Water Quality Technical Report
(WQTR)
For

Bear Valley Parkway

Preparation/Revision Date:
May 22, 2015

Prepared for:

Speith & Wohlford, Inc.
PO Box 5005 #17
Rancho Santa Fe, CA 92067
760-753-5252

Prepared by:

Hunsaker & Associates - San Diego, Inc.
9707 Waples Street
San Diego, CA 92121
858-558-4500

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 R9-2010-0001 and subsequent amendments.

Raymond L. Martin, RCE# 48670 Date

PROJECT INFORMATION

Project Name:	Bear Valley Parkway
Project Location:	West of I-15 and south of Hwy 78 in the northern part of San Diego County
Permit Number (Land Development Projects):	
Work Authorization Number (**CIP only**):	
Applicant:	Speith & Wohlford
Applicant's Address:	PO Box 5005 #17 Rancho Santa Fe, CA 92067
Plan Prepared By:	Hunsaker & Associates - San Diego, Inc.
Preparer's Address:	9707 Waples Street San Diego, CA 92121
Date:	May 22, 2015

PRIORITY DEVELOPMENT PROJECT DETERMINATION

Yes ☒	No ☐	**A**	**Housing subdivision of 10 or more dwelling units.** Examples: single-family homes, multi-family homes, condominiums, and apartments.
Yes ☐	No ☒	**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 ☐	No ☒	**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 ☐	No ☒	**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 ☐	No ☒	**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 ☒	No ☐	**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 ☐	No ☒	**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 ☐	No ☒	**H**	**Parking lots 5,000 square feet or more** or with 15 or more parking spaces and potentially exposed to urban runoff.
Yes ☒	No ☐	**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 ☐	No ☒	**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.

If any of the boxes are checked "Yes", the project is a Priority Development Project.

PROJECT STORMWATER INFORMATION

Total Project Site Area 41.3 Acres
Estimated amount of disturbed acreage: 41.3 Acres

A. Total size of project site: 41.3 Acres
B. Total impervious area (including roof tops) before construction 5.4 Acres
C. Total impervious area (including roof tops) after construction 19.3 Acres

Calculate percent impervious before construction: B/A 13%
Calculate percent impervious after construction: C/A 47%

PROJECT SPECIFIC STORMWATER DISCUSSION

1.	Brief description of the project.

The proposed development will create 55 single family residential lots. The project proposes to extend a private street from Bear Valley Parkway, through the site. The onsite road will generally follow existing terrain, bifurcating the site necessitating creating approximately 10' high cut or fill slopes.

Proposed frontage improvements to Bear Valley Parkway include widening in addition to replacing the existing paved shoulder and berm with a new curb, gutter and sidewalk. A new storm drain inlet will be added on Bear Valley Parkway, adjacent to the southerly property limits. Surface improvements will only be made to the easterly shoulder of Bear Valley Parkway, and drainage patterns on Bear Valley will remain unchanged, as the existing road is super elevated, which will remain unchanged.

2.	Describe the current and proposed zoning and land use designation.

The current and proposed zoning for the property are RE-20 and PD.

The current and proposed land use designations for the project are Estate II and Estate II.

3.	Describe the pre-project and post-project topography of the project.

Pre-project topography varies from 680 to 525 MSL and includes two creeks that drain in a southerly direction.

Post-project topography will include graded roads and pads for single family detached residences. Manufactured slopes will tie the proposed roads and pads in to existing topography. The existing creek channels will remain undisturbed.

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.

Soils in the vicinity of the project are classified as types C. Infiltration BMPs are not proposed, however natural infiltration will occur within the pervious areas and bioretention areas.

5.	Describe if contaminated or hazardous soils are within the project area.

None

6.	Describe the existing site drainage and natural hydrologic features.

Existing – The site drains via sheet flow to three arroyos that ultimately drain to a small creek at the southerly portion of the site. The arroyos drain from northeast to southwest and the creek runs north to south. The easterly arroyo joins the creek just south of the project boundary. All storm runoff continues south/southwest and ultimately drains to Lake Hodges,

then the Pacific Ocean.

Proposed – All onsite runoff is directed towards 2 bioretention areas designed to mitigate for water quality and hydromodification. The bioretention areas will be located near the westerly project boundary, adjacent to the DMAs they are designed to treat. Drainage patterns will remain generally unchanged, and all mitigated runoff will drain to the existing 60" culvert under Bear Valley Parkway.

Runoff from frontage improvements to Bear Valley Parkway is intercepted and treated in modular wetlands units.

7.	Describe site features and conditions that constrain, or provide opportunities for stormwater control, such as LID features.

The available surface area onsite provides the opportunity to implement bioretention areas, and bioretention is the preferred method of treatment, per the City SUSMP. Poorly draining soils prevent the use of infiltration.

Water quality mitigation for the widening to Hamilton Ln, Felicita Rd and Miller Ave is limited by the onsite creeks and wetland areas adjacent to the existing roads. Also limiting mitigation are topographical constraints and lack of storm drain at the southeast corner of the site that would enable collecting, treating and discharging surface runoff using bio-retention for a small portion of the site that cannot drain to the existing 60" culvert to the west.

8.	Is this project within the environmentally sensitive areas as defined on the maps in Appendix A of the *City of Escondido Standard Urban Storm Water Mitigation Plan for Land Development and Public Improvement Projects?*
☐ Yes	☒ No
9.	Is this an emergency project?
☐ Yes	☒ No

PROJECT SPECIFIC DISCUSSION/CHANNELS

No.	CRITERIA	YES	NO	N/A	COMMENTS
1.	Will the project include work in channels?	☒	☐	☐	If YES go to 2 If NO go to 13.
2.	Will the project increase velocity or volume of downstream flow?	☐	☒	☐	If YES go to 6.
3.	Will the project discharge to unlined channels?	☒	☐	☐	If YES go to. 6.
4.	Will the project increase potential sediment load of downstream flow?	☐	☒	☐	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?	☐	☒	☐	If YES go to 8.
6.	Review channel lining materials and design for stream bank erosion.	☐	☐	☒	Continue to 7.
7.	Consider channel erosion control measures within the project limits as well as downstream. Consider scour velocity.	☐	☐	☒	Continue to 8.
8.	Include, where appropriate, energy dissipation devices at culverts.	☐	☐	☒	Continue to 9.
9.	Ensure all transitions between culvert outlets/headwalls/wingwalls and channels are smooth to reduce turbulence and scour.	☐	☐	☒	Continue to 10.
10.	Include, if appropriate, detention facilities to reduce peak discharges.	☐	☐	☒	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.	☐	☒	☒	Continue to 12.
12.	Provide other design principles that are comparable and equally effective.	☐	☐	☒	Continue to 13.
13.	End	☒	☐	☐	

TEMPORARY CONSTRUCTION BMPS

The checked construction BMPs 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 during construction.

- ☒ Silt Fence
- ☒ Fiber Rolls
- ☒ Street Sweeping and Vacuuming
- ☒ Storm Drain Inlet Protection
- ☒ Stockpile Management
- ☒ Solid Waste Management
- ☒ Stabilized Construction Entrance/Exit
- ☐ Dewatering Operations
- ☐ Vehicle and Equipment Maintenance
- ☒ Desilting Basin
- ☒ Gravel Bag Berm
- ☒ Sandbag Barrier
- ☒ Material Delivery and Storage
- ☒ Spill Prevention and Control
- ☐ Concrete Waste Management
- ☐ Water Conservation Practices
- ☒ Paving and Grinding Operations

☒ 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

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	☒	☐	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?	☒	☐	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?	☐	☒	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?	☐	☐	If YES, continue to 6. If NO, go to 5.
5.	Project is not required to use Advanced Treatment BMPs.	☐	☒	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.	☐	☐	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

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?	☐	☒	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?	☐	☒	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?	☐	☒	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?	☐	☒	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?	☐	☒	If NO, continue to 6. If YES, go to 7.
6.	Project is required to manage hydromodification impacts.	☒	☐	Reference Appendix G "Hydromodification Management Plan" of the County SUSMP.
7.	Project is not required to manage hydromodification impacts.	☐	☐	Hydromodification Exempt. Keep on file.

POLLUTANTS OF CONCERN DETERMINATION

WATERSHED

☐ San Juan 901	☐ Santa Margarita 902	☐ San Luis Rey 903	☐ Carlsbad 904
☒ San Dieguito 905	☐ Penasquitos 906	☐ San Diego 907	☐ Sweetwater 909
☐ Otay 910	☐ Tijuana 911	☐ Whitewater 719	☐ Clark 720
☐ West Salton 721	☐ Anza Borrego 722	☐ Imperial 723	

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

HYDROLOGIC SUB-AREA NAME AND NUMBER(S)

Number	Name
905.2	**Hodges**

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

SURFACE WATERS

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	905.24	Aluminum, TDS	100

http://www.waterboards.ca.gov/water_issues/programs/tmdl/docs/ 303dlists2006/epa/r9 06 303d reqtmdls.pdf

GROUND WATERS

Ground Waters	Hydrologic Unit Basin Number	**MUN**	**AGR**	**IND**	**PROC**	**CWR**	**FRESH**
Hodges	**905.24**	•	•	•			

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

+ Excepted from Municipal • Existing Beneficial Use ◦Potential Beneficial Use

ANTICIPATED & POTENTIAL POLLUTANTS GENERATED BY LAND USE TYPE

	General Pollutant categories								
PDP Categories	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

Pollutant Category	Anticipated (X)	Potential (P)	Surface Water Impairments
Sediments	X		None
Nutrients	X		None
Heavy Metals	X		None
Organic Compounds	X		None
Trash & Debris	X		None
Oxygen Demanding Substances	X		None
Oil & Grease	X		None
Bacteria & Viruses	X		None
Pesticides	X		None

LID AND SITE DESIGN STRATEGIES

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

☒ Downspout to yard
☐ Vegetated Roofs
☐ Other. Description:
LID Landscaping Design
☒ Soil Amendments
☐ Reuse of Native Soils
☒ Smart Irrigation Systems
☐ Street Trees
☐ Other. Description:
6. Minimize erosion from slopes
☒ Disturb existing slopes only when necessary
☒ Minimize cut and fill areas to reduce slope lengths
☐ Incorporate retaining walls to reduce steepness of slopes or to shorten slopes
☐ Provide benches or terraces on high cut and fill slopes to reduce concentration of flows
☒ Rounding and shaping slopes to reduce concentrated flow
☒ Collect concentrated flows in stabilized drains and channels
☐ Other. Description:

PROJECT 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.

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**
☒ **A.** On-site storm drain inlets	☒ Location of inlets.	☒ Mark all inlets with the words "No Dumping! Flows to Bay" or similar.	☒ Maintain and periodically repaint or replace inlet markings. ☒ Provide stormwater pollution prevention information to new site owners, lessees, or operators. ☒ See applicable operational BMPs in Fact Sheet SC-44, "Drainage System Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com ☐ 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."
☐ **B**. Interior floor drains and elevator shaft sump pumps		☐ State that interior floor drains and elevator shaft sump pumps will be plumbed to sanitary sewer.	☐ Inspect and maintain drains to prevent blockages and overflow.
☐ **C.** Interior parking garages		☐ State that parking garage floor drains will be plumbed to the sanitary sewer.	☐ Inspect and maintain drains to prevent blockages and overflow.

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☐ **D.** Need for future indoor & structural pest control		☒ Note building design features that discourage entry of pests.	☒ Provide Integrated Pest Management information to owners, lessees, and operators.

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☒ **D2.** Landscape/ Outdoor Pesticide Use Note: Should be consistent with project landscape plan (if applicable).	☐ Show locations of native trees or areas of shrubs and ground cover to be undisturbed and retained. ☐ Show self-retaining landscape areas, if any. ☒ Show stormwater treatment facilities	State that final landscape plans will accomplish all of the following: ☐ 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. ☒ Consider using pest-resistant plants, especially adjacent to hardscape. ☒ 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. ☐ See applicable operational BMPs in Fact Sheet SC-41, "Building and Grounds Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com. ☐ Provide IPM information to new owners, lessees and operators.

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☐ **E.** Pools, spas, ponds decorative fountains, and other water features.	☐ Show location of water feature and a sanitary sewer cleanout in an accessible area within 10 feet.	☐ 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
☐ **F**. Food service	☐ 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. ☐ On the drawing, show a note that this drain will be connected to a grease interceptor before discharging to the sanitary sewer.	☐ Describe the location and features of the designated cleaning area. ☐ Describe the items to be cleaned in this facility and how it has been sized to insure that the largest items can be accommodated.	☐

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☐ **G.** Refuse areas	☐ 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. ☐ 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. ☐ Any drains from dumpsters, compactors, and tallow bin areas shall be connected to a grease removal device before discharge to sanitary sewer.	☐ State how site refuse will be handled and provide supporting detail to what is shown on plans. ☐ State that signs will be posted on or near dumpsters with the words "Do not dump hazardous materials here" or similar.	☐ 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
☐ **H**. Industrial processes.	☐ Show process area.	☐ 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."	☐ 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**
☐ **I.** Outdoor storage of equipment or materials. (See rows J and K for source control measures for vehicle cleaning, repair, and maintenance.)	☐ 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. ☐ 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. ☐ 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.	☐ 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: ▪ 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	☐ 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

☐ **J.** Vehicle and Equipment Cleaning	☐ 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.	☐ 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): ☐ Washwater from vehicle and equipment washing operations shall not be discharged to the storm drain system. ☐ Car dealerships and similar may rinse cars with water only. ☐ See Fact Sheet SC-21, "Vehicle and Equipment Cleaning," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com

☐ **K.** Vehicle/Equipment Repair and Maintenance	☐ 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. ☐ 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. ☐ 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.	☐ State that no vehicle repair or maintenance will be done outdoors, or else describe the required features of the outdoor work area. ☐ 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. ☐ 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.	In the SUSMP report, note that all of the following restrictions apply to use the site: ☐ 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. ☐ 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. ☐ 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.

☐ **L.** Fuel Dispensing Area	☐ 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 ☐ 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.		☐ The property owner shall sweep the fueling area routinely. ☐ See the Business Guide Sheet, "Automotive Service - Service, Stations" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com.

[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.

☐ **M.** Loading Docks	☐ 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. ☐ 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. ☐ Provide a roof overhang over the loading area or install door skirts (cowling) at each bay that enclose the end of the trailer.		☐ Move loaded and unloaded items indoors as soon as possible ☐ See Fact Sheet SC-30, "Outdoor Loading and Unloading," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com
☐ **N**. Fire Sprinkler Test Water		☐ Provide a means to drain fire sprinkler test water to the sanitary sewer.	☐ See the note in Fact Sheet SC-41, "Building and Grounds Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com

☐ **O.** Miscellaneous Drain or Wash Water ☐ Boiler drain lines ☐ Condensate drain lines ☐ Rooftop equipment ☐ Drainage sumps ☒ Roofing, gutters, and trim		☐ Boiler drain lines shall be directly or indirectly connected to the sanitary sewer system and may not discharge to the storm drain system. ☐ 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 dram system. ☐ Rooftop mounted equipment with potential to produce pollutants shall be roofed and/or have secondary containment. ☐ Any drainage sumps on-site shall feature a sediment sump to reduce the quantity of sediment in pumped water. ☒ Avoid roofing, gutters, and trim made of copper or other unprotected metals that may leach into runoff.	
☒ **P**. 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.

LID AND TREATMENT CONTROL SELECTION

A treatment control BMP and/or LID facility must be selected to treat the project pollutants of concern identified as a "Project Pollutants of Concern". A treatment control facility with high or medium pollutant removal efficiency for the project's most significant pollutant of concern shall be selected.

Will this project be utilizing the unified LID design procedure as described in Chapter 4 of the Local SUSMP? *(If yes, please document in Attachment D following the steps in Chapter 4 of the City SUSMP)*	
Yes	No
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.	

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	

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

PROJECT LID AND TC-BMPS

TCBMP Type	Water Quality Treatment	Hydromodification Flow Control
Bioretention Facilities (LID)		
Bioretention area	**X**	**X**
Flow-through Planter	**X**	
Cistern with Bioretention Facility		
Settling Basins (Dry Ponds)		
Extended / dry detention basin with grass / vegetated lining		
Extended / dry detention basin with impervious lining		
Infiltration Facilities or Practices (LID)		
Infiltration basin		
Dry well		
Infiltration trench		
Wet Ponds and Constructed Wetlands		
Wet pond / basin (permanent pool)		
Constructed wetland		
Vegetated Swales (LID [(1)])		
Vegetated Swale		
Media Filters		
Austin Sand Filter		
Delaware Sand Filter		
Multi-Chambered Treatment Train (MCTT)		
Higher-rate Biofilters		
Tree-pit-style unit		
Other _____		

TCBMP Type	Water Quality Treatment	Hydromodification Flow Control
Higher-rate Media Filters		
Vault-based filtration unit with replaceable cartridges		
Other _____		
Hydrodynamic Separator Systems		
Swirl Concentrator		
Cyclone Separator		
Trash Racks		
Catch Basin Insert		
Catch Basin Insert w/ Hydrocarbon boom		
Other _____		
Self-Treating or Self-Retaining Areas (LID)		
Pervious Pavements		
Vegetated Roofs		
Other _____		

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

Construction Plan SWMP Checklist for Oak Creek

Stormwater Treatment Control and LID BMPs		
Description / Type		Maintenance Responsibility
Bioretention Areas		HOA
Modular Wetlands Unit		City

Justification for chosen treatment BMP(s) selection for this project.

This project proposes bioretention for this project where hydraulic head and footprint are available, as recommended by the City SUSMP. Flow based calculations are utilized to size water quality mitigation for all DMAs.

DMAs 1-2 drain to bioretention areas, as the necessary hydraulic head and surface area are available.
DMAs 5-8 are made up of existing/widened roads that abut the project and drain to flow through planters (Modular Wetlands units) at the downstream terminus of offsite improvements. At each of these locations, hydraulic head is available, but due to the adjacent creeks and environmentally sensitive areas, the necessary footprint for bioretention is not.

Since this project has no primary pollutants of concern, the treatment that is proposed by the bioretention basins and modular wetlands exceed the treatment requirements of the project.

Hydromodification mitigation and flow control measures are discussed in Appendix G

PROJECT BMP MAINTENANCE RESPONSIBILITY

MAINTENANCE RESPONSIBILITY	BMP Description
CITY	MWS Units
HOA	Bioretention 1-2

Responsible Party for the Construction Phase

Developer's Name: Speith & Wohlford, Inc.
Address: PO Box 5005 #17
City / State / Zip: Santa Monica CA 90401
Email Address: TBD
Phone Number: 760-753-5252
Engineer of Work: Hunsaker and Associates – San Diego
Engineer's Phone Number: 858-558-4500

Responsible Party for Ongoing Maintenance

Owner's Name: Future Homeowners Association
Address:
City / State / Zip:
Email Address:
Phone Number:

► Funding Source

The developer will be responsible for maintaining all BMPs onsite, until the Homeowner's Association is established and the BMP turned over to the HOA for maintenance. At that time, the Homeowner's Association will be permanently responsible for maintaining all BMPs.

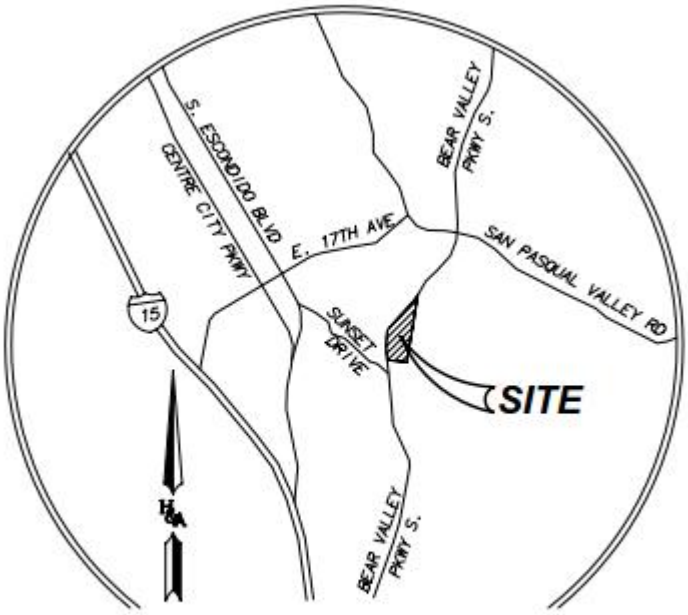
ATTACHMENTS

Please include the following attachments.

ATTACHMENT		COMPLETED	N/A
A	Project Location Map	☒	☐
B	Source Control Exhibit	☒	☐
C	Drainage Management Area (DMA)Exhibit	☒	☐
D	BMP Sizing Design Calculations (Water Quality and Hydromodification) and TC-BMP/IMP Design Details	☒	☐
E	Geotechnical Certification Sheet	☐	☒
F	Maintenance Plan	☒	☐
G	Hydromodification Management	☒	☐

Note: Attachments B and C may be combined.

ATTACHMENT A



ATTACHMENTS B&C

Drainage Management Area (DMA) Exhibit and Source Control Exhibit

PREPARED BY:

HUNSAKER & ASSOCIATES
SAN DIEGO, INC

PLANNING 9707 Waples Street
ENGINEERING San Diego, Ca 92121
SURVEYING PH(858)558-4500 · FX(858)558-1414

DMA MAP

BEAR VALLEY PARKWAY

CITY OF ESCONDIDO, CALIFORNIA

SHEET 1 OF 1

W.O. 2510-08

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ATTACHMENT D

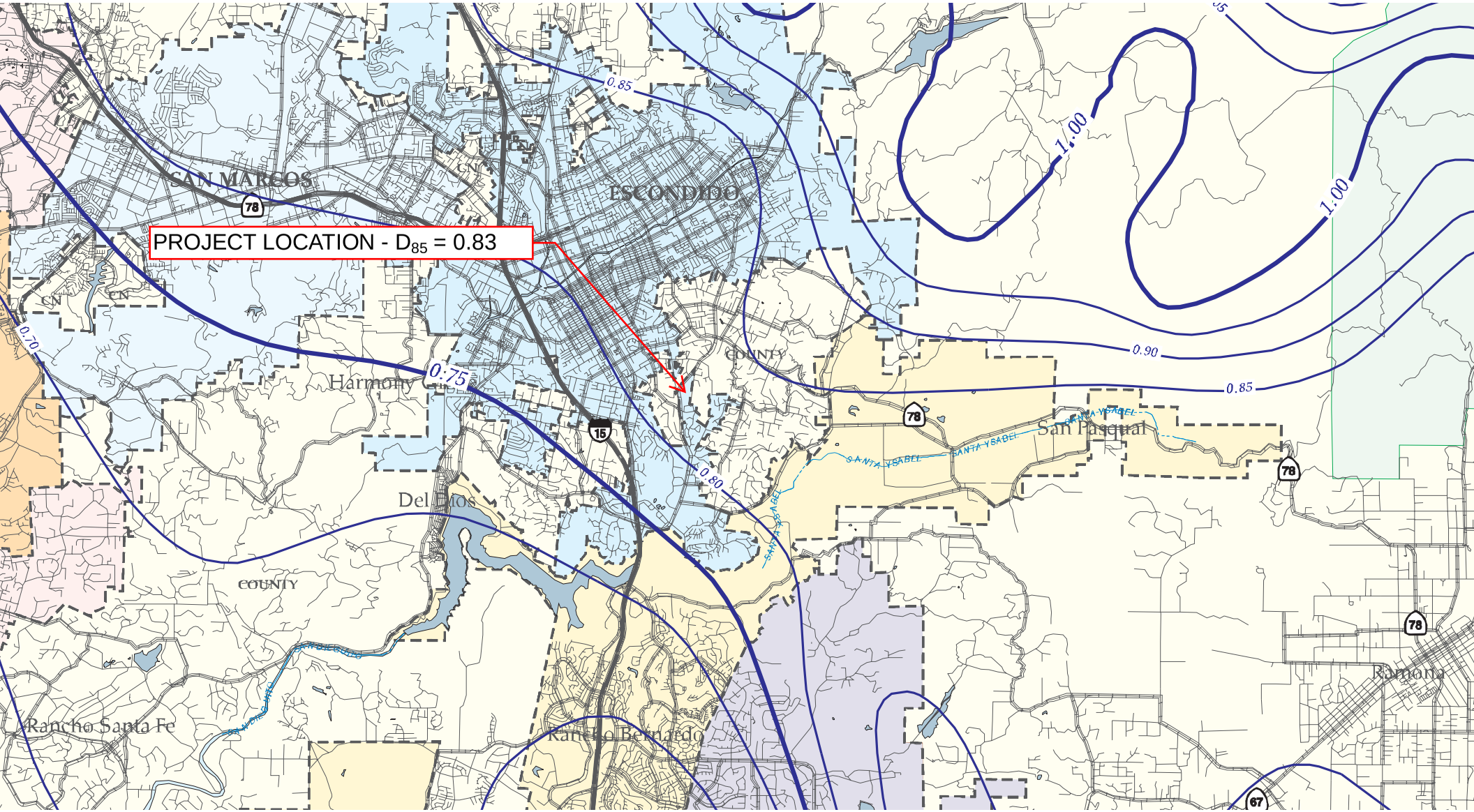
Sizing Design Calculations and TC-BMP/LID Design Details

PROJECT NAME: Bear Valley Parkway
PROJECT LOCATION: City of Escondido, CA
85TH PERCENTILE PRECIPITATION INTENSITY (IN/HR): 0.2
85TH PERCENTILE PRECIPITATION DEPTH (IN): 0.83

DMAs DRAINING TO FLOW BASED IMPs

DMA NAME	IMP TYPE	SURFACE TYPE	DMA AREA (SQ FT)*	DMA AREA (AC)	DMA RUNOFF FACTOR	MINIMUM VOLUME (SQ FT)	VOLUME PROVIDED (SQ FT)	85th PERCENTILE FLOWRATE (CFS)	MWS UNIT NUMBER	MWS Unit Capacity (CFS)
1	BIORETENTION	PERVIOUS	251,113	5.8	0.1	14421	20821	-	-	-
		IMPERVIOUS	183,379	4.2	1					
2	BIORETENTION	PERVIOUS	347,865	8.0	0.1	34287	39543	-	-	-
		IMPERVIOUS	460,935	10.6	1					
3	MWS Unit	PERVIOUS	2,247	0.0	0.1	-	-	0.257	MWS-L-5-21	0.32
		IMPERVIOUS	55,243	1.3	1					

* From Watershed Boundaries/DMA Areas delineated on the DMA Map.


PROJECT LOCATION - D_{85} = 0.83
SAN MARCOS
ESCONDIDO
Harmony
Del Dios
San Pasqual
Rancho Santa Fe
Rancho Bernardo
Ramona
COUNTY
0.70
0.75
0.80
0.85
0.90
1.00
1.00
78
15
67

ATTACHMENT E

Geotechnical Certification Sheet
(Not Applicable)

ATTACHMENT F

Maintenance Plan

Maintenance Program for Bioretention Areas

Inspection Frequency/Indications:	Regular Inspections ❑ Before wet season begins (September); ❑ After wet season (April). Performance Inspections ❑ After rainfall events greater than 0.5 inch
Maintenance Indications	**Maintenance Activities**
❑ Damage to slopes, inlet, outlet, or other structures	❑ Repair slopes, inlet, outlet, or other structures
❑ Barren areas or badly established vegetation	❑ Re-plant or re-seed barren areas or badly established vegetation, use erosion control mats if necessary
❑ Over-grown vegetation, emergent woody vegetation and/or weeds	❑ Trim vegetation to 6 inches, remove emergent woody vegetation and weeds
❑ Sediment accumulation over 3 inches	❑ Remove sediment accumulation
❑ Trash and litter present in swale	❑ Remove trash and debris
❑ Rodent burrows that inhibit function of facility	❑ Abate rodents and other vectors as necessary
❑ Standing water in facility	❑ 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 Funding

Funding for all water quality treatment areas will be provided by New Urban West, Inc. for the Oak Creek development until a formal agreement has been developed by New Urban West, Inc. and approved by the City of Escondido. The agreement will establish a Homeowners Association which will be responsible to perform the maintenance activities and to ensure adequate funding into perpetuity.

