PERMIT NUMBER D21-00011

CITY OF OCEANSIDE
ENGINEERING DIVISION

PRIORITY DEVELOPMENT PROJECT

STORM WATER QUALITY MANAGEMENT PLAN

FOR

Modera Melrose

ENGINEER OF WORK

Erin Lee, PE – #92949

PREPARED FOR:

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How to Use This Template

This template, assembled by GHD Inc. on behalf of the City of Oceanside, is for the development of Storm Water Quality Management Plans (SWQMPs) for Priority Development Projects (PDPs) proposed within Oceanside, CA. It is based on requirements set forth in the Regional Water Quality Control Board's National Pollutant Discharge Elimination System MS4 Permit that covers the San Diego Region (Order No. R9-2013-0001).

All references within the template refer to the City of Oceanside BMP Design Manual dated February 2016 (Manual). Use of this template in conjunction with the Manual is intended to help a project applicant develop a SWQMP compliant with City of Oceanside and MS4 Permit requirements.

Template Date: February 16, 2016

Assembled By:

Quick Reference Guide

Item	Project Information
Project Name	Modera Melrose
Application Number(s)	D21-00011
Project Address	SEC Melrose Dr & Oceanside Blvd
Total Parcel Area	322,275 sq. ft.
Project Description	The project is proposing to develop the 7.40-acre site into a mixed-use multifamily building complex. The site is bounded by single family to the east, Oceanside Blvd to the north, Melrose Drive to west, and the NCTD Sprinter Line to the south.
Proposed Disturbed Area	322,275 sq. ft.
Created or Replaced Impervious	240,257 sq. ft.
Project Hydrologic Unit Watershed	☐ Santa Maria ☒ San Luis Rey ☒ Carlsbad
Required to implement HMP	☒ Yes ☐ No

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CERTIFICATION PAGE

Project Name: Modera Melrose
Permit Application Number: D21-00011

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 City of Oceanside BMP Design Manual, which is based on the requirements of San Diego Regional Water Quality Control Board Order No. R9-2013-0001 (MS4 Permit).

I have read and understand that the City 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 City staff is confined to a review and does not relieve me, as the Engineer in Responsible Charge of design of storm water BMPs for this project, of my responsibilities for project design.

As Engineer of Work, I agree to indemnify, defend, and hold harmless the City of Oceanside, its officers, agents, and employees from any and all liability, claims, damages, or injuries to any person or property which might arise from the negligent acts, errors, or omissions of the Engineer of Work, my employees, agents or consultants.

_____ #92949 12/31/2023

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

Erin Lee, PE

Print Name

Kimley-Horn

Company

04/05/2022

Date

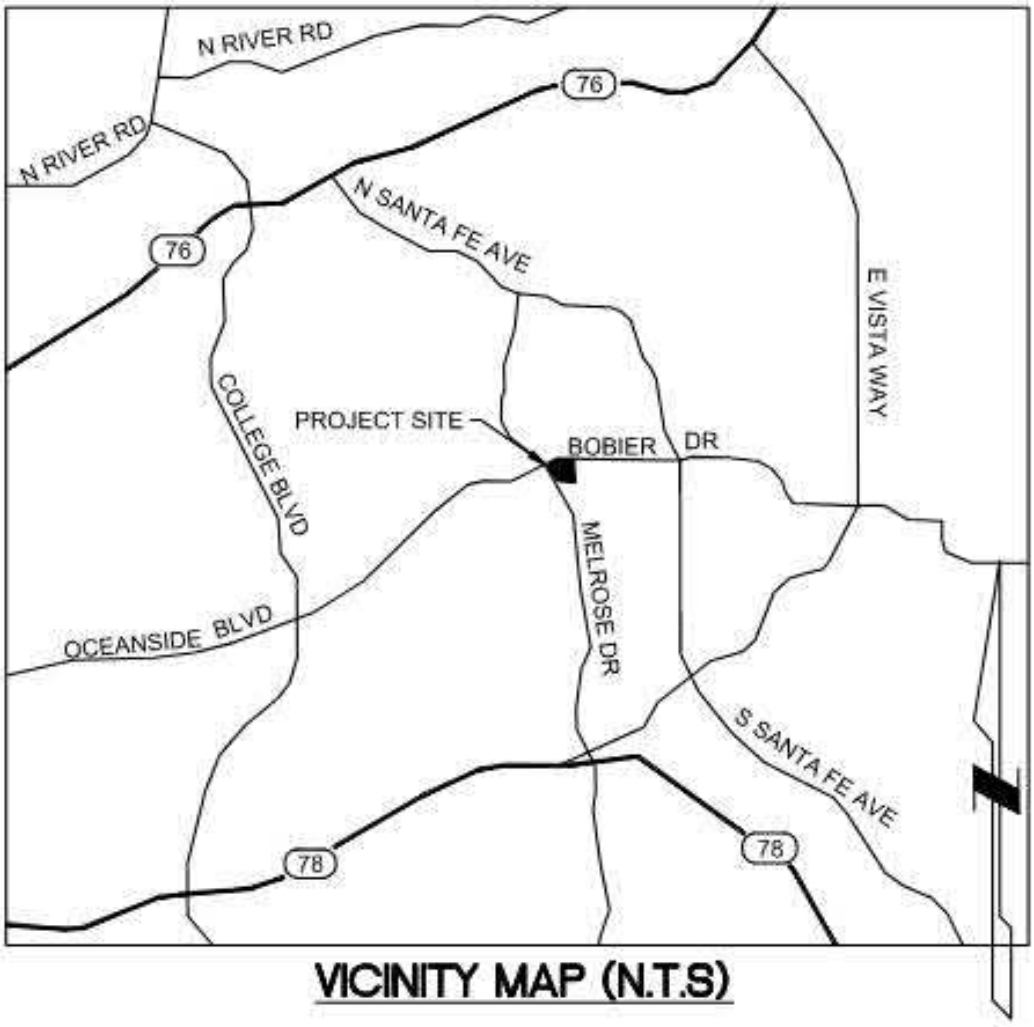
Engineer's Seal:

SUBMITTAL RECORD

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

Submittal Number	Date	Project Status	Changes
1	8/12/2021	☒ Preliminary Design/ Planning/ CEQA ☐ Final Design	Initial Submittal
2	10/15/2021	☒ Preliminary Design/ Planning/ CEQA ☐ Final Design	Second Submittal
3	12/20/2021	☒ Preliminary Design/ Planning/ CEQA ☐ Final Design	Third Submittal
4	04/05/2022	☒ Preliminary Design/ Planning/ CEQA ☐ Final Design	Fourth Submittal

Placeholder – **Project Vicinity Map**



VICINITY MAP (N.T.S)

Applicability of Permanent, Post-Construction Storm Water BMP Requirements (Storm Water Intake Form for all Development Permit Applications)	Form I-1

Project Identification

Project Name: Modera Melrose

Permit Application Number: D21-00011 | Date: 04/05/2022

Determination of Requirements

The purpose of this form is to identify permanent, post-construction requirements that apply to the project. This form serves as a short summary of applicable requirements, in some cases referencing separate forms that will serve as the backup for the determination of requirements.

Answer each step below, starting with Step 1 and progressing through each step until reaching "Stop".
Refer to the manual sections and/or separate forms referenced in each step below.

Step	Answer	Progression
Step 1: Is the project a "development project"? See Section 1.3 of the manual for guidance.	☒Yes	Go to Step 2.
	☐No	Stop. Permanent BMP requirements do not apply. No SWQMP will be required. Provide discussion below.
Discussion / justification if the project is not a "development project" (e.g., the project includes *only* interior remodels within an existing building):		
Step 2: Is the project a Standard Project, PDP, or exception to PDP definitions? To answer this item, see Section 1.4 of the manual *in its entirety* for guidance, AND complete Form I-2, Project Type Determination.	☐Standard Project	Stop. Standard Project requirements apply, including Standard Project SWQMP.
	☒PDP	PDP requirements apply, including PDP SWQMP. Go to Step 3.
	☐ Exception to PDP definitions	Stop. Standard Project requirements apply. Provide discussion and list any additional requirements below. Prepare Standard Project SWQMP.
Discussion / justification, and additional requirements for exceptions to PDP definitions, if applicable:		

Form I-1 Page 2 of 2		
Step	Answer	Progression
Step 3. Is the project subject to earlier PDP requirements due to a prior lawful approval? See Section 1.10 of the manual for guidance.	☐Yes	Consult the [City Engineer] to determine requirements. Provide discussion and identify requirements below. Go to Step 4.
	☒No	BMP Design Manual PDP requirements apply. Go to Step 4.
Discussion / justification of prior lawful approval, and identify requirements (*not required if prior lawful approval does not apply*):		
Step 4. Do hydromodification control requirements apply? See Section 1.6 of the manual for guidance.	☒Yes	PDP structural BMPs required for pollutant control (Chapter 5) and hydromodification control (Chapter 6). Go to Step 5.
	☐No	Stop. PDP structural BMPs required for pollutant control (Chapter 5) only. Provide brief discussion of exemption to hydromodification control below.
Discussion / justification if hydromodification control requirements do <u>not</u> apply:		
Step 5. Does protection of critical coarse sediment yield areas apply? See Section 6.2 of the manual for guidance.	☒Yes	Management measures required for protection of critical coarse sediment yield areas (Chapter 6.2). Stop.
	☐No	Management measures not required for protection of critical coarse sediment yield areas. Provide brief discussion below. Stop.
Discussion / justification if protection of critical coarse sediment yield areas does <u>not</u> apply:		

Project Type Determination Checklist			Form I-2
Project Information			
Project Name: Modera Melrose			
Permit Application Number: D21-00011			
Project Type Determination: PDP			
The project is (select one): ☒ New Development ☐ Redevelopment			
The total proposed newly created or replaced impervious area is: 240,257 ft² (5.52) acres			
Is the project in any of the following categories, (a) through (f)?			
Yes ☒	No ☐	(a)	New development projects that create 10,000 square feet or more of impervious surfaces (collectively over the entire project site). This includes commercial, industrial, residential, mixed-use, and public development projects on public or private land.
Yes ☐	No ☒	(b)	Redevelopment projects that create and/or replace 5,000 square feet or more of impervious surface (collectively over the entire project site on an existing site of 10,000 square feet or more of impervious surfaces). This includes commercial, industrial, residential, mixed-use, and public development projects on public or private land.
Yes ☐	No ☒	(c)	New and redevelopment projects that create 5,000 square feet or more of impervious surface (collectively over the entire project site), and support one or more of the following uses: (i) Restaurants. This category is defined as a facility that sells prepared foods and drinks for consumption, including stationary lunch counters and refreshment stands selling prepared foods and drinks for immediate consumption SIC code 5812). (ii) Hillside development projects. This category includes development on any natural slope that is twenty-five percent or greater. (iii) Parking lots. This category is defined as a land area or facility for the temporary parking or storage of motor vehicles used personally, for business, or for commerce. (iv) Streets, roads, highways, freeways, and driveways. This category is defined as any paved impervious surface used for the transportation of automobiles, trucks, motorcycles, and other vehicles.

Form I-2 Page 2 of 2			
Yes ☐	No ☒	(d)	New or redevelopment projects that create or replace 2,500 square feet or more of impervious surface (collectively over the entire project site), and discharging directly to an Environmentally Sensitive Area (ESA). "Discharging directly to" includes flow that is conveyed overland a distance of 200 feet or less from the project to the ESA, or conveyed in a pipe or open channel any distance as an isolated flow from the project to the ESA (i.e. not commingled with flows from adjacent lands). Note: ESAs are areas that include but are not limited to all Clean Water Act Section 303(d) impaired water bodies; areas designated as Areas of Special Biological Significance by the State Water Board and SDRWQCB; State Water Quality Protected Areas; water bodies designated with the RARE beneficial use by the State Water Board and SDRWQCB; and any other equivalent environmentally sensitive areas which have been identified by the Copermittees. See manual Section 1.4.2 for additional guidance.
Yes ☐	No ☒	(e)	New development projects that support one or more of the following uses: (i) Automotive repair shops. This category is defined as a facility that is categorized in any one of the following SIC codes: 5013, 5014, 5541, 7532-7534, or 7536-7539. (ii) Retail gasoline outlets. This category includes retail gasoline outlets that meet the following criteria: (a) 5,000 square feet or more or (b) a projected Average Daily Traffic of 100 or more vehicles per day.
Yes ☒	No ☐	(f)	New or redevelopment projects that result in the disturbance of one or more acres of land and are expected to generate pollutants post construction. *Note: See manual Section 1.4.2 for additional guidance.*

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

☐ No – the project is not a PDP (Standard Project).

☒ Yes – the project is a PDP.

The following is for redevelopment PDPs only:

The area of existing (pre-project) impervious area at the project site is: _____ ft^2 (A)
The total proposed newly created or replaced impervious area is: _____ ft^2 (B)
Percent impervious surface created or replaced (A/B)*100: _____%
The percent impervious surface created or replaced is (select one based on the above calculation):

☐ less than or equal to fifty percent (50%) – only new impervious areas are considered PDP

OR

☐ greater than fifty percent (50%) – the entire project site is a PDP

Site Information Checklist For PDPs	Form I-3B (PDPs)
Project Summary Information	
Project Name	Modera Melrose
Project Address	SEC Melrose Dr and Oceanside Blvd Oceanside, CA 92056
Assessor's Parcel Number(s)	161-030-23-00, 161-030-24-00
Permit Application Number	D21-00011
Project Watershed (Hydrologic Unit)	Select One: ☐Santa Margarita 902 ☒San Luis Rey 903 ☒Carlsbad 904
Parcel Area (total area of Assessor's Parcel(s) associated with the project)	7.40 Acres (322,275 Square Feet)
Area to be disturbed by the project (Project Area)	7.40 Acres (322,275 Square Feet)
Project Proposed Impervious Area (subset of Project Area)	5.52 Acres (240,257 Square Feet)
Project Proposed Pervious Area (subset of Project Area)	1.88 Acres (82,018 Square Feet)
Note: Proposed Impervious Area + Proposed Pervious Area = Area to be Disturbed by the Project. This may be less than the Parcel Area.	

Hydrologic Unit	Hydrologic Area	Hydrologic Sub-Area
Santa Margarita 902.00	☐ Ysidora 902.10	☐ Lower Ysidora 902.11
San Luis Rey 903.00	☒ Lower San Luis 903.10	☒ Mission 903.11
		☐ Bonsall 903.12
Carlsbad 904.00	☒ Loma Alta 904.10	Not Applicable
	☐ Buena Vista Creek 904.20	☐ El Salto 904.21
		☐ Vista 904.22
	☐ Agua Hedionda 4.30	☐ Los Monos 904.31

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

☐NRCS Type C

☒NRCS Type D

Approximate Depth to Groundwater:

☐Groundwater Depth < 5 feet

☐5 feet < Groundwater Depth < 10 feet

☐10 feet < Groundwater Depth < 20 feet

☒Groundwater Depth > 20 feet

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]:

The project site is currently undeveloped but previously graded and consists of a mixture of bare land and native vegetation. The topography generally slopes from northeast to southwest. Runoff from the property is captured by an existing concrete lined channel along the southern property line where it is collected in the City's storm drain system that ultimately discharges into the Pacific Ocean.

Runoff from the parcels east of the site run onto the eastern portion of the property so it can be collected into the concrete lined channel.

Description of Proposed Site Development and Drainage Patterns

Project Description / Proposed Land Use and/or Activities:

The project is proposing to develop the 7.40-acre site into a mixed-use multifamily building complex. The site is bounded by single family to the east, Oceanside Blvd to the north, Melrose Drive to west, and the Sprinter Light Rail to the south.

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

Impervious features include buildings, roadways, sidewalks, parking lots, and courtyards.

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

Pervious features include planters and landscaping around the perimeter of the site.

Does the project include grading and changes to site topography?

☒Yes

☐No

Description / Additional Information:

The project proposes to drain from the northeast to southwest, as it does today. Topography will be sloped to capture stormwater runoff locally in biofiltration planters and modular wetlands for water quality control.

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

☒Yes

☐No

Description / Additional Information:

The project proposes to sheet flow stormwater to biofiltration planters and modular wetlands for water quality control and then routes flow to the underground storm detention tank to meet detention and hydromodification requirements. Flow will then be conveyed to connect to the existing public curb inlet along the bike path south of the property where storm water will enter the City's storm drain system.

