

Appendix I

Major Stormwater Management Plan

Hunsaker & Associates 2015

**Major Stormwater Management Plan
(Major SWMP)
For**

Amanda Estates

**Preparation/Revision Date:
February 12, 2015**

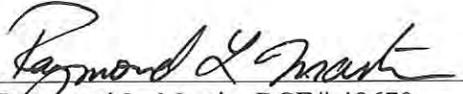
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The selection, sizing, and preliminary design of stormwater treatment and other control measures in this plan have been prepared under the direction of the following Registered Civil Engineer and meet the requirements of Regional Water Quality Control Board Order R9-2007-0001 and subsequent amendments.


Raymond L. Martin, RCE# 48670



2/12/15
Date

The Major Stormwater Management Plan (Major SWMP) must be completed in its entirety and accompany applications to the County for a permit or approval associated with certain types of development projects. To determine whether your project is required to submit a Major or Minor SWMP, please reference the County's Stormwater Intake Form for Development Projects.

Project Name:	Amanda Estates
Project Location:	West of Interstate-15 and north of Gamble Lane, east of Greenwood Place, south of Blackhawk Glen in the City of Escondido within San Diego County
Permit Number (Land Development Projects):	TM XXXX-X
Work Authorization Number (CIP only):	
Applicant:	New Urban West, Inc.
Applicant's Address:	1733 Ocean Avenue, Suite 350 Santa Monica CA 90401
Plan Prepared By:	Hunsaker & Associates - San Diego, Inc.
Preparer's Address:	9707 Waples Street San Diego, CA 92121
Date:	February 12, 2015

The County of San Diego Watershed Protection, Storm Water Management, and Discharge Control Ordinance (WPO) (Ordinance No. 9926) requires all applications for a permit or approval associated with a Land Disturbance Activity to be accompanied by a Storm Water Management Plan (SWMP) (section 67.806.b). The purpose of the SWMP is to describe how the project will minimize the short and long-term impacts on receiving water quality. Projects that meet the criteria for a priority development project are required to prepare a Major SWMP.

Since the SWMP is a living document, revisions may be necessary during various stages of approval by the County. Please provide the approval information requested below.

Project Stages	Does the SWMP need revisions?		If YES, Provide Revision Date
	YES	NO	
Tentative Map		X	

Instructions for a Major SWMP can be downloaded at http://www.co.san-diego.ca.us/dpw/watersheds/susmp/susmppdf/susmp_manual.pdf

Completion of the following checklists and attachments will fulfill the requirements of a Major SWMP for the project listed above.

STEP 1**PRIORITY DEVELOPMENT PROJECT DETERMINATION****TABLE 1: IS THE PROJECT IN ANY OF THESE CATEGORIES?**

Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	A	Housing subdivision of 10 or more dwelling units. Examples: single-family homes, multi-family homes, condominiums, and apartments.
Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	B	Commercial—greater than one acre. Any development other than heavy industry or residential. Examples: hospitals; laboratories and other medical facilities; educational institutions; recreational facilities; municipal facilities; commercial nurseries; multi-apartment buildings; car wash facilities; mini-malls and other business complexes; shopping malls; hotels; office buildings; public warehouses; automotive dealerships; airfields; and other light industrial facilities.
Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	C	Heavy industry—greater than one acre. Examples: manufacturing plants, food processing plants, metal working facilities, printing plants, and fleet storage areas (bus, truck, etc.).
Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	D	Automotive repair shops. A facility categorized in any one of Standard Industrial Classification (SIC) codes 5013, 5014, 5541, 7532-7534, or 7536-7539.
Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	E	Restaurants. Any facility that sells prepared foods and drinks for consumption, including stationary lunch counters and refreshment stands selling prepared foods and drinks for immediate consumption (SIC code 5812), where the land area for development is greater than 5,000 square feet. Restaurants where land development is less than 5,000 square feet shall meet all SUSMP requirements except for structural treatment BMP and numeric sizing criteria requirements and hydromodification requirements.
Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	F	Hillside development greater than 5,000 square feet. Any development that creates 5,000 square feet of impervious surface and is located in an area with known erosive soil conditions, where the development will grade on any natural slope that is twenty-five percent or greater.
Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	G	Environmentally Sensitive Areas (ESAs). All development located within or directly adjacent to or discharging directly to an ESA (where discharges from the development or redevelopment will enter receiving waters within the ESA), which either creates 2,500 square feet of impervious surface on a proposed project site or increases the area of imperviousness of a proposed project site to 10% or more of its naturally occurring condition. “Directly adjacent” means situated within 200 feet of the ESA. “Discharging directly to” means outflow from a drainage conveyance system that is composed entirely of flows from the subject development or redevelopment site, and not commingled with flows from adjacent lands.
Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	H	Parking lots 5,000 square feet or more or with 15 or more parking spaces and potentially exposed to urban runoff.
Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	I	Street, roads, highways, and freeways. Any paved surface that is 5,000 square feet or greater used for the transportation of automobiles, trucks, motorcycles, and other vehicles.
Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	J	Retail Gasoline Outlets (RGOs) that are: (a) 5,000 square feet or more or (b) a projected Average Daily Traffic (ADT) of 100 or more vehicles per day.

To use the table, review each definition A through K. If any of the definitions match, the project is a Priority Development Project. Note some thresholds are defined by square footage of impervious area created; others by the total area of the development. Please see special requirements for previously developed sites and project exemptions on page 6 of the County SUSMP.

STEP 2

PROJECT STORMWATER QUALITY DETERMINATION

Total Project Site Area 11.22 Acres

Estimated amount of disturbed acreage: 10.42 (Acres or ft²)

(If >1 acre, you must also provide a WDID number from the SWRCB) WDID: TBD

Complete A through C and the calculations below to determine the amount of impervious surface on your project before and after construction.

A. Total size of project site: 11.22 Acres

B. Total impervious area (including roof tops) before construction 0.33 (Acres)

C. Total impervious area (including roof tops) after construction 6.34 (Acres)

Calculate percent impervious before construction: B/A 2.96%

Calculate percent impervious after construction: C/A 56.50%

Please provide detailed descriptions regarding the following questions:

TABLE 2: PROJECT SPECIFIC STORMWATER ANALYSIS

1.	Please provide a brief description of the project.
<p>The proposed development will create 21 single family residential lots. The property is located west of the proposed extension of Amanda Lane, north of Gamble Lane within the City of Escondido, California. Please refer to the Vicinity Map in Appendix 1. The project will include utility improvements including sewer water, and storm drain. Water quality, hydromodification, and detention facilities will be included in the development of this project. Separate from the onsite ‘Amanda Estates’ improvements, this project will also improvements along Amanda Lane and Gamble Lane. These improvements include storm drain facilities along with curb and some pavement.</p>	
2.	Describe the current and proposed zoning and land use designation.
<p>The general plan designation for this site is Residential Estate (R-E) II. The proposed plan designation will be Estate II.</p> <p>The current and proposed land use designations for the project are agriculture and single family residential.</p>	
3.	Describe the pre-project and post-project topography of the project. (Show on Plan)
<p>The Amanda Estates project site is 11.22 acres, located in the City of Escondido, California. The property is located west of the proposed extension of Amanda Lane, north of Gamble Lane, east of Greenwood Place, and south of Blackhawk Glen. See Vicinity Map below.</p> <p>The pre-project topography varies from 842 to 743 MSL. A hill is currently centrally located with a residential home at its peak. An access road to the home connects it to Amanda Lane. Drainage is radial down the slope. However, runoff from the eastern half of the site is eventually directed towards the southeast within both man-made and naturally occurring drainage channels. This runoff sheet flows in a southeasterly direction and confluences with runoff generated by areas south and east of the project boundary. A riser located at the northwest corner of Gamble Lane and Eucalyptus Avenue collects this flow and directs it south within the existing 48” storm drain on Eucalyptus Avenue. The eastern portion of the site is within the Hamilton Lane storm drain basin as designated in the City of Escondido Drainage Master Plan.</p> <p>The western portion of the site slopes towards the west. Runoff from this area is collected by storm drain facilities located at the rear of two existing residential lots along Greenwood Place. Both lots combined receive runoff from approximately 5.4 acres of the Amanda Estates project area. This area is part of the Del Dios Avenue Drainage Basin as designated in the City’s Drainage Master Plan.</p> <p>See Item 6 below for discussion related to the post development condition of the site.</p>	
4.	Describe the soil classification, permeability, erodibility, and depth to groundwater for LID and Treatment BMP consideration. (Show on Plan). If infiltration BMPs are proposed, a Geotechnical Engineer must certify infiltration BMPs in Attachment E.
<p>Soils in the vicinity of the project are classified as types B. Infiltration BMPs are not proposed. The proposed water quality facilities will include an impermeable liner to deter any local ground infiltration from occurring and potentially undermining the surrounding facilities.</p>	
5.	Describe if contaminated or hazardous soils are within the project area.
None detected.	

6.	Describe the existing and proposed site drainage and natural hydrologic features. (Show on Plan)
<p>Existing – The existing site consists of a centrally located hill which drains radially. However, runoff from the eastern half of the site eventually drains towards the southeast along the project boundary. Runoff sheet flows across several properties in a southeasterly direction until it reaches the intersection of Gamble Lane and Eucalyptus Avenue. An existing riser structure connects to the storm drain along Eucalyptus Avenue which conveys runoff south, ultimately outletting into Felicita Creek. The western half the site drains west and is collected by the existing drainage facilities located in the rear of the existing residential lots. This runoff is conveyed downstream by the existing storm drain along Greenwood Place. Runoff eventually discharges into Escondido Creek downstream.</p> <p>Proposed – The proposed site design will cut and flatten the existing hill. Street grades will vary between 4-12% and slope towards the southeast corner of the site. A small portion of area which previously drained west is diverted east in the proposed design. Approximately 2.65 acres will be diverted from the west (Del Dios Drainage Basin) to the east (Hamilton Lane Drainage Basin). The reduction in area towards the west will reduce the amount of runoff flowing onto two residential lots along Greenwood Place. No impervious areas will be added to the westward-draining areas. On the other hand, the increase in acreage towards the west will increase the unmitigated peak flow amounts. Therefore, an onsite detention basin is proposed to attenuate the peak developed flows draining to the southeast corner of the site and will reduce them below existing condition. This basin will also serve water quality and hydromodification uses as described later in this SWMP.</p> <p>Currently, drainage from the west side of Amanda Lane generally sheet flows across Amanda Lane towards the east then southeast till it reaches a riser located at the northwest corner of Gamble Lane and Eucalyptus Avenue. The improvements of Amanda Lane will alter this existing drainage scenario. For example, offsite flows from the northern portion of existing Amanda Lane will be collected with catch basin inlets and be conveyed together with developed onsite ‘Amanda Estate’ flows towards the existing storm drain on Gamble Lane. These offsite flows are from approximately 4 acres east of Amanda Lane. The drainage patterns associated with the southern portion of Amanda Lane will remain unaffected by the Amanda Estate project and continue to flow overland towards the riser at the northwest corner of Gamble Lane and Eucalyptus Avenue and continue downstream in the existing 48” storm drain.</p> <p>A small portion of Amanda Lane at the entrance to the developed site will include a bioretention swale along the east side of the road to collect and treat the 85th percentile rainfall event.</p> <p>The proposed onsite detention basin was sized to attenuate peak flows to below existing condition in order to insure that the existing downstream storm drain infrastructure along Gamble Lane and Eucalyptus Avenue was not compromised. The basin will also address hydromodification in accordance with the City of Escondido HMP requirements.</p>	
7.	Describe site features and conditions that constrain, or provide opportunities for stormwater control, such as LID features.
<p>The available surface area provides the opportunity to implement bioretention areas. Bioretention is the preferred method of treatment, per the County of San Diego SUSMP. Poorly draining soils within the project area prevent the use of infiltration.</p>	

8.	Is this project within the environmentally sensitive areas as defined on the maps in Appendix A of the <i>County of San Diego Standard Urban Storm Water Mitigation Plan for Land Development and Public Improvement Projects</i> ?
	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
9.	Is this an emergency project?
	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No

CHANNELS & DRAINAGES

Complete the following checklist to determine if the project includes work in channels.

TABLE 3: PROJECT SPECIFIC STORMWATER ANALYSIS

No.	CRITERIA	YES	NO	N/A	COMMENTS
1.	Will the project include work in channels?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	If YES go to 2 If NO go to 13.
2.	Will the project increase velocity or volume of downstream flow?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	If YES go to 6.
3.	Will the project discharge to unlined channels?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	If YES go to 6.
4.	Will the project increase potential sediment load of downstream flow?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	If YES go to 6.
5.	Will the project encroach, cross, realign, or cause other hydraulic changes to a stream that may affect downstream channel stability?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	If YES go to 8.
6.	Review channel lining materials and design for stream bank erosion.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Continue to 7.
7.	Consider channel erosion control measures within the project limits as well as downstream. Consider scour velocity.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Continue to 8.
8.	Include, where appropriate, energy dissipation devices at culverts.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Continue to 9.
9.	Ensure all transitions between culvert outlets/headwalls/wingwalls and channels are smooth to reduce turbulence and scour.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Continue to 10.
10.	Include, if appropriate, detention facilities to reduce peak discharges.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Continue to 11.
11.	“Hardening” natural downstream areas to prevent erosion is not an acceptable technique for protecting channel slopes, unless pre-development conditions are determined to be so erosive that hardening would be required even in the absence of the proposed development.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Continue to 12.
12.	Provide other design principles that are comparable and equally effective.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Continue to 13.
13.	End	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

TEMPORARY CONSTRUCTION BMPs

Please check the construction BMPs that may be implemented during construction of the project. The applicant will be responsible for the placement and maintenance of the BMPs incorporated into the final project design.

- | | |
|---|---|
| <input checked="" type="checkbox"/> Silt Fence | <input checked="" type="checkbox"/> Desilting Basin |
| <input checked="" type="checkbox"/> Fiber Rolls | <input checked="" type="checkbox"/> Gravel Bag Berm |
| <input checked="" type="checkbox"/> Street Sweeping and Vacuuming | <input checked="" type="checkbox"/> Sandbag Barrier |
| <input checked="" type="checkbox"/> Storm Drain Inlet Protection | <input checked="" type="checkbox"/> Material Delivery and Storage |
| <input checked="" type="checkbox"/> Stockpile Management | <input checked="" type="checkbox"/> Spill Prevention and Control |
| <input checked="" type="checkbox"/> Solid Waste Management | <input type="checkbox"/> Concrete Waste Management |
| <input checked="" type="checkbox"/> Stabilized Construction Entrance/Exit | <input checked="" type="checkbox"/> Water Conservation Practices |
| <input type="checkbox"/> Dewatering Operations | <input type="checkbox"/> Paving and Grinding Operations |
| <input type="checkbox"/> Vehicle and Equipment Maintenance | |
| <input type="checkbox"/> Any minor slopes created incidental to construction and not subject to a major or minor grading permit shall be protected by covering with plastic or tarp prior to a rain event, and shall have vegetative cover reestablished within 180 days of completion of the slope and prior to final building approval. | |

EXCEPTIONAL THREAT TO WATER QUALITY DETERMINATION

Complete the checklist below to determine if a proposed project will pose an “exceptional threat to water quality,” and therefore require Advanced Treatment Best Management Practices during the construction phase.

TABLE 4: EXCEPTIONAL THREAT TO WATER QUALITY DETERMINATION
Exemption potentially available for projects that require advanced treatment:

No.	CRITERIA	YES	NO	INFORMATION
1.	Is all or part of the proposed project site within 200 feet of waters named on the Clean Water Act (CWA) Section 303(d) list of Water Quality Limited Segments as impaired for sedimentation and/or turbidity? Current 303d list may be obtained from the following site: http://www.waterboards.ca.gov/water_issues/programs/tmdl/2010state_ir_reports/category5_report.shtml	<input type="checkbox"/>	<input checked="" type="checkbox"/>	If YES, continue to 2. If NO, go to 5.
2.	Will the project disturb more than 5 acres, including all phases of the development?	<input type="checkbox"/>	<input type="checkbox"/>	If YES, continue to 3. If NO, go to 5.
3.	Will the project disturb slopes that are steeper than 4:1 (horizontal: vertical) with at least 10 feet of relief, and that drain toward the 303(d) listed receiving water for sedimentation and/or turbidity?	<input type="checkbox"/>	<input type="checkbox"/>	If YES, continue to 4. If NO, go to 5.
4.	Will the project disturb soils with a predominance of USDA-NRCS Erosion factors k_f greater than or equal to 0.4?	<input type="checkbox"/>	<input type="checkbox"/>	If YES, continue to 6. If NO, go to 5.
5.	Project is not required to use Advanced Treatment BMPs.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Document for Project Files by referencing this checklist.
6.	Project poses an “exceptional threat to water quality” and is required to use Advanced Treatment BMPs.	<input type="checkbox"/>	<input type="checkbox"/>	Advanced Treatment BMPs must be consistent with WPO section 67.811(b)(20)(D) performance criteria.

Exemption potentially available for projects that require advanced treatment: Project proponent may perform a Revised Universal Soil Loss Equation, Version 2 (RUSLE 2), Modified Universal Soil Loss Equation (MUSLE), or similar analysis that shows to the County official’s satisfaction that advanced treatment is not required

STEP 3**HYDROMODIFICATION DETERMINATION**

The following questions provide a guide to collecting information relevant to hydromodification management issues.

TABLE 5: HYDROMODIFICATION DETERMINATION

	QUESTIONS	YES	NO	Information
1.	Will the project reduce the pre-project impervious area and are the unmitigated post-project outflows (outflows without detention routing) to each outlet location less as compared to the pre-project condition?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	If NO, continue to 2. If YES, go to 7.
2.	Would the project site discharge runoff directly to an exempt receiving water, such as the Pacific Ocean, San Diego Bay, an exempt reservoir, or a tidally-influenced area?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	If NO, continue to 3. If YES, go to 7.
3.	Would the project site discharge to a stabilized conveyance system, which has the capacity for the ultimate Q 10, and extends to the Pacific Ocean, San Diego Bay, a tidally-influenced area, an exempt river reach or reservoir?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	If NO, continue to 4. If YES, go to 7.
4.	Does the contributing watershed area to which the project discharges have an impervious area percentage greater than 70 percent?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	If NO, continue to 5. If YES, go to 7.
5.	Is this an urban infill project which discharges to an existing hardened or rehabilitated conveyance system that extends beyond the "domain of analysis," where the potential for cumulative impacts in the watershed are low, and the ultimate receiving channel has a "Low" susceptibility to erosion as defined in the SCCWRP channel assessment tool?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	If NO, continue to 6. If YES, go to 7.
6.	Project is required to manage hydromodification impacts.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Reference Appendix G "Hydromodification Management Plan" of the County SUSMP.
7.	Project is not required to manage hydromodification impacts.	<input type="checkbox"/>	<input type="checkbox"/>	Hydromodification Exempt. Keep on file.

STEP 4**POLLUTANTS OF CONCERN DETERMINATION****WATERSHED**

Please check the watershed(s) for the project.

<input type="checkbox"/> San Juan 901	<input type="checkbox"/> Santa Margarita 902	<input type="checkbox"/> San Luis Rey 903	<input checked="" type="checkbox"/> Carlsbad 904
<input checked="" type="checkbox"/> San Dieguito 905	<input type="checkbox"/> Penasquitos 906	<input type="checkbox"/> San Diego 907	<input type="checkbox"/> Sweetwater 909
<input type="checkbox"/> Otay 910	<input type="checkbox"/> Tijuana 911	<input type="checkbox"/> Whitewater 719	<input type="checkbox"/> Clark 720
<input type="checkbox"/> West Salton 721	<input type="checkbox"/> Anza Borrego 722	<input type="checkbox"/> Imperial 723	

http://www.waterboards.ca.gov/sandiego/water_issues/programs/basin_plan/index.shtml

HYDROLOGIC SUB-AREA NAME AND NUMBER(S)

Number	Name
905.23	Felicita
904.62	Escondido

http://www.waterboards.ca.gov/sandiego/water_issues/programs/basin_plan/index.shtml

SURFACE WATERS that each project discharge point proposes to discharge to. List the impairments identified in Table 7.

