CITY OF CARLSBAD

PRIORITY DEVELOPMENT PROJECT (PDP)
PRELIMINARY STORM WATER QUALITY MANAGEMENT PLAN (SWQMP)

FOR

HOPE AVENUE APARTMENTS
945 & 955 GRAND AVENUE
2944 HOPE AVENUE
1006 CARLBAD VILLAGE DRIVE

CT 2022-0001 / SDP 2022-0006

ENGINEER OF WORK:

TYLER G LAWSON, PE #80356

PREPARED FOR:

CARLSBAD VILLAGE II, LLC
5120 SHOREHAM PLACE #150
SAN DIEGO, CA 92122
PH:

PREPARED BY:

PASCO, LARET, SUITER & ASSOCIATES
535 N. HWY 101, SUITE A
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REGISTERED PROFESSIONAL ENGINEER
TYLER G LAWSON
No. 80356
Exp. 12/31/24
CIVIL
STATE OF CALIFORNIA

DATE:
July 2022

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CERTIFICATION PAGE

Project Name: HOPE AVENUE APARTMENTS
Project ID: CT 2022-0001

I hereby declare that I am the Engineer in Responsible Charge of design of storm water BMPs for this project, and that I have exercised responsible charge over the design of the project as defined in Section 6703 of the Business and Professions Code, and that the design is consistent with the requirements of the BMP Design Manual, which is based on the requirements of SDRWQCB Order No. R9-2013-0001 (MS4 Permit) or the current Order.

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 SWQMP has been completed to the best of my ability and accurately reflects the project being proposed and the applicable source control and site design 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 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 12/31/2024

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

Tyler Lawson

Print Name

Pasco, Laret, Suiter & Associates

Company

02/02/2023

Date

PROJECT VICINITY MAP

STORM WATER STANDARDS QUESTIONNAIRE E-34

Development Services
Land Development Engineering
1635 Faraday Avenue
442-339-2750
www.carlsbadca.gov

INSTRUCTIONS:

To address post-development pollutants that may be generated from development projects, the city requires that new development and significant redevelopment priority projects incorporate Permanent Storm Water Best Management Practices (BMPs) into the project design per Carlsbad BMP Design Manual (BMP Manual). To view the BMP Manual, refer to the Engineering Standards (Volume 5).

This questionnaire must be completed by the applicant in advance of submitting for a development application (subdivision, discretionary permits and/or construction permits). The results of the questionnaire determine the level of storm water standards that must be applied to a proposed development or redevelopment project. Depending on the outcome, your project will either be subject to '**STANDARD PROJECT'** requirements, **'STANDARD PROJECT' with TRASH CAPTURE REQUIREMENTS**, or be subject to '**PRIORITY DEVELOPMENT PROJECT' (PDP)** requirements.

Your responses to the questionnaire represent an initial assessment of the proposed project conditions and impacts. City staff has responsibility for making the final assessment after submission of the development application. If staff determines that the questionnaire was incorrectly filled out and is subject to more stringent storm water standards than initially assessed by you, this will result in the return of the development application as incomplete. In this case, please make the changes to the questionnaire and resubmit to the city.

If you are unsure about the meaning of a question or need help in determining how to respond to one or more of the questions, please seek assistance from Land Development Engineering staff.

A completed and signed questionnaire must be submitted with each development project application. Only one completed and signed questionnaire is required when multiple development applications for the same project are submitted concurrently.

PROJECT INFORMATION

PROJECT NAME: Hope Avenue Apartments	APN: 230-320-20, 230-320-02, 230-320-41,-40, 230-320-48,-51
ADDRESS: 955 & 945 Grand Ave, 2944 Hope Ave, 1006 Carlsbad Village Dr	

The project is (check one): ☐ New Development ☒ Redevelopment

The total proposed disturbed area is: 84,914 ft² (1.95) acres w/ ROW (89,896 SF / 2.06 acres)

The total proposed newly created and/or replaced impervious area is: 71,399 ft² (1.64) acres w/ ROW (75,320 SF / 1.73 acres)

If your project is covered by an approved SWQMP as part of a larger development project, provide the project ID and the SWQMP # of the larger development project:

Project ID_____ SWQMP #: _____

Then, go to Step 1 and follow the instructions. When completed, sign the form at the end and submit this with your application to the city.

This Box for City Use Only

City Concurrence:	YES	NO	Date:	Project ID:
	☐	☐	By:	

STEP 1
TO BE COMPLETED FOR ALL PROJECTS

To determine if your project is a "development project", please answer the following question:

	YES	NO
Is your project LIMITED TO routine maintenance activity and/or repair/improvements to an existing building or structure that do not alter the size (See Section 1.3 of the BMP Design Manual for guidance)?	☐	☒

If you answered "yes" to the above question, provide justification below then **go to Step 6**, mark the box stating "my project is **not a 'development project'** and not subject to the requirements of the BMP manual" and complete applicant information.

Justification/discussion: (e.g. the project includes only interior remodels within an existing building):

If you answered "no" to the above question, the project is a '**development project**', **go to Step 2**.

STEP 2
TO BE COMPLETED FOR ALL DEVELOPMENT PROJECTS

To determine if your project is exempt from PDP requirements pursuant to MS4 Permit Provision E.3.b.(3), please answer the following questions:

Is your project LIMITED to one or more of the following:

	YES	NO
1. Constructing new or retrofitting paved sidewalks, bicycle lanes or trails that meet the following criteria: a) Designed and constructed to direct storm water runoff to adjacent vegetated areas, or other non-erodible permeable areas; OR b) Designed and constructed to be hydraulically disconnected from paved streets or roads; OR c) Designed and constructed with permeable pavements or surfaces in accordance with USEPA Green Streets guidance?	☐	☒
2. Retrofitting or redeveloping existing paved alleys, streets, or roads that are designed and constructed in accordance with the USEPA Green Streets guidance?	☐	☒
3. Ground Mounted Solar Array that meets the criteria provided in section 1.4.2 of the BMP manual?	☐	☒

If you answered "yes" to one or more of the above questions, provide discussion/justification below, then **go to Step 6**, mark the second box stating "my project is **EXEMPT** from PDP …" and complete applicant information.

Discussion to justify exemption (e.g. the project redeveloping existing road designed and constructed in accordance with the USEPA Green Street guidance):

If you answered "no" to the above questions, your project is not exempt from PDP, **go to Step 3**.

STEP 3 TO BE COMPLETED FOR ALL NEW OR REDEVELOPMENT PROJECTS		
To determine if your project is a PDP, please answer the following questions (MS4 Permit Provision E.3.b.(1)):		
	YES	NO
1. Is your project a new development that creates 10,000 square feet or more of impervious surfaces collectively over the entire project site? *This includes commercial, industrial, residential, mixed-use, and public development projects on public or private land.*	☒	☐
2. Is your project a redevelopment project creating and/or replacing 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 surface? *This includes commercial, industrial, residential, mixed-use, and public development projects on public or private land.*	☒	☐
3. Is your project a new or redevelopment project that creates and/or replaces 5,000 square feet or more of impervious surface collectively over the entire project site and supports a restaurant? A restaurant is a facility that sells prepared foods and drinks for consumption, including stationary lunch counters and refreshment stands selling prepared foods and drinks for immediate consumption (Standard Industrial Classification (SIC) code 5812).	☐	☒
4. Is your project a new or redevelopment project that creates 5,000 square feet or more of impervious surface collectively over the entire project site and supports a hillside development project? A hillside development project includes development on any natural slope that is twenty-five percent or greater.	☐	☒
5. Is your project a new or redevelopment project that creates and/or replaces 5,000 square feet or more of impervious surface collectively over the entire project site and supports a parking lot? A parking lot is a land area or facility for the temporary parking or storage of motor vehicles used personally for business or for commerce.	☐	☒
6. Is your project a new or redevelopment project that creates and/or replaces 5,000 square feet or more of impervious street, road, highway, freeway or driveway surface collectively over the entire project site? *A street, road, highway, freeway or driveway is any paved impervious surface used for the transportation of automobiles, trucks, motorcycles, and other vehicles.*	☐	☒
7. Is your project a new or redevelopment project that creates and/or replaces 2,500 square feet or more of impervious surface collectively over the entire site, and discharges directly to an Environmentally Sensitive Area (ESA)? *"Discharging Directly to" includes flow that is conveyed overland a distance of 200 feet or less from the project to the ESA, or conveyed in a pipe or open channel any distance as an isolated flow from the project to the ESA (i.e. not commingled with flows from adjacent lands).**	☐	☒
8. Is your project a new development or redevelopment project that creates and/or replaces 5,000 square feet or more of impervious surface that supports an automotive repair shop? *An automotive repair shop is a facility that is categorized in any one of the following Standard Industrial Classification (SIC) codes: 5013, 5014, 5541, 7532-7534, or 7536-7539.*	☐	☒
9. Is your project a new development or redevelopment project that creates and/or replaces 5,000 square feet or more of impervious area that supports a retail gasoline outlet (RGO)? *This category includes RGO's that meet the following criteria: (a) 5,000 square feet or more or (b) a project Average Daily Traffic (ADT) of 100 or more vehicles per day.*	☐	☒
10. Is your project a new or redevelopment project that results in the disturbance of one or more acres of land and are expected to generate pollutants post construction?	☒	☐
11. Is your project located within 200 feet of the Pacific Ocean and (1) creates 2,500 square feet or more of impervious surface or (2) increases impervious surface on the property by more than 10%? (CMC 21.203.040)	☐	☒
If you answered "yes" to one or more of the above questions, your project is a **PDP**. If your project is a redevelopment project, **go to step 4**. If your project is a new project, **go to step 6,** check the first box stating, "My project is a **PDP** …" and complete applicant information. If you answered "no" to all of the above questions, your project is a '**STANDARD PROJECT'. Go to step 5**, complete the trash capture questions..		

* Environmentally Sensitive Areas 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 Resources Control Board (Water Quality Control Plan for the San Diego Basin (1994) and amendments); water bodies designated with the RARE beneficial use by the State Water Resources Control Board (Water Quality Control Plan for the San Diego Basin (1994) and amendments); areas designated as preserves or their equivalent under the Multi Species Conservation Program within the Cities and County of San Diego; Habitat Management Plan; and any other equivalent environmentally sensitive areas which have been identified by the City.

STEP 4
TO BE COMPLETED FOR REDEVELOPMENT PROJECTS THAT ARE PRIORITY DEVELOPMENT PROJECTS (PDP) ONLY

Complete the questions below regarding your redevelopment project (MS4 Permit Provision E.3.b.(2)):

	YES	NO
Does the redevelopment project result in the creation or replacement of impervious surface in an amount of less than 50% of the surface area of the previously existing development? Complete the percent impervious calculation below: Existing impervious area (A) = 50,139 sq. ft. Total proposed newly created or replaced impervious area (B) = 75,320 sq. ft. Percent impervious area created or replaced (B/A)*100 = 150.2 %	☐	☒

If you answered "yes", the structural BMPs required for PDP apply only to the creation or replacement of impervious surface and not the entire development. **Go to step 6,** check the first box stating, "My project is a **PDP** …" and complete applicant information.

If you answered "no," the structural BMP's required for PDP apply to the entire development. **Go to step 6**, check the first box stating, "My project is a **PDP** …" and complete applicant information.

STEP 5
TO BE COMPLETED FOR STANDARD PROJECTS

Complete the question below regarding your Standard Project (SDRWQCB Order No. 2017-0077):

	YES	NO
Is the Standard Project within any of the following Priority Land Use (PLU) categories? R-23 (15-23 du/ac), R-30 (23-30 du/ac), PI (Planned Industrial), CF (Community Facilities), GC (General Commercial), L (Local Shopping Center), R (Regional Commercial), V-B (Village-Barrio), VC (Visitor Commercial), O (Office), VC/OS (Visitor Commercial/Open Space), PI/O (Planned Industrial/Office), or Public Transportation Station	☐	☐

If you answered "yes", the 'STANDARD PROJECT' is subject to **TRASH CAPTURE REQUIREMENTS**. **Go to step 6,** check the third box stating, "My project **is a 'STANDARD PROJECT' subject to TRASH CAPTURE REQUIREMENTS** …" and complete applicant information.

If you answered "no", your project is a 'STANDARD PROJECT'. Go to step 6, check the second box stating, "My project is a 'STANDARD PROJECT'…" and complete applicant information.

STEP 6
CHECK THE APPROPRIATE BOX AND COMPLETE APPLICANT INFORMATION

☒ My project **is a PDP** and must comply with **PDP** stormwater requirements of the BMP Manual. I understand I must prepare a Storm Water Quality Management Plan **(SWQMP)** per **E-35 template** for submittal at time of application.

☐ My project **is a 'STANDARD PROJECT'** OR **EXEMPT** from PDP and must only comply with '**STANDARD PROJECT'** stormwater requirements of the BMP Manual. As part of these requirements, I will submit a "*Standard Project Requirement Checklist Form E-36*" and incorporate low impact development strategies throughout my project.

☐ My project **is a 'STANDARD PROJECT' subject to TRASH CAPTURE REQUIREMENTS** and must comply with **TRASH CAPTURE REQUIREMENTS** of the BMP Manual. I understand I must prepare a **TRASH CAPTURE Storm Water Quality Management Plan (SWQMP)** per **E-35A template** for submittal at time of application.

Note: For projects that are close to meeting the PDP threshold, staff may require detailed impervious area calculations and exhibits to verify if 'STANDARD PROJECT' stormwater requirements apply.

☐ My project is **NOT a 'development project**' and is not subject to the requirements of the BMP Manual.

Applicant Information and Signature Box

Applicant Name: Patrick Zabrocki for: Wermers Companies Applicant Title: Managing Member

Applicant Signature: Date: 5/24/2022

SITE INFORMATION CHECKLIST

Project Summary Information	
Project Name	HOPE AVENUE APARTMENTS
Project ID	(CT 2022-0001)
Project Address	945 & 955 Hope Avenue, 2944 Hope Avenue, 1006 Carlsbad Village, Carlsbad, CA 92008
Assessor's Parcel Number(s) (APN(s))	230-320-20, 230-320-02, 230-320-41, 230-320-48
Project Watershed (Hydrologic Unit)	Carlsbad 904.21 (Buena Vista Creek)
Parcel Area	2.948 Acres (128,416 Square Feet)
Existing Impervious Area (subset of Parcel Area)	1.151 Acres (50,139 Square Feet)
Area to be disturbed by the project (Project Area Onsite) (Project Area w/ ROW)	1.949 Acres (84,914 Square Feet) 2.066 Acres (89,975 Square Feet)
Project Proposed Impervious Area (subset of Project Area)	1.729 Acres (75,320 Square Feet)
Project Proposed Pervious Area (subset of Project Area)	0.310 Acres (13,515 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 and Drainage Patterns
Current Status of the Site (select all that apply): ☒ Existing Development ☒ Previously graded but not built out ☐ Agricultural or other non-impervious use ☐ Vacant, undeveloped/natural Description / Additional Information:
Existing Land Cover Includes (select all that apply): ☒ Vegetative Cover ☒ Non-Vegetated Pervious Areas ☒ Impervious Areas Description / Additional Information:
Underlying Soil belongs to Hydrologic Soil Group (select all that apply): ☐ NRCS Type A ☐ NRCS Type B ☐ NCRS 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 Topography and Drainage

[How is storm water runoff conveyed from the site? At a minimum, this description should answer (1) whether existing drainage conveyance is natural or urban; (2) describe existing constructed storm water conveyance systems, if applicable; and (3) is runoff from offsite conveyed through the site? if so, describe]:

(1) Existing drainage conveyance can be categorized as urban. There is not any significant drainage infrastructure onsite to convey storm water, and water travels through the site on the surface by means of sheet flow. Water eventually leaves the site in two locations. The majority of the site drains towards the northern property line and toward the intersection of Grand and Hope Avenue before entering the public storm drain system. The remaining portion of the site drains to the eastern property line. Runoff draining to the east enter curb inlets within the private drive between Grand Avenue and Carlsbad Village Drive. From there runoff is treated then routed south through a buried network to the public storm drain under Carlsbad Village Drive.

(2) There is an existing storm water conveyance system located within the private drive between Grand Avenue and Carlsbad village. As runoff drains to the east runoff enters curb cuts to be treated by either modular wetland systems located in the sourthern and mid sections of the private drive or by a biofiltration basin at the south end of the private drive by Carlsbad Village Drive. After being treated water is then routed through a private buried storm drain system to the public storm drain system under Carlsbad Village Drive.

(3) No, there does not appear to be any runoff from offsite entering the project site.

Description of Proposed Site Development and Drainage Patterns
Project Description / Proposed Land Use and/or Activities: The project proposes to demolish all existing onsite structures, clear and grub the site, and construct a new multi-family structure with 156 dwelling units along with other hardscape and landscape improvements typical of multi-family development.
List/describe proposed impervious features of the project (e.g., buildings, roadways, parking lots, courtyards, athletic courts, other impervious features): Proposed impervious features onsite include buildings / roof areas, concrete walkways, and a private drive.
List/describe proposed pervious features of the project (e.g., landscape areas): Proposed pervious features onsite include landscaping and a biofiltration treatment control raised planter BMPs.
Does the project include grading and changes to site topography? ☒ Yes ☐ No Description / Additional Information: Project proposes to precise grade the site along with some changes to onsite topography. The onsite grading consists of approximately 47,500 CY of cut and 650 CY of fill, resulting in 46,850 CY of export. The proposed drainage system has been designed to route runoff from the roof to raised planters around the site and then outlet from the site toward the northern and eastern property lines similar to the existing conditions.

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

☒ Yes
☐ No

Description / Additional Information:

Although the project proposes onsite grading, the drainage patterns after precise grading mimic pre-development patterns. The majority of the site will continue to drain to the northern property line, and discharge on Grand Avenue near the intersection with Hope Avenue, after being treated in a biofiltration raised planter BMPs. The remainder of the site will continue to drain towards the east before entering existing pollutant control BMPs or a proposed tree well within the private drive.

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

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

Identification of Receiving Water Pollutants of Concern
Describe path of storm water from the project site to the Pacific Ocean (or bay, lagoon, lake or reservoir, as applicable): Drainage leaving the site eventually makes its way to Buena Vista Lagoon through the buried public storm drain conveyance system. Runoff continues in Buena Vista Lagoon before entering the Pacific Ocean.

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

303(d) Impaired Water Body	Pollutant(s)/Stressor(s)	TMDLs
Buena Vista Lagoon	Indicator Bacteria	
	Nutrients	
	Sedimentation / Siltation	
	Toxicity	

Identification of Project Site Pollutants

Identify pollutants anticipated 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	Anticipated from the Project Site	Also a Receiving Water Pollutant of Concern
Sediment		X	
Nutrients		X	
Heavy Metals			
Organic Compounds			
Trash & Debris		X	
Oxygen Demanding Substances		X	
Oil & Grease		X	
Bacteria & Viruses		X	
Pesticides		X	

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):

Per “Hydromodification Exemption analyses for the select Carlsbad Watersheds” dated June 10, 2013 by Chang Consultants our project site is considered HMP exempt.

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 is the final result?

☐ No critical coarse sediment yield areas to be protected based on verification of GLUs onsite
☐ Critical coarse sediment yield areas exist but additional analysis has determined that protection is not required. Documentation attached in Attachment 8 of the SWQMP.
☐ Critical coarse sediment yield areas exist and require protection. The project will implement management measures described in Sections 6.2.4 and 6.2.5 as applicable, and the areas are identified on the SWQMP Exhibit.

Discussion / Additional Information:

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.
Has a geomorphic assessment been performed for the receiving channel(s)? □ No, the low flow threshold is 0.1Q2 (default low flow threshold) □ Yes, the result is the low flow threshold is 0.1Q2 □ Yes, the result is the low flow threshold is 0.3Q2 □ Yes, the result is the low flow threshold is 0.5Q2 If a geomorphic assessment has been performed, provide title, date, and preparer: N/A 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 City codes governing minimum street width, sidewalk construction, allowable pavement types, and drainage requirements.
Optional Additional Information or Continuation of Previous Sections As Needed
This space provided for additional information or continuation of information from previous sections as needed.

STANDARD PROJECT REQUIREMENT CHECKLIST E-36

Development Services
Land Development Engineering
1635 Faraday Avenue
442-339-2750
www.carlsbadca.gov

Project Information
Project Name: Hope Avenue Apartments
Project ID: CT 2022-0001
DWG No. or Building Permit No.:

Baseline BMPs for Existing and Proposed Site Features

Complete the **Table 1 - Site Design Requirement** to document existing and proposed site features and the BMPs to be implemented for them. All BMPs must be implemented ***where applicable and feasible***. Applicability is generally assumed if a feature exists or is proposed.

BMPs must be implemented for **site design** features ***where feasible***. Leaving the box for a BMP unchecked means it will not be implemented (either partially or fully) either because it is inapplicable or infeasible. Explanations must be provided in the **area below**. The table provides specific instructions on when explanations are required.

Table 1 - Site Design Requirement

A. Existing Natural Site Features (see Fact Sheet BL-1)

1. Check the boxes below for each existing feature on the site.	1. *Select the BMPs to be implemented for each identified feature. Explain why any BMP not selected is infeasible in the area below.*	
	SD-G Conserve natural features	**SD-H** Provide buffers around waterbodies
☐ Natural waterbodies	☐	☐
☐ Natural storage reservoirs & drainage corridors	☐	--
☐ Natural areas, soils, & vegetation (incl. trees)	☐	--

B. BMPs for Common Impervious Outdoor Site Features (see Fact Sheet BL-2)

1. Check the boxes below for each proposed feature.	*2. Select the BMPs to be implemented for each proposed feature. If neither BMP **SD-B** nor **SD-I** is selected for a feature, explain why both BMPs are infeasible in the area below.*		
	SD-B Direct runoff to pervious areas	**SD-I** Construct surfaces from permeable materials	Minimize size of impervious areas
☐ Streets and roads	☐	☐	☒ *Check this box to confirm that all impervious areas on the site will be minimized where feasible.*
☒ Sidewalks & walkways	☒	☐	
☐ Parking areas & lots	☐	☐	
☐ Driveways	☐	☐	*If this box is not checked, identify the surfaces that cannot be minimized in area below, and explain why it is*
☒ Patios, decks, & courtyards	☒	☐	
☐ Hardcourt recreation areas	☐	☐	

☐ Other: _____	☐	☐	*infeasible to do so.*

C. ☒ **BMPs for Rooftop Areas:** *Check this box if rooftop areas are proposed and select at least one BMP below.*
If no BMPs are selected, explain why they are infeasible in the area below.

(see Fact Sheet BL-3)

☒ **SD-B**	☐ **SD-C**	☐ **SD-E**
Direct runoff to pervious areas	Install green roofs	Install rain barrels

D. ☒ **BMPs for Landscaped Areas:** *Check this box if landscaping is proposed and select the BMP below*
☒ **SD-K Sustainable Landscaping**
If SD-K is not selected, explain why it is infeasible in the area below.

(see Fact Sheet BL-4)

*Provide discussion/justification for site design BMPs that will **not** be implemented (either partially or fully):*

Baseline BMPs for Pollutant-generating Sources

All development projects must complete **Table 2 - Source Control Requirement** to identify applicable requirements for documenting pollutant-generating sources/ features and source control BMPs.

BMPs must be implemented for **source control** features ***where feasible***. Leaving the box for a BMP unchecked means it will not be implemented (either partially or fully) either because it is inapplicable or infeasible. Explanations must be provided in the **area below**. The table provides specific instructions on when explanations are required.

Table 2 - Source Control Requirement

A. Management of Storm Water Discharges

1. Identify all proposed outdoor work areas below ☐ *Check here if none are proposed*	**2. Which BMPs will be used to prevent materials from contacting rainfall or runoff?** **(See Fact Sheet BL-5)** *Select all feasible BMPs for each work area*			**3. Where will runoff from the work area be routed?** **(See Fact Sheet BL-6)** *Select one or more option for each work area*		
	SC-A Overhead covering	**SC-B** Separation flows from adjacent areas	**SC-C** Wind protection	**SC-D** Sanitary sewer	**SC-E** Containment system	Other
☒ Trash & Refuse Storage	☒	☒	☒	☒	☐	☐
☐ Materials & Equipment Storage	☐	☐	☐	☐	☐	☐

☐ Loading & Unloading	☐	☐	☐	☐	☐	☐
☐ Fueling	☐	☐	☐	☐	☐	☐
☐ Maintenance & Repair	☐	☐	☐	☐	☐	☐
☐ Vehicle & Equipment Cleaning	☐	☐	☐	☐	☐	☐
☐ Other: _____	☐	☐	☐	☐	☐	☐

B. Management of Storm Water Discharges **(see Fact Sheet BL-7)**

Select one option for each feature below:

• Storm drain inlets and catch basins …	☐ are not proposed	☒ will be labeled with stenciling or signage to discourage dumping **(SC-F)**
• Interior work surfaces, floor drains & sumps …	☐ are not proposed	☒ will not discharge directly or indirectly to the MS4 or receiving waters
• Drain lines (e.g. air conditioning, boiler, etc.) …	☐ are not proposed	☒ will not discharge directly or indirectly to the MS4 or receiving waters
• Fire sprinkler test water …	☐ are not proposed	☒ will not discharge directly or indirectly to the MS4 or receiving waters

*Provide discussion/justification for source control BMPs that will **not** be implemented (either partially or fully):*

Form Certification	
This E-36 Form is intended to comply with applicable requirements of the city's BMP Design Manual. I certify that it 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 review of this form by City staff is confined to a review and does not relieve me as the person in charge of overseeing the selection and design of storm water BMPs for this project, of my responsibilities for project design.	
Preparer Signature: 	Date: 5/24/2022
Print preparer name: Bryan Knapp	

SUMMARY OF PDP STRUCTURAL BMPS

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 City at the completion of construction. This may include requiring the project owner or project owner's representative to certify construction of the structural BMPs (see Section 1.12 of the BMP Design Manual). PDP structural BMPs must be maintained into perpetuity, and the City must confirm the maintenance (see Section 7 of the BMP Design Manual). Use this form to provide narrative description of the general strategy for structural BMP implementation at the project site in the box below. Then complete the PDP structural BMP summary information sheet 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 together or separate.

After development of the project site plan (including size of proposed structures) in accordance with City of Carlsbad General Plan and local zoning ordinance, the structural BMPs deemed most feasible for the site were biofiltration raised planters and a tree well. The project will also utilize the existing BMPs with in the private drive between Grand Avenue and Carlsbad Village Drive. The existing area within this projects portion of the shared private drive currently draining to the existing Modular Wetland BMPs as shown in MS 16-06 (DWG 515-5A) is approximately 9,193 SF impervious and 245 SF pervious. The proposed impervious area draining to the existing BMPs is 6,065 SF resulting in a reduction of 3,128 SF of impervious area draining to the existing BMPs. The existing northerly and southerly Modular Wetland BMP currently receive 5,077 SF and 4,116 SF of impervious area respectively. The project proposes to drain 3,858 SF of impervious area to the northerly existing Modular Wetland BMP and 2,207 SF of impervious area to the existing southerly Modular Wetland BMP. The project proposes eleven biofiltration raised planters to be located onsite. Runoff that lands on the roof will be routed to a raised planter BMP through a pipe system. Runoff from DMA 12 will not land on the roof and will sheet flow to the proposed tree well. Runoff from the disturbed area within Grand Avenue will also be treated by tree wells. Runoff from DMA 16 cannot be feasibly captured and treated by a tree well but will still generate a DCV of 201.2 cubic feet. In accordance with section 3.5 of the City of Carlsbad BMP design manual an equivalent treatment area has been delineated. Tree well from DMA's 15 will capture and treat this equivalent area. DMA 15 will handle an equivalent area 4,471 square feet of existing impervious area. The equivalent area is completely impervious and will generate a DCV of 201.2 cubic feet which is equal to the 201.2 cubic feet of runoff that is not being treated by DMA 16.

The project is HMP exempt and the BMPs will be used for treatment control only.

Structural BMP Summary Information
[Copy this page as needed to provide information for each individual proposed structural BMP]

Structural BMP ID No. BMP-1

DWG ____ Sheet No. ___

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)
- ☐ 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)
- ☐ Detention pond or vault for hydromodification management
- ☐ Other (describe in discussion section below)

Purpose:

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

Discussion (as needed):

339 SF biofiltration basin located within the courtyard on the west side of the property. Refer to project DMA Exhibit for size of drainage area tributary to basin and cross-section of BMP. Emergency overflow structure included in BMP for higher intensity storm events to convey water offsite also provided.

Structural BMP Summary Information
[Copy this page as needed to provide information for each individual proposed structural BMP]

Structural BMP ID No. BMP-2

DWG ____ Sheet No. ___

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)
- ☐ 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)
- ☐ Detention pond or vault for hydromodification management
- ☐ Other (describe in discussion section below)

Purpose:

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

Discussion (as needed):

389 SF biofiltration basin located within the courtyard on the west side of the property. Refer to project DMA Exhibit for size of drainage area tributary to basin and cross-section of BMP. Emergency overflow structure included in BMP for higher intensity storm events to convey water offsite also provided.

Structural BMP Summary Information
[Copy this page as needed to provide information for each individual proposed structural BMP]

Structural BMP ID No. BMP-3

DWG ____ Sheet No. ___

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)
- □ 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)
- □ Detention pond or vault for hydromodification management
- □ Other (describe in discussion section below)

Purpose:

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

Discussion (as needed):

486 SF biofiltration basin located within the pool/courtyard area with a finished grade elevation of 50.5. Refer to project DMA Exhibit for size of drainage area tributary to basin and cross-section of BMP. Emergency overflow structure included in BMP for higher intensity storm events to convey water offsite also provided.

Structural BMP Summary Information
[Copy this page as needed to provide information for each individual proposed structural BMP]

Structural BMP ID No. BMP-4

DWG ____ Sheet No. ___

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)
- ☐ 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)
- ☐ Detention pond or vault for hydromodification management
- ☐ Other (describe in discussion section below)

Purpose:

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

Discussion (as needed):

313 SF biofiltration basin located within the pool/courtyard area with a finished grade elevation of 50.5. Refer to project DMA Exhibit for size of drainage area tributary to basin and cross-section of BMP. Emergency overflow structure included in BMP for higher intensity storm events to convey water offsite also provided.

Structural BMP Summary Information
[Copy this page as needed to provide information for each individual proposed structural BMP]

Structural BMP ID No. BMP-5

DWG ____ Sheet No. ___

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)
- ☐ 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)
- ☐ Detention pond or vault for hydromodification management
- ☐ Other (describe in discussion section below)

Purpose:

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

Discussion (as needed):

627 SF biofiltration basin located within the pool/courtyard area with a finished grade elevation of 50.5. Refer to project DMA Exhibit for size of drainage area tributary to basin and cross-section of BMP. Emergency overflow structure included in BMP for higher intensity storm events to convey water offsite also provided.

Structural BMP Summary Information
[Copy this page as needed to provide information for each individual proposed structural BMP]

Structural BMP ID No. BMP-6

DWG ____ Sheet No. ___

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)
- ☐ 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)
- ☐ Detention pond or vault for hydromodification management
- ☐ Other (describe in discussion section below)

Purpose:

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

Discussion (as needed):

616 SF biofiltration basin located along the east side of the building next to the private drivey. Refer to project DMA Exhibit for size of drainage area tributary to basin and cross-section of BMP. Emergency overflow structure included in BMP for higher intensity storm events to convey water offsite also provided.

Structural BMP Summary Information
[Copy this page as needed to provide information for each individual proposed structural BMP]

Structural BMP ID No. BMP-7

DWG ____ Sheet No. ___

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)
- ☐ 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)
- ☐ Detention pond or vault for hydromodification management
- ☐ Other (describe in discussion section below)

Purpose:

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

Discussion (as needed):

346 SF biofiltration basin located along the east side of the building next to the private drivey. Refer to project DMA Exhibit for size of drainage area tributary to basin and cross-section of BMP. Emergency overflow structure included in BMP for higher intensity storm events to convey water offsite also provided.

