County of San Diego
PRIORITY DEVELOPMENT PROJECT (PDP) SWQMP

PERRIN WINERY
RECORD ID: PDS2016-AD-16-023

16138 Highland Valley Road
ESCONDIDO, CA 92025

ASSESSOR'S PARCEL NUMBER(S):
276-101-04, 276-101-14, 276-101-06

ENGINEER OF WORK:



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DATE OF SWQMP:
[November 8, 2019]

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SWQMP APPROVED BY:

APPROVAL DATE:

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Table of Contents

Table of Contents iii
Attachments iv
Acronyms iv
PDP SWQMP Preparer's Certification Page v
Submittal Record vii
Project Vicinity Map ix
Step 1: Project type determination (Standard or Priority Development Project) 1
Step 1.1: Storm Water Quality Management Plan requirements 3
Step 1.2: Exemption to PDP definitions 3
Step 2: Construction Storm Water BMP Checklist 4
Step 3: County of San Diego PDP SWQMP Site Information Checklist 7
Step 3.1: Description of Existing Site Condition 7
Step 3.2: Description of Existing Site Drainage Patterns 8
Step 3.3: Description of Proposed Site Development 10
Step 3.4: Description of Proposed Site Drainage Patterns 11
Step 3.5: Potential Pollutant Source Areas 12
Step 3.6: Identification and Narrative of Receiving Water and Pollutants of Concern 13
Step 3.7: Hydromodification Management Requirements 14
Step 3.7.1: Critical Coarse Sediment Yield Areas* 15
Step 3.7.2: Flow Control for Post-Project Runoff* 16
Step 3.8: Other Site Requirements and Constraints 17
Step 4: Source Control BMP Checklist 18
Step 5: Site Design BMP Checklist 20
Step 6: PDP Structural BMPs 22
Step 6.1: Description of structural BMP strategy 22
Step 6.2: Structural BMP Checklist 24
Step 6.3: Offsite Alternative Compliance Participation Form 25

Attachments

Attachment 1: Backup for PDP Pollutant Control BMPs
- Attachment 1a: Storm Water Pollutant Control Worksheet Calculations
- Attachment 1b: DMA Exhibit
- Attachment 1c: Individual Structural BMP DMA Mapbook

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

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

Attachment 4: County of San Diego PDP Structural BMP Verification for DPW Permitted Land Development Projects

Attachment 5: Copy of Plan Sheets Showing Permanent Storm Water BMPs

Attachment 6: Copy of Project's Drainage Report

Attachment 7: Copy of Project's Geotechnical and Groundwater Investigation Report

Acronyms

ACP	Alternative Compliance Project
APN	Assessor's Parcel Number
BMP	Best Management Practice
BMP DM	Best Management Practice Design Manual
HMP	Hydromodification Management Plan
HSG	Hydrologic Soil Group
MS4	Municipal Separate Storm Sewer System
N/A	Not Applicable
NRCS	Natural Resources Conservation Service
PDCI	Private Development Construction Inspection Section
PDP	Priority Development Project
PDS	Planning and Development Services
PE	Professional Engineer
RPO	Resource Protection Ordinance
SC	Source Control
SD	Site Design
SDRWQCB	San Diego Regional Water Quality Control Board
SIC	Standard Industrial Classification
SWQMP	Storm Water Quality Management Plan
WMAA	Watershed Management Area Analysis
WPO	Watershed Protection Ordinance
WQIP	Water Quality Improvement Plan

PDP SWQMP Preparer's Certification Page

Project Name: Perrin Winery
Permit Application Number: PDS2016-AD-16-023

PREPARER'S CERTIFICATION

I hereby declare that I am the Engineer in Responsible Charge of design of storm water best management practices (BMPs) for this project, and that I have exercised responsible charge over the design of the BMPs as defined in Section 6703 of the Business and Professions Code, and that the design is consistent with the PDP requirements of the County of San Diego BMP Design Manual, which is a design manual for compliance with local County of San Diego Watershed Protection Ordinance (Sections 67.801 et seq.) and regional MS4 Permit (California Regional Water Quality Control Board San Diego Region Order No. R9-2013-0001 as amended by R9-2015-0001 and R9-2015-0100) requirements for storm water management.

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

C063621 9/30/20

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

DAMON MORELLI

Print Name

EBA Engineering

Company

11/08/2019

Date

Engineer's Seal:



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Submittal Record

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

Preliminary Design / Planning / CEQA

Submittal Number	Date	Summary of Changes
1	01/12/2018	Initial Submittal
2	08/08/2018	Added CEQA Preliminary Drainage Report and updated existing impervious area
3	05/09/2019	Update CEQA Preliminary Drainage Report and SWQMP Plan per plan check comments on 12/27/2018
4	11/08/2019	Update CEQA Preliminary Drainage Report and SWQMP Plan per plan check comments on 10/15/2019

Final Design

Submittal Number	Date	Summary of Changes
1		Initial Submittal
2		
3		
4		

Plan Changes

Submittal Number	Date	Summary of Changes
1		Initial Submittal
2		
3		
4		

Project Vicinity Map

Project Name: Perrin Winery
Record ID: PDS2016-AD-16-023



Step 1: Project type determination (Standard or Priority Development Project)

Is the project part of another Priority Development Project (PDP)? If so, a PDP SWQMP is required. Go to Step 2.			(☐ Yes ☒ No
The project is (select one): ☐ New Development ☒ Redevelopment[1]			
The total proposed newly created or replaced impervious area is:			127431 ft²
The total existing (pre-project) impervious area is:			53000 ft²
The total area disturbed by the project is:			197069 ft²
If the total area disturbed by the project is 1 acre (43,560 sq. ft.) or more OR the project is part of a larger common plan of development disturbing 1 acre or more, a Waste Discharger Identification (WDID) number must be obtained from the State Water Resources Control Board. WDID: _TBA_ (will be provided during the final engineering)__			
Is the project in any of the following categories, (a) through (f)?[2]			
Yes ☐	No ☒	(a)	New development projects that create 10,000 square feet or more of impervious surfaces [3](collectively over the entire project site). This includes commercial, industrial, residential, mixed-use, and public development projects on public or private land.
Yes ☒	No ☐	(b)	Redevelopment projects that create and/or replace 5,000 square feet or more of impervious surface (collectively over the entire project site on an existing site of 10,000 square feet or more of impervious surfaces). This includes commercial, industrial, residential, mixed-use, and public development projects on public or private land.
Yes ☒	No ☐	(c)	New and redevelopment projects that create and/or replace 5,000 square feet or more of impervious surface (collectively over the entire project site), and support one or more of the following uses: (i) Restaurants. This category is defined as a facility that sells prepared foods and drinks for consumption, including stationary lunch counters and refreshment stands selling prepared foods and drinks for immediate consumption (Standard Industrial Classification (SIC) code 5812). (ii) Hillside development projects. This category includes development on any natural slope that is twenty-five percent or greater. (iii) Parking lots. This category is defined as a land area or facility for the temporary parking or storage of motor vehicles used personally, for business, or for commerce. (iv) Streets, roads, highways, freeways, and driveways. This category is defined as any paved impervious surface used for the transportation of automobiles, trucks, motorcycles, and other vehicles.

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

[2] Applicants should note that any development project that will create and/or replace 10,000 square feet or more of impervious surface (collectively over the entire project site) is considered a new development.

[3] For solar energy farm projects, the area of the solar panels does not count toward the total impervious area of the site.

Project type determination (continued)

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

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

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

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

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

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

The area of existing (pre-project) impervious area at the project site is: 53000 ft^2 (A)
The total proposed newly created or replaced impervious area is 127431 ft^2 (B)
Percent impervious surface created or replaced (B/A)*100: 240 %
The percent impervious surface created or replaced is (select one based on the above calculation):

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

OR

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

Step 1.1: Storm Water Quality Management Plan requirements

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

Step 1.2: Exemption to PDP definitions

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

Discussion / justification, and additional requirements for exceptions to PDP definitions, if applicable:

Step 2: Construction Storm Water BMP Checklist

Minimum Required Standard Construction Storm Water BMPs		
If you answer "Yes" to any of the questions below, your project is subject to Table 1 on the following page (Minimum Required Standard Construction Stormwater BMPs). As noted in Table 1, please select at least the minimum number of required BMPs, or as many as are feasible for your project. If no BMP is selected, an explanation must be given in the box provided. The following questions are intended to aid in determining construction BMP requirements for your project. **Note: All selected BMPs below must be included on the BMP plan incorporated into the construction plan sets.**		
1. Will there be soil disturbing activities that will result in exposed soil areas? (This includes minor grading and trenching.) **Reference Table 1 Items A, B, D, and E** Note: Soil disturbances NOT considered significant include, but are not limited to, change in use, mechanical/electrical/plumbing activities, signs, temporary trailers, interior remodeling, and minor tenant improvement.	☒Yes	☐No
2. Will there be asphalt paving, including patching? **Reference Table 1 Items D and F**	☒Yes	☐No
3. Will there be slurries from mortar mixing, coring, or concrete saw cutting? **Reference Table 1 Items D and F**	☒Yes	☐No
4. Will there be solid wastes from concrete demolition and removal, wall construction, or form work? **Reference Table 1 Items D and F**	☒Yes	☐No
5. Will there be stockpiling (soil, compost, asphalt, concrete, solid waste) for over 24 hours? **Reference Table 1 Items D and F**	☒Yes	☐No
6. Will there be dewatering operations? **Reference Table 1 Items C and D**	☐Yes	☒No
7. Will there be temporary on-site storage of construction materials, including mortar mix, raw landscaping and soil stabilization materials, treated lumber, rebar, and plated metal fencing materials? **Reference Table 1 Items E and F**	☒Yes	☐No
8. Will trash or solid waste product be generated from this project? **Reference Table 1 Item F**	☒Yes	☐No
9. Will construction equipment be stored on site (e.g.: fuels, oils, trucks, etc.?) **Reference Table 1 Item F**	☒Yes	☐No
10. Will Portable Sanitary Services ("Porta-potty") be used on the site? **Reference Table 1 Item F**	☒Yes	☐No

Table 1. Construction Storm Water BMP Checklist

Minimum Required Best Management Practices (BMPs)	CALTRANS SW Handbook[4] Detail or County Std. Detail	✔ BMP Selected	Reference sheet No.'s where each selected BMP is shown on the plans. If no BMP is selected, an explanation must be provided.
A. Select Erosion Control Method for Disturbed Slopes (choose at least one for the appropriate season)			
Vegetation Stabilization Planting[5] (Summer)	SS-2, SS-4	☒	
Hydraulic Stabilization Hydroseeding[2] (Summer)	SS-4	☒	
Bonded Fiber Matrix or Stabilized Fiber Matrix[6] (Winter)	SS-3	☐	
Physical Stabilization Erosion Control Blanket[3] (Winter)	SS-7	☐	
B. Select erosion control method for disturbed flat areas (slope < 5%) (choose at least one)			
County Standard Lot Perimeter Protection Detail	PDS 659[7], SC-2	☐	
Will use erosion control measures from Item A on flat areas also	SS-3, 4, 7	☒	
County Standard Desilting Basin (must treat all site runoff)	PDS 660[8], SC-2	☐	
Mulch, straw, wood chips, soil application	SS-6, SS-8	☒	

4 State of California Department of Transportation (Caltrans). 2003. Storm Water Quality Handbooks, Construction Site Best Management Practices (BMPs) Manual. March. Available online at: http://www.dot.ca.gov/hq/construc/stormwater/manuals.htm.

5 If Vegetation Stabilization (Planting or Hydroseeding) is proposed for erosion control it may be installed between May 1st and August 15th. Slope irrigation is in place and needs to be operable for slopes >3 feet. Vegetation must be watered and established prior to October 1st. The owner must implement a contingency physical BMP by August 15th if vegetation establishment does not occur by that date. If landscaping is proposed, erosion control measures must also be used while landscaping is being established. Established vegetation must have a subsurface mat of intertwined mature roots with a uniform vegetative coverage of 70 percent of the natural vegetative coverage or more on all disturbed areas.

6 All slopes over three feet must have established vegetative cover prior to final permit approval.

7 County of San Diego, Planning & Development Services. 2012. Standard Lot Perimeter Protection Design System. Building Division. PDS 659. Available online at http://www.sandiegocounty.gov/pds/docs/pds659.pdf.

8 County of San Diego, Planning & Development Services. 2012. County Standard Desilting Basin for Disturbed Areas of 1 Acre or Less Building Division. PDS 659. Available online at http://www.sandiegocounty.gov/pds/docs/pds660.pdf.

Table 1. Construction Storm Water BMP Checklist (continued)

Minimum Required Best Management Practices (BMPs)	CALTRANS SW Handbook Detail or County Std. Detail	✔ BMP Selected	Reference sheet No.'s where each selected BMP is shown on the plans. If no BMP is selected, an explanation must be provided.
C. If runoff or dewatering operation is concentrated, velocity must be controlled using an energy dissipater			
Energy Dissipater Outlet Protection[9]	SS-10	☐	
D. Select sediment control method for all disturbed areas (choose at least one)			
Silt Fence	SC-1	☐	
Fiber Rolls (Straw Wattles)	SC-5	☒	
Gravel & Sand Bags	SC-6 & 8	☐	
Dewatering Filtration	NS-2	☐	
Storm Drain Inlet Protection	SC-10	☒	
Engineered Desilting Basin (sized for 10-year flow)	SC-2	☐	
E. Select method for preventing offsite tracking of sediment (choose at least one)			
Stabilized Construction Entrance	TC-1	☒	
Construction Road Stabilization	TC-2	☐	
Entrance/Exit Tire Wash	TC-3	☐	
Entrance/Exit Inspection & Cleaning Facility	TC-1	☐	
Street Sweeping and Vacuuming	SC-7	☐	
F. Select the general site management BMPs			
F.1 Materials Management			
Material Delivery & Storage	WM-1	☒	
Spill Prevention and Control	WM-4	☒	
F.2 Waste Management[10]			
Waste Management Concrete Waste Management	WM-8	☒	
Solid Waste Management	WM-5	☒	
Sanitary Waste Management	WM-9	☒	
Hazardous Waste Management	WM-6	☐	

Note: The Construction General Permit (Order No. 2009-0009-DWQ) also requires all projects not subject to the BMP Design Manual to comply with runoff reduction requirements through the implementation of post-construction BMPs as described in Section XIII of the order.

[9] Regional Standard Drawing D-40 – Rip Rap Energy Dissipater is also acceptable for velocity reduction.

[10] Not all projects will have every waste identified. The applicant is responsible for identifying wastes that will be onsite and applying the appropriate BMP. For example, if concrete will be used, BMP WM-8 must be selected.

Step 3: County of San Diego PDP SWQMP Site Information Checklist

Step 3.1: Description of Existing Site Condition

Project Watershed (Complete Hydrologic Unit, Area, and Subarea Name with Numeric Identifier)	San Dieguito HU, San Pasqual HA, Las Lomas Muertas HAS, 905.32

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

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

Description / Additional Information:
The site is developed over the existing single family residence and over 22 acres of vineyard.

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

- ☒ Vegetative Cover 0.67 Acres (29027 Square Feet)
- ☒ Non-Vegetated Pervious Areas 0.64 Acres (27922 Square Feet)
- ☒ Impervious Areas 0.22 Acres (9440 Square Feet)

Description / Additional Information:
The project area consists existing concrete paved for road and residential area, pervious driveway, and existing vineyard area.

Underlying Soil belongs to Hydrologic Soil Group (select all that apply):

- ☐ NRCS Type A
- ☒ NRCS Type B
- ☐ NRCS Type C
- ☒ NRCS Type D

Approximate Depth to Groundwater (GW) (or N/A if no infiltration is used):

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

Existing Natural Hydrologic Features (select all that apply):
☒ Watercourses
☐ Seeps
☐ Springs
☒ Wetlands
☐ None
☒ Other

Description / Additional Information:
The Jurisdictional Delineation Features such as 50-ft oak root protection zone and jurisdictional watercourse along an existing seasonal creek passing at the south side of the project site are shown on SWQMP Exhibits in Attachment 1.

Step 3.2: Description of Existing Site Drainage Patterns

How is storm water runoff conveyed from the site? At a minimum, this description should answer:

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

Describe existing site drainage patterns:
The site improvements occur along on the onsite private concrete/dirt road that connects to Highland Valley Road and run along mountain ridge which wrap around the existing residential area. The existing drainage conveyance at the site is considered to be natural type that the stormwater runoff mostly sheets flow to the lower existing area and to the seasonal creek located along the south side of the site. The seasonal creek runs in parallel to Highland Valley Road in east to west direction receiving the offsite flow and onsite flow from the overall watershed of 706 acres. There are two entrances that connect the private access road with Highland Valley Road (public) crossing the seasonal creek. Each entrance has two 36-inch CMP pipes handling a peak flow rate of 845 cfs during the 100-year storm event.
The existing site drainage patterns study is divided into 5 systems along the proposed site improvement areas.
System #1 includes the northwest area of the project site. The stormwater runoff flows from the top of the hillside through the open area and discharge the peak flow of 12 cfs at the west entrance during the 100-yr storm event.

System #2 includes the northeast area of the site. The runoff flows along the existing private road and discharge the peak flow of 2.0 cfs to the open area at the northeast vineyard area that will flow down to the lower creek.

System #3 includes the area along the east private road and discharges the flow of 4.1 cfs on the sideslope concrete V-ditch that connects to the seasonal creek at the bottom. This concrete V-ditch will be abandoned and replaced with a proposed bioretention (INF-2) and a stormwater drainage system at a nearby location.

System #4 includes the area around the east entrance that discharge the flow of 0.9 cfs to the seasonal creek next to the east entrance.

System #5 includes a small area on the top hill that discharge the flow 0.5 cfs to the other side of the hill.

Step 3.3: Description of Proposed Site Development

Project Description / Proposed Land Use and/or Activities:
The project consists of a new winery facility, a crush pad, hospitality building, a climatized storage building, and parking. There will be concrete pavement improvements over existing concrete/dirt driveway which connecting to Highland Valley Road. The proposed concrete paved driveway will be widened and regraded to provide stability and improve drainage along the driveway. The total project site is 4.5 acres.

List/describe proposed impervious features of the project (e.g., buildings, roadways, parking lots, courtyards, athletic courts, other impervious features):
The proposed impervious features consist of a hospitality building and parking located on the north of the project site. The winery facility building, a storage building, a crush pad, and paved parking are located on the northwest of the project site. The additional parking is located on the northwest side of the project site. The concrete paved driveway will be three gated driveways connecting to Highland Valley Road

List/describe proposed pervious features of the project (e.g., landscape areas):
There are several pervious landscaping area and bioretention facilities around the site with the proposed of permanent BMPs to reduce and capture pollutants and runoff before exiting the site.

Does the project include grading and changes to site topography?
☒Yes
☐No

Description / Additional Information:
The site topography will be changed around the proposed winery buildings located at west side of the project site and the proposed wine testing building located at the north of the project site. The majority of excavation occurs at the proposed winery buildings. The stormwater runoff around the winery building is to sheet flow down to the lower section to the onsite private road. The onsite driveway and parking lots require minor grading. The overall drainage pattern is similar to the predevelopment but with the road site curb and gutter and drop inlet to collect the runoff and directs to the designated discharge locations to prevent erosion and sediment runoff.

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

Change in Land Cover Type Summary			
Land Cover Type	Existing (acres or ft^2)	Proposed (acres or ft^2)	Percent Change
Vegetation	116147	69638	-40%
Pervious (non-vegetated)	27922	N/A	N/A
Impervious	53000	127431	240%

Step 3.4: Description of Proposed Site Drainage Patterns

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

☒Yes
☐No

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

Describe proposed site drainage patterns:
The post development site drainage patterns will be similar to the pre-development conditions. The unpaved existing driveway will be replaced with concrete pavement. The stormwater runoff will be collected along curb and gutter and flow to designated drop inlets and pipe conveyance networks and get treated in the BMPs and discharged as sheet-flow through the vegetation area or seasonal creek. The runoff from the roof of the buildings and the parking lot will be collected and treated to the BMPs as located on the plans. The drainage study and calculations will be provided during the complete design phase. The major change in topography are the two areas where the winery buildings and the hospitality building are located. There will be a major cut in those area into the existing ground but the drainage patterns of those area stay the same. The change in topography along the private road should be minimal.

The proposed drainage systems are divided to 5 systems and the runoff will be collected into the designated conveyance system before discharging to each bioretention basins or biofiltrations with hydromodification storage to reduce the peak flow to be less or equal to the predevelopment conditions. Each BMPs systems will discharge the treated excess runoff closed to the pre-development discharge locations. Please refer to Preliminary Drainage Study Report for calculations and Hydrology Site Map for pre-development and post development drainage flow for each system.

System# 1 has been divided into 3 subsystems; #1A, 1B, & 1C with the proposed peak flow (Q100) without mitigation of 14.4, 4.2, & 6.2 cfs, consecutively where the existing flow is 12 cfs.
System#2 has proposed peak flow of 2.5 cfs where the existing flow is 2.0 cfs.
System#3 has proposed peak flow of 4.4 cfs where the existing flow is 4.1 cfs.
System#4 has proposed peak flow of 0.8 cfs where the existing flow is 0.9 cfs.
System#5 has proposed peak flow of 1.0 cfs where the existing flow is 0.5 cfs.

The post development overall watershed hydrology study shows that the 100-yr offsite runoff flow (Q100) through the site has increased from 845 cfs to 849 cfs after the site improvements. The increased flow is relatively small and should not affect existing culvert pipes at both entrances. However, the existing culverts improvements or restoration may occur to ensure that the culverts are capable to handle such flow.

Step 3.5: Potential Pollutant Source Areas

Identify whether any of the following features, activities, and/or pollutant source areas will be present (select all that apply). Select "Other" if the project is a phased development and provide a description:

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

Description / Additional Information:

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

Describe flow path of storm water from the project site discharge location(s), through urban storm conveyance systems as applicable, to receiving creeks, rivers, and lagoons as applicable, and ultimate discharge to the Pacific Ocean (or bay, lagoon, lake or reservoir, as applicable): The driveway of the site is the high point along the mountain ridge. The runoff from the paved driveway and building will be collected and discharge to respective bioretention facilities to capture the pollutants. The treated stormwater will percolate through the underground and the overflow will either be redirected to sheet flow through vegetative area or to convey further to the downstream seasonal creek. There is an existing seasonal water channel on the south side of the project site that flows from east to west close to Highland Valley Road. Excess runoff from the vineyard area north and south of the channel will flow in to the existing channel and eventually flows to Santa Maria Creek, Santa Ysabel Creek, Hodges Lake, and San Dieguito River before discharges to Pacific Ocean.

List any 303(d) impaired water bodies[11] within the path of storm water from the project site to the Pacific Ocean (or bay, lagoon, lake or reservoir, as applicable), identify the pollutant(s)/stressor(s) causing impairment, and identify any TMDLs and/or Highest Priority Pollutants from the WQIP for the impaired water bodies:

303(d) Impaired Water Body	Pollutant(s)/Stressor(s)	TMDLs / WQIP Highest Priority Pollutant
Santa Maria Creek and Santa Ysabel Creek	*Nothing to be listed*	*Report Category 2 for Santa Maria and Report Category 1 for Santa Ysabel Creek*
Hodges, Lake	*Color, Manganese, Mercury, Nitrogen, Phosphorus, Turbidity, pH*	*Report Category 5A*
San Dieguito River	*Benthic Community Effects, Indicator Bacteria (5B), Nitrogen, Phosphorus, Total Dissolved Solids, Toxicity*	*5A on all except for Indicator Bacteria as 5B*

Identification of Project Site Pollutants*

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

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

Pollutant	Not Applicable to the Project Site	Anticipated from the Project Site	Also a Receiving Water Pollutant of Concern
Sediment	☐	☒	☐
Nutrients	☐	☒	☐
Heavy Metals	☐	☒	☐

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

Organic Compounds	☐	☒	☐
Trash & Debris	☐	☒	☐
Oxygen Demanding Substances	☐	☒	☐
Oil & Grease	☐	☒	☐
Bacteria & Viruses	☐	☒	☐
Pesticides	☒	☐	☒

Step 3.7: Hydromodification Management Requirements

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

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

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

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

☐No, the project will discharge runoff directly to an area identified as appropriate for an exemption by the WMAA[12] for the watershed in which the project resides.

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

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

Step 3.7.1: Critical Coarse Sediment Yield Areas*

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

Projects must satisfy critical coarse sediment yield area (CCSYA) requirements by characterizing the project as one of the scenario-types presented below and satisfying associated criteria. Projects must appropriately satisfy all requirements for identification, avoidance, and bypass, OR may alternatively elect to demonstrate no net impact.

☒ **Scenario 1**: Project is subject to and in compliance with RPO requirements *(without utilization of RPO exemptions 86.604(e)(2)(cc) or 86.604(e)(3) that result in impacts to more than 15% of the project-scale CCSYAs)*.

- ☒ Identify: Project has identified both onsite and upstream CCSYAs as areas that are coarse, ≥25% slope, and ≥50' tall. *(Optional refinement methods may be performed per guidance in Section H.1.2). AND,*
- ☒ Avoid: Project has avoided onsite CCSYAs per existing RPO steep slope encroachment criteria. AND,
- ☒ Bypass: Project has demonstrated that both onsite and upstream CCSYAs are bypassed through or around the project site with a 2 year peak storm velocity of 3 feet per second or greater. OR,
- ☐ No Net Impact: Project does not satisfy all Scenario 1 criteria above and must alternatively demonstrate no net impact to the receiving water.

☐ **Scenario 2**: Project is entirely exempt/not subject to RPO requirements without utilization of RPO exemptions 86.604(e)(2)(cc) or 86.604(e)(3).

- ☐ Identify: Project has identified upstream CCSYAs that are coarse, ≥25% slope, and ≥50' tall. *(Optional refinement methods may be performed per guidance in Section H.1.2). AND,*
- ☐ Avoid: Project is not required to avoid onsite CCSYAs as none were identified in the previous step. AND,
- ☐ Bypass: Project has demonstrated that upstream CCSYAs are bypassed through or around the project site with a 2 year peak storm velocity of 3 feet per second or greater. OR,
- ☐ No Net Impact: Project does not satisfy all Scenario 2 criteria above and must alternatively demonstrate no net impact to the receiving water. *(Skip to next row).*

☐ **Scenario 3**: Project utilizes exemption(s) via RPO Section 86.604(e)(2)(cc) or 86.604(e)(3) and impacts more than 15% of the project-scale CCSYAs.

- ☐ No Net Impact: Project is not eligible for traditional methods of identification, avoidance, and bypass. Project must demonstrate no net impact to the receiving water.

Critical Coarse Sediment Yield Areas Continued
Demonstrate No Net Impact
If the project elects to satisfy CCSYA criteria through demonstration of no net impact to the receiving water. Applicants must identify the methods utilized from the list below and provide supporting documentation in Attachment 2c of the SWQMP. Check all that are applicable. ☐ N/A, the project appropriately identifies, avoids, and bypasses CCSYAs. ☐ Project has performed additional analysis to demonstrate that impacts to CCSYAs satisfy the no net impact standard of Ep/Sp≤1.1. ☐ Project has provided alternate mapping of CCSYAs. ☒ Project has implemented additional onsite hydromodification flow control measures. ☐ Project has implemented an offsite stream rehabilitation project to offset impacts. ☐ Project has implemented other applicant-proposed mitigation measures.

Step 3.7.2: Flow Control for Post-Project Runoff*

*This Section only required if hydromodification management requirements apply
List and describe point(s) of compliance (POCs) for flow control for hydromodification management (see Section 6.3.1). For each POC, provide a POC identification name or number correlating to the project's HMP Exhibit and a receiving channel identification name or number correlating to the project's HMP Exhibit. POCs #10, #9, #14 discharge from Bioretention #1, #2, #3 respectively through the storm drain pipe outfall to the seasonal creek at the west entrance. POC#15 discharges the runoff from biofiltration #4 to the other side of the hill. POC#16 discharges the runoff from biofiltration #5 to the open area which ultimately sheet flow to the seasonal creek. POC#19 discharges the runoff from bioretention #6 to the seasonal creek. POC #21 discharges the runoff from bioretention #7 to the seasonal creek near the east entrance.
Has a geomorphic assessment been performed for the receiving channel(s)? ☒ No, the low flow threshold is 0.1Q2 (default low flow threshold) ☐ Yes, the result is the low flow threshold is 0.1Q2 ☐ Yes, the result is the low flow threshold is 0.3Q2 ☐ Yes, the result is the low flow threshold is 0.5Q2 *If a geomorphic assessment has been performed, provide title, date, and preparer:* *Discussion / Additional Information: (optional)*

Step 3.8: Other Site Requirements and Constraints

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

Optional Additional Information or Continuation of Previous Sections As Needed

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

Step 4: Source Control BMP Checklist

Source Control BMPs			
All development projects must implement source control BMPs 4.2.1 through 4.2.6 where applicable and feasible. See Chapter 4.2 and Appendix E of the County BMP Design Manual for information to implement source control BMPs shown in this checklist. Answer each category below pursuant to the following: • "Yes" means the project will implement the source control BMP as described in Chapter 4.2 and/or Appendix E of the County BMP Design Manual. Discussion / justification is not required. • "No" means the BMP is applicable to the project but it is not feasible to implement. Discussion / justification must be provided. • "N/A" means the BMP is not applicable at the project site because the project does not include the feature that is addressed by the BMP (e.g., the project has no outdoor materials storage areas). Discussion / justification must be provided.			
Source Control Requirement	**Applied?**		
4.2.1 Prevention of Illicit Discharges into the MS4	☒Yes	☐No	☐N/A
Discussion / justification if 4.2.1 not implemented: .			
4.2.2 Storm Drain Stenciling or Signage	☒Yes	☐No	☐N/A
Discussion / justification if 4.2.2 not implemented:			
4.2.3 Protect Outdoor Materials Storage Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☒Yes	☐No	☐N/A
Discussion / justification if 4.2.3 not implemented:			
4.2.4 Protect Materials Stored in Outdoor Work Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☒Yes	☐No	☐N/A
Discussion / justification if 4.2.4 not implemented:			

Source Control Requirement	Applied?		
4.2.5 Protect Trash Storage Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☒Yes	☐No	☐N/A
Discussion / justification if 4.2.5 not implemented:			
4.2.6 Additional BMPs Based on Potential Sources of Runoff Pollutants (must answer for each source listed below):			
☒ A. On-site storm drain inlets	☒Yes	☐No	☐N/A
☐ B. Interior floor drains and elevator shaft sump pumps	☐Yes	☐No	☒N/A
☐ C. Interior parking garages	☐Yes	☐No	☒N/A
☒ D. Need for future indoor & structural pest control	☒Yes	☐No	☐N/A
☒ E. Landscape/outdoor pesticide use	☒Yes	☐No	☐N/A
☒ F. Pools, spas, ponds, fountains, and other water features	☒Yes	☐No	☐N/A
☒ G. Food service	☒Yes	☐No	☐N/A
☐ H. Refuse areas	☐Yes	☐No	☒N/A
☐ I. Industrial processes	☐Yes	☐No	☒N/A
☐ J. Outdoor storage of equipment or materials	☐Yes	☐No	☒N/A
☐ K. Vehicle and equipment cleaning	☐Yes	☐No	☒N/A
☐ L. Vehicle/equipment repair and maintenance	☐Yes	☐No	☒N/A
☐ M. Fuel dispensing areas	☐Yes	☐No	☒N/A
☐ N. Loading docks	☐Yes	☐No	☒N/A
☐ O. Fire sprinkler test water	☐Yes	☐No	☒N/A
☒ P. Miscellaneous drain or wash water	☒Yes	☐No	☐N/A
☒ Q. Plazas, sidewalks, and parking lots	☒Yes	☐No	☐N/A
Discussion / justification if 4.2.6 not implemented. Clearly identify which sources of runoff pollutants are discussed. Justification must be provided for <u>all</u> "No" answers shown above.			

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

Step 5: Site Design BMP Checklist

Site Design BMPs
All development projects must implement site design BMPs SD-A through SD-H where applicable and feasible. See Chapter 4.3 and Appendix E of the County BMP Design Manual for information to implement site design BMPs shown in this checklist. Answer each category below pursuant to the following: • "Yes" means the project will implement the site design BMP as described in Chapter 4.3 and/or Appendix E of the County BMP Design Manual. Discussion / justification is not required. • "No" means the BMP is applicable to the project but it is not feasible to implement. Discussion / justification must be provided. • "N/A" means the BMP is not applicable at the project site because the project does not include the feature that is addressed by the BMP (e.g., the project site has no existing natural areas to conserve). Discussion / justification must be provided.

Site Design Requirement	Applied?		
4.3.1 Maintain Natural Drainage Pathways and Hydrologic Features	☒Yes	☐No	☐N/A
Discussion / justification if 4.3.1 not implemented:			
4.3.2 Conserve Natural Areas, Soils, and Vegetation	☒Yes	☐No	☐N/A
Discussion / justification if 4.3.2 not implemented:			
4.3.3 Minimize Impervious Area	☒Yes	☐No	☐N/A
Discussion / justification if 4.3.3 not implemented:			
4.3.4 Minimize Soil Compaction	☒Yes	☐No	☐N/A
Discussion / justification if 4.3.4 not implemented:			
4.3.5 Impervious Area Dispersion	☒Yes	☐No	☐N/A
Discussion / justification if 4.3.5 not implemented:			

Site Design Requirement	Applied?		
4.3.6 Runoff Collection	☒Yes	☐No	☐N/A
Discussion / justification if 4.3.6 not implemented:			
4.3.7 Landscaping with Native or Drought Tolerant Species	☒Yes	☐No	☐N/A
Discussion / justification if 4.3.7 not implemented:			
4.3.8 Harvesting and Using Precipitation	☐Yes	☒No	☐N/A
Discussion / justification if 4.3.8 not implemented: Based on the feasibility analysis per checklist B.3-1, full capture and use technique is not feasible for this project. There is no plan for harvesting and using precipitation at the moment. If the project desires to harvest and use precipitation, feasibility will be evaluated per Section 5.4.1 of San Diego County Hydrology Manual and Appendix B-3 of County of San Diego BMP Design Manual.			

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

Step 6: PDP Structural BMPs

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

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

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

Step 6.1: Description of structural BMP strategy

Describe the general strategy for structural BMP implementation at the site. This information must describe how the steps for selecting and designing storm water pollutant control BMPs presented in Section 5.1 of the BMP Design Manual were followed, and the results (type of BMPs selected). For projects requiring hydromodification flow control BMPs, indicate whether pollutant control and flow control BMPs are integrated or separate. At the end of this discussion provide a summary of all the structural BMPs within the project including the type and number.

The structural BMP strategy for this project with no harvesting is based on feasibility category 4 per worksheet B.3-1 of the County of San Diego Design Manual.

Stormwater runoff from roof and other impervious surface will get collected at the designated drop inlets in each DMAs and it will flow to the BMPs to capture the pollutants.

There are nine Drainage Management Area (DMA) from A through I on this project for a total of seven BMPs #1 through #7. BMPs #1, #2, #3, #6, and #7 are unlined bioretention basin (INF-2) assuming those BMPs are located in hydrologic soil group B with assumed infiltration rate of 0.3 in/hr. BMPs #4, & #5 are biofiltration with partial retention (PR-1) located hydrologic soil group D with the assumed infiltration rate of 0.06 in/hr. There is no geotechnical investigation report at the time. The report will be prepared during the final design and all the BMPs will be revisited based on the geotechnical engineer recommendations. All BMPs are integrated for both pollutant control and flow control.

BMP #1 (INF-2) receives the stormwater runoff from DMA E, F, & A. The BMP is located at the west entrance. The overflow structure will discharge to the seasonal creek next to the west entrance.

(Continue on following page as necessary.)

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

(Continued from previous page)

BMP#2 (INF-2) receives the stormwater runoff from DMA B. The BMP is located on the west of the project site. The overflow structure will discharge to the seasonal creek next to the west entrance.

BMP#3 (INF-2) receives the stormwater runoff from DMA C. The BMP is located on the west side of the project site. The overflow structure will discharge to the seasonal creek next to the west entrance.

BMP#4 (PR-1) receives the stormwater runoff from DMA D. The BMP is located on the northwest of the project site. The overflow structure will discharge to the other side of the hill.

BMP#5 (PR-1) receives the stormwater runoff from DMA G. The BMP is located on the northeast of the project site. The overflow structure will discharge to the northeast vineyard area which will ultimately sheet flow to the lower creek.

BMP#6 (INF-2) receives the stormwater runoff from DMA H. The BMP is located on the east of the project site. The overflow structure will discharge to the seasonal creek below.

BMP#7 (INF-2) receives the stormwater runoff from DMA I. The BMP is located next to the east entrance. The overflow structure will discharge to the seasonal creek.

For the preliminary design purpose, it is considered that all DMAs (A through I) are not self mitigating, de minimis, or self retaining and are not excluded from DCV calculation. As being conservative in BMPs calculation, existing trees are not currently considered as part of pollutant and hydromodification DCV reduction. If the geotechnical and groundwater investigation report and design constraint require to eliminate or to have smaller BMPs, DCV reduction calculations may be applied.

