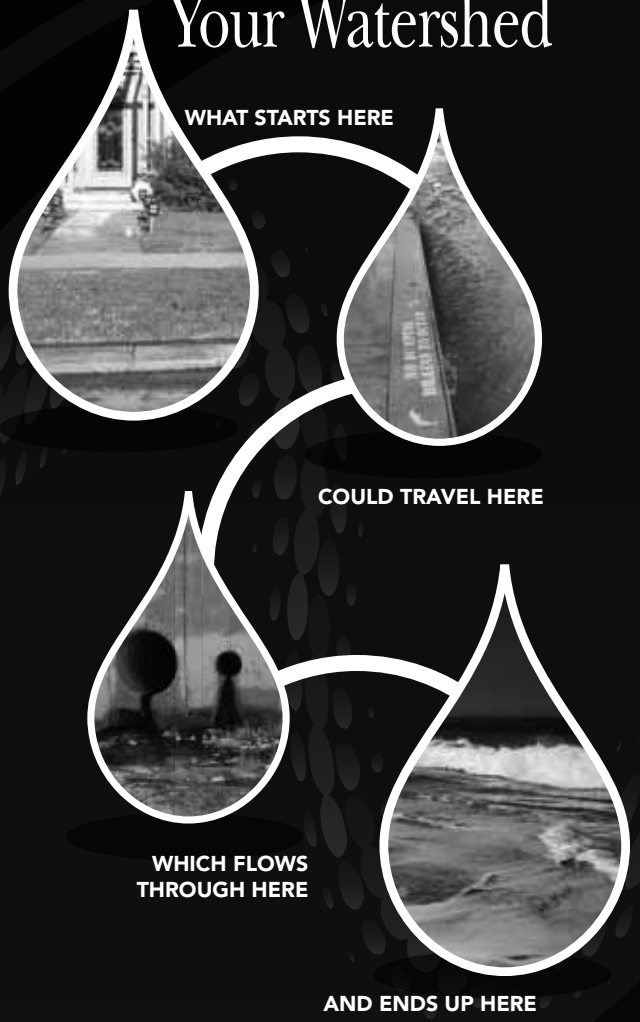
For emergencies, dial 911.

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.

Printed on Recycled Paper

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.**

ATTACHMENT B

OPERATIONS AND MAINTENANCE (O&M) PLAN

OPERATION & MAINTENANCE (O&M) PLAN

Project Name:
OAKBROOK PLAZA

Prepared for:

Matthew Haugen
3501 Jamboree Rd
Newport Beach, CA 92660
949-721-1414

Prepared on:

February 18, 2025

CONTENTS

SECTION 1 PROJECT DESCRIPTION AND BMP OVERVIEW

GENERAL PROJECT ATTRIBUTES AND STORMWATER CONTROL MEASURES		
Site Location:	24422 Avenida De La Carlota, Laguna Hills, CA 92653	
Project Area: 3.10 ac	Number of Dwelling Units: 240	SIC Code: 6513
Narrative Project Description:	The existing site is located at 24422 Avenida De La Carlota in the City of Laguna Hills within County of Orange and is part of an existing office plaza that consists of an office building and a surface parking lot. The property is approximately 8.43 acres, of which 3.10 acres of the southerly parking lot is being developed, and is bounded by Los Alisos Blvd to the southeast, Freeway 5 to the northeast, and Avenida De La Carlota to the west. The existing southerly parking lot is proposed to be redeveloped to 7 story apartment building with 3 stories of parking garage and 4 stories of apartment units (240 total units). The building will also have one partial subterranean parking level.	
Project-Specific Source Control BMPs:	Non-Structural Source Control BMPs : • N1 – Education for Property Owners • N2 – Activity Restrictions • N3 – Common Area Landscape Management • N4 – BMP Maintenance • N11 – Common Area Litter Control • N12 – Employee Training • N14 – Common Area Catch Basin Inspection • N15 – Street Sweeping Structural Source Control BMPs: • S1 – Storm Drain System Stencil • S3 – Construct trash and waste storage areas to reduce pollution • S4 – Efficient irrigation system	
Summary of Drainage Patterns:	The drainage areas within the proposed project area will generally follow existing drainage patterns. Flows from the building, parking lot, and drive aisle will be treated by Modular Wetland Systems (MWS) located along the private drive aisle for water quality treatment. The treated flows then are directed to the onsite detention system for hydromodification flowrate mitigation. The flows will then be pumped to the existing an existing 24' catch basin on	

GENERAL PROJECT ATTRIBUTES AND STORMWATER CONTROL MEASURES	
	Avenida De La Carlota, before draining to Aliso Creek and ultimately, the Pacific Ocean The frontage of the project along Los Alisos will remain mostly vegetated and slopes towards the building. Flows will be collected in a proposed v-gutter and directed to inlets that send flows to the existing 10' catch basin along Los Alisos Boulevard. The frontage of the project along Avenida De La Carlota will continue to remain mostly vegetated and maintains the existing drainage pattern of draining to the street. The frontage areas are mostly vegetated, and impervious areas flow to pervious areas so Hydrologic Source Controls are implemented for treatment of these areas. Off-site run-on coming from the existing building and parking area to the north will be picked up by a proposed v-gutter that keeps offsite flows from comingling with onsite flows
Summary of Hydrologic Source Controls:	Hydrologic Source Controls (HSC) are utilized at DMA A5. The frontage of the project along Los Alisos will remain mostly vegetated and slopes towards the building. Flows will be collected in a proposed v-gutter and directed to inlets that send flows to the existing 10' catch basin along Los Alisos Boulevard. The frontage of the project along Avenida De La Carlota will continue to remain mostly vegetated and maintains the existing drainage pattern of draining to the street. The frontage areas are mostly vegetated, and impervious areas flow to pervious areas so Hydrologic Source Controls are implemented for treatment of these areas.
Structural Treatment and Hydromodification BMPs:	The project will drain and is delineated as five DMAs, consistent with the limit of work for the project. Flows will be picked up by catch basins and treated by Modular Wetland System BMPs that drain to the detention systems before being discharged to the City MS4. The detention systems have been sized in accordance with the criteria for hydromodification (see Section 6.0 of the WQMP for details).

The drainage areas within the proposed project area will generally follow existing drainage patterns. Flows from the building, parking lot, and drive aisle will be treated by Modular Wetland Systems (MWS) located along the private drive aisle for water quality treatment. The treated flows then are directed to the onsite detention system for hydromodification flowrate mitigation. The flows will then be pumped to the existing an existing 24' catch basin on Avenida De La Carlota, before draining to Aliso Creek and ultimately, the Pacific Ocean

The frontage of the project along Los Alisos will remain mostly vegetated and slopes towards the building. Flows will be collected in a proposed v-gutter and directed to inlets that send flows to the existing 10' catch basin along Los Alisos Boulevard. The frontage of the project along Avenida De La Carlota will continue to remain mostly vegetated and maintains the existing drainage pattern of draining to the street. The frontage areas are mostly vegetated, and impervious areas flow to pervious areas so Hydrologic Source Controls are implemented for treatment of these areas.

Off-site run-on coming from the existing building and parking area to the north will be picked up by a proposed v-gutter that keeps offsite flows from comingling with onsite flows.

BMP ID	BMP Type	Narrative Description	Location	Other Considerations
BMP #1	Proprietary Biofiltration (BIO-7)	Modular Wetlands Systems are proprietary biotreatment systems that utilize multi-stage treatment processes including screening media filtration, settling, and biofiltration.	Along eastern side of the drive aisle	Curb opening model
BMP #2	Proprietary Biofiltration (BIO-7)	Modular Wetlands Systems are proprietary biotreatment systems that utilize multi-stage treatment processes including screening media filtration, settling, and biofiltration.	Along eastern side of the drive aisle	Flow is directed from DVERT from catch basin
BMP #3	Proprietary Biofiltration (BIO-7)	Modular Wetlands Systems are proprietary	Along eastern side of the drive aisle	Flow is directed from

BMP ID	BMP Type	Narrative Description	Location	Other Considerations
		biotreatment systems that utilize multi-stage treatment processes including screening media filtration, settling, and biofiltration.		DVERT from catch basin
BMP #4	Proprietary Biofiltration (BIO-7)	Modular Wetlands Systems are proprietary biotreatment systems that utilize multi-stage treatment processes including screening media filtration, settling, and biofiltration.	Along eastern side of the drive aisle	Flow is directed from DVERT from catch basin

SECTION 2 PERSONNEL, DOCUMENTATION, AND REPORTING

2.1 MAINTENANCE ROLES AND RESPONSIBILITIES

The roles related to O&M of the BMPs are defined as follows:

- ***Facility Owner*** – The Facility Owner is the party who is ultimately responsible for the functionality of all BMPs. The maintenance agreement (Attachment 2) identifies the facility owner for each BMP, including the timing of any ownership transitions.
- ***Responsible Party*** – The Responsible Party is the party that shall have direct responsibility for the O&M of the BMPs. This party shall be the designated contact with inspectors and lead maintenance personnel. The Responsible Party shall sign self-inspection reports and any correspondence regarding the verification of inspections and required maintenance. The Responsible Party will establish a system to delegate general inquiries to the appropriate maintenance personnel concerning the operation and maintenance of the BMPs. The Responsible Party reports directly to the Facility Owner and operates and manages the BMPs on the Facility Owner's behalf.
- ***Designated Emergency Respondent*** – The Designated Emergency Respondent is the party responsible for directing activities and communications during emergencies such as broken irrigation pipes, landslides, hazardous spill responses etc., that would require immediate response should they occur during off-hours. It is the responsibility of the Designated Emergency Respondent to communicate the emergent situation with the Responsible Party as soon as possible.
- ***Key Maintenance Personnel*** – Key Maintenance Personnel are the designated lead field manager(s) or supervisor(s) who directly oversee and delegate the maintenance activities, maintain the scheduling, and coordinate activities between all personnel. These tend to change more often than other personnel over time, so their names do not necessarily need to be included in the O&M Plan. However, they must be properly trained as recorded in the training logs (Section 2.2).

The table below lists the roles for this project. This table must be updated whenever changes occur.

Role	Name (Title and Affiliation)	Phone Number	Address	Email Address
Facility Owner	Buchanan Street Partners	949-721-1919	3501 Jamboree Rd, Newport Beach, CA 92660	info@buchananstreet.com

Role	Name (Title and Affiliation)	Phone Number	Address	Email Address
Responsible Party	Buchanan Street Partners	949-721-1919	3501 Jamboree Rd, Newport Beach, CA 92660	info@buchananstreet.com
Designated Emergency Respondent	TBD	TBD	TBD	TBD

2.2 QUALIFICATION AND TRAINING REQUIREMENTS FOR PERSONNEL

Many of the activities presented in this O&M plan can be completed by personnel with basic landscaping and yard maintenance skills and project-specific orientation. However, there are activities that require a more experienced skillset to identify and remediate potential issues that could compromise the functionality of each BMP. The Responsible Party shall exercise discretion in determining the skillset required to complete each task.

Activities that can typically be completed by maintenance personnel with basic training and/or qualifications include:

- General landscaping activities (pruning, weeding, and raking)
- Routine sediment, trash and debris removal;
- Filling in minor scour or erosion areas, or replacing rip rap that has become displaced; and
- Watering or irrigation, as necessary.

Activities that typically require maintenance personnel with specialized qualifications, training, and/or engineering oversight include:

- Inspection and/or repair of inflow and outflow structures;
- Inspection and/or repair of underground elements;
- Large-volume sediment or media removal requiring specialized equipment;
- Inspection, diagnosis, and remediation of significant erosion issues potentially compromising function and/or structural stability; and
- Spill response and remediation.

Maintenance personnel who have identified a potential major issue with any facility should contact the designated key maintenance personnel for the facility immediately.

Training must be provided for all personnel performing maintenance tasks on or providing maintenance oversight of structural BMPs. The table below provides the personnel and relevant training topics.

Training Logs contained in Attachment 3 should be used to document training of maintenance personnel.

Training Topic	Responsible Party	Designated Emergency Respondent	Key Maintenance Personnel
Proper Maintenance of all BMP components	X		X
Identification and clean-up procedures for spills and overflows	X	X	X
Safety concerns when maintaining devices and responding to emergency situations	X	X	X

2.3 MAINTENANCE AGREEMENTS AND FUNDING MECHANISMS

Property management will maintain the BMP specified in this O&M Plan. Funding will be provided through rental fees to residents.

2.4 RECORD KEEPING REQUIREMENTS

Documentation of site conditions, maintenance activities performed, and any other remaining maintenance required is necessary during each inspection/maintenance visit. Inspection and maintenance records shall be retained in an accessible, secure location for the life of the facility, and not less than 10 years.

The following documentation mechanisms and procedures have been established for this O&M Plan:

- Training Logs: Personnel must document training activities as part of implementing this O&M Plan. Attachment 3 contains a sample training log.

- Inspection and Routine Maintenance Logs: Maintenance personnel are required to maintain logs of inspection and maintenance activities. Attachment 4 contain inspection and maintenance logs.
- Rehabilitative and Corrective Maintenance Log and Reporting: Rehabilitation and corrective maintenance activities should be documented at a degree of detail that is commensurate to the complexity/significance of the activity. Any significant changes to the BMP designs that arise from rehabilitation/corrective maintenance will be documented via an update to the Project WQMP and as-built drawings. Corrective maintenance that does not result in design changes will be documented as a special entry in the maintenance logs to provide pertinent details of that rehabilitative or corrective maintenance activity.

2.5 REQUIRED PERMITS ASSOCIATED WITH MAINTENANCE ACTIVITIES

No permits required for the operations and maintenance of the BMPs prescribed in this Plan.

2.6 SELF-REPORTING REQUIREMENTS

The WQMP Verification Form [Attachment 4] shall be completed accurately and submitted with associated documentation to the City of Laguna Hills by September 30 of each year, or as requested by the City. Failure to complete and submit the verification form will result in a noncompliance and enforcement actions may be taken.

2.7 CITY INSPECTIONS

The City of Laguna Hills may conduct a site inspection to evaluate compliance with the Project WQMP, at any time, in accordance with City of Laguna Hills municipal code.

2.8 ELECTRONIC DATA SUBMITTAL

This document, along with the attachments, shall be provided to the City or County in PDF format. Autocad files and/or GIS coordinates of BMPs shall also be submitted to the City/County.

SECTION 3 INSPECTION AND MAINTENANCE ACTIVITIES

This section identifies the inspection and O&M activities for each BMP incorporated into the project. Section 3.1 and 3.2 contain common maintenance activities and frequencies associated with Source Control BMPs and HSCs, respectively. Section 3.3 contains individual tables for each structural LID or hydromodification BMP with an explanation of the various types of maintenance activities associated with these BMPs.

3.1 INSPECTION AND MAINTENANCE OF SOURCE CONTROL BMPS

Source Control BMP	Activity	Frequency
Dry Weather Flow Source Control **Note: this is a South Orange County High Priority Water Quality Condition for All Projects**	Check for dry weather flows such as street washing, irrigation overspray, air conditioner condensate in areas of the project that do not drain to LID BMPs, the sanitary sewer, or landscaped pervious areas. Notify residents of any dry weather flows and follow up to correct.	Twice per year during dry season
	Inspect project outfall or most-downstream project manhole for presence of dry weather flow. If present, conduct reconnaissance to determine source and implement actions to eliminate source.	Twice per year during dry season
N1. Education for Property Owner's Tenants and Occupants	Distribute appropriate materials to owners, tenants, and/or occupants via contract language, mailings, website, or meetings.	Information provided to owners and tenants upon sale or lease. Reminders sent or posted as needed.
	Check www.ocwatersheds.com and/or City website for updated educational materials.	Annually

Source Control BMP	Activity	Frequency
N2. Activity Restrictions	Within the CC&R's or lease agreement, restrict the following activities: handling and disposal of contaminants, fertilizer and pesticide application restrictions, litter control and pick-up, and vehicle or equipment repair and maintenance in non-designated areas, as well as any other activities that may potentially contribute to water pollution.	Information provided to owners and tenants upon sale or lease. Reminders sent or posted as needed.
N3/S4. Common Area Landscape Management, Efficient Landscape Design, and Efficient Irrigation	Check that fertilizer and pesticide usage is in accordance wiN1th the Integrated Pest Management Program. Adjust, if needed.	Annually
	Check the irrigation system water budget to ensure efficiency targets are being met and the system is in good condition. Adjust/repair irrigation system and controllers, if needed.	Annually prior to irrigation system activation
	Check landscaping for presence of invasive species and remove, if needed.	Annually
N11. Common Area Litter Control	Remove trash from around trash enclosure, inspect to ensure lids closed, structurally sound, and not overflowing. Repair or replace, as needed.	Monthly
	Inspect common area for litter and trash disposal violations by homeowners and reporting to the HOA or responsible party for investigation. Remove litter, as needed.	Weekly
N14. Common Area Catch Basin Inspection	Remove trash and debris from catch basins and grates. Check for damage, clogging, and standing water. Repair or mitigate clogging/standing water, as needed.	Four times per year during wet season, including inspection just before the wet season and within 24 hours after at least two storm events >0.5 inches

Source Control BMP	Activity	Frequency
N15. Street Sweeping Private Streets and Parking Lots	Sweep curb and gutter areas using a vacuum street sweeper. Report any significant or illicit debris in curb/gutter to HOA or responsible party, as needed.	Weekly
S1. Provide Storm Drain System Stenciling and Signage	Check that all catch basins in paved areas marked or stenciled with "No dumping-Drains to Ocean; No Descargue Basura" language. Replace/repaint markings if faded, damaged, removed, or otherwise illegible.	Annually
S5. Protect Slopes and Channels and Provide Energy Dissipation	Check slopes, channels, riprap and other conveyance or energy dissipation areas for signs of erosion or scour. Replace material, repair channels, replant vegetation, and/or redesign, as needed for signs of erosion/scour.	Four times per year during wet season, including inspection just before the wet season and within 24 hours after at least two storm events >0.5 inches
S12. Hillside Landscaping	Check the vegetation on steep hillsides to ensure healthy, and check for signs of erosion. Replace eroded areas with deep-rooted, drought tolerant vegetation and remove invasives, as needed.	Twice per year

3.2 INSPECTION AND MAINTENANCE OF STRUCTURAL LID AND HYDROMODIFICATION BMPS

The section is organized by type of structural LID or hydromodification BMP with separate tables for each BMP type included in the project. The section identifies four categories of activities related to O&M of the BMPs:

General Inspections – Evaluations conducted at regularly scheduled intervals to indicate the need for maintenance of structural BMPs.

Routine Maintenance Activities – Activities conducted at regularly scheduled intervals to sustain long-term performance of each BMP, including inspections and normal upkeep.

Corrective (Major) Maintenance Activities – Includes activities conducted to replace or rehabilitate system components at the end of their usable life as well as activities conducted to resolve major issues that are not anticipated.

Emergency Response Activities – Activities related to emergencies, primarily concerning spills, which may require immediate action and notifications (Section 3.4).

BMP ID	BMP Type	Reference Maintenance Table
BMP #1	Modular Wetland System	Manufacturer O&M Manual (attached)
BMP #2	Modular Wetland System	Manufacturer O&M Manual (attached)
BMP #3	Modular Wetland System	Manufacturer O&M Manual (attached)
BMP #4	Modular Wetland System	Manufacturer O&M Manual (attached)
Hydromodification Detention System	StormTrap Vault	Manufacturer O&M Manual (attached)

BIO-7 PROPRIETARY BIOTREATMENT	
Activity	Frequency
GENERAL INSPECTIONS	
Remove trash and debris	Four times per year during wet season, including inspection just before the wet season and within 24 hours after at least two storm events ≥ 0.5 inches.
Identify excess erosion or scour	
Identify sediment accumulation that requires maintenance	
Inspect during storm event, when possible, to estimate treatment capacity and determine if premature bypass is occurring	
Evaluate plant health and need for corrective action	
Identify any needed corrective maintenance that will require site-specific planning or design	
OPERATION AND MAINTENANCE	
• O&M of proprietary BMPs must follow established manufacturer guidelines • O&M of accompanying retention BMPs should follow the guidelines established in the associated fact sheet for that BMP.	

Hydromodification Detention System	
Activity	Frequency
GENERAL INSPECTIONS	
Inspect degree of sediment accumulation in storage reservoir, if possible	Four times per year during wet season, including inspection just before the wet season and within 24 hours after at least two storm events ≥ 0.5 inches.
Observe and record drawdown rate	
Identify any needed corrective maintenance that will require site-specific planning or design	
Remove accumulated trash and debris	
Inspect inlets and outlets and remove accumulated sediment	
Repair structural damage to inlets and outlets	
OPERATION AND MAINTENANCE	
• O&M of proprietary BMPs must follow established manufacturer guidelines	

Hydromodification Detention System	
Activity	Frequency
• O&M of accompanying retention BMPs should follow the guidelines established in the associated fact sheet for that BMP.	

3.4 EMERGENCY RESPONSE PLAN

In some cases, adverse conditions may occur which could be an imminent threat to human or environmental health or severe damage to infrastructure or property. For example, a spill of hazardous substances in the contributing area to a BMP could cause harmful substances to enter the BMP and be released downstream, affecting environmental and public health. Other emergencies could arise related to the stormwater features or water quality protection, such as landsliding, major erosion, or burst pipes in the tributary area.

In the event of an actual or suspected hazardous material release, the following plan shall take effect.
The primary importance of initial response to an actual or suspected spill will be public safety, control of the source of pollution, and containment of spills that have occurred, as applicable. The table below provides the emergency contact information for hazardous materials spills affecting BMPs.

Name	Phone	When to Report
Local Emergency Response (Fire Department)	911	Immediately
Orange County 24-Hour Water Pollution Problem Reporting Hotline	1-877-897-7455	Immediately
CalOES State Warning Center	1-800-852-7550	Immediately

The first number to call is emergency response (9-1-1), followed by the California Governor's Office of Emergency Services (CalOES), formerly the California Emergency Management Agency (CalEMA). (CalOES) maintains guidance and instructions of what to do in the event of a spill of hazardous substances (http://www.caloes.ca.gov/cal-oes-divisions/fire-rescue/hazardous-materials/spill-release-reporting). This plan is based on the guidance provided by CalOES (CalOES, 2014).

1. If an actual or suspected hazardous material incident exists, maintenance personnel will immediately call 911 and the CalOES State Warning Center (Table 6).
2. The Designated Emergency Respondent and Responsible Party assigned to the facility (from Section 2.1) must also be notified of any actual or potential spill.
3. Remediation of contamination in the water quality facility should be handled as a corrective maintenance issue per Section 3.2 of this O&M plan.

In the event that a potential spill is identified prior to it reaching the BMPs, the Designated Emergency Respondent will implement an isolation protocol to prevent the spill from entering the BMP. An inflatable plug, Hazmat Plug, or equivalent device as approved by

the Designated Emergency Respondent will be installed within the storm drains or catch basins to block upstream flow from reaching and contaminating the BMP. The temporary plug will be an interim measure until the spill is properly maintained and remediated and the Designated Emergency Respondent has determined the risk to the BMP of contamination no longer exists.

Similar measures should be taken in the event of a landslide, mudslide, or major erosion within the tributary area of the BMP to prevent sediment from damaging the BMP to the extent possible.

3.5 VECTOR CONTROL

In addition to the inspection and maintenance activities listed in Section 3, all BMPs shall be inspected for standing water on a regular basis. Standing water which exists for longer than 72 hours may contribute to mosquito breeding areas. Standing water may indicate that the BMP is not functioning properly and proper action to remedy the situation shall be taken in a timely manner.

Elimination of standing water and managing garbage, lawn clippings, and pet droppings can help decrease the present of mosquitoes and flies in the area.

The Orange County Vector Control District may be contacted for more information and support at 714-971-2421 or 949-654-2421 or www.ocvcd.org.

ATTACHMENT 1 PHOTOS AND EXHIBITS

- WQMP Exhibit

LEGEND

- PROPERTY LINE/RIGHT OF WAY
- EX STORM DRAIN
- PROPOSED STORM DRAIN
- CATCH BASIN (N14, S1)
- DIRECTION OF PIPED FLOW
- DIRECTION OF SURFACE FLOW
- BMP DRAINAGE AREA BOUNDARY
- DMA X / X.XX AC — DRAINAGE MANAGEMENT AREA
- MODULAR WETLAND SYSTEM (N4)
- BUILDING

LID BMPs

BIO-7	PROPRIETARY BIOTREATMENT

NON-STRUCTURAL SOURCE CONTROL BMPs

N1	EDUCATION FOR PROPERTY OWNERS, TENANTS AND OCCUPANTS
N2	ACTIVITY RESTRICTIONS
N3	COMMON AREA LANDSCAPE MANAGEMENT
N4	BMP MAINTENANCE
N11	COMMON AREA LITTER CONTROL
N12	EMPLOYEE TRAINING
N14	COMMON AREA CATCH BASIN INSPECTION
N15	STREET SWEEPING PRIVATE STREETS AND PARKING LOTS

STRUCTURAL SOURCE CONTROL BMPs

S1	PROVIDE STORM DRAIN SYSTEM STENCILING AND SIGNAGE
S4	USE EFFICIENT IRRIGATION SYSTEMS & LANDSCAPE DESIGN, WATER CONSERVATION, SMART CONTROLLERS, AND SOURCE CONTROL
S5	PROTECT SLOPES AND CHANNELS AND PROVIDE ENERGY DISSIPATION

DMA ID	BMP ID	GPS Coordinates	Drainage Area (ft^2)	Drainage Area (acres)	Assumed % Imp.	Simple Method DCV (ft^3)	Q_{Design} (cfs)	1.5 x QDesign (cfs)
DMA A1	BMP 1	33.607615, -117.698673	12,029	0.28	90%	**744**	**0.059**	**0.089**
DMA A2	BMP 2	33.607517, -117.699104	21,183	0.49	90%	**1,310**	**0.104**	**0.156**
DMA A3	BMP 3	33.607625, -117.699494	42,786	0.98	90%	**2,647**	**0.211**	**0.316**
DMA A4	BMP 4	33.607755, -117.699737	31,899	0.73	90%	**1,973**	**0.157**	**0.236**
DMA A5			27,292	0.63	10%	**461**	**0.037**	**0.055**

BMP Size/Model	BMP Treatment Capacity
MWS-L-4-8	0.115
MWS-L-4-15	0.175
MWS-L-8-12	0.346
MWS-L-8-12	0.346
-	HSC-2

N

40' 0' 20' 40'

SCALE: 1" = 40'

PREPARED FOR:

BUCHANAN STREET PARTNERS, L.P.
3501 JAMBOREE ROAD, SUITE 4200
NEWPORT BEACH, CA 92660
PHONE: (949) 721-1414

PREPARED BY:

FUSCOE ENGINEERING
15535 Sand Canyon Ave, Suite 100
Irvine, California 92618
949.474.1960 fuscoe.com

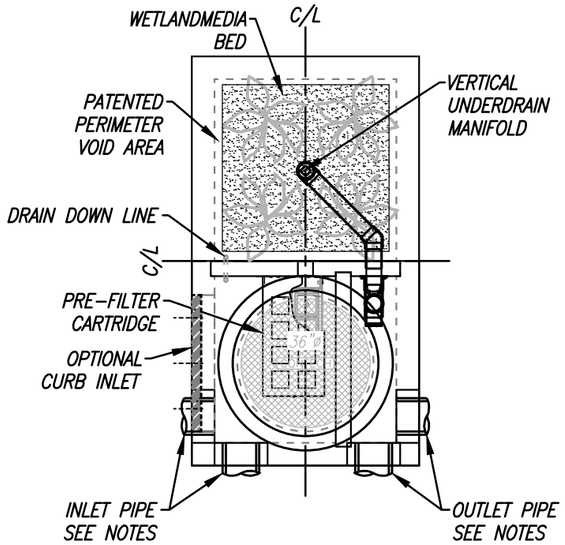
CITY OF LAGUNA HILLS
PERMIT # 0166-2023

WQMP EXHIBIT

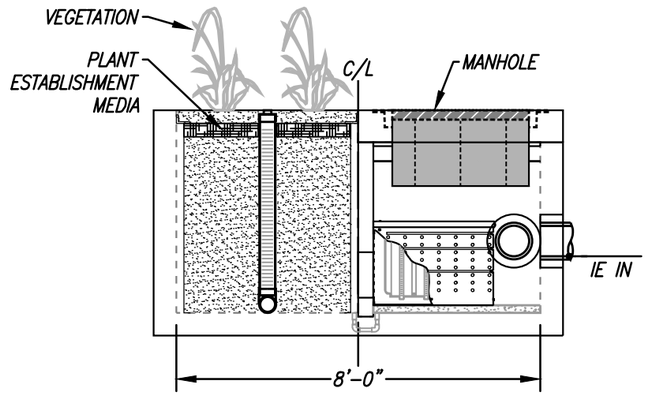
OAKBROOK PLAZA
24422 AVENIDA DE LA CARLOTA