Structural BMP Summary Information
[Copy this page as needed to provide information for each individual proposed structural BMP]

Structural BMP ID No. BMP-8

DWG ____ Sheet No. ___

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)
- ☐ 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)
- ☐ Detention pond or vault for hydromodification management
- ☐ Other (describe in discussion section below)

Purpose:

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

Discussion (as needed):

240 SF biofiltration basin located along the east side of the building next to the private drivey. Refer to project DMA Exhibit for size of drainage area tributary to basin and cross-section of BMP. Emergency overflow structure included in BMP for higher intensity storm events to convey water offsite also provided.

Structural BMP Summary Information
[Copy this page as needed to provide information for each individual proposed structural BMP]

Structural BMP ID No. BMP-9

DWG ____ Sheet No. ___

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)
- □ 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)
- □ Detention pond or vault for hydromodification management
- □ Other (describe in discussion section below)

Purpose:

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

Discussion (as needed):

411 SF biofiltration basin located along the south side of the building next to Parcel 1 from Parcel Map 2868. Refer to project DMA Exhibit for size of drainage area tributary to basin and cross-section of BMP. Emergency overflow structure included in BMP for higher intensity storm events to convey water offsite also provided.

Structural BMP Summary Information
[Copy this page as needed to provide information for each individual proposed structural BMP]

Structural BMP ID No. BMP-10

DWG ____ Sheet No. ___

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)
- ☐ 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)
- ☐ Detention pond or vault for hydromodification management
- ☐ Other (describe in discussion section below)

Purpose:

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

Discussion (as needed):

119 SF biofiltration basin located along the northeast corner of the site adjacent to the intersection of Hope Avenue and Grand Avenue. Refer to project DMA Exhibit for size of drainage area tributary to basin and cross-section of BMP. Emergency overflow structure included in BMP for higher intensity storm events to convey water offsite also provided.

Structural BMP Summary Information
[Copy this page as needed to provide information for each individual proposed structural BMP]

Structural BMP ID No. BMP-11

DWG ____ Sheet No. ___

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)
- ☐ 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)
- ☐ Detention pond or vault for hydromodification management
- ☐ Other (describe in discussion section below)

Purpose:

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

Discussion (as needed):

175 SF biofiltration basin located along the north side of the building south of Grand Avenue. Refer to project DMA Exhibit for size of drainage area tributary to basin and cross-section of BMP. Emergency overflow structure included in BMP for higher intensity storm events to convey water offsite also provided.

Structural BMP Summary Information
[Copy this page as needed to provide information for each individual proposed structural BMP]

Structural BMP ID No. BMP-12

DWG ____ Sheet No. ___

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)
- ☐ 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)
- ☐ Detention pond or vault for hydromodification management
- ☒ Other (describe in discussion section below)

Purpose:

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

Discussion (as needed):

4' x 10' tree well located near the southeast corner of the building adjacent to the parking stalls. Refer to project DMA Exhibit for size of drainage area tributary to basin and cross-section of BMP.

Structural BMP Summary Information
[Copy this page as needed to provide information for each individual proposed structural BMP]

Structural BMP ID No. BMP-13

DWG ____ Sheet No. ___

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)
- ☐ 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)
- ☐ Detention pond or vault for hydromodification management
- ☒ Other (describe in discussion section below)

Purpose:

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

Discussion (as needed):

Existing Modular Wetland BMP slight north of the mid point of the private drive sized for approximately 5,077 SF of impervious per MS 16-06 SQWMP DMA exhibit. This project proses to drain 4,162 SF of impervious area to this northerly existing BMP resulting in a reduction of 915 SF of impervious area.

Structural BMP Summary Information
[Copy this page as needed to provide information for each individual proposed structural BMP]

Structural BMP ID No. BMP-14

DWG ____ Sheet No. ___

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)
- ☐ 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)
- ☐ Detention pond or vault for hydromodification management
- ☒ Other (describe in discussion section below)

Purpose:

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

Discussion (as needed):

Existing Modular Wetland BMP south of the mid point of the private drive sized for approximately 4,116 SF of impervious per MS 16-06 SQWMP DMA exhibit. This project proses to drain 2,030 SF of impervious area to this southerly existing BMP resulting in a reduction of 2,086 SF of impervious area.

Structural BMP Summary Information
[Copy this page as needed to provide information for each individual proposed structural BMP]

Structural BMP ID No. BMP-15

DWG ____ Sheet No. ___

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)
- ☐ 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)
- ☐ Detention pond or vault for hydromodification management
- ☒ Other (describe in discussion section below)

Purpose:

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

Discussion (as needed):

5' deep x 10' wide x 20' long tree well located along frontage of site on Grand Avenue. Refer to project DMA Exhibit for size of drainage area tributary to basin and cross-section of BMP.

ATTACHMENT 1

BACKUP FOR PDP POLLUTANT CONTROL BMPS

This is the cover sheet for Attachment 1.

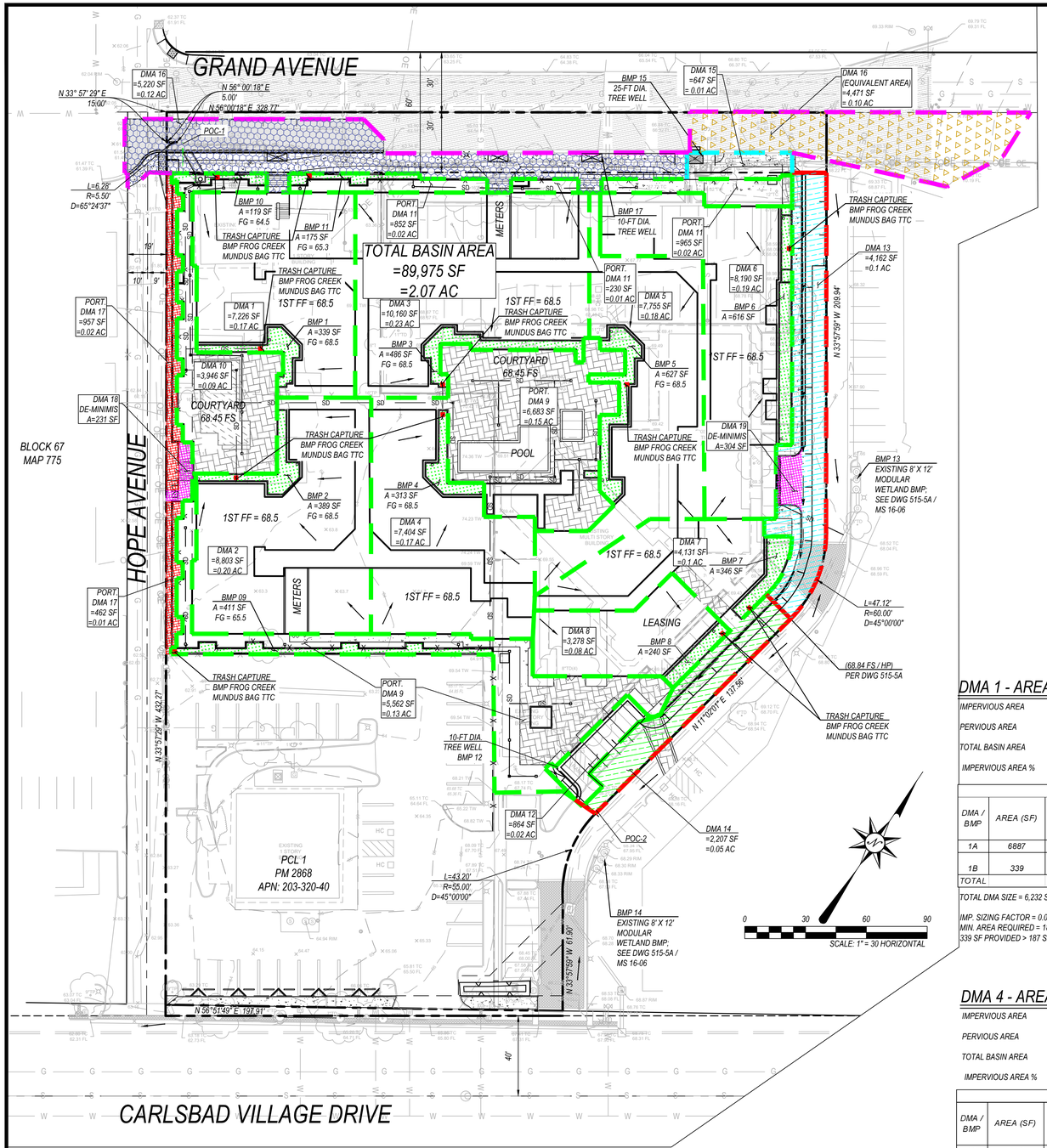
Check which Items are Included behind this cover sheet:

Attachment Sequence	Contents	Checklist
Attachment 1a	DMA Exhibit (Required) See DMA Exhibit Checklist on the back of this Attachment cover sheet. (24"x36" Exhibit typically required)	☒ 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
(N/A) Existing natural hydrologic features (watercourses, seeps, springs, wetlands)
(N/A) Critical coarse sediment yield areas to be protected (if present)
✓ Existing topography and impervious areas
✓ 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
✓ 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)
✓ Structural BMPs (identify location and type of BMP)



PLAN VIEW - DMA EXHIBIT

SCALE: 1" = 30' HORIZONTAL

LEGEND

- PROPERTY LINE
- RIGHT-OF-WAY
- CENTERLINE OF ROAD
- EXISTING CONTOUR LINE — 150
- PROPOSED CONTOUR LINE — 150
- FLOW DIRECTION
- PROPOSED RAISED PLANTER DMA BOUNDARY
- PROPOSED TREE WELL DMA BOUNDARY
- PROPOSED EQUIVALENT AREA SWAP BOUNDARY
- PROPOSED DISTURBED AREA INFEASIBLE TO REACH TREE WELLS BMP
- PROPOSED EQUIVALENT AREA FOR DMA 19 (2,877 SF)
- PROPOSED DMA DRAINING TO EXISTING BMP PER MS 16-06
- PROPOSED BIOFILTRATION BASIN / RAISED PLANTER BMP AREA
- PROPOSED DE MINIMIS AREA PER CITY OF CARLSBAD BMP DESIGN MANUAL SECTION 5.2.2
- PROPOSED REMOVED / REPLACED HARDSCAPE TREATED BY EXISTING NORTHERLY BMP (BMP 13)
- PROPOSED REMOVED / REPLACED HARDSCAPE TREATED BY EXISTING SOUTHERLY BMP (BMP 14)
- PROPOSED SELF-MITIGATING AREA PER CITY OF CARLSBAD BMP DESIGN MANUAL 5.2.1
- PROPOSED TREE WELL
- PROPOSED TRASH CAPTURE BMP FROG CREEK MUNDUS BAG TTC (PLACED INSIDE BMP RISERS)

BMP LEGEND

POST-CONSTRUCTION SITE DESIGN BMPs		POST-CONSTRUCTION SITE DESIGN BMPs		
SD-1	MAINTAIN NATURAL DRAINAGE PATHWAYS AND HYDROLOGIC FEATURES	SD-1	PREVENTION OF ILLICIT DISCHARGE INTO THE MS4	YES
SD-2	CONSERVE NATURAL AREAS, SOILS AND VEGETATION	SD-2	STORM DRAIN STENCILING AND POSTING OF SIGNAGE	YES
SD-3	MINIMIZE IMPERVIOUS AREA	SD-3	PROTECTED OUTDOOR MATERIALS STORAGE AREAS	N/A
SD-4	MINIMIZE SOIL COMPACTION	SD-4	PROTECT MATERIAL STORED IN OUTDOOR WORK AREAS	YES
SD-5	IMPERVIOUS AREA DISPERSION	SD-5	ADDITIONAL BMPs BASED ON POTENTIAL RUNOFF POLLUTANTS:	
SD-6	RUNOFF COLLECTION	A	ONSITE STARDOM DRAIN INLET	YES
SD-7	LANDSCAPING WITH NATIVE OR DROUGHT TOLERANT SPECIES	D1	NEED FOR FUTURE INDOOR & STR. PEST CONTROL	YES
SD-8	HARVIESTING AND USE PERCIPITATION	D2	LANDSCAPE / OUTDOOR PESTICIDE USE	YES
		M	FIRE SPRINKLER TEST WATER	YES

PROJECT SITE AREA CALCULATIONS

TOTAL GROSS SITE AREA	128,416 SF / 2.95 AC
TOTAL DISTURBED AREA	89,975 SF / 2.07 AC
EXISTING IMPERVIOUS AREA	50,139 SF / 1.15 AC
EXISTING PERVIOUS AREA	34,833 SF / 0.79 AC
TOTAL ONSITE IMPERVIOUS AREA	71,399 SF / 1.64 AC
TOTAL IMPERVIOUS AREA W/ ROW	75,320 SF / 1.73 AC

DMA TABLE

DMA	AREA (SF)	BMP	BMP TYPE
1	7,266	1	BIOFILTRATION RAISED PLANTER
2	8,803	2	BIOFILTRATION RAISED PLANTER
3	10,160	3	BIOFILTRATION RAISED PLANTER
4	7,404	4	BIOFILTRATION RAISED PLANTER
5	7,755	5	BIOFILTRATION RAISED PLANTER
6	8,190	6	BIOFILTRATION RAISED PLANTER
7	4,131	7	BIOFILTRATION RAISED PLANTER
8	3,278	8	BIOFILTRATION RAISED PLANTER
9	12,245	9	BIOFILTRATION RAISED PLANTER
10	3,946	10	BIOFILTRATION RAISED PLANTER
11	2,047	11	BIOFILTRATION RAISED PLANTER
12	864	12	TREE WELL
13	3,858	13	EX. MODULAR WETLAND SYSTEM
14	2,207	14	EX. MODULAR WETLAND SYSTEM
15	676	15	TREE WELL
16	5,191	-	EQUIVALENT AREA BY PASSING BMP
17	1,419	-	SELF-MITIGATING
18	231	-	DE MINIMIS
19	304	-	DE MINIMIS
TOTAL AREA	89,975		

DMA 1 - AREA CALCULATIONS

IMPERVIOUS AREA (BUILDING ROOF) 6,887 SF
PERVIOUS AREA (BIORETENTION BASIN) 339 SF
TOTAL BASIN AREA 7,226 SF
IMPERVIOUS AREA % 95.3%

DMA 1 - SURFACE TYPE AREA SUMMARY

DMA / BMP	AREA (SF)	POST-PROJECT SURFACE TYPE	SURFACE RUNOFF FACTOR	ADJUSTMENT FACTOR	AREA X ADJUSTED RUNOFF (SF)
1A	6887	ROOF	0.9	1	6198
1B	339	BIOFILTRATION BMP	0.1	1	34
TOTAL					6232

TOTAL DMA SIZE = 6,232 SF

IMP. SIZING FACTOR = 0.03 (FOR BIOFILTRATION BMPS)
MIN. AREA REQUIRED = 187
339 SF PROVIDED > 187 SF MINIMUM **STANDARD BIOFILTRATION SIZING MEET

DMA 2 - AREA CALCULATIONS

IMPERVIOUS AREA (BUILDING ROOF) 8,414 SF
PERVIOUS AREA (BIORETENTION BASIN) 389 SF
TOTAL BASIN AREA 8,803 SF
IMPERVIOUS AREA % 95.6%

DMA 2 - SURFACE TYPE AREA SUMMARY

DMA / BMP	AREA (SF)	POST-PROJECT SURFACE TYPE	SURFACE RUNOFF FACTOR	ADJUSTMENT FACTOR	AREA X ADJUSTED RUNOFF (SF)
2A	8414	ROOF	0.9	1	7573
2B	389	BIOFILTRATION BMP	0.1	1	39
TOTAL					7612

TOTAL DMA SIZE = 7,612 SF

IMP. SIZING FACTOR = 0.03 (FOR BIOFILTRATION BMPS)
MIN. AREA REQUIRED = 228

389 SF PROVIDED > 228 SF MINIMUM **STANDARD BIOFILTRATION SIZING MEET

DMA 3 - AREA CALCULATIONS

IMPERVIOUS AREA (BUILDING ROOF) 9,674 SF
PERVIOUS AREA (BIORETENTION BASIN) 486 SF
TOTAL BASIN AREA 10,160 SF
IMPERVIOUS AREA % 95.2%

DMA 3 - SURFACE TYPE AREA SUMMARY

DMA / BMP	AREA (SF)	POST-PROJECT SURFACE TYPE	SURFACE RUNOFF FACTOR	ADJUSTMENT FACTOR	AREA X ADJUSTED RUNOFF (SF)
3A	9674	ROOF	0.9	1	8707
3B	486	BIOFILTRATION BMP	0.1	1	49
TOTAL					8755

TOTAL DMA SIZE = 8,755 SF

IMP. SIZING FACTOR = 0.03 (FOR BIOFILTRATION BMPS)
MIN. AREA REQUIRED = 263

486 SF PROVIDED > 263 SF MINIMUM **STANDARD BIOFILTRATION SIZING MEET

DMA 4 - AREA CALCULATIONS

IMPERVIOUS AREA (BUILDING ROOF) 7,091 SF
PERVIOUS AREA (BIORETENTION BASIN) 313 SF
TOTAL BASIN AREA 7,404 SF
IMPERVIOUS AREA % 95.8%

DMA 4 - SURFACE TYPE AREA SUMMARY

DMA / BMP	AREA (SF)	POST-PROJECT SURFACE TYPE	SURFACE RUNOFF FACTOR	ADJUSTMENT FACTOR	AREA X ADJUSTED RUNOFF (SF)
4A	7091	ROOF	0.9	1	6382
4B	313	BIOFILTRATION BMP	0.1	1	31
TOTAL					6413

TOTAL DMA SIZE = 6,413 SF

IMP. SIZING FACTOR = 0.03 (FOR BIOFILTRATION BMPS)
MIN. AREA REQUIRED = 192

313 SF PROVIDED > 192 SF MINIMUM **STANDARD BIOFILTRATION SIZING MEET

DMA 5 - AREA CALCULATIONS

IMPERVIOUS AREA (BUILDING ROOF) 7,128 SF
PERVIOUS AREA (BIORETENTION BASIN) 627 SF
TOTAL BASIN AREA 7,755 SF
IMPERVIOUS AREA % 91.9%

DMA 5 - SURFACE TYPE AREA SUMMARY

DMA / BMP	AREA (SF)	POST-PROJECT SURFACE TYPE	SURFACE RUNOFF FACTOR	ADJUSTMENT FACTOR	AREA X ADJUSTED RUNOFF (SF)
5A	7128	ROOF	0.9	1	6415
5B	627	BIOFILTRATION BMP	0.1	1	63
TOTAL					6478

TOTAL DMA SIZE = 6,478 SF

IMP. SIZING FACTOR = 0.03 (FOR BIOFILTRATION BMPS)
MIN. AREA REQUIRED = 194

627 SF PROVIDED > 194 SF MINIMUM **STANDARD BIOFILTRATION SIZING MEET

DMA 6 - AREA CALCULATIONS

IMPERVIOUS AREA (BUILDING ROOF) 7,574 SF
PERVIOUS AREA (BIORETENTION BASIN) 616 SF
TOTAL BASIN AREA 8,190 SF
IMPERVIOUS AREA % 92.5%

DMA 6 - SURFACE TYPE AREA SUMMARY

DMA / BMP	AREA (SF)	POST-PROJECT SURFACE TYPE	SURFACE RUNOFF FACTOR	ADJUSTMENT FACTOR	AREA X ADJUSTED RUNOFF (SF)
6A	7574	ROOF	0.9	1	6817
6B	616	BIOFILTRATION BMP	0.1	1	62
TOTAL					6878

TOTAL DMA SIZE =6,878 SF

IMP. SIZING FACTOR = 0.03 (FOR BIOFILTRATION BMPS)
MIN. AREA REQUIRED = 206

616 SF PROVIDED > 206 SF MINIMUM **STANDARD BIOFILTRATION SIZING MEET

SOIL TYPE INFORMATION

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

GROUNDWATER INFORMATION

GROUND WATER ENCOUNTERED AT DEPTHS OF 5-10 FT

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

TREATMENT CONTROL BMPS

BIOFILTRATION	BF-1
TREE WELL	SD-A

ATTACHMENT 1A - DMA EXHIBIT

HOPE AVENUE APARTMENTS
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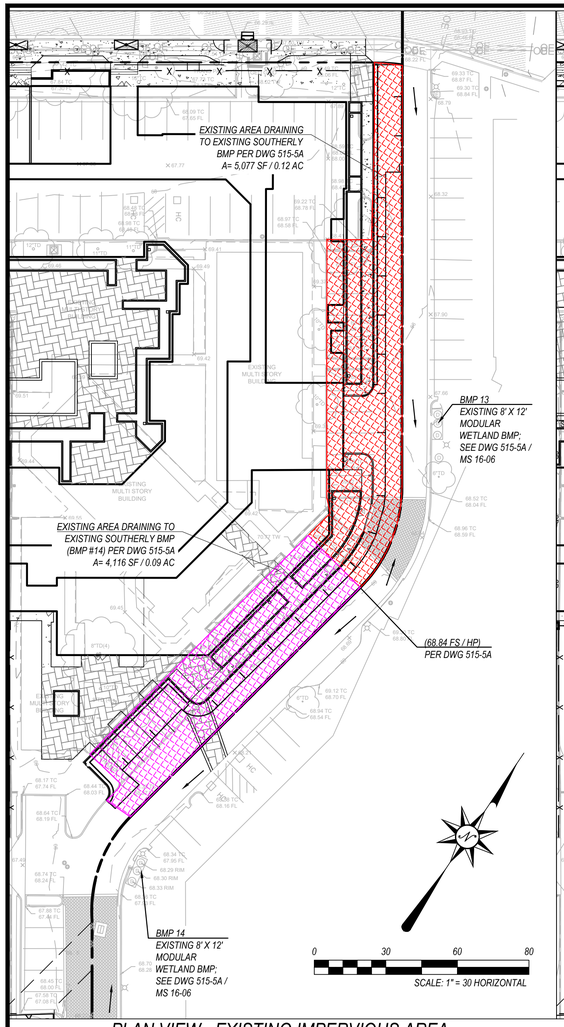
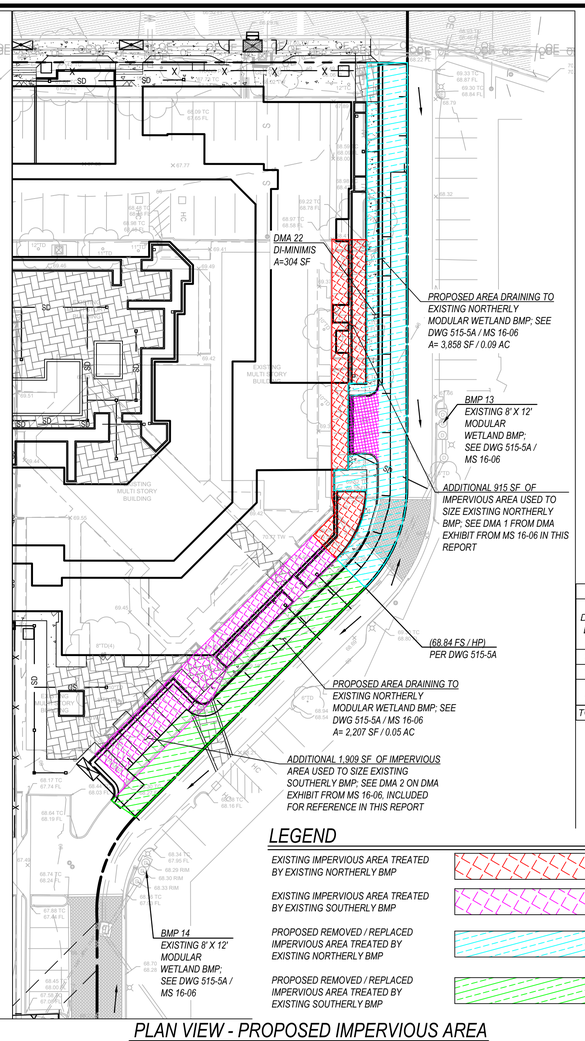


PLAN VIEW - EXISTING IMPERVIOUS AREA

SCALE: 1" = 30' HORIZONTAL



PLAN VIEW - PROPOSED IMPERVIOUS AREA

SCALE: 1" = 30' HORIZONTAL

LEGEND

- EXISTING IMPERVIOUS AREA TREATED BY EXISTING NORTHERLY BMP
- EXISTING IMPERVIOUS AREA TREATED BY EXISTING SOUTHERLY BMP
- PROPOSED REMOVED / REPLACED IMPERVIOUS AREA TREATED BY EXISTING NORTHERLY BMP
- PROPOSED REMOVED / REPLACED IMPERVIOUS AREA TREATED BY EXISTING SOUTHERLY BMP

DMA 7 - AREA CALCULATIONS

IMPERVIOUS AREA	(BUILDING ROOF)	3,785 SF
PERVIOUS AREA	(BIORETENTION BASIN)	346 SF
TOTAL BASIN AREA	4,131 SF	
IMPERVIOUS AREA %	91.6%	

DMA 7 - SURFACE TYPE AREA SUMMARY

DMA / BMP	AREA (SF)	POST-PROJECT SURFACE TYPE	SURFACE RUNOFF FACTOR	ADJUSTMENT FACTOR	AREA X ADJUSTED RUNOFF (SF)
7A	3785	ROOF	0.9	1	3407
7B	346	BIOFILTRATION BMP	0.1	1	35
TOTAL					3441

TOTAL DMA SIZE = 3,441 SF

IMP. SIZING FACTOR = 0.03 (FOR BIOFILTRATION BMPS)
MIN. AREA REQUIRED = 103

346 SF PROVIDED > 103 SF MINIMUM **STANDARD BIOFILTRATION SIZING MEET

DMA 8 - AREA CALCULATIONS

IMPERVIOUS AREA	(BUILDING ROOF)	3,038 SF
PERVIOUS AREA	(BIORETENTION BASIN)	240 SF
TOTAL BASIN AREA	3,278 SF	
IMPERVIOUS AREA %	92.7%	

DMA 8 - SURFACE TYPE AREA SUMMARY

DMA / BMP	AREA (SF)	POST-PROJECT SURFACE TYPE	SURFACE RUNOFF FACTOR	ADJUSTMENT FACTOR	AREA X ADJUSTED RUNOFF (SF)
8A	3056	ROOF	0.9	1	2750
8B	240	BIOFILTRATION BMP	0.1	1	24
TOTAL					2774

TOTAL DMA SIZE =2,774 SF

IMP. SIZING FACTOR = 0.03 (FOR BIOFILTRATION BMPS)
MIN. AREA REQUIRED = 83

240 SF PROVIDED > 83 SF MINIMUM **STANDARD BIOFILTRATION SIZING MEET

DMA 9 - AREA CALCULATIONS

IMPERVIOUS AREA	(HARDSCAPE)	6,596 SF
	(POOL/SPA)	3,041 SF
PERVIOUS AREA	(LANDSCAPE)	1,859 SF
	(BIOFILTRATION BMP)	411 SF
TOTAL BASIN AREA	12,245 SF	
IMPERVIOUS AREA %	81.5%	

DMA 9 - SURFACE TYPE AREA SUMMARY

DMA / BMP	AREA (SF)	POST-PROJECT SURFACE TYPE	SURFACE RUNOFF FACTOR	ADJUSTMENT FACTOR	AREA X ADJUSTED RUNOFF (SF)
9A	6596	HARDSCAPE	0.9	1	5936
9B	3379	POOL/SPA	0.9	1	3041
9C	1859	LANDSCAPE	0.3	1	558
9D	411	BIOFILTRATION BMP	0.1	1	41
TOTAL					9576

TOTAL DMA SIZE =9,576 SF

IMP. SIZING FACTOR = 0.03 (FOR BIOFILTRATION BMPS)
MIN. AREA REQUIRED = 287

411 SF PROVIDED > 287 SF MINIMUM **STANDARD BIOFILTRATION SIZING MEET

DMA 10 - AREA CALCULATIONS

IMPERVIOUS AREA	(HARDSCAPE)	2,595 SF
PERVIOUS AREA	(LANDSCAPE)	1,232 SF
	(BIORETENTION BASIN)	119 SF
TOTAL BASIN AREA	3,946 SF	
IMPERVIOUS AREA %	65.8%	

DMA 10 - SURFACE TYPE AREA SUMMARY

DMA / BMP	AREA (SF)	POST-PROJECT SURFACE TYPE	SURFACE RUNOFF FACTOR	ADJUSTMENT FACTOR	AREA X ADJUSTED RUNOFF (SF)
10A	2595	HARDSCAPE	0.9	1	2336
10B	1232	LANDSCAPE	0.3	1	370
10C	119	BIOFILTRATION BMP	0.1	1	12
TOTAL					2717

TOTAL DMA SIZE = 2,717

IMP. SIZING FACTOR = 0.03 (FOR BIOFILTRATION BMPS)
MIN. AREA REQUIRED = 82
82 SF PROVIDED > 119 SF MINIMUM **STANDARD BIOFILTRATION SIZING MEET

DMA 11 - AREA CALCULATIONS

IMPERVIOUS AREA	(HARDSCAPE)	770 SF
PERVIOUS AREA	(LANDSCAPE)	1,102 SF
	(BIORETENTION BASIN)	175 SF
TOTAL BASIN AREA	2,047 SF	
IMPERVIOUS AREA %	37.6%	

DMA 11 - SURFACE TYPE AREA SUMMARY

DMA / BMP	AREA (SF)	POST-PROJECT SURFACE TYPE	SURFACE RUNOFF FACTOR	ADJUSTMENT FACTOR	AREA X ADJUSTED RUNOFF (SF)
11A	770	HARDSCAPE	0.9	1	693
11B	1102	LANDSCAPE	0.3	1	331
11C	175	BIOFILTRATION BMP	0.1	1	18
TOTAL					1041

TOTAL DMA SIZE =1,041 SF

IMP. SIZING FACTOR = 0.03 (FOR BIOFILTRATION BMPS)
MIN. AREA REQUIRED = 31

175 SF PROVIDED > 31 SF MINIMUM **STANDARD BIOFILTRATION SIZING MEET

DMA 12 - AREA CALCULATIONS

IMPERVIOUS AREA	(HARDSCAPE)	824 SF
PERVIOUS AREA	(TREE WELL)	40 SF
TOTAL BASIN AREA	864 SF	
IMPERVIOUS AREA %	95.4%	

DMA 12 - SURFACE TYPE AREA SUMMARY

DMA / BMP	AREA (SF)	POST-PROJECT SURFACE TYPE	SURFACE RUNOFF FACTOR	ADJUSTMENT FACTOR	AREA X ADJUSTED RUNOFF (SF)
12A	824	HARDSACPE	0.9	1	742
12B	40	TREE WELL	0.3	1	12
TOTAL					754

TOTAL DMA SIZE = 754 SF

RUNOFF FACTOR = 0.87
85TH PRECENTILE RAINFALL DEPTH = 0.60

DCV = 37.7 CU FT

10-FT DIAMETER TREE WELL DVC CREDIT = 40.0 CU FT

40.0 CU FT > 37.7 CU FT

DMA 13 - AREA CALCULATION

DMA 13 WILL UTILIZE AN EXISTING TREATMENT CONTROL BMP WITHIN THE PRIVATE DRIVE. THE EXISTING IMPERVIOUS AREA WITHIN THIS PROJECTS PORTION OF THE SHARED DRIVE DRAINING TO THE EXISTING BMPS IS APPROXIMATELY 5,077 SF AS SHOWN IN MS 16-06 SWQMP DMA EXHIBIT. THE PROJECT PROPOSES TO REPLACE IMPERVIOUS SURFACES WITH PERVIOUS SURFACES THUS REDUCING THE IMPERVIOUS AREA DRAINING TO THE EXISTING BMPS TO 3,858 SF; A REDUCTION OF 1,523 SF.

DMA 14 - AREA CALCULATION

DMA 14 WILL UTILIZE AN EXISTING TREATMENT CONTROL BMP WITHIN THE PRIVATE DRIVE. THE EXISTING IMPERVIOUS AREA WITHIN THIS PROJECTS PORTION OF THE SHARED DRIVE DRAINING TO THE EXISTING BMPS IS APPROXIMATELY 4,116 SF AS SHOWN IN MS 16-06 SWQMP DMA EXHIBIT. THE PROJECT PROPOSES TO REPLACE IMPERVIOUS SURFACES WITH PERVIOUS SURFACES THUS REDUCING THE IMPERVIOUS AREA DRAINING TO THE EXISTING BMPS TO 2,207 SF; A REDUCTION OF 1,909 SF.