Please contact New Urban West, Inc. with any project-specific funding inquiries.

Speith & Wohlford, Inc.
PO Box 5005 #17
Rancho Santa Fe, CA 92067
760-753-5252

ATTACHMENT G

Hydromodification Management

SWMM MODEL DEVELOPMENT

The following provides calculations to meet the flow control requirements (hydromodification mitigation) set forth in 2007 MS4 Permit, the Final HMP dated March 2011, as well as the City of Escondido SUSMP, dated 2011. This section summarizes the approach used to model the proposed Bear Valley Parkway 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

Six (6) SWMM models were prepared for this study, one for each point of compliance (POC) in existing conditions and one for each POC in the proposed condition. For all 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 closest and most representative of the project site precipitation among the three gages recommended in the county HMP

Evaporation for the site was modeled using average monthly values from the county hourly dataset. The site was modeled with hydrologic soil group C 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

Storm water runoff from the proposed project site is routed through two (2) bioretention basins (BR1 & BR-2) located within the main project boundary. Portions of Bear Valley Parkway drain on to the project site and in to the two bioretention basins, where they are mitigated for water quality and flow control, with onsite runoff. Minor slopes draining away from the project bypass the onsite basins and drain to a small creek to the west, and a small arroyo to the east, both of which run south along the project boundary.

Storm flows from the proposed project ultimately discharge to the afore mentioned creek and arroyo.

Basin Discussion:

Flow control in each basin is achieved using orifices on a concrete riser. The size, number and location of the orifices are presented in the Basin Table below. Each basin also contains an emergency overflow riser or notched spillway that is only utilized if the orifices become blocked. Sizing and further peak flow discussion is in the "Drainage Report for Oak Creek".

Basin Table

	BR-1	BR-2
Riser/Spillway Height (ft)*	3.65	7.2
Spillway Length (ft)	15.7	15.7
Basin Depth (ft)	5	5
Amended Soil Depth (in)	18	18
Class 2 Perm. Depth (in)	36	36
Top Orifice		
No. of Orifices	-	5
Diameter (in)	-	6
Depth (ft)	-	6
Bottom Orifice		
No. of Orifices	1	1
Diameter (in)	1.5	2
Depth (ft)	0.35	0.35
Sub-Drain Orifice		
No. of Orifices	1	1
Diameter (in)	1.5	2

*From finish grade

FLOW DURATION CURVE COMPARISON

The Flow Duration Curves (FDC) for the site were compared at the POCs 1-3 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 comparison at POCs 1-3 are illustrated in Figures 1-3 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 are 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 project at the Bear Valley Parkway 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. C 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

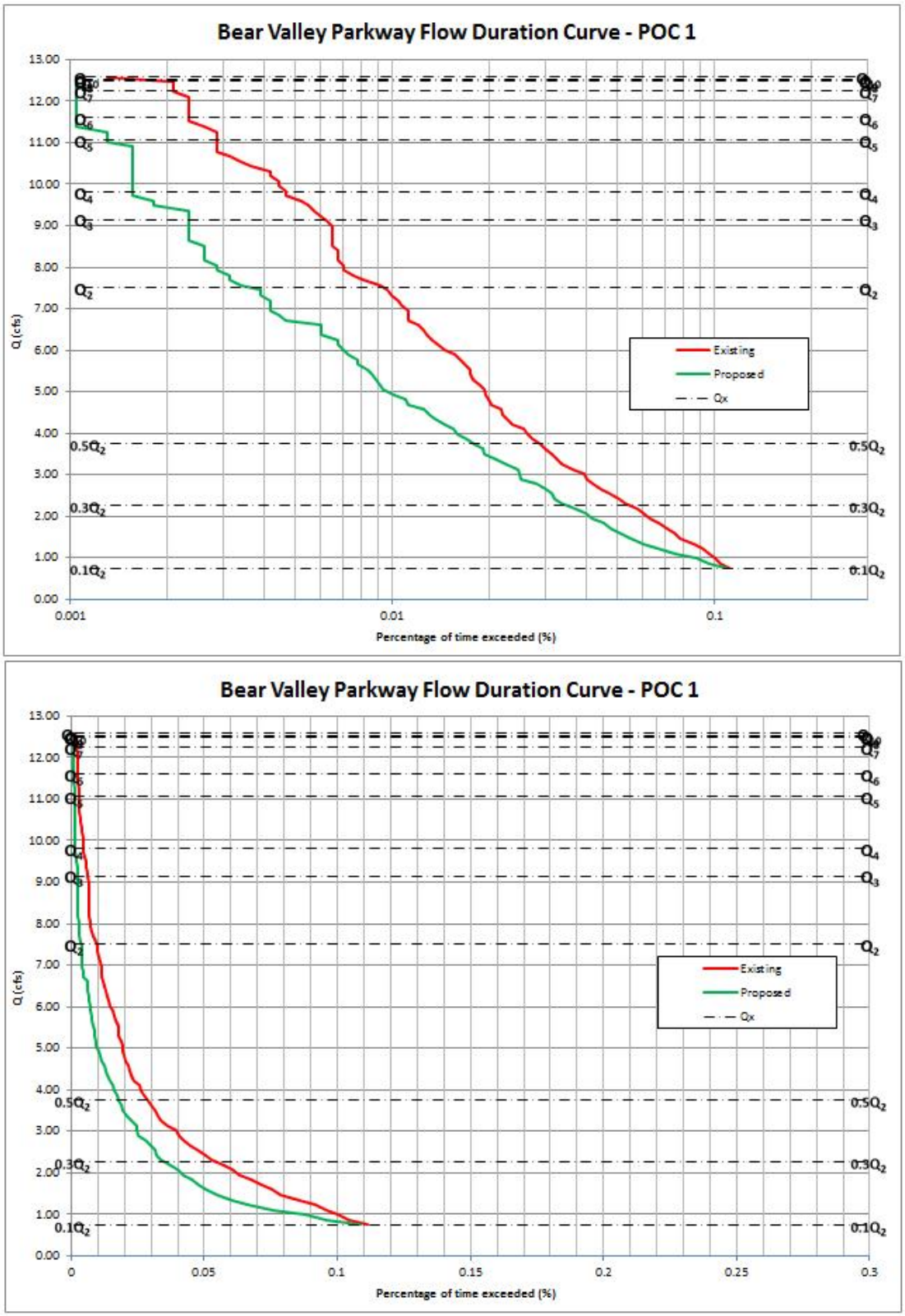


Figure 1a and 1b. Flow Duration Curve Comparison (logarithmic and normal "x" scale)

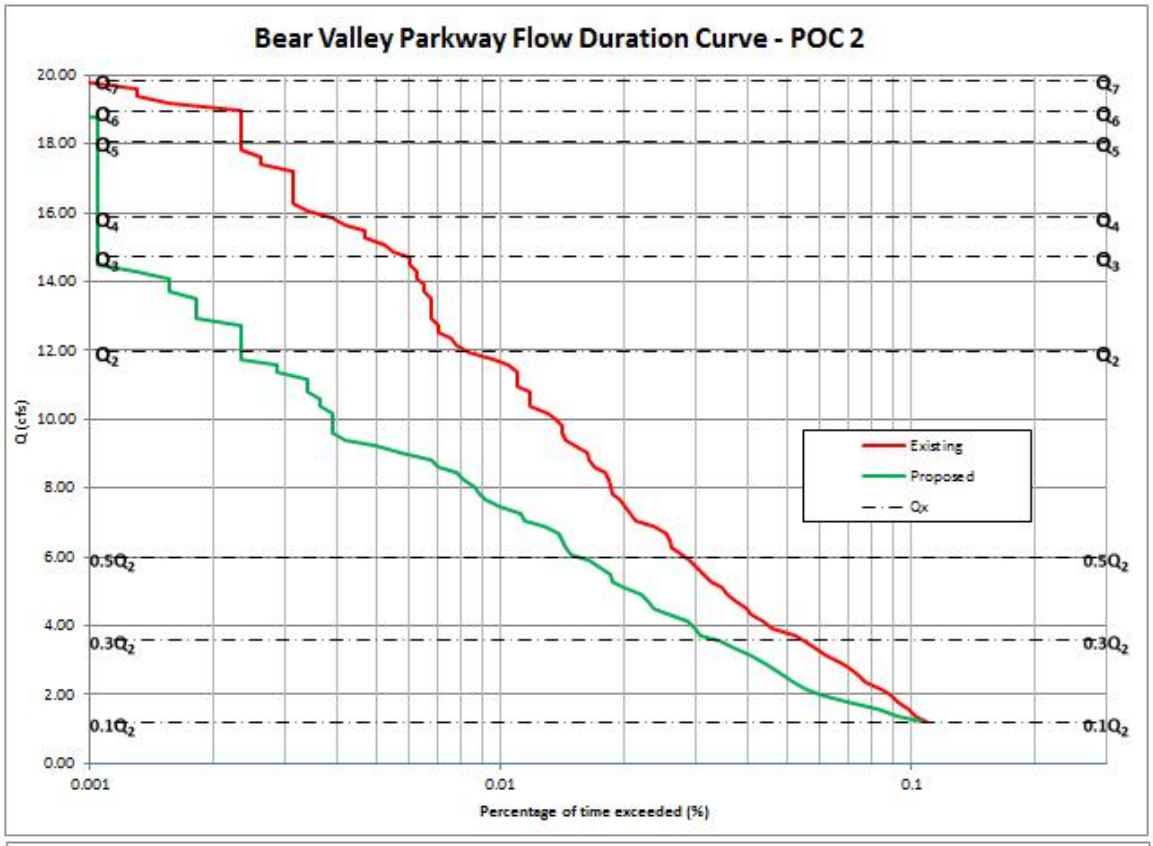
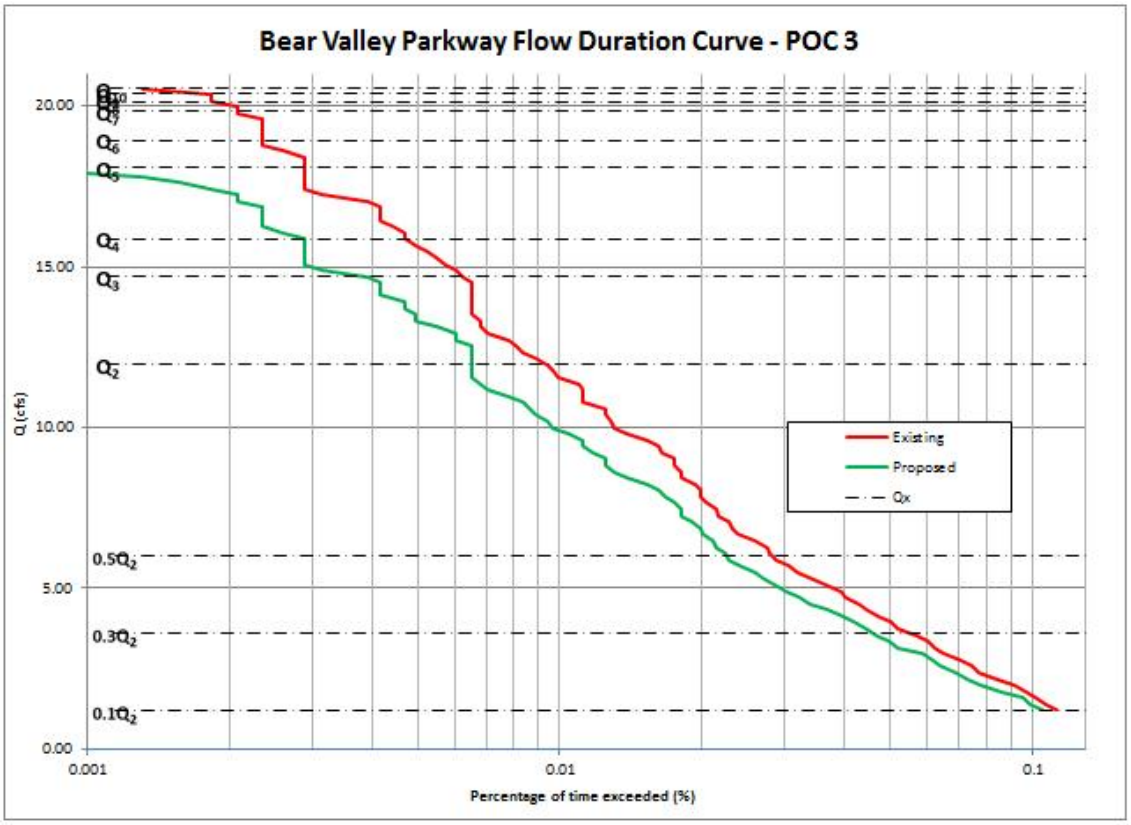


Figure 2a and 2b. Flow Duration Curve Comparison (logarithmic and normal "x" scale)



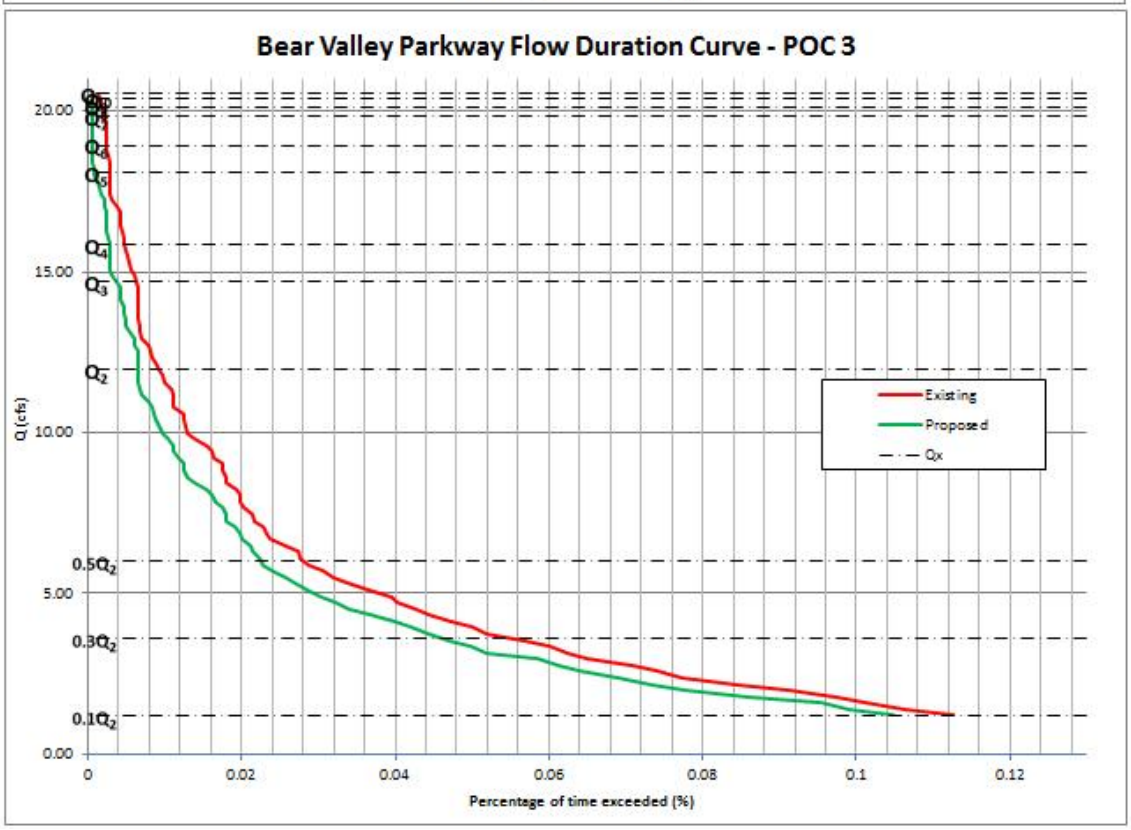


Figure 3a and 3b. Flow Duration Curve Comparison (logarithmic and normal "x" scale)

ATTACHMENT 1.

Q_2 to Q_{10} Comparison Table Basin 1

Return Period	Existing Condition (cfs)	Mitigated Condition (cfs)	Reduction, Exist - Mitigated (cfs)
10-year	12.582	6.196	6.386
9-year	12.507	6.057	6.450
8-year	12.475	5.972	6.503
7-year	12.247	5.864	6.382
6-year	11.613	5.575	6.038
5-year	11.052	5.173	5.879
4-year	9.816	4.641	5.175
3-year	9.152	4.267	4.885
2-year	7.516	3.181	4.335

Q_2 to Q_{10} Comparison Table Basin 2

Return Period	Existing Condition (cfs)	Mitigated Condition (cfs)	Reduction, Exist - Mitigated (cfs)
10-year	20.554	11.352	9.202
9-year	20.365	10.627	9.738
8-year	20.138	9.516	10.622
7-year	19.854	9.364	10.490
6-year	18.938	9.203	9.735
5-year	18.081	8.878	9.203
4-year	15.872	7.511	8.361
3-year	14.707	6.791	7.915
2-year	11.982	4.989	6.993

Q_2 to Q_{10} Comparison Table Basin 3

Return Period	Existing Condition (cfs)	Mitigated Condition (cfs)	Reduction, Exist - Mitigated (cfs)
10-year	20.554	17.744	2.810
9-year	20.365	17.560	2.805
8-year	20.138	17.299	2.839
7-year	19.854	17.074	2.780
6-year	18.938	16.319	2.619
5-year	18.081	15.604	2.476
4-year	15.872	13.618	2.254
3-year	14.707	12.664	2.043
2-year	11.982	10.230	1.753

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 page illustrates 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.

POC 1 - Flow Duration Curve Data for Bear Valley - Escondido, CA

Q2 =	7.52	cfs	Fraction	10 %
Q10 =	12.58	cfs		
Step =	0.1195	cfs		
Count =	382678	hours		
	43.65	years		

	Existing Condition			Underground Detention Optimized			Pass or
Interval	Q (cfs)	Hours > Q	% time	Hours>Q	% time	Post/Pre	Fail?
1	0.752	425	1.11E-01	416	1.09E-01	98%	Pass
2	0.871	399	1.04E-01	368	9.62E-02	92%	Pass
3	0.991	384	1.00E-01	337	8.81E-02	88%	Pass
4	1.110	368	9.62E-02	290	7.58E-02	79%	Pass
5	1.230	352	9.20E-02	255	6.66E-02	72%	Pass
6	1.349	329	8.60E-02	231	6.04E-02	70%	Pass
7	1.469	300	7.84E-02	210	5.49E-02	70%	Pass
8	1.588	288	7.53E-02	194	5.07E-02	67%	Pass
9	1.708	274	7.16E-02	183	4.78E-02	67%	Pass
10	1.827	258	6.74E-02	173	4.52E-02	67%	Pass
11	1.947	241	6.30E-02	161	4.21E-02	67%	Pass
12	2.066	231	6.04E-02	152	3.97E-02	66%	Pass
13	2.186	220	5.75E-02	142	3.71E-02	65%	Pass
14	2.305	202	5.28E-02	129	3.37E-02	64%	Pass
15	2.425	193	5.04E-02	122	3.19E-02	63%	Pass
16	2.544	181	4.73E-02	120	3.14E-02	66%	Pass
17	2.664	171	4.47E-02	115	3.01E-02	67%	Pass
18	2.783	161	4.21E-02	107	2.80E-02	66%	Pass
19	2.903	154	4.02E-02	96	2.51E-02	62%	Pass
20	3.022	151	3.95E-02	95	2.48E-02	63%	Pass
21	3.142	139	3.63E-02	94	2.46E-02	68%	Pass
22	3.261	129	3.37E-02	86	2.25E-02	67%	Pass
23	3.381	125	3.27E-02	81	2.12E-02	65%	Pass
24	3.500	120	3.14E-02	74	1.93E-02	62%	Pass
25	3.620	114	2.98E-02	73	1.91E-02	64%	Pass
26	3.739	110	2.87E-02	69	1.80E-02	63%	Pass
27	3.859	104	2.72E-02	65	1.70E-02	63%	Pass
28	3.978	101	2.64E-02	61	1.59E-02	60%	Pass
29	4.098	98	2.56E-02	59	1.54E-02	60%	Pass
30	4.217	90	2.35E-02	56	1.46E-02	62%	Pass
31	4.337	87	2.27E-02	52	1.36E-02	60%	Pass
32	4.456	84	2.20E-02	50	1.31E-02	60%	Pass
33	4.576	83	2.17E-02	48	1.25E-02	58%	Pass
34	4.695	78	2.04E-02	43	1.12E-02	55%	Pass
35	4.815	76	1.99E-02	42	1.10E-02	55%	Pass
36	4.934	75	1.96E-02	39	1.02E-02	52%	Pass

	Existing Condition			Underground Detention Optimized			Pass or
Interval	Q (cfs)	Hours > Q	% time	Hours>Q	% time	Post/Pre	Fail?
37	5.054	74	1.93E-02	36	9.41E-03	49%	Pass
38	5.173	72	1.88E-02	35	9.15E-03	49%	Pass
39	5.293	68	1.78E-02	34	8.88E-03	50%	Pass
40	5.412	67	1.75E-02	33	8.62E-03	49%	Pass
41	5.532	67	1.75E-02	32	8.36E-03	48%	Pass
42	5.651	64	1.67E-02	30	7.84E-03	47%	Pass
43	5.771	62	1.62E-02	30	7.84E-03	48%	Pass
44	5.890	60	1.57E-02	28	7.32E-03	47%	Pass
45	6.010	56	1.46E-02	27	7.06E-03	48%	Pass
46	6.129	53	1.38E-02	26	6.79E-03	49%	Pass
47	6.249	51	1.33E-02	26	6.79E-03	51%	Pass
48	6.368	49	1.28E-02	23	6.01E-03	47%	Pass
49	6.488	48	1.25E-02	23	6.01E-03	48%	Pass
50	6.607	46	1.20E-02	23	6.01E-03	50%	Pass
51	6.727	43	1.12E-02	18	4.70E-03	42%	Pass
52	6.846	43	1.12E-02	17	4.44E-03	40%	Pass
53	6.966	43	1.12E-02	16	4.18E-03	37%	Pass
54	7.085	41	1.07E-02	16	4.18E-03	39%	Pass
55	7.205	40	1.05E-02	16	4.18E-03	40%	Pass
56	7.324	38	9.93E-03	15	3.92E-03	39%	Pass
57	7.444	37	9.67E-03	15	3.92E-03	41%	Pass
58	7.563	35	9.15E-03	13	3.40E-03	37%	Pass
59	7.683	31	8.10E-03	12	3.14E-03	39%	Pass
60	7.802	29	7.58E-03	12	3.14E-03	41%	Pass
61	7.922	27	7.06E-03	11	2.87E-03	41%	Pass
62	8.041	27	7.06E-03	11	2.87E-03	41%	Pass
63	8.161	26	6.79E-03	10	2.61E-03	38%	Pass
64	8.280	26	6.79E-03	10	2.61E-03	38%	Pass
65	8.400	26	6.79E-03	10	2.61E-03	38%	Pass
66	8.519	25	6.53E-03	10	2.61E-03	40%	Pass
67	8.639	25	6.53E-03	9	2.35E-03	36%	Pass
68	8.758	25	6.53E-03	9	2.35E-03	36%	Pass
69	8.878	25	6.53E-03	9	2.35E-03	36%	Pass
70	8.997	25	6.53E-03	9	2.35E-03	36%	Pass
71	9.117	24	6.27E-03	9	2.35E-03	38%	Pass
72	9.236	23	6.01E-03	9	2.35E-03	39%	Pass
73	9.356	22	5.75E-03	9	2.35E-03	41%	Pass
74	9.475	21	5.49E-03	7	1.83E-03	33%	Pass
75	9.595	20	5.23E-03	7	1.83E-03	35%	Pass
76	9.714	18	4.70E-03	6	1.57E-03	33%	Pass
77	9.834	18	4.70E-03	6	1.57E-03	33%	Pass
78	9.953	17	4.44E-03	6	1.57E-03	35%	Pass
79	10.073	17	4.44E-03	6	1.57E-03	35%	Pass
80	10.192	16	4.18E-03	6	1.57E-03	38%	Pass
81	10.312	16	4.18E-03	6	1.57E-03	38%	Pass

Interval	Existing Condition			Underground Detention Optimized			Pass or Fail?
	Q (cfs)	Hours > Q	% time	Hours>Q	% time	Post/Pre	
82	10.431	14	3.66E-03	6	1.57E-03	43%	Pass
83	10.551	13	3.40E-03	6	1.57E-03	46%	Pass
84	10.670	12	3.14E-03	6	1.57E-03	50%	Pass
85	10.790	11	2.87E-03	6	1.57E-03	55%	Pass
86	10.909	11	2.87E-03	6	1.57E-03	55%	Pass
87	11.029	11	2.87E-03	5	1.31E-03	45%	Pass
88	11.148	11	2.87E-03	5	1.31E-03	45%	Pass
89	11.268	11	2.87E-03	5	1.31E-03	45%	Pass
90	11.387	10	2.61E-03	4	1.05E-03	40%	Pass
91	11.507	9	2.35E-03	4	1.05E-03	44%	Pass
92	11.626	9	2.35E-03	4	1.05E-03	44%	Pass
93	11.746	9	2.35E-03	4	1.05E-03	44%	Pass
94	11.865	9	2.35E-03	4	1.05E-03	44%	Pass
95	11.985	9	2.35E-03	4	1.05E-03	44%	Pass
96	12.104	9	2.35E-03	4	1.05E-03	44%	Pass
97	12.224	8	2.09E-03	4	1.05E-03	50%	Pass
98	12.343	8	2.09E-03	4	1.05E-03	50%	Pass
99	12.463	8	2.09E-03	4	1.05E-03	50%	Pass
100	12.582	5	1.31E-03	4	1.05E-03	80%	Pass

POC 2 - Flow Duration Curve Data for Bear Valley - Escondido, CA

Q2 =	11.98	cfs	Fraction	10 %
Q10 =	20.55	cfs		
Step =	0.1955	cfs		
Count =	382678	hours		
	43.65	years		

