City of Escondido
PRIORITY DEVELOPMENT PROJECT (PDP) SWQMP

GAMBLE LANE
TENTATIVE PARCEL MAP
PROJECT ID: PL21-0508

ASSESSOR'S PARCEL NUMBER(S):
238-071-23

ENGINEER OF WORK:

RONALD HOLLOWAY, R.C.E. 29271 EXP. 3-31-2023

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DATE OF SWQMP:
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SWQMP APPROVED BY:
[FOR CITY STAFF ONLY]

APPROVAL DATE:

ESCONDIDO
City of Choice

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ATTACHMENTS

Attachment 1: Backup for PDP Pollutant Control BMPs
- Attachment 1a: Storm Water Pollutant Control Worksheet Calculations (Worksheet B.2-1 DCV, Form I-4)
- Attachment 1b: Form I-5, Categorization of Infiltration Feasibility Condition
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- Attachment 1d: Drainage Management Area (DMA) Exhibit
- Attachment 1e: Individual Structural BMP DMA Mapbook

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

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

Attachment 4: City of Escondido PDP Structural BMP Verification
Attachment 5: Copy of Plan Sheets Showing Permanent Storm Water BMPs

ACRONYMS

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

PDP SWQMP PREPARER'S CERTIFICATION PAGE

Project Name: Gamble Lane Tentative Parcel Map
Permit Application Number: PL21-0508

PREPARER'S CERTIFICATION

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

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

RCE 29271, EXP. 3-31-23
Engineer of Work's Signature, PE Number & Expiration Date

Ronald Holloway
Print Name

Bha Inc.
Company

4-11-22
Date

Engineer's Seal:

SUBMITTAL RECORD

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

Preliminary Design / Planning / CEQA

Submittal Number	Date	Summary of Changes
1	December 7, 2021	Initial Submittal
2	April	2nd Submittal
3		
4		

Final Design

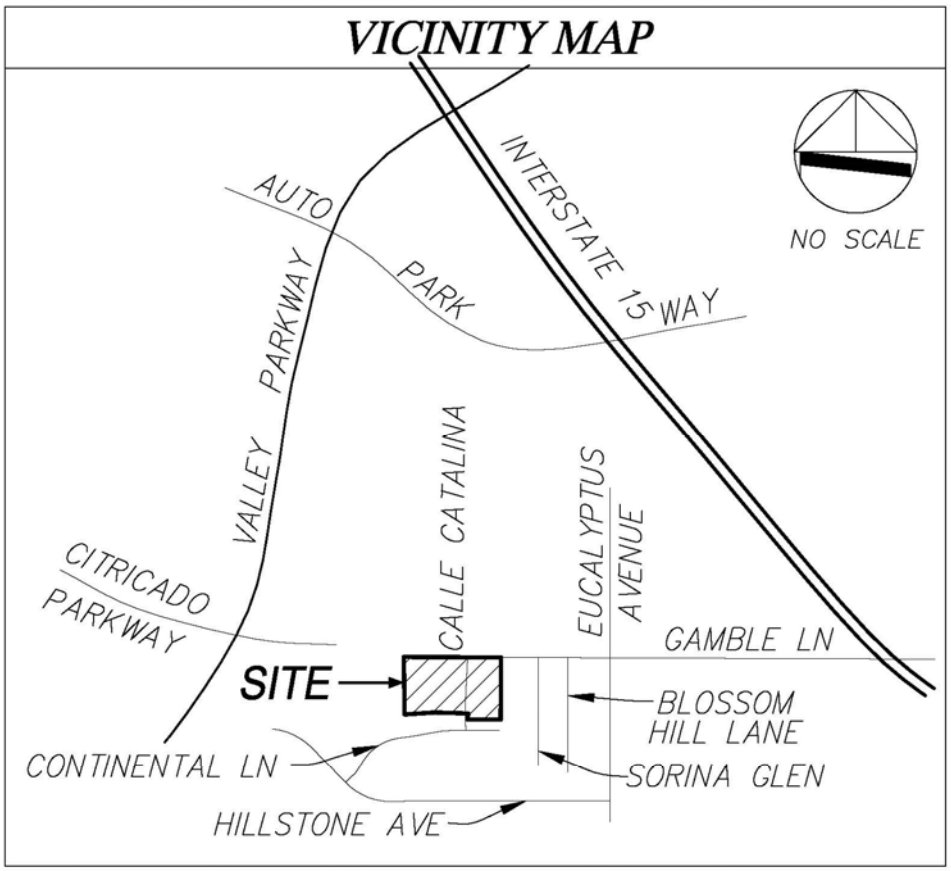
Submittal Number	Date	Summary of Changes
1		
2		
3		
4		

Plan Changes

Submittal Number	Date	Summary of Changes
1		
2		
3		
4		

PROJECT VICINITY MAP

Project Name: Gamble Lane Tentative Parcel Map
Record ID:



Step 1: Project type determination (Standard or Priority Development Project) (Form I-2a)

Project Summary Information	
Project Name	Gamble Lane Tentative Parcel Map
Project Address	North of Calle Catalina and south of Gamble Lane
Assessor's Parcel Number(s)	238-071-23
Permit Application Number	PL21-0508
Project Watershed (Hydrologic Unit)	Select One: San Dieguito 905
Parcel Area (total area of Assessor's Parcel(s) associated with the project)	2.502 Acres (108,968 Square Feet)
Area to be disturbed by the project (Project Area)	1.972 Acres (85,915 Square Feet)
Project Proposed Impervious Area (subset of Project Area)	0.741 Acres (32,275 Square Feet)
Project Proposed Pervious Area (subset of Project Area)	1.231 Acres (53,640 Square Feet)
Note: Proposed Impervious Area + Proposed Pervious Area = Area to be Disturbed by the Project. This may be less than the Parcel Area.	
Confirmation of Priority Development Project Determination	
The project is (select one): ☑ New Development ☐ Redevelopment[1]	
The total proposed newly created or replaced impervious area is: 32,275 ft^2	

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

Solar energy farms that are not also one of the categories listed in Step 2b of Table 1-1. City staff must also determine that appropriate BMPs are provided to mitigate for downstream impacts due to significant changes to the existing hydrology

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 and/or replace 5,000 square feet or more of impervious surface (collectively over the entire project site), and support one or more of the following uses: (i) Restaurants. This category is defined as a facility that sells prepared foods and drinks for consumption, including stationary lunch counters and refreshment stands selling prepared foods and drinks for immediate consumption (Standard Industrial Classification (SIC) code 5812). (ii) Hillside development projects. This category includes development on any natural slope that is twenty-five percent or greater. (iii) Parking lots. This category is defined as a land area or facility for the temporary parking or storage of motor vehicles used personally, for business, or for commerce. (iv) Streets, roads, highways, freeways, and driveways. This category is defined as any paved impervious surface used for the transportation of automobiles, trucks, motorcycles, and other vehicles.
Yes ☐	No ☒	(d)	New or redevelopment projects that create and/or replace 2,500 square feet or more of impervious surface (collectively over the entire project site), and discharging directly to an Environmentally Sensitive Area (ESA). "Discharging directly to" includes flow that is conveyed overland a distance of 200 feet or less from the project to the ESA, or conveyed in a pipe or open channel any distance as an isolated flow from the project to the ESA (i.e. not commingled with flows from adjacent lands). *Note: ESAs are areas that include but are not limited to all Clean Water Act Section 303(d) impaired water bodies; areas designated as Areas of Special Biological Significance by the State Water Board and San Diego Water Board; State Water Quality Protected Areas; water bodies designated with the RARE beneficial use by the State Water Board and San Diego Water Board; and any other equivalent environmentally sensitive areas which have been identified by the Copermittees.*
Yes ☐	No ☒	(e)	New development projects, or redevelopment projects that create and/or replace 5,000 square feet or more of impervious surface, that support one or more of the following uses: (i) Automotive repair shops. This category is defined as a facility that is categorized in any one of the following SIC codes: 5013, 5014, 5541, 7532-7534, or 7536-7539. (ii) Retail gasoline outlets (RGOs). This category includes RGOs that meet the following criteria: (a) 5,000 square feet or more or (b) a projected Average Daily Traffic (ADT) of 100 or more vehicles per day.

Yes ☐	No ☒	(e)	New development projects, or redevelopment projects that create and/or replace 5,000 square feet or more of impervious surface, that support one or more of the following uses: (iii) 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. (iv) Retail gasoline outlets (RGOs). This category includes RGOs that meet the following criteria: (a) 5,000 square feet or more or (b) a projected Average Daily Traffic (ADT) of 100 or more vehicles per day.
Yes ☒	No ☐	(f)	New or redevelopment projects that result in the disturbance of one or more acres of land and are expected to generate pollutants post construction. *Note: See Storm Water Design Manual Section 1.4.2 for additional guidance.*

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

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

☒ Yes – the project is a Priority Development Project (PDP).

Further guidance may be found in Chapter 1 and Table 1-2 of the Storm Water Design Manual.

The following is for **redevelopment PDPs only**:

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

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

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

OR

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

Step 1.1: Storm Water Quality Management Plan requirements

Step	Answer	Progression
Is the project a Standard Project, Priority Development Project (PDP), or exception to PDP definitions? To answer this item, complete Step 1 Project Type Determination Checklist on Pages 1 and 2, and see PDP exemption information below. For further guidance, see Section 1.4 of the Storm Water Design Manual *in its entirety*.	☐ Standard Project	Standard Project requirements apply, including Standard Project SWQMP. **Complete Form I-1.**
	☒ PDP	Standard and PDP requirements apply, including PDP SWQMP. **SWQMP Required.**
	☐ PDP with ACP	If participating in offsite alternative compliance, **complete Step 6.3 and an ACP SWQMP.**
	☐ PDP Exemption	**Go to Step 1.2 below.**

Step 1.2: Exemption to PDP definitions

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

Step 2: Construction Storm Water BMPs

Construction storm water BMPs shall be shown on the Grading Plan and (if applicable) included in the Storm Water Pollution Prevention Plan (SWPPP).

Step 3: City of Escondido PDP SWQMP Site Information Checklist (Form I-2a)

Step 3.1: Description of Existing Site Condition

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

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

Description / Additional Information:
The existing site comprises of previously cleared and partially graded site. The site is a u-shaped property with Gamble Lane to the north, and single family residential developments on the east, south and west sides of the project. There is a lot with a single family residential building, concrete driveway and accessory improvements separating the west and east portions of the property. An existing public street, Calle Catalina, traverses the property in a south to north direction beginning where the improved portion of Calle Catalina ends along the southerly boundary. Unimproved Calle Catalina extends northerly to Gamble Lane. Drainage from the site is conveyed to three separate Points of Compliances (POCs).

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

☒Vegetative Cover 2.502 Acres (108,968 Square Feet)
☒Non-Vegetated Pervious Areas 0.000 Acres (0 Square Feet)
☒Impervious Areas 0.000 Acres (0 Square Feet)

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 (GW) (or N/A for no infiltration BMPs):

☐GW Depth < 5 feet
☐5 feet < GW Depth < 10 feet
☐10 feet < GW Depth < 20 feet
☒ GW Depth > 20 feet

Existing Natural Hydrologic Features (select all that apply):

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

Description / Additional Information:

Step 3.2: Description of Existing Site Drainage Patterns

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

Describe existing site drainage patterns:

The existing site comprises of previously cleared and partially graded site. The site is a u-shaped property with Gamble Lane to the north, and single family residential developments on the east, south and west sides of the project. There is a lot with a single family residential building, concrete driveway and accessory improvements separating the west and east portions of the property. An existing public emergency access and public utilities easement, Calle Catalina, traverses the property in a south to north direction beginning where the improved portion of Calle Catalina ends along the southerly boundary. Unimproved Calle Catalina extends northerly to Gamble Lane. Drainage from the site is conveyed to three separate POCs.

Drainage Basin A, 0.84 acres, drains to POC A. POC A is generally described as the southwest portion of the property that drains southeasterly to Calle Catalina. Drainage sheet flows to an existing concrete brow ditch along the southerly boundary where it discharges onto Calle Catalina. A portion of the offsite lot with a single family residential building and accessory improvements drains onsite towards Calle Catalina. Total discharge at POC A is 2.15 cfs.

Drainage Basin B, 0.96 acres, drains to POC B. POC B is generally described as the northwest portion of the property. Drainage is conveyed toward the northwest corner of the property and discharged onto Gamble Lane. A portion of the offsite lot with a single family residential building, concrete driveway and accessory improvements drains onsite towards Calle Catalina. A portion of the offsite existing single family residential dwelling drains northerly onto Gamble Lane. Total discharge at POC B is 2.80 cfs.

Drainage Basin C, 2.29 acres, drains to POC C. POC C is generally described as the easterly half of the property. Drainage is conveyed from the easterly edge of Calle Catalina toward the northeasterly corner of the project. A portion of the offsite lot with a single family residential building, concrete driveway and accessory improvements drains onto Gamble Lane and confluences with onsite flows at northeasterly corner of the project. Total discharge at POC C is 5.30 cfs.

Per the National Resources Conservation Service (NRCS) Web Survey the hydrologic Soil Type is Type C. Type C soils have a slow infiltration rate when thoroughly wet.

Step 3.3: Description of Proposed Site Development

Project Description / Proposed Land Use and/or Activities:

The proposed Gamble Lane Tentative Parcel Map (TPM) is being proposed with three (3) parcels. Each parcel will have a single family residential dwelling unit. Un-improved Calle Catalina will be improved onsite and will connect to Gamble Lane along the northerly project boundary.

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

The proposed impervious features of the project include improvements to Gamble Lane and Calle Catalina that will include asphalt concrete and concrete curb and gutter. Parcel 1 is located on the westerly half of the project and will get access from Calle Catalina via a permeable paver driveway. Parcels 2 and 3 will get access from Calle Catalina via concrete driveways. A single family residential dwelling, concrete driveway and concrete walkways will be located on each parcel.

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

Proposed pervious features will include landscaping on each parcel and a permeable paver driveway on Parcel 1.

Does the project include grading and changes to site topography?

☑Yes

☐No

Description / Additional Information:

Grading will occur on approximately 1.97 acres of the site. Approximately 0.55 acres will be offsite for Gamble Lane improvements. One pad will be graded on each parcel for a single family residential dwelling unit. Calle Catalina will be improved to serve as access to all three parcels.

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

Table 1 – Change in Land Cover Type Summary

Change in Land Cover Type Summary			
Land Cover Type	Existing (acres or ft^2)	Proposed (acres or ft^2)	Percent Change
Vegetation	108,698 ft^2	47,392 ft^2	56%
Pervious (non-vegetated)	0 ft^2	6,248 ft^2	100%
Impervious	0 ft^2	32,275 ft^2	100 %

Step 3.4: Description of Proposed Site Drainage Patterns

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

☑Yes
☐No

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

Describe proposed site drainage patterns:

Storm water facilities will be constructed to collect runoff from new and existing impervious surfaces prior to discharging offsite onto Calle Catalina and Gamble Lane. The project site drains to three (3) separate POCs. POC A, POC B and POC C.

Drainage Basin A, 0.89 acres, drains to POC A. Drainage Basin A, encompasses runoff from Parcel 1 graded pad, permeable paver driveway serving Parcel 1 from Calle Catalina and a portion of the offsite lot with a single family residential building and accessory improvements that drain onsite. Runoff from the graded pad will be conveyed into a biofiltration basin for pollutant control treatment, hydromodification (flow control) and mitigation of the 100-year runoff. The outlets from the biofiltration basin and permeable pavers will be discharged into an existing concrete brow ditch along the southerly boundary. The permeable pavers will provide pollutant control treatment and flow control for onsite pervious areas and runoff from the existing offsite lot with a single family residential building and accessory improvements that drains onto the site. A tree well will provide pollutant control for a portion of onsite improvements of Calle Catalina. The tree well will be lined to prevent infiltration. Low flows will infiltrate through the structural soil of the tree well at approximately 5 in/hr, then will be discharged through a 6” subdrain that will be connected to the yard drain for Parcel 3, and eventually discharged into the biofiltration basin part of POC C. High flows that bypass the tree well will continue downstream onto Calle Catalina. Total discharge at POC A (Node 40) after mitigation of the 100-year runoff is 1.87 cfs.

Drainage Basin B, 0.81 acres, drains to POC B. Drainage Basin B, encompasses runoff from the rear slopes of Parcel 1 graded pad and a portion the offsite lot with a single family residential building and accessory improvements. No stormwater BMPs are being proposed for DMA B. Total discharge at POC B (Node 70) is 2.36 cfs.

Continuation of Step 3.4

Drainage Basin C, 2.35 acres, drains to POC C. Drainage Basin C, encompasses runoff from Parcel 2, Parcel 3, portion of Calle Catalina, and a portion of the offsite lot with a single family residential building and accessory improvements that drain onto Gamble Lane. Runoff from Parcel 2 and Parcel 3 will be discharged into the biofiltration basin via separate yard drains. A portion of runoff from Gamble Lane will be intercepted by a curb inlet and discharged into the biofiltration basin via a storm drain. The biofiltraton basin will provide pollutant control treatment, flow control and to mitigate the 100-year runoff. The outlet form the biofiltration basin will be discharged onto Gamble Lane via a curb outlet. A tree well will provide partial pollutant control for Gamble Lane. The tree well will be lined to provide some infiltration, no subdrain is provided due to elevation constraints. Low flows will infiltrate through the structural soil of the tree well at approximately 5 in/hr, then will infiltrate into onsite soils. High flows that bypass the tree well will continue onto Gamble Lane.

Total discharge at POC C (confluence of Nodes 200 and 220) is 4.95 cfs.

There is one (1) De Minimis Areas that is not feasible to drain into the biofiltration basins or tree well for pollutant control. DMIN C1 (122 sf of area of impervious area, 174 sf total area).

There are two self-mitigating areas that are landscaped and do not generate significant pollutants and drain offsite. SM B is 563 sf and drains to POC B. SM C is 7,910 sf and drains to POC C.

Step 3.5: Potential Pollutant Source Areas

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

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

Description / Additional Information:

Step 3.6: Identification and Narrative of Receiving Water and Pollutants of Concern

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

List any 303(d) impaired water bodies[2] within the path of storm water from the project site to the Pacific Ocean (or bay, lagoon, lake or reservoir, as applicable), identify the pollutant(s)/stressor(s) causing impairment, and identify any TMDLs and/or Highest Priority Pollutants from the WQIP for the impaired water bodies:

303(d) Impaired Water Body	Pollutant(s)/Stressor(s)	TMDLs / WQIP Highest Priority Pollutant
Felicita Creek (905.23)	Aluminum Total Dissolved Solids	N/A
Lake Hodges (905.21)	Color Manganese Mercury Nitrogen Phosphorus Turbidity pH	N/A
San Dieguito River (905.11	Enterococcus Fecal Coliform Nitrogen Phosphorus Total Dissolved Solids Toxicity	N/A

Identification of Project Site Pollutants*

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

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

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

[2] The current list of Section 303(d) impaired water bodies can be found at http://www.waterboards.ca.gov/water_issues/programs/water_quality_assessment/#impaired

Step 3.7: Hydromodification Management Requirements

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

☒Yes, hydromodification management requirements for flow control and preservation of critical coarse sediment yield areas are applicable.

☐No, the project will discharge runoff directly to 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[3] for the watershed in which the project resides.

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

[3]The Watershed Management Area Analysis (WMAA) is an optional element for inclusion in the Water Quality Improvement Plans (WQIPs) described in the 2013 MS4 Permit [Provision B.3.b.(4)]. It is available online at the Project Clean Water website: http://www.projectcleanwater.org/index.php?option=com_content&view=article&id=248

Step 3.7.1: 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 (classification that provides an estimate of sediment yield based on geology, hillslope, and land cover) Onsite

☐6.2.2 Downstream Systems Sensitivity to Coarse Sediment

☐6.2.3 Optional Additional Analysis of Potential Critical Coarse Sediment Yield Areas Onsite

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

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

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

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

☐Critical coarse sediment yield areas exist and require protection. The project will implement management measures described in Sections 6.2.4 and 6.2.5 as applicable, and the areas are identified on the SWQMP Exhibit.

Discussion / Additional Information:

Flow Control for Post-Project Runoff*

***This Section only required if hydromodification management requirements apply**
List and describe point(s) of compliance (POCs) for flow control for hydromodification management (see Section 6.3.1). For each POC, provide a POC identification name or number correlating to the project's HMP Exhibit and a receiving channel identification name or number correlating to the project's HMP Exhibit.
Has a geomorphic assessment been performed for the receiving channel(s)? ☒No, the low flow threshold is 0.1Q2 (default low flow threshold) ☐Yes, the result is the low flow threshold is 0.1Q2 ☐Yes, the result is the low flow threshold is 0.3Q2 ☐Yes, the result is the low flow threshold is 0.5Q2 *Discussion / Additional Information: (optional)*

Step 3.8: 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.

Optional Additional Information or Continuation of Previous Sections As Needed

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

.

Step 4: Source Control BMP Checklist (Form I-2b)

Source Control BMPs

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

Answer each category below pursuant to the following:

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

Source Control Requirement	Applied?		
SC-1 Prevention of Illicit Discharges into the MS4	☒Yes	☐No	☐N/A
☒ Direct irrigation water away from impervious surfaces ☐ Direct vehicle wash water away from impervious surfaces ☐ Other: _____ *Discussion / justification if SC-1 not implemented:*			
SC-2 Storm Drain Stenciling or Signage	☒Yes	☐No	☐N/A
☒ Stencil or stamp storm drains with anti-dumping message ☒ Post signs prohibiting illegal dumping ☐ Other *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
☐ Store materials inside a covered enclosure ☐ Direct runoff from downspouts and roofs away from storage areas ☐ Other *Discussion / justification if SC-3 not implemented:* *No outdoor materials storage areas are proposed*			

SC-4 Protect Materials Stored in Outdoor Work Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☐Yes	☐No	☒N/A
☐ Locate work area away from storm drains or catch basins ☐ Work over impermeable surfaces where spills and pollutants can be captured and removed *Discussion / justification if SC-4 not implemented:* *No materials stored in outdoor work areas*			
SC-5 Protect Trash Storage Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☐Yes	☐No	☒ N/A
☐ Locate trash containers in a roofed, walled enclosure ☐ Locate trash containers away from storm drains *Discussion / justification if SC-5 not implemented:*			
SC-6 Additional BMPs Based on Potential Sources of Runoff Pollutants (must answer for each source listed below):			
☒ A. On-site storm drain inlets	☒Yes	☐No	☐N/A
☐ B. Interior floor drains and elevator shaft sump pumps	☐Yes	☐No	☒N/A
☐ C. Interior parking garages	☐Yes	☐No	☒N/A
☒ D. Need for future indoor & structural pest control	☐Yes	☐No	☒ N/A
☒ E. Landscape/outdoor pesticide use	☒Yes	☐No	☐N/A
☐ F. Pools, spas, ponds, fountains, and other water features	☐Yes	☐No	☒N/A
☐ G. Food service	☐Yes	☐No	☒N/A
☐ H. Refuse areas	☐Yes	☐No	☒N/A
☐ I. Industrial processes	☐Yes	☐No	☒N/A
☐ J. Outdoor storage of equipment or materials	☐Yes	☐No	☒N/A
☐ K. Vehicle and equipment cleaning	☐Yes	☐No	☒N/A
☐ L. Vehicle/equipment repair and maintenance	☐Yes	☐No	☒ N/A
☐ M. Fuel dispensing areas	☐Yes	☐No	☒N/A
☐ N. Loading docks	☐Yes	☐No	☒N/A
☐ O. Fire sprinkler test water	☐Yes	☐No	☒N/A
☐ P. Miscellaneous drain or wash water	☐Yes	☐No	☒N/A
☒ Q. 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 <u>all</u> "No" answers shown above.			

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

Step 5: Site Design BMP Checklist (Form I-2c)

Site Design BMPs

All development projects must implement site design BMPs SD-A through SD-H where applicable and feasible. See Chapter 4.3 and Appendix E of the City Storm Water Design Manual for information to implement site design BMPs shown in this checklist. The following checklists serve as guides only. Mark what elements are included in your project. See Storm Water Design Manual Chapter 4 and Appendix E for more information on determining appropriate BMPs for your project.

Answer each category below pursuant to the following:

- "Yes" means the project will implement the site design BMP as described in Chapter 4.3 and/or Appendix E of the City Storm Water Design Manual. Discussion / justification is not required.
- "No" means the BMP is applicable to the project but it is not feasible to implement. Discussion / justification must be provided.
- "N/A" means the BMP is not applicable at the project site because the project does not include the feature that is addressed by the BMP (e.g., the project site has no existing natural areas to conserve). Discussion / justification must be provided.

Site Design Requirement	Applied?		
SD-1 Maintain Natural Drainage Pathways and Hydrologic Features	☐Yes	☐No	☒ N/A
☐ Maintain existing drainage patterns *Discussion / justification if SD-1 not implemented:* *No natural drainage pathways exist on-site.*			
SD-2 Conserve Natural Areas, Soils, and Vegetation	☒ Yes	☐No	☐N/A
☐ Preserve trees (see Zoning Code Art. 55 Grading & Erosion Control; Art. 62 Landscape Regulations) ☐ Avoid sensitive areas such as wetlands and waterways *Discussion / justification if SD-2 not implemented:*			
SD-3 Minimize Impervious Area	☒Yes	☐No	☐ N/A
☐ Install parking and driving aisles to minimum width required to meet standards *Discussion / justification if SD-3 not implemented:*			

SD-4 Minimize Soil Compaction	☒Yes	☐No	☐N/A
☒ Avoid compaction in planned landscaped spaces ☐ Till and amend soil for improved infiltration capacity *Discussion / justification if SD-4 not implemented:*			
SD-5 Impervious Area Dispersion	☒Yes	☐No	☐N/A
☒ Drain rooftops, roads or sidewalks into adjacent landscape areas ☐ Drain impervious surfaces through pervious areas *Discussion / justification if SD-5 not implemented:*			
SD-6 Runoff Collection	☐Yes		
Discussion / justification if SD-6 not implemented:	☒Yes	☐No	☐N/A
SD-7 Landscaping with Native or Drought Tolerant Species			
Discussion / justification if SD-7 not implemented:	☒Yes	☐No	☐N/A
SD-8 Harvesting and Using Precipitation			
Discussion / justification if SD-8 not implemented: *No rain-water harvesting strategies proposed. Harvest and Use is considered to be infeasible for this project.* *See Attachment 1c for Harvest and Use Feasibility Screening Checklist (Worksheet B.3-1).*	☐ Yes	☐No	☒N/A

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

Step 6: PDP Structural BMPs (Form I-3)

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

PDP structural BMPs must be verified by the City at the completion of construction. This may include requiring the project owner or project owner's representative and engineer of record to certify construction of the structural BMPs (see Section 8.2.3.2 of the Storm Water Design Manual). PDP structural BMPs must be maintained into perpetuity, and the City must confirm the maintenance (see Section 7 of the Storm Water Design Manual).

Use this section to provide narrative description of the general strategy for structural BMP implementation at the project site in the box below. Then complete the PDP structural BMP summary information sheet (Step 6.2) for each structural BMP within the project (copy the BMP summary information sheet [Step 6.2] as many times as needed to provide summary information for each individual structural BMP).

Step 6.1: Description of structural BMP strategy

Describe the general strategy for structural BMP implementation at the site. This information must describe how the steps for selecting and designing storm water pollutant control BMPs presented in Section 5.1 of the Storm Water D*esign 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. At the end of this discussion provide a summary of all the structural BMPs within the project including the type and number.*

For the purpose of this SWQMP, the proposed site condition has been divided into two (2) Drainage Management Areas (DMAs) draining to biofiltration basin BMPs. The DMAs have been delineated based on onsite drainage patters, soil type, and BMP locations.

The type of structural BMP chosen for the project was based on the flow chart presented in Figures 5-1 and 5-2 of the City of Escondido BMP Design Manual (BMP DM). Using Form I-4 to gauge the feasibility of capture and use techniques for the project site, it was determined that harvesting is considered impractical for use on the project site due to it being a proposed residential area with low water use. A feasibility analysis was then conducted for infiltration and if infiltration is fully or partially feasible for the project's structural BMP. Partial infiltration is considered feasible based on the presence to Type C soils per the USDA Web Soils Survey in the vicinity.

Description of structural **BMP** strategy continued

(Continued from previous page)

Based on Categorization of Infiltration Feasibility Condition Worksheet C.4.1 it has been determined that partial infiltration into onsite soils is feasible for permeable pavers (BMP A2). However, it is has determined that partial infiltration to be infeasible for both biofiltration basins BMP A1 and BMP C1.

Since infiltration is considered infeasible, BF-1 biofiltration basins with no infiltration were chosen as the type of structural BMP for DMA A1 and DMA C. Permeable Pavers, INF-3, were chosen for DMA A2. Green street tree wells for chosen for both DMA A3 and DMA C2.

DMA A1, BMP A1 (Biofiltration Basin) is partially responsible for handling hydromodification requirements for POC A. In developed conditions, the basin will have a total depth of 24-inches. The BMP is comprised of 6-inches of ponding, 3-inches of non-floatable mulch, an 18-inch layer of amended soil (a highly sandy, organic rich compost with an infiltration capacity of at least 5 in/hr), 6-inches of pea gravel, and a 12-inch reservoir layer of gravel for additional detention, and to accommodate the French drain system. Below the reservoir layer, the basin will include 3-inches of saturated storage. Flows will discharge from the basin via a low-flow orifice outlet within the gravel layer to the receiving storm drain system. A riser structure will also be constructed within the BMP with an emergency overflow, such that peak flows can be safely discharged downstream. See dimensions in Tables 2 and 3.

DMA A2, BMP A2 (Permeable Pavers) is partially responsible for handling hydromodification requirements for POC A. The permeable paver BMP will comprise of permeable pavers, 4-inches of bedding layer of aggregate (ASTM No. 8 Stone), 12-inches of aggregate (ASTM No. 57 Stone), including an 8-inch PVC drain, and 6-inches of compacted aggregate (ASTM No. 57 Stone). The permeable pavers will treat the DCV based on the available infiltration storage volume calculated from the permeable paver footprint, aggregate storage layer depth, and in-situ soil design infiltration rate for a maximum 36 hour drawdown time.

DMA A3, BMP A3 (Green Street Tree Well) will provide pollutant control for a portion of the onsite improvements of Calle Catalina. The tree well will be lined to prevent infiltration. Low flows will infiltrate through the structural soil of the tree well at approximately 5 in/hr, then will be discharged through a 6” subdrain that will be connected to the yard drain for Parcel 3, and eventually discharged into the biofiltration basin part of POC C. High flows that bypass the tree well will continue downstream onto Calle Catalina.

(Continued from previous page)

bypass the tree well will continue downstream onto Calle Catalina.

DMA C, BMP C (Biofiltration Basin) responsible for handling hydromodification requirements for POC C. In developed conditions, the basin will have a total depth of 24-inches. The BMP is comprised of 6-inches of ponding, 3-inches of non-floatable mulch, an 18-inch layer of amended soil (a highly sandy, organic rich compost with an infiltration capacity of at least 5 in/hr), 6-inches of pea gravel, and a 12-inch reservoir layer of gravel for additional detention, and to accommodate the French drain system. Below the reservoir layer, the basin will include 3-inches of saturated storage. Flows will discharge from the basin via a low-flow orifice outlet within the gravel layer to the receiving storm drain system. A riser structure will also be constructed within the BMP with an emergency overflow, such that peak flows can be safely discharged downstream.

DMA C2, BMP C2 (Green Street Tree Well) will provide pollutant control for a portion of the onsite improvements Gamble Lane. The tree well will be lined to provide some infiltration, no subdrain is provided due to elevation constraints. Low flows will infiltrate through the structural soil of the tree well at approximately 5 in/hr, then will infiltrate into onsite soils. High flows that bypass the tree well will continue onto Gamble Lane.

See dimensions in Tables 2 and 3.

Table 2 – Summary of Post Developed Dual Purpose BMPs:

Biofiltration BMP	Tributary Area (Ac)	DIMENSIONS					
		BMP Area[(1)] (ft^2)	Underdrain Orifice,	Total Media Depth	Total Gravel Depth[(3)]	Riser Invert Elev,	Total Surface Depth,
BMPA	0.30	342	1.00	18	12	12	24
BMP C	2.08	1,825	1.42	18	12	14	29

Notes:

(1): Area of amended soil = area of gravel = area of BMP.

(2): Diameter of the orifice in gravel layer with invert at bottom of layer; tied with hydromod min threshold (10%Q2).

(3): Does not include gravel below pipe invert.

(4): Depth from bottom of pond to invert of emergency overflow weir.

(5): Total surface ponding depth from the bottom of the pond to the top of the pond berm (pond spill crest).

(Continued from previous page)

Table 3 – Summary of HMP Riser Surface Discharge Structures:

POC 1	Lower Orifice Dimensions			Middle Orifice Dimensions			Emergency Weir		
	Outlet Type[1]	Invert Elev, HL[2] (in)	Dimensions (#) - height x width[3]	Outlet Type[1]	Invert Elev, HL[2] (in)	Dimensions (#) - height x width[3]	Riser Type	Riser Invert Elev,	Weir Perimeter Length (ft)
BMP A	Diameter	6	(4) - 1"	Slot	7	(1) 1" x 16"	Type G CB	12	11.84
BMP C	Slot	6	(1) - 3" x 23"	n/a	n/a	n/a	Type G CB	12	11.84

Notes: (1): Shape of orifice opening in riser structure.

(2): Depth from bottom of pond to invert of orifice or weir.

(3): Number of orifices - dimensions of orifice. For example for Basin C: one (1) slot orifice, slot height (hs) =3", slot width (bs) = 23", invert at 6".

(4): Depth from bottom of pond to invert of emergency overflow weir.