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

☒Onsite 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):
Flows enter the City storm drain system to the south of the site. The City's storm system discharges into Loma Alta Creek flowing west and ultimately discharges into 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
Loma Alta Creek	Selenium Toxicity	
Loma Alta Slough	Eutrophic Indicator Bacteria	
Pacific Ocean Shoreline, Loma Alta HSA, at Loma Alta Creek mouth	Indicator Bacteria Trash	
East Channel Creek	Indicator Bacteria	
Guajome Lake	Eutrophic	
Pacific Ocean Shoreline, San Luis Rey HU, at San Luis Rey River mouth	Enterococcus Total Coliform	TDML Required

Form I-3B Page 7 of 10

Identification of Project Site Pollutants*

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

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

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

NOT APPLICABLE

Note: **Indicator Bacteria shall be addressed as a Pollutant of Concern (POC) for projects located in** the Lower San Luis Hydrologic Area and for projects that discharge to the Pacific Ocean Shoreline within the boundaries of the City of Oceanside.

Note: Nutrients shall be addressed as a Pollutant of Concern (POC) for projects located in the Loma Alta Hydrologic Area.

Hydromodification Management Requirements

Do hydromodification management requirements apply (see Section 1.6 of the manual)?

☒Yes, hydromodification management flow control structural BMPs required.

☐No, the project will discharge runoff directly to existing underground storm drains discharging directly to water storage reservoirs, lakes, enclosed embayments, or the Pacific Ocean.

☐No, the project will discharge runoff directly to conveyance channels whose bed and bank are concrete-lined all the way from the point of discharge to water storage reservoirs, lakes, enclosed embayments, or the Pacific Ocean.

☐No, the project will discharge runoff directly to an area identified as appropriate for an exemption by the WMAA for the watershed in which the project resides.

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

Critical Coarse Sediment Yield Areas*

***This Section only required if hydromodification management requirements apply**

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

☒Yes

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

If yes, have any of the optional analyses presented in Section 6.2 of the manual been performed?

☒6.2.1 Verification of 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 2 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:

Optional Additional Analysis of Potential Critical Coarse Sediment Yield Areas Onsite was performed and additional analysis determined that protection onsite is not necessary. See Attachment 2B.

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.

The site is proposing to have two POCs. POC 1 is at the southeastern property line where the private storm system connects with the existing public headwall to the north of the bike path where flows enter the City of Vista's public storm system.

POC 2 is at the curb inlet in Oceanside Boulevard at the northwest corner of the site where it enters the City of Oceanside's public storm system.

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

☒No, the low flow threshold is 0.1Q2 (default low flow threshold)

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

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

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

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

Discussion / Additional Information: (optional)

Other Site Requirements and Constraints

When applicable, list other site requirements or constraints that will influence storm water management design, such as zoning requirements including setbacks and open space, or local codes governing minimum street width, sidewalk construction, allowable pavement types, and drainage requirements.

N/A

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.

There are two Points of Compliance (POC). The first point is located at the southwest corner of the project site and is displayed as a light blue ring reading POC #1. The second point is located at the northwest corner of the site and is displayed as a light blue ring reading POC #2.

Source Control BMP Checklist for All Development Projects (Standard Projects and PDPs)	Form I-4

Project Identification

Project Name Modera Melrose

Permit Application Number D21-00011

Source Control BMPs

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

Answer each category below pursuant to the following.

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

Source Control Requirement	Implemented?		
SC-1 Prevention of Illicit Discharges into the MS4	☒ Yes	☐ No	☐ N/A
Discussion / justification if SC-1 not implemented:			
SC-2 Storm Drain Stenciling or Signage	☒ Yes	☐ No	☐ N/A
Discussion / justification if SC-2 not implemented:			
SC-3 Protect Outdoor Materials Storage Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☐ Yes	☐ No	☒ N/A
Discussion / justification if SC-3 not implemented:			

Form I-4 Page 2 of 3			
Source Control Requirement	Implemented?		
SC-4 Protect Materials Stored in Outdoor Work Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☐ Yes	☐ No	☒ N/A
Discussion / justification if SC-4 not implemented:			
SC-5 Protect Trash Storage Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☐ Yes	☐ No	☒ N/A
Discussion / justification if SC-5 not implemented:			

Form I-4 Page 3 of 3			
SC-6 Additional BMPs Based on Potential Sources of Runoff Pollutants (must answer for each source listed below)	Implemented?		
Onsite storm drain inlets	☒ Yes	☐ No	☐ N/A
Interior floor drains and elevator shaft sump pumps	☒ Yes	☐ No	☐ N/A
Interior parking garages	☒ Yes	☐ No	☐ N/A
Need for future indoor & structural pest control	☐ Yes	☐ No	☒ N/A
Landscape/outdoor pesticide use	☒ Yes	☐ No	☐ N/A
Pools, spas, ponds, decorative fountains, and other water features	☒ Yes	☐ No	☐ N/A
Food service	☐ Yes	☐ No	☒ N/A
Refuse area	☒ Yes	☐ No	☐ N/A
Industrial processes	☐ Yes	☐ No	☒ N/A
Outdoor storage of equipment or materials	☐ Yes	☐ No	☒ N/A
Vehicle and equipment cleaning	☐ Yes	☐ No	☒ N/A
Vehicle/equipment repair and maintenance	☐ Yes	☐ No	☒ N/A
Fuel dispensing areas	☐ Yes	☐ No	☒ N/A
Loading docks	☐ Yes	☐ No	☒ N/A
Fire sprinkler test water	☒ Yes	☐ No	☐ N/A
Miscellaneous drain or wash water	☐ Yes	☐ No	☒ N/A
Plazas, sidewalks, and parking lots	☒ Yes	☐ No	☐ N/A
Discussion / justification if SC-6 not implemented. Clearly identify which sources of runoff pollutants are discussed. Justification must be provided for all "No" answers shown above.			

Site Design BMP Checklist for All Development Projects (Standard Projects and PDPs)	Form I-5

Project Identification

Project Name **Modera Melrose**

Permit Application Number **D21-00011**

Site Design BMPs

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

Answer each category below pursuant to the following.

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

Site Design Requirement	Applied?		
SD-1 Maintain Natural Drainage Pathways and Hydrologic Features	☐ Yes	☒ No	☐ N/A
Discussion / justification if SD-1 not implemented: Majority of site will be developed. Flows routed throughout site to get to the underground storage tank before discharge. Natural pathways were infeasible to keep.			
SD-2 Conserve Natural Areas, Soils, and Vegetation	☐ Yes	☒ No	☐ N/A
Discussion / justification if SD-2 not implemented: Majority of site will be developed, with new parkway requirement no natural vegetation will be kept.			
SD-3 Minimize Impervious Area	☒ Yes	☐ No	☐ N/A
Discussion / justification if SD-3 not implemented:			
SD-4 Minimize Soil Compaction	☒ Yes	☐ No	☐ N/A
Discussion / justification if SD-4 not implemented:			

Form I-5 Page 2 of 2			
Site Design Requirement	**Applied?**		
SD-5 Impervious Area Dispersion	☒ Yes	☐ No	☐ N/A
Discussion / justification if SD-5 not implemented:			
SD-6 Runoff Collection	☐ Yes	☐ No	☒ N/A
Discussion / justification if SD-6 not implemented:			
SD-7 Landscaping with Native or Drought Tolerant Species	☒ Yes	☐ No	☐ N/A
Discussion / justification if SD-7 not implemented:			
SD-8 Harvesting and Using Precipitation	☐ Yes	☒ No	☐ N/A
Discussion / justification if SD-8 not implemented: Harvest and Reuse considered infeasible. The 36-hour demand is less than 0.25DCV per Form I-7 Harvest and Use Feasibility Checklist.			

Summary of PDP Structural BMPs	Form I-6 (PDPs)

Project Identification

Project Name Modera Melrose

Permit Application Number D21-00011

PDP Structural BMPs

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

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

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

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

According to the Preliminary Geotechnical Investigation from Geocon dated January 26, 2021, infiltration is considered infeasible.

The proposed BMPs for treatment of the site are raised biofiltration planters for the roof runoff treatment and modular wetlands for the rest of the site's runoff treatment. The raised biofiltration planters were sized according to the Worksheet B.5-1 from the City of Oceanside BMP Design manual. The modular wetlands were sized according to Worksheet J.5-1 of the County of San Diego BMP Design Manual.

Runoff is collected from the modular wetlands and biofiltration planters, then conveyed to the underground detention tank for flow control to meet detention and hydromodification requirements. The underground tank was sized utilizing the criteria in Appendix G of the City of Oceanside BMP Design Manual. The unit sizing factors from Table G.2-7 for cistern sizing were used. See associated BMP sizing worksheets in Attachment 1 and the hydromodification sizing in Attachment 2.

(Continue on page 2 as necessary.)

(Page reserved for continuation of description of general strategy for structural BMP implementation at the site)

(Continued from page 1)

Form I-6 Page 3 of X (Copy as many as needed)	
Structural BMP Summary Information (Copy this page as needed to provide information for each individual proposed structural BMP)	
Structural BMP ID No. BMP 1a, 1b, 2a, 2b, 4, 5a, 5b, 5c, 5d, 5e, 5f, 6a, 6b, 7a, 7b, 9a, & 9b	
Construction Plan 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 with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below) ☐Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below) ☐Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below) ☐Detention pond or vault for hydromodification management ☐Other (describe in discussion section below)	
Purpose: ☒Pollutant control only ☐Hydromodification control only ☐Combined pollutant control and hydromodification control ☐Pre-treatment/forebay for another structural BMP ☐Other (describe in discussion section below)	
Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification forms if required by the [City Engineer] (See Section 1.12 of the manual)	Kimley-Horn Bryan Nord, PE Bryan.Nord@kimley-horn.com
Who will be the final owner of this BMP?	Mill Creek Residential Trust, LLC
Who will maintain this BMP into perpetuity?	Mill Creek Residential Trust, LLC
What is the funding mechanism for maintenance?	Mill Creek Residential Trust, LLC

Form I-6 Page 4 of X (Copy as many needed)
Structural BMP Summary Information (Copy this page as needed to provide information for each individual proposed structural BMP)
Discussion (as needed): BMP's 1a, 1b, 2a, 2b, 4, 5a, 5b, 5c, 5d, 5e, 5f, 6a, 6b, 7a, 7b, 9a, & 9b are biofiltration raised planters. See Attachment 1 for sizing calculations.

Form I-6 Page 3 of X (Copy as many as needed)	
Structural BMP Summary Information **(Copy this page as needed to provide information for each individual proposed structural BMP)**	
Structural BMP ID No. BMP 3 & 8	
Construction Plan 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 with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below) ☐Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below) ☐Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below) ☐Detention pond or vault for hydromodification management ☐Other (describe in discussion section below)	
Purpose: ☒Pollutant control only ☐Hydromodification control only ☐Combined pollutant control and hydromodification control ☐Pre-treatment/forebay for another structural BMP ☐Other (describe in discussion section below)	
Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification forms if required by the [City Engineer] (See Section 1.12 of the manual)	Kimley-Horn Bryan Nord, PE Bryan.Nord@kimley-horn.com
Who will be the final owner of this BMP?	Mill Creek Residential Trust, LLC
Who will maintain this BMP into perpetuity?	Mill Creek Residential Trust, LLC
What is the funding mechanism for maintenance?	Mill Creek Residential Trust, LLC

Form I-6 Page 4 of X (Copy as many needed)
Structural BMP Summary Information **(Copy this page as needed to provide information for each individual proposed structural BMP)**
Discussion (as needed): BMP's 3 and 8 are proprietary biofiltration systems, Modular Wetland Systems, designed to treat for pollutant control. The modular wetlands were sized to handle the required DCV. Worksheet B.2-1 was used to find the required DCV per each DMA. Table J.5-1 from Appendix J was used to determine the size of each wetland. See Attachment 1 for full sizing calculations.

Form I-6 Page 3 of X (Copy as many as needed)	
Structural BMP Summary Information (Copy this page as needed to provide information for each individual proposed structural BMP)	
Structural BMP ID No.BMP A	
Construction Plan 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 with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below) ☐Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below) ☐Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below) ☒Detention pond or vault for hydromodification management ☐Other (describe in discussion section below)	
Purpose: ☐Pollutant control only ☒Hydromodification control only ☐Combined pollutant control and hydromodification control ☐Pre-treatment/forebay for another structural BMP ☐Other (describe in discussion section below)	
Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification forms if required by the [City Engineer] (See Section 1.12 of the manual)	Kimley-Horn Bryan Nord, PE Bryan.Nord@kimley-horn.com
Who will be the final owner of this BMP?	Mill Creek Residential Trust, LLC
Who will maintain this BMP into perpetuity?	Mill Creek Residential Trust, LLC
What is the funding mechanism for maintenance?	Mill Creek Residential Trust, LLC

Form I-6 Page 4 of X (Copy as many needed)
Structural BMP Summary Information (Copy this page as needed to provide information for each individual proposed structural BMP)
Discussion (as needed): BMP A is an underground detention storage tank implemented to meet detention and hydromodification requirements. See Attachment 2 for sizing calculations.

	City of Oceanside 300 N Coast Highway Oceanside, CA 92054	**Permanent BMP Construction** **Self Certification Form**	February 2016

Date Prepared:	Project No.: D21-00011
Project Applicant: Mill Creek Residential Trust LLC	Phone: 714.966.9355
Project Address: SEC Melrose Drive and Oceanside Blvd, Oceanside, CA 92056	
Project Engineer: Erin Lee, PE	Phone: 619.234.9411

The purpose of this form is to verify that the site improvements for the project, identified above, have been constructed in conformance with the approved Storm Water Quality Management Plan (SWQMP) documents and drawings.

This form must be completed by the engineer and installing contractor and submitted prior to final inspection of the construction permit. Completion and submittal of this form is required for all new development and redevelopment projects in order to comply with the City's Storm Water ordinances and NDPES Permit Order No. R9-2013-0001. Final inspection for occupancy and/or release of grading or public improvement bonds may be delayed if this form is not submitted and approved by the City of Oceanside.

ENGINEER'S CERTIFICATION:

As the professional in responsible charge for the design of the above project, I certify that I have inspected all constructed Low Impact Development (LID) site design, source control and treatment control BMP's required per the approved SWQMP and Construction Permit No. Click here to enter text.; and that said BMP's have been constructed in compliance with the approved plans and all applicable specifications, permits, ordinances and Order No. R9-2013-0001 of the San Diego Regional Water Quality Control Board.

I understand that this BMP certification statement does not constitute an operation and maintenance verification.

Signature: _____

Date of Signature: _ _

Printed Name: _ Erin Lee, PE_____

Title: _ Civil Engineer_____

Phone No. _619.234.9411_____

Engineer's Stamp

CONTRACTOR'S CERTIFICATION:

As the professional in responsible charge for construction of the above project, I certify that all constructed Low Impact Development (LID) site design, source control and treatment control BMP's required per the approved SWQMP and Construction Permit No. Click here to enter text.; have been constructed in compliance with the approved plans and all applicable specifications, permits, and ordinances.

I understand that this BMP certification statement does not constitute an operation and maintenance verification.

Signature: _____

Date of Signature: _ Click here to enter text._

Printed Name: _ Click here to enter text._____

Title: _ Click here to enter text._____

Phone No. _ Click here to enter text. _____

ATTACHMENT 1

BACKUP FOR PDP POLLUTANT CONTROL BMPS

This is the cover sheet for Attachment 1.

