CITY OF ENCINITAS
STORMWATER INTAKE FORM AND PRIORITY DEVELOPMENT PROJECT STORMWATER QUALITY MANAGEMENT PLAN (SWQMP)

FOR:
OCEAN BLUFF HOMES
CASE NO: MULTI-006443-2023

501 OCEAN BLUFF WAY
ENCINITAS, CA 92024
APN: 258-141-23. -24, -25, & - 26-00

PREPARED BY:
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DATE OF SWQMP:
08/14/2023
10/17/2024

TENTATIVE MAP PREPARED BY:
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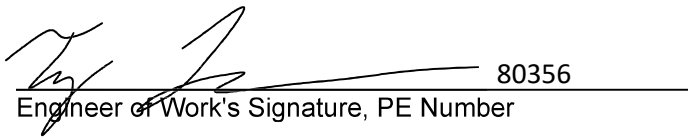
TABLE OF CONTENTS

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 Priority Development Project (PDP) requirements of the City of Encinitas BMP Design Manual, which is a design manual for compliance with local City of Encinitas and regional MS4 Permit (California Regional Water Quality Control Board San Diego Region Order No. R9-2015-0100) requirements for storm water management.

I have read and understand that the City Engineer has adopted minimum requirements for managing urban runoff, including storm water, from land development activities, as described in the BMP 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 Storm Water Quality Management Plan (SWQMP) by the City Engineer 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.



80356
Engineer of Work's Signature, PE Number

Tyler G Lawson
Print Name

Pasco, Laret, Suiter, & Associates
Company

August 11, 2023
Date

Engineer's Seal

PROJECT OWNER'S CERTIFICATION

This PDP SWQMP has been prepared for 501 OCEAN BLUFF, LLC by PASCO, LARET, SUITER & ASSOCIATES. The PDP SWQMP is intended to comply with the PDP requirements of the City of Encinitas BMP Design Manual, which is a design manual for compliance with local City of Encinitas and regional MS4 Permit (California Regional Water Quality Control Board San Diego Region Order No. R9-2015-0100) requirements for storm water management.

The undersigned, while it owns the subject property, is responsible for the implementation of the provisions of this plan. Once the undersigned transfers its interests in the property, its successor-in-interest shall bear the aforementioned responsibility to implement the best management practices (BMPs) described within this plan, including ensuring on-going operation and maintenance of structural BMPs. A signed copy of this document shall be available on the subject property into perpetuity.

Preliminary

Project Owner's Signature

Kevin Dunn

Print Name

501 Ocean Bluff, LLC

Company

Date

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 the fourth column, 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.

Submittal Number	Date	Project Status	Summary of Changes
1	8/14/23	☑ Preliminary Design / Planning/ CEQA ☐Final Design	Initial Submittal
2	7/2/2024	☑Preliminary Design / Planning/ CEQA ☐Final Design	Resubmittal
3	10/17/2024	☑ Preliminary Design / Planning/ CEQA ☐Final Design	Resubmittal
4		☐Preliminary Design / Planning/ CEQA ☐Final Design	

PROJECT IDENTIFICATION

Project/Applicant Name: OCEAN BLUFF HOMES / 501 OCEAN BLUFF, LLC	
Permit/Application Number:	Date: August 11, 2023
Site Address: 501 Ocean Bluff Way	APN: 258-141-23, -24, -25 & -26-00
Scope of work/project description: Project proposes demolition of all existing onsite improvements and construction of 27x new single-family detached homes, new private road with onstreet parking, and miscellaneous surface, grading, and utility improvements typical of this type of development.	

DETERMINATION OF PROJECT STATUS AND REQUIREMENTS

This form will identify permanent, post construction BMP requirements. Refer to City of Encinitas Stormwater BMP Design Manual for guidance.

Step 1: Is the project a "development project"? Development projects are defined as "construction, rehabilitation, redevelopment, or reconstruction of any public or private projects". See Section 1.3 and Table 1-2 of the manual for guidance. For example, interior remodels, roof replacements, and electrical and plumbing work are not development projects.	☑ Yes	***Go to Step 2.***
	☐ No	***Stop.*** Permanent BMP requirements do not apply. No SWQMP will be required. Provide discussion below.

If "No", provide discussion / justification explaining why the project is not a "development project":

Step 2: Complete questions below for Project Type Determination.
The project is (select one): ☒ New Development ☐ Redevelopment

The total proposed, newly created and/or replaced impervious area is: 123,170 ft^2

Is the project in any of the following categories, (a) through (f) below?

Yes ☑	No ☐	(a)	New development projects or redevelopment projects that create and/or replaced 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.
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.
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 (SIC code 5812). (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 discharge directly to an Environmentally Sensitive Area (ESA). "Discharge 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 SDRWQCB; State Water Quality Protected Areas; water bodies designated with the RARE beneficial use by the State Water Board and SDRWQCB; and any other equivalent environmentally sensitive areas which have been identified by the Copermittees. See manual Section 1.4.2 for additional guidance.
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. (ii) Retail gasoline outlets. This category includes retail gasoline outlets that meet the following criteria: (a) 5,000 square feet or more or (b) a projected Average Daily Traffic 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 manual Section 1.4.2 for additional guidance.*

Does the project meet the definition of one or more of the PDP categories (a) through (f) listed above?

☑ Yes – **The project is a Priority Development Project, the applicant shall provide PDP Post Construction BMPs and *continue to Step 3*.**

☐No – **The project is a Standard or Basic Project. *Stop here and complete the "City of Encinitas Stormwater Intake Form for All Developments and Standard Projects SWQMP".***

The following is for *redevelopment PDPs* only:

The area of existing (pre-project) impervious area at the project site is: _____ ft^2 (A)

The total proposed newly created or replaced impervious area is: _____ ft^2 (B)

Percent impervious surface created or replaced (B/A)*100: _____%

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

☐ Less than or equal to fifty percent (50%) – only new and/or replaced impervious areas are considered PDP subject to treatment and HMP criteria

OR

☐ Greater than fifty percent (50%) – the entire site is a PDP; treatment and HMP criteria apply to entire site regardless of whether it is replaced

Step 3 (PDPs only): Do hydromodification control requirements apply? See Section 1.6 of the BMP Design Manual for guidance.	☑ Yes	PDP structural BMPs required for pollutant control (Chapter 5) and hydromodification control (Chapter 6). ***Go to Step 4.***
	☐ No	PDP structural BMPs required for pollutant control (Chapter 5) only. Provide brief discussion of exemption to hydromodification control below. ***Go to "Site Information Checklist"***
Discussion / justification if hydromodification control requirements do not apply:		
Step 4 (PDPs subject to treatment and hydromodification controls): Does protection of critical coarse sediment yield areas apply based on review of City of Encinitas Potential Critical Coarse Sediment Yield Area Map? See Section 6.2 of the BMP Design Manual for guidance.	☐ Yes	Management measures required for protection of critical coarse sediment yield areas (Chapter 6.2). ***Go to "Site Information Checklist"***
	☑ No	Management measures not required for protection of critical coarse sediment yield areas. Provide brief discussion below. ***Go to "Site Information Checklist"***
Discussion / justification if management measures not required for protection of critical coarse sediment yield areas: Project site does contain potential Critical Coarse Sediment Yield Areas per the City of Encinitas Potential Critical Coarse Sediment Yield Area Map in the City's BMP Design Manual.		

SITE INFORMATION CHECKLIST

Project's Watershed (Complete Hydrologic Unit, Area, and Subarea Name with Numeric Identifier)	Carlsbad Hydrologic Unit, San Marcos Creek Hydrologic Area, Batiquitos Lagoon Sub-Area (905.41) & Escondido Creek Hydrologic Area (904.61)
Parcel Area (Total area of Assessor's Parcel(s) associated with the project)	7.19 Acres (313,111 Square Feet)
Area to be Disturbed by the Project (Project Area)	4.48 Acres (195,354 Square Feet)
Project Proposed Impervious Area (Subset of Project Area)	2.83 Acres (123,170 Square Feet)
Project Proposed Pervious Area (Subset of Project Area)	1.66 Acres (72,184 Square Feet)

Note: Proposed Impervious Area + Proposed Pervious Area = Area to be Disturbed by the Project. This may be less than the Parcel Area.

Description of Existing Site Condition

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:

The site consists of an asphalt concrete driveway with a concrete access road with a few dry utility fenced encloses along with open space filled with trees, bushes and shrubs. The site is undeveloped and contains a manufactured slope per as-built R.S. 458-66.

Existing Land Cover includes (select all that apply):

☑ Vegetative Cover

☑ Non-Vegetated Pervious Areas

☑ Impervious Areas

Description / Additional Information:

Existing site consists of multiple dry utility structures and an access road that make up the impervious area for the site. Vegetative cover includes landscaped areas and planting on previously manufactured slopes.

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):
☐ GW Depth < 5 feet
☐5 feet < GW Depth < 10 feet
☐10 feet < GW Depth < 20 feet
☑ GW Depth > 20 feet

Existing Natural Hydrologic Features (select all that apply):
☐Watercourses
☐Seeps
☐ Springs
☐ Wetlands
☑ None

Description / Additional Information:

Description of Existing Site Drainage Patterns

How is storm water runoff conveyed from the site? At a minimum, this description should answer:

1) Is existing drainage conveyance natural or urban?
2) Is runoff from offsite conveyed through the site? If yes, quantify all offsite drainage areas, design flows, and locations where offsite flows enter the project site, and summarize how such flows are conveyed through the site.
3) Provide details regarding existing project site drainage conveyance network, including any existing storm drains, concrete channels, swales, detention facilities, storm water treatment facilities, natural or constructed channels. And
4) Identify all discharge locations from the existing project site along with a summary of conveyance system size and capacity for each of the discharge locations. Provide summary of the pre-project drainage areas and design flows to each of the existing runoff discharge locations.

Describe existing site drainage patterns:

The site itself contains 30 feet of elevation change within the proposed disturbed area. Runoff drains via sheet flow generally to the north. The existing site is undeveloped and the drainage conveyance would be considered natural. Runoff from the surrounding sites are not conveyed through the project site.

While the site appears to ultimately discharge to one major watersheds and receiving body, runoff in the existing condition discharges from the property from 3 main locations (Drainage basins EX-1 through -3). Runoff from EX-1 drains to the north east and through 500 Camino De Orchidia (APN: 258-141-29) and an unassigned vacant lot off Encinitas Boulevard (APN: 258-141-27) before continuing to Encinitas Boulevard creating a cross lot drainage condition. Once in Encinitas Boulevard runoff enters a public storm drain inlet and is routed to a sump inlet across the Encinitas Boulevard located between 662 & 710 Encinitas Boulevard. Runoff from EX-2 drains to the north before entering an existing brow ditch to be routed down the manufactured slope to a “L” shaped splash wall that pipes runoff down to an existing public curb inlet. Once in the curb inlet runoff is routed north and then to the east to confluence with runoff from EX-1. EX-3 generally drains to the northeast and through 911 Encinitas Boulevard (APN: 258-141-22) before reaching Encinitas Boulevard. Once runoff reaches Encinitas Boulevard its routed in the concrete curb and gutter back to the west to the same public curb inlet that EX-2 ties into. After confluencing with runoff from EX-2 both basin follow the path described for EX-2 to the sump inlet where all basins confluence before ultimately reaching the Pacific Ocean at Moonlight Beach.

Description of Proposed Site Development

Project Description / Proposed Land Use and/or Activities:

Project proposes clearing and grubbing of existing vegetation within the proposed disturbed area, demolition of all existing onsite improvements and construction of 27-lot single-family residential detached homes, along with miscellaneous surface, grading, storm water and utility improvements to support the new homes.

List/describe proposed impervious features of the project (e.g., buildings, roadways, parking lots, courtyards, athletic courts, other impervious features):

Proposed impervious features of the project include the building footprints and roof areas, private road pavement, driveways, and private walkways / porches.

List/describe proposed pervious features of the project (e.g., landscape areas):

Pervious features of the project include graded slopes, landscape areas around the building footprint on each lot, proposed trees and two biofiltration basins located in the northwest and northeast corners of the disturbed area for storm water treatment.

Does the project include grading and changes to site topography?
☑ Yes
☐ No

Description / Additional Information:

Retaining walls and site grading are proposed to accommodate the new lots and to construct buildable pads. The site generally slopes down from Ocean Bluff Way to a low point located near the BMP in the northwestern corner or to the other low point adjacent to the BMP in the northeastern corner. The proposed site layout will have the lots south of the high point drain toward a BMP in the southeastern corner of the site. Refer to DMA exhibit in attachment 1 for delineation of lot drainage to each BMP. The project proposes ~5,225 CY of cut and ~11,700 CY of fill for ~6,475 CY of import, along with remedial grading.

Description of Proposed Site Drainage Patterns

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:

The project site can be consolidated into two major drainage basins in the proposed condition. The majority of runoff from EX-1 will be routed to the biofiltration basin in the northwest corner to alleviate the cross-lot drainage condition through 500 Camino De Orchidia (APN: 258-141-29) and reducing the runoff through the unassigned vacant lot off Encinitas Boulevard (APN: 258-141-27). Similar to EX-1, EX-3 will have the majority of runoff routed to a biofiltration basin reducing the amount of runoff draining through east 911 Encinitas Boulevard (APN: 258-141-22).

The majority of runoff in the proposed condition will be routed to a biofiltration basin in the northwest or northeast corners of the site. The lots will be graded to have runoff generally flow from the rear yard to front yard via sheet flow and then onto the Private Road. The Private Road is super elevated directing runoff to the low side where runoff will be routed in the proposed concrete curb and gutter to a concrete spill way adjacent to each respective biofiltration basin. After filtering through each basin runoff will be routed through a 18” PVC storm drain pipe and then a concrete headwall to enter into the existing brow ditch. Within the brow ditch runoff will confluence with runoff sheeting flowing into it. From there runoff will follow the same path as described in a previous section for EX-2. There are fill slopes along the northwestern and eastern portions of the site that will follow the drainage paths of EX-1 and EX-3 respectively and will improve the cross-lot drainage conditions as described above. The project also proposes to drain a small portion of runoff to Ocean Bluff Way creating a local diversion. Runoff entering Ocean Bluff Way will be routed in the existing concrete curb and gutter to an existing public curb inlet. Once in the inlet runoff will be routed down to Encinitas Boulevard and across the street in the public storm drain system to confluence with all other on-site basins.

Identification and Narrative of Receiving Water and Pollutants of Concern

Describe flow path of storm water from the project site discharge location(s), through urban storm conveyance systems as applicable, to receiving creeks, rivers, and lagoons as applicable, and ultimate discharge to the Pacific Ocean (or bay, lagoon, lake or reservoir, as applicable):

Storm water leaving the site will enter the existing public storm drain system in Encinitas Boulevard. This system will have all runoff confluence at the previously mentioned sump inlet and eventually discharge into Moonlight State Beach and ultimately the Pacific Ocean west of Coast Highway 101.

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 and/or Highest Priority Pollutants from the WQIP for the impaired water bodies:

303(d) Impaired Water Body	Pollutant(s)/Stressor(s)	TMDLs / WQIP Highest Priority Pollutant
Cottonwood Creek (outlet)	Trash, Indicator Bacteria, Benthic Community Effects, DDT, Nitrogen, Phosphorus, Selenium, Toxicity	Indicator Bacteria
Pacific Ocean		

Identification of Project Site Pollutants*

***Identification of project site pollutants 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 BMP Design Manual Appendix B.6):

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

Hydromodification Management Requirements

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

☑ Yes, hydromodification management flow control structural BMPs required.
☐ 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.
☐ 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.
☐ No, the project will discharge runoff directly to an area identified as appropriate for an exemption by the WMAA for the watershed in which the project resides.

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

Critical Coarse Sediment Yield Areas*

*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 Section 6.2 of the BMP Design Manual been performed?
☑ 6.2.1 Verification of Geomorphic Landscape Units (GLUs) Onsite
☐ 6.2.2 Downstream Systems Sensitivity to Coarse Sediment
☐ 6.2.3 Optional Additional Analysis of Potential Critical Coarse Sediment Yield Areas Onsite
☐ No optional analyses performed, the project will avoid critical coarse sediment yield areas identified based on WMAA maps

If optional analyses were performed, what was 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 2.b of the SWQMP.
☐ Critical coarse sediment yield areas exist and require protection. The project will implement management measures described in Sections 6.2.4 and 6.2.5 as applicable, and the areas are identified on the SWQMP Exhibit.

Discussion / Additional Information:

Area identified on City's GIS map is not a potential Critical Coarse Sediment Yield Area. See discussion provided on Page 17 of 31 of this report.

Flow Control for Post-Project Runoff*

*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.

There is one (1) point of compliance for flow control / hydromodification management leaving the subject property; the point of compliance is located at the sump inlet adjacent to 662 & 710 Encinitas Boulevard.

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 low flow threshold 0.1Q2
☐Yes, the result is low flow threshold 0.3Q2
☐Yes, the result is low flow threshold 0.5Q2

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

Channel assessment has not been performed for project site. Thus, low-flow threshold of 0.1Q2 is assumed for the project.

Discussion / Additional Information: (optional)

Other Site Requirements and Constraints

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.

There are multiple site constraints that have influence on the storm water management design as well as the overall laying out of the site plan. First, as it relates to storm water, the project geotechnical engineer has identified defined a no infiltration conditions due to the BMPs proximity to the existing bluff, preventing any further infiltration in the post-project condition as part of the storm water strategy. See further discussion of BMP strategy, implementation, including the proposed storage system to comply with hydromodification low-flow requirements.

Optional Additional Information or Continuation of Previous Sections As Needed

Description of Existing Site Drainage Patterns

Existing drainage Basin EX-1, discharging to the northwest of the project site before entering Encinitas Boulevard, has an area of approximately 2.68 acres and has a peak flow rate of 5.02 cfs. Existing drainage basin EX-2, discharges to the northern portion of the project site and into the existing brow ditch, has an area of approximately 1.71 acres and has a peak flow rate of 3.14 cfs. Existing drainage basin EX-3, discharging from the northeast corner of the project site before entering Encinitas Boulevard, has an area of approximately 0.13 acres and a peak flow rate of 0.39 cfs.

Description of Proposed Site Drainage Patterns

The two onsite HMP-sized flow-control biofiltration detention basin and BMP system ("Basin") provides pollutant control as well as hydromodification management and mitigation of the 100-year, 6-hour storm event peak flow rate. Basin PR-1.1 and PR-1.2 will serve to capture, treat, and detain storm water and is composed of a cross-section of an engineered soil, storage layer, and hydraulic mulch on the surface. Runoff from higher frequency, lower intensity storm events will first be filtered through the Basin section to the storage layer that connects into emergency outlet brooks boxes.

During higher intensity storm events, water will pond on the surface of the Basin, and enter an overflow catch basin that will route water to the existing brow ditch. Similar to the existing condition, runoff leaving from the northwest corner and eastern side of the project site continues down the existing slope to Encinitas Boulevard, eventually reaching storm drain improvements in Encinitas Boulevard before outletting to the previously mentioned sump inlet and then Moonlight State Beach. The majority of runoff from the site will be routed to a biofiltration basin that tie into the existing brow ditch before being routed to the sump inlet.

The total unmitigated, undetained peak flow rate for the 100-year, 6-hour storm event generated for the analyzed drainage area is 16.98 cfs. Based on the analysis included in this report, the proposed onsite detention facilities accommodate the increase in peak runoff generated in the proposed condition, mitigating peak flows to below pre-developed conditions. The site has been designed and graded in a way to minimize earthwork to the greatest extent feasible and maintain historic drainage patterns. Water leaving the subject property will continue to do so from the same points of discharge as in the existing condition. Refer to project Hydrology Report / Drainage Study prepared by Pasco, Laret, Suiter & Associates under separate cover for additional information.

This space provided for additional information or continuation of information from previous sections as needed.

Discussion of Critical Coarse Sediment Yield Areas

Priority Development Projects (PDPs) must satisfy critical coarse sediment yield area (CCSYA) requirements as addressed in Appendix H of the City of Encinitas BMP Design Manual.

Regional-level mapping of potential critical coarse sediment yield areas was prepared using regional data sets included from the Regional WMAA.

A portion of the site was identified on the City of Encinitas' GIS as containing a potential Critical Coarse Sediment Yield Area (PCCSYA). Per Section 6.2.1 of the City of Encinitas BMP Design Manual, "GLU's (Geomorphic Landscape Units) are areas with a combination of open (undeveloped) land cover, high relative sediment production based on a normalized revised universal soil loss equation analysis, and coarse-grained geologic material (material that is expected to produce greater than 50% sand when weathered)."

However, per Appendix H of the City of Encinitas BMP Design Manual, the "regional data set .. may not conform to all site conditions, or does not reflect changes to particular areas that have occurred since the underlying data was developed. This means slopes, geology, or land cover at the project site can be mischaracterized in the regional data set."

Consistent with the City of Encinitas BMP Design Manual section 6.2 and Appendix H, a detailed project-level verification of site specific GLU's was conducted. None of the GLU's listed in Table 6-1 of the BMP manual are present, as the area in question does not contain a combination of slope, geology, and land cover as listed in Table 6-1 (slope in this area is less than 10%). In the area of the site where there are CCSYA identified per the city of Encinitas GIS the area did not met the specified geological condition. Thus, the area identified on the City's GIS are Potential CCSYA's that become non-Critical Coarse Sediment Yield Areas. Thus, there are no critical coarse sediment yield areas to be protected based on verification of GLUs onsite. Refer to CCSYA Overlay Exhibit included in Attachment 2 of this report.

Discussion of Green Streets Design Standards

As mentioned in a previous section the site will have PR-2 a small basin drains onto Ocean Bluff Way as it is infeasible to route the impervious area within that basin to a biofiltration basin. PR-2 is 0.16 acres in size and 60.4% impervious. The project proposes four (4) tree well BMPs along Ocean Bluff Way to treat the impervious area leaving the site.

SOURCE CONTROL BMP CHECKLIST

All development projects must implement source control BMPs SC-1 through SC-6 where applicable and feasible. See Chapter 4 and Appendix E of the manual for information to implement source control BMPs shown in this checklist.

Answer each category below pursuant to the following.

- "Yes" means the project will implement the source control 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 has no outdoor materials storage areas). Discussion / justification may be provided.

Source Control Requirement	Applied?		
SC-1 Prevention of Illicit Discharges into the MS4	☑ Yes	□ No	□ N/A
SC-2 Storm Drain Stenciling or Signage	☑ Yes	□ No	□ N/A
SC-3 Protect Outdoor Materials Storage Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☐ Yes	□ No	☑ N/A
SC-4 Protect Materials Stored in Outdoor Work Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☐ Yes	□ No	☑ N/A
SC-5 Protect Trash Storage Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☐ Yes	□ No	☑ N/A
SC-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 drain to sewer	□ Yes	□ No	☑ N/A
☐ Interior parking garages drain to sewer	□ 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/Trash areas must be covered	□ Yes	□ No	☑ N/A
☐ Industrial processes	□ Yes	□ No	☑ N/A
☐ Outdoor storage of equipment or materials must be covered	□ 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 SC-1 through SC-6 not implemented. Justification must be provided for ALL "No" answers shown above.

SITE DESIGN BMP CHECKLIST

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 may be provided.

Source Control Requirement	Applied?		
SD-1 Maintain Natural Drainage Pathways and Hydrologic Features	☑ Yes	□ No	□ N/A
SD-2 Conserve Natural Areas, Soils, and Vegetation	☑ Yes	☐ No	□ N/A
SD-3 Minimize Impervious Area	☑ Yes	□ No	□ N/A
SD-4 Minimize Soil Compaction	☑ Yes	☐ No	□ N/A
SD-5 Impervious Area Dispersion - Directly Connected Impervious Areas (e.g. roof downspouts connected to street) are not allowed	☑ Yes	□ No	□ N/A
SD-6 Runoff Collection	☑ Yes	□ No	□ N/A
SD-7 Landscaping with Native or Drought Tolerant Species	☑ Yes	□ No	□ N/A
SD-8 Harvesting and Using Precipitation	□ Yes	☑ No	□ N/A

Discussion / justification if SD-1 through SD-8 not implemented. Justification must be provided for ALL "No" answers shown above.

SD-4: Minimizing soil compaction will be implemented to the greatest extent feasible but will not occur under building footprints.

SD-8: Harvesting and reuse deemed infeasible for this site

PDP STRUCTURAL BMPS

All PDPs must implement structural BMPs for storm water pollutant control (see Chapter 5 of the BMP Design 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 BMP Design 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 and engineer of record to certify construction of the structural BMPs (see Section 1.12 of the BMP Design Manual). PDP structural BMPs must be maintained into perpetuity (see Section 7 of the BMP Design Manual). The local jurisdiction will confirm the maintenance annually.

Use this section 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).

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 BMP Design 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 structural BMP chosen for this project is a biofiltration basin with impermeable liner (BF-1). After infiltration was deemed infeasible by the project geotechnical engineer due to the proximity of the biofiltration basins to the existing bluff.

DMA 1 and DMA 2 have a proposed structural BMP system consisting of a pre-treatment biofiltration basin with impermeable liner (BF-1), and a gravel storage layer. DMA 4 will use tree wells (SD-A) to treat impervious are leaving the site per green street design standards. Refer to Attachment 2d for additional details. The system will integrate both pollutant control measures with flow control for hydromodification management. The biofiltration pre-treatment basins have been sized to provide a minimum surface area of 3.0% of the contributing area times adjusted runoff factor draining to it to comply with water quality requirements per Appendix B of the City of Encinitas BMP Design Manual. There are no site design BMP's proposed for the project for which the runoff factor can be adjusted.

The basin, and detention storage system has been sized to demonstrate compliance with HMP requirements using the San Diego Hydrology Model 3.1 (SDHM 3.1), including using no infiltration.

STRUCTURAL BMP SUMMARY INFORMATION

Copy this page as necessary to provide information on each individual proposed structural BMP

Structural BMP ID No: BF-1	DMA No: 1 / DMA 1
Construction Plan Sheet No: Civil Design Review / Plan Sheets 4-5	
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) □ 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 inspect and certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification forms required by the City Engineer (See Section 1.12 of the BMP Design Manual)	Tyler G Lawson Associate Principal Pasco, Laret, Suiter & Associates
Who will be the final owner of this BMP?	Ocean Bluff Homes / HOA
Who will maintain this BMP into perpetuity?	Ocean Bluff Homes / HOA
What is the funding mechanism for maintenance?	Ocean Bluff Homes / HOA
Discussion (as needed): The Homeowner's Association created with the new lots will be responsible for the maintenance of storm water facilities into perpetuity, as required by the City. The proposed structural BMP system consists of a pre-treatment biofiltration basin, with a gravel detention storage layer. Refer to Attachment 2d for additional details.	

