PRELIMINARY PRIORITY
WATER QUALITY MANAGEMENT PLAN
(WQMP)

For:

TTM 19392
2375 North Tustin Street
Orange, Ca 92685

Prepared for:
Melia Homes
9860 Irvine Center Drive
Irvine, Ca 92618
(949) 759-4367

Prepared by:
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April 2025
Revised September 2025

_____ _____
Public Works Director **Date**

_____ _____
City Engineer **Date**

OWNER'S CERTIFICATION

WATER QUALITY MANAGEMENT PLAN

FOR

2375 North Tustin Street

This Water Quality Management Plan (WQMP) for the **2375 North Tustin Street** has been prepared for **Melia Homes**. This WQMP is intended to comply with the requirements of the City of Orange's **TTM 19392** requiring the preparation of a Water Quality Management 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 City of Orange Local Implementation Plan (LIP), and the intent of NPDES Permit and Waste Discharge Requirements for the City of Orange, County of Orange, Orange County Flood Control District and the incorporated Cities of Orange County within the Santa Ana Region.

This WQMP will be reviewed with the facility operator, facility supervisors, employees, tenants, maintenance and service contractors, or any other party having responsibility for implementing portions of this WQMP. Maintenance requirements within Section V and Appendix D will be adhered to with particular emphasis on maintaining the BMPs described within Sections IV and V. The Owner's Annual Self Certification Statement along with a BMP maintenance implementation table will be submitted by June 30th every year following project completion. At least one copy of the approved WQMP shall be available on the subject property in perpetuity.

Once the undersigned transfers its interest in the property, its successors-in-interest shall bear the aforementioned responsibility to implement and amend the WQMP. The City of Orange will be notified of the change of ownership and the new owner will submit a new certification.

Signature: _____ Date:

Name: Chad Brown

Title: Vice President of Planning and Development

Company: Melia Homes

Address: 9830 Irvine Center Drive

Telephone Number: (949) 759-4367

Notice of Transfer of Responsibility

Water Quality Management Plan (WQMP)

WQMP Number – As assigned by the City of Orange:

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

I. Owner/ Responsible Party Information

Company/ Individual: Melia Homes — Contact Person: Chad Brown

Street Address: 9830 Irvine Center Drive — Title: VP of Planning and Development

City Irvine State CA Zip 92618 — Phone: (949) 759-4367

II. Information about Site Relevant to WQMP

Name of Project:
Title of WQMP applicable to site:
Street Address of the site:
Date of Transfer of Responsibility:

III. New Owner (Upon Transfer)/ Responsible Party Information

Company/ Individual: Appointed HOA TBD — Contact Person:

Street Address: — Title:

City State Zip — Phone:

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I. Discretionary Permit Number(s), Water Quality Condition Number(s) and Conditions of Approval

Tract No 19392 Lot No._____

GPS Coordinates: 33.82781, -117.83406

Water Quality Conditions (WQMP conditions listed below)
A complete copy of the signed Conditions of Approval, Resolution Number _____ dated _____ are included as Appendix A

Conditions of Approval: Conditions of approval are not available at this time.

II. Project Description

Refer to Section 2.2 of the Technical Guidance Document for completion of this section.

Planning Area (Location): 2375 N. Tustin Street, Orange, CA 92685

Project Site Area (ac): 4.322 ac (gross) 4.229 ac (net)

Project Disturbed Area (ac): 3.944 acres

Percent Change in Impermeable Surfaces: -4.9% (estimating post developed perviousness at 13%)

Project Description
The property consists of 4.229 acres located at 2375 N. Tustin Street in the City of Orange. The project proposes to construct 71 residential units which consists of 29 duplex residential condominium units and 13 single family detached condominium units. There will be a triangular shaped dedication (approximately 0.007ac) to the city along the frontage of the property on N. Tustin Street. The existing main access of the site (approximately 0.285 ac) will remain as is and is not being considered in the water quality analysis. The site does experience offsite run-on from the parcel to the east (approximately 0.47 ac). This flow will be accounted for in water quality calculations as comingling of offsite and onsite flows cannot be avoided. The development proposes open space areas, parking areas, walkways, and driveways. Each residential unit will have two garage parking spaces and additional uncovered parking. The site has one (1) entrance/ exit on N. Tustin Street and one (1) secondary access for emergency vehicles only.

Potential Storm Water Pollutants
The proposed residential project is expected to produce: Suspended Solids, Nutrients, Pathogens, Pesticides, Oil and Grease, and Trash and Debris.

Hydrologic Conditions of Concern
Per the TGD Figure 3, Susceptibility Analysis of Santa Ana River dated February 2013, the project site drains to engineered facilities, therefore HCOCs do not exist. Refer to Section IV.8 for the TGD Figure.

Post Development Drainage Characteristics
The proposed development has been designed utilizing three (3) Drainage Management Areas (DMA) based on the Preliminary Grading and Drainage design. Runoff will be captured by five (5) sump curb inlet catch basins and one (1) proposed grate inlet throughout the site. Runoff will be routed into a proposed Biofiltration Vault treatment device prior to discharge to the existing stormwater sump pump system. After entering the sump pump system, runoff will follow historic drainage patterns.

The Connector Pipe Screen (CPS) devices will be located onsite upstream of the proposed storm drain overflow pipes to mitigate the required full trash captures requirements.

According to the Federal Emergency Management Agency (FEMA), FIRM rate map Number 06059C0154J, revised December 3, 2009, the site is located within the flood zone as follows: Zone X – “Area of minimal flood hazard.”

Project Purpose and Activities
71 Residential units in 29 duplex buildings and 13 single family detach condominium buildings

Site Ownership and Easements
Melia Homes, (Owner/ Developer) will appoint a Homeowner’s Association (HOA) or Property Management Company (PMC) to manage the operation and maintenance of the property.

Melia Homes
9860 Irvine Center Drive
Irvine, Ca 92618
(949) 759-4367

An ALTA Survey is shown in Section VI with all easements.

III. Site Description

Reference Location Map: Refer to Vicinity Map in Section VI

Site Address: 2375 N. Tustin Street, Orange, Ca 92685

Zoning: Limited Business Tustin Redevelopment Project Area (C-TR)

Predominant Soil Type: C

Pre-Project Percent Pervious: 8% **Post Project Percent Pervious:** 13%

Pre-Project Percent Impervious: 92% **Post Project Percent Impervious:** 87%

Site Characteristics

The existing site at 3.944 acres is currently occupied by a commercial building situated in the more easterly portion of the site with associated parking throughout the rest of the site. There are small landscaped medians throughout the parking area. The site is bounded by a multi family residential development to the north, an existing mobile home park to the south, the 55 Freeway to the east, and a multi family residential development and commercial development to the west. The site has block wall along the north and south property lines and a wall and fencing along the eastern property line. North Tustin Street is along the western property line of the site. The site is accessed via one signalized intersection from N. Tustin Street.

The Precipitation Zone for this area equals 0.9” Per Rainfall Zone per Figure XVI-1 per the Orange County Technical Guidance. Elevations on site range from 271 to 258 above mean sea level. The site primarily slopes in the westerly direction toward N. Tustin Street. Existing stormwater runoff is collected in valley gutters throughout the site. East of the existing building, runoff is conveyed overland into a valley gutter and into an existing storm drain inlet. To the west of the building, runoff is conveyed overland into existing valley gutters that route runoff into two existing storm drain catch basins in the easterly portion of the main entrance drive aisle. Runoff in the main entrance drive aisle is routed via curb and gutter into two existing catch basins located just east of the public right-of-way of N. Tustin Street. The site does experience offsite runon at the southeast corner from the triangular shaped parcel to the east. Due to the nature of the proposed design this runoff will be comingled with onsite flows and therefore accounted for in the required water quality treatment flows.

Per the Orange County Flood Control District (OCFCD) Drainage Maps, surface runoff from the site continues in the southerly direction in N. Tustin Street where it is conveyed into an existing catch basin and enters the existing underground storm drain system and continues to the Buckeye Storm Channel just south of Meats Avenue. Runoff converges

with the Collins Storm Channel, Santa Ana River, and ultimately discharging to the Pacific Ocean.

To support the proposed development, all onsite utilities will be demolished and capped appropriately at the right-of-way.

Per the "Updated Geotechnical and Infiltration Evaluation" dated December 30, 2024, the following subsurface soil conditions were encountered:

Two (2) borings (Borings I-1 and I-2) were excavated on the project site to evaluate preliminary infiltration rates for the proposed stormwater management facilities to be located in the southwestern and southeastern portions of the site. The boring diameter was approximately eight inches. Percolation testing was performed within the lower approximately 24 inches in the borings by a representative of GeoTek, in general conformance with the Boring Percolation Test Procedure outlined in the Technical Guidance Document Appendix VII (Orange County, 2013). As required, the percolation rates were corrected to account for discharge of water from both the sides and bottom of the borings. This correction was done using the Porchet Method, obtaining the infiltration rates tabulated below:

Summary of Results

Boring	Observed Infiltration Rate $K_{observed}$ (inches per Hour)	Observed Infiltration Rate $K_{measured}$ (inches per Hour)
I-1	7.7	3.86
I-2	1.1	0.57

As recommended by the referenced Technical Guidance Document (Orange County, 2013), a factor of safety of 2.0 was applied to the observed (field) rates to estimate measured infiltration rates. As shown on the table above, poor to favorable infiltration rates (0.57 to 3.86 inches per hour) were encountered at the site. Detailed infiltration test data is included in Appendix D. Stormwater BMP systems should be setback from foundations and improvements as required by the regulatory agency or jurisdiction.

"Field explorations were previously performed at this site by Southern California Geotechnical, Inc. (SCGI) in February, 2005. The subsurface exploration program conducted by SCGI occurred on February 9 and 23, and included the excavation of five (5) exploratory borings (B-1 through B-5) to a maximum depth of 32 feet below existing grades."

"SCGI reported that artificial fill was encountered beneath existing pavement sections at Boring B-5 and extended to a depth of 3± feet below existing grade. SCGI stated that additional soils classified as possible fill were encountered in all of the borings and extended to depths of up to 5.5± feet. These fill soils consisted of stiff to very stiff clays

with some fine to coarse gravel (CL soil type based upon the Unified Soil Classification System).

Native soils (alluvium) were reported by SCGI to underlie the artificial fills at the site. The alluvium encountered to depths of 5.5± to 12± feet generally consisted of very stiff to hard silty clays with tract to some fine gravel content (CL soil type). Beneath these materials, the borings generally encountered interbedded zones of dense to very dense silty sands and very stiff to hard silty clays (SM and CL soil types) with varying amounts of fine to coarse gravel content, extending to depths of at least 32± feet (the deepest depth explored).

SCGI stated that the site soils possess a high expansion potential (EI = 108).

GeoTek's recent exploration also encountered alluvium below the existing asphalt concrete pavement sections to the maximum depth explored of approximately 26.5 feet below existing site grades at the boring locations. The alluvium consisted of interbedded layers of clay, clayey sand, silty sands and fine to coarse gravel CL, SC, SM and GP soil types).

SCGI stated that groundwater was not encountered in their borings to a maximum depth of approximately 32 feet below existing site grades (Boring B-1). SCGI stated that based upon the Seismic Hazard Zone Map published by the Site of California, the project is not mapped as having a potential for seismic induced liquefaction. SCGI stated that based upon the soil encountered on the site and the depth to groundwater liquefaction is not considered to be a significant design concern for the project.

The California Water Data Library shows that the depth to groundwater in the site region is in excess of 40 feet. The depth of historic groundwater at the site is estimated to be greater than 40 feet below existing grades.

Based on the above, groundwater is not anticipated to be a factor during the site grading. However, seasonal perched groundwater may be encountered during grading within portions of the site."

Per the Stormwater Infiltration Feasibility Letter dated June 19, 2025 provided by Geotek, Inc. "Two percolation tests were conducted for the referenced Updated Geotechnical and Infiltration Evaluation dated December 30, 2024 (GeoTek, 2024) at depths of approximately 10 feet below the existing ground surface (see Exploration Location Map, Figure 2, of the referenced report for the test locations). The results of the infiltration testing indicated poor to favorable rates (0.57 to 3.86 inches per hour). Both percolation tests appear to have been conducted within a fine- to coarse-gravel with sand and trace clay (GP soil type based upon the Unified Soil Classification System), indicating highly variable percolation characteristics within the on-site soils."

"Soils encountered in the recent borings conducted for the referenced Update Evaluation, as well as a previous Geotechnical Investigation prepared by Southern

California Geotechnical, Inc. (SCGI, 2005) for the existing site improvements, indicated the presence of fine-grained silty clay and very dense silty sand soils (CL and SM soil types) below the gravel soils. These soils are anticipated to locally act as barriers to downward percolation of water from on-site disposal facilities, most likely leading to "mounding" of the water atop these soils. Over time, this water mounding will lead to a non-functional stormwater disposal system and possible migration of water to adjacent sites."

"Based on the highly variable infiltration rates obtained from the on-site percolation testing, the presence of expansive clay and very dense soil layers acting as downward water migration barriers leading to "mounding" of subsurface water, along with the possible negative effects of "mounding" subsurface waters on proposed site and off-site improvements, it is GeoTek's opinion that stormwater infiltration is not considered suitable for the project development."

Watershed Characteristics

Watershed: Lower Santa Ana River

Downstream Receiving Waters: Buckeye Storm Channel, Collins Channel, Santa Ana River, Pacific Ocean

Water Quality Impairments (if applicable): None

Identify hydromodification susceptibility: Project site is not susceptible to hydromodification concerns since all downstream waterbodies are stabilized. Refer to the Section IV.8 of this report for a copy of the TGD Appendix XVI, Figure 3 Susceptibility Analysis Map for the Santa Ana River dated February 2013.

Identify watershed management priorities: Not Applicable

IV. Best Management Practices

Street/ parking lot surface runoff will be collected and conveyed via a concrete longitudinal v-gutter to proposed catch basins connected to a Modular Wetlands System (MWS), Biofiltration vault for water quality treatment. The offsite runon will be conveyed through the proposed wall into the onsite curb and gutter which will direct runoff into the proposed catch basin. An onsite area drain system will connect directly to the MWS Biofiltration system for treatment of landscaped areas. Treated runoff will be routed to the existing stormwater sump pump which discharges through a parkway drain into the public right of way at N. Tustin Street. Overflow runoff will pond at the proposed catch basin and flow overland through the site entry into the public right of way of N. Tustin Street.

The Modular Wetland System (MWS) Biofiltration vault is designed to provide a 3-phase treatment train. Initially, when the stormwater enters the system, a trash rack, filter media and settling chamber will capture large trash/ debris and sediment in the stormwater before entering the planting media. This system is designed to treat stormwater flow horizontally. Before the stormwater enters the planting or "wetland" chamber, the runoff flows through the 2nd phase, a pre-filter cartridge which captures fines TSS, metals, nutrients and bacteria. The pre-filter chamber eliminates additional maintenance of the planting area. The wetland chamber is the 3rd phase of the system which provides final treatment through a combination of physical, chemical and biological processes.

Connector Pipe Screen (CPS) devices will be located at each catch basin to mitigate the required full trash captures requirements.

IV.1 Site Design and Drainage Characteristics

Table 1

Site Design BMPs

Technique	Included? Yes	Included? No	If no, state justification.
Minimize Directly Connected Impervious Areas (DCIAs) (C-Factor Reduction)	X		
Create Reduced or "Zero Discharge" Areas (Runoff Volume Reduction)[1]		X	Although site landscaping design has been incorporated throughout the development, additional retention is not anticipated.
Minimize Impervious Area/Maximize Permeability (C-Factor Reduction)[2]	X		
Conserve Natural Areas (C-Factor Reduction)		X	No existing area to conserve.

1 Detention and retention areas incorporated into landscape design provide areas for retaining and detaining stormwater flows, resulting in lower runoff rates and reductions in volume due to limited infiltration and evaporation. Such Site Design BMPs may reduce the size of Treatment Control BMPs.

2 The "C Factor" is a representation of the ability of a surface to produce runoff. Surfaces that produce higher volumes of runoff are represented by higher C Factors. By incorporating more pervious, lower C Factor surfaces into a development, lower volumes of runoff will be produced. Lower volumes and rates of runoff translate directly to lowering treatment requirements.

Minimize Directly Connected Impervious Areas (DCIAs)

The proposed site has been designed at minimum widths in accordance to fire and planning departments.

Minimize Impervious Area/Maximize Permeability

The proposed site has been designed to allow for the maximum pervious coverage possible in order to maximize natural permeability.

The proposed project is designed to capture and treat the required storm water quality volume utilizing a Modular Wetlands System (MWS), Biofiltration vault.

IV.2 Source Control BMPs

IV.2.1 Routine Non-Structural BMPs

Table 2

Routine Non-Structural BMPs

BMP No.	Name	Check One		If not applicable, state brief reason.
		Included	Not Applicable	
N1	Education for Property Owners, Tenants and Occupants	X		
N2	Activity Restriction	X		
N3	Common Area Landscape Management	X		
N4	BMP Maintenance	X		
N5	Title 22 CCR Compliance		X	
N6	Local Water Quality Permit Compliance		X	This BMP is not applicable. The City of Orange does not issue water quality permits.
N7	Spill Contingency Plan		X	
N8	Underground Storage Tank Compliance		X	Not Applicable
N9	Hazardous Materials Disclosure Compliance		X	Not Applicable
N10	Uniform Fire Code Implementation	X		
N11	Common Area Litter Control	X		
N12	Employee Training	X		
N13	Housekeeping of Loading Docks		X	Not Applicable
N14	Common Area Catch Basin Inspection	X		
N15	Street Sweeping Private Streets and Parking Lots	X		

Non-Structural Measures

Non-structural BMPs are generally managerial, educational, inspection and/ or maintenance oriented. These items consist of educating employees and occupants, developing and implementing Owner guidelines, implementing BMPs and enforcing Code requirements. Non-structural BMPs used for this project are summarized below:

N1. Education for Employees and Occupants

Practical informational materials will be provided to owners, occupants and employees on general good housekeeping practices that contribute to protection of storm water quality. Among other things, these materials will describe the use of chemicals (including household type) that should be limited to the property, with no discharge of specified wastes via hosing or other direct discharge to gutters, catch basins and storm

drains. The property owner will provide these materials. Thereafter, such materials will be available through the property owner education program. This program must be maintained, enforced, and updated periodically by the property owner. Educational materials including, but not limited to, the materials included in the Appendix B section of this plan will be made available to the employees and contractors of the property owner.

N2. Activity Restrictions
CC&R's will be recorded for the subject site and will implement all restrictions as conditions. These will also cover any restrictions as denoted in the final set of conditions of approve as provided by the subject site. Restrictions shall include, but not limited to car washing, washing of any hard pavement such as sidewalks, parking lots, streets, mandatory pet waste management, etc.

N3. Common Area Landscape Management
Management programs will be designed and established by the property owner, who will maintain the common areas within the project site. These programs will include how to mitigate the potential dangers of fertilizer and pesticide usage (refer to the Maintenance and Frequency Table – See project Operations and Maintenance Plan).

Ongoing maintenance will be consistent with the City of Orange Model Water-Efficient Landscape Ordinance.

Fertilizer and pesticide usage shall be consistent with City of Orange Guidelines for use of Fertilizers and Pesticides.

N4. BMP Maintenance
The Homeowner Association through use of their management contractors will be responsible for maintenance each of the BMPs detailed in this plan. Maintenance operations should be logged in Appendix D.

N10: Uniform Fire Code Implementation
HOA is responsible for compliance with Article 80 of the Uniform Fire Code enforced by the City of Orange Fire Department.

N11. Common Area Litter Control
The property owners through the HOA and the contracted maintenance company will perform required common area litter control to remove any accumulated trash, debris and other litter.

N12. Employee Training
A training program will be established as it would apply to future employees, contractors, and leasers of the property owner to inform and train in maintenance activities regarding the impact of dumping oil, paints, solvents, or other potentially harmful chemicals into storm drains; the proper use of fertilizers and pesticides in landscaping maintenance practices; and the impacts of littering and improper water

disposal. Training will be done annually and with any new employees.

N14. Catch Basin Inspection

The HOA will maintain the drainage systems, including catch basins and detention systems. The HOA is required to have catch basins inspected and, if necessary, cleaned prior to the storm season, no later than October 1st each year. These duties may be contracted out to the landscape maintenance firm hired by the property owner. Please see Appendix D for maintenance program. Maintenance operations should be logged in Appendix.

N15. Street Sweeping Private Streets and Parking Lots

The HOA shall clean the surface of pavement surfaces by mechanized methods at least one time per week.

IV.2.2 Routine Structural BMPs

Table 3

Routine Structural BMPs

Name	Check One		If not applicable, state brief reason
	Included	Not Applicable	
Provide storm drain system stenciling and signage- "No Dumping – Drains to Ocean"	X		
Design and construct outdoor material storage areas to reduce pollution introduction		X	No outside storage
Design and construct trash and waste storage areas to reduce pollution introduction		X	No trash enclosures proposed
Use efficient irrigation systems & landscape design	X		
Protect slopes and channels and provide energy dissipation		X	No proposed slopes
Incorporate requirements applicable to individual project features			
a. Dock areas		X	No proposed dock areas
b. Maintenance bays		X	No proposed maintenance bays
c. Vehicle or community wash areas		X	No proposed vehicle wash areas
d. Outdoor processing areas		X	No proposed outdoor processing areas
e. Equipment wash areas		X	No proposed equipment wash areas
f. Fueling areas		X	No proposed fuel areas
g. Hillside landscaping		X	Project Site not located within hillside area
h. Wash water control for food preparation areas		X	No proposed food preparation areas

Structural BMPs

Structural BMPs shall be installed by the developer/ owner, through the construction and development of the project, for instance; slope planting and irrigation systems shall be designed by licensed landscape architects and installed by qualified contractors to specifications and standards of the City of Orange. The structural BMPs used for this project are summarized below:

Efficient Irrigation

As part of the design of all common area landscape irrigation shall employ water conservation principals, including, but not limited to, such provisions as water sensors, programmable irrigation times (for short cycles), etc., will be used. Such common areas will be maintained by the HOA.

Runoff-Minimizing Landscape Design

As part of the design of all common area landscape areas, similar planting material with

similar water requirements will be used in order to reduce excess irrigation runoff and promote surface filtration. Such common areas will be maintained by the property owner/HOA.

Catch Basin Stenciling

Phrase "No Dumping – Drains to Ocean" to be stenciled on catch basins to alert the public to the destination of pollutants discharged into storm water. This stenciling will be inspected and re-stenciled on a periodic basis by the HOA. Please see Table (8) for maintenance frequency.

IV.3 Low Impact Development BMP Selection

IV.3.1 Hydrologic Source Controls

Table 4

Hydrologic Source Control BMPs

Name	Check If Used
Localized on-lot infiltration	
Impervious area dispersion (e.g. roof top disconnection)	
Street trees (canopy interception)	
Residential rain barrels (not actively managed)	
Green roofs/Brown roofs	
Blue roofs	
Other:	
Other:	
Other:	
Other:	
Other:	
Other:	
Other:	
Other:	

* HSC BMPs are not implemented for this development.

IV.3.2 Infiltration BMPs

Table 5

Infiltration BMPs

Name	Check If Used
Bioretention without underdrains	
Rain gardens	
Porous landscaping	
Infiltration planters	
Retention swales	
Infiltration trenches	
Infiltration basins	
Drywells	
Subsurface infiltration galleries	
French drains	
Permeable asphalt	
Permeable concrete	
Permeable concrete pavers	
Other:	
Other:	

Infiltration BMPs will not be utilized and have been determined to be infeasible for this site due to potential geotechnical hazards. Biotreatment BMPs will be utilized to provide the required treatment flow rates. Refer to Geotechnical Report and Infiltration Infeasibility Letter in Appendix E.

Refer to Table 2.7 Infiltration BMP Feasibility Worksheet located within Section IV.8 for additional information.

IV.3.3 Evapotranspiration, Rainwater Harvesting BMPs

Table 6

Evapotranspiration, Rainwater Harvesting BMP

Name	Check If Used
All HSCs; *See Section IV.3.1*	
Surface-based infiltration BMPs	
Biotreatment BMPs (Modular Wetlands)	
Above-ground cisterns and basins	
Underground detention	
Other:	
Other:	
Other:	

Evapotranspiration, Rainwater Harvesting BMPs will not be utilized and have been determined to be infeasible for this site due to development type, density and available amount of landscaped area for irrigation purposes. Refer to Worksheet J for feasibility calculations within Attachment A of this report. Biotreatment BMPs will be utilized to provide the required treatment flow rates.

IV.3.4 Biotreatment BMPs

Table 7
Biotreatment BMPs

Bioretention with underdrains
Storm water planter boxes with underdrains
Rain gardens with underdrains
Constructed wetlands
Vegetated swales
Vegetated filter strips
Proprietary vegetated biotreatment systems
Wet extended detention basin
Dry extended detention basins
Other:
Other:

Proprietary Vegetated Biotreatment Systems:

Modular Wetland System (MWS) Biofiltration curb inlets will be utilized to capture and treat the stormwater runoff before leaving the site. The Modular Wetland System (MWS) Biofiltration vaults are designed to provide a 3-phase treatment train. Initially, when the stormwater enters the system, a trash rack, filter media and settling chamber will capture large trash/ debris and sediment in the stormwater before entering the planting media. This system is designed to treat stormwater flow horizontally. Before the stormwater enters the planting or "wetland" chamber, the runoff flows through the 2nd phase, a pre-filter cartridge which captures fines TSS, metals, nutrients, and bacteria. The pre-filter chamber eliminates additional maintenance of the planting area. The wetland chamber is the 3rd phase of the system which provides final treatment through a combination of physical, chemical, and biological processes. Treated stormwater runoff will be pumped and discharged into a proposed parkway drain on N. Tustin Street. There is an existing cartridge based filtration system in the existing storm drain manhole adjacent to Tustin Street. This development will not be utilizing this system to satisfy water quality requirements. Water quality requirements are satisfied with proposed facilities as noted in this report.

Refer to Attachment C for additional manufacturer's BMP information.

The MWS Biofiltration vaults were sized based on the drainage management areas and treatment flow rate method per the Orange County Technical Guidance Document worksheets. Refer to Worksheet D in Attachment A for calculations.

Catch Basin/ MWS #	Tributary Area (ac)	Required Treatment Flowrate, Q (cfs)	MWS Model	Treatment Capacity, Q (cfs)
1	1.00	0.209	MWS-L-8-8 (3.6)	0.245
2	3.07	0.641	MWS-L-10-20 (3.4)	0.693
3	0.34	0.07	MWS-L-4-6 (3.4)	0.073

*Project-specific Modular Wetland System (MWS) Biofiltration details will be provided during final engineering. Refer to additional manufacturer sizing information located within Attachment C of this report.

Treated storm water runoff discharging from the MWS Biofiltration vaults will enter the existing stormwater sump pump system and follow historic drainage patterns.

Refer to Section V and Attachment E within this report for the project-specific Operation and Maintenance (O&M) Plan.

IV.3.5 Hydromodification Control BMPs
NA

IV.3.6 Regional/Sub-Regional LID BMPs
NA

IV.3.7 Treatment Control BMPs
Connector Pipe Screen (CPS) Device: Each proposed onsite MWS vault will be equipped with a Connector Pipe Screen (CPS) device that provides full trash capture compliance and bypass sized for the 1-year, 1-hour storm event. Stormwater Connector Pipe Screens (CPS) are used to prevent trash and debris from entering the stormwater system during dry weather and moderate storm flows by keeping the trash inside the catch basin. The CPS is a screen placed permanently or temporarily in a catch basin at the location of the outlet pipe. The screen separates trash and debris from stormwater treatment flows. Flows that exceed the treatment flow rate bypass over the top of the screen. When the outlet pipe is located below a curb opening the CPS features a lid to prevent debris from passing behind the screen and flowing directly to the outlet pipe. The CPS shall be designed to retain all trash larger than 5 mm (0.197 inches) in the catch basin.

IV. 4 Water Quality Credits
NA

IV.5 Alternative Compliance Plan
NA

IV.6 Vector Control
NA

IV.7 Drainage Management Area (DMA)

DMA Number	BMPs	Area Treated
1	BIO-7: Proprietary Biofiltration	1.00
2	BIO-7: Proprietary Biofiltration	3.07
3	BIO-7: Proprietary Biofiltration	0.34
Total Area		4.41

Total Treated Area = 4.42 acres (192,099.6 sf)

IV.8 Calculations
DMA 1

$d_{remainder}$= 0.9" remainder of the design capture storm depth
A=1.00 acres (area tributary to BMP)
imp=0.87 (project imperviousness)
*C=0.*803 *(runoff coefficient, ((0.75 x imp) + 0.15))*
V_{design} = (C x $d_{remainder}$ x A x 43560 x (1/12))
= 0.803 x 0.9 x 1.00 x 43560 x (1/12) = ***2623.4 cf***
*Q_{design}= (C x i_{design} x A) = 0.*803 *x 0.2*6 *x 1.00 =* ***0.209 cfs***

DMA 2
$d_{remainder}$= 0.9" remainder of the design capture storm depth
A=3.07 acres (area tributary to BMP)
imp=0.87 (project imperviousness)
*C=0.*803 *(runoff coefficient, ((0.75 x imp) + 0.15))*
V_{design} = (C x $d_{remainder}$ x A x 43560 x (1/12))
= 0.803 x 0.9 x 3.07 x 43560 x (1/12) = ***8053.8 cf***
*Q_{design}= (C x i_{design} x A) = 0.*803 *x 0.2*6 *x 3.07 =* ***0.641 cfs***

DMA 3
$d_{remainder}$= 0.9" remainder of the design capture storm depth
A=0.34 acres (area tributary to BMP)
imp=0.87 (project imperviousness)
*C=0.*803 *(runoff coefficient, ((0.75 x imp) + 0.15))*
V_{design} = (C x $d_{remainder}$ x A x 43560 x (1/12))
= 0.803 x 0.9 x 0.34 x 43560 x (1/12) = ***891.6 cf***
*Q_{design}= (C x i_{design} x A) = 0.*803 *x 0.2*6 *x 0.34 =* ***0.07 cfs***

Refer to Worksheet B and D in this section.

Table 2.7: Infiltration BMP Feasibility Worksheet

	Infeasibility Criteria	*Yes*	*No*
1	**Would Infiltration BMPs pose significant risk for groundwater related concerns?** Refer to Appendix VII (Worksheet I) for guidance on groundwater-related infiltration feasibility criteria.	X	

Provide basis:
Soils with a medium to high expansion index were found during the geotechnical investigation at depths ranging from 5.5' to 32' deep. Historic high groundwater levels were found to be at approximately 40 feet deep. Infiltration in these conditions would pose risk to groundwater concerns.

Per the "Updated Geotechnical and Infiltration Evaluation" dated December 30, 2024 by Geotek Inc.

"SCGI reported that artificial fill was encountered beneath existing pavement sections at Boring B-5 and extended to a depth of 3± feet below existing grade. SCGI reported that artificial fill was encountered beneath existing pavement sections at Boring B-5 and extended to a depth of 3± feet below existing grade. SCGI stated that additional soils classified as possible fill were encountered in all of the borings and extended to depths of up to 5.5± feet. These fill soils consisted of stiff to very stiff clays with some fine to coarse gravel (CL soil type based upon the Unified Soil Classification System)."

"Native soils (alluvium) were reported by SCGI to underlie the artificial fills at the site. The alluvium encountered to depths of 5.5± to 12± feet generally consisted of very stiff to hard silty clays with tract to some fine gravel content (CL soil type). Beneath these materials, the borings generally encountered interbedded zones of dense to very dense silty sands and very stiff to hard silty clays (SM and CL soil types) with varying amounts of fine to coarse gravel content, extending to depths of at least 32± feet (the deepest depth explored)."

"SCGI stated that the site soils possess a high expansion potential (EI = 108)."

Per the "Review – Stormwater Infiltration Feasibility" Letter dated June 19, 2025 by GeoTek, Inc "Based upon review of the referenced Phase I Environmental Site Assessment dated February 6, 2024, prepared by EDI Consultants, leaking underground gasoline tanks from a former car wash also dispensing gasoline fuel facility resulted in subsurface soil contamination of the property (2355 North Tustin Street) located adjacent to the southwest corner of the project site. While soil vapor extraction (SVE) well operations conducted on this property resulted in the reduction of soil contamination to levels which allowed "Case Closure" of this site, some soil contamination remained in these site soils. Mounding and migration of water from the project site (2375 North Tustin Street) may also lead to migration of contaminated soil from this adjacent site."

Refer to Attachment E of this report for a copy of the Geotechnical report.

2	Would Infiltration BMPs **pose significant risk of increasing risk of geotechnical hazards that cannot be mitigated to an acceptable level**? (Yes if the answer to any of the following questions is yes, as established by a geotechnical expert): • The BMP can only be located less than 50 feet away from slopes steeper than 15 percent • The BMP can only be located less than eight feet from building foundations or an alternative setback. • A study prepared by a geotechnical professional or an available watershed study substantiates that stormwater infiltration would potentially result in significantly increased risks of geotechnical hazards that cannot be mitigated to an acceptable level.		X

Provide basis:

The site soils were found to exhibit a “Medium” (51≤EI≤90) to “High” (91≤EI≤120) Expansion Index “Updated Geotechnical and Infiltration Evaluation” dated December 30, 2024 by Geotek Inc.

The alluvium encountered to depths of 5.5± to 12± feet generally consisted of very stiff to hard silty clays with tract to some fine gravel content (CL soil type). Beneath these materials, the borings generally encountered interbedded zones of dense to very dense silty sands and very stiff to hard silty clays (SM and CL soil types) with varying amounts of fine to coarse gravel content, extending to depths of at least 32± feet (the deepest depth explored).

Soils encountered in the recent borings conducted for the referenced Update Evaluation, as well as a previous Geotechnical Investigation prepared by Southern California Geotechnical, Inc. (SCGI, 2005) for the existing site improvements, indicated the presence of fine-grained silty clay and very dense silty sand soils (CL and SM soil types) below the gravel soils. These soils are anticipated to locally act as barriers to downward percolation of water from on-site disposal facilities, most likely leading to “mounding” of the water atop these soils. Over time, this water mounding will lead to a non-functional stormwater disposal system and possible migration of water to adjacent sites.

Historic high groundwater levels are recorded to be 40’ below the existing grade.

3	Would infiltration of the DCV from drainage area **violate downstream water rights**?		X

Provide basis:

Partial Infeasibility Criteria	***Yes***	***No***

4	Is proposed infiltration facility **located on HSG D soils** or the site geotechnical investigation identifies presence of soil characteristics which support categorization as D soils?	X

Provide basis:

5	Is measured infiltration rate below proposed facility less than 0.3 inches per hour? This calculation shall be based on the methods described in Appendix VII.	X

Provide basis:
Per the Stormwater Infiltration Feasibility Letter dated June 19, 2025 provided by Geotek, Inc. “Two percolation tests were conducted for the referenced Updated Geotechnical and Infiltration Evaluation dated December 30, 2024 (GeoTek, 2024) at depths of approximately 10 feet below the existing ground surface (see Exploration Location Map, Figure 2, of the referenced report for the test locations). The results of the infiltration testing indicated poor to favorable rates (0.57 to 3.86 inches per hour). Both percolation tests appear to have been conducted within a fine- to coarse-gravel with sand and trace clay (GP soil type based upon the Unified Soil Classification System), indicating highly variable percolation characteristics within the on-site soils.”

“Soils encountered in the recent borings conducted for the referenced Update Evaluation, as well as a previous Geotechnical Investigation prepared by Southern California Geotechnical, Inc. (SCGI, 2005) for the existing site improvements, indicated the presence of fine-grained silty clay and very dense silty sand soils (CL and SM soil types) below the gravel soils. These soils are anticipated to locally act as barriers to downward percolation of water from on-site disposal facilities, most likely leading to “mounding” of the water atop these soils. Over time, this water mounding will lead to a non-functional stormwater disposal system and possible migration of water to adjacent sites.”

“As discussed in various site documents (GeoTek, 2024 and C&V, 2025), the site soils are also considered to possess up to a high expansion potential. Mounding soils and a non-functional stormwater disposal system will eventually exacerbate problems caused by expansive soil on site improvements (structures and infrastructure).”

6	Would reduction of over predeveloped conditions cause impairments to downstream beneficial uses, such as change of seasonality of ephemeral washes or increased discharge of contaminated groundwater to surface waters?	X

Provide citation to applicable study and summarize findings relative to the amount of infiltration that is permissible:

7	Would an increase in infiltration over predeveloped conditions cause impairments to downstream beneficial uses, such as change of seasonality of ephemeral washes or increased discharge of contaminated groundwater to surface waters?	X

Provide citation to applicable study and summarize findings relative to the amount of infiltration that is permissible:

Infiltration Screening Results (check box corresponding to result):

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

Worksheet B: Simple Design Capture Volume Sizing Method — DMA 1

Step 1: Determine the design capture storm depth used for calculating volume

1	Enter design capture storm depth from Figure III.1, *d* (inches)	d=	0.90	inches
2	Enter the effect of provided HSCs, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	0	inches
3	Calculate the remainder of the design capture storm depth, $d_{remainder}$ (inches) (Line 1 – Line 2)	$d_{remainder}$=	0.90	inches

Step 2: Calculate the DCV

1	Enter Project area tributary to BMP (s), *A* (acres)	A=	1.00	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	0.87	
3	Calculate runoff coefficient, *C= (0.75 x imp) + 0.15*	C=	0.803	
4	Calculate runoff volume, V_{design}= *(C x* $d_{remainder}$ *x A x 43560 x (1/12))*	V_{design}=	2,623.4	cu-ft

Step 3: Design BMPs to ensure full retention of the DCV

Step 3a: Determine design infiltration rate N/A

1	Enter measured infiltration rate, $K_{measured}$ (in/hr) (Appendix VII)	$K_{measured}$=	NA	In/hr
2	Enter combined safety factor from Worksheet H, S_{final} (unitless)	S_{final}=	NA	
3	Calculate design infiltration rate, $K_{design} = K_{measured} / S_{final}$	K_{design}=	NA	In/hr

Step 3b: Determine minimum BMP footprint

4	Enter drawdown time, *T* (max 48 hours)	T=	NA	Hours
5	Calculate max retention depth that can be drawn down within the drawdown time (feet), $D_{max} = K_{design} \times T \times (1/12)$	D_{max}=	NA	feet
6	Calculate minimum area required for BMP (sq-ft), $A_{min} = V_{design} / d_{max}$	A_{min}=	NA	sq-ft

Worksheet B: Simple Design Capture Volume Sizing Method DMA 2

Step 1: Determine the design capture storm depth used for calculating volume

1	Enter design capture storm depth from Figure III.1, *d* (inches)	d=	0.90	inches
2	Enter the effect of provided HSCs, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	0	inches
3	Calculate the remainder of the design capture storm depth, $d_{remainder}$ (inches) (Line 1 – Line 2)	$d_{remainder}$=	0.90	inches

Step 2: Calculate the DCV

1	Enter Project area tributary to BMP (s), *A* (acres)	A=	3.07	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	0.87	
3	Calculate runoff coefficient, *C= (0.75 x imp) + 0.15*	C=	0.803	
4	Calculate runoff volume, V_{design}= *(C x* $d_{remainder}$ *x A x 43560 x (1/12))*	V_{design}=	8,053.8	cu-ft

Step 3: Design BMPs to ensure full retention of the DCV

Step 3a: Determine design infiltration rate N/A

1	Enter measured infiltration rate, $K_{measured}$ (in/hr) (Appendix VII)	$K_{measured}$=	NA	In/hr
2	Enter combined safety factor from Worksheet H, S_{final} (unitless)	S_{final}=	NA	
3	Calculate design infiltration rate, $K_{design} = K_{measured} / S_{final}$	K_{design}=	NA	In/hr

Step 3b: Determine minimum BMP footprint

4	Enter drawdown time, *T* (max 48 hours)	T=	NA	Hours
5	Calculate max retention depth that can be drawn down within the drawdown time (feet), $D_{max} = K_{design} \times T \times (1/12)$	D_{max}=	NA	feet
6	Calculate minimum area required for BMP (sq-ft), $A_{min} = V_{design} / d_{max}$	A_{min}=	NA	sq-ft

Worksheet B: Simple Design Capture Volume Sizing Method DMA 3

Step 1: Determine the design capture storm depth used for calculating volume

1	Enter design capture storm depth from Figure III.1, *d* (inches)	d=	0.90	inches
2	Enter the effect of provided HSCs, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	0	inches
3	Calculate the remainder of the design capture storm depth, $d_{remainder}$ (inches) (Line 1 – Line 2)	$d_{remainder}$=	0.90	inches

Step 2: Calculate the DCV

1	Enter Project area tributary to BMP (s), *A* (acres)	A=	0.34	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	0.87	
3	Calculate runoff coefficient, *C= (0.75 x imp) + 0.15*	C=	0.803	
4	Calculate runoff volume, V_{design}= *(C x* $d_{remainder}$ *x A x 43560 x (1/12))*	V_{design}=	891.96	cu-ft

Step 3: Design BMPs to ensure full retention of the DCV

Step 3a: Determine design infiltration rate N/A

1	Enter measured infiltration rate, $K_{measured}$ (in/hr) (Appendix VII)	$K_{measured}$=	NA	In/hr
2	Enter combined safety factor from Worksheet H, S_{final} (unitless)	S_{final}=	NA	
3	Calculate design infiltration rate, $K_{design} = K_{measured} / S_{final}$	K_{design}=	NA	In/hr

Step 3b: Determine minimum BMP footprint

4	Enter drawdown time, *T* (max 48 hours)	T=	NA	Hours
5	Calculate max retention depth that can be drawn down within the drawdown time (feet), $D_{max} = K_{design} \times T \times (1/12)$	D_{max}=	NA	feet
6	Calculate minimum area required for BMP (sq-ft), $A_{min} = V_{design} / d_{max}$	A_{min}=	NA	sq-ft

Worksheet D: Capture Efficiency Method for Flow-Based BMPs DMA 1

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	
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=	0.26	in/hr
3	Enter the effect depth of provided HSCs upstream, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	0	inches
4	Enter capture efficiency corresponding to d_{HSC}, Y_2 (Worksheet A)	Y_2=	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	
6	Determine the design intensity that must be provided by BMP, $I_{design}= I_1-I_2$	I_{design}=	0.26	

Step 2: Calculate the design flowrate

1	Enter Project area tributary to BMP (s), *A* (acres)	A=	1.00	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	0.87	
3	Calculate runoff coefficient, $C= (0.75 \times imp) + 0.15$	C=	0.803	
4	Calculate design flowrate, $Q_{design}= (C \times i_{design} \times A)$	Q_{design}=	0.209	cfs

Supporting Calculations

Describe system:
Stormwater runoff will be collected by catch basins each equipped with a Connector Pipe Screen (CPS) Device: Connector Pipe Screen (CPS) devices will be utilized prior to the proposed overflow storm drain pipe to provide full trash capture requirements and an area drain system and routed to one of three (3) Modular Wetlands System (MWS) Biofiltration vaults for treatment and discharge via a stormwater sump pump system and parkway drain to the public right-of-way of N. Tustin Street.

Provide time of concentration assumptions:

The Time of Concentration was assumed to be 5 minutes for conservative purposes.

Worksheet D: Capture Efficiency Method for Flow-Based BMPs DMA 2

Step 1: Determine the design capture storm depth used for calculating volume

1	Enter the time of concentration, T_c (min) (See Appendix IV.2)	T_c=	5	
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=	0.26	in/hr
3	Enter the effect depth of provided HSCs upstream, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	0	inches
4	Enter capture efficiency corresponding to d_{HSC}, Y_2 (Worksheet A)	Y_2=	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	
6	Determine the design intensity that must be provided by BMP, $I_{design}= I_1-I_2$	I_{design}=	0.26	

Step 2: Calculate the design flowrate

1	Enter Project area tributary to BMP (s), *A* (acres)	A=	3.07	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	0.87	
3	Calculate runoff coefficient, $C= (0.75 \times imp) + 0.15$	C=	0.803	
4	Calculate design flowrate, $Q_{design}= (C \times i_{design} \times A)$	Q_{design}=	0.641	cfs

Supporting Calculations

Describe system:
Stormwater runoff will be collected by catch basins each equipped with a Connector Pipe Screen (CPS) Device: Connector Pipe Screen (CPS) devices will be utilized prior to the proposed overflow storm drain pipe to provide full trash capture requirements and an area drain system and routed to one of three (3) Modular Wetlands System (MWS) Biofiltration vaults for treatment and discharge via a stormwater sump pump system and parkway drain to the public right-of-way of N. Tustin Street.

Provide time of concentration assumptions:

The Time of Concentration was assumed to be 5 minutes for conservative purposes.

Worksheet D: Capture Efficiency Method for Flow-Based BMPs DMA 3

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	
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=	0.26	in/hr
3	Enter the effect depth of provided HSCs upstream, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	0	inches
4	Enter capture efficiency corresponding to d_{HSC}, Y_2 (Worksheet A)	Y_2=	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	
6	Determine the design intensity that must be provided by BMP, $I_{design}= I_1-I_2$	I_{design}=	0.26	

Step 2: Calculate the design flowrate

1	Enter Project area tributary to BMP (s), *A* (acres)	A=	0.34	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	0.87	
3	Calculate runoff coefficient, $C= (0.75 \times imp) + 0.15$	C=	0.803	
4	Calculate design flowrate, $Q_{design}= (C \times i_{design} \times A)$	Q_{design}=	0.07	cfs

Supporting Calculations

Describe system:
Stormwater runoff will be collected by catch basins each equipped with a Connector Pipe Screen (CPS) Device: Connector Pipe Screen (CPS) devices will be utilized prior to the proposed overflow storm drain pipe to provide full trash capture requirements and an area drain system and routed to one of three (3) Modular Wetlands System (MWS) Biofiltration vaults for treatment and discharge via a stormwater sump pump system and parkway drain to the public right-of-way of N. Tustin Street.

Provide time of concentration assumptions:

The Time of Concentration was assumed to be 5 minutes for conservative purposes.

Worksheet D: Capture Efficiency Method for Flow-Based BMPs

Graphical Operations

$I(2) = 0.00$ $I(1) = 0.26$

Provide supporting graphical operations. See Example III.7.

Susceptibility

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TITLE

SUSCEPTIBILITY ANALYIS
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V. Implementation, Maintenance and Inspection Responsibility for BMPs (O&M Plan)

Responsible Party Information (Local Contact Information)

Name: Chad Brown Title: Vice President of Planning and Development

Company: Melia Homes Phone Number: (949) 759-4367

The property is currently owned by Melia Homes. The Owner will be responsible for the long term maintenance of the project's storm water facilities and conformance to this WQMP after construction is complete. A Notice of Transfer of Responsibility is located at the beginning of this report and should be executed as part of any ownership transfer after construction is complete. The owner will appoint a Homeowner's Association (HOA) to provide long term BMP maintenance for the proposed development upon completion of construction.

Table 8 - Frequency Inspection Matrix

BMP	Responsible Party	*Maintenance Activity	*Inspection/Maintenance Frequency
Source Control BMPs (Structural and Non-structural)			
N1. Education for Property Owners, Tenants & Occupants	Owner/ HOA	This will be addressed through educational materials. All included materials provide ways of mitigating stormwater pollution in everyday activities associated with residents as well as employees of the property management company and their sub-contractors. Practical informational materials are provided to residents, occupants, or tenants to increase the public's understanding of stormwater quality, sources of pollutants, and what they can do to reduce pollutants in	The distribution of these materials will be the responsibility of the HOA at the time of the leasing signing or purchase per property owner, tenant or occupant. Annual newsletters shall be provided by HOA to property owners, tenants and occupants.

		stormwater.	
N2. Activity Restriction	Owner/ HOA	Rules or guidelines for developments are established within the appropriate documents which prohibit activities that can result in discharges of pollutants. Car washing or washing of hardscaped surfaced such as sidewalks, streets, parking lots, vehicle maintenance will not be allowed on the subject site.	The distribution of these materials will be the responsibility of the HOA at the time of the leasing signing or purchase per property owner, tenant or occupant.
N3. Common Area Landscaped Management	Owner / HOA	Specific practices are followed and ongoing maintenance is conducted to minimize erosion and over-irrigation, conserve water, and reduce pesticide and fertilizer applications and remove all trash/ debris and litter.	Landscape maintenance should occur at least once per week or to the desire of the HOA. Overall landscape care should be inspected monthly.
N4. BMP Maintenance	Owner / HOA	In order to ensure adequate and comprehensive BMP implementation, all responsible parties are identified for implementing all non-structural and structural BMPs, cleaning, inspection, and other maintenance activities are specified including responsible parties for conducting such activities.	4 Inspections/ Cleanings per year per manufacturer's specifications starting on or near October 1st (before the rainy season)
N11. Common Area Litter Control		The landscape contractor through the HOA will remove trash	It will be the responsibility of the HOA to empty and maintain the upkeep of

		within the open areas.	these areas on a weekly basis.
N12. Employee Training	Owner / HOA	HOA to provide proper employee training for all site concerns.	At the time of employment or when there is a policy change
N14. Common Area Catch Basin Inspection	Owner / HOA	Common inspection should occur weekly or prior to any significant storm events by method of clearing any trash/ debris from the catch basin.	Weekly visual inspection and maintenance when debris is present.
N15. Street Sweeping Private Street and Parking Lots	Owner / HOA	Regular sweeping is conducted to reduce pollution of drainage water.	On a weekly basis
S1. Storm Drain System Stenciling & Signage	Owner / HOA	Catch Basin Stenciling and Signage will be specified on all on-site catch basins.	Any defacement of the signage should be addressed immediately by the HOA and visually inspected annually.
S2. Use Efficient Irrigation Systems & Landscape Design	Owner / HOA	Irrigation system and landscaped design shall be monitored by HOA selected landscaping company to verify appropriate watering measures and the landscaping/ irrigation systems are maintained.	At minimum one time per month.
Low Impact Development and Treatment BMPs			
BIO-7: Modular Wetlands System (MWS) Biofiltration Vault	Owner/ HOA	Owner/ HOA will be required to hire a professional maintenance company to provide regular inspections, repairs and cleaning per manufacturer's specifications.	Inspections/ Cleanings should occur at least two times per year and before the start of the rainy season (October 1st). Refer to Attachment C for additional information and manufacturer's specifications.
Connector Pipe Screen (CPS) Device	Owner/ HOA	HOA will be required to hire a professional maintenance company to provide regular	Inspections/ cleanings should occur at least two times per year and before the start of the rainy

		inspection, repairs, and cleaning per manufacturer's specifications. All trash/ debris and loose sediment/ silt shall be removed and screen replacement per manufacturer's specifications.	season (October 1st). Refer to Attachment C for additional information and manufacturer's specifications.
Storm Water Sump Pump	Owner/ HOA	Owner/ HOA to conduct regular inspections and cleanings of pump station area, report performance deficiencies, and schedule regular inspections by professional technician.	Inspections/ cleanings should occur at least two times per year and before the start of the rainy season (October 1st). Scheduled inspections by technician should occur at least once per year/ per manufacturer's recommendation.
Existing CDS 816 Media Filter System	Owner/ HOA	Owner/ HOA will be required to hire a professional maintenance company to provide regular inspections, repairs and cleaning per manufacturer's specifications.	Inspections/ Cleanings should occur at least two times per year and before the start of the rainy season (October 1st). Refer to Attachment C for additional information and manufacturer's specifications.
Existing Catch Basin Inlet Filter	Owner/ HOA	Owner/ HOA to conduct regular inspections and cleanings. Clean and remove all debris within basins at least once per month.	Inspection three times per year, at minimum or per manufacturer's specifications. Replacement of filter once per year, prior to start of rainy season (October 1 st). Repair and/ or replacement of components as needed.

Regulatory Permits
NA

Funding
Melia Homes
9860 Irvine Center Drive
Irvine, Ca 92618
(949) 759-4367

Maintenance requirements and responsibilities for the property will be listed in the Maintenance Contract for this project and will be the responsibility of the HOA after final construction at all times. Maintenance Contract to follow during final WQMP approval.

OWNER SELF CERTIFICATION STATEMENT

As the owner representative of the 2375 N. Tustin Street project for which a Water Quality Management Plan (WQMP) was approved by the City, I hereby certify under penalty of law that all Best Management Practices contained within the approved Project WQMP have been maintained and inspected in accordance with the schedule and frequency outlined in the approved WQMP Maintenance Table.

The maintenance activities and inspections conducted are shown in the attached table and have been performed by qualified and knowledgeable individuals. Structural Treatment BMPs have been inspected and certified by a licensed professional engineer.

To the best of my knowledge, the information submitted is true and accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and citations for violating water quality regulations.

Signed: _____

Name: _____

Title: _____

Company: _____

Address: _____

Telephone Number: _____

Date: _____

BMP Implementation Tracking Table

BMP	Activity/ Frequency	Completion Dates	Initial
Source Control BMPs (Structural and Nonstructural)			
N1. Education for Property Owners, Tenants & Occupants	This will be addressed through educational materials. All included materials provide ways of mitigating stormwater pollution in everyday activities associated with residents as well as employees of the property management company and their sub-contractors. Practical informational materials are provided to residents, occupants, or tenants to increase the public's understanding of stormwater quality, sources of pollutants, and what they can do to reduce pollutants in stormwater. Distribution of these materials is required at the time of purchase or lease signing.		
N2. Activity Restriction	Rules or guidelines for developments are established within the appropriate documents which prohibit activities that can result in discharges of pollutants. Car washing or washing of hardscaped surfaced such as sidewalks, streets, parking lots, vehicle maintenance will not be allowed on the subject site. Distribution of these materials is required at the time of purchase or lease signing. Landscape maintenance shall occur at least once per week.		
N3. Common Area Landscaped Management	Specific practices are followed and ongoing maintenance is conducted to minimize erosion and over-irrigation, conserve water, and reduce pesticide and fertilizer applications and remove all trash/ debris and litter.		
N4. BMP	In order to ensure adequate and		

Maintenance	comprehensive BMP implementation, all responsible parties are identified for implementing all non-structural and structural BMPs, cleaning, inspection, and other maintenance activities are specified including responsible parties for conducting such activities. 4 Inspections per year per manufacturer's specifications.		
N11. Common Area Litter Control	The landscape contractor through the HOA will remove trash within the open areas. Litter control shall be maintained at least once per week.		
N12. Employee Training	HOA to provide proper employee training for all site concerns. Shall be provided to all new employees at the time of hiring.		
N14. Common Area Catch Basin Inspection	Common inspection should occur weekly or prior to any significant storm events by method of clearing any trash/ debris from the catch basin. Shall occur on a weekly basis.		
N15. Street Sweeping Private Street and Parking Lots	Regular sweeping is conducted to reduce pollution of drainage water. Shall occur on a weekly basis.		
S1. Storm Drain System Stenciling & Signage	Catch Basin Stenciling and Signage will be specified on all on-site catch basins. Visually inspected yearly, replace/ repair immediately as needed.		
S2. Use Efficient Irrigation Systems & Landscape Design	Irrigation system and landscaped design shall be monitored by HOA selected landscaping company to verify appropriate watering measures and the landscaping/ irrigation systems are maintained. Shall be inspected at minimum one time per month.		
Low Impact Development and Treatment BMPs			
BIO-7: Modular	Owner/ HOA will be required to hire		

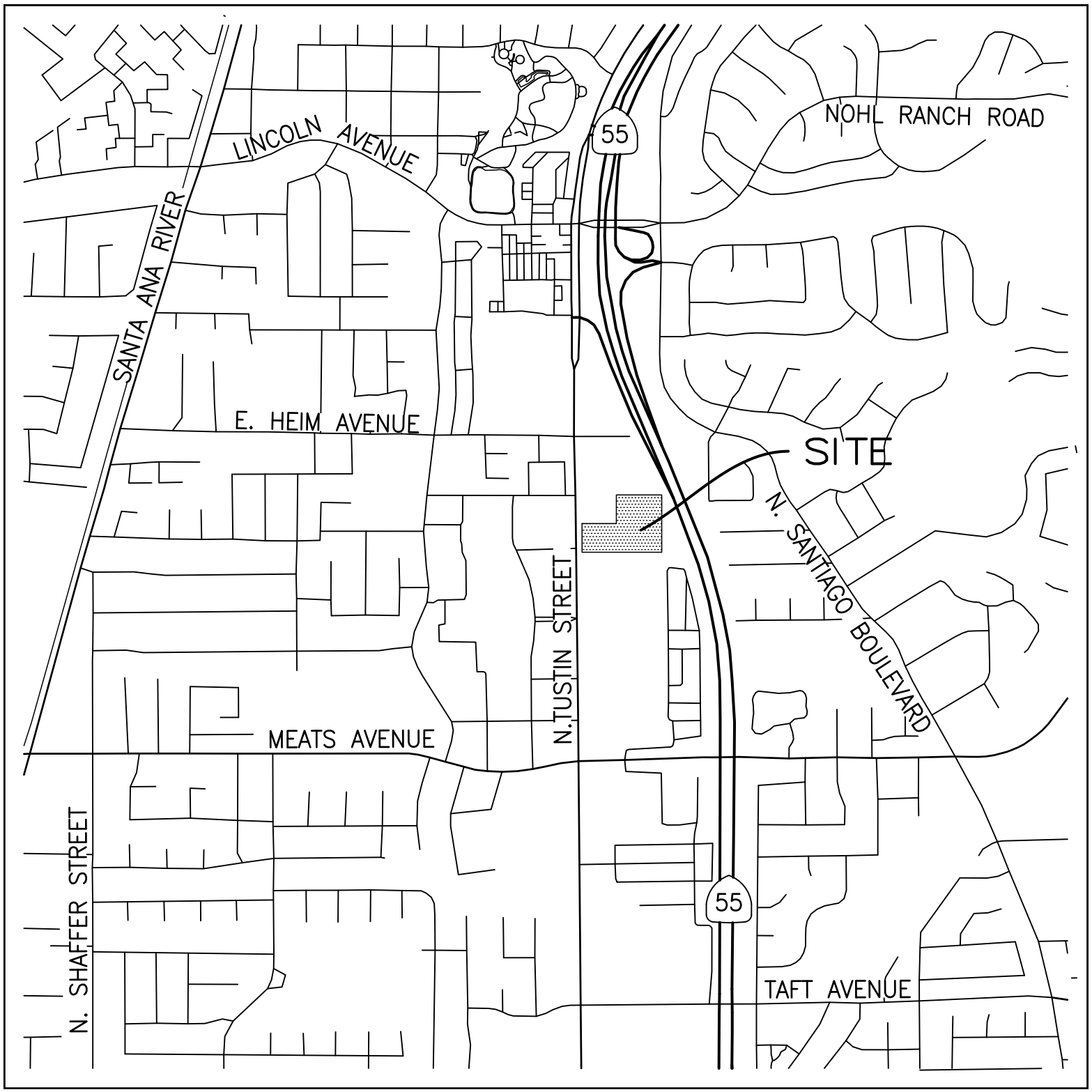
Wetlands System (MWS) Biofiltration Vaults	a professional maintenance company to provide regular inspections, repairs and cleaning per manufacturer's specifications.		
Connector Pipe Screen (CPS) Device	HOA will be required to hire a professional maintenance company to provide regular inspection, repairs, and cleaning per manufacturer's specifications. All trash/ debris and loose sediment/ silt shall be removed and screen replacement per manufacturer's specifications.		
Storm Water Sump Pump	Owner/ HOA to conduct regular inspections and cleanings of pump station area, report performance deficiencies, and schedule regular inspections by professional technician.		
Existing CDS 816 Media Filter System	HOA will be required to hire a professional maintenance company to provide regular inspection, repairs, and cleaning per manufacturer's specifications. All trash/ debris and loose sediment/ silt shall be removed and screen replacement per manufacturer's specifications.		
Existing Catch Basin Inlet Filter	HOA will be required to hire a professional maintenance company to provide regular inspection, repairs, and cleaning per manufacturer's specifications. All trash/ debris and loose sediment/ silt shall be removed and screen replacement per manufacturer's specifications.		

* This sheet is to be submitted annually with the Owner Self Certification Statement.
** Structural Treatment BMPs should be certified by a Licensed Professional Engineer.

VI. Location Map, Site Plan, and BMP Details

Include a location map that identifies project location and proximity to nearby water bodies. In an 11X17 sheet Identify land use, cover, feasibility constraints, structures, buildings, number of units, landscape areas, storm drain inlets, storm drain facilities, drainage flow direction, structural and treatment BMP locations, dumpsters, trash enclosures, wash areas, etc.

Delineate drainage management areas showing limits (acreage) of each drainage area for all structural, treatment and Low Impact Development BMPs used and provide BMP details on plan or in Appendix C.



VICINITY MAP

NOT TO SCALE

N



LOCATION MAP

NOT TO SCALE

VII. Educational Materials

Refer to the City's website www.cityoforange.org or the Orange County Stormwater Program (ocwatersheds.com) for a library of materials available. Attach *only* the educational materials specifically applicable to the project.

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

Appendix A:

Conditions of Approval

Resolution Number_____ dated_____

Appendix B:

Educational Material

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

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

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

Did You Know?

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

Where Does It Go?

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

Sources of Non-Point Source Pollution

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



The Effect on the Ocean



Non-point source pollution can have a serious impact on water quality in Orange County. Pollutants from the storm drain system can harm marine life as well as coastal and wetland habitats. They can also degrade recreation areas such as beaches, harbors and bays.