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

* PRELIMINARY ONLY - NOT FOR CONSTRUCTION



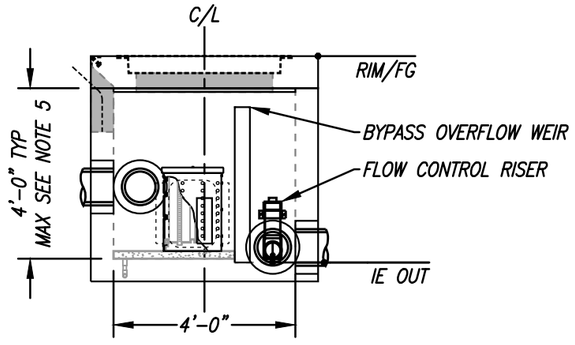
PLAN VIEW



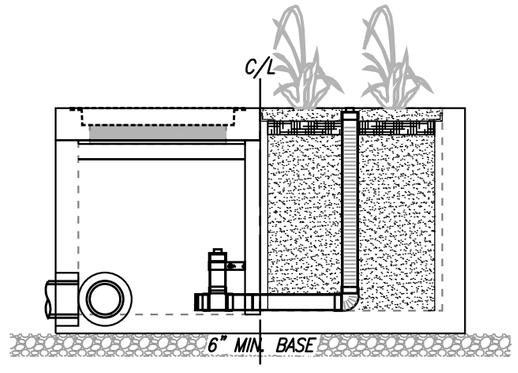
LEFT END VIEW

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



ELEVATION VIEW



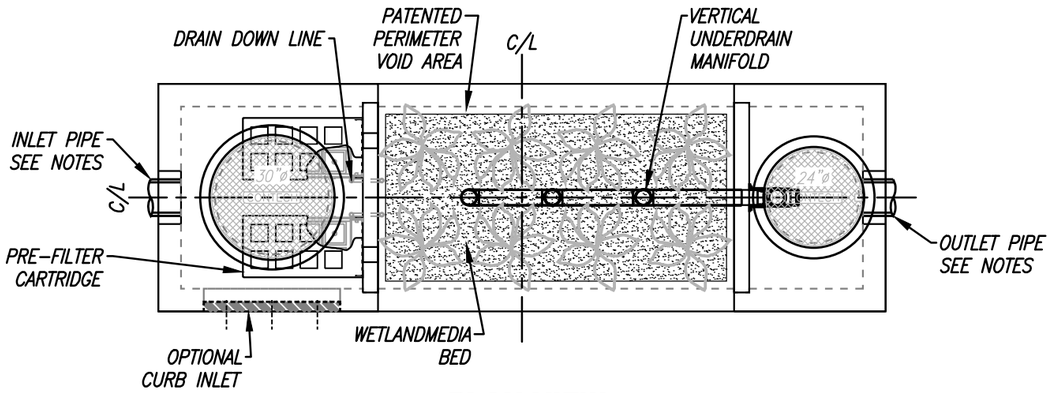
RIGHT END VIEW

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

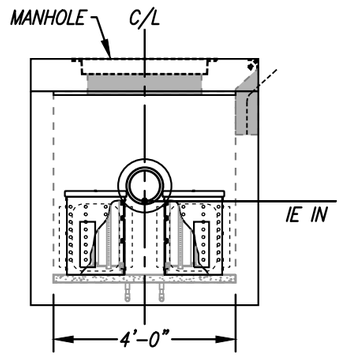
8/15/23SCOTT.SERTICH

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

* PRELIMINARY ONLY - NOT FOR CONSTRUCTION



PLAN VIEW



LEFT END VIEW

INSTALLATION NOTES

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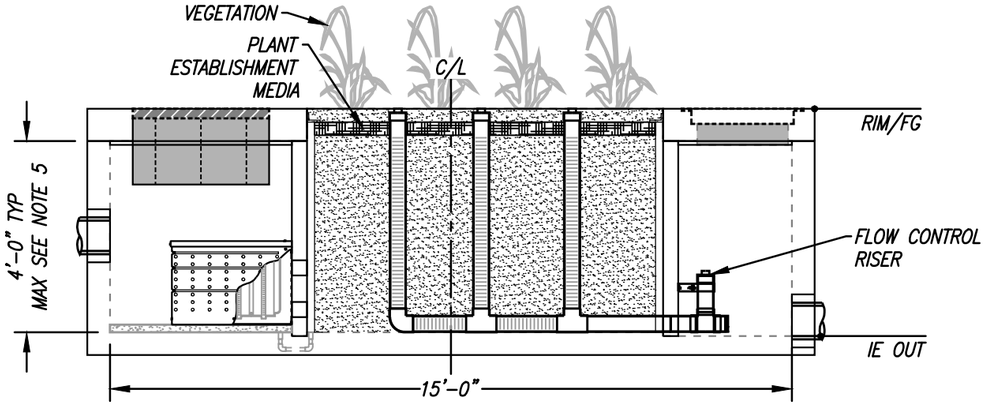
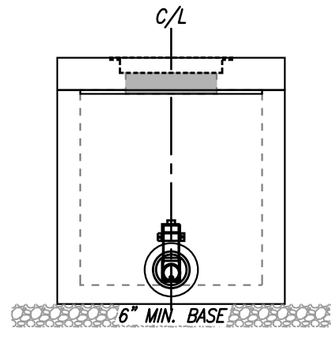


ELEVATION VIEW



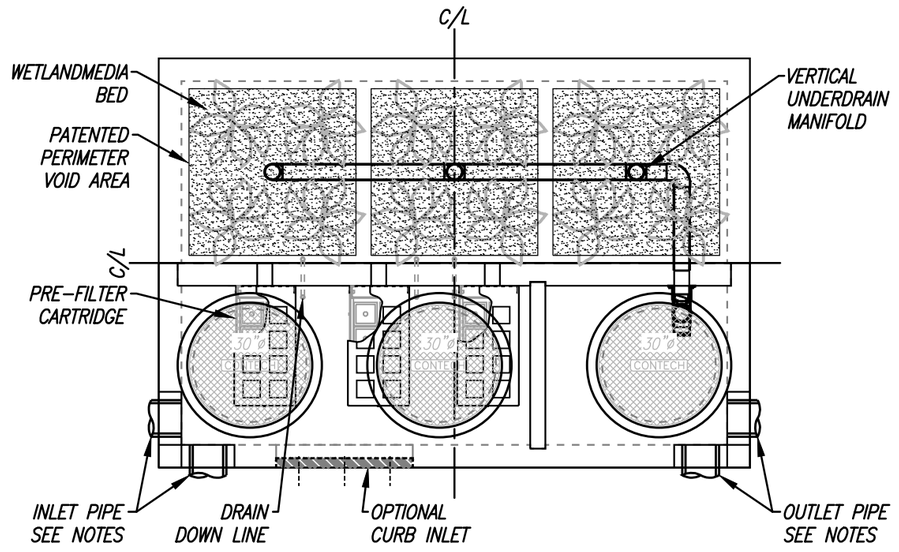
RIGHT END VIEW

MWS-L-4-15-V
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

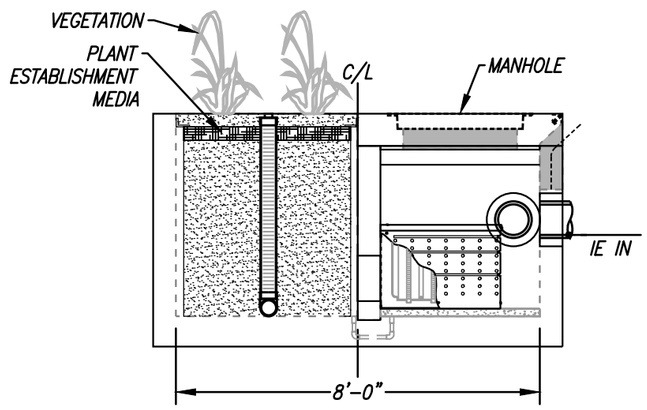
1/12/24TIM.GIRARD

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

* PRELIMINARY ONLY - NOT FOR CONSTRUCTION



PLAN VIEW



LEFT END VIEW

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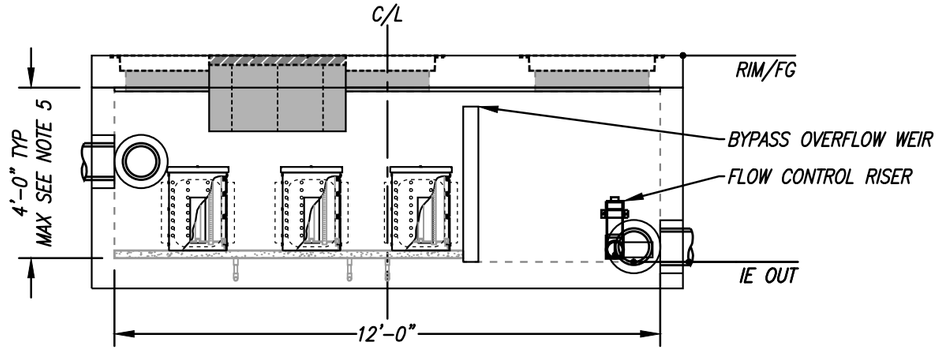
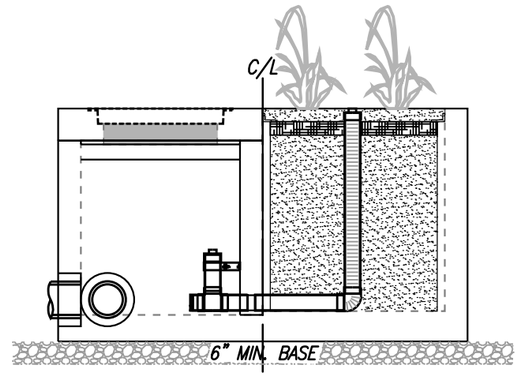


ELEVATION VIEW



RIGHT END VIEW

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

8/14/23SCOTT.SERTICH

StormTrap®

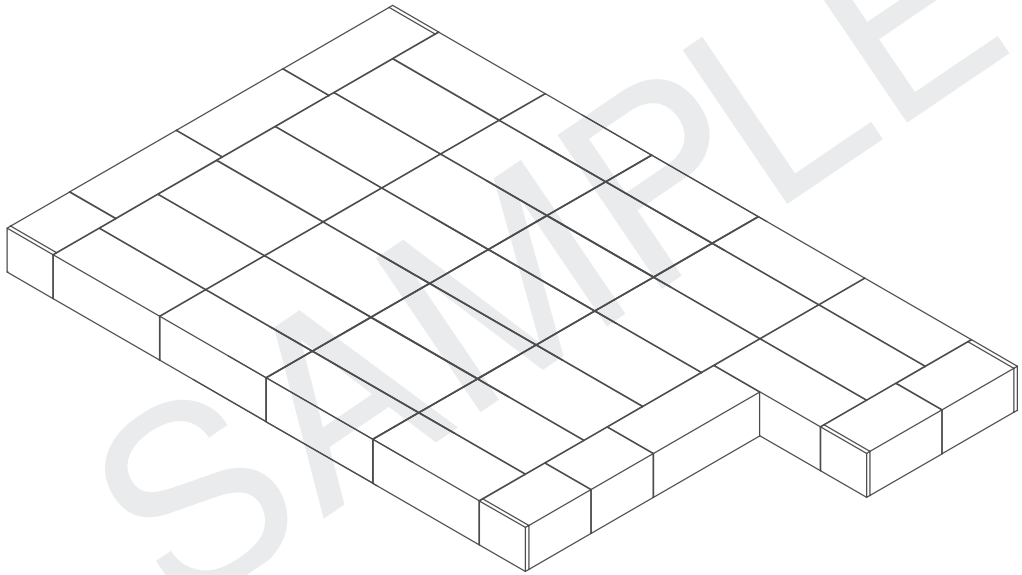
MODULAR CONCRETE
STORMWATER MANAGEMENT

CONTACT STORMTRAP TO REQUEST A DESIGN AND BUDGET FOR YOUR SPECIFIC PROJECT NEEDS.

SHEET INDEX

STORMTRAP CONTACT INFORMATION

STORM TRAP SUPPLIER: STORMTRAP
CONTACT NAME: STORMTRAP
CELL PHONE: STORMTRAP
SALES EMAIL: STORMTRAP



SINGLETRAP® - DETENTION
SAMPLE DRAWING

StormTrap®

PATENTS LISTED AT: [HTTP://STORMTRAP.COM/PATENT]

1-877-867-6872

ENGINEER INFORMATION:

PROJECT INFORMATION:

SINGLETRAP

DETENTION

CURRENT ISSUE DATE:

ISSUED FOR:

SAMPLE PROJECT

REV.	DATE:	ISSUED FOR:	DWN BY:

SCALE:

NTS

SHEET TITLE:

COVER SHEET

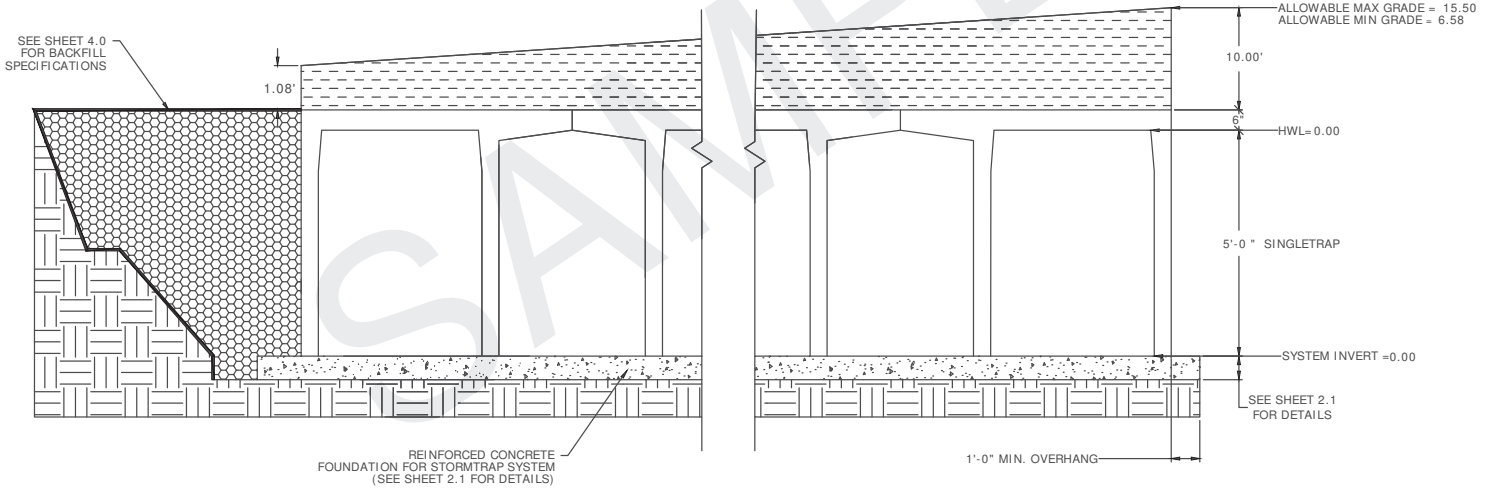
SHEET NUMBER:

0.0

STORMTRAP SYSTEM INFORMATION		
WATER STORAGE REQ'D:	20000	CUBIC FEET
WATER STORAGE PROV:	21379.17	CUBIC FEET
UNIT HEADROOM:	5' 0 "	SINGLETRAP
UNIT QUANTITY:	42	TOTAL PIECES

STORMTRAP STRUCTURAL DESIGN CRITERIA

1. STORMTRAP MODULES SHALL BE MANUFACTURED AND INSTALLED ACCORDING TO SHOP DRAWINGS APPROVED BY THE INSTALLING CONTRACTOR AND ENGINEER OF RECORD. THE SHOP DRAWINGS SHALL INDICATE SIZE AND LOCATION OF ROOF OPENINGS AND INLET/ OUTLET PIPE TYPES, SIZES, INVERT ELEVATIONS AND SIZE OF OPENINGS.
2. COVER RANGE: MIN. 1.08' MAX. 10.00'(CONSULT STORMTRAP FOR ADDITIONAL COVER OPTIONS).
3. ALL DIMENSIONS AND SOIL CONDITIONS, INCLUDING BUT NOT LIMITED TO GROUNDWATER AND SOIL BEARING CAPACITY ARE REQUIRED TO BE VERIFIED IN THE FIELD BY OTHERS PRIOR TO STORMTRAP INSTALLATION.



5'-0 " SINGLETRAP

StormTrap®
PATENTS LISTED AT: [HTTP://STORMTRAP.COM/PATENT]
1-877-867-6872

ENGINEER INFORMATION:

PROJECT INFORMATION:

SINGLETRAP

DETENTION

CURRENT ISSUE DATE:

ISSUED FOR:

SAMPLE PROJECT

REV.	DATE:	ISSUED FOR:	DWN BY:

SCALE:

NTS

SHEET TITLE:

SINGLETRAP DESIGN CRITERIA

SHEET NUMBER:

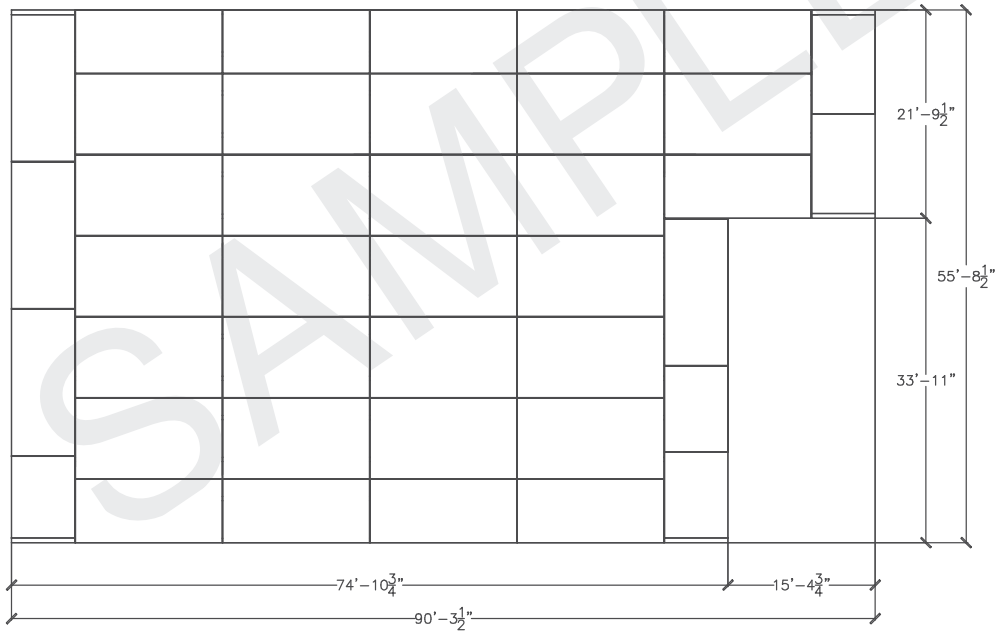
1.0

BILL OF MATERIALS

QTY.	UNIT TYPE	DESCRIPTION	WEIGHT
21	I	5' 0 " SINGLETRAP	
0	II	5' 0 " SINGLETRAP	
13	III	5' 0 " SINGLETRAP	
3	IV	5' 0 " SINGLETRAP	
0	VII	5' 0 " SINGLETRAP	
5	SPIV	5' 0 " SINGLETRAP	
5	PANEL	8" THICK PANELS	
8	JOINTWRAP	150' PER ROLL	
32	JOINTTAPE	14.5' PER ROLL	

DESIGN CRITERIA
ALLOWABLE MAX GRADE= 15.50
ALLOWABLE MIN GRADE =6.58
INSIDE HEIGHT ELEVATION = 0.00
SYSTEM INVERT = 0.00
STORMTRAP VOLUME = 21379.17 C.F.

NOTES:
1. DIMENSIONING OF STORMTRAP SYSTEM SHOWN BELOW ALLOW FOR A 3/4" GAP BETWEEN EACH MODULE.
2. ALL DIMENSIONS TO BE VERIFIED IN THE FIELD BY OTHERS.
3. SEE SHEET 3.0 FOR INSTALLATION SPECIFICATIONS.
4. SP - INDICATES A MODULE WITH MODIFICATIONS.
5. P - INDICATES A MODULE WITH A PANEL ATTACHMENT.
6. CONTRACTORS RESPONSIBILITY TO ENSURE CONSISTENCY/ACCURACY TO FINAL ENGINEER OF RECORD PLAN SET.



StormTrap®
PATENTS LISTED AT: [HTTP://STORMTRAP.COM/PATENT]
1-877-867-6872

ENGINEER INFORMATION:

PROJECT INFORMATION:
SINGLETRAP
DETENTION

CURRENT ISSUE DATE:

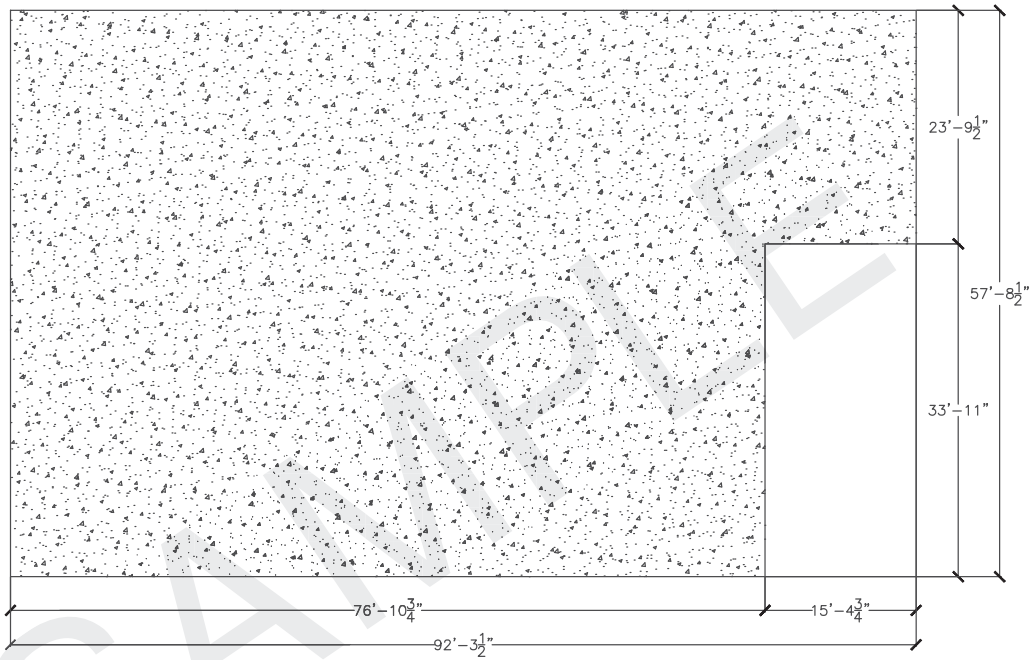
ISSUED FOR:
SAMPLE PROJECT

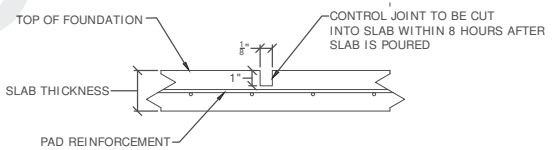
REV.	DATE:	ISSUED FOR:	DWN BY:

SCALE:
NTS

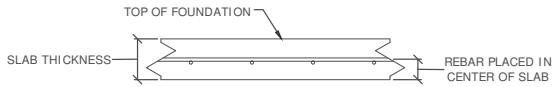
SHEET TITLE:
SINGLETRAP SYSTEM LAYOUT

SHEET NUMBER:
2.0





CONTROL JOINT DETAIL



STORMTRAP FOUNDATION DETAIL

NOTES:

1. CONCRETE STRENGTH @ 28 DAYS, 5%-8% ENTRAINED AIR, 4" MAX. SLUMP.
2. NET ALLOWABLE SOIL PRESSURE AS INDICATED ON SHEET 1.0.
3. SOIL CONDITIONS TO BE VERIFIED ON SITE BY OTHERS.
4. REBAR: ASTM A-615 GRADE 60. BLACK BAR.
5. DIMENSION OF FOUNDATION MUST HAVE 1'-0" OVERHANG BEYOND EXTERNAL FACE OF MODULE.
6. DIMENSION OF STORMTRAP SYSTEM ALLOW FOR A 3/4" GAP BETWEEN EACH MODULE.
7. ALL DIMENSIONS TO BE VERIFIED IN THE FIELD BY OTHERS.
8. THE CONTROL JOINTS SHALL BE BETWEEN (IF REQUIRED BY ENGINEER OF RECORD) 16'-0" TO 24'-0" MAX APART.
9. SEE SHEET 3.0 FOR INSTALLATION SPECIFICATIONS.

MAXIMUM SYSTEM COVER	SLAB THICKNESS	CONCRETE STRENGTH	REINFORCEMENT (BOTH DIRECTIONS)
6" - 12"	0'-8"	4000 PSI	#4 @ 18" O.C.
> 1'-0" - 2'-0"	0'-8"	4000 PSI	#4 @ 16" O.C.
> 2'-0" - 3'-0"	0'-8"	4000 PSI	#4 @ 12" O.C.
> 3'-0" - 4'-0"	0'-8"	4000 PSI	#4 @ 12" O.C.
> 4'-0" - 5'-0"	0'-8"	4000 PSI	#5 @ 18" O.C.
> 5'-0" - 6'-0"	0'-8"	4000 PSI	#5 @ 16" O.C.
> 6'-0" - 7'-0"	0'-8"	4000 PSI	#5 @ 16" O.C.
> 7'-0" - 8'-0"	0'-9"	4000 PSI	#5 @ 12" O.C.
> 8'-0" - 9'-0"	0'-10"	4000 PSI	#5 @ 12" O.C.
> 9'-0" - 10'-0"	0'-10"	4500 PSI	#5 @ 12" O.C.

StormTrap®

PATENTS LISTED AT: [HTTP://STORMTRAP.COM/PATENT]

1-877-867-6872

ENGINEER INFORMATION:

PROJECT INFORMATION:

SINGLETRAP

DETENTION

CURRENT ISSUE DATE:

ISSUED FOR:

SAMPLE PROJECT

REV.	DATE:	ISSUED FOR:	DWN BY:

SCALE:

NTS

SHEET TITLE:

SINGLETRAP FOUNDATION LAYOUT

SHEET NUMBER:

2.1

STORMTRAP INSTALLATION SPECIFICATIONS

1. STORMTRAP SHALL BE INSTALLED IN ACCORDANCE WITH ASTM C891, STANDARD FOR INSTALLATION OF UNDERGROUND PRECAST CONCRETE UTILITY STRUCTURES, THE FOLLOWING ADDITIONS AND/OR EXCEPTIONS SHALL APPLY:

2. IT IS THE RESPONSIBILITY OF THE INSTALLING CONTRACTOR TO ENSURE THAT PROPER/ADEQUATE EQUIPMENT IS USED TO SET/INSTALL THE MODULES.

3. STORMTRAP MODULES SHALL BE PLACED ON A LEVEL CONCRETE FOUNDATION (SEE SHEET 2.1) WITH A 1'-0" OVERHANG ON ALL SIDES THAT SHALL BE POURED IN PLACE BY INSTALLING CONTRACTOR. A QUALIFIED GEOTECHNICAL ENGINEER WILL BE EMPLOYED, BY OWNER, TO PROVIDE ASSISTANCE IN EVALUATING THE EXISTING SOIL CONDITIONS. TO ENSURE THAT HE SOIL BEARING PRESSURE MEET OR EXCEED THE STRUCTURAL DESIGN LOADING CRITERIA AS SPECIFIED ON SHEET 1.0.

4. THE STORMTRAP MODULES SHALL BE PLACED SUCH THAT THE MAXIMUM SPACE BETWEEN ADJACENT MODULES DOES NOT EXCEED $\frac{3}{4}$" (SEE DETAIL 2). IF THE SPACE EXCEEDS $\frac{3}{4}$", THE MODULES SHALL BE RESET WITH APPROPRIATE ADJUSTMENT MADE TO LINE AND GRADE TO BRING THE SPACE INTO SPECIFICATION.

5. THE PERIMETER HORIZONTAL JOINT BETWEEN THE STORMTRAP MODULES AND THE CONCRETE FOUNDATION SHALL BE SEALED TO THE FOUNDATION WITH PRE-FORMED MASTIC JOINT SEALER ACCORDING TO ASTM C891, 8.8 AND 8.12 (SEE DETAIL 1). THE MASTIC JOINT TAPE DOES NOT PROVIDE A WATERTIGHT SEAL. THE SOLE PURPOSE OF THE JOINT TAPE IS TO PROVIDE A SILT AND SOIL TIGHT SYSTEM.

6. STORMTRAP MODULES ARE NOT WATERTIGHT. IF A WATERTIGHT SOLUTION IS REQUIRED, CONTACT STORMTRAP FOR RECOMMENDATIONS. THE WATERTIGHT APPLICATION IS TO BE PROVIDED AND IMPLEMENTED BY THE CONTRACTOR. THE CONTRACTOR IS RESPONSIBLE TO ENSURE THAT THE SELECTED WATERTIGHT SOLUTION PERFORMS AS SPECIFIED BY THE MANUFACTURER. CONTACT STORMTRAP IF A WATERTIGHT APPLICATION IS REQUIRED.

7. ALL EXTERIOR JOINTS BETWEEN ADJACENT STORMTRAP MODULES SHALL BE SEALED WITH 8" WIDE PRE-FORMED, COLD-APPLIED, SELF-ADHERING ELASTOMERIC RESIN, BONDED TO A WOVEN , HIGHLY PUNCTURE RESISTANT POLYMER WRAP, CONFORMING TO ASTM C891 AND SHALL BE INTEGRATED WITH PRIMER SEALANT AS APPROVED BY STORMTRAP (SEE DETAILS 3 & 4). THE JOINT WRAP DOES NOT PROVIDE A WATERTIGHT SEAL. THE SOLE PURPOSE OF THE JOINT WRAP IS TO PROVIDE A SILT AND SOIL TIGHT SYSTEM. THE ADHESIVE EXTERIOR JOINT WRAP SHALL BE INSTALLED ACCORDING TO THE FOLLOWING INSTALLATION INSTRUCTIONS:

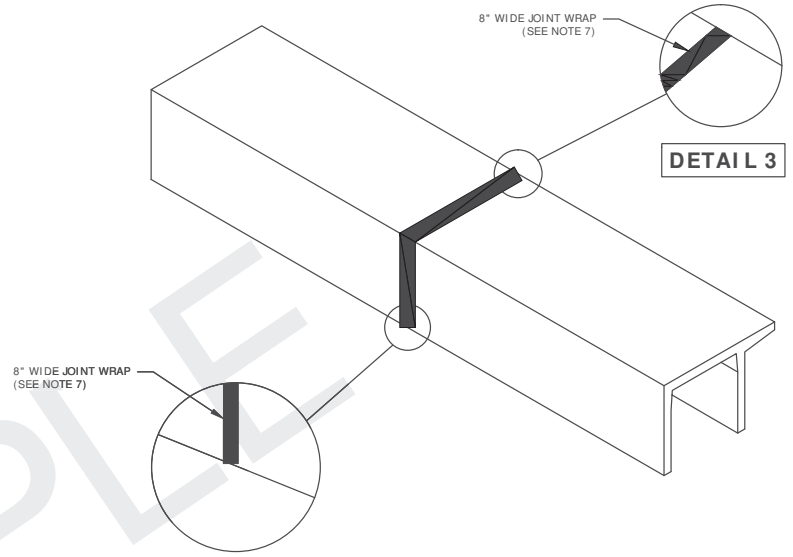
   7.1. USE A BRUSH OR WET CLOTH TO THOROUGHLY CLEAN THE OUTSIDE SURFACE AT THE POINT WHERE JOINT WRAP IS TO BE APPLIED.