Step 6.2: Structural BMP Checklist

(Copy this page as needed to provide information for each individual proposed structural BMP)	
Structural BMP ID No. BMP A1	
Construction Plan Sheet No. TPM, Sheet 1	
Type of structural BMP: ☐Retention by harvest and use (HU-1) ☐Retention by infiltration basin (INF-1) ☐Retention by bioretention (INF-2) ☐Retention by permeable pavement (INF-3) ☐ Partial retention by biofiltration with partial retention (PR-1) ☑Biofiltration (BF-1) ☐Biofiltration with Nutrient Sensitive Media Design (BF-2) ☐Proprietary Biofiltration (BF-3) meeting all requirements of Appendix F ☐Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below) ☐Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below) ☐Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below) ☐Detention pond or vault for hydromodification management ☐Other (describe in discussion section below)	
Purpose: ☐Pollutant control only ☐Hydromodification control only ☒Combined pollutant control and hydromodification control ☐Pre-treatment/forebay for another structural BMP ☐Other (describe in discussion section below)	
Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification forms (See Section 8.2.3.2 of the Storm Water Design Manual)	
Who will be the final owner of this BMP?	☐HOA ☒Property Owner ☐City ☐Other (describe)
Who will maintain this BMP into perpetuity?	☐HOA ☒Property Owner ☐City ☐Other (describe)
Discussion (as needed): *(Continue on subsequent pages as necessary)*	

(Copy this page as needed to provide information for each individual proposed structural BMP)	
Structural BMP ID No. BMP A2	
Construction Plan Sheet No. TPM, Sheet 1	
Type of structural BMP: ☐Retention by harvest and use (HU-1) ☐Retention by infiltration basin (INF-1) ☐Retention by bioretention (INF-2) ☒ Retention by permeable pavement (INF-3) ☐Partial retention by biofiltration with partial retention (PR-1) ☐Biofiltration (BF-1) ☐Biofiltration with Nutrient Sensitive Media Design (BF-2) ☐Proprietary Biofiltration (BF-3) meeting all requirements of Appendix F ☐Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below) ☐Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below) ☐Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below) ☐Detention pond or vault for hydromodification management ☐Other (describe in discussion section below)	
Purpose: ☐Pollutant control only ☐Hydromodification control only ☒Combined pollutant control and hydromodification control ☐Pre-treatment/forebay for another structural BMP ☐Other (describe in discussion section below)	
Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification forms (See Section 8.2.3.2 of the Storm Water Design Manual)	
Who will be the final owner of this BMP?	☐HOA ☒Property Owner ☐City ☐Other (describe)
Who will maintain this BMP into perpetuity?	☐HOA ☒Property Owner ☐City ☐Other (describe)
Discussion (as needed): *(Continue on subsequent pages as necessary)*	

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

Structural BMP ID No. BMP A3

Construction Plan Sheet No. TPM, Sheet 1

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

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

Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification forms (See Section 8.2.3.2 of the Storm Water Design Manual)	
Who will be the final owner of this BMP?	☐HOA ☒Property Owner ☐City ☐Other (describe)
Who will maintain this BMP into perpetuity?	☐HOA ☒Property Owner ☐City ☐Other (describe)
Discussion (as needed): *Green Street Tree Well*	

(Copy this page as needed to provide information for each individual proposed structural BMP)	
Structural BMP ID No. BMP C1	
Construction Plan Sheet No. TPM, Sheet 1	
Type of structural BMP: ☐Retention by harvest and use (HU-1) ☐Retention by infiltration basin (INF-1) ☐Retention by bioretention (INF-2) ☐ Retention by permeable pavement (INF-3) ☐Partial retention by biofiltration with partial retention (PR-1) ☑Biofiltration (BF-1) ☐Biofiltration with Nutrient Sensitive Media Design (BF-2) ☐Proprietary Biofiltration (BF-3) meeting all requirements of Appendix F ☐Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below) ☐Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below) ☐Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below) ☐Detention pond or vault for hydromodification management ☐Other (describe in discussion section below)	
Purpose: ☐Pollutant control only ☐Hydromodification control only ☒Combined pollutant control and hydromodification control ☐Pre-treatment/forebay for another structural BMP ☐Other (describe in discussion section below)	
Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification forms (See Section 8.2.3.2 of the Storm Water Design Manual)	
Who will be the final owner of this BMP?	☐HOA ☒Property Owner ☐City ☐Other (describe)
Who will maintain this BMP into perpetuity?	☐HOA ☒Property Owner ☐City ☐Other (describe)
Discussion (as needed): *(Continue on subsequent pages as necessary)*	
(	

Structural BMP ID No. BMP C2
Construction Plan Sheet No. TPM, Sheet 1
Type of structural BMP: ☐Retention by harvest and use (HU-1) ☐Retention by infiltration basin (INF-1) ☐Retention by bioretention (INF-2) ☐Retention by permeable pavement (INF-3) ☐ Partial retention by biofiltration with partial retention (PR-1) ☐Biofiltration (BF-1) ☐Biofiltration with Nutrient Sensitive Media Design (BF-2) ☐Proprietary Biofiltration (BF-3) meeting all requirements of Appendix F ☐Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below) ☐Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below) ☐Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below) ☐Detention pond or vault for hydromodification management ☑Other (describe in discussion section below)
Purpose: ☑Pollutant control only ☐Hydromodification control only ☐Combined pollutant control and hydromodification control ☐Pre-treatment/forebay for another structural BMP ☐Other (describe in discussion section below)

Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification forms (See Section 8.2.3.2 of the Storm Water Design Manual)	
Who will be the final owner of this BMP?	☐HOA ☒Property Owner ☐City ☐Other (describe)
Who will maintain this BMP into perpetuity?	☐HOA ☒Property Owner ☐City ☐Other (describe)
Discussion (as needed): *Green Street Tree Well*	

Step 6.3: Offsite Alternative Compliance Participation Form

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

ATTACHMENT 1

BACKUP FOR PDP POLLUTANT CONTROL BMPS

This is the cover sheet for Attachment 1.

Indicate which Items are Included behind this cover sheet:

Attachment Sequence	Contents	Checklist
Attachment 1a	Storm Water Pollutant Control Worksheet Calculations -Worksheet B.2-1 (Required) -Worksheet B.3-1 (Form I-4; Required) -Worksheet B.4-1 (if applicable) -Worksheet B.5-1 (if applicable) -Worksheet B.5-2 (if applicable) -Worksheet B.5-3 (if applicable) -Worksheet B.6-1 (if applicable) -Summary Worksheet (optional)	☒Included
Attachment 1b	Form I-5, Categorization of Infiltration Feasibility Condition (Required unless the project will use harvest and use BMPs) Refer to Appendices C and D of the Storm Water Design Manual to complete Form I-5.	☐Included ☐Not included because the entire project will use harvest and use BMPs See Worksheet C.4-1
Attachment 1c	Form I-6, Factor of Safety and Design Infiltration Rate Worksheet (Required unless the project will use harvest and use BMPs) Refer to Appendices C and D of the Storm Water Design Manual to complete Form I-6.	☐Included ☐Not included because the entire project will use harvest and use BMPs See Worksheet C.4-1
Attachment 1d	DMA Exhibit (Required) See DMA Exhibit Checklist on the back of this Attachment cover sheet.	☒Included
Attachment 1e	Individual Structural BMP DMA Mapbook (Required) -Place each map on 8.5”x11” paper. -Show at a minimum the DMA, Structural BMP, and any existing hydrologic features within the DMA.	☒Included

DMA Surface Tabulation to Support Partial Infiltration of Design Capture Volume (DCV) Determination		DMA Name – DMA A1
DMA Impervious Area Tabulation		
Surface Name	**Surface Type**	**Area (ft^2)**
IMPERV 1	Roof, Concrete, Asphalt	4,875
	Total Impervious Area (ft^2)	4,875
DMA Pervious Area Tabulation		
Surface Name	**Surface Type**	**Area (ft^2)**
L1	Landscape	8,081
	Total Pervious Area (ft^2)	8,081
	Total DMA (A)	12,956
	Total Impervious Area (ft^2) ⁄ Total DMA (ft^2) = Percent Impervious	38%
	Soil Type	C
	Area Weighted Runoff Factor (Using Appendix B.1.1 and B.2.1)	0.40
	85th Percentile Rainfall (I)	0.50
	Design Capture Volume (DVC) = (C)(I)(A) ⁄ 12	216

DMA Surface Tabulation to Support Partial Infiltration of Design Capture Volume (DCV) Determination		DMA Name – DMA A2
DMA Impervious Area Tabulation		
Surface Name	**Surface Type**	**Area (ft^2)**
IMPERV 1	Existing Roof, Concrete, Asphalt	5,624
	Total Impervious Area (ft^2)	5,624
DMA Pervious Area Tabulation		
Surface Name	**Surface Type**	**Area (ft^2)**
PP	Permeable Pavers	6,248
	Total Pervious Area (ft^2)	6,248
DMA Permeable Paver Area		
Surface Name	**Surface Type**	**Area (ft^2)**
LS	Landscape	13,619
	Total Pervious Area (ft^2)	13,619
	Total DMA (A)	25,491
Total Impervious Area (ft^2) / Total DMA (ft^2) = Percent Impervious		22%
	Soil Type	C
	Area Weighted Runoff Factor (Using Appendix B.1.1 and B.2.1)	0.25

DMA Surface Tabulation to Support Partial Infiltration of Design Capture Volume (DCV) Determination		DMA Name – DMA A2
DMA Impervious Area Tabulation		
Surface Name	**Surface Type**	**Area (ft^2)**
IMPERV 1	Roof, Concrete, Asphalt	5,624
	Total Impervious Area (ft^2)	5,624
DMA Pervious Area Tabulation		
Surface Name	**Surface Type**	**Area (ft^2)**
L1	Landscape	13,619
	Total Pervious Area (ft^2)	13,619
	Total DMA (A)	19,243
	Total Impervious Area (ft^2) / Total DMA (ft^2) = Percent Impervious	29%
	Soil Type	C
	Area Weighted Runoff Factor (Using Appendix B.1.1 and B.2.1)	0.33
	85th Percentile Rainfall (I)	0.50
	Design Capture Volume (DVC) = (C)(I)(A) / 12	268

Determine Infiltration Storage Volume below underdrain from Permeable Paver Footprint	DMA Name – DMA A2
Surface Area of Permeable Pavers (ft^2)	6,248
Use a Void Ratio (Voids/solids)	0.67
Depth of Aggregate Base 1-1/2" (ASTM No, 57 Stone) (in)	6
Volume Available for Storage (ft^3) = Area x Void Ratio x Depth	2,093

Determine Drawdown Time for In-situ Soil Design Infiltration	DMA Name – DMA A2
In-situ Soil Design Infiltration per Preliminary Storm Water Infiltration Feasibility Study (0.08 in/hr)	0.08
Infiltration Rate in cfs Based on Surface Area of Permeable Pavers = Area x Infiltration Rate (cfs)	0.012
Drawdown of of DVC = (DCV / Infiltration Rate) (hrs)	**6.43**
Drawdown of Aggregate Base 1-1/2" = (DCV / Infiltration Rate) (hrs)	**50.25**

DMA Surface Tabulation to Support Partial Infiltration of Design Capture Volume (DCV) Determination		DMA Name – DMA C1
DMA Impervious Area Tabulation		
Surface Name	**Surface Type**	**Area (ft^2)**
IMPERV 1	Roof, Concrete, Asphalt	36,320
	Total Impervious Area (ft^2)	36,320
DMA Pervious Area Tabulation		
Surface Name	**Surface Type**	**Area (ft^2)**
L1	Landscape	55,821
	Total Pervious Area (ft^2)	55,821
	Total DMA (A)	92,141
	Total Impervious Area (ft^2) / Total DMA (ft^2) = Percent Impervious	39%
	Soil Type	C
	Area Weighted Runoff Factor (Using Appendix B.1.1 and B.2.1)	0.42
	85th Percentile Rainfall (I)	0.50
	Design Capture Volume (DVC) = (C)(I)(A) / 12	1,595

Tabulation of Self-Mitigating DMAs		
Surface Name	**Surface Type**	**Area (ft^2)**
SM B	Landscape	563
	Subtotal Pervious Area	563
	Roof	0
	PCC	0
	Subtotal Impervious Area	0
	Total Self-Mitigating Area	563
Percent Impervious Area (Not to Exceed 5%)		0%

Tabulation of Self-Mitigating DMAs		
Surface Name	**Surface Type**	**Area (ft^2)**
SM C	Landscape	7,910
	Subtotal Pervious Area	7,910
	Roof	0
	PCC	0
	Subtotal Impervious Area	0
	Total Self-Mitigating Area	7,910
	Percent Impervious Area (Not to Exceed 5%)	0%

Tabulation of De Minimis DMAs				
Surface Name	**Surface Type**	**Concrete Area (ft^2)**	**Landscaping Area (ft^2)**	**Total Area (ft^2)**
DMIN C1	Concrete/Landscaping	122	52	174

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Summary of DMA Treatment Practices			
DMA Classification	Quantity	Subtotal DMA (ft^2)	Subtotal DMA (acres)
Self-Mitigating DMAs	2	8,473	0.19
Self-Retaining DMAs	0	0	0
Surfaces Draining to Self-Retaining DMAs	0	0	0
Biofiltration IMPs	2	2,167	0.05
Biofiltration with Partial Retention IMPs	0	0	0
Infiltration IMPs	0	0	0
Harvest and Use BMPs	0	0	0
Vegetated Swales	0	0	0
Media Filters	0	0	0
Sand Filters	0	0	0
Dry Extended Detention Basin	0	0	0
Proprietary Flow-thru Treatment BMPs	0	0	0
Street Trees	2	32	0.00
Impervious Area Dispersion	0	0	0
Green Roofs	0	0	0
Permeable Pavement	1	6,248	0.14
Rain Barrels	0	0	0
De Minimis DMAs	1	174	0
Total Project DMA	8	17,094	0.39
Total Parcel Area		108,968	2.50
Comment:			

Appendix B: Storm Water Pollutant Control Hydrologic Calculations and Sizing Methods

Worksheet B.3-1. Harvest and Use Feasibility Screening

Harvest and Use Feasibility Screening		Worksheet B.3-1
1. Is there a demand for harvested water (check all that apply) at the project site that is reliably present during the wet season? ☐ Toilet and urinal flushing ☒ Landscape irrigation ☐ Other:_____		
2. If there is a demand; estimate the anticipated average wet season demand over a period of 36 hours. Guidance for planning level demand calculations for toilet/urinal flushing and landscape irrigation is provided in Section B.3.2. Modified ETWU = 2.7 x [[(0.2 x53,640)/0.9] x 0.015] = 483 cf Total Previous Area = 53,640 sf		
3. Calculate the DCV using worksheet B-2.1. DCV = 2,079 cf		
3a. Is the 36-hour demand greater than or equal to the DCV? Yes / (No) ⇨ ⇩	3b. Is the 36-hour demand greater than 0.25DCV but less than the full DCV? Yes / (No) ⇨ ⇩	3c. Is the 36-hour demand less than 0.25DCV? (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.

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	BMP A1	BMP C1	BMP A3	BMP C2							unitless
	2	85th Percentile 24-hr Storm Depth	0.50	0.50	0.50	0.50							inches
	3	Impervious Surfaces Not Directed to Dispersion Area (C=0.90)	4,875	36,320	2,246	1,145							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)	8,081	55,821	1,808	475							sq-ft
	6	Natural Type A Soil Not Serving as Dispersion Area (C=0.10)											sq-ft
	7	Natural Type B Soil Not Serving as Dispersion Area (C=0.14)											sq-ft
	8	Natural Type C Soil Not Serving as Dispersion Area (C=0.23)											sq-ft
	9	Natural Type D Soil Not Serving as Dispersion Area (C=0.30)											sq-ft
Dispersion Area, Tree Well & Rain Barrel Inputs (Optional)	10	Does Tributary Incorporate Dispersion, Tree Wells, and/or Rain Barrels?	No	No	Yes	Yes	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			1	1							#
	19	Average Mature Tree Canopy Diameter			15	15							ft
	20	Number of Rain Barrels Proposed per SD-E											#
	21	Average Rain Barrel Size											gal
Initial Runoff Factor Calculation	22	Total Tributary Area	12,956	92,141	4,054	1,620	0	0	0	0	0	0	sq-ft
	23	Initial Runoff Factor for Standard Drainage Areas	0.40	0.42	0.54	0.67	0.00	0.00	0.00	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	0.40	0.42	0.54	0.67	0.00	0.00	0.00	0.00	0.00	0.00	unitless
	26	Initial Design Capture Volume	216	1,612	91	45	0	0	0	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	0.40	0.42	0.54	0.67	n/a	n/a	n/a	n/a	n/a	n/a	unitless
	32	Design Capture Volume After Dispersion Techniques	216	1,612	91	45	0	0	0	0	0	0	cubic-feet
Tree & Barrel Adjustments	33	Total Tree Well Volume Reduction	0	0	100	100	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	0.40	0.42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	unitless
	36	Final Effective Tributary Area	5,182	38,699	0	0	0	0	0	0	0	0	sq-ft
	37	Initial Design Capture Volume Retained by Site Design Elements	0	0	100	100	0	0	0	0	0	0	cubic-feet
	38	Final Design Capture Volume Tributary to BMP	216	1,612	0	0	0	0	0	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	BMP A1	BMP C1	BMP A3	BMP C2	-	-	-	-	-	-	unitless
	2	85th Percentile Rainfall Depth	0.50	0.50	0.50	0.50	-	-	-	-	-	-	inches
	3	Predominant NRCS Soil Type Within BMP Location	C	C									unitless
	4	Is proposed BMP location Restricted or Unrestricted for Infiltration Activities?	Restricted	Restricted									unitless
	5	Nature of Restriction	Slopes	Slopes									unitless
	6	Do Minimum Retention Requirements Apply to this Project?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	yes/no
	7	Are Habitable Structures Greater than 9 Stories Proposed?	No	No									yes/no
Advanced Analysis	8	Has Geotechnical Engineer Performed an Infiltration Analysis?	No	No									yes/no
	9	Design Infiltration Rate Recommended by Geotechnical Engineer											in/hr
Result	10	Design Infiltration Rate Used To Determine Retention Requirements	0.000	0.000	-	-	-	-	-	-	-	-	in/hr
	11	Percent of Average Annual Runoff that Must be Retained within DMA	4.5%	4.5%	-	-	-	-	-	-	-	-	percentage
	12	Fraction of DCV Requiring Retention	0.02	0.02	-	-	-	-	-	-	-	-	ratio
	13	Required Retention Volume	4	32	-	-	-	-	-	-	-	-	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	BMP A1	BMP C1	BMP A3	BMP C2	-	-	-	-	-	-	sq-ft
	2	Design Infiltration Rate Recommended	0.000	0.000	#VALUE!	#VALUE!	-	-	-	-	-	-	in/hr
	3	Design Capture Volume Tributary to BMP	216	1,612	0	0	-	-	-	-	-	-	cubic-feet
	4	Is BMP Vegetated or Unvegetated?	Vegetated	Vegetated									unitless
	5	Is BMP Impermeably Lined or Unlined?	Lined	Lined									unitless
	6	Does BMP Have an Underdrain?	Underdrain	Underdrain									unitless
	7	Does BMP Utilize Standard or Specialized Media?	Standard	Standard									unitless
	8	Provided Surface Area	342	1,825									sq-ft
	9	Provided Surface Ponding Depth	6	6									inches
	10	Provided Soil Media Thickness	18	18									inches
	11	Provided Gravel Thickness (Total Thickness)	7	12									inches
	12	Underdrain Offset	3	3									inches
	13	Diameter of Underdrain or Hydromod Orifice (Select Smallest)	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	1.00	1.00	1.00	1.00	1.00	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	0.40	0.40	0.40	0.40	0.40	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	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	inches
	24	Fraction of DCV Retained (Independent of Drawdown Time)	0.28	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	ratio
	25	Calculated Retention Storage Drawdown Time	120	120	0	0	0	0	0	0	0	0	hours
	26	Efficacy of Retention Processes	0.29	0.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	ratio
	27	Volume Retained by BMP (Considering Drawdown Time)	63	356	0	0	0	0	0	0	0	0	cubic-feet
	28	Design Capture Volume Remaining for Biofiltration	153	1,256	0	0	0	0	0	0	0	0	cubic-feet
Biofiltration Calculations	29	Max Hydromod Flow Rate through Underdrain	1.3646	1.4948	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	cfs
	30	Max Soil Filtration Rate Allowed by Underdrain Orifice	172.37	35.38	0.00	0.00	0.00	0.00	0.00	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	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	in/hr
	33	Depth Biofiltered Over 6 Hour Storm	30.00	30.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	inches
	34	Ponding Pore Space Available for Biofiltration	1.00	1.00	0.00	0.00	0.00	0.00	0.00	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	11.20	13.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	inches
	38	Drawdown Time for Surface Ponding	1	1	#VALUE!	#VALUE!	0	0	0	0	0	0	hours
	39	Drawdown Time for Effective Biofiltration Depth	2	3	0	0	0	0	0	0	0	0	hours
	40	Total Depth Biofiltered	41.20	43.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	inches
	41	Option 1 - Biofilter 1.50 DCV: Target Volume	230	1,883	0	0	0	0	0	0	0	0	cubic-feet
	42	Option 1 - Provided Biofiltration Volume	230	1,883	0	0	0	0	0	0	0	0	cubic-feet
	43	Option 2 - Store 0.75 DCV: Target Volume	115	942	0	0	0	0	0	0	0	0	cubic-feet
	44	Option 2 - Provided Storage Volume	115	942	0	0	0	0	0	0	0	0	cubic-feet
	45	Portion of Biofiltration Performance Standard Satisfied	1.00	1.00	#VALUE!	#VALUE!	0.00	0.00	0.00	0.00	0.00	0.00	ratio
Result	46	Do Site Design Elements and BMPs Satisfy Annual Retention Requirements?	Yes	Yes	No	No	-	-	-	-	-	-	yes/no
	47	Overall Portion of Performance Standard Satisfied (BMP Efficacy Factor)	1.00	1.00	#VALUE!	#VALUE!	0.00	0.00	0.00	0.00	0.00	0.00	ratio
	48	**Deficit of Effectively Treated Stormwater**	0	0	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	cubic-feet

Attention!

-Minimum annual retention criteria are not satisfied for each individual drainage area. Implement additional site design elements, increase structural BMP retention capacity, or demonstrate that such requirements are satisfied at the project-level

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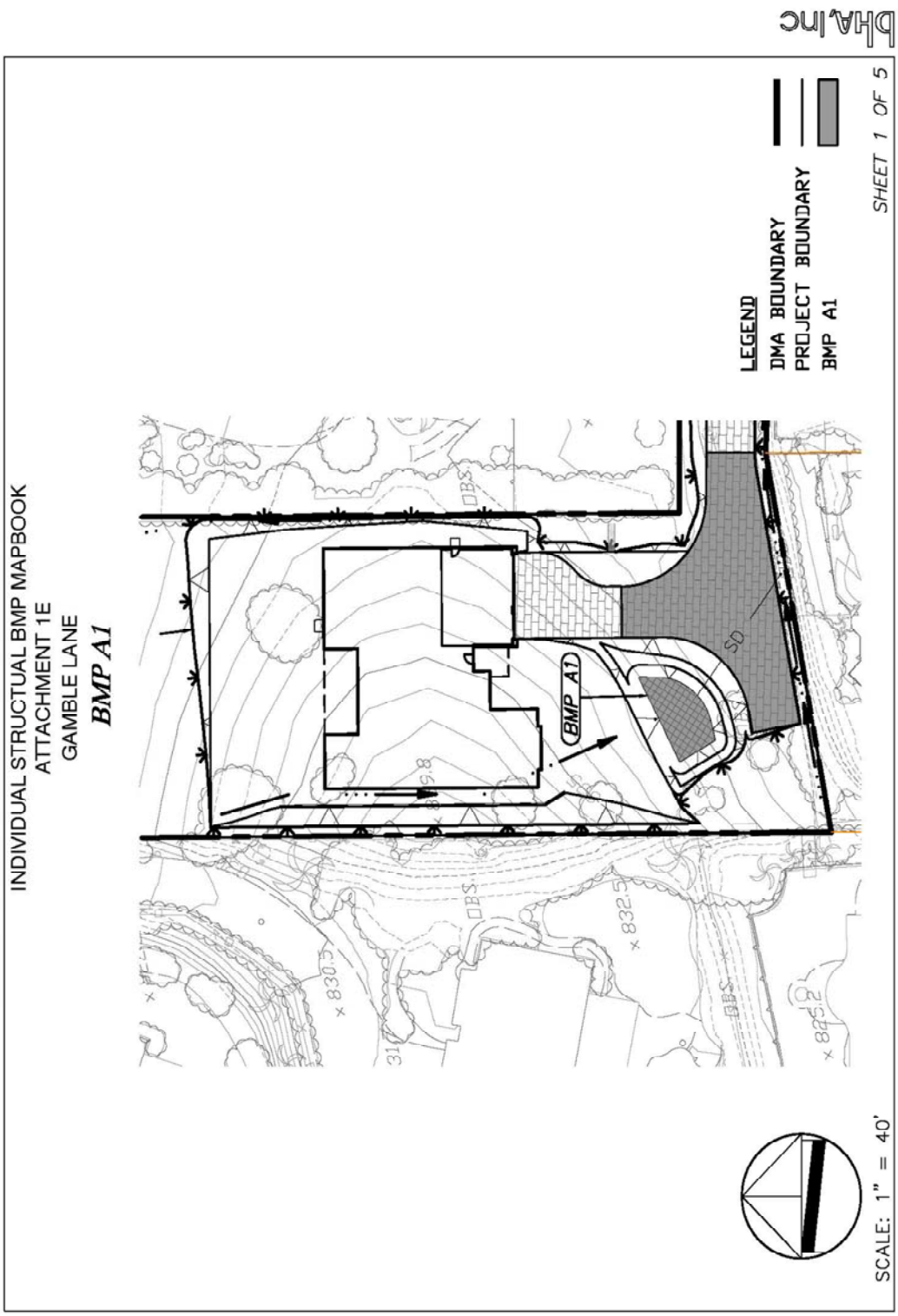
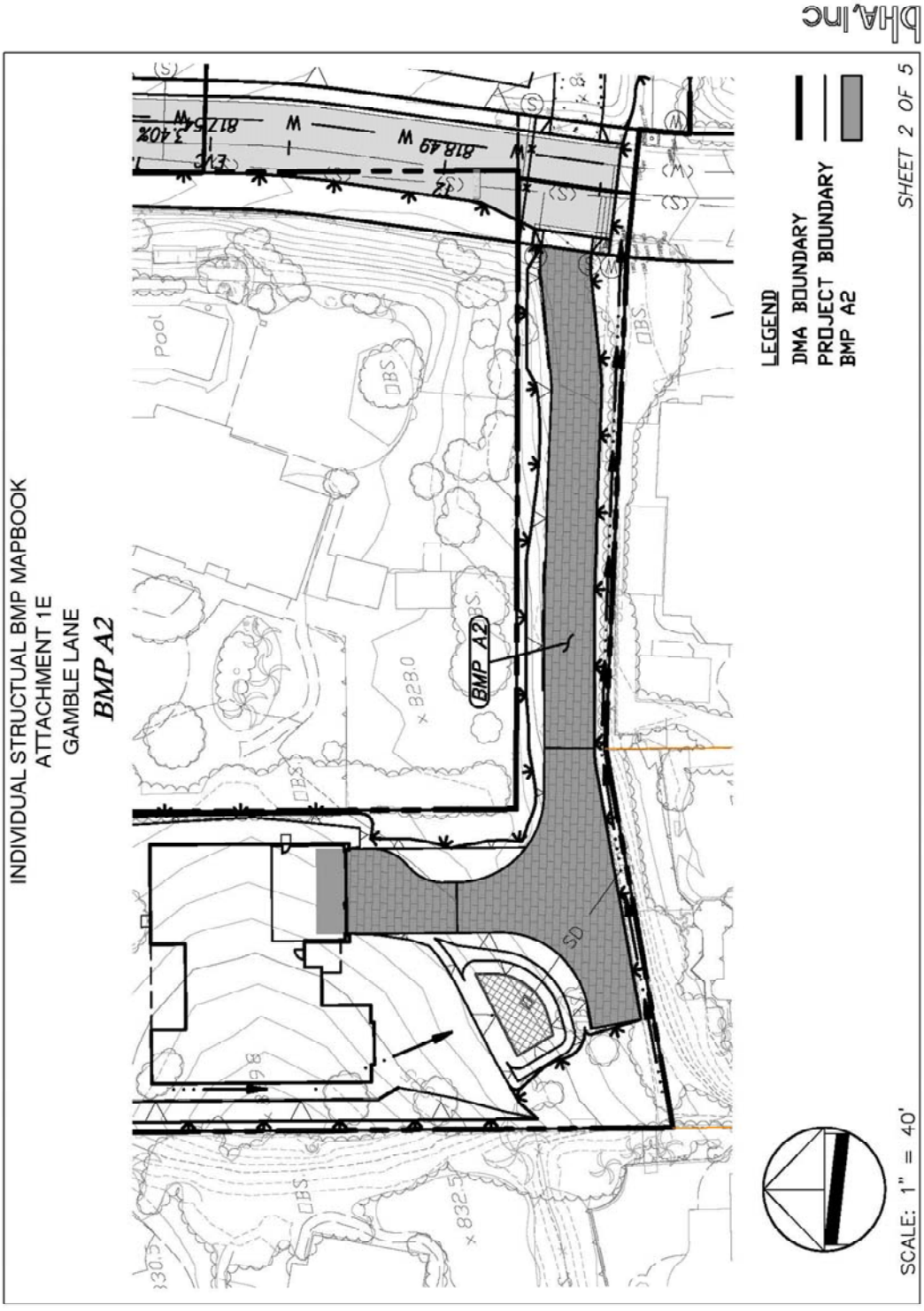