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

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



For More Information

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

Orange County Stormwater Program

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

Printed on Recycled Paper

The Ocean Begins at Your Front Door





Preventing water pollution at your commercial/industrial site

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

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

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

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

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

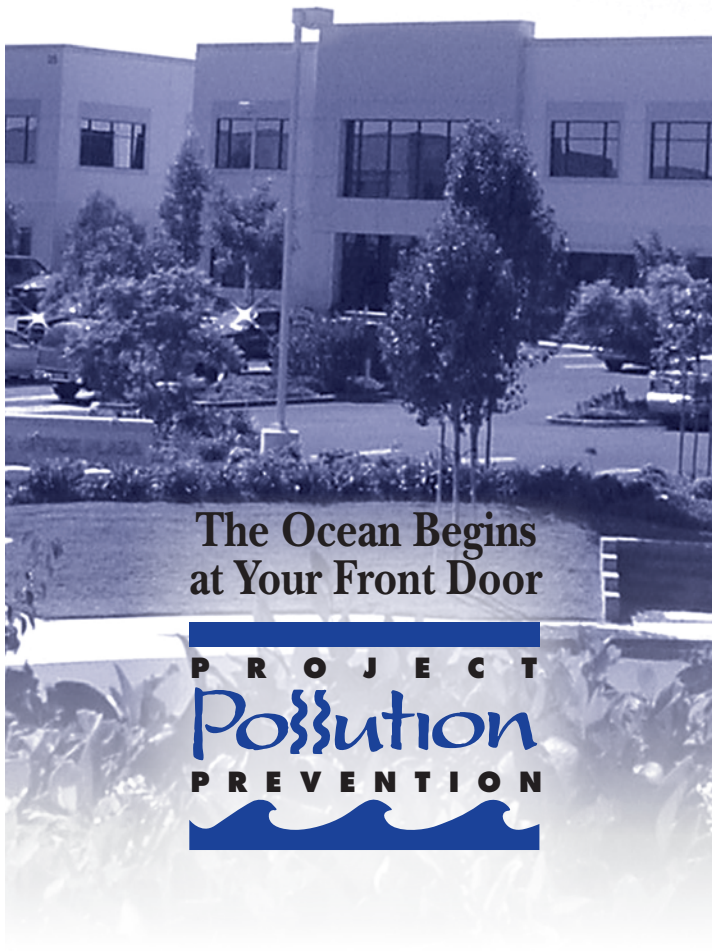
For emergencies, dial 911.

RECYCLE USED OIL

Printed on Recycled Paper

Help Prevent Ocean Pollution:

Proper Maintenance Practices for Your Business



The Ocean Begins at Your Front Door

PROJECT Pollution PREVENTION

Proper Maintenance Practices for your Business

Landscape Maintenance

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

Building Maintenance

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

Never Dispose of Anything in the Storm Drain.

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

PROJECT Pollution PREVENTION

HOMEOWNER TIPS
PROTECTING WATER

Before Buying Pest Control Products

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

Before Mixing Your Sprayer



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

When You're Ready To Spray

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

When You're Spraying

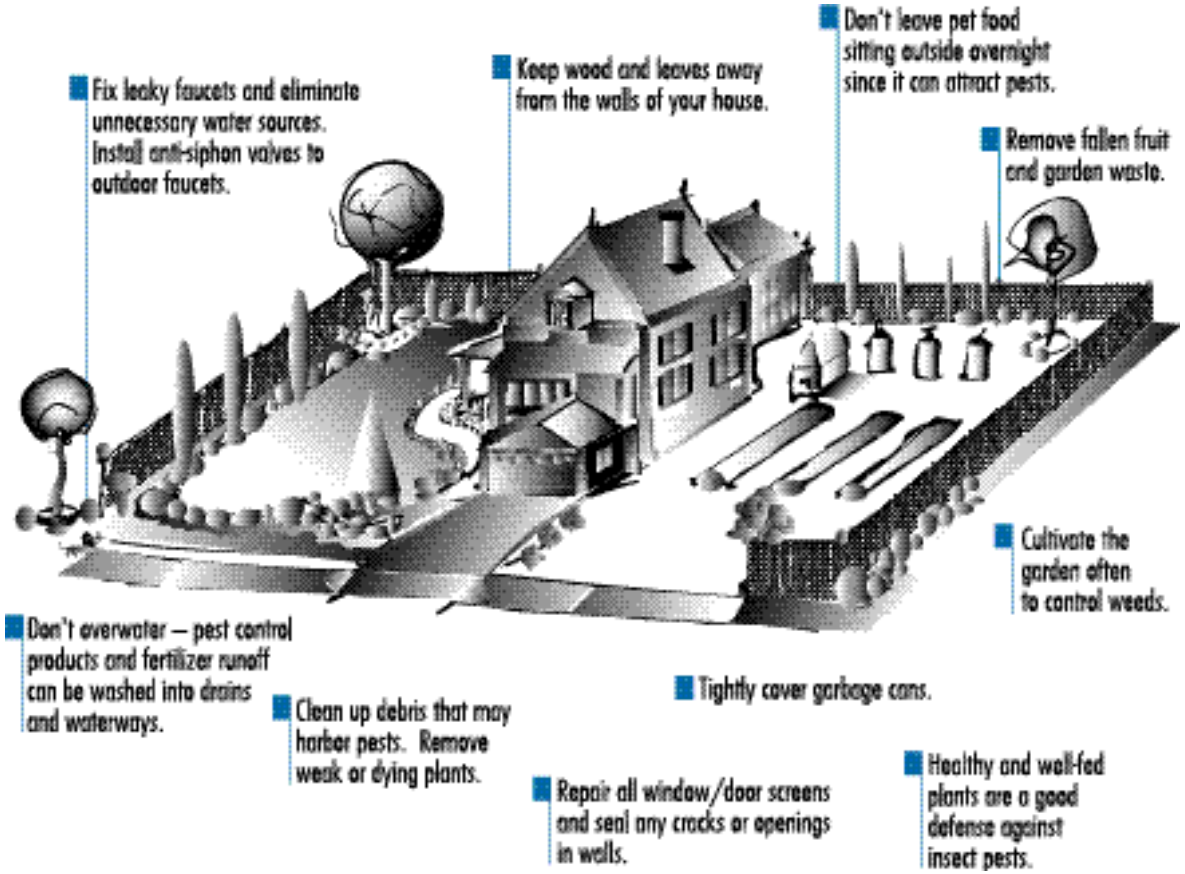
- AVOID spraying in or near storm drains, ditches, streams, and ponds!
- Leave an untreated strip around these areas to protect the water.

When You're done

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

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





IPM... Outsmarting Pests While Protecting Water

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

- First, identify your pest problem. To find the best solution, you need to pin down the problem. Consult gardening books, your county cooperative extension office or your local nursery.
- Decide how much pest control is necessary. If you can live with some pest damage, you can avoid intensive pest control product treatments.
- Choose an effective option. Try various types of controls first: washing bugs off plants, pruning diseased parts of plants. If you need to use pest control products, choose one that targets the problem and poses the least hazard.
- Finally, it's easier to prevent pests than to control them.

Think ahead.



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

Orange County Storm Water Program Participants:

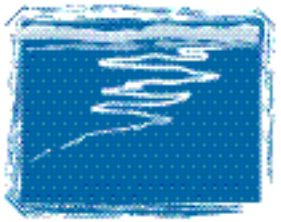
Anaheim Public Works/Engineering	(714) 765-5176
Brea Engineering	(714) 990-7666
Buena Park Public Works	(714) 562-3655
Costa Mesa Public Services	(714) 754-5248
Cypress Engineering	(714) 229-6752
Dana Point Public Works	(949) 248-3562
Fountain Valley Public Works	(714) 593-4400 x347
Fullerton Engineering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

Other Important Phone Numbers:

For Additional Brochures	1-877-89-SPILL (1-877-897-7455)
UC Masters & Coop Extension	(714) 708-1646 ucmastergardeners@yahoo.com
O.C. Household Hazardous Waste Information	(714) 834-6752 or www.oc.ca.gov/IWMD
Information on agriculture chemicals, pesticides and possible alternatives, O.C. Agriculture Commissioner	(714) 447-7115

Original graphics developed with support from:
Coalition For Urban/Rural Environmental Stewardship (CURES)
Western Crop Protection Association (WCPA)
Responsible Industry for a Sound Environment (RISE)

Keeping Pest Control Products Out of Creeks, Rivers and The Ocean



HOMEOWNER TIPS

PROTECTING WATER

Sewage Spill Regulatory Requirements

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

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

Orange County Stormwater Program
24 Hour Water Pollution Reporting Hotline
1-877-89-SPILL (1-877-897-7455)

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

Orange County Health Care Agency Environmental Health
(714) 433-6419

California Health and Safety Code, Sections 5410-5416

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

Regional Water Quality Control Board
Santa Ana Region (951) 782-4130
San Diego Region (858) 467-2952

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

California Office of Emergency Services
(800) 852-7550

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

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

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Sewage Spill
Reference Guide

Your Responsibilities as a Private Property Owner

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



Orange County Sanitation District

Health Care Agency
Environmental Health

PROJECT Pollution PREVENTION
www.ocwatersheds.com

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

What is a Sewage Spill?

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

Common Causes of Sewage Spills

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

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

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

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

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

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

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

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

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



Overflowing cleanout pipe located on private property

You Could Be Liable

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

What to Look For

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

Look for:

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

Caution

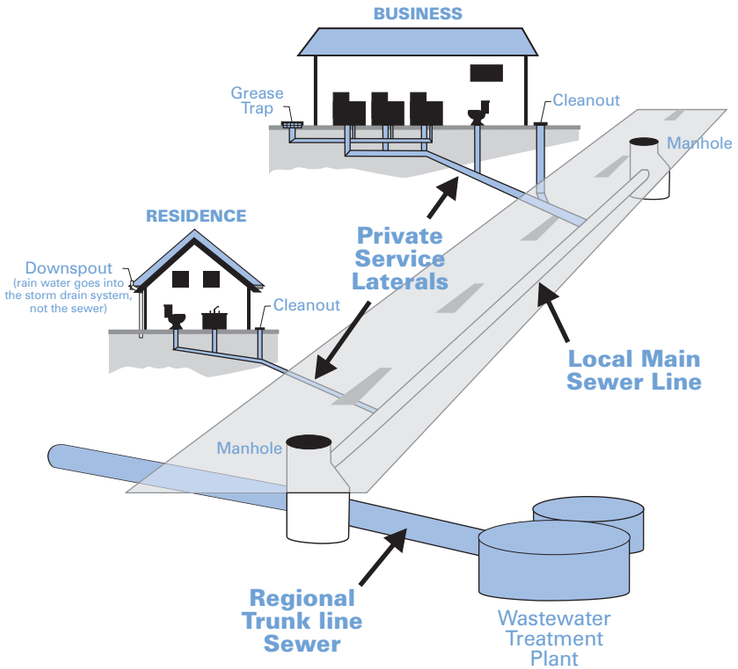
Keep people and pets away from the affected area. Untreated sewage has high levels of disease-causing viruses and bacteria. Call your local health care agency listed on the back for more information.

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

How a Sewer System Works

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

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



How You Can Prevent Sewage Spills

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



Preventing Grease Blockages

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

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

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

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

Orange County Agency Responsibilites

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

You Could Be Liable for Not Protecting the Environment

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

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

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



Report Sewage Spills!

City Sewer/Public Works Departments

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

Public Sewer/Water Districts

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

Other Agencies

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



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

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

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

UCCE Master Gardener Hotline:
(714) 708-1646

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

For emergencies, dial 911.

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

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Help Prevent Ocean Pollution:

Tips for Landscape & Gardening



The Ocean Begins at Your Front Door

PROJECT Pollution PREVENTION

Tips for Landscape & Gardening

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

General Landscaping Tips

- Protect stockpiles and materials from wind and rain by storing them under tarps or secured plastic sheeting.
- Prevent erosion of slopes by planting fast-growing, dense ground covering plants. These will shield and bind the soil.
- Plant native vegetation to reduce the amount of water, fertilizers, and pesticide applied to the landscape.



- Never apply pesticides or fertilizers when rain is predicted within the next 48 hours.

Garden & Lawn Maintenance

- Do not overwater. Use irrigation practices such as drip irrigation, soaker hoses or micro spray systems. Periodically inspect and fix leaks and misdirected sprinklers.
- Do not rake or blow leaves, clippings or pruning waste into the street, gutter or storm drain. Instead, dispose of green waste by composting, hauling it to a permitted landfill, or recycling it through your city's program.



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



- Rinse empty pesticide containers and re-use rinse water as you would use the product. Do not dump rinse water down storm drains. Dispose of empty containers in the trash.
- When available, use non-toxic alternatives to traditional pesticides, and use pesticides specifically designed to control the pest you are targeting. For more information, visit **www.ipm.ucdavis.edu**.
- If fertilizer is spilled, sweep up the spill before irrigating. If the spill is liquid, apply an absorbent material such as cat litter, and then sweep it up and dispose of it in the trash.
- Take unwanted pesticides to a Household Hazardous Waste Collection Center to be recycled. Locations are provided below.

Household Hazardous Waste Collection Centers

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

For more information, call (714) 834-6752 or visit www.oclandfills.com



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

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

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

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

For emergencies, dial 911.

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

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Help Prevent Ocean Pollution:

Tips for Projects Using Paint



Tips for Projects Using Paint

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

Purchasing Paint

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

Painting

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

Cleaning

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

Storing Paint

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

Alternatives to Disposal

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



Disposing of Paint

- Never put wet paint in the trash.

For water-based paint:

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

For oil-based paint:

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

Aerosol paint:

- Dispose of aerosol paint cans at a HHWCC.

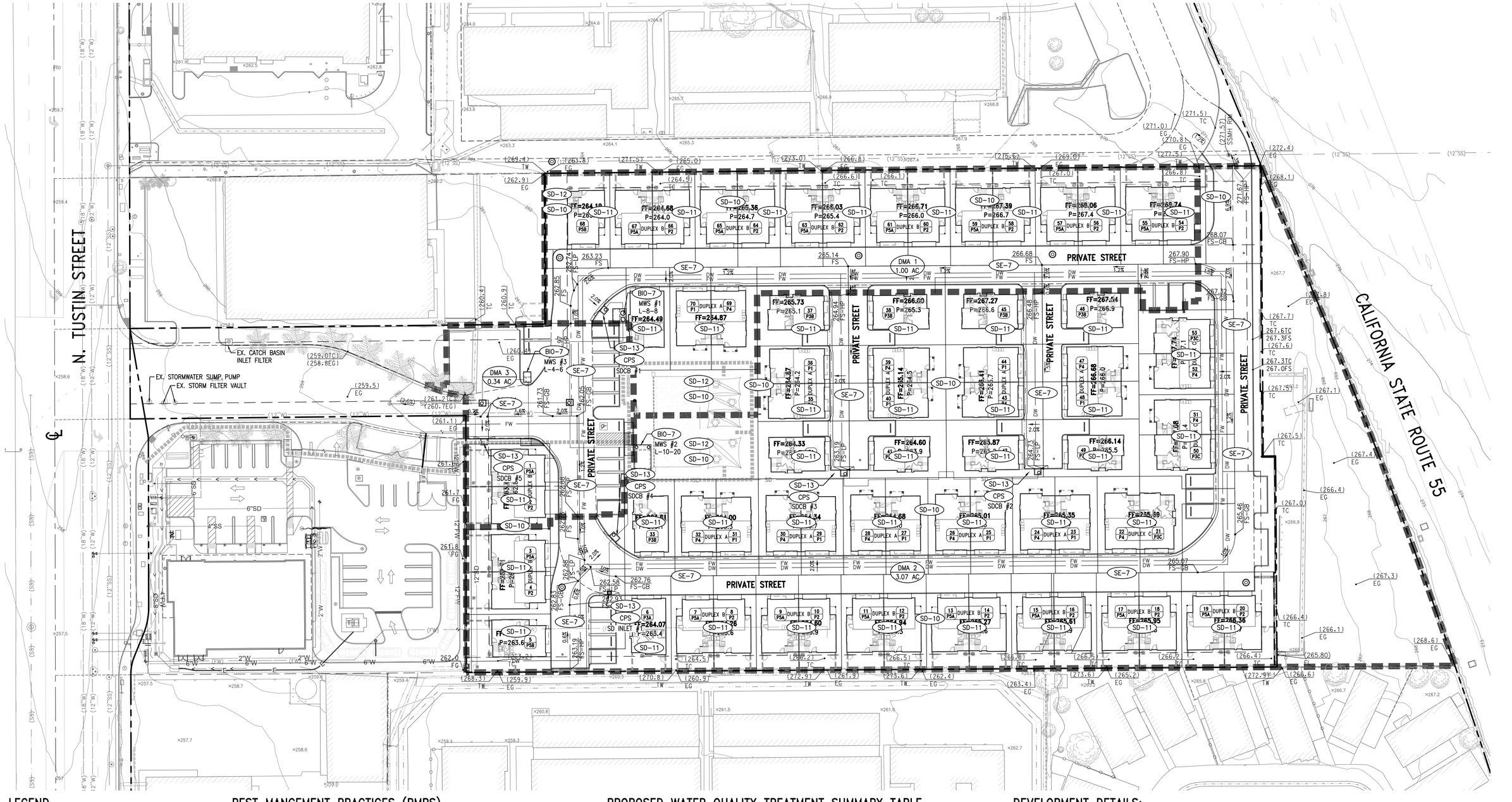
Spills

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

PROJECT Pollution PREVENTION

Appendix C:

BMP Details



LEGEND

- EXISTING RIGHT-OF-WAY/ BOUNDARY
- PROPOSED RIGHT-OF-WAY/ BOUNDARY
- DRAINAGE MANAGEMENT AREA (DMA)
- EXISTING STORM DRAIN
- PROPOSED STORM DRAIN
- DRAINAGE FLOW ARROWS
- PROPOSED CATCH BASIN
- DMA X / X.XX AC — DRAINAGE MANAGEMENT AREA (DMA) / ACREAGE

BEST MANGEMENT PRACTICES (BMPS)

SD-10	SITE DESIGN & LANDSCAPE PLANNING
SD-11	ROOF RUNOFF CONTROLS
SD-12	EFFICIENT IRRIGATION
SD-13	STORM DRAIN SIGNAGE
SE-7	STREET SWEEPING & VACUUMING
BIO-7	MODULAR WETLANDS SYSTEM (MWS), BIOFILTRATION VAULT (SEE PROJECT WQMP FOR ADDITIONAL DETAILS)
CPS	CONNECTOR PIPE SCREEN (CPS) DEVICE

PROPOSED WATER QUALITY TREATMENT SUMMARY TABLE

DMA	AREA (AC)	REQUIRED TREATMENT FLOW RATE (CFS)	MWS MODEL	TREATMENT CAPACITY (CFS)
1	1.00	0.209	MWS-L-8-8	0.231
2	3.07	0.641	MWS-L-10-20	0.693
3	0.34	0.07	MWS-L-4-6	0.073

DEVELOPMENT DETAILS:

- LAND USE: RESIDENTIAL
- FEASIBILITY CONSTRAINTS: DENSE/ EXPANSIVE SOILS, MOUNDING, VARIABLE SOILS ACROSS THE SITE
- NUMBER OF BUILDINGS: 48 BUILDINGS
- NUMBER OF UNITS: 71 UNITS
- TRASH IS PROPOSED TO BE INDIVIDUAL BINS
- WASH AREAS ARE PROHIBITED ONSITE

SCALE: 1" = 30'

0 15 30 60

PREPARED BY:
C&V CONSULTING, INC.
CIVIL ENGINEERING
LAND PLANNING & SURVEYING
9830 IRVINE CENTER DRIVE
IRVINE, CALIFORNIA 92618
(949) 581-3800
INFO@CVC-INC.NET
WWW.CVC-INC.NET

PRELIMINARY WQMP EXHIBIT

TTM 19392

2375 N. TUSTIN STREET,
CITY OF ORANGE

SHEET 1 OF 1
CONTRACT
ACCOUNT
DWG. NO.

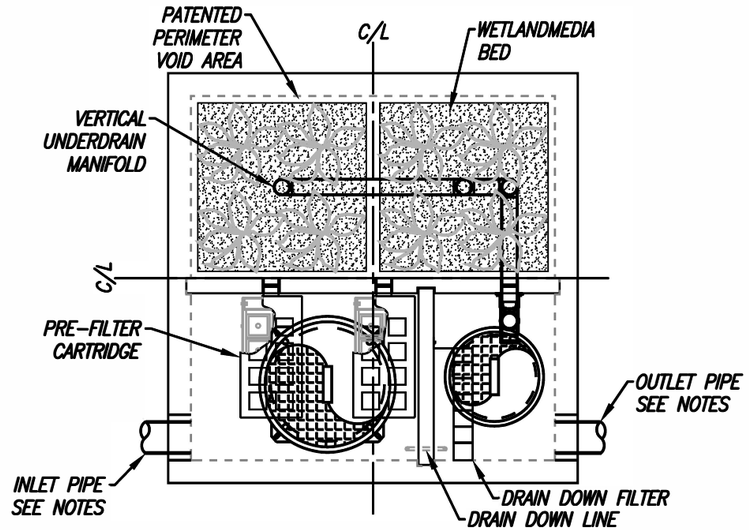
PLAN SET:
DATE: 9/14/23

DWG: P:\VMEGA-019\dwg\Sheets\EH\wqmp\Preliminary\EH-WQMP-Prelim.dwg BY: smcmasters Sep 04, 2023 - 7:12:48pm PROJ: MEGA-019

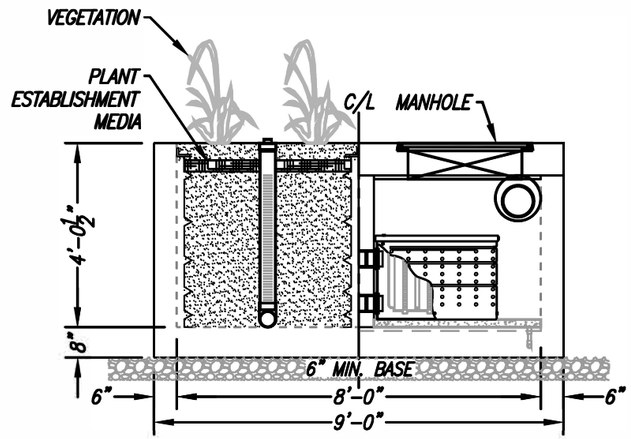
MWS Linear 2.0 HGL Sizing Calculations

MWS MODEL SIZE	WETLAND PERMITER LENGTH	LOADING RATE GPM/SF	HGL HEIGHT																												
			SHALLOW MODELS																			STANDARD HEIGHT MODEL	HIGH CAPACITY MODELS									
			1.4	1.5	1.6	1.7	1.8	1.9	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0	3.1	3.2	3.3	3.4	3.5	3.6	3.65	3.70	3.75	3.80	3.85	3.90	3.95
MWS-L-4-4	6.70	1.0	0.022	0.023	0.025	0.026	0.028	0.029	0.031	0.032	0.034	0.035	0.037	0.038	0.040	0.042	0.043	0.045	0.046	0.048	0.049	0.051	**0.052**	0.054	0.055	0.056	0.057	0.058	0.058	0.059	0.060	0.061
~~**MWS-L-4-6**~~	~~10.00~~	~~1.0~~	~~0.032~~	~~0.035~~	~~0.037~~	~~0.039~~	~~0.042~~	~~0.044~~	~~0.046~~	~~0.048~~	~~0.051~~	~~0.053~~	~~0.055~~	~~0.058~~	~~0.060~~	~~0.062~~	~~0.065~~	~~0.067~~	~~0.069~~	~~0.072~~	~~0.074~~	~~0.076~~	~~**0.078**~~	~~0.081~~	~~0.083~~	~~0.084~~	~~0.085~~	~~0.087~~	~~0.088~~	~~0.089~~	~~0.090~~	~~0.091~~
MWS-L-4-6	9.30	1.0	0.030	0.032	0.034	0.036	0.038	0.041	0.043	0.045	0.047	0.049	0.051	0.053	0.055	0.058	0.060	0.062	0.064	0.066	0.068	0.070	**0.073**	0.075	0.077	0.078	0.079	0.080	0.081	0.082	0.083	0.084
MWS-L-4-8	14.80	1.0	0.048	0.051	0.054	0.058	0.061	0.065	0.068	0.071	0.075	0.078	0.082	0.085	0.088	0.092	0.095	0.099	0.102	0.105	0.109	0.112	**0.115**	0.119	0.122	0.124	0.126	0.127	0.129	0.131	0.132	0.134
MWS-L-4-13	18.40	1.0	0.059	0.063	0.068	0.072	0.076	0.080	0.084	0.089	0.093	0.097	0.101	0.106	0.110	0.114	0.118	0.122	0.127	0.131	0.135	0.139	**0.144**	0.148	0.152	0.154	0.156	0.158	0.160	0.163	0.165	0.167
MWS-L-4-15	22.40	1.0	0.072	0.077	0.082	0.087	0.093	0.098	0.103	0.108	0.113	0.118	0.123	0.129	0.134	0.139	0.144	0.149	0.154	0.159	0.165	0.170	**0.175**	0.180	0.185	0.188	0.190	0.193	0.195	0.198	0.200	0.203
MWS-L-4-17	26.40	1.0	0.085	0.091	0.097	0.103	0.109	0.115	0.121	0.127	0.133	0.139	0.145	0.151	0.158	0.164	0.170	0.176	0.182	0.188	0.194	0.200	**0.206**	0.212	0.218	0.221	0.224	0.227	0.230	0.233	0.236	0.239
MWS-L-4-19	30.40	1.0	0.098	0.105	0.112	0.119	0.126	0.133	0.140	0.147	0.153	0.160	0.167	0.174	0.181	0.188	0.195	0.202	0.209	0.216	0.223	0.230	**0.237**	0.244	0.251	0.255	0.258	0.262	0.265	0.269	0.272	0.276
MWS-L-4-21	34.40	1.0	0.111	0.118	0.126	0.134	0.142	0.150	0.158	0.166	0.174	0.182	0.189	0.197	0.205	0.213	0.221	0.229	0.237	0.245	0.253	0.261	**0.268**	0.276	0.284	0.288	0.292	0.296	0.300	0.304	0.308	0.312
MWS-L-6-8	18.80	1.0	0.060	0.065	0.069	0.073	0.078	0.082	0.086	0.091	0.095	0.099	0.104	0.108	0.112	0.116	0.121	0.125	0.129	0.134	0.138	0.142	**0.147**	0.151	0.155	0.157	0.160	0.162	0.164	0.166	0.168	0.170
MWS-L-8-8	29.60	1.0	0.095	0.102	0.109	0.115	0.122	0.129	0.136	0.143	0.149	0.156	0.163	0.170	0.177	0.183	0.190	0.197	0.204	0.211	0.217	0.224	**0.231**	0.238	0.245	0.248	0.251	0.255	0.258	0.262	0.265	0.268
MWS-L-8-12	44.40	1.0	0.143	0.153	0.163	0.173	0.183	0.194	0.204	0.214	0.224	0.234	0.245	0.255	0.265	0.275	0.285	0.296	0.306	0.316	0.326	0.336	**0.346**	0.357	0.367	0.372	0.377	0.382	0.387	0.392	0.397	0.402
MWS-L-8-16	59.20	1.0	0.190	0.204	0.217	0.231	0.245	0.258	0.272	0.285	0.299	0.312	0.326	0.340	0.353	0.367	0.380	0.394	0.408	0.421	0.435	0.448	**0.462**	0.476	0.489	0.496	0.503	0.509	0.516	0.523	0.530	0.537
MWS-L-8-20	74.00	1.0	0.238	0.255	0.272	0.289	0.306	0.323	0.340	0.357	0.374	0.391	0.408	0.425	0.442	0.459	0.476	0.493	0.509	0.526	0.543	0.560	**0.577**	0.594	0.611	0.620	0.628	0.637	0.645	0.654	0.662	0.671
MWS-L-10-20 or MWS-L-8-24	88.80	1.0	0.285	0.306	0.326	0.346	0.367	0.387	0.408	0.428	0.448	0.469	0.489	0.509	0.530	0.550	0.571	0.591	0.611	0.632	0.652	0.673	**0.693**	0.713	0.734	0.744	0.754	0.764	0.774	0.785	0.795	0.805
4'x'4 media cage	14.80	1.0	0.048	0.051	0.054	0.058	0.061	0.065	0.068	0.071	0.075	0.078	0.082	0.085	0.088	0.092	0.095	0.099	0.102	0.105	0.109	0.112	**0.115**	0.119	0.122	0.124						

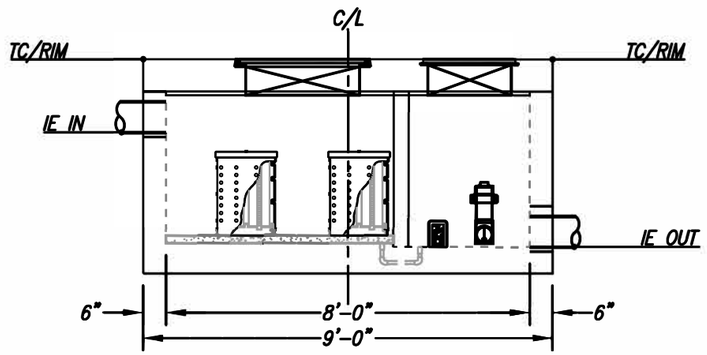
SITE SPECIFIC DATA			
PROJECT NAME			
PROJECT LOCATION			
STRUCTURE ID			
TREATMENT REQUIRED			
VOLUME BASED (CF)		FLOW BASED (CFS)	
TREATMENT HGL AVAILABLE (FT)			
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1			
INLET PIPE 2			
OUTLET PIPE			
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION			
SURFACE LOAD	PARKWAY	OPEN PLANTER	PARKWAY
FRAME & COVER	ø30"	N/A	ø24"
WETLANDMEDIA VOLUME (CY)			4.84
WETLANDMEDIA DELIVERY METHOD			TBD
ORIFICE SIZE (DIA. INCHES)			ø2.16"
MAXIMUM PICK WEIGHT (LBS)			TBD
NOTES:			



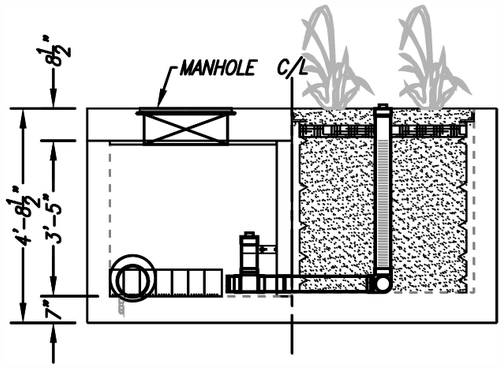
PLAN VIEW



LEFT END VIEW
BIOFILTRATION/PRETREATMENT



ELEVATION VIEW



RIGHT END VIEW
DISCHARGE/BIOFILTRATION

INSTALLATION NOTES

1. CONTRACTOR TO PROVIDE ALL LABOR, EQUIPMENT, MATERIALS AND INCIDENTALS REQUIRED TO OFFLOAD AND INSTALL THE SYSTEM AND APPURTENANCES IN ACCORDANCE WITH THIS DRAWING AND THE MANUFACTURERS SPECIFICATIONS, UNLESS OTHERWISE STATED IN MANUFACTURERS CONTRACT.
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4. CONTRACTOR TO SUPPLY AND INSTALL ALL EXTERNAL CONNECTING PIPES.
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6. DRIP OR SPRAY IRRIGATION REQUIRED ON ALL UNITS WITH VEGETATION.

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TREATMENT FLOW (CFS)	0.230
OPERATING HEAD (FT)	3.4
PRETREATMENT LOADING RATE (GPM/SF)	TBD
WETLAND MEDIA LOADING RATE (GPM/SF)	1.0

THE PRODUCT DESCRIBED MAY BE PROTECTED BY ONE OR MORE OF THE FOLLOWING US PATENTS: 7,425,262; 7,470,362; 7,674,378; 8,303,816; RELATED FOREIGN PATENTS OR OTHER PATENTS PENDING

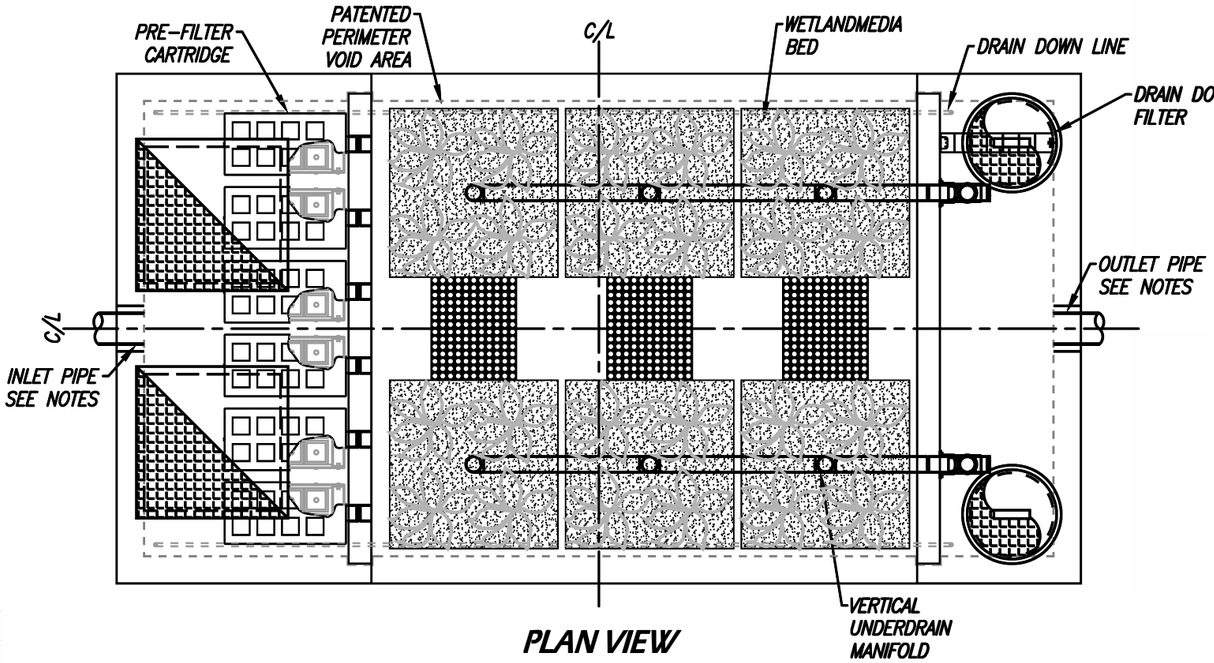
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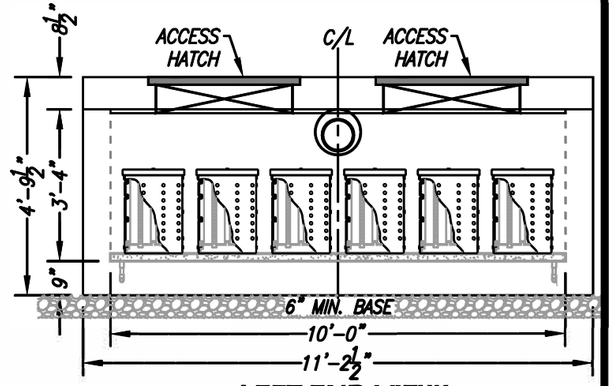
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MWS-L-8-8-V
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

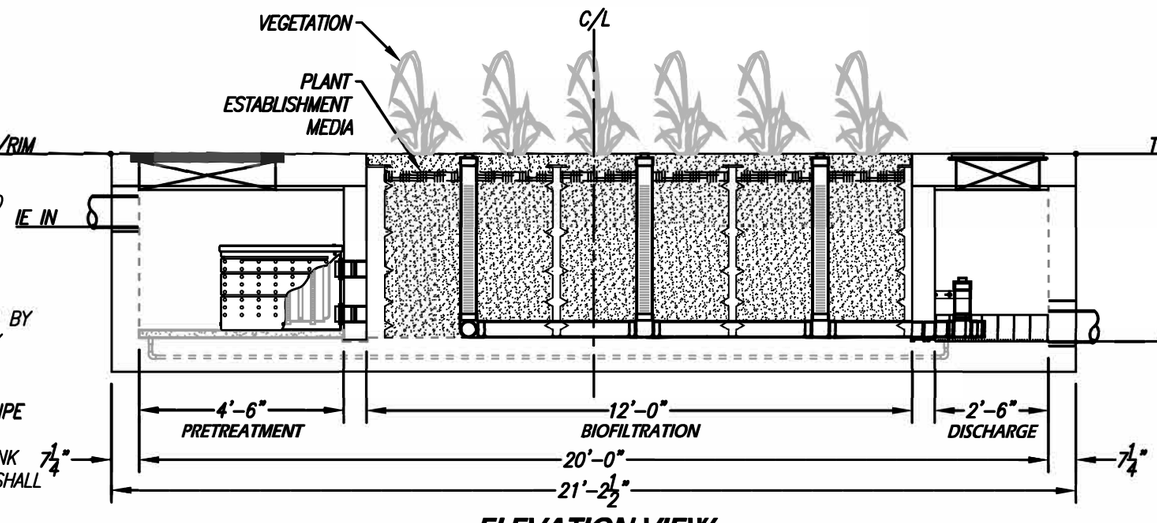
SITE SPECIFIC DATA			
PROJECT NAME			
PROJECT LOCATION			
STRUCTURE ID			
TREATMENT REQUIRED			
VOLUME BASED (CF)		FLOW BASED (CFS)	
TREATMENT HGL AVAILABLE (FT)			
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1			
INLET PIPE 2			
OUTLET PIPE			
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION			
SURFACE LOAD	PARKWAY	OPEN PLANTER	PARKWAY
FRAME & COVER	36" X 36"	N/A	ø24"
WETLANDMEDIA VOLUME (CY)			14.50
WETLANDMEDIA DELIVERY METHOD			TBD
ORIFICE SIZE (DIA. INCHES)			ø2.67"
MAXIMUM PICK WEIGHT (LBS)			TBD
NOTES:			



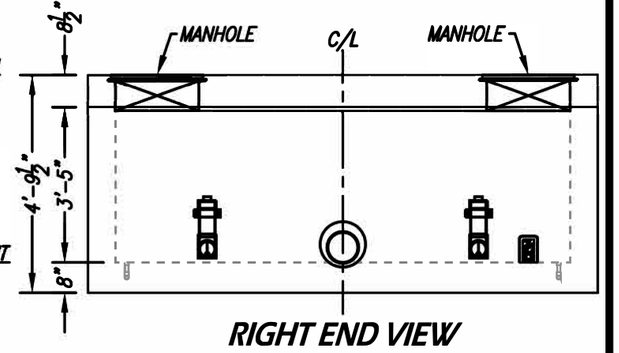
PLAN VIEW



LEFT END VIEW



ELEVATION VIEW



RIGHT END VIEW

INSTALLATION NOTES

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TREATMENT FLOW (CFS)	0.693
OPERATING HEAD (FT)	3.4
PRETREATMENT LOADING RATE (GPM/SF)	TBD
WETLAND MEDIA LOADING RATE (GPM/SF)	1.0

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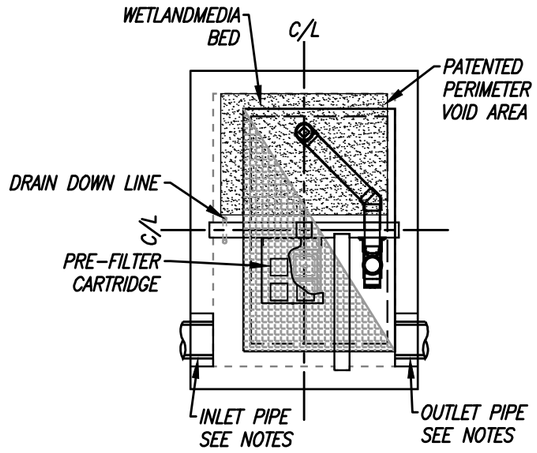
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MWS-L-10-20-V

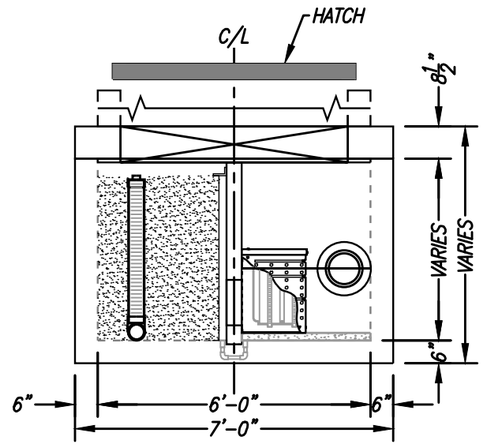
STORMWATER BIOFILTRATION SYSTEM STANDARD DETAIL

3/20/15,USTIN

SITE SPECIFIC DATA			
PROJECT NUMBER			
PROJECT NAME			
PROJECT LOCATION			
STRUCTURE ID			
TREATMENT REQUIRED			
FLOW BASED (CFS)			
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1			
INLET PIPE 2			
OUTLET PIPE			
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION			
SURFACE LOAD			
NOTES:			



PLAN VIEW



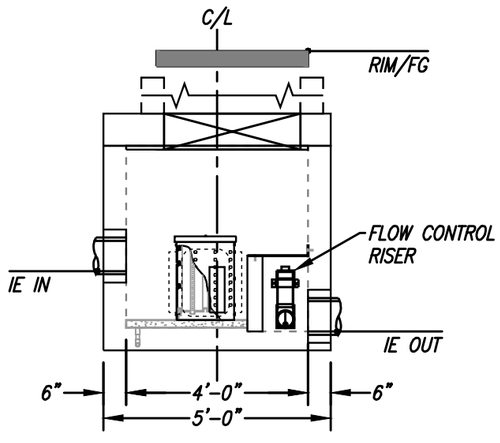
LEFT END VIEW

INSTALLATION NOTES

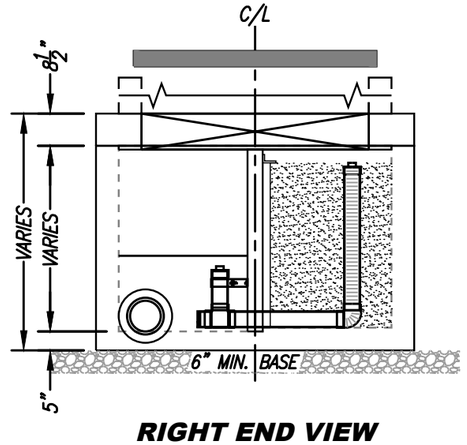
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5. CONTRACTOR RESPONSIBLE FOR INSTALLATION OF ALL PIPES, RISERS, MANHOLES, AND HATCHES. CONTRACTOR TO USE GROUT AND/OR BRICKS TO MATCH COVERS WITH FINISHED SURFACE UNLESS SPECIFIED OTHERWISE.
6. VEGETATION SUPPLIED AND INSTALLED BY OTHERS. ALL UNITS WITH VEGETATION MUST HAVE DRIP OR SPRAY IRRIGATION SUPPLIED AND INSTALLED BY OTHERS.
7. CONTRACTOR RESPONSIBLE FOR CONTACTING CONTECH FOR ACTIVATION OF UNIT. MANUFACTURER'S WARRANTY IS VOID WITHOUT PROPER ACTIVATION BY A CONTECH REPRESENTATIVE.

GENERAL NOTES

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ELEVATION VIEW



RIGHT END VIEW

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

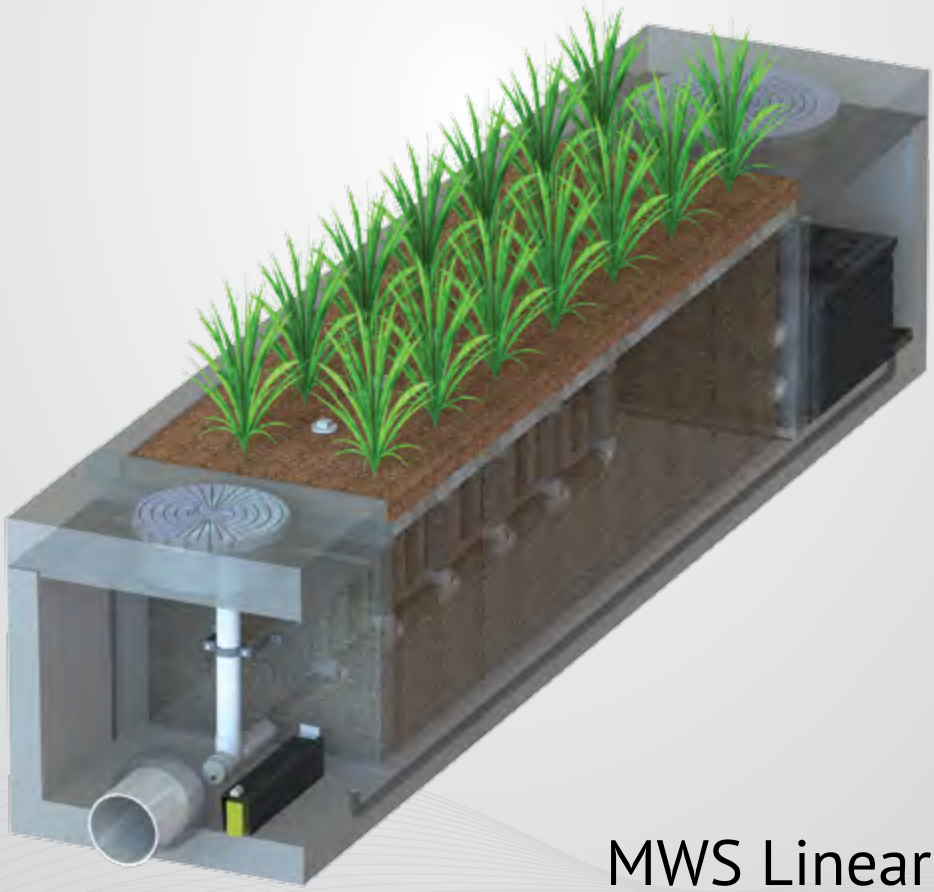
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FOR PATENT INFORMATION, GO TO www.ContechES.com/IP

CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com

MWS-L-4-6-V-UG
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

MODULAR WETLANDS™

*Advanced **Stormwater** Biofiltration*



MWS Linear



Contents

1 Introduction

2 Applications

3 Configurations

4 Advantages

5 Operation

6 Orientations | Bypass

7 Performance | Approvals

8 Sizing

9 Installation | Maintenance | Plants

The Urban Impact

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



Plant A Wetland

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





MWS Linear

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

Applications

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



Industrial

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



Residential

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



Streets

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



Parking Lots

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



Commercial

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



Mixed Use

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

More applications are available on our website: www.ModularWetlands.com/Applications

- Agriculture
- Reuse
- Low Impact Development
- Waste Water





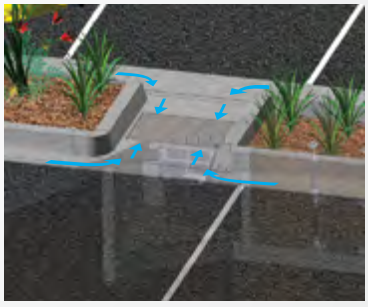
Configurations

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



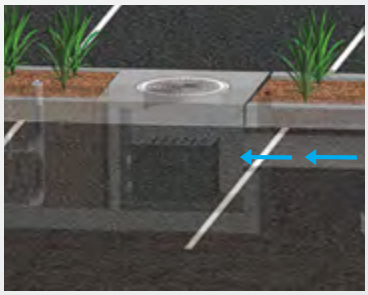
Curb Type

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



Grate Type

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



Vault Type

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



Downspout Type

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

Advantages & Operation

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

Featured Advantages

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

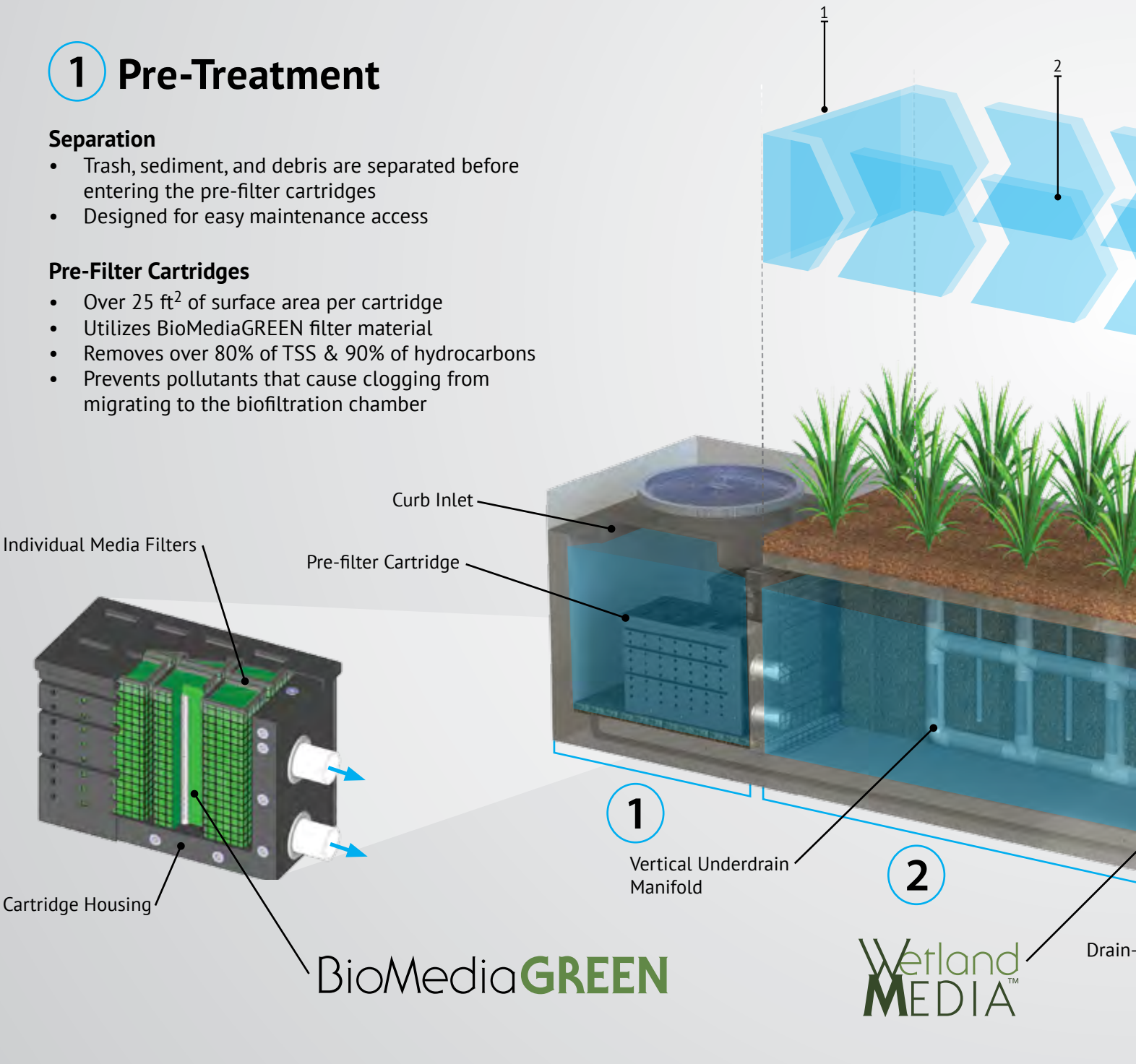
1 Pre-Treatment

Separation

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

Pre-Filter Cartridges

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



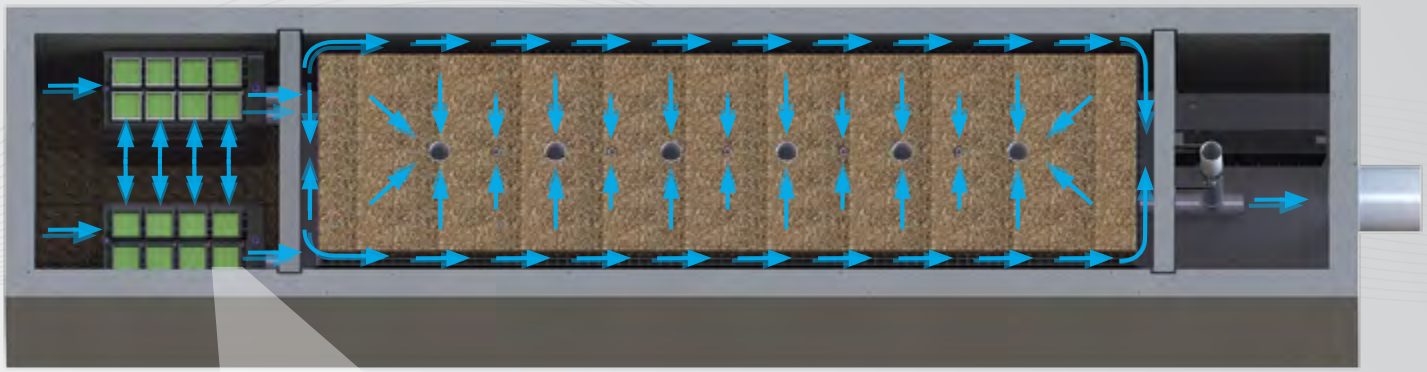


Fig. 2 - Top View

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



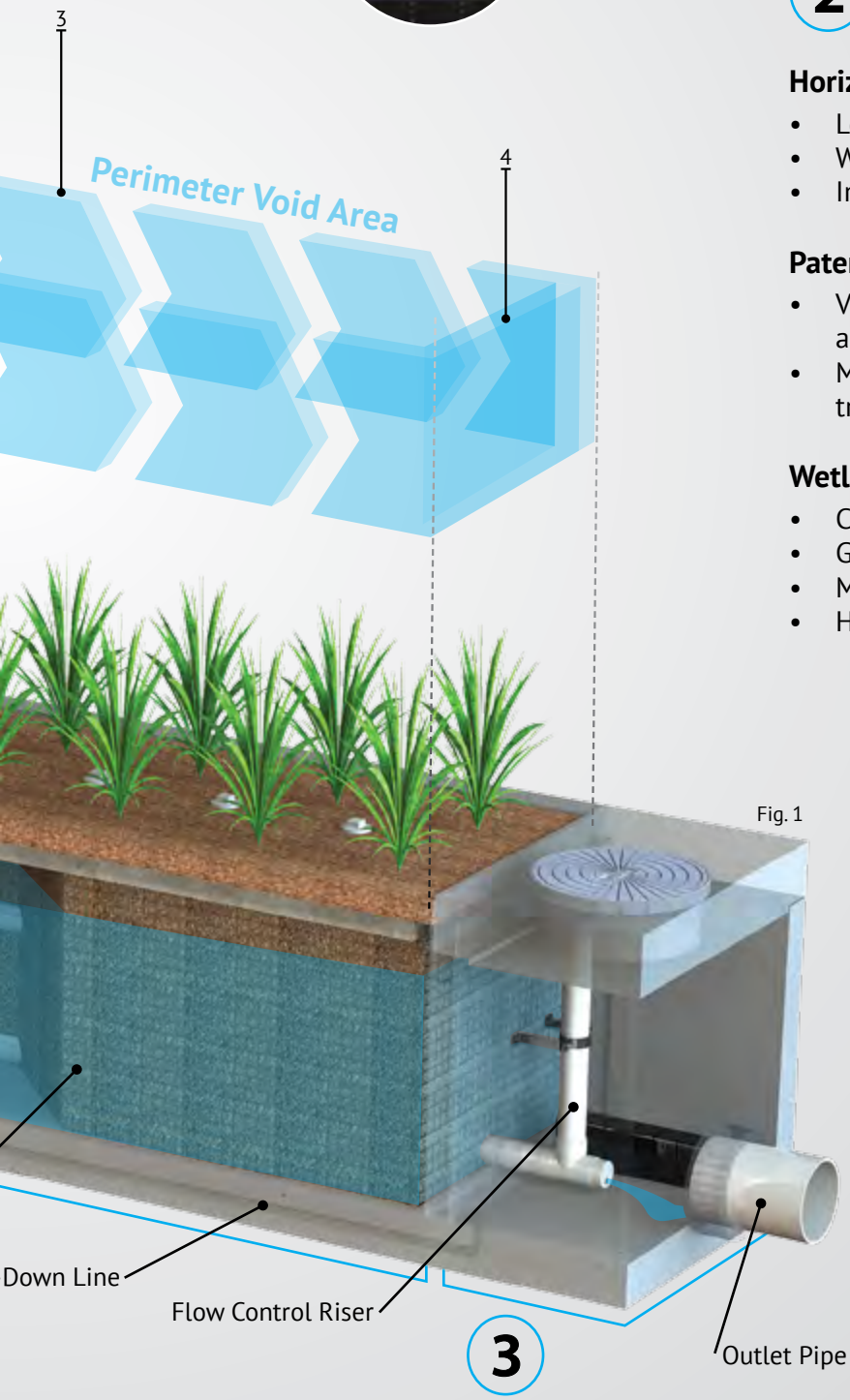


Fig. 1

2 Biofiltration

Horizontal Flow

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

Patented Perimeter Void Area

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

WetlandMEDIA

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

3 Discharge

Flow Control

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

Drain-Down Filter

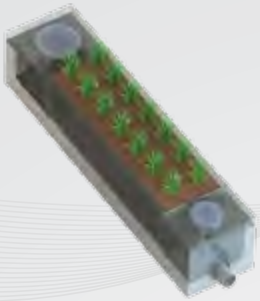
- The Drain-Down is an optional feature that completely drains the pre-treatment chamber
- Water that drains from the pre-treatment chamber between storm events will be treated

Orientations



Side-By-Side

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



End-To-End

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

Bypass

Internal Bypass Weir (Side-by-Side Only)

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

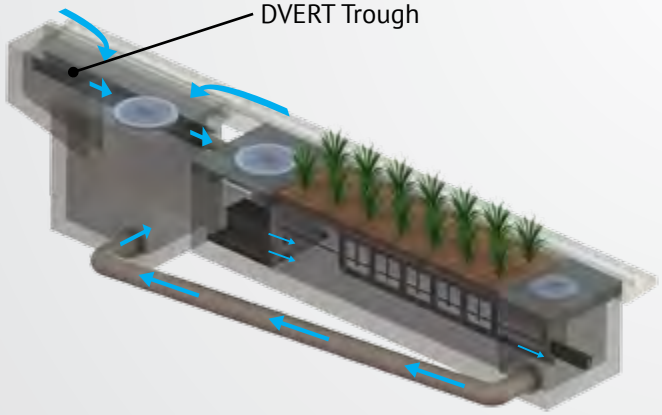
External Diversion Weir Structure

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

Flow By Design

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

DVERT Low Flow Diversion



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





Performance

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

Approvals

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



Washington State DOE Approved

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

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



DEQ Assignment

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



MASTEP Evaluation

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



Rhode Island DEM Approved

Approved as an authorized BMP and noted to achieve the following minimum removal efficiencies: 85% TSS, 60% Pathogens, 30% Total Phosphorus for discharges to freshwater systems, and 30% Total Nitrogen for discharges to saltwater or tidal systems.

Flow Based Sizing

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

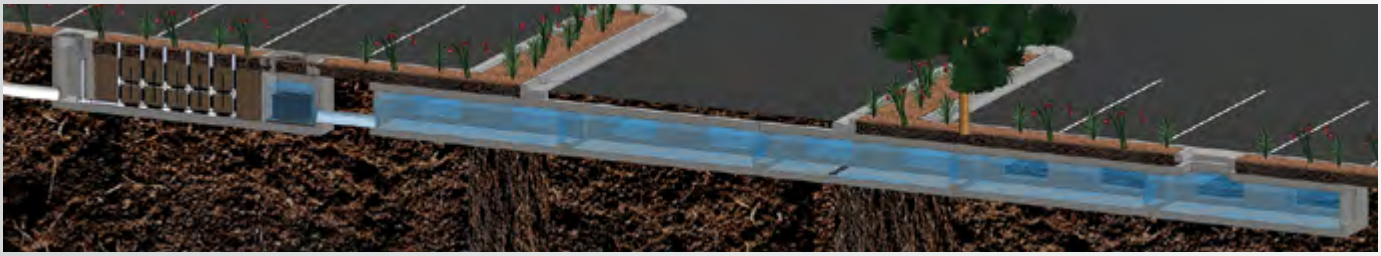


Treatment Flow Sizing Table

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

Volume Based Sizing

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



Treatment Volume Sizing Table

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

Installation

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

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



Maintenance

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

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



Plant Selection

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

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

Please visit www.ModularWetlands.com/Plants for more information and various plant lists.