   7.2. A RELEASE PAPER PROTECTS THE ADHESIVE SIDE OF THE JOINT WRAP. PLACE THE ADHESIVE TAPE (ADHESIVE SIDE DOWN) AROUND THE STRUCTURE, REMOVING THE RELEASE PAPER AS YOU GO. PRESS THE JOINT WRAP FIRMLY AGAINST THE STORMTRAP MODULE SURFACE WHEN APPLYING.

8. IF THE CONTRACTOR NEEDS TO CANCEL ANY SHIPMENTS, THEY MUST DO SO 48 HOURS PRIOR TO THEIR SCHEDULED ARRIVAL AT THE JOB SITE. IF CANCELED AFTER THAT TIME, PLEASE CONTACT THE PROJECT MANAGER.

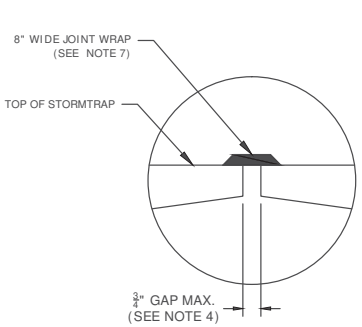
9. IF THE STORMTRAP MODULE(S) IS DAMAGED IN ANY WAY PRIOR, DURING, OR AFTER INSTALL, STORMTRAP MUST BE CONTACTED IMMEDIATELY TO ASSESS THE DAMAGE AND DETERMINE WHETHER OR NOT THE MODULE(S) WILL NEED TO BE REPLACED. IF ANY MODULE ARRIVES AT THE JOBSITE DAMAGED DO NOT UNLOAD IT; CONTACT STORMTRAP IMMEDIATELY. ANY DAMAGE NOT REPORTED BEFORE THE TRUCK IS UNLOADED WILL BE THE CONTRACTOR'S RESPONSIBILITY.

10. STORMTRAP MODULES CANNOT BE ALTERED IN ANY WAY AFTER MANUFACTURING WITHOUT WRITTEN CONSENT FROM STORMTRAP.



DETAIL 3

DETAIL 4



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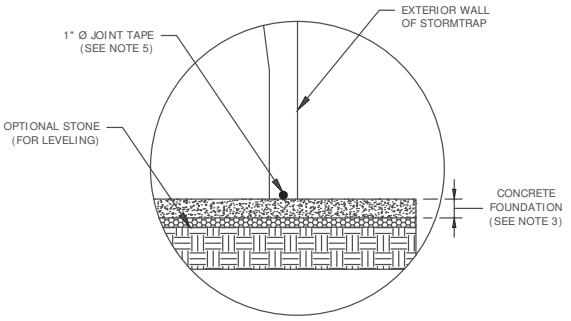

DETAIL 1

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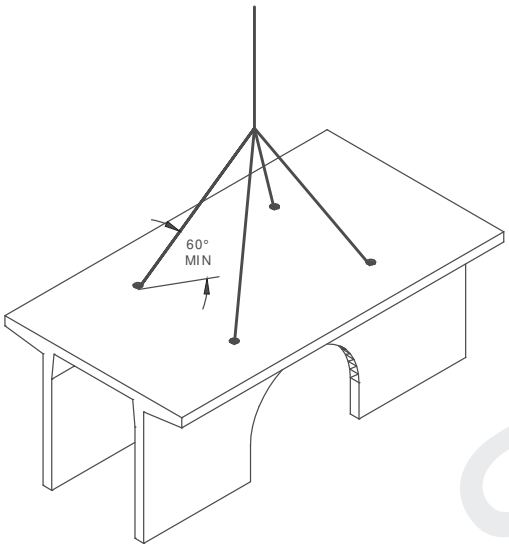
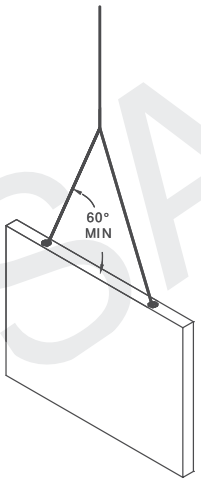
3.0

END PANEL ERECTION/INSTALLATION NOTES

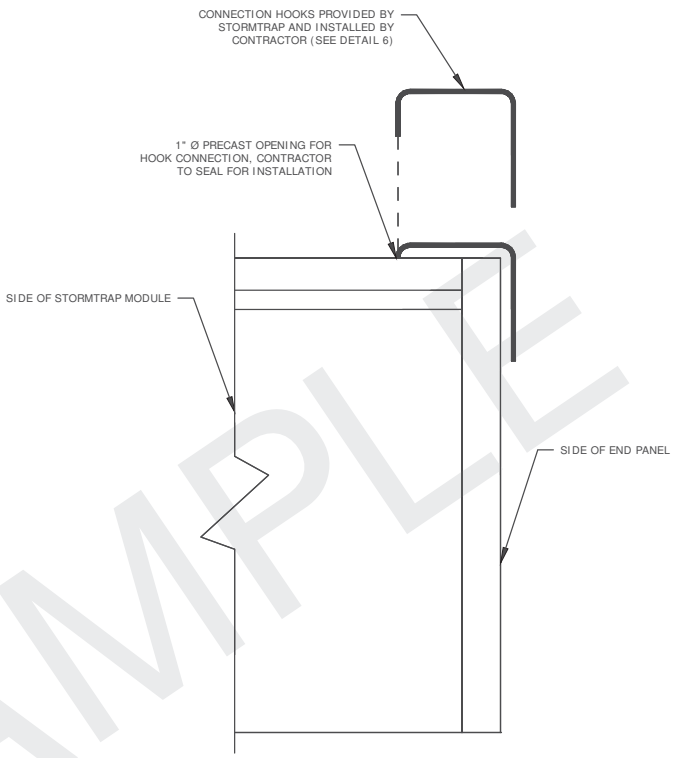
1. END PANELS WILL BE SUPPLIED TO CLOSE OFF OPEN ENDS OF ROWS.
2. PANELS SHALL BE INSTALLED IN A TILT UP FASHION DIRECTLY ADJACENT TO OPEN END OF MODULE (REFER TO SHEET 2.0 FOR END PANEL LOCATIONS).
3. CONNECTION HOOKS WILL BE SUPPLIED WITH END PANELS TO SECURELY CONNECT PANEL TO ADJACENT STORMTRAP MODULE (SEE PANEL CONNECTION ELEVATION VIEW).
4. ONCE CONNECTION HOOKS ARE ATTACHED, LIFTING CLUTCHES MAY BE REMOVED.
5. JOINT WRAP SHALL BE PLACED AROUND PERIMETER JOINT PANEL (SEE SHEET 3.0).



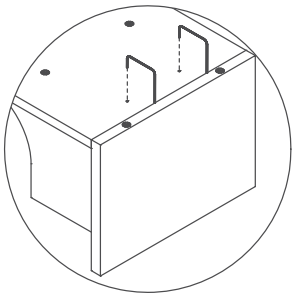
MODULE LIFTING DETAIL



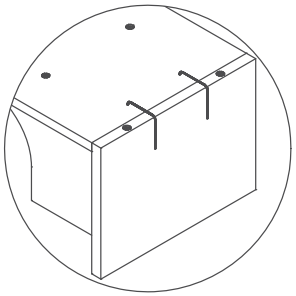
END PANEL LIFTING DETAIL



PANEL CONNECTION ELEVATION VIEW



STEP 1



STEP 2

DETAIL 6

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3.1

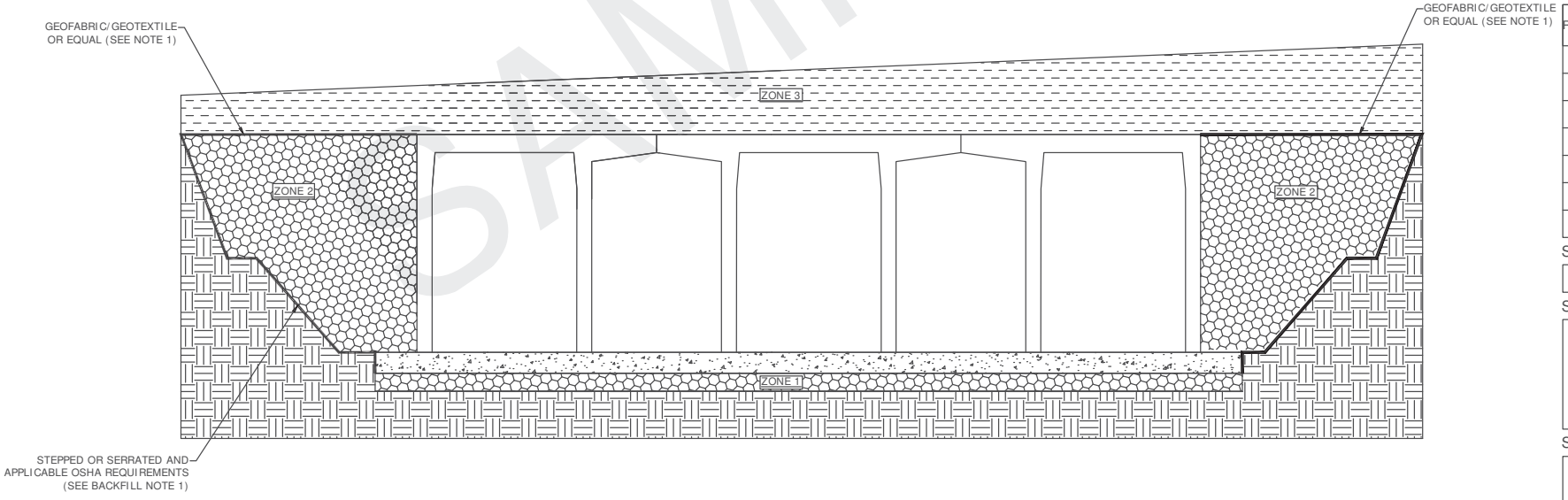
ZONE CHART		
ZONES	ZONE DESCRIPTIONS	REMARKS
ZONE 1 (OPTIONAL)	FOUNDATION AGGREGATE	
ZONE 2	BACKFILL	
ZONE 3	FINAL COVER OVERTOP	

STORMTRAP ZONE INSTALLATION SPECIFICATIONS/ PROCEDURES

1. THE FILL PLACED AROUND THE STORMTRAP MODULES MUST DEPOSITED ON BOTH SIDES AT THE SAME TIME AND TO APPROXIMATELY THE SAME ELEVATION. AT NO TIME SHALL THE FILL BEHIND ONE SIDE WALL BE MORE THAN 2'-0" HIGHER THAN THE FILL ON THE OPPOSITE SIDE. BACKFILL SHALL EITHER BE COMPACTED AND/OR VIBRATED TO ENSURE THAT BACKFILL AGGREGATE/STONE MATERIAL IS WELL SEATED AND PROPERLY INTER LOCKED. CARE SHALL BE TAKEN TO PREVENT ANY WEDGING ACTION AGAINST THE STRUCTURE, AND ALL SLOPES WITHIN THE AREA TO BE BACKFILLED MUST BE STEPPED OR SERRATED TO PREVENT WEDGING ACTION. CARE SHALL ALSO BE TAKEN AS NOT TO DISRUPT THE JOINT WRAP FROM THE JOINT DURING THE BACKFILL PROCESS. BACKFILL MATERIAL SHALL BE CLEAN, CRUSHED, ANGULAR No. 5 (AASHTO M43) AGGREGATE. IF NATIVE EARTH IS SUSCEPTIBLE TO MIGRATION, CONFIRM WITH GEOTECHNICAL ENGINEER AND PROVIDE PROTECTION AS REQUIRED.

2. DURING PLACEMENT OF MATERIAL OVERTOP THE SYSTEM, AT NO TIME SHALL MACHINERY BE USED OVERTOP THAT EXCEEDS THE DESIGN LIMITATIONS OF THE SYSTEM. WHEN PLACEMENT OF MATERIAL OVERTOP, MATERIAL SHALL BE PLACED SUCH THAT THE DIRECTION OF PLACEMENT IS PARALLEL WITH THE OVERALL LONGITUDINAL DIRECTION OF THE SYSTEM WHENEVER POSSIBLE.

3. THE FILL PLACED OVERTOP THE SYSTEM SHALL BE PLACED AT A MINIMUM OF 6" LIFTS. AT NO TIME SHALL MACHINERY OR VEHICLES GREATER THAN THE DESIGN HS-20 LOADING CRITERIA TRAVEL OVERTOP THE SYSTEM WITHOUT THE MINIMUM DESIGN COVERAGE. IF TRAVEL IS NECESSARY OVERTOP THE SYSTEM PRIOR TO ACHIEVING THE MINIMUM DESIGN COVER, IT MAY BE NECESSARY TO REDUCE THE ULTIMATE LOAD/BURDEN OF THE OPERATING MACHINERY SO AS TO NOT EXCEED THE DESIGN CAPACITY OF THE SYSTEM. IN SOME CASES, IN ORDER TO ACHIEVE REQUIRED COMPACTION, HAND COMPACTION MAY BE NECESSARY IN ORDER NOT TO EXCEED THE ALLOTTED DESIGN LOADING.



BACKFILL DETAIL

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4.0

RECOMMENDED ACCESS OPENING SPECIFICATION

1. A TYPICAL ACCESS OPENING FOR THE STORMTRAP SYSTEM ARE 2'-0" IN DIAMETER. ACCESS OPENINGS LARGER THAN 3'-0" IN DIAMETER NEED TO BE APPROVED BY STORMTRAP. ALL OPENINGS MUST RETAIN AT LEAST 1'-0" OF CLEARANCE FROM THE END OF THE STORMTRAP MODULE UNLESS NOTED OTHERWISE. ALL ACCESS OPENINGS TO BE LOCATED ON INSIDE LEG UNLESS OTHERWISE SPECIFIED.

2. PLASTIC COATED STEEL STEPS PRODUCED BY M.A. INDUSTRIES PART #PS3-PFC OR APPROVED EQUAL (SEE STEP DETAIL) ARE PROVIDED INSIDE ANY MODULE WHERE DEEMED NECESSARY. THE HIGHEST STEP IN THE MODULE IS TO BE PLACED A DISTANCE OF 1'-0" FROM THE INSIDE EDGE OF THE STORMTRAP MODULES. ALL ENSUING STEPS SHALL BE PLACED WITH A MAXIMUM DISTANCE OF 1'-4" BETWEEN THEM. STEPS MAY BE MOVED OR ALTERED TO AVOID OPENINGS OR OTHER IRREGULARITIES IN THE MODULE.

3. STORMTRAP LIFTING INSERTS MAY BE RELOCATED TO AVOID INTERFERENCE WITH ACCESS OPENINGS OR THE CENTER OF GRAVITY OF THE MODULE AS NEEDED.

4. STORMTRAP ACCESS OPENINGS MAY BE RELOCATED TO AVOID INTERFERENCE WITH INLET AND/OR OUTLET PIPE OPENINGS SO PLACEMENT OF STEPS IS ATTAINABLE.

5. ACCESS OPENINGS SHOULD BE LOCATED IN ORDER TO MEET THE APPROPRIATE MUNICIPAL REQUIREMENTS. STORMTRAP RECOMMENDS AT LEAST TWO ACCESS OPENINGS PER SYSTEM FOR ACCESS AND INSPECTION.

6. USE PRECAST ADJUSTING RINGS AS NEEDED TO MEET GRADE. STORMTRAP RECOMMENDS FOR COVER OVER 2' TO USE PRECAST BARREL OR CONE INSPECTIONS. (PROVIDED BY OTHERS)

RECOMMENDED PIPE OPENING SPECIFICATION

1. MINIMUM EDGE DISTANCE FOR AN OPENING ON THE OUTSIDE WALL SHALL BE NO LESS THAN 1'-0".

2. MAXIMUM OPENING SIZE TO BE DETERMINED BY THE MODULE HEIGHT. PREFERRED OPENING SIZE Ø 36" OR LESS. ANY OPENING NEEDED THAT DOES NOT FIT THIS CRITERIA SHALL BE BROUGHT TO THE ATTENTION OF STORMTRAP FOR REVIEW.

3. CONNECTING PIPES SHALL BE INSTALLED WITH A 1'-0" CONCRETE COLLAR, AND AN AGGREGATE CRADLE FOR AT LEAST ONE PIPE LENGTH (SEE PIPE CONNECTION DETAIL). A STRUCTURAL GRADE CONCRETE OR HIGH STRENGTH, NON-SHRINK GROUT WITH A MINIMUM 28 DAY COMPRESSIVE STRENGTH OF 3000 PSI SHALL BE USED.

4. THE ANNULAR SPACE BETWEEN THE PIPE AND THE HOLE SHALL BE FILLED WITH HIGH STRENGTH NON-SHRINK GROUT.

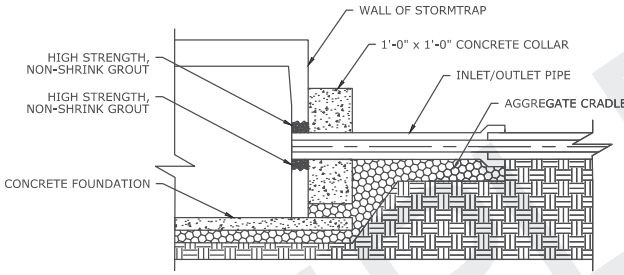
RECOMMENDED PIPE INSTALLATION INSTRUCTIONS

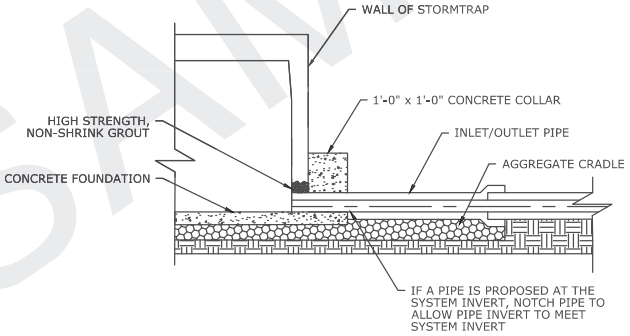
1. CLEAN AND LIGHTLY LUBRICATE ALL OF THE PIPE TO BE INSERTED INTO STORMTRAP.

2. IF PIPE IS CUT, CARE SHOULD BE TAKEN TO ALLOW NO SHARP EDGES. BEVEL AND LUBRICATE LEAD END OF PIPE.

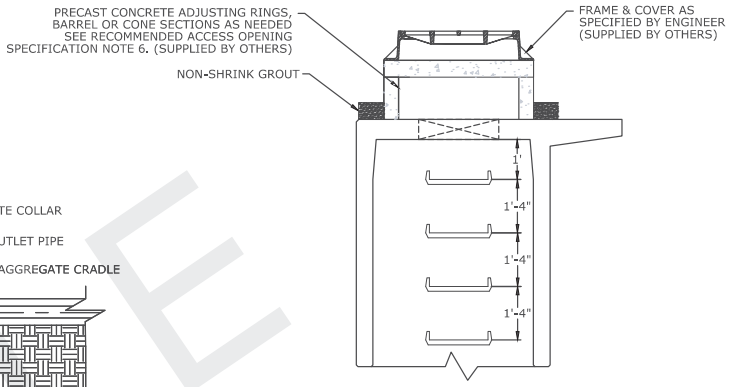
3. ALIGN CENTER OF PIPE TO CORRECT ELEVATION AND INSERT INTO OPENING.

NOTE: ALL ANCILLARY PRODUCTS RECOMMENDED AND SHOWN ON THIS SHEET ARE RECOMMENDATIONS ONLY AND SUBJECT TO CHANGE PER THE INSTALLING CONTRACTOR.

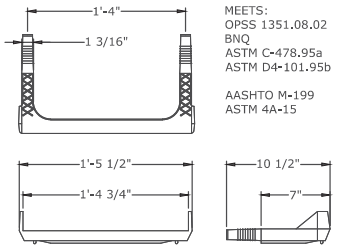




PIPE CONNECTION DETAIL



RISER / STAIR DETAIL



MEETS:
OPSS 1351.08.02
BNQ
ASTM C-478.95a
ASTM D4-101.95b

AASHTO M-199
ASTM 4A-15

STEP DETAIL

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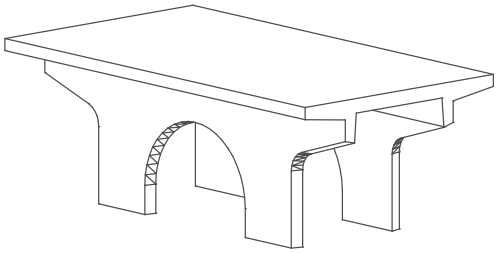
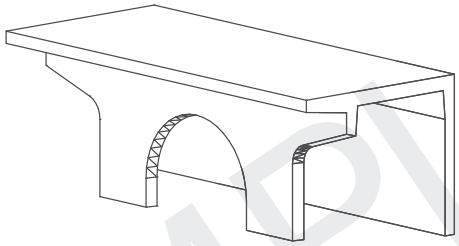
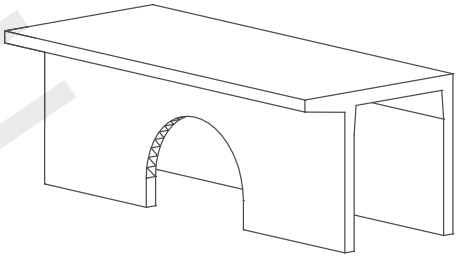


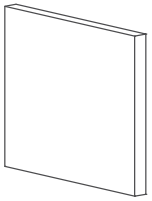
TYPE I



TYPE III



TYPE IV



TYPE IV
END PANEL

NOTES:
1. OPENING LOCATIONS AND SHAPES MAY VARY.
2. SP - INDICATES A MODULE WITH MODIFICATIONS.
3. P - INDICATES A MODULE WITH A PANEL ATTACHMENT.
4. POCKET WINDOW OPENINGS ARE OPTIONAL.

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MODULE TYPES

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6.0

ATTACHMENT 2 MAINTENANCE AGREEMENT AND FUNDING MECHANISM DOCUMENTATION

ATTACHMENT 3 TRAINING LOG FORM

TRAINING / EDUCATIONAL LOG

Date of Training/Educational Activity: _____

Name of Person Performing Activity (Printed): _____

Signature: _____

Topic of Training/Educational Activity

_____

_____

Name of Participant	Signature of Participant

For newsletter or mailer educational activities, please include the following information:

- Date of mailing:
- Number distributed:
- Method of distribution:
- Topics addressed:

If a newsletter article was distributed, please include a copy of it.

ATTACHMENT 4 INSPECTION AND MAINTENANCE LOG FORM

TRAINING / EDUCATIONAL LOG

Date of Training/Educational Activity: _____

Name of Person Performing Activity (Printed): _____

Signature: _____

BMP Name or Type (As Shown in O&M Plan)	Brief Description of Operation, Maintenance or Inspection Activity Performed	Summary of Notable Observations or Outcomes from Activity

[add additional pages, photographs, drawings, notes as needed]

ATTACHMENT 5 INSPECTION AND O&M CHECKLIST (OPTIONAL)

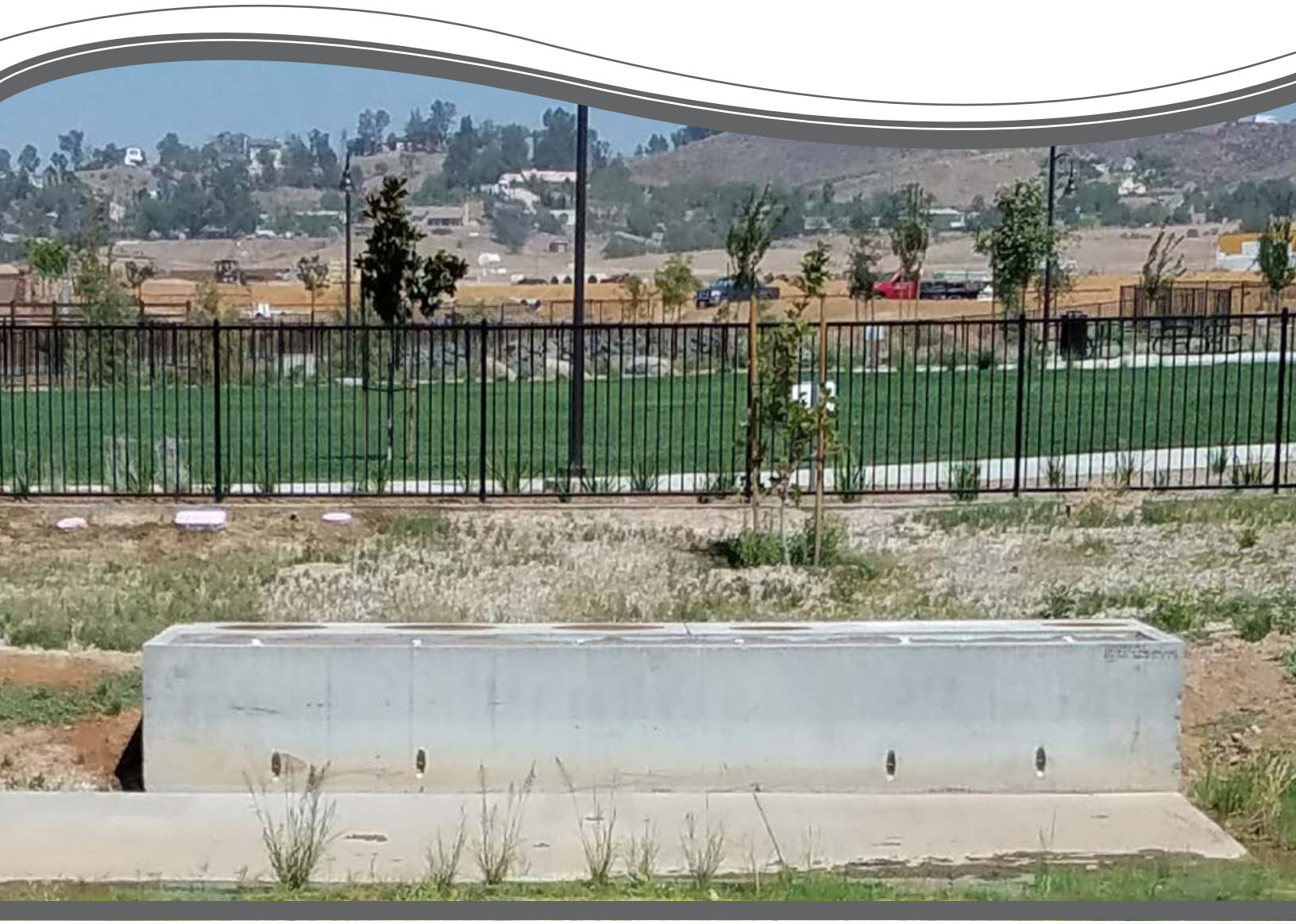
Guidance: Based on the BMPs present at the site, this checklist is intended to summarize the activities necessary at each frequency. Include more details if desired.

Weekly Activities	**Check Box**
Selected source control/housekeeping activities (See Section 3.1)	
Monthly Activities	
Selected source control/housekeeping activities (See Section 3.1)	
Quarterly Activities (before wet season, after wet season, plus twice after rain > 0.5 inches)	
Inspections of selected source control BMPs (See Section 3.1)	
Inspections and as-needed minor maintenance of all structural treatment and hydromodification BMPs (See Section 3.3)	
Twice Yearly Activities (during dry weather)	
Dry weather flow inspections (non-structural source control) (See Section 3.1)	
Inspection and as-needed maintenance of other selected source control BMPs (See Section 3.1)	
Annual Activities	
Self-certification (See Section 2.6)	
Various source control BMP and housekeeping activities (See Section 3.1)	
Inspection and maintenance of HSCs (See Section 3.2)	
Various planned maintenance activities of treatment and hydromodification BMPs, such as vegetation maintenance, minor sediment maintenance, etc. (See Section 3.3)	

ATTACHMENT 6 VENDOR O&M INFORMATION

CONTECH®
ENGINEERED SOLUTIONS

Modular Wetlands® Linear Operations & Maintenance Manual



MODULAR WETLANDS®

MODULAR WETLANDS LINEAR
OPERATION & MAINTENANCE MANUAL

TABLE OF CONTENTS

OVERVIEW

This operation and maintenance (O&M) manual is for the Modular Wetlands Linear Biofilter (MWL). Please read the instructions and equipment lists closely prior to starting. It is important to follow all necessary safety procedures associated with state and local regulations. Please contact Contech for more information on pre-authorized third-party service providers who can provide inspection and maintenance services in your area. For a list of service providers in your area, please visit www.conteches.com/maintenance.

WARNING

Confined space entry may be required. Contractor to obtain all equipment and training to meet applicable local and OSHA regulations regarding confined space entry. It is the Contractor's or entry personnel's responsibility to always proceed safely.

SAFETY NOTICE & PERSONAL SAFETY EQUIPMENT

Job site safety is a topic and a practice addressed comprehensively by others. The inclusions here are merely reminders to whole areas of Safety Practice that are the responsibility of the Owner(s), Manager(s), and Service Provider(s). OSHA and Canadian OSH, Federal, State/Provincial, and Local Jurisdiction Safety Standards apply on any given site or project. The knowledge and applicability of those responsibilities is the Service Provider's responsibility and outside the scope of Contech Engineered Solutions.

