City of Escondido
PRIORITY DEVELOPMENT PROJECT (PDP) SWQMP

Parkview Townhomes

550 W EL NORTE PARKWAY
ESCONDIDO CA, 92026

ASSESSOR'S PARCEL NUMBER(S):
226-380-48

ENGINEER OF WORK:

Touchstone Development, Inc.
Mike Wagner, RCE 74067

PREPARED FOR:
Touchstone Development, Inc.
9815 Mira Mesa Blvd
San Diego, CA 92131
858-586-0414

PDP SWQMP PREPARED BY:
Touchstone Development, Inc.
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DATE OF SWQMP:
May, 2024

PLANS PREPARED BY:
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SWQMP APPROVED BY:
[FOR CITY STAFF ONLY]

APPROVAL DATE:
[APPROVAL DATE]

ESCONDIDO
City of Choice

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ATTACHMENTS

Attachment 1: Backup for PDP Pollutant Control BMPs
- Attachment 1a: Storm Water Pollutant Control Worksheet Calculations (Applicable worksheets)
- Attachment 1b: Form I-8, Categorization of Infiltration Feasibility Condition
- Attachment 1c: Form I-9, Factor of Safety and Design Infiltration Rate Worksheet
- Attachment 1d: Drainage Management Area (DMA) Exhibit
- Attachment 1e: Individual Structural BMP DMA Mapbook

Attachment 2: Backup for PDP Hydromodification Control Measures
- Attachment 2a: Flow Control Facility Design
- Attachment 2b: Hydromodification Management Exhibit
- Attachment 2c: Management of Critical Coarse Sediment Yield Areas
- Attachment 2d: Geomorphic Assessment of Receiving Channels (optional)
- Attachment 2e: Vector Control Plan (if applicable)

Attachment 3: Structural BMP Maintenance Plan
- Attachment 3a: Structural BMP Maintenance Thresholds and Actions
- Attachment 3b: Draft Maintenance Agreements / Notifications (when applicable)

Attachment 4: City of Escondido PDP Structural BMP Verification

Attachment 5: Copy of Plan Sheets Showing Permanent Storm Water BMPs

ACRONYMS

ACP	Alternative Compliance Project
APN	Assessor's Parcel Number
BMP	Best Management Practice
DMA	Drainage Management Area
EOW	Engineer of Work
HMP	Hydromodification Management Plan
HSG	Hydrologic Soil Group
MS4	Municipal Separate Storm Sewer System
N/A	Not Applicable
PDP	Priority Development Project
PE	Professional Engineer
SC	Source Control
SD	Site Design
SDRWQCB	San Diego Regional Water Quality Control Board
SIC	Standard Industrial Classification
SWDM	Storm Water Design Manual
SWQMP	Storm Water Quality Management Plan
USGS	US Geological Survey
WMAA	Watershed Management Area Analysis
WQIP	Water Quality Improvement Plan

PDP SWQMP PREPARER'S CERTIFICATION PAGE

Project Name: Parkview Townhomes
Permit Number: _____

PREPARER'S CERTIFICATION

I hereby declare that I am the Engineer in Responsible Charge of design of storm water best management practices (BMPs) for this project, and that I have exercised responsible charge over the design of the BMPs as defined in Section 6703 of the Business and Professions Code, and that the design is consistent with the PDP requirements of the City of Escondido Storm Water Design Manual, which is a design manual for compliance with the City of Escondido Municipal Code (Chapter 22, Article 2) and regional MS4 Permit (California Regional Water Quality Control Board San Diego Region Order No. R9-2013-0001 as amended by R9-2015-0001 and R9-2015-0100) requirements for storm water management.

I have read and understand that the City of Escondido has adopted minimum requirements for managing urban runoff, including storm water, from land development activities, as described in the Storm Water Design Manual. I certify that this PDP SWQMP has been completed to the best of my ability and accurately reflects the project being proposed and the applicable BMPs proposed to minimize the potentially negative impacts of this project's land development activities on water quality. I understand and acknowledge that the plan check review of this PDP SWQMP by City staff is confined to a review and does not relieve me, as the Engineer in Responsible Charge of design of storm water BMPs for this project, of my responsibilities for project design.

_____
Engineer of Work's Signature, PE Number & Expiration Date

Mike Wagner
_____
Print Name

Touchstone Development, Inc.
_____
Company

May, 2024
_____
Date

Engineer's Seal:

SUBMITTAL RECORD

Use this Table to keep a record of submittals of this PDP SWQMP. Each time the PDP SWQMP is re-submitted, provide the date and status of the project. In column 4 summarize the changes that have been made or indicate if response to plancheck comments is included. When applicable, insert response to plancheck comments behind this page.

Preliminary Design / Planning / CEQA

Submittal Number	Date	Summary of Changes
1	June, 2024	Initial Submittal
2		
3		
4		

Final Design

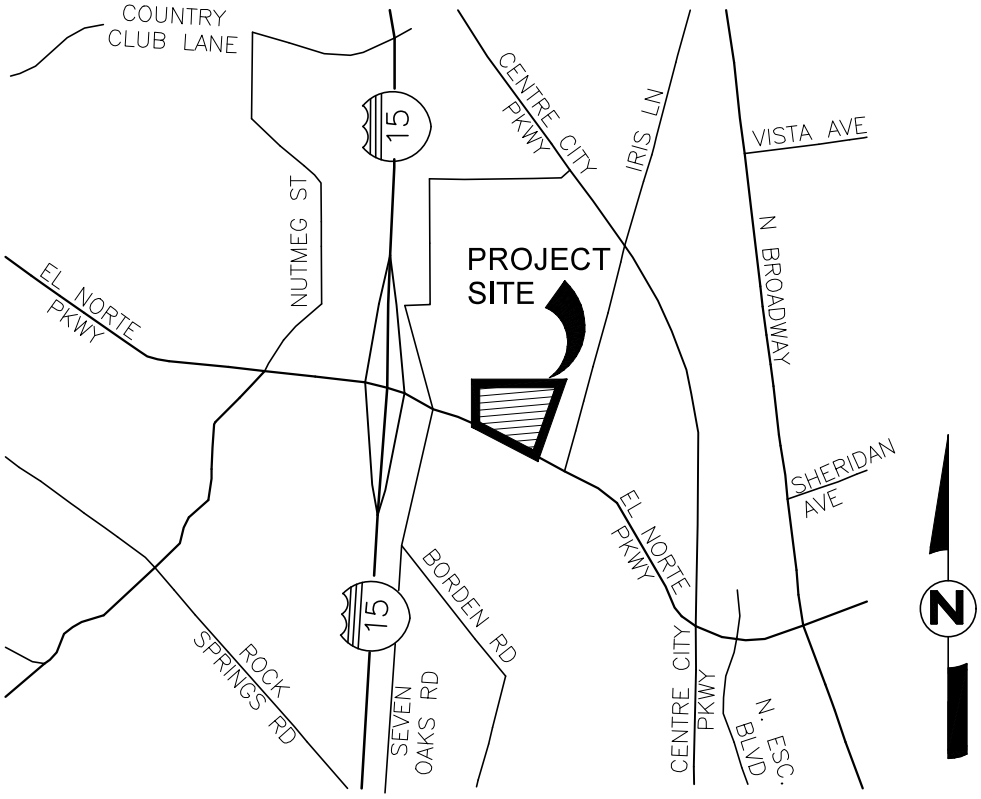
Submittal Number	Date	Summary of Changes
1		Initial Submittal
2		
3		
4		

Plan Changes

Submittal Number	Date	Summary of Changes
1		Initial Submittal
2		
3		
4		

PROJECT VICINITY MAP

Project Name: Parkview Townhomes
Permit Number: _____



VICINITY MAP

Step 1: Project type determination

Project Name	Parkview Townhomes
Project Address	550 W El Norte Parkway
Assessor's Parcel Number(s)	226-380-48
Permit Number	
Project Watershed (Hydrologic Unit)	Select One: ☑ Carlsbad 904 ☐ San Dieguito 905
Parcel Area (total area of Assessor's Parcel(s) associated with the project)	4.96 Acres (216,179.5 Square Feet)
Area to be disturbed by the project (Project Area)	5.08 Acres (221,494.4 Square Feet)
Project Proposed Impervious Area (subset of Project Area)	2.59 Acres (113,028.0 Square Feet)
Project Proposed Pervious Area (subset of Project Area)	2.49 Acres (108,464.4 Square Feet)
Note: Proposed Impervious Area + Proposed Pervious Area = Area to be Disturbed by the Project. This may be less than the Parcel Area.	

Step 1.1: Storm Water Quality Management Plan requirements

Site Information Checklist for PDPs		Form I-2a
Step	**Answer**	**Progression**
Is the project a Standard Project, Priority Development Project (PDP), or exception to PDP definitions? To answer this item, complete Step 1 Project Type Determination Checklist on Pages 3 and 4, and see PDP exemption information below. For further guidance, see Section 1.4 of the Storm Water Design Manual *in its entirety*.	☐ Standard Project	Standard Project requirements apply. **Complete Form I-1.**
	■ PDP	Standard and PDP requirements apply, including PDP SWQMP. **SWQMP Required.**
	☐ PDP with ACP	If participating in offsite alternative compliance, **complete Step 5.1** (Offsite Alternative Compliance Participation Form) **and an ACP SWQMP.**
	☐ PDP Exemption	**Go to Step 1.2 below.**

Step 1.2: Exemption to PDP definitions

Site Information Checklist for PDPs	Form I-2a
Is the project exempt from PDP definitions based on either of the following: ☐ Projects that are only new or retrofit paved sidewalks, bicycle lanes, or trails that meet the following criteria: (i) Designed and constructed to direct storm water runoff to adjacent vegetated areas, or other non-erodible permeable areas; OR (ii) Designed and constructed to be hydraulically disconnected from paved streets or roads [i.e., runoff from the new improvement does not drain directly onto paved streets or roads]; OR (iii) Designed and constructed with permeable pavements or surfaces in accordance with County of San Diego Green Streets Infrastructure;	If so: Standard Project requirements apply, AND any additional requirements specific to the type of project. City concurrence with the exemption is required. *Provide discussion and list any additional requirements below in this form.*
☐ Projects that are only retrofitting or redeveloping existing paved alleys, streets or roads that are designed and constructed in accordance with the County of San Diego Green Streets Infrastructure;	**PDP Exempt.**
Discussion / justification, and additional requirements for exceptions to PDP definitions, if applicable:	

Step 1.3: Confirmation of PDP Determination

Site Information Checklist for PDPs			Form I-2a
The project is (select one): ☐ New Development ■ Redevelopment[1]			
The total proposed newly created or replaced impervious area is: 113,028.0 ft²			
The project meets the following categories, (a) through (f): [select all that apply]			
Yes ☐	No ☑	(a)	New development projects that create 10,000 square feet or more of impervious surfaces (collectively over the entire project site). This includes commercial, industrial, residential, mixed-use, and public development projects on public or private land.
Yes ☑	No ☐	(b)	Redevelopment projects that create and/or replace 5,000 square feet or more of impervious surface (collectively over the entire project site on an existing site of 10,000 square feet or more of impervious surfaces). This includes commercial, industrial, residential, mixed-use, and public development projects on public or private land.
Yes ☑	No ☐	(c)	New and redevelopment projects that create and/or replace 5,000 square feet or more of impervious surface (collectively over the entire project site), and support one or more of the following uses: (i) Restaurants. This category is defined as a facility that sells prepared foods and drinks for consumption, including stationary lunch counters and refreshment stands selling prepared foods and drinks for immediate consumption (Standard Industrial Classification (SIC) code 5812). *Information and an SIC search function are available at www.osha.gov/pls/imis/sicsearch.html.* (ii) Hillside development projects. This category includes development on any natural slope that is twenty-five percent or greater. (iii) Parking lots. This category is defined as a land area or facility for the temporary parking or storage of motor vehicles used personally, for business, or for commerce. (iv) Streets, roads, highways, freeways, and driveways. This category is defined as any paved impervious surface used for the transportation of automobiles, trucks, motorcycles, and other vehicles.
Yes ☐	No ☑	(d)	New or redevelopment projects that create and/or replace 2,500 square feet or more of impervious surface (collectively over the entire project site), and discharging directly to an Environmentally Sensitive Area (ESA). "Discharging directly to" includes flow that is conveyed overland a distance of 200 feet or less from the project to the ESA, or conveyed in a pipe or open channel any distance as an isolated flow from the project to the ESA (i.e. not commingled with flows from adjacent lands). *Note: ESAs are areas that include but are not limited to all Clean Water Act Section 303(d) impaired water bodies; areas designated as Areas of Special Biological Significance by the State Water Board and San Diego Water Board; State Water Quality Protected Areas; water bodies designated with the RARE beneficial use by the State Water Board and San Diego Water Board; and any*

[1] Redevelopment is defined as: The creation and/or replacement of impervious surface on an already developed site. Examples include the expansion of a building footprint, road widening, the addition to or replacement of a structure, and creation or addition of impervious surfaces. Replacement of impervious surfaces includes any activity that is not part of a routine maintenance activity where impervious material(s) are removed, exposing underlying soil during construction. Redevelopment does not include routine maintenance activities, such as trenching and resurfacing associated with utility work; pavement grinding; resurfacing existing roadways; sidewalks; pedestrian ramps; or bike lanes on existing roads; and routine replacement of damaged pavement, such as pothole repair.

Site Information Checklist for PDPs			Form I-2a
			other equivalent environmentally sensitive areas which have been identified by the Copermittees. *For projects adjacent to an ESA, but not discharging to an ESA, the 2,500 square foot threshold does not apply as long as the project does not physically disturb the ESA and the ESA is upstream of the project.*
Yes ☐	No ☑	(e)	New development projects, or redevelopment projects that create and/or replace 5,000 square feet or more of impervious surface, that support one or more of the following uses: (i) Automotive repair shops. This category is defined as a facility that is categorized in any one of the following SIC codes: 5013, 5014, 5541, 7532-7534, or 7536-7539. *Information and an SIC search function are available at www.osha.gov/pls/imis/sicsearch.html.* (ii) Retail gasoline outlets (RGOs). This category includes RGOs that meet the following criteria: (a) 5,000 square feet or more or (b) a projected Average Daily Traffic (ADT) of 100 or more vehicles per day.
Yes ☑	No ☐	(f)	New or redevelopment projects that result in the disturbance of one or more acres of land and are expected to generate pollutants post construction. Note: See Storm Water Design Manual Section 1.4.2 for additional guidance.

The following is for redevelopment PDPs only:

The area of existing (pre-project) impervious area at the project site is:	A	21,500	ft²
The total proposed newly created or replaced impervious area is:	B	113,028.0	ft²
Percent impervious surface created or replaced:	(B/A)*100	525.7	%

The percent impervious surface created or replaced is (select one based on the above calculation):

☐ **less than or equal to fifty percent (50%)** – only newly created or replaced impervious areas are considered a PDP and subject to stormwater requirements

OR

▬ **greater than fifty percent (50%)** – the entire project site is considered a PDP and subject to stormwater requirements

Step 2: City of Escondido PDP SWQMP Site Information Checklist

Step 2.1: Description of Existing Site Condition and Drainage Patterns

Site Information Checklist for PDPs	Form I-2a

Current Status of the Site (select all that apply):

- ☒ Existing development
- ☐ Previously graded but not built out
- ☐ Demolition completed without new construction
- ☐ Agricultural or other non-impervious use
- ☐ Vacant, undeveloped/natural

Description / Additional Information:

Existing Site contains one single family home and AC driveway.

Existing Land Cover Includes (select all that apply and provide each area on site):

- ☒ Vegetative Cover 4.51 Acres (196,455.6 Square Feet)
- ☐ Non-Vegetated Pervious Areas _____ Acres (_____ Square Feet)
- ☐ Impervious Areas 0.45 Acres (19,567 Square Feet)

Description / Additional Information:

Existing Site contains one single family home and AC driveway.

Underlying Soil belongs to Hydrologic Soil Group (select all that apply):

- ☐ NRCS Type A
- ☒ NRCS Type B
- ☐ NRCS Type C
- ☐ NRCS Type D

Approximate Depth to Groundwater (GW) (or N/A for no infiltration BMPs):

- ☐ Groundwater Depth < 5 feet
- ☐ 5 feet < Groundwater Depth < 10 feet
- ☐ 10 feet < Groundwater Depth < 20 feet
- ☒ Groundwater Depth > 20 feet

Existing Natural Hydrologic Features (select all that apply):

- ☐ Watercourses
- ☐ Seeps
- ☐ Springs
- ☐ Wetlands
- ☒ None
- ☐ Other

Description / Additional Information:

Existing Site contains one single family home and AC driveway.

Step 2.2: Description of Existing Site Drainage Patterns

Site Information Checklist for PDPs	Form I-2a
How is storm water runoff conveyed from the site? At a minimum, this description should answer (1) whether existing drainage conveyance is natural or urban; (2) describe existing constructed storm water conveyance systems, if applicable; and (3) is runoff from offsite conveyed through the site? If so, describe:	
Existing site drainage consists of 3 drainage areas: Basin 1: 1.18 acres on the west side of the the project site and includes approx. 0.36 acres of run on from the north. Basin is entirely natural terrain. Storm water ultimately collects into a concrete drainage ditch that starts near the existing driveway and continues westerly and connects to existing underground storm water infrastructure. Basin 2: 4.63 acres in the center of the site which includes approx. 0.87 acres of run on from the north. Includes single family home and existing driveway areas. Storm water runs southerly until collecting into a drainage ditch that starts on the east side of existing driveway and carries water easterly to a curb outlet structure which discharges to the curb line at El Norte Parkway. Curb flows easterly to existing storm drain curb inlet at the corner of El Norte Parkway and Iris. Basin 3: 0.65 acres on the east side of the site which includes approx. 0.14 acres of off-site run on from the north. Basin is entirely natural terrain. Storm water sheet flows easterly across the property line towards adjacent properties. Storm water ultimately collects into existing storm drain curb inlet at the corner of El Norte Parkway and Iris.	

Step 2.3: Description of Proposed Site Development

Site Information Checklist for PDPs	Form I-2a
Project Description / Proposed Land Use and/or Activities:	
Proposed project includes construction of 70 Townhome Units and associated infrastructure.	
List/describe proposed impervious features of the project (e.g., buildings, roadways, parking lots, courtyards, athletic courts, other impervious features):	
Proposed project includes construction of 70 Townhome Units, private streets, sidewalks, parking and common areas including pool/patio and Tot-Lot.	
List/describe proposed pervious features of the project (e.g., landscape areas):	
Pervious features include landscape/planter areas throughout the site and graded/vegatated slopes.	
Does the project include grading and changes to site topography? ■ Yes ☐ No Description / Additional Information:	
Site slopes North to South at grades of 10-20%. Proposed grading will create 2:1 slopes to create a pad to allow the construction of the proposed project Townhomes and infrastructure.	

Insert acreage or square feet for the different land cover types in the table below:

Change in Land Cover Type Summary

Land Cover Type	Existing (acres or ft^2)	Proposed (acres or ft^2)	Percent Change
Vegetation	4.51	2.51	-55%
Pervious (non-vegetated)			
Impervious	0.45	2.45	+544%
total	4.96	4.96	Sum Existing must equal Sum Proposed

Step 2.4: Description of Proposed Site Drainage Patterns

Site Information Checklist for PDPs	Form I-2a

Does the project include changes to site drainage (e.g., installation of new storm water conveyance systems)?

- ☒ Yes
- ☐ No

If yes, provide details regarding the proposed project site drainage conveyance network, including storm drains, concrete channels, swales, detention facilities, storm water treatment facilities, natural or constructed channels, and the method for conveying offsite flows through or around the proposed project site. Identify all discharge locations from the proposed project site along with a summary of the conveyance system size and capacity for each of the discharge locations. Provide a summary of pre- and post-project drainage areas and design flows to each of the runoff discharge locations. Reference the drainage study for detailed calculations.

Describe proposed site drainage patterns:

See Preliminary Hydrology Study included in appendices for existing and proposed drainage maps and Total Q calculations.

In the existing condition there area 3 drainage analyze points:
#1 is the the concrete channel leaving the project site and draining westerly to connect to existing U/G SD systems in El Norte. Total CFS is to analyze point #1 is 2.934 CFS.

#2 is the concrete channel leaving running westerly and discharging to the curb outlet structure at the curb line on El Norte. Total CFS is 12.869 CFS.

#3 is sheet flow across the easterly property line. Total CFS is 1.467.

In the proposed condition, there are 2 drainage analyze points:
#1 is the concrete channel leaving the project site and draining westerly to connect to existing U/G SD systems in El Norte. (2.611 CFS). (2.611 CFC < 2.934 CFS, O.K.)

#2 is the the U/G Storm drain leaving the site and connecting to existing SD infrastructure at the corner of Iris/El Norte. Total CFS is (14.952CFS)
(14.952 CFS > 12.869 CFS, Basin to Detain 3.608 CFS, see detention calcs in preliminary hydrology study).
14.952- 3.608 = 11.344 CFS < 12.869 CFS ex, OK.

#3 analysis point is no longer applicable in the proposed condition. Area and flows are reduced to zero.

Step 2.5: Potential Pollutant Source Areas

Site Information Checklist for PDPs	Form I-2a

Identify whether any of the following features, activities, and/or pollutant source areas will be present (select all that apply).

- ■ On-site storm drain inlets
- ☐ Interior floor drains and elevator shaft sump pumps
- ■ Interior parking garages
- ■ Need for future indoor & structural pest control
- ■ Landscape/Outdoor Pesticide Use
- ■ Pools, spas, ponds, decorative fountains, and other water features
- ☐ Food service
- ☐ Refuse areas
- ☐ Industrial processes
- ☐ Outdoor storage of equipment or materials
- ☐ Vehicle and Equipment Cleaning
- ☐ Vehicle/Equipment Repair and Maintenance
- ☐ Fuel Dispensing Areas
- ☐ Loading Docks
- ■ Fire Sprinkler Test Water
- ☐ Miscellaneous Drain or Wash Water
- ■ Plazas, sidewalks, and parking lots
- ☐ Large Trash Generating Facilities
- ☐ Animal Facilities
- ☐ Nurseries and Garden Centers
- ☐ Automotive Facilities
- ☐ Other (provide description)

Description / Additional Information:

Step 2.6: Identification of Receiving Water and Pollutants of Concern

Site Information Checklist for PDPs	Form I-2a

Describe path of storm water from the project site to the Pacific Ocean (or bay, lagoon, lake or reservoir, as applicable):

All Storm water from project site is collected in U/G systems and discharge to the natural terrain Flood Control Channel between Morning View Dr and El Norte Pkwy. Flood control channel transition to a concrete channel before discharging to Escondido Creek, which eventually feeds into San Elijo Lagoon and the Pacific Ocean.

List any 303(d) impaired water bodies within the path of storm water from the project site to the Pacific Ocean (or bay, lagoon, lake or reservoir, as applicable), identify the pollutant(s)/stressor(s) causing impairment, and identify any TMDLs for the impaired water bodies:

303(d) Impaired Water Body	Pollutant(s)/Stressor(s)	TMDLs / WQIP Highest Priority Pollutant
Escondido Creek	DDT,Manganese,Phosphate, Selenium,Sulfates,TDS	
San Elijo Lagoon	Eutrophic, Indicator Bacteria, Sediment	

Identification of Project Site Pollutants*

*Identification of project site pollutants below is only required if flow-thru treatment BMPs are implemented onsite in lieu of retention or biofiltration BMPs. Note the project must also participate in an alternative compliance program (unless prior lawful approval to meet earlier PDP requirements is demonstrated).

Identify pollutants expected from the project site based on all proposed use(s) of the site (see Storm Water Design Manual Appendix B.6):

Pollutant	Not Applicable to the Project Site	Anticipated from the Project Site	Also a Receiving Water Pollutant of Concern
Sediment		X	X
Nutrients		X	
Heavy Metals	X		
Organic Compounds	X		
Trash & Debris		X	
Oxygen Demanding Substances		X	
Oil & Grease		X	
Bacteria & Viruses		X	X
Pesticides		X	

Step 2.7: Hydromodification Management Requirements

Site Information Checklist for PDPs	Form I-2a

Do hydromodification management requirements apply (see Section 1.6 of the Storm Water Design Manual)?

- ■ Yes, hydromodification management requirements for flow control and preservation of critical coarse sediment yield areas are applicable.
- ☐ No, the project will discharge runoff directly to the exempt portion of Escondido Creek as detailed in the Carlsbad Watershed WQIP (May 2018 Update). Direct discharge is defined in section 1.6 of the Escondido Storm Water Design Manual.
- ☐ No, the project will discharge runoff directly to existing underground storm drains discharging directly to water storage reservoirs, lakes, enclosed embayments, or the Pacific Ocean. Refer to HMP Exhibit in Attachment 2.
- ☐ No, the project will discharge runoff directly to conveyance channels whose bed and bank are concrete-lined all the way from the point of discharge to water storage reservoirs, lakes, enclosed embayments, or the Pacific Ocean. Refer to HMP Exhibit in Attachment 2.

Note: Direct Discharge refers to an uninterrupted hardened conveyance system. Projects claiming the Direct Discharge exemption must satisfy the applicable criteria (energy dissipation, invert elevation, etc.) included in Section 1.6 of the Escondido Storm Water Design Manual.

Description / Additional Information (to be provided if a 'No' answer has been selected above):

HMP Exemption Exhibit

Attach an HMP Exemption Exhibit that shows direct storm water runoff discharge from the project site to the HMP exempt area. Include project area, applicable underground storm drain line and/or concrete lined channels, outfall information, and exempt waterbody.

Reference applicable drawing number(s).

See Sheet 4, DMA Map/HMP Exhibit

Step 2.7.1: Critical Coarse Sediment Yield Areas

Site Information Checklist for PDPs	Form I-2a

☐ **N/A - This Section only required if hydromodification management requirements apply**

Based on the maps provided within the WMAA, do potential critical coarse sediment yield areas exist within the project drainage boundaries?

☐ Yes

☒ No, no critical coarse sediment yield areas to be protected based on WMAA maps

If yes, have any of the optional analyses presented in Appendix H of the manual been performed?

☐ H.6.1 Site-Specific GLU Analysis

☐ H.7 Downstream Systems Sensitivity to Coarse Sediment

- H.7.1 Depositional Analysis,
- H.7.2 Threshold Channel Analysis, or
- H.7.3 Course Sediment Source Area Verification Analysis

☐ No optional analyses performed, the project will avoid critical coarse sediment yield areas identified based on WMAA maps

If optional analyses were performed, what is the final result?

☐ No critical coarse sediment yield areas to be protected based on verification of GLUs onsite.

☐ Critical coarse sediment yield areas exist but additional analysis has determined that protection is not required. Documentation attached in Attachment 8 of the SWQMP.

☐ Critical coarse sediment yield areas exist and require protection. The project will implement management measures described in Sections H.2, H.3, and H.4 as applicable, and the areas are identified on the SWQMP Exhibit.

Discussion / Additional Information:

Step 2.7.2: Flow Control for Post-Project Runoff

Site Information Checklist for PDPs	Form I 2a

☐ **N/A - This Section only required if hydromodification management requirements apply**

List and describe point(s) of compliance (POCs) for flow control for hydromodification management (see Section 6.3.1). For each POC, provide a POC identification name or number correlating to the project's HMP Exhibit and a receiving channel identification name or number correlating to the project's HMP Exhibit.

Project has 3 points of compliance. POC 1: existing drainage channel flowing westerly along El Norte. POC 2: Existing U/G Storm drain at El Norte and Iris. POC 3: The eastern property line, POC 3 is not used in the proposed condition as all storm water is now routed to POC 2.

Has a geomorphic assessment been performed for the receiving channel(s)?

- ☒ No, the low flow threshold is 0.1Q2 (default low flow threshold)
- ☐ Yes, the result is the low flow threshold is 0.1Q2
- ☐ Yes, the result is the low flow threshold is 0.3Q2
- ☐ Yes, the result is the low flow threshold is 0.5Q2

If a geomorphic assessment has been performed, provide title, date, and preparer:

Discussion / Additional Information: (optional)

Select method used to determine low flow threshold:

- ☐ Sizing Factor Method
- ☐ US Geological Survey (USGS) Equation
- ☒ Continuous Simulation Modeling

Step 2.8: Other Site Requirements and Constraints

Site Information Checklist for PDPs	Form I-2a
When applicable, list other site requirements or constraints that will influence storm water management design, such as zoning requirements including setbacks and open space, or local codes governing minimum street width, sidewalk construction, allowable pavement types, and drainage requirements.	
Optional Additional Information or Continuation of Previous Sections As Needed	
This space provided for additional information or continuation of information from previous sections as needed.	

Step 3: Source Control BMP Checklist

Source Control BMP Checklist for PDPs	Form I 2b

All development projects must implement source control BMPs 4.2.1 through 4.2.6 where applicable and feasible. See Chapter 4.2 and Appendix E of the City Storm Water Design Manual for information to implement source control BMPs shown in this checklist. The following checklists serve as guides only. Mark what elements are included in your project. See Storm Water Design Manual Chapter 4 and Appendix E for more information on determining appropriate BMPs for your project.