STRUCTURAL BMP SUMMARY INFORMATION

Copy this page as necessary to provide information on each individual proposed structural BMP

Structural BMP ID No: BF-1	DMA No: 2 / DMA 2
Construction Plan Sheet No: Civil Design Review / Plan Sheets 4-5	
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) □ 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 inspect and certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification forms required by the City Engineer (See Section 1.12 of the BMP Design Manual)	Tyler G Lawson Associate Principal Pasco, Laret, Suiter & Associates
Who will be the final owner of this BMP?	Ocean Bluff Homes / HOA
Who will maintain this BMP into perpetuity?	Ocean Bluff Homes / HOA
What is the funding mechanism for maintenance?	Ocean Bluff Homes / HOA
Discussion (as needed): The Homeowner's Association created with the new lots will be responsible for the maintenance of storm water facilities into perpetuity, as required by the City. The proposed structural BMP system consists of a pre-treatment biofiltration basin, with a gravel detention storage layer. Refer to Attachment 2d for additional details.	

STRUCTURAL BMP SUMMARY INFORMATION

Copy this page as necessary to provide information on each individual proposed structural BMP

Structural BMP ID No: SD-A	DMA No: 4 / DMA 4
Construction Plan Sheet No: Civil Design Review / Plan Sheets 4-5	
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) □ 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 inspect and certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification forms required by the City Engineer (See Section 1.12 of the BMP Design Manual)	Tyler G Lawson Associate Principal Pasco, Laret, Suiter & Associates
Who will be the final owner of this BMP?	Ocean Bluff Homes / HOA
Who will maintain this BMP into perpetuity?	Ocean Bluff Homes / HOA
What is the funding mechanism for maintenance?	Ocean Bluff Homes / HOA
Discussion (as needed): The Homeowner's Association created with the new lots will be responsible for the maintenance of storm water facilities into perpetuity, as required by the City. The proposed structural BMP system consists of a engineered soil layer for treatment control of proposed hardscape draining to Ocean Bluff Way. Refer to Attachment 2d for additional details.	

ATTACHMENT 1 - BACKUP FOR PDP POLLUTANT CONTROL BMPS

This is the cover sheet for Attachment 1.

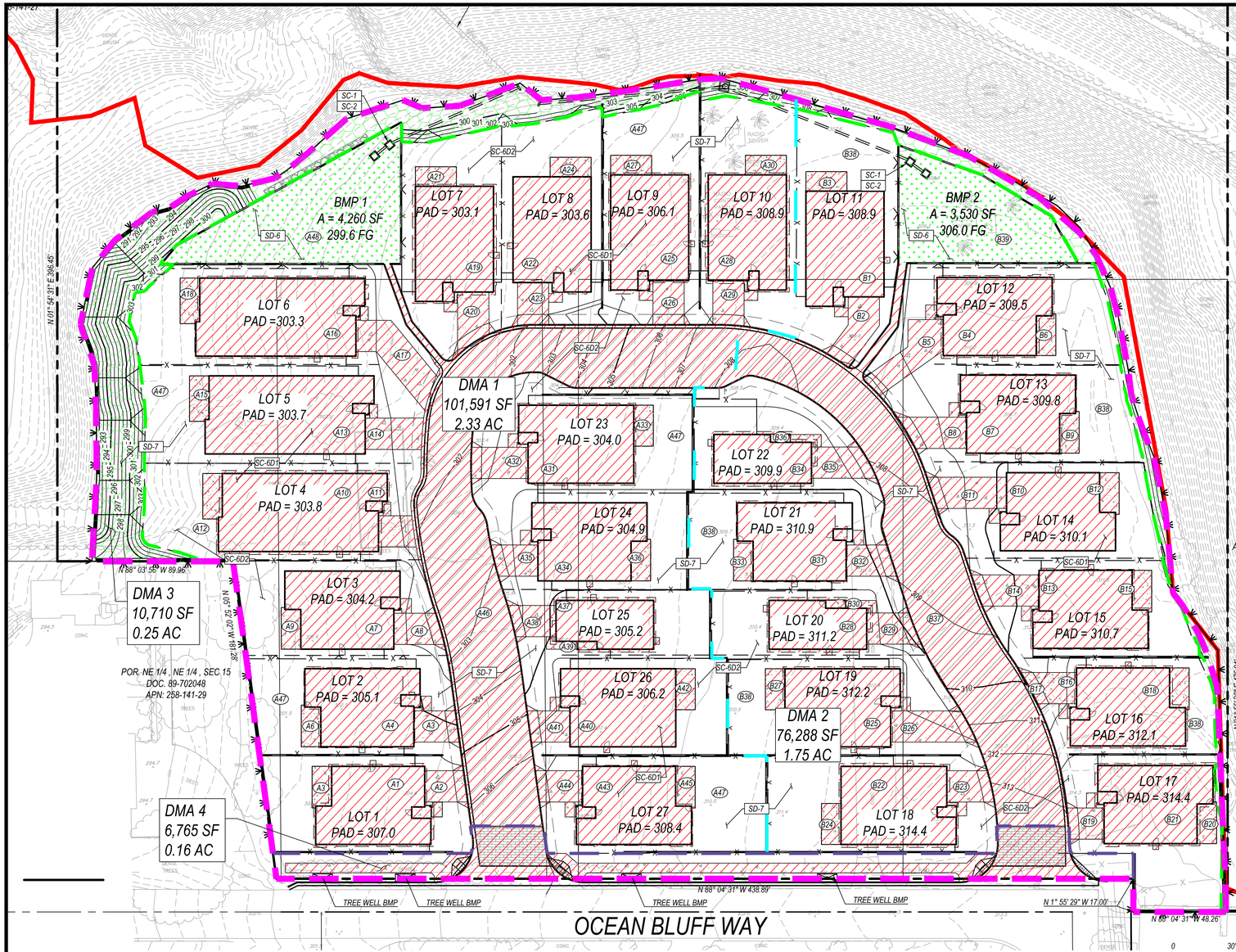
Indicate which items are included behind this cover sheet:

Attachment	Contents	Checklist
Attachment 1a	DMA Exhibit (Required) See DMA Exhibit Checklist on the back of this Attachment cover sheet.	☑ Included
Attachment 1b	Tabular Summary of DMAs Showing DMA ID matching DMA Exhibit, DMA Area, and DMA Type (Required)* *Provide table in this Attachment OR on DMA Exhibit in Attachment 1a	☑ Included on DMA Exhibit in Attachment 1a ☐ Included as Attachment 1b, separate from DMA Exhibit
Attachment 1c	Form I-7, Harvest and Use Feasibility Screening Checklist (Required unless the entire project will use infiltration BMPs) Refer to Appendix B.3-1 of the BMP Design Manual to complete Form I-7.	☑ Included ☐ Not included because the entire project will use infiltration BMPs
Attachment 1d	Form I-8, Categorization of Infiltration Feasibility Condition (Required unless the project will use harvest and use BMPs) Refer to Appendices C and D of the BMP Design Manual to complete Form I-8.	☑ Included ☐ Not included because the entire project will use harvest and use BMPs
Attachment 1e	Pollutant Control BMP Design Worksheets / Calculations (Required) Refer to Appendices B and E of the BMP Design Manual for structural pollutant control BMP design guidelines	☑ Included

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

The DMA Exhibit must identify:

☑ Underlying hydrologic soil group
☑ 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
☑ Existing and proposed site drainage network and connections to drainage offsite
☑ Proposed demolition
☑ Proposed grading
☑ Proposed impervious features
☑ 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 Form I-3B)
☑ Structural BMPs (identify location, type of BMP, and size/detail)



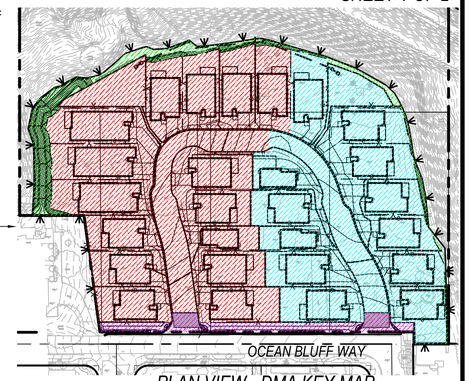
PLAN VIEW - DMA EXHIBIT

SCALE: 1" = 30'

GRAPHIC SCALE: 1" = 30'

LEGEND

- EXISTING PROPERTY BOUNDARY
- ADJACENT PROPERTY LINE / RIGHT-OF-WAY
- CENTERLINE OF ROAD
- EXISTING ASSESSOR PARCEL BOUNDARY
- ADJACENT LOT LINE
- EXISTING CONTOUR
- PROPOSED CONTOUR
- PROPOSED FLOW LINE
- PROPOSED DIRECTION OF FLOW
- PROPOSED DISTURBED AREA
- PROPOSED OVERALL DRAINAGE AREA
- PROPOSED DRAINAGE MANAGEMENT AREA SPLIT
- PROPOSED SELF-MITIGATING DRAINAGE MANAGEMENT AREA BOUNDARY
- PROPOSED SELF-MITIGATING DRAINAGE MANAGEMENT AREA BOUNDARY
- PROPOSED BIOFILTRATION BASIN
- PROPOSED DRAINAGE MANAGEMENT AREA (DMA 1 SEE KEY MAP BELWO)
- PROPOSED DRAINAGE MANAGEMENT AREA (DMA 2 SEE KEY MAP BELOW)
- PROPOSED DRAINAGE MANAGEMENT AREA (DMA 3 SEE KEY MAP BELOW)
- PROPOSED DRAINAGE MANAGEMENT AREA (DMA 4 SEE KEY MAP BELOW)
- PROPOSED REMOVED / REPLACED IMPERVIOUS AREA
- PROPOSED TREE WELL BMP



PLAN VIEW - DMA KEY MAP

SCALE: 1" = 100'

PROJECT SITE AREA CALCULATIONS

TOTAL GROSS SITE AREA	313,111 SF / 7.19 AC
TOTAL DISTURBED AREA	195,354 SF / 4.48 AC
EXISTING IMPERVIOUS AREA	3,074 SF / 0.07 AC
EXISTING PERVIOUS AREA	193,917 SF / 4.45 AC
*TOTAL REMOVED/REPLACED IMPERVIOUS AREA	123,170 SF / 2.83 AC
*TOTAL ONSITE IMPERVIOUS AREA:	120,105 SF / 2.76 AC
TOTAL ROW IMPERVIOUS AREA:	3,065 SF / 0.07 AC

*INCLUDES A 15% FUTURE LOT HARDSCAPE CONTINGENCY BASED ON ROOF AREA AND PRIVATE WALKWAYS / PATIOS, EXCLUSIVE OF PRIVATE ROAD, SIDEWALK AND PRIVATE DRIVEWAYS

DMA TABLE		
DMA	BMP	AREA (SF)
1	BIOFILTARTION BASIN	101,591
2	BIOFILTARTION BASIN	76,288
3	SELF-MITIGATING	10,710
4	TREE WELL	6,765
	TOTAL	195,354

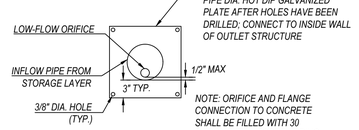
BMP LEGEND

POST-CONSTRUCTION SITE DESIGN BMPs

- SD-1 MAINTAIN NATURAL DRAINAGE PATHWAYS AND HYDROLOGIC FEATURES
- SD-2 CONSERVE NATURAL AREAS, SOILS AND VEGETATION
- SD-3 MINIMIZE IMPERVIOUS AREA
- SD-4 MINIMIZE SOIL COMPACTION
- SD-5 IMPERVIOUS AREA DISPERSION
- SD-6 RUNOFF COLLECTION
- SD-7 LANDSCAPING WITH NATIVE OR DROUGHT TOLERANT SPECIES

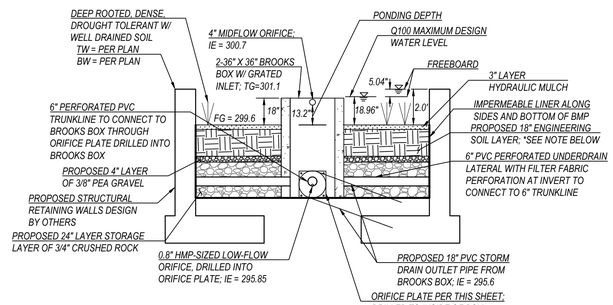
POST-CONSTRUCTION SITE DESIGN BMPs

- SC-1 PREVENTION OF ILLICIT DISCHARGE INTO THE MS4 — YES
- SC-2 STORM DRAIN STENCILING AND POSTING OF SIGNAGE — YES
- SC-6 ADDITIONAL BMPs BASED ON POTENTIAL RUNOFF POLLUTANTS:
  - A ONSITE STORM DRAIN INLET — YES
  - B NEED FOR FUTURE INDOOR & STR. PEST CONTROL — YES
  - D LANDSCAPE / OUTDOOR PESTICIDE USE — YES



TYPICAL DETAIL - ORIFICE PLATE

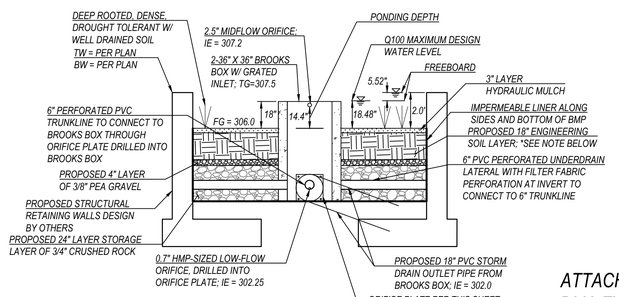
NOT TO SCALE



TYPICAL DETAIL - BIOFILTRATION BASIN (BMP 1)

NOT TO SCALE

*BIOFILTRATION "ENGINEERED SOIL" LAYER SHALL BE MINIMUM 18" DEEP "SANDY LOAM" SOIL MIX WITH NO MORE THAN 5% CLAY CONTENT. THE MIX SHALL CONTAIN 50-60% SAND, 20-30% COMPOST OR HARDWOOD MULCH, AND 20-30% TOPSOIL.



TYPICAL DETAIL - BIOFILTRATION BASIN (BMP 2)

NOT TO SCALE

*BIOFILTRATION "ENGINEERED SOIL" LAYER SHALL BE MINIMUM 18" DEEP "SANDY LOAM" SOIL MIX WITH NO MORE THAN 5% CLAY CONTENT. THE MIX SHALL CONTAIN 50-60% SAND, 20-30% COMPOST OR HARDWOOD MULCH, AND 20-30% TOPSOIL.

SOIL TYPE INFORMATION

SOIL: TYPE D HYDROLOGIC SOILS PER WEB SOIL SURVEY APPLICATION AVAILABLE THROUGH UNITED STATES DEPARTMENT OF AGRICULTURE

COARSE SEDIMENT YIELD

NO CRITICAL COARSE SEDIMENT YIELD AREAS TO BE PROTECTED. REFER TO PRIORITY DEVELOPMENT PROJECT SWQMP PREPARED BY PASCO, LARET, SUITER AND ASSOCIATES

GROUNDWATER INFORMATION

GROUND WATER WAS NOT ENCOUNTERED DEPTH GREATER THAN 20-FT

TREATMENT CONTROL BMPS

BIOFILTRATION	BF-1
TREE WELL	SD-A

ATTACHMENT 1
DMA EXHIBIT
OCEAN BLUFF WAY,
ENCINITAS, CA 92024

PLSA
PLSAENGINEERING.COM

DMA 1 - AREA CALCULATIONS

IMPERVIOUS AREA	(BUILDING / ROOF)	37,642 SF
	(DRIVEWAYS)	6,181 SF
	(MISC HARDSCAPE)	3,386 SF
	(ACCESS ROAD)	12,535 SF
	(*CONTINGENCY)	+8,962 SF
	TOTAL	68,706 SF
PERVIOUS AREA	(LANDSCAPED AREA)	37,587 SF
	(BIOFILTRATION BMP)	4,260 SF
	(*CONTINGENCY)	-8,962 SF
	TOTAL	32,885 SF
TOTAL BASIN AREA	101,591 SF / 2.33 AC	
% IMPERVIOUS	67.6%	

*15% FUTURE LOT HARDSCAPE CONTINGENCY BASED ON ROOF AREA AND PRIVATE WALKWAYS / PATIOS, EXCLUSIVE OF PRIVATE ROAD, SIDEWALK AND PRIVATE DRIVEWAYS

DMA 1 - SURFACE TYPE AREA SUMMARY

DMA / BMP	AREA (SF)	POST-PROJECT SURFACE TYPE	SURFACE RUNOFF FACTOR	ADJUSTMENT FACTOR	AREA X ADJUSTED RUNOFF (SF)
A1	2,368	LOT 1 BUILDING/ROOF	0.9	1	2,131
A2	345	LOT 1 DRIVEWAY	0.9	1	311
A3	195	LOT 1 HARDSCAPE	0.9	1	176
A4	2,222	LOT 2 BUILDING/ROOF	0.9	1	2,000
A5	367	LOT 2 DRIVEWAY	0.9	1	330
A6	237	LOT 2 HARDSCAPE	0.9	1	213
A7	2,131	LOT 3 BUILDING/ROOF	0.9	1	1,918
A8	391	LOT 3 DRIVEWAY	0.9	1	352
A9	245	LOT 3 HARDSCAPE	0.9	1	221
A10	3,676	LOT 4 BUILDING/ROOF	0.9	1	3,308
A11	291	LOT 4 DRIVEWAY	0.9	1	262
A12	217	LOT 4 HARDSCAPE	0.9	1	195
A13	3,310	LOT 5 BUILDING/ROOF	0.9	1	2,979
A14	471	LOT 5 DRIVEWAY	0.9	1	424
A15	314	LOT 5 HARDSCAPE	0.9	1	283
A16	3,557	LOT 6 BUILDING/ROOF	0.9	1	3,201
A17	833	LOT 6 DRIVEWAY	0.9	1	750
A18	234	LOT 6 HARDSCAPE	0.9	1	211
A19	2,533	LOT 7 BUILDING/ROOF	0.9	1	2,280
A20	437	LOT 7 DRIVEWAY	0.9	1	393
A21	224	LOT 7 HARDSCAPE	0.9	1	202
A22	2,271	LOT 8 BUILDING/ROOF	0.9	1	2,044
A23	356	LOT 8 DRIVEWAY	0.9	1	320
A24	256	LOT 8 HARDSCAPE	0.9	1	230
A25	2,468	LOT 9 BUILDING/ROOF	0.9	1	2,221
A26	372	LOT 9 DRIVEWAY	0.9	1	335
A27	229	LOT 9 HARDSCAPE	0.9	1	206
A28	2,533	LOT 10 BUILDING/ROOF	0.9	1	2,280
A29	374	LOT 10 DRIVEWAY	0.9	1	337
A30	224	LOT 10 HARDSCAPE	0.9	1	202
A31	2,466	LOT 23 BUILDING/ROOF	0.9	1	2,219
A32	475	LOT 23 DRIVEWAY	0.9	1	428
A33	227	LOT 23 HARDSCAPE	0.9	1	204
A34	2,131	LOT 24 BUILDING/ROOF	0.9	1	1,918
A35	367	LOT 24 DRIVEWAY	0.9	1	330
A36	254	LOT 24 HARDSCAPE	0.9	1	229
A37	1,438	LOT 25 BUILDING/ROOF	0.9	1	1,294
A38	376	LOT 25 DRIVEWAY	0.9	1	338
A39	57	LOT 25 HARDSCAPE	0.9	1	51
A40	2,271	LOT 26 BUILDING/ROOF	0.9	1	2,044
A41	345	LOT 26 DRIVEWAY	0.9	1	311
A42	252	LOT 26 HARDSCAPE	0.9	1	227
A43	2,267	LOT 27 BUILDING/ROOF	0.9	1	2,040
A44	381	LOT 27 DRIVEWAY	0.9	1	343
A45	221	LOT 27 HARDSCAPE	0.9	1	199
A46	12,535	PRIVATE DRIVE	0.9	1	11,282
A47	37,587	LANDSCAPE	0.3	1	11,276
A48	4,260	BMP	0.1	1	426
					65,472

DMA 1 - DCV CALCULATIONS

AREA TRIBUTARY TO BMP (A)	= 101,591 SF / 2.33 AC
*TOTAL DMA SIZE (Cx * Ax)	= 71,114 SF / 1.65 AC
WEIGHTED RUNOFF FACTOR (Cx)	= 0.71
85TH PRECENTILE RAINFALL DEPTH (d)	= 0.60 INCHES
DCV (C*d*A*3,630)	= 3,556 CU. FT.

*TOTAL DMA SIZE ADJUSTED WITH HARDSCAPE CONTINGENCY

SELF-MITIGATING DMA - DMA 3

TOTAL BASIN SIZE	=	10,710 SF (0.25 AC)
SELF-MITIGATING IMPERVIOUS AREA	=	0 SF
% IMPERVIOUS	=	0.0%

SECTION 5.2.1 OF CITY OF ENCINITAS BMP DESIGN MANUAL ALLOWS FOR SELF-MITIGATING DMA AREAS THAT DRAIN DIRECTLY OFFSITE OR TO THE PUBLIC STORM DRAIN SYSTEM. WITH INCIDENTAL IMPERVIOUS AREAS THAT ARE LESS THAN 5% OF THE SELF-MITIGATING AREA.

DMA 2 - AREA CALCULATIONS

IMPERVIOUS AREA	(BUILDING / ROOF)	25,752 SF
	(DRIVEWAYS)	5,642 SF
	(MISC HARDSCAPE)	2,451 SF
	(ACCESS ROAD)	9,958 SF
	(*CONTINGENCY)	+6,570 SF
	TOTAL	50,373 SF
PERVIOUS AREA	(LANDSCAPED AREA)	28,955 SF
	(BIOFILTRATION BMP)	3,530 SF
	(*CONTINGENCY)	-6,570 SF
	TOTAL	25,915 SF
TOTAL BASIN AREA	76,288 SF / 1.75 AC	
% IMPERVIOUS	66.0%	

*15% FUTURE LOT HARDSCAPE CONTINGENCY BASED ON ROOF AREA AND PRIVATE WALKWAYS / PATIOS, EXCLUSIVE OF PRIVATE ROAD, SIDEWALK AND PRIVATE DRIVEWAYS

DMA 2 - SURFACE TYPE AREA SUMMARY

DMA / BMP	AREA (SF)	POST-PROJECT SURFACE TYPE	SURFACE RUNOFF FACTOR	ADJUSTMENT FACTOR	AREA X ADJUSTED RUNOFF (SF)
B1	2,271	LOT 11 BUILDING/ROOF	0.9	1	2,044
B2	533	LOT 11 DRIVEWAY	0.9	1	480
B3	253	LOT 11 HARDSCAPE	0.9	1	228
B4	2,367	LOT 12 BUILDING/ROOF	0.9	1	2,130
B5	682	LOT 12 DRIVEWAY	0.9	1	614
B6	201	LOT 12 HARDSCAPE	0.9	1	181
B7	2,267	LOT 13 BUILDING/ROOF	0.9	1	2,040
B8	503	LOT 13 DRIVEWAY	0.9	1	453
B9	221	LOT 13 HARDSCAPE	0.9	1	199
B10	2,131	LOT 14 BUILDING/ROOF	0.9	1	1,918
B11	621	LOT 14 DRIVEWAY	0.9	1	559
B12	254	LOT 14 HARDSCAPE	0.9	1	229
B13	2,267	LOT 15 BUILDING/ROOF	0.9	1	2,040
B14	524	LOT 15 DRIVEWAY	0.9	1	472
B15	221	LOT 15 HARDSCAPE	0.9	1	199
B16	2,367	LOT 16 BUILDING/ROOF	0.9	1	2,130
B17	395	LOT 16 DRIVEWAY	0.9	1	356
B18	201	LOT 16 HARDSCAPE	0.9	1	181
B19	2,367	LOT 17 BUILDING/ROOF	0.9	1	2,130
B20	201	LOT 17 DRIVEWAY	0.9	1	181
B21	310	LOT 17 HARDSCAPE	0.9	1	279
B22	2,533	LOT 18 BUILDING/ROOF	0.9	1	2,280
B23	350	LOT 18 DRIVEWAY	0.9	1	315
B24	224	LOT 18 HARDSCAPE	0.9	1	202
B25	2,466	LOT 19 BUILDING/ROOF	0.9	1	2,219
B26	639	LOT 19 DRIVEWAY	0.9	1	575
B27	228	LOT 19 HARDSCAPE	0.9	1	205
B28	1,438	LOT 20 BUILDING/ROOF	0.9	1	1,294
B29	370	LOT 20 DRIVEWAY	0.9	1	333
B30	57	LOT 20 HARDSCAPE	0.9	1	51
B31	2,112	LOT 21 BUILDING/ROOF	0.9	1	1,901
B32	377	LOT 21 DRIVEWAY	0.9	1	339
B33	224	LOT 21 HARDSCAPE	0.9	1	202
B34	1,166	LOT 22 BUILDING/ROOF	0.9	1	1,049
B35	447	LOT 22 DRIVEWAY	0.9	1	402
B36	57	LOT 22 HARDSCAPE	0.9	1	51
B37	9,958	PRIVATE DRIVE	0.9	1	8,962
B38	28,955	LANDSCAPE	0.3	1	8,687
B39	3,530	BMP	0.1	1	353
				TOTAL	48,462

DMA 2 - DCV CALCULATIONS

AREA TRIBUTARY TO BMP (A)	= 76,228 SF / 1.75 AC
*TOTAL DMA SIZE (Cx * Ax)	= 54,686 SF / 1.26 AC
WEIGHTED RUNOFF FACTOR (Cx)	= 0.76
85TH PRECENTILE RAINFALL DEPTH (d)	= 0.60 INCHES
DCV (C*d*A*3,630)	= 2,734 CU. FT.

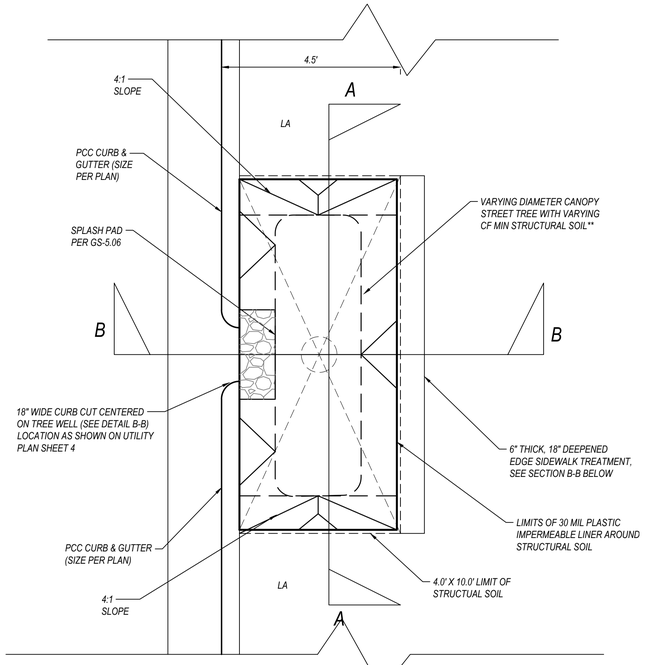
*TOTAL DMA SIZE ADJUSTED WITH HARDSCAPE CONTINGENCY

DMA 4 - AREA CALCULATIONS

IMPERVIOUS AREA	(HARDSCAPE)	4,091 SF
	TOTAL	4,091 SF
PERVIOUS AREA	(LANDSCAPED AREA)	2,674 SF
	TOTAL	2,674 SF
TOTAL BASIN AREA	6,765 SF / 0.16 AC	
% IMPERVIOUS	60.4%	

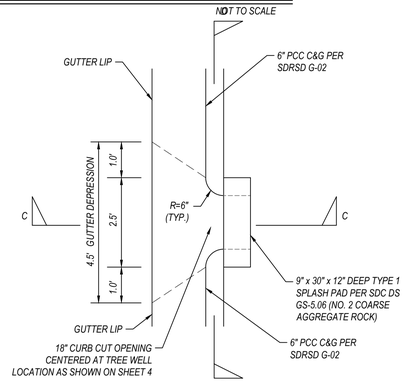
DMA 4 - DCV CALCULATIONS

AREA TRIBUTARY TO BMP (A)	= 6,765 SF / 0.16 AC
*TOTAL DMA SIZE (Cx * Ax)	= 3,622 SF / 0.08 AC
WEIGHTED RUNOFF FACTOR (Cx)	= 0.54
85TH PRECENTILE RAINFALL DEPTH (d)	= 0.60 INCHES
DCV (C*d*A*3,630)	= 181 CU. FT.