Safety Boots

Gloves

Hard Hat

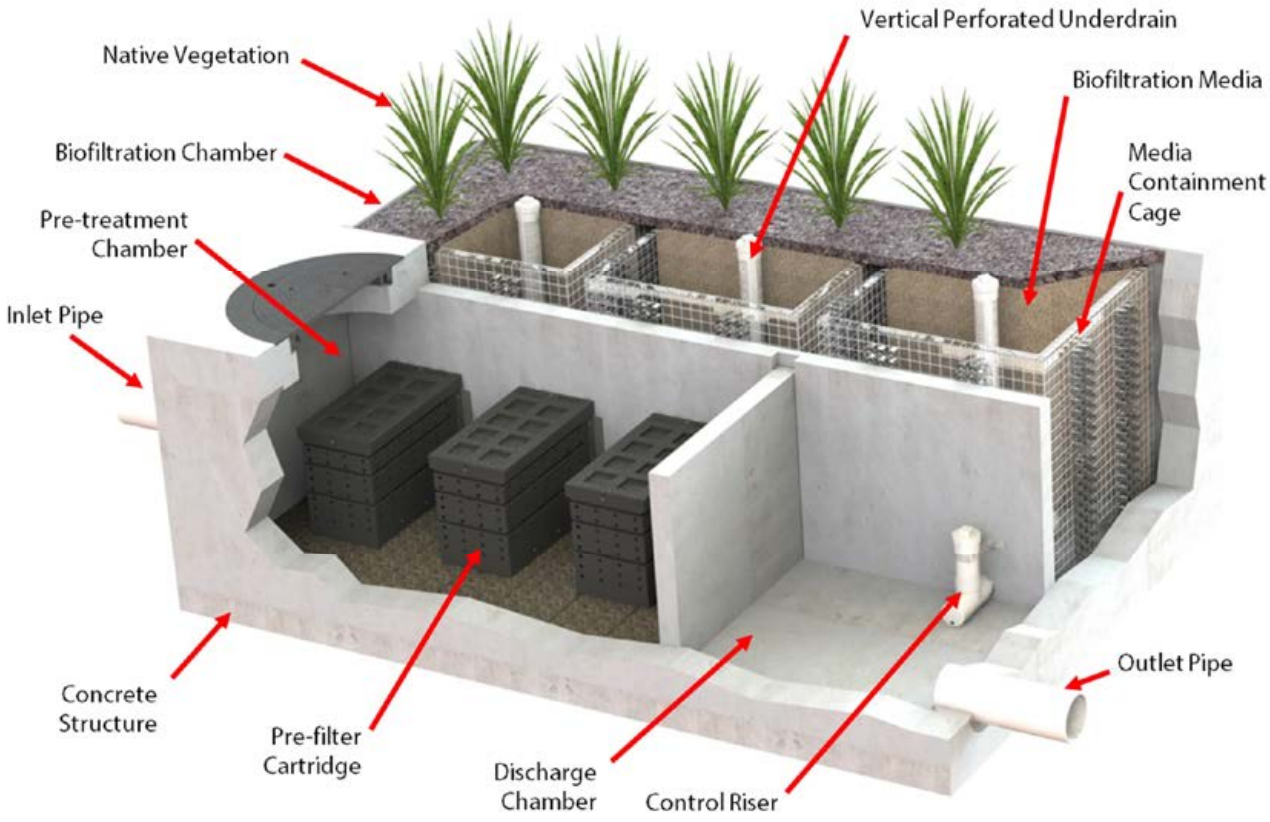
Eye Protection

Maintenance and Protection of Traffic Plan

MODULAR WETLANDS LINEAR COMPONENTS LIST

The MWL system comes in multiple sizes and configurations, including side by side or end to end layouts, both as open planters or underground systems. See shop drawings (plans) for project specific details.

The standard MWL system is comprised of the following components:



INSPECTION SUMMARY & EQUIPMENT LIST

Stormwater regulations require BMPs be inspected and maintained to ensure they are operating as designed to allow for effective pollutant removal and provide protection to receiving water bodies. It is recommended that inspections be performed multiple times during the first year to assess the site-specific loading conditions. The first year of inspections can be used to set inspection and maintenance intervals for subsequent years to ensure appropriate maintenance is provided.

- Inspect pre-treatment, biofiltration, and discharge chambers an average of once every six to twelve months. Varies based on site specific and local conditions.
- Average inspection time is approximately 15 minutes. Always ensure appropriate safety protocol and procedures are followed.

The following is a list of equipment required to allow for simple and effective inspection of the MWL:

Modular Wetlands Linear Inspection Form

Flashlight

Tape Measure

Access Cover Hook

Ratchet
& 7/16" Socket
(if required for older pre-filter cartridges that have two bolts holding the lids on)

INSPECTION & MAINTENANCE NOTES

1. Following maintenance and/or inspection, it is recommended that 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 not require irrigation after initial establishment.

INSPECTION PROCESS

1. Prepare the inspection form by writing in the necessary information including project name, location, date & time, unit number and other information (see inspection form).
2. Observe the inside of the system through the access covers. If minimal light is available and vision into the unit is impaired, utilize a flashlight to see inside the system and all chambers.
3. Look for any out of the ordinary obstructions in the inflow pipe, pre-treatment chamber, biofiltration chamber, discharge chamber or outflow pipe. Write down any observations on the inspection form.
4. Through observation and/or digital photographs, estimate the amount of trash, debris accumulated in the pre-treatment chamber. Utilizing a tape measure or measuring stick, estimate the amount of sediment in this chamber. Record this depth on the inspection form.
5. Through visual observation, inspect the condition of the pre-filter cartridges. Look for excessive build-up of sediment on the cartridges, any build-up on the tops of the cartridges, or clogging of the holes. Record this information on the inspection form. The pre-filter cartridges can be further inspected by removing the cartridge tops and assessing the color of the BioMediaGREEN filter cubes (requires entry into pre-treatment chamber - see notes previous notes regarding confined space entry). Record the color of the material. New material is a light green color. As the media becomes clogged, it will turn darker in color, eventually becoming dark brown or black. The closer to black the media is the higher percentage that the media is exhausted and in need of replacement.

6. The biofiltration chamber is generally maintenance-free due to the system's advanced pre-treatment chamber. For units which have open planters with vegetation, it is recommended that the vegetation be inspected. Look for any plants that are dead or showing signs of disease or other negative stressors. Record the general health of the plants on the inspection form and indicate through visual observation or digital photographs if trimming of the vegetation is required.

7. The discharge chamber houses the control riser (if applicable), drain down filter (only in California - older models), and is connected to the outflow pipe. It is important to check to ensure the orifice is in proper operating condition and free of any obstructions. It is also important to assess the condition of the drain down filter media which utilizes a block form of the BioMediaGREEN. Assess in the same manner as the cubes in the pre-filter cartridge as mentioned above.

8. Finalize the inspection report for analysis by the maintenance manager to determine if maintenance is required.

MAINTENANCE INDICATORS

Based upon the observations made during inspection, maintenance of the system may be required based on the following indicators:

- Missing or damaged internal components or cartridges.
- Obstructions in the system or its inlet and/or outlet pipes.
- Excessive accumulation of floatables in the pre-treatment chamber in which the length and width of the chamber is fully impacted more than 18".
- Excessive accumulation of sediment in the pre-treatment chamber of more than 6" in depth.
- Excessive accumulation of sediment on the BioMediaGREEN media housed within the pretreatment cartridges. When media is more than 85% clogged, replacement is required. The darker the BioMediaGREEN, the more clogged it is and in need of replacement.
- Excessive accumulation of sediment on the BioMediaGREEN media housed within the drain down filter (California only - older models).
- Overgrown vegetation.

MAINTENANCE SUMMARY & EQUIPMENT LIST

The time has come to maintain your MWL. All necessary pre-maintenance steps must be carried out before maintenance occurs. Once traffic control has been set up per local and state regulations and access covers have been safely opened, the maintenance process can begin. It should be noted that some maintenance activities require confined space entry. All confined space requirements must be strictly followed before entry into the system. In addition, the following is recommended:

- Prepare the maintenance form by writing in the necessary information including project name, location, date & time, unit number and other info (see maintenance form).
- Set up all appropriate safety and maintenance equipment.
- Ensure traffic control is set up and properly positioned.
- Prepared pre-checks (OSHA, safety, confined space entry) are performed.
    - A gas meter should be used to detect the presence of any hazardous gases prior to entering the system. If hazardous gases are present, do not enter the vault. Following appropriate confined space procedures, take steps such as utilizing a venting system to address the hazard. Once it is determined to be safe, enter the system utilizing appropriate entry equipment such as a ladder and tripod with harness.

The following is a list of equipment required for maintenance of the MWL:

Modular Wetlands Linear Maintenance Form

Flashlight

Access Cover Hook

Ratchet
& 7/16" Socket
(if required for older pre-filter cartridges that have two bolts holding the lids on)

Vacuum Assisted Truck with Pressure Washer

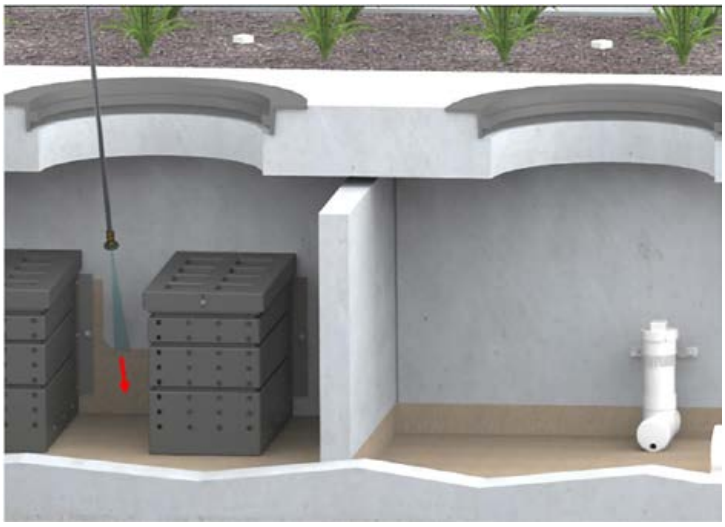
Replacement
BioMediaGREEN
(If Required)

(order BioMediaGREEN from Contech's Maintenance Team members at https://www.conteches.com/maintenance)

MAINTENANCE INSTRUCTIONS

1. ACCESS COVER REMOVAL

Upon determining that the vault is safe for entry, remove all access cover(s) and position the vacuum truck accordingly.



2. PRESSURE WASH SYSTEM CHAMBERS

With the pressure washer, spray down pollutants accumulated on the walls and floors of the pre-treatment and discharge chambers. Then wash any accumulated sediment from the pre-filter cartridge(s).

3. VACUUM SYSTEM CHAMBERS

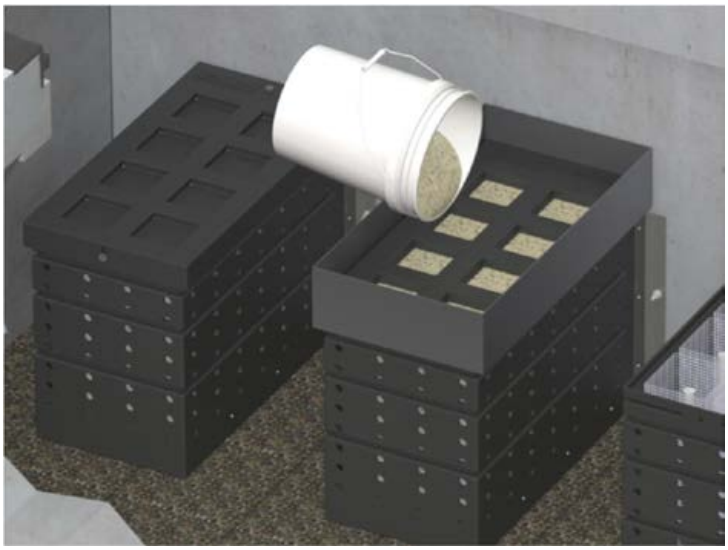
Vacuum out pre-treatment and discharge chambers and remove all accumulated pollutants including trash, debris, and sediments. Be sure to vacuum the pre-treatment floor until the pervious pavers are visible and clean. **(MWL systems outside of California may or may not have pervious pavers on the floor in the pre-treatment chamber)** If pre-filter cartridges require media replacement, proceed to **Step 4**. If not, replace the access cover(s) and proceed to **Step 7**.

4. PRE-FILTER CARTRIDGE LID REMOVAL

After successfully cleaning out the pre-treatment chamber, enter the chamber and remove the lid(s) from the pre-filter cartridge(s) by removing the two thumb screws. (Older pre-filter cartridges have two bolts holding the lids on that require a 7/16" socket to remove)

5. VACUUM EXISTING PRE-FILTER MEDIA

Utilize the vacuum truck hose or hose extension to remove the filter media from each of the individual media cages. Once filter media has been sucked out, use a pressure washer to spray down the inside of the cartridge and its media cages. Remove cleaned media cages and place to the side. Once removed, the vacuum hose can be inserted into the cartridge to vacuum out any remaining material near the bottom of the cartridge.



6. PRE-FILTER MEDIA REPLACEMENT

Reinstall media cages and fill with new media from the manufacturer or outside supplier. Manufacturer will provide specification of media and sources to purchase. The easiest way to fill the media cages is to utilize a refilling tray that can also be sourced from the manufacturer. Place the refilling tray on top of the cartridge and fill with new bulk media shaking it down into the cages. Using your hands, lightly compact the media into each filter cage. Once the cages are full (each cartridge will hold five heaping 5gal buckets of bulk media), remove the refilling tray and replace the cartridge top, ensuring fasteners are properly tightened.

7. MAINTAINING VEGETATION

In general, the biofiltration chamber is maintenance-free with the exception of maintaining the vegetation. The MWL utilizes vegetation similar to surrounding landscape areas, therefore, trim vegetation to match surrounding vegetation. If any plants have died, replace them with new ones.

8. INSPECT UNDERDRAIN SYSTEM

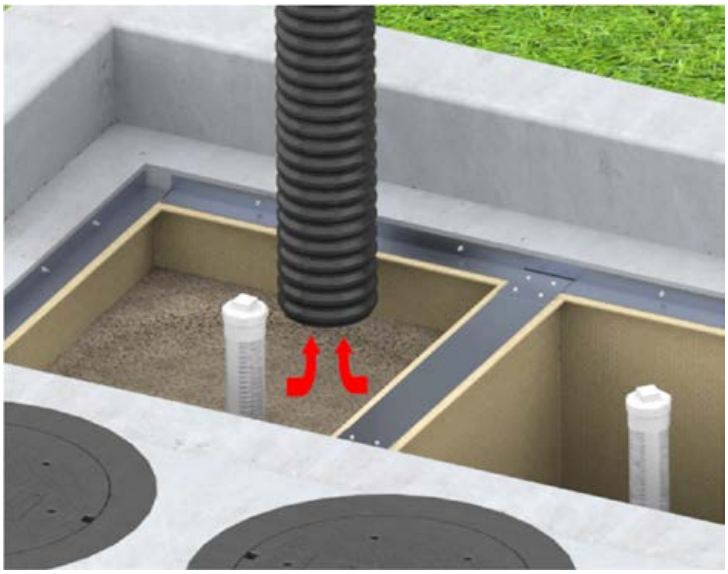
Each vertical under drain on the biofiltration chamber has a removable threaded cap that can be taken off to check for any blockages or root growth. Once removed, a jetting attachment to the pressure washer can be used to clean out the under drain and orifice riser if needed.

9. REPLACE ACCESS COVERS

Once maintenance is complete, replace all access cover(s)

REPLACING BIOFILTRATION MEDIA IF REQUIRED

As with all biofilter systems, at some point the biofiltration media will need to be replaced, either due to physical clogging or sorptive exhaustion (for dissolved pollutants) of the media ion exchange capacity (to remove dissolved metals and phosphorous). The general life of this media is 10 to 20 years based on site specific conditions and pollutant loading, so replacing the biofiltration media should not be a common occurrence. In the event that the biofiltration media requires replacement, contact one of Contech's Maintenance Team members at https://www.conteches.com/maintenance to order new biofiltration media. The quantity of media needed can be determined by providing the model number and unit depth. Media will be provided in super sacks for easy installation. Each sack will weigh between 1,000 and 2,000 lbs. Biofiltration media replacement can be done following the steps below:



1. VACUUM EXISTING BIOFILTRATION MEDIA

Remove the mulch and vegetation to access the biofiltration media, and then position the vacuum truck accordingly. Utilize the vacuum truck to vacuum out all the media. Once all media is removed, use the pressure washer to spray down all the netting and underdrain systems on the inside of the media containment cage. Vacuum out any remaining debris after spraying down netting. Inspect the netting for any damage or holes. If the netting is damaged, it can be repaired or replaced with guidance by the manufacturer.

2. INSTALLING NEW BIOFILTRATION MEDIA

Ensure that the chamber is fully cleaned prior to installation of new media into the media containment cage(s). Media will be provided in super sacks for easy installation. A lifting apparatus (forklift, backhoe, boom truck, or other) is recommended to position the super sack over the biofiltration chamber. Add media in lifts to ensure that the riser pipes remain vertical. Be sure to only fill the media cage(s) up to the same level as the old media.

3. REPLANT VEGETATION

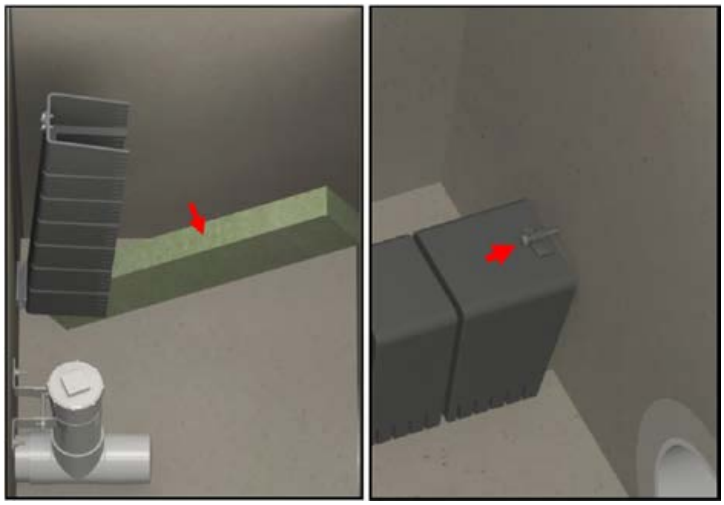
Once the media has been replaced, replant the vegetation and cover biofiltration chamber with approved mulch (if applicable). If the existing vegetation is not being reused, and new vegetation is being planted, you will need to acquire new plant establishment media that will be installed just below the mulch layer at each plant location. (see plan drawings for details). Contact one of Contech's Maintenance Team members at https://www.conteches.com/maintenance to order new plant establishment media.

REPLACING DRAIN DOWN FILTER MEDIA (ONLY ON OLDER CALIFORNIA MODELS)

NOTE: The drain down filter is only found on units installed in California prior to 2023
If during inspection it was determined that the drain down filter media requires replacement, contact one of Contech's Maintenance Team members at https://www.conteches.com/maintenance to order new media.

1. REMOVE EXISTING DRAIN DOWN MEDIA

Pull knob back to unlock the locking mechanism and lift the drain down filter housing to remove the used BioMediaGREEN filter block.



2. INSTALL NEW DRAIN DOWN MEDIA

Ensure that the chamber and housing are fully cleaned prior to installation of new media, and then insert the new BioMediaGREEN filter block. The media filter block should fit snugly between the chamber walls and be centered under the filter housing. Lower the housing over the filter block and secure the locking mechanism.

NOTES

CONTECH® ENGINEERED SOLUTIONS

Inspection Report
Modular Wetlands Linear

Project Name _____

Project Address _____
(city) (Zip Code)

Owner / Management Company _____

Contact _____ Phone ( ) –

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

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 _____

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: _____

CONTECH®
ENGINEERED SOLUTIONS

Cleaning and Maintenance Report
Modular Wetlands Linear

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 _____

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:

CONTECH®
ENGINEERED SOLUTIONS

800-338-1122

WWW.CONTECHES.COM

CONTECH ENGINEERED SOLUTIONS LLC PROVIDES SITE SOLUTIONS FOR THE CIVIL ENGINEERING INDUSTRY. CONTECH'S PORTFOLIO INCLUDES BRIDGES, DRAINAGE, SANITARY SEWER, STORMWATER AND EARTH STABILIZATION PRODUCTS. FOR INFORMATION ON OTHER CONTECH DIVISION OFFERINGS, VISIT CONTECHES.COM OR CALL 800-338-1122.

SUPPORT

DRAWINGS AND SPECIFICATIONS ARE AVAILABLE AT WWW.CONTECHES.COM

ModWetLinear OM Manual 03/24

StormTrap®

MODULAR CONCRETE
STORMWATER MANAGEMENT

STORMWATER MANAGEMENT SOLUTIONS

StormTrap offers the industry's best solutions for managing runoff, protecting waterways and improving the use of your property. Whether you are concerned about detention, retention, water quality or water harvesting, StormTrap has a design that will reduce your footprint, accommodate any site constraints, lower overall costs and meet your specific project needs.

SingleTrap®

A durable stormwater management system customized to your site's exact requirements, ideal for working in an extremely limited space while preserving land above for parks, buildings or parking lots.

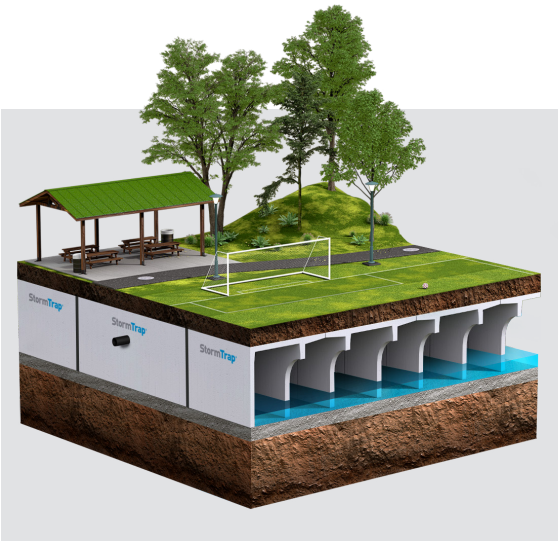
DoubleTrap®

The stormwater management solution you need to control runoff volume and discharge timing. Its modular design maximizes storage volume while minimizing footprint and installation cost.

STORMWATER APPLICATIONS

Detention

StormTrap underground stormwater detention systems temporarily store runoff in large underground chambers before releasing it at a controlled rate. This mitigates erosion, flooding and many of the other harmful effects of high volumes of stormwater runoff.



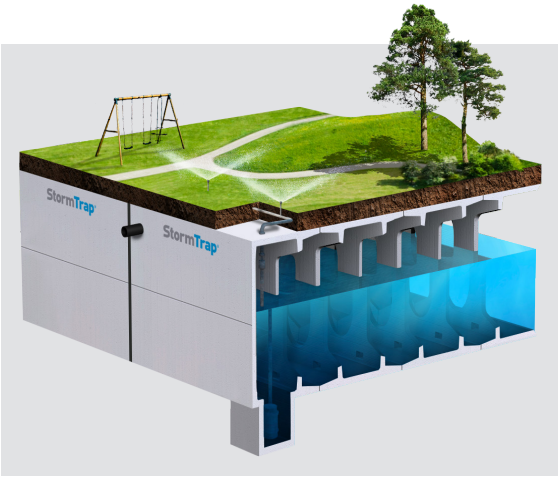
Infiltration

The StormTrap infiltration system provides a large infiltrative surface area that allows water to recharge into the native soil. The system can also help meet low impact development (LID) goals by reducing the volume of stormwater runoff discharged from a site.

Treatment

StormTrap is committed to improving stormwater quality by deploying our range of treatment products that target your pollutant issues with integrated or stand-alone solutions.

- **Filtration:** Sandfilters use various media to remove pollutants such as nutrients and heavy metals
- **Sedimentation:** Remove suspended solids with systems customized for your particle size and flow rate
- **Oil/Water Separation:** Baffle chambers eliminate hydrocarbons from runoff
- **Litter, Trash and Debris Removal:** Disposable mesh nets efficiently capture and remove trash and floatables from Stormwater and CSO discharges



Reuse and Harvesting

StormTrap offers rainwater harvesting applications that collect stormwater on site for use in irrigation or as greywater inside buildings.

These sustainable stormwater management practices adhere to low impact development (LID) principles for runoff reduction and also contribute to LEED (Leadership in Energy and Environmental Design) design credits for Sustainable Sites and Water Efficiency.

SIGNIFICANT ADVANTAGES

Increase Options

Sizes ranging from 1'1" to 15'0"

Designed to exceed HS-20 loading with minimum of 6" cover

Locally manufactured in a NPCA (National Precast Concrete Association) certified facility

Modular design maximizes storage volume while minimizes footprint and cost

Lower Costs

Installed savings compared to traditional systems

Innovative design allows quick and efficient installation

Reduced labor and excavation costs

Meets water quantity requirements without compromising land use

Minimize Maintenance

Total accessible void storage for easy maintenance

Reclaim 100% of original storage volume

High-strength precast concrete provides up to 100 years of service life

Streamline Design and Installation

Structural stamp on each project

Budget estimate for system and installation

Complete set of drawings

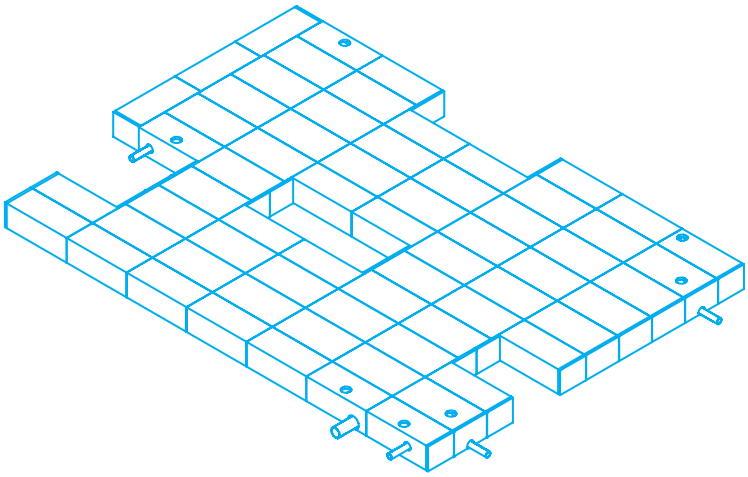
Pre-construction meeting

Representative on site during installation

FLEXIBLE AND ADAPTABLE DESIGNS

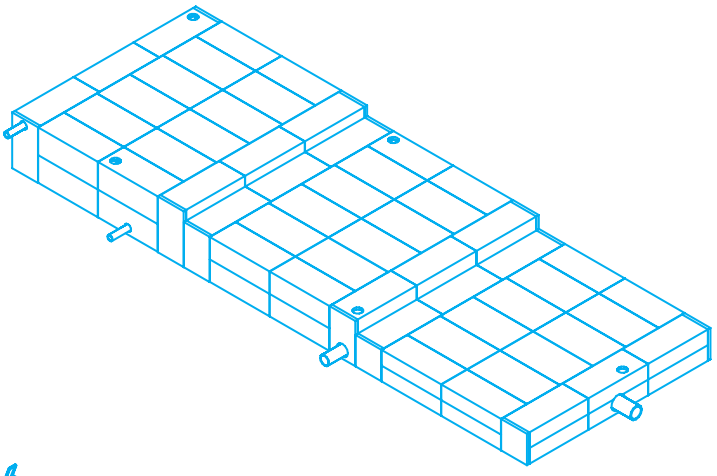
Unique Configurations

Flexible, modular design easily accommodates existing utilities, light pole foundations, trees and other job site constraints



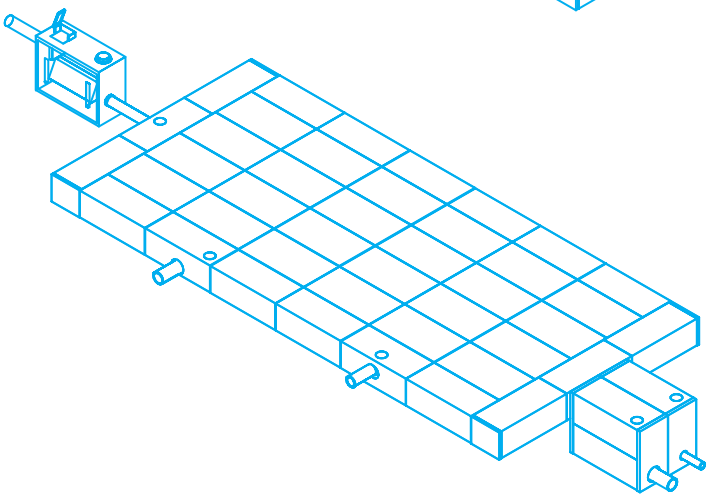
Varying Heights

Made of reinforced, high strength concrete available in sizes ranging from 1'1" to 15'0"



Integrated Applications

Integrated solutions, such as the SiteSaver water quality device or outlet control structures



PHONE 877 867 6872
WEB stormtrap.com

Schedule a lunch and learn, download product specifications, or request a free Design & Budget estimate to get your project started!

