Major Stormwater Management Plan
For
Public Storage Spring Valley

Preparation/Revision Date:

November 3, 2014

Prepared for:

Public Storage, Inc.
701 Western Avenue
Glendale, CA 91201
Telephone:

Prepared by:

Chris McKee
DRC Engineering
160 S Old Springs Road, Suite 210
Anaheim Hills, CA, 92808
(714) 685 6860

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

Chris McKee, RCE #74414

2/2/15
Date

SDC PDS RCVD 05-12-15
MUP82-066W2

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

Project Name:	Public Storage Spring Valley
Project Location/Address:	1247 Sweetwater Road, Spring Valley, CA
Permit Number (Land Development Projects):	
Work Authorization Number (**CIP only**):	
Applicant:	Public Storage, Inc.
Applicant's Address:	701 Western Avenue, Glendale, CA 91201
Plan Prepared By (*Leave blank if same as applicant*):	DRC Engineering Inc.
Preparer's Address:	160 S Old Springs Rd, Suite 210 Anaheim Hills, CA, 92808
Date:	November 3, 2014

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

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

Project Stages	Does the SWMP need revisions?		If YES, Provide Revision Date	County Reviewer
	YES	NO		

Instructions for a Major SWMP can be downloaded at
http://www.sdcounty.ca.gov/dpw/watersheds/susmp/susmp.html

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

STEP 1

PRIORITY DEVELOPMENT PROJECT DETERMINATION

TABLE 1: IS THE PROJECT IN ANY OF THESE CATEGORIES?

Yes ❑	No X	A	Housing subdivisions of 10 or more dwelling units. Examples: single-family homes, multi-family homes, condominiums, and apartments.
Yes X	No ❑	B	Commercial—greater than one acre (total disturbed area). 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 X	C	Heavy industry—greater than one acre (total disturbed area). Examples: manufacturing plants, food processing plants, metal working facilities, printing plants, and fleet storage areas (bus, truck, etc.).
Yes ❑	No X	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 X	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 X	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 X	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 X	H	Parking lots 5,000 square feet or more or with 15 or more (paved) parking spaces and potentially exposed to urban runoff.
Yes ❑	No X	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 X	J	Retail Gasoline Outlets (RGOs) that are: (a) 5,000 square feet or more or (b) a projected Average Daily Traffic (ADT) of 100 or more vehicles per day.

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

STEP 2

PROJECT STORMWATER QUALITY DETERMINATION

Total Project Site Area 171,200 (ft^2)

Estimated amount of disturbed area: 78,990 (ft^2)
(If >1 acre, you must also provide a WDID number from the SWRCB) WDID: TBD

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

A. Total size of project site: 1.81 (Acres)

B. Total impervious area (including roof tops) before construction 0.28 (Acres)

C. Total impervious area (including roof tops) after construction 1.50 (Acres)

Calculate percent impervious before construction: B/A = 20 %
Calculate percent impervious after construction: C/A = 83 %

Please provide detailed descriptions regarding the following questions:

TABLE 2: PROJECT SPECIFIC STORMWATER ANALYSIS

1.	Please provide a brief description of the project.
The project will entail removal of existing residential buildings and removal of existing driveway. The proposed project will include the construction of a 3-story public storage facility with associated parking lot addition and landscaping, installation of utilities to serve the building, and installation of a stormwater conveyance and detention system.	
2.	Describe the current and proposed zoning and land use designation.
Current & Proposed Zoning: General Commercial (C36)	
3.	Describe the pre-project and post-project topography of the project. (Show on Plan)
The existing site generally slopes from the northeast to south and is generally flat (1%-5% grade). The site overland surface flows into a series of lined dirt swales on the south side of the project. Runoff from the swales drain into public catch basins located in Sweetwater Road and Jamacha Road. The proposed site will maintain the existing drainage patterns by continuing to discharge at existing flow rates to the dirt swale and ultimately into the catch basin in Sweetwater Road. A portion of the existing swales will be removed and replaced with an equivalent area of landscaping on the north and south sides of the proposed building.	
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.
Per a soils investigation done by Giles Engineering Associates, Inc. in July 2014, the soils consist of fill materials to depths of approximately 3 feet to 6 feet below existing grades and consisted of generally moist, stiff to very stiff, sandy clay with some silt and damp to moist, firm clayey sand. Native soils under the fill consisted of moist stiff to very stiff sandy clay and dry to wet, firm, clayey sand. These soils were underlain by very dense possible Mission Valley Formation deposits sampled as a coarse sand with some gravel. A gravel and cobble layer was encountered in depths ranging from 13 to 17.5 feet. Groundwater was encountered at a depth of approximately 31 feet below existing ground surface during subsurface investigation.	
5.	Describe if contaminated or hazardous soils are within the project area. (Show on Plan)
No hazardous or contaminated soils were observed during the geotechnical investigations and none are anticipated on-site.	

6.	Describe the existing site drainage and natural hydrologic features. (Show on Plan).
The existing site generally drains from the northeast corner to the south into a series of lined dirt swales. Runoff collected in these swales eventually drains to the public catch basins located in Sweetwater Road and Jamacha Road. The site contains no natural hydrologic features.	
7.	Describe site features and conditions that constrain, or provide opportunities for stormwater control, such as LID features.
The site will maintain the drain pattern from the northeast to the south side of the project. Two proposed landscaping areas, directly north and south of the proposed building, will replace existing landscaping that will be removed. An underground infiltration/detention system will be located between the buildings and in the south side of the parking area. Overflows from this underground system will discharge to the public catch basin in Sweetwater Road.	
8.	Is this project within the environmentally sensitive areas as defined on the maps in Appendix A of the *County of San Diego Standard Urban Storm Water Mitigation Plan for Land Development and Public Improvement Projects?*
Yes	No
9.	Is this an emergency project? If yes, please provide a description below.
Yes	No

CHANNELS & DRAINAGES

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

TABLE 3: CHANNEL& DRAINAGE ANALYSIS

No.	CRITERIA	YES	NO	N/A	COMMENTS
1.	Will the project include work in channels?		X		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				If YES go to 8.

No.	CRITERIA	YES	NO	N/A	COMMENTS
	stability?				
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

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

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

- Dewatering Operations
- Paving and Grinding Operations
- Vehicle and Equipment Maintenance
- Any minor slopes created incidental to construction and not subject to a major or minor grading permit shall be protected by covering with plastic or tarp prior to a rain event, and shall have vegetative cover reestablished within 180 days of completion of the slope and prior to final building approval.

EXCEPTIONAL THREAT TO WATER QUALITY DETERMINATION

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

TABLE 4: EXCEPTIONAL THREAT TO WATER QUALITY DETERMINATION

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		X	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? http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm			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: Project proponent may perform a Revised Universal Soil Loss Equation, Version 2 (RUSLE 2), Modified Universal Soil Loss Equation (MUSLE), or similar analysis that demonstrates (to the County official's satisfaction) that advanced treatment is not required.

STEP 3

HYDROMODIFICATION DETERMINATION

The following questions provide a guide to collecting information relevant to hydromodification management plan (HMP) issues. If the project is exempt from the HMP criteria, please provide the supporting documentation in Attachment H. Please reference the full descriptions of the HMP exemptions located in Figure 1-1 of the County SUSMP.

TABLE 5: HYDROMODIFICATION DETERMINATION

	QUESTIONS	YES	NO	Information
1.	Will the project reduce the pre-project impervious area and are the unmitigated post-project outflows (outflows without detention routing) to each outlet location less as compared to the pre-project condition?		X	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?		X	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?		X	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?		X	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?		X	If NO, continue to 6. If YES, go to 7.
6.	Project is required to manage hydromodification impacts.	X		Reference Appendix G "Hydromodification Management Plan" of the County SUSMP.
7.	Project is not required to manage hydromodification impacts.			Hydromodification Exempt. Keep on file.

STEP 4

POLLUTANTS OF CONCERN DETERMINATION

WATERSHED

Please check the watershed(s) for the project.

☐ 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

*Projects located fully within these watersheds require only a Minor SWMP.

HYDROLOGIC SUB-AREA NAME AND BASIN NUMBER(S)

Basin Number	Sub-Area Name
909.10	Lower Sweetwater HA

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

RECEIVING WATERS that each project discharge point proposes to discharge to.

RECEIVING WATERS (river, lake, reservoir, etc.)	Hydrologic Unit Basin Number	Impairment(s) listed [303(d) listed waters or waters with established TMDLs]. List the impairments identified in **Table 7**.	Distance to Project
Sweetwater Reservoir	9.21	Dissolved oxygen	1.6 miles
Sweetwater River	9.21	Enterococcus, Fecal Coliform, Phosphorus, Selenium, Total Dissolved Solids, Total Nitrogen, Toxicity	1.7 miles

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	GWR	FRESH
Sweetwater Reservoir	9.21	●	●	●	●		
Sweetwater River	9.21	●	●	●	●		

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

+ Excepted from Municipal ● Existing Beneficial Use ○ Potential Beneficial Use

PROJECT ANTICIPATED AND POTENTIAL POLLUTANTS

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

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

	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 ft²	X	X			X	X	X		X
Parking Lots	P(1)	P(1)	X		X	P(1)	X		P(1)
Retail Gasoline Outlets			X	X	X	X	X		
Streets, Highways & Freeways	X	P(1)	X	X(4)	X	P(5)	X		

X = anticipated
P = potential
(1) A potential pollutant if landscaping exists on-site.
(2) A potential pollutant if the project includes uncovered parking areas.
(3) A potential pollutant if land use involves food or animal waste products.
(4) Including petroleum hydrocarbons.
(5) Including solvents.

PROJECT POLLUTANTS OF CONCERN SUMMARY TABLE

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

TABLE 7: PROJECT POLLUTANTS OF CONCERN

Pollutant Category	**Anticipated (X)**	**Potential (P)**	**Surface Water Impairments (determined by your receiving waters impairments on page 10)**
Sediments		P	Total Dissolved Solids
Nutrients		P	
Heavy Metals	X		
Organic Compounds		P	Phosphorus, Selenium, Total Nitrogen
Trash & Debris	X		
Oxygen Demanding Substances		P	Dissolved oxygen
Oil & Grease	X		
Bacteria & Viruses		P	Enterococcus, Fecal Coliform, Toxicity
Pesticides		P	

STEP 5

LID AND SITE DESIGN STRATEGIES

Each numbered item below is a Low Impact Development (LID) requirement of the WPO. Please check the box(s) under each number that best describes the LID BMP(s) and Site Design Strategies selected for this project. LID BMPs selected on this table will be typically represented as a self-retaining area, self-treating area, pervious pavement and greenroof, which, should be delineated in the Drainage Management Area map in Attachment C.

TABLE 8: LID AND SITE DESIGN

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:

	LID Parking Lot Design
☐	Permeable Pavements
☐	Curb-cuts to landscaping
☐	Other. Description:
	LID Driveway, Sidewalk, Bike-path Design
☐	Permeable Pavements
●	Pitch pavements toward landscaping
☐	Other. Description:
	LID Building Design
☐	Cisterns & Rain Barrels
●	Downspout to swale or landscaping
☐	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:

STEP 6

SOURCE CONTROL

Please complete the checklist on the following pages to determine Source Control BMPs. Below is instruction on how to use the checklist. (Also see instructions on page 60 of the *SUSMP)*

1. Review Column 1 and identify which of these potential sources of stormwater pollutants apply to your site. Check each box that applies and list in Table 9.

2. Review Column 2 and incorporate all of the corresponding applicable BMPs in your Source Control Exhibit in Attachment B.

3. Review Columns 3 and 4 and incorporate all of the corresponding applicable permanent controls and operational BMPs into Table 9.

4. Use the format in Table 9 below to summarize the project Source Control BMPs. Incorporate all identified Source Control BMPs in your Source Control Exhibit in Attachment B.

TABLE 9: PROJECT SOURCE CONTROL BMPS

Potential source of runoff pollutants	*Permanent source control BMPs*	*Operational source control BMPs*
On-Site storm drain inlets	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 owner, 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."
Interior floor drains and elevator shaft sump pumps	Interior floor drains and elevator shaft sump pumps will be plumbed to sanitary sewer.	Inspect and maintain drains to prevent blockages and overflow.
Need for future indoor & structural pest control	Minimize the number of entry ways and openings to the building at ground surface elevation.	Provide Integrated Pest Management information to owners, lessees, and operators.

Landscape/Outdoor Pesticide Use	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.
Fire Sprinkler Test Water	Provide a means to drain fire sprinkler test water to the sanitary sewer.	See note in Fact Sheet SC-41, "Building and Grounds Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com
Miscellaneous Drain or Wash Water • Rooftop equipment • Roofing, gutters, and trim	Rooftop mounted equipment with potential to produce pollutants shall be roofed and/or have secondary containment. Avoid roofing, gutters, and trim made of copper or other unprotected metals that may leach into runoff.	
Plazas, sidewalks, and parking lots.		Plazas, sidewalks, and parking lots shall be swept regularly to prevent to 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.

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

Mark all inlets with the words "No Dumping! Flows to Bay". Each drain inlet identified on the Source Control Exhibit shall be painted in either blue or white lettering on the drain inlet or immediately adjacent to the inlet.

Interior floor drains and elevator shaft sump pumps will be plumbed to sanitary sewer. All drains located interior to the building will be directed into the sanitary sewer system within the building and discharge to the public sewer system.

Minimize the number of entry ways and openings to the building at ground surface elevation. The building is designed to minimize the number of locations where pests can enter the building. Doors are designed to close with minimal gaps to the frame and point of penetration into the wall by utilities are to be sealed.

Preserve existing native trees, shrubs, and ground cover to the maximum extent possible. The existing project site contains a series of landscaped swales. A portion of the swales will be removed and replaced with an equivalent amount of landscaped area adjacent to the proposed building.

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. Landscape materials have been chosen with water wise practices in mind and drought tolerant plantings. Landscape areas are designed as sumps with overflow drains located higher than the bottom of sump to infiltrate low flows and reduce runoff. The use of fertilizers and pesticides will be in conformance with the CASQA recommendations of SC-41.

Where landscaped areas are used to retain or detain stormwater, specify plants that are tolerant of saturated soil conditions. Plants located in landscape retention areas are tolerant to over-saturated soils for short periods of time.

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. The landscape plant list for this project has been specifically design to work with the project site and to be in conformance with the area of Spring Valley design requirements.

Provide a means to drain fire sprinkler test water to the sanitary sewer. Drains located internal to the building will drain into the building's sanitary sewer system and discharge into the public sewer system.

Rooftop mounted equipment with potential to produce pollutants shall be roofed and/or have secondary containment. Rooftop equipment will discharge through the roof drain system into landscape areas for infiltration.

Avoid roofing, gutters, and trim made of copper or other unprotected metals that may leach into runoff. Unprotected metals will not be used for the roofing, gutter or building trim.

Operational Source Control BMPs

Maintain and periodically repaint or replace inlet markings. Inlet markings to be inspected on an annual basis for fading. Markings to be repainted as required.

Provide stormwater pollution prevention information to new site owner, lessees or operators. A copy of the SWMP is to be kept on-site at all times by management. At time of hire, operation and maintenance staff are to be educated on the source control BMPs and treatment BMPs for the project.

See applicable operational BMPs in Fact Sheet SC-44, "Drainage System Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com. Educational material, included Fact Sheet SC-44, found within this SWMP report is to be made available to maintenance staff by owner.

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." While the current project is not intended to be leased, the owner shall include this language in the event that the property does become leased.

Inspect and maintain drains to prevent blockages and overflow. Drains internal to the building will be routinely inspected and maintained by the maintenance staff.

Provide Integrated Pest Management (IPM) information to owners, lessees, and operators. Owner shall develop an IPM prior to occupancy and provide this information to the maintenance staff at time of employment and provide to future property owner or lessees.

Maintain landscaping using minimum or no pesticides. Plantings chosen for the site are to be pest-resistant plants around the building and pesticides used are to be environmentally sensitive varieties.

See applicable operation BMPs in Fact Sheet SC-41, "Building and Grounds Maintenance," in the CASQA Stormwater Quality Handbooks.

Provide IPM information to new owners, lessees and operators. Owner to develop the IPM for the project and distribute to maintenance staff at time of employment and provide to future lessees and new owners.

See the note in Fact Sheet SC-41, "Building and Grounds Maintenance," in the CASQA Stormwater Quality Handbooks. Owner to provide BMP fact sheet to maintenance staff at time of employment and to future lessees.

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 discharge to a storm drain. Owner to fire parking lot sweeping service or provide maintenance staff proper vacuuming equipment to collect litter and debris from the site. In the event water is used to clean the site, wastewater shall be collected and disposed of properly, not dumped down the storm drain system.

IF THESE SOURCES WILL BE ON THE PROJECT SITE …	… THEN YOUR STORMWATER CONTROL PLAN SHOULD INCLUDE THESE SOURCE CONTROL BMPs		
1 Potential Sources of Runoff Pollutants – List in Table 9	2 Permanent Controls—Show on Source Control Exhibit, Attachment B	3 Permanent Controls—List in Table 9 and Narrative	4 Operational BMPs—Include in Table 9 and Narrative
✓ A. **On-site storm drain inlets**	✓ **Locations of inlets.**	✓ **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.** ✓ **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.**

IF THESE SOURCES WILL BE ON THE PROJECT SITE …	… THEN YOUR STORMWATER CONTROL PLAN SHOULD INCLUDE THESE SOURCE CONTROL BMPs		
1 Potential Sources of Runoff Pollutants – List in Table 9	2 Permanent Controls—Show on Source Control Exhibit, Attachment B	3 Permanent Controls—List in Table 9 and Narrative	4 Operational BMPs—Include in Table 9 and Narrative
✓ D1. **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.**
✓ D2. **Landscape/ Outdoor Pesticide Use** **<u>Note: Should be consistent with project landscape plan (if applicable).</u>**	❑ **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.**

IF THESE SOURCES WILL BE ON THE PROJECT SITE …	… THEN YOUR STORMWATER CONTROL PLAN SHOULD INCLUDE THESE SOURCE CONTROL BMPs		
1 Potential Sources of Runoff Pollutants – List in Table 9	2 Permanent Controls—Show on Source Control Exhibit, Attachment B	3 Permanent Controls—List in Table 9 and Narrative	4 Operational BMPs—Include in Table 9 and Narrative
❑ 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.**	❑

IF THESE SOURCES WILL BE ON THE PROJECT SITE …	… THEN YOUR STORMWATER CONTROL PLAN SHOULD INCLUDE THESE SOURCE CONTROL BMPs		
1 Potential Sources of Runoff Pollutants – List in Table 9	2 Permanent Controls—Show on Source Control Exhibit, Attachment B	3 Permanent Controls—List in Table 9 and Narrative	4 Operational BMPs—Include in Table 9 and Narrative
❑ 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 SOURCE CONTROL BMPs		
1 Potential Sources of Runoff Pollutants – List in Table 9	2 Permanent Controls—Show on Source Control Exhibit, Attachment B	3 Permanent Controls—List in Table 9 and Narrative	4 Operational BMPs—Include in Table 9 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 the Fact Sheets 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 shut-off 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 Areas**	❑ **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 dry 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 drain 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.**

STEP 7

LID AND TREATMENT CONTROL SELECTION

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

Will this project be utilizing the unified LID design procedure as described in Chapter 4 of the Local SUSMP? *(If yes, please document in Attachment D following the steps in Chapter 4 of the County 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.	

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

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

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

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

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

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

- Please check the box(s) that best describes the Treatment Control BMP(s) and/or LID IMP selected for this project. Please check if the treatment facility is designed for water quality or hydromodification flow control. Check both boxes if the facility is designed for both water quality and hydromodification flow control.

TABLE 12: PROJECT TCBMPS - BMPs designed to treat stormwater (e.g., LID and hydromod) shall be considered TCBMPs.

TCBMP Type	**Water Quality Treatment**	**Hydromodification Flow Control**
Bioretention Facilites (LID)		
☐ Bioretention area		
☐ Flow-through Planter		
☐ Cistern with Bioretention		
Basins		
☐ Extended/dry detention basin with grass/vegetated lining		
☐ Extended/dry detention basin with impervious lining		
✓ Underground vault		X
☐ Cistern		
Infiltration Devices (LID)		

☐ Infiltration basin		
☐ Infiltration trench		
✓ Other__Underground Arch Pipes____	X	
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_____		
Higher-rate Media Filters		
☐ Vault-based filtration unit with replaceable cartridges		
☐ Other_____		
Hydrodynamic Separator Systems		
☐ Swirl Concentrator		
☐ Other_____		
Trash Racks		
✓ Catch Basin Insert	X	
☐ Catch Basin Insert w/ Hydrocarbon boom		
☐ Other_____		
Self-Retaining Areas (LID)		
☐ Permeable Pavements		
☐ Self-Retaining		
☐ Vegetated Roof		

[1] Must be designed per SUSMP "Vegetated Swales" design criteria for water quality treatment credit (p. 102-103).

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

- Create a Construction Plan SWMP Checklist for your project.

Instructions on how to fill out table

1. Number and list each measure or BMP you have specified in your SWMP in Columns 1 and Maintenance Category in Column 3 of the table. Leave Column 2 blank.

2. When you submit construction plans, duplicate the table (by photocopy or electronically). Now fill in Column 2, identifying the plan sheets where the BMPs are shown. List all plan sheets on which the BMP appears. **This table must be shown on the front sheet of the grading and improvement plans.**

Treatment Control BMPs[1]			
Description / Type	Sheet	Maintenance Category	Revisions
Underground Infiltration/Detention Pipes	1	1	
Filter Inserts (Trash Rack)	1	1	
[1] BMPs designed to treat stormwater (e.g., LID and hydromod) shall be considered TCBMPs.			

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

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

The infiltration BMPs were selected based on the high removal efficiencies for course sediments and trash, fine particle pollutants, and dissolvable pollutants. The results from geotechnical investigation have shown a low infiltration rate for the proposed project site. Based on this rate, a maximum 12" high rock bed (40% voids) will be utilized for infiltration in order to control drawdown times and vector control issues. Additionally, an infiltration basin will be provided at a maximum depth of 12". A low profile underground arch pipe system will be used for hydromodification detention plus storage to get the 100-year post-construction flows below the pre-construction levels. Kristar FloGard Plus grate inlet and curb opening catch basin filter inserts were chosen to provide pre-treatment facilities especially for course sediment/trash and extend the life of the infiltration system.

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

STEP 8

OPERATION AND MAINTENANCE

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

TABLE 13: PROJECT BMP CATEGORY

CATEGORY	SELECTED		BMP Description
	YES	NO	
First[1]	X		Underground Infiltration System and Trash Racks
Second[2]			
Third[3]			
Fourth[4]			

Note:

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

- Please list all individual Treatment Control BMPs (TCBMPs) incorporated into the project. Please attach the record plan sheets upon completion of project and amend the Major SWMP where appropriate. For each type of TCBMP provide an inspection sheet in Attachment F "Maintenance Plan". Replicate Table 14 in Attachment G once the TCBMP has been constructed.

TABLE 14: PROJECT SPECIFIC LID AND TCBMPS

Treatment Control BMPs (TCBMPs)[1,2] (List all from SWMP)		
Lot Number Or Location	**Description/Type**	**Sheet**
INF#1	Infiltration facility	1
INF#2	Infiltration facility	1
TR#1	Trash Rack	1
TR#2	Trash Rack	1

[1] All Priority Development Projects (PDPs) require a TCBMP.
[2] BMPs designed to treat stormwater (e.g. LID and hydromod) shall be considered TCBMPs.

* For location of BMP's, see approved Record Plan dated XX/XX/XX , plan (TYPE) sheet (#)

- Responsible Party for the Construction Phase:

Identify the parties responsible for maintenance during the construction phase of the BMPs identified above and Source Controls specified in Attachment B.

Developer's Name: _____

Address: _____

City _____ State _____Zip_____

Email Address: _____

Phone Number: _____

Engineer of Work: DRC Engineering Inc.

Engineer's Phone Number: (714) 685-6860

- Responsible Party for Ongoing Maintenance:

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

Owner's Name: _____

Address: _____

City _____ State _____Zip_____

Email Address: _____

Phone Number: _____

* Note: If a corporation or LLC, provide information for principal partner or Agent for Service of Process. If an HOA, provide information for the Board or property manager at time of project closeout.

- Funding Source:

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

The property owner will be responsible for funding and maintaining the proposed BMPs for the life of the project. As these are Category 1 BMPs, the SWMP does not require any special provisions for funding.

ATTACHMENTS

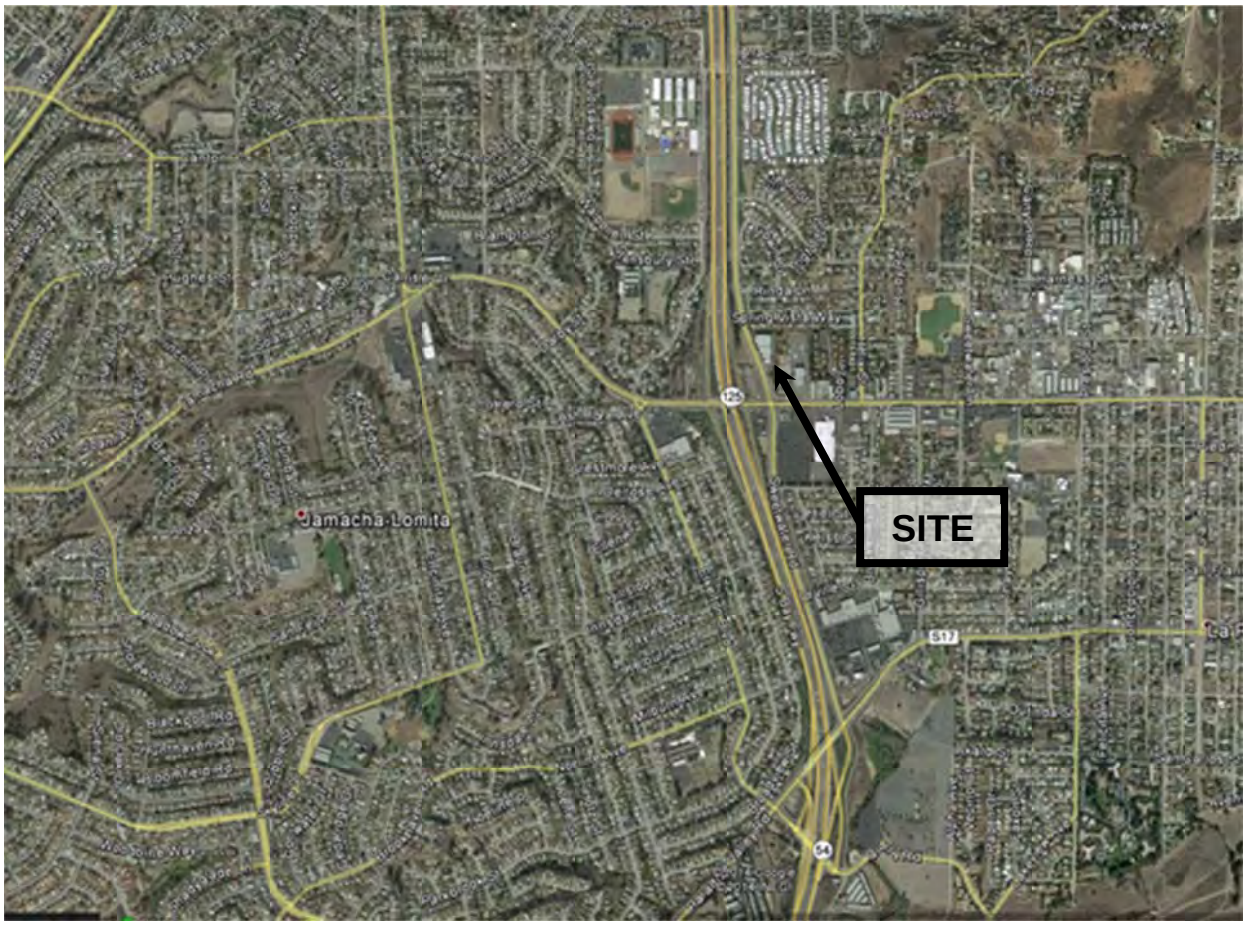
Please include the following attachments.