INDIVIDUAL STRUCTUAL BMP MAPBOOK
ATTACHMENT 1E
GAMBLE LANE
BMP A1
LEGEND
DMA BOUNDARY
PROJECT BOUNDARY
BMP A1
SHEET 1 OF 5
SCALE: 1" = 40'
BMP A1
SD
830.5
832.5
825.2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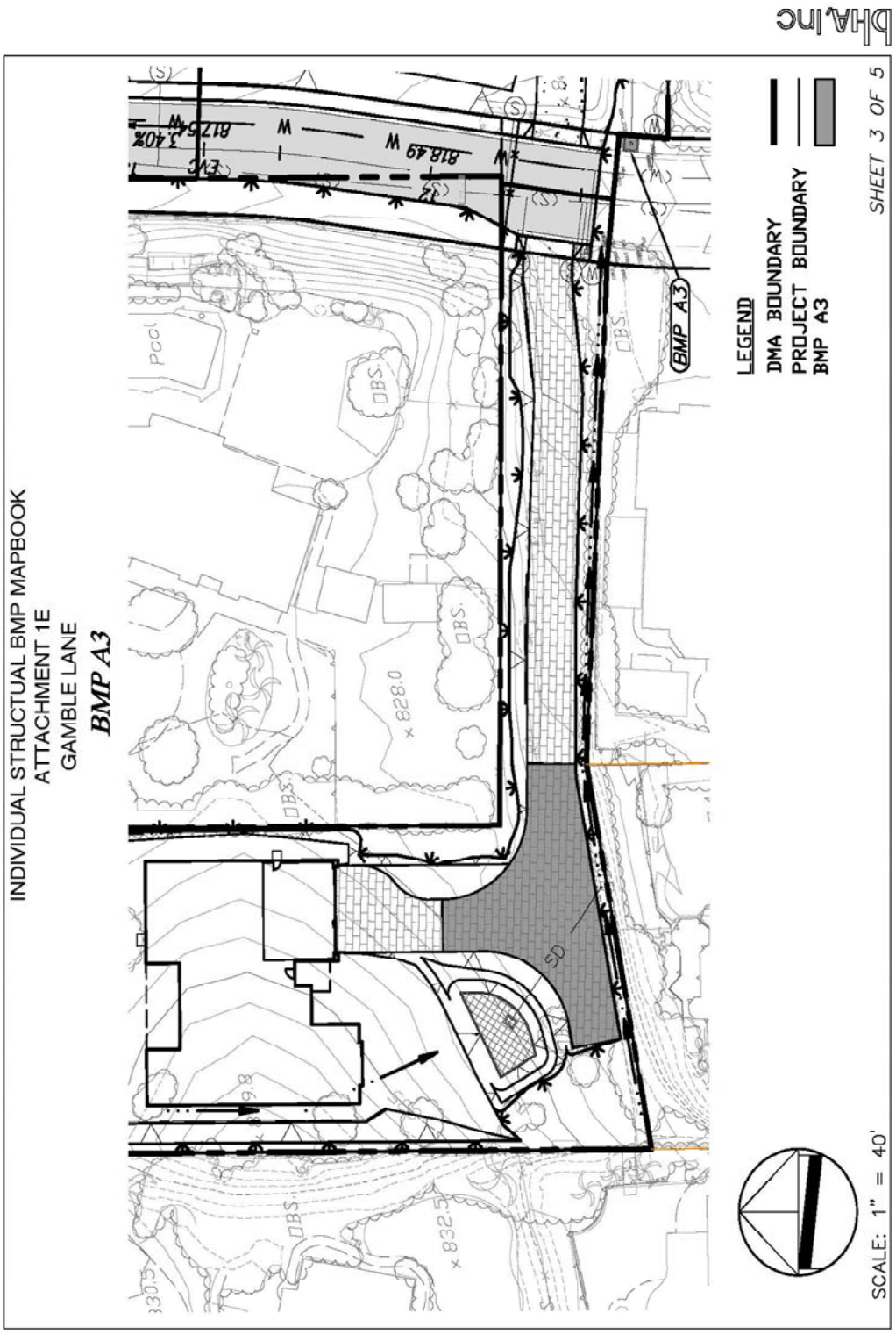
GAMBLE LANE
BMP A2
BMP A2
LEGEND
DMA BOUNDARY
PROJECT BOUNDARY
BMP A2
SHEET 2 OF 5
SCALE: 1" = 40'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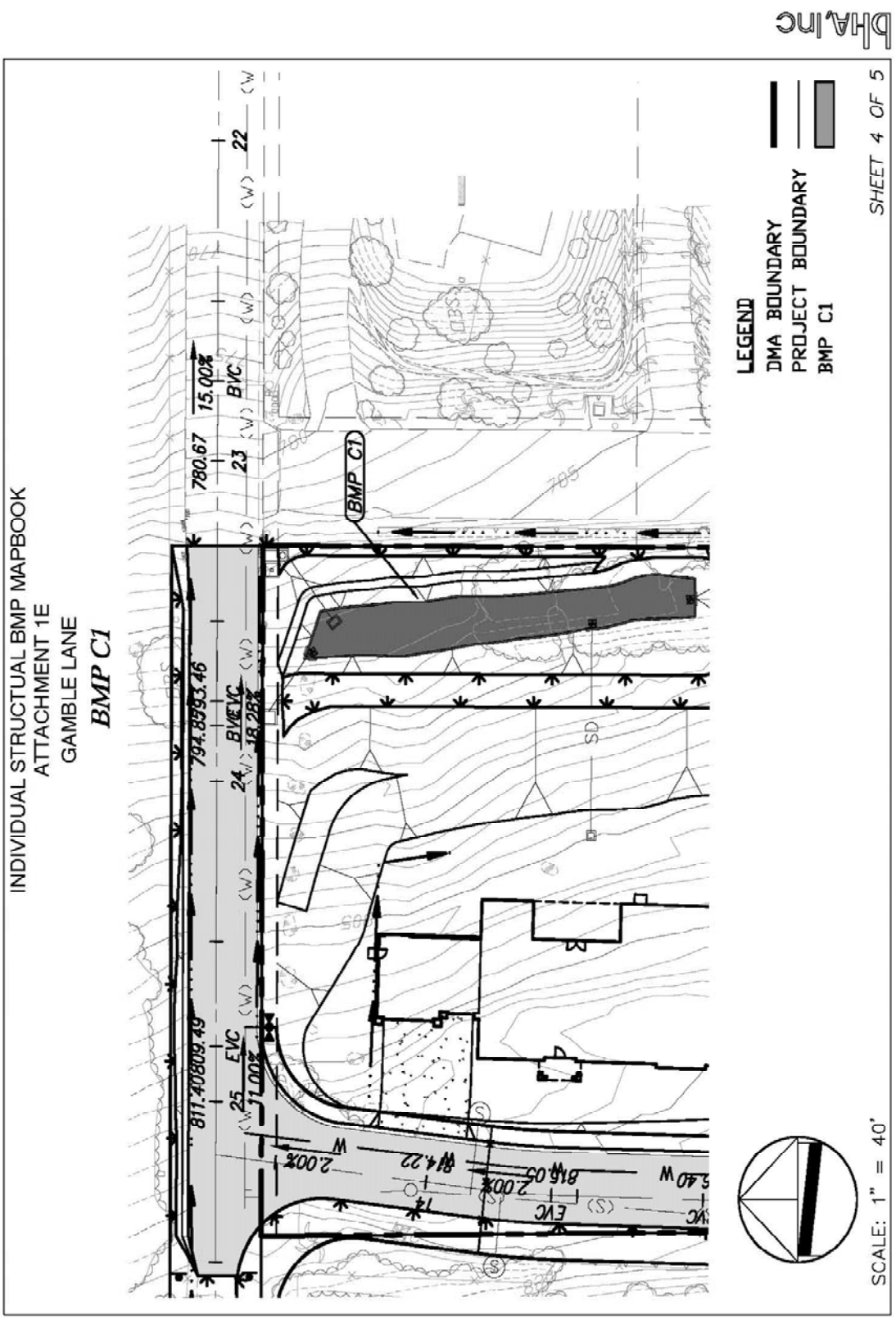
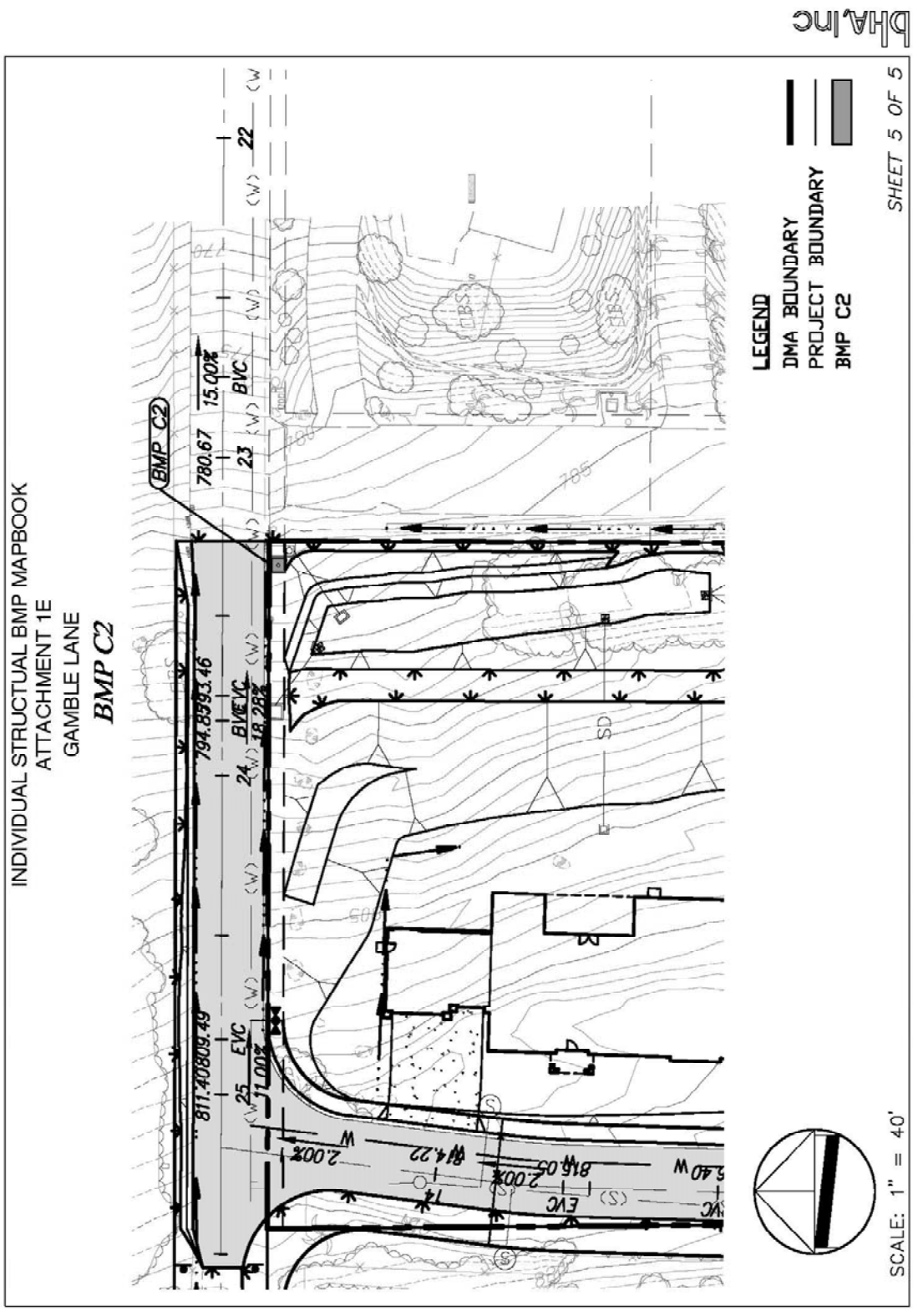
ATTACHMENT 1E
GAMBLE LANE
BMP A3
LEGEND
DMA BOUNDARY
PROJECT BOUNDARY
BMP A3
SHEET 3 OF 5
SCALE: 1" = 40'
BMP A3
Pool
SD


BHA, Inc
INDIVIDUAL STRUCTUAL BMP MAPBOOK
ATTACHMENT 1E
GAMBLE LANE
BMP C1
SHEET 4 OF 5
LEGEND
DMA BOUNDARY
PROJECT BOUNDARY
BMP C1
BMP C1
SCALE: 1" = 40'


INDIVIDUAL STRUCTUAL BMP MAPBOOK
ATTACHMENT 1E
GAMBLE LANE
BMP C2
LEGEND
DMA BOUNDARY
PROJECT BOUNDARY
BMP C2
SHEET 5 OF 5
SCALE: 1" = 40'
BMP C2
780.67
15.00%
BVC
794.8593.46
BVC EVC
18.28%
811.40809.49
EVC
11.00%
22
23
24
25
2.00%
2.00%
EVC
SD

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

The DMA Exhibit must identify:

☒Underlying hydrologic soil group
☒Approximate depth to groundwater
☒Existing natural hydrologic features (watercourses, seeps, springs, wetlands)
☒Critical coarse sediment yield areas to be protected
☒Existing topography and impervious areas
☒Existing and proposed site drainage network and connections to drainage offsite
☒Proposed demolition
☒Proposed grading
☒Proposed impervious features
☒Proposed design features and surface treatments used to minimize imperviousness
☒Drainage management area (DMA) boundaries, DMA ID numbers, and DMA areas (square footage or acreage), and DMA type (i.e., drains to BMP, self-retaining, or self-mitigating)
☒Potential pollutant source areas and corresponding required source controls (see Chapter 4, Appendix E.1, and Step 3.5)
☒Structural BMPs (identify location, structural BMP ID#, type of BMP, and size/detail)

Worksheet C.4-1: Categorization of Infiltration Feasibility Condition

Categorization of Infiltration Feasibility Condition		Worksheet C.4-1	
Part 1 - Full Infiltration Feasibility Screening Criteria Would infiltration of the full design volume be feasible from a physical perspective without any undesirable consequences that cannot be reasonably mitigated?			
Criteria	Screening Question	Yes	No
1	Is the estimated reliable infiltration rate below proposed facility locations greater than 0.5 inches per hour? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.		X
Provide basis: An infiltration rate assessment has been performed for the soils beneath the subject site as presented in the Preliminary Geotechnical Investigation and Infiltration Feasibility Study (CWE 2220070.01). The measured percolation rates were converted to infiltration rates using the Porchet Method. The City of Escondido BMP Design Manual states that "a maximum factor of safety (FOS) of 2.0 is recommended for infiltration feasibility screening such that an artificially high factor of safety cannot be used to inappropriately rule out infiltration, unless justified." Field infiltration rates within the weathered granitic rock were relatively low and fall into the partial infiltration criterion. The average field infiltration rate was calculated to be 0.16 inches per hour. A default safety factor of 2.0 was applied in order to determine a design infiltration rate of 0.08 inches per hour.			
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.		

Worksheet C.4-1 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:			
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:			
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		

*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 City Engineer to substantiate findings.

Worksheet C.4-1 Page 3 of 4			
Part 2 – Partial Infiltration vs. No Infiltration Feasibility Screening Criteria Would infiltration of water in any appreciable amount be physically feasible without any negative consequences that cannot be reasonably mitigated?			
Criteria	Screening Question	Yes	No
5	Do soil and geologic conditions allow for infiltration in any appreciable rate or volume? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.	X	
Provide basis: An infiltration rate assessment has been performed for the soils beneath the subject site as presented in the Preliminary Geotechnical Investigation and Infiltration Feasibility Study (CWE 2220070.01). The measured percolation rates were converted to infiltration rates using the Porchet Method. The City of Escondido BMP Design Manual states that "a maximum factor of safety (FOS) of 2.0 is recommended for infiltration feasibility screening such that an artificially high factor of safety cannot be used to inappropriately rule out infiltration, unless justified." Field infiltration rates within the weathered granitic rock were relatively low and fall into the partial infiltration criterion. The average field infiltration rate was calculated to be 0.16 inches per hour. A default safety factor of 2.0 was applied in order to determine a design infiltration rate of 0.08 inches per hour.			
6	Can Infiltration in any appreciable quantity be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.	X	
Provide basis: An infiltration rate assessment has been performed for the subject site. Based on the underlying soil conditions and our recommendations presented in our report, we anticipate that infiltration greater than 0.5 inches per hour can be allowed without increasing risk of geologic hazards that cannot be mitigated to an acceptable level. C.2.1 A site specific geotechnical investigation was performed. C.2.2 The underlying weathered granitics were found to have a low and very low potential for hydro collapse and consolidation, respectively. C.2.3 BMP A1 is located within 20 feet of a descending slope. We recommend that BMP A1 have an impermeable liner be designed for no infiltration condition. C.2.6 BMP C will be located above an existing retaining wall associated with a neighboring asphaltic concrete (AC) driveway. In our opinion, infiltrating storm water into BMP C will result in the migration of water behind and below the nearby retaining wall as well as into the pavement section for the driveway. Distress to the retaining wall and AC pavement from storm water infiltration could occur. Due to these geotechnical concerns we recommend that BMP C have an impermeable liner be designed for a no infiltration condition.			

Worksheet C.4-1 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.		X
Provide basis: Based on our review of items presented in Appendix C.3, we anticipate that infiltration greater than 0.5 inches per hour can be allowed without increasing risk of groundwater contamination that cannot be mitigated to an acceptable level. C.3.1 The subgrade soil appears to be suitable for onsite infiltration. We have no knowledge of groundwater or soil contamination onsite or down-gradient from the site. C.3.2 The depth to seasonal high groundwater beneath the site is expected to fluctuate seasonally and is estimated to be 100 feet below the existing site grades. Based on this information we anticipate that seasonal high groundwater will not encroach within 10 feet of the base of the proposed BMPs. C.3.3 No existing wellheads are known within the vicinity of the subject site. C.3.4 We have no knowledge of the site being previously used for industrial use. C.3.5 We recommend that infiltration activities be coordinated with the applicable groundwater management agency. C.3.6 There does not appear to be a high risk of causing potential water balance issues. C.3.7 We do not know of any water rights downstream of the project and have not evaluated this impact as part of our study.			
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.	X	
Provide basis: Downstream water rights have not been evaluated at this time; however, we are not aware of any water rights in the area of the project or downstream of the project.			
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

*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 City Engineer to substantiate findings

Daniel J. Flowers, CEG #2686

PROJECT CHARACTERISTICS	
SOIL TYPE	TYPE C
PROJECT AREA	2.50 ACRES
DISTURBED AREA	1.97 ACRES
PROPOSED IMPERVIOUS AREA	0.74 ACRES
PROPOSED PERVIOUS AREA	1.23 ACRES
DEPTH TO GROUNDWATER	> 20 FEET

LEGEND

DMA NAME	DMA A1
AREA (SQUARE FEET)	12,956 SF
SELF-MITIGATING DMA	SM B
POINT OF COMPLIANCE (POC)	POC A
CONCRETE	
ASPHALT	
BIOFILTRATION BASIN	
PERMEBLE PAVERS	
TREE WELL	
DMA BOUNDARY	
PROJECT BOUNDARY	
EXISTING CONCRETE BROW DITCH	
RIP RAP ENERGY DISSIPATERS (D-40)	

SOURCE CONTROL BMPS:

- SC-1 PREVENTION OF ILLICIT DISCHARGES INTO THE MS4
- SC-2 STORM DRAIN STENCILING AND SIGNAGE
- SC-6 ADDITIONAL BMPS BASED ON POTENTIAL RUNOFF POLLUTANTS:
  - A ON-SITE STORM DRAIN INLETS
  - D NEED FOR FUTURE INDOOR & STRUCTURAL PEST CONTROL
  - E LANDSCAPE/OUTDOOR PESTICIDE USE
  - Q PLAZAS, SIDEWALKS AND PARKING LOTS

LID AND SITE DESIGN:

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

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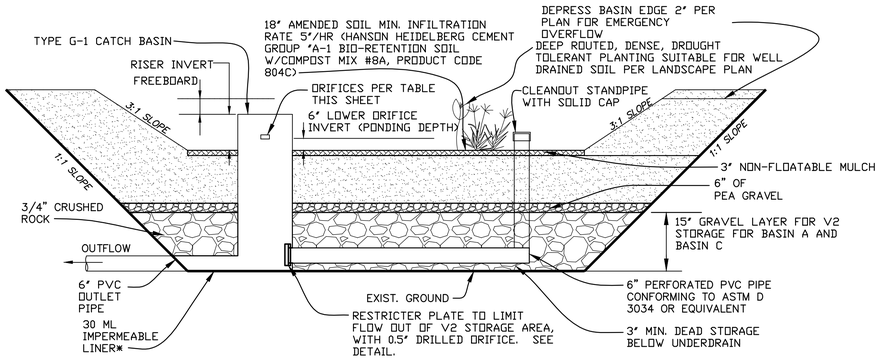
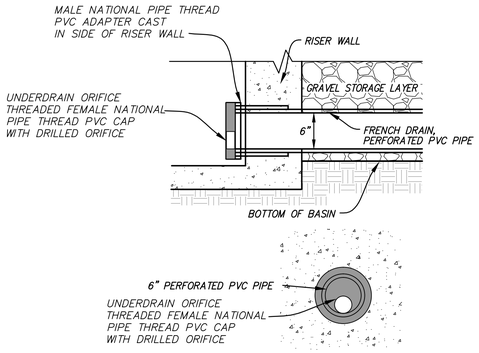
DMA EXHIBIT
GAMBLE LANE
TENTATIVE PARCEL MAP
ESCONDIDO, CA



BIOFILTRATION BASIN DETAIL, BMP A1 & C1

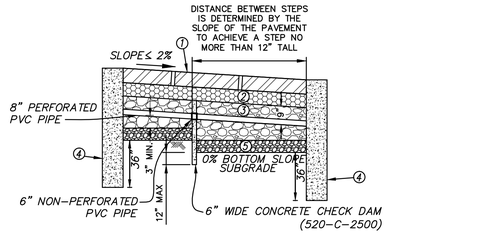
NOT TO SCALE

**30 MIL LINER NOTE: 30-MIL IMPERMEABLE LINER FOR BIORETENTION CONFORM TO THE FOLLOWING SPECIFICATIONS: SPECIFIC GRAVITY (ASTM D792): 1.2 (G/CC, MIN.); TENSILE (ASTM D882): 73 (LB/IN-WIDTH, MIN); ELONGATION AT BREAK (ASTM D882): 380 (% MIN); MODULUS (ASTM D882): 30 (LB/IN-WIDTH, MIN.); AND TEAR STRENGTH (ASTM D1004): 8 (LB/IN, MIN); SEAM SHEAR STRENGTH (ASTM D882) 58.4 (LB/IN, MIN); SEAM PEEL STRENGTH (ASTM D882) 15 (LB/IN, IN). SEE COLORADO LINING INTERNATIONAL PVC 30 HTTP://WWW.COLORADOLINING.COM/PRODUCTS/PVC.PDF) OR APPROVED EQUAL.*



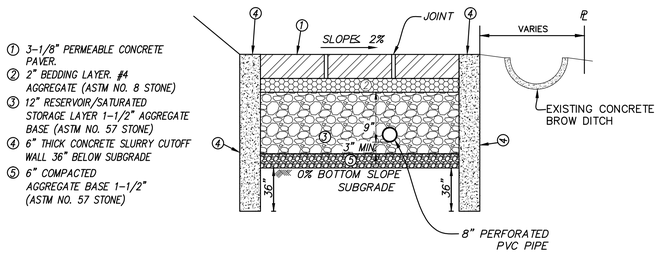
RESTRICTOR CAP DETAIL

NOT TO SCALE



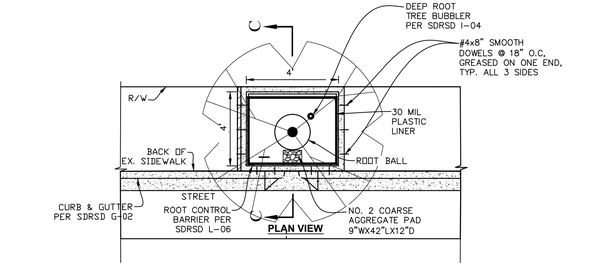
PERMEABLE PAVERS

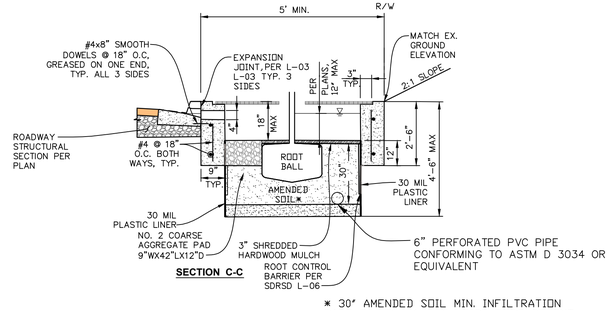
LONGITUDINAL/TERRACED SLOPE
NOT TO SCALE



PERMEABLE PAVERS, BMP A2

NOT TO SCALE

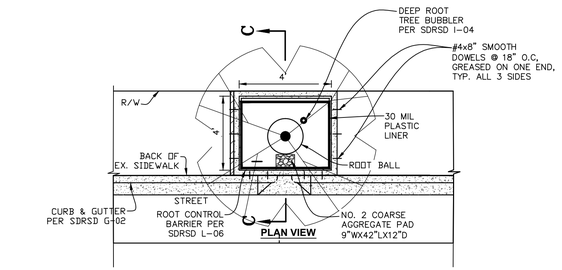


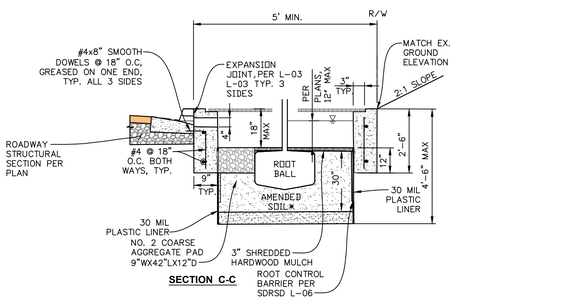


* 30" AMENDED SOIL MIN. INFILTRATION RATE 5"/HR (HANSON HEIDELBERG CEMENT GROUP "A-1 BIO-RETENTION SOIL W/COMPOST MIX #8A, PRODUCT CODE 804C)

TREE WELL, BMP A3

WITH SUBDRAIN
NOT TO SCALE





* 30" AMENDED SOIL MIN. INFILTRATION RATE 5"/HR (HANSON HEIDELBERG CEMENT GROUP "A-1 BIO-RETENTION SOIL W/COMPOST MIX #8A, PRODUCT CODE 804C)

TREE WELL, BMP C2

WITHOUT SUBDRAIN
NOT TO SCALE

Biofiltration BMP	Tributary Area (Ac)	DIMENSIONS					
		BMP Area[1] (ft^2)	Underdrain Orifice,	Total Media Depth	Total Gravel Depth[3]	Riser Invert Elev,	Total Surface Depth,
BMPA	0.30	342	1.00	18	12	12	24
BMP C	2.08	1,825	1.42	18	12	14	29

Notes:
(1): Area of amended soil = area of gravel = area of BMP.
(2): Diameter of the orifice in gravel layer with invert at bottom of layer; tied with hydromod min threshold (10%Q2).
(3): Does not include gravel below pipe invert.
(4): Depth from bottom of pond to invert of emergency overflow weir.
(5): Total surface ponding depth from the bottom of the pond to the top of the pond berm (pond spill crest).

POC 1	Lower Orifice Dimensions			Middle Orifice Dimensions			Emergency Weir		
	Outlet Type[1]	Invert Elev, HL[2] (in)	Dimensions (#) - height x width[3]	Outlet Type[1]	Invert Elev, HL[2] (in)	Dimensions (#) - height x width[3]	Riser Type	Riser Invert Elev,	Weir Perimeter Length (ft)
BMP A	Diameter	6	(4) - 1"	Slot	7	(1) 1" x 16"	Type G CB	12	11.84
BMP C	Slot	6	(1) - 3" x 23"	n/a	n/a	n/a	Type G CB	12	11.84

Notes:
(1): Shape of orifice opening in riser structure.
(2): Depth from bottom of pond to invert of orifice or weir.
(3): Number of orifices - dimensions of orifice. For example for Basin C: one (1) slot orifice, slot height (hs) =3", slot width (bs) = 23", invert at 6".
(4): Depth from bottom of pond to invert of emergency overflow weir.

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DMA EXHIBIT
GAMBLE LANE
TENTATIVE PARCEL MAP
ESCONDIDO, CA

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ATTACHMENT 2

BACKUP FOR PDP HYDROMODIFICATION CONTROL MEASURES

This is the cover sheet for Attachment 2.

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

Indicate which Items are Included behind this cover sheet:

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

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HYDROMODIFICATION MANAGEMENT PLAN (HMP)

SWMM Modeling for Hydromodification Compliance of:

Gamble Lane
Tentative Parcel Map

City of Escondido
APN: 238-071-23

Prepared For:

Michael H. Galey, Trustee
171 Saxony Road, Suite 101
Encinitas, CA 92024

April 8, 2022

Prepared By:

Ronald Holloway, R.C.E. 29271

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HYDROMODIFICATION MANAGEMENT PLAN (HMP)

SWMM Modeling for Hydromodification Compliance of:
Gamble Lane Project, City of Escondido, CA

INTRODUCTION

This document summarizes the approach used to model the proposed Gamble Lane project site in the City of Escondido using the Environmental Protection Agency (EPA) Storm Water Management Model 5.1 (SWMM). SWMM simulations were prepared for the pre and post-development conditions at the site in order to determine if the proposed LID biofiltration facilities have sufficient volume to meet the current Hydromodification Management Plan (HMP) requirements from the San Diego Regional Water Quality Control Board (SDRWQCB), as established in the Model BMP Design Manual San Diego Region (BMPDM) for the County of San Diego Copermittees, which includes the City of Escondido.

SWMM MODEL DEVELOPMENT

The existing site comprises of previously cleared and partially graded site. The site is a u-shaped property with Gamble Lane to the north, and single family residential developments on the east, south and west sides of the project. There is a lot with a single family residential building, concrete driveway and accessory improvements separating the west and east portions of the property. An existing public street, Calle Catalina, traverses the property in a south to north direction beginning where the improved portion of Calle Catalina ends along the southerly boundary. Unimproved Calle Catalina extends northerly to Gamble Lane. Drainage from the site is conveyed to three separate Points of Compliances (POCs).

A Tentative Parcel Map (TPM) is being proposed with three (3) parcels for the Gamble Lane project. Each parcel will have a single family residential dwelling unit. Un-improved Calle Catalina will be improved onsite and will connect to Gamble Lane along the northerly project boundary.

Two (2) SWMM simulations were prepared for the study: the first for pre-development and the second for the post-developed conditions. The project site drains to two (2) Points of Compliances.

POC A is generally described as the southwest portion of the property that drains southeasterly to Calle Catalina. Drainage sheet flows to an existing concrete brow ditch along the southerly boundary where it discharges onto Calle Catalina. A portion of the offsite lot with a single family residential building and accessory improvements drains onsite towards Calle Catalina.

POC B is generally described as the northwest portion of the property. Drainage is conveyed toward the northwest corner of the property and discharged onto Gamble Lane. A portion of the offsite lot with a single family residential building, concrete driveway and accessory improvements drains onsite towards Calle Catalina. A portion of the offsite existing single family residential dwelling drains northerly onto Gamble Lane.

POC C is generally described as the easterly half of the property. Drainage is conveyed from the easterly edge of Calle Catalina toward the northeasterly corner of the project. A portion of the offsite lot with a single family residential building, concrete driveway and accessory improvements drains onto Gamble Lane and confluences with onsite flows at northeasterly corner of the project.

Drainage patterns reflected on the DMA Exhibits will slightly decrease the acreage draining to the northeast corner (POC B) and increase the acreage draining towards the southeast corner (POC C) and the northeast corner (POC C). POC A and POC C include impervious contributing areas and require SWMM continuous simulation analysis to prove compliance with HMP requirements. See Table 1.1 below summarizing the areas for POC A and POC D.

Table 1.1 Summary of Areas for POC A and POC

POC-ID	Pre-Dev Area (ac)	Post-Dev Area (ac)	Difference (ac)
POC A1 (BMP A1 & BMP A2)	0.84	0.98	0.14
POC C (BMP C1)	2.29	2.34	0.05

The SWMM was used since we have found it to be more comparable to San Diego area watersheds than the alternative San Diego Hydrology Model (SDHM) and also because it is a non-proprietary model approved by the HMP document. For both SWMM simulations, flow duration curves were prepared to determine if the proposed HMP facilities are sufficient to meet the current HMP requirements.

The inputs required to develop SWMM simulations include rainfall, watershed characteristics, and BMP configuration. The Escondido Gage from the Project Clean Water website was used for this study, since it is the most representative of the project site precipitation due to elevation and proximity to the project site.

Per the California Irrigation Management Information System “Reference Evaporation Zones” (CIMIS ETo Zone Map), the project site is located within the Zone 4 Evapotranspiration Area. Thus evapotranspiration values for the site were modeled using Zone 4 monthly values from Table G.1-1 from the City of Escondido BMP Design Manual.

A feasibility analysis was then conducted for infiltration and if infiltration is fully or partially feasible for the project’s structural BMP. Partial infiltration is considered feasible based on the presence to Type C soils per the USDA Web Soils Survey in the vicinity.

Based on Categorization of Infiltration Feasibility Condition Worksheet C.4.1 it has been determined that partial infiltration into onsite soils is feasible for permeable pavers (BMP A2). However, it is has determined that partial infiltration to be infeasible for both biofiltration basins BMP A1 and BMP C1.

Onsite soil areas have been assumed to be compacted in the offsite conditions to represent the current condition of the site and fully compacted in the post development conditions. Other SWMM inputs for

subareas are discussed in the appendices to this document, where the selection of the parameters is explained in detail.

HMP MODELING

POC A

POC A is generally described as the southwest portion of the property that drains in a southeasterly direction to Calle Catalina. Drainage sheet flows to an existing concrete brow ditch along the southerly boundary where it discharges onto Calle Catalina. A portion of the existing offsite single family residential building and improvements drains through the site toward Calle Catalina also.

POC A, encompasses runoff from Parcel 1 graded pad, permeable paver driveway serving Parcel 1 from Calle Catalina and a portion of the offsite lot with a single family residential building and accessory improvements that drain onsite. Runoff from the graded pad will be conveyed into a biofiltration basin for pollutant control treatment, hydromodification (flow control) and mitigation of the 100-year runoff. The outlets from the biofiltration basin and permeable pavers will be discharged into an existing concrete brow ditch along the southerly boundary. The permeable pavers will provide pollutant control treatment and flow control for onsite pervious areas and runoff from the existing offsite lot with a single family residential building and accessory improvements that drain onto the site. There will be a green street tree well near southeast corner of the Calle Catalina improvements. The tree well will be lined to prevent infiltration. Low flows will infiltrate through the structural soil of the tree well at approximately 5 in/hr, then will be discharged through a 6" subdrain that will be connected to the yard drain for Parcel 3, and eventually discharged into the biofiltration basin part of POC C. This low flow is considered minuscule and is not modeled in SWMM for POC C. High flows that bypass the tree well will continue downstream onto Calle Catalina.

The BMP A1 is comprised of 6-inches of ponding, 3-inches of non-floatable mulch, an 18-inch layer of amended soil (a highly sandy, organic rich compost with an infiltration capacity of at least 5 in/hr), 6-inches of pea gravel, and a 12-inch reservoir layer of gravel for additional detention, and to accommodate the French drain system. Below the reservoir layer, the basin will include 3-inches of saturated storage. Flows will discharge from the basin via a low-flow orifice outlet within the gravel layer to the receiving storm drain system. A riser structure will also be constructed within the BMP with an emergency overflow, such that peak flows can be safely discharged downstream.

BMP A2 (Permeable Pavers) is partially responsible for handling hydromodification requirements for POC A. The permeable pavers BMP will comprise of permeable pavers, 4-inches of bedding layer of aggregate (ASTM No. 8 Stone), 12-inches of aggregate (ASTM No. 57 Stone), including an 8-inch PVC drain, and 6-inches of compacted aggregate (ASTM No. 57 Stone).

BMP A3 (Green Street Tree Well) provides no hydromodification, but is modeled in SWMM for POC A.

Table 2.1 Summary of Existing Conditions for POC A

DMA	Tributary Area, A (ac)	Impervious Percentage, Ip
DMA A-1	0.38949	34.8%
DMA A-2	0.45044	0.0%

Table 2.1 Summary of Proposed Conditions for POC A

DMA	Tributary Area, A (ac)	Impervious Percentage, Ip
DMA A1	0.29743	37.6%
BMP A	0.00785	0.0%
DMA A3	0.09307	51.2%
DMA A2 ON TO PP	0.44176	29.2%
DMA A2 PP	0.14343	0.0%

POC-C

POC C is generally described as the easterly half of the property. Drainage is conveyed from the easterly edge of Calle Catalina toward the northeasterly corner of the project. A portion of the existing offsite single family residential building and improvements drain onto Gamble Lane and confluences with onsite flows at northeasterly corner of the project.

Drainage Basin C, encompasses runoff from Parcel 2, Parcel 3, portion of Calle Catalina, Gamble Lane and a portion of the existing offsite single family residential dwelling draining onto Gamble Lane. Runoff from Parcel 2 and Parcel 3 will be discharged into the biofiltration basin via separate yard drains. A portion of runoff from Gamble Lane will be intercepted by a curb inlet and discharged into the biofiltration basin via a storm drain. The biofiltraton basin will provide pollutant control treatment, hydromodification (flow control) and to mitigate the 100-year runoff. There will be a green street tree well near northeast corner of the Gamble Lane improvements. The tree well will be lined to provide some infiltration, no subdrain is provided due to elevation constraints. Low flows will infiltrate through the structural soil of the tree well at approximately 5 in/hr, then will infiltrate into onsite soils. High flows that bypass the tree well will continue downstream onto Gamble Lane.

BMP C1 (Biofiltration Basin) responsible for handling hydromodification requirements for POC C. BMP C1 will have a total depth of 24-inches including freeboard. The BMP is comprised of 6-inches of ponding, 3-inches of non-floatable mulch, an 18-inch layer of amended soil (a highly sandy, organic rich compost with an infiltration capacity of at least 5 in/hr), 6-inches of pea gravel, and a 12-inch reservoir layer of gravel for additional detention, and to accommodate the French drain system. Below the reservoir layer, the basin will include 3-inches of saturated storage. Flows will discharge from the basin via a low-flow orifice

outlet within the gravel layer to the receiving storm drain system. A riser structure will also be constructed within the BMP with an emergency overflow, such that peak flows can be safely discharged downstream.