Answer each category below pursuant to the following:

- "Yes" means the project will implement the source control BMP as described in Chapter 4.2 and/or Appendix E of the City Storm Water Design Manual. Discussion / justification is not required.
- "No" means the BMP is applicable to the project but it is not feasible to implement. Discussion / justification must be provided.
- "N/A" means the BMP is not applicable at the project site because the project does not include the feature that is addressed by the BMP (e.g., the project has no outdoor materials storage areas). Discussion / justification must be provided.

Source Control Requirement	Applied?		
4.2.1 Prevention of Illicit Discharges into the MS4	▣ Yes	☐ No	☐ N/A
Discussion / justification if 4.2.1 not implemented:			
4.2.2 Storm Drain Stenciling or Signage	▣ Yes	☐ No	☐ N/A
Discussion / justification if 4.2.2 not implemented:			
4.2.3 Protect Outdoor Materials Storage Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	▣ Yes	☐ No	☐ N/A
Discussion / justification if 4.2.3 not implemented:			
4.2.4 Protect Materials Stored in Outdoor Work Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	▣ Yes	☐ No	☐ N/A
Discussion / justification if 4.2.4 not implemented:			
4.2.5 Protect Trash Storage Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	▣ Yes	☐ No	☐ N/A
Discussion / justification if 4.2.5 not implemented:			

Form I-2b Page 2 of 2			
Source Control Requirement	**Applied.**		
4.2.6 Additional BMPs Based on Potential Sources of Runoff Pollutants (must answer for each source listed below):			
☐ Onsite storm drain inlets	■ Yes	☐ No	☐ N/A
☐ Interior floor drains and elevator shaft sump pumps	☐ Yes	☐ No	■ N/A
☐ Interior parking garages	☐ Yes	☐ No	■ N/A
☐ Need for future indoor & structural pest control	■ Yes	☐ No	☐ N/A
☐ Landscape/outdoor pesticide use	■ Yes	☐ No	☐ N/A
☐ Pools, spas, ponds, decorative fountains, and other water features	■ Yes	☐ No	☐ N/A
☐ Food service	☐ Yes	■ No	■ N/A
☐ Refuse areas	☐ Yes	☐ No	■ N/A
☐ Industrial processes	☐ Yes	☐ No	■ N/A
☐ Outdoor storage of equipment or materials	☐ Yes	☐ No	■ N/A
☐ Vehicle and equipment cleaning	☐ Yes	☐ No	■ N/A
☐ Vehicle/equipment repair and maintenance	☐ Yes	☐ No	■ N/A
☐ Fuel dispensing areas	☐ Yes	☐ No	■ N/A
☐ Loading docks	☐ Yes	☐ No	■ N/A
☐ Fire sprinkler test water	☐ Yes	☐ No	■ N/A
☐ Miscellaneous drain or wash water	☐ Yes	☐ No	■ N/A
☐ Plazas, sidewalks, and parking lots	■ Yes	☐ No	☐ N/A
Discussion / justification if 4.2.6 not implemented. Clearly identify which sources of runoff pollutants are discussed. Justification must be provided for <u>all</u> "No" answers shown above.			

Note: Show all source control measures described above that are included in design capture volume calculations in the plan sheets of Attachment 5.

Step 4: Site Design BMP Checklist

Site Design BMP Checklist for PDPs	Form I 2c

All development projects must implement site design BMPs SD-1 through SD-8 where applicable and feasible. See Chapter 4 and Appendix E of the manual for information to implement site design BMPs shown in this checklist.

Answer each category below pursuant to the following.

- "Yes" means the project will implement the site design BMP as described in Chapter 4 and/or Appendix E of the manual. Discussion / justification is not required.
- "No" means the BMP is applicable to the project but it is not feasible to implement. Discussion / justification must be provided.
- "N/A" means the BMP is not applicable at the project site because the project does not include the feature that is addressed by the BMP (e.g., the project site has no existing natural areas to conserve). Discussion / justification must be provided.

Site Design Requirement	Applied?		
4.3.1 Maintain Natural Drainage Pathways and Hydrologic Features	■ Yes	☐ No	☐ N/A
Discussion / justification if 4.3.1 not implemented:			
1-1 Are existing natural drainage pathways and hydrologic features mapped on the site map?	■ Yes	☐ No	☐ N/A
1-2 Are trees implemented? If yes, are they shown on the site map?	☐ Yes	☐ No	■ N/A
1-3 Implemented trees meet the design criteria in 4.3.1 Fact Sheet (e.g. soil volume, maximum credit, etc.)?	☐ Yes	☐ No	■ N/A
1-4 Is tree credit volume calculated using Appendix B.2.2.1 and SD-1 Fact Sheet in Appendix E?	☐ Yes	☐ No	■ N/A
4.3.2 Conserve Natural Areas, Soils, and Vegetation	■ Yes	■ No	☐ N/A
Discussion / justification if 4.3.2 not implemented:			
Majority of the site will be disturbed by grading operations. New landscape per landscaping plans.			
4.3.3 Minimize Impervious Area	■ Yes	☐ No	☐ N/A
Discussion / justification if 4.3.3 not implemented:			
4.3.4 Minimize Soil Compaction	■ Yes	☐ No	☐ N/A
Discussion / justification if 4.3.4 not implemented:			

Form I-2c Page 2 of 2			
Site Design Requirement	**Applied.**		
4.3.5 Impervious Area Dispersion	■ Yes	☐ No	☐ N/A
Discussion / justification if 4.3.5 not implemented:			
5-1 Is the pervious area receiving runon from impervious area identified on the site map?	■ Yes	☐ No	☐ N/A
5-2 Does the pervious area satisfy the design criteria in 4.3.5. Fact Sheet in Appendix E (e.g. maximum slope, minimum length, etc.)	■ Yes	☐ No	☐ N/A
5-3 Is impervious area dispersion credit volume calculated using Appendix B.2.1.1 and 4.3.5 Fact Sheet in Appendix E?	☐ Yes	☐ No	■ N/A
4.3.6 Runoff Collection	■ Yes	☐ No	☐ N/A
Discussion / justification if 4.3.6 not implemented:			
6a-1 Are green roofs implemented in accordance with design criteria in 4.3.6A Fact Sheet? If yes, are they shown on the site map?	☐ Yes	■ No	☐ N/A
6a-2 Is the green roof credit volume calculated using Appendix B.2.1.2 and 4.3.6A Fact Sheet in Appendix E?	☐ Yes	☐ No	■ N/A
6b-1 Are permeable pavements implemented in accordance with design criteria in 4.3.6B Fact Sheet? If yes, are they shown on the site map?	☐ Yes	☐ No	■ N/A
6b-2 Is the permeable pavement credit volume calculated using Appendix B.2.1.3 and 4.3.6B Fact Sheet in Appendix E?	☐ Yes	☐ No	■ N/A
4.3.7 Landscaping with Native or Drought Tolerant Species	■ Yes	☐ No	☐ N/A
Discussion / justification if 4.3.7 not implemented:			
4.3.8 Harvesting and Using Precipitation	☐ Yes	■ No	☐ N/A
Discussion / justification if 4.3.8 not implemented:			
8-1 Are rain barrels implemented in accordance with design criteria in 4.3.8 Fact Sheet? If yes, are they shown on the site map?	☐ Yes	☐ No	■ N/A
8-2 Is the rain barrel credit volume calculated using Appendix B.2.2.2 and 4.3.8 Fact Sheet in Appendix E?	☐ Yes	☐ No	■ N/A

Note: Show all site design measures described above that are included in design capture volume calculations in the plan sheets of Attachment 5.

Step 5: Summary of Structural BMPs

Summary of Structural BMPs	Form I-3

PDP Structural BMPs

All PDPs must implement structural BMPs for storm water pollutant control (see Chapter 5 of the manual). Selection of PDP structural BMPs for storm water pollutant control must be based on the selection process described in Chapter 5. PDPs subject to hydromodification management requirements must also implement structural BMPs for flow control for hydromodification management (see Chapter 6 of the manual). Both storm water pollutant control and flow control for hydromodification management can be achieved within the same structural BMP(s).

PDP structural BMPs must be verified by the local jurisdiction at the completion of construction. This may include requiring the project owner or project owner's representative to certify construction of the structural BMPs (see Section 1.12 of the manual). PDP structural BMPs must be maintained into perpetuity, and the local jurisdiction must confirm the maintenance (see Section 7 of the manual).

Use this form to provide narrative description of the general strategy for structural BMP implementation at the project site in the box below. Then complete the PDP structural BMP summary information sheet (page 3 of this form) for each structural BMP within the project (copy the BMP summary information page as many times as needed to provide summary information for each individual structural BMP).

Description of Structural BMP Strategy

Describe the general strategy for structural BMP implementation at the site. This information must describe how the steps for selecting and designing storm water pollutant control BMPs presented in Section 5.1 of the manual were followed, and the results (type of BMPs selected). For projects requiring hydromodification flow control BMPs, indicate whether pollutant control and flow control BMPs are integrated or separate.

The BMP feasibility analysis (Worksheet B.3-1) was performed and the results were that Biofiltration BMPs be implemented. The anticipated demand for the project to implement capture and reuse was less than was was available. Furthermore, the site consists of hydro-logic soil C, which provides low infiltration rates, therefore infiltration was deemed infeasible. (Infiltration testing will be performed during final engineering).

Partial retention of water in type C soil has the potential to undermine the structural stability of the building walls. Harvest and reuse was considered but determined to be impractical due to the space constraints and lack of demand.
Runoff from rooftops and impervious areas are collected and directed to a biolfiltration basin for treatment and hydromodification management. The biofiltration (BF-2) will be lined. A portion of the driveway from El Norte Parkway will be captured and treated through the use of a proprietary storm water treatment unit, Filterra (BF-3).

(Continue on page 2 as necessary.)

Form I-3 Page 2 of 3
(Page reserved for continuation of description of general strategy for structural BMP implementation at the site)
(Continued from page 1)

Form I-3 Page 3 of 3

Structural BMP Summary Information

(Copy this page as needed to provide information for each individual proposed structural BMP)

Structural BMP ID No. BMP #1

Construction Plan Sheet No. DMA Map/HMP Exhibit (Sheet 4)

Type of structural BMP:

☐Retention by harvest and use (HU-1)
☐Retention by infiltration basin (INF-1)
☐Retention by bioretention (INF-2)
☐Retention by permeable pavement (INF-3)
☐Retention by dry wells (INF-4)
☐Partial retention by biofiltration with partial retention (PR-1)
☐Biofiltration (BF-1)
■Biofiltration with Nutrient Sensitive Media Design (BF-2)
☐Proprietary Biofiltration (BF-3) meeting all requirements of Appendix F
☐Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below)
☐Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below)
☐Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below)
☐Detention pond or vault for hydromodification management
☐Other (describe in discussion section below)

Purpose:

☐Pollutant control only
☐Hydromodification control only
■Combined pollutant control and hydromodification control
☐Pre-treatment/forebay for another structural BMP
☐Other (describe in discussion section below)

Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification forms (See Section 8.2.3.2 of the Storm Water Design Manual)	Property owner to contract third party during final engineering.
Who will be the final owner of this BMP?	■HOA ☐Property Owner ☐City ☐Other (describe)
Who will maintain this BMP into perpetuity?	■HOA ☐Property Owner ☐City ☐Other (describe)

Discussion (as needed):

Form I-3 Page 3 of 3

Structural BMP Summary Information

(Copy this page as needed to provide information for each individual proposed structural BMP)

Structural BMP ID No. BMP #2 (Filterra)

Construction Plan Sheet No. DMA Map/HMP Exhibit (Sheet 4)

Type of structural BMP:

☐Retention by harvest and use (HU-1)
☐Retention by infiltration basin (INF-1)
☐Retention by bioretention (INF-2)
☐Retention by permeable pavement (INF-3)
☐Retention by dry wells (INF-4)
☐Partial retention by biofiltration with partial retention (PR-1)
☐Biofiltration (BF-1)
☐Biofiltration with Nutrient Sensitive Media Design (BF-2)
■Proprietary Biofiltration (BF-3) meeting all requirements of Appendix F
☐Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below)
☐Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below)
☐Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below)
☐Detention pond or vault for hydromodification management
☐Other (describe in discussion section below)

Purpose:

■Pollutant control only
☐Hydromodification control only
☐Combined pollutant control and hydromodification control
☐Pre-treatment/forebay for another structural BMP
☐Other (describe in discussion section below)

Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification forms (See Section 8.2.3.2 of the Storm Water Design Manual)	Property owner to contract third party during final engineering.
Who will be the final owner of this BMP?	■HOA ☐Property Owner ☐City ☐Other (describe)
Who will maintain this BMP into perpetuity?	■HOA ☐Property Owner ☐City ☐Other (describe)

Discussion (as needed):

Step 5.1: Offsite Alternative Compliance Participation Form

THIS FORM IS NOT APPLICABLE AT THIS TIME: An Alternative Compliance Program is under consideration by the City of Escondido.	
PDP INFORMATION	
Record ID:	N/A
Assessor's Parcel Number(s) [APN(s)]	
What are your PDP Pollutant Control Debits? *See Attachment 1 of the PDP SWQMP	
What are your PDP HMP Debits? (if applicable) *See Attachment 2 of the PDP SWQMP	
ACP Information	
Record ID:	
Assessor's Parcel Number(s) [APN(s)]	
Project Owner/Address	
What are your ACP Pollutant Control Credits? *See Attachment 1 of the ACP SWQMP	
What are your ACP HMP Debits? (if applicable) *See Attachment 2 of the ACP SWQMP	
Is your ACP in the same watershed as your PDP? ☐Yes ☐No	Will your ACP project be completed prior to the completion of the PDP? ☐Yes ☐No
Does your ACP account for all Deficits generated by the PDP? ☐Yes ☐No (PDP and/or ACP must be redesigned to account for all deficits generated by the PDP.)	What is the difference between your PDP debits and ACP Credits? *(ACP Credits -Total PDP Debits = Total Earned Credits) _____

ATTACHMENT 1

BACKUP FOR PDP POLLUTANT CONTROL BMPS

This is the cover sheet for Attachment 1.

Indicate which Items are Included behind this cover sheet:

Attachment Sequence	Contents	Checklist
Attachment 1a	Storm Water Pollutant Control Worksheet Calculations -Worksheet B.1-DMA Summary (Optional) -Worksheet B.2-1- DCV (Required) -Worksheet B.3-1- H&U Checklist (Required) -Worksheet B.4-1-Simple Sizing Inf. (if applicable) -Worksheet B.5-1-Biofilt. Sizing (Pollutant)(if applicable) -Worksheet B.5-2-Biofilt. Sizing (Volume) (if applicable) -Worksheet B.5-3-Biofilt. Volume Ret. (if applicable) -Worksheet B.5-4-Biofilt. Alt. Min. Footprint(if applicable) -Worksheet B.5-5-Biofilt. w/Upstream Stor. (if applicable) -Worksheet B.5-6-Biofilt. Ret. No Inf. (if applicable) -Worksheet B.5-7-Vol. Ret. Amended Soils (if applicable) -Worksheet B.6-1-Flow-Thru Design Flow (if applicable) -Form I-10-Compact Biofilt. Checklist (if applicable) -Summary Worksheet (optional)	☐ Worksheet B.1 (Optional) ■ Worksheet B.2-1 (Required) ■ Worksheet B.3-1 (Required) ☐ Worksheet B.4-1 (if applicable) ■ Worksheet B.5-1 (if applicable) ■ Worksheet B.5-2 (if applicable) ☐ Worksheet B.5-3 (if applicable) ■ Worksheet B.5-4 (if applicable) ☐ Worksheet B.5-5 (if applicable) ☐ Worksheet B.5-6 (if applicable) ☐ Worksheet B.5-7 (if applicable) ☐ Worksheet B.6-1 (if applicable) ■ Form I-10 (if applicable) ☐ Summary Worksheet (optional)
Attachment 1b	-Worksheet C.4-1 (Form I-8A), Categorization of Infiltration Feasibility Condition Based on Geotechnical Conditions -Worksheet C.4-2 (Form I-8B), Categorization of Infiltration Feasibility Condition based on Groundwater and Water Balance Conditions (Required unless the project will use harvest and use BMPs, or an Infiltration Feasibility Condition Letter is submitted) Refer to Appendices C and D of the Storm Water Design Manual to complete Form I-8.	To be provided at Final Engineering by Geotechnical Engineer. Infiltration is assumed to be infeasible due to slope stability analysis.
Attachment 1c	Form I-9, Factor of Safety and Design Infiltration Rate Worksheet (Required unless the project will use harvest and use BMPs, or an Infiltration Feasibility Condition Letter is submitted) Refer to Appendices C and D of the Storm Water Design Manual to complete Form I-9.	To be provided at Final Engineering by Geotechnical Engineer. Infiltration is assumed to be infeasible due to slope stability analysis.
Attachment 1d	DMA Exhibit (Required) See DMA Exhibit Checklist on the back of this Attachment cover sheet.	■Included
Attachment 1e	Individual Structural BMP DMA Mapbook (Required) -Place each map on 8.5"x11" paper. -Show at a minimum the DMA, Structural BMP, and any existing hydrologic features within the DMA.	To be provided at Final Engineering.

Use this checklist to ensure the required information has been included on the DMA Exhibit:

The DMA Exhibit must identify:

- ▣ Proposed design features and surface treatments used to minimize imperviousness
- ▣ Drainage management area (DMA) boundaries, DMA ID numbers, and DMA areas (square footage or acreage), and DMA type (i.e., drains to BMP, self-retaining, or self-mitigating)
- ▣ Potential pollutant source areas and corresponding required source controls (see Chapter 4, Appendix E.1, and Step 3.5)
- ▣ Structural BMPs (identify location, structural BMP ID#, type of BMP, and size/detail)
- ▣ Flow direction arrows
- ▣ Site Design BMPs used for volume reduction credits
- ▣ Existing and proposed site drainage network and connections to drainage offsite
- ▣ Trash Enclosure(s), if available
- ▣ Roof downspouts

Additionally, it is generally best practice (and the City may require) that these additional features listed below be included on the DMA Exhibit:

- ▣ Approximate depth to groundwater
- ▣ Existing natural hydrologic features (watercourses, seeps, springs, wetlands)
- ▣ Critical coarse sediment yield areas to be protected
- ▣ Existing topography and impervious areas
- ▣ Proposed grading
- ▣ Proposed impervious features

Worksheet B.2-1. BMP Design Capture Volume

Design Capture Volume		Worksheet B-2.1		
1	85th percentile 24-hr storm depth from Figure B.1-1	d=	.82	inches
2	Area tributary to BMP (s)	A=	3.57	acres
3	Area weighted runoff factor (estimate using Appendix B.1.1 and B.2.1)	C=	0.68	unitless
4	Tree well volume reduction	TCV=	0	cubic-feet
5	Rain barrels volume reduction	RCV=	0	cubic-feet
6	Calculate DCV = (3630 x C x d x A) – TCV - RCV	DCV=	7,225	cubic-feet

Worksheet B.3-1. Harvest and Use Feasibility Checklist (Form I-7)

Harvest and Use Feasibility Checklist	Worksksheet B.3-1

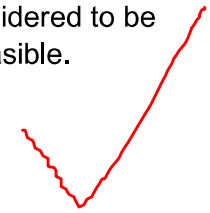
1. Is there a demand for harvested water (check all that apply) at the project site that is reliably present during the wet season?
- ☒ Toilet and urinal flushing
- ☒ Landscape irrigation
- ☐ Other:_____

2. If there is a demand; estimate the anticipated average wet season demand over a period of 36 hours. Guidance for planning level demand calculations for toilet/urinal flushing and landscape irrigation is provided in Section B.3.2.

Assumed N/A, will confirm during final engineering.

3. Calculate the DCV using worksheet B-2.1.

7,225

3a. Is the 36-hour demand greater than or equal to the DCV?	3b. Is the 36-hour demand greater than 0.25DCV but less than the full DCV?	3c. Is the 36-hour demand less than 0.25DCV?
Yes / No ⇨ ⇩	Yes / No ⇨ ⇩	Yes ⇩
Harvest and use appears to be feasible. Conduct more detailed evaluation and sizing calculations to confirm that DCV can be used at an adequate rate to meet drawdown criteria.	Harvest and use may be feasible. Conduct more detailed evaluation and sizing calculations to determine feasibility. Harvest and use may only be able to be used for a portion of the site, or (optionally) the storage may need to be upsized to meet long term capture targets while draining in longer than 36 hours.	Harvest and use is considered to be infeasible. 

Note: 36-hour demand calculations are for feasibility analysis only. Once feasibility analysis is complete the applicant may be allowed to use a different drawdown time provided they meet the 80% annual capture standard (refer to B.4.2) and 96-hour vector control drawdown requirement.

ESCONDIDO City of Choice	Project Name	Parkview Townhomes	
	BMP ID	BMP#1	
Sizing Method for Pollutant Removal Criteria		**Worksheet B.5-1**	
1	Area draining to the BMP	155509	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.68	
3	85th percentile 24-hour rainfall depth	0.82	inches
4	Design capture volume [Line 1 x Line 2 x (Line 3/12)]	7226	cu. ft.
BMP Parameters			
5	Surface ponding [6 inch minimum, 12 inch maximum]	18	inches
6	Media thickness [18 inches minimum], also add mulch layer and washed ASTM 33 fine aggregate sand thickness to this line for sizing calculations	21	inches
7	Aggregate storage (also add ASTM No 8 stone) above underdrain invert (12 inches typical) – use 0 inches if the aggregate is not over the entire bottom surface area	42	inches
8	Aggregate storage below underdrain invert (3 inches minimum) – use 0 inches if the aggregate is not over the entire bottom surface area	3	inches
9	Freely drained pore storage of the media	0.2	in/in
10	Porosity of aggregate storage	0.4	in/in
11	Media filtration rate to be used for sizing (maximum filtration rate of 5 in/hr. with no outlet control; if the filtration rate is controlled by the outlet use the outlet controlled rate (includes infiltration into the soil and flow rate through the outlet structure) which will be less than 5 in/hr.)	0.36	in/hr.
Baseline Calculations			
12	Allowable routing time for sizing	6	hours
13	Depth filtered during storm [Line 11 x Line 12]	2.16	inches
14	Depth of Detention Storage [Line 5 + (Line 6 x Line 9) + (Line 7 x Line 10) + (Line 8 x Line 10)]	40.2	inches
15	Total Depth Treated [Line 13 + Line 14]	42.36	inches
Option 1 – Biofilter 1.5 times the DCV			
16	Required biofiltered volume [1.5 x Line 4]	10839	cu. ft.
17	Required Footprint [Line 16/ Line 15] x 12	3071	sq. ft.
Option 2 - Store 0.75 of remaining DCV in pores and ponding			
18	Required Storage (surface + pores) Volume [0.75 x Line 4]	5419	cu. ft.
19	Required Footprint [Line 18/ Line 14] x 12	1618	sq. ft.
Footprint of the BMP			
20	BMP Footprint Sizing Factor (Default 0.03 or an alternative minimum footprint sizing factor from Line 11 in Worksheet B.5-4)	0.025	
21	Minimum BMP Footprint [Line 1 x Line 2 x Line 20]	2644	sq. ft.
22	Footprint of the BMP = Maximum(Minimum(Line 17, Line 19), Line 21)	2644	sq. ft.
23	Provided BMP Footprint	3042	sq. ft.
24	Is Line 23 ≥ Line 22?	**Yes, Performance Standard is Met**	

ESCONDIDO City of Choice	Project Name	Parkview Townhomes	
	BMP ID	BMP#1	
Sizing Method for Volume Retention Criteria		Worksheet B.5-2	
1	Area draining to the BMP	155509	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.68	
3	85th percentile 24-hour rainfall depth	0.82	inches
4	Design capture volume [Line 1 x Line 2 x (Line 3/12)]	7226	cu. ft.
Volume Retention Requirement			
5	Measured infiltration rate in the DMA Note: When mapped hydrologic soil groups are used enter 0.10 for NRCS Type D soils and for NRCS Type C soils enter 0.30 When in no infiltration condition and the actual measured infiltration rate is unknown enter 0.0 if there are geotechnical and/or groundwater hazards identified in Appendix C or enter 0.05	0.05	in/hr.
6	Factor of safety	2	
7	Reliable infiltration rate, for biofiltration BMP sizing [Line 5 / Line 6]	0.025	in/hr.
8	Average annual volume reduction target (Figure B.5-2) When Line 7 > 0.01 in/hr. = Minimum (40, 166.9 x Line 7 +6.62) When Line 7 ≤ 0.01 in/hr. = 3.5%	10.8	%
9	Fraction of DCV to be retained (Figure B.5-3) When Line 8 > 8% = 0.0000013 x Line 8^3 - 0.000057 x Line 8^2 + 0.0086 x Line 8 - 0.014 When Line 8 ≤ 8% = 0.023	0.074	
10	Target volume retention [Line 9 x Line 4]	535	cu. ft.

ESCONDIDO City of Choice	Project Name	Parkview Townhomes	
	BMP ID	BMP#1	
Alternative Minimum Footprint Sizing Factor for Non-Standard Biofiltration		**Worksheet B.5-4**	
1	Area draining to the BMP	155509	sq. ft.
2	Adjusted Runoff Factor for drainage area (Refer to Appendix B.1 and B.2)	0.68	
3	Load to Clog (default value when using Appendix E fact sheets is 2.0)	2	lb/sq. ft.
4	Allowable Period to Accumulate Clogging Load (T_L) (default value is 10)	10	years

Volume Weighted EMC Calculation

Land Use	Fraction of Total DCV	TSS EMC (mg/L)	Product
Single Family Residential		123	0
Commercial		128	0
Industrial		125	0
Education (Municipal)		132	0
Transportation		78	0
Multi-family Residential	0.9	40	36
Roof Runoff		14	0
Low Traffic Areas		50	0
Open Space	0.1	216	21.6
Other, specify:			0
Other, specify:			0
Other, specify:			0

5	Volume Weighted EMC (sum of all products)	57.6	mg/L

Sizing Factor for Clogging

6	Adjustment for pretreatment measures Where: Line 6 = 0 if no pretreatment; Line 6 = 0.25 when pretreatment is included; Line 6 = 0.5 if the pretreatment has an active Washington State TAPE approval rating for "pre-treatment."	0	
7	Average Annual Precipitation [Provide documentation of the data source in the discussion box; SanGIS has a GIS layer for average annual precipitation]	16.8	inches
8	Calculate the Average Annual Runoff (Line 7/12) x Line 1 x Line2	148045	cu-ft/yr
9	Calculate the Average Annual TSS Load (Line 8 x 62.4 x Line 5 x (1 – Line 6))/10^6	532	lb/yr
10	Calculate the BMP Footprint Needed (Line 9 x Line 4)/Line 3	2661	sq. ft.
11	Calculate the Minimum Footprint Sizing Factor for Clogging [Line 10/ (Line 1 x Line 2)]	0.025	

Discussion:

Form I-10: Compact (high rate) Biofiltration BMP Checklist

Compact (high rate) Biofiltration BMP Checklist	Form I-10

Compact (high rate) biofiltration BMPs have a media filtration rate greater than 5 in/hr. and a media surface area smaller than 3% of contributing area times adjusted runoff factor. Compact biofiltration BMPs are typically proprietary BMPs that may qualify as biofiltration.

A compact biofiltration BMP may satisfy the pollutant control requirements for a DMA onsite in some cases. This depends on the characteristics of the DMA and the performance certification/data of the BMP. If the pollutant control requirements for a DMA are met onsite, then the DMA is not required to participate in an offsite storm water alternative compliance program to meet its pollutant control obligations.

An applicant using a compact biofiltration BMP to meet the pollutant control requirements onsite must complete Section 1 of this form and include it in the PDP SWQMP. A separate form must be completed for each DMA. In instances where the City Engineer does not agree with the applicant's determination, Section 2 of this form will be completed by the City and returned to the applicant.

Section 1: Biofiltration Criteria Checklist (Appendix F)

Refer to Part 1 of the Storm Water Standards to complete this section. When separate forms/worksheets are referenced below, the applicant must also complete these separate forms/worksheets (as applicable) and include in the PDP SWQMP. The criteria numbers below correspond to the criteria numbers in Appendix F.

Criteria	Answer	Progression
Criteria 1 and 3: What is the infiltration condition of the DMA? Refer to Section 5.4.2 and Appendix C of the BMP Design Manual (Part 1 of Storm Water Standards) for guidance. Applicant must complete and include the following in the PDP SWQMP submittal to support the feasibility determination: • Infiltration Feasibility Condition Letter; or • Worksheet C.4-1: Form I-8A and Worksheet C.4-2: Form I- 8B. Applicant must complete and include all applicable sizing worksheets in the SWQMP submittal	☐ Full Infiltration Condition	**Stop**. Compact biofiltration BMP is not allowed.
	☐ Partial Infiltration Condition	Compact biofiltration BMP is only allowed, if the target volume retention is met onsite (Refer to Table B.5-1 in Appendix B.5). Use Worksheet B.5- 2 in Appendix B.5 to estimate the target volume retention (Note: retention in this context means reduction). If the required volume reduction is achieved **proceed to Criteria 2**. If the required volume reduction is not achieved, compact biofiltration BMP is not allowed. **Stop**.
	☑ No Infiltration Condition	Compact biofiltration BMP is allowed if volume retention criteria in Table B.5-1 in Appendix B.5 for the no infiltration condition is met. Compliance with this criterion must be documented in the PDP SWQMP. If the criteria in Table B.5-1 is met **proceed to Criteria 2**. If the criteria in Table B.5-1 is not met, compact biofiltration BMP is not allowed. **Stop**.