DMA 17 - AREA CALCULATIONS

TOTAL BASIN SIZE = 1,419 SF

SECTION 5.2.1 OF CITY OF CARLSBAD 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 18 - AREA CALCULATIONS

TOTAL BASIN SIZE = 231 SF
%OF OVERALL IMPERVIOUS AREA = 231 SF / 75,320 SF
= 0.3%

SECTION 5.2.2 OF CITY OF CARLSBAD BMP DESIGN MANUAL ALLOWS FOR DE MINIMIS DMA AREAS THAT ARE LESS THAN 250 SQUARE FEET. ALL THE DE MINIMIS AREAS REPRESENT LESS THAN TWO PERCENT OF THE TOTAL ADDED OR REPLACED IMPERVIOUS AREA, AND ARE NOT HYDRAULICALLY CONNECTED TO OTHER DE MINIMIS AREAS.

DMA 19 - AREA CALCULATIONS

TOTAL BASIN SIZE = 304 SF
% OF OVERALL IMPERVIOUS AREA = 304 SF / 75,320 SF
= 0.4%

SECTION 5.2.2 OF CITY OF CARLSBAD BMP DESIGN MANUAL ALLOWS FOR DE MINIMIS DMA AREAS THAT ARE LESS THAN 250 SQUARE FEET. ALL THE DE MINIMIS AREAS REPRESENT LESS THAN TWO PERCENT OF THE TOTAL ADDED OR REPLACED IMPERVIOUS AREA, AND ARE NOT HYDRAULICALLY CONNECTED TO OTHER DE MINIMIS AREAS.

ATTACHMENT 1A - DMA EXHIBIT

HOPE AVENUE APARTMENTS
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DMA 15 (TREE WELL DMA) - AREA CALCULATIONS

IMPERVIOUS AREA	(HARDSCAPE)	330 SF
PERVIOUS AREA	(LANDSCAPE)	346 SF
TOTAL BASIN AREA	676 SF	
IMPERVIOUS AREA %	48.8%	

DMA 15 - SURFACE TYPE AREA SUMMARY

DMA / BMP	AREA (SF)	POST-PROJECT SURFACE TYPE	SURFACE RUNOFF FACTOR	ADJUSTMENT FACTOR	AREA X ADJUSTED RUNOFF (SF)
17A	330	HARDSCAPE	0.9	1	297
17B	346	LANDSCAPE	0.3	1	104
TOTAL					401

*PER APPENDIX B OF CITY OF CARLSBAD BMP DESIGN MANUAL
**ONLY NEW AND REMOVED/REPLACE IMPERVIOUS AREAS CONSIDERED FOR EQUIVALENT DCV CALCULATION OF DMA 17; AC GRIND AND OVERLAY SURFACE IMPROVEMENTS AND AREAS UPSTREAM OF PROJECT DISTURBED AREA NOT INCLUDED

TOTAL DMA SIZE =676 SF

DCV CALCULATION - DMA 15

AREA TRIBUTARY TO BMP (A)	=	676 SF (0.02 AC)
TOTAL DMA SIZE (Cx * Ax)	=	401 SF (0.01 AC)
WEIGHTED RUNOFF COEFFICIENT	=	0.59
85TH PERCENTILE STORM DEPTH	=	0.60 IN
DCV (C*D*A*3,600)	=	20.05 CU. FT
25-FT DIAMETER TREE WELL DVC CREDIT	=	290.00 CU.FT
SURPLUS IN DVC	=	290.0 - 20.05
	=	269.95 CU. FT

DMA 16 (EQUIVALENT DMA) - AREA CALCULATIONS

IMPERVIOUS AREA	(HARDSCAPE)	4,096 SF
PERVIOUS AREA	(LANDSCAPE)	1,124 SF
TOTAL BASIN AREA	5,220 SF	
IMPERVIOUS AREA %	78.5%	

DMA 16 - SURFACE TYPE AREA SUMMARY

DMA / BMP	AREA (SF)	POST-PROJECT SURFACE TYPE	SURFACE RUNOFF FACTOR	ADJUSTMENT FACTOR	AREA X ADJUSTED RUNOFF (SF)
18A	4096	HARDSCAPE	0.9	1	3686
18B	1124	LANDSCAPE	0.3	1	337
TOTAL					4024

*PER APPENDIX B OF CITY OF CARLSBAD BMP DESIGN MANUAL
**ONLY NEW AND REMOVED/REPLACE IMPERVIOUS AREAS CONSIDERED FOR EQUIVALENT DCV CALCULATION OF DMA 17; AC GRIND AND OVERLAY SURFACE IMPROVEMENTS AND AREAS UPSTREAM OF PROJECT DISTURBED AREA NOT INCLUDED

TOTAL DMA SIZE = 5,220 SF
(BY PASSING TREE WELL BMPS)

DCV CALCULATION - DMA 16

AREA TRIBUTARY TO BMP (A)	=	5,220 SF (0.12 AC)
TOTAL DMA SIZE (Cx * Ax)	=	4,024 SF (0.09 AC)
WEIGHTED RUNOFF COEFFICIENT	=	0.77
85TH PERCENTILE STORM DEPTH	=	0.60 IN
DCV (C*D*A*3,600)	=	201.2 CU. FT*

*DCV WILL NOT BE CAPTURE AN EQUIVALENT AREA WILL BE DELINEATED TO EQUATE FOR UNTREATED DMA

*4,024 SF OF EXISTING IMPERVIOUS AREA ROUTED TO TREE WELL BMP FOR TREATMENT TO ACCOUNT FOR 201.2 CF WATER QUALITY VOLUME GENERATED AS PART OF DMA 16 THAT IS INFEASIBLE TO ROUTE TO PROPOSED TREE WELLS

AREA TRIBUTARY TO BMP (A)	=	4,471 SF (0.10 AC)
TOTAL DMA SIZE (Cx * Ax)	=	4,024 SF (0.09 AC)
WEIGHTED RUNOFF COEFFICIENT	=	0.9
85TH PERCENTILE STORM DEPTH	=	0.60 IN
DCV (C*D*A*3,600)	=	201.2 CU. FT**
**DCV USED TO MEET UNTREATED DCV FROM DMA 16		
SURPLUS IN DVC FROM TREE WELLS	=	269.95 CU. FT
		269.95 CU. FT > 201.2 CU. FT

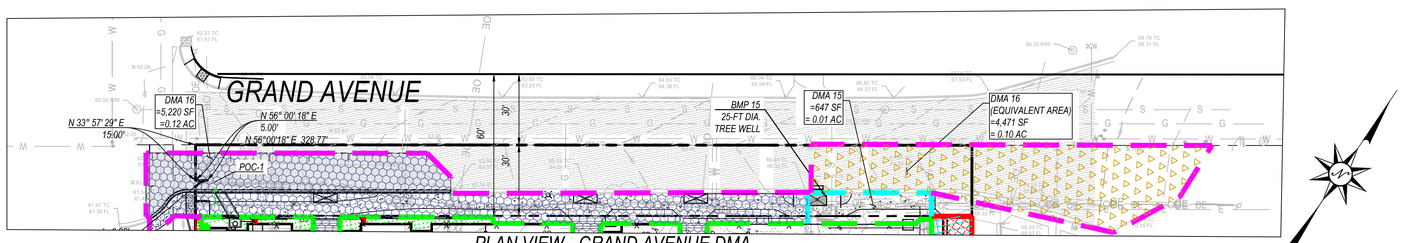
STRUCTURAL SOIL REQUIREMENT CALCULATIONS

A MINIMUM OF SOIL VOLUME OF 2 CUBIC FEET PER SQUARE FOOT OF CANOPY PROJECTION VOLUME IS PROVIDED FOR EACH TREE PER TREE WELL FACT SHEET SD-A

25-FT MATURE CANOPY DIAMETER (5' X 10' X 20' TREE WELL)

SQUARE FEET OF CANOPY PROJECTION:	$(^{25}/_{2})^2 * 3.14 = 490.625$ SQUARE FEET
VOLUME REQUIRED:	490.625 * 2 = 981.25 CUBIC FEET
VOLUME PROVIDED:	5*10*20 = 1,000 CUBIC FEET

1,000 CU. FT PROVIDED > 981.25 CU. FT REQUIRED



PLAN VIEW - GRAND AVENUE DMA

NOT TO SCALE

SCALE: 1" = 30 HORIZONTAL

ATTACHMENT 1A - DMA EXHIBIT

HOPE AVENUE APARTMENTS
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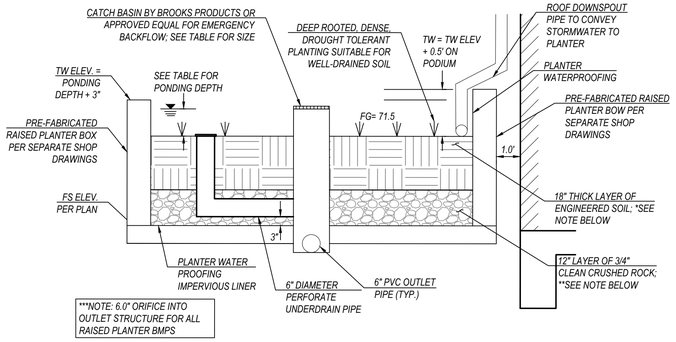
BMP	GRATE SIZE	PONDING DEPTH	LOCATION TYPE
1	18"X18"	12"	PODIUM LEVEL
2	18"X18"	12"	PODIUM LEVEL
3	24"X24"	12"	PODIUM LEVEL
4	18"X18"	12"	PODIUM LEVEL
5	18"X18"	12"	PODIUM LEVEL
6	18"X18"	12"	PODIUM LEVEL
7	12"X12"	12"	PODIUM LEVEL
8	12"X12"	12"	PODIUM LEVEL
9	24"X24"	9"	TERRACED WALL
10	12"X12"	9"	TERRACED WALL
11	12"X12"	9"	TERRACED WALL

**** WATER QUALITY SIGN TO BE INCLUDED W/ EACH BASIN

PERMANENT WATER QUALITY TREATMENT FACILITY

KEEPING OUR WATERWAYS CLEAN
MAINTAIN WITH CARE - NO MODIFICATIONS WITHOUT AGENCY APPROVAL



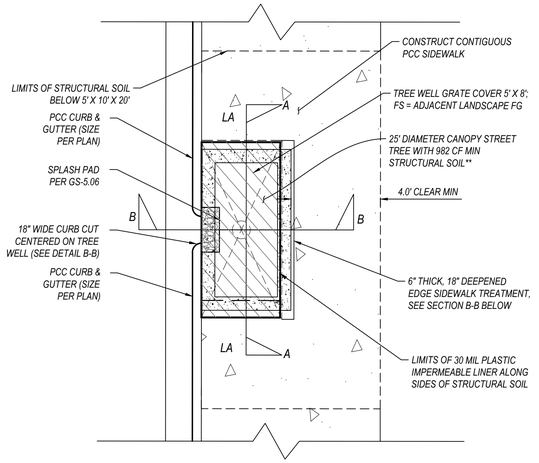
***NOTE: 6.0" ORIFICE INTO OUTLET STRUCTURE FOR ALL RAISED PLANTER BMPS

TYPICAL DETAIL - RAISED PLANTER BMP

NOT TO SCALE

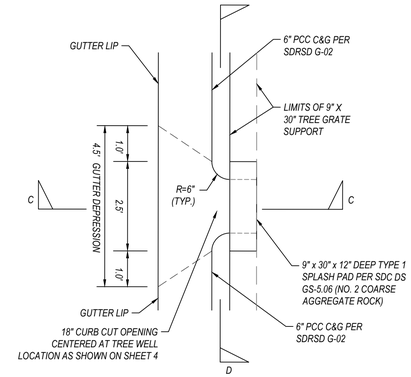
*"BIOFILTRATION "ENGINEERED SOIL" LAYER SHALL BE MINIMUM 18" DEEP "SANDY LOAM" SOIL MIX WITH NO MORE THAN 5% CLAY CONTENT. THE MIX SHALL CONTAIN 50-60% SAND, 20-30% COMPOST OR HARDWOOD MULCH, AND 20-30% TOPSOIL.

**3/4" CRUSHED ROCK LAYER SHALL BE A MINIMUM OF 12" BUT MAY BE DEEPENED TO INCREASE THE INFILTRATION AND STORAGE ABILITY OF THE DETAIL



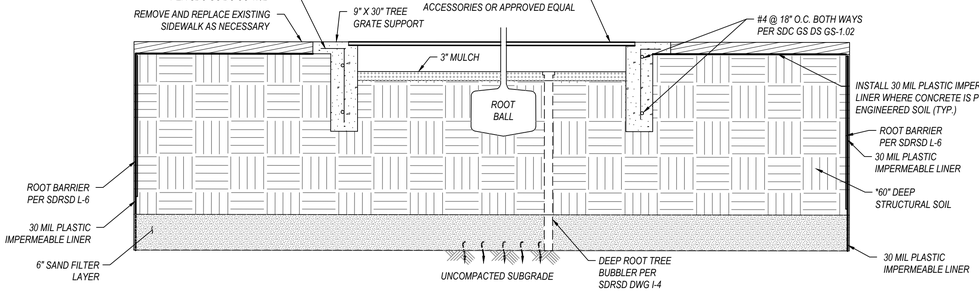
PLAN VIEW - CURB CUT @ TREE WELL

NOT TO SCALE



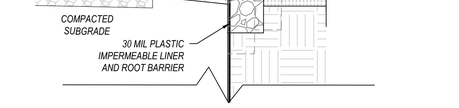
PLAN VIEW - CURB CUT @ TREE WELL SDC GS DS GS-5.01

NOT TO SCALE



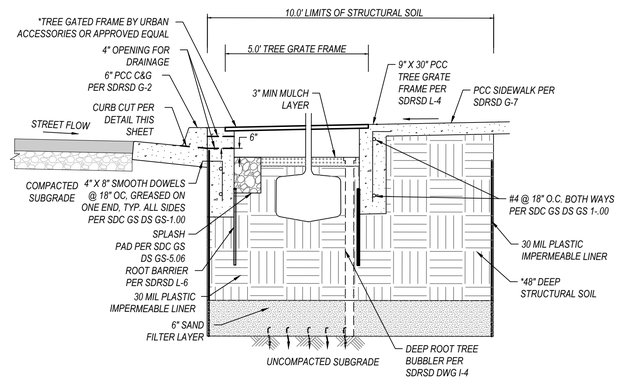
SECTION A-A TREE WELL W/ GRATE MODIFIED SDC GS DS SD-1.04A+GS-1.04B

NOT TO SCALE



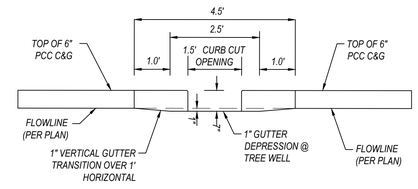
SECTION C-C CURB CUT @ TREE WELL SDC GS DS GS-5.01

NOT TO SCALE



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

NOT TO SCALE



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

NOT TO SCALE

ATTACHMENT 1A - DMA EXHIBIT

HOPE AVENUE APARTMENTS
CITY OF CARLSBAD - CA 92008

PASCO LARET SUITER & ASSOCIATES
San Diego | Solana Beach | Orange County
Phone 858.259.8212 | www.plsaengineering.com

PLSA 3802

J:\ACTIVE JOBS\3802 WERMERS\CIVIL\REPORTS\SWQMP\DISCETIONARY\ATTACHMENT 1 - POLLUTANT CONTROL\3802-ATT1A-DMA.DWG

Carlsbad Village Lofts
City of Carlsbad

Attachment 1B

DMA SUMMARY TABLE

DMA	DESCRIPTION	AREA (SF)	AREA (AC)	IMPERVIOUS (SF)	PERVIOUS (SF)	SEMI-PERVIOUS (SF)	IMPERVIOUS (%)	TO BMP
1	North Parking	35,031	0.800	34,786	245	0	99%	MWS-N
2	South Parking	38,376	0.880	37,641	735	0	98%	MWS-N
3	North Courtyard	12,329	0.283					
3A			0.130	5,680	0	0	100%	BIO-N 3A
3B			0.153	6,649	0	0	100%	BIO-N 3B
4	Central Courtyard	9,805	0.225					
4A			0.047	2,065	0	0	100%	BIO-C 4A
4B			0.125	5,462	0	0	100%	BIO-C 4B
4C			0.052	2,278	0	0	100%	BIO-C 4C
5	South Courtyard	10,737	0.246					
5A			0.055	2,407	0	0	100%	BIO-S 5A
5B			0.114	4,976	0	0	100%	BIO-S 5B
5C			0.077	3,354	0	0	100%	BIO-S 5C
6	SW Parking Lot	3,358	0.08	3,083	275	0	92%	BIO-W
	TOTALS	109,636	2.512	108,381	1,255	0	99%	

Table D.1-1 For BMP 1-14 Onsite

Appendix D Geotechnical Engineer Analysis

D.1 Analysis of Infiltration Restrictions

This section is only applicable if the analysis of infiltration restrictions is performed by a licensed engineer practicing in geotechnical engineering. The SWQMP Preparer and Geotechnical Engineer must work collaboratively to identify any infiltration restrictions identified in Table D.1-1 below. Upon completion of this section, the Geotechnical Engineer must characterize each DMA as Restricted or Unrestricted for infiltration and provide adequate support/discussion in the geotechnical report. A DMA is considered restricted when one or more restrictions exist which cannot be reasonably resolved through site design changes.

Table D.1-1: Considerations for Geotechnical Analysis of Infiltration Restrictions

Restriction Element		Is Element Applicable? (Yes/No)
Mandatory Considerations	BMP is within 100' of Contaminated Soils	No
	BMP is within 100' of Industrial Activities Lacking Source Control	No
	BMP is within 100' of Well/Groundwater Basin	No
	BMP is within 50' of Septic Tanks/Leach Fields	No
	BMP is within 10' of Structures/Tanks/Walls	Yes
	BMP is within 10' of Sewer Utilities	Yes
	BMP is within 10' of Groundwater Table	Yes
	BMP is within Hydric Soils	Yes
	BMP is within Highly Liquefiable Soils and has Connectivity to Structures	No
	BMP is within 1.5 Times the Height of Adjacent Steep Slopes (≥25%)	No
	County Staff has Assigned "Restricted" Infiltration Category	No
Optional Considerations	BMP is within Predominantly Type D Soil	No
	BMP is within 10' of Property Line	Yes
	BMP is within Fill Depths of ≥5' (Existing or Proposed)	No
	BMP is within 10' of Underground Utilities	No
	BMP is within 250' of Ephemeral Stream	No
	Other (Provide detailed geotechnical support)	
Result	Based on examination of the best available information, I have **not identified any restrictions** above.	☐ Unrestricted
	Based on examination of the best available information, I have **identified one or more restrictions** above.	☒ Restricted

Table D.1-1 is divided into Mandatory Considerations and Optional Considerations. Mandatory

Table D.2-1 For BMP 1-14 Onsite

Considerations include elements that may pose a significant risk to human health and safety and must always be evaluated. Optional Considerations include elements that are not necessarily associated with human health and safety, so analysis is not mandated through this guidance document. All elements presented in this table are subject to the discretion of the Geotechnical Engineer if adequate supporting information is provided.

Applicants must evaluate infiltration restrictions through use of the best available data. A list of resources available for evaluation is provided in Section B.2

D.2 Determination of Design Infiltration Rates

This section is only applicable if the determination of design infiltration rates is performed by a licensed engineer practicing in geotechnical engineering. The guidance in this section identifies methods for identifying observed infiltration rates, corrected infiltration rates, safety factors, and design infiltration rates for use in structural BMP design. Upon completion of this section, the Geotechnical Engineer must recommend a design infiltration rate for each DMA and provide adequate support/discussion in the geotechnical report.

Table D.2-1: Elements for Determination of Design Infiltration Rates

Item	Value	Unit
Initial Infiltration Rate Identify per Section D.2.1	0.54	in/hr
Corrected Infiltration Rate Identify per Section D.2.2	0.54	in/hr
Safety Factor Identify per Section D.2.3	4.0	unitless
Design Infiltration Rate Corrected Infiltration Rate ÷ Safety Factor	0.135	in/hr

Table D.2-3 For BMP 1-14 Onsite

Table D.2-3: Determination of Safety Factor

Consideration		Assigned Weight (w)	Factor Value (v)	Product (p) p = w x v
Suitability Assessment (A)	Infiltration Testing Method	0.25	2	0.5
	Soil Texture Class	0.25	2	0.5
	Soil Variability	0.25	2	0.5
	Depth to Groundwater/Obstruction	0.25	2	0.5
	Suitability Assessment Safety Factor, $S_A = \Sigma p$			2.0
Design (B)	Pretreatment	0.50	2	1.0
	Resiliency	0.25	2	0.5
	Compaction	0.25	3	0.5
	Design Safety Factor, $S_B = \Sigma p$			2.0
Safety Factor, $S = S_A \times S_B$ (Must be always greater than or equal to 2)				4.0

The geotechnical engineer should reference Table D.2-4 below in order to determine appropriate factor values for use in the table above. The values in the table below are subjective in nature and the geotechnical engineer may use professional discretion in how the points are assigned.

Table D.1-1 For BMP 15-18 along Grand Avenue

Appendix D Geotechnical Engineer Analysis

D.1 Analysis of Infiltration Restrictions

This section is only applicable if the analysis of infiltration restrictions is performed by a licensed engineer practicing in geotechnical engineering. The SWQMP Preparer and Geotechnical Engineer must work collaboratively to identify any infiltration restrictions identified in Table D.1-1 below. Upon completion of this section, the Geotechnical Engineer must characterize each DMA as Restricted or Unrestricted for infiltration and provide adequate support/discussion in the geotechnical report. A DMA is considered restricted when one or more restrictions exist which cannot be reasonably resolved through site design changes.

Table D.1-1: Considerations for Geotechnical Analysis of Infiltration Restrictions

Restriction Element		Is Element Applicable? (Yes/No)
Mandatory Considerations	BMP is within 100' of Contaminated Soils	No
	BMP is within 100' of Industrial Activities Lacking Source Control	No
	BMP is within 100' of Well/Groundwater Basin	No
	BMP is within 50' of Septic Tanks/Leach Fields	No
	BMP is within 10' of Structures/Tanks/Walls	No
	BMP is within 10' of Sewer Utilities	No
	BMP is within 10' of Groundwater Table	Yes *
	BMP is within Hydric Soils	No
	BMP is within Highly Liquefiable Soils and has Connectivity to Structures	No
	BMP is within 1.5 Times the Height of Adjacent Steep Slopes (≥25%)	No
	County Staff has Assigned "Restricted" Infiltration Category	No
Optional Considerations	BMP is within Predominantly Type D Soil	Yes
	BMP is within 10' of Property Line	Yes
	BMP is within Fill Depths of ≥5' (Existing or Proposed)	No
	BMP is within 10' of Underground Utilities	No
	BMP is within 250' of Ephemeral Stream	No
	Other (Provide detailed geotechnical support)	
Result	Based on examination of the best available information, I have **not identified any restrictions** above.	☒ * Unrestricted
	Based on examination of the best available information, I have **identified one or more restrictions** above.	☐ Restricted

Table D.1-1 is divided into Mandatory Considerations and Optional Considerations. Mandatory

* Unrestricted with conditions, see "Supplemental Infiltration Recommendation Letter, APN 203-320-20, -02, -48, -51, 40, and -41, Carlsbad Village Drive and Hope Avenue, Carlsbad, California 92008" Prepared by GeoTek, Inc. Project Number 3780-SD, dated January 23, 2023, revised March 22, 2023.

Table D.2-1 For BMP 15-18 along Grand Avenue

Considerations include elements that may pose a significant risk to human health and safety and must always be evaluated. Optional Considerations include elements that are not necessarily associated with human health and safety, so analysis is not mandated through this guidance document. All elements presented in this table are subject to the discretion of the Geotechnical Engineer if adequate supporting information is provided.

Applicants must evaluate infiltration restrictions through use of the best available data. A list of resources available for evaluation is provided in Section B.2

D.2 Determination of Design Infiltration Rates

This section is only applicable if the determination of design infiltration rates is performed by a licensed engineer practicing in geotechnical engineering. The guidance in this section identifies methods for identifying observed infiltration rates, corrected infiltration rates, safety factors, and design infiltration rates for use in structural BMP design. Upon completion of this section, the Geotechnical Engineer must recommend a design infiltration rate for each DMA and provide adequate support/discussion in the geotechnical report.

Table D.2-1: Elements for Determination of Design Infiltration Rates

Item	Value	Unit
Initial Infiltration Rate Identify per Section D.2.1	0.94	in/hr
Corrected Infiltration Rate Identify per Section D.2.2	0.94	in/hr
Safety Factor Identify per Section D.2.3	4.0	unitless
Design Infiltration Rate Corrected Infiltration Rate ÷ Safety Factor	0.235	in/hr

Table D.2-3 For BMP 15-18 along Grand Avenue

Table D.2-3: Determination of Safety Factor

Consideration		Assigned Weight (w)	Factor Value (v)	Product (p) p = w x v
Suitability Assessment (A)	Infiltration Testing Method	0.25	2	0.5
	Soil Texture Class	0.25	2	0.5
	Soil Variability	0.25	2	0.5
	Depth to Groundwater/Obstruction	0.25	2	0.5
	Suitability Assessment Safety Factor, $S_A = \Sigma p$			2.0
Design (B)	Pretreatment	0.50	2	1.0
	Resiliency	0.25	2	0.5
	Compaction	0.25	2	0.5
	Design Safety Factor, $S_B = \Sigma p$			2.0
Safety Factor, $S = S_A \times S_B$ (Must be always greater than or equal to 2)				4.0

The geotechnical engineer should reference Table D.2-4 below in order to determine appropriate factor values for use in the table above. The values in the table below are subjective in nature and the geotechnical engineer may use professional discretion in how the points are assigned.

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

Category	#	Description	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	Units
Standard Drainage Basin Inputs	1	Drainage Basin ID or Name	1	2	3	4	5	6	7	8	9	10	unitless
	2	85th Percentile 24-hr Storm Depth	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	inches
	3	Impervious Surfaces Not Directed to Dispersion Area (C=0.90)	6,887	8,414	9,674	7,091	7,128	7,574	3,785	3,056	9,975	2,555	sq-ft
	4	Semi-Pervious Surfaces Not Serving as Dispersion Area (C=0.30)									1,859	1,247	sq-ft
	5	Engineered Pervious Surfaces Not Serving as Dispersion Area (C=0.10)	339	389	486	313	627	616	346	240	411	119	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	No	No	No	No	No	No	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	7,226	8,803	10,160	7,404	7,755	8,190	4,131	3,296	12,245	3,921	sq-ft
	23	Initial Runoff Factor for Standard Drainage Areas	0.86	0.86	0.86	0.87	0.84	0.84	0.83	0.84	0.78	0.68	unitless
	24	Initial Runoff Factor for Dispersed & Dispersion Areas	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	unitless
	25	Initial Weighted Runoff Factor	0.86	0.86	0.86	0.87	0.84	0.84	0.83	0.84	0.78	0.68	unitless
	26	Initial Design Capture Volume	311	379	437	322	326	344	171	138	478	133	cubic-feet
Dispersion Area Adjustments	27	Total Impervious Area Dispersed to Pervious Surface	0	0	0	0	0	0	0	0	0	0	sq-ft
	28	Total Pervious Dispersion Area	0	0	0	0	0	0	0	0	0	0	sq-ft
	29	Ratio of Dispersed Impervious Area to Pervious Dispersion Area	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	ratio
	30	Adjustment Factor for Dispersed & Dispersion Areas	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	ratio
	31	Runoff Factor After Dispersion Techniques	0.86	0.86	0.86	0.87	0.84	0.84	0.83	0.84	0.78	0.68	unitless
	32	Design Capture Volume After Dispersion Techniques	311	379	437	322	326	344	171	138	478	133	cubic-feet
Tree & Barrel Adjustments	33	Total Tree Well Volume Reduction	0	0	0	0	0	0	0	0	0	0	cubic-feet
	34	Total Rain Barrel Volume Reduction	0	0	0	0	0	0	0	0	0	0	cubic-feet
Results	35	Final Adjusted Runoff Factor	0.86	0.86	0.86	0.87	0.84	0.84	0.83	0.84	0.78	0.68	unitless
	36	Final Effective Tributary Area	6,214	7,571	8,738	6,441	6,514	6,880	3,429	2,769	9,551	2,666	sq-ft
	37	Initial Design Capture Volume Retained by Site Design Elements	0	0	0	0	0	0	0	0	0	0	cubic-feet
	38	Final Design Capture Volume Tributary to BMP	311	379	437	322	326	344	171	138	478	133	cubic-feet

No Warning Messages

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

Category	#	Description	*i*	Units
Standard Drainage Basin Inputs	1	Drainage Basin ID or Name	11	unitless
	2	85th Percentile 24-hr Storm Depth	0.60	inches
	3	Impervious Surfaces Not Directed to Dispersion Area (C=0.90)	770	sq-ft
	4	Semi-Pervious Surfaces Not Serving as Dispersion Area (C=0.30)	1,102	sq-ft
	5	Engineered Pervious Surfaces Not Serving as Dispersion Area (C=0.10)	175	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	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	2,047	sq-ft
	23	Initial Runoff Factor for Standard Drainage Areas	0.51	unitless
	24	Initial Runoff Factor for Dispersed & Dispersion Areas	0.00	unitless
	25	Initial Weighted Runoff Factor	0.51	unitless
	26	Initial Design Capture Volume	52	cubic-feet
Dispersion Area Adjustments	27	Total Impervious Area Dispersed to Pervious Surface	0	sq-ft
	28	Total Pervious Dispersion Area	0	sq-ft
	29	Ratio of Dispersed Impervious Area to Pervious Dispersion Area	n/a	ratio
	30	Adjustment Factor for Dispersed & Dispersion Areas	1.00	ratio
	31	Runoff Factor After Dispersion Techniques	0.51	unitless
	32	Design Capture Volume After Dispersion Techniques	52	cubic-feet
Tree & Barrel Adjustments	33	Total Tree Well Volume Reduction	0	cubic-feet
	34	Total Rain Barrel Volume Reduction	0	cubic-feet
Results	35	Final Adjusted Runoff Factor	0.51	unitless
	36	Final Effective Tributary Area	1,044	sq-ft
	37	Initial Design Capture Volume Retained by Site Design Elements	0	cubic-feet
	38	Final Design Capture Volume Tributary to BMP	52	cubic-feet