BMP C2 (Green Street Tree Well) provides no hydromodification, but is modeled in SWMM POC C.

Tables 3.1 and 3.2 summarize data for the POC A DMAs.

Table 3.1 Summary of Existing Conditions for POC C

DMA	Tributary Area, A (ac)	Impervious Percentage, Ip
DMA C	2.28951	27.7%

Table 3.2 Summary of Proposed Conditions for POC C

DMA	Tributary Area, A (ac)	Impervious Percentage, Ip
DMA C1	2.07808	38.9%
BMP C	0.04190	0.0%
DMA C2	0.03719	70.7%
DMIN C1	0.00399	70.1%
SM-C	0.18159	0.0%

General Considerations

The biofiltration basins (BMP A1 and BMP C1) and the permeable pavers (BMP A2) were modeled using the biofiltration and permeable pavement LID modules within SWMM. The modules can model the underground gravel storage layer, underdrain with orifice plate, amended soil layer, and a surface storage pond up to the elevation of the invert of the lowest surface discharge opening in the basin riser structure. Ponding above the invert of the lowest surface discharge opening in the basin riser structure is modeled as a detention basin: elevation vs. area, and elevation vs. discharge tables, are needed by SWMM for Modified Puls routing purposes. Detailed outlet structure location and elevations should be shown on the construction plans based on the recommendations of this study. The permeable pavers were modeled using the permeable pavement LID module within SWMM. The permeable pavement module can model the surface, pavement, soil, storage

BMP MODELING FOR HMP PURPOSES

Modeling of dual purpose Water Quality/HMP IMP

HMP-BMP biofiltration basins are proposed for hydromodification conformance and flood control for the project site. Tables 5 and 6 illustrate the dimensions required for HMP compliance according to the SWMM model that was undertaken for the project. Flood control is discussed within the Drainage Report prepared by BHA for this project.

Table 5 Summary of Developed Dual Purpose BMPs

Biofiltration BMP	Tributary Area (Ac)	DIMENSIONS					
		BMP Area[1] (ft^2)	Underdrain Orifice, D[2] (in)	Total Media Depth	Total Gravel Depth[3]	Riser Invert Elev,	Total Surface Depth,
BMPA	0.30	342	1.00	18	12	12	24
BMP C	2.08	1,825	1.42	18	12	14	29

Notes: (1): Area of amended soil = area of gravel = area of BMP.

(2): Diameter of the orifice in gravel layer with invert at bottom of layer; tied with hydromod min threshold (10%Q2).

(3): Does not include gravel below pipe invert.

(4): Depth from bottom of pond to invert of emergency overflow weir.

(5): Total surface ponding depth from the bottom of the pond to the top of the pond berm (pond spill crest).

Table 6 Summary of Orifices for Dual Purpose BMPs

POC 1	Lower Orifice Dimensions			Middle Orifice Dimensions			Emergency Weir		
	Outlet Type[1]	Invert Elev, HL[2] (in)	Dimensions (#) - height x width [3]	Outlet Type[1]	Invert Elev, HL[2] (in)	Dimensions (#) - height x width [3]	Riser Type	Riser Invert Elev,	Weir Perimeter Length (ft)
BMP A	Diameter	6	(4) - 1"	Slot	7	(1) 1" x 16"	Type G CB	12	11.84
BMP C	Slot	6	(1) - 3" x 23"	n/a	n/a	n/a	Type G CB	12	11.84

Notes: (1): Shape of orifice opening in riser structure.

(2): Depth from bottom of pond to invert of orifice or weir.

(3): Number of orifices - dimensions of orifice. For example for Basin C: one (1) slot orifice, slot height (hs) =3", slot width (bs) = 23", invert at 6".

(4): Depth from bottom of pond to invert of emergency overflow weir.

FLOW DURATION CURVE COMPARISON

The Flow Duration Curves (FDC) for the site was compared at POC A and POC C by exporting the hourly runoff time series results from SWMM to a spreadsheet. At the POCs, the FDC was compared between 10% of the existing condition Q_2 up to the existing condition Q_{10}. The Q_2 and Q_{10} were determined using a partial duration statistical analysis of the runoff time series in an Excel spreadsheet using the Weibull plotting position method.

The range between 10% of Q_2 and Q_{10} was divided into 100 equal time intervals; the number of hours that each flow rate was exceeded was counted from the hourly series. Additionally, the intermediate peaks with a return period "I" were obtained (Qi with i=3 to 9). For the purpose of the plot, the values were presented as percentage of time exceeded for each flow rate. FDC comparison at POC A, POC B and POC D are illustrated in both normal and logarithmic scale.

As can be seen in in Attachment 2, the FDCs for the proposed condition with the HMP facilities is within 110% of the curve for the existing condition in both peak and duration. The additional runoff volume generated from developing the site will be released to the existing point of discharge at a flow rate below the 10% Q_2 lower threshold. Additionally, the project will also not increase peak flow rates between the pre-development Q_2 and the Q_{10}, as shown in the peak flow tables listed in Attachment 1 and the graphics in Attachment 2.

Discussion of the Manning's coefficient (Pervious Areas) for Pre and Post-Development Conditions

Typically the Manning's coefficient is selected as n = 0.15 for pervious areas and n = 0.012 for impervious areas (as consistent with the BMP Design Manual). However, due to the impact that n has in the continuous simulation a more accurate value of the Manning's coefficient has been chosen for pervious areas. Taken into consideration the study prepared by Tory R. Walker Engineering (Reference [6]) a value of n = 0.08 has been selected (see Table 1 of Reference [6] included in Attachment 7). The existing condition site includes paved driveways and impervious accessory buildings. Existing impervious areas are assumed to be pervious areas consisting of the bare soil underlying the impervious surfaces. Therefore the existing condition site is primarily a mix of bare dirt and shrubs. Based on these existing site observations, the N value was conservatively selected as 0.08, which is consistent per the reference cited. The BMP Design Manual default value of n = 0.10 was used for the developed portions of the project, as the developed site is assumed to include dense landscaping.

DRAWDOWN TIME

To ensure compliance with the 24 hour and 96 hour drawdown requirements (per Section 6.3.7 of the BMP Design Manual); drawdown calculations are provided in Attachment 10 of this report.

SUMMARY

This study has demonstrated that the proposed biofiltration basins provided for the Gamble Lane project site are sufficient to meet current HMP criteria if the cross-section areas and volumes recommended within this document, and the respective orifice and outlet structures are incorporated as specified within the proposed project site.

KEY ASSUMPTIONS

1. According to the percolation data, infiltration rates are considered low and within the range of Type D soils.
2. The biofiltration basins will be lined with an impermeable liner (no infiltration).

ATTACHMENTS

1. Q_2 to Q_{10} Comparison Tables
2. FDC Plots (log and natural "x" scale) and Flow Duration Table

3. List of the “n” largest Peaks: Pre-Development and Post-Development Conditions
4. Elevation vs. Area Curves & Elevation vs. Discharge Curves to be used in SWMM
5. Basin Outlet Structure Details
6. SWMM Input Data in Input Format (Existing and Proposed Models)
7. SWMM Screens and Explanation of Significant Variables
8. Soil Map
9. Summary files from the SWMM Model & CD
10. Drawdown calculations

REFERENCES

[1] – "*City of Escondido BMP Design Manual*", June 2016, City of Escondido.

[2] – "*Final Hydromodification Management Plan (HMP) prepared for the County of San Diego*", March 2011, Brown and Caldwell.

[3] – Order R9-2013-001, California Regional Water Quality Control Board San Diego Region (SDRWQCB).

[4] – "*Review and Analysis of San Diego County Hydromodification Management Plan (HMP): Assumptions, Criteria, Methods, & Modeling Tools – Prepared for the Cities of San Marcos, Oceanside & Vista*", May 2012, Tory R. Walker Engineering.

[5] – "*San Diego County Hydraulic Design Manual*", September 2014, County of San Diego Department of Public Works Flood Control Section.

[6] – "*Improving Accuracy in Continuous Hydrologic Modeling: Guidance for Selecting Pervious Overland Flow Manning's n Value in the San Diego Region*", Tory R. Walker Engineering, 2016.

[7] – *"Priority Development Project (PDP) Storm Water Quality Management Plan (SWQMP) for Gamble Drive*", September 24, 2021, BHA, Inc.

ATTACHMENT 1

Q_2 to Q_{10} Comparison Tables

Peak Flow Frequency Summary – POC A

Q2 to Q10 Comparison Table - POC A

Return Period	*Existing Condition (cfs)*	*Mitigated Condition (cfs)*	*Reduction, Exist - Mitigated (cfs)*
LF = 0.1xQ2	*0.033*	*0.009*	*0.025*
2-year	*0.330*	*0.085*	*0.245*
3-year	*0.382*	*0.135*	*0.247*
4-year	*0.403*	*0.176*	*0.227*
5-year	*0.427*	*0.195*	*0.232*
6-year	*0.432*	*0.227*	*0.205*
7-year	*0.435*	*0.233*	*0.201*
8-year	*0.450*	*0.235*	*0.215*
9-year	*0.474*	*0.264*	*0.210*
10-year	*0.493*	*0.292*	*0.201*

Peak Flow Frequency Summary – POC C

Q_2 to Q_{10} Comparison Table - POC C

Return Period	Existing Condition (cfs)	Mitigated Condition (cfs)	Reduction, Exist - Mitigated (cfs)
LF = 0.1xQ_2	0.091	0.070	0.021
2-year	0.907	0.695	0.212
3-year	1.071	0.843	0.228
4-year	1.126	0.928	0.198
5-year	1.180	1.046	0.134
6-year	1.205	1.105	0.100
7-year	1.211	1.195	0.016
8-year	1.255	1.218	0.037
9-year	1.311	1.226	0.085
10-year	1.353	1.235	0.118

ATTACHMENT 2

FDC Plots (log and natural “x” scale) and Flow Duration Table

Flow Duration Curve Analysis

1) Flow duration curve shall not exceed the existing conditions by more than 10%, neither in peak flow nor duration.

The figures on the following pages illustrate that the flow duration curve in post-development conditions after the proposed BMP is below the existing flow duration curve. The flow duration curve table following the curve shows that if the interval $0.1Q_2 – Q_{10}$ is divided into 100 sub intervals, the post development divided by pre-development durations is never larger than 110% (the permit allows up to 110%)

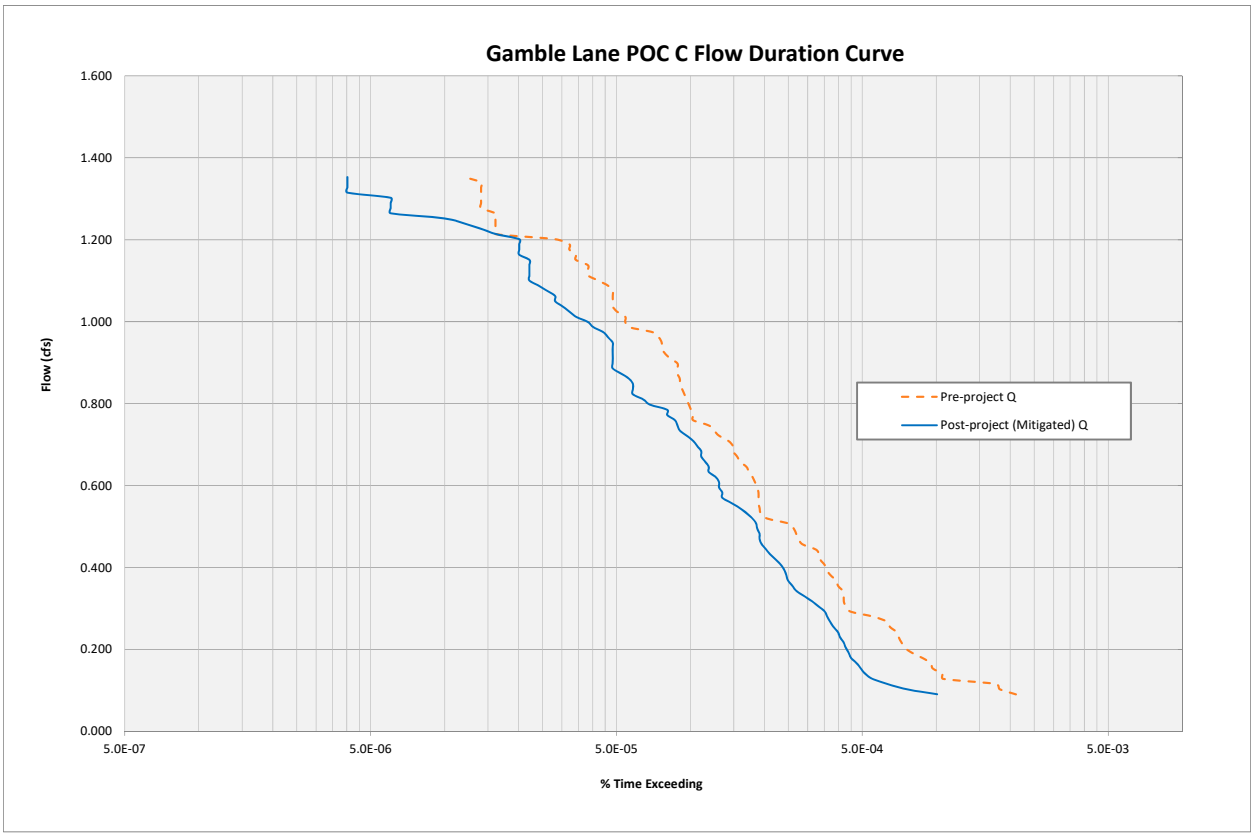
Consequently, the design passes the hydromodification test.

It is important to note that the flow duration curve can be expressed in the "x" axis as percentage of time, hours per year, total number of hours, or any other similar time variable. As those variables only differ by a multiplying constant, their plot in logarithmic scale is going to look exactly the same, and compliance can be observed regardless of the variable selected. However, in order to satisfy the County of San Diego HMP example, % of time exceeded is the variable of choice in the flow duration curve. The selection of a logarithmic scale in lieu of the normal scale is preferred, as differences between the pre-development and post-development curves can be seen more clearly in the entire range of analysis. Both graphics are presented just to prove the difference.

In terms of the "y" axis, the peak flow value is the variable of choice. As an additional analysis performed by BHA, not only the range of analysis is clearly depicted (10% of Q_2 to Q_{10}) but also all intermediate flows are shown (Q_2, Q_3, Q_4, Q_5, Q_6, Q_7, Q_8, and Q_9) in order to demonstrate compliance at any range $Q_x – Q_{x+1}$. It must be pointed out that one of the limitations of both the SWMM and SDHM models is that the intermediate analysis is not performed (to obtain Q_i from i = 2 to 10). BHA performed the analysis using the Weibull Plotting positon Method from the "n" largest independent peak flows obtained from the continuous time series.

The largest "n" peak flows are attached in this appendix, as well as the values of Q_i with a return period "i", from i = 2 to 10. The Q_i values are also added into the flow-duration plot.

Figure 1a and 1b. POC A Flow Duration Curve Comparison (logarithmic and normal "x" scale)



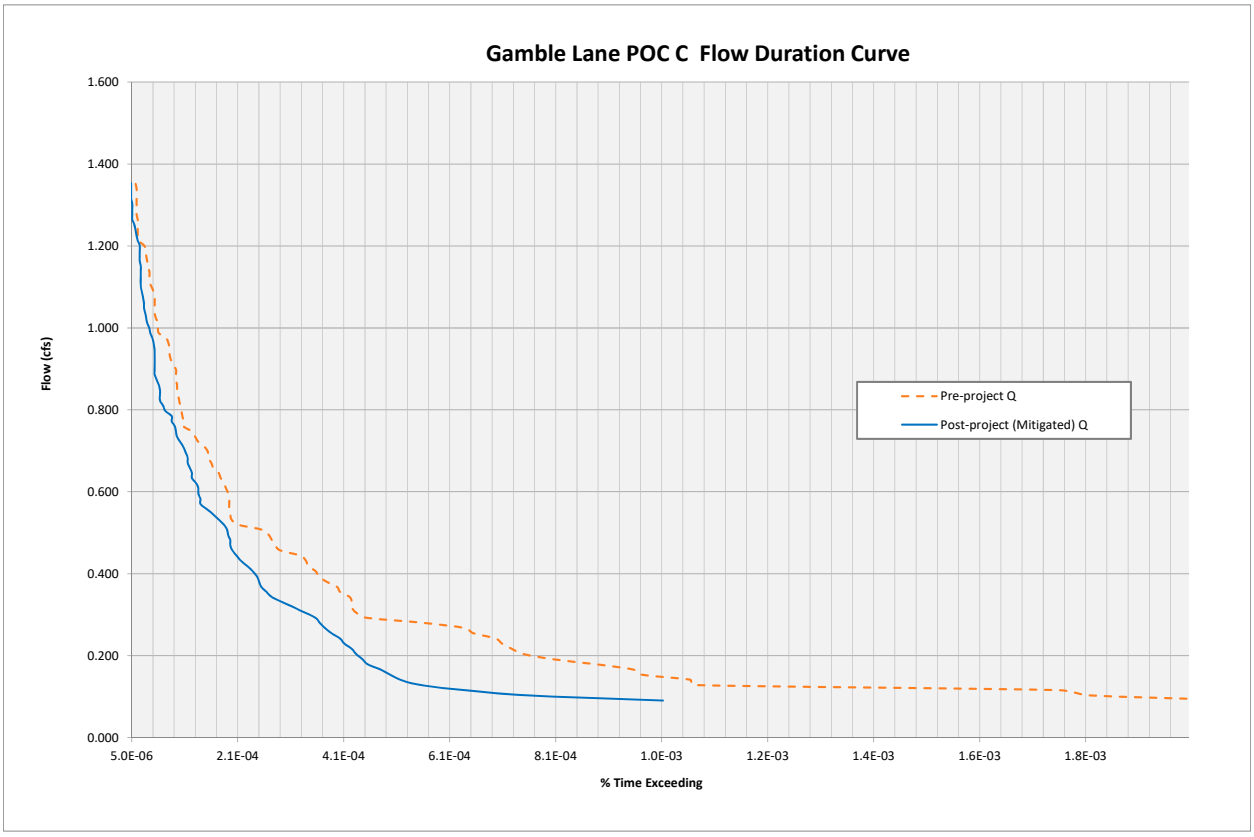
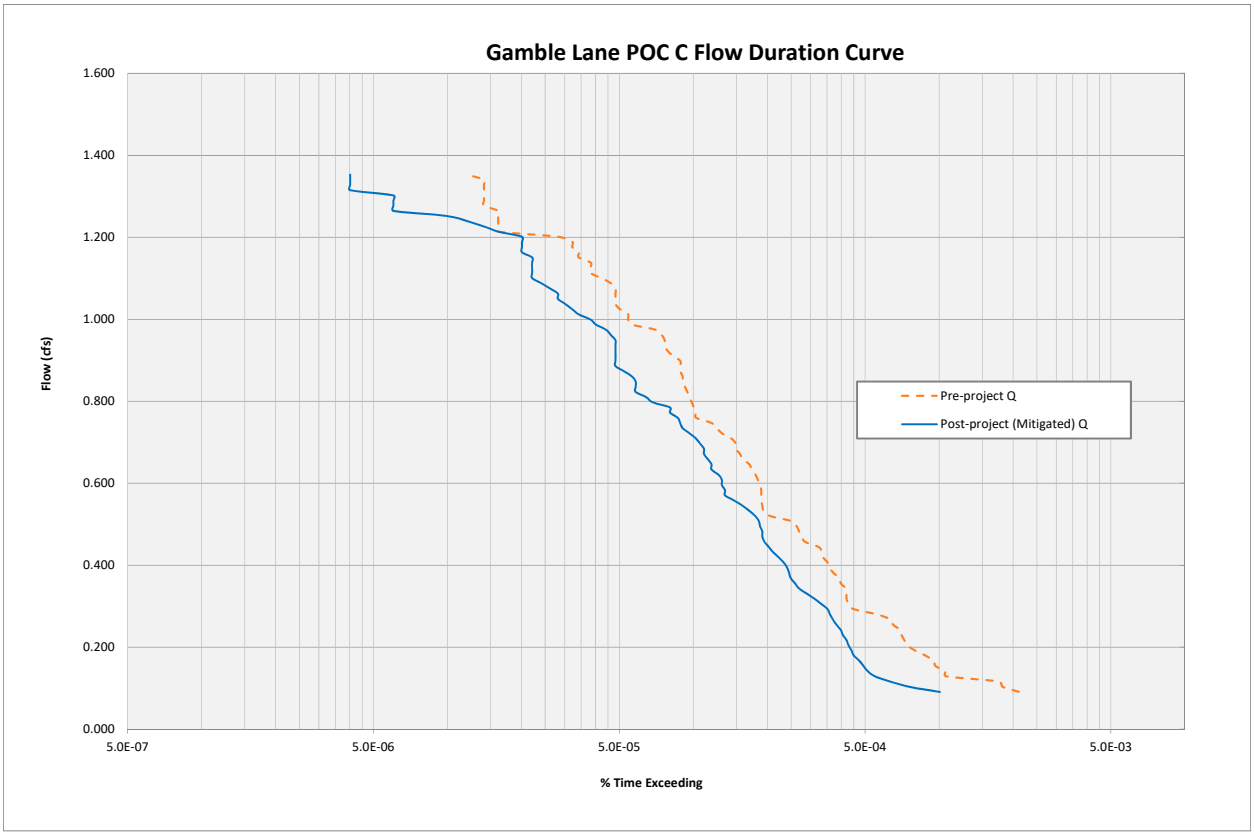
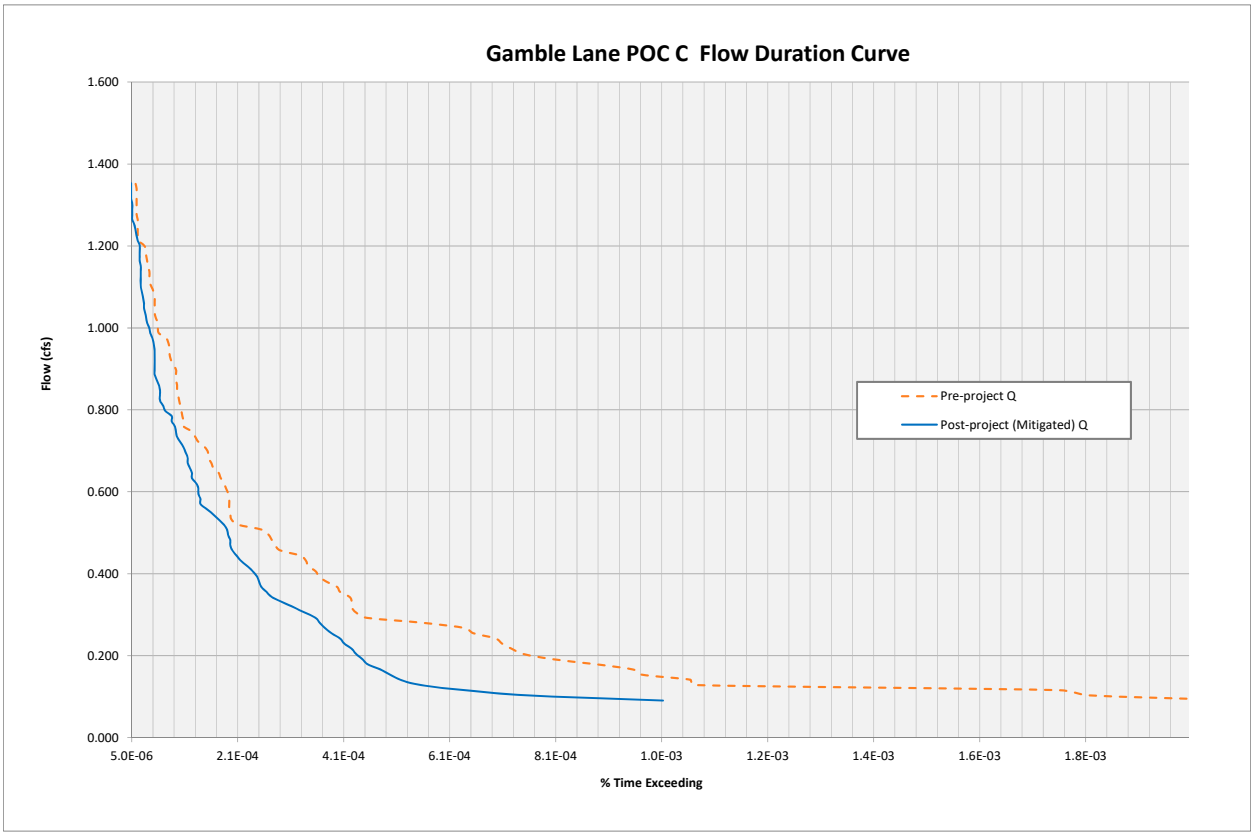


Figure 2a and 2b. POC C Flow Duration Curve Comparison (logarithmic and normal "x" scale)





Flow Duration Curve Data for Gamble Lane, POC A, Escondido, CA

Low Flow Threshold: 10%
0.1xQ2 (Pre): 0.033 cfs
Q10 (Pre): 0.493 cfs
# of Ordinates: 100
Incremental Q (Pre): 0.00460 cfs
Total Hourly Data: 497370 hours

The proposed BMP: PASSED

Interval	Pre-project Flow (cfs)	Pre-project Hours	Pre-project % Time Exceeding	Post-project Hours	Post-project % Time Exceeding	Percentage	Pass/Fail
0	0.033	541	1.09E-03	525	1.06E-03	97%	Pass
1	0.038	515	1.04E-03	429	8.63E-04	83%	Pass
2	0.042	458	9.21E-04	324	6.51E-04	71%	Pass
3	0.047	435	8.75E-04	241	4.85E-04	55%	Pass
4	0.051	424	8.52E-04	201	4.04E-04	47%	Pass
5	0.056	401	8.06E-04	166	3.34E-04	41%	Pass
6	0.061	383	7.70E-04	142	2.86E-04	37%	Pass
7	0.065	368	7.40E-04	127	2.55E-04	35%	Pass
8	0.070	344	6.92E-04	116	2.33E-04	34%	Pass
9	0.074	331	6.66E-04	110	2.21E-04	33%	Pass
10	0.079	327	6.57E-04	100	2.01E-04	31%	Pass
11	0.084	320	6.43E-04	91	1.83E-04	28%	Pass
12	0.088	310	6.23E-04	83	1.67E-04	27%	Pass
13	0.093	297	5.97E-04	77	1.55E-04	26%	Pass
14	0.097	260	5.23E-04	69	1.39E-04	27%	Pass
15	0.102	234	4.70E-04	61	1.23E-04	26%	Pass
16	0.107	224	4.50E-04	57	1.15E-04	25%	Pass
17	0.111	217	4.36E-04	54	1.09E-04	25%	Pass
18	0.116	212	4.26E-04	50	1.01E-04	24%	Pass
19	0.120	207	4.16E-04	45	9.05E-05	22%	Pass
20	0.125	200	4.02E-04	42	8.44E-05	21%	Pass
21	0.130	190	3.82E-04	41	8.24E-05	22%	Pass
22	0.134	185	3.72E-04	37	7.44E-05	20%	Pass
23	0.139	180	3.62E-04	36	7.24E-05	20%	Pass
24	0.143	178	3.58E-04	29	5.83E-05	16%	Pass
25	0.148	176	3.54E-04	28	5.63E-05	16%	Pass
26	0.153	169	3.40E-04	26	5.23E-05	15%	Pass
27	0.157	157	3.16E-04	25	5.03E-05	16%	Pass
28	0.162	151	3.04E-04	25	5.03E-05	17%	Pass
29	0.166	147	2.96E-04	24	4.83E-05	16%	Pass
30	0.171	143	2.88E-04	23	4.62E-05	16%	Pass
31	0.176	132	2.65E-04	21	4.22E-05	16%	Pass
32	0.180	122	2.45E-04	20	4.02E-05	16%	Pass
33	0.185	110	2.21E-04	18	3.62E-05	16%	Pass
34	0.189	107	2.15E-04	18	3.62E-05	17%	Pass
35	0.194	105	2.11E-04	17	3.42E-05	16%	Pass
36	0.199	103	2.07E-04	17	3.42E-05	17%	Pass

37	0.203	99	1.99E-04	16	3.22E-05	16%	Pass
38	0.208	96	1.93E-04	16	3.22E-05	17%	Pass
39	0.212	95	1.91E-04	16	3.22E-05	17%	Pass
40	0.217	92	1.85E-04	16	3.22E-05	17%	Pass
41	0.222	88	1.77E-04	16	3.22E-05	18%	Pass
42	0.226	86	1.73E-04	15	3.02E-05	17%	Pass
43	0.231	86	1.73E-04	14	2.81E-05	16%	Pass
44	0.235	84	1.69E-04	12	2.41E-05	14%	Pass
45	0.240	78	1.57E-04	11	2.21E-05	14%	Pass
46	0.245	75	1.51E-04	10	2.01E-05	13%	Pass
47	0.249	73	1.47E-04	10	2.01E-05	14%	Pass
48	0.254	69	1.39E-04	10	2.01E-05	14%	Pass
49	0.258	66	1.33E-04	10	2.01E-05	15%	Pass
50	0.263	61	1.23E-04	9	1.81E-05	15%	Pass
51	0.268	54	1.09E-04	9	1.81E-05	17%	Pass
52	0.272	51	1.03E-04	9	1.81E-05	18%	Pass
53	0.277	51	1.03E-04	9	1.81E-05	18%	Pass
54	0.281	50	1.01E-04	9	1.81E-05	18%	Pass
55	0.286	49	9.85E-05	9	1.81E-05	18%	Pass
56	0.291	49	9.85E-05	9	1.81E-05	18%	Pass
57	0.295	49	9.85E-05	8	1.61E-05	16%	Pass
58	0.300	47	9.45E-05	7	1.41E-05	15%	Pass
59	0.304	46	9.25E-05	6	1.21E-05	13%	Pass
60	0.309	46	9.25E-05	5	1.01E-05	11%	Pass
61	0.314	46	9.25E-05	4	8.04E-06	9%	Pass
62	0.318	43	8.65E-05	4	8.04E-06	9%	Pass
63	0.323	43	8.65E-05	4	8.04E-06	9%	Pass
64	0.327	43	8.65E-05	4	8.04E-06	9%	Pass
65	0.332	42	8.44E-05	4	8.04E-06	10%	Pass
66	0.337	39	7.84E-05	4	8.04E-06	10%	Pass
67	0.341	38	7.64E-05	3	6.03E-06	8%	Pass
68	0.346	35	7.04E-05	3	6.03E-06	9%	Pass
69	0.350	32	6.43E-05	3	6.03E-06	9%	Pass
70	0.355	28	5.63E-05	3	6.03E-06	11%	Pass
71	0.360	28	5.63E-05	3	6.03E-06	11%	Pass
72	0.364	28	5.63E-05	3	6.03E-06	11%	Pass
73	0.369	26	5.23E-05	1	2.01E-06	4%	Pass
74	0.373	24	4.83E-05	1	2.01E-06	4%	Pass
75	0.378	24	4.83E-05	1	2.01E-06	4%	Pass
76	0.383	24	4.83E-05	1	2.01E-06	4%	Pass
77	0.387	23	4.62E-05	1	2.01E-06	4%	Pass
78	0.392	22	4.42E-05	1	2.01E-06	5%	Pass
79	0.396	21	4.22E-05	1	2.01E-06	5%	Pass
80	0.401	21	4.22E-05	1	2.01E-06	5%	Pass

81	0.406	17	3.42E-05	1	2.01E-06	6%	Pass
82	0.410	17	3.42E-05	1	2.01E-06	6%	Pass
83	0.415	16	3.22E-05	1	2.01E-06	6%	Pass
84	0.419	16	3.22E-05	1	2.01E-06	6%	Pass
85	0.424	16	3.22E-05	1	2.01E-06	6%	Pass
86	0.429	15	3.02E-05	1	2.01E-06	7%	Pass
87	0.433	9	1.81E-05	1	2.01E-06	11%	Pass
88	0.438	8	1.61E-05	1	2.01E-06	13%	Pass
89	0.442	8	1.61E-05	1	2.01E-06	13%	Pass
90	0.447	8	1.61E-05	1	2.01E-06	13%	Pass
91	0.452	8	1.61E-05	1	2.01E-06	13%	Pass
92	0.456	8	1.61E-05	1	2.01E-06	13%	Pass
93	0.461	7	1.41E-05	1	2.01E-06	14%	Pass
94	0.465	7	1.41E-05	1	2.01E-06	14%	Pass
95	0.470	7	1.41E-05	1	2.01E-06	14%	Pass
96	0.475	7	1.41E-05	0	0.00E+00	0%	Pass
97	0.479	7	1.41E-05	0	0.00E+00	0%	Pass
98	0.484	7	1.41E-05	0	0.00E+00	0%	Pass
99	0.488	7	1.41E-05	0	0.00E+00	0%	Pass
100	0.493	6	1.21E-05	0	0.00E+00	0%	Pass

Peak flows calculated with the Weibull Plotting Position for POC A

Return Period (years)	Pre-Dev. Peak Flows (cfs)	Post-Dev. Peak Flows (cfs)	Reduction (cfs)
LF = 0.1xQ2	0.033	0.009	0.025
2-year	0.330	0.085	0.245
3-year	0.382	0.135	0.247
4-year	0.403	0.176	0.227
5-year	0.427	0.195	0.232
6-year	0.432	0.227	0.205
7-year	0.435	0.233	0.201
8-year	0.450	0.235	0.215
9-year	0.474	0.264	0.210
10-year	0.493	0.292	0.201

Flow Duration Curve Data for Gamble Lane, POC C, Escondido, CA

Low Flow Threshold: 10%
0.1xQ2 (Pre): 0.091 cfs
Q10 (Pre): 1.353 cfs
# of Ordinates: 100
Incremental Q (Pre): 0.01262 cfs
Total Hourly Data: 497370 hours