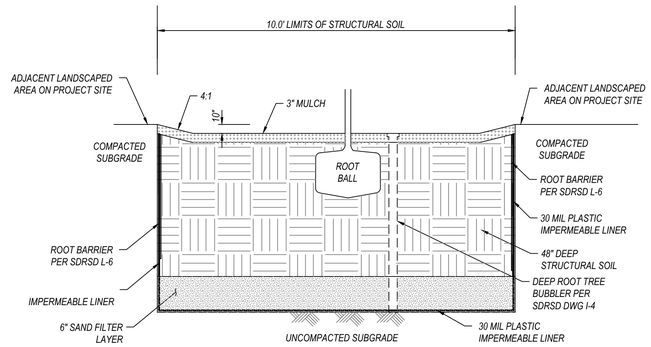
PLAN VIEW - CURB CUT @ TREE WELL SDS GS DS GS-5.01

NOT TO SCALE



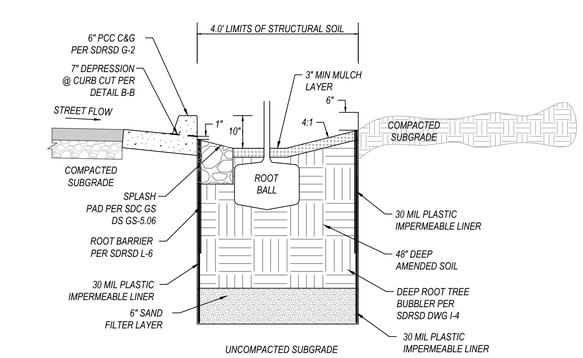
PLAN VIEW - CURB CUT @ TREE WELL SDC GS DS GS-5.01

NOT TO SCALE



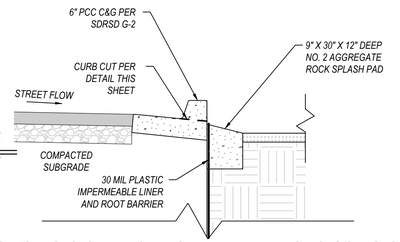
SECTION A-A TREE WELL W/O GRATE MODIFIED SDC GS DS SD-1.04A + GS-1.04B

NOT TO SCALE



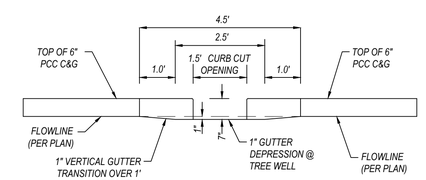
SECTION B-B TREE WELL W/O GRATE MODIFIED SDC GS DS SD-1.04A + GS-1.04B

NOT TO SCALE



SECTION C-C CURB CUT @ TREE WELL SDC GS DS GS 5.01

NOT TO SCALE



SECTION D-D CURB CUT @ TREE WELL SDC GS DS GS 5.01

NOT TO SCALE

ATTACHMENT 1
DMA EXHIBIT
OCEAN BLUFF WAY,
ENCINITAS, CA 92024

PLSA
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Worksheet B.2-1. DCV

Design Capture Volume		Worksheet B-2.1		
1	85th percentile 24-hr storm depth from Figure B.1-1	d=	0.60	inches
2	Area tributary to BMP (s)	A=	2.33	acres
3	Area weighted runoff factor (estimate using Appendix B.1.1 and B.2.1)	C=	0.71	unitless
4	Street trees volume reduction	TCV=	N/A	cubic-feet
5	Rain barrels volume reduction (1 cubic foot=7.48 gallons)	RCV=	0	cubic-feet
6	Calculate DCV = (3630 x C x d x A) – TCV - RCV	DCV=	3,556	cubic-feet

Worksheet B.2-1. DCV

Design Capture Volume		Worksheet B-2.1		
1	85th percentile 24-hr storm depth from Figure B.1-1	d=	0.60	inches
2	Area tributary to BMP (s)	A=	1.75	acres
3	Area weighted runoff factor (estimate using Appendix B.1.1 and B.2.1)	C=	0.76	unitless
4	Street trees volume reduction	TCV=	N/A	cubic-feet
5	Rain barrels volume reduction (1 cubic foot=7.48 gallons)	RCV=	0	cubic-feet
6	Calculate DCV = (3630 x C x d x A) – TCV - RCV	DCV=	2,734	cubic-feet

Worksheet B.5-1: Simple Sizing Method for Biofiltration BMPs			DMA 1
Simple Sizing Method for Biofiltration BMPs		**Worksheet B.5-1**	
1	Remaining DCV after implementing retenion BMPs	3329	cubic-feet
Partial Retention			
2	Infiltration rate from Worksheet D.5-1 if partial infiltation is feasible	0	in/hr
3	allowable drawdown time for aggregate storage below the underdrain	36	hours
4	Depth of runoff that can be infilrated [Line 2 x Line 3]	0	inches
5	Aggregate pore space	0.4	in/in
6	Required depth of gravel below the underdrain [Line 4 / Line 5]	0	inches
7	Assumed surface area of biofiltration BMP	4260	sq-ft
8	Media Retained pore space	0.1	in/in
9	Volume retrained by BMP [Line 4 + (Line 12 x Line 8)/12] x Line 7	639	cubic-feet
10	DCV that requires biofiltration [Line 1 - Line 9]	2690	cubic-feet
BMP Parameters			
11	Surface Ponding [6in minimum, 12 inch maximum]	18	inches
12	Media Thickness [18 inches minimum]	18	inches
13	Aggregate Storage Above underdrain invert (12 inches typical) - use 0 inches for sizing if the aggregate is not over the entire bottom surface area	21	inches
14	Media available pore space	0.2	in/in
15	Media filtration rate to be used for sizing	5	in/hr
Baseline Calculations			
16	Allowable Routing Time for Sizing	6	hours
17	Depth filtered during strom [Line 15 x Line 16]	30	inches
18	Depth of detention storage [line 11 + (Line 12 Line 14) + (Line 13 x Line 5)]	30	inches
19	Total Depth Treated [Line 17 + Line 18]	36	inches
Option 1 - Biofilter 1.5 times the DVC			
20	Required biofiltrated volume [1.5 x Line 10]	4035.0	cubic-feet
21	Required Footprint [Line 20 / Line 19] x 12	1345	sq-ft
Option 2 - Store 0.75 of the remaining DCV in pores and ponding			
22	Required Storage (surface + pores) Volume [0.75 x Line 10]	2018	cubic-feet
23	Required Footprint [Line 22 / Line 18] x 12	538	sq-ft
Footprint of the BMP			
24	Area draining to the BMP	102114	sq-ft
25	Adjusted Runoff Factor for drainage area (Refere to Appendix B.1 and B.2)	0.65	
26	Minimum BMP Footprint [Line 24 x Line 25 X 0.03]	1991	sq-ft
27	Footprint of the BMP = Maximum(minimum(Line 21, Line 23), Line 26)	1991	sq-ft

Worksheet B.5-1: Simple Sizing Method for Biofiltration BMPs			DMA 2
Simple Sizing Method for Biofiltration BMPs		**Worksheet B.5-1**	
1	Remaining DCV after implementing retenion BMPs	2427	cubic-feet
Partial Retention			
2	Infiltration rate from Worksheet D.5-1 if partial infiltation is feasible	0	in/hr
3	allowable drawdown time for aggregate storage below the underdrain	36	hours
4	Depth of runoff that can be infilrated [Line 2 x Line 3]	0	inches
5	Aggregate pore space	0.4	in/in
6	Required depth of gravel below the underdrain [Line 4 / Line 5]	0	inches
7	Assumed surface area of biofiltration BMP	3530	sq-ft
8	Media Retained pore space	0.1	in/in
9	Volume retrained by BMP [Line 4 + (Line 12 x Line 8)/12] x Line 7	530	cubic-feet
10	DCV that requires biofiltration [Line 1 - Line 9]	1898	cubic-feet
BMP Parameters			
11	Surface Ponding [6in minimum, 12 inch maximum]	18	inches
12	Media Thickness [18 inches minimum]	18	inches
13	Aggregate Storage Above underdrain invert (12 inches typical) - use 0 inches for sizing if the aggregate is not over the entire bottom surface area	21	inches
14	Media available pore space	0.2	in/in
15	Media filtration rate to be used for sizing	5	in/hr
Baseline Calculations			
16	Allowable Routing Time for Sizing	6	hours
17	Depth filtered during strom [Line 15 x Line 16]	30	inches
18	Depth of detention storage [line 11 + (Line 12 Line 14) + (Line 13 x Line 5)]	30	inches
19	Total Depth Treated [Line 17 + Line 18]	36	inches
Option 1 - Biofilter 1.5 times the DVC			
20	Required biofiltrated volume [1.5 x Line 10]	2846.3	cubic-feet
21	Required Footprint [Line 20 / Line 19] x 12	949	sq-ft
Option 2 - Store 0.75 of the remaining DCV in pores and ponding			
22	Required Storage (surface + pores) Volume [0.75 x Line 10]	1423	cubic-feet
23	Required Footprint [Line 22 / Line 18] x 12	380	sq-ft
Footprint of the BMP			
24	Area draining to the BMP	77913	sq-ft
25	Adjusted Runoff Factor for drainage area (Refere to Appendix B.1 and B.2)	0.63	
26	Minimum BMP Footprint [Line 24 x Line 25 X 0.03]	1473	sq-ft
27	Footprint of the BMP = Maximum(minimum(Line 21, Line 23), Line 26)	1473	sq-ft

Automated Worksheet B.1: Calculation of Design Capture Volume (V2.0)

Category	#	Description	*i*	*ii*	Units
Standard Drainage Basin Inputs	1	Drainage Basin ID or Name	1	2	unitless
	2	85th Percentile 24-hr Storm Depth	0.60	0.60	inches
	3	Impervious Surfaces Not Directed to Dispersion Area (C=0.90)	68,706	50,373	sq-ft
	4	Semi-Pervious Surfaces Not Serving as Dispersion Area (C=0.30)	28,625	28,955	sq-ft
	5	Engineered Pervious Surfaces Not Serving as Dispersion Area (C=0.10)	4,260	3,530	sq-ft
	6	Natural Type A Soil Not Serving as Dispersion Area (C=0.10)			sq-ft
	7	Natural Type B Soil Not Serving as Dispersion Area (C=0.14)			sq-ft
	8	Natural Type C Soil Not Serving as Dispersion Area (C=0.23)			sq-ft
	9	Natural Type D Soil Not Serving as Dispersion Area (C=0.30)			sq-ft
Dispersion Area, Tree Well & Rain Barrel Inputs (Optional)	10	Does Tributary Incorporate Dispersion, Tree Wells, and/or Rain Barrels?	No	No	yes/no
	11	Impervious Surfaces **Directed to Dispersion Area** per SD-B (Ci=0.90)			sq-ft
	12	Semi-Pervious Surfaces **Serving as Dispersion Area** per SD-B (Ci=0.30)			sq-ft
	13	Engineered Pervious Surfaces **Serving as Dispersion Area** per SD-B (Ci=0.10)			sq-ft
	14	Natural Type A Soil **Serving as Dispersion Area** per SD-B (Ci=0.10)			sq-ft
	15	Natural Type B Soil **Serving as Dispersion Area** per SD-B (Ci=0.14)			sq-ft
	16	Natural Type C Soil **Serving as Dispersion Area** per SD-B (Ci=0.23)			sq-ft
	17	Natural Type D Soil **Serving as Dispersion Area** per SD-B (Ci=0.30)			sq-ft
	18	Number of Tree Wells Proposed per SD-A			#
	19	Average Mature Tree Canopy Diameter			ft
	20	Number of Rain Barrels Proposed per SD-E			#
	21	Average Rain Barrel Size			gal
Initial Runoff Factor Calculation	22	Total Tributary Area	101,591	82,858	sq-ft
	23	Initial Runoff Factor for Standard Drainage Areas	0.70	0.66	unitless
	24	Initial Runoff Factor for Dispersed & Dispersion Areas	0.00	0.00	unitless
	25	Initial Weighted Runoff Factor	0.70	0.66	unitless
	26	Initial Design Capture Volume	3,556	2,734	cubic-feet
Dispersion Area Adjustments	27	Total Impervious Area Dispersed to Pervious Surface	0	0	sq-ft
	28	Total Pervious Dispersion Area	0	0	sq-ft
	29	Ratio of Dispersed Impervious Area to Pervious Dispersion Area	n/a	n/a	ratio
	30	Adjustment Factor for Dispersed & Dispersion Areas	1.00	1.00	ratio
	31	Runoff Factor After Dispersion Techniques	0.70	0.66	unitless
	32	Design Capture Volume After Dispersion Techniques	3,556	2,734	cubic-feet
Tree & Barrel Adjustments	33	Total Tree Well Volume Reduction	0	0	cubic-feet
	34	Total Rain Barrel Volume Reduction	0	0	cubic-feet
Results	35	Final Adjusted Runoff Factor	0.70	0.66	unitless
	36	Final Effective Tributary Area	71,114	54,686	sq-ft
	37	Initial Design Capture Volume Retained by Site Design Elements	0	0	cubic-feet
	38	Final Design Capture Volume Tributary to BMP	3,556	2,734	cubic-feet

No Warning Messages

Automated Worksheet B.2: Retention Requirements (V2.0)

Category	#	Description	*i*	*ii*	Units
Basic Analysis	1	Drainage Basin ID or Name	1	2	unitless
	2	85th Percentile Rainfall Depth	0.60	0.60	inches
	3	Predominant NRCS Soil Type Within BMP Location	B	B	unitless
	4	Is proposed BMP location Restricted or Unrestricted for Infiltration Activities?	Restricted	Restricted	unitless
	5	Nature of Restriction	Slopes	Slopes	unitless
	6	Do Minimum Retention Requirements Apply to this Project?	Yes	Yes	yes/no
	7	Are Habitable Structures Greater than 9 Stories Proposed?	No	No	yes/no
Advanced Analysis	8	Has Geotechnical Engineer Performed an Infiltration Analysis?	No	No	yes/no
	9	Design Infiltration Rate Recommended by Geotechnical Engineer			in/hr
Result	10	Design Infiltration Rate Used To Determine Retention Requirements	0.000	0.000	in/hr
	11	Percent of Average Annual Runoff that Must be Retained within DMA	4.5%	4.5%	percentage
	12	Fraction of DCV Requiring Retention	0.02	0.02	ratio
	13	Required Retention Volume	71	55	cubic-feet

No Warning Messages

Automated Worksheet B.3: BMP Performance (V2.0)

Category	#	Description	*i*	*ii*	Units
BMP Inputs	1	Drainage Basin ID or Name	1	2	sq-ft
	2	Design Infiltration Rate Recommended	0.000	0.000	in/hr
	3	Design Capture Volume Tributary to BMP	3,556	2,734	cubic-feet
	4	Is BMP Vegetated or Unvegetated?	Vegetated	Vegetated	unitless
	5	Is BMP Impermeably Lined or Unlined?	Lined	Lined	unitless
	6	Does BMP Have an Underdrain?	Underdrain	Underdrain	unitless
	7	Does BMP Utilize Standard or Specialized Media?	Standard	Standard	unitless
	8	Provided Surface Area	4,260	3,530	sq-ft
	9	Provided Surface Ponding Depth	13.2	14.4	inches
	10	Provided Soil Media Thickness	21	21	inches
	11	Provided Gravel Thickness (Total Thickness)	28	28	inches
	12	Underdrain Offset	3	3	inches
	13	Diameter of Underdrain or Hydromod Orifice (Select Smallest)	0.80	0.70	inches
	14	Specialized Soil Media Filtration Rate			in/hr
	15	Specialized Soil Media Pore Space for Retention			unitless
	16	Specialized Soil Media Pore Space for Biofiltration			unitless
	17	Specialized Gravel Media Pore Space			unitless
Retention Calculations	18	Volume Infiltrated Over 6 Hour Storm	0	0	cubic-feet
	19	Ponding Pore Space Available for Retention	0.00	0.00	unitless
	20	Soil Media Pore Space Available for Retention	0.05	0.05	unitless
	21	Gravel Pore Space Available for Retention (Above Underdrain)	0.00	0.00	unitless
	22	Gravel Pore Space Available for Retention (Below Underdrain)	0.40	0.40	unitless
	23	Effective Retention Depth	2.25	2.25	inches
	24	Fraction of DCV Retained (Independent of Drawdown Time)	0.22	0.24	ratio
	25	Calculated Retention Storage Drawdown Time	120	120	hours
	26	Efficacy of Retention Processes	0.24	0.26	ratio
	27	Volume Retained by BMP (Considering Drawdown Time)	847	698	cubic-feet
	28	Design Capture Volume Remaining for Biofiltration	2,709	2,036	cubic-feet
Biofiltration Calculations	29	Max Hydromod Flow Rate through Underdrain	0.0372	0.0288	cfs
	30	Max Soil Filtration Rate Allowed by Underdrain Orifice	0.38	0.35	in/hr
	31	Soil Media Filtration Rate per Specifications	5.00	5.00	in/hr
	32	Soil Media Filtration Rate to be used for Sizing	0.38	0.35	in/hr
	33	Depth Biofiltered Over 6 Hour Storm	2.26	2.11	inches
	34	Ponding Pore Space Available for Biofiltration	1.00	1.00	unitless
	35	Soil Media Pore Space Available for Biofiltration	0.20	0.20	unitless
	36	Gravel Pore Space Available for Biofiltration (Above Underdrain)	0.40	0.40	unitless
	37	Effective Depth of Biofiltration Storage	27.40	28.60	inches
	38	Drawdown Time for Surface Ponding	35	41	hours
	39	Drawdown Time for Effective Biofiltration Depth	73	81	hours
	40	Total Depth Biofiltered	29.66	30.71	inches
	41	Option 1 - Biofilter 1.50 DCV: Target Volume	4,064	3,054	cubic-feet
	42	Option 1 - Provided Biofiltration Volume	4,064	3,054	cubic-feet
	43	Option 2 - Store 0.75 DCV: Target Volume	2,032	1,527	cubic-feet
	44	Option 2 - Provided Storage Volume	2,032	1,527	cubic-feet
	45	Portion of Biofiltration Performance Standard Satisfied	1.00	1.00	ratio
Result	46	Do Site Design Elements and BMPs Satisfy Annual Retention Requirements?	Yes	Yes	yes/no
	47	Overall Portion of Performance Standard Satisfied (BMP Efficacy Factor)	1.00	1.00	ratio
	48	**Deficit of Effectively Treated Stormwater**	**0**	**0**	cubic-feet

Attention!

-Vegetated BMPs with surface ponding drawdown times over 24 hours must be certified by a landscape architect or agronomist. All BMPs must have a surface

Harvest and Use Feasibility Checklist	Form I-7

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.

Toilet & Urinal Demand -> 9.3 Gal / resident
Landscape Demand -> 1,470 Gal / irrigated acre moderate water use
9.3 gal/day x (0.13368 cu ft/gal) x (1.5 days) = 1.86 cu ft / person over 36 hrs
27 units x 4.0 people/unit x (1.86 cu ft / person = 36 hr) = 201 cu ft / 36 hrs (toilet/urinal flushing)
1.86 ac irrigated x 1,470 gal / ac - 36 hr x 0.13368 cu ft / gal = 366 cu ft / 36 hrs (landscaping)
Total = 201 cu ft + 366 cu ft = 391 cu ft

3. Calculate the DCV using worksheet B-2.1.

DCV = 6,290 (cubic feet) Total

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.

Is harvest and use feasible based on further evaluation?

☐ Yes, refer to Appendix E to select and size harvest and use BMPs.

☒ No, select alternate BMPs.

Categorization of Infiltration Feasibility Condition	Form I-8

Part 1 - Full Infiltration Feasibility Screening Criteria

Would infiltration of the full design volume be feasible from a physical perspective without any undesirable consequences that cannot be reasonably mitigated?

Criteria	Screening Question	Yes	No
1	**Is the estimated reliable infiltration rate below proposed facility locations greater than 0.5 inches per hour?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.		X

Provide basis:

Yes, an infiltration evaluation was performed that showed results of the site soils in the vicinity of the water quality control basin to be 0.085 and 0.207 in/hr. "Updated Geotechnical Repor, Ocean Bluff Development" Prepared by GeoTek, Inc. PN 3889-SD, dated June 5, 2023.

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

Criteria	Screening Question	Yes	No
2	**Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.		

Provide basis:

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

Form I-8 Page 2 of 4			
Criteria	Screening Question	**Yes**	**No**
3	**Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of groundwater contamination (shallow water table, stormwater pollutants or other factors) that cannot be mitigated to an acceptable level?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.		
Provide basis: Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
4	**Can infiltration greater than 0.5 inches per hour be allowed without causing potential water balance issues such as change of seasonality of ephemeral streams or increased discharge of contaminated groundwater to surface waters?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.		
Provide basis: Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
Part 1 Result *	If all answers to rows 1 - 4 are "**Yes**" a full infiltration design is potentially feasible. The feasibility screening category is **Full Infiltration** If any answer from row 1-4 is "**No**", infiltration may be possible to some extent but would not generally be feasible or desirable to achieve a "full infiltration" design. Proceed to Part 2	NO	

*To be completed using gathered site information and best professional judgment considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by Agency/Jurisdictions to substantiate findings

Form I-8 Page 3 of 4

Part 2 – Partial Infiltration vs. No Infiltration Feasibility Screening Criteria

Would infiltration of water in any appreciable amount be physically feasible without any negative consequences that cannot be reasonably mitigated?

Criteria	Screening Question	Yes	No
5	**Do soil and geologic conditions allow for infiltration in any appreciable rate or volume?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.	X	

Provide basis:

[illegible] an infiltration evaluation [illegible] performed that [illegible] noted results of the site soils in the vicinity of the [illegible] water [illegible] facility control [illegible] in to be 0.085 and 0.207 in/hr. "[illegible] dated [illegible] Geotechnical [illegible] for [illegible] Ocean [illegible] Development" Prepared [illegible] Geo-Engineering, Inc. P/[illegible] 88-[illegible] dated [illegible] June 5, 202[illegible].

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.

6	**Can Infiltration in any appreciable quantity be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level**? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.		X

Provide basis:

No. See recommendation referenced in Section 5.1 Storm Water Infiltration of "[illegible] dated [illegible] Geotechnical [illegible] for [illegible] Ocean [illegible] Development" Prepared [illegible] Geo-Engineering, Inc. P/[illegible] 88-[illegible] dated [illegible] June 5, 202[illegible]

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.

Form I-8 Page 4 of 4			
Criteria	Screening Question	**Yes**	**No**
7	**Can Infiltration in any appreciable quantity be allowed without posing significant risk for groundwater related concerns (shallow water table, stormwater pollutants or other factors)?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.		
Provide basis: Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.			
8	**Can infiltration be allowed without violating downstream water rights**? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.		
Provide basis: Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.			
Part 2 Result*	If all answers from row 1-4 are yes then partial infiltration design is potentially feasible. The feasibility screening category is **Partial Infiltration.** If any answer from row 5-8 is no, then infiltration of any volume is considered to be **infeasible** within the drainage area. The feasibility screening category is **No Infiltration.**	No Infiltration	

*To be completed using gathered site information and best professional judgment considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by Agency/Jurisdictions to substantiate findings

E.12 BF-1 Biofiltration

Location: 43rd Street and Logan Avenue, San Diego, California

MS4 Permit Category
Biofiltration

Manual Category
Biofiltration

Applicable Performance Standard
Pollutant Control
Flow Control

Primary Benefits
Treatment
Volume Reduction (Incidental)
Peak Flow Attenuation (Optional)

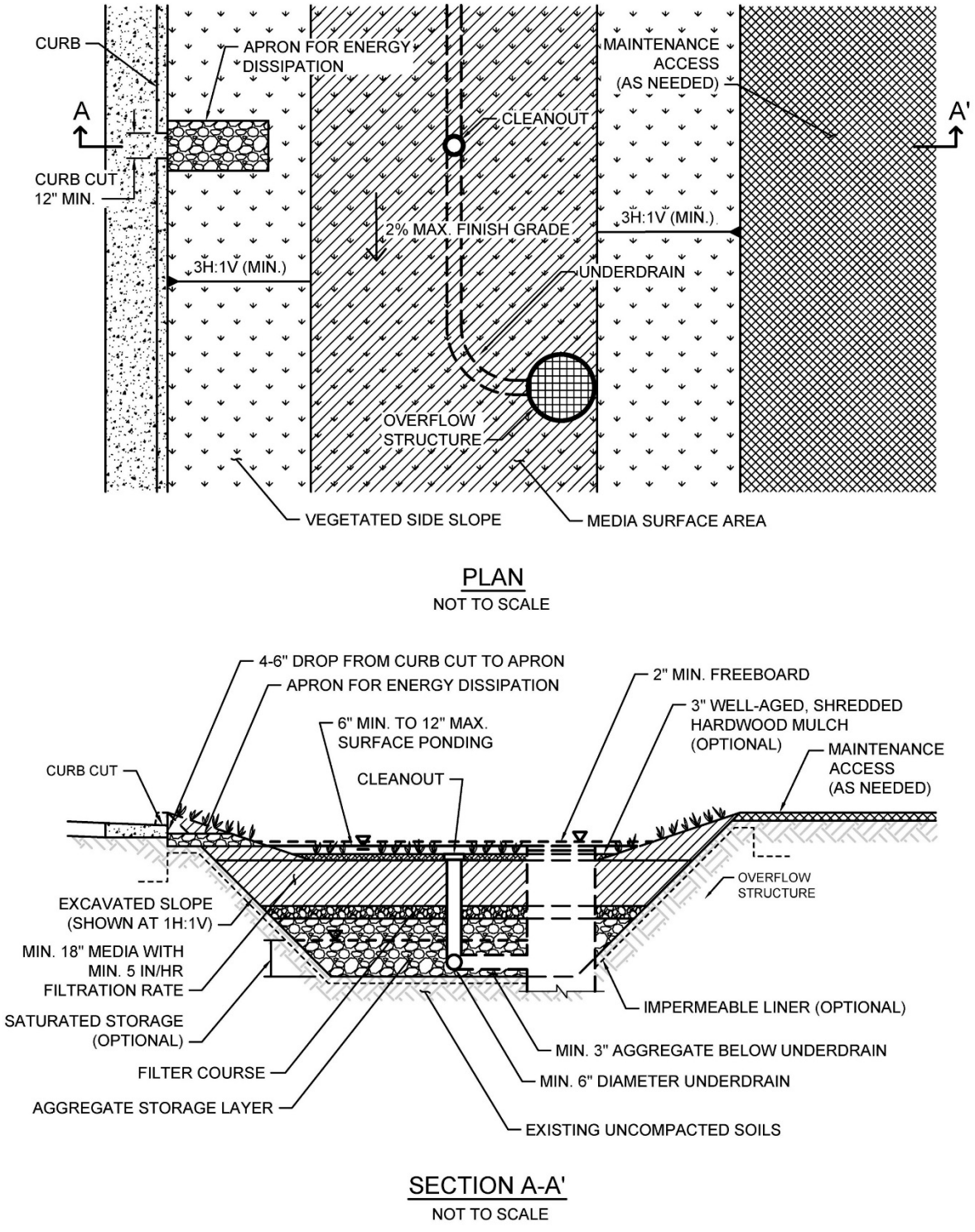
Description

Biofiltration (Bioretention with underdrain) 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. Bioretention with underdrain facilities are commonly incorporated into the site within parking lot landscaping, along roadsides, and in open spaces. Because these types of 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. Treatment is achieved through filtration, sedimentation, sorption, biochemical processes and plant uptake.