ATTACHMENT C

EXHIBITS

LEGEND

- PROPERTY LINE/RIGHT OF WAY
- EX STORM DRAIN
- PROPOSED STORM DRAIN
- CATCH BASIN (N14, S1)
- DIRECTION OF PIPED FLOW
- DIRECTION OF SURFACE FLOW
- BMP DRAINAGE AREA BOUNDARY
- DMA X / X.XX AC — DRAINAGE MANAGEMENT AREA
- MODULAR WETLAND SYSTEM (N4)
- BUILDING

LID BMPs

BIO-7	PROPRIETARY BIOTREATMENT

NON-STRUCTURAL SOURCE CONTROL BMPs

N1	EDUCATION FOR PROPERTY OWNERS, TENANTS AND OCCUPANTS
N2	ACTIVITY RESTRICTIONS
N3	COMMON AREA LANDSCAPE MANAGEMENT
N4	BMP MAINTENANCE
N11	COMMON AREA LITTER CONTROL
N12	EMPLOYEE TRAINING
N14	COMMON AREA CATCH BASIN INSPECTION
N15	STREET SWEEPING PRIVATE STREETS AND PARKING LOTS

STRUCTURAL SOURCE CONTROL BMPs

S1	PROVIDE STORM DRAIN SYSTEM STENCILING AND SIGNAGE
S4	USE EFFICIENT IRRIGATION SYSTEMS & LANDSCAPE DESIGN, WATER CONSERVATION, SMART CONTROLLERS, AND SOURCE CONTROL
S5	PROTECT SLOPES AND CHANNELS AND PROVIDE ENERGY DISSIPATION

DMA ID	BMP ID	GPS Coordinates	Drainage Area (ft^2)	Drainage Area (acres)	Assumed % Imp.	Simple Method DCV (ft^3)	Q_{Design} (cfs)	1.5 x QDesign (cfs)
DMA A1	BMP 1	33.607615, -117.698673	12,029	0.28	90%	**744**	**0.059**	**0.089**
DMA A2	BMP 2	33.607517, -117.699104	21,183	0.49	90%	**1,310**	**0.104**	**0.156**
DMA A3	BMP 3	33.607625, -117.699494	42,786	0.98	90%	**2,647**	**0.211**	**0.316**
DMA A4	BMP 4	33.607755, -117.699737	31,899	0.73	90%	**1,973**	**0.157**	**0.236**
DMA A5			27,292	0.63	10%	**461**	**0.037**	**0.055**

BMP Size/Model	BMP Treatment Capacity
MWS-L-4-8	0.115
MWS-L-4-15	0.175
MWS-L-8-12	0.346
MWS-L-8-12	0.346
-	HSC-2

N

40' 0' 20' 40'

SCALE: 1" = 40'

PREPARED FOR:

BUCHANAN STREET PARTNERS, L.P.
3501 JAMBOREE ROAD, SUITE 4200
NEWPORT BEACH, CA 92660
PHONE: (949) 721-1414

PREPARED BY:

FUSCOE ENGINEERING
15535 Sand Canyon Ave, Suite 100
Irvine, California 92618
949.474.1960 fuscoe.com

CITY OF LAGUNA HILLS
PERMIT #

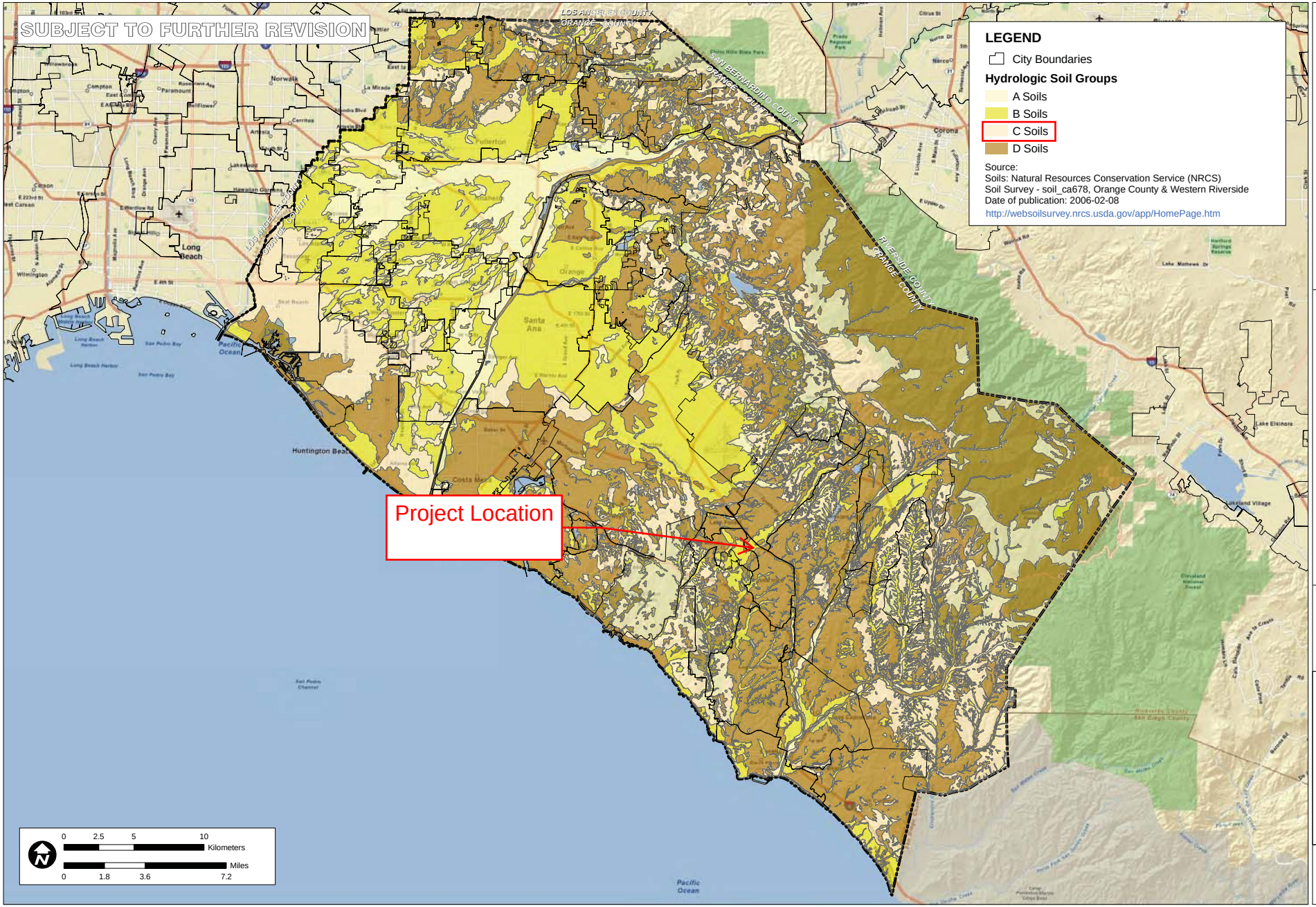
WQMP EXHIBIT

OAKBROOK PLAZA
24422 AVENIDA DE LA CARLOTA

XVI.2. Infiltration Feasibility Constraints Maps

Figure XVI.2: Infiltration Feasibility Constraints Maps

Exhibits start on following page



TITLE
NRCS HYDROLOGIC SOILS GROUPS

JOB
ORANGE COUNTY INFILTRATION STUDY
ORANGE CO. CA

SCALE	1" = 1.6 miles
DESIGNED	TH
DRAWING	TH
CHECKED	BMP
DATE	02/09/11
JOB NO.	9526-E

PACE Advanced Water Engineering

FIGURE
XVI-2a

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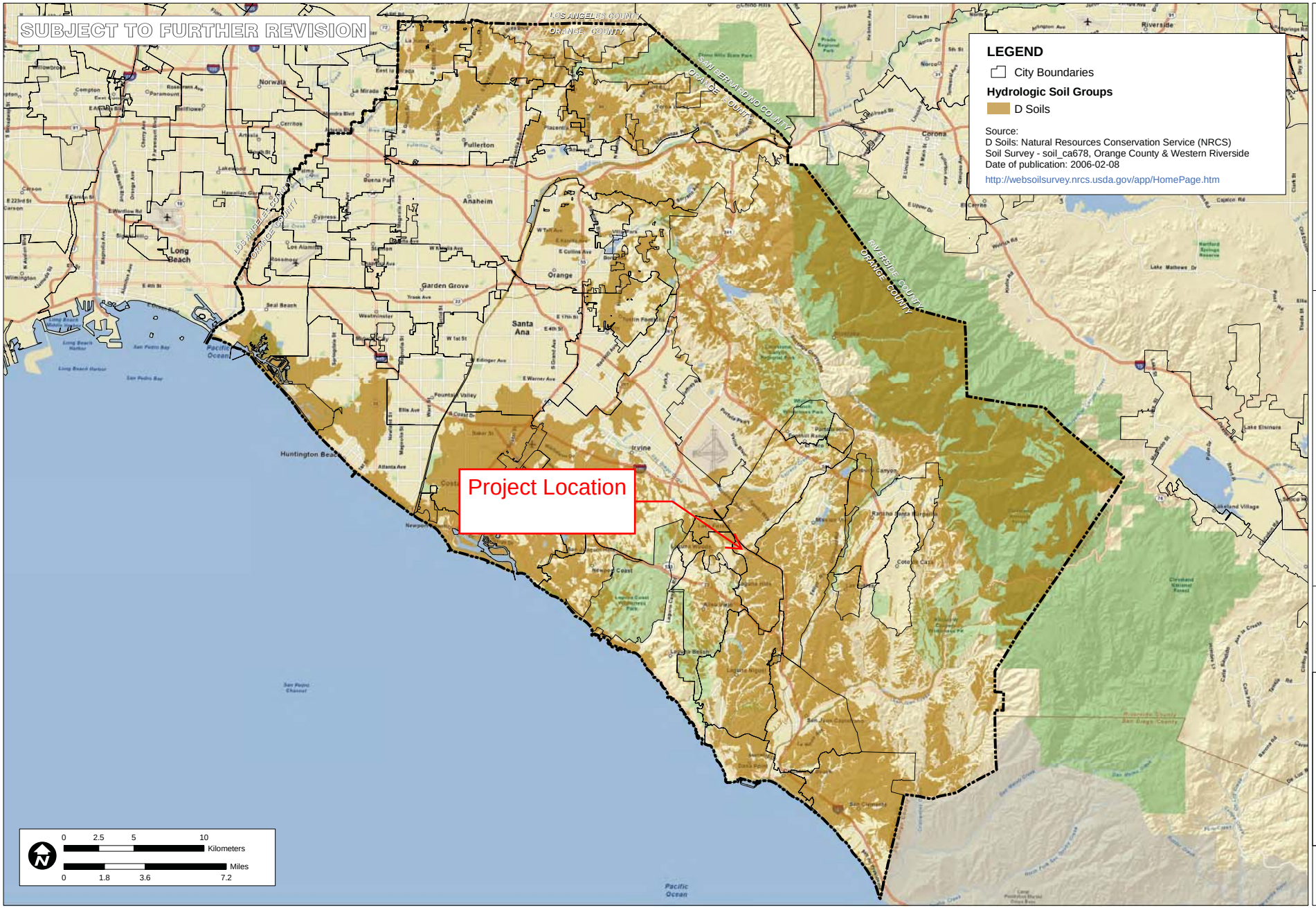

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TITLE
HYDROLOGIC SOIL GROUP
TYPE D NRCS SOIL SURVEY

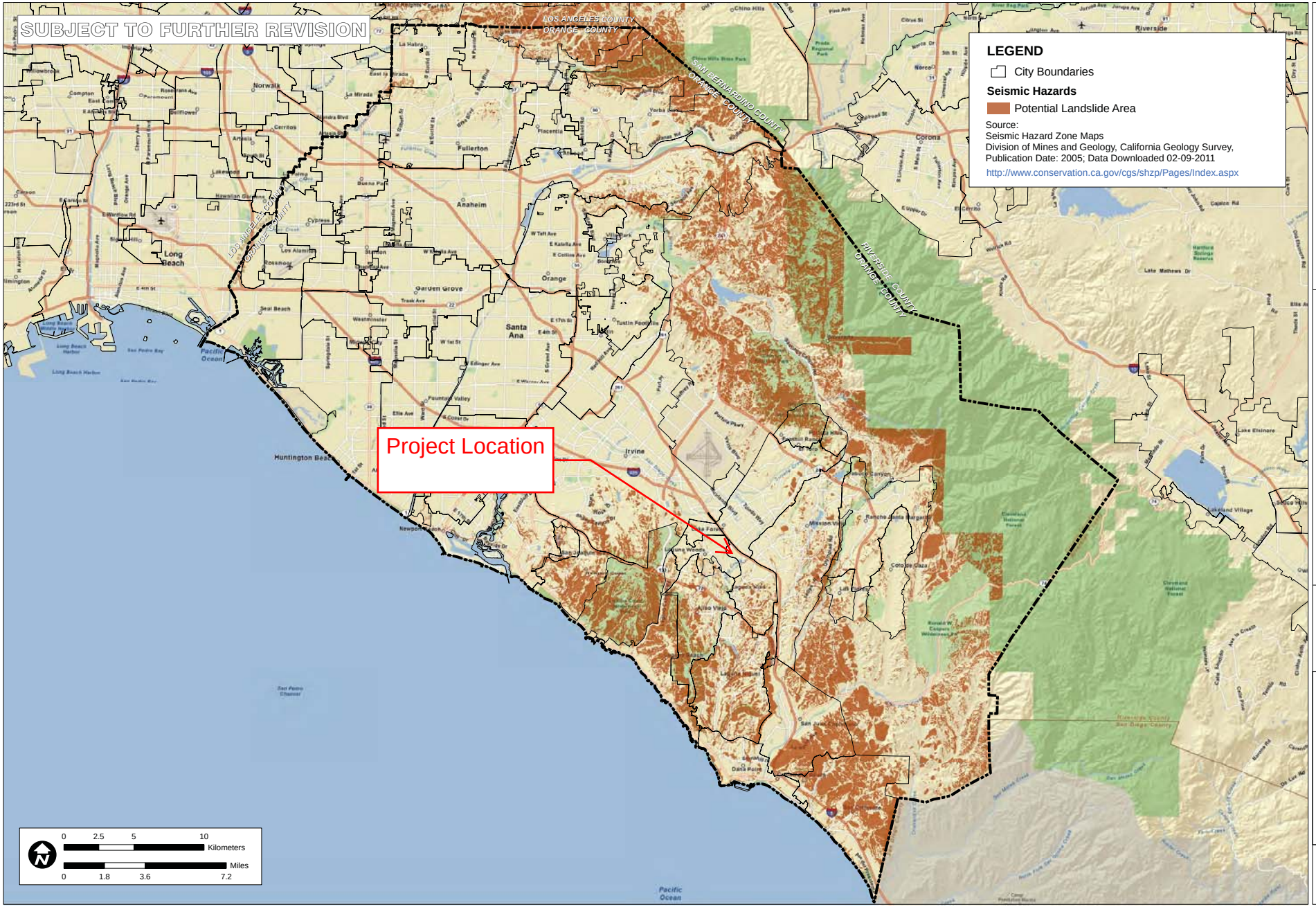
ORANGE COUNTY
INFILTRATION STUDY

JOB
ORANGE CO. CA

SCALE	1" = 1.6 miles
DESIGNED	TH
DRAWING	TH
CHECKED	BMP
DATE	02/09/11
JOB NO.	9526-E

PACE
Advanced Water Engineering

FIGURE
XVI-2b



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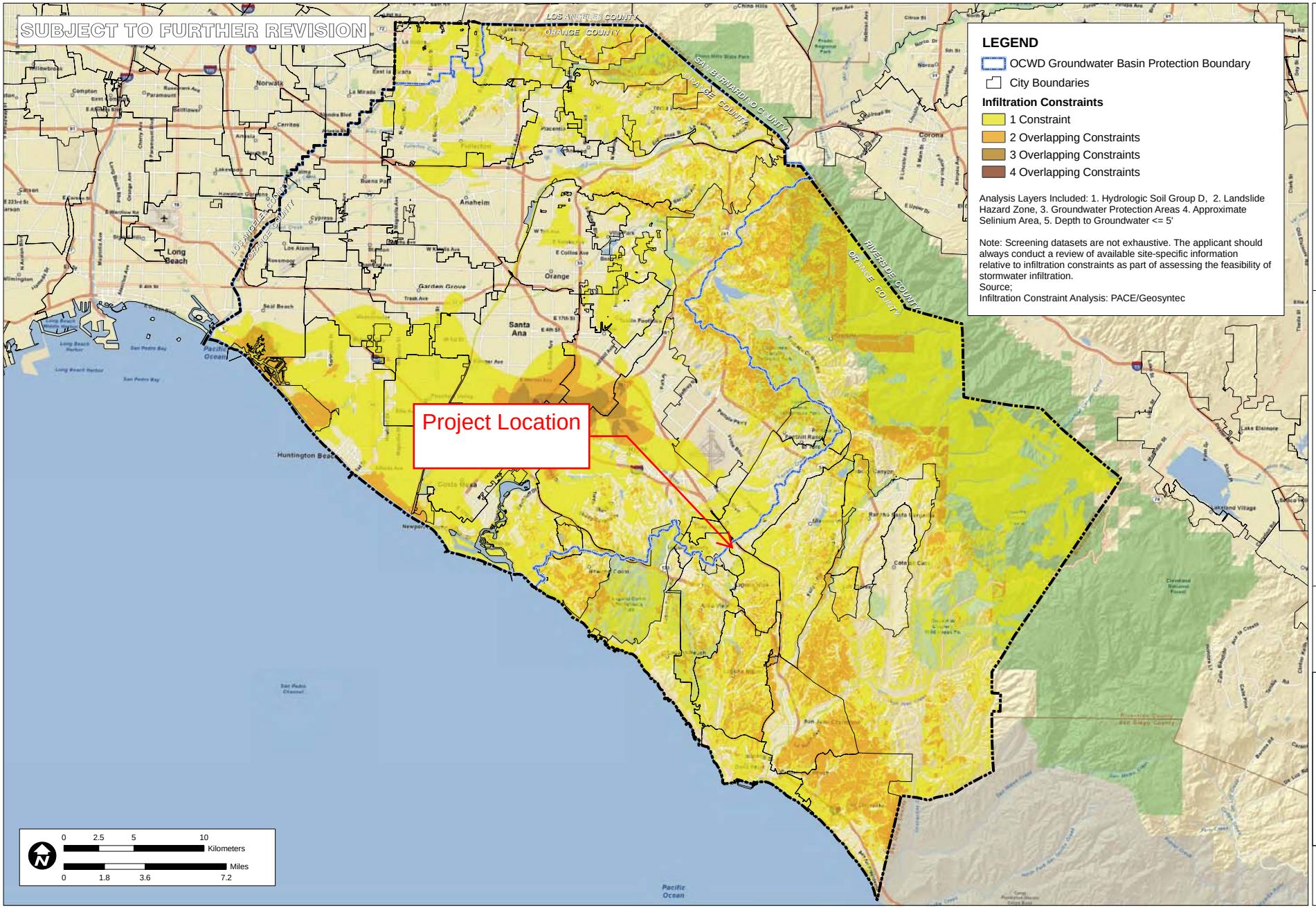
TITLE
HYDROLOGIC SOIL GROUP
TYPE D NRCS SOIL SURVEY

JOB
ORANGE COUNTY
INFILTRATION STUDY
ORANGE CO., CA

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

PACE
Advanced Water Engineering

FIGURE
XVI-2c



TITLE
INFILTRATION ANALYSIS
OVERLAPPING CONSTRAINT
LOCATIONS

JOB
ORANGE COUNTY
INFILTRATION STUDY
CA
ORANGE CO.

SCALE	1" = 1.6 miles
DESIGNED	TH
DRAWING	TH
CHECKED	BMP
DATE	04/23/10
JOB NO.	9526-E

PACE
Advanced Water Engineering

FIGURE
XVI-2g

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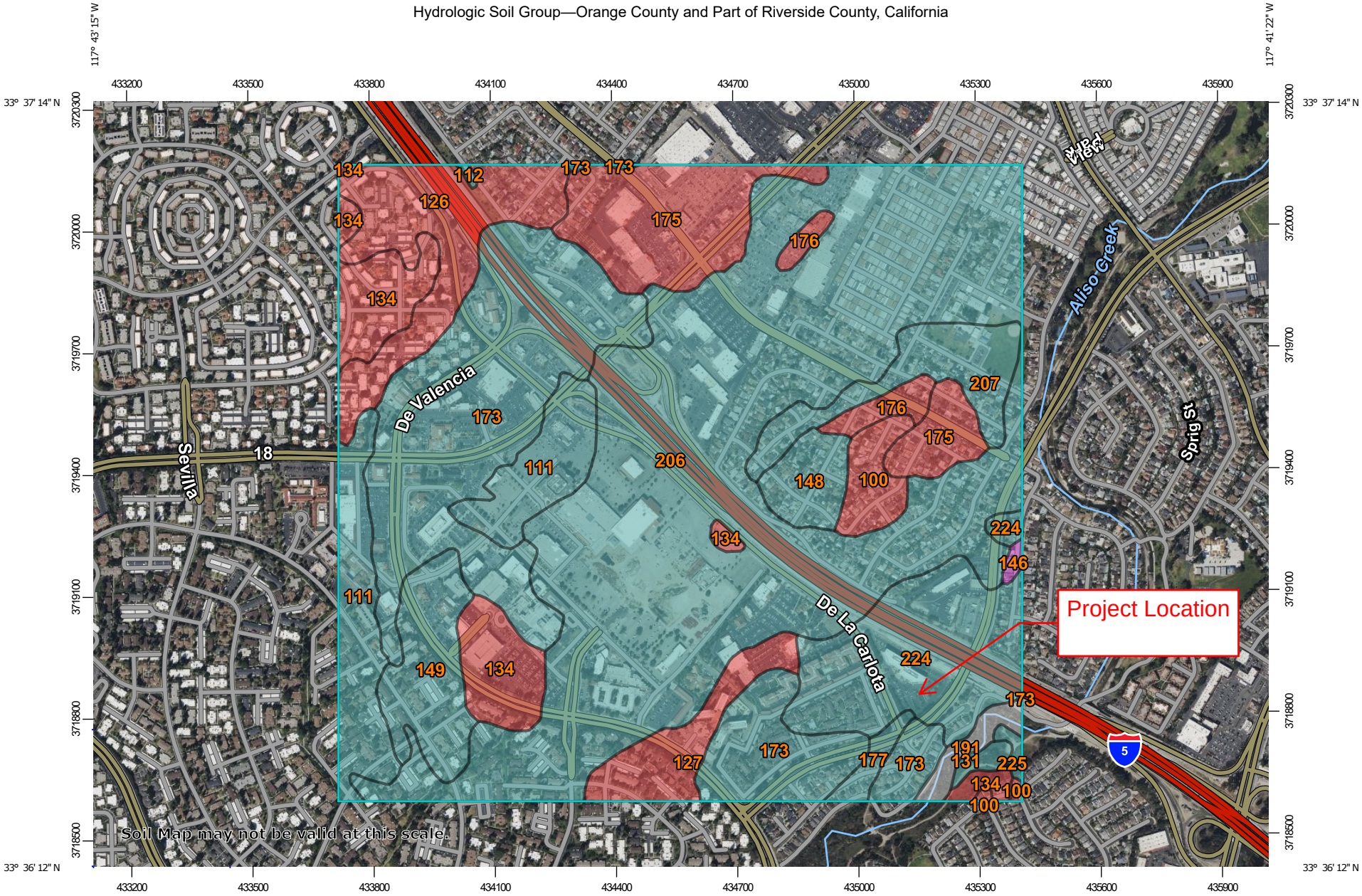


Map Scale: 1:13,300 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 150 300 600 900

Feet: 0 500 1000 2000 3000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Orange County and Part of Riverside County, California
Survey Area Data: Version 16, Sep 6, 2022

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

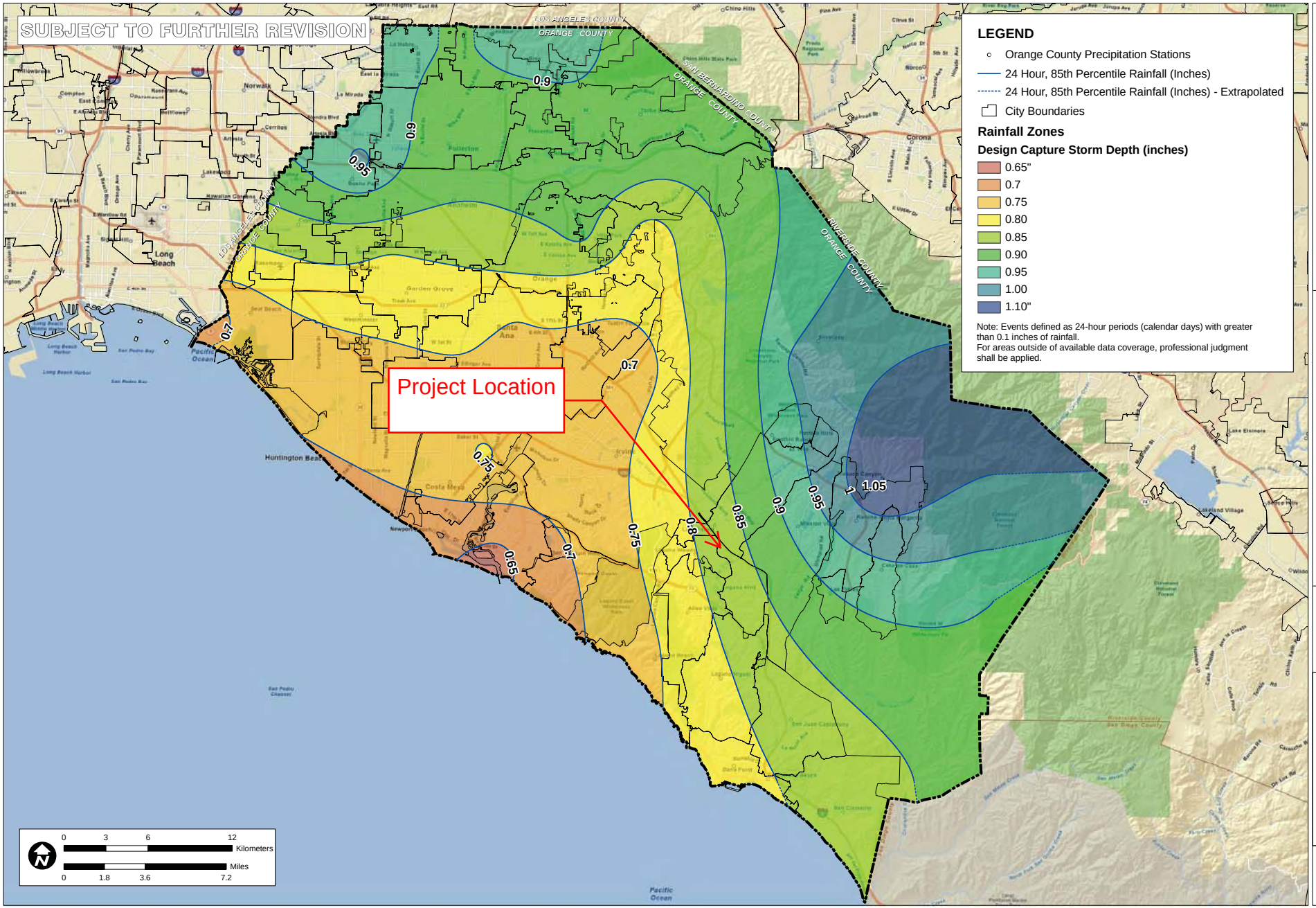
Date(s) aerial images were photographed: Mar 14, 2022—Mar 17, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

XVI.1. Rainfall Zones Map

Figure XVI.1: Orange County Rainfall Zones Map

Exhibit on following page



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TITLE
RAINFALL ZONES

ORANGE COUNTY
TECHNICAL GUIDANCE
DOCUMENT

JOB
ORANGE CO. CA

SCALE	1" = 1.6 miles
DESIGNED	TH
DRAWING	TH
CHECKED	BMP
DATE	04/22/10
JOB NO.	9526-E

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FIGURE
XVI-1

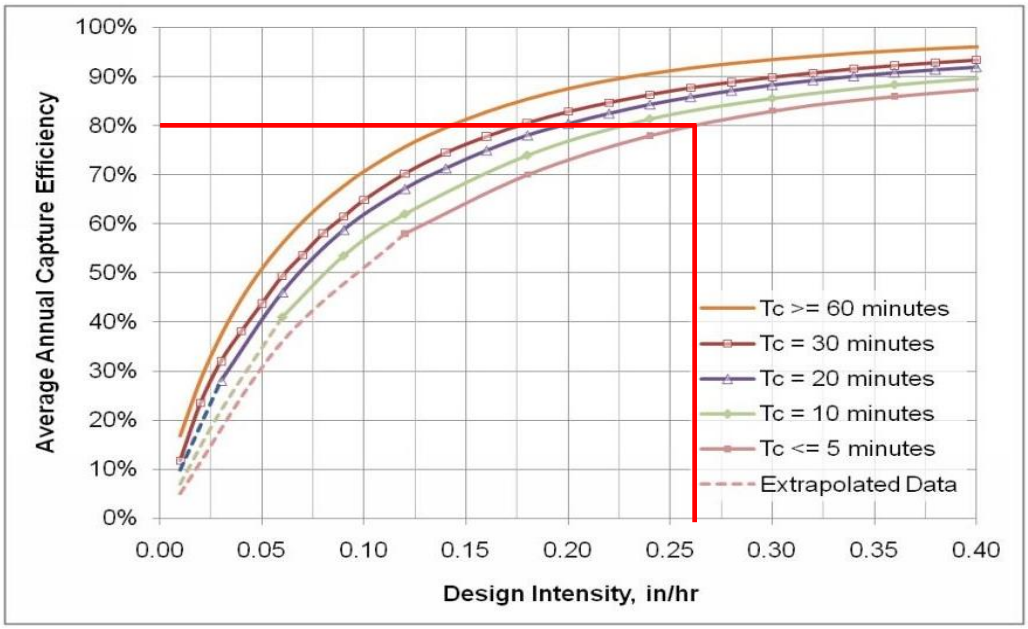
ATTACHMENT D

BMP DESIGN CALCULATIONS & DETAILS

Worksheet D: Capture Efficiency Method for Flow-Based BMPs

			DMA A1	DMA A2	DMA A3	DMA A4	
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	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	0.260	0.260	in/hr
3	Enter the effect depth of provided HSCs upstream, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	0	0	0	0	inches
4	Enter capture efficiency corresponding to d_{HSC}, Y_2 (Worksheet A)	Y_2=	0%	0%	0%	0%	%
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	0	0	in/hr
6	Determine the design intensity that must be provided by BMP, $I_{design} = I_1 - I_2$	I_{design}=	0.260	0.260	0.260	0.260	in/hr
Step 2: Calculate the design flowrate							
1	Enter Project area tributary to BMP(s), *A* (acres)	A=	0.28	0.49	0.98	0.73	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	90%	90%	90%	90%	%
3	Calculate runoff coefficient, $C = (0.75 \times imp) + 0.15$	C=	0.825	0.825	0.825	0.825	
4	Calculate design flowrate, $Q_{design} = (C \times I_{design} \times A)$	Q_{design}=	0.059	0.104	0.211	0.157	cfs
5	1.5 X Q	Qdesign x 150%=	0.089	0.156	0.316	0.236	
Supporting Calculations							
Describe System:							
		Proprietary Biotreatment (BIO-7):					
		Unit Size / Model =	*MWS-L-4-8*	*MWS-L-4-15*	*MWS-L-8-12*	*MWS-L-8-12*	
		Unit Size / Model Treatment Capacity =	*0.115*	*0.175*	*0.346*	*0.346*	cfs
		Number of Units Needed =	*1*	*1*	*1*	*1*	
		Total Bio-treatment Provided =	*0.115*	*0.175*	*0.346*	*0.346*	cfs

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



Worksheet A: Hydrologic Source Control Calculation Form

HSC-2: Impervious Area Dispersion

Drainage area ID	**See Below**		
Total drainage area	0.630	acres	
Total drainage area Impervious Area (IA_{total})	0.063	acres	

HSC ID	HSC Type/ Description/ Reference BMP Fact Sheet	Effect of individual HSC_i per BMP Fact Sheets (XIV.1) (d_{HSCi})[1]	Impervious Area Tributary to HSC_i (IA_i)	$d_i \times IA_i$
DMA A5	HSC-2: Impervious Area Dispersion, Ratio = 9.0	0.90"	0.0627	0.0564
	Box 1:		$\sum d_i \times Iai$ =	0.0564
	Box 2:		IA_{total} =	0.063
	[Box 1]/[Box 2]:		$d_{HSC\ total}$ =	0.900

1 - For HSCs meeting criteria to be considered self-retaining, enter the DCV for the project.