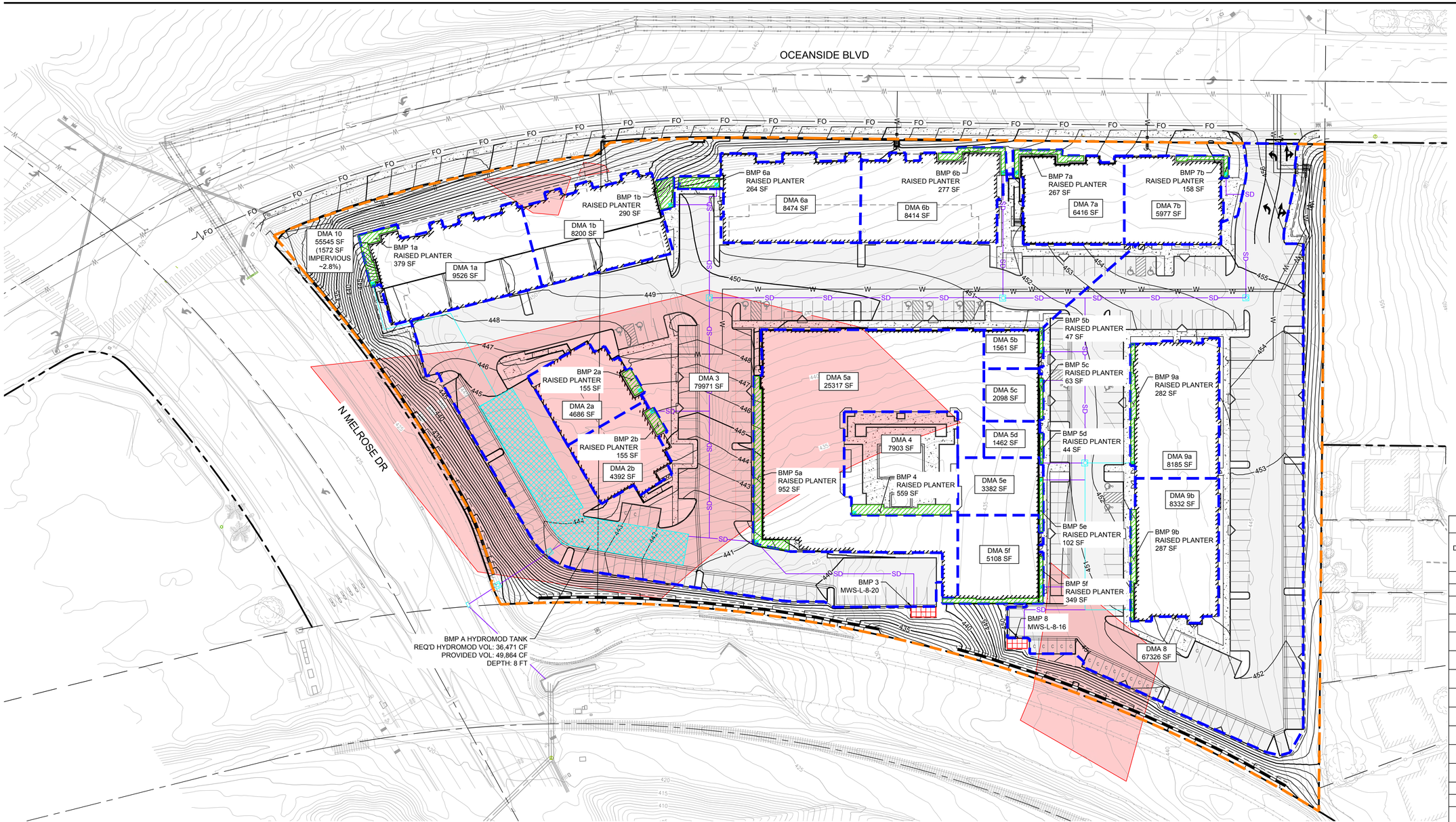
Indicate which Items are Included:

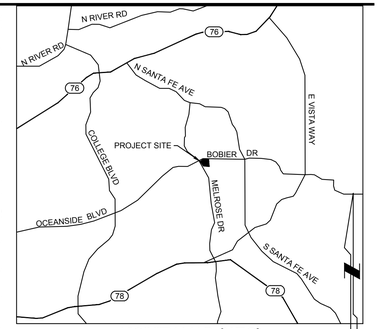
Attachment Sequence	Contents	Checklist
Attachment 1a	DMA Exhibit (Required) See DMA Exhibit Checklist.	☒Included
Attachment 1b	Tabular Summary of DMAs Showing DMA ID matching DMA Exhibit, DMA Area, and DMA Type (Required)* *Provide table in this Attachment OR on DMA Exhibit in Attachment 1a	☒Included on DMA Exhibit in Attachment 1a ☐Included as Attachment 1b, separate from DMA Exhibit
Attachment 1c	Design Capture Volume Worksheet	☒Included
Attachment 1d	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 1e	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 1f	Pollutant Control BMP Design Worksheets / Calculations (Required) Refer to Appendices B and E of the BMP Design Manual for structural pollutant control BMP design guidelines	☒Included

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

The DMA Exhibit must identify:

☒Underlying hydrologic soil group
☒Approximate depth to groundwater
☒Existing natural hydrologic features (watercourses, seeps, springs, wetlands)
☒Critical coarse sediment yield areas to be protected
☒Existing topography and impervious areas
☒Existing and proposed site drainage network and connections to drainage offsite
☒Proposed grading
☒Proposed impervious features
☒Proposed design features and surface treatments used to minimize imperviousness
☒Drainage management area (DMA) boundaries, DMA ID numbers, and DMA areas (square footage or acreage), and DMA type (i.e., drains to BMP, self-retaining, or self-mitigating)
☒Potential pollutant source areas and corresponding required source controls (see Chapter 4, Appendix E.1, and Form I-3B)
☒Structural BMPs (identify location, type of BMP, and size/detail)





VICINITY MAP (N.T.S)

LEGEND

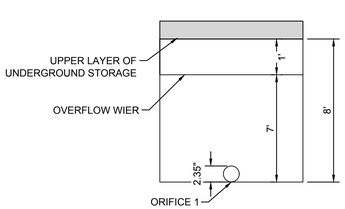
- PROPERTY BOUNDARY
- DRAINAGE MANAGEMENT AREA BOUNDARY
- SELF MITIGATING DMA BOUNDARY
- EXISTING CONTOUR
- PROPOSED CONTOUR
- STORM DRAIN
- BIOFILTRATION BMP AREA
- HYDROMOD TANK
- DRAINAGE MANAGEMENT AREA LABEL (DMA / AREA — ACRES)
- POTENTIAL CCSYAs
- PROP. AC PAVING
- PROP. CONCRETE SIDEWALK

BMP SUMMARY

DMA #	DMA AREA (SF)	REQUIRED BMP VOL OR FLOW RATE	PROVIDED BMP VOL OR FLOW*	BMP TYPE
1a	9526	449 CF	558 CF	RAISED PLANTER
1b	8200	386 CF	492 CF	RAISED PLANTER
2a	4686	221 CF	285 CF	RAISED PLANTER
2b	4392	207 CF	264 CF	RAISED PLANTER
3	79971	0.479 CFS	0.577 CFS	MODULAR WETLAND
4	7903	360 CF	388 CF	RAISED PLANTER
5a	25317	1193 CF	1502 CF	RAISED PLANTER
5b	1561	74 CF	96 CF	RAISED PLANTER
5c	2098	100 CF	130 CF	RAISED PLANTER
5d	1462	70 CF	91 CF	RAISED PLANTER
5e	3382	161 CF	210 CF	RAISED PLANTER
5f	5108	235 CF	256 CF	RAISED PLANTER
6a	8474	404 CF	527 CF	RAISED PLANTER
6b	8414	397 CF	512 CF	RAISED PLANTER
7a	6416	302 CF	376 CF	RAISED PLANTER
7b	5977	285 CF	376 CF	RAISED PLANTER
8	67326	0.403 CFS	0.462 CFS	MODULAR WETLAND
9a	8185	386 CF	492 CF	RAISED PLANTER
9b	8332	393 CF	501 CF	RAISED PLANTER
10	55545	--	--	SELF-RETAINING AREA

SITE DESIGN BMPS	
BMP ID	BMP DESCRIPTION
SD-B	MINIMIZE IMPERVIOUS ARES
	LANDSCAPING WITH NATIVE OR DROUGHT TOLERANT LANDSCAPING

SOURCE CONTROL BMPS	
BMP ID	BMP DESCRIPTION
SC-1	PREVENT ILLICIT DISCHARGE INTO MS4 ---> ALL LANDSCAPE AREAS (TYP.)
SC-2	STORM DRAIN STENCILING AND SIGNAGE ---> ALL SD GRATED INLETS (TYP.)
SC-6	ADDITIONAL BMPS BASED ON POTENTIAL SOURCES OF RUNOFF POLLUTANTS
	ON-SITE STORM DRAIN INLETS
	LANDSCAPE / OUTDOOR PESTICIDE USE
	PLAZA, SIDEWALKS, PARKING LOTS



1 BMP 1 OUTLET STRUCTURE
NOT TO SCALE

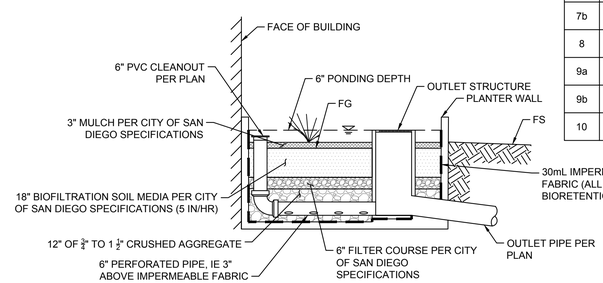
SITE INFORMATION

HYDROLOGIC SOIL GROUP: TYPE A & D

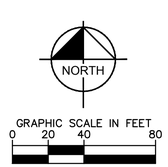
DEPTH TO GROUNDWATER: GREATER THAN 20'

THERE ARE NO EXISTING HYDROLOGIC FEATURES ONSITE

AREAS NOT SHOWN AS ASPHALT, CONCRETE, OR BUILDING ARE PERVIOUS



2 RAISED PLANTER WITH UNDERDRAIN
NOT TO SCALE



Kimley»Horn

DMA EXHIBIT
MODERA MELROSE
4/5/2022

Placeholder – **Tabular Summary of DMAs (if separate from DMA Exhibit)**

Leave placeholder intact if not applicable.

☒Not Applicable – Tabular Summary included on DMA Exhibit

BMP 1a

Design Capture Volume		Worksheet B-2.1		
1	85th percentile 24-hr storm depth from Figure B.1-1	d=	0.65	inches
2	Area tributary to BMP (s)	A=	0.22	acres
3	Area weighted runoff factor (estimate using Appendix B.1.1 and B.2.1)	C=	0.87	unitless
4	Street trees volume reduction	TCV=	0	cubic-feet
5	Rain barrels volume reduction	RCV=	0	cubic-feet
6	Calculate DCV = (3630 x C x d x A) – TCV - RCV	DCV=	449	cubic-feet

BMP 1b

Design Capture Volume		Worksheet B-2.1		
1	85th percentile 24-hr storm depth from Figure B.1-1	d=	0.65	inches
2	Area tributary to BMP (s)	A=	0.19	acres
3	Area weighted runoff factor (estimate using Appendix B.1.1 and B.2.1)	C=	0.87	unitless
4	Street trees volume reduction	TCV=	0	cubic-feet
5	Rain barrels volume reduction	RCV=	0	cubic-feet
6	Calculate DCV = (3630 x C x d x A) – TCV - RCV	DCV=	386	cubic-feet

BMP 2a

Design Capture Volume		Worksheet B-2.1		
1	85th percentile 24-hr storm depth from Figure B.1-1	d=	0.65	inches
2	Area tributary to BMP (s)	A=	0.11	acres
3	Area weighted runoff factor (estimate using Appendix B.1.1 and B.2.1)	C=	0.87	unitless
4	Street trees volume reduction	TCV=	0	cubic-feet
5	Rain barrels volume reduction	RCV=	0	cubic-feet
6	Calculate DCV = (3630 x C x d x A) – TCV - RCV	DCV=	221	cubic-feet

BMP 2b

Design Capture Volume		Worksheet B-2.1		
1	85th percentile 24-hr storm depth from Figure B.1-1	d=	0.65	inches
2	Area tributary to BMP (s)	A=	0.10	acres
3	Area weighted runoff factor (estimate using Appendix B.1.1 and B.2.1)	C=	0.87	unitless
4	Street trees volume reduction	TCV=	0	cubic-feet
5	Rain barrels volume reduction	RCV=	0	cubic-feet
6	Calculate DCV = (3630 x C x d x A) – TCV - RCV	DCV=	207	cubic-feet

BMP 3

Design Capture Volume		Worksheet B-2.1		
1	85th percentile 24-hr storm depth from Figure B.1-1	d=	0.65	inches
2	Area tributary to BMP (s)	A=	1.84	acres
3	Area weighted runoff factor (estimate using Appendix B.1.1 and B.2.1)	C=	0.87	unitless
4	Street trees volume reduction	TCV=	0	cubic-feet
5	Rain barrels volume reduction	RCV=	0	cubic-feet
6	Calculate DCV = (3630 x C x d x A) – TCV - RCV	DCV=	3769	cubic-feet

BMP 4

Design Capture Volume		Worksheet B-2.1		
1	85th percentile 24-hr storm depth from Figure B.1-1	d=	0.65	inches
2	Area tributary to BMP (s)	A=	0.18	acres
3	Area weighted runoff factor (estimate using Appendix B.1.1 and B.2.1)	C=	0.84	unitless
4	Street trees volume reduction	TCV=	0	cubic-feet
5	Rain barrels volume reduction	RCV=	0	cubic-feet
6	Calculate DCV = (3630 x C x d x A) – TCV - RCV	DCV=	360	cubic-feet

BMP 5a

Design Capture Volume		Worksheet B-2.1		
1	85th percentile 24-hr storm depth from Figure B.1-1	d=	0.65	inches
2	Area tributary to BMP (s)	A=	0.58	acres
3	Area weighted runoff factor (estimate using Appendix B.1.1 and B.2.1)	C=	0.87	unitless
4	Street trees volume reduction	TCV=	0	cubic-feet
5	Rain barrels volume reduction	RCV=	0	cubic-feet
6	Calculate DCV = (3630 x C x d x A) – TCV - RCV	DCV=	1193	cubic-feet

BMP 5b

Design Capture Volume		Worksheet B-2.1		
1	85th percentile 24-hr storm depth from Figure B.1-1	d=	0.65	inches
2	Area tributary to BMP (s)	A=	0.04	acres
3	Area weighted runoff factor (estimate using Appendix B.1.1 and B.2.1)	C=	0.88	unitless
4	Street trees volume reduction	TCV=	0	cubic-feet
5	Rain barrels volume reduction	RCV=	0	cubic-feet
6	Calculate DCV = (3630 x C x d x A) – TCV - RCV	DCV=	74	cubic-feet

BMP 5c

Design Capture Volume		Worksheet B-2.1		
1	85th percentile 24-hr storm depth from Figure B.1-1	d=	0.65	inches
2	Area tributary to BMP (s)	A=	0.05	acres
3	Area weighted runoff factor (estimate using Appendix B.1.1 and B.2.1)	C=	0.88	unitless
4	Street trees volume reduction	TCV=	0	cubic-feet
5	Rain barrels volume reduction	RCV=	0	cubic-feet
6	Calculate DCV = (3630 x C x d x A) – TCV - RCV	DCV=	100	cubic-feet

BMP 5d

Design Capture Volume		Worksheet B-2.1		
1	85th percentile 24-hr storm depth from Figure B.1-1	d=	0.65	inches
2	Area tributary to BMP (s)	A=	0.03	acres
3	Area weighted runoff factor (estimate using Appendix B.1.1 and B.2.1)	C=	0.88	unitless
4	Street trees volume reduction	TCV=	0	cubic-feet
5	Rain barrels volume reduction	RCV=	0	cubic-feet
6	Calculate DCV = (3630 x C x d x A) – TCV - RCV	DCV=	70	cubic-feet

BMP 5e

Design Capture Volume		Worksheet B-2.1		
1	85th percentile 24-hr storm depth from Figure B.1-1	d=	0.65	inches
2	Area tributary to BMP (s)	A=	0.08	acres
3	Area weighted runoff factor (estimate using Appendix B.1.1 and B.2.1)	C=	0.88	unitless
4	Street trees volume reduction	TCV=	0	cubic-feet
5	Rain barrels volume reduction	RCV=	0	cubic-feet
6	Calculate DCV = (3630 x C x d x A) – TCV - RCV	DCV=	161	cubic-feet