ATTACHMENT		COMPLETED	N/A
A	Project Location Map	X	
B	Source Control Exhibit	X	
C	Drainage Management Area (DMA)Exhibit	X	
D	BMP Sizing Design Calculations (Water Quality and Hydromodification) and TCBMP/IMP Design Details	X	
E	Geotechnical Certification Sheet		X
F	Maintenance Plan	X	
G	Treatment Control BMP Certification (due at project completion)		X
H	HMP Study		X
I	Geomorphic Assessment		X
J	HMP Exemption Documentation		X
K	Addendum		X

Note: Attachments B and C may be combined.

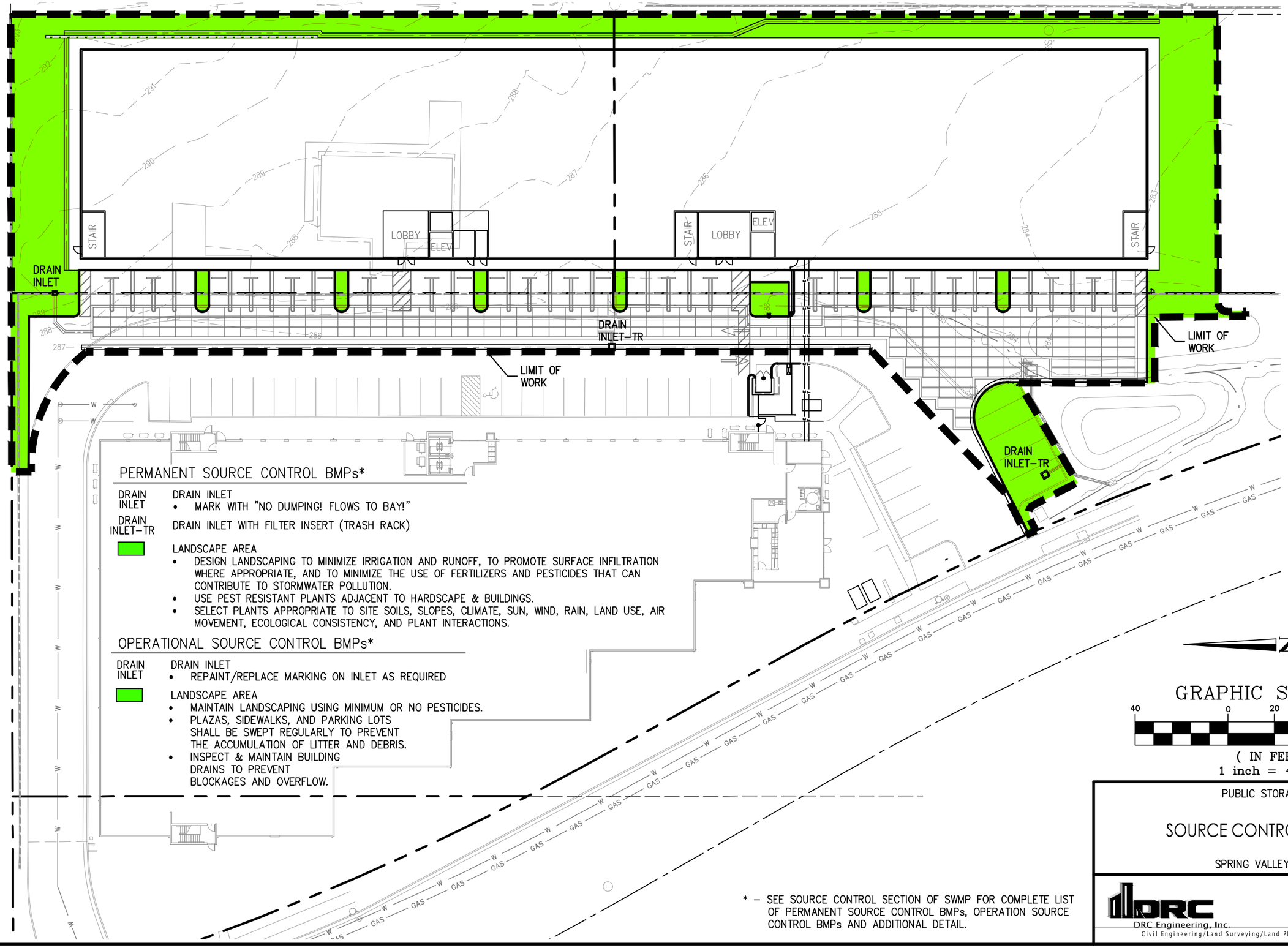
ATTACHMENT A

Project Location Map



ATTACHMENT B

Source Control Exhibit



PERMANENT SOURCE CONTROL BMPs*

DRAIN INLET — DRAIN INLET
- MARK WITH "NO DUMPING! FLOWS TO BAY!"

DRAIN INLET-TR — DRAIN INLET WITH FILTER INSERT (TRASH RACK)

LANDSCAPE AREA
- 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.
- USE PEST RESISTANT PLANTS ADJACENT TO HARDSCAPE & BUILDINGS.
- SELECT PLANTS APPROPRIATE TO SITE SOILS, SLOPES, CLIMATE, SUN, WIND, RAIN, LAND USE, AIR MOVEMENT, ECOLOGICAL CONSISTENCY, AND PLANT INTERACTIONS.

OPERATIONAL SOURCE CONTROL BMPs*

DRAIN INLET — DRAIN INLET
- REPAINT/REPLACE MARKING ON INLET AS REQUIRED

LANDSCAPE AREA
- MAINTAIN LANDSCAPING USING MINIMUM OR NO PESTICIDES.
- PLAZAS, SIDEWALKS, AND PARKING LOTS SHALL BE SWEPT REGULARLY TO PREVENT THE ACCUMULATION OF LITTER AND DEBRIS.
- INSPECT & MAINTAIN BUILDING DRAINS TO PREVENT BLOCKAGES AND OVERFLOW.

* – SEE SOURCE CONTROL SECTION OF SWMP FOR COMPLETE LIST OF PERMANENT SOURCE CONTROL BMPs, OPERATION SOURCE CONTROL BMPs AND ADDITIONAL DETAIL.

PUBLIC STORAGE

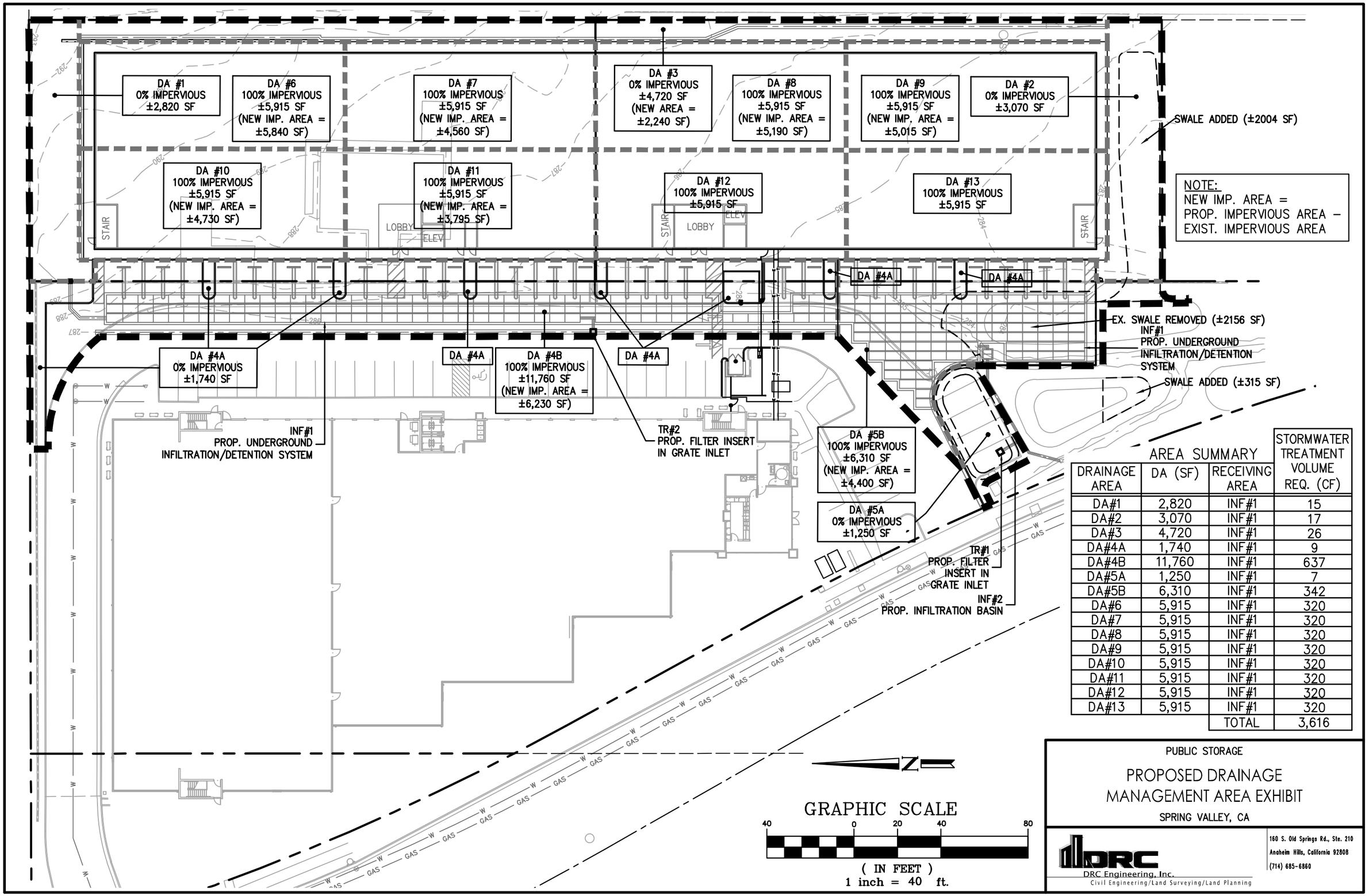
SOURCE CONTROL EXHIBIT

SPRING VALLEY, CA

DRC Engineering, Inc.
Civil Engineering/Land Surveying/Land Planning
160 S. Old Springs Rd., Ste. 210
Anaheim Hills, California 92808
(714) 685-6860

ATTACHMENT C

Drainage Management Area (DMA) Exhibit



AREA SUMMARY

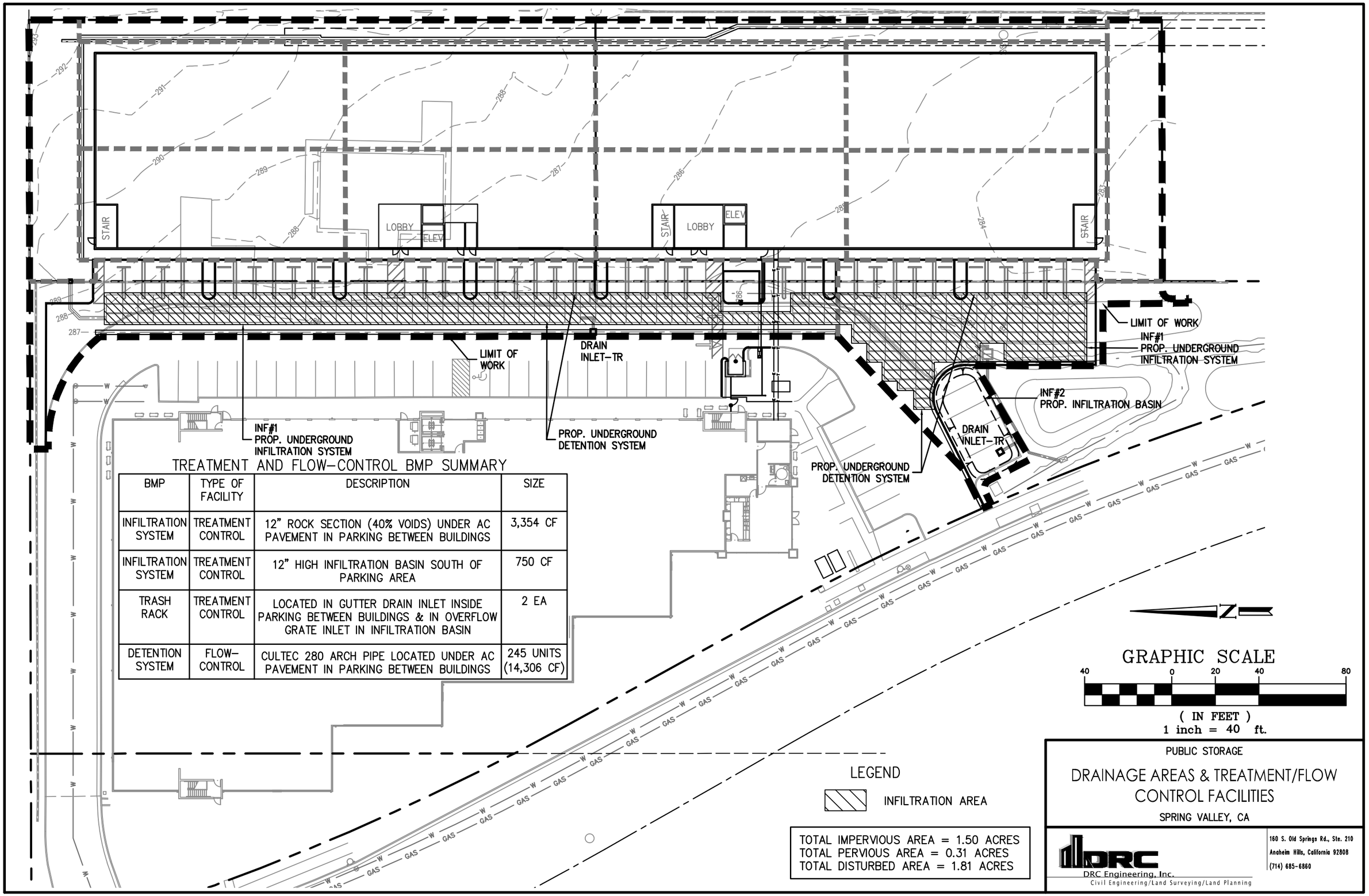
DRAINAGE AREA	DA (SF)	RECEIVING AREA	STORMWATER TREATMENT VOLUME REQ. (CF)
DA#1	2,820	INF#1	15
DA#2	3,070	INF#1	17
DA#3	4,720	INF#1	26
DA#4A	1,740	INF#1	9
DA#4B	11,760	INF#1	637
DA#5A	1,250	INF#1	7
DA#5B	6,310	INF#1	342
DA#6	5,915	INF#1	320
DA#7	5,915	INF#1	320
DA#8	5,915	INF#1	320
DA#9	5,915	INF#1	320
DA#10	5,915	INF#1	320
DA#11	5,915	INF#1	320
DA#12	5,915	INF#1	320
DA#13	5,915	INF#1	320
		TOTAL	3,616

PUBLIC STORAGE

PROPOSED DRAINAGE MANAGEMENT AREA EXHIBIT

SPRING VALLEY, CA

DRC Engineering, Inc.
Civil Engineering/Land Surveying/Land Planning
160 S. Old Springs Rd., Ste. 210
Anaheim Hills, California 92808
(714) 685-6860



TREATMENT AND FLOW-CONTROL BMP SUMMARY

BMP	TYPE OF FACILITY	DESCRIPTION	SIZE
INFILTRATION SYSTEM	TREATMENT CONTROL	12" ROCK SECTION (40% VOIDS) UNDER AC PAVEMENT IN PARKING BETWEEN BUILDINGS	3,354 CF
INFILTRATION SYSTEM	TREATMENT CONTROL	12" HIGH INFILTRATION BASIN SOUTH OF PARKING AREA	750 CF
TRASH RACK	TREATMENT CONTROL	LOCATED IN GUTTER DRAIN INLET INSIDE PARKING BETWEEN BUILDINGS & IN OVERFLOW GRATE INLET IN INFILTRATION BASIN	2 EA
DETENTION SYSTEM	FLOW-CONTROL	CULTEC 280 ARCH PIPE LOCATED UNDER AC PAVEMENT IN PARKING BETWEEN BUILDINGS	245 UNITS (14,306 CF)

ATTACHMENT D

Sizing Design Calculations and TCBMP/LID Design Details

(Provide BMP Sizing Calculator results and/or continuous simulation modeling results, if applicable)

► STEP 6: CALCULATE MINIMUM AREA AND VOLUME OF EACH IMP

A. FOR "WATER QUALITY TREATMENT ONLY"

The minimum area of bioretention facilities and flow-through planters is found by summing up the contributions of each tributary DMA and multiplying by the adjusted sizing factor for the IMP. Note that if the IMP is designed to provide hydromodification flow control, then sizing factors from Tables 4-8 through 4-12 should be used in lieu of the "water quality only" sizing factors presented in Table 4-6.

Equation 4-7

$$Min.\,IMP\,Area = \sum \begin{pmatrix} DMA & DMA \\ Square & \times Runoff \\ Footage & Factor \end{pmatrix} \times \begin{pmatrix} IMP \\ Sizing \\ Factor \end{pmatrix}$$

DMA = Drainage Management Area

IMP = Integrated Management Practice

Use the format of Table 4-7 to present the calculations of the required minimum area and volumes for bioretention areas and planter boxes:

TABLE 4-7. Format for presenting calculations of minimum IMP Areas for bioretention areas and planter boxes.

DMA Name	*DMA Area (square feet)*	*Post-project surface type*	*DMA Runoff factor*	*DMA Area × runoff factor*	*Soil Type:*	*IMP Name*			
					IMP Sizing factor		*Minimum Area*	*Proposed Area*	
			Total		***0.04***				***IMP Area***

To size dry wells, infiltration basins, or infiltration trenches for the "water quality treatment only" option, use the following procedure:

1. Use the County of San Diego's 85th Percentile Isopluvial Map to determine the minimum unit volume.

2. Determine the weighted runoff factor ("C" factor) for the area tributary to the facility. The factors in Table 4-2 may be used.

3. Multiply the weighted runoff factor times the tributary area times the minimum unit volume.

Equation 4-8

$$Volume = [Tributary\ Area] \times [weighted\ runoff\ \ factor] \times [unit\ volume]$$

4. Select a facility depth.

5. Determine the required facility area. Dry wells may be designed as an open vault or with rock fill. If rock fill is used, assume a porosity of 40%.

6. Ensure the facility can infiltrate the entire volume within 96 hours.

To size a cistern or vault in series with a bioretention facility:

1. Use Equation 4-8 to calculate the required cistern or vault volume.

2. Design a discharge orifice for a drawdown time of 24 hours.

3. Determine the maximum discharge from the orifice.

4. The minimum area of the bioretention facility must treat this flow based on a percolation rate of 5" per hour through the engineered soil.

B. FOR "WATER QUALITY TREATMENT AND HYDROMODIFICATON"

Tables 4-8 through 4-12 summarize sizing factors that may be used to provide minimum sizing criteria for IMP facilities. Sizing factors detailed in the tables represent minimum surface area and volumetric sizing factors which would be required to meet both the 85th percentile water quality treatment and hydromodification flow control criteria.

To use the sizing factor approach, Drainage Management Area (DMAs) are initially delineated to quantify all areas draining to an IMP. DMAs are defined as areas with a unique combination of soil type and slope type and multiple DMAs can drain to an IMP facility. Post-project surface cover conditions are quantified for each DMA using the surface cover coefficient in Table 4-2. Often times, impervious DMAs (with a high runoff coefficient) and pervious DMAs (with a low runoff coefficient) both drain to the same IMP. In addition, alternate surface cover conditions such as porous pavement require definition with a separate surface cover coefficient.

The minimum area of the IMP facility is determined by summing the products of each DMA area and surface cover coefficient draining to the IMP and then multiplying by the applicable

sizing factor (based on rain gauge, soil type, slope, low flow threshold, and IMP type and summarized in Tables 4-8 through 4-12).

This approach assumes the DMA pre-project cover is pervious and that development results in no significant diversion of drainage area as compared to the pre-project condition. For this approach to work for a project containing existing impervious area, the new impervious areas must be separated from the existing impervious area and drained to an IMP facility designed to treat the new impervious area only.

C. STORAGE VOLUME REQUIREMENTS FOR FLOOD CONTROL, WATER QUALITY AND HYDROMODIFICATION FACILITIES

1. If facility is sized for hydromodification only:

   10 Year Water Surface Elevation (WSEL) with orifice at outlet structure to meet lower flow threshold per hydromodification requirements.

2. If facility is sized for water quality only:

   Water quality volume is equivalent to the 85% percentile 24-hour event.

3. If facility is sized for flood control only:

   100 year flood frequency {note it is unlikely that new facilities would be sized to only satisfy flood control purposes. In addition certain jurisdictions require flood control for other frequencies (5, 10, 25, & 50 year flood) besides the 100. In those cases the outlet structure should be designed to detain other frequencies as well}.

4. If facility is sized for hydromodification and water quality:

   Must meet both 1 (size to meet 10 year WSEL & hydromodification outlet structure) and 2 (WQ volume).

5. If facility is sized for hydromodification and flood control:

   Must meet both 1 (size to meet 10 year WSEL & hydromodification outlet structure) and 3 (100 year flood frequency).

6. If facility is sized for water quality and flood control:

   Volume equal to 2 (85% water quality volume) plus the 3 (100 year flood frequency).

7. If facility is sized for flood control, water quality & hydromodification:

Infiltration Trenches and Infiltration Basins

The typical infiltration trench is a prefabricated structure, such as an open-bottomed vault or box, placed in an excavation or boring. The vault may be empty, which provides maximum space efficiency, or may be filled in rock.

An infiltration basin has the same functional components—a volume to store runoff and sufficient area to infiltrate that volume into the native soil—but is open rather than covered.

► CRITERIA

Infiltration trenches and infiltration basins must be designed with the minimum volume calculated by Equation 4-8 using a unit volume based on the County of San Diego's 85th Percentile Isopluvial Map.

Consult with the local jurisdiction engineer regarding the need to verify soil permeability and other site conditions are suitable for infiltration trenches and infiltration basins. Some proposed criteria are on Page 5-12 of Caltrans' 2004 *BMP Retrofit Pilot Study Final Report* (CTSW-RT-01-050).

The infiltration rate and infiltrative area must be sufficient to drain a full facility within 96 hours.

► DETAILS

Infiltration trenches should be sited to allow for the potential future need for removal and replacement.

In locations where native soils are coarser than a medium sand, the area directly beneath the facility should be over-excavated by two feet and backfilled with sand as a groundwater protection measure.

Best Uses

- Alternative to bioretention in areas with permeable soils

Advantages

- Compact footprint
- Can be installed in paved areas

Limitations

- Can be used only on sites with "A" and "B" soils
- Requires minimum of 10' from bottom of facility to seasonal high groundwater
- Not suitable for drainage from some industrial areas or arterial roads
- Must be maintained to prevent clogging.

Design Checklist for Infiltration trench

- ❒ Volume and infiltrative area meet or exceed minimum.
- ❒ Overflow connected to a downstream storm drain or approved discharge point.
- ❒ Emergency spillage will be safely conveyed overland.
- ❒ Depth from bottom of the facility to seasonally high groundwater elevation is ≥10'.
- ❒ Areas tributary to the facility do not include automotive repair shops; car washes; fleet storage areas (Bus, truck, etc.); nurseries, or other uses that may present an exceptional threat to groundwater quality.
- ❒ Underlying soils are in Hydrologic Soil Group A or B. Infiltration rate is sufficient to ensure a full basin will drain completely within 96 hours. Soil infiltration rate has been confirmed.
- ❒ Set back from structures 10' or as recommended by structural or geotechnical engineer

Water Quality Only

DMA Name	Drainage Area	Surface Type	Weighed Runoff Factor	Unit Volume	Required Infiltration Volume (CF)
DA 1	2,820	Landscape	0.1	0.05417	15
DA 2	3,070	Landscape	0.1	0.05417	17
DA 3	4,720	Landscape	0.1	0.05417	26
DA 4A	1,740	Landscape	0.1	0.05417	9
DA 4B	11,760	Asphalt	1.0	0.05417	637
DA 5A	1,250	Landscape	0.1	0.05417	7
DA 5B	6,310	Asphalt	1.0	0.05417	342
DA 6	5,915	Roof	1.0	0.05417	320
DA 7	5,915	Roof	1.0	0.05417	320
DA 8	5,915	Roof	1.0	0.05417	320
DA 9	5,915	Roof	1.0	0.05417	320
DA 10	5,915	Roof	1.0	0.05417	320
DA 11	5,915	Roof	1.0	0.05417	320
DA 12	5,915	Roof	1.0	0.05417	320
DA 13	5,915	Roof	1.0	0.05417	320

Totals:	78,990	**Total Required Infiltration Volume (CF):**	3,616

BMP Sizing Spreadsheet V1.04			
Project Name:	Public Storage Spring Valley	Hydrologic Unit:	Sweetwater
Project Applicant:	DRC Engineering	Rain Gauge:	Oceanside
Jurisdiction:	San Diego County	Total Project Area:	78990
Parcel (APN):		Low Flow Threshold:	0.3Q2
BMP Name:	IMP 1	BMP Type:	Bioretention Plus Vault
BMP Native Soil Type:	D	BMP Infiltration Rate (in/hr):	0.024

Areas Draining to BMP						HMP Sizing Factors			Minimum BMP Size		
DMA Name	Area (sf)	Soil Type	Slope	Post Project Surface Type	Runoff Factor (Table 4-2)	Bioretention Surface Area	Vault Volume	N/A	Bioretention Surface Area (sf)	Vault Volume (cf)	N/A
DA 1	2820	D	Flat	Landscape	0.1	0.04	0.14	N/A	11	39	N/A
DA 2	3070	D	Flat	Landscape	0.1	0.04	0.14	N/A	12	43	N/A
DA 3	2240	D	Flat	Landscape	0.1	0.04	0.14	N/A	9	31	N/A
DA 4A	1740	D	Flat	Landscape	0.1	0.04	0.14	N/A	7	24	N/A
DA 4B	6230	D	Flat	Asphalt	1.0	0.04	0.14	N/A	249	872	N/A
DA 5A	1250	D	Flat	Landscape	0.1	0.04	0.14	N/A	5	18	N/A
DA 5B	4400	D	Flat	Asphalt	1.0	0.04	0.14	N/A	176	616	N/A
DA 6	5840	D	Flat	Roof	1.0	0.04	0.14	N/A	234	818	N/A
DA 7	4560	D	Flat	Roof	1.0	0.04	0.14	N/A	182	638	N/A
DA 8	5190	D	Flat	Roof	1.0	0.04	0.14	N/A	208	727	N/A
DA 9	5015	D	Flat	Roof	1.0	0.04	0.14	N/A	201	702	N/A
DA 10	4730	D	Flat	Roof	1.0	0.04	0.14	N/A	189	662	N/A
DA 11	3795	D	Flat	Roof	1.0	0.04	0.14	N/A	152	531	N/A
DA 12	5915	D	Flat	Roof	1.0	0.04	0.14	N/A	237	828	N/A
DA 13	5915	D	Flat	Roof	1.0	0.04	0.14	N/A	237	828	N/A
Total BMP Area	62710							Minimum BMP Size	2108.08	7378	
								Proposed BMP Size*		N/A	N/A
										18.00	in
								Minimum Vault Depth		N/A	in
								Maximum Vault Depth		N/A	in
								Selected Vault Depth		6.00	in
								Selected Vault Volume			cubic feet

STORMWATER TREATMENT
VOLUME REQUIRED = 3,616 CF FROM SEPARATE
CALCULATION PER COUNTY SUSMP CHAPTER 4

HYDROMODIFICATION
VOLUME REQUIRED (CF)

Describe the BMP's in sufficient detail in your SWMP to demonstrate the area, volume, and other criteria can be met within the constraints of the site.