Area	***Impervious Area (SF)***	***Pervious Area (SF)***	***Total Area (SF)***	***Ratio***	***Required Ratio***
DMA A5	*2,729*	*24,563*	*27,292*	*9.0*	*1.8*

Storm Retention Depth (d_{HSC}) for HSC-2: Impervious Area Dispersion

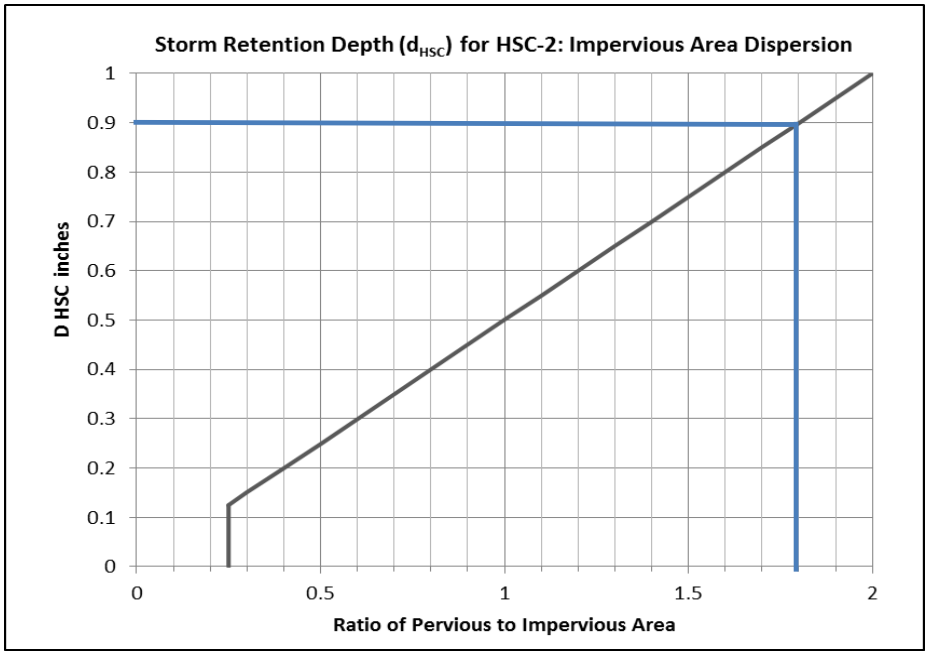


Table III.1: Fraction of Average Long Term Runoff Reduced (Capture Efficiency) by HSCs

Cumulative HSC Adjustment to Design Capture Storm Depth (d_{hsc})	Capture Efficiency Achieved Lowland Regions (<1,000 ft)	Capture Efficiency Achieved Mountainous Regions (>1,000 ft)
<0.05	0	0%
0.05"	8%	7%
0.1"	20%	16%
0.2"	37%	31%
0.3"	48%	42%
0.4"	57%	50%
0.5"	64%	57%
0.6"	70%	63%
0.7"	75%	68%
0.8"	80%	72%
0.9"	80%	76%
1.0"	80%	80%

Worksheet 1: Infiltration Feasibility Categorization

Categorization of Infiltration Feasibility Condition			*Page 1 of 5*
Part 1: Physical Limitations of Infiltration Based on the criteria for physical limitations of infiltration described in Section 4.2.2.2, what level of physical feasibility of infiltration is the maximum that the BMP location will support?			
	Physical Infiltration Feasibility Category	**Mark applicable category**	**Next step**
1	Full Infiltration of the DCV		Continue to Part 2
	Biotreatment with Partial Infiltration		Continue to Part 3
	Biotreatment with No Infiltration	X	Select and Utilize Biotreatment without Infiltration

Provide summary of basis:

The project site is in an area characterized by Hydrologic Soil Group C soils. Based on preliminary correspondence with the geotechnical engineer, perched groundwater is approximately 30 ft bgs at the project site. The following excerpt is from the Geotechnical Report:

"Three infiltration tests were performed in general accordance with the Santa Ana Regional Water Quality Control Board Technical Guidance Document (TGD) Appendices dated March 2011, utilizing the shallow percolation test procedure contained in Section VII.3.8. To comply with the requirements of the TGD, three 8-inch-diameter test holes (P-1 through P-3) were drilled within the areas of proposed infiltration to a depth of 10 feet below existing ground surface using a hollow stem auger drill rig. The infiltration tests were performed at depth intervals of 8 to 10 feet within the drill holes (i.e., the lower 2 feet of each test hole) which corresponds to the infiltration zones of potential infiltration systems. Per Section V11.1.3 of the TGD, the percolation rates measured in the field were converted to infiltration rates by means of the Porchet Method. The infiltration rates were calculated to range from only 0.01 inch/hour to 0.04 inch/hour (See Appendix B). Per the TGD,a factor of safety of at least 2 should then be applied to the infiltration rates for design purposes. This results in infiltration rates well below the required 0.3 inch/hour minimum rate accepted by the TGD. Therefore, **the site is not considered acceptable for infiltration**."

<table>
<tr><th colspan="2">Categorization of Infiltration Feasibility Condition</th><th colspan="2">Page 2 of 5</th></tr>
<tr><td colspan="2">Part 2: Risks Limiting Full Infiltration of the DCV –Would infiltration of the full DCV introduce risks of undesirable consequences that cannot reasonably be mitigated?</td><td>Yes</td><td>No</td></tr>
<tr><td>2</td><td>Would infiltration of the DCV pose significant risk for groundwater related concerns? Use criteria described in Section 4.2.2.3 and results from Worksheet 2 (Appendix C) to describe groundwater-related infiltration feasibility criteria.</td><td></td><td>X</td></tr>
<tr><td colspan="4">Provide basis:

Summarize findings of studies provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</td></tr>
<tr><td>3</td><td>Would infiltration of the full DCV pose significant risk of increasing risk of geotechnical hazards that cannot be mitigated to an acceptable level? Use criteria described in Section 4.2.2.4.</td><td>X</td><td></td></tr>
<tr><td colspan="4">Provide basis:

Based on setback requirements of the BMP location needing to be greater than eight feet from building foundations, and 50ft from slopes steeper than 15%, full infiltration is impractical.

Summarize findings of studies provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</td></tr>
<tr><td>4</td><td>Would infiltration of the DCV cause an increase in groundwater flow or decrease in surface runoff over predevelopment conditions that would cause impairment to downstream beneficial uses, such as change of seasonality of ephemeral washes or increased discharge of contaminated groundwater to surface waters? Use criteria in Section 4.2.2.5</td><td></td><td>X</td></tr>
</table>

Provide basis:

Assumes no groundwater concerns for the project.

Summarize findings of studies provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.

Categorization of Infiltration Feasibility Condition		***Page 3 of 5***	
Part 2 (continued): Risks Limiting Full Infiltration of the DCV –*Would infiltration of the full DCV introduce risks of undesirable consequences that cannot reasonably be mitigated?*		***Yes***	***No***
5	Is there substantial evidence that infiltration of the DCV would **result in a significant increase in I&I to the sanitary sewer** that cannot be sufficiently mitigated?		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 infiltration of the DCV **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.

Part 2 Result	If the answer to all questions 2-6 are “No”, then the DMA is categorized as “Full Infiltration” for the purposes of LID BMP type selection. Describe finding. At the Preliminary/Conceptual WQMP phase, describe the additional design-phase testing required to confirm this determination and identify contingencies for final design. At the Final Project WQMP phase, identify any required construction-phase testing and identify the design contingencies that should result based on construction-phase testing. If the answer to any of questions 2-6 is “Yes” then the site cannot be categorized as “Full Infiltration”. Continue to Part 3: Partial Infiltration Feasibility		
Categorization of Infiltration Feasibility Condition		***Page 4 of 5***	
Part 3: Partial Infiltration Feasibility Criteria –*Would infiltration of any appreciable volume of stormwater result in risks of undesirable consequences that cannot reasonably be mitigated?*		***Yes***	***No***
8	**Would use of biotreatment BMPs with partial infiltration pose significant risk for groundwater related concerns?** Refer to criteria in Section 4.2.2.3 and Worksheet 1 (Appendix C) 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.			
9	**Would the use of biotreatment BMPs with partial infiltration pose elevated risks of geotechnical hazards that cannot be mitigated to an acceptable level**? Refer to Section 4.2.2.4.		X
Provide basis: Summarize findings of studies provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
10	**Would the use of biotreatment BMPs with partial infiltration elevate risks or introduced conflicts related to groundwater balance, inflow and infiltration, or water rights?** Refer to Section 4.2.2.5. Note: this is uncommon and must be supported by site-specific analysis if it is used as a basis to reject biotreatment with partial infiltration.		X

Provide basis: Summarize findings of studies provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.

Categorization of Infiltration Feasibility Condition		***Page 5 of 5***
Part 3 Result	If the answer to all questions 8-10 are “No”, then the DMA is categorized as “Biotreatment with Partial Infiltration” for the purposes of LID BMP type selection. If the answer to any of questions 8-10 is “Yes” then the site is categorized as “Biotreatment with No Infiltration” for the purposes of LID BMP type selection.	Biotreatment with no infiltration.

Harvest & Reuse Irrigation Demand Calculations

Storm Water Design Capture Volume (SQDV)

DMA ID	Impervious Area (ac)	Irrigated Area (ac)	% Imp	Runoff Coefficient	Design Storm Depth (in)	Drainage Area (acres)	DCV (ft^3)	DCV (gal)
DMA A1	0.25	0.03	90%	0.825	0.90	0.28	**744**	**5,564**
DMA A2	0.44	0.05	90%	0.825	0.90	0.49	**1,310**	**9,798**
DMA A3	0.88	0.10	90%	0.825	0.90	0.98	**2,647**	**19,798**
DMA A4	0.66	0.07	90%	0.825	0.90	0.73	**1,973**	**14,758**

Blend of High-Use and Low-Use Landscaping

Drainage Area / Land Use Type	Total Area (ac)	Total Area (sf)	% Imp	Impervious (sf)	Pervious / LA (sf)	Eto	KL	Modified EAWU	EAWU/ Impervious Acre	Drawdown (days)	Drawdown (hours)
DMA A1	0.276	12,029	90%	10,826	1,203	2.75	0.55	30.32	122.01	183.5	4,404
DMA A2	0.486	21,183	90%	19,065	2,118	2.75	0.55	53.40	122.01	183.5	4,404
DMA A3	0.982	42,786	90%	38,507	4,279	2.75	0.55	107.86	122.01	183.6	4,405
DMA A4	0.732	31,899	90%	28,709	3,190	2.75	0.55	80.41	122.01	183.5	4,405

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 CAPT

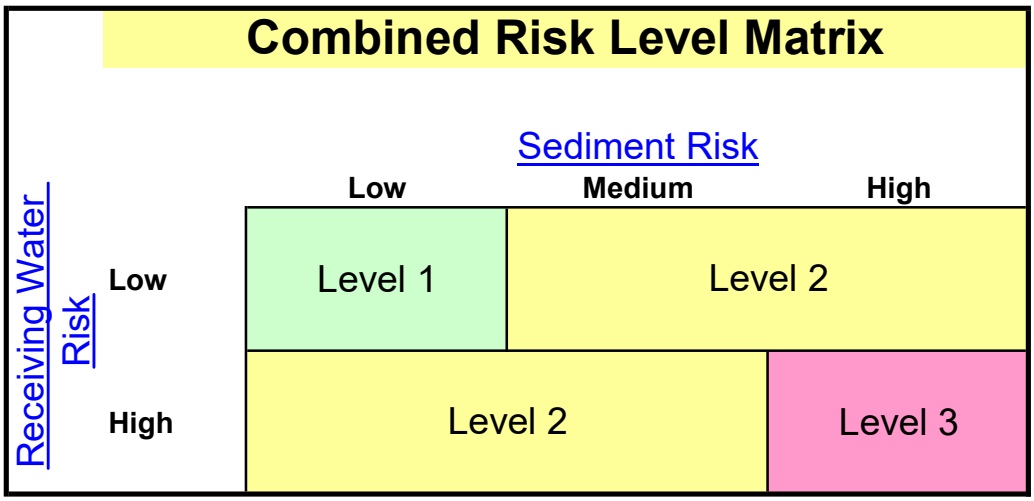
General Landscape Type	Conservation Design: KL = 0.35	
Closest ET Station	Irvine	Santa Ana
Design Capture Storm Depth, inches	Minimum Required Irrigated Area per Tributary Impervious Acre for Potential	
0.60	0.66	0.68
0.65	0.72	0.73
0.70	0.77	0.79
0.75	0.83	0.84
0.80	0.88	0.9
0.85	0.93	0.95
0.90	0.99	1.01
0.95	1.04	1.07
1.00	1.1	1.12

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

	A	B	C
1	**Sediment Risk Factor Worksheet**		**Entry**
2	**A) R Factor**		
3	Analyses of data indicated that when factors other than rainfall are held constant, soil loss is directly proportional to a rainfall factor composed of total storm kinetic energy (E) times the maximum 30-min intensity (I30) (Wischmeier and Smith, 1958). The numerical value of R is the average annual sum of EI30 for storm events during a rainfall record of at least 22 years. "Isoerodent" maps were developed based on R values calculated for more than 1000 locations in the Western U.S. Refer to the link below to determine the R factor for the project site.		
4	http://cfpub.epa.gov/npdes/stormwater/LEW/lewCalculator.cfm		
5	**R Factor Value**		62.48
6	**B) K Factor (weighted average, by area, for all site soils)**		
7	The soil-erodibility factor K represents: (1) susceptibility of soil or surface material to erosion, (2) transportability of the sediment, and (3) the amount and rate of runoff given a particular rainfall input, as measured under a standard condition. Fine-textured soils that are high in clay have low K values (about 0.05 to 0.15) because the particles are resistant to detachment. Coarse-textured soils, such as sandy soils, also have low K values (about 0.05 to 0.2) because of high infiltration resulting in low runoff even though these particles are easily detached. Medium-textured soils, such as a silt loam, have moderate K values (about 0.25 to 0.45) because they are moderately susceptible to particle detachment and they produce runoff at moderate rates. Soils having a high silt content are especially susceptible to erosion and have high K values, which can exceed 0.45 and can be as large as 0.65. Silt-size particles are easily detached and tend to crust, producing high rates and large volumes of runoff. Use Site-specific data must be submitted.		
8	Site-specific K factor guidance		
9	**K Factor Value**		0.32
10	**C) LS Factor (weighted average, by area, for all slopes)**		
11	The effect of topography on erosion is accounted for by the LS factor, which combines the effects of a hillslope-length factor, L, and a hillslope-gradient factor, S. Generally speaking, as hillslope length and/or hillslope gradient increase, soil loss increases. As hillslope length increases, total soil loss and soil loss per unit area increase due to the progressive accumulation of runoff in the downslope direction. As the hillslope gradient increases, the velocity and erosivity of runoff increases. Use the LS table located in separate tab of this spreadsheet to determine LS factors. Estimate the weighted LS for the site prior to construction.		
12	LS Table		
13	**LS Factor Value**		3.97
14			
15	**Watershed Erosion Estimate (=RxKxLS) in tons/acre**		79.374592
16	**Site Sediment Risk Factor**		**High**
17	Low Sediment Risk: < 15 tons/acre		
18	Medium Sediment Risk: >=15 and <75 tons/acre		
19	High Sediment Risk: >= 75 tons/acre		
20			

Receiving Water (RW) Risk Factor Worksheet	Entry	Score
A. Watershed Characteristics	**yes/no**	
A.1. Does the disturbed area discharge (either directly or indirectly) to a **303(d)-listed waterbody impaired by sediment**? For help with impaired waterbodies please check the attached worksheet or visit the link below:	**No**	**Low**
2006 Approved Sediment-impared WBs Worksheet		
http://www.waterboards.ca.gov/water_issues/programs/tmdl/303d_lists2006_epa.shtml		
OR		
A.2. Does the disturbed area discharge to a waterbody with designated beneficial uses of SPAWN & COLD & MIGRATORY?		
http://www.ice.ucdavis.edu/geowbs/asp/wbquse.asp		

Combined Risk Level Matrix



Project Sediment Risk:	**High**
Project RW Risk:	**Low**
Project Combined Risk:	**Level 2**

ATTACHMENT E

HYDROMODIFICATION CONTROL CALCULATIONS

SOHM

PROJECT REPORT

General Model Information

Project Name:	1363-005 Oakbrook Plaza SOHM
Site Name:	Oakbrook Plaza
Site Address:	24422 Avenida De La Carlota
City:	Laguna Hills
Report Date:	2/14/2025
Gage:	Laguna Beach
Data Start:	10/01/1949
Data End:	09/30/2006
Timestep:	15 Minute
Precip Scale:	1.000
Version Date:	2019/04/19

POC Thresholds

Low Flow Threshold for POC1:	10 Percent of the 2 Year
High Flow Threshold for POC1:	10 Year

Landuse Basin Data

Predeveloped Land Use

Basin 1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C,Scrub,VSteep(>15%)	1.555
C,Open Brush,VSteep	1.555
Pervious Total	3.11
Impervious Land Use	acre
Impervious Total	0
Basin Total	3.11

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Basin 1

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C,Urban,Flat(0-5%)	0.248
Pervious Total	0.248

Impervious Land Use	acre
Impervious,Flat(0-5)	2.232
Impervious Total	2.232
Basin Total	2.48

Element Flows To:

Surface	Interflow	Groundwater
Vault 1	Vault 1	

Basin 2

Bypass:	Yes
GroundWater:	No

Pervious Land Use	acre
C,Urban,Flat(0-5%)	0.315
Pervious Total	0.315

Impervious Land Use	acre
Impervious,Flat(0-5)	0.315
Impervious Total	0.315
Basin Total	0.63

Element Flows To:

Surface	Interflow	Groundwater

Routing Elements
Predeveloped Routing

Mitigated Routing

Vault 1

Width: 8 ft.
Length: 233 ft.
Depth: 4.17 ft.

Volume required = 8' x 233' x 4.17'
= 7,773 cubic feet

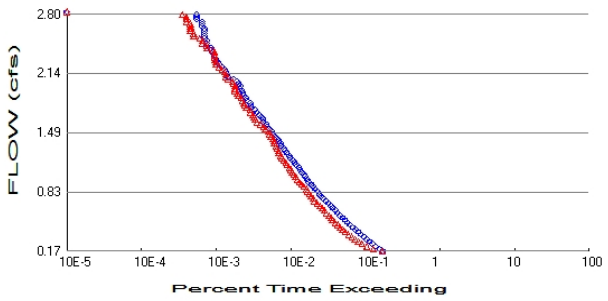
Discharge Structure
Riser Height: 3.17 ft.
Riser Diameter: 54 in.
Notch Type: Rectangular
Notch Width: 0.446 ft.
Notch Height: 0.024 ft.
Orifice 1 Diameter: 1.687 in. Elevation:0 ft.
Element Flows To:
Outlet 1 Outlet 2

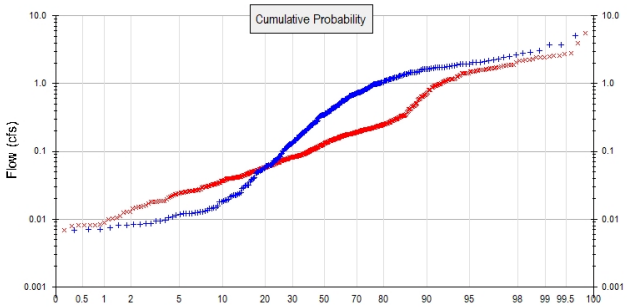
Vault Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.042	0.000	0.000	0.000
0.0463	0.042	0.002	0.016	0.000
0.0927	0.042	0.004	0.023	0.000
0.1390	0.042	0.005	0.028	0.000
0.1853	0.042	0.007	0.033	0.000
0.2317	0.042	0.009	0.037	0.000
0.2780	0.042	0.011	0.040	0.000
0.3243	0.042	0.013	0.044	0.000
0.3707	0.042	0.015	0.047	0.000
0.4170	0.042	0.017	0.049	0.000
0.4633	0.042	0.019	0.052	0.000
0.5097	0.042	0.021	0.055	0.000
0.5560	0.042	0.023	0.057	0.000
0.6023	0.042	0.025	0.059	0.000
0.6487	0.042	0.027	0.062	0.000
0.6950	0.042	0.029	0.064	0.000
0.7413	0.042	0.031	0.066	0.000
0.7877	0.042	0.033	0.068	0.000
0.8340	0.042	0.035	0.070	0.000
0.8803	0.042	0.037	0.072	0.000
0.9267	0.042	0.039	0.074	0.000
0.9730	0.042	0.041	0.076	0.000
1.0193	0.042	0.043	0.078	0.000
1.0657	0.042	0.045	0.079	0.000
1.1120	0.042	0.047	0.081	0.000
1.1583	0.042	0.049	0.083	0.000
1.2047	0.042	0.051	0.084	0.000
1.2510	0.042	0.053	0.086	0.000
1.2973	0.042	0.055	0.088	0.000
1.3437	0.042	0.057	0.089	0.000
1.3900	0.042	0.059	0.091	0.000
1.4363	0.042	0.061	0.092	0.000
1.4827	0.042	0.063	0.094	0.000
1.5290	0.042	0.065	0.095	0.000
1.5753	0.042	0.067	0.096	0.000
1.6217	0.042	0.069	0.098	0.000
1.6680	0.042	0.071	0.099	0.000

1.7143	0.042	0.073	0.101	0.000
1.7607	0.042	0.075	0.102	0.000
1.8070	0.042	0.077	0.103	0.000
1.8533	0.042	0.079	0.105	0.000
1.8997	0.042	0.081	0.106	0.000
1.9460	0.042	0.083	0.107	0.000
1.9923	0.042	0.085	0.109	0.000
2.0387	0.042	0.087	0.110	0.000
2.0850	0.042	0.089	0.111	0.000
2.1313	0.042	0.091	0.112	0.000
2.1777	0.042	0.093	0.114	0.000
2.2240	0.042	0.095	0.115	0.000
2.2703	0.042	0.097	0.116	0.000
2.3167	0.042	0.099	0.117	0.000
2.3630	0.042	0.101	0.118	0.000
2.4093	0.042	0.103	0.119	0.000
2.4557	0.042	0.105	0.121	0.000
2.5020	0.042	0.107	0.122	0.000
2.5483	0.042	0.109	0.123	0.000
2.5947	0.042	0.111	0.124	0.000
2.6410	0.042	0.113	0.125	0.000
2.6873	0.042	0.115	0.126	0.000
2.7337	0.042	0.117	0.127	0.000
2.7800	0.042	0.119	0.128	0.000
2.8263	0.042	0.120	0.129	0.000
2.8727	0.042	0.122	0.130	0.000
2.9190	0.042	0.124	0.131	0.000
2.9653	0.042	0.126	0.133	0.000
3.0117	0.042	0.128	0.134	0.000
3.0580	0.042	0.130	0.135	0.000
3.1043	0.042	0.132	0.136	0.000
3.1507	0.042	0.134	0.137	0.000
3.1970	0.042	0.136	0.355	0.000
3.2433	0.042	0.138	1.093	0.000
3.2897	0.042	0.140	2.121	0.000
3.3360	0.042	0.142	3.373	0.000
3.3823	0.042	0.144	4.814	0.000
3.4287	0.042	0.146	6.419	0.000
3.4750	0.042	0.148	8.173	0.000
3.5213	0.042	0.150	10.06	0.000
3.5677	0.042	0.152	12.07	0.000
3.6140	0.042	0.154	14.19	0.000
3.6603	0.042	0.156	16.42	0.000
3.7067	0.042	0.158	18.74	0.000
3.7530	0.042	0.160	21.14	0.000
3.7993	0.042	0.162	23.62	0.000
3.8457	0.042	0.164	26.17	0.000
3.8920	0.042	0.166	28.77	0.000
3.9383	0.042	0.168	31.43	0.000
3.9847	0.042	0.170	34.12	0.000
4.0310	0.042	0.172	36.84	0.000
4.0773	0.042	0.174	39.58	0.000
4.1237	0.042	0.176	42.34	0.000
4.1700	0.042	0.178	45.09	0.000
4.2163	0.042	0.180	47.84	0.000
4.2627	0.000	0.000	50.57	0.000

Analysis Results
POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 3.11
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0.563
Total Impervious Area: 2.547

Flow Frequency Method: Cunnane

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	1.730202
5 year	2.209809
10 year	2.802171
25 year	3.680291

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	1.638724
5 year	2.241871
10 year	2.547796
25 year	3.090441

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.1730	3438	3366	97	Pass
0.1996	3090	2542	82	Pass
0.2261	2760	2081	75	Pass
0.2527	2494	1812	72	Pass
0.2792	2270	1615	71	Pass
0.3058	2069	1450	70	Pass
0.3324	1917	1320	68	Pass
0.3589	1747	1195	68	Pass
0.3855	1603	1074	66	Pass
0.4120	1468	989	67	Pass
0.4386	1350	916	67	Pass
0.4651	1242	853	68	Pass
0.4917	1150	790	68	Pass
0.5183	1057	726	68	Pass
0.5448	985	692	70	Pass
0.5714	918	647	70	Pass
0.5979	851	595	69	Pass
0.6245	791	561	70	Pass
0.6510	728	525	72	Pass
0.6776	684	493	72	Pass
0.7042	636	455	71	Pass
0.7307	593	418	70	Pass
0.7573	542	399	73	Pass
0.7838	506	371	73	Pass
0.8104	478	355	74	Pass
0.8369	453	341	75	Pass
0.8635	421	324	76	Pass
0.8901	392	298	76	Pass
0.9166	376	279	74	Pass
0.9432	348	259	74	Pass
0.9697	337	242	71	Pass
0.9963	314	232	73	Pass
1.0228	298	219	73	Pass
1.0494	283	210	74	Pass
1.0760	266	200	75	Pass
1.1025	257	190	73	Pass
1.1291	237	179	75	Pass
1.1556	224	173	77	Pass
1.1822	211	161	76	Pass
1.2087	196	151	77	Pass
1.2353	190	146	76	Pass
1.2619	176	139	78	Pass
1.2884	168	136	80	Pass
1.3150	161	131	81	Pass
1.3415	149	126	84	Pass
1.3681	145	120	82	Pass
1.3946	138	119	86	Pass
1.4212	130	116	89	Pass
1.4478	123	109	88	Pass
1.4743	116	104	89	Pass
1.5009	110	101	91	Pass
1.5274	102	91	89	Pass
1.5540	96	86	89	Pass

1.5805	95	79	83	Pass
1.6071	87	70	80	Pass
1.6337	85	67	78	Pass
1.6602	81	65	80	Pass
1.6868	76	62	81	Pass
1.7133	71	58	81	Pass
1.7399	66	57	86	Pass
1.7664	60	51	85	Pass
1.7930	58	48	82	Pass
1.8196	57	47	82	Pass
1.8461	52	45	86	Pass
1.8727	50	43	86	Pass
1.8992	47	40	85	Pass
1.9258	46	38	82	Pass
1.9523	44	36	81	Pass
1.9789	42	36	85	Pass
2.0055	42	36	85	Pass
2.0320	40	34	85	Pass
2.0586	38	33	86	Pass
2.0851	34	29	85	Pass
2.1117	29	27	93	Pass
2.1382	28	27	96	Pass
2.1648	27	26	96	Pass
2.1914	26	24	92	Pass
2.2179	24	22	91	Pass
2.2445	22	20	90	Pass
2.2710	21	20	95	Pass
2.2976	20	19	95	Pass
2.3241	19	19	100	Pass
2.3507	19	19	100	Pass
2.3773	18	19	105	Pass
2.4038	17	18	105	Pass
2.4304	17	15	88	Pass
2.4569	15	15	100	Pass
2.4835	15	13	86	Pass
2.5100	15	13	86	Pass
2.5366	14	12	85	Pass
2.5632	14	10	71	Pass
2.5897	14	10	71	Pass
2.6163	14	9	64	Pass
2.6428	14	9	64	Pass
2.6694	13	9	69	Pass
2.6959	13	9	69	Pass
2.7225	13	8	61	Pass
2.7491	11	8	72	Pass
2.7756	11	8	72	Pass
2.8022	11	7	63	Pass

Water Quality

Model Default Modifications

Total of 0 changes have been made.