BMP 5f

Design Capture Volume		Worksheet B-2.1		
1	85th percentile 24-hr storm depth from Figure B.1-1	d=	0.65	inches
2	Area tributary to BMP (s)	A=	0.12	acres
3	Area weighted runoff factor (estimate using Appendix B.1.1 and B.2.1)	C=	0.85	unitless
4	Street trees volume reduction	TCV=	0	cubic-feet
5	Rain barrels volume reduction	RCV=	0	cubic-feet
6	Calculate DCV = (3630 x C x d x A) – TCV - RCV	DCV=	235	cubic-feet

BMP 6a

Design Capture Volume		Worksheet B-2.1		
1	85th percentile 24-hr storm depth from Figure B.1-1	d=	0.65	inches
2	Area tributary to BMP (s)	A=	0.19	acres
3	Area weighted runoff factor (estimate using Appendix B.1.1 and B.2.1)	C=	0.88	unitless
4	Street trees volume reduction	TCV=	0	cubic-feet
5	Rain barrels volume reduction	RCV=	0	cubic-feet
6	Calculate DCV = (3630 x C x d x A) – TCV - RCV	DCV=	404	cubic-feet

BMP 6b

Design Capture Volume		Worksheet B-2.1		
1	85th percentile 24-hr storm depth from Figure B.1-1	d=	0.65	inches
2	Area tributary to BMP (s)	A=	0.19	acres
3	Area weighted runoff factor (estimate using Appendix B.1.1 and B.2.1)	C=	0.87	unitless
4	Street trees volume reduction	TCV=	0	cubic-feet
5	Rain barrels volume reduction	RCV=	0	cubic-feet
6	Calculate DCV = (3630 x C x d x A) – TCV - RCV	DCV=	397	cubic-feet

BMP 7a

Design Capture Volume		Worksheet B-2.1		
1	85th percentile 24-hr storm depth from Figure B.1-1	d=	0.65	inches
2	Area tributary to BMP (s)	A=	0.15	acres
3	Area weighted runoff factor (estimate using Appendix B.1.1 and B.2.1)	C=	0.87	unitless
4	Street trees volume reduction	TCV=	0	cubic-feet
5	Rain barrels volume reduction	RCV=	0	cubic-feet
6	Calculate DCV = (3630 x C x d x A) – TCV - RCV	DCV=	302	cubic-feet

BMP 7b

Design Capture Volume		Worksheet B-2.1		
1	85th percentile 24-hr storm depth from Figure B.1-1	d=	0.65	inches
2	Area tributary to BMP (s)	A=	0.14	acres
3	Area weighted runoff factor (estimate using Appendix B.1.1 and B.2.1)	C=	0.88	unitless
4	Street trees volume reduction	TCV=	0	cubic-feet
5	Rain barrels volume reduction	RCV=	0	cubic-feet
6	Calculate DCV = (3630 x C x d x A) – TCV - RCV	DCV=	285	cubic-feet

BMP 8

Design Capture Volume		Worksheet B-2.1		
1	85th percentile 24-hr storm depth from Figure B.1-1	d=	0.65	inches
2	Area tributary to BMP (s)	A=	1.55	acres
3	Area weighted runoff factor (estimate using Appendix B.1.1 and B.2.1)	C=	0.87	unitless
4	Street trees volume reduction	TCV=	0	cubic-feet
5	Rain barrels volume reduction	RCV=	0	cubic-feet
6	Calculate DCV = (3630 x C x d x A) – TCV - RCV	DCV=	3173	cubic-feet

BMP 9a

Design Capture Volume		Worksheet B-2.1		
1	85th percentile 24-hr storm depth from Figure B.1-1	d=	0.65	inches
2	Area tributary to BMP (s)	A=	0.19	acres
3	Area weighted runoff factor (estimate using Appendix B.1.1 and B.2.1)	C=	0.87	unitless
4	Street trees volume reduction	TCV=	0	cubic-feet
5	Rain barrels volume reduction	RCV=	0	cubic-feet
6	Calculate DCV = (3630 x C x d x A) – TCV - RCV	DCV=	386	cubic-feet

BMP 9b

Design Capture Volume		Worksheet B-2.1		
1	85th percentile 24-hr storm depth from Figure B.1-1	d=	0.65	inches
2	Area tributary to BMP (s)	A=	0.19	acres
3	Area weighted runoff factor (estimate using Appendix B.1.1 and B.2.1)	C=	0.87	unitless
4	Street trees volume reduction	TCV=	0	cubic-feet
5	Rain barrels volume reduction	RCV=	0	cubic-feet
6	Calculate DCV = (3630 x C x d x A) – TCV - RCV	DCV=	393	cubic-feet

Harvest and Use Feasibility Checklist	Form I-7

1. Is there a demand for harvested water (check all that apply) at the project site that is reliably present during the wet season?

☒ Toilet and urinal flushing
☒ Landscape irrigation
☐ Other:_____

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

[Prov

Landscape Irrigation
ETWU = ETo(wet) * [[Sum(PF * HA) / IE] + SLA] * 0.015
= 2.8 * [[(0.1 *79,520) / 0.9] + 0] * 0.015 ETWU = 371 CF
Toilet/Urinal Flushing - 400 residences from unit mix.
400 x 9.3 gallons/resident = 3720 gallons per day x 1.5 = 5580 gallons per 36 hours
5580 gallons = 746 cubic feet
12,119 x 0.25 = 3030 cubic feet 746 + 371 = 1117 cubic feet < 3030 cubic feet

3. Calculate the DCV using worksheet B-2.1.

DCV = 12,119 (cubic feet)

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

Is harvest and use feasible based on further evaluation?

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

☐ No, select alternate BMPs.

Categorization of Infiltration Feasibility Condition	Form I-8

Part 1 - Full Infiltration Feasibility Screening Criteria

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

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

Provide basis:

Two permeability tests using our constant-head downhole permeameter were performed. The unfactored infiltration rates were measured to be 0.003 and 0.030 inches/hour (iph). After applying a feasibility factor of safety of 2, the design infiltration rates for the Santiago Formation are 0.001 and 0.015 iph. The downhole permeameter test results are attached. The USDA NRCS Web Soil Survey shows that 12% of the property is classified as Diablo Clay (DaC), which belongs to Hydrologic Soil Group D, and 87% belongs to Tujunga Sand (TuB) which is considered Hydrologic Soil Group A. Based on the above information, full infiltration BMP's supported by the onsite soils are not feasible due to the very low infiltration rates. Please refer to the geotechnical investigation, for additional information.

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

2	**Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.	☐	☒

Provide basis:

Descending fill slopes are planned at 2:1 or flatter, a liquefaction potential is very low to negligible, and the landslide potential is very low to negligible. The storm water BMP's will be founded in compacted fill or Santiago formation. The potential for fill slope instability exists if water is allowed to infiltrate adjacent to fill slopes. The onsite soils are highly expansive. The potential for adverse soil movement and lateral water migration to adversely impact existing and proposed private and public utilities, foundations, roadways and improvements is high. Compacted fill will be placed across the property and result in fills of greater than 5 to 20 feet thick. Infiltration BMP's founded in compacted fill should be avoided to prevent adverse swelling of the expansive soils, and adverse hydro-consolidation of the granular fill soils which causes differential settlement. Groundwater is not encountered during the field investigation, the potential for groundwater mounding is negligible.

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

Form I-8 Page 2 of 4			
Criteria	Screening Question	**Yes**	**No**
3	**Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of groundwater contamination (shallow water table, storm water pollutants or other factors) that cannot be mitigated to an acceptable level?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.	☒	☐
Provide basis: Groundwater was not encountered during the investigation, and is not expected within 10 feet of the bottom of any proposed BMP, therefore the risk of storm water infiltration BMP's adversely impacting groundwater is negligible. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
4	**Can infiltration greater than 0.5 inches per hour be allowed without causing potential water balance issues such as change of seasonality of ephemeral streams or increased discharge of contaminated groundwater to surface waters?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.	☒	☐
Provide basis: We are not aware of any water balance issues. Researching downstream water rights or evaluating water balance issues to stream flows is beyond the scope of the geotechnical consultant. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
Part 1 Result *	If all answers to rows 1 - 4 are "**Yes**" a full infiltration design is potentially feasible. The feasibility screening category is **Full Infiltration** If any answer from row 1-4 is "**No**", infiltration may be possible to some extent but would not generally be feasible or desirable to achieve a "full infiltration" design. Proceed to Part 2	☐Full Infiltration ☒No	

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

Form I-8 Page 3 of 4

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

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

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

Provide basis:

Two permeability tests using our constant-head downhole permeameter were performed. The unfactored infiltration rates were measured to be 0.003 and 0.030 inches/hour (iph). After applying a feasibility factor of safety of 2, the design infiltration rates for the Santiago Formation are 0.001 and 0.015 iph, which is less than 0.05 iph, the commonly used minimum threshold for partial infiltration. The downhole permeameter test results are attached. The USDA NRCS Web Soil Survey shows that 12% of the property is classified as Diablo Clay (DaC), which belongs to Hydrologic Soil Group D, and 87% belongs to Tujunga Sand (TuB) which is considered Hydrologic Soil Group A. Based on the above information, partial infiltration BMP's supported by the onsite soils are not feasible due to the very low infiltration rates. Please refer to the geotechnical investigation, for additional information.

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

Criteria	Screening Question	Yes	No
6	**Can Infiltration in any appreciable quantity be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level**? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.	☐	☒

Provide basis:

Descending fill slopes are planned at 2:1 or flatter, a liquefaction potential is very low to negligible, and the landslide potential is very low to negligible. The storm water BMP's will be founded in compacted fill or Santiago formation. The potential for fill slope instability exists if water is allowed to infiltrate adjacent to fill slopes. The onsite soils are highly expansive. The potential for adverse soil movement and lateral water migration to adversely impact existing and proposed private and public utilities, foundations, roadways and improvements is high. Compacted fill will be placed across the property and result in fills of greater than 5 to 20 feet thick. Infiltration BMP's founded in compacted fill should be avoided to prevent adverse swelling of the expansive soils, and adverse hydro-consolidation of the granular fill soils which causes differential settlement. Groundwater is not encountered during the field investigation, the potential for groundwater mounding is negligible.

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

Form I-8 Page 4 of 4			
Criteria	Screening Question	**Yes**	**No**
7	**Can Infiltration in any appreciable quantity be allowed without posing significant risk for groundwater related concerns (shallow water table, storm water pollutants or other factors)?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.	☒	☐
Provide basis: Groundwater was not encountered during the investigation and is not expected within 10 feet from the bottom of any proposed storm water BMP, therefore the risk of storm water infiltration BMP's adversely impacting groundwater is negligible. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.			
8	**Can infiltration be allowed without violating downstream water rights**? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.	☒	☐
Provide basis: We are not aware of any downstream water rights. Researching downstream water rights or evaluating water balance issues to stream flows is beyond the scope of the geotechnical consultant. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.			
Part 2 Result*	If all answers from row 1-4 are yes then partial infiltration design is potentially feasible. The feasibility screening category is **Partial Infiltration.** If any answer from row 5-8 is no, then infiltration of any volume is considered to be **infeasible** within the drainage area. The feasibility screening category is **No Infiltration.**	☐Partial Infiltration ☒No Infiltration	

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

Factor of Safety and Design Infiltration Rate Worksheet			Worksheet D.5-1		
Factor Category		Factor Description	Assigned Weight (w)	Factor Value (v)	Product (p) p = w x v
A	Suitability Assessment	Soil assessment methods	0.25	3	0.75
		Predominant soil texture	0.25	2	0.50
		Site soil variability	0.25	2	0.50
		Depth to groundwater / impervious layer	0.25	1	0.25
		Suitability Assessment Safety Factor, $S_A = \Sigma p$			2.0
B	Design	Level of pretreatment/ expected sediment loads	0.5		
		Redundancy/resiliency	0.25		
		Compaction during construction	0.25		
		Design Safety Factor, $S_B = \Sigma p$			
Combined Safety Factor, $S_{total} = S_A \times S_B$					
Observed Infiltration Rate, inch/hr, $K_{observed}$ (corrected for test-specific bias)					
Design Infiltration Rate, in/hr, $K_{design} = K_{observed} / S_{total}$					
Supporting Data					
Briefly describe infiltration test and provide reference to test forms:					