SURFACE WATERS (river, creek, stream, etc.)	Hydrologic Unit Basin Number	Impairment(s) listed [303(d) listed waters or waters with established TMDLs]	Distance to Project
Felicita Creek	905.23	Aluminum, TDS	1.2 miles
Escondido Creek	904.62	DDT, manganese, phosphate, selenium, sulfates, TDS	1.57 miles

http://www.waterboards.ca.gov/water_issues/programs/tmdl/docs/303dlists2006/epa/r9_06_303d_reqtmlds.pdf

GROUND WATERS

Ground Waters	Hydrologic Unit Basin Number	MUN	AGR	IND	PROC	CWR	FRESH
Hodges	905.2	•	•	•			
Escondido	904.62	•	•	•			

http://www.waterboards.ca.gov/sandiego/water_issues/programs/basin_plan/index.shtml

+ Excepted from Municipal

• Existing Beneficial Use

◦ Potential Beneficial Use

PROJECT ANTICIPATED AND POTENTIAL POLLUTANTS

Using Table 6, identify pollutants that are anticipated to be generated from the proposed priority project categories. Pollutants associated with any hazardous material sites that have been remediated or are not threatened by the proposed project are not considered a pollutant of concern.

TABLE 6: ANTICIPATED AND POTENTIAL POLLUTANTS GENERATED BY LAND USE TYPE

<i>PDP Categories</i>	<i>General Pollutant categories</i>								
	Sediments	Nutrients	Heavy Metals	Organic Compounds	Trash & Debris	Oxygen Demanding Substances	Oil & Grease	Bacteria & Viruses	Pesticides
Detached Residential Development	X	X			X	X	X	X	X
Attached Residential Development	X	X			X	P ⁽¹⁾	P ⁽²⁾	P	X
Commercial Development 1 acre or greater	P ⁽¹⁾	P ⁽¹⁾		P ⁽²⁾	X	P ⁽⁵⁾	X	P ⁽³⁾	P ⁽⁵⁾
Heavy industry /industrial development	X		X	X	X	X	X		
Automotive Repair Shops			X	X ⁽⁴⁾⁽⁵⁾	X		X		
Restaurants					X	X	X	X	
Hillside Development >5,000 ft ₂	X	X			X	X	X		X
Parking Lots	P ⁽¹⁾	P ⁽¹⁾	X		X	P ⁽¹⁾	X		P ⁽¹⁾
Retail Gasoline Outlets			X	X	X	X	X		
Streets, highways & Freeways	X	P ⁽¹⁾	X	X ⁽⁴⁾	X	P ⁽⁵⁾		X	

X = anticipated

P = potential

(1) A potential pollutant if landscaping exists on-site.

(2) A potential pollutant if the project includes uncovered parking areas.

(3) A potential pollutant if land use involves food or animal waste products.

(4) Including petroleum hydrocarbons.

(5) Including solvents.

PROJECT POLLUTANTS OF CONCERN SUMMARY TABLE

Please summarize the identified project pollutants of concern by checking the appropriate boxes in the table below and list any surface water impairments identified. Pollutants anticipated to be generated by the project, which are also causing impairment of receiving waters, shall be considered the primary pollutants of concern. For projects where no primary pollutants of concern exist, those pollutants identified as anticipated shall be considered secondary pollutants of concern.

TABLE 7: PROJECT POLLUTANTS OF CONCERN

Pollutant Category	Anticipated (X)	Potential (P)	Surface Water Impairments
Sediments	X		None
Nutrients	X		Phosphate
Heavy Metals	X		Aluminum, manganese
Organic Compounds	X		TDS
Trash & Debris	X		None
Oxygen Demanding Substances	X		Sulfates, selenium
Oil & Grease	X		None
Bacteria & Viruses	X		None
Pesticides	X		DDT

STEP 5

LID AND SITE DESIGN STRATEGIES

Each numbered item below is a Low Impact Development (LID) requirement of the WPO. Please check the box(s) under each number that best describes the LID BMP(s) and Site Design Strategies selected for this project.

TABLE 8: LID AND SITE DESIGN

1. Conserve natural Areas, Soils, and Vegetation
<input type="checkbox"/> Preserve well draining soils (Type A or B)
<input checked="" type="checkbox"/> Preserve Significant Trees
<input type="checkbox"/> Preserve critical (or problematic) areas such as floodplains, steep slopes, wetlands, and areas with erosive or unstable soil conditions
<input type="checkbox"/> Other. Description:
2. Minimize Disturbance to Natural Drainages
<input type="checkbox"/> Set-back development envelope from drainages
<input checked="" type="checkbox"/> Restrict heavy construction equipment access to planned green/open space areas
<input type="checkbox"/> Other. Description:
3. Minimize and Disconnect Impervious Surfaces (see 5)
<input type="checkbox"/> Clustered Lot Design
<input checked="" type="checkbox"/> Items checked in 5?
<input type="checkbox"/> Other. Description:
4. Minimize Soil Compaction
<input checked="" type="checkbox"/> Restrict heavy construction equipment access to planned green/open space areas
<input type="checkbox"/> Re-till soils compacted by construction vehicles/equipment
<input type="checkbox"/> Collect & re-use upper soil layers of development site containing organic Materials
<input type="checkbox"/> Other. Description:
5. Drain Runoff from Impervious Surfaces to Pervious Areas
<u>LID Street & Road Design</u>
<input checked="" type="checkbox"/> Curb-cuts to landscaping
<input checked="" type="checkbox"/> Rural Swales
<input type="checkbox"/> Concave Median
<input type="checkbox"/> Cul-de-sac Landscaping Design
<input type="checkbox"/> Other. Description:

<u>LID Parking Lot Design</u>
<input type="checkbox"/> Permeable Pavements
<input type="checkbox"/> Curb-cuts to landscaping
<input type="checkbox"/> Other. Description:
<u>LID Driveway, Sidewalk, Bike-path Design</u>
<input type="checkbox"/> Permeable Pavements
<input checked="" type="checkbox"/> Pitch pavements toward landscaping
<input type="checkbox"/> Other. Description:
<u>LID Building Design</u>
<input type="checkbox"/> Cisterns & Rain Barrels
<input checked="" type="checkbox"/> Downspout to yard
<input type="checkbox"/> Vegetated Roofs
<input type="checkbox"/> Other. Description:
<u>LID Landscaping Design</u>
<input type="checkbox"/> Soil Amendments
<input type="checkbox"/> Reuse of Native Soils
<input checked="" type="checkbox"/> Smart Irrigation Systems
<input type="checkbox"/> Street Trees
<input type="checkbox"/> Other. Description:
6. Minimize erosion from slopes
<input type="checkbox"/> Disturb existing slopes only when necessary
<input checked="" type="checkbox"/> Minimize cut and fill areas to reduce slope lengths
<input type="checkbox"/> Incorporate retaining walls to reduce steepness of slopes or to shorten slopes
<input type="checkbox"/> Provide benches or terraces on high cut and fill slopes to reduce concentration of flows
<input type="checkbox"/> Rounding and shaping slopes to reduce concentrated flow
<input checked="" type="checkbox"/> Collect concentrated flows in stabilized drains and channels
<input type="checkbox"/> Other. Description:

STEP 6

SOURCE CONTROL

Please complete the checklist on the following pages to determine Source Control BMPs. Below is instruction on how to use the checklist. (Also see instructions on page 42 of the *SUSMP*)

1. Review Column 1 and identify which of these potential sources of stormwater pollutants apply to your site. Check each box that applies.
2. Review Column 2 and incorporate all of the corresponding applicable BMPs in your Source Control Exhibit in Attachment B.
3. Review Columns 3 and 4 and incorporate all of the corresponding applicable permanent controls and operational BMPs in a table in your Project-Specific *SUSMP*.
4. Use the format in Table 9 below to summarize the project Source Control BMPs. Incorporate all identified Source Control BMPs in your Source Control Exhibit in Attachment B.

TABLE 9: PROJECT SOURCE CONTROL BMPS

<i>Potential source of runoff pollutants</i>	<i>Permanent source control BMPs</i>	<i>Operational source control BMPs</i>
<u>Onsite Storm Drains</u>	Mark all inlets with the words “No Dumping! Flows to Bay” or similar where feasible	Maintain and periodically repaint or replace inlet markings. Provide stormwater pollution prevention information to new site owners, lessees, or operators.
<u>Landscaped Areas</u>	Preserve existing native trees, shrubs, and ground cover to the maximum extent possible. Design landscaping to minimize irrigation and runoff, to promote surface infiltration where appropriate, and to minimize the use of fertilizers and pesticides that can contribute to stormwater pollution. Where landscaped areas are used to retain or detain stormwater, specify plants that are tolerant of saturated soil conditions. To insure successful establishment, select plants appropriate to site soils, slopes, climate, sun, wind, rain, land use, air movement, ecological consistency, and plant interactions.	Maintain landscaping using minimum or no pesticides. Provide IPM information to new owners, lessees and operators.

<u>Pools, spas, ponds, decorative fountains, and other water features</u>	If the local municipality requires pools to be plumbed to the sanitary sewer, place a note on the plans and state in the narrative that this connection will be made according to local requirements.	See applicable operational BMPs in Fact Sheet SC-72, "Fountain and Pool Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com
<u>Plazas, sidewalks, and parking lots.</u>		Plazas, sidewalks, and parking lots shall be swept regularly to prevent the accumulation of litter and debris. Debris from pressure washing shall be collected to prevent entry into the storm drain system. Washwater containing any cleaning agent or degreaser shall be collected and discharged to the sanitary sewer and not discharged to a storm drain.
Miscellaneous Drain or Wash Water	Avoid roofing, gutters, and trim made of copper or other unprotected metals that may leach into runoff	

Describe your specific Source Control BMPs in an accompanying narrative, and explain any special conditions or situations that required omitting Source Control BMPs or substituting alternatives.

Source Control BMPs listed in Table 9 cover the proposed development associated with the grading permit and possible future uses of all graded areas to the best of our knowledge. Future development should process separate SWMPs specific to the scope of the permit. (Building and/or Grading)

IF THESE SOURCES WILL BE ON THE PROJECT SITE...	...THEN YOUR STORMWATER CONTROL PLAN SHOULD INCLUDE THESE SOURCES CONTROL BMPs		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls – Show on Source Control Exhibit, Attachment B	3 Permanent Controls – List in SUSMP Table and Narrative	4 Operational BMPs – Include in SUSMP Table and Narrative
<input checked="" type="checkbox"/> A. On-site storm drain inlets	<input checked="" type="checkbox"/> Location of inlets.	<input checked="" type="checkbox"/> Mark all inlets with the words “No Dumping! Flows to Bay” or similar.	<input checked="" type="checkbox"/> Maintain and periodically repaint or replace inlet markings. <input checked="" type="checkbox"/> Provide stormwater pollution prevention information to new site owners, lessees, or operators. <input checked="" type="checkbox"/> See applicable operational BMPs in Fact Sheet SC-44, “Drainage System Maintenance,” in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com <input type="checkbox"/> Include the following in lease agreements: “Tenant shall not allow anyone to discharge anything to storm drains or to store or deposit materials so as to create a potential discharge to storm drains.”
<input type="checkbox"/> B. Interior floor drains and elevator shaft sump pumps		<input type="checkbox"/> State that interior floor drains and elevator shaft sump pumps will be plumbed to sanitary sewer.	<input type="checkbox"/> Inspect and maintain drains to prevent blockages and overflow.
<input type="checkbox"/> C. Interior parking garages		<input type="checkbox"/> State that parking garage floor drains will be plumbed to the sanitary sewer.	<input type="checkbox"/> Inspect and maintain drains to prevent blockages and overflow.

IF THESE SOURCES WILL BE ON THE PROJECT SITE...	...THEN YOUR STORMWATER CONTROL PLAN SHOULD INCLUDE THESE SOURCES CONTROL BMPs		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls – Show on Source Control Exhibit, Attachment B	3 Permanent Controls – List in SUSMP Table and Narrative	4 Operational BMPs – Include in SUSMP Table and Narrative
<input type="checkbox"/> D. Need for future indoor & structural pest control		<input type="checkbox"/> Note building design features that discourage entry of pests.	<input type="checkbox"/> Provide Integrated Pest Management information to owners, lessees, and operators.

IF THESE SOURCES WILL BE ON THE PROJECT SITE...	...THEN YOUR STORMWATER CONTROL PLAN SHOULD INCLUDE THESE SOURCES CONTROL BMPs		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls – Show on Source Control Exhibit, Attachment B	3 Permanent Controls – List in SUSMP Table and Narrative	4 Operational BMPs – Include in SUSMP Table and Narrative
<input checked="" type="checkbox"/> D2. Landscape/ Outdoor Pesticide Use <u>Note: Should be consistent with project landscape plan (if applicable).</u>	<input type="checkbox"/> Show locations of native trees or areas of shrubs and ground cover to be undisturbed and retained. <input type="checkbox"/> Show self-retaining landscape areas, if any. <input checked="" type="checkbox"/> Show stormwater treatment facilities	<p>State that final landscape plans will accomplish all of the following:</p> <input type="checkbox"/> Preserve existing native trees, shrubs, and ground cover to the maximum extent possible. <input checked="" type="checkbox"/> Design landscaping to minimize irrigation and runoff, to promote surface infiltration where appropriate, and to minimize the use of fertilizers and pesticides that can contribute to stormwater pollution. <input checked="" type="checkbox"/> Where landscaped areas are used to retain or detain stormwater, specify plants that are tolerant of saturated soil conditions. <input checked="" type="checkbox"/> Consider using pest-resistant plants, especially adjacent to hardscape. <input checked="" type="checkbox"/> To insure successful establishment, select plants appropriate to site soils, slopes, climate, sun, wind, rain, land use, air movement, ecological consistency, and plant interactions.	<input checked="" type="checkbox"/> Maintain landscaping using minimum or no pesticides. <input type="checkbox"/> See applicable operational BMPs in Fact Sheet SC-41, “Building and Grounds Maintenance,” in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com . <input type="checkbox"/> Provide IPM information to new owners, lessees and operators.

IF THESE SOURCES WILL BE ON THE PROJECT SITE...	...THEN YOUR STORMWATER CONTROL PLAN SHOULD INCLUDE THESE SOURCES CONTROL BMPs		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls – Show on Source Control Exhibit, Attachment B	3 Permanent Controls – List in SUSMP Table and Narrative	4 Operational BMPs – Include in SUSMP Table and Narrative
<input type="checkbox"/> E. Pools, spas, ponds decorative fountains, and other water features.	<input type="checkbox"/> Show location of water feature and a sanitary sewer cleanout in an accessible area within 10 feet.	<input type="checkbox"/> If the local municipality requires pools to be plumbed to the sanitary sewer, place a note on the plans and state in the narrative that this connection will be made according to local requirements.	<input type="checkbox"/> See applicable operational BMPs in Fact Sheet SC-72, “Fountain and Pool Maintenance,” in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com
<input type="checkbox"/> F. Food service	<input type="checkbox"/> For restaurants, grocery stores, and other food service operations, show location (indoors or in a covered area outdoors) of a floor sink or other area for cleaning floor mats, containers, and equipment. <input type="checkbox"/> On the drawing, show a note that this drain will be connected to a grease interceptor before discharging to the sanitary sewer.	<input type="checkbox"/> Describe the location and features of the designated cleaning area. <input type="checkbox"/> Describe the items to be cleaned in this facility and how it has been sized to insure that the largest items can be accommodated.	<input type="checkbox"/>

IF THESE SOURCES WILL BE ON THE PROJECT SITE...	...THEN YOUR STORMWATER CONTROL PLAN SHOULD INCLUDE THESE SOURCES CONTROL BMPs		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls – Show on Source Control Exhibit, Attachment B	3 Permanent Controls – List in SUSMP Table and Narrative	4 Operational BMPs – Include in SUSMP Table and Narrative
<input type="checkbox"/> G. Refuse areas	<input type="checkbox"/> Show where site refuse and recycled materials will be handled and stored for pickup. See local municipal requirements for sizes and other details of refuse areas. <input type="checkbox"/> If dumpsters or other receptacles are outdoors, show how the designated area will be covered, graded, and paved to prevent run-on and show locations of berms to prevent runoff from the area. <input type="checkbox"/> Any drains from dumpsters, compactors, and tallow bin areas shall be connected to a grease removal device before discharge to sanitary sewer.	<input type="checkbox"/> State how site refuse will be handled and provide supporting detail to what is shown on plans. <input type="checkbox"/> State that signs will be posted on or near dumpsters with the words “Do not dump hazardous materials here” or similar.	<input type="checkbox"/> State how the following will be implemented: Provide adequate number of receptacles. Inspect receptacles regularly; repair or replace leaky receptacles. Keep receptacles covered. Prohibit/prevent dumping of liquid or hazardous wastes. Post “no hazardous materials” signs. Inspect and pick up litter daily and clean up spills immediately. Keep spill control materials available on- site. See Fact Sheet SC-34, “Waste Handling and Disposal” in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com
<input type="checkbox"/> H. Industrial processes.	<input type="checkbox"/> Show process area.	<input type="checkbox"/> If industrial processes are to be located on site, state: “All process activities to be performed indoors. No processes to drain to exterior or to storm drain system.”	<input type="checkbox"/> See Fact Sheet SC-10, “Non Stormwater Discharges” in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com

IF THESE SOURCES WILL BE ON THE PROJECT SITE...	...THEN YOUR STORMWATER CONTROL PLAN SHOULD INCLUDE THESE SOURCES CONTROL BMPs		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls – Show on Source Control Exhibit, Attachment B	3 Permanent Controls – List in SUSMP Table and Narrative	4 Operational BMPs – Include in SUSMP Table and Narrative
<input type="checkbox"/> I. Outdoor storage of equipment or materials. (See rows J and K for source control measures for vehicle cleaning, repair, and maintenance.)	<input type="checkbox"/> Show any outdoor storage areas, including how materials will be covered. Show how areas will be graded and bermed to prevent run-on or run-off from area. <input type="checkbox"/> Storage of non-hazardous liquids shall be covered by a roof and/or drain to the sanitary sewer system, and be contained by berms, dikes, liners, or vaults. <input type="checkbox"/> Storage of hazardous materials and wastes must be in compliance with the local hazardous materials ordinance and a Hazardous Materials Management Plan for the site.	<input type="checkbox"/> Include a detailed description of materials to be stored, storage areas, and structural features to prevent pollutants from entering storm drains. Where appropriate, reference documentation of compliance with the requirements of local Hazardous Materials Programs for: <ul style="list-style-type: none"> ▪ Hazardous Waste Generation ▪ Hazardous Materials Release Response and Inventory ▪ California Accidental Release (CalARP) ▪ Aboveground Storage Tank ▪ Uniform Fire Code Article 80 Section 103(b) & (c) 1991 ▪ Underground Storage Tank 	<input type="checkbox"/> See Fact Sheet SC-31, “Outdoor Liquid Container Storage” and SC-33, “Outdoor Storage of Raw Materials” in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com

<input type="checkbox"/> J. Vehicle and Equipment Cleaning	<input type="checkbox"/> Show on drawings as appropriate: (1) Commercial/industrial facilities having vehicle /equipment cleaning needs shall either provide a covered, bermed area for washing activities or discourage vehicle/equipment washing by removing hose bibs and installing signs prohibiting such uses. (2) Multi-dwelling complexes shall have a paved, bermed, and covered car wash area (unless car washing is prohibited on-site and hoses are provided with an automatic shutoff to discourage such use). (3) Washing areas for cars, vehicles, and equipment shall be paved, designed to prevent run-on to or runoff from the area, and plumbed to drain to the sanitary sewer. (4) Commercial car wash facilities shall be designed such that no runoff from the facility is discharged to the storm drain system. Wastewater from the facility shall discharge to the sanitary sewer, or a wastewater reclamation system shall be installed.	<input type="checkbox"/> If a car wash area is not provided, describe measures taken to discourage on-site car washing and explain how these will be enforced.	Describe operational measures to implement the following (if applicable): <input type="checkbox"/> Washwater from vehicle and equipment washing operations shall not be discharged to the storm drain system. <input type="checkbox"/> Car dealerships and similar may rinse cars with water only. <input type="checkbox"/> See Fact Sheet SC-21, “Vehicle and Equipment Cleaning,” in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com
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<input type="checkbox"/> K. Vehicle/Equipment Repair and Maintenance	<input type="checkbox"/> Accommodate all vehicle equipment repair and maintenance indoors. Or designate an outdoor work area and design the area to prevent run-on and runoff of stormwater. <input type="checkbox"/> Show secondary containment for exterior work areas where motor oil, brake fluid, gasoline, diesel fuel, radiator fluid, acid-containing batteries or other hazardous materials or hazardous wastes are used or stored. Drains shall not be installed within the secondary containment areas. <input type="checkbox"/> Add a note on the plans that states either (1) there are no floor drains, or (2) floor drains are connected to wastewater pretreatment systems prior to discharge to the sanitary sewer and an industrial waste discharge permit will be obtained.	<input type="checkbox"/> State that no vehicle repair or maintenance will be done outdoors, or else describe the required features of the outdoor work area. <input type="checkbox"/> State that there are no floor drains or if there are floor drains, note the agency from which an industrial waste discharge permit will be obtained and that the design meets that agency's requirements. <input type="checkbox"/> State that there are no tanks, containers or sinks to be used for parts cleaning or rinsing or, if there are, note the agency from which an industrial waste discharge permit will be obtained and that the design meets that agency's requirements.	<p>In the SUSMP report, note that all of the following restrictions apply to use the site:</p> <input type="checkbox"/> No person shall dispose of, nor permit the disposal, directly or indirectly of vehicle fluids, hazardous materials, or rinsewater from parts cleaning into storm drains. <input type="checkbox"/> No vehicle fluid removal shall be performed outside a building, nor on asphalt or ground surfaces, whether inside or outside a building, except in such a manner as to ensure that any spilled fluid will be in an area of secondary containment. Leaking vehicle fluids shall be contained or drained from the vehicle immediately. <input type="checkbox"/> No person shall leave unattended drip parts or other open containers containing vehicle fluid, unless such containers are in use or in an area of secondary containment.
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<input type="checkbox"/> L. Fuel Dispensing Area	<input type="checkbox"/> Fueling areas ¹ shall have impermeable floors (i.e., portland cement concrete or equivalent smooth impervious surface) that are: a) graded at the minimum slope necessary to prevent ponding; and b) separated from the rest of the site by a grade break that prevents run-on of stormwater to the maximum extent practicable <input type="checkbox"/> Fueling areas shall be covered by a canopy that extends a minimum of ten feet in each direction from each pump. [Alternative: The fueling area must be covered and the cover's minimum dimensions must be equal to or greater than the area within the grade break or fuel dispensing area ¹ .] The canopy [or cover] shall not drain onto the fueling area.		<input type="checkbox"/> The property owner shall sweep the fueling area routinely. <input type="checkbox"/> See the Business Guide Sheet, "Automotive Service - Service, Stations" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com .
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¹ The fueling area shall be defined as the area extending a minimum of 6.5 feet from the corner of each fuel dispenser or the length at which the hose and nozzle assembly may be operated plus a minimum of one foot, whichever is greater.