	Existing Condition			Underground Detention Optimized			Pass or
Interval	Q (cfs)	Hours > Q	% time	Hours>Q	% time	Post/Pre	Fail?
1	1.198	415	1.08E-01	408	1.07E-01	98%	Pass
2	1.394	391	1.02E-01	353	9.22E-02	90%	Pass
3	1.589	375	9.80E-02	316	8.26E-02	84%	Pass
4	1.785	353	9.22E-02	268	7.00E-02	76%	Pass
5	1.980	342	8.94E-02	231	6.04E-02	68%	Pass
6	2.176	323	8.44E-02	213	5.57E-02	66%	Pass
7	2.371	297	7.76E-02	197	5.15E-02	66%	Pass
8	2.567	283	7.40E-02	186	4.86E-02	66%	Pass
9	2.762	270	7.06E-02	175	4.57E-02	65%	Pass
10	2.958	258	6.74E-02	167	4.36E-02	65%	Pass
11	3.153	238	6.22E-02	155	4.05E-02	65%	Pass
12	3.349	224	5.85E-02	142	3.71E-02	63%	Pass
13	3.544	210	5.49E-02	131	3.42E-02	62%	Pass
14	3.740	200	5.23E-02	117	3.06E-02	59%	Pass
15	3.935	175	4.57E-02	114	2.98E-02	65%	Pass
16	4.131	167	4.36E-02	109	2.85E-02	65%	Pass
17	4.326	156	4.08E-02	98	2.56E-02	63%	Pass
18	4.522	152	3.97E-02	90	2.35E-02	59%	Pass
19	4.717	144	3.76E-02	88	2.30E-02	61%	Pass
20	4.913	136	3.55E-02	84	2.20E-02	62%	Pass
21	5.108	132	3.45E-02	76	1.99E-02	58%	Pass
22	5.304	125	3.27E-02	72	1.88E-02	58%	Pass
23	5.500	120	3.14E-02	71	1.86E-02	59%	Pass
24	5.695	115	3.01E-02	67	1.75E-02	58%	Pass
25	5.891	110	2.87E-02	63	1.65E-02	57%	Pass
26	6.086	106	2.77E-02	57	1.49E-02	54%	Pass
27	6.282	100	2.61E-02	55	1.44E-02	55%	Pass
28	6.477	99	2.59E-02	54	1.41E-02	55%	Pass
29	6.673	97	2.53E-02	53	1.38E-02	55%	Pass
30	6.868	90	2.35E-02	49	1.28E-02	54%	Pass
31	7.064	82	2.14E-02	44	1.15E-02	54%	Pass
32	7.259	79	2.06E-02	43	1.12E-02	54%	Pass
33	7.455	77	2.01E-02	38	9.93E-03	49%	Pass
34	7.650	75	1.96E-02	35	9.15E-03	47%	Pass
35	7.846	72	1.88E-02	34	8.88E-03	47%	Pass
36	8.041	71	1.86E-02	33	8.62E-03	46%	Pass

Interval	Existing Condition			Underground Detention Optimized			Pass or Fail?
	Q (cfs)	Hours > Q	% time	Hours>Q	% time	Post/Pre	
37	8.237	70	1.83E-02	31	8.10E-03	44%	Pass
38	8.432	69	1.80E-02	30	7.84E-03	43%	Pass
39	8.628	65	1.70E-02	27	7.06E-03	42%	Pass
40	8.823	63	1.65E-02	26	6.79E-03	41%	Pass
41	9.019	62	1.62E-02	22	5.75E-03	35%	Pass
42	9.214	58	1.52E-02	19	4.97E-03	33%	Pass
43	9.410	55	1.44E-02	16	4.18E-03	29%	Pass
44	9.605	54	1.41E-02	15	3.92E-03	28%	Pass
45	9.801	54	1.41E-02	15	3.92E-03	28%	Pass
46	9.996	52	1.36E-02	15	3.92E-03	29%	Pass
47	10.192	50	1.31E-02	15	3.92E-03	30%	Pass
48	10.387	45	1.18E-02	14	3.66E-03	31%	Pass
49	10.583	45	1.18E-02	14	3.66E-03	31%	Pass
50	10.778	45	1.18E-02	13	3.40E-03	29%	Pass
51	10.974	42	1.10E-02	13	3.40E-03	31%	Pass
52	11.169	42	1.10E-02	13	3.40E-03	31%	Pass
53	11.365	42	1.10E-02	11	2.87E-03	26%	Pass
54	11.560	40	1.05E-02	11	2.87E-03	28%	Pass
55	11.756	37	9.67E-03	9	2.35E-03	24%	Pass
56	11.951	32	8.36E-03	9	2.35E-03	28%	Pass
57	12.147	30	7.84E-03	9	2.35E-03	30%	Pass
58	12.342	29	7.58E-03	9	2.35E-03	31%	Pass
59	12.538	27	7.06E-03	9	2.35E-03	33%	Pass
60	12.733	27	7.06E-03	9	2.35E-03	33%	Pass
61	12.929	26	6.79E-03	7	1.83E-03	27%	Pass
62	13.125	26	6.79E-03	7	1.83E-03	27%	Pass
63	13.320	26	6.79E-03	7	1.83E-03	27%	Pass
64	13.516	26	6.79E-03	7	1.83E-03	27%	Pass
65	13.711	25	6.53E-03	6	1.57E-03	24%	Pass
66	13.907	25	6.53E-03	6	1.57E-03	24%	Pass
67	14.102	24	6.27E-03	6	1.57E-03	25%	Pass
68	14.298	24	6.27E-03	5	1.31E-03	21%	Pass
69	14.493	23	6.01E-03	4	1.05E-03	17%	Pass
70	14.689	23	6.01E-03	4	1.05E-03	17%	Pass
71	14.884	21	5.49E-03	4	1.05E-03	19%	Pass
72	15.080	20	5.23E-03	4	1.05E-03	20%	Pass
73	15.275	18	4.70E-03	4	1.05E-03	22%	Pass
74	15.471	18	4.70E-03	4	1.05E-03	22%	Pass
75	15.666	16	4.18E-03	4	1.05E-03	25%	Pass
76	15.862	15	3.92E-03	4	1.05E-03	27%	Pass
77	16.057	13	3.40E-03	4	1.05E-03	31%	Pass
78	16.253	12	3.14E-03	4	1.05E-03	33%	Pass
79	16.448	12	3.14E-03	4	1.05E-03	33%	Pass
80	16.644	12	3.14E-03	4	1.05E-03	33%	Pass
81	16.839	12	3.14E-03	4	1.05E-03	33%	Pass

Interval	Existing Condition			Underground Detention Optimized			Pass or Fail?
	Q (cfs)	Hours > Q	% time	Hours>Q	% time	Post/Pre	
82	17.035	12	3.14E-03	4	1.05E-03	33%	Pass
83	17.230	12	3.14E-03	4	1.05E-03	33%	Pass
84	17.426	10	2.61E-03	4	1.05E-03	40%	Pass
85	17.621	10	2.61E-03	4	1.05E-03	40%	Pass
86	17.817	9	2.35E-03	4	1.05E-03	44%	Pass
87	18.012	9	2.35E-03	4	1.05E-03	44%	Pass
88	18.208	9	2.35E-03	4	1.05E-03	44%	Pass
89	18.403	9	2.35E-03	4	1.05E-03	44%	Pass
90	18.599	9	2.35E-03	4	1.05E-03	44%	Pass
91	18.794	9	2.35E-03	4	1.05E-03	44%	Pass
92	18.990	9	2.35E-03	3	7.84E-04	33%	Pass
93	19.185	6	1.57E-03	2	5.23E-04	33%	Pass
94	19.381	5	1.31E-03	1	2.61E-04	20%	Pass
95	19.576	5	1.31E-03	0	0.00E+00	0%	Pass
96	19.772	4	1.05E-03	0	0.00E+00	0%	Pass
97	19.967	3	7.84E-04	0	0.00E+00	0%	Pass
98	20.163	3	7.84E-04	0	0.00E+00	0%	Pass
99	20.359	3	7.84E-04	0	0.00E+00	0%	Pass
100	20.554	2	5.23E-04	0	0.00E+00	0%	Pass

POC 3 - Flow Duration Curve Data for Bear Valley - Escondido, CA

Q2 =	11.98	cfs	Fraction	10 %
Q10 =	20.55	cfs		
Step =	0.1955	cfs		
Count =	382678	hours		
	43.65	years		

0

	Existing Condition			Underground Detention Optimized			Pass or
Interval	Q (cfs)	Hours > Q	% time	Hours>Q	% time	Post/Pre	Fail?
1	1.198	431	1.13E-01	401	1.05E-01	93%	Pass
2	1.394	407	1.06E-01	379	9.90E-02	93%	Pass
3	1.589	387	1.01E-01	365	9.54E-02	94%	Pass
4	1.785	373	9.75E-02	330	8.62E-02	88%	Pass
5	1.980	349	9.12E-02	298	7.79E-02	85%	Pass
6	2.176	324	8.47E-02	281	7.34E-02	87%	Pass
7	2.371	296	7.73E-02	264	6.90E-02	89%	Pass
8	2.567	284	7.42E-02	245	6.40E-02	86%	Pass
9	2.762	271	7.08E-02	235	6.14E-02	87%	Pass
10	2.958	249	6.51E-02	224	5.85E-02	90%	Pass
11	3.153	239	6.25E-02	199	5.20E-02	83%	Pass
12	3.349	230	6.01E-02	191	4.99E-02	83%	Pass
13	3.544	218	5.70E-02	180	4.70E-02	83%	Pass
14	3.740	199	5.20E-02	170	4.44E-02	85%	Pass
15	3.935	192	5.02E-02	161	4.21E-02	84%	Pass
16	4.131	181	4.73E-02	153	4.00E-02	85%	Pass
17	4.326	170	4.44E-02	141	3.68E-02	83%	Pass
18	4.522	164	4.29E-02	130	3.40E-02	79%	Pass
19	4.717	154	4.02E-02	123	3.21E-02	80%	Pass
20	4.913	151	3.95E-02	116	3.03E-02	77%	Pass
21	5.108	140	3.66E-02	109	2.85E-02	78%	Pass
22	5.304	129	3.37E-02	103	2.69E-02	80%	Pass
23	5.500	122	3.19E-02	99	2.59E-02	81%	Pass
24	5.695	117	3.06E-02	92	2.40E-02	79%	Pass
25	5.891	110	2.87E-02	87	2.27E-02	79%	Pass
26	6.086	106	2.77E-02	86	2.25E-02	81%	Pass
27	6.282	105	2.74E-02	82	2.14E-02	78%	Pass
28	6.477	99	2.59E-02	81	2.12E-02	82%	Pass
29	6.673	91	2.38E-02	77	2.01E-02	85%	Pass
30	6.868	89	2.33E-02	76	1.99E-02	85%	Pass
31	7.064	87	2.27E-02	73	1.91E-02	84%	Pass
32	7.259	83	2.17E-02	69	1.80E-02	83%	Pass
33	7.455	82	2.14E-02	69	1.80E-02	84%	Pass
34	7.650	78	2.04E-02	67	1.75E-02	86%	Pass
35	7.846	76	1.99E-02	64	1.67E-02	84%	Pass
36	8.041	76	1.99E-02	62	1.62E-02	82%	Pass

Interval	Existing Condition			Underground Detention Optimized			Pass or Fail?
	Q (cfs)	Hours > Q	% time	Hours>Q	% time	Post/Pre	
37	8.237	74	1.93E-02	59	1.54E-02	80%	Pass
38	8.432	69	1.80E-02	53	1.38E-02	77%	Pass
39	8.628	69	1.80E-02	50	1.31E-02	72%	Pass
40	8.823	67	1.75E-02	48	1.25E-02	72%	Pass
41	9.019	67	1.75E-02	48	1.25E-02	72%	Pass
42	9.214	63	1.65E-02	45	1.18E-02	71%	Pass
43	9.410	62	1.62E-02	43	1.12E-02	69%	Pass
44	9.605	59	1.54E-02	43	1.12E-02	73%	Pass
45	9.801	53	1.38E-02	40	1.05E-02	75%	Pass
46	9.996	50	1.31E-02	37	9.67E-03	74%	Pass
47	10.192	49	1.28E-02	36	9.41E-03	73%	Pass
48	10.387	48	1.25E-02	34	8.88E-03	71%	Pass
49	10.583	48	1.25E-02	33	8.62E-03	69%	Pass
50	10.778	43	1.12E-02	32	8.36E-03	74%	Pass
51	10.974	43	1.12E-02	30	7.84E-03	70%	Pass
52	11.169	43	1.12E-02	27	7.06E-03	63%	Pass
53	11.365	42	1.10E-02	26	6.79E-03	62%	Pass
54	11.560	38	9.93E-03	25	6.53E-03	66%	Pass
55	11.756	37	9.67E-03	25	6.53E-03	68%	Pass
56	11.951	36	9.41E-03	25	6.53E-03	69%	Pass
57	12.147	34	8.88E-03	25	6.53E-03	74%	Pass
58	12.342	32	8.36E-03	25	6.53E-03	78%	Pass
59	12.538	31	8.10E-03	25	6.53E-03	81%	Pass
60	12.733	30	7.84E-03	23	6.01E-03	77%	Pass
61	12.929	27	7.06E-03	23	6.01E-03	85%	Pass
62	13.125	26	6.79E-03	21	5.49E-03	81%	Pass
63	13.320	26	6.79E-03	19	4.97E-03	73%	Pass
64	13.516	25	6.53E-03	19	4.97E-03	76%	Pass
65	13.711	25	6.53E-03	18	4.70E-03	72%	Pass
66	13.907	25	6.53E-03	18	4.70E-03	72%	Pass
67	14.102	25	6.53E-03	16	4.18E-03	64%	Pass
68	14.298	25	6.53E-03	16	4.18E-03	64%	Pass
69	14.493	25	6.53E-03	16	4.18E-03	64%	Pass
70	14.689	24	6.27E-03	15	3.92E-03	63%	Pass
71	14.884	23	6.01E-03	12	3.14E-03	52%	Pass
72	15.080	22	5.75E-03	11	2.87E-03	50%	Pass
73	15.275	21	5.49E-03	11	2.87E-03	52%	Pass
74	15.471	20	5.23E-03	11	2.87E-03	55%	Pass
75	15.666	19	4.97E-03	11	2.87E-03	58%	Pass
76	15.862	18	4.70E-03	11	2.87E-03	61%	Pass
77	16.057	18	4.70E-03	10	2.61E-03	56%	Pass
78	16.253	17	4.44E-03	9	2.35E-03	53%	Pass
79	16.448	16	4.18E-03	9	2.35E-03	56%	Pass
80	16.644	16	4.18E-03	9	2.35E-03	56%	Pass
81	16.839	16	4.18E-03	9	2.35E-03	56%	Pass

Interval	Existing Condition			Underground Detention Optimized			Pass or Fail?
	Q (cfs)	Hours > Q	% time	Hours>Q	% time	Post/Pre	
82	17.035	15	3.92E-03	8	2.09E-03	53%	Pass
83	17.230	12	3.14E-03	8	2.09E-03	67%	Pass
84	17.426	11	2.87E-03	7	1.83E-03	64%	Pass
85	17.621	11	2.87E-03	6	1.57E-03	55%	Pass
86	17.817	11	2.87E-03	5	1.31E-03	45%	Pass
87	18.012	11	2.87E-03	3	7.84E-04	27%	Pass
88	18.208	11	2.87E-03	3	7.84E-04	27%	Pass
89	18.403	11	2.87E-03	2	5.23E-04	18%	Pass
90	18.599	10	2.61E-03	2	5.23E-04	20%	Pass
91	18.794	9	2.35E-03	2	5.23E-04	22%	Pass
92	18.990	9	2.35E-03	2	5.23E-04	22%	Pass
93	19.185	9	2.35E-03	2	5.23E-04	22%	Pass
94	19.381	9	2.35E-03	2	5.23E-04	22%	Pass
95	19.576	9	2.35E-03	2	5.23E-04	22%	Pass
96	19.772	8	2.09E-03	2	5.23E-04	25%	Pass
97	19.967	8	2.09E-03	2	5.23E-04	25%	Pass
98	20.163	7	1.83E-03	2	5.23E-04	29%	Pass
99	20.359	7	1.83E-03	2	5.23E-04	29%	Pass
100	20.554	5	1.31E-03	2	5.23E-04	40%	Pass

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

POC 1 - List of Peak events and Determination of P2 and P10 (PRE-Development)

T	Cunnane	Weibull
10	12.58	12.70
9	12.51	12.53
8	12.48	12.49
7	12.25	12.33
6	11.61	11.79
5	11.05	11.31
4	9.82	9.86
3	9.15	9.18
2	7.52	7.52

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

Peaks	Date	Position	Period of Return	
			Weibull	Cunnane
4.587	12/4/1974	44	1.02	1.01
4.928	2/16/1980	43	1.05	1.04
5.049	1/15/1978	42	1.07	1.06
5.226	2/25/2003	41	1.10	1.09
5.262	11/30/2007	40	1.13	1.12
5.272	2/18/1980	39	1.15	1.15
5.567	8/26/2007	38	1.18	1.18
5.625	1/5/1979	37	1.22	1.21
5.674	1/1/1982	36	1.25	1.24
5.695	1/11/1980	35	1.29	1.28
5.791	2/26/2004	34	1.32	1.32
5.953	3/5/1995	33	1.36	1.36
6.071	3/20/1991	32	1.41	1.40
6.137	10/19/2004	31	1.45	1.44
6.224	1/13/1993	30	1.50	1.49
6.276	2/15/1992	29	1.55	1.55
6.373	2/3/1998	28	1.61	1.60
6.693	2/19/1980	27	1.67	1.66
7.191	12/25/1983	26	1.73	1.73
7.245	1/7/2005	25	1.80	1.80
7.383	1/30/2007	24	1.88	1.87
7.464	2/9/1981	23	1.96	1.96
7.571	1/9/1998	22	2.05	2.05
7.667	1/11/2005	21	2.14	2.15
7.697	11/25/1983	20	2.25	2.26
7.797	11/22/1965	19	2.37	2.38
8.081	12/19/1967	18	2.50	2.51
8.43	11/14/1972	17	2.65	2.66
9.007	2/7/1993	16	2.81	2.83
9.176	4/20/1988	15	3.00	3.03
9.475	10/17/2004	14	3.21	3.25
9.477	11/19/1967	13	3.46	3.51
9.706	2/15/1986	12	3.75	3.81
9.915	1/24/1969	11	4.09	4.17
10.317	1/28/1980	10	4.50	4.60
11.311	3/2/1983	9	5.00	5.14
11.466	1/16/1978	8	5.63	5.82
12.17	2/14/1998	7	6.43	6.70
12.472	1/25/1995	6	7.50	7.89
12.526	3/17/1978	5	9.00	9.61
12.909	2/23/1971	4	11.25	12.28
12.929	12/5/1966	3	15.00	17.00
14.649	1/4/1995	2	22.50	27.63
17.423	1/6/1993	1	45.00	73.67

POC 1 - List of Peak events and Determination of P2 and P10 (POST-Development)

T	Cunnane	Weibull				Period of Return	
10	2.41	2.43	Peaks	Date	Position	Weibull	Cunnane
9	2.33	2.41	0.707	11/26/1970	44	1.02	1.01
8	2.19	2.25	0.756	2/4/1976	43	1.05	1.04
7	2.16	2.16	0.762	5/8/1977	42	1.07	1.06
6	2.12	2.13	0.763	12/4/1974	41	1.10	1.09
5	1.93	1.96	0.81	2/19/2004	40	1.13	1.12
4	1.51	1.59	0.831	1/31/1996	39	1.15	1.15
3	1.21	1.21	0.831	1/9/1998	38	1.18	1.18
2	1.05	1.05	0.85	1/23/1967	37	1.22	1.21
			0.852	2/18/2005	36	1.25	1.24
			0.87	12/17/1978	35	1.29	1.28
Note:			0.889	11/22/1996	34	1.32	1.32
Cunnane is the preferred			0.938	3/7/1974	33	1.36	1.36
method by the HMP permit.			0.939	1/21/1995	32	1.41	1.40
			0.941	3/15/1982	31	1.45	1.44
			0.959	2/28/1991	30	1.50	1.49
			1.003	4/20/1988	29	1.55	1.55
			1.016	10/27/2004	28	1.61	1.60
			1.024	3/19/1991	27	1.67	1.66
			1.034	2/8/1993	26	1.73	1.73
			1.042	8/26/2007	25	1.80	1.80
			1.043	2/9/1981	24	1.88	1.87
			1.05	12/25/1983	23	1.96	1.96
			1.054	11/30/2007	22	2.05	2.05
			1.093	3/3/1980	21	2.14	2.15
			1.1	3/1/1970	20	2.25	2.26
			1.121	2/13/1980	19	2.37	2.38
			1.14	11/19/1967	18	2.50	2.51
			1.173	11/25/1985	17	2.65	2.66
			1.19	1/8/1980	16	2.81	2.83
			1.212	3/5/1995	15	3.00	3.03
			1.243	12/28/2004	14	3.21	3.25
			1.247	2/23/1971	13	3.46	3.51
			1.313	2/14/1998	12	3.75	3.81
			1.691	2/24/1983	11	4.09	4.17
			1.854	1/5/1979	10	4.50	4.60
			1.959	11/22/1965	9	5.00	5.14
			2.109	3/12/1978	8	5.63	5.82
			2.148	2/15/1986	7	6.43	6.70
			2.178	1/14/1969	6	7.50	7.89
			2.408	1/28/1980	5	9.00	9.61
			2.45	1/11/1978	4	11.25	12.28
			2.813	1/6/1993	3	15.00	17.00
			2.953	12/3/1966	2	22.50	27.63
			3.166	1/3/1995	1	45.00	73.67

POC 2 - List of Peak events and Determination of P2 and P10 (PRE-Development)

T	Cunnane	Weibull				Period of Return	
10	20.55	20.66	Peaks	Date	Position	Weibull	Cunnane
9	20.37	20.50	7.161	12/4/1974	44	1.02	1.01
8	20.14	20.24	8.074	2/16/1980	43	1.05	1.04
7	19.85	19.95	8.229	2/25/2003	42	1.07	1.06
6	18.94	19.21	8.266	1/15/1978	41	1.10	1.09
5	18.08	18.51	8.268	11/30/2007	40	1.13	1.12
4	15.87	16.02	8.401	2/18/1980	39	1.15	1.15
3	14.71	14.71	9.063	8/26/2007	38	1.18	1.18
2	11.98	11.98	9.091	1/1/1982	37	1.22	1.21
			9.127	1/11/1980	36	1.25	1.24
			9.209	1/5/1979	35	1.29	1.28
Note:			9.422	2/26/2004	34	1.32	1.32
Cunnane is the preferred			9.67	3/5/1995	33	1.36	1.36
method by the HMP permit.			9.689	10/19/2004	32	1.41	1.40
			9.83	1/13/1993	31	1.45	1.44
			9.88	3/20/1991	30	1.50	1.49
			9.95	2/15/1992	29	1.55	1.55
			10.12	2/3/1998	28	1.61	1.60
			10.758	2/19/1980	27	1.67	1.66
			11.409	12/25/1983	26	1.73	1.73
			11.502	1/7/2005	25	1.80	1.80
			11.676	1/30/2007	24	1.88	1.87
			11.867	2/9/1981	23	1.96	1.96
			12.103	1/9/1998	22	2.05	2.05
			12.232	11/25/1983	21	2.14	2.15
			12.573	1/11/2005	20	2.25	2.26
			12.736	11/22/1965	19	2.37	2.38
			13.034	12/19/1967	18	2.50	2.51
			13.459	11/14/1972	17	2.65	2.66
			14.681	4/20/1988	16	2.81	2.83
			14.711	2/7/1993	15	3.00	3.03
			15.178	11/19/1967	14	3.21	3.25
			15.356	10/17/2004	13	3.46	3.51
			15.493	2/15/1986	12	3.75	3.81
			16.211	1/24/1969	11	4.09	4.17
			16.874	1/28/1980	10	4.50	4.60
			18.506	3/2/1983	9	5.00	5.14
			18.719	1/16/1978	8	5.63	5.82
			19.766	2/14/1998	7	6.43	6.70
			20.114	1/25/1995	6	7.50	7.89
			20.503	3/17/1978	5	9.00	9.61
			20.851	2/23/1971	4	11.25	12.28
			21.138	12/5/1966	3	15.00	17.00
			23.935	1/4/1995	2	22.50	27.63
			28.448	1/6/1993	1	45.00	73.67

POC 2 - List of Peak events and Determination of P2 and P10 (POST-Development)

T	Cunnane	Weibull				Period of Return	
10	2.41	2.43	Peaks	Date	Position	Weibull	Cunnane
9	2.33	2.41	0.707	11/26/1970	44	1.02	1.01
8	2.19	2.25	0.756	2/4/1976	43	1.05	1.04
7	2.16	2.16	0.762	5/8/1977	42	1.07	1.06
6	2.12	2.13	0.763	12/4/1974	41	1.10	1.09
5	1.93	1.96	0.81	2/19/2004	40	1.13	1.12
4	1.51	1.59	0.831	1/31/1996	39	1.15	1.15
3	1.21	1.21	0.831	1/9/1998	38	1.18	1.18
2	1.05	1.05	0.85	1/23/1967	37	1.22	1.21
			0.852	2/18/2005	36	1.25	1.24
			0.87	12/17/1978	35	1.29	1.28
Note:			0.889	11/22/1996	34	1.32	1.32
Cunnane is the preferred			0.938	3/7/1974	33	1.36	1.36
method by the HMP permit.			0.939	1/21/1995	32	1.41	1.40
			0.941	3/15/1982	31	1.45	1.44
			0.959	2/28/1991	30	1.50	1.49
			1.003	4/20/1988	29	1.55	1.55
			1.016	10/27/2004	28	1.61	1.60
			1.024	3/19/1991	27	1.67	1.66
			1.034	2/8/1993	26	1.73	1.73
			1.042	8/26/2007	25	1.80	1.80
			1.043	2/9/1981	24	1.88	1.87
			1.05	12/25/1983	23	1.96	1.96
			1.054	11/30/2007	22	2.05	2.05
			1.093	3/3/1980	21	2.14	2.15
			1.1	3/1/1970	20	2.25	2.26
			1.121	2/13/1980	19	2.37	2.38
			1.14	11/19/1967	18	2.50	2.51
			1.173	11/25/1985	17	2.65	2.66
			1.19	1/8/1980	16	2.81	2.83
			1.212	3/5/1995	15	3.00	3.03
			1.243	12/28/2004	14	3.21	3.25
			1.247	2/23/1971	13	3.46	3.51
			1.313	2/14/1998	12	3.75	3.81
			1.691	2/24/1983	11	4.09	4.17
			1.854	1/5/1979	10	4.50	4.60
			1.959	11/22/1965	9	5.00	5.14
			2.109	3/12/1978	8	5.63	5.82
			2.148	2/15/1986	7	6.43	6.70
			2.178	1/14/1969	6	7.50	7.89
			2.408	1/28/1980	5	9.00	9.61
			2.45	1/11/1978	4	11.25	12.28
			2.813	1/6/1993	3	15.00	17.00
			2.953	12/3/1966	2	22.50	27.63
			3.166	1/3/1995	1	45.00	73.67

POC 3 - List of Peak events and Determination of P2 and P10 (PRE-Development)