BMP's must be adapted and applied to the conditions specific to the development project such as unstable slopes or the lack of available head.
Designated Staff have final review and approval authority over the project design.

This Sizing Calculator has been developed in compliance with the Countywide Model SUSMP. For questions or concerns please contact the jurisdiction in which your project is located.

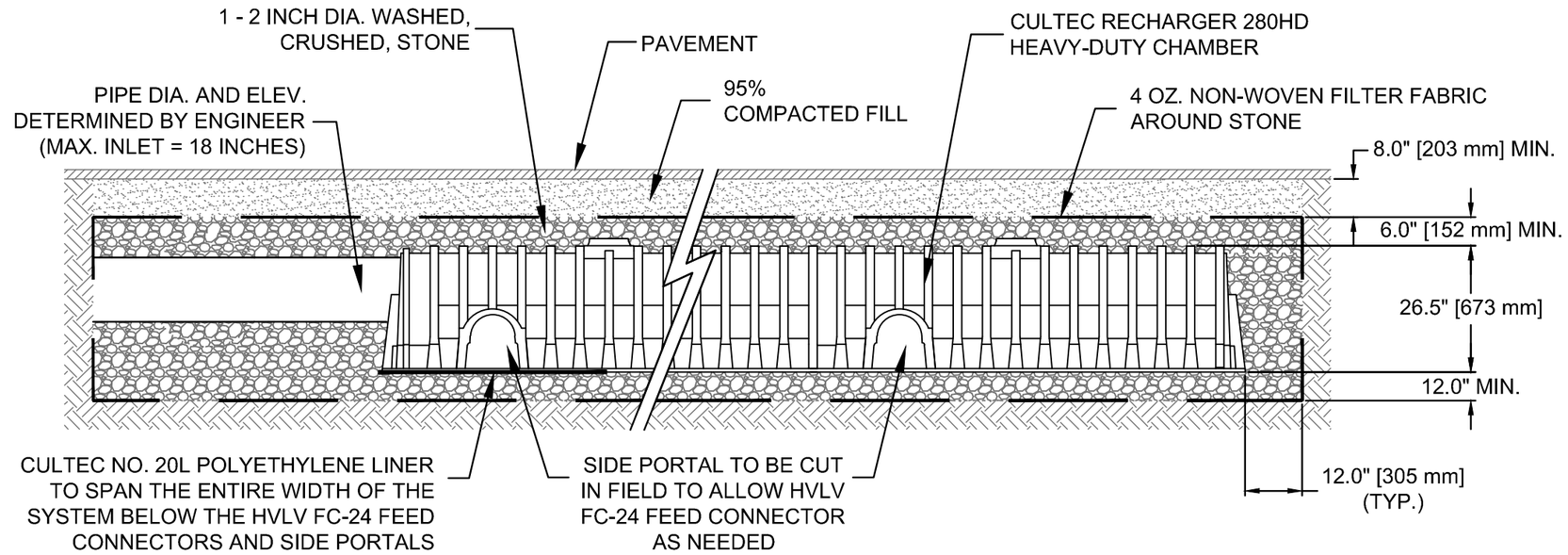
BMP Sizing Spreadsheet V1.04			
Project Name:	ublic Storage Spring Vall	Hydrologic Unit:	Sweetwater
Project Applicant:	DRC Engineering	Rain Gauge:	Oceanside
Jurisdiction:	San Diego County	Total Project Area:	78990
Parcel (APN):		Low Flow Threshold:	0.3Q2
BMP Name	IMP 1	BMP Type:	Bioretention Plus Vault

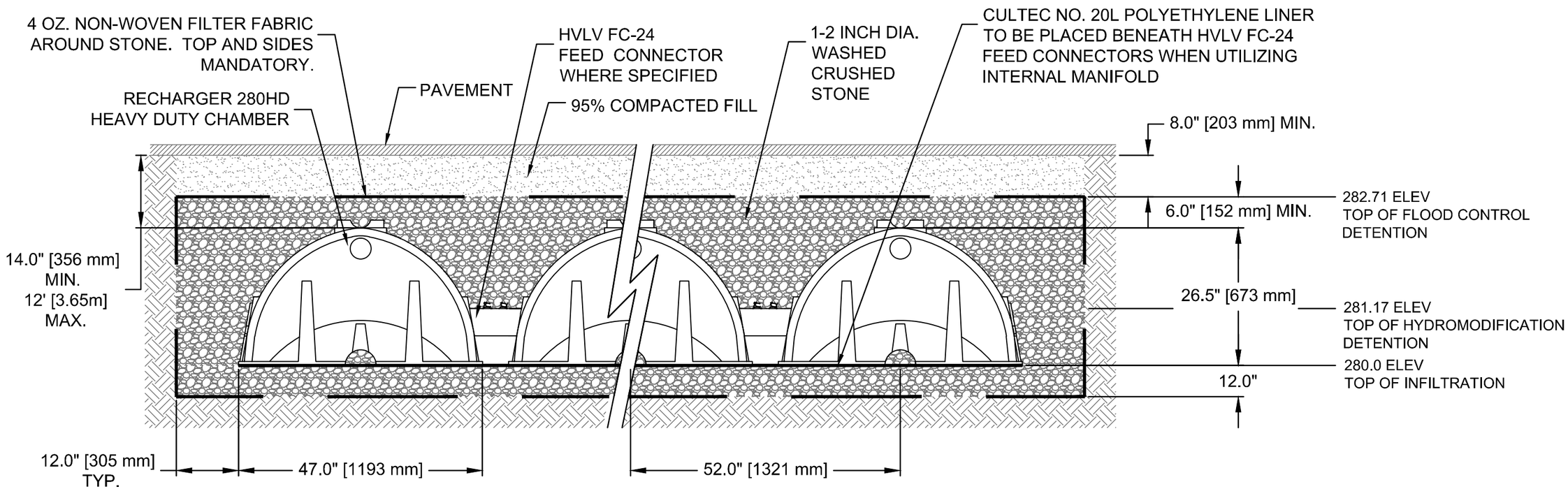
DMA Name	Rain Gauge	Existing Condition			Q2 Sizing Factor (cfs/ac)	DMA Area (ac)	Orifice Flow - $\%Q_2$ (cfs)	**Orifice Area (in2)**
		Soil Type	Cover	Slope				
DA 1	Oceanside	D	Scrub	Flat	0.175	0.065	0.003	**0.16**
DA 2	Oceanside	D	Scrub	Flat	0.175	0.070	0.004	**0.17**
DA 3	Oceanside	D	Scrub	Flat	0.175	0.051	0.003	**0.13**
DA 4A	Oceanside	D	Scrub	Flat	0.175	0.040	0.002	**0.10**
DA 4B	Oceanside	D	Urban	Flat		0.143		
DA 5A	Oceanside	D	Scrub	Flat	0.175	0.029	0.002	**0.07**
DA 5B	Oceanside	D	Urban	Flat		0.101		
DA 6	Oceanside	D	Urban	Flat		0.134		
DA 7	Oceanside	D	Urban	Flat		0.105		
DA 8	Oceanside	D	Urban	Flat		0.119		
DA 9	Oceanside	D	Urban	Flat		0.115		
DA 10	Oceanside	D	Urban	Flat		0.109		
DA 11	Oceanside	D	Urban	Flat		0.087		
DA 12	Oceanside	D	Urban	Flat		0.136		
DA 13	Oceanside	D	Urban	Flat		0.136		

0.013	**0.63**	**0.90**
Tot. Allowable Orifice Flow (cfs)	**Tot. Allowable Orifice Area (in2)**	**Max Orifice Diameter (in)**

0.010	**0.44**	**0.75**
Actual Orifice Flow (cfs)	Actual Orifice Area (in2)	Selected Orifice Diameter (in)

Drawdown (Hrs)	





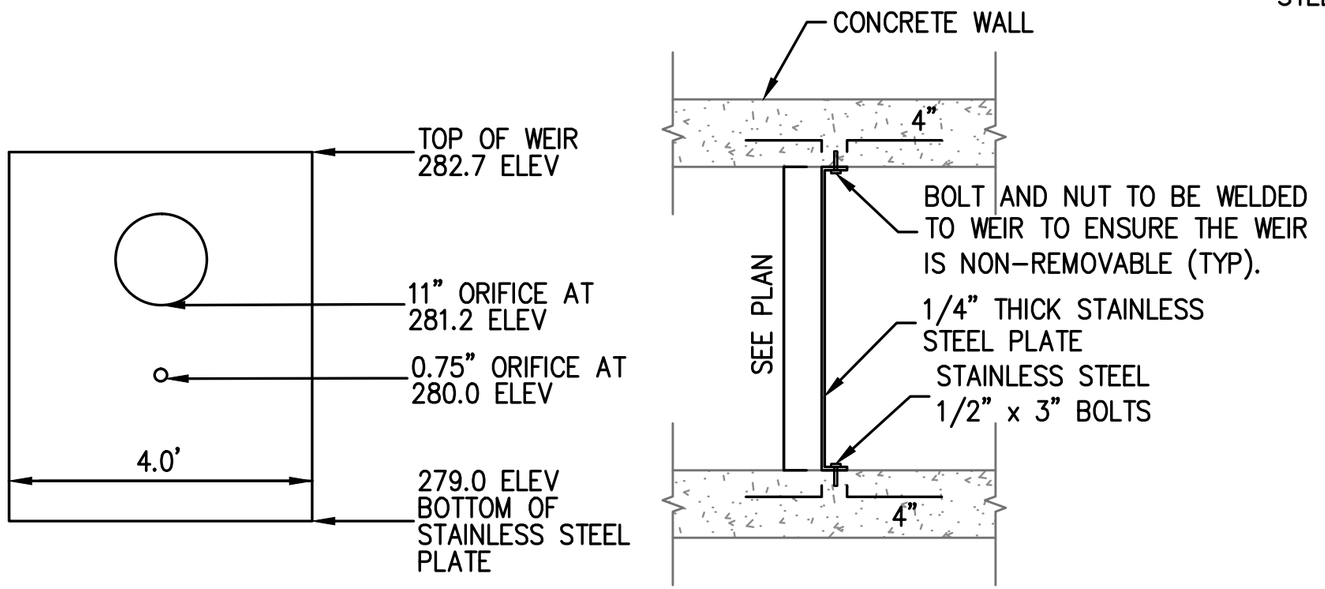
GENERAL NOTES

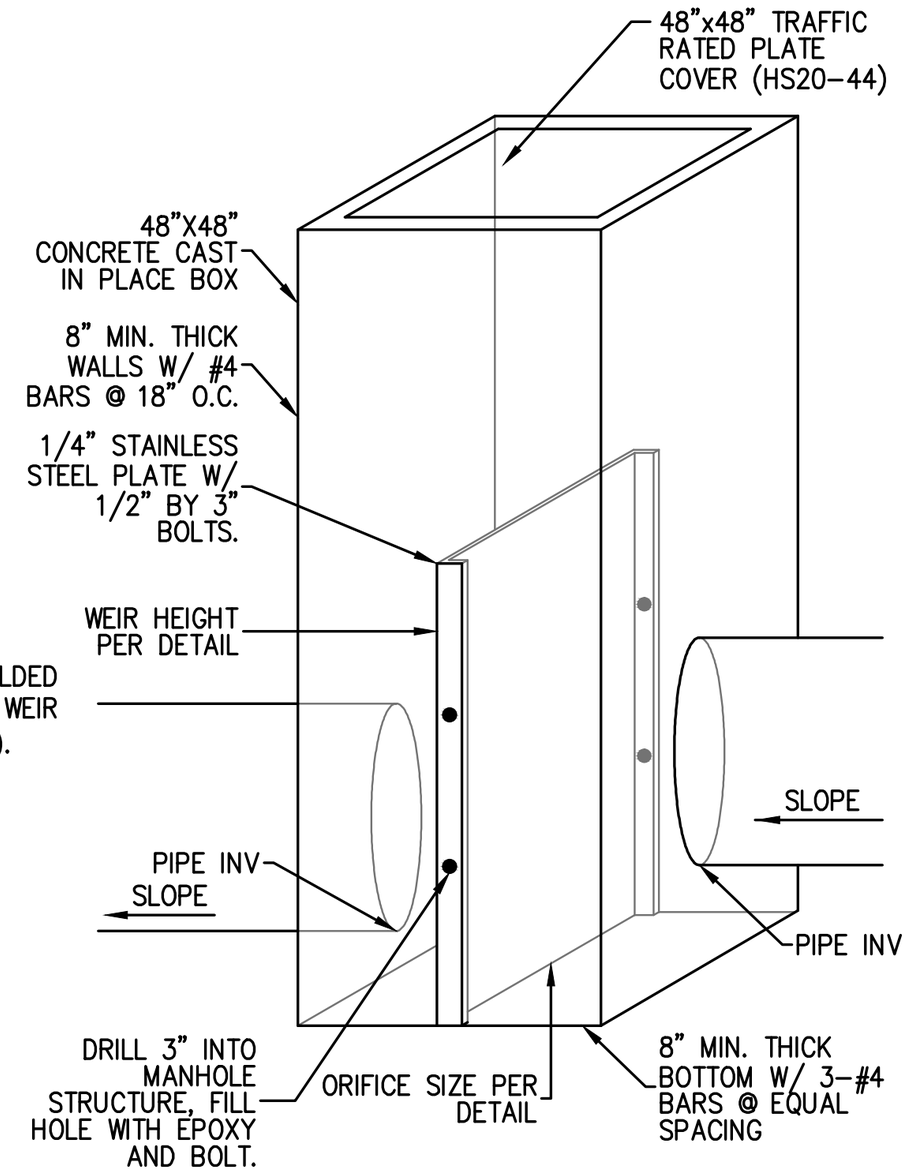
RECHARGER 280HD BY CULTEC, INC. OF BROOKFIELD, CT.
STORAGE PROVIDED = 9.2 CF/FT PER DESIGN UNIT.
REFER TO CULTEC, INC.'S CURRENT RECOMMENDED INSTALLATION GUIDELINES.

MAXIMUM ALLOWED COVER OVER TOP OF UNIT SHALL BE 12' (3.65m)
THE CHAMBER WILL BE DESIGNED TO WITHSTAND TRAFFIC LOADS WHEN INSTALLED ACCORDING TO CULTEC'S RECOMMENDED INSTALLATION INSTRUCTIONS.

ALL RECHARGER 280HD HEAVY DUTY UNITS ARE MARKED WITH A COLOR STRIPE FORMED INTO THE PART ALONG THE LENGTH OF THE CHAMBER.
ALL RECHARGER 280HD CHAMBERS MUST BE INSTALLED IN ACCORDANCE WITH ALL APPLICABLE LOCAL, STATE AND FEDERAL REGULATIONS.

UNDERGROUND INFILTRATION/DETENTION PIPE DETAILS





STORM DRAIN MANHOLE DETAILS

PRELIMINARY
HYDROLOGY AND HYDRAULICS REPORT

For:

PUBLIC STORAGE SPRING VALLEY

1247 Sweetwater Road
Spring Valley, CA 91977

Prepared for:

Public Storage, Inc.
701 Western Avenue
Glendale, CA 91201

Lead Agency:

County of San Diego
Department of Public Works
5201 Ruffin Road, Suite D
San Diego, CA 92123

Prepared by:

DRC Engineering, Inc.
160 South Old Springs Road, Suite 210
Anaheim Hills, CA 92808
(714) 685-6860
Chris Mckee, P.E.

DECLARATION OF RESPONSIBLE CHARGE

I HERBY DECLARE THAT I AM THE ENGINEER OF WORK FOR THIS PROJECT. THAT I HAVE EXERCISED RESPONSIBLE CHARGE OVER THE DESIGN OF THE PROJECT AS DEFINED IN SECTION 6703 OF THE BUSINESS AND PROFESSIONS CODE, AND THAT THE DESIGN IS CONSISTENT WITH CURRENT STANDARDS.

I UNDERSTAND THAT THE CHECK OF PROJECT DRAWINGS AND SPECIFICATIONS BY THE CITY OF SAN DIEGO IS CONFINED TO A REVIEW ONLY AND DOES NOT RELIEVE ME, AS ENGINEER OF WORK, OF MY RESPONSIBILITIES FOR PROJECT DESIGN.

2/2/15

CHRIS MCKEE R.C.E. 74414 DATE

REGISTERED PROFESSIONAL ENGINEER
CHRISTOPHER McKEE
No. 74414
Exp. 9-30-15
CIVIL
STATE OF CALIFORNIA

November 3, 2014

DRC Project No. 14-545

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- Cultec Recharger 280 Storage Volumes
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- San Diego County 100-Year Storm Hydrograph
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- Hydroflow Hydrograph Calculations
- Cultec Recharger 280 Storage Volumes
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SECTION I

Introduction

The proposed project is located on approximately 3.93 acres of partially developed land at the northeast corner of Sweetwater Road and Jamacha Road in the City of Spring Valley, County of San Diego, California. The project will include the demolition of existing residential building and shed and existing driveway as well as the grading and construction of a new commercial development and associated parking lot expansion. This report has been prepared to calculate the pre-construction and post-construction hydrologic conditions for peak storm water runoff rates and time of concentration.

SECTION II

Project Description

Existing Site Conditions: The existing site consists of 3.93 acres of partially developed land that generally drains from the northeast towards the southwest direction. Approximately, 1.81 acres of the project site will be disturbed area. Of the disturbed area, the site is 20% impervious/80% pervious and is developed as existing residential with associated driveway and shed. Site runoff travels by overland surface flow south into a series of lined dirt swales that drain into public catch basins located in Sweetwater Road and Jamacha Road. See Existing Hydrology Map in Appendix B for illustration of existing site conditions.

Proposed Site Development: The proposed site consists of the removal of existing residential buildings, removal of driveway, and the construction of commercial development with associated parking lot and landscaping. The proposed improvements will cover 1.81 acres or 46% of the total site. In the proposed condition, the pervious area decreases to 17% of the site. Runoff from the proposed building and parking lot areas will be directed to a series of on-site catch basins or grated inlets. Drainage from the catch basins will flow to an underground infiltration system (Cultec Arch Pipe Chamber System). The underground infiltration system will also be used as storage to detain flows down to the allowable 100-year pre-construction levels. Overflow from the underground infiltration system will drain to the existing catch basin located on Sweetwater Road. See Proposed Hydrology Map in Appendix B for illustration of proposed site conditions. The public storm drain discharges into Sweetwater River which eventually drains into San Diego Bay and then the Pacific Ocean.

SECTION III

Hydrologic Analysis

For the existing and proposed condition, the peak storm discharges for the drainage sub-areas (see Hydrology Maps in Appendix B of this report) were calculated using the San Diego County Hydrology Manual. A soil type of D was used for the project site based on the San Diego County Soils Map (see Appendix B). Soils group D is defined as having high runoff potential. Soils having very slow infiltration rates when thoroughly wetted and consisting of chiefly clay soils with a high swelling potential, soils with a permanent high water table, soils with a claypan or clay layer at or near the surface, and shallow soils over nearly impervious material. These soils have a very slow rate of water transmission. The rational method equation, using AES Software (Ratscx), was used to calculate the existing and proposed 100-year storm event (see calculations in Appendix C). Hydrographs were

modeled using Rick Engineering Rational Hydrograph Program (RickRatHydro). A detention analysis was calculated using Hydraflow Hydrographs Extension version 6.066 for the proposed 100-year storm event (see calculations in Appendix C). The 100-Year 6-hour rainfall was determined to be 2.8" and the 100-Year 24 hour rainfall was determined to be 5.2" per San Diego County Hydrology Manual Isopluvial Maps.

Existing Conditions: The hydrologic analysis for the existing site was performed by analyzing a total of eight drainage areas. The longest existing flow path for each of the drainage areas was selected and an average slope of the path calculated. See the Existing Hydrology Map in Appendix B. The results of the drainage area calculations are located in Appendix B and are summarized in Table A below.

Proposed Conditions: The hydrologic analysis for the proposed site was performed by analyzing four drainage areas. The longest existing flow path for the drainage area was selected and an average slope of the path calculated. See the Proposed Hydrology Map in Appendix B. The results of the drainage area calculations are located in Appendix B and are summarized in Table A below.

TABLE A: 100-YEAR STORM SUMMARY TABLE

	EXISTING	PROPOSED
Flowrate	3.33 cfs	7.36 cfs
Tc	10.86 mins.	8.48 mins.
Volume Required for Hydromod.	___	7,378 cf
Volume Required for Pre vs. Post Detention	___	6,224 cf
Flowrate after Detention	___	3.101 cfs

SECTION IV

Detention Analysis

The proposed site meets all of the requirements to be considered for design to urban flood protection standards. A detention analysis was therefore conducted for the 100 year storm event to ensure that discharge does not exceed the pre-construction 100-year peak flow rate of 3.33 cfs. RickRatHydro was utilized to generate 100-year hydrographs for the proposed drainage areas. Hydroflow Hydrographs used this hydrograph information to generate a peak discharge rate for the proposed storm drain system. A proposed underground infiltration/detention system will be provided with Cultec Arch Pipe Infiltration System located on the south side of the parking lot. The bottom 12" of rock section (40% voids) will be used for infiltration, the bottom 14" of the underground system will be used for detention for hydromodification, while the top 12.5" of pipe plus top 6" of rock section will be used for detention for the difference in 100-year pre versus post construction volumes. The

underground system will include 245 chambers with a 6" thick rock section (40% voids) above, 12" thick rock section (40% voids) below, and 26.5" high arch pipes. A one foot wide band of rock will also surround the underground system. With the proposed detention system, the peak discharge rate for the disturbed area (1.81 acres) will be reduced from 7.36 cfs to 3.10 cfs < 3.33 cfs allowable. The required storage volume for hydromodification is 7,378 cf. The required storage volume for the difference in 100-year pre versus post construction is 6,224 cf. The total storage volume provided is 7,681.86 cf and 6,624.40 cf for a total of 14,306.26 cf. A summary of the detention calculations has been prepared and included in Appendix C.

SECTION V

Conclusions

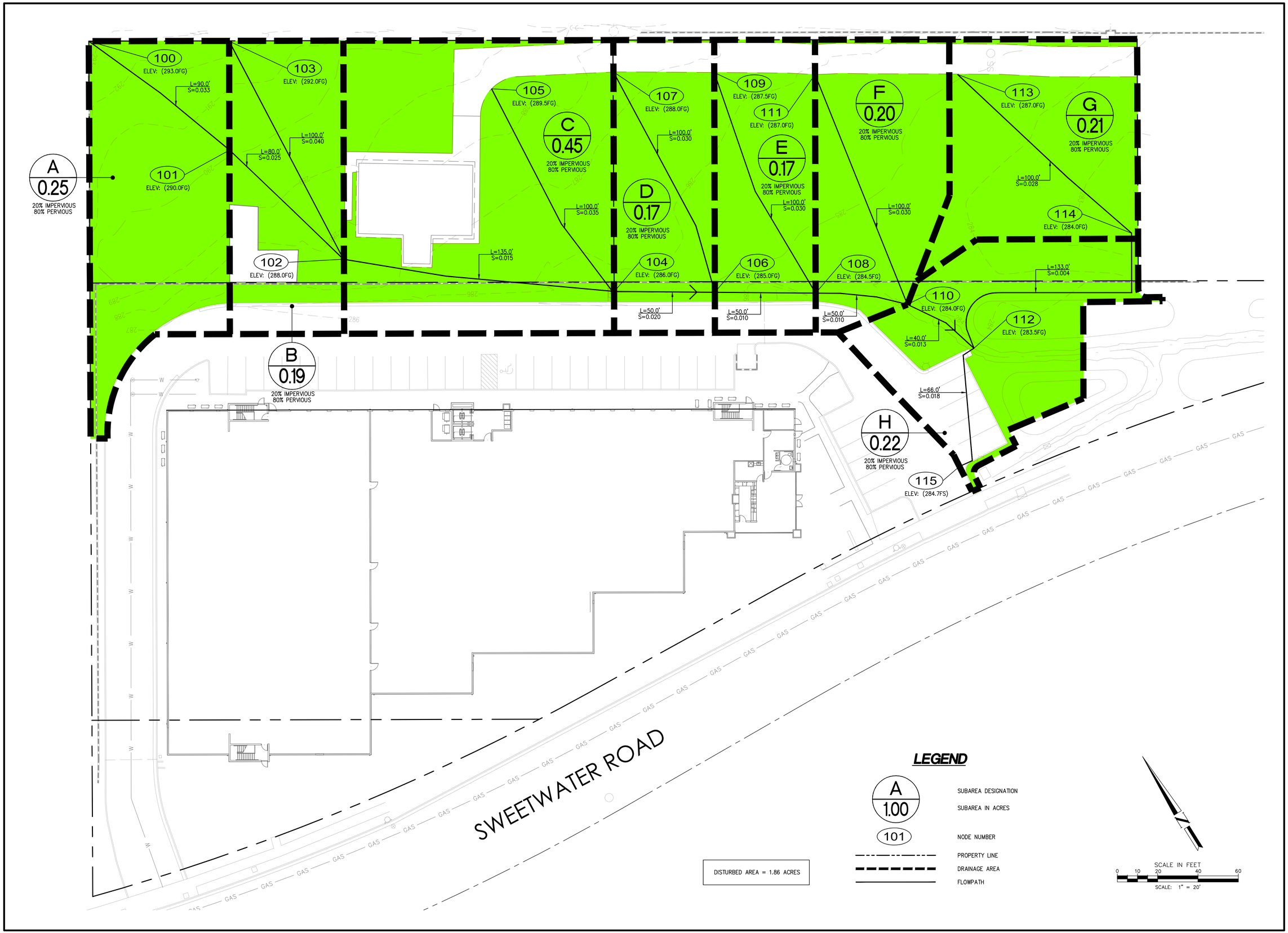
The proposed site is designed to convey the 100-year peak runoff from the site into the public infrastructure without damaging the proposed site or the downstream public facilities. The existing project site discharges stormwater into the public right of way on Sweetwater Road and Jamacha Road. The proposed site will be designed to discharge storm water to the public storm drain on Sweetwater Road. The project will discharge runoff from the site at a rate below the allowable 100-year storm in the existing condition. The site will contain several design systems to ensure that the stormwater is discharge into the public facilities prior to flooding/damaging the proposed buildings or risk damage to any of the adjacent structures.