Compact (high rate) Biofiltration BMP Checklist	Form I-10
Provide basis for Criteria 1 and 3:	
Feasibility Analysis: Summarize findings and include either infiltration feasibility condition letter or Worksheet C.4-1: Form I-8A and Worksheet C.4-2: Form I-8B in the PDP SWQMP submittal.	
Infiltration feasibility will be performed during the preparation of Grading and improvements plans (Final engineering).	
If Partial Infiltration Condition: Provide documentation that target volume retention is met (include Worksheet B.5-2 in the PDP SWQMP submittal). Worksheet B.5-7 in Appendix B.5 can be used to estimate volume retention benefits from landscape areas.	
Worksheet B.5-2 provided.	
If No Infiltration Condition: Provide documentation that the volume retention performance standard is met (include Worksheet B.5-2 in the PDP SWQMP submittal) in the PDP SWQMP submittal. Worksheet B.5-6 in Appendix B.5 can be used to document that the performance standard is met.	

Criteria	Answer	Progression
Criteria 2: Is the compact biofiltration BMP sized to meet the performance standard from the MS4 Permit? Refer to Appendix B.5 and Appendix F.2 of the BMP Design Manual (Part 1 of Storm Water Standards) for guidance.	☑ Meets Flow Based Criteria	Use guidance from **Appendix F.2.2** to size the compact biofiltration BMP to meet the flow based criteria. Include the calculations in the PDP SWQMP. Use parameters for sizing consistent with manufacturer guidelines and conditions of its third party certifications (i.e. a BMP certified at a loading rate of 1 gpm/sq. ft. cannot be designed using a loading rate of 1.5 gpm/sq. ft.) **Proceed to Criteria 4.**
	☐ Meets Volume Based Criteria	Provide documentation that the compact biofiltration BMP has a total static (i.e. non-routed) storage volume, including pore-spaces and pre-filter detention volume (Refer to Appendix B.5 for a schematic) of at least 0.75 times the portion of the DCV not reliably retained onsite. **Proceed to Criteria 4.**
	☐ Does not Meet either	**Stop**. Compact biofiltration BMP is not allowed.

Compact (high rate) Biofiltration BMP Checklist	Form I-10

Provide basis for Criteria 2:
Provide documentation that the BMP meets the numeric criteria and is designed consistent with the manufacturer guidelines and conditions of its third-party certification (i.e., loading rate, etc., as applicable).

Criteria	Answer	Progression
Criteria 4: Does the compact biofiltration BMP meet the pollutant treatment performance standard for the projects most significant pollutants of concern? Refer to Appendix B.6 and Appendix F.1 of the BMP Design Manual (Part 1 of Storm Water Standards) for guidance.	☑ Yes, meets the TAPE certification.	Provide documentation that the compact BMP has an appropriate TAPE certification for the projects most significant pollutants of concern. **Proceed to Criteria 5.**
	☐ Yes, through other third-party documentation.	Acceptance of third-party documentation is at the discretion of the City Engineer. The City engineer will consider, (a) the data submitted; (b) representativeness of the data submitted; and (c) consistency of the BMP performance claims with pollutant control objectives in Table F.1-2 and Table F.1-1 while making this determination. If a compact biofiltration BMP is not accepted, a written explanation/ reason will be provided in Section 2. **Proceed to Criteria 5.**
	☐ No	**Stop**. Compact biofiltration BMP is not allowed.

Provide basis for Criteria 4:
Provide documentation that identifies the projects most significant pollutants of concern and TAPE certification or other third party documentation that shows that the compact biofiltration BMP meets the pollutant treatment performance standard for the projects most significant pollutants of concern.

The Filterra has the highest level of approval (GULD) through the TAPE protocol for Basic Treatment (TSS), Enhanced Treatment (Dissolved Metals), Phosphorous Treatment, and Oil Treatment (see attached TAPE approval).

Compact (high rate) Biofiltration BMP Checklist		Form I 10
Criteria	**Answer**	**Progression**
Criteria 5: Is the compact biofiltration BMP designed to promote appropriate biological activity to support and maintain treatment process? Refer to Appendix F of the BMP Design Manual (Part 1 of Storm Water Standards) for guidance.	☑ Yes	Provide documentation that the compact biofiltration BMP support appropriate biological activity. Refer to Appendix F for guidance. **Proceed to Criteria 6.**
	☐ No	**Stop**. Compact biofiltration BMP is not allowed.
Provide basis for Criteria 5: Provide documentation that appropriate biological activity is supported by the compact biofiltration BMP to maintain treatment process.		
All Filterra units include vegetation in their design which meets the requirements of "appropriate biological activity". Specifiers are provided a pre-approved list of plants suitable for use within the Filterra in San Diego's semi-arid climate. The Landscape Architect or Engineer of Record are responsible for the actual plant chosen for use within the Filterra.		
Criteria	**Answer**	**Progression**
Criteria 6: Is the compact biofiltration BMP designed with a hydraulic loading rate to prevent erosion, scour and channeling within the BMP?	☑ Yes	Provide documentation that the compact biofiltration BMP is used in a manner consistent with manufacturer guidelines and conditions of its third-party certification. **Proceed to Criteria 7.**
	☐ No	**Stop**. Compact biofiltration BMP is not allowed.
Provide basis for Criteria 6: Provide documentation that the BMP meets the numeric criteria and is designed consistent with the manufacturer guidelines and conditions of its third-party certification (i.e., maximum tributary area, maximum inflow velocities, etc., as applicable).		
All Filterras are designed with the following parameters to prevent erosion, scour, and channeling: 1. Dispersion stones or pavers are placed at all inlet locations into the Filterra biofiltration bay. 2. Peak flows in excess of the required treatment flow are bypassed around the Filterra biofiltration bay. For offline systems the bypass flows are diverted to the adjacent driveway, out to the curbline on El Norte Parkway and eventually enter existing curb inlet at El Norte and Iris.		

Compact (high rate) Biofiltration BMP Checklist		Form I-10
Criteria	**Answer**	**Progression**
Criteria 7: Is the compact biofiltration BMP maintenance plan consistent with manufacturer guidelines and conditions of its third-party certification (i.e., maintenance activities, frequencies)?	☑ Yes, and the compact BMP is privately owned, operated and not in the public right of way.	Submit a maintenance agreement that will also include a statement that the BMP will be maintained in accordance with manufacturer guidelines and conditions of third-party certification. **Stop**. The compact biofiltration BMP meets the required criteria.
	☐ Yes, and the BMP is either owned or operated by the City or in the public right of way.	Approval is at the discretion of the City Engineer. The city engineer will consider maintenance requirements, cost of maintenance activities, relevant previous local experience with operation and maintenance of the BMP type, ability to continue to operate the system in event that the vending company is no longer operating as a business or other relevant factors while making the determination. **Stop**. Consult the City Engineer for a determination.
	☐ No	**Stop**. Compact biofiltration BMP is not allowed.
Provide basis for Criteria 7: Include copy of manufacturer guidelines and conditions of third-party certification in the maintenance agreement. PDP SWQMP must include a statement that the compact BMP will be maintained in accordance with manufacturer guidelines and conditions of third-party certification.		

Compact (high rate) Biofiltration BMP Checklist	Form I-10
Section 1: Biofiltration Criteria Checklist (Appendix F)	
Is the proposed compact BMP accepted by the City Engineer for onsite pollutant control compliance for the DMA?	■ Yes ☐ No, See explanation below
Explanation/reason if the compact BMP is not accepted by the City for onsite pollutant control compliance:	

WASHINGTON STATE DEPARTMENT OF ECOLOGY

February 2020

GENERAL USE LEVEL DESIGNATION FOR BASIC (TSS), ENHANCED, PHOSPHORUS & OIL TREATMENT

For

CONTECH Engineered Solutions Filterra®

Ecology's Decision:

Based on Contech's submissions, including the Final Technical Evaluation Reports, dated August 2019, March 2014, December 2009, and additional information provided to Ecology dated October 9, 2009, Ecology hereby issues the following use level designations:

1. A General Use Level Designation for Basic, Enhanced, Phosphorus, and Oil Treatment for the Filterra® system constructed with a minimum media thickness of 21 inches (1.75 feet), at the following water quality design hydraulic loading rates:

Treatment	Infiltration Rate (in/hr) for use in Sizing
Basic	175
Phosphorus	100
Oil	50
Enhanced	175

2. The Filterra is not appropriate for oil spill-control purposes.
3. Ecology approves Filterra systems for treatment at the hydraulic loading rates listed above, and sized based on the water quality design flow rate for an off-line system. Calculate the water quality design flow rates using the following procedures:

- Western Washington: for treatment installed upstream of detention or retention, the water quality design flow rate is the peak 15-minute flow rate as calculated using the latest version of the Western Washington Hydrology Model or other Ecology-approved continuous runoff model.
- Eastern Washington: For treatment installed upstream of detention or retention, the water quality design flow rate is the peak 15-minute flow rate as calculated using one of the three flow rate based methods described in Chapter 2.2.5 of the Stormwater Management Manual for Eastern Washington (SWMMEW) or local manual.
- Entire State: For treatment installed downstream of detention, the water quality design flow rate is the full 2-year release rate of the detention facility.

4. This General Use Level Designation has no expiration date, but Ecology may revoke or amend the designation, and is subject to the conditions specified below.

Ecology's Conditions of Use:

Filterra systems shall comply with these conditions shall comply with the following conditions:

1. Design, assemble, install, operate, and maintain the Filterra systems in accordance with applicable Contech Filterra manuals and this Ecology Decision.
2. The minimum size filter surface-area for use in Washington is determined by using the design water quality flow rate (as determined in this Ecology Decision, Item 3, above) and the Infiltration Rate from the table above (use the lowest applicable Infiltration Rate depending on the level of treatment required). Calculate the required area by dividing the water quality design flow rate (cu-ft/sec) by the Infiltration Rate (converted to ft/sec) to obtain required surface area (sq-ft) of the Filterra unit.
3. Each site plan must undergo Contech Filterra review before Ecology can approve the unit for site installation. This will ensure that design parameters including site grading and slope are appropriate for use of a Filterra unit.
4. Filterra media shall conform to the specifications submitted to and approved by Ecology and shall be sourced from Contech Engineered Solutions, LLC with no substitutions.
5. Maintenance includes removing trash, degraded mulch, and accumulated debris from the filter surface and replacing the mulch layer. Use inspections to determine the site-specific maintenance schedules and requirements. Follow maintenance procedures given in the most recent version of the Filterra Operation and Maintenance Manual.
6. Maintenance: The required maintenance interval for stormwater treatment devices is often dependent upon the degree of pollutant loading from a particular drainage basin. Therefore, Ecology does not endorse or recommend a "one size fits all" maintenance cycle for a particular model/size of manufactured treatment device.
    - Contech designs Filterra systems for a target maintenance interval of 6 months in the Pacific Northwest. Maintenance includes removing and replacing the mulch layer above the media along with accumulated sediment, trash, and captured organic materials therein, evaluating plant health, and pruning the plant if deemed necessary.
    - Conduct maintenance following manufacturer's guidelines.
7. Filterra systems come in standard sizes.
8. Install the Filterra in such a manner that flows exceeding the maximum Filterra operating rate are conveyed around the Filterra mulch and media and will not resuspend captured sediment.
9. Discharges from the Filterra units shall not cause or contribute to water quality standards violations in receiving waters.

Approved Alternate Configurations

Filterra Internal Bypass - Pipe (FTIB-P)

1. The Filterra® Internal Bypass – Pipe allows for piped-in flow from area drains, grated inlets, trench drains, and/or roof drains. Design capture flows and peak flows enter the structure through an internal slotted pipe. Filterra® inverted the slotted pipe to allow design flows to drop through to a series of splash plates that then disperse the design flows over the top surface of the Filterra® planter area. Higher flows continue to bypass the slotted pipe and convey out the structure.
2. To select a FTIB-P unit, the designer must determine the size of the standard unit using the sizing guidance described above.

Filterra Internal Bypass – Curb (FTIB-C)

1. The Filterra® Internal Bypass –Curb model (FTIB-C) incorporates a curb inlet, biofiltration treatment chamber, and internal high flow bypass in one single structure. Filterra® designed the FTIB-C model for use in a "Sag" or "Sump" condition and will accept flows from both directions along a gutter line. An internal flume tray weir component directs treatment flows entering the unit through the curb inlet to the biofiltration treatment chamber. Flows in excess of the water quality treatment flow rise above the flume tray weir and discharge through a standpipe orifice; providing bypass of untreated peak flows. Americast manufactures the FTIB-C model in a variety of sizes and configurations and you may use the unit on a continuous grade when a single structure providing both treatment and high flow bypass is preferred. The FTIB-C model can also incorporate a separate junction box chamber to allow larger diameter discharge pipe connections to the structure.
2. To select a FTIB-C unit, the designer must determine the size of the standard unit using the sizing guidance described above.

Filterra® Shallow

1. The Filterra Shallow provides additional flexibility for design engineers and designers in situations where various elevation constraints prevent application of a standard Filterra configuration. Engineers can design this system up to six inches shallower than any of the previous Filterra unit configurations noted above.
2. Ecology requires that the Filterra Shallow provide a media contact time equivalent to that of the standard unit. This means that with a smaller depth of media, the surface area must increase.
3. To select a Filterra Shallow System unit, the designer must first identify the size of the standard unit using the modeling guidance described above.
4. Once the size of the standard Filterra unit is established using the sizing technique described above, use information from the following table to select the appropriate size Filterra Shallow System unit.

Shallow Unit Basic, Enhanced, and Oil Treatment Sizing

Standard Depth	Equivalent Shallow Depth
4x4	4x6 or 6x4
4x6 or 6x4	6x6
4x8 or 8x4	6x8 or 8x6
6x6	6x10 or 10x6
6x8 or 8x6	6x12 or 12x6
6x10 or 10x6	13x7

Notes:
1. Shallow Depth Boxes are less than the standard depth of 3.5 feet but no less than 3.0 feet deep (TC to INV).

Applicant: Contech Engineered Solutions, LLC.

Applicant's Address: 11815 NE Glenn Widing Drive
Portland, OR 97220

Application Documents:

- State of Washington Department of Ecology Application for Conditional Use Designation, Americast (September 2006)
- Quality Assurance Project Plan Filterra® Bioretention Filtration System Performance Monitoring, Americast (April 2008)
- Quality Assurance Project Plan Addendum Filterra® Bioretention Filtration System Performance Monitoring, Americast (June 2008)
- Draft Technical Evaluation Report Filterra® Bioretention Filtration System Performance Monitoring, Americast (August 2009)
- Final Technical Evaluation Report Filterra® Bioretention Filtration System Performance Monitoring, Americast (December 2009)
- Technical Evaluation Report Appendices Filterra® Bioretention Filtration System Performance Monitoring, Americast, (August 2009)
- Memorandum to Department of Ecology Dated October 9, 2009 from Americast, Inc. and Herrera Environmental Consultants
- Quality Assurance Project Plan Filterra® Bioretention System Phosphorus treatment and Supplemental Basic and Enhanced Treatment Performance Monitoring, Americast (November 2011)
- Filterra® letter August 24, 2012 regarding sizing for the Filterra® Shallow System.
- University of Virginia Engineering Department Memo by Joanna Crowe Curran, Ph. D dated March 16, 2013 concerning capacity analysis of Filterra® internal weir inlet tray.
- Terraphase Engineering letter to Jodi Mills, P.E. dated April 2, 2013 regarding Terraflume Hydraulic Test, Filterra® Bioretention System and attachments.
- Technical Evaluation Report, Filterra® System Phosphorus Treatment and Supplemental Basic Treatment Performance Monitoring. March 27th, 2014.
- State of Washington Department of Ecology Application for Conditional Use Level Designation, Contech Engineered Solutions (May 2015)

- Quality Assurance Project Plan Filterra® Bioretention System, Contech Engineered Solutions (May 2015)
- Filterra Bioretention System Armco Avenue General Use Level Designation Technical Evaluation Report, Contech Engineered Solutions (August 2019)

Applicant's Use Level Request:

General Level Use Designation for Basic (175 in/hr), Enhanced (175 in/hr), Phosphorus (100 in/hr), and Oil Treatment (50 in/hr).

Applicant's Performance Claims:

Field-testing and laboratory testing show that the Filterra® unit is promising as a stormwater treatment best management practice and can meet Ecology's performance goals for basic, enhanced, phosphorus, and oil treatment.

Findings of Fact:

Field Testing 2015-2019

1. Contech completed field testing of a 4 ft. x 4 ft. Filterra® unit at one site in Hillsboro, Oregon from September 2015 to July 2019. Throughout the monitoring period a total of 24 individual storm events were sampled, of which 23 qualified for TAPE sampling criteria.
2. Contech encountered several unanticipated events and challenges that prevented them from collecting continuous flow and rainfall data. An analysis of the flow data from the sampled events, including both the qualifying and non-qualifying events, demonstrated the system treated over 99 % of the influent flows. Peak flows during these events ranged from 25 % to 250 % of the design flow rate of 29 gallons per minute.
3. Of the 23 TAPE qualified sample events, 13 met requirements for TSS analysis. Influent concentrations ranged from 20.8 mg/L to 83 mg/L, with a mean concentration of 46.3 mg/L. The UCL95 mean effluent concentration was 15.9 mg/L, meeting the 20 mg/L performance goal for Basic Treatment.
4. All 23 TAPE qualified sample events met requirements for dissolved zinc analysis. Influent concentrations range from 0.0384 mg/L to 0.2680 mg/L, with a mean concentration of 0.0807 mg/L. The LCL 95 mean percent removal was 62.9 %, meeting the 60 % performance goal for Enhanced Treatment.
5. Thirteen of the 23 TAPE qualified sample events met requirements for dissolved copper analysis. Influent concentrations ranged from 0.00543 mg/L to 0.01660 mg/L, with a mean concentration of 0.0103 mg/L. The LCL 95 mean percent removal was 41.2 %, meeting the 30 % performance goal for Enhanced Treatment.
6. Total zinc concentrations were analyzed for all 24 sample events. Influent EMCs for total zinc ranged from 0.048 mg/L to 5.290 mg/L with a median of 0.162 mg/L. Corresponding effluent EMCs for total zinc ranged from 0.015 mg/L to 0.067 mg/L with a median of

0.029 mg/L. Total event loadings for the study for total zinc were 316.85 g at the influent and 12.92 g at the effluent sampling location, resulting in a summation of loads removal efficiency of 95.9 %.

7. Total copper concentrations were analyzed for all 24 sample events. Influent EMCs for total copper ranged from 0.003 mg/L to 35.600 mg/L with a median value of 0.043 mg/L. Corresponding effluent EMCs for total copper ranged from 0.002 mg/L to 0.015 mg/L with a median of 0.004 mg/L. Total event loadings for total copper for the study were 1,810.06 g at the influent and 1.90 g at the effluent sampling location, resulting in a summation of loads removal efficiency of 99.9 %.

Field Testing 2013

1. Filterra completed field-testing of a 6.5 ft x 4 ft. unit at one site in Bellingham, Washington. Continuous flow and rainfall data collected from January 1, 2013 through July 23, 2013 indicated that 59 storm events occurred. Water quality data was obtained from 22 storm events. Not all the sampled storms produced information that met TAPE criteria for storm and/or water quality data.
2. The system treated 98.9 % of the total 8-month runoff volume during the testing period. Consequently, the system achieved the goal of treating 91 % of the volume from the site. Stormwater runoff bypassed Filterra treatment during four of the 59 storm events.
3. Of the 22 sampled events, 18 qualified for TSS analysis (influent TSS concentrations ranged from 25 to 138 mg/L). The data were segregated into sample pairs with influent concentration greater than and less than 100 mg/L. The UCL95 mean effluent concentration for the data with influent less than 100 mg/L was 5.2 mg/L, below the 20-mg/L threshold. Although the TAPE guidelines do not require an evaluation of TSS removal efficiency for influent concentrations below 100 mg/L, the mean TSS removal for these samples was 90.1 %. Average removal of influent TSS concentrations greater than 100 mg/L (three events) was 85 %. In addition, the system consistently exhibited TSS removal greater than 80 % at flow rates equivalent to a 100 in/hr infiltration rate and was observed at 150 in/hr.
4. Ten of the 22 sampled events qualified for TP analysis. Americast augmented the dataset using two sample pairs from previous monitoring at the site. Influent TP concentrations ranged from 0.11 to 0.52 mg/L. The mean TP removal for these twelve events was 72.6 %. The LCL95 mean percent removal was 66.0, well above the TAPE requirement of 50 %. Treatment above 50 % was evident at 100 in/hr infiltration rate and as high as 150 in/hr. Consequently, the Filterra test system met the TAPE Phosphorus Treatment goal at 100 in/hr. Influent ortho-P concentrations ranged from 0.005 to 0.012 mg/L; effluent ortho-P concentrations ranged from 0.005 to 0.013 mg/L. The reporting limit/resolution for the ortho-P test method is 0.01 mg/L, therefore the influent and effluent ortho-P concentrations were both at and near non-detect concentrations.

Field Testing 2008-2009

1. Filterra completed field-testing at two sites at the Port of Tacoma. Continuous flow and rainfall data collected during the 2008-2009 monitoring period indicated that 89 storm events occurred. The monitoring obtained water quality data from 27 storm events. Not all the sampled storms produced information that met TAPE criteria for storm and/or water quality data.
2. During the testing at the Port of Tacoma, 98.96 to 99.89 % of the annual influent runoff volume passed through the POT1 and POT2 test systems respectively. Stormwater runoff bypassed the POT1 test system during nine storm events and bypassed the POT2 test system during one storm event. Bypass volumes ranged from 0.13 % to 15.3% of the influent storm volume. Both test systems achieved the 91 % water quality treatment-goal over the 1-year monitoring period.
3. Consultants observed infiltration rates as high as 133 in/hr during the various storms. Filterra did not provide any paired data that identified percent removal of TSS, metals, oil, or phosphorus at an instantaneous observed flow rate.
4. The maximum storm average hydraulic loading rate associated with water quality data is <40 in/hr, with the majority of flow rates < 25 in/hr. The average instantaneous hydraulic loading rate ranged from 8.6 to 53 in/hr.
5. The field data showed a removal rate greater than 80 % for TSS with an influent concentration greater than 20 mg/L at an average instantaneous hydraulic loading rate up to 53 in/hr (average influent concentration of 28.8 mg/L, average effluent concentration of 4.3 mg/L).
6. The field data showed a removal rate generally greater than 54 % for dissolved zinc at an average instantaneous hydraulic loading rate up to 60 in/hr and an average influent concentration of 0.266 mg/L (average effluent concentration of 0.115 mg/L).
7. The field data showed a removal rate generally greater than 40 % for dissolved copper at an average instantaneous hydraulic loading rate up to 35 in/hr and an average influent concentration of 0.0070 mg/L (average effluent concentration of 0.0036 mg/L).
8. The field data showed an average removal rate of 93 % for total petroleum hydrocarbon (TPH) at an average instantaneous hydraulic loading rate up to 53 in/hr and an average influent concentration of 52 mg/L (average effluent concentration of 2.3 mg/L). The data also shows achievement of less than 15 mg/L TPH for grab samples. Filterra provided limited visible sheen data due to access limitations at the outlet monitoring location.
9. The field data showed low percentage removals of total phosphorus at all storm flows at an average influent concentration of 0.189 mg/L (average effluent concentration of 0.171 mg/L). We may relate the relatively poor treatment performance of the Filterra system at this location to influent characteristics for total phosphorus that are unique to the Port of Tacoma site. It appears that the Filterra system will not meet the 50 % removal performance goal when the majority of phosphorus in the runoff is expected to be in the dissolved form.

Laboratory Testing

1. Filterra performed laboratory testing on a scaled down version of the Filterra unit. The lab data showed an average removal from 83-91 % for TSS with influents ranging from 21 to 320 mg/L, 82-84 % for total copper with influents ranging from 0.94 to 2.3 mg/L, and 50-61 % for orthophosphate with influents ranging from 2.46 to 14.37 mg/L.
2. Filterra conducted permeability tests on the soil media.
3. Lab scale testing using Sil-Co-Sil 106 showed removals ranging from 70.1 % to 95.5 % with a median removal of 90.7 %, for influent concentrations ranging from 8.3 to 260 mg/L. Filterra ran these laboratory tests at an infiltration rate of 50 in/hr.
4. Supplemental lab testing conducted in September 2009 using Sil-Co-Sil 106 showed an average removal of 90.6 %. These laboratory tests were run at infiltration rates ranging from 25 to 150 in/hr for influent concentrations ranging from 41.6 to 252.5 mg/L. Regression analysis results indicate that the Filterra system's TSS removal performance is independent of influent concentration in the concentration rage evaluated at hydraulic loading rates of up to 150 in/hr.

Contact Information:

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Ecology web link: http://www.ecy.wa.gov/programs/wq/stormwater/newtech/index.html

Ecology:
Douglas C. Howie, P.E.
Department of Ecology
Water Quality Program
(360) 407-6444
douglas.howie@ecy.wa.gov

Date	Revision
December 2009	GULD for Basic, Enhanced, and Oil granted, CULD for Phosphorus
September 2011	Extended CULD for Phosphorus Treatment
September 2012	Revised design storm discussion, added Shallow System.
January 2013	Revised format to match Ecology standards, changed Filterra contact information
February 2013	Added FTIB-P system
March 2013	Added FTIB-C system
April 2013	Modified requirements for identifying appropriate size of unit

June 2013	Modified description of FTIB-C alternate configuration
March 2014	GULD awarded for Phosphorus Treatment. GULD updated for a higher flow-rate for Basic Treatment.
June 2014	Revised sizing calculation methods
March 2015	Revised Contact Information
June 2015	CULD for Basic and Enhanced at 100 in/hr infiltration rate
September 2019	GULD for Basic and Enhanced at 175 in/hr infiltration rate
February 2020	Revised sizing language to note sizing based on off-line calculations.

Filterra®– Vault Configuration
Bioretention System Standard Specification

1.0 GENERAL

1.1 This item shall govern the furnishing and installation of the Filterra® Bioretention System by Contech Engineered Solutions LLC, complete and operable as shown and as specified herein, in accordance with the requirements of the plans and contract documents.

1.2 Contractor shall furnish all labor, materials, equipment and incidentals necessary to install the bioretention system, appurtenances and incidentals in accordance with the Drawings and as specified herein.

1.3 Bioretention system shall utilize the physical, chemical and biological mechanisms of an engineered biofiltration media, plant and microbe complex to remove pollutants typically found in urban stormwater runoff. The treatment system shall be a fully equipped, pre-constructed, drop-in-place unit designed for applications in the urban landscape to treat contaminated runoff from impervious surfaces.

1.4 Bioretention system shall be capable of stand-alone stormwater treatment. No pretreatment to biofiltration media shall be required.

1.5 The bioretention system shall be of a type that has been installed and in use for a minimum of five (5) consecutive years preceding the date of installation of the system. The Manufacturer shall have been, during the same consecutive five (5) year period, engaged in the engineering design and production of systems deployed for the treatment of storm water runoff and which have a history of successful production, acceptable to the Engineer of Record and/or the approving Jurisdiction. The Manufacturer of the Filterra Bioretention System shall be, without exception:

Contech Engineered Solutions LLC
9025 Centre Pointe Drive
West Chester, OH, 45069
Tel: 1 800 338 1122

1.6 Applicable provisions of any Division shall govern work in this section.

1.7 American Society for Testing and Materials (ASTM) Reference Specifications

1.7.1 ASTM C857: Standard Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures

1.7.2 ASTM C858: Standard Specification of Underground Precast Concrete Utility Structures

1.7.3 ASTM C990: Standard Specification for Joints for Precast Box Sections Using Preformed Flexible Joint Sealants

1.7.4 ASTM C109: Standard Test Method for Compressive Strength of Hydraulic Cement Mortars

1.8 Manufacturer or authorized supplier to submit shop drawings for bioretention System with the vault, engineered biofiltration media and accessory equipment. Drawings shall include principal dimensions, engineered biofiltration media placement, location of piping and unit foundation.

1.8.1 Manufacturer or authorized supplier shall submit installation instructions to the contractor.

1.8.2 Manufacturer or authorized supplier shall submit Operations and Maintenance Manual to the contractor.

1.8.3 Before installation of the bioretention system, Contractor shall obtain the written approval of the Engineer of Record for the system drawings.

1.9 No product substitutions shall be accepted unless submitted 10 days prior to project bid date, or as directed by the Engineer of Record. Submissions for substitutions require review and approval by the Engineer of Record, for hydraulic performance, impact to project designs, equivalent treatment performance, and any required project plan and report (hydrology/hydraulic, water quality, stormwater pollution) modifications that would be required by the approving jurisdictions/agencies. Contractor to coordinate with the Engineer of Record any applicable modifications to the project estimates of cost, bonding amount determinations, plan check fees for changes to approved documents, and/or any other regulatory requirements resulting from the product substitution.

2.0 MATERIALS

2.1 All internal components including engineered biofiltration media, underdrain stone, PVC underdrain piping, mulch, dissipation stone, and vegetation must be included as part of the bioretention system and shall be provided by Contech Engineered Solutions LLC.

2.1.1 Engineered biofiltration media shall consist of both organic and inorganic components. Stormwater shall be directed to flow vertically through the media profile, saturating the full media profile without downstream flow control.