The proposed BMP: PASSED

Interval	Pre-project Flow (cfs)	Pre-project Hours	Pre-project % Time Exceeding	Post-project Hours	Post-project % Time Exceeding	Percentage	Pass/Fail
0	0.091	1049	2.11E-03	501	1.01E-03	48%	Pass
1	0.103	899	1.81E-03	374	7.52E-04	42%	Pass
2	0.116	872	1.75E-03	315	6.33E-04	36%	Pass
3	0.129	530	1.07E-03	273	5.49E-04	52%	Pass
4	0.141	527	1.06E-03	255	5.13E-04	48%	Pass
5	0.154	481	9.67E-04	245	4.93E-04	51%	Pass
6	0.166	473	9.51E-04	236	4.74E-04	50%	Pass
7	0.179	438	8.81E-04	224	4.50E-04	51%	Pass
8	0.192	397	7.98E-04	219	4.40E-04	55%	Pass
9	0.204	370	7.44E-04	213	4.28E-04	58%	Pass
10	0.217	359	7.22E-04	209	4.20E-04	58%	Pass
11	0.230	350	7.04E-04	202	4.06E-04	58%	Pass
12	0.242	344	6.92E-04	198	3.98E-04	58%	Pass
13	0.255	323	6.49E-04	190	3.82E-04	59%	Pass
14	0.267	315	6.33E-04	184	3.70E-04	58%	Pass
15	0.280	277	5.57E-04	179	3.60E-04	65%	Pass
16	0.293	223	4.48E-04	175	3.52E-04	78%	Pass
17	0.305	213	4.28E-04	165	3.32E-04	77%	Pass
18	0.318	209	4.20E-04	155	3.12E-04	74%	Pass
19	0.330	209	4.20E-04	144	2.90E-04	69%	Pass
20	0.343	207	4.16E-04	134	2.69E-04	65%	Pass
21	0.356	198	3.98E-04	129	2.59E-04	65%	Pass
22	0.368	195	3.92E-04	124	2.49E-04	64%	Pass
23	0.381	185	3.72E-04	122	2.45E-04	66%	Pass
24	0.394	178	3.58E-04	120	2.41E-04	67%	Pass
25	0.406	175	3.52E-04	116	2.33E-04	66%	Pass
26	0.419	168	3.38E-04	111	2.23E-04	66%	Pass
27	0.431	166	3.34E-04	105	2.11E-04	63%	Pass
28	0.444	161	3.24E-04	101	2.03E-04	63%	Pass
29	0.457	142	2.86E-04	97	1.95E-04	68%	Pass
30	0.469	137	2.75E-04	95	1.91E-04	69%	Pass
31	0.482	134	2.69E-04	95	1.91E-04	71%	Pass
32	0.495	131	2.63E-04	93	1.87E-04	71%	Pass
33	0.507	125	2.51E-04	92	1.85E-04	74%	Pass
34	0.520	102	2.05E-04	89	1.79E-04	87%	Pass
35	0.532	96	1.93E-04	84	1.69E-04	88%	Pass
36	0.545	95	1.91E-04	79	1.59E-04	83%	Pass

37	0.558	94	1.89E-04	73	1.47E-04	78%	Pass
38	0.570	94	1.89E-04	67	1.35E-04	71%	Pass
39	0.583	94	1.89E-04	67	1.35E-04	71%	Pass
40	0.596	93	1.87E-04	65	1.31E-04	70%	Pass
41	0.608	91	1.83E-04	65	1.31E-04	71%	Pass
42	0.621	89	1.79E-04	63	1.27E-04	71%	Pass
43	0.633	86	1.73E-04	59	1.19E-04	69%	Pass
44	0.646	84	1.69E-04	59	1.19E-04	70%	Pass
45	0.659	79	1.59E-04	57	1.15E-04	72%	Pass
46	0.671	77	1.55E-04	55	1.11E-04	71%	Pass
47	0.684	74	1.49E-04	55	1.11E-04	74%	Pass
48	0.697	74	1.49E-04	53	1.07E-04	72%	Pass
49	0.709	71	1.43E-04	51	1.03E-04	72%	Pass
50	0.722	65	1.31E-04	48	9.65E-05	74%	Pass
51	0.734	62	1.25E-04	45	9.05E-05	73%	Pass
52	0.747	59	1.19E-04	44	8.85E-05	75%	Pass
53	0.760	51	1.03E-04	43	8.65E-05	84%	Pass
54	0.772	51	1.03E-04	40	8.04E-05	78%	Pass
55	0.785	50	1.01E-04	40	8.04E-05	80%	Pass
56	0.797	49	9.85E-05	34	6.84E-05	69%	Pass
57	0.810	48	9.65E-05	32	6.43E-05	67%	Pass
58	0.823	47	9.45E-05	29	5.83E-05	62%	Pass
59	0.835	46	9.25E-05	29	5.83E-05	63%	Pass
60	0.848	45	9.05E-05	29	5.83E-05	64%	Pass
61	0.861	45	9.05E-05	28	5.63E-05	62%	Pass
62	0.873	44	8.85E-05	26	5.23E-05	59%	Pass
63	0.886	44	8.85E-05	24	4.83E-05	55%	Pass
64	0.898	44	8.85E-05	24	4.83E-05	55%	Pass
65	0.911	41	8.24E-05	24	4.83E-05	59%	Pass
66	0.924	39	7.84E-05	24	4.83E-05	62%	Pass
67	0.936	38	7.64E-05	24	4.83E-05	63%	Pass
68	0.949	38	7.64E-05	24	4.83E-05	63%	Pass
69	0.962	37	7.44E-05	23	4.62E-05	62%	Pass
70	0.974	35	7.04E-05	22	4.42E-05	63%	Pass
71	0.987	28	5.63E-05	20	4.02E-05	71%	Pass
72	0.999	27	5.43E-05	19	3.82E-05	70%	Pass
73	1.012	27	5.43E-05	17	3.42E-05	63%	Pass
74	1.025	25	5.03E-05	16	3.22E-05	64%	Pass
75	1.037	24	4.83E-05	15	3.02E-05	63%	Pass
76	1.050	24	4.83E-05	14	2.81E-05	58%	Pass
77	1.063	24	4.83E-05	14	2.81E-05	58%	Pass
78	1.075	24	4.83E-05	13	2.61E-05	54%	Pass
79	1.088	23	4.62E-05	12	2.41E-05	52%	Pass
80	1.100	21	4.22E-05	11	2.21E-05	52%	Pass

81	1.113	19	3.82E-05	11	2.21E-05	58%	Pass
82	1.126	19	3.82E-05	11	2.21E-05	58%	Pass
83	1.138	19	3.82E-05	11	2.21E-05	58%	Pass
84	1.151	17	3.42E-05	11	2.21E-05	65%	Pass
85	1.163	17	3.42E-05	10	2.01E-05	59%	Pass
86	1.176	16	3.22E-05	10	2.01E-05	63%	Pass
87	1.189	16	3.22E-05	10	2.01E-05	63%	Pass
88	1.201	14	2.81E-05	10	2.01E-05	71%	Pass
89	1.214	8	1.61E-05	8	1.61E-05	100%	Pass
90	1.227	8	1.61E-05	7	1.41E-05	88%	Pass
91	1.239	8	1.61E-05	6	1.21E-05	75%	Pass
92	1.252	8	1.61E-05	5	1.01E-05	63%	Pass
93	1.264	8	1.61E-05	3	6.03E-06	38%	Pass
94	1.277	7	1.41E-05	3	6.03E-06	43%	Pass
95	1.290	7	1.41E-05	3	6.03E-06	43%	Pass
96	1.302	7	1.41E-05	3	6.03E-06	43%	Pass
97	1.315	7	1.41E-05	2	4.02E-06	29%	Pass
98	1.328	7	1.41E-05	2	4.02E-06	29%	Pass
99	1.340	7	1.41E-05	2	4.02E-06	29%	Pass
100	1.353	6	1.21E-05	2	4.02E-06	33%	Pass

Peak flows calculated with the Weibull Plotting Position for POC C

Return Period (years)	Pre-Dev. Peak Flows (cfs)	Post-Dev. Peak Flows (cfs)	Reduction (cfs)
LF = 0.1xQ2	0.091	0.070	0.021
2-year	0.907	0.695	0.212
3-year	1.071	0.843	0.228
4-year	1.126	0.928	0.198
5-year	1.180	1.046	0.134
6-year	1.205	1.105	0.100
7-year	1.211	1.195	0.016
8-year	1.255	1.218	0.037
9-year	1.311	1.226	0.085
10-year	1.353	1.235	0.118

ATTACHMENT 3

List of the “n” largest Peaks: Pre-Development and Post-Development Conditions

List of the "n" Largest Peaks: Pre & Post-Developed Conditions

- Basic Probabilistic Equation: $R = \frac{1}{P}$

  where,

  R = Return period in years; and

  P = Probability of a flow to be equaled or exceeded any given year (dimensionless).

- Weibull Equation: $P = \frac{i}{n+1}$

  where,

  i = Position of the peak whose probability is desired (sorted from large to small); and

  n = number of years analyzed.

Explanation of Variables for the Tables in this Attachment

- Peak: Refers to the peak flow at the date given, taken from the continuous simulation hourly results of the n year analyzed.
- Posit: If all peaks are sorted from large to small, the position of the peak in a sorting analysis is included under the variable Posit.
- Date: Date of the occurrence of the peak at the outlet form the continuous simulation.
- Note: All peaks are not annual maxima; instead they are defined as event maxima, with a threshold to separate peaks of at least 12 hours. In other words, any peak P in a time series is defined as a value where dP/dt=0, and the peak is the largest value in 25 hours (12 hours before the hour of occurrence and 12 hours after the occurrence, so it is in essence a daily peak).

Pre-Project Flow Frequency for Long-term Simulation

Gamble Lane, Pre-Developed Runoff Condition POC A

Statistics - Node POC-A Total Inflow

Rank	Start Date	Event Duration (hours)	Event Peak (CFS)	Exceedance Frequency (percent)	Return Period (years)
1	1/6/1993	111	0.645	0.12	58
2	2/23/1971	13	0.563	0.24	29
3	1/23/1995	52	0.543	0.36	19.33
4	1/3/1995	55	0.508	0.49	14.5
5	2/14/1986	29	0.503	0.61	11.6
6	2/14/1998	23	0.491	0.73	9.67
7	11/19/1967	32	0.456	0.85	8.29
8	12/3/1966	91	0.436	0.97	7.25
9	4/19/1988	48	0.432	1.09	6.44
10	3/16/1978	45	0.432	1.22	5.8
11	8/26/2007	3	0.429	1.34	5.27
12	1/16/1978	8	0.425	1.46	4.83
13	3/1/1983	68	0.414	1.58	4.46
14	12/24/1983	73	0.403	1.7	4.14
15	1/29/2007	39	0.403	1.82	3.87
16	11/14/1972	4	0.403	1.95	3.63
17	10/17/2004	94	0.396	2.07	3.41
18	11/24/1983	5	0.391	2.19	3.22
19	2/8/1981	40	0.384	2.31	3.05
20	1/7/2005	118	0.373	2.43	2.9
21	1/9/1998	44	0.365	2.55	2.76
22	2/13/1980	191	0.354	2.68	2.64
23	1/24/1969	38	0.353	2.8	2.52
24	12/18/1967	43	0.344	2.92	2.42
25	1/27/1980	72	0.344	3.04	2.32
26	1/12/1993	39	0.339	3.16	2.23
27	3/19/1991	58	0.335	3.28	2.15
28	2/15/1992	11	0.335	3.41	2.07
29	2/3/1998	39	0.33	3.53	2
30	11/30/2007	19	0.317	3.65	1.93
31	4/11/1967	22	0.317	3.77	1.87
32	2/7/1993	52	0.315	3.89	1.81
33	2/25/2003	64	0.296	4.01	1.76
34	11/22/1965	27	0.285	4.14	1.71
35	12/4/1974	12	0.278	4.26	1.66
36	12/30/1981	75	0.267	4.38	1.61

37	3/17/1982	63	0.265	4.5	1.57
38	2/26/1983	50	0.264	4.62	1.53
39	1/7/1980	131	0.263	4.74	1.49
40	2/5/1978	47	0.258	4.87	1.45
41	2/11/2003	86	0.253	4.99	1.41
42	1/17/1979	35	0.253	5.11	1.38
43	4/14/2003	40	0.251	5.23	1.35
44	12/16/1978	62	0.247	5.35	1.32
45	11/28/1970	32	0.244	5.47	1.29
46	11/24/1985	30	0.242	5.6	1.26
47	2/10/1973	52	0.239	5.72	1.23
48	2/5/1969	40	0.239	5.84	1.21
49	2/26/2004	44	0.237	5.96	1.18
50	12/31/2005	56	0.237	6.08	1.16
51	3/5/1995	28	0.232	6.2	1.14
52	3/4/1970	5	0.225	6.33	1.12
53	1/5/1979	25	0.22	6.45	1.09
54	10/27/2004	33	0.22	6.57	1.07
55	2/21/2004	35	0.218	6.69	1.05
56	12/30/1976	24	0.217	6.81	1.04
57	3/2/1980	23	0.214	6.93	1.02
58	1/4/1974	18	0.209	7.06	1

Pre-project

10-year Q:	0.493	cfs
5-year Q:	0.427	cfs
2-year Q:	0.330	cfs

Lower Flow Threshold: 10%

$0.1xQ_2$ (Pre): 0.033 cfs

Gamble Lane, Pre-Developed Runoff Condition POC C

Statistics - Node POC-C Total Inflow

Rank	Start Date	Event Duration (hours)	Event Peak (CFS)	Exceedance Frequency (percent)	Return Period (years)
1	1/6/1993	111	1.766	0.11	58
2	2/23/1971	13	1.55	0.22	29
3	1/23/1995	54	1.485	0.33	19.33
4	1/3/1995	55	1.395	0.44	14.5
5	2/14/1986	29	1.376	0.55	11.6
6	2/14/1998	24	1.348	0.66	9.67
7	11/19/1967	32	1.272	0.77	8.29
8	12/3/1966	91	1.212	0.88	7.25
9	3/1/1983	68	1.208	0.99	6.44
10	3/16/1978	45	1.203	1.1	5.8
11	4/19/1988	56	1.196	1.22	5.27
12	1/16/1978	8	1.17	1.33	4.83
13	1/29/2007	40	1.146	1.44	4.46
14	11/14/1972	4	1.142	1.55	4.14
15	12/24/1983	73	1.111	1.66	3.87
16	11/24/1983	5	1.104	1.77	3.63
17	8/26/2007	3	1.097	1.88	3.41
18	10/17/2004	94	1.097	1.99	3.22
19	2/8/1981	40	1.077	2.1	3.05
20	1/7/2005	119	1.016	2.21	2.9
21	1/9/1998	47	0.998	2.32	2.76
22	1/27/1980	72	0.981	2.43	2.64
23	1/24/1969	38	0.98	2.54	2.52
24	12/18/1967	43	0.979	2.65	2.42
25	2/13/1980	191	0.965	2.76	2.32
26	2/7/1993	59	0.933	2.87	2.23
27	1/12/1993	155	0.92	2.98	2.15
28	3/19/1991	58	0.908	3.09	2.07
29	2/15/1992	18	0.907	3.2	2
30	2/3/1998	39	0.9	3.31	1.93
31	11/30/2007	19	0.866	3.43	1.87
32	4/11/1967	22	0.843	3.54	1.81
33	12/4/1974	12	0.817	3.65	1.76
34	2/25/2003	64	0.802	3.76	1.71
35	11/22/1965	27	0.787	3.87	1.66
36	1/7/1980	131	0.747	3.98	1.61

37	12/30/1981	75	0.747	4.09	1.57
38	12/16/1978	62	0.73	4.2	1.53
39	2/5/1978	47	0.722	4.31	1.49
40	2/10/1973	52	0.722	4.42	1.45
41	2/26/1983	50	0.722	4.53	1.41
42	3/17/1982	63	0.719	4.64	1.38
44	1/17/1979	35	0.699	4.86	1.32
44	12/30/1976	24	0.699	4.86	1.32
45	11/28/1970	32	0.679	4.97	1.29
46	2/11/2003	86	0.675	5.08	1.26
47	2/5/1969	40	0.667	5.19	1.23
48	4/14/2003	40	0.666	5.3	1.21
49	2/26/2004	45	0.656	5.41	1.18
50	3/5/1995	28	0.652	5.52	1.16
51	11/24/1985	30	0.635	5.64	1.14
52	12/31/2005	56	0.632	5.75	1.12
53	3/4/1970	5	0.621	5.86	1.09
54	1/5/1979	25	0.618	5.97	1.07
55	1/4/1974	18	0.597	6.08	1.05
56	10/27/2004	34	0.589	6.19	1.04
57	2/27/1991	49	0.546	6.3	1.02
58	2/21/2004	42	0.544	6.41	1

Pre-project

10-year Q:	1.353	cfs
5-year Q:	1.180	cfs
2-year Q:	0.907	cfs

Lower Flow Threshold: 10%

$0.1xQ_2$ (Pre): 0.091 cfs

Post-Project (Mitigated) Flow Frequency for Long-term Simulation

Gamble Lane,Post-Developed Runoff Condition POC A

Statistics - Node POC-A Total Inflow

Rank	Start Date	Event Duration (hours)	Event Peak (CFS)	Exceedance Frequency (percent)	Return Period (years)
1/1/1900	1/6/1993	112	0.471	0.13	58
2	1/3/1995	55	0.367	0.26	29
3	1/14/1978	50	0.365	0.38	19.33
4	12/3/1966	95	0.338	0.51	14.5
5	2/26/1983	143	0.296	0.64	11.6
6	3/16/1978	46	0.291	0.77	9.67
7	2/14/1986	30	0.235	0.89	8.29
8	1/27/1980	75	0.235	1.02	7.25
9	1/24/1969	66	0.23	1.15	6.44
10	11/22/1965	31	0.226	1.28	5.8
11	2/14/1998	23	0.202	1.4	5.27
12	2/23/1971	14	0.19	1.53	4.83
13	2/13/1980	192	0.183	1.66	4.46
14	3/5/1995	28	0.177	1.79	4.14
15	8/26/2007	6	0.175	1.91	3.87
16	1/5/1979	28	0.163	2.04	3.63
17	1/23/1995	52	0.147	2.17	3.41
18	1/7/2005	118	0.141	2.3	3.22
19	3/2/1980	24	0.141	2.42	3.05
20	3/19/1991	58	0.124	2.55	2.9
21	11/19/1967	33	0.121	2.68	2.76
22	10/17/2004	94	0.114	2.81	2.64
23	12/24/1983	73	0.104	2.93	2.52
24	4/19/1988	51	0.099	3.06	2.42
25	1/30/2007	27	0.098	3.19	2.32
26	2/8/1981	41	0.094	3.32	2.23
27	1/9/1998	43	0.092	3.44	2.15
28	1/7/1980	132	0.09	3.57	2.07
29	11/30/2007	21	0.085	3.7	2
30	2/7/1993	53	0.082	3.83	1.93
31	2/27/1991	51	0.079	3.95	1.87
32	2/26/2004	44	0.078	4.08	1.81
33	10/27/2004	33	0.078	4.21	1.76
34	11/29/1985	18	0.074	4.34	1.71
35	11/14/1972	8	0.07	4.46	1.66
36	2/28/1970	46	0.069	4.59	1.61
37	2/15/1992	11	0.065	4.72	1.57

38	11/24/1983	8	0.065	4.85	1.53
39	4/11/1967	23	0.064	4.97	1.49
40	2/3/1998	39	0.058	5.1	1.45
41	12/18/1967	44	0.057	5.23	1.41
42	12/4/1974	13	0.057	5.36	1.38
43	3/25/1991	60	0.057	5.48	1.35
44	9/24/1986	34	0.054	5.61	1.32
45	2/22/1969	102	0.054	5.74	1.29
46	3/17/1982	64	0.054	5.87	1.26
47	11/24/1985	30	0.054	5.99	1.23
48	11/28/1970	33	0.053	6.12	1.21
49	2/3/1976	165	0.053	6.25	1.18
50	3/4/1970	9	0.052	6.38	1.16
51	1/12/1993	154	0.051	6.51	1.14
52	3/1/1976	50	0.051	6.63	1.12
53	2/5/1969	41	0.051	6.76	1.09
54	2/25/2003	61	0.051	6.89	1.07
55	2/21/2005	59	0.051	7.02	1.05
56	12/30/1981	76	0.049	7.14	1.04
57	11/14/1965	93	0.049	7.27	1.02
58	2/22/2008	11	0.048	7.4	1

Post-project (Mitigated)

10-year Q:	0.292	cfs
5-year Q:	0.195	cfs
2-year Q:	0.085	cfs

Lower Flow Threshold:	10%

0.1xQ_2 (Pre):	0.009	cfs

Gamble Lane,Post-Developed Runoff Condition POC C

Statistics - Node POC-C Total Inflow

Rank	Start Date	Event Duration (hours)	Event Peak (CFS)	Exceedance Frequency (percent)	Return Period (years)
1/1/1900	1/6/1993	116	1.724	0.15	58
2	1/3/1995	56	1.45	0.3	29
3	2/14/1998	30	1.31	0.45	19.33
4	3/16/1978	50	1.253	0.6	14.5
5	12/3/1966	99	1.253	0.75	11.6
6	2/26/1983	145	1.231	0.9	9.67
7	1/14/1978	58	1.221	1.05	8.29
8	2/23/1971	20	1.21	1.2	7.25
9	11/19/1967	103	1.16	1.36	6.44
10	1/23/1995	59	1.08	1.51	5.8
11	2/15/1986	32	1.072	1.66	5.27
12	1/24/1969	118	1.03	1.81	4.83
13	1/27/1980	82	0.993	1.96	4.46
14	10/17/2004	93	0.977	2.11	4.14
15	12/24/1983	75	0.883	2.26	3.87
16	2/8/1981	43	0.882	2.41	3.63
17	11/22/1965	38	0.868	2.56	3.41
18	2/7/1993	54	0.866	2.71	3.22
19	1/9/1998	48	0.859	2.86	3.05
20	1/7/2005	120	0.812	3.01	2.9
21	2/13/1980	194	0.799	3.16	2.76
22	4/20/1988	58	0.794	3.31	2.64
23	3/2/1980	25	0.791	3.46	2.52
24	8/26/2007	13	0.762	3.61	2.42
25	2/26/2004	45	0.725	3.77	2.32
26	1/5/1979	36	0.723	3.92	2.23
27	10/27/2004	35	0.722	4.07	2.15
28	3/19/1991	61	0.713	4.22	2.07
29	3/3/1995	78	0.695	4.37	2
30	1/30/2007	28	0.694	4.52	1.93
31	11/24/1985	32	0.661	4.67	1.87
32	11/14/1972	14	0.656	4.82	1.81
33	3/4/1970	16	0.652	4.97	1.76
34	2/3/1998	43	0.629	5.12	1.71
35	11/25/1983	14	0.621	5.27	1.66
36	1/12/1993	156	0.62	5.42	1.61

37	11/30/2007	28	0.619	5.57	1.57
38	11/29/1985	22	0.595	5.72	1.53
39	4/11/1967	28	0.587	5.87	1.49
40	2/15/1992	18	0.558	6.02	1.45
41	1/8/1980	121	0.554	6.17	1.41
42	1/24/1967	21	0.537	6.33	1.38
43	2/5/1969	46	0.499	6.48	1.35
44	2/28/1970	52	0.452	6.63	1.32
45	12/18/1967	46	0.45	6.78	1.29
46	3/25/1991	65	0.443	6.93	1.26
47	3/6/1974	54	0.431	7.08	1.23
48	2/18/2005	134	0.419	7.23	1.21
49	12/4/1974	17	0.417	7.38	1.18
50	5/8/1977	40	0.402	7.53	1.16
51	12/30/1981	79	0.4	7.68	1.14
52	2/25/2003	69	0.37	7.83	1.12
53	4/7/1965	120	0.35	7.98	1.09
54	9/24/1986	43	0.342	8.13	1.07
55	11/21/1996	38	0.338	8.28	1.05
56	2/4/1976	152	0.335	8.43	1.04
57	2/22/1969	106	0.329	8.58	1.02
58	3/17/1982	65	0.311	8.73	1

Post-project (Mitigated)

10-year Q:	1.235	cfs
5-year Q:	1.046	cfs
2-year Q:	0.695	cfs

Lower Flow Threshold:	10%

$0.1xQ_2$ (Pre):	0.070	cfs

ATTACHMENT 4

Elevation vs. Area Curves and Elevation vs. Discharge Curves to be used in SWMM

Elevation vs. Area

The elevation vs. area curves in the model are calculated in Excel and imported into the model. The summary of elevation vs. area for each BMP has been provided on the following pages.

The LID surface storage depth beneath the lowest surface discharge structure is accounted for in the LID module as illustrated in Attachment 7.

Elevation vs. Discharge

The total elevation vs. discharge curve is imported from an Excel spreadsheet that calculates the elevation vs. discharge of the outlet system. Elevation vs. discharge relationships are provided in the surface discharge of the biofiltration basin as this is where a Modified Puls routing procedure will be applied in the continuous simulation model.

The low-flow orifice size has been selected to maximum its size while still restricting flows to conform with the required 10% of the Q_2 event flow as mandated in the Final Hydromodification Management Plan by Brown & Caldwell, dated March 2011. While BHA acknowledges that this orifice is small, to increase the size of these outlets would impact the basin's ability to restrict flows beneath the HMP thresholds, thus preventing the BMP from conforming to HMP requirements.

In order to further reduce the risk of blockage of the orifice, regular maintenance of the riser and orifice must be performed to ensure potential blockages are minimized. A detail of the orifice and riser structures are provided in Attachment 5 of this memorandum.

Discharge Equations

The following equations are based on the *San Diego County Hydraulic Design Manual* (September 2014):

- Weir:
  $Q_W = C_W * L * H^{3/2}$ (1)

- Slot:

  As an orifice: $Q_S = B_S * h_S * c_g * \sqrt{2g(H - \frac{h_S}{2})}$ (2.a)

  As a weir: $Q_S = C_W * B_S * H^{3/2}$ (2.b)

  For $H > h_S$ slot works as weir until orifice equation provides a smaller discharge. The elevation such that equation (2.a) = equation (2.b) is the elevation at which the behavior changes from weir to orifice.

- Vertical Orifices:

  As an orifice: $Q_O = 0.25 * \pi D^2 * c_g * \sqrt{2g(H - \frac{D}{2})}$ (3.a)

  As a weir: Critical depth and geometric family of circular sector must be solved to determine Q as a function of H:

  $$\frac{Q_o^2}{g} = \frac{A_{cr}^3}{T_{cr}}; H = y_{cr} + \frac{A_{cr}}{2*T_{cr}}; T_{cr} = 2\sqrt{y_{cr}(D - y_{cr})}; A_{cr} = \frac{D^2}{8}[a_{cr} - \sin(a_{cr})];$$
  $$y_{cr} = \frac{D}{2}[1 - \sin(0.5 * a_{cr})]$$ (3.b.1, 3.b.2, 3.b.3, 3.b.4 and 3.b.5)

  There is a value of H (approximately H=110%D) from which orifices no longer work as weirs as critical depth is not possible at the entrance of the orifice. This value of H is obtained equaling the discharge using critical equations and equations (3.b).

A mathematical model is prepared with the previous equations depending on the type of discharge.

The following are the variables used above:

Q_W, Q_s, Q_o : Discharge of weir, slot or orifice (cfs)

C_W, c_g: Coefficients of discharge of weir (typically 3.1) and orifice (0.61 to 0.62)

L, B_s, D, h_s: Length of weir, width of slot, diameter of orifice and height of slot, respectively; (ft)

H: Level of water in the pond over the invert of slot, weir or orifice (ft)

$A_{cr}, T_{cr}, y_{cr}, a_{cr}$: Critical variables for circular sector: area (sq-ft), top width (ft), critical depth (ft), and angle to the center, respectively.

Stage-Area for Basin A1

Elevation vs. Area Tables

0.500	420	191
0.583	433	226
0.667	446	263
0.750	459	300
0.833	472	339
0.917	485	379
1.000	498	420
1.083	511	462
1.167	524	505
1.250	537	549
1.333	550	595
1.417	563	641
1.500	576	689
1.583	589	737
1.667	602	787
1.750	615	837
1.833	628	889
1.917	641	942
2.000	654	996

Stage-Area for Basin A2

Depth (ft)	Area (ft^2)	Volume (ft^3)
0.000	**6248**	0
0.083	**6248**	275
0.167	**6248**	549
0.250	**6248**	824
0.333	**6248**	1,098
0.417	**6248**	1,373
0.500	**6248**	1,648
0.583	**6248**	1,922
0.667	**6248**	2,197
0.750	**6248**	2,471
0.833	**6248**	2,746
0.917	**6248**	3,020
1.000	**6248**	3,295
1.083	**6248**	3,570
1.167	**6248**	3,844
1.250	**6248**	4,119
1.333	**6248**	4,393
1.417	**6248**	4,668
1.500	**6248**	4,943
1.583	**6248**	5,217
1.667	**6248**	5,492
1.750	**6248**	5,766
1.833	**6248**	6,041
1.917	**6248**	6,315
2.000	**6248**	6,590

Outlet Structure for Discharge of Basin A1

Elevation vs. Discharge Table

Lower orifice			Emergency Weir		
No. of orif:	4		Invert:	0.500	ft
Dia:	1	in	B:	11.84	ft
Invert:	0.000	ft			
Area:	0.022	ft^2			
Cg-low:	0.62				

slot-1		
No. of slots:	1	
Height:	0.083	ft
Invert:	0.583	ft
Cg-low:	0.620	
Length:	1.333	ft
Area:	0.111	ft^2

***Note: h = head above the invert of the lowest surface discharge opening.**

H (ft)	h* (ft)	$Q_{orifice-low}$ (cfs)	$Q_{orifice-slot}$ (cfs)	Q_{emerg} (cfs)	Q_{tot} (cfs)
0.500	0.000	0.000	0.000	0.000	0.000
0.583	0.083	0.031	0.000	0.000	0.031
0.667	0.167	0.044	0.159	0.000	0.203
0.750	0.250	0.054	0.225	0.000	0.279
0.833	0.333	0.063	0.275	0.000	0.338
0.917	0.417	0.070	0.318	0.000	0.388
1.000	0.500	0.077	0.355	0.000	0.432
1.083	0.583	0.083	0.389	0.883	1.355
1.167	0.667	0.089	0.421	2.497	3.007
1.250	0.750	0.094	0.450	4.588	5.132
1.333	0.833	0.099	0.477	7.064	7.640
1.417	0.917	0.104	0.503	9.872	10.478
1.500	1.000	0.109	0.527	12.977	13.613
1.583	1.083	0.113	0.551	16.353	17.016
1.667	1.167	0.117	0.573	19.979	20.669
1.750	1.250	0.121	0.595	23.840	24.556
1.833	1.333	0.125	0.616	27.922	28.663
1.917	1.417	0.129	0.636	32.213	32.978
2.000	1.500	0.133	0.655	36.704	37.492
2.083	1.583	0.137	0.674	41.386	42.197
2.167	1.667	0.140	0.693	46.252	47.085
2.250	1.750	0.144	0.711	51.295	52.150
2.333	1.833	0.147	0.728	56.510	57.385
2.417	1.917	0.150	0.746	61.889	62.785
2.500	2.000	0.154	0.762	67.430	68.345

SWMM Model Flow Coefficient Calculation - BMP A1

PARAMETER	ABBREV.	Bio-Retention Cell LID BMP	
Ponding Depth	PD	**6**	in
Bioretention Soil Layer	S	**18**	in
Gravel Layer	G	**12**	in
TOTAL		3.00	ft
		36	in
Orifice Coefficient	Cg	0.6	--
Low Flow Orifice Diameter	D	1	in
Drain exponent	n	0.5	--
Flow Rate (volumetric)	Q	0.045	ft^3/s
Ponding Depth Surface Area	A_{PD}	**407**	ft^2
	A_S, A_G	**342**	ft^2
Bioretention Surface Area	A_S, A_G	0.0079	ac
Porosity of Bioretention Soil	η	0.40	--
Flow Rate (per unit area)	q	14.264	in/hr
Effective Ponding Depth	PD_{eff}	6.57	in
Flow Coefficient	C	0.9656	--
Ponding Depth @ $V_{WQ,\ required}$	$PD_{orificeFL}$	6	in
Cutoff Flow	Q_{cutoff}	0.04517	cfs

SWMM Model Flow Coefficient Calculation - BMP A2

PARAMETER	ABBREV.	Bio-Retention Cell LID BMP	
Ponding Depth	PD	**0**	in
Bioretention Soil Layer	S	**4**	in
Gravel Layer	G	**12**	in
TOTAL		1.33	ft
		16	in
Orifice Coefficient	Cg	0.6	--
Low Flow Orifice Diameter	D	8	in
Drain exponent	n	0.5	--
Flow Rate (volumetric)	Q	1.681	ft^3/s
Ponding Depth Surface Area	A_{PD}	**6248**	ft^2
	A_S, A_G	**6248**	ft^2
Bioretention Surface Area	A_S, A_G	0.1434	ac
Porosity of Bioretention Soil	η	0.40	--
Flow Rate (per unit area)	q	29.053	in/hr
Effective Ponding Depth	PD_{eff}	0.00	in
Flow Coefficient	C	3.3827	--
Ponding Depth @ $V_{WQ,\ required}$	$PD_{orificeFL}$	0	in
Cutoff Flow	Q_{cutoff}	1.68074	cfs

Stage-Area for Basin C

Elevation vs. Area Tables

Depth (ft)	Area (ft^2)	Volume (ft^3)
0.000	**1825**	0
0.083	1868	154
0.167	1911	311
0.250	1955	472
0.333	1998	637
0.417	2041	805
0.500	2084	977
0.583	2127	1,153
0.667	2170	1,332
0.750	2214	1,514
0.833	2257	1,701
0.917	2300	1,891
1.000	2343	2,084
1.083	2386	2,281
1.167	2429	2,482
1.250	2473	2,686
1.333	2516	2,894
1.417	2559	3,105
1.500	2602	3,320
1.583	2645	3,539
1.667	2688	3,761
1.750	2732	3,987
1.833	2775	4,216
1.917	2818	4,449
2.000	2861	4,686