<input type="checkbox"/> M. Loading Docks	<input type="checkbox"/> Show a preliminary design for the loading dock area, including roofing and drainage. Loading docks shall be covered and/or graded to minimize run-on to and runoff from the loading area. Roof downspouts shall be positioned to direct stormwater away from the loading area. Water from loading dock areas should be drained to the sanitary sewer where feasible. Direct connections to storm drains from depressed loading docks are prohibited. <input type="checkbox"/> Loading dock areas draining directly to the sanitary sewer shall be equipped with a spill control valve or equivalent device, which shall be kept closed during periods of operation. <input type="checkbox"/> Provide a roof overhang over the loading area or install door skirts (cowling) at each bay that enclose the end of the trailer.		<input type="checkbox"/> Move loaded and unloaded items indoors as soon as possible <input type="checkbox"/> See Fact Sheet SC-30, “Outdoor Loading and Unloading,” in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com
<input type="checkbox"/> N. Fire Sprinkler Test Water		<input type="checkbox"/> Provide a means to drain fire sprinkler test water to the sanitary sewer.	<input type="checkbox"/> See the note in Fact Sheet SC-41, “Building and Grounds Maintenance,” in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com

<ul style="list-style-type: none"> <input type="checkbox"/> O. Miscellaneous Drain or Wash Water <input type="checkbox"/> Boiler drain lines <input type="checkbox"/> Condensate drain lines <input type="checkbox"/> Rooftop equipment <input type="checkbox"/> Drainage sumps <input checked="" type="checkbox"/> Roofing, gutters, and trim 		<ul style="list-style-type: none"> <input type="checkbox"/> Boiler drain lines shall be directly or indirectly connected to the sanitary sewer system and may not discharge to the storm drain system. <input type="checkbox"/> Condensate drain lines may discharge to landscaped areas if the flow is small enough that runoff will not occur. Condensate drain lines may not discharge to the storm drain system. <input type="checkbox"/> Rooftop mounted equipment with potential to produce pollutants shall be roofed and/or have secondary containment. <input type="checkbox"/> Any drainage sumps on-site shall feature a sediment sump to reduce the quantity of sediment in pumped water. <input checked="" type="checkbox"/> Avoid roofing, gutters, and trim made of copper or other unprotected metals that may leach into runoff. 	
<ul style="list-style-type: none"> <input checked="" type="checkbox"/> P. Plazas, sidewalks and parking lots. 			<ul style="list-style-type: none"> <input checked="" type="checkbox"/> Plazas, sidewalks, and parking lots shall be swept regularly to prevent the accumulation of litter and debris. Debris from pressure washing shall be collected to prevent entry into the storm drain system. Washwater containing any cleaning agent or degreaser shall be collected and discharged to the sanitary sewer and not discharged to a storm drain.

STEP 7

LID AND TREATMENT CONTROL SELECTION

A treatment control BMP and/or LID facility must be selected to treat the project pollutants of concern identified in Table 7 “Project Pollutants of Concern”. A treatment control facility with a high or medium pollutant removal efficiency for the project’s most significant pollutant of concern shall be selected. It is recommended to use the design procedure in Chapter 4 of the SUSMP to meet NPDES permit LID requirements, treatment requirements, and flow control requirements. If your project does not utilize this approach, the project will need to demonstrate compliance with LID, treatment and flow control requirements. Review Chapter 2 “Selection of Stormwater Treatment Facilities” in the SUSMP to assist in determining the appropriate treatment facility for your project.

Will this project be utilizing the unified LID design procedure as described in Chapter 4 of the Local SUSMP? <i>(If yes, please document in Attachment D following the steps in Chapter 4 of the County SUSMP)</i>	
<u>Yes</u>	<u>No</u>
If this project is not utilizing the unified LID design procedure, please describe how the alternative treatment facilities will comply with applicable LID criteria, stormwater treatment criteria, and hydromodification management criteria.	
This project proposes bioretention as listed in Chapter 4 and uses the unified LID design procedure, utilizing flow based calculations for water quality mitigation in to treat all <u>onsite</u> DMAs.	
This project proposes bioretention facilities as mitigation facilities for water quality and hydromodification for all onsite-related DMAs.	
The DMA calculations were performed as recommended in the City of Escondido SUSMP and the County of San Diego’s Treatment BMP Design Guidelines.	

- Indicate the project pollutants of concern (POCs) from Table 7 in Column 2 below.

TABLE 10: GROUPING OF POTENTIAL POLLUTANTS of Concern (POCs) by fate during stormwater treatment

Pollutant	Check Project Specific POCs	Course Sediment and Trash	Pollutants that tend to associate with fine particles during treatment	Pollutants that tend to be dissolved following treatment
Sediment	X	X	X	
Nutrients	X		X	X
Heavy Metals	X		X	
Organic Compounds	X		X	
Trash & Debris	X	X		
Oxygen Demanding	X		X	
Bacteria	X		X	
Oil & Grease	X		X	
Pesticides	X		X	

► Indicate the treatment facility(s) chosen for this project in the following table.

TABLE 11: GROUPS OF POLLUTANTS and relative effectiveness of treatment facilities

Pollutants of Concern	Bioretention Facilities (LID)	Settling Basins (Dry Ponds)	Wet Ponds and Constructed Wetlands	Infiltration Facilities or Practices (LID)	Media Filters	Higher-rate biofilters*	Higher-rate media filters*	Trash Racks & Hydro-dynamic Devices	Vegetated Swales
Course Sediment and Trash	High	High	High	High	High	High	High	High	High
Pollutants that tend to associate with fine particles during treatment	High	High	High	High	High	Medium	Medium	Low	Medium
Pollutants that tend to be dissolved following treatment	Medium	Low	Medium	High	Low	Low	Low	Low	Low

► Please check the box(s) that best describes the Treatment BMP(s) and / or LID BMP selected for this project.

TABLE 12: PROJECT LID AND TC-BMPS - BMPs designed to treat stormwater (e.g., LID and hydromod) shall be considered TCMPPBs.

TCBMP Type	Water Quality Treatment	Hydromodification Flow Control
Bioretention Facilities (LID)		
<input checked="" type="checkbox"/> Bioretention area	X	
<input type="checkbox"/> Flow-through Planter		
<input checked="" type="checkbox"/> Cistern with Bioretention Facility	X	X
Basins		
<input type="checkbox"/> Extended / dry detention basin with grass / vegetated lining		
<input type="checkbox"/> Extended / dry detention basin with impervious lining		
<input type="checkbox"/> Underground Vault		
<input type="checkbox"/> Cistern		
Infiltration Devices (LID)		
<input type="checkbox"/> Infiltration basin		
<input type="checkbox"/> Infiltration trench		
<input type="checkbox"/> Other _____		
Wet Ponds and Constructed Wetlands		
<input type="checkbox"/> Wet pond / basin (permanent pool)		
<input type="checkbox"/> Constructed wetland		
Vegetated Swales (LID ⁽¹⁾)		

<input type="checkbox"/> Vegetated Swale		
Media Filters		
<input type="checkbox"/> Austin Sand Filter		
<input type="checkbox"/> Delaware Sand Filter		
<input type="checkbox"/> Multi-Chambered Treatment Train (MCTT)		
Higher-rate Biofilters		
<input type="checkbox"/> Tree-pit-style unit		
<input type="checkbox"/> Other _____		
Higher-rate Media Filters		
<input type="checkbox"/> Vault-based filtration unit with replaceable cartridges		
<input type="checkbox"/> Other _____		
Hydrodynamic Separator Systems		
<input type="checkbox"/> Swirl Concentrator		
<input type="checkbox"/> Other _____		
Trash Racks		
<input type="checkbox"/> Catch Basin Insert		
<input type="checkbox"/> Catch Basin Insert w/ Hydrocarbon boom		
<input type="checkbox"/> Other _____		
Self-Retaining Areas (LID)		
<input type="checkbox"/> Permeable Pavements		
<input type="checkbox"/> Self-Retaining		
<input type="checkbox"/> Vegetated Roof		
<input checked="" type="checkbox"/> Other: <u>Graded Slopes are 100% pervious</u>		X

⁽¹⁾ Must be designated per SUSMP “Vegetated Swales” design criteria for LID credit (p. 65).

For design guidelines and calculations refer to Chapter 4 “Low Impact Development Design Guide” in the SUSMP. Please show all calculations and design sheets for all treatment facilities proposed in Attachment D.

- ▶ Create a Construction Plan SWMP Checklist for your project.

Instructions on how to fill out table

1. Number and list each measure or BMP you have specified in your SWMP in Columns 1 and Maintenance Category in Column 3 of the table. Leave Column 2 blank.
2. When you submit construction plans, duplicate the table (by photocopy or electronically). Now fill in Column 2, identifying the plan sheets where the BMPs are shown. List all plan sheets on which the BMP appears. This table must be shown on the front sheet of the grading and improvement plans.

Stormwater Treatment Control and LID BMPs			
Description / Type	Sheet	Maintenance Category	Revisions
BB-1: Bioretention Basin (Areas)		1	
BS-1: Bioretention Swale		1	

* BMP's approved as part of Stormwater Management Plan (SWMP) dated xx/xx/xx on file with DPW. Any changes to the above BMP's will require SWMP revision and Plan Change approvals.

- ▶ Please describe why the chosen treatment BMP(s) was selected for this project. For project utilizing a low performing BMP, please provide a feasibility analysis that demonstrates utilization of a treatment facility with a high or medium removal efficiency ranking is infeasible.

Bioretention is the preferred method of treatment, per the City SUSMP, and is utilized for this project. The residential portion of the site, which is the vast majority of the project area, will be treated by the onsite bioretention basin which has a 'high' to 'medium' level of effectiveness in addressing the pollutants of concern. The bioretention swale will treat a portion of the access street (Amanda Lane) only and will provide 'high' to 'medium' level of effectiveness. The bioretention swale will treat its respective area for water quality only as its area of treatment will have a negligible effect in regards to hydromodification due to its pre and post-condition imperviousness remaining essentially equivalent.

Please provide the sizing design calculations for each Drainage Management Area in **Attachment D**. Guidelines for design calculations are located in Chapter 4 of the County SUSMP. To assist in these calculations a BMP sizing calculator is available for use at the following location: http://www.projectcleanwater.org/html/wg_susmp.html.

STEP 8

OPERATION AND MAINTENANCE

► Please check the box that best describes the maintenance mechanism(s) for this project. The recorded maintenance agreement shall be included in the Maintenance Plan for this project (Attachment F).

TABLE 13: PROJECT BMP CATEGORY

CATEGORY	SELECTED		BMP Description
	YES	NO	
First	X		Bioretention Basin Area (BB-1) Bioretention Swale (BS-1)
Second ¹			
Third ²			
Fourth			

Note:

1. A maintenance notification will be required.
2. A recorded maintenance agreement and access easement will be required.
3. The project will be required to establish or be included in a watershed specific Community Facility District (CFD) for long-term maintenance.
4. The developer would be required to dedicate the BMP (and the property on which it is located and any necessary access) to the County.

► Please list all individual LID and Treatment Control BMPs (TC-BMPs) incorporated into the project. Please ensure the “BMP Identifier” is consistent with the legend in Attachment C “Drainage Management Area Exhibit”. Please attach the record plan sheets upon completion of project and amend the Major SWMP where appropriate. For each type of LID or TC-BMP provide an inspection sheet in Attachment F “Maintenance Plan”.

TABLE 14: PROJECT SPECIFIC LID AND TCBMPS (List all from SWMP)

Lot Number Or Location	Description/Type	Sheet
O.S. Lot	BB-1: Bioretention Basin	
Amanda Lane ROW	BS-1: Bioretention Swale	
1 – All Priority Development Projects (PDPs) require a TCBMP. 2 – BMPs designed to treat stormwater (e.g. LID and hydromod) shall be considered TCBMPS.		

*For location of BMPs, see approved Record Plan dated XX/XX/XX, Grading Plan # xxxx, Sheets x, x, x.

► Responsible Party for the Construction Phase

Identify the parties responsible for long-term maintenance of the BMPs identified above and Source Controls specified in Attachment B.

Developer's Name: New Urban West, Inc.
Address: 1733 Ocean Avenue, Suite 350
City / State / Zip: Santa Monica CA 90401
Email Address:
Phone Number: (310) 394-3379
Engineer of Work: Hunsaker and Associates – San Diego
Engineer's Phone Number: 858-558-4500

► Responsible Party for Ongoing Maintenance

Identify the parties responsible for long-term maintenance of the BMPs identified above and Source Controls specified in Attachment B. include the appropriate written agreement with the entities responsible for O&M in Attachment F. Please see Chapter 5 “Stormwater Facility Maintenance” of the County SUSMP for appropriate maintenance mechanisms.

Owner's Name: Future HOA to be established for onsite Basin and bioretention area along Amanda Lane. Respective property owner for the two offsite bioretention areas along Gamble Lane will maintain the two BMPs.
Address: TBD
City / State / Zip: TBD
Email Address: TBD
Phone Number: TBD

► Funding Source

Provide the funding source or sources for long-term operation and maintenance of each BMP identified above. Please see Chapter 5 “Stormwater Facility Maintenance” of the County SUSMP for the appropriate funding source options. By certifying the Major SWMP the applicant is certifying that the funding responsibilities have been addressed and will be transferred to future owners.

Until a Homeowner's Association has been established for the Amanda Estates project site, the property owner will be responsible for maintaining all onsite BMPs. Thereafter, the Homeowner's Association will be permanently responsible for maintaining all BMPs. Funding for maintenance of the bioretention swale along Amanda Lane at the site's entrance will fall under the same responsibility mentioned above.

ATTACHMENTS

Please include the following attachments.

ATTACHMENT		COMPLETED	N/A
A	Project Location Map	<input checked="" type="checkbox"/>	<input type="checkbox"/>
B	Source Control Exhibit	<input checked="" type="checkbox"/>	<input type="checkbox"/>
C	Drainage Management Area (DMA)Exhibit	<input checked="" type="checkbox"/>	<input type="checkbox"/>
D	BMP Sizing Design Calculations (Water Quality and Hydromodification) and TC-BMP/IMP Design Details	<input checked="" type="checkbox"/>	<input type="checkbox"/>
E	Geotechnical Certification Sheet	<input type="checkbox"/>	<input checked="" type="checkbox"/>
F	Maintenance Plan	<input checked="" type="checkbox"/>	<input type="checkbox"/>
G	HMP Study	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Note: Attachments B and C may be combined.