Typical bioretention with underdrain 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 expected climate and ponding depth
- Non-floating mulch layer (Optional)
- 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



Typical plan and Section view of a Biofiltration BMP

Design Adaptations for Project Goals

Biofiltration Treatment BMP for stormwater pollutant control. The system is lined or un-lined to provide incidental infiltration, and an underdrain is provided at the bottom to carry away filtered runoff. This configuration is considered to provide biofiltration treatment via flow through the media layer. Storage provided above the underdrain within surface ponding, media, and aggregate storage is considered included in the biofiltration treatment volume. Saturated storage within the aggregate storage layer can be added to this design by raising the underdrain above the bottom of the aggregate storage layer or via an internal weir structure designed to maintain a specific water level elevation.

Integrated stormwater flow control and pollutant control configuration. The system can be designed to provide flow rate and duration control by primarily providing increased surface ponding and/or having a deeper aggregate storage layer above the underdrain. This will allow for significant detention storage, which can be controlled via inclusion of an outlet structure at the downstream end of the underdrain.

Design Criteria and Considerations

Bioretention with underdrain must meet the following design criteria. Deviations from the below criteria may be approved at the discretion of the City Engineer if it is determined to be appropriate:

	Siting and Design	*Intent/Rationale*
☒	Placement observes geotechnical recommendations regarding potential hazards (e.g., slope stability, landslides, liquefaction zones) and setbacks (e.g., slopes, foundations, utilities).	Must not negatively impact existing site geotechnical concerns.
☒	An impermeable liner or other hydraulic restriction layer is included if site constraints indicate that infiltration or lateral flows should not be allowed.	Lining prevents stormwater from impacting groundwater and/or sensitive environmental or geotechnical features. Incidental infiltration, when allowable, can aid in pollutant removal and groundwater recharge.
☒	Contributing tributary area shall be ≤ 5 acres (≤ 1 acre preferred).	Bigger BMPs require additional design features for proper performance. Contributing tributary area greater than 5 acres may be allowed at the discretion of the City Engineer if the following conditions are met: 1) incorporate design features (e.g. flow spreaders) to

Siting and Design		*Intent/Rationale*
		minimizing short circuiting of flows in the BMP and 2) incorporate additional design features requested by the City Engineer for proper performance of the regional BMP.
☒	Finish grade of the facility is ≤ 2%.	Flatter surfaces reduce erosion and channelization within the facility.
Surface Ponding		
☐	Surface ponding is limited to a 24-hour drawdown time.	Surface ponding limited to 24 hour for plant health.
☐	Surface ponding depth is ≥ 6 and ≤ 12 inches.	Surface ponding capacity lowers subsurface storage requirements. Deep surface ponding raises safety concerns. Surface ponding depth greater than 12 inches (for additional pollutant control or surface outlet structures or flow-control orifices) may be allowed at the discretion of the City Engineer if the following conditions are met: 1) surface ponding depth drawdown time is less than 24 hours; and 2) safety issues and fencing requirements are considered (typically ponding greater than 18" will require a fence and/or flatter side slopes) and 3) potential for elevated clogging risk is considered.
☒	A minimum of 2 inches of freeboard is provided.	Freeboard provides room for head over overflow structures and minimizes risk of uncontrolled surface discharge.
☐	Side slopes are stabilized with vegetation and are = 3H:1V or shallower.	Gentler side slopes are safer, less prone to erosion, able to establish vegetation more quickly and easier to maintain.
Vegetation		
☒	Plantings are suitable for the climate and expected ponding depth. A plant list to aid in selection can be found in Appendix E.20.	Plants suited to the climate and ponding depth are more likely to survive.

Siting and Design		*Intent/Rationale*
☒	An irrigation system with a connection to water supply should be provided as needed.	Seasonal irrigation might be needed to keep plants healthy.
Mulch (Optional or Mandatory – Dependent on jurisdiction)		
☒	A minimum of 3 inches of well-aged, shredded hardwood mulch that has been stockpiled or stored for at least 12 months is provided.	Mulch will suppress weeds and maintain moisture for plant growth. Aging mulch kills pathogens and weed seeds and allows the beneficial microbes to multiply.
Media Layer		
☒	Media maintains a minimum filtration rate of 5 in/hr over lifetime of facility. An initial filtration rate of 8 to 12 in/hr is recommended to allow for clogging over time; the initial filtration rate should not exceed 12 inches per hour.	A filtration rate of at least 5 inches per hour allows soil to drain between events. The initial rate should be higher than long term target rate to account for clogging over time. However an excessively high initial rate can have a negative impact on treatment performance, therefore an upper limit is needed.
☒	Media is a minimum 18 inches deep, meeting either of these two media specifications: City of San Diego Low Impact Development Design Manual (page B-18) (July 2011, unless superseded by more recent edition) **or** County of San Diego Low Impact Development Handbook: Appendix G -Bioretention Soil Specification (June 2014, unless superseded by more recent edition). Alternatively, for proprietary designs and custom media mixes not meeting the media specifications contained in the City or County LID Manual, the media meets the pollutant treatment performance criteria in Section F.1.	A deep media layer provides additional filtration and supports plants with deeper roots. Standard specifications shall be followed. For non-standard or proprietary designs, compliance with F.1 ensures that adequate treatment performance will be provided.
☒	Media surface area is 3% of contributing area times adjusted runoff factor or greater.	Greater surface area to tributary area ratios: a) maximizes volume retention as required by the MS4 Permit and b) decrease loading rates per square foot and therefore increase longevity. Adjusted runoff factor is to account for site design BMPs implemented upstream of the BMP (such as rain barrels,

Siting and Design		*Intent/Rationale*
		impervious area dispersion, etc.). Refer to Appendix B.2 guidance. Use Worksheet B.5-1 Line 26 to estimate the minimum surface area required per this criteria.
☐	Where receiving waters are impaired or have a TMDL for nutrients, the system is designed with nutrient sensitive media design (see fact sheet BF-2).	Potential for pollutant export is partly a function of media composition; media design must minimize potential for export of nutrients, particularly where receiving waters are impaired for nutrients.
Filter Course Layer		
☒	A filter course is used to prevent migration of fines through layers of the facility. Filter fabric is not used.	Migration of media can cause clogging of the aggregate storage layer void spaces or subgrade. Filter fabric is more likely to clog.
☒	Filter course is washed and free of fines.	Washing aggregate will help eliminate fines that could clog the facility and impede infiltration.
☒	Filter course calculations assessing suitability for particle migration prevention have been completed.	Gradation relationship between layers can evaluate factors (e.g., bridging, permeability, and uniformity) to determine if particle sizing is appropriate or if an intermediate layer is needed.
Aggregate Storage Layer		
☒	Class 2 Permeable per Caltrans specification 68-1.025 is recommended for the storage layer. Washed, open-graded crushed rock may be used, however a 4-6 inch washed pea gravel filter course layer at the top of the crushed rock is required.	Washing aggregate will help eliminate fines that could clog the aggregate storage layer void spaces or subgrade.
☒	The depth of aggregate provided (12-inch typical) and storage layer configuration is adequate for providing conveyance for underdrain flows to the outlet structure.	Proper storage layer configuration and underdrain placement will minimize facility drawdown time.
Inflow, Underdrain, and Outflow Structures		
☒	Inflow, underdrains and outflow structures are accessible for inspection and maintenance.	Maintenance will prevent clogging and ensure proper operation of the flow

Siting and Design		*Intent/Rationale*
		control structures.
☒	Inflow velocities are limited to 3 ft/s or less or use energy dissipation methods. (e.g., riprap, level spreader) for concentrated inflows.	High inflow velocities can cause erosion, scour and/or channeling.
☐	Curb cut inlets are at least 12 inches wide, have a 4-6 inch reveal (drop) and an apron and energy dissipation as needed.	Inlets must not restrict flow and apron prevents blockage from vegetation as it grows in. Energy dissipation prevents erosion.
☒	Underdrain outlet elevation should be a minimum of 3 inches above the bottom elevation of the aggregate storage layer.	A minimal separation from subgrade or the liner lessens the risk of fines entering the underdrain and can improve hydraulic performance by allowing perforations to remain unblocked.
☒	Minimum underdrain diameter is 6 inches.	Smaller diameter underdrains are prone to clogging.
☒	Underdrains are made of slotted, PVC pipe conforming to ASTM D 3034 or equivalent or corrugated, HDPE pipe conforming to AASHTO 252M or equivalent.	Slotted underdrains provide greater intake capacity, clog resistant drainage, and reduced entrance velocity into the pipe, thereby reducing the chances of solids migration.
☒	An underdrain cleanout with a minimum 6-inch diameter and lockable cap is placed every 250 to 300 feet as required based on underdrain length.	Properly spaced cleanouts will facilitate underdrain maintenance.
☒	Overflow is safely conveyed to a downstream storm drain system or discharge point Size overflow structure to pass 100-year peak flow for on-line infiltration basins and water quality peak flow for off-line basins.	Planning for overflow lessens the risk of property damage due to flooding.

Conceptual Design and Sizing Approach for Stormwater Pollutant Control Only

To design bioretention with underdrain for stormwater pollutant control only (no flow control required), the following steps should be taken:

1. Verify that siting and design criteria have been met, including placement requirements, contributing tributary area, maximum side and finish grade slopes, and the recommended media surface area tributary ratio.
2. Calculate the DCV per Appendix B based on expected site design runoff for tributary areas.

3. Use the sizing worksheet presented in Appendix B.5 to size biofiltration BMPs.

Conceptual Design and Sizing Approach when Stormwater Flow Control is Applicable

Control of flow rates and/or durations will typically require significant surface ponding and/or aggregate storage volumes, and therefore the following steps should be taken prior to determination of stormwater pollutant control design. Pre-development and allowable post-project flow rates and durations should be determined as discussed in Chapter 6 of the manual.

1. Verify that siting and design criteria have been met, including placement requirements, contributing tributary area, maximum side and finish grade slopes, and the recommended media surface area tributary ratio.
2. Iteratively determine the facility footprint area, surface ponding and/or aggregate storage layer depth required to provide detention storage to reduce flow rates and durations to allowable limits. Flow rates and durations can be controlled from detention storage by altering outlet structure orifice size(s) and/or water control levels. Multi-level orifices can be used within an outlet structure to control the full range of flows.
3. If bioretention with underdrain cannot fully provide the flow rate and duration control required by this manual, an upstream or downstream structure with significant storage volume such as an underground vault can be used to provide remaining controls.
4. After bioretention with underdrain has been designed to meet flow control requirements, calculations must be completed to verify if stormwater pollutant control requirements to treat the DCV have been met.

E.7 SD-A Tree Wells

Tree Wells (Source: County of San Diego LID Manual – EOA, Inc.)

MS4 Permit Category

Site Design
Retention

Manual Category

Site Design
Infiltration

Applicable Performance Standard

Site Design
Pollutant Control
Flow Control

Primary Benefits

Volume Reduction

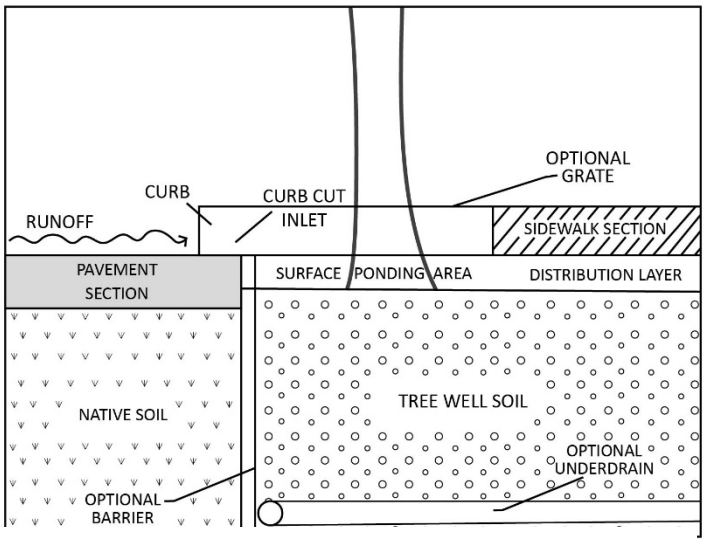
Description

Trees planted to intercept rainfall and runoff as described in this fact sheet may be used as storm water management measures to provide runoff reduction of the DCV per Appendix B.1.4. Additional benefits associated with tree wells, include energy conservation, air quality improvement, and aesthetic enhancement. In addition to the requirements provided in this fact sheet, tree wells located in the County Right-of-Way shall follow requirements in Appendix K of this manual. Deviations from the outlined criteria may be approved at the discretion of County staff. Typical storm water management benefits associated with trees include:

- **Interception of rainfall** – tree surfaces (roots, foliage, bark, and branches) intercept, evaporate, store, or convey precipitation to the soil before it reaches surrounding impervious surfaces
- **Reduced erosion** – trees protect denuded area by intercepting or reducing the velocity of rain drops as they fall through the tree canopy
- **Increased infiltration** – soil conditions created by roots and fallen leaves promote infiltration
- **Treatment of storm water** – trees provide treatment through uptake of nutrients and other storm water pollutants (phytoremediation) and support of other biological processes that break down pollutants

Typical tree well system components include:

- Trees of the appropriate species for site conditions and constraints. Refer to the Plant List in this fact sheet.
- Available soil media reservoir volume based on mature tree size, soil type, water availability, surrounding land uses, and project goals
- Optional suspended pavement design to provide structural support for adjacent pavement without requiring compaction of underlying layers



Schematic of Tree Well

- Optional root barrier devices as needed; a root barrier is a device installed in the ground, between a tree and the sidewalk, intended to guide roots down and away from the sidewalk in order to prevent sidewalk lifting from tree roots.
- Optional tree grates; to be considered to maximize available space for pedestrian circulation and to protect tree roots from compaction related to pedestrian circulation; tree grates are typically made up of porous material that will allow the runoff to soak through.
- Optional shallow surface depression for ponding of excess runoff
- Optional planter box drain

Design Adaptations for Project Goals

Site design BMP to provide incidental treatment. Tree wells primarily function as site design BMPs for incidental treatment.

Pollutant Control BMP to provide treatment. Project proponents are allowed to design trees to reduce the volume of stormwater runoff that requires treatment, (the Design Capture Volume [DCV]), or completely fulfill the pollutant control BMP requirements by retaining the entire DCV. Benefits from tree wells are accounted for by using the volume reduction values in Table B.1-3 presented in Appendix B. This credit can apply to other trees that are used for landscaping purposes that meet the same criteria. Project proponents are required to provide calculations supporting the amount of credit claimed from implementing trees within the project footprint.

Flow Control BMP to meet hydromodification requirements. Project proponents are also allowed to design tree wells as a flow control BMP. Benefits from tree wells are accounted for by using the

DCV multipliers listed below. Project proponents are required to provide calculations showing that the entire DCV including the DCV multiplier is retained.

Design Criteria and Considerations

Tree Wells, whether designed as Site Design BMPs, as Stormwater Pollutant Control BMP, or as a Flow Control BMP must meet the following design criteria and considerations, and if placed in the right-of-way must be consistent with the County of San Diego Green Streets Design Criteria and Green Streets Standard Drawings in Appendix K. Deviations from the below criteria may be approved at the discretion of the County staff if it is determined to be appropriate:

	Siting and Design	*Intent/Rationale*
☐	**Tree species** is appropriately chosen for the development (private or public). For public rights-of-ways, local planning guidelines and zoning provisions for the permissible species and placement of trees are consulted. A list of trees appropriate for site design that can be used by all county municipalities are provided in this fact sheet.	Proper tree placement and species selection minimizes problems such as pavement damage by surface roots and poor growth.
☐	**Tree well placement:** ensure area is graded; and the well is located so that full amount of DCV reduction drains to the well.	Minimizes short-circuiting of run off and assures DCV reductions are retained onsite.

Siting and Design		*Intent/Rationale*
☐	**Location of trees planted along public streets** follows guidance on green infrastructure (Appendix K). Vehicle and pedestrian line of sight and clear recovery zones are considered in tree selection and placement. Unless exemption is granted by County staff the following minimum tree separation distance is followed <table><tr><th>Improvement</th><th>Minimum distance to tree well</th></tr><tr><td>Traffic Signal, Stop sign</td><td>20 feet</td></tr><tr><td>Underground Utility lines (except sewer)</td><td>5 feet</td></tr><tr><td>Sewer Lines</td><td>10 feet</td></tr><tr><td>Above ground utility structures (Transformers, Hydrants, Utility poles, etc.)</td><td>10 feet</td></tr><tr><td>Driveways</td><td>10 feet</td></tr><tr><td>Intersections (intersecting curb lines of two streets)</td><td>25 feet</td></tr></table>	Roadway safety for both vehicular and pedestrian traffic is a key consideration for placement along public streets.
☐	**Underground utilities and overhead wires** are considered in the design and avoided or circumvented. Underground utilities are routed around or through the planter in suspended pavement applications. All underground utilities are protected from water and root penetration.	Tree growth can damage utilities and overhead wires resulting in service interruptions. Protecting utilities routed through the planter prevents damage and service interruptions. Refer to Section 6.6 of the Green Streets Design Criteria in Appendix K for guidelines regarding utility placement and potential conflict with BMP facilities.
☐	Suspended pavement was used for confined Tree Well soil volume. Suspended pavement design was developed where appropriate to minimize soil compaction and improve infiltration and filtration capabilities.	Suspended pavement designs as shown in Page 7 of the Green Streets Guidelines in Appendix K provide structural support without compaction of the underlying layers, thereby promoting tree growth.

Siting and Design		*Intent/Rationale*
	Suspended pavement was constructed with an approved structural cell.	Recommended structural cells include poured in place concrete columns, Silva Cells manufactured by Deeproot Green Infrastructures and Stratacell and Stratavault systems manufactured by Citygreen Systems.
☐	A minimum soil volume of 2 cubic feet per square foot of mature tree canopy projection area is provided for each tree. Canopy projection area is the ground area beneath the mature tree, measured at the drip line. Soil volume must be within 1.5 times the mature tree canopy radius. Soil depth shall be a minimum of 30 inches deep, preferably 36 inches deep. When placing tree well next to curb use Structural Soil as outlined in the section below titled "Confined Tree Well Soil Volume" and use Specifications in Appendix K Use Amended Soil per Fact Sheet SD-F in all other cases.	The minimum soil volume ensures that there is adequate storage volume to allow for unrestricted evapotranspiration and infiltration.
☐	To claim credit for existing trees, the root structure of existing tree shall be protected and additional soil volumes provided to meet the above requirements. A berm or well must be constructed around the perimeter of the soil volume to be credited and an inlet structure must be of the appropriate size to allow runoff to enter the well. Considerations should be made to prevent root and water intrusion damage to surrounding infrastructure.	The minimum soil volume ensures that there is adequate storage volume to allow for unrestricted storage, evapotranspiration, and infiltration.
☐	DCV from the tributary area draining to the tree is equal to or greater than the tree credit volume	The minimum tributary area ensures that the tree receives enough runoff to fully utilize the infiltration and evapotranspiration potential provided. In cases where the minimum tributary area is not provided, the tree credit volume

Siting and Design		*Intent/Rationale*
		must be reduced proportionately to the actual tributary area.
☐	Inlet opening to the tree that is at least 18 inches wide. A minimum 2 inch drop in grade from the inlet to the finish grade of the tree. Grated inlets are allowed for pedestrian circulation. Grates need to be ADA compliant and have sufficient slip resistance.	Design requirement to ensure that the runoff from the tributary area does not bypass the BMP. Different inlet openings and drops in grade may be allowed at the discretion of County staff if calculations are shown that the diversion flow rate (Appendix B.) from the tributary area can be conveyed to the tree. In cases where the inlet capacity is limiting the amount of runoff draining to the tree, the tree credit volume must be reduced proportionately.

Conceptual Design and Sizing Approach for Site Design

Determine the areas where tree wells can be used in the site design to achieve incidental treatment. Tree wells reduce runoff volumes from the site. Refer to Appendix B.2. Document the proposed tree locations in the SWQMP.

Conceptual Design and Sizing Approach for Pollutant Control

When trees are proposed as a storm water pollutant control BMP, the project proponent must submit detailed calculations for the DCV treated by trees. Document the proposed tree locations on the BMP Plan & DMA Map, and provide sizing calculations in the SWQMP Attachment following the steps in Appendix B.

Conceptual Design and Sizing Approach for Flow Control

When trees are proposed as a flow control BMP, the project proponent must submit detailed calculations for the Required Retention Volume (RRV) treated by trees. Document the proposed tree locations on the BMP Plan & DMA Map, and provide sizing calculations in the SWQMP Attachment. Tree Wells that are designed to meet flow control requirements are designated as SSD BMPs.

1. **Determine how much volume you need**. The Required Retention Volume (RRV) is the volume of rainfall that must be retained by the tree wells in the DMA to meet flow control requirements. It is calculated by multiplying the DCV by a DCV multiplier.

a. Determine the DCV. See Appendix B.

b. Determine the DCV Multiplier. The DCV Multiplier is based on two factors: (1) The tree well soil depth and, (2) The Hydrologic Soil Group. Once you know both values, determine the DCV Multiplier using this table:

c. Calculate the Required Retention Volume (DCV x DCV Multiplier). Calculate the RRV by multiplying the DCV by the DCV Multiplier. This is the volume of runoff that must be offset by the Tree Well Credit Volume. Repeat this process for each DMA.

Minimum Tree Well Soil Depth (inches)	Hydrologic Soil Group				
	A	B	C	D (Default)	
30"	1.60	2.20	2.50	2.90	DCV Multiplier
36"	1.80	2.47	2.83	3.17	
42"	2.00	2.73	3.17	3.43	
48"	2.20	3.00	3.50	3.70	

DCV Multiplier Table

Tree Well Soil Depth is the vertical distance from the top to the bottom of the soil layer in the tree well. **Hydrologic Soil Group** describes the native soil surrounding the tree well. Soil type affects how well water can infiltrate into the area surrounding the tree well. Group A soils provide the most infiltration and Group D the least. If your soil type is unknown, you can assume Group D. But this will result in larger DCV Multipliers, and in turn increase the size or number of tree wells needed.

Alternative Proposals: You can also propose RRV values or use methods and assumptions different than those described here. Proposals must be based on SWMM modeling or other methods acceptable to the County.

2. **Determine how much volume you have**. The Tree Well Credit Volume is the volume of runoff retention in cubic feet per tree (ft^3/tree) to be provided by each tree well (or group) in the DMA. Together retain a volume that is equal to or greater than the RRV for the DMA.

   The volume credited for each tree well is based on the mature canopy diameter of the tree species selected. Any species listed below can be used in a tree well so long as it meets all other applicable restrictions and requirements for the project area. Native and drought tolerant species are required where feasible.

	Botanical Name	Common Name	Mature Height (ft)	Mature Canopy Diameter (ft)	Credit Volume per Tree (ft3)
1	*Ceanothus 'Ray Hartman"*	California Mountain Lillac	30	**10**	**40**
2	*Pittosporum Phillyraeoides*	Willow Pittosporum	25	**15**	**100**
3	*Salix Lasiolepsis*	Arroyo Willow	25		
4	*Arbutus Unedo*	Strawberry Tree	30	**20**	**180**
5	*Prunus Ilicifolia*	Hollyleaf Cherry	30		
6	*Prunus Lynoii*	Catalina Cherry	40		
7	*Cercis Occidentalis*	Western Redbud	25	**25**	**290**
8	*Heteromeles Arbutifolia*	Toyon, Christmas Berry	25		
9	*Alnus Rhombifolia*	White Elder	75	**30**	**420**
10	*Arbutus 'Marina'*	Hybrid Strawberry Tree	35		
11	*Chilopsis Linearis*	Desert Willow	30		
12	*Lyonothamnus Floribundus*	Catalina Ironwood	50		
13	*Magnolia Grandiflora*	Southern Magnolia	40		
14	*Pinus Torreyana*	Torrey Pines	80		
15	*Platanus Racemosa*	California sycamore	60		
16	*Quercus Agrifolia*	Coast Live Oak	70		
17	*Quercus Engelmannii*	Engelmann Oak	50		
18	*Quercus Suber*	Cork Oak	40		
19	*Sambucus Mexicana*	Blue Elderberry	30		

Tree Palette Table

Below are sources for Tree Palette Mature Height and Mature Canopy Diameter:

A. Water Efficient Landscape Design Manual, County of San Diego, 2016
B. Sustainable Landscapes Guidelines, San Diego County Water Authority, 2015
C. Low Impact Development Handbook, County of San Diego, 2014
D. Low Impact Development Design Manual, City of San Diego, 2011
E. Street Tree Selection Guide, City of San Diego, 2013
F. Environmentally Friendly Garden Plant List, City of San Diego, 2004
G. BMP Design Manual, County of San Diego, 2016
H. California Native Plant Society. 2017

Alternative Species. Tree species other than those listed are allowable, but must be approved by the County. If you know the mature canopy diameter of the species you want to propose, use the values in the table to determine its credit volume. Note that even if you select a species with a canopy diameter greater than **30 feet**, the maximum credit any tree can generate is **420 ft^3**.