SPECIFICATIONS

MWS – Linear

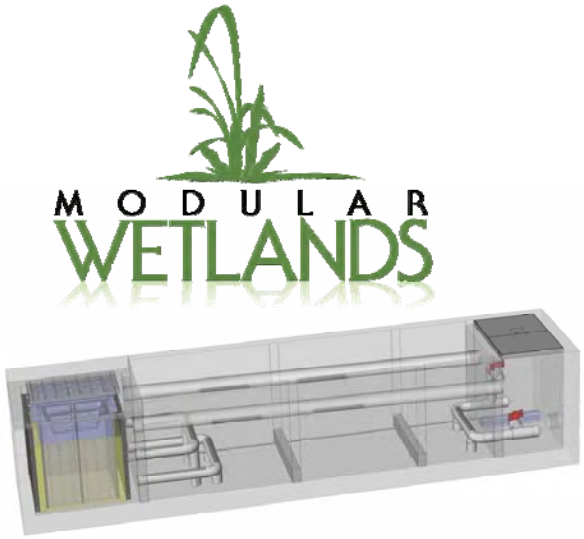
Hybrid Stormwater Filtration System

Modular Wetland Systems, Inc.
P.O. Box 869
Oceanside, CA 92049

www.modularwetlands.com
P 760-433-7640
F 760-433-3179

MWS – Linear

Hybrid Stormwater Filtration System



Save valuable space with small footprint for urban sites.

Improve BMP aesthetics with attractive native and tropical landscape plants.

Reduce lifetime costs with safer and less expensive maintenance

"The MWS – Linear hybrid stormwater treatment system is described as a self contained treatment train. This system utilizes an innovative combination of l treatment processes. Stormwater runoff flows into the system via pipe or curb/grate type catch basin opening. Polluted runoff first encounters a screening device to remove larger pollutants and then enters a hydrodynamic separation chamber which settles out the sediments and larger suspended solids. Next the runoff is treated by a revolutionary filter media, BioMediaGREEN that removes fines and associated pollutants, including bacteria. From there runoff enters of bioretention filter in the form of a subsurface flow vegetated gravel wetland. Within the wetland physical, chemical, and biological mechanisms remove the remaining particulate and dissolved pollutants. The purified runoff leaves the system via the discharge chamber. In the discharge chamber the rate of discharge is controlled by valves set to a desired rate".

Tested Pollutant Removal Efficiencies:

TSS Removal	Dissolved Lead Removal	Dissolved Copper Removal	TPH	E. coli Removal	Turbidity Removal
98%	81%	92%	99%	60.2%	92%

"Nature and Harmony Working Together in Perfect Harmony"

SPECIFICATIONS – MWS- LINEAR

Track Record: The MWS- Linear Hybrid Stormwater Treatment System is manufactured by a company whom is regularly engaged in the engineering design and production of treatment systems for stormwater.

Coverage: The MWS- Linear is designed to treat the water quality volume or water quality flow. For flow based design, high flow bypass is internal, for volume based design, high flow bypass is external and prior to pre-detention system. For offline volume based designs the MWS - Linear has the ability to treat the entire water quality volume when used with pre-storage and properly sized.

Non-Corrosive Materials: The MWS – Linear is designed with non-corrosive materials. All internal piping is SD35 PVC. Catch basin filter components, including mounting hardware, fasteners, support brackets, filtration material, and support frame are constructed of non-corrosive materials (316 stainless steel, and UV protected/marine grade fiberglass). Fasteners are stainless steel. Primary filter mesh is 316 stainless steel welded screens. Filtration basket screens for coarse, medium and fine filtration is ¾" x 1 ¾"expanded, 10 x 10 mesh, and 35 x 35 mesh, respectively. No polypropylene, monofilament netting or fabrics shall be used in this system. Media Protective Panels are constructed of UV protected/marine grade fiberglass. Mounts are constructed of stainless steel. BioMediaGREEN is an inert rock substrate and is non-corrosive. Perimeter filter structure is constructed of lightweight injection molded plastic. Mounting brackets are constructed of SD40 PVC and are mounted with 3/8" diameter stainless steel redheads. Drain down filter cover is constructed of UV protected/marine grade fiberglass and stainless steel hinge and mount.

Weight: Each complete unit weighs approximately 29,000 to 40,000 pounds and requires a boom crane to install. Details of this are provided in the installation section of the MWS-Linear Design Kit.

Transportation: The Modular Wetland System – Linear is designed to be transported on a standard flat bed truck. The unit easily fits on a flat bed truck without the need of special permitting.

Alternative Technology Configurations: The Modular Wetland System – Linear is modular is design. Each module will be up to 22 feet long and 5 feet wide. The system can be made in lengths varying from 13 to 100s of feet long. For lengths longer than 22 feet the system will shipped in modules and assembled on site. The Modular Wetland System – Linear has many alternative configurations. This allows the system to be adapted to many site conditions. Runoff can enter the system through a pipe, and/or a built in curb or grate type opening.

Energy Requirements: The Modular Wetland System – Linear is completely passive and requires no external energy sources.

Buoyancy Issues: Buoyancy is only a an issue when ground water levels rise above the bottom of the Modular Wetland System – Linear's concrete structure. With 8.5 cubic yards of wetland media there is no concern of floatation. As a precaution a footing can also be built into the systems concrete structure.

Durability: The structure of the box will be precast concrete. The concrete will be 28 day compressive strength fc = 5,000 psi. Steel reinforcing will be ASTM A – C857. Structure will support an H20 loading as indicted by AASHTO. The joint between the concrete sections will ship lap and joint sealed with ram-nek. Filter (excluding oil absorbent media) and support structures are of proven durability. The filter and mounting structures are of sufficient strength to support water, sediment, and debris loads when the filter is full, with no slippage, breaking, or tearing. All filters are warranted for a minimum of five (5) years.

Oil Absorbent Media: The MWS – Linear utilizes both physical and biological mechanisms to capture and filter oil and grease. A skimmer and boom system will be positioned on the internal perimeter of the catch basin insert. The primary filtration media, BioMediaGreen, utilized in the perimeter and drain down filters, has excellent hydrocarbon removal abilities. Within the wetland filter biological processes capture and

break down oil and grease. Much of the breakdown and transformation of oil and grease is performed by natural occurring bacteria.

Overflow Protection: The grate and curb type MWS – Linear are designed with an internal bypass consisting of two SD PVC pipes which direct high flows around the perimeter and wetland filter, directly into the discharge chamber. For the volume based vault type configuration, bypass should be located prior to the pre-detention system. For peak flows that exceed internal bypass capacity, external bypass is use.

Filter Bypass: Runoff will bypass filtration (BioMediaGREEN and wetland filter) components of the MWS - Linear. The system will still provide screening and settling during higher flow rates for internally bypassed flows. External bypass will bypass of treatment processes.

Pollutant Removal Efficiency: The MWS - Linear is capable of removing over 90% of the net annual total suspended solids (TSS) load based on a 20-micron particle size. Annual TSS removal efficiency models are based on documented removal efficiency performance from full-scale laboratory tests on BioMediaGreen and quarter-scale laboratory tests on the MWS – Linear flow based system.

POLLUTANT	REMOVAL EFFICIENCY
Trash & Litter	99%
TPH (mg/L)	99%
TSS (mg/L)	98%
E. Coli (MPN/100ml)	60%
Turbidity (NTU)	92%
Dissolved Metals (mg/L)	76%

Sil-Co-Sil 106. Mean particle diameter = 19 microns

Non-Scouring: During heavy storm events the runoff bypasses perimeter and wetland filter components. The system will not re-suspend solids at design flows.

Uniqueness: The Modular Wetland System – Linear is a complete self contained treatment train that incorporates capture, screening, sedimentation, filtration, bioretention, high flow bypass, and flow control into a single modular structure. This system provides four stages of treatment making it the only 4 stage treatment train stormwater filtration system, therefore making it unique to the industry. Other systems do not incorporate all the necessary attributes to make it a complete stormwater management device as with the Modular Wetland System – Linear. Therefore, no equal exists for this system.

Pretreatment & Preconditioning: Since the Modular Wetland System – Linear is a complete capture and treatment train stormwater management system no external pretreatment of preconditioning is necessary.

SPECIFICATIONS – BioMediaGREEN

BioMediaGREEN is a proprietary engineered filter media. Made of a unique combination of the inert naturally occurring material this product is non-combustible and do not pose a fire hazard, stable and non-reactive, and is also biodegradable. It is stable with no known adverse environmental effects.

This product has been tested in long-term carcinogenicity studies [inhalation and intraperitoneal injection (i.p.)] with no significant increase in lung tumors or abdominal tumors. Short-term biopersistent (inhalation and intra-tracheal injection) studies have shown that the products disappear very rapidly from the lung.

In October 2001, IARC classified this product as Group 3, "not classifiable as to its carcinogenicity to humans". The 2001 decision was based on the latest epidemiological studies and animal inhalation studies that show no relation between inhalation exposure and the development of tumors.

The product can typically be disposed of in an ordinary landfill (local regulations may apply). If you are unsure of the regulations, contact your local Public Health Department or the local office of the Environmental Protection Agency (EPA).

Coverage: When properly installed BioMediaGREEN Filter Blocks provide sufficient contact time, at rated flows, of passing contaminate water. The BioMediaGREEN material will capture and retain most pollutants that pass through it. The BioMediaGREEN material is made of a proprietary blend of inert substances. The BioMediaGREEN Filter Blocks can be used in different treatment devices, including but not limited to flume filters, trench drain filters, downspout filters, catch basin inserts, water polishing units, and hydrodynamic separators.

Non-Corrosive Materials: The BioMediaGreen material is made of non-corrosive materials.

Durability: The BioMediaGREEN material has been chosen for its proven durability, with an expected life of 2 plus years. The BioMediaGREEN material is of sufficient strength to support water, sediment, and debris loads when the media is at maximum flow; with no slippage, breaking, or tearing. The BioMediaGREEN material has been tested through rigorous flow and loading conditions.

Oil Absorbent Media: The BioMediaGREEN material has been proven to capture and retain hydrocarbons.

Pollutant Removal Efficiency: The BioMediaGREEN Filter Blocks are designed to capture high levels of Hydrocarbons including but not limited to oils & grease, gasoline, diesel, and PAHs. BioMediaGREEN Filter Blocks have the physical ability to block and filter trash and litter, grass and foliage, sediments, TSS, particulate and dissolved metals, nutrients, and bacteria.

BioMediaGREEN technology is based on a proprietary blend of synthetic inert natural substances aimed at removal of various stormwater pollutants. BioMediaGREEN was created to have a very porous structure capable of selectively removing pollutants while

allowing high flow through rates for water. As pollutants are captured by its structure, BioMediaGREEN captures most pollutants and maintains porosity and filtering capabilities.

Field and laboratory tests have confirmed the BioMediaGREEN capability to capture large percentage of TSS, hydrocarbons, nutrients, and heavy metals. Microbial reduction efficiency will vary depending on colony size, flow rates and site specific conditions.

POLLUTANT	REMOVAL EFFICIENCY
Oil & Grease (mg/L)	90%
TPH (mg/L)	99%
TSS (mg/L)	85%
Turbidity (NTU)	99%
Total Phosphorus (mg/L)	69.6%
Dissolved Metals (mg/L)	75.6%

Sil-Co-Sil 106. Mean particle diameter = 19 microns

Replacement: Removal and replacement of the blocks is simple. Remove blocks from filtration system. Replace with new block of equal size.

BIO-7: Proprietary Biotreatment

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

Also known as:

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



Proprietary biotreatment
Source: http://www.americastusa.com /index.php/filterra/

Feasibility Screening Considerations

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

Opportunity Criteria

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

OC-Specific Design Criteria and Considerations

☐ Frequent maintenance and the use of screens and grates to keep trash out may decrease the likelihood of clogging and prevent obstruction and bypass of incoming flows.

☐ Consult proprietors for specific criteria concerning the design and performance.

☐ Proprietary biotreatment may include specific media to address pollutants of concern. However, for proprietary device to be considered a biotreatment device the media must be capable of supporting rigorous growth of vegetation.

☐ Proprietary systems must be acceptable to the reviewing agency. Reviewing agencies shall have the discretion to request performance information. Reviewing agencies shall have the discretion to deny the use of a proprietary BMP on the grounds of performance, maintenance considerations, or other relevant factors.

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

Computing Sizing Criteria for Proprietary Biotreatment Device

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

In South Orange County, the provided ponding plus pore volume must be checked to demonstrate that it is greater than 0.75 of the remaining DCV that this BMP is designed to address. Many propretary biotreatment BMPs will not be able to meet the definition of "biofiltration" that applies in South Orange County. See Section III.7 and Worksheet SOC-1.

Additional References for Design Guidance

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

PRE-2: Catch Basin Insert Fact Sheet

Catch basin inserts are manufactured filters or fabric placed in a drop inlet to remove sediment and debris and may include sorbent media (oil absorbent pouches) to remove floating oils and grease. Catch basin inserts are selected specifically based upon the orientation of the inlet and the expected sediment and debris loading.

Also known as:

- *Drop Inlet Filters*
- *Catch Basin Filters*



Catch Basin Insert (DrainPac™)

Opportunity Criteria

- Catch basin inserts come in such a wide range of configurations that it is practically impossible to generalize the expected performance. Inserts should mainly be used for catching coarse sediments and floatable trash and are effective as pretreatment in combination with other types of structures that are recognized as water quality treatment BMPs. Trash and large objects can greatly reduce the effectiveness of catch basin inserts with respect to sediment and hydrocarbon capture.
- Catch basin inserts are applicable for drainage area that include parking lots, vehicle maintenance areas, and roadways with catch basins that discharge directly to a receiving water.

OC-Specific Design Criteria and Considerations

☐ Frequent maintenance and the use of screens and grates to keep trash out may decrease the likelihood of clogging and prevent obstruction and bypass of incoming flows.

☐ Consult proprietors for specific criteria concerning the design of catch basin inserts.

☐ Catch basin inserts can be installed with specific media for pollutants of concern.

Proprietary Manufacturer / Supplier Websites

- **Table XIV.2** is a list of manufacturers that provide catch basin inserts. The inclusion of these manufacturers does not represent an endorse of their products. Other devices and manufacturers may be acceptable for pretreatment.

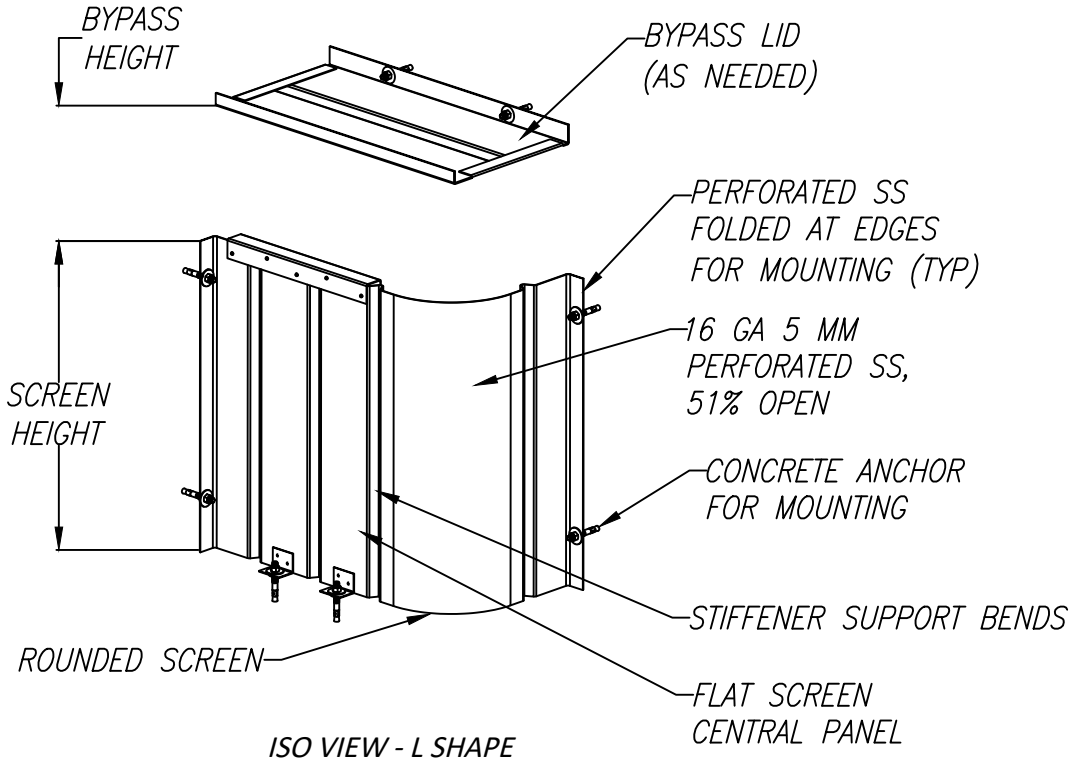
Table XIV.2: Proprietary Catch Basin Insert Manufacturer Websites

Device	Manufacturer	Website
AbTech Industries Ultra-Urban Filter™	AbTech Industries	www.abtechindustries.com
Aquashield Aqua-Guardian™ Catch Basin Insert	Aquashield™ Inc.	www.aquashieldinc.com
Bowhead StreamGuard™	Bowhead Environmental & Safety, Inc.	http://www.shopbowhead.com/
Contech® Triton Catch Basin Filter™	Contech® Construction Products Inc.	www.contech-cpi.com
Contech® Triton Curb Inlet Filter™	Contech® Construction Products Inc.	www.contech-cpi.com

Table XIV.2: Proprietary Catch Basin Insert Manufacturer Websites

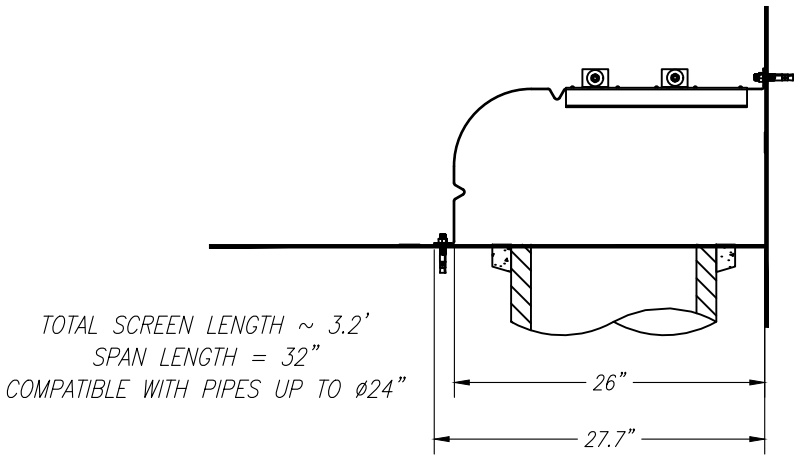
Device	Manufacturer	Website
Contech® Triton Basin StormFilter™	Contech® Construction Products Inc.	www.contech-cpi.com
Contech® Curb Inlet StormFilter™	Contech® Construction Products Inc.	www.contech-cpi.com
Curb Inlet Basket	SunTree Technologies Inc.	www.suntreetech.com
Curb Inlet Grates	EcoSense International™	http://www.ecosenseint.com/
DrainPac™	United Storm Water, Inc.	http://www.unitedstormwater.com
Grate Inlet Skimmer Box	SunTree Technologies Inc.	www.suntreetech.com
KriStar FloGard+PLUS®	KriStar Enterprises Inc.	www.kristar.com
KriStar FloGard®	KriStar Enterprises Inc.	www.kristar.com
KriStar FloGard LoPro Matrix Filter®	KriStar Enterprises Inc.	www.kristar.com
Nyloplast Storm-PURE Catch Basin Insert	Nyloplast Engineered Surface Drainage Products	www.nyloplast-us.com
StormBasin®	FabCo® Industries Inc.	www.fabco-industries.com
Stormdrain Solutions Interceptor	FabCo® Industries Inc.	www.fabco-industries.com
Stormdrain Solutions Inceptor®	Stormdrain Solutions	www.stormdrains.com
StormPod®	FabCo® Industries Inc.	www.fabco-industries.com
Stormwater Filtration Systems	EcoSense International™	http://www.ecosenseint.com/
Ultra-CurbGuard®	UltraTech International Inc.	www.spillcontainment.com
Ultra-DrainGuard®	UltraTech International Inc.	www.spillcontainment.com
Ultra-GrateGuard®	UltraTech International Inc.	www.spillcontainment.com
Ultra-GutterGuard®	UltraTech International Inc.	www.spillcontainment.com
Ultra-InletGuard®	UltraTech International Inc.	www.spillcontainment.com

CONNECTOR PIPE SCREEN (CPS)
L 3.2



ISO VIEW - L SHAPE

CPS L WITH 3.2 FT SCREEN LENGTH	
CPS HEIGHT (IN)	SCREEN FLOW (CFS)
12	4.53
18	8.32
24	12.81
30	17.91
36	23.55
NOTE: BYPASS FLOW RATES VARY WITH VAULT DEPTH AND BYPASS HEIGHT. CONTACT BIO CLEAN FOR ADDITIONAL INFORMATION.	



TOP SECTION VIEW - L SHAPE

GENERAL NOTES

1. BIO CLEAN TO PROVIDE ALL MATERIALS UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS, ELEVATIONS, SPECIFICATIONS, AND CAPACITIES ARE SUBJECT TO CHANGE.
3. THIS CPS UNIT IS DESIGNED FOR TREATMENT FLOWS THROUGH THE SCREEN. FLOWS GREATER THAN THE TREATMENT FLOW RATE WILL BYPASS OVER THE SCREEN.
4. A BYPASS LID IS REQUIRED WHEN THE OUTLET PIPE IS DIRECTLY BELOW THE CURB OPENING.
5. CPS IS COMPRISED OF 304 STAINLESS STEEL. THICKNESS IS 16 GAUGE. SCREEN PERFORATIONS ARE 5 MILLIMETERS IN DIAMETER. THE SCREEN AREA IS 51% OPEN SPACE.

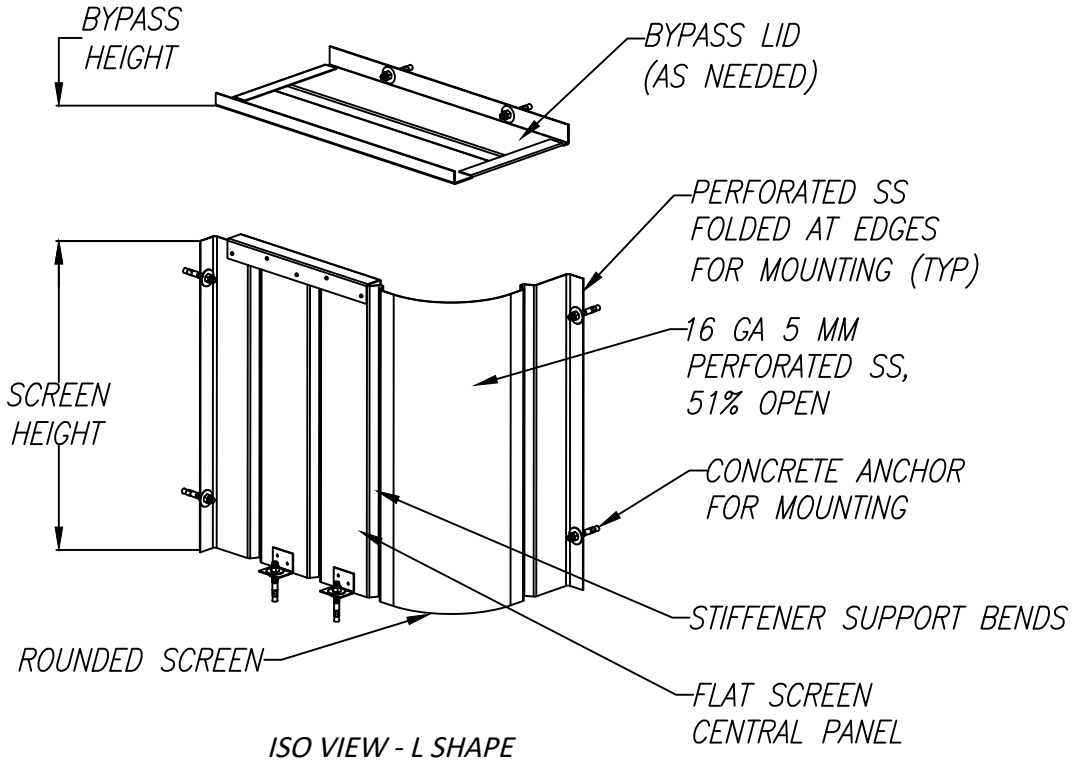
INSTALLATION NOTES

1. CONTRACTOR TO PROVIDE ALL LABOR, EQUIPMENT, MATERIALS, AND INCIDENTALS REQUIRED TO INSTALL THE CPS UNIT AND APPURTENANCES IN ACCORDANCE WITH THIS DRAWING AND THE MANUFACTURER'S SPECIFICATIONS, UNLESS OTHERWISE STATED IN MANUFACTURER'S CONTRACT.
2. POSITION THE CPS SO IT IS EVENLY SPACED AROUND THE CONNECTOR PIPE, ENSURING A MIN. OF 4" SPACING AWAY FROM ANY CORNERS. SCREEN BOTTOM SHALL BE FLUSH WITH THE CATCH BASIN FLOOR, OR WITH GAPS NO GREATER THAN 5 MM.
3. IF A BYPASS LID IS REQUIRED, VERIFY THE BYPASS HEIGHT NEEDED AND MARK THAT LOCATION ON THE WALL DIRECTLY ABOVE THE BASE UPRIGHTS. LIFT THE LID IN PLACE AND MARK THE HOLE LOCATIONS FOR THE LID MOUNTING BRACKETS. SECURE THE LID WITH STAINLESS STEEL NUTS.

WARRANTY: 3 YEAR MANUFACTURER'S		MEETS FULL CAPTURE REQUIREMENTS	
BIO CLEAN ENVIRONMENTAL SERVICES, INC. 398 VIA EL CENTRO, OCEANSIDE CA 92058 PHONE: 760-433-7640		REVISIONS:	DATE:
		REVISIONS:	DATE:
DATE: 1/17/2020	SCALE: NTS	REVISIONS:	DATE:
DRAFTER: G.M.S.	UNITS = INCHES	REVISIONS:	DATE:

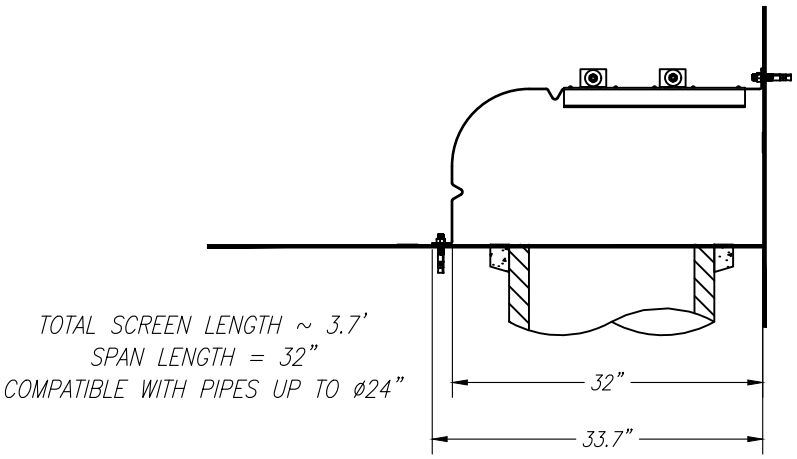
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A Forterra Company

CONNECTOR PIPE SCREEN (CPS)
L 3.7



ISO VIEW - L SHAPE

CPS L WITH 3.7 FT SCREEN LENGTH	
CPS HEIGHT (IN)	SCREEN FLOW (CFS)
12	5.26
18	9.66
24	14.88
30	20.80
36	27.35
NOTE: BYPASS FLOW RATES VARY WITH VAULT DEPTH AND BYPASS HEIGHT. CONTACT BIO CLEAN FOR ADDITIONAL INFORMATION.	



TOP SECTION VIEW - L SHAPE

GENERAL NOTES

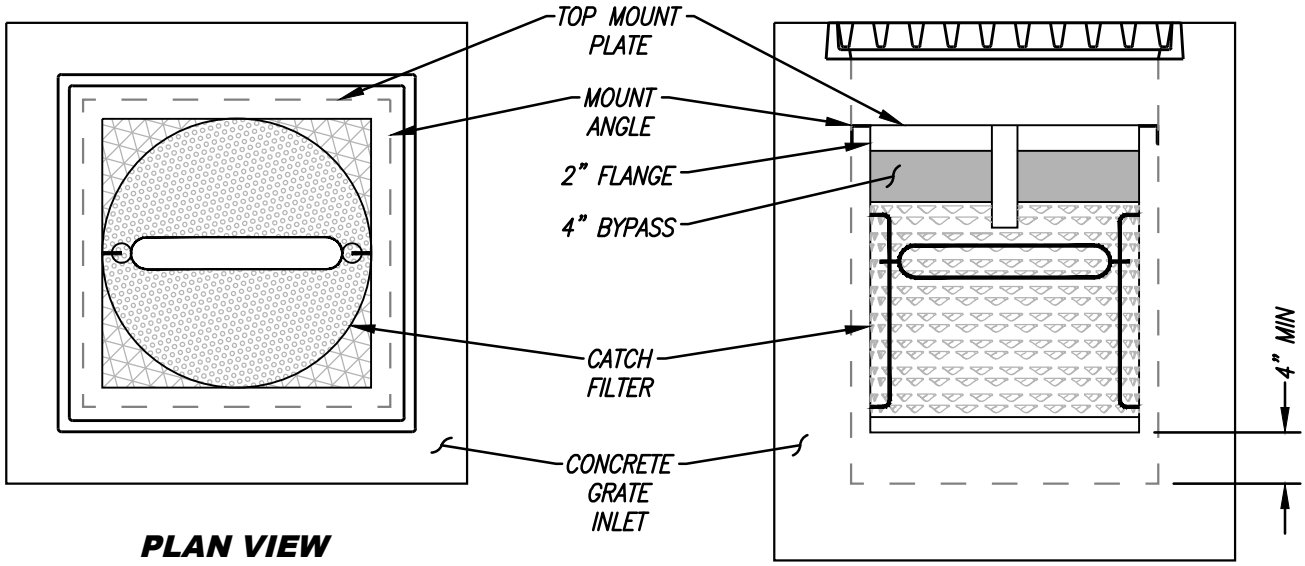
1. BIO CLEAN TO PROVIDE ALL MATERIALS UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS, ELEVATIONS, SPECIFICATIONS, AND CAPACITIES ARE SUBJECT TO CHANGE.
3. THIS CPS UNIT IS DESIGNED FOR TREATMENT FLOWS THROUGH THE SCREEN. FLOWS GREATER THAN THE TREATMENT FLOW RATE WILL BYPASS OVER THE SCREEN.
4. A BYPASS LID IS REQUIRED WHEN THE OUTLET PIPE IS DIRECTLY BELOW THE CURB OPENING.
5. CPS IS COMPRISED OF 304 STAINLESS STEEL. THICKNESS IS 16 GAUGE. SCREEN PERFORATIONS ARE 5 MILLIMETERS IN DIAMETER. THE SCREEN AREA IS 51% OPEN SPACE.

INSTALLATION NOTES

1. CONTRACTOR TO PROVIDE ALL LABOR, EQUIPMENT, MATERIALS, AND INCIDENTALS REQUIRED TO INSTALL THE CPS UNIT AND APPURTENANCES IN ACCORDANCE WITH THIS DRAWING AND THE MANUFACTURER'S SPECIFICATIONS, UNLESS OTHERWISE STATED IN MANUFACTURER'S CONTRACT.
2. POSITION THE CPS SO IT IS EVENLY SPACED AROUND THE CONNECTOR PIPE, ENSURING A MIN. OF 4" SPACING AWAY FROM ANY CORNERS. SCREEN BOTTOM SHALL BE FLUSH WITH THE CATCH BASIN FLOOR, OR WITH GAPS NO GREATER THAN 5 MM.
3. IF A BYPASS LID IS REQUIRED, VERIFY THE BYPASS HEIGHT NEEDED AND MARK THAT LOCATION ON THE WALL DIRECTLY ABOVE THE BASE UPRIGHTS. LIFT THE LID IN PLACE AND MARK THE HOLE LOCATIONS FOR THE LID MOUNTING BRACKETS. SECURE THE LID WITH STAINLESS STEEL NUTS.

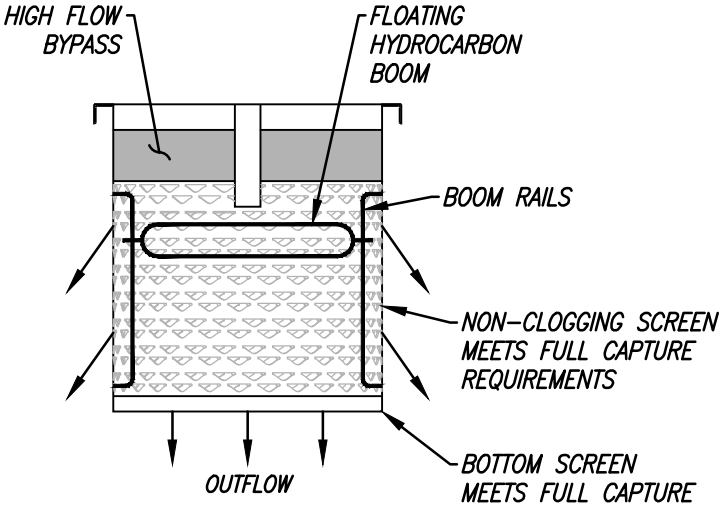
WARRANTY: 1 YEAR MANUFACTURER'S		MEETS FULL CAPTURE REQUIREMENTS	
BIO CLEAN ENVIRONMENTAL SERVICES, INC. 398 VIA EL CENTRO, OCEANSIDE CA 92058 PHONE: 760-433-7640		REVISIONS:	DATE:
		REVISIONS:	DATE:
DATE: 1/17/2020	SCALE: NTS	REVISIONS:	DATE:
DRAFTER: G.M.S.	UNITS = INCHES	REVISIONS:	DATE:

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PLAN VIEW
(GRATE NOT SHOWN)

ELEVATION VIEW



FLOW DIAGRAM

MODEL #	TREATMENT FLOW RATE (CFS)	BYPASS FLOW (CFS)	SOLIDS STORAGE CAPACITY (CF)
BIO-GRATE-KMF 12-12-12	0.97	1.55	0.14
BIO-GRATE-KMF 18-18-12	1.86	3.68	0.35
BIO-GRATE-KMF 26-26-12	2.78	4.83	0.60
BIO-GRATE-KMF 24-40-12	6.71	6.59	1.04
BIO-GRATE-KMF 26-26-24	9.49	4.83	1.80
BIO-GRATE-KMF 24-40-24	13.53	6.59	3.12
BIO-GRATE-KMF 36-36-24	17.14	7.60	4.45

INSTALLATION NOTES:

1. ALL HARDWARE, FLANGE, FRAME, SCREENS SHALL BE STAINLESS STEEL.
2. HYDROCARBON BOOM SHALL BE 2" DIAMETER AND CONNECTED, MECHANICALLY TO THE FILTER FRAME WITH RAILS ALLOWING IT TO FLOAT ON THE WATER SURFACE REGARDLESS OF HEIGHT.
3. SEE PERFORMANCE REPORTS IN MANUFACTURES SPECIFICATIONS.
4. OTHER STANDARD AND CUSTOM MODEL SIZES AVAILABLE – CONTACT BIO CLEAN FOR MORE INFORMATION.
5. BASED ON 37% OPEN AREA.
6. CONSIDERS A SAFETY FACTOR OF 2.0.
7. CONSIDERS A LOCAL DEPRESSION PONDIING DEPTH OF 6 INCHES..
8. STORAGE CAPACITY BASED ON THE BASKET HALF FULL.
9. CONCRETE STRUCTURES SOLD SEPARATELY.

1:15 SCALE

PROPRIETARY AND CONFIDENTIAL:

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

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GRATE INLET FILTER
FULL CAPTURE
STANDARD DETAIL

8/27/21GIRARDT

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Section [_____]
Stormwater Connector Pipe Screen

PART 1 – GENERAL

01.01.00 Purpose
The purpose of this specification is to establish generally acceptable criteria for Connector Pipe Screens used for collecting trash and debris inside catch basins. It is intended to serve as a guide to producers, distributors, architects, engineers, contractors, plumbers, installers, inspectors, agencies and users; to promote understanding regarding materials, manufacture and installation; and to provide for identification of devices complying with this specification.

01.02.00 Description
Stormwater Connector Pipe Screens (CPS) are used to prevent trash and debris from entering the stormwater system during dry weather and moderate storm flows by keeping the trash inside the catch basin. The CPS is a screen placed permanently or temporarily in a catch basin at the location of the outlet pipe. The screen separates trash and debris from stormwater treatment flows. Flows that exceed the treatment flow rate bypass over the top of the screen. When the outlet pipe is located below a curb opening the CPS features a lid to prevent debris from passing behind the screen and flowing directly to the outlet pipe. The CPS shall be designed to retain all trash larger than 5 mm (0.197 inches) in the catch basin.

01.03.00 Manufacturer
The manufacturer of the CPS shall be one that is regularly engaged in the engineering, design and production of systems developed for the treatment of stormwater runoff for at least (10) years, and which has a history of successful production, acceptable to the engineer of work. In accordance with the drawings, the CPS(s) shall be a screen device manufactured/distributed by Bio Clean Environmental Services, Inc., or assigned distributors or licensees. Bio Clean Environmental Services, Inc. can be reached at:

5796 Armada Drive, Suite 250
Carlsbad, CA 92008
Phone: (760) 433-7640
Fax: (760) 433-3176
www.biocleanenvironmental.net

01.04.00 Submittals

01.04.01 Submittal drawings will be provided with each order to the contractor and engineer of work.

01.04.02 Submittal drawings are to detail the CPS, its components and the sequence for installation, including:

- CPS configuration with primary dimensions
- Various CPS components
- Any accessory equipment

01.04.03 Inspection and maintenance documentation submitted upon request.

01.05.00 Work Included

01.05.01 Specification requirements for installation of CPS.

01.05.02 Manufacturer to supply CPS(s):

- Screen
- Mounting hardware
- Bypass lid with supports (when required)

PART 2 – COMPONENTS

02.01.01 The CPS shall have a sufficient structural integrity to withstand a lateral force of standing water within the catch basin area when the screen becomes 100% clogged. The CPS unit shall be bolted to the catch basin walls.

02.01.02 The CPS shall be configured with deflector plates or screens preventing trash from falling between the screen and connector pipe. The deflector plate shall be designed to withstand a vertical load.

02.01.03 The gap at the bottom, sides, and joints of the CPS unit shall not exceed 5 mm (0.197 inches).

02.01.04 The CPS shall include vertical structural stiffeners extending the full length of the screen in the form as bends in the screen itself, a bolting surface to fasten the CPS to the wall of the catch basin, and support for the upper portion of the CPS unit referred to as the "bypass."

02.01.05 All parts/components of the CPS unit must be sized to fit through the catch basin's manhole opening.

02.01.06 The CPS frame shall be fabricated from 304 stainless steel.

02.01.07 The CPS screen shall be fabricated from perforated 304 stainless steel. The screen shall have a minimum thickness of 16 gauge. The geometrical opening shape shall have a diameter of 5 mm (0.197 inches).

02.01.08 The screen material used shall have at least 45% open area.

02.01.09 Any edge of the CPS that is not flush with the wall or floor of the catch basin shall be smooth with no prongs or jagged edges.

02.01.10 The assembly bolts, screws, nuts, and washers shall be fabricated entirely from 316 stainless steel. The concrete anchor bolts shall use a wedge anchor, with Type 316 stainless steel threaded rods, nuts, and washers.

PART 3 – PERFORMANCE

03.01.00 General

03.01.01 Function - The CPS has no moving internal components and functions based on gravity flow, unless otherwise specified. Stormwater runoff enters the catch basin through a curb opening and flows toward the connector pipe. The CPS is placed to intercept flows prior to exiting the catch basin through the connector pipe. The CPS must be able to be removed through the catch basin opening. Stormwater flow up to the peak treatment rate is processed through the screen. Flows in excess of the peak treatment rate will overtop the screen in a bypass. The lid (when required) shall be place high enough above the screen to allow for full bypass flow.

03.01.02 Pollutants - The CPS will remove and retain trash and debris larger than 5 mm in diameter entering the catch basin during frequent storm events and specified flow rates.

03.01.03 Treatment Flow Rate - The CPS operates through gravity flow. The CPS is to be sized so the screen is capable of passing the calculated project specific water quality flow rate per local standards. All treatment flow rates must include a 50% screen clogging factor.

03.01.04 Bypass Flow Rate – The CPS is designed to fit within the catch basin in a way not to affect the existing hydraulics and treat or bypass all flows. The bypass must be sized with a surface area greater than the outlet pipe size, thus the CPS shall not be a critical point of flow restriction.

PART 4 - EXECUTION

04.01.00 General

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

04.02.00 Installation

The contractor shall furnish all labor, equipment, materials and incidentals required to install the CPS device(s) and appurtenances in accordance with the drawings, installation manual, and these specifications, and be inspected and approved by the local governing agency. Any damage to catch basin and surrounding infrastructure caused by the installation of the CPS is the responsibility of the installation contractor.

04.02.01 CPS and all components or accessories shall be inserted through the catch basin and properly secured per manufactures installation manual and these specifications.

04.03.00 Shipping, Storage and Handling

04.03.01 Shipping – CPS shall be shipped to the contractor's address and is the responsibility of the contractor to transport the unit(s) to the exact site of installation.

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

04.04.00 Maintenance and Inspection

04.04.01 Inspection – After installation, the contractor shall demonstrate that the CPS has been properly installed at the correct location(s), elevations, and with appropriate supports and fasteners. All components associated with the CPS and its installation shall be subject to inspection by the engineer of work, governing agency, and the manufacture at the place of installation. In addition, the contractor shall demonstrate that the CPS has been installed per the manufacturer's specifications and recommendations. CPS(s) shall be physically inspected regularly in accordance to owner's Stormwater Pollution Prevention Plans (SWPPP) and manufacture's recommendations. An inspection record shall be kept by the inspection operator. The record shall include the condition of the CPS and its appurtenances. The most current copy of the inspection record shall always be copied and placed in the owner's SWPPP.

04.04.02 Maintenance – The maintenance shall be performed by someone qualified. A Maintenance Manual is available upon request from the manufacturer. The

manual has detailed information regarding the maintenance of the CPS(s). A detailed Maintenance Record shall be kept by the maintenance operator. The Maintenance Record shall include any maintenance activities preformed, amount and description of debris collected, and the condition of the CPS. The most current copy of the Maintenance Record shall always be copied and placed in the owner's Stormwater Pollution Prevention Plan (SWPPP) per governing agency. Upon cleaning: no trash or debris shall be located in the catch basin, on top of the bypass lid, or between the screen; no vegetation shall block the catch basin opening or connector pipe; and no trash or debris shall be located within the catch basin opening.

04.04.03 Material Disposal - All debris, trash, organics, and sediments captured and removed from the CPS shall be transported and disposed of at an approved facility for disposal in accordance with local and state regulations. Please refer to state and local regulations for the proper disposal of toxic and non-toxic material.

PART 5 – QUALITY ASSURANCE

05.01.00 Warranty

The manufacturer shall guarantee the CPS against all manufacturing defects in materials and workmanship for a period of (3) years from the date of delivery to the contractor. The manufacturer shall be notified of repair or replacement issues in writing within the warranty period. The CPS is limited to recommended application for which it was designed.

[End of This Section]

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.

Roof Runoff Controls SD-11



Rain Garden

Design Objectives

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

Description

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

Approach

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

Suitable Applications

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

Design Considerations

Designing New Installations

Cisterns or Rain Barrels

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

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

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

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

Dry wells and Infiltration Trenches

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

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

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

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

Pop-up Drainage Emitter

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

Foundation Planting

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

Redeveloping Existing Installations

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

Supplemental Information

Examples

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

Other Resources

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

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

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

Efficient Irrigation SD-12



Design Objectives

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

Description

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

Approach

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

Suitable Applications

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

Design Considerations

Designing New Installations

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

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

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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

CASQA
CALIFORNIA STORMWATER QUALITY ASSOCIATION

– 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.

Street Sweeping and Vacuuming SE-7



Description and Purpose

Street sweeping and vacuuming includes use of self-propelled and walk-behind equipment to remove sediment from streets and roadways, and to clean paved surfaces in preparation for final paving. Sweeping and vacuuming prevents sediment from the project site from entering storm drains or receiving waters.

Suitable Applications

Sweeping and vacuuming are suitable anywhere sediment is tracked from the project site onto public or private paved streets and roads, typically at points of egress. Sweeping and vacuuming are also applicable during preparation of paved surfaces for final paving.

Limitations

Sweeping and vacuuming may not be effective when sediment is wet or when tracked soil is caked (caked soil may need to be scraped loose).

Implementation

- Controlling the number of points where vehicles can leave the site will allow sweeping and vacuuming efforts to be focused, and perhaps save money.
- Inspect potential sediment tracking locations daily.
- Visible sediment tracking should be swept or vacuumed on a daily basis.

Categories

EC	Erosion Control	
SE	Sediment Control	☒
TC	Tracking Control	☑
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

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

Potential Alternatives

None

If User/Subscriber modifies this fact sheet in any way, the CASQA name/logo and footer below must be removed from each page and not appear on the modified version.

- Do not use kick brooms or sweeper attachments. These tend to spread the dirt rather than remove it.
- If not mixed with debris or trash, consider incorporating the removed sediment back into the project

Costs

Rental rates for self-propelled sweepers vary depending on hopper size and duration of rental. Expect rental rates from $58/hour (3 yd^3 hopper) to $88/hour (9 yd^3 hopper), plus operator costs. Hourly production rates vary with the amount of area to be swept and amount of sediment. Match the hopper size to the area and expect sediment load to minimize time spent dumping.

Inspection and Maintenance

- Inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- When actively in use, points of ingress and egress must be inspected daily.
- When tracked or spilled sediment is observed outside the construction limits, it must be removed at least daily. More frequent removal, even continuous removal, may be required in some jurisdictions.
- Be careful not to sweep up any unknown substance or any object that may be potentially hazardous.
- Adjust brooms frequently; maximize efficiency of sweeping operations.
- After sweeping is finished, properly dispose of sweeper wastes at an approved dumpsite.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Labor Surcharge and Equipment Rental Rates, State of California Department of Transportation (Caltrans), April 1, 2002 – March 31, 2003.

Appendix D:

BMP Maintenance Information

BioMediaGREEN

Modular Wetland System (MWS) – LINEAR

Maintenance Cost (per acre)

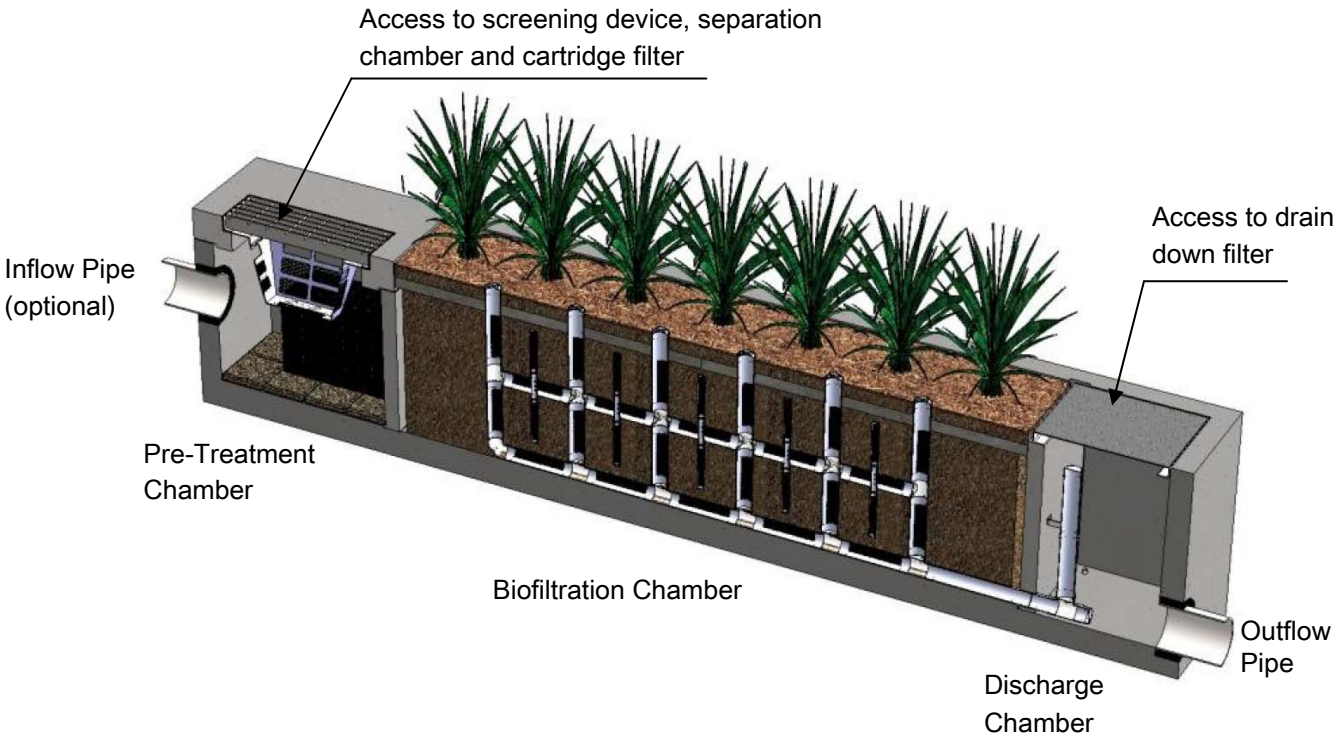
MWS - LINEAR	Cleaning Required	Yearly Maintenance Cost
Year 1	□□Clean Inlet Filter □□ Mont□ Inter□al□□ □□□acuu□ Catc□ □a□in □□□ Mont□ Inter□al□□ 3□Re□lace □ioMedia Green Filter Media	□□□ □eac□ □□□□ □3□□ □□ear □□□□ □□ear
Year 2	□□Clean Inlet Filter □□ Mont□ Inter□al□□ □□□acuu□ Catc□ □a□in □□□ Mont□ Inter□al□□ 3□Re□lace □ioMedia Green Filter Media	□□□ □eac□ □□□□ □3□□ □□ear □□□□ □□ear
Year 3	□□Clean Inlet Filter □□ Mont□ Inter□al□□ □□□acuu□ Catc□ □a□in □□□ Mont□ Inter□al□□ 3□Re□lace □ioMedia Green Filter Media	□□□ □eac□ □□□□ □3□□ □□ear □□□□ □□ear
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Year 5	□□Clean Inlet Filter □□ Mont□ Inter□al□□ □□□acuu□ Catc□ □a□in □□□ Mont□ Inter□al□□ 3□Re□lace □ioMedia Green Filter Media	□□□ □eac□ □□□□ □3□□ □□ear □□□□ □□ear
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Year 7	□□Clean Inlet Filter □□ Mont□ Inter□al□□ □□□acuu□ Catc□ □a□in □□□ Mont□ Inter□al□□ 3□Re□lace □ioMedia Green Filter Media	□□□ □eac□ □□□□ □3□□ □□ear □□□□ □□ear
Year 8	□□Clean Inlet Filter □□ Mont□ Inter□al□□ □□□acuu□ Catc□ □a□in □□□ Mont□ Inter□al□□ 3□Re□lace □ioMedia Green Filter Media	□□□ □eac□ □□□□ □3□□ □□ear □□□□ □□ear
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Total 1 - 10	**Total Maintenance Cost Over 10 Years**	**$11,800**
Average Yearly Cost	**Assumes 10 Year Replacement of Wetland Media.**	**$1,180 / Year**

Maintenance Guidelines for Modular Wetland System - Linear

Maintenance Summary

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

System Diagram



Maintenance Procedures

Screening Device

□□ Re□o□e grate or □an□ole co□er to gain acce□□ to t□e □creening de□ice in t□e Pre□ Treat□ent C□a□ □er□□ault t□□e unit□ do not □a□e □creening de□ice□Maintenance can □e □er□or□ed □it□out entr□□
□□ Re□o□e all □ollutant□ collected □□ t□e □creening de□ice□ Re□o□al can □e done □anuall□ or □it□ t□e u□e o□a □acuu□ truc□□ T□e □o□e o□ t□e □acuu□ truc□ □ill not da□age t□e □creening de□ice□
3□ □creening de□ice can ea□il□ □e re□o□ed □ro□ t□e Pre□Treat□ent C□a□ □er to gain acce□□ to □e□aration c□a□ □er and □edia □ilter□ □elo□□Re□lace grate or □an□ole co□er □□en co□ □leted□

Separation Chamber

□□ Per□or□ □aintenance □rocedure□ o□□creening de□ice li□ted a□o□e □e□ore □aintaining t□e □e□aration c□a□ □er□
□□ □ it□ a □re□□ure □a□□er □□ra□do□n □ollutant□ accu□ulated on □all□and cartridge □ilter□□
3□ □acuu□ out □e□aration C□a□ □er and re□o□e all accu□ulated □ollutant□□Re□lace □creening de□ice□grate or □an□ole co□er □□en co□ □leted□

Cartridge Filters

□□ Per□or□ □aintenance □rocedure□ on □creening de□ice and □e□aration c□a□ □er □e□ore □aintaining cartridge □ilter□□
□□ Enter □e□aration c□a□ □er□
3□ □n□cre□ t□e t□o □olt□ □olding t□e lid on eac□ cartridge □ilter and re□o□e lid□
□□ Re□o□e eac□ o□□ to □ □edia cage□ □olding t□e □edia in □lace□
□□ □□ra□do□n t□e cartridge □ilter to re□o□e an□ accu□ulated □ollutant□□
□□ □acuu□ out old □edia and accu□ulated □ollutant□□
□□ Rein□tall □edia cage□ and □ill □it□ ne□ □edia □ro□ □anu□acturer or out□ide □u□□lier□Manu□acturer □ill □ro□ide □□eci□ication o□□edia and □ource□ to □urc□a□e□
□□ Re□lace t□e lid and tig□ten do□n □olt□□Re□lace □creening de□ice□grate or □an□ole co□er □□en co□ □leted□

Drain Down Filter

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□□ □nloc□and li□t drain do□n □ilter □ou□ing and re□o□e old □edia □loc□□Re□lace □it□ ne□ □edia □loc□□Lo□er drain do□n □ilter □ou□ing and loc□ into □lace□
3□ E□it c□a□ □er and re□lace □atc□or □an□ole co□er□

Maintenance Notes

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Maintenance Procedure Illustration

Screening Device

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Separation Chamber

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Cartridge Filters

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Drain Down Filter

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Trim Vegetation

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Inspection Form



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

www.modularwetlands.com

Inspection Report
Modular Wetlands System

Project Name _____

Project Address _____
City, State, Zip Code

Owner/Management Company _____

Contact _____ Phone ( ) -

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

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

Weather Condition _____ Additional Notes _____

For Office Use Only
Reviewed By
Date
Office Personnel to complete section to the left

Inspection Checklist

Modular Wetland System Size: 6' Curb/Grate or 8' Vault _____ Size (22', 14', or etc.) _____

Structural Integrity:	Yes	No	Comments
Damage to Pretreatment access cover (manhole cover/grate) cannot be opened using normal lifting pressure?			
Damage to discharge chamber access cover (manhole cover/grate) cannot be opened using normal lifting pressure?			
Does the MWS unit show signs of structural deterioration (cracks in the walls/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 automotive 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 shelves (if applicable)?			
Does the determination/sediment transport/deposition (sediment depth) measurement indicate one in the pretreatment section (note depth of accumulation in in pretreatment chamber)?			Depth:
Does the cartridge filter media need replacement in the pretreatment 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 structure?			

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

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

Plant Information	
Damage to Plants	
Plant Replacement	
Plant Trimming	

Additional Notes

San Luis Rey Road Oceanside CA 92058 P (760) 433-7640 F (760) 433-3201

Maintenance Report



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

www.modularwetlands.com

Cleaning and Maintenance Report
Modular Wetlands System

Project □a□e _____

Project Addre□□ _____
□cit□□ □□i□Code□

O□ner □Manage□ent Co□ □an□ _____

Contact _____ P□one □ □ □

In□□ector □a□e _____ Date ____ □ ____ □ _____ Ti□e _____ AM □PM

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		M□ □ □edi□entation □a□in						
		Media Filter Condition						
		Plant Condition						
		Drain Do□n Media Condition						
		Di□c□arge C□a□ □er Condition						
		Drain Do□n Pi□e Condition						
		Inlet and Outlet Pi□e Condition						

Co□ □ent□□

CONTECH®
ENGINEERED SOLUTIONS

Modular Wetlands® Linear
Operation & Maintenance Manual



MODULAR WETLANDS®

MODULAR WETLANDS® LINEAR OPERATION & MAINTENANCE MANUAL

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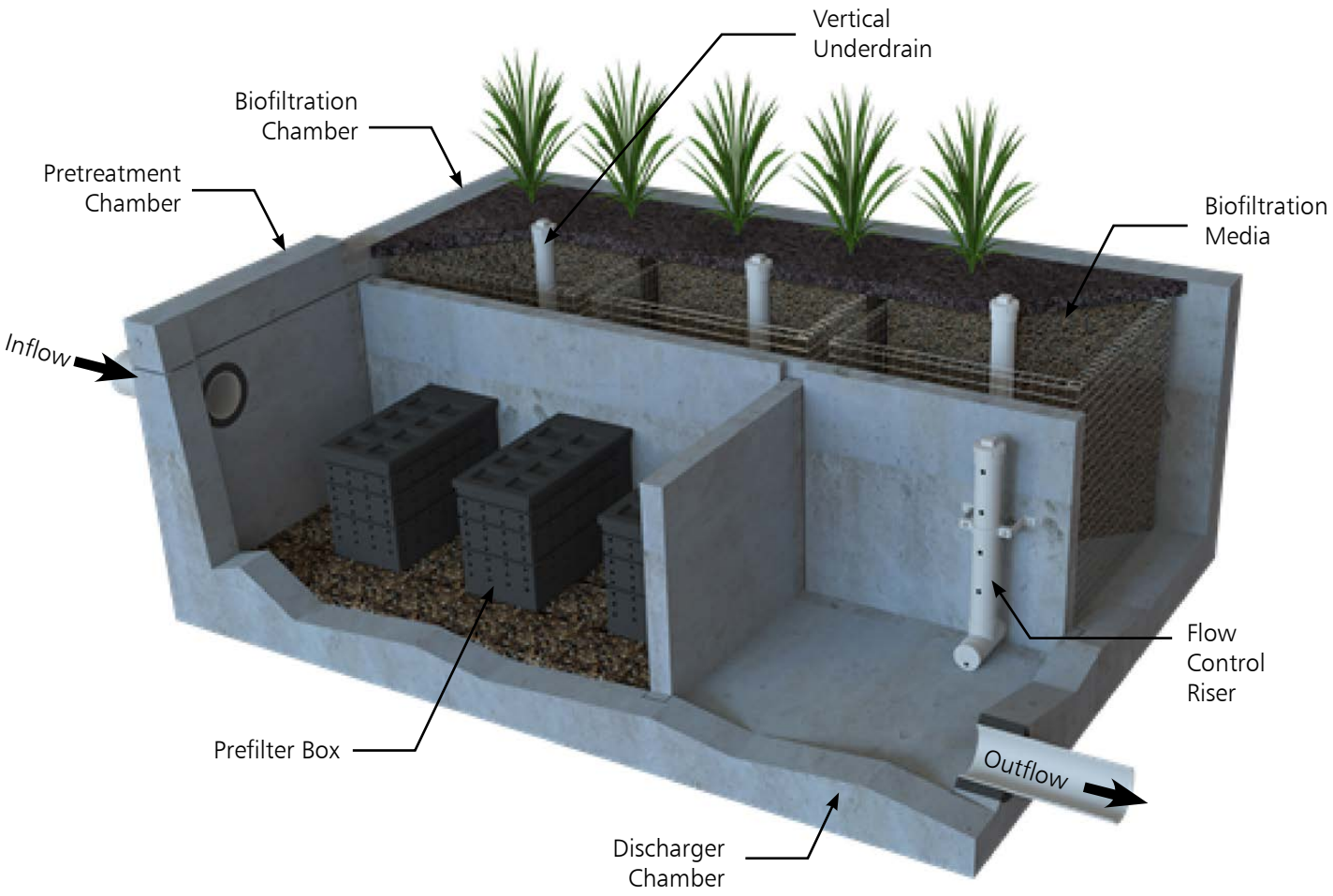
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OVERVIEW

The Modular Wetlands® Linear Biofilter is designed to remove high levels of trash, debris, sediments, nutrients, metals, and hydrocarbons. Its simple design allows for quick and easy installation. The system is housed in a standard precast structure and can be installed at various depths to meet site-specific conditions.

INTRODUCTION

This is the Modular Wetlands Linear Biofilter operation and maintenance manual. Before starting, read the instructions and equipment lists closely. It is important to follow all necessary safety procedures associated with state and local regulations. Some steps required confined space entry. Please contact Contech for more information on pre-authorized third party contractors who can provide installation services in your area. For a list of service providers in your area please visit: www.conteches.com/maintenance.



INSTRUCTIONS

INSPECTION SUMMARY

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 Modular Wetlands Linear:

- Modular Wetlands Linear Inspection Form
- Flashlight
- Manhole hook or appropriate tools to remove access hatches and covers
- Appropriate traffic control signage and procedures
- Measuring pole and/or tape measure
- Protective clothing and eye protection
- 7/16" open or closed ended wrench
- Large permanent black marker (initial inspections only - first year)

Note: entering a confined space requires appropriate safety and certification. It is generally not required for routine inspections of the system

INSPECTION AND 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 of its 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 prefilter 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 is in need of replacement.