Outlet Structure for Discharge of Basin C

Elevation vs. Discharge Table

Lower orifice			Emergency Weir		
No. of orif:	0		Invert:	1.000	ft
Dia:	1	in	B:	11.84	ft
Invert:	0.000	ft			
Area:	0.000	ft^2			
Cg-low:	0.62				

slot-1			slot-2		
No. of slots:	1		No. of slots:	0	
Height:	0.250	ft	Height:	0.167	ft
Invert:	0	ft	Invert:	0	ft
Cg-low:	0.620		Cg-low:	0.620	
Length:	1.917	ft	Length:	0.167	ft
Area:	0.479	ft^2	Area:	0.028	ft^2

***Note: h = head above the invert of the lowest surface discharge opening.**

H (ft)	h* (ft)	$Q_{orifice-low}$ (cfs)	$Q_{orifice-slot1}$ (cfs)	$Q_{orifice-slot2}$ (cfs)	Q_{emerg} (cfs)	Q_{tot} (cfs)
0.500	0.000	0.000	0.000	0.000	0.000	0.000
0.583	0.083	0.000	0.688	0.000	0.000	0.688
0.667	0.167	0.000	0.973	0.000	0.000	0.973
0.750	0.250	0.000	1.192	0.000	0.000	1.192
0.833	0.333	0.000	1.376	0.000	0.000	1.376
0.917	0.417	0.000	1.539	0.000	0.000	1.539
1.000	0.500	0.000	1.686	0.000	0.000	1.686
1.083	0.583	0.000	1.821	0.000	0.000	1.821
1.167	0.667	0.000	1.947	0.000	0.000	1.947
1.250	0.750	0.000	2.065	0.000	0.883	2.948
1.333	0.833	0.000	2.176	0.000	2.497	4.674
1.417	0.917	0.000	2.283	0.000	4.588	6.871
1.500	1.000	0.000	2.384	0.000	7.064	9.448
1.583	1.083	0.000	2.481	0.000	9.872	12.353
1.667	1.167	0.000	2.575	0.000	12.977	15.552
1.750	1.250	0.000	2.665	0.000	16.353	19.018
1.833	1.333	0.000	2.753	0.000	19.979	22.732
1.917	1.417	0.000	2.838	0.000	23.840	26.678
2.000	1.500	0.000	2.920	0.000	27.922	30.842
2.083	1.583	0.000	3.000	0.000	32.213	35.213
2.167	1.667	0.000	3.078	0.000	36.704	39.782
2.250	1.750	0.000	3.154	0.000	41.386	44.540
2.333	1.833	0.000	3.228	0.000	46.252	49.480
2.417	1.917	0.000	3.301	0.000	51.295	54.596
2.500	2.000	0.000	3.372	0.000	56.510	59.881

SWMM Model Flow Coefficient Calculation - BMP C

PARAMETER	ABBREV.	Bio-Retention Cell LID BMP	
Ponding Depth	PD	**6**	in
Bioretention Soil Layer	S	**18**	in
Gravel Layer	G	**12**	in
TOTAL		3.00	ft
		36	in
Orifice Coefficient	Cg	0.6	--
Low Flow Orifice Diameter	D	1.417	in
Drain exponent	n	0.5	--
Flow Rate (volumetric)	Q	0.090	ft^3/s
Ponding Depth Surface Area	A_{PD}	**2041**	ft^2
	A_S, A_G	**1825**	ft^2
Bioretention Surface Area	A_S, A_G	0.0419	ac
Porosity of Bioretention Soil	η	0.40	--
Flow Rate (per unit area)	q	5.351	in/hr
Effective Ponding Depth	PD_{eff}	6.35	in
Flow Coefficient	C	0.3633	--
Ponding Depth @ $V_{WQ,\ required}$	$PD_{orificeFL}$	6	in
Cutoff Flow	Q_{cutoff}	0.09043	cfs

ATTACHMENT 5

Basin Outlet Structure Details
See Hydromodification Exhibit

ATTACHMENT 6

SWMM Input Data in Input Format
(Existing and Proposed Models)

POC A

PRE-DEVELOPED RUNOFF CONDITION INPUT FILE

```
[TITLE]
;;Project Title/Notes
Gamble Lane, Pre-Developed Runoff Condition POC A

[OPTIONS]
;;Option             Value
FLOW_UNITS           CFS
INFILTRATION         GREEN_AMPT
FLOW_ROUTING         KINWAVE
LINK_OFFSETS         DEPTH
MIN_SLOPE            0
ALLOW_PONDING        NO
SKIP_STEADY_STATE    NO

START_DATE           08/28/1951
START_TIME           05:00:00
REPORT_START_DATE    08/28/1951
REPORT_START_TIME    05:00:00
END_DATE             05/23/2008
END_TIME             23:00:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          01:00:00
WET_STEP             00:15:00
DRY_STEP             04:00:00
ROUTING_STEP         0:01:00

INERTIAL_DAMPING     PARTIAL
NORMAL_FLOW_LIMITED  BOTH
FORCE_MAIN_EQUATION  H-W
VARIABLE_STEP        0.75
LENGTHENING_STEP     0
MIN_SURFAREA         0
MAX_TRIALS           0
HEAD_TOLERANCE       0
SYS_FLOW_TOL         5
LAT_FLOW_TOL         5
MINIMUM_STEP         0.5
THREADS              1

[EVAPORATION]
;;Data Source    Parameters
;;-------------- ----------------
MONTHLY          .060   .08    .11    .15    .17    .19    .19    .18    .15    .11    .08    .06
DRY_ONLY         NO
```

```
[RAINGAGES]
;;Name           Format    Interval SCF      Source
;;-------------- --------- ------ ------ ----------
ESCONDIDO        INTENSITY 1:00     1.0      TIMESERIES ESCONDIDO

[SUBCATCHMENTS]
;;Name           Rain Gage        Outlet           Area     %Imperv  Width    %Slope   CurbLen  SnowPack
;;-------------- ---------------- ---------------- -------- -------- -------- -------- -------- ----------------
DMA-A1           ESCONDIDO        POC-A            0.38949  34.8     231      6.2      0
DMA-A2           ESCONDIDO        POC-A            0.45044  0        317      7.2      0

[SUBAREAS]
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo    PctRouted
;;-------------- ---------- ---------- ---------- ---------- ---------- ---------- ----------
DMA-A1           0.012      0.10       0.05       0.10       25         OUTLET
DMA-A2           0.012      0.10       0.05       0.10       25         OUTLET

[INFILTRATION]
;;Subcatchment   Suction    Ksat       IMD
;;-------------- ---------- ---------- ----------
DMA-A1           6          0.075      0.31
DMA-A2           6          0.10       0.31

[OUTFALLS]
;;Name           Elevation  Type       Stage Data       Gated    Route To
;;-------------- ---------- ---------- ---------------- -------- ----------------
POC-A            0          FREE                        NO

[TIMESERIES]
;;Name           Date       Time       Value
;;-------------- ---------- ---------- ----------
ESCONDIDO        FILE "K:\Library\Stormwater\SWMM\RAIN GAGES\Escondido.dat"

[REPORT]
;;Reporting Options
INPUT      NO
CONTROLS   NO
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]

[MAP]
DIMENSIONS 2182.681359 6021.851375 2183.279716 6040.229030
Units      Degrees

[COORDINATES]
;;Node           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
POC-A            2182.708557        6022.686723
```

```
[VERTICES]
;;Link           X-Coord            Y-Coord
;;-------------- ------------------ ------------------

[Polygons]
;;Subcatchment   X-Coord            Y-Coord
;;-------------- ------------------ ------------------
DMA-A1           2182.692422        6035.392805
DMA-A2           2186.211547        6035.166429

[SYMBOLS]
;;Gage           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
ESCONDIDO        2182.692422        6037.800628
```

POC A

POST-DEVELOPED RUNOFF CONDITION INPUT FILE

```
[TITLE]
;;Project Title/Notes
Gamble Lane,Post-Developed Runoff Condition POC A

[OPTIONS]
;;Option             Value
FLOW_UNITS           CFS
INFILTRATION         GREEN_AMPT
FLOW_ROUTING         KINWAVE
LINK_OFFSETS         DEPTH
MIN_SLOPE            0
ALLOW_PONDING        NO
SKIP_STEADY_STATE    NO

START_DATE           08/28/1951
START_TIME           05:00:00
REPORT_START_DATE    08/28/1951
REPORT_START_TIME    05:00:00
END_DATE             05/23/2008
END_TIME             23:00:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          01:00:00
WET_STEP             00:15:00
DRY_STEP             04:00:00
ROUTING_STEP         0:01:00

INERTIAL_DAMPING     PARTIAL
NORMAL_FLOW_LIMITED  BOTH
FORCE_MAIN_EQUATION  H-W
VARIABLE_STEP        0.75
LENGTHENING_STEP     0
MIN_SURFAREA         0
MAX_TRIALS           0
HEAD_TOLERANCE       0
SYS_FLOW_TOL         5
LAT_FLOW_TOL         5
MINIMUM_STEP         0.5
THREADS              1

[EVAPORATION]
;;Data Source    Parameters
;;-------------- ----------------
```

```
MONTHLY          0.06   .08    .11    .15    .17    .19    .19    .18    .15    .11    .08    .06
DRY_ONLY         NO

[RAINGAGES]
;;Name           Format    Interval SCF      Source
;;-------------- --------- ------ ------ ----------
ESCONDIDO        INTENSITY 1:00     1.0      TIMESERIES ESCONDIDO

[SUBCATCHMENTS]
;;Name           Rain Gage        Outlet           Area     %Imperv  Width    %Slope   CurbLen  SnowPack
;;-------------- ---------------- ---------------- -------- -------- -------- -------- -------- ----------------
DMIN-A2          ESCONDIDO        POC-A            0.09307  51.2     100      12.3     0
DMA-A            ESCONDIDO        BMP-A            0.29743  37.6     150      1.0      0
BMP-A            ESCONDIDO        DIV-A            0.00785  0        10       0        0
PERM_PVMT        ESCONDIDO        POC-A            0.14343  0        295      5.2      0
DMA-PP           ESCONDIDO        PERM_PVMT        0.44176  29.2     10       11.1     0

[SUBAREAS]
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo    PctRouted
;;-------------- ---------- ---------- ---------- ---------- ---------- ---------- ----------
DMIN-A2          0.012      0.10       0.05       0.10       25         OUTLET
DMA-A            0.012      0.10       0.05       0.10       25         OUTLET
BMP-A            0.012      0.10       0.05       0.10       25         OUTLET
PERM_PVMT        0.012      0.10       0.05       0.10       25         OUTLET
DMA-PP           0.012      0.10       0.05       0.10       25         OUTLET

[INFILTRATION]
;;Subcatchment   Suction    Ksat       IMD
;;-------------- ---------- ---------- ----------
DMIN-A2          6          0.075      0.31
DMA-A            6          0.075      0.31
BMP-A            6          0.10       0.31
PERM_PVMT        6          0.10       0.31
DMA-PP           6          0.75       0.31

[LID_CONTROLS]
;;Name           Type/Layer Parameters
;;-------------- ---------- ----------
BASIN-A          BC
BASIN-A          SURFACE    6.57       0.05       0          0          5
BASIN-A          SOIL       18         0.4        0.2        0.1        5          5          1.5
BASIN-A          STORAGE    12         0.67       0          0
BASIN-A          DRAIN      0.9656     0.5        3          6

PERM_PVMT        PP
PERM_PVMT        SURFACE    0          0.10       0.1        5.2        5
PERM_PVMT        PAVEMENT   3.125      0.15       0          100        0
PERM_PVMT        SOIL       4          0.5        0.2        0.1        0.5        10.0       3.5
PERM_PVMT        STORAGE    12         0.67       0.08       0
PERM_PVMT        DRAIN      3.3827     0.5        6          6
```

```
[LID_USAGE]
;;Subcatchment   LID Process      Number  Area       Width      InitSat    FromImp    ToPerv     RptFile
DrainTo
;;-------------- ---------------- ------- ---------- ---------- ---------- ---------- ---------- ----------------------
-- ----------------
BMP-A            BASIN-A          1       341.95     0          0          0          0
PERM_PVMT        PERM_PVMT        1       6247.81    0          0          0          0

[OUTFALLS]
;;Name           Elevation  Type       Stage Data       Gated    Route To
;;-------------- ---------- ---------- ---------------- -------- ----------------
POC-A            0          FREE                        NO

[DIVIDERS]
;;Name           Elevation  Diverted Link    Type       Parameters
;;-------------- ---------- ---------------- ---------- ----------
DIV-A            0          BYPASS-A         CUTOFF     0.04517    0          0          0          0

[STORAGE]
;;Name           Elev.    MaxDepth   InitDepth  Shape      Curve Name/Params            N/A      Fevap    Psi      Ksat
IMD
;;-------------- -------- ---------- ---------- ---------- ---------------------------- -------- --------          ---
----- --------
STOR-A           0        1.5        0          TABULAR    STOR-A                       0        1

[CONDUITS]
;;Name           From Node        To Node          Length     Roughness  InOffset   OutOffset  InitFlow   MaxFlow
;;-------------- ---------------- ---------------- ---------- ---------- ---------- ---------- ---------- ----------
DRAIN-2          DIV-A            POC-A            400        0.01       0          0          0          0
BYPASS-A         DIV-A            STOR-A           400        0.01       0          0          0          0

[OUTLETS]
;;Name           From Node        To Node          Offset     Type            QTable/Qcoeff    Qexpon     Gated
;;-------------- ---------------- ---------------- ---------- --------------- ---------------- ---------- --------
MID-FLOW-A       STOR-A           POC-A            0          TABULAR/DEPTH   MID-FLOW-C                  NO

[XSECTIONS]
;;Link           Shape        Geom1            Geom2      Geom3      Geom4      Barrels    Culvert
;;-------------- ------------ ---------------- ---------- ---------- ---------- ---------- ----------
DRAIN-2          DUMMY        0                0          0          0          1
BYPASS-A         DUMMY        0                0          0          0          1

[CURVES]
;;Name           Type       X-Value    Y-Value
;;-------------- ---------- ---------- ----------
MID-FLOW-C       Rating     0.000      0.000
MID-FLOW-C                  0.083      0.031
MID-FLOW-C                  0.167      0.203
MID-FLOW-C                  0.250      0.279
MID-FLOW-C                  0.333      0.338
MID-FLOW-C                  0.417      0.388
```

```
MID-FLOW-C                0.500      0.432
MID-FLOW-C                0.583      1.355
MID-FLOW-C                0.667      3.007
MID-FLOW-C                0.750      5.132
MID-FLOW-C                0.833      7.640
MID-FLOW-C                0.917      10.478
MID-FLOW-C                1.000      13.613
MID-FLOW-C                1.083      17.016
MID-FLOW-C                1.167      20.669
MID-FLOW-C                1.250      24.556
MID-FLOW-C                1.333      28.663
MID-FLOW-C                1.417      32.978
MID-FLOW-C                1.500      37.492
MID-FLOW-C                1.583      42.197
MID-FLOW-C                1.667      47.085
MID-FLOW-C                1.750      52.150
MID-FLOW-C                1.833      57.385
MID-FLOW-C                1.917      62.785
MID-FLOW-C                2.000      68.345
;
STOR-A           Storage  0.000      420
STOR-A                    0.083      433
STOR-A                    0.167      446
STOR-A                    0.250      459
STOR-A                    0.333      472
STOR-A                    0.417      485
STOR-A                    0.500      498
STOR-A                    0.583      511
STOR-A                    0.667      524
STOR-A                    0.750      537
STOR-A                    0.833      550
STOR-A                    0.917      563
STOR-A                    1.000      576
STOR-A                    1.083      589
STOR-A                    1.167      602
STOR-A                    1.250      615
STOR-A                    1.333      628
STOR-A                    1.417      641
STOR-A                    1.500      654

[TIMESERIES]
;;Name           Date       Time       Value
;;-------------- ---------- ---------- ----------
OCEANSIDE        FILE "K:\Library\Stormwater\SWMM\RAIN GAGES\Oceanside Rain Data.dat"
;
ESCONDIDO        FILE "K:\Library\Stormwater\SWMM\RAIN GAGES\Escondido.dat"

[REPORT]
;;Reporting Options
INPUT      NO
CONTROLS   NO
```

```
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]

[MAP]
DIMENSIONS 2182.681359 6021.851375 2183.279716 6040.229030
Units      Degrees

[COORDINATES]
;;Node           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
POC-A            2182.666926        6022.708581
DIV-A            2180.325759        6025.926152
STOR-A           2183.309812        6026.049630

[VERTICES]
;;Link           X-Coord            Y-Coord
;;-------------- ------------------ ------------------

[Polygons]
;;Subcatchment   X-Coord            Y-Coord
;;-------------- ------------------ ------------------
DMIN-A2          2178.782865        6024.629632
DMIN-A2          2178.822860        6024.629632
DMA-A            2176.847793        6028.848466
BMP-A            2178.531105        6027.170696
PERM_PVMT        2178.699964        6022.715722
DMA-PP           2176.374460        6022.921518

[SYMBOLS]
;;Gage           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
ESCONDIDO        2173.021808        6028.550520
```

POC C

PRE-DEVELOPED RUNOFF CONDITION INPUT FILE

```
[TITLE]
;;Project Title/Notes
Gamble Lane, Pre-Developed Runoff Condition POC C

[OPTIONS]
;;Option             Value
FLOW_UNITS           CFS
INFILTRATION         GREEN_AMPT
FLOW_ROUTING         KINWAVE
LINK_OFFSETS         DEPTH
MIN_SLOPE            0
ALLOW_PONDING        NO
SKIP_STEADY_STATE    NO

START_DATE           08/28/1951
START_TIME           05:00:00
REPORT_START_DATE    08/28/1951
REPORT_START_TIME    05:00:00
END_DATE             05/23/2008
END_TIME             23:00:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          01:00:00
WET_STEP             00:15:00
DRY_STEP             04:00:00
ROUTING_STEP         0:01:00

INERTIAL_DAMPING     PARTIAL
NORMAL_FLOW_LIMITED  BOTH
FORCE_MAIN_EQUATION  H-W
VARIABLE_STEP        0.75
LENGTHENING_STEP     0
MIN_SURFAREA         0
MAX_TRIALS           0
HEAD_TOLERANCE       0
SYS_FLOW_TOL         5
LAT_FLOW_TOL         5
MINIMUM_STEP         0.5
THREADS              1
```

```
[EVAPORATION]
;;Data Source    Parameters
;;-------------- ----------------
MONTHLY          .060   .08    .11    .15    .17    .19    .19    .18    .15    .11    .08    .06
DRY_ONLY         NO

[RAINGAGES]
;;Name           Format    Interval SCF      Source
;;-------------- --------- ------ ------ ----------
ESCONDIDO        INTENSITY 1:00     1.0      TIMESERIES ESCONDIDO

[SUBCATCHMENTS]
;;Name           Rain Gage        Outlet           Area     %Imperv  Width    %Slope   CurbLen  SnowPack
;;-------------- ---------------- ---------------- -------- -------- -------- -------- -------- ----------------
DMA-C            ESCONDIDO        POC-C            2.28951  27.70    422      10.50    0

[SUBAREAS]
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo    PctRouted
;;-------------- ---------- ---------- ---------- ---------- ---------- ---------- ----------
DMA-C            0.012      0.10       0.05       0.10       25         OUTLET

[INFILTRATION]
;;Subcatchment   Suction    Ksat       IMD
;;-------------- ---------- ---------- ----------
DMA-C            6          0.10       0.31

[OUTFALLS]
;;Name           Elevation  Type       Stage Data       Gated    Route To
;;-------------- ---------- ---------- ---------------- -------- ----------------
POC-C            0          FREE                        NO

[TIMESERIES]
;;Name           Date       Time       Value
;;-------------- ---------- ---------- ----------
ESCONDIDO        FILE "K:\Library\Stormwater\SWMM\RAIN GAGES\Escondido.dat"

[REPORT]
;;Reporting Options
INPUT      NO
CONTROLS   NO
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]

[MAP]
DIMENSIONS 2182.681359 6021.851375 2183.279716 6040.229030
Units      Degrees

[COORDINATES]
```

```
;;Node           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
POC-C            2182.708557        6022.686723

[VERTICES]
;;Link           X-Coord            Y-Coord
;;-------------- ------------------ ------------------

[Polygons]
;;Subcatchment   X-Coord            Y-Coord
;;-------------- ------------------ ------------------
DMA-C            2182.692422        6035.392805

[SYMBOLS]
;;Gage           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
ESCONDIDO        2182.692422        6037.800628
```

POC C

POST-DEVELOPED RUNOFF CONDITION INPUT FILE

```
[TITLE]
;;Project Title/Notes
Gamble Lane,Post-Developed Runoff Condition POC C

[OPTIONS]
;;Option             Value
FLOW_UNITS           CFS
INFILTRATION         GREEN_AMPT
FLOW_ROUTING         KINWAVE
LINK_OFFSETS         DEPTH
MIN_SLOPE            0
ALLOW_PONDING        NO
SKIP_STEADY_STATE    NO

START_DATE           08/28/1951
START_TIME           05:00:00
REPORT_START_DATE    08/28/1951
REPORT_START_TIME    05:00:00
END_DATE             05/23/2008
END_TIME             23:00:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          01:00:00
WET_STEP             00:15:00
DRY_STEP             04:00:00
ROUTING_STEP         0:01:00

INERTIAL_DAMPING     PARTIAL
NORMAL_FLOW_LIMITED  BOTH
FORCE_MAIN_EQUATION  H-W
VARIABLE_STEP        0.75
LENGTHENING_STEP     0
MIN_SURFAREA         0
MAX_TRIALS           0
HEAD_TOLERANCE       0
SYS_FLOW_TOL         5
LAT_FLOW_TOL         5
MINIMUM_STEP         0.5
```

```
THREADS             1

[EVAPORATION]
;;Data Source    Parameters
;;-------------- ----------------
MONTHLY          0.06   .08    .11    .15    .17    .19    .19    .18    .15    .11    .08    .06
DRY_ONLY         NO

[RAINGAGES]
;;Name           Format    Interval SCF      Source
;;-------------- --------- ------ ------ ----------
ESCONDIDO        INTENSITY 1:00     1.0      TIMESERIES ESCONDIDO

[SUBCATCHMENTS]
;;Name           Rain Gage        Outlet           Area     %Imperv  Width    %Slope   CurbLen  SnowPack
;;-------------- ---------------- ---------------- -------- -------- -------- -------- -------- ----------------
BMP-C            ESCONDIDO        DIV-C            0.04190  0        85       0        0
SM-C             ESCONDIDO        POC-C            0.18159  0        327      6.2      0
DMAC2            ESCONDIDO        POC-C            0.03719  70.7     46       17.4     0
DMA-C            ESCONDIDO        BMP-C            2.07808  38.9     264      12.7     0
DMINC1           ESCONDIDO        POC-C            0.00399  70.1     5        17.4     0

[SUBAREAS]
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo    PctRouted
;;-------------- ---------- ---------- ---------- ---------- ---------- ---------- ----------
BMP-C            0.012      0.10       0.05       0.10       25         OUTLET
SM-C             0.012      0.10       0.05       0.10       25         OUTLET
DMAC2            0.012      0.10       0.05       0.10       25         OUTLET
DMA-C            0.012      0.10       0.05       0.10       25         OUTLET
DMINC1           0.012      0.10       0.05       .10        25         OUTLET

[INFILTRATION]
;;Subcatchment   Suction    Ksat       IMD
;;-------------- ---------- ---------- ----------
BMP-C            6          0.10       0.31
SM-C             6          0.10       0.31
DMAC2            6          0.075      0.31
DMA-C            6          0.075      0.31
DMINC1           6          0.075      0.31

[LID_CONTROLS]
;;Name           Type/Layer Parameters
;;-------------- ---------- ----------
BASIN-C          BC
BASIN-C          SURFACE    6.32       0.05       0          0          5
BASIN-C          SOIL       18         0.4        0.2        0.1        5          5          1.5
BASIN-C          STORAGE    12         0.67       0          0
BASIN-C          DRAIN      0.3633     0.5        3          6

[LID_USAGE]
```

```
;;Subcatchment   LID Process      Number  Area       Width      InitSat    FromImp    ToPerv     RptFile
DrainTo
;;-------------- ---------------- ------- ---------- ---------- ---------- ---------- ---------- ----------
-- ----------------
BMP-C            BASIN-C          1       1825.16    0          0          0          0

[OUTFALLS]
;;Name           Elevation  Type       Stage Data       Gated    Route To
;;-------------- ---------- ---------- ---------------- -------- ----------------
POC-C            0          FREE                        NO

[DIVIDERS]
;;Name           Elevation  Diverted Link    Type       Parameters
;;-------------- ---------- ---------------- ---------- ----------
DIV-C            0          BYPASS-C         CUTOFF     0.09043    0          0          0          0

[STORAGE]
;;Name           Elev.    MaxDepth   InitDepth  Shape      Curve Name/Params            N/A      Fevap    Psi      Ksat
IMD
;;-------------- -------- ---------- ---------- ---------- ---------------------------- -------- --------          ---
----- --------
STOR-C           0        1.5        0          TABULAR    STOR-C                       0        1

[CONDUITS]
;;Name           From Node        To Node          Length     Roughness  InOffset   OutOffset  InitFlow   MaxFlow
;;-------------- ---------------- ---------------- ---------- ---------- ---------- ---------- ---------- ----------
DRAIN-2          DIV-C            POC-C            400        0.01       0          0          0          0
BYPASS-C         DIV-C            STOR-C           400        0.01       0          0          0          0

[OUTLETS]
;;Name           From Node        To Node          Offset     Type            QTable/Qcoeff    Qexpon     Gated
;;-------------- ---------------- ---------------- ---------- --------------- ---------------- ---------- --------
MID-FLOW-C       STOR-C           POC-C            0          TABULAR/DEPTH   MID-FLOW-C                  NO

[XSECTIONS]
;;Link           Shape        Geom1            Geom2      Geom3      Geom4      Barrels    Culvert
;;-------------- ------------ ---------------- ---------- ---------- ---------- ---------- ----------
DRAIN-2          DUMMY        0                0          0          0          1
BYPASS-C         DUMMY        0                0          0          0          1

[CURVES]
;;Name           Type       X-Value    Y-Value
;;-------------- ---------- ---------- ----------
MID-FLOW-C       Rating     0.000      0.000
MID-FLOW-C                  0.083      0.688
MID-FLOW-C                  0.167      0.973
MID-FLOW-C                  0.250      1.192
MID-FLOW-C                  0.333      1.376
MID-FLOW-C                  0.417      1.539
MID-FLOW-C                  0.500      1.686
MID-FLOW-C                  0.583      1.821
```

```
MID-FLOW-C                 0.667      1.947
MID-FLOW-C                 0.750      2.948
MID-FLOW-C                 0.833      4.674
MID-FLOW-C                 0.917      6.871
MID-FLOW-C                 1.000      9.448
MID-FLOW-C                 1.083      12.353
MID-FLOW-C                 1.167      15.552
MID-FLOW-C                 1.250      19.018
MID-FLOW-C                 1.333      22.732
MID-FLOW-C                 1.417      26.678
MID-FLOW-C                 1.500      30.842
MID-FLOW-C                 1.583      35.213
MID-FLOW-C                 1.667      39.782
MID-FLOW-C                 1.750      44.540
MID-FLOW-C                 1.833      49.480
MID-FLOW-C                 1.917      54.596
MID-FLOW-C                 2.000      59.881
;
STOR-C           Storage   0.000      2084
STOR-C                     0.083      2127
STOR-C                     0.167      2170
STOR-C                     0.250      2214
STOR-C                     0.333      2257
STOR-C                     0.417      2300
STOR-C                     0.500      2343
STOR-C                     0.583      2386
STOR-C                     0.667      2429
STOR-C                     0.750      2473
STOR-C                     0.833      2516
STOR-C                     0.917      2559
STOR-C                     1.000      2602
STOR-C                     1.083      2645
STOR-C                     1.167      2688
STOR-C                     1.250      2732
STOR-C                     1.333      2775
STOR-C                     1.417      2818
STOR-C                     1.500      2861

[TIMESERIES]
;;Name           Date       Time       Value
;;-------------- ---------- ---------- ----------
ESCONDIDO        FILE "K:\Library\Stormwater\SWMM\RAIN GAGES\Escondido.dat"

[REPORT]
;;Reporting Options
INPUT      NO
CONTROLS   NO
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL
```

```
[TAGS]

[MAP]
DIMENSIONS 2182.681359 6021.851375 2183.279716 6040.229030
Units      Degrees

[COORDINATES]
;;Node           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
POC-C            2182.666926        6022.708581
DIV-C            2180.280882        6025.890860
STOR-C           2183.186334        6025.987891

[VERTICES]
;;Link           X-Coord            Y-Coord
;;-------------- ------------------ ------------------

[Polygons]
;;Subcatchment   X-Coord            Y-Coord
;;-------------- ------------------ ------------------
BMP-C            2178.576486        6027.202092
SM-C             2179.173297        6022.653983
DMAC2            2185.985171        6024.526734
DMA-C            2175.962866        6028.807307
DMINC1           2178.988079        6024.609052

[SYMBOLS]
;;Gage           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
ESCONDIDO        2173.021808        6028.550520
```

ATTACHMENT 7

SWMM Screens and Explanation of Significant Variables

EPA SWMM Figures and Explanations

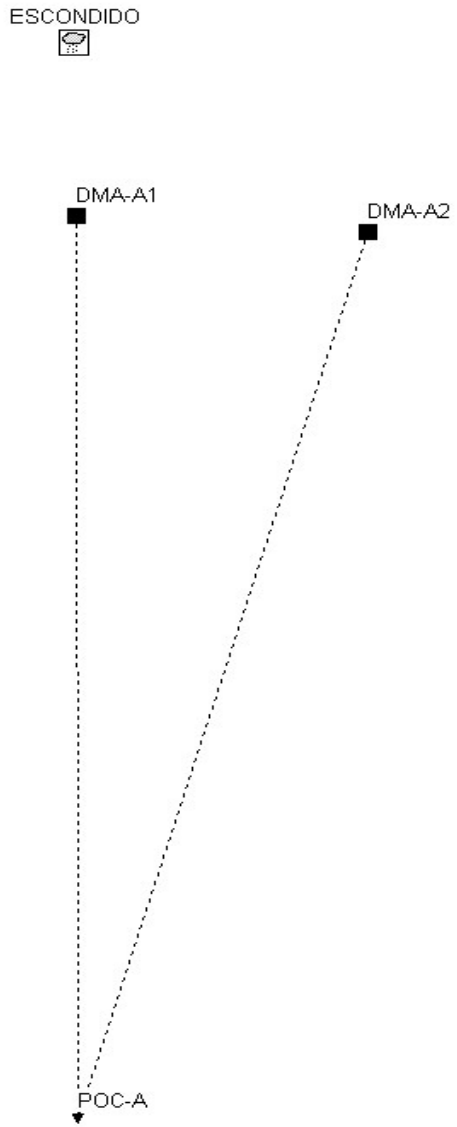
Per the attached, the reader can see the screens associated with the EPA-SWMM Model in both pre-development and post-development conditions. Each portion, i.e., sub-catchments, storage units, weirs and orifices as a discharge, and outfalls (point of compliance), are also shown.

Variables for modeling are associated with typical recommended values by the EPA-SWMM model and the Model BMP Design Manual San Diego Region.

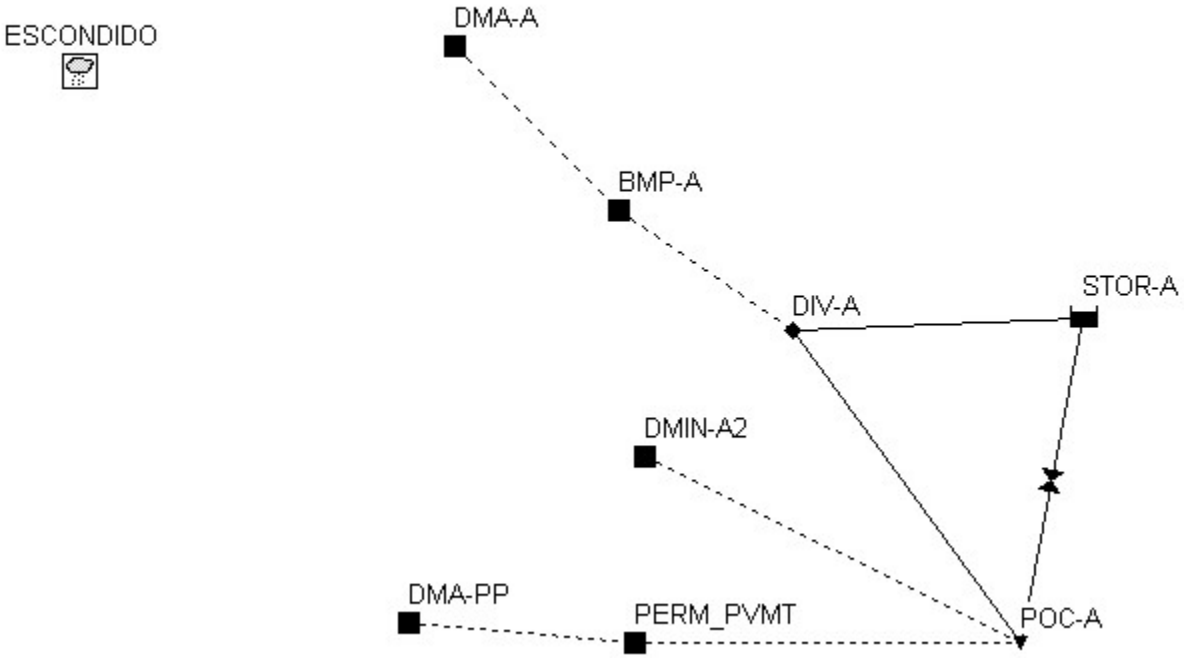
Soil characteristics of the existing soils were determined from the site specific NRCS Web Soil Survey.