2.1.2 Underdrain stone shall be of size and shape to provide adequate bridging between the media and stone for the prevention of migration of fine particles. Underdrain stone must also be able to convey the design flow rate of the system without restriction and be approved for use in the Filterra Bioretention System by Contech Engineered Solutions LLC.

2.1.3 PVC Underdrain Piping shall be SDR35 with perforation pattern designed to convey system design flow rate without restriction.

2.1.4 Mulch shall be double shredded wood or bark mulch approved for use with the Filterra Bioretention System by Contech Engineered Solutions LLC.

2.1.5 Vegetation shall comply with the type and size required by the approved drawings and shall be alive and free of obvious signs of disease.

2.1.6 Dissipation stone shall be 3”-6” diameter washed stones or cobbles.

2.2 Precast concrete vault shall be provided by Manufacturer or authorized supplier according to ASTM C857 and C858.

2.2.1 Vault joint sealant shall be Conseal CS-101 or approved equal. Joints shall be sealed with preformed joint sealing compound conforming to ASTM C 990.

2.2.2 If interior concrete baffle walls are provided, baffle walls shall be cast-in or sealed to the interior vault walls and floor with a polyurethane construction sealant rated for use below the waterline, SikaFlex 1a or equal. Contractor to provide sealant material and installation unless completed prior to shipment.

2.3 Tree grates and access covers shall be cast iron. Tree grate frames shall be galvanized steel.

2.4 Curb Nosing (where applicable) shall be galvanized steel and where specified shall be cast into a top slab designed to support AASHTO HS-20 loading at the curb.

2.5 All contractor-provided components shall meet the requirements of this section, the plans specifications and contract documents. In the case of conflict, the more stringent specification shall apply.

2.5.1 Crushed rock base material shall be six-inch minimum layer of ¾-inch minus rock. Compact undisturbed sub-grade materials to 95% of maximum density at +/-2% of optimum moisture content. Unsuitable material below sub-grade shall be replaced to engineer’s approval.

2.5.2 Concrete shall have an unconfined compressive strength at 28 days of at least 3000 psi, with ¾-inch round rock, a 4-inch slump maximum, and shall be placed within 90 minutes of initial mixing.

2.5.3 Silicone Sealant shall be pure RTV silicone conforming to Federal Specification Number TT S001543A or TT S00230C or Engineer approved.

2.5.4 Grout shall be non-shrink grout meeting the requirements of Corps of Engineers CRD-C588. Specimens molded, cured and tested in accordance with ASTM C-109 shall have minimum compressive strength of 6,200 psi. Grout shall not exhibit visible bleeding.

2.5.5 Backfill material shall be ¾-inch minus crushed rock, or approved equal.

3.0 PERFORMANCE

3.1 Treatment Capabilities shall be verified via third-party reports following TAPE or TARP protocols.

3.1.1 Engineered biofiltration Media flow rate shall be verified via third-party report following TAPE or TARP protocols. The minimum treatment flow rate based on target pollutant shall be as follows:

TSS: 100”/hr
Phosphorus: 100”/hr
Oil/Grease: 50”/hr
Metals: 35”/hr

The system shall be designed to ensure that high flow events shall bypass the Engineered biofiltration media preventing erosion and resuspension of pollutants.

3.1.2 The system shall remove a minimum of 86% Total Suspended Solids (TSS) based on aggregated data from at least four third party field studies following TAPE or TARP protocols. Aggregated median effluent concentration shall be less than 3.3 mg/L.

3.1.3 The system shall remove a minimum of 70% Total Phosphorus (TP) based on aggregated data from at least two third party field studies following TAPE protocols. Aggregated median effluent concentration shall be less than 0.05 mg/L.

3.1.4 The system shall remove a minimum of 34% Total Nitrogen (TN) based on aggregated data from at least one third party field study following TAPE or TARP protocols. Aggregated median effluent concentration shall be less than 0.54 mg/L.

3.1.5 The system shall remove a minimum of 55% Total Copper based on aggregated data from at least two third party field studies following TAPE or TARP protocols. Aggregated median effluent concentration shall be less than 0.004 mg/L.

3.1.6 The system shall remove a minimum of 43% Dissolved Copper based on aggregated data from at least one third party field study following TAPE or TARP protocols. Aggregated median effluent concentration shall be less than 0.003 mg/L.

3.1.7 The system shall remove a minimum of 56% Total Zinc based on aggregated data from at least three third party field studies following TAPE or TARP protocols. Aggregated median effluent concentration shall be less than 0.04 mg/L.

3.1.8 The system shall remove a minimum of 54% Dissolved Zinc based on aggregated data from at least one third party field study following TAPE or TARP protocols. Aggregated median effluent concentration shall be less than 0.003 mg/L.

3.1.9 The system shall remove a minimum of 87% Total Petroleum Hydrocarbons based on aggregated data from at least one third party field study following TAPE or TARP protocols. Aggregated median effluent concentration shall be less than 0.71 mg/L.

3.2 The system shall have General Use Level Designation from Washington Department of Ecology for Basic (TSS), Phosphorus, Enhanced (Metals), and Oil/Grease and have Certification by New Jersey Department of Environment.

3.3 Quality Assurance and Quality Control procedures shall be followed for all batches of engineered biofiltration media produced. Engineered biofiltration media shall be certified by the Manufacturer for performance and composition.

3.3.1 Media particle size distribution and composition shall be verified as per relevant ASTM Standards.

3.3.2 Media pollutant removal performance shall be verified as per relevant ASTM Standards as well as a minimum of one scientific method approved by the USEPA.

3.3.3 Media hydraulic performance shall be verified as per relevant ASTM Standards.

3.3.4 Media fertility shall be verified as per a minimum of one published scientific method.

3.4 The Manufacturer shall ensure through third party full scale field testing of installed units that the design flow rate of the system is not reduced over time. Studies shall be performed on a minimum of 10 systems of various ages, maintenance frequencies, and land uses. At least 80% of the tested systems shall have been installed 2.5 or more years. At least 50% of the systems shall have previous maintenance intervals greater than 2 times the manufacturer's recommendation.

4.0 EXECUTION

4.1 Set precast vault on crushed rock base material that has been placed in maximum 6-inch lifts, loose thickness, and compacted to at least 95-percent of the maximum dry density as determined by the standard Proctor compaction test, ASTM D698, at moisture content of +/- 2% of optimum water content.

4.2 Inlet and outlet pipes shall be attached to provided couplers or grouted in and connected to precast concrete vault according to Engineer's requirements and specifications. All connections to be water tight.

4.3 All throat and grate protection covers shall remain in place until the system is activated.

4.4 Contractor to cast-in-place throat inlet to convey stormwater into bioretention System according to Engineer's requirements and specifications.

4.5 Engineered biofiltration media shall be delivered installed in the vault, unless otherwise agreed upon with the Manufacturer. Contractor shall take appropriate action to protect the media from sediment and other debris during construction. The method ultimately selected shall be at Contractor's discretion and Contractor's risk.

4.5.1 If media is shipped separately from vault, Manufacturer or a Manufacturer's certified representative shall install media into the vault or be present to supervise installation in order to ensure proper installation.

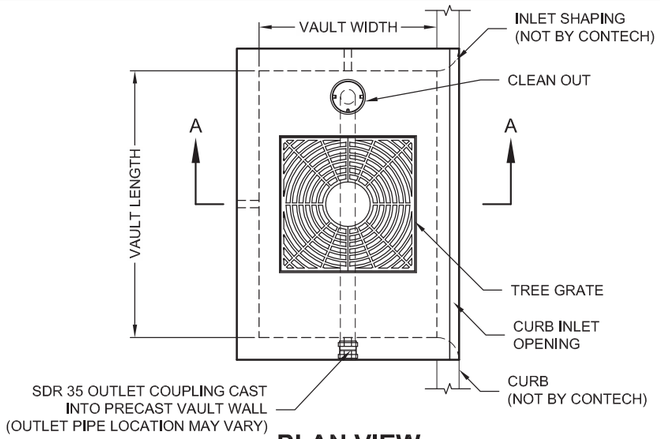
4.6 The bioretention system shall not be placed in operation (activated) until the project site is clean and stabilized (construction erosion control measures no longer required). The project site includes any surface that contributes storm drainage to the system. All impermeable surfaces shall be clean and free of dirt and debris. All catch basins, manholes and pipes shall be free of dirt and sediment. Activation shall be provided by Manufacturer or authorized supplier.

4.7 Each correctly installed system shall be maintained by Manufacturer or authorized supplier for a minimum period of one year. The cost of this service shall be included in the price of the system.

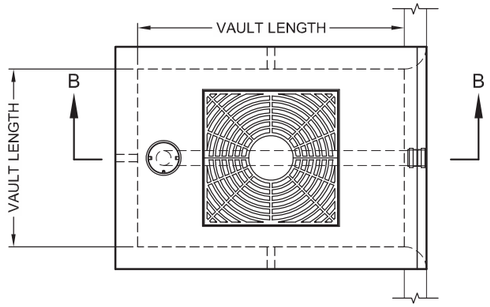
4.7.1 Annual maintenance consists of a maximum of two [2] scheduled visits.

4.7.2 Each routine maintenance visit shall consist of only the following items: system inspection; removal of foreign debris, silt, loose plant material and trash; mulch removal; engineered biofiltration media evaluation; plant health evaluation and pruning; replacement of mulch; disposal of all maintenance refuse items; and updating of maintenance records

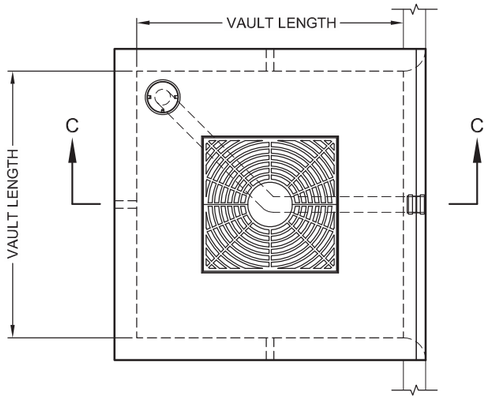
4.8 To ensure long term performance of the bioretention system, continuing annual maintenance programs should be performed or purchased by the owner per the latest Filterra Bioretention System Operation and Maintenance manual.



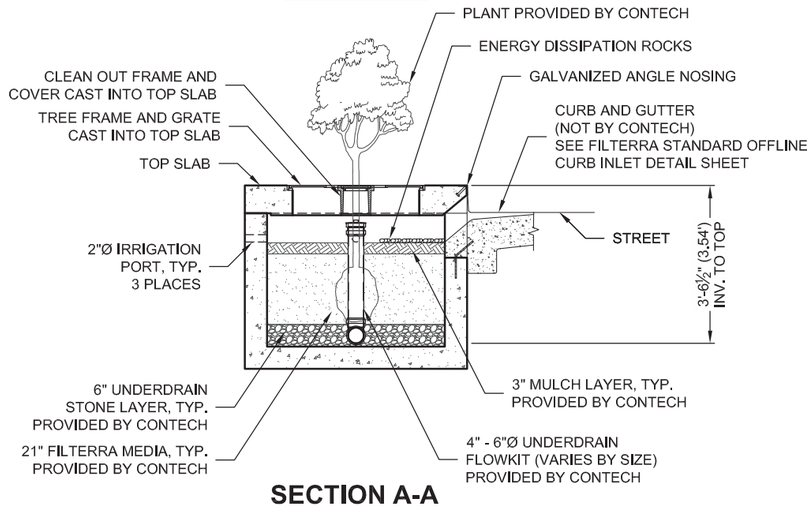
PLAN VIEW



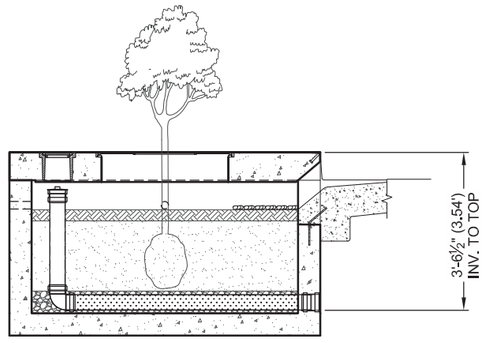
PLAN VIEW



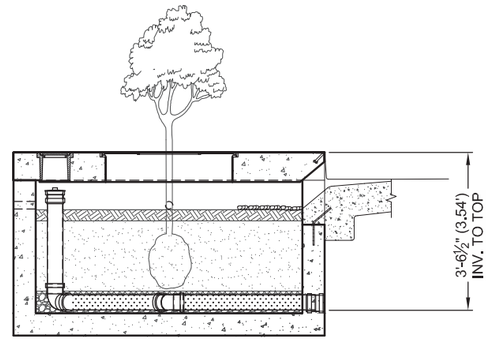
PLAN VIEW



SECTION A-A



SECTION B-B



SECTION C-C

FT LONG SIDE INLET CONFIGURATION

DESIGNATION	AVAILABILITY	MEDIA BAY SIZE	VAULT SIZE (L x W)	OUTLET PIPE DIA	TREE GRATE QTY & SIZE
FT0604	N/A CA	6 x 4	6 x 4	4" SDR 35	(1) 3' x 3'
FT06504	CA ONLY	6.5 x 4	6.5 x 4	4" SDR 35	(1) 3' x 3'
FT078045	MID-ATL ONLY	7.83 x 4.5	7.83 x 4.5	4" SDR 35	(1) 3' x 3'
FT0804	N/A MID-ATL	8 x 4	8 x 4	4" SDR 35	(1) 3' x 3'
FT0806	ALL	8 x 6	8 x 6	4" SDR 35	(1) 4' x 4'
FT1006	ALL	10 x 6	10 x 6	6" SDR 35	(1) 4' x 4'
FT1206	ALL	12 x 6	12 x 6	6" SDR 35	(2) 4' x 4'
FT1307	ALL	13 x 7	13 x 7	6" SDR 35	(2) 4' x 4'
FT1408	CALL CONTECH	14 x 8	14 x 8	6" SDR 35	(2) 4' x 4'
FT1608	CALL CONTECH	16 x 8	16 x 8	6" SDR 35	(2) 4' x 4'
FT1808	CALL CONTECH	18 x 8	18 x 8	6" SDR 35	(2) 4' x 4'
FT2008	CALL CONTECH	20 x 8	20 x 8	6" SDR 35	(3) 4' x 4'
FT2208	CALL CONTECH	22 x 8	22 x 8	6" SDR 35	(3) 4' x 4'

N/A = NOT AVAILABLE

FT SHORT SIDE INLET CONFIGURATION

DESIGNATION	AVAILABILITY	MEDIA BAY SIZE	VAULT SIZE (W x L)	OUTLET PIPE DIA	TREE GRATE QTY & SIZE
FT0406	N/A CA	4 x 6	4 x 6	4" SDR 35	(1) 3' x 3'
FT04065	CA ONLY	4 x 6.5	4 x 6.5	4" SDR 35	(1) 3' x 3'
FT0408	N/A MID-ATL	4 x 8	4 x 8	4" SDR 35	(1) 3' x 3'
FT045078	MID-ATL ONLY	4.5 x 7.83	4.5 x 7.83	4" SDR 35	(1) 3' x 3'
FT0608	ALL	6 x 8	6 x 8	4" SDR 35	(1) 4' x 4'
FT0610	ALL	6 x 10	6 x 10	6" SDR 35	(1) 4' x 4'
FT0612	ALL	6 x 12	6 x 12	6" SDR 35	(2) 4' x 4'
FT0713	ALL	7 x 13	7 x 13	6" SDR 35	(2) 4' x 4'

N/A = NOT AVAILABLE

FT SQUARE INLET CONFIGURATION

DESIGNATION	AVAILABILITY	MEDIA BAY SIZE	VAULT SIZE (W x L)	OUTLET PIPE DIA	TREE GRATE QTY & SIZE
FT0404	ALL	4 x 4	4 x 4	4" SDR 35	(1) 3' x 3'
FT0606	ALL	6 x 6	6 x 6	4" SDR 35	(1) 3' x 3'

N/A = NOT AVAILABLE

INTERNAL PIPE CONFIGURATION MAY VARY
DEPENDING UPON OUTLET LOCATION.

filterra®
THIS PRODUCT MAY BE PROTECTED BY ONE OR MORE OF THE FOLLOWING U.S. PATENTS: 8,277,274; 8,568,321; 7,625,485; 7,425,261; 7,833,412. RELATED FOREIGN PATENTS.

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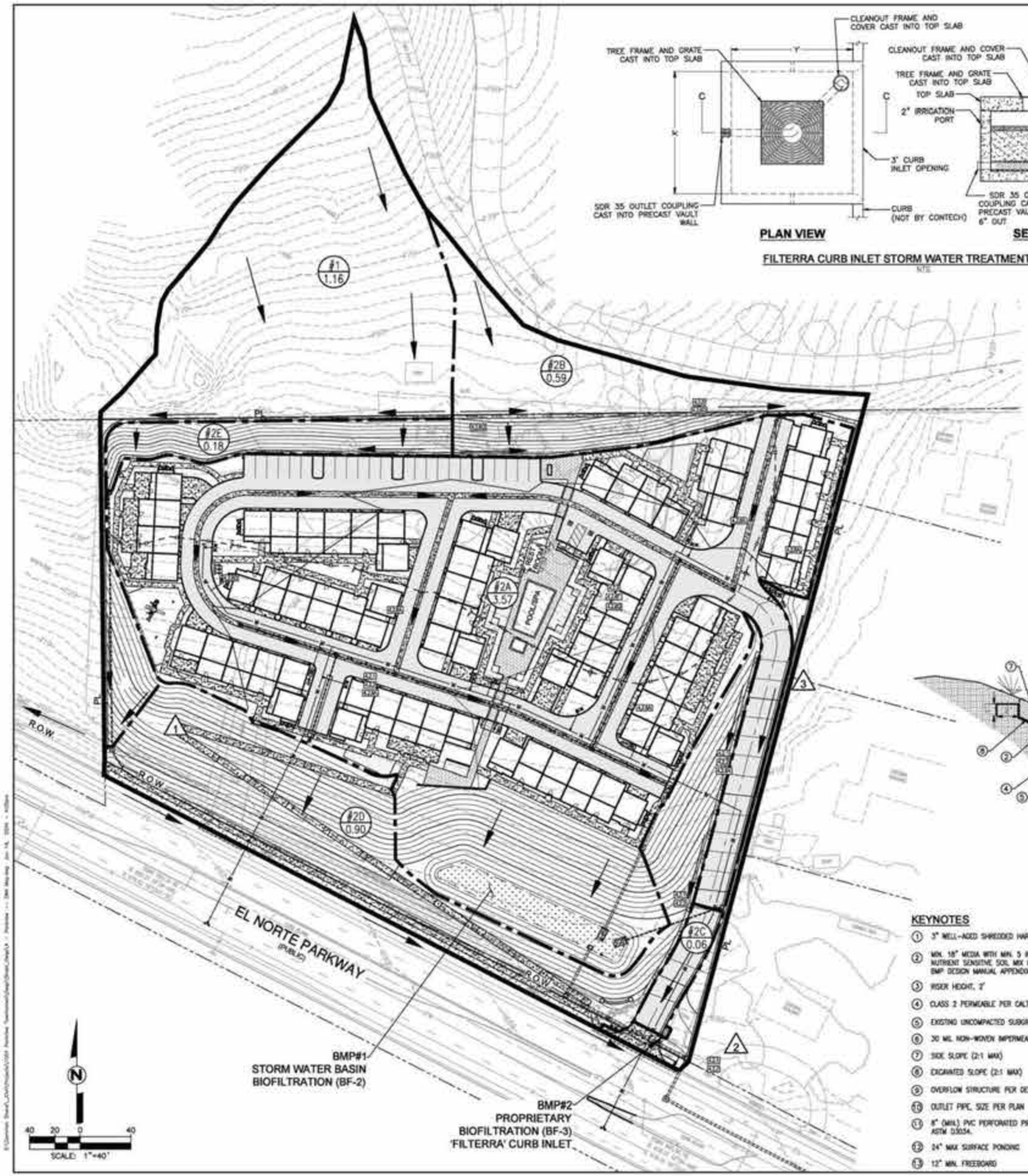
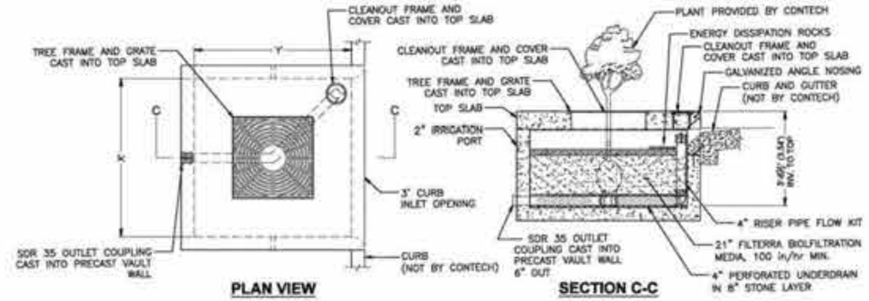
800-338-1122 513-645-7000 513-645-7993 FAX

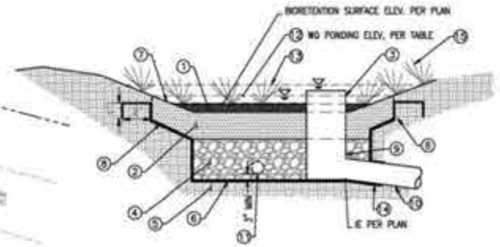
FILTERRA OFFLINE (FT) CONFIGURATION DETAIL

I:\COMMON\CAD\TREATMENT\54 FILTERRA\40 STANDARD DRAWINGS\FT - OFFLINE\LAYOUT DETAILS\DWG\FILTERRA STANDARD OFFLINE CONFIG DTL.DWG 11/1/2017 11:31 AM





FILTERRA CURB INLET STORM WATER TREATMENT UNIT (BF-3)
NTS



BIOFILTRATION BASIN (BF-2) DETAIL
NTS

LEGEND
- 18" MIN SOIL MIX
- AGGREGATE STORAGE LAYER
- 3" MULCH

KEYNOTES
1. 3" WELL-AGED SHREDDED HARDWOOD NON-FLOATABLE MULCH
2. MIN. 18" MEDIA WITH MIN. 5 IN/HR FILTRATION RATE. NUTRIENT SENSITIVE SOIL MIX PER COUNTY OF SAN DIEGO BMP DESIGN MANUAL APPENDIX F.2
3. RISER HEIGHT, 3'
4. CLASS 2 PERMEABLE PER CALTRANS SPECIFICATION 68-1.025
5. EXISTING UNCOMPACTED SUBGRADE
6. 30 MIL NON-WOVEN IMPERMEABLE LINER
7. SIDE SLOPE (2:1 MAX)
8. EXCAVATED SLOPE (2:1 MAX)
9. OVERFLOW STRUCTURE PER DETAIL THIS SHEET
10. OUTLET PIPE, SIZE PER PLAN
11. 8" (MIN.) PVC PERFORATED PIPE CONFORMING TO ASTM D3034.
12. 24" MAX SURFACE PONDING
13. 12" MIN. FREEBOARD
14. CLAMP LINER TO OUTLET PIPE FOR WATERTIGHT SEAL
15. PLANTING PER LANDSCAPE PLANS

NOTES
1. CONTRACTOR SHALL HIRE A LICENSED LAND SURVEYOR TO STAKE THE SUBGRADE OF THE ROCK STORAGE LAYER, BIORETENTION PONDING SURFACE, AND TOP SLOPE OF BIORETENTION BASIN. MINIMUM SURFACE AREAS AND DEPTHS SHALL BE PROVIDED PER PLANS.
2. CONTRACTOR IS REQUIRED TO NOTIFY ENGINEER OF RECORD (EOR) DURING CONSTRUCTION FOR INSPECTION OF THE SUBGRADE AND INSTALLATION OF THE LINER, ROCK STORAGE, SUBDRAINAGE, SOIL MEDIA AND OVERFLOW STRUCTURE. IF EOR IS NOT NOTIFIED, CONTRACTOR IS RESPONSIBLE FOR ALL COSTS ASSOCIATED WITH REMOVING LAYERS AND REPLACING AS NEEDED FOR PROPER INSPECTION.
3. CONTRACTOR SHALL PROVIDE AN AS-BUILT SURVEY PREPARED BY A LICENSED LAND SURVEYOR OF THE BIORETENTION BASIN.
4. CONTRACTOR SHALL PROVIDE CONTRACTOR SUBMITTALS FOR ALL BIORETENTION MATERIALS FOR THE EOR'S REVIEW. THIS INCLUDES, BUT IS NOT LIMITED TO: SOIL MIX, MULCH, FILTER LAYER, AGGREGATE BASE, IMPERMEABLE LINER AND OVERFLOW STRUCTURE.

LEGEND

ITEMS	SYMBOL
OUTER BASIN BOUNDARY	
INNER BASIN BOUNDARY	
FLOW DIRECTION	
BASIN INDENTIFIER/AREA (ACRES)	1 / 1.0

SOURCE CONTROL BMPs

(PER COUNTY OF SAN DIEGO BMP DESIGN MANUAL)

4.2.1 PREVENTION OF ILLICIT DISCHARGES INTO THE MS4
4.2.2 STORM DRAIN STENCILING OR SIGNAGE
4.2.5 PROTECT TRASH STORAGE AREAS FROM RAINFALL, RUN-ON, RUNOFF & WIND DISPERSAL.
4.2.6 ADDITIONAL BMPS BASED ON POTENTIAL SOURCES OF POLLUTANTS:
- A. ON-SITE STORM DRAIN INLETS
- D. NEED FOR FUTURE INDOOR & STRUCTURAL PEST CONTROL
- E. LANDSCAPE/OUTDOOR PESTICIDES USE
- F. POOLS, SPAS, PONDS, FOUNTAINS, AND OTHER WATER FEATURES.
- G. PLAZAS, SIDEWALKS, AND PARKING LOTS.