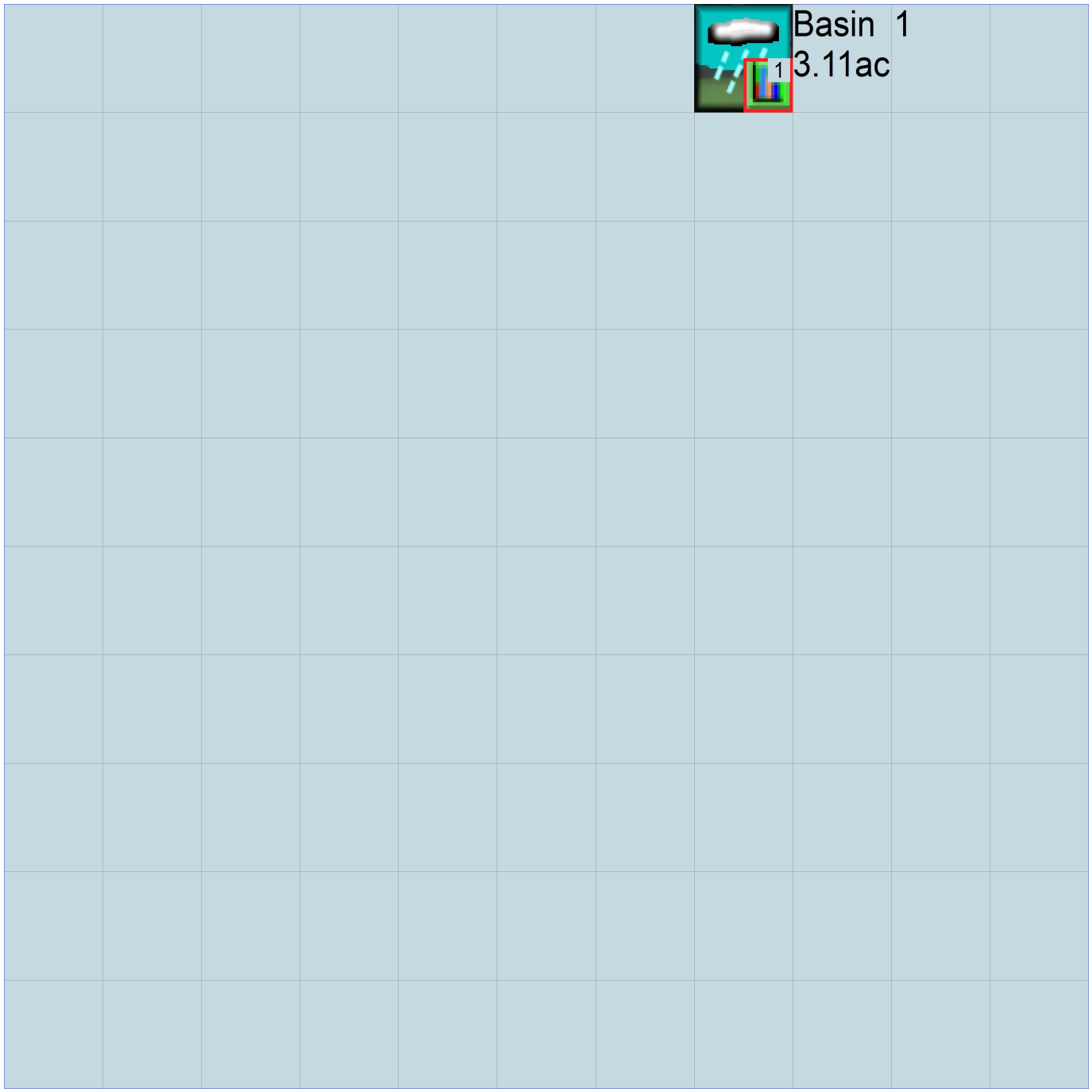
PERLND Changes

No PERLND changes have been made.

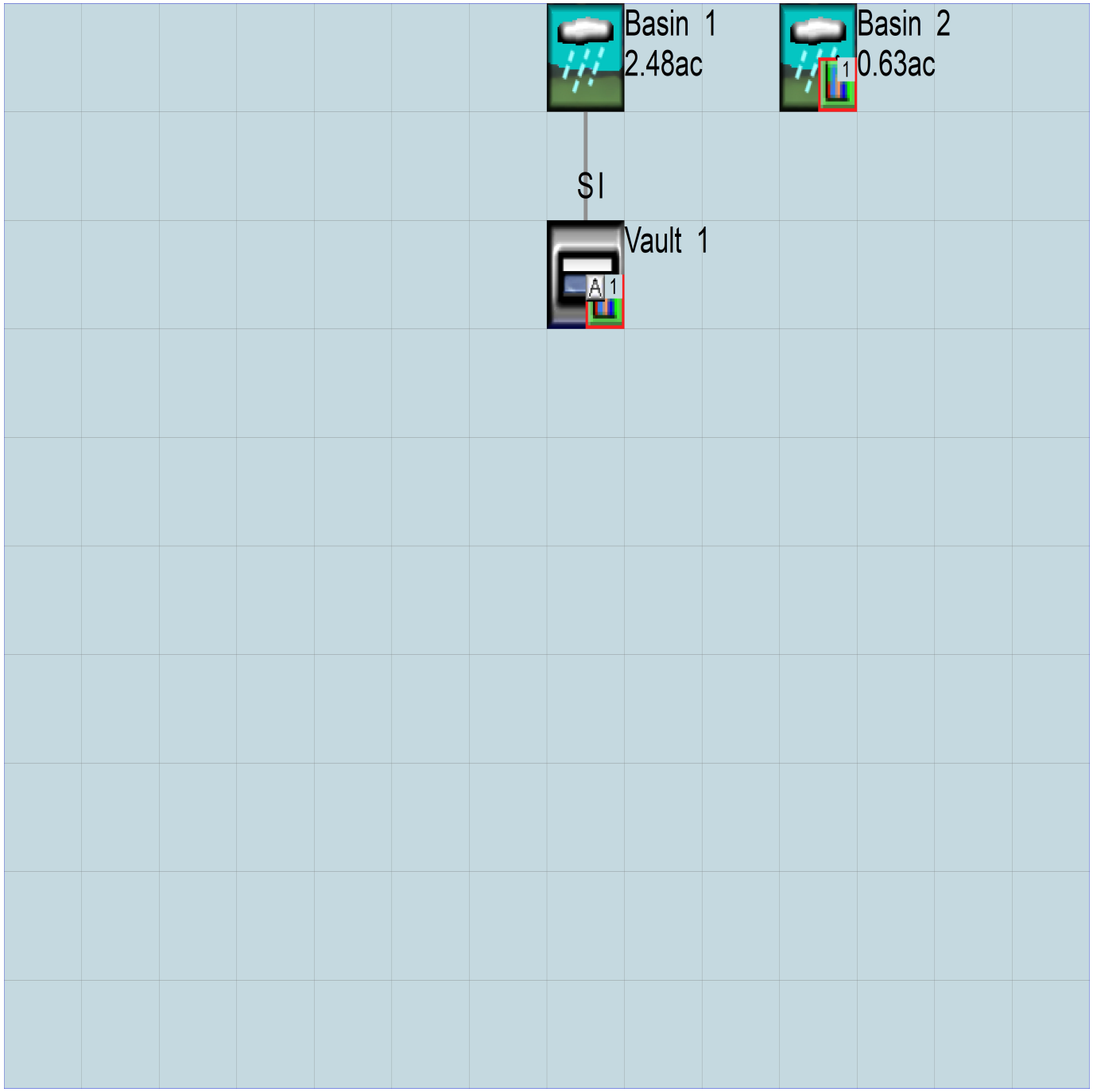
IMPLND Changes

No IMPLND changes have been made.

Appendix
Predeveloped Schematic



Mitigated Schematic



Predeveloped UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1949 10 01        END    2006 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                    UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM         26   1363-005 Oakbrook Plaza SOHM.wdm
MESSU       25   Pre1363-005 Oakbrook Plaza SOHM.MES
            27   Pre1363-005 Oakbrook Plaza SOHM.L61
            28   Pre1363-005 Oakbrook Plaza SOHM.L62
            30   POC1363-005 Oakbrook Plaza SOHM1.dat
END FILES

OPN SEQUENCE
    INGRP               INDELT 00:15
      PERLND      28
      PERLND      32
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Basin  1                   MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                       in  out           ***
   28     C,Scrub,VSteep(>15%)    1    1    1    1   27    0
   32     C,Open Brush,VSteep     1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   28         0    0    1    0    0    0    0    0    0    0    0    0
   32         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags **************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
```

```
   28         0    0    4    0    0    0    0    0    0    0    0    0    1    9
   32         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
   28         0    0    0    1    0    0    0    0    1    0    0
   32         0    0    0    1    0    0    0    0    1    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
   28              0       3.9     0.015       250       0.2       0.8     0.955
   32              0         4     0.015       250       0.2       0.8     0.955
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   28             40        35         3         2         0      0.03         0
   32             40        35         3         2         0      0.03         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   28              0       0.3       0.3       0.4       0.3         0
   32              0      0.25      0.25       0.4       0.3         0
  END PWAT-PARM4
  MON-LZETPARM
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   28       0.5  0.5  0.5  0.6 0.65 0.65 0.65 0.65 0.65 0.65 0.55  0.5
   32       0.4  0.4  0.4  0.5 0.55 0.55 0.55 0.55 0.55 0.55 0.45  0.4
  END MON-LZETPARM
  MON-INTERCEP
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   28      0.13 0.13 0.13 0.13 0.13 0.13 0.13 0.13 0.13 0.13 0.13    0
   32      0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12    0
  END MON-INTERCEP

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
               ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS       AGWS      GWVS
   28              0         0      0.03         0      0.78       0.3      0.01
   32              0         0     0.025         0       0.8       0.3      0.01
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                     in  out           ***
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
  END PRINT-INFO
```

```
  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin  1***
PERLND  28                       1.555     COPY   501     12
PERLND  28                       1.555     COPY   501     13
PERLND  32                       1.555     COPY   501     12
PERLND  32                       1.555     COPY   501     13

******Routing******
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   48.4        DISPLY   1     INPUT  TIMSER 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<----------------><---> User T-series  Engl Metr LKFG             ***
                                      in  out                               ***
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ****************** PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                  ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
            FG FG FG FG  possible  exit  *** possible  exit      possible  exit
             *  *  *  *    *  *  *  *  *       *  *  *  *  *         ***
  END HYDR-PARM1
```

```
  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->       ***
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                         ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit       for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1              PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1              IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    1              PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    1              IMPLND   1 999 EXTNL  PETINP

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    501 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>      <-Grp> <-Member->***
<Name>            <Name> # #<-factor->     <Name>               <Name> # #***
  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY          INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY          INPUT  MEAN
  END MASS-LINK   13


END MASS-LINK

END RUN
```

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1949 10 01        END    2006 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                   UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM         26   1363-005 Oakbrook Plaza SOHM.wdm
MESSU       25   Mit1363-005 Oakbrook Plaza SOHM.MES
            27   Mit1363-005 Oakbrook Plaza SOHM.L61
            28   Mit1363-005 Oakbrook Plaza SOHM.L62
            30   POC1363-005 Oakbrook Plaza SOHM1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      57
      IMPLND       1
      RCHRES       1
      COPY         1
      COPY       501
      COPY       601
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Vault  1                   MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  601         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                          in  out           ***
   57     C,Urban,Flat(0-5%)      1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   57         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
```

```
    <PLS > ***************** Print-flags ***************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
   57         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
   57         0    0    0    1    0    0    0    0    1    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
   57              0       4.6     0.045       400      0.05       0.8     0.955
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   57             40        35         3         2         0      0.03         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   57              0       0.7      0.25         3       0.7         0
  END PWAT-PARM4
  MON-LZETPARM
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   57       0.5  0.5  0.5  0.6 0.65 0.65 0.65 0.65 0.65 0.65 0.55  0.5
  END MON-LZETPARM
  MON-INTERCEP
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   57      0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12    0
  END MON-INTERCEP

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
               ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
   57              0         0      0.07         0      0.92       0.3      0.01
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                     in  out           ***
    1     Impervious,Flat(0-5)    1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************* Active Sections ******************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
    1         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
    1         0    0    4    0    0    0    1    9
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
```

```
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
    1         0    0    0    0    0
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    1            100      0.05       0.1       0.1
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    1              0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    1              0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin  1***
PERLND  57                       0.248     RCHRES   1      2
PERLND  57                       0.248     RCHRES   1      3
IMPLND   1                       2.232     RCHRES   1      5
Basin  2***
PERLND  57                       0.315     COPY   501     12
PERLND  57                       0.315     COPY   601     12
PERLND  57                       0.315     COPY   501     13
PERLND  57                       0.315     COPY   601     13
IMPLND   1                       0.315     COPY   501     15
IMPLND   1                       0.315     COPY   601     15

******Routing******
PERLND  57                       0.248     COPY     1     12
IMPLND   1                       2.232     COPY     1     15
PERLND  57                       0.248     COPY     1     13
RCHRES   1                           1     COPY   501     16
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   48.4        DISPLY   1     INPUT  TIMSER 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<----------------><---> User T-series  Engl Metr LKFG             ***
                                        in  out                             ***
    1     Vault  1               1    1    1    1   28    0    1
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
    1         1    0    0    0    0    0    0    0    0    0
```

```
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ******************* PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
    1         4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                    ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
           FG FG FG FG  possible  exit  *** possible  exit      possible  exit
            *  *  *  *    *  *  *  *  *       *  *  *  *  *        ***
    1       0  1  0  0    4  0  0  0  0       0  0  0  0  0       2  2  2  2  2
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->       ***
    1               1      0.04       0.0       0.0       0.5       0.0
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                       ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
         *** ac-ft     for each possible exit        for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
    1           0         4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
  FTABLE      1
   92    4
     Depth      Area    Volume  Outflow1 Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.042792  0.000000  0.000000
  0.046333  0.042792  0.001983  0.016624
  0.092667  0.042792  0.003965  0.023510
  0.139000  0.042792  0.005948  0.028794
  0.185333  0.042792  0.007931  0.033248
  0.231667  0.042792  0.009913  0.037172
  0.278000  0.042792  0.011896  0.040720
  0.324333  0.042792  0.013879  0.043983
  0.370667  0.042792  0.015861  0.047020
  0.417000  0.042792  0.017844  0.049872
  0.463333  0.042792  0.019827  0.052570
  0.509667  0.042792  0.021809  0.055136
  0.556000  0.042792  0.023792  0.057587
  0.602333  0.042792  0.025775  0.059939
  0.648667  0.042792  0.027757  0.062201
  0.695000  0.042792  0.029740  0.064384
  0.741333  0.042792  0.031723  0.066496
  0.787667  0.042792  0.033705  0.068543
  0.834000  0.042792  0.035688  0.070530
  0.880333  0.042792  0.037671  0.072462
  0.926667  0.042792  0.039654  0.074345
  0.973000  0.042792  0.041636  0.076181
  1.019333  0.042792  0.043619  0.077973
  1.065667  0.042792  0.045602  0.079726
  1.112000  0.042792  0.047584  0.081441
  1.158333  0.042792  0.049567  0.083120
  1.204667  0.042792  0.051550  0.084766
  1.251000  0.042792  0.053532  0.086381
  1.297333  0.042792  0.055515  0.087966
  1.343667  0.042792  0.057498  0.089523
  1.390000  0.042792  0.059480  0.091053
  1.436333  0.042792  0.061463  0.092559
  1.482667  0.042792  0.063446  0.094040
```

```
  1.529000  0.042792  0.065428  0.095498
  1.575333  0.042792  0.067411  0.096934
  1.621667  0.042792  0.069394  0.098349
  1.668000  0.042792  0.071376  0.099744
  1.714333  0.042792  0.073359  0.101120
  1.760667  0.042792  0.075342  0.102477
  1.807000  0.042792  0.077324  0.103817
  1.853333  0.042792  0.079307  0.105139
  1.899667  0.042792  0.081290  0.106446
  1.946000  0.042792  0.083272  0.107736
  1.992333  0.042792  0.085255  0.109011
  2.038667  0.042792  0.087238  0.110271
  2.085000  0.042792  0.089220  0.111517
  2.131333  0.042792  0.091203  0.112749
  2.177667  0.042792  0.093186  0.113968
  2.224000  0.042792  0.095168  0.115174
  2.270333  0.042792  0.097151  0.116368
  2.316667  0.042792  0.099134  0.117549
  2.363000  0.042792  0.101116  0.118719
  2.409333  0.042792  0.103099  0.119877
  2.455667  0.042792  0.105082  0.121025
  2.502000  0.042792  0.107064  0.122161
  2.548333  0.042792  0.109047  0.123287
  2.594667  0.042792  0.111030  0.124403
  2.641000  0.042792  0.113012  0.125508
  2.687333  0.042792  0.114995  0.126605
  2.733667  0.042792  0.116978  0.127691
  2.780000  0.042792  0.118961  0.128769
  2.826333  0.042792  0.120943  0.129838
  2.872667  0.042792  0.122926  0.130898
  2.919000  0.042792  0.124909  0.131949
  2.965333  0.042792  0.126891  0.132992
  3.011667  0.042792  0.128874  0.134027
  3.058000  0.042792  0.130857  0.135054
  3.104333  0.042792  0.132839  0.136073
  3.150667  0.042792  0.134822  0.137555
  3.197000  0.042792  0.136805  0.355584
  3.243333  0.042792  0.138787  1.092968
  3.289667  0.042792  0.140770  2.121636
  3.336000  0.042792  0.142753  3.373761
  3.382333  0.042792  0.144735  4.814133
  3.428667  0.042792  0.146718  6.419724
  3.475000  0.042792  0.148701  8.173513
  3.521333  0.042792  0.150683  10.06184
  3.567667  0.042792  0.152666  12.07304
  3.614000  0.042792  0.154649  14.19669
  3.660333  0.042792  0.156631  16.42308
  3.706667  0.042792  0.158614  18.74296
  3.753000  0.042792  0.160597  21.14731
  3.799333  0.042792  0.162579  23.62719
  3.845667  0.042792  0.164562  26.17366
  3.892000  0.042792  0.166545  28.77775
  3.938333  0.042792  0.168527  31.43037
  3.984667  0.042792  0.170510  34.12236
  4.031000  0.042792  0.172493  36.84444
  4.077333  0.042792  0.174475  39.58723
  4.123667  0.042792  0.176458  42.34133
  4.170000  0.042792  0.178441  45.09725
  4.216333  0.042792  0.180423  47.84555
  END FTABLE  1
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1              PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1              IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    1              PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    1              IMPLND   1 999 EXTNL  PETINP
WDM     22 IRRG     ENGL    0.7       SAME PERLND  57     EXTNL  SURLI
```

```
END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #       <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
COPY     1 OUTPUT MEAN   1 1     48.4      WDM    701 FLOW     ENGL      REPL
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    801 FLOW     ENGL      REPL
COPY   601 OUTPUT MEAN   1 1     48.4      WDM    901 FLOW     ENGL      REPL
RCHRES   1 HYDR   RO     1 1        1      WDM   1000 FLOW     ENGL      REPL
RCHRES   1 HYDR   STAGE  1 1        1      WDM   1001 STAG     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>             <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK        2
PERLND     PWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    2

  MASS-LINK        3
PERLND     PWATER IFWO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    3

  MASS-LINK        5
IMPLND     IWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    5

  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13

  MASS-LINK       15
IMPLND     IWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   15

  MASS-LINK       16
RCHRES     ROFLOW                          COPY           INPUT  MEAN
  END MASS-LINK   16


END MASS-LINK

END RUN
```

Predeveloped HSPF Message File

Mitigated HSPF Message File

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ATTACHMENT F

CONDITIONS OF APPROVAL

ATTACHMENT G

CITY CORRESPONDENCE

ATTACHMENT G

INFILTRATION TEST RESULTS

December 23, 2024

Mr. Matthew Haugen
Buchanan Street Partners
3501 Jamboree Road, Suite 4200
Newport Beach, CA 92660

GMU Project: 23-008-00

Subject: Infiltration Testing, Proposed Multi-Story Residential Development, 24422 Avenida De La Carlota, Laguna Hills, California.

References: See Attached List.

Dear Mr. Haugen:

At the request of the project civil engineer, we performed infiltration testing to determine the feasibility of the infiltration of storm water into the subsurface soils beneath the subject site. The following scope of work was performed as part of the preparation of this infiltration testing report:

SCOPE OF WORK

The scope of our services was as follows:

- We visited the site to mark the three locations of our infiltration tests (borings). As required by law, we notified Underground Service Alert (USA) of the proposed boring locations prior to drilling.
- We drilled three (3) 8-inch-diameter drill holes within the areas of proposed infiltration to the same depth as the proposed system (10 feet).
- On the same day, we presoaked each of the three borings with clear water for at least 4 hours.
- On the following day, we performed infiltration testing within each boring and then backfilled the borings and capped them with asphalt patch.
- We calculated the infiltration rates at each boring location.
- We prepare this letter that shows the locations of our borings, presents the results of our infiltration testing, and provides a summary of the infiltration rates for submittal to the governing agency.

SITE LOCATION AND DESCRIPTION

The subject site currently consists of a paved parking lot that is located north of the intersection of Avenida De La Carlota and Los Alisos Boulevard within the City of Laguna Hills, California. The general location of the subject site with respect to nearby roadways is shown on Plate 1 – Location Map.

The site has been previously graded into a relatively flat parking lot that slopes towards the west at a sheet flow gradient of approximately 2 percent. The parking lot is bordered on the north by an existing office building, on the southwest by an approximately 5- to 8-foot-high slope that descends to Avenida De La Carlota at a slope ratio of 2:1, horizontal to vertical, and on the southeast by an approximately 2- to 12-foot-high slope that both descends and ascends to Los Alisos Boulevard at a slope ratio of 2:1, horizontal to vertical.

The areas of proposed infiltration are located within the existing parking stalls that run along the south side of the existing office building.

SUBSURFACE EXPLORATION

Our previous subsurface exploration consisted of the drilling of five exploratory drill holes (DH-1 through DH-5) throughout the existing parking lot to depths of 31.5 to 51 feet below the existing ground surfaces using a hollow-stem auger drill rig to confirm existing subsurface geologic and groundwater or seepage conditions.

Our recent infiltration testing consisted of the drilling of three (3) hollow stem auger drill holes (P-1 through P-2) each to a depth of 10 feet below the existing ground surface (bgs) for infiltration testing. Our staff geologist logged the drill holes in the field and performed the infiltration tests in general accordance with the protocol of Appendix VII of the Santa Ana Regional Water Quality Control Board Technical Guidance Document (TGD) dated March 2011. The infiltration tests were performed utilizing the shallow boring percolation test procedure contained in Section VII.3.8.

The locations of the previous drill holes (DH-1 through DH-5) and our percolation holes (P-1 through P-3) are shown on the attached site plan, Plate 2. The logs of the previous drill holes are provided in Appendix A.

LOCAL GEOLOGY AND SUBSURFACE SOIL CONDITIONS

Based on our previous subsurface exploration, the subject site is underlain by approximately 4 to 12 feet of compacted fill that overlies both native slopewash/colluvial materials and bedrock materials of the Niguel Formation. The fill materials within the northwesterly and northeasterly portions of the site (within the areas of proposed infiltration) are underlain directly by the Niguel Formation bedrock while the fill materials within the southern portion of the site are underlain by approximately 6.5 to 10 feet of in-place native slopewash/colluvial materials and then the bedrock materials.

The fill materials consist of interlayered sandy clays (CL), sandy to clayey silts (ML), and clayey sands (SC) that were observed to be olive to olive gray to brown, damp to moist, and firm to stiff or medium dense with occasional minor gravel. The bedrock was observed to consist of damp to

moist to very moist, moderately hard to hard, fine to medium grained sandy siltstones and clayey siltstones.

GROUNDWATER

No static groundwater was encountered within our previous drill holes at least to the maximum depth explored (51 feet); however, some seepage was encountered within previous drill holes DH-3, DH-4 and DH-5 at depths of 30 to 31 feet below the existing ground surface.

SOIL INFILTRATION TESTING AND RESULTS

Three infiltration tests were performed in general accordance with the Santa Ana Regional Water Quality Control Board Technical Guidance Document (TGD) Appendices dated March 2011, utilizing the shallow percolation test procedure contained in Section VII.3.8. To comply with the requirements of the TGD, three 8-inch-diameter test holes (P-1 through P-3) were drilled within the areas of proposed infiltration to a depth of 10 feet below existing ground surface using a hollow stem auger drill rig.

The infiltration tests were performed at depth intervals of 8 to 10 feet within the drill holes (i.e., the lower 2 feet of each test hole) which corresponds to the infiltration zones of potential infiltration systems. Per Section V11.1.3 of the TGD, the percolation rates measured in the field were converted to infiltration rates by means of the Porchet Method. The infiltration rates were calculated to range from only 0.01 inch/hour to 0.04 inch/hour (See Appendix B). Per the TGD, a factor of safety of at least 2 should then be applied to the infiltration rates for design purposes. This results in infiltration rates well below the required 0.3 inch/hour minimum rate accepted by the TGD. Therefore, ***the site is not considered acceptable for infiltration***.

CLOSURE

We are pleased to present the results of our infiltration testing for this project. Please do not hesitate to contact the undersigned if you have any questions regarding this information.

Respectfully submitted,

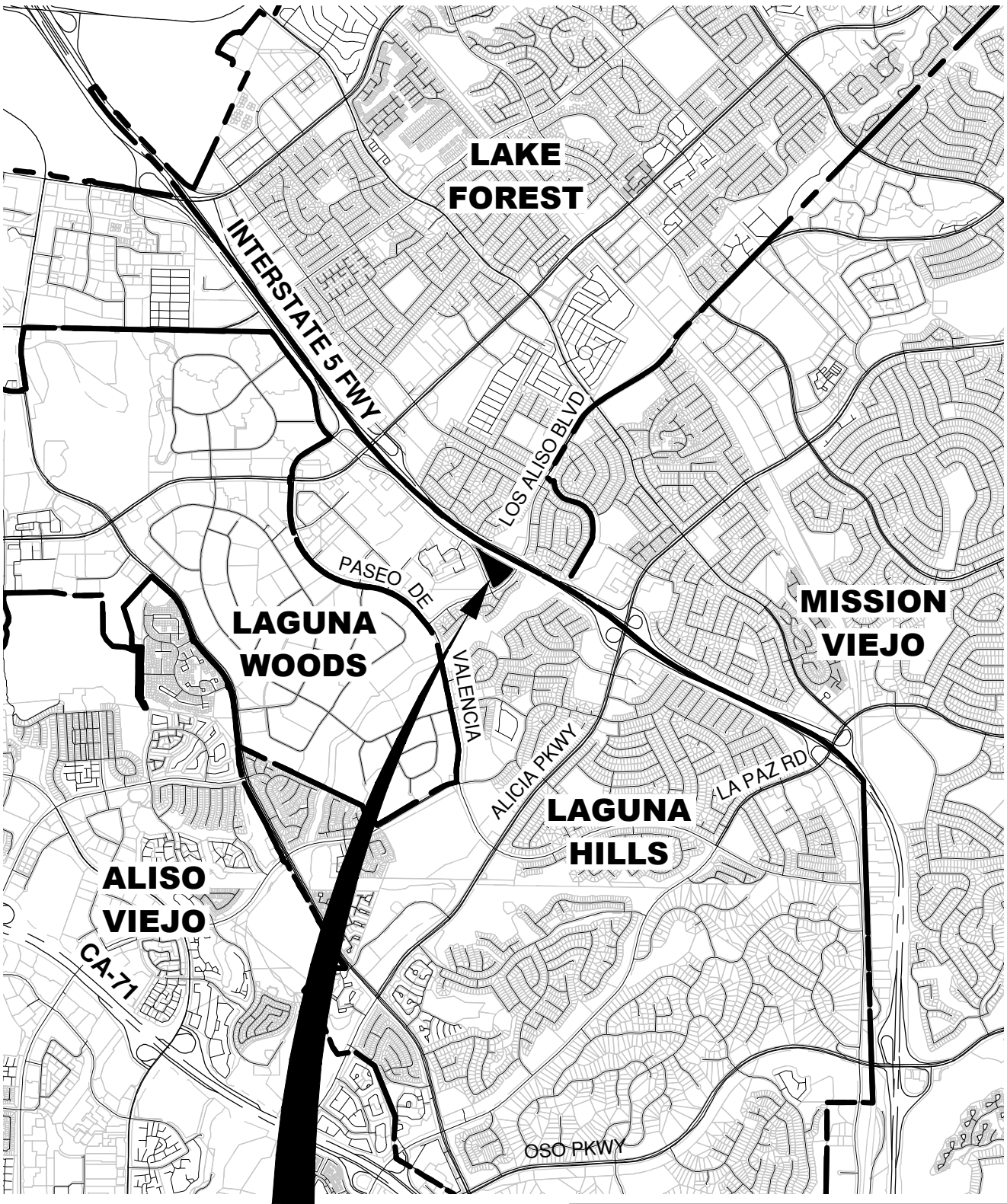
David Hansen, M.Sc., PE, GE 3056
Associate Geotechnical Engineer

dwh/23-008-00L Infiltration Letter (12-23-24)

REFERENCES

(1) *Geotechnical Investigation, Proposed 7- to 8-Story Residential Development, 24422 Avenida De La Carlota, Laguna Hills, California;* dated June 29, 20123.

(2) *Exhibit 7.III, Technical Guidance Document (TGD) for the Preparation of Conceptual/Preliminary and/or Project Water Quality Management Plans (WQMPs) in South Orange County; Version 1.1,* dated December 21, 2018.