No Warning Messages

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

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

No Warning Messages

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

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

No Warning Messages

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

Category	#	Description	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	Units
BMP Inputs	1	Drainage Basin ID or Name	1	2	3	4	5	6	7	8	9	10	sq-ft
	2	Design Infiltration Rate Recommended	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	in/hr
	3	Design Capture Volume Tributary to BMP	311	379	437	322	326	344	171	138	478	133	cubic-feet
	4	Is BMP Vegetated or Unvegetated?	Vegetated	Vegetated	Vegetated	Vegetated	Vegetated	Vegetated	Vegetated	Vegetated	Vegetated	Vegetated	unitless
	5	Is BMP Impermeably Lined or Unlined?	Lined	Lined	Lined	Lined	Lined	Lined	Lined	Lined	Lined	Lined	unitless
	6	Does BMP Have an Underdrain?	Underdrain	Underdrain	Underdrain	Underdrain	Underdrain	Underdrain	Underdrain	Underdrain	Underdrain	Underdrain	unitless
	7	Does BMP Utilize Standard or Specialized Media?	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	unitless
	8	Provided Surface Area	339	389	486	313	627	616	346	240	411	119	sq-ft
	9	Provided Surface Ponding Depth	12	12	12	12	12	12	12	12	9	9	inches
	10	Provided Soil Media Thickness	18	18	18	18	18	18	18	18	18	18	inches
	11	Provided Gravel Thickness (Total Thickness)	12	12	12	12	12	12	12	12	12	12	inches
	12	Underdrain Offset	3	3	3	3	3	3	3	3	3	3	inches
	13	Diameter of Underdrain or Hydromod Orifice (Select Smallest)	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	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	0	0	0	0	0	0	0	0	cubic-feet
	19	Ponding Pore Space Available for Retention	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	unitless
	20	Soil Media Pore Space Available for Retention	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	unitless
	21	Gravel Pore Space Available for Retention (Above Underdrain)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	unitless
	22	Gravel Pore Space Available for Retention (Below Underdrain)	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	unitless
	23	Effective Retention Depth	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	inches
	24	Fraction of DCV Retained (Independent of Drawdown Time)	0.19	0.18	0.19	0.17	0.34	0.31	0.35	0.30	0.15	0.16	ratio
	25	Calculated Retention Storage Drawdown Time	120	120	120	120	120	120	120	120	120	120	hours
	26	Efficacy of Retention Processes	0.21	0.20	0.21	0.19	0.34	0.32	0.35	0.31	0.17	0.18	ratio
	27	Volume Retained by BMP (Considering Drawdown Time)	66	76	92	61	111	108	60	42	82	24	cubic-feet
	28	Design Capture Volume Remaining for Biofiltration	245	303	345	261	215	236	111	96	396	109	cubic-feet
Biofiltration Calculations	29	Max Hydromod Flow Rate through Underdrain	1.6375	1.6375	1.6375	1.6375	1.6375	1.6375	1.6375	1.6375	1.5678	1.5678	cfs
	30	Max Soil Filtration Rate Allowed by Underdrain Orifice	208.67	181.85	145.56	226.01	112.82	114.84	204.45	294.75	164.79	569.15	in/hr
	31	Soil Media Filtration Rate per Specifications	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	in/hr
	32	Soil Media Filtration Rate to be used for Sizing	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	in/hr
	33	Depth Biofiltered Over 6 Hour Storm	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	inches
	34	Ponding Pore Space Available for Biofiltration	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	unitless
	35	Soil Media Pore Space Available for Biofiltration	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	unitless
	36	Gravel Pore Space Available for Biofiltration (Above Underdrain)	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	unitless
	37	Effective Depth of Biofiltration Storage	19.20	19.20	19.20	19.20	19.20	19.20	19.20	19.20	16.20	16.20	inches
	38	Drawdown Time for Surface Ponding	2	2	2	2	2	2	2	2	2	2	hours
	39	Drawdown Time for Effective Biofiltration Depth	4	4	4	4	4	4	4	4	3	3	hours
	40	Total Depth Biofiltered	49.20	49.20	49.20	49.20	49.20	49.20	49.20	49.20	46.20	46.20	inches
	41	Option 1 - Biofilter 1.50 DCV: Target Volume	368	454	517	391	322	353	167	144	594	163	cubic-feet
	42	Option 1 - Provided Biofiltration Volume	368	454	517	391	322	353	167	144	594	163	cubic-feet
	43	Option 2 - Store 0.75 DCV: Target Volume	184	227	259	195	161	177	83	72	297	82	cubic-feet
	44	Option 2 - Provided Storage Volume	184	227	259	195	161	177	83	72	297	82	cubic-feet
	45	Portion of Biofiltration Performance Standard Satisfied	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	ratio
Result	46	Do Site Design Elements and BMPs Satisfy Annual Retention Requirements?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	yes/no
	47	Overall Portion of Performance Standard Satisfied (BMP Efficacy Factor)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	ratio
	48	**Deficit of Effectively Treated Stormwater**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	cubic-feet

No Warning Messages

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

Category	#	Description	*i*	Units
BMP Inputs	1	Drainage Basin ID or Name	11	sq-ft
	2	Design Infiltration Rate Recommended	0.000	in/hr
	3	Design Capture Volume Tributary to BMP	52	cubic-feet
	4	Is BMP Vegetated or Unvegetated?	Vegetated	unitless
	5	Is BMP Impermeably Lined or Unlined?	Lined	unitless
	6	Does BMP Have an Underdrain?	Underdrain	unitless
	7	Does BMP Utilize Standard or Specialized Media?	Standard	unitless
	8	Provided Surface Area	175	sq-ft
	9	Provided Surface Ponding Depth	9	inches
	10	Provided Soil Media Thickness	18	inches
	11	Provided Gravel Thickness (Total Thickness)	12	inches
	12	Underdrain Offset	3	inches
	13	Diameter of Underdrain or Hydromod Orifice (Select Smallest)	6.00	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	cubic-feet
	19	Ponding Pore Space Available for Retention	0.00	unitless
	20	Soil Media Pore Space Available for Retention	0.05	unitless
	21	Gravel Pore Space Available for Retention (Above Underdrain)	0.00	unitless
	22	Gravel Pore Space Available for Retention (Below Underdrain)	0.40	unitless
	23	Effective Retention Depth	2.10	inches
	24	Fraction of DCV Retained (Independent of Drawdown Time)	0.59	ratio
	25	Calculated Retention Storage Drawdown Time	120	hours
	26	Efficacy of Retention Processes	0.53	ratio
	27	Volume Retained by BMP (Considering Drawdown Time)	27	cubic-feet
	28	Design Capture Volume Remaining for Biofiltration	25	cubic-feet
Biofiltration Calculations	29	Max Hydromod Flow Rate through Underdrain	1.5678	cfs
	30	Max Soil Filtration Rate Allowed by Underdrain Orifice	387.02	in/hr
	31	Soil Media Filtration Rate per Specifications	5.00	in/hr
	32	Soil Media Filtration Rate to be used for Sizing	5.00	in/hr
	33	Depth Biofiltered Over 6 Hour Storm	30.00	inches
	34	Ponding Pore Space Available for Biofiltration	1.00	unitless
	35	Soil Media Pore Space Available for Biofiltration	0.20	unitless
	36	Gravel Pore Space Available for Biofiltration (Above Underdrain)	0.40	unitless
	37	Effective Depth of Biofiltration Storage	16.20	inches
	38	Drawdown Time for Surface Ponding	2	hours
	39	Drawdown Time for Effective Biofiltration Depth	3	hours
	40	Total Depth Biofiltered	46.20	inches
	41	Option 1 - Biofilter 1.50 DCV: Target Volume	37	cubic-feet
	42	Option 1 - Provided Biofiltration Volume	37	cubic-feet
	43	Option 2 - Store 0.75 DCV: Target Volume	18	cubic-feet
	44	Option 2 - Provided Storage Volume	18	cubic-feet
	45	Portion of Biofiltration Performance Standard Satisfied	1.00	ratio
Result	46	Do Site Design Elements and BMPs Satisfy Annual Retention Requirements?	Yes	yes/no
	47	Overall Portion of Performance Standard Satisfied (BMP Efficacy Factor)	1.00	ratio
	48	**Deficit of Effectively Treated Stormwater**	**0**	cubic-feet

No Warning Messages

SSD-BMP Automated Worksheet I-1: Step 1. Calculation of Design Capture Volume (V1.0)						
Category	**#**	**Description**	*i*	*ii*	*iii*	**Units**
Standard Drainage Basin Inputs	1	Drainage Basin ID or Name	12	15	16	unitless
	2	85th Percentile 24-hr Storm Depth	0.60	0.60	0.60	inches
	3	Is Hydromodification Control Applicable?	No	No	No	yes/no
	4	Impervious Surfaces Not Directed to Dispersion Area (C=0.90)	824	330	4,096	sq-ft
	5	Semi-Pervious Surfaces Not Serving as Dispersion Area (C=0.30)	40	346	1,124	sq-ft
	6	Engineered Pervious Surfaces Not Serving as Dispersion Area (C=0.10)				sq-ft
	7	Natural Type A Soil Not Serving as Dispersion Area (C=0.10)				sq-ft
	8	Natural Type B Soil Not Serving as Dispersion Area (C=0.14)				sq-ft
	9	Natural Type C Soil Not Serving as Dispersion Area (C=0.23)				sq-ft
	10	Natural Type D Soil Not Serving as Dispersion Area (C=0.30)				sq-ft
SSD-BMPs Proposed	11	Does Tributary Incorporate Dispersion and/or Rain Barrels?	No	No	No	yes/no
	12	Does Tributary Incorporate Tree Wells?	Yes	Yes	Yes	yes/no
Dispersion Area & Rain Barrel Inputs (Optional)	13	Impervious Surfaces **Directed to Dispersion Area** per SD-B (Ci=0.90)				sq-ft
	14	Semi-Pervious Surfaces **Serving as Dispersion Area** per SD-B (Ci=0.30)				sq-ft
	15	Engineered Pervious Surfaces **Serving as Dispersion Area** per SD-B (Ci=0.10)				sq-ft
	16	Natural Type A Soil **Serving as Dispersion Area** per SD-B (Ci=0.10)				sq-ft
	17	Natural Type B Soil **Serving as Dispersion Area** per SD-B (Ci=0.14)				sq-ft
	18	Natural Type C Soil **Serving as Dispersion Area** per SD-B (Ci=0.23)				sq-ft
	19	Natural Type D Soil **Serving as Dispersion Area** per SD-B (Ci=0.30)				sq-ft
	20	Number of Rain Barrels Proposed per SD-E				#
	21	Average Rain Barrel Size				gal
Initial Runoff Factor Calculation	22	Total Tributary Area	864	676	5,220	sq-ft
	23	Initial Runoff Factor for Standard Drainage Areas	0.87	0.59	0.77	unitless
	24	Initial Runoff Factor for Dispersed & Dispersion Areas	0.00	0.00	0.00	unitless
	25	Initial Weighted Runoff Factor	0.87	0.59	0.77	unitless
	26	Initial Design Capture Volume	38	20	201	cubic-feet
Dispersion Area Adjustment & Rain Barrel Adjustment	27	Total Impervious Area Dispersed to Pervious Surface	0	0	0	sq-ft
	28	Total Pervious Dispersion Area	0	0	0	sq-ft
	29	Ratio of Dispersed Impervious Area to Pervious Dispersion Area for DCV Reduction	n/a	n/a	n/a	ratio
	30	Adjustment Factor for Dispersed & Dispersion Areas	1.00	1.00	1.00	ratio
	31	Runoff Factor After Dispersion Techniques	0.87	0.59	0.77	unitless
	32	Design Capture Volume After Dispersion Techniques	38	20	201	cubic-feet
	33	Total Rain Barrel Volume Reduction	0	0	0	cubic-feet
Results	34	Final Adjusted Runoff Factor	0.87	0.59	0.77	unitless
	35	Final Effective Tributary Area	752	399	4,019	sq-ft
	36	Initial Design Capture Volume Retained by Dispersion Area and Rain Barrel(s)	0	0	0	cubic-feet
	37	Remaining Design Capture Volume Tributary to Tree Well(s)	38	20	201	cubic-feet

No Warning Messages

SSD-BMP Automated Worksheet I-3: Step 3. Tree Well Sizing (V1.0)

Category	#	Description	*i*	*ii*	*iii*	Units
Standard Tree Well Inputs	1	Drainage Basin ID or Name	12	15	16	unitless
	2	Design Capture Volume Tributary to BMP	38	20	201	cubic-feet
	3	Is Hydromodification Control Applicable?	No	No	No	yes/no
	4	Predominant NRCS Soil Type Within Tree Well(s) Location	D			unitless
	5	Select a Tree Species for the Tree Well(s) Consistent with SD-A Tree Palette Table Note: Numbers shown in list are Tree Species Mature Canopy Diameters	10' - Other	25' - Other	10' - Other	unitless
	6	Tree Well(s) Soil Depth (Installation Depth) Must be 30, 36, 42, or 48 Inches; Select from Standard Depths**	48	48	48	inches
	7	Number of Identical* Tree Wells Proposed for this DMA	1	1	1	trees
	8	Proposed Width of Tree Well(s) Soil Installation for One (1) Tree	4.0	10.0	4.0	feet
	9	Proposed Length of Tree Well(s) Soil Installation for One (1) Tree	10.0	20.0	10.0	feet
Tree Data	10	Botanical Name of Tree Species	Provide in PDP SWQMP	Provide in PDP SWQMP	Provide in PDP SWQMP	unitless
	11	Tree Species Mature Height per SD-A	Provide in PDP SWQMP	Provide in PDP SWQMP	Provide in PDP SWQMP	feet
	12	Tree Species Mature Canopy Diameter per SD-A	10	25	10	feet
	13	Minimum Soil Volume Required In Tree Well (2 Cubic Feet Per Square Foot of Mature Tree Canopy Projection Area)	157	982	157	cubic-feet
	14	Credit Volume Per Tree	40	290	40	cubic-feet
Tree Well Sizing Calculations	15	DCV Multiplier To Meet Flow Control Requirements	n/a	n/a	n/a	unitless
	16	Required Retention Volume (RRV) To Meet Flow Control Requirements	n/a	n/a	n/a	cubic-feet
	17	Number of Trees Required	1	1	6	trees
	18	Total Area of Tree Well Soil Required for Each Tree	39	245	39	sq-ft
	19	Approximate Required Width of Tree Well Soil Area for Each Tree	7	16	7	feet
	20	Approximate Required Length of Tree Well Soil Area for Each Tree	7	16	7	feet
	21	Number of Trees Proposed for this DMA	1	1	1	trees
	22	Total Area of Tree Well Soil Proposed for Each Tree	40	200	40	sq-ft
	23	Minimum Spacing Between Multiple Trees To Meet Soil Area Requirements (when applicable)***	n/a	n/a	10.0	feet
Results	24	Are Tree Well Soil Installation Requirements Met?	Yes	No	Yes	yes/no
	25	Is Remaining DCV Requirement Fully Satisfied by Tree Well(s)?	Yes	No	No	yes/no
	26	Is Hydromodification Control Requirement Satisfied by Tree Well(s)?	n/a	n/a	n/a	yes/no

SEE NOTE BELOW TREE WELLS WILL BE CONSTRUCTED WITH 60" OF SOIL DEPTH

Attention!

SEE NEXT SHEET FOR CREDIT VOLUME NARRATIVE

-[Line 12] Applicant to provide supporting documentation for tree species in PDP SWQMP.

-[Line 21] The number of trees proposed do not provide enough credit volume to meet the requirement (i.e., to satisfy the DCV or RRV as applicable). Increase the number of trees or select a tree that provides
-[Line 22] The length and width dimensions proposed for the tree well(s) in Lines 8 and 9 do not provide enough area to meet the tree well soil volume requirement (Line 13) at the installation depth proposed.

Notes:

*If using more than one mature canopy diameter within the same DMA, only the smallest mature canopy diameter should be entered. Alternatively, if more than one mature canopy diameter is proposed and/or tl

**If the actual proposed installation depth is not available in the table of standard depths, select the next lower depth.

***Tree Canopy or Agency Requirements May Also Influence the Minimum Spacing of Trees.

CREDIT VOLUME NARRATIVE

Tree Well on Grand Avenue will be 5' deep 10' wide and 20' long per detail sheet 8

Required soil volume for 25-ft diameter Tree Well per SD-A fact sheet = (25/2)^2*2(3.14)
= 982 CU. FT Required

Soil Volume provided = 5 * 10 * 20 = 1,000 CU. FT

1,000 CU. FT Provided > 982 Cu. FT Required ==> Ok

Per DMA Exhibit sheet 4

STRUCTURAL SOIL REQUIREMENT CALCULATIONS

A MINIMUM OF SOIL VOLUME OF 2 CUBIC FEET PER SQUARE FOOT OF CANOPY PROJECTION VOLUME IS PROVIDED FOR EACH TREE PER TREE WELL FACT SHEET SD-A

25-FT MATURE CANOPY DIAMETER (5' X 10' X 20' TREE WELL)

SQUARE FEET OF CANOPY PROJECTION:	*$(25/2)^2$ * 3.14 = 490.625 SQUARE FEET*
VOLUME REQUIRED:	*490.625 * 2 = 981.25 CUBIC FEET*
VOLUME PROVIDED:	*5*10*20 = 1,000 CUBIC FEET*

1,000 CU. FT PROVIDED > 981.25 CU. FT REQUIRED

DMA 16 is to show the equivalent area that is by passing the tree well.

DMA 16 DVC = 200 CU. FT (per worksheet)

DMA Surplus for DMA 15 = 290 Cu. FT - 20 CU. FT = 270 CU. FT

Surplus DVC = 270 Cu. FT > 200 Cu. FT (Required) ==> Ok

Per DMA Exhibit sheet 4

**4,024 SF OF EXISTING IMPERVIOUS AREA ROUTED TO TREE WELL BMP FOR TREATMENT TO ACCOUNT FOR 201.2 CF WATER QUALITY VOLUME GENERATED AS PART OF DMA 16 THAT IS INFEASIBLE TO ROUTE TO PROPOSED TREE WELLS*

AREA TRIBUTARY TO BMP (A)	=	*4,471 SF (0.10 AC)*
*TOTAL DMA SIZE (Cx * Ax)*	=	*4,024 SF (0.09 AC)*
WEIGHTED RUNOFF COEFFICIENT	=	*0.9*
85TH PERCENTILE STORM DEPTH	=	*0.60 IN*
*DCV (C*D*A*3,600)*	=	*201.2 CU. FT***
***DCV USED TO MEET UNTREATED DCV FROM DMA 16*		
SURPLUS IN DVC FROM TREE WELLS	=	*269.95 CU. FT*
		269.95 CU. FT > 201.2 CU. FT

E.13 BF-1 Biofiltration

MS4 Permit Category
Biofiltration
Manual Category
Biofiltration
Applicable Performance Standard
Pollutant Control Flow Control
Primary Benefits
Treatment Volume Reduction (Incidental) Peak Flow Attenuation (Optional)

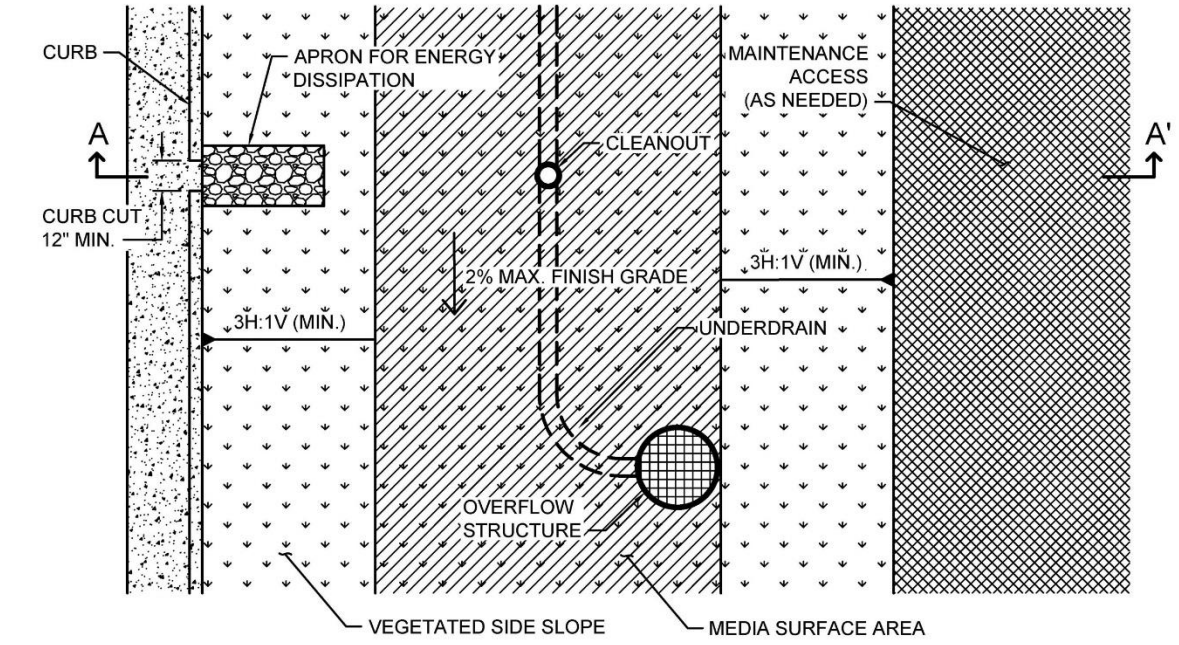
Location: 43rd Street and Logan Avenue, San Diego, California

Description

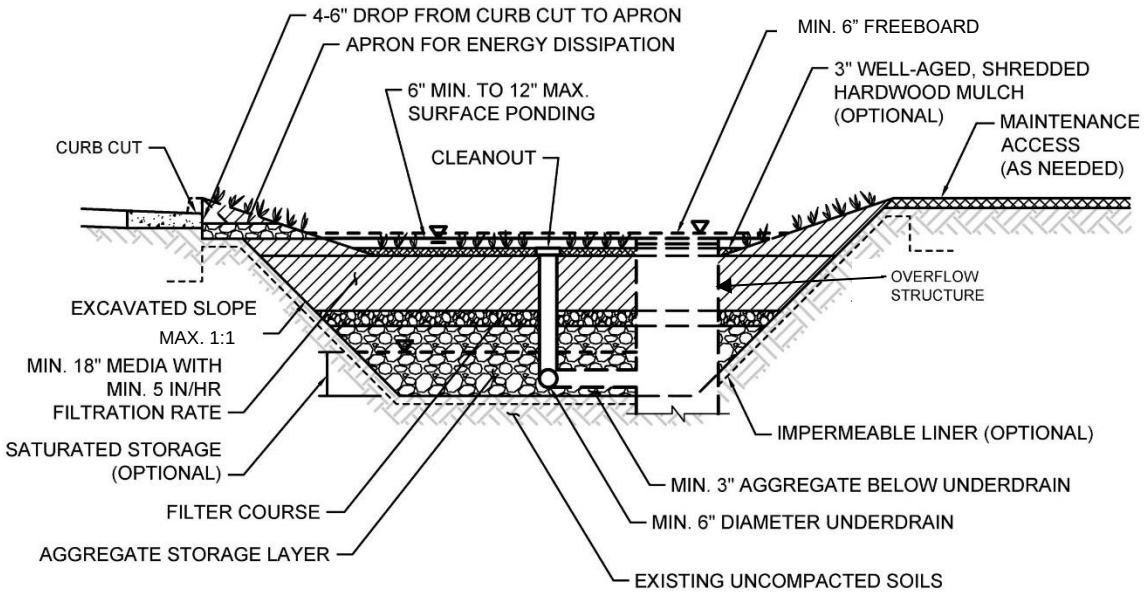
Biofiltration (Bioretention with underdrain) facilities are vegetated surface water systems that filter water through vegetation, and soil or engineered media prior to discharge via underdrain or overflow to the downstream conveyance system. Bioretention with underdrain facilities are commonly incorporated 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



PLAN
NOT TO SCALE



SECTION A-A'
NOT TO SCALE

Typical plan and Section view of a Biofiltration BMP

Design Adaptations for Project Goals

Biofiltration Treatment BMP for storm water 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 storm water 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.

Recommended Siting Criteria

	Siting Criteria	*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 storm water 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 minimizing short circuiting of flows in the BMP and 2) incorporate additional design features requested by the City

Siting Criteria	*Intent/Rationale*
	Engineer for proper performance of the regional BMP.
☐ Finish grade of the facility is ≤ 2%.	Flatter surfaces reduce erosion and channelization within the facility.

Recommended BMP Component Dimensions

BMP Component	*Dimension*	*Intent/Rationale*
Freeboard	≥ 6 inches for earth basin ≥ 2 inches for concrete planter/box structure	Freeboard provides room for head over overflow structures and minimizes risk of uncontrolled surface discharge.
Surface Ponding	≥ 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.
Ponding Area Side Slopes	3H:1V or shallower	Gentler side slopes are safer, less prone to erosion, able to establish vegetation more quickly and easier to maintain.
Mulch	≥ 3 inches	Mulch will suppress weeds and maintain moisture for plant growth. Aging mulch kills pathogens and

BMP Component	*Dimension*	*Intent/Rationale*
		weed seeds and allows the beneficial microbes to multiply.
Media Layer	≥ 18 inches 1:1 slope maximum for edge condition	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.
Underdrain Diameter	≥ 6 inches	Smaller diameter underdrains are prone to clogging.
Cleanout Diameter	≥ 6 inches	Properly spaced cleanouts will facilitate underdrain maintenance.

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:

Design Criteria	*Intent/Rationale*
Surface Ponding	
☐ Surface ponding is limited to a 24-hour drawdown time.	Surface ponding limited to 24 hours for plant health. Surface ponding drawdown time greater than 24-hours but less than 96 hours may be allowed at the discretion of the City Engineer if certified by a landscape architect or agronomist.
Vegetation	
☐ Plantings are suitable for the climate and expected ponding depth. A plant list to aid in selection can be found in Appendix E.21.	Plants suited to the climate and ponding depth are more likely to survive.
☐ 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)	

Design Criteria		*Intent/Rationale*
☐	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: Section F.3 Bioretention Soil Media (BSM) or specific jurisdictional guidance. Alternatively, for proprietary designs and custom media mixes not meeting the media specifications, 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. Unless demonstrated that the BMP surface area can be smaller than 3%.	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, impervious area dispersion, etc.). Refer to Appendix B.1 guidance.

Design Criteria		*Intent/Rationale*
☐	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 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.

Design Criteria		*Intent/Rationale*
☐	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 Storm Water Pollutant Control Only

To design bioretention with underdrain for storm water 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.3 to size biofiltration BMPs.

Conceptual Design and Sizing Approach when Storm Water 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 storm water 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 storm water pollutant control requirements to treat the DCV have been met.

Maintenance Overview

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.

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	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. • Maintain when needed.
Poor vegetation establishment	Re-seed, re-plant, or re-establish vegetation per original plans.	• Inspect monthly. • Maintain when needed.

Threshold/Indicator	Maintenance Action	Typical Maintenance Frequency
Dead or diseased vegetation	Remove dead or diseased vegetation, re-seed, re-plant, or re-establish vegetation per original plans.	• Inspect monthly. • Maintain when needed.
Overgrown vegetation	Mow or trim as appropriate.	• Inspect monthly. • Maintain 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.
Erosion due to concentrated irrigation flow	Repair/re-seed/re-plant eroded areas and adjust the irrigation system.	• Inspect monthly. • Maintain 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. • Maintain 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. • Maintain when needed.

Threshold/Indicator	Maintenance Action	Typical Maintenance Frequency
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. • Maintain when needed.
Underdrain clogged	Clear blockage.	• Inspect if standing water is observed for longer than 24-96 hours following a storm event. • Maintain when needed.

"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).

E.1 SD-A Tree Well

(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

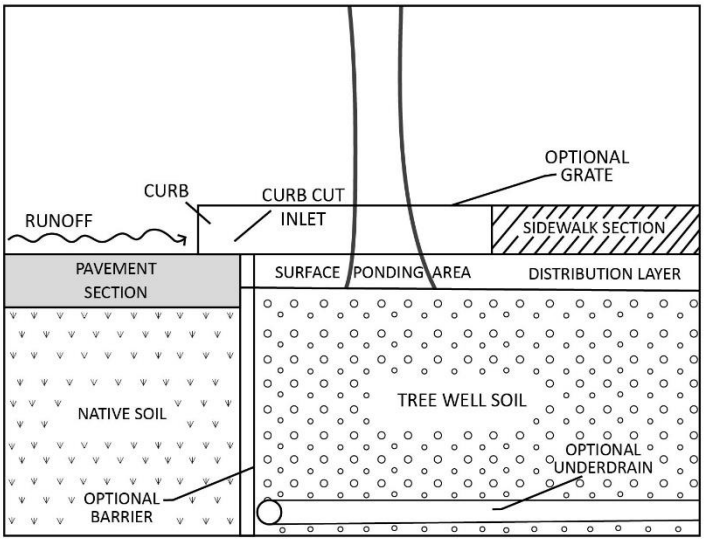
Description

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. Tree wells located in the City's Right-of-Way are subject to the discretion of City Engineer and Parks and Recreation Director. Typical storm water management benefits associated with trees include:

- **Treatment of storm water** – Storm water from impervious area should be directed to the tree wells. Trees provide treatment through uptake of nutrients and other storm water pollutants (phytoremediation) and support of other biological processes that break down pollutants
- **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

Typical tree well system components include:

- Directing runoff from impervious areas through a drainage opening into a tree well planting area.
- Trees of the appropriate species for site conditions and constraints. Refer to the Plant List fact sheet (Appendix E.21).
- 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 or other structures, intended to guide roots down and away from the sidewalk or structures in order to prevent damage 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 underdrain

Design Adaptations for Project Goals

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

Storm water pollutant control BMP to provide treatment. Project proponents are allowed to design tree wells 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. Tree wells designed to completely fulfill the pollutant control BMP requirements by retaining the entire

DCV are designated as SSD-BMPs and located in Appendix I.

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 in Appendix I. 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 Standard Drawings. 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***
☐	**Tree species** is appropriately chosen for the development (private or public). For public rights-of-ways, city planning guidelines and zoning provisions for the permissible species and placement of trees are consulted. A list of trees appropriate for site design are provided in Appendix E.21	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 well.	Minimizes short-circuiting of run off and assures DCV reductions are retained onsite.
☐	**Location of trees** planted along public streets follows city requirements and guidelines. Vehicle and pedestrian line of sight are considered in tree selection and placement. Location of trees planted within private development follows city landscape guidelines. Building setbacks, utility alignments, vehicle and pedestrian line of sight are considered in tree selection and placement. Unless otherwise approved by the City Engineer the following minimum tree separation distance is followed	Roadway safety for both vehicular and pedestrian traffic is a key consideration for placement along public streets.

Siting and Design		*Intent/Rationale*
	Improvement: Minimum distance to Tree Well Traffic Signal, Stop sign: 20 feet Underground Utility lines (except sewer): 5 feet Sewer Lines: 10 feet Above ground utility structures (Transformers, Hydrants, Utility poles, etc.): 10 feet Driveways: 10 feet Intersections (intersecting curb lines of two streets): 25 feet	
☐	**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.
☐	**Suspended pavement** is 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 was constructed with an approved structural cell.	Suspended pavement designs provide structural support without compaction of the underlying layers, thereby promoting tree growth. 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 or approved equal. Suspended pavement shall not be used within the city's right-of-way and easements.
☐	A minimum soil volume of 2 cubic feet per square foot of canopy projection volume is provided for each tree. Canopy projection area	The minimum soil volume ensures that there is adequate storage volume to allow for unrestricted evapotranspiration and infiltration.

	Siting and Design	*Intent/Rationale*
	is the ground area beneath the 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 curbs or other structures use Structural Soil as outlined in the section below titled "Confined Tree Well Soil Volume". Use Amended Soil per Fact Sheet SD-F in all other cases.	
☐	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 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 is not bypassed. Different inlet openings and drops in grade may be allowed at the discretion of the City Engineer if calculations are shown that the diversion flow rate (Appendix B.4.4) 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.1. Document the proposed tree locations in the SWQMP.

For conceptual design and sizing approach for pollutant control and flow control, refer to Appendix I.

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. 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.

Suspended pavement shall not be used within the city's right-of-way and easements.

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 City requirements in Appendix B of this manual. These facilities can be designed to meet the City 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/evapotranspire 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 City 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 City Engineer to determine requirements.

ATTACHMENT 2

BACKUP FOR PDP HYDROMODIFICATION CONTROL MEASURES

[This is the cover sheet for Attachment 2.]