ATTACHMENT A



ATTACHMENT B

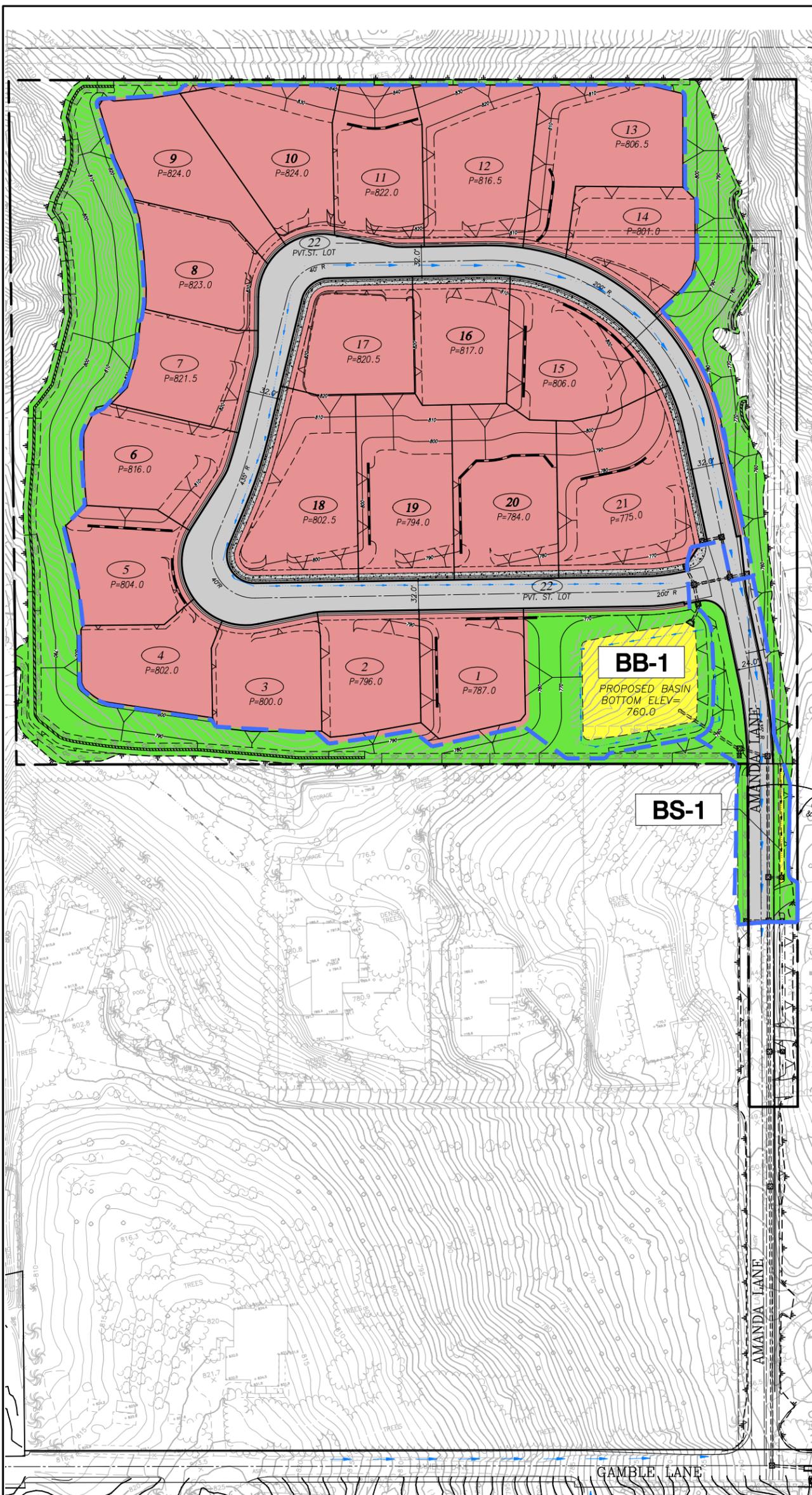
Source Control Exhibit

AMANDA ESTATES: SOURCE CONTROL BMPS

<i>Potential source of runoff pollutants</i>	<i>Permanent source control BMPs</i>	<i>Operational source control BMPs</i>
<u>Onsite Storm Drains</u>	Mark all inlets with the words “No Dumping! Flows to Bay” or similar where feasible	Maintain and periodically repaint or replace inlet markings. Provide stormwater pollution prevention information to new site owners, lessees, or operators.
<u>Landscaped Areas</u>	Preserve existing native trees, shrubs, and ground cover to the maximum extent possible. Design landscaping to minimize irrigation and runoff, to promote surface infiltration where appropriate, and to minimize the use of fertilizers and pesticides that can contribute to stormwater pollution. Where landscaped areas are used to retain or detain stormwater, specify plants that are tolerant of saturated soil conditions. To insure successful establishment, select plants appropriate to site soils, slopes, climate, sun, wind, rain, land use, air movement, ecological consistency, and plant interactions.	Maintain landscaping using minimum or no pesticides. Provide IPM information to new owners, lessees and operators.
<u>Pools, spas, ponds, decorative fountains, and other water features</u>	If the local municipality requires pools to be plumbed to the sanitary sewer, place a note on the plans and state in the narrative that this connection will be made according to local requirements.	See applicable operational BMPs in Fact Sheet SC-72, “Fountain and Pool Maintenance,” in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com
<u>Plazas, sidewalks, and parking lots.</u>		Plazas, sidewalks, and parking lots shall be swept regularly to prevent the accumulation of litter and debris. Debris from pressure washing shall be collected to prevent entry into the storm drain system. Washwater containing any cleaning agent or degreaser shall be collected and discharged to the sanitary sewer and not discharged to a storm drain.
Miscellaneous Drain or Wash Water	Avoid roofing, gutters, and trim made of copper or other unprotected metals that may leach into runoff	

ATTACHMENT C

Drainage Management Area (DMA) Exhibit



LID AND SITE DESIGN STRATEGIES:
 PRESERVE SIGNIFICANT TREES
 RESTRICT HEAVY EQUIPMENT TO GREEN/OPEN SPACE AREAS
 DRAIN RUNOFF FROM IMPERVIOUS TO PERVIOUS AREAS
 PITCH PAVEMENTS TO LANDSCAPING
 ROOF DOWNSPOUTS TO LANDSCAPING
 SMART IRRIGATION SYSTEMS
 COLLECT CONCENTRATED FLOWS IN STABILIZED CHANNELS

AMANDA ESTATES: SOURCE CONTROL BMPs

Potential source of runoff pollutants	Permanent source control BMPs	Operational source control BMPs
Onsite Storm Drains	Mark all inlets with the words "No Dumping! Flows to Bay" or similar where feasible	Maintain and periodically repaint or replace inlet markings. Provide stormwater pollution prevention information to new site owners, lessees, or operators.
Landscaped Areas	Preserve existing native trees, shrubs, and ground cover to the maximum extent possible. Design landscaping to minimize irrigation and runoff, to promote surface infiltration where appropriate, and to minimize the use of fertilizers and pesticides that can contribute to stormwater pollution. Where landscaped areas are used to retain or detain stormwater, specify plants that are tolerant of saturated soil conditions. To insure successful establishment, select plants appropriate to site soils, slopes, climate, sun, wind, rain, land use, air movement, ecological consistency, and plant interactions.	Maintain landscaping using minimum or no pesticides. Provide IPM information to new owners, lessees and operators.
Pools, spas, ponds, decorative fountains, and other water features	If the local municipality requires pools to be plumbed to the sanitary sewer, place a note on the plans and state in the narrative that this connection will be made according to local requirements.	See applicable operational BMPs in Fact Sheet SC-72, "Fountain and Pool Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com
Plazas, sidewalks, and parking lots		Plazas, sidewalks, and parking lots shall be swept regularly to prevent the accumulation of litter and debris. Debris from pressure washing shall be collected to prevent entry into the storm drain system. Washwater containing any cleaning agent or degreaser shall be collected and discharged to the sanitary sewer and not discharged to a storm drain.
Miscellaneous Drain or Wash Water	Avoid roofing, gutters, and trim made of copper or other unprotected metals that may leach into runoff	

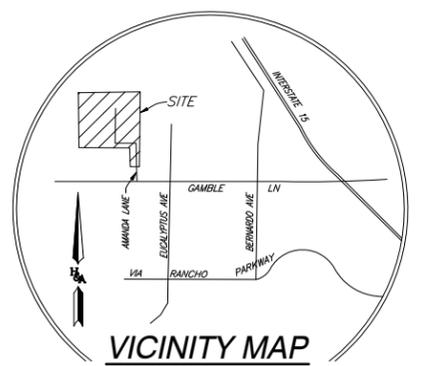
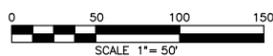
LEGEND

- PERVIOUS
- PADS (ASSUME 50% IMPERVIOUS)
- STREETS
- EFFECTIVE BIORETENTION SURFACE AREA
- PROJECT BOUNDARY
- DMA SUBAREA BOUNDARY
- FLOW DIRECTION
- BB-#** BIORETENTION BASIN IDENTIFIER
- BS-#** BIORETENTION SWALE IDENTIFIER

TREATMENT CONTROL STRATEGIES:

AREAS DRAINING TO INTEGRATED MANAGEMENT PRACTICES								
DMA NAME	IMP TYPE	SURFACE TYPE	DMA AREA (SQ FT)	DMA AREA (AC)	DMA RUNOFF FACTOR	85TH PERCENTILE FLOWRATE (CFS)	85TH PERCENTILE VOLUME (CU FT)	MIN IMP AREA REQUIRED (SQ FT)
BS-1	Bioretention Swale	IMPERVIOUS	10,871	0.25	1	0.052	589	455
		PERVIOUS	5,164	0.12	0.1		28	
BB-1	Bioretention Basin	IMPERVIOUS	183,419	4.21	1	0.915	9,935	7,975
		PERVIOUS	159,610	3.66	0.1		865	

* Area requirements determined by routing flow using Darcy's equation. See Attachment D for Calculations.



PREPARED BY:
HUNSAKER & ASSOCIATES
 SAN DIEGO, INC.
 PLANNING 9707 Wiggins Street
 ENGINEERING San Diego, CA 92121
 SURVEYING PH4089558-4600 • PH4089558-1414

DRAINAGE MANAGEMENT AREA EXHIBIT
AMANDA ESTATES
 CITY OF ESCONDIDO, CA

SHEET
 1
 OF
 1

ATTACHMENT D

Sizing Design Calculations and TC-BMP/LID Design Details

PROJECT NAME: AMANDA ESTATES

PROJECT LOCATION: CITY OF ESCONDIDO

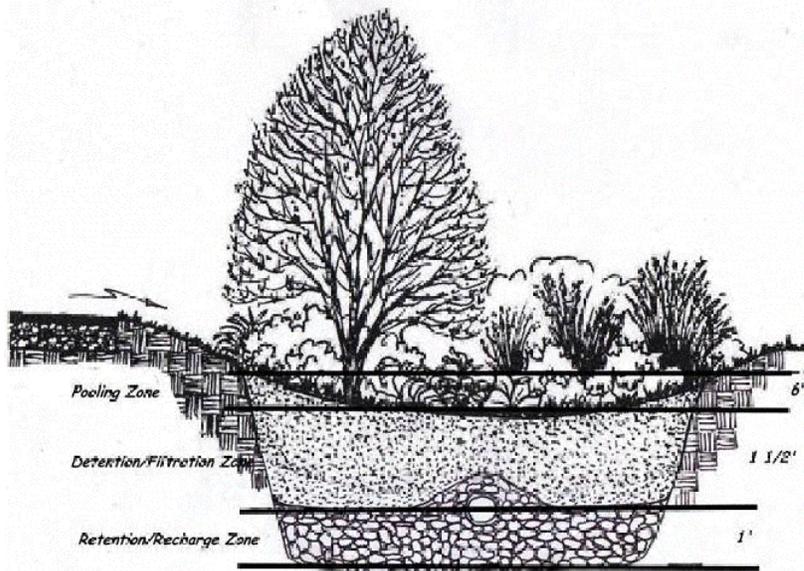
85TH PERCENTILE PRECIPITATION DEPTH (IN): 0.75

85TH PERCENTILE PRECIPITATION INTENSITY (IN/HR): 0.2

AREAS DRAINING TO INTEGRATED MANAGEMENT PRACTICES								
DMA NAME	IMP TYPE	SURFACE TYPE	DMA AREA (SQ FT)	DMA AREA (AC)	DMA RUNOFF FACTOR	85TH PERCENTILE FLOWRATE (CFS)	85TH PERCENTILE VOLUME (CU FT)	MIN IMP AREA REQUIRED (SQ FT)
BS-1	Bioretention Swale	IMPERVIOUS	10,871	0.25	1	0.052	589	455
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		PERVIOUS	159,610	3.66	0.1		865	

* Area requirements determined by routing flow using Darcy's equation. See Attachment D for Calculations.

Fact Sheet 7. Bioretention Systems



Typical Bioretention cross section, *Anatomy of a Rain Garden*, n.d.

Bioretention systems are essentially a surface and sub-surface water filtration system. In function they are similar to sand filters. Bioretention systems incorporate both plants and underlying filter soils for removal of contaminants. These facilities normally consist of a treatment train approach: filter strip, sand bed, ponding area, organic layer, planting soil, and plants.

CHARACTERISTICS

- Effective in removing sediments and attached pollutants by filtration through surface vegetation, ground cover and underlying filter media layer
- Delay runoff peaks by providing retention capacity and reducing flow velocities.
- Vegetation increases aesthetic value while also enhancing filtration capacity and helping to maintain the porosity of the filter media.
- Can be constructed as either large or small scale devices, with native or amended soils.
- Small scale units are usually located in a residential planter box that filters collected stormwater through the filter media and to an outlet.
- Larger scale devices work on the same methodology, however are generally located along the streetscapes and retarding basins over large open areas.
- In addition, there are two main types of bioretention system: Non-conveyance systems, which generally pond runoff volume, and Conveyance, which generally convey minor storm events along longitudinal channels. Such conveyance systems generally include an amended soil layer under the surface for additional storage and filtration

APPLICATION

- Effective in removing medium to fine size sediments and attached pollutants (such as nutrients, free oils/grease and metals), but typically have higher pollutant

- removal efficiencies for a wider range of contaminants due to enhanced filtration/biological processes associated with the surface vegetation.
- Best suited to small residential, commercial, and industrial developments with high percentages of impervious areas, including parking lots, high density residential housing, and roadways.
 - Aesthetic benefits due to the surface vegetation make bioretention systems appealing for incorporation into streetscape and general landscape features.

DESIGN

- Provide a gentle slope for overland flow and adequate water storage. No water should be allowed to pond in the bioretention system for longer than 72 hours.
- Usually designed in conjunction with swales and other devices upstream so as to reduce filter clogging and provide water treatment (treatment train).
- Filter media employed is usually the plant growing material, which may comprise soil, sand and peat mixtures.
- “Planting box” type systems should be restricted to very small catchment areas.
- A subdrain system should be included in urban areas along with associated cleanout to facilitate maintenance.
- For more precise design techniques, see: CASQA (2003, January) California Stormwater BMP Handbook: New Development and Redevelopment

MAINTENANCE

- Generally, only routine periodic maintenance typical of any landscaped area (mulching, plant replacement, pruning, weeding) is necessary.
- Regular inspections and maintenance are particularly important during the vegetation establishment period.
- Routine maintenance should include a biannual health evaluation of the trees and shrubs and subsequent removal of any dead or diseased vegetation.
- Other potential tasks include soil pH regulation, erosion repair at inflow points, mulch replenishment, unclogging the under-drain, and repairing overflow structures.

LIMITATIONS

- Adequate sunlight is required for vegetation growth.
- The use of irrigation may not meet State water conservation goals. Appropriate drought-tolerant plants should be considered.
- Placement may be limited by the need for upstream pre-treatment so as to avoid filter clogging (treatment train).
- Contributing drainage area should be less than 1 acre for small-scale, on-lot devices
- Bioretention (a BMP with incidental infiltration) is not an appropriate BMP when:
 - the seasonal high groundwater table is within 6 feet of the ground surface (US EPA 1999)
 - at locations where or where surrounding soil stratum is unstable
- exceptions to the 6 foot separation can be made when:
 - the BMP is designed with an under-drain and approved by a qualified licensed professional, or when:

- written approval of a separation in the interval of 4-6 feet has been obtained by the Regional Water Quality Control Board and the Department of Environmental Health.
- Site must contain sufficient elevation relief so that subdrain system may discharge to receiving swale, curb or storm drain system.

ECONOMICS

- Construction cost estimates for a bioretention area are slightly greater than those for the required landscaping for a new development (EPA, 1999).
- The operation and maintenance costs for a bioretention facility will be comparable to those of typical landscaping required for a site. (CASQA, 2003)
- Maintenance costs are projected at 5-7% of the construction cost annually.

REFERENCES

- California Stormwater Quality Association. (2003, January) California Stormwater BMP Handbook: New Development and Redevelopment.
- URS Australia Pty Ltd, (2004, May), Water Sensitive Urban Design: Technical Guidelines for Western Sydney, Upper Parramatta River Catchment Trust.
- US EPA (1999, September) BMP Fact Sheet 832-F-99-012.
<http://www.epa.gov/owm/mtb/biortn.pdf>
- US EPA (1999, August) Preliminary Studies: Preliminary Data Summary of Urban Stormwater Best Management Practices. EPA-821-R-99-012 Part D.
- For additional information pertaining to Bioretention Systems, see the works cited in the San Diego County LID Literature Index.

ATTACHMENT E

Geotechnical Certification Sheet (Not Applicable)

ATTACHMENT F

Maintenance Plan

(Use Chapter 5 of the SUSMP as guidance in developing your Maintenance Plan)

I. Inspection, Maintenance Log and Self-Verification Forms

The proposed Bioretention facilities shall be inspected and maintained according to the attached County Verification Form and according to the County of San Diego SUSMP LID Fact Sheets.

II. Updates, Revisions and Errata

This is a living document and should be updated and revised as needed during the life of the project.

III. Introduction

The project consists of approximately 11.2 acres of single family residential development including 1.75 acres of parks and open space. The following LID measures will be incorporated into the design of the project:

1. Onsite Bioretention facilities will treat all of the runoff for water quality and flow control for the designated DMAs.
2. One offsite bioretention swale located along Amanda Lane will be constructed to treat runoff from paved portions of Amanda Lane in the vicinity of the site entrance.

IV. Responsibility for Maintenance

Owner:

New Urban West, Inc.
1733 Ocean Avenue, Suite 350
Santa Monica CA 90401
(310) 394-3379

Operation and Maintenance Agreement

To be completed upon construction

Maintenance Funding

The proposed bioretention facilities (category 1 BMP) require the creation and execution of an agreement between the owner(s) or the Homeowners Association to maintain the facility as well as an access easement and annual inspection fee determined by the County of San Diego. BMP Maintenance Agreement with Easement and Covenant: An agreement will be entered into with the City of Escondido, which will function in three ways:

- (a) It will commit the land to being used only for purposes of the BMP;
- (b) It will include an agreement by the landowner/Homeowners Association, to maintain the BMPs in accordance with the maintenance plan (this obligation would be passed on to future purchasers or successors of the landowner, as a covenant); and

(c) It will include an easement giving the City of Escondido the right to enter onto the land (and any necessary adjacent land needed for access) to maintain the BMPs.

Funding:

Developer would provide the City of Escondido with security to substantiate the maintenance agreement; security would remain in place for an interim period of 5 years. The amount of the security would equal the estimated cost of 2 years of maintenance activities. The security can be a Cash Deposit, Letter of Credit or other form acceptable to the City of Escondido. If at any time, owners fail to maintain BMPs and the City must perform any of the maintenance activities, then owners shall pay all of City's costs incurred in performing the maintenance as defined in the maintenance agreement.

(4) Training Program

The current owner and subsequent ownership individual and/or groups must read the project SWMP to get informed on the operation and maintenance of the different post construction BMPs. The report will list possible operational problems that the owner should rectify as soon as possible.

V. Summary of Drainage Areas and Stormwater Facilities

A. Drainage Areas DMA

- (1) Drawings showing pervious and impervious areas (copied or adapted from initial SWMP).
- (2) Designation and description of each drainage area and how flow is routed to the corresponding facility.

See Attachment C

Treatment and Flow-Control Facilities

The project proposes the use of bioretention facilities and a bioswale.

Bioretention is a terrestrial-based, water quality and water quantity control practice using the chemical, biological, and physical properties of plants, microbes, and soils for removal of pollutants from stormwater runoff. Some of the processes that may take place in a bioretention facility include sedimentation, adsorption, filtration, volatilization, ion exchange, decomposition, phytoremediation, bioremediation, and storage capacity. Bioretention can also be designed to mimic predevelopment hydrology.

See Attachment C

VI. Facility Documentation

Included Copy of Site Plan showing location of TC BMPs

See Attachment C

VII. Maintenance Schedule

Maintenance Program for Bioretention Area and swales

Inspection Frequency/Indications:

Regular Inspections

- Before wet season begins (September);
- Every 60 days during wet season (September-April);
- After wet season (April).

Performance Inspections

	<input type="checkbox"/> After rainfall events greater than 0.5 inch
Maintenance Indications Connections	Maintenance Activities Connections
<input type="checkbox"/> Damage to inlet/outlet, sideslopes, headwall, or other structures	<input type="checkbox"/> Repair inlet/outlet structures, side slopes, fences, or other structural elements as needed to maintain performance of the facility.
<input type="checkbox"/> Over-grown vegetation, emergent woody vegetation and/or weeds	<input type="checkbox"/> Trim vegetation to average height of 12 inches and remove trimmings.
	<input type="checkbox"/> Remove emergent trees and other vegetation that are not part of bioretention basin plan and weeds
	<input type="checkbox"/> Re-seed and re-plan barren areas prior to rainy season
	<input type="checkbox"/> Install erosion blanket on barren spots if re-vegetation is not successful
<input type="checkbox"/> Sediment accumulation over 3 inches	<input type="checkbox"/> Remove sediment accumulation at or near plant height
<input type="checkbox"/> Trash, debris, and vegetative litter	<input type="checkbox"/> Remove trash, debris, and vegetative litter
<input type="checkbox"/> Rodents or other vectors	<input type="checkbox"/> Abate and control rodents as necessary to maintain performance of the facility
	<input type="checkbox"/> Drain standing water
Waste Disposal	Sediment, other pollutants, and all other waste shall be properly disposed of in a licensed landfill or by another appropriate disposal method in accordance with local, state, and federal regulations.

Maintenance Program for Inlet Stenciling

Inspection Frequency/Indications:	<u>Regular Maintenance Inspections</u>
	<input type="checkbox"/> Before wet season begins (September);
	<input type="checkbox"/> After wet season (April).
Maintenance Indications	Maintenance Activities
<input type="checkbox"/> Inlet stenciling/signage begins to weather or fade	<input type="checkbox"/> Re-stamp signage
<input type="checkbox"/> Broken or damaged structure	<input type="checkbox"/> Repair or replace signage structure

Important Note- Service Agreement Information

Assemble and make copies of your maintenance plan. One copy must be submitted to the City of Escondido, and at least one copy kept on-site.