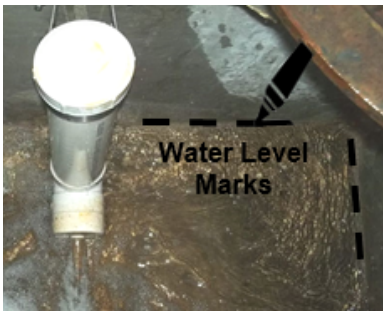


6. The biofiltration chamber is generally maintenance-free due to the system's advanced pre-treatment chamber. For units which have open planters with vegetation, it is recommended that the vegetation be inspected. Look for any plants that are dead or showing signs of disease or other negative stressors. 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 orifice control structure, 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 conditions 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. Generally, the discharge chamber will be clean and free of debris. Inspect the water marks on the side walls. If possible, inspect the discharge chamber during a rain event to assess the amount of flow leaving the system while it is at 100% capacity (pre-treatment chamber water level at peak HGL - top of bypass weir). The water level of the flowing water should be compared to the watermark level on the side walls, which is an indicator of the highest discharge rate the system achieved when initially installed. Record on the form if there is any difference in level from the watermark in inches.

NOTE: During the first few storms, the water level in the outflow chamber should be observed and a 6" long horizontal watermark line drawn (using a large permanent marker) at the water level in the discharge chamber while the system is operating at 100% capacity. The diagram below illustrates where the line should be drawn. This line is a reference point for future inspections of the system.

Water level in the discharge chamber is a function of flow rate and pipe size. Observation of the water level during the first few months of operation can be used as a benchmark level for future inspections. The initial mark and all future observations shall be made when the system is at 100% capacity (water level at maximum level in the pre-treatment chamber). If future water levels are below this mark when the system is at 100% capacity, this is an indicator that maintenance to the pre-filter cartridges may be needed.

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 pretreatment chamber in which the length and width of the chamber is fully impacted more than 18". See photo below.
- Excessive accumulation of sediment in the pretreatment chamber of more than 6" in depth.
- Excessive accumulation of sediment on the BioMediaGREEN media housed within the pretreatment cartridges. The following chart shows photos of the condition of the BioMediaGREEN contained within the pre-filter cartridges. When media is more than 85% clogged, replacement is required.
- 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.





INSPECTION PROCESS

- Excessive accumulation of sediment on the BioMediaGREEN media housed within the drain down filter (California only - older models). The following photos show the condition of the BioMediaGREEN contained within the drain down filter. When media is more than 85% clogged, replacement is required.





- Overgrown vegetation.



- Water level in the discharge chamber during 100% operating capacity (pretreatment chamber water level at max height) is lower than the water mark by 20%.

MAINTENANCE SUMMARY

The time has come to maintain your Modular Wetlands® Linear. 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 cleaning equipment.
- Ensure traffic control is set up and properly positioned.
- Prepared pre-checks (OSHA, safety, confined space entry) are performed.

The following is a list of equipment to required for maintenance of the Modular Wetlands® Linear:

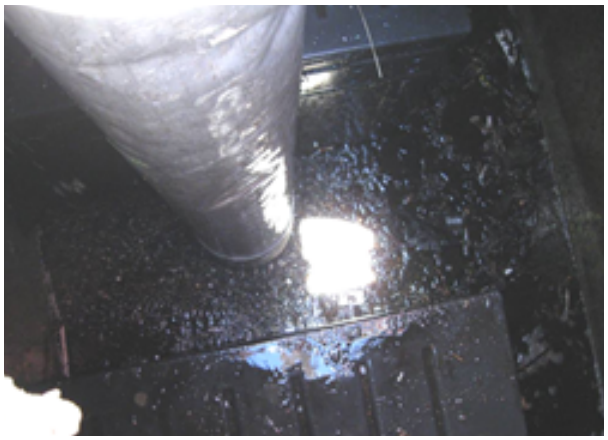
- Modular Wetlands Linear Maintenance Form
- Manhole hook or appropriate tools to access hatches and covers
- Protective clothing, flashlight, and eye protection
- 7/16" open or closed ended wrench
- Vacuum assisted truck with pressure washer
- Replacement BioMediaGREEN for pre-filter cartridges if required (order from one of Contech's Maintenance Team members at https://www.conteches.com/maintenance).

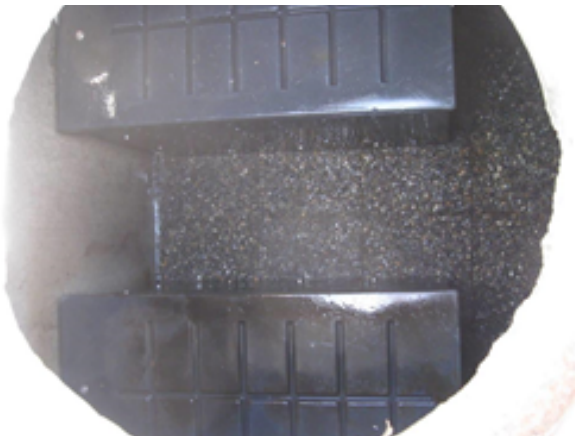
MAINTENANCE | PRETREATMENT CHAMBER

1. Remove access cover over pre-treatment chamber and position vacuum truck accordingly.
2. With a pressure washer, spray down pollutants accumulated on walls and pre-filter cartridges.
3. Vacuum out pre-treatment chamber and remove all accumulated pollutants including trash, debris, and sediments. Be sure to vacuum the floor until the pervious pavers are visible and clean.
4. If pre-filter cartridges require media replacement, continue to step 5. If not, replace access cover and move to step 11.





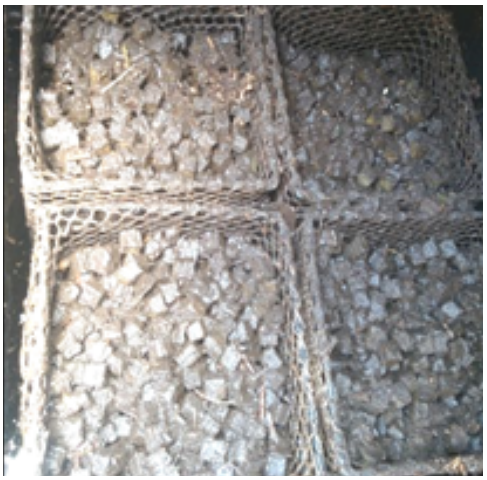




MAINTENANCE | PREFILTER CARTRIDGES

5. After successfully cleaning out the pre-treatment chamber (previous page) enter the pre-treatment chamber.
6. Unscrew the two bolts (circles shown below) holding the lid on each cartridge filter and remove lid.

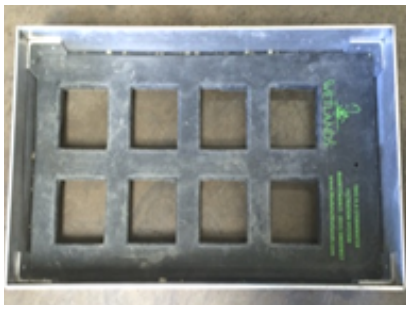


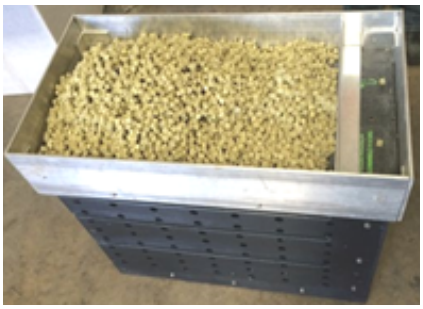


7. Place the vacuum hose over each individual media filter to suck out filter media.



8. Once filter media has been sucked out, use a pressure washer to spray down the inside of the cartridge and it's 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.
9. Reinstall media cages and fill with new media from the manufacturer or outside supplier. Manufacturer will provide specification of media and sources to purchase. Utilize the manufacture-provided refilling tray and place on top of the cartridge. Fill the tray with new bulk media and shake down into place. Using your hands, lightly compact the media into each filter cage. Once the cages are full, remove the refilling tray and replace the cartridge top, ensuring bolts are properly tightened.







10. Exit the pre-treatment chamber. Replace access hatch or manhole cover.

MAINTENANCE | BIOFILTRATION CHAMBER

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



12. Each vertical under drain on the biofiltration chamber has a removable (threaded cap) that can be taken off to check any blockages or root growth. Once removed, a jetting attachment can be used to clean out the under drain and orifice riser.
13. As with all biofilter systems, at some point the biofiltration media (WetlandMedia) will need to be replaced. Either because of physical clogging of sorptive exhaustion 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. Utilize the vacuum truck to vacuum out the media by placing the hose into the chamber. Once all the media is removed use the power washer to spray down all the netting on the outer metal cage. Inspect the netting for any damage or holes. If the netting is damaged it can be repaired or replaced with guidance by the manufacturer.
14. Contact one of Contech's Maintenance Team members at https://www.conteches.com/maintenance to order new WetlandMedia. 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 1000 and 2000 lbs. A lifting apparatus (backhoe, boom truck, or other) is recommended to position the super sack over the biofiltration chamber. Fill the media cages up to the same level as the old media. Replant with vegetation.





MAINTENANCE | DISCHARGE CHAMBER

15. Remove access hatch or manhole cover over discharge chamber.
16. Enter chamber to gain access to the drain down filter. Unlock the locking mechanism and lift up drain down filter housing to remove used BioMediaGREEN filter block as shown below. *NOTE: Drain down filter is only found on units installed in California prior to 2023. If no drain down filter is present, skip steps 16 and 17.*





17. Insert a new BioMediaGREEN filter block and lock drain down filter housing back in place.
18. Replace access hatch or manhole cover over discharge chamber.

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 ( ) –

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 _____

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:



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SUPPORT

DRAWINGS AND SPECIFICATIONS ARE AVAILABLE AT WWW.CONTECHES.COM

Modular Wetlands Maintenance Guide 1/2023

Bio Clean

A Forterra Company

Bio Clean CPS

A Stormwater Trash Capture Solution

OPERATION & MAINTENANCE MANUAL

5796 Armada Drive Suite 250 | Carlsbad, CA 92008 | 855.566.3938

stormwater@forterrabp.com | biocleanenvironmental.com

OPERATION & MAINTENANCE

CPS devices should be maintained by individuals who are trained in proper disposal procedures, confined space entry and traffic safety regulations. When servicing a Bio Clean CPS device be sure to follow all safety and traffic control protocols as well as wearing all proper personal protection equipment such as gloves, safety glasses, hard-hat, safety vest and work boots.



Visual Inspection

1. Begin by inspecting the inflow of the catch basin where the Bio Clean CPS device is located. Check for any obstructions to inflow of the CB unit. If any large obstructions are found, have them removed. Once the inflow inspection is completed, remove the man-hole cover for further inspection. (Note: Confined Space Entry Procedures may apply if trained personnel intend to enter the interior space of any Catch Basin. Please follow all applicable confined space entry procedures)

2. Remove the manhole cover and visually estimate the amount and types of debris found in the CB unit. Look for any visual signs of damage that may compromise the CB unit to function properly. Inspect for any standing water in the CB unit as well as for large amounts of sediment and debris surrounding the CPS device. If standing water and high sediment volume is found, remove water, sediment and debris by vacuum truck or by other debris removal methods.

Cleaning Procedures and Frequencies

1. Like all other storm water BMP's, Bio Clean CPS devices require periodic maintenance. Routine inspection and maintenance intervals for all CPS devices are typically twice per year for inspections and once per year for maintenance service. Bio Clean CPS devices may require more frequent maintenance service if the device is located in a high debris loading drainage area, such as certain downtown areas, retail/restaurant, or residential areas where a significant amount of vegetation/foliage is located. In such cases, Bio Clean CPS devices may require more frequent inspection and maintenance service, which could range from twice per year to monthly inspection and maintenance service, depending on pollutant load conditions.

2. To begin Bio Clean CPS cleaning procedures, conduct a visual inspection of the CPS device and the surrounding area to ensure a safe working environment. Setup appropriate barriers and signage as necessary to establish a work zone surrounding the catch basin. Once the work zone has been established, remove the manhole cover from the catch basin.

3. Once the manhole cover is removed from the basin the Bio Clean CPS is ready for servicing. All debris can be removed by either a vacuum truck or manually removing sediment and debris by hand.

4. Bio Clean CPS devices shall be cleaned using a pressure washer as may be necessary if any materials are found to cause occlusion or clogging of the screen.

Disposal

1. All trash and debris removed from the Bio Clean CPS unit shall be disposed of in accordance with local, state and federal regulation.

2. Solid waste disposal can be coordinated with local landfills. Liquids may need to be disposed of by wastewater treatment plant, municipal vacuum truck decant facility or approved facility.

For Maintenance Services or Information Please Contact Us At:
760-433-7640
Or Email:
info@biocleanenvironmental.com

Appendix E:

Geotechnical Report

UPDATED GEOTECHNICAL AND INFILTRATION EVALUATION
PROPOSED TOWNHOME RESIDENTIAL DEVELOPMENT
2375 NORTH TUSTIN STREET
ORANGE, ORANGE COUNTY, CALIFORNIA

PREPARED FOR

MELIA HOMES
9860 IRVINE CENTER DRIVE
IRVINE, CALIFORNIA 92618

PREPARED BY

GEOTEK, INC.
1548 NORTH MAPLE STREET
CORONA, CALIFORNIA 92878

PROJECT NO. 4150-CR **DECEMBER 30, 2024**

GEOTEK

GeoTek, Inc.
1548 North Maple Street, Corona, California 92878
(951) 710-1160 Office (951) 710-1167 Fax www.geotekusa.com

December 30, 2024
Project No. 4150-CR

Melia Homes
9860 Irvine Center Drive
Irvine, California 92618

Attention: Mr. Chad Brown,
Vice President of Planning & Development

Subject: **Updated Geotechnical and Infiltration Evaluation**
Proposed Townhome Residential Development
2375 North Tustin Street
Orange, Orange County, California

Dear Mr. Brown:

GeoTek, Inc. (GeoTek) is pleased to provide the results of this Updated Geotechnical and Infiltration Evaluation for a Proposed Townhome Residential Development that will be constructed at 2375 North Tustin Street, in the City of Orange, Orange County, California. This report presents a discussion of GeoTek's evaluation and provides preliminary geotechnical recommendations for site preparation, foundation design, preliminary infiltration rates and construction of proposed site improvements.

Based upon review and evaluation, site development appears feasible from a geotechnical viewpoint provided that the recommendations included in this report are incorporated into the design and construction phases of site development.

The opportunity to be of service is sincerely appreciated. If you have any questions, please do not hesitate to contact GeoTek.

Respectfully submitted,
GeoTek, Inc.





Bruce A. Hick
GE 2284, Exp. 12/31/26
Geotechnical Engineer

Edward H. LaMont
CEG 1892, Exp. 07/31/26
Principal Geologist

Distribution: (1) Addressee via email (one PDF file)

"\\geotekfs1\Orange\Projects\4101 to 4150\4150CR Melia Homes 2375 North Tustin Street Orange\Updated Geotechnical and Infiltration Evaluation\4150CR UPD INFIL ORANGE 12-17-24.docx"

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1. PURPOSE AND SCOPE OF SERVICES

The purpose of this study was to evaluate the site geotechnical conditions for a proposed townhome residential development to be constructed at 2375 North Tustin Street, in the City of Orange, Orange County, California, as outlined in GeoTek's proposal P-1105024r-CR dated November 14, 2024. Services provided for this study included the following:

- Research and review of available geologic and geotechnical data and general information pertinent to the site,
- Review of a Geotechnical Investigation previously prepared for this site by Southern California Geotechnical, Inc. (SCGI, 2005), as well as additional geotechnical reports issued by SCGI (SCGI, 2007) for the subject site. Select information contained in these reports was used in the preparation of this report,
- A site reconnaissance,
- Advancement of three (3) exploratory borings to depths ranging between about 10 to 25.2 feet below existing grades,
- Infiltration testing of two (2) test borings at depths of about ten (10) feet each within the area of the proposed project stormwater management facility (BMP) in the southwestern and southeastern portions of the site,
- Review and evaluation of site seismicity,
- Compilation of this Updated Geotechnical and Infiltration Evaluation which presents GeoTek's findings, preliminary recommendations and a general summary of pertinent geotechnical conditions relevant for site development.

The intent of this report is to aid in the evaluation of the site for future proposed development from a geotechnical perspective. The professional opinions and geotechnical information contained in this report may need to be updated based upon review of the final site development plans. These plans should be provided to GeoTek, Inc. for review when available.

2. SITE DESCRIPTION AND PROPOSED DEVELOPMENT

2.1 SITE DESCRIPTION

The irregular-shaped project site is located at 2375 North Tustin Street in a mixed-use residential/commercial area of Orange, California. The project site is comprised of one (1) parcel of land totaling approximately 4.32-acres in size, located on the east side of Tustin Street, on the south side of East Heim Avenue, in the City of Orange, Orange County, California (see Figure 1, Site Location Map). California State Highway 55 (Costa Mesa freeway) is located adjacent to the eastern side of the project but does not provide direct access as it is separated from the site by a sound wall. The site is fenced/block walled along most of the site perimeter with access only available from Tustin Street, a paved and improved roadway adjacent to the western boundary of the site.

The site is bordered to the south by an existing mobile home park, a multi-family residential development and a commercial development. A munti-family residential development and commercial development border the proejct site to the north. The site is currently occupied by an existing approximate 45,000 square foot one-story retail building (Best Buy) and adjacent parking/drive lane/hardscape/landscape improvements. Numerous utility lines, light poles, loading docks, domestic trees, and associated improvements are present on the proejct site.

The site can be considered as having a relatively flat to gently sloping topography (see Figure 1). Elevations range from approximately 271 feet above mean sea level (amsl) in the northeastern corner to about 263 feet amsl in the southwest corner. Drainage is generally directed in a southwesterly direction by sheetflow.

2.2 PROPOSED DEVELOPMENT

Based upon review of *Site Plan - A*, prepared by Summa Architecture and dated March 25, 2024 (see Figure 3, Project Plan), site development for the project will consist of 84 three-story row townhomes in multi-family structures (see Figure 3, Project Plan). The development will also include a recreation area, as well as stormwater disposal facilities, open space, perimeter/retaining walls, associated interior parking/driveways, underground utilities and other typical tract improvements.

It is anticipated that the residential structures will be of wood frame construction, supported by a post-tensioned (PT) slab foundation system. Although structural loading information was not

provided, GeoTek has assumed the structures will exert relatively light to moderate foundation loads. Maximum column and wall loads on the order of 100 kips and 3.5 kips per lineal foot, respectively, are estimated for the proposed structures. Once actual loads are known, that information should be provided to GeoTek to determine if modifications to the recommendations presented in this report are warranted.

On-site storm water disposal is proposed by means of underground disposal systems to be located in the southwestern and southeastern portions of the site. Cut and fills of less than approximately 5 feet in height, not including any recommended remedial grading are anticipated for site development. Perimeter/retaining walls are anticipated. Sewage disposal is anticipated to be be provided by a public sewer system. If site development differs from the assumptions made herein, the recommendations included in this report should be subject to further review and evaluation.

3. FIELD EXPLORATION AND LABORATORY TESTING

3.1 CURRENT FIELD EXPLORATION

The current field exploration by GeoTek for this evaluation was conducted on December 3, 2024. For the geotechnical portion of the investigation, one (1) exploratory boring (Boring B-1) was excavated with a hollow-stem auger drill rig to a depth of about 25.3 feet below the existing ground surface at the boring location. For the infiltration part of the study, two (2) test borings were excavated to a depth of approximately ten (10) feet each below the existing ground location within the proposed stormwater management chambers (BMP) in the southwestern and southeastern portions of the site.

A hollow-stem auger with an outside diameter of approximately 8.0 inches was utilized to conduct the borings. The inside diameter of the auger was approximately 4.5 inches. A geologist from GeoTek, Inc. logged the exploratory borings and obtained soil samples from within the borings. The boring and infiltration test locations are presented on Figure 2. The logs of the exploratory borings are included in Appendix A.

The exploration logs in Appendix A show subsurface conditions at the dates and locations indicated and may not be representative of other locations and times. The stratification lines presented on the logs represent the approximate boundaries between soil types, and the transitions may be gradual.

In the geotechnical boring, relatively undisturbed soil samples were recovered at various intervals with a California sampler. The California sampler is a 2.9-inch outside diameter, 2.5-inch inside diameter, split barrel sampler lined with brass rings. The sampler is approximately 18 inches in length. The sampler conformed to the requirements of ASTM D 3550. A 140-pound automatic trip hammer was utilized, dropping approximately 30 inches for each blow. The relatively undisturbed samples, together with bulk samples of representative soil types, were returned to the laboratory for testing and evaluation.

Infiltration Testing

Two (2) borings (Borings I-1 and I-2) were excavated on the project site to evaluate preliminary infiltration rates for the proposed stormwater management facilities to be located in the southwestern and southeastern portions of the site. The boring diameter was approximately eight inches. Percolation testing was performed within the lower approximately 24 inches in the borings by a representative of GeoTek, in general conformance with the Boring Percolation Test Procedure outlined in the Technical Guidance Document Appendix VII (Orange County, 2013). As required, the percolation rates were corrected to account for discharge of water from both the sides and bottom of the borings. This correction was done using the Porchet Method, obtaining the infiltration rates tabulated below:

SUMMARY OF RESULTS		
Boring	Observed Infiltration Rate, $K_{observed}$ (inches per hour)	Measured Infiltration Rate, $K_{measured}$ (inches per hour)
I-1	7.7	3.86
I-2	1.1	0.57

As recommended by the referenced Technical Guidance Document (Orange County, 2013), a factor of safety of 2.0 was applied to the observed (field) rates to estimate measured infiltration rates. As shown on the table above, poor to favorable infiltration rates (0.57 to 3.86 inches per hour) were encountered at the site. Detailed infiltration test data is included in Appendix D. Stormwater BMP systems should be setback from foundations and improvements as required by the regulatory agency or jurisdiction.

It should be noted that the infiltration rates provided above were performed in relatively undisturbed on-site soil. Infiltration rates will vary and are mostly dependent on the underlying consistency of the site soils and relative density. Infiltration rates may be impacted by the weight of equipment travelling over the soils, placement of engineered fill and other various factors.

GeoTek assumes no responsibility or liability for the ultimate design or performance of the storm water facility.

Representatives of GeoTek should observe the soils exposed at the bottom of the stormwater management basin during construction/earthwork operations to confirm suitability and that the conditions exposed are as anticipated for the proposed stormwater disposal basin.

3.2 PREVIOUS FIELD EXPLORATION

Field explorations were previously performed at this site by Southern California Geotechnical, Inc. (SCGI) in February, 2005. The subsurface exploration program conducted by SCGI occurred on February 9 and 23, and included the excavation of five (5) exploratory borings (B-1 through B-5) to a maximum depth of 32 feet below existing grades. The approximate locations of the SCGI excavations for the project are presented on the *Boring Location Plan* (Plate 2) attached to the referenced SCGI report dated March 29, 2005, prepared by Southern California Geotechnical, Inc. (SCGI, 2005). This plan is included in Appendix C of this report. The logs of the exploratory borings performed by SCGI are also included in Appendix C of this report.

3.3 LABORATORY TESTING

Laboratory testing was previously performed by Southern California Geotechnical, Inc. as indicated in their report dated March 29, 2005 (SCGI, 2005). This laboratory testing included in-situ dry density and moisture content, expansion index, direct shear, consolidation, and soluble sulfate testing. The results of this laboratory testing are presented in Appendix C of this report.

Laboratory testing was recently performed by GeoTek on selected relatively undisturbed and bulk soil samples collected during the recent field exploration. The purpose of the laboratory testing was to confirm the field classification of the soil materials encountered and to evaluate the physical properties of the onsite soils for use in engineering design and analysis. Results of the laboratory testing program along with a brief description and relevant information regarding testing procedures are included in Appendix B.

4. PREVIOUS REPORT REVIEW

Geotechnical Investigation (Southern California Geotechnical, Inc., 2005)

SCGI issued the referenced *Geotechnical Investigation* for the project on March 29, 2005. SCGI stated that detailed site plans for the proposed development had not been prepared at the time of their field exploration. SCGI understood that the proposed project would consist of the demolition of an existing site structure (Brunswick Orange Bowl) and construction of several two and three-story structures. Field exploration was conducted by drilling and sampling five (5) hollow stem auger borings to a maximum depth of approximately 32 below existing grades. Boring B-1 was terminated at approximately 32 feet due to auger refusal on gravel and cobbles.

SCGI reported that artificial fill was encountered beneath existing pavement sections at Boring B-5 and extended to a depth of 3± feet below existing grade. SCGI stated that additional soils classified as possible fill were encountered in all of the borings and extended to depths of up to 5.5± feet. These fill soils consisted of stiff to very stiff clays with some fine to coarse gravel (CL soil type based upon the Unified Soil Classification System).

Native soils (alluvium) were reported by SCGI to underlie the artificial fills at the site. The alluvium encountered to depths of 5.5± to 12± feet generally consisted of very stiff to hard silty clays with tract to some fine gravel content (CL soil type). Beneath these materials, the borings generally encountered interbedded zones of dense to very dense silty sands and very stiff to hard silty clays (SM and CL soil types) with varying amounts of fine to coarse gravel content, extending to depths of at least 32± feet (the deepest depth explored).

SCGI stated that the site soils possess a high expansion potential (EI = 108).

SCGI stated that groundwater was not encountered in their borings to a maximum depth of approximately 32 feet below existing site grades (Boring B-1). SCGI stated that based upon the Seismic Hazard Zone Map published by the Site of California, the project is not mapped as having a potential for seismic induced liquefaction. SCGI stated that based upon the soil encountered on the site and the depth to groundwater liquefaction is not considered to be a significant design concern for the project.

SCGI stated that remedial grading should be performed within the proposed building areas in order to remove the existing fill and possible fill soils and a portion of the near-surface native soils, as well as any soils disturbed by the demolition procedures. SCGI stated that that overexcavation was to extend to a depth of at least 3 feet below proposed pad grade and to a

depth of 3 feet below existing grade or to the fill/native content, or to a depth of 3 feet below the foundation bearing grade, whichever is greater, within the building areas.

SCGI provided seismic design parameters for the project structures based on the 1997 Uniform Building Code (UBC).

SCGI stated that shrinkage of reworked materials should be in the range of 8 to 10 percent. SCGI estimated subsidence to be on the order of 0.1 feet.

SCGI provided geotechnical recommendations for shallow foundations and a conventional slab on grade system for the project structures, based on a "High" (90-120) expansion index laboratory testing. SCGI also reported the on-site soils as having a "negligible" water soluble sulfate content. No discussion regarding the potential corrosivity of the site soils and buried ferrous metals was provided.

SCGI provided geotechnical recommendations for site retaining walls for the project. Preliminary pavement design recommendations for the project were also provided and were based on an assumed R-Value of 10.

No percolation testing was conducted for the referenced report dated March 29, 2005.

Geotechnical Update and Plan Review (Southern California Geotechnical, Inc., 2005)

SCGI issued the referenced *Geotechnical Update and Plan Review* for the project on October 17, 2007. SCGI stated that the architectural site plan and conceptual grading plan indicated the proposed development will consist of a 45,750 square foot Best Buy store and a 1,7000 square foot retail outlot pad.

SCGI stated that based upon review of the submitted plans and a recent site reconnaissance, it was their opinion that the proposed development was suitable from a geotechnical standpoint, and the referenced report was still applicable.

SCGI provided additional recommendations for new asphalt concrete (AC) and Portland Cement Concrete (PCC) pavement sections for the proposed Best Buy development.

5. GEOLOGIC AND SOILS CONDITIONS

5.1 REGIONAL SETTING

The subject property is situated in the Peninsular Ranges geomorphic province. The Peninsular Ranges province is one of the largest geomorphic units in western North America. Basically, it extends roughly 975 miles from the north and extends from the Transverse Ranges geomorphic province to the tip of Baja California, from north to south. This province varies in width from about 30 to 100 miles. It is bounded on the west by the Pacific Ocean, on the south by the Gulf of California and on the east by the Colorado Desert Province.

The Peninsular Ranges are essentially a series of northwest-southeast oriented fault blocks. Several major fault zones are found in this province. The Elsinore Fault zone and the San Jacinto Fault zone trend northwest-southeast and are found in the near the middle of the province. The San Andreas Fault zone borders the northeasterly margin of the province.

More specifically to the subject property, Morton, D.M., and Miller, F.K., (2006) map the site to be underlain by old alluvial fan deposits (late to middle Pleistocene age). Additionally, the nearest known active fault to the site is the Elsinore fault (Whittier Section) located approximately 6.4 miles to the northeast.

5.2 GENERAL SOIL/GEOLOGIC CONDITIONS

A brief description of the soils encountered at the site as reported by SCGI is presented in the following sections and supplemented by the current GeoTek exploration findings. Based on the previous and current field explorations, the area investigated has artificial fill which transitions into deeper alluvium.

5.2.1 Artificial Fill

SCGI reported that artificial fill was encountered beneath existing pavement sections at Boring B-5 and extended to a depth of 3± feet below existing grade prior to development of the site. SCGI stated that additional soils classified as possible fill were encountered in all of the borings and extended to depths of up to 5.5± feet. These fill soils consisted of stiff to very stiff clays with some fine to coarse gravel (CL soil type based upon the Unified Soil Classification System). Compacted fill is anticipated to be present within the existing building area and pavement areas.

Asphalt concrete pavement sections, consisting of asphalt concrete (AC) and crushed miscellaneous base (CBB), were encountered at all of the boring locations during GeoTek's recent site exploration.

5.2.2 Alluvium

SCGI reported that mostly clayey alluvium was encountered to depths of 5.5± to 12± feet. This alluvium was stated by SCGI to generally consist of very stiff to hard silty clays with tract to some fine gravel content (CL soil type). Beneath these materials, SCGI state that the borings generally encountered interbedded zones of dense to very dense silty sands and very stiff to hard silty clays (SM and CL soil types) with varying amounts of fine to coarse gravel content, extending to depths of at least 32± feet (the deepest depth explored). SCGI stated that the site soils possess a high expansion potential (EI = 108).

GeoTek's recent exploration also encountered alluvium below the existing asphalt concrete pavement sections to the maximum depth explored of approximately 26.5 feet below existing site grades at the boring locations. The alluvium consisted of interbedded layers of clay, clayey sand, silty sands and fine to coarse gravel CL, SC, SM and GP soil types).

SCGI (2005) and GeoTek's current laboratory testing indicated that the near surface soils exhibit a "Medium" (51≤EI≤90) to "High" (91≤EI≤120) Expansion Index when tested in accordance with ASTM D 4829. Based on the SCGI and current GeoTek laboratory test results, the near surface soils have a soluble sulfate content of less than 0.1 percent. The results of the recent testing performed by GeoTek indicate that the soil samples were considered "highly corrosive" to buried ferrous metals, based on the guidelines provided in *Corrosion Basics: An Introduction* (Roberge, 2005).

5.3 SURFACE AND GROUNDWATER

5.3.1 Surface Water

Surface water was not observed during the previous or current site explorations. If encountered during earthwork construction, surface water on this site is the result of precipitation or possibly some minor surface run-off from surrounding areas. Overall site drainage is generally in a northerly direction, as directed by site topography. Provisions for surface drainage will need to be accounted for by the project civil engineer.

5.3.2 Groundwater

Groundwater was not encountered in the previous site borings conducted by SCGI to a maximum depth of about 32 feet (Boring B-1) at the time of drilling or the current GeoTek borings to a maximum depth of about 26.5 feet. The California Water Data Library shows that the depth to groundwater in the site region is in excess of 40 feet. The depth of historic groundwater at the site is estimated to be greater than 40 feet below existing grades.

Based on the above, groundwater is not anticipated to be a factor during the site grading. However, seasonal perched groundwater may be encountered during grading within portions of the site.

5.4 FAULTING AND SEISMICITY

The geologic structure of the entire southern California area is dominated mainly by northwest-trending faults associated with the San Andreas system. The site is in a seismically active region. No active or potentially active fault is known to exist at this site nor is the site situated within an *"Alquist-Priolo"* Earthquake Fault Zone (Bryant and Hart, 2007; CGS, 1986). The subject property is not located within a State of California Seismic Hazard Zone for earthquake induced liquefaction (CGS, 1997). The subject property is not located within a State of California Seismic Hazard Zone for earthquake induced landsliding. The nearest known active fault to the site is the Elsinore fault (Whittier Section) located approximately 6.4 miles to the north.

5.4.1 Seismic Design Parameters

The site is located at approximately 33.8279 degrees Latitude and -117.8340 degrees Longitude. Based on the relatively dense soil conditions encountered across the site, a Site Class "D" is considered appropriate for this project. Site spectral accelerations (Sa and S1), for 0.2 and 1.0 second periods for a Class "D" site, was determined from the SEAOC/OSHPD web interface that utilizes the USGS web services and retrieves the seismic design data and presents that information in a report format.

The following seismic design parameters, based on the 2015 National Earthquake Hazards Reduction Program (NEHRP)/ASCE 7-16/2022 CBC, are presented below:

SITE SEISMIC PARAMETERS	
Mapped 0.2 sec Period Spectral Acceleration, S_S	1.0508g
Mapped 1.0 sec Period Spectral Acceleration, S_1	0.534g
Site Coefficient for Site Class "D", F_a	1.0
Site Coefficient for Site Class "D", F_v	1.766**
Maximum Considered Earthquake Spectral Response Acceleration for 0.2 Second, S_{MS}	1.508
Maximum Considered Earthquake Spectral Response Acceleration for 1.0 Second, S_{M1}	1.415g*
5% Damped Design Spectral Response Acceleration Parameter at 0.2 Second, S_{DS}	1.005
5% Damped Design Spectral Response Acceleration Parameter at 1 second, S_{D1}	0.944
Site Modified Peak Ground Acceleration, PGA_M	0.698g
Seismic Design Category	D

*ASCE 7-16 Supplement 3 Section 11.4.8 requires a ground motion hazard analysis for structures on Site Class "D" for values of S1 greater than or equal to 0.2g. However, a ground motion hazard analysis is not required where the values of SM1 and SD1 are increased by 50%. The SM1 and SD1 values shown above already include the 50% increase, so that exception can be obtained.

**ASCE 7-16 Supplement 3 Section 11.4.8 indicates that the value of Fv should only be used for calculation of Ts, determination of Seismic Design Category, linear interpolation for intermediate values of S1, and when taking the exceptions under Items 1 and 2 of Section 11.4.8 for the calculation of SD1.

Final selection of the appropriate seismic design coefficients should be made by the project structural engineer based upon the local practices and ordinances, expected building response and desired level of conservatism.

5.5 LIQUEFACTION AND SEISMIC SETTLEMENT

Liquefaction describes a phenomenon in which cyclic stresses, produced by earthquake-induced ground motion, create excess pore pressures in relatively cohesionless soils. These soils may acquire a high degree of mobility which can lead to lateral movement, sliding, settlement of loose sediments, sand boils and other damaging deformations. This phenomenon occurs only below the water table, but, after liquefaction has developed, the effects can propagate upward into overlying non-saturated soil as excess pore water dissipates.

The factors known to influence liquefaction potential include soil type and grain size, relative density, groundwater level, confining pressures, and both intensity and duration of ground shaking. In general, materials that are susceptible to liquefaction are loose, saturated granular soils having low fines content under low confining pressures.

The project site is not located within an area mapped by the State of California for liquefaction potential. Due to the lack of shallow groundwater, the liquefaction hazard at the site is nil.

Due to the relatively dense/clayey nature of the subsurface soils and anticipated site grading, the seismic settlement potential of the site soils is anticipated to be minimal.

5.6 OTHER SEISMIC HAZARDS

Evidence of ancient landslides or slope instability at this site was not observed during the field investigation. Due to the relatively flat site topography and relatively low liquefaction hazard potential, the potential for seismic-induced lateral displacements (i.e., "lateral spread") and slope instability hazards are considered negligible.

The potential for secondary seismic hazards such as a seiche and tsunami is considered negligible due to site elevation and distance from an open body of water.

6. CONCLUSIONS AND RECOMMENDATIONS

6.1 GENERAL

The anticipated site development appears feasible from a geotechnical viewpoint provided that the following recommendations, and those provided by this firm at a later date are incorporated into the design and construction phases of development. Site development, grading and foundation plans should be reviewed by GeoTek, Inc. when they become available so the recommendations contained in this report can be confirmed.

The near-surface upper site soils are anticipated to contain undocumented fill. In addition, removal of the existing site improvements and utility lines is anticipated to disturb the upper soils. Therefore, the upper site soils are not considered suitable for foundation loading in their current condition. Remedial grading, consisting of overexcavation and recompaction of the upper site soils, is recommended to provide a uniform bearing for any proposed structures.

The site soils were found to exhibit a "Medium" ($51 \leq EI \leq 90$) to "High" ($91 \leq EI \leq 120$) Expansion Index when tested in accordance with ASTM D 4829. As noted in the proposed development section of this report, a post-tensioned (PT) slab foundation system will be used to support the

proposed structures. This foundation system should be designed to accommodate the site soil expansion potential and the total and differential settlement potentials provided in this report.

6.2 EARTHWORK CONSIDERATIONS

Earthwork and grading should be performed in accordance with the applicable grading ordinances of the City of Orange, the 2022 California Building Code (CBC) and recommendations contained in this report. The Grading Guidelines included in Appendix E outline general procedures and do not anticipate all site-specific situations. In the event of conflict, the recommendations presented in the text of this report should supersede those contained in Appendix E.

6.2.1 Site Clearing and Demolition

In areas of planned grading and improvements, the locations of existing utilities should be determined. Existing utilities should be relocated or abandoned. The site should be cleared of existing structures, foundations, abandoned utilities, pavements, slabs, trees, vegetation and other deleterious materials. Demolition of existing buildings/structures should include removal of all shallow foundations, floor slabs and any below-grade construction. Debris should be properly disposed of off-site. Voids resulting from site clearing should be backfilled with engineered fill.

Portland Cement Concrete (PCC) generated from the demolition of existing site improvements may be incorporated into site fills provided the following guidelines are implemented: 1) concrete should be free of rebar or other deleterious materials and should be broken down to a maximum dimension of six (6) inches; 2) concrete should not be placed within three (3) feet of finish grade in the building pad areas or within one (1) foot of subgrade elevations in the street/drive areas; 3) concrete should be distributed in the fill and should not be "nested" or placed in concentrated pockets.

Asphalt concrete (AC) should not be used in fill for building pads or landscape areas. This material may be used in pavement areas of the project or should be removed from the site.

Alternatively, existing PCC concrete, AC and aggregate base may be pulverized and reused as Crushed Miscellaneous Base (CMB) in new pavement sections. These pulverized materials should not contain any detrimental or deleterious materials (reinforcing steel, nails, metal, glass, plastic rubber, wood, organic matter, friable materials, elongated or laminated pieces, etc.). Any materials to be used as CMB should be tested to confirm conformance with appropriate Standard Specifications for Public Works Construction ("Greenbook") specifications (Section 200-2.4).

6.2.2 Site Preparation

Due to the non-uniform condition of the near-surface upper site soils, presence of undocumented fill/soils and expected disturbance form the removal of the existing site improvements, it is recommended that the soils be removed beneath the planned building footprints to a depth of at least five (5) feet below existing grades, or three (3) feet below the base of the proposed foundations, whichever is greater. It should be noted that the above recommendations are recommended throughout the majority of the site; however, deeper artificial fills may be present within the site. These artificial fills will require deeper removals accordingly. All undocumented fill soils shall be removed as part of remedial grading. The lateral extent of this recommended over-excavation should extend at least five (5) feet beyond the building limits, where obtainable.

Removal bottoms should be relatively uniform in soil type and not adversely porous and having an in-place density of at least 85 percent of the soil's maximum dry density as determined by ASTM D 1557 test procedures. Deeper removals may be required and should be determined during site grading by a GeoTek representative.

Following site clearing operations, over-excavation and lowering of site grades, where necessary, it is recommended that the exposed subgrade soils beneath all surface improvements be proof rolled with a heavy rubber-tired piece of construction equipment approved by and in the presence of the geotechnical engineering representative. All soil that ruts or excessively deflects during proof rolling should be removed as recommended by the GeoTek representative.

Following proof rolling and removal of any unsuitable bearing soil, the exposed subgrade should be scarified to a depth of about 12 inches, be moisture conditioned to at least 2 percent above the soil's optimum moisture content and then be compacted to at least 90 percent of the soil's maximum dry density as determined by ASTM D-1557 test procedures.

6.2.3 Pavement Areas

Undocumented fill should be removed below proposed pavement areas. If no undocumented fill is encountered or is relatively shallow, the natural soils should be overexcavated to a depth of 12 inches below existing grade or 12 inches below proposed finished grade, whichever is deeper. Finished grade is defined as the top of the subgrade. The exposed soils in these areas and in cut areas should be scarified to a depth of approximately eight inches, moistened to at least 2 percent above the optimum moisture content and compacted to a minimum relative compaction of at least 90 percent of maximum dry density as determined by ASTM D 1557 test procedures. Pavement subgrade should be firm and unyielding upon proof rolling with heavy construction equipment prior to placement of aggregate base material.

6.2.4 Hardscape Areas

Undocumented fill should be removed below hardscape areas. The exposed soils in these areas and in cut areas should be scarified to a depth of approximately eight inches, moistened to at least 2 percent above the optimum moisture content and compacted to a minimum relative compaction of at least 90 percent of maximum dry density as determined by ASTM D 1557 test procedures. Due to the soil expansion potential, a minimum of four inches of gravel (1-inch minus) or crushed aggregate base should be placed below all exterior hardscape improvements.

6.2.5 Preparation of Excavation Bottoms

A representative of this firm should observe the bottom of all excavations. Upon approval, the exposed soils should be scarified to a depth of approximately eight inches, moistened to at least 2 percent above the optimum moisture content and compacted to a minimum relative compaction of at least 95 percent of maximum dry density as determined by ASTM D 1557 test procedures.

6.2.6 Engineered Fills

The on-site soils are generally considered suitable for reuse as engineered fill provided they are free from vegetation, debris and other deleterious material. Engineered fill should be placed in loose lifts with a thickness of eight inches or less and moisture conditioned to at least two percent above the optimum moisture content.

Below and within the proposed building area, engineered fill should be moisture conditioned to at least 2 percent above optimum moisture content and be compacted to at least 90 percent of maximum dry density as determined by ASTM D 1557 test procedures if a shallow foundation system is used.

Below other structural elements, such as hardscape areas and walls independent of the building, engineered fill should be moisture conditioned to at least 2 percent above optimum moisture content and be compacted to at least 90 percent of maximum dry density as determined by ASTM D 1557 test procedures.

6.2.7 Excavation Characteristics

Excavation of the on-site alluvial soils is expected to be feasible utilizing heavy-duty grading equipment in good operating condition. All temporary excavations for grading purposes and installation of underground utilities should be constructed in accordance with local and Cal-OSHA guidelines. Temporary excavations within the on-site materials should be stable at 1.5:1 (horizontal: vertical) inclinations for cuts less than five feet in height.

6.2.8 Slot-Cut Excavations

Assuming that any existing block walls along existing site boundaries are screen walls (imparting minimal loads), GeoTek evaluated the use of slot-cut excavations adjacent to these improvements in order to facilitate the required remedial grading for construction of proposed site walls. Preliminary analyses by GeoTek using a soil cohesion of about 250 psf along a friction angle of approximately 24 degrees, an assumed slot-cut height of about five feet, and an assumed footing surcharge of approximately 1,000 psf yielded an approximate slot-cut width of six feet. Wider slot cuts may be feasible if favorable conditions (i.e. denser soils with significant cohesion) are exposed in the site excavations.

Slot-cut excavations should follow an A-B-C sequence. Each "A" section should be excavated to the required depth and then backfilled with compacted soil (or wall section constructed). Following completion of the "A" sections, the "B" sections are then excavated and backfilled/constructed and then all "C" sections are completed in a similar manner. A GeoTek representative should observe that the slot-cuts are being performed in conformance with these recommendations.

6.2.9 Shrinkage and Subsidence

Several factors will impact earthwork balancing on the site, including orchard tree removal, shrinkage, subsidence, trench spoil from utilities and footing excavations, as well as the accuracy of topography. Shrinkage and subsidence are primarily dependent upon the degree of compactive effort achieved during construction. For planning purposes, a shrinkage factor of 5 to 10 percent may be considered for the materials requiring removal and/or recompaction. Site balance areas should be available in order to adjust project grades, depending on actual field conditions at the conclusion of earthwork. Subsidence on the order of up to 0.1 foot may be anticipated for the underlying soils.

6.2.10 Import Soils

Import soils should have a "Very Low" (0-20) to "Low" (21-50) Expansion Index. GeoTek, Inc. also recommends that the proposed import soils be tested for expansion and corrosivity potential. GeoTek, Inc. should be notified a minimum of 72 hours prior to importing so that appropriate sampling and laboratory testing can be performed.

6.3 DESIGN RECOMMENDATIONS

6.3.1 Foundation Design

The soils are classified as having a "Medium" (51≤EI≤90) to "High" (91≤EI≤120) Expansion Index in accordance with ASTM D 4829. However, verification testing should be performed after site remedial grading.

The foundation elements for the proposed structures should bear entirely in engineered fill soils and should be designed in accordance with the 2022 CBC. Given the site soil expansion potential at the site, residential buildings should be supported by post-tension (PT) slab foundation systems. Geotechnical parameters for post-tension slab design, in general conformance with *Design of Post-Tensioned Slabs-on-Ground*, Third Edition *with 2008 Supplement* (PTI, 2008), are provided below. These recommendations are minimal recommendations and are not intended to supersede the design by the project structural engineer.

DESIGN PARAMETERS FOR POST-TENSION SLABS	
Foundation Design Parameter	Design Value
	"High" Expansion Index (LL≤46; PI≤26; Passing #200 Sieve ≈ 60%; Clay fines ≈ 20%)
Edge Moisture Variation Distance, e_m -Edge Lift (swelling) -Center Lift (shrinkage)	 4.5 ft 8.7 ft
Soil Differential Movement, y_m -Edge Lift (swelling) -Center Lift (shrinkage)	 ≈ 1.07 in ≈ 0.39 in
Exterior Perimeter Beam Embedment	One- and Two-Story – 12 inches* Three-story – 18 inches*
Presaturation of Subgrade Soil (Percent of Optimum)	Minimum 120% to a depth of 18 inches

*Required depth of perimeter beam/stiffening rib per structural calculations may govern.
The following assumptions were used to generate e_m and y_m values: Thornthwaite Moisture Index = -20; constant suction value = 3.9pF; post-equilibrium case assumed with wet (swelling) cycle going from 3.9pF to 3.0pF and drying (shrinking) cycle going from 3.9pF to 4.5pF.

Based upon review, a modulus of subgrade reaction (E_I) of 75 pci may be used in the design of the post-tensioned slab foundation system. It should be noted that this value is based upon standard one foot plate load tests. Depending upon the design methodology and foundation geometry this value may need to be modified.

It should be noted that the criteria provided are based on soil support characteristics only. The structural engineer should design the slab and foundation reinforcement based on actual loading conditions.

The following criteria for design of foundations are preliminary and should be re-evaluated based on the results of additional laboratory testing of samples obtained near finish pad grade. An allowable bearing capacity of 2,000 pounds per square foot (psf) may be used for design of continuous and perimeter footings 18 inches deep and 12 inches wide, and pad footings 24 inches square and 12 inches deep. This allowable soil bearing capacity may be increased by 200 psf for each additional foot of footing depth and 100 psf for each additional foot of footing width to a maximum value of 3,000 psf. An increase of one-third may be applied when considering short-term live loads (e.g., seismic and wind loads). These bearing values contain a minimum factor of safety of three (3).

The recommended allowable bearing capacity is based on an estimated maximum post-construction static settlement of approximately 1-inch. Static differential settlement of about one-half of the total settlement over a horizontal distance of 40 feet could result. Estimated seismic settlements are anticipated to be minimal. The project structural engineer, foundation engineer, and earth retention structure designer should incorporate these settlement estimates into the design, as appropriate.

The passive earth pressure may be computed as an equivalent fluid having a density of 280 psf per foot of depth, to a maximum earth pressure of 2,800 psf for footings founded on engineered fill or competent native soil. A coefficient of friction between soil and concrete of 0.30 may be used with dead load forces. Passive pressure and frictional resistance may be combined without reduction. The upper one foot of soil should be ignored in the passive pressure calculations unless the surface is covered with pavements.

A grade beam, a minimum of 12 inches wide and 18 inches deep, should be utilized across large entrances. The base of the grade beam should be at the same elevation as the bottom of the adjoining footings.

It is recommended that control joints be placed in two directions spaced approximately 24 to 36 times the thickness of the slab in inches. These joints are a widely accepted means to control cracks and should be reviewed by the project structural engineer.

6.3.2 Moisture Vapor and Retarding System

A moisture and vapor retarding system should be placed below slabs-on-grade where moisture migration through the slab is undesirable. Guidelines for these are provided in the 2022 California Green Building Standards Code (CALGreen) Section 4.505.2, the 2022 CBC Section 1907.1 and ACI 360R-10. The vapor retarder design and construction should also meet the requirements of ASTM E 1643. A portion of the vapor retarder design should be the implementation of a moisture vapor retardant membrane.

The effectiveness of the vapor retarding membrane can be adversely impacted as a result of construction related punctures. These occurrences should be limited as much as possible during construction. Thicker membranes are generally more resistant to accidental puncture than thinner ones. Products specifically designed for use as moisture/vapor retarders may also be more puncture resistant. Although the CBC specifies a 6-mil vapor retarder membrane, a minimum 10 mil thick membrane with joints properly overlapped and sealed should be considered, unless otherwise specified by the slab design professional. The membrane should consist of Stego wrap or the equivalent.

Moisture and vapor retarding systems are intended to provide a certain level of resistance to vapor and moisture transmission through the concrete, but do not eliminate it. The acceptable level of moisture transmission through the slab is to a large extent based on the type of flooring used and environmental conditions. Ultimately, the vapor retarding system should be comprised of suitable elements to limit migration of water and reduce transmission of water vapor through the slab to acceptable levels. The selected elements should have suitable properties such as thickness, composition, strength, and permeability to achieve the desired performance level. Moisture retarders can reduce, but not eliminate, moisture vapor rise from the underlying soils up through the slab. Moisture retarder systems should be designed and constructed in accordance with applicable American Concrete Institute, Portland Cement Association, Post-Tensioning Concrete Institute, ASTM and California Building Code requirements and guidelines.

GeoTek recommends that a qualified person, such as a flooring contractor, structural engineer, architect, and/or other experts specializing in moisture control within buildings be consulted to evaluate the general and specific moisture and vapor transmission paths and associated potential impact on the proposed construction. That person should provide recommendations relative to the slab moisture and vapor retarder systems and for migration of potential adverse impact of moisture vapor transmission on various components of the structures, as deemed appropriate.

In addition, the recommendations in this report and GeoTek's services in general are not intended to address mold prevention, since GeoTek, along with geotechnical consultants in

general, do not practice in the area of mold prevention. If specific recommendations addressing potential mold issues are desired, then a professional mold prevention consultant should be contacted.

6.3.3 Miscellaneous Foundation Recommendations

To minimize moisture penetration beneath the slab-on-grade areas, utility trenches should be backfilled with engineered fill, lean concrete or concrete slurry where they intercept the perimeter footing or thickened slab edge.

Soils from the footing excavations should not be placed in the slab-on-grade areas unless properly compacted and tested. The excavations should be free of loose/sloughed materials and be neatly trimmed at the time of concrete placement.

6.3.4 Foundation Setbacks

Minimum setbacks for all foundations should comply with the 2022 CBC or City of Orange requirements, whichever is more stringent. Improvements not conforming to these setbacks are subject to the increased likelihood of excessive lateral movement and/or differential settlement. If large enough, these movements can compromise the integrity of the improvements.

- The outside top edge of all footings should be set back a minimum of H/3, where H is the slope height, from the face of any descending slope. The setback should be at least five feet and need not exceed 40 feet.
- The bottom of any proposed foundations should be deepened so as to extend below a 1:1 upward projection from the bottom edge of the nearest excavation and the bottom edge of the closest footing.

6.3.5 Soil Corrosivity

Corrosivity test results recently performed by GeoTek are presented in Appendix B. These test results indicate that the on-site soils are "highly corrosive" (1,005 ohm-cm) to buried ferrous metal. This corrosion classification is obtained from "Corrosion Basics: An Introduction," by Pierre R. Roberge, 2nd Edition, 2005. Recommendations for protection of buried ferrous metal should be provided by a corrosion engineer.

6.3.6 Soil Sulfate Content

Based on the chemical test results presented in the SCGI report (see Appendix C) and recent testing performed by GeoTek (Appendix B), the sulfate test results on soil samples obtained from the project site indicate a soluble sulfate content of less than 0.1% by weight. Soluble sulfate contents of this level would be in the range of "negligible" (i.e., "S0" exposure classification) in accordance with ACI 318-19. Based on the test results and Table 19.3.1.1 of

ACI 318-19, no special recommendations for concrete are required for this project due to soil sulfate exposure.

6.4 RETAINING AND SCREEN WALL DESIGN AND CONSTRUCTION

6.4.1 General Design Criteria

Retaining wall foundations independent of the building should be embedded a minimum of 18 inches into engineered fill. Retaining wall foundations should be designed in accordance with Section 5.3.1 of this report. Structural requirements may govern and should be evaluated by the project structural engineer. All earth retention structure plans should be reviewed by this office prior to finalization.

Site clearing and remedial earthwork for all earth retention structures should meet the requirements of this report, unless specifically provided otherwise, or more stringent requirements or recommendations are made by the wall designer. The soil used as backfill behind retaining walls should have a "Very Low" (0-20) Expansion Index and should be compacted to at least 90 percent relative compaction (ASTM D 1557).

In general, cantilever retaining walls which are designed to yield at least 0.001H, where H is equal to the height of the wall to the base of the footing may be designed using the active condition. Rigid earth retention structures (including but not limited to rigid walls, and walls braced at the top, such as typical basement walls) should be designed using the at-rest condition.

In addition to the design lateral forces due to retained earth, surcharges due to improvements, such as an adjacent structure, should be considered in the design of the retaining walls. Loads applied within a 1:1 (horizontal : vertical) projection from the surcharging structure on the stem of the retaining wall should be considered in the design.

Final selection of the appropriate design parameters should be made by the retaining wall designer based upon the local practices and ordinances, expected structure response, and desired level of conservatism.

6.4.2 Cantilevered Walls

The recommendations presented below are for cantilevered retaining walls up to six (6) feet high. Active earth pressure may be used for retaining wall design, provided the top of the wall is not restrained from minor deflections. Appropriate fluid unit weights are given below for specific

slope gradients of the retained material. These do not include other superimposed loading conditions such as traffic, structures, seismic events, or adverse geologic conditions.

ACTIVE EARTH PRESSURES	
Surface Slope of Retained Materials (h:v)	Equivalent Fluid Pressure* (pcf)
Level	50
2:1	85

*The design pressures assume the backfill materials have an expansion index less than or equal to 20. Backfill zone includes the area between the back of the wall to a plane (1:1, h:v) up from the bottom of the wall foundation to the adjacent ground surface.

For walls with a retained height greater than six (6) feet, an incremental seismic pressure should be included in the wall design. Where needed, it is recommended that an incremental seismic load for unrestrained walls with level backfill of $10H^2$ [Units: pounds per lineal foot of wall] should be included into the wall design to account for seismic loading conditions, where H is the retained height of the wall. For unrestrained walls with a retained height greater than six (6) feet with backfill of a 2:1 [horizontal: vertical] gradient, a dynamic load increment of $17H^2$ should be included in the wall design. These incremental seismic loads may be assumed to be applied at a point 1/3H above the base of the wall.

6.4.3 Retaining Wall Backfill and Drainage

Wall backfill should include a minimum one-foot-wide section of ¾- to one-inch clean crushed rock or approved equivalent. The rock should be placed immediately adjacent to the back of the wall and extend up from a backdrain to within approximately 12 inches of finish grade. The portion of the rock opposite the back of the wall adjacent to the soil backfill should be covered with a layer of filter fabric comprised of Mirafi 140N or the equivalent. The upper 12 inches of backfill should consist of compacted on-site soil. Backfill placed within the active zone as defined by a 1:1 (h:v) projection from the back of the retaining wall footing up to the retained surface behind the wall should consist of very low expansive soil. The presence of other soils placed within the 1:1 projection will necessitate revision to the parameters provided and modification of wall designs.

The backfill soil should be placed in lifts no greater than eight inches in thickness, moisture conditioned to at least optimum moisture content and compacted to at least 90 percent of maximum dry density as determined by ASTM D 1557 test procedures. Proper surface drainage needs to be provided and maintained. Water should not be allowed to pond behind retaining

walls. Waterproofing of site walls should be performed where moisture migration through the walls is undesirable.

Retaining walls should be provided with an adequate pipe and gravel back drain system to reduce the potential for hydrostatic pressures to develop. A 4-inch diameter perforated collector pipe (Schedule 40 PVC or approved equivalent) in a minimum of one cubic foot per linear foot of ¾-inch or one-inch clean crushed rock or equivalent, wrapped in filter fabric should be placed near the bottom of the backfill and the water should be directed to an appropriate disposal area.

As an alternative to the drain, rock and fabric, a pre-manufactured wall drainage product (example: Mira Drain 6000 or approved equivalent) may be used behind the retaining wall. The wall drainage product should extend from the base of the wall to within two (2) feet of the ground surface. The subdrain should be placed in direct contact with the wall drainage product.

Walls less than two (2) feet in height do not require backdrains. Walls from two to four feet in height may be drained using localized gravel packs (e.g., approximately 1.5 cubic feet of gravel in a woven plastic bag) behind weep holes at 10 feet maximum spacing. Weep holes should be provided or the head joints omitted in the first course of block extended above the ground surface. However, nuisance water may still collect in front of the wall.

Drain outlets should be maintained over the life of the project and should not be obstructed or plugged by adjacent improvements.

6.4.4 Restrained Retaining Walls

Retaining walls that will be restrained prior to placing and compacting backfill material or that have reentrant or male corners, should be designed for an at-rest equivalent fluid pressure of 65 pcf, plus any applicable surcharge loading. For areas of male or reentrant corners, the restrained wall design should extend a minimum distance of twice the height of the wall laterally from the corner, or a distance otherwise determined by the project structural engineer.

6.4.5 Additional Retaining Wall Design Considerations

- Retaining and screen wall foundation elements should be designed in accordance with building code setback requirements. A minimum horizontal setback distance of five feet as measured from the top outside edge of the footing to an adjacent slope face is recommended.
- Wall design should consider the additional surcharge loads from superjacent slopes and/or footings, where appropriate.

- No backfill should be placed against concrete until minimum design strengths are evident by compression tests of cylinders.
- The retaining wall footing excavations, backcuts, and backfill materials should be approved by the project geotechnical engineer or their authorized representative.
- Positive separations should be provided in screen walls at horizontal distances not exceeding 20 feet.

6.5 CONCRETE FLATWORK

6.5.1 Exterior Concrete Slabs, Sidewalks and Driveways

Exterior concrete slabs, sidewalks and driveways should be designed using a four-inch minimum thickness. Some shrinkage and cracking of the concrete should be anticipated as a result of typical mix designs and curing practices utilized in construction.

Due to the soil expansion potential, a minimum of four inches of gravel (1-inch minus) or crushed aggregate base should be placed below all exterior hardscape improvements. In addition, reinforcement of exterior slabs with at least 6" x 6" – W2.6 x W2.6 welded wire fabric placed at the middle of the slab should be considered.

Sidewalks may be under the jurisdiction of the governing agency. If so, jurisdictional design and construction criteria will apply, if more restrictive than the recommendations presented in this report.

Subgrade soils should be pre-moistened prior to placing concrete. The subgrade soils below exterior slabs and sidewalks should be pre-saturated to a minimum of 100 percent of the optimum moisture content to a depth of 12 inches.

All concrete installation, including preparation and compaction of subgrade, should be done in accordance with the City of Orange specifications, and under the observation and testing of GeoTek, Inc. and a City inspector, if necessary.

6.5.2 Concrete Performance

Concrete cracks should be expected. These cracks can vary from sizes that are hairline to more than 1/8 inch in width. Most cracks in concrete, while unsightly, do not significantly impact long-term performance. While it is possible to take measures (proper concrete mix, placement, curing, control joints, etc.) to reduce the extent and size of cracks that occur, some cracking will

occur despite the best efforts to minimize it. Concrete undergoes chemical processes that are dependent on a wide range of variables which are difficult, at best, to control. Concrete, while seemingly a stable material, is subject to internal expansion and contraction due to external changes over time.

One of the simplest means to control cracking is to provide weakened control joints for cracking to occur along. These do not prevent cracks from developing; they simply provide a relief point for the stresses that develop. These joints are a widely accepted means to control cracks but are not always effective. Control joints are more effective the more closely spaced they are. GeoTek, Inc. suggests that control joints be placed in two directions and located a distance approximately equal to 24 to 36 times the slab thickness. All concrete flatwork subgrade should be moisture conditioned to at least 120% of optimum moisture content down to a depth of 18" below subgrade prior to placing concrete.