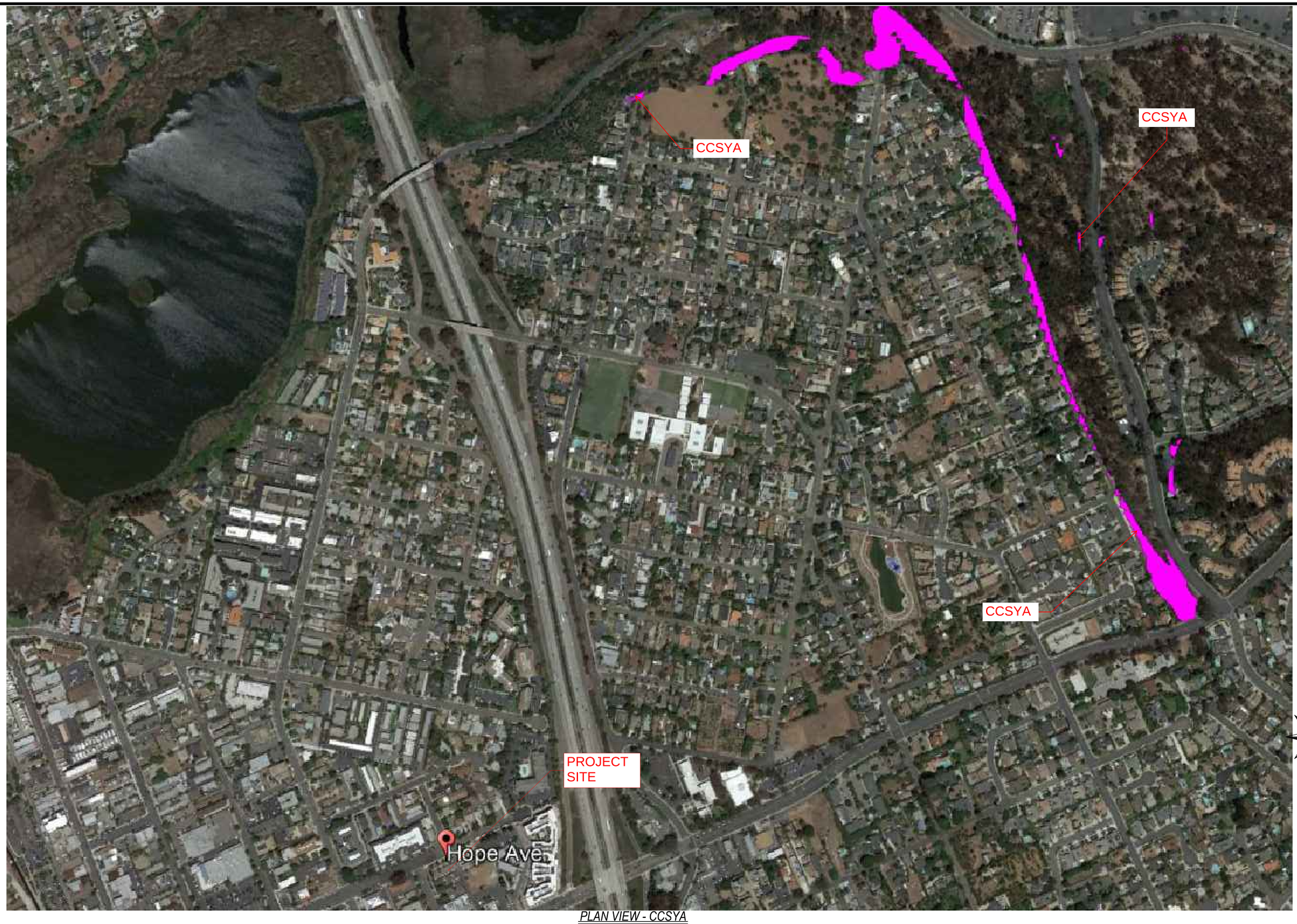
Indicate which Items are Included behind this cover sheet:

Attachment Sequence	**Contents**	**Checklist**
Attachment 2a	Hydromodification Management Exhibit (Required)	☐ Included
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
Attachment 2d	Flow Control Facility Design and Structural BMP Drawdown Calculations (Required) See Chapter 6 and Appendix G of the BMP Design Manual	☐ Included

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 (if present)
- ☐ 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 - CCSYA
NOT TO SCALE

CCSYA EXHIBIT

945 & 955 Hope Avenue, 2944 Hope Avenue,
1006 Carlsbad Village,
Carlsbad, CA 92008

PREPARED BY:
PASCO LARET SUITER & ASSOCIATES
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Drawdown Calculation for BMP-11

Project Name Hope Ave Apartments

Project No 3802

Surface Drawdown Time:	1.8	**hr**
Surface Area	**119**	**sq ft**
Underdrain Orifice Diameter: in	**6**	in
C:	**0.6**	
Surface Ponding (to invert of lowest surface discharge opening in outlet structure):	**0.75**	ft
Amended Soil Depth:	**1.5**	ft
Gravel Depth:	**1**	ft
Orifice Q =	**1.637**	cfs
Effective Depth	17.4	in
Infiltration controlled by orifice	594.157	in/hr
Infiltration controlled by media	5.000	in/hr

Drawdown Calculation for BMP-1

Project Name Hope Ave Apartments

Project No 3802

Surface Drawdown Time:	2.4	**hr**
Surface Area	**339**	**sq ft**
Underdrain Orifice Diameter: in	**6**	in
C:	**0.6**	
Surface Ponding (to invert of lowest surface discharge opening in outlet structure):	**1**	ft
Amended Soil Depth:	**1.5**	ft
Gravel Depth:	**1**	ft
Orifice Q =	**1.704**	cfs
Effective Depth	20.4	in
Infiltration controlled by orifice	217.085	in/hr
Infiltration controlled by media	5.000	in/hr

Drawdown Calculation for BMP-2

Project Name Hope Ave Apartments

Project No 3802

Surface Drawdown Time:	2.4	**hr**
Surface Area	**389**	**sq ft**
Underdrain Orifice Diameter: in	**6**	in
C:	**0.6**	
Surface Ponding (to invert of lowest surface discharge opening in outlet structure):	**1**	ft
Amended Soil Depth:	**1.5**	ft
Gravel Depth:	**1**	ft
Orifice Q =	**1.704**	cfs
Effective Depth	20.4	in
Infiltration controlled by orifice	189.182	in/hr
Infiltration controlled by media	5.000	in/hr

Drawdown Calculation for BMP-3

Project Name Hope Ave Apartments

Project No 3802

Surface Drawdown Time:	0.1	**hr**
Surface Area	**486**	**sq ft**
Underdrain Orifice Diameter: in	**6**	in
C:	**0.6**	
Surface Ponding (to invert of lowest surface discharge opening in outlet structure):	**1**	ft
Amended Soil Depth:	**1.5**	ft
Gravel Depth:	**1**	ft
Orifice Q =	**1.704**	cfs
Effective Depth	20.4	in
Infiltration controlled by orifice	151.423	in/hr
Infiltration controlled by media	5.000	in/hr

Drawdown Calculation for BMP-4

Project Name Hope Ave Apartments

Project No 3802

Surface Drawdown Time:	2.4	**hr**
Surface Area	**313**	**sq ft**
Underdrain Orifice Diameter: in	**6**	in
C:	**0.6**	
Surface Ponding (to invert of lowest surface discharge opening in outlet structure):	**1**	ft
Amended Soil Depth:	**1.5**	ft
Gravel Depth:	**1**	ft
Orifice Q =	**1.704**	cfs
Effective Depth	20.4	in
Infiltration controlled by orifice	235.117	in/hr
Infiltration controlled by media	5.000	in/hr

Drawdown Calculation for BMP-5

Project Name Hope Ave Apartments

Project No 3802

Surface Drawdown Time:	2.4	**hr**
Surface Area	**627**	**sq ft**
Underdrain Orifice Diameter: in	**6**	in
C:	**0.6**	
Surface Ponding (to invert of lowest surface discharge opening in outlet structure):	**1**	ft
Amended Soil Depth:	**1.5**	ft
Gravel Depth:	**1**	ft
Orifice Q =	**1.704**	cfs
Effective Depth	20.4	in
Infiltration controlled by orifice	117.371	in/hr
Infiltration controlled by media	5.000	in/hr

Drawdown Calculation for BMP-6

Project Name Hope Ave Apartments

Project No 3802

Surface Drawdown Time:	2.4	**hr**
Surface Area	**616**	**sq ft**
Underdrain Orifice Diameter: in	**6**	in
C:	**0.6**	
Surface Ponding (to invert of lowest surface discharge opening in outlet structure):	**1**	ft
Amended Soil Depth:	**1.5**	ft
Gravel Depth:	**1**	ft
Orifice Q =	**1.704**	cfs
Effective Depth	20.4	in
Infiltration controlled by orifice	119.467	in/hr
Infiltration controlled by media	5.000	in/hr

Drawdown Calculation for BMP-7

Project Name Hope Ave Apartments

Project No 3802

Surface Drawdown Time:	2.4	**hr**
Surface Area	**346**	**sq ft**
Underdrain Orifice Diameter: in	**6**	in
C:	**0.6**	
Surface Ponding (to invert of lowest surface discharge opening in outlet structure):	**1**	ft
Amended Soil Depth:	**1.5**	ft
Gravel Depth:	**1**	ft
Orifice Q =	**1.704**	cfs
Effective Depth	20.4	in
Infiltration controlled by orifice	212.693	in/hr
Infiltration controlled by media	5.000	in/hr

Drawdown Calculation for BMP-9

Project Name Hope Ave Apartments

Project No 3802

Surface Drawdown Time:	1.8	**hr**
Surface Area	**411**	**sq ft**
Underdrain Orifice Diameter: in	**6**	in
C:	**0.6**	
Surface Ponding (to invert of lowest surface discharge opening in outlet structure):	**0.75**	ft
Amended Soil Depth:	**1.5**	ft
Gravel Depth:	**1**	ft
Orifice Q =	**1.637**	cfs
Effective Depth	17.4	in
Infiltration controlled by orifice	172.031	in/hr
Infiltration controlled by media	5.000	in/hr

Drawdown Calculation for BMP-10

Project Name Hope Ave Apartments

Project No 3802

Surface Drawdown Time:	1.8	**hr**
Surface Area	**119**	**sq ft**
Underdrain Orifice Diameter: in	**6**	in
C:	**0.6**	
Surface Ponding (to invert of lowest surface discharge opening in outlet structure):	**0.75**	ft
Amended Soil Depth:	**1.5**	ft
Gravel Depth:	**1**	ft
Orifice Q =	**1.637**	cfs
Effective Depth	17.4	in
Infiltration controlled by orifice	594.157	in/hr
Infiltration controlled by media	5.000	in/hr

Drawdown Calculation for BMP-11

Project Name Hope Ave Apartments

Project No 3802

Surface Drawdown Time:	1.8	**hr**
Surface Area	**175**	**sq ft**
Underdrain Orifice Diameter: in	**6**	in
C:	**0.6**	
Surface Ponding (to invert of lowest surface discharge opening in outlet structure):	**0.75**	ft
Amended Soil Depth:	**1.5**	ft
Gravel Depth:	**1**	ft
Orifice Q =	**1.637**	cfs
Effective Depth	17.4	in
Infiltration controlled by orifice	404.027	in/hr
Infiltration controlled by media	5.000	in/hr

Surface Volume Drawdown Calculation for Tree Well BMPs 15-17

Project Name Hope Ave Apartments

Project No 3802

Surface Drawdown Time:	34.2	**hr**
Surface Area	**40**	**sq ft**
Surface Volume (See Calc Below)	**26.8**	**cu ft**
Surface Ponding (to invert of lowest surface discharge opening in outlet structure):	**0.67**	ft
Infiltration underlying soil (Design)	0.235	in/hr
Q soil	**0.00022**	**cfs**
Total Qout	**0.00022**	**cfs**

Surface Volume = Surface Area * Ponding Depth

Per Tree Well fact sheet SD-A surface ponding of runoff directed into tree wells is expected to infiltrate / evapotranspire within 24 to 96 hours

Surface Volume Drawdown Calculation for Tree Well BMPs 18

Project Name Hope Ave Apartments

Project No 3802

Surface Drawdown Time:	34.2	**hr**
Surface Area	**90**	**sq ft**
Surface Volume (See Calc Below)	**60.3**	**cu ft**
Surface Ponding (to invert of lowest surface discharge opening in outlet structure):	**0.67**	ft
Infiltration underlying soil (Design)	0.235	in/hr
Q soil	**0.00049**	**cfs**
Total Qout	**0.00049**	**cfs**

Surface Volume = Surface Area * Ponding Depth

Per Tree Well fact sheet SD-A surface ponding of runoff directed into tree wells is expected to infiltrate / evapotranspire within 24 to 96 hours

Map Scale: 1:962 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 10 20 40 60

Feet
0 45 90 180 270

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

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: San Diego County Area, California
Survey Area Data: Version 16, Sep 13, 2021

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

Date(s) aerial images were photographed: Jan 24, 2020—Feb 12, 2020

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
MIC	Marina loamy coarse sand, 2 to 9 percent slopes	B	4.6	100.0%
Totals for Area of Interest			**4.6**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

ATTACHMENT 3
Structural BMP Maintenance Information

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 3 must identify:

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

Final Design level submittal:

Attachment 3 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 for BMPs subject to siltation or heavy trash(e.g., silt level posts or other markings shall be included in all BMP components that will trap and store sediment, trash, and/or debris, so that the inspector may determine how full the BMP is, and the maintenance personnel may determine where the bottom of the BMP is . If required, posts or other markings shall be indicated and described on structural BMP plans.)
✓ 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

APPENDIX 3a
BMP MAINTENANCE THRESHOLDS

BMP DESCRIPTION

BIOFILTRATION (1,110 SF) TOTAL ALL RAISED PLANTERS W/ 12"X12" GRATES	MAINTENANCE AGREEMENT FOR PRIVATE STORMWATER TREATMENT AND STORMWATER POLLUTION CONTROL AND HYDROMODIFICATION MANAGEMENT FACILITIES BY HOMEOWNER'S ASSOCIATION O&M RESPONSIBLE PARTY DESIGNEE: CARLSBAD VILLAGE II, LLC 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 12" X 12" 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.

OWNER INFORMATION:

OWNER: WERMERS PROPERTIES
CONTACT: AUSTIN WERMERS
EMAIL: AUSTINW@WERMERSCOMPANIES.COM

PROPERTY MANAGEMENT INFORMATION:

ADDITIONAL INFORMATION WILL BE PROVIDED PRIOR TO CONSTRUCTION PERMIT ISSUANCE.

*CITY OF CARLSBAD TO CONTACT PROPERTY MANAGEMENT COMPANY AND / OR PROPERTY OWNER PRIOR TO ACCESSING THE SITE FOR BMP INSPECTION; ADDITIONAL CONTACT INFORMATION WILL BE PROVIDED PRIOR TO PERMIT ISSUANCE.

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APPENDIX 3a
BMP MAINTENANCE THRESHOLDS

BMP DESCRIPTION

BIOFILTRATION (2,382 SF) TOTAL ALL RAISED PLANTERS W/ 18"X18" GRATES	MAINTENANCE AGREEMENT FOR PRIVATE STORMWATER TREATMENT AND STORMWATER POLLUTION CONTROL AND HYDROMODIFICATION MANAGEMENT FACILITIES BY HOMEOWNER'S ASSOCIATION O&M RESPONSIBLE PARTY DESIGNEE: CARLSBAD VILLAGE II, LLC 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 18" X 18" 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.

OWNER INFORMATION:

OWNER: WERMERS PROPERTIES
CONTACT: AUSTIN WERMERS
EMAIL: AUSTINW@WERMERSCOMPANIES.COM

PROPERTY MANAGEMENT INFORMATION:

ADDITIONAL INFORMATION WILL BE PROVIDED PRIOR TO CONSTRUCTION PERMIT ISSUANCE.

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APPENDIX 3a
BMP MAINTENANCE THRESHOLDS

BMP DESCRIPTION

BIOFILTRATION (619 SF) TOTAL ALL RAISED PLANTERS W/ 24"X24" GRATE	MAINTENANCE AGREEMENT FOR PRIVATE STORMWATER TREATMENT AND STORMWATER POLLUTION CONTROL AND HYDROMODIFICATION MANAGEMENT FACILITIES BY HOMEOWNER'S ASSOCIATION O&M RESPONSIBLE PARTY DESIGNEE: CARLSBAD VILLAGE II, LLC 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 24" X 24" 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.

OWNER INFORMATION:

OWNER: WERMERS PROPERTIES
CONTACT: AUSTIN WERMERS
EMAIL: AUSTINW@WERMERSCOMPANIES.COM

PROPERTY MANAGEMENT INFORMATION:

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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):	

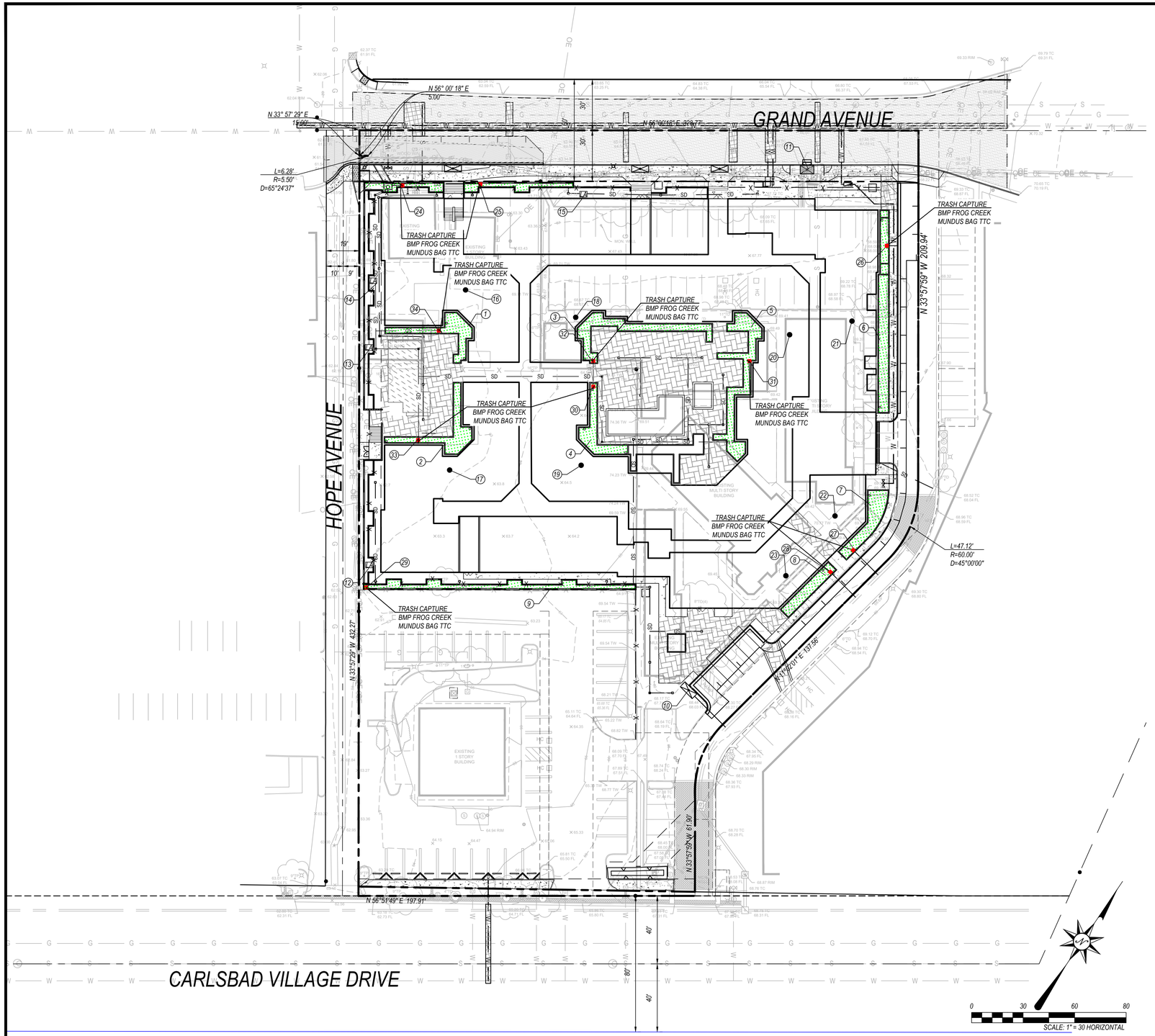
INSPECTION AND MAINTENANCE CHECKLIST FOR BF-1 BIOFILTRATION PAGE 5 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Standing water in BMP for longer than 24-96 hours following a storm event* Surface ponding longer than approximately 24 hours 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.

ATTACHMENT 4
City standard Single Sheet BMP (SSBMP) Exhibit

[Use the City's standard Single Sheet BMP Plan.]



PLAN VIEW - TRASH CAPTURE & TREATMENT CONTROL

SCALE: 1" = 30' HORIZONTAL

LEGEND

- PROPERTY BOUNDARY
- CENTERLINE OF ROAD
- ADJACENT PROPERTY LINE
- PUBLIC RIGHT-OF-WAY

BMP TABLE

BMP ID #	BMP TYPE	SYMBOL	CASQA NO.	QUANTITY	DRAWING NO.	SHEET NO.(S)	INSPECTION FREQUENCY	MAINTENANCE FREQUENCY
TREATMENT CONTROL								
(1) - (9)	BIOFILTRATION RAISED PLANTER		TC-32	4,078 SF.	____	DWG ___ SHEETS 4	SEMI-ANNUALLY	ANNUALLY & AS-NEEDED
(10) - (11)	TREE WELL		TC-32	4 EA	SD-A	DWG ___ SHEETS 4	SEMI-ANNUALLY	ANNUALLY & AS-NEEDED
SITE DESIGN								
(12) - (15)	SUSTAINABLE LANDSCAPING	LA		17,875 SF.	SD-K	DWG ___ SHEETS 4	ANNUALLY	MONTHLY
(16) - (23)	DIRECT RUNOFF TO IMPERVIOUS AREA	●			SD-B	DWG ___ SHEETS 4	ANNUALLY	AS-NEEDED
TRASH CAPTURE BMPS								
(24) - (33)	FROG CREEK MUNDUS BAG TTC		TC-50	11 EA		DWG ___ SHEETS 4	SEMI-ANNUALLY	ANNUALLY & AS-NEEDED

PARTY RESPONSIBLE FOR MAINTENANCE:

NAME CARLSBAD VILLAGE II, LLC

ADDRESS 5120 SHOREHAM PLACE #150
SAN DIEGO, CA 92122

CONTACT PATRICK ZABROCKI

PHONE NO. (949)-812-0274

PLAN PREPARED BY:

NAME TYLER LAWSON

SIGNATURE

COMPANY PLSA ENGINEERING

ADDRESS 1911 SAN DIEGO AVENUNE
SAN DIEGO, CA 92110

PHONE NO. (858) 259-8212

BMP NOTES:

CERTIFICATION _____

1. THESE BMPS ARE MANDATORY TO BE INSTALLED PER MANUFACTURER'S RECOMMENDATIONS AND/OR THESE PLANS.
2. NO CHANGES TO THE PROPOSED BMPS ON THIS SHEET WITHOUT PRIOR APPROVAL FROM THE CITY ENGINEER.
3. NO SUBSTITUTIONS TO THE MATERIAL OR TYPES OR PLANTING TYPES WITHOUT PRIOR APPROVAL FROM THE CITY ENGINEER.
4. NO OCCUPANCY WILL BE GRANTED UNTIL THE CITY INSPECTION STAFF HAS INSPECTED THIS PROJECT FOR APPROPRIATE BMP CONSTRUCTION AND INSTALLATION.
5. REFER TO MAINTENANCE AGREEMENT DOCUMENT.
6. SEE PROJECT SWQMP FOR ADDITIONAL INFORMATION.

BMP CONSTRUCTION AND INSPECTION NOTES:

THE EOW WILL VERIFY THAT PERMANENT BMPS ARE CONSTRUCTED AND OPERATING IN COMPLIANCE WITH THE APPLICABLE REQUIREMENTS. PRIOR TO OCCUPANCY THE EOW MUST PROVIDE:

1. PHOTOGRAPHS OF THE INSTALLATION OF PERMANENT BMPS PRIOR TO CONSTRUCTION, DURING CONSTRUCTION, AND AT FINAL INSTALLATION.
2. A WET STAMPED LETTER VERIFYING THAT PERMANENT BMPS ARE CONSTRUCTED AND OPERATING PER THE REQUIREMENTS OF THE APPROVED PLANS.
3. PHOTOGRAPHS TO VERIFY THAT PERMANENT WATER QUALITY TREATMENT SIGNAGE HAS BEEN INSTALLED. PRIOR TO RELEASE OF SECURITIES, THE DEVELOPER IS RESPONSIBLE FOR ENSURING THE PERMANENT BMPS HAVE NOT BEEN REMOVED OR MODIFIED BY THE NEW HOMEOWNER OR HOA WITHOUT THE APPROVAL OF THE CITY ENGINEER.

FROG CREEK PARTNERS MUNDUS BAG TTC

NOT TO SCALE

REGISTERED PROFESSIONAL ENGINEER
TYLER G LAWSON
No. 80356
Exp. 12/31/24
CIVIL
STATE OF CALIFORNIA

SHEET	CITY OF CARLSBAD TENTATIVE TRACT MAP	SHEETS 8

SINGLE SHEET BMP:
HOPE AVENUE APARTMENTS
HOPE AVENUE

ENGINEER OF WORK:
TYLER G LAWSON
DATE:
RCE: 80356

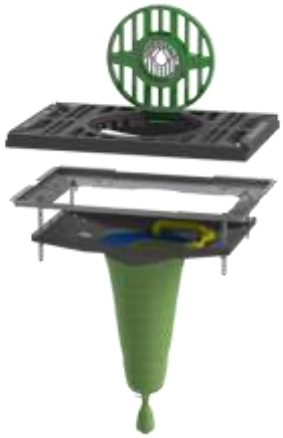
DWN BY: BAK
CHKD BY: ___
RVWD BY: TGL

PASCO LARET SUITER & ASSOCIATES
San Diego | Solana Beach | Orange County
Phone 858.259.8212 | www.plsaengineering.com

J:\ACTIVE JOBS\3802 WERMERS\CIVIL\REPORTS\SWQMP\DISCETIONARY\ATTACHMENT 4 - SINGLE SHEET BMP\3802-CV-SSBMP.DWG

FROG CREEK PARTNERS, LLC

Device Application for Full Trash Capture Certification of the Gutter Bin® Eco Drop Inlet Filter and the Mundus Bag® water filter



Gutter Bin® Eco Drop Inlet Filter (DIF) with optional Original Gutter Bin® grate

Gutter Bin® Eco Drop Inlet Filter for Combination Inlets (DIF-C)

1. Cover Letter

January 7th, 2020

Eileen Sobeck
Executive Director
California State Water Resources Control Board
Division of Water Quality
P.O. Box 100
Sacramento, CA 95812-100

Re: Application for Trash Treatment Control Device – Gutter Bin® Eco Drop Inlet Filter & Mundus Bag® water filter

Dear Director Sobeck:

Frog Creek Partners, LLC is pleased to submit this updated application for Certification as a Full Capture System - Trash Treatment Control Device for the Gutter Bin® stormwater filtration system Eco Drop Inlet Filter and the Mundus Bag® water filter. We submit this application in accordance with the California State Water Resources Control Board Trash Treatment Control Device Application Requirements and it includes the following minimum requisite sections:

1. Cover Letter
2. Table of Contents
3. Physical Description
4. Installation Information
5. Operation and Maintenance Information
6. Reliability Information
7. Field/Lab Testing Information and Analysis

I appreciate your review of our application and the work that you do to keep our watersheds clean. If you require additional information, please feel free to contact me at brian@frogcreek.partners or 307.439.9570.

With kind regards,

Brian Deurloo
President & Founder
Frog Creek Partners

1.A. General description of the Device.

The patent pending Gutter Bin® stormwater filtration system Eco Drop Inlet Filter ("DIF") is a proven permanent or temporary stormwater filter for use in removing pollution from drop inlets. The DIF consists of five main components: 1) the under-grate frame, 2) the filter hanger with receiver, 3) the diverter screen or inlet screen for DIF-C Devices 4) the sampling port, and 5) the patent pending Mundus Bag® water filter. The DIF is installed under the drop inlet's existing storm drain cover. The DIF's adjustable under-grate frame (UGF) is placed on the grate shelf under the storm grate and acts as a frame to suspend and secure the other DIF components. A filter hanger with a circular opening (aka receiver) and a progressive overflow trash screen is suspended below the UGF. The distance between the UGF and the filter hanger acts as an overflow which can be adjusted by raising or lowering the filter hanger in relation to the UGF. For combination inlets with curb inlet openings under the sidewalk, the DIF can be fitted with a diverter screen or inlet screen to direct water entering the curb inlet opening onto the filter hanger (this product configuration is known as the DIF-C). Collectively, the DIF and DIF-C are referred to in the remainder of this application as "Device" or "Devices".

A removable and flexible Mundus Bag® water filter is placed in the circular receiver of the Device's filter hanger. The reusable or single-use Mundus Bag ("MB") water filter, when used in conjunction with the Devices, captures 100% of trash 5mm or greater in size because the MB's maximum orifice size is less than 5mm. The MB drops into the Device's filter hanger receiver and captures target pollutants while retaining pollution with an integrated backflow preventer. The Device's filter hanger channels water to flow through the flexible MB to remove 100% of trash from stormwater inlets.

The modular and scalable design of the Device allows it to fit within a variety of drop inlet configurations and catch basin sizes. A circular version of the DIF is available to fit round drop inlets. The Device captures a wide range of pollutants including trash, gross pollutants, vegetative waste, sediment, hydrocarbons, and heavy metals. The Device is a passive, gravity flow device that allows water to bypass the MB in high flow events by overflowing the filter hanger, thereby minimizing flooding risks. The Device also allows water to bypass even if the MB is 100% full of material or if stormwater flow exceeds the MB's hydraulic capacity. A progressive overflow trash screen surrounds the filter hanger and allows water to flow through the perforated trash screen while also retaining material 5mm or greater in size. The Device requires routine maintenance to remove captured pollutants and/or replace filtration media on an as-needed basis.

The Mundus Bag® water filter is used in conjunction with the Gutter Bin® stormwater filtration system products to remove 100% of trash from stormwater inlets. The MB is unique because it allows for customizable pollution removal, backflow prevention, and

adjustable sizing. The MB can be adjusted to different lengths and also cleaned through the bottom of the filter, rather than just the top like other types of stormwater filters. Frog Creek Partners (FCP) offers a variety of sizes and filtering configurations to suit the customer's and environment's needs. The MB's flexible design allows it hang straight or bend within irregularly shaped or shallow catch basins. Total trash capture model Mundus Bags (TTC-MB) are reusable and are standard on all Devices. Other MBs that provide additional filtration are optional and may have limited reusability but still allow for full trash capture. For example, the Mundus Hoop, MB trash capture model, and some MYCLEX media is reusable and the MBs with sediment lining are generally single use.

Optional filter media may be added or attached to the MB to provide additional filtration or vector control management including but not limited to:

1) MYCELX filter media (MYCELX is an anti-fungal, anti-microbial and certified environmentally safe media that removes fuel, oil, grease, emulsified oils, pesticides, and heavy metals from water);
2) Proprietary activated carbon-based filtration pillows for heavy metal removal;
3) Non-woven or woven filter material (usually geotextile); and/or
4) Perforated metal filter basket (with or without a releasable bottom closure).

1.B. The applicant's contact information and location.

Corporate contact:
Brian Deurloo
President & Founder
Frog Creek Partners, LLC
800 West Yellowstone Highway
Casper, WY 82601
307-439-9570 or 307-797-7720
brian@frogcreek.partners
https://frogcreek.partners/

1.C. The Device's manufacturing location.

Frog Creek Partners' Devices and Mundus Bags are designed and manufactured in the United States. FCP engages multiple manufacturing subcontractors to produce all or part of the metal and fabric components with strict QA/QC oversite by Frog Creek Partners. Gutter Bin Eco Drop Inlet Filters are assembled at the FCP manufacturing facility in Casper, Wyoming and the MBs are fabricated in Casper, Wyoming.

1.D. A brief summary of any field/lab testing results that demonstrate the Device's functions as described within the application.

The Frog Creek Partners' Gutter Bin Eco Drop Inlet Filter system and MB water filter successfully captured and retained 100% of trash 5mm or greater in size in multiple tests in water flows that exceeded a design one-year, one-hour storm event. Repeated tests successfully captured cigarette butts and trash without resuspension given the MB's high storage capacity, low differential pressure, and backflow preventer. The MB's large screen openings (less than 5mm in size) allowed ample hydraulic capacity and did not blind from sand and sediment loading. Additionally, the progressive overflow trash screen proves to be an excellent mechanism to capture trash during extremely high-volume simulated storm events.

Multiple third party validated field and lab tests proved the Devices' successful performance. FCP conducted the lab test at FCP headquarters in Casper, Wyoming. FCP used a "trash recipe" as recommended by Stormwater Environment Manufacturers Association (SWEMA). The Device captured 100% of the trash recipe in flowrates ranging from 50 gpm to 500 gpm. Multiple MB models were tested to ensure that the both the TTC-MB (Total Trash Capture MB) and the TDS-MB (Trash, Debris & Sediment MB) performed to State Water Resource Control Board ("SWRCB") requirements for 100% trash capture.