Step 6.2: Structural BMP Checklist

(Copy this page as needed to provide information for each individual proposed structural BMP)	
Structural BMP ID No. 1, DMAs E,F, & A	
Construction Plan Sheet No. SWQMP, Figure 3	
Type of structural BMP: ☐ Retention by harvest and use (HU-1) ☐ Retention by infiltration basin (INF-1) ☒ Retention by bioretention (INF-2) ☐ Retention by permeable pavement (INF-3) ☐ Partial retention by biofiltration with partial retention (PR-1) ☐ Biofiltration (BF-1) ☐ Biofiltration with Nutrient Sensitive Media Design (BF-2) ☐ Proprietary Biofiltration (BF-3) meeting all requirements of Appendix F ☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below) ☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below) ☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below) ☐ Detention pond or vault for hydromodification management ☐ Other (describe in discussion section below)	
Purpose: ☐ Pollutant control only ☐ Hydromodification control only ☒ Combined pollutant control and hydromodification control ☐ Pre-treatment/forebay for another structural BMP ☐ Other (describe in discussion section below)	
Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification forms (See Section 1.12 of the BMP Design Manual)	To be determined during the final engineering.
Who will be the final owner of this BMP?	☐ HOA ☒ Property Owner ☐ County ☐ Other (describe)
Who will maintain this BMP into perpetuity?	☐ HOA ☒ Property Owner ☐ County ☐ Other (describe)
What Category (1-4) is the Structural BMP? Refer to the Category definitions in Section 7.3 of the BMP DM. Attach the appropriate maintenance agreement in Attachment 3.	Category 1
Discussion (as needed): In the absent of the geotechnical report, it is assumed that the soil is suitable for INF-2. *(Continue on subsequent pages as necessary)*	

Step 6.2: Structural BMP Checklist

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

Structural BMP ID No. 2, DMA B

Construction Plan Sheet No. SWQMP, Figure 3

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

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

Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification forms (See Section 1.12 of the BMP Design Manual)	To be determined during the final engineering.
Who will be the final owner of this BMP?	☐ HOA ☒ Property Owner ☐ County ☐ Other (describe)
Who will maintain this BMP into perpetuity?	☐ HOA ☒ Property Owner ☐ County ☐ Other (describe)
What Category (1-4) is the Structural BMP? Refer to the Category definitions in Section 7.3 of the BMP DM. Attach the appropriate maintenance agreement in Attachment 3.	Category 1

Discussion (as needed):
In the absent of the geotechnical report, it is assumed that the soil is suitable for INF-2.
(Continue on subsequent pages as necessary)

Step 6.2: Structural BMP Checklist

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

Structural BMP ID No. 3, DMA C

Construction Plan Sheet No. SWQMP, Figure 3

Type of structural BMP:

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

Purpose:

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

Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification forms (See Section 1.12 of the BMP Design Manual)	To be determined during the final engineering.
Who will be the final owner of this BMP?	☐ HOA ☒ Property Owner ☐ County ☐ Other (describe)
Who will maintain this BMP into perpetuity?	☐ HOA ☒ Property Owner ☐ County ☐ Other (describe)
What Category (1-4) is the Structural BMP? Refer to the Category definitions in Section 7.3 of the BMP DM. Attach the appropriate maintenance agreement in Attachment 3.	Category 1

Discussion (as needed):

In the absent of the geotechnical report, it is assumed that the soil is suitable for INF-2.

(Continue on subsequent pages as necessary)

Step 6.2: Structural BMP Checklist

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

Structural BMP ID No. 4, DMA D

Construction Plan Sheet No. SWQMP, Figure 3

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

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

Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification forms (See Section 1.12 of the BMP Design Manual)	To be determined during the final engineering.
Who will be the final owner of this BMP?	☐ HOA ☒ Property Owner ☐ County ☐ Other (describe)
Who will maintain this BMP into perpetuity?	☐ HOA ☒ Property Owner ☐ County ☐ Other (describe)
What Category (1-4) is the Structural BMP? Refer to the Category definitions in Section 7.3 of the BMP DM. Attach the appropriate maintenance agreement in Attachment 3.	Category 1

Discussion (as needed):
Using biofiltration with partial retention (PR-1) for hydrologic soil group D. The BMP will be reevaluated once the geotechnical report is available.
(Continue on subsequent pages as necessary)

Step 6.2: Structural BMP Checklist

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

Structural BMP ID No. 5, DMA G

Construction Plan Sheet No. SWQMP, Figure 3

Type of structural BMP:

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

Purpose:

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

Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification forms (See Section 1.12 of the BMP Design Manual)	To be determined during the final engineering.
Who will be the final owner of this BMP?	☐ HOA ☒ Property Owner ☐ County ☐ Other (describe)
Who will maintain this BMP into perpetuity?	☐ HOA ☒ Property Owner ☐ County ☐ Other (describe)
What Category (1-4) is the Structural BMP? Refer to the Category definitions in Section 7.3 of the BMP DM. Attach the appropriate maintenance agreement in Attachment 3.	Category 1

Discussion (as needed):

Using biofiltration with partial retention (PR-1) for hydrologic soil group D. The BMP will be reevaluated once the geotechnical report is available.

(Continue on subsequent pages as necessary)

Step 6.2: Structural BMP Checklist

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

Structural BMP ID No. 6, DMA H

Construction Plan Sheet No. SWQMP, Figure 3

Type of structural BMP:

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

Purpose:

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

Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification forms (See Section 1.12 of the BMP Design Manual)	To be determined during the final engineering.
Who will be the final owner of this BMP?	☐ HOA ☒ Property Owner ☐ County ☐ Other (describe)
Who will maintain this BMP into perpetuity?	☐ HOA ☒ Property Owner ☐ County ☐ Other (describe)
What Category (1-4) is the Structural BMP? Refer to the Category definitions in Section 7.3 of the BMP DM. Attach the appropriate maintenance agreement in Attachment 3.	Category 1

Discussion (as needed):

In the absent of the geotechnical report, it is assumed that the soil is suitable for INF-2.

(Continue on subsequent pages as necessary)

Step 6.2: Structural BMP Checklist

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

Structural BMP ID No. 7, DMA I

Construction Plan Sheet No. SWQMP, Figure 3

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

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

Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification forms (See Section 1.12 of the BMP Design Manual)	To be determined during the final engineering.
Who will be the final owner of this BMP?	☐ HOA ☒ Property Owner ☐ County ☐ Other (describe)
Who will maintain this BMP into perpetuity?	☐ HOA ☒ Property Owner ☐ County ☐ Other (describe)
What Category (1-4) is the Structural BMP? Refer to the Category definitions in Section 7.3 of the BMP DM. Attach the appropriate maintenance agreement in Attachment 3.	Category 1

Discussion (as needed):
In the absent of the geotechnical report, it is assumed that the soil is suitable for INF-2.
(Continue on subsequent pages as necessary)

Step 6.3: Offsite Alternative Compliance Participation Form

PDP INFORMATION	
Record ID:	
Assessor's Parcel Number(s) [APN(s)]	
What are your PDP Pollutant Control Debits? *See Attachment 1 of the PDP SWQMP	
What are your PDP HMP Debits? (if applicable) *See Attachment 2 of the PDP SWQMP	
ACP Information	
Record ID:	
Assessor's Parcel Number(s) [APN(s)]	
Project Owner/Address	
What are your ACP Pollutant Control Credits? *See Attachment 1 of the ACP SWQMP	
What are your ACP HMP Debits? (if applicable) *See Attachment 2 of the ACP SWQMP	
Is your ACP in the same watershed as your PDP? ☐ Yes ☐ No	Will your ACP project be completed prior to the completion of the PDP? ☐ Yes ☐ No
Does your ACP account for all Deficits generated by the PDP? ☐ Yes ☐ No (PDP and/or ACP must be redesigned to account for all deficits generated by the PDP.	What is the difference between your PDP debits and ACP Credits? *(ACP Credits -Total PDP Debits = Total Earned Credits)

ATTACHMENT 1

BACKUP FOR PDP POLLUTANT CONTROL BMPS

This is the cover sheet for Attachment 1.

Indicate which Items are Included behind this cover sheet:

Attachment Sequence	Contents	Checklist
Attachment 1a	Storm Water Pollutant Control Worksheet Calculations -Worksheet B.3-1 (Required) -Worksheet B.1-1 (Required) -Worksheet B.4-1 (if applicable) -Worksheet B.4-2 (if applicable) -Worksheet B.5-1 (if applicable) -Worksheet B.5-2 (if applicable) -Worksheet B.5-3 (if applicable) -Worksheet B.6-1 (if applicable) -Summary Worksheet (optional)	☒ Included
Attachment 1b	Form I-8, Categorization of Infiltration Feasibility Condition (Required unless the project will use harvest and use BMPs) Refer to Appendices C and D of the BMP Design Manual to complete Form I-8.	☒ Included ☐ Not included because the entire project will use harvest and use BMPs
Attachment 1c	DMA Exhibit (Required) See DMA Exhibit Checklist on the back of this Attachment cover sheet.	☒ Included
Attachment 1d	Individual Structural BMP DMA Mapbook (Required) -Place each map on 8.5”x11” paper. -Show at a minimum the DMA, Structural BMP, and any existing hydrologic features within the DMA.	☒ Included

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

The DMA Exhibit must identify:

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

ATTACHMENT 1 BACKUP FOR PDP POLLUTANT CONTROL BMPS

ATTACHMENT 1a STORM WATER POLLUTANT CONTROL (WORKSHEET CALCULATION)

Automated Worksheet B.1-1: Calculation of Design Capture Volume (V1.3)

Category	#	Description	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	Units
Standard Drainage Basin Inputs	0	Drainage Basin ID or Name	DMA-1	DMA-2	DMA-3	DMA-4	DMA-5	DMA-6	DMA-7				unitless
	1	Basin Drains to the Following BMP Type	Retention	Retention	Retention	Biofiltration	Biofiltration	Retention	Retention				unitless
	2	85th Percentile 24-hr Storm Depth	0.67	0.67	0.67	0.67	0.67	0.67	0.67				inches
	3	Design Infiltration Rate Recommended by Geotechnical Engineer	0.300	0.300	0.300	0.060	0.060	0.300	0.300				in/hr
	4	Impervious Surfaces Not Directed to Dispersion Area (C=0.90)	59,880	9,650	8,830	5,480	15,410	13,840	4,500				sq-ft
	5	Semi-Pervious Surfaces Not Serving as Dispersion Area (C=0.30)											sq-ft
	6	Engineered Pervious Surfaces Not Serving as Dispersion Area (C=0.10)											sq-ft
	7	Natural Type A Soil Not Serving as Dispersion Area (C=0.10)											sq-ft
	8	Natural Type B Soil Not Serving as Dispersion Area (C=0.14)	68,000	24,348				43,725	5,500				sq-ft
	9	Natural Type C Soil Not Serving as Dispersion Area (C=0.23)											sq-ft
	10	Natural Type D Soil Not Serving as Dispersion Area (C=0.30)	51,460	21,352	63,500	720	6,740	10,335					sq-ft
Dispersion Area, Tree Well & Rain Barrel Inputs (Optional)	11	Does Tributary Incorporate Dispersion, Tree Wells, and/or Rain Barrels?	No	No	No	No	No	No	No	No	No	No	yes/no
	12	Impervious Surfaces **Directed to Dispersion Area** per SD-B (Ci=0.90)											sq-ft
	13	Semi-Pervious Surfaces **Serving as Dispersion Area** per SD-B (Ci=0.30)											sq-ft
	14	Engineered Pervious Surfaces **Serving as Dispersion Area** per SD-B (Ci=0.10)											sq-ft
	15	Natural Type A Soil **Serving as Dispersion Area** per SD-B (Ci=0.10)											sq-ft
	16	Natural Type B Soil **Serving as Dispersion Area** per SD-B (Ci=0.14)											sq-ft
	17	Natural Type C Soil **Serving as Dispersion Area** per SD-B (Ci=0.23)											sq-ft
	18	Natural Type D Soil **Serving as Dispersion Area** per SD-B (Ci=0.30)											sq-ft
	19	Number of Tree Wells Proposed per SD-A											#
	20	Average Mature Tree Canopy Diameter											ft
	21	Number of Rain Barrels Proposed per SD-E											#
	22	Average Rain Barrel Size											gal
Treatment Train Inputs & Calculations	23	Does BMP Overflow to Stormwater Features in Downstream Drainage?	No	No	No	No	No	No	No	No	No	No	unitless
	24	Identify Downstream Drainage Basin Providing Treatment in Series											unitless
	25	Percent of Upstream Flows Directed to Downstream Dispersion Areas											percent
	26	Upstream Impervious Surfaces Directed to Dispersion Area (Ci=0.90)	0	0	0	0	0	0	0	0	0	0	cubic-feet
	27	Upstream Impervious Surfaces Not Directed to Dispersion Area (C=0.90)	0	0	0	0	0	0	0	0	0	0	cubic-feet
Initial Runoff Factor Calculation	28	Total Tributary Area	179,340	55,350	72,330	6,200	22,150	67,900	10,000	0	0	0	sq-ft
	29	Initial Runoff Factor for Standard Drainage Areas	0.44	0.33	0.37	0.83	0.72	0.32	0.48	0.00	0.00	0.00	unitless
	30	Initial Runoff Factor for Dispersed & Dispersion Areas	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	unitless
	31	Initial Weighted Runoff Factor	0.44	0.33	0.37	0.83	0.72	0.32	0.48	0.00	0.00	0.00	unitless
	32	Initial Design Capture Volume	4,406	1,020	1,494	287	890	1,213	268	0	0	0	cubic-feet
Dispersion Area Adjustments	33	Total Impervious Area Dispersed to Pervious Surface	0	0	0	0	0	0	0	0	0	0	sq-ft
	34	Total Pervious Dispersion Area	0	0	0	0	0	0	0	0	0	0	sq-ft
	35	Ratio of Dispersed Impervious Area to Pervious Dispersion Area	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	ratio
	36	Adjustment Factor for Dispersed & Dispersion Areas	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	ratio
	37	Runoff Factor After Dispersion Techniques	0.44	0.33	0.37	0.83	0.72	0.32	0.48	n/a	n/a	n/a	unitless
	38	Design Capture Volume After Dispersion Techniques	4,406	1,020	1,494	287	890	1,213	268	0	0	0	cubic-feet
Tree & Barrel Adjustments	39	Total Tree Well Volume Reduction	0	0	0	0	0	0	0	0	0	0	cubic-feet
	40	Total Rain Barrel Volume Reduction	0	0	0	0	0	0	0	0	0	0	cubic-feet
Results	41	Final Adjusted Runoff Factor	0.44	0.33	0.37	0.83	0.72	0.32	0.48	0.00	0.00	0.00	unitless
	42	Final Effective Tributary Area	78,910	18,266	26,762	5,146	15,948	21,728	4,800	0	0	0	sq-ft
	43	Initial Design Capture Volume Retained by Site Design Elements	0	0	0	0	0	0	0	0	0	0	cubic-feet
	44	Final Design Capture Volume Tributary to BMP	4,406	1,020	1,494	287	890	1,213	268	0	0	0	cubic-feet

Worksheet B.1-1 General Notes:

A. Applicants may use this worksheet to calculate design capture volumes for up to 10 drainage areas User input must be provided for yellow shaded cells, values for all other cells will be automatically generated, errors/notifications will be highlighted in red and summarized below. Upon completion of this worksheet, proceed to the appropriate BMP Sizing worksheet(s).

Automated Worksheet B.4-1: Sizing Retention BMPs (V1.3)

Category	#	Description	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	Units
BMP Inputs	0	Drainage Basin ID or Name	DMA-1	DMA-2	DMA-3	-	-	DMA-6	DMA-7	-	-	-	unitless
	1	Design Infiltration Rate Recommended by Geotechnical Engineer	0.300	0.300	0.300	-	-	0.300	0.300	-	-	-	in/hr
	2	Design Capture Volume Tributary to BMP	4,406	1,020	1,494	-	-	1,213	268	-	-	-	cubic-feet
	3	Is Retention BMP Vegetated or Non-Vegetated?	Vegetated	Vegetated	Vegetated			Vegetated	Vegetated				unitless
	4	Provided Surface Area	3,000	800	1,200			950	200				sq-ft
	5	Provided Surface Ponding Depth	6	6	6			6	6				inches
	6	Provided Soil Media Thickness	18	18	18			18	18				inches
	7	Provided Gravel Storage Thickness	36	36	36			36	36				inches
Infiltration Calculations	8	Volume Infiltrated Over 6 Hour Storm	450	120	180	0	0	143	30	0	0	0	cubic-feet
	9	Soil Media Pore Space	0.25	0.25	0.25	0.40	0.40	0.25	0.25	0.40	0.40	0.40	unitless
	10	Gravel Pore Space	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	unitless
	11	Effective Depth of Retention Storage	24.9	24.9	24.9	0.0	0.0	24.9	24.9	0.0	0.0	0.0	inches
	12	Drawdown Time for Surface Ponding (Post-Storm)	20	20	20	0	0	20	20	0	0	0	hours
	13	Drawdown Time for Entire Basin (Including 6 Hour Storm)	89	89	89	0	0	89	89	0	0	0	hours
	14	Volume Retained by BMP	6,675	1,780	2,670	0	0	2,114	445	0	0	0	cubic-feet
	15	Fraction of DCV Retained	1.51	1.75	1.79	0.00	0.00	1.74	1.66	0.00	0.00	0.00	ratio
	16	Percentage of Performance Requirement Satisfied	1.00	1.00	1.00	0.00	0.00	1.00	1.00	0.00	0.00	0.00	ratio
	17	Fraction of DCV Retained (normalized to 36-hr drawdown)	1.00	1.00	1.00	0.00	0.00	1.00	1.00	0.00	0.00	0.00	ratio
	18	This BMP Overflows to the Following Drainage Basin	-	-	-	-	-	-	-	-	-	-	unitless
Result	19	**Deficit of Effectively Treated Stormwater**	**0**	**0**	**0**	**n/a**	**n/a**	**0**	**0**	**n/a**	**n/a**	**n/a**	cubic-feet

Worksheet B.4-1 General Notes:

A. Applicants may use this worksheet to size Infiltration, Bioretention, and/or Permeable Pavement BMPs (INF-1, INF-2, INF-3) for up to 10 basins. User input must be provided for yellow shaded cells, values for blue cells are automatically populated based on user inputs from previous worksheets, values for all other cells will be automatically generated, errors/notifications will be highlighted in red/orange and summarized below. BMPs fully satisfying the pollutant control performance standards will have a deficit treated volume of zero and be highlighted in green.

Automated Worksheet B.5-1: Sizing Lined or Unlined Biofiltration BMPs (V1.3)

Category	#	Description	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	Units
BMP Inputs	0	Drainage Basin ID or Name	-	-	-	DMA-4	DMA-5	-	-	-	-	-	sq-ft
	1	Design Infiltration Rate Recommended by Geotechnical Engineer	-	-	-	0.060	0.060	-	-	-	-	-	in/hr
	2	Effective Tributary Area	-	-	-	5,146	15,948	-	-	-	-	-	sq-ft
	3	Minimum Biofiltration Footprint Sizing Factor	-	-	-	#REF!	#REF!	-	-	-	-	-	ratio
	4	Design Capture Volume Tributary to BMP	-	-	-	287	890	-	-	-	-	-	cubic-feet
	5	Is Biofiltration Basin Impermeably Lined or Unlined?				Unlined	Unlined						unitless
	6	Provided Biofiltration BMP Surface Area				200	550						sq-ft
	7	Provided Surface Ponding Depth				6	6						inches
	8	Provided Soil Media Thickness				18	18						inches
	9	Provided Depth of Gravel Above Underdrain Invert				8	8						inches
	10	Diameter of Underdrain or Hydromod Orifice (Select Smallest)				6.00	6.00						inches
	11	Provided Depth of Gravel Below the Underdrain				12	12						inches
Retention Calculations	12	Volume Infiltrated Over 6 Hour Storm	0	0	0	6	17	0	0	0	0	0	cubic-feet
	13	Soil Media Pore Space Available for Retention	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	unitless
	14	Gravel Pore Space Available for Retention	0.00	0.00	0.00	0.40	0.40	0.00	0.00	0.00	0.00	0.00	unitless
	15	Effective Retention Depth	0.00	0.00	0.00	5.70	5.70	0.00	0.00	0.00	0.00	0.00	inches
	16	Calculated Retention Storage Drawdown (Including 6 Hr Storm)	0	0	0	86	86	0	0	0	0	0	hours
	17	Volume Retained by BMP	0	0	0	101	278	0	0	0	0	0	cubic-feet
	18	Fraction of DCV Retained	0.00	0.00	0.00	0.35	0.31	0.00	0.00	0.00	0.00	0.00	ratio
	19	Portion of Retention Performance Standard Satisfied	0.00	0.00	0.00	0.39	0.36	0.00	0.00	0.00	0.00	0.00	ratio
	20	Fraction of DCV Retained (normalized to 36-hr drawdown)	0.00	0.00	0.00	0.24	0.20	0.00	0.00	0.00	0.00	0.00	ratio
	21	Design Capture Volume Remaining for Biofiltration	0	0	0	218	712	0	0	0	0	0	cubic-feet
Biofiltration Calculations	22	Max Hydromod Flow Rate through Underdrain	n/a	n/a	n/a	1.4697	1.4697	n/a	n/a	n/a	n/a	n/a	CFS
	23	Max Soil Filtration Rate Allowed by Underdrain Orifice	n/a	n/a	n/a	317.46	115.44	n/a	n/a	n/a	n/a	n/a	in/hr
	24	Soil Media Filtration Rate per Specifications	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	in/hr
	25	Soil Media Filtration Rate to be used for Sizing	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	in/hr
	26	Depth Biofiltered Over 6 Hour Storm	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	inches
	27	Soil Media Pore Space Available for Biofiltration	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	unitless
	28	Effective Depth of Biofiltration Storage	0.00	0.00	0.00	12.80	12.80	0.00	0.00	0.00	0.00	0.00	inches
	29	Drawdown Time for Surface Ponding	0	0	0	1	1	0	0	0	0	0	hours
	30	Drawdown Time for Effective Biofiltration Depth	0	0	0	3	3	0	0	0	0	0	hours
	31	Total Depth Biofiltered	30.00	30.00	30.00	42.80	42.80	30.00	30.00	30.00	30.00	30.00	inches
	32	Option 1 - Biofilter 1.50 DCV: Target Volume	0	0	0	327	1,068	0	0	0	0	0	cubic-feet
	33	Option 1 - Provided Biofiltration Volume	0	0	0	327	1,068	0	0	0	0	0	cubic-feet
	34	Option 2 - Store 0.75 DCV: Target Volume	0	0	0	164	534	0	0	0	0	0	cubic-feet
	35	Option 2 - Provided Storage Volume	0	0	0	164	534	0	0	0	0	0	cubic-feet
	36	Portion of Biofiltration Performance Standard Satisfied	0.00	0.00	0.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00	ratio
Result	37	Do Site Design Elements and BMPs Satisfy Annual Retention Requirements?	-	-	-	#REF!	#REF!	-	-	-	-	-	yes/no
	38	Overall Portion of Performance Standard Satisfied	0.00	0.00	0.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00	ratio
	39	This BMP Overflows to the Following Drainage Basin	-	-	-	-	-	-	-	-	-	-	unitless
	40	**Deficit of Effectively Treated Stormwater**	**n/a**	**n/a**	**n/a**	**0**	**0**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	cubic-feet

Worksheet B.5-1 General Notes:

A. Applicants may use this worksheet to size Lined or Unlined Biofiltration BMPs (BF-1, PR-1) for up to 10 basins. User input must be provided for yellow shaded cells, values for blue cells are automatically populated based on user inputs from previous worksheets, values for all other cells will be automatically generated, errors/notifications will be highlighted in red/orange and summarized below. BMPs fully satisfying the pollutant control performance standards will have a deficit treated volume of zero and be highlighted in green.

Summary of Stormwater Pollutant Control Calculations (V1.3)

Category	#	Description	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	Units
General Info	0	Drainage Basin ID or Name	DMA-1	DMA-2	DMA-3	DMA-4	DMA-5	DMA-6	DMA-7	-	-	-	unitless
	1	85th Percentile Storm Depth	0.67	0.67	0.67	0.67	0.67	0.67	0.67	-	-	-	inches
	2	Design Infiltration Rate Recommended by Geotechnical Engineer	0.300	0.300	0.300	0.060	0.060	0.300	0.300	-	-	-	in/hr
	3	Total Tributary Area	179,340	55,350	72,330	6,200	22,150	67,900	10,000	-	-	-	sq-ft
	4	85th Percentile Storm Volume (Rainfall Volume)	10,013	3,090	4,038	346	1,237	3,791	558	-	-	-	cubic-feet
Initial DCV	5	Initial Weighted Runoff Factor	0.44	0.33	0.37	0.83	0.72	0.32	0.48	-	-	-	unitless
	6	Initial Design Capture Volume	4,406	1,020	1,494	287	890	1,213	268	-	-	-	cubic-feet
Site Design Volume Reductions	7	Dispersion Area Reductions	0	0	0	0	0	0	0	-	-	-	cubic-feet
	8	Tree Well and Rain Barrel Reductions	0	0	0	0	0	0	0	-	-	-	cubic-feet
BMP Volume Reductions	9	Effective Area Tributary to BMP	78,910	18,266	26,762	5,146	15,948	21,728	4,800	-	-	-	square feet
	10	Final Design Capture Volume Tributary to BMP	4,406	1,020	1,494	287	890	1,213	268	-	-	-	cubic-feet
	11	Basin Drains to the Following BMP Type	Retention	Retention	Retention	Biofiltration	Biofiltration	Retention	Retention	-	-	-	unitless
	12	Volume Retained by BMP (normalized to 36 hour drawdown)	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	-	-	-	cubic-feet
Total Volume Reductions	13	Total Fraction of Initial DCV Retained within DMA	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	-	-	-	fraction
	14	Percent of Average Annual Runoff Retention Provided	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	-	-	-	%
	15	Percent of Average Annual Runoff Retention Required	36.0%	36.0%	36.0%	12.3%	12.3%	36.0%	36.0%	-	-	-	%
Performance Standard	16	Percent of Pollution Control Standard Satisfied	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	-	-	-	%
Treatment Train	17	Discharges to Secondary Treatment in Drainage Basin	-	-	-	-	-	-	-	-	-	-	unitless
	18	Impervious Surface Area Still Requiring Treatment	0	0	0	0	0	0	0	-	-	-	square feet
	19	Impervious Surfaces Directed to Downstream Dispersion Area	-	-	-	-	-	-	-	-	-	-	square feet
	20	Impervious Surfaces Not Directed to Downstream Dispersion Area	-	-	-	-	-	-	-	-	-	-	square feet
Result	21	Deficit of Effectively Treated Stormwater	0	0	0	0	0	0	0	-	-	-	cubic-feet

Summary Notes:

All fields in this summary worksheet are populated based on previous user inputs. If applicable, drainage basin elements that require revisions and/or supplemental information outside the scope of these worksheets are highlighted in orange and summairzed in the red text below. If all drainage basins achieve full compliance without a need for supplemental information, a green message will appear below.

-Congratulations, all specified drainage basins and BMPs are in compliance with stormwater pollutant control requirements. Include 11x17 color prints of this summary sheet and supporting worksheet calculations as part of the SWQMP submittal package.

False

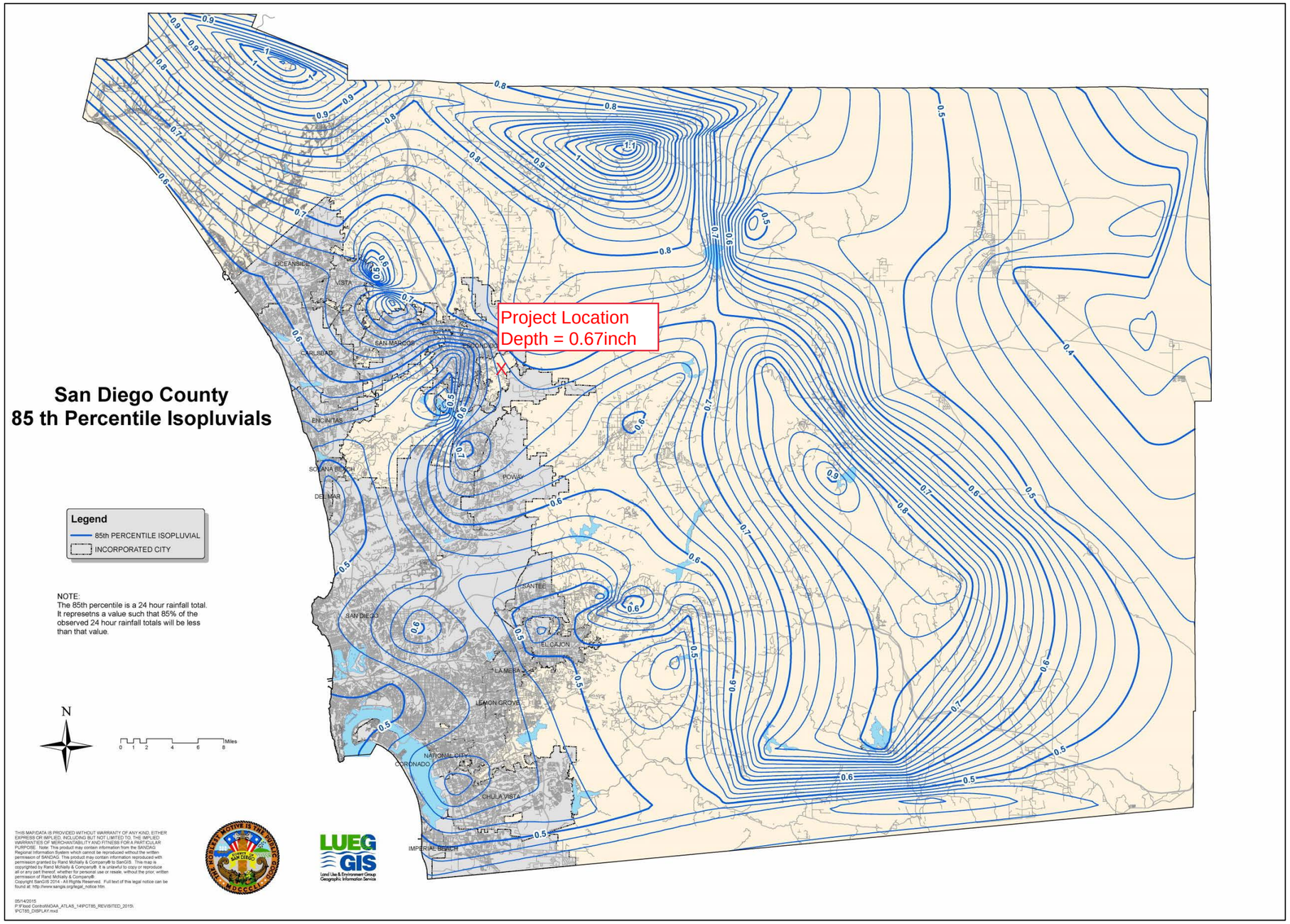


Figure B.1-1: 85th Percentile 24-hour Isopluvial Map

ATTACHMENT 1b FORM I-8 CATEGORIZATION OF INFILTRATION FEASIBILITY CONDITION

Categorization of Infiltration Feasibility Condition	Form I-8

Part 1 - Full Infiltration Feasibility Screening Criteria

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

Note that it is not necessary to investigate each and every criterion in the worksheet if infiltration is precluded. Instead a letter of justification from a geotechnical professional familiar with the local conditions substantiating any geotechnical issues will be required.

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

Provide basis:

The project site is susceptible for hydrologic soil group type B and D. Assuming the infiltration rate for hydrologic soil group B is 0.6 in/hr and the infiltration rate for hydrologic soil group D is 0.06 in/hr. A geotechnical investigation and testing will be performed during the final design stage.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative

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

Provide basis:

A geotechnical investigation and testing will be performed during the final design stage.

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

Form I-8 Page 2 of 4			
Criteria	Screening Question	**Yes**	**No**
3	**Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of groundwater contamination (shallow water table, storm water pollutants or other factors) that cannot be mitigated to an acceptable level?** The response to this Screening Question must be based on a comprehensive evaluation of the factors presented in Appendix C.3.		
Provide basis: A geotechnical investigation and testing will be performed during the final design stage. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
4	**Can infiltration greater than 0.5 inches per hour be allowed without causing potential water balance issues such as change of seasonality of ephemeral streams or increased discharge of contaminated groundwater to surface waters?** The response to this Screening Question must be based on a comprehensive evaluation of the factors presented in Appendix C.3.		
Provide basis: A geotechnical investigation and testing will be performed during the final design stage. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
Part 1 Result *	If all answers to rows 1 - 4 are "**Yes**" a full infiltration design is potentially feasible. The feasibility screening category is **Full Infiltration** If any answer from row 1-4 is "**No**", infiltration may be possible to some extent but would not generally be feasible or desirable to achieve a "full infiltration" design. Proceed to Part 2		

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

Form I-8 Page 3 of 4

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

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

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

Provide basis:

It is assumed that the partial infiltration is feasible for BMPs in hydrologic soil group D. Actual evaluation will be performed once the geotechnical investigation report is prepared during the final design.

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

6	**Can Infiltration in any appreciable quantity be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level**? The response to this Screening Question must be based on a comprehensive evaluation of the factors presented in Appendix C.2.	/	

Provide basis:

Proper BMPs will be reevaluated to avoid the risk of geotechnical hazards once the geotechnical investigation report is prepared during the final design.

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

Form I-8 Page 4 of 4			
Criteria	Screening Question	**Yes**	**No**
7	**Can Infiltration in any appreciable quantity be allowed without posing significant risk for groundwater related concerns (shallow water table, storm water pollutants or other factors)?** The response to this Screening Question must be based on a comprehensive evaluation of the factors presented in Appendix C.3.	/	
Provide basis: Groundwater investigation will be performed during the final design stage and BMPs will be designed to avoid the risk of groundwater contaminations. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.			
8	**Can infiltration be allowed without violating downstream water rights**? The response to this Screening Question must be based on a comprehensive evaluation of the factors presented in Appendix C.3.	/	
Provide basis: All BMPs will be designed to avoid the risk of violating downstream water rights. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.			
Part 2 Result*	If all answers from row 1-4 are yes then partial infiltration design is potentially feasible. The feasibility screening category is **Partial Infiltration.** If any answer from row 5-8 is no, then infiltration of any volume is considered to be **infeasible** within the drainage area. The feasibility screening category is **No Infiltration.**		

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

ATTACHMENT 1C DMA EXHIBITS

**It is considered that there are no self mitigating, de minimis, or self retaining on this project site.
** Assuming groundwater depth >20 ft.
**The drawing will be updated once the geotechnical and groundwater investigation report is available.