T	Cunnane	Weibull				Period of Return	
10	20.55	20.66	Peaks	Date	Position	Weibull	Cunnane
9	20.37	20.50	7.161	12/4/1974	44	1.02	1.01
8	20.14	20.24	8.074	2/16/1980	43	1.05	1.04
7	19.85	19.95	8.229	2/25/2003	42	1.07	1.06
6	18.94	19.21	8.266	1/15/1978	41	1.10	1.09
5	18.08	18.51	8.268	11/30/2007	40	1.13	1.12
4	15.87	16.02	8.401	2/18/1980	39	1.15	1.15
3	14.71	14.71	9.063	8/26/2007	38	1.18	1.18
2	11.98	11.98	9.091	1/1/1982	37	1.22	1.21
			9.127	1/11/1980	36	1.25	1.24
			9.209	1/5/1979	35	1.29	1.28
Note:			9.422	2/26/2004	34	1.32	1.32
Cunnane is the preferred			9.67	3/5/1995	33	1.36	1.36
method by the HMP permit.			9.689	10/19/2004	32	1.41	1.40
			9.83	1/13/1993	31	1.45	1.44
			9.88	3/20/1991	30	1.50	1.49
			9.95	2/15/1992	29	1.55	1.55
			10.12	2/3/1998	28	1.61	1.60
			10.758	2/19/1980	27	1.67	1.66
			11.409	12/25/1983	26	1.73	1.73
			11.502	1/7/2005	25	1.80	1.80
			11.676	1/30/2007	24	1.88	1.87
			11.867	2/9/1981	23	1.96	1.96
			12.103	1/9/1998	22	2.05	2.05
			12.232	11/25/1983	21	2.14	2.15
			12.573	1/11/2005	20	2.25	2.26
			12.736	11/22/1965	19	2.37	2.38
			13.034	12/19/1967	18	2.50	2.51
			13.459	11/14/1972	17	2.65	2.66
			14.681	4/20/1988	16	2.81	2.83
			14.711	2/7/1993	15	3.00	3.03
			15.178	11/19/1967	14	3.21	3.25
			15.356	10/17/2004	13	3.46	3.51
			15.493	2/15/1986	12	3.75	3.81
			16.211	1/24/1969	11	4.09	4.17
			16.874	1/28/1980	10	4.50	4.60
			18.506	3/2/1983	9	5.00	5.14
			18.719	1/16/1978	8	5.63	5.82
			19.766	2/14/1998	7	6.43	6.70
			20.114	1/25/1995	6	7.50	7.89
			20.503	3/17/1978	5	9.00	9.61
			20.851	2/23/1971	4	11.25	12.28
			21.138	12/5/1966	3	15.00	17.00
			23.935	1/4/1995	2	22.50	27.63
			28.448	1/6/1993	1	45.00	73.67

POC 3 - List of Peak events and Determination of P2 and P10 (POST-Development)

T	Cunnane	Weibull				Period of Return	
10	2.41	2.43	Peaks	Date	Position	Weibull	Cunnane
9	2.33	2.41	0.707	11/26/1970	44	1.02	1.01
8	2.19	2.25	0.756	2/4/1976	43	1.05	1.04
7	2.16	2.16	0.762	5/8/1977	42	1.07	1.06
6	2.12	2.13	0.763	12/4/1974	41	1.10	1.09
5	1.93	1.96	0.81	2/19/2004	40	1.13	1.12
4	1.51	1.59	0.831	1/31/1996	39	1.15	1.15
3	1.21	1.21	0.831	1/9/1998	38	1.18	1.18
2	1.05	1.05	0.85	1/23/1967	37	1.22	1.21
			0.852	2/18/2005	36	1.25	1.24
			0.87	12/17/1978	35	1.29	1.28
Note:			0.889	11/22/1996	34	1.32	1.32
Cunnane is the preferred			0.938	3/7/1974	33	1.36	1.36
method by the HMP permit.			0.939	1/21/1995	32	1.41	1.40
			0.941	3/15/1982	31	1.45	1.44
			0.959	2/28/1991	30	1.50	1.49
			1.003	4/20/1988	29	1.55	1.55
			1.016	10/27/2004	28	1.61	1.60
			1.024	3/19/1991	27	1.67	1.66
			1.034	2/8/1993	26	1.73	1.73
			1.042	8/26/2007	25	1.80	1.80
			1.043	2/9/1981	24	1.88	1.87
			1.05	12/25/1983	23	1.96	1.96
			1.054	11/30/2007	22	2.05	2.05
			1.093	3/3/1980	21	2.14	2.15
			1.1	3/1/1970	20	2.25	2.26
			1.121	2/13/1980	19	2.37	2.38
			1.14	11/19/1967	18	2.50	2.51
			1.173	11/25/1985	17	2.65	2.66
			1.19	1/8/1980	16	2.81	2.83
			1.212	3/5/1995	15	3.00	3.03
			1.243	12/28/2004	14	3.21	3.25
			1.247	2/23/1971	13	3.46	3.51
			1.313	2/14/1998	12	3.75	3.81
			1.691	2/24/1983	11	4.09	4.17
			1.854	1/5/1979	10	4.50	4.60
			1.959	11/22/1965	9	5.00	5.14
			2.109	3/12/1978	8	5.63	5.82
			2.148	2/15/1986	7	6.43	6.70
			2.178	1/14/1969	6	7.50	7.89
			2.408	1/28/1980	5	9.00	9.61
			2.45	1/11/1978	4	11.25	12.28
			2.813	1/6/1993	3	15.00	17.00
			2.953	12/3/1966	2	22.50	27.63
			3.166	1/3/1995	1	45.00	73.67

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 0.1 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 impact 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.

BASIN 1 STAGE STORAGE

Depth (ft)	Area (sq ft)	Volume (cu ft)
0	15065	-
0.05	15124	755
0.1	15183	1,512
0.15	15241	2,273
0.2	15300	3,037
0.25	15359	3,803
0.3	15418	4,572
0.35	15476	5,345
0.4	15535	6,120
0.45	15594	6,898
0.5	15653	7,679
0.55	15711	8,463
0.6	15770	9,251
0.65	15829	10,040
0.7	15888	10,833
0.75	15946	11,629
0.8	16005	12,428
0.85	16064	13,230
0.9	16123	14,034
0.95	16181	14,842
1	16240	15,653
1.05	16300	16,466
1.1	16360	17,283
1.15	16420	18,102
1.2	16480	18,925
1.25	16540	19,750
1.3	16600	20,579
1.35	16660	21,410
1.4	16720	22,245
1.45	16780	23,082
1.5	16840	23,923
1.55	16900	24,766
1.6	16960	25,613
1.65	17020	26,462
1.7	17080	27,315
1.75	17140	28,170
1.8	17200	29,029
1.85	17260	29,890
1.9	17320	30,755
1.95	17380	31,622
2	17440	32,493
2.05	17501	33,366
2.1	17562	34,243
2.15	17624	35,122

2.2	17685	36,005
2.25	17746	36,891
2.3	17807	37,780
2.35	17868	38,671
2.4	17930	39,566
2.45	17991	40,464
2.5	18052	41,366
2.55	18113	42,270
2.6	18174	43,177
2.65	18236	44,087
2.7	18297	45,000
2.75	18358	45,917
2.8	18419	46,836
2.85	18480	47,759
2.9	18542	48,684
2.95	18603	49,613
3	18664	50,545
3.05	18726	51,479
3.1	18789	52,417
3.15	18851	53,358
3.2	18914	54,302
3.25	18976	55,250
3.3	19039	56,200
3.35	19101	57,153
3.4	19164	58,110
3.45	19226	59,070
3.5	19289	60,033
3.55	19351	60,999
3.6	19413	61,968
3.65	19476	62,940
3.7	19538	63,915
3.75	19601	64,894
3.8	19663	65,875
3.85	19726	66,860
3.9	19788	67,848
3.95	19851	68,839
4	19913	69,833
4.05	19977	70,830
4.1	20041	71,831
4.15	20104	72,834
4.2	20168	73,841
4.25	20232	74,851
4.3	20296	75,864
4.35	20360	76,881
4.4	20423	77,900
4.45	20487	78,923
4.5	20551	79,949

4.55	20615	80,978
4.6	20679	82,010
4.65	20742	83,046
4.7	20806	84,085
4.75	20870	85,127
4.8	20934	86,172
4.85	20998	87,220
4.9	21061	88,271
4.95	21125	89,326
5	21189	90,384

Bear Valley Basin 1 Discharge

Discharge vs Elevation Table

Bottom orifice diameter:	1.5 "	Top orifice diameter:	4 "
Number:	1	Number:	0
Cg-low:	0.61	Cg-low:	0.61
invert elev:	0.35 ft	invert elev:	2.50 ft
Middle orifice diameter:	2 "	Emergency weir:	
number of orif:	0	Invert:	3.65 ft
Cg-middle:	0.61	Weir Length (fl	15.7 ft
invert elev:	1.50 ft		

h (ft)	H/D-low -	H/D-mid -	H/D-top -	H/D-peak -	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)	Qpeak-top (cfs)	Qtot (cfs)
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.4	0.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.45	0.80	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
0.5	1.20	0.00	0.00	0.00	0.02	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02
0.55	1.60	0.00	0.00	0.00	0.02	0.03	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02
0.6	2.00	0.00	0.00	0.00	0.03	0.03	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03
0.65	2.40	0.00	0.00	0.00	0.03	0.04	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03
0.7	2.80	0.00	0.00	0.00	0.03	0.04	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03
0.75	3.20	0.00	0.00	0.00	0.03	0.04	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03
0.8	3.60	0.00	0.00	0.00	0.04	0.05	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04
0.85	4.00	0.00	0.00	0.00	0.04	0.07	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04
0.9	4.40	0.00	0.00	0.00	0.04	0.11	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04
0.95	4.80	0.00	0.00	0.00	0.04	0.20	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04
1	5.20	0.00	0.00	0.00	0.05	0.35	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05
1.05	5.60	0.00	0.00	0.00	0.05	0.59	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05
1.1	6.00	0.00	0.00	0.00	0.05	0.95	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05
1.15	6.40	0.00	0.00	0.00	0.05	1.47	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05
1.2	6.80	0.00	0.00	0.00	0.05	2.19	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05
1.25	7.20	0.00	0.00	0.00	0.05	3.18	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05
1.3	7.60	0.00	0.00	0.00	0.06	4.49	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06
1.35	8.00	0.00	0.00	0.00	0.06	6.18	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06
1.4	8.40	0.00	0.00	0.00	0.06	8.34	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06
1.45	8.80	0.00	0.00	0.00	0.06	11.06	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06
1.5	9.20	0.00	0.00	0.00	0.06	14.44	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06
1.55	9.60	0.30	0.00	0.00	0.06	18.58	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06
1.6	10.00	0.60	0.00	0.00	0.07	23.61	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07
1.65	10.40	0.90	0.00	0.00	0.07	29.65	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07
1.7	10.80	1.20	0.00	0.00	0.07	36.86	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07
1.75	11.20	1.50	0.00	0.00	0.07	45.39	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07
1.8	11.60	1.80	0.00	0.00	0.07	55.41	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07
1.85	12.00	2.10	0.00	0.00	0.07	67.11	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07
1.9	12.40	2.40	0.00	0.00	0.07	80.69	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07
1.95	12.80	2.70	0.00	0.00	0.07	96.36	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07
2	13.20	3.00	0.00	0.00	0.08	114.36	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08
2.05	13.60	3.30	0.00	0.00	0.08	134.92	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08
2.1	14.00	3.60	0.00	0.00	0.08	158.32	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08
2.15	14.40	3.90	0.00	0.00	0.08	184.84	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08
2.2	14.80	4.20	0.00	0.00	0.08	214.77	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08
2.25	15.20	4.50	0.00	0.00	0.08	248.43	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08
2.3	15.60	4.80	0.00	0.00	0.08	286.15	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08
2.35	16.00	5.10	0.00	0.00	0.08	328.30	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08
2.4	16.40	5.40	0.00	0.00	0.08	375.25	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08
2.45	16.80	5.70	0.00	0.00	0.09	427.39	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09
2.5	17.20	6.00	0.00	0.00	0.09	485.14	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09
2.55	17.60	6.30	0.15	0.00	0.09	548.94	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09
2.6	18.00	6.60	0.30	0.00	0.09	619.25	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09
2.65	18.40	6.90	0.45	0.00	0.09	696.55	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09
2.7	18.80	7.20	0.60	0.00	0.09	781.35	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09
2.75	19.20	7.50	0.75	0.00	0.09	874.19	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09
2.8	19.60	7.80	0.90	0.00	0.09	975.61	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09
2.85	20.00	8.10	1.05	0.00	0.09	1086.19	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09
2.9	20.40	8.40	1.20	0.00	0.09	1206.55	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09
2.95	20.80	8.70	1.35	0.00	0.10	1337.31	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10
3	21.20	9.00	1.50	0.00	0.10	1479.13	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10
3.05	21.60	9.30	1.65	0.00	0.10	1632.69	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10
3.1	22.00	9.60	1.80	0.00	0.10	1798.71	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10
3.15	22.40	9.90	1.95	0.00	0.10	1977.93	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10
3.2	22.80	10.20	2.10	0.00	0.10	2171.11	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10
3.25	23.20	10.50	2.25	0.00	0.10	2379.06	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10
3.3	23.60	10.80	2.40	0.00	0.10	2602.61	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10
3.35	24.00	11.10	2.55	0.00	0.10	2842.60	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10

3.4	24.40	11.40	2.70	0.00	0.10	3099.94	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10
3.45	24.80	11.70	2.85	0.00	0.10	3375.54	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10
3.5	25.20	12.00	3.00	0.00	0.11	3670.36	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.11
3.55	25.60	12.30	3.15	0.00	0.11	3985.37	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.11
3.6	26.00	12.60	3.30	0.00	0.11	4321.61	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.11
3.65	26.40	12.90	3.45	0.00	0.11	4680.11	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.11
3.7	26.80	13.20	3.60	0.04	0.11	5061.97	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.58	0.69
3.75	27.20	13.50	3.75	0.08	0.11	5468.31	0.11	0.00	0.00	0.00	0.00	0.00	0.00	1.65	1.76
3.8	27.60	13.80	3.90	0.11	0.11	5900.28	0.11	0.00	0.00	0.00	0.00	0.00	0.00	3.04	3.15
3.85	28.00	14.10	4.05	0.15	0.11	6359.08	0.11	0.00	0.00	0.00	0.00	0.00	0.00	4.68	4.79
3.9	28.40	14.40	4.20	0.19	0.11	6845.93	0.11	0.00	0.00	0.00	0.00	0.00	0.00	6.54	6.65
3.95	28.80	14.70	4.35	0.23	0.11	7362.10	0.11	0.00	0.00	0.00	0.00	0.00	0.00	8.60	8.71
4	29.20	15.00	4.50	0.27	0.11	7908.88	0.11	0.00	0.00	0.00	0.00	0.00	0.00	10.83	10.94
4.05	29.60	15.30	4.65	0.31	0.11	8487.63	0.11	0.00	0.00	0.00	0.00	0.00	0.00	13.23	13.35
4.1	30.00	15.60	4.80	0.34	0.12	9099.71	0.12	0.00	0.00	0.00	0.00	0.00	0.00	15.79	15.91
4.15	30.40	15.90	4.95	0.38	0.12	9746.55	0.12	0.00	0.00	0.00	0.00	0.00	0.00	18.49	18.61
4.2	30.80	16.20	5.10	0.42	0.12	10429.61	0.12	0.00	0.00	0.00	0.00	0.00	0.00	21.34	21.45
4.25	31.20	16.50	5.25	0.46	0.12	11150.37	0.12	0.00	0.00	0.00	0.00	0.00	0.00	24.31	24.43
4.3	31.60	16.80	5.40	0.50	0.12	11910.39	0.12	0.00	0.00	0.00	0.00	0.00	0.00	27.41	27.53
4.35	32.00	17.10	5.55	0.53	0.12	12711.23	0.12	0.00	0.00	0.00	0.00	0.00	0.00	30.63	30.75
4.4	32.40	17.40	5.70	0.57	0.12	13554.52	0.12	0.00	0.00	0.00	0.00	0.00	0.00	33.97	34.09
4.45	32.80	17.70	5.85	0.61	0.12	14441.92	0.12	0.00	0.00	0.00	0.00	0.00	0.00	37.43	37.55
4.5	33.20	18.00	6.00	0.65	0.12	15375.13	0.12	0.00	0.00	0.00	0.00	0.00	0.00	40.99	41.11
4.55	33.60	18.30	6.15	0.69	0.12	16355.92	0.12	0.00	0.00	0.00	0.00	0.00	0.00	44.66	44.78
4.6	34.00	18.60	6.30	0.73	0.12	17386.06	0.12	0.00	0.00	0.00	0.00	0.00	0.00	48.43	48.56
4.65	34.40	18.90	6.45	0.76	0.12	18467.40	0.12	0.00	0.00	0.00	0.00	0.00	0.00	52.31	52.43
4.7	34.80	19.20	6.60	0.80	0.12	19601.82	0.12	0.00	0.00	0.00	0.00	0.00	0.00	56.28	56.40
4.75	35.20	19.50	6.75	0.84	0.13	20791.25	0.13	0.00	0.00	0.00	0.00	0.00	0.00	60.35	60.47
4.8	35.60	19.80	6.90	0.88	0.13	22037.66	0.13	0.00	0.00	0.00	0.00	0.00	0.00	64.51	64.63
4.85	36.00	20.10	7.05	0.92	0.13	23343.08	0.13	0.00	0.00	0.00	0.00	0.00	0.00	68.76	68.89
4.9	36.40	20.40	7.20	0.95	0.13	24709.57	0.13	0.00	0.00	0.00	0.00	0.00	0.00	73.10	73.23
4.95	36.80	20.70	7.35	0.99	0.13	26139.24	0.13	0.00	0.00	0.00	0.00	0.00	0.00	77.53	77.66
5	37.20	21.00	7.50	1.03	0.13	27634.27	0.13	0.00	0.00	0.00	0.00	0.00	0.00	82.05	82.18

BASIN 2 STAGE STORAGE

Depth (ft)	Area (sq ft)	Volume (cu ft)
0	21148	-
0.05	21212	1,059
0.1	21277	2,121
0.15	21341	3,187
0.2	21406	4,255
0.25	21470	5,327
0.3	21535	6,402
0.35	21599	7,481
0.4	21664	8,562
0.45	21728	9,647
0.5	21793	10,735
0.55	21857	11,826
0.6	21921	12,921
0.65	21986	14,019
0.7	22050	15,119
0.75	22115	16,224
0.8	22179	17,331
0.85	22244	18,441
0.9	22308	19,555
0.95	22373	20,672
1	22437	21,793
1.05	22503	22,916
1.1	22568	24,043
1.15	22634	25,173
1.2	22700	26,306
1.25	22766	27,443
1.3	22831	28,583
1.35	22897	29,726
1.4	22963	30,872
1.45	23028	32,022
1.5	23094	33,175
1.55	23160	34,332
1.6	23225	35,491
1.65	23291	36,654
1.7	23357	37,820
1.75	23423	38,990
1.8	23488	40,163
1.85	23554	41,339
1.9	23620	42,518
1.95	23685	43,701
2	23751	44,887
2.05	23818	46,076
2.1	23885	47,268
2.15	23952	48,464

2.2	24018	49,663
2.25	24085	50,866
2.3	24152	52,072
2.35	24219	53,281
2.4	24286	54,494
2.45	24353	55,710
2.5	24420	56,929
2.55	24486	58,152
2.6	24553	59,378
2.65	24620	60,607
2.7	24687	61,840
2.75	24754	63,076
2.8	24821	64,315
2.85	24887	65,558
2.9	24954	66,804
2.95	25021	68,053
3	25088	69,306
3.05	25156	70,562
3.1	25224	71,822
3.15	25293	73,085
3.2	25361	74,351
3.25	25429	75,621
3.3	25497	76,894
3.35	25565	78,170
3.4	25634	79,450
3.45	25702	80,734
3.5	25770	82,021
3.55	25838	83,311
3.6	25906	84,604
3.65	25975	85,901
3.7	26043	87,202
3.75	26111	88,506
3.8	26179	89,813
3.85	26247	91,124
3.9	26316	92,438
3.95	26384	93,755
4	26452	95,076
4.05	26521	96,400
4.1	26591	97,728
4.15	26660	99,059
4.2	26730	100,394
4.25	26799	101,732
4.3	26869	103,074
4.35	26938	104,419
4.4	27008	105,768
4.45	27077	107,120
4.5	27147	108,476

4.55	27216	109,835
4.6	27285	111,197
4.65	27355	112,563
4.7	27424	113,933
4.75	27494	115,306
4.8	27563	116,682
4.85	27633	118,062
4.9	27702	119,445
4.95	27772	120,832
5	27841	122,223
5.05	27912	123,616
5.1	27982	125,014
5.15	28053	126,415
5.2	28124	127,819
5.25	28194	129,227
5.3	28265	130,638
5.35	28336	132,053
5.4	28406	133,472
5.45	28477	134,894
5.5	28548	136,320
5.55	28618	137,749
5.6	28689	139,181
5.65	28759	140,618
5.7	28830	142,057
5.75	28901	143,501
5.8	28971	144,947
5.85	29042	146,398
5.9	29113	147,852
5.95	29183	149,309
6	29254	150,770
6.05	29326	152,235
6.1	29398	153,703
6.15	29470	155,174
6.2	29542	156,650
6.25	29614	158,129
6.3	29686	159,611
6.35	29758	161,097
6.4	29830	162,587
6.45	29902	164,080
6.5	29974	165,577
6.55	30046	167,078
6.6	30118	168,582
6.65	30190	170,089
6.7	30262	171,601
6.75	30334	173,116
6.8	30406	174,634
6.85	30478	176,156

6.9	30550	177,682
6.95	30622	179,211
7	30694	180,744
7.05	30767	182,281
7.1	30840	183,821
7.15	30914	185,365
7.2	30987	186,912
7.25	31060	188,463
7.3	31133	190,018
7.35	31206	191,577
7.4	31280	193,139
7.45	31353	194,705
7.5	31426	196,274
7.55	31499	197,847
7.6	31572	199,424
7.65	31646	201,004
7.7	31719	202,588
7.75	31792	204,176
7.8	31865	205,768
7.85	31938	207,363
7.9	32012	208,962
7.95	32085	210,564
8	32158	212,170
8.05	32232	213,780
8.1	32306	215,393
8.15	32381	217,010
8.2	32455	218,631
8.25	32529	220,256
8.3	32603	221,884
8.35	32677	223,516
8.4	32752	225,152
8.45	32826	226,791
8.5	32900	228,435

Bear Valley Basin 2 Discharge

Discharge vs Elevation Table

Bottom orifice diameter:	2 "	Top orifice diameter:	6 "
Number:	1	Number:	5
Cg-low:	0.61	Cg-low:	0.61
invert elev:	0.35 ft	invert elev:	6.00 ft
Middle orifice diameter:	2 "	Emergency weir:	
number of orif:	0	Invert:	7.20 ft
Cg-middle:	0.61	Weir Length (fl	15.7 ft
invert elev:	3.00 ft		

h (ft)	H/D-low -	H/D-mid -	H/D-top -	H/D-peak -	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	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.4	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.45	0.60	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
0.5	0.90	0.00	0.00	0.00	0.03	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02
0.55	1.20	0.00	0.00	0.00	0.04	0.04	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04
0.6	1.50	0.00	0.00	0.00	0.04	0.05	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04
0.65	1.80	0.00	0.00	0.00	0.05	0.06	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05
0.7	2.10	0.00	0.00	0.00	0.06	0.07	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06
0.75	2.40	0.00	0.00	0.00	0.06	0.08	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06
0.8	2.70	0.00	0.00	0.00	0.06	0.08	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06
0.85	3.00	0.00	0.00	0.00	0.07	0.08	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07
0.9	3.30	0.00	0.00	0.00	0.07	0.08	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07
0.95	3.60	0.00	0.00	0.00	0.08	0.09	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08
1	3.90	0.00	0.00	0.00	0.08	0.12	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08
1.05	4.20	0.00	0.00	0.00	0.08	0.17	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08
1.1	4.50	0.00	0.00	0.00	0.09	0.26	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09
1.15	4.80	0.00	0.00	0.00	0.09	0.41	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09
1.2	5.10	0.00	0.00	0.00	0.09	0.62	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09
1.25	5.40	0.00	0.00	0.00	0.10	0.93	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10
1.3	5.70	0.00	0.00	0.00	0.10	1.36	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10
1.35	6.00	0.00	0.00	0.00	0.10	1.94	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10
1.4	6.30	0.00	0.00	0.00	0.11	2.71	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.11
1.45	6.60	0.00	0.00	0.00	0.11	3.70	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.11
1.5	6.90	0.00	0.00	0.00	0.11	4.96	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.11
1.55	7.20	0.00	0.00	0.00	0.11	6.53	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.11
1.6	7.50	0.00	0.00	0.00	0.12	8.47	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12
1.65	7.80	0.00	0.00	0.00	0.12	10.84	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12
1.7	8.10	0.00	0.00	0.00	0.12	13.70	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12
1.75	8.40	0.00	0.00	0.00	0.12	17.13	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12
1.8	8.70	0.00	0.00	0.00	0.12	21.20	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12
1.85	9.00	0.00	0.00	0.00	0.13	26.00	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13
1.9	9.30	0.00	0.00	0.00	0.13	31.61	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13
1.95	9.60	0.00	0.00	0.00	0.13	38.14	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13
2	9.90	0.00	0.00	0.00	0.13	45.70	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13
2.05	10.20	0.00	0.00	0.00	0.14	54.39	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14
2.1	10.50	0.00	0.00	0.00	0.14	64.34	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14
2.15	10.80	0.00	0.00	0.00	0.14	75.67	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14
2.2	11.10	0.00	0.00	0.00	0.14	88.53	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14
2.25	11.40	0.00	0.00	0.00	0.14	103.06	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14
2.3	11.70	0.00	0.00	0.00	0.15	119.42	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.15
2.35	12.00	0.00	0.00	0.00	0.15	137.77	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.15
2.4	12.30	0.00	0.00	0.00	0.15	158.29	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.15
2.45	12.60	0.00	0.00	0.00	0.15	181.17	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.15
2.5	12.90	0.00	0.00	0.00	0.15	206.59	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.15
2.55	13.20	0.00	0.00	0.00	0.16	234.76	0.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.16
2.6	13.50	0.00	0.00	0.00	0.16	265.90	0.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.16
2.65	13.80	0.00	0.00	0.00	0.16	300.23	0.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.16
2.7	14.10	0.00	0.00	0.00	0.16	337.99	0.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.16
2.75	14.40	0.00	0.00	0.00	0.16	379.44	0.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.16
2.8	14.70	0.00	0.00	0.00	0.16	424.82	0.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.16
2.85	15.00	0.00	0.00	0.00	0.17	474.42	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.17
2.9	15.30	0.00	0.00	0.00	0.17	528.52	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.17
2.95	15.60	0.00	0.00	0.00	0.17	587.42	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.17
3	15.90	0.00	0.00	0.00	0.17	651.41	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.17
3.05	16.20	0.30	0.00	0.00	0.17	720.84	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.17
3.1	16.50	0.60	0.00	0.00	0.17	796.03	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.17
3.15	16.80	0.90	0.00	0.00	0.18	877.34	0.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.18
3.2	17.10	1.20	0.00	0.00	0.18	965.12	0.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.18
3.25	17.40	1.50	0.00	0.00	0.18	1059.76	0.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.18
3.3	17.70	1.80	0.00	0.00	0.18	1161.65	0.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.18
3.35	18.00	2.10	0.00	0.00	0.18	1271.19	0.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.18