100% trash capture test results = SUCCESSFUL - PASS TEST.

1.E. A brief summary of Device limits, and operational, sizing, and maintenance considerations.

Limitations

The Device's limitations are one of the DIF's strongest attributes as the product has few limits. Albeit, the MB does have limited capacity to hold pollutants before it needs to be replaced or evacuated, but this can be solved by installing the largest MB possible for the catch basin and by scheduling regular maintenance. Field test prove that a 13" MB can hold over 150 pounds of sediment and a 16" MB can hold over 200 pounds of sediment if both are fastened at a depth of approximately 3.5 feet below the Mundus Hoop. Industrial grade thread and high-quality sewing prevent the MB from ripping at the seams. The MB can be configured to capture sediment, heavy metals, hydrocarbons and 100% of trash. The UV protected and industrial strength fabric used in the MB may need replacement every one (1) to two (2) years depending upon the fabric or filter media used. To avoid fabric limitations, a metal basket of the anticorrosive type may be used to maximize filtration media life. The fabric style MB is preferred because of its ease of maintenance and flexible nature.

Operation

The Device has very few moving parts and is a passive filtration device. Once installed, minimal operational oversight is required except during servicing. One can easily introduce vector controls in, around, or under the Device. The vector control devices/media can be placed in, around, or below the Device including:

1) attached to the surface of the filter hanger or frame;
2) inside the MB;
3) placed on the filter hanger of the Device so the vector control material is washed into the catch basin during the next storm; and/or
4) through the sample port and below the Device in the catch basin.

Sizing

FCP offers custom made and adjustable Devices to fit a plethora of drop inlet configurations. The. FCP has a library of design templates to choose from and can provide Devices to fit nearly any size and style drop inlet or combo inlet configuration. FCP (or designee) measures and records each catch basin prior to engineering so the fit and function align with the Engineer's requirements for a specific application. The fact that the UGF is adjustable allows the Device to fit in almost any length or width drop inlet. Additionally, the distance by which the filter hanger is suspended below the UGF and the overall MB length can be adjusted so that the Devices can fit both deep and shallow drop inlet catch basins with varying hydraulic capacities. The smallest MB currently made by FCP is 9 inches in diameter so a catch basin smaller than 12" x 12" may require a custom sized MB. As an alternate configuration, the Device's filter hanger can be constructed to accept multiple MBs side by side for high aspect ratio drop inlet configurations.

Maintenance

The Device is one of the most easily maintained storm inlet filters on the market. Experience has proven that the DIF and MB can be manually cleaned within three to five minutes per maintenance cycle. The Device, as all storm drain filter systems, has its own unique maintenance interval requirements that depend upon local climate, pollution load, staffing, and network infrastructure. Low traffic area installations may only need to be inspected and/or maintained once per year. High traffic areas with frequent gatherings of people and sensitive discharge requirements may require monthly Device inspection and/or maintenance. FCP recommends that each Gutter Bin be inspected at least twice per year to ensure proper function and filtration.

Maintenance frequency is also driven by the intensity of filtration efforts. For example, industrial facilities who require sediment, heavy metal, hydrocarbon, and trash (SHHT) removal may need more frequent inspection to stay in compliance with their industrial general permit (IGP). FCP offers the SHHT-MB to remove the SHHT contaminants. Maintenance is performed by removing the inlet cover (aka storm grate), visually inspecting the Device, and removal/replacement of the filter media and MB. Depending on the type of MB used, it may either be emptied of pollutants and reused; or the MB may be disposed of and replaced. Once maintained, the inlet cover is replaced.

1.F. Description or list of locations where Device has been installed.

The city of Santa Maria, California is the site of a field test of the Device since January 2019. The Carpinteria Fire Department is also the site of a field test where the customer requires trash and hydrocarbon removal since July 2018. The customer performs the service at these locations.

Outside of California, the following cities use the Devices for stormwater pollution capture:

- Parker, Colorado
- Colorado Springs, Colorado
- Denver, Colorado
- Vail, Colorado
- Cheyenne, Wyoming
- Casper, Wyoming
- Sheridan, Wyoming
- Jackson Hole, Wyoming

References available upon request.

1.G. Certification Clause.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons that manage the system or those persons directly responsible for gathering the information, to the best of my knowledge and belief, the information submitted is, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Brian Deurloo
President
Frog Creek Partners, LLC

2. Table of Contents

Table of Acronyms

Abbreviation or Acronym	Explanation
AOS	apparent opening size
ARS	automatic retractable screen
bbls	barrels
BFP	back flow preventer
BMP	best management practice
CAMP	Clean and Measure Pollution Service
CDC	Center for Disease Control
CFS	Channel Filter System
cfs	cubic feet per second
CIF	Curb Inlet Filter
cm	centimeters
COB	close of business
CRM	customer relationship manager
CSS	combined sewer system
dia	diameter
DIF	Drop Inlet Filter
DIF-C	Drop Inlet Filter for Combination inlets
dP	differential pressure
EOP	end of pipe
EOY	end of year
EPA	Environmental Protection Agency
FCP	Frog Creek Partners
FH	Filter Hanger
ft	feet
ga	gallons
GAC	granulated activated carbon
GB	Gutter Bin® stormwater filtration system
GPM	gallons per minute
ID	inside dimension
IF	Interface Funnel
IFE	interface funnel extender
IGP	Industrial General Permit
in	inches
IP	Intellectual Property

Abbreviation or Acronym	Explanation
l	liters
lbs	pounds
m	meters
MB	Mundus Bag® water filter
MFH	manhole frame hanger
MH	Mundus Hoop
min	minutes
mm	millimeters
MS4	municipal separate storm sewer system
MVCAC	Mosquito Vector Control Assoc. of California
ND	non detect
NDA	nondisclosure agreement
NJCAT	New Jersey Corporation for Advanced Technology
NPDES	National Pollutant Discharge Elimination System
OD	outside dimensions
OGB	Original Gutter Bin
PCT	Patent Cooperation Treaty
PE	professional engineer
POA	percent open area
PPE	personal protection equipment
PPP	public private sponsorships
PSI	pounds per square inch
s	seconds
SAT	suspender anchor tab
SHHT	Sediment, Heavy Metals, Hydrocarbons, Trash
SPCC	Spill, Prevention Control, and Countermeasure
SS	stainless steel
SWEMA	Stormwater Environment Manufacturers Assoc.
SWPPP	Stormwater Pollution Prevention Plan
SWRCB	Stormwater Resources Control Board
TAPE	Technology Assessment Protocol - Ecology
TDS	trash debris & sediment (for Mundus Bags)
TDS	total dissolved solids (for water sampling)
TMDL	Total Maximum Daily Load
TSS	total suspended solids
TTC	total trash capture
UGF	Under Grate Frame
USPTO	United States Patent and Trademark Office

3. Physical Description

3.A. Description of how the Device works to trap all particles that are 5mm or greater in size and how it is sized for varying flow volumes.

The Device's components are arranged to employ a shingling effect to direct water into the filter hanger; much the same way shingles on a roof overlap to allow water to cascade down a roof. The inside dimension (ID) of the under-grate frame (UGF) is greater than the outside dimension (OD) of the filter hanger that is suspended below the UGF. Water travels vertically through the storm grate and onto the UGF and then it cascades downward onto the filter hanger. The filter hanger is sloped towards a receiver where the MB water filter is placed. The MB hoop diameter is slightly larger than the receiver's diameter in the filter hanger thereby preventing the MB hoop from falling through the receiver. The Device's filter hanger positions the MB near the center of the catch basin and directs stormwater into the MB so that pollutants can be filtered from the water as it flows through the filter media. The filter hanger can accommodate one or more MBs depending upon the aspect ratio of the storm drain. Longer and narrower storm drains may accommodate two (2) MBs side by side to increase pollution capture capabilities, hydraulic capacity, and increased service interval.

In the alternate DIF-C configuration for combination drop inlets, stormwater entering the curb inlet opening is directed onto the filter hanger and into the MB by a diverter screen attached to the filter hanger and below the curb inlet opening. The diverter screen is perforated with holes less than 5mm in size and may embody diverter wings on either end to channel water/pollution from the corners of the inlet and into the MB. As an alternative to the diverter screen, an inlet screen can attach to the curb inlet opening entrance to prevent any trash 5mm or greater in size from entering the curb inlet. The inlet screen is sloped to prevent clogging and has an opening at the top to allow high flow water to bypass the inlet screen thereby preventing flooding. Neither the diverter screen nor the inlet screen affects the means by which vector control accesses the sampling port. Vector control personnel can operate any of the vector control sampling port options with either the diverter screen or the inlet screen present.

Devices are sized to fit each catch basin. As a result, the Device size is directly proportional to the size of the catch basin and performance characteristics generally scale with the increase overall hydraulic capacity of a larger frame. The Device is adjusted for length and height to fit the full dimensions of the drop inlet's grate shelf. The area between the top of the Device's filter hanger and the bottom of the UGF acts as the bypass (aka overflow). The greater the distance between the UGF and the filter hanger equates to greater overflow capacity.

The Device and the MB incorporate the following design features to ensure full capture of all particles 5mm or greater in size:

- An adjustable backflow preventer at the mouth of the MB prevents resuspension or expulsion of captured pollutants in times of high precipitation or system backflush;
- The top of the Device's filter hanger is rimmed with a progressive overflow trash screen that is approximately 2 inches high and maximum aperture openings of less than 5mm in size. If the MB is unable to accommodate the volume of water due to quantity or previously captured pollution, then the trash screen will allow water to overflow the filter hanger while still capturing trash 5mm or greater in size. An extremely high flow of water will overtop the trash screen which allows water to drain from the streets and prevent flooding;
- High flow and downward pressure of water causes trash to pack near the bottom of the MB; and
- No holes in the Device or MB that exceed 5mm in size except in bypass/overflow area.

The filter media normally comprises of polypropylene netting material with a maximum aperture size of less than 5mm in size. An expandable and adjustable backflow preventer at the entrance to the filter media can expand to accept larger trash during high flow and can constrict at low flow, thereby capturing and retaining 100% trash. The bottom of the MB is fastened to prevent trash loss but can be opened during service to allow pollutants to drop out for MB reuse.

The MB's net material has excellent wear & tear characteristics, UV protection, and chemical resistance. The MB's flexible structure allows installation in a variety of environments and catch basin configurations. The net material normally comprises of polypropylene or propylene but can be substituted with any other suitable material(s) (i.e. plastic, fiberglass, fabric, carbon, etc.) that capture trash 5mm or greater in size. FCP can also offer a more rigid style filter media in the form of a perforated basket constructed of plastic, stainless steel, carbon, or other material that suits the environment and customer's needs. The rigid style basket offers greater longevity with the same 100% trash capture capabilities but, is less flexible in shape.

The adjustable overflow of the Device is variable depending upon the environment's hydraulic requirements and the catch basin's depth. For example, a catch basin that is sufficiently deep (>24") can be fitted with a Device with up to a 24 inch in depth adjustable overflow (see 3.C. for more information).

A typical MB for DIF and DIF-C applications comprises of:

- **Mundus Hoop (“MH”):** a reusable hoop that serves as a rigid connection mechanism between the MB and the Device’s filter hanger and receiver. The MH can also be permanently integrated to the MB;
- **Anchor Wrap:** industrial grade fabric and expandable closure located at the top of the MB to fasten the MB to the MH;
- **Lifting Strap:** a strap attached to the anchor wrap allows for lifting, handling, and weighing of the MB;
- **Backflow Preventer (“BFP”):** an adjustable and flexible device located at the inlet of the MB to prevent captured pollutants from escaping the filter during high water flow or system backflush;
- **Filter Media (“FM”):** a porous media incorporated to the MB that allows water to flow through while capturing target pollutants. A typical FM used with the trash capture MB is a chemical and UV resistant polypropylene netting with a 4.9mm maximum aperture size. Alternative filter media such as geofabric, MYCELX, and activated carbon can also be used to capture sediment, hydrocarbons, and heavy metals. Alternatively, a removeable perforated rigid basket can be used as a gross pollutant trap; and
- **Bag Tie:** a removable fastener attached to the bottom end of the MB to provide closure. A removable bag tie allows a service technician to dump contents from the bottom of the MB.

FCP can provide specialty MYCELX infused products to safely capture and retain hydrocarbons from stormwater in a plethora of configurations and environments. FCP is seeking partnerships and facilities to explore ways to recycle components of the MB water filter and its captured pollutants.

The patent pending MB has many advantages, including:

- 100% trash capture and retention;
- Easily cleaned – pull, dump, replace;
- High quality – UV resistant, chemical resistant, tear resistant material;
- Flexible tubular shape – fits in more places than rigid baskets;
- Adjustable and expandable backflow preventer – opens/closes to accept large pollutants and prevents loss of captured pollutants;
- Adjustable height – for shallow and deep applications;
- Customizable filtration – targeted pollution removal to fit the environment;
- Easily lifted – lifting strap allow person or machine to lift and weigh bag;
- Reusable – the total trash capture (TTC) model is reusable;
- Disposable – The TTC-MB and TDS-MB can also be thrown away;

- Closure strap – the MB can be cinched up tight on both ends to encapsulate trash for cleaner disposal;
- No vacuum truck needed – an industrial vac truck requires a lot of maintenance, it's highly intensive to run, and the removed pollutants from other devices must be decanted, loaded and hauled to a dump;
- Cleaned by vac truck – a vac truck crew can evacuate the contents of an MB with proper instruction by FCP and minor alterations to the standard MB;
- Minimal waste handling – the MB and/or the trash only needs to be handled once. Where a vac truck requires the waste to be handled three times (suck, decant, load, haul, dump at landfill;
- MYCELX capable – one of the cleanest hydrocarbon capture medias on the market. So much so, it is approved for use in the Galapagos National Park and certified environmentally safe by Lloyds Register Marine and Shipping; and
- Environmentally friendly - FCP is seeking partnerships and facilities to explore methods to recycle components of the MB water filter and/or its captured pollutants.

3.B. Design drawings for all standard Device sizes including dimensions, and alternative configurations.

Please refer to Appendix C for design drawings and Device specifications. The Device's UGF is adjusted to fit the width and length of the drop inlet catch basin. The four corners of the UGF are a common part. FCP can provide any size spacers for different sized catch basins; even bent grates. The Devices are offered in custom or adjustable sizing. FCP has a library of design templates to choose from and can provide Devices to fit nearly any size and style drop inlet. FCP (or designee) measures records each catch basin prior to engineering so the fit and function align with the Engineer's requirements for a specific application.

The Engineer is a person who designs, builds, specifies or maintains stormwater infrastructure for FCP's customer or end-user.

The fact that the UGF is adjustable allows the Device to fit in almost any length or width drop inlet. Additionally, the distance by which the filter hanger is suspended below the UGF and the overall MB length can be adjusted so that the Devices can fit both deep and shallow drop inlet catch basins with varying hydraulic capacities (outlet capacity). As an alternate configuration, the Device's filter hanger can be constructed to accept multiple MBs side by side for high aspect ratio drop inlet configurations for longer service intervals.

The Device is engineered to fit the following rectangular catch basin dimensions:

- Length (measured parallel to the street): 12 to 72 inches
- Width (measured perpendicular to the street): 12 to 72 inches

The Device is engineered to fit the following round catch basin dimensions:

- Diameter (measured parallel to the street): 12 to 72 inches

The Device can be altered, or custom made to suit the customer's need and the environment in which it operates.

The alternative Device configurations comprise of:

1. **Diverter Screen & Diverter Wings**: for combination inlets with curb inlet openings under the sidewalk, a diverter screen and diverter wings can be attached to the filter hanger to direct water onto the Device's filter hanger and into the MB. The diverter screen is situated approximately six to eight inches below the curb inlet opening and directs water spilling in from the curb inlet opening onto the filter hanger and into the MB. This is an advantage because trash does not accumulate at street level with this orientation, but it can be slightly more difficult to clean the diverter screen because it is below the curb inlet opening. One should choose the diverter screen over the inlet screen if trash accumulation at street level is not preferred. Either the diverter screen or inlet screen should be used for catch basins with a curb inlet opening to achieve 100% trash capture. The diverter screen does not affect the means by which vector control accesses the sampling port. Vector control personnel can operate any of the vector control sampling port options with the diverter screen present. As previously mentioned, this configuration is referred to as DIF-C;
2. **Inlet Screen**: an inlet screen can be placed in the curb inlet opening that prevents trash 5mm or greater in size from entering the curb inlet. This inlet screen is engineered and installed allow water to bypass the inlet screen during high water events (i.e. greater than one year, one hour events). The inlet screen is installed at street level and prevents trash from entering the curb inlet opening and directs trash to fall into the storm grate and filtered by the MB. Compared to the diverter screen, the inlet screen is easier to access and clean because it is at street level. One simply wipes off the surface of the inlet screen to cause trash to fall off. One should choose the inlet screen over the diverter screen if trash accumulation at the street level is preferred which can aid in street sweeping activities. Either the diverter screen or inlet screen should be used for catch basins with a curb inlet opening to achieve 100% trash capture. The inlet screen does not affect the means by which vector control accesses the sampling port. Vector control personnel can operate any of the vector control sampling port

options with the inlet screen present. As previously mentioned, this configuration is referred to as DIF-C;

3. **Original Gutter Bin Grate**: The Devices can be covered with an optional Original Gutter Bin grate (OGB) instead of a typical cast iron grate. The OGB is HS-20 load rated and has a hinged access hatch directly over the MB to provide easy access for inspection and servicing. The OGB is not required for stormwater filtration, it is simply an optional replacement for a cast iron grate. Please see Appendix C for more information;

Image 1 - Custom zebra edition optional Original Gutter Bin grate

4. Automatic Retractable Screen (ARS): An ARS can be used in conjunction with the Devices. FCP does not manufacture nor install ARS devices, but the DIF can be installed in a combination inlet that employs the use of an existing or proposed ARS. If an ARS is used in conjunction with the DIF (and/or optional OGB), then a diverter screen or curb inlet screen is likely not required since the ARS will prevent trash from entering the curb inlet opening if properly constructed, installed and certified by the SWRCB. An ARS does not affect the means by which vector control accesses the sampling port. Vector control personnel can operate any of the vector control sampling port options with an ARS present;

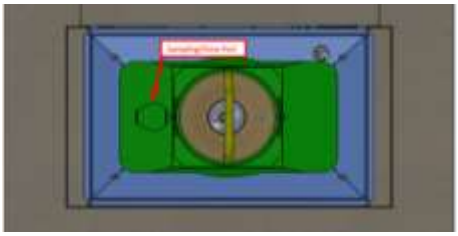


Figure 1 – Sampling/View port (5" in diameter)

5. **Mundus Bag**: can be in flexible or rigid structure as described in the application;
6. **Sampling/View Port**: Device can be equipped with a sampling port located on the Device's filter hanger or UGF. The sampling port can also be used for vector control inspection and servicing. *The Sampling/View Port is mandatory in California.*

3.C. If the Device is designed with an internal bypass, explain how the bypass only operates for volumes greater than the design storm.

The Device's bypass (aka overflow) is located above the filter hanger and MB water filter. The bypass becomes active when the stormwater flow exceeds the hydraulic capacity of the MB or when the MB is full of material. In these cases, the water spills over the side of the filter hanger and enters bypass mode while the MB continues to filter stormwater. All TTC-MB and TDS-MB model MBs have the hydraulic capacity to

handle a one (1) hour, one (1) year design storm event prior to entering bypass mode. See Appendix C for the hydraulic calculations of the MB water filter.

The Device has an adjustable overflow that acts as an internal bypass. The adjustable overflow is formed by the space between the bottom of the UGF and the top of the suspended filter hanger. This overflow can be adjusted by raising and lowering the filter hanger based on the hydraulic capacity needs of the environment and the relative depth of the catch basin. For example, if the catch basin has a 12” outlet pipe, then the Device overflow open area must be equal to or greater than the open area of the outlet pipe; in this case 113 sq. in. A DIF with filter hanger dimensions of 30” long and 18” wide set to an overflow depth of 2” below the UGF achieves an open area of 192 sq. in. (which is 70% greater than the hydraulic capacity of the 12” outlet. The MB adjustable overflow can be adjusted to 8 inches or more in depth. Therefore, the unique design of the Devices provides unparalleled overflow capability.

The adjustable overflow forms a space in which stormwater will overtop the edges of the filter hanger and cascade down to the bottom of the catch basin. As an added level of trash capture, a progressive overflow trash screen approximately 2 inches high and maximum aperture openings of 4mm surrounds the top of the Device’s filter hanger (required on all California models). If the MB is unable to accommodate the volume of water due to quantity or previously captured pollution, then the trash screen will allow water to overflow the filter hanger while still capturing trash 5mm or greater in size. In normal operation, water will only exceed the progressive overflow trash screen and bypass the filtering capabilities of the Device under extreme weather situations or if the Device is not properly maintained and captured pollutants significantly decrease the flow capacity of the MB.

The Engineer is responsible for confirming that the flowrate and bypass capacity of the Device meet or exceed infrastructure and hydraulic capacity requirements.

3.D. Engineering plans/diagrams for a typical installation.

Typical installation configuration engineering plans may be found in Appendix C.

3.E. Photographs, if any, of pre-and post-installation examples.

Photographs showing the typical installation of the Device are found below.

Image 2 – Adjustable DIF with closed sample port and without a Mundus Bag

Image 3 – Installed custom made DIF-C with Mundus Bag, diverter screen, diverter wings, and sample port location

Image 4 – Installed DIF-C below the existing storm grate cover and an inlet screen in curb inlet opening

Image 5 - Installed DIF-C with diverter screen and optional OGB grate (access hatch closed)

Image 6 - DIF with progressive overflow trash screen

Image 7 - DIF with progressive overflow trash screen with Mundus Bag register visible in filter hanger

Image 8 - Demonstrating Mundus Bag removal for a DIF with grate removed

Image 9 - Demonstrating Mundus Bag removal for a DIF

Image 10 – Opening the sample port through the optional OGB grate with access hatch in locked open position and Mundus Bag installed

Image 11 - Demonstrating the closing of the OGB access hatch

Image 12 - Installation of an optional OGB grate for a DIF-C

Image 13 – Optional Custom OGB in front of United State Olympic Basketball Headquarters

Image 14 – Open hinged sample port located on UGF to view catch basin

Image 15 – Opening pivot sample port through grate hole with 1" PVC pipe

Image 16 – perspective view of a DIF-C with cast iron grate.

3.F. Device maximum trash capture capacity.

The calculation for the MB trash capacity is very simple with the formula *(radius and height in inches)*:

$(3.14 \times r^2 \times h)/1{,}728$ = volume (cu. ft.)

(pi) x (radius squared x height)/ (1,728 cubic inches/ft^3) = volume in cubic feet

Table 1 - Mundus Bag® water filter specifications

Model	Bag dia (inches)	Max capacity (cu.ft)	Aperture size - particle retention (mm) (X 1000 for micron)	Min/Max length of filter (in)	Max capture load (lbs)	Max load rating of filter bag (lbs)	Empty bag flow rate (gpm)	Reusable	Est. useful life (months)
TTC-9	9	1.77	3.5	12/48	33	291	1,037	Yes	6-18
TTC-9D*	9D	1.77	3.5	12/48	33	291	2,074	Yes	6-18
TTC-13	13	3.14	3.5	12/48	59	517	2,153	Yes	6-18
TTC-14	14	4.27	3.5	12/48	80	704	2,615	Yes	6-18
TTC-16	16	5.58	3.5	12/48	104	920	3,447	Yes	6-18
TDS-9	9	1.77	0.21	12/48	242	291	1,037	No	3-12
TDS-9D*	9D	1.77	0.21	12/48	242	291	2,074	No	3-12
TDS-13	13	3.14	0.21	12/48	431	517	1,935	No	3-12
TDS-14	14	4.27	0.21	12/48	587	704	2,125	No	3-12
TDS-16	16	5.58	0.21	12/48	766	920	2,428	No	3-12
HST-9	9	1.77	0.21	12/48	242	291	1,037	Partial	3-12
HST-9D*	9D	1.77	0.21	12/48	242	291	2,074	Partial	3-12
HST-13	13	3.14	0.21	12/48	431	517	1,935	Partial	3-12
HST-14	14	4.27	0.21	12/48	587	704	2,125	Partial	3-12
HST-16	16	5.58	0.21	12/48	766	920	2,428	Partial	3-12
SHHT-9	9	1.41	0.10	24/72	194	233	410	Partial	3-12
SHHT-9D*	9D	1.41	0.10	24/72	194	233	820	Partial	3-12
SHHT-13	13	2.51	0.10	24/72	242	414	581	Partial	3-12
SHHT-14	14	3.42	0.10	24/72	431	563	637	Partial	3-12
SHHT-16	16	4.47	0.10	24/72	587	736	728	Partial	3-12

Please refer to the MB specification sheet in Appendix C for specific filter media capacities.

The same sizing variances can be applied to the rigid style filter media for maximum trash capture and extended service intervals. Field experience has shown that the 13” total trash capture model Mundus Bag (TTC-MB) can easily hold up to 70 pounds of trash and debris. Additionally, field experience demonstrates that a 13” TDS-MB can hold over 150 pounds of sediment and a 16” TDS-MB can hold over 200 pounds of sediment when both are fastened at a depth of approximately 3.5 to 4 feet below the Mundus Hoop.

3.G. The Device hydraulic capacity (flow in cfs) at its maximum trash capture capacity for all standard Device sizes.

Please refer to the MB spec sheet in Appendix C for specific filter media hydraulic capacities.

The Devices and MB are designed for a filtering hydraulic capacity of at least a one (1) hour, one (1) year storm event. The smallest diameter total trash capture MB (TTC-9) can accommodate a flowrate of 2.31 cfs (1,037 gpm) when empty or half full. The average size MB for typical drop inlets is 13” (TTC-13). The TTC-13 can accommodate

a flowrate of 4.80 cfs (2,153 gpm) when empty or half full. If a flowrate into a storm inlet exceeds the maximum flowrate capacity of an MB, then the water will bypass the MB water filter through the overflow and thereby minimizing the risk of localized flooding.

Table 2 - Hydraulic capacity & trash capture volume for Mundus Bag model TTC-MB

MB dia. (in)	MB length (in)	Max flowrate of empty MB (cfs)	Max flowrate of MB half full (cfs)	Max capture volume (ft^3)
9	48	2.31	2.31	1.77
13	48	4.80	4.80	3.14
14	48	5.83	5.83	4.27
16	48	7.68	7.68	5.58

** Additional sizes of MBs may be added to product line to suit customer's needs. Any new sized MB's will meet or exceed a design storm as required by the State Water Board with 100% trash capture.*

The system maintains full hydraulic capacity until the MB is approximately 75% full. At this point, water accumulates on the filter hanger and trash is prevented from leaving the device by the progressive overflow trash screen before cascading around the filter hanger and into the catch basin. The Device will continue to function with full trash capture unless:

1) the progressive overflow trash screen experiences hydraulic capacity loss as pollutants blind off openings in the trash screen reducing the overall capacity of the Device to the point where water begins to overtop the progressive overflow trash screen and cascade into the catch basin unfiltered, or;
2) If the storm event exceeds the combined hydraulic capacity of the MB and progressive overflow trash screen.

The differential pressure (dP) created by the Device and MB is negligible when empty. The Device offers minimal flow resistance. The dP increases as the MB accumulates trash and debris when over half full.

As an example of the high flow capabilities of the Device, in a controlled test environment FCP introduced trash and 1.11 cfs (500 gpm) of water to a 36" x 24" DIF equipped with a 13" TTC-MB model MB. The tests were also performed using the TDS-MB model MB with similar results. The Device maintained 100% trash capture and complete water flow through the MB without bypass. Therefore, a properly sized Device can easily and effectively capture 100% of trash in a high flow environment and especially during the first flush.

The Device is also highly capable of capturing 100% of gross pollutants 5mm or greater in size during non-stormwater discharge (aka dry weather runoff). All low flow water and

pollution is funneled into the MB. The first flush of a rainstorm will push any pollutants into the MB that may be deposited on the filter hanger of the Device because the dry weather runoff may have lacked the volume to transport the pollutants into the MB.

3.H. Each material and material grade used to construct the Device.

The Device and MB are constructed of durable, weather resistant, high strength materials to provide a long service life. The materials used in the construction of the Device and the MB are as follows:

- **Device Under-Grate Frame (UGF):** Stainless steel (SS) of varying gauge;
- **Device Filter Hanger:** SS of varying gauge;
- **Diverter Screen & Inlet Screen:** SS of varying gauge;
- **Filter Hanger Suspenders:** SS of varying gauge, SS chain or rigid bar, and/or plastic;
- **Mundus Bag Hoop:** SS, fiberglass, or plastic of varying diameter or gauge;
- **MB Anchor Fabric:** marine grade, environmentally safe material;
- **MB Lifting Handle:** marine grade webbing;
- **Mundus Basket:** SS of varying gauge with orifice opening less than 5mm in size (rigid alternative to MB);
- **MB Netting Outer Shell:** polypropylene, propylene, or similarly durable fabric with orifice opening less than 5mm in size;
- **MB Closure Fastener:** industrial grade zip tie (or another fastener);

FCP uses stainless steel (SS) for the construction of the Devices but may use alternative environmentally safe materials for certain components (i.e. plastic, weathering steel, cast iron, carbon, fiberglass, rubber, silicone, etc.) if allowed by local, state and Federal regulations. California Device models are 100% stainless steel (or approved alternative). These materials are used throughout the entire line of Gutter Bin models and are the most durable materials available for these products. Adherence to current installation and maintenance procedures are required to ensure the design service life of the Devices and filter media.

3.I. Conditions under which the Device re-introduces previously trapped trash.

The Device is designed and engineered to capture and permanently retain all particles 5mm or greater in size. The backflow preventer (BFP) in the MB expands during high flow and restricts during low flow thereby capturing and retaining trash and pollution. The method in which the BFP captures and retains trash is similar to how a crab trap works - it is easy to enter but difficult to exit. Additionally, the progressive overflow trash screen acts as a second layer of defense against the reintroduction of previously

trapped trash. Conditions in which the Device and MB might reintroduce previously trapped trash include:

- If the Device becomes blinded because it is not properly maintained and pollutants are allowed to accumulate beyond the specified allowable limit, then water may accumulate on the filter hanger to such an extent that it will overtop the trash screen and overflow, thus bypassing the Device's filtration system;
- If the MB is damaged, then it may cause a condition that would allow for the reintroduction of captured pollutants. The filter media should be replaced if holes appear that are greater than 5mm in size;
- Unusual weather events that exceed the filter flow capacity of the Device may cause a condition that would allow for the re-introduction of captured pollutants;
- Backflow of the stormwater network may cause pollutants to reintroduce to the system. Backflow may be caused by a downstream stormwater network obstruction or from extreme tidal flows near coastal installations. The MB backflow preventer will prevent most, if not all, of the previously captured trash from escaping.

3.J. Estimated design life of the Device.

The DIF and DIF-C have a design life of 25 years assuming the proper installation, maintenance and service of the Device. The total trash capture (TTC model) MBs are reusable and have a service life of one (1) to two (2) years, depending upon site conditions. Trash, debris and sediment (TDS model) MBs with a liner and are a single use filter with a maximum service life of 12 to 18 months, depending upon site conditions.

3.K. Product Comparison

Removed at the direction of the California State Water Resources Control Board.

3.L. Optional components.

FCP offers the following optional components:

1. **Diverter Screen & Diverter Wings**: for combination drop inlets with curb inlet openings under the sidewalk, a diverter screen and diverter wings can be attached to the filter hanger that direct water onto the Device's filter hanger and into the MB. Either the diverter screen or inlet screen should be used for combination inlets to achieve 100% trash capture. See additional information in Section 3.B. As previously mentioned, this configuration is referred to as DIF-C;
2. **Inlet Screen**: a screen can be placed in the curb inlet opening that prevents trash 5mm or greater in size from entering the curb inlet entrance so all trash 5mm or greater is diverted into the storm grate cover and then into the Device.