3. **Determine if you have enough volume**. Compare your total Tree Well Credit Volume from Step 2 to the RRV you calculated in Step 1. Once your Credit Volume is equal to or greater than your RRV, this requirement is satisfied. If your Credit Volume is initially too low, adjust your design either to (1) increase it with more or bigger trees, or (2) decrease the RRV through DCV reductions.

Tree wells will normally be placed at the **discharge point** of the DMA, either individually or in groups. If some of them will retain runoff from different areas in the DMA, RRV and DCV calculations must be specific to each subarea.

If an **underdrain** is proposed for the Tree Well, the sizing factors shown in the DCV Multiplier Table cannot be used, and instead continuous simulation modeling should be performed. This would allow to obtain credit for soil volume underneath the underdrain.

Tree Planting Design in New or Reconstructed Streetscapes

1. Maximized open soil area for tree planting is the most cost effective method of achieving the required soil volume.

2. Tree wells within sidewalks shall have a minimum open area of four feet wide by six feet long. Larger areas may be required to accommodate large root balls.

3. Tree well soil characteristics shall meet the requirements of SD-F Amended Soil.

Structural Requirements for Confined Tree Well Soil Volume

In order to provide adequate soil volume for tree wells, soils may be placed confined beneath adjacent paved surfaces. Acceptable soil systems capable of carrying D-50 loading include structural soils, structural slabs, and structural cells:

1. Structural soil systems include CU-StructuralSoil™, Stalite Structural Soil, or equivalent.

2. Suspended pavements that allow uncompacted growing soil beneath the sidewalk include; structural slabs that span between structural supports, structural cells, and other commercially available structural systems. See Page 7 of the Green Streets Guidelines in Appendix K for illustrations. Manufacturer details and certification must be provided for commercial systems. Structural calculations and details must be provided for structural slab installations. Structural cells are commercially-available structural systems placed subsurface that support the sidewalk and are filled with amended soil (SD-F). Manufacturer details and certification must be provided for commercial systems.

Stormwater Retention and Treatment Volume

Tree wells with expanded soil volume will serve as a method of capturing and retaining the required volume of stormwater in accordance with County requirements in Appendix B of this manual. These facilities can be designed to meet the County requirements when surface ponding volume is provided, whether designed as an enclosed plant bed with covered soil volume, or a continuous open area (either mulched or with turf) with soil volume under the adjacent sidewalk.

Maintenance Overview

Normal Expected Maintenance. Tree health shall be maintained as part of normal landscape maintenance. Additionally, ensure that storm water runoff can be conveyed into the tree well as designed. That is, the opening that allows storm water runoff to flow into the tree well (e.g., a curb opening, tree grate, or surface depression) shall not be blocked, filled, re-graded, or otherwise changed in a manner that prevents storm water from draining into the tree well. A summary table of standard inspection and maintenance indicators is provided within this Fact Sheet.

Non-Standard Maintenance or BMP Failure. Trees wells are site design BMPs that normally do not require maintenance actions beyond routine landscape maintenance. The normal expected maintenance described above ensures the BMP functionality. If changes have been made to the tree well entrance / opening such that runoff is prevented from draining into the tree well (e.g., a curb inlet opening is blocked by debris or a grate is clogged causing runoff to flow around instead of into the tree well, or a surface depression has been filled so runoff flows away from the tree well), the BMP is not performing as intended to protect downstream waterways from pollution and/or erosion. Corrective maintenance will be required to restore drainage into the tree well as designed.

Surface ponding of runoff directed into tree wells is expected to infiltrate/evapotranspirate within 24-96 hours following a storm event. 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 or compaction of the soils surrounding the tree. Loosen or replace the soils to restore drainage.

Other Special Considerations. Site design BMPs, such as tree wells, installed within a new development or redevelopment project are components of an overall storm water management strategy for the project. The presence of site design BMPs within a project is usually a factor in the determination of the amount of runoff to be managed with structural BMPs (i.e., the amount of runoff expected to reach downstream retention or biofiltration basins that process storm water runoff from the project as a whole). When site design BMPs are not maintained or are removed, this can lead to clogging or failure of downstream structural BMPs due to greater delivery of runoff and pollutants than intended for the structural BMP. Therefore, the County Engineer may require confirmation of maintenance of site design BMPs as part of their structural BMP maintenance documentation requirements. Site design BMPs that have been installed as part of the project should not be removed, nor should they be bypassed by re-routing roof drains or re-grading surfaces within the project. If changes are necessary, consult the County Engineer to determine requirements.

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ATTACHMENT 2 - BACKUP FOR PDP HYDROMODIFICATION CONTROL MEASURES

This is the cover sheet for Attachment 2.

□ Mark this box if this attachment is not included because the project is exempt from PDP hydromodification management requirements.

Indicate which items are included behind this cover sheet:

Attachment	Contents	Checklist
Attachment 2a	Hydromodification Management Exhibit (Required)	☑ Included See Hydromodification Management Exhibit Checklist on the back of this Attachment cover sheet.
Attachment 2b	Management of Critical Coarse Sediment Yield Areas (WMAA Exhibit is required, additional analyses are optional) See Section 6.2 of the BMP Design Manual.	☑ Exhibit showing project drainage boundaries marked on WMAA Critical Coarse Sediment Yield Area Map (Required) Optional analyses for Critical Coarse Sediment Yield Area Determination □ 6.2.1 Verification of Geomorphic Landscape Units Onsite □ 6.2.2 Downstream Systems Sensitivity to Coarse Sediment □ 6.2.3 Optional Additional Analysis of Potential Critical Coarse Sediment Yield Areas Onsite
Attachment 2c	Geomorphic Assessment of Receiving Channels (Optional) See Section 6.3.4 of the BMP Design Manual.	□ Not performed ☑ Included □ Submitted as separate stand-alone document
Attachment 2d	Flow Control Facility Design, including Structural BMP Drawdown Calculations and Overflow Design Summary (Required) See Chapter 6 and Appendix G of the BMP Design Manual	□ 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

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

The Hydromodification Management Exhibit must identify:

☑ Underlying hydrologic soil group

☑ Approximate depth to groundwater

□ Existing natural hydrologic features (watercourses, seeps, springs, wetlands)

☑ Critical coarse sediment yield areas to be protected

☑ Existing topography

☑ Existing and proposed site drainage network and connections to drainage offsite

☑ Proposed grading

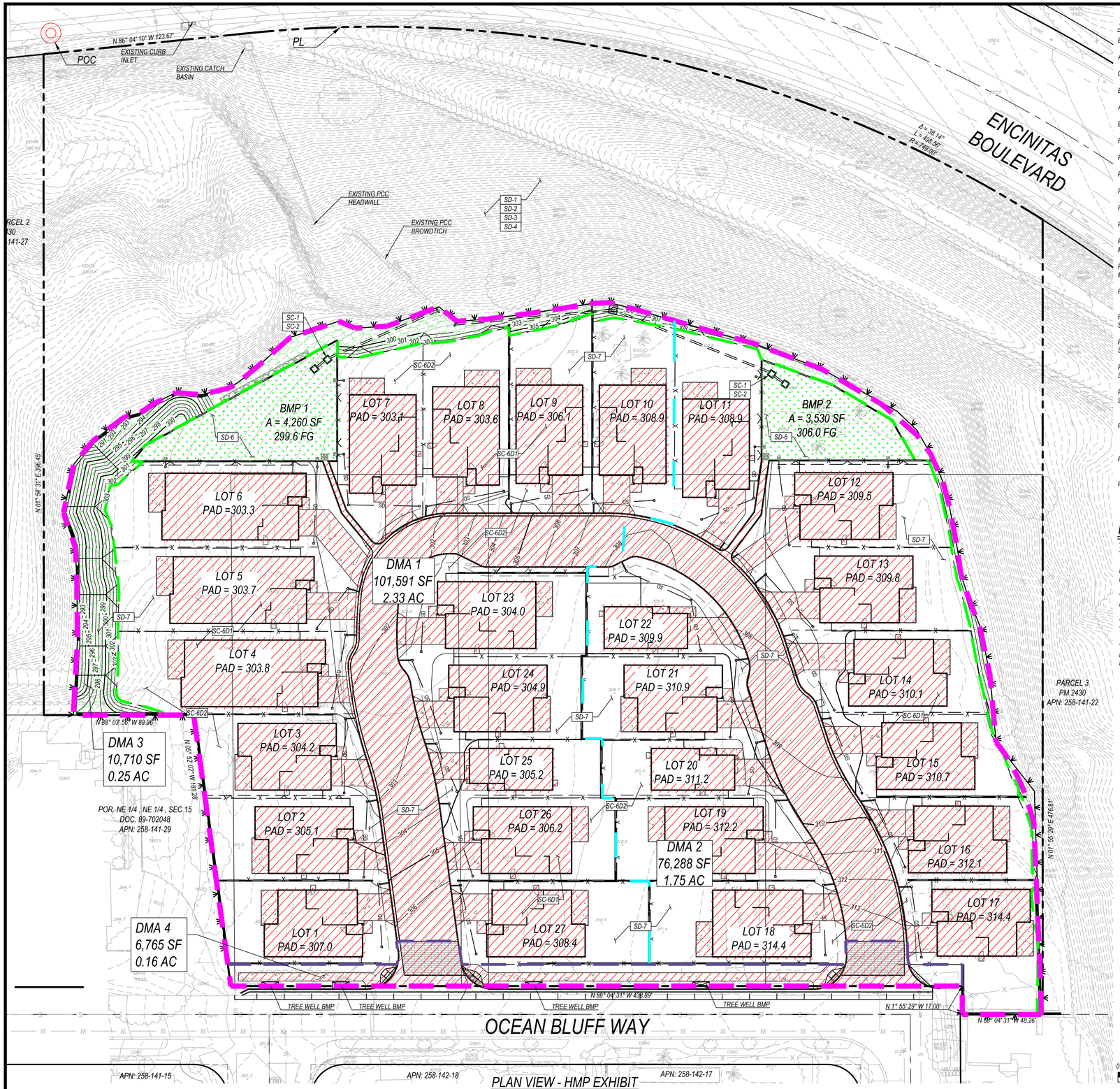
☑ Proposed impervious features

☑ Proposed design features and surface treatments used to minimize imperviousness

☑ Point(s) of Compliance (POC) for Hydromodification Management

☑ Existing and proposed drainage boundary and drainage area to each POC (when necessary, create separate exhibits for pre-development and post-project conditions)

☑ Structural BMPs for hydromodification management (identify location, type of BMP, and size/detail)



PLAN VIEW - HMP EXHIBIT

SCALE: 1" = 30'

LEGEND

- EXISTING PROPERTY BOUNDARY
- ADJACENT PROPERTY LINE / RIGHT-OF-WAY
- CENTERLINE OF ROAD
- EXISTING ASSESSOR PARCEL BOUNDARY
- ADJACENT LOT LINE
- EXISTING CONTOUR
- PROPOSED CONTOUR
- PROPOSED FLOW LINE
- PROPOSED DIRECTION OF FLOW
- PROPOSED DISTURBED AREA
- PROPOSED OVERALL DRAINAGE AREA
- PROPOSED DRAINAGE MANAGEMENT AREA SPLIT
- PROPOSED SELF-MITIGATING DRAINAGE MANAGEMENT AREA BOUNDARY
- PROPOSED SELF-MITIGATING DRAINAGE MANAGEMENT AREA BOUNDARY
- PROPOSED BIOFILTRATION BASIN
- PROPOSED DRAINAGE MANAGEMENT AREA (DMA 1 SEE KEY MAP BELWO)
- PROPOSED DRAINAGE MANAGEMENT AREA (DMA 2 SEE KEY MAP BELOW)
- PROPOSED DRAINAGE MANAGEMENT AREA (DMA 3 SEE KEY MAP BELOW)
- PROPOSED DRAINAGE MANAGEMENT AREA (DMA 4 SEE KEY MAP BELOW)
- PROPOSED REMOVED / REPLACED IMPERVIOUS AREA
- PROPOSED TREE WELL BMP
- POINT OF COMPLIANCE

PROJECT SITE AREA CALCULATIONS

TOTAL GROSS SITE AREA	313,111 SF / 7.19 AC
TOTAL DISTURBED AREA	195,354 SF / 4.48 AC
EXISTING IMPERVIOUS AREA	3,074 SF / 0.07 AC
EXISTING PERVIOUS AREA	193,917 SF / 4.45 AC
*TOTAL REMOVED/REPLACED IMPERVIOUS AREA	123,170 SF / 2.83 AC
*TOTAL ONSITE IMPERVIOUS AREA:	120,105 SF / 2.76 AC
TOTAL ROW IMPERVIOUS AREA:	3,065 SF / 0.07 AC

*INCLUDES A 15% FUTURE LOT HARDSCAPE CONTINGENCY BASED ON ROOF AREA AND PRIVATE WALKWAYS / PATIOS, EXCLUSIVE OF PRIVATE ROAD, SIDEWALK AND PRIVATE DRIVEWAYS

SOIL TYPE INFORMATION

SOIL: TYPE D HYDROLOGIC SOILS PER WEB SOIL SURVEY APPLICATION AVAILABLE THROUGH UNITED STATES DEPARTMENT OF AGRICULTURE

COARSE SEDIMENT YIELD

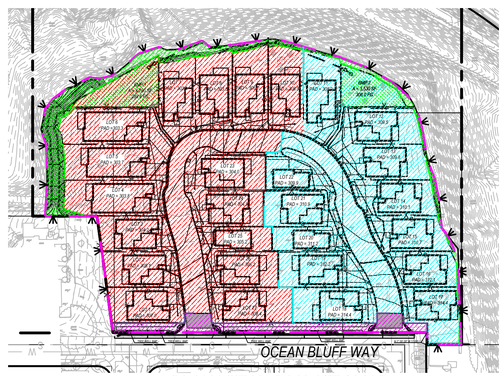
NO CRITICAL COARSE SEDIMENT YIELD AREAS TO BE PROTECTED. REFER TO PRIORITY DEVELOPMENT PROJECT SWQMP PREPARED BY PASCO, LARET, SUITER AND ASSOCIATES

GROUNDWATER INFORMATION

GROUND WATER WAS NOT ENCOUNTERED DEPTH GREATER THAN 20-FT

TREATMENT CONTROL BMPS

BIOFILTRATION	BF-1
TREE WELL	SD-A



PLAN VIEW - DMA KEY MAP

SCALE: 1" = 100'

BMP LEGEND

POST-CONSTRUCTION SITE DESIGN BMPs		POST-CONSTRUCTION SITE DESIGN BMPs		
SD-1	MAINTAIN NATURAL DRAINAGE PATHWAYS AND HYDROLOGIC FEATURES	SC-1	PREVENTION OF ILLICIT DISCHARGE INTO THE MS4	YES
SD-2	CONSERVE NATURAL AREAS, SOILS AND VEGETATION	SC-2	STORM DRAIN STENCILING AND POSTING OF SIGNAGE	YES
SD-3	MINIMIZE IMPERVIOUS AREA	SC-6	ADDITIONAL BMPs BASED ON POTENTIAL RUNOFF POLLUTANTS:	
SD-4	MINIMIZE SOIL COMPACTION	A	ONSITE STORM DRAIN INLET	YES
SD-5	IMPERVIOUS AREA DISPERSION	B	NEED FOR FUTURE INDOOR & STR. PEST CONTROL	YES
SD-6	RUNOFF COLLECTION	D	LANDSCAPE / OUTDOOR PESTICIDE USE	YES
SD-7	LANDSCAPING WITH NATIVE OR DROUGHT TOLERANT SPECIES			

ATTACHMENT 2
HMP EXHIBIT
OCEAN BLUFF WAY,
ENCINITAS, CA 92024

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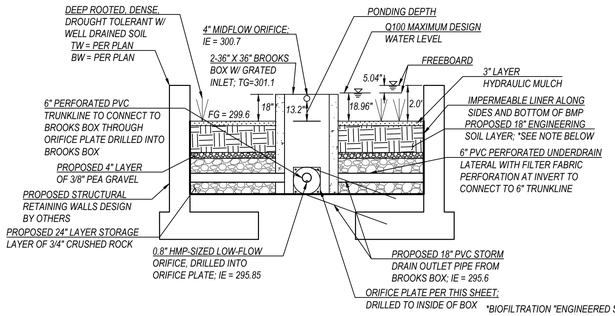
0 30' 60' 90'

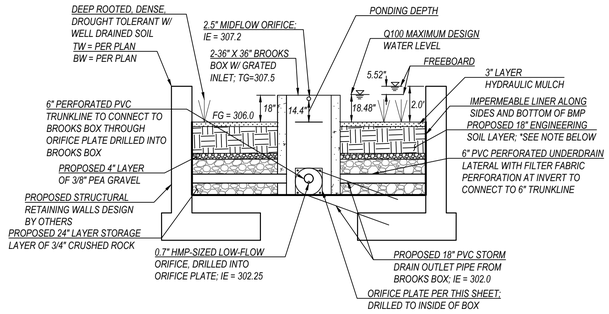
GRAPHIC SCALE: 1" = 30'



TYPICAL DETAIL - BIOFILTRATION BASIN (BMP 1)

NOT TO SCALE

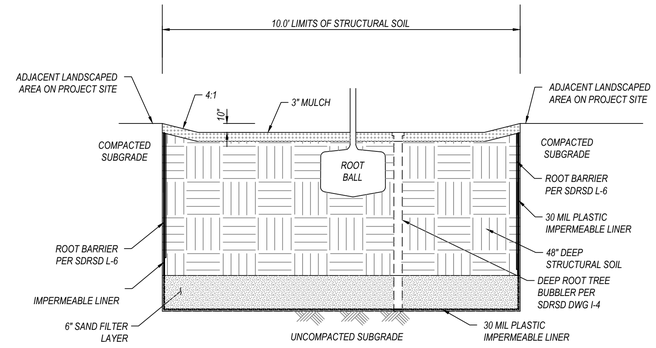
*"BIOFILTRATION "ENGINEERED SOIL" LAYER SHALL BE MINIMUM 18" DEEP "SANDY LOAM" SOIL MIX WITH NO MORE THAN 5% CLAY CONTENT. THE MIX SHALL CONTAIN 50-60% SAND, 20-30% COMPOST OR HARDWOOD MULCH, AND 20-30% TOPSOIL.



TYPICAL DETAIL - BIOFILTRATION BASIN (BMP 2)

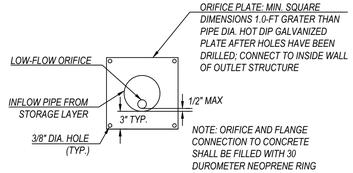
NOT TO SCALE

*"BIOFILTRATION "ENGINEERED SOIL" LAYER SHALL BE MINIMUM 18" DEEP "SANDY LOAM" SOIL MIX WITH NO MORE THAN 5% CLAY CONTENT. THE MIX SHALL CONTAIN 50-60% SAND, 20-30% COMPOST OR HARDWOOD MULCH, AND 20-30% TOPSOIL.



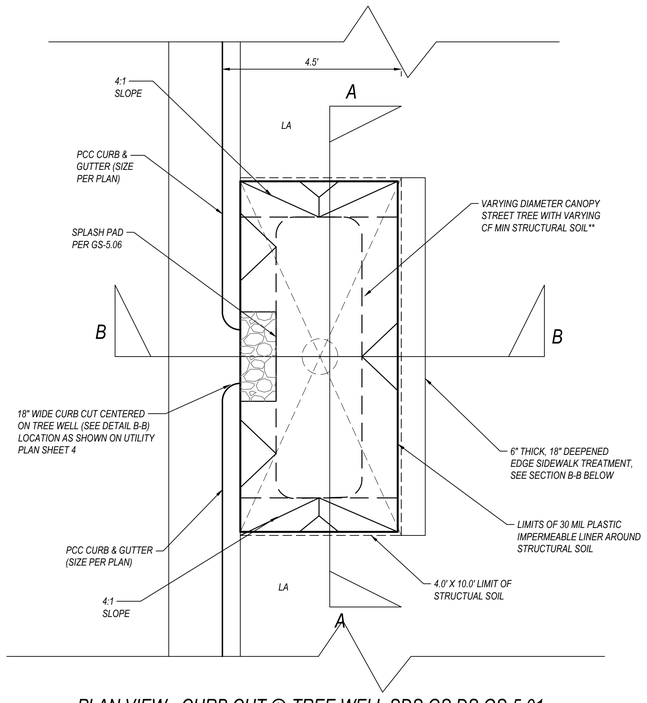
SECTION A-A TREE WELL W/O GRATE MODIFIED SDC GS DS SD-1.04A + GS-1.04B

NOT TO SCALE



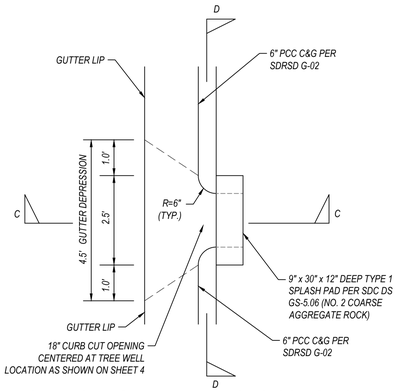
TYPICAL DETAIL - ORIFICE PLATE

NOT TO SCALE



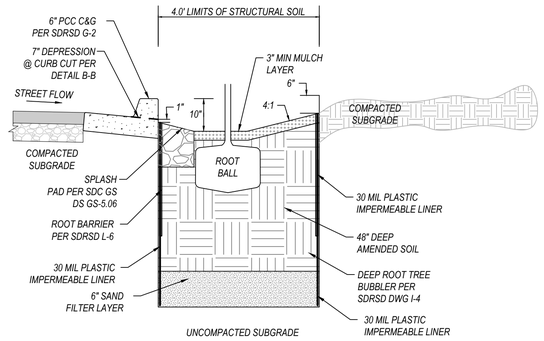
PLAN VIEW - CURB CUT @ TREE WELL SDS GS DS GS-5.01

NOT TO SCALE



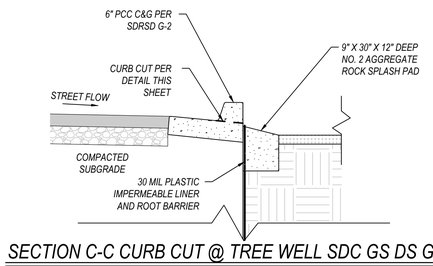
PLAN VIEW - CURB CUT @ TREE WELL SDC GS DS GS-5.01

NOT TO SCALE



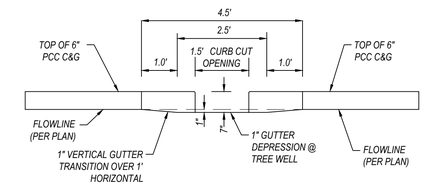
SECTION B-B TREE WELL W/O GRATE MODIFIED SDC GS DS SD-1.04A + GS-1.04B

NOT TO SCALE



SECTION C-C CURB CUT @ TREE WELL SDC GS DS GS 5.01

NOT TO SCALE



SECTION D-D CURB CUT @ TREE WELL SDC GS DS GS 5.01

NOT TO SCALE

ATTACHMENT 2
HMP EXHIBIT
OCEAN BLUFF WAY,
ENCINITAS, CA 92024

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SDHM 3.1

PROJECT REPORT

General Model Information

Project Name:	3877-HMP_working
Site Name:	Ocean Bluff
Site Address:	
City:	
Report Date:	10/16/2024
Gage:	BONITA
Data Start:	10/01/1971
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

Basin 1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
D,Dirt,Moderate	1.74
Pervious Total	1.74
Impervious Land Use	acre
Impervious Total	0
Basin Total	1.74

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Basin 1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
D,Urban,Flat	0.75
Pervious Total	0.75
Impervious Land Use	acre
IMPERVIOUS-FLAT	1.58
Impervious Total	1.58
Basin Total	2.33

Element Flows To:

Surface	Interflow	Groundwater
Surface Bio Basin 1	Surface Bio Basin 1	

Basin 2

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
D,Urban,Flat	0.59
Pervious Total	0.59

Impervious Land Use	acre
IMPERVIOUS-FLAT	1.16
Impervious Total	1.16
Basin Total	1.75

Element Flows To:

Surface	Interflow	Groundwater
Surface Biofilter 2	Surface Biofilter 2	

Basin 3

Bypass:	Yes
GroundWater:	No
Pervious Land Use	acre
D,Urban,Steep	0.25
Pervious Total	0.25
Impervious Land Use	acre
Impervious Total	0
Basin Total	0.25

Element Flows To:

Surface	Interflow	Groundwater

Routing Elements
Predeveloped Routing

Mitigated Routing

HMP Bio Basin 1

Bottom Length:	42.60 ft.
Bottom Width:	100.00 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:	2.33
Material type for third layer:	GRAVEL
Underdrain used	
Underdrain Diameter (feet):	0.5
Orifice Diameter (in.):	0.8
Offset (in.):	3
Flow Through Underdrain (ac-ft.):	27.177
Total Outflow (ac-ft.):	29.372
Percent Through Underdrain:	92.53
Discharge Structure	
Riser Height:	1.5 ft.
Riser Diameter:	36 in.
Orifice 1 Diameter:	4 in. Elevation:1.1 ft.
Element Flows To:	
Outlet 1	Outlet 2

Biofilter Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.0978	0.0000	0.0000	0.0000
0.0668	0.0978	0.0020	0.0000	0.0000
0.1336	0.0978	0.0039	0.0000	0.0000
0.2004	0.0978	0.0059	0.0000	0.0000
0.2673	0.0978	0.0078	0.0000	0.0000
0.3341	0.0978	0.0098	0.0000	0.0000
0.4009	0.0978	0.0118	0.0000	0.0000
0.4677	0.0978	0.0137	0.0000	0.0000
0.5345	0.0978	0.0157	0.0000	0.0000
0.6013	0.0978	0.0176	0.0000	0.0000
0.6681	0.0978	0.0196	0.0000	0.0000
0.7349	0.0978	0.0216	0.0000	0.0000
0.8018	0.0978	0.0235	0.0000	0.0000
0.8686	0.0978	0.0255	0.0000	0.0000
0.9354	0.0978	0.0274	0.0000	0.0000
1.0022	0.0978	0.0294	0.0000	0.0000
1.0690	0.0978	0.0314	0.0000	0.0000
1.1358	0.0978	0.0333	0.0000	0.0000
1.2026	0.0978	0.0353	0.0000	0.0000
1.2695	0.0978	0.0372	0.0000	0.0000
1.3363	0.0978	0.0392	0.0009	0.0000
1.4031	0.0978	0.0412	0.0013	0.0000
1.4699	0.0978	0.0431	0.0025	0.0000
1.5367	0.0978	0.0451	0.0031	0.0000
1.6035	0.0978	0.0470	0.0039	0.0000
1.6703	0.0978	0.0490	0.0044	0.0000
1.7371	0.0978	0.0510	0.0051	0.0000
1.8040	0.0978	0.0537	0.0054	0.0000