Format plans to 8½" x 11" to facilitate duplication, filing, and handling.

Include the revision date in the footer on each page.

Scan graphics and incorporate with text into a single electronic file. Keep the electronic file backed up so that copies of the maintenance plan can be made if the hard copy is lost or damaged.

**PRIVATE TREATMENT CONTROL BMP
OPERATION AND MAINTENANCE VERIFICATION FORM
BIORETENTION FACILITIES, VEGETATED SWALES & HIGHER RATE
BIOFILTERS-SIDE 2**

This guide sheet provides general indicators for maintenance only and for a wide array of treatment control BMPs. Your developer prepared maintenance plans specifically for your treatment control BMP as an appendix to the Stormwater Management Plan. Also, if you have a manufactured structure, please refer to the manufacturer's maintenance instructions.

Biofilters include the following :

- Vegetated Filter Strip/Swale** **Bioswale** **Bioretention Facility** **Planter Boxes**
 Manufactured Higher-Flow-Rate Biofilters, such as Tree-Pit-Style Units.

Routine maintenance is needed to ensure that flow is unobstructed, that erosion is prevented, and that soils are held together by plant roots and are biologically active. Typical maintenance consists of the following:

Bioretention BMPs Inspection and Maintenance Checklist	
Typical Maintenance Indicators	Typical Maintenance Actions
Accumulation of sediment (over 2 inches deep or covers vegetation), litter, or debris	Remove and properly dispose of accumulated materials, without damage to the vegetation. Confirm that soil is not clogging and that the area drains after a storm event. Till or replace soil as necessary.
Poor vegetation establishment	Ensure vegetation is healthy and dense enough to provide filtering and to protect soils from erosion. Replenish mulch as necessary (if less than 3 inches deep), remove fallen leaves and debris, prune large shrubs or trees, and mow turf areas.
Overgrown vegetation—woody vegetation not part of design is present and grass excessively tall (greater than 10 inches)	Mow or trim as appropriate, but not less than the design height of the vegetation (typically 4-6 inches for grass). Confirm that irrigation is adequate and not excessive and that sprays do not directly enter overflow grates. Replace dead plants and remove noxious and invasive weeds.
Erosion due to concentrated irrigation flow	Repair/re-seed eroded areas and adjust the irrigation.
Erosion due to concentrated stormwater runoff flow	Repair/re-seed eroded areas and make appropriate corrective measures such as adding erosion control blankets, adding stone at flow entry points, or re-grading where necessary. Remove obstructions and sediment accumulations so water disperses.
Standing water (BMP not draining) . If mosquito larvae are present and persistent, contact the San Diego County Vector Control Program at (858) 694-2888. Mosquito larvicides should be applied only when absolutely necessary and then only by a licensed individual or contractor.	Where there is an underdrain, such as in planter boxes and manufactured biofilters, check the underdrain piping to make sure it is intact and unobstructed. Abate any potential vectors by filling holes in the ground in and around the biofilter facility and by insuring that there are no areas where water stands longer than 96 hours following a storm .
Obstructed inlet or outlet structure	Clear obstructions.
Damage to structural components such as weirs, inlet, or outlet structures	Repair or replace as applicable.
Before the wet season and after rain events: remove sediment and debris from screens and overflow drains and downspouts; ensure pumps are functioning, where applicable; check integrity of mosquito screens; and; check that covers are properly seated and locked.	Where cisterns are part of the system
For manufactured high-flow-rate biofilters, see manufacturer's maintenance guidelines	

ATTACHMENT G

Hydromodification Mitigation Plan

Hydromodification Management Plan

INTRODUCTION

This report summarizes the approach used to model the proposed Amanda Estates project site in the City of Escondido, CA using the Environmental Protection Agency (EPA) Storm Water Management Model 5.0 (SWMM). SWMM models were prepared for the pre and post developed conditions at the site in order to determine if the proposed bioretention facilities have sufficient footprint to meet the current Hydromodification Management Plan (HMP) requirements from the Regional Water Quality Control Board (RWQCB).

SWMM MODEL DEVELOPMENT

Two (2) SWMM models were prepared for this study at the point of compliance (POC); one for existing condition and one for the proposed condition. POC #1 was set at the intersection of Gamble Lane and Eucalyptus Avenue and included the areas tributary to that point and west of the intersection. For both SWMM models, flow duration curves were prepared to determine if the proposed bioretention footprint was sufficient to meet the current HMP requirements.

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

Evaporation for the site was modeled using average monthly values from the county hourly dataset. The site was modeled with hydrologic soil group D soils as determined from both the San Diego County Hydrology Manual soil map and the USGS Survey web-based Soil Survey Map. Other SWMM inputs for the subareas are discussed in the appendix to this document where the selection of the parameters is explained in detail.

BIORETENTION MODELING

Developed storm water runoff from the main body of the project site is routed through one (1) bioretention basin located within the Amanda Estate project area. Flows from the proposed residential area drains to the aforementioned bioretention basin via storm drain, ultimately discharging downstream into the existing storm drain on Eucalyptus Avenue.

Basin Discussion:

Flow control to the basin will be achieved using orifices on a riser standpipe. The size, number and location of the orifices are presented in the Basin Riser Table below. Sizing and further peak flow discussion is in the *Drainage Report for Amanda Estates* dated February 2015.

Basin Riser Table

		BB-1
Riser/Spillway Height (ft)*		2.5
Spillway Width (ft)		-
Basin Depth (ft)		5
Amended Soil Depth (in)		18
Class 2 Perm. Depth (in)		24
Peak Orifice		
Riser		1
Area (sq ft)		4
Depth (ft)		2.5
Top Orifice		
No. of Orifices		2
Diameter (in)		4
Depth (ft)		2.0
Middle Orifice		
No. of Orifices		2
Diameter (in)		3
Depth (ft)		1.5
Bottom Orifice		
No. of Orifices		1
Diameter (in)		0.25
Depth (ft)		1.0
Sub-Drain Orifice		
No. of Orifices		1
Diameter (in)		1.8

*From finish grade

FLOW DURATION CURVE COMPARISON

The Flow Duration Curves (FDC) for the site were compared at POC 1 by exporting the hourly runoff time series results from SWMM to a spreadsheet. 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 Cunnane plotting position method (which is the preferred plotting methodology in the HMP Permit). As the SWMM Model is a statistical analysis based on the Weibull Plotting Position Method, the Weibull Method was also used within the spreadsheet to ensure that the results were similar to those obtained by the SWMM Model.

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 (Q_i 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 comparisons at the POC are illustrated in Figure 1 in both normal and logarithmic scale. Attachment 7 provides detailed drainage exhibit for the post-developed condition.

As can be seen in Figure 1, the FDC for the proposed condition with the bioretention basin is within 110% of the curve for the existing condition. The additional runoff volume generated from developing the site will be released to the downstream storm drain at a flow rate below the 10% Q_2 lower threshold. Additionally, the project will also not increase peak flow rates between the Q_2 and the Q_{10} , as shown in the graphic and also in the attached table.

SUMMARY

This study has demonstrated that the proposed bioretention footprint at the Amanda Estates site is sufficient to meet the current HMP criteria if the bioretention cross-section areas and volumes recommended within this technical memorandum are incorporated within the proposed project site.

KEY ASSUMPTIONS

1. D Soils are representative of the existing condition site.

ATTACHMENTS

1. Q_2 to Q_{10} Comparison Table
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 and Elevations vs. Discharge Curves to be used in SWMM
5. Project Plan and Bioretention section sketches
6. SWMM Input Data in Input Format (Existing and Proposed Models)
7. SWMM Screens and Explanation of Significant Variables
8. Drying Time of the Surface Layer of Bio-retention cells

9. USGS Soil Map for justification of Soil Type D Conditions
10. Summary files from the SWMM Model

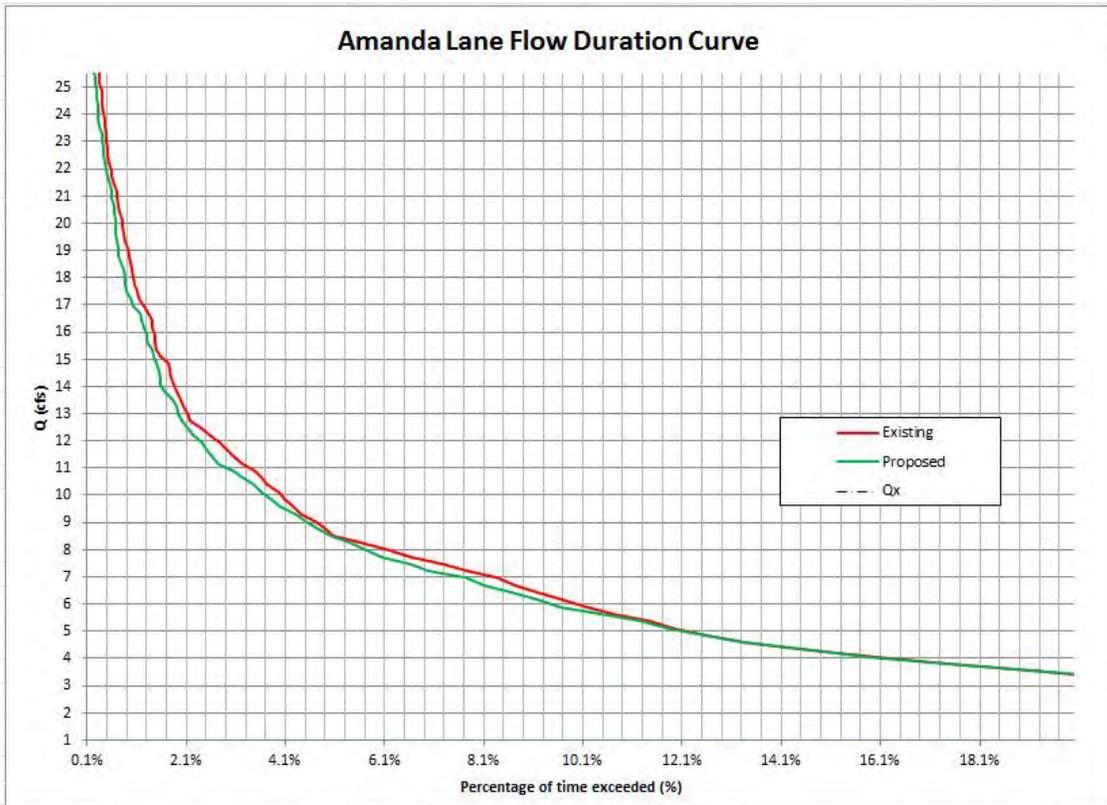
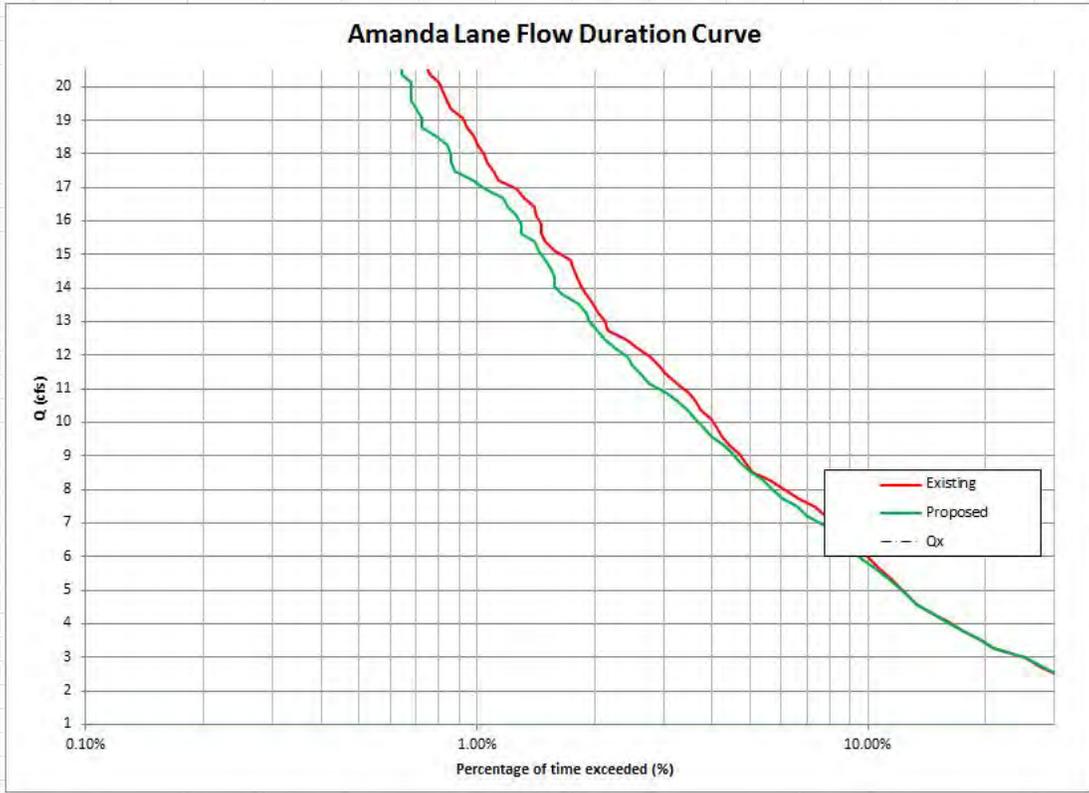


Figure 1a and 1b. Flow Duration Curve Comparison (logarithmic and normal “x” scale)

ATTACHMENT 1.

Q₂ to Q₁₀ Comparison Table POC 1

Return Period	Existing Condition (cfs)	Mitigated Condition (cfs)	Reduction, Exist - Mitigated (cfs)
10-year	28.039	26.895	1.145
9-year	27.290	26.636	0.654
8-year	26.830	26.293	0.537
7-year	26.638	25.623	1.015
6-year	26.356	25.018	1.338
5-year	26.277	24.466	1.811
4-year	25.002	22.858	2.144
3-year	23.009	21.212	1.798
2-year	19.730	17.990	1.740

ATTACHMENT 2 - Flow Duration Curve Analysis, Plot & Table

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

The figure on the following pages illustrate that the flow duration curve in post-development conditions after the proposed BMPs is below the existing flow duration curve. The flow duration curve table following the curve shows that if the interval $0.10Q_2 - Q_{10}$ is divided in 100 sub-intervals, then a) the post development divided by pre-development durations are never larger than 110% (the permit allows up to 110%); and b) there are no more than 10 intervals in the range 101%-110% which would imply an excess over 10% of the length of the curve (the permit allows less than 10% of excesses measured as 101-110%).

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. 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 for reference.

In terms of the "y" axis, the peak flow value is the variable of choice. As an additional analysis performed by H&A, not only the range of analysis is clearly depicted (10% of Q_2 to Q_{10}) but also all intermediate flows are shown (30% of Q_2 , 50% of Q_2 , 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). H&A performed the analysis using the Cunnane Plotting position Method (the preferred method in the HMP permit) 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.

Flow Duration Curve Data for Amanda Lane

Q2 = 19.73 cfs Fraction Q2= 10 %
 Q10 = 28.04 cfs
 Step = 0.2633 cfs
 Count = 499678 hours
 57.00 years

Interval	Existing Condition			Detention Basin Optimized			Pass or Fail?
	Q (cfs)	Hours > Q	% time	Hours>Q	% time	Post/Pre	
1	1.973	1526	3.05E-01	1542	3.09E-01	101%	Pass
2	2.236	1355	2.71E-01	1383	2.77E-01	102%	Pass
3	2.500	1269	2.54E-01	1270	2.54E-01	100%	Pass
4	2.763	1047	2.10E-01	1053	2.11E-01	101%	Pass
5	3.026	959	1.92E-01	959	1.92E-01	100%	Pass
6	3.289	875	1.75E-01	875	1.75E-01	100%	Pass
7	3.553	802	1.61E-01	793	1.59E-01	99%	Pass
8	3.816	723	1.45E-01	727	1.45E-01	101%	Pass
9	4.079	668	1.34E-01	668	1.34E-01	100%	Pass
10	4.343	630	1.26E-01	629	1.26E-01	100%	Pass
11	4.606	598	1.20E-01	593	1.19E-01	99%	Pass
12	4.869	570	1.14E-01	562	1.12E-01	99%	Pass
13	5.133	535	1.07E-01	523	1.05E-01	98%	Pass
14	5.396	509	1.02E-01	482	9.65E-02	95%	Pass
15	5.659	482	9.65E-02	458	9.17E-02	95%	Pass
16	5.922	459	9.19E-02	433	8.67E-02	94%	Pass
17	6.186	437	8.75E-02	406	8.13E-02	93%	Pass
18	6.449	418	8.37E-02	386	7.72E-02	92%	Pass
19	6.712	388	7.77E-02	349	6.98E-02	90%	Pass
20	6.976	364	7.28E-02	331	6.62E-02	91%	Pass
21	7.239	332	6.64E-02	302	6.04E-02	91%	Pass
22	7.502	306	6.12E-02	285	5.70E-02	93%	Pass
23	7.766	281	5.62E-02	270	5.40E-02	96%	Pass
24	8.029	253	5.06E-02	250	5.00E-02	99%	Pass
25	8.292	244	4.88E-02	235	4.70E-02	96%	Pass
26	8.555	234	4.68E-02	225	4.50E-02	96%	Pass
27	8.819	221	4.42E-02	215	4.30E-02	97%	Pass
28	9.082	212	4.24E-02	199	3.98E-02	94%	Pass
29	9.345	204	4.08E-02	190	3.80E-02	93%	Pass
30	9.609	199	3.98E-02	181	3.62E-02	91%	Pass
31	9.872	186	3.72E-02	173	3.46E-02	93%	Pass
32	10.135	181	3.62E-02	162	3.24E-02	90%	Pass
33	10.398	174	3.48E-02	152	3.04E-02	87%	Pass
34	10.662	162	3.24E-02	137	2.74E-02	85%	Pass
35	10.925	152	3.04E-02	131	2.62E-02	86%	Pass
36	11.188	146	2.92E-02	125	2.50E-02	86%	Pass

Interval	Existing Condition			Detention Basin Optimized			Pass or Fail?
	Q (cfs)	Hours > Q	% time	Hours>Q	% time	Post/Pre	
37	11.452	139	2.78E-02	121	2.42E-02	87%	Pass
38	11.715	128	2.56E-02	112	2.24E-02	88%	Pass
39	11.978	120	2.40E-02	106	2.12E-02	88%	Pass
40	12.242	108	2.16E-02	101	2.02E-02	94%	Pass
41	12.505	106	2.12E-02	97	1.94E-02	92%	Pass
42	12.768	102	2.04E-02	95	1.90E-02	93%	Pass
43	13.031	99	1.98E-02	91	1.82E-02	92%	Pass
44	13.295	95	1.90E-02	83	1.66E-02	87%	Pass
45	13.558	92	1.84E-02	79	1.58E-02	86%	Pass
46	13.821	90	1.80E-02	79	1.58E-02	88%	Pass
47	14.085	88	1.76E-02	77	1.54E-02	88%	Pass
48	14.348	87	1.74E-02	75	1.50E-02	86%	Pass
49	14.611	79	1.58E-02	72	1.44E-02	91%	Pass
50	14.875	75	1.50E-02	70	1.40E-02	93%	Pass
51	15.138	73	1.46E-02	65	1.30E-02	89%	Pass
52	15.401	73	1.46E-02	65	1.30E-02	89%	Pass
53	15.664	71	1.42E-02	63	1.26E-02	89%	Pass
54	15.928	70	1.40E-02	60	1.20E-02	86%	Pass
55	16.191	66	1.32E-02	58	1.16E-02	88%	Pass
56	16.454	63	1.26E-02	52	1.04E-02	83%	Pass
57	16.718	57	1.14E-02	49	9.81E-03	86%	Pass
58	16.981	55	1.10E-02	44	8.81E-03	80%	Pass
59	17.244	53	1.06E-02	43	8.61E-03	81%	Pass
60	17.508	52	1.04E-02	43	8.61E-03	83%	Pass
61	17.771	50	1.00E-02	42	8.41E-03	84%	Pass
62	18.034	49	9.81E-03	39	7.81E-03	80%	Pass
63	18.297	47	9.41E-03	36	7.20E-03	77%	Pass
64	18.561	46	9.21E-03	36	7.20E-03	78%	Pass
65	18.824	43	8.61E-03	35	7.00E-03	81%	Pass
66	19.087	42	8.41E-03	34	6.80E-03	81%	Pass
67	19.351	41	8.21E-03	34	6.80E-03	83%	Pass
68	19.614	40	8.01E-03	34	6.80E-03	85%	Pass
69	19.877	38	7.60E-03	32	6.40E-03	84%	Pass
70	20.140	37	7.40E-03	32	6.40E-03	86%	Pass
71	20.404	35	7.00E-03	29	5.80E-03	83%	Pass
72	20.667	35	7.00E-03	29	5.80E-03	83%	Pass
73	20.930	32	6.40E-03	28	5.60E-03	88%	Pass
74	21.194	30	6.00E-03	26	5.20E-03	87%	Pass
75	21.457	29	5.80E-03	24	4.80E-03	83%	Pass
76	21.720	27	5.40E-03	23	4.60E-03	85%	Pass
77	21.984	26	5.20E-03	22	4.40E-03	85%	Pass
78	22.247	25	5.00E-03	21	4.20E-03	84%	Pass
79	22.510	24	4.80E-03	20	4.00E-03	83%	Pass
80	22.773	24	4.80E-03	20	4.00E-03	83%	Pass
81	23.037	23	4.60E-03	17	3.40E-03	74%	Pass