APPENDIX A

LOCATION MAP

APPENDIX B

Existing Hydrology Map
Proposed Hydrology Map
San Diego County Soils Map
San Diego County Rainfall Maps
San Diego County Isopluvial Maps



160 S. Old Springs Road
Suite 210
Anaheim Hills, CA 92808
714-685-6860
DRC Engineering, Inc.
Civil Engineering/Land Surveying/Land Planning

NOT FOR CONSTRUCTION

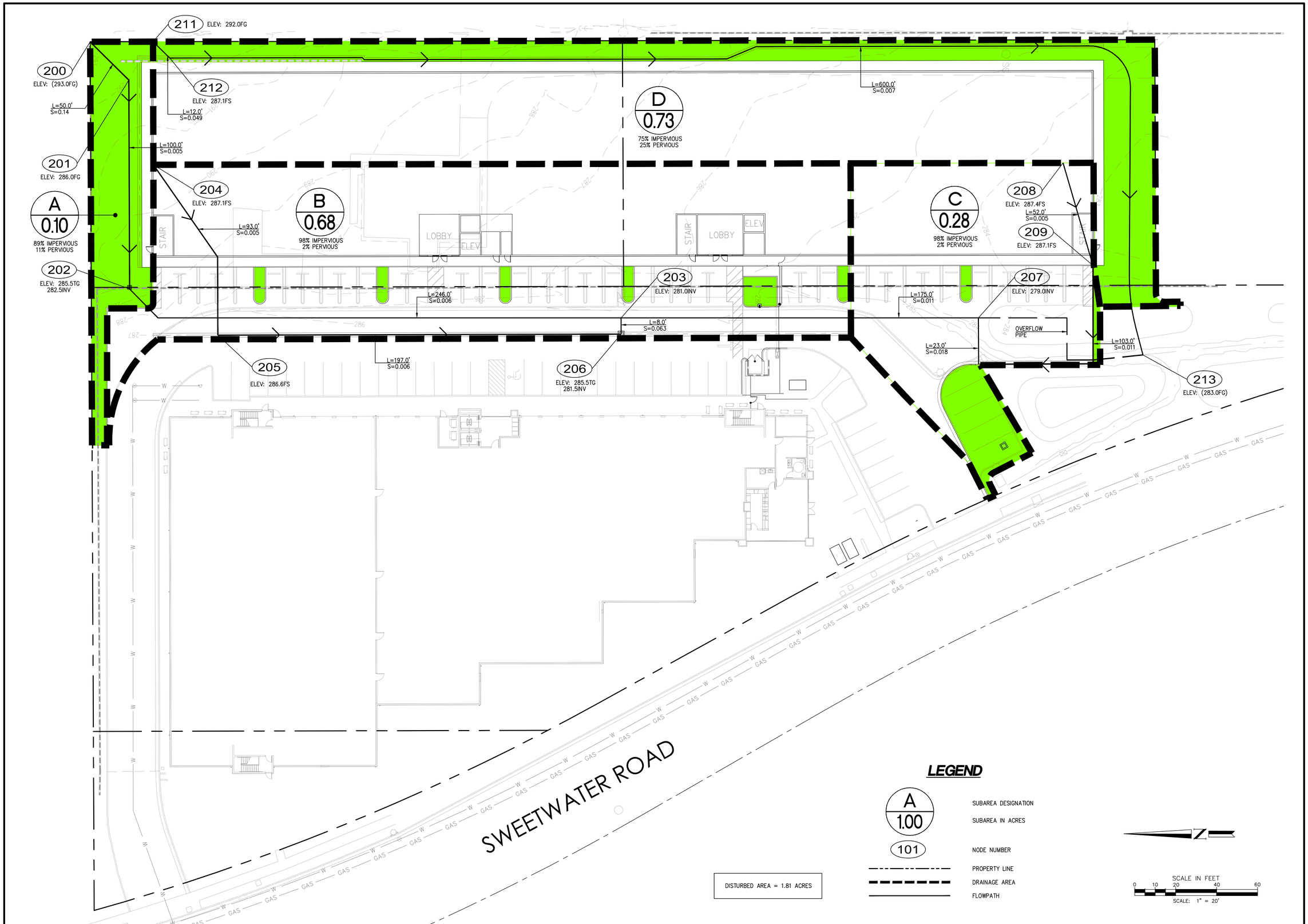
NO.:	REVISION:	DATE:

PROJECT: **PUBLIC STORAGE**
1247 SWEETWATER ROAD
SPRING VALLEY, CALIFORNIA

DRAWING NAME: **EXISTING HYDROLOGY MAP**

ISSUE:	PRELIM
DATE:	10/20/14
CHECKED: CM	DRAWN: LS
DRAWING FILE:	14404HMEX
PROJECT NO.:	14-545
SHEET NUMBER:	1
OF 1	SHEETS
SCALE:	AS SHOWN

EXTERNAL REFERENCES: 14-545 BT 14-545 Brady 15-545 CT
FILNAME: M:\2014\14-545 Public Storage Spring Valley\M\C945 HMEX.dwg LAST SAVED ON: Oct 30, 2014 4:19pm PLOTTED BY: LIANNE ON: Nov 03, 2014 12:24pm CFG:



160 S. Old Springs Road
Suite 210
Anaheim Hills, CA 92808
714-685-6860

DRC Engineering, Inc.
Civil Engineering/Land Surveying/Land Planning

NOT FOR CONSTRUCTION

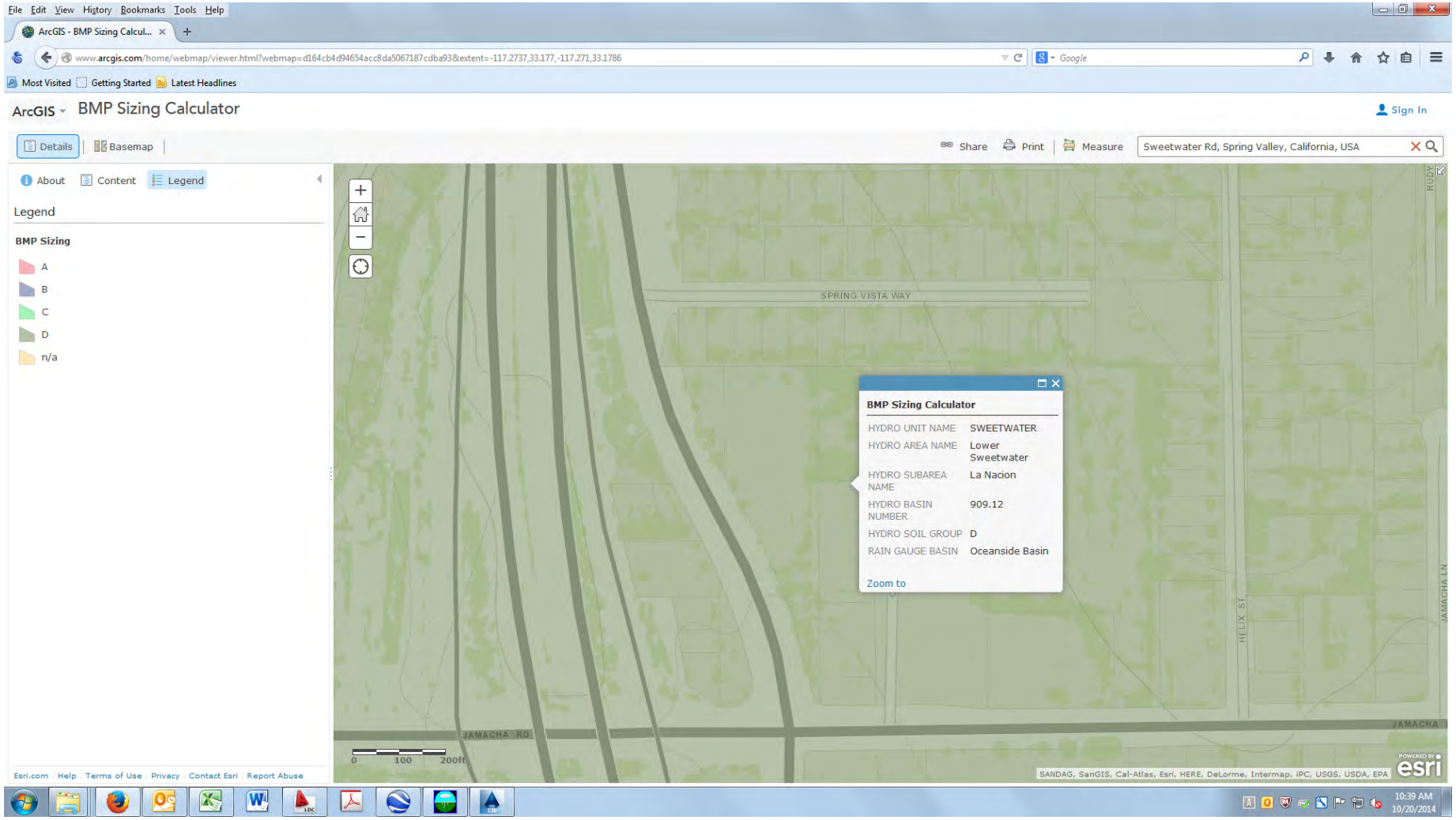
NO.:	REVISION:	DATE:

PROJECT: **PUBLIC STORAGE**
1247 SWEETWATER ROAD
SPRING VALLEY, CALFORNIA

DRAWING NAME: **PROPOSED HYDROLOGY MAP**

ISSUE:	PRELIM
DATE:	03/31/15
CHECKED: CM	DRAWN: LS
DRAWING FILE: 14404HMEX	
PROJECT NO.: 14-545	
SHEET NUMBER: 1 OF 1 SHEETS	
SCALE: AS SHOWN	

EXTERNAL REFERENCES: 14-545 BT 14-545 Brady 15-545 CT 14-545 MA
FILNAME: M:\2014\14-545 Public Storage Spring Valley\M\14545 HMPR.dwg LAST SAVED ON: Mar 28 2015 4:20pm PLOTTED BY: LIANNE ON: Mar 31 2015 12:14pm CFG:

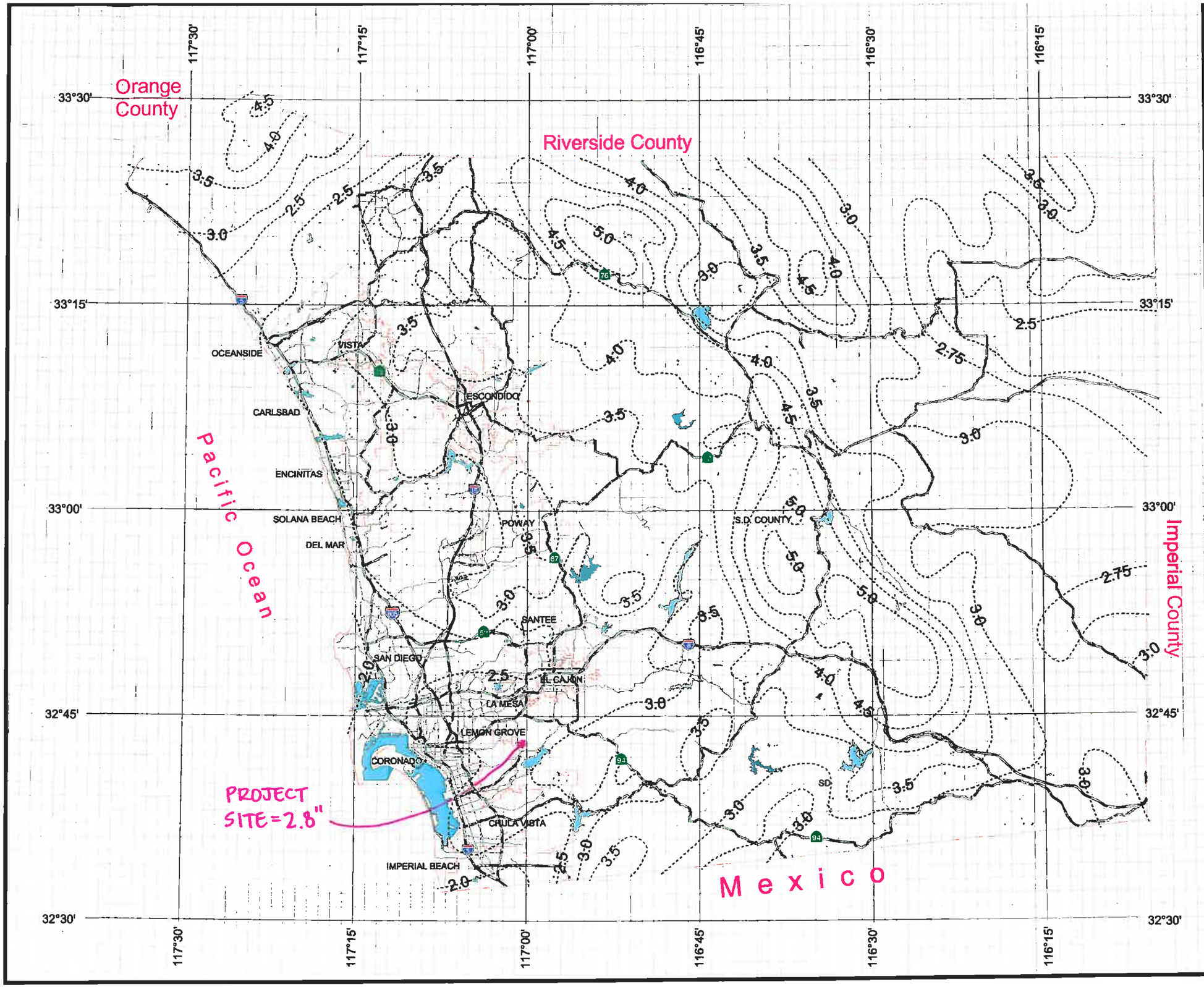

File Edit View History Bookmarks Tools Help
ArcGIS - BMP Sizing Calcul...
www.arcgis.com/home/webmap/viewer.html?webmap=d164cb4d94654acc8da5067187cdba93&extent=-117.2737,33.177,-117.271,33.1786
Most Visited Getting Started Latest Headlines
ArcGIS BMP Sizing Calculator
Sign In
Details Basemap
Share Print Measure
Sweetwater Rd, Spring Valley, California, USA
About Content Legend
Legend
BMP Sizing
A
B
C
D
n/a
SPRING VISTA WAY
JAMACHA RD
HELIX ST
JAMACHA LN
BMP Sizing Calculator
HYDRO UNIT NAME SWEETWATER
HYDRO AREA NAME Lower Sweetwater
HYDRO SUBAREA NAME La Nacion
HYDRO BASIN NUMBER 909.12
HYDRO SOIL GROUP D
RAIN GAUGE BASIN Oceanside Basin
Zoom to
0 100 200ft
SANDAG, SanGIS, Cal-Atlas, Esri, HERE, DeLorme, Intermap, iPC, USGS, USDA, EPA
esri
Esri.com Help Terms of Use Privacy Contact Esri Report Abuse
10:39 AM
10/20/2014

County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 6 Hours

Isopluvial (inches)



DPW GIS
Department of Public Works Geographic Information Services

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N
W E
S

3 0 3 Miles

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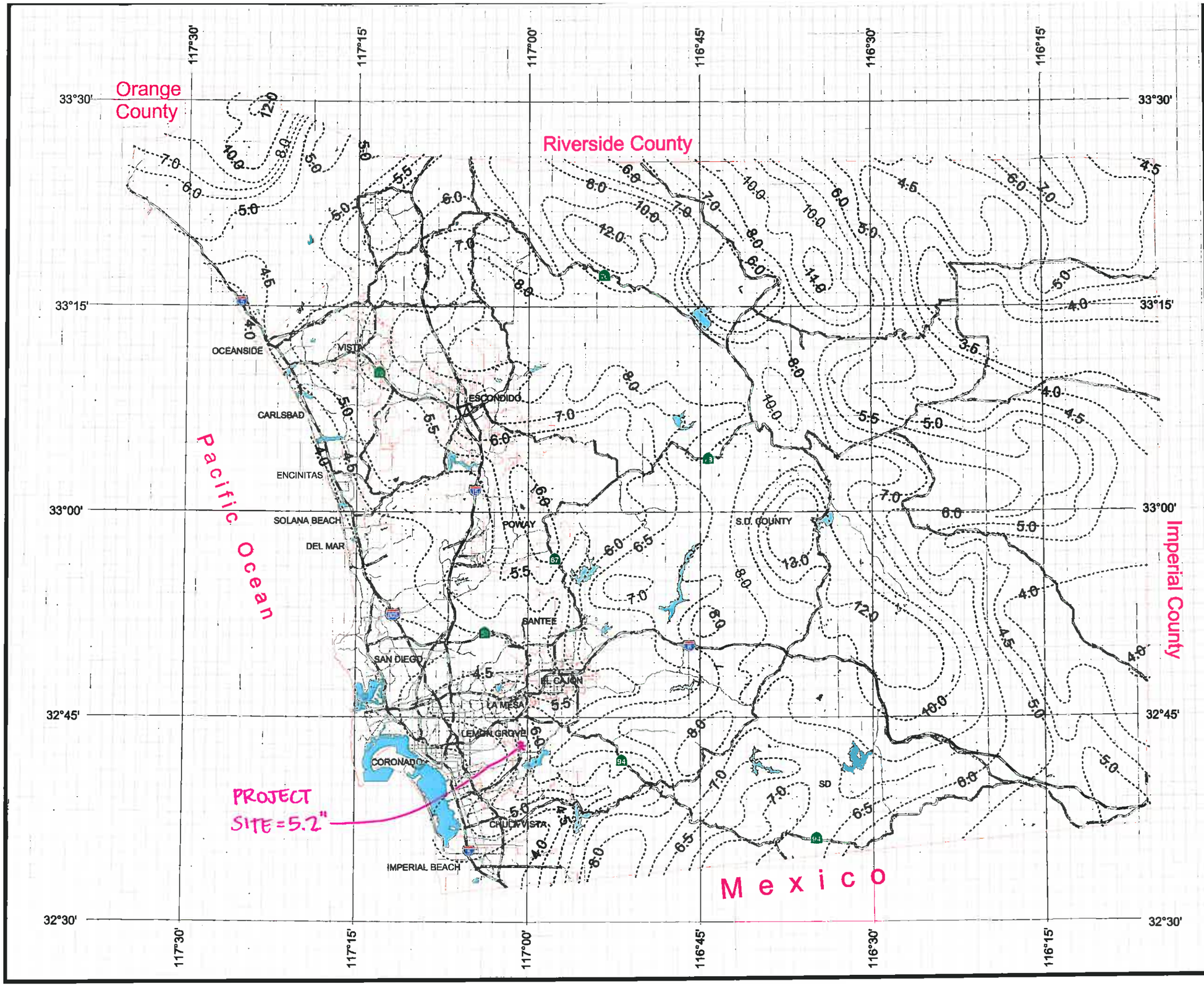
County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 24 Hours

Isopluvial (inches)



DPW GIS
Department of Public Works
Geographic Information Services

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N
W E
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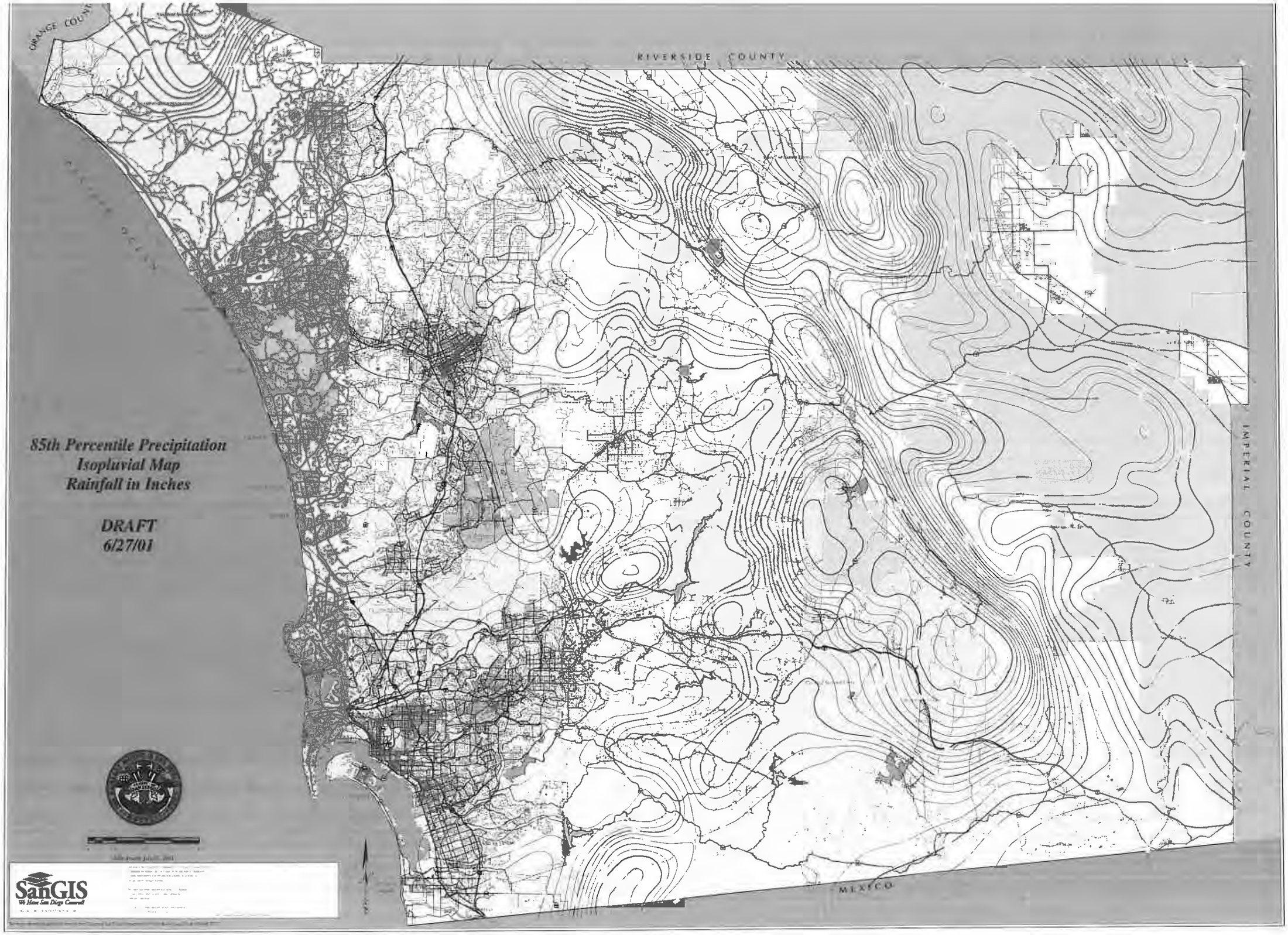
3 0 3 Miles


ORANGE COUNTY
RIVERSIDE COUNTY
IMPERIAL COUNTY
MEXICO
85th Percentile Precipitation
Isopluvial Map
Rainfall in Inches
DRAFT
6/27/01
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PROJECT SITE = 0.65"

APPENDIX C

San Diego County BMP Sizing Spreadsheets
Cultec Recharger 280 Storage Volumes
Detention Analysis Summary

BMP Sizing Spreadsheet V1.04			
Project Name:	Public Storage Spring Valley	Hydrologic Unit:	Sweetwater
Project Applicant:	DRC Engineering	Rain Gauge:	Oceanside
Jurisdiction:	San Diego County	Total Project Area:	78990
Parcel (APN):		Low Flow Threshold:	0.3Q2
BMP Name:	IMP 1	BMP Type:	Bioretention Plus Vault
BMP Native Soil Type:	D	BMP Infiltration Rate (in/hr):	0.024

Areas Draining to BMP						HMP Sizing Factors			Minimum BMP Size		
DMA Name	Area (sf)	Soil Type	Slope	Post Project Surface Type	Runoff Factor (Table 4-2)	Bioretention Surface Area	Vault Volume	N/A	Bioretention Surface Area (sf)	Vault Volume (cf)	N/A
DA 1	2820	D	Flat	Landscape	0.1	0.04	0.14	N/A	11	39	N/A
DA 2	3070	D	Flat	Landscape	0.1	0.04	0.14	N/A	12	43	N/A
DA 3	2240	D	Flat	Landscape	0.1	0.04	0.14	N/A	9	31	N/A
DA 4A	1740	D	Flat	Landscape	0.1	0.04	0.14	N/A	7	24	N/A
DA 4B	6230	D	Flat	Asphalt	1.0	0.04	0.14	N/A	249	872	N/A
DA 5A	1250	D	Flat	Landscape	0.1	0.04	0.14	N/A	5	18	N/A
DA 5B	4400	D	Flat	Asphalt	1.0	0.04	0.14	N/A	176	616	N/A
DA 6	5840	D	Flat	Roof	1.0	0.04	0.14	N/A	234	818	N/A
DA 7	4560	D	Flat	Roof	1.0	0.04	0.14	N/A	182	638	N/A
DA 8	5190	D	Flat	Roof	1.0	0.04	0.14	N/A	208	727	N/A
DA 9	5015	D	Flat	Roof	1.0	0.04	0.14	N/A	201	702	N/A
DA 10	4730	D	Flat	Roof	1.0	0.04	0.14	N/A	189	662	N/A
DA 11	3795	D	Flat	Roof	1.0	0.04	0.14	N/A	152	531	N/A
DA 12	5915	D	Flat	Roof	1.0	0.04	0.14	N/A	237	828	N/A
DA 13	5915	D	Flat	Roof	1.0	0.04	0.14	N/A	237	828	N/A
Total BMP Area	62710							Minimum BMP Size	2108.08	7378	
								Proposed BMP Size*		N/A	N/A
										18.00	in
								Minimum Vault Depth		N/A	in
								Maximum Vault Depth		N/A	in
								Selected Vault Depth		6.00	in
								Selected Vault Volume			cubic feet

STORMWATER TREATMENT
VOLUME REQUIRED = 3,616 CF FROM SEPARATE
CALCULATION PER COUNTY SUSMP CHAPTER 4

HYDROMODIFICATION
VOLUME REQUIRED (CF)

Describe the BMP's in sufficient detail in your SWMP to demonstrate the area, volume, and other criteria can be met within the constraints of the site.