Due to the soil expansion potential, a minimum of four inches of gravel (1-inch minus) or crushed aggregate base should be placed below all exterior hardscape improvements. In addition, reinforcement of exterior slabs with at least 6" x 6" – W2.6 x W2.6 welded wire fabric placed at the middle of the slab should be considered.

6.6 PRELIMINARY PAVEMENT DESIGN

6.6.1 Asphaltic Concrete Pavement

Preliminary pavement thickness design is based on the Caltrans Highway Design Manual (2018). The following preliminary pavement design recommendations are based on assumed Traffic Indexes of 5.0 for automobile parking and 5.5 for interior drives. An R-value of 10 was assumed for the determination of preliminary pavement sections for this report. Once the traffic loading information becomes more defined, revision to the pavement design recommendations may be warranted. It is recommended that the final pavement design be based on R-value testing of the as-graded subgrade soils within the pavement areas.

Based on the assumptions noted above, the following preliminary pavement section recommendations are provided for the site:

PRELIMINARY MINIMUM PAVEMENT SECTION		
Traffic Index	Thickness of Asphalt Concrete (inches)	Thickness of Aggregate Base (inches)
5.0 (Local Street)	3.0	9.0
5.5 (Interior Drives)	4.0 5.0	9.0 7.0

Traffic Indices (TIs) used in the pavement design are considered reasonable values for the proposed residential street areas and should provide a pavement life of approximately 20 years with a normal amount of flexible pavement maintenance. Irrigation adjacent to pavements, without a deep curb or other cutoff to separate landscaping from the paving may result in premature pavement failure. Traffic parameters used for design were selected based upon engineering judgment and not upon information furnished to us such as an equivalent wheel load analysis or a traffic study.

Pavement subgrade should be compacted to at least 90 percent relative compaction and 2 percent over optimum, and be firm and unyielding to heavy construction equipment prior to placing aggregate base materials. All base material should be compacted to at least 95 percent of the material's maximum dry density as determined by ASTM D1557 test procedures. All materials and methods of construction should conform to the requirements of the City of Orange.

6.6.2 Permeable Interlocking Concrete Pavers

Interlocking concrete pavers can be used for this project. The pavers are assumed to be approximately 3.2 inches (80 millimeters) in thickness. Concrete pavers should be underlain by 1.0 inch to 1.5 inches of bedding sand overlying four inches of aggregate base founded on compacted subgrade soils (90 percent relative compaction, at least 2% over optimum moisture content). The aggregate base should be compacted to at least 95 percent of maximum dry density as determined by ASTM D 1557 test procedures.

Where possible, the aggregate base should extend beyond the perimeter of the pavers a minimum distance of four inches.

The bedding sand should be placed and lightly moistened and compacted. Since this compaction cannot be tested it should be observed by a representative of this firm.

Historically, paver systems have experienced failures in areas where water has degraded the support characteristics of the underlying base and/or subgrade soils. Since paver systems are permeable and allow transmission of water into the underlying materials, it may be prudent to discuss with the paver designer/manufacturer what methods may be employed to address the issue of potential water introduction into the underlying materials. Underdrain systems, local subgrade reinforcement, tilting the pavement subgrade to drain away from paver areas and not pond, or additional structural elements such as geotextiles can be considered, particularly in high traffic areas and/or low areas where water will tend to collect. The recommendations of the designer/manufacturer should then be implemented in the design and construction of the paver system.

6.6.3 Portland Cement Concrete (PCC) Pavement

For the proposed vehicle parking areas, it is recommended that a minimum of six (6.0) inches of PCC pavement over 12 inches subgrade compacted to at least 90 percent of maximum dry density as determined by ASTM D 1557 test procedures and at least 2 percent over-optimum be utilized. For vehicle service and access lanes, it is recommended that a minimum of seven (7.0) inches of PCC pavement over 12 inches subgrade compacted to at least 90 percent of maximum dry density be utilized. All pavement subgrade should be firm and unyielding to heavy construction equipment prior to base and PCC placement. This section should also be used in heavy truck traffic areas such as fire lanes, trash dumpster pads and approaches. Due to the soil expansion potential, a minimum of four inches of gravel (1-inch minus) or crushed aggregate base should be placed below all exterior pavement improvements. In addition, reinforcement of exterior slabs with at least 6" x 6" – W2.6 x W2.6 welded wire fabric placed at the middle of the slab should be considered.

Requirements of Section 90 of Caltrans Standard Specifications, and various ACI and ASTM standards regarding mixing and placing concrete should be followed. The PCC pavement should have a minimum modulus of rupture of 500 pounds per square inch, and a minimum 28-day compressive strength of 4,000 pounds per square inch. Concrete should incorporate a 1-inch maximum size aggregate and should be proportioned to achieve a maximum slump of four inches. Instead of increasing the water content, a plasticizing admixture may be utilized to increase the workability of the concrete. The concrete should be properly cured after placement. Concrete should not be placed during hot and windy weather.

Crack control joints should be provided in the transverse direction spaced at horizontal intervals ranging from 24 to 36 times the thickness of the concrete.

6.6.4 Pavement Construction

All pavement installation, including preparation and compaction of subgrade and base material, placement and rolling of asphaltic concrete and placement of concrete pavement, should be done in accordance with the City of Orange guidelines, and under the observation and testing of GeoTek and a City inspector, where required.

Any aggregate base should consist of crushed rock with an R-Value and gradation in accordance with Crushed Aggregate Base (Section 400-2.4 of the "Greenbook" Regional Supplement Amendments). Any Crushed Miscellaneous Base shall conform to Section 200-2.4 of the Green Book.

Minimum compaction requirements for aggregate base should be 95 percent of maximum dry density as determined by ASTM D 1557 test procedures for aggregate base. Jurisdictional minimum compaction requirements in excess of the aforementioned minimums may govern. The upper 12 inches of subgrade should be moisture-conditioned to at least 2 percent over optimum moisture and be compacted to at least 90 percent relative compaction. The top of the subgrade and aggregate base should be graded to drain to the perimeter of the pavement.

6.7 POST CONSTRUCTION CONSIDERATIONS

6.7.1 Landscape Maintenance and Planting

Water has been shown to weaken the inherent strength of soil, and slope stability is significantly reduced by overly wet conditions. Positive surface drainage away from graded slopes should be maintained and only the amount of irrigation necessary to sustain plant life should be provided for planted slopes. Controlling surface drainage and runoff and maintaining a suitable vegetation cover can minimize erosion. Plants selected for landscaping should be lightweight, deep-rooted types that require little water and are capable of surviving the prevailing climate.

Overwatering should be avoided. An abatement program to control ground-burrowing rodents should be implemented and maintained. Burrowing rodents can decrease the long-term performance of slopes.

It is common for planting to be placed adjacent to structures in planter or lawn areas. This will result in the introduction of water into the ground adjacent to the foundations. This type of landscaping should be avoided.

6.7.2 Drainage

Positive site drainage should be maintained at all times. Drainage should not flow uncontrolled down any descending slope. Water should be directed away from foundations and not allowed to pond or seep into the ground adjacent to the footings and floor-slabs. Pad drainage should be directed toward approved areas and not be blocked by other improvements. Roof gutters should be installed that will direct the collected water at least 20 feet from the buildings.

6.8 PLAN REVIEW AND CONSTRUCTION OBSERVATIONS

It is recommended that specifications and foundation and grading plans be reviewed by GeoTek prior to construction to check for conformance with the recommendations of this report. It is also recommended that GeoTek, Inc. representatives be present during site grading and foundation construction to observe and document proper implementation of the geotechnical recommendations. The owner/developer should verify that GeoTek, Inc. representatives perform at least the following duties:

- Observe site clearing and grubbing operations for proper removal of unsuitable materials.
- Observe and test bottom of removals prior to fill placement.
- Evaluate the suitability of on-site and import materials for fill placement and collect soil samples for laboratory testing where necessary.
- Observe the fill for uniformity during placement, including utility trench backfill. Perform field density testing of the fill materials.
- Observe and probe foundation excavations to confirm suitability of bearing materials with respect to density.

If requested, a construction observation and compaction report can be provided by GeoTek, Inc. which can comply with the requirements of the governmental agencies having jurisdiction over the project. It is recommended that these agencies be notified prior to commencement of construction so that necessary grading permits can be obtained.

7. INTENT

It is the intent of this report to aid in the design and construction of the proposed development. Implementation of the advice presented in this report is intended to reduce risk associated with construction projects. The professional opinions and geotechnical advice contained in this report are not intended to imply total performance of the project or guarantee that unusual or variable conditions will not be discovered during or after construction.

The scope of this evaluation is limited to the boundaries of the subject property. This review does not and should in no way be construed to encompass any areas beyond the specific area of the proposed construction as indicated to us by the client. Further, no evaluation of any existing site improvements is included. The scope of this evaluation is based on GeoTek's understanding of the project and geotechnical engineering standards normally used on similar projects in this locality.

8. LIMITATIONS

GeoTek's findings are based on site conditions observed and the stated sources. Thus, GeoTek's comments are professional opinions that are limited to the extent of the available data.

GeoTek has prepared this report in a manner consistent with that level of care and skill ordinarily exercised by members of the engineering and science professions currently practicing under similar conditions in the jurisdiction in which the services are provided, subject to the time limits and physical constraints applicable to this report.

Since GeoTek's recommendations are based on the site conditions observed and encountered, and laboratory testing, GeoTek's conclusions and recommendations are professional opinions that are limited to the extent of the available data. Observations during construction are important to allow for any change in recommendations found to be warranted. These opinions have been derived in accordance with current standards of practice and no warranty of any kind is expressed or implied. Standards of care/practice are subject to change with time.

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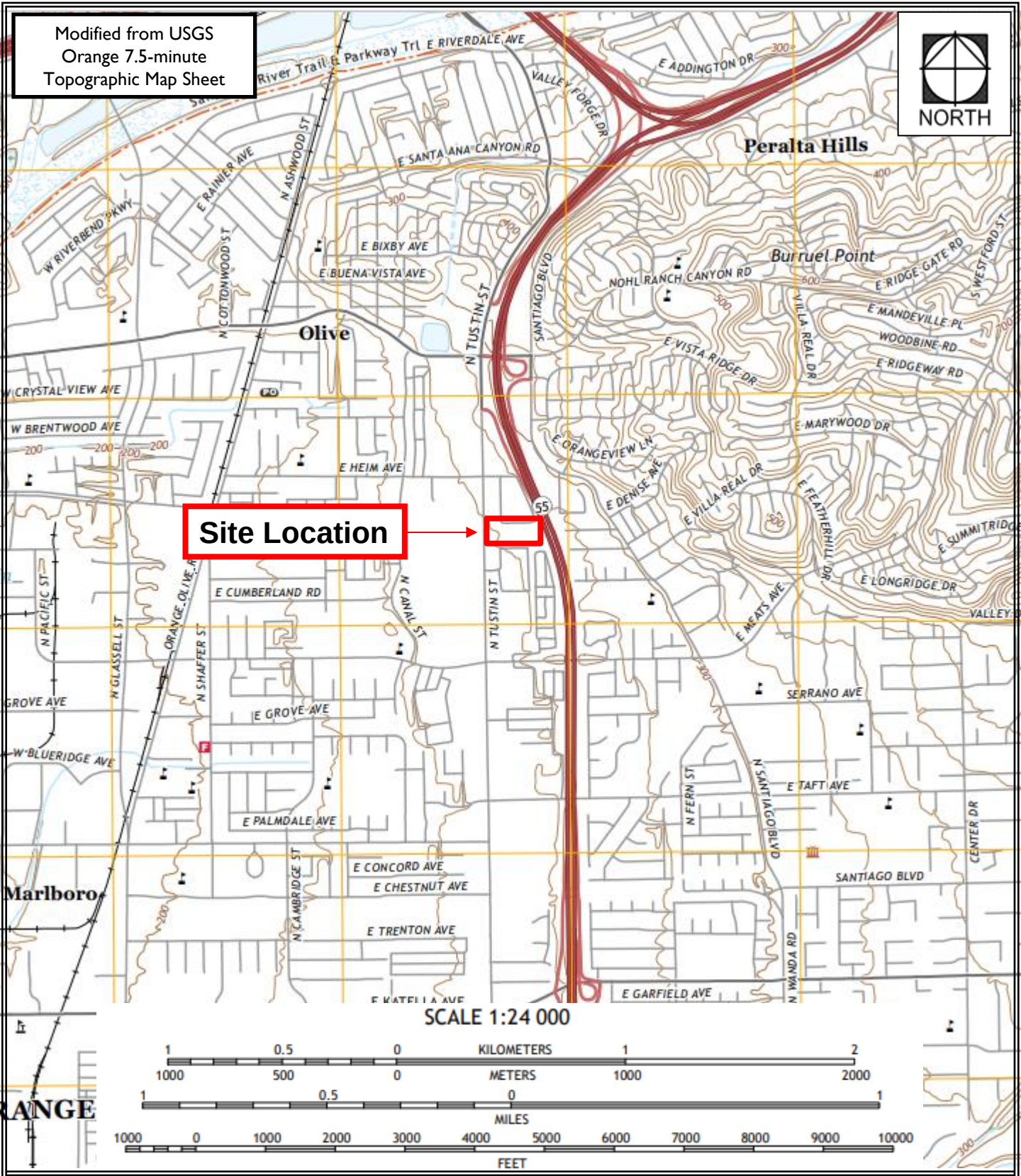
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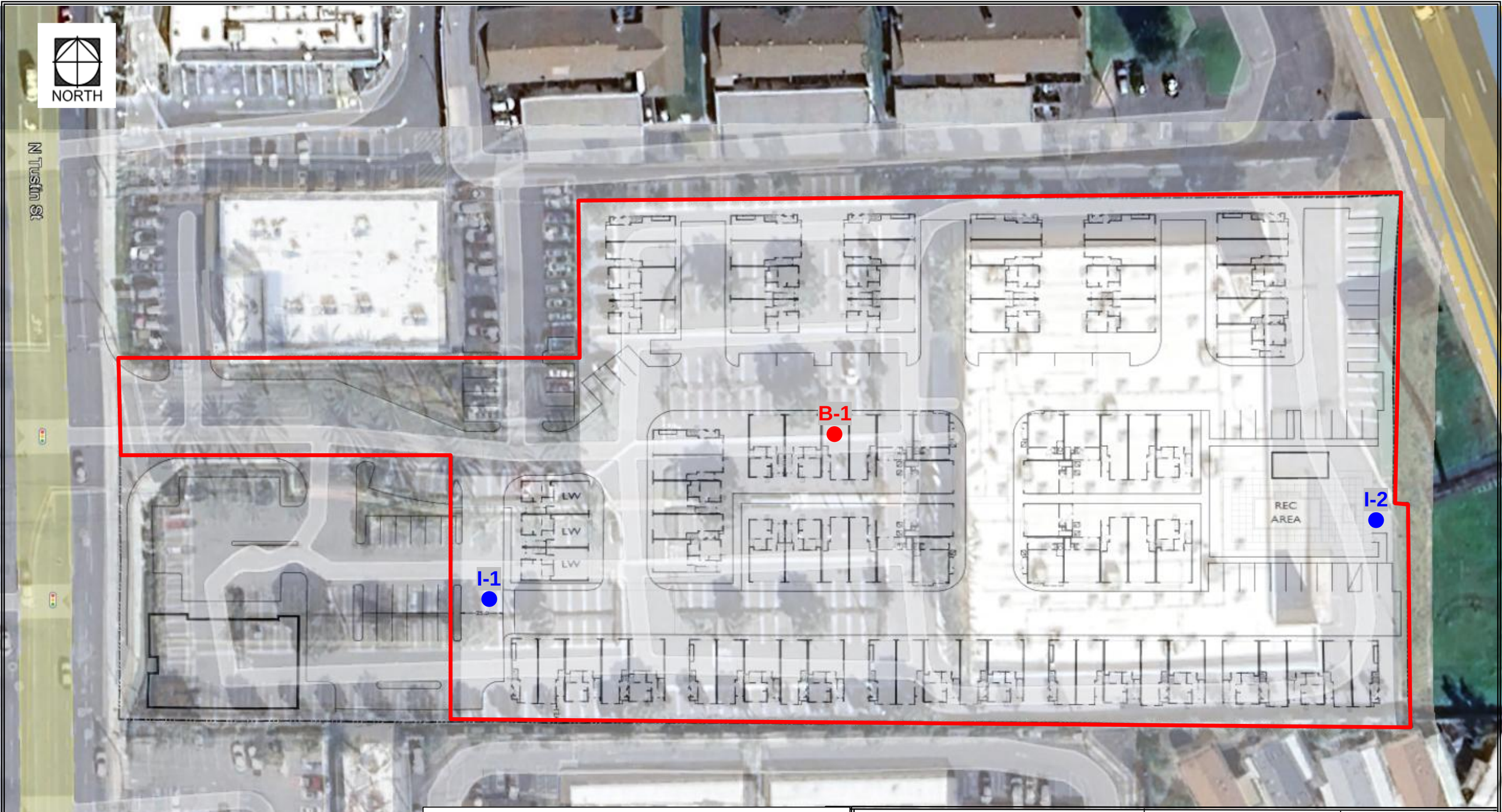
Melia Homes
2375 North Tustin Street
Orange, Orange County, California

Project No. 4150-CR

Figure 1

Site Location Map

GEOTEK



LEGEND
(Locations are Approximate)

Site Boundary

B-1 Geotechnical Boring

I-2 Infiltration Test

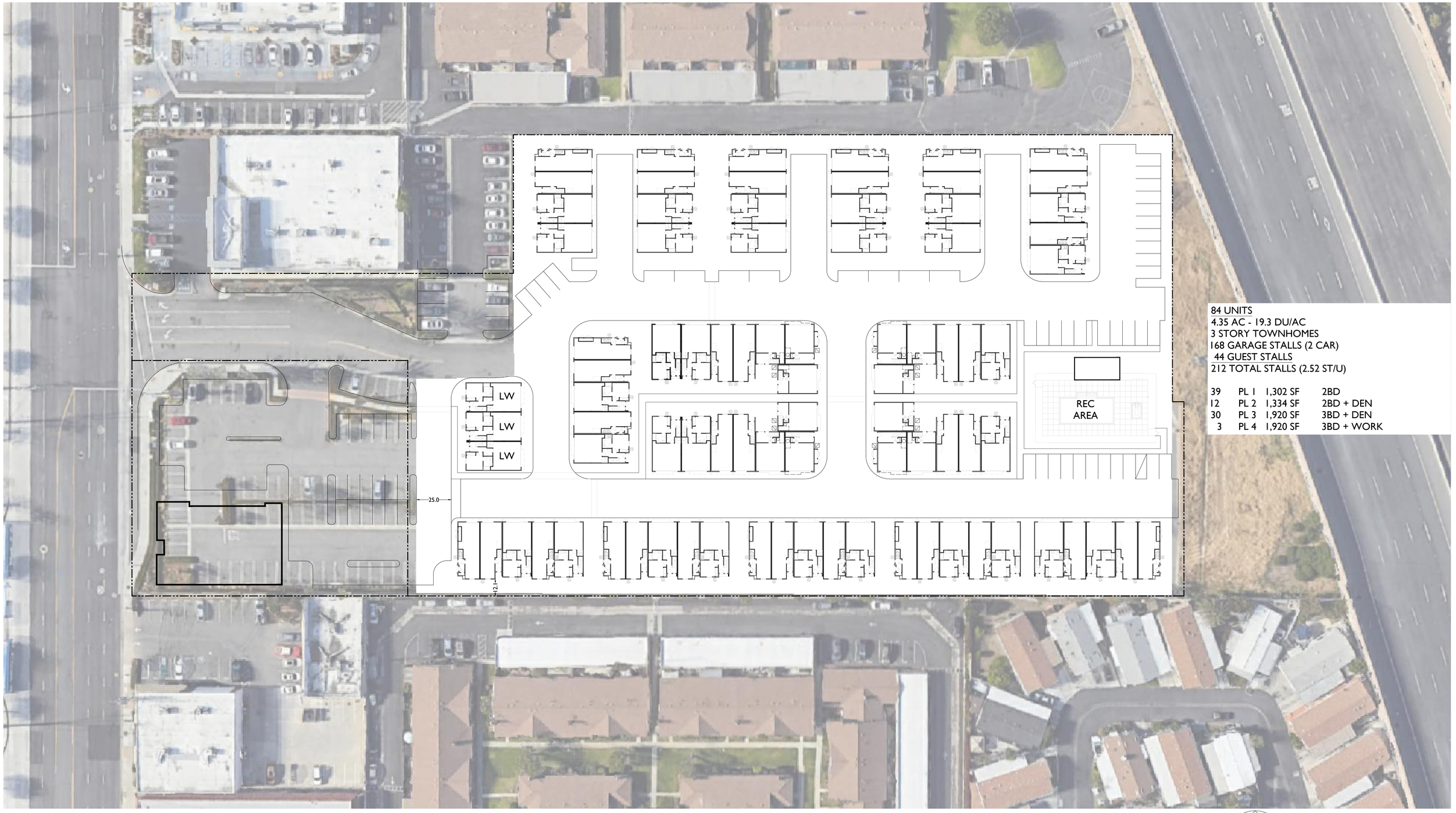
Melia Homes
2375 North Tustin Street
Orange, Orange County, California

Project No. 4150-CR

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Figure 2

Exploration Location Map



84 UNITS
4.35 AC - 19.3 DU/AC
3 STORY TOWNHOMES
168 GARAGE STALLS (2 CAR)
44 GUEST STALLS
212 TOTAL STALLS (2.52 ST/U)

39	PL 1	1,302 SF	2BD
12	PL 2	1,334 SF	2BD + DEN
30	PL 3	1,920 SF	3BD + DEN
3	PL 4	1,920 SF	3BD + WORK

NORTH

ORANGE

Figure 3
Project Plan

2375 N. TUSTIN ST. - 3 STORY ROW TOWNHOMES

SITE PLAN - A

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MAR 25, 2024

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SP

APPENDIX A

LOGS OF EXPLORATORY BORINGS

Updated Geotechnical and Infiltration Evaluation
Proposed Townhome Residential Development
2375 North Tustin Street
Orange, Orange County, California
Project No. 4150-CR

GEOTEK

A - FIELD TESTING AND SAMPLING PROCEDURES

The Modified Split-Barrel Sampler (Ring)

The Ring sampler is driven into the ground at various depths in accordance with ASTM D 3550 test procedures. The sampler, with an external diameter of 3.0 inches, is lined with 1-inch long, thin brass rings with inside diameters of approximately 2.4 inches. The sampler is typically driven into the ground 12 or 18 inches with a 140-pound hammer free falling from a height of 30 inches. Blow counts are recorded for every 6 inches of penetration as indicated on the log of boring. The samples are removed from the sample barrel in the brass rings, sealed, and transported to the laboratory for testing.

Bulk Samples (Large)

These samples are normally large bags of earth materials over 20 pounds in weight collected from the field by means of hand digging or exploratory cuttings.

Bulk Samples (Small)

These are plastic bag samples which are normally airtight and contain less than 5 pounds in weight of earth materials collected from the field by means of hand digging or exploratory cuttings. These samples are primarily used for determining natural moisture content and classification indices.

B – BORING/TRENCH LOG LEGEND

The following abbreviations and symbols often appear in the classification and description of soil and rock on the logs of borings/trenches:

SOILS

USCS	Unified Soil Classification System
f-c	Fine to coarse
f-m	Fine to medium

GEOLOGIC

B: Attitudes	Bedding: strike/dip
J: Attitudes	Joint: strike/dip
C: Contact line	
……..	Dashed line denotes USCS material change
———	Solid Line denotes unit / formational change
———	Thick solid line denotes end of boring/trench

(Additional denotations and symbols are provided on the log of borings/trenches)

GeoTek, Inc.

LOG OF EXPLORATORY BORING

CLIENT:	Melia Homes	**DRILLER:**	2R Drilling Inc.	**LOGGED BY:**	KLP
PROJECT NAME:	2375 N Tustin St	**DRILL METHOD:**	Hollw stem Auger	**OPERATOR:**	Jaime
PROJECT NO.:	4150-CR	**HAMMER:**	140lbs/30in.	**RIG TYPE:**	Truck rig (CME 75)
LOCATION:	See Boring Location Map			**DATE:**	12/3/2024

BORING NO.: B-1

Depth (ft)	SAMPLES: Sample Type	SAMPLES: Blows/ 6 in	SAMPLES: Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Laboratory Testing: Dry Density (pcf)	Laboratory Testing: Others
					3" Asphaltic Concrete over 8" CMB			
		7			**Alluvium:**			MD, EI, SH, SR, AL, SA
		11		CL	Fine sandy silty CLAY, gray, slightly moist, trace asphalt pieces, stiff	16.4	107.7	Expansion Index = 88
		11						Liquid Limit = 46
								Plastic Limit = 20
		6			Silty CLAY, gray, slightly moist, very stiff			PI = 26
		10				21.3	101.6	60% Passing #200 Sieve
		15						
5		11			Olive-brown, trace rootlets, hard			
		20		SC	Silty clayey f SAND, yellow-brown, slightly moist, dense	19.4	111.4	
		27						
		9		SM	Silty f SAND, yellow-brown, slightly moist, trace clay, trace m-c sand, dense	9.8	125.1	
		15						
		30						
10		12			Silty f SAND, light olive-brown, slightly moist, trace clay, medium dense			
		14				10.3	117.3	
		16						
15		11		GP	F-c GRAVEL, gray, slightly moist, little f-c sand, dense			
		17						
		30						
20		50/3			Very dense			
25		50/3						
					BORING TERMINATED AT 25.25 FEET			
					No groundwater encountered			
					Boring backfilled with excavated materials			
30								

LEGEND

Sample type: ---SPT; ---Small Bulk; ---Large Bulk; ---No Recovery; ---Water Table

Lab testing: AL = Atterberg Limits; EI = Expansion Index; SA = Sieve Analysis; RV = R-Value Test; SR = Sulfate/Resisitivity Test; SH = Shear Test; HC= Consolidation; MD = Maximum Density

GeoTek, Inc.

LOG OF EXPLORATORY BORING

CLIENT:	Melia Homes	**DRILLER:**	2R Drilling Inc.	**LOGGED BY:**	KLP
PROJECT NAME:	2375 N Tustin St	**DRILL METHOD:**	Hollw stem Auger	**OPERATOR:**	Jaime
PROJECT NO.:	4150-CR	**HAMMER:**	140lbs/30in.	**RIG TYPE:**	Truck rig (CME 75)
LOCATION:	See Boring Location Map			**DATE:**	12/3/2024

Depth (ft)	SAMPLES: Sample Type	SAMPLES: Blows/ 6 in	SAMPLES: Sample Number	USCS Symbol	**BORING NO.: I-1** / MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Laboratory Testing: Dry Density (pcf)	Laboratory Testing: Others
					3" Asphaltic Concrete over 7" CMB			
				CL	**Alluvium:** Silty CLAY, gray-brown, slightly moist			
5								
				GP	F-c GRAVEL, gray, slightly moist, trace f-c sand, trace clay			
10					**BORING TERMINATED AT 10 FEET** No groundwater encountered Boring backfilled with excavated materials			
15								
20								
25								
30								

LEGEND

Sample type: ---SPT ---Small Bulk ---Large Bulk ---No Recovery ---Water Table

Lab testing: AL = Atterberg Limits; EI = Expansion Index; SA = Sieve Analysis; RV = R-Value Test; SR = Sulfate/Resisitivity Test; SH = Shear Test; HC= Consolidation; MD = Maximum Density

GeoTek, Inc.

LOG OF EXPLORATORY BORING

CLIENT:	Melia Homes	**DRILLER:**	2R Drilling Inc.	**LOGGED BY:**	KLP
PROJECT NAME:	2375 N Tustin St	**DRILL METHOD:**	Hollw stem Auger	**OPERATOR:**	Adrian
PROJECT NO.:	4150-CR	**HAMMER:**	140lbs/30in.	**RIG TYPE:**	Truck rig (Simco 2800)
LOCATION:	See Boring Location Map			**DATE:**	12/3/2024

Depth (ft)	SAMPLES: Sample Type	SAMPLES: Blows/ 6 in	SAMPLES: Sample Number	USCS Symbol	**BORING NO.: I-2** / MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Laboratory Testing: Dry Density (pcf)	Laboratory Testing: Others
					5.5" Asphaltic Concrete over 12" CMB			
				CL	**Alluvium:** Silty CLAY, gray-brown, slightly moist			
5								
				GP	F-c GRAVEL, gray, slightly moist, trace f-c sand, little clay			
10					**BORING TERMINATED AT 10 FEET** No groundwater encountered Boring backfilled with excavated materials			
15								
20								
25								
30								

LEGEND

Sample type: ---SPT; ---Small Bulk; ---Large Bulk; ---No Recovery; ---Water Table

Lab testing: AL = Atterberg Limits; EI = Expansion Index; SA = Sieve Analysis; RV = R-Value Test; SR = Sulfate/Resisitivity Test; SH = Shear Test; HC= Consolidation; MD = Maximum Density

APPENDIX B

LABORATORY TEST RESULTS

Updated Geotechnical and Infiltration Evaluation
Proposed Townhome Residential Development
2375 North Tustin Street
Orange, Orange County, California

GEOTEK

SUMMARY OF LABORATORY TESTING

Classification
Soils were classified visually in general accordance with the Unified Soil Classification System (ASTM Test Method D 2487). The soil classifications are shown on the logs of exploratory borings in Appendix A.

Direct Shear
Direct shear testing was performed on remolded samples of the surficial soils according to ASTM Test Method D 3080. The results of these tests are presented in Appendix B.

Expansion Index
The expansion potential of the soils was determined by performing expansion index tests on two representative soil samples from the site in general accordance with ASTM D 4829. The results of these tests are presented in Appendix B.

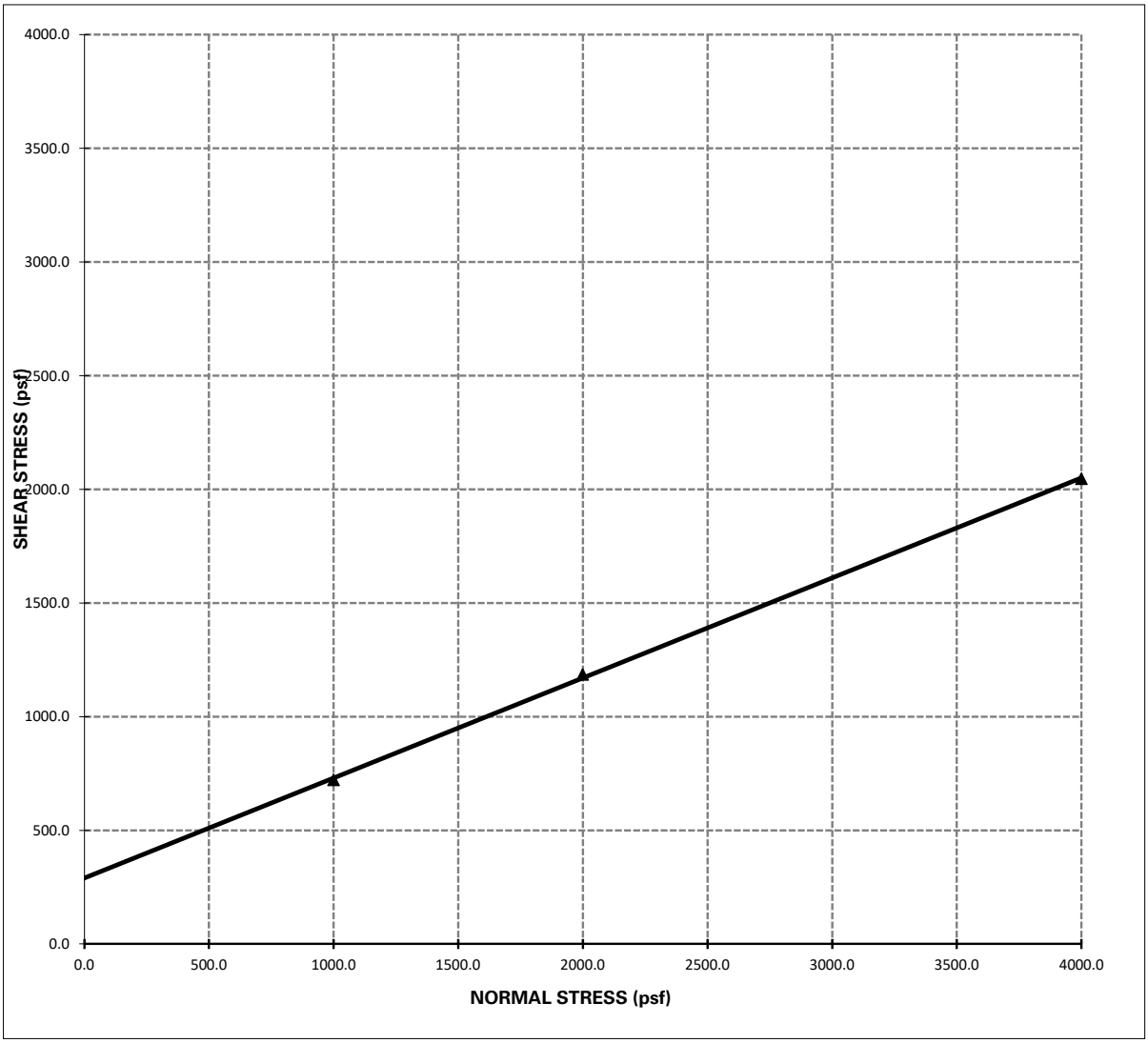
In Situ Moisture Content and Unit Weight
The field moisture content was measured in the laboratory on selected samples collected during the field investigation. The field moisture content is determined as a percentage of the dry unit weight. The dry density was measured in the laboratory on selected ring samples. The results are shown on the logs of exploratory borings in Appendix A.

Moisture-Density Relationship
Laboratory testing was performed on two representative soil samples collected during the subsurface exploration. The laboratory maximum dry density and optimum moisture content for the soil type was determined in general accordance with test method ASTM Test Procedure D 1557. The results are included in Appendix B.

Sulfate Content, Resistivity and Chloride Content
Testing to determine the water-soluble sulfate content was performed by others in general accordance with ASTM D4327. Resistivity testing was completed by others in general accordance with ASTM G187. Testing to determine the chloride content was performed by others in general accordance with ASTM D4327. The results are included in Appendix B.

DIRECT SHEAR TEST

Project Name:	2375 N. Tustin St.	***Sample Location:***	B-1 @ 0-5 Feet
Project Number:	4150-CR	***Date Tested:***	12/12/2024



Shear Strength: Φ = **24°** , **C = 291 psf**

Notes:
1 - The soil specimen used in the shear box was a ring sample remolded to approximately 90% relative compaction from a bulk sample collected during the field investigation.
2 - The above reflect direct shear strength at saturated conditions.
3 - The tests were run at a shear rate of 0.01 in/min.

GeoTek - Corona
1548 N. Maple St.
Corona, CA 92880
Phone: (951) 710-1160
Fax: (951) 710-1167

Proctor Report

Report No: PTR:24-00241-S01

Client: Melia Homes
9860 Irvine Center Drive
Irvine CA 92618

CC:

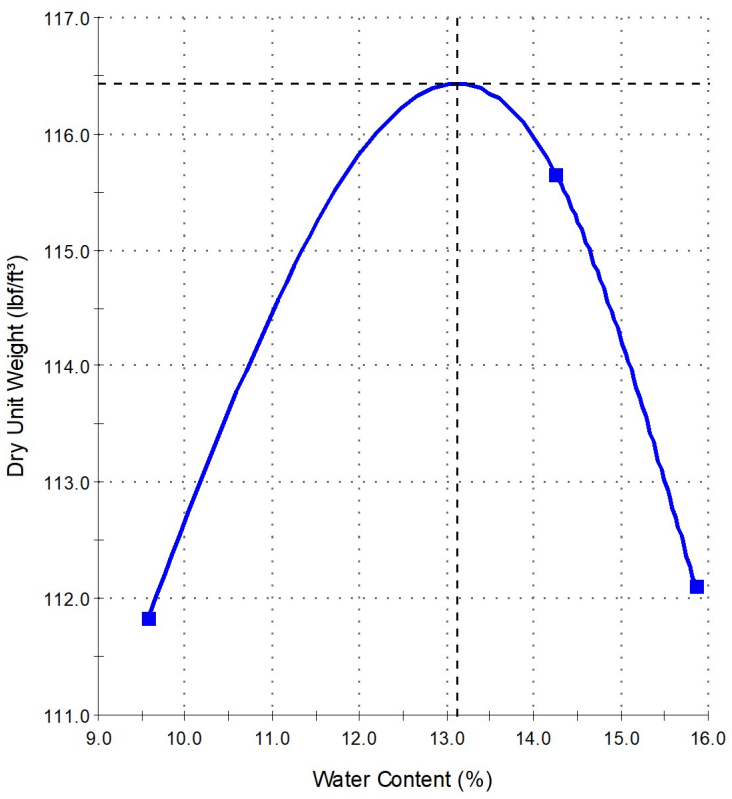
Project: 4150-CR
Multi-Family Residential Development -
Updated Geotechnical & Infiltration Eval

THIS DOCUMENT SHALL NOT BE REPRODUCED EXCEPT IN FULL

Sample Details

Sample ID: 24-00241-S01
Date Sampled: 12/3/2024
Sampled By:
Material: CLAY
Location: B-1 @ 0-5 Feet

Dry Unit Weight - Water Content Relationship



Test Results

ASTM D 1557

Maximum Dry Unit Weight (lbf/ft³):	**116.4**
Optimum Water Content (%):	**13.1**
Method:	A
Preparation Method:	Moist
Retained Sieve No 4 (4.75mm) (%):	5
Passing Sieve No 4 (4.75mm) (%):	95
Tested By:	Eduardo Cuevas
Date Tested:	12/9/2024

ASTM D 4718

Corrected Maximum Dry Unit Weight (lbf/ft³):	**116.4**
Corrected Optimum Water Content (%):	**13.1**
Sieve Size (Oversize):	No 4
Oversize Particles (%):	5

Comments

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EXPANSION INDEX TEST

(ASTM D4829)

Client:	Melia Homes	***Tested/ Checked By:***	JZ Lab No Corona
Project Number:	4150-CR	***Date Tested:***	12/10/2024
Project Location:	2375 N. Tustin St.	***Sample Source:***	B-1 @ 0-5 Feet
		Sample Description:	

Ring #: _____ Ring Dia. : 4.01" Ring Ht. 1"

DENSITY DETERMINATION

Weight of compacted sample & ring (gm)	744.2
Weight of ring (gm)	366.2
Net weight of sample (gm)	**378.0**
Wet Density, lb / ft3 (C*0.3016)	**114.0**
Dry Density, lb / ft3 (D/1.F)	**101.8**

SATURATION DETERMINATION

Moisture Content, %	12.0
Specific Gravity, assumed	**2.70**
Unit Wt. of Water @ 20 °C, (pcf)	**62.4**
% Saturation	**49.5**

READINGS

DATE	TIME	READING	
12/10/2024		891.0000	Initial
12/10/2024		0.8900	10 min/Dry
12/11/2024		0.9780	Final

FINAL MOISTURE

Final Weight of wet sample & tare	% Moisture
785.6	**23.0**

EXPANSION INDEX = 88

Results Only Soil Testing for 2375 N. Tustin Street

December 6, 2024

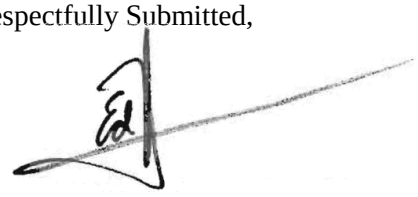
Prepared for:

Eddy Cuevas
GeoTek USA
1548 N. Maple Avenue
Corona, CA 92878
Ecuevas@geotekusa.com, jbrucelas@geotekusa.com

Project X Job#: S241205B
Client Job or PO#: 4150-CR

Prepared by:
D. Bobrova

Respectfully Submitted,





Eduardo Hernandez, M.Sc., P.E.
Sr. Corrosion Consultant
NACE Corrosion Technologist #16592
Professional Engineer
California No. M37102
ehernandez@projectxcorrosion.com

Soil Analysis Lab Results

Client: GeoTek USA
Job Name: 2375 N. Tustin Street
Client Job Number: 4150-CR
Project X Job Number: S241205B
December 6, 2024

	Method	ASTM D4327		ASTM D4327		ASTM G187		ASTM G51	ASTM G200	SM 4500-D	ASTM D4327	ASTM D6919	ASTM D6919	ASTM D6919	ASTM D6919	ASTM D6919	ASTM D6919	ASTM D4327	ASTM D4327
Bore# / Description	**Depth**	**Sulfates** SO_4^{2-}		**Chlorides** Cl^-		**Resistivity** As Rec'd | Minimum		**pH**	**Redox**	**Sulfide** S^{2-}	**Nitrate** NO_3^-	**Ammonium** NH_4^+	**Lithium** Li^+	**Sodium** Na^+	**Potassium** K^+	**Magnesium** Mg^{2+}	**Calcium** Ca^{2+}	**Fluoride** F_2^{2-}	**Phosphate** PO_4^{3-}
	(ft)	(mg/kg)	(wt%)	(mg/kg)	(wt%)	(Ω-cm)	(Ω-cm)		(mV)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
B1	0-5	144.8	0.0145	18.6	0.0019	1,072	1,005	8.2	123	4.0	6.0	22.1	ND	257.7	49.3	117.7	637.0	8.1	0.5

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

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

If one sample pops up much more corrosive than all others, we would recommend collecting more samples surrounding the problem sample location to determine if the peak is isolated to it. This allows us to conclude it was a contaminated sample and able to declare it an outlier.

Try out our new online forms: SOIL CORROSIVITY & THERMAL RESISTIVITY LAB REQUEST FORM & IN-SITU WENNER 4 PIN QUOTE REQUEST FORM

APPENDIX C

EXPLORATION LOCATION MAP, LOGS OF EXPLORATORY BORINGS AND LABORATORY TEST RESULTS (SCGI, 2005)

Updated Geotechnical and Infiltration Evaluation

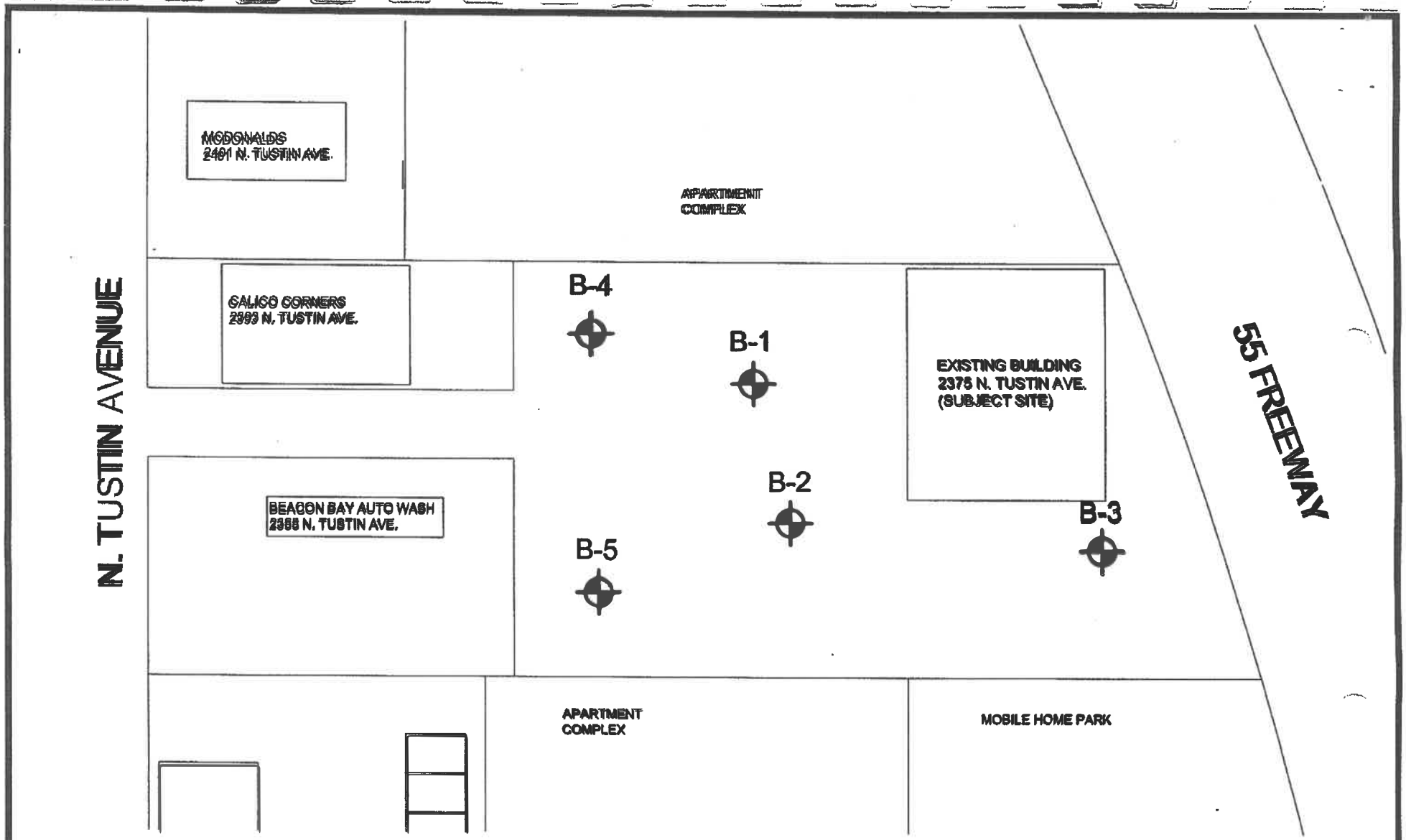
Proposed Townhome Residential Development

2375 North Tustin Street

Orange, Orange County, California

Project No. 4150-CR

GEOTEK



GEOTECHNICAL LEGEND

APPROXIMATE BORING LOCATION

NOTE: BASE MAP PROVIDED BY H & A ARCHITECTS

BORING LOCATION PLAN

PROPOSED RESIDENTIAL DEVELOPMENT

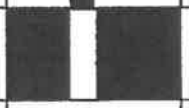
ORANGE, CALIFORNIA

SCALE 1" = 100'	Southern California Geotechnical INC.
DRAWN: DRK CHKD: JAS	1260 North Hancock Street, Suite 101 Anaheim, California 92807 Phone: (714) 777-0883 Fax: (714) 777-0388
SCG PROJECT 05G124-1	
PLATE 2	

APPENDIX B

BORING LOGS

BORING LOG LEGEND

SAMPLE TYPE	GRAPHICAL SYMBOL	SAMPLE DESCRIPTION
AUGER		SAMPLE COLLECTED FROM AUGER CUTTINGS, NO FIELD MEASUREMENT OF SOIL STRENGTH. (DISTURBED)
CORE		ROCK CORE SAMPLE: TYPICALLY TAKEN WITH A DIAMOND-TIPPED CORE BARREL. TYPICALLY USED ONLY IN HIGHLY CONSOLIDATED BEDROCK.
GRAB		SOIL SAMPLE TAKEN WITH NO SPECIALIZED EQUIPMENT, SUCH AS FROM A STOCKPILE OR THE GROUND SURFACE. (DISTURBED)
CS		CALIFORNIA SAMPLER: 2-1/2 INCH I.D. SPLIT BARREL SAMPLER, LINED WITH 1-INCH HIGH BRASS RINGS. DRIVEN WITH SPT HAMMER. (RELATIVELY UNDISTURBED)
NSR		NO RECOVER: THE SAMPLING ATTEMPT DID NOT RESULT IN RECOVERY OF ANY SIGNIFICANT SOIL OR ROCK MATERIAL.
SPT		STANDARD PENETRATION TEST: SAMPLER IS A 1.4 INCH INSIDE DIAMETER SPLIT BARREL, DRIVEN 18 INCHES WITH THE SPT HAMMER. (DISTURBED)
SH		SHEBLY TUBE: TAKEN WITH A THIN WALL SAMPLE TUBE, PUSHED INTO THE SOIL AND THEN EXTRACTED. (UNDISTURBED)
VANE		VANE SHEAR TEST: SOIL STRENGH OBTAINED USING A 4 BLADED SHEAR DEVICE. TYPICALLY USED IN SOFT CLAYS-NO SAMPLE RECOVERED.

COLUMN DESCRIPTIONS

DEPTH: Distance in feet below the ground surface.

SAMPLE: Sample Type as depicted above.

BLOW COUNT: Number of blow required to advance the sampler 12 inches using a 140 lb hammer with a 30-inch drop. 50/3" indicates penetration refusal (>50 blows) at 3 inches. WH indicates that the weight of the hammer was sufficient to push the sampler 6 inches or more.

POCKET PEN.: Approximate shear strength of a cohesive soil sample as measured by pocket penetrometer.

GRAPHIC LOG: Graphic Soil Symbol as depicted on the following page.

DRY DENSITY: Dry density of an undisturbed or relatively undisturbed sample.

MOISTURE CONTENT: Moisture content of a soil sample, expressed as a percentage of the dry weight.

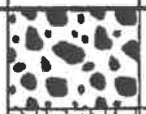
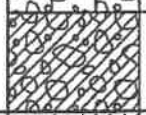
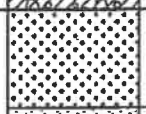
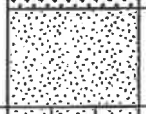
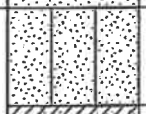
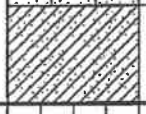
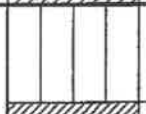
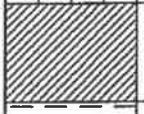
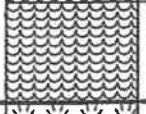
LIQUID LIMIT: The moisture content above which a soil behaves as a liquid.

PLASTIC LIMIT: The moisture content above which a soil behaves as a plastic.

PASSING #200 SIEVE: The percentage of the sample finer than the #200 standard sieve.

UNCONFINED SHEAR: The shear strength of a cohesive soil sample, as measured in the unconfined state.

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
			GRAPH	LETTER	
COARSE GRAINED SOILS — MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS — MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS — MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS — MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

Southern California Geotechnical INC.

BORING NO. B-1

JOB NO.: 05G124 | DRILLING DATE: 2/9/05 | WATER DEPTH: Dry
PROJECT: Proposed Residential Development | DRILLING METHOD: Hollow Stem Auger | CAVE DEPTH: 26 feet
LOCATION: Orange, California | LOGGED BY: Mike Adams | READING TAKEN: At Completion

FIELD RESULTS					LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	UNCONFINED SHEAR (TSF)	COMMENTS
					4½ inches Asphaltic Concrete over 6 to 8 inches Aggregate Base							
		37	4.5+		POSSIBLE FILL: Dark Brown Silty Clay, some fine Sand, roots to ⅛- inch thick, very stiff-damp	104	10					
		30	4.5+		ALLUVIUM: Dark Brown Silty Clay, trace fine Sand, trace calcareous veining, very stiff-moist	110	14					
5		39	4.5+		@ 5 to 6 feet, Light Brown, little calcareous nodules	118	14					
		46			Brown Silty fine Sand, some fine to coarse Gravel, dense-damp	115	6					
		30			Brown Silty fine Sand, medium dense-moist	102	8					
10												
					Brown Silty Clay, trace fine Sand, hard-moist							
		37	4.5+			112	16					
15												
					Brown Silty fine to medium Sand, some fine to coarse Gravel, very dense-damp		4					
		50/5"										
20												
		50/5"										No Sample Recovered
25												
		50/4"					5					
30												
					Boring Terminated at 32' due to Auger Refusal on Gravel and Cobbles							

TBL 05G124.GPJ SOCALGEO.GDT 3/30/05

TEST BORING LOG

PLATE B-1

Southern California Geotechnical INC.

BORING NO. B-2

JOB NO.: 05G124 | DRILLING DATE: 2/9/05 | WATER DEPTH: Dry
PROJECT: Proposed Residential Development | DRILLING METHOD: Hollow Stem Auger | CAVE DEPTH: 16 feet
LOCATION: Orange, California | LOGGED BY: Mike Adams | READING TAKEN: At Completion

DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	UNCONFINED SHEAR (TSF)	COMMENTS
					4 inches Asphaltic Concrete over 7 to 8 inches Aggregate Base							
		40	4.5+		POSSIBLE FILL: Dark Brown Silty Clay, some fine Sand, very stiff-damp to moist	109	12					
		50	4.5+		ALLUVIUM: Dark Brown Silty Clay, trace fine Sand, hard-moist	113	15					
5		47	4.5+		@ 5 to 6 feet, trace calcareous veining	113	13					
		50/5"	4.5+		Brown Silty Clay, trace fine Sand, very stiff to hard-moist .	114	12					
		50/4"			Brown Silty fine to medium Sand, trace Clay, some fine to coarse Gravel, very dense-damp		5					
10												
15		50/5"			Brown Silty Clay, some fine to coarse Gravel, hard-damp to moist		12					
20		50/1"										No Sample Recovered
					Boring Terminated at 21' due to Auger Refusal on Gravel and Cobbles							

TBL 05G124.GPJ SOCALGEO.GDT 3/30/05

TEST BORING LOG **PLATE B-2**

Southern California Geotechnical INC.

BORING NO. B-3

JOB NO.: 05G124 | DRILLING DATE: 2/9/05 | WATER DEPTH: Dry
PROJECT: Proposed Residential Development | DRILLING METHOD: Hollow Stem Auger | CAVE DEPTH: 9 feet
LOCATION: Orange, California | LOGGED BY: Mike Adams | READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	UNCONFINED SHEAR (TSF)	COMMENTS
					3½ inches Asphaltic Concrete over 8 inches Aggregate Base							
		25	1.75		POSSIBLE FILL: Dark Brown Silty Clay, trace fine Gravel, stiff to very stiff-moist	103	21					El = 108 @ 0 to 5'
		29	3.0		ALLUVIUM: Dark Brown Silty Clay, trace calcareous veining, very stiff-moist	105	21					
5		37	4.5+			107	18					
		48	4.5+		Brown Silty Clay, trace fine Sand, hard-moist	111	17					
		50/1"			Silty fine to coarse Sand, trace Clay and fine Gravel, dense-moist		8					Disturbed Sample
10					Boring Terminated at 10'							

TBL 05G124.GPJ SOCALGEO.GDT 2/20/05

TEST BORING LOG

PLATE B-3

Southern California Geotechnical INC.

BORING NO. B-4

JOB NO.: 05G124 | DRILLING DATE: 2/23/05 | WATER DEPTH: Dry
PROJECT: Proposed Residential Development | DRILLING METHOD: Hollow Stem Auger | CAVE DEPTH: 14 feet
LOCATION: Orange, California | LOGGED BY: Mike Adams | READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	UNCONFINED SHEAR (TSF)	COMMENTS
					3½ inches Asphaltic Concrete over 8 inches Aggregate Base							
		42	4.5+		POSSIBLE FILL: Dark Brown Silty Clay, trace fine Gravel, very stiff to hard-moist	112	18					
		42	4.5+		ALLUVIUM: Dark Brown Silty Clay, very stiff-moist	117	15					
5		32	4.5+		Brown Silty Clay, trace to little fine Sand, very stiff-moist to very moist	107	20					
		37	4.5+		Brown fine Sandy Clay to Silty fine Sand, very stiff-moist to very moist	108	19					
		44	3.75			102	25					
10												
		50/5"			Brown Silty fine to medium Sand, some fine to coarse Gravel, very dense-damp		4					
15					Boring Terminated at 15'							

TBL 05G124.GPJ SOCALGEO.GDT 3/30/05

TEST BORING LOG **PLATE B-4**

Southern California Geotechnical INC.