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	1a	1b	2a	2b	4	5a	5b	5c	5d	5e	unitless
	2	85th Percentile 24-hr Storm Depth	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	inches
	3	Impervious Surfaces Not Directed to Dispersion Area (C=0.90)	9,147	7,910	4,531	4,237	7,344	24,365	1,514	2,035	1,418	3,280	sq-ft
	4	Semi-Pervious Surfaces Not Serving as Dispersion Area (C=0.30)											sq-ft
	5	Engineered Pervious Surfaces Not Serving as Dispersion Area (C=0.10)	379	290	155	155	559	952	47	63	44	102	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	9,526	8,200	4,686	4,392	7,903	25,317	1,561	2,098	1,462	3,382	sq-ft
	23	Initial Runoff Factor for Standard Drainage Areas	0.87	0.87	0.87	0.87	0.84	0.87	0.88	0.88	0.88	0.88	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	0.87	0.87	0.87	0.87	0.84	0.87	0.88	0.88	0.88	0.88	unitless
	26	Initial Design Capture Volume	449	386	221	207	360	1,193	74	100	70	161	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	0.87	0.87	0.87	0.87	0.84	0.87	0.88	0.88	0.88	0.88	unitless
	32	Design Capture Volume After Dispersion Techniques	449	386	221	207	360	1,193	74	100	70	161	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	0.87	0.87	0.87	0.87	0.84	0.87	0.88	0.88	0.88	0.88	unitless
	36	Final Effective Tributary Area	8,288	7,134	4,077	3,821	6,639	22,026	1,374	1,846	1,287	2,976	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	449	386	221	207	360	1,193	74	100	70	161	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	1a	1b	2a	2b	4	5a	5b	5c	5d	5e	unitless
	2	85th Percentile Rainfall Depth	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	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	Soil Type	Soil Type	Soil Type	Soil Type	Soil Type	Soil Type	Soil Type	Soil Type	Soil Type	Soil Type	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	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	percentage
	12	Fraction of DCV Requiring Retention	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	ratio
	13	Required Retention Volume	4	4	2	2	4	12	1	1	1	2	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	1a	1b	2a	2b	4	5a	5b	5c	5d	5e	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	449	386	221	207	360	1,193	74	100	70	161	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	379	290	155	155	559	952	47	63	44	102	sq-ft
	9	Provided Surface Ponding Depth	6	6	6	6	6	6	6	6	6	6	inches
	10	Provided Soil Media Thickness	18	18	18	18	18	18	18	18	18	18	inches
	11	Provided Gravel Thickness (Total Thickness)	18	18	18	18	18	18	18	18	18	18	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)	0.15	0.13	0.12	0.13	0.27	0.14	0.11	0.11	0.11	0.11	ratio
	25	Calculated Retention Storage Drawdown Time	120	120	120	120	120	120	120	120	120	120	hours
	26	Efficacy of Retention Processes	0.17	0.15	0.14	0.15	0.28	0.16	0.13	0.13	0.13	0.13	ratio
	27	Volume Retained by BMP (Considering Drawdown Time)	77	58	31	31	101	192	10	13	9	21	cubic-feet
	28	Design Capture Volume Remaining for Biofiltration	372	328	190	176	259	1,001	64	87	61	140	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	1.6375	1.6375	cfs
	30	Max Soil Filtration Rate Allowed by Underdrain Orifice	186.65	243.93	456.39	456.39	126.55	74.31	1,505.12	1,122.87	1,607.74	693.53	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	15.60	15.60	15.60	15.60	15.60	15.60	15.60	15.60	15.60	15.60	inches
	38	Drawdown Time for Surface Ponding	1	1	1	1	1	1	1	1	1	1	hours
	39	Drawdown Time for Effective Biofiltration Depth	3	3	3	3	3	3	3	3	3	3	hours
	40	Total Depth Biofiltered	45.60	45.60	45.60	45.60	45.60	45.60	45.60	45.60	45.60	45.60	inches
	41	Option 1 - Biofilter 1.50 DCV: Target Volume	558	492	285	264	388	1,502	96	130	91	210	cubic-feet
	42	Option 1 - Provided Biofiltration Volume	558	492	285	264	388	1,502	96	130	91	210	cubic-feet
	43	Option 2 - Store 0.75 DCV: Target Volume	279	246	142	132	194	751	48	65	46	105	cubic-feet
	44	Option 2 - Provided Storage Volume	279	246	142	132	194	751	48	65	46	105	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.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	5f	6a	6b	7a	7b	9a	9b				unitless
	2	85th Percentile 24-hr Storm Depth	0.65	0.65	0.65	0.65	0.65	0.65	0.65				inches
	3	Impervious Surfaces Not Directed to Dispersion Area (C=0.90)	4,759	8,210	8,137	6,149	5,819	7,903	8,045				sq-ft
	4	Semi-Pervious Surfaces Not Serving as Dispersion Area (C=0.30)											sq-ft
	5	Engineered Pervious Surfaces Not Serving as Dispersion Area (C=0.10)	349	264	277	267	158	282	287				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				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	5,108	8,474	8,414	6,416	5,977	8,185	8,332	0	0	0	sq-ft
	23	Initial Runoff Factor for Standard Drainage Areas	0.85	0.88	0.87	0.87	0.88	0.87	0.87	0.00	0.00	0.00	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	0.85	0.88	0.87	0.87	0.88	0.87	0.87	0.00	0.00	0.00	unitless
	26	Initial Design Capture Volume	235	404	397	302	285	386	393	0	0	0	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	0.85	0.88	0.87	0.87	0.88	0.87	0.87	n/a	n/a	n/a	unitless
	32	Design Capture Volume After Dispersion Techniques	235	404	397	302	285	386	393	0	0	0	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	0.85	0.88	0.87	0.87	0.88	0.87	0.87	0.00	0.00	0.00	unitless
	36	Final Effective Tributary Area	4,342	7,457	7,320	5,582	5,260	7,121	7,249	0	0	0	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	235	404	397	302	285	386	393	0	0	0	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	5f	6a	6b	7a	7b	9a	9b	-	-	-	unitless
	2	85th Percentile Rainfall Depth	0.65	0.65	0.65	0.65	0.65	0.65	0.65	-	-	-	inches
	3	Predominant NRCS Soil Type Within BMP Location	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				unitless
	5	Nature of Restriction	Soil Type	Soil Type	Soil Type	Soil Type	Soil Type	Soil Type	Soil Type				unitless
	6	Do Minimum Retention Requirements Apply to this Project?	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				yes/no
Advanced Analysis	8	Has Geotechnical Engineer Performed an Infiltration Analysis?	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	-	-	-	in/hr
	11	Percent of Average Annual Runoff that Must be Retained within DMA	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	-	-	-	percentage
	12	Fraction of DCV Requiring Retention	0.01	0.01	0.01	0.01	0.01	0.01	0.01	-	-	-	ratio
	13	Required Retention Volume	2	4	4	3	3	4	4	-	-	-	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	5f	6a	6b	7a	7b	9a	9b	-	-	-	sq-ft
	2	Design Infiltration Rate Recommended	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-	-	-	in/hr
	3	Design Capture Volume Tributary to BMP	235	404	397	302	285	386	393	-	-	-	cubic-feet
	4	Is BMP Vegetated or Unvegetated?	Vegetated	Vegetated	Vegetated	Vegetated	Vegetated	Vegetated	Vegetated				unitless
	5	Is BMP Impermeably Lined or Unlined?	Lined	Lined	Lined	Lined	Lined	Lined	Lined				unitless
	6	Does BMP Have an Underdrain?	Underdrain	Underdrain	Underdrain	Underdrain	Underdrain	Underdrain	Underdrain				unitless
	7	Does BMP Utilize Standard or Specialized Media?	Standard	Standard	Standard	Standard	Standard	Standard	Standard				unitless
	8	Provided Surface Area	349	264	277	267	158	282	287				sq-ft
	9	Provided Surface Ponding Depth	6	6	6	6	6	6	6				inches
	10	Provided Soil Media Thickness	18	18	18	18	18	18	18				inches
	11	Provided Gravel Thickness (Total Thickness)	18	18	18	18	18	18	18				inches
	12	Underdrain Offset	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				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	1.00	1.00	1.00	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	0.40	0.40	0.40	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	0.00	0.00	0.00	inches
	24	Fraction of DCV Retained (Independent of Drawdown Time)	0.26	0.11	0.12	0.15	0.10	0.13	0.13	0.00	0.00	0.00	ratio
	25	Calculated Retention Storage Drawdown Time	120	120	120	120	120	120	120	0	0	0	hours
	26	Efficacy of Retention Processes	0.27	0.13	0.14	0.17	0.12	0.15	0.15	0.00	0.00	0.00	ratio
	27	Volume Retained by BMP (Considering Drawdown Time)	64	53	56	52	34	58	59	0	0	0	cubic-feet
	28	Design Capture Volume Remaining for Biofiltration	171	351	341	250	251	328	334	0	0	0	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	0.0000	0.0000	0.0000	cfs
	30	Max Soil Filtration Rate Allowed by Underdrain Orifice	202.69	267.96	255.38	264.95	447.73	250.85	246.48	0.00	0.00	0.00	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	0.00	0.00	0.00	in/hr
	33	Depth Biofiltered Over 6 Hour Storm	30.00	30.00	30.00	30.00	30.00	30.00	30.00	0.00	0.00	0.00	inches
	34	Ponding Pore Space Available for Biofiltration	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	0.00	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	15.60	15.60	15.60	15.60	15.60	15.60	15.60	0.00	0.00	0.00	inches
	38	Drawdown Time for Surface Ponding	1	1	1	1	1	1	1	0	0	0	hours
	39	Drawdown Time for Effective Biofiltration Depth	3	3	3	3	3	3	3	0	0	0	hours
	40	Total Depth Biofiltered	45.60	45.60	45.60	45.60	45.60	45.60	45.60	0.00	0.00	0.00	inches
	41	Option 1 - Biofilter 1.50 DCV: Target Volume	256	527	512	376	376	492	501	0	0	0	cubic-feet
	42	Option 1 - Provided Biofiltration Volume	256	527	512	376	376	492	501	0	0	0	cubic-feet
	43	Option 2 - Store 0.75 DCV: Target Volume	128	263	256	188	188	246	250	0	0	0	cubic-feet
	44	Option 2 - Provided Storage Volume	128	263	256	188	188	246	250	0	0	0	cubic-feet
	45	Portion of Biofiltration Performance Standard Satisfied	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	0.00	ratio
Result	46	Do Site Design Elements and BMPs Satisfy Annual Retention Requirements?	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	0.00	0.00	0.00	ratio
	48	Deficit of Effectively Treated Stormwater	0	0	0	0	0	0	0	n/a	n/a	n/a	cubic-feet

No Warning Messages

Worksheet J.5-1: Flow-Thru Design Flows

DMA 3

Category	#	Description	Value	Units
Flow-Thru BMP Inputs	0	Drainage Basin ID or Name	3	unitless
	1	Total Tributary Area	79971	sq-ft
	2	Final Adjusted Runoff Factor	0.87	unitless
	3	Design Capture Volume	3769	cubic-feet
	4	Volume Effectively Retained and/or Biofiltered	0	cubic-feet
	5	Deficit of Effectively Treated Stormwater Requiring Flow-Thru Treatment	3769	cubic-feet
	6	Maximum Rated Water Quality Flow Rate of Proposed BMP	0.577	CFS
Flow Rate Calculations	7	Adjustment Factor	1	unitless
	8	Design Rainfall Intensity for Flow-Thru BMPs	0.20	in/hr
	9	Water Quality Flow Rate Requiring Flow-Thru Treatment	0.319	CFS
Result	10	Flow thru treatment *1.5 per F.1.2.2 Flow Based Biofiltration BMP	0.479	CFS

Worksheet J.5-1 General Notes:

A. Applicants may use this worksheet to size flow-thru BMPs. Applicants must provide inputs for yellow shaded cells and calculate appropriate values for unshaded cells. Note that applicants proposing on-site flow-thru BMPs must also implement an offsite alternative compliance project to offset the deficit of effectively treated stormwater volume. An automated version of this worksheet is available for download at the County of San Diego Department of Public Works website.

Worksheet J.5-1 Line Item Notes:

0. Populated per Worksheet B.1-1.
1. Populated per Worksheet B.1-1.
2. Populated per Worksheet B.1-1.
3. Populated per Worksheet B.2-1.
4. Populated per Retention and/or Biofiltration treatment determined in Worksheets B.3-1 through B.5-3.
5. Line 4 - Line 3
6. User input per manufacturer's specification sheet.
7. -Line 5 / Line 3
8. Default value of 0.20 inches per hour
9. (Line 1/43,560) x Line 2 x Line 7 x Line 8
10. If Line 6 ≥ Line 9 then "Yes". If Line 6 < Line 9 then "No".

Model #	Dimensions	WetlandMEDIA Surface Area (sq.ft.)	Treatment Flow Rate (cfs)
TIER 1: EXPRESS MODELS Express model options give our customers an opportunity to benefit from optimal lead times, pricing, and the industry's leading MTD.			
MWS-L-4-8	**4'x8'**	**50**	**0.115**
MWS-L-8-8	**8'x8'**	**100**	**0.230**
TIER 2: PREFERRED MODELS Preferred model sizes give our customers a dependable selection with favorable lead times and dependable pricing.			
MWS-L-4-4	4'x4'	23	0.052
MWS-L-4-6	4'x6'	32	0.073
MWS-L-4-8	**4'x8'**	**50**	**0.115**
MWS-L-8-8	**8'x8'**	**100**	**0.230**
MWS-L-8-12	8'x12'	151	0.346
MWS-L-8-16	8'x16'	201	0.462
MWS-L-8-20	8'x20'	252	0.577
MWS-L-8-24	8'x24'	302	0.693
TIER 3: CUSTOM Custom sizes and applications are always available upon project review, but they may include supplemental lead times and pricing.			

Worksheet J.5-1: Flow-Thru Design Flows

DMA 8

Category	#	Description	Value	Units
Flow-Thru BMP Inputs	0	Drainage Basin ID or Name	8	unitless
	1	Total Tributary Area	67,326	sq-ft
	2	Final Adjusted Runoff Factor	0.87	unitless
	3	Design Capture Volume	3173	cubic-feet
	4	Volume Effectively Retained and/or Biofiltered	0	cubic-feet
	5	Deficit of Effectively Treated Stormwater Requiring Flow-Thru Treatment	3173	cubic-feet
	6	Maximum Rated Water Quality Flow Rate of Proposed BMP	0.462	CFS
Flow Rate Calculations	7	Adjustment Factor	1	unitless
	8	Design Rainfall Intensity for Flow-Thru BMPs	0.20	in/hr
	9	Water Quality Flow Rate Requiring Flow-Thru Treatment	0.269	CFS
Result	10	Flow thru treatment *1.5 per F.1.2.2 Flow Based Biofiltration BMP	0.403	CFS

Worksheet J.5-1 General Notes:

A. Applicants may use this worksheet to size flow-thru BMPs. Applicants must provide inputs for yellow shaded cells and calculate appropriate values for unshaded cells. Note that applicants proposing on-site flow-thru BMPs must also implement an offsite alternative compliance project to offset the deficit of effectively treated stormwater volume. An automated version of this worksheet is available for download at the County of San Diego Department of Public Works website.

Worksheet J.5-1 Line Item Notes:

0. Populated per Worksheet B.1-1.
1. Populated per Worksheet B.1-1.
2. Populated per Worksheet B.1-1.
3. Populated per Worksheet B.2-1.
4. Populated per Retention and/or Biofiltration treatment determined in Worksheets B.3-1 through B.5-3.
5. Line 4 - Line 3
6. User input per manufacturer's specification sheet.
7. -Line 5 / Line 3
8. Default value of 0.20 inches per hour
9. (Line 1/43,560) x Line 2 x Line 7 x Line 8
10. If Line 6 ≥ Line 9 then "Yes". If Line 6 < Line 9 then "No".

Model #	Dimensions	WetlandMEDIA Surface Area (sq.ft.)	Treatment Flow Rate (cfs)
TIER 1: EXPRESS MODELS Express model options give our customers an opportunity to benefit from optimal lead times, pricing, and the industry's leading MTD.			
MWS-L-4-8	**4'x8'**	**50**	**0.115**
MWS-L-8-8	**8'x8'**	**100**	**0.230**
TIER 2: PREFERRED MODELS Preferred model sizes give our customers a dependable selection with favorable lead times and dependable pricing.			
MWS-L-4-4	4'x4'	23	0.052
MWS-L-4-6	4'x6'	32	0.073
MWS-L-4-8	**4'x8'**	**50**	**0.115**
MWS-L-8-8	**8'x8'**	**100**	**0.230**
MWS-L-8-12	8'x12'	151	0.346
MWS-L-8-16	8'x16'	201	0.462
MWS-L-8-20	8'x20'	252	0.577
MWS-L-8-24	8'x24'	302	0.693
TIER 3: CUSTOM Custom sizes and applications are always available upon project review, but they may include supplemental lead times and pricing.			

WASHINGTON STATE DEPARTMENT OF ECOLOGY

December 2019

GENERAL USE LEVEL DESIGNATION FOR BASIC, ENHANCED, AND PHOSPHORUS TREATMENT

For the

MWS-Linear Modular Wetland

Ecology's Decision:

Based on Modular Wetland Systems, Inc. application submissions, including the Technical Evaluation Report, dated April 1, 2014, Ecology hereby issues the following use level designation:

1. General use level designation (GULD) for the MWS-Linear Modular Wetland Stormwater Treatment System for Basic treatment

   - Sized at a hydraulic loading rate of 1 gallon per minute (gpm) per square foot (sq ft) of wetland cell surface area. For moderate pollutant loading rates (low to medium density residential basins), size the Prefilters at 3.0 gpm/sq ft of cartridge surface area. For high loading rates (commercial and industrial basins), size the Prefilters at 2.1 gpm/sq ft of cartridge surface area.

2. General use level designation (GULD) for the MWS-Linear Modular Wetland Stormwater Treatment System for Phosphorus treatment

   - Sized at a hydraulic loading rate of 1 gallon per minute (gpm) per square foot (sq ft) of wetland cell surface area. For moderate pollutant loading rates (low to medium density residential basins), size the Prefilters at 3.0 gpm/sq ft of cartridge surface area. For high loading rates (commercial and industrial basins), size the Prefilters at 2.1 gpm/sq ft of cartridge surface area.

3. General use level designation (GULD) for the MWS-Linear Modular Wetland Stormwater Treatment System for Enhanced treatment

   - Sized at a hydraulic loading rate of 1 gallon per minute (gpm) per square foot (sq ft) of wetland cell surface area. For moderate pollutant loading rates (low to medium density residential basins), size the Prefilters at 3.0 gpm/sq ft of cartridge surface area. For high loading rates (commercial and industrial basins), size the Prefilters at 2.1 gpm/sq ft of cartridge surface area.

4. Ecology approves the MWS - Linear Modular Wetland Stormwater Treatment System units for Basic, Phosphorus, and Enhanced treatment at the hydraulic loading rate listed above. Designers shall calculate the water quality design flow rates using the following procedures:

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

5. These use level designations have no expiration date but may be revoked or amended by Ecology, and are subject to the conditions specified below.

Ecology's Conditions of Use:

Applicants shall comply with the following conditions:

1. Design, assemble, install, operate, and maintain the MWS – Linear Modular Wetland Stormwater Treatment System units, in accordance with Modular Wetland Systems, Inc. applicable manuals and documents and the Ecology Decision.
2. Each site plan must undergo Modular Wetland Systems, Inc. review and approval before site installation. This ensures that site grading and slope are appropriate for use of a MWS – Linear Modular Wetland Stormwater Treatment System unit.
3. MWS – Linear Modular Wetland Stormwater Treatment System media shall conform to the specifications submitted to, and approved by, Ecology.
4. The applicant tested the MWS – Linear Modular Wetland Stormwater Treatment System with an external bypass weir. This weir limited the depth of water flowing through the media, and therefore the active treatment area, to below the root zone of the plants. This GULD applies to MWS – Linear Modular Wetland Stormwater Treatment Systems whether plants are included in the final product or not.
5. Maintenance: The required maintenance interval for stormwater treatment devices is often dependent upon the degree of pollutant loading from a particular drainage basin. Therefore, Ecology does not endorse or recommend a "one size fits all" maintenance cycle for a particular model/size of manufactured filter treatment device.