BMP's must be adapted and applied to the conditions specific to the development project such as unstable slopes or the lack of available head.
Designated Staff have final review and approval authority over the project design.

This Sizing Calculator has been developed in compliance with the Countywide Model SUSMP. For questions or concerns please contact the jurisdiction in which your project is located.

BMP Sizing Spreadsheet V1.04			
Project Name:	ublic Storage Spring Vall	Hydrologic Unit:	Sweetwater
Project Applicant:	DRC Engineering	Rain Gauge:	Oceanside
Jurisdiction:	San Diego County	Total Project Area:	78990
Parcel (APN):		Low Flow Threshold:	0.3Q2
BMP Name	IMP 1	BMP Type:	Bioretention Plus Vault

DMA Name	Rain Gauge	Existing Condition			Q2 Sizing Factor (cfs/ac)	DMA Area (ac)	Orifice Flow - $\%Q_2$ (cfs)	**Orifice Area (in2)**
		Soil Type	Cover	Slope				
DA 1	Oceanside	D	Scrub	Flat	0.175	0.065	0.003	**0.16**
DA 2	Oceanside	D	Scrub	Flat	0.175	0.070	0.004	**0.17**
DA 3	Oceanside	D	Scrub	Flat	0.175	0.051	0.003	**0.13**
DA 4A	Oceanside	D	Scrub	Flat	0.175	0.040	0.002	**0.10**
DA 4B	Oceanside	D	Urban	Flat		0.143		
DA 5A	Oceanside	D	Scrub	Flat	0.175	0.029	0.002	**0.07**
DA 5B	Oceanside	D	Urban	Flat		0.101		
DA 6	Oceanside	D	Urban	Flat		0.134		
DA 7	Oceanside	D	Urban	Flat		0.105		
DA 8	Oceanside	D	Urban	Flat		0.119		
DA 9	Oceanside	D	Urban	Flat		0.115		
DA 10	Oceanside	D	Urban	Flat		0.109		
DA 11	Oceanside	D	Urban	Flat		0.087		
DA 12	Oceanside	D	Urban	Flat		0.136		
DA 13	Oceanside	D	Urban	Flat		0.136		

0.013	**0.63**	**0.90**
Tot. Allowable Orifice Flow (cfs)	**Tot. Allowable Orifice Area (in2)**	**Max Orifice Diameter (in)**

0.010	**0.44**	**0.75**
Actual Orifice Flow (cfs)	Actual Orifice Area (in2)	Selected Orifice Diameter (in)

Drawdown (Hrs)	

CULTEC, Inc.
P.O. Box 280
Brookfield, CT 06804

Phone: 203-775-4416
Fax: 203-775-1462
www.cultec.com
custservice@cultec.com

CULTEC

Number of chambers -	245
Stone Void -	0.40
Base of Stone Elevation -	279.00

Given: 12" stone base
6" stone above units
52" center to center

CULTEC Recharger 280 Incremental Storage Volumes

Height of System (in)	Chamber Ht (in)	Incremental Chamber (ft^3)	Incremental Stone (ft^3)	Incremental Chamber & Stone (ft^3)	Cumulative Storage per Chamber (ft^3)	Cumulative Storage for System (ft^3)	Elevation
44.5		0.00	1.01	1.01	70.53	17278.93	282.71
43.5		0.00	1.01	1.01	69.52	17031.21	282.63
42.5		0.00	1.01	1.01	68.50	16783.49	282.54
41.5		0.00	1.01	1.01	67.49	16535.76	282.46
40.5		0.00	1.01	1.01	66.48	16288.04	282.38
39.5		0.00	1.01	1.01	65.47	16040.32	282.29
38.5	26.5	0.00	0.51	0.51	64.46	15792.60	282.21
38	26	0.13	0.96	1.09	63.95	15668.74	282.17
37	25	0.33	0.88	1.21	62.87	15402.49	282.08
36	24	0.70	0.73	1.43	61.66	15106.41	282.00
35	23	0.94	0.64	1.57	60.23	14755.78	281.92
34	22	1.11	0.57	1.68	58.65	14370.18	281.83
33	21	1.25	0.51	1.76	56.97	13958.84	281.75
32	20	1.37	0.47	1.83	55.21	13526.93	281.67
31	19	1.46	0.43	1.89	53.38	13078.55	281.58
30	18	1.55	0.39	1.94	51.49	12615.77	281.50
29	17	1.62	0.36	1.99	49.55	12140.64	281.42
28	16	1.69	0.34	2.02	47.57	11654.19	281.33
27	15	1.74	0.31	2.06	45.54	11158.48	281.25
26	14	1.84	0.27	2.12	43.49	10654.53	281.17
25	13	1.87	0.26	2.13	41.37	10136.18	281.08
24	12	1.90	0.25	2.15	39.24	9613.72	281.00
23	11	1.93	0.24	2.17	37.09	9087.14	280.92
22	10	1.95	0.23	2.18	34.92	8556.44	280.83
21	9	2.01	0.21	2.22	32.74	8021.63	280.75
20	8	2.04	0.19	2.24	30.52	7478.58	280.67
19	7	2.06	0.19	2.25	28.29	6930.39	280.58
18	6	2.14	0.16	2.29	26.04	6380.14	280.50
17	5	2.14	0.15	2.30	23.75	5818.58	280.42
16	4	2.16	0.15	2.30	21.45	5255.98	280.33
15	3	2.17	0.14	2.31	19.15	4691.33	280.25
14	2	2.18	0.14	2.32	16.84	4124.61	280.17
13	1	2.28	0.10	2.38	14.51	3555.84	280.08
12		0.00	1.01	1.01	12.13	2972.67	280.00
11		0.00	1.01	1.01	11.12	2724.94	279.92
10		0.00	1.01	1.01	10.11	2477.22	279.83
9		0.00	1.01	1.01	9.10	2229.50	279.75
8		0.00	1.01	1.01	8.09	1981.78	279.67
7		0.00	1.01	1.01	7.08	1734.06	279.58
6		0.00	1.01	1.01	6.07	1486.33	279.50
5		0.00	1.01	1.01	5.06	1238.61	279.42
4		0.00	1.01	1.01	4.04	990.89	279.33
3		0.00	1.01	1.01	3.03	743.17	279.25
2		0.00	1.01	1.01	2.02	495.44	279.17
1		0.00	1.01	1.01	1.01	247.72	279.08
TOTALS		**42.55**	**27.97**	**70.53**	**70.53**	**17278.93**	

VOLUME PROVIDED FOR HYDROMOD = 7681.86 CF

VOLUME REQUIRED = 7,378 CF

7,681.86 CF > 7,378 CF ✓

Created on: 3/30/2015

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APPENDIX D

San Diego County 100-Year Storm Calculations
San Diego County 100-Year Storm Hydrograph
Runoff Coefficient Calculations
Hydroflow Hydrograph Calculations
Cultec Recharger 280 Storage Volumes
Pre-Construction vs. Post-Construction 100-year Summary

```
****************************************************************************

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
         (c) Copyright 1982-2008 Advanced Engineering Software (aes)
             Ver. 15.0 Release Date: 04/01/2008  License ID 1510

                           Analysis prepared by:

                           DRC Engineering, Inc.
                    160 South Old Springs Road, Suite 210
                           Anaheim Hills, CA 92808
                                714-685-6860

 ************************** DESCRIPTION OF STUDY **************************
* 14-545 SPRING VALLEY                                                     *
* EXISTING CONDITION                                                       *
* 100 YEAR                                                                 *
 ***************************************************************************

  FILE NAME: 4545E100.DAT
  TIME/DATE OF STUDY: 14:58 10/30/2014
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   2.800
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

+--------------------------------------------------------------------------+
| AREA A                                                                   |
|                                                                          |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    101.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
```

```
  RESIDENTIAL (2. DU/AC OR LESS) RUNOFF COEFFICIENT = .3800
  SOIL CLASSIFICATION IS "B"
  S.C.S. CURVE NUMBER (AMC II) =  68
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    90.00
  UPSTREAM ELEVATION(FEET) =    293.00
  DOWNSTREAM ELEVATION(FEET) =    290.00
  ELEVATION DIFFERENCE(FEET) =      3.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    8.231
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.349
  SUBAREA RUNOFF(CFS) =      0.51
  TOTAL AREA(ACRES) =      0.25   TOTAL RUNOFF(CFS) =      0.51

+----------------------------------------------------------------------+
| AREA B                                                               |
|                                                                      |
|                                                                      |
+----------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    290.00  DOWNSTREAM(FEET) =    288.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =    80.00   CHANNEL SLOPE =  0.0250
  CHANNEL BASE(FEET) =    6.00   "Z" FACTOR =  50.000
  MANNING'S FACTOR = 0.020   MAXIMUM DEPTH(FEET) =   1.00
  CHANNEL FLOW THRU SUBAREA(CFS) =       0.51
  FLOW VELOCITY(FEET/SEC.) =   1.24   FLOW DEPTH(FEET) =   0.05
  TRAVEL TIME(MIN.) =   1.08   Tc(MIN.) =    9.31
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =     170.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    102.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    9.31
  RAINFALL INTENSITY(INCH/HR) =   4.94
  TOTAL STREAM AREA(ACRES) =     0.25
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.51

****************************************************************************
  FLOW PROCESS FROM NODE    103.00 TO NODE    102.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  RESIDENTIAL (2. DU/AC OR LESS) RUNOFF COEFFICIENT = .3800
  SOIL CLASSIFICATION IS "B"
  S.C.S. CURVE NUMBER (AMC II) =  68
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    292.00
  DOWNSTREAM ELEVATION(FEET) =    288.00
  ELEVATION DIFFERENCE(FEET) =      4.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    8.165
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.377
  SUBAREA RUNOFF(CFS) =      0.39
```

```
  TOTAL AREA(ACRES) =      0.19   TOTAL RUNOFF(CFS) =      0.39

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    102.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.16
  RAINFALL INTENSITY(INCH/HR) =   5.38
  TOTAL STREAM AREA(ACRES) =     0.19
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.39

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        0.51     9.31        4.941          0.25
      2        0.39     8.16        5.377          0.19

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1        0.83     8.16       5.377
      2        0.86     9.31       4.941

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       0.86   Tc(MIN.) =    9.31
  TOTAL AREA(ACRES) =        0.4
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =     170.00 FEET.

+---------------------------------------------------------------------------+
| AREA C                                                                    |
|                                                                           |
|                                                                           |
+---------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    104.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    288.00  DOWNSTREAM(FEET) =    286.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   135.00   CHANNEL SLOPE =  0.0148
  CHANNEL BASE(FEET) =    6.00   "Z" FACTOR =  50.000
  MANNING'S FACTOR = 0.020   MAXIMUM DEPTH(FEET) =   1.00
  CHANNEL FLOW THRU SUBAREA(CFS) =       0.86
  FLOW VELOCITY(FEET/SEC.) =   1.26   FLOW DEPTH(FEET) =   0.07
  TRAVEL TIME(MIN.) =   1.78   Tc(MIN.) =   11.09
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    104.00 =     305.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    104.00 TO NODE    104.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
```

```
==============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   11.09
  RAINFALL INTENSITY(INCH/HR) =   4.41
  TOTAL STREAM AREA(ACRES) =     0.44
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.86

******************************************************************************
  FLOW PROCESS FROM NODE    105.00 TO NODE    104.00 IS CODE =  21
------------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==============================================================================
  RESIDENTIAL (2. DU/AC OR LESS) RUNOFF COEFFICIENT = .3800
  SOIL CLASSIFICATION IS "B"
  S.C.S. CURVE NUMBER (AMC II) =  68
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    289.50
  DOWNSTREAM ELEVATION(FEET) =    286.00
  ELEVATION DIFFERENCE(FEET) =      3.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    8.536
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.225
  SUBAREA RUNOFF(CFS) =      0.89
  TOTAL AREA(ACRES) =      0.45   TOTAL RUNOFF(CFS) =      0.89

******************************************************************************
  FLOW PROCESS FROM NODE    104.00 TO NODE    104.00 IS CODE =   1
------------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
==============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.54
  RAINFALL INTENSITY(INCH/HR) =   5.22
  TOTAL STREAM AREA(ACRES) =     0.45
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.89

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        0.86    11.09        4.413          0.44
      2        0.89     8.54        5.225          0.45

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1        1.62     8.54       5.225
      2        1.62    11.09       4.413

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       1.62   Tc(MIN.) =    8.54
  TOTAL AREA(ACRES) =        0.9
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    104.00 =     305.00 FEET.

+----------------------------------------------------------------------------+
| AREA D                                                                     |
```

```
|                                                                          |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    104.00 TO NODE    106.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    286.00  DOWNSTREAM(FEET) =    285.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =    50.00   CHANNEL SLOPE =  0.0200
  CHANNEL BASE(FEET) =    6.00   "Z" FACTOR =  50.000
  MANNING'S FACTOR = 0.020   MAXIMUM DEPTH(FEET) =   1.00
  CHANNEL FLOW THRU SUBAREA(CFS) =       1.62
  FLOW VELOCITY(FEET/SEC.) =   1.75   FLOW DEPTH(FEET) =   0.09
  TRAVEL TIME(MIN.) =   0.47   Tc(MIN.) =    9.01
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    106.00 =     355.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    106.00 TO NODE    106.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    9.01
  RAINFALL INTENSITY(INCH/HR) =   5.05
  TOTAL STREAM AREA(ACRES) =     0.89
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.62

****************************************************************************
  FLOW PROCESS FROM NODE    107.00 TO NODE    106.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  RESIDENTIAL (2. DU/AC OR LESS) RUNOFF COEFFICIENT = .3800
  SOIL CLASSIFICATION IS "B"
  S.C.S. CURVE NUMBER (AMC II) =  68
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    288.00
  DOWNSTREAM ELEVATION(FEET) =    285.00
  ELEVATION DIFFERENCE(FEET) =      3.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    8.986
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.054
  SUBAREA RUNOFF(CFS) =      0.33
  TOTAL AREA(ACRES) =      0.17   TOTAL RUNOFF(CFS) =      0.33

****************************************************************************
  FLOW PROCESS FROM NODE    106.00 TO NODE    106.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.99
  RAINFALL INTENSITY(INCH/HR) =   5.05
  TOTAL STREAM AREA(ACRES) =     0.17
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.33
```

```
  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        1.62     9.01        5.045          0.89
      2        0.33     8.99        5.054          0.17

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1        1.95     8.99       5.054
      2        1.95     9.01       5.045

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       1.95   Tc(MIN.) =    9.01
  TOTAL AREA(ACRES) =        1.1
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    106.00 =     355.00 FEET.

+----------------------------------------------------------------------------+
| AREA E                                                                     |
|                                                                            |
|                                                                            |
+----------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    106.00 TO NODE    108.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    285.00  DOWNSTREAM(FEET) =    284.75
  CHANNEL LENGTH THRU SUBAREA(FEET) =    50.00   CHANNEL SLOPE =  0.0050
  CHANNEL BASE(FEET) =    6.00   "Z" FACTOR =  50.000
  MANNING'S FACTOR = 0.020   MAXIMUM DEPTH(FEET) =   1.00
  CHANNEL FLOW THRU SUBAREA(CFS) =       1.95
  FLOW VELOCITY(FEET/SEC.) =   1.07   FLOW DEPTH(FEET) =   0.14
  TRAVEL TIME(MIN.) =   0.78   Tc(MIN.) =    9.79
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    108.00 =     405.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    108.00 TO NODE    108.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    9.79
  RAINFALL INTENSITY(INCH/HR) =   4.78
  TOTAL STREAM AREA(ACRES) =     1.06
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.95

****************************************************************************
  FLOW PROCESS FROM NODE    109.00 TO NODE    108.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  RESIDENTIAL (2. DU/AC OR LESS) RUNOFF COEFFICIENT = .3800
```

```
  SOIL CLASSIFICATION IS "B"
  S.C.S. CURVE NUMBER (AMC II) =  68
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    287.50
  DOWNSTREAM ELEVATION(FEET) =    284.50
  ELEVATION DIFFERENCE(FEET) =      3.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    8.986
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.054
  SUBAREA RUNOFF(CFS) =      0.33
  TOTAL AREA(ACRES) =      0.17   TOTAL RUNOFF(CFS) =      0.33

****************************************************************************
  FLOW PROCESS FROM NODE    108.00 TO NODE    108.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.99
  RAINFALL INTENSITY(INCH/HR) =   5.05
  TOTAL STREAM AREA(ACRES) =     0.17
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.33

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        1.95     9.79        4.783          1.06
      2        0.33     8.99        5.054          0.17

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1        2.17     8.99       5.054
      2        2.26     9.79       4.783

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       2.26   Tc(MIN.) =    9.79
  TOTAL AREA(ACRES) =        1.2
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    108.00 =     405.00 FEET.

+--------------------------------------------------------------------------+
| AREA F                                                                   |
|                                                                          |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    108.00 TO NODE    110.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    284.75  DOWNSTREAM(FEET) =    284.50
  CHANNEL LENGTH THRU SUBAREA(FEET) =    50.00   CHANNEL SLOPE =  0.0050
  CHANNEL BASE(FEET) =    6.00   "Z" FACTOR =  50.000
  MANNING'S FACTOR = 0.020   MAXIMUM DEPTH(FEET) =   1.00
```

```
  CHANNEL FLOW THRU SUBAREA(CFS) =       2.26
  FLOW VELOCITY(FEET/SEC.) =   1.12   FLOW DEPTH(FEET) =   0.15
  TRAVEL TIME(MIN.) =   0.74   Tc(MIN.) =   10.54
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    110.00 =     455.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    110.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   10.54
  RAINFALL INTENSITY(INCH/HR) =   4.56
  TOTAL STREAM AREA(ACRES) =     1.23
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.26

****************************************************************************
  FLOW PROCESS FROM NODE    111.00 TO NODE    110.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  RESIDENTIAL (2. DU/AC OR LESS) RUNOFF COEFFICIENT = .3800
  SOIL CLASSIFICATION IS "B"
  S.C.S. CURVE NUMBER (AMC II) =  68
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    287.00
  DOWNSTREAM ELEVATION(FEET) =    284.00
  ELEVATION DIFFERENCE(FEET) =      3.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    8.986
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.054
  SUBAREA RUNOFF(CFS) =      0.38
  TOTAL AREA(ACRES) =      0.20   TOTAL RUNOFF(CFS) =      0.38

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    110.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.99
  RAINFALL INTENSITY(INCH/HR) =   5.05
  TOTAL STREAM AREA(ACRES) =     0.20
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.38

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        2.26    10.54        4.562          1.23
      2        0.38     8.99        5.054          0.20

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1        2.42     8.99       5.054
```

```
     2        2.61    10.54       4.562

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       2.61   Tc(MIN.) =   10.54
  TOTAL AREA(ACRES) =        1.4
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    110.00 =     455.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    112.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    284.50  DOWNSTREAM(FEET) =    283.50
  CHANNEL LENGTH THRU SUBAREA(FEET) =    40.00   CHANNEL SLOPE =  0.0250
  CHANNEL BASE(FEET) =    6.00   "Z" FACTOR =  50.000
  MANNING'S FACTOR = 0.020   MAXIMUM DEPTH(FEET) =   1.00
  CHANNEL FLOW THRU SUBAREA(CFS) =       2.61
  FLOW VELOCITY(FEET/SEC.) =   2.07   FLOW DEPTH(FEET) =   0.11
  TRAVEL TIME(MIN.) =   0.32   Tc(MIN.) =   10.86
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    112.00 =     495.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    112.00 TO NODE    112.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   10.86
  RAINFALL INTENSITY(INCH/HR) =   4.47
  TOTAL STREAM AREA(ACRES) =     1.43
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.61

+--------------------------------------------------------------------------+
| AREA G                                                                   |
|                                                                          |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    113.00 TO NODE    114.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  RESIDENTIAL (2. DU/AC OR LESS) RUNOFF COEFFICIENT = .3800
  SOIL CLASSIFICATION IS "B"
  S.C.S. CURVE NUMBER (AMC II) =  68
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    287.00
  DOWNSTREAM ELEVATION(FEET) =    284.00
  ELEVATION DIFFERENCE(FEET) =      3.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    8.986
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.054
  SUBAREA RUNOFF(CFS) =      0.40
  TOTAL AREA(ACRES) =      0.21   TOTAL RUNOFF(CFS) =      0.40

+--------------------------------------------------------------------------+
| AREA H                                                                   |
|                                                                          |
```

```
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    114.00 TO NODE    112.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    284.10  DOWNSTREAM(FEET) =    283.50
  CHANNEL LENGTH THRU SUBAREA(FEET) =   133.00   CHANNEL SLOPE =  0.0045
  CHANNEL BASE(FEET) =    6.00   "Z" FACTOR =  50.000
  MANNING'S FACTOR = 0.020   MAXIMUM DEPTH(FEET) =   1.00
  CHANNEL FLOW THRU SUBAREA(CFS) =       0.40
  FLOW VELOCITY(FEET/SEC.) =   0.66   FLOW DEPTH(FEET) =   0.07
  TRAVEL TIME(MIN.) =   3.36   Tc(MIN.) =   12.35
  LONGEST FLOWPATH FROM NODE    113.00 TO NODE    112.00 =     233.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    112.00 TO NODE    112.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   12.35
  RAINFALL INTENSITY(INCH/HR) =   4.12
  TOTAL STREAM AREA(ACRES) =     0.21
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.40

****************************************************************************
  FLOW PROCESS FROM NODE    115.00 TO NODE    112.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  RESIDENTIAL (2. DU/AC OR LESS) RUNOFF COEFFICIENT = .3800
  SOIL CLASSIFICATION IS "B"
  S.C.S. CURVE NUMBER (AMC II) =  68
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    66.00
  UPSTREAM ELEVATION(FEET) =    284.70
  DOWNSTREAM ELEVATION(FEET) =    283.50
  ELEVATION DIFFERENCE(FEET) =      1.20
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    8.627
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.189
  SUBAREA RUNOFF(CFS) =      0.43
  TOTAL AREA(ACRES) =      0.22   TOTAL RUNOFF(CFS) =      0.43

****************************************************************************
  FLOW PROCESS FROM NODE    112.00 TO NODE    112.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.63
  RAINFALL INTENSITY(INCH/HR) =   5.19
  TOTAL STREAM AREA(ACRES) =     0.22
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.43
```

```
** CONFLUENCE DATA **
STREAM     RUNOFF       Tc      INTENSITY      AREA
NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
    1        2.61    10.86        4.474          1.43
    2        0.40    12.35        4.118          0.21
    3        0.43     8.63        5.189          0.22

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
CONFLUENCE FORMULA USED FOR  3 STREAMS.

** PEAK FLOW RATE TABLE **
STREAM     RUNOFF      Tc      INTENSITY
NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
    1        2.96     8.63       5.189
    2        3.33    10.86       4.474
    3        3.15    12.35       4.118

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =       3.33   Tc(MIN.) =   10.86
TOTAL AREA(ACRES) =        1.9
LONGEST FLOWPATH FROM NODE    100.00 TO NODE    112.00 =     495.00 FEET.
============================================================================
END OF STUDY SUMMARY:
TOTAL AREA(ACRES)     =        1.9  TC(MIN.) =     10.86
PEAK FLOW RATE(CFS)   =       3.33
============================================================================
============================================================================
END OF RATIONAL METHOD ANALYSIS
```

```
****************************************************************************

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
         (c) Copyright 1982-2008 Advanced Engineering Software (aes)
             Ver. 15.0 Release Date: 04/01/2008  License ID 1510

                           Analysis prepared by:

                           DRC Engineering, Inc.
                    160 South Old Springs Road, Suite 210
                           Anaheim Hills, CA 92808
                                714-685-6860

 ************************** DESCRIPTION OF STUDY **************************
* 14-545 SPRING VALLEY                                                     *
* PROPOSED CONDITION                                                       *
* 100 YEAR                                                                 *
 ***************************************************************************

  FILE NAME: 4545P100.DAT
  TIME/DATE OF STUDY: 15:56 10/30/2014
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   2.800
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

+--------------------------------------------------------------------------+
| AREA A                                                                   |
|                                                                          |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    201.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
```

```
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8000
  SOIL CLASSIFICATION IS "B"
  S.C.S. CURVE NUMBER (AMC II) =  92
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    10.00
  UPSTREAM ELEVATION(FEET) =    293.00
  DOWNSTREAM ELEVATION(FEET) =    287.00
  ELEVATION DIFFERENCE(FEET) =      6.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    0.793
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.377
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.12
  TOTAL AREA(ACRES) =      0.02   TOTAL RUNOFF(CFS) =      0.12

****************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =    287.00
  DOWNSTREAM NODE ELEVATION(FEET) =    285.50
  CHANNEL LENGTH THRU SUBAREA(FEET) =   150.00
  "V" GUTTER WIDTH(FEET) =   3.00   GUTTER HIKE(FEET) =  0.080
  PAVEMENT LIP(FEET) =  0.040   MANNING'S N = .0300
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.01000
  MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.377
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8000
  SOIL CLASSIFICATION IS "B"
  S.C.S. CURVE NUMBER (AMC II) =  92
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      0.35
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.94
  AVERAGE FLOW DEPTH(FEET) =   0.14   FLOOD WIDTH(FEET) =    7.98
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =   2.66   Tc(MIN.) =    3.45
  SUBAREA AREA(ACRES) =    0.08       SUBAREA RUNOFF(CFS) =    0.47
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.800
  TOTAL AREA(ACRES) =        0.1         PEAK FLOW RATE(CFS) =       0.59

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.17   FLOOD WIDTH(FEET) =   12.80
  FLOW VELOCITY(FEET/SEC.) =   0.94   DEPTH*VELOCITY(FT*FT/SEC) =   0.16
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    202.00 =     160.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    203.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   282.50  DOWNSTREAM(FEET) =   281.00
  FLOW LENGTH(FEET) =   246.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   3.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   2.59
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.59
  PIPE TRAVEL TIME(MIN.) =   1.58    Tc(MIN.) =    5.04
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    203.00 =     406.00 FEET.

****************************************************************************
```

```
  FLOW PROCESS FROM NODE    203.00 TO NODE    203.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

+--------------------------------------------------------------------------+
| AREA B                                                                   |
|                                                                          |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    204.00 TO NODE    205.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8000
  SOIL CLASSIFICATION IS "B"
  S.C.S. CURVE NUMBER (AMC II) =  92
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    59.00
  UPSTREAM ELEVATION(FEET) =    287.20
  DOWNSTREAM ELEVATION(FEET) =    286.60
  ELEVATION DIFFERENCE(FEET) =      0.60
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.125
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.377
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.47
  TOTAL AREA(ACRES) =      0.08   TOTAL RUNOFF(CFS) =      0.47

****************************************************************************
  FLOW PROCESS FROM NODE    205.00 TO NODE    206.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =    286.60
  DOWNSTREAM NODE ELEVATION(FEET) =    285.50
  CHANNEL LENGTH THRU SUBAREA(FEET) =   197.00
  "V" GUTTER WIDTH(FEET) =   3.00   GUTTER HIKE(FEET) =  0.080
  PAVEMENT LIP(FEET) =  0.040   MANNING'S N = .0200
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.01000
  MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.884
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8000
  SOIL CLASSIFICATION IS "B"
  S.C.S. CURVE NUMBER (AMC II) =  92
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      1.89
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.10
  AVERAGE FLOW DEPTH(FEET) =   0.23   FLOOD WIDTH(FEET) =   24.48
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =   2.97   Tc(MIN.) =    7.10
  SUBAREA AREA(ACRES) =    0.60       SUBAREA RUNOFF(CFS) =    2.82
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.800
  TOTAL AREA(ACRES) =        0.7         PEAK FLOW RATE(CFS) =       3.20

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.26   FLOOD WIDTH(FEET) =   31.02
  FLOW VELOCITY(FEET/SEC.) =   1.22   DEPTH*VELOCITY(FT*FT/SEC) =   0.32
  LONGEST FLOWPATH FROM NODE    204.00 TO NODE    206.00 =     256.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    206.00 TO NODE    203.00 IS CODE =  41
```

```
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   281.50  DOWNSTREAM(FEET) =   281.00
  FLOW LENGTH(FEET) =     8.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   4.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   9.70
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.20
  PIPE TRAVEL TIME(MIN.) =   0.01    Tc(MIN.) =    7.11
  LONGEST FLOWPATH FROM NODE    204.00 TO NODE    203.00 =     264.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    203.00 TO NODE    203.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        3.20     7.11       5.877        0.68
  LONGEST FLOWPATH FROM NODE    204.00 TO NODE    203.00 =     264.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        0.59     5.04       7.343        0.10
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    203.00 =     406.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1       2.86       5.04        7.343
      2       3.67       7.11        5.877

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       3.67   Tc(MIN.) =    7.11
  TOTAL AREA(ACRES) =        0.8

****************************************************************************
  FLOW PROCESS FROM NODE    203.00 TO NODE    203.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    203.00 TO NODE    207.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   281.00  DOWNSTREAM(FEET) =   279.00
  FLOW LENGTH(FEET) =   175.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   7.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.47
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.67
  PIPE TRAVEL TIME(MIN.) =   0.53    Tc(MIN.) =    7.65
```

```
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    207.00 =     581.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    207.00 TO NODE    207.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 2 <<<<<
============================================================================

+--------------------------------------------------------------------------+
| AREA C                                                                   |
|                                                                          |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    208.00 TO NODE    209.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8000
  SOIL CLASSIFICATION IS "B"
  S.C.S. CURVE NUMBER (AMC II) =  92
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    51.00
  UPSTREAM ELEVATION(FEET) =    287.40
  DOWNSTREAM ELEVATION(FEET) =    287.10
  ELEVATION DIFFERENCE(FEET) =      0.30
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.602
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.377
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.59
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.59

****************************************************************************
  FLOW PROCESS FROM NODE    209.00 TO NODE    210.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =    287.10
  DOWNSTREAM NODE ELEVATION(FEET) =    284.70
  CHANNEL LENGTH THRU SUBAREA(FEET) =   127.00
  "V" GUTTER WIDTH(FEET) =   1.50   GUTTER HIKE(FEET) =  0.120
  PAVEMENT LIP(FEET) =  0.040   MANNING'S N = .0200
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.01200
  MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.740
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3200
  SOIL CLASSIFICATION IS "B"
  S.C.S. CURVE NUMBER (AMC II) =  65
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      0.86
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.84
  AVERAGE FLOW DEPTH(FEET) =   0.21   FLOOD WIDTH(FEET) =   10.39
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =   1.15   Tc(MIN.) =    5.75
  SUBAREA AREA(ACRES) =    0.25       SUBAREA RUNOFF(CFS) =    0.54
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.457
  TOTAL AREA(ACRES) =        0.3         PEAK FLOW RATE(CFS) =       1.08

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.22   FLOOD WIDTH(FEET) =   12.30
  FLOW VELOCITY(FEET/SEC.) =   1.81   DEPTH*VELOCITY(FT*FT/SEC) =   0.41
  LONGEST FLOWPATH FROM NODE    208.00 TO NODE    210.00 =     178.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    210.00 TO NODE    207.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   280.20  DOWNSTREAM(FEET) =   279.00
  FLOW LENGTH(FEET) =    64.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   3.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.61
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.08
  PIPE TRAVEL TIME(MIN.) =   0.23    Tc(MIN.) =    5.98
  LONGEST FLOWPATH FROM NODE    208.00 TO NODE    207.00 =     242.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    207.00 TO NODE    207.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 2 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        1.08     5.98       6.570        0.35
  LONGEST FLOWPATH FROM NODE    208.00 TO NODE    207.00 =     242.00 FEET.

  ** MEMORY BANK #  2 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        3.67     7.65       5.609        0.78
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    207.00 =     581.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1       3.95       5.98        6.570
      2       4.59       7.65        5.609

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       4.59   Tc(MIN.) =    7.65
  TOTAL AREA(ACRES) =        1.1

****************************************************************************
  FLOW PROCESS FROM NODE    207.00 TO NODE    207.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 2 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    207.00 TO NODE    207.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 3 <<<<<
============================================================================

+--------------------------------------------------------------------------+
| AREA D                                                                   |
|                                                                          |
|                                                                          |
```

```
+----------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    211.00 TO NODE    212.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8000
  SOIL CLASSIFICATION IS "B"
  S.C.S. CURVE NUMBER (AMC II) =  92
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    85.00
  UPSTREAM ELEVATION(FEET) =    292.00
  DOWNSTREAM ELEVATION(FEET) =    287.10
  ELEVATION DIFFERENCE(FEET) =      4.90
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.777
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.377
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.30
  TOTAL AREA(ACRES) =      0.05   TOTAL RUNOFF(CFS) =      0.30

****************************************************************************
  FLOW PROCESS FROM NODE    212.00 TO NODE    213.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =    287.10
  DOWNSTREAM NODE ELEVATION(FEET) =    283.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   525.00
  "V" GUTTER WIDTH(FEET) =   3.00   GUTTER HIKE(FEET) =  0.080
  PAVEMENT LIP(FEET) =  0.040   MANNING'S N = .0250
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.05000
  MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.247
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8000
  SOIL CLASSIFICATION IS "B"
  S.C.S. CURVE NUMBER (AMC II) =  92
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      1.75
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.53
  AVERAGE FLOW DEPTH(FEET) =   0.27   FLOOD WIDTH(FEET) =    9.02
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =   5.70   Tc(MIN.) =    8.48
  SUBAREA AREA(ACRES) =    0.68       SUBAREA RUNOFF(CFS) =    2.85
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.800
  TOTAL AREA(ACRES) =        0.7         PEAK FLOW RATE(CFS) =       3.06

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.33   FLOOD WIDTH(FEET) =   11.49
  FLOW VELOCITY(FEET/SEC.) =   1.72   DEPTH*VELOCITY(FT*FT/SEC) =   0.57
  LONGEST FLOWPATH FROM NODE    211.00 TO NODE    213.00 =     610.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    213.00 TO NODE    213.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 3 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        3.06     8.48       5.247        0.73
  LONGEST FLOWPATH FROM NODE    211.00 TO NODE    213.00 =     610.00 FEET.
```

```
  ** MEMORY BANK #  3 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        4.59     7.65       5.609        1.13
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    213.00 =     581.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1       7.36       7.65        5.609
      2       7.36       8.48        5.247

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       7.36   Tc(MIN.) =    8.48
  TOTAL AREA(ACRES) =        1.9
================================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        1.9  TC(MIN.) =      8.48
  PEAK FLOW RATE(CFS)   =       7.36
================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS
```