BORING NO. B-5

JOB NO.: 05G124 | DRILLING DATE: 2/23/05 | WATER DEPTH: Dry
PROJECT: Proposed Residential Development | DRILLING METHOD: Hollow Stem Auger | CAVE DEPTH: 12 feet
LOCATION: Orange, California | LOGGED BY: Mike Adams | READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS							
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	UNCONFINED SHEAR (TSF)	COMMENTS
					4½ inches Asphaltic Concrete over 10 inches Aggregate Base							
		24	4.5+		FILL: Brown Silty Clay, trace fine Sand, some fine to coarse Gravel, very stiff-damp to moist		13					
		39	4.5+		POSSIBLE FILL: Brown Silty Clay, trace fine Sand and some fine Gravel, hard-damp to moist		13					
5												
		81			ALLUVIUM: Brown Silty fine to medium Sand, some fine to coarse Gravel, very dense-damp		5					
		50/2"										No Sample Recovered
10												
					Brown Silty fine Sand, some fine to coarse Gravel, dense-moist							
		35					16					
15					Boring Terminated at 15'							

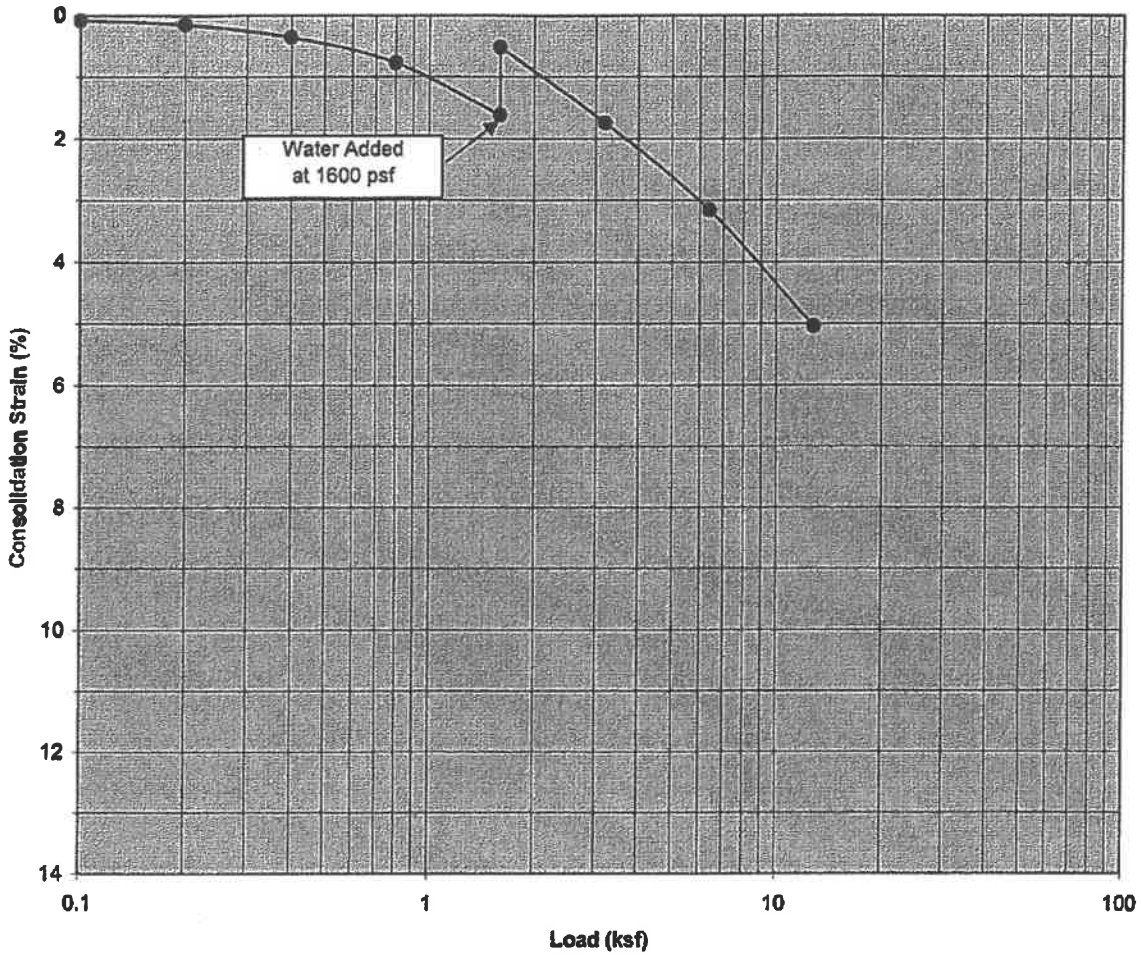
TBL 05G124.GPJ SOCALGEO.GDT 3/30/05

TEST BORING LOG **PLATE B-5**

APPENDIX C

LABORATORY TESTING

Consolidation/Collapse Test Results



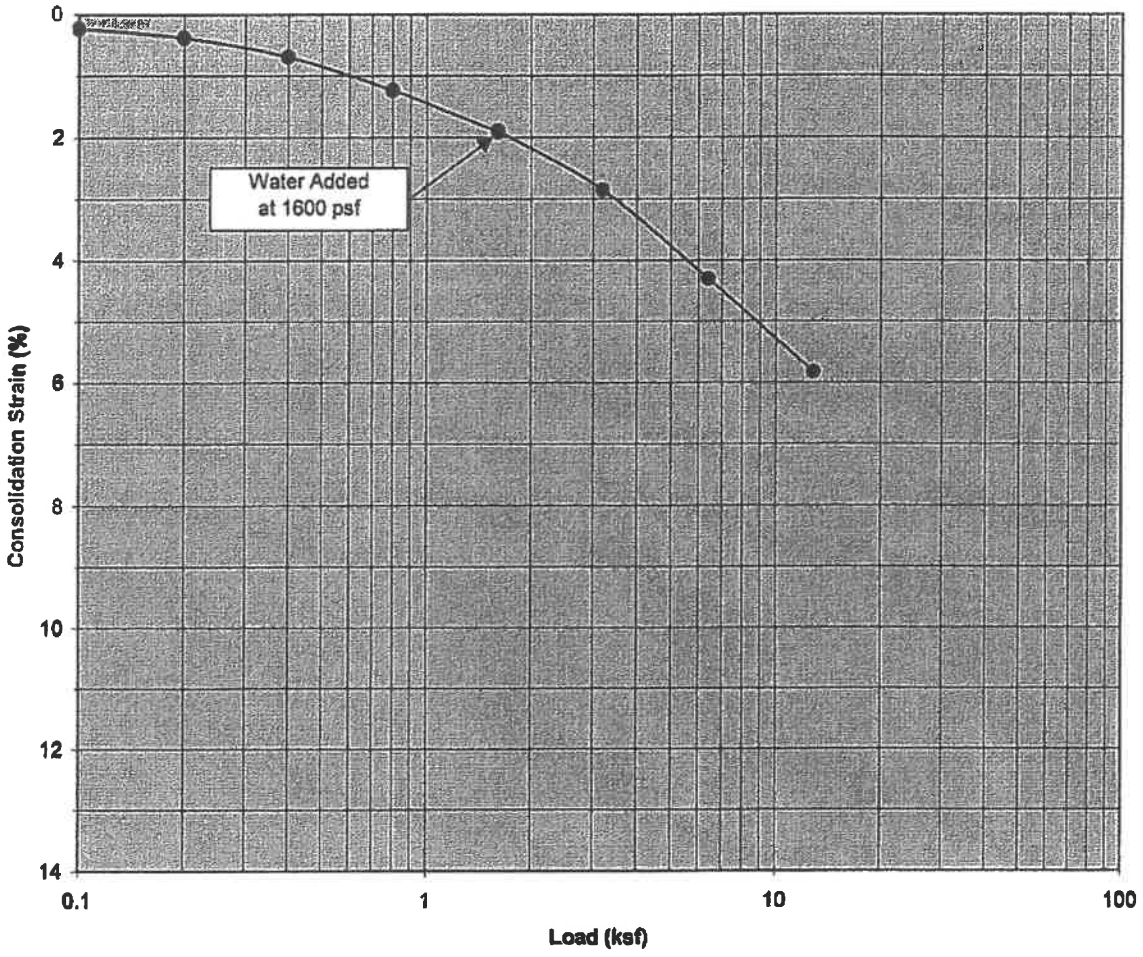
Classification: POSSIBLE FILL: Dark Brown Silty Clay, some fine Sand

Boring Number:	B-1	Initial Moisture Content (%)	11
Sample Number:	---	Final Moisture Content (%)	16
Depth (ft)	1 to 2	Initial Dry Density (pcf)	103.9
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	108.5
Specimen Thickness (in)	1.0	Percent Collapse (%)	-1.10

Proposed Residential Development
Orange, California
Project No. 05G124
PLATE C- 1

Southern California Geotechnical
1260 North Hancock Street, Suite 101
Anaheim, California 92807
Phone: (714) 777-0333 Fax: (714) 777-0388

Consolidation/Collapse Test Results



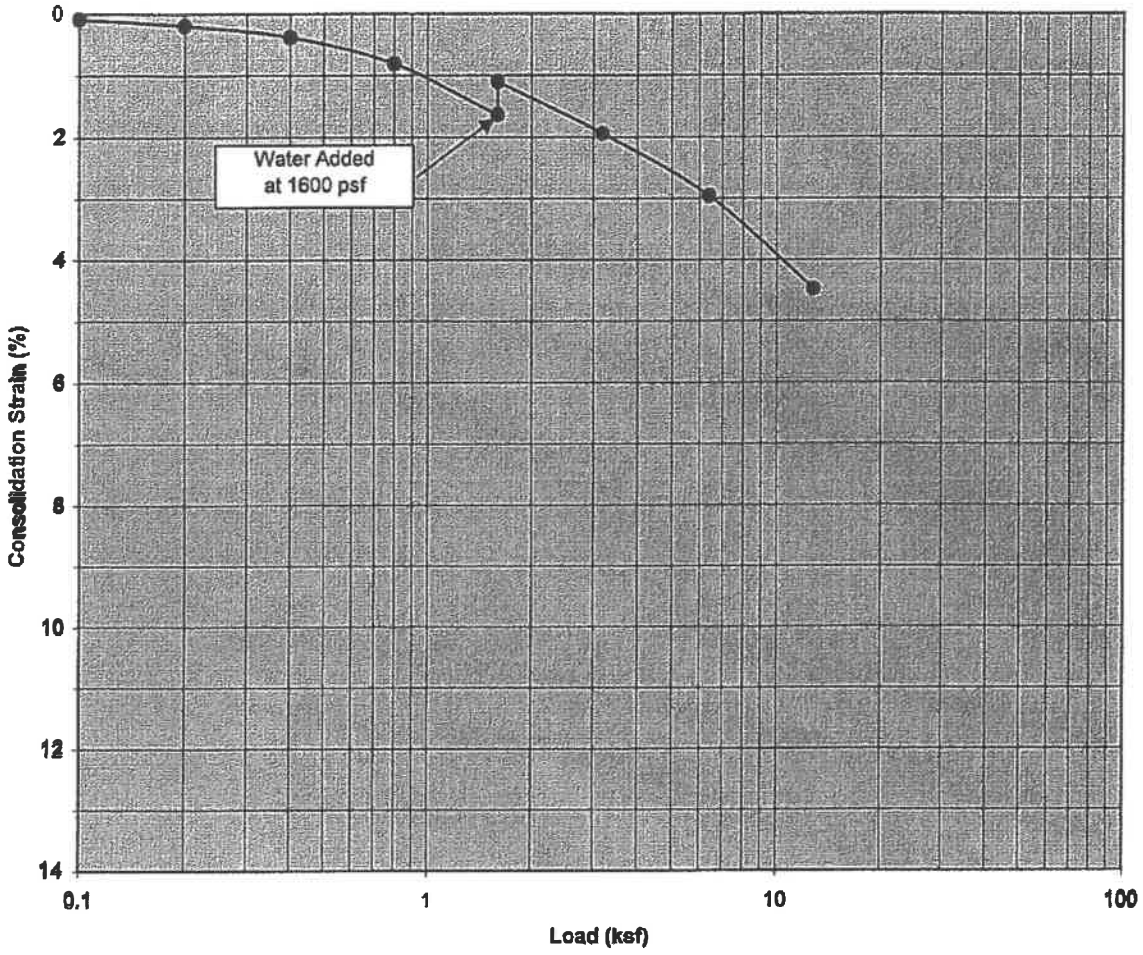
Classification: ALLUVIUM: Dark Brown Silty Clay, trace fine Sand

Boring Number:	B-1	Initial Moisture Content (%)	15
Sample Number:	---	Final Moisture Content (%)	17
Depth (ft)	3 to 4	Initial Dry Density (pcf)	109.6
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	115.8
Specimen Thickness (in)	1.0	Percent Collapse (%)	-0.02

Proposed Residential Development
Orange, California
Project No. 05G124
PLATE C- 2

Southern California Geotechnical INC.
1280 North Hancock Street, Suite 101
Anaheim, California 92807
Phone: (714) 777-0333 Fax: (714) 777-0388

Consolidation/Collapse Test Results



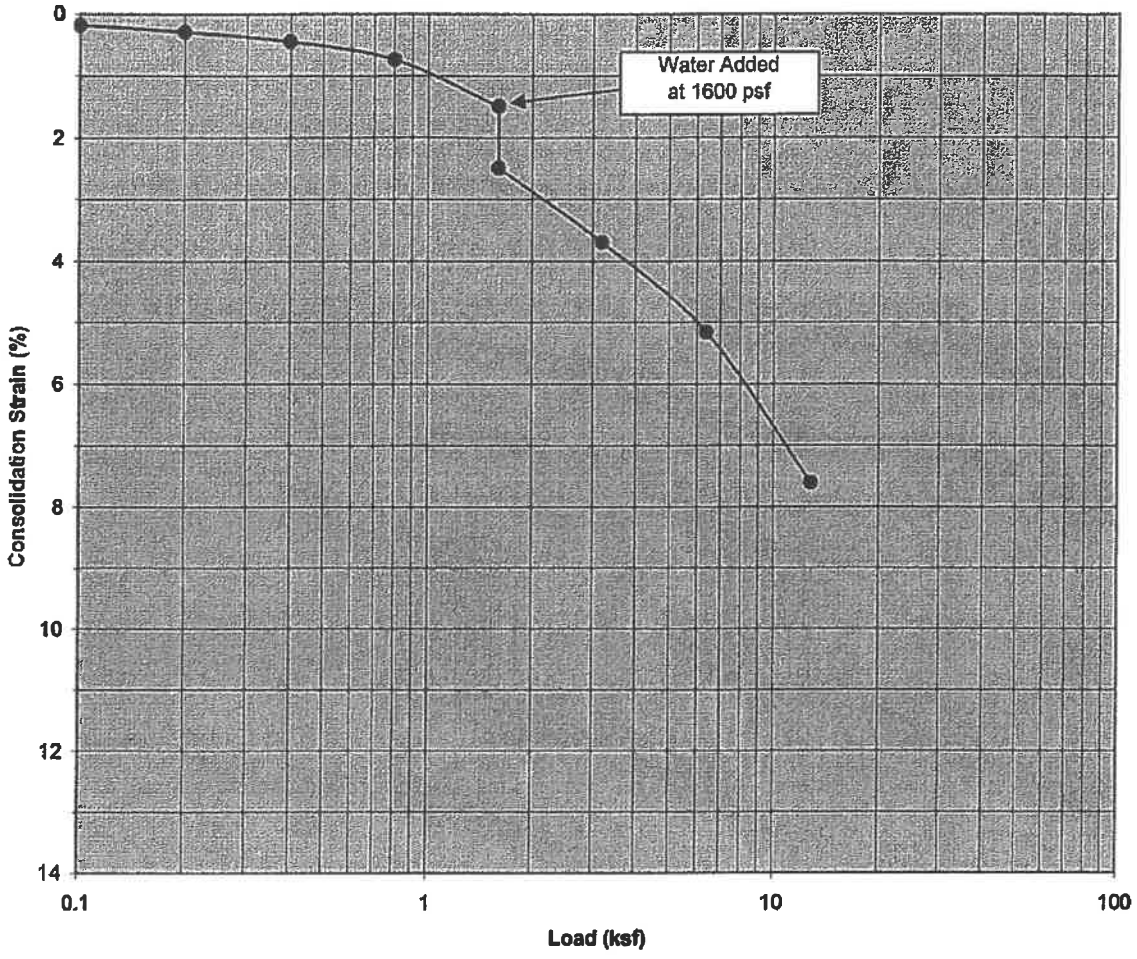
Classification: ALLUVIUM: Light Brown Silty Clay, trace fine Sand

Boring Number:	B-1	Initial Moisture Content (%)	14
Sample Number:	---	Final Moisture Content (%)	22
Depth (ft)	5 to 6	Initial Dry Density (pcf)	108.1
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	112.9
Specimen Thickness (in)	1.0	Percent Collapse (%)	-0.54

Proposed Residential Development
Orange, California
Project No. 05G124
PLATE C- 3

Southern California Geotechnical
1260 North Hancock Street, Suite 101
Anaheim, California 92807
Phone: (714) 777-0333 Fax: (714) 777-0388

Consolidation/Collapse Test Results



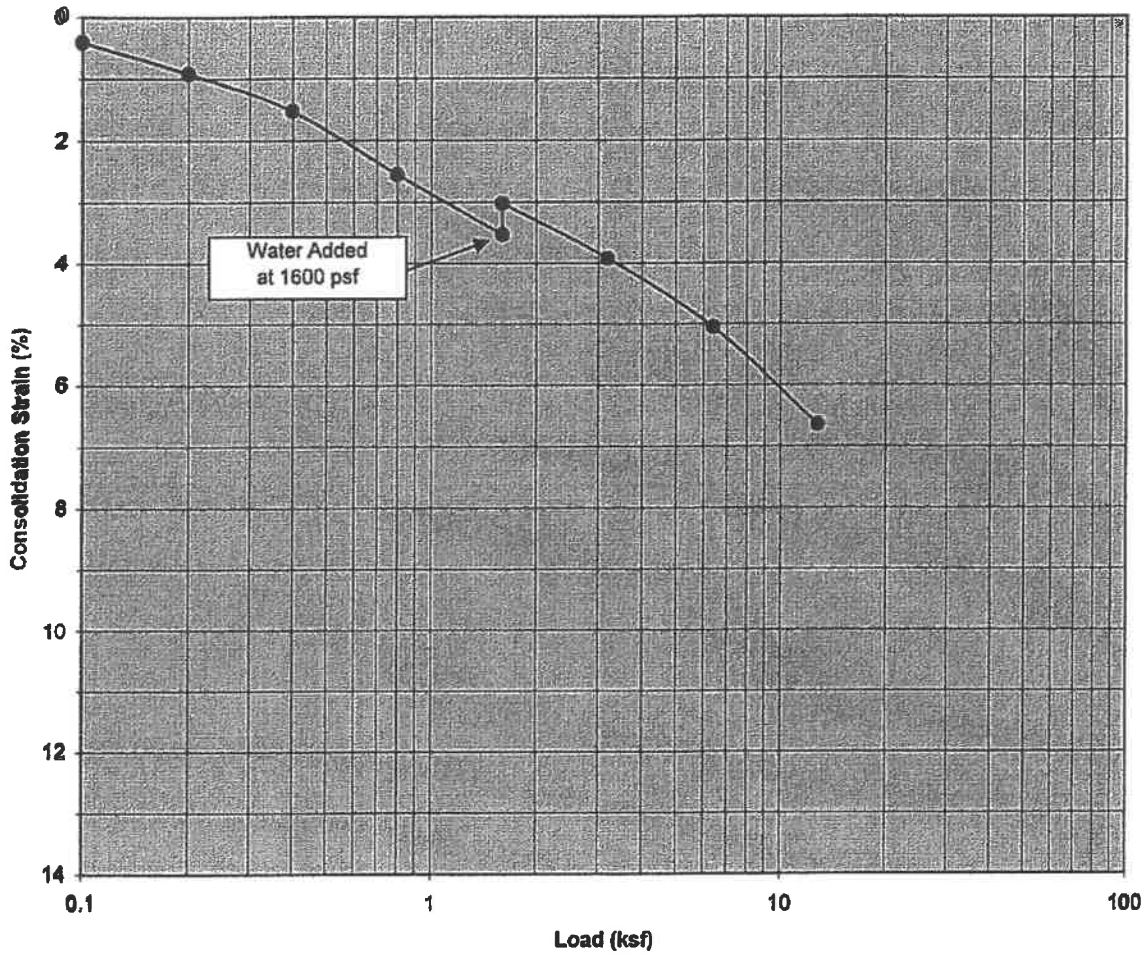
Classification: Brown Silty fine Sand, some fine to coarse Gravel

Boring Number:	B-1	Initial Moisture Content (%)	7
Sample Number:	---	Final Moisture Content (%)	12
Depth (ft)	7 to 8	Initial Dry Density (pcf)	115.2
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	122.2
Specimen Thickness (in)	1.0	Percent Collapse (%)	1.00

Proposed Residential Development
Orange, California
Project No. 05G124
PLATE C- 4

Southern California Geotechnical
INC.
1260 North Hancock Street, Suite 101
Anaheim, California 92807
Phone: (714) 777-0333 Fax: (714) 777-0388

Consolidation/Collapse Test Results



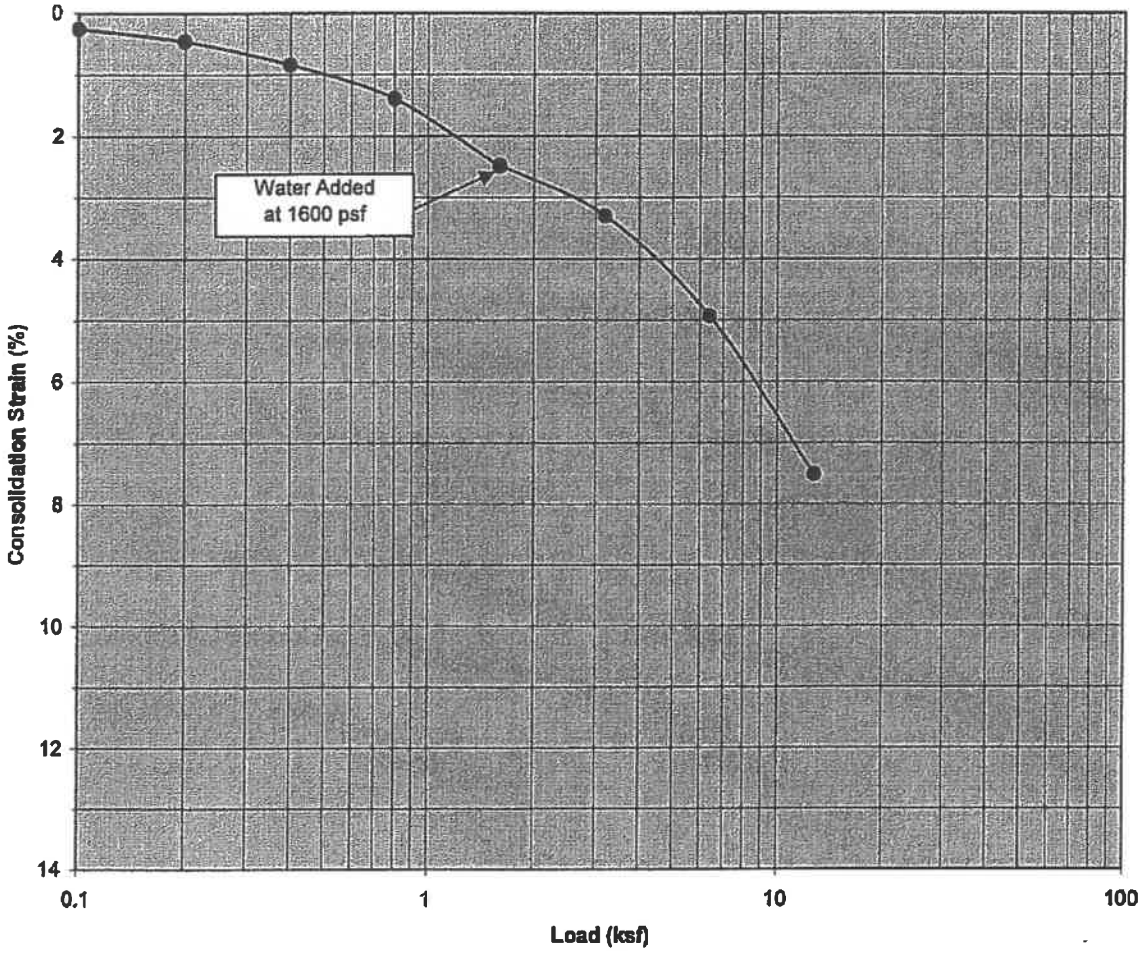
Classification: POSSIBLE FILL: Dark Brown Silty Clay, trace fine Gravel

Boring Number:	B-3	Initial Moisture Content (%)	21
Sample Number:	----	Final Moisture Content (%)	25
Depth (ft)	1 to 2	Initial Dry Density (pcf)	103.1
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	109.5
Specimen Thickness (in)	1.0	Percent Collapse (%)	-0.51

Proposed Residential Development
Orange, California
Project No. 05G124
PLATE C- 5

Southern California Geotechnical
INC.
1260 North Hancock Street, Suite 101
Anaheim, California 92807
Phone: (714) 777-0333 Fax: (714) 777-0388

Consolidation/Collapse Test Results



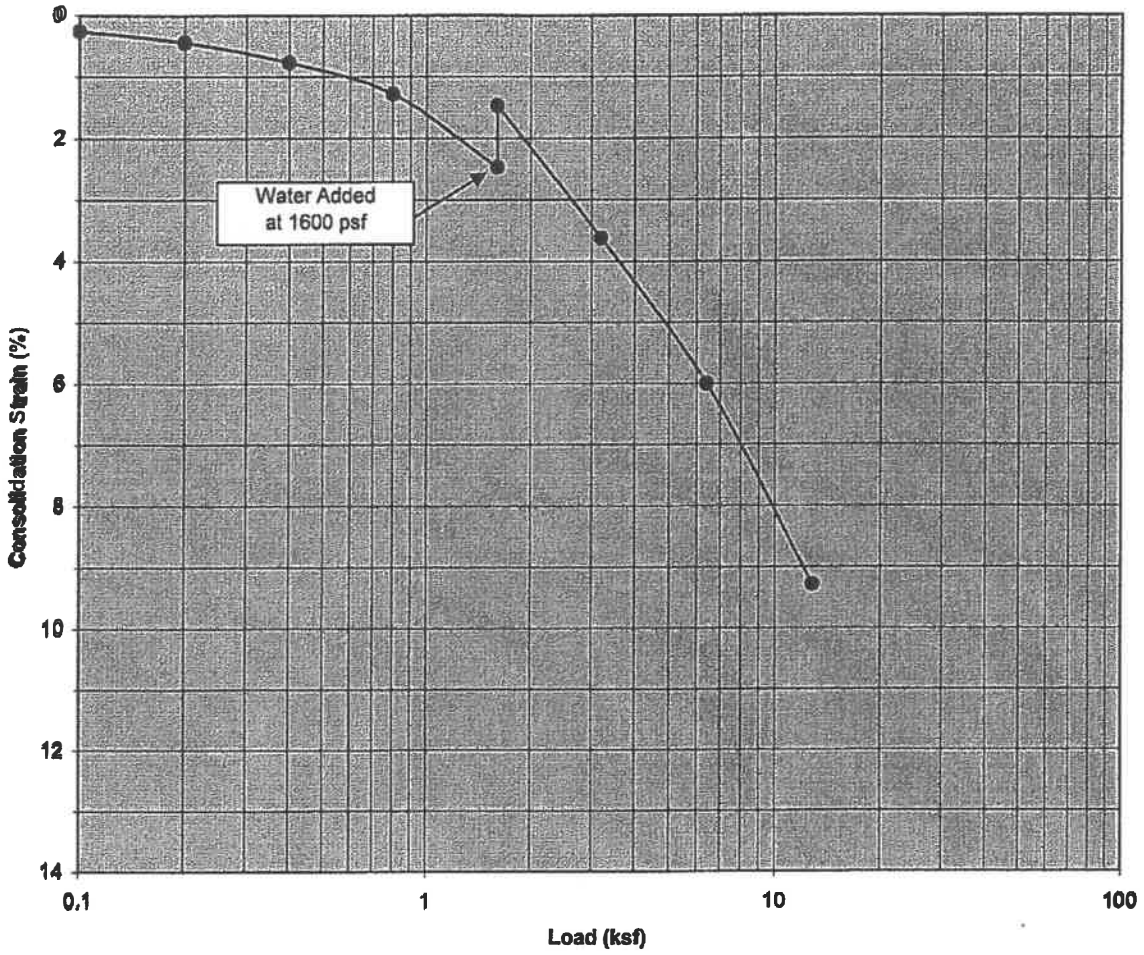
Classification: ALLUVIUM: Dark Brown Silty Clay

Boring Number:	B-3	Initial Moisture Content (%)	20
Sample Number:	---	Final Moisture Content (%)	22
Depth (ft)	3 to 4	Initial Dry Density (pcf)	104.5
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	112.2
Specimen Thickness (in)	1.0	Percent Collapse (%)	-0.02

Proposed Residential Development
Orange, California
Project No. 05G124
PLATE C- 6

Southern California Geotechnical
INC.
1250 North Hancock Street, Suite 101
Anaheim, California 92807
Phone: (714) 777-0333 Fax: (714) 777-0388

Consolidation/Collapse Test Results



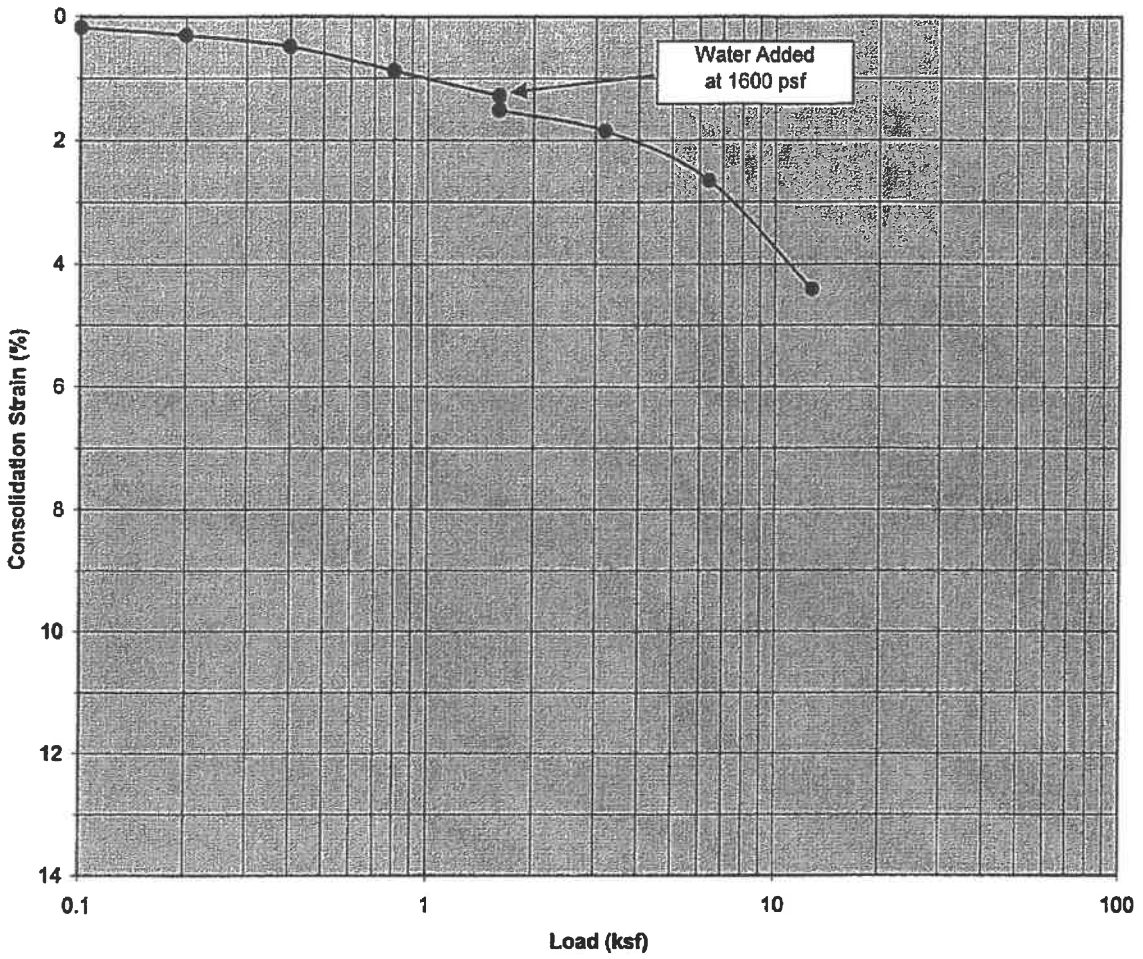
Classification: ALLUVIUM: Dark Brown Silty Clay

Boring Number:	B-3	Initial Moisture Content (%)	18
Sample Number:	---	Final Moisture Content (%)	21
Depth (ft)	5 to 6	Initial Dry Density (pcf)	103.9
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	114.5
Specimen Thickness (in)	1.0	Percent Collapse (%)	-1.00

Proposed Residential Development
Orange, California
Project No. 05G124
PLATE C- 7

Southern California Geotechnical
INC.
1260 North Hancock Street, Suite 101
Anaheim, California 92807
Phone: (714) 777-0333 Fax: (714) 777-0388

Consolidation/Collapse Test Results



Classification: Brown Silty Sand, trace fine Gravel

Boring Number:	B-3	Initial Moisture Content (%)	17
Sample Number:	---	Final Moisture Content (%)	18
Depth (ft)	7 to 8	Initial Dry Density (pcf)	110.7
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	114.9
Specimen Thickness (in)	1.0	Percent Collapse (%)	0.23

Proposed Residential Development
Orange, California
Project No. 05G124
PLATE C- 8

Southern California Geotechnical
Inc.
1260 North Hancock Street, Suite 101
Anaheim, California 92807
Phone: (714) 777-0333 Fax: (714) 777-0398

5.0 LABORATORY TESTING

The soil samples recovered from the subsurface exploration were returned to our laboratory for further testing to determine selected physical and engineering properties of the soils. The tests are briefly discussed below. It should be noted that the test results are specific to the actual samples tested, and variations could be expected at other locations and depths.

Classification

All recovered soil samples were classified using the Unified Soil Classification System (USCS), in accordance with ASTM D-2488. Field identifications were then supplemented with additional visual classifications and/or by laboratory testing. The USCS classifications are shown on the Boring Logs and are periodically referenced throughout this report.

In-situ Density and Moisture Content

The density has been determined for selected relatively undisturbed ring samples. These densities were determined in general accordance with the method presented in ASTM D-2937. The results are recorded as dry unit weight in pounds per cubic foot. The moisture contents are determined in accordance with ASTM D-2216, and are expressed as a percentage of the dry weight. These test results are presented on the Boring Logs.

Consolidation

Selected soil samples have been tested to determine their consolidation potential, in accordance with ASTM D-2435. The testing apparatus is designed to accept either natural or remolded samples in a one-inch high ring, approximately 2.416 inches in diameter. Each sample is then loaded incrementally in a geometric progression and the resulting deflection is recorded at selected time intervals. Porous stones are in contact with the top and bottom of the sample to permit the addition or release of pore water. The samples are typically inundated with water at an intermediate load to determine their potential for collapse or heave. The results of the consolidation testing are plotted on Plates C-1 through C-8 in Appendix C of this report.

Soluble Sulfates

Representative samples of the near-surface soils were submitted to a subcontracted analytical laboratory for determination of soluble sulfate content. Soluble sulfates are naturally present in soils, and if the concentration is high enough, can result in degradation of concrete which comes into contact with these soils. The results of the

soluble sulfate testing are presented below, and are discussed further in a subsequent section of this report.

Sample Identification	Soluble Sulfates (%)	UBC Classification
B-1 @ 0 to 5 feet	0.037	Negligible
B-3 @ 0 to 5 feet	0.070	Negligible

Expansion Index

The expansion potential of the on-site soils was determined in general accordance with Uniform Building Code (UBC) Standard 18-2. The testing apparatus is designed to accept a 4-inch diameter, 1-in high, remolded sample. The sample is initially remolded to 50 ± 1 percent saturation and then loaded with a surcharge equivalent to 144 pounds per square foot. The sample is then inundated with water, and allowed to swell against the surcharge. The resultant swell or consolidation is recorded after a 24-hour period. The results of the EI testing are as follows:

Sample Identification	Expansion Index	Expansive Potential
B-3 @ 0 to 5 feet	108	High

APPENDIX D

INFILTRATION TEST DATA

Updated Geotechnical and Infiltration Evaluation
Proposed Townhome Residential Development
2375 North Tustin Street
Orange, Orange County, California
Project No. 4150-CR

GEOTEK

PERCOLATION DATA SHEET

Project: 2375 N Tustin St **Job No.:** 4150-CR

Test Hole No.: I-I **Tested By:** KLP **Date:** 12/4/2024

Depth of Hole As Drilled: 120" **Before Test:** 120" **After Test:** 120"

Reading No.	Time	Time Interval (Min)	Total Depth of Hole (Inches)	Initial Water Level (Inches)	Final Water Level (Inches)	Δ in Water Level (Inches)	Rate (Minutes per Inch)	Comments
1	9:00 AM		120	24				presoaked
	9:25 AM	25			7 4/5	16 1/5	1.5	
2	9:26 AM		120	24				
	9:51 AM	25			8 2/5	15 3/5	1.6	
1	9:52 AM		120	24				
	10:02 AM	10			15 3/5	8 2/5	1.2	
2	10:03 AM		120	24				
	10:13 AM	10			15 3/5	8 2/5	1.2	
3	10:14 AM		120	24				
	10:24 AM	10			16 1/5	7 4/5	1.3	
4	10:25 AM		120	24				
	10:35 AM	10			16 1/5	7 4/5	1.3	
5	10:36 AM		120	24				
	10:46 AM	10			16 4/5	7 1/5	1.4	
6	10:47 AM		120	24				
	10:57 AM	10			16 4/5	7 1/5	1.4	

GEOTEK

PERCOLATION DATA SHEET

Project: 2375 N Tustin St **Job No.:** 4150-CR

Test Hole No.: I-2 **Tested By:** KLP **Date:** 12/4/2024

Depth of Hole As Drilled: 120" **Before Test:** 120" **After Test:** 120"

Reading No.	Time	Time Interval (Min)	Total Depth of Hole (Inches)	Initial Water Level (Inches)	Final Water Level (Inches)	Δ in Water Level (Inches)	Rate (Minutes per Inch)	Comments
1	7:00 AM		120	24				presoaked
	7:25 AM	25			18	6	4.2	
2	7:26 AM		120	24				
	7:51 AM	25			18	6	4.2	
1	7:52 AM		120	24				
	8:02 AM	10			21 3/5	2 2/5	4.2	
2	8:03 AM		120	24				
	8:13 AM	10			22	2	5.0	
3	8:14 AM		120	24				
	8:24 AM	10			22 1/5	1 4/5	5.6	
4	8:25 AM		120	24				
	8:35 AM	10			22 1/5	1 4/5	5.6	
5	8:36 AM		120	24				
	8:46 AM	10			22 4/5	1 1/5	8.3	
6	8:47 AM		120	24				
	8:57 AM	10			22 4/5	1 1/5	8.3	

GEOTEK

Client:	**Melia Homes**
Project:	**2375 N Tustin St**
Project No:	**4150-CR**
Date:	**12/4/2024**

Boring No. **I-1**

Percolation to Infiltration Rate (Porchet Method)

Time Interval, Δt =	10
Final Depth to Water, D_F =	103.2
Test Hole Radius, r =	4
Initial Depth to Water, D_O =	96
Total Test Hole Depth, D_T =	120

Equation - $I_t = \dfrac{\Delta H\ (60r)}{\Delta t\ (r+2H_{avg})}$

$H_O = D_T - D_O$ =	24
$H_F = D_T - D_F$ =	16.8
$\Delta H = \Delta D = H_O - H_F$ =	7.2
$Havg = (H_O+H_F)/2$ =	20.4

I_t = 3.86 **Inches per Hour**

GEOTEK

Client:	**Melia Homes**
Project:	**2375 N Tustin St**
Project No:	**4150-CR**
Date:	**12/4/2024**

Boring No. **I-2**

Percolation to Infiltration Rate (Porchet Method)

Time Interval, Δt =	10
Final Depth to Water, D_F =	97.2
Test Hole Radius, r =	4
Initial Depth to Water, D_O =	96
Total Test Hole Depth, D_T =	120

Equation - $I_t = \dfrac{\Delta H\,(60r)}{\Delta t\,(r+2H_{avg})}$

$H_O = D_T - D_O$ =	24
$H_F = D_T - D_F$ =	22.8
$\Delta H = \Delta D = H_O - H_F$ =	1.2
$Havg = (H_O+H_F)/2$ =	23.4

I_t = 0.57 **Inches per Hour**

GEOTEK

APPENDIX E

GENERAL EARTHWORK GRADING GUIDELINES

Updated Geotechnical and Infiltration Evaluation
Proposed Townhome Residential Development
2375 North Tustin Street
Orange, Orange County, California
Project No. 4150-CR

GEOTEK

GENERAL GRADING GUIDELINES

Guidelines presented herein are intended to address general construction procedures for earthwork construction. Specific situations and conditions often arise which cannot reasonably be discussed in general guidelines, when anticipated these are discussed in the text of the report. Often unanticipated conditions are encountered which may necessitate modification or changes to these guidelines. It is our hope that these will assist the contractor to more efficiently complete the project by providing a reasonable understanding of the procedures that would be expected during earthwork and the testing and observation used to evaluate those procedures.

General

Grading should be performed to at least the minimum requirements of governing agencies, Chapters 18 and 33 of the Uniform Building Code, CBC (2022) and the guidelines presented below.

Preconstruction Meeting

A preconstruction meeting should be held prior to site earthwork. Any questions the contractor has regarding our recommendations, general site conditions, apparent discrepancies between reported and actual conditions and/or differences in procedures the contractor intends to use should be brought up at that meeting. The contractor (including the main onsite representative) should review our report and these guidelines in advance of the meeting. Any comments the contractor may have regarding these guidelines should be brought up at that meeting.

Grading Observation and Testing

1. Observation of the fill placement should be provided by our representative during grading. Verbal communication during the course of each day will be used to inform the contractor of test results. The contractor should receive a copy of the "Daily Field Report" indicating results of field density tests that day. If our representative does not provide the contractor with these reports, our office should be notified.
2. Testing and observation procedures are, by their nature, specific to the work or area observed and location of the tests taken, variability may occur in other locations. The contractor is responsible for the uniformity of the grading operations; our observations and test results are intended to evaluate the contractor's overall level of efforts during grading. The contractor's personnel are the only individuals participating in all aspects of site work. Compaction testing and observation should not be considered as relieving the contractor's responsibility to properly compact the fill.
3. Cleanouts, processed ground to receive fill, key excavations, and subdrains should be observed by our representative prior to placing any fill. It will be the contractor's responsibility to notify our representative or office when such areas are ready for observation.

4. Density tests may be done on the surface material to receive fill, as considered warranted by this firm.
5. In general, density tests would be made at maximum intervals of two feet of fill height, or every 1,000 cubic yards of fill placed. Criteria will vary depending on soil conditions and size of the fill. More frequent testing may be performed. In any case, an adequate number of field density tests should be made to evaluate the required compaction and moisture content is generally being obtained.
6. Laboratory testing to support field test procedures will be performed, as considered warranted, based on conditions encountered (e.g. change of material sources, types, etc.) Every effort will be made to process samples in the laboratory as quickly as possible and in progress construction projects are our first priority. However, laboratory workloads may cause delays and some soils may require a **minimum of 48 to 72 hours to complete test procedures**. Whenever possible, our representative(s) should be informed in advance of operational changes that might result in different source areas for materials.
7. Procedures for testing of fill slopes are as follows:
    a) Density tests should be taken periodically during grading on the flat surface of the fill, three to five feet horizontally from the face of the slope.
    b) If a method other than over building and cutting back to the compacted core is to be employed, slope compaction testing during construction should include testing the outer six inches to three feet in the slope face to determine if the required compaction is being achieved.
8. Finish grade testing of slopes and pad surfaces should be performed after construction is complete.

Site Clearing

1. All vegetation, and other deleterious materials, should be removed from the site. If material is not immediately removed from the site it should be stockpiled in a designated area(s) well outside of all current work areas and delineated with flagging or other means. Site clearing should be performed in advance of any grading in a specific area.
2. Efforts should be made by the contractor to remove all organic or other deleterious material from the fill, as even the most diligent efforts may result in the incorporation of some materials. This is especially important when grading is occurring near the natural grade. All equipment operators should be aware of these efforts. Laborers may be required as root pickers.
3. Nonorganic debris or concrete may be placed in deeper fill areas provided the procedures used are observed and found acceptable by our representative.

Treatment of Existing Ground

1. Following site clearing, all surficial deposits of alluvium and colluvium as well as weathered or creep effected bedrock, should be removed unless otherwise specifically indicated in the text of this report.
2. In some cases, removal may be recommended to a specified depth (e.g. flat sites where partial alluvial removals may be sufficient). The contractor should not exceed these depths unless directed otherwise by our representative.
3. Groundwater existing in alluvial areas may make excavation difficult. Deeper removals than indicated in the text of the report may be necessary due to saturation during winter months.
4. Subsequent to removals, the natural ground should be processed to a depth of six inches, moistened to near optimum moisture conditions and compacted to fill standards.
5. Exploratory backhoe or dozer trenches still remaining after site removal should be excavated and filled with compacted fill if they can be located.

Fill Placement

1. Unless otherwise indicated, all site soil and bedrock may be reused for compacted fill; however, some special processing or handling may be required (see text of report).
2. Material used in the compacting process should be evenly spread, moisture conditioned, processed, and compacted in thin lifts six (6) to eight (8) inches in compacted thickness to obtain a uniformly dense layer. The fill should be placed and compacted on a nearly horizontal plane, unless otherwise found acceptable by our representative.
3. If the moisture content or relative density varies from that recommended by this firm, the contractor should rework the fill until it is in accordance with the following:
    a) The moisture content of the fill should be at or above optimum moisture. Moisture should be evenly distributed without wet and dry pockets. Pre-watering of cut or removal areas should be considered in addition to watering during fill placement, particularly in clay or dry surficial soils. The ability of the contractor to obtain the proper moisture content will control production rates.
    b) Each six-inch layer should be compacted to at least 90 percent of the maximum dry density in compliance with the testing method specified by the controlling governmental agency. In most cases, the testing method is ASTM Test Designation D 1557.
4. Rock fragments less than eight inches in diameter may be utilized in the fill, provided:
    a) They are not placed in concentrated pockets;
    b) There is a sufficient percentage of fine-grained material to surround the rocks;
    c) The distribution of the rocks is observed by, and acceptable to, our representative.

5. Rocks exceeding eight (8) inches in diameter should be taken off site, broken into smaller fragments, or placed in accordance with recommendations of this firm in areas designated suitable for rock disposal. On projects where significant large quantities of oversized materials are anticipated, alternate guidelines for placement may be included. If significant oversize materials are encountered during construction, these guidelines should be requested.
6. In clay soil, dry or large chunks or blocks are common. If in excess of eight (8) inches minimum dimension, then they are considered as oversized. Sheepsfoot compactors or other suitable methods should be used to break up blocks. When dry, they should be moisture conditioned to provide a uniform condition with the surrounding fill.

Slope Construction

1. The contractor should obtain a minimum relative compaction of 90 percent out to the finished slope face of fill slopes. This may be achieved by either overbuilding the slope and cutting back to the compacted core, or by direct compaction of the slope face with suitable equipment.
2. Slopes trimmed to the compacted core should be overbuilt by at least three (3) feet with compaction efforts out to the edge of the false slope. Failure to properly compact the outer edge results in trimming not exposing the compacted core and additional compaction after trimming may be necessary.
3. If fill slopes are built "at grade" using direct compaction methods, then the slope construction should be performed so that a constant gradient is maintained throughout construction. Soil should not be "spilled" over the slope face nor should slopes be "pushed out" to obtain grades. Compaction equipment should compact each lift along the immediate top of slope. Slopes should be back rolled or otherwise compacted at approximately every 4 feet vertically as the slope is built.
4. Corners and bends in slopes should have special attention during construction as these are the most difficult areas to obtain proper compaction.
5. Cut slopes should be cut to the finished surface. Excessive undercutting and smoothing of the face with fill may necessitate stabilization.

UTILITY TRENCH CONSTRUCTION AND BACKFILL

Utility trench excavation and backfill is the contractor's responsibility. The geotechnical consultant typically provides periodic observation and testing of these operations. While efforts are made to make sufficient observations and tests to verify that the contractors' methods and procedures are adequate to achieve proper compaction, it is typically impractical to observe all backfill procedures. As such, it is critical that the contractor use consistent backfill procedures.

Compaction methods vary for trench compaction and experience indicates many methods can be successful. However, procedures that "worked" on previous projects may or may not prove effective on a given site. The contractor(s) should outline the procedures proposed, so that we may discuss them **prior** to construction. We will offer comments based on our knowledge of site conditions and experience.

1. Utility trench backfill in slopes, structural areas, in streets and beneath flat work or hardscape should be brought to at least optimum moisture and compacted to at least 90 percent of the laboratory standard. Soil should be moisture conditioned prior to placing in the trench.
2. Flooding and jetting are not typically recommended or acceptable for native soils. Flooding or jetting may be used with select sand having a Sand Equivalent (SE) of 30 or higher. This is typically limited to the following uses:
   a) shallow (12 + inches) under slab interior trenches and,
   b) as bedding in pipe zone.

   The water should be allowed to dissipate prior to pouring slabs or completing trench compaction.
3. Care should be taken not to place soils at high moisture content within the upper three feet of the trench backfill in street areas, as overly wet soils may impact subgrade preparation. Moisture may be reduced to 2% below optimum moisture in areas to be paved within the upper three feet below sub grade.
4. Sand backfill should not be allowed in exterior trenches adjacent to and within an area extending below a 1:1 projection from the outside bottom edge of a footing, unless it is similar to the surrounding soil.
5. Trench compaction testing is generally at the discretion of the geotechnical consultant. Testing frequency will be based on trench depth and the contractors' procedures. A probing rod would be used to assess the consistency of compaction between tested areas and untested areas. If zones are found that are considered less compact than other areas, this should be brought to the contractor's attention.

JOB SAFETY

General

Personnel safety is a primary concern on all job sites. The following summaries are safety considerations for use by all our employees on multi-employer construction sites. On ground personnel are at the highest risk of injury and possible fatality on grading construction projects. The company recognizes that construction activities will vary on each site and that job site safety is the contractor's responsibility. However, it is imperative that all personnel be safety conscious to avoid accidents and potential injury.

In an effort to minimize risks associated with geotechnical testing and observation, the following precautions are to be implemented for the safety of our field personnel on grading and construction projects.

1. Safety Meetings: Our field personnel are directed to attend the contractor's regularly scheduled safety meetings.
2. Safety Vests: Safety vests are provided for and are to be worn by our personnel while on the job site.
3. Safety Flags: Safety flags are provided to our field technicians; one is to be affixed to the vehicle when on site, the other is to be placed atop the spoil pile on all test pits.

In the event that the contractor's representative observes any of our personnel not following the above, we request that it be brought to the attention of our office.

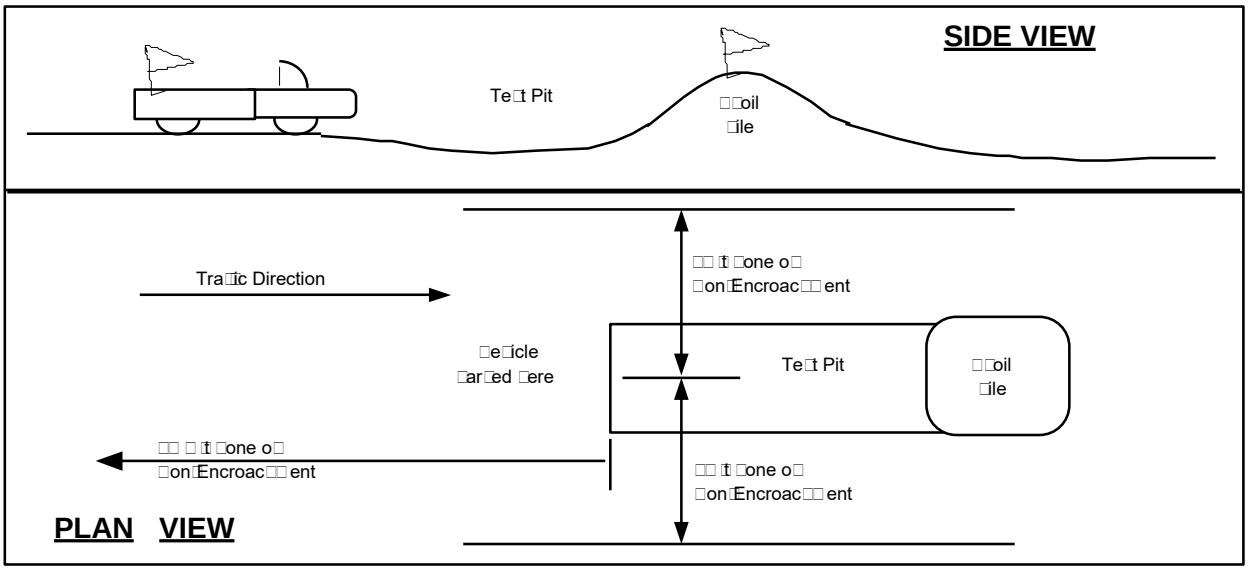
Test Pits Location, Orientation and Clearance

The technician is responsible for selecting test pit locations. The primary concern is the technician's safety. However, it is necessary to take sufficient tests at various locations to obtain a representative sampling of the fill. As such, efforts will be made to coordinate locations with the grading contractors authorized representatives (e.g. dump man, operator, supervisor, grade checker, etc.), and to select locations following or behind the established traffic pattern, preferably outside of current traffic. The contractors authorized representative should direct excavation of the pit and safety during the test period. Again, safety is the paramount concern.

Test pits should be excavated so that the spoil pile is placed away from oncoming traffic. The technician's vehicle is to be placed next to the test pit, opposite the spoil pile. This necessitates that the fill be maintained in a drivable condition. Alternatively, the contractor may opt to park a piece of equipment in front of test pits, particularly in small fill areas or those with limited access.

A zone of non-encroachment should be established for all test pits (see diagram below). No grading equipment should enter this zone during the test procedure. The zone should extend outward to the sides approximately 50 feet from the center of the test pit and 100 feet in the direction of traffic flow. This zone is established both for safety and to avoid excessive ground vibration, which typically decreases test results.

TEST PIT SAFETY PLAN



Slope Tests

When taking slope tests, the technician should park their vehicle directly above or below the test location on the slope. The contractor's representative should effectively keep all equipment at a safe operation distance (e.g. 50 feet) away from the slope during testing.

The technician is directed to withdraw from the active portion of the fill as soon as possible following testing. The technician's vehicle should be parked at the perimeter of the fill in a highly visible location.

Trench Safety

It is the contractor's responsibility to provide safe access into trenches where compaction testing is needed. Trenches for all utilities should be excavated in accordance with CAL-OSHA and any other applicable safety standards. Safe conditions will be required to enable compaction testing of the trench backfill.

All utility trench excavations in excess of 5 feet deep, which a person enters, are to be shored or laid back. Trench access should be provided in accordance with OSHA standards. Our personnel are directed not to enter any trench by being lowered or "riding down" on the equipment.

Our personnel are directed not to enter any excavation which;

1. is 5 feet or deeper unless shored or laid back,
2. exit points or ladders are not provided,
3. displays any evidence of instability, has any loose rock or other debris which could fall into the trench, or

4. displays any other evidence of any unsafe conditions regardless of depth.

If the contractor fails to provide safe access to trenches for compaction testing, our company policy requires that the soil technician withdraws and notifies their supervisor. The contractor's representative will then be contacted in an effort to effect a solution. All backfill not tested due to safety concerns or other reasons is subject to reprocessing and/or removal.

Procedures

In the event that the technician's safety is jeopardized or compromised as a result of the contractor's failure to comply with any of the above, the technician is directed to inform both the developer's and contractor's representatives. If the condition is not rectified, the technician is required, by company policy, to immediately withdraw and notify their supervisor. The contractor's representative will then be contacted in an effort to affect a solution. No further testing will be performed until the situation is rectified. Any fill placed in the interim can be considered unacceptable and subject to reprocessing, recompaction or removal.

In the event that the soil technician does not comply with the above or other established safety guidelines, we request that the contractor bring this to the technician's attention and notify our project manager or office. Effective communication and coordination between the contractors' representative and the field technician(s) is strongly encouraged in order to implement the above safety program and safety in general.

The safety procedures outlined above should be discussed at the contractor's safety meetings. This will serve to inform and remind equipment operators of these safety procedures, particularly the zone of non-encroachment.

The safety procedures outlined above should be discussed at the contractor's safety meetings. This will serve to inform and remind equipment operators of these safety procedures, particularly the zone of non-encroachment.

GeoTek, Inc.
1548 North Maple Street, Corona, California 92878
(951) 710-1160 Office (951) 710-1167 Fax www.geotekusa.com

June 19, 2025
Project No. 4150-CR

Melia Homes
9860 Irvine Center Drive
Irvine, California 92618

Attention: Mr. Chad Brown

Subject: **Review – Stormwater Infiltration Feasibility**
Proposed Townhome Residential Development – Tract 19392
2375 North Tustin Street
City of Orange, Orange County, California

References: See Page 3

Dear Mr. Brown:

Two percolation tests were conducted for the referenced Updated Geotechnical and Infiltration Evaluation dated December 30, 2024 (GeoTek, 2024) at depths of approximately 10 feet below the existing ground surface (see Exploration Location Map, Figure 2, of the referenced report for the test locations). The results of the infiltration testing indicated poor to favorable rates (0.57 to 3.86 inches per hour). Both percolation tests appear to have been conducted within a fine- to coarse-gravel with sand and trace clay (GP soil type based upon the Unified Soil Classification System), indicating highly variable percolation characteristics within the on-site soils.

Soils encountered in the recent borings conducted for the referenced Update Evaluation, as well as a previous Geotechnical Investigation prepared by Southern California Geotechnical, Inc. (SCGI, 2005) for the existing site improvements, indicated the presence of fine-grained silty clay and very dense silty sand soils (CL and SM soil types) below the gravel soils. These soils are anticipated to locally act as barriers to downward percolation of water from on-site disposal facilities, most likely leading to "mounding" of the water atop these soils. Over time, this water mounding will lead to a non-functional stormwater disposal system and possible migration of water to adjacent sites.

As discussed in various site documents (GeoTek, 2024 and C&V, 2025), the site soils are also considered to possess up to a high expansion potential. Mounding soils and a non-functional stormwater disposal system will eventually exacerbate problems caused by expansive soil on site improvements (structures and infrastructure).

Based upon review of the referenced Phase I Environmental Site Assessment dated February 6, 2024, prepared by EDI Consultants, leaking underground gasoline tanks from a former car wash also dispensing gasoline fuel facility resulted in subsurface soil contamination of the property (2355 North Tustin Street) located adjacent to the southwest corner of the project site. While soil vapor extraction (SVE) well operations conducted on this property resulted in the reduction of soil contamination to levels which allowed "Case Closure" of this site, some soil contamination remained in these site soils. Mounding and migration of water from the project site (2375 North Tustin Street) may also lead to migration of contaminated soil from this adjacent site.

Based on the highly variable infiltration rates obtained from the on-site percolation testing, the presence of expansive clay and very dense soil layers acting as downward water migration barriers leading to "mounding" of subsurface water, along with the possible negative effects of "mounding" subsurface waters on proposed site and off-site improvements, it is GeoTek's opinion that stormwater infiltration is not considered suitable for the project development.

Should you have any questions after reviewing this letter, please feel free to contact GeoTek, Inc. at your convenience.

Respectfully submitted,
GeoTek, Inc.





Edward H. LaMont
CEG 1892, Exp. 7/31/26
Principal Geologist

Bruce A. Hick
GE 2284, Exp. 12/31/26
Geotechnical Engineer

Distribution: (1) Addressee via email

G:\Projects\4100 to 4199\4150CR Tract 19392 2375 North Tustin Street Orange\4150-CR Stormwater Infiltration Feasibility Tract 19392 Orange.docx

REFERENCES

C&V Consulting, Inc., 2025, "[Preliminary} Priority Water Quality Management Plan (WQMP), TTM 19392, 2375 North Tustin Street, Orange, Ca 92865", dated April, with City of Orange comments.

EDI Consultants, 2024, "Phase I Environmental Site Assessment, Vacant Commercial Retail Building, 2375 North Tustin Street, Orange, California 92865", EDI Project No. 224-0059, dated February 6.

GeoTek, Inc., 2024, "Updated Geotechnical and Infiltration Evaluation, Proposed Townhome Residential Development, 2375 North Tustin Street, Orange, Orange County, California", Project No. 4150-CR, dated December 30.

Southern California Geotechnical, Inc., 2005, "Geotechnical Investigation, Proposed Residential Development, 2375 North Tustin Avenue, Orange, California," Project No. 05G124-1, dated March 29.

Appendix F:

References

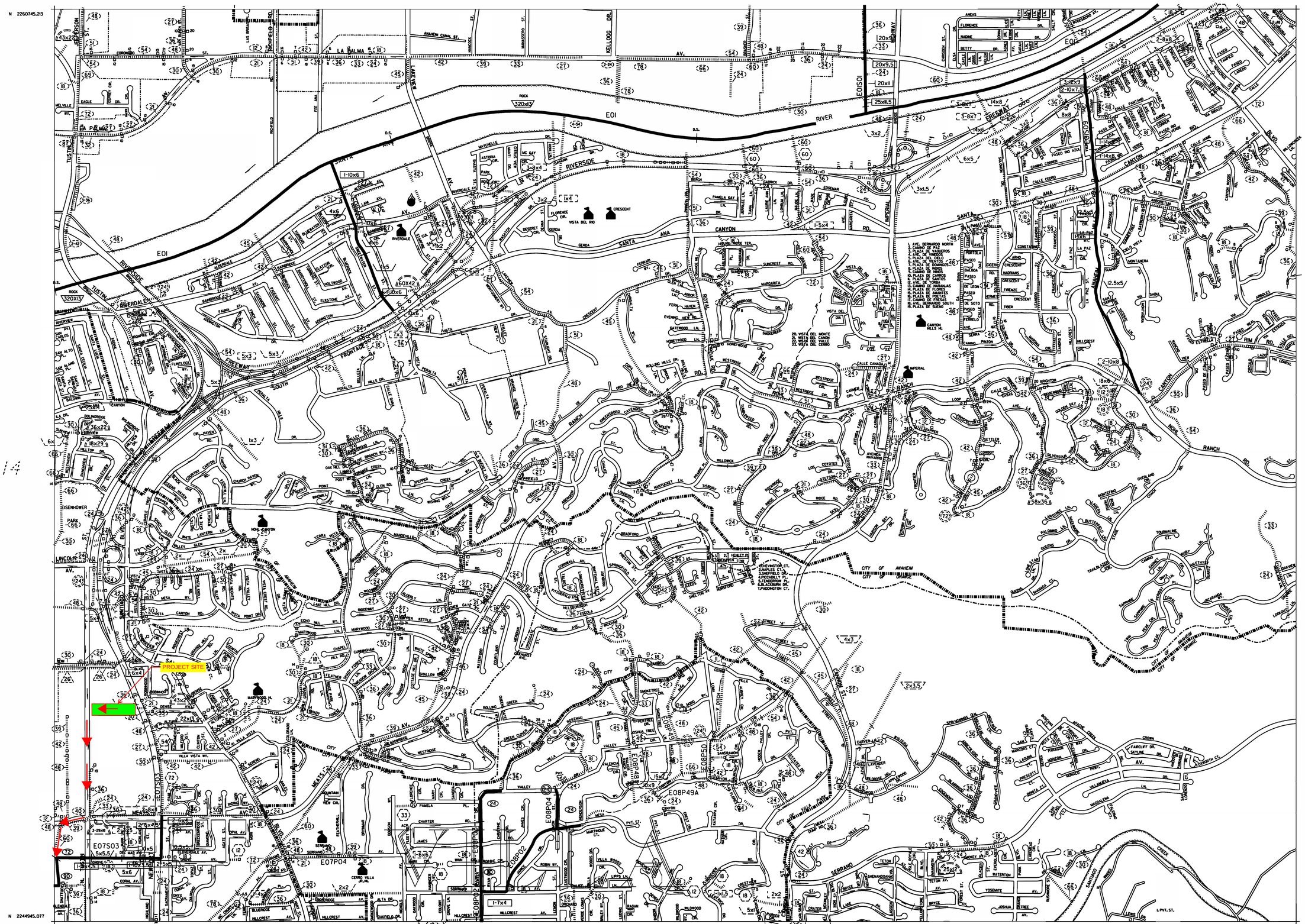
E 6079407.208 N 2260745.213

8

E 6100907.413 N 2260745.163

14

16



15

15

Scale: 1" = 600'

NOTICE

This drainage map has been prepared for information purposes only. The location and ownership of facilities have been determined from available information provided by public agencies, but may not be exact. The user of this map is responsible for verifying exact location, ownership and regional versus local character of drainage facilities.

Additional information may be obtained from public plans and recorded deeds. Character designations shown on this map are for convenience only and are not controlling. Neither the county of Orange nor the Orange County Flood Control District (OCFCD) assumes any liabilities for inaccuracies of this map.