LID, SITE DESIGN & TREATMENT CONTROL BMPs

4.3.1 MAINTAIN NATURAL DRAINAGE PATHWAYS & HYDROLOGIC FEATURES
4.3.2 CONSERVE NATURAL AREAS, SOILS, & VEGETATION
4.3.3 MINIMIZE IMPERVIOUS AREAS
4.3.4 MINIMIZE SOIL COMPACTION
4.3.7 LANDSCAPING WITH NATIVE & DROUGHT TOLERANT SPECIES

ANALYSIS POINT FLOW DATA (POINTS OF COMPLIANCE)

1 — CUMULATIVE AREA: 1.16 ACRES
Q100: 2.61 CFS

2 — CUMULATIVE AREA: 5.30 ACRES
Q100: 14.95 CFS (UNMITIGATED)
11.57 CFS (MITIGATED)

3 — CUMULATIVE AREA: 0.0 ACRES
Q100: 0.0 CFS

DMA SUMMARY

POC #1

DMA 1 (SELF-MITIGATING)
C_6 NATVEG,STEEP --- 1.16 ACRES

POC # 1 SDHM TOTAL --- 1.16 ACRES

POC #2

DMA 2A (DRAINS TO BMP#1)
C,URBAN,FLAT --- 1.18 ACRES
IMPERVIOUS-FLAT --- 1.92 ACRES
C,NATVEG,STEEP--- 0.47
TOTAL --- 3.57 ACRES

DMA 2B (SELF MITIGATING)
C,NATVEG,MODERATE --- 0.19 ACRES
C,NATVEG,STEEP --- 0.4 ACRES
TOTAL --- 0.59 ACRES

DMA 2C (DRAINS TO FILTERRA)
IMPERVIOUS-MOD --- 0.06 ACRES
TOTAL --- 0.06 ACRES

DMA 2D (SELF MITIGATING)
C,NATVEG,FLAT --- 0.1 ACRES
C,NATVEG,STEEP --- 0.76 ACRES
IMPERVIOUS-MOD --- .04 ACRES
TOTAL --- 0.9 ACRES

DMA 2E (SELF MITIGATING)
C,NATVEG,STEEP --- 0.18 ACRES

POC # 2 SDHM TOTAL --- 5.30 ACRES

NET TOTAL --- 6.46 ACRES

DMA MAP/HMP EXHIBIT
PARKVIEW TOWNHOMES

PREPARED BY:
TOUCHSTONE DEVELOPMENT

PROJECT ADDRESS
550 W. EL NORTE PARKWAY, ESCONDIDO CA 92026

ASSESSOR'S PARCEL NO:
226-380-48

OWNER/APPLICANT:
TOUCHTONE COMMUNITIES
KERRY GARZA
9815 MIRA MESA BLVD.
SAN DIEGO, CA 92131
858-204-1342

PROJECT DESCRIPTION
70 3-STORY CONDOMINIUM UNITS

NO.	DATE	REVISIONS

SHEET C4 OF 4

ATTACHMENT 2

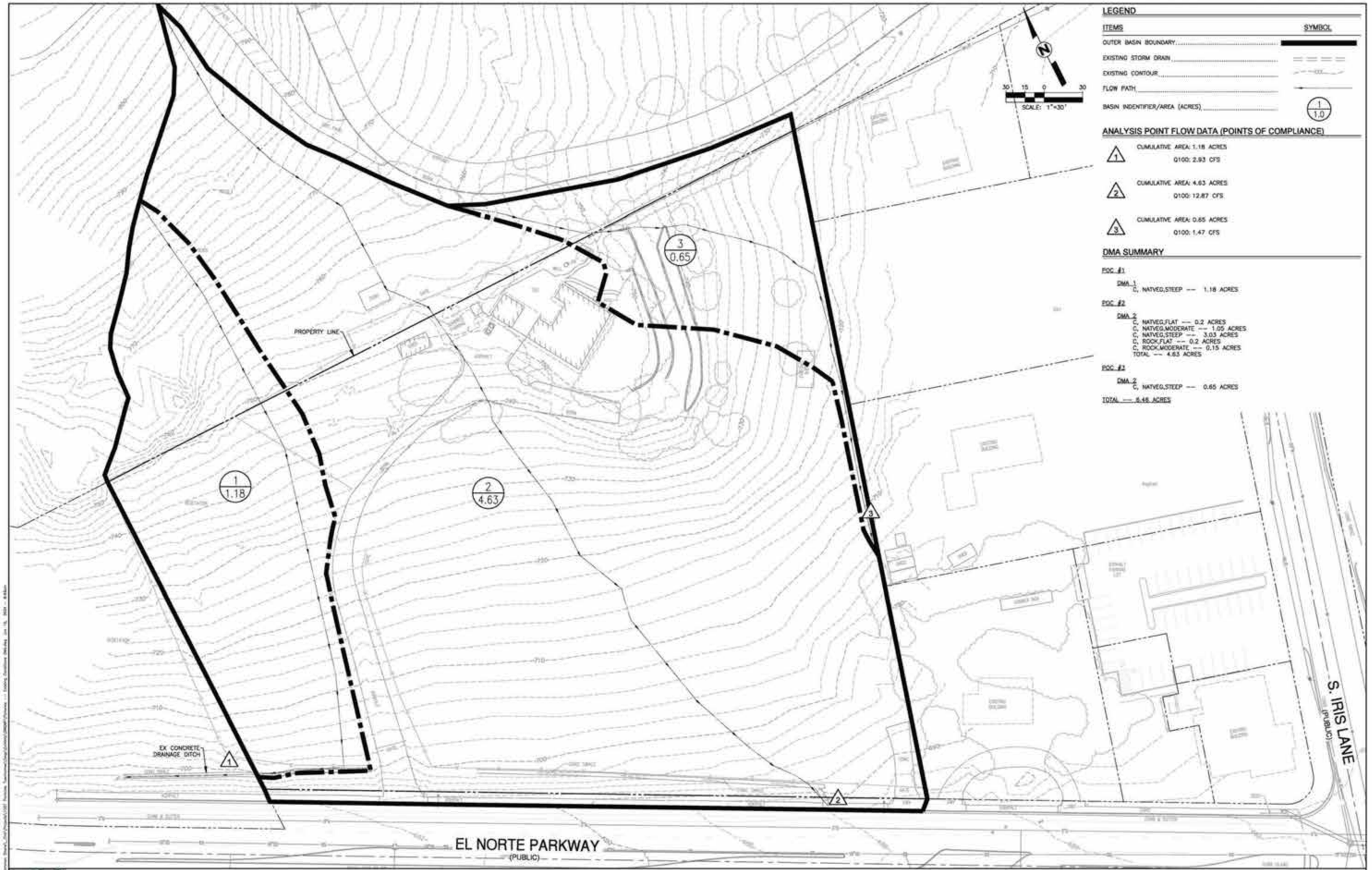
BACKUP FOR PDP HYDROMODIFICATION CONTROL MEASURES

This is the cover sheet for Attachment 2.

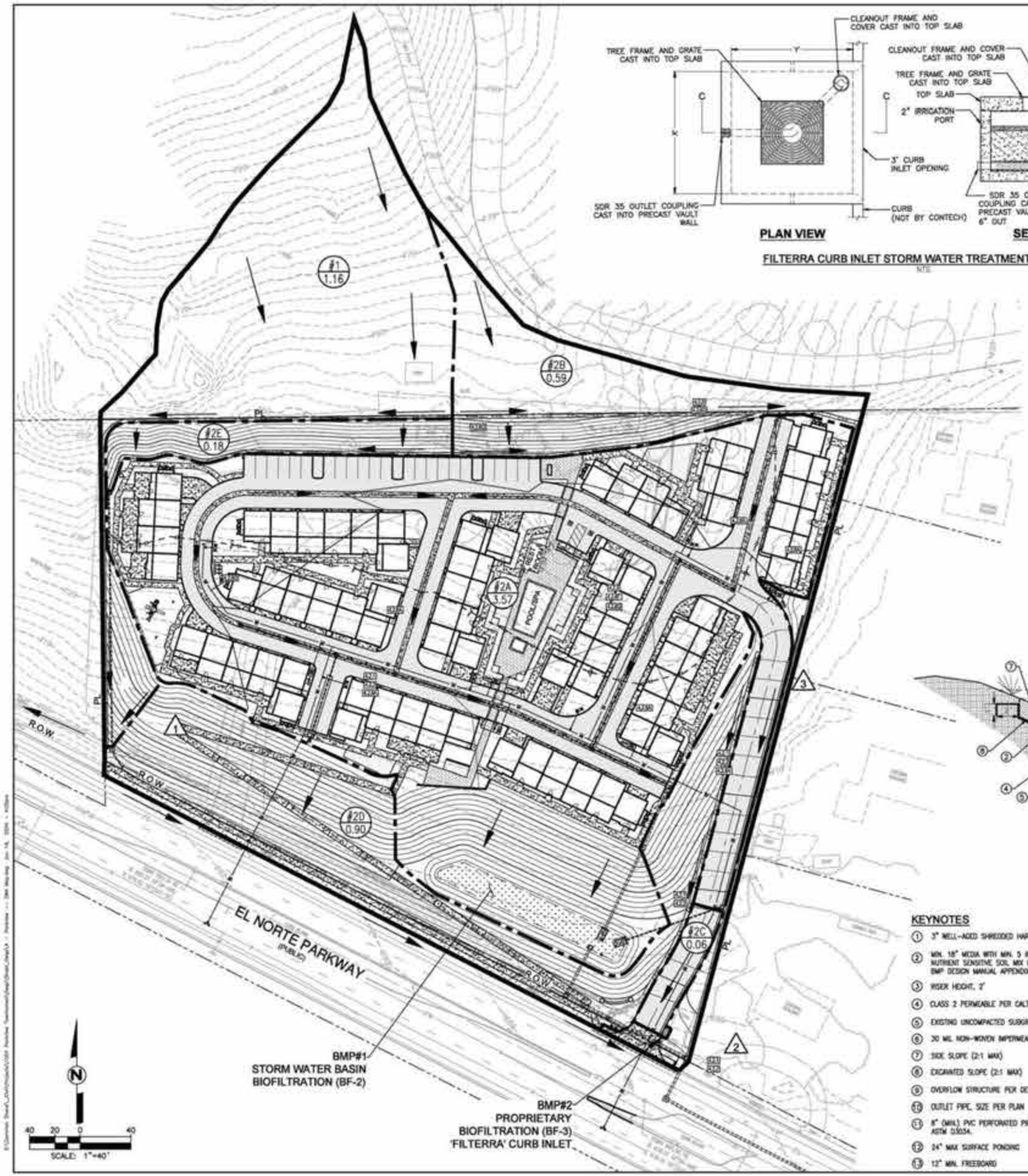
☐Mark this box if this attachment is empty because the project is exempt from PDP hydromodification management requirements.

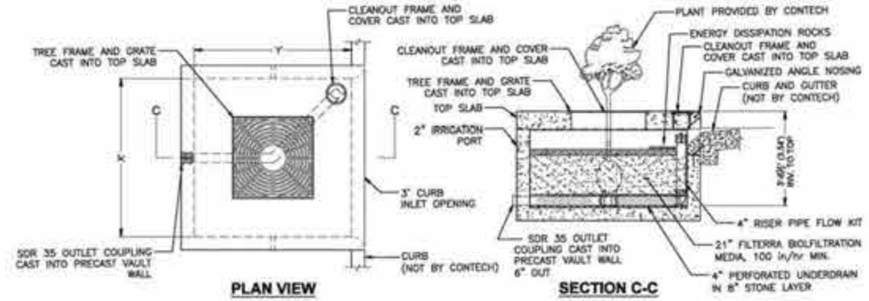
Indicate which Items are Included behind this cover sheet:

Attachment Sequence	Contents	Checklist
Attachment 2a	Flow Control Facility Design, including Structural BMP Drawdown Calculations and Overflow Design Summary (Required) See Chapter 6 and Appendix G of the Storm Water Design Manual	▣Included ☐Submitted as separate stand-alone document
Attachment 2b	Hydromodification Management Exhibit (Required)	▣Included See Hydromodification Management Exhibit Checklist on the back of this Attachment cover sheet.
Attachment 2c	Management of Critical Coarse Sediment Yield Areas See Section 6.2 and Appendix H of the Storm Water Design Manual.	☐Exhibit depicting onsite and/or upstream sources of critical coarse sediment as mapped in the WMAA AND, ▣Demonstration that the project effectively avoids and bypasses sources of mapped critical coarse sediment OR, ☐Demonstration that the downstream system is not sensitive to preservation of Coarse Sediment Supply (Form I-11). ☐Demonstration that project does not generate a net impact on the receiving water.
Attachment 2d	Geomorphic Assessment of Receiving Channels (Optional) See Section 6.3.4 of the Storm Water Design Manual.	▣Not performed ☐Included ☐Submitted as separate stand-alone document
Attachment 2e	Vector Control Plan (Required when structural BMPs will not drain in 96 hours)	☐Included ▣Not required because BMPs will drain in less than 96 hours

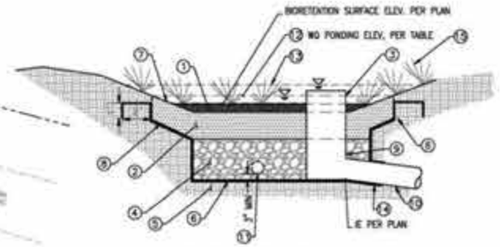


EXISTING CONDITIONS DMA EXHIBIT





FILTERRA CURB INLET STORM WATER TREATMENT UNIT (BF-3)
NTS



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NTS

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8. EXCAVATED SLOPE (2:1 MAX)
9. OVERFLOW STRUCTURE PER DETAIL THIS SHEET
10. OUTLET PIPE, SIZE PER PLAN
11. 8" (MIN.) PVC PERFORATED PIPE CONFORMING TO ASTM D3034.
12. 24" MAX SURFACE PONDING
13. 12" MIN. FREEBOARD
14. CLAMP LINER TO OUTLET PIPE FOR WATERTIGHT SEAL
15. PLANTING PER LANDSCAPE PLANS

NOTES
1. CONTRACTOR SHALL HIRE A LICENSED LAND SURVEYOR TO STAKE THE SUBGRADE OF THE ROCK STORAGE LAYER, BIORETENTION PONDING SURFACE, AND TOP SLOPE OF BIORETENTION BASIN. MINIMUM SURFACE AREAS AND DEPTHS SHALL BE PROVIDED PER PLANS.
2. CONTRACTOR IS REQUIRED TO NOTIFY ENGINEER OF RECORD (EOR) DURING CONSTRUCTION FOR INSPECTION OF THE SUBGRADE AND INSTALLATION OF THE LINER, ROCK STORAGE, SUBDRAINAGE, SOIL MEDIA AND OVERFLOW STRUCTURE. IF EOR IS NOT NOTIFIED, CONTRACTOR IS RESPONSIBLE FOR ALL COSTS ASSOCIATED WITH REMOVING LAYERS AND REPLACING AS NEEDED FOR PROPER INSPECTION.
3. CONTRACTOR SHALL PROVIDE AN AS-BUILT SURVEY PREPARED BY A LICENSED LAND SURVEYOR OF THE BIORETENTION BASIN.
4. CONTRACTOR SHALL PROVIDE CONTRACTOR SUBMITTALS FOR ALL BIORETENTION MATERIALS FOR THE EOR'S REVIEW. THIS INCLUDES, BUT IS NOT LIMITED TO: SOIL MIX, MULCH, FILTER LAYER, AGGREGATE BASE, IMPERMEABLE LINER AND OVERFLOW STRUCTURE.

LEGEND

ITEMS	SYMBOL
OUTER BASIN BOUNDARY	
INNER BASIN BOUNDARY	
FLOW DIRECTION	
BASIN INDENTIFIER/AREA (ACRES)	1 / 1.0

SOURCE CONTROL BMPs

(PER COUNTY OF SAN DIEGO BMP DESIGN MANUAL)

4.2.1 PREVENTION OF ILLICIT DISCHARGES INTO THE MS4
4.2.2 STORM DRAIN STENCILING OR SIGNAGE
4.2.5 PROTECT TRASH STORAGE AREAS FROM RAINFALL, RUN-ON, RUNOFF & WIND DISPERSAL.
4.2.6 ADDITIONAL BMPS BASED ON POTENTIAL SOURCES OF POLLUTANTS:
- A. ON-SITE STORM DRAIN INLETS
- D. NEED FOR FUTURE INDOOR & STRUCTURAL PEST CONTROL
- E. LANDSCAPE/OUTDOOR PESTICIDES USE
- F. POOLS, SPAS, PONDS, FOUNTAINS, AND OTHER WATER FEATURES.
- G. PLAZAS, SIDEWALKS, AND PARKING LOTS.

LID, SITE DESIGN & TREATMENT CONTROL BMPs

4.3.1 MAINTAIN NATURAL DRAINAGE PATHWAYS & HYDROLOGIC FEATURES
4.3.2 CONSERVE NATURAL AREAS, SOILS, & VEGETATION
4.3.3 MINIMIZE IMPERVIOUS AREAS
4.3.4 MINIMIZE SOIL COMPACTION
4.3.7 LANDSCAPING WITH NATIVE & DROUGHT TOLERANT SPECIES

ANALYSIS POINT FLOW DATA (POINTS OF COMPLIANCE)

1 — CUMULATIVE AREA: 1.16 ACRES
Q100: 2.61 CFS

2 — CUMULATIVE AREA: 5.30 ACRES
Q100: 14.95 CFS (UNMITIGATED)
11.57 CFS (MITIGATED)

3 — CUMULATIVE AREA: 0.0 ACRES
Q100: 0.0 CFS

DMA SUMMARY

POC #1

DMA 1 (SELF-MITIGATING)
C_6 NATVEG,STEEP --- 1.16 ACRES

POC # 1 SDHM TOTAL --- 1.16 ACRES

POC #2

DMA 2A (DRAINS TO BMP#1)
C,URBAN,FLAT --- 1.18 ACRES
IMPERVIOUS-FLAT --- 1.92 ACRES
C,NATVEG,STEEP--- 0.47
TOTAL --- 3.57 ACRES

DMA 2B (SELF MITIGATING)
C,NATVEG,MODERATE --- 0.19 ACRES
C,NATVEG,STEEP --- 0.4 ACRES
TOTAL --- 0.59 ACRES

DMA 2C (DRAINS TO FILTERRA)
IMPERVIOUS-MOD --- 0.06 ACRES
TOTAL --- 0.06 ACRES

DMA 2D (SELF MITIGATING)
C,NATVEG,FLAT --- 0.1 ACRES
C,NATVEG,STEEP --- 0.76 ACRES
IMPERVIOUS-MOD --- .04 ACRES
TOTAL --- 0.9 ACRES

DMA 2E (SELF MITIGATING)
C,NATVEG,STEEP --- 0.18 ACRES

POC # 2 SDHM TOTAL --- 5.30 ACRES

NET TOTAL --- 6.46 ACRES

DMA MAP/HMP EXHIBIT
PARKVIEW TOWNHOMES

PREPARED BY:
TOUCHSTONE DEVELOPMENT

PROJECT ADDRESS
550 W. EL NORTE PARKWAY, ESCONDIDO CA 92026

ASSESSOR'S PARCEL NO:
226-380-48

OWNER/APPLICANT:
TOUCHTONE COMMUNITIES
KERRY GARZA
9815 MIRA MESA BLVD.
SAN DIEGO, CA 92131
858-204-1342

PROJECT DESCRIPTION
70 3-STORY CONDOMINIUM UNITS

NO.	DATE	REVISIONS

SHEET C4 OF 4

HYDROMODIFICATION MANAGEMENT PLAN

FOR

Parkview Townhomes

City of Escondido, CA

Purpose

This project is classified as a Priority Development Project (PDP) category and is required to manage hydromodification impacts due to the development. The hydromodification management plan is required for all non-exempt PDPs to demonstrate that the project is designed to manage increases in runoff discharge rates and durations in the proposed condition. Increased flow rates and durations are likely to cause increased erosion of channel beds and banks, sediment pollutant generation, or other impacts to beneficial uses and stream habitat due to increased erosive force. The results of a hydromodification management analysis must comply with the following design criteria:

- Post-development flow rates and durations must not exceed pre-development flow rates and durations by more than 10 percent for flow rates ranging from 10 percent, 30 percent or 50 percent of the 2-year runoff event (0.1Q2, 0.3Q2, or 0.5Q2) to the 10-year runoff event (Q10).

- Each PDP must avoid critical sediment yield areas identified by the optional WMAA, or implement measures that allow critical coarse sediment to be discharged to receiving waters, such that there is no net impact to the receiving water.

Method of Analysis

The hydromodification analysis is prepared utilizing continuous simulation of long term rainfall records. San Diego Hydrology Model (SDHM) Version 3.1 developed by Clear Creek Solutions Inc., is used for this purpose. The following site-specific information are required to perform the simulation:

- Rainfall basin information for the project site. This information is included in the program.
- Hydrologic soil group at the project site.
- Pre-development and post-project slope categories (low = 0% – 5%, moderate = 5% – 15%, steep = >15%)
- Drainage area tributary to the BMP
- A fraction of Q2 to Q10 for HMP control.

A comparison of the pre-development and mitigated flow duration curves is conducted for 100 flow levels between the lower and the upper flow thresholds. The comparison of these flow results shows compliance with the hydromodification criteria as all results are passed.

Rainfall Station

This site is located closest to the Escondido rainfall station. Therefore, continuous simulation is performed by utilizing the long term rainfall records for this station.

Predevelopment Condition Scenario

The site area is divided into 3 major drainage management areas (DMAs) and Point of Compliance (POC) POC #1 is the existing concrete ditch which takes water westerly. POC #2 is the curb line along El Norte where another existing concrete ditch discharges to the curb line. POC#3 is the eastern property line where water sheet flows towards neighboring properties. The site is developed with a single family

home and the majority area still in the natural condition. Therefore, the landuse type in the predevelopment condition is assumed as Natural Vegetation (NatVeg). The underlying soil is comprised of hydrologic soil type B, although we have considered C to be more conservative.

Developed Condition (Mitigated) Scenario

The site area is divided into 3 major drainage management areas (DMAs) and 3 Point of Compliance (POC) for the HMP analysis purpose. The land uses Urban (landscaped areas) and Impervious (paved, building areas) are assigned in the model to depict the development in the proposed condition.

The majority of runoff from DMA #2 is directed to bioretention to be treated, the other sub-areas of DMA #2 are self-mitigating but ultimately drain to the same POC, #2.

The runoff originating from self-mitigating areas does not require to route through the pollutant control BMPs and is shown as by-pass to the point of compliance.

A model comprising of multiple land use basins are developed within SDHM within the mitigated scenario. The land use basins are then connected to structural BMPs. The outflows from the structural BMPs are assigned with same POC number in the model to determine the cumulative outflow rates from all the DMAs contributing to the same POC.

The outlet structure for the treatment basin will have properties matching those modeled in the SDHM analysis. The SDHM analysis considers the Outlet Riser Structure as a vertical standpipe. The design will provide a Modified Type-F Catch Basin per San Diego Regional Standard Drawings, which has a window outlet. The weir length of the inlet shall be equal to the circumference of the riser diameter as shown in the SDHM Analysis. *(C=Pi * r ^2)*

Calculations

The pre-development 2 and 10-year peak flow rates are determined by using the SDHM program. The low flow threshold is determined by multiplying the 2-yr flow rate by a factor of 0.2.

POC 1

The area discharging to POC 1 is approximately 1.16 acres and is self-mitigating. In the proposed condition, this POC has less area draining to it, and the flow rates are lower than existing condition. There are also no impervious areas draining to this POC. Therefore, this POC does not require hydromodification management analysis.

POC 2

The area discharging to POC 2 is approximately 5.30 acres. This consists of DMA #2A which drains directly to Bio-filtration BF2. DMA #2B which is self-mitigating. DMA #2C which drains to Bio-filtration BF-3. DMA 2D which is self mitigating. DMA 2E which is self mitigating.

POC 3

In the proposed condition, the eastern property line analysis point no longer exists as this water is now diverted to POC #2.

DMA #2A is directed to a biofiltration basin BMP (BF-2). The biofiltration BMP (BF-2) is lined with an underdrain and volume is stored within a gravel layer and at the surface of the basin. It is designed to treat 1.5 times the DCV within the planting media. A maximum of 18" of surface ponding depth, a minimum of 18" media layer depth and gravel storage layer of 45" is provided to meet the hydromodification requirements.

DMA #2B is composed of entirely self-mitigating areas consisting of landscaped areas. This DMA drains to concrete drainage ditches before ultimately contributing to POC 2 via the SD inlet located near El Norte Parkway. This DMA is modeled to bypass the basin but is considered tributary to the only POC (POC 2) for the purposes of hydromodification and are included in the volume calculations.

DMA #2C is directed to a proprietary stormwater filter unit "Filterra", curb inlet model FT0404 (BF-3). This unit has TAPE approval to meet treatment requirements. After treatment, stormwater is pipe outlets to POC 2. This DMA is modeled to bypass the basin but is considered tributary to the only POC (POC 2) for the purposes of hydromodification and are included in the volume calculations.

DMA #2D is composed of entirely self-mitigating areas consisting of landscaped. Sidewalk contributes less than 5% of incidental area. This DMA drains to SD inlet near the driveway entrance off El Norte before contributing to POC #2. This DMA is modeled to bypass the basin but is considered tributary to the only POC (POC 2) for the purposes of hydromodification and are included in the volume calculations.

DMA #2D is composed of entirely self-mitigating areas consisting of landscaped. This DMA drains to concrete ditch, then collected in type F SD, piped to new headwall near El Norte Parkway then surface flows to inlet near Driveway, before contributing to POC #2. This DMA is modeled to bypass the basin but is considered tributary to the only POC (POC 2) for the purposes of hydromodification and are included in the volume calculations.

Conclusions

This study has demonstrated that the proposed HMP BMPs provided for the site are adequate to meet the current HMP criteria if constructed according to the details, surface areas, volumes, and orifice sizes recommended within this report. See attached results obtained from SDHM and exhibits for further details.

SDHM 3.1

PROJECT REPORT

General Model Information

Project Name:	El Norte V1 (revised)
Site Name:	
Site Address:	
City:	
Report Date:	6/18/2024
Gage:	ESCONDID
Data Start:	10/01/1964
Data End:	09/30/2004
Timestep:	Hourly
Precip Scale:	1.000
Version Date:	2021/06/28

POC Thresholds

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

Landuse Basin Data

Predeveloped Land Use

DMA #2 Predeveloped

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C,NatVeg,Flat	0.2
C,NatVeg,Moderate	1.05
C,NatVeg,Steep	3.03
C,Rock,Flat	0.2
C,Rock,Moderate	0.15
Pervious Total	4.63

Impervious Land Use	acre
Impervious Total	0
Basin Total	4.63

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

DMA #2 (BMP#1 Tributary)

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C,Urban,Flat	1.18
C,NatVeg,Steep	0.47
Pervious Total	1.65

Impervious Land Use	acre
IMPERVIOUS-FLAT	1.92
Impervious Total	1.92
Basin Total	3.57

Element Flows To:

Surface	Interflow	Groundwater
Surface BMP #1	Surface BMP #1	

DMA #2B (East Diversion)

Bypass:	Yes
GroundWater:	No

Pervious Land Use	acre
C,NatVeg,Moderate	0.19
C,NatVeg,Steep	0.4
Pervious Total	0.59

Impervious Land Use	acre
Impervious Total	0
Basin Total	0.59

Element Flows To:

Surface	Interflow	Groundwater

DMA#2C (Filterra Tributary)

Bypass:	Yes
GroundWater:	No
Pervious Land Use	acre
Pervious Total	0
Impervious Land Use	acre
IMPERVIOUS-MOD	0.06
Impervious Total	0.06
Basin Total	0.06

Element Flows To:

Surface	Interflow	Groundwater

DMA #2 D(Frontage Basin)

Bypass:	Yes
GroundWater:	No

Pervious Land Use	acre
C,NatVeg,Steep	0.76
C,NatVeg,Flat	0.1
Pervious Total	0.86

Impervious Land Use	acre
IMPERVIOUS-MOD	0.04
Impervious Total	0.04
Basin Total	0.9

Element Flows To:

Surface	Interflow	Groundwater

DMA #2E (NW Cut Slope)

Bypass:	Yes
GroundWater:	No
Pervious Land Use	acre
C,NatVeg,Steep	0.18
Pervious Total	0.18
Impervious Land Use	acre
Impervious Total	0
Basin Total	0.18

Element Flows To:

Surface	Interflow	Groundwater

Routing Elements
Predeveloped Routing

Mitigated Routing

BMP #1

Bottom Length:	150.00 ft.
Bottom Width:	20.28 ft.
Material thickness of first layer:	0.25
Material type for first layer:	Mulch
Material thickness of second layer:	1.5
Material type for second layer:	ESM
Material thickness of third layer:	3.75
Material type for third layer:	GRAVEL
Underdrain used	
Underdrain Diameter (feet):	0.67
Orifice Diameter (in.):	0.75
Offset (in.):	3
Flow Through Underdrain (ac-ft.):	68.468
Total Outflow (ac-ft.):	86.025
Percent Through Underdrain:	79.59
Discharge Structure	
Riser Height:	1.5 ft.
Riser Diameter:	7.5 in.
Orifice 1 Diameter:	0.85 in. Elevation:0.75 ft.
Orifice 2 Diameter:	0.75 in. Elevation:0.5 ft.
Element Flows To:	
Outlet 1	Outlet 2

Biofilter Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.1669	0.0000	0.0000	0.0000
0.1099	0.1668	0.0023	0.0000	0.0000
0.2198	0.1647	0.0047	0.0000	0.0000
0.3297	0.1625	0.0072	0.0000	0.0000
0.4396	0.1604	0.0097	0.0000	0.0000
0.5495	0.1583	0.0122	0.0000	0.0000
0.6593	0.1561	0.0148	0.0000	0.0000
0.7692	0.1540	0.0175	0.0000	0.0000
0.8791	0.1519	0.0203	0.0000	0.0000
0.9890	0.1498	0.0231	0.0000	0.0000
1.0989	0.1477	0.0259	0.0015	0.0000
1.2088	0.1457	0.0288	0.0022	0.0000
1.3187	0.1436	0.0318	0.0034	0.0000
1.4286	0.1415	0.0348	0.0040	0.0000
1.5385	0.1395	0.0379	0.0050	0.0000
1.6484	0.1374	0.0411	0.0054	0.0000
1.7582	0.1354	0.0455	0.0062	0.0000
1.8681	0.1334	0.0501	0.0067	0.0000
1.9780	0.1314	0.0547	0.0078	0.0000
2.0879	0.1294	0.0594	0.0083	0.0000
2.1978	0.1274	0.0642	0.0093	0.0000
2.3077	0.1254	0.0690	0.0098	0.0000
2.4176	0.1234	0.0740	0.0106	0.0000
2.5275	0.1214	0.0791	0.0110	0.0000
2.6374	0.1195	0.0842	0.0114	0.0000
2.7473	0.1175	0.0894	0.0121	0.0000
2.8571	0.1156	0.0947	0.0130	0.0000

2.9670	0.1136	0.1001	0.0139	0.0000
3.0769	0.1117	0.1056	0.0147	0.0000
3.1868	0.1098	0.1112	0.0155	0.0000
3.2967	0.1079	0.1169	0.0163	0.0000
3.4066	0.1060	0.1226	0.0171	0.0000
3.5165	0.1041	0.1285	0.0179	0.0000
3.6264	0.1022	0.1344	0.0186	0.0000
3.7363	0.1003	0.1405	0.0192	0.0000
3.8462	0.0985	0.1466	0.0199	0.0000
3.9560	0.0966	0.1528	0.0205	0.0000
4.0659	0.0948	0.1591	0.0212	0.0000
4.1758	0.0929	0.1656	0.0218	0.0000
4.2857	0.0911	0.1721	0.0223	0.0000
4.3956	0.0893	0.1787	0.0229	0.0000
4.5055	0.0875	0.1853	0.0235	0.0000
4.6154	0.0857	0.1921	0.0240	0.0000
4.7253	0.0839	0.1990	0.0245	0.0000
4.8352	0.0821	0.2060	0.0251	0.0000
4.9451	0.0803	0.2131	0.0256	0.0000
5.0549	0.0785	0.2202	0.0261	0.0000
5.1648	0.0768	0.2275	0.0266	0.0000
5.2747	0.0750	0.2349	0.0270	0.0000
5.3846	0.0733	0.2423	0.0275	0.0000
5.4945	0.0716	0.2499	0.0280	0.0000
5.5000	0.0698	0.2503	0.0350	0.0000