RATIONAL METHOD HYDROGRAPH PROGRAM
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RUN DATE 10/30/2014
HYDROGRAPH FILE NAME Text1
TIME OF CONCENTRATION 8 MIN.
6 HOUR RAINFALL 2.8 INCHES
BASIN AREA 1.86 ACRES
RUNOFF COEFFICIENT 0.8
PEAK DISCHARGE 7.36 CFS

TIME (MIN) = 0	DISCHARGE (CFS) = 0
TIME (MIN) = 8	DISCHARGE (CFS) = 0.2
TIME (MIN) = 16	DISCHARGE (CFS) = 0.3
TIME (MIN) = 24	DISCHARGE (CFS) = 0.3
TIME (MIN) = 32	DISCHARGE (CFS) = 0.3
TIME (MIN) = 40	DISCHARGE (CFS) = 0.3
TIME (MIN) = 48	DISCHARGE (CFS) = 0.3
TIME (MIN) = 56	DISCHARGE (CFS) = 0.3
TIME (MIN) = 64	DISCHARGE (CFS) = 0.3
TIME (MIN) = 72	DISCHARGE (CFS) = 0.3
TIME (MIN) = 80	DISCHARGE (CFS) = 0.3
TIME (MIN) = 88	DISCHARGE (CFS) = 0.3
TIME (MIN) = 96	DISCHARGE (CFS) = 0.3
TIME (MIN) = 104	DISCHARGE (CFS) = 0.3
TIME (MIN) = 112	DISCHARGE (CFS) = 0.4
TIME (MIN) = 120	DISCHARGE (CFS) = 0.4
TIME (MIN) = 128	DISCHARGE (CFS) = 0.4
TIME (MIN) = 136	DISCHARGE (CFS) = 0.4
TIME (MIN) = 144	DISCHARGE (CFS) = 0.4
TIME (MIN) = 152	DISCHARGE (CFS) = 0.5
TIME (MIN) = 160	DISCHARGE (CFS) = 0.5
TIME (MIN) = 168	DISCHARGE (CFS) = 0.5
TIME (MIN) = 176	DISCHARGE (CFS) = 0.5
TIME (MIN) = 184	DISCHARGE (CFS) = 0.6
TIME (MIN) = 192	DISCHARGE (CFS) = 0.6
TIME (MIN) = 200	DISCHARGE (CFS) = 0.7
TIME (MIN) = 208	DISCHARGE (CFS) = 0.8
TIME (MIN) = 216	DISCHARGE (CFS) = 1
TIME (MIN) = 224	DISCHARGE (CFS) = 1.1
TIME (MIN) = 232	DISCHARGE (CFS) = 1.6
TIME (MIN) = 240	DISCHARGE (CFS) = 3
TIME (MIN) = 248	DISCHARGE (CFS) = 7.36
TIME (MIN) = 256	DISCHARGE (CFS) = 1.3
TIME (MIN) = 264	DISCHARGE (CFS) = 0.9
TIME (MIN) = 272	DISCHARGE (CFS) = 0.7
TIME (MIN) = 280	DISCHARGE (CFS) = 0.6
TIME (MIN) = 288	DISCHARGE (CFS) = 0.5
TIME (MIN) = 296	DISCHARGE (CFS) = 0.4
TIME (MIN) = 304	DISCHARGE (CFS) = 0.4
TIME (MIN) = 312	DISCHARGE (CFS) = 0.4
TIME (MIN) = 320	DISCHARGE (CFS) = 0.3
TIME (MIN) = 328	DISCHARGE (CFS) = 0.3
TIME (MIN) = 336	DISCHARGE (CFS) = 0.3
TIME (MIN) = 344	DISCHARGE (CFS) = 0.3
TIME (MIN) = 352	DISCHARGE (CFS) = 0.3
TIME (MIN) = 360	DISCHARGE (CFS) = 0.3
TIME (MIN) = 368	DISCHARGE (CFS) = 0

- The storm frequency of peak discharges is the same as that of I for the given T_c.

- The fraction of rainfall that becomes runoff (or the runoff coefficient, C) is independent of I or precipitation zone number (PZN) condition (PZN Condition is discussed in Section 4.1.2.4).

- The peak rate of runoff is the only information produced by using the RM.

3.1.2 Runoff Coefficient

Table 3-1 lists the estimated runoff coefficients for urban areas. The concepts related to the runoff coefficient were evaluated in a report entitled *Evaluation, Rational Method "C" Values* (Hill, 2002) that was reviewed by the Hydrology Manual Committee. The Report is available at San Diego County Department of Public Works, Flood Control Section and on the San Diego County Department of Public Works web page.

The runoff coefficients are based on land use and soil type. Soil type can be determined from the soil type map provided in Appendix A. An appropriate runoff coefficient (C) for each type of land use in the subarea should be selected from this table and multiplied by the percentage of the total area (A) included in that class. The sum of the products for all land uses is the weighted runoff coefficient ($\Sigma[CA]$). Good engineering judgment should be used when applying the values presented in Table 3-1, as adjustments to these values may be appropriate based on site-specific characteristics. In any event, the impervious percentage (% Impervious) as given in the table, for any area, shall govern the selected value for C. The runoff coefficient can also be calculated for an area based on soil type and impervious percentage using the following formula:

$$C = 0.90 \times (\% \text{ Impervious}) + C_p \times (1 - \% \text{ Impervious})$$

Where: C_p = Pervious Coefficient Runoff Value for the soil type (shown in Table 3-1 as Undisturbed Natural Terrain/Permanent Open Space, 0% Impervious). Soil type can be determined from the soil type map provided in Appendix A.

The values in Table 3-1 are typical for most urban areas. However, if the basin contains rural or agricultural land use, parks, golf courses, or other types of nonurban land use that are expected to be permanent, the appropriate value should be selected based upon the soil and cover and approved by the local agency.

Table 3-1
RUNOFF COEFFICIENTS FOR URBAN AREAS

Land Use		Runoff Coefficient "C"				
			Soil Type			
NRCS Elements	County Elements	% IMPER.	A	B	C	D
Undisturbed Natural Terrain (Natural)	Permanent Open Space	0*	0.20	0.25	0.30	0.35
Low Density Residential (LDR)	Residential, 1.0 DU/A or less	10	0.27	0.32	0.36	0.41
Low Density Residential (LDR)	Residential, 2.0 DU/A or less	20	0.34	0.38	0.42	0.46
Low Density Residential (LDR)	Residential, 2.9 DU/A or less	25	0.38	0.41	0.45	0.49
Medium Density Residential (MDR)	Residential, 4.3 DU/A or less	30	0.41	0.45	0.48	0.52
Medium Density Residential (MDR)	Residential, 7.3 DU/A or less	40	0.48	0.51	0.54	0.57
Medium Density Residential (MDR)	Residential, 10.9 DU/A or less	45	0.52	0.54	0.57	0.60
Medium Density Residential (MDR)	Residential, 14.5 DU/A or less	50	0.55	0.58	0.60	0.63
High Density Residential (HDR)	Residential, 24.0 DU/A or less	65	0.66	0.67	0.69	0.71
High Density Residential (HDR)	Residential, 43.0 DU/A or less	80	0.76	0.77	0.78	0.79
Commercial/Industrial (N. Com)	Neighborhood Commercial	80	0.76	0.77	0.78	0.79
Commercial/Industrial (G. Com)	General Commercial	85	0.80	**0.80**	0.81	0.82
Commercial/Industrial (O.P. Com)	Office Professional/Commercial	90	0.83	**0.84**	0.84	0.85
Commercial/Industrial (Limited I.)	Limited Industrial	90	0.83	**0.84**	0.84	0.85
Commercial/Industrial (General I.)	General Industrial	95	0.87	**0.87**	0.87	0.87

*The values associated with 0% impervious may be used for direct calculation of the runoff coefficient as described in Section 3.1.2 (representing the pervious runoff coefficient, Cp, for the soil type), or for areas that will remain undisturbed in perpetuity. Justification must be given that the area will remain natural forever (e.g., the area is located in Cleveland National Forest).
DU/A = dwelling units per acre
NRCS = National Resources Conservation Service

RUNOFF COEFFICIENT PROPOSED

Hydrograph Return Period Recap

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066

Hyd. No.	Hydrograph type (origin)	Inflow Hyd(s)	Peak Outflow (cfs)								Hydrograph description
			1-Yr	2-Yr	3-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr	
1	Manual	------	-------	-------	-------	-------	-------	7.360	-------	7.360	<no description>
3	Reservoir	1	-------	-------	-------	-------	-------	3.101	-------	3.101	<no description>

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	Manual	7.360	10	250	16,116	------	------	------	<no description>
3	Reservoir	3.101	10	260	16,035	1	282.58	6,224	<no description>

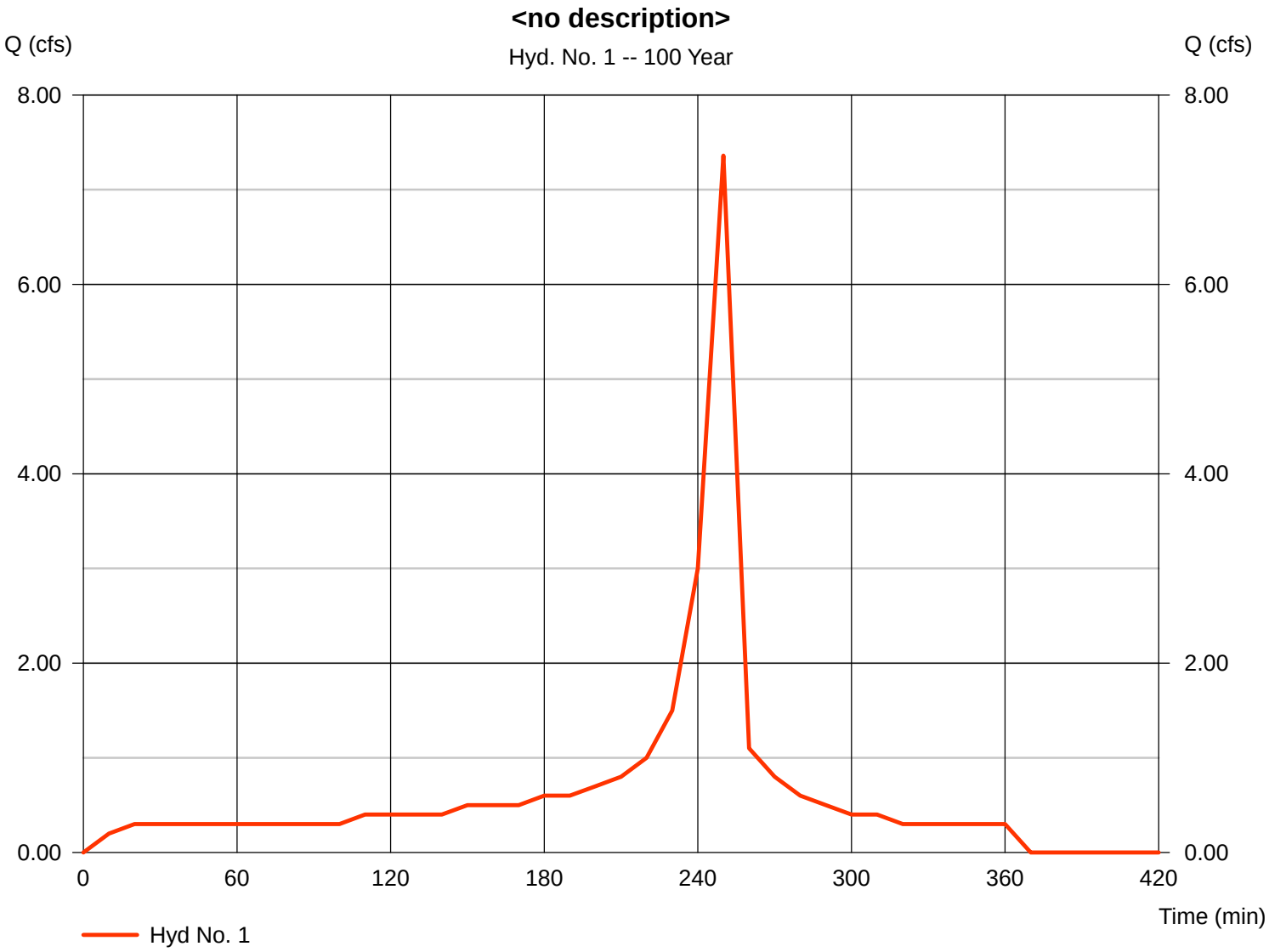
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Monday, Mar 30, 2015

Hyd. No. 1

<no description>

Hydrograph type	=	Manual	Peak discharge	=	7.360 cfs
Storm frequency	=	100 yrs	Time to peak	=	250 min
Time interval	=	10 min	Hyd. volume	=	16,116 cuft



Hydrograph Report

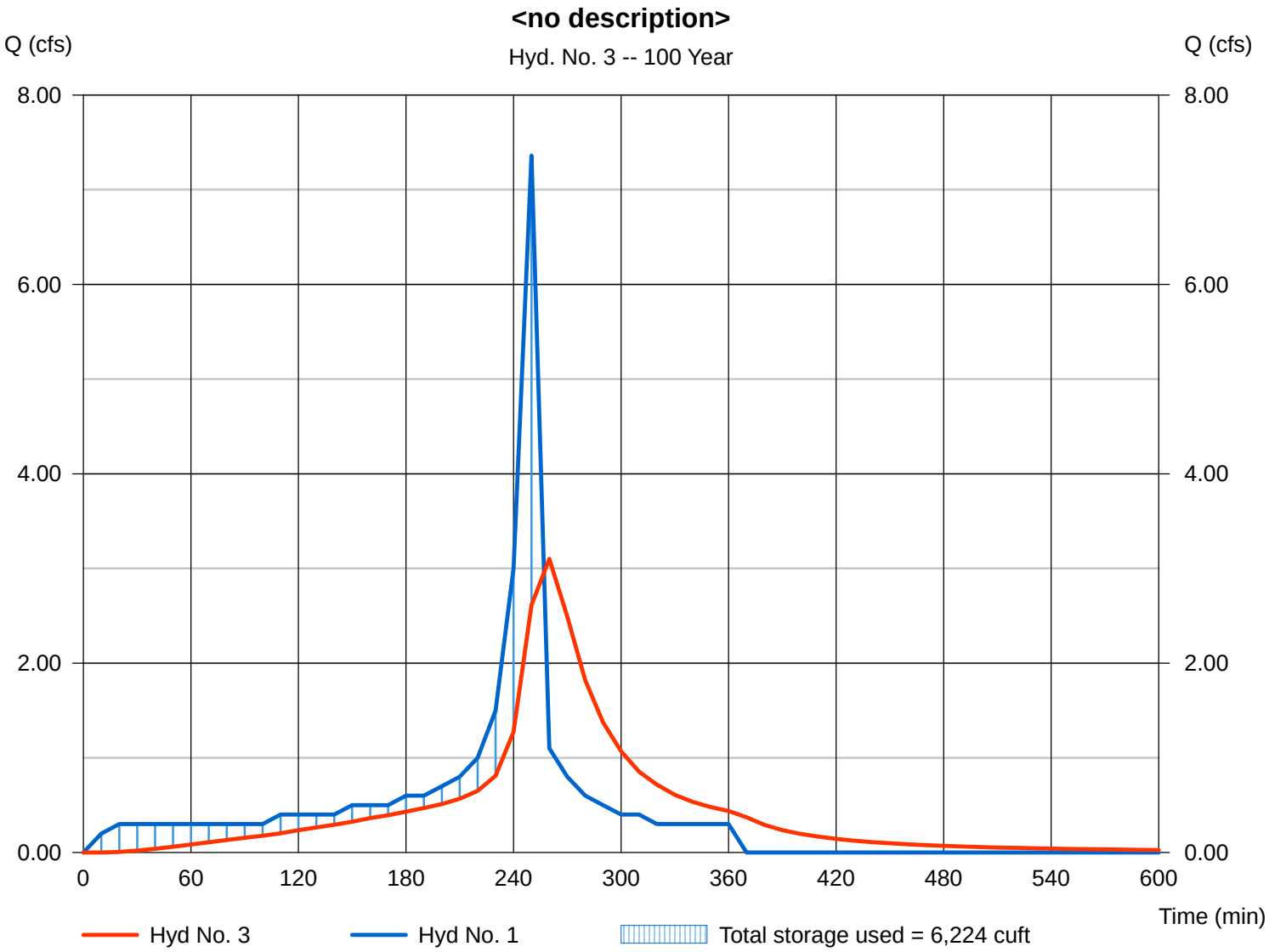
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Monday, Mar 30, 2015

Hyd. No. 3

<no description>

Hydrograph type	=	Reservoir	Peak discharge	=	3.101 cfs
Storm frequency	=	100 yrs	Time to peak	=	260 min
Time interval	=	10 min	Hyd. volume	=	16,035 cuft
Inflow hyd. No.	=	1 - <no description>	Max. Elevation	=	282.58 ft
Reservoir name	=	Arch Pipe	Max. Storage	=	6,224 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Monday, Mar 30, 2015

Pond No. 1 - Arch Pipe

Pond Data

Pond storage is based on user-defined values.