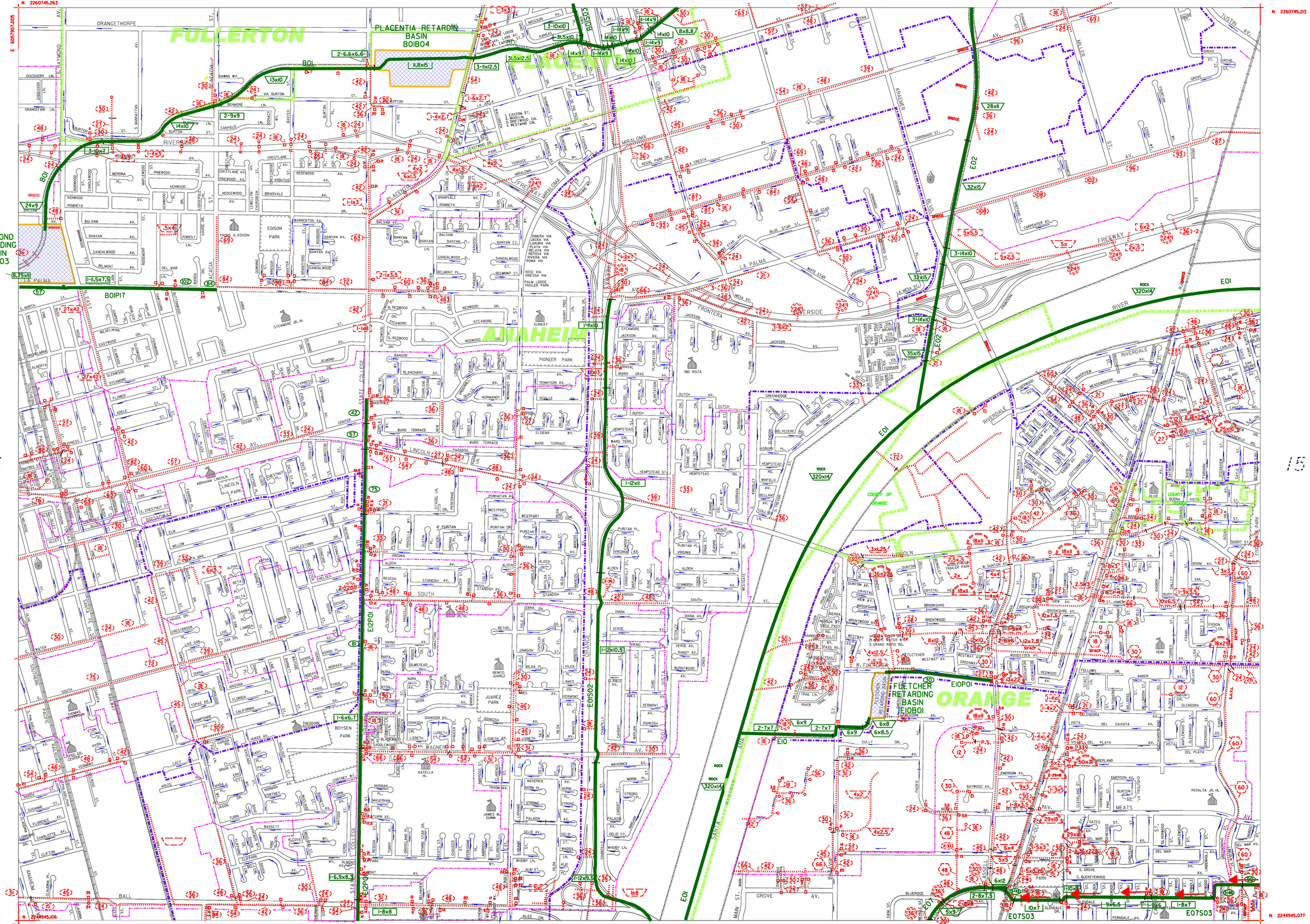
To notify the Resources & Development Management Department (RDMD) of additions or corrections, please call Sal Gutierrez at (714) 834-5396 or by email at sal.gutierrez@rdmd.ocgov.com

ORANGE COUNTY FLOOD CONTROL DISTRICT

BASEMAP OF DRAINAGE FACILITIES IN ORANGE COUNTY

REVISION	DATE	SHEET NO.	DRG. NO.
AMD	JAN.12 2000	15	MAPS-113-3

		Existing O.C.F.C.D.	Existing LOCAL	
	Channel Drainage Area Boundary			Earth Trapezoidal Channel (base width by height in feet)
	Major Sub-Area Drainage Boundary			Reinforced Concrete Trapezoidal Channel (base width by height in feet)
	Minor Sub-Area Drainage Boundary			Reinforced Concrete Rectangular Channel (base width by height in feet)
	Existing O.C.F.C.D. Facility			Reinforced Concrete Box (RCB) (number of barrels-span by height in feet)
	Existing Local Facility			Reinforced Concrete Pipe (RCP) (diameter in inches)
	Existing Retarding Basin or Reservoir			Metal Sheet Channel (MSC) (base width by pile height in feet/pile length in feet)
	Natural Watercourse			Corrugated Metal Pipe (CMP) (diameter in inches)
	City Limits			Concrete Pipe (diameter in inches)
G G	Greenbelt			Concrete Oval Pipe (width by height in inches)
P.S. P.S.	Pump Station			Steel Pipe (diameter in inches)
□	Catch Basin (length in feet)			Reinforced Concrete Arch (base span by height in inches)
o	Drop Inlet or Other Entry			Corrugated Metal Arch (base span by height in inches)
	Ownership (if other than City or County)			
P	Private			
S	State			
F	Federal			



NOTICE

The drainage information has been prepared for information purposes only. The location, ownership, facility information and limits have been determined from available information provided by public agencies, but may not be exact, accurate, or up-to-date. The user of this information is responsible for verifying exact location, ownership, accuracy, and the regional versus local character of drainage facilities.

Additional information may be obtained from public plans and recorded deeds. Facility designations included with this information are for convenience only and are not controlling or intended to imply ownership by the County or the Orange County Flood Control District (OCFCD). The information is being provided as a courtesy and neither the County of Orange nor OCFCD assume any liabilities for inaccuracy of the information.

To notify OC Public Works Flood Control Section of additions or corrections, please contact Sal Gutierrez at (714) 834-5396 or by email at sal.gutierrez@ocpw.ocgov.com

0 200 400 600 800 FEET

ORANGE COUNTY FLOOD CONTROL DISTRICT

BASE MAP OF DRAINAGE FACILITIES IN ORANGE COUNTY

REVISION	DATE	SHEET NO.	DWG. NO.
S. GUTIERREZ	APR.27.200	14	MAPS-113-3

- Channel Drainage Area Boundary
- Major Sub-Area Drainage Boundary
- Minor Sub-Area Drainage Boundary
- Existing O.C.F.C.D. Facility
- Existing Local Facility
- Existing Retarding Basin or Reservoir
- Natural Watercourse
- City Limits
- G G Greenbelt
- P.S. P.S. Pump Station
- Catch Basin (length in feet)
- Drop Inlet or Other Entry
- OCFCD Basins or Reservoirs

Ownership (If other than City or County): Private=P State=S Federal=F

EXISTING FACILITIES

O.C.F.C.D.	LOCAL	
		Earth Trapezoidal Channel (base width by height in feet)
		Reinforced Concrete Trapezoidal Channel (base width by height in feet)
		Reinforced Concrete Rectangular Channel (base width by height in feet)
		Reinforced Concrete Box (RCB) (number of barrels-span by height in feet)
		Reinforced Concrete Pipe (RCP) (diameter in inches)
		Metal Sheet Channel (MSC) (Base width by pile height in feet /Sheet pile total length)
		Corrugated Metal Pipe (CMP) (diameter in inches)
		Concrete Pipe (diameter in inches)
		Concrete Oval Pipe (width by height in inches)
		Steel Pipe (diameter in inches)
		Reinforced Concrete Arch (base span by height in inches)
		Corrugated Metal Arch (base span by height in inches)

STORM DRAIN CONSTRUCTION NOTES:

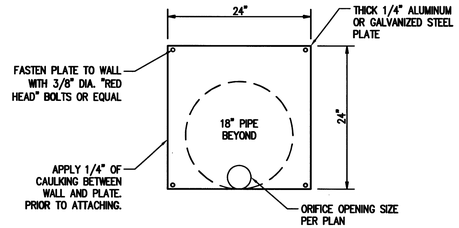
51 — INSTALL CDS 816 MEDIA FILTER SYSTEM, 31 CARTRIDGES PER DETAIL ON SHEET 9
52 — CONNECT PROPOSED PIPE TO CDS MEDIA FILTER SYSTEM
53 — INSTALL 12" PVC SDR 35 STORM DRAIN
54 — INSTALL 12" PVC 60° ELBOW FITTING
55 — INSTALL 18" HDPE STORM DRAIN, ADS OR APPROVED EQUAL
56 — INSTALL HDPE WYE (ADS INC. OR APPROVED EQUAL) 18"
58 — INSTALL HDPE FABRICATED ECCENTRIC REDUCER (ADS INC. OR APPROVED EQUAL) SIZE AS INDICATED
59 — INSTALL HDPE FABRICATED 60° ELBOW (ADS INC. OR APPROVED EQUAL) 18"X18'
60 — INSTALL HDPE FABRICATED 45° ELBOW (ADS INC. OR APPROVED EQUAL) 18"X18"
61 — INSTALL HDPE FABRICATED 22.5° ELBOW (ADS INC. OR APPROVED EQUAL) 18"X18'
62 — CONSTRUCT JUNCTION STRUCTURE TYPE 1 PER CITY OF ORANGE STD. PLAN NO. 301
63 — INSTALL 48" MANHOLE STRUCTURE PER DETAIL ON SHEET 10
64 — CURB OPENING CATCH BASIN INLET PER CITY OF ORANGE STD. PLAN NO. 301, PER PRECISE GRADING PLAN SHT. 3
65 — GRATING CATCH BASIN INLET PER APWA STD. PLAN NO. 305-2 W/TRAFFIC GRATE. PER PRECISE GRADING PLAN SHT. 4
66 — CONSTRUCT PARKWAY CULVERT (TYPE C) PER CITY OF ORANGE STD. PLAN NO. 311
67 — INSTALL 6" PVC SDR 35 STORM DRAIN
68 — INSTALL 6" PVC 90° ELBOW FITTING
69 — RESTRICTION PLATE PER DETAIL ON SHEET NO. 7 (ORFICE OPENING SIZE PER PLAN)
70 — CONSTRUCT 18" X 18" GRATE INLET PER DETAIL ON SHEET 2, PER PRECISE GRADING PLAN SHEET 3
71 — INSTALL HDPE TEE (ADS INC. OR APPROVED EQUAL) 18"X18"X6"

TUSTIN STREET

PROP. R/W

254.45 INV.
254.25 INV.
257.92 TG
254.92 INV
S44°36'14"W 3.89' S=0.1208
N00°23'46"W 38.42' S=0.0539
N89°36'14"E 3.00' S=0.0333
249.60 INV.
251.93 INV.
4" ORFICE
251.38 INV.
N89°36'14"E 32.06' S=0.0078
252.18 INV.
6" PVC 45° EL.
248.50 INV
6" PVC 45° EL.
252.04 INV.
N00°23'46"W L=12.58' S=0.0048
252.50 INV.
252.73 INV.
N13°08'12"W L=6.15' S=0.0049
N13°08'12"W L=6.15' S=0.0049
252.53 INV.
S58°38'20"W 24.10' S=0.0095
257.46 TG
252.96 INV
N00°20'22"W 66.00'
6" PVC 45° EL.
N89°36'14"E 131.08' S=0.0080
C INT SD MH
253.01 INV
252.97 INV
253.19 INV.
253.39 INV.
N22°06'14"E 43.10' S=0.0050
18"X18"X6" TEE
253.61 INV 18"
254.11 INV 6"
N22°06'14"E 6.15' S=0.0050
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N89°36'14"E 83.09' S=0.0241
257.53 INV.
257.99 INV.

SEE SHEET 8



RESTRICTION PLATE DETAIL (69)
NOT TO SCALE

N

20' 0' 20' 40' 60'
GRAPHIC SCALE: 1"=20'

REGISTERED PROFESSIONAL ENGINEER DON R. LINDGREN No. 20953 Exp. 09-30-09 CIVIL STATE OF CALIFORNIA

PREPARED UNDER THE SUPERVISION OF:

DON R. LINDGREN R.C.E. 20953 12/20/07 DATE

Development Resource Consultants, Inc.
Civil Engineering • Land Surveying • Land Planning
8175 EAST KAISER BOULEVARD
ANAHEIM HILLS, CA 92808 (714) 685-6860

DRC

NO.:	REVISION:	DATE:

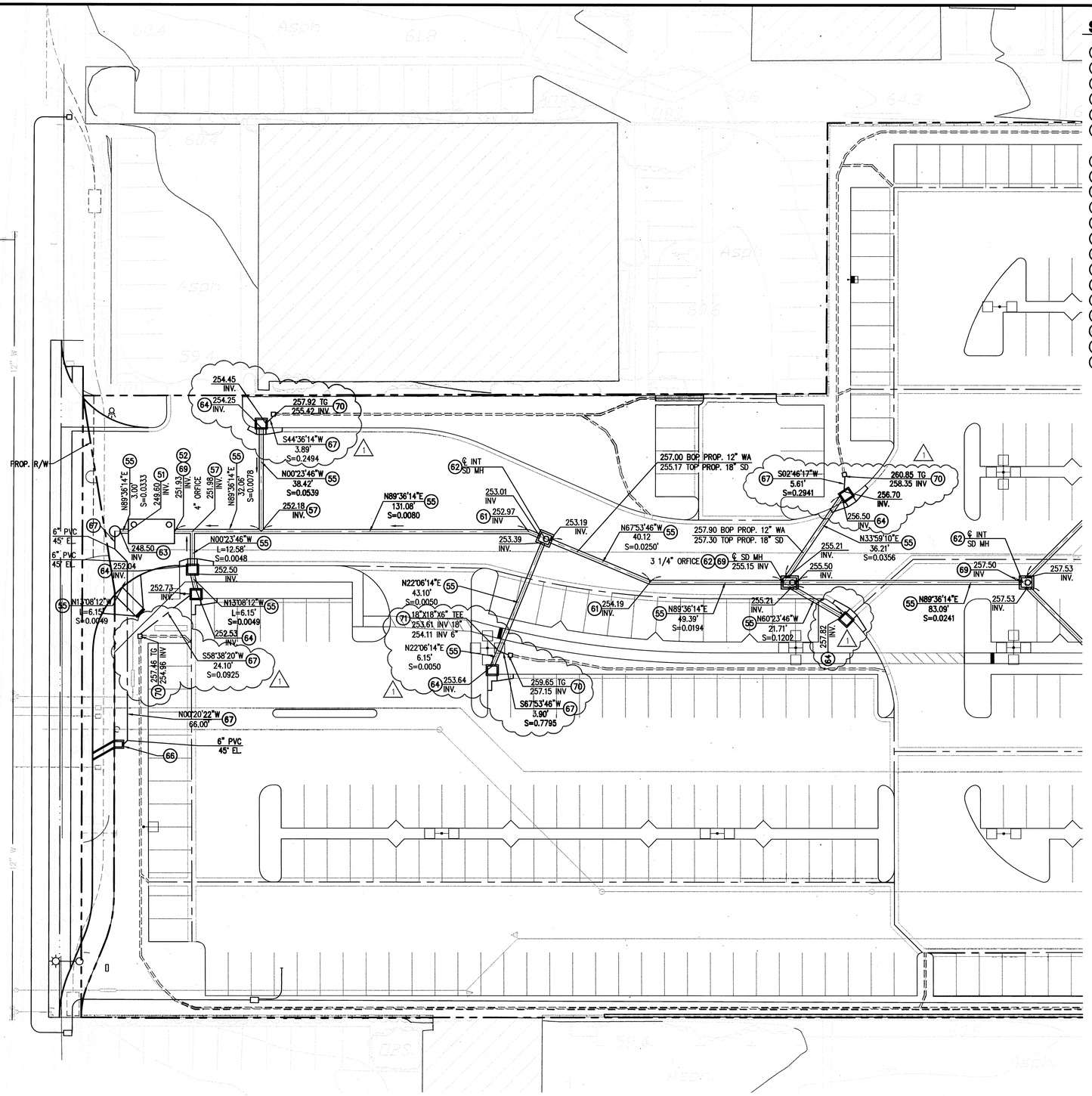
PROJECT: ORANGE BEST BUY
2355 & 2375 NORTH TUSTIN STREET
ORANGE, CALIFORNIA

DRAWING NAME: STORM DRAIN PLAN

ISSUE:	PLAN CHECK
DATE:	12/18/07
CHECKED: DRL	DRAWN: TC
DRAWING FILE: 07-583pg07	
PROJECT NO.: 07-583	
SHEET NUMBER: 7	
OF 11 SHEETS	
SCALE: AS SHOWN	

SP 3631

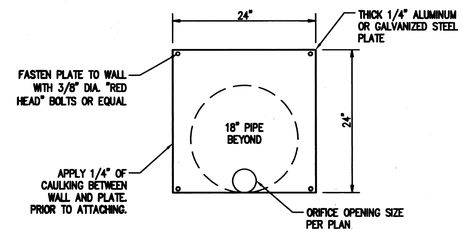
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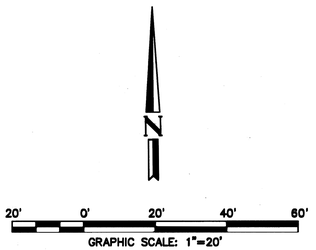
STORM DRAIN CONSTRUCTION NOTES:

(51) INSTALL CDS 816 MEDIA FILTER SYSTEM, 31 CARTRIDGES PER DETAIL ON SHEET 9
(52) CONNECT PROPOSED PIPE TO CDS MEDIA FILTER SYSTEM
(53) INSTALL 12" PVC SDR 35 STORM DRAIN
(54) INSTALL 12" PVC 60° ELBOW FITTING
(55) INSTALL 18" HDPE STORM DRAIN, ADS OR APPROVED EQUAL
(56) INSTALL HDPE WYE (ADS INC. OR APPROVED EQUAL) 18"

(58) INSTALL HDPE FABRICATED ECCENTRIC REDUCER (ADS INC. OR APPROVED EQUAL) SIZE AS INDICATED
(59) INSTALL HDPE FABRICATED 60° ELBOW (ADS INC. OR APPROVED EQUAL) 18"X18'
(60) INSTALL HDPE FABRICATED 45° ELBOW (ADS INC. OR APPROVED EQUAL) 18"X18"
(61) INSTALL HDPE FABRICATED 22.5° ELBOW (ADS INC. OR APPROVED EQUAL) 18"X18'
(62) CONSTRUCT JUNCTION STRUCTURE TYPE 1 PER CITY OF ORANGE STD. PLAN NO. 301
(63) INSTALL 48" MANHOLE STRUCTURE PER DETAIL ON SHEET 10
(64) CURB OPENING CATCH BASIN INLET PER CITY OF ORANGE STD. PLAN NO. 301, PER PRECISE GRADING PLAN SHT. 3
(65) GRATING CATCH BASIN INLET PER APWA STD. PLAN NO. 305-2 W/TRAFFIC GRATE. PER PRECISE GRADING PLAN SHT. 4
(66) CONSTRUCT PARKWAY CULVERT (TYPE C) PER CITY OF ORANGE STD. PLAN NO. 311
(67) INSTALL 6" PVC SDR 35 STORM DRAIN
(68) INSTALL 6" PVC 90° ELBOW FITTING
(69) RESTRICTION PLATE PER DETAIL ON SHEET NO. 7 (ORFICE OPENING SIZE PER PLAN)
(70) CONSTRUCT 18" X 18" GRATE INLET PER DETAIL ON SHEET 2, PER PRECISE GRADING PLAN SHEET 3
(71) INSTALL HDPE TEE (ADS INC. OR APPROVED EQUAL) 18"X18"X6"



RESTRICTION PLATE DETAIL (69)
NOT TO SCALE



GRAPHIC SCALE: 1"=20'

REGISTERED PROFESSIONAL ENGINEER DON R. LINDGREN No. 20953 Exp. 09-30-09 CIVIL STATE OF CALIFORNIA

PREPARED UNDER THE SUPERVISION OF:

DON R. LINDGREN R.C.E. 20953 DATE 1/3/08

Rev 1

Development Resource Consultants, Inc.
Civil Engineering • Land Surveying • Land Planning
8133 E. KAISER BOULEVARD
ANAHEIM HILLS, CA 92808 (714) 685-6860

DRC

NO.:	REVISION:	DATE:
1	REV. GRADING TO REFLECT CHANGES FOR CURB TRANS. IN FRONT OF BLDG. & C.B. LOCAL DEPRESSIONS.	01/09/2008
	ADDED BIOSWALE SUBDRAIN & ADJUSTED INV. ELEV.	
	MODIFIED CONST. NOTES 11, 13, & 23.	

PROJECT: ORANGE BEST BUY
2355 & 2375 NORTH TUSTN STREET
ORANGE, CALIFORNIA

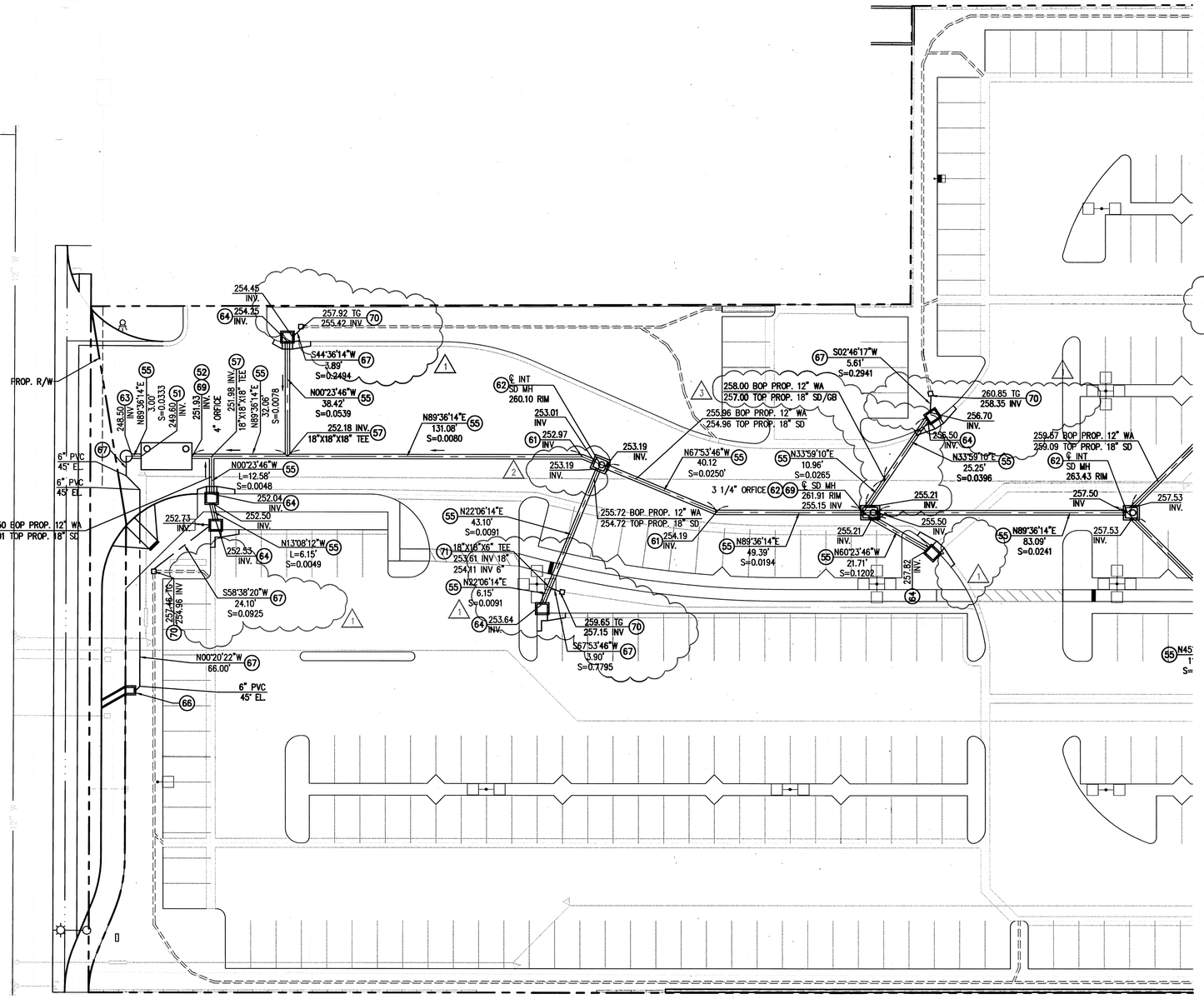
DRAWING NAME: STORM DRAIN PLAN

ISSUE:	PLAN CHECK
DATE:	12/18/07
CHECKED: DRL	DRAWN: TC
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PROJECT NO.: 07-583	
SHEET NUMBER: 7 OF 11 SHEETS	
SCALE: AS SHOWN	

SP 3631

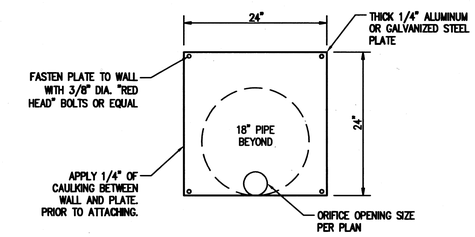
SP 3631

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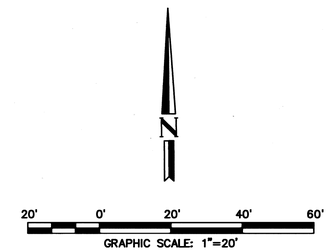


STORM DRAIN CONSTRUCTION NOTES:

		QUANTITIES:
51	INSTALL CDS 816 MEDIA FILTER SYSTEM, 31 CARTRIDGES PER DETAIL ON SHEET 9	1 EA
52	CONNECT PROPOSED PIPE TO CDS MEDIA FILTER SYSTEM	1 EA
53	INSTALL 12" PVC SDR 35 STORM DRAIN	107 LF
54	INSTALL 12" PVC 60° ELBOW FITTING	1 EA
55	INSTALL 18" HDPE STORM DRAIN, ADS OR APPROVED EQUAL	1,562 LF
56	INSTALL HDPE WYE (ADS INC. OR APPROVED EQUAL) 18"	1 EA
57	NOT USED	– EA
58	INSTALL HDPE FABRICATED ECCENTRIC REDUCER (ADS INC. OR APPROVED EQUAL) SIZE AS INDICATED	xx EA
59	INSTALL HDPE FABRICATED 60° ELBOW (ADS INC. OR APPROVED EQUAL) 18"X18'	xx EA
60	INSTALL HDPE FABRICATED 45° ELBOW (ADS INC. OR APPROVED EQUAL) 18"X18"	4 EA
61	INSTALL HDPE FABRICATED 22.5° ELBOW (ADS INC. OR APPROVED EQUAL) 18"X18'	2 EA
62	CONSTRUCT JUNCTION STRUCTURE TYPE 1 PER CITY OF ORANGE STD. PLAN NO. 301	6 EA
63	INSTALL 48" MANHOLE STRUCTURE PER DETAIL ON SHEET 10	1 EA
64	CURB OPENING CATCH BASIN INLET PER CITY OF ORANGE STD. PLAN NO. 301, PER PRECISE GRADING PLAN SHT. 3	N/A
65	GRATING CATCH BASIN INLET PER APWA STD. PLAN NO. 305-2 W/TRAFFIC GRATE. PER PRECISE GRADING PLAN SHT. 4	N/A
66	CONSTRUCT PARKWAY CULVERT (TYPE C) PER CITY OF ORANGE STD. PLAN NO. 311	1 EA
67	INSTALL 6" PVC SDR 35 STORM DRAIN	325 LF
68	INSTALL 6" PVC 90° ELBOW FITTING	1 EA
69	RESTRICTION PLATE PER DETAIL ON SHEET NO. 7 (ORFICE OPENING SIZE PER PLAN)	2 EA
70	CONSTRUCT 18" X 18" GRATE INLET PER DETAIL ON SHEET 2, PER PRECISE GRADING PLAN SHEET 3	N/A
71	INSTALL HDPE TEE (ADS INC. OR APPROVED EQUAL)(SIZE & TYPE PER PLAN)	6 EA
72	INSTALL 6" PVC 45° ELBOW FITTING	4 EA
73	INSTALL 6" ROUND TO 3" X 12-1/2" RECTANGULAR CIP	2 EA
74	INSTALL 3" X 12-1/2" RECTANGULAR CIP	2 EA



RESTRICTION PLATE DETAIL (69)
NOT TO SCALE



REGISTERED PROFESSIONAL ENGINEER DON R. LINDGREN No. 20953 Exp. 09-30-09 CIVIL STATE OF CALIFORNIA

PREPARED UNDER THE SUPERVISION OF:

DON R. LINDGREN R.C.E. 20953 — DATE 4/10/08

Utility Plan

Development Resource Consultants, Inc.
Civil Engineering • Land Surveying • Land Planning
8175 EAST KAISER BOULEVARD ANAHEIM HILLS, CA 92808 (714) 685-6860
DRC

NO.:	REVISION:	DATE:
1	REV. GRADING TO REFLECT CHANGES FOR CURB TRANS. IN FRONT OF BLDG. & C.B. LOCAL DEPRESSIONS. ADDED BIOSWALE SUBDRAIN & ADJUSTED INV. ELEV. MODIFIED CONST. NOTES 11, 13, & 23.	01/02/2008
2	REVISED BIOSWALE, COMPACTOR PAD	02/26/2008
3	ADDED ROOF DRAIN SYSTEM, ADJ. SD ELEV., ADDED NOTES 72-74.	02/26/2008

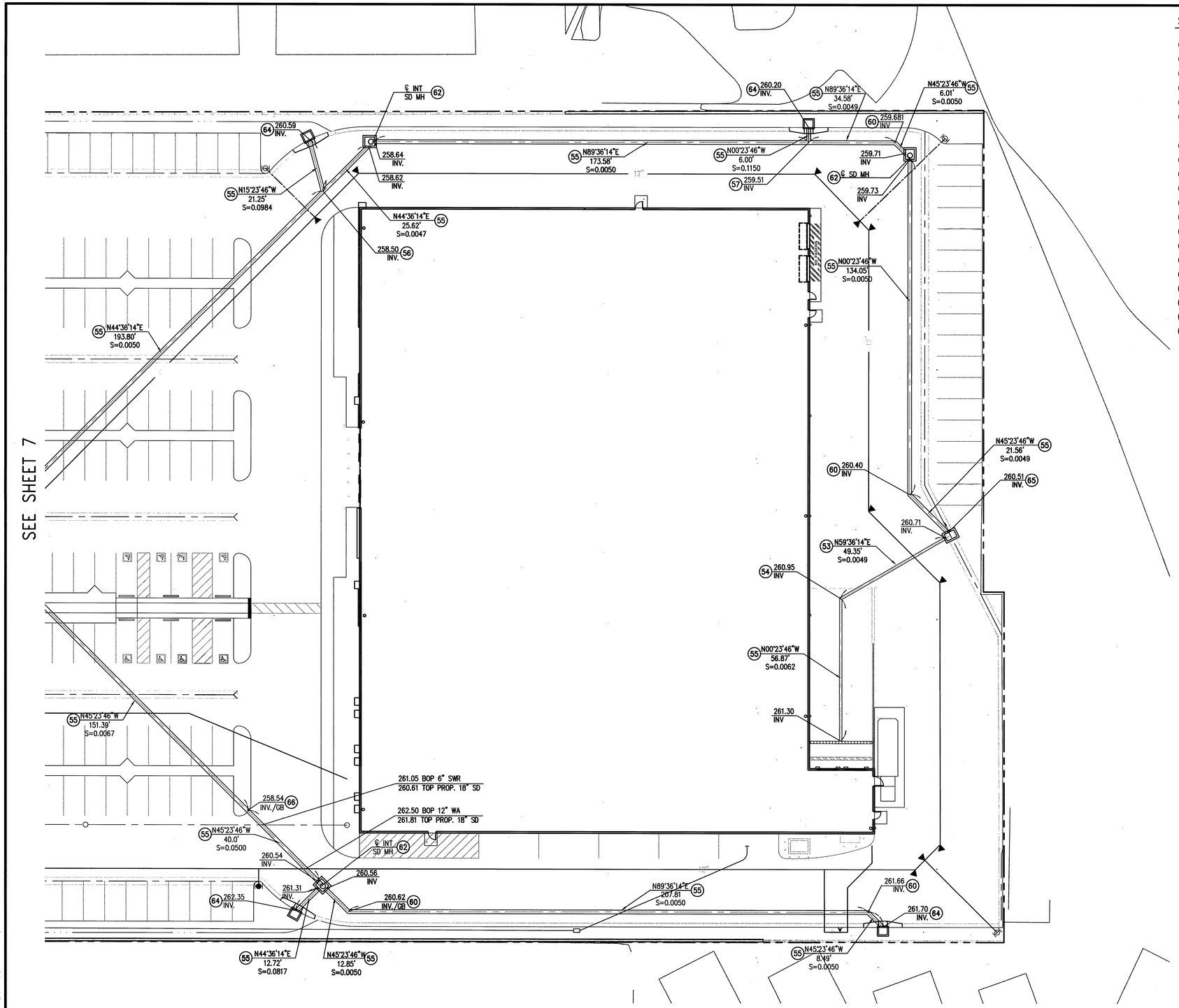
PROJECT: ORANGE BEST BUY
2355 & 2375 NORTH TUSTN STREET
ORANGE, CALIFORNIA
DRAWING NAME: STORM DRAIN PLAN

ISSUE:	PLAN CHECK
DATE:	12/18/07
CHECKED: DRL	DRAWN: TC
DRAWING FILE: 07-583pg07	
PROJECT NO.: 07-583	
SHEET NUMBER: 7 OF 11 SHEETS	
SCALE: AS SHOWN	

SP 3631

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STORM DRAIN CONSTRUCTION NOTES:

(51) INSTALL CDS 816 MEDIA FILTER SYSTEM, 31 CARTRIDGES PER DETAIL ON SHEET 9
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N

20' 0' 20' 40' 60'
GRAPHIC SCALE: 1"=20'

REGISTERED PROFESSIONAL ENGINEER DON R. LINDGREN No. 20953 Exp. 09-30-09 CIVIL STATE OF CALIFORNIA

PREPARED UNDER THE SUPERVISION OF:

DON R. LINDGREN R.C.E. 20953 DATE 12/18/07

Development Resource Consultants, Inc.
Civil Engineering • Land Surveying • Land Planning
8175 EAST KAISER BOULEVARD
ANAHEIM HILLS, CA 92808 (714) 685-6860
DRC

NO.: REVISION: DATE:

PROJECT: ORANGE BEST BUY
2355 & 2375 NORTH TUSTIN STREET
ORANGE, CALIFORNIA

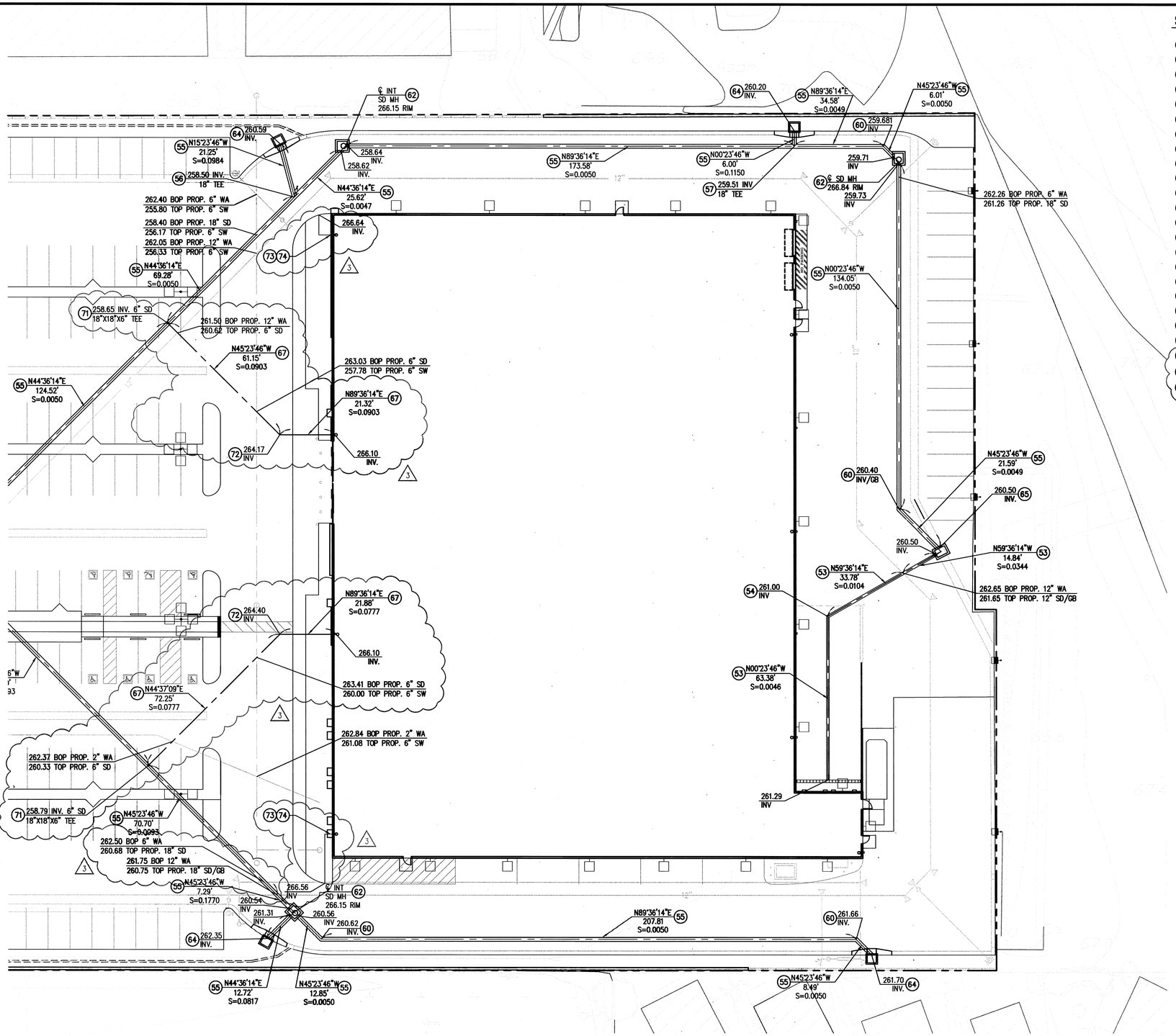
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ISSUE:	PLAN CHECK
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PROJECT NO.: 07-583	
SHEET NUMBER: 8	
OF 11 SHEETS	
SCALE: AS SHOWN	

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74. INSTALL 3" X 12-1/2" RECTANGULAR CIP

3

N

20' 0' 20' 40' 60'

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PREPARED UNDER THE SUPERVISION OF:

DON R. LINDGREN R.C.E. 20953 — 4/10/08 DATE

Utility Plan

Development Resource Consultants, Inc.
CIVIL Engineering • Land Surveying • Land Planning
8175 EAST KAISER BOULEVARD
ANAHEIM HILLS, CA 92808 (714) 685-6860
DRC

NO:	REMISION:	DATE:
1	REV. GRADING TO REFLECT CHANGES FOR CURB TRANS. IN FRONT OF BLDG. & C.B. LOCAL DEPRESSIONS. ADDED BIOSWALE SUBDRAIN & ADJUSTED INV. ELEV. MODIFIED CONST. NOTES 11, 13, & 23.	01/02/2008
2	REVISED BIOSWALE, COMPACTOR PAD	02/26/2008
3	ADDED ROOF DRAIN SYSTEM, ADJ. SD ELEV., ADDED NOTES 72-74.	02/28/2008

PROJECT: ORANGE BEST BUY
2355 & 2375 NORTH TUSTIN STREET
ORANGE, CALFORNA

DRAWING NAME: STORM DRAIN PLAN

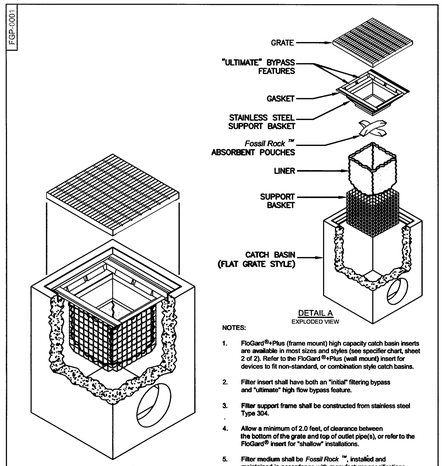
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CHECKED: DRL	DRAWN: TC
DRAWING FILE: 07-583pg08	
PROJECT NO.: 07-583	
SHEET NUMBER: 8 OF 11 SHEETS	
SCALE: AS SHOWN	

SP 3631

SP 3631

FILENAME: M:\2007\07-583 Orange Best Buy\Prg\7583pg08_std02.dwg, LAST SAVED ON: Mar 17 2008 4:34pm PLOTTED BY: DON, ON: Apr 10 2008 2:15pm, CFG:

FGP-0001



DETAIL A
EXPLODED VIEW

FLOGARD+PLUS® FILTER
-INSTALLED INTO CATCH BASIN-

U.S. PATENT # 6,00,023 & 6,877,029

NOTES:

1. FloGard®+Plus (frame mount) high capacity catch basin inserts are available in most sizes and styles (see specifier chart, sheet 2 of 2). Refer to the FloGard®+Plus (wall mount) insert for devices to fit non-standard, or combination style catch basins.
2. Filter insert shall have both an "initial" filtering bypass and "ultimate" high flow bypass feature.
3. Filter support frame shall be constructed from stainless steel Type 304.
4. Allow a minimum of 2.0 feet, of clearance between the bottom of the grate and top of outlet pipe(s), or refer to the FloGard® insert for "shallow" installations.
5. Filter medium shall be *Fossil Rock ™*, installed and maintained in accordance with manufacturer specifications .
6. Storage capacity reflects 80% of maximum solids collection prior to impeding filtering bypass.
7. Filtered flow rtate includes a safety factor of two.

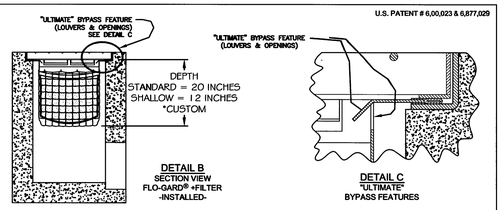
TITLE
FloGard®+PLUS
CATCH BASIN FILTER INSERT
(Frame Mount)
FLAT GRATED INLET

KriStar Enterprises, Inc.
P.O. Box 6419, Santa Rosa, CA 95406
Ph: 800.579.8819, Fax: 707.524.8186, www.kristar.com

DRAWING NO. FGP-0001 | REV. A | SIZE 0001 | DWN JPR 09/01/06 | SHEET 1 OF 2

FGP-0001

U.S. PATENT # 6,00,023 & 6,877,029



DETAIL B
SECTION VIEW
FLO-GARD® +FILTER
-INSTALLED-

DETAIL C
"ULTIMATE"
BYPASS FEATURES

* MANY OTHER STANDARD & CUSTOM SIZES & DEPTHS AVAILABLE UPON REQUEST.

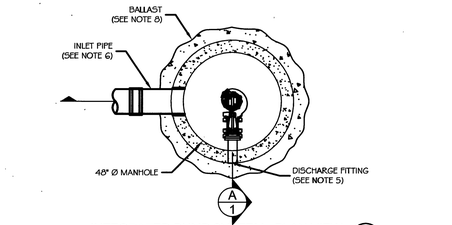
SPECIFIER CHART

MODEL NO. STANDARD DEPTH	STANDARD & SHALLOW DEPTH (Data in these columns is the same for both STANDARD & SHALLOW versions)			STANDARD DEPTH -20 Inches-		MODEL NO. SHALLOW DEPTH	SHALLOW DEPTH -12 Inches-	
	INLET ID Inside Dimension (inch x inch)	GRATE OD Outside Dimension (inch x inch)	TOTAL BYPASS CAPACITY (cu. ft.)	SOLIDS STORAGE CAPACITY (cu. ft.)	FILTERED FLOW (cu. ft. / sec.)		SOLIDS STORAGE CAPACITY (cu. ft.)	FILTERED FLOW (cu. ft. / sec.)
FGP-12F	12 X 12	12 X 14	2.8	0.3	0.4	FGP-12F8	.15	.25
FGP-1530F	15 X 30	15 X 35	6.9	2.3	1.6	FGP-1530F8	1.3	.9
FGP-16F	16 X 16	16 X 19	4.7	0.8	0.7	FGP-16F8	.45	.4
FGP-1624F	16 X 24	16 X 26	5.0	1.5	1.2	FGP-1624F8	.85	.7
FGP-18F	18 X 18	18 X 20	4.7	0.8	0.7	FGP-18F8	.45	.4
FGP-1820F	18 X 19	18 X 21	5.9	2.1	1.4	FGP-1820F8	1.2	.8
FGP-1824F	18 X 22	18 X 24	5.0	1.5	1.2	FGP-1824F8	.85	.7
FGP-1836F	18 X 36	18 X 40	6.9	2.3	1.6	FGP-1836F8	1.3	.9
FGP-2024F	18 X 22	20 X 24	5.9	1.2	1.0	FGP-2024F8	.7	.55
FGP-21F	22 X 22	22 X 24	6.1	2.2	1.5	FGP-21F8	1.25	.85
FGP-2142F	21 X 40	24 X 40	9.1	4.3	2.4	FGP-2142F8	2.45	1.35
FGP-2148F	19 X 46	22 X 48	9.8	4.7	2.6	FGP-2148F8	2.7	1.5
FGP-24F	24 X 24	24 X 27	6.1	2.2	1.5	FGP-24F8	1.25	.85
FGP-2430F	24 X 30	26 X 30	7.0	2.8	1.8	FGP-2430F8	1.6	1.05
FGP-2436F	24 X 36	24 X 40	8.0	3.4	2.0	FGP-2436F8	1.95	1.15
FGP-2448F	24 X 48	26 X 48	9.3	4.4	2.4	FGP-2448F8	2.5	1.35
FGP-28F	28 X 28	32 X 32	6.3	2.2	1.5	FGP-28F8	1.25	.85
FGP-2440F	24 X 36	28 X 40	8.3	4.2	2.3	FGP-2440F8	2.4	1.3
FGP-30F	30 X 30	30 X 34	8.1	3.6	2.0	FGP-30F8	2.05	1.15
FGP-36F	36 X 36	36 X 40	9.1	4.6	2.4	FGP-36F8	2.65	1.35
FGP-3648F	36 X 48	40 X 48	11.5	6.8	3.2	FGP-3648F8	3.9	1.85
FGP-48F	48 X 48	48 X 54	13.2	9.5	3.9	FGP-48F8	5.45	2.25
FGP-SD24F	24 X 24	28 X 28	6.1	2.2	1.5	FGP-SD24F8	1.25	.85
FGP-1836FGO	18 X 36	20 X 40	6.9	2.3	1.6	FGP-1836F8GO	1.3	.9
FGP-2436FGO	20 X 36	24 X 40	8.0	3.4	2.0	FGP-2436F8GO	1.95	1.15
FGP-48FGO	18 X 48	20 X 54	6.3	2.2	1.5	FGP-48F8GO	1.25	.85

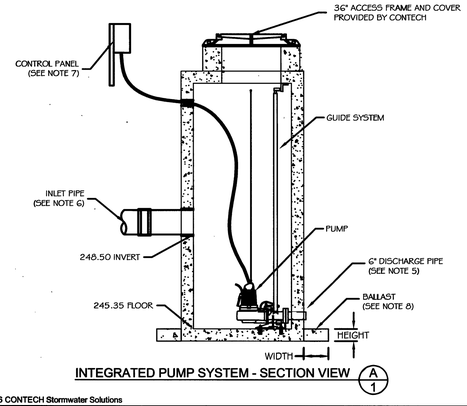
TITLE
FloGard®+PLUS
CATCH BASIN FILTER INSERT
(Frame Mount)
FLAT GRATED INLET

KriStar Enterprises, Inc.
P.O. Box 6419, Santa Rosa, CA 95406
Ph: 800.579.8819, Fax: 707.524.8186, www.kristar.com

DRAWING NO. FGP-0001 | REV. A | SIZE 0001 | DWN JPR 09/01/06 | SHEET 2 OF 2



INTEGRATED PUMP SYSTEM - PLAN VIEW (1/1)



INTEGRATED PUMP SYSTEM - SECTION VIEW (A 1/1)

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CONTECH STORMWATER SOLUTIONS
contechstormwater.com

INTEGRATED PUMP SYSTEM
PLAN AND SECTION VIEWS
STANDARD DETAIL

DRAWING 1 1/2

DATE: 11/21/06 | SCALE: NONE | FILE NAME: IPS-48PC-WV | DRAWN: MJW | CHECKED:

GENERAL NOTES

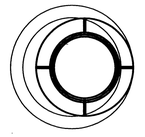
1) INTEGRATED PUMP SYSTEM BY CONTECH STORMWATER SOLUTIONS; PORTLAND, OREGON (800) 548-4667; SCARBOROUGH, ME (877) 907-8676; LINTHICUM, MD (866) 740-3318.
2) PRECAST MANHOLE STRUCTURE TO BE CONSTRUCTED IN ACCORDANCE WITH ASTM C478. DETAIL REFLECTS DESIGN INTENT ONLY. ACTUAL DIMENSIONS AND CONFIGURATION OF STRUCTURE WILL BE SHOWN ON PRODUCTION SHOP DRAWING.
3) STRUCTURE AND ACCESS COVERS TO MEET AASHTO H-20 LOAD RATING.
4) CONTRACTOR RESPONSIBLE FOR PROVIDING CHECK VALVE AND ISOLATION VALVE IF REQUIRED BY LOCAL CODE.
5) WET WELL IS PROVIDED WITH PRELOCATED OPENING FOR INLET. DISCHARGE FITTING PROVIDED BY CONTECH STORMWATER SOLUTIONS AND IS PRE-INSTALLED INTO WET WELL.
6) INLET PIPING TO BE SPECIFIED BY ENGINEER AND PROVIDED BY CONTRACTOR. CONNECTION TO DOWNSTREAM PIPING TO BE MADE USING A FLEXIBLE COUPLING OR ECCENTRIC REDUCER, AS REQUIRED. COUPLING BY FERNCO OR EQUAL AND PROVIDED BY CONTRACTOR.
7) CONTROL PANEL PROVIDED BY CONTECH STORMWATER SOLUTIONS. CONTRACTOR RESPONSIBLE FOR ELECTRICAL CONNECTIONS TO POWER SOURCE AND PUMP AND FOR LOCATING THE CONTROL PANEL.
8) ANTI-FLOTATION BALLAST TO BE SPECIFIED BY ENGINEER AND PROVIDED BY CONTRACTOR, IF REQUIRED. BALLAST TO BE SET AROUND THE PERIMETER OF THE STRUCTURE.
9) ALL SYSTEMS REQUIRE REGULAR MAINTENANCE. REFER TO OPERATION AND MAINTENANCE GUIDELINES FOR MORE INFORMATION.

PRECAST WET VAULT
INTEGRATED PUMP SYSTEM DATA

STRUCTURE ID				NA
OPERATING FLOW RATE (gpm)				467
PUMP MANUFACTURER				FLYGT
PUMP MODEL				3102
POWER REQUIRED (volts/phase/hertz)				460V/3PH
PUMP SPEED (rpm)				VAR
IMPELLER DIAMETER (in)				6.4
OFF SWITCH ELEVATION				246.60
ON SWITCH ELEVATION				249.00
ACCESS OPENING DIAMETER (in)				36
PIPE DATA:	I.E.	ORIENTATION	MATERIAL	DIAMETER
INLET PIPE #1	248.50	0	HDPE	16"
OUTLET PIPE	245.65	90	PVC	6"
ECCENTRIC REDUCER (BY CONTRACTOR)			YES/NO	SIZE
			NO	SIZE

NOTES/SPECIAL REQUIREMENTS:

PIPE ORIENTATION KEY:
90°
180° 0°
270°



INTEGRATED PUMP SYSTEM - TOP VIEW (1/1)

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INTEGRATED PUMP SYSTEM
TOP VIEW, NOTES AND DATA
STANDARD DETAIL

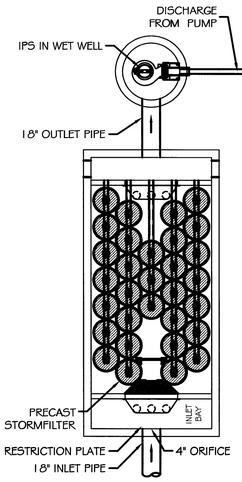
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DATE: 11/21/06 | SCALE: NONE | FILE NAME: IPS-48PC-WV | DRAWN: MJW | CHECKED:

DRC Development Resource Consultants, Inc.
Civil Engineering • Land Surveying • Land Planning
8175 EAST KAISER BOULEVARD
ANAHEIM HILLS, CA 92808 (714) 685-6860

NO.: REVISION: DATE:

PROJECT: ORANGE BEST BUY
2355 & 2375 NORTH TUSTIN STREET
ORANGE, CALFORNA
DRAWING NAME: STORM DRAIN DETAILS

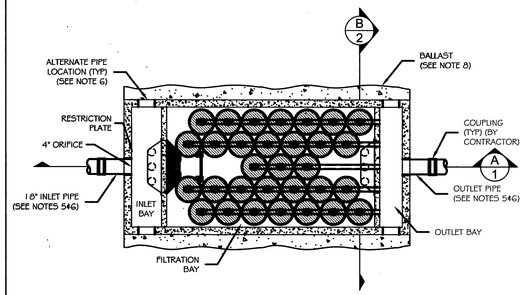


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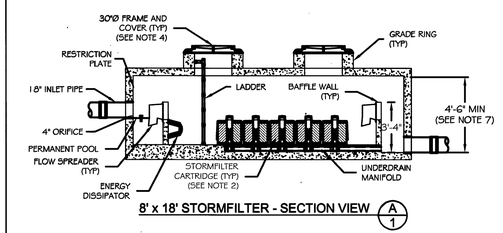
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STORMGATE, STORMFILTER AND IPS
PLAN VIEW
SCHEMATIC

DATE: XX/XX/XX | SCALE: NONE | FILE NAME: XXX | DRAWN: XXX | CHECKED: XXX



8' x 18' STORMFILTER - PLAN VIEW (1/1)



8' x 18' STORMFILTER - SECTION VIEW (A 1/1)

THE STORMWATER MANAGEMENT StormFilter® U.S. PATENT No. 5,322,629, No. 5,707,527, No. 6,027,639 No. 6,649,048, No. 5,624,576, AND OTHER U.S. AND FOREIGN PATENTS PENDING

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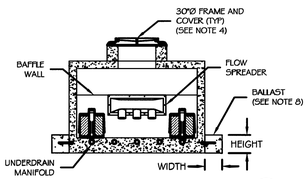
8' x 18' PRECAST STORMFILTER
PLAN AND SECTION VIEWS
STANDARD DETAIL

DRAWING 1 1/2

DATE: 09/29/05 | SCALE: NONE | FILE NAME: SF818-PC-DTL | DRAWN: MJW | CHECKED: ARG

GENERAL NOTES

1) STORMFILTER BY CONTECH STORMWATER SOLUTIONS; PORTLAND, OR (800) 548-4667; SCARBOROUGH, ME (877) 907-8676; LINTHICUM, MD (866) 740-3318.
2) FILTER CARTRIDGE(S) TO BE SIPHON-ACTUATED AND SELF-CLEANING. STANDARD DETAIL DRAWING SHOWS MAXIMUM NUMBER OF CARTRIDGES. ACTUAL NUMBER REQUIRED TO BE SPECIFIED ON SITE PLANS OR IN DATA TABLE BELOW.
3) PRECAST VAULT TO BE CONSTRUCTED IN ACCORDANCE WITH ASTM C857 AND C858. DETAIL DRAWING REFLECTS DESIGN INTENT ONLY. ACTUAL DIMENSIONS AND CONFIGURATION OF STRUCTURE WILL BE SHOWN ON PRODUCTION SHOP DRAWING.
4) STRUCTURE AND ACCESS COVERS TO MEET AASHTO H-20 LOAD RATING.
5) STORMFILTER REQUIRES 2.3 FEET OF DROP FROM INLET TO OUTLET. IF LESS DROP IS AVAILABLE, CONTACT CONTECH STORMWATER SOLUTIONS.
6) INLET AND OUTLET PIPING TO BE SPECIFIED BY ENGINEER AND PROVIDED BY CONTRACTOR. PRECAST STORMFILTER VAULT EQUIPPED WITH EITHER CORED OPENINGS OR KNOCKOUTS AT INLET AND OUTLET LOCATIONS.
7) PROVIDE MINIMUM CLEARANCE FOR MAINTENANCE ACCESS. IF A SHALLOWER SYSTEM IS REQUIRED, CONTACT CONTECH STORMWATER SOLUTIONS FOR OTHER OPTIONS.
8) ANTI-FLOTATION BALLAST TO BE SPECIFIED BY ENGINEER AND PROVIDED BY CONTRACTOR, IF REQUIRED. BALLAST TO BE SET ALONG ENTIRE LENGTH OF BOTH SIDES OF THE STRUCTURE.
9) ALL STORMFILTERS REQUIRE REGULAR MAINTENANCE. REFER TO OPERATION AND MAINTENANCE GUIDELINES FOR MORE INFORMATION.