Interval	Existing Condition			Detention Basin Optimized			Pass or Fail?
	Q (cfs)	Hours > Q	% time	Hours>Q	% time	Post/Pre	
82	23.300	23	4.60E-03	16	3.20E-03	70%	Pass
83	23.563	21	4.20E-03	16	3.20E-03	76%	Pass
84	23.827	20	4.00E-03	16	3.20E-03	80%	Pass
85	24.090	20	4.00E-03	15	3.00E-03	75%	Pass
86	24.353	20	4.00E-03	14	2.80E-03	70%	Pass
87	24.617	18	3.60E-03	13	2.60E-03	72%	Pass
88	24.880	18	3.60E-03	13	2.60E-03	72%	Pass
89	25.143	17	3.40E-03	11	2.20E-03	65%	Pass
90	25.406	17	3.40E-03	10	2.00E-03	59%	Pass
91	25.670	16	3.20E-03	10	2.00E-03	63%	Pass
92	25.933	15	3.00E-03	10	2.00E-03	67%	Pass
93	26.196	14	2.80E-03	9	1.80E-03	64%	Pass
94	26.460	10	2.00E-03	8	1.60E-03	80%	Pass
95	26.723	8	1.60E-03	7	1.40E-03	88%	Pass
96	26.986	8	1.60E-03	6	1.20E-03	75%	Pass
97	27.249	7	1.40E-03	6	1.20E-03	86%	Pass
98	27.513	7	1.40E-03	6	1.20E-03	86%	Pass
99	27.776	7	1.40E-03	5	1.00E-03	71%	Pass
100	28.039	7	1.40E-03	5	1.00E-03	71%	Pass

Peak Flows calculated with Cunnane Plotting Position

Return Period	Pre-dev. Q	Post-Dev. Q	Reduction
10	28.039	26.895	1.145
9	27.290	26.636	0.654
8	26.830	26.293	0.537
7	26.638	25.623	1.015
6	26.356	25.018	1.338
5	26.277	24.466	1.811
4	25.002	22.858	2.144
3	23.009	21.212	1.798
2	19.730	17.990	1.740

ATTACHMENT 3 - List of Peak Events and Determination of Q2 & Q10

List of Peak events and Determination of P2 and P10 (Pre-Development)

T	Cunnane	Weibull	Peaks	Date	Position	Period of Return	
						Weibull	Cunnane
10	28.04	28.41					
9	27.29	27.64	14.48	3/16/1954	57	1.02	1.01
8	26.83	26.94	14.53	2/11/1959	56	1.04	1.03
7	26.64	26.66	14.54	12/2/1961	55	1.05	1.05
6	26.36	26.42	14.56	1/21/1964	54	1.07	1.07
5	26.28	26.29	14.59	11/16/1965	53	1.09	1.09
4	25.00	25.28	14.71	11/17/1972	52	1.12	1.11
3	23.01	23.14	14.79	3/20/1973	51	1.14	1.13
2	19.73	19.73	14.86	1/6/1977	50	1.16	1.15
			15.46	1/14/1978	49	1.18	1.18
			15.85	3/11/1978	48	1.21	1.20
			16.07	11/25/1985	47	1.23	1.23
			16.14	1/18/1952	46	1.26	1.25
			16.33	12/18/1967	45	1.29	1.28
			16.38	1/14/1969	44	1.32	1.31
			16.46	2/6/1969	43	1.35	1.34
			16.51	2/17/1971	42	1.38	1.38
			16.66	2/8/1976	41	1.41	1.41
			16.89	12/31/1976	40	1.45	1.44
			17.75	5/8/1977	39	1.49	1.48
			17.91	1/6/1979	38	1.53	1.52
			18.13	3/1/1981	37	1.57	1.56
			18.22	3/17/1982	36	1.61	1.61
			18.41	3/24/1983	35	1.66	1.65
			18.58	11/25/1983	34	1.71	1.70
			18.59	1/18/1993	33	1.76	1.75
			18.9	3/11/1995	32	1.81	1.81
			19.35	12/28/2004	31	1.87	1.87
			19.39	2/21/2005	30	1.93	1.93
			19.73	2/21/2005	29	2.00	2.00
			19.74	2/3/1958	28	2.07	2.07
			19.95	3/6/1975	27	2.15	2.15
			20.15	2/25/1981	26	2.23	2.23
			20.77	3/1/1983	25	2.32	2.33
			20.79	11/17/1986	24	2.42	2.42
			20.91	12/4/1987	23	2.52	2.53
			21.56	4/21/1988	22	2.64	2.65
			21.98	1/31/1993	21	2.76	2.78
			22.51	2/14/1995	20	2.90	2.92
			23.47	12/23/1995	19	3.05	3.08
			23.54	1/12/1960	18	3.22	3.25
			23.59	3/8/1968	17	3.41	3.45
			24.54	12/4/1974	16	3.63	3.67
			24.6	3/16/1986	15	3.87	3.92
			26.01	11/5/1987	14	4.14	4.21
			26.27	1/10/1955	13	4.46	4.54
			26.27	1/10/1978	12	4.83	4.93
			26.32	1/25/1995	11	5.27	5.40
			26.34	10/27/2004	10	5.80	5.96
			26.61	11/21/1967	9	6.44	6.65
			26.68	2/28/1970	8	7.25	7.53
			27.04	11/16/1972	7	8.29	8.67
			28.2	1/31/1979	6	9.67	10.21
			29.42	2/24/1998	5	11.60	12.43
			29.57	12/29/2004	4	14.50	15.89
			32.86	2/20/1980	3	19.33	22.00
			33.89	3/7/1952	2	29.00	35.75
			37.37	12/10/1965	1	58.00	95.33

Note:

Cunnane is the preferred method by the HMP permit.

List of Peak events and Determination of P2 and P10 (Post-Development)

T	Cunnane	Weibull	Peaks	Date	Position	Period of Return	
						Weibull	Cunnane
10	26.89	27.05					
9	26.64	26.76	13.1	1/13/1952	57	1.02	1.01
8	26.29	26.43	13.12	1/18/1952	56	1.04	1.03
7	25.62	25.86	13.14	1/18/1952	55	1.05	1.05
6	25.02	25.09	13.15	12/20/1952	54	1.07	1.07
5	24.47	24.60	13.4	1/10/1955	53	1.09	1.09
4	22.86	23.15	13.44	1/7/1957	52	1.12	1.11
3	21.21	21.22	13.51	1/20/1962	51	1.14	1.13
2	17.99	17.99	13.93	4/8/1965	50	1.16	1.15
			13.95	3/22/1954	49	1.18	1.18
			14.59	12/5/1957	48	1.21	1.20
			14.59	1/12/1960	47	1.23	1.23
			14.76	12/2/1961	46	1.26	1.25
			14.97	11/20/1963	45	1.29	1.28
			15.01	12/5/1966	44	1.32	1.31
			15.05	1/14/1969	43	1.35	1.34
			15.49	12/21/2002	42	1.38	1.38
			15.96	2/14/2003	41	1.41	1.41
			16.2	2/22/2004	40	1.45	1.44
			16.35	3/7/1952	39	1.49	1.48
			16.4	3/16/1958	38	1.53	1.52
			16.74	3/1/1981	37	1.57	1.56
			16.79	3/17/1982	36	1.61	1.61
			16.86	2/2/1983	35	1.66	1.65
			16.91	3/1/1983	34	1.71	1.70
			16.99	11/25/1985	33	1.76	1.75
			17.77	3/1/1991	32	1.81	1.81
			17.92	2/19/1993	31	1.87	1.87
			17.94	3/11/1995	30	1.93	1.93
			17.99	3/11/1995	29	2.00	2.00
			18.17	2/3/1998	28	2.07	2.07
			18.19	2/8/1998	27	2.15	2.15
			18.64	2/12/2003	26	2.23	2.23
			18.83	3/5/2005	25	2.32	2.33
			19.63	12/30/1951	24	2.42	2.42
			19.64	3/16/1952	23	2.52	2.53
			20.24	3/16/1986	22	2.64	2.65
			21.01	1/14/1990	21	2.76	2.78
			21.17	1/15/1993	20	2.90	2.92
			21.25	1/25/1995	19	3.05	3.08
			21.35	1/25/1995	18	3.22	3.25
			21.98	11/22/1996	17	3.41	3.45
			22.01	10/27/2004	16	3.63	3.67
			22.43	12/29/2004	15	3.87	3.92
			23.93	1/3/2005	14	4.14	4.21
			24.16	3/6/1975	13	4.46	4.54
			24.38	1/10/1978	12	4.83	4.93
			24.96	1/14/1978	11	5.27	5.40
			25	1/11/2001	10	5.80	5.96
			25.3	3/2/1983	9	6.44	6.65
			26.11	11/5/1987	8	7.25	7.53
			26.55	11/21/1967	7	8.29	8.67
			26.95	2/28/1970	6	9.67	10.21
			27.53	11/16/1972	5	11.60	12.43
			29.11	1/31/1979	4	14.50	15.89
			30	1/4/1995	3	19.33	22.00
			30.54	2/21/2005	2	29.00	35.75
			35.51	12/10/1965	1	58.00	95.33

Note:
Cunnane is the preferred method by the HMP permit.

ATTACHMENT 4 - Elevation vs. Area Curves vs. Discharge Curves to be used in SWMM

Elevation vs. Area

For the portion of the flow diverted in the LID Control to the receiving detention basin, a pond is used to route the hydrographs. The elevation vs area curve in the model is calculated in Excel and imported into the model at a 0.5 ft interval range.

Elevation vs Discharge

The total discharge peak flow is imported from an Excel spreadsheet that calculated the elevation vs discharge of the multiple outlet system.

The orifices have been selected to maximize their size while still restricting flows to conform to the required 10% of the Q2 event flow as mandated in the Final Hydromodification Management Plan by Brown & Caldwell, dated March 2011. While we acknowledge that these orifices are small, to increase the size of these outlets would affect the basins' ability to restrict flows beneath the HMP thresholds, thus preventing the BMP from conformance with HMP requirements.

In order to prevent blockage of the orifices, a debris screen will be fitted to the base invert of the lower orifices located within the detention basin. Regular maintenance of the riser and orifices will be performed to ensure potential blockages are minimized. A detail of the orifice and riser structure is provided in Attachment 5 of this attachment. The stage-storage and stage-discharge calculations have been provided on the following pages.

AMANDA LANE

Basin Stage-Storage	
Depth (ft)	Area (sf)
0.0	10,317
0.5	10,720
1.0	11,122
1.5	11,537
2.0	11,952
2.5	12,380
3.0	12,807
3.5	13,248
4.0	13,688
4.5	14,141
5.0	14,593

Basin #1 Discharge

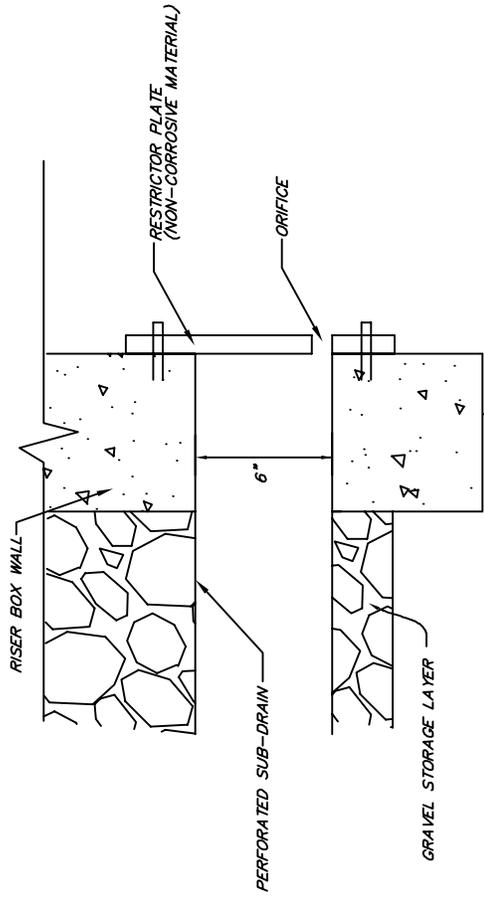
Discharge vs Elevation Table

Low orifice: 0.25 "	Top orifice: 4 "
Number: 1	Number: 2
Cg-low: 0.61	Cg-low: 0.61
Invert elev: 1.00 ft	Invert elev: 2.00 ft
Middle orifice: 3 "	Emergency inlet:
number of orif: 2	Invert: 3.00 ft
Cg-middle: 0.61	Area (SF=2) 4.00 sq ft
Invert elev: 1.50 ft	

h (ft)	H/D-low	H/D-mid	H/D-top	Qlow-orif (cfs)	Qlow-weir (cfs)	Qtot-low (cfs)	Qmid-orif (cfs)	Qmid-weir (cfs)	Qtot-med (cfs)	Qtop-orif (cfs)	Qtop-weir (cfs)	Qtot-top (cfs)	Qemerg (cfs)	Qtot (cfs)
0.0	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.1	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.2	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.3	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.4	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.5	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.6	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.7	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.8	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.9	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1.0	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1.1	4.80	0.00	0.00	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1.2	9.60	0.00	0.00	0.001	0.211	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
1.3	14.40	0.00	0.00	0.001	2.096	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
1.4	19.20	0.00	0.00	0.001	9.913	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
1.5	24.00	0.00	0.00	0.001	32.236	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
1.6	28.80	0.40	0.00	0.001	83.488	0.001	0.000	0.032	0.032	0.000	0.000	0.000	0.000	0.033
1.7	33.60	0.80	0.00	0.001	185.480	0.001	0.132	0.112	0.112	0.000	0.000	0.000	0.000	0.113
1.8	38.40	1.20	0.00	0.001	368.941	0.001	0.201	0.215	0.201	0.000	0.000	0.000	0.000	0.203
1.9	43.20	1.60	0.00	0.002	675.054	0.002	0.252	0.316	0.252	0.000	0.000	0.000	0.000	0.254
2.0	48.00	2.00	0.00	0.002	1156.986	0.002	0.294	0.391	0.294	0.000	0.000	0.000	0.000	0.296
2.1	52.80	2.40	0.30	0.002	1881.427	0.002	0.331	0.430	0.331	0.000	0.037	0.037	0.000	0.370
2.2	57.60	2.80	0.60	0.002	2930.120	0.002	0.364	0.439	0.364	0.156	0.138	0.138	0.000	0.504
2.3	62.40	3.20	0.90	0.002	4401.395	0.002	0.395	0.449	0.395	0.312	0.280	0.280	0.000	0.677
2.4	67.20	3.60	1.20	0.002	6411.703	0.002	0.423	0.517	0.423	0.413	0.442	0.413	0.000	0.838
2.5	72.00	4.00	1.50	0.002	9097.150	0.002	0.450	0.738	0.450	0.493	0.600	0.493	0.000	0.945
2.6	76.80	4.40	1.80	0.002	12615.034	0.002	0.475	1.249	0.475	0.562	0.734	0.562	0.000	1.039
2.7	81.60	4.80	2.10	0.002	17145.370	0.002	0.498	2.233	0.498	0.624	0.830	0.624	0.000	1.124
2.8	86.40	5.20	2.40	0.002	22892.432	0.002	0.521	3.930	0.521	0.680	0.883	0.680	0.000	1.203
2.9	91.20	5.60	2.70	0.002	30086.285	0.002	0.543	6.636	0.543	0.732	0.901	0.732	0.000	1.277
3.0	96.00	6.00	3.00	0.002	38984.315	0.002	0.564	10.717	0.564	0.780	0.906	0.780	0.000	1.346
3.1	100.80	6.40	3.30	0.002	49872.765	0.002	0.584	16.611	0.584	0.825	0.938	0.825	0.221	1.633
3.2	105.60	6.80	3.60	0.002	63068.273	0.002	0.603	24.831	0.603	0.869	1.061	0.869	0.626	2.100
3.3	110.40	7.20	3.90	0.003	78919.395	0.003	0.622	35.980	0.622	0.910	1.358	0.910	1.150	2.684
3.4	115.20	7.60	4.20	0.003	97808.152	0.003	0.640	50.749	0.640	0.949	1.944	0.949	1.770	3.362
3.5	120.00	8.00	4.50	0.003	#####	0.003	0.658	69.926	0.658	0.987	2.960	0.987	2.473	4.121
3.6	124.80	8.40	4.80	0.003	#####	0.003	0.675	94.402	0.675	1.023	4.584	1.023	3.251	4.952
3.7	129.60	8.80	5.10	0.003	#####	0.003	0.692	125.180	0.692	1.058	7.028	1.058	4.097	5.850
3.8	134.40	9.20	5.40	0.003	#####	0.003	0.709	163.374	0.709	1.092	10.542	1.092	5.006	6.809
3.9	139.20	9.60	5.70	0.003	#####	0.003	0.725	210.225	0.725	1.125	15.420	1.125	5.973	7.826
4.0	144.00	10.00	6.00	0.003	#####	0.003	0.741	267.097	0.741	1.157	22.001	1.157	6.996	8.896
4.1	148.80	10.40	6.30	0.003	#####	0.003	0.756	335.490	0.756	1.188	30.670	1.188	8.071	10.018
4.2	153.60	10.80	6.60	0.003	#####	0.003	0.771	417.046	0.771	1.218	41.866	1.218	9.196	11.189
4.3	158.40	11.20	6.90	0.003	#####	0.003	0.786	513.550	0.786	1.248	56.080	1.248	10.370	12.407
4.4	163.20	11.60	7.20	0.003	#####	0.003	0.801	626.941	0.801	1.277	73.861	1.277	11.589	13.669
4.5	168.00	12.00	7.50	0.003	#####	0.003	0.815	759.316	0.815	1.305	95.817	1.305	12.852	14.975
4.6	172.80	12.40	7.80	0.003	#####	0.003	0.829	912.938	0.829	1.333	122.620	1.333	14.159	16.324
4.7	177.60	12.80	8.10	0.003	#####	0.003	0.843	1090.239	0.843	1.360	155.009	1.360	15.507	17.713
4.8	182.40	13.20	8.40	0.003	#####	0.003	0.856	1293.829	0.856	1.386	193.789	1.386	16.895	19.141
4.9	187.20	13.60	8.70	0.003	#####	0.003	0.870	1526.502	0.870	1.413	239.840	1.413	18.322	20.608
5.0	192.00	14.00	9.00	0.003	#####	0.003	0.883	1791.239	0.883	1.438	294.116	1.438	19.788	22.112

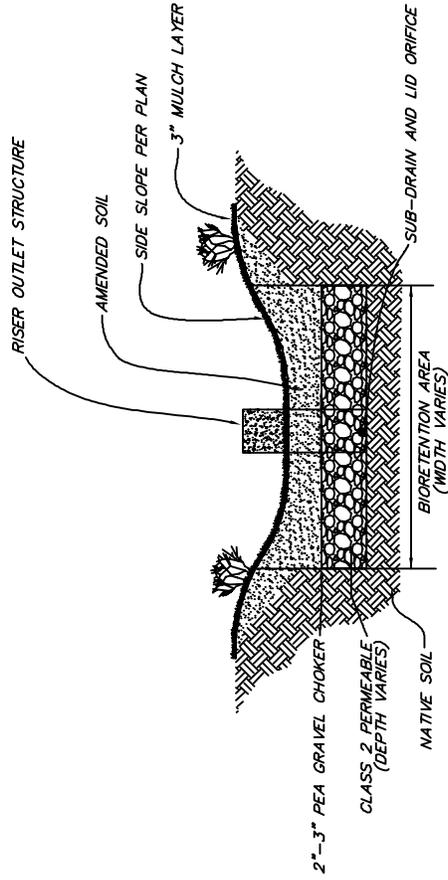
LID Outlet #1			
ABMP=	10317	sq-ft	(Area above engineered fill/bio-retention section)
			(It can also be area of infiltration at the bottom)
Cg=	0.61		(coefficient of discharge of the bottom orifice)
Dorif=	1.8	in	(diameter in inches of the bottom orifice)
Aorifice=	0.01767	sq-ft	(area of orifice in sq-ft)
C _{SWMM} =	0.1046		C coefficient to be inserted into SWMM
H-gravel=	2	ft	Depth of the gravel layer where water is ponding
	24	in	(In this case: superior bottom - mulch - ammended soil - invert of French drain)
	22.2	in	
H-design=	1.850	ft	H-gravel minus radius of the discharge
Q _{orif-classic} =	0.11766	cfs	
Q _{orif-SWMM} =	0.11766	cfs	
Q _{diversion} =	0.11884	cfs	1% additional to the Qorifice.