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	281.17	n/a	0	0
0.09	281.26	n/a	504	504
0.17	281.34	n/a	496	1,000
0.25	281.42	n/a	486	1,486
0.34	281.51	n/a	475	1,961
0.42	281.59	n/a	463	2,424
0.50	281.67	n/a	448	2,872
0.59	281.76	n/a	432	3,304
0.67	281.84	n/a	411	3,716
0.75	281.92	n/a	386	4,101
0.84	282.01	n/a	351	4,452
0.92	282.09	n/a	296	4,748
1.00	282.17	n/a	266	5,014
1.09	282.26	n/a	124	5,138
1.13	282.30	n/a	248	5,386
1.21	282.38	n/a	248	5,634
1.30	282.47	n/a	248	5,881
1.38	282.55	n/a	248	6,129
1.46	282.63	n/a	248	6,377
1.54	282.71	n/a	248	6,624

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 11.00	0.00	0.00	0.00
Span (in)	= 11.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 281.17	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.01	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

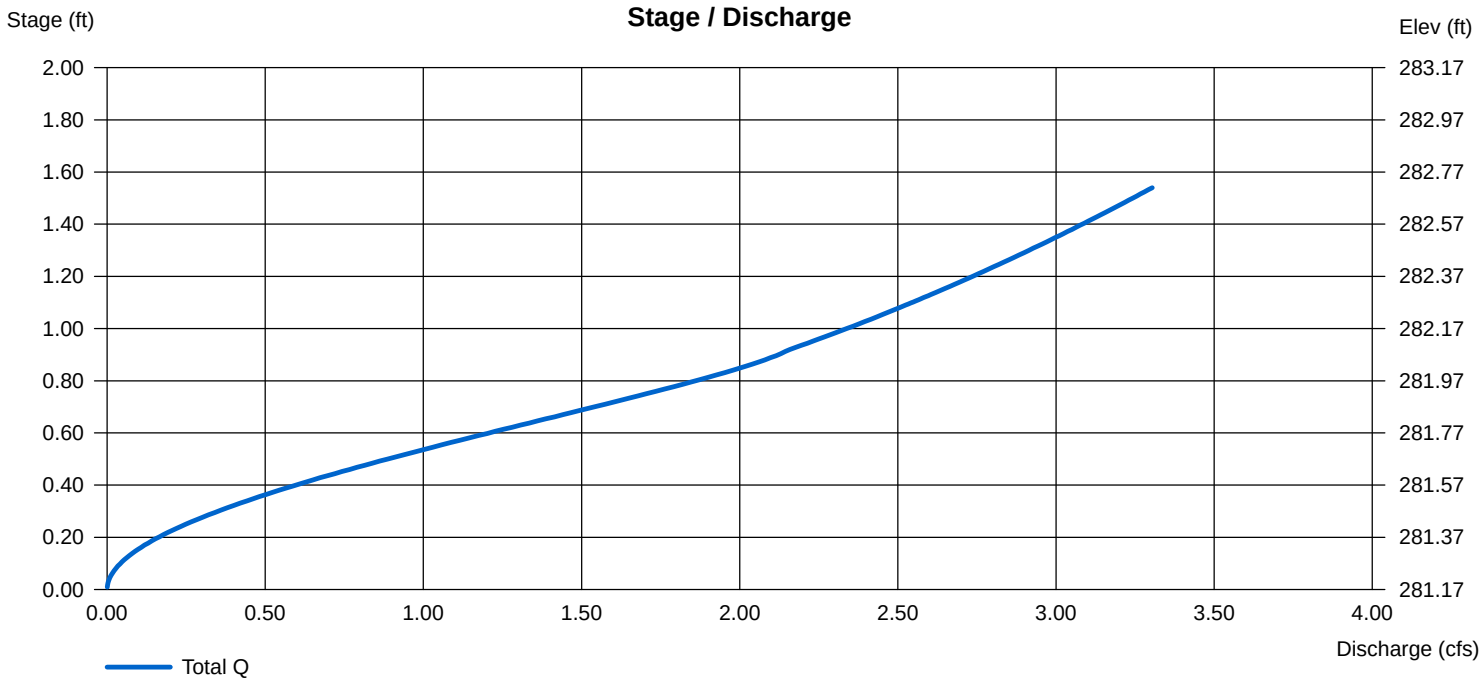
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 0.00	0.00	0.00	0.00
Crest El. (ft)	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 0.000 (by Wet area)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



CULTEC, Inc.
P.O. Box 280
Brookfield, CT 06804

Phone: 203-775-4416
Fax: 203-775-1462
www.cultec.com
custservice@cultec.com

CULTEC

Number of chambers -	245
Stone Void -	0.40
Base of Stone Elevation -	279.00

Given: 12" stone base
6" stone above units
52" center to center

CULTEC Recharger 280 Incremental Storage Volumes

Height of System (in)	Chamber Ht (in)	Incremental Chamber (ft^3)	Incremental Stone (ft^3)	Incremental Chamber & Stone (ft^3)	Cumulative Storage per Chamber (ft^3)	Cumulative Storage for System (ft^3)	Elevation
44.5		0.00	1.01	1.01	70.53	17278.93	282.71
43.5		0.00	1.01	1.01	69.52	17031.21	282.63
42.5		0.00	1.01	1.01	68.50	16783.49	282.54
41.5		0.00	1.01	1.01	67.49	16535.76	282.46
40.5		0.00	1.01	1.01	66.48	16288.04	282.38
39.5		0.00	1.01	1.01	65.47	16040.32	282.29
38.5	26.5	0.00	0.51	0.51	64.46	15792.60	282.21
38	26	0.13	0.96	1.09	63.95	15668.74	282.17
37	25	0.33	0.88	1.21	62.87	15402.49	282.08
36	24	0.70	0.73	1.43	61.66	15106.41	282.00
35	23	0.94	0.64	1.57	60.23	14755.78	281.92
34	22	1.11	0.57	1.68	58.65	14370.18	281.83
33	21	1.25	0.51	1.76	56.97	13958.84	281.75
32	20	1.37	0.47	1.83	55.21	13526.93	281.67
31	19	1.46	0.43	1.89	53.38	13078.55	281.58
30	18	1.55	0.39	1.94	51.49	12615.77	281.50
29	17	1.62	0.36	1.99	49.55	12140.64	281.42
28	16	1.69	0.34	2.02	47.57	11654.19	281.33
27	15	1.74	0.31	2.06	45.54	11158.48	281.25
26	14	1.84	0.27	2.12	43.49	10654.53	281.17
25	13	1.87	0.26	2.13	41.37	10136.18	281.08
24	12	1.90	0.25	2.15	39.24	9613.72	281.00
23	11	1.93	0.24	2.17	37.09	9087.14	280.92
22	10	1.95	0.23	2.18	34.92	8556.44	280.83
21	9	2.01	0.21	2.22	32.74	8021.63	280.75
20	8	2.04	0.19	2.24	30.52	7478.58	280.67
19	7	2.06	0.19	2.25	28.29	6930.39	280.58
18	6	2.14	0.16	2.29	26.04	6380.14	280.50
17	5	2.14	0.15	2.30	23.75	5818.58	280.42
16	4	2.16	0.15	2.30	21.45	5255.98	280.33
15	3	2.17	0.14	2.31	19.15	4691.33	280.25
14	2	2.18	0.14	2.32	16.84	4124.61	280.17
13	1	2.28	0.10	2.38	14.51	3555.84	280.08
12		0.00	1.01	1.01	12.13	2972.67	280.00
11		0.00	1.01	1.01	11.12	2724.94	279.92
10		0.00	1.01	1.01	10.11	2477.22	279.83
9		0.00	1.01	1.01	9.10	2229.50	279.75
8		0.00	1.01	1.01	8.09	1981.78	279.67
7		0.00	1.01	1.01	7.08	1734.06	279.58
6		0.00	1.01	1.01	6.07	1486.33	279.50
5		0.00	1.01	1.01	5.06	1238.61	279.42
4		0.00	1.01	1.01	4.04	990.89	279.33
3		0.00	1.01	1.01	3.03	743.17	279.25
2		0.00	1.01	1.01	2.02	495.44	279.17
1		0.00	1.01	1.01	1.01	247.72	279.08
TOTALS		**42.55**	**27.97**	**70.53**	**70.53**	**17278.93**	

VOLUME PROVIDED FOR 100-YEAR PRE V. POST = 6,624.4 CF

VOLUME REQUIRED = 6,224 CF

6,624.4 CF > 6,224 CF ✓

Created on: 3/30/2015

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Technical Information

CULTEC Recharger® 280HD

The Recharger® 280HD is a 26.5" (673 mm) tall, mid-size chamber and is typically used for installations with depth restrictions or when a larger infiltrative area is required. The Recharger® 280HD has the side portal internal manifold feature. HVLV™ FC-24 Feed Connectors are inserted into the side portals to create the internal manifold.

Size (L x W x H)	8' x 47" x 26.5" 2.44 m x 1194 mm x 673 mm
Installed Length	7' 2.13 m
Length Adjustment per Run	1' 0.30 m
Chamber Storage	6.08 ft^3/ft 0.56 m^3/m 42.55 $ft^3/unit$ 1.21 $m^3/unit$
Min. Installed Storage	9.21 ft^3/ft 0.86 m^3/m 64.46 $ft^3/unit$ 1.83 $m^3/unit$
Min. Area Required	30.33 ft^2 2.82 m^2
Min. Center to Center Spacing	4.33' 1.32 m
Max. Allowable Cover	12' 3.66 m
Max. Inlet Opening in Endwall	18" 450 mm
Side Portal Dimensions (H x W)	12" x 12" 305 mm x 305 mm
Max. Allowable Pipe Size in Side Portal	10" 250 mm
Compatible Feed Connector	HVLV™ FC-24 Feed Connector

	Stone Foundation Depth		
	6"	12"	18"
	152 mm	305 mm	457 mm
Chamber and Stone Storage Per Chamber	64.46 ft^3 1.83 m^3	70.53 ft^3 2.00 m^3	76.59 ft^3 2.17 m^3
Min. Effective Depth	3.21' 0.98 m	3.71' 1.13 m	4.21' 1.28 m
Stone Required Per Chamber	2.03 yd^3 1.55 m^3	2.59 yd^3 1.98 m^3	3.15 yd^3 2.41 m^3

Calculations are based on installed chamber length.
Includes 6" (152 mm) stone above crown of chamber and typical stone surround.
Stone void calculated at 40%.

Recharger® 280HD Bare Chamber Storage Volumes

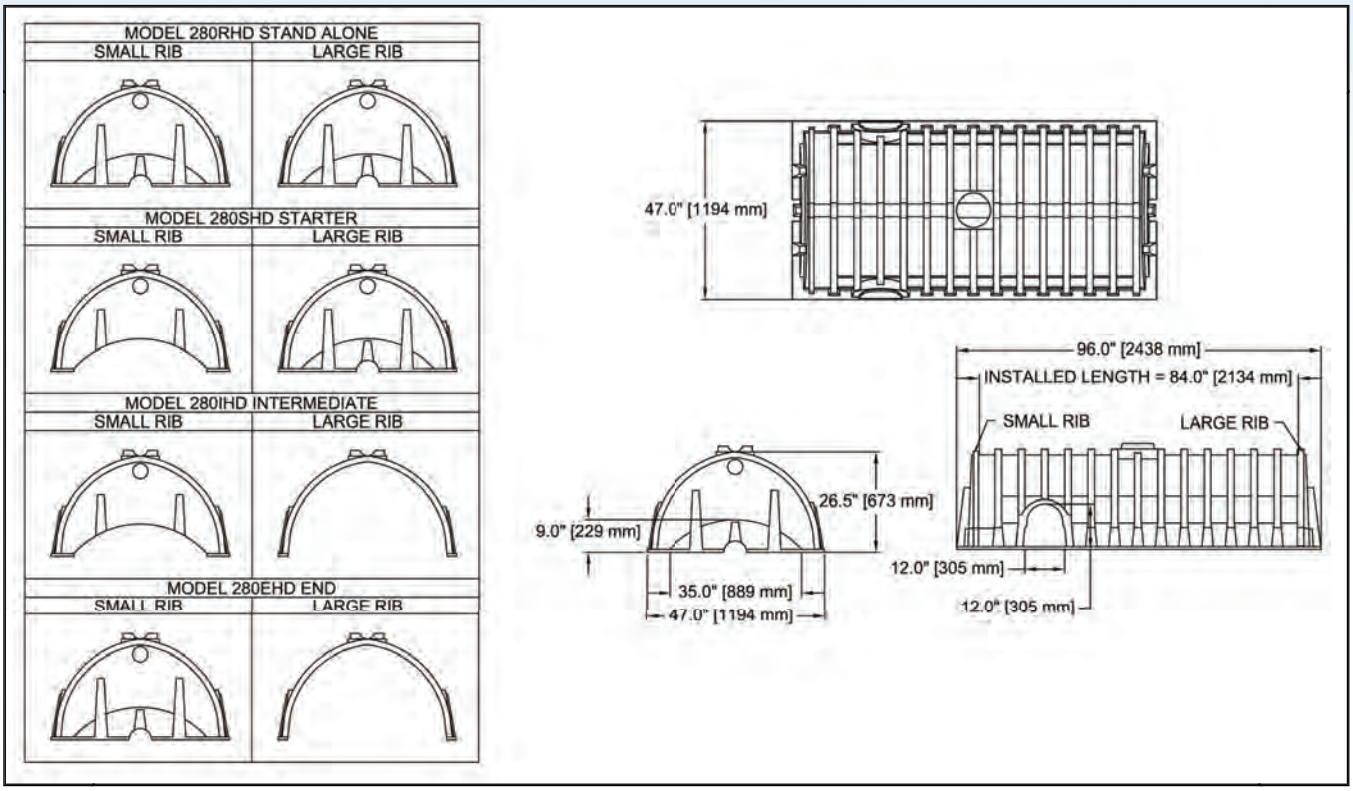
Elevation		Incremental Storage Volume				Cumulative Storage	
in.	mm	ft^3/ft	m^3/m	ft^3	m^3	ft^3	m^3
26.5	686	0.000	0.000	0.000	0.000	42.553	1.205
26	660	0.018	0.002	0.126	0.004	42.553	1.205
25	635	0.047	0.004	0.329	0.009	42.427	1.202
24	609	0.100	0.009	0.700	0.020	42.098	1.192
23	584	0.134	0.012	0.938	0.027	41.398	1.172
22	559	0.159	0.015	1.113	0.032	40.460	1.146
21	533	0.179	0.017	1.253	0.035	39.347	1.114
20	508	0.195	0.018	1.365	0.039	38.094	1.079
19	483	0.209	0.019	1.463	0.041	36.729	1.040
18	457	0.221	0.021	1.547	0.044	35.266	0.999
17	432	0.232	0.022	1.624	0.046	33.719	0.955
16	406	0.241	0.022	1.687	0.048	32.095	0.909
15	381	0.249	0.023	1.743	0.049	30.408	0.861
14	356	0.263	0.024	1.841	0.052	28.665	0.812
13	330	0.267	0.025	1.869	0.053	26.824	0.760
12	305	0.271	0.025	1.897	0.054	24.955	0.707
11	279	0.275	0.026	1.925	0.055	23.058	0.653
10	254	0.279	0.026	1.953	0.055	21.133	0.598
9	229	0.287	0.027	2.009	0.057	19.180	0.543
8	203	0.292	0.027	2.044	0.058	17.171	0.486
7	178	0.294	0.027	2.058	0.058	15.127	0.428
6	152	0.305	0.028	2.135	0.060	13.069	0.370
5	127	0.306	0.028	2.142	0.061	10.934	0.310
4	102	0.308	0.029	2.156	0.061	8.792	0.249
3	76	0.310	0.029	2.170	0.061	6.636	0.188
2	51	0.312	0.029	2.184	0.062	4.466	0.126
1	25	0.326	0.030	2.282	0.065	2.282	0.065
Total		6.079	0.565	42.553	1.205	42.553	1.205

Calculations are based on installed chamber length.

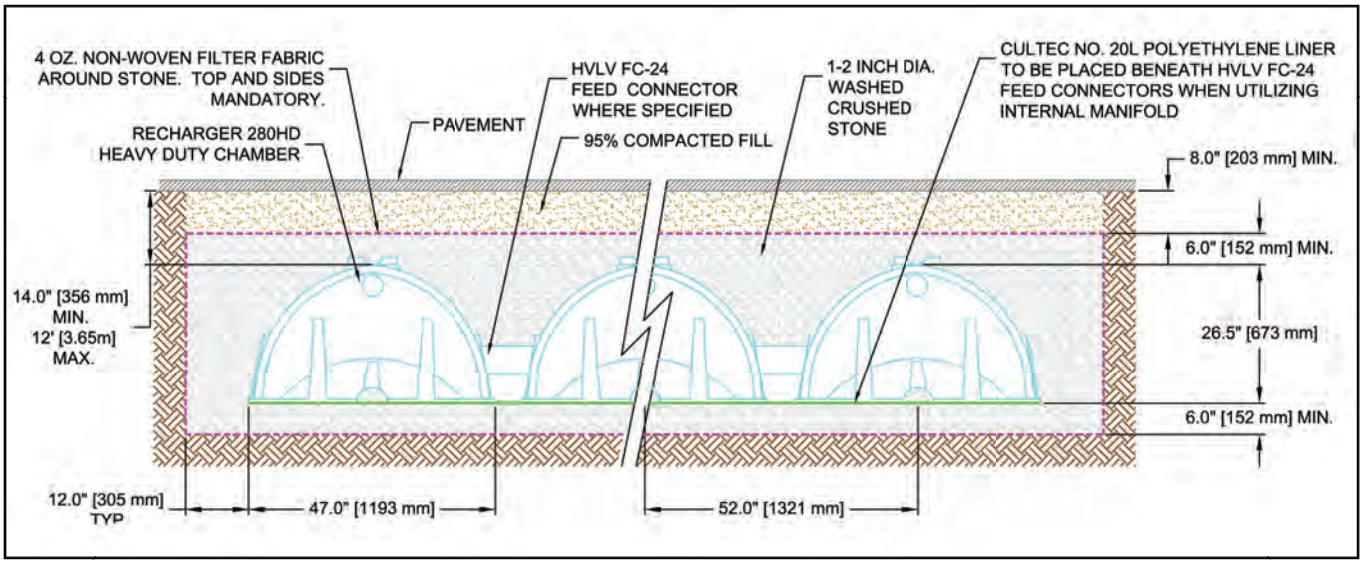
Technical Information

CULTEC Recharger® 280HD

Three View Drawing



Typical Cross Section for Paved Traffic Application



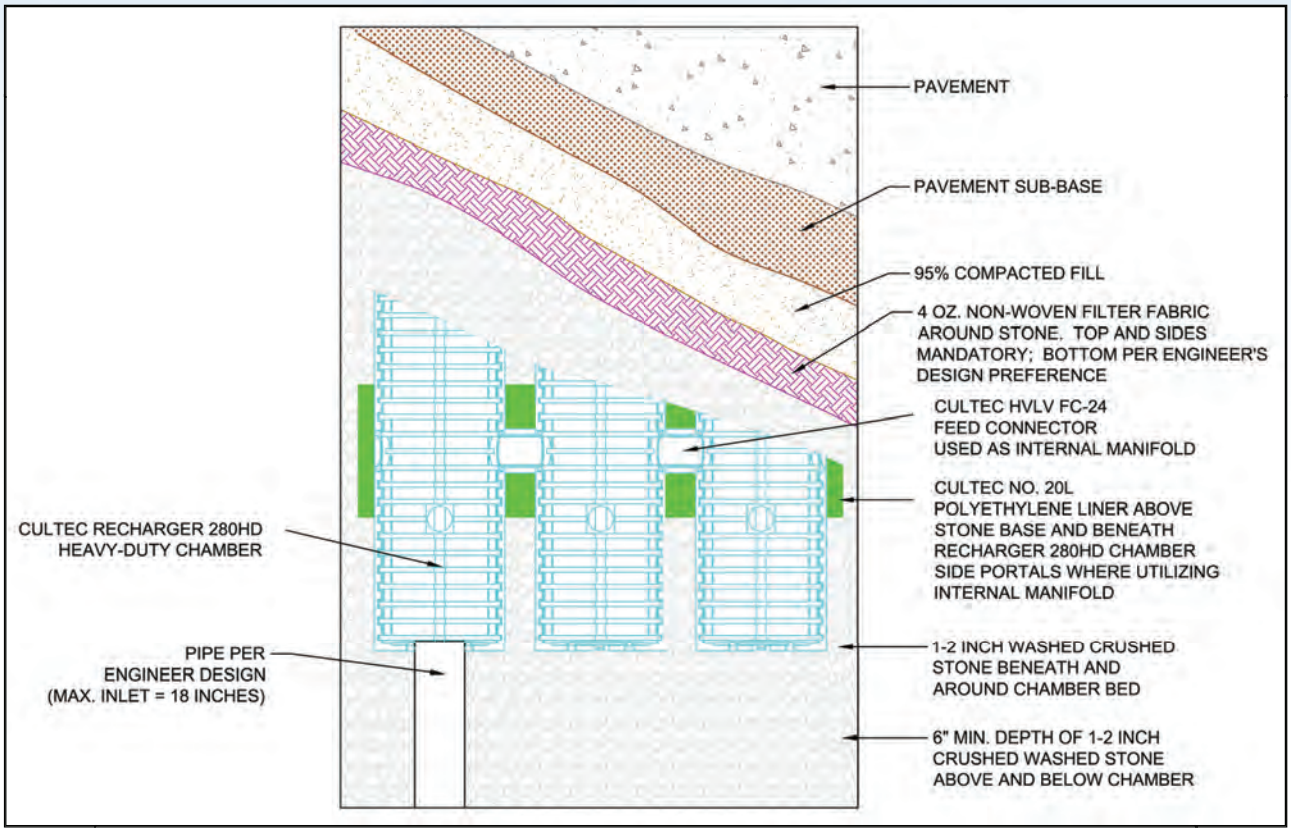
Scan for Recharger 280HD downloads

Recharger® 280HD

Technical Information

CULTEC Recharger® 280HD

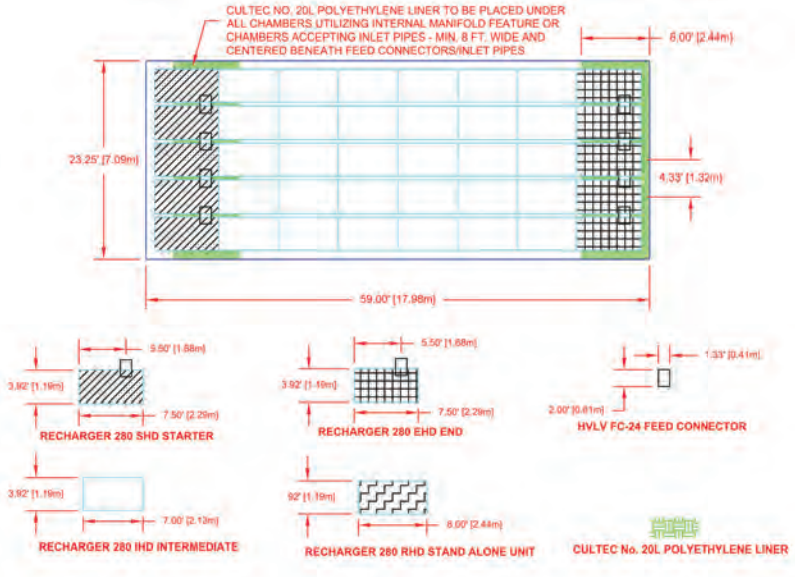
Plan View Drawing



Typical Bed Layout

Using AutoCAD Array Function

1. Add Alternate Units to your Dimension Style and use 0.3048 as the Multiplier
2. Using the Rectangle command, create the three chamber outlines and the feed connectors:
   - Starter: 3.92' x 7.5'
   - Intermediate: 3.92' x 7.0'
   - End: 3.92' x 7.5'
   - Feed Connector: 1.33' x 2'
3. Hatch the Starter and End chambers to differentiate them. Place a feed connector (as shown) at one end of the starter and end chambers.
4. Select the Intermediate chamber and select the array command.
5. Specify the number of rows and columns (ex. 10 rows, 7 columns). Do not included the starter and end chambers in the column count.
6. The chambers should be oriented horizontally (as shown). Set the row offset to 4.33' and the column offset to 7'. The rotation angle should be 0.
7. Click accept to create the bed.
8. If R-Model chamber is incorporated into the design, use the Rectangle command to create a chamber outline 8.00' x 3.92'. Hatch the R-Model chambers using a unique pattern to differntiate them. Orient the R-Model chambers horizontally, and orient the chambers so there is a .42' spacing between the R-Model and the rest of the chamber rows. Proceed to steps 9 and 10 using the Polyline command instead of the Rectange command to show the stone border and polyethylene liner. If no R-Model is incorporated into the design, proceed to steps 9 and 10.
9. Using the Rectangle command to surround the bed. Offset the rectangle 1' to represent the stone border.
10. Using the Rectangle command create a polyethylene liner underneath the feed connectors at both ends of the bed. It should be 5' wide and span the width of the bed. Apply correct hatching and label the liner.



Bed Design Aide download available online

CULTEC

CULTEC Recharger® 280HD Specifications

GENERAL

CULTEC Recharger® 280HD chambers are designed for underground stormwater management. The chambers may be used for retention, recharging, detention or controlling the flow of on-site stormwater runoff.

CHAMBER PARAMETERS

1. The chambers will be manufactured by CULTEC, Inc. of Brookfield, CT. (203-775-4416 or 1-800-428-5832)
2. The chamber will be vacuum thermoformed of black high molecular weight high density polyethylene (HMWHDPE).
3. The chamber will be arched in shape.
4. The chamber will be open-bottomed.
5. The chamber will be joined using an interlocking overlapping rib method. Connections must be fully shouldered overlapping ribs, having no separate couplings or separate end walls.
6. The nominal chamber dimensions of the CULTEC Recharger® 280HD shall be 26.5 inches (673 mm) tall, 47 inches (1194 mm) wide and 8 feet (2.44 m) long. The installed length of a joined Recharger® 280HD shall be 7 feet (2.13 m).
7. Maximum inlet opening on the chamber endwall is 18 inches (450 mm).
8. The chamber will have two side portals to accept CULTEC HVLV® FC-24 Feed Connectors to create an internal manifold. The nominal dimensions of each side portal will be 12 inches (305 mm) high by 12 inches (305 mm) wide. Maximum allowable pipe size in the side portal is 10 inches (250 mm).
9. The nominal chamber dimensions of the CULTEC HVLV® FC-24 Feed Connector shall be 12 inches (305 mm) tall, 16 inches (406 mm) wide and 24.2 inches (614 mm) long.
10. The nominal storage volume of the Recharger® 280HD chamber will be 6.079 ft^3 / ft (0.565 m^3 / m) - without stone. The nominal storage volume of a single Recharger 280RHD Stand Alone unit shall be 48.63 ft^3 (1.38 m^3) - without stone. The nominal storage volume of a joined Recharger® 280IHD Intermediate unit shall be 42.553 ft^3 (1.205 m^3) - without stone. The nominal storage volume of the length adjustment amount per run shall be 6.08 ft^3 (0.56 m^3) - without stone.
11. The nominal storage volume of the HVLV® FC-24 Feed Connector will be 0.913 ft^3 / ft (0.085 m^3 / m) - without stone.
12. The Recharger® 280HD chamber will have eighty-two discharge holes bored into the sidewalls of the unit's core to promote lateral conveyance of water.
13. The Recharger® 280HD chamber shall have 15 corrugations.
14. The endwall of the chamber, when present, will be an integral part of the continuously formed unit. Separate end plates cannot be used with this unit.
15. The Recharger® 280RHD Stand Alone unit must be formed as a whole chamber having two fully formed integral endwalls and having no separate end plates or separate end walls.
16. The Recharger® 280SHD Starter unit must be formed as a whole chamber having one fully formed integral endwall and one partially formed integral endwall with a lower transfer opening of 9 inches (229 mm) high x 35 inches (889 mm) wide.
17. The Recharger® 280IHD Intermediate unit must be formed as a whole chamber having one fully open endwall and one partially formed integral endwall with a lower transfer opening of 9 inches (229 mm) high x 35 inches (889 mm) wide.
18. The Recharger® 280EHD End unit must be formed as a whole chamber having one fully formed integral endwall and one fully open end wall and having no separate end plates or end walls.
19. The HVLV® FC-24 Feed Connector must be formed as a whole chamber having two open end walls and having no separate end plates or separate end walls. The unit will fit into the side portals of the Recharger® 280HD and act as cross feed connections.
20. Chambers must have horizontal stiffening flex reduction steps between the ribs.
21. Heavy duty units are designated by a colored stripe formed into the part along the length of the chamber.
22. The chamber will have a raised integral cap at the top of the arch in the center of each unit to be used as an optional inspection port or clean-out.
23. The units may be trimmed to custom lengths by cutting back to any corrugation on the large rib end.
24. The chamber shall be manufactured in an ISO 9001:2000 certified facility.
25. Maximum allowable cover over the top of the chamber shall be 12' (3.66 m).
26. The chamber will be designed to withstand traffic loads when installed according to CULTEC's recommended installation instructions.