APN 276-101-04

APN 276-101-14

APN 276-101-06

FLOW LINE (TYP)

VvE
(Soil Rating B)

CnG2
(Soil Rating D)

(P) BIOFILTRATION #4
(PR-1), DMA-4

(P) BIORETENTION #3
(INF-2), DMA-3

(P) BIORETENTION #2
(INF-2), DMA-2

(P) BIORETENTION #1
(INF-2), DMA-1

(P) BIOFILTRATION #5
(PR-1), DMA-5

(P) BIORETENTION #6
(INF-2), DMA-6

(P) BIORETENTION #7
(INF-2), DMA-7

DRAINAGE OUTLET PROTECTION WITH ENERGY DISSIPATOR

DRAINAGE OUTLET PROTECTION WITH ENERGY DISSIPATOR

STAGING AREA

STAGING AREA

JURISDICTIONAL WATERCOURSE

JURISDICTIONAL 50-FT OAK ROOT PROTECTION ZONE (TYP)

GRADING LIMITS (TYP)

HIGHLAND VALLEY ROAD

SCALE : 1" = 80'

BMP LEGEND

DIRECTION OF LOT DRAINAGE

TEMPORARY RUNOFF CONTROL BMPs:

- SS-2 PRESERVATION OF EXISTING VEGETATION
- SS-4 HYDROSEED **(ALL DISTURBED AREAS)**
- SS-8 WOOD MULCH
- SC-5 FIBER ROLLS
- SC-10 STORM DRAIN INLET PROTECTION
- TC-1 STABILIZED CONSTRUCTION ENTRANCE
- STAGING AREA - MATERIALS, EQUIP. & STORAGE CONTAINERS

MATERIALS & WASTE MANAGEMENT CONTROL BMPs:

- WM-1 MATERIAL DELIVERY AND STORAGE
- WM-4 SPILL PREVENTION AND CONTROL
- WM-5 SOLID WASTE MANAGEMENT
- WM-8 CONCRETE WASTE MANAGEMENT
- WM-9 SANITARY WASTE MANAGEMENT

POST-CONSTRUCTION SITE DESIGN BMPs:

- 4.3.1 MAINTAIN NATURAL DRAINAGE PATHWAYS AND HYDROLOGIC FEATURES
- 4.3.2 CONSERVE NATURAL AREAS, SOILS, AND VEGETATION
- 4.3.3 MINIMIZE IMPERVIOUS AREA
- 4.3.4 MINIMIZE SOIL COMPACTION
- 4.3.5 IMPERVIOUS AREA DISPERSION

POST-CONSTRUCTION SOURCE CONTROL BMPs:

- 4.2.3 PROTECTED OUTDOOR MATERIALS STORAGE AREAS
- 4.3.4 PROTECT MATERIALS STORED IN OUTDOOR WORK AREAS
- 4.3.5 PROTECT TRASH STORAGE AREAS
- 4.3.6 ADDNL BMPs BASED ON POTENTIAL RUNOFF POLLUTANTS:
  - A ON-SITE STORM DRAIN INLETS
  - D NEED FOR FUTURE INDOOR & STR. PEST CONTROL
  - E LANDSCAPE/OUTDOOR PESTICIDE USE
  - F POOLS, SPAS, PONDS, FOUNTAINS, & WATER FEATURES
  - G FOOD SERVICE

PERMANENT BMPs:

- SD-10 PROTECTION OF CHANNEL BANKS/ MFR'D SLOPES & FLAT PAD AREAS COVERAGE
- SD-12 IMPLEMENTATION OF EFFICIENT IRRIGATION SYSTEMS
- SD-32 PROPER DESIGN OF TRASH STORAGE AREAS (TBD.)
- SD-34 PROPER DESIGN OF OUTDOOR MATERIAL STORAGE AREAS
- EC-10 OUTLET PROTECTION

NOTES:

1. **DRAWINGS FOR REFERENCE ONLY. CONTRACTOR SHALL REFER TO IMPROVEMENT PLANS AND PROJECT SPECIFICATIONS FOR CONSTRUCTION DETAILS AND EROSION AND SEDIMENT CONTROL DRAWINGS.**
2. **CONTRACTOR TO PLACE AND MAINTAIN EROSION AND SEDIMENT CONTROL BMP'S IN CONFORMANCE WITH CALIFORNIA STATE WATER RESOURCES CONTROL BOARD'S CONSTRUCTION ACTIVITIES STORMWATER GENERAL PERMIT ORDER NO. 2009-0009-DWQ (JULY 1, 2010)**
3. **CONTRACTOR SHALL COORDINATE ALL EROSION AND SEDIMENT CONTROL MEASURES WITH MULTIPLE CONSTRUCTION AREAS WITHIN THE PROJECT SITE.**
4. **SOME STRAW WATTLES NOT SHOWN FOR CLARITY. CONTRACTOR SHALL PROVIDE PERIMETER AND SLOPE STRAW WATTLES AS NECESSARY. WATTLES SHALL BE PLACED ON CONTOUR.**
5. **CONTRACTOR SHALL SEED ALL GRADED AREAS**

CALLOUT LEGEND

- EXTENTS OF DISTURBANCE FOR SITE IMPROVEMENTS
- DRAINAGE MANAGEMENT AREA (DMA)
- HYDROLOGIC SOIL GROUP BOUNDARY
- JURISDICTIONAL 50-FT OAK ROOT PROTECTION ZONE
- PROPOSED STORM DRAIN
- STORM DRAIN DROP INLET
- STORM DRAIN MANHOLE
- (A) AREA TRIBUTARY TO BMP
- SURFACE AREA OF VOLUME CAPTURE AND TREATMENT BIORETENTION BMP
- PROPOSED AREA OF BIOFILTRATION WITH PARTIAL RETENTION BMP
- HYDROLOGIC SOIL GROUP B
- HYDROLOGIC SOIL GROUP D
- POTENTIAL CRITICAL COARSE SEDIMENT YIELD AREA

STRUCTURE LEGEND

BMP	BASIN ID	DMA TO BMP	TOTAL TRIB. AREA (SF)	BMP AREA (SF)	IMPERVIOUS AREA (SF)	PERVIOUS AREA (SF)
(P) BIORETENTION #1		E	36,540		24,780	11,760
		F	17,700		14,950	2,750
		A	125,100		20,150	104,950
"Σ"	DMA-1	E,F,A	179,340	3,000	59,880	119,460
(P) BIORETENTION #2	DMA-2	B	55,350	800	9,650	45,700
(P) BIORETENTION #3	DMA-3	C	72,330	1,200	8,830	63,500
(P) BIOFILTRATION #4	DMA-4	D	6,200	200	5,480	720
(P) BIOFILTRATION #5	DMA-5	G	22,150	550	15,410	6,740
(P) BIORETENTION #6	DMA-6	H	67,900	950	13,840	54,060
(P) BIORETENTION #7	DMA-7	I	10,000	200	4,500	5,500

STRATA AP
STRATEGIC DESIGN STUDIO

ARCHITECTURE

23562 Arnold Drive
Sonoma, California 95476
T 707.935.7944
F 707.935.6618
www.STRATAap.com

CONSULTANTS:

EBA ENGINEERING
825 SONOMA AVENUE
SUITE C
SANTA ROSA, CA 95404
TEL: (707) 544-0784

PROJECT

PROPOSED WINERY PROJECT
16138 HIGHLAND VALLEY ROAD,
ESCONDIDO, CA

REVISIONS

SHEET TITLE

ATTACHMENT 1C
DMA EXHIBIT

CHECKED BY: DM
DRAWN BY: WC
SCALE: AS SHOWN
DATE: NOVEMBER 8, 2019

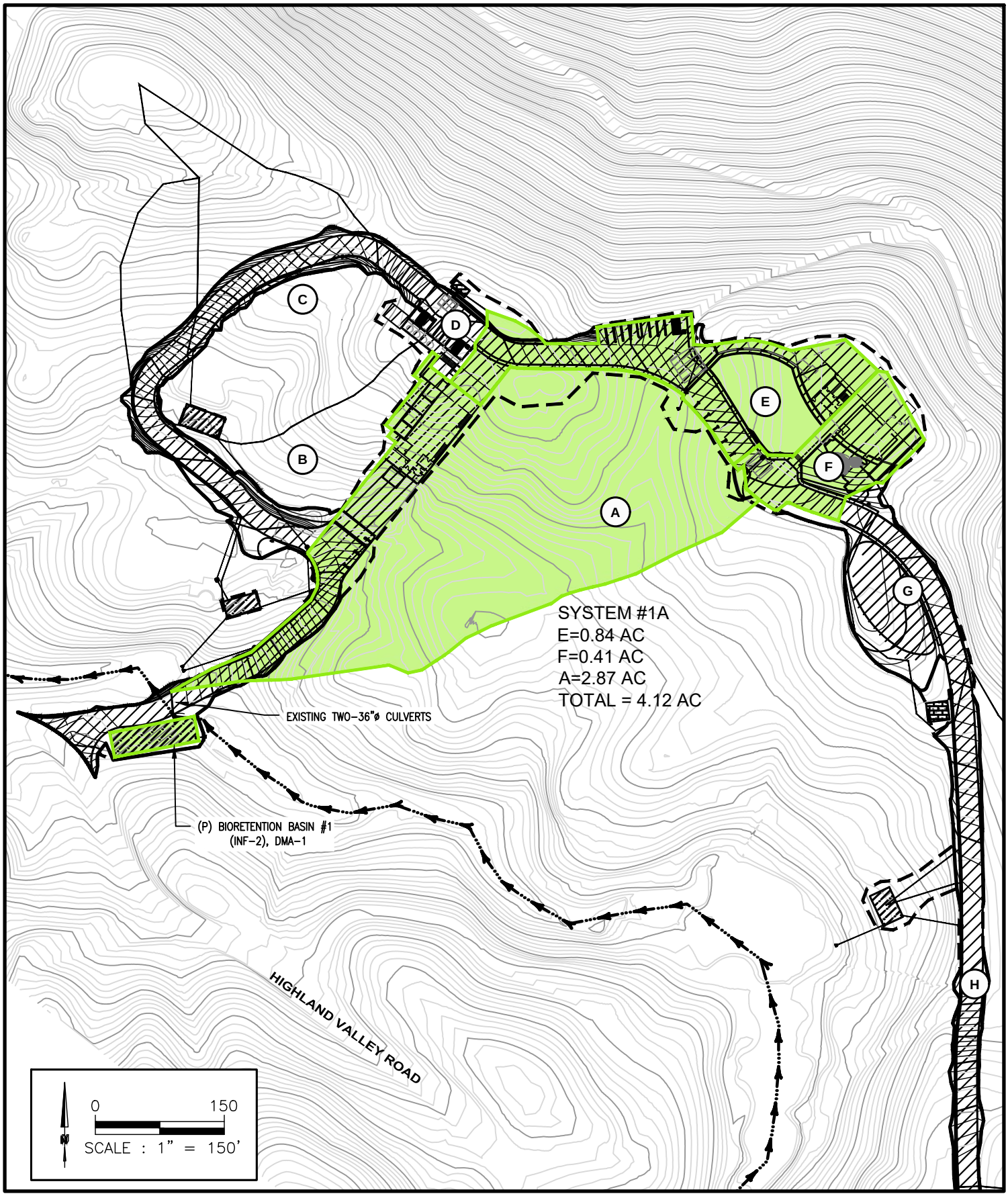
PROJECT NO. 16-2281

1

FIGURE NO.

Xrefs: X-Ref - Topo - (SITE).dwg X-Ref - Design\dwg\Permit Set Stock Winery 70ft_Current.dwg 24x36 Winery Blocks.dwg 24x36 Hospitality\Blocks.dwg temp arch Topo - (SITE).dwg X-Ref - Jurisdictional Delineation Map.dwg
Plot: 8/1/2019 3:00pm Wade.Cook P:\Projects\Winery - Highway 78\Plans

ATTACHMENT 1d INDIVIDUAL STRUCTURAL BMP DMA MAPBOOKS



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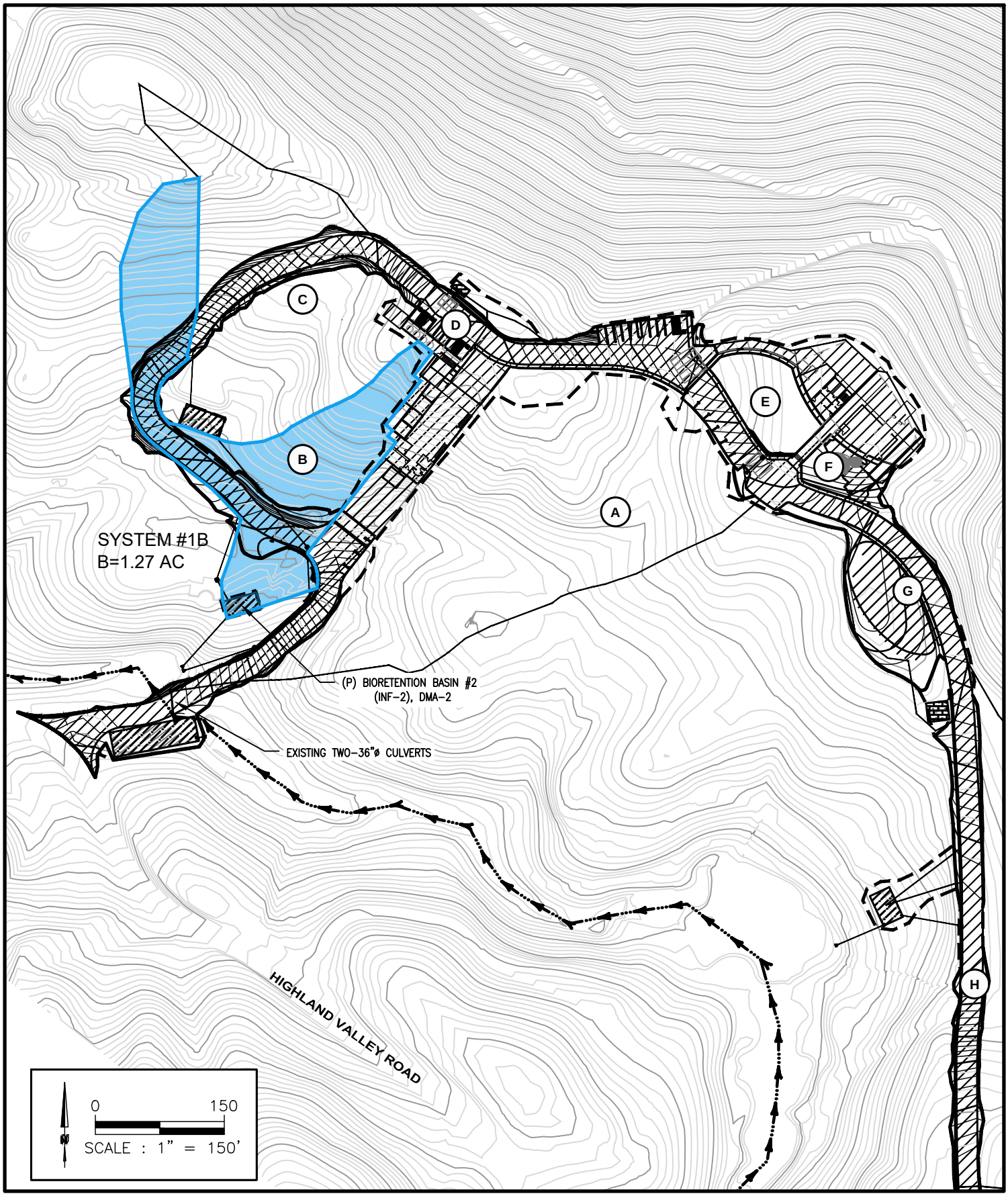
ATTACHMENT 1D - DMA MAPBOOK - BASIN #1

PERRIN WINERY PROJECT
16138 HIGHLAND VALLEY ROAD
ESCONDIDO, CALIFORNIA

FIGURE
1

16-2281



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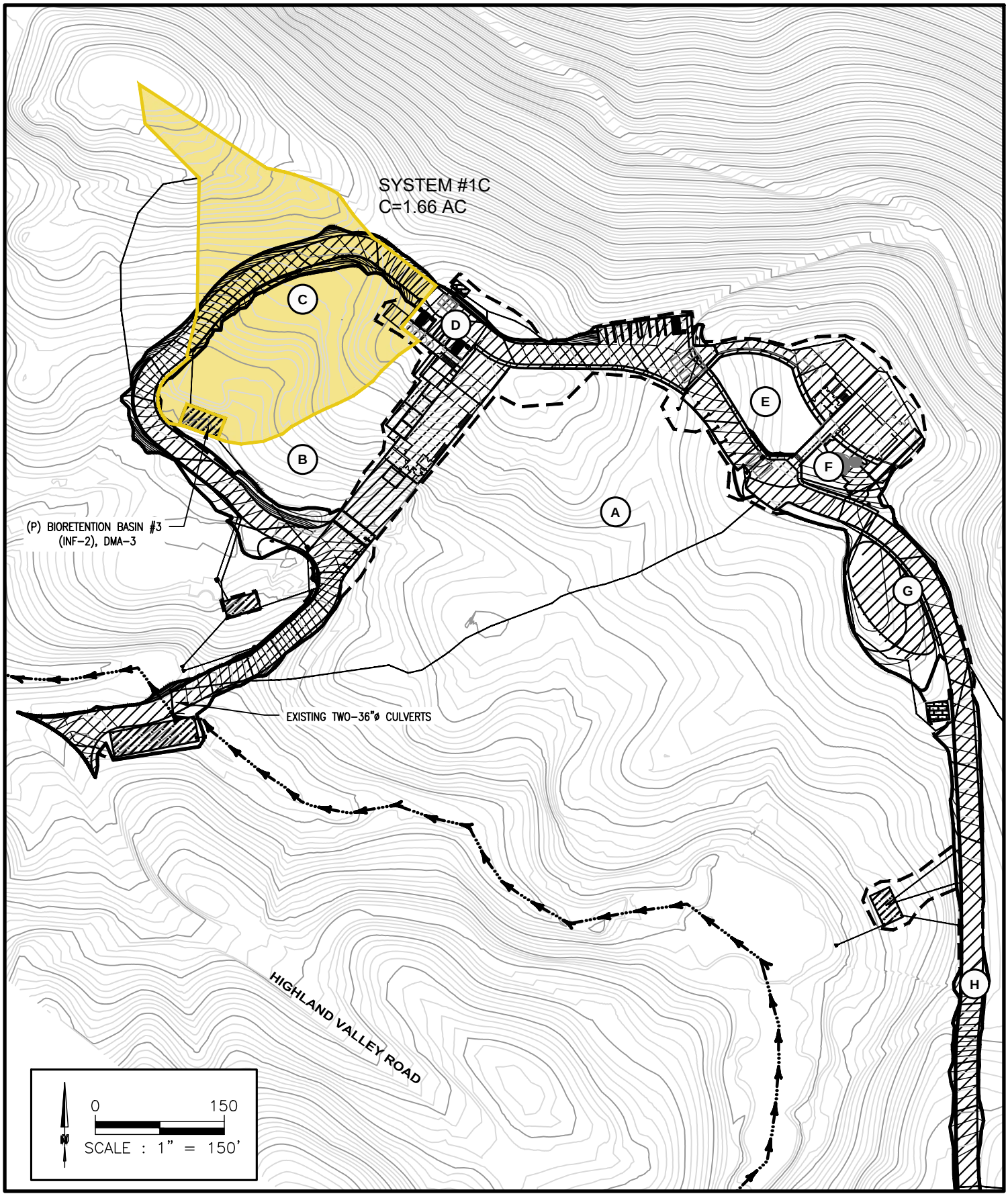
ATTACHMENT 1D - DMA MAPBOOK - BASIN #2

PERRIN WINERY PROJECT
16138 HIGHLAND VALLEY ROAD
ESCONDIDO, CALIFORNIA

FIGURE
2

16-2281



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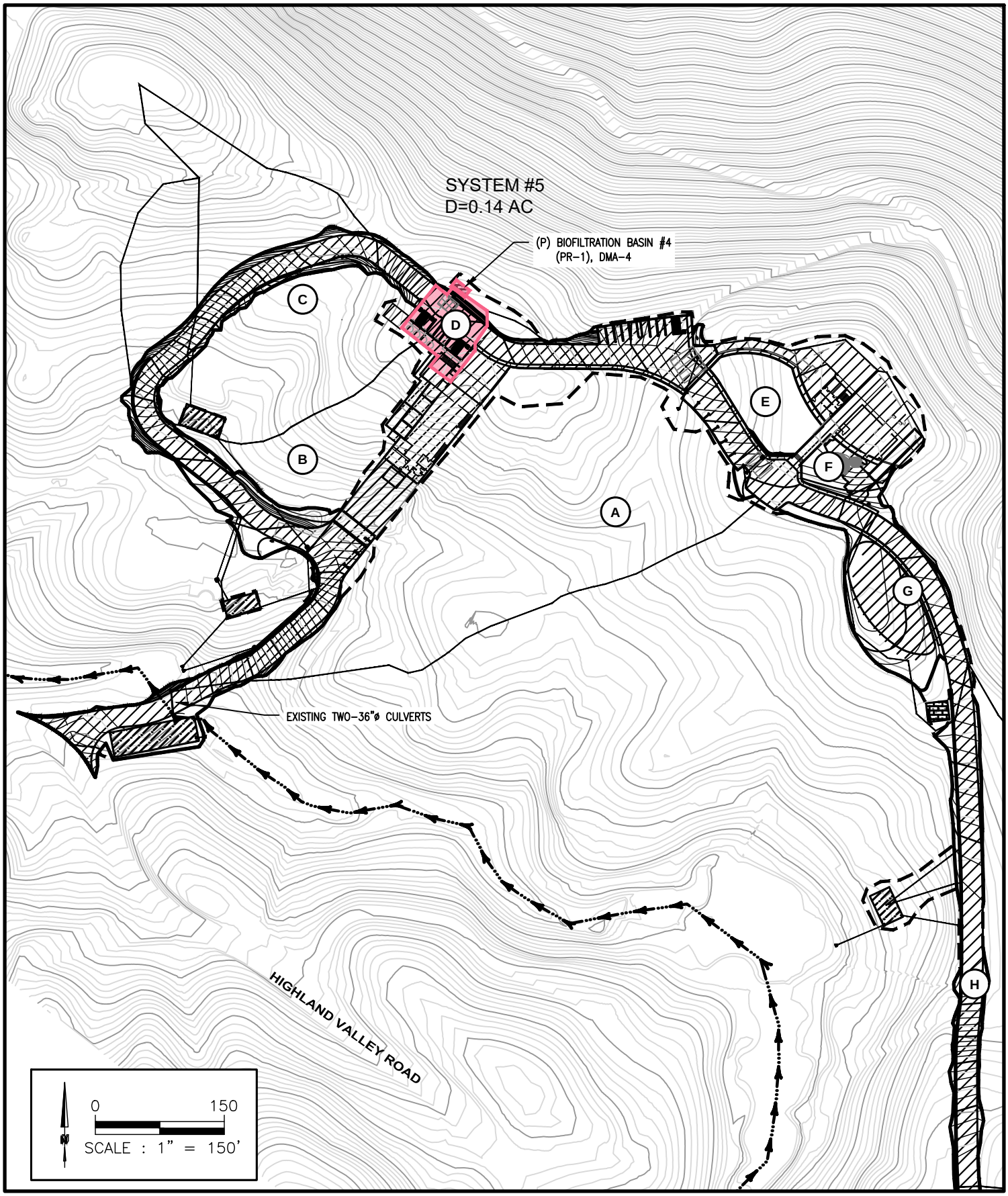
ATTACHMENT 1D - DMA MAPBOOK - BASIN #3

PERRIN WINERY PROJECT
16138 HIGHLAND VALLEY ROAD
ESCONDIDO, CALIFORNIA

FIGURE
3

16-2281



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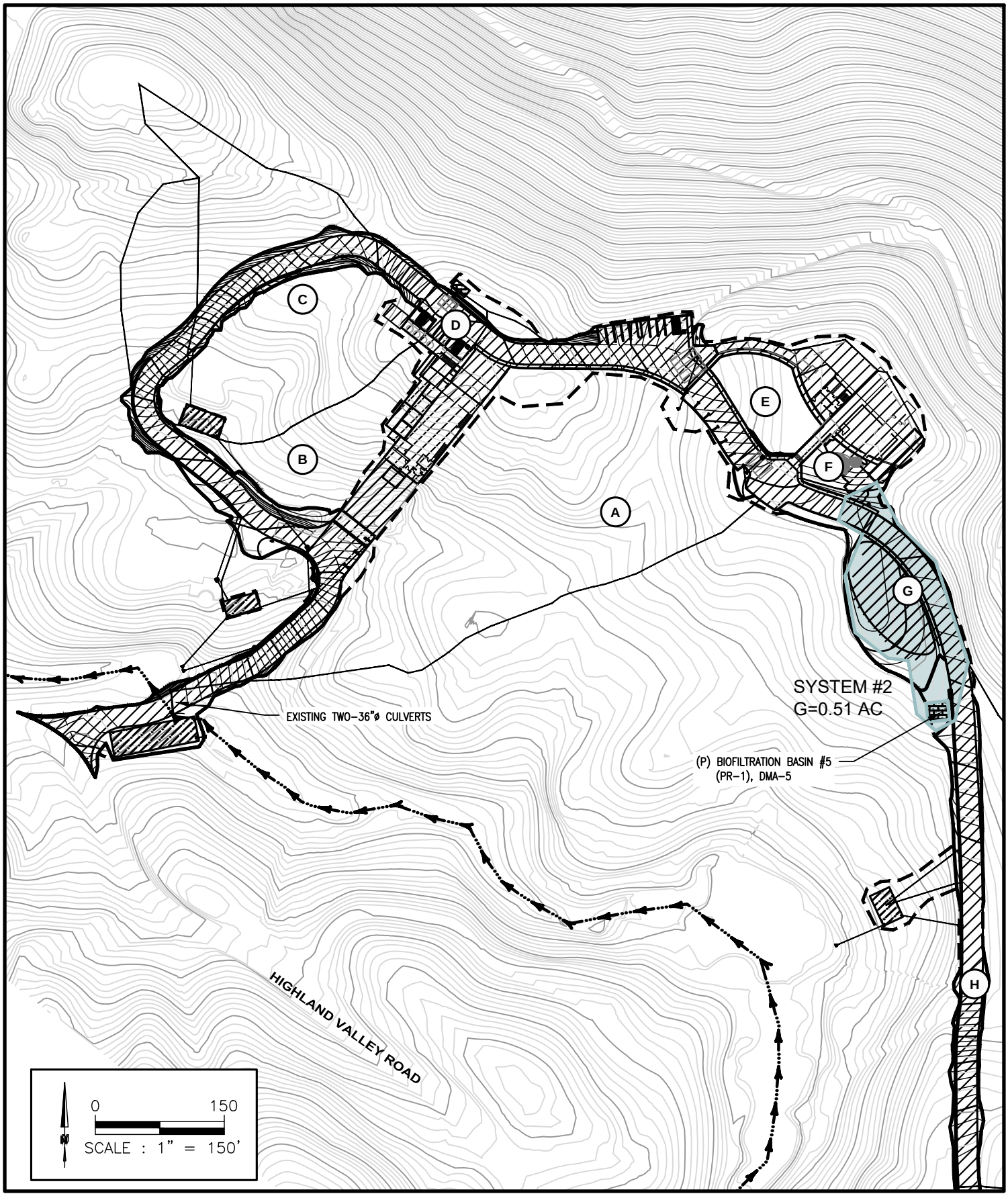
ATTACHMENT 1D - DMA MAPBOOK - BASIN #4

PERRIN WINERY PROJECT
16138 HIGHLAND VALLEY ROAD
ESCONDIDO, CALIFORNIA

FIGURE
4

16-2281



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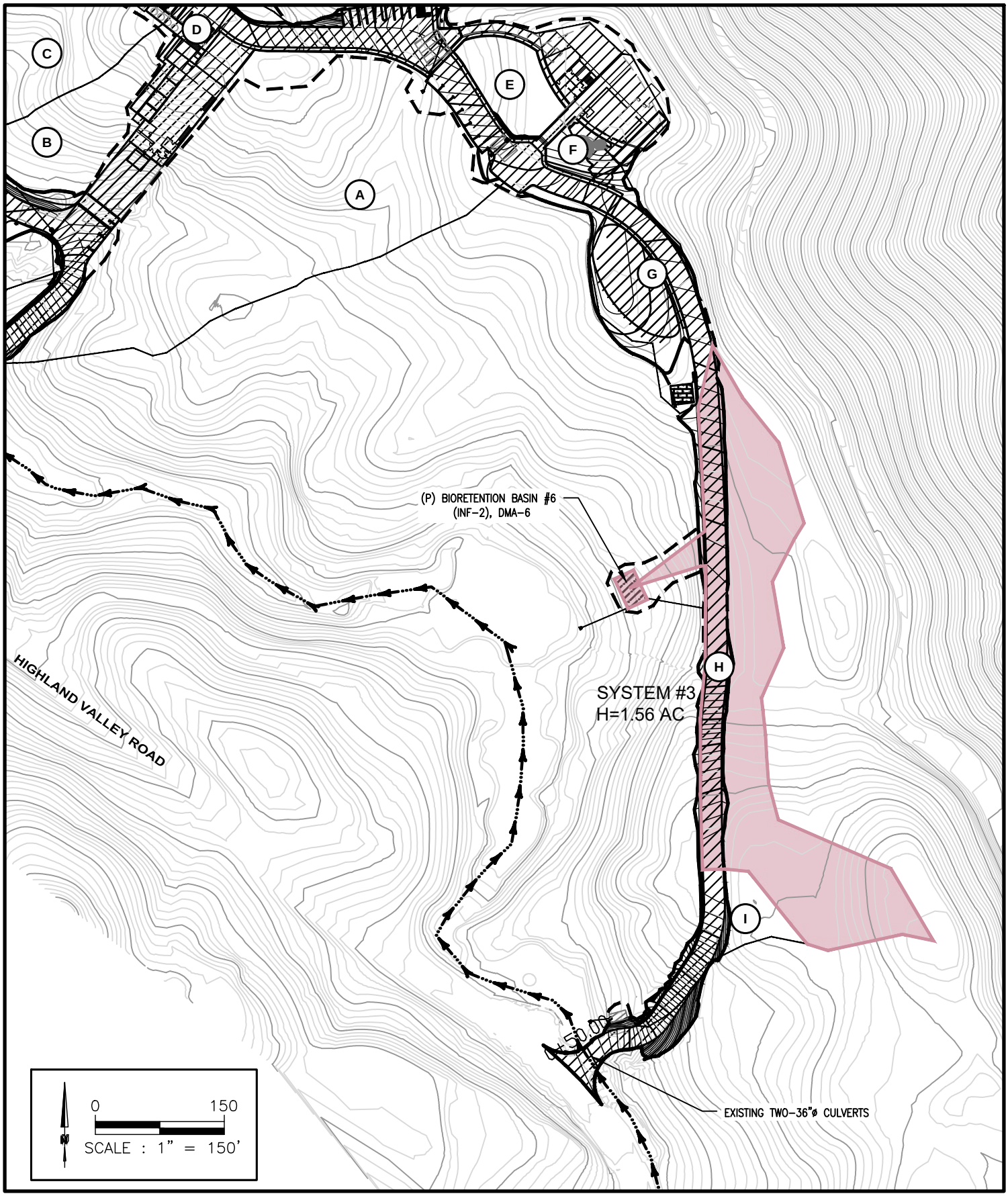
ATTACHMENT 1D - DMA MAPBOOK - BASIN #5

PERRIN WINERY PROJECT
16138 HIGHLAND VALLEY ROAD
ESCONDIDO, CALIFORNIA

FIGURE
5

16-2281



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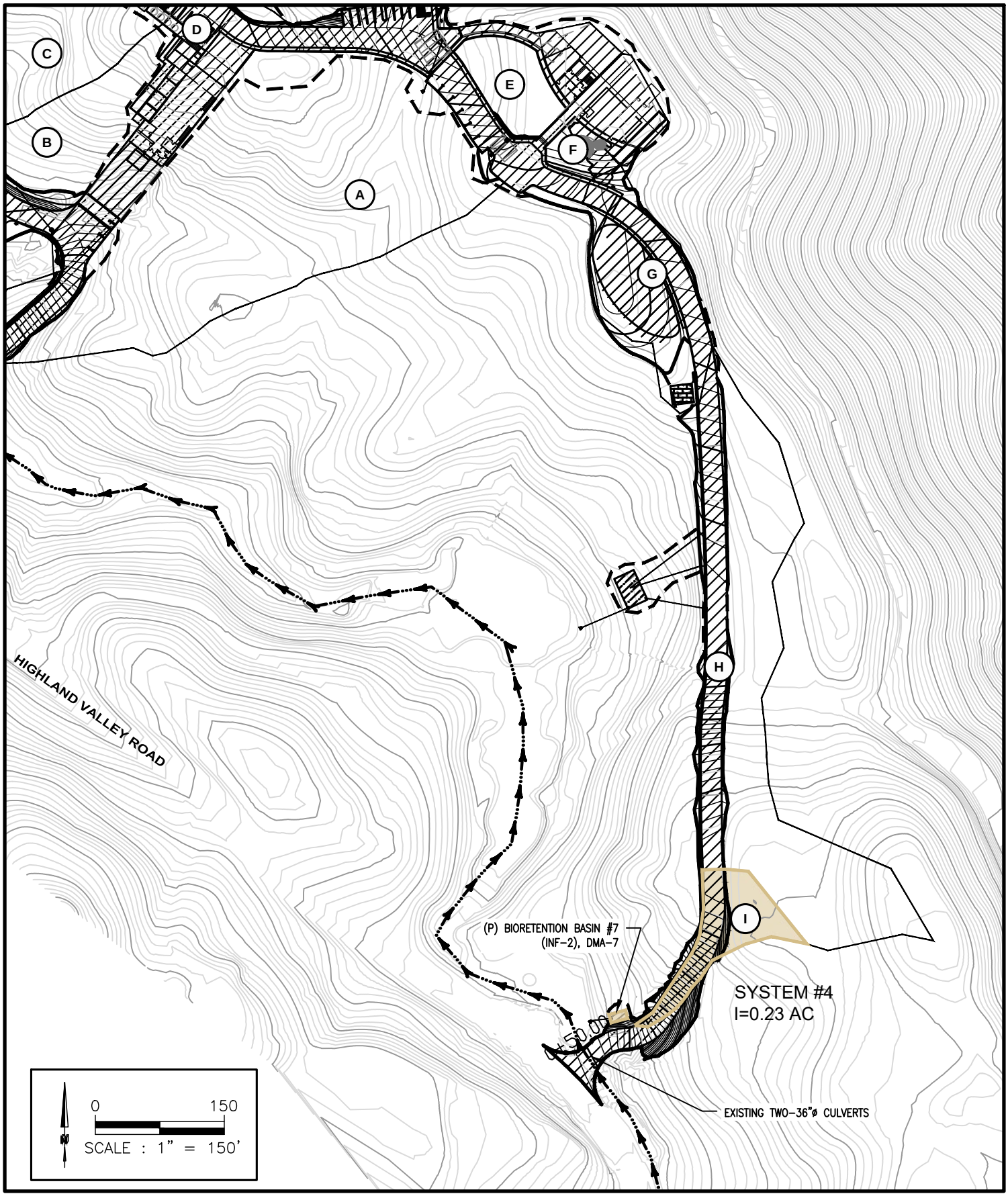
ATTACHMENT 1D - DMA MAPBOOK - BASIN #6

PERRIN WINERY PROJECT
16138 HIGHLAND VALLEY ROAD
ESCONDIDO, CALIFORNIA

FIGURE
6

16-2281



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ATTACHMENT 1D - DMA MAPBOOK - BASIN #7

PERRIN WINERY PROJECT
16138 HIGHLAND VALLEY ROAD
ESCONDIDO, CALIFORNIA

FIGURE
7
16-2281

ATTACHMENT 1e STRUCTURAL BMP FACT SHEETS

E.14 INF-2 Bioretention



MS4 Permit Category
Retention

Manual Category
Infiltration

Applicable Performance Standard
Pollutant Control
Flow Control

Primary Benefits
Volume Reduction
Treatment
Peak Flow Attenuation

Photo Credit: Ventura County Technical Guidance Document

Description

Bioretention (bioretention without underdrain) facilities are vegetated surface water systems that filter water through vegetation and soil, or engineered media prior to infiltrating into native soils. These facilities are designed to infiltrate the full DCV. Bioretention facilities are commonly incorporated into the site within parking lot landscaping, along roadsides, and in open spaces. They can be constructed inground or partially aboveground, such as planter boxes with open bottoms (no impermeable liner at the bottom) to allow infiltration. Treatment is achieved through filtration, sedimentation, sorption, infiltration, biochemical processes and plant uptake.

Typical bioretention without underdrain components include:

- Inflow distribution mechanisms (e.g, perimeter flow spreader or filter strips)
- Energy dissipation mechanism for concentrated inflows (e.g., splash blocks or riprap)
- Shallow surface ponding for captured flows
- Side slope and basin bottom vegetation selected based on expected climate and ponding depth
- Non-floating mulch layer (optional)

- Media layer (planting mix or engineered media) capable of supporting vegetation growth
- Filter course layer consisting of aggregate to prevent the migration of fines into uncompacted native soils or the optional aggregate storage layer
- Optional aggregate storage layer for additional infiltration storage
- Uncompacted native soils at the bottom of the facility
- Overflow structure

Design Adaptations for Project Goals

- **Full infiltration BMP for storm water pollutant control.** Bioretention can be used as a pollutant control BMP designed to infiltrate runoff from direct rainfall as well as runoff from adjacent tributary areas. Bioretention facilities must be designed with an infiltration storage volume (a function of the ponding, media and aggregate storage volumes) equal to the full DCV and able to meet drawdown time limitations.
- **Integrated storm water flow control and pollutant control configuration.** Bioretention facilities can be designed to provide flow rate and duration control. This may be accomplished by providing greater infiltration storage with increased surface ponding and/or aggregate storage volume for storm water flow control.

E.17 PR-1 Biofiltration with Partial Retention



Location: 805 and Bonita Road, Chula vista, CA.

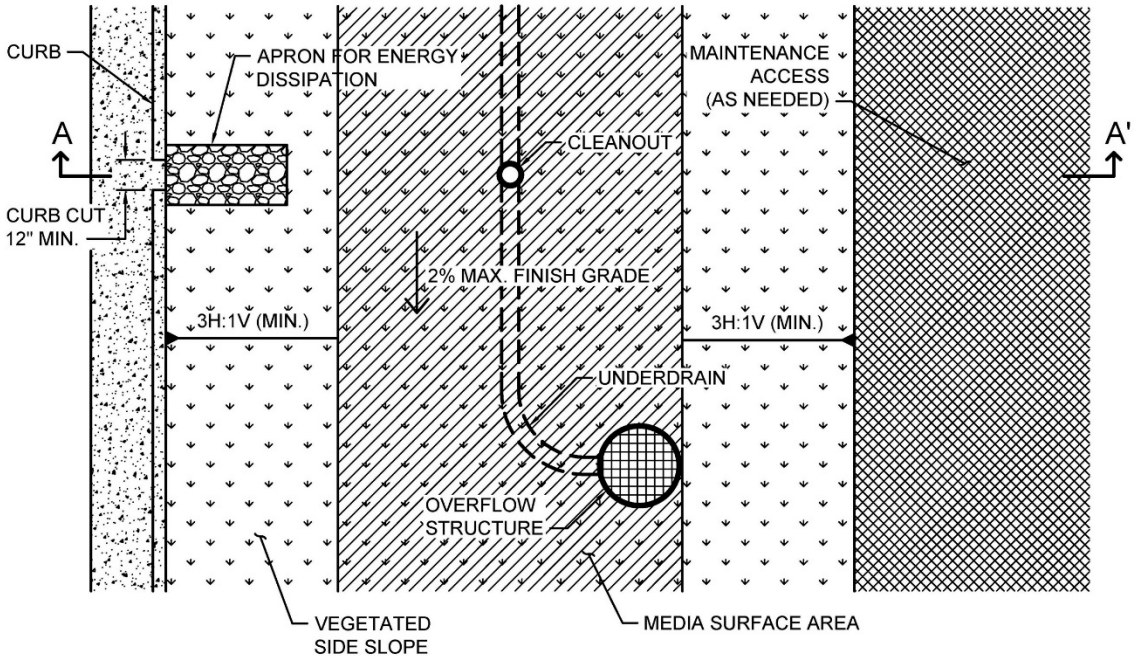
MS4 Permit Category
NA
Manual Category
Partial Retention
Applicable Performance Standard
Pollutant Control Flow Control
Primary Benefits
Volume Reduction Treatment Peak Flow Attenuation

Description

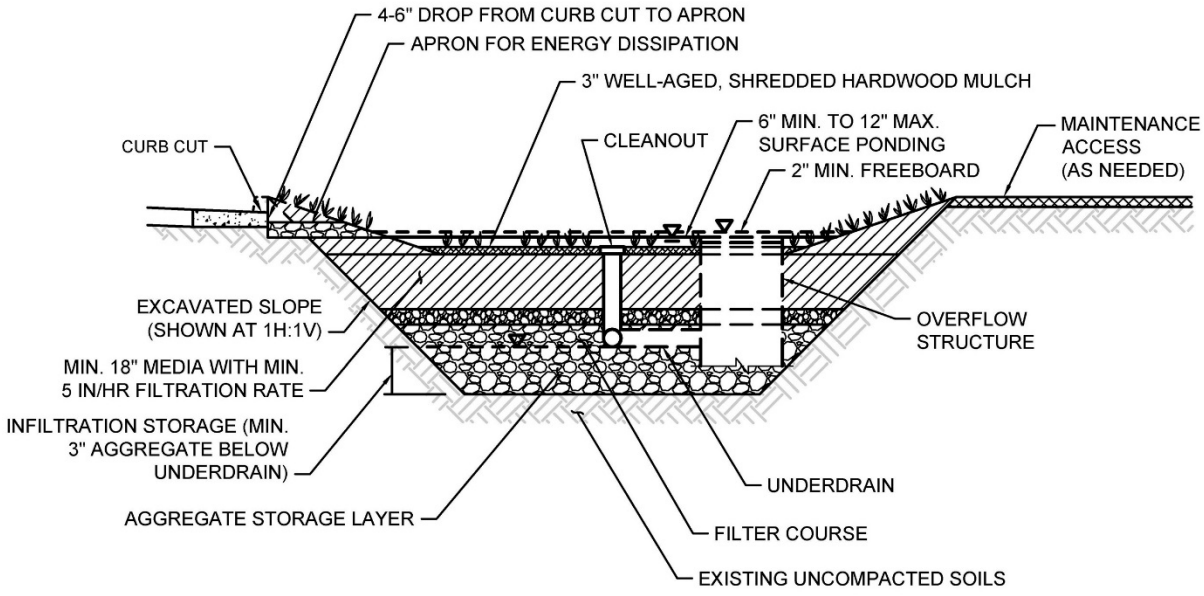
Biofiltration with partial retention (partial infiltration and biofiltration) facilities are vegetated surface water systems that filter water through vegetation, and soil or engineered media prior to infiltrating into native soils, discharge via underdrain, or overflow to the downstream conveyance system. Where feasible, these BMPs have an elevated underdrain discharge point that creates storage capacity in the aggregate storage layer. Biofiltration with partial retention facilities are commonly incorporated into the site within parking lot landscaping, along roadsides, and in open spaces. They can be constructed in ground or partially aboveground, such as planter boxes with open bottoms to allow infiltration. Treatment is achieved through filtration, sedimentation, sorption, infiltration, biochemical processes and plant uptake.