3.4	18.30	2.40	0.00	0.00	0.18	1388.80	0.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.18
3.45	18.60	2.70	0.00	0.00	0.19	1514.93	0.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.19
3.5	18.90	3.00	0.00	0.00	0.19	1650.01	0.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.19
3.55	19.20	3.30	0.00	0.00	0.19	1794.53	0.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.19
3.6	19.50	3.60	0.00	0.00	0.19	1948.96	0.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.19
3.65	19.80	3.90	0.00	0.00	0.19	2113.80	0.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.19
3.7	20.10	4.20	0.00	0.00	0.19	2289.57	0.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.19
3.75	20.40	4.50	0.00	0.00	0.19	2476.80	0.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.19
3.8	20.70	4.80	0.00	0.00	0.20	2676.05	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20
3.85	21.00	5.10	0.00	0.00	0.20	2887.86	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20
3.9	21.30	5.40	0.00	0.00	0.20	3112.84	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20
3.95	21.60	5.70	0.00	0.00	0.20	3351.59	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20
4	21.90	6.00	0.00	0.00	0.20	3604.71	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20
4.05	22.20	6.30	0.00	0.00	0.20	3872.86	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20
4.1	22.50	6.60	0.00	0.00	0.20	4156.69	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20
4.15	22.80	6.90	0.00	0.00	0.21	4456.87	0.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.21
4.2	23.10	7.20	0.00	0.00	0.21	4774.09	0.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.21
4.25	23.40	7.50	0.00	0.00	0.21	5109.08	0.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.21
4.3	23.70	7.80	0.00	0.00	0.21	5462.57	0.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.21
4.35	24.00	8.10	0.00	0.00	0.21	5835.30	0.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.21
4.4	24.30	8.40	0.00	0.00	0.21	6228.06	0.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.21
4.45	24.60	8.70	0.00	0.00	0.21	6641.63	0.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.21
4.5	24.90	9.00	0.00	0.00	0.22	7076.84	0.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.22
4.55	25.20	9.30	0.00	0.00	0.22	7534.51	0.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.22
4.6	25.50	9.60	0.00	0.00	0.22	8015.51	0.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.22
4.65	25.80	9.90	0.00	0.00	0.22	8520.71	0.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.22
4.7	26.10	10.20	0.00	0.00	0.22	9051.01	0.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.22
4.75	26.40	10.50	0.00	0.00	0.22	9607.34	0.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.22
4.8	26.70	10.80	0.00	0.00	0.22	10190.63	0.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.22
4.85	27.00	11.10	0.00	0.00	0.22	10801.86	0.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.22
4.9	27.30	11.40	0.00	0.00	0.23	11442.02	0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.23
4.95	27.60	11.70	0.00	0.00	0.23	12112.11	0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.23
5	27.90	12.00	0.00	0.00	0.23	12813.17	0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.23
5.05	28.20	12.30	0.00	0.00	0.23	13546.27	0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.23
5.1	28.50	12.60	0.00	0.00	0.23	14312.48	0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.23
5.15	28.80	12.90	0.00	0.00	0.23	15112.92	0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.23
5.2	29.10	13.20	0.00	0.00	0.23	15948.71	0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.23
5.25	29.40	13.50	0.00	0.00	0.23	16821.01	0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.23
5.3	29.70	13.80	0.00	0.00	0.24	17731.01	0.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.24
5.35	30.00	14.10	0.00	0.00	0.24	18679.90	0.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.24
5.4	30.30	14.40	0.00	0.00	0.24	19668.93	0.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.24
5.45	30.60	14.70	0.00	0.00	0.24	20699.34	0.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.24
5.5	30.90	15.00	0.00	0.00	0.24	21772.43	0.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.24
5.55	31.20	15.30	0.00	0.00	0.24	22889.50	0.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.24
5.6	31.50	15.60	0.00	0.00	0.24	24051.88	0.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.24
5.65	31.80	15.90	0.00	0.00	0.24	25260.95	0.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.24
5.7	32.10	16.20	0.00	0.00	0.25	26518.09	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25
5.75	32.40	16.50	0.00	0.00	0.25	27824.72	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25
5.8	32.70	16.80	0.00	0.00	0.25	29182.28	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25
5.85	33.00	17.10	0.00	0.00	0.25	30592.25	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25
5.9	33.30	17.40	0.00	0.00	0.25	32056.13	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25
5.95	33.60	17.70	0.00	0.00	0.25	33575.44	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25
6	33.90	18.00	0.00	0.00	0.25	35151.75	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25
6.05	34.20	18.30	0.10	0.00	0.25	36786.63	0.25	0.00	0.00	0.00	0.00	0.03	0.03	0.00	0.28
6.1	34.50	18.60	0.20	0.00	0.25	38481.72	0.25	0.00	0.00	0.00	0.00	0.12	0.12	0.00	0.37
6.15	34.80	18.90	0.30	0.00	0.26	40238.64	0.26	0.00	0.00	0.00	0.00	0.26	0.26	0.00	0.51
6.2	35.10	19.20	0.40	0.00	0.26	42059.08	0.26	0.00	0.00	0.00	0.00	0.45	0.45	0.00	0.70
6.25	35.40	19.50	0.50	0.00	0.26	43944.74	0.26	0.00	0.00	0.00	0.00	0.68	0.68	0.00	0.94
6.3	35.70	19.80	0.60	0.00	0.26	45897.36	0.26	0.00	0.00	0.00	1.07	0.95	0.95	0.00	1.21
6.35	36.00	20.10	0.70	0.00	0.26	47918.70	0.26	0.00	0.00	0.00	1.52	1.25	1.25	0.00	1.51
6.4	36.30	20.40	0.80	0.00	0.26	50010.55	0.26	0.00	0.00	0.00	1.86	1.58	1.58	0.00	1.84
6.45	36.60	20.70	0.90	0.00	0.26	52174.75	0.26	0.00	0.00	0.00	2.15	1.93	1.93	0.00	2.19
6.5	36.90	21.00	1.00	0.00	0.26	54413.15	0.26	0.00	0.00	0.00	2.40	2.30	2.30	0.00	2.56
6.55	37.20	21.30	1.10	0.00	0.26	56727.65	0.26	0.00	0.00	0.00	2.63	2.67	2.67	0.00	2.93
6.6	37.50	21.60	1.20	0.00	0.27	59120.16	0.27	0.00	0.00	0.00	2.84	3.05	2.84	0.00	3.11
6.65	37.80	21.90	1.30	0.00	0.27	61592.63	0.27	0.00	0.00	0.00	3.04	3.42	3.04	0.00	3.31
6.7	38.10	22.20	1.40	0.00	0.27	64147.07	0.27	0.00	0.00	0.00	3.22	3.78	3.22	0.00	3.49
6.75	38.40	22.50	1.50	0.00	0.27	66785.47	0.27	0.00	0.00	0.00	3.40	4.13	3.40	0.00	3.67
6.8	38.70	22.80	1.60	0.00	0.27	69509.90	0.27	0.00	0.00	0.00	3.56	4.46	3.56	0.00	3.83
6.85	39.00	23.10	1.70	0.00	0.27	72322.43	0.27	0.00	0.00	0.00	3.72	4.77	3.72	0.00	3.99
6.9	39.30	23.40	1.80	0.00	0.27	75225.20	0.27	0.00	0.00	0.00	3.87	5.05	3.87	0.00	4.15
6.95	39.60	23.70	1.90	0.00	0.27	78220.34	0.27	0.00	0.00	0.00	4.02	5.31	4.02	0.00	4.29
7	39.90	24.00	2.00	0.00	0.27	81310.04	0.27	0.00	0.00	0.00	4.16	5.53	4.16	0.00	4.44
7.05	40.20	24.30	2.10	0.00	0.27	84496.53	0.27	0.00	0.00	0.00	4.30	5.72	4.30	0.00	4.57
7.1	40.50	24.60	2.20	0.00	0.28	87782.06	0.28	0.00	0.00	0.00	4.43	5.87	4.43	0.00	4.71
7.15	40.80	24.90	2.30	0.00	0.28	91168.91	0.28	0.00	0.00	0.00	4.56	5.99	4.56	0.00	4.84
7.2	41.10	25.20	2.40	0.00	0.28	94659.41	0.28	0.00	0.00	0.00	4.68	6.08	4.68	0.00	4.96
7.25	41.40	25.50	2.50	0.04	0.28	98255.92	0.28	0.00	0.00	0.00	4.81	6.14	4.81	0.58	5.67
7.3	41.70	25.80	2.60	0.08	0.28	101960.83	0.28	0.00	0.00	0.00	4.92	6.18	4.92	1.65	6.86
7.35	42.00	26.10	2.70	0.11	0.28	105776.57	0.28	0.00	0.00	0.00	5.04	6.20	5.04	3.04	8.36
7.4	42.30	26.40	2.80	0.15	0.28	109705.62	0.28	0.00	0.00	0.00	5.15	6.21	5.15	4.68	10.11
7.45	42.60	26.70	2.90	0.19	0.28	113750.47	0.28	0.00	0.00	0.00	5.26	6.22	5.26	6.54	12.09
7.5	42.90	27.00	3.00	0.23	0.28	117913.66	0.28	0.00	0.00	0.00	5.37	6.24	5.37	8.60	14.25

7.55	43.20	27.30	3.10	0.27	0.28	122197.76	0.28	0.00	0.00	0.00	5.48	6.28	5.48	10.83	16.60
7.6	43.50	27.60	3.20	0.31	0.29	126605.40	0.29	0.00	0.00	0.00	5.58	6.35	5.58	13.23	19.10
7.65	43.80	27.90	3.30	0.34	0.29	131139.21	0.29	0.00	0.00	0.00	5.69	6.46	5.69	15.79	21.76
7.7	44.10	28.20	3.40	0.38	0.29	135801.90	0.29	0.00	0.00	0.00	5.79	6.65	5.79	18.49	24.57
7.75	44.40	28.50	3.50	0.42	0.29	140596.17	0.29	0.00	0.00	0.00	5.89	6.92	5.89	21.34	27.51
7.8	44.70	28.80	3.60	0.46	0.29	145524.81	0.29	0.00	0.00	0.00	5.98	7.31	5.98	24.31	30.58
7.85	45.00	29.10	3.70	0.50	0.29	150590.60	0.29	0.00	0.00	0.00	6.08	7.82	6.08	27.41	33.78
7.9	45.30	29.40	3.80	0.53	0.29	155796.40	0.29	0.00	0.00	0.00	6.17	8.49	6.17	30.63	37.10
7.95	45.60	29.70	3.90	0.57	0.29	161145.08	0.29	0.00	0.00	0.00	6.27	9.36	6.27	33.97	40.53
8	45.90	30.00	4.00	0.61	0.29	166639.55	0.29	0.00	0.00	0.00	6.36	10.44	6.36	37.43	44.08
8.05	46.20	30.30	4.10	0.65	0.29	172282.79	0.29	0.00	0.00	0.00	6.45	11.77	6.45	40.99	47.73
8.1	46.50	30.60	4.20	0.69	0.30	178077.78	0.30	0.00	0.00	0.00	6.54	13.39	6.54	44.66	51.49
8.15	46.80	30.90	4.30	0.73	0.30	184027.57	0.30	0.00	0.00	0.00	6.62	15.34	6.62	48.43	55.36
8.2	47.10	31.20	4.40	0.76	0.30	190135.24	0.30	0.00	0.00	0.00	6.71	17.66	6.71	52.31	59.32
8.25	47.40	31.50	4.50	0.80	0.30	196403.89	0.30	0.00	0.00	0.00	6.80	20.39	6.80	56.28	63.37
8.3	47.70	31.80	4.60	0.84	0.30	202836.70	0.30	0.00	0.00	0.00	6.88	23.59	6.88	60.35	67.53
8.35	48.00	32.10	4.70	0.88	0.30	209436.86	0.30	0.00	0.00	0.00	6.96	27.30	6.96	64.51	71.77
8.4	48.30	32.40	4.80	0.92	0.30	216207.62	0.30	0.00	0.00	0.00	7.05	31.58	7.05	68.76	76.11
8.45	48.60	32.70	4.90	0.95	0.30	223152.26	0.30	0.00	0.00	0.00	7.13	36.49	7.13	73.10	80.53
8.5	48.90	33.00	5.00	0.99	0.30	230274.10	0.30	0.00	0.00	0.00	7.21	42.08	7.21	77.53	85.04

ATTACHMENT 5 - Bio Retention Details

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

SWMM ANALYSIS INPUT PARAMETERS

EX

	POC 1		POC 2	POC 3
	Area 1	Area 2	Area 3	Area 4
Soil Type	C	C	C	C
Area (AC)	21.66	3.82	13.11	41.63
Flowpath (ft)	2300	790	1300	2090
Width (ft)	410	211	439	868
% Slope	8.0	10.0	10.0	8.0
%Impervious	8%	0%	6%	7%
Suction Head (in)	6	6	6	6
Conductivity (in/hr)	0.1	0.1	0.1	0.1
Initial Deficit	0.31	0.31	0.31	0.31

PR

	POC 1							POC 2	POC 3
	Area 1	BR1	Area 2	BR2	Area 3	Area 4	Area 5	Area 6	Area 7
Soil Type	C	A	C	A	C	C	C	C	C
Area (AC)	9.49	0.4864	17.81	0.7553	4.78	3.82	1.22	5.73	36.09
Flowpath (ft)	860	190	1400	230	470	790	180	810	2090
Width (ft)	481	112	554	143	443	211	294	308	752
% Slope	3.0	0.0	3.0	0.0	8.0	10.0	8.0	10	8.0
%Impervious	44%	0%	59%	0%	10%	0%	0%	22%	8%
Suction Head (in)	6	1.5	6	1.5	6	6	6	6	6
Conductivity (in/hr)	0.1	0.3	0.1	0.3	0.1	0.1	0.1	0.1	0.1
Initial Deficit	0.31	0.33	0.31	0.33	0.31	0.31	0.31	0.31	0.31

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 comfuctivity (in/hr)

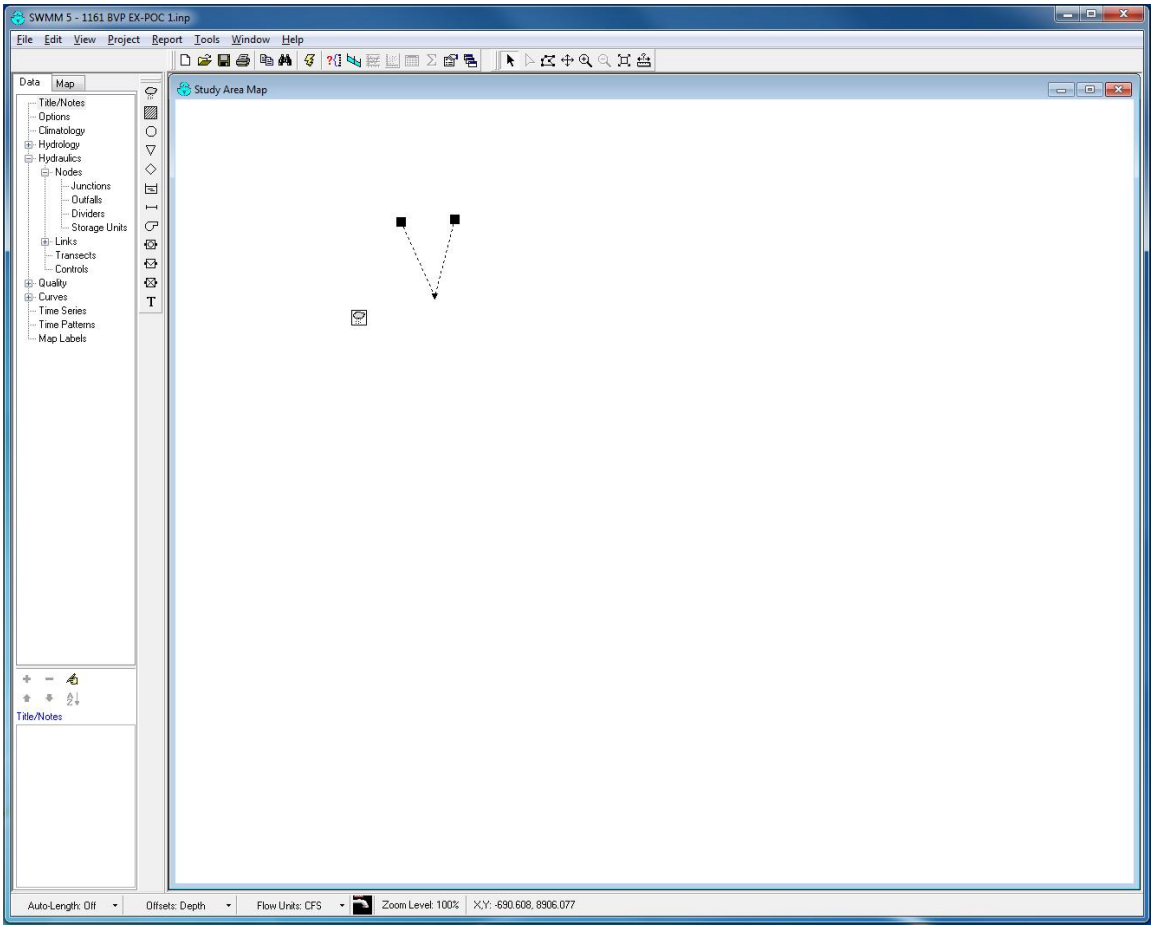
-75% of these values if subcatchment is graded/compacted

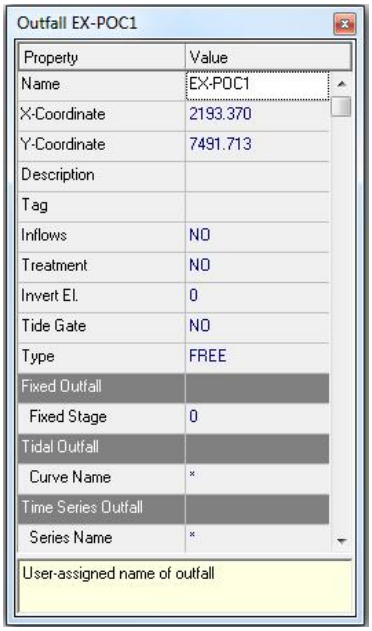
Initial Deficit – Initial moisture deficit (fraction)

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 form the EPA SWMM program.

POC 1 – Pre-Developed Condition

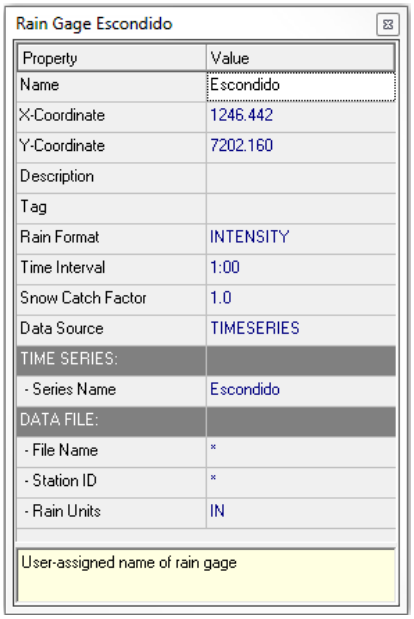




Outfall EX-POC1

Property	Value
Name	EX-POC1
X-Coordinate	2193.370
Y-Coordinate	7491.713
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



Rain Gage Escondido

Property	Value
Name	Escondido
X-Coordinate	1246.442
Y-Coordinate	7202.160
Description	
Tag	
Rain Format	INTENSITY
Time Interval	1:00
Snow Catch Factor	1.0
Data Source	TIMESERIES
TIME SERIES:	
- Series Name	Escondido
DATA FILE:	
- File Name	*
- Station ID	*
- Rain Units	IN

User-assigned name of rain gage

Subcatchment EX-Area1

Property	Value
Name	EX-Area1
X-Coordinate	1762.431
Y-Coordinate	8441.989
Description	
Tag	
Rain Gage	Escondido
Outlet	EX-POC1
Area	21.66
Width	410
% Slope	8
% Imperv	8
N-Imperv	0.012
N-Perv	0.05
Dstore-Imperv	0.02
Dstore-Perv	0.1
%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 Editor

Infiltration Method: GREEN_AMPT

Property	Value
Suction Head	6
Conductivity	.1
Initial Deficit	.31

Soil capillary suction head (inches or mm)

OK Cancel Help

Subcatchment EX-Area2

Property	Value
Name	EX-Area2
X-Coordinate	2447.514
Y-Coordinate	8475.138
Description	
Tag	
Rain Gage	Escondido
Outlet	EX-POC1
Area	3.82
Width	211
% Slope	10
% Imperv	0
N-Imperv	0.012
N-Perv	0.05
Dstore-Imperv	0.02
Dstore-Perv	0.1
%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 Editor

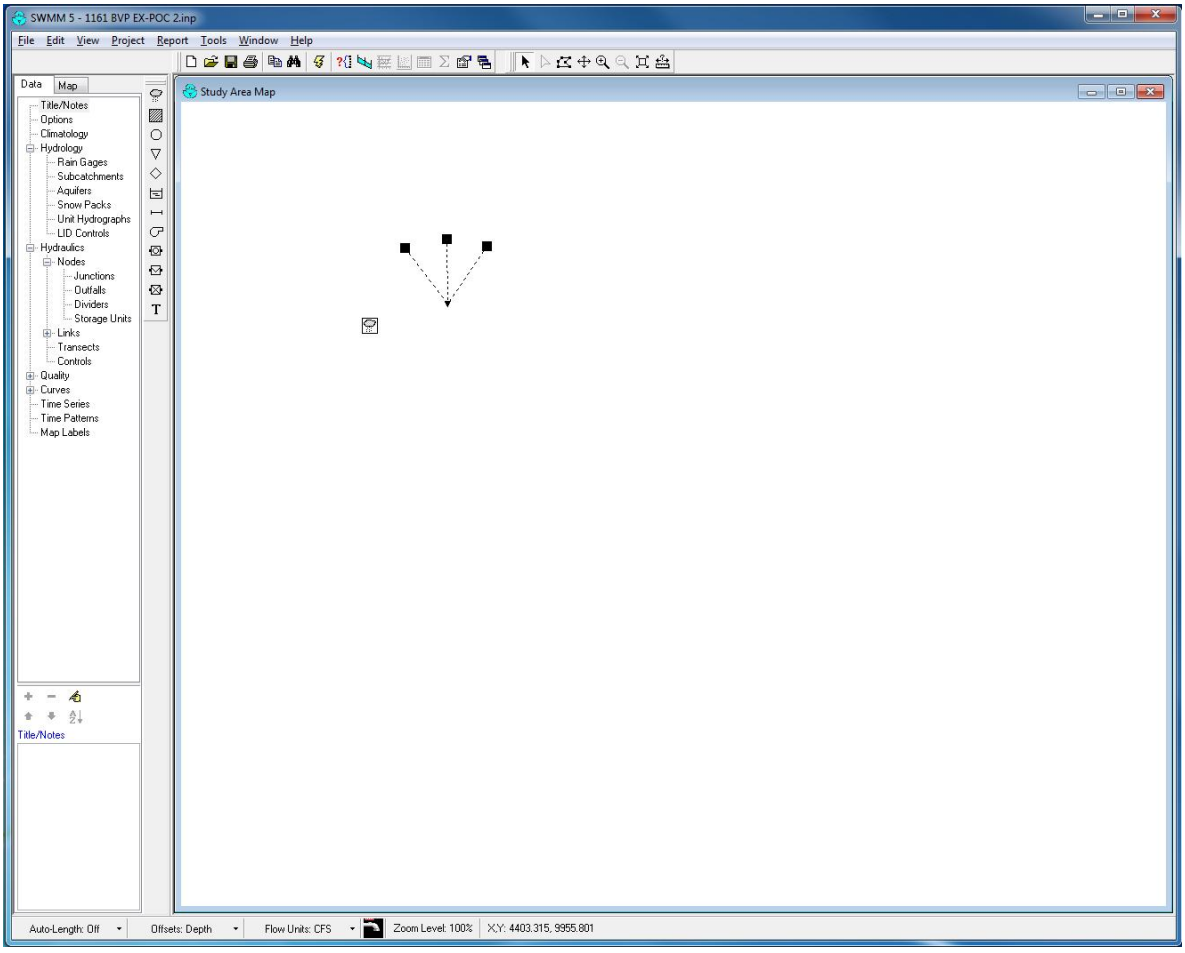
Infiltration Method: GREEN_AMPT

Property	Value
Suction Head	6
Conductivity	.1
Initial Deficit	.31

Soil capillary suction head (inches or mm)

OK Cancel Help

POC 2 – Pre-Developed Condition



Outfall EX-POC1

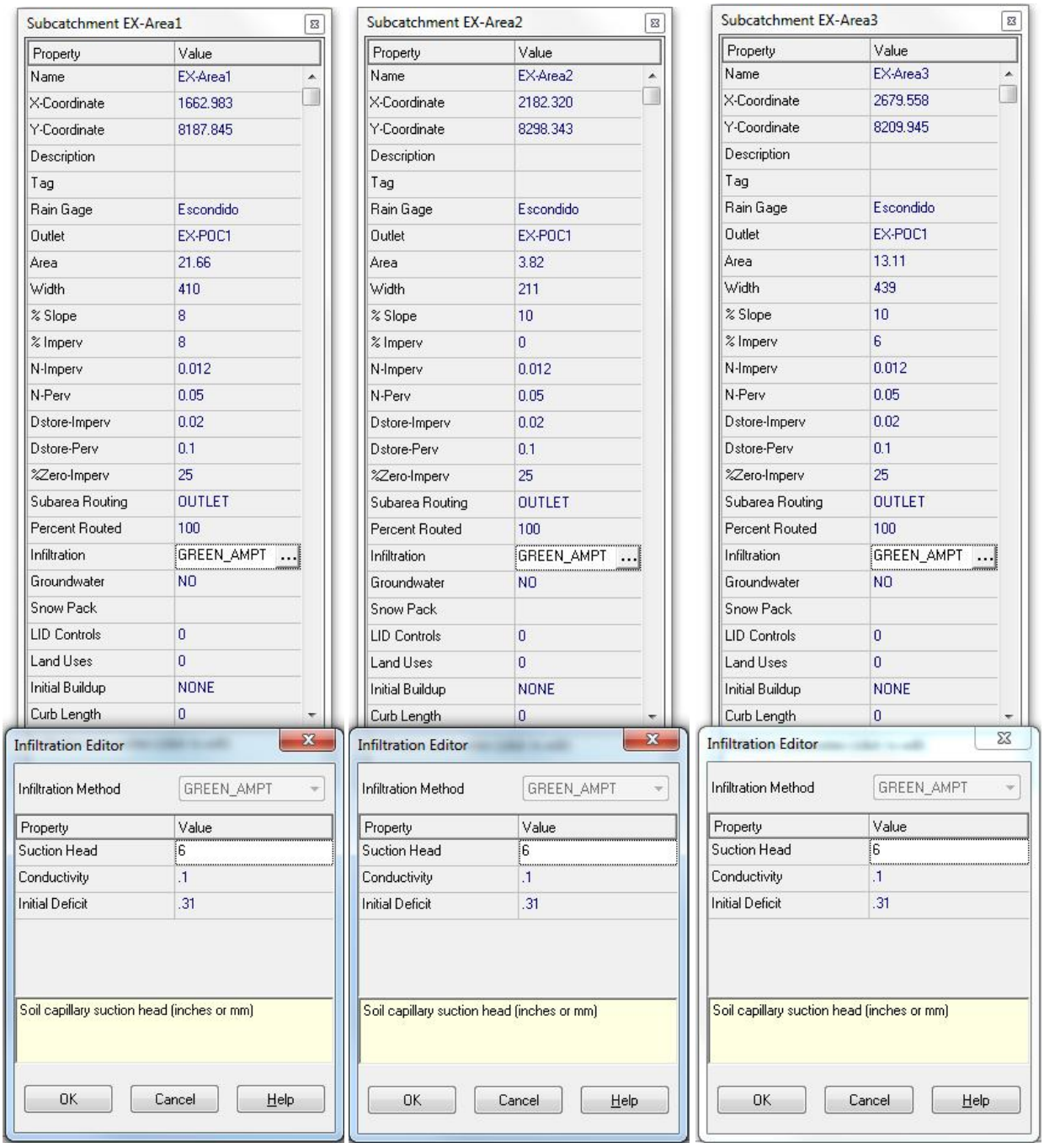
Property	Value
Name	EX-POC1
X-Coordinate	2193.370
Y-Coordinate	7491.713
Description	
Tag	
Inflows	NO
Treatment	NO
Invert El.	0
Tide Gate	NO
Type	FREE
Fixed Outfall	
Fixed Stage	0
Tidal Outfall	
Curve Name	*
Time Series Outfall	
Series Name	*