This curb inlet screen can be fit to allow water to bypass the system during storms that exceed a one (1) hour and one (1) year storm event. Either the diverter screen or inlet screen should be used for combination inlets to achieve 100% trash capture. See additional information in Section 3.B. This configuration is also known as the DIF-C;

3. **Original Gutter Bin Grate**: The Device can be covered with an optional Original Gutter Bin grate (OGB) made of high-quality weathering steel (or other approved material). The OGB is engineered to HS-20 standards and has a hinged access hatch directly over the MB to provide easy access for inspection and servicing. The OGB replaces the old cast iron storm grate. The OGB is an optional component used to replace a cast iron grate. The OGB can be customized and branded for customers who want to participate in public private partnerships (PPP) and corporate sponsorship programs. Please see Appendix C for more information;
4. **Mundus Bag**: can be in flexible or rigid structure as described in the application;
5. **Filter Hanger Only**: there may be instances where a UGF is not necessary for the DIF installation and the filter hanger is suspended below the grate by anchoring it to the walls of the catch basin. This method also offers overflow capabilities without the UGF and the bypass can be adjusted with the suspension parts;
6. **Round DIF**: FCP offers a circular model of the Device for round drop inlets. The Device functions in a similar way as the normal rectangular DIF.
7. **Mundus Bag Sediment Liner**: nonwoven or woven fabric of varying thickness, apparent opening size (AOS) and sieve rating can be used as well as a number of other effective medias;
8. **Mundus Bag Proprietary Granulated Activated Carbon (GAC)**; a proprietary mixture of environmentally safe media for heavy metal removal also known as Performer™.
9. **Vacuum Truck Friendly MB:** One of the main attributes of the Gutter Bin stormwater filtration system and the Mundus Bag water filter is that together they provide measurable and quantifiable results. This is because the MB is removable so it can be individually weighed to determine how much pollution is being recovered over time and location. However, many organizations prefer to use vacuum trucks (aka “vac trucks” or “suck trucks”) because it is easy for them. For this reason, FCP offers a vac truck friendly MB that can be locked into the filter hanger and embodies a more robust filter media that stands up to the rigors

of repeated vacuum cycles. The apparent opening size (AOS) for this media is less than 5mm in size to ensure full trash capture. The vac truck friendly MB comes in a rigid perforated SS basket form and a flexible fabric. The vac truck friendly MB fastens to the filter hanger in same way as the MB does and locks in.

It is important to note that the MYCELX Oil-Free Technology is proven to be an effective and safe hydrocarbon capture media that is used in sensitive areas around the world. MYCELX hydrocarbon capture media is approved by Lloyd's Register Marine and Shipping for environmentally friendly, type C emulsion, 99% hydrocarbon removal. MYCELX is approved for hydrocarbon removal in the Galapagos Islands, Galapagos National Park. Vessels operating in the Galapagos National Park Reserve are required to have a bilge water treatment system and MYCELX is approved for this application.

4. Installation Guidance

4.A. Device installation considerations.

Frog Creek Partners can provide detailed instructions in written format to the installer to ensure proper installation techniques. Further, FCP offers video instruction on our website and can also provide virtual reality (VR) videos for viewing with the installers' VR headset (FCP can also provide the customer/installer a VR headset for instructional purposes).

Device installation requires a hand trowel, wrench, silicone (optional), hammer, metal punch and grate puller (installs in about five (5) minutes with experienced crew and up to 15 minutes for unique inlet configurations).

Size & Placement Considerations

The following instructions are the fitting procedures and considerations for the Device and MB installation:

1. **Measure & Quantify:** Determine the following catch basin dimensions:
    a. width and length of the drop inlet open area - inside dimension (ID);
    b. width and length of drop inlet from outside of grate shelf – outside dimension (OD);
    c. total depth of catch basin from grate shelf;
    d. distance between grate shelf and top of outlet;
    e. diameter of outlet pipe;
    f. width, height and length of curb inlet opening (for DIF-C model);
    g. dimensions of any obstructions within the catch basin than may impede Device insertion (ladder, grouting, abnormal catch basin configurations);

h. thickest point of storm grate within 5 inches of the perimeter;
i. thickest point of the storm grate and the distance from the perimeter; and
j. FCP can provide measurement data sheets or access to the FCP filed app for customers to record catch basin measurements

2. **Sizing:** Select or engineer the appropriately sized Device based on the catch basin dimensions. FCP provides adjustable and custom built Devices for unusual drop inlet applications
3. **MB Selection:** Select the appropriate MB model based on the following considerations:
    a. Device filter hanger MB receiver size. Multiple diameters of MBs are available (e.g. 9", 13", 14" and 16" as outlined in the MB spec sheet in Appendix C) to fit the different sized Devices;
    b. FCP offers the following models of Mundus Bag:
        - TTC-MB (Total Trash Capture Mundus Bag): standard MB offered in California for 100% trash capture with an apparent opening size (AOS) less than 5mm. This MB can be selected to capture 100% of trash.
        - TDS-MB (Trash, Debris, & Sediment Mundus Bag): optional MB that is tested and proven to capture 100% of trash 5mm or greater in size plus sediment and debris. This MB can be selected to capture other pollutants in addition to 100% trash.
        - SHHT-MB (Sediment, Heavy metals, Hydrocarbons & Trash Mundus Bag): optional MB that is tested and proven to capture 100% of trash 5mm or greater in size plus sediment, heavy metals, and hydrocarbons. The MB embodies MYCELX filter media to target the hydrocarbons and heavy metals. This MB can be selected to capture other pollutants in addition to 100% trash.
        - Vacuum Friendly Mundus Bag (VAC-MB): optional VAC-MB can be locked into the filter hanger and embodies a more robust filter media that stands up to the rigors of repeated vacuum cycles. The apparent opening size (AOS) for this media is less than 5mm in size to ensure 100% trash capture. The VAC-MB is offered in a rigid perforated SS basket form and a flexible fabric. This MB can be selected to capture 100% of trash.
    c. Hydraulic capacity; and
    d. Desired maintenance frequency.

4.B. Device installation procedures

Special Note: To ensure the best results and personnel safety, the catch basin and immediate areas should be thoroughly cleaned within one (1) week prior to Device installation to remove potentially hazardous material and objects from the work area.

1. **Site Preparation:**
    a. Deploy safety equipment, ensure proper PPE is worn, and necessary permits are in place (if necessary and as directed by Engineer). No confined space entry is required. (Engineer or customer is responsible for confined space determination and permit). All site preparation and installation activities can take place with personnel above the catch basin;
    b. Remove the drop inlet cover;
    c. Clean the immediate area and catch basin by hand or with a vacuum truck to remove debris from the catch basin;
    d. Clean the drop inlet grate shelf of existing pollutants or debris with hand trowel or gloved hand.

    To ensure the best results and personal safety, the catch basin should be cleaned 1-7 days prior to Device installation.

2. **Device Installation:**
    a. Required tools: 7/16” wrench, metal punch, and hammer (the Device may require an alternative size wrench);
    b. Attach the filter hanger to the bottom of the UGF at a distance based on the depth of the catch basin and the desired maximum overflow hydraulic capacity. FCP recommends a minimum adjustable overflow of 2” inches. Ensure the filter hanger is horizontal when hanging in the catch basin. One can simply adjust the plane of the filter hanger by adjusting the suspender length. The Device can be adjusted to meet the slope and grade of about any environment;
    c. Clean the grate shelf of debris. Place the UGF on the drop inlet grate shelf and allow the filter hanger to suspend freely within the catch basin;
    d. To ensure a proper fit, adjust the UGF to expand or contract so the UGF adequately contacts the grate shelf so as not to fall into the catch basin. The UGF must overlap the grate shelf at least three-quarter (3/4) the distance between the shelf inside dimension (ID) and outside

dimension (OD) to adequately support the load of a full MB. For a one (1) inch grate shelf, the UGF must overlap the shelf by ¾".

e. **(For Combination Inlets):**
    i. **Diverter Screen & Diverter Wings** – fit diverter screen over banana clips and hold in position by inserting cotter pins at desired location above and below the diverter plate. Install wings at each end (or just upstream side for sloped installs) of curb inlet opening so the wings touch the side of the curb inlet opening to capture the pollution from trickling water. Fasten in place with ¼" SS bolts or bendable tabs;
    ii. **Inlet Screen** – place the inlet screen frame in curb inlet opening so it spans the length. Expand frame by using a 1/2" wrench to lengthen bolt which causes the frame expand and engage the walls of the curb inlet opening. Fit the screen gussets over the frame at predetermined locations marked by slots cut out of the frame. Cut the length of the screen to equal the width of the curb inlet opening. Place the screen over the frame and insert the fastening tabs thru the screen to secure the screen to the frame. Use a hammer to pound the tabs over thereby locking the screen in place. Span any gap between the inlet screen and the top of the storm grate with a flexible shield. The flexible shield connects to the inlet screen with rivets (or other environmentally safe fastener) and should contact the wall of the storm grate to achieve full trash capture during high flow events.

f. **Optional**: fill any gaps that may be present between the walls of the inlet's grate shelf and the Device's UGF with silicone or other approved environmentally safe sealant;

g. **Optional**: Record location and serial number information into the FCP Field App on mobile device.

3. **MB Installation:**
    a. Align the bends in the Mundus Hoop (MH) with the MB handle attachment points. The handle of the MB and the bends of the MH will be parallel with the street when inserted into the Device. This allows the handle to be draped over the MB handle hook so the handle does not impede water flow and the MB is easily removed during service. *In unusual cases, the handle may not be parallel to the street and the MB*

needs to be inserted so the handle is parallel to the bends in the filter hanger register. **Always align the handle with the bends**;

b. Hold the Mundus Hoop so the bend of the MH points downward. Pull the top of the MB thru the inside of the MH a few inches and fold the elastic anchor fabric over the top and outside of the MH. This secures the MB to the MH. (method is akin to pulling the top of a tube sock thru the inside of a bracelet and wrapping the top of the sock over the bracelet). The elastic band around the anchor fabric will hold the MB to the Mundus Hoop (MH). When the MB and MH are secured within the filter hanger, then the added friction will hold the MB in place and prevent it from falling through the filter hanger hole. Make sure that the handle is parallel with the bends in MH;
c. Grab the handle or hoop of the MB, step on the bottom of the MB and pull snugly away from each other. This equilaterally aligns the MB around the MH;
d. Secure the bottom of the MB with the recommended fastener at a position based on the desired overall length of the MB. NOTE: for shallower catch basins, the end of the MB may be trimmed to provide an overall shorter length. The MB should not be so long that it can block the outlet;
e. Adjust the backflow preventer to design aperture by pulling the backflow preventer (BFP) cord and sliding the fastener into position. The BFP should usually be tightened at least a little bit for ease of maintenance later but not tightened so much that it prevents the inflow of trash. A four (4) to six (6) inch opening is usually sufficient for a TTC-13 MB BFP;
f. Drop MB with MH into the receiver so the handle aligns with the bends in the filter hanger receiver and drape handle over handle hook, Adjust for a snug fit;
g. Attach or place any additional filtration media inside or to the MB - *not required for full trash capture;*

4. **Installation Completion:** Replace the inlet covering and remove safety equipment.

Total Installation Time: about 5 minutes

4.C. Methods for diagnosing and correcting installation errors.

Frog Creek Partners maintains a rigorous quality assurance and quality control (QA/QC) processes and standards. Prior to the shipment of any Device or MB, each part is

inspected, and cross-referenced with the field measurements and capacity considerations. A manifest of each component of the Device is delivered to the customer and we recommend each customer perform an inspection upon receipt to confirm conformity to the desired application of the Device. FCP offers standard sized configurations, however there are instances where the Device has been customized or varies from typical designs. This is not an issue as long as the dimensions are documented. FCP can build Devices for about any drop inlet configuration.

Checklists are provided to assist each Device installation and maintenance visit:

Site Preparation and Selection:

- The drop inlet grate shelf is a uniform surface and of relatively plumb dimensions;
- There is enough space and depth for the installation of the Device, its adjustable overflow and MB to perform properly; and
- Prior to installation, the catch basin should be clean and be free of sediment, debris, and harmful pollutants like hypodermic needles, sharp metal, and broken glass.

Installation Error Considerations:

- The sides of the Device's UGF should nest snugly against the walls of the inlet's grate shelf without any significant gaps. Gaps may be filled using a California approved marine grade sealant (i.e. 100% silicone);
- The UGF should sit flush with the top of the inlet's grate shelf and allow the inlet's covering to be seated flush on top of the UGF with minimal rise. Some grate frames have notches or protrusions in them. One may need to slightly modify the UGF to accommodate inconsistencies in the storm grate or frame;
- The filter hanger must be allowed to be suspended freely under the UGF. Some catch basins may have structures that impede free suspension. Modifying the adjustable overflow (the distance between the UGF and the filter hanger) may rectify this situation;
- The MB hoop should fit snugly into the Device's receiver. The receiver and Mundus hoop are bent to fit one another. If the MB does not fit snugly, then the MB hoop be upside down, or the MB may need to be rotated to achieve a snug fit;
- The MB should be fully extended vertically to ensure maximum hydraulic capacity and trash capture capacity. If the catch basin is too shallow to allow for full extension, then either shorten the MB (see above) or curve the MB so it rests on the catch basin floor. <u>However, under no circumstances, should the tail of the MB obstruct the outlet connector pipe as this can cause blockage or the outlet.</u>

- In some instances, a storm grate cover may have alternate configurations where the grate has abnormally large structural beams under the grate to aid in load rating. Occasionally these structural beams can hit the Device and prevent a good fit. FCP can account for these inconsistencies if the catch basin and grate are properly measured prior to engineering; and
- It should be noted that some catch basins may be inadequately constructed and may be prone to retaining small amounts of water. This can cause proliferation of mosquito breeding. The preferred course of action is to repair any deficiencies in the catch basin construction that may cause standing water prior to installation of the Device. It is important that the deficient areas be visible and accessible by the mosquito vector control personnel if repairs to the catch basin have not occurred prior to Device installation. The Engineer and MVCAC personnel can make this determination.

The Device is designed to meet site-specific water quality filtration requirements. Conformance with the Engineer's Plans and Specifications and proper installation is paramount to ensure proper Device operation.

4.D. Optional components guide: An explanation of the condition or circumstance that would necessitate the implementation of that component and render it no longer optional.

In the event that the site is a combination inlet with a curb inlet opening, the diverter screen or inlet screen must be used to maintain 100% trash capture. In the event the drop inlet is a bent grate (aka "valley grate"), a special spacer is used to accommodate the bend. For storm grates that have abnormally large structural beams under the grate, a high-profile UGF may need to be used to accommodate the beams so as to allow the storm grate to sit flush in the frame.

5. Operation and Maintenance Information

5.A. Device inspection frequency considerations, and inspection procedures.

Upon inspection, the MB water filter should be emptied if it is more than half full of trash and debris, or as directed by the Engineer, city, or contract. The MB can be 75% full and still work properly in most instances but allowing filtration capacity for future rain events is important.

During inspection, the following should be checked:

- Visually inspect the MB for abnormal pooling of water inside the bag. Pooling of water is indicative of a MB that requires replacement or emptying due to pollutants or debris blinding the openings in the filter;

- Pooling of water in the MB can also be indicative of hydrocarbon loading from stormwater runoff. Add MYCELX to remove hydrocarbons from stormwater to rectify the problem;
- Visually inspect the MB to determine if the filter media has any holes greater than 5mm in size. Replace MB if necessary;
- Visually inspect the Device to check if any significant gaps exist between the UGF and the inlet's grate shelf;
- Visually inspect the filter hanger for accumulated debris. Excessive accumulation of debris on the filter hanger or particularly the progressive trash screen may indicate a full MB that needs emptying or replacing;
- Visually inspect the diverter screen or inlet screen (if present). If either are covered with debris, then they should be wiped off to ensure proper filtration for future storm events;
- Inspect the DIF frame to make sure all components look or feel secure;
- Inspect after first rain event greater than ¼";
- Inspect after every storm of ½" or greater;
- Inspect every one (1) to two (2) months during the first year than at least quarterly thereafter; and
- See 5.C. for more information.

5.B. Maintenance frequency consideration, procedures, and a description of necessary equipment and materials.

The Device may be serviced in one of two simple ways through manual maintenance or vac truck maintenance as described below:

Manual Maintenance:

To service the Device manually within three (3) to seven (7) minutes, follow these steps:

Equipment needed for manual maintenance: PPE, safety equipment, grate puller, broom, weight scale, FCP Field App mobile device, replacement media, disposal receptacle (trash bag, dumpster, trailer, etc.).

1. **Deploy safety equipment:** place cones around area and make sure it is safe to remove storm grate. Wear personal protective equipment (PPE). No confined space entry is required. The Engineer will make the final determination of necessary safety equipment, processes, and permits. All maintenance personnel may be above the catch basin during maintenance of the Device;
2. **Remove covering:** Use grate puller or another tool to remove the inlet to expose the Device;

3. **Stuff MB:** Push overflowing pollutions (if any) into the MB with hand tool or spray wand. Be sure to inspect the trash screen around filter hanger and remove any debris that may have blocked the screen;
4. **Remove & record:** Remove MB by lifting handle or hoop. Weigh the MB with a common crane scale (FCP can provide if necessary). Record weight of MB and any other pollution data such as density, pollutant type, etc. Dispose of pollutants properly and in accordance with local laws;
5. **Dump and dispose:** The MB has the unique capability of being reused or replaced. To dump, remove fastener at the bottom of the MB. Dump contents into approved receptacle. Alternatively, one can dispose of the whole MB if the filtration media is compromised. Dispose of filter media and captured pollutants in accordance with local regulations or as directed by the Engineer;
6. **Replace MB & cover:** Close the bottom of the MB with a zip tie or wire, replace the bag into the receiver on the Device's filter hanger, and replace the grate.

It is important to note that this method is the most efficient way to perform maintenance on a low volume of Gutter Bins and in space restricted areas. Service can be done in conjunction with a service hand cart, 4-wheeler with trailer/bed, or a pickup truck. A low height trailer can also be useful.

Vac truck maintenance: To service the Device with a vac truck within four (4) to twelve (12) minutes, follow these steps:

Equipment needed for vac truck maintenance: PPE, safety equipment, vacuum truck, cover removal tool, weight scale, FCP Field App mobile device, replacement media, disposal receptacle (vac truck vessel), and replacement media.

Prepare vac truck: deploy safety equipment (cones, lights, etc.) and vac truck for operation (turn on pumps, adjust valves, deploy boom, etc.). The Engineer will make the final determination of necessary safety equipment, processes, and permits. No confined space entry is required. All maintenance activities can take place with personnel above the catch basin.

1. **Remove covering:** Use hook or another tool to remove the drop inlet cover to expose the Device;
2. **Stuff MB** *(optional)***:** Push overflowing pollutions (if any) into the MB with hand tool or spray wand. Be sure to inspect the trash screen around filter hanger and remove any debris that may have blocked the screen;
3. **Record** *(optional)***:** Lift MB by pulling up the handle or hoop. Weigh the bag with a common crane scale. Record weight of MB plus any other pollution data such as density, pollutant type, etc.;

4. **Evacuate MB:** Vacuum contents out of MB. The bag may be sucked inside out so one may have to push the bag right side out and realign the MB. Be careful that the MB is not sucked into the vacuum. One may need to secure the MB to the MH to prevent loss of flexible filter media. A vac truck crew can evacuate the contents of an MB with proper instruction by FCP and minor alterations to the standard MB;
7. **Replace MB & cover:** replace the MB (or reuse existing MB if TTC-MB is used) into the receiver on the Device's filter hanger, drape handle over the handle hook, and replace the grate;
5. **Prepare vac truck for relocation**: gather safety equipment, turn off pumps, close valves, deploy boom, etc.

It is important to note that the use of a vac truck can be highly inefficient due to its maintenance requirements, truck purchase costs, and the fact that it requires the waste removed by a vac truck to be handled at least three (3) times before it reaches the landfill (suck, decant, load, haul, dump). It may also take a few minutes longer to service a Gutter Bin with a vac truck rather than doing it manually because of the set-up/take-down time required to operate a vac truck.

As with any manufactured device, there may be product limits that need acceptance or correction. At times, it may be prudent to relocate or modify the Device or move to another location as polluting behaviors and infrastructure changes.

Each Device installation is unique based on location conditions and targeted pollutants.

- The inspection frequency mainly depends upon climate events and pollutant load.
    - Inspect after the first and second rain event to ensure proper function (break-in period);
    - For construction sites, one should inspect the Device after each storm event greater than ½" of precipitation or heavy snow melt; and
    - For post construction and permanent installations, one should inspect the Device three (3) to four (4) times per year or as directed by the Engineer.

Maintenance frequency considerations include:

- **Typical pollutant load:** areas with bulky trash and debris may require more frequent service intervals to ensure that pollutants don't bypass the MB via the Device's adjustable overflow;
- **Local climate conditions:** areas with heavy rainfall or snowfall may require a more frequent maintenance cycle if pollutant load is high. During the autumn leaf

fall, more frequent maintenance may be required. High rainfall does not always equate to more frequent service visits;

- **Infrastructure constraints:** drop inlets with large drainage areas and high pollutant loads may require more frequent service intervals. Smaller drop inlets may require smaller diameter MBs thereby decreasing the pollutant capacity and shortening the service interval;
- **Type of MB being used:** Total Trash Capture (TTC-MB) model MBs typically have a longer service life than the Trash Debris & Sediment (TDS-MB) model MB because the TTC-MB allows anything smaller than 5mm to pass the filtration system. The VAC-MB can last for several years. Replace or empty a MB if it is more than 75% full or if MB water filter has blinded and as directed by the Engineer.

It is important that the Device be maintained to ensure proper function, minimize any pollution bypass and mitigate flooding risks during extreme weather events. The Engineer may prescribe an alternative means of maintenance per local regulations, site requirements, and/or contract requirement. Captured pollutants and spent media must be disposed of in accordance with all Federal, State, and Local Laws and Regulations.

5.C. Effects of delayed maintenance on Device structural integrity, performance, odors.

Delayed maintenance may cause the MB to become completely full of material thereby causing stormwater to bypass the filter system and the Device not performing as designed. It is unlikely that a completely full MB will affect the structural integrity of the Device because of its solid frame suspension system and configuration. The MB will drain between rainstorms but there may be trash within the bag that holds water and causes odors. Performance and odor problems can be solved by more frequent servicing of the Device.

Maintenance Troubleshooting:

- Pooling of water inside of a MB is most likely indicative of:
    - A full MB that needs emptying or replacement;
    - A TDS-MB model with a sediment capture liner with too fine of filter is clogging due to hydrocarbon loading. A coarser filter material can be substituted or MYCELX can be added to the filter chain to remove hydrocarbons before they foul the sediment liner. A sediment liner is not required for full trash capture.
- Pooling of water below the Device can be caused from the catch basin sump or irregularities in the catch basin construction;

- Pollution or vegetation accumulating on the progressive overflow trash screen is most likely indicative of a weather event in excess of the design storm or a full MB that needs emptying or replacement;
- A compromised MB is likely indicative that it has exceeded its specified service life.

5.D. Device maintenance and vector control accessibility

1) FCP originally submitted a vector control application for the DIF Device to the Mosquito Vector Control Association of California (MVCAC) on June 26th, 2019. FCP resubmitted the application on November 6th, 2019.
2) MVCAC originally denied approval of the application because FCP did not specify the sample port size. There was also concerns that the original hinged sampling port on the filter hanger may be difficult to operate. FCP had multiple communications by phone and in person with several MVCAC personnel to better understand their operational requirements for vector control. Based upon these conversations, FCP revised the sample port design and provided information to MVCAC personnel for their review and approval at the 2019 CASQA conference. All MVCAC personnel who reviewed the Device determined the sampling port options that FCP offers are an acceptable means to perform vector operations and were satisfied with their ease of operation and accessibility. FCP subsequently revised the MVCAC application and re-submitted it for approval on 6Nov2019. FCP currently awaits their review and approval. A video explaining how the vector control sampling ports work can be found at this link: https://www.youtube.com/watch?v=k952B-kW9Qg&feature=youtu.be
3) Neither the diverter screen nor the inlet screen affects the means by which vector control accesses the sampling port. Vector control personnel can operate any of the vector control sampling port options with either the diverter screen or the inlet screen present.
4) See Appendix E for the updated MVCAC application.

5.E. Repair procedures for the Device's structural components.

To repair a worn or broken part of the Device, one must simply remove the Device from the catch basin and identify the part that needs replacement. Because of the Device's modular design, usually only a small part may need to be replaced rather than the whole unit. Take pictures and measurements of the part and contact FCP for a replacement part and instructions for repair. FCP offers a 7-year warranty as described in Section 6.C.

6.0 Reliability Information

6.A. Estimated design life of Device components before major overhaul.

The Device has a minimum design life of 25 years assuming the proper installation, maintenance and service of the Device. The total trash capture (TTC-MB model) MBs are reusable and have a service life of one (1) to two (2) years, depending upon site conditions. Trash, debris and sediment (TDS model) MBs with a liner are generally single use filters because of their fine filtration capabilities and have a maximum service life of 12 months, depending upon site conditions. Major overhauls of the Device are not expected and FCP provides a 7-year warranty as described in 6.C.

6.B. Device sensitivity to loadings other than trash (i.e. leaves, sediment).

The Device has an excellent ability to capture vegetation (including leaves and grass clippings) with any MB model. The MB backflow preventer helps minimize or prevent loss of pollutants after capture. Typically, leaves and debris are quite bulky. Therefore, the maintenance frequency should be increased during seasonal leaf drop or after high wind events such as the Santa Ana winds. Delayed maintenance of the Devices in areas with high leaf drop can cause the storm grate to be covered with leaves and cause flooding. If a Device is seriously neglected, then debris may eventually clog the Device's overflow and cause flooding. Frequent and proper maintenance of the Devices will increase the likelihood of successful trash capture and high flow bypass.

Devices equipped with geotextile-lined MBs (TDS-MB) will also capture significant amounts of sediment. Therefore, maintenance frequency should be increased after sediment runoff causing events such as intense heavy rainfall, nearby construction activity, road sanding, chip sealing, etc.

One can switch or alternate the types of MB throughout the year. If the customer requires finer filtration most of the year to capture sediment, then the TDS-MB (trash, debris & sediment) is used. In the fall when leaves are dropping, then one can temporarily replace the TDS-MB with the TTC-MB (total trash capture) to capture particles 5mm or greater in size. This temporary replacement will allow finer particles to bypass the system. Advantageously, if the captured particles are mainly vegetative waste, then the customer may be able to compost the captured material.

In areas where hydrocarbons are prevalent and a TDS model MB is used, then one may require the use of MYCELX to remove hydrocarbons from the stormwater to prevent blinding of the filter due to hydrocarbon loading.

6.C. Warranty information.

The Device material and product construction are warranted for seven (7) years from the date of purchase. Device replacement parts will be supplied at no charge to the end user provided the Device unit was properly installed and serviced for its intended us as a full trash capture device per the Engineer's recommendations and as specified in this application or most current FCP product and service recommendations. MBs have a warranty on workmanship for one (1) year from date of install provided the customer properly records service details as recommended by FCP and/or the Engineer.

The Gutter Bin® stormwater filtration system Eco Drop Inlet Filter and Mundus Bag® water filter are pre-engineered filtration systems designed to meet site-specific water quality treatment requirements. Conformance with the Engineer's Plans and Specifications and the manufacturer's recommendations is essential to ensure proper operation and function of the Device.

6.D. Customer support information.

Frog Creek Partners corporate office is open during normal business hours. Customer support can be reached via telephone and/or email 24 hours per day and 7 days per week. Contact information:

Email: support@frogcreek.partners
Phone: 307-797-7720 or 307-439-9570
Website: www.frogcreek.partners

Frog Creek Partners maintains a nationwide agreement with APEX Companies to provide installation and service capabilities upon request. However, FCP, the city, the customer, or an approved local contractor can perform the install and maintenance as required by the Engineer or customer.

7. Field/Lab Testing Information and Analysis

7.A. Provide available field or lab testing information that demonstrates Device functionality and performance.

Appendix A contains the Device and field test results. Summary test results prove 100% trash capture and retention. Results = SUCCESSFUL TEST – PASS.

Please refer to Appendix B for third party certification of FCP's testing.

Multiple Device configurations successfully removed 100% of trash 5mm or greater in size from water flows ranging from 50 to 500 gpm in multiple third-party validated lab

tests. The tests were conducted in FCP's headquarters with a third-party professional engineer present to verify the test results. FCP used a "trash recipe" as recommended by Stormwater Environment Manufacturers Association (SWEMA). Two types of MBs were tested with the Device to ensure that both the Total Trash Capture (TTC-13) MB and Trash, Debris & Sediment (TDS-13) MB performed to State Water Resource Control Board ("SWRCB") requirements.

Overview of test platform and testing procedure for the FCP DIF and MB

An FCP Device measuring 36" x 24" was installed into a standard drop inlet located in the parking lot of the Frog Creek Partner's headquarters in Casper, Wyoming. The outlet pipe was covered with a 4mm mesh screen to prevent any loss of trash if it escaped the Device during the test. Tests were performed with the following inlet covering configurations:

1) No inlet covering;
2) Existing standard drop inlet cast iron grate; and
3) The optional Original Gutter Bin® (OGB) grate.

FCP used a "trash recipe" as prescribed by SWEMA. The trash recipe comprised of:

- 30 cigarette filters
- Six (6) pieces of paper cut into 2" wide by 12" long strips
- 10 wood popsicle sticks
- Six (6) pieces of plastic cup cut into 2" wide by 5" long strips
- Six (6) pieces of plastic bag cut into 2" wide by 12" long strips
- Six (6) pieces of cardboard cut into 2" wide by 8" long strips
- Six (6) pieces of cloth cut into 2" wide by 12" long strips
- six (6) pieces of aluminum cans cut into 2" wide by 5" long strips
- 15 pieces of Styrofoam packing peanuts

FCP endeavored to re-use as many of the trash recipe components from one test to the other to simulate weathering in the field. FCP found it necessary to replace some pieces of cardboard and paper between tests because of deterioration.

Prior to each test, the entire trash recipe was laid out on a table and organized by material type. Each piece was counted, and the trash recipe was recorded and photographed to get a "before picture". The trash recipe was mixed with water in a 5-gallon bucket and set aside until introduced to the test platform. FCP kept detailed notes on individual data worksheets recording the trash count (before & after), water flow, device type, witness, filter type, date, time, and any relevant notes from each test.

Water was introduced into the test platform upstream of the DIF in several ways to achieve the desired flowrate. A 3” hose from an adjustable hydrant meter was able to produce flows between 50 gpm to 350 gpm. In higher flow tests, FCP used a water truck with either gravity flow or pressurized flow to gain larger flowrates up to an additional 150 gpm. A garden hose was used intermittently with a flow rate ranging from 13 to 15 gpm. When the desired flowrate was steady, FCP personnel introduced the 5-gallon bucket with trash recipe into the water flow upstream of the Device and MB. Multiple video cameras were used to capture visual data. A virtual reality camera was placed next to the Device on the sidewalk showing an unobstructed 360-degree view of the test. Another camera was placed directly above the Device to capture the introduction of water and trash into the Device in detail. To simulate high flow, FCP ran both the hydrant meter hose and pressurized water truck hose onto the test platform upstream of the Device with all water going into the inlet. A 4mm screen covered the catch basin outlet to capture any pollutants that may have bypassed the Devices during testing.

When each test was completed, FCP personnel removed the MB and any trash residing on the grate, the filter hanger and/or the progressive overflow trash screen from the Device and dumped the captured trash onto a table. Each piece of trash was organized, counted, recorded and then photographed for an “after picture”. All trash 5mm and greater in size was captured by the Device during each test.

FCP performed tests 1 through 4 with an alternative overflow design utilizing a 4mm net that covered the entire space between the filter hanger and the UGF. The Device captured 100% of trash with sustained flows ranging from 200 to 350 gpm and a fully screened overflow.

FCP performed test 5 and 6 with an overflow design where the filter hanger did not embody a full trash net or progressive overflow trash screen. The Device captured 100% of trash with sustained flows ranging from 100 to 350 gpm with no screen around the filter hanger.

FCP performed test 7 through 10 with a progressive overflow trash screen (POTS) surrounding the top of the filter hanger perimeter. The POTS is made of 4.76mm (3/16”) perforated stainless steel that extends approximately 50mm (2”) above the filter hanger. The Device captured 100% of trash with sustained flows ranging from 50 to 500 gpm with a POTS.