1.8708	0.0978	0.0564	0.0060	0.0000
1.9376	0.0978	0.0591	0.0063	0.0000
2.0044	0.0978	0.0618	0.0068	0.0000
2.0712	0.0978	0.0645	0.0071	0.0000
2.1380	0.0978	0.0672	0.0076	0.0000
2.2048	0.0978	0.0699	0.0078	0.0000
2.2716	0.0978	0.0727	0.0081	0.0000
2.3385	0.0978	0.0754	0.0088	0.0000
2.4053	0.0978	0.0781	0.0097	0.0000
2.4721	0.0978	0.0808	0.0106	0.0000
2.5389	0.0978	0.0835	0.0114	0.0000
2.6057	0.0978	0.0862	0.0123	0.0000
2.6725	0.0978	0.0889	0.0131	0.0000
2.7393	0.0978	0.0916	0.0138	0.0000
2.8062	0.0978	0.0944	0.0145	0.0000
2.8730	0.0978	0.0971	0.0152	0.0000
2.9398	0.0978	0.0998	0.0159	0.0000
3.0066	0.0978	0.1025	0.0165	0.0000
3.0734	0.0978	0.1052	0.0171	0.0000
3.1402	0.0978	0.1079	0.0177	0.0000
3.2070	0.0978	0.1106	0.0183	0.0000
3.2738	0.0978	0.1133	0.0188	0.0000
3.3407	0.0978	0.1160	0.0193	0.0000
3.4075	0.0978	0.1188	0.0199	0.0000
3.4743	0.0978	0.1215	0.0204	0.0000
3.5411	0.0978	0.1242	0.0209	0.0000
3.6079	0.0978	0.1269	0.0213	0.0000
3.6747	0.0978	0.1296	0.0218	0.0000
3.7415	0.0978	0.1323	0.0223	0.0000
3.8084	0.0978	0.1350	0.0227	0.0000
3.8752	0.0978	0.1377	0.0232	0.0000
3.9420	0.0978	0.1404	0.0236	0.0000
4.0088	0.0978	0.1432	0.0240	0.0000
4.0756	0.0978	0.1459	0.0245	0.0000
4.0800	0.0978	0.1461	0.0340	0.0000

Biofilter Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
4.0800	0.0978	0.1461	0.0000	0.4931	0.0000
4.1468	0.0978	0.1526	0.0000	0.4931	0.0000
4.2136	0.0978	0.1591	0.0000	0.6192	0.0000
4.2804	0.0978	0.1657	0.0000	0.6411	0.0000
4.3473	0.0978	0.1722	0.0000	0.6631	0.0000
4.4141	0.0978	0.1787	0.0000	0.6850	0.0000
4.4809	0.0978	0.1853	0.0000	0.7070	0.0000
4.5477	0.0978	0.1918	0.0000	0.7290	0.0000
4.6145	0.0978	0.1983	0.0000	0.7509	0.0000
4.6813	0.0978	0.2049	0.0000	0.7729	0.0000
4.7481	0.0978	0.2114	0.0000	0.7948	0.0000
4.8149	0.0978	0.2179	0.0000	0.8168	0.0000
4.8818	0.0978	0.2245	0.0000	0.8388	0.0000
4.9486	0.0978	0.2310	0.0000	0.8607	0.0000
5.0154	0.0978	0.2375	0.0000	0.8827	0.0000
5.0822	0.0978	0.2441	0.0000	0.9047	0.0000
5.1490	0.0978	0.2506	0.0000	0.9266	0.0000
5.2158	0.0978	0.2571	0.0048	0.9486	0.0000
5.2826	0.0978	0.2637	0.0364	0.9705	0.0000
5.3495	0.0978	0.2702	0.0913	0.9925	0.0000

5.4163	0.0978	0.2767	0.1599	1.0145	0.0000
5.4831	0.0978	0.2833	0.2282	1.0364	0.0000
5.5499	0.0978	0.2898	0.2641	1.0584	0.0000
5.6167	0.0978	0.2963	0.5108	1.0804	0.0000
5.6835	0.0978	0.3029	1.3677	1.1023	0.0000
5.7503	0.0978	0.3094	2.5620	1.1243	0.0000
5.8171	0.0978	0.3159	4.0104	1.1462	0.0000
5.8840	0.0978	0.3225	5.6654	1.1682	0.0000
5.9508	0.0978	0.3290	7.4901	1.1902	0.0000
6.0176	0.0978	0.3355	9.4511	1.2121	0.0000
6.0800	0.0978	0.3416	11.516	1.2326	0.0000

Surface Bio Basin 1

Element Flows To:

Outlet 1	Outlet 2
	HMP Bio Basin 1

Biofilter 2

Bottom Length:	35.30 ft.
Bottom Width:	100.00 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:	2.33
Material type for third layer:	GRAVEL
Underdrain used	
Underdrain Diameter (feet):	0.5
Orifice Diameter (in.):	0.7
Offset (in.):	3
Flow Through Underdrain (ac-ft.):	20.305
Total Outflow (ac-ft.):	21.561
Percent Through Underdrain:	94.18
Discharge Structure	
Riser Height:	1.5 ft.
Riser Diameter:	36 in.
Orifice 1 Diameter:	2.5 in. Elevation:1.2 ft.
Element Flows To:	
Outlet 1	Outlet 2

Biofilter Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.0810	0.0000	0.0000	0.0000
0.0668	0.0810	0.0016	0.0000	0.0000
0.1336	0.0810	0.0032	0.0000	0.0000
0.2004	0.0810	0.0049	0.0000	0.0000
0.2673	0.0810	0.0065	0.0000	0.0000
0.3341	0.0810	0.0081	0.0000	0.0000
0.4009	0.0810	0.0097	0.0000	0.0000
0.4677	0.0810	0.0114	0.0000	0.0000
0.5345	0.0810	0.0130	0.0000	0.0000
0.6013	0.0810	0.0146	0.0000	0.0000
0.6681	0.0810	0.0162	0.0000	0.0000
0.7349	0.0810	0.0179	0.0000	0.0000
0.8018	0.0810	0.0195	0.0000	0.0000
0.8686	0.0810	0.0211	0.0000	0.0000
0.9354	0.0810	0.0227	0.0000	0.0000
1.0022	0.0810	0.0244	0.0000	0.0000
1.0690	0.0810	0.0260	0.0000	0.0000
1.1358	0.0810	0.0276	0.0000	0.0000
1.2026	0.0810	0.0292	0.0000	0.0000
1.2695	0.0810	0.0309	0.0000	0.0000
1.3363	0.0810	0.0325	0.0007	0.0000
1.4031	0.0810	0.0341	0.0010	0.0000
1.4699	0.0810	0.0357	0.0019	0.0000
1.5367	0.0810	0.0374	0.0023	0.0000
1.6035	0.0810	0.0390	0.0030	0.0000
1.6703	0.0810	0.0406	0.0034	0.0000
1.7371	0.0810	0.0422	0.0039	0.0000
1.8040	0.0810	0.0445	0.0042	0.0000
1.8708	0.0810	0.0467	0.0046	0.0000
1.9376	0.0810	0.0490	0.0048	0.0000

2.0044	0.0810	0.0512	0.0052	0.0000
2.0712	0.0810	0.0535	0.0054	0.0000
2.1380	0.0810	0.0557	0.0058	0.0000
2.2048	0.0810	0.0580	0.0060	0.0000
2.2716	0.0810	0.0602	0.0062	0.0000
2.3385	0.0810	0.0625	0.0067	0.0000
2.4053	0.0810	0.0647	0.0074	0.0000
2.4721	0.0810	0.0669	0.0081	0.0000
2.5389	0.0810	0.0692	0.0088	0.0000
2.6057	0.0810	0.0714	0.0094	0.0000
2.6725	0.0810	0.0737	0.0100	0.0000
2.7393	0.0810	0.0759	0.0106	0.0000
2.8062	0.0810	0.0782	0.0111	0.0000
2.8730	0.0810	0.0804	0.0117	0.0000
2.9398	0.0810	0.0827	0.0122	0.0000
3.0066	0.0810	0.0849	0.0126	0.0000
3.0734	0.0810	0.0872	0.0131	0.0000
3.1402	0.0810	0.0894	0.0136	0.0000
3.2070	0.0810	0.0917	0.0140	0.0000
3.2738	0.0810	0.0939	0.0144	0.0000
3.3407	0.0810	0.0962	0.0148	0.0000
3.4075	0.0810	0.0984	0.0152	0.0000
3.4743	0.0810	0.1007	0.0156	0.0000
3.5411	0.0810	0.1029	0.0160	0.0000
3.6079	0.0810	0.1051	0.0163	0.0000
3.6747	0.0810	0.1074	0.0167	0.0000
3.7415	0.0810	0.1096	0.0171	0.0000
3.8084	0.0810	0.1119	0.0174	0.0000
3.8752	0.0810	0.1141	0.0177	0.0000
3.9420	0.0810	0.1164	0.0181	0.0000
4.0088	0.0810	0.1186	0.0184	0.0000
4.0756	0.0810	0.1209	0.0187	0.0000
4.0800	0.0810	0.1210	0.0260	0.0000

Biofilter Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
4.0800	0.0810	0.1210	0.0000	0.4086	0.0000
4.1468	0.0810	0.1264	0.0000	0.4086	0.0000
4.2136	0.0810	0.1319	0.0000	0.5131	0.0000
4.2804	0.0810	0.1373	0.0000	0.5313	0.0000
4.3473	0.0810	0.1427	0.0000	0.5495	0.0000
4.4141	0.0810	0.1481	0.0000	0.5677	0.0000
4.4809	0.0810	0.1535	0.0000	0.5858	0.0000
4.5477	0.0810	0.1589	0.0000	0.6040	0.0000
4.6145	0.0810	0.1643	0.0000	0.6222	0.0000
4.6813	0.0810	0.1698	0.0000	0.6404	0.0000
4.7481	0.0810	0.1752	0.0000	0.6586	0.0000
4.8149	0.0810	0.1806	0.0000	0.6768	0.0000
4.8818	0.0810	0.1860	0.0000	0.6950	0.0000
4.9486	0.0810	0.1914	0.0000	0.7132	0.0000
5.0154	0.0810	0.1968	0.0000	0.7314	0.0000
5.0822	0.0810	0.2022	0.0000	0.7496	0.0000
5.1490	0.0810	0.2077	0.0000	0.7678	0.0000
5.2158	0.0810	0.2131	0.0000	0.7860	0.0000
5.2826	0.0810	0.2185	0.0000	0.8042	0.0000
5.3495	0.0810	0.2239	0.0130	0.8224	0.0000
5.4163	0.0810	0.2293	0.0434	0.8406	0.0000
5.4831	0.0810	0.2347	0.0759	0.8588	0.0000

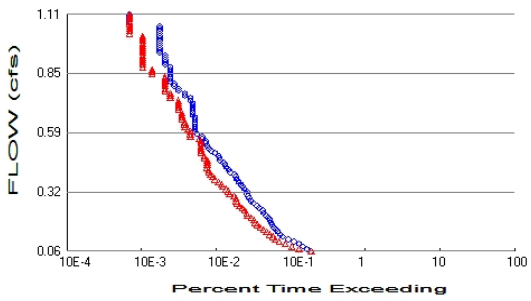
5.5499	0.0810	0.2401	0.0881	0.8770	0.0000
5.6167	0.0810	0.2456	0.3223	0.8952	0.0000
5.6835	0.0810	0.2510	1.1673	0.9134	0.0000
5.7503	0.0810	0.2564	2.3504	0.9316	0.0000
5.8171	0.0810	0.2618	3.7882	0.9498	0.0000
5.8840	0.0810	0.2672	5.4329	0.9680	0.0000
5.9508	0.0810	0.2726	7.2478	0.9862	0.0000
6.0176	0.0810	0.2780	9.1994	1.0044	0.0000
6.0800	0.0810	0.2831	11.255	1.0214	0.0000

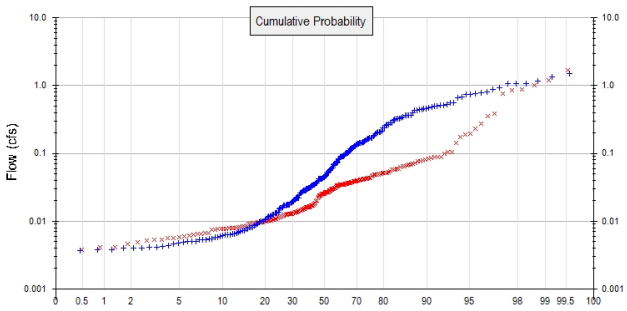
Surface Biofilter 2

Element Flows To:

Outlet 1	Outlet 2
	Biofilter 2

Analysis Results
POC 1





+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 1.74
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 1.59
Total Impervious Area: 2.74

Flow Frequency Method: Cunnane

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.555325
5 year	0.95738
10 year	1.11462
25 year	1.424702

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.099522
5 year	0.455998
10 year	0.95358
25 year	1.44291

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0555	534	548	102	Pass
0.0662	475	372	78	Pass
0.0769	418	301	72	Pass
0.0876	374	244	65	Pass
0.0983	321	202	62	Pass
0.1090	267	178	66	Pass
0.1197	224	166	74	Pass
0.1304	210	150	71	Pass
0.1411	194	137	70	Pass
0.1518	184	125	67	Pass
0.1625	173	112	64	Pass
0.1732	162	103	63	Pass
0.1839	158	96	60	Pass
0.1946	152	93	61	Pass
0.2053	143	85	59	Pass
0.2160	134	76	56	Pass
0.2267	127	74	58	Pass
0.2374	120	69	57	Pass
0.2481	110	65	59	Pass
0.2588	102	59	57	Pass
0.2695	91	56	61	Pass
0.2802	84	54	64	Pass
0.2909	80	53	66	Pass
0.3016	78	50	64	Pass
0.3123	75	44	58	Pass
0.3230	74	42	56	Pass
0.3337	69	39	56	Pass
0.3444	65	35	53	Pass
0.3551	62	34	54	Pass
0.3658	58	31	53	Pass
0.3765	55	28	50	Pass
0.3872	53	26	49	Pass
0.3979	51	24	47	Pass
0.4086	45	23	51	Pass
0.4193	43	23	53	Pass
0.4300	40	22	55	Pass
0.4407	38	22	57	Pass
0.4514	36	22	61	Pass
0.4621	33	22	66	Pass
0.4727	32	20	62	Pass
0.4834	31	20	64	Pass
0.4941	28	18	64	Pass
0.5048	25	18	72	Pass
0.5155	23	18	78	Pass
0.5262	22	18	81	Pass
0.5369	21	18	85	Pass
0.5476	21	18	85	Pass
0.5583	19	17	89	Pass
0.5690	19	13	68	Pass
0.5797	16	13	81	Pass
0.5904	15	13	86	Pass
0.6011	15	12	80	Pass
0.6118	15	11	73	Pass

0.6225	15	11	73	Pass
0.6332	15	11	73	Pass
0.6439	15	10	66	Pass
0.6546	15	10	66	Pass
0.6653	14	10	71	Pass
0.6760	14	10	71	Pass
0.6867	14	9	64	Pass
0.6974	14	9	64	Pass
0.7081	14	9	64	Pass
0.7188	14	9	64	Pass
0.7295	13	9	69	Pass
0.7402	13	7	53	Pass
0.7509	11	7	63	Pass
0.7616	11	7	63	Pass
0.7723	9	6	66	Pass
0.7830	9	6	66	Pass
0.7937	8	6	75	Pass
0.8044	8	6	75	Pass
0.8151	7	6	85	Pass
0.8258	7	6	85	Pass
0.8365	7	6	85	Pass
0.8472	7	4	57	Pass
0.8579	7	4	57	Pass
0.8686	7	4	57	Pass
0.8793	7	3	42	Pass
0.8900	6	3	50	Pass
0.9007	6	3	50	Pass
0.9114	6	3	50	Pass
0.9221	6	3	50	Pass
0.9328	6	3	50	Pass
0.9435	5	3	60	Pass
0.9542	5	3	60	Pass
0.9649	5	3	60	Pass
0.9755	5	3	60	Pass
0.9862	5	3	60	Pass
0.9969	5	3	60	Pass
1.0076	5	3	60	Pass
1.0183	5	3	60	Pass
1.0290	5	2	40	Pass
1.0397	5	2	40	Pass
1.0504	5	2	40	Pass
1.0611	5	2	40	Pass
1.0718	2	2	100	Pass
1.0825	2	2	100	Pass
1.0932	2	2	100	Pass
1.1039	2	2	100	Pass
1.1146	2	2	100	Pass

Water Quality

POC 2

POC #2 was not reported because POC must exist in both scenarios and both scenarios must have been run.

Model Default Modifications

Total of 0 changes have been made.

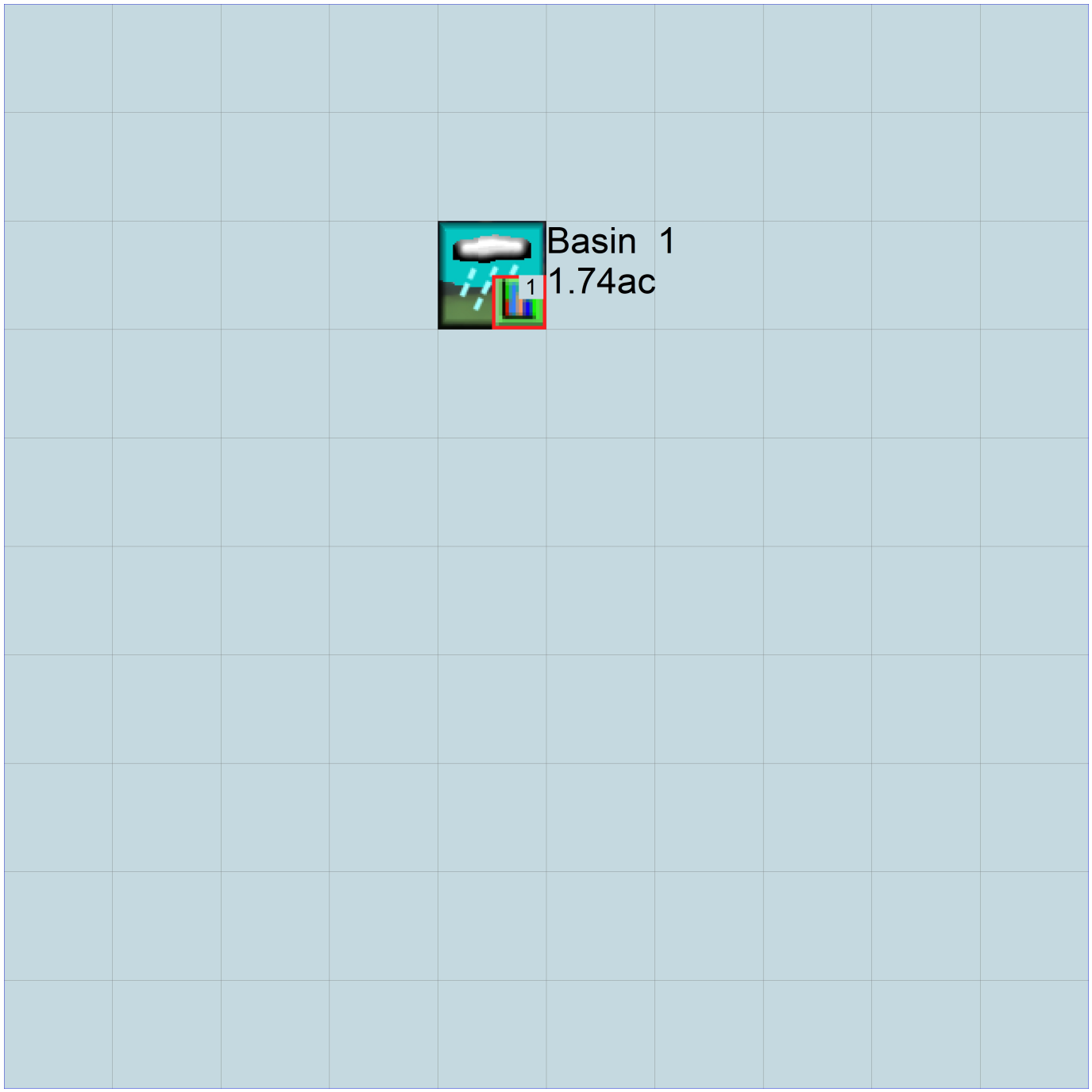
PERLND Changes

No PERLND changes have been made.

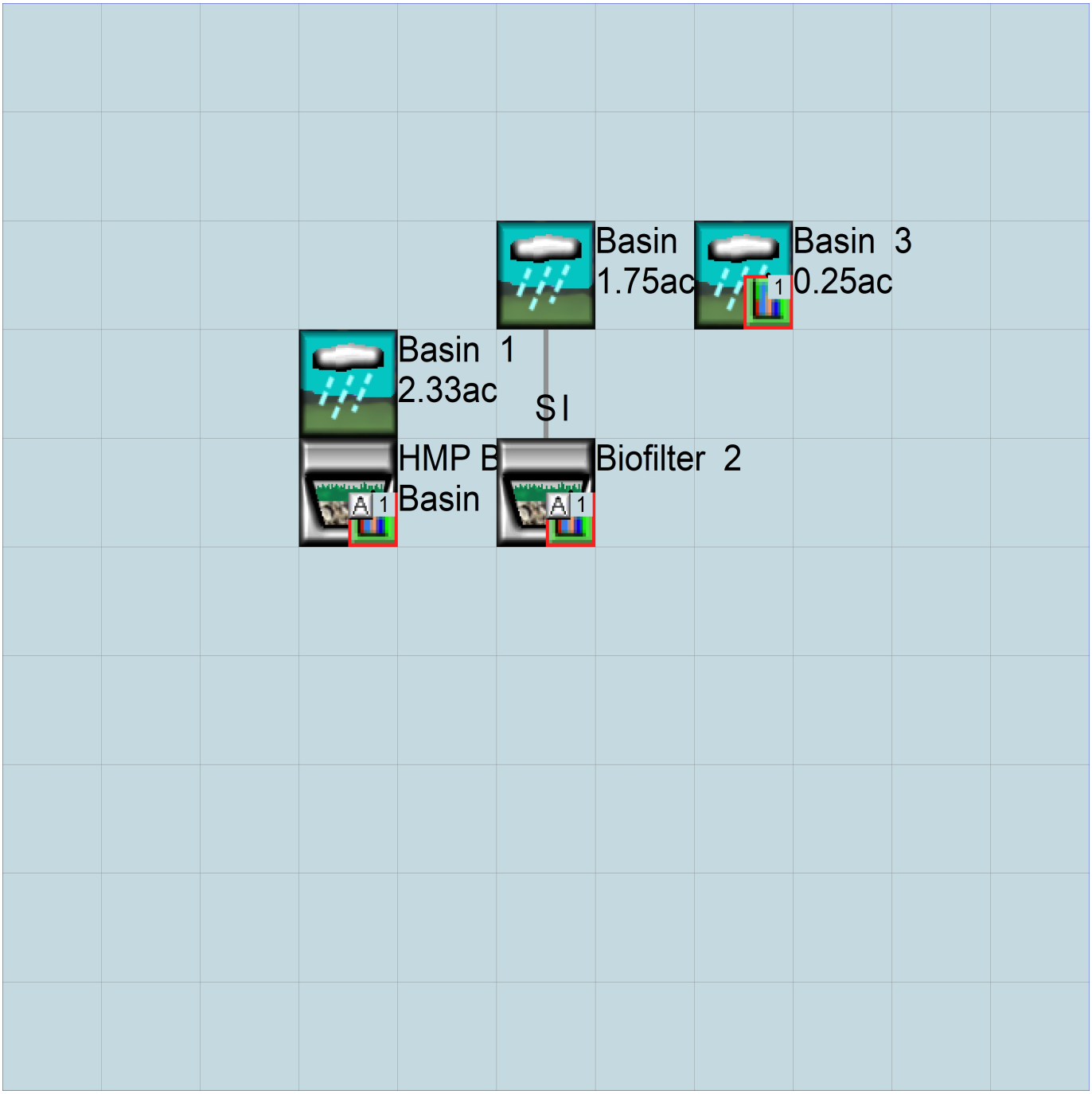
IMPLND Changes

No IMPLND changes have been made.