    - Typically, Modular Wetland Systems, Inc. designs MWS - Linear Modular Wetland systems for a target prefilter media life of 6 to 12 months.
    - Indications of the need for maintenance include effluent flow decreasing to below the design flow rate or decrease in treatment below required levels.
    - Owners/operators must inspect MWS - Linear Modular Wetland systems for a minimum of twelve months from the start of post-construction operation to determine site-specific

maintenance schedules and requirements. You must conduct inspections monthly during the wet season, and every other month during the dry season. (According to the SWMMWW, the wet season in western Washington is October 1 to April 30. According to SWMMEW, the wet season in eastern Washington is October 1 to June 30). After the first year of operation, owners/operators must conduct inspections based on the findings during the first year of inspections.

- Conduct inspections by qualified personnel, follow manufacturer's guidelines, and use methods capable of determining either a decrease in treated effluent flowrate and/or a decrease in pollutant removal ability.
- When inspections are performed, the following findings typically serve as maintenance triggers:
    - Standing water remains in the vault between rain events, or
    - Bypass occurs during storms smaller than the design storm.
    - If excessive floatables (trash and debris) are present (but no standing water or excessive sedimentation), perform a minor maintenance consisting of gross solids removal, not prefilter media replacement.
    - Additional data collection will be used to create a correlation between pretreatment chamber sediment depth and pre-filter clogging (see *Issues to be Addressed by the Company* section below)

6. Discharges from the MWS - Linear Modular Wetland Stormwater Treatment System units shall not cause or contribute to water quality standards violations in receiving waters.

Applicant:	Modular Wetland Systems, Inc.
Applicant's Address:	5796 Armada Drive, Suite 250 Carlsbad, CA 92008

Application Documents:

- *Original Application for Conditional Use Level Designation*, Modular Wetland System, Linear Stormwater Filtration System Modular Wetland Systems, Inc., January 2011
- *Quality Assurance Project Plan*: Modular Wetland system – Linear Treatment System performance Monitoring Project, draft, January 2011.
- *Revised Application for Conditional Use Level Designation*, Modular Wetland System, Linear Stormwater Filtration System Modular Wetland Systems, Inc., May 2011
- *Memorandum: Modular Wetland System-Linear GULD Application Supplementary Data, April 2014*
- *Technical Evaluation Report: Modular Wetland System Stormwater Treatment System Performance Monitoring, April 2014.*

Field Testing

- Modular Wetland Systems, Inc. conducted monitoring of an MWS-Linear (Model # MWS-L-4-13) from April 2012 through May 2013, at a transportation maintenance facility in Portland, Oregon. The manufacturer collected flow-weighted composite samples of the system's influent and effluent during 28 separate storm events. The system treated approximately 75 percent of the runoff from 53.5 inches of rainfall during the monitoring period. The applicant sized the system at 1 gpm/sq ft. (wetland media) and 3gpm/sq ft. (prefilter).
- Influent TSS concentrations for qualifying sampled storm events ranged from 20 to 339 mg/L. Average TSS removal for influent concentrations greater than 100 mg/L (n=7) averaged 85 percent. For influent concentrations in the range of 20-100 mg/L (n=18), the upper 95 percent confidence interval about the mean effluent concentration was 12.8 mg/L.
- Total phosphorus removal for 17 events with influent TP concentrations in the range of 0.1 to 0.5 mg/L averaged 65 percent. A bootstrap estimate of the lower 95 percent confidence limit (LCL95) of the mean total phosphorus reduction was 58 percent.
- The lower 95 percent confidence limit of the mean percent removal was 60.5 percent for dissolved zinc for influent concentrations in the range of 0.02 to 0.3 mg/L (n=11). The lower 95 percent confidence limit of the mean percent removal was 32.5 percent for dissolved copper for influent concentrations in the range of 0.005 to 0.02 mg/L (n=14) at flow rates up to 28 gpm (design flow rate 41 gpm). Laboratory test data augmented the data set, showing dissolved copper removal at the design flow rate of 41 gpm (93 percent reduction in influent dissolved copper of 0.757 mg/L).

Issues to be addressed by the Company:

1. Modular Wetland Systems, Inc. should collect maintenance and inspection data for the first year on all installations in the Northwest in order to assess standard maintenance requirements for various land uses in the region. Modular Wetland Systems, Inc. should use these data to establish required maintenance cycles.
2. Modular Wetland Systems, Inc. should collect pre-treatment chamber sediment depth data for the first year of operation for all installations in the Northwest. Modular Wetland Systems, Inc. will use these data to create a correlation between sediment depth and pre-filter clogging.

Technology Description:
Download at http://www.modularwetlands.com/

Contact Information:

Applicant: Zach Kent
BioClean A Forterra Company.
5796 Armada Drive, Suite 250
Carlsbad, CA 92008
zach.kent@forterrabp.com

2018

Project: All Related

Subject: MWS Linear BMP Classification Per San Diego Manual

To Whom it May Concern:

Based upon definitions of Biofiltration as found in Section 2.2.1 and Appendix F of the Manual the MWS Linear meets the criteria to be classified as biofiltration and therefore is not flow through treatment and thus does not trigger the need for alternative compliance. The MWS Linear has GULD approval for basic, phosphorus and enhanced treatment under the TAPE approval. The system is certified under the TAPE approval at a loading rate of 1 gpm/sq ft for all three pollutant categories. This is consistent with the performance criteria related to the performance of Appendix F.

Let us first address the comment regarding the MWS (referring to the Modular Wetland System Linear) being flow through treatment. To do so let us look at the definition of biofiltration as provided by the Design Manual which states:

> *"For situations where onsite retention of the 85th percentile storm volume is not feasible, biofiltration must be provided to satisfy specific "biofiltration standards" i.e. a set of selection, sizing, design and operation and maintenance (O&M) criteria that must be met for a BMP to be considered a "biofiltration BMP" – see Section 2.2.1 and Appendix F."*

If we look at section 2.2.2 Storm Water Pollutant Control Performance Standard it states:

> *"(i) If it is not technically feasible to implement retention BMPs for the full DCV onsite for a PDP, then the PDP shall utilize biofiltration BMPs for the remaining volume not reliably retained. Biofiltration BMPs must be designed as described in Appendix F to have an appropriate hydraulic loading rate to maximize storm water retention and pollutant removal, as well as to prevent erosion, scour, and channeling within the BMP, and must be sized to:*
>
> > *[a]. Treat 1.5 times the DCV not reliably retained onsite, OR*
> >
> > *[b]. Treat the DCV not reliably retained onsite with a flow-thru design that has a total volume, including pore spaces and pre-filter detention volume, sized to hold at least 0.75 times the portion of the DCV not reliably retained onsite."*

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As the manual states Biofiltration BMPs must be designed as described in Appendix F which states:

> *"A project applicant must be able to affirmatively demonstrate that a given BMP is designed and sized in a manner consistent with this definition to be considered as a "biofiltration BMP" as part of a compliant storm water management plan."*
>
> *"This appendix contains a checklist of the key underlying criteria that must be met for a BMP to be considered a biofiltration BMP. The purpose of this checklist is to facilitate consistent review and approval of biofiltration BMPs that meet the "biofiltration standard" defined by the MS4 Permit."*
>
> *"This checklist includes specific design criteria that are essential to defining a system as a biofiltration BMP; however it does not present a complete design basis. This checklist was used to develop BMP Fact Sheets for PR-1 biofiltration with partial retention and BF-1 biofiltration, which do present a complete design basis. Therefore, biofiltration BMPs that substantially meet all aspects of the Fact sheets PR-1 or BF-1 should be able to complete this checklist without additional documentation beyond what would already be required for a project submittal."*
>
> *"Other biofiltration BMP designs (including both non-proprietary and proprietary designs) may also meet the underlying MS4 Permit requirements to be considered biofiltration BMPs. These BMPs may be classified as biofiltration BMPs if they (1) meet the minimum design criteria listed in this appendix, including the pollutant treatment performance standard in Appendix F.1, (2) are designed and maintained in a manner consistent with their performance certifications (See explanation in Appendix F.2), if applicable, and (3) are acceptable at the discretion of the [City Engineer]. The applicant may be required to provide additional studies and/or required to meet additional design criteria beyond the scope of this document in order to demonstrate that these criteria are met."*

As stated the Biofiltration BMP must meet three objectives. The following outlines how the Modular Wetland System Linear meets these criteria.

Minimum Design Criteria

1. Biofiltration BMPs shall be allowed only as described in the BMP selection process in this manual (i.e., retention feasibility hierarchy).

    a. The Modular Wetland System Linear (MWS Linear) is only being proposed on plans when retention via infiltration or reuse is proven infeasible. Conditions such as soils with little to no infiltration rate or sites in which insufficient landscaping warrant to successful implementation of reuse systems.

2. Biofiltration BMPs must be sized using acceptable sizing methods described in this manual.

    a. Section B.5.2 Basis for Minimum Sizing Factor for Biofiltration BMPs states:

    "The MS4 Permit describes conceptual performance goals for biofiltration BMPs and specifies numeric criteria for sizing biofiltration BMPs (See Section 2.2.1 of this Manual). However, the MS4 Permit does not define a specific footprint sizing factor or design profile that must be provided for the BMP to be considered "biofiltration."

    "Additionally, it does not apply to alternative biofiltration designs that utilize the checklist in Appendix F (Biofiltration Standard and Checklist). Acceptable alternative designs (such as proprietary systems meeting Appendix F criteria) typically include design features intended to allow acceptable performance with a smaller footprint and have undergone field scale testing to evaluate performance and required O&M frequency."

    As stated in the Manual alternative biofiltration designs are allowed. The MWS Linear therefore qualifies as a biofiltration BMP under this definition as it has both undergone field scale testing (TAPE tested and approved with a GULD) and provides requirements on O&M frequency. In addition, the MWS Linear can be sized to treat either 1.5 times the DCV not reliably retained onsite OR 1.0 times the portion of the DCV not reliably retained onsite; and additionally check that the system has a total static (i.e. non-routed) storage volume, including pore spaces and pre-filter detention volume to at least 0.75 times the portion of the DCV not reliably retained onsite.

3. Biofiltration BMPs must be sited and designed to achieve maximum feasible infiltration and evapotranspiration.

    a. The MWS Linear is utilized and placed in the same manner as other types of biofiltration systems. As with other biofiltration systems the MWS Linear includes and underdrain for the remaining portion of the DCV that is not retained via incidental infiltration (as biofiltration if infiltration is not feasible due to poor soils) and evapotranspiration. The MWS Linear can be design with an open bottom to maximize this incidental infiltration. The only exception to this, as with other biofiltration BMPs, is when the geotechnical consultant recommends an impervious liner be used due to specific soil conditions such as expansive clays. Additionally, the MWS Linear utilizes an amended media that is much more porous than the standard prescribed biofiltration media which is a mix of sand and compost. 100% of the media uses in the MWS Linear has interparticle voids of 48% plus and 24% internal void space for each media particle. This is much greater than the sand which has interparticle voids of 35% and internal voids of 0%. As such, the MWS Linear retains greater moisture which allows for greater volume retention and ultimately evapotranspiration via respiration of the contained vegetation.

4. Biofiltration BMPs must be designed with a hydraulic loading rate to maximize pollutant retention, preserve pollutant control/sequestration processes, and minimize potential for pollutant washout.

    a. The manual states:

    "Alternatively, for proprietary designs and custom media mixes not meeting the media specifications contained in the City or County LID Manual, field scale testing data are provided to demonstrate that proposed media meets the pollutant treatment performance criteria in Section F.1 below."

    The MWS Linear has been tested under the Washington State TAPE protocol which is full scale field testing and has received General Use Level Designation under that protocol. Table F.1-1, as shown below, requires a biofiltration BMP to have Basic Treatment, Phosphorus Treatment, and Enhanced Treatment under this protocol. The MWS Linear has GULD approval for all three and therefore meets this minimum requirement 4. A copy of the TAPE approval has been attached to this document.

Table F.1-1: Required Technology Acceptance Protocol-Ecology Certifications for Polltuants of Concern for Biofiltration Performance Standard

Project Pollutant of Concern	Required Technology Acceptance Protocol-Ecology Certification for Biofiltration Performance Standard
Trash	Basic Treatment, Phosphorus Treatment, Enhanced Treatment
Sediments	Basic Treatment, Phosphorus Treatment, Enhanced Treatment
Oil and Grease	Basic Treatment, Phosphorus Treatment, Enhanced Treatment
Nutrients	Phosphorus Treatment[1]
Metals	Enhanced Treatment
Pesticides	Basic Treatment (including filtration)[2] Phosphorus Treatment, Enhanced Treatment
Organics	Basic Treatment (including filtration)[2] Phosphorus Treatment, Enhanced Treatment
Bacteria and Viruses	Basic Treatment (including bacteria removal processes)[3] , Phosphorus Treatment, Enhanced Treatment
Basic Treatment (including filtration)[2] Phosphorus Treatment, Enhanced Treatment	Basic Treatment (including filtration)[2] Phosphorus Treatment, Enhanced Treatment

5. Biofiltration BMPs must be designed to promote appropriate biological activity to support and maintain treatment processes.

    a. The MWS Linear an advanced vegetated biofiltration system based that promote biological processes found in both upland bioretention systems and wetlands. The system utilizes an advanced horizontal flow design to ensure maximum contact with the vegetation root mass. Bacterial growth, supported by the root system in the wetland chamber, performs a number of treatment processes. These vary as a function of moisture, temperature, pH, salinity, and pollutant concentrations. Biologically available forms of nitrogen, phosphorus, and carbon are actively taken into the cells of vegetation and bacteria, and used for metabolic processes (i.e., energy production and growth). Nitrogen and phosphorus are actively taken up as nutrients that are vital for a number of cell functions, growth, and energy production. These processes remove metabolites from the media during and between storm events, making the media available to capture more nutrients from subsequent storms.

    b. Soil organisms in the wetland chamber can break down a wide array of organic compounds into less toxic forms or completely break them down into carbon dioxide and water (Means and Hinchee 1994). Bacteria can also cause metals to precipitate out as salts, bind them within organic material, and accumulate metals in nodules within the cells. Finally, plant growth may metabolize many pollutants, sequester them or rendering them less toxic (Reeves and Baker 2000).

    c. Following are pictures from the plants pulled from a MWS Linear after only 14 months of growth. The media used in the system is designed to maximize biological activity:

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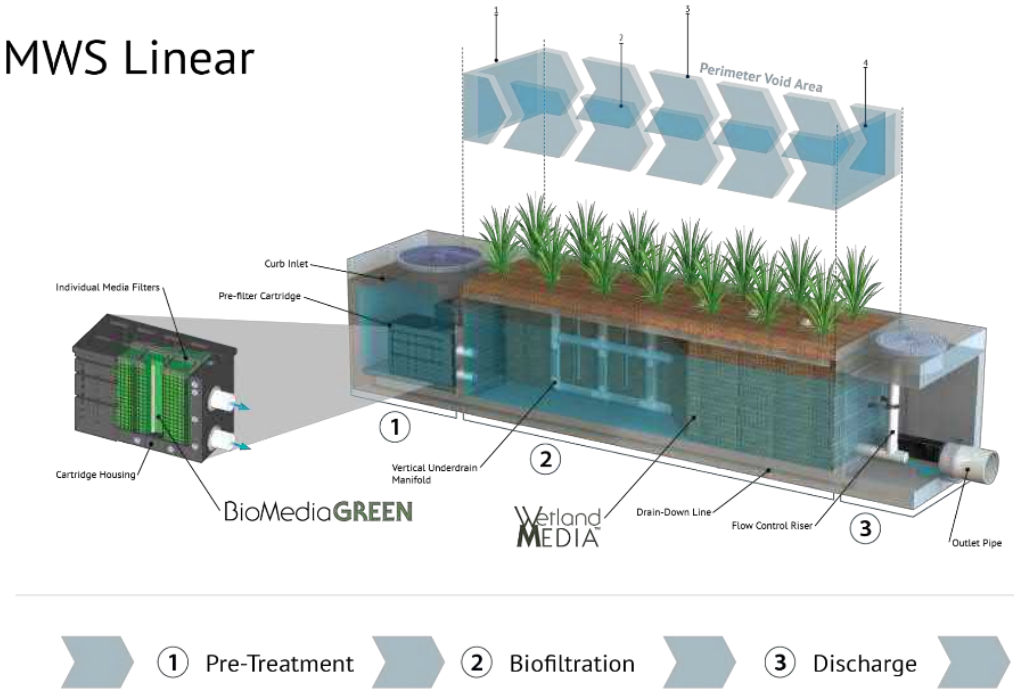
6. Biofiltration BMPs must be designed to prevent erosion, scour, and channeling within the BMP.

    a. The MWS Linear is a self-contained system with a pre-treatment chamber. Unlike other biofiltration BMPs erosion, scour, and channeling with in the BMP is not an issue. Following is a diagram of the BMP. The system pre-treatment chamber prevent any erosion or scour. The system downstream orifice control prevents channeling of the media:



7. Biofiltration BMP must include operations and maintenance design features and planning considerations to provide for continued effectiveness of pollutant and flow control functions.

    a. The MWS Linear provides activation along with the first year of maintenance and inspection free on all installation in the county of San Diego. Unlike other biofiltration BMPs the City and Co-permitees can be assured the system is being properly installed and maintained. The first year of inspections is used the gauge the amount of loading in the system and this information is used to set appropriate maintenance interval for subsequent years. Attached is a copy of the maintenance manual for the MWS Linear.