Typical biofiltration with partial retention components include:

- Inflow distribution mechanisms (e.g, perimeter flow spreader or filter strips)
- Energy dissipation mechanism for concentrated inflows (e.g., splash blocks or riprap)
- Shallow surface ponding for captured flows
- Side Slope and basin bottom vegetation selected based on climate and ponding depth
- Non-floating mulch layer
- Media layer (planting mix or engineered media) capable of supporting vegetation growth
- Filter course layer consisting of aggregate to prevent the migration of fines into uncompacted native soils or the optional aggregate storage layer
- Aggregate storage layer with underdrain(s)
- Uncompacted native soils at the bottom of the facility
- Overflow structure



PLAN
NOT TO SCALE



SECTION A-A'
NOT TO SCALE

Typical plan and Section view of a Biofiltration with Partial Retention BMP

Design Adaptations for Project Goals

Partial infiltration BMP with biofiltration treatment for storm water pollutant control. Biofiltration with partial retention can be designed so that a portion of the DCV is infiltrated by providing infiltration storage below the underdrain invert. The infiltration storage depth should be determined by the volume that can be reliably infiltrated within drawdown time limitations. Water discharged through the underdrain is considered biofiltration treatment. Storage provided above the underdrain within surface ponding, media, and aggregate storage is included in the biofiltration treatment volume.

Integrated storm water flow control and pollutant control configuration. The system can be designed to provide flow rate and duration control by primarily providing increased surface ponding and/or having a deeper aggregate storage layer. This will allow for significant detention storage, which can be controlled via inclusion of an orifice in an outlet structure at the downstream end of the underdrain.

Design Criteria and Considerations

Biofiltration with partial retention must meet the following design criteria and considerations. Deviations from the below criteria may be approved at the discretion of County staff if it is determined to be appropriate:

	Siting and Design	*Intent/Rationale*
☐	Placement observes geotechnical recommendations regarding potential hazards (e.g., slope stability, landslides, liquefaction zones) and setbacks (e.g., slopes, foundations, utilities).	Must not negatively impact existing site geotechnical concerns.
☐	Selection and design of basin is based on infiltration feasibility criteria and appropriate design infiltration rate (See Appendix C and D).	Must operate as a partial infiltration design and must be supported by drainage area and in-situ infiltration rate feasibility findings.

Siting and Design		*Intent/Rationale*
☐	Contributing tributary area must be ≤ 5 acres (≤ 1 acre preferred).	Bigger BMPs require additional design features for proper performance. Contributing tributary area greater than 5 acres may be allowed at the discretion of County staff if the following conditions are met: 1) incorporate design features (e.g. flow spreaders) to minimize short circuiting of flows in the BMP and 2) incorporate additional design features requested by County staff for proper performance of the regional BMP.
☐	Finish grade of the facility is ≤ 2%.	Flatter surfaces reduce erosion and channelization within the facility.
Surface Ponding		
☐	Surface ponding is limited to a 24-hour drawdown time.	Surface ponding limited to 24 hours for plant health.
☐	Surface ponding depth is ≥ 6 and ≤ 12 inches.	Surface ponding capacity lowers subsurface storage requirements. Deep surface ponding raises safety concerns. Surface ponding depth greater than 12 inches (for additional pollutant control or surface outlet structures or flow-control orifices) may be allowed at the discretion of County staff if the following conditions are met: 1) surface ponding depth drawdown time is less than 24 hours; and 2) safety issues and fencing requirements are considered (typically ponding greater than 18" will require a fence and/or flatter side slopes) and 3) potential for elevated clogging risk is considered.
☐	A minimum of 2 inches of freeboard is provided.	Freeboard provides room for head over overflow structures and minimizes risk of uncontrolled surface discharge.
☐	Side slopes are stabilized with vegetation and are = 3H:1V or shallower.	Gentler side slopes are safer, less prone to erosion, able to establish vegetation more quickly and easier to maintain.

Vegetation		
☐	Plantings are suitable for the climate and expected ponding depth. A plant list to aid in selection can be found in Appendix E.20	Plants suited to the climate and ponding depth are more likely to survive.
☐	An irrigation system with a connection to water supply should be provided as needed.	Seasonal irrigation might be needed to keep plants healthy.
Mulch (Mandatory)		
☐	A minimum of 3 inches of well-aged, shredded hardwood mulch that has been stockpiled or stored for at least 12 months is provided. Mulch must be non-floating to avoid clogging of overflow structure.	Mulch will suppress weeds and maintain moisture for plant growth. Aging mulch kills pathogens and weed seeds and allows the beneficial microbes to multiply.
Media Layer		
☐	Media maintains a minimum filtration rate of 5 in/hr over lifetime of facility. An initial filtration rate of 8 to 12 in/hr is recommended to allow for clogging over time; the initial filtration rate should not exceed 12 inches per hour.	A filtration rate of at least 5 inches per hour allows soil to drain between events, and allows flows to relatively quickly enter the aggregate storage layer, thereby minimizing bypass. The initial rate should be higher than long term target rate to account for clogging over time. However an excessively high initial rate can have a negative impact on treatment performance, therefore an upper limit is needed.

Media Layer		
☐	Media is a minimum 18 inches deep, meeting either of these two media specifications: City of San Diego Storm Water Standards Appendix F (February 2016, unless superseded by more recent edition) **or** County of San Diego Low Impact Development Handbook: Appendix G -Bioretention Soil Specification (June 2014, unless superseded by more recent edition).	A deep media layer provides additional filtration and supports plants with deeper roots. Standard specifications must be followed.
	Alternatively, for proprietary designs and custom media mixes not meeting the media specifications contained in the 2016 City Storm Water Standards or County LID Manual, the media meets the pollutant treatment performance criteria in Section F.1.	For non-standard or proprietary designs, compliance with Appendix F.1 ensures that adequate treatment performance will be provided.
☐	Media surface area is 3% of contributing area times adjusted runoff factor or greater. Unless demonstrated that the BMP surface area can be smaller than 3%.	Greater surface area to tributary area ratios: a) maximizes volume retention as required by the MS4 Permit and b) decrease loading rates per square foot and therefore increase longevity. Adjusted runoff factor is to account for site design BMPs implemented upstream of the BMP (such as rain barrels, impervious area dispersion, etc.). Refer to Appendix B.2 guidance. Use Worksheet B.5-1 Line 26 to estimate the minimum surface area required per this criteria.
☐	Where receiving waters are impaired or have a TMDL for nutrients, the system is designed with nutrient sensitive media design (see fact sheet BF-2).	Potential for pollutant export is partly a function of media composition; media design must minimize potential for export of nutrients, particularly where receiving waters are impaired for nutrients.

Filter Course Layer		
☐	A filter course is used to prevent migration of fines through layers of the facility. Filter fabric is not used.	Migration of media can cause clogging of the aggregate storage layer void spaces or subgrade. Filter fabric is more likely to clog.
☐	Filter course is washed and free of fines.	Washing aggregate will help eliminate fines that could clog the facility
☐	Filter course calculations assessing suitability for particle migration prevention have been completed.	Gradation relationship between layers can evaluate factors (e.g., bridging, permeability, and uniformity) to determine if particle sizing is appropriate or if an intermediate layer is needed.
Aggregate Storage Layer		
☐	Class 2 Permeable per Caltrans specification 68-1.025 is recommended for the storage layer. Washed, open-graded crushed rock may be used, however a 4-6 inch washed pea gravel filter course layer at the top of the crushed rock is required.	Washing aggregate will help eliminate fines that could clog the aggregate storage layer void spaces or subgrade.
☐	Maximum aggregate storage layer depth below the underdrain invert is determined based on the infiltration storage volume that will infiltrate within a 48-hour drawdown time.	A maximum drawdown time is needed for vector control and to facilitate providing storm water storage for the next storm event.
Inflow, Underdrain, and Outflow Structures		
☐	Inflow, underdrains and outflow structures are accessible for inspection and maintenance.	Maintenance will prevent clogging and ensure proper operation of the flow control structures.
☐	Inflow velocities are limited to 3 ft/s or less or use energy dissipation methods. (e.g., riprap, level spreader) for concentrated inflows.	High inflow velocities can cause erosion, scour and/or channeling.
☐	Curb cut inlets are at least 12 inches wide, have a 4-6 inch reveal (drop) and an apron and energy dissipation as needed.	Inlets must not restrict flow and apron prevents blockage from vegetation as it grows in. Energy dissipation prevents erosion.

Inflow, Underdrain, and Outflow Structures		
☐	Underdrain outlet elevation should be a minimum of 3 inches above the bottom elevation of the aggregate storage layer.	A minimal separation from subgrade or the liner lessens the risk of fines entering the underdrain and can improve hydraulic performance by allowing perforations to remain unblocked.
☐	Minimum underdrain diameter is 6 inches.	Smaller diameter underdrains are prone to clogging.
☐	Underdrains are made of slotted, PVC pipe conforming to ASTM D 3034 or equivalent or corrugated, HDPE pipe conforming to AASHTO 252M or equivalent.	Slotted underdrains provide greater intake capacity, clog resistant drainage, and reduced entrance velocity into the pipe, thereby reducing the chances of solids migration.
☐	An underdrain cleanout with a minimum 6-inch diameter and lockable cap is placed every 250 to 300 feet as required based on underdrain length.	Properly spaced cleanouts will facilitate underdrain maintenance.
☐	Overflow is safely conveyed to a downstream storm drain system or discharge point. Size overflow structure to pass 100-year peak flow for on-line infiltration basins and water quality peak flow for off-line basins.	Planning for overflow lessens the risk of property damage due to flooding.

Nutrient Sensitive Media Design

To design biofiltration with partial retention with underdrain for storm water pollutant control only (no flow control required), the following steps should be taken:

Conceptual Design and Sizing Approach for Storm Water Pollutant Control Only

To design biofiltration with partial retention and an underdrain for storm water pollutant control only (no flow control required), the following steps should be taken:

1. Verify that siting and design criteria have been met, including placement requirements, contributing tributary area, maximum side and finish grade slopes, and the recommended media surface area tributary ratio.
2. Calculate the DCV per Appendix B based on expected site design runoff for tributary areas.
3. Generalized sizing procedure is presented in Appendix B.5. The surface ponding should be verified to have a maximum 24-hour drawdown time.

Conceptual Design and Sizing Approach when Storm Water Flow Control is Applicable

Control of flow rates and/or durations will typically require significant surface ponding and/or aggregate storage volumes, and therefore the following steps should be taken prior to determination of storm water pollutant control design. Pre-development and allowable post-project flow rates and durations should be determined as discussed in Chapter 6 of the manual.

1. Verify that siting and design criteria have been met, including placement requirements, contributing tributary area, maximum side and finish grade slopes, and the recommended media surface area tributary ratio.
2. Iteratively determine the facility footprint area, surface ponding and/or aggregate storage layer depth required to provide detention and/or infiltration storage to reduce flow rates and durations to allowable limits. Flow rates and durations can be controlled from detention storage by altering outlet structure orifice size(s) and/or water control levels. Multi-level orifices can be used within an outlet structure to control the full range of flows.
3. If biofiltration with partial retention cannot fully provide the flow rate and duration control required by this manual, an upstream or downstream structure with significant storage volume such as an underground vault can be used to provide remaining controls.
4. After biofiltration with partial retention has been designed to meet flow control requirements, calculations must be completed to verify if storm water pollutant control requirements to treat the DCV have been met.

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ATTACHMENT 2

BACKUP FOR PDP HYDROMODIFICATION CONTROL MEASURES

This is the cover sheet for Attachment 2.

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

Indicate which Items are Included behind this cover sheet:

Attachment Sequence	Contents	Checklist
Attachment 2a	Flow Control Facility Design, including Structural BMP Drawdown Calculations and Overflow Design Summary (Required) See Chapter 6 and Appendix G of the BMP Design Manual	☐ Included ☒ Submitted as separate stand-alone document
Attachment 2b	Hydromodification Management Exhibit (Required)	☒ Included See Hydromodification Management Exhibit Checklist on the back of this Attachment cover sheet.
Attachment 2c	Management of Critical Coarse Sediment Yield Areas See Section 6.2 and Appendix H of the BMP Design Manual.	☒ Exhibit depicting onsite and/or upstream sources of critical coarse sediment as mapped by Regional or Jurisdictional approaches outlined in Appendix H.1 AND, ☐ Demonstration that the project effectively avoids and bypasses sources of mapped critical coarse sediment per approaches outlined in Appendix H.2 and H.3. OR, ☐ Demonstration that project does not generate a net impact on the receiving water per approaches outlined in Appendix H.4.
Attachment 2d	Geomorphic Assessment of Receiving Channels (Optional) See Section 6.3.4 of the BMP Design Manual.	☒ Not performed ☐ Included ☐ Submitted as separate stand-alone document
Attachment 2e	Vector Control Plan (Required when structural BMPs will not drain in 96 hours)	☐ Included ☒ Not required because BMPs will drain in less than 96 hours

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

The Hydromodification Management Exhibit must identify:

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

ATTACHMENT 2 BACKUP FOR PDP HYDROMODIFICATION CONTROL MEASURES

ATTACHMENT 2a FLOW CONTROL FACILITY DESIGN, INCLUDING STRUCTUTRAL BMP DRAWDOWN CALCULATIONS AND OVERFLOW DESIGN SUMMARY

SDHM 3.1

PROJECT REPORT

General Model Information

Project Name:	16-2281 POC i
Site Name:	Perrin Winery POC i
Site Address:	16138 Highland Valley Road
City:	Escondido
Report Date:	11/20/2019
Gage:	BONITA
Data Start:	10/01/1971
Data End:	09/30/2004
Timestep:	Hourly
Precip Scale:	1.000
Version Date:	2019/10/18

POC Thresholds

Low Flow Threshold for POC1:	10 Percent of the 2 Year
High Flow Threshold for POC1:	10 Year

Landuse Basin Data

Predeveloped Land Use

Basin 1

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
B,NatVeg,Moderate	2.474
D,NatVeg,Moderate	3.789
Pervious Total	6.263

Impervious Land Use	acre
IMPERVIOUS-MOD	0.581
Impervious Total	0.581
Basin Total	6.844

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Basin AEF

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
B,NatVeg,Moderate	1.561
D,NatVeg,Moderate	1.181
Pervious Total	2.742

Impervious Land Use	acre
IMPERVIOUS-MOD	1.375
Impervious Total	1.375
Basin Total	4.117

Element Flows To:

Surface	Interflow	Groundwater
Surface Biofilter 1	Surface Biofilter 1	

Basin B

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
B,NatVeg,Moderate	0.559
D,NatVeg,Moderate	0.49
Pervious Total	1.049

Impervious Land Use	acre
IMPERVIOUS-MOD	0.222
Impervious Total	0.222
Basin Total	1.271

Element Flows To:

Surface	Interflow	Groundwater
Surface Biofilter 2	Surface Biofilter 2	

Basin C

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
D,NatVeg,Moderate	1.458
Pervious Total	1.458

Impervious Land Use	acre
IMPERVIOUS-MOD	0.203
Impervious Total	0.203
Basin Total	1.661

Element Flows To:

Surface	Interflow	Groundwater
Surface Biofilter 3	Surface Biofilter 3	

Routing Elements
Predeveloped Routing

Mitigated Routing

Biofilter 1

Bottom Length: 85.70 ft.
Bottom Width: 35.00 ft.
Material thickness of first layer: 0.25
Material type for first layer: Mulch
Material thickness of second layer: 1.5
Material type for second layer: ESM
Material thickness of third layer: 3
Material type for third layer: GRAVEL
Infiltration On
Infiltration rate: 0.3
Infiltration safety factor: 1
Wetted surface area On
Total Volume Infiltrated (ac-ft.): 24.07
Total Volume Through Riser (ac-ft.): 6.141
Total Volume Through Facility (ac-ft.): 30.211
Percent Infiltrated: 79.67
Total Precip Applied to Facility: 2.143
Total Evap From Facility: 2.173
Underdrain not used
Discharge Structure
Riser Height: 0.5 ft.
Riser Diameter: 12 in.
Orifice 1 Diameter: 0.25 in. Elevation:0.06 ft.
Element Flows To:
Outlet 1 Outlet 2

Biofilter Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
1145	0.1298	0.0000	0.0000	0.0000
1145.0	0.1296	0.0013	0.0000	0.0000
1145.1	0.1287	0.0026	0.0000	0.0000
1145.1	0.1278	0.0040	0.0000	0.0000
1145.2	0.1269	0.0053	0.0000	0.0000
1145.3	0.1260	0.0067	0.0000	0.0000
1145.3	0.1251	0.0081	0.0041	0.0041
1145.4	0.1242	0.0095	0.0043	0.0043
1145.5	0.1233	0.0109	0.0068	0.0068
1145.5	0.1224	0.0123	0.0106	0.0106
1145.6	0.1215	0.0137	0.0155	0.0155
1145.6	0.1206	0.0152	0.0191	0.0191
1145.7	0.1197	0.0166	0.0220	0.0220
1145.8	0.1188	0.0181	0.0237	0.0237
1145.8	0.1179	0.0196	0.0239	0.0239
1145.9	0.1170	0.0211	0.0241	0.0241
1146.0	0.1162	0.0226	0.0243	0.0243
1146.0	0.1153	0.0242	0.0246	0.0246
1146.1	0.1144	0.0257	0.0248	0.0248
1146.2	0.1135	0.0273	0.0250	0.0250
1146.2	0.1127	0.0288	0.0252	0.0252
1146.3	0.1118	0.0304	0.0255	0.0255
1146.3	0.1110	0.0320	0.0257	0.0257
1146.4	0.1101	0.0336	0.0259	0.0259

1146.5	0.1092	0.0353	0.0262	0.0262
1146.5	0.1084	0.0369	0.0264	0.0264
1146.6	0.1075	0.0386	0.0266	0.0266
1146.7	0.1067	0.0403	0.0269	0.0269
1146.7	0.1059	0.0426	0.0271	0.0271
1146.8	0.1050	0.0450	0.0273	0.0273
1146.8	0.1042	0.0473	0.0276	0.0276
1146.9	0.1033	0.0497	0.0278	0.0278
1147.0	0.1025	0.0522	0.0281	0.0281
1147.0	0.1017	0.0546	0.0283	0.0283
1147.1	0.1009	0.0571	0.0285	0.0285
1147.2	0.1000	0.0596	0.0288	0.0288
1147.2	0.0992	0.0621	0.0290	0.0290
1147.3	0.0984	0.0646	0.0293	0.0293
1147.4	0.0976	0.0671	0.0295	0.0295
1147.4	0.0968	0.0697	0.0298	0.0298
1147.5	0.0960	0.0723	0.0300	0.0300
1147.5	0.0952	0.0749	0.0303	0.0303
1147.6	0.0944	0.0776	0.0305	0.0305
1147.7	0.0936	0.0802	0.0308	0.0308
1147.7	0.0928	0.0829	0.0310	0.0310
1147.8	0.0920	0.0856	0.0313	0.0313
1147.9	0.0912	0.0883	0.0315	0.0315
1147.9	0.0904	0.0910	0.0318	0.0318
1148.0	0.0896	0.0938	0.0320	0.0320
1148.0	0.0888	0.0966	0.0323	0.0323
1148.1	0.0881	0.0994	0.0325	0.0325
1148.2	0.0873	0.1022	0.0328	0.0328
1148.2	0.0865	0.1051	0.0330	0.0330
1148.3	0.0857	0.1080	0.0333	0.0333
1148.4	0.0850	0.1109	0.0336	0.0336
1148.4	0.0842	0.1138	0.0338	0.0338
1148.5	0.0835	0.1167	0.0341	0.0341
1148.6	0.0827	0.1197	0.0343	0.0343
1148.6	0.0819	0.1227	0.0346	0.0346
1148.7	0.0812	0.1257	0.0349	0.0349
1148.7	0.0804	0.1287	0.0351	0.0351
1148.8	0.0797	0.1318	0.0354	0.0354
1148.9	0.0790	0.1349	0.0357	0.0357
1148.9	0.0782	0.1380	0.0359	0.0359
1149.0	0.0775	0.1411	0.0362	0.0362
1149.1	0.0767	0.1442	0.0365	0.0365
1149.1	0.0760	0.1474	0.0367	0.0367
1149.2	0.0753	0.1506	0.0370	0.0370
1149.2	0.0746	0.1538	0.0373	0.0373
1149.3	0.0738	0.1571	0.0376	0.0376
1149.4	0.0731	0.1604	0.0378	0.0378
1149.4	0.0724	0.1636	0.0381	0.0381
1149.5	0.0717	0.1670	0.0384	0.0384
1149.6	0.0710	0.1703	0.0387	0.0387
1149.6	0.0703	0.1737	0.0389	0.0389
1149.7	0.0696	0.1770	0.0392	0.0392
1149.7	0.0689	0.1776	0.0392	0.0392

Biofilter Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
4.7500	0.1298	0.1776	0.0000	0.0392	0.0003
4.8132	0.1307	0.1859	0.0000	0.0392	0.0006

4.8764	0.1316	0.1942	0.0000	0.0392	0.0008
4.9396	0.1326	0.2025	0.0000	0.0392	0.0011
5.0027	0.1335	0.2109	0.0000	0.0392	0.0014
5.0659	0.1344	0.2194	0.0000	0.0392	0.0017
5.1291	0.1354	0.2279	0.0000	0.0392	0.0020
5.1923	0.1363	0.2365	0.0000	0.0392	0.0023
5.2555	0.1373	0.2451	0.0000	0.0392	0.0025
5.3187	0.1382	0.2538	0.0000	0.0392	0.0028
5.3819	0.1391	0.2626	0.0000	0.0392	0.0031
5.4451	0.1401	0.2714	0.0000	0.0392	0.0034
5.5082	0.1411	0.2803	0.0000	0.0392	0.0037
5.5714	0.1420	0.2892	0.0000	0.0392	0.0040
5.6346	0.1430	0.2982	0.0000	0.0392	0.0043
5.6978	0.1439	0.3073	0.0000	0.0392	0.0045
5.7500	0.1447	0.3148	0.0000	0.0392	0.0000

Surface Biofilter 1

Element Flows To:

Outlet 1	Outlet 2
	Biofilter 1

Biofilter 2

Bottom Length: 40.00 ft.
Bottom Width: 20.00 ft.
Material thickness of first layer: 0.25
Material type for first layer: Mulch
Material thickness of second layer: 1.5
Material type for second layer: ESM
Material thickness of third layer: 3
Material type for third layer: GRAVEL
Infiltration On
Infiltration rate: 0.3
Infiltration safety factor: 1
Wetted surface area On
Total Volume Infiltrated (ac-ft.): 5.317
Total Volume Through Riser (ac-ft.): 0.667
Total Volume Through Facility (ac-ft.): 5.984
Percent Infiltrated: 88.85
Total Precip Applied to Facility: 0.707
Total Evap From Facility: 0.639
Underdrain not used
Discharge Structure
Riser Height: 0.5 ft.
Riser Diameter: 12 in.
Orifice 1 Diameter: 0.25 in. Elevation:0.06 ft.
Element Flows To:
Outlet 1 Outlet 2

Biofilter Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
1170	0.0528	0.0000	0.0000	0.0000
1170.0	0.0527	0.0004	0.0000	0.0000
1170.1	0.0522	0.0007	0.0000	0.0000
1170.1	0.0516	0.0011	0.0000	0.0000
1170.2	0.0510	0.0014	0.0000	0.0000
1170.3	0.0505	0.0018	0.0000	0.0000
1170.3	0.0499	0.0022	0.0012	0.0012
1170.4	0.0494	0.0026	0.0012	0.0012
1170.5	0.0488	0.0030	0.0020	0.0020
1170.5	0.0483	0.0034	0.0030	0.0030
1170.6	0.0477	0.0038	0.0045	0.0045
1170.6	0.0472	0.0042	0.0056	0.0056
1170.7	0.0467	0.0047	0.0065	0.0065
1170.8	0.0461	0.0051	0.0070	0.0070
1170.8	0.0456	0.0055	0.0071	0.0071
1170.9	0.0451	0.0060	0.0072	0.0072
1171.0	0.0445	0.0065	0.0074	0.0074
1171.0	0.0440	0.0069	0.0075	0.0075
1171.1	0.0435	0.0074	0.0076	0.0076
1171.2	0.0430	0.0079	0.0077	0.0077
1171.2	0.0425	0.0084	0.0078	0.0078
1171.3	0.0419	0.0089	0.0080	0.0080
1171.3	0.0414	0.0094	0.0081	0.0081
1171.4	0.0409	0.0099	0.0082	0.0082
1171.5	0.0404	0.0104	0.0083	0.0083
1171.5	0.0399	0.0109	0.0085	0.0085

1171.6	0.0394	0.0114	0.0086	0.0086
1171.7	0.0389	0.0120	0.0087	0.0087
1171.7	0.0385	0.0127	0.0089	0.0089
1171.8	0.0380	0.0135	0.0090	0.0090
1171.8	0.0375	0.0143	0.0091	0.0091
1171.9	0.0370	0.0151	0.0092	0.0092
1172.0	0.0365	0.0159	0.0094	0.0094
1172.0	0.0360	0.0167	0.0095	0.0095
1172.1	0.0356	0.0176	0.0096	0.0096
1172.2	0.0351	0.0184	0.0098	0.0098
1172.2	0.0346	0.0193	0.0099	0.0099
1172.3	0.0342	0.0201	0.0101	0.0101
1172.4	0.0337	0.0210	0.0102	0.0102
1172.4	0.0333	0.0219	0.0103	0.0103
1172.5	0.0328	0.0228	0.0105	0.0105
1172.5	0.0323	0.0237	0.0106	0.0106
1172.6	0.0319	0.0246	0.0108	0.0108
1172.7	0.0315	0.0256	0.0109	0.0109
1172.7	0.0310	0.0265	0.0110	0.0110
1172.8	0.0306	0.0275	0.0112	0.0112
1172.9	0.0301	0.0285	0.0113	0.0113
1172.9	0.0297	0.0295	0.0115	0.0115
1173.0	0.0293	0.0305	0.0116	0.0116
1173.0	0.0288	0.0315	0.0118	0.0118
1173.1	0.0284	0.0325	0.0119	0.0119
1173.2	0.0280	0.0335	0.0121	0.0121
1173.2	0.0276	0.0346	0.0122	0.0122
1173.3	0.0271	0.0357	0.0124	0.0124
1173.4	0.0267	0.0367	0.0125	0.0125
1173.4	0.0263	0.0378	0.0127	0.0127
1173.5	0.0259	0.0389	0.0128	0.0128
1173.6	0.0255	0.0401	0.0130	0.0130
1173.6	0.0251	0.0412	0.0132	0.0132
1173.7	0.0247	0.0423	0.0133	0.0133
1173.7	0.0243	0.0435	0.0135	0.0135
1173.8	0.0239	0.0447	0.0136	0.0136
1173.9	0.0235	0.0459	0.0138	0.0138
1173.9	0.0231	0.0471	0.0140	0.0140
1174.0	0.0228	0.0483	0.0141	0.0141
1174.1	0.0224	0.0495	0.0143	0.0143
1174.1	0.0220	0.0508	0.0144	0.0144
1174.2	0.0216	0.0520	0.0146	0.0146
1174.2	0.0212	0.0533	0.0148	0.0148
1174.3	0.0209	0.0546	0.0149	0.0149
1174.4	0.0205	0.0559	0.0151	0.0151
1174.4	0.0201	0.0572	0.0153	0.0153
1174.5	0.0198	0.0585	0.0154	0.0154
1174.6	0.0194	0.0599	0.0156	0.0156
1174.6	0.0191	0.0612	0.0158	0.0158
1174.7	0.0187	0.0626	0.0159	0.0159
1174.7	0.0184	0.0628	0.0159	0.0159

Biofilter Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
4.7500	0.0528	0.0628	0.0000	0.0159	0.0002
4.8132	0.0534	0.0662	0.0000	0.0159	0.0003
4.8764	0.0540	0.0696	0.0000	0.0159	0.0005
4.9396	0.0545	0.0730	0.0000	0.0159	0.0007

5.0027	0.0551	0.0765	0.0000	0.0159	0.0009
5.0659	0.0557	0.0800	0.0000	0.0159	0.0010
5.1291	0.0563	0.0835	0.0000	0.0159	0.0012
5.1923	0.0569	0.0871	0.0000	0.0159	0.0014
5.2555	0.0575	0.0907	0.0000	0.0159	0.0016
5.3187	0.0581	0.0944	0.0000	0.0159	0.0018
5.3819	0.0587	0.0981	0.0000	0.0159	0.0019
5.4451	0.0593	0.1018	0.0000	0.0159	0.0021
5.5082	0.0599	0.1055	0.0000	0.0159	0.0023
5.5714	0.0605	0.1093	0.0000	0.0159	0.0025
5.6346	0.0611	0.1132	0.0000	0.0159	0.0027
5.6978	0.0617	0.1171	0.0000	0.0159	0.0028
5.7500	0.0622	0.1203	0.0000	0.0159	0.0000

Surface Biofilter 2

Element Flows To:

Outlet 1	Outlet 2
	Biofilter 2

Biofilter 3

Bottom Length: 48.00 ft.
Bottom Width: 25.00 ft.
Material thickness of first layer: 0.25
Material type for first layer: Mulch
Material thickness of second layer: 1.5
Material type for second layer: ESM
Material thickness of third layer: 3
Material type for third layer: GRAVEL
Infiltration On
Infiltration rate: 0.3
Infiltration safety factor: 1
Wetted surface area On
Total Volume Infiltrated (ac-ft.): 6.061
Total Volume Through Riser (ac-ft.): 1.147
Total Volume Through Facility (ac-ft.): 7.208
Percent Infiltrated: 84.09
Total Precip Applied to Facility: 0.888
Total Evap From Facility: 0.844
Underdrain not used
Discharge Structure
Riser Height: 0.5 ft.
Riser Diameter: 12 in.
Orifice 1 Diameter: 0.25 in. Elevation:0.06 ft.
Element Flows To:
Outlet 1 Outlet 2

Biofilter Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
1190	0.0677	0.0000	0.0000	0.0000
1190.0	0.0676	0.0005	0.0000	0.0000
1190.1	0.0669	0.0011	0.0000	0.0000
1190.1	0.0663	0.0016	0.0000	0.0000
1190.2	0.0656	0.0022	0.0000	0.0000
1190.3	0.0650	0.0027	0.0000	0.0000
1190.3	0.0644	0.0033	0.0017	0.0017
1190.4	0.0638	0.0039	0.0018	0.0018
1190.5	0.0631	0.0044	0.0028	0.0028
1190.5	0.0625	0.0050	0.0044	0.0044
1190.6	0.0619	0.0056	0.0065	0.0065
1190.6	0.0613	0.0062	0.0081	0.0081
1190.7	0.0607	0.0069	0.0093	0.0093
1190.8	0.0601	0.0075	0.0101	0.0101
1190.8	0.0594	0.0081	0.0102	0.0102
1190.9	0.0588	0.0088	0.0104	0.0104
1191.0	0.0582	0.0094	0.0105	0.0105
1191.0	0.0576	0.0101	0.0106	0.0106
1191.1	0.0570	0.0108	0.0108	0.0108
1191.2	0.0565	0.0114	0.0109	0.0109
1191.2	0.0559	0.0121	0.0111	0.0111
1191.3	0.0553	0.0128	0.0112	0.0112
1191.3	0.0547	0.0135	0.0114	0.0114
1191.4	0.0541	0.0142	0.0115	0.0115
1191.5	0.0535	0.0150	0.0117	0.0117
1191.5	0.0530	0.0157	0.0118	0.0118

1191.6	0.0524	0.0165	0.0120	0.0120
1191.7	0.0518	0.0172	0.0121	0.0121
1191.7	0.0513	0.0183	0.0123	0.0123
1191.8	0.0507	0.0193	0.0124	0.0124
1191.8	0.0501	0.0204	0.0126	0.0126
1191.9	0.0496	0.0215	0.0127	0.0127
1192.0	0.0490	0.0226	0.0129	0.0129
1192.0	0.0485	0.0238	0.0130	0.0130
1192.1	0.0479	0.0249	0.0132	0.0132
1192.2	0.0474	0.0260	0.0134	0.0134
1192.2	0.0468	0.0272	0.0135	0.0135
1192.3	0.0463	0.0284	0.0137	0.0137
1192.4	0.0458	0.0296	0.0138	0.0138
1192.4	0.0452	0.0308	0.0140	0.0140
1192.5	0.0447	0.0320	0.0142	0.0142
1192.5	0.0442	0.0332	0.0143	0.0143
1192.6	0.0436	0.0345	0.0145	0.0145
1192.7	0.0431	0.0358	0.0147	0.0147
1192.7	0.0426	0.0370	0.0148	0.0148
1192.8	0.0421	0.0383	0.0150	0.0150
1192.9	0.0416	0.0396	0.0152	0.0152
1192.9	0.0411	0.0410	0.0153	0.0153
1193.0	0.0406	0.0423	0.0155	0.0155
1193.0	0.0401	0.0436	0.0157	0.0157
1193.1	0.0396	0.0450	0.0158	0.0158
1193.2	0.0391	0.0464	0.0160	0.0160
1193.2	0.0386	0.0478	0.0162	0.0162
1193.3	0.0381	0.0492	0.0164	0.0164
1193.4	0.0376	0.0506	0.0165	0.0165
1193.4	0.0371	0.0521	0.0167	0.0167
1193.5	0.0366	0.0535	0.0169	0.0169
1193.6	0.0361	0.0550	0.0171	0.0171
1193.6	0.0356	0.0565	0.0173	0.0173
1193.7	0.0352	0.0580	0.0174	0.0174
1193.7	0.0347	0.0595	0.0176	0.0176
1193.8	0.0342	0.0610	0.0178	0.0178
1193.9	0.0338	0.0626	0.0180	0.0180
1193.9	0.0333	0.0642	0.0182	0.0182
1194.0	0.0328	0.0657	0.0184	0.0184
1194.1	0.0324	0.0673	0.0185	0.0185
1194.1	0.0319	0.0690	0.0187	0.0187
1194.2	0.0315	0.0706	0.0189	0.0189
1194.2	0.0310	0.0722	0.0191	0.0191
1194.3	0.0306	0.0739	0.0193	0.0193
1194.4	0.0301	0.0756	0.0195	0.0195
1194.4	0.0297	0.0773	0.0197	0.0197
1194.5	0.0293	0.0790	0.0199	0.0199
1194.6	0.0288	0.0807	0.0201	0.0201
1194.6	0.0284	0.0825	0.0202	0.0202
1194.7	0.0280	0.0842	0.0204	0.0204
1194.7	0.0275	0.0845	0.0204	0.0204

Biofilter Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
4.7500	0.0677	0.0845	0.0000	0.0204	0.0002
4.8132	0.0683	0.0888	0.0000	0.0204	0.0004
4.8764	0.0690	0.0932	0.0000	0.0204	0.0006
4.9396	0.0696	0.0976	0.0000	0.0204	0.0008

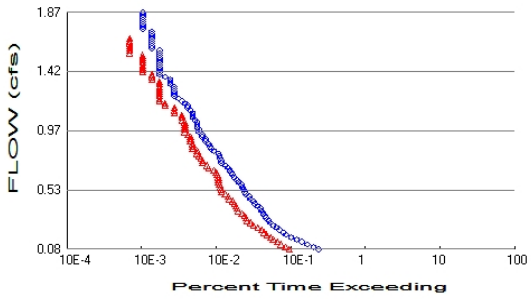
5.0027	0.0703	0.1020	0.0000	0.0204	0.0010
5.0659	0.0709	0.1064	0.0000	0.0204	0.0012
5.1291	0.0716	0.1109	0.0000	0.0204	0.0014
5.1923	0.0723	0.1155	0.0000	0.0204	0.0016
5.2555	0.0729	0.1201	0.0000	0.0204	0.0018
5.3187	0.0736	0.1247	0.0000	0.0204	0.0020
5.3819	0.0743	0.1294	0.0000	0.0204	0.0022
5.4451	0.0749	0.1341	0.0000	0.0204	0.0024
5.5082	0.0756	0.1388	0.0000	0.0204	0.0026
5.5714	0.0763	0.1436	0.0000	0.0204	0.0028
5.6346	0.0770	0.1485	0.0000	0.0204	0.0030
5.6978	0.0777	0.1534	0.0000	0.0204	0.0032
5.7500	0.0782	0.1574	0.0000	0.0204	0.0000

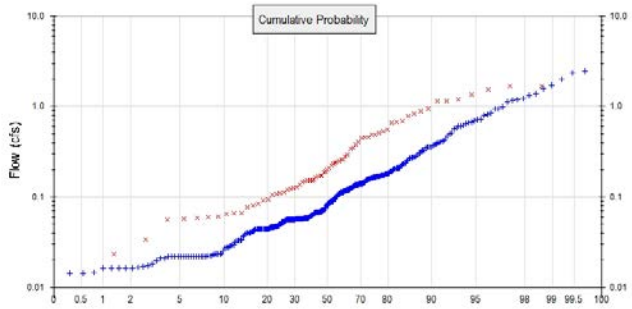
Surface Biofilter 3

Element Flows To:

Outlet 1	Outlet 2
	Biofilter 3

Analysis Results
POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 6.263
Total Impervious Area: 0.581

Mitigated Landuse Totals for POC #1
Total Pervious Area: 5.249
Total Impervious Area: 1.8

Flow Frequency Method: Cunnane

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.80278
5 year	1.331847
10 year	1.865215
25 year	2.421702

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.506255
5 year	1.145356
10 year	1.456374
25 year	1.67375

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0803	685	275	40	Pass
0.0983	581	247	42	Pass
0.1163	482	215	44	Pass
0.1344	409	192	46	Pass
0.1524	348	169	48	Pass
0.1704	292	155	53	Pass
0.1885	252	138	54	Pass
0.2065	230	128	55	Pass
0.2245	205	118	57	Pass
0.2425	186	105	56	Pass
0.2606	168	91	54	Pass
0.2786	156	83	53	Pass
0.2966	147	75	51	Pass
0.3147	136	73	53	Pass
0.3327	129	69	53	Pass
0.3507	124	64	51	Pass
0.3688	116	57	49	Pass
0.3868	112	55	49	Pass
0.4048	104	53	50	Pass
0.4228	96	51	53	Pass
0.4409	92	48	52	Pass
0.4589	83	44	53	Pass
0.4769	81	42	51	Pass
0.4950	73	38	52	Pass
0.5130	69	34	49	Pass
0.5310	67	34	50	Pass
0.5490	65	33	50	Pass
0.5671	63	32	50	Pass
0.5851	58	31	53	Pass
0.6031	55	31	56	Pass
0.6212	50	31	62	Pass
0.6392	48	30	62	Pass
0.6572	46	29	63	Pass
0.6753	44	27	61	Pass
0.6933	42	23	54	Pass
0.7113	39	22	56	Pass
0.7293	34	19	55	Pass
0.7474	34	19	55	Pass
0.7654	33	18	54	Pass
0.7834	32	17	53	Pass
0.8015	31	16	51	Pass
0.8195	27	16	59	Pass
0.8375	25	14	56	Pass
0.8556	24	14	58	Pass
0.8736	23	14	60	Pass
0.8916	21	13	61	Pass
0.9096	21	13	61	Pass
0.9277	19	13	68	Pass
0.9457	19	12	63	Pass
0.9637	17	11	64	Pass
0.9818	17	11	64	Pass
0.9998	16	11	68	Pass
1.0178	16	11	68	Pass

1.0359	16	11	68	Pass
1.0539	15	10	66	Pass
1.0719	14	10	71	Pass
1.0899	14	10	71	Pass
1.1080	14	8	57	Pass
1.1260	13	8	61	Pass
1.1440	12	8	66	Pass
1.1621	12	6	50	Pass
1.1801	11	6	54	Pass
1.1981	10	5	50	Pass
1.2161	9	5	55	Pass
1.2342	8	5	62	Pass
1.2522	8	5	62	Pass
1.2702	8	5	62	Pass
1.2883	8	5	62	Pass
1.3063	8	5	62	Pass
1.3243	7	5	71	Pass
1.3424	7	5	71	Pass
1.3604	7	4	57	Pass
1.3784	6	4	66	Pass
1.3964	5	4	80	Pass
1.4145	5	3	60	Pass
1.4325	5	3	60	Pass
1.4505	5	3	60	Pass
1.4686	5	3	60	Pass
1.4866	5	3	60	Pass
1.5046	5	3	60	Pass
1.5227	5	3	60	Pass
1.5407	5	3	60	Pass
1.5587	5	2	40	Pass
1.5767	5	2	40	Pass
1.5948	4	2	50	Pass
1.6128	4	2	50	Pass
1.6308	4	2	50	Pass
1.6489	4	2	50	Pass
1.6669	4	2	50	Pass
1.6849	4	0	0	Pass
1.7029	4	0	0	Pass
1.7210	4	0	0	Pass
1.7390	3	0	0	Pass
1.7570	3	0	0	Pass
1.7751	3	0	0	Pass
1.7931	3	0	0	Pass
1.8111	3	0	0	Pass
1.8292	3	0	0	Pass
1.8472	3	0	0	Pass
1.8652	3	0	0	Pass

Water Quality

Model Default Modifications

Total of 0 changes have been made.