Some values incorporated within the SWMM model have been determined from the professional experience of BHA using conservative assumptions that have a tendency to increase the size of the needed BMP and also generate a long-term runoff as a percentage of rainfall similar to those measured in gage stations in Southern California by the USGS.

PREDEVELOPED CONDITION (POC A)

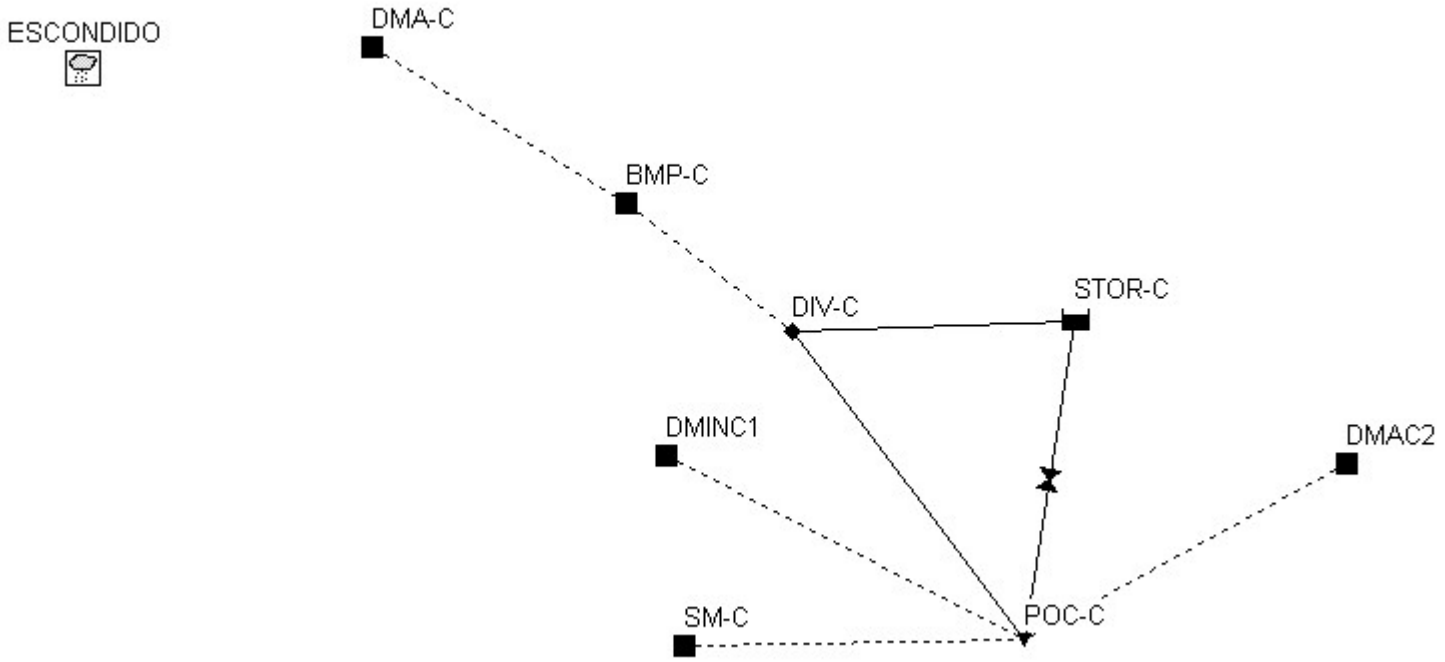


POST DEVELOPED CONDITION (POC A)



PREDEVELOPED CONDITION (POC C)

POST DEVELOPED CONDITION (POC C)



Explanation of Selected Variables

- Sub Catchment Areas: Please refer to the attached diagram that indicates the DMA and biofiltration BMP sub-areas modeled within the project site at both the pre and post-developed conditions draining to the project's POCs.

  Parameters for the pre-developed model include soils Type C and D as determined from the NRCS Web Soils Survey and ArcGIS BMP Sizing Calculator (see Attachment 8). For the purpose of this report, the entire project site will be modeled with Type D soils. Suction head, conductivity and initial deficit correspond to average values expected for this soil type, according to the BMP Design Manual (BMPDM).

- Selection of a Kinematic Approach: As the continuous model is based on hourly rainfall, and the time of concentration for the pre-development and post-development conditions is significantly smaller than 60 minutes, precise routing of the flows through the impervious surfaces, the underdrain pipe system, and the discharge pipe was considered unnecessary. The truncation error of the precipitation into hourly steps is much more significant that the precious routing in a system where the time of concentration is much smaller than 1 hour.

- Sub Catchment BMP: The subcatchment BMP is assigned the area of biofiltration, which is equal to the area of amended soil. At least five (5) decimal places were given regarding the area of the biofiltration to insure that the area used by the program for the LID subroutine corresponds exactly with the actual biofiltration area.

LID Control Editor: Explanation of Significant Variables

- Storage Depth: The storage depth variable within the SWMM model is representative of the storage volume provided beneath the lowest surface outlet within the biofiltration basin. This is the volume that can only discharge from the facility via the LID portion of the basin.

  In those cases where the surface storage has a variable area that is also different to the area of the gravel and amended soil, the SWMM model needs to be calibrated as the LID module will use the storage depth multiplied by the BMP area as the amount of volume stored at the surface.

Let A_{BMP} be the area of the BMP (area of amended soil and area of gravel). The proper value of the storage depth S_D to be included in the LID module can be calculated by using geometric properties of the surface volume. Let A_0 be the surface area at the bottom of the surface pond, and let A_i be the surface area at the elevation of the invert of the first row of orifices (or at the invert of the riser if not surface orifices are included). Finally, let h_i be the difference in elevation between A_0 and A_i. By volumetric definition:

$$A_{BMP} * S_D = \frac{(A_0 + A_i)}{2} h_i \qquad (1)$$

Equation (1) allows the determination of SD to be included as Storage Depth in the LID module.

- Porosity: A porosity value of 0.4 has been selected for the model. The amended soil is to be highly sandy in content in order to have a saturated hydraulic conductivity of approximately 5 in/hr.

  BHA considers such a value to be slightly high; however, in order to comply with the BMPDM, the value recommended by the Copermittees for the porosity of amended soil is 0.4, per Appendix G of the BMPDM. Such porosity is equal to the porosity of the gravel per the same manual.

- Porosity: The ratio of the void volume divided by the soil volume is directly related to porosity. Note, by definition, Porosity = Void Ratio ÷ (1 + Void Ratio). As the underdrain layer is composed of gravel, a porosity value of 0.4 has been selected (also per Appendix G of the BMPDM), which results in a void ratio of 0.4/(1+0.4) = 0.67 for the gravel detention layer.

- Conductivity: Due to the preliminary nature of this study, infiltration may not be a viable addition to the LID design. Even when soil types C and D are present, which generally have low infiltration rates, the possibility that a very low infiltration rate could be determined at design level must be considered. The range of potential infiltration rates to be studied when a site-specific geotechnical investigation has not been completed is shown in Table G.1-5 of the BMP Design Manual. Based on the infiltration rates shown, a conservative low infiltration rate of 0 inches per hour was selected for soil Type D. Therefore, as the BMPs are designed without infiltration, the conductivity value was set to 0 to represent zero infiltration.

- Clogging factor: A clogging factor was not used (0 indicates that there is not clogging assumed within the model). The reason for this is related to the fairness of a comparison with the SDHM model and the HMP sizing tables: a clogging factor was not considered.

- Drain (Flow) coefficient: The flow coefficient in the SWMM Model is the coefficient needed to transform the orifice equation into a general power law equation of the form:

$$q = C(H - H_D)^n \quad (2)$$

where,

q is the peak flow in in/hr;
n is exponent (typically 0.5 for orifice equation);
H_D is the elevation of the centroid of the orifice in inches (assumed equal to the invert of the orifice for small orifices and in our design equal to 0); and
H is the depth of the water in inches.

The general orifice equation can be expressed as:

$$Q = \frac{\pi}{4} c_g \frac{D^2}{144} \sqrt{2g \frac{(H - H_D)}{12}} \quad (3)$$

where,

Q is the peak flow in cfs;
D is the underdrain orifice diameter in inches;
c_g is the typical discharge coefficient for orifices (0.60-0.65 for thin walls and 0.75-0.80 for thick walls);
g is the gravitational constant (32.2 ft/s^2); and
H and H_D are defined above are also used in inches in Equation (3).

It is clear that:

$$q = \left(\frac{in}{hr}\right) \frac{A_{BMP}}{12*3600} = Q(cfs) \quad (4)$$

The flow coefficient used in the SWMM Model characterizes the rate of discharge to the outlet as a function of the height of water stored in the biofiltration cell. The flow coefficient, as presented in the BMPDM, can be determined by the following equation:

$$C = c_g \left(\frac{605}{A_{lid}}\right) \left(\frac{\pi D^2}{8}\right) \sqrt{\frac{g}{6}} \quad (5)$$

where,

c_g is the orifice discharge coefficient (0.60-0.65 for thin walls and 0.75-0.80 for thick walls);
A_{lid} is the cumulative footprint area (ft2) of all LID controls;

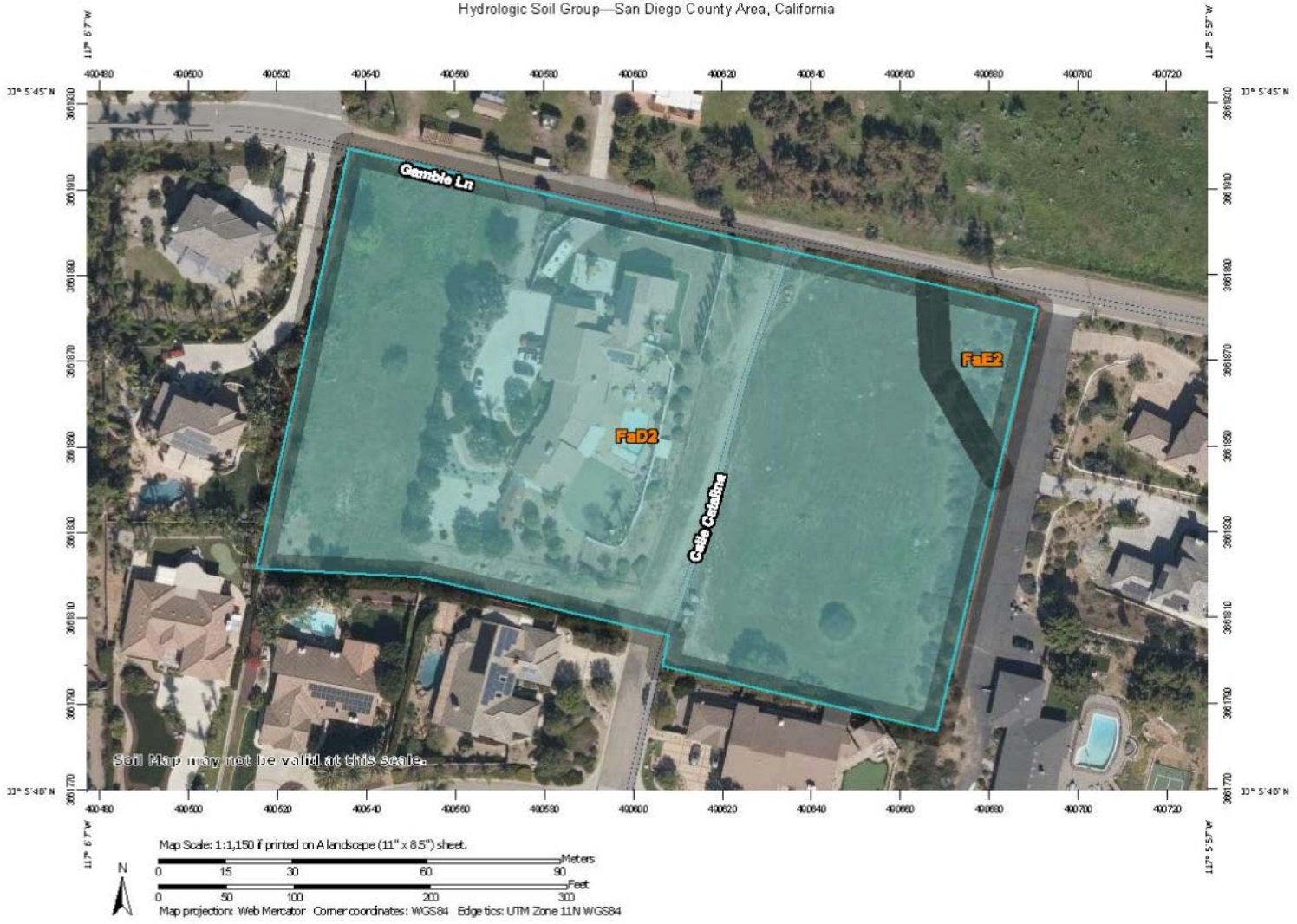
D is the underdrain orifice diameter in inches; and
g is the gravitational constant (32.2 ft/s^2);

- Cut-Off Flow: The cut-off flow represents the maximum flow rate leaving the "low flow" outlet. The low-flow restrictor is typically more restrictive (i.e. smaller flow rate) than the percolation rate through the engineered soil; therefore, the orifice equation is used to calculate the cutoff flow when H is maximum.

ATTACHMENT 8

Soil Map

Hydrologic Soil Group—San Diego County Area, California



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: San Diego County Area, California
Survey Area Data: Version 15, May 27, 2020

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

Date(s) aerial images were photographed: Jan 23, 2020—Feb 13, 2020

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
FaD2	Fallbrook sandy loam, 9 to 15 percent slopes, eroded	C	3.7	96.1%
FaE2	Fallbrook sandy loam, 15 to 30 percent slopes, eroded	C	0.1	3.9%
Totals for Area of Interest			**3.8**	**100.0%**

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: *None Specified*

Tie-break Rule: Higher

PRE-DEVELOPED RUNOFF CONDITION (POC A) OUTPUT FILE

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)
--------------------------------------------------------------

Gamble Lane, Pre-Developed Runoff Condition POC A


***********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
***********************************************************

****************
Analysis Options
****************
Flow Units ............... CFS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... NO
  Water Quality .......... NO
Infiltration Method ...... GREEN_AMPT
Starting Date ............ 08/28/1951 05:00:00
Ending Date .............. 05/23/2008 23:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 01:00:00
Wet Time Step ............ 00:15:00
Dry Time Step ............ 04:00:00


**************************        Volume         Depth
Runoff Quantity Continuity     acre-feet        inches
**************************     ---------       -------
Total Precipitation ......        42.780       611.200
Evaporation Loss .........         1.286        18.370
Infiltration Loss ........        32.388       462.728
Surface Runoff ...........         9.504       135.778
Final Storage ............         0.000         0.007
Continuity Error (%) .....        -0.930
```

Flow Routing Continuity	Volume acre-feet	Volume 10^6 gal
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	9.504	3.097
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	9.504	3.097
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.000
Continuity Error (%)	0.000	

Subcatchment Runoff Summary

Subcatchment	Total Precip in	Total Runon in	Total Evap in	Total Infil in	Total Runoff in	Total Runoff 10^6 gal	Peak Runoff CFS	Runoff Coeff
DMA-A1	611.20	0.00	32.73	356.29	229.47	2.43	0.31	0.375
DMA-A2	611.20	0.00	5.95	554.76	54.76	0.67	0.33	0.090

Analysis begun on: Tue Apr 05 11:34:33 2022
Analysis ended on: Tue Apr 05 11:35:10 2022
Total elapsed time: 00:00:37

POST-DEVELOPED RUNOFF CONDITION (POC A) OUTPUT FILE

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)
--------------------------------------------------------------

Gamble Lane,Post-Developed Runoff Condition POC A

WARNING 04: minimum elevation drop used for Conduit DRAIN-2
WARNING 04: minimum elevation drop used for Conduit BYPASS-A

***********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
***********************************************************

***************
Analysis Options
***************
Flow Units ............... CFS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Infiltration Method ...... GREEN_AMPT
Flow Routing Method ...... KINWAVE
Starting Date ............ 08/28/1951 05:00:00
Ending Date .............. 05/23/2008 23:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 01:00:00
Wet Time Step ............ 00:15:00
Dry Time Step ............ 04:00:00
Routing Time Step ........ 60.00 sec


*************************       Volume         Depth
```

Runoff Quantity Continuity	acre-feet	inches
Initial LID Storage	0.006	0.073
Total Precipitation	50.095	611.200
Evaporation Loss	6.059	73.925
Infiltration Loss	35.622	434.620
Surface Runoff	2.889	35.247
LID Drainage	5.818	70.989
Final Storage	0.012	0.140
Continuity Error (%)	-0.597	

Flow Routing Continuity	Volume acre-feet	Volume 10^6 gal
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	8.707	2.837
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	8.706	2.837
Flooding Loss	0.000	0.000
Evaporation Loss	0.001	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.000
Continuity Error (%)	0.004	

****
Highest Flow Instability Indexes
****
All links are stable.

****
Routing Time Step Summary
****

Minimum Time Step	:	60.00 sec
Average Time Step	:	60.00 sec
Maximum Time Step	:	60.00 sec
Percent in Steady State	:	0.00
Average Iterations per Step	:	1.00
Percent Not Converging	:	0.00

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip in	Total Runon in	Total Evap in	Total Infil in	Total Runoff in	Total Runoff 10^6 gal	Peak Runoff CFS	Runoff Coeff
DMIN-A2	611.20	0.00	43.87	266.06	310.10	0.78	0.08	0.507
DMA-A	611.20	0.00	34.59	342.32	239.97	1.94	0.24	0.393
BMP-A	611.20	9092.16	806.69	0.00	8898.28	1.90	0.24	0.917
PERM_PVMT	611.20	479.46	285.07	765.02	40.26	0.16	0.37	0.037
DMA-PP	611.20	0.00	25.17	432.73	155.68	1.87	0.11	0.255

****
LID Performance Summary
****

Subcatchment	LID Control	Total Inflow in	Evap Loss in	Infil Loss in	Surface Outflow in	Drain Outflow in	Initial Storage in	Final Storage in	Continuity Error %
BMP-A	BASIN-A	9703.36	806.71	0.00	609.57	8288.93	1.80	4.12	-0.04
PERM_PVMT	PERM_PVMT	1090.66	285.08	765.05	7.11	33.14	0.40	0.64	0.00

****
Node Depth Summary
****

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min	Reported Max Depth Feet
POC-A	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
DIV-A	DIVIDER	0.00	0.00	0.00	0 00:00	0.00
STOR-A	STORAGE	0.00	0.16	0.16	15108 12:04	0.16

****
Node Inflow Summary

****

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent
POC-A	OUTFALL	0.42	0.58	5578 02:16	0.94	2.84	0.000
DIV-A	DIVIDER	0.24	0.24	15108 12:01	1.9	1.9	0.000
STOR-A	STORAGE	0.00	0.20	15108 12:01	0	0.0982	0.115

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 ft3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 ft3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CFS
STOR-A	0.000	0	0	0	0.071	9	15108 12:03	0.20

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CFS	Max Flow CFS	Total Volume 10^6 gal
POC-A	1.70	0.01	0.58	2.837
System	1.70	0.01	0.58	2.837

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days	hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
DRAIN-2	DUMMY	0.05	7119	00:04			
BYPASS-A	DUMMY	0.20	15108	12:01			
MID-FLOW-A	DUMMY	0.20	15108	12:04			

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Mon Apr 11 11:20:56 2022
Analysis ended on: Mon Apr 11 11:21:53 2022
Total elapsed time: 00:00:57

PRE-DEVELOPED RUNOFF CONDITION (POC C) OUTPUT FILE

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)
--------------------------------------------------------------

Gamble Lane, Pre-Developed Runoff Condition POC C


***********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
***********************************************************

****************
Analysis Options
****************
Flow Units ............... CFS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... NO
  Water Quality .......... NO
Infiltration Method ...... GREEN_AMPT
Starting Date ............ 08/28/1951 05:00:00
Ending Date .............. 05/23/2008 23:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 01:00:00
Wet Time Step ............ 00:15:00
Dry Time Step ............ 04:00:00


**************************        Volume         Depth
Runoff Quantity Continuity     acre-feet        inches
**************************     ---------       -------
Total Precipitation ......       116.612       611.200
Evaporation Loss .........         5.114        26.806
Infiltration Loss ........        76.720       402.111
Surface Runoff ...........        35.846       187.878
Final Storage ............         0.002         0.012
```

Continuity Error (%) ..... -0.917

Flow Routing Continuity	Volume acre-feet	Volume 10^6 gal
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	35.845	11.681
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	35.845	11.681
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.000
Continuity Error (%)	0.000	

Subcatchment Runoff Summary

Subcatchment	Total Precip in	Total Runon in	Total Evap in	Total Infil in	Total Runoff in	Total Runoff 10^6 gal	Peak Runoff CFS	Runoff Coeff
DMA-C	611.20	0.00	26.81	402.11	187.88	11.68	1.77	0.307

Analysis begun on: Thu Apr 07 15:42:27 2022
Analysis ended on: Thu Apr 07 15:43:04 2022
Total elapsed time: 00:00:37

POST-DEVELOPED RUNOFF CONDITION (POC C) OUTPUT FILE

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)
------------------------------------------------------------

Gamble Lane,Post-Developed Runoff Condition POC C

WARNING 04: minimum elevation drop used for Conduit DRAIN-2
WARNING 04: minimum elevation drop used for Conduit BYPASS-C

***********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
***********************************************************

***************
Analysis Options
***************
Flow Units ............... CFS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Infiltration Method ...... GREEN_AMPT
Flow Routing Method ...... KINWAVE
Starting Date ............ 08/28/1951 05:00:00
Ending Date .............. 05/23/2008 23:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 01:00:00
Wet Time Step ............ 00:15:00
Dry Time Step ............ 04:00:00
Routing Time Step ........ 60.00 sec


*************************        Volume         Depth
Runoff Quantity Continuity     acre-feet        inches
*************************     ---------       -------
Initial LID Storage ......         0.006         0.032
```

```
Total Precipitation ......       119.324       611.200
Evaporation Loss .........         9.379        48.040
Infiltration Loss ........        66.998       343.174
Surface Runoff ...........         9.436        48.332
LID Drainage .............        34.591       177.182
Final Storage ............         0.020         0.103
Continuity Error (%) .....        -0.916

**************************        Volume        Volume
Flow Routing Continuity        acre-feet      10^6 gal
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......        44.027        14.347
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........        44.026        14.347
Flooding Loss ............         0.000         0.000
Evaporation Loss .........         0.005         0.002
Exfiltration Loss ........         0.000         0.000
Initial Stored Volume ....         0.000         0.000
Final Stored Volume ......         0.000         0.000
Continuity Error (%) .....        -0.009

*******************************
Highest Flow Instability Indexes
*******************************
All links are stable.

*************************
Routing Time Step Summary
*************************
Minimum Time Step           :    60.00 sec
Average Time Step           :    60.00 sec
Maximum Time Step           :    60.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     1.00
Percent Not Converging      :     0.00

**************************
Subcatchment Runoff Summary
```

****

Subcatchment	Total Precip in	Total Runon in	Total Evap in	Total Infil in	Total Runoff in	Total Runoff 10^6 gal	Peak Runoff CFS	Runoff Coeff
BMP-C	611.20	12195.25	838.82	0.00	11967.10	13.62	1.69	0.934
SM-C	611.20	0.00	4.64	553.67	56.62	0.28	0.14	0.093
DMAC2	611.20	0.00	58.34	159.57	403.88	0.41	0.03	0.661
DMA-C	611.20	0.00	35.68	335.33	245.90	13.88	1.66	0.402
DMINC1	611.20	0.00	57.88	162.84	400.89	0.04	0.00	0.656

****
LID Performance Summary
****

Subcatchment	LID Control	Total Inflow in	Evap Loss in	Infil Loss in	Surface Outflow in	Drain Outflow in	Initial Storage in	Final Storage in	Continuity Error %
BMP-C	BASIN-C	12806.45	838.86	0.00	2060.42	9907.15	1.80	4.85	-0.02

****
Node Depth Summary
****

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min	Reported Max Depth Feet
POC-C	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
DIV-C	DIVIDER	0.00	0.00	0.00	0 00:00	0.00
STOR-C	STORAGE	0.00	0.42	0.42	15108 12:17	0.38

****
Node Inflow Summary
****

	Maximum	Maximum		Lateral	Total	Flow

Node	Type	Lateral Inflow CFS	Total Inflow CFS	Time of Max Occurrence days hr:min	Inflow Volume 10^6 gal	Inflow Volume 10^6 gal	Balance Error Percent
POC-C	OUTFALL	0.17	1.73	15108 12:01	0.73	14.3	0.000
DIV-C	DIVIDER	1.69	1.69	15108 12:01	13.6	13.6	0.000
STOR-C	STORAGE	0.00	1.60	15108 12:01	0	2.3	-0.059

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 ft3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 ft3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CFS
STOR-C	0.000	0	0	0	0.913	25	15108 12:16	1.54

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CFS	Max Flow CFS	Total Volume 10^6 gal
POC-C	2.73	0.04	1.73	14.345
System	2.73	0.04	1.73	14.345

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days	hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
DRAIN-2	DUMMY	0.09	4973	16:08			
BYPASS-C	DUMMY	1.60	15108	12:01			
MID-FLOW-C	DUMMY	1.54	15108	12:17			

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Fri Apr 08 10:48:58 2022
Analysis ended on: Fri Apr 08 10:49:58 2022
Total elapsed time: 00:01:00

ATTACHMENT 10
Drawdown Calculations

Drawdown Calculations

Note: Drawdown calculations are from invert of lowest surface discharge opening in riser structure to the surface bottom of the basin. Therefore, discharge occurs only through the underdrain orifice.

Drawdown Calculations - BMP A1

Surface Ponding Depth:	PD	**6**	in
Ponding Depth Surface Area:	A_{PD}	**407**	ft^2
Surface Ponding Volume:	V_{PD}	**156**	ft^3
Low Flow Orifice Diameter:	D	**1**	in
Flow Rate (volumetric):	Q	**0.045**	ft^3/s
Drawdown Time:		0.96	hrs

Drawdown Calculations - BMP C1

Surface Ponding Depth:	PD	**6**	in
Ponding Depth Surface Area:	A_{PD}	**2041**	ft^2
Surface Ponding Volume:	V_{PD}	**805**	ft^3
Low Flow Orifice Diameter:	D	**1.417**	in
Flow Rate (volumetric):	Q	**0.090**	ft^3/s
Drawdown Time:		2.47	hrs

PROJECT CHARACTERISTICS	
SOIL TYPE	TYPE C
PROJECT AREA	2.50 ACRES
DISTURBED AREA	1.97 ACRES
PROPOSED IMPERVIOUS AREA	0.74 ACRES
PROPOSED PERVIOUS AREA	1.23 ACRES
DEPTH TO GROUNDWATER	> 20 FEET

LEGEND

DMA NAME	DMA A1
AREA (SQUARE FEET)	12,956 SF
SELF-MITIGATING DMA	SM B
POINT OF COMPLIANCE (POC)	POC A
CONCRETE	
ASPHALT	
BIOFILTRATION BASIN	
PERMEBLE PAVERS	
TREE WELL	
DMA BOUNDARY	
PROJECT BOUNDARY	
EXISTING CONCRETE BROW DITCH	
RIP RAP ENERGY DISSIPATERS (D-40)	

HMP MODELING

DEVELOPED CONDITIONS

A TENTATIVE PARCEL MAP (TPM) IS BEING PROPOSED WITH THREE (3) PARCELS FOR THE GAMBLE LANE PROJECT. EACH PARCEL WILL HAVE A SINGLE FAMILY RESIDENTIAL DWELLING UNIT. UN-IMPROVED CALLE CATALINA WILL BE IMPROVED ONSITE AND WILL CONNECT TO GAMBLE LANE ALONG THE NORTHERLY PROJECT BOUNDARY.

TWO (2) SWMM SIMULATIONS WERE PREPARED FOR THE STUDY: THE FIRST FOR PRE-DEVELOPMENT AND THE SECOND FOR THE POST-DEVELOPED CONDITIONS. THE PROJECT SITE DRAINS TO TWO (2) POINTS OF COMPLIANCES.

POC A, ENCOMPASSES RUNOFF FROM PARCEL 1 GRADED PAD, PERMEABLE PAVER DRIVEWAY SERVING PARCEL 1 FROM CALLE CATALINA AND A PORTION OF THE OFFSITE LOT WITH A SINGLE FAMILY RESIDENTIAL BUILDING AND ACCESSORY IMPROVEMENTS THAT DRAIN ONSITE. RUNOFF FROM THE GRADED PAD WILL BE CONVEYED INTO A BIOFILTRATION BASIN FOR POLLUTANT CONTROL TREATMENT, HYDROMODIFICATION (FLOW CONTROL) AND MITIGATION OF THE 100-YEAR RUNOFF. THE OUTLETS FROM THE BIOFILTRATION BASIN AND PERMEABLE PAVERS WILL BE DISCHARGED INTO AN EXISTING CONCRETE BROW DITCH ALONG THE SOUTHERLY BOUNDARY. THE PERMEABLE PAVERS WILL PROVIDE POLLUTANT CONTROL TREATMENT AND FLOW CONTROL FOR ONSITE PERVIOUS AREAS AND RUNOFF FROM THE EXISTING OFFSITE LOT WITH A SINGLE FAMILY RESIDENTIAL BUILDING AND ACCESSORY IMPROVEMENTS THAT DRAIN ONTO THE SITE. THERE WILL BE A GREEN STREET TREE WELL NEAR SOUTHEAST CORNER OF THE CALLE CATALINA IMPROVEMENTS. THE TREE WELL WILL BE LINED TO PREVENT INFILTRATION. LOW FLOWS WILL INFILTRATE THROUGH THE STRUCTURAL SOIL OF THE TREE WELL AT APPROXIMATELY 5 IN/HR, THEN WILL BE DISCHARGED THROUGH A 6" SUBDRAIN THAT WILL BE CONNECTED TO THE YARD DRAIN FOR PARCEL 3, AND EVENTUALLY DISCHARGED INTO THE BIOFILTRATION BASIN PART OF POC C. THIS LOW FLOW IS CONSIDERED MINUSCULE AND IS NOT MODELED IN SWMM FOR POC C. HIGH FLOWS THAT BYPASS THE TREE WELL WILL CONTINUE DOWNSTREAM ONTO CALLE CATALINA.

THE BMP A1 IS COMPRISED OF 6-INCHES OF PONDING, 3-INCHES OF NON-FLOATABLE MULCH, AN 18-INCH LAYER OF AMENDED SOIL (A HIGHLY SANDY, ORGANIC RICH COMPOST WITH AN INFILTRATION CAPACITY OF AT LEAST 5 IN/HR), 6-INCHES OF PEA GRAVEL, AND A 12-INCH RESERVOIR LAYER OF GRAVEL FOR ADDITIONAL DETENTION, AND TO ACCOMMODATE THE FRENCH DRAIN SYSTEM. BELOW THE RESERVOIR LAYER, THE BASIN WILL INCLUDE 3-INCHES OF SATURATED STORAGE. FLOWS WILL DISCHARGE FROM THE BASIN VIA A LOW-FLOW ORIFICE OUTLET WITHIN THE GRAVEL LAYER TO THE RECEIVING STORM DRAIN SYSTEM. A RISER STRUCTURE WILL ALSO BE CONSTRUCTED WITHIN THE BMP WITH AN EMERGENCY OVERFLOW, SUCH THAT PEAK FLOWS CAN BE SAFELY DISCHARGED DOWNSTREAM.

BMP A2 (PERMEABLE PAVERS) IS PARTIALLY RESPONSIBLE FOR HANDLING HYDROMODIFICATION REQUIREMENTS FOR POC A. THE PERMEABLE PAVERS BMP WILL COMPRISE OF PERMEABLE PAVERS, 4-INCHES OF BEDDING LAYER OF AGGREGATE (ASTM NO. 8 STONE), 12-INCHES OF AGGREGATE (ASTM NO. 57 STONE), INCLUDING AN 8-INCH PVC DRAIN, AND 6-INCHES OF COMPACTED AGGREGATE (ASTM NO. 57 STONE).

BMP A3 (GREEN STREET TREE WELL) PROVIDES NO HYDROMODIFICATION, BUT IS MODELED IN SWMM FOR POC A.

DRAINAGE BASIN C, ENCOMPASSES RUNOFF FROM PARCEL 2, PARCEL 3, PORTION OF CALLE CATALINA, GAMBLE LANE AND A PORTION OF THE EXISTING OFFSITE SINGLE FAMILY RESIDENTIAL DWELLING DRAINING ONTO GAMBLE LANE. RUNOFF FROM PARCEL 2 AND PARCEL 3 WILL BE DISCHARGED INTO THE BIOFILTRATION BASIN VIA SEPARATE YARD DRAINS. A PORTION OF RUNOFF FROM GAMBLE LANE WILL BE INTERCEPTED BY A CURB INLET AND DISCHARGED INTO THE BIOFILTRATION BASIN VIA A STORM DRAIN. THE BIOFILTRATON BASIN WILL PROVIDE POLLUTANT CONTROL TREATMENT, HYDROMODIFICATION (FLOW CONTROL) AND TO MITIGATE THE 100-YEAR RUNOFF. THERE WILL BE A GREEN STREET TREE WELL NEAR NORTHEAST CORNER OF THE GAMBLE LANE IMPROVEMENTS. THE TREE WELL WILL BE LINED TO PROVIDE SOME INFILTRATION, NO SUBDRAIN IS PROVIDED DUE TO ELEVATION CONSTRAINTS. LOW FLOWS WILL INFILTRATE THROUGH THE STRUCTURAL SOIL OF THE TREE WELL AT APPROXIMATELY 5 IN/HR, THEN WILL INFILTRATE INTO ONSITE SOILS. HIGH FLOWS THAT BYPASS THE TREE WELL WILL CONTINUE DOWNSTREAM ONTO GAMBLE LANE.