User-assigned name of outfall

Rain Gage Escondido

Property	Value
Name	Escondido
X-Coordinate	1246.442
Y-Coordinate	7202.160
Description	
Tag	
Rain Format	INTENSITY
Time Interval	1:00
Snow Catch Factor	1.0
Data Source	TIMESERIES
TIME SERIES:	
- Series Name	Escondido
DATA FILE:	
- File Name	*
- Station ID	*
- Rain Units	IN

User-assigned name of rain gage



Subcatchment EX-Area1

Property	Value
Name	EX-Area1
X-Coordinate	1662.983
Y-Coordinate	8187.845
Description	
Tag	
Rain Gage	Escondido
Outlet	EX-POC1
Area	21.66
Width	410
% Slope	8
% Imperv	8
N-Imperv	0.012
N-Perv	0.05
Dstore-Imperv	0.02
Dstore-Perv	0.1
%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 Editor

Infiltration Method: GREEN_AMPT

Property	Value
Suction Head	6
Conductivity	.1
Initial Deficit	.31

Soil capillary suction head (inches or mm)

OK Cancel Help

Subcatchment EX-Area2

Property	Value
Name	EX-Area2
X-Coordinate	2182.320
Y-Coordinate	8298.343
Description	
Tag	
Rain Gage	Escondido
Outlet	EX-POC1
Area	3.82
Width	211
% Slope	10
% Imperv	0
N-Imperv	0.012
N-Perv	0.05
Dstore-Imperv	0.02
Dstore-Perv	0.1
%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 Editor

Infiltration Method: GREEN_AMPT

Property	Value
Suction Head	6
Conductivity	.1
Initial Deficit	.31

Soil capillary suction head (inches or mm)

OK Cancel Help

Subcatchment EX-Area3

Property	Value
Name	EX-Area3
X-Coordinate	2679.558
Y-Coordinate	8209.945
Description	
Tag	
Rain Gage	Escondido
Outlet	EX-POC1
Area	13.11
Width	439
% Slope	10
% Imperv	6
N-Imperv	0.012
N-Perv	0.05
Dstore-Imperv	0.02
Dstore-Perv	0.1
%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 Editor

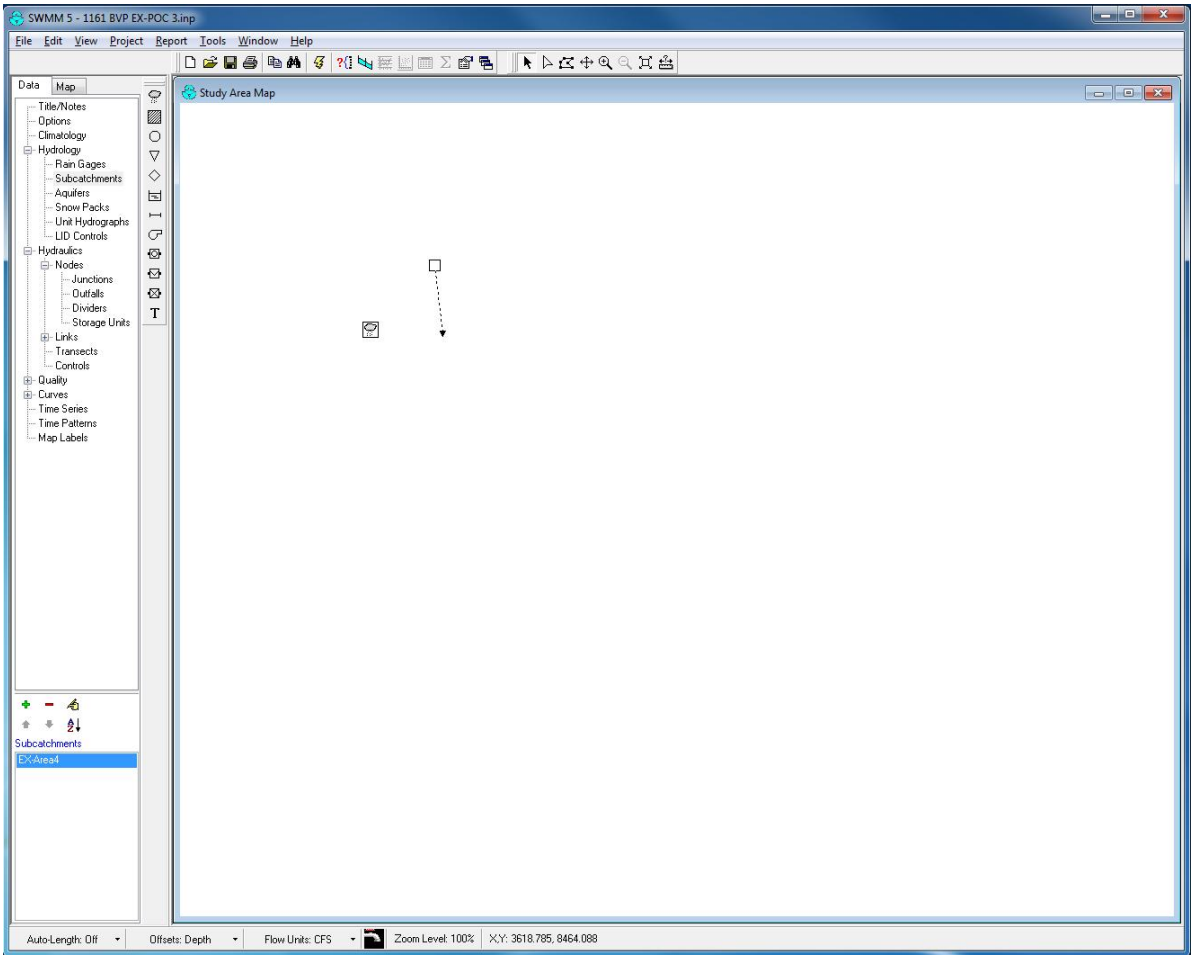
Infiltration Method: GREEN_AMPT

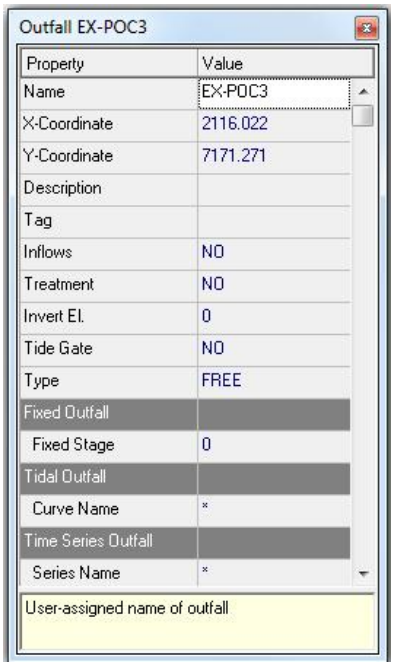
Property	Value
Suction Head	6
Conductivity	.1
Initial Deficit	.31

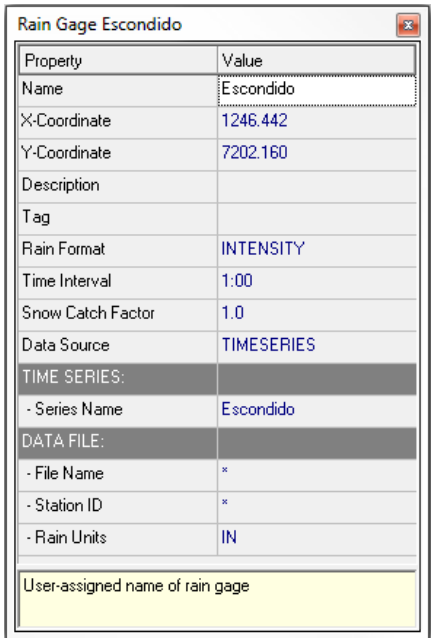
Soil capillary suction head (inches or mm)

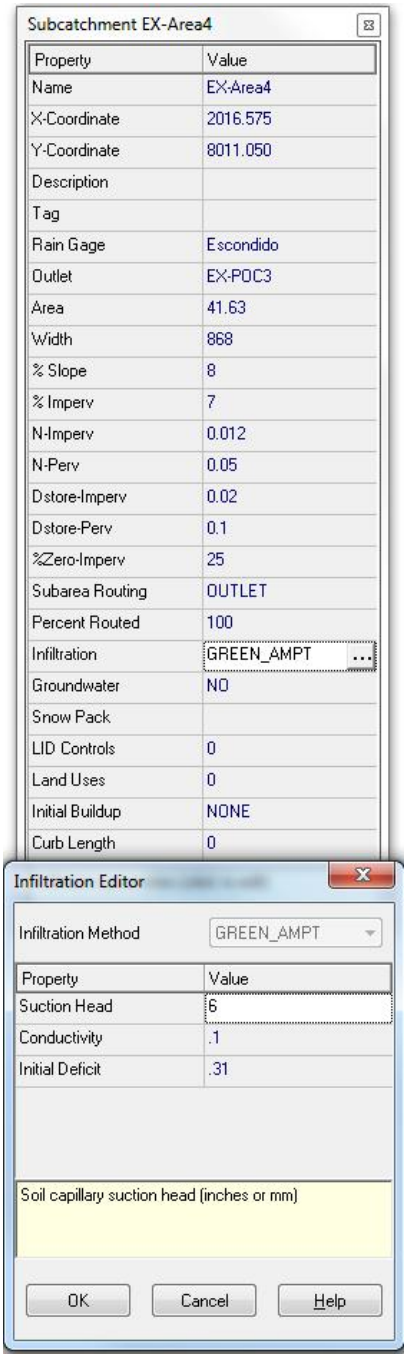
OK Cancel Help

POC 3 – Pre-Developed Condition

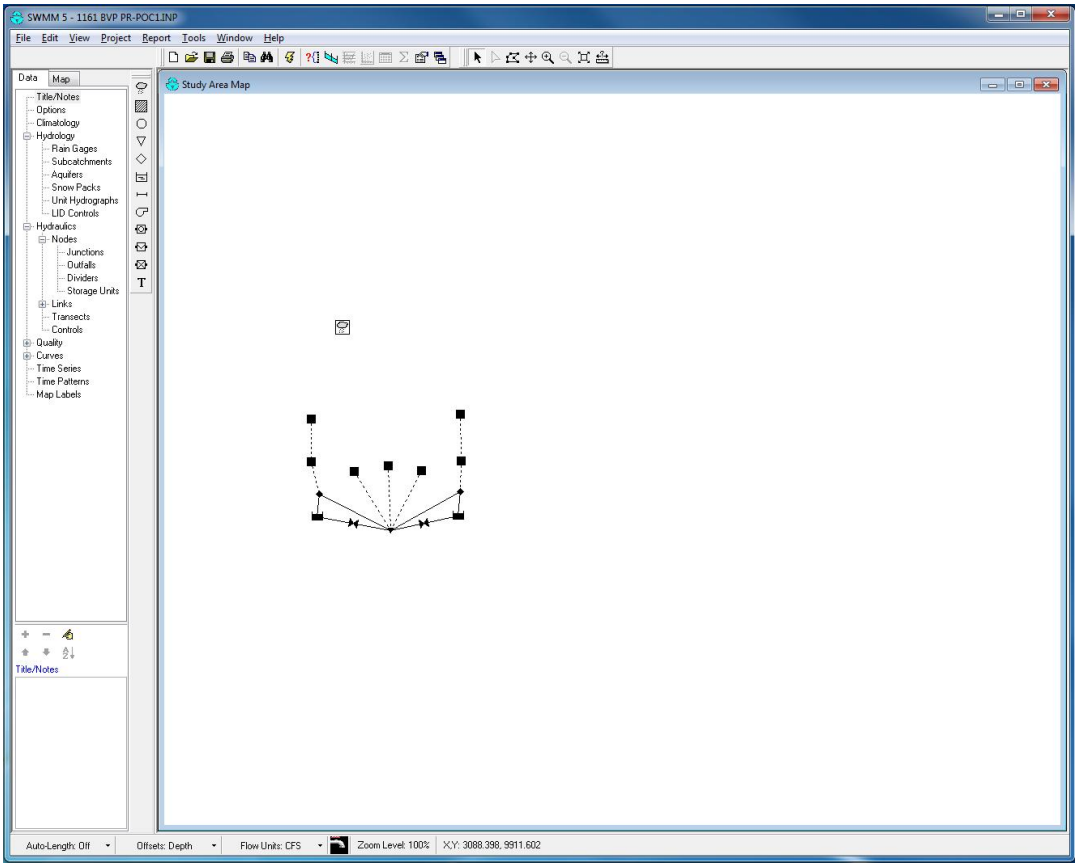







Subcatchment EX-Area4
Property
Value
Name
EX-Area4
X-Coordinate
2016.575
Y-Coordinate
8011.050
Description
Tag
Rain Gage
Escondido
Outlet
EX-POC3
Area
41.63
Width
868
% Slope
8
% Imperv
7
N-Imperv
0.012
N-Perv
0.05
Dstore-Imperv
0.02
Dstore-Perv
0.1
%Zero-Imperv
25
Subarea Routing
OUTLET
Percent Routed
100
Infiltration
GREEN_AMPT
Groundwater
NO
Snow Pack
LID Controls
0
Land Uses
0
Initial Buildup
NONE
Curb Length
0
Infiltration Editor
Infiltration Method
GREEN_AMPT
Property
Value
Suction Head
6
Conductivity
.1
Initial Deficit
.31
Soil capillary suction head (inches or mm)
OK
Cancel
Help

POC 1 – Developed Condition



Outfall PR-POC1

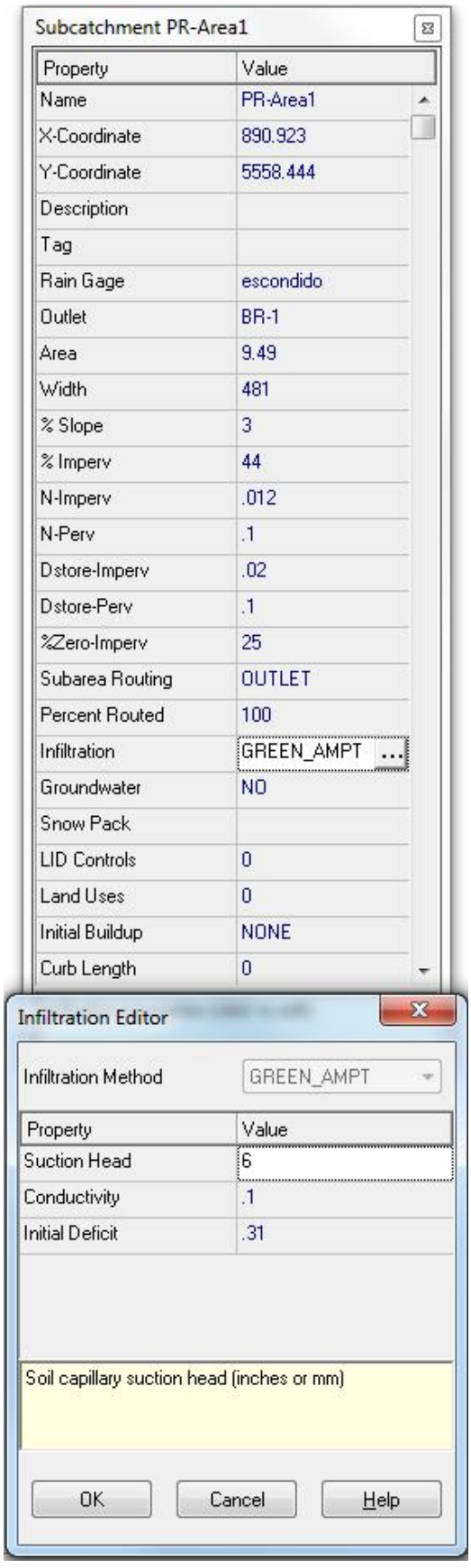
Property	Value
Name	PR-POC1
X-Coordinate	1977.425
Y-Coordinate	4026.567
Description	
Tag	
Inflows	NO
Treatment	NO
Invert El.	0
Tide Gate	NO
Type	FREE
Fixed Outfall	
Fixed Stage	0
Tidal Outfall	
Curve Name	*
Time Series Outfall	
Series Name	*

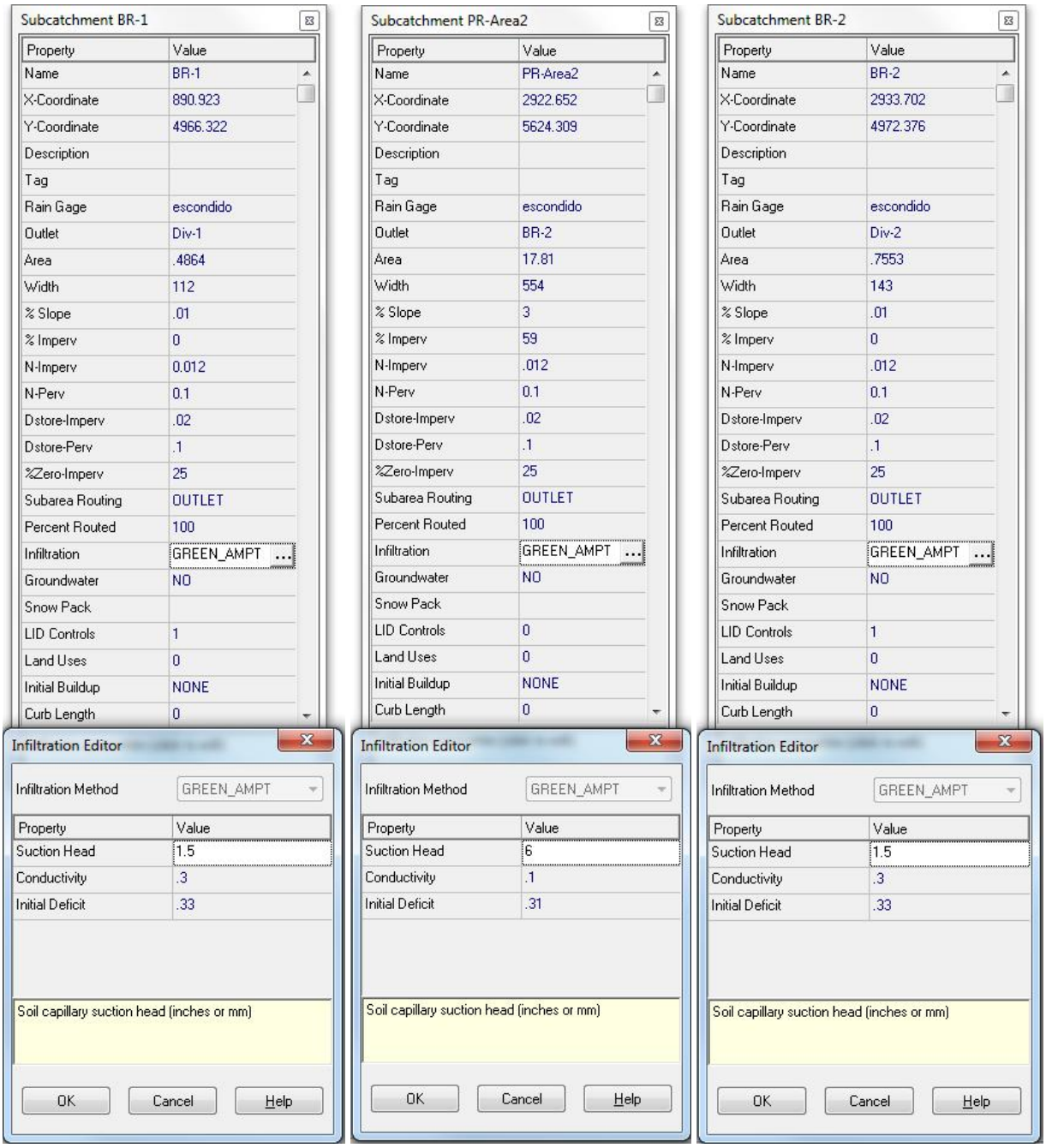
User-assigned name of outfall

Rain Gage Escondido

Property	Value
Name	Escondido
X-Coordinate	1246.442
Y-Coordinate	7202.160
Description	
Tag	
Rain Format	INTENSITY
Time Interval	1:00
Snow Catch Factor	1.0
Data Source	TIMESERIES
TIME SERIES:	
- Series Name	Escondido
DATA FILE:	
- File Name	*
- Station ID	*
- Rain Units	IN

User-assigned name of rain gage


Subcatchment PR-Area1
Property
Value
Name
PR-Area1
X-Coordinate
890.923
Y-Coordinate
5558.444
Description
Tag
Rain Gage
escondido
Outlet
BR-1
Area
9.49
Width
481
% Slope
3
% Imperv
44
N-Imperv
.012
N-Perv
.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
0
Land Uses
0
Initial Buildup
NONE
Curb Length
0
Infiltration Editor
Infiltration Method
GREEN_AMPT
Property
Value
Suction Head
6
Conductivity
.1
Initial Deficit
.31
Soil capillary suction head (inches or mm)
OK
Cancel
Help



Subcatchment BR-1

Property	Value
Name	BR-1
X-Coordinate	890.923
Y-Coordinate	4966.322
Description	
Tag	
Rain Gage	escondido
Outlet	Div-1
Area	.4864
Width	112
% Slope	.01
% 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 Editor

Infiltration Method: GREEN_AMPT

Property	Value
Suction Head	1.5
Conductivity	.3
Initial Deficit	.33

Soil capillary suction head (inches or mm)

OK Cancel Help

Subcatchment PR-Area2

Property	Value
Name	PR-Area2
X-Coordinate	2922.652
Y-Coordinate	5624.309
Description	
Tag	
Rain Gage	escondido
Outlet	BR-2
Area	17.81
Width	554
% Slope	3
% Imperv	59
N-Imperv	.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	0
Land Uses	0
Initial Buildup	NONE
Curb Length	0

Infiltration Editor

Infiltration Method: GREEN_AMPT

Property	Value
Suction Head	6
Conductivity	.1
Initial Deficit	.31

Soil capillary suction head (inches or mm)

OK Cancel Help

Subcatchment BR-2

Property	Value
Name	BR-2
X-Coordinate	2933.702
Y-Coordinate	4972.376
Description	
Tag	
Rain Gage	escondido
Outlet	Div-2
Area	.7553
Width	143
% Slope	.01
% Imperv	0
N-Imperv	.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

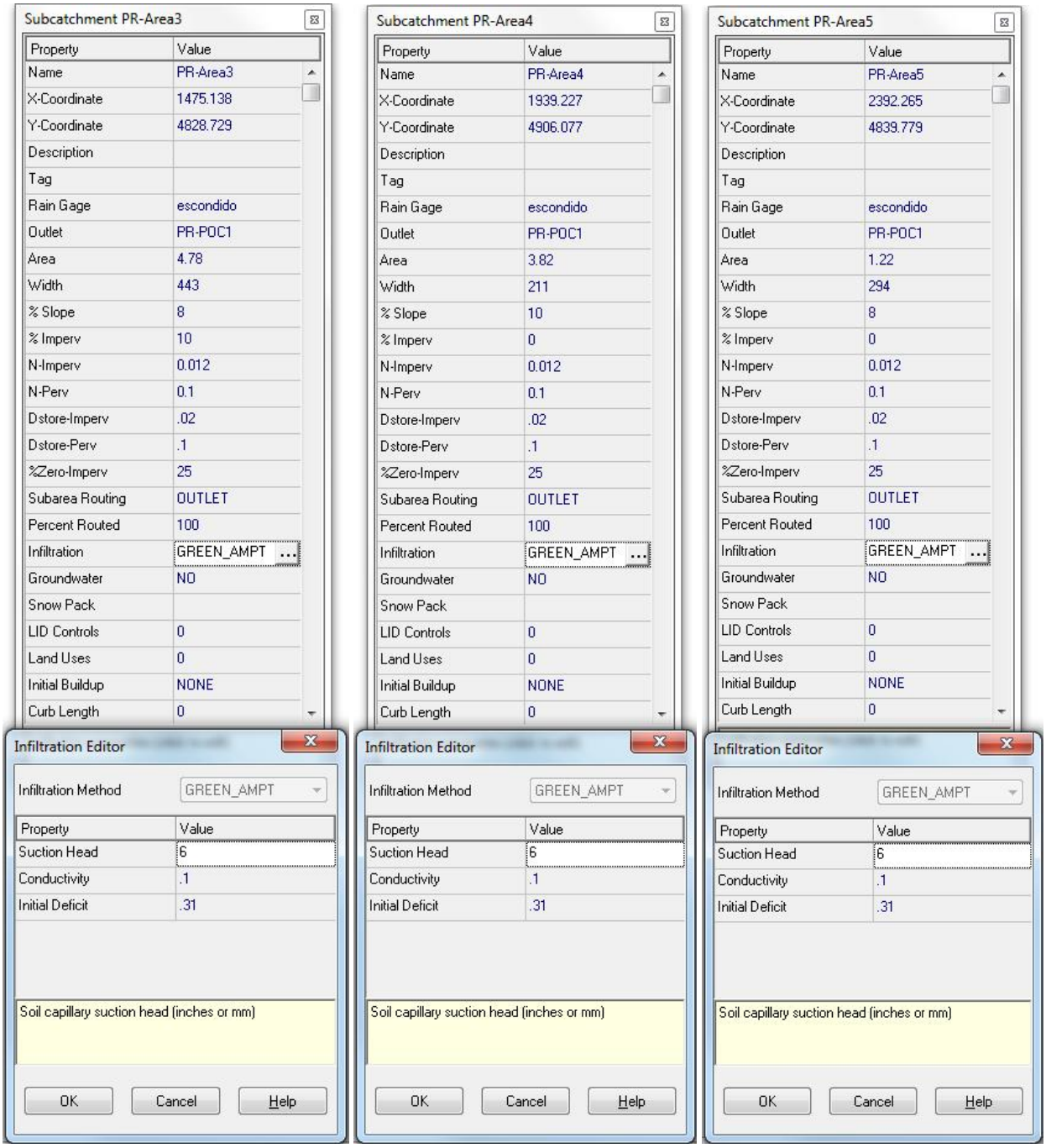
Infiltration Editor

Infiltration Method: GREEN_AMPT

Property	Value
Suction Head	1.5
Conductivity	.3
Initial Deficit	.33

Soil capillary suction head (inches or mm)

OK Cancel Help



Subcatchment PR-Area3

Property	Value
Name	PR-Area3
X-Coordinate	1475.138
Y-Coordinate	4828.729
Description	
Tag	
Rain Gage	escondido
Outlet	PR-POC1
Area	4.78
Width	443
% Slope	8
% Imperv	10
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	0
Land Uses	0
Initial Buildup	NONE
Curb Length	0

Infiltration Editor

Infiltration Method: GREEN_AMPT

Property	Value
Suction Head	6
Conductivity	.1
Initial Deficit	.31

Soil capillary suction head (inches or mm)

OK Cancel Help

Subcatchment PR-Area4

Property	Value
Name	PR-Area4
X-Coordinate	1939.227
Y-Coordinate	4906.077
Description	
Tag	
Rain Gage	escondido
Outlet	PR-POC1
Area	3.82
Width	211
% Slope	10
% 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	0
Land Uses	0
Initial Buildup	NONE
Curb Length	0

Infiltration Editor

Infiltration Method: GREEN_AMPT

Property	Value
Suction Head	6
Conductivity	.1
Initial Deficit	.31

Soil capillary suction head (inches or mm)