8' x 18' STORMFILTER - SECTION VIEW (B 2/2)

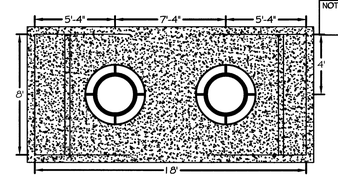
8' x 18' PRECAST
STORMFILTER DATA

STRUCTURE ID			NA
WATER QUALITY FLOW RATE (cfs)			1.04
PEAK FLOW RATE (cfs)			1.04
RETURN PERIOD OF PEAK FLOW (yrs)			NA
# OF CARTRIDGES REQUIRED			3 I
CARTRIDGE FLOW RATE (1.5 OR 7.5 gpm)			1.5
MEDIA TYPE (CSF, PERLITE, ZPG)			*
PIPE DATA:	I.E.	MATERIAL	DIAMETER
INLET PIPE #1	251.93	HDPE	18
INLET PIPE #2	NA	NA	NA
OUTLET PIPE	249.60	HDPE	18

RIM
258.3 FLOW 258.0

LADDER		YES/NO
ANTI-FLOTATION BALLAST	WIDTH	HEIGHT
	WIDTH	HEIGHT

NOTES/SPECIAL REQUIREMENTS:



8' x 18' STORMFILTER - TOP VIEW (1/2)

*45% ZEOLITE, 50% PERLITE, 5% GRANULATED ACTIVATED CARBON

THE STORMWATER MANAGEMENT StormFilter® U.S. PATENT No. 5,322,629, No. 5,707,527, No. 6,027,639 No. 6,649,048, No. 5,624,576, AND OTHER U.S. AND FOREIGN PATENTS PENDING

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8' x 18' PRECAST STORMFILTER
TOP AND SECTION VIEWS, NOTES AND DATA
STANDARD DETAIL

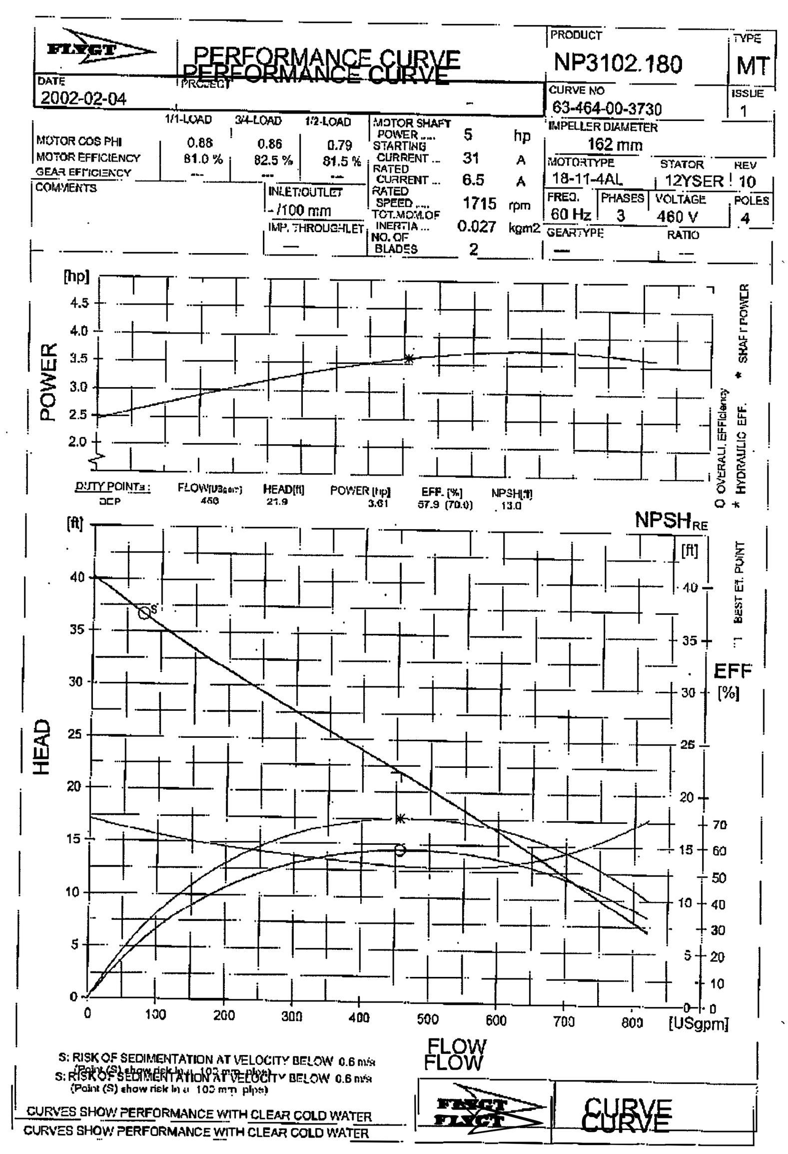
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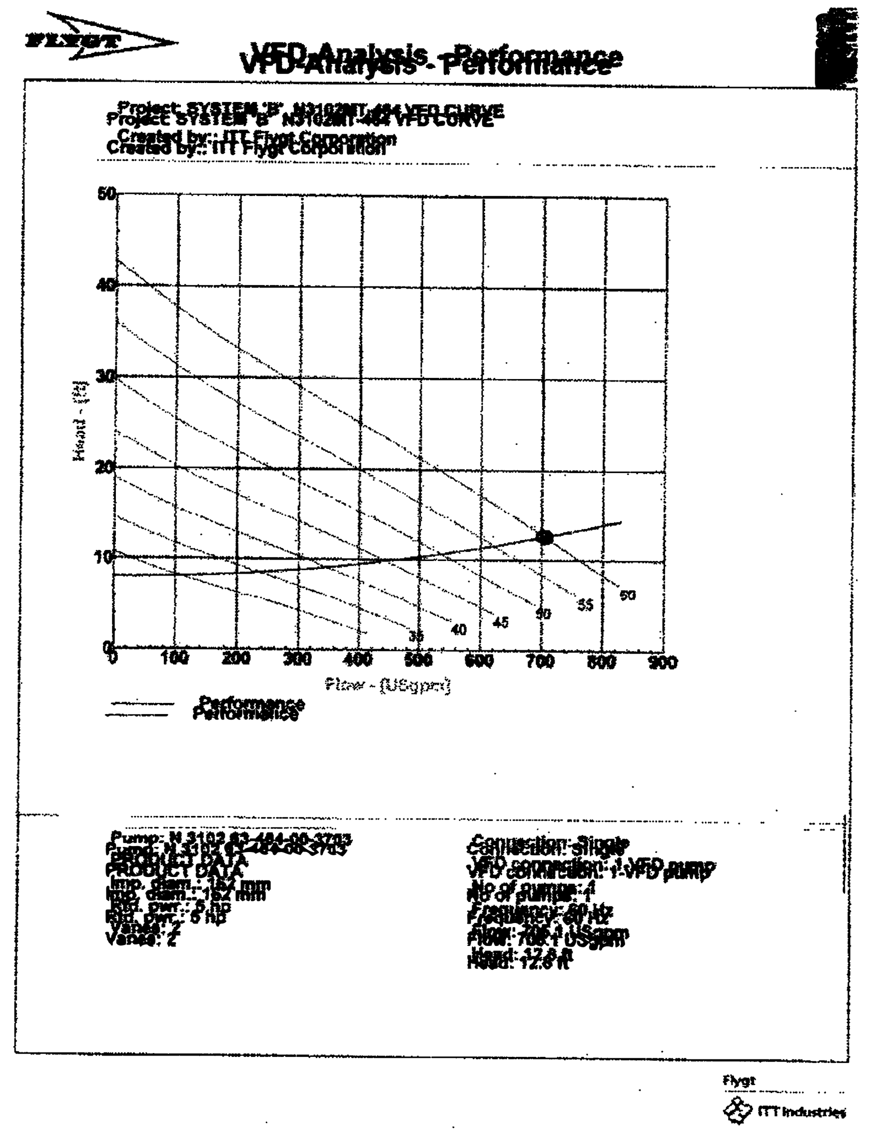
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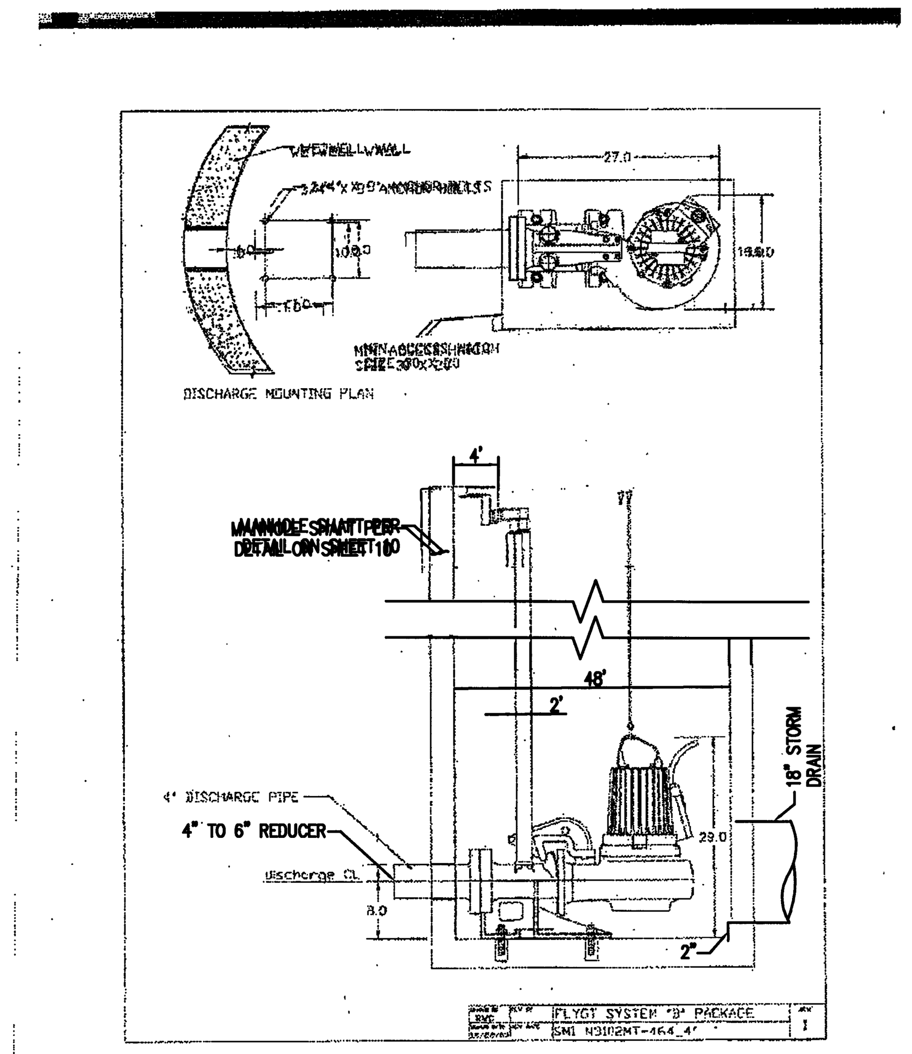
SP-3631

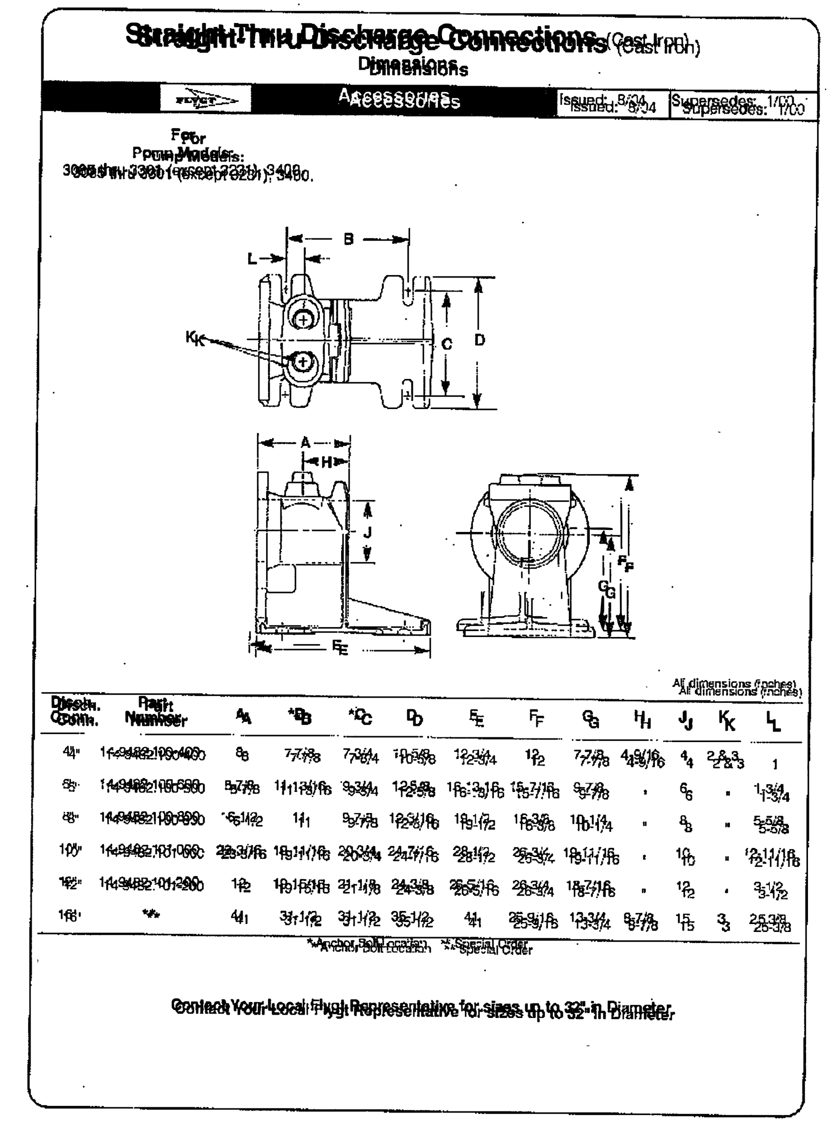
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CHECKED: DRL DRAWN: TC
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PROJECT NO.: 07-583
SHEET NUMBER: 9
OF 11 SHEETS
SCALE: AS SHOWN

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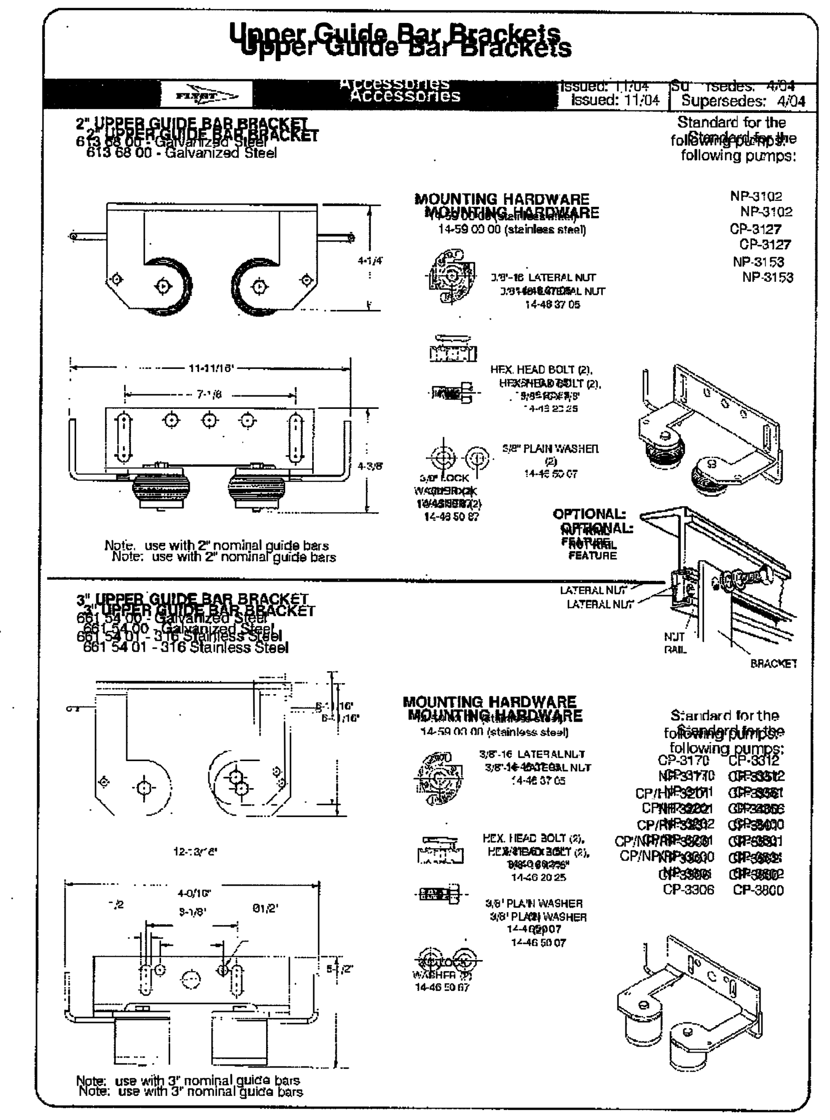


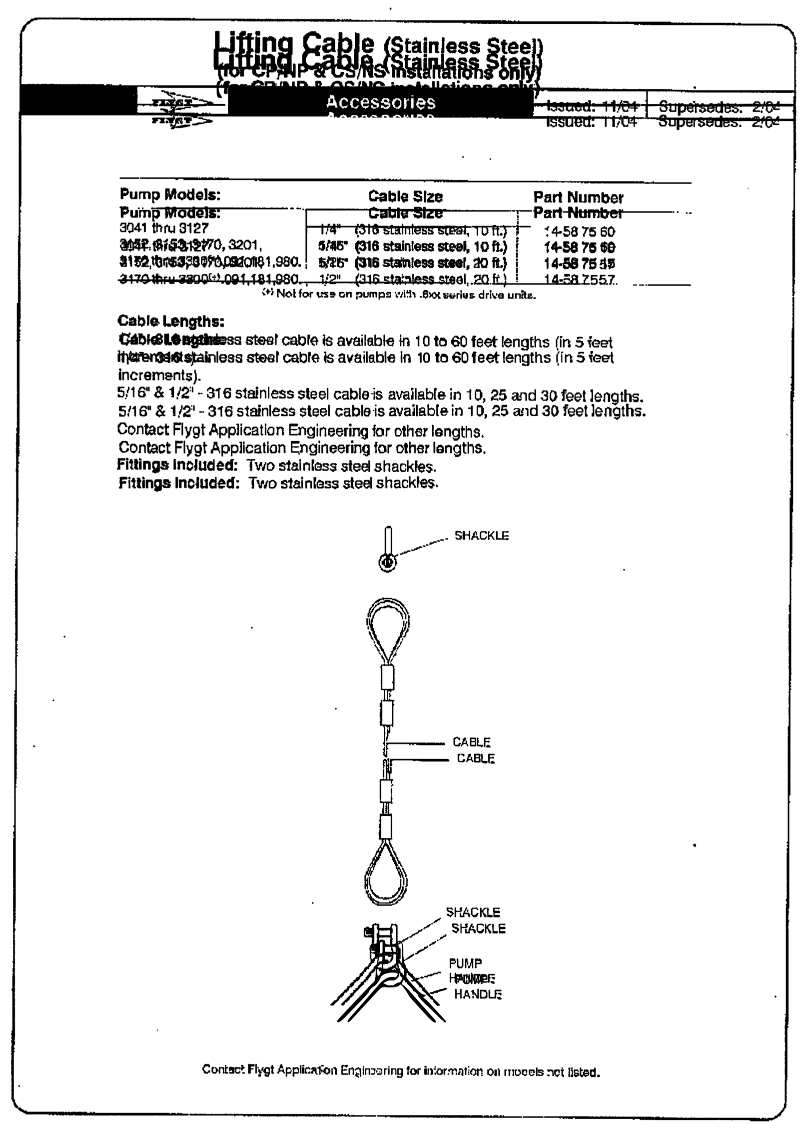






Disch. Conn.	Part Number	A	*B	*C	D	E	F	G	H	J	K	L
4"	14-9482-100-400	8	7-7/8	7-3/4	10-5/8	12-3/4	12	7-7/8	4-9/16	4	2&3	1
6"	14-9482-100-600	8-7/8	11-13/16	9-3/4	12-5/8	16-13/16	15-7/16	9-7/8	•	6	•	1-3/4
8"	14-9482-100-800	6-1/2	11	9-7/8	12-5/16	19-1/2	16-3/8	10-1/4	•	8	•	5-5/8
10"	14-9482-101-000	22-3/16	19-11/16	20-3/4	24-7/16	28-1/2	26-3/4	19-11/16	•	10	•	12-11/16
12"	14-9482-101-200	12	19-15/16	21-1/8	24-3/8	26-5/16	26-3/4	18-7/16	•	12	•	3-1/2
16"	**	41	31-1/2	31-1/2	35-1/2	41	25-9/16	13-3/4	8-7/8	15	3	25-3/8





Lifting Cable (Stainless Steel)

(for CP/NP & CS/NS installations only)

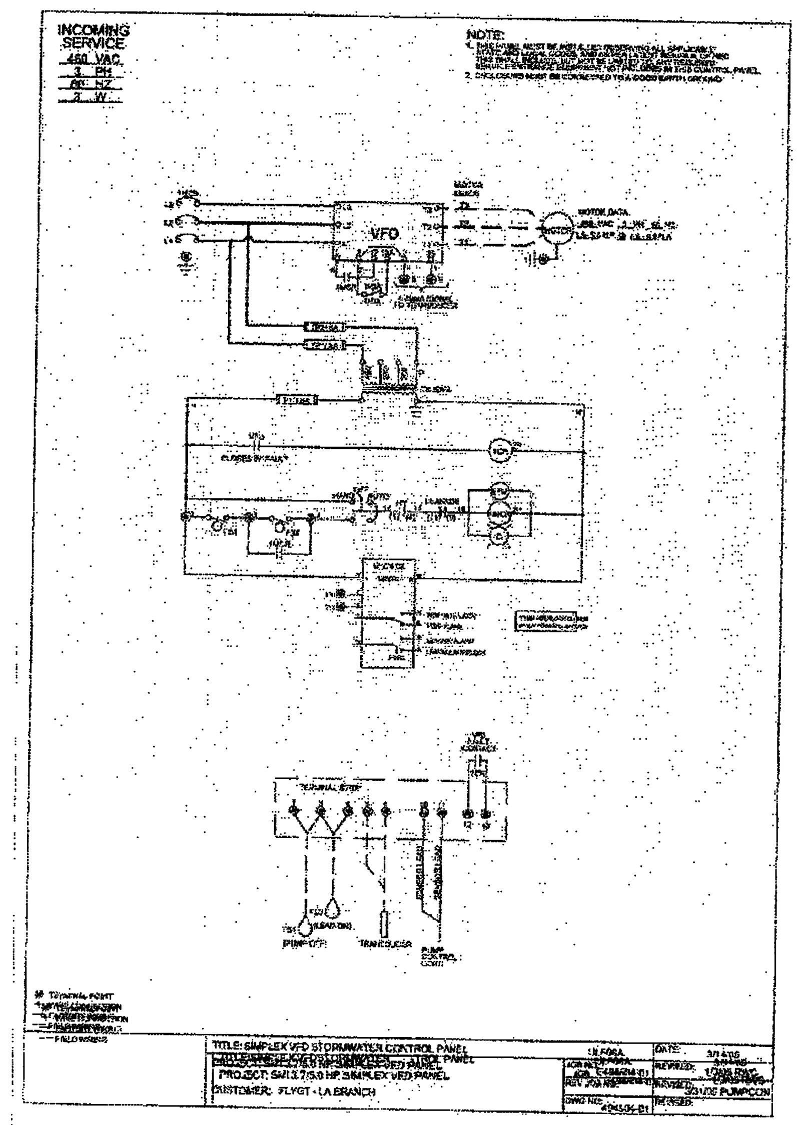
Accessories — Issued: 11/04 — Supersedes: 2/04

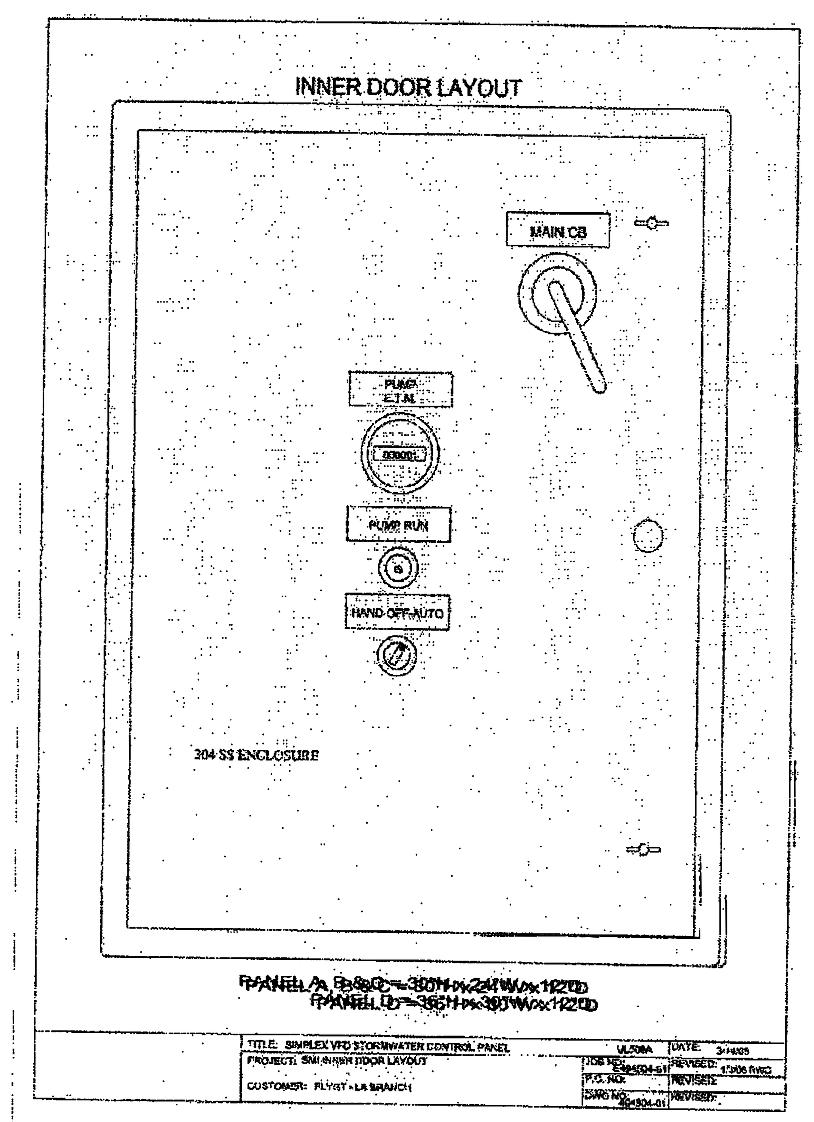
Pump Models:	Cable Size	Part Number
3041 thru 3127	1/4" (316 stainless steel, 10 ft.)	14-58 75 60
3152, 3153, 3170, 3201,	5/16" (316 stainless steel, 10 ft.)	14-58 75 69
3152, thru 3300, 091,181,980.	5/16" (316 stainless steel, 20 ft.)	14-58 75 58
3170 thru 3300(*) 091,181,980.	1/2" (316 stainless steel, 20 ft.)	14-58 7557

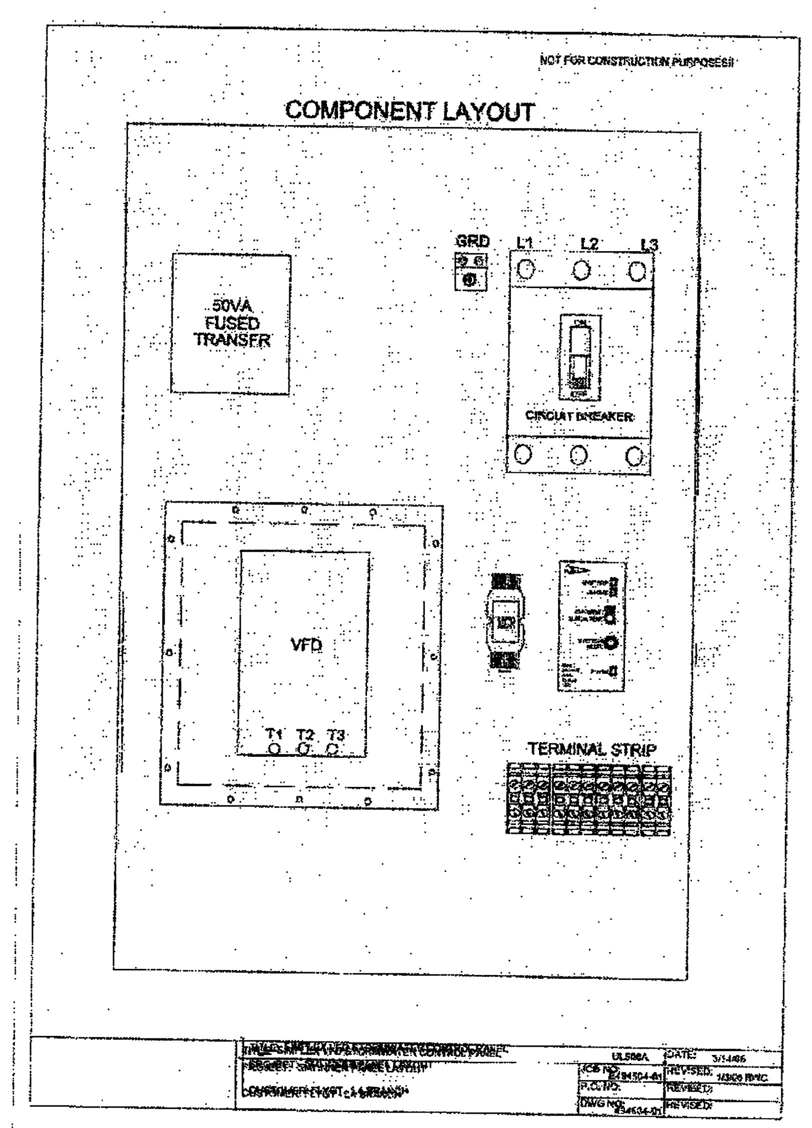
(*) Not for use on pumps with .6xx series drive units.

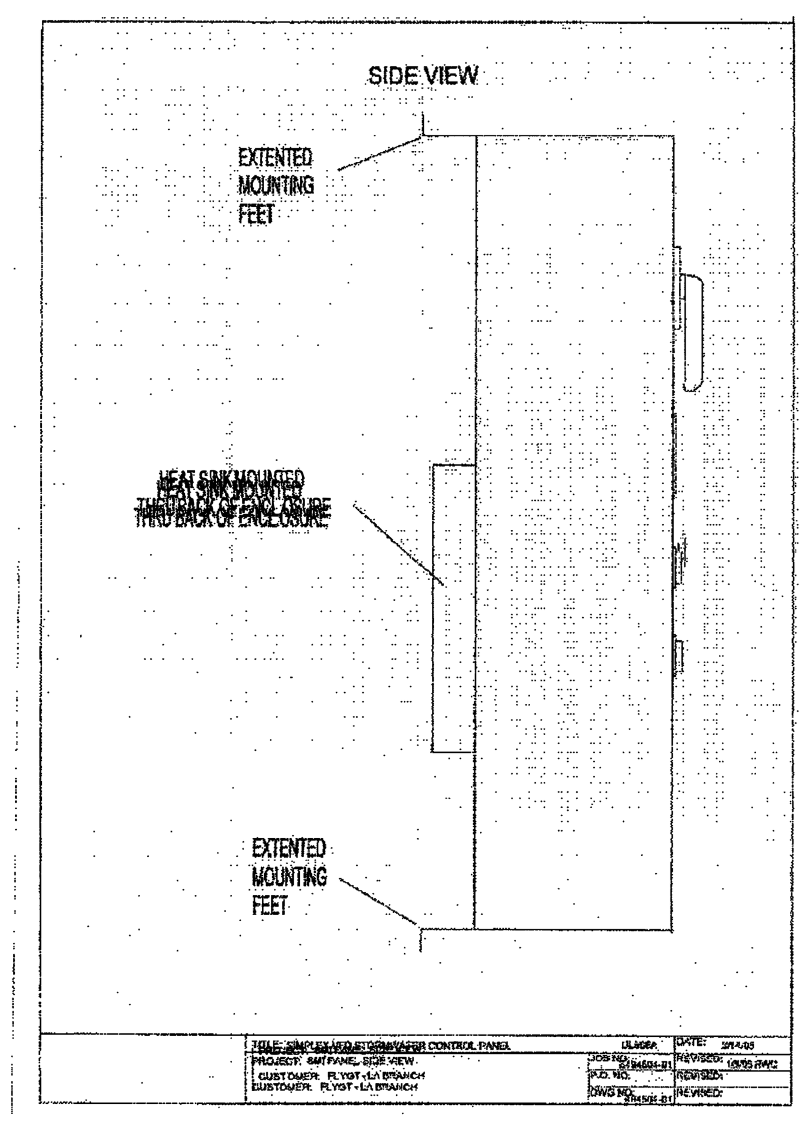
Cable Lengths:
1/4" - 316 stainless steel cable is available in 10 to 60 feet lengths (in 5 feet increments).
5/16" & 1/2" - 316 stainless steel cable is available in 10, 25 and 30 feet lengths.
Contact Flygt Application Engineering for other lengths.
Fittings Included: Two stainless steel shackles.

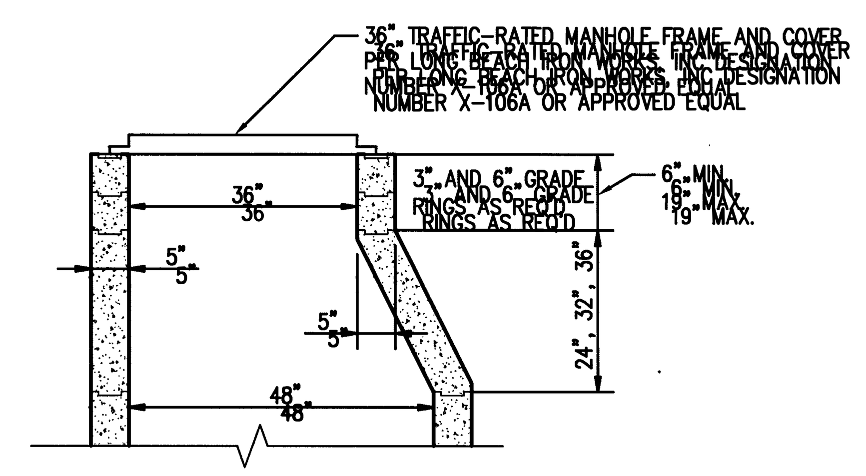
Contact Flygt Application Engineering for information on models not listed.











MAHHOLE SHAFT DETAIL
NOT TO SCALE

SP-3631

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Civil Engineering • Land Surveying • Land Planning
8175 EAST KAISER BOULEVARD
ANAHEIM HILLS, CA 92808 (714) 685-6860

NO.	REVISION	DATE:

PROJECT: **ORANGE BEST BUY**
2355 & 2375 NORTH TUSTIN STREET
ORANGE, CALIFORNIA

DRAWING NAME: **STORM DRAIN DETAILS**

ISSUE: PLAN CHECK
DATE: 12/18/07
CHECKED: DRL DRAWN: ASM
DRAWING FILE: 07-583pg10
PROJECT NO.: 07-583
SHEET NUMBER: 10
OF 11 SHEETS
SCALE: AS SHOWN

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N-3102

Performance Specifications | Issued: 2/05 | Supersedes: 9/04

REQUIREMENTS
Furnish and install (1) submersible non-clog wastewater pump. Each pump shall be equipped with a 5.0 HP submersible electric motor connected for operation on 460 volts, 3 phase, 60 hertz, 4 wire service, with 50 feet of submersible cable (SUBCAB) suitable for submersible pump applications. The power cable shall be sized according to NEC and ICEA standards and also meet with P-MSHA Approval. The pump shall be supplied with a mating cast iron 4 inch discharge connection and be capable of delivering 465 GPM at 12 feet TDH. An additional point on the same curve shall be 300 GPM at 10 feet total head. Shut off head shall be 25 feet (minimum). Each pump shall be fitted with 10 feet of galvanized lifting chain/cable. The working load of the lifting system shall be 50% greater than the pump unit weight.

PUMP DESIGN
The pump shall be automatically and firmly connected to the discharge connection, guided by no less than two guide bars extending from the top of the station to the discharge connection. There shall be no need for personnel to enter the wet-well. Sealing of the pumping unit to the discharge connection shall be accomplished by a machined metal to metal watertight contact. **Sealing of the discharge interface with a diaphragm, O-ring or profile gasket will not be acceptable.** No portion of the pump shall bear directly on the sump floor.

PUMP CONSTRUCTION
Major pump components shall be of grey cast iron, ASTM A-48, Class 35B, with smooth surfaces devoid of blow holes or other irregularities. All exposed nuts or bolts shall be AISI type 304 stainless steel construction. All metal surfaces coming into contact with the pumpage, other than stainless steel or brass, shall be protected by a factory applied spray coating of acrylic dispersion zinc phosphate primer with a polyester resin paint finish on the exterior of the pump.

Sealing design shall incorporate **metal-to-metal contact** between machined surfaces. Critical mating surfaces where watertight sealing is required shall be machined and fitted with Nitrile or Viton rubber O-rings. Fittings will be the result of controlled compression of rubber O-rings in two planes and O-ring contact of four sides without the requirement of a specific torque limit.

Rectangular cross sectioned gaskets requiring specific torque limits to achieve compression shall not be considered as adequate or equal. No secondary sealing compounds, elliptical O-rings, grease or other devices shall be used.

COOLING SYSTEM
Motors are sufficiently cooled by the surrounding environment or pumped media. A water cooling jacket is not required.

CABLE ENTRY SEAL
The cable entry seal design shall preclude specific torque requirements to insure a watertight and submersible seal. The cable entry shall consist of a single cylindrical elastomer grommet, flanked by washers, all having a close tolerance fit against the cable outside diameter and the entry inside diameter and compressed by the body containing a strain relief function, separate from the function of sealing the cable. The assembly shall provide ease of changing the cable when necessary using the same entry seal.

MOTOR
The pump motor shall be a NEMA B design, induction type with a squirrel cage rotor, shell type design, housed in an air filled, watertight chamber. The stator windings shall be insulated with moisture resistant Class H insulation rated for 180°C (356°F). The stator shall be insulated by the trickle impregnation method using Class H monomer-free polyester resin resulting in a winding fill factor of at least 95%. The motor shall be inverter duty rated in accordance with NEMA MG1, Part 31. The stator shall be heat-shrink fitted into the cast iron stator housing. The use of multiple step dip and bake-type stator insulation process is not acceptable. The use of bolts, pins or other fastening devices requiring penetration of the stator housing is not acceptable. The motor shall be designed for continuous duty handling pumped media of 40°C (104°F) and capable of up to 15 evenly spaced starts per hour. The rotor bars and short circuit rings shall be made of cast aluminum. Thermal switches set to open at 125°C (260°F) shall be embedded in the stator end coils to monitor the temperature of each phase winding. These thermal switches shall be used in conjunction with and supplemental to external motor overload protection and shall be connected to the control panel. The motor and the pump shall be produced by the same manufacturer.

The combined service factor (combined effect of voltage, frequency and specific gravity) shall be a minimum of 1.15. The motor shall have a voltage tolerance of plus or

N-3102

Performance Specifications | Issued: 2/05 | Supersedes: 9/04

minus 10%. The motor shall be designed for operation up to 40°C (104°F) ambient and with a temperature rise not to exceed 80°C. A performance chart shall be provided upon request showing curves for torque, current, power factor, input/output kW and efficiency. This chart shall also include data on starting and no-load characteristics.

The power cable shall be sized according to the NEC and ICEA standards and shall be of sufficient length to reach the junction box without the need of any splices. The outer jacket of the cable shall be oil resistant chlorinated polyethylene rubber. The motor and cable shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of 65 feet or greater.

The motor horsepower shall be adequate so that the pump is non-overloading throughout the entire pump performance curve from shut-off through run-out.

BEARINGS
The pump shaft shall rotate on two bearings. Motor bearings shall be permanently grease lubricated. The upper bearing shall be a single deep groove ball bearing. The lower bearing shall be a two row angular contact bearing to compensate for axial thrust and radial forces. **Single row lower bearings are not acceptable.**

MECHANICAL SEAL
Each pump shall be provided with a tandem mechanical shaft seal system consisting of two totally independent seal assemblies. The seals shall operate in an lubricant reservoir that hydrodynamically lubricates the lapped seal faces at a constant rate. The lower, primary seal unit, located between the pump and the lubricant chamber, shall contain one stationary and one positively driven rotating, corrosion resistant tungsten-carbide ring. The upper, secondary seal unit, located between the lubricant chamber and the motor housing, shall contain one stationary **ceramic** seal ring and one positively driven rotating **carbon** seal ring. Each seal interface shall be held in contact by its own spring system. The seals shall require neither maintenance nor adjustment **nor depend on direction of rotation for sealing**. The position of both mechanical seals shall depend on the shaft. Mounting of the lower mechanical seal on the impeller hub will not be acceptable. For special applications, other seal face materials shall be available.

The following seal types shall not be considered acceptable nor equal to the dual independent seal specified: shaft seals without positively driven rotating members, or conventional double mechanical seals containing either a common single or double spring acting between the upper and lower seal faces. No system requiring a pressure differential to offset pressure and to effect sealing shall be used.

Each pump shall be provided with a lubricant chamber for the shaft sealing system. The lubricant chamber shall be designed to prevent overfilling and to provide lubricant expansion capacity. The drain and inspection plug, with positive anti-leak seal shall be easily accessible from the outside. The seal system shall not rely upon the pumped media for lubrication. **The motor shall be able to operate dry without damage while pumping under load.**

Seal lubricant shall be FDA Approved, nontoxic.

PUMP SHAFT
Pump and motor shaft shall be the same unit. The pump shaft is an extension of the motor shaft. Couplings shall not be acceptable. The pump shaft shall be stainless steel - ASTM A479 S43100-T.

If a shaft material of lower quality than stainless steel - ASTM A479 S43100-T is used, a shaft sleeve of stainless steel - ASTM A479 S43100-T is used to protect the shaft material. However, shaft sleeves only protect the shaft around the lower mechanical seal. No protection is provided in the lubricant housing and above. Therefore, the use of stainless steel sleeves will not be considered equal to stainless steel shafts.

IMPELLER
The impeller shall be of gray cast iron, Class 35B, dynamically balanced semi-open multivane back swept screw shaped non-clog design. The impeller shall be capable of handling solids, fibrous materials, heavy sludge and other matter found in stormwater. The screw shape of the impeller inlet shall provide an inducing effect for handling rag laden wastewater. The impeller to volute clearance shall be readily adjustable by the means of a single trim screw. The impeller shall be locked to the shaft, held by an impeller bolt and treated with a corrosion inhibitor.

VOLUTE/SUCTION COVER
The pump volute shall be a single piece gray cast iron, ASTM A-48, Class 35B, non-concentric design

N-3102

Performance Specifications | Issued: 2/05 | Supersedes: 9/04

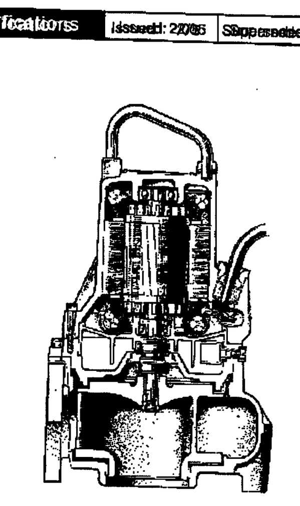
with smooth passages of sufficient size to pass any solids that may enter the impeller. Minimum inlet and discharge size shall be as specified. The volute shall have an integral spiral-shaped, sharp-edged groove(s) that is cast into the suction cover. The spiral groove(s) shall provide the sharp edge(s) across which each impeller vane leading edge shall cross during rotation so to remain unobstructed. The internal volute bottom shall provide effective sealing between the multi-vane semi-open impeller and the volute.

PROTECTION
All stators shall incorporate thermal switches in series to monitor the temperature of each phase winding. The thermal switches shall open at 125°C (260°F), stop the motor and activate an alarm.

A leakage sensor shall be available as an option to detect water in the stator chamber. The Float Leakage Sensor (FLS) is a small float switch used to detect the presence of water in the stator chamber. When activated, the FLS will stop the motor and send an alarm both local and/or remote. **USE OF VOLTAGE SENSITIVE SOLID STATE SENSORS AND TRIP TEMPERATURE ABOVE 125°C (260°F) SHALL NOT BE ALLOWED.**

The thermal switches and FLS shall be connected to a Mini CAS (Control and Status) monitoring unit. The Mini CAS shall be designed to be mounted in any control panel.

Note:



General Guide Specifications

Section 7 | Issued: 5/97 | Supersedes: 5/96

GENERAL
The general guide specifications is intended to cover the items applying to all Flygt pumps for this project. Pump specifications follow the general section. Thus; Quality, Technical Support, Testing and Experience apply to all Flygt pumps for this project.

SCOPE
The specifications shall govern all work necessary to furnish, install and place into operation the electrical submersible pump(s) required to complete this project. This section includes electric submersible pump(s) to be supplied with motor, close coupled volute, cast iron discharge fitting, guide rail brackets, power cable and accessories. The pumps shall be for wet pit installations.

QUALITY ASSURANCE
The pump(s) shall be heavy duty, electric submersible, centrifugal non-clog units designed for handling raw, wastewater and stormwater and shall be fully guaranteed for this use. The pumps provided shall be capable of operating in an ambient liquid temperature of 104°F. Since the high temperature of 104°F is specified by the National Electric Manufacturers Association (NEMA) and Factory Mutual (FM), motors with a maximum ambient temperature rating below 104°F shall not be acceptable.

The pump and motor unit shall be suitable for continuous operation at full nameplate load while the motor is completely submerged, partially submerged or totally non-submerged. The use of blower systems, secondary pumps or cooling fans to cool the motor shall not be acceptable.

The pump, mechanical seals and motor units provided under this specification shall be from the same manufacturer in order to achieve standardization of operation, maintenance, spare parts, manufacturer's service and warranty.

SUBMITTALS
Submittal data shall be provided to show compliance with these specifications, plans or other specifications that will influence the proper operation of the pump(s). Standard submittal data for approval must consist of:

a. Pump Performance Curves.
b. Pump Outline Drawing.
c. Station Drawing for Accessories.
d. Electrical Motor Data.
e. Control Drawing and Data.
f. Typical Installation Guides.
g. Parts List.
h. Printed Warranty.
i. Manufacturer's Equipment Storage Recommendations.
j. Manufacturer's Standard Recommended Inspection & Start-Up Report Form.

Lack of the above requested submittal data is cause for rejection.

TESTING
Factory testing performed upon each pump shall include the following inspections:

a. Impeller, motor rating and electrical connections shall be checked for compliance with this specification.
b. Prior to submergence, each pump shall be run dry to establish correct rotation.
c. Each pump shall be run submerged in water.
d. Motor and cable insulation shall be tested for moisture content or insulation defects.

The pump(s) shall be rejected if the above requirements are not satisfied.

START-UP SERVICE
After the pump(s) have been installed and wired the, the contractor shall inspect and fill out the manufacturers installation and inspection report form. The contractor shall follow the manufacturers startup procedures and complete the manufacturers startup report for warranty.

a. Megger stator and power cables.
b. Check seal lubrication.
c. Check for proper rotation.
d. Check power supply voltage.
e. Measure motor operating load and no load current.
f. Check level control operation and sequence.

General Guide Specifications

Section 7 | Issued: | Supersedes:

During this initial inspection, the contractor shall review recommended operation and maintenance procedures with the owner's personnel.

FACTORY SERVICE
Factory-Approved service facilities with qualified factory-trained mechanics shall be available for prompt emergency and routine service.

GUARANTEE
See individual market sector Warranty Policies

The warranty shall be in printed form and previously published as the manufacturer's standard warranty for all similar units manufactured.

EXPERIENCE
The pump manufacturer shall have a minimum of 10,000 heavy-duty submersible wastewater pumps installed and operating for no less than 5 years in the United States.

MANUFACTURERS
a. The pump, mechanical seals and motor shall be from the same manufacturer.
b. The pump, mechanical seals and motor manufacturer shall be Flygt.

The pump system including the pump, motor and power cable shall be approved for use in areas classified.

SIMPLEX CONTROL PANEL SPECIFICATION FOR 3.0 – 5.0 HP STORM WATER STATION

Scope
Control panel shall designed for purpose intended and be provided by the pump supplier. Panel shall be of simplex design with float start, level control maintained by VFD PID, float stop *and may have optional backup bypass contactor.*

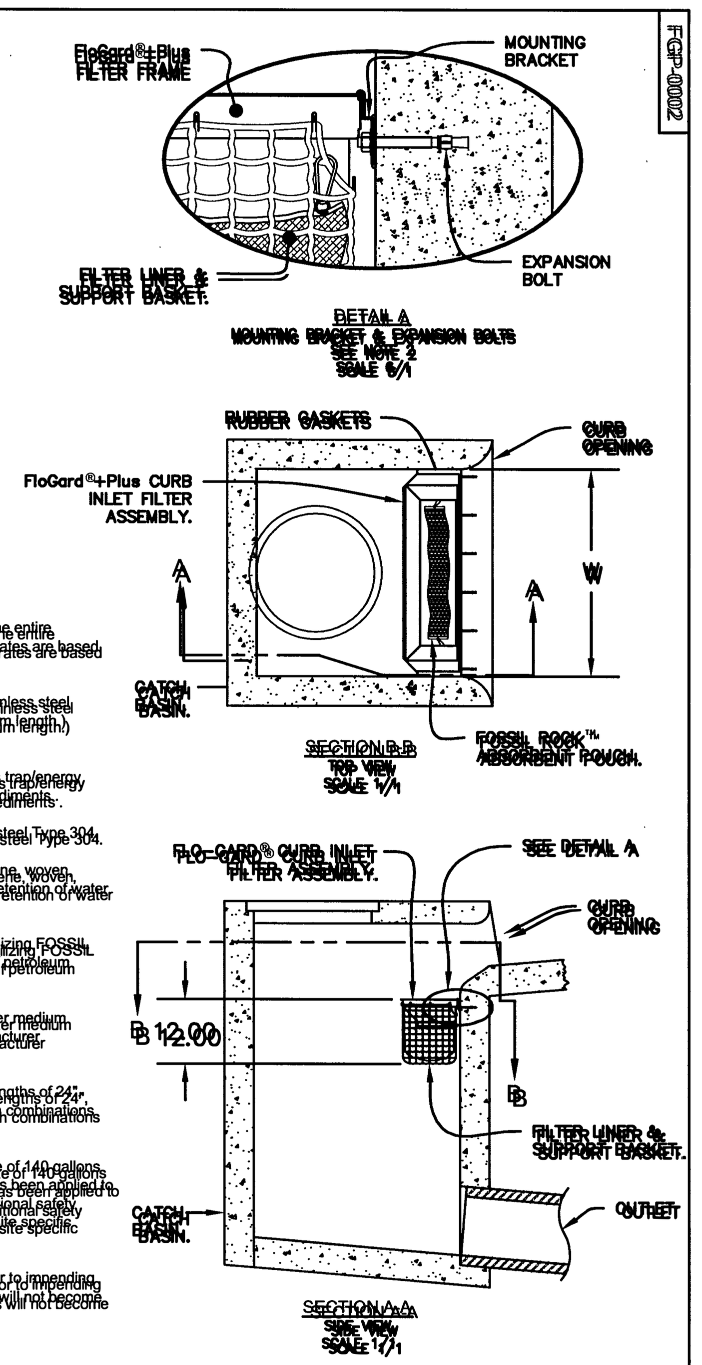
Enclosure
Shall be corrosion resistant NEMA 4X 316SS with stainless steel padlockable latch and aluminum back component mounting panel. Panel shall include mounting feet for mounting to wall or pedestal plate

Field Equipment
The contractor shall ensure that panel manufacturer furnishes the following field instruments:
- Low Level Float w/30' cable
- High Level Float w/30' cable
- 4-20mA, stainless steel pressure transducer (0-10 psi range) w/ 50' cable

Major Components
Shall include, but not limited to:
- 460 – V, 3 Ph, 60 Hz rated panel
- Disconnect breaker
- Control power transformer
- VFD sized for 3.0 - 5.0 HP motor
- HOA switch
- Run time meter
- Run light
- Alarm output contacts
- Terminal strip for landing power, inputs & outputs
- Mini CAS motor sensor relay

SPECIFIER CHART

MODEL NO.	Curb Opening Width -W-	Storage Capacity -Cu. Ft.-	Clean Flow Rate -GPM/CFS-
FGP-24CI	2.0' (24")	.95	338 / .75
FGP-30CI	2.5' (30")	1.20	450 / 1.00
FGP-36CI	3.0' (36")	1.50	563 / 1.25
FGP-42CI	3.5' (42")	1.80	675 / 1.50
FGP-48CI	4.0' (48")	2.10	768 / 1.76
FGP-5.0CI	5.0' (60")	2.40	900 / 2.00
FGP-6.0CI	6.0' (72")	3.05	1,126 / 2.51
FGP-7.0CI	7.0' (84")	3.65	1,350 / 3.01
FGP-8.0CI	8.0' (96")	4.25	1,576 / 3.51
FGP-10.0CI	10.0' (120")	4.85	1,800 / 4.01
FGP-12.0CI	12.0' (144")	6.10	2,252 / 5.02
FGP-14.0CI	14.0' (168")	7.30	2,700 / 6.02
FGP-16.0CI	16.0' (192")	8.55	3,152 / 7.02
FGP-18.0CI	18.0' (216")	9.45	3,490 / 7.78
FGP-21.0CI	21.0' (252")	10.95	4,050 / 9.02
FGP-28.0CI	28.0' (336")	14.60	5,400 / 12.03



NOTES:

1. FloGard®+PLUS filter inserts shall be installed across the entire width of curb opening. Storage capacity and clean flow rates are based on full width installation.
2. Filter insert shall be attached to the catch basin with stainless steel expansion anchor bolts & washers (3/8" x 2 1/2" minimum length.) See detail A.
3. FloGard®+PLUS filter inserts are designed with a debris trap/energy dissipator for the retention of floatables and collected sediments.
4. Filter support frame shall be constructed from stainless steel Type 304.
5. Filter liner shall be constructed from durable polypropylene, woven, monofilament, geotextile. Filter liner shall not allow the retention of water between storm events.
6. Filter inserts are supplied with "clip-in" filter pouches utilizing FOSSIL ROCK ™ filter medium for the collection and retention of petroleum hydrocarbons (oils & greases).
7. FloGard®+PLUS filter inserts and FOSSIL ROCK ™ filter medium pouches must be maintained in accordance with manufacturer recommendations.
8. FloGard +PLUS filter inserts are available in standard lengths of 24", 30", 35", 42" & 48" and may be installed in various length combinations (end to end) to fit length of noted catch basin.
9. Clean flow rates are "calculated" based on liner flow rate of 140 gallons per minute per square foot of material, a factor of .50 has been applied to allow for anticipated sediment & debris loading. An additional safety factor of between .25 & .50 may be applied to allow for site specific sediment loading.
10. Storage capacity reflects maximum solids collection prior to impending "initial" filtering bypass. The "ultimate" high-flow bypass will not become impeded due to maximum solids loading.

TITLE: FloGard®+PLUS CATCH BASIN FILTER INSERT (Curb Inlet Style)

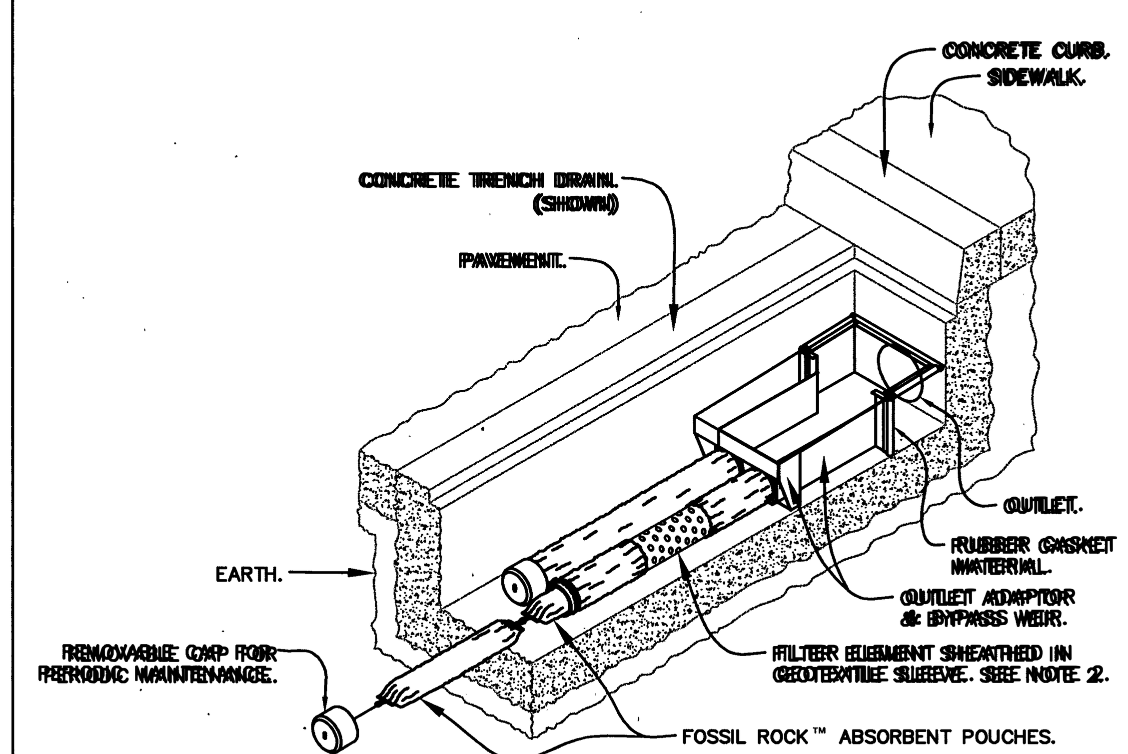
KriStar Enterprises, Inc.
P.O. Box 6419, Santa Rosa, CA 95406
Ph: 800.579.8819, Fax: 707.524.8186, www.kristar.com

DRAWING NO.	REV	ECO	DATE	SHEET
FGP-0002	B	0925 3/29/07	JPR 11/7/06	SHEET 1 OF 1

FG-LP-0002

NOTES:

1. FILTER OUTLET ADAPTER SHALL BE CONSTRUCTED FROM STAINLESS STEEL TYPE 304.
2. FILTER ELEMENT IS CONSTRUCTED FROM POLYPROPYLENE WOVEN MONOFILAMENT GEOTEXTILE SURROUNDING A PERFORATED FILTER HOUSING. FILTER ELEMENT SHALL NOT ALLOW THE RETENTION OF WATER BETWEEN STORM EVENTS.
3. FILTER INSERTS ARE SUPPLIED WITH "CLIP-IN" FILTER POUCHES UTILIZING FOSSIL ROCKF FILTER MEDIUM FOR THE COLLECTION AND RETENTION OF PETROLEUM HYDROCARBONS (OILS & GREASES).
4. FLOGARDD LOPROF FILTER INSERTS AND FOSSIL ROCKF FILTER MEDIUM POUCHES MUST BE MAINTAINED IN ACCORDANCE WITH MANUFACTURER RECOMMENDATIONS.
5. OUTLET ADAPTER CAN ACCOMMODATE OUTLET OPENINGS AT RIGHT ANGLES AND/OR BOTTOM OUTLET OPENINGS.
6. FOR ALTERNATE OUTLET ADAPTER CONFIGURATIONS USED FOR EXTREMELY SHALLOW TRENCH DRAINS CONTACT KRISTAR ENTERPRISES FOR ENGINEERING ASSISTANCE.

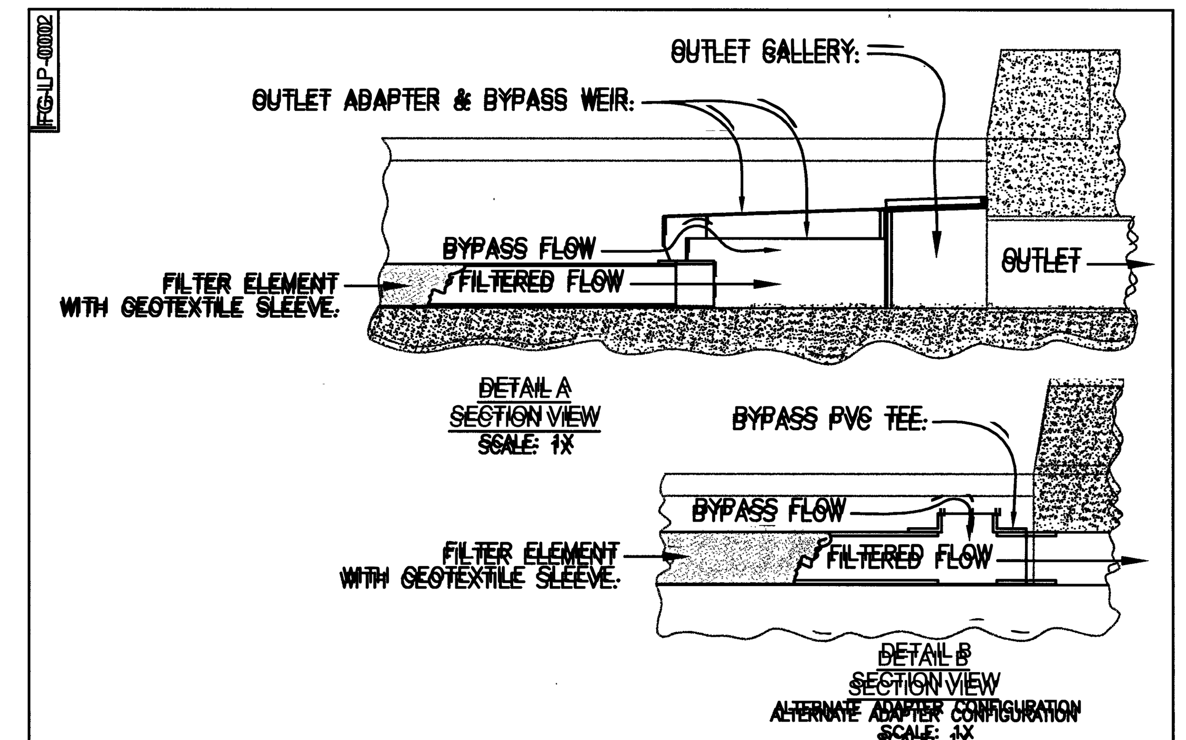


TITLE: FloGard® LoPro™ TRENCH DRAIN FILTER INSERT

KriStar Enterprises, Inc.
P.O. Box 6419, Santa Rosa, CA 95406
Ph: 800.579.8819, Fax: 707.524.8186, www.kristar.com

DRAWING NO.	REV	ECO	DATE	SHEET
FG-LP-0002	C	0020 3/7/07	JPR 2/21/07	SHEET 1 OF 2

FG-LP-0002



SPECIFIER CHART

MODEL	FILTER TYPE	TRENCH WIDTH "ID" (CLEAR OPENING)	MINIMUM TRENCH DEPTH (FROM BOTTOM OF GRATE)	SOLIDS STORAGE CAPACITY CUBIC FEET	FILTERED FLOW CUBIC FEET / SECOND	TOTAL BYPASS CAPACITY CUBIC FEET /SECOND
FG-TDOF3	PIPE*	3.0	6.5	0.1	0.5	0.1
FG-TDOF4	PIPE*	4.0	6.5	0.2	0.5	0.1
FG-TDOF6	PIPE	6.0	6.5	0.4	0.5	0.2
FG-TDOF8	PIPE	8.0	6.5	0.7	0.5	0.3
FG-TDOF10	PIPE	10.0	6.5	0.9	0.5	0.5
FG-TDOF12	PIPE	12.0	6.5	0.9	1.0	0.6
FG-TDOF18	PIPE	18.0	6.5	1.3	1.5	1.1
FG-TDOF24	PIPE	24.0	6.5	1.8	2.0	1.5
FG-TDOA6	PANEL	6.0	6.5	0.5	0.2	0.3
FG-TDOA8	PANEL	8.0	6.5	0.7	0.2	0.3
FG-TDOA10	PANEL	10.0	6.5	0.8	0.3	0.5
FG-TDOA12	PANEL	12.0	6.5	1.0	0.4	0.6
FG-TDOA18	PANEL	18.0	6.5	1.4	0.8	1.1
FG-TDOA24	PANEL	24.0	6.5	1.8	1.1	1.5

*ALTERNATE ADAPTER CONFIGURATION. SEE DETAIL B.

TITLE: FloGard® LoPro™ TRENCH DRAIN FILTER INSERT

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DRAWING NO.	REV	ECO	DATE	SHEET
FG-LP-0002	C	0020 3/7/07	JPR 2/21/07	SHEET 2 OF 2

SP-3631

DRC
Development Resource Consultants, Inc.
Civil Engineering · Land Surveying · Land Planning
8175 EAST KAISER BOULEVARD
ANAHEIM HILLS, CA 92808 (714) 685-6860

NO.	REVISION	DATE

PROJECT: ORANGE BEST BUY
2355 & 2375 NORTH TUSTIN STREET
ORANGE, CALIFORNIA

DRAWING NAME: STORM DRAIN DETAILS

ISSUE: PLAN CHECK
DATE: 12/18/07
CHECKED: DRL DRAWN: ASM
DRAWING FILE: 07-583pg11
PROJECT NO.: 07-583
SHEET NUMBER: 11
OF 11 SHEETS
SCALE: AS SHOWN