100% trash capture test results = SUCCESSFUL - PASS TEST.

All Devices tested successfully captured 100% of trash in the lab. The Devices have also been tested for multiple seasons in snow, ice, rain and hail with successful trash

capture results and hydraulic capacity. FCP recommends a progressive overflow trash screen (POTS) for DIF or DIF-C Devices installed in California because of the added protection it affords the customer and watershed.

FCP tested two types of MBs in the Device trash capture test. Both the Total Trash Capture MB (TTC-16) and the Trash, Debris & Sediment MB (TDS-16) performed perfectly and the Device achieved 100% trash capture in every test. Both MBs also retained 100% of their trash even after the flow subsided to 0 gpm. Therefore, the Device and MBs achieved 100% trash capture and retention in all tests.

A third-party professional engineer was present to independently verify that the Frog Creek Partners' products did indeed pass the trash capture test as required by the California State Water Resources Control Board. The third-party professional engineer's certification letter can be found in Appendix B.

All tests of the Device and MB were filmed. FCP can provide YouTube links to these videos upon request. Select pictures of the trash capture test and results can be found in Appendix A. The Gutter Bin® stormwater filtration system and Mundus Bag® water filter are patent pending and registered trademarks of Frog Creek Partners, LLC.

Get Your Mind into the Gutter™

Because Clean Water is a Good Thing™

Testing Photographs

Image 17 - Adjustable hydrant meter water source - up to 350 gpm

Image 18 - Combined test water sources output. Adjustable hydrant meter max capacity 350 GPM Pressurized water truck max capacity 150 gpm

Image 19 - 500 gpm test of Device. Prior to the introduction of simulated trash

Image 20 - 500 gpm test of Device. Introducing simulated trash recipe

Image 21 - 500 gpm test of Device. Close-up of simulated trash entering Device thru storm grate

Image 22 - 500 gpm test of Device showing trash entering Device

Image 23 - Device equipped with optional OGB grate during a 350 gpm test

Image 24 – Device in round catch basin. Vector control achieved around filter hanger as one can see the bottom of the catch basin from above.

APPENDIX B - CERTIFICATION OF FIELD TEST RESULTS

David Bell, PhD, PE
David A. Bell Associates, Inc.
542 South 350 East
Farmington, UT 84025
801.540.8742

To whom it may concern:

The Frog Creek Partners ("FCP") patent pending Gutter Bin® Eco Drop Inlet Filter (DIF), the Original Gutter Bin® (OGB) grate, and the patent pending Mundus Bag™ water filter were tested on April 18, 2019.

Frog Creek Partners (FCP) has determined that the *Storm Water Equipment Manufacturers Association (SWEMA)'s Laboratory Protocol and trash recipe* provides a strong baseline testing method for confirming a 100% trash capture in accordance with the California State Water Board's current requirements. FCP's testing was fundamentally based on the SWEMA protocol and followed best reasonable practice throughout the entirety of the trash capture test regime.

I am a professional engineer with more than 30 years of water-related product design and field/deployment and process validation testing. FCP asked if I would be an independent witness and third party observer/resident expert. I am registered as a Professional Engineer in Utah and Wyoming. My PhD and research specialty is computational fluid dynamics. I have been involved in projects involving blood flow in the tissues, produced water reclamation in the oil and gas field and the modeling of multi-contaminant, turbulent wastewater flows. I have numerous patents relating to this work covering years of field experience.

Now, under my observation, FCP's DIF and multiple Mundus Bag™ configurations passed all testing regimes without failure when subjected to water flow rates ranging from 50 gallons per minute (50 GPM) to 500 GPM. At no time during these tests, using simulated trash and conducted in accordance with the SWEMA Laboratory Protocol, were any escaping trash particulates observed.

In concurrence and observation with testing I can attest that the Frog Creek Partners Gutter Bin® Eco Drop Inlet Filter (DIF), the Original Gutter Bin Grate (OGB), and the Mundus Bag™ water filter passed all testing protocols and procedures as outlined in the document without any failure. I neither asked for nor received any compensation or remuneration for my observations.

Sincerely,

Date: 5/6/19

David A. Bell, PhD, PE
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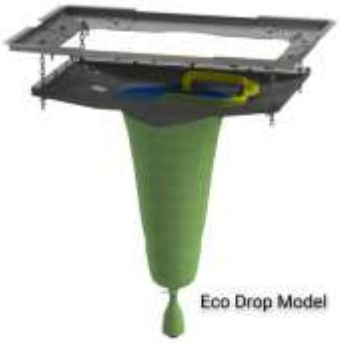
APPENDIX C - SPECIFICATION SHEETS & ENGINEERING DRAWINGS

Eco Drop Inlet Filter (DIF)

Gutter Bin® Stormwater Filtration System



Eco Drop Model

100% TRASH CAPTURE RATED

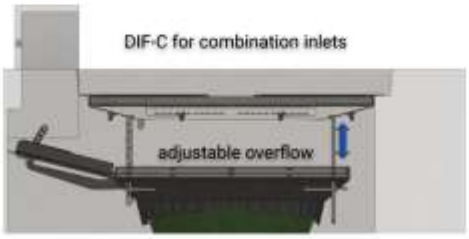
The patent pending Gutter Bin Eco Drop Inlet Filter provides unparalleled protection and accepts the full line of Mundus Bag® water filters.

Installation and Servicing

- 5 minute install - no confined space entry, catch basin retrofit, or drilling required
- Servicing performed in 2 minutes or less
- Service interval depends upon climate, pollutant load, & infrastructure constraints
- To service: remove grate, remove and replace soiled Mundus Bag, replace grate

Product Highlights

- Flexible design fits under existing storm grate in a drop inlet or combo inlet (DIF-C) with bent or flat frame
- Largest adjustable overflow on the market; meets or exceeds hydraulic capacity of the catch basin
- Dual stage overflow provides superior trash capture while maintaining hydraulic capacity
- Stainless steel, weathering steel and/or plastic construction to meet local & federal regulations
- HS-20 load rated - installs below existing storm grate
- Easily removed for maintenance, relocation, or TV camera access
- Optional sampling port - can be used for vector control
- Variable depth for deep or shallow catch basins
- Compatible with 9, 13, 14 & 16 inch Mundus Bag
- Rectangular and round models
- Can be used in conjunction with connector pipe screens (CPS) and automatic retractable screens (ARS)
- Can be used as a pre-treatment solution for downstream filtration systems
- 7 year limited warranty



DIF - for circular inlets

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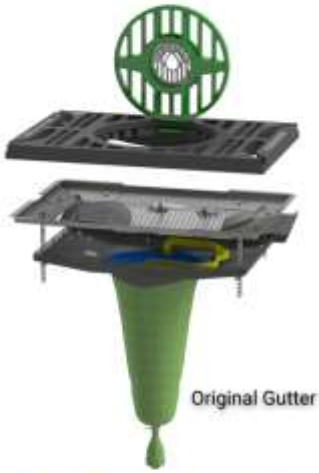
Original Gutter Bin (OGB)

Gutter Bin® Stormwater Filtration System



Original Gutter Bin

100% TRASH CAPTURE RATED

The patent pending Original Gutter Bin model provides unparalleled protection and accepts the full line of Mundus Bag® water filters.

Product Highlights

- Flexible design replaces existing storm grate in a drop inlet or combo inlet with bent or flat frame
- Hinged access hatch for quick service
- Largest adjustable overflow on the market; meets or exceeds hydraulic capacity of the catch basin
- Dual stage overflow provides superior trash capture while maintaining hydraulic capacity
- Stainless steel and/or weathering steel construction
- HS-20 load rated - replaces existing storm grate
- Easily removed for maintenance, relocation, or TV camera access
- Optional sampling port - can be used for vector control
- Variable depth for deep or shallow catch basins
- Compatible with 9, 13 and 14 inch Mundus Bag
- Rectangular and round models
- 7 year limited warranty
- Functional art design builds public awareness

Installation and Servicing

- 5 minute install - **no** confined space entry, catch basin retrofit, or drilling required
- Servicing performed in 2 minutes or less
- Service interval depends upon climate, pollutant load, & infrastructure constraints
- To service: open hatch, remove and replace soiled Mundus Bag, close hatch

Frog Creek Partners OGB

Customized designs available for sponsorship

Denver Zoo zebra edition OGB

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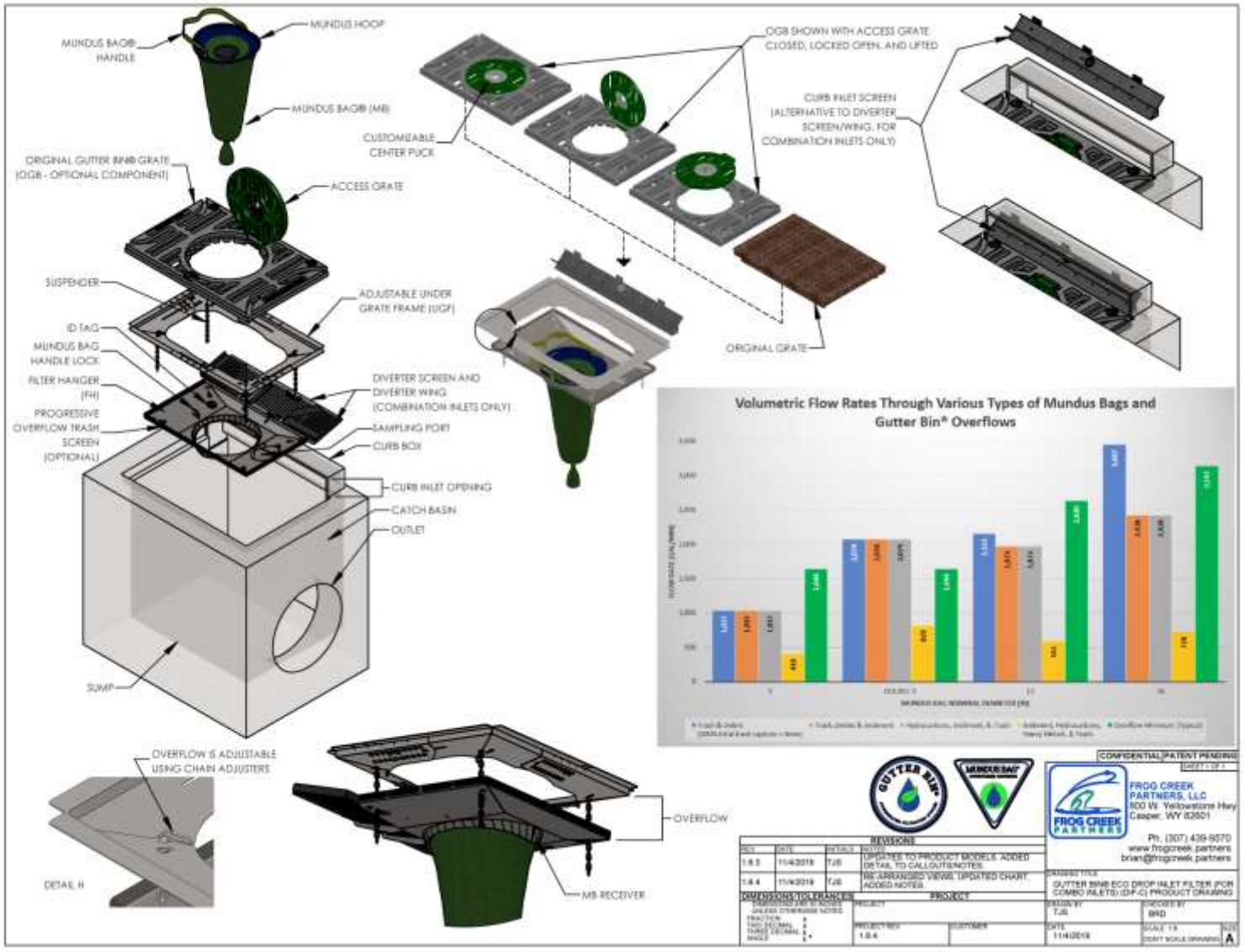
MUNDUS HOOP
MUNDUS BAG® HANDLE
MUNDUS BAG® (MB)
ORIGINAL GUTTER BIN® GRATE (OGB - OPTIONAL COMPONENT)
ACCESS GRATE
SUSPENDER
ADJUSTABLE UNDER GRATE FRAME (UGF)
ID TAG
MUNDUS BAG HANDLE LOCK
FILTER HANGER (FH)
PROGRESSIVE OVERFLOW TRASH SCREEN (OPTIONAL)
DIVERTER SCREEN AND DIVERTER WING (COMBINATION INLETS ONLY)
SAMPLING PORT
CURB BOX
CURB INLET OPENING
CATCH BASIN
OUTLET
SUMP
OGB SHOWN WITH ACCESS GRATE CLOSED, LOCKED OPEN, AND LIFTED
CUSTOMIZABLE CENTER PUCK
CURB INLET SCREEN (ALTERNATIVE TO DIVERTER SCREEN/WING, FOR COMBINATION INLETS ONLY)
ORIGINAL GRATE
Volumetric Flow Rates Through Various Types of Mundus Bags and Gutter Bin® Overflows
OVERFLOW IS ADJUSTABLE USING CHAIN ADJUSTERS
DETAIL H
OVERFLOW
MB RECEIVER
CONFIDENTIAL/PATENT PENDING
FROG CREEK PARTNERS, LLC
800 W. Yellowstone Hwy
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GUTTER BIN® ECO DROP INLET FILTER (FOR COMBO INLETS) (DIF-C) PRODUCT DRAWING
REVISIONS
PROJECT
DRAWN BY: TJB
CHECKED BY: BRD
DATE: 11/4/2019
SCALE: 1:5
SIZE: A

Mundus Bag™

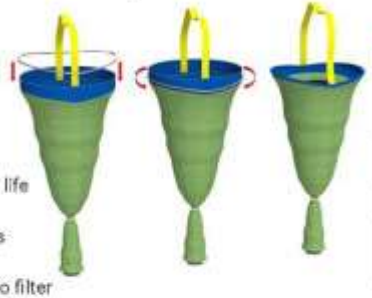
Gutter Bin® Filtration Media

100% TRASH CAPTURE

The patent pending Mundus Bag™ water filter removes a broad spectrum of sediment, trash and hydrocarbons from stormwater. It integrates fully with the complete line of Gutter Bin stormwater filtration systems.

Product Specifications

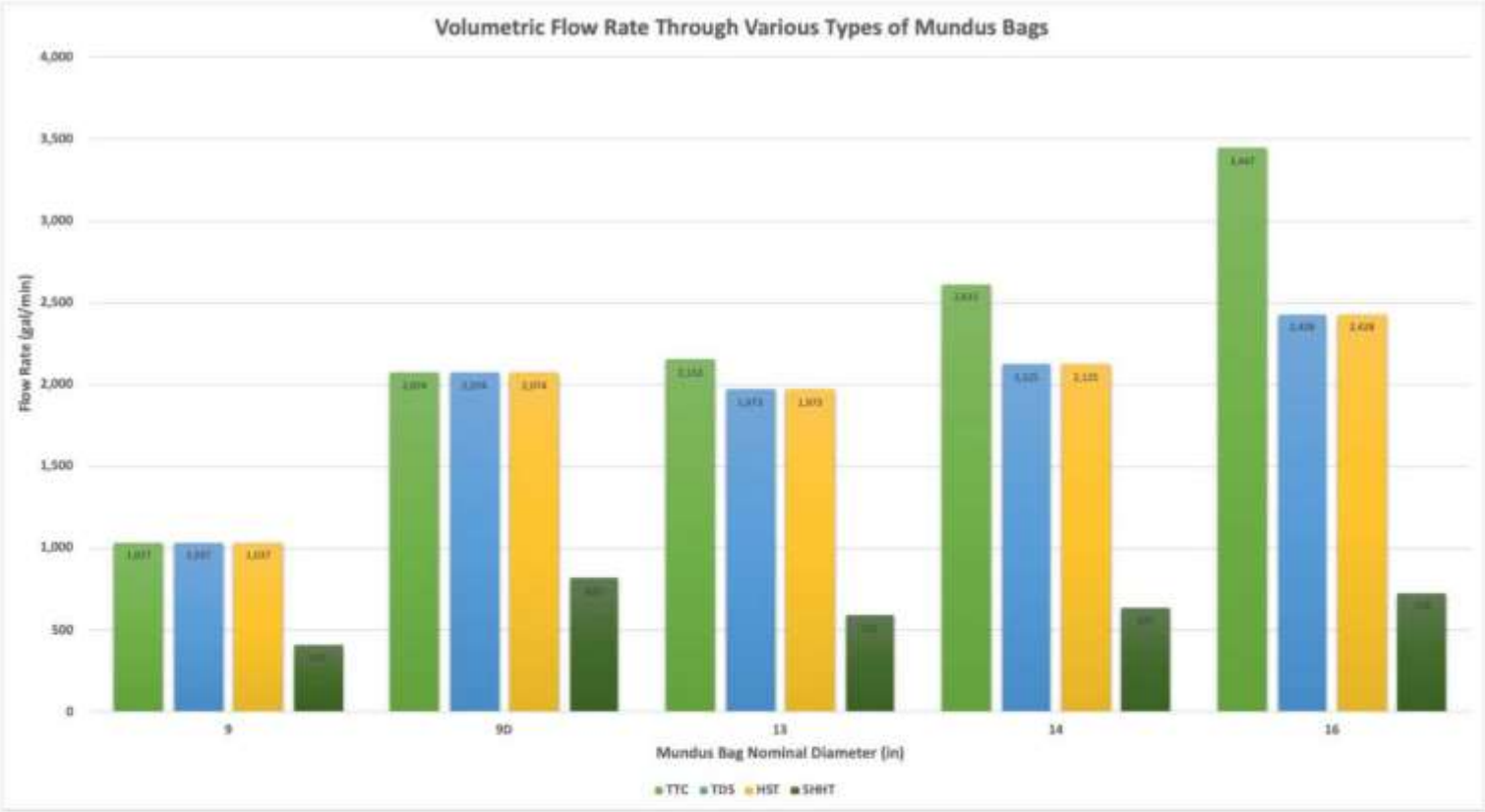
- Adjustable backflow preventer
- Variable depth for deep or shallow catch basins
- Integrated lifting straps for quick removal
- UV resistant durable construction for extended field life
- Single use and reusable models available
- Easily weighed for measurable & quantifiable results
- Cleaned by dumping, vac truck or bag replacement
- To service: load Mundus Hoop, wrap anchor, ready to filter



Targeted Pollution	Model	Filter Media
100% Total Trash Capture (Trash & debris > 4 mm)	TTC	polypropylene net
Trash, Debris & Sediment (80% TSS capture)	TDS	geofabric
Hydrocarbons, Sediment, & Trash	HST	Mycelx, geofabric
Sediment, Hydrocarbons, Heavy Metals, & Trash	SHHT	Granulated activated carbon, adsorbent, Mycelx, geofabric

Model	Bag dia (inches)	Max capacity (cu.ft)	Aperture size - particle retention (mm) (X 1000 for micron)	Min/Max length of filter (in)	Max capture load (lbs)	Max load rating of filter bag (lbs)	Empty bag flow rate (gpm)	Reusable	Est. useful life (months)
TTC-9	9	1.77	3.5	12/48	33	291	1,037	Yes	6-18
TTC-9D*	9D	1.77	3.5	12/48	33	291	2,074	Yes	6-18
TTC-13	13	3.14	3.5	12/48	59	517	2,153	Yes	6-18
TTC-14	14	4.27	3.5	12/48	80	704	2,615	Yes	6-18
TTC-16	16	5.58	3.5	12/48	104	920	3,447	Yes	6-18
TDS-9	9	1.77	0.21	12/48	242	291	1,037	No	3-12
TDS-9D*	9D	1.77	0.21	12/48	242	291	2,074	No	3-12
TDS-13	13	3.14	0.21	12/48	431	517	1,935	No	3-12
TDS-14	14	4.27	0.21	12/48	587	704	2,125	No	3-12
TDS-16	16	5.58	0.21	12/48	766	920	2,428	No	3-12
HST-9	9	1.77	0.21	12/48	242	291	1,037	Partial	3-12
HST-9D*	9D	1.77	0.21	12/48	242	291	2,074	Partial	3-12
HST-13	13	3.14	0.21	12/48	431	517	1,935	Partial	3-12
HST-14	14	4.27	0.21	12/48	587	704	2,125	Partial	3-12
HST-16	16	5.58	0.21	12/48	766	920	2,428	Partial	3-12
SHHT-9	9	1.41	0.10	24/72	194	233	410	Partial	3-12
SHHT-9D*	9D	1.41	0.10	24/72	194	233	820	Partial	3-12
SHHT-13	13	2.51	0.10	24/72	242	414	581	Partial	3-12
SHHT-14	14	3.42	0.10	24/72	431	563	637	Partial	3-12
SHHT-16	16	4.47	0.10	24/72	587	736	728	Partial	3-12

* 9D: two 9 inch diameter Mundus Bags™ installed side by side in a single Gutter Bin



Notes:

- Table data based on field trials, model data and vendor specifications
- Geofabric aperture size may be customized for customer requirements (i.e. 80% TSS removal)- may affect differential pressure
- Bags can be cut or secured to desired length for short install
- 9D: two 9" diameter Mundus Bags™ installed side by side in a single Gutter Bin
- Mundus Bag can be configured with an RFID for greater tracking abilities

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APPENDIX D - VECTOR CONTROL APPLICATION

The FCP DIF and DIF-C was submitted to the MVCAC on November 6th, 2019. The Device spec sheets originally included in the application are not included here because they are included in Appendix C above. The application is included below:

FROG CREEK PARTNERS

Mosquito Vector Control Accessibility Application for Gutter Bin® Eco Drop Inlet Filter (DIF and DIF-C) and Mundus Bag® water filter

Seeking approval from the Mosquito Vector Control Association of California confirming the patent pending Gutter Bin® stormwater filtration system Eco Drop Inlet Filter and Mundus Bag® water filter are readily accessible for vector observation and treatment; or that the Devices do not require mosquito vector control accessibility

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November 6th, 2019

Dear Director Achermann and members of the Association:

Frog Creek Partners (FCP), LLC respectfully re-submits this application for approval to the Mosquito Vector Control Association of California (MVCAC) for the Gutter Bin® Eco Drop Inlet Filter (DIF), Gutter Bin® Eco Drop Inlet Filter for combination inlets (DIF-C) and the Mundus Bag® (MB) water filter (collectively "Devices"). The patent pending Devices are a stormwater filter system for drop inlet style storm drains that remove pollutants from stormwater and results in cleaner rivers and oceans. The system offers access to the bottom of a catch basin for vector control observation and/or treatment.

Fig. 2 - DIF model with no screen or diverter

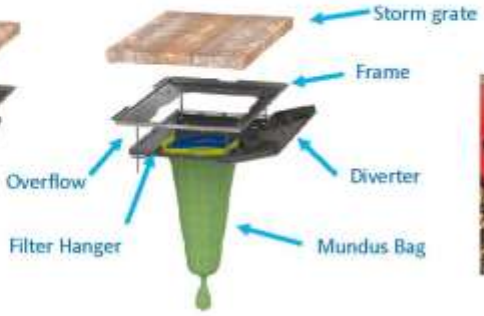

Fig. 1 - DIF-C model with optional diverter

Fig. 3 - DIF-C model with optional screen

The Devices are comprised of three (3) main parts:

1) a frame, overflow system, and filter hanger that diverts water and pollution into a water filter. The system is designed for permanent or temporary use;
2) a customizable and removable Mundus Bag® water filter that can remove pollution from flowing water; and
3) a reusable Mundus Hoop that connects the Gutter Bin to the Mundus Bag.

The Mundus Bag is a removable and customizable water filter media with a backflow preventer that works in conjunction with the Devices to remove trash, debris, sediment, hydrocarbons, and

heavy metals from stormwater. The City of Santa Maria and the Carpinteria Fire Department are currently performing pilot projects of the Devices in California.

The DIF is intended for use in drop inlet catch basins that do not have a curb inlet opening. The DIF-C is intended for use in drop inlet catch basins that also have a curb inlet opening (aka throat or curb cut). FCP offers two optional components to prevent pollution 5mm or greater in size from entering the curb inlet opening in a DIF-C application. One DIF-C optional component is a diverter attached to the filter hanger and positioned under the curb inlet opening. The second DIF-C optional component is a screen placed across the curb inlet opening that prevents pollution from entering the catch basin.

Access and Observation

It is necessary to provide more than one sampling port option to meet each customer's unique needs because there are many different catch basin configurations with different sized storm grates presently used in California. For this reason, FCP offers multiple sampling port configuration options for the DIF and DIF-C Devices. Each sampling port option offers an opening of at least 5" in diameter (unless specified otherwise by local or state regulations). A video explaining how the vector control ports work can be found at this YouTube video link https://www.youtube.com/watch?v=k952B-kW9Qg&feature=youtu.be

The different sampling port configurations include:

1. **Pivot sampling port on filter hanger** – this sample port is located on the filter hanger of the Device and pivots about an axis. It can be opened and closed with the storm grate situated within the frame. To inspect the catch basin with the storm grate and Device in place, use a tool that can fit through a storm grate hole and rotate the sample port cover aside (see Image 3). The sample port is located on the Devices' filter hanger. Most any rod-like tool can open the sample port such as a long screwdriver, wood dowel, or a 1" diameter by 2-foot long PVC pipe. One will need to remove the storm grate if inserting anything larger than the size of a typical storm grate drain hole opening.

Fig. 4 - 5" diameter pivoting sample port on filter hanger in closed

Fig. 5 - 5" diameter pivoting sample port on filter hanger in open

2. **Sliding sampling port on filter hanger (FCP recommended option)** – this sample port is located on the filter hanger of the Device and slides back and forth. It can be opened and closed with the storm grate in place. To inspect the catch basin with the storm grate and Device in place, use a tool that can fit through a storm grate hole and slide the sample port cover aside. The sample port is located on the Devices' filter hanger. Most any rod-like tool can open the sample port such as a long screwdriver, grate tool, or a 1" diameter by 2-foot long PVC pipe. One will need to remove the storm grate if inserting anything larger than the size of a typical storm grate drain hole opening.

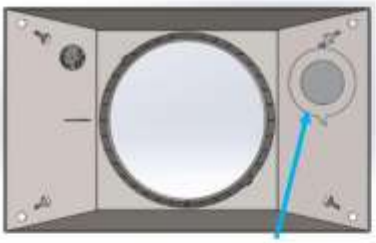

Fig. 6 – 5" diameter sliding sample port on filter hanger in closed position

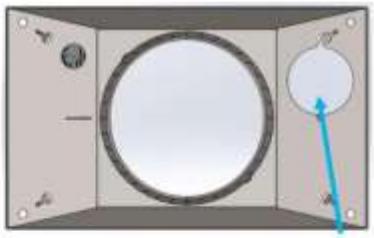

Fig. 7 – 5" diameter sliding sample port on filter hanger in open position

3. **Hinged sampling port on frame** - this sample port configuration is located on the frame of the Device and opens/closes by about a hinge by lifting/dropping the sample port cover. It cannot be opened/closed with the storm grate in place. One will need to remove the storm grate to access the sampling port.

Figure 8 - Overhead view of hinged sample port on frame in a closed position

Figure 9 – DIF with hinged sample port on frame in an open position

One can easily view or access the bottom of the catch basin while the Device and storm grate are in place through the Device's sample port to determine if water is present within the catch basin and to sample for vectors. The sample port is at least 5" in diameter (unless prescribed otherwise by regulations). Inspect the catch basin through the sample port. One can insert vector control

material through the sample port so it will drop directly into the bottom of the catch basin. The sample port can then be closed in the reverse order that it was opened.

In the event that the vector control technician must take a water sample or access the bottom of the catch basin with something that is larger than the typical storm grate hole, then the technician may need to remove the storm grate from the catch basin frame. It is understood that it is common for vector control technicians to use a sample bottle that is approximately 5-inches in diameter. Storm grates typically have less than 3-inch holes. In the event that the filter hanger dimensions of the Device cannot accommodate a 5-inch diameter sample port, then the sample port may need to be situated on the frame of the Device. In the unlikely event that this is the case, then the storm grate may need to be removed to open the sample port. Alternatively, the technician can remove the Mundus Bag® water filter to access the bottom of the catch basin. With the Mundus Bag removed, the vector control technician will have at least a 9-inch hole to access through the Device's filter hanger.

It should be noted that some catch basins may be inadequately constructed and may be prone to retaining small amounts of water. This can cause proliferation of mosquito breeding. The preferred course of action is to repair any deficiencies in the catch basin construction that may cause standing water prior to installation of the Devices. It is important that the deficient areas be visible and accessible by the mosquito vector control personnel if repairs to the catch basin have not occurred prior to Device installation.

Vector Control Treatment

Based upon the mosquito vector control technician's judgment, the vector control abatement may be placed in one of several locations related to the Devices:

1) Through the sample port opening so it drops into the bottom of the catch basin
2) inside the Mundus Bag;
3) on the filter hanger of the Device so the vector control material is washed into the catch basin during the next storm;
4) below the Device in the catch basin; or
5) attached to the exterior of the Mundus Bag's tail to act as a wick during moisture events.

A storm grate tool may be required to remove the storm drain cover and Mundus Bag. Other than that, no special tools or equipment are required.

Please refer to the pictures in Appendix A for more information

Optional Device Configurations

The Gutter Bin® DIF and DIF-C may include one or more of the following Device configurations:

1. **Sample Port Window** - The Device's sample port can be equipped with an optional viewing window made of clear acrylic so one does not have to open the sample port to see the bottom of the catch basin. Though this is not a preferred option because it can be difficult to see the bottom of the catch basin without some backlighting.

2. **Rigid Basket** – A perforated rigid metal basket may be used in lieu of a flexible Mundus Bag. This rigid basket is removed the same way as the flexible MB.
3. **Curb inlet screen and overflow** – a perforated screen is placed within the curb inlet opening of a combination drop inlet to prevent trash (5mm and greater) from entering the curb inlet opening while also allowing high water to overflow the screen (as shown in Figure 3 above). This screen system can be used in lieu of the diverter that attaches to the DIF filter hanger (as shown in Figure 2 above). This configuration allows the vector control technician to inspect and maintain the catch basin in the same way as described above.
4. **Original Gutter Bin® (OGB) grate** – Frog Creek Partners produces a customized storm grate with a hinged access hatch for more efficient means of accessing and maintaining the Mundus Bag. The original cast iron storm grate is replaced with the OGB. To access the catch basin and Mundus Bag, simply open the OGB access hatch by rotating it about a hinge. The access hatch can be locked open to prevent accidental closure while technicians are accessing the catch basin. Once the vector control technician completes his or her inspection/maintenance, lift the 35-pound access hatch up about ½ inch to disengage it from the lock and then slam it shut. The OGB is an optional component and not required for the Device to filter stormwater nor is it required for vector control accessibility. The MVCAC and SWRCB should not require the OGB to be installed with the DIF or DIF-C.

Figure 10 - DIF-C with optional OGB grate

Please refer to the specification sheets in Appendix B for more information

Please notify us at your earliest convenience when the Device is approved by MVCAC. Frog Creek Partners is applying to the California State Water Resources Control Board to gain approval of the same Devices for 100% trash capture certification.

We thank you for your time and attention while reviewing this application. We also thank you for the work that you do for public health and safety. Please call or email if you have any questions or comments.

Respectfully submitted,

Brian Deurloo
President
Frog Creek Partners, LLC

Appendix A - Photographs of Device

Image 1 - Mundus Bag® removal with storm grate removed

Image 2 - Overhead view of exposed DIF with closed sampling port and Mundus Bag in place

Image 3 – opening sample port through grate hole with 1" PVC pipe

Image 4 - top view of Device with Mundus Bag removed and sample port open that shows catch basin access

Image 5 - DIF equipped with an optional OGB grate

Image 6 - Opening the OGB hinged access hatch

Image 7 - Mundus Bag® removal thru the OGB hinged access hatch

Image 8 - Mundus Bag® removal thru the OGB hinged access hatch

Image 9 – Sample port being pivoted with grate in place to view bottom of catch basin

Image 10 – Opening the sample port through the optional OGB access grate.

Image 11 – View of the catch basin sump through the hinged sample port located on the frame.