OK Cancel Help

Subcatchment PR-Area5

Property	Value
Name	PR-Area5
X-Coordinate	2392.265
Y-Coordinate	4839.779
Description	
Tag	
Rain Gage	escondido
Outlet	PR-POC1
Area	1.22
Width	294
% Slope	8
% 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	0
Land Uses	0
Initial Buildup	NONE
Curb Length	0

Infiltration Editor

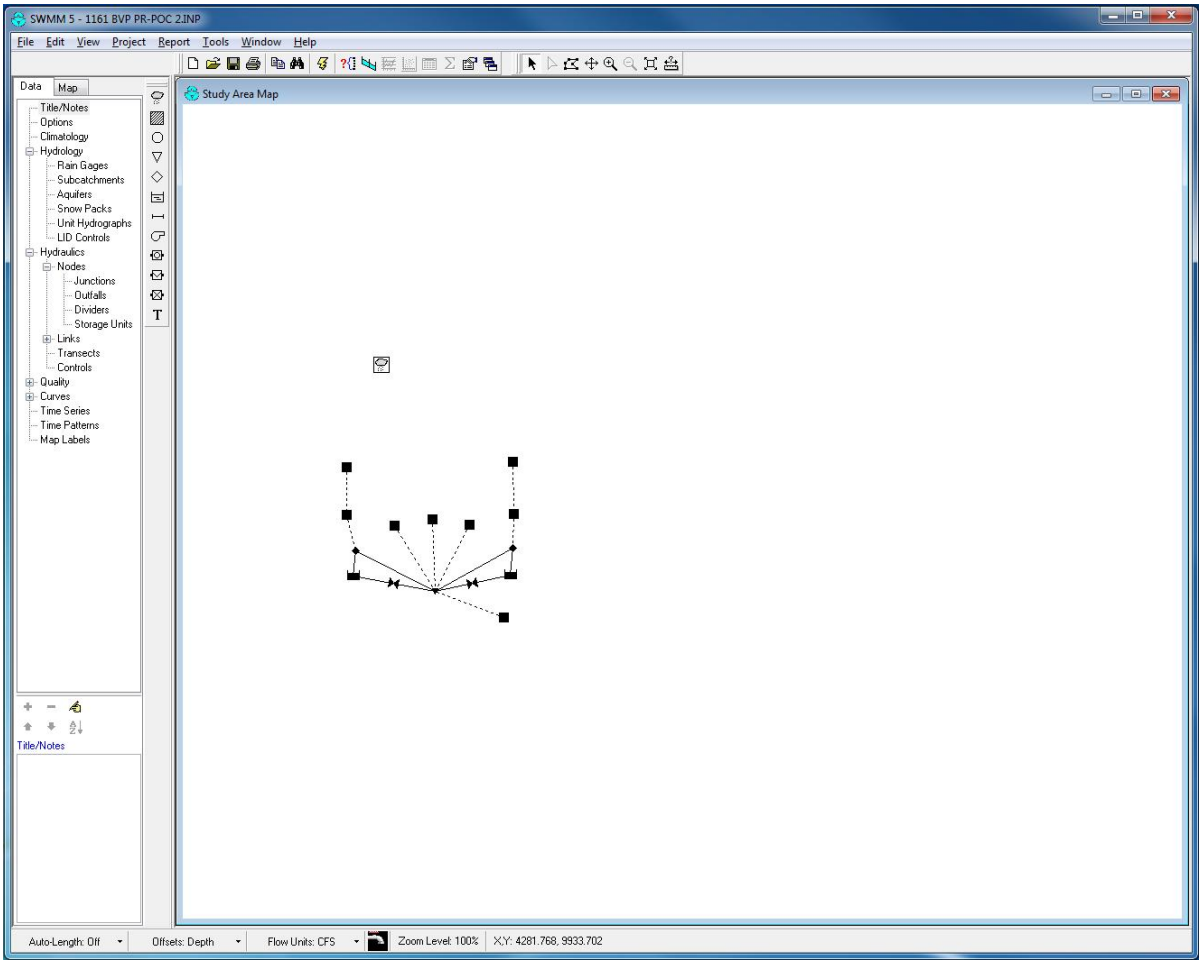
Infiltration Method: GREEN_AMPT

Property	Value
Suction Head	6
Conductivity	.1
Initial Deficit	.31

Soil capillary suction head (inches or mm)

OK Cancel Help

POC 2 – Developed Condition



Outfall PR-POC2

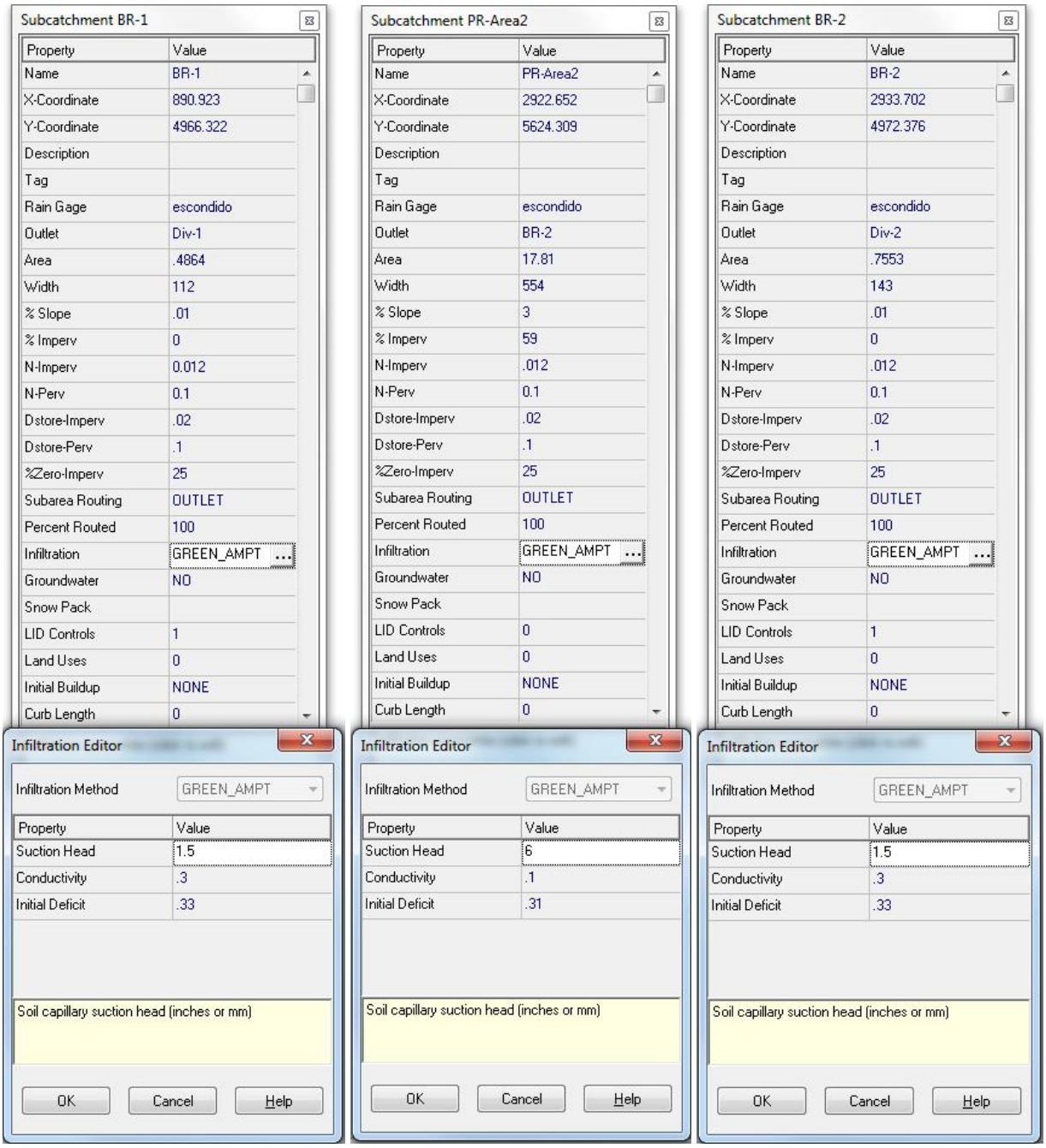
Property	Value
Name	PR-POC2
X-Coordinate	1977.425
Y-Coordinate	4026.567
Description	
Tag	
Inflows	NO
Treatment	NO
Invert El.	0
Tide Gate	NO
Type	FREE
Fixed Outfall	
Fixed Stage	0
Tidal Outfall	
Curve Name	*
Time Series Outfall	
Series Name	*

User-assigned name of outfall

Rain Gage Escondido

Property	Value
Name	Escondido
X-Coordinate	1246.442
Y-Coordinate	7202.160
Description	
Tag	
Rain Format	INTENSITY
Time Interval	1:00
Snow Catch Factor	1.0
Data Source	TIMESERIES
TIME SERIES:	
- Series Name	Escondido
DATA FILE:	
- File Name	*
- Station ID	*
- Rain Units	IN

User-assigned name of rain gage



Subcatchment BR-1

Property	Value
Name	BR-1
X-Coordinate	890.923
Y-Coordinate	4966.322
Description	
Tag	
Rain Gage	escondido
Outlet	Div-1
Area	.4864
Width	112
% Slope	.01
% 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 Editor

Infiltration Method: GREEN_AMPT

Property	Value
Suction Head	1.5
Conductivity	.3
Initial Deficit	.33

Soil capillary suction head (inches or mm)

OK Cancel Help

Subcatchment PR-Area2

Property	Value
Name	PR-Area2
X-Coordinate	2922.652
Y-Coordinate	5624.309
Description	
Tag	
Rain Gage	escondido
Outlet	BR-2
Area	17.81
Width	554
% Slope	3
% Imperv	59
N-Imperv	.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	0
Land Uses	0
Initial Buildup	NONE
Curb Length	0

Infiltration Editor

Infiltration Method: GREEN_AMPT

Property	Value
Suction Head	6
Conductivity	.1
Initial Deficit	.31

Soil capillary suction head (inches or mm)

OK Cancel Help

Subcatchment BR-2

Property	Value
Name	BR-2
X-Coordinate	2933.702
Y-Coordinate	4972.376
Description	
Tag	
Rain Gage	escondido
Outlet	Div-2
Area	.7553
Width	143
% Slope	.01
% Imperv	0
N-Imperv	.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

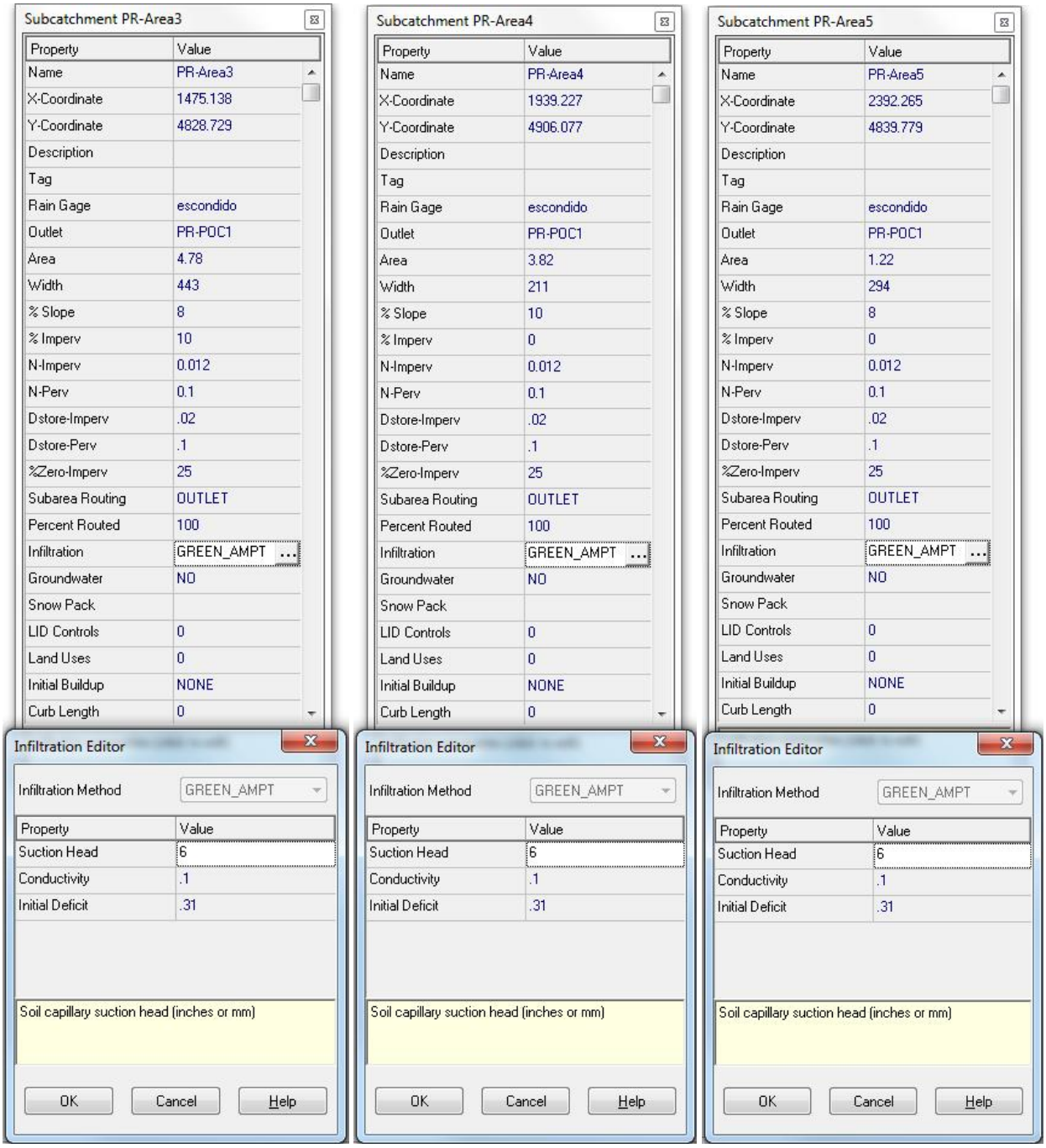
Infiltration Editor

Infiltration Method: GREEN_AMPT

Property	Value
Suction Head	1.5
Conductivity	.3
Initial Deficit	.33

Soil capillary suction head (inches or mm)

OK Cancel Help



Subcatchment PR-Area3

Property	Value
Name	PR-Area3
X-Coordinate	1475.138
Y-Coordinate	4828.729
Description	
Tag	
Rain Gage	escondido
Outlet	PR-POC1
Area	4.78
Width	443
% Slope	8
% Imperv	10
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	0
Land Uses	0
Initial Buildup	NONE
Curb Length	0

Infiltration Editor

Infiltration Method: GREEN_AMPT

Property	Value
Suction Head	6
Conductivity	.1
Initial Deficit	.31

Soil capillary suction head (inches or mm)

OK Cancel Help

Subcatchment PR-Area4

Property	Value
Name	PR-Area4
X-Coordinate	1939.227
Y-Coordinate	4906.077
Description	
Tag	
Rain Gage	escondido
Outlet	PR-POC1
Area	3.82
Width	211
% Slope	10
% 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	0
Land Uses	0
Initial Buildup	NONE
Curb Length	0

Infiltration Editor

Infiltration Method: GREEN_AMPT

Property	Value
Suction Head	6
Conductivity	.1
Initial Deficit	.31

Soil capillary suction head (inches or mm)

OK Cancel Help

Subcatchment PR-Area5

Property	Value
Name	PR-Area5
X-Coordinate	2392.265
Y-Coordinate	4839.779
Description	
Tag	
Rain Gage	escondido
Outlet	PR-POC1
Area	1.22
Width	294
% Slope	8
% 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	0
Land Uses	0
Initial Buildup	NONE
Curb Length	0

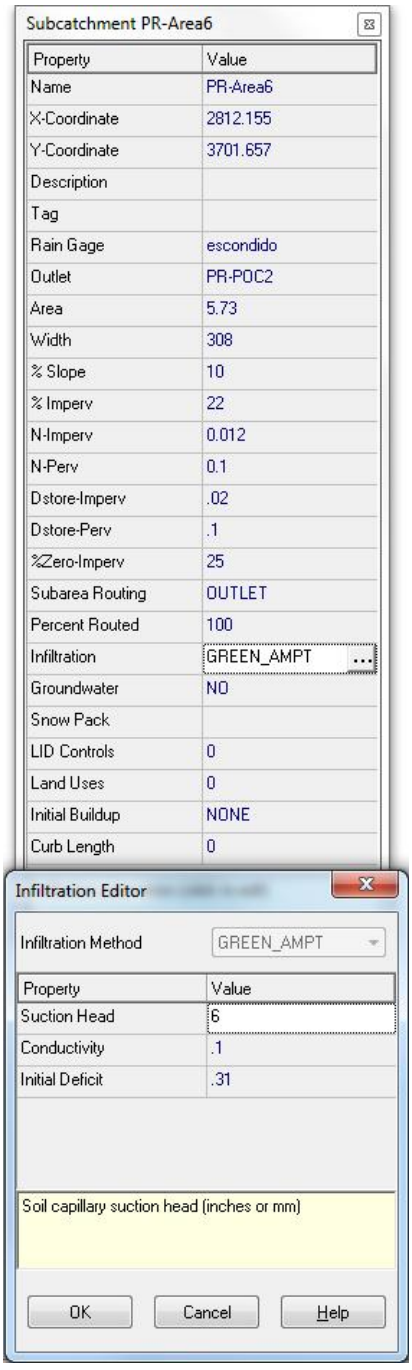
Infiltration Editor

Infiltration Method: GREEN_AMPT

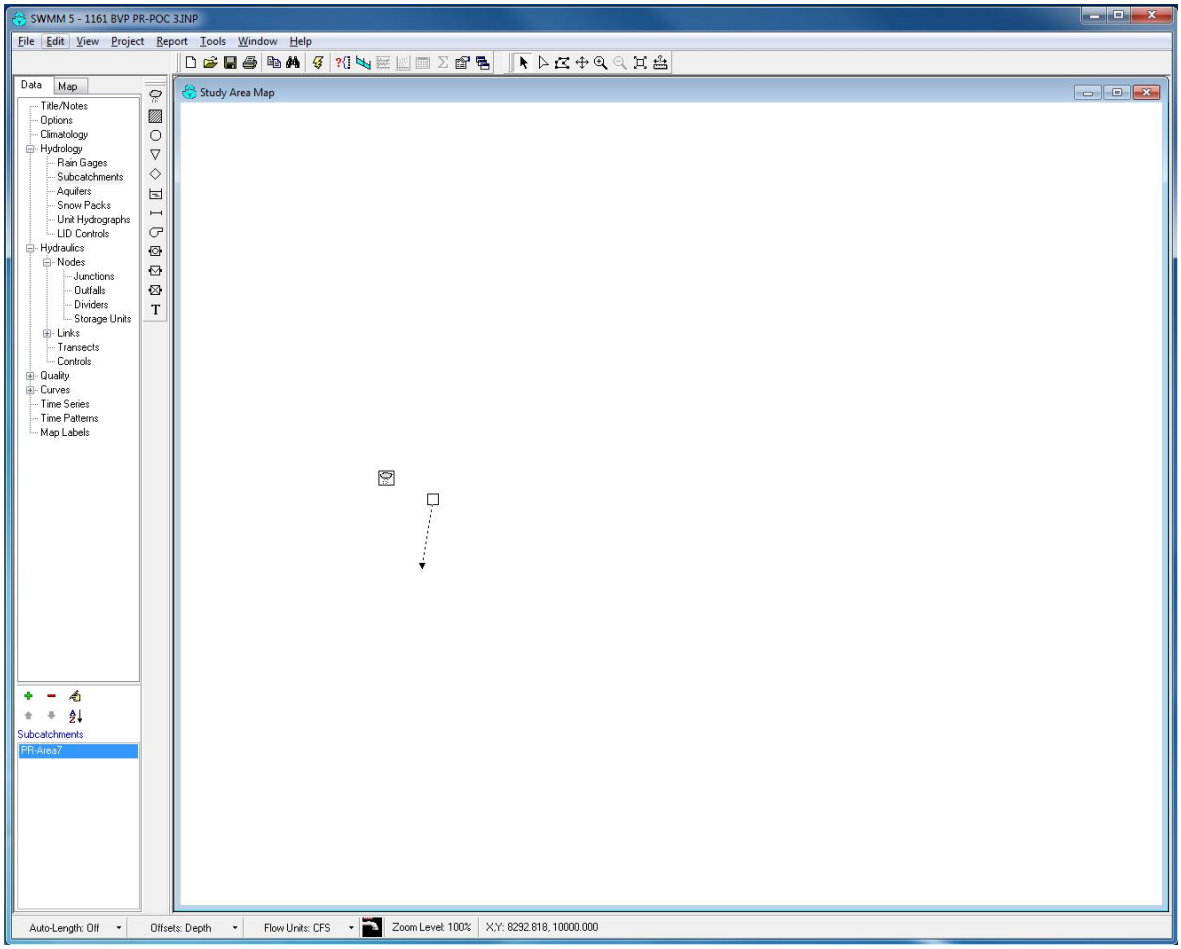
Property	Value
Suction Head	6
Conductivity	.1
Initial Deficit	.31

Soil capillary suction head (inches or mm)

OK Cancel Help


Subcatchment PR-Area6
Property
Value
Name
PR-Area6
X-Coordinate
2812.155
Y-Coordinate
3701.657
Description
Tag
Rain Gage
escondido
Outlet
PR-POC2
Area
5.73
Width
308
% Slope
10
% Imperv
22
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
0
Land Uses
0
Initial Buildup
NONE
Curb Length
0
Infiltration Editor
Infiltration Method
GREEN_AMPT
Property
Value
Suction Head
6
Conductivity
.1
Initial Deficit
.31
Soil capillary suction head (inches or mm)
OK
Cancel
Help

POC 3 – Developed Condition



Outfall PR-POC3

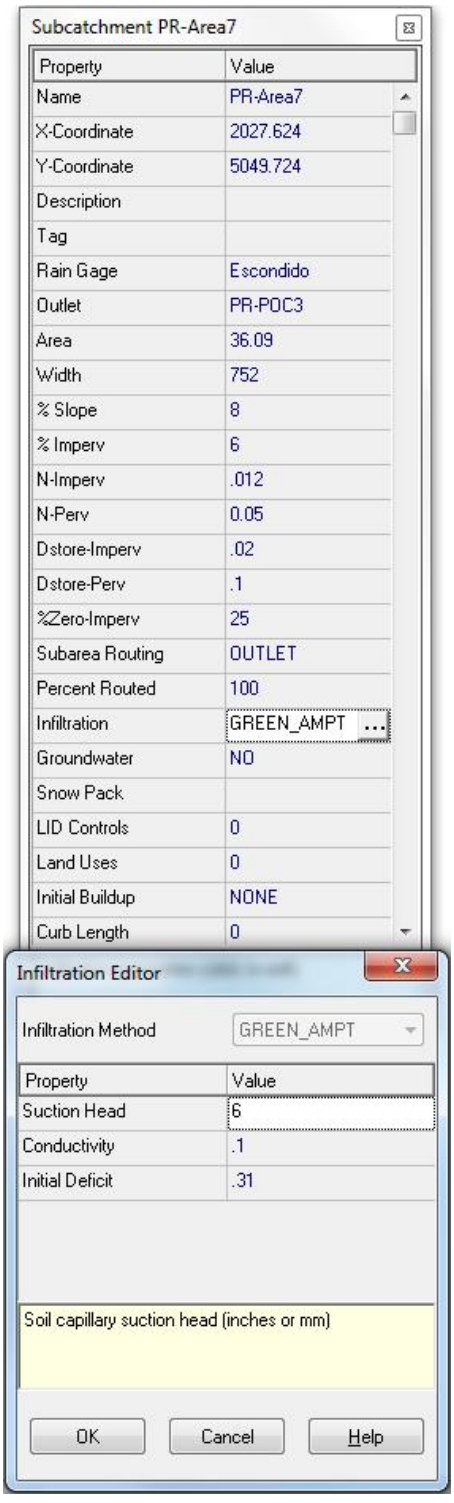
Property	Value
Name	PR-POC3
X-Coordinate	1895.028
Y-Coordinate	4220.994
Description	
Tag	
Inflows	NO
Treatment	NO
Invert El.	0
Tide Gate	NO
Type	FREE
Fixed Outfall	
Fixed Stage	0
Tidal Outfall	
Curve Name	*
Time Series Outfall	
Series Name	*

User-assigned name of outfall

Rain Gage Escondido

Property	Value
Name	Escondido
X-Coordinate	1246.442
Y-Coordinate	7202.160
Description	
Tag	
Rain Format	INTENSITY
Time Interval	1:00
Snow Catch Factor	1.0
Data Source	TIMESERIES
TIME SERIES:	
- Series Name	Escondido
DATA FILE:	
- File Name	*
- Station ID	*
- Rain Units	IN

User-assigned name of rain gage


Subcatchment PR-Area7
Property
Value
Name
PR-Area7
X-Coordinate
2027.624
Y-Coordinate
5049.724
Description
Tag
Rain Gage
Escondido
Outlet
PR-POC3
Area
36.09
Width
752
% Slope
8
% Imperv
6
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 Editor
Infiltration Method
GREEN_AMPT
Property
Value
Suction Head
6
Conductivity
.1
Initial Deficit
.31
Soil capillary suction head (inches or mm)
OK
Cancel
Help

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.

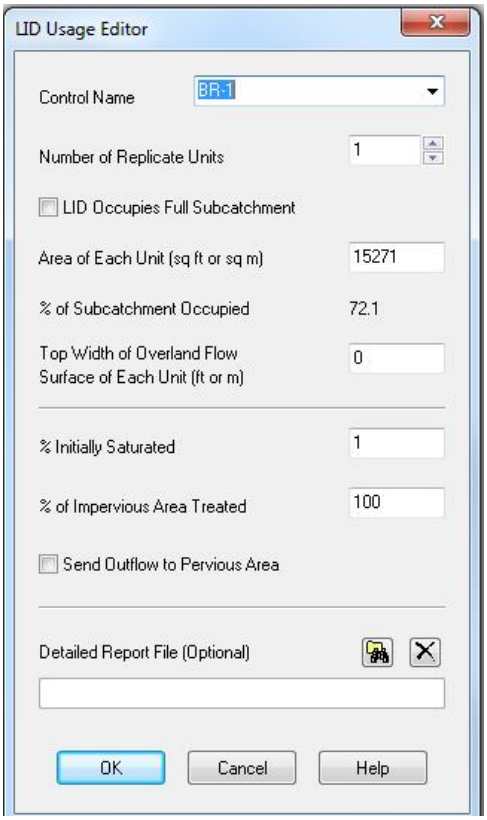
H&A selected infiltration values, such that the percentage of total precipitation that becomes runoff, is realistic for soil type D and slightly smaller than measured values for Southern California watersheds.