Appendix
Predeveloped Schematic



Mitigated Schematic



Predeveloped UCI File

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1971 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   3877-HMP_working.wdm
MESSU       25   Mit3877-HMP_working.MES
            27   Mit3877-HMP_working.L61
            28   Mit3877-HMP_working.L62
            30   POC3877-HMP_working1.dat
END FILES

OPN SEQUENCE
    INGRP               INDELT 00:60
      PERLND      46
      IMPLND       1
      PERLND      48
      GENER        2
      RCHRES       1
      RCHRES       2
      GENER        4
      RCHRES       3
      RCHRES       4
      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 Bio Basin  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
    4        24
  END OPCODE
  PARM
    #    #         K ***
    2             0.
    4             0.
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                          in  out           ***
   46      D,Urban,Flat           1    1    1    1   27    0
```

```
  48      D,Urban,Steep          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 ***
   46         0    0    1    0    0    0    0    0    0    0    0    0
   48         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  *********
   46         0    0    4    0    0    0    0    0    0    0    0    0    1    9
   48         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 ***
   46         0    1    1    1    0    0    0    0    1    1    0
   48         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
   46              0       3.8      0.03        50      0.05        2.5      0.915
   48              0       3.2      0.02        50      0.15        2.5      0.915
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   46              0         0         2         2         0      0.05      0.05
   48              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 ***
   46              0       0.6      0.03         1       0.3         0
   48              0       0.6      0.03         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  ***
   46       0.6  0.6  0.6  0.6  0.7  0.7  0.7  0.7  0.7  0.6  0.6  0.6
   48       0.6  0.6  0.6  0.6  0.7  0.7  0.7  0.7  0.7  0.6  0.6  0.6
  END MON-LZETPARM
  MON-INTERCEP
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   46       0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1
   48       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
   46              0         0      0.15         0         1      0.05         0
   48              0         0      0.15         0         1      0.05         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
  END GEN-INFO
  *** Section IWATER***

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

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

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

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

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

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

END IMPLND

SCHEMATIC
<-Source->                 <--Area-->     <-Target->   MBLK    ***
<Name>   #                 <-factor->     <Name>   #   Tbl#    ***
Basin  1***
PERLND  46                      0.75     RCHRES   1      2
PERLND  46                      0.75     RCHRES   1      3
IMPLND   1                      1.58     RCHRES   1      5
Basin  2***
PERLND  46                      0.59     RCHRES   3      2
PERLND  46                      0.59     RCHRES   3      3
IMPLND   1                      1.16     RCHRES   3      5
Basin  3***
PERLND  48                      0.25     COPY   501     12
PERLND  48                      0.25     COPY   601     12
PERLND  48                      0.25     COPY   501     13
PERLND  48                      0.25     COPY   601     13

******Routing******
PERLND  46                      0.75     COPY     1     12
IMPLND   1                      1.58     COPY     1     15
PERLND  46                      0.75     COPY     1     13
RCHRES   1                         1     RCHRES   2      8
PERLND  46                      0.59     COPY     1     12
IMPLND   1                      1.16     COPY     1     15
PERLND  46                      0.59     COPY     1     13
RCHRES   3                         1     RCHRES   4      8
```

```
RCHRES   2                          1     COPY   501     16
RCHRES   1                          1     COPY   501     17
RCHRES   4                          1     COPY   501     16
RCHRES   3                          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
GENER    4 OUTPUT TIMSER      .0002778     RCHRES   3     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 Bio Basi-004    2    1    1    1   28    0    1
    2     HMP Bio Basin  1-003    1    1    1    1   28    0    1
    3     Surface Biofilte-007    2    1    1    1   28    0    1
    4     Biofilter  2            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
    3         1    0    0    0    0    0    0    0    0    0
    4         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
    3         4    0    0    0    0    0    0    0    0    0    1    9
    4         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
    3        0  1  0  0    4  5  0  0  0       0  1  0  0  0       2  1  2  2  2
    4        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      0.01       0.0       0.0       0.0       0.0
    3              3      0.01       0.0       0.0       0.0       0.0
    4              4      0.01       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
    3            0        4.0  5.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    4            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 Variable Quantity Lines
***                          addr
***                         <------>
*** kwd  varnam optyp  opn  vari  s1 s2 s3 tp multiply  lc ls ac as agfn ***
  <****> <----> <----> <-> <----><-><-><-><-><--------> <><-> <><-> <--> ***
  UVQUAN vol4   RCHRES   4 VOL              4
  UVQUAN v2m4   GLOBAL     WORKSP  3        3
  UVQUAN vpo4   GLOBAL     WORKSP  4        3
  UVQUAN v2d4   GENER    4 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
*** 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  v2m4    1 WORKSP  3         1.0 QUAN
  UVNAME  vpo4    1 WORKSP  4         1.0 QUAN
  UVNAME  v2d4    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            =  6484.37
*** 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
*** opt foplop dcdts  yr mo dy hr mn d t   vnam  s1 s2 s3 ac quantity  tc  ts rp
  <****><-><--><><-><--> <> <> <> <><><>  <----><-><-><-><-><--------> <> <-><->
  GENER   4                               v2m4            =  5365.48
*** Compute remaining available pore space
  GENER   4                               vpo4            =  v2m4
  GENER   4                               vpo4           -=  vol4
*** Check to see if VPORA goes negative; if so set VPORA = 0.0
IF (vpo4 < 0.0) THEN
  GENER   4                               vpo4            =  0.0
END IF
*** Infiltration volume
  GENER   4                               v2d4            =  vpo4
END SPEC-ACTIONS
```

FTABLES
FTABLE 2
63 4

Depth (ft)	Area (acres)	Volume (acre-ft)	Outflow1 (cfs)	Velocity (ft/sec)	Travel Time*** (Minutes)***
0.000000	0.097796	0.000000	0.000000		
0.066813	0.097796	0.001960	0.000000		
0.133626	0.097796	0.003920	0.000000		
0.200440	0.097796	0.005881	0.000000		
0.267253	0.097796	0.007841	0.000000		
0.334066	0.097796	0.009801	0.000000		
0.400879	0.097796	0.011761	0.000000		
0.467692	0.097796	0.013722	0.000000		
0.534505	0.097796	0.015682	0.000000		
0.601319	0.097796	0.017642	0.000000		
0.668132	0.097796	0.019602	0.000000		
0.734945	0.097796	0.021562	0.000000		
0.801758	0.097796	0.023523	0.000000		
0.868571	0.097796	0.025483	0.000000		
0.935385	0.097796	0.027443	0.000000		
1.002198	0.097796	0.029403	0.000000		
1.069011	0.097796	0.031364	0.000000		
1.135824	0.097796	0.033324	0.000000		
1.202637	0.097796	0.035284	0.000000		
1.269451	0.097796	0.037244	0.000000		
1.336264	0.097796	0.039204	0.000865		
1.403077	0.097796	0.041165	0.001297		
1.469890	0.097796	0.043125	0.002467		
1.536703	0.097796	0.045085	0.003052		
1.603516	0.097796	0.047045	0.003947		
1.670330	0.097796	0.049006	0.004395		
1.737143	0.097796	0.050966	0.005098		
1.803956	0.097796	0.053677	0.005450		
1.870769	0.097796	0.056389	0.006036		
1.937582	0.097796	0.059101	0.006329		
2.004396	0.097796	0.061812	0.006841		
2.071209	0.097796	0.064524	0.007096		
2.138022	0.097796	0.067236	0.007555		
2.204835	0.097796	0.069947	0.007785		
2.271648	0.097796	0.072659	0.008091		
2.338462	0.097796	0.075371	0.008811		
2.405275	0.097796	0.078082	0.009677		
2.472088	0.097796	0.080794	0.010572		
2.538901	0.097796	0.083505	0.011446		
2.605714	0.097796	0.086217	0.012282		
2.672527	0.097796	0.088929	0.013076		
2.739341	0.097796	0.091640	0.013829		
2.806154	0.097796	0.094352	0.014545		
2.872967	0.097796	0.097064	0.015229		
2.939780	0.097796	0.099775	0.015883		
3.006593	0.097796	0.102487	0.016511		
3.073407	0.097796	0.105199	0.017116		
3.140220	0.097796	0.107910	0.017699		
3.207033	0.097796	0.110622	0.018264		
3.273846	0.097796	0.113333	0.018812		
3.340659	0.097796	0.116045	0.019345		
3.407473	0.097796	0.118757	0.019863		
3.474286	0.097796	0.121468	0.020368		
3.541099	0.097796	0.124180	0.020861		
3.607912	0.097796	0.126892	0.021342		
3.674725	0.097796	0.129603	0.021813		
3.741538	0.097796	0.132315	0.022274		
3.808352	0.097796	0.135027	0.022727		
3.875165	0.097796	0.137738	0.023171		
3.941978	0.097796	0.140450	0.023608		
4.008791	0.097796	0.143162	0.024040		
4.075604	0.097796	0.145873	0.024477		
4.080000	0.097796	0.148861	0.033989		

END FTABLE 2
FTABLE 1

```
 31    5
   Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
    (ft)   (acres) (acre-ft)   (cfs)     (cfs)   (ft/sec)    (Minutes)***
0.000000  0.097796  0.000000  0.000000  0.000000
0.066813  0.097796  0.006534  0.000000  0.493056
0.133626  0.097796  0.013068  0.000000  0.619155
0.200440  0.097796  0.019602  0.000000  0.641117
0.267253  0.097796  0.026136  0.000000  0.663079
0.334066  0.097796  0.032670  0.000000  0.685041
0.400879  0.097796  0.039204  0.000000  0.707002
0.467692  0.097796  0.045739  0.000000  0.728964
0.534505  0.097796  0.052273  0.000000  0.750926
0.601319  0.097796  0.058807  0.000000  0.772888
0.668132  0.097796  0.065341  0.000000  0.794850
0.734945  0.097796  0.071875  0.000000  0.816811
0.801758  0.097796  0.078409  0.000000  0.838773
0.868571  0.097796  0.084943  0.000000  0.860735
0.935385  0.097796  0.091477  0.000000  0.882697
1.002198  0.097796  0.098011  0.000000  0.904658
1.069011  0.097796  0.104545  0.000000  0.926620
1.135824  0.097796  0.111079  0.004753  0.948582
1.202637  0.097796  0.117613  0.036383  0.970544
1.269451  0.097796  0.124147  0.091258  0.992505
1.336264  0.097796  0.130681  0.159938  1.014467
1.403077  0.097796  0.137216  0.228222  1.036429
1.469890  0.097796  0.143750  0.264068  1.058391
1.536703  0.097796  0.150284  0.510839  1.080352
1.603516  0.097796  0.156818  1.367657  1.102314
1.670330  0.097796  0.163352  2.561999  1.124276
1.737143  0.097796  0.169886  4.010426  1.146238
1.803956  0.097796  0.176420  5.665395  1.168199
1.870769  0.097796  0.182954  7.490093  1.190161
1.937582  0.097796  0.189488  9.451124  1.212123
2.000000  0.097796  0.195592  11.51568  1.232640
END FTABLE  1
FTABLE      4
 63    4
   Depth      Area    Volume  Outflow1 Velocity  Travel Time***
    (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
0.000000  0.081038  0.000000  0.000000
0.066813  0.081038  0.001624  0.000000
0.133626  0.081038  0.003249  0.000000
0.200440  0.081038  0.004873  0.000000
0.267253  0.081038  0.006497  0.000000
0.334066  0.081038  0.008122  0.000000
0.400879  0.081038  0.009746  0.000000
0.467692  0.081038  0.011370  0.000000
0.534505  0.081038  0.012995  0.000000
0.601319  0.081038  0.014619  0.000000
0.668132  0.081038  0.016243  0.000000
0.734945  0.081038  0.017867  0.000000
0.801758  0.081038  0.019492  0.000000
0.868571  0.081038  0.021116  0.000000
0.935385  0.081038  0.022740  0.000000
1.002198  0.081038  0.024365  0.000000
1.069011  0.081038  0.025989  0.000000
1.135824  0.081038  0.027613  0.000000
1.202637  0.081038  0.029238  0.000000
1.269451  0.081038  0.030862  0.000000
1.336264  0.081038  0.032486  0.000662
1.403077  0.081038  0.034111  0.000993
1.469890  0.081038  0.035735  0.001889
1.536703  0.081038  0.037359  0.002337
1.603516  0.081038  0.038984  0.003022
1.670330  0.081038  0.040608  0.003365
1.737143  0.081038  0.042232  0.003903
1.803956  0.081038  0.044479  0.004173
1.870769  0.081038  0.046726  0.004621
1.937582  0.081038  0.048973  0.004846
2.004396  0.081038  0.051220  0.005237
```