Designed & Maintained Consistent with their Performance Certifications

We are in agreement that all BMPs should be designed in a manner consistent with the TAPE certification. The MWS Linear is sized in accordance with the TAPE GULD approval which provides certification at a loading rate of 1 gpm/sq ft (100 in/hr) for Basic, Phosphorus and Enhanced treatment. In addition, as stated previously, Modular Wetland System, Inc. provide activation of all system installed in San Diego County along with the first year of inspections and maintenance to ensure appropriate function. As previously stated, a copy of the TAPE GULD approval is attached to support this claim.

Additionally, it should be noted that the manual allows for biofiltration BMPs to be sized in either volume based (DCV) or flow based design. The manual states in section F.2.2 Sizing of Flow-Based Biofiltration *BMPs:*

> *"This sizing method is only available when the BMP meets the pollutant treatment performance standard in Appendix F.1."*
>
> *"Proprietary biofiltration BMPs are typically designed as a flow-based BMPs (i.e., a constant treatment capacity with negligible storage volume). Additionally, proprietary biofiltration is only acceptable if no infiltration is feasible and where site-specific documentation demonstrates that the use of larger footprint biofiltration BMPs would be infeasible. The applicable sizing method for biofiltration is therefore reduced to: Treat 1.5 times the DCV."*
>
> *"The following steps should be followed to demonstrate that the system is sized to treat 1.5 times the DCV."*
>
> > *1. Calculate the flow rate required to meet the pollutant treatment performance standard without scaling for the 1.5 factor. Options include either:*
> >
> > - *Calculate the runoff flow rate from a 0.2 inch per hour uniform intensity precipitation event (See methodology Appendix B.6.3), or*
> >
> > - *Conduct a continuous simulation analysis to compute the size required to capture and treat 80 percent of average annual runoff; for small catchments, 5-minute precipitation data should be used to account for short time of concentration. Nearest rain gage with 5-minute precipitation data is allowed for this analysis.*

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2. Multiply the flow rate from Step 1 by 1.5 to compute the design flow rate for the biofiltration system.

3. Based on the conditions of certification/verification (discussed above), establish the design capacity, as a flow rate, of a given sized unit.

4. Demonstrates that an appropriate unit size and number of units is provided to provide a flow rate that meets the required flow rate from Step 2.

In conclusion, we have closely followed the process and protocol for showing the MWS Linear meets all the criteria to be accepted as Biofiltration as found in Appendix F.

If you have any questions please feel free to contact us directly.

Sincerely,

Sean M. Hasan

Manager San Diego/Riverside, CA

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ENVIRONMENTAL SERVICES, INC.

To Whom It May Concern,

The Modular Wetland System – Linear (MWS – Linear) is an advanced stormwater treatment system which utilizes several filtration and pretreatment processes to effectively remove particulate and dissolved stormwater pollutants. The system is based upon subsurface flow wetland technology that has been proven effective for several decades.

The MWS – Linear can be installed at grade with the wetland filter portion planted with various types of vegetation. The system can also be installed underground with lids and risers. When the system is installed underground the wetland filter is not planted.
Here are the effects of not having plants:

- The absence of plants only has a marginal effect on only one pollutant, nitrogen, especially the dissolved nitrogen species.

- In general, plants play a secondary role to the filter media and the indigenous bacteria and microorganisms that populate the system. These beneficial bacteria establish within the biofiltration media with or with plants.

- Plants utilize the nitrogen and phosphorus that is captured on the filter media (soil particles). In doing so, the plants continually replenish the media's ability to absorb nutrients through physical and chemical means.

- The plant root systems transfer oxygen subsurface that increases the populations of beneficial indigenous bacteria and microorganisms which play the primary role in biological filtration.

- Biological filtration is the primary unit process in the removal of soluble nitrogen species. The absence of plants can decrease the removal of soluble nitrogen marginally.

However, biological filtration is not the primary means for the removal of TSS, oils & grease, TPH, particulate nitrogen, particulate and dissolved phosphorus, particulate and dissolved metals, pathogens and oxygen demanding substances.

A performance report titled "Vegetated Rock Filter Treats Stormwater Pollutants in Florida" studied subsurface wetland cells with and without plants. The study concluded that the filter media itself was much more important than the plants. The study said "in addition, the unplanted crushed concrete cells performed better than any other planted cells, suggesting that wetland vegetation had no discernible influence on pollutant removal."

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The Modular Wetland System Linear has been approved by the Washington Department of Ecology under the TAPE protocol for treatment for all three pollutant categories that the agency provides approval for: TSS, nutrients and metals. It is the only system (proprietary or non) that has received approval for all three during the same independent third party multi-year field study. The unit was able to achieve these removal efficiencies with the absence of any vegetation in the active biofiltration media. The system is approved by TAPE without plants. Below is a performance summary from:

- TSS – 85%
- Phosphorus – 65%
- Ortho-phosphorus – 67%
- Nitrogen – 45%
- Dissolved Copper – 38%
- Total Copper – 50%
- Dissolved Zinc – 66%
- Total Zinc – 69%
- Motor Oil – 95%
- Turbidity – 99.19%
- Fecal Coliform – 55%

In addition, the MWS – Linear has been tested in other third party field studies with similar results on installations without plants or vegetation. Based on these test results the MWS – Linear when placed underground will provide the same performance for all pollutants of concern.

If you have any questions regarding MWS - Linear or the information contained in this letter please feel free to contact us.

Sincerely,

Zach J Kent

Stormwater Engineer

zkent@biocleanenvironmental.net

Applicant website: http://www.modularwetlands.com/

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

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

Revision History

Date	**Revision**
June 2011	Original use-level-designation document
September 2012	Revised dates for TER and expiration
January 2013	Modified Design Storm Description, added Revision Table, added maintenance discussion, modified format in accordance with Ecology standard
December 2013	Updated name of Applicant
April 2014	Approved GULD designation for Basic, Phosphorus, and Enhanced treatment
December 2015	Updated GULD to document the acceptance of MWS-Linear Modular Wetland installations with or without the inclusion of plants
July 2017	Revised Manufacturer Contact Information (name, address, and email)
December 2019	Revised Manufacturer Contact Address

ATTACHMENT 2
BACKUP FOR PDP HYDROMODIFICATION CONTROL MEASURES

This is the cover sheet for Attachment 2.

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

Indicate which Items are Included:

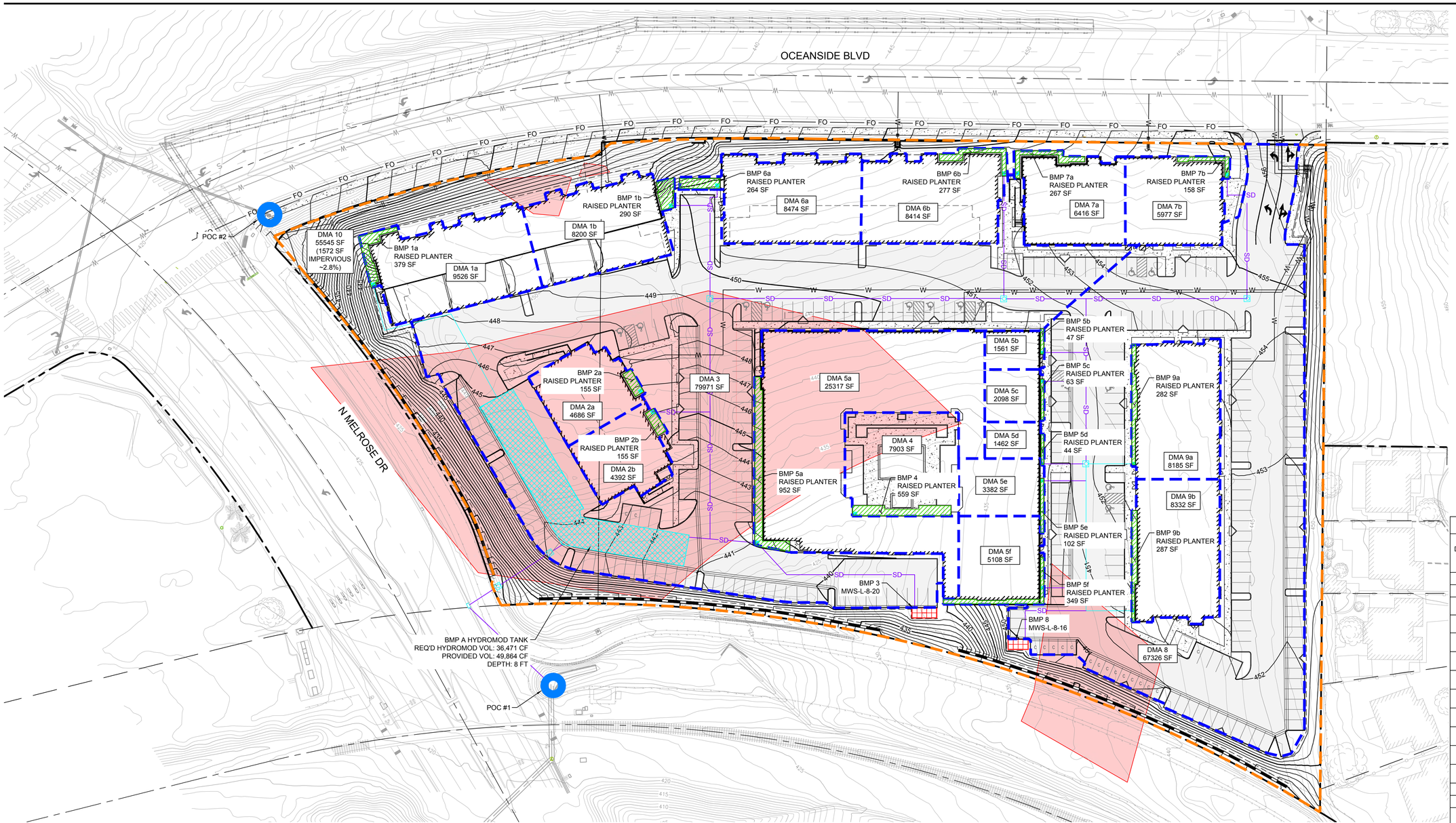
Attachment Sequence	Contents	Checklist
Attachment 2a	1. Hydromodification Management Exhibit (Required)	☒Included See Hydromodification Management Exhibit Checklist.
Attachment 2b	Management of Critical Coarse Sediment Yield Areas (WMAA Exhibit is required, additional analyses are optional) See Section 6.2 of the BMP Design Manual.	☒Exhibit showing project drainage boundaries marked on WMAA Critical Coarse Sediment Yield Area Map (Required) Optional analyses for Critical Coarse Sediment Yield Area Determination ☒6.2.1 Verification of Geomorphic Landscape Units Onsite ☒6.2.2 Downstream Systems Sensitivity to Coarse Sediment ☒6.2.3 Optional Additional Analysis of Potential Critical Coarse Sediment Yield Areas Onsite
Attachment 2c	Geomorphic Assessment of Receiving Channels (Optional) See Section 6.3.4 of the BMP Design Manual.	☒Not performed ☐Included ☐Submitted as separate stand-alone document
Attachment 2d	Flow Control Facility Design and Structural BMP Drawdown Calculations (Required) Overflow Design Summary for each structural BMP See Chapter 6 and Appendix G of the BMP Design Manual	☒Included ☐Submitted as separate stand-alone document
Attachment 2e	Vector Control Plan (Required when structural BMPs will not drain in 96 hours)	☐Included ☒Not required because BMPs will drain in less than 96 hours

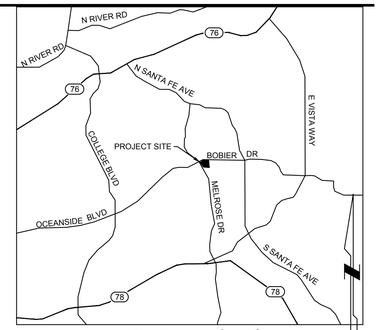
Use this checklist to ensure the required information has been included on the Hydromodification Management Exhibit:

The Hydromodification Management Exhibit must identify:

☒Underlying hydrologic soil group
☒Approximate depth to groundwater
☒Existing natural hydrologic features (watercourses, seeps, springs, wetlands)
☒Critical coarse sediment yield areas to be protected
☒Existing topography
☒Existing and proposed site drainage network and connections to drainage offsite
☒Proposed grading
☒Proposed impervious features
☒Proposed design features and surface treatments used to minimize imperviousness
☒Point(s) of Compliance (POC) for Hydromodification Management
☒Existing and proposed drainage boundary and drainage area to each POC (when necessary, create separate exhibits for pre-development and post-project conditions)
☒Structural BMPs for hydromodification management (identify location, type of BMP, and size/detail)

Please provide the Exhibit in 24”x36” format with map pocket, wet date, and stamp.