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-1-4:

The area of Prop-X + BR-X 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



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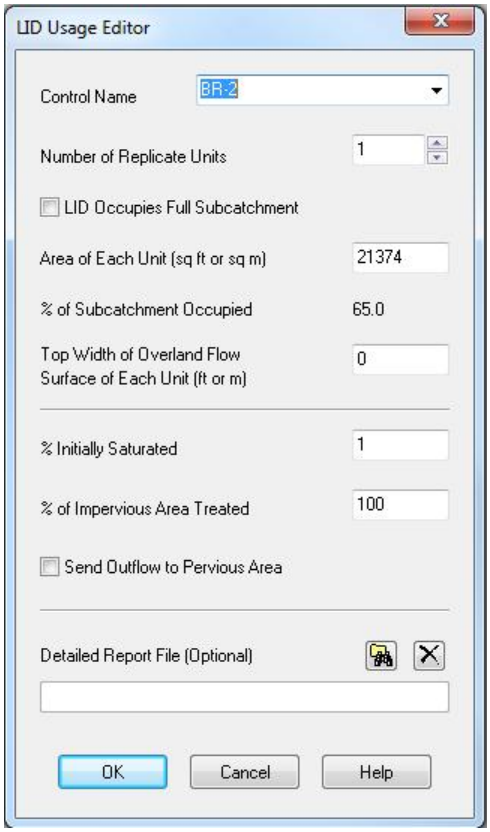
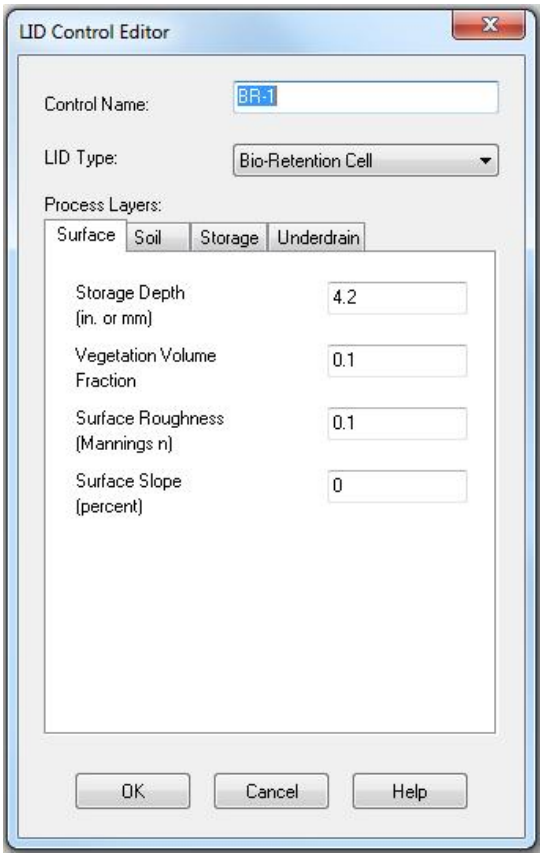
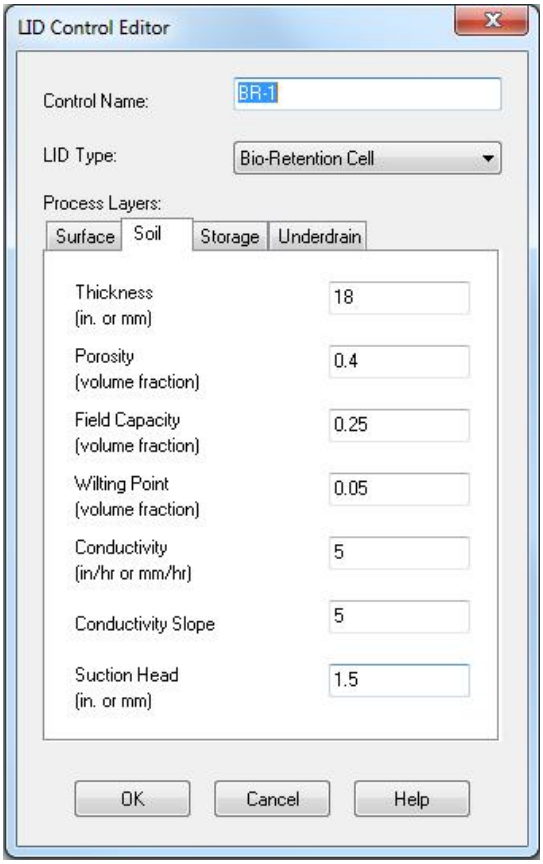
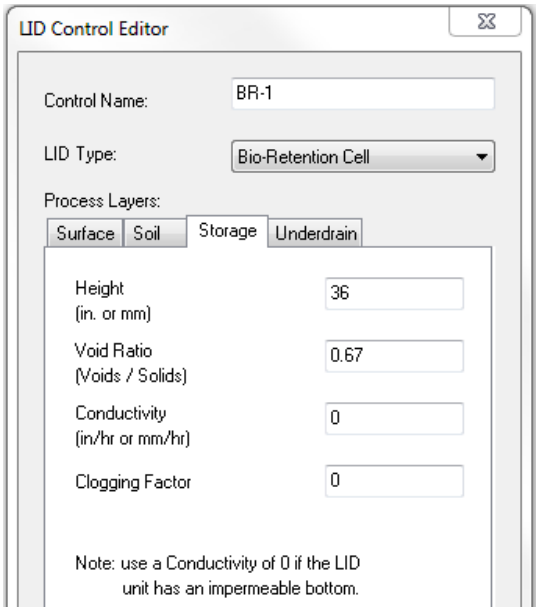
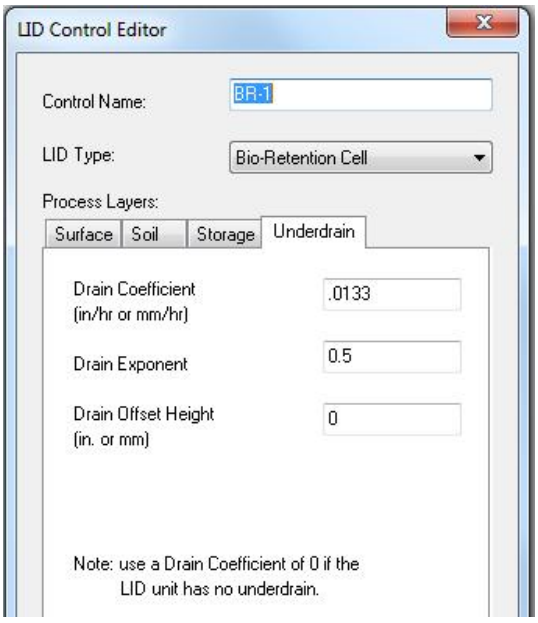


BIORETENTION 1









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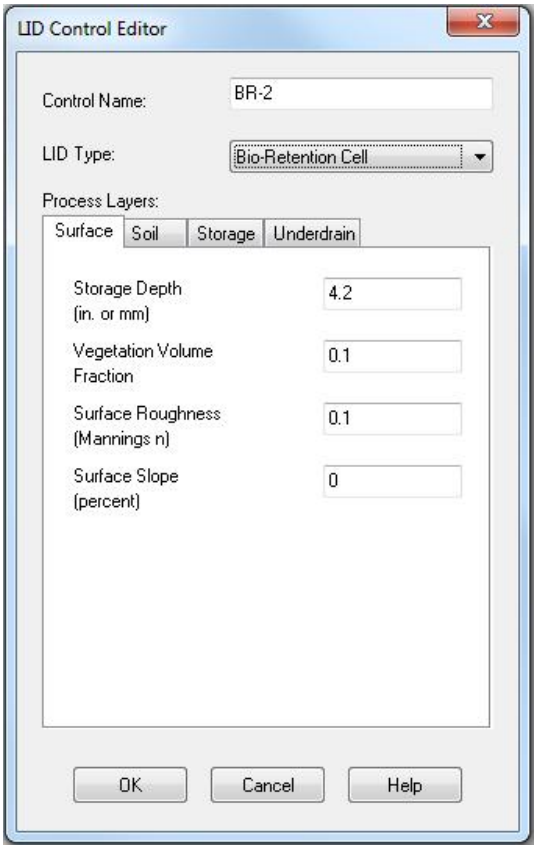
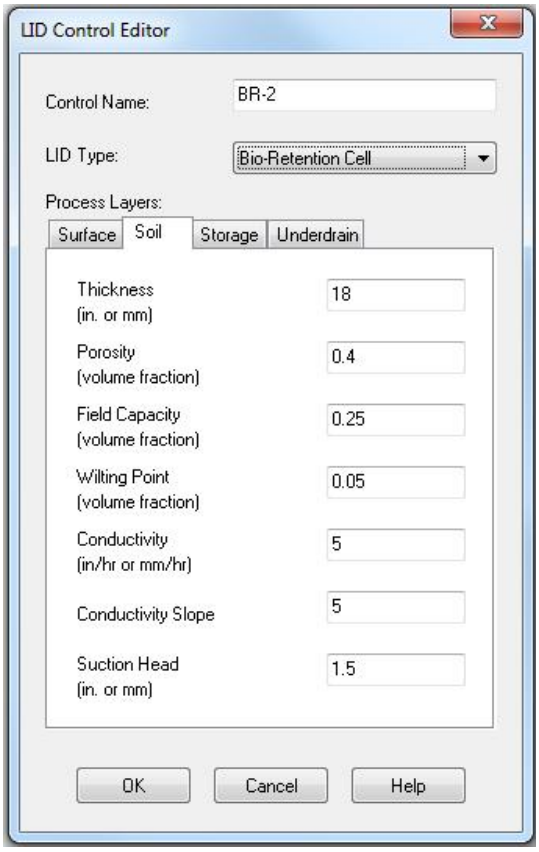
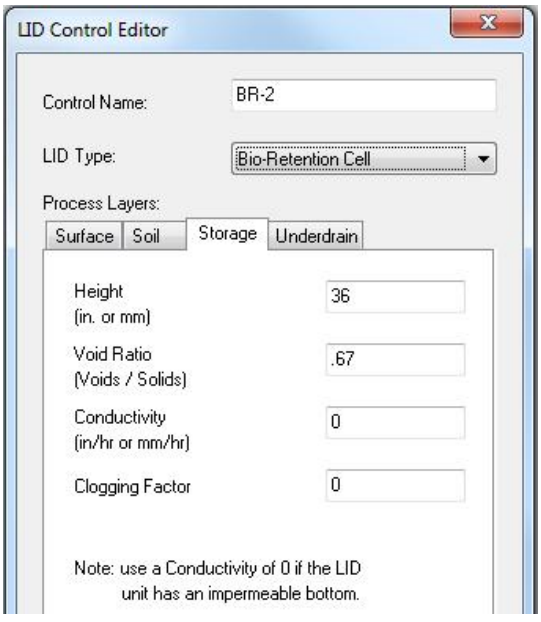
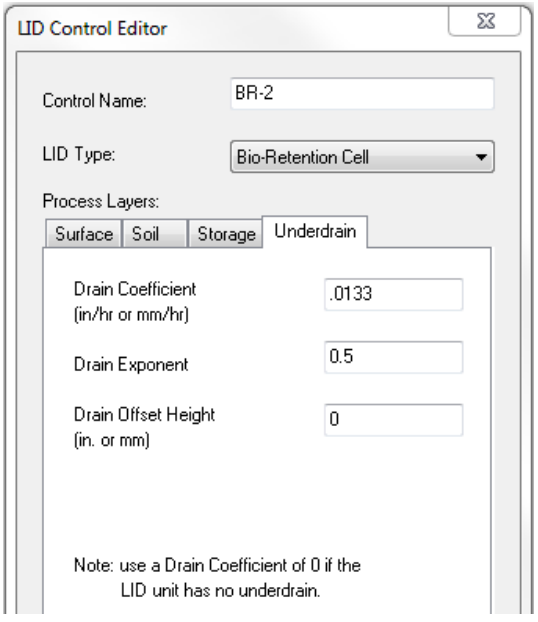








LID Control Editor: Explanation of Significant Variables

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:

(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.

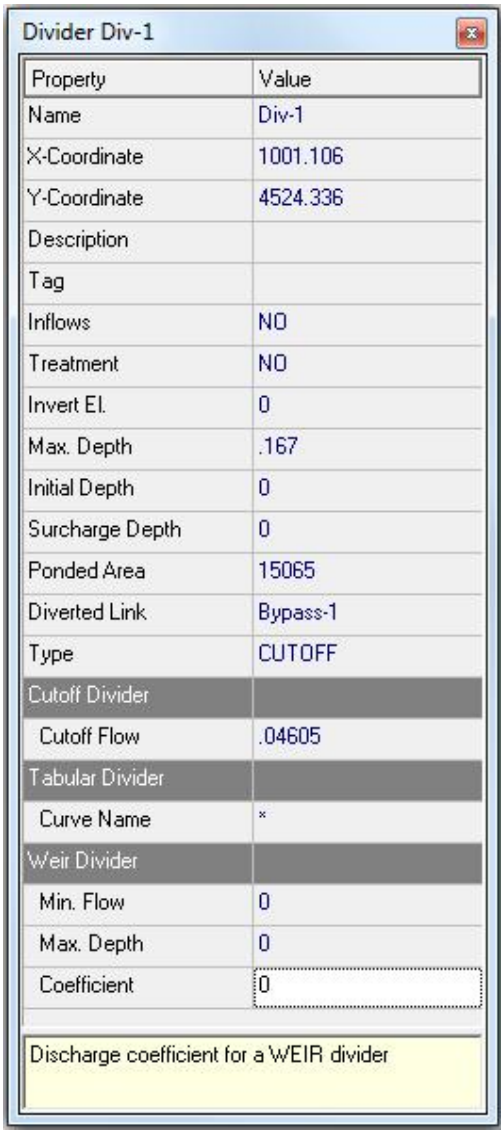
The general orifice equation can be expressed as:

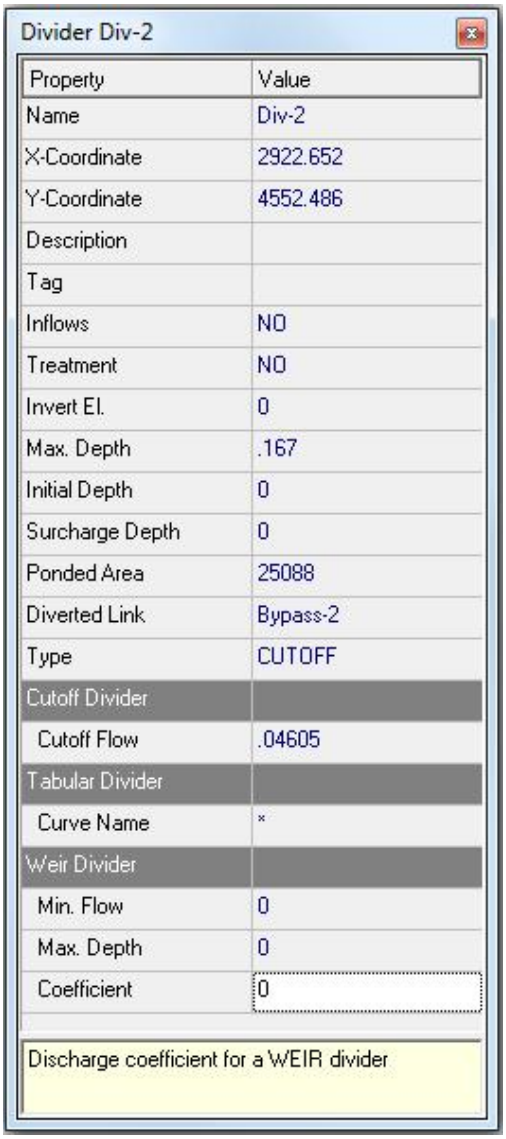
(2)

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:

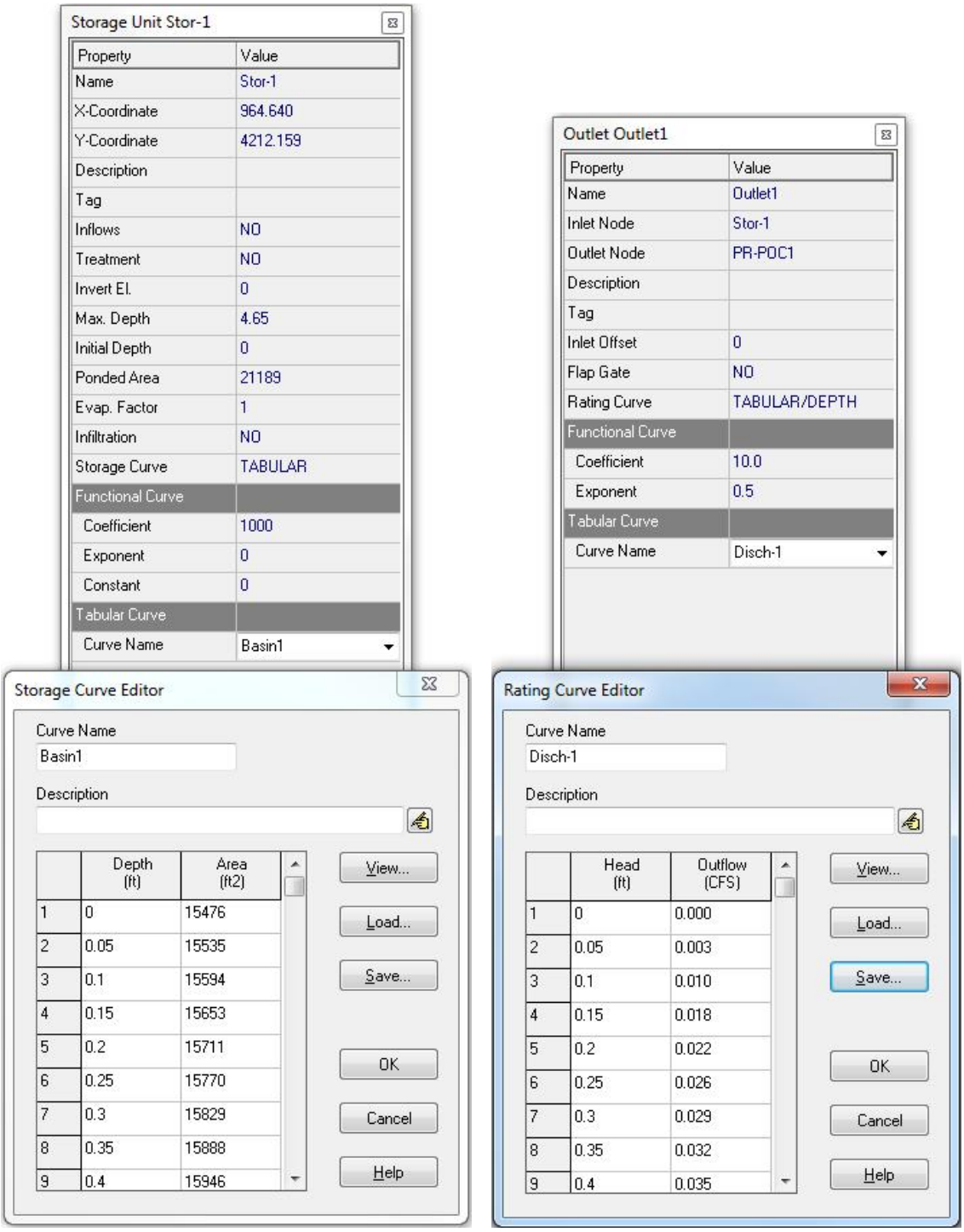
This is the only significant variable in the diversion, as the type of diversion is defined by this value. Any excess of flow over this value will be diverted into a pond subroutine (the surface stage of the bio-retention basin) and routed there. The determination of this value equates to the value obtained 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.





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	964.640
Y-Coordinate	4212.159
Description	
Tag	
Inflows	NO
Treatment	NO
Invert El.	0
Max. Depth	4.65
Initial Depth	0
Ponded Area	21189
Evap. Factor	1
Infiltration	NO
Storage Curve	TABULAR
Functional Curve	
Coefficient	1000
Exponent	0
Constant	0
Tabular Curve	
Curve Name	Basin1

Outlet Outlet1

Property	Value
Name	Outlet1
Inlet Node	Stor-1
Outlet Node	PR-POC1
Description	
Tag	
Inlet Offset	0
Flap Gate	NO
Rating Curve	TABULAR/DEPTH
Functional Curve	
Coefficient	10.0
Exponent	0.5
Tabular Curve	
Curve Name	Disch-1

Storage Curve Editor

Curve Name: Basin1

Description:

	Depth (ft)	Area (ft2)
1	0	15476
2	0.05	15535
3	0.1	15594
4	0.15	15653
5	0.2	15711
6	0.25	15770
7	0.3	15829
8	0.35	15888
9	0.4	15946

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

Rating Curve Editor

Curve Name: Disch-1

Description:

	Head (ft)	Outflow (CFS)
1	0	0.000
2	0.05	0.003
3	0.1	0.010
4	0.15	0.018
5	0.2	0.022
6	0.25	0.026
7	0.3	0.029
8	0.35	0.032
9	0.4	0.035

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

BIORETENTION 2

Storage Unit Stor-2

Property	Value
Name	Stor-2
X-Coordinate	2889.503
Y-Coordinate	4220.994
Description	
Tag	
Inflows	NO
Treatment	NO
Invert El.	0
Max. Depth	8.15
Initial Depth	0
Ponded Area	32900
Evap. Factor	1
Infiltration	NO
Storage Curve	TABULAR
Functional Curve	
Coefficient	1000
Exponent	0
Constant	0
Tabular Curve	
Curve Name	Basin2

Storage Curve Editor

Curve Name: Basin2

Description:

	Depth (ft)	Area (ft2)
1	0	21599
2	0.05	21664
3	0.1	21728
4	0.15	21793
5	0.2	21857
6	0.25	21921
7	0.3	21986
8	0.35	22050
9	0.4	22115

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

Outlet Outlet2

Property	Value
Name	Outlet2
Inlet Node	Stor-2
Outlet Node	PR-POC1
Description	
Tag	
Inlet Offset	0
Flap Gate	NO
Rating Curve	TABULAR/DEPTH
Functional Curve	
Coefficient	10.0
Exponent	0.5
Tabular Curve	
Curve Name	Disch-2

Rating Curve Editor

Curve Name: Disch-2

Description:

	Head (ft)	Outflow (CFS)
1	0	0.000
2	0.05	0.003
3	0.1	0.012
4	0.15	0.025
5	0.2	0.036
6	0.25	0.044
7	0.3	0.050
8	0.35	0.055
9	0.4	0.060

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

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

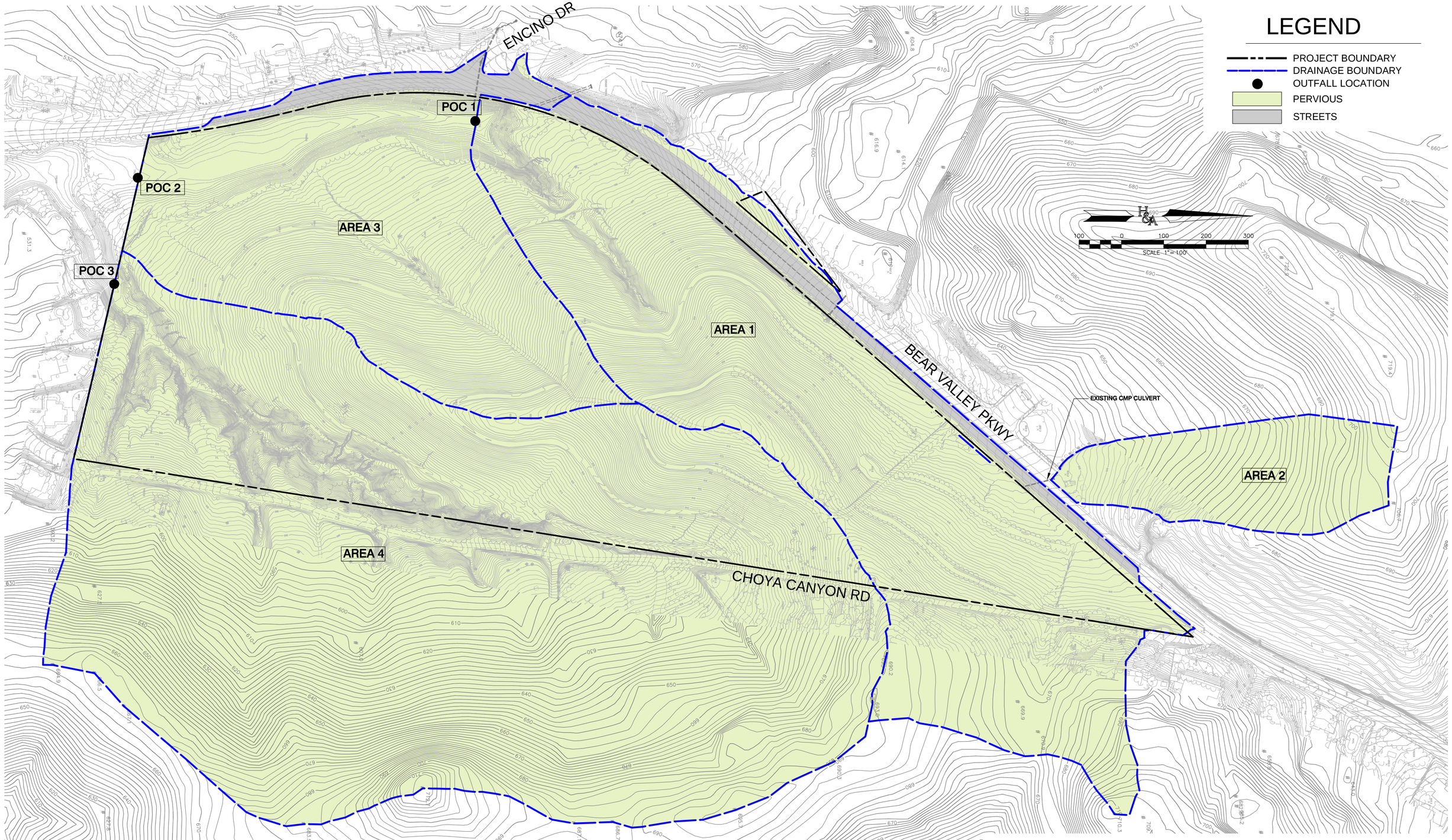
The LID subroutine of the SWMM Model does not increase the discharge of the lower LID orifice once the storage layer is full (in other words, it does not consider the influence of the pressure in the amended soil layer). The discharge of the lower LID orifice when the surface layer is full is considered 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 and another elevation can be obtained by:

Q_{ave} represents the average discharge between elevation y_i and y_{i+1} obtained by where ΔV represents the fraction of the volume that must be discharged at a peak flow .

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

ATTACHMENT 9 – Hydromodification Watershed Maps



PREPARED BY:

HUNSAKER & ASSOCIATES
SAN DIEGO, INC

PLANNING
ENGINEERING
SURVEYING

9707 Waples Street
San Diego, Ca 92121
PH(858)558-4500 · FX(858)558-1414

EXISTING CONDITION HYDROMODIFICATION MAP

BEAR VALLEY

ESCONDIDO, CALIFORNIA

SHEET 1 OF 2

W.O. 2510-08

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LEGEND

- PROJECT BOUNDARY
- DRAINAGE BOUNDARY
- OUTFALL LOCATION
- PERVIOUS
- PADS
- STREETS

SCALE 1" = 100'

AREA 1
AREA 2
AREA 3
AREA 4
AREA 5
AREA 6
AREA 7
AREA 8

POC 1
POC 2
POC 3

BR-1
BR-2

STREET 'A'
ST. 'A'
ST. 'B'
ST. 'C'
STREET 'D'

BEAR VALLEY PKWY.

FUEL MOD

EMERGENCY ACCESS RD

PROPOSED BASIN BOTTOM ELEVATION

HIGH DEFF LETTING LANDSCAPE WALL (SEE FIRE PROTECTION PLAN)

PREPARED BY:

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PROPOSED CONDITION HYDROMODIFICAITON MAP

BEAR VALLEY

CITY OF ESCONDIDO, CALIFORNIA

SHEET 2 OF 2

W.O. 2510-08

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