BMP C1 (BIOFILTRATION BASIN) RESPONSIBLE FOR HANDLING HYDROMODIFICATION REQUIREMENTS FOR POC C. BMP C1 WILL HAVE A TOTAL DEPTH OF 24-INCHES INCLUDING FREEBOARD. THE BMP IS COMPRISED OF 6-INCHES OF PONDING, 3-INCHES OF NON-FLOATABLE MULCH, AN 18-INCH LAYER OF AMENDED SOIL (A HIGHLY SANDY, ORGANIC RICH COMPOST WITH AN INFILTRATION CAPACITY OF AT LEAST 5 IN/HR), 6-INCHES OF PEA GRAVEL, AND A 12-INCH RESERVOIR LAYER OF GRAVEL FOR ADDITIONAL DETENTION, AND TO ACCOMMODATE THE FRENCH DRAIN SYSTEM. BELOW THE RESERVOIR LAYER, THE BASIN WILL INCLUDE 3-INCHES OF SATURATED STORAGE. FLOWS WILL DISCHARGE FROM THE BASIN VIA A LOW-FLOW ORIFICE OUTLET WITHIN THE GRAVEL LAYER TO THE RECEIVING STORM DRAIN SYSTEM. A RISER STRUCTURE WILL ALSO BE CONSTRUCTED WITHIN THE BMP WITH AN EMERGENCY OVERFLOW, SUCH THAT PEAK FLOWS CAN BE SAFELY DISCHARGED DOWNSTREAM.

BMP C2 (GREEN STREET TREE WELL) PROVIDES NO HYDROMODIFICATION, BUT IS MODELED IN SWMM POC C.

30' 15' 0' 30' 60' 90'

SCALE: 1" = 30'

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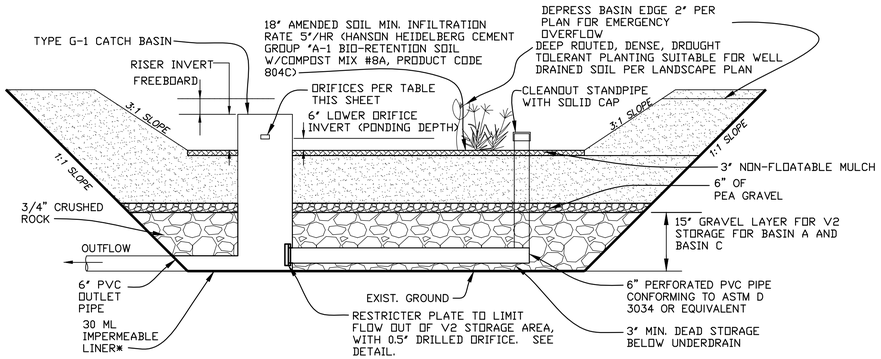
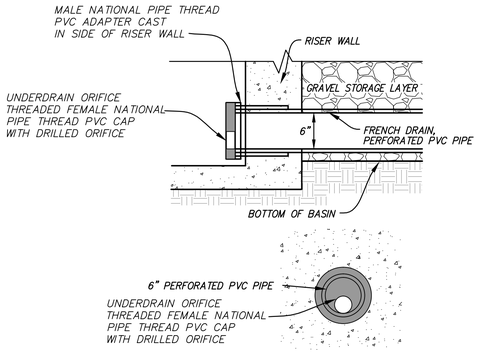
HMP EXHIBIT
GAMBLE LANE
TENTATIVE PARCEL MAP
ESCONDIDO, CA



BIOFILTRATION BASIN DETAIL, BMP A1 & C1

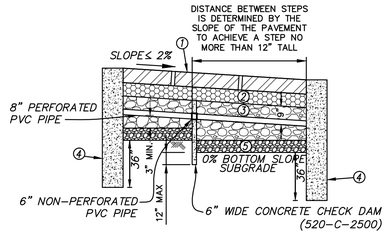
NOT TO SCALE

**30 MIL LINER NOTE: 30-MIL IMPERMEABLE LINER FOR BIORETENTION CONFORM TO THE FOLLOWING SPECIFICATIONS: SPECIFIC GRAVITY (ASTM D792): 1.2 (G/CC, MIN.); TENSILE (ASTM D882): 73 (LB/IN-WIDTH, MIN); ELONGATION AT BREAK (ASTM D882): 380 (% MIN); MODULUS (ASTM D882): 30 (LB/IN-WIDTH, MIN.); AND TEAR STRENGTH (ASTM D1004): 8 (LB/IN, MIN); SEAM SHEAR STRENGTH (ASTM D882) 58.4 (LB/IN, MIN); SEAM PEEL STRENGTH (ASTM D882) 15 (LB/IN, IN). SEE COLORADO LINING INTERNATIONAL PVC 30 HTTP://WWW.COLORADOLINING.COM/PRODUCTS/PVC.PDF) OR APPROVED EQUAL.*



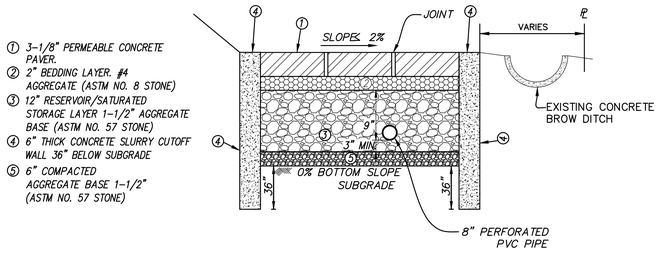
RESTRICTOR CAP DETAIL

NOT TO SCALE



PERMEABLE PAVERS

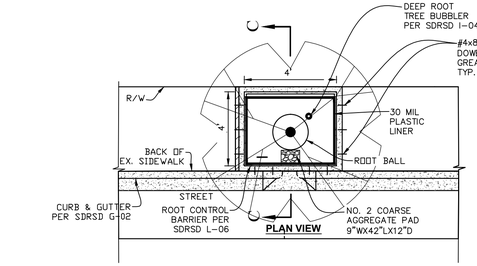
LONGITUDINAL/TERRACED SLOPE
NOT TO SCALE

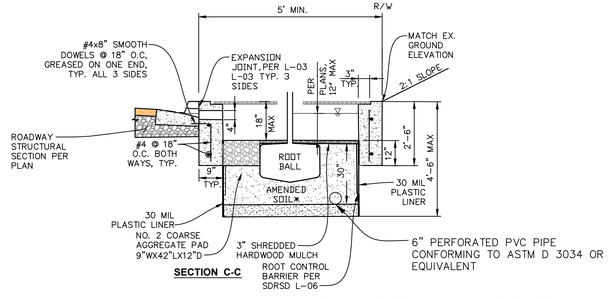


① 3-1/8" PERMEABLE CONCRETE PAVER.
② 2" BEDDING LAYER. #4 AGGREGATE (ASTM NO. 8 STONE)
③ 12" RESERVOIR/SATURATED STORAGE LAYER 1-1/2" AGGREGATE BASE (ASTM NO. 57 STONE)
④ 6" THICK CONCRETE SLURRY CUTOFF WALL 36" BELOW SUBGRADE
⑤ 6" COMPACTED AGGREGATE BASE 1-1/2" (ASTM NO. 57 STONE)

PERMEABLE PAVERS

NOT TO SCALE

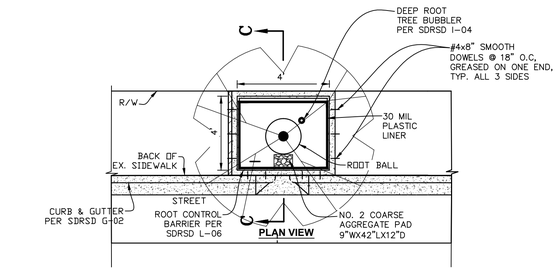


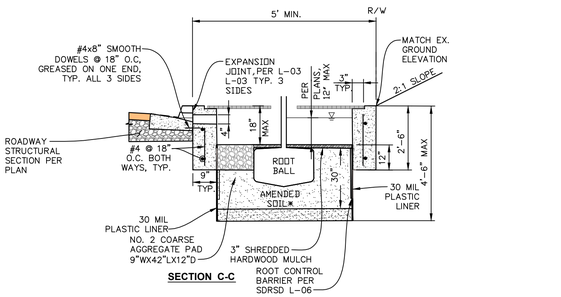


* 30" AMENDED SOIL MIN. INFILTRATION RATE 5"/HR (HANSON HEIDELBERG CEMENT GROUP "A-1 BIO-RETENTION SOIL W/COMPOST MIX #8A, PRODUCT CODE 804C)

TREE WELL, BMP A3

WITH SUBDRAIN
NOT TO SCALE





* 30" AMENDED SOIL MIN. INFILTRATION RATE 5"/HR (HANSON HEIDELBERG CEMENT GROUP "A-1 BIO-RETENTION SOIL W/COMPOST MIX #8A, PRODUCT CODE 804C)

TREE WELL, BMP C2

WITHOUT SUBDRAIN
NOT TO SCALE

Biofiltration BMP	Tributary Area (Ac)	DIMENSIONS					
		BMP Area[1] (ft^2)	Underdrain Orifice,	Total Media Depth	Total Gravel Depth[3]	Riser Invert Elev,	Total Surface Depth,
BMPA	0.30	342	1.00	18	12	12	24
BMP C	2.08	1,825	1.42	18	12	14	29

Notes:
(1): Area of amended soil = area of gravel = area of BMP.
(2): Diameter of the orifice in gravel layer with invert at bottom of layer; tied with hydromod min threshold (10%Q2).
(3): Does not include gravel below pipe invert.
(4): Depth from bottom of pond to invert of emergency overflow weir.
(5): Total surface ponding depth from the bottom of the pond to the top of the pond berm (pond spill crest).

POC 1	Lower Orifice Dimensions			Middle Orifice Dimensions			Emergency Weir		
	Outlet Type[1]	Invert Elev, HL[2] (in)	Dimensions (#) - height x width[3]	Outlet Type[1]	Invert Elev, HL[2] (in)	Dimensions (#) - height x width[3]	Riser Type	Riser Invert Elev,	Weir Perimeter Length (ft)
BMP A	Diameter	6	(4) - 1"	Slot	7	(1) 1" x 16"	Type G CB	12	11.84
BMP C	Slot	6	(1) - 3" x 23"	n/a	n/a	n/a	Type G CB	12	11.84

Notes:
(1): Shape of orifice opening in riser structure.
(2): Depth from bottom of pond to invert of orifice or weir.
(3): Number of orifices - dimensions of orifice. For example for Basin C: one (1) slot orifice, slot height (hs) =3", slot width (bs) = 23", invert at 6".
(4): Depth from bottom of pond to invert of emergency overflow weir.

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HMP EXHIBIT
GAMBLE LANE
TENTATIVE PARCEL MAP
ESCONDIDO, CA

POTENTIAL CCSYAS
Legend
Yes
Amanda Ln
Amanda Ln
Amanda Ln
Gamble Ln
Gamble Ln
Mountain Hills Pl
Cl Catalina
Calle Catalina
Continental Ln
Continental Ln
Sonrisa Glen
Google Earth
500 ft
N
Google

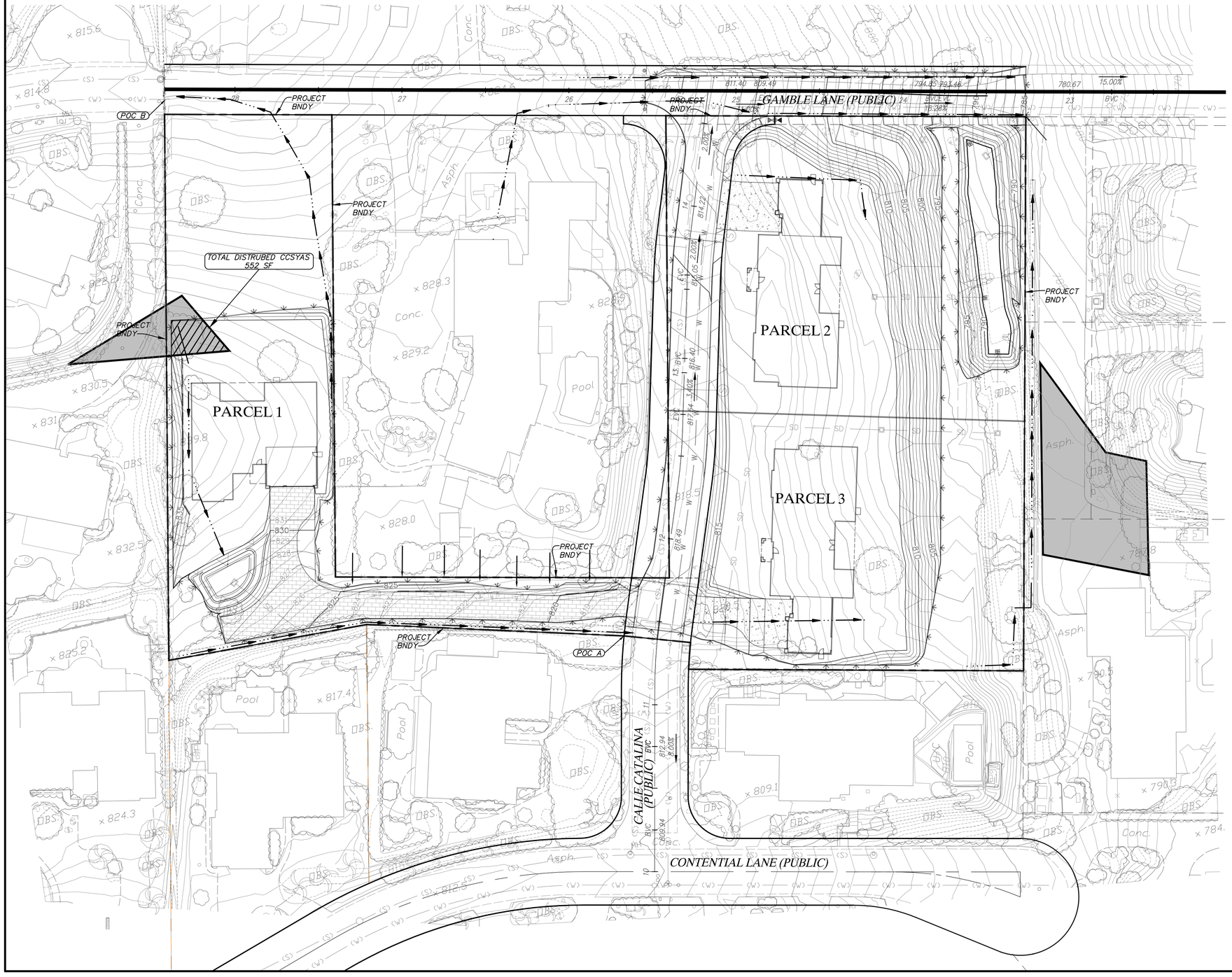
LEGEND

POTENTIAL CRITICAL COARSE SEDIMENT YIELD AREAS (CCSYA)

DISTRUBED POTENTIAL CRITICAL COARSE SEDIMENT YIELD AREAS (CCSYA)

LIMITS OF GRADING

PROJECT BOUNDARY



30' 15' 0' 30' 60' 90'

SCALE: 1" = 30'

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CCSYAS EXHIBIT
GAMBLE LANE
ESCONDIDO, CA

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)

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ATTACHMENT 3

Structural BMP Maintenance Information

This is the cover sheet for Attachment 3.

Indicate which Items are Included behind this cover sheet:

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

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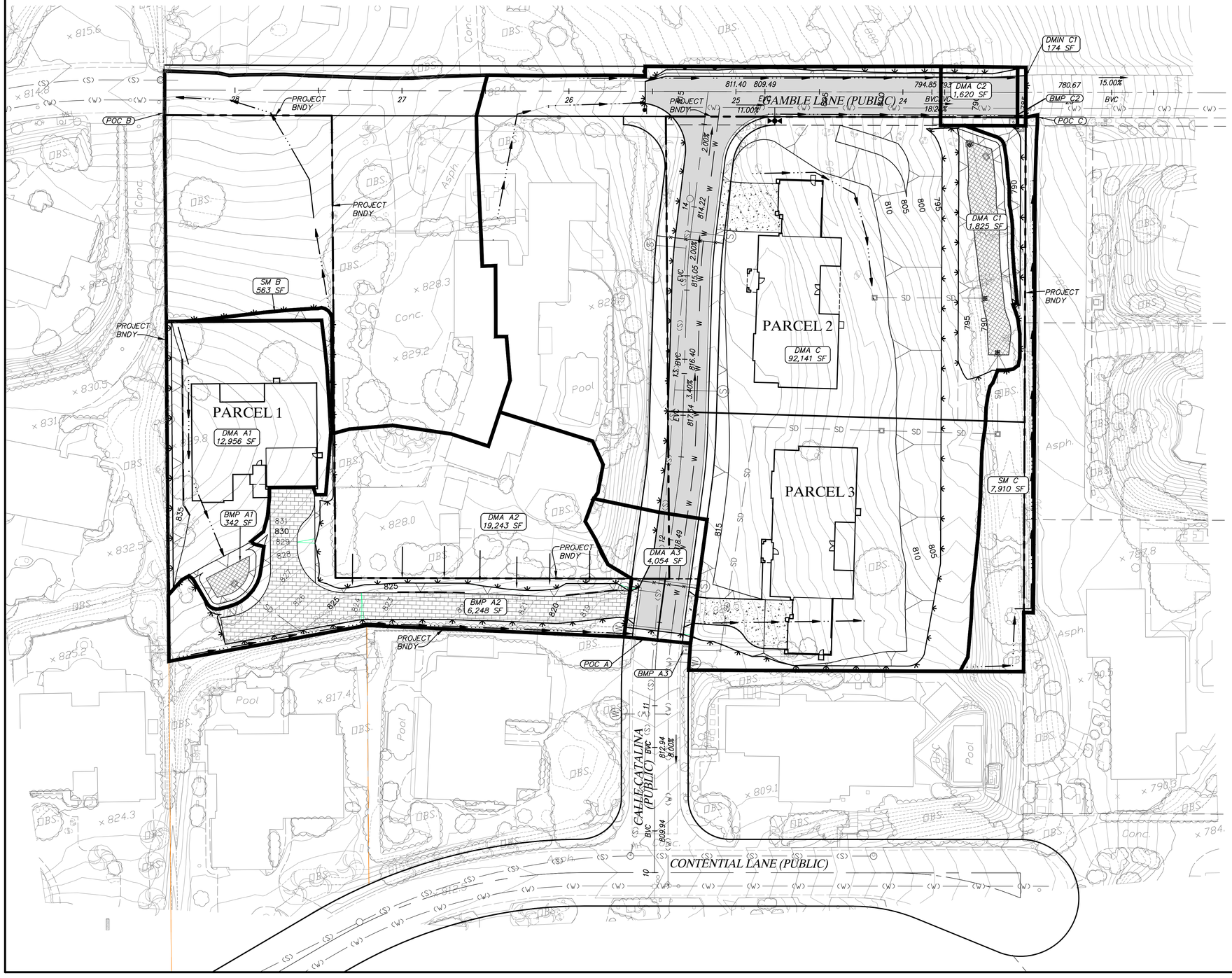
PROJECT CHARACTERISTICS	
SOIL TYPE	TYPE C
PROJECT AREA	2.50 ACRES
DISTURBED AREA	1.97 ACRES
PROPOSED IMPERVIOUS AREA	0.74 ACRES
PROPOSED PERVIOUS AREA	1.23 ACRES
DEPTH TO GROUNDWATER	> 20 FEET

LEGEND

DMA NAME	DMA A1
AREA (SQUARE FEET)	12,956 SF
SELF-MITIGATING DMA	SM B
POINT OF COMPLIANCE (POC)	POC A
CONCRETE	
ASPHALT	
BIOFILTRATION BASIN	
PERMEBLE PAVERS	
TREE WELL	
DMA BOUNDARY	
PROJECT BOUNDARY	
EXISTING CONCRETE BROW DITCH	
RIP RAP ENERGY DISSIPATERS (D-40)	



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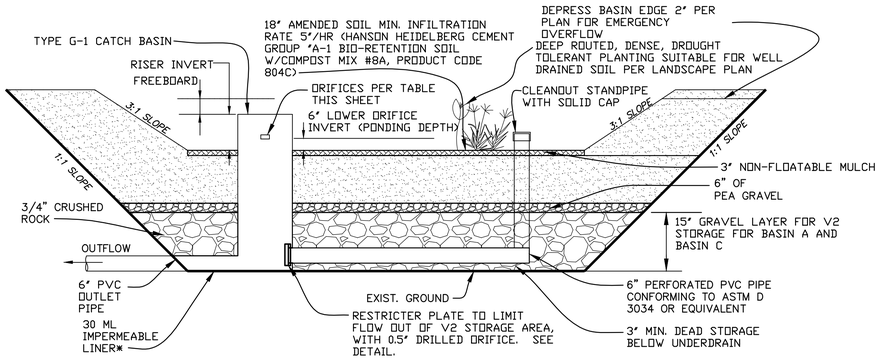
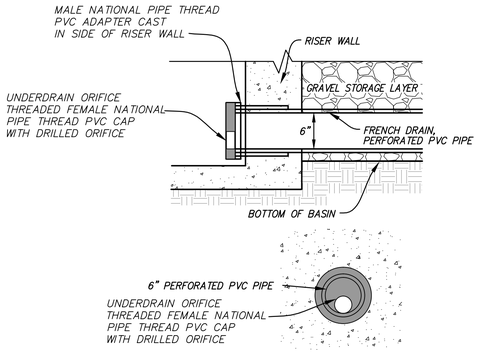
BMP EXHIBIT
GAMBLE LANE
TENTATIVE PARCEL MAP
ESCONDIDO, CA



BIOFILTRATION BASIN DETAIL, BMP A1 & C1

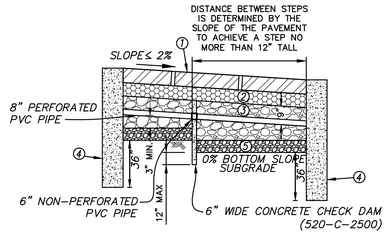
NOT TO SCALE

**30 MIL LINER NOTE: 30-MIL IMPERMEABLE LINER FOR BIORETENTION CONFORM TO THE FOLLOWING SPECIFICATIONS: SPECIFIC GRAVITY (ASTM D792): 1.2 (G/CC, MIN.); TENSILE (ASTM D882): 73 (LB/IN-WIDTH, MIN); ELONGATION AT BREAK (ASTM D882): 380 (% MIN); MODULUS (ASTM D882): 30 (LB/IN-WIDTH, MIN.); AND TEAR STRENGTH (ASTM D1004): 8 (LB/IN, MIN); SEAM SHEAR STRENGTH (ASTM D882) 58.4 (LB/IN, MIN); SEAM PEEL STRENGTH (ASTM D882) 15 (LB/IN, IN). SEE COLORADO LINING INTERNATIONAL PVC 30 HTTP://WWW.COLORADOLINING.COM/PRODUCTS/PVC.PDF) OR APPROVED EQUAL.*



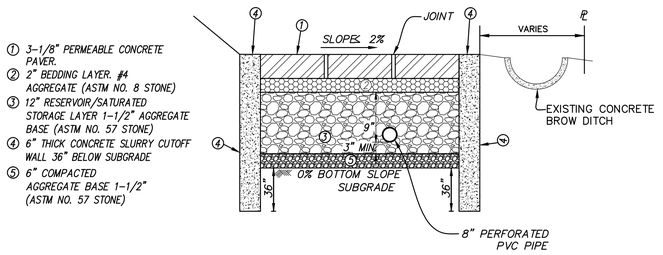
RESTRICTOR CAP DETAIL

NOT TO SCALE



PERMEABLE PAVERS

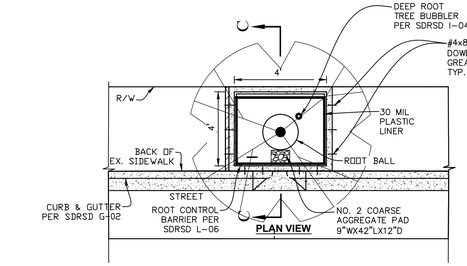
LONGITUDINAL/TERRACED SLOPE
NOT TO SCALE

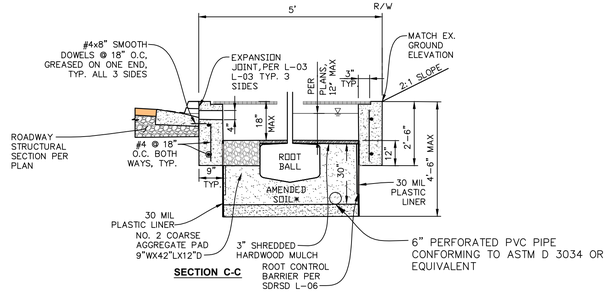


① 3-1/8" PERMEABLE CONCRETE PAVER.
② 2" BEDDING LAYER. #4 AGGREGATE (ASTM NO. 8 STONE)
③ 12" RESERVOIR/SATURATED STORAGE LAYER 1-1/2" AGGREGATE BASE (ASTM NO. 57 STONE)
④ 6" THICK CONCRETE SLURRY CUTOFF WALL 36" BELOW SUBGRADE
⑤ 6" COMPACTED AGGREGATE BASE 1-1/2" (ASTM NO. 57 STONE)

PERMEABLE PAVERS

NOT TO SCALE

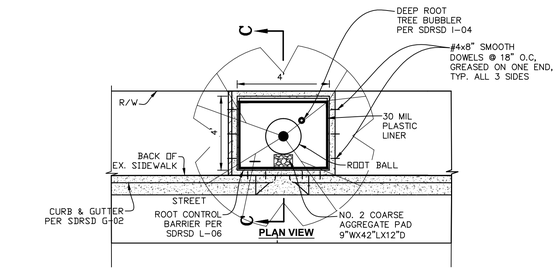


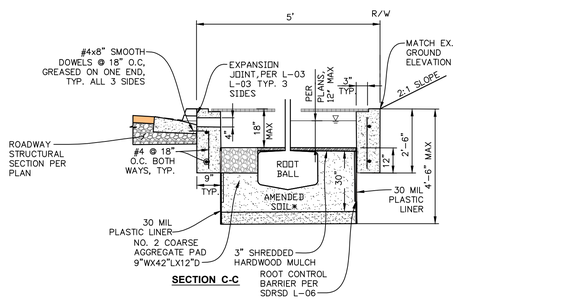


* 30" AMENDED SOIL MIN. INFILTRATION RATE 5"/HR (HANSON HEIDELBERG CEMENT GROUP "A-1 BIO-RETENTION SOIL W/COMPOST MIX #8A, PRODUCT CODE 804C)

TREE WELL, BMP A3

WITH SUBDRAIN
NOT TO SCALE





* 30" AMENDED SOIL MIN. INFILTRATION RATE 5"/HR (HANSON HEIDELBERG CEMENT GROUP "A-1 BIO-RETENTION SOIL W/COMPOST MIX #8A, PRODUCT CODE 804C)

TREE WELL, BMP C2

WITHOUT SUBDRAIN
NOT TO SCALE

Biofiltration BMP	Tributary Area (Ac)	DIMENSIONS					
		BMP Area[1] (ft^2)	Underdrain Orifice,	Total Media Depth	Total Gravel Depth[3]	Riser Invert Elev,	Total Surface Depth,
BMPA	0.30	342	1.00	18	12	12	24
BMP C	2.08	1,825	1.42	18	12	14	29

Notes:
(1): Area of amended soil = area of gravel = area of BMP.
(2): Diameter of the orifice in gravel layer with invert at bottom of layer; tied with hydromod min threshold (10%Q2).
(3): Does not include gravel below pipe invert.
(4): Depth from bottom of pond to invert of emergency overflow weir.
(5): Total surface ponding depth from the bottom of the pond to the top of the pond berm (pond spill crest).

POC 1	Lower Orifice Dimensions			Middle Orifice Dimensions			Emergency Weir		
	Outlet Type[1]	Invert Elev, HL[2] (in)	Dimensions (#) - height x width[3]	Outlet Type[1]	Invert Elev, HL[2] (in)	Dimensions (#) - height x width[3]	Riser Type	Riser Invert Elev,	Weir Perimeter Length (ft)
BMP A	Diameter	6	(4) - 1"	Slot	7	(1) 1" x 16"	Type G CB	12	11.84
BMP C	Slot	6	(1) - 3" x 23"	n/a	n/a	n/a	Type G CB	12	11.84

Notes:
(1): Shape of orifice opening in riser structure.
(2): Depth from bottom of pond to invert of orifice or weir.
(3): Number of orifices - dimensions of orifice. For example for Basin C: one (1) slot orifice, slot height (hs) =3", slot width (bs) = 23", invert at 6".
(4): Depth from bottom of pond to invert of emergency overflow weir.

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BMP EXHIBIT
GAMBLE LANE
TENTATIVE PARCEL MAP
ESCONDIDO, CA

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

Attachment 3a must identify:

- ☒Specific maintenance indicators and actions for proposed structural BMP(s). This must be based on Section 7.7 of the Storm Water Design Manual and enhanced to reflect actual proposed components of the structural BMP(s)
- ☒How to access the structural BMP(s) to inspect and perform maintenance
- ☒Features that are provided to facilitate inspection (e.g., observation ports, cleanouts, silt posts, or other features that allow the inspector to view necessary components of the structural BMP and compare to maintenance thresholds)
- ☒Manufacturer and part number for proprietary parts of structural BMP(s) when applicable
- ☒Maintenance thresholds specific to the structural BMP(s), with a location-specific frame of reference (e.g., level of accumulated materials that triggers removal of the materials, to be identified based on viewing marks on silt posts or measured with a survey rod with respect to a fixed benchmark within the BMP)
- ☒Recommended equipment to perform maintenance
- ☒When applicable, necessary special training or certification requirements for inspection and maintenance personnel such as confined space entry or hazardous waste management

Attachment 3b: For all Structural BMPs, Attachment 3b must include a draft maintenance agreement in the City's standard format (PDP applicant to contact City staff to obtain the current maintenance agreement forms or download from City's website).

Attachment 3b:

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ATTACHMENT 4

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

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City of Escondido Storm Water Structural BMP Verification Form Page 1 of 4	
Project Summary Information	
Project Name	Gamble Lane Tentative Parcel Map
Record ID (e.g., grading/improvement plan number)	
Project Address	North of Calle Catalina and south of Gamble Lane
Assessor's Parcel Number(s) (APN(s))	238-071-23
Project Watershed (Complete Hydrologic Unit, Area, and Subarea Name with Numeric Identifier)	San Dieguito 905, Felicita Creek (905.23), Lake Hodges (905.21), San Dieguito River (905.11
Maintenance Notification / Agreement No.	
Responsible Party for Construction Phase	
Developer's Name	Michael H. Galey, Trustee
Address	171 Saxony Road, Suite 101 Encinitas, CA 92024
Email Address	mhgaley@galeyhomes.com
Phone Number	(760) 632-8032
Engineer of Work	Ronald Holloway
Engineer's Phone Number	760-931-8700
Responsible Party for Ongoing Maintenance	
Owner's Name(s)*	Michael H. Galey, Trustee
Address	171 Saxony Road, Suite 101 Encinitas, CA 92024
Email Address	mhgaley@galeyhomes.com
Phone Number	(760) 632-8032
*Note: If a corporation or LLC, provide information for principal partner or Agent for Service of Process. If an HOA, provide information for the Board or property manager at time of project closeout.	

City of Escondido Storm Water Structural BMP Verification Form Page 2 of 4				
Stormwater Structural Pollutant Control & Hydromodification Control BMPs* (List all from SWQMP)				
Description/Type of Structural BMP	**Plan Sheet #**	**Structural BMP ID#**	**Maintenance Agreement Recorded Doc #**	**Revisions**
*All Priority Development Projects (PDPs) require a Structural BMP				

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

City of Escondido Storm Structural BMP Verification Form Page 3 of 4

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

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

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

Please sign your name and seal.

Professional Engineer's Printed Name:

_____

Professional Engineer's Signed Name:

_____

[SEAL]

Date: _____

City of Escondido Storm Water Structural BMP Verification Form Page 4 of 4

CITY - OFFICIAL USE ONLY:

Permit #:_____

City Inspector: _____

Date Project has/expects to close: _____

Date verification received from Engineer of Work (EOW): _____

By signing below, City Inspector concurs that every noted Structural BMP has been installed per plan.

City Inspector's Signature: _____Date: _____

FOR Environmental Programs:

Date Received from Field Engineering:_____

Environmental Programs Submittal Reviewer:_____

Environmental Programs Reviewer concurs that the information provided for the following Structural BMPs is acceptable to enter into the Structural BMP Maintenance verification inventory:

List **acceptable** Structural BMPs:

Environmental Programs Reviewer's Signature: _____

Date: _____

ATTACHMENT 5

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

This is the cover sheet for Attachment 5.

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

The plans must identify:

☒Structural BMP(s) with ID numbers matching Step 6 Summary of PDP Structural BMPs
☒The grading and drainage design shown on the plans must be consistent with the delineation of DMAs shown on the DMA exhibit
☒Details and specifications for construction of structural BMP(s)
☒Signage indicating the location and boundary of structural BMP(s) as required by City staff
☒How to access the structural BMP(s) to inspect and perform maintenance
☒Features that are provided to facilitate inspection (e.g., observation ports, cleanouts, silt posts, or other features that allow the inspector to view necessary components of the structural BMP and compare to maintenance thresholds)
☒Manufacturer and part number for proprietary parts of structural BMP(s) when applicable
☒Maintenance thresholds specific to the structural BMP(s), with a location-specific frame of reference (e.g., level of accumulated materials that triggers removal of the materials, to be identified based on viewing marks on silt posts or measured with a survey rod with respect to a fixed benchmark within the BMP)
☒Recommended equipment to perform maintenance
☒When applicable, necessary special training or certification requirements for inspection and maintenance personnel such as confined space entry or hazardous waste management
☒Include landscaping plan sheets showing vegetation requirements for vegetated structural BMP(s)
☒All BMPs must be fully dimensioned on the plans
☒When proprietary BMPs are used, site-specific cross section with outflow, inflow, and model number must be provided. Photocopies of general brochures are not acceptable.
☒Include all source control and site design measures described in Steps 4 and 5 of the SWQMP. Can be included as a separate exhibit as necessary.

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