VICINITY MAP (N.T.S)

LEGEND

- PROPERTY BOUNDARY
- DRAINAGE MANAGEMENT AREA BOUNDARY
- SELF MITIGATING DMA BOUNDARY
- EXISTING CONTOUR (XXXX)
- PROPOSED CONTOUR (XXXX)
- STORM DRAIN (SD)
- BIOFILTRATION BMP AREA
- HYDROMOD TANK
- DRAINAGE MANAGEMENT AREA LABEL (DMA / AREA / ACRES)
- POTENTIAL CCSYAs
- PROP. AC PAVING
- PROP. CONCRETE SIDEWALK
- POINT OF COMPLIANCE (POC)

BMP SUMMARY

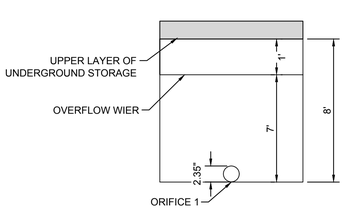
DMA #	DMA AREA (SF)	REQUIRED BMP VOL OR FLOW RATE	PROVIDED BMP VOL OR FLOW*	BMP TYPE
1a	9526	449 CF	558 CF	RAISED PLANTER
1b	8200	386 CF	492 CF	RAISED PLANTER
2a	4686	221 CF	285 CF	RAISED PLANTER
2b	4392	207 CF	264 CF	RAISED PLANTER
3	79971	0.479 CFS	0.577 CFS	MODULAR WETLAND
4	7903	360 CF	388 CF	RAISED PLANTER
5a	25317	1193 CF	1502 CF	RAISED PLANTER
5b	1561	74 CF	96 CF	RAISED PLANTER
5c	2098	100 CF	130 CF	RAISED PLANTER
5d	1462	70 CF	91 CF	RAISED PLANTER
5e	3382	161 CF	210 CF	RAISED PLANTER
5f	5108	235 CF	256 CF	RAISED PLANTER
6a	8474	404 CF	527 CF	RAISED PLANTER
6b	8414	397 CF	512 CF	RAISED PLANTER
7a	6416	302 CF	376 CF	RAISED PLANTER
7b	5977	285 CF	376 CF	RAISED PLANTER
8	67326	0.403 CFS	0.462 CFS	MODULAR WETLAND
9a	8185	386 CF	492 CF	RAISED PLANTER
9b	8332	393 CF	501 CF	RAISED PLANTER
10	55545	--	--	SELF-RETAINING AREA

SITE DESIGN BMPS	
BMP ID	BMP DESCRIPTION
SD-B	MINIMIZE IMPERVIOUS ARES
	LANDSCAPING WITH NATIVE OR DROUGHT TOLERANT LANDSCAPING

SOURCE CONTROL BMPS	
BMP ID	BMP DESCRIPTION
SC-1	PREVENT ILLICIT DISCHARGE INTO MS4 ---> ALL LANDSCAPE AREAS (TYP.)
SC-2	STORM DRAIN STENCILING AND SIGNAGE ---> ALL SD GRATED INLETS (TYP.)
SC-6	ADDITIONAL BMPS BASED ON POTENTIAL SOURCES OF RUNOFF POLLUTANTS
	ON-SITE STORM DRAIN INLETS
	LANDSCAPE / OUTDOOR PESTICIDE USE
	PLAZA, SIDEWALKS, PARKING LOTS

NORTH

GRAPHIC SCALE IN FEET
0 20 40 80



1 BMP 1 OUTLET STRUCTURE
NOT TO SCALE

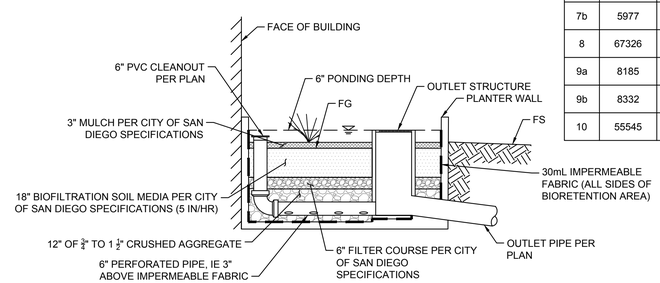
SITE INFORMATION

HYDROLOGIC SOIL GROUP: TYPE A & D

DEPTH TO GROUNDWATER: GREATER THAN 20'

THERE ARE NO EXISTING HYDROLOGIC FEATURES ONSITE

AREAS NOT SHOWN AS ASPHALT, CONCRETE, OR BUILDING ARE PERVIOUS



2 RAISED PLANTER WITH UNDERDRAIN
NOT TO SCALE

Kimley»Horn

HYDROMOD EXHIBIT
MODERA MELROSE
4/5/2022

Legend

- Watershed Boundaries
- Municipal Boundaries
- Rivers & Streams
- Regional WMAA Streams
- Potential Critical Coarse Sediment Yield Areas

WINDMILL LAKE
GUAJOME LAKE
San Luis Rey River
HUBBERT LAKE
OCEANSIDE
Project Site
VISTA
TURNER LAKE
Buena Vista Creek
BUENA VISTA LAGOON
CALAVERAS LAKE
SQUIRES DAM
LAKE WOHLFORD
DIXON RESERVOIR
S.D. COUNTY
AQUA HEDIONDA LAGOON
Agua Hedionda Creek
CARLSBAD
San Marcos Creek
SAN MARCOS
ESCONDIDO
Escondido Creek
BATIQUITOS LAGOON
Encinitas Creek
Santa Ysabel Creek
San Dieguito River
LAKE HODGES
ENCINITAS
SAN DIEGUITO RESERVOIR
SAN DIEGO
LAKE RAMONA
Lusardi Creek
LAKE POWAY
POWAY
Rattlesnake Creek
SAN DIEGUITO LAGOON

PROJECT SITE
Melrose Dr
Shell
Skye Apartm
Image Landsat / Copernicus

Aerial Imagery Source: DigitalGlobe, 06/2012

Miles 0 25 50 100 150

NORTH

Potential Critical Coarse Sediment Yield Areas

Carlsbad Watershed - HU 904.00, 211 mi2

Exhibit Date: Sept. 8, 2014

Geosyntec consultants

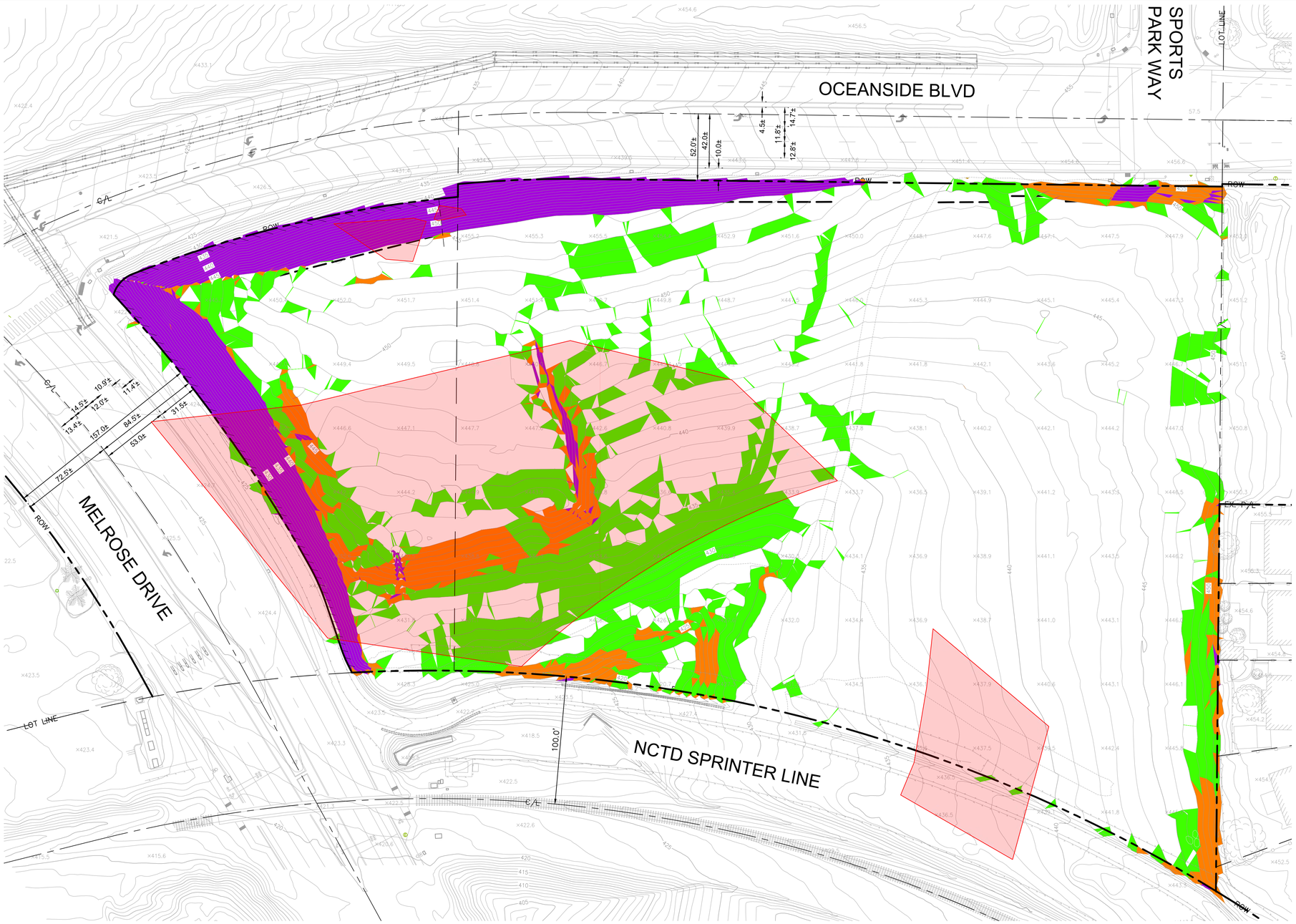
RICK ENGINEERING COMPANY

Placeholder – **6.2.1 Verification of GLUs Onsite** (if applicable)

Replace placeholder with required calculations/documentation.

Leave placeholder intact if not applicable.

☐Not Applicable



Slopes Table				
Number	Minimum Slope	Maximum Slope	Area	Color
1	10.00%	20.00%	177424.14	
2	20.00%	40.00%	97560.44	
3	40.00%	100.00%	71855.47	

LEGEND

POTENTIAL CCSYAs PER WMAA 2018 DATA

NORTH

GRAPHIC SCALE IN FEET
0 20 40 80

Kimley»Horn

GLU SLOPE ANALYSIS EXHIBIT

MODERA MELROSE

10/14/2021

6.2.1 Verification of GLUs Onsite

The Potential Critical Coarse Sediment Yield Area maps in the WMAAs identify areas that are considered potential critical coarse sediment yield areas based on their GLU. A GLU is a combination of slope, geology, and land cover. A regional-level WMAA was prepared that determined GLUs that are considered to be potential critical coarse sediment yield areas. These GLUs are areas with a combination of open (undeveloped) land cover, high relative sediment production based on a normalized revised universal soil loss equation analysis, and coarse grained geologic material (material that is expected to produce greater than 50% sand when weathered).

The maps included in the WMAA are macro-level maps that may not represent project-level detail. If the WMAA maps indicate the presence of potential critical coarse sediment yield areas within the project site, detailed project-level review of GLUs onsite may be performed to verify the presence or absence of potential critical coarse sediment yield areas within the project site. Some jurisdictions may require verification of GLUs for all projects (including projects where the WMAA maps do not indicate the presence of potential critical coarse sediment yield areas).

The following data are needed to verify the GLUs onsite:

- Project boundary
- Classification of pre-project slopes within the project boundary into four (4) categories defined in Appendix H
- Classification of underlying geology within the project boundary into seven (7) categories defined in Appendix H
- Classification of pre-project land cover within the project boundary into six (6) categories defined in Appendix H. In this context, use "pre-project" land cover, including any existing impervious areas. Assumption of "pre-development" land cover is not required for GLU analysis

Intersect the geologic categories, land cover categories, and slope categories within the project boundary to create GLUs. This is a similar procedure to intersecting land uses with soil types to determine runoff coefficients or runoff curve numbers for hydrologic studies, but there are three categories to consider for the GLU analysis (slope, geology, and land cover), and the GLUs are not to be composited into a single GLU. When GLUs have been created, determine whether any of the GLUs listed in Table 6-1 are found within the project boundary. The GLUs listed in Table 6-1 are considered to be potential critical coarse sediment yield areas.

TABLE 6-1. Potential Critical Coarse Sediment Yield Areas

GLU	Geology	Land Cover	Slope (%)
CB-Agricultural/Grass-3	Coarse Bedrock	Agricultural/Grass	20% - 40%
CB-Agricultural/Grass-4	Coarse Bedrock	Agricultural/Grass	>40%
CB-Forest-2	Coarse Bedrock	Forest	10 – 20%
CB-Forest-3	Coarse Bedrock	Forest	20% - 40%
CB-Forest-4	Coarse Bedrock	Forest	>40%
CB-Scrub/Shrub-4	Coarse Bedrock	Scrub/Shrub	>40%
CB-Unknown-4	Coarse Bedrock	Unknown	>40%

GLU	Geology	Land Cover	Slope (%)
CSI-Agricultural/Grass-2	Coarse Sedimentary Impermeable	Agricultural/Grass	10 – 20%
CSI-Agricultural/Grass-3	Coarse Sedimentary Impermeable	Agricultural/Grass	20% - 40%
CSI-Agricultural/Grass-4	Coarse Sedimentary Impermeable	Agricultural/Grass	>40%
CSP-Agricultural/Grass-4	Coarse Sedimentary Permeable	Agricultural/Grass	>40%
CSP-Forest-3	Coarse Sedimentary Permeable	Forest	20% - 40%
CSP-Forest-4	Coarse Sedimentary Permeable	Forest	>40%
CSP-Scrub/Shrub-4	Coarse Sedimentary Permeable	Scrub/Shrub	>40%

If none of the GLUs listed in Table 6-1 are present within the project boundary, no measures for protection of critical coarse sediment yield areas onsite are necessary. If one or more GLUs listed in Table 6-1 are present within the project boundary, they shall be considered critical coarse sediment yield areas and protected with measures described in Section 6.2.4, or the project applicant may elect to continue to Section 6.2.2 to determine whether downstream systems would be sensitive to reduction of coarse sediment yield from the project site. If any of the GLUs listed in Table 6-1 are present offsite within area that drains through the project site, see Section 6.2.5 for management measures for critical coarse sediment yield areas offsite and draining through the project.

6.2.2 Downstream Systems Sensitivity to Coarse Sediment

If it has been determined that potential critical coarse sediment yield areas exist within the project site, the next step is to determine whether downstream systems would be sensitive to reduction of coarse sediment yield from the project site. Protection of critical coarse sediment yield areas is a necessary element of hydromodification management because coarse sediment supply is as much an issue for causing erosive conditions to receiving streams as are accelerated flows. However, not all downstream systems warrant preservation of coarse sediment supply. In some cases, downstream systems are negatively impacted by coarse sediment. For example, existing MS4 systems that cannot convey coarse sediment and become clogged, resulting in urban flood hazards and on-going maintenance needs. In some cases, downstream channels are aggrading with undesirable results (e.g. impacts to habitat or urban flooding). Use Figure 6-1 and the associated node descriptions to determine whether downstream systems require protection.

A checklist based on Figure 6-1 is provided in Appendix I. If, based on Figure 6-1, downstream systems do not warrant preservation of coarse sediment supply, no measures for protection of critical coarse sediment yield areas are necessary. If, based on Figure 6-1, downstream systems must be protected, continue to Section 6.2.3 for optional additional analysis that may refine the extents of critical coarse sediment yield areas onsite, and Section 6.2.4 for management measures.

- Figure 6-1, Node 1 – Determine what type of system receives the project site runoff: does the project connect to an existing hardened MS4 system or discharge to an un-lined channel?
- Figure 6-1, Node 2 – If the project discharges runoff to an existing hardened MS4 system, determine whether the system can convey sediment (self-cleaning system) or will trap (sink) sediment. Existing systems with very low slope, constrictions, existing treatment control (pollutant control) BMPs, or existing detention basins typically will trap sediment, which can result in flooding and increased maintenance costs. When existing systems will trap sediment,

Map Unit	Map Name	Anticipated Grain size of Weathered Material	Bedrock or Sedimentary	Impermeable/ Permeable	Geology Grouping
Kjv	El Cajon 30' x 60'	Coarse	Bedrock	Impermeable	CB
Klb	El Cajon 30' x 60'	Coarse	Bedrock	Impermeable	CB
Klh	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Klp	El Cajon 30' x 60'	Coarse	Bedrock	Impermeable	CB
Km	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kmg	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kmgp	El Cajon 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kmm	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kpa	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kpv	El Cajon 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kqbd	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kr	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Krm	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Krr	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kt	San Diego & Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Ktr	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kvc	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kwm	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kwp	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kwsr	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
m	Jennings; CA	Coarse	Bedrock	Impermeable	CB
Mzd	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Mzg	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Mzq	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Mzs	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
sch	Jennings; CA	Coarse	Bedrock	Impermeable	CB
Kp	San Diego & Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Ql	El Cajon 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
QTf	El Cajon 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Ec	Jennings; CA	Coarse	Sedimentary	Impermeable	CSI
K	Jennings; CA	Coarse	Sedimentary	Impermeable	CSI
Kccg	San Diego 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Kcs	San Diego 30' x 60'	Coarse	Sedimentary	Impermeable	CSI

Map Unit	Map Name	Anticipated Grain size of Weathered Material	Bedrock or Sedimentary	Impermeable/ Permeable	Geology Grouping
Qvop10	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvop10a	San Diego 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvop11	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvop11a	San Diego 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvop12	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvop13	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvop2	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvop3	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvop4	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvop5	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvop6	San Diego 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvop7	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvop8	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvop9	San Diego 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Tsa	Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qof	Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qof1	Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qof2	Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Q	Jennings; CA	Coarse	Sedimentary	Permeable	CSP
Qa	Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qd	Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qf	Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qmb	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qop	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qw	San Diego & Oceanside	Coarse	Sedimentary	Permeable	CSP