```
  2.071209  0.081038  0.053467  0.005433
  2.138022  0.081038  0.055714  0.005785
  2.204835  0.081038  0.057961  0.005960
  2.271648  0.081038  0.060208  0.006194
  2.338462  0.081038  0.062455  0.006746
  2.405275  0.081038  0.064702  0.007409
  2.472088  0.081038  0.066949  0.008094
  2.538901  0.081038  0.069196  0.008763
  2.605714  0.081038  0.071443  0.009403
  2.672527  0.081038  0.073690  0.010011
  2.739341  0.081038  0.075937  0.010588
  2.806154  0.081038  0.078184  0.011136
  2.872967  0.081038  0.080431  0.011659
  2.939780  0.081038  0.082678  0.012160
  3.006593  0.081038  0.084925  0.012641
  3.073407  0.081038  0.087172  0.013104
  3.140220  0.081038  0.089419  0.013551
  3.207033  0.081038  0.091666  0.013984
  3.273846  0.081038  0.093912  0.014403
  3.340659  0.081038  0.096159  0.014811
  3.407473  0.081038  0.098406  0.015208
  3.474286  0.081038  0.100653  0.015594
  3.541099  0.081038  0.102900  0.015971
  3.607912  0.081038  0.105147  0.016340
  3.674725  0.081038  0.107394  0.016701
  3.741538  0.081038  0.109641  0.017054
  3.808352  0.081038  0.111888  0.017400
  3.875165  0.081038  0.114135  0.017740
  3.941978  0.081038  0.116382  0.018075
  4.008791  0.081038  0.118629  0.018405
  4.075604  0.081038  0.120876  0.018740
  4.080000  0.081038  0.123175  0.026023
  END FTABLE  4
  FTABLE      3
   31    5
     Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.081038  0.000000  0.000000  0.000000
  0.066813  0.081038  0.005414  0.000000  0.408565
  0.133626  0.081038  0.010829  0.000000  0.513056
  0.200440  0.081038  0.016243  0.000000  0.531254
  0.267253  0.081038  0.021658  0.000000  0.549453
  0.334066  0.081038  0.027072  0.000000  0.567651
  0.400879  0.081038  0.032486  0.000000  0.585849
  0.467692  0.081038  0.037901  0.000000  0.604048
  0.534505  0.081038  0.043315  0.000000  0.622246
  0.601319  0.081038  0.048729  0.000000  0.640445
  0.668132  0.081038  0.054144  0.000000  0.658643
  0.734945  0.081038  0.059558  0.000000  0.676841
  0.801758  0.081038  0.064973  0.000000  0.695040
  0.868571  0.081038  0.070387  0.000000  0.713238
  0.935385  0.081038  0.075801  0.000000  0.731436
  1.002198  0.081038  0.081216  0.000000  0.749635
  1.069011  0.081038  0.086630  0.000000  0.767833
  1.135824  0.081038  0.092045  0.000000  0.786031
  1.202637  0.081038  0.097459  0.000021  0.804230
  1.269451  0.081038  0.102873  0.013043  0.822428
  1.336264  0.081038  0.108288  0.043384  0.840627
  1.403077  0.081038  0.113702  0.075908  0.858825
  1.469890  0.081038  0.119116  0.088111  0.877023
  1.536703  0.081038  0.124531  0.322326  0.895222
  1.603516  0.081038  0.129945  1.167300  0.913420
  1.670330  0.081038  0.135360  2.350415  0.931618
  1.737143  0.081038  0.140774  3.788155  0.949817
  1.803956  0.081038  0.146188  5.432909  0.968015
  1.870769  0.081038  0.151603  7.247810  0.986213
  1.937582  0.081038  0.157017  9.199418  1.004412
  2.000000  0.081038  0.162075  11.25488  1.021413
  END FTABLE  3
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  46     EXTNL  SURLI
WDM     22 IRRG     ENGL    0.7       SAME PERLND  48     EXTNL  SURLI
WDM      2 PREC     ENGL    1              RCHRES   1     EXTNL  PREC
WDM      2 PREC     ENGL    1              RCHRES   3     EXTNL  PREC
WDM      1 EVAP     ENGL    0.5            RCHRES   1     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.7            RCHRES   2     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.5            RCHRES   3     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.7            RCHRES   4     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
RCHRES   4 HYDR   RO     1 1        1      WDM   1004 FLOW     ENGL      REPL
RCHRES   4 HYDR   STAGE  1 1        1      WDM   1005 STAG     ENGL      REPL
RCHRES   3 HYDR   STAGE  1 1        1      WDM   1006 STAG     ENGL      REPL
RCHRES   3 HYDR   O      1 1        1      WDM   1007 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
```

Disclaimer

Legal Notice

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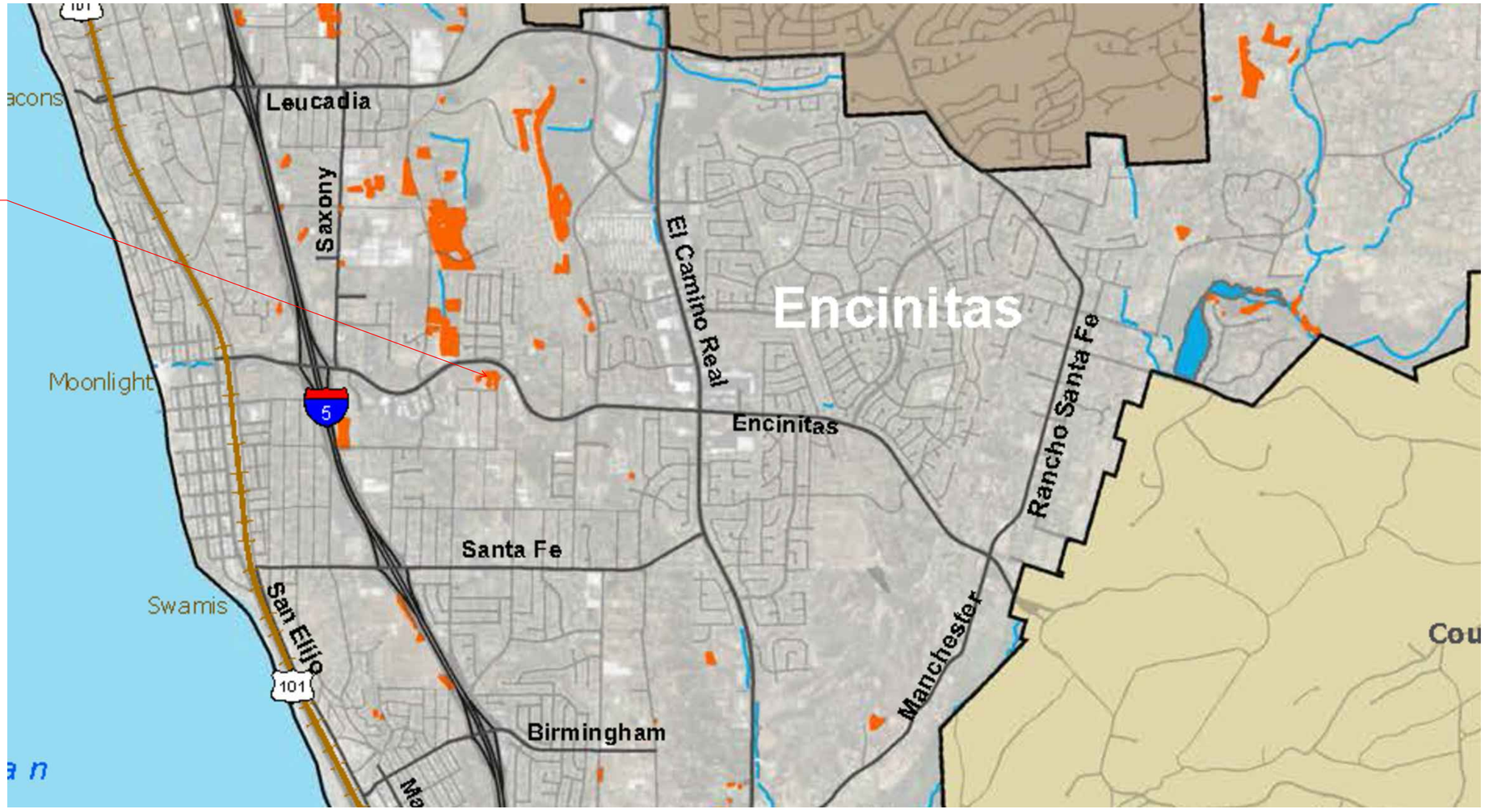
CRITICAL COARSE SEDIMENT YIELD AREA EXHIBIT

OCEAN BLUFF HOMES



PLAN VIEW - CCSYA EXHIBIT

NOT TO SCALE

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PLAN VIEW - CCSYA OVERLAY EXHIBIT

NOT TO SCALE

0 30 60 90

GRAPHIC SCALE: 1" = 30'

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J:\ACTIVE JOBS\3877 RINCON OCEAN BLUFF\CIVIL\REPORTS\SWQMP\ATTACHMENT 2

Surface Volume Drawdown Calculation for BMP-1

Project Name OCEAN BLUFF HOMES

Project No 3877

Surface Drawdown Time:	35.0	**hr**
Surface Area	**4260**	**sq ft**
Surface Volume (Surf. Area * Ponding Depth)	**4686**	**cu ft**
Underdrain Orifice Diameter: in	**0.8**	in
C:	**0.6**	
Surface Ponding (to invert of lowest surface discharge opening in outlet structure):	**1.1**	ft
Amended Soil Depth:	**1.5**	ft
GRAVEL DEPTH	**2.33**	ft
Orifice Q =	**0.037**	cfs
Effective Depth	43.362	in
Infiltration controlled by orifice	0.377	in/hr

Surface Volume Drawdown Calculation for BMP-2

Project Name OCEAN BLUFF HOMES

Project No 3877

Surface Drawdown Time:	40.9	**hr**
Surface Area	**3530**	**sq ft**
Surface Volume (Surf. Area * Ponding Depth)	**4236**	**cu ft**
Underdrain Orifice Diameter: in	**0.7**	in
C:	**0.6**	
Surface Ponding (to invert of lowest surface discharge opening in outlet structure):	**1.2**	ft
Amended Soil Depth:	**1.5**	ft
GRAVEL DEPTH	**2.33**	ft
Orifice Q =	**0.029**	cfs
Effective Depth	44.562	in
Infiltration controlled by orifice	0.352	in/hr

ATTACHMENT 3 - STRUCTURAL BMP MAINTENANCE INFORMATION

This is the cover sheet for Attachment 3.

Indicate which items are included behind this cover sheet:

Attachment	Contents	Checklist
Attachment 3a	Structural BMP Maintenance Thresholds and Actions (Required)	☑ Included See Structural BMP Maintenance Information Checklist on the back of this Attachment cover sheet.
Attachment 3b	Draft Maintenance Agreement (when applicable)	□ Included □ Not Applicable

Use this checklist to ensure the required information has been included in the Structural BMP Maintenance Information Attachment:

□ **Preliminary Design / Planning / CEQA level submittal:**

Attachment 3a must identify:

□ Typical maintenance indicators and actions for proposed structural BMP(s) based on Section 7.7 of the BMP Design Manual

Attachment 3b is not required for preliminary design / planning / CEQA level submittal.

□ **Final Design level submittal:**

Attachment 3a must identify:

□ Specific maintenance indicators and actions for proposed structural BMP(s). This shall be based on Section 7.7 of the BMP Design Manual and enhanced to reflect actual proposed components of the structural BMP(s)

□ 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

Attachment 3b: For private entity operation and maintenance, Attachment 3b shall include a draft maintenance agreement in the local jurisdiction's standard format (PDP applicant to contact the City Engineer to obtain the current maintenance agreement forms).

APPENDIX 3a
BMP MAINTENANCE THRESHOLDS

BMP DESCRIPTION

BIOFILTRATION (4,260 SF)	MAINTENANCE AGREEMENT FOR PRIVATE STORMWATER TREATMENT AND STORMWATER POLLUTION CONTROL AND HYDROMODIFICATION MANAGEMENT FACILITIES BY HOMEOWNER'S ASSOCIATION O&M RESPONSIBLE AS DOCUMENT #_____ RECORD_____

POST-CONSTRUCTION PERMANENT BMP OPERATION & MAINTENANCE PROCEDURE DETAILS

MAINTENANCE INDICATORS	MAINTENANCE ACTION
ACCUMULATION OF SEDIMENT, LITTER, OR DEBRIS	REMOVE AND PROPERLY DISPOSE OF ACCUMULATED MATERIALS, WITHOUT DAMAGE TO THE VEGETATION
POOR VEGETATION ESTABLISHMENT	RE-SEED, RE-PLANT, OR RE-ESTABLISH VEGETATION PER ORIGINAL PLANS
OVERGROWN VEGETATION	MOW OR TRIM AS APPROPRIATE, BUT NOT LESS THAT THE DESIGN HEIGHT OF THE VEGETATION PER ORIGINAL PLANS.
EROSION DUE TO CONCENTRATED IRRIGATION FLOW	REPAIR/RE-SEED/RE-PLANT ERODED AREAS AND ADJUST THE IRRIGATION SYSTEM
EROSION DUE TO CONCENTRATED STORM WATER RUNOFF FLOW	REPAIR/RE-SEED/RE-PLANT ERODED AREAS AND MAKE APPROPRIATE CORRECTIVE MEASURES SUCH AS ADDING STONE AT FLOW ENTRY POINTS OR MINOR RE-GRADING TO RESTORE PROPER DRAINAGE ACCORDING TO THE ORIGINAL PLAN.
STANDING WATER IN BIOFILTRATION AREAS	MAKE APPROPRIATE CORRECTIVE MEASURES SUCH AS ADJUSTING IRRIGATION SYSTEM, REMOVING OBSTRUCTION OF DEBRIS OR INVASIVE VEGETATION, OR CLEANING UNDERDRAINS
OBSTRUCTED INLET OR OUTLET STRUCTURE	CLEAR OBSTRUCTIONS
DAMAGE TO INLET OR OUTLET STRUCTURE	REPAIR OR REPLACE AS APPLICABLE

MAINTENANCE EQUIPMENT AND ACCESS
USE LANDSCAPE EQUIPMENT FOR MAINTENANCE; ACCESS BMP'S FROM GROUND LEVEL OF THE APARTMENT COMPLEX

INSPECTION FACILITATION
INSTALL 36" X 36" OUTLET RISER STRUCTURE TO PROVIDE OBSERVATION ACCESS FOR INSPECTION OF MAINTENANCE THRESHOLDS; MARKING TO BE PROVIDED ON BMP COMPONENTS TO DETERMINE HOW FULL BMP IS.

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APPENDIX 3a
BMP MAINTENANCE THRESHOLDS

BMP DESCRIPTION

BIOFILTRATION (3,530 SF)	MAINTENANCE AGREEMENT FOR PRIVATE STORMWATER TREATMENT AND STORMWATER POLLUTION CONTROL AND HYDROMODIFICATION MANAGEMENT FACILITIES BY HOMEOWNER'S ASSOCIATION O&M RESPONSIBLE AS DOCUMENT #_____ RECORD_____

POST-CONSTRUCTION PERMANENT BMP OPERATION & MAINTENANCE PROCEDURE DETAILS

MAINTENANCE INDICATORS	MAINTENANCE ACTION
ACCUMULATION OF SEDIMENT, LITTER, OR DEBRIS	REMOVE AND PROPERLY DISPOSE OF ACCUMULATED MATERIALS, WITHOUT DAMAGE TO THE VEGETATION
POOR VEGETATION ESTABLISHMENT	RE-SEED, RE-PLANT, OR RE-ESTABLISH VEGETATION PER ORIGINAL PLANS
OVERGROWN VEGETATION	MOW OR TRIM AS APPROPRIATE, BUT NOT LESS THAT THE DESIGN HEIGHT OF THE VEGETATION PER ORIGINAL PLANS.
EROSION DUE TO CONCENTRATED IRRIGATION FLOW	REPAIR/RE-SEED/RE-PLANT ERODED AREAS AND ADJUST THE IRRIGATION SYSTEM
EROSION DUE TO CONCENTRATED STORM WATER RUNOFF FLOW	REPAIR/RE-SEED/RE-PLANT ERODED AREAS AND MAKE APPROPRIATE CORRECTIVE MEASURES SUCH AS ADDING STONE AT FLOW ENTRY POINTS OR MINOR RE-GRADING TO RESTORE PROPER DRAINAGE ACCORDING TO THE ORIGINAL PLAN.
STANDING WATER IN BIOFILTRATION AREAS	MAKE APPROPRIATE CORRECTIVE MEASURES SUCH AS ADJUSTING IRRIGATION SYSTEM, REMOVING OBSTRUCTION OF DEBRIS OR INVASIVE VEGETATION, OR CLEANING UNDERDRAINS
OBSTRUCTED INLET OR OUTLET STRUCTURE	CLEAR OBSTRUCTIONS
DAMAGE TO INLET OR OUTLET STRUCTURE	REPAIR OR REPLACE AS APPLICABLE

MAINTENANCE EQUIPMENT AND ACCESS
USE LANDSCAPE EQUIPMENT FOR MAINTENANCE; ACCESS BMP'S FROM GROUND LEVEL OF THE APARTMENT COMPLEX

INSPECTION FACILITATION
INSTALL 36" X 36" OUTLET RISER STRUCTURE TO PROVIDE OBSERVATION ACCESS FOR INSPECTION OF MAINTENANCE THRESHOLDS; MARKING TO BE PROVIDED ON BMP COMPONENTS TO DETERMINE HOW FULL BMP IS.

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BF-1
Biofiltration

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.

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**.

BF-1
Biofiltration

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.

References

American Mosquito Control Association.
http://www.mosquito.org/
California Storm Water Quality Association (CASQA). 2003. Municipal BMP Handbook.
https://www.casqa.org/resources/bmp-handbooks/municipal-bmp-handbook
County of San Diego. 2014. Low Impact Development Handbook.
http://www.sandiegocounty.gov/content/sdc/dpw/watersheds/susmp/lid.html
San Diego County Copermittees. 2016. Model BMP Design Manual, Appendix E, Fact Sheet BF-1.
http://www.projectcleanwater.org/index.php?option=com_content&view=article&id=250&Itemid=220

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BF-1
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).

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:		

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:		

BF-1
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:		

BF-1
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.

Summary of Standard Inspection and Maintenance

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	Inspection and Maintenance Frequency
Tree health	Routine actions as necessary to maintain tree health.	• Inspect monthly. • Maintain when needed.
Dead or diseased tree	Remove dead or diseased tree. Replace per original plans.	• Inspect monthly. • Maintain when needed.
Standing water in tree well for longer than 24 hours following a storm event Surface ponding longer than approximately 24 hours following a storm event may be detrimental to tree health	Loosen or replace soils surrounding the tree to restore drainage.	• 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. • Maintain when needed.
Presence of mosquitos/larvae For images of egg rafts, larva, pupa, and adult mosquitos, see http://www.mosquito.org/biology	Disperse any standing water from the tree well to nearby landscaping. Loosen or replace soils surrounding the tree to restore drainage (and prevent standing water).	• 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. • Maintain when needed

Threshold/Indicator	Maintenance Action	Inspection and Maintenance Frequency
Entrance / opening to the tree well is blocked such that storm water will not drain into the tree well (e.g., a curb inlet opening is blocked by debris or a grate is clogged causing runoff to flow around instead of into the tree well; or a surface depression is filled such that runoff drains away from the tree well)	Make repairs as appropriate to restore drainage into the tree well.	• Inspect monthly. • Maintain when needed.

ATTACHMENT 4 - COPY OF PLAN SHEETS SHOWING PERMANENT STORM WATER BMPS

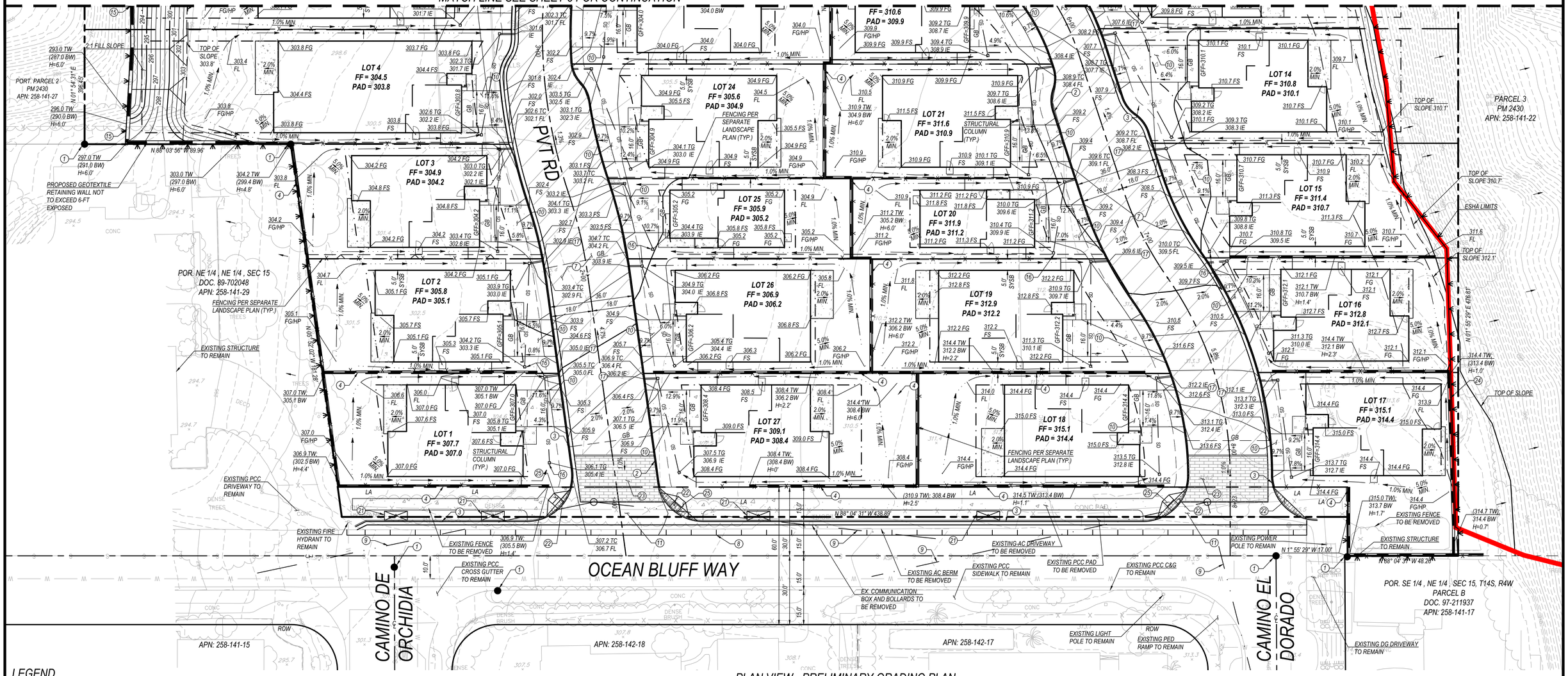
This is the cover sheet for Attachment 4.

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 Form I-6 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 the [City Engineer]
- □ 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 shall be provided. Photocopies of general brochures are not acceptable.

MATCH LINE SEE SHEET 5 FOR CONTINUATION



LEGEND

PROPERTY LINE	PROPOSED 6" CURB & GUTTER
RIGHT-OF-WAY	PROPOSED 6" CURB
CENTERLINE OF ROAD	PROPOSED HARDSCAPE
PROPOSED LOT LINES	PROPOSED MASONRY RETAINING WALL
ADJACENT LOT LINES	PROPOSED RETAINING WALL (DESIGN BY OTHERS)
EXISTING EASEMENTS	PROPOSED GEOTEXTILE RETAINING WALL (DESIGN BY OTHERS)
PROPOSED EASEMENT	PROPOSED BMP
PROPOSED SETBACKS	PROPOSED AC PAVEMENT
PROPOSED LIMIT OF GRADING	EXISTING WATER MAIN (SIZE PER PLAN)
PROPOSED CONTOUR 140	EXISTING SEWER MAIN (SIZE PER PLAN)
EXISTING CONTOUR 140	EXISTING STORM DRAIN (SIZE PER PLAN)
LIMITS OF ENVIRONMENTALLY SENSITIVE HABITAT AREA (NORTH OF LINE)	EXISTING GAS MAIN
	PROPOSED 4" PVC STORM DRAIN
	PROPOSED 18" PVC PRIVATE STORM DRAIN
	PROPOSED 12" X 12" AREA DRAIN
	PROPOSED 4, X 10' TREE WELL BMP

ABBREVIATIONS

AR/AV	AIR-RELEASE & AIR/VACUUM VALVE
BO	BLOW-OFF
BS	BOTTOM OF STAIR
BW	BOTTOM OF WALL
DI	DUCTILE IRON
FF	FINISHED FLOOR ELEVATION PER ARCHITECT
FG	FINISHED GRADE
FS	FINISHED SURFACE
GB	GRADE BREAK
GF	FACE OF GARAGE ELEVATION
GV	GATE VALVE
HP	HIGH POINT
IE	INVERT ELEVATION
LP	LOW POINT
TB	THRUST BLOCK
TC	OP OF CURB
TG	TOP OF GRATE
TS	TOP OF STAIR
TW	TOP OF WALL
WAS	WATER AGENCIES' STANDARDS

SITE NOTES

1. ALL UTILITIES SHOWN HEREON PER BEST AVAILABLE RECORDS. CONTRACTOR SHALL VERIFY EXACT HORIZONTAL AND VERTICAL LOCATION PRIOR TO CONSTRUCTION. CONTRACTOR SHALL NOTIFY ENGINEER OF RECORD OF DISCREPANCIES UPON DISCOVERY.

PROPOSED EASEMENT NOTES

SEE SHEET 2 FOR PLOTTING AND SUMMARY OF PROPOSED EASEMENTS

EXISTING EASEMENT NOTES

SEE SHEET 3 FOR PLOTTING AND SUMMARY OF EXISTING EASEMENTS

PLAN VIEW - PRELIMINARY GRADING PLAN

SCALE: 1" = 20'

CONSTRUCTION NOTES

1. EXISTING SURVEY MONUMENT TO BE PROTECTED IN PLACE; CORNER RECORD OR RECORD OF SURVEY TO BE FILED WITH THE COUNTY IF DISTURBED OR DESTROYED
2. PROPOSED 6" PCC CURB PER SDRSD G-1
3. PROPOSED 6" PCC CURB & GUTTER PER SDRSD G-2
4. PROPOSED MASONRY RETAINING WALL PER SDRSD C-03
5. PROPOSED 4'X4' RIP RAP ENERGY DISSIPATER PER SDRSD D-40; 1/4 TON CLASS BACKING; T = 2.7 FT
6. PROPOSED 36" X 36" BROOKS BOX OUTLET STRUCTURE; SEE BIOFILTRATION BASIN DETAIL SHEET 9
7. PROPOSED 4" AC PAVEMENT OVER 6" CLASS II AB PER GEOTECH RECCOMENDATIONS
8. PROPOSED AC PAVEMENT SAWCUT SEE DETAIL SHEET 9
9. 150-FT SIGHT DISTANCE VIEW CORRIDOR PER CALTRANS HIGHWAY DESIGN MANUAL
10. PROPOSED PCC DRIVEWAY APRON PER SDRSD G-14B (NO SIDEWALK); SEE DETAIL SHEET 9
11. PROPOSED PCC CROSS GUTTER PER SDRSD G-12
12. PROPOSED RETAINING WALL PER STRUCTURAL DESIGN
13. PROPOSED 6" PCC ROLLED CURB PER SDRSD G-4B
14. PROPOSED TYPE A CLEANOUT PER SDRSD D-09
15. PROPOSED GEOGRID RETAINING WALL; DESIGN BY OTHERS
16. PROPOSED 12" X 12" AREA DRAIN BY NDS OR APPROVED EQUAL
17. PROPOSED 3" PVC UNDERDRAIN PER SDRSD D-27 @2.0%
18. PROPOSED 2' X 2' RIP RAP ENERGY DISSIPATER PER SDRSD D-40; ROCK CLASS NO. 2 BACKING; T = 1.1 FT
19. PROPOSED MAILBOX AND "USPS ONLY, NO PARKING" SIGN
20. PROPOSED MODIFIED PCC HEADWALL PER DETAIL SHEET 9
21. PROPOSED 4' X 10' TREE WELL BMP PER DETAIL SHEET 9
22. 15-FT SIGHT DISTANCE TRIANGLE
23. PROPOSED DECORATIVE PAVERS PER SEPARATE LANDSCAPE PLAN SEE NOTE THIS SHEET
24. PROPOSED GRAVITY RETAINING WALL PER SDRSD C-9
25. PROPOSED TYPE A PCC PED RAMP PER SDRSD G-27A

PAVER NOTE:
DECORATIVE PAVERS SHALL BE A MINIMUM OF 20-FT IN DEPTH

NOTE:
PROPOSED ABOVE-GROUND EQUIPMENT TO BE SCREENED TO THE SATISFACTION OF THE CITY OF ENCINITAS PLANNING DEPARTMENT

0 20 40 60
GRAPHIC SCALE: 1" = 20'

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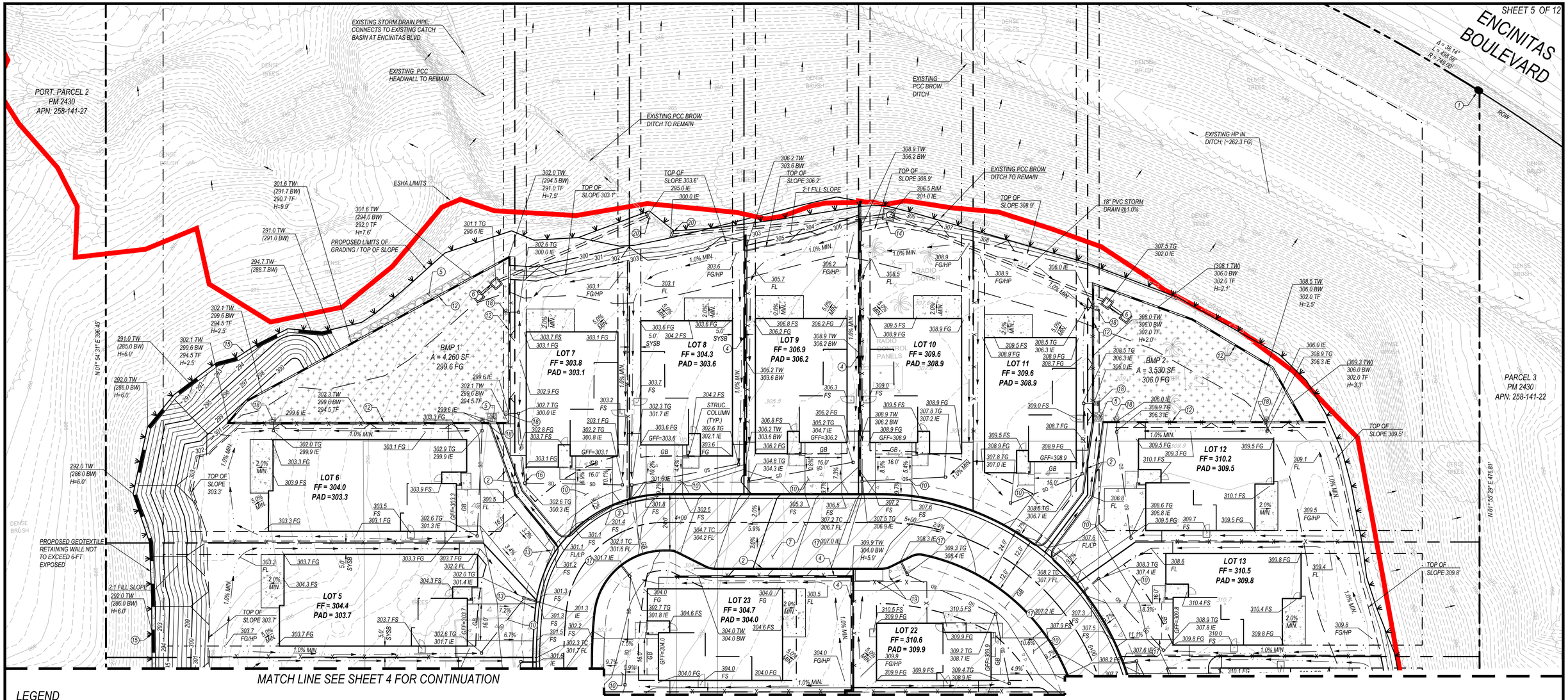

MATCH LINE SEE SHEET 4 FOR CONTINUATION

PLAN VIEW - PRELIMINARY GRADING PLAN

SCALE: 1" = 20'

LEGEND

- PROPERTY LINE
- RIGHT-OF-WAY
- CENTERLINE OF ROAD
- PROPOSED LOT LINES
- ADJACENT LOT LINES
- EXISTING EASEMENTS
- PROPOSED EASEMENT
- PROPOSED SETBACKS
- PROPOSED LIMIT OF GRADING
- PROPOSED CONTOUR (140)
- EXISTING CONTOUR (140)
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- PROPOSED 6" CURB & GUTTER
- PROPOSED 6" CURB
- PROPOSED HARDSCAPE
- PROPOSED MASONRY RETAINING WALL
- PROPOSED RETAINING WALL (DESIGN BY OTHERS)
- PROPOSED GEOTEXTILE RETAINING WALL (DESIGN BY OTHERS)
- PROPOSED BMP
- PROPOSED AC PAVEMENT
- EXISTING WATER MAIN (SIZE PER PLAN) (W)
- EXISTING SEWER MAIN (SIZE PER PLAN) (S)
- EXISTING STORM DRAIN (SIZE PER PLAN)
- EXISTING GAS MAIN (G)
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- PROPOSED 18" PVC PRIVATE STORM DRAIN
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- PROPOSED 4, X 10' TREE WELL BMP

ABBREVIATIONS

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BO	BLOW-OFF
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N

0 20 40 60

GRAPHIC SCALE: 1" = 20'

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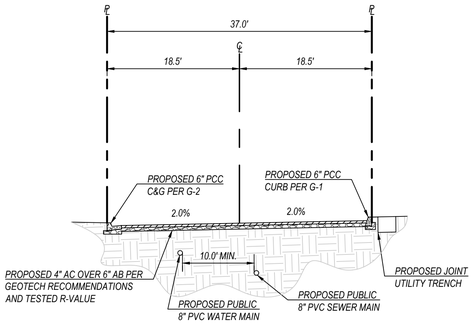
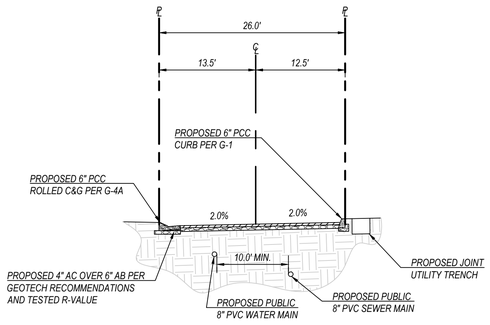


TYPICAL SECTION - PVT ROAD (STA. 1+00 TO 2+57.91 & STA. 6+55+74 TO 8+22.83)

NOT TO SCALE



TYPICAL SECTION - PVT ROAD (STA. 3+05.61 TO 3+48.66)

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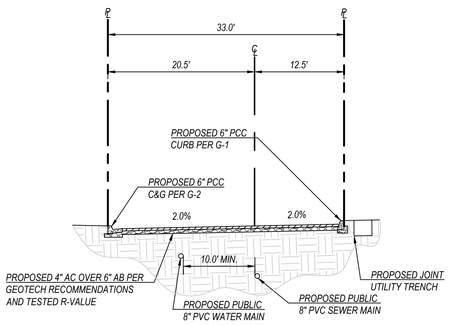

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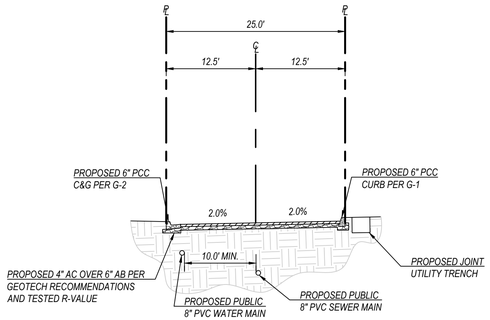

TYPICAL SECTION - PVT ROAD (STA. 3+58.24 TO 3+95.05 & STA. 5+08.35 TO 6+16.18)

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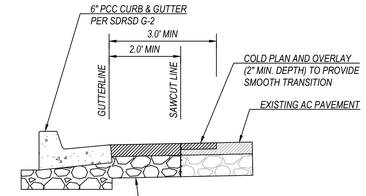
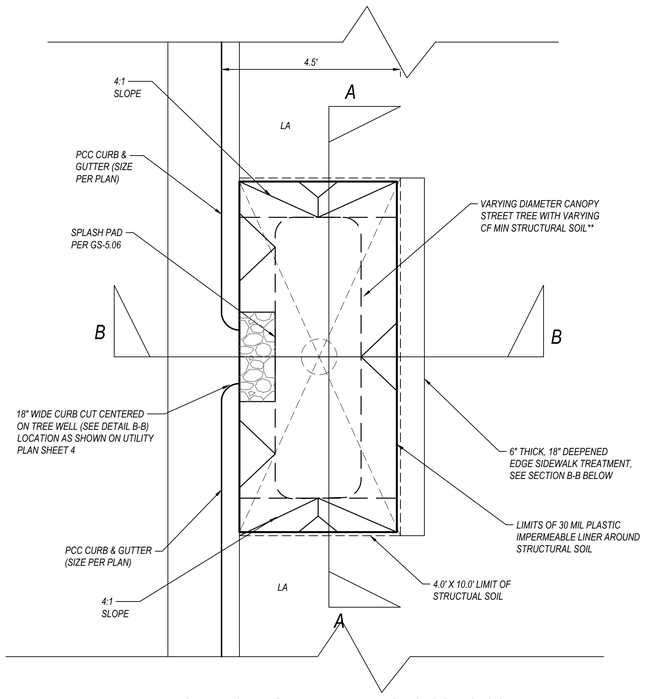


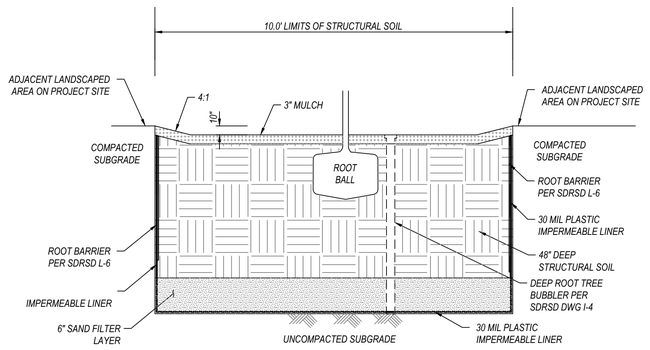
TYPICAL DETAIL - AC PAVEMENT SAWCUT

NOT TO SCALE



PLAN VIEW - CURB CUT @ TREE WELL SDS GS DS GS-5.01

NOT TO SCALE



SECTION A-A TREE WELL W/O GRATE MODIFIED SDC GS DS SD-1.04A + GS-1.04B

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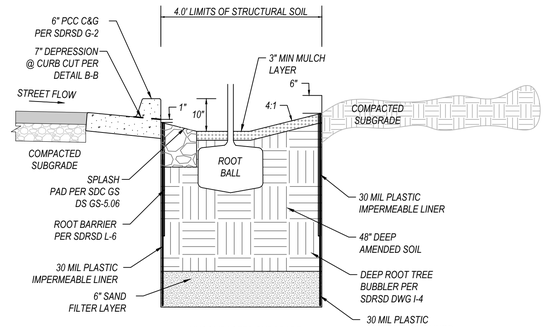
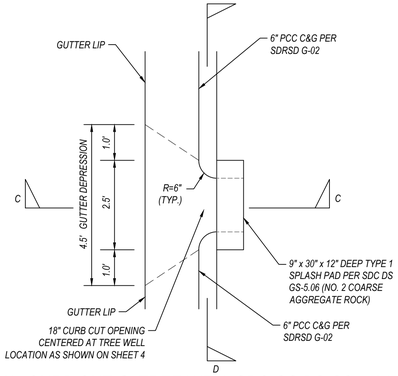


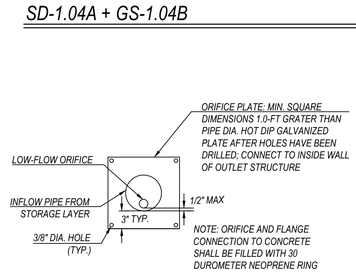
SECTION B-B TREE WELL W/O GRATE MODIFIED SDC GS DS SD-1.04A + GS-1.04B

NOT TO SCALE



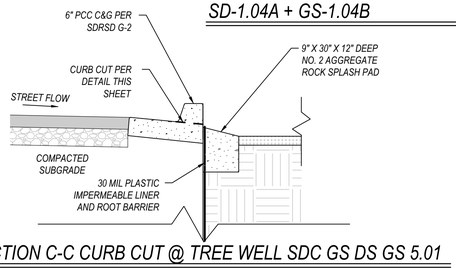
PLAN VIEW - CURB CUT @ TREE WELL SDC GS DS GS-5.01

NOT TO SCALE



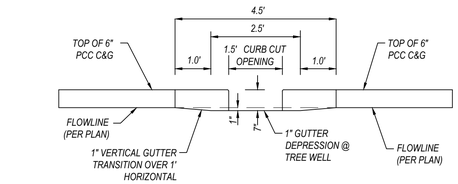
TYPICAL DETAIL - ORIFICE PLATE

NOT TO SCALE



SECTION C-C CURB CUT @ TREE WELL SDC GS DS GS 5.01

NOT TO SCALE



SECTION D-D CURB CUT @ TREE WELL SDC GS DS GS 5.01

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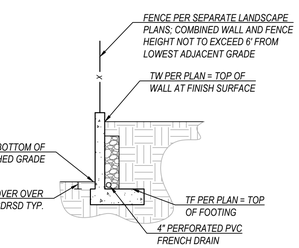
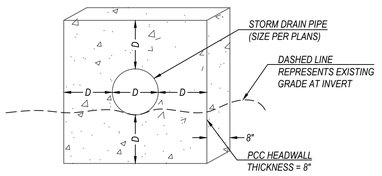


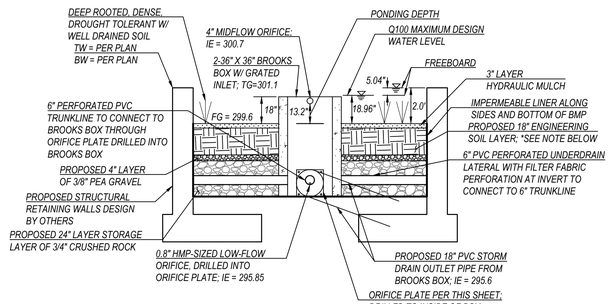
TYPICAL DETAIL - RETAINING WALL

NOT TO SCALE



TYPICAL DETAIL - MODIFIED PCC HEADWALL

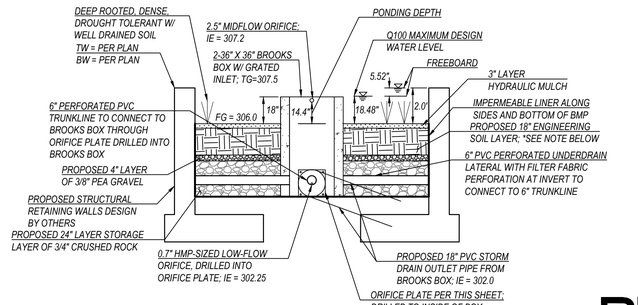
NOT TO SCALE



TYPICAL DETAIL - BIOFILTRATION BASIN (BMP 1)

NOT TO SCALE

*"BIOFILTRATION "ENGINEERED SOIL" LAYER SHALL BE MINIMUM 18" DEEP "SANDY LOAM" SOIL MIX WITH NO MORE THAN 5% CLAY CONTENT. THE MIX SHALL CONTAIN 50-60% SAND, 20-30% COMPOST OR HARDWOOD MULCH, AND 20-30% TOPSOIL.



TYPICAL DETAIL - BIOFILTRATION BASIN (BMP 2)

NOT TO SCALE

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