ATTACHMENT 5 - Bio Retention Details



LID ORIFICE DETAIL

NOT TO SCALE



TYPICAL BIORETENTION BASIN CROSS SECTION

NOT TO SCALE

ATTACHMENT 6 - SWMM Input Data (Existing and Proposed Models)

ATTACHMENT 7 - SWMM Screens and Explanation of Significant Variables

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, outfalls, storage units, LID controls for the bio-retention cells, ponding on top of the bio-retention (modeled as a storage unit), weir 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, typical values found in technical literature (such as Maidment's Handbook of Hydrology). Recommended values for the SWMM model have been attained from the interim Orange County criteria established for their SWMM calibration. Currently, no recommended values have been established by the San Diego County HMP Permit for the SWMM Model.

Soil characteristics of the existing soils were determined from the USGS sources.

Some values incorporated within the SWMM model have been determined from the professional experience of H&A using conservative assumption 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.

Description of model parameters and assumptions:

N-Imperv – Manning's N for impervious surfaces

0.012 (typical)

N-Perv – Manning's N for pervious surfaces

0.05 (typical)

Dstore-Imperv – Depth of depression storage on impervious area (in)

0.02 (typical)

Dstore-Perv – Depth of depression storage on pervious area (in)

0.1 (typical)

%Zero-Imperv – Percentage of impervious area with no depression storage (%)

25 (typical)

Suction Head – Soil capillary suction head (in)

Conductivity – Soil saturated hydraulic conductivity (in/hr)

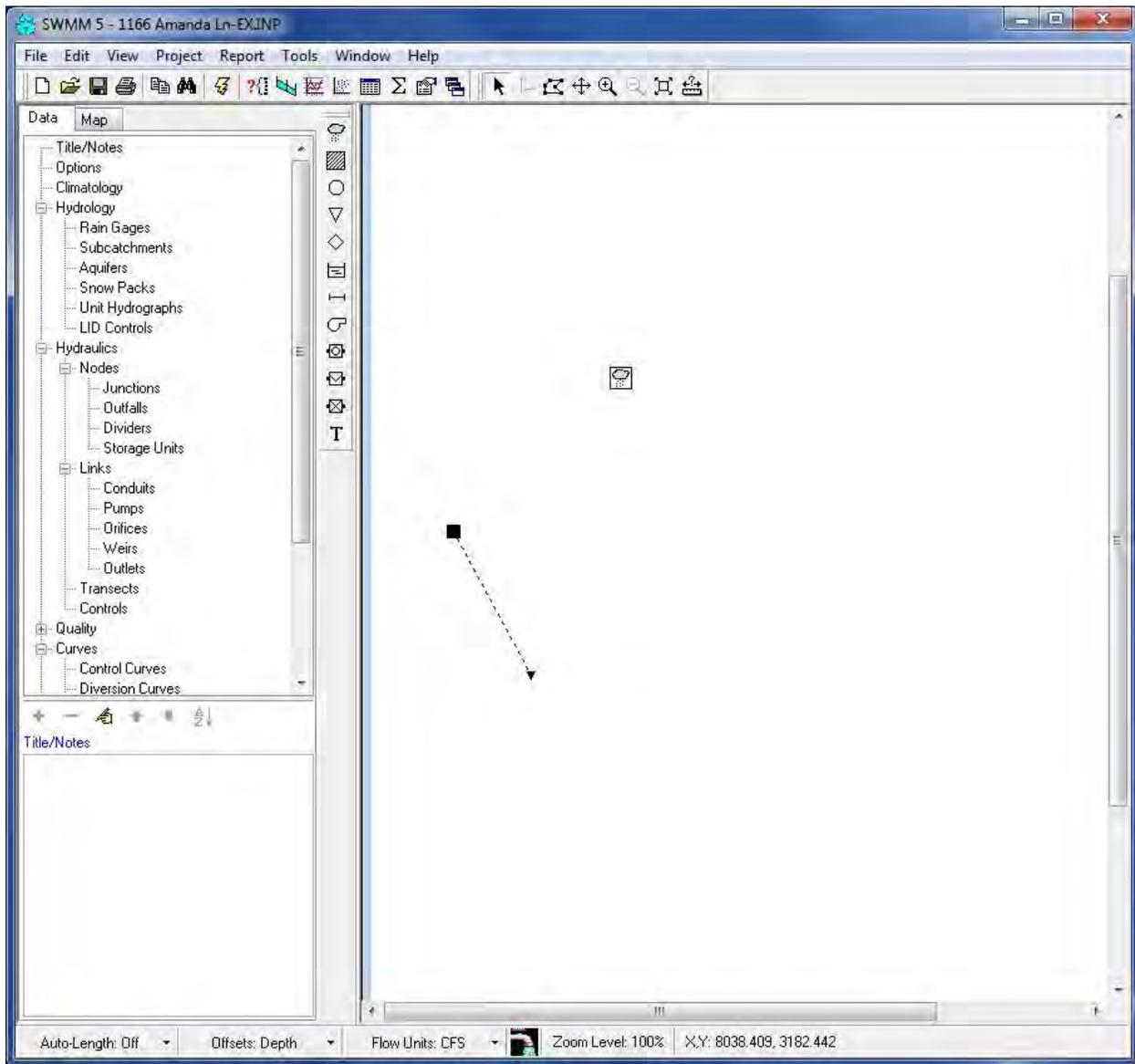
-75% of these values if subcatchment is graded/compacted

Initial Deficit – Initial moisture deficit (fraction)

Soil Type	Suction Head	Conductivity	Initial Deficit
A	1.5	0.3	0.33
B	3	0.2	0.32
C	6	0.1	0.31
D	9	0.025	0.30

NOTE : These values are based on Maidment's Handbook of Hydrology, Orange County calibrations for SWMM and recommended values from the EPA SWMM program.

POC 1 – Pre-Developed Condition



Outfall POC1Ex

Property	Value
Name	POC1Ex
X-Coordinate	1740.113
Y-Coordinate	3977.401
Description	
Tag	
Inflows	NO
Treatment	NO
Invert El.	0
Tide Gate	NO
Type	FREE
Fixed Outfall	
Fixed Stage	0
Tidal Outfall	
Curve Name	*
Time Series Outfall	
Series Name	*
Water elevation for a FIXED type of boundary condition (ft)	

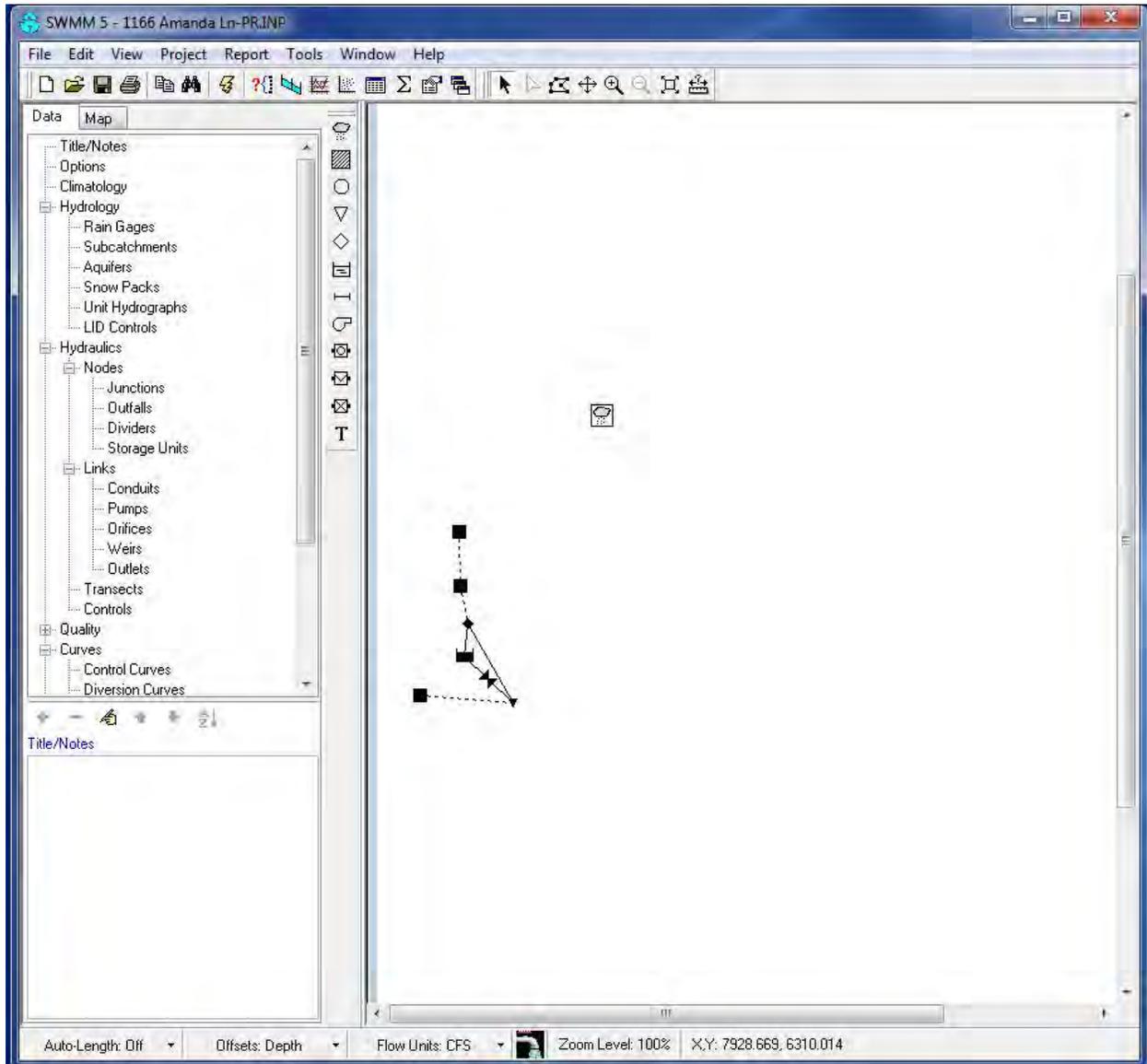
Property	Value
Name	Basin1
X-Coordinate	890.923
Y-Coordinate	5558.444
Description	Existing Area
Tag	
Rain Gage	Escondido
Outlet	POC1Ex
Area	46.2
Width	1119
% Slope	7.9
% Imperv	28
N-Imperv	.012
N-Perv	0.05
Dstore-Imperv	.02
Dstore-Perv	.1
%Zero-Imperv	25
Subarea Routing	OUTLET
Percent Routed	100
Infiltration	GREEN_AMPT ...
Groundwater	NO
Snow Pack	
LID Controls	0
Land Uses	0
Initial Buildup	NONE
Curb Length	0

Infiltration parameters (click to edit)

Property	Value
Infiltration Method	GREEN_AMPT
Suction Head	9
Conductivity	.025
Initial Deficit	0.3
Soil capillary suction head (inches or mm)	

OK Cancel Help

POC 1 – Developed Condition



Outfall POC-1

Property	Value
Name	POC-1
X-Coordinate	1477.152
Y-Coordinate	3687.566
Description	
Tag	
Inflows	NO
Treatment	NO
Invert El.	0
Tide Gate	NO
Type	FREE
Fixed Outfall	
Fixed Stage	0
Tidal Outfall	
Curve Name	∞
Time Series Outfall	
Series Name	∞
User-assigned name of outfall	

Subcatchment Basin1

Property	Value
Name	Basin1
X-Coordinate	890.923
Y-Coordinate	5558.444
Description	Area Tributary to Basin #1
Tag	
Rain Gage	Escondido
Outlet	BR-1
Area	7.5
Width	362
% Slope	7.3
% Imperv	56
N-Imperv	.012
N-Perv	0.05
Dstore-Imperv	.02
Dstore-Perv	.1
%Zero-Imperv	25
Subarea Routing	OUTLET
Percent Routed	100
Infiltration	GREEN_AMPT ...
Groundwater	NO
Snow Pack	
LID Controls	0
Land Uses	0
Initial Buildup	NONE
Curb Length	0

Infiltration parameters (click to edit)

Infiltration Editor

Infiltration Method: GREEN_AMPT

Property	Value
Suction Head	9
Conductivity	0.025
Initial Deficit	0.3

Soil capillary suction head (inches or mm)

OK Cancel Help

Property	Value
Name	BR-1
X-Coordinate	904.472
Y-Coordinate	4959.350
Description	
Tag	
Rain Gage	Escondido
Outlet	Div-1
Area	.25
Width	85
% Slope	0.1
% Imperv	0
N-Imperv	0.012
N-Perv	0.1
Dstore-Imperv	.02
Dstore-Perv	.1
%Zero-Imperv	25
Subarea Routing	OUTLET
Percent Routed	100
Infiltration	GREEN_AMPT ...
Groundwater	NO
Snow Pack	
LID Controls	1
Land Uses	0
Initial Buildup	NONE
Curb Length	0

Infiltration parameters (click to edit)

Property	Value
Name	BR-1
X-Coordinate	904.472
Y-Coordinate	4959.350
Description	
Tag	
Rain Gage	Lindberg
Outlet	Div-1
Area	.25
Width	85
% Slope	0.1
% Imperv	0
N-Imperv	0.012
N-Perv	0.1
Dstore-Imperv	.02
Dstore-Perv	.1
%Zero-Imperv	25
Subarea Routing	OUTLET
Percent Routed	100
Infiltration	GREEN_AMPT ..
Groundwater	NO
Snow Pack	
LID Controls	1
Land Uses	0
Initial Buildup	NONE
Curb Length	0

Infiltration parameters (click to edit)

Infiltration Editor

Infiltration Method: GREEN_AMPT

Property	Value
Suction Head	1.5
Conductivity	0.3
Initial Deficit	0.33

Soil capillary suction head (inches or mm)

OK Cancel Help

Infiltration Editor

Infiltration Method: GREEN_AMPT

Property	Value
Suction Head	1.5
Conductivity	0.3
Initial Deficit	0.33

Soil capillary suction head (inches or mm)

OK Cancel Help

Subcatchment Basin2

Property	Value
Name	Basin2
X-Coordinate	467.751
Y-Coordinate	3777.964
Description	Additional area not tributary to basin
Tag	
Rain Gage	Escondido
Outlet	POC-1
Area	41.0
Width	956
% Slope	7.6
% Imperv	31
N-Imperv	0.012
N-Perv	.05
Dstore-Imperv	.02
Dstore-Perv	.1
%Zero-Imperv	25
Subarea Routing	OUTLET
Percent Routed	100
Infiltration	GREEN_AMPT ...
Groundwater	NO
Snow Pack	
LID Controls	0
Land Uses	0
Initial Buildup	NONE
Curb Length	0

Infiltration parameters (click to edit)

Infiltration Editor

Infiltration Method: GREEN_AMPT

Property	Value
Suction Head	3
Conductivity	.025
Initial Deficit	0.3

Soil capillary suction head (inches or mm)

OK Cancel Help

Property	Value
Name	Div-1
X-Coordinate	981.151
Y-Coordinate	4560.296
Description	
Tag	
Inflows	NO
Treatment	NO
Invert El.	0
Max. Depth	2
Initial Depth	0
Surcharge Depth	0
Ponded Area	0
Diverted Link	Bypass-1
Type	CUTOFF
Cutoff Divider	
Cutoff Flow	.11884
Tabular Divider	
Curve Name	*
Weir Divider	
Min. Flow	0
Max. Depth	0
Coefficient	0

Outlet 1

Property	Value
Name	1
Inlet Node	Stor-1
Outlet Node	POC-1
Description	
Tag	
Inlet Offset	0
Flap Gate	NO
Rating Curve	TABULAR/DEPTH
Functional Curve	
Coefficient	10.0
Exponent	0.5
Tabular Curve	
Curve Name	Basin#1Outlet

User-assigned name of outlet

EXPLANATION OF SELECTED VARIABLES

Parameters for the pre- and post-developed models include soil type B in accordance with the San Diego County Hydrology Manual and the USGS Soil Survey Map (attached at the end of this appendix). Suction head, conductivity and initial deficit corresponds to average values expected for the soil types, according to sources consulted, professional experience, and approximate values obtained by the interim Orange County modeling approach.

H&A selected infiltration values, such that the percentage of total precipitation that becomes runoff, is realistic for soil type D and slightly smaller than measured values for Southern California watersheds.

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 than the precise routing in a system where the time of concentration is much smaller than 1 hour.

Sub-catchments BR-1 & Basin1:

The area of Subcatchment Basin 1 + BR-1 must be equal to the area of the development tributary to that particular bio-retention facility. Five (5) decimal places were given regarding the areas of the bio-retention to insure that the area used by the program for the LID subroutine corresponds exactly with these tributaries.

BIORETENTION 1

Property	Value
Name	BR-1
X-Coordinate	904.472
Y-Coordinate	4959.350
Description	
Tag	
Rain Gage	Escondido
Outlet	Div-1
Area	.25
Width	85
% Slope	0.1
% Imperv	0
N-Imperv	0.012
N-Perv	0.1
Dstore-Imperv	.02
Dstore-Perv	.1
%Zero-Imperv	25
Subarea Routing	OUTLET
Percent Routed	100
Infiltration	GREEN_AMPT
Groundwater	NO
Snow Pack	
LID Controls	1
Land Uses	0
Initial Buildup	NONE
Curb Length	0
User-assigned name of subcatchment	

LID Control Editor

Control Name:

LID Type:

Process Layers:

Surface	Soil	Storage	Underdrain
Storage Depth (in. or mm)		<input type="text" value=".001"/>	
Vegetation Volume Fraction		<input type="text" value="0.1"/>	
Surface Roughness (Mannings n)		<input type="text" value="0.1"/>	
Surface Slope (percent)		<input type="text" value="0"/>	

OK Cancel Help

LID Control Editor

Control Name:

LID Type:

Process Layers:

Surface Soil Storage Underdrain

Thickness (in. or mm)	<input type="text" value="24"/>
Porosity (volume fraction)	<input type="text" value="0.4"/>
Field Capacity (volume fraction)	<input type="text" value="0.25"/>
Wilting Point (volume fraction)	<input type="text" value="0.05"/>
Conductivity (in/hr or mm/hr)	<input type="text" value="5"/>
Conductivity Slope	<input type="text" value="5"/>
Suction Head (in. or mm)	<input type="text" value="1.5"/>

LID Control Editor

Control Name:

LID Type:

Process Layers:

Surface	Soil	Storage	Underdrain
Height (in. or mm)		24	
Void Ratio (Voids / Solids)		0.40	
Conductivity (in/hr or mm/hr)		0.025	
Clogging Factor		0	

Note: use a Conductivity of 0 if the LID unit has an impermeable bottom.