Biofilter Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
5.5000	0.1669	0.2503	0.0000	0.3521	0.0000
5.6099	0.1691	0.2687	0.0000	0.3521	0.0000
5.7198	0.1713	0.2874	0.0000	0.4624	0.0000
5.8297	0.1735	0.3064	0.0000	0.4881	0.0000
5.9396	0.1757	0.3256	0.0000	0.5139	0.0000
6.0495	0.1779	0.3450	0.0034	0.5397	0.0000
6.1593	0.1801	0.3646	0.0061	0.5655	0.0000
6.2692	0.1823	0.3846	0.0106	0.5913	0.0000
6.3791	0.1845	0.4047	0.0164	0.6171	0.0000
6.4890	0.1868	0.4251	0.0203	0.6429	0.0000
6.5989	0.1890	0.4458	0.0234	0.6687	0.0000
6.7088	0.1913	0.4667	0.0261	0.6945	0.0000
6.8187	0.1935	0.4878	0.0286	0.7203	0.0000
6.9286	0.1958	0.5092	0.0309	0.7461	0.0000
7.0385	0.1981	0.5308	0.0829	0.7719	0.0000
7.1484	0.2004	0.5527	0.3870	0.7977	0.0000
7.2582	0.2027	0.5749	0.6552	0.8235	0.0000
7.3681	0.2050	0.5973	0.7851	0.8493	0.0000
7.4780	0.2073	0.6199	0.8909	0.8751	0.0000
7.5879	0.2096	0.6428	0.9853	0.9008	0.0000
7.6978	0.2120	0.6660	1.0712	0.9266	0.0000
7.8077	0.2143	0.6894	1.1507	0.9524	0.0000
7.9176	0.2167	0.7131	1.2250	0.9782	0.0000
8.0275	0.2190	0.7370	1.2950	1.0040	0.0000
8.1374	0.2214	0.7612	1.3614	1.0298	0.0000
8.2473	0.2238	0.7857	1.4246	1.0556	0.0000
8.3571	0.2262	0.8104	1.4852	1.0814	0.0000
8.4670	0.2286	0.8354	1.5434	1.1072	0.0000
8.5769	0.2310	0.8606	1.5994	1.1330	0.0000
8.6868	0.2334	0.8862	1.6535	1.1588	0.0000

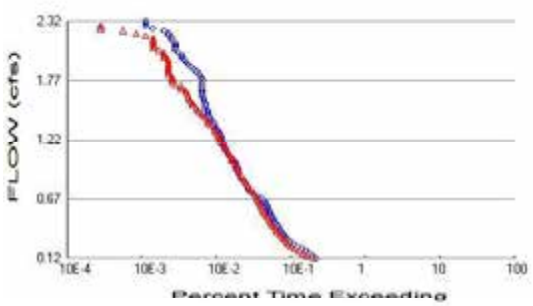
8.7967	0.2358	0.9119	1.7060	1.1846	0.0000
8.9066	0.2382	0.9380	1.7568	1.2104	0.0000
9.0165	0.2407	0.9643	1.8062	1.2362	0.0000
9.1264	0.2431	0.9909	1.8543	1.2620	0.0000
9.2363	0.2456	1.0177	1.9012	1.2877	0.0000
9.3462	0.2481	1.0449	1.9469	1.3135	0.0000
9.4560	0.2505	1.0723	1.9916	1.3393	0.0000
9.5659	0.2530	1.0999	2.0353	1.3651	0.0000
9.6758	0.2555	1.1279	2.0781	1.3909	0.0000
9.7857	0.2580	1.1561	2.1200	1.4167	0.0000
9.8956	0.2605	1.1846	2.1611	1.4425	0.0000
10.000	0.2629	1.2119	2.2015	1.4670	0.0000

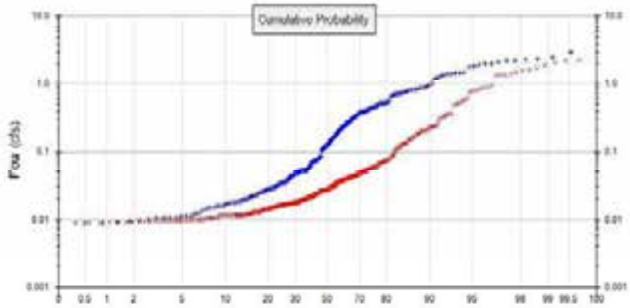
Surface BMP #1

Element Flows To:

Outlet 1	Outlet 2
	BMP #1

Analysis Results
POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 4.63
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 3.28
Total Impervious Area: 2.02

Flow Frequency Method: Cunnane

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	1.214158
5 year	2.009662
10 year	2.316899
25 year	2.619824

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.594474
5 year	1.505575
10 year	1.934622
25 year	2.255335

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.1214	777	717	92	Pass
0.1436	685	582	84	Pass
0.1658	620	505	81	Pass
0.1879	554	450	81	Pass
0.2101	487	393	80	Pass
0.2323	433	354	81	Pass
0.2545	379	325	85	Pass
0.2767	342	302	88	Pass
0.2988	310	283	91	Pass
0.3210	294	266	90	Pass
0.3432	278	247	88	Pass
0.3654	266	231	86	Pass
0.3875	255	222	87	Pass
0.4097	238	214	89	Pass
0.4319	230	197	85	Pass
0.4541	217	187	86	Pass
0.4762	206	182	88	Pass
0.4984	201	171	85	Pass
0.5206	191	164	85	Pass
0.5428	184	155	84	Pass
0.5649	179	148	82	Pass
0.5871	172	143	83	Pass
0.6093	168	140	83	Pass
0.6315	160	134	83	Pass
0.6537	153	127	83	Pass
0.6758	141	123	87	Pass
0.6980	126	119	94	Pass
0.7202	109	115	105	Pass
0.7424	99	109	110	Pass
0.7645	93	100	107	Pass
0.7867	92	94	102	Pass
0.8089	88	91	103	Pass
0.8311	84	86	102	Pass
0.8532	80	81	101	Pass
0.8754	75	77	102	Pass
0.8976	72	76	105	Pass
0.9198	70	71	101	Pass
0.9419	70	67	95	Pass
0.9641	67	65	97	Pass
0.9863	66	64	96	Pass
1.0085	64	62	96	Pass
1.0307	59	57	96	Pass
1.0528	56	57	101	Pass
1.0750	52	54	103	Pass
1.0972	50	52	104	Pass
1.1194	47	50	106	Pass
1.1415	46	46	100	Pass
1.1637	44	45	102	Pass
1.1859	44	42	95	Pass
1.2081	42	40	95	Pass
1.2302	41	40	97	Pass
1.2524	41	39	95	Pass
1.2746	40	36	90	Pass

1.2968	38	35	92	Pass
1.3190	37	34	91	Pass
1.3411	34	33	97	Pass
1.3633	33	30	90	Pass
1.3855	32	27	84	Pass
1.4077	30	27	90	Pass
1.4298	29	25	86	Pass
1.4520	27	23	85	Pass
1.4742	27	22	81	Pass
1.4964	27	20	74	Pass
1.5185	25	19	76	Pass
1.5407	25	17	68	Pass
1.5629	25	17	68	Pass
1.5851	24	16	66	Pass
1.6072	24	15	62	Pass
1.6294	23	15	65	Pass
1.6516	23	14	60	Pass
1.6738	23	14	60	Pass
1.6960	23	12	52	Pass
1.7181	23	12	52	Pass
1.7403	23	10	43	Pass
1.7625	23	9	39	Pass
1.7847	23	9	39	Pass
1.8068	22	9	40	Pass
1.8290	21	8	38	Pass
1.8512	19	8	42	Pass
1.8734	18	8	44	Pass
1.8955	16	8	50	Pass
1.9177	15	8	53	Pass
1.9399	14	8	57	Pass
1.9621	13	8	61	Pass
1.9843	12	7	58	Pass
2.0064	12	7	58	Pass
2.0286	11	7	63	Pass
2.0508	10	6	60	Pass
2.0730	10	5	50	Pass
2.0951	10	5	50	Pass
2.1173	10	5	50	Pass
2.1395	9	5	55	Pass
2.1617	9	5	55	Pass
2.1838	8	4	50	Pass
2.2060	8	3	37	Pass
2.2282	7	2	28	Pass
2.2504	5	1	20	Pass
2.2725	4	1	25	Pass
2.2947	4	0	0	Pass
2.3169	4	0	0	Pass

Water Quality

Model Default Modifications

Total of 0 changes have been made.

PERLND Changes

No PERLND changes have been made.

IMPLND Changes

No IMPLND changes have been made.

Appendix
Predeveloped Schematic

Mitigated Schematic

Predeveloped UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1964 10 01         END    2004 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                    UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM         26   El Norte V1 (revised).wdm
MESSU       25   PreEl Norte V1 (revised).MES
            27   PreEl Norte V1 (revised).L61
            28   PreEl Norte V1 (revised).L62
            30   POCEl Norte V1 (revised)1.dat
END FILES

OPN SEQUENCE
    INGRP               INDELT 00:60
      PERLND      19
      PERLND      20
      PERLND      21
      PERLND      25
      PERLND      26
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        DMA #2 Predeveloped         MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                          in  out           ***
   19      C,NatVeg,Flat          1    1    1    1   27    0
   20      C,NatVeg,Moderate      1    1    1    1   27    0
   21      C,NatVeg,Steep         1    1    1    1   27    0
   25      C,Rock,Flat            1    1    1    1   27    0
   26      C,Rock,Moderate        1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   19         0    0    1    0    0    0    0    0    0    0    0    0
```

```
 20          0    0    1    0    0    0    0    0    0    0    0    0
 21          0    0    1    0    0    0    0    0    0    0    0    0
 25          0    0    1    0    0    0    0    0    0    0    0    0
 26          0    0    1    0    0    0    0    0    0    0    0    0
END ACTIVITY

PRINT-INFO
  <PLS > ***************** Print-flags ***************************** PIVL  PYR
  # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
 19          0    0    4    0    0    0    0    0    0    0    0    0    1    9
 20          0    0    4    0    0    0    0    0    0    0    0    0    1    9
 21          0    0    4    0    0    0    0    0    0    0    0    0    1    9
 25          0    0    4    0    0    0    0    0    0    0    0    0    1    9
 26          0    0    4    0    0    0    0    0    0    0    0    0    1    9
END PRINT-INFO

PWAT-PARM1
  <PLS >  PWATER variable monthly parameter value flags  ***
  # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
 19          0    1    1    1    0    0    0    0    1    1    0
 20          0    1    1    1    0    0    0    0    1    1    0
 21          0    1    1    1    0    0    0    0    1    1    0
 25          0    1    1    1    0    0    0    0    1    1    0
 26          0    1    1    1    0    0    0    0    1    1    0
END PWAT-PARM1

PWAT-PARM2
  <PLS >      PWATER input info: Part 2          ***
  # -  # ***FOREST      LZSN     INFILT      LSUR     SLSUR      KVARY      AGWRC
 19               0       3.8     0.035       100      0.05        2.5      0.915
 20               0       3.5     0.033        80       0.1        2.5      0.915
 21               0       3.2      0.03        75      0.15        2.5      0.915
 25               0       2.4     0.022       100      0.05        2.5      0.915
 26               0       2.2      0.02        80       0.1        2.5      0.915
END PWAT-PARM2

PWAT-PARM3
  <PLS >      PWATER input info: Part 3          ***
  # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
 19               0         0         2         2         0      0.05      0.05
 20               0         0         2         2         0      0.05      0.05
 21               0         0         2         2         0      0.05      0.05
 25               0         0         2         2         0      0.05      0.05
 26               0         0         2         2         0      0.05      0.05
END PWAT-PARM3
PWAT-PARM4
  <PLS >     PWATER input info: Part 4                                  ***
  # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
 19              0       0.6      0.04         1       0.3         0
 20              0       0.6      0.04         1       0.3         0
 21              0       0.6      0.04         1       0.3         0
 25              0       0.6     0.025         1       0.3         0
 26              0       0.6     0.025         1       0.3         0
END PWAT-PARM4
MON-LZETPARM
  <PLS >      PWATER input info: Part 3          ***
  # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
 19       0.4  0.4  0.4  0.4  0.6  0.6  0.6  0.6  0.6  0.4  0.4  0.4
 20       0.4  0.4  0.4  0.4  0.6  0.6  0.6  0.6  0.6  0.4  0.4  0.4
 21       0.4  0.4  0.4  0.4  0.6  0.6  0.6  0.6  0.6  0.4  0.4  0.4
 25       0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3
 26       0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3
END MON-LZETPARM
MON-INTERCEP
  <PLS >      PWATER input info: Part 3          ***
  # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
 19       0.1  0.1  0.1  0.1 0.06 0.06 0.06 0.06 0.06  0.1  0.1  0.1
 20       0.1  0.1  0.1  0.1 0.06 0.06 0.06 0.06 0.06  0.1  0.1  0.1
 21       0.1  0.1  0.1  0.1 0.06 0.06 0.06 0.06 0.06  0.1  0.1  0.1
 25       0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1
```

```
   26       0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1
  END MON-INTERCEP

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
             ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
   19              0         0      0.01         0       0.4      0.01         0
   20              0         0      0.01         0       0.4      0.01         0
   21              0         0      0.01         0       0.4      0.01         0
   25              0         0      0.01         0       0.4      0.01         0
   26              0         0      0.01         0       0.4      0.01         0
  END PWAT-STATE1

END PERLND

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

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

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

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

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

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

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

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
DMA #2 Predeveloped***
PERLND  19                        0.2     COPY   501     12
PERLND  19                        0.2     COPY   501     13
PERLND  20                       1.05     COPY   501     12
PERLND  20                       1.05     COPY   501     13
PERLND  21                       3.03     COPY   501     12
PERLND  21                       3.03     COPY   501     13
PERLND  25                        0.2     COPY   501     12
PERLND  25                        0.2     COPY   501     13
PERLND  26                       0.15     COPY   501     12
PERLND  26                       0.15     COPY   501     13
```

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

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   12.1        DISPLY   1     INPUT  TIMSER 1



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

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

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

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

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

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

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
END FTABLES

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

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
```

```
COPY   501 OUTPUT MEAN   1 1     12.1      WDM    501 FLOW     ENGL      REPL
END EXT TARGETS

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

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


END MASS-LINK

END RUN
```

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1964 10 01         END    2004 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                    UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM         26   El Norte V1 (revised).wdm
MESSU       25   MitEl Norte V1 (revised).MES
            27   MitEl Norte V1 (revised).L61
            28   MitEl Norte V1 (revised).L62
            30   POCEl Norte V1 (revised)1.dat
END FILES

OPN SEQUENCE
    INGRP               INDELT 00:60
      PERLND      43
      PERLND      21
      IMPLND       1
      PERLND      20
      IMPLND       2
      PERLND      19
      GENER        2
      RCHRES       1
      RCHRES       2
      COPY         1
      COPY       501
      COPY       601
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Surface BMP #1              MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  601         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
    2        24
  END OPCODE
  PARM
    #    #         K ***
    2             0.
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                          in  out           ***
   43      C,Urban,Flat           1    1    1    1   27    0
   21      C,NatVeg,Steep         1    1    1    1   27    0
   20      C,NatVeg,Moderate      1    1    1    1   27    0
```

```
 19      C,NatVeg,Flat          1    1    1    1   27    0
END GEN-INFO
*** Section PWATER***

ACTIVITY
  <PLS > ************ Active Sections ******************************
  # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
 43         0    0    1    0    0    0    0    0    0    0    0    0
 21         0    0    1    0    0    0    0    0    0    0    0    0
 20         0    0    1    0    0    0    0    0    0    0    0    0
 19         0    0    1    0    0    0    0    0    0    0    0    0
END ACTIVITY

PRINT-INFO
  <PLS > ***************** Print-flags **************************** PIVL  PYR
  # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
 43         0    0    4    0    0    0    0    0    0    0    0    0    1    9
 21         0    0    4    0    0    0    0    0    0    0    0    0    1    9
 20         0    0    4    0    0    0    0    0    0    0    0    0    1    9
 19         0    0    4    0    0    0    0    0    0    0    0    0    1    9
END PRINT-INFO

PWAT-PARM1
  <PLS >  PWATER variable monthly parameter value flags  ***
  # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
 43         0    1    1    1    0    0    0    0    1    1    0
 21         0    1    1    1    0    0    0    0    1    1    0
 20         0    1    1    1    0    0    0    0    1    1    0
 19         0    1    1    1    0    0    0    0    1    1    0
END PWAT-PARM1

PWAT-PARM2
  <PLS >      PWATER input info: Part 2         ***
  # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
 43              0       3.8      0.04        50      0.05       2.5     0.915
 21              0       3.2      0.03        75      0.15       2.5     0.915
 20              0       3.5     0.033        80       0.1       2.5     0.915
 19              0       3.8     0.035       100      0.05       2.5     0.915
END PWAT-PARM2

PWAT-PARM3
  <PLS >      PWATER input info: Part 3         ***
  # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
 43              0         0         2         2         0      0.05      0.05
 21              0         0         2         2         0      0.05      0.05
 20              0         0         2         2         0      0.05      0.05
 19              0         0         2         2         0      0.05      0.05
END PWAT-PARM3
PWAT-PARM4
  <PLS >     PWATER input info: Part 4                              ***
  # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
 43              0       0.6      0.03         1       0.3         0
 21              0       0.6      0.04         1       0.3         0
 20              0       0.6      0.04         1       0.3         0
 19              0       0.6      0.04         1       0.3         0
END PWAT-PARM4
MON-LZETPARM
  <PLS >      PWATER input info: Part 3         ***
  # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
 43       0.6  0.6  0.6  0.6  0.7  0.7  0.7  0.7  0.7  0.6  0.6  0.6
 21       0.4  0.4  0.4  0.4  0.6  0.6  0.6  0.6  0.6  0.4  0.4  0.4
 20       0.4  0.4  0.4  0.4  0.6  0.6  0.6  0.6  0.6  0.4  0.4  0.4
 19       0.4  0.4  0.4  0.4  0.6  0.6  0.6  0.6  0.6  0.4  0.4  0.4
END MON-LZETPARM
MON-INTERCEP
  <PLS >      PWATER input info: Part 3         ***
  # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
 43       0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1
 21       0.1  0.1  0.1  0.1 0.06 0.06 0.06 0.06 0.06  0.1  0.1  0.1
 20       0.1  0.1  0.1  0.1 0.06 0.06 0.06 0.06 0.06  0.1  0.1  0.1
```

```
   19       0.1  0.1  0.1  0.1 0.06 0.06 0.06 0.06 0.06  0.1  0.1  0.1
  END MON-INTERCEP

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
             ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS       IFWS       LZS       AGWS       GWVS
   43             0         0      0.15          0         1       0.05          0
   21             0         0      0.01          0       0.4       0.01          0
   20             0         0      0.01          0       0.4       0.01          0
   19             0         0      0.01          0       0.4       0.01          0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                     in  out           ***
    1      IMPERVIOUS-FLAT        1    1    1   27    0
    2      IMPERVIOUS-MOD         1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
    1         0    0    1    0    0    0
    2         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
    1         0    0    4    0    0    0    1    9
    2         0    0    4    0    0    0    1    9
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
    1         0    0    0    0    1
    2         0    0    0    0    1
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    1            100      0.05     0.011       0.1
    2            100       0.1     0.011      0.08
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    1              0         0
    2              0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    1              0         0
    2              0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
```

```
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
DMA #2 (BMP#1 Tributary)***
PERLND  43                        1.18     RCHRES   1      2
PERLND  43                        1.18     RCHRES   1      3
PERLND  21                        0.47     RCHRES   1      2
PERLND  21                        0.47     RCHRES   1      3
IMPLND   1                        1.92     RCHRES   1      5
DMA #2B  (East Diversion)***
PERLND  20                        0.19     COPY   501     12
PERLND  20                        0.19     COPY   601     12
PERLND  20                        0.19     COPY   501     13
PERLND  20                        0.19     COPY   601     13
PERLND  21                         0.4     COPY   501     12
PERLND  21                         0.4     COPY   601     12
PERLND  21                         0.4     COPY   501     13
PERLND  21                         0.4     COPY   601     13
DMA#2C (Filterra Tributary)***
IMPLND   2                        0.06     COPY   501     15
IMPLND   2                        0.06     COPY   601     15
DMA #2 D(Frontage Basin)***
PERLND  21                        0.76     COPY   501     12
PERLND  21                        0.76     COPY   601     12
PERLND  21                        0.76     COPY   501     13
PERLND  21                        0.76     COPY   601     13
PERLND  19                         0.1     COPY   501     12
PERLND  19                         0.1     COPY   601     12
PERLND  19                         0.1     COPY   501     13
PERLND  19                         0.1     COPY   601     13
IMPLND   2                        0.04     COPY   501     15
IMPLND   2                        0.04     COPY   601     15
DMA #2E (NW Cut Slope)***
PERLND  21                        0.18     COPY   501     12
PERLND  21                        0.18     COPY   601     12
PERLND  21                        0.18     COPY   501     13
PERLND  21                        0.18     COPY   601     13

******Routing******
PERLND  43                        1.18     COPY     1     12
PERLND  21                        0.47     COPY     1     12
IMPLND   1                        1.92     COPY     1     15
PERLND  43                        1.18     COPY     1     13
PERLND  21                        0.47     COPY     1     13
RCHRES   1                           1     RCHRES   2      8
RCHRES   2                           1     COPY   501     16
RCHRES   1                           1     COPY   501     17
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   12.1        DISPLY   1     INPUT  TIMSER 1
GENER    2 OUTPUT TIMSER      .0002778     RCHRES   1     EXTNL  OUTDGT 1



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

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<------------------><---> User T-series  Engl Metr LKFG           ***
                                        in  out                             ***
    1     Surface BMP #1          2    1    1    1   28    0    1
    2     BMP #1                  1    1    1    1   28    0    1
  END GEN-INFO
  *** Section RCHRES***
```

```
  ACTIVITY
    <PLS > ************* Active Sections ******************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
    1         1    0    0    0    0    0    0    0    0    0
    2         1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ******************* PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
    1         4    0    0    0    0    0    0    0    0    0    1    9
    2         4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                    ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
            FG FG FG FG  possible  exit  *** possible  exit      possible  exit
             *  *  *  *    *  *  *  *  *       *  *  *  *  *         ***
    1        0  1  0  0    4  5  0  0  0       0  1  0  0  0       2  1  2  2  2
    2        0  1  0  0    4  0  0  0  0       0  0  0  0  0       2  2  2  2  2
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN      DELTH     STCOR        KS       DB50       ***
  <------><--------><--------><--------><--------><--------><--------->       ***
    1              1      0.01       0.0       0.0       0.0       0.0
    2              2      0.03       0.0       0.0       0.0       0.0
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                       ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
           *** ac-ft     for each possible exit        for each possible exit
  <------><--------->     <---><---><---><---><---> *** <---><---><---><---><--->
    1            0         4.0  5.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    2            0         4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
*** User-Defined Variable Quantity Lines
***                          addr
***                         <------>
*** kwd  varnam optyp  opn  vari  s1 s2 s3 tp multiply  lc ls ac as agfn ***
  <****> <----> <----> <-> <----><-><-><-><-><---------> <><-> <><-> <--> ***
  UVQUAN vol2   RCHRES   2 VOL              4
  UVQUAN v2m2   GLOBAL     WORKSP  1        3
  UVQUAN vpo2   GLOBAL     WORKSP  2        3
  UVQUAN v2d2   GENER    2 K       1        3
*** User-Defined Target Variable Names
***                  addr or                      addr or
***                 <------>                     <------>
*** kwd   varnam ct  vari  s1 s2 s3  frac oper     vari  s1 s2 s3  frac oper
  <****>  <----><-> <----><-><-><-> <---> <-->    <----><-><-><-> <---> <-->
  UVNAME  v2m2    1 WORKSP  1         1.0 QUAN
  UVNAME  vpo2    1 WORKSP  2         1.0 QUAN
  UVNAME  v2d2    1 K       1         1.0 QUAN
*** opt foplop dcdts  yr mo dy hr mn d t   vnam  s1 s2 s3 ac quantity  tc  ts rp
  <****><-><--><><-><--> <> <> <> <><><>  <----><-><-><-><-><---------> <> <-><->
  GENER   2                              v2m2            =  11027.09
*** Compute remaining available pore space
  GENER   2                              vpo2            =  v2m2
  GENER   2                              vpo2           -=  vol2
*** Check to see if VPORA goes negative; if so set VPORA = 0.0
IF (vpo2 < 0.0) THEN
  GENER   2                              vpo2            =  0.0
END IF
*** Infiltration volume
  GENER   2                              v2d2            =  vpo2
END SPEC-ACTIONS
```

```
FTABLES
  FTABLE      2
   52    4
     Depth       Area     Volume  Outflow1 Velocity  Travel Time***
      (ft)    (acres) (acre-ft)    (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.166946  0.000000  0.000000
  0.109890  0.166838  0.002331  0.000000
  0.219780  0.164680  0.004718  0.000000
  0.329670  0.162532  0.007163  0.000000
  0.439560  0.160392  0.009665  0.000000
  0.549451  0.158261  0.012226  0.000000
  0.659341  0.156139  0.014844  0.000000
  0.769231  0.154026  0.017520  0.000000
  0.879121  0.151922  0.020256  0.000000
  0.989011  0.149827  0.023050  0.000000
  1.098901  0.147740  0.025904  0.001468
  1.208791  0.145663  0.028817  0.002202
  1.318681  0.143594  0.031790  0.003425
  1.428571  0.141534  0.034823  0.004036
  1.538462  0.139483  0.037917  0.004958
  1.648352  0.137441  0.041071  0.005418
  1.758242  0.135408  0.045519  0.006155
  1.868132  0.133384  0.050052  0.006719
  1.978022  0.131368  0.054670  0.007802
  2.087912  0.129362  0.059374  0.008349
  2.197802  0.127364  0.064164  0.009292
  2.307692  0.125375  0.069040  0.009768
  2.417582  0.123395  0.074003  0.010597
  2.527473  0.121424  0.079053  0.011015
  2.637363  0.119462  0.084191  0.011418
  2.747253  0.117508  0.089418  0.012141
  2.857143  0.115564  0.094732  0.012985
  2.967033  0.113628  0.100136  0.013857
  3.076923  0.111702  0.105628  0.014717
  3.186813  0.109784  0.111211  0.015550
  3.296703  0.107875  0.116883  0.016349
  3.406593  0.105975  0.122646  0.017116
  3.516484  0.104083  0.128500  0.017852
  3.626374  0.102201  0.134445  0.018559
  3.736264  0.100327  0.140482  0.019241
  3.846154  0.098463  0.146611  0.019899
  3.956044  0.096607  0.152833  0.020536
  4.065934  0.094760  0.159147  0.021153
  4.175824  0.092922  0.165555  0.021754
  4.285714  0.091093  0.172057  0.022337
  4.395604  0.089273  0.178652  0.022906
  4.505495  0.087461  0.185343  0.023462
  4.615385  0.085659  0.192128  0.024004
  4.725275  0.083865  0.199008  0.024534
  4.835165  0.082080  0.205985  0.025054
  4.945055  0.080304  0.213057  0.025562
  5.054945  0.078537  0.220226  0.026062
  5.164835  0.076779  0.227492  0.026552
  5.274725  0.075029  0.234856  0.027034
  5.384615  0.073289  0.242317  0.027510
  5.494505  0.071557  0.249876  0.027987
  5.500000  0.069835  0.253147  0.034975
  END FTABLE  2
  FTABLE      1
   42    5
     Depth       Area     Volume  Outflow1  Outflow2  Velocity  Travel Time***
      (ft)    (acres) (acre-ft)    (cfs)      (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.069835  0.000000  0.000000  0.000000
  0.109890  0.169113  0.018465  0.000000  0.352084
  0.219780  0.171288  0.037168  0.000000  0.462352
  0.329670  0.173473  0.056111  0.000000  0.488145
  0.439560  0.175666  0.075294  0.000000  0.513939
  0.549451  0.177868  0.094719  0.003394  0.539733
  0.659341  0.180079  0.114387  0.006093  0.565526
  0.769231  0.182299  0.134298  0.010639  0.591320
```