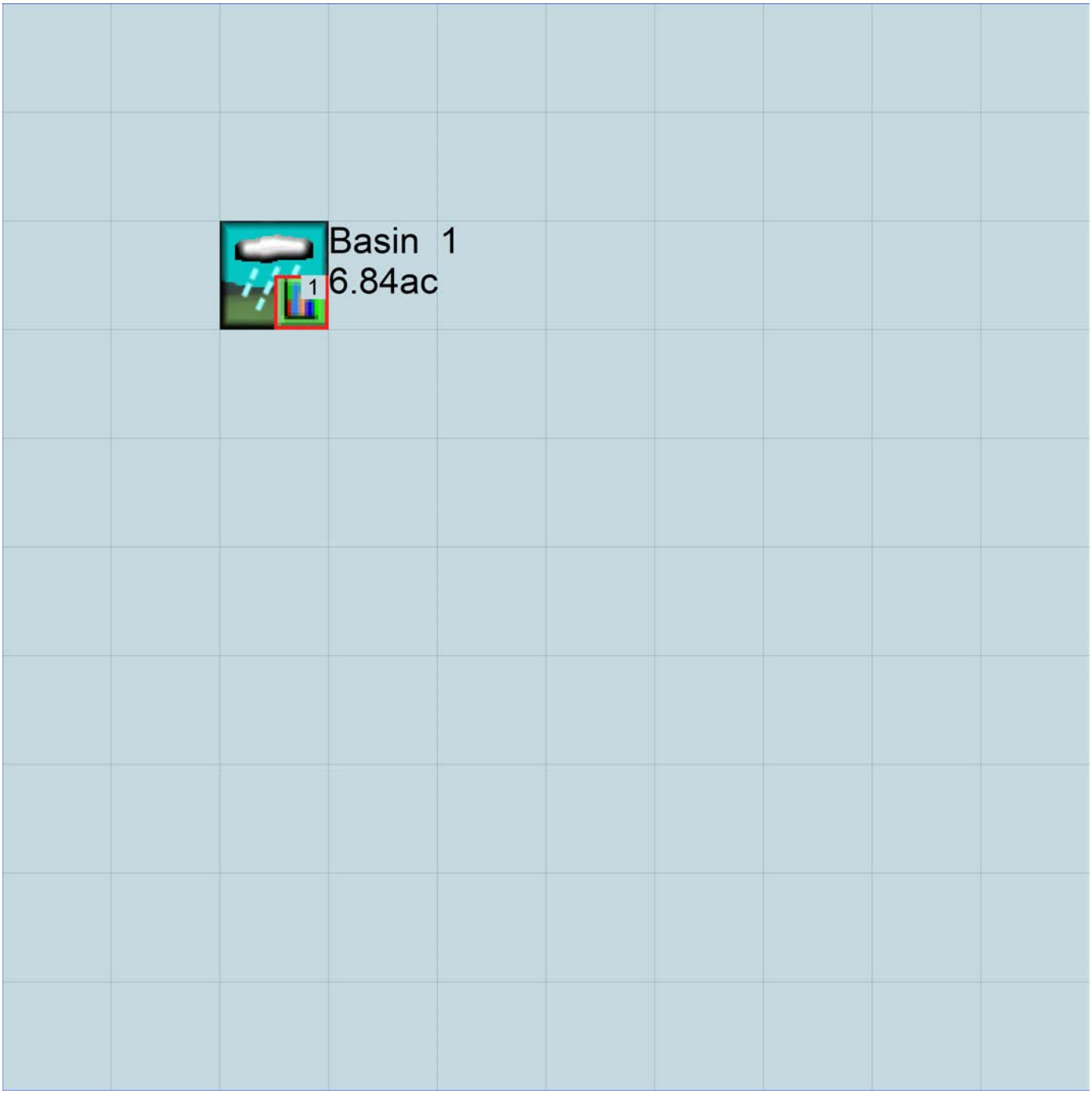
PERLND Changes

No PERLND changes have been made.

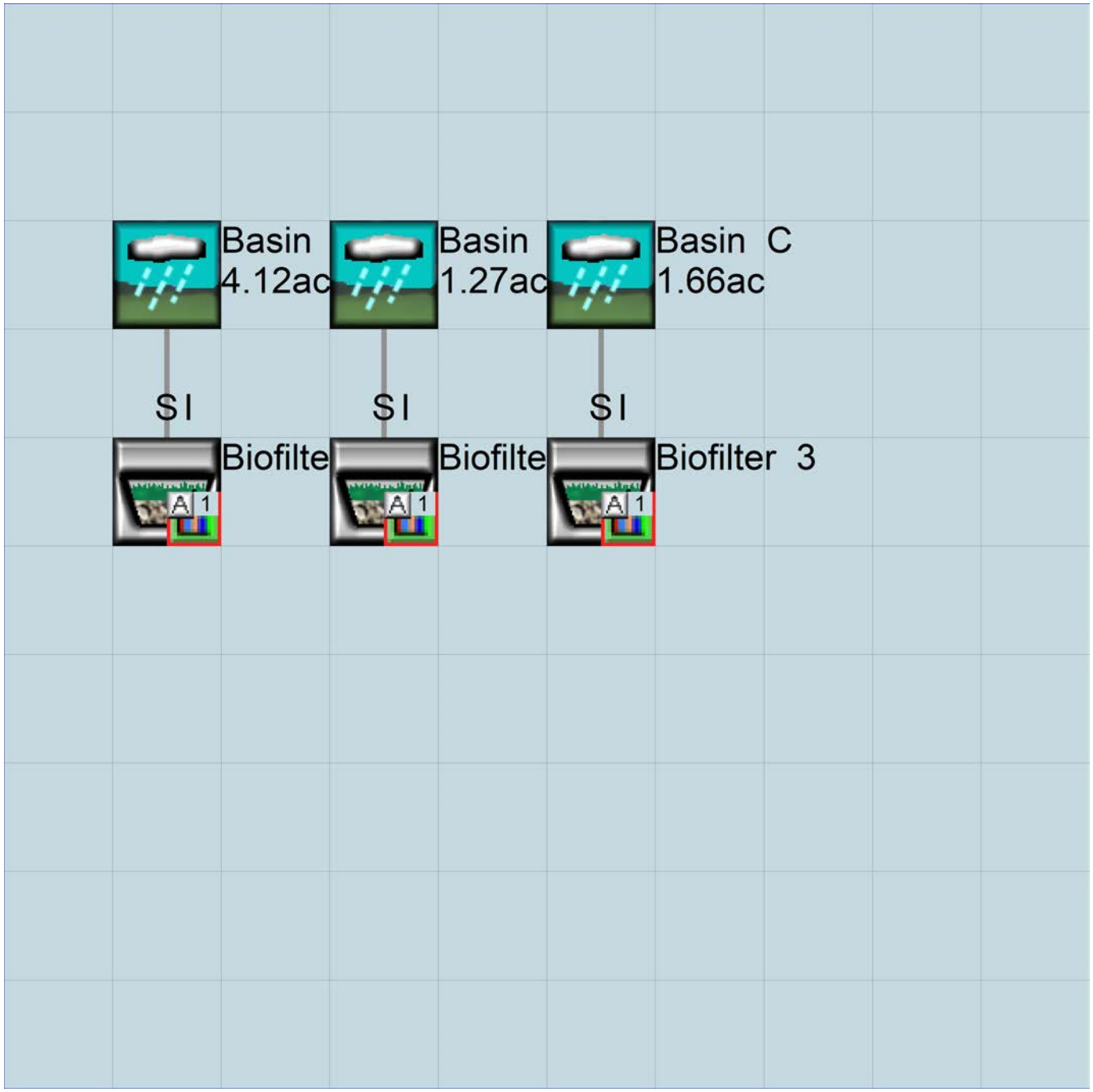
IMPLND Changes

No IMPLND changes have been made.

Appendix
Predeveloped Schematic



Mitigated Schematic



Predeveloped UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1971 10 01        END    2004 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                    UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM         26   16-2281 POC i.wdm
MESSU       25   Pre16-2281 POC i.MES
            27   Pre16-2281 POC i.L61
            28   Pre16-2281 POC i.L62
            30   POC16-2281 POC i1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:60
      PERLND      11
      PERLND      29
      IMPLND       2
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Basin  1                   MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                        in  out           ***
   11      B,NatVeg,Moderate      1    1    1    1   27    0
   29      D,NatVeg,Moderate      1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   11         0    0    1    0    0    0    0    0    0    0    0    0
   29         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags **************************** PIVL  PYR
```

```
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
   11         0    0    4    0    0    0    0    0    0    0    0    0    1    9
   29         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
   11         0    1    1    1    0    0    0    0    1    1    0
   29         0    1    1    1    0    0    0    0    1    1    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
   11              0       3.7     0.055        80       0.1       2.5     0.915
   29              0         3     0.025        80       0.1       2.5     0.915
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   11              0         0         2         2         0      0.05      0.05
   29              0         0         2         2         0      0.05      0.05
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   11              0       0.6      0.04         1       0.3         0
   29              0       0.6      0.04         1       0.3         0
  END PWAT-PARM4
  MON-LZETPARM
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   11       0.4  0.4  0.4  0.4  0.6  0.6  0.6  0.6  0.6  0.4  0.4  0.4
   29       0.4  0.4  0.4  0.4  0.6  0.6  0.6  0.6  0.6  0.4  0.4  0.4
  END MON-LZETPARM
  MON-INTERCEP
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   11       0.1  0.1  0.1  0.1 0.06 0.06 0.06 0.06 0.06  0.1  0.1  0.1
   29       0.1  0.1  0.1  0.1 0.06 0.06 0.06 0.06 0.06  0.1  0.1  0.1
  END MON-INTERCEP

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
               ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS       GWVS
   11              0         0      0.01         0       0.4      0.01          0
   29              0         0      0.01         0       0.4      0.01          0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                     in  out           ***
    2      IMPERVIOUS-MOD         1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
    2         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
```

```
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
    2         0    0    4    0    0    0    1    9
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
    2         0    0    0    0    1
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    2            100       0.1     0.011      0.08
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    2              0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    2              0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                 <--Area-->     <-Target->   MBLK   ***
<Name>   #                 <-factor->     <Name>   #   Tbl#   ***
Basin  1***
PERLND  11                      2.474     COPY   501     12
PERLND  11                      2.474     COPY   501     13
PERLND  29                      3.789     COPY   501     12
PERLND  29                      3.789     COPY   501     13
IMPLND   2                      0.581     COPY   501     15

******Routing******
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   12.1        DISPLY   1     INPUT  TIMSER 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<------------------><---> User T-series  Engl Metr LKFG           ***
                                       in  out                              ***
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ****************** PIVL  PYR
```

```
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                      ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
           FG FG FG FG  possible  exit  *** possible  exit      possible  exit
            *  *  *  *    *  *  *  *  *       *  *  *  *  *         ***
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->       ***
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                         ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit        for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1              PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1              IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    1              PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    1              IMPLND   1 999 EXTNL  PETINP

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
COPY   501 OUTPUT MEAN   1 1     12.1      WDM    501 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>            <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13

  MASS-LINK       15
IMPLND     IWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   15


END MASS-LINK

END RUN
```

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1971 10 01        END    2004 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                    UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM         26   16-2281 POC i.wdm
MESSU       25   Mit16-2281 POC i.MES
            27   Mit16-2281 POC i.L61
            28   Mit16-2281 POC i.L62
            30   POC16-2281 POC i1.dat
END FILES

OPN SEQUENCE
    INGRP               INDELT 00:60
      PERLND      11
      PERLND      29
      IMPLND       2
      RCHRES       1
      RCHRES       2
      RCHRES       3
      RCHRES       4
      RCHRES       5
      RCHRES       6
      COPY         1
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Surface Biofilter  1        MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                          in  out           ***
   11      B,NatVeg,Moderate      1    1    1    1   27    0
   29      D,NatVeg,Moderate      1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
```

```
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   11         0    0    1    0    0    0    0    0    0    0    0    0
   29         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags **************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
   11         0    0    4    0    0    0    0    0    0    0    0    0    1    9
   29         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
   11         0    1    1    1    0    0    0    0    1    1    0
   29         0    1    1    1    0    0    0    0    1    1    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR      KVARY      AGWRC
   11              0       3.7     0.055        80       0.1        2.5     0.915
   29              0         3     0.025        80       0.1        2.5     0.915
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   11              0         0         2         2         0      0.05      0.05
   29              0         0         2         2         0      0.05      0.05
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   11              0       0.6      0.04         1       0.3         0
   29              0       0.6      0.04         1       0.3         0
  END PWAT-PARM4
  MON-LZETPARM
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   11       0.4  0.4  0.4  0.4  0.6  0.6  0.6  0.6  0.6  0.4  0.4  0.4
   29       0.4  0.4  0.4  0.4  0.6  0.6  0.6  0.6  0.6  0.4  0.4  0.4
  END MON-LZETPARM
  MON-INTERCEP
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   11       0.1  0.1  0.1  0.1 0.06 0.06 0.06 0.06 0.06  0.1  0.1  0.1
   29       0.1  0.1  0.1  0.1 0.06 0.06 0.06 0.06 0.06  0.1  0.1  0.1
  END MON-INTERCEP

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
               ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
   11              0         0      0.01         0       0.4      0.01         0
   29              0         0      0.01         0       0.4      0.01         0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                     in  out           ***
    2      IMPERVIOUS-MOD         1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***
```

```
  ACTIVITY
    <PLS > ************* Active Sections ******************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
    2         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
    2         0    0    4    0    0    0    1    9
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
    2         0    0    0    0    1
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    2           100       0.1     0.011      0.08
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    2              0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    2             0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin  AEF***
PERLND  11                       1.561     RCHRES   1      2
PERLND  11                       1.561     RCHRES   1      3
PERLND  29                       1.181     RCHRES   1      2
PERLND  29                       1.181     RCHRES   1      3
IMPLND   2                       1.375     RCHRES   1      5
Basin  B***
PERLND  11                       0.559     RCHRES   3      2
PERLND  11                       0.559     RCHRES   3      3
PERLND  29                        0.49     RCHRES   3      2
PERLND  29                        0.49     RCHRES   3      3
IMPLND   2                       0.222     RCHRES   3      5
Basin  C***
PERLND  29                       1.458     RCHRES   5      2
PERLND  29                       1.458     RCHRES   5      3
IMPLND   2                       0.203     RCHRES   5      5

******Routing******
PERLND  11                       1.561     COPY     1     12
PERLND  29                       1.181     COPY     1     12
IMPLND   2                       1.375     COPY     1     15
PERLND  11                       1.561     COPY     1     13
PERLND  29                       1.181     COPY     1     13
PERLND  11                       0.559     COPY     1     12
PERLND  29                        0.49     COPY     1     12
IMPLND   2                       0.222     COPY     1     15
PERLND  11                       0.559     COPY     1     13
PERLND  29                        0.49     COPY     1     13
PERLND  29                       1.458     COPY     1     12
```

```
IMPLND   2                       0.203     COPY     1     15
PERLND  29                       1.458     COPY     1     13
RCHRES   1                           1     RCHRES   2      8
RCHRES   3                           1     RCHRES   4      8
RCHRES   5                           1     RCHRES   6      8
RCHRES   2                           1     COPY   501     17
RCHRES   1                           1     COPY   501     17
RCHRES   4                           1     COPY   501     17
RCHRES   3                           1     COPY   501     17
RCHRES   6                           1     COPY   501     17
RCHRES   5                           1     COPY   501     17
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   12.1        DISPLY   1     INPUT  TIMSER 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<----------------><---> User T-series  Engl Metr LKFG             ***
                                      in  out                               ***
    1     Surface Biofilte-006    3    1    1    1   28    0    1
    2     Biofilter  1            2    1    1    1   28    0    1
    3     Surface Biofilte-008    3    1    1    1   28    0    1
    4     Biofilter  2            2    1    1    1   28    0    1
    5     Surface Biofilte-010    3    1    1    1   28    0    1
    6     Biofilter  3            2    1    1    1   28    0    1
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
    1         1    0    0    0    0    0    0    0    0    0
    2         1    0    0    0    0    0    0    0    0    0
    3         1    0    0    0    0    0    0    0    0    0
    4         1    0    0    0    0    0    0    0    0    0
    5         1    0    0    0    0    0    0    0    0    0
    6         1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ******************* PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
    1         4    0    0    0    0    0    0    0    0    0    1    9
    2         4    0    0    0    0    0    0    0    0    0    1    9
    3         4    0    0    0    0    0    0    0    0    0    1    9
    4         4    0    0    0    0    0    0    0    0    0    1    9
    5         4    0    0    0    0    0    0    0    0    0    1    9
    6         4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                  ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
           FG FG FG FG  possible  exit  *** possible  exit      possible  exit
            *  *  *  *    *  *  *  *  *       *  *  *  *  *        ***
    1       0  1  0  0    4  5  6  0  0       0  0  0  0  0       2  2  2  2  2
    2       0  1  0  0    4  5  0  0  0       0  0  0  0  0       2  2  2  2  2
    3       0  1  0  0    4  5  6  0  0       0  0  0  0  0       2  2  2  2  2
    4       0  1  0  0    4  5  0  0  0       0  0  0  0  0       2  2  2  2  2
    5       0  1  0  0    4  5  6  0  0       0  0  0  0  0       2  2  2  2  2
```

```
    6        0  1  0  0    4  5  0  0  0       0  0  0  0  0       2  2  2  2  2
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN      DELTH     STCOR        KS      DB50        ***
  <------><--------><--------><--------><--------><--------><--------><--------> ***
    1              1      0.01       0.0    1145.0       0.0       0.0
    2              2      0.02       0.0    1145.0       0.0       0.0
    3              3      0.01       0.0    1170.0       0.0       0.0
    4              4      0.01       0.0    1170.0       0.0       0.0
    5              5      0.01       0.0    1190.0       0.0       0.0
    6              6      0.01       0.0    1190.0       0.0       0.0
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                          ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit        for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
    1            0         4.0  5.0  6.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    2            0         4.0  5.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    3            0         4.0  5.0  6.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    4            0         4.0  5.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    5            0         4.0  5.0  6.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    6            0         4.0  5.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
  FTABLE      2
   77    5
     Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.129793  0.000000  0.000000  0.000000
  0.063187  0.129633  0.001312  0.000000  0.000000
  0.126374  0.128714  0.002637  0.000000  0.000000
  0.189560  0.127799  0.003976  0.000000  0.000000
  0.252747  0.126886  0.005328  0.000000  0.000000
  0.315934  0.125976  0.006694  0.000000  0.000000
  0.379121  0.125068  0.008073  0.000000  0.004102
  0.442308  0.124164  0.009466  0.000000  0.004271
  0.505495  0.123263  0.010872  0.000000  0.006845
  0.568681  0.122365  0.012292  0.000000  0.010588
  0.631868  0.121469  0.013726  0.000000  0.015533
  0.695055  0.120577  0.015174  0.000000  0.019124
  0.758242  0.119687  0.016635  0.000000  0.022038
  0.821429  0.118801  0.018111  0.000000  0.023659
  0.884615  0.117917  0.019601  0.000000  0.023883
  0.947802  0.117036  0.021104  0.000000  0.024107
  1.010989  0.116159  0.022622  0.000000  0.024333
  1.074176  0.115284  0.024154  0.000000  0.024560
  1.137363  0.114412  0.025700  0.000000  0.024787
  1.200549  0.113543  0.027260  0.000000  0.025015
  1.263736  0.112677  0.028835  0.000000  0.025244
  1.326923  0.111814  0.030424  0.000000  0.025474
  1.390110  0.110953  0.032028  0.000000  0.025705
  1.453297  0.110096  0.033646  0.000000  0.025937
  1.516484  0.109242  0.035279  0.000000  0.026170
  1.579670  0.108391  0.036926  0.000000  0.026403
  1.642857  0.107542  0.038588  0.000000  0.026638
  1.706044  0.106697  0.040264  0.000000  0.026873
  1.769231  0.105854  0.042604  0.000000  0.027109
  1.832418  0.105014  0.044965  0.000000  0.027347
  1.895604  0.104178  0.047345  0.000000  0.027585
  1.958791  0.103344  0.049747  0.000000  0.027824
  2.021978  0.102513  0.052169  0.000000  0.028063
  2.085165  0.101685  0.054612  0.000000  0.028304
  2.148352  0.100860  0.057076  0.000000  0.028546
  2.211538  0.100038  0.059561  0.000000  0.028788
```

```
  2.274725  0.099219  0.062068  0.000000  0.029031
  2.337912  0.098403  0.064595  0.000000  0.029276
  2.401099  0.097589  0.067143  0.000000  0.029521
  2.464286  0.096779  0.069713  0.000000  0.029767
  2.527473  0.095972  0.072304  0.000000  0.030014
  2.590659  0.095167  0.074916  0.000000  0.030261
  2.653846  0.094366  0.077550  0.000000  0.030510
  2.717033  0.093567  0.080206  0.000000  0.030760
  2.780220  0.092771  0.082883  0.000000  0.031010
  2.843407  0.091979  0.085582  0.000000  0.031262
  2.906593  0.091189  0.088303  0.000000  0.031514
  2.969780  0.090402  0.091046  0.000000  0.031767
  3.032967  0.089618  0.093811  0.000000  0.032021
  3.096154  0.088837  0.096598  0.000000  0.032276
  3.159341  0.088059  0.099407  0.000000  0.032531
  3.222527  0.087284  0.102238  0.000000  0.032788
  3.285714  0.086512  0.105091  0.000000  0.033046
  3.348901  0.085743  0.107967  0.000000  0.033304
  3.412088  0.084976  0.110865  0.000000  0.033563
  3.475275  0.084213  0.113786  0.000000  0.033824
  3.538462  0.083452  0.116729  0.000000  0.034085
  3.601648  0.082695  0.119695  0.000000  0.034347
  3.664835  0.081940  0.122684  0.000000  0.034610
  3.728022  0.081189  0.125696  0.000000  0.034873
  3.791209  0.080440  0.128730  0.000000  0.035138
  3.854396  0.079694  0.131788  0.000000  0.035404
  3.917582  0.078951  0.134868  0.000000  0.035670
  3.980769  0.078211  0.137972  0.000000  0.035937
  4.043956  0.077474  0.141099  0.000000  0.036205
  4.107143  0.076740  0.144249  0.000000  0.036474
  4.170330  0.076009  0.147422  0.000000  0.036744
  4.233516  0.075281  0.150619  0.000000  0.037015
  4.296703  0.074556  0.153840  0.000000  0.037287
  4.359890  0.073833  0.157084  0.000000  0.037560
  4.423077  0.073114  0.160352  0.000000  0.037833
  4.486264  0.072397  0.163643  0.000000  0.038108
  4.549451  0.071684  0.166959  0.000000  0.038383
  4.612637  0.070973  0.170298  0.000000  0.038659
  4.675824  0.070266  0.173661  0.000000  0.038936
  4.739011  0.069561  0.177048  0.000000  0.039214
  4.750000  0.068859  0.180881  0.000000  0.039214
  END FTABLE  2
  FTABLE      1
   17    6
     Depth      Area    Volume  Outflow1  Outflow2  Outflow3  Velocity  Travel
Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)     (cfs)   (ft/sec)
(Minutes)***
  0.000000  0.068859  0.000000  0.000000  0.000000  0.000279
  0.063187  0.130716  0.008230  0.000096  0.039214  0.000279
  0.126374  0.131641  0.016519  0.000437  0.039214  0.000559
  0.189560  0.132569  0.024866  0.000610  0.039214  0.000840
  0.252747  0.133500  0.033272  0.000745  0.039214  0.001121
  0.315934  0.134434  0.041737  0.000858  0.039214  0.001404
  0.379121  0.135371  0.050261  0.000958  0.039214  0.001687
  0.442308  0.136311  0.058845  0.001049  0.039214  0.001972
  0.505495  0.137254  0.067488  0.005457  0.039214  0.002257
  0.568681  0.138200  0.076190  0.191737  0.039214  0.002543
  0.631868  0.139148  0.084953  0.502780  0.039214  0.002830
  0.695055  0.140100  0.093775  0.878351  0.039214  0.003118
  0.758242  0.141054  0.102658  1.268988  0.039214  0.003406
  0.821429  0.142012  0.111601  1.625269  0.039214  0.003696
  0.884615  0.142972  0.120604  1.906900  0.039214  0.003987
  0.947802  0.143936  0.129669  2.097906  0.039214  0.004278
  1.000000  0.144734  0.137203  2.253120  0.039214  0.004519
  END FTABLE  1
  FTABLE      4
   77    5
     Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)   (ft/sec)    (Minutes)***
```

0.000000	0.052824	0.000000	0.000000	0.000000
0.063187	0.052725	0.000351	0.000000	0.000000
0.126374	0.052158	0.000710	0.000000	0.000000
0.189560	0.051594	0.001074	0.000000	0.000000
0.252747	0.051034	0.001446	0.000000	0.000000
0.315934	0.050476	0.001824	0.000000	0.000000
0.379121	0.049921	0.002210	0.000000	0.001151
0.442308	0.049369	0.002602	0.000000	0.001207
0.505495	0.048820	0.003001	0.000000	0.001950
0.568681	0.048274	0.003407	0.000000	0.003040
0.631868	0.047731	0.003821	0.000000	0.004494
0.695055	0.047190	0.004241	0.000000	0.005575
0.758242	0.046653	0.004669	0.000000	0.006473
0.821429	0.046119	0.005104	0.000000	0.007000
0.884615	0.045587	0.005546	0.000000	0.007117
0.947802	0.045059	0.005996	0.000000	0.007235
1.010989	0.044533	0.006453	0.000000	0.007354
1.074176	0.044010	0.006918	0.000000	0.007474
1.137363	0.043491	0.007390	0.000000	0.007595
1.200549	0.042974	0.007869	0.000000	0.007717
1.263736	0.042460	0.008357	0.000000	0.007839
1.326923	0.041949	0.008852	0.000000	0.007963
1.390110	0.041441	0.009355	0.000000	0.008087
1.453297	0.040936	0.009866	0.000000	0.008212
1.516484	0.040434	0.010384	0.000000	0.008339
1.579670	0.039935	0.010911	0.000000	0.008466
1.642857	0.039439	0.011445	0.000000	0.008594
1.706044	0.038945	0.011988	0.000000	0.008722
1.769231	0.038455	0.012749	0.000000	0.008852
1.832418	0.037967	0.013522	0.000000	0.008983
1.895604	0.037483	0.014307	0.000000	0.009114
1.958791	0.037001	0.015103	0.000000	0.009247
2.021978	0.036523	0.015910	0.000000	0.009380
2.085165	0.036047	0.016729	0.000000	0.009514
2.148352	0.035574	0.017559	0.000000	0.009649
2.211538	0.035104	0.018402	0.000000	0.009785
2.274725	0.034637	0.019256	0.000000	0.009922
2.337912	0.034173	0.020122	0.000000	0.010059
2.401099	0.033712	0.021000	0.000000	0.010198
2.464286	0.033254	0.021890	0.000000	0.010337
2.527473	0.032799	0.022792	0.000000	0.010478
2.590659	0.032347	0.023707	0.000000	0.010619
2.653846	0.031897	0.024633	0.000000	0.010761
2.717033	0.031451	0.025572	0.000000	0.010904
2.780220	0.031008	0.026524	0.000000	0.011048
2.843407	0.030567	0.027488	0.000000	0.011193
2.906593	0.030129	0.028464	0.000000	0.011339
2.969780	0.029695	0.029454	0.000000	0.011485
3.032967	0.029263	0.030456	0.000000	0.011633
3.096154	0.028834	0.031470	0.000000	0.011781
3.159341	0.028408	0.032498	0.000000	0.011930
3.222527	0.027985	0.033539	0.000000	0.012080
3.285714	0.027565	0.034593	0.000000	0.012231
3.348901	0.027148	0.035659	0.000000	0.012383
3.412088	0.026734	0.036739	0.000000	0.012536
3.475275	0.026323	0.037833	0.000000	0.012690
3.538462	0.025915	0.038940	0.000000	0.012844
3.601648	0.025509	0.040060	0.000000	0.013000
3.664835	0.025107	0.041193	0.000000	0.013156
3.728022	0.024708	0.042341	0.000000	0.013313
3.791209	0.024311	0.043502	0.000000	0.013471
3.854396	0.023917	0.044676	0.000000	0.013630
3.917582	0.023527	0.045865	0.000000	0.013790
3.980769	0.023139	0.047067	0.000000	0.013951
4.043956	0.022754	0.048283	0.000000	0.014113
4.107143	0.022372	0.049514	0.000000	0.014275
4.170330	0.021993	0.050758	0.000000	0.014439
4.233516	0.021617	0.052017	0.000000	0.014603
4.296703	0.021244	0.053290	0.000000	0.014768
4.359890	0.020874	0.054577	0.000000	0.014934

```
  4.423077  0.020507  0.055879  0.000000  0.015101
  4.486264  0.020143  0.057196  0.000000  0.015269
  4.549451  0.019781  0.058527  0.000000  0.015438
  4.612637  0.019423  0.059872  0.000000  0.015607
  4.675824  0.019068  0.061232  0.000000  0.015778
  4.739011  0.018715  0.062608  0.000000  0.015949
  4.750000  0.018365  0.064166  0.000000  0.015949
  END FTABLE  4
  FTABLE      3
   17    6
     Depth      Area    Volume  Outflow1  Outflow2  Outflow3  Velocity  Travel
Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)     (cfs)   (ft/sec)
(Minutes)***
  0.000000  0.018365  0.000000  0.000000  0.000000  0.000172
  0.063187  0.053394  0.003356  0.000096  0.015949  0.000172
  0.126374  0.053967  0.006748  0.000437  0.015949  0.000346
  0.189560  0.054543  0.010176  0.000610  0.015949  0.000520
  0.252747  0.055122  0.013641  0.000745  0.015949  0.000695
  0.315934  0.055703  0.017142  0.000858  0.015949  0.000871
  0.379121  0.056288  0.020680  0.000958  0.015949  0.001048
  0.442308  0.056876  0.024255  0.001049  0.015949  0.001226
  0.505495  0.057467  0.027868  0.005457  0.015949  0.001404
  0.568681  0.058060  0.031518  0.191737  0.015949  0.001584
  0.631868  0.058657  0.035205  0.502780  0.015949  0.001764
  0.695055  0.059256  0.038930  0.878351  0.015949  0.001946
  0.758242  0.059858  0.042694  1.268988  0.015949  0.002128
  0.821429  0.060464  0.046495  1.625269  0.015949  0.002311
  0.884615  0.061072  0.050335  1.906900  0.015949  0.002495
  0.947802  0.061683  0.054213  2.097906  0.015949  0.002680
  1.000000  0.062190  0.057446  2.253120  0.015949  0.002833
  END FTABLE  3
  FTABLE      6
   77    5
     Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.067677  0.000000  0.000000  0.000000
  0.063187  0.067565  0.000526  0.000000  0.000000
  0.126374  0.066923  0.001061  0.000000  0.000000
  0.189560  0.066284  0.001603  0.000000  0.000000
  0.252747  0.065647  0.002154  0.000000  0.000000
  0.315934  0.065014  0.002713  0.000000  0.000000
  0.379121  0.064384  0.003280  0.000000  0.001691
  0.442308  0.063756  0.003855  0.000000  0.001769
  0.505495  0.063132  0.004439  0.000000  0.002849
  0.568681  0.062510  0.005032  0.000000  0.004427
  0.631868  0.061892  0.005633  0.000000  0.006525
  0.695055  0.061276  0.006242  0.000000  0.008071
  0.758242  0.060663  0.006861  0.000000  0.009342
  0.821429  0.060053  0.007488  0.000000  0.010074
  0.884615  0.059447  0.008123  0.000000  0.010214
  0.947802  0.058843  0.008768  0.000000  0.010355
  1.010989  0.058242  0.009421  0.000000  0.010497
  1.074176  0.057644  0.010083  0.000000  0.010640
  1.137363  0.057048  0.010755  0.000000  0.010783
  1.200549  0.056456  0.011435  0.000000  0.010928
  1.263736  0.055867  0.012124  0.000000  0.011073
  1.326923  0.055281  0.012823  0.000000  0.011220
  1.390110  0.054697  0.013530  0.000000  0.011367
  1.453297  0.054117  0.014247  0.000000  0.011515
  1.516484  0.053539  0.014974  0.000000  0.011664
  1.579670  0.052964  0.015709  0.000000  0.011814
  1.642857  0.052393  0.016454  0.000000  0.011965
  1.706044  0.051824  0.017209  0.000000  0.012116
  1.769231  0.051258  0.018266  0.000000  0.012269
  1.832418  0.050695  0.019336  0.000000  0.012422
  1.895604  0.050135  0.020419  0.000000  0.012576
  1.958791  0.049578  0.021516  0.000000  0.012732
  2.021978  0.049024  0.022627  0.000000  0.012888
  2.085165  0.048473  0.023751  0.000000  0.013045
```

```
  2.148352  0.047925  0.024888  0.000000  0.013203
  2.211538  0.047380  0.026040  0.000000  0.013361
  2.274725  0.046837  0.027205  0.000000  0.013521
  2.337912  0.046298  0.028384  0.000000  0.013681
  2.401099  0.045761  0.029577  0.000000  0.013843
  2.464286  0.045228  0.030784  0.000000  0.014005
  2.527473  0.044697  0.032005  0.000000  0.014168
  2.590659  0.044170  0.033240  0.000000  0.014332
  2.653846  0.043645  0.034490  0.000000  0.014497
  2.717033  0.043123  0.035754  0.000000  0.014663
  2.780220  0.042604  0.037032  0.000000  0.014830
  2.843407  0.042088  0.038325  0.000000  0.014997
  2.906593  0.041575  0.039632  0.000000  0.015166
  2.969780  0.041065  0.040954  0.000000  0.015335
  3.032967  0.040558  0.042291  0.000000  0.015506
  3.096154  0.040054  0.043642  0.000000  0.015677
  3.159341  0.039552  0.045009  0.000000  0.015849
  3.222527  0.039054  0.046390  0.000000  0.016022
  3.285714  0.038559  0.047787  0.000000  0.016196
  3.348901  0.038066  0.049198  0.000000  0.016370
  3.412088  0.037576  0.050625  0.000000  0.016546
  3.475275  0.037090  0.052067  0.000000  0.016722
  3.538462  0.036606  0.053524  0.000000  0.016900
  3.601648  0.036125  0.054997  0.000000  0.017078
  3.664835  0.035648  0.056485  0.000000  0.017257
  3.728022  0.035173  0.057989  0.000000  0.017437
  3.791209  0.034701  0.059508  0.000000  0.017618
  3.854396  0.034232  0.061043  0.000000  0.017800
  3.917582  0.033766  0.062594  0.000000  0.017983
  3.980769  0.033302  0.064161  0.000000  0.018166
  4.043956  0.032842  0.065744  0.000000  0.018351
  4.107143  0.032385  0.067342  0.000000  0.018536
  4.170330  0.031931  0.068957  0.000000  0.018722
  4.233516  0.031479  0.070588  0.000000  0.018909
  4.296703  0.031031  0.072236  0.000000  0.019097
  4.359890  0.030585  0.073899  0.000000  0.019286
  4.423077  0.030142  0.075580  0.000000  0.019476
  4.486264  0.029703  0.077276  0.000000  0.019667
  4.549451  0.029266  0.078989  0.000000  0.019858
  4.612637  0.028832  0.080719  0.000000  0.020051
  4.675824  0.028401  0.082465  0.000000  0.020244
  4.739011  0.027973  0.084229  0.000000  0.020438
  4.750000  0.027548  0.086226  0.000000  0.020438
  END FTABLE  6
  FTABLE      5
   17    6
     Depth      Area    Volume  Outflow1  Outflow2  Outflow3  Velocity  Travel
Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)     (cfs)   (ft/sec)
(Minutes)***
  0.000000  0.027548  0.000000  0.000000  0.000000  0.000195
  0.063187  0.068322  0.004297  0.000096  0.020438  0.000195
  0.126374  0.068971  0.008634  0.000437  0.020438  0.000391
  0.189560  0.069622  0.013013  0.000610  0.020438  0.000588
  0.252747  0.070276  0.017433  0.000745  0.020438  0.000786
  0.315934  0.070934  0.021894  0.000858  0.020438  0.000985
  0.379121  0.071594  0.026397  0.000958  0.020438  0.001185
  0.442308  0.072257  0.030942  0.001049  0.020438  0.001386
  0.505495  0.072923  0.035528  0.005457  0.020438  0.001587
  0.568681  0.073592  0.040157  0.191737  0.020438  0.001789
  0.631868  0.074264  0.044829  0.502780  0.020438  0.001993
  0.695055  0.074939  0.049542  0.878351  0.020438  0.002197
  0.758242  0.075617  0.054299  1.268988  0.020438  0.002402
  0.821429  0.076297  0.059098  1.625269  0.020438  0.002608
  0.884615  0.076981  0.063941  1.906900  0.020438  0.002815
  0.947802  0.077668  0.068827  2.097906  0.020438  0.003022
  1.000000  0.078237  0.072896  2.253120  0.020438  0.003194
  END FTABLE  5
END FTABLES
```

```
EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1              PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1              IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    1              PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    1              IMPLND   1 999 EXTNL  PETINP
WDM      2 PREC     ENGL    1              RCHRES   1     EXTNL  PREC
WDM      2 PREC     ENGL    1              RCHRES   3     EXTNL  PREC
WDM      2 PREC     ENGL    1              RCHRES   5     EXTNL  PREC
WDM      1 EVAP     ENGL    0.5            RCHRES   1     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.7            RCHRES   2     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.5            RCHRES   3     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.7            RCHRES   4     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.5            RCHRES   5     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.7            RCHRES   6     EXTNL  POTEV

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
RCHRES   2 HYDR   RO     1 1        1      WDM   1000 FLOW     ENGL      REPL
RCHRES   2 HYDR   O      1 1        1      WDM   1001 FLOW     ENGL      REPL
RCHRES   2 HYDR   O      2 1        1      WDM   1002 FLOW     ENGL      REPL
RCHRES   2 HYDR   STAGE  1 1        1      WDM   1003 STAG     ENGL      REPL
RCHRES   1 HYDR   STAGE  1 1        1      WDM   1004 STAG     ENGL      REPL
RCHRES   1 HYDR   O      1 1        1      WDM   1005 FLOW     ENGL      REPL
COPY     1 OUTPUT MEAN   1 1     12.1      WDM    701 FLOW     ENGL      REPL
COPY   501 OUTPUT MEAN   1 1     12.1      WDM    801 FLOW     ENGL      REPL
RCHRES   4 HYDR   RO     1 1        1      WDM   1006 FLOW     ENGL      REPL
RCHRES   4 HYDR   O      1 1        1      WDM   1007 FLOW     ENGL      REPL
RCHRES   4 HYDR   O      2 1        1      WDM   1008 FLOW     ENGL      REPL
RCHRES   4 HYDR   STAGE  1 1        1      WDM   1009 STAG     ENGL      REPL
RCHRES   3 HYDR   STAGE  1 1        1      WDM   1010 STAG     ENGL      REPL
RCHRES   3 HYDR   O      1 1        1      WDM   1011 FLOW     ENGL      REPL
RCHRES   6 HYDR   RO     1 1        1      WDM   1012 FLOW     ENGL      REPL
RCHRES   6 HYDR   O      1 1        1      WDM   1013 FLOW     ENGL      REPL
RCHRES   6 HYDR   O      2 1        1      WDM   1014 FLOW     ENGL      REPL
RCHRES   6 HYDR   STAGE  1 1        1      WDM   1015 STAG     ENGL      REPL
RCHRES   5 HYDR   STAGE  1 1        1      WDM   1016 STAG     ENGL      REPL
RCHRES   5 HYDR   O      1 1        1      WDM   1017 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>             <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK        2
PERLND     PWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    2

  MASS-LINK        3
PERLND     PWATER IFWO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    3

  MASS-LINK        5
IMPLND     IWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    5

  MASS-LINK        8
RCHRES     OFLOW  OVOL   2                 RCHRES         INFLOW IVOL
  END MASS-LINK    8

  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13
```

```
  MASS-LINK       15
IMPLND     IWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   15

  MASS-LINK       17
RCHRES     OFLOW  OVOL   1               COPY           INPUT  MEAN
  END MASS-LINK   17


END MASS-LINK

END RUN
```