OK Cancel Help

LID Control Editor

Control Name:

LID Type:

Process Layers:

Drain Coefficient (in/hr or mm/hr)	<input type="text" value="0.1046"/>
Drain Exponent	<input type="text" value="0.5"/>
Drain Offset Height (in. or mm)	<input type="text" value="0"/>

Note: use a Drain Coefficient of 0 if the LID unit has no underdrain.

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 engineered soil and mulch components of the bioretention facility. This storage volume is comprised of a gravel located bed beneath a layer of engineered soil and a 0.25 foot (3-inch) layer of landscaping mulch.

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.

H&A considers such a value to be slightly high; however, in order to comply with the HMP Permit, the value recommended by the Copermittees for the porosity of amended soil is 0.4, per Appendix A of the Final Hydromodification Management Plan by Brown & Caldwell, dated March 2011.

Void Ratio:

The ratio of the void volume divided by the soil volume is directly related to porosity as $n/(1-n)$. As the underdrain layer is composed of gravel, a porosity value of 0.4 has been selected, which results in a void ratio of $0.4/(1-0.4) = 0.67$ for the gravel detention layer.

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, and instead, a conservative value of infiltration was recommended.

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:

$$q = C D^n H^m \quad (1)$$

where q is the peak flow in in/hr, n is the 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:

$$q = C D^n H^m \quad (2)$$

where Q is the peak flow in cfs, D is the diameter in inches, c_g is the typical discharge coefficient for orifices (0.61-0.63 for thin walls and around 0.75-0.8 for thick walls), g is the acceleration of gravity in ft/s^2 , and H and H_D are defined above and are also used in inches in Equation (2).

Cutoff Flow:

This is the only significant variable in the diversion, as the type of diversion is defined by this value. Any excess of flow over this value will be diverted into a pond subroutine (the surface stage of the bio-retention basin) and routed there. The determination of this value equates to the value obtained with equation (2) above, plus 1%, when H = depth of gravel layer and $H_D=0$ (orifice situated at the datum). Thus, once flows exceed the maximum discharge the LID orifice experiences a head of the storage depth, ponding occurs within the bioretention basin, routing these additional flows via the pond riser.

Property	Value
Name	Div-1
X-Coordinate	981.151
Y-Coordinate	4560.296
Description	
Tag	
Inflows	NO
Treatment	NO
Invert El.	0
Max. Depth	2
Initial Depth	0
Surcharge Depth	0
Ponded Area	0
Diverted Link	Bypass-1
Type	CUTOFF
Cutoff Divider	
Cutoff Flow	.11884
Tabular Divider	
Curve Name	*
Weir Divider	
Min. Flow	0
Max. Depth	0
Coefficient	0
User-assigned name of divider	

Note:

The complete storage and rating curves and the respective explanation is shown at the end of this appendix. A variable area vs. elevation storage curve was used for the final model, and a discharge that is a function of the outlet structure in the surface was used also.

BIORETENTION 1

Storage Unit Stor-1

Property	Value
Name	Stor-1
X-Coordinate	947.368
Y-Coordinate	4198.830
Description	Basin #1
Tag	
Inflows	NO
Treatment	NO
Invert El.	760
Max. Depth	5
Initial Depth	0
Ponded Area	10317
Evap. Factor	1
Infiltration	NO
Storage Curve	TABULAR
Functional Curve	
Coefficient	1000
Exponent	0
Constant	0
Tabular Curve	
Curve Name	Basin#1

User-assigned name of storage unit

Storage Curve Editor

Curve Name
Basin#1

Description
Basin #1

	Depth (ft)	Area (ft ²)
1	0	10317
2	0.5	10719.5
3	1	11122
4	1.5	11537
5	2	11952
6	2.5	12379.5
7	3	12807
8	3.5	13247.5
9	4	13688

View...
Load...
Save...
OK
Cancel
Help

Outfall POC-1

Property	Value
Name	POC-1
X-Coordinate	1477.152
Y-Coordinate	3687.566
Description	
Tag	
Inflows	NO
Treatment	NO
Invert El.	0
Tide Gate	NO
Type	FREE
Fixed Outfall	
Fixed Stage	0
Tidal Outfall	
Curve Name	*
Time Series Outfall	
Series Name	*

Rating Curve Editor

Curve Name: Basin#1 Outlet

Description:

	Head (ft)	Outflow (CFS)
1	0.0	0.000
2	0.1	0.000
3	0.2	0.000
4	0.3	0.000
5	0.4	0.000
6	0.5	0.000
7	0.6	0.000
8	0.7	0.000
9	0.8	0.000

Buttons: View..., Load..., Save..., OK, Cancel, Help

ATTACHMENT 8 - Drying Time of the Surface Layer of Bio-retention cells

The LID subroutine of the SWMM Model does not increase the discharge of the lower LID orifice once the storage layer is full (in other words, it does not consider the influence of the pressure in the amended soil layer). The discharge of the lower LID orifice when the surface layer is full is considered constant by the model and equal to the discharge of the lower orifice when the storage layer is full (equal to the cutoff flows).

The drying time interval between an elevation y_i and another elevation $y_i - \Delta y$ can be obtained by:

$$\Delta t_i(\text{hours}) = \frac{(Q(y_i) + Q(y_i - \Delta y))}{7200 (V(y_i) - V(y_i - \Delta y))} = \frac{Q_{\text{ave}}}{3600 \Delta V}$$

$$t = \sum_{i=1}^n \Delta t_i (\text{hours})$$

Q_{ave} represents the average discharge between elevation y_i and y_{i+1} obtained by $\frac{Q(y_i) + Q(y_i - \Delta y)}{2}$ where ΔV represents the fraction of the volume that must be discharged at a peak flow $Q_{\text{ave}}(V(y_i) - V(y_i - \Delta y))$.

The volume and the discharge change as the elevation changes; the calculation takes into account this change.

Basin #1		$Q_{\text{Sub Drain}} =$	0.12 cfs	
Elevation	Q_{AVG} (CFS)	DV (CF)	DT (HR)	Total T
760.1	0.12	1036	2.42	47.84
760.2	0.12	1044	2.44	45.42
760.3	0.12	1052	2.46	42.98
760.4	0.12	1060	2.48	40.52
760.5	0.12	1069	2.50	38.04
760.6	0.12	1077	2.52	35.54
760.7	0.12	1085	2.54	33.03
760.8	0.12	1094	2.56	30.49
760.9	0.12	1102	2.58	27.93
761.0	0.12	1110	2.59	25.36
761.1	0.12	1119	2.60	22.77
761.2	0.12	1127	2.62	20.17
761.3	0.12	1136	2.63	17.55
761.4	0.12	1144	2.65	14.92
761.5	0.14	1153	2.36	12.27
761.6	0.19	1161	1.68	9.91
761.7	0.28	1170	1.17	8.23
761.8	0.35	1179	0.94	7.05
761.9	0.39	1188	0.84	6.11
762.0	0.45	1196	0.74	5.27
762.1	0.56	1205	0.60	4.53
762.2	0.71	1214	0.48	3.93
762.3	0.88	1223	0.39	3.46
762.4	1.01	1231	0.34	3.07
762.5	1.11	1240	0.31	2.73
762.6	1.20	1249	0.29	2.42
762.7	1.28	1258	0.27	2.13
762.8	1.36	1267	0.26	1.86
762.9	1.43	1276	0.25	1.60
763.0	1.61	1285	0.22	1.35
763.1	1.99	1294	0.18	1.13
763.2	2.51	1304	0.14	0.95
763.3	3.14	1313	0.12	0.80
763.4	3.86	1322	0.10	0.69
763.5	4.66	1331	0.08	0.59
763.6	5.52	1340	0.07	0.51
763.7	6.45	1350	0.06	0.45
763.8	7.44	1359	0.05	0.39
763.9	8.48	1368	0.04	0.34
764.0	9.58	1378	0.04	0.29
764.1	10.72	1387	0.04	0.25
764.2	11.92	1396	0.03	0.22
764.3	13.16	1406	0.03	0.18
764.4	14.44	1415	0.03	0.15
764.5	15.77	1425	0.03	0.13
764.6	17.14	1435	0.02	0.10
764.7	18.55	1444	0.02	0.08
764.8	19.99	1454	0.02	0.06
764.9	21.48	1463	0.02	0.04
765.0	23.00	1473	0.02	0.02

ATTACHMENT 9 – Hydromodification Watershed Maps

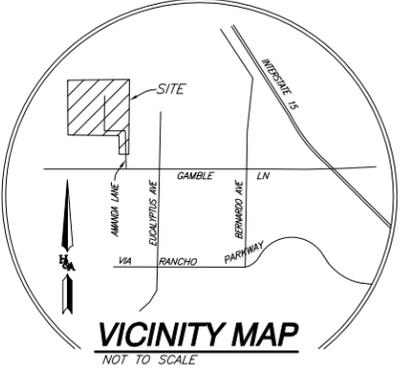
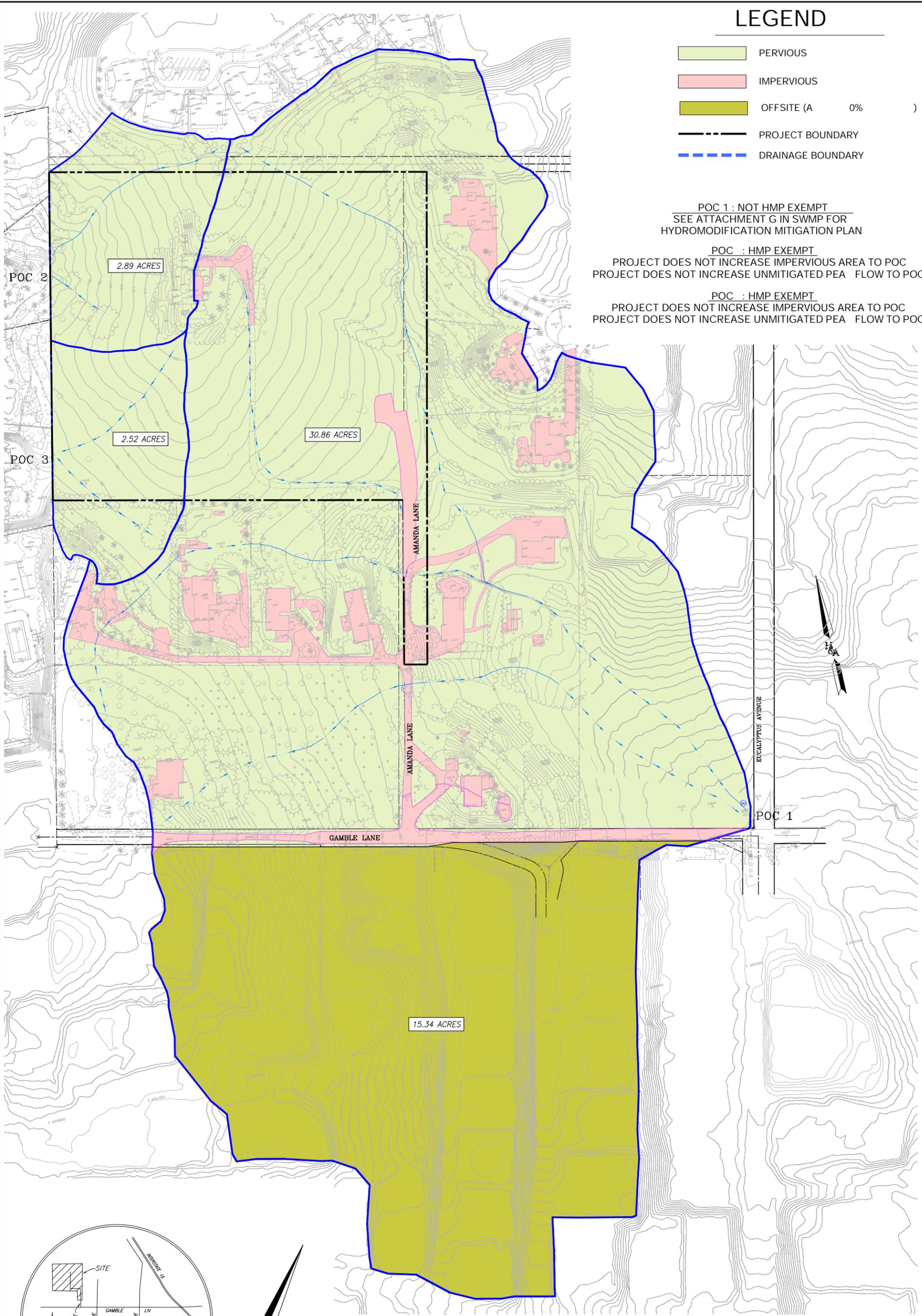
LEGEND

- PERVIOUS
- IMPERVIOUS
- OFFSITE (A 0%)
- PROJECT BOUNDARY
- DRAINAGE BOUNDARY

POC 1 : NOT HMP EXEMPT
SEE ATTACHMENT G IN SWMP FOR
HYDROMODIFICATION MITIGATION PLAN

POC 2 : HMP EXEMPT
PROJECT DOES NOT INCREASE IMPERVIOUS AREA TO POC
PROJECT DOES NOT INCREASE UNMITIGATED PEAK FLOW TO POC

POC 3 : HMP EXEMPT
PROJECT DOES NOT INCREASE IMPERVIOUS AREA TO POC
PROJECT DOES NOT INCREASE UNMITIGATED PEAK FLOW TO POC



<p>PREPARED BY:</p> <p>HUNSAKER & ASSOCIATES SAN DIEGO, INC.</p> <p><small>PLANNING 5907 Village Street ENGINEERING San Diego, Ca 92121 SURVEYING 95456555-4500-74838558-1414</small></p>	<p>EXHIBIT 1 EXISTING CONDITION HYDROMODIFICATION MAP</p> <p>AMANDA ESTATES</p> <p>CITY OF ESCONDIDO, CALIFORNIA 0</p>	<p>MAP 1 OF 0</p>
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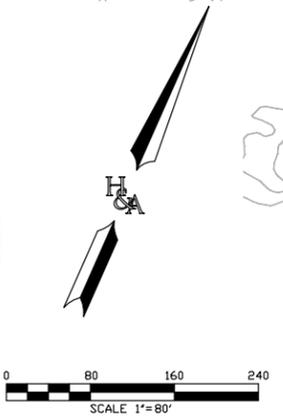
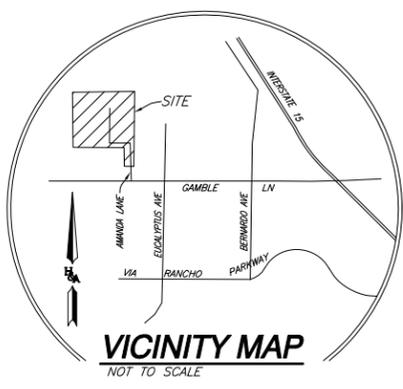
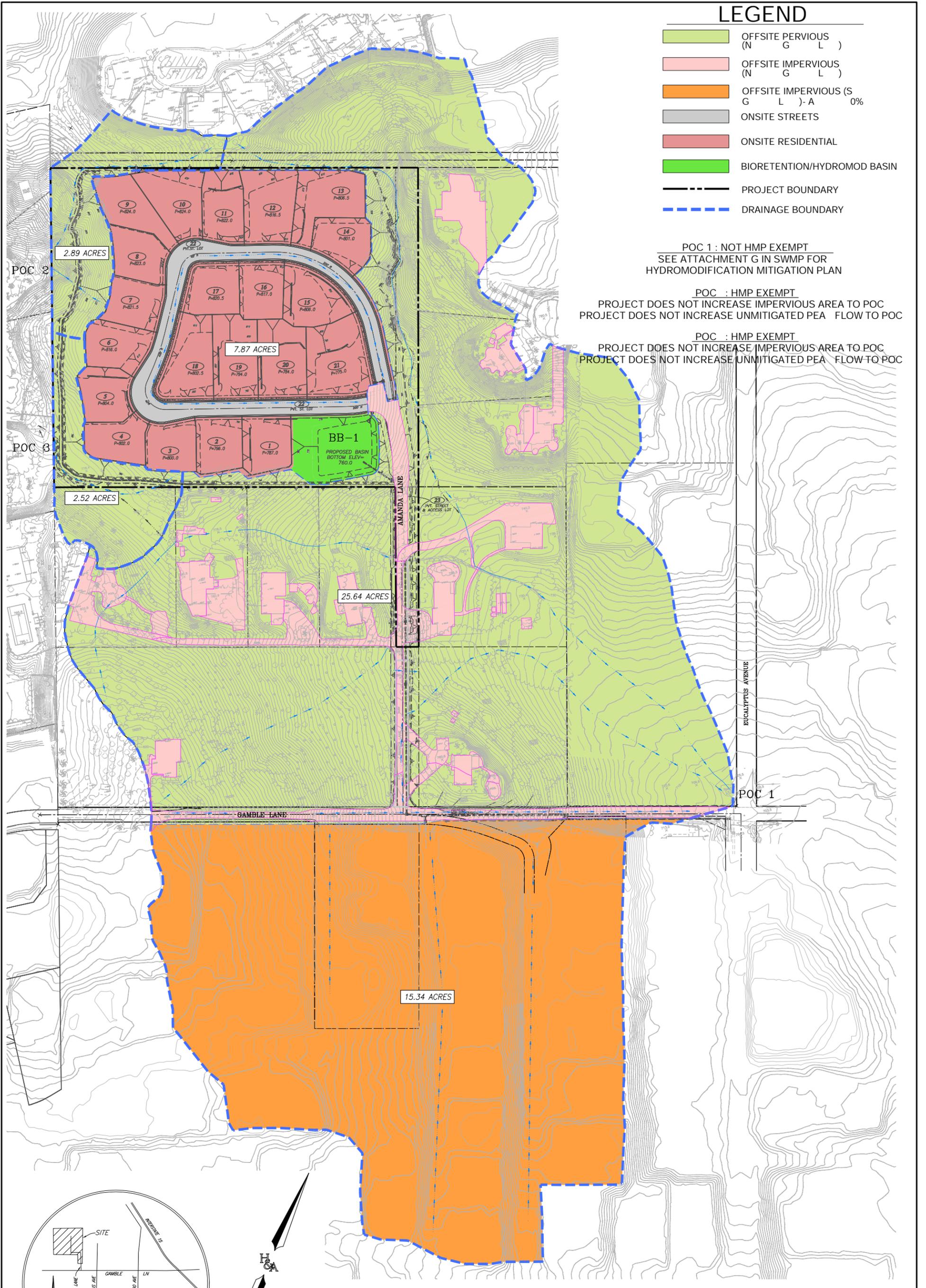
LEGEND

- OFFSITE PERVIOUS (N G L)
- OFFSITE IMPERVIOUS (N G L)
- OFFSITE IMPERVIOUS (S G L)-A 0%
- ONSITE STREETS
- ONSITE RESIDENTIAL
- BIORETENTION/HYDROMOD BASIN
- PROJECT BOUNDARY
- DRAINAGE BOUNDARY

POC 1 : NOT HMP EXEMPT
SEE ATTACHMENT G IN SWMP FOR
HYDROMODIFICATION MITIGATION PLAN

POC 2 : HMP EXEMPT
PROJECT DOES NOT INCREASE IMPERVIOUS AREA TO POC
PROJECT DOES NOT INCREASE UNMITIGATED PEAK FLOW TO POC

POC 3 : HMP EXEMPT
PROJECT DOES NOT INCREASE IMPERVIOUS AREA TO POC
PROJECT DOES NOT INCREASE UNMITIGATED PEAK FLOW TO POC



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SURVEYING PH650558-4500 FAX650558-1444

EXHIBIT
DEVELOPED CONDITION
HYDROMODIFICATION MAP
AMANDA ESTATES
CITY OF ESCONDIDO, CALIFORNIA 0

MAP
OF