```
  0.879121  0.184528  0.154453  0.016444  0.617114
  0.989011  0.186766  0.174854  0.020260  0.642907
  1.098901  0.189012  0.195501  0.023394  0.668701
  1.208791  0.191268  0.216395  0.026131  0.694495
  1.318681  0.193532  0.237538  0.028597  0.720288
  1.428571  0.195805  0.258930  0.030860  0.746082
  1.538462  0.198087  0.280573  0.082892  0.771876
  1.648352  0.200378  0.302467  0.386977  0.797669
  1.758242  0.202678  0.324612  0.655222  0.823463
  1.868132  0.204986  0.347012  0.785072  0.849257
  1.978022  0.207304  0.369665  0.890920  0.875050
  2.087912  0.209630  0.392573  0.985270  0.900844
  2.197802  0.211966  0.415738  1.071227  0.926638
  2.307692  0.214310  0.439160  1.150707  0.952431
  2.417582  0.216663  0.462840  1.224990  0.978225
  2.527473  0.219025  0.486778  1.294984  1.004019
  2.637363  0.221395  0.510977  1.361358  1.029812
  2.747253  0.223775  0.535437  1.424623  1.055606
  2.857143  0.226164  0.560159  1.485180  1.081400
  2.967033  0.228561  0.585144  1.543352  1.107193
  3.076923  0.230967  0.610393  1.599399  1.132987
  3.186813  0.233382  0.635907  1.653540  1.158781
  3.296703  0.235806  0.661686  1.705957  1.184574
  3.406593  0.238239  0.687733  1.756805  1.210368
  3.516484  0.240681  0.714047  1.806219  1.236162
  3.626374  0.243131  0.740630  1.854312  1.261955
  3.736264  0.245591  0.767483  1.901186  1.287749
  3.846154  0.248059  0.794606  1.946929  1.313543
  3.956044  0.250536  0.822002  1.991619  1.339336
  4.065934  0.253023  0.849670  2.035326  1.365130
  4.175824  0.255518  0.877612  2.078113  1.390924
  4.285714  0.258021  0.905828  2.120034  1.416717
  4.395604  0.260534  0.934320  2.161141  1.442511
  4.500000  0.262929  0.961644  2.201480  1.467015
  END FTABLE  1
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1              PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1              IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    1              PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    1              IMPLND   1 999 EXTNL  PETINP
WDM     22 IRRG     ENGL    0.7       SAME PERLND  43     EXTNL  SURLI
WDM      2 PREC     ENGL    1              RCHRES   1      EXTNL  PREC
WDM      1 EVAP     ENGL    0.5            RCHRES   1      EXTNL  POTEV
WDM      1 EVAP     ENGL    0.7            RCHRES   2      EXTNL  POTEV

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
RCHRES   2 HYDR   RO     1 1         1      WDM   1000 FLOW     ENGL      REPL
RCHRES   2 HYDR   STAGE  1 1         1      WDM   1001 STAG     ENGL      REPL
RCHRES   1 HYDR   STAGE  1 1         1      WDM   1002 STAG     ENGL      REPL
RCHRES   1 HYDR   O      1 1         1      WDM   1003 FLOW     ENGL      REPL
COPY     1 OUTPUT MEAN   1 1      12.1      WDM    701 FLOW     ENGL      REPL
COPY   501 OUTPUT MEAN   1 1      12.1      WDM    801 FLOW     ENGL      REPL
COPY   601 OUTPUT MEAN   1 1      12.1      WDM    901 FLOW     ENGL      REPL
END EXT TARGETS