Predeveloped HSPF Message File

Mitigated HSPF Message File

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SDHM 3.1

PROJECT REPORT

General Model Information

Project Name:	16-2281 POC ii
Site Name:	Perrin Winer [v]
Site Address:	16138 Highland Valley Road
City:	Escondido
Report Date:	11/20/2019
Gage:	ESCONDID
Data Start:	10/01/1964
Data End:	09/30/2004
Timestep:	Hourly
Precip Scale:	1.000
Version Date:	2019/10/18

POC Thresholds

Low Flow Threshold for POC1:	10 Percent of the 2 Year
High Flow Threshold for POC1:	10 Year

Landuse Basin Data

Predeveloped Land Use

Basin 1

Bypass: No

GroundWater: No

Pervious Land Use	acre
D,NatVeg,Moderate	0.069
Pervious Total	0.069

Impervious Land Use	acre
IMPERVIOUS-MOD	0.057
Impervious Total	0.057
Basin Total	0.126

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Basin 1

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
D,NatVeg,Moderate	0.017
Pervious Total	0.017

Impervious Land Use	acre
IMPERVIOUS-MOD	0.126
Impervious Total	0.126
Basin Total	0.143

Element Flows To:

Surface	Interflow	Groundwater
Surface Biofilter 1	Surface Biofilter 1	

Routing Elements
Predeveloped Routing

Mitigated Routing

Biofilter 1

Bottom Length:	20.00 ft.
Bottom Width:	10.00 ft.
Material thickness of first layer:	0.25
Material type for first layer:	Mulch
Material thickness of second layer:	1.5
Material type for second layer:	ESM
Material thickness of third layer:	3
Material type for third layer:	GRAVEL
Infiltration On	
Infiltration rate:	0.06
Infiltration safety factor:	1
Wetted surface area On	
Total Volume Infiltrated (ac-ft.):	1.621
Total Volume Through Riser (ac-ft.):	3.788
Total Volume Through Facility (ac-ft.):	5.409
Percent Infiltrated:	29.97
Total Precip Applied to Facility:	0.909
Total Evap From Facility:	0.422
Underdrain not used	
Discharge Structure	
Riser Height:	0.75 ft.
Riser Diameter:	12 in.
Orifice 1 Diameter:	0.625 in. Elevation:0.05 ft.
Orifice 2 Diameter:	1.5 in. Elevation:0.4 ft.
Element Flows To:	
Outlet 1	Outlet 2

Biofilter Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
1235	0.0260	0.0000	0.0000	0.0000
1235.0	0.0259	0.0001	0.0000	0.0000
1235.1	0.0255	0.0002	0.0000	0.0000
1235.1	0.0251	0.0003	0.0000	0.0000
1235.2	0.0247	0.0004	0.0000	0.0000
1235.3	0.0243	0.0005	0.0000	0.0000
1235.3	0.0239	0.0006	0.0003	0.0003
1235.4	0.0235	0.0007	0.0004	0.0004
1235.5	0.0231	0.0008	0.0004	0.0004
1235.5	0.0228	0.0010	0.0004	0.0004
1235.6	0.0224	0.0011	0.0004	0.0004
1235.7	0.0220	0.0012	0.0004	0.0004
1235.7	0.0216	0.0014	0.0004	0.0004
1235.8	0.0212	0.0015	0.0004	0.0004
1235.9	0.0209	0.0017	0.0005	0.0005
1235.9	0.0205	0.0018	0.0005	0.0005
1236.0	0.0201	0.0020	0.0005	0.0005
1236.1	0.0198	0.0021	0.0005	0.0005
1236.1	0.0194	0.0023	0.0005	0.0005
1236.2	0.0191	0.0024	0.0005	0.0005
1236.3	0.0187	0.0026	0.0005	0.0005
1236.3	0.0184	0.0028	0.0006	0.0006
1236.4	0.0180	0.0030	0.0006	0.0006

1236.5	0.0177	0.0032	0.0006	0.0006
1236.5	0.0173	0.0034	0.0006	0.0006
1236.6	0.0170	0.0036	0.0006	0.0006
1236.7	0.0167	0.0038	0.0006	0.0006
1236.7	0.0163	0.0040	0.0006	0.0006
1236.8	0.0160	0.0043	0.0007	0.0007
1236.9	0.0157	0.0046	0.0007	0.0007
1236.9	0.0154	0.0050	0.0007	0.0007
1237.0	0.0150	0.0053	0.0007	0.0007
1237.1	0.0147	0.0056	0.0007	0.0007
1237.1	0.0144	0.0059	0.0007	0.0007
1237.2	0.0141	0.0063	0.0008	0.0008
1237.3	0.0138	0.0066	0.0008	0.0008
1237.3	0.0135	0.0070	0.0008	0.0008
1237.4	0.0132	0.0073	0.0008	0.0008
1237.5	0.0129	0.0077	0.0008	0.0008
1237.5	0.0126	0.0081	0.0009	0.0009
1237.6	0.0123	0.0085	0.0009	0.0009
1237.7	0.0120	0.0089	0.0009	0.0009
1237.7	0.0118	0.0093	0.0009	0.0009
1237.8	0.0115	0.0097	0.0009	0.0009
1237.9	0.0112	0.0101	0.0009	0.0009
1237.9	0.0109	0.0106	0.0010	0.0010
1238.0	0.0107	0.0110	0.0010	0.0010
1238.0	0.0104	0.0115	0.0010	0.0010
1238.1	0.0101	0.0119	0.0010	0.0010
1238.2	0.0099	0.0124	0.0010	0.0010
1238.2	0.0096	0.0129	0.0011	0.0011
1238.3	0.0094	0.0134	0.0011	0.0011
1238.4	0.0091	0.0139	0.0011	0.0011
1238.4	0.0089	0.0144	0.0011	0.0011
1238.5	0.0086	0.0149	0.0012	0.0012
1238.6	0.0084	0.0154	0.0012	0.0012
1238.6	0.0081	0.0159	0.0012	0.0012
1238.7	0.0079	0.0165	0.0012	0.0012
1238.8	0.0077	0.0170	0.0012	0.0012
1238.8	0.0074	0.0176	0.0013	0.0013
1238.9	0.0072	0.0182	0.0013	0.0013
1239.0	0.0070	0.0188	0.0013	0.0013
1239.0	0.0068	0.0194	0.0013	0.0013
1239.1	0.0066	0.0200	0.0014	0.0014
1239.2	0.0064	0.0206	0.0014	0.0014
1239.2	0.0061	0.0212	0.0014	0.0014
1239.3	0.0059	0.0219	0.0014	0.0014
1239.4	0.0057	0.0225	0.0014	0.0014
1239.4	0.0055	0.0232	0.0015	0.0015
1239.5	0.0053	0.0238	0.0015	0.0015
1239.6	0.0052	0.0245	0.0015	0.0015
1239.6	0.0050	0.0252	0.0015	0.0015
1239.7	0.0048	0.0259	0.0016	0.0016
1239.7	0.0046	0.0260	0.0016	0.0016

Biofilter Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
4.7500	0.0260	0.0260	0.0000	0.0016	0.0000
4.8159	0.0264	0.0277	0.0000	0.0016	0.0001
4.8819	0.0268	0.0294	0.0000	0.0016	0.0001
4.9478	0.0272	0.0312	0.0000	0.0016	0.0001

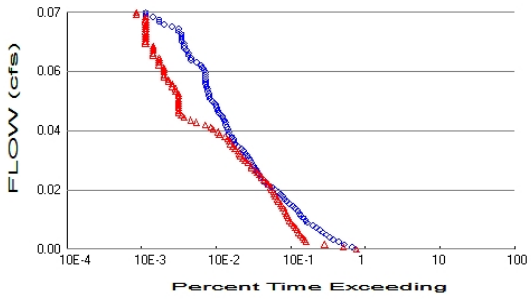
5.0137	0.0276	0.0330	0.0000	0.0016	0.0001
5.0797	0.0281	0.0349	0.0000	0.0016	0.0002
5.1456	0.0285	0.0367	0.0000	0.0016	0.0002
5.2115	0.0289	0.0386	0.0000	0.0016	0.0002
5.2775	0.0294	0.0405	0.0000	0.0016	0.0002
5.3434	0.0298	0.0425	0.0000	0.0016	0.0003
5.4093	0.0302	0.0445	0.0000	0.0016	0.0003
5.4753	0.0307	0.0465	0.0000	0.0016	0.0003
5.5412	0.0311	0.0485	0.0000	0.0016	0.0003
5.6071	0.0316	0.0506	0.0000	0.0016	0.0004
5.6731	0.0320	0.0527	0.0000	0.0016	0.0004
5.7390	0.0325	0.0548	0.0000	0.0016	0.0004
5.8049	0.0330	0.0570	0.0000	0.0016	0.0005
5.8709	0.0334	0.0592	0.0000	0.0016	0.0005
5.9368	0.0339	0.0614	0.0000	0.0016	0.0005
6.0000	0.0343	0.0635	0.0000	0.0016	0.0000

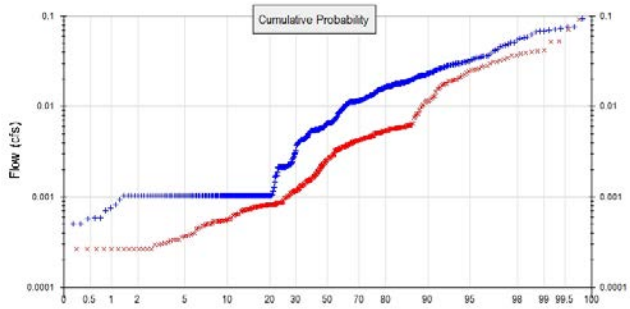
Surface Biofilter 1

Element Flows To:

Outlet 1	Outlet 2
	Biofilter 1

Analysis Results
POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 0.069
Total Impervious Area: 0.057

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0.017
Total Impervious Area: 0.126

Flow Frequency Method: Cunnane

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.044262
5 year	0.067694
10 year	0.072175
25 year	0.080814

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.02686
5 year	0.039247
10 year	0.050886
25 year	0.075633

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0044	2564	2673	104	Pass
0.0051	2309	1773	76	Pass
0.0058	1811	1001	55	Pass
0.0065	1539	565	36	Pass
0.0072	1301	538	41	Pass
0.0078	1181	505	42	Pass
0.0085	1063	474	44	Pass
0.0092	941	449	47	Pass
0.0099	847	426	50	Pass
0.0106	778	405	52	Pass
0.0113	690	383	55	Pass
0.0120	587	360	61	Pass
0.0126	553	339	61	Pass
0.0133	518	324	62	Pass
0.0140	480	314	65	Pass
0.0147	455	304	66	Pass
0.0154	434	294	67	Pass
0.0161	401	278	69	Pass
0.0167	371	267	71	Pass
0.0174	338	257	76	Pass
0.0181	309	241	77	Pass
0.0188	288	232	80	Pass
0.0195	274	219	79	Pass
0.0202	254	211	83	Pass
0.0209	241	206	85	Pass
0.0215	217	194	89	Pass
0.0222	197	190	96	Pass
0.0229	169	176	104	Pass
0.0236	155	168	108	Pass
0.0243	151	155	102	Pass
0.0250	141	143	101	Pass
0.0256	133	133	100	Pass
0.0263	126	124	98	Pass
0.0270	121	116	95	Pass
0.0277	115	106	92	Pass
0.0284	111	103	92	Pass
0.0291	105	93	88	Pass
0.0297	100	85	85	Pass
0.0304	97	79	81	Pass
0.0311	92	75	81	Pass
0.0318	87	72	82	Pass
0.0325	82	69	84	Pass
0.0332	77	63	81	Pass
0.0339	69	59	85	Pass
0.0345	64	55	85	Pass
0.0352	61	53	86	Pass
0.0359	60	50	83	Pass
0.0366	57	46	80	Pass
0.0373	52	39	75	Pass
0.0380	52	37	71	Pass
0.0386	50	32	64	Pass
0.0393	49	30	61	Pass
0.0400	47	25	53	Pass

0.0407	47	19	40	Pass
0.0414	45	16	35	Pass
0.0421	43	13	30	Pass
0.0427	41	12	29	Pass
0.0434	38	11	28	Pass
0.0441	37	11	29	Pass
0.0448	36	11	30	Pass
0.0455	35	11	31	Pass
0.0462	33	11	33	Pass
0.0469	31	11	35	Pass
0.0475	29	11	37	Pass
0.0482	28	11	39	Pass
0.0489	28	11	39	Pass
0.0496	27	10	37	Pass
0.0503	27	10	37	Pass
0.0510	26	9	34	Pass
0.0516	25	9	36	Pass
0.0523	25	8	32	Pass
0.0530	25	8	32	Pass
0.0537	25	7	28	Pass
0.0544	25	7	28	Pass
0.0551	25	7	28	Pass
0.0558	24	7	29	Pass
0.0564	23	7	30	Pass
0.0571	22	6	27	Pass
0.0578	19	6	31	Pass
0.0585	16	6	37	Pass
0.0592	16	6	37	Pass
0.0599	15	5	33	Pass
0.0605	15	5	33	Pass
0.0612	14	5	35	Pass
0.0619	13	5	38	Pass
0.0626	13	5	38	Pass
0.0633	13	4	30	Pass
0.0640	12	4	33	Pass
0.0646	12	4	33	Pass
0.0653	12	4	33	Pass
0.0660	12	4	33	Pass
0.0667	11	4	36	Pass
0.0674	11	4	36	Pass
0.0681	9	4	44	Pass
0.0688	7	4	57	Pass
0.0694	6	4	66	Pass
0.0701	6	4	66	Pass
0.0708	5	4	80	Pass
0.0715	4	3	75	Pass
0.0722	4	3	75	Pass

Water Quality

Model Default Modifications

Total of 0 changes have been made.

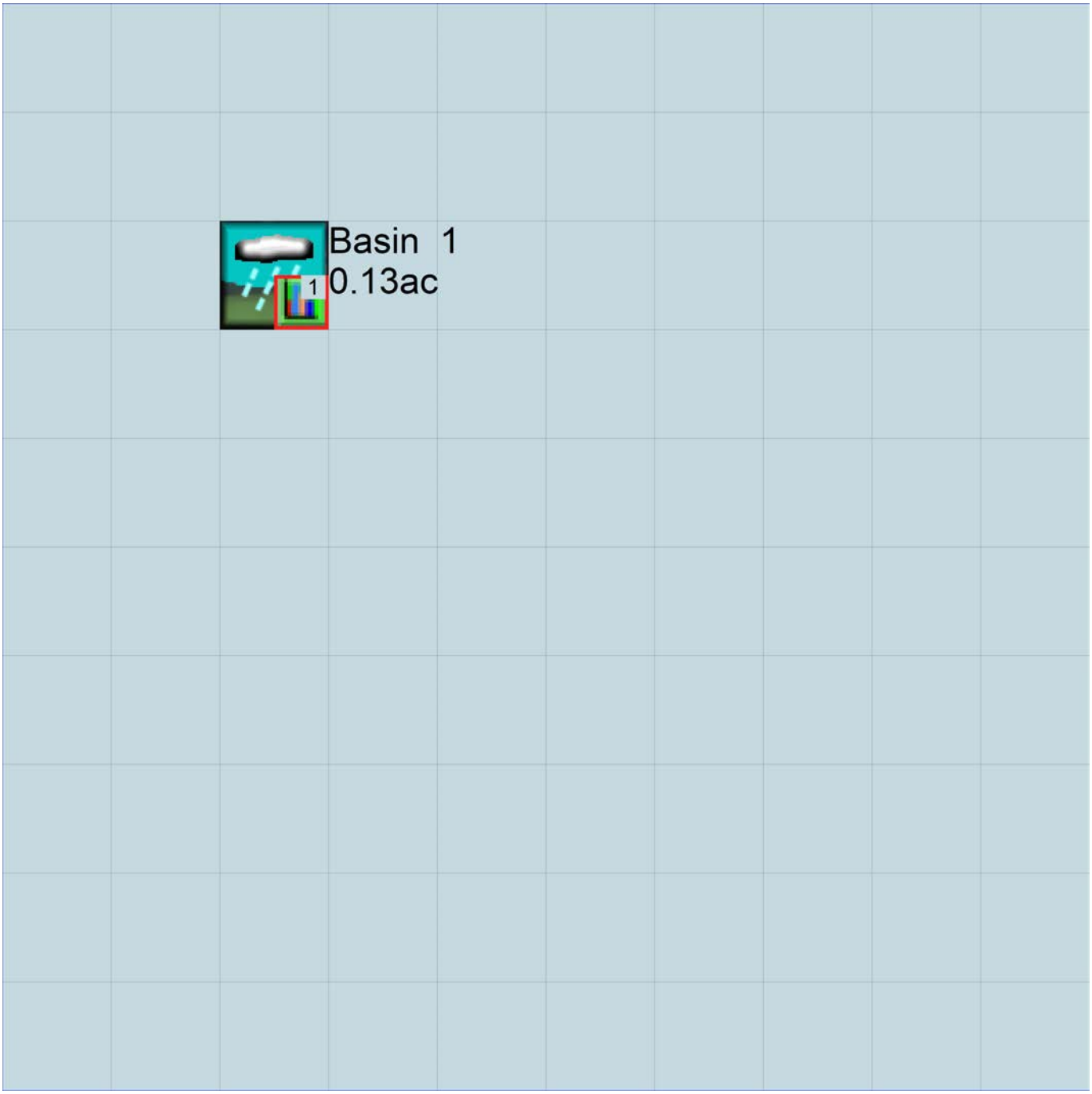
PERLND Changes

No PERLND changes have been made.

IMPLND Changes

No IMPLND changes have been made.

Appendix
Predeveloped Schematic



Mitigated Schematic



Predeveloped UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1964 10 01        END    2004 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                    UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM         26   16-2281 POC ii.wdm
MESSU       25   Pre16-2281 POC ii.MES
            27   Pre16-2281 POC ii.L61
            28   Pre16-2281 POC ii.L62
            30   POC16-2281 POC ii1.dat
END FILES

OPN SEQUENCE
    INGRP               INDELT 00:60
      PERLND      29
      IMPLND       2
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Basin  1                   MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                          in  out           ***
   29      D,NatVeg,Moderate      1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   29         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags **************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
   29         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO
```

```
  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
   29         0    1    1    1    0    0    0    0    1    1    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
   29             0         3     0.025        80       0.1       2.5     0.915
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   29             0         0         2         2         0      0.05      0.05
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   29             0       0.6      0.04         1       0.3         0
  END PWAT-PARM4
  MON-LZETPARM
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   29       0.4  0.4  0.4  0.4  0.6  0.6  0.6  0.6  0.6  0.4  0.4  0.4
  END MON-LZETPARM
  MON-INTERCEP
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   29       0.1  0.1  0.1  0.1 0.06 0.06 0.06 0.06 0.06  0.1  0.1  0.1
  END MON-INTERCEP

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
               ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
   29             0         0      0.01         0       0.4      0.01         0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                     in  out           ***
    2      IMPERVIOUS-MOD         1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
    2         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
    2         0    0    4    0    0    0    1    9
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
    2         0    0    0    0    1
  END IWAT-PARM1
```

```
  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    2            100       0.1     0.011      0.08
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    2              0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    2              0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin  1***
PERLND  29                       0.069     COPY   501     12
PERLND  29                       0.069     COPY   501     13
IMPLND   2                       0.057     COPY   501     15

******Routing******
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   12.1        DISPLY   1     INPUT  TIMSER 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<------------------><---> User T-series  Engl Metr LKFG           ***
                                      in  out                               ***
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ****************** PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                 ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
            FG FG FG FG  possible  exit  *** possible  exit      possible  exit
             *  *  *  *    *  *  *  *  *      *  *  *  *  *         ***
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->       ***
```

```
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                        ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit        for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1              PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1              IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    1              PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    1              IMPLND   1 999 EXTNL  PETINP

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
COPY   501 OUTPUT MEAN   1 1     12.1      WDM    501 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>            <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13

  MASS-LINK       15
IMPLND     IWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   15


END MASS-LINK

END RUN
```

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1964 10 01        END    2004 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                    UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM         26   16-2281 POC ii.wdm
MESSU       25   Mit16-2281 POC ii.MES
            27   Mit16-2281 POC ii.L61
            28   Mit16-2281 POC ii.L62
            30   POC16-2281 POC ii1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:60
      PERLND      29
      IMPLND       2
      RCHRES       1
      RCHRES       2
      COPY         1
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Surface Biofilter  1        MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                          in  out           ***
   29      D,NatVeg,Moderate      1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   29         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags **************************** PIVL  PYR
```

```
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
   29         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
   29         0    1    1    1    0    0    0    0    1    1    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
   29              0         3     0.025        80       0.1       2.5     0.915
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   29              0         0         2         2         0      0.05      0.05
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   29             0       0.6      0.04         1       0.3         0
  END PWAT-PARM4
  MON-LZETPARM
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   29       0.4  0.4  0.4  0.4  0.6  0.6  0.6  0.6  0.6  0.4  0.4  0.4
  END MON-LZETPARM
  MON-INTERCEP
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   29       0.1  0.1  0.1  0.1 0.06 0.06 0.06 0.06 0.06  0.1  0.1  0.1
  END MON-INTERCEP

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
               ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
   29             0         0      0.01         0       0.4      0.01         0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                     in  out           ***
    2      IMPERVIOUS-MOD         1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
    2         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
    2         0    0    4    0    0    0    1    9
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
```

```
    2         0    0    0    0    1
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    2            100       0.1     0.011      0.08
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    2              0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    2              0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin  1***
PERLND  29                       0.017     RCHRES   1      2
PERLND  29                       0.017     RCHRES   1      3
IMPLND   2                       0.126     RCHRES   1      5

******Routing******
PERLND  29                       0.017     COPY     1     12
IMPLND   2                       0.126     COPY     1     15
PERLND  29                       0.017     COPY     1     13
RCHRES   1                           1     RCHRES   2      8
RCHRES   2                           1     COPY   501     17
RCHRES   1                           1     COPY   501     17
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   12.1        DISPLY   1     INPUT  TIMSER 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<------------------><---> User T-series  Engl Metr LKFG           ***
                                       in  out                              ***
    1     Surface Biofilte-004    3    1    1    1   28    0    1
    2     Biofilter  1            2    1    1    1   28    0    1
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
    1         1    0    0    0    0    0    0    0    0    0
    2         1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ****************** PIVL  PYR
```

```
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
    1         4    0    0    0    0    0    0    0    0    0    1    9
    2         4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                    ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
           FG FG FG FG  possible  exit  *** possible  exit      possible  exit
            *  *  *  *    *  *  *  *  *      *  *  *  *  *         ***
    1        0  1  0  0    4  5  6  0  0       0  0  0  0  0       2  2  2  2  2
    2        0  1  0  0    4  5  0  0  0       0  0  0  0  0       2  2  2  2  2
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><--------->      ***
    1              1      0.01       0.0    1235.0       0.0       0.0
    2              2      0.01       0.0    1235.0       0.0       0.0
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                       ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit        for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
    1            0         4.0  5.0  6.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    2            0         4.0  5.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
  FTABLE      2
   74    5
     Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.025964  0.000000  0.000000  0.000000
  0.065934  0.025947  0.000093  0.000000  0.000000
  0.131868  0.025537  0.000189  0.000000  0.000000
  0.197802  0.025130  0.000289  0.000000  0.000000
  0.263736  0.024727  0.000393  0.000000  0.000000
  0.329670  0.024326  0.000500  0.000000  0.000000
  0.395604  0.023929  0.000612  0.000000  0.000345
  0.461538  0.023535  0.000727  0.000000  0.000359
  0.527473  0.023144  0.000847  0.000000  0.000372
  0.593407  0.022757  0.000971  0.000000  0.000385
  0.659341  0.022372  0.001098  0.000000  0.000397
  0.725275  0.021991  0.001230  0.000000  0.000410
  0.791209  0.021613  0.001367  0.000000  0.000424
  0.857143  0.021238  0.001507  0.000000  0.000437
  0.923077  0.020866  0.001653  0.000000  0.000451
  0.989011  0.020498  0.001802  0.000000  0.000464
  1.054945  0.020133  0.001956  0.000000  0.000478
  1.120879  0.019771  0.002115  0.000000  0.000493
  1.186813  0.019412  0.002278  0.000000  0.000507
  1.252747  0.019056  0.002446  0.000000  0.000521
  1.318681  0.018704  0.002619  0.000000  0.000536
  1.384615  0.018354  0.002797  0.000000  0.000551
  1.450549  0.018008  0.002980  0.000000  0.000566
  1.516484  0.017665  0.003167  0.000000  0.000582
  1.582418  0.017325  0.003360  0.000000  0.000597
  1.648352  0.016989  0.003558  0.000000  0.000613
  1.714286  0.016656  0.003761  0.000000  0.000629
  1.780220  0.016325  0.004049  0.000000  0.000645
  1.846154  0.015999  0.004344  0.000000  0.000661
  1.912088  0.015675  0.004647  0.000000  0.000678
  1.978022  0.015354  0.004957  0.000000  0.000694
  2.043956  0.015037  0.005275  0.000000  0.000711
  2.109890  0.014723  0.005601  0.000000  0.000728
```

```
  2.175824  0.014412  0.005934  0.000000  0.000746
  2.241758  0.014104  0.006275  0.000000  0.000763
  2.307692  0.013799  0.006624  0.000000  0.000781
  2.373626  0.013498  0.006981  0.000000  0.000799
  2.439560  0.013200  0.007347  0.000000  0.000817
  2.505495  0.012905  0.007720  0.000000  0.000835
  2.571429  0.012613  0.008102  0.000000  0.000853
  2.637363  0.012324  0.008492  0.000000  0.000872
  2.703297  0.012039  0.008891  0.000000  0.000891
  2.769231  0.011757  0.009298  0.000000  0.000910
  2.835165  0.011478  0.009714  0.000000  0.000929
  2.901099  0.011202  0.010138  0.000000  0.000948
  2.967033  0.010929  0.010571  0.000000  0.000968
  3.032967  0.010660  0.011014  0.000000  0.000988
  3.098901  0.010393  0.011465  0.000000  0.001008
  3.164835  0.010130  0.011925  0.000000  0.001028
  3.230769  0.009870  0.012395  0.000000  0.001048
  3.296703  0.009614  0.012873  0.000000  0.001069
  3.362637  0.009360  0.013361  0.000000  0.001089
  3.428571  0.009110  0.013859  0.000000  0.001110
  3.494505  0.008863  0.014366  0.000000  0.001132
  3.560440  0.008619  0.014883  0.000000  0.001153
  3.626374  0.008378  0.015409  0.000000  0.001174
  3.692308  0.008141  0.015945  0.000000  0.001196
  3.758242  0.007906  0.016491  0.000000  0.001218
  3.824176  0.007675  0.017047  0.000000  0.001240
  3.890110  0.007447  0.017613  0.000000  0.001262
  3.956044  0.007223  0.018189  0.000000  0.001285
  4.021978  0.007001  0.018775  0.000000  0.001308
  4.087912  0.006783  0.019371  0.000000  0.001330
  4.153846  0.006567  0.019978  0.000000  0.001354
  4.219780  0.006355  0.020596  0.000000  0.001377
  4.285714  0.006147  0.021224  0.000000  0.001400
  4.351648  0.005941  0.021862  0.000000  0.001424
  4.417582  0.005739  0.022512  0.000000  0.001448
  4.483516  0.005539  0.023172  0.000000  0.001472
  4.549451  0.005343  0.023843  0.000000  0.001496
  4.615385  0.005151  0.024525  0.000000  0.001520
  4.681319  0.004961  0.025218  0.000000  0.001545
  4.747253  0.004775  0.025923  0.000000  0.001570
  4.750000  0.004591  0.026082  0.000000  0.001570
  END FTABLE  2
  FTABLE      1
   20    6
     Depth      Area    Volume  Outflow1  Outflow2  Outflow3  Velocity  Travel
Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)     (cfs)   (ft/sec)
(Minutes)***
  0.000000  0.004591  0.000000  0.000000  0.000000  0.000025
  0.065934  0.026377  0.001726  0.001338  0.001570  0.000025
  0.131868  0.026794  0.003478  0.003033  0.001570  0.000050
  0.197802  0.027214  0.005259  0.004075  0.001570  0.000076
  0.263736  0.027637  0.007067  0.004901  0.001570  0.000101
  0.329670  0.028063  0.008903  0.005606  0.001570  0.000127
  0.395604  0.028492  0.010768  0.006232  0.001570  0.000153
  0.461538  0.028924  0.012661  0.021947  0.001570  0.000179
  0.527473  0.029360  0.014582  0.029124  0.001570  0.000205
  0.593407  0.029799  0.016532  0.034666  0.001570  0.000232
  0.659341  0.030241  0.018512  0.039369  0.001570  0.000259
  0.725275  0.030686  0.020520  0.043534  0.001570  0.000286
  0.791209  0.031135  0.022558  0.136002  0.001570  0.000313
  0.857143  0.031586  0.024626  0.420232  0.001570  0.000340
  0.923077  0.032041  0.026724  0.796185  0.001570  0.000368
  0.989011  0.032499  0.028851  1.207260  0.001570  0.000395
  1.054945  0.032960  0.031009  1.596757  0.001570  0.000423
  1.120879  0.033425  0.033198  1.914643  0.001570  0.000451
  1.186813  0.033892  0.035417  2.134582  0.001570  0.000480
  1.250000  0.034343  0.037573  2.301244  0.001570  0.000507
  END FTABLE  1
END FTABLES
```

```
EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1              PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1              IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    1              PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    1              IMPLND   1 999 EXTNL  PETINP
WDM      2 PREC     ENGL    1              RCHRES   1     EXTNL  PREC
WDM      1 EVAP     ENGL    0.5            RCHRES   1     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.7            RCHRES   2     EXTNL  POTEV

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
RCHRES   2 HYDR   RO     1 1        1      WDM   1000 FLOW     ENGL      REPL
RCHRES   2 HYDR   O      1 1        1      WDM   1001 FLOW     ENGL      REPL
RCHRES   2 HYDR   O      2 1        1      WDM   1002 FLOW     ENGL      REPL
RCHRES   2 HYDR   STAGE  1 1        1      WDM   1003 STAG     ENGL      REPL
RCHRES   1 HYDR   STAGE  1 1        1      WDM   1004 STAG     ENGL      REPL
RCHRES   1 HYDR   O      1 1        1      WDM   1005 FLOW     ENGL      REPL
COPY     1 OUTPUT MEAN   1 1     12.1      WDM    701 FLOW     ENGL      REPL
COPY   501 OUTPUT MEAN   1 1     12.1      WDM    801 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>             <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK        2
PERLND     PWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    2

  MASS-LINK        3
PERLND     PWATER IFWO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    3

  MASS-LINK        5
IMPLND     IWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    5

  MASS-LINK        8
RCHRES     OFLOW  OVOL   2                 RCHRES         INFLOW IVOL
  END MASS-LINK    8

  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13

  MASS-LINK       15
IMPLND     IWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   15

  MASS-LINK       17
RCHRES     OFLOW  OVOL   1                 COPY           INPUT  MEAN
  END MASS-LINK   17


END MASS-LINK

END RUN
```

Predeveloped HSPF Message File

Mitigated HSPF Message File

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SDHM 3.1

PROJECT REPORT

General Model Information

Project Name:	16-2281 POC iii
Site Name:	Perrin Winery [iii]
Site Address:	16138 Highland Valley Road
City:	Escondido
Report Date:	11/20/2019
Gage:	ESCONDID
Data Start:	10/01/1964
Data End:	09/30/2004
Timestep:	Hourly
Precip Scale:	1.000
Version Date:	2019/10/18

POC Thresholds

Low Flow Threshold for POC1:	10 Percent of the 2 Year
High Flow Threshold for POC1:	10 Year

Landuse Basin Data

Predeveloped Land Use

Basin 1

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
D,NatVeg,Moderate	0.54
Pervious Total	0.54

Impervious Land Use	acre
IMPERVIOUS-MOD	0.187
Impervious Total	0.187
Basin Total	0.727

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Basin 1

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
D,NatVeg,Moderate	0.155
Pervious Total	0.155

Impervious Land Use	acre
IMPERVIOUS-MOD	0.354
Impervious Total	0.354
Basin Total	0.509

Element Flows To:

Surface	Interflow	Groundwater
Surface Biofilter 1	Surface Biofilter 1	

Routing Elements
Predeveloped Routing

Mitigated Routing

Biofilter 1

Bottom Length:	25.00 ft.
Bottom Width:	22.00 ft.
Material thickness of first layer:	0.25
Material type for first layer:	Mulch
Material thickness of second layer:	1.5
Material type for second layer:	ESM
Material thickness of third layer:	3
Material type for third layer:	GRAVEL
Infiltration On	
Infiltration rate:	0.06
Infiltration safety factor:	1
Wetted surface area On	
Total Volume Infiltrated (ac-ft.):	6.39
Total Volume Through Riser (ac-ft.):	8.987
Total Volume Through Facility (ac-ft.):	15.377
Percent Infiltrated:	41.56
Total Precip Applied to Facility:	1.655
Total Evap From Facility:	1.078
Underdrain not used	
Discharge Structure	
Riser Height:	0.5 ft.
Riser Diameter:	12 in.
Orifice 1 Diameter:	0.25 in. Elevation:0.06 ft.
Orifice 2 Diameter:	1 in. Elevation:0.4 ft.
Element Flows To:	
Outlet 1	Outlet 2

Biofilter Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
1225	0.0414	0.0000	0.0000	0.0000
1225.0	0.0413	0.0002	0.0000	0.0000
1225.1	0.0408	0.0005	0.0000	0.0000
1225.1	0.0403	0.0007	0.0000	0.0000
1225.2	0.0399	0.0010	0.0000	0.0000
1225.3	0.0394	0.0013	0.0000	0.0000
1225.3	0.0389	0.0015	0.0008	0.0008
1225.4	0.0384	0.0018	0.0008	0.0008
1225.5	0.0380	0.0021	0.0009	0.0009
1225.5	0.0375	0.0024	0.0009	0.0009
1225.6	0.0370	0.0027	0.0009	0.0009
1225.6	0.0365	0.0030	0.0010	0.0010
1225.7	0.0361	0.0033	0.0010	0.0010
1225.8	0.0356	0.0036	0.0010	0.0010
1225.8	0.0352	0.0039	0.0010	0.0010
1225.9	0.0347	0.0042	0.0010	0.0010
1226.0	0.0343	0.0045	0.0011	0.0011
1226.0	0.0338	0.0049	0.0011	0.0011
1226.1	0.0334	0.0052	0.0011	0.0011
1226.2	0.0329	0.0055	0.0011	0.0011
1226.2	0.0325	0.0059	0.0011	0.0011
1226.3	0.0321	0.0063	0.0011	0.0011
1226.3	0.0316	0.0066	0.0012	0.0012

1226.4	0.0312	0.0070	0.0012	0.0012
1226.5	0.0308	0.0074	0.0012	0.0012
1226.5	0.0303	0.0077	0.0012	0.0012
1226.6	0.0299	0.0081	0.0013	0.0013
1226.7	0.0295	0.0085	0.0013	0.0013
1226.7	0.0291	0.0091	0.0013	0.0013
1226.8	0.0287	0.0097	0.0013	0.0013
1226.8	0.0283	0.0102	0.0013	0.0013
1226.9	0.0279	0.0108	0.0014	0.0014
1227.0	0.0275	0.0114	0.0014	0.0014
1227.0	0.0271	0.0120	0.0014	0.0014
1227.1	0.0267	0.0126	0.0014	0.0014
1227.2	0.0263	0.0132	0.0015	0.0015
1227.2	0.0259	0.0139	0.0015	0.0015
1227.3	0.0255	0.0145	0.0015	0.0015
1227.4	0.0251	0.0152	0.0015	0.0015
1227.4	0.0247	0.0158	0.0015	0.0015
1227.5	0.0243	0.0165	0.0016	0.0016
1227.5	0.0240	0.0172	0.0016	0.0016
1227.6	0.0236	0.0179	0.0016	0.0016
1227.7	0.0232	0.0186	0.0016	0.0016
1227.7	0.0229	0.0193	0.0017	0.0017
1227.8	0.0225	0.0200	0.0017	0.0017
1227.9	0.0221	0.0208	0.0017	0.0017
1227.9	0.0218	0.0215	0.0017	0.0017
1228.0	0.0214	0.0223	0.0018	0.0018
1228.0	0.0211	0.0230	0.0018	0.0018
1228.1	0.0207	0.0238	0.0018	0.0018
1228.2	0.0204	0.0246	0.0018	0.0018
1228.2	0.0200	0.0254	0.0019	0.0019
1228.3	0.0197	0.0262	0.0019	0.0019
1228.4	0.0193	0.0271	0.0019	0.0019
1228.4	0.0190	0.0279	0.0019	0.0019
1228.5	0.0187	0.0287	0.0020	0.0020
1228.6	0.0183	0.0296	0.0020	0.0020
1228.6	0.0180	0.0305	0.0020	0.0020
1228.7	0.0177	0.0313	0.0020	0.0020
1228.7	0.0174	0.0322	0.0021	0.0021
1228.8	0.0170	0.0331	0.0021	0.0021
1228.9	0.0167	0.0341	0.0021	0.0021
1228.9	0.0164	0.0350	0.0022	0.0022
1229.0	0.0161	0.0359	0.0022	0.0022
1229.1	0.0158	0.0369	0.0022	0.0022
1229.1	0.0155	0.0378	0.0022	0.0022
1229.2	0.0152	0.0388	0.0023	0.0023
1229.2	0.0149	0.0398	0.0023	0.0023
1229.3	0.0146	0.0408	0.0023	0.0023
1229.4	0.0143	0.0418	0.0024	0.0024
1229.4	0.0140	0.0429	0.0024	0.0024
1229.5	0.0137	0.0439	0.0024	0.0024
1229.6	0.0135	0.0449	0.0024	0.0024
1229.6	0.0132	0.0460	0.0025	0.0025
1229.7	0.0129	0.0471	0.0025	0.0025
1229.7	0.0126	0.0473	0.0025	0.0025

Biofilter Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
4.7500	0.0414	0.0473	0.0000	0.0025	0.0000

4.8132	0.0419	0.0499	0.0000	0.0025	0.0001
4.8764	0.0424	0.0526	0.0000	0.0025	0.0001
4.9396	0.0429	0.0553	0.0000	0.0025	0.0001
5.0027	0.0434	0.0580	0.0000	0.0025	0.0002
5.0659	0.0439	0.0607	0.0000	0.0025	0.0002
5.1291	0.0444	0.0635	0.0000	0.0025	0.0002
5.1923	0.0449	0.0664	0.0000	0.0025	0.0002
5.2555	0.0455	0.0692	0.0000	0.0025	0.0003
5.3187	0.0460	0.0721	0.0000	0.0025	0.0003
5.3819	0.0465	0.0750	0.0000	0.0025	0.0003
5.4451	0.0470	0.0780	0.0000	0.0025	0.0004
5.5082	0.0475	0.0810	0.0000	0.0025	0.0004
5.5714	0.0481	0.0840	0.0000	0.0025	0.0004
5.6346	0.0486	0.0870	0.0000	0.0025	0.0005
5.6978	0.0491	0.0901	0.0000	0.0025	0.0005
5.7500	0.0496	0.0927	0.0000	0.0025	0.0038

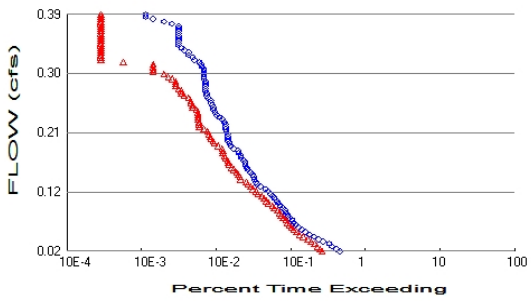
Surface Biofilter 1

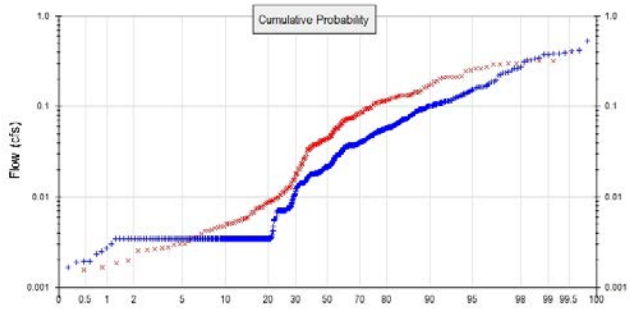
Element Flows To:

Outlet 1	Outlet 2
	Biofilter 1

Analysis Results

POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 0.54
Total Impervious Area: 0.187

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0.155
Total Impervious Area: 0.354

Flow Frequency Method: Cunnane

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.230557
5 year	0.37029
10 year	0.394448
25 year	0.441131

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.197438
5 year	0.289156
10 year	0.314105
25 year	0.33785

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0231	1597	923	57	Pass
0.0268	1430	858	60	Pass
0.0306	1260	796	63	Pass
0.0343	1146	730	63	Pass
0.0381	940	654	69	Pass
0.0418	831	596	71	Pass
0.0456	721	520	72	Pass
0.0493	632	457	72	Pass
0.0531	550	421	76	Pass
0.0568	490	386	78	Pass
0.0606	445	360	80	Pass
0.0643	418	335	80	Pass
0.0681	389	317	81	Pass
0.0718	366	302	82	Pass
0.0756	339	277	81	Pass
0.0793	320	260	81	Pass
0.0831	302	247	81	Pass
0.0868	290	232	80	Pass
0.0906	275	210	76	Pass
0.0943	252	200	79	Pass
0.0981	239	176	73	Pass
0.1018	228	166	72	Pass
0.1056	211	153	72	Pass
0.1093	202	143	70	Pass
0.1131	189	127	67	Pass
0.1168	175	121	69	Pass
0.1206	160	110	68	Pass
0.1243	138	101	73	Pass
0.1281	125	93	74	Pass
0.1318	119	89	74	Pass
0.1356	114	75	65	Pass
0.1394	111	73	65	Pass
0.1431	107	69	64	Pass
0.1469	100	66	66	Pass
0.1506	94	60	63	Pass
0.1544	90	56	62	Pass
0.1581	86	52	60	Pass
0.1619	86	51	59	Pass
0.1656	81	50	61	Pass
0.1694	77	47	61	Pass
0.1731	75	45	60	Pass
0.1769	70	43	61	Pass
0.1806	69	43	62	Pass
0.1844	60	42	70	Pass
0.1881	55	37	67	Pass
0.1919	53	33	62	Pass
0.1956	50	32	64	Pass
0.1994	50	30	60	Pass
0.2031	50	29	58	Pass
0.2069	50	28	56	Pass
0.2106	48	27	56	Pass
0.2144	47	24	51	Pass
0.2181	47	21	44	Pass

0.2219	47	21	44	Pass
0.2256	45	21	46	Pass
0.2294	42	20	47	Pass
0.2331	39	20	51	Pass
0.2369	36	20	55	Pass
0.2406	34	20	58	Pass
0.2444	32	19	59	Pass
0.2481	32	17	53	Pass
0.2519	31	17	54	Pass
0.2556	30	16	53	Pass
0.2594	30	16	53	Pass
0.2631	27	15	55	Pass
0.2669	26	13	50	Pass
0.2707	26	12	46	Pass
0.2744	25	12	48	Pass
0.2782	25	11	44	Pass
0.2819	25	10	40	Pass
0.2857	25	10	40	Pass
0.2894	25	10	40	Pass
0.2932	24	9	37	Pass
0.2969	24	8	33	Pass
0.3007	24	7	29	Pass
0.3044	24	5	20	Pass
0.3082	24	5	20	Pass
0.3119	23	5	21	Pass
0.3157	22	5	22	Pass
0.3194	21	2	9	Pass
0.3232	18	1	5	Pass
0.3269	17	1	5	Pass
0.3307	15	1	6	Pass
0.3344	15	1	6	Pass
0.3382	13	1	7	Pass
0.3419	12	1	8	Pass
0.3457	11	1	9	Pass
0.3494	11	1	9	Pass
0.3532	11	1	9	Pass
0.3569	11	1	9	Pass
0.3607	11	1	9	Pass
0.3644	11	1	9	Pass
0.3682	11	1	9	Pass
0.3719	11	1	9	Pass
0.3757	11	1	9	Pass
0.3794	9	1	11	Pass
0.3832	7	1	14	Pass
0.3869	5	1	20	Pass
0.3907	4	1	25	Pass
0.3944	4	1	25	Pass

Water Quality

Model Default Modifications

Total of 0 changes have been made.

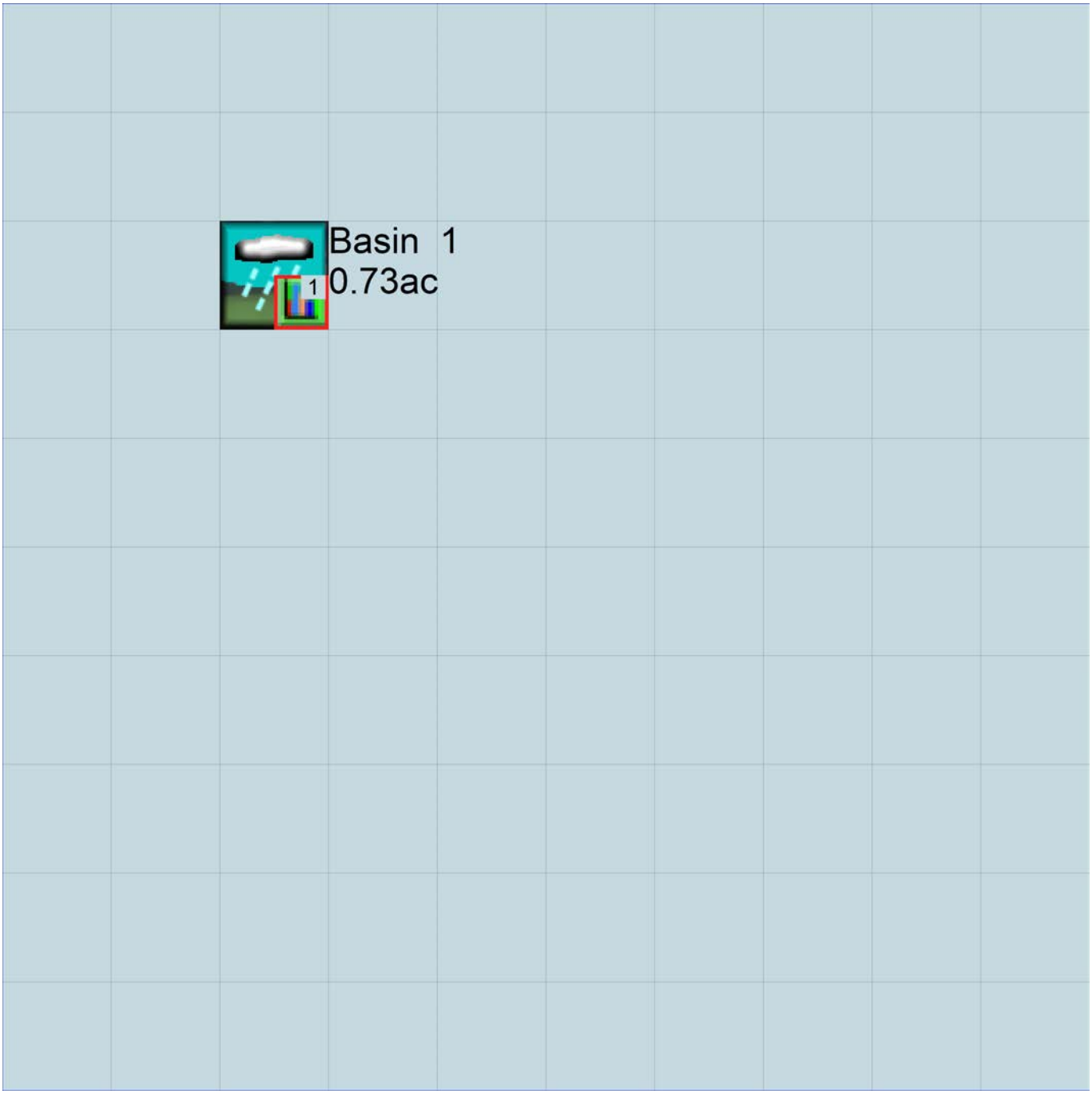
PERLND Changes

No PERLND changes have been made.

IMPLND Changes

No IMPLND changes have been made.

Appendix
Predeveloped Schematic



Mitigated Schematic



Predeveloped UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1964 10 01        END    2004 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                    UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM         26   16-2281 POC iii.wdm
MESSU       25   Pre16-2281 POC iii.MES
            27   Pre16-2281 POC iii.L61
            28   Pre16-2281 POC iii.L62
            30   POC16-2281 POC iii1.dat
END FILES

OPN SEQUENCE
    INGRP               INDELT 00:60
      PERLND      29
      IMPLND       2
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Basin  1                   MAX                     1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                          in  out           ***
   29      D,NatVeg,Moderate      1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   29         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags **************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
   29         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO
```

```
  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
   29         0    1    1    1    0    0    0    0    1    1    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
   29             0         3     0.025        80       0.1       2.5     0.915
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   29             0         0         2         2         0      0.05      0.05
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   29             0       0.6      0.04         1       0.3         0
  END PWAT-PARM4
  MON-LZETPARM
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   29       0.4  0.4  0.4  0.4  0.6  0.6  0.6  0.6  0.6  0.4  0.4  0.4
  END MON-LZETPARM
  MON-INTERCEP
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   29       0.1  0.1  0.1  0.1 0.06 0.06 0.06 0.06 0.06  0.1  0.1  0.1
  END MON-INTERCEP

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
               ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
   29             0         0      0.01         0       0.4      0.01         0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                     in  out           ***
    2      IMPERVIOUS-MOD         1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
    2         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
    2         0    0    4    0    0    0    1    9
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
    2         0    0    0    0    1
  END IWAT-PARM1
```

```
  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    2            100       0.1     0.011      0.08
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    2              0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    2              0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                 <--Area-->     <-Target->   MBLK   ***
<Name>   #                 <-factor->     <Name>   #   Tbl#   ***
Basin  1***
PERLND  29                       0.54     COPY   501     12
PERLND  29                       0.54     COPY   501     13
IMPLND   2                      0.187     COPY   501     15

******Routing******
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   12.1        DISPLY   1     INPUT  TIMSER 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<------------------><---> User T-series  Engl Metr LKFG           ***
                                      in  out                               ***
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ****************** PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                 ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
            FG FG FG FG  possible  exit  *** possible  exit      possible  exit
             *  *  *  *    *  *  *  *  *      *  *  *  *  *         ***
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->       ***
```

```
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                        ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit        for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1              PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1              IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    1              PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    1              IMPLND   1 999 EXTNL  PETINP

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
COPY   501 OUTPUT MEAN   1 1     12.1      WDM    501 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>            <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13

  MASS-LINK       15
IMPLND     IWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   15


END MASS-LINK

END RUN
```

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1964 10 01        END    2004 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                    UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM         26   16-2281 POC iii.wdm
MESSU       25   Mit16-2281 POC iii.MES
            27   Mit16-2281 POC iii.L61
            28   Mit16-2281 POC iii.L62
            30   POC16-2281 POC iii1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:60
      PERLND      29
      IMPLND       2
      RCHRES       1
      RCHRES       2
      COPY         1
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Surface Biofilter  1        MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                          in  out           ***
   29      D,NatVeg,Moderate      1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   29         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags **************************** PIVL  PYR
```

```
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
   29         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
   29         0    1    1    1    0    0    0    0    1    1    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
   29              0         3     0.025        80       0.1       2.5     0.915
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   29              0         0         2         2         0      0.05      0.05
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   29             0       0.6      0.04         1       0.3         0
  END PWAT-PARM4
  MON-LZETPARM
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   29       0.4  0.4  0.4  0.4  0.6  0.6  0.6  0.6  0.6  0.4  0.4  0.4
  END MON-LZETPARM
  MON-INTERCEP
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   29       0.1  0.1  0.1  0.1 0.06 0.06 0.06 0.06 0.06  0.1  0.1  0.1
  END MON-INTERCEP

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
               ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
   29             0         0      0.01         0       0.4      0.01         0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                     in  out           ***
    2      IMPERVIOUS-MOD         1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
    2         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
    2         0    0    4    0    0    0    1    9
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
```

```
    2         0    0    0    0    1
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    2            100       0.1     0.011      0.08
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    2              0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    2              0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin  1***
PERLND  29                       0.155     RCHRES   1      2
PERLND  29                       0.155     RCHRES   1      3
IMPLND   2                       0.354     RCHRES   1      5

******Routing******
PERLND  29                       0.155     COPY     1     12
IMPLND   2                       0.354     COPY     1     15
PERLND  29                       0.155     COPY     1     13
RCHRES   1                           1     RCHRES   2      8
RCHRES   2                           1     COPY   501     17
RCHRES   1                           1     COPY   501     17
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   12.1        DISPLY   1     INPUT  TIMSER 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<------------------><---> User T-series  Engl Metr LKFG           ***
                                       in  out                              ***
    1     Surface Biofilte-004    3    1    1    1   28    0    1
    2     Biofilter  1            2    1    1    1   28    0    1
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
    1         1    0    0    0    0    0    0    0    0    0
    2         1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ****************** PIVL  PYR
```

```
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
    1         4    0    0    0    0    0    0    0    0    0    1    9
    2         4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                    ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
           FG FG FG FG  possible  exit  *** possible  exit      possible  exit
            *  *  *  *    *  *  *  *  *      *  *  *  *  *         ***
    1        0  1  0  0    4  5  6  0  0       0  0  0  0  0       2  2  2  2  2
    2        0  1  0  0    4  5  0  0  0       0  0  0  0  0       2  2  2  2  2
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->       ***
    1              1      0.01       0.0    1225.0       0.0       0.0
    2              2      0.01       0.0    1225.0       0.0       0.0
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                       ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit        for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><---><--->
    1            0         4.0  5.0  6.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    2            0         4.0  5.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
  FTABLE      2
   77    5
     Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.041414  0.000000  0.000000  0.000000
  0.063187  0.041328  0.000242  0.000000  0.000000
  0.126374  0.040837  0.000489  0.000000  0.000000
  0.189560  0.040349  0.000742  0.000000  0.000000
  0.252747  0.039864  0.000999  0.000000  0.000000
  0.315934  0.039381  0.001263  0.000000  0.000000
  0.379121  0.038902  0.001531  0.000000  0.000803
  0.442308  0.038425  0.001805  0.000000  0.000845
  0.505495  0.037951  0.002085  0.000000  0.000902
  0.568681  0.037481  0.002370  0.000000  0.000920
  0.631868  0.037013  0.002661  0.000000  0.000938
  0.695055  0.036548  0.002958  0.000000  0.000956
  0.758242  0.036086  0.003260  0.000000  0.000975
  0.821429  0.035627  0.003569  0.000000  0.000993
  0.884615  0.035171  0.003883  0.000000  0.001012
  0.947802  0.034718  0.004203  0.000000  0.001031
  1.010989  0.034268  0.004529  0.000000  0.001051
  1.074176  0.033821  0.004861  0.000000  0.001070
  1.137363  0.033377  0.005200  0.000000  0.001090
  1.200549  0.032935  0.005544  0.000000  0.001109
  1.263736  0.032497  0.005895  0.000000  0.001129
  1.326923  0.032061  0.006252  0.000000  0.001149
  1.390110  0.031629  0.006615  0.000000  0.001170
  1.453297  0.031199  0.006985  0.000000  0.001190
  1.516484  0.030772  0.007361  0.000000  0.001211
  1.579670  0.030349  0.007744  0.000000  0.001232
  1.642857  0.029928  0.008133  0.000000  0.001253
  1.706044  0.029510  0.008529  0.000000  0.001274
  1.769231  0.029095  0.009086  0.000000  0.001295
  1.832418  0.028683  0.009652  0.000000  0.001317
  1.895604  0.028274  0.010228  0.000000  0.001339
  1.958791  0.027868  0.010813  0.000000  0.001361
  2.021978  0.027465  0.011407  0.000000  0.001383
```

```
  2.085165  0.027064  0.012011  0.000000  0.001405
  2.148352  0.026667  0.012625  0.000000  0.001427
  2.211538  0.026272  0.013249  0.000000  0.001450
  2.274725  0.025881  0.013882  0.000000  0.001473
  2.337912  0.025492  0.014525  0.000000  0.001496
  2.401099  0.025107  0.015179  0.000000  0.001519
  2.464286  0.024724  0.015842  0.000000  0.001542
  2.527473  0.024344  0.016516  0.000000  0.001566
  2.590659  0.023967  0.017200  0.000000  0.001589
  2.653846  0.023594  0.017894  0.000000  0.001613
  2.717033  0.023223  0.018598  0.000000  0.001637
  2.780220  0.022855  0.019313  0.000000  0.001662
  2.843407  0.022489  0.020039  0.000000  0.001686
  2.906593  0.022127  0.020775  0.000000  0.001711
  2.969780  0.021768  0.021521  0.000000  0.001735
  3.032967  0.021412  0.022279  0.000000  0.001760
  3.096154  0.021058  0.023047  0.000000  0.001785
  3.159341  0.020708  0.023827  0.000000  0.001811
  3.222527  0.020361  0.024617  0.000000  0.001836
  3.285714  0.020016  0.025418  0.000000  0.001862
  3.348901  0.019674  0.026231  0.000000  0.001888
  3.412088  0.019336  0.027055  0.000000  0.001914
  3.475275  0.019000  0.027890  0.000000  0.001940
  3.538462  0.018667  0.028736  0.000000  0.001966
  3.601648  0.018337  0.029594  0.000000  0.001993
  3.664835  0.018010  0.030463  0.000000  0.002019
  3.728022  0.017686  0.031344  0.000000  0.002046
  3.791209  0.017365  0.032237  0.000000  0.002073
  3.854396  0.017047  0.033142  0.000000  0.002100
  3.917582  0.016732  0.034058  0.000000  0.002128
  3.980769  0.016419  0.034986  0.000000  0.002155
  4.043956  0.016110  0.035927  0.000000  0.002183
  4.107143  0.015803  0.036879  0.000000  0.002211
  4.170330  0.015500  0.037843  0.000000  0.002239
  4.233516  0.015199  0.038820  0.000000  0.002268
  4.296703  0.014902  0.039809  0.000000  0.002296
  4.359890  0.014607  0.040810  0.000000  0.002325
  4.423077  0.014315  0.041824  0.000000  0.002354
  4.486264  0.014026  0.042851  0.000000  0.002383
  4.549451  0.013741  0.043890  0.000000  0.002412
  4.612637  0.013458  0.044941  0.000000  0.002441
  4.675824  0.013178  0.046006  0.000000  0.002471
  4.739011  0.012900  0.047083  0.000000  0.002500
  4.750000  0.012626  0.047478  0.000000  0.002500
  END FTABLE  2
  FTABLE      1
   17    6
     Depth      Area    Volume  Outflow1  Outflow2  Outflow3  Velocity  Travel
Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)     (cfs)   (ft/sec)
(Minutes)***
  0.000000  0.012626  0.000000  0.000000  0.000000  0.000030
  0.063187  0.041909  0.002632  0.000096  0.002500  0.000030
  0.126374  0.042406  0.005296  0.000437  0.002500  0.000060
  0.189560  0.042907  0.007992  0.000610  0.002500  0.000090
  0.252747  0.043410  0.010719  0.000745  0.002500  0.000121
  0.315934  0.043917  0.013478  0.000858  0.002500  0.000151
  0.379121  0.044426  0.016269  0.000958  0.002500  0.000182
  0.442308  0.044938  0.019092  0.006630  0.002500  0.000213
  0.505495  0.045454  0.021948  0.014271  0.002500  0.000244
  0.568681  0.045972  0.024836  0.202883  0.002500  0.000276
  0.631868  0.046493  0.027757  0.515847  0.002500  0.000307
  0.695055  0.047017  0.030712  0.893091  0.002500  0.000339
  0.758242  0.047544  0.033699  1.285230  0.002500  0.000371
  0.821429  0.048073  0.036720  1.642885  0.002500  0.000403
  0.884615  0.048606  0.039775  1.925791  0.002500  0.000435
  0.947802  0.049142  0.042863  2.117991  0.002500  0.000468
  1.000000  0.049587  0.045439  2.274331  0.002500  0.000494
  END FTABLE  1
END FTABLES
```

```
EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1              PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1              IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    1              PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    1              IMPLND   1 999 EXTNL  PETINP
WDM      2 PREC     ENGL    1              RCHRES   1     EXTNL  PREC
WDM      1 EVAP     ENGL    0.5            RCHRES   1     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.7            RCHRES   2     EXTNL  POTEV

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
RCHRES   2 HYDR   RO     1 1        1      WDM   1000 FLOW     ENGL      REPL
RCHRES   2 HYDR   O      1 1        1      WDM   1001 FLOW     ENGL      REPL
RCHRES   2 HYDR   O      2 1        1      WDM   1002 FLOW     ENGL      REPL
RCHRES   2 HYDR   STAGE  1 1        1      WDM   1003 STAG     ENGL      REPL
RCHRES   1 HYDR   STAGE  1 1        1      WDM   1004 STAG     ENGL      REPL
RCHRES   1 HYDR   O      1 1        1      WDM   1005 FLOW     ENGL      REPL
COPY     1 OUTPUT MEAN   1 1     12.1      WDM    701 FLOW     ENGL      REPL
COPY   501 OUTPUT MEAN   1 1     12.1      WDM    801 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>             <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK        2
PERLND     PWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    2

  MASS-LINK        3
PERLND     PWATER IFWO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    3

  MASS-LINK        5
IMPLND     IWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    5

  MASS-LINK        8
RCHRES     OFLOW  OVOL   2                 RCHRES         INFLOW IVOL
  END MASS-LINK    8

  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13

  MASS-LINK       15
IMPLND     IWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   15

  MASS-LINK       17
RCHRES     OFLOW  OVOL   1                 COPY           INPUT  MEAN
  END MASS-LINK   17


END MASS-LINK

END RUN
```

Predeveloped HSPF Message File

Mitigated HSPF Message File

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SDHM 3.1

PROJECT REPORT

General Model Information

Project Name:	16-2281 POC iv
Site Name:	Perrin Winery [iv]
Site Address:	16138 Highland Valley Road
City:	Escondido
Report Date:	11/20/2019
Gage:	BONITA
Data Start:	10/01/1971
Data End:	09/30/2004
Timestep:	Hourly
Precip Scale:	1.000
Version Date:	2019/10/18

POC Thresholds

Low Flow Threshold for POC1:	10 Percent of the 2 Year
High Flow Threshold for POC1:	10 Year

Landuse Basin Data

Predeveloped Land Use

Basin 1

Bypass: No

GroundWater: No

Pervious Land Use	acre
B,NatVeg,Moderate	0.966
D,NatVeg,Moderate	0.236
Pervious Total	1.202

Impervious Land Use	acre
IMPERVIOUS-MOD	0.31
Impervious Total	0.31

Basin Total 1.512

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Basin 1

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
B,NatVeg,Moderate	1.004
D,NatVeg,Moderate	0.237
Pervious Total	1.241

Impervious Land Use	acre
IMPERVIOUS-MOD	0.318
Impervious Total	0.318
Basin Total	1.559

Element Flows To:

Surface	Interflow	Groundwater
Surface Biofilter 1	Surface Biofilter 1	

Routing Elements
Predeveloped Routing

Mitigated Routing

Biofilter 1

Bottom Length: 38.00 ft.
Bottom Width: 25.00 ft.
Material thickness of first layer: 0.25
Material type for first layer: Mulch
Material thickness of second layer: 1.5
Material type for second layer: ESM
Material thickness of third layer: 3
Material type for third layer: GRAVEL
Infiltration On
Infiltration rate: 0.3
Infiltration safety factor: 1
Wetted surface area On
Total Volume Infiltrated (ac-ft.): 6.829
Total Volume Through Riser (ac-ft.): 0.867
Total Volume Through Facility (ac-ft.): 7.696
Percent Infiltrated: 88.73
Total Precip Applied to Facility: 0.818
Total Evap From Facility: 0.752
Underdrain not used
Discharge Structure
Riser Height: 0.5 ft.
Riser Diameter: 12 in.
Orifice 1 Diameter: 0.25 in. Elevation:0.06 ft.
Element Flows To:
Outlet 1 Outlet 2

Biofilter Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
1190	0.0576	0.0000	0.0000	0.0000
1190.0	0.0575	0.0004	0.0000	0.0000
1190.1	0.0569	0.0008	0.0000	0.0000
1190.1	0.0563	0.0013	0.0000	0.0000
1190.2	0.0557	0.0017	0.0000	0.0000
1190.3	0.0552	0.0022	0.0000	0.0000
1190.3	0.0546	0.0026	0.0013	0.0013
1190.4	0.0540	0.0031	0.0014	0.0014
1190.5	0.0534	0.0035	0.0023	0.0023
1190.5	0.0529	0.0040	0.0035	0.0035
1190.6	0.0523	0.0045	0.0052	0.0052
1190.6	0.0518	0.0050	0.0065	0.0065
1190.7	0.0512	0.0055	0.0075	0.0075
1190.8	0.0507	0.0060	0.0081	0.0081
1190.8	0.0501	0.0065	0.0082	0.0082
1190.9	0.0496	0.0070	0.0084	0.0084
1191.0	0.0490	0.0075	0.0085	0.0085
1191.0	0.0485	0.0081	0.0086	0.0086
1191.1	0.0479	0.0086	0.0087	0.0087
1191.2	0.0474	0.0092	0.0089	0.0089
1191.2	0.0469	0.0097	0.0090	0.0090
1191.3	0.0464	0.0103	0.0091	0.0091
1191.3	0.0458	0.0109	0.0092	0.0092
1191.4	0.0453	0.0115	0.0094	0.0094

1191.5	0.0448	0.0120	0.0095	0.0095
1191.5	0.0443	0.0126	0.0096	0.0096
1191.6	0.0438	0.0133	0.0098	0.0098
1191.7	0.0432	0.0139	0.0099	0.0099
1191.7	0.0427	0.0147	0.0100	0.0100
1191.8	0.0422	0.0156	0.0102	0.0102
1191.8	0.0417	0.0165	0.0103	0.0103
1191.9	0.0412	0.0174	0.0105	0.0105
1192.0	0.0407	0.0183	0.0106	0.0106
1192.0	0.0402	0.0192	0.0107	0.0107
1192.1	0.0397	0.0202	0.0109	0.0109
1192.2	0.0393	0.0211	0.0110	0.0110
1192.2	0.0388	0.0221	0.0112	0.0112
1192.3	0.0383	0.0231	0.0113	0.0113
1192.4	0.0378	0.0240	0.0114	0.0114
1192.4	0.0373	0.0250	0.0116	0.0116
1192.5	0.0369	0.0260	0.0117	0.0117
1192.5	0.0364	0.0271	0.0119	0.0119
1192.6	0.0359	0.0281	0.0120	0.0120
1192.7	0.0355	0.0292	0.0122	0.0122
1192.7	0.0350	0.0302	0.0123	0.0123
1192.8	0.0346	0.0313	0.0125	0.0125
1192.9	0.0341	0.0324	0.0126	0.0126
1192.9	0.0336	0.0335	0.0128	0.0128
1193.0	0.0332	0.0346	0.0129	0.0129
1193.0	0.0327	0.0357	0.0131	0.0131
1193.1	0.0323	0.0369	0.0132	0.0132
1193.2	0.0319	0.0380	0.0134	0.0134
1193.2	0.0314	0.0392	0.0135	0.0135
1193.3	0.0310	0.0404	0.0137	0.0137
1193.4	0.0306	0.0416	0.0139	0.0139
1193.4	0.0301	0.0428	0.0140	0.0140
1193.5	0.0297	0.0440	0.0142	0.0142
1193.6	0.0293	0.0452	0.0143	0.0143
1193.6	0.0289	0.0465	0.0145	0.0145
1193.7	0.0284	0.0477	0.0147	0.0147
1193.7	0.0280	0.0490	0.0148	0.0148
1193.8	0.0276	0.0503	0.0150	0.0150
1193.9	0.0272	0.0516	0.0152	0.0152
1193.9	0.0268	0.0529	0.0153	0.0153
1194.0	0.0264	0.0543	0.0155	0.0155
1194.1	0.0260	0.0556	0.0157	0.0157
1194.1	0.0256	0.0570	0.0158	0.0158
1194.2	0.0252	0.0584	0.0160	0.0160
1194.2	0.0248	0.0598	0.0162	0.0162
1194.3	0.0244	0.0612	0.0163	0.0163
1194.4	0.0241	0.0626	0.0165	0.0165
1194.4	0.0237	0.0640	0.0167	0.0167
1194.5	0.0233	0.0655	0.0169	0.0169
1194.6	0.0229	0.0670	0.0170	0.0170
1194.6	0.0225	0.0684	0.0172	0.0172
1194.7	0.0222	0.0699	0.0174	0.0174
1194.7	0.0218	0.0702	0.0174	0.0174

Biofilter Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
4.7500	0.0576	0.0702	0.0000	0.0174	0.0002
4.8132	0.0582	0.0739	0.0000	0.0174	0.0004

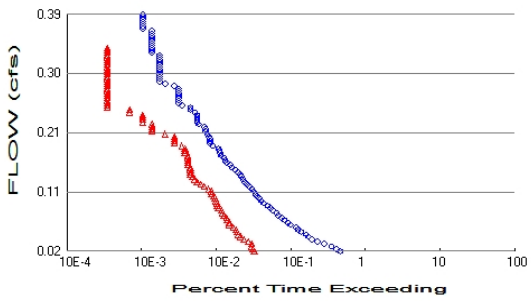
4.8764	0.0588	0.0776	0.0000	0.0174	0.0005
4.9396	0.0593	0.0813	0.0000	0.0174	0.0007
5.0027	0.0599	0.0851	0.0000	0.0174	0.0009
5.0659	0.0605	0.0889	0.0000	0.0174	0.0011
5.1291	0.0611	0.0927	0.0000	0.0174	0.0013
5.1923	0.0617	0.0966	0.0000	0.0174	0.0014
5.2555	0.0624	0.1005	0.0000	0.0174	0.0016
5.3187	0.0630	0.1045	0.0000	0.0174	0.0018
5.3819	0.0636	0.1085	0.0000	0.0174	0.0020
5.4451	0.0642	0.1125	0.0000	0.0174	0.0022
5.5082	0.0648	0.1166	0.0000	0.0174	0.0024
5.5714	0.0654	0.1207	0.0000	0.0174	0.0026
5.6346	0.0661	0.1249	0.0000	0.0174	0.0028
5.6978	0.0667	0.1290	0.0000	0.0174	0.0029
5.7500	0.0672	0.1325	0.0000	0.0174	0.0000

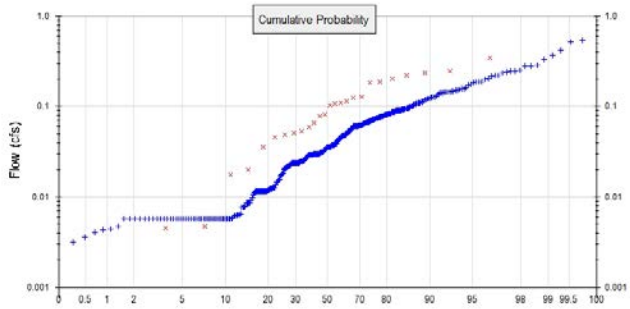
Surface Biofilter 1

Element Flows To:

Outlet 1	Outlet 2
	Biofilter 1

Analysis Results
POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 1.202
Total Impervious Area: 0.31

Mitigated Landuse Totals for POC #1
Total Pervious Area: 1.241
Total Impervious Area: 0.318

Flow Frequency Method: Cunnane

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.205536
5 year	0.282873
10 year	0.394119
25 year	0.527319

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.058963
5 year	0.183735
10 year	0.229333
25 year	0.29166

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0206	1342	94	7	Pass
0.0243	1174	89	7	Pass
0.0281	1011	86	8	Pass
0.0319	809	86	10	Pass
0.0356	663	78	11	Pass
0.0394	555	68	12	Pass
0.0432	504	61	12	Pass
0.0470	471	58	12	Pass
0.0507	399	55	13	Pass
0.0545	362	53	14	Pass
0.0583	341	49	14	Pass
0.0621	288	44	15	Pass
0.0658	263	44	16	Pass
0.0696	239	41	17	Pass
0.0734	217	40	18	Pass
0.0772	195	37	18	Pass
0.0809	186	35	18	Pass
0.0847	167	34	20	Pass
0.0885	154	31	20	Pass
0.0922	141	30	21	Pass
0.0960	127	30	23	Pass
0.0998	116	29	25	Pass
0.1036	110	28	25	Pass
0.1073	103	27	26	Pass
0.1111	97	25	25	Pass
0.1149	93	25	26	Pass
0.1187	87	23	26	Pass
0.1224	80	20	25	Pass
0.1262	75	18	24	Pass
0.1300	70	16	22	Pass
0.1338	66	15	22	Pass
0.1375	63	14	22	Pass
0.1413	61	13	21	Pass
0.1451	57	13	22	Pass
0.1488	52	13	25	Pass
0.1526	47	13	27	Pass
0.1564	45	12	26	Pass
0.1602	40	12	30	Pass
0.1639	38	12	31	Pass
0.1677	37	12	32	Pass
0.1715	34	12	35	Pass
0.1753	33	11	33	Pass
0.1790	32	11	34	Pass
0.1828	31	11	35	Pass
0.1866	26	10	38	Pass
0.1904	24	8	33	Pass
0.1941	24	8	33	Pass
0.1979	24	8	33	Pass
0.2017	23	8	34	Pass
0.2054	22	6	27	Pass
0.2092	21	4	19	Pass
0.2130	21	4	19	Pass
0.2168	20	4	20	Pass

0.2205	17	4	23	Pass
0.2243	16	3	18	Pass
0.2281	16	3	18	Pass
0.2319	16	3	18	Pass
0.2356	16	3	18	Pass
0.2394	15	2	13	Pass
0.2432	13	2	15	Pass
0.2470	13	1	7	Pass
0.2507	10	1	10	Pass
0.2545	9	1	11	Pass
0.2583	9	1	11	Pass
0.2621	9	1	11	Pass
0.2658	9	1	11	Pass
0.2696	9	1	11	Pass
0.2734	9	1	11	Pass
0.2771	9	1	11	Pass
0.2809	8	1	12	Pass
0.2847	6	1	16	Pass
0.2885	5	1	20	Pass
0.2922	5	1	20	Pass
0.2960	5	1	20	Pass
0.2998	5	1	20	Pass
0.3036	5	1	20	Pass
0.3073	5	1	20	Pass
0.3111	5	1	20	Pass
0.3149	5	1	20	Pass
0.3187	5	1	20	Pass
0.3224	5	1	20	Pass
0.3262	5	1	20	Pass
0.3300	5	1	20	Pass
0.3337	4	1	25	Pass
0.3375	4	1	25	Pass
0.3413	4	1	25	Pass
0.3451	4	0	0	Pass
0.3488	4	0	0	Pass
0.3526	4	0	0	Pass
0.3564	4	0	0	Pass
0.3602	4	0	0	Pass
0.3639	4	0	0	Pass
0.3677	4	0	0	Pass
0.3715	3	0	0	Pass
0.3753	3	0	0	Pass
0.3790	3	0	0	Pass
0.3828	3	0	0	Pass
0.3866	3	0	0	Pass
0.3903	3	0	0	Pass
0.3941	3	0	0	Pass

Water Quality

Model Default Modifications

Total of 0 changes have been made.