PROJECT LOCATION

24422 AVENIDA DE LA CARLOTA
LAGUNA HILLS, CALIFORNIA

0 3000'

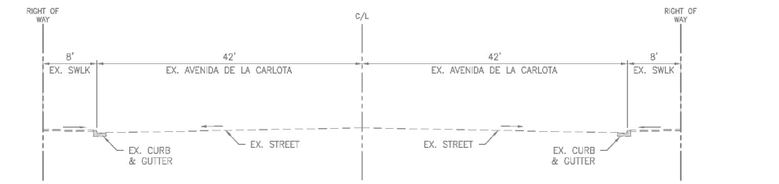
Location Map

GMU ENGINEERS & GEOLOGISTS

Date:	December 23, 2024
Project No.:	23-008-00

Plate 1

DRAWING: q:\2023\23-008-00\dwg\2300800_plate 1_location map.dwg PLOTTED: 7/5/2023 11:09 AM BY: Jesus Meza

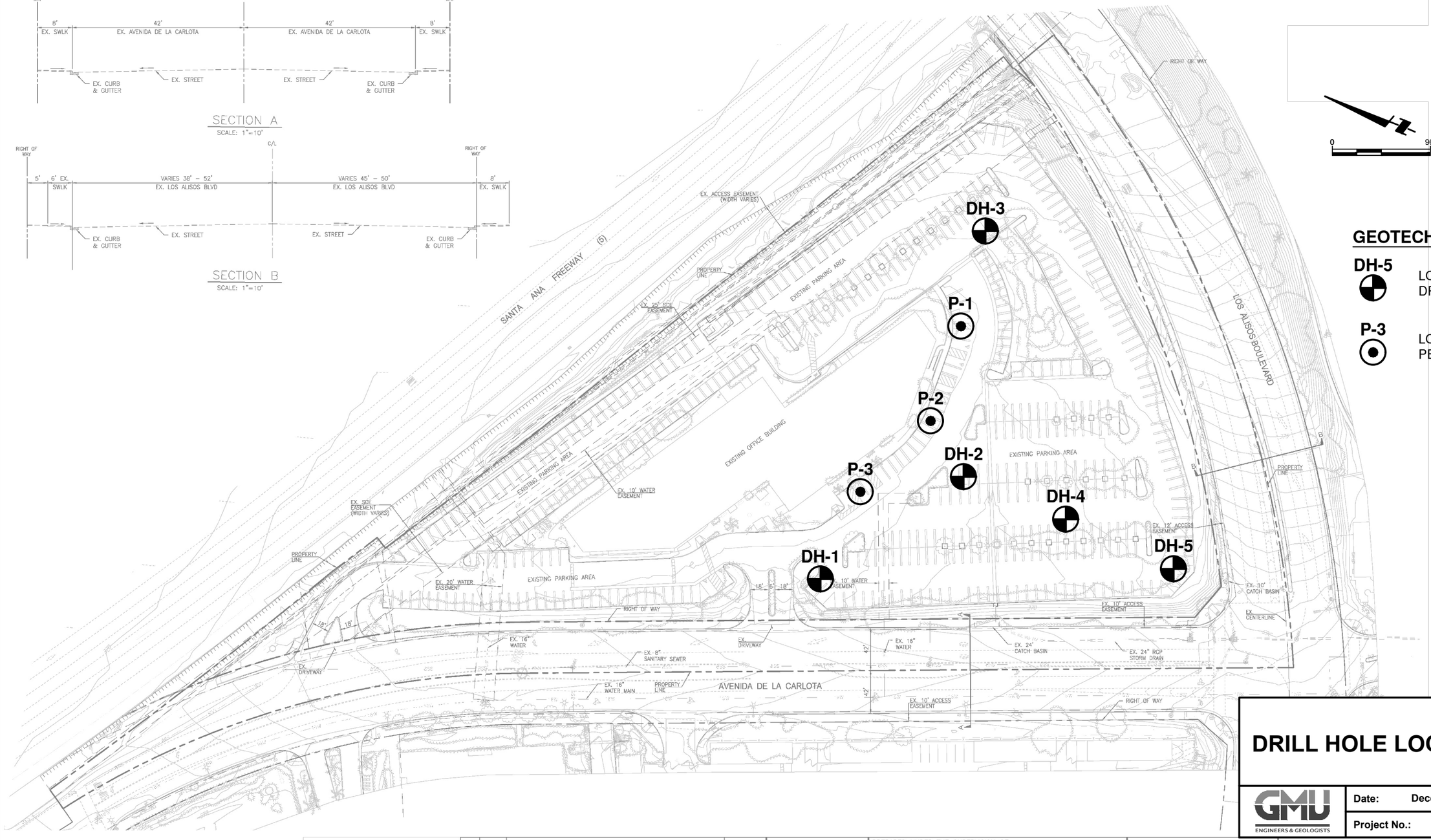


SECTION A

SCALE: 1"=10'

SECTION B

SCALE: 1"=10'



GEOTECHNICAL LEGEND

DH-5 — LOCATION OF PREVIOUS DRILL HOLE

P-3 — LOCATION OF PERCOLATION HOLE

DRILL HOLE LOCATION MAP

GMU ENGINEERS & GEOLOGISTS

Date: December 23, 2024

Project No.: 23-008-00

Plate 2

NO.	DATE	REVISIONS	APPROVED

MARCH 2023

DRAWN BY: NM

DESIGNED BY: NM

CHECKED BY: TD

PREPARED UNDER THE SUPERVISION OF:

TREVOR S. DODSON RCE 42029 EXP. 03/31/24

REGISTERED PROFESSIONAL ENGINEER TREVOR S. DODSON NO. C42029 EXP. 03/31/24 CIVIL STATE OF CALIFORNIA

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CONCEPTUAL GRADING PLAN

24422 Avenida De La Carlota
LAGUNA HILLS , CALIFORNIA

SHEET C-4 OF C-5

DRAWING: q:\2023\23-008-00\dwg\2300800_plate 2_ drill hole location map.dwg PLOTTED: 12/23/2024 9:42 AM BY: Devon Rutherford

APPENDIX A

Logs of Previous GMU Drill Holes

Project: Buchanan Street Partners
Project Location: 24422 Avenida De La Carlota, Laguna Hills
Project Number: 23-008-00

Log of Drill Hole DH-1

Date(s) Drilled	**1/20/23**	Logged By	**RA**	Checked By	**DW**
Drilling Method	**Hollow Stem Auger**	Drilling Contractor	**2R Drilling**	Total Depth of Drill Hole	**31.5 feet**
Drill Rig Type	**CME 75**	Diameter(s) of Hole, inches	**8**	Approx. Surface Elevation, ft MSL	**372.0**
Groundwater Depth [Elevation], feet	**NA**	Sampling Method(s)	**Open drive sampler with 6-inch sleeve, Bulk**	Drill Hole Backfill	**Native**
Remarks				Driving Method and Drop	**Auto Hammer**

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS / 6"	SAMPLE DATA: DRIVING WEIGHT, lbs	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
			ARTIFICIAL FILL (Qaf)		ASHPALT CONCRETE - 4-inches AGGREGATE BASE - 6-inches						
370			Few roots up to 1/4" in diameter, few subangular gravel up to 1/2" in diameter		SANDY CLAY (CL); olive gray, damp, firm, fine- to medium-grained sand						
			BEDROCK - NIGUEL FORMATION (Tn)		SANDY SILTSTONE; pale brown to light gray, damp, moderately hard to hard, fine- to medium-grained sand						
	5		Slightly oxidized sand grains				12 25 36	140	26		
365											
	10		Becomes unoxidized		SANDY CLAYEY SILTSTONE; pale brown, damp, moderately hard to hard, fine-grained sand		10 19 21	140	22	110	
360											
	15		Pinhole sized charcoal fragments		SANDY SILTSTONE; pale brown, damp, moderately hard to hard, fine-grained sand		16 26 26	140	25		
355											

DH_REV3 23-008-00.GPJ GMULAB.GPJ 6/20/23

Project: Buchanan Street Partners
Project Location: 24422 Avenida De La Carlota, Laguna Hills
Project Number: 23-008-00

Log of Drill Hole DH-1

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS / 6"	SAMPLE DATA: DRIVING WEIGHT, lbs	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
			BEDROCK - NIGUEL FORMATION (Tn) Sand grains become slight to moderately oxidized, yellow fine-grained sand blips, increase in mica abundance		SANDY SILTSTONE; pale brown, damp, moderately hard, fine-grained sand		12 15 25	140	26	108	
350											
	25		Decrease in oxidized sand grains, minor rig chatter				12 18 27	140	27		
345											
	30		Increase in oxidized sand grains, yellow fine-grained sand blips		Becomes pale brown to light gray, few fine-grained sand		10 18 27	140	26	109	
					Total Depth = 31.5' No Groundwater						

Project: Buchanan Street Partners
Project Location: 24422 Avenida De La Carlota, Laguna Hills
Project Number: 23-008-00

Log of Drill Hole DH-2

Sheet 1 of 2

Date(s) Drilled	1/20/23	Logged By	DW/RA	Checked By	
Drilling Method	Hollow Stem Auger	Drilling Contractor	2R Drilling	Total Depth of Drill Hole	31.5 feet
Drill Rig Type	CME 75	Diameter(s) of Hole, inches	8	Approx. Surface Elevation, ft MSL	372.0
Groundwater Depth [Elevation], feet	NA []	Sampling Method(s)	Open drive sampler with 6-inch sleeve, Bulk	Drill Hole Backfill	Native
Remarks				Driving Method and Drop	Auto Hammer

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS / 6"	SAMPLE DATA: DRIVING WEIGHT, lbs	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
			ARTIFICIAL FILL (Qaf)		ASPHALT CONCRETE - 3.5-inches AGGREGATE BASE - 6.0-inches						
370					SANDY CLAY (CL); olive with gray, firm, damp, fine- to medium-grained sand, trace gravel				20		PS ATT CP EI pH SU CH MR R-val
	5		**SLOPEWASH/COLLUVIUM (Qsw/Qcol)** Moderate rig chatter		SANDY SILT (SL); grayish yellow, damp, firm, fine-grained sand		4 6 15	140	16	96	
365											
	10		Some rootlets, caliche stringers		SILTY CLAY (CL); gray and brown, damp to moist, very stiff, some fine-grained sand		6 10 18	140	20	98	
360			**BEDROCK - NIGUEL FORMATION (Tn)** Moderately weathered		CLAYEY SILTSTONE; light gray and light olive, damp, moderately hard, some very fine-grained sand						
	15		Oxidized blips				13 22 30	140	24	108	DS
355											

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Project: Buchanan Street Partners
Project Location: 24422 Avenida De La Carlota, Laguna Hills
Project Number: 23-008-00

Log of Drill Hole DH-2

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS / 6"	SAMPLE DATA: DRIVING WEIGHT, lbs	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
350			**BEDROCK - NIGUEL FORMATION (Tn)** Slightly oxidized sand grains, pinhole charcoal fragments		SANDY SILTSTONE; pale brown to light gray, damp, moderately hard, fine- to medium-grained sand		13 24 27	140	27		
	25		Slight increase in oxidized sand grain abundance		SANDY CLAYEY SILTSTONE; light gray, damp, moderaly hard, fine-grained sand		11 15 18	140	23	109	
345	30				SANDY SILTSTONE; pale brown to light gray, damp, moderaly hard, fine-grained sand		8 16 19	140	26		
					Total Depth = 31.5' No Groundwater						

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Project: Buchanan Street Partners
Project Location: 24422 Avenida De La Carlota, Laguna Hills
Project Number: 23-008-00

Log of Drill Hole DH-3

Sheet 1 of 2

Date(s) Drilled	**1/20/23**	Logged By	**RA**	Checked By	**DW**
Drilling Method	**Hollow Stem Auger**	Drilling Contractor	**2R Drilling**	Total Depth of Drill Hole	**31.5 feet**
Drill Rig Type	**CME 75**	Diameter(s) of Hole, inches	**8**	Approx. Surface Elevation, ft MSL	**376.0**
Groundwater Depth [Elevation], feet	**NA**	Sampling Method(s)	**Open drive sampler with 6-inch sleeve, Bulk**	Drill Hole Backfill	**Native**
Remarks				Driving Method and Drop	**Auto Hammer**

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS / 6"	SAMPLE DATA: DRIVING WEIGHT, lbs	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
			ARTIFICIAL FILL (Qaf)		ASPHALT CONCRETE - 3.5-inches AGGREGATE BASE - 6.0-inches						
375			Few roots up to 1/4" in diameter, some bedrock fragments, trace sub-angular gravel up to 1/4" in diameter		SANDY SILT (ML); brown, damp, medium dense, fine- to medium-grained sand,						
			BEDROCK - NIGUEL FORMATION (Tn)		SANDY SILTSTONE; pale brown, damp, moderately hard to hard, fine-grianed sand						
	5		Slower drilling, some minor rig chatter, bedrock is massive with no discernible bedding, slightly oxidized sand grain blips				14 34 36	140	18	113	
370											
	10		Increase in mica abundance, pinhole sized charcoal fragments				11 18 31	140	26		
365											
	15				Becomes pale brown to gray		10 20 22	140	22	108	
360											

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Project: Buchanan Street Partners
Project Location: 24422 Avenida De La Carlota, Laguna Hills
Project Number: 23-008-00

Log of Drill Hole DH-3

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS / 6"	SAMPLE DATA: DRIVING WEIGHT, lbs	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
355			**BEDROCK - NIGUEL FORMATION (Tn)** Slightly oxidized sand grains		CLAYEY SILTSTONE; pale brown, damp, moderately hard to hard, some fine-grained sand		15 28 29	140	23		
	25		Slight increase in oxidized sand grains, white fine-grained sand blips		Becomes damp to moist, moderately hard		9 13 19	140	25	107	
350											
	30		Moderately oxidized sand grains				12 13 21	140	26		
345			Slight seepage		Becomes very moist						
					Total Depth = 31.5' Seepage at 31'						

Project: Buchanan Street Partners
Project Location: 24422 Avenida De La Carlota, Laguna Hills
Project Number: 23-008-00

Log of Drill Hole DH-4

Date(s) Drilled: **1/20/23**	Logged By: **DW**	Checked By:
Drilling Method: **Hollow Stem Auger**	Drilling Contractor: **2R Drilling**	Total Depth of Drill Hole: **41.5 feet**
Drill Rig Type: **CME 75**	Diameter(s) of Hole, inches: **8**	Approx. Surface Elevation, ft MSL: **373.0**
Groundwater Depth [Elevation], feet: **NA**	Sampling Method(s): **Open drive sampler with 6-inch sleeve, Bulk**	Drill Hole Backfill: **Native**
Remarks		Driving Method and Drop: **Auto Hammer**

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS / 6"	SAMPLE DATA: DRIVING WEIGHT, lbs	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
			ARTIFICIAL FILL (Qaf)		ASPHALT CONCRETE - 3.5-inches AGGREGATE BASE - 6.0-inches						
370					SANDY SILT (ML); brown with gray, moist, firm, fine- to medium-grained sand, trace gravel						
	5				CLAYEY SILT (ML); light gray with orange staining, moist, firm to stiff, some very fine-grained sand		6 10 19	140	24	97	
			SLOPEWASH (Qsw) Moderate rig chatter, some rootlets		SANDY CLAY (CL); dark brown, damp, firm, fine- to medium-grained sand						
365											
	10		Rootlets continue		Becomes moist to very moist		4 4 10	140	14	93	CN
360											
	15				SANDY SILT (ML); light brown, moist, firm to stiff, fine- to medium-grained sand, some gravel		6 12 14	140	11		
			BEDROCK - NIGUEL FORMATION (Tn) Moderately weathered		CLAYEY SILTSTONE; yellow with gray, moist, moderately hard, trace very fine-grained sand						
355											

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Drill Hole DH-4

Project: Buchanan Street Partners
Project Location: 24422 Avenida De La Carlota, Laguna Hills
Project Number: 23-008-00

Log of Drill Hole DH-4

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS / 6"	SAMPLE DATA: DRIVING WEIGHT, lbs	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
350			**BEDROCK - NIGUEL FORMATION (Tn)** Manganese staining blips, rootlets within fractures		CLAYEY SILTSTONE; light yellowish brown with gray and orange staining, damp to moist, moderately hard, some very fine-grained sand		12 19 23	140	25	108	
	25				SANDY SILTSTONE; light olive, moist, moderately hard, very fine-grained sand		10 13 17	140	27		
345											
	30		Slight Seepage		CLAYEY SILTSTONE; light olive and yellow, moist to very moist, moderately hard, some very fine-grained sand		10 13 16	140	26	106	
340											
	35		Starting to become unoxidized		SANDY SILTSTONE; gray with orange staining, damp to moist, moderately hard		15 16 20	140	28		
335											
	40		Unoxidized, faint subhorizontal wavy laminations		Becomes dark gray and dark brownish gray, damp, hard		10 28 38	140	25	107	
					Total Depth = 41.5' Seepage at 30'						

Project: Buchanan Street Partners
Project Location: 24422 Avenida De La Carlota, Laguna Hills
Project Number: 23-008-00

Log of Drill Hole DH-5

Date(s) Drilled	**1/20/23**	Logged By	**DW**	Checked By	
Drilling Method	**Hollow Stem Auger**	Drilling Contractor	**2R Drilling**	Total Depth of Drill Hole	**51.0 feet**
Drill Rig Type	**CME 75**	Diameter(s) of Hole, inches	**8**	Approx. Surface Elevation, ft MSL	**374.0**
Groundwater Depth [Elevation], feet	**NA**	Sampling Method(s)	**Open drive sampler with 6-inch sleeve, Bulk**	Drill Hole Backfill	**Native**
Remarks				Driving Method and Drop	**Auto Hammer**

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS / 6"	SAMPLE DATA: DRIVING WEIGHT, lbs	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
			ARTIFICIAL FILL (Qaf)		ASPHALT CONCRETE - 3.5-inches AGGREGATE BASE - 6.0-inches						
					SANDY SILT (ML); olive, damp, medium dense, fine- to medium-grained sand						
370	5		Lifts of brown silty sand, pinhole porosity		Becomes yellow with olive and brown, trace gravel		10 13 13	140	12	110	
365	10		Moderate rig chatter, fine-grained silty sandstone fragments		CLAYEY SAND (SC); yellow and olive, moist, dense, fine- to coarse-grained sand, some gravel		27 40 40	140	7	123	
			SLOPEWASH/COLLUVIUM (Qsw/Qcol)		SANDY SILT (ML); brownish gray, moist, very stiff, fine- to medium-grained sand, trace gravel						
360	15		Grass pieces				5 9 10	140	20	92	CN
355											

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Project: Buchanan Street Partners
Project Location: 24422 Avenida De La Carlota, Laguna Hills
Project Number: 23-008-00

Log of Drill Hole DH-5

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS / 6"	SAMPLE DATA: DRIVING WEIGHT, lbs	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
			Ped surfaces around gravel		SANDY CLAY (CL); brownish gray, moist, firm, fine- to medium-grained sand, trace gravel		10 7 9	140	17 14	93	PS ATT EI pH SU CH MR
			Moderate rig chatter Moderately weathered								
			BEDROCK - NIGUEL FORMATION (Tn)		SANDY SILTSTONE; yellowish brown, damp, moderately hard, fine-grained sand						
			No rig chatter								
350											
	25		Manganese stained blips - pinhole sized				17 20 48	140	11		
345											
	30		Some seepage		CLAYEY SILTSTONE; light brown, soft to moderately hard, wet, fine- to medium-grained sand		15 17 32	140	17	114	
340											
	35		Moderately to well cemented		SANDY SILTSTONE; gray with orange staining, damp, moderately hard, some very fine-grained sand		12 19 23	140	28		
335											
	40		Becomes unoxidized, faint subhorizontal wavy laminations		CLAYEY SILTSTONE; dark gray, damp, moderately hard		16 24 31	140	26	107	
330											

Project: Buchanan Street Partners
Project Location: 24422 Avenida De La Carlota, Laguna Hills
Project Number: 23-008-00

Log of Drill Hole DH-5

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA			TEST DATA		
						SAMPLE	NUMBER OF BLOWS / 6"	DRIVING WEIGHT, lbs	MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
325			**BEDROCK - NIGUEL FORMATION (Tn)**		SANDY SILTSTONE; dark gray, damp, moderately hard		22 50/6"	140	26		
	50						26 50/6"	140	25	109	
					Total Depth = 51' Seepage at 30'						

APPENDIX B

Infiltration Test Results

Falling Head Borehole Infiltration Test

Project Name:	Buchanan Street Partners				**Date:**	10/24/2024	
Project Number:	23-008-00				**Tested By:**	ER	
Test Hole Number:	P-1				**USCS Soil Classification:**	CL	
Total Depth From Reference:	10.00	feet					
Height of Reference above Existing Grade:	0.00	feet	**Depth of Hole:**	10.00	feet		
Test Hole Diameter:	8.00	inches	radius=	4	inches		

Test No.	Start Time	End Time	ΔT	Total Time	Initial Depth of Water	Final Depth of Water	H_0	H_f	ΔH	H_{avg}	Unfactored Percolation Rate
			(min)	*(min)*	*(ft)*	*(ft)*	*(in)*	*(in)*	*(in)*	*(in)*	*(in/hour)*
1	8:33	9:03	30.0	90.0	3.23	3.30	81.24	80.40	0.84	80.82	0.04
2	9:08	9:38	30.0	120.0	3.23	3.27	81.24	80.76	0.48	81.00	0.02
3	9:38	10:08	30.0	150.0	3.23	3.27	81.24	80.76	0.48	81.00	0.02
4	10:08	10:38	30.0	180.0	3.23	3.27	81.24	80.76	0.48	81.00	0.02
5	10:38	11:08	30.0	210.0	3.23	3.27	81.24	80.76	0.48	81.00	0.02
6	11:11	11:41	30.0	240.0	3.22	3.26	81.36	80.88	0.48	81.12	0.02
7	11:42	12:12	30.0	270.0	3.21	3.24	81.48	81.12	0.36	81.30	0.02
8	12:14	12:44	30.0	300.0	3.22	3.25	81.36	81.00	0.36	81.18	0.02
9	12:45	13:15	30.0	330.0	3.22	3.25	81.36	81.00	0.36	81.18	0.02
10	13:16	13:46	30.0	360.0	3.22	3.25	81.36	81.00	0.36	81.18	0.02
11	13:47	14:17	30.0	390.0	3.22	3.26	81.36	80.88	0.48	81.12	0.02
12	14:18	14:48	30.0	420.0	3.22	3.25	81.36	81.00	0.36	81.18	0.02

WATER TEMPERATURE CORRECTION FACTOR:	1.00
SAFETY FACTOR*:	2
UNFACTORED INFILTRATION RATE (IN/HR):	0.02
FACTORED INFILTRATION RATE (IN/HR):	0.01

Factor Category	Factor Description	Assigned Weight (w)	Factor Value (v)	Product (p) = w x v
Suitability Assessment	Soil assessment methods	0.25		0
	Predominant soil texture	0.25		0
	Site soil variablity	0.25		0
	Depth to groundwater	0.25		0
			Geotechnical Factor of Safety (SA):	0

Concern Level	Factor Value (v)
Low	1
Medium	2
High	3

Factor Description	High Concern	Medium Concern	Low Concern
Soil assessment methods	Use of borehole methods to estimate vertical infiltration rate (not recommended, but may be necessary at a planning level). Less than 2 tests per BMP	At least 2 tests per BMP. Use of borehole tests for dry wells or infiltration trenches. Use of infiltrometer or small scale PIT methods for vertical infiltration BMPs.	Extensive infiltration testing such as: PIT testing or infiltrometer testing at 3+ locations per BMP, and/or commitment to construction phase testing and design adaption if necessary.
Predominant soil texture	Silty and clayey soils with significant fines	Finer sandy soils with some loam content	Clean, granular soils (sands)
Site soil variablity	Highly variable soils indicated from site assessment or limited soil borings collected during site assessment.	Soil borings/test pits indicate moderately homogeneous soils.	Multiple soil borings/test pits indicate relatively homogeneous soils.
Depth to groundwater	Groundwater conditions or movement not well understood.	Seasonal high GW at least 10 ft below facility bottom.	Seasonal high GW at least 15 ft below facility bottom.

***Factor of safety should not be less than 2. Additional factor of safety in accordance with Table D-7 of the South Orange County Technical Guidance Document should be applied by the project civil engineer.**

Falling Head Borehole Infiltration Test

Project Name:	Buchanan Street Partners				**Date:**	10/24/2024
Project Number:	23-008-00				**Tested By:**	ER
Test Hole Number:	P-2				**USCS Soil Classification:**	CL
Total Depth From Reference:	10.30	feet				
Height of Reference above Existing Grade:	0.00	feet	**Depth of Hole:**	10.30	feet	
Test Hole Diameter:	8.00	inches	radius=	4	inches	

Test No.	Start Time	End Time	ΔT	Total Time	Initial Depth of Water	Final Depth of Water	H_0	H_f	ΔH	H_{avg}	Unfactored Percolation Rate
			(min)	*(min)*	*(ft)*	*(ft)*	*(in)*	*(in)*	*(in)*	*(in)*	*(in/hour)*
1	8:28	8:58	30.0	90.0	3.28	3.35	84.24	83.40	0.84	83.82	0.04
2	8:59	9:29	30.0	120.0	3.28	3.36	84.24	83.28	0.96	83.76	0.04
3	9:29	9:59	30.0	150.0	3.28	3.36	84.24	83.28	0.96	83.76	0.04
4	9:59	10:29	30.0	180.0	3.28	3.36	84.24	83.28	0.96	83.76	0.04
5	10:34	11:04	30.0	210.0	3.25	3.29	84.60	84.12	0.48	84.36	0.02
6	11:07	11:37	30.0	240.0	3.25	3.32	84.60	83.76	0.84	84.18	0.04
7	11:39	12:09	30.0	270.0	3.22	3.24	84.96	84.72	0.24	84.84	0.01
8	12:11	12:41	30.0	300.0	3.22	3.24	84.96	84.72	0.24	84.84	0.01
9	12:42	13:12	30.0	330.0	3.22	3.24	84.96	84.72	0.24	84.84	0.01
10	13:13	13:43	30.0	360.0	3.22	3.24	84.96	84.72	0.24	84.84	0.01
11	13:44	14:14	30.0	390.0	3.22	3.24	84.96	84.72	0.24	84.84	0.01
12	14:15	14:45	30.0	420.0	3.22	3.24	84.96	84.72	0.24	84.84	0.01

WATER TEMPERATURE CORRECTION FACTOR:	1.00
SAFETY FACTOR*:	2
UNFACTORED INFILTRATION RATE (IN/HR):	0.01
FACTORED INFILTRATION RATE (IN/HR):	0.01

Factor Category	Factor Description	Assigned Weight (w)	Factor Value (v)	Product (p) = w x v
Suitability Assessment	Soil assessment methods	0.25		0
	Predominant soil texture	0.25		0
	Site soil variablity	0.25		0
	Depth to groundwater	0.25		0
			Geotechnical Factor of Safety (SA):	0

Concern Level	Factor Value (v)
Low	1
Medium	2
High	3

Factor Description	High Concern	Medium Concern	Low Concern
Soil assessment methods	Use of borehole methods to estimate vertical infiltration rate (not recommended, but may be necessary at a planning level). Less than 2 tests per BMP	At least 2 tests per BMP. Use of borehole tests for dry wells or infiltration trenches. Use of infiltrometer or small scale PIT methods for vertical infiltration BMPs.	Extensive infiltration testing such as: PIT testing or infiltrometer testing at 3+ locations per BMP, and/or commitment to construction phase testing and design adaption if necessary.
Predominant soil texture	Silty and clayey soils with significant fines	Finer sandy soils with some loam content	Clean, granular soils (sands)
Site soil variablity	Highly variable soils indicated from site assessment or limited soil borings collected during site assessment.	Soil borings/test pits indicate moderately homogeneous soils.	Multiple soil borings/test pits indicate relatively homogeneous soils.
Depth to groundwater	Groundwater conditions or movement not well understood.	Seasonal high GW at least 10 ft below facility bottom.	Seasonal high GW at least 15 ft below facility bottom.

***Factor of safety should not be less than 2. Additional factor of safety in accordance with Table D-7 of the South Orange County Technical Guidance Document should be applied by the project civil engineer.**

Falling Head Borehole Infiltration Test

Project Name:	Buchanan Street Partners				**Date:**	10/24/2024
Project Number:	23-008-00				**Tested By:**	ER
Test Hole Number:	P-3				**USCS Soil Classification:**	CL
Total Depth From Reference:	10.00	feet				
Height of Reference above Existing Grade:	0.00	feet	**Depth of Hole:**	10.00	feet	
Test Hole Diameter:	8.00	inches	radius=	4	inches	

Test No.	Start Time	End Time	ΔT	Total Time	Initial Depth of Water	Final Depth of Water	H_0	H_f	ΔH	H_{avg}	Unfactored Percolation Rate
			(min)	*(min)*	*(ft)*	*(ft)*	*(in)*	*(in)*	*(in)*	*(in)*	*(in/hour)*
1	8:23	8:53	30.0	90.0	3.29	3.38	80.52	79.44	1.08	79.98	0.05
2	8:56	9:26	30.0	120.0	3.29	3.37	80.52	79.56	0.96	80.04	0.05
3	9:27	9:57	30.0	150.0	3.29	3.37	80.52	79.56	0.96	80.04	0.05
4	9:57	10:27	30.0	180.0	3.29	3.37	80.52	79.56	0.96	80.04	0.05
5	10:27	10:57	30.0	210.0	3.29	3.37	80.52	79.56	0.96	80.04	0.05
6	11:00	11:30	30.0	240.0	3.14	3.22	82.32	81.36	0.96	81.84	0.05
7	11:31	12:01	30.0	270.0	3.09	3.17	82.92	81.96	0.96	82.44	0.05
8	12:02	12:32	30.0	300.0	3.11	3.19	82.68	81.72	0.96	82.20	0.05
9	12:33	13:03	30.0	330.0	3.11	3.18	82.68	81.84	0.84	82.26	0.04
10	13:04	13:34	30.0	360.0	3.11	3.18	82.68	81.84	0.84	82.26	0.04
11	13:35	14:05	30.0	390.0	3.10	3.17	82.80	81.96	0.84	82.38	0.04
12	14:06	14:36	30.0	420.0	3.11	3.18	82.68	81.84	0.84	82.26	0.04

WATER TEMPERATURE CORRECTION FACTOR:	1.00
SAFETY FACTOR*:	2
UNFACTORED INFILTRATION RATE (IN/HR):	0.04
FACTORED INFILTRATION RATE (IN/HR):	0.02

Factor Category	Factor Description	Assigned Weight (w)	Factor Value (v)	Product (p) = w x v
Suitability Assessment	Soil assessment methods	0.25		0
	Predominant soil texture	0.25		0
	Site soil variablity	0.25		0
	Depth to groundwater	0.25		0
			Geotechnical Factor of Safety (SA):	0

Concern Level	Factor Value (v)
Low	1
Medium	2
High	3

Factor Description	High Concern	Medium Concern	Low Concern
Soil assessment methods	Use of borehole methods to estimate vertical infiltration rate (not recommended, but may be necessary at a planning level). Less than 2 tests per BMP	At least 2 tests per BMP. Use of borehole tests for dry wells or infiltration trenches. Use of infiltrometer or small scale PIT methods for vertical infiltration BMPs.	Extensive infiltration testing such as: PIT testing or infiltrometer testing at 3+ locations per BMP, and/or commitment to construction phase testing and design adaption if necessary.
Predominant soil texture	Silty and clayey soils with significant fines	Finer sandy soils with some loam content	Clean, granular soils (sands)
Site soil variablity	Highly variable soils indicated from site assessment or limited soil borings collected during site assessment.	Soil borings/test pits indicate moderately homogeneous soils.	Multiple soil borings/test pits indicate relatively homogeneous soils.
Depth to groundwater	Groundwater conditions or movement not well understood.	Seasonal high GW at least 10 ft below facility bottom.	Seasonal high GW at least 15 ft below facility bottom.

***Factor of safety should not be less than 2. Additional factor of safety in accordance with Table D-7 of the South Orange County Technical Guidance Document should be applied by the project civil engineer.**