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

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

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

  MASS-LINK         8
RCHRES     OFLOW  OVOL   2                 RCHRES         INFLOW IVOL
  END MASS-LINK    8

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

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

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

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

  MASS-LINK        17
RCHRES     OFLOW  OVOL   1                 COPY           INPUT  MEAN
  END MASS-LINK   17


END MASS-LINK

END RUN
```

Predeveloped HSPF Message File

Mitigated HSPF Message File

Disclaimer

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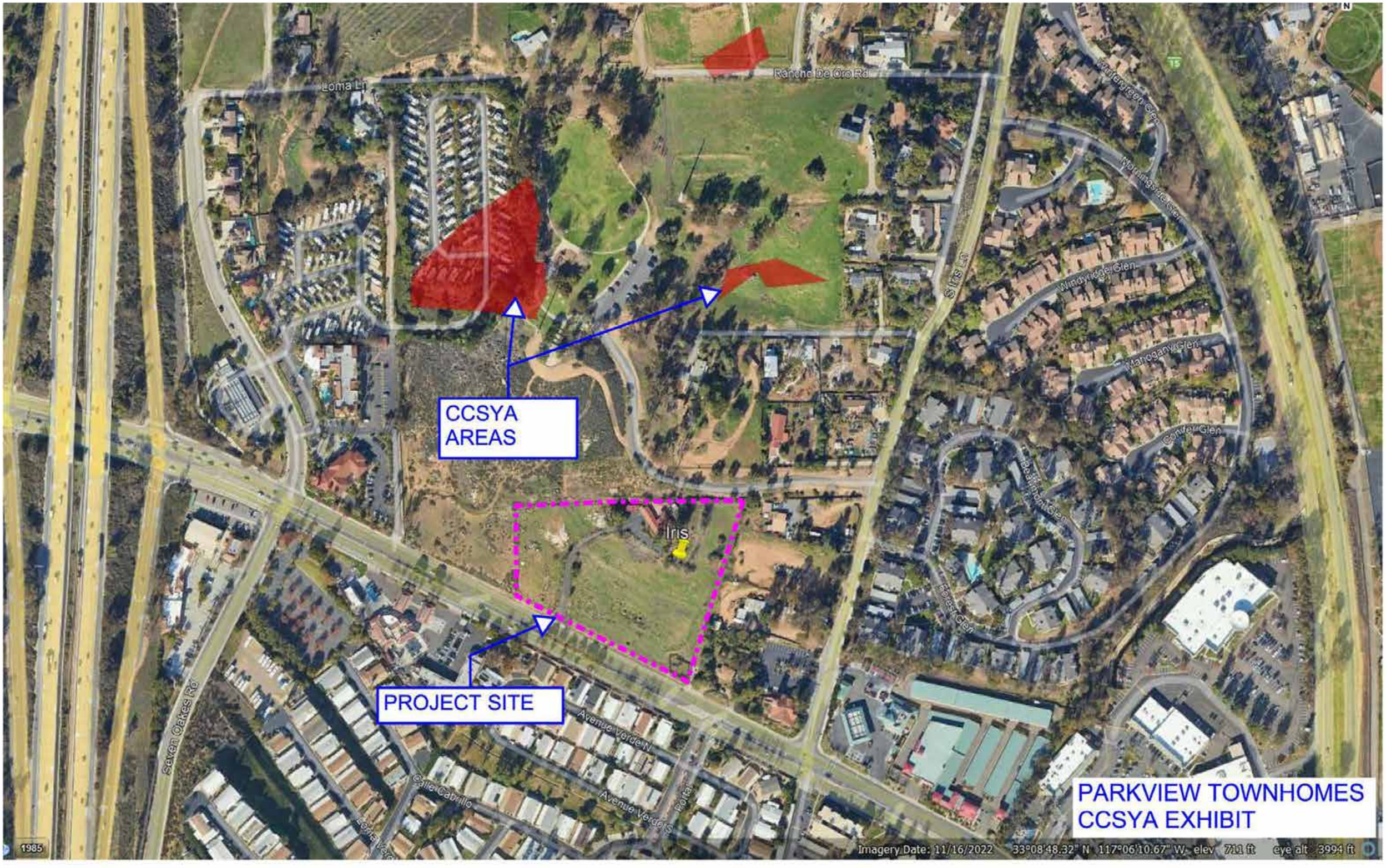

PARKVIEW TOWNHOMES
CCSYA EXHIBIT

ATTACHMENT 3

Structural BMP Maintenance Information

This is the cover sheet for Attachment 3.

Indicate which Items are Included behind this cover sheet:

Attachment Sequence	Contents	Checklist
Attachment 3a	Structural BMP Maintenance Plan (Required)	▣Included See Structural BMP Maintenance Information Checklist on the back of this Attachment cover sheet.
Attachment 3b	Draft Storm Water Control Facilities Maintenance Agreement (SWCFMA) (when applicable)	▣Included ☐Not Applicable

BMP MAINTENANCE PROGRAM

	PROPOSED OPERATION AND MAINTENANCE PROCEDURE DETAILS (TREATMENT CONTROL BMPs)				
	O&M RESPONSIBLE PARTY DESIGNEE : HOA				
	ROUTINE ACTION	**MAINTENANCE INDICATOR**	**FIELD MEASUREMENT**	**MEASUREMENT FREQUENCY**	**MAINTENANCE ACTIVITY**
TC BMP: BIOFILTRATION BASIN	INSPECT FOR STANDING WATER AND DRAINAGE PROBLEMS	WHEN WATER STANDS BETWEEN STORM AND REMAINS ON THE SURFACE MORE THAN 48 HRS AFTER A STORM	VISUAL	BIANNUALLY	CHECK FOR CLOGGED OR SLOW-DRAINING FILTER MEDIA, A CRUST FORMED ON THE TOP LAYER, OR OTHER CAUSES OF INSUFFICIENT FILTERING TIME AND RESTORE PROPER FILTRATION CHARACTERISTICS. REMOVE SEDIMENT OR TRASH BLOCKAGE, OR ADD UNDERDRAIN IF NECESSARY
	INSPECT FOR VEGETATION	DEAD, DISEASED AND/OR OVERGROWN VEGETATION	VISUAL	BIANNUALLY	REMOVE AND REPLACE THE DEAD & DISEASED PLANTS WITH HEALTHY PLANTS. TRIM AND PURNE EXCESS VEGETATION
	INSPECT FOR MULCH	MULCH IS MISSING OR PATCHY IN APPEARANCE	VISUAL	BIANNUALLY	RE-MULCH ANY VOID AREAS, MAKE SURE MULCH IS EVEN IN APPEARANCE AT A DEPTH OF 3 INCHES. ADD FRESH MULCH LAYER EVERY 6 MONTHS. ONCE EVERY 2 TO 3 YEARS REMOVE OLD MULCH LAYER BEFORE APPLYING NEW ONE.

POST-CONSTRUCTION PERMANENT BMPs	PROPOSED OPERATION AND MAINTENANCE PROCEDURE DETAILS (LID/SITE DESIGN AND SOURCE CONTROL BMPs)				
	O&M RESPONSIBLE PARTY DESIGNEE : HOA				
	ROUTINE ACTION	**MAINTENANCE INDICATOR**	**FIELD MEASUREMENT**	**MEASUREMENT FREQUENCY**	**MAINTENANCE ACTIVITY**
LID/SITE DESIGN: - LANDSCAPE/PLANTER AREA	REFUSE/TRASH PICK-UP, FERTILIZING	TRASH, TALL GRASS, WEEDS, DEAD OR POORLY GROWING LANDSCAPE	VISUAL	BIWEEKLY	REMOVE TRASH & DEAD VEGETATION, REMOVE WEEDS, AND APPLY FERTILIZER
SOURCE CONTROLS:					
- HARDSCAPE SWEEPING	SWEEPING	DIRT ACCUMULATION	VISUAL	MONTHLY	SWEEP PAVED AREAS REGULARLY TO COLLECT LOOSE DUST PARTICLES. WIPE UP SPILLS WITH RAGS AND OTHER ABSORBENT MATERIAL IMMEDIATELY, DO NOT HOSE DOWN THE AREA TO A STORM DRAIN
- STORM DRAIN SYSTEM SIGNAGE	RESIGNAGE/RESTENCILING	ILLEGIBLE SIGNAGE/STENCILING	VISUAL	AS REQUIRED	PROVIDE EMPLOYEE TRAINING, INSPECT/REPAIR STORM DRAIN INLET SIGNAGE/STENCILING FOR LEGIBILITY
- NON-STORM WATER DISCHARGES	PREVENT NON-STORM WATER DISCHARGES	NON-STORM WATER DISCHARGE/RELEASE	VISUAL	AS REQUIRED	PROVIDE EMPLOYEE TRAINING MAINTAIN LEGIBILITY OF STORM DRAIN INLET ISOLATE PROBLEM AREAS AND PLUG ILLEGAL DISCHARGE POINTS . ON PAVED AREAS, CLEAN UP SPILLS WITH AS LITTLE WATER AS POSSIBLE . FOR SMALL SPILLS, USE ABSORBENT MATERIALS RATHER THAN HOSING DOWN SPILL AREAS

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BMP MAINTENANCE FACT SHEET
FOR
STRUCTURAL BMP BF-1 BIOFILTRATION

Biofiltration facilities are vegetated surface water systems that filter water through vegetation, and soil or engineered media prior to discharge via underdrain or overflow to the downstream conveyance system. Biofiltration facilities have limited or no infiltration. They are typically designed to provide enough hydraulic head to move flows through the underdrain connection to the storm drain system. Typical biofiltration components include:

- Inflow distribution mechanisms (e.g., perimeter flow spreader or filter strips)
- Energy dissipation mechanism for concentrated inflows (e.g., splash blocks or riprap)
- Shallow surface ponding for captured flows
- Side slope and basin bottom vegetation selected based on climate and ponding depth
- Non-floating mulch layer
- Media layer (planting mix or engineered media) capable of supporting vegetation growth
- Filter course layer consisting of aggregate to prevent the migration of fines into uncompacted native soils or the aggregate storage layer
- Aggregate storage layer with underdrain(s)
- Impermeable liner or uncompacted native soils at the bottom of the facility
- Overflow structure

Normal Expected Maintenance

Biofiltration requires routine maintenance to: remove accumulated materials such as sediment, trash or debris; maintain vegetation health; maintain infiltration capacity of the media layer; replenish mulch; and maintain integrity of side slopes, inlets, energy dissipators, and outlets. A summary table of standard inspection and maintenance indicators is provided within this Fact Sheet.

Non-Standard Maintenance or BMP Failure

If any of the following scenarios are observed, the BMP is not performing as intended to protect downstream waterways from pollution and/or erosion. Corrective maintenance, increased inspection and maintenance, BMP replacement, or a different BMP type will be required.

- The BMP is not drained between storm events. Surface ponding longer than approximately 24 hours following a storm event may be detrimental to vegetation health, and surface ponding longer than approximately 96 hours following a storm event poses a risk of vector (mosquito) breeding. Poor drainage can result from clogging of the media layer, filter course, aggregate storage layer, underdrain, or outlet structure. The specific cause of the drainage issue must be determined and corrected.
- Sediment, trash, or debris accumulation greater than 25% of the surface ponding volume within one month. This means the load from the tributary drainage area is too high, reducing BMP function or clogging the BMP. This would require pretreatment measures within the tributary area draining to the BMP to intercept the materials. Pretreatment components, especially for sediment, will extend the life of components that are more expensive to replace such as media, filter course, and aggregate layers.
- Erosion due to concentrated storm water runoff flow that is not readily corrected by adding erosion control blankets, adding stone at flow entry points, or minor re-grading to restore proper drainage according to the original plan. If the issue is not corrected by restoring the BMP to the original plan and grade, the [City Engineer] shall be contacted prior to any additional repairs or reconstruction.

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Other Special Considerations

Biofiltration is a vegetated structural BMP. Vegetated structural BMPs that are constructed in the vicinity of, or connected to, an existing jurisdictional water or wetland could inadvertently result in creation of expanded waters or wetlands. As such, vegetated structural BMPs have the potential to come under the jurisdiction of the United States Army Corps of Engineers, SDRWQCB, California Department of Fish and Wildlife, or the United States Fish and Wildlife Service. This could result in the need for specific resource agency permits and costly mitigation to perform maintenance of the structural BMP. Along with proper placement of a structural BMP, **routine maintenance is key to preventing this scenario**.

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SUMMARY OF STANDARD INSPECTION AND MAINTENANCE FOR BF-1 BIOFILTRATION		
The property owner is responsible to ensure inspection, operation and maintenance of permanent BMPs on their property unless responsibility has been formally transferred to an agency, community facilities district, homeowners association, property owners association, or other special district. Maintenance frequencies listed in this table are average/typical frequencies. Actual maintenance needs are site-specific, and maintenance may be required more frequently. Maintenance must be performed whenever needed, based on maintenance indicators presented in this table. The BMP owner is responsible for conducting regular inspections to see when maintenance is needed based on the maintenance indicators. During the first year of operation of a structural BMP, inspection is recommended at least once prior to August 31 and then monthly from September through May. Inspection during a storm event is also recommended. After the initial period of frequent inspections, the minimum inspection and maintenance frequency can be determined based on the results of the first year inspections.		
Threshold/Indicator	**Maintenance Action**	**Typical Maintenance Frequency**
Accumulation of sediment, litter, or debris	Remove and properly dispose of accumulated materials, without damage to the vegetation or compaction of the media layer.	• Inspect monthly. If the BMP is 25% full* or more in one month, increase inspection frequency to monthly plus after every 0.1-inch or larger storm event. • Remove any accumulated materials found at each inspection.
Obstructed inlet or outlet structure	Clear blockage.	• Inspect monthly and after every 0.5-inch or larger storm event. • Remove any accumulated materials found at each inspection.
Damage to structural components such as weirs, inlet or outlet structures	Repair or replace as applicable	• Inspect annually. • Maintenance when needed.
Poor vegetation establishment	Re-seed, re-plant, or re-establish vegetation per original plans.	• Inspect monthly. • Maintenance when needed.
Dead or diseased vegetation	Remove dead or diseased vegetation, re-seed, re-plant, or re-establish vegetation per original plans.	• Inspect monthly. • Maintenance when needed.
Overgrown vegetation	Mow or trim as appropriate.	• Inspect monthly. • Maintenance when needed.
2/3 of mulch has decomposed, or mulch has been removed	Remove decomposed fraction and top off with fresh mulch to a total depth of 3 inches.	• Inspect monthly. • Replenish mulch annually, or more frequently when needed based on inspection.

*"25% full" is defined as ¼ of the depth from the design bottom elevation to the crest of the outflow structure (e.g., if the height to the outflow opening is 12 inches from the bottom elevation, then the materials must be removed when there is 3 inches of accumulation – this should be marked on the outflow structure).

SUMMARY OF STANDARD INSPECTION AND MAINTENANCE FOR BF-1 BIOFILTRATION (Continued from previous page)		
Threshold/Indicator	**Maintenance Action**	**Typical Maintenance Frequency**
Erosion due to concentrated irrigation flow	Repair/re-seed/re-plant eroded areas and adjust the irrigation system.	• Inspect monthly. • Maintenance when needed.
Erosion due to concentrated storm water runoff flow	Repair/re-seed/re-plant eroded areas, and make appropriate corrective measures such as adding erosion control blankets, adding stone at flow entry points, or minor re-grading to restore proper drainage according to the original plan. If the issue is not corrected by restoring the BMP to the original plan and grade, the [City Engineer] shall be contacted prior to any additional repairs or reconstruction.	• Inspect after every 0.5-inch or larger storm event. If erosion due to storm water flow has been observed, increase inspection frequency to after every 0.1-inch or larger storm event. • Maintenance when needed. If the issue is not corrected by restoring the BMP to the original plan and grade, the [City Engineer] shall be contacted prior to any additional repairs or reconstruction.
Standing water in BMP for longer than 24 hours following a storm event Surface ponding longer than approximately 24 hours following a storm event may be detrimental to vegetation health	Make appropriate corrective measures such as adjusting irrigation system, removing obstructions of debris or invasive vegetation, clearing underdrains, or repairing/replacing clogged or compacted soils.	• Inspect monthly and after every 0.5-inch or larger storm event. If standing water is observed, increase inspection frequency to after every 0.1-inch or larger storm event. • Maintenance when needed.
Presence of mosquitos/larvae For images of egg rafts, larva, pupa, and adult mosquitos, see http://www.mosquito.org/biology	If mosquitos/larvae are observed: first, immediately remove any standing water by dispersing to nearby landscaping; second, make corrective measures as applicable to restore BMP drainage to prevent standing water. If mosquitos persist following corrective measures to remove standing water, or if the BMP design does not meet the 96-hour drawdown criteria due to release rates controlled by an orifice installed on the underdrain, the [City Engineer] shall be contacted to determine a solution. A different BMP type, or a Vector Management Plan prepared with concurrence from the County of San Diego Department of Environmental Health, may be required.	• Inspect monthly and after every 0.5-inch or larger storm event. If mosquitos are observed, increase inspection frequency to after every 0.1-inch or larger storm event. • Maintenance when needed.
Underdrain clogged	Clear blockage.	• Inspect if standing water is observed for longer than 24-96 hours following a storm event. • Maintenance when needed.

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Biofiltration

Date:	Inspector:	BMP ID No.:
Permit No.:	APN(s):	
Property / Development Name:	Responsible Party Name and Phone Number:	
Property Address of BMP:	Responsible Party Address:	

INSPECTION AND MAINTENANCE CHECKLIST FOR BF-1 BIOFILTRATION PAGE 1 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Accumulation of sediment, litter, or debris Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Remove and properly dispose of accumulated materials, without damage to the vegetation ☐ If sediment, litter, or debris accumulation exceeds 25% of the surface ponding volume within one month (25% full*), add a forebay or other pre-treatment measures within the tributary area draining to the BMP to intercept the materials. ☐ Other / Comments:		
Poor vegetation establishment Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Re-seed, re-plant, or re-establish vegetation per original plans ☐ Other / Comments:		

*"25% full" is defined as ¼ of the depth from the design bottom elevation to the crest of the outflow structure (e.g., if the height to the outflow opening is 12 inches from the bottom elevation, then the materials must be removed when there is 3 inches of accumulation – this should be marked on the outflow structure).

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Date:	Inspector:	BMP ID No.:
Permit No.:	APN(s):	

INSPECTION AND MAINTENANCE CHECKLIST FOR BF-1 BIOFILTRATION PAGE 2 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Dead or diseased vegetation Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Remove dead or diseased vegetation, re-seed, re-plant, or re-establish vegetation per original plans ☐ Other / Comments:		
Overgrown vegetation Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Mow or trim as appropriate ☐ Other / Comments:		
2/3 of mulch has decomposed, or mulch has been removed Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Remove decomposed fraction and top off with fresh mulch to a total depth of 3 inches ☐ Other / Comments:		

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Biofiltration

Date:	Inspector:	BMP ID No.:
Permit No.:	APN(s):	

INSPECTION AND MAINTENANCE CHECKLIST FOR BF-1 BIOFILTRATION PAGE 3 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Erosion due to concentrated irrigation flow Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Repair/re-seed/re-plant eroded areas and adjust the irrigation system ☐ Other / Comments:		
Erosion due to concentrated storm water runoff flow Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Repair/re-seed/re-plant eroded areas, and make appropriate corrective measures such as adding erosion control blankets, adding stone at flow entry points, or minor re-grading to restore proper drainage according to the original plan ☐ If the issue is not corrected by restoring the BMP to the original plan and grade, the [City Engineer] shall be contacted prior to any additional repairs or reconstruction ☐ Other / Comments:		

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Biofiltration

Date:	Inspector:	BMP ID No.:
Permit No.:	APN(s):	

INSPECTION AND MAINTENANCE CHECKLIST FOR BF-1 BIOFILTRATION PAGE 4 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Obstructed inlet or outlet structure Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Clear blockage ☐ Other / Comments:		
Underdrain clogged (inspect underdrain if standing water is observed for longer than 24-96 hours following a storm event) Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Clear blockage ☐ Other / Comments:		
Damage to structural components such as weirs, inlet or outlet structures Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Repair or replace as applicable ☐ Other / Comments:		

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Biofiltration

Date:	Inspector:	BMP ID No.:
Permit No.:	APN(s):	

INSPECTION AND MAINTENANCE CHECKLIST FOR BF-1 BIOFILTRATION PAGE 5 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Standing water in BMP for longer than 24-96 hours following a storm event* Surface ponding longer than approximately 24 hours following a storm event may be detrimental to vegetation health Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Make appropriate corrective measures such as adjusting irrigation system, removing obstructions of debris or invasive vegetation, clearing underdrains, or repairing/replacing clogged or compacted soils ☐ Other / Comments:		
Presence of mosquitos/larvae For images of egg rafts, larva, pupa, and adult mosquitos, see http://www.mosquito.org/biology Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Apply corrective measures to remove standing water in BMP when standing water occurs for longer than 24-96 hours following a storm event.** ☐ Other / Comments:		

*Surface ponding longer than approximately 24 hours following a storm event may be detrimental to vegetation health, and surface ponding longer than approximately 96 hours following a storm event poses a risk of vector (mosquito) breeding. Poor drainage can result from clogging of the media layer, filter course, aggregate storage layer, underdrain, or outlet structure. The specific cause of the drainage issue must be determined and corrected.

**If mosquitos persist following corrective measures to remove standing water, or if the BMP design does not meet the 96-hour drawdown criteria due to release rates controlled by an orifice installed on the underdrain, the [City Engineer] shall be contacted to determine a solution. A different BMP type, or a Vector Management Plan prepared with concurrence from the County of San Diego Department of Environmental Health, may be required.

Filterra Owner's Manual

filterra®

Bioretention Systems

CONTECH®

ENGINEERED SOLUTIONS

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Bioretention Systems

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Enclosed

Local Area Filterra Plant List

CONTECH®
ENGINEERED SOLUTIONS

Introduction

Thank you for your purchase of the Filterra® Bioretention System. Filterra is a specially engineered stormwater treatment system incorporating high performance biofiltration media to remove pollutants from stormwater runoff. The system's biota (vegetation and soil microorganisms) then further breakdown and absorb captured pollutants. All components of the system work together to provide a sustainable long-term solution for treating stormwater runoff.

The Filterra system has been delivered to you with protection in place to resist intrusion of construction related sediment which can contaminate the biofiltration media and result in inadequate system performance. These protection devices are intended as a best practice and cannot fully prevent contamination. It is the purchaser's responsibility to provide adequate measures to prevent construction related runoff from entering the Filterra system.

Included with your purchase is Activation of the Filterra system by the manufacturer as well as a 1-year warranty from delivery of the system and 1-year of routine maintenance (mulch replacement, debris removal, and pruning of vegetation) up to twice during the first year after activation.

Design and Installation

Each project presents different scopes for the use of Filterra systems. Information and help may be provided to the design engineer during the planning process. Correct Filterra box sizing (by rainfall region) is essential to predict pollutant removal rates for a given area. The engineer shall submit calculations for approval by the local jurisdiction. The contractor is responsible for the correct installation of Filterra units as shown in approved plans. A comprehensive installation manual is available at www.ContechES.com.

Activation Overview

Activation of the Filterra system is a procedure completed by the manufacturer to place the system into working condition. This involves the following items:

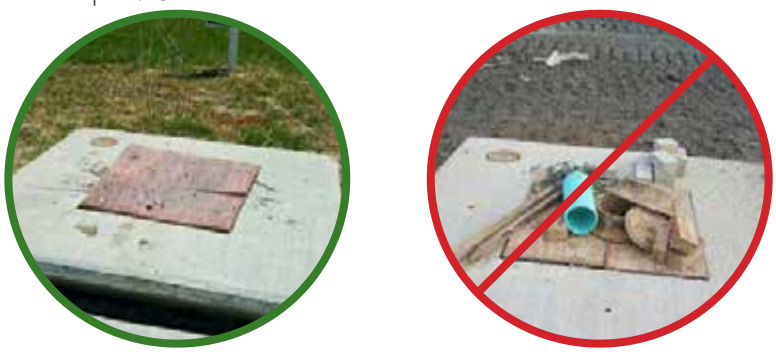
- Removal of construction runoff protection devices
- Planting of the system's vegetation
- Placement of pretreatment mulch layer using mulch certified for use in Filterra systems.

Activation MUST be provided by the manufacturer to ensure proper site conditions are met for Activation, proper installation of the vegetation, and use of pretreatment mulch certified for use in Filterra systems.

Minimum Requirements

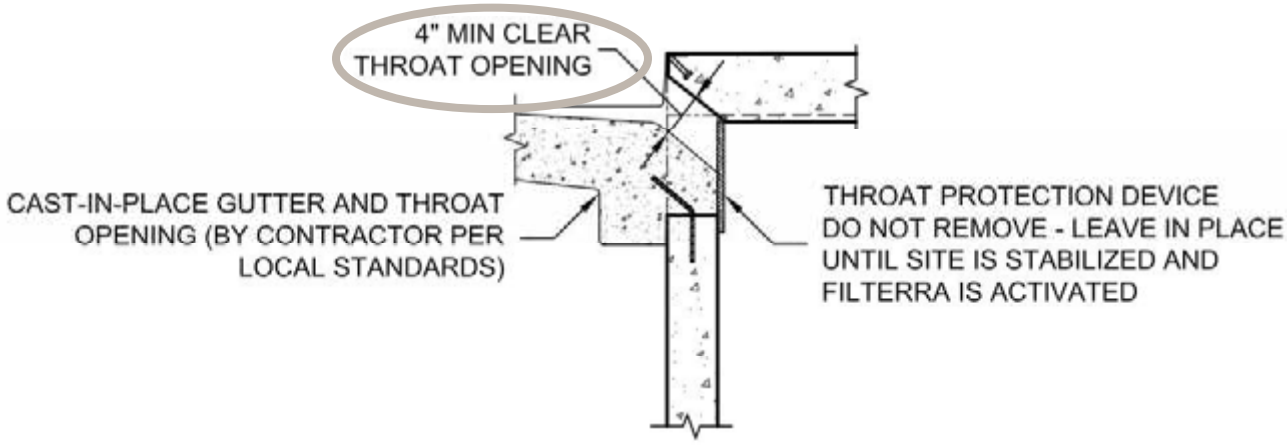
The minimum requirements for Filterra Activation are as follows:

1. The site landscaping must be fully stabilized, i.e. full landscaping installed and some grass cover (not just straw and seed) is required to reduce sediment transport. Construction debris and materials should be removed from surrounding area.



2. Final paving must be completed. Final paving ensures that paving materials will not enter and contaminate the Filterra system during the paving process, and that the plant will receive runoff from the drainage area, assisting with plant survival for the Filterra system.

3. Filterra throat opening should be at least 4" in order to ensure adequate capacity for inflow and debris.



An Activation Checklist is included on page 12 to ensure proper conditions are met for Contech to perform the Activation services. A charge of $500.00 will be invoiced for each Activation visit requested by Customer where Contech determines that the site does not meet the conditions required for Activation.

Filterra Plant Selection Overview

A Plant List has been enclosed with this packet highlighting recommended plants for Filterra systems in your area. Keep in mind that plants are subject to availability due to seasonality and required minimum size for the Filterra system. Plants installed in the Filterra system are container plants (max 15 gallon) from nursery stock and will be immature in height and spread at Activation.

It is the responsibility of the owner to provide adequate irrigation when necessary to the plant of the Filterra system.

The "Planting Requirements for Filterra Systems" document is included as an appendix and discusses proper selection and care of the plants within Filterra systems.

Warranty Overview

Refer to the Contech Engineered Solutions LLC Stormwater Treatment System LIMITED WARRANTY for further information. The following conditions may void the Filterra system's warranty and waive the manufacturer provided Activation and Maintenance services:

- Unauthorized activation or performance of any of the items listed in the activation overview
- Any tampering, modifications or damage to the Filterra system or runoff protection devices
- Removal of any Filterra system components
- Failure to prevent construction related runoff from entering the Filterra system
- Failure to properly store and protect any Filterra components (including media and underdrain stone) that may be shipped separately from the vault

Routine Maintenance Guidelines

With proper routine maintenance, the biofiltration media within the Filterra system should last as long as traditional bioretention media. Routine maintenance is included by the manufacturer on all Filterra systems for the first year after activation. This includes a maximum of 2 visits to remove debris, replace pretreatment mulch, and prune the vegetation. More information is provided in the Operations and Maintenance Guidelines. Some Filterra systems also contain pretreatment or outlet bays. Depending on site pollutant loading, these bays may require periodic removal of debris, however this is not included in the first year of maintenance, and would likely not be required within the first year of operation.

These services, as well as routine maintenance outside of the included first year, can be provided by certified maintenance providers listed on the Contech website. Training can also be provided to other stormwater maintenance or landscape providers.

Why Maintain?

All stormwater treatment systems require maintenance for effective operation. This necessity is often incorporated in your property's permitting process as a legally binding BMP maintenance agreement. Other reasons to maintain are:

- Avoiding legal challenges from your jurisdiction's maintenance enforcement program.
- Prolonging the expected lifespan of your Filterra media.
- Avoiding more costly media replacement.
- Helping reduce pollutant loads leaving your property.

Simple maintenance of the Filterra is required to continue effective pollutant removal from stormwater runoff before discharge into downstream waters. This procedure will also extend the longevity of the living biofilter system. The unit will recycle and accumulate pollutants within the biomass, but is also subjected to other materials entering the inlet. This may include trash, silt and leaves etc. which will be contained above the mulch layer. Too much silt may inhibit the Filterra's flow rate, which is the reason for site stabilization before activation. Regular replacement of the mulch stops accumulation of such sediment.

When to Maintain?

Contech includes a 1-year maintenance plan with each system purchase. Annual included maintenance consists of a maximum of two (2) scheduled visits. Additional maintenance may be necessary depending on sediment and trash loading (by Owner or at additional cost). The start of the maintenance plan begins when the system is activated.

Maintenance visits are scheduled seasonally; the spring visit aims to clean up after winter loads including salts and sands while the fall visit helps the system by removing excessive leaf litter.

It has been found that in regions which receive between 30-50 inches of annual rainfall, (2) two visits are generally required; regions with less rainfall often only require (1) one visit per annum. Varying land uses can affect maintenance frequency; e.g. some fast food restaurants require more frequent trash removal. Contributing drainage areas which are subject to new development wherein the recommended erosion and sediment control measures have not been implemented may require additional maintenance visits.

Some sites may be subjected to extreme sediment or trash loads, requiring more frequent maintenance visits. This is the reason for detailed notes of maintenance actions per unit, helping the Supplier and Owner predict future maintenance frequencies, reflecting individual site conditions.

Owners must promptly notify the (maintenance) Supplier of any damage to the plant(s), which constitute(s) an integral part of the bioretention technology. Owners should also advise other landscape or maintenance contractors to leave all maintenance to the Supplier (i.e. no pruning or fertilizing) during the first year.

Exclusion of Services

Clean up due to major contamination such as oils, chemicals, toxic spills, etc. will result in additional costs and are not covered under the Supplier maintenance contract. Should a major contamination event occur the Owner must block off the outlet pipe of the Filterra (where the cleaned runoff drains to, such as drop inlet) and block off the throat of the Filterra. The Supplier should be informed immediately.

Maintenance Visit Summary

Each maintenance visit consists of the following simple tasks (detailed instructions below).

1. Inspection of Filterra and surrounding area
2. Removal of tree grate and erosion control stones
3. Removal of debris, trash and mulch
4. Mulch replacement
5. Plant health evaluation and pruning or replacement as necessary
6. Clean area around Filterra
7. Complete paperwork

Maintenance Tools, Safety Equipment and Supplies

Ideal tools include: camera, bucket, shovel, broom, pruners, hoe/rake, and tape measure. Appropriate Personal Protective Equipment (PPE) should be used in accordance with local or company procedures. This may include impervious gloves where the type of trash is unknown, high visibility clothing and barricades when working in close proximity to traffic and also safety hats and shoes. A T-Bar or crowbar should be used for moving the tree grates (up to 170 lbs ea.). Most visits require minor trash removal and a full replacement of mulch. See below for actual number of bagged mulch that is required in each media bay size. Mulch should be a double shredded, hardwood variety. Some visits may require additional Filterra engineered soil media available from the Supplier.

Box Length	Box Width	Filter Surface Area (ft^2)	Volume at 3" (ft^3)	# of 2 ft^3 Mulch Bags
4	4	4	4	2
6	4	6	6	3
8	4	8	8	4
6	6	9	9	5
8	6	12	12	6
10	6	15	15	8
12	6	18	18	9
13	7	23	23	12

Maintenance Visit Procedure

Keep sufficient documentation of maintenance actions to predict location specific maintenance frequencies and needs. An example Maintenance Report is included in this manual.

1. Inspection of Filterra and surrounding area

- Record individual unit before maintenance with photograph (numbered). Record on Maintenance Report (see example in this document) the following:

Record on Maintenance Report the following:

Standing Water	yes | no
Damage to Box Structure	yes | no
Damage to Grate	yes | no
Is Bypass Clear	yes | no

If yes answered to any of these observations, record with close-up photograph (numbered).

2. Removal of tree grate and erosion control stones

- Remove cast iron grates for access into Filterra box.
- Dig out silt (if any) and mulch and remove trash & foreign items.

3. Removal of debris, trash and mulch

Record on Maintenance Report the following:

Silt/Clay	yes | no
Cups/ Bags	yes | no
Leaves	yes | no
Buckets Removed	_____

- After removal of mulch and debris, measure distance from the top of the Filterra engineered media soil to the top of the top slab. Compare the measured distance to the distance shown on the approved Contract Drawings for the system. Add Filterra media (not top soil or other) to bring media up as needed to distance indicated on drawings.

Record on Maintenance Report the following:

Distance to Top of Top Slab (inches)	_____
Inches of Media Added	_____

4. Mulch replacement

- Add double shredded mulch evenly across the entire unit to a depth of 3".
- Refer to Filterra Mulch Specifications for information on acceptable sources.
- Ensure correct repositioning of erosion control stones by the Filterra inlet to allow for entry of trash during a storm event.
- Replace Filterra grates correctly using appropriate lifting or moving tools, taking care not to damage the plant.

5. Plant health evaluation and pruning or replacement as necessary

- Examine the plant's health and replace if necessary.
- Prune as necessary to encourage growth in the correct directions

Record on Maintenance Report the following:

Height above Grate	_____ (ft)
Width at Widest Point	_____ (ft)
Health	healthy | unhealthy
Damage to Plant	yes | no
Plant Replaced	yes | no

6. Clean area around Filterra

- Clean area around unit and remove all refuse to be disposed of appropriately.

7. Complete paperwork

- Deliver Maintenance Report and photographs to appropriate location (normally Contech during maintenance contract period).
- Some jurisdictions may require submission of maintenance reports in accordance with approvals. It is the responsibility of the Owner to comply with local regulations.

Maintenance Checklist

Drainage System Failure	Problem	Conditions to Check	Condition that Should Exist	Actions
Inlet	Excessive sediment or trash accumulation.	Accumulated sediments or trash impair free flow of water into Filterra.	Inlet should be free of obstructions allowing free distributed flow of water into Filterra.	Sediments and/or trash should be removed.
Mulch Cover	Trash and floatable debris accumulation.	Excessive trash and/or debris accumulation.	Minimal trash or other debris on mulch cover.	Trash and debris should be removed and mulch cover raked level. Ensure bark nugget mulch is not used.
Mulch Cover	"Ponding" of water on mulch cover.	"Ponding" in unit could be indicative of clogging due to excessive fine sediment accumulation or spill of petroleum oils.	Stormwater should drain freely and evenly through mulch cover.	Recommend contact manufacturer and replace mulch as a minimum.
Vegetation	Plants not growing or in poor condition.	Soil/mulch too wet, evidence of spill. Incorrect plant selection. Pest infestation. Vandalism to plants.	Plants should be healthy and pest free.	Contact manufacturer for advice.
Vegetation	Plant growth excessive.	Plants should be appropriate to the species and location of Filterra.		Trim/prune plants in accordance with typical landscaping and safety needs.
Structure	Structure has visible cracks.	Cracks wider than 1/2 inch or evidence of soil particles entering the structure through the cracks.		Vault should be repaired.
Maintenance is ideally to be performed twice annually.				

Filterra Inspection & Maintenance Log

Filterra System Size/Model:_____**Location:** _____

Date	Mulch & Debris Removed	Depth of Mulch Added	Mulch Brand	Height of Vegetation Above Grate	Vegetation Species	Issues with System	Comments
1/1/17	*5 – 5 gal Buckets*	*3"*	*Lowe's Premium Brown Mulch*	*4'*	*Galaxy Magnolia*	*- Standing water in downstream structure*	*- Removed blockage in downstream structure*

Appendix 1 – Filterra® Activation Checklist

CONTECH® ENGINEERED SOLUTIONS

Project Name:_____ Company:_____

Site Contact Name: _____ Site Contact Phone/Email: _____

Site Owner/End User Name:_____ Site Owner/End User Phone/Email: _____

Preferred Activation Date: _____ (provide 2 weeks minimum from date this form is submitted)

Site Designation	System Size	Final Pavement / Top Coat Complete	Landscaping Complete / Grass Emerging	Construction materials / Piles / Debris Removed	Throat Opening Measures 4" Min. Height	Plant Species Requested
		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	

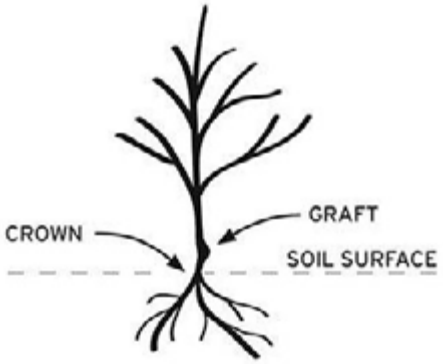
Attach additional sheets as necessary.

NOTE: A charge of $500.00 will be invoiced for each Activation visit requested by Customer where Contech determines that the site does not meet the conditions required for Activation. ONLY Contech authorized representatives can perform Activation of Filterra systems; unauthorized Activations will void the system warranty and waive manufacturer supplied Activation and 1st Year Maintenance.

Signature _____ Date _____

Appendix 2 – Planting Requirements for Filterra® Systems

Plant Material Selection



- Select plant(s) as specified in the engineering plans and specifications.
- Select plant(s) with full root development but not to the point where root bound.
- Use local nursery container plants only. Ball and burlapped plants are not permitted.
- For precast Filterra systems with a tree grate, plant(s) must not have scaffold limbs at least 14 inches from the crown due to spacing between the top of the mulch and the tree grate. Lower branches can be pruned away provided there are sufficient scaffold branches for tree or shrub development.
- For precast Filterra systems with a tree grate, at the time of installation, it is required that plant(s) must be at least 6" above the tree grate opening at installation for all Filterra configurations. This DOES NOT apply to Full Grate Cover designs.
- Plant(s) shall not have a mature height greater than 25 feet.
- For standard 21" media depth, a 7 – 15 gallon container size shall be used. Media less than 21" (Filterra boxes only) will require smaller container plants.
- For precast Filterra systems, plant(s) should have a single trunk at installation, and pruning may be necessary at activation and maintenance for some of the faster growing species, or species known to produce basal sprouts.

Plant Installation

- During transport protect the plant leaves from wind and excessive jostling.
- Prior to removing the plant(s) from the container, ensure the soil moisture is sufficient to maintain the integrity of the root ball. If needed, pre-wet the container plant.
- Cut away any roots which are growing out of the container drain holes. Plants with excessive root growth from the drain holes should be rejected.
- Plant(s) should be carefully removed from the pot by gently pounding on the sides of the container with the fist to loosen root ball. Then carefully slide out. Do not lift plant(s) by trunk as this can break roots and cause soil to fall off. Extract the root ball in a horizontal position and support it to prevent it from breaking apart. Alternatively the pot can be cut away to minimize root ball disturbance.
- Remove any excess soil from above the root flare after removing plant(s) from container.
- Excavate a hole with a diameter 4" greater than the root ball, gently place the plant(s).
- If plant(s) have any circling roots from being pot bound, gently tease them loose without breaking them.
- If root ball has a root mat on the bottom, it should be shaved off with a knife just above the mat line.
- Plant the tree/shrub/grass with the top of the root ball 1" above surrounding media to allow for settling.
- All plants should have the main stem centered in the tree grate (where applicable) upon completion of installation.
- With all trees/shrubs, remove dead, diseased, crossed/rubbing, sharply crotched branches or branches growing excessively long or in wrong direction compared to majority of branches.
- To prevent transplant shock (especially if planting takes place in the hot season), it may be necessary to prune some of the foliage to compensate for reduced root uptake capacity. This is accomplished by pruning away some of the smaller secondary branches or a main scaffold branch if there are too many. Too much foliage relative to the root ball can dehydrate and damage the plant.
- Plant staking may be required.

Mulch Installation

- Only mulch that has been meeting Contech Engineered Solutions' mulch specifications can be used in the Filterra system.
- Mulch must be applied to a depth of 3" evenly over the surface of the media.

Irrigation Requirements

- Each Filterra system must receive adequate irrigation to ensure survival of the living system during periods of drier weather.
- Irrigation sources include rainfall runoff from downspouts and/or gutter flow, applied water through the tree grate or in some cases from an irrigation system with emitters installed during construction.
- At Activation: Apply about one (cool climates) to two (warm climates) gallons of water per inch of trunk diameter over the root ball.
- During Establishment: In common with all plants, each Filterra plant will require more frequent watering during the establishment period. One inch of applied water per week for the first three months is recommended for cooler climates (2 to 3 inches for warmer climates). If the system is receiving rainfall runoff from the drainage area, then irrigation may not be needed. Inspection of the soil moisture content can be evaluated by gently brushing aside the mulch layer and feeling the soil. Be sure to replace the mulch when the assessment is complete. Irrigate as needed**.
- Established Plants: Established plants have fully developed root systems and can access the entire water column in the media. Therefore irrigation is less frequent but requires more applied water when performed. For a mature system assume 3.5 inches of available water within the media matrix. Irrigation demand can be estimated as 1" of irrigation demand per week. Therefore if dry periods exceed 3 weeks, irrigation may be required. It is also important to recognize that plants which are exposed to windy areas and reflected heat from paved surfaces may need more frequent irrigation. Long term care should develop a history which is more site specific.

** Five gallons per square yard approximates 1 inch of water Therefore for a 6' by 6' Filterra approximately 20-60 gallons of water is needed. To ensure even distribution of water it needs to be evenly sprinkled over the entire surface of the filter bed, with special attention to make sure the root ball is completely wetted. NOTE: if needed, measure the time it takes to fill a five gallon bucket to estimate the applied water flow rate then calculate the time needed to irrigate the Filterra. For example, if the flow rate of the sprinkler is 5 gallons/minute then it would take 12 minutes to irrigate a 6' by 6' filter.

Notes

ATTACHMENT 4

City of Escondido PDP Structural BMP Verification for Permitted Land Development Projects

This is the cover sheet for Attachment 4.

City of Escondido Storm Water Structural BMP Verification Form Page 1 of 3	
Project Summary Information	
Project Name	Parkview Townhomes
Permit Number (e.g., grading/improvement plan number)	
Project Address	
Assessor's Parcel Number(s) (APN(s))	
Project Watershed (Complete Hydrologic Unit, Area, and Subarea Name with Numeric Identifier)	
Maintenance Notification / Agreement No.	
Responsible Party for Construction Phase	
Developer's Name	
Address	
Email Address	
Phone Number	
Engineer of Work	
Engineer's Phone Number	
Responsible Party for Ongoing Maintenance	
Owner's Name(s)*	
Address	
Email Address	
Phone Number	
*Note: If a corporation or LLC, provide information for principal partner or Agent for Service of Process. If an HOA, provide information for the Board or property manager at time of project closeout.	

City of Escondido Storm Water Structural BMP Verification Form Page 2 of 3				
Stormwater Structural Pollutant Control & Hydromodification Control BMPs* (List all from SWQMP)				
Description/Type of Structural BMP	**Plan Sheet #**	**Structural BMP ID#**	**Maintenance Agreement Recorded Doc #**	**Revisions**
*All Priority Development Projects (PDPs) require a Structural BMP				

Note: If this is a partial verification of Structural BMPs, provide a list and map denoting Structural BMPs that have already been submitted, those for this submission, and those anticipated in future submissions.

City of Escondido Storm Structural BMP Verification Form Page 3 of 3

Checklist for Engineer of Work (EOW) to submit to Field Engineering:

- ☐ Copy of the final accepted SWQMP and any accepted addendum.
- ☐ Copy of the most current plan showing the Storm Water Structural BMP Table, plans/cross-section sheets of the Structural BMPs and the location of each verified as-built Structural BMP.
- ☐ Photograph of each Structural BMP.
- ☐ Photograph(s) of each Structural BMP during the construction process to illustrate proper construction.
- ☐ Copy of the approved Structural BMP maintenance agreement and associated security

By signing below, I certify that the Structural BMP(s) for this project have been constructed and all BMPs are in substantial conformance with the approved plans and applicable regulations. I understand the City reserves the right to inspect the above BMPs to verify compliance with the approved plans and Storm Water Ordinance. Should it be determined that the BMPs were not constructed to plan or code, corrective actions may be necessary before permits can be closed.

Please sign your name and seal.

Professional Engineer's Printed Name:

_____

Professional Engineer's Signed Name:

_____

Date: _____

[SEAL]

ATTACHMENT 5

Copy of Plan Sheets Showing Permanent Storm Water BMPs, Source Control, and Site Design BMPs

This is the cover sheet for Attachment 5.

Use this checklist to ensure the required information has been included on the plans:

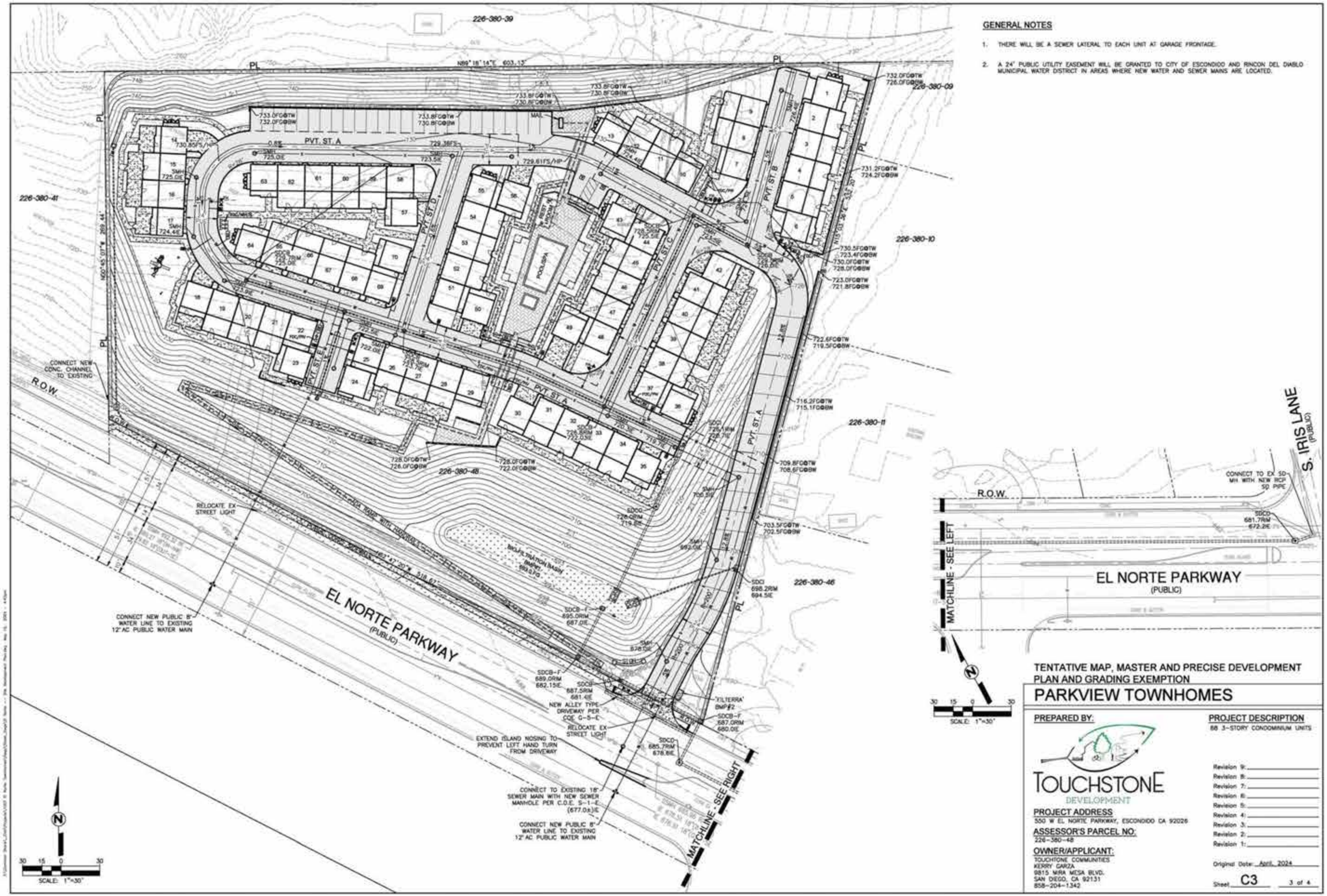
The plans must identify:

☐Structural BMP(s) with ID numbers matching Step 5 Summary of PDP Structural BMPs
☐The grading and drainage design shown on the plans must be consistent with the delineation of DMAs shown on the DMA exhibit
☐Details and specifications for construction of structural BMP(s)
☐Signage indicating the location and boundary of structural BMP(s) as required by City staff
☐How to access the structural BMP(s) to inspect and perform maintenance
☐Features that are provided to facilitate inspection (e.g., observation ports, cleanouts, silt posts, or other features that allow the inspector to view necessary components of the structural BMP and compare to maintenance thresholds)
☐Manufacturer and part number for proprietary parts of structural BMP(s) when applicable
☐Maintenance thresholds specific to the structural BMP(s), with a location-specific frame of reference (e.g., level of accumulated materials that triggers removal of the materials, to be identified based on viewing marks on silt posts or measured with a survey rod with respect to a fixed benchmark within the BMP)
☐Recommended equipment to perform maintenance
☐When applicable, necessary special training or certification requirements for inspection and maintenance personnel such as confined space entry or hazardous waste management
☐Include landscaping plan sheets showing vegetation requirements for vegetated structural BMP(s)
☐All BMPs must be fully dimensioned on the plans
☐When proprietary BMPs are used, site-specific cross section with outflow, inflow, and model number must be provided. Photocopies of general brochures are not acceptable.
☐Include all source control and site design measures described in Steps 3 and 4 of the SWQMP. Can be included as a separate exhibit as necessary.

***Note: Plan sheets included in this attachment can be full size or half size.**

GENERAL NOTES

1. THERE WILL BE A SEWER LATERAL TO EACH UNIT AT GARAGE FRONTAGE.
2. A 24' PUBLIC UTILITY EASEMENT WILL BE GRANTED TO CITY OF ESCONDIDO AND RINCON DEL DIABLO MUNICIPAL WATER DISTRICT IN AREAS WHERE NEW WATER AND SEWER MAINS ARE LOCATED.



TENTATIVE MAP, MASTER AND PRECISE DEVELOPMENT PLAN AND GRADING EXEMPTION

PARKVIEW TOWNHOMES

PREPARED BY:

TOUCHSTONE DEVELOPMENT

PROJECT DESCRIPTION
88 3-STORY CONDOMINIUM UNITS

PROJECT ADDRESS
550 W EL NORTE PARKWAY, ESCONDIDO CA 92026

ASSESSOR'S PARCEL NO:
226-380-48

OWNER/APPLICANT:
TOUCHTONE COMMUNITIES
KERRY GARZA
9815 MIRA MESA BLVD.
SAN DIEGO, CA 92131
858-204-1342

Revision 9: _____
Revision 8: _____
Revision 7: _____
Revision 6: _____
Revision 5: _____
Revision 4: _____
Revision 3: _____
Revision 2: _____
Revision 1: _____

Original Date: April, 2024

Sheet C3 3 of 4

LEGEND

ITEMS	SYMBOL
OUTER BASIN BOUNDARY	———
OUTER BASIN BOUNDARY	— · —
FLOW DIRECTION	←
BASIN INDENTIFIER/AREA (ACRES)	1 / 1.0

SOURCE CONTROL BMPs

(PER COUNTY OF SAN DIEGO BMP DESIGN MANUAL)

4.2.1 PREVENTION OF ILLICIT DISCHARGES INTO THE MS4
4.2.2 STORM DRAIN STENCILING OR SIGNAGE
4.2.5 PROTECT TRASH STORAGE AREAS FROM RAINFALL, RUN-ON, RUNOFF & WIND DISPERSAL.
4.2.6 ADDITIONAL BMPS BASED ON POTENTIAL SOURCES OF POLLUTANTS:
- A. ON-SITE STORM DRAIN INLETS
- D. NEED FOR FUTURE INDOOR & STRUCTURAL PEST CONTROL
- E. LANDSCAPE/OUTDOOR PESTICIDES USE
- F. POOLS, SPAS, PONDS, FOUNTAINS, AND OTHER WATER FEATURES.
- G. PLAZAS, SIDEWALKS, AND PARKING LOTS.

LID, SITE DESIGN & TREATMENT CONTROL BMPs

4.3.1 MAINTAIN NATURAL DRAINAGE PATHWAYS & HYDROLOGIC FEATURES
4.3.2 CONSERVE NATURAL AREAS, SOILS, & VEGETATION
4.3.3 MINIMIZE IMPERVIOUS AREAS
4.3.4 MINIMIZE SOIL COMPACTION
4.3.7 LANDSCAPING WITH NATIVE & DROUGHT TOLERANT SPECIES

ANALYSIS POINT FLOW DATA (POINTS OF COMPLIANCE)

△1 CUMULATIVE AREA: 0.99 ACRES
Q100: 2.423 CFS

△2 CUMULATIVE AREA: 5.37 ACRES
Q100: 15.960 CFS

DMA SUMMARY

POC #1

DMA 1 (SELF-MITIGATING)
C, NATVEG,STEEP --- 1.16 ACRES

POC # 1 SDHM TOTAL --- 1.16 ACRES

POC #2

DMA 2A (DRAINS TO BMP#1)
C,URBAN,FLAT --- 1.18 ACRES
IMPERVIOUS-FLAT --- 1.92 ACRES
C,NATVEG,STEEP --- 0.47
TOTAL --- 3.57 ACRES

DMA 2B (SELF MITIGATING)
C,NATVEG,MODERATE --- 0.19 ACRES
C,NATVEG,STEEP --- 0.4 ACRES
TOTAL --- 0.59 ACRES

DMA 2C (DRAINS TO FILTERRA)
IMPERVIOUS-MOD --- 0.06 ACRES
TOTAL --- 0.06 ACRES

DMA 2D (SELF MITIGATING)
C,NATVEG,FLAT --- 0.1 ACRES
C,NATVEG,STEEP --- 0.76 ACRES
IMPERVIOUS-MOD --- .04 ACRES
TOTAL --- 0.9 ACRES

DMA 2E (SELF MITIGATING)
C,NATVEG,STEEP --- 0.18 ACRES

POC # 2 SDHM TOTAL --- 5.30 ACRES

NET TOTAL --- 6.46 ACRES

DMA MAP/HMP EXHIBIT
PARKVIEW TOWNHOMES

PREPARED BY:

TOUCHSTONE
DEVELOPMENT

PROJECT ADDRESS
550 W EL NORTE PARKWAY, ESCONDIDO CA 92026

ASSESSOR'S PARCEL NO:
226-380-48

OWNER/APPLICANT:
TOUCHTONE COMMUNITIES
KERRY GARZA
9815 MIRA MESA BLVD.
SAN DIEGO, CA 92131
858-204-1342

PROJECT DESCRIPTION
88 3-STORY CONDOMINIUM UNITS

Revision 9:
Revision 8:
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Revision 5:
Revision 4:
Revision 3:
Revision 2:
Revision 1:

Original Date: April, 2024

Sheet C4 4 of 4