GILES
ENGINEERING ASSOCIATES, INC.
GEOTECHNICAL, ENVIRONMENTAL & CONSTRUCTION MATERIALS CONSULTANTS

• Atlanta, GA
• Baltimore/Wash. DC
• Dallas, TX
• Los Angeles, CA
• Milwaukee, WI
• Orlando, FL

October 23, 2014

Public Storage, Inc.
701 Western Avenue
Glendale, California 91201-2349

Attention: Mr. Jim Fitzpatrick
Senior Vice President

Subject: Infiltration Test Results
Public Storage Facility
1247 Sweetwater Road
Spring Valley, CA
Project No. 2G-1410001

Reference: *Geotechnical Engineering Exploration and Analysis, Proposed New Three Story Building, Public Storage Facility, 1247 Sweetwater Road, Spring Valley, California*; prepared by Giles Engineering Associates, Inc., dated July 24, 2014 (Project No. 2G-1406010).

Dear Mr. Fitzpatrick,

Giles Engineering Associates, Inc. (Giles) is pleased to present this report summarizing the results of the double-ring infiltration tests conducted at the subject site in accordance with the test method described in ASTM D 3385 (Infiltration Rate of Soils in Field Using Double Ring Infiltrometer) and in accordance with County of San Diego LID Manual.

Per our discussions and site plan provided to us by Mr. Chris McKee with DRC Engineering, Inc (project Civil Engineer), it is understood that the planned storm water management system will be located within the southwest end of the Public Storage property adjacent to the existing parking lot. It is also understood from DRC that the County of San Diego is requiring a Double-Ring Infiltration (DRI) test to determine the one-dimensional infiltration characteristics of the site soils for design of the storm water management system.

Site Description

The subject site, which is an existing Public Storage facility, is located at 1247 Sweetwater Road in the City of Spring Valley, California. The irregular-shaped property is bounded on the south by Jamacha Road, on the east by residential structures, on the north by residential housing units, and on the west by Sweetwater Road. Other existing site improvements include paved entry driveway and parking stalls.

The southern portion of the site is vegetated with a moderate growth of shrubs, grasses, and large trees. Topography within the site is a gentle slope downward to the west.

Field Infiltration Testing

Two DRI tests (designated as P-1 and P-2) were conducted on October 17, 2014 at depths of about 7 feet below existing grade by Giles subcontractor Hilltop Geotechnical of San Bernardino, California. The approximate locations of the DRI tests are shown on the attached Figure 1. A backhoe was utilized in the excavation of test pits about 7 feet deep. Soils encountered in the test pit were comprised generally of sandy clay soils which are consistent with the subsoils encountered during our recent subsurface exploration (reference).

The double-ring infiltrometer method consists of driving two open cylinders (a 23.75-inch annular (outer) cylinder and an 11.75-inch-diameter inner cylinder), one inside the other, into the ground, partially filling the rings with water and then maintaining the water at a constant level. Two calibrated head tanks (Mariotte tubes) are used for measurement of water flow during the test. The volume of water added to the inner ring, to maintain the liquid level constant, is the measure of the volume of water that infiltrates the soil. The volume infiltrated during time intervals was converted to an incremental infiltration velocity expressed in centimeters per hour, and the results were plotted on a graph versus elapsed time.

Cleared water was poured into the rings (annular and inner) while using protective cardboard sheeting to prevent splashing and disturbance of the soil boundary. The pre-selected water test depth was approximately 6.0 inches (15.24 cm). Initially, water levels were maintained within 5.0 millimeters of this depth during the test by periodic additions from the 1000 millimeter graduated cylinder. No significant wind occurred on the day of the testing.

Water added to the inner ring and annular space was made at periodic time intervals ranging from 15 to 60 minutes.

The infiltration tests indicated very slow rates due to on-site (low-permeable) clayey soils. The calculated average inner ring infiltration rates were 0.42 and 0.67 cm/hr for P-1 and P-2, respectively. The average outer ring infiltration rates were 0.42 and 1.58 cm/hr for P-1 and P-2, respectively.

Discussion

The soil conditions encountered within the test pits consisted generally of relatively stiff sandy clay.

Groundwater was encountered during our recent subsurface exploration (reference) at a depth of about 31 feet below existing ground surface.

Field infiltration tests are subject to many factors that affect the infiltration rate, including soils characteristics, the subsoil conditions, the degree of saturation, the temperature of the water used and on-site soils, the percentage of entrapped air in the soils, and the head of the applied water.

Recommendations

The results of our infiltration tests indicated very slow percolation rates that are generally consistent with respect to the on-site soil classification and apparent density. The rates obtained during our infiltration tests should be evaluated by the project Civil Engineer to determine the suitability for adequate elimination of surface water within the basin.

Caution should be used in determining the percolation rate for the proposed infiltration system. Eventual siltation from windblown silt, water borne silt from irrigation and precipitation runoff and the accumulation of organic material in surface soils due to landscape grass and plant growth, can drastically reduce percolation rates over time. We recommend that suitable methods to prevent siltation be considered in the project design.

Closure

It should be noted that the infiltration rates of the on-site soils represent the specific areas tested and may fluctuate throughout other parts of the site. The infiltration rates determined by the field tests are considered reasonable for the type of materials encountered during the tests.

The findings of this report were prepared in accordance with the generally accepted professional engineering principles and practice. The conclusions and recommendations are based on the results of our field testing. This firm should be notified if conditions encountered during construction appeared to be different than those indicated in this report.

We appreciate the opportunity to be of continued service on this project. If there are any questions concerning these test results or the associated recommendations, please contact our office at your convenience.

Respectfully submitted,

GILES ENGINEERING ASSOCIATES, INC.

REGISTERED PROFESSIONAL ENGINEER EDGAR L. GATUS C 070687 EXP 6-30-15 CIVIL STATE OF CALIFORNIA

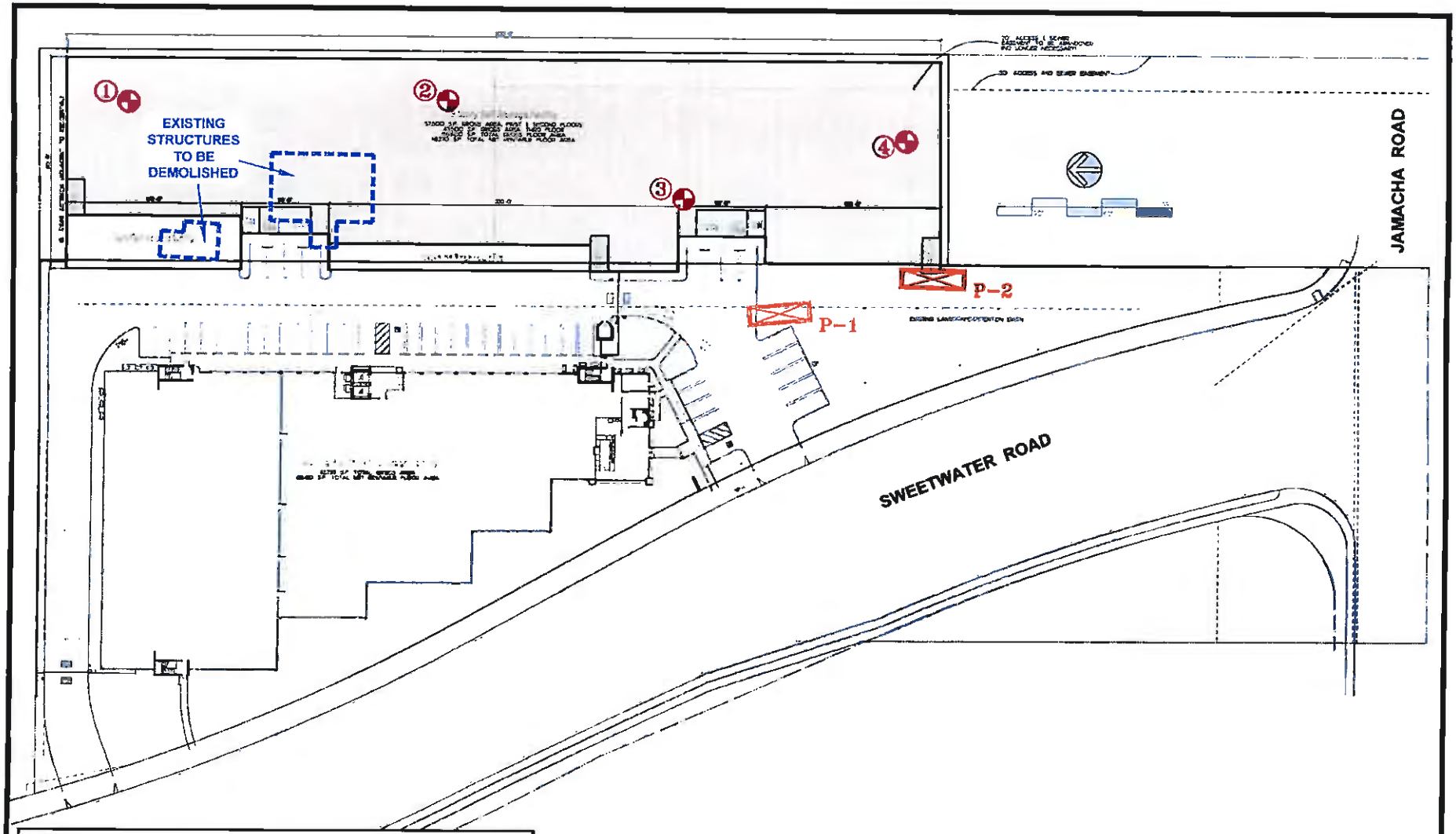
Edgar L. Gatus, P.E.
Assistant Brach Manager

REGISTERED PROFESSIONAL ENGINEER ROBERT R. RUSSELL No. 2042 GEOTECHNICAL STATE OF CALIFORNIA

Robert R. Russell, P.E., G.E.
Regional Director

Enclosures: Figure 1, Infiltration Test Location Plan
Infiltrometer Test Results (P-1 and P-2)

Distribution: Public Storage, Inc.
Attn.: Mr. Jim Fitzpatrick (1 US Mail; email: jfitzpatrick@publicstorage.com)
DRC Engineering, Inc.
Attn.: Chris McKee (2 US Mail; email: cmckee@drc-eng.com)



GILES ENGINEERING ASSOCIATES, INC.
1965 N. MAIN STREET
ORANGE, CA 92865 (714)279-0817

FIGURE 1
INFILTROMETER TEST LOCATION PLAN
PUBLIC STORAGE - SPRING VALLEY
1247 SWEETWATER ROAD
SPRING VALLEY, CALIFORNIA

DESIGNED	DRAWN	SCALE	DATE	REVISED
ELG	JSZ	approx. 1"=80'	10-22-14	–
PROJECT NO.: 2G-1410001			CAD No. 2g1410001-blp	

LEGEND:

P-1 INFILTRATION TEST LOCATION

1 GEOTECHNICAL TEST BORING

NOTES:

1.) TEST BORING & INFILTRATION TEST LOCATIONS ARE APPROXIMATE.

2.) BASE MAP DEVELOPED FROM THE "SITE PLAN" DATED 4-9-14, PREPARED BY JAMES GOODMAN ARCHITECTURE.

3.) EXISTING STRUCTURES (IN BLUE) ARE APPROXIMATE BASED ON AERIAL PHOTOGRAPHY.

INFILTROMETER TEST P-1 DATE OF TEST 17-Oct-14 DEPTH OF

PROJECT IDENTIFICATION: 977-A14.1 AREA(CM2) LIQUID (CM)

TEST LOCATION: Public Storage Facility Southen Portion INNER 699.6 INNER 15.24

LIQUID USED: Municipal H20 OUTER 2128.5 OUTER 15.24

TESTED BY AH _____ LIQUID LEVEL MAINTAINED USING: __X__ MANUAL ADDITIONS (VISUAL)

DEPTH TO WATER TABLE: INNER RING AVERAGE RATE 0.42

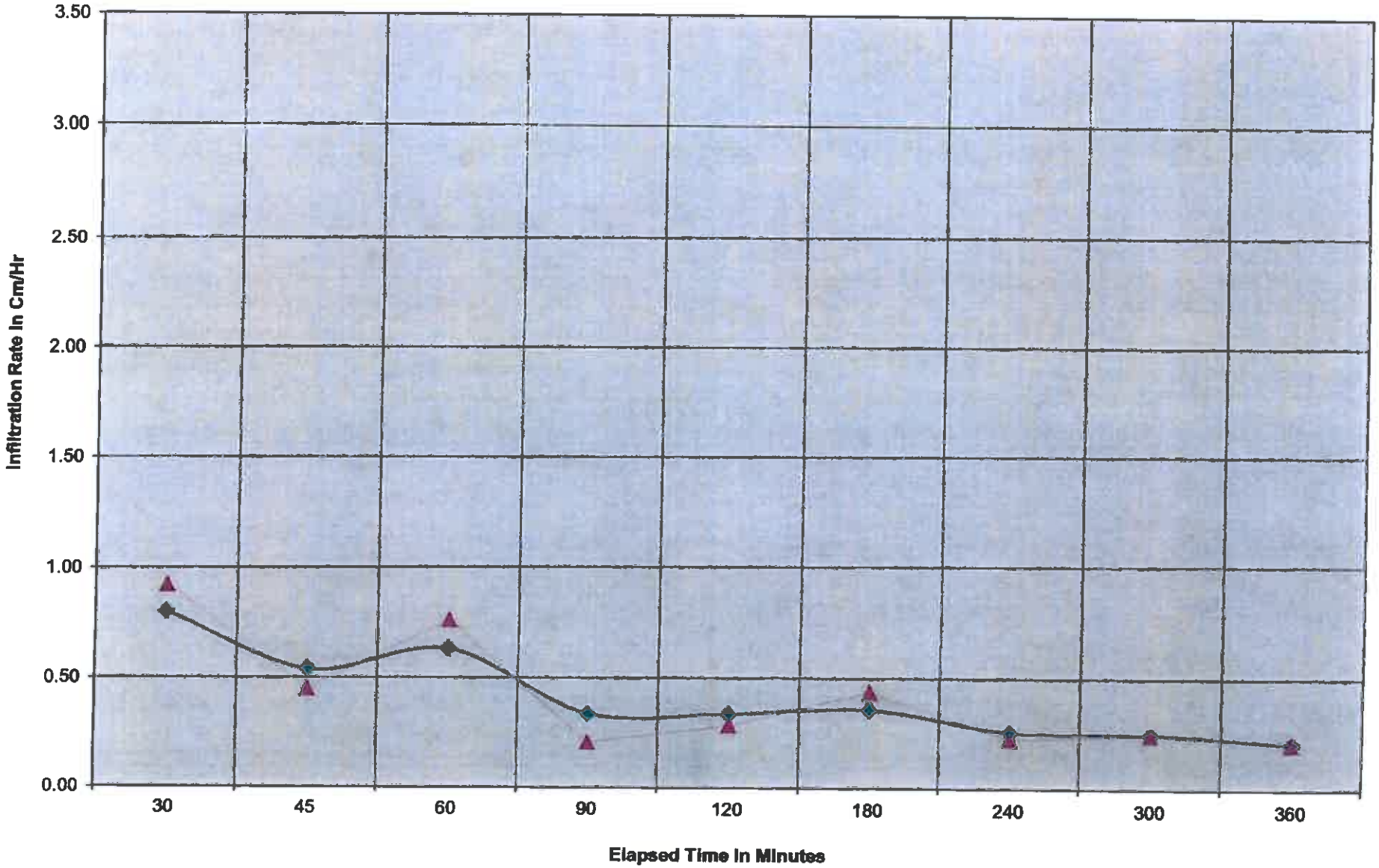
OUTER RING AVERAGE RATE 0.42

Increment No.	DATE	TIME START= 08:52 AM HR: MM	ELAPSED TIME/ INCREMENT MIN	FLOW READINGS INNER FLOW CM3	FLOW READINGS OUTER FLOW CM3	LIQUID TEMP. F	INCREMENTAL INFILTRATION RATE INNER CM/H	INCREMENTAL INFILTRATION RATE ANNULAR CM/H	GROUND TEMP = 73 F @ DEPTH OF 12 INCHES AIR TEMP, WEATHER
1	17-Oct-14	8:52	15	270	1680	72	1.54	3.16	75, Partly Cloudy
2	17-Oct-14	9:07	15	140	490	72	0.80	0.92	74, Partly Cloudy
3	17-Oct-14	9:22	15	95	240	72	0.54	0.45	74, Partly Cloudy
4	17-Oct-14	9:37	15	110	405	72	0.63	0.78	75, Partly Cloudy
5	17-Oct-14	10:07	30	120	220	73	0.34	0.21	75, Partly Cloudy
6	17-Oct-14	10:37	30	120	310	73	0.34	0.29	77, Partly Cloudy
7	17-Oct-14	11:37	60	250	930	73	0.36	0.44	79, Partly Cloudy
8	17-Oct-14	12:37	60	185	480	73	0.26	0.23	79, Partly Cloudy slight breeze
9	17-Oct-14	13:37	60	175	540	73	0.25	0.25	78, Partly Cloudy
10	17-Oct-14	14:37	60	145	440	73	0.21	0.21	78, Partly Cloudy

P-1

Infiltration Graph: Infiltration Rate vs. Time

PROPOSED INFILTRATION BASIN



Hilltop Geotechnical, Inc.

Infiltration Rate: Inner Ring Area — Infiltration Rate: Annular Ring Area

977-A14.1
Plate No. 3

INFILTROMETER TEST P-2 DATE OF TEST 17-Oct-14 DEPTH OF

PROJECT IDENTIFICATION: 977-A14.1 AREA(CM2) LIQUID (CM)

TEST LOCATION: Public Storage Facility Southen Portion INNER 699.6 INNER 15.24

LIQUID USED: Municipal H20 OUTER 2128.5 OUTER 15.24

TESTED BY AH _____ LIQUID LEVEL MAINTAINED USING: __X__ MANUAL ADDITIONS (VISUAL)

DEPTH TO WATER TABLE: INNER RING AVERAGE RATE 0.67

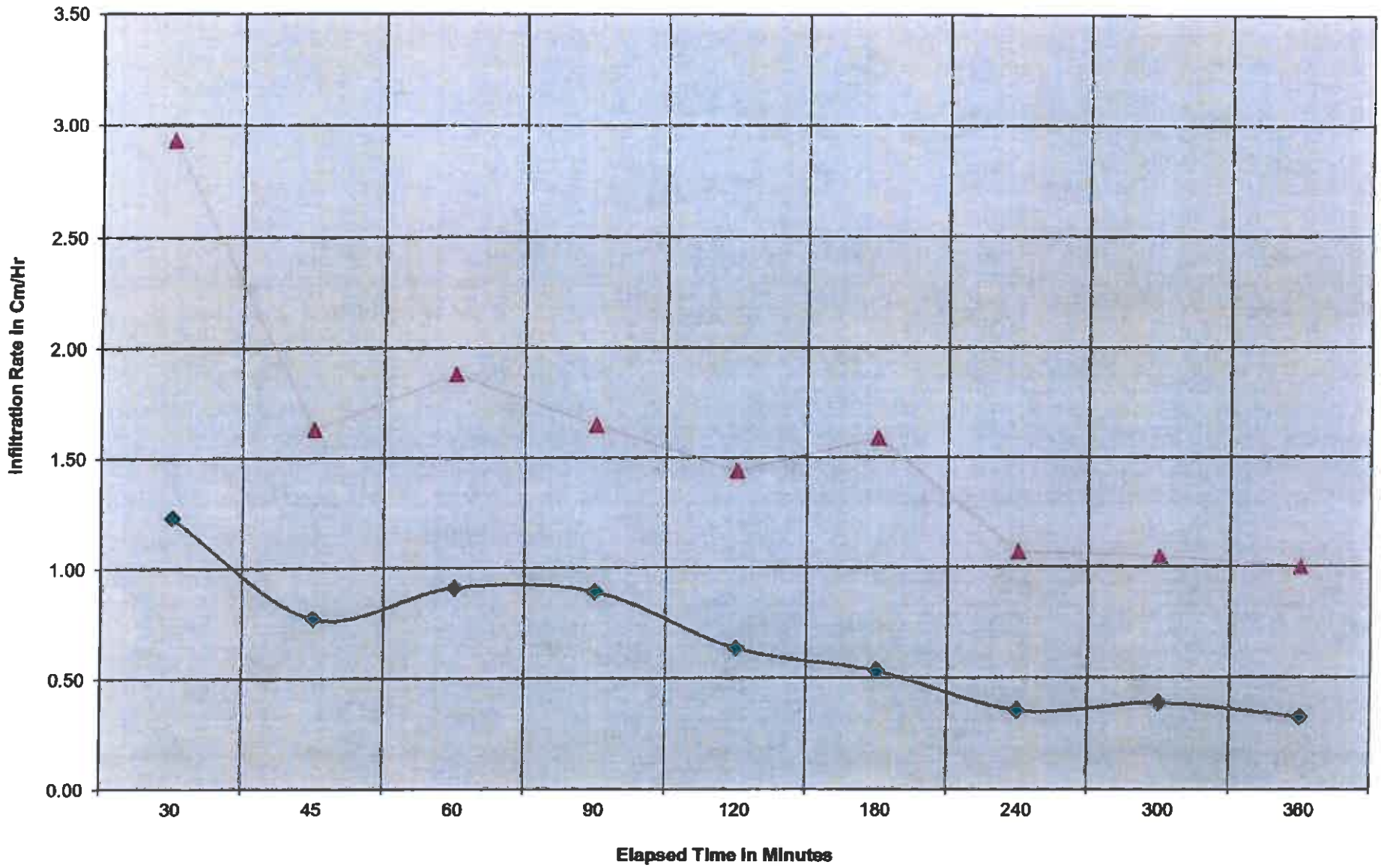
OUTER RING AVERAGE RATE 1.58

Increment No.	DATE	TIME START= 08:52 AM HR: MM	ELAPSED TIME/ INCREMENT MIN	FLOW READINGS INNER FLOW CM3	FLOW READINGS OUTER FLOW CM3	LIQUID TEMP. F	INCREMENTAL INFILTRATION RATE INNER CM/H	INCREMENTAL INFILTRATION RATE ANNULAR CM/H	GROUND TEMP = 73 F @ DEPTH OF 12 INCHES AIR TEMP, WEATHER
1	17-Oct-14	9:24	15	540	3000	72	3.09	5.64	74, Partly Cloudy
2	17-Oct-14	9:39	15	215	1560	72	1.23	2.93	75, Partly Cloudy
3	17-Oct-14	9:54	15	135	865	72	0.77	1.63	75, Partly Cloudy
4	17-Oct-14	10:09	15	160	1000	72	0.91	1.88	76, Partly Cloudy
5	17-Oct-14	10:39	30	310	1760	73	0.89	1.65	77, Partly Cloudy
6	17-Oct-14	11:09	30	220	1530	73	0.63	1.44	78, Partly Cloudy
7	17-Oct-14	0:09	60	370	3380	73	0.53	1.59	79, Partly Cloudy
8	17-Oct-14	13:09	60	250	2280	73	0.36	1.07	79, Partly Cloudy
9	17-Oct-14	14:09	60	270	2230	73	0.39	1.05	78, Partly Cloudy
10	17-Oct-14	15:09	60	230	2130	73	0.33	1.00	78, Partly Cloudy

P-2

Infiltration Graph: Infiltration Rate vs. Time

PROPOSED INFILTRATION BASIN



Hilltop Geotechnical, Inc.

977-A14.1
Plate No. 5

ATTACHMENT E

Geotechnical Certification Sheet

(if applicable)

The design of stormwater treatment and other control measures proposed in this plan requiring specific soil infiltration characteristics and/or geological conditions has been reviewed and approved by a registered Civil Engineer, Geotechnical Engineer, or Geologist in the State of California.

_____ _____

Name and registration # Date

ATTACHMENT F

Maintenance Plan

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

The following is a general outline to create your project specific Maintenance Plan. A Maintenance Plan is a living document and field conditions may require modifications to the Maintenance Plan.

I. Inspection, Maintenance Log and Self-Verification Forms (Examples are provided in Appendix F of the San Diego County SUSMP)

II. Updates, Revisions and Errata

III. Introduction

A. Narrative overview describing the site; drainage areas, routing, and discharge points; and treatment facilities.

IV. Responsibility for Maintenance

A. General

(1) Name and contact information for responsible individual(s).

(2) Organization chart or charts showing organization of the maintenance function and location within the overall organization.

(3) Insert a copy of the recorded maintenance agreement.

(4) Maintenance Funding

(1) Sources of funds for maintenance

(2) Budget category or line item

(3) Description of procedure and process for ensuring adequate funding for maintenance

B. Staff Training Program

C. Records

D. Safety

V. Summary of Drainage Areas and Stormwater Facilities

A. Drainage Areas

(1) Drawings showing pervious and impervious areas (copied or adapted from initial SWMP).

(2) Designation and description of each drainage area and how flow is routed to the corresponding facility.

B. Treatment and Flow-Control Facilities

(1) Drawings showing location and type of each facility

(2) General description of each facility (Consider a table if more than two facilities)

(1) Area drained and routing of discharge.

(2) Facility type and size

VI. Facility Documentation

A. "As-built" drawings of each facility (design drawings in the draft Plan)

B. Manufacturer's data, manuals, and maintenance requirements for pumps, mechanical or electrical equipment, and proprietary facilities (include a "placeholder" in the draft plan for information not yet available).

C. Specific operation and maintenance concerns and troubleshooting

VII. Maintenance Schedule or Matrix

A. Maintenance Schedule for each facility with specific requirements for:

(1) Routine inspection and maintenance

(2) Annual inspection and maintenance

(3) Inspection and maintenance after major storms

B. Service Agreement Information

Assemble and make copies of your maintenance plan. One copy must be submitted to the County, and at least one copy kept on-site. Here are some suggestions for formatting the maintenance plan:

- Format plans to 8½" x 11" to facilitate duplication, filing, and handling.
- Include the revision date in the footer on each page.
- Scan graphics and incorporate with text into a single electronic file. Keep the electronic file backed-up so that copies of the maintenance plan can be made if the hard copy is lost or damaged.

ATTACHMENT G

Treatment Control BMP Certification for DPW Permitted Land Development Projects

After TCBMP construction, complete a TCBMP Certification form to verify with County staff that all constructed TCBMPs on the record plans match the approved TCBMPs in the most current SWMP. TCBMP Certification must be completed and verified for permit closure.

ATTACHMENT H

HMP Study

(Contact County staff to determine if this should be a separate report from the Major SWMP)

ATTACHMENT I

Geomorphic Assessment

(Contact County staff immediately if you are planning to conduct a Geomorphic Assessment. A Geomorphic Assessment must be performed if the project is using a "Medium" low flow threshold of $0.3Q_2$ or a "High" low flow threshold of $0.5Q_2$.)

ATTACHMENT J

HMP Exemption Documentation

(if applicable)

ATTACHMENT K

Addendum