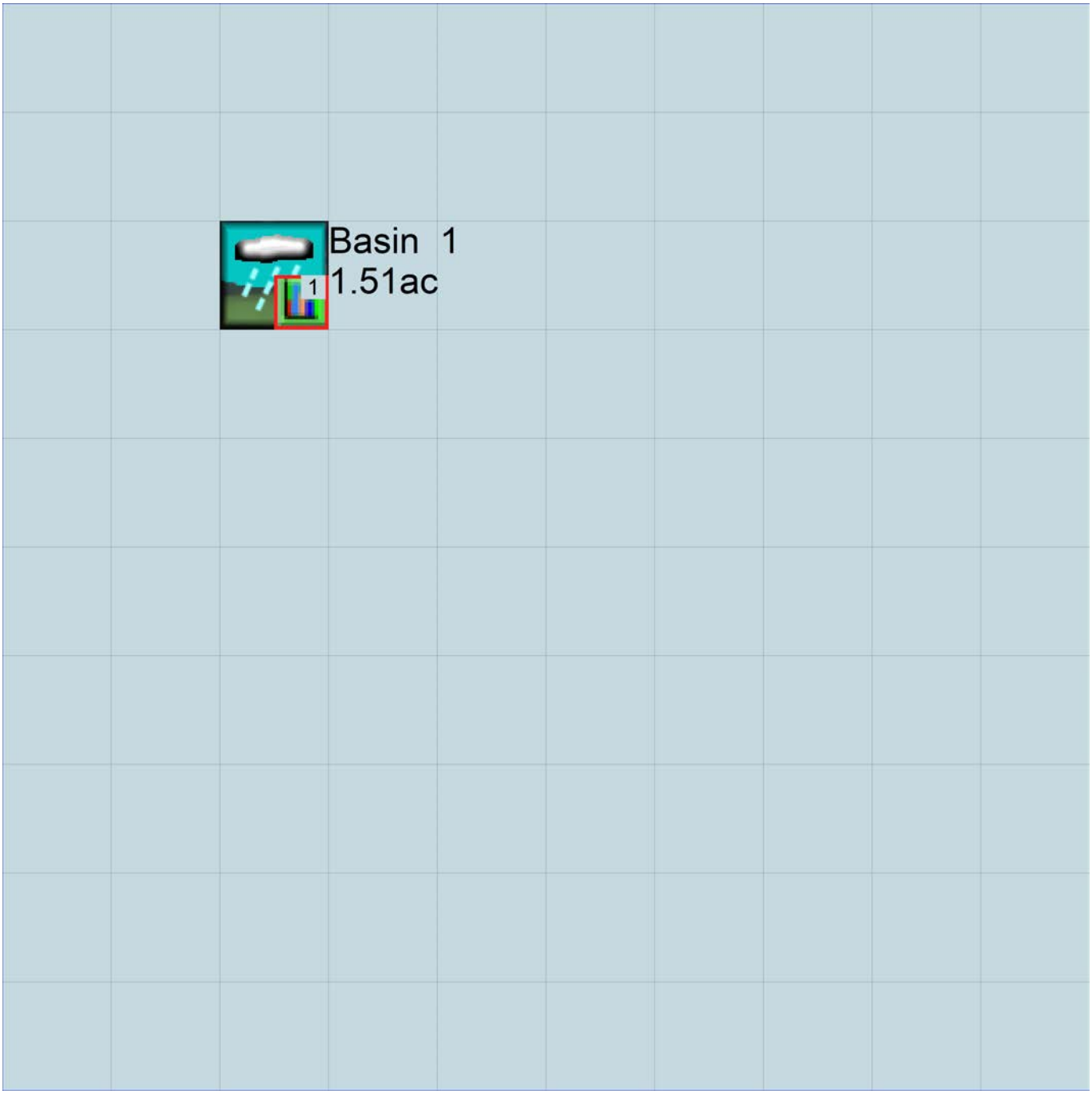
PERLND Changes

No PERLND changes have been made.

IMPLND Changes

No IMPLND changes have been made.

Appendix
Predeveloped Schematic



Mitigated Schematic



Predeveloped UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1971 10 01        END    2004 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                    UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM         26   16-2281 POC iv.wdm
MESSU       25   Pre16-2281 POC iv.MES
            27   Pre16-2281 POC iv.L61
            28   Pre16-2281 POC iv.L62
            30   POC16-2281 POC iv1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:60
      PERLND      11
      PERLND      29
      IMPLND       2
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Basin  1                   MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                        in  out           ***
   11      B,NatVeg,Moderate      1    1    1    1   27    0
   29      D,NatVeg,Moderate      1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   11         0    0    1    0    0    0    0    0    0    0    0    0
   29         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags **************************** PIVL  PYR
```

```
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
   11         0    0    4    0    0    0    0    0    0    0    0    0    1    9
   29         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
   11         0    1    1    1    0    0    0    0    1    1    0
   29         0    1    1    1    0    0    0    0    1    1    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
   11              0       3.7     0.055        80       0.1       2.5     0.915
   29              0         3     0.025        80       0.1       2.5     0.915
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   11              0         0         2         2         0      0.05      0.05
   29              0         0         2         2         0      0.05      0.05
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   11              0       0.6      0.04         1       0.3         0
   29              0       0.6      0.04         1       0.3         0
  END PWAT-PARM4
  MON-LZETPARM
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   11       0.4  0.4  0.4  0.4  0.6  0.6  0.6  0.6  0.6  0.4  0.4  0.4
   29       0.4  0.4  0.4  0.4  0.6  0.6  0.6  0.6  0.6  0.4  0.4  0.4
  END MON-LZETPARM
  MON-INTERCEP
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   11       0.1  0.1  0.1  0.1 0.06 0.06 0.06 0.06 0.06  0.1  0.1  0.1
   29       0.1  0.1  0.1  0.1 0.06 0.06 0.06 0.06 0.06  0.1  0.1  0.1
  END MON-INTERCEP

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
              ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS       GWVS
   11              0         0      0.01         0       0.4      0.01          0
   29              0         0      0.01         0       0.4      0.01          0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                     in  out           ***
    2      IMPERVIOUS-MOD         1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
    2         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
```

```
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
    2         0    0    4    0    0    0    1    9
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
    2         0    0    0    0    1
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    2           100       0.1     0.011      0.08
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    2             0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    2             0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                 <--Area-->     <-Target->   MBLK   ***
<Name>   #                 <-factor->     <Name>   #   Tbl#   ***
Basin  1***
PERLND  11                      0.966     COPY   501     12
PERLND  11                      0.966     COPY   501     13
PERLND  29                      0.236     COPY   501     12
PERLND  29                      0.236     COPY   501     13
IMPLND   2                       0.31     COPY   501     15

******Routing******
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   12.1        DISPLY   1     INPUT  TIMSER 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<----------------><---> User T-series  Engl Metr LKFG             ***
                                      in  out                               ***
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ****************** PIVL  PYR
```

```
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                      ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
           FG FG FG FG  possible  exit  *** possible  exit      possible  exit
            *  *  *  *    *  *  *  *  *       *  *  *  *  *         ***
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->       ***
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                         ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit        for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1              PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1              IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    1              PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    1              IMPLND   1 999 EXTNL  PETINP

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
COPY   501 OUTPUT MEAN   1 1     12.1      WDM    501 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>            <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13

  MASS-LINK       15
IMPLND     IWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   15


END MASS-LINK

END RUN
```

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1971 10 01        END    2004 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                    UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM         26   16-2281 POC iv.wdm
MESSU       25   Mit16-2281 POC iv.MES
            27   Mit16-2281 POC iv.L61
            28   Mit16-2281 POC iv.L62
            30   POC16-2281 POC iv1.dat
END FILES

OPN SEQUENCE
    INGRP               INDELT 00:60
      PERLND      11
      PERLND      29
      IMPLND       2
      RCHRES       1
      RCHRES       2
      COPY         1
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Surface Biofilter  1        MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                          in  out           ***
   11      B,NatVeg,Moderate      1    1    1    1   27    0
   29      D,NatVeg,Moderate      1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   11         0    0    1    0    0    0    0    0    0    0    0    0
   29         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY
```

```
  PRINT-INFO
    <PLS > ***************** Print-flags **************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
   11         0    0    4    0    0    0    0    0    0    0    0    0    1    9
   29         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
   11         0    1    1    1    0    0    0    0    1    1    0
   29         0    1    1    1    0    0    0    0    1    1    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
   11              0       3.7     0.055        80       0.1       2.5     0.915
   29              0         3     0.025        80       0.1       2.5     0.915
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   11              0         0         2         2         0      0.05      0.05
   29              0         0         2         2         0      0.05      0.05
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                          ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   11              0       0.6      0.04         1       0.3         0
   29              0       0.6      0.04         1       0.3         0
  END PWAT-PARM4
  MON-LZETPARM
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   11       0.4  0.4  0.4  0.4  0.6  0.6  0.6  0.6  0.6  0.4  0.4  0.4
   29       0.4  0.4  0.4  0.4  0.6  0.6  0.6  0.6  0.6  0.4  0.4  0.4
  END MON-LZETPARM
  MON-INTERCEP
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   11       0.1  0.1  0.1  0.1 0.06 0.06 0.06 0.06 0.06  0.1  0.1  0.1
   29       0.1  0.1  0.1  0.1 0.06 0.06 0.06 0.06 0.06  0.1  0.1  0.1
  END MON-INTERCEP

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
               ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
   11              0         0      0.01         0       0.4      0.01         0
   29              0         0      0.01         0       0.4      0.01         0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                     in  out           ***
    2      IMPERVIOUS-MOD         1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************* Active Sections ****************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
    2         0    0    1    0    0    0
```

```
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
    2         0    0    4    0    0    0    1    9
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
    2         0    0    0    0    1
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    2            100       0.1     0.011      0.08
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    2              0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    2              0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin  1***
PERLND  11                       1.004     RCHRES   1      2
PERLND  11                       1.004     RCHRES   1      3
PERLND  29                       0.237     RCHRES   1      2
PERLND  29                       0.237     RCHRES   1      3
IMPLND   2                       0.318     RCHRES   1      5

******Routing******
PERLND  11                       1.004     COPY     1     12
PERLND  29                       0.237     COPY     1     12
IMPLND   2                       0.318     COPY     1     15
PERLND  11                       1.004     COPY     1     13
PERLND  29                       0.237     COPY     1     13
RCHRES   1                           1     RCHRES   2      8
RCHRES   2                           1     COPY   501     17
RCHRES   1                           1     COPY   501     17
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   12.1        DISPLY   1     INPUT  TIMSER 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<----------------><---> User T-series  Engl Metr LKFG             ***
```

```
                                        in  out                                 ***
    1     Surface Biofilte-004    3    1    1    1   28    0    1
    2     Biofilter  1            2    1    1    1   28    0    1
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
    1         1    0    0    0    0    0    0    0    0    0
    2         1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ******************* PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
    1         4    0    0    0    0    0    0    0    0    0    1    9
    2         4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                     ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
          FG FG FG FG  possible  exit  *** possible  exit      possible  exit
           *  *  *  *    *  *  *  *  *      *  *  *  *  *        ***
    1      0  1  0  0    4  5  6  0  0       0  0  0  0  0       2  2  2  2  2
    2      0  1  0  0    4  5  0  0  0       0  0  0  0  0       2  2  2  2  2
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->       ***
    1              1      0.01       0.0    1190.0       0.0       0.0
    2              2      0.01       0.0    1190.0       0.0       0.0
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                        ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
         *** ac-ft     for each possible exit        for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
    1            0         4.0  5.0  6.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    2            0         4.0  5.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
  FTABLE      2
   77    5
     Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)     (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.057576  0.000000  0.000000  0.000000
  0.063187  0.057474  0.000417  0.000000  0.000000
  0.126374  0.056890  0.000841  0.000000  0.000000
  0.189560  0.056309  0.001272  0.000000  0.000000
  0.252747  0.055731  0.001710  0.000000  0.000000
  0.315934  0.055155  0.002155  0.000000  0.000000
  0.379121  0.054583  0.002607  0.000000  0.001350
  0.442308  0.054014  0.003067  0.000000  0.001414
  0.505495  0.053447  0.003534  0.000000  0.002279
  0.568681  0.052884  0.004008  0.000000  0.003547
  0.631868  0.052323  0.004490  0.000000  0.005234
  0.695055  0.051765  0.004979  0.000000  0.006481
  0.758242  0.051211  0.005476  0.000000  0.007512
  0.821429  0.050659  0.005980  0.000000  0.008110
  0.884615  0.050110  0.006492  0.000000  0.008232
  0.947802  0.049564  0.007012  0.000000  0.008356
  1.010989  0.049021  0.007540  0.000000  0.008480
  1.074176  0.048481  0.008075  0.000000  0.008605
```

```
  1.137363  0.047944  0.008618  0.000000  0.008731
  1.200549  0.047410  0.009169  0.000000  0.008858
  1.263736  0.046878  0.009728  0.000000  0.008986
  1.326923  0.046350  0.010295  0.000000  0.009115
  1.390110  0.045825  0.010871  0.000000  0.009245
  1.453297  0.045302  0.011454  0.000000  0.009375
  1.516484  0.044783  0.012046  0.000000  0.009507
  1.579670  0.044266  0.012646  0.000000  0.009639
  1.642857  0.043752  0.013254  0.000000  0.009772
  1.706044  0.043242  0.013870  0.000000  0.009906
  1.769231  0.042734  0.014735  0.000000  0.010041
  1.832418  0.042229  0.015611  0.000000  0.010177
  1.895604  0.041727  0.016499  0.000000  0.010314
  1.958791  0.041228  0.017399  0.000000  0.010451
  2.021978  0.040732  0.018311  0.000000  0.010590
  2.085165  0.040239  0.019235  0.000000  0.010729
  2.148352  0.039749  0.020172  0.000000  0.010870
  2.211538  0.039261  0.021120  0.000000  0.011011
  2.274725  0.038777  0.022081  0.000000  0.011153
  2.337912  0.038296  0.023054  0.000000  0.011296
  2.401099  0.037817  0.024039  0.000000  0.011440
  2.464286  0.037342  0.025037  0.000000  0.011584
  2.527473  0.036869  0.026048  0.000000  0.011730
  2.590659  0.036399  0.027071  0.000000  0.011877
  2.653846  0.035933  0.028107  0.000000  0.012024
  2.717033  0.035469  0.029155  0.000000  0.012172
  2.780220  0.035008  0.030217  0.000000  0.012321
  2.843407  0.034550  0.031292  0.000000  0.012472
  2.906593  0.034095  0.032379  0.000000  0.012622
  2.969780  0.033643  0.033480  0.000000  0.012774
  3.032967  0.033194  0.034594  0.000000  0.012927
  3.096154  0.032748  0.035721  0.000000  0.013081
  3.159341  0.032304  0.036862  0.000000  0.013235
  3.222527  0.031864  0.038016  0.000000  0.013390
  3.285714  0.031427  0.039183  0.000000  0.013547
  3.348901  0.030992  0.040365  0.000000  0.013704
  3.412088  0.030561  0.041559  0.000000  0.013862
  3.475275  0.030132  0.042768  0.000000  0.014021
  3.538462  0.029706  0.043990  0.000000  0.014181
  3.601648  0.029284  0.045226  0.000000  0.014341
  3.664835  0.028864  0.046477  0.000000  0.014503
  3.728022  0.028447  0.047741  0.000000  0.014665
  3.791209  0.028033  0.049019  0.000000  0.014829
  3.854396  0.027622  0.050312  0.000000  0.014993
  3.917582  0.027214  0.051619  0.000000  0.015158
  3.980769  0.026809  0.052940  0.000000  0.015324
  4.043956  0.026407  0.054276  0.000000  0.015491
  4.107143  0.026007  0.055626  0.000000  0.015659
  4.170330  0.025611  0.056990  0.000000  0.015828
  4.233516  0.025218  0.058370  0.000000  0.015997
  4.296703  0.024827  0.059764  0.000000  0.016168
  4.359890  0.024440  0.061173  0.000000  0.016339
  4.423077  0.024055  0.062597  0.000000  0.016511
  4.486264  0.023673  0.064036  0.000000  0.016684
  4.549451  0.023295  0.065489  0.000000  0.016858
  4.612637  0.022919  0.066958  0.000000  0.017033
  4.675824  0.022546  0.068443  0.000000  0.017209
  4.739011  0.022176  0.069942  0.000000  0.017386
  4.750000  0.021809  0.071641  0.000000  0.017386
  END FTABLE  2
  FTABLE      1
   17    6
     Depth      Area    Volume  Outflow1  Outflow2  Outflow3  Velocity  Travel
Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)     (cfs)   (ft/sec)
(Minutes)***
  0.000000  0.021809  0.000000  0.000000  0.000000  0.000178
  0.063187  0.058163  0.003657  0.000096  0.017386  0.000178
  0.126374  0.058754  0.007350  0.000437  0.017386  0.000356
  0.189560  0.059347  0.011082  0.000610  0.017386  0.000536
```

```
  0.252747  0.059943  0.014850  0.000745  0.017386  0.000716
  0.315934  0.060543  0.018657  0.000858  0.017386  0.000897
  0.379121  0.061145  0.022501  0.000958  0.017386  0.001080
  0.442308  0.061750  0.026384  0.001049  0.017386  0.001263
  0.505495  0.062358  0.030305  0.005457  0.017386  0.001447
  0.568681  0.062969  0.034265  0.191737  0.017386  0.001631
  0.631868  0.063583  0.038263  0.502780  0.017386  0.001817
  0.695055  0.064200  0.042300  0.878351  0.017386  0.002004
  0.758242  0.064819  0.046376  1.268988  0.017386  0.002191
  0.821429  0.065442  0.050491  1.625269  0.017386  0.002380
  0.884615  0.066068  0.054646  1.906900  0.017386  0.002569
  0.947802  0.066696  0.058841  2.097906  0.017386  0.002759
  1.000000  0.067218  0.062336  2.253120  0.017386  0.002917
  END FTABLE  1
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1              PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1              IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    1              PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    1              IMPLND   1 999 EXTNL  PETINP
WDM      2 PREC     ENGL    1              RCHRES   1     EXTNL  PREC
WDM      1 EVAP     ENGL    0.5            RCHRES   1     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.7            RCHRES   2     EXTNL  POTEV

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
RCHRES   2 HYDR   RO     1 1        1      WDM   1000 FLOW     ENGL      REPL
RCHRES   2 HYDR   O      1 1        1      WDM   1001 FLOW     ENGL      REPL
RCHRES   2 HYDR   O      2 1        1      WDM   1002 FLOW     ENGL      REPL
RCHRES   2 HYDR   STAGE  1 1        1      WDM   1003 STAG     ENGL      REPL
RCHRES   1 HYDR   STAGE  1 1        1      WDM   1004 STAG     ENGL      REPL
RCHRES   1 HYDR   O      1 1        1      WDM   1005 FLOW     ENGL      REPL
COPY     1 OUTPUT MEAN   1 1     12.1      WDM    701 FLOW     ENGL      REPL
COPY   501 OUTPUT MEAN   1 1     12.1      WDM    801 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>             <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK        2
PERLND     PWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    2

  MASS-LINK        3
PERLND     PWATER IFWO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    3

  MASS-LINK        5
IMPLND     IWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    5

  MASS-LINK        8
RCHRES     OFLOW  OVOL   2                 RCHRES         INFLOW IVOL
  END MASS-LINK    8

  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13

  MASS-LINK       15
```

```
IMPLND     IWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   15

  MASS-LINK       17
RCHRES     OFLOW  OVOL   1               COPY           INPUT  MEAN
  END MASS-LINK   17


END MASS-LINK

END RUN
```

Predeveloped HSPF Message File

Mitigated HSPF Message File

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SDHM 3.1

PROJECT REPORT

General Model Information

Project Name:	16-2281 POC v
Site Name:	Perrin Winery [v]
Site Address:	16138 Highland Valley Road
City:	Escondido
Report Date:	11/20/2019
Gage:	ESCONDID
Data Start:	10/01/1964
Data End:	09/30/2004
Timestep:	Hourly
Precip Scale:	1.000
Version Date:	2019/10/18

POC Thresholds

Low Flow Threshold for POC1:	10 Percent of the 2 Year
High Flow Threshold for POC1:	10 Year

Landuse Basin Data

Predeveloped Land Use

Basin 1

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
B,NatVeg,Moderate	0.151
Pervious Total	0.151

Impervious Land Use	acre
IMPERVIOUS-MOD	0.112
Impervious Total	0.112
Basin Total	0.263

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Basin 1

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
B,NatVeg,Moderate	0.126
Pervious Total	0.126

Impervious Land Use	acre
IMPERVIOUS-MOD	0.103
Impervious Total	0.103
Basin Total	0.229

Element Flows To:

Surface	Interflow	Groundwater
Surface Biofilter 1	Surface Biofilter 1	

Routing Elements
Predeveloped Routing

Mitigated Routing

Biofilter 1

Bottom Length: 20.00 ft.
Bottom Width: 10.00 ft.
Material thickness of first layer: 0.25
Material type for first layer: Mulch
Material thickness of second layer: 1.5
Material type for second layer: ESM
Material thickness of third layer: 3
Material type for third layer: GRAVEL
Infiltration On
Infiltration rate: 0.3
Infiltration safety factor: 1
Wetted surface area On
Total Volume Infiltrated (ac-ft.): 4.388
Total Volume Through Riser (ac-ft.): 0.63
Total Volume Through Facility (ac-ft.): 5.018
Percent Infiltrated: 87.45
Total Precip Applied to Facility: 0.757
Total Evap From Facility: 0.345
Underdrain not used
Discharge Structure
Riser Height: 0.5 ft.
Riser Diameter: 12 in.
Orifice 1 Diameter: 0.25 in. Elevation:0.06 ft.
Element Flows To:
Outlet 1 Outlet 2

Biofilter Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
1200	0.0260	0.0000	0.0000	0.0000
1200.0	0.0259	0.0001	0.0000	0.0000
1200.1	0.0255	0.0002	0.0000	0.0000
1200.1	0.0251	0.0003	0.0000	0.0000
1200.2	0.0247	0.0004	0.0000	0.0000
1200.3	0.0243	0.0005	0.0000	0.0000
1200.3	0.0240	0.0006	0.0003	0.0003
1200.4	0.0236	0.0007	0.0003	0.0003
1200.5	0.0232	0.0008	0.0006	0.0006
1200.5	0.0228	0.0009	0.0009	0.0009
1200.6	0.0225	0.0010	0.0013	0.0013
1200.6	0.0221	0.0012	0.0017	0.0017
1200.7	0.0217	0.0013	0.0020	0.0020
1200.8	0.0214	0.0014	0.0021	0.0021
1200.8	0.0210	0.0016	0.0022	0.0022
1200.9	0.0207	0.0017	0.0023	0.0023
1201.0	0.0203	0.0019	0.0023	0.0023
1201.0	0.0200	0.0020	0.0024	0.0024
1201.1	0.0196	0.0022	0.0025	0.0025
1201.2	0.0193	0.0023	0.0025	0.0025
1201.2	0.0189	0.0025	0.0026	0.0026
1201.3	0.0186	0.0026	0.0027	0.0027
1201.3	0.0183	0.0028	0.0028	0.0028
1201.4	0.0179	0.0030	0.0028	0.0028

1201.5	0.0176	0.0032	0.0029	0.0029
1201.5	0.0173	0.0034	0.0030	0.0030
1201.6	0.0170	0.0035	0.0031	0.0031
1201.7	0.0166	0.0037	0.0031	0.0031
1201.7	0.0163	0.0040	0.0032	0.0032
1201.8	0.0160	0.0043	0.0033	0.0033
1201.8	0.0157	0.0046	0.0034	0.0034
1201.9	0.0154	0.0049	0.0034	0.0034
1202.0	0.0151	0.0052	0.0035	0.0035
1202.0	0.0148	0.0055	0.0036	0.0036
1202.1	0.0145	0.0058	0.0037	0.0037
1202.2	0.0142	0.0061	0.0038	0.0038
1202.2	0.0139	0.0065	0.0039	0.0039
1202.3	0.0136	0.0068	0.0039	0.0039
1202.4	0.0133	0.0071	0.0040	0.0040
1202.4	0.0130	0.0075	0.0041	0.0041
1202.5	0.0128	0.0079	0.0042	0.0042
1202.5	0.0125	0.0082	0.0043	0.0043
1202.6	0.0122	0.0086	0.0044	0.0044
1202.7	0.0119	0.0090	0.0045	0.0045
1202.7	0.0117	0.0094	0.0046	0.0046
1202.8	0.0114	0.0098	0.0047	0.0047
1202.9	0.0111	0.0102	0.0047	0.0047
1202.9	0.0109	0.0106	0.0048	0.0048
1203.0	0.0106	0.0110	0.0049	0.0049
1203.0	0.0104	0.0115	0.0050	0.0050
1203.1	0.0101	0.0119	0.0051	0.0051
1203.2	0.0099	0.0123	0.0052	0.0052
1203.2	0.0096	0.0128	0.0053	0.0053
1203.3	0.0094	0.0133	0.0054	0.0054
1203.4	0.0091	0.0137	0.0055	0.0055
1203.4	0.0089	0.0142	0.0056	0.0056
1203.5	0.0087	0.0147	0.0057	0.0057
1203.6	0.0084	0.0152	0.0058	0.0058
1203.6	0.0082	0.0157	0.0059	0.0059
1203.7	0.0080	0.0162	0.0060	0.0060
1203.7	0.0078	0.0168	0.0061	0.0061
1203.8	0.0075	0.0173	0.0063	0.0063
1203.9	0.0073	0.0179	0.0064	0.0064
1203.9	0.0071	0.0184	0.0065	0.0065
1204.0	0.0069	0.0190	0.0066	0.0066
1204.1	0.0067	0.0196	0.0067	0.0067
1204.1	0.0065	0.0201	0.0068	0.0068
1204.2	0.0063	0.0207	0.0069	0.0069
1204.2	0.0061	0.0213	0.0070	0.0070
1204.3	0.0059	0.0220	0.0071	0.0071
1204.4	0.0057	0.0226	0.0072	0.0072
1204.4	0.0055	0.0232	0.0074	0.0074
1204.5	0.0053	0.0239	0.0075	0.0075
1204.6	0.0051	0.0245	0.0076	0.0076
1204.6	0.0049	0.0252	0.0077	0.0077
1204.7	0.0048	0.0258	0.0078	0.0078
1204.7	0.0046	0.0260	0.0078	0.0078

Biofilter Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
4.7500	0.0260	0.0260	0.0000	0.0078	0.0001
4.8132	0.0264	0.0276	0.0000	0.0078	0.0002

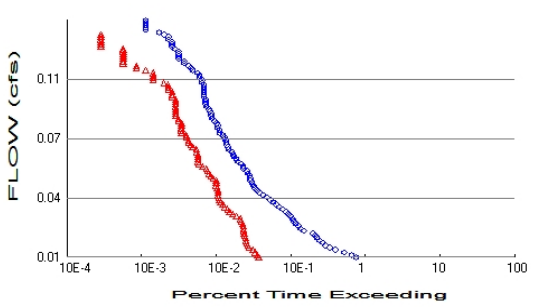
4.8764	0.0268	0.0293	0.0000	0.0078	0.0004
4.9396	0.0272	0.0310	0.0000	0.0078	0.0005
5.0027	0.0276	0.0327	0.0000	0.0078	0.0006
5.0659	0.0280	0.0345	0.0000	0.0078	0.0007
5.1291	0.0284	0.0363	0.0000	0.0078	0.0009
5.1923	0.0288	0.0381	0.0000	0.0078	0.0010
5.2555	0.0292	0.0399	0.0000	0.0078	0.0011
5.3187	0.0296	0.0418	0.0000	0.0078	0.0012
5.3819	0.0301	0.0436	0.0000	0.0078	0.0014
5.4451	0.0305	0.0456	0.0000	0.0078	0.0015
5.5082	0.0309	0.0475	0.0000	0.0078	0.0016
5.5714	0.0313	0.0495	0.0000	0.0078	0.0018
5.6346	0.0318	0.0515	0.0000	0.0078	0.0019
5.6978	0.0322	0.0535	0.0000	0.0078	0.0020
5.7500	0.0326	0.0552	0.0000	0.0078	0.0014

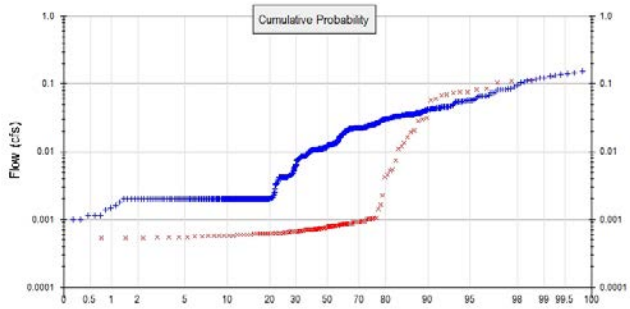
Surface Biofilter 1

Element Flows To:

Outlet 1	Outlet 2
	Biofilter 1

Analysis Results
POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 0.151
Total Impervious Area: 0.112

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0.126
Total Impervious Area: 0.103

Flow Frequency Method: Cunnane

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.082252
5 year	0.121431
10 year	0.138972
25 year	0.146812

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.012805
5 year	0.076041
10 year	0.102549
25 year	0.116164

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0082	2622	130	4	Pass
0.0095	2300	125	5	Pass
0.0109	1841	117	6	Pass
0.0122	1399	108	7	Pass
0.0135	1159	97	8	Pass
0.0148	1021	93	9	Pass
0.0161	939	90	9	Pass
0.0175	860	88	10	Pass
0.0188	788	87	11	Pass
0.0201	752	84	11	Pass
0.0214	697	83	11	Pass
0.0228	533	82	15	Pass
0.0241	476	81	17	Pass
0.0254	439	81	18	Pass
0.0267	408	79	19	Pass
0.0280	387	76	19	Pass
0.0294	370	74	20	Pass
0.0307	349	65	18	Pass
0.0320	326	58	17	Pass
0.0333	304	53	17	Pass
0.0346	275	50	18	Pass
0.0360	246	45	18	Pass
0.0373	224	43	19	Pass
0.0386	205	40	19	Pass
0.0399	188	39	20	Pass
0.0412	167	38	22	Pass
0.0426	149	37	24	Pass
0.0439	133	37	27	Pass
0.0452	125	37	29	Pass
0.0465	116	36	31	Pass
0.0478	111	35	31	Pass
0.0492	106	35	33	Pass
0.0505	101	35	34	Pass
0.0518	101	32	31	Pass
0.0531	99	30	30	Pass
0.0544	93	28	30	Pass
0.0558	91	27	29	Pass
0.0571	82	26	31	Pass
0.0584	80	23	28	Pass
0.0597	76	21	27	Pass
0.0611	68	20	29	Pass
0.0624	65	20	30	Pass
0.0637	61	20	32	Pass
0.0650	59	20	33	Pass
0.0663	57	19	33	Pass
0.0677	51	19	37	Pass
0.0690	50	17	34	Pass
0.0703	49	16	32	Pass
0.0716	48	15	31	Pass
0.0729	47	15	31	Pass
0.0743	45	14	31	Pass
0.0756	43	14	32	Pass
0.0769	39	12	30	Pass

0.0782	39	12	30	Pass
0.0795	37	12	32	Pass
0.0809	37	12	32	Pass
0.0822	36	12	33	Pass
0.0835	33	11	33	Pass
0.0848	31	11	35	Pass
0.0861	30	10	33	Pass
0.0875	30	10	33	Pass
0.0888	29	10	34	Pass
0.0901	28	10	35	Pass
0.0914	26	10	38	Pass
0.0927	25	10	40	Pass
0.0941	25	10	40	Pass
0.0954	25	10	40	Pass
0.0967	24	9	37	Pass
0.0980	24	9	37	Pass
0.0994	24	9	37	Pass
0.1007	24	8	33	Pass
0.1020	24	8	33	Pass
0.1033	24	8	33	Pass
0.1046	23	7	30	Pass
0.1060	23	5	21	Pass
0.1073	21	5	23	Pass
0.1086	21	5	23	Pass
0.1099	20	5	25	Pass
0.1112	17	4	23	Pass
0.1126	16	3	18	Pass
0.1139	15	3	20	Pass
0.1152	13	2	15	Pass
0.1165	13	2	15	Pass
0.1178	11	2	18	Pass
0.1192	11	2	18	Pass
0.1205	11	2	18	Pass
0.1218	11	2	18	Pass
0.1231	10	2	20	Pass
0.1244	9	1	11	Pass
0.1258	9	1	11	Pass
0.1271	9	1	11	Pass
0.1284	8	1	12	Pass
0.1297	8	1	12	Pass
0.1310	7	1	14	Pass
0.1324	6	0	0	Pass
0.1337	4	0	0	Pass
0.1350	4	0	0	Pass
0.1363	4	0	0	Pass
0.1377	4	0	0	Pass
0.1390	4	0	0	Pass

Water Quality

Model Default Modifications

Total of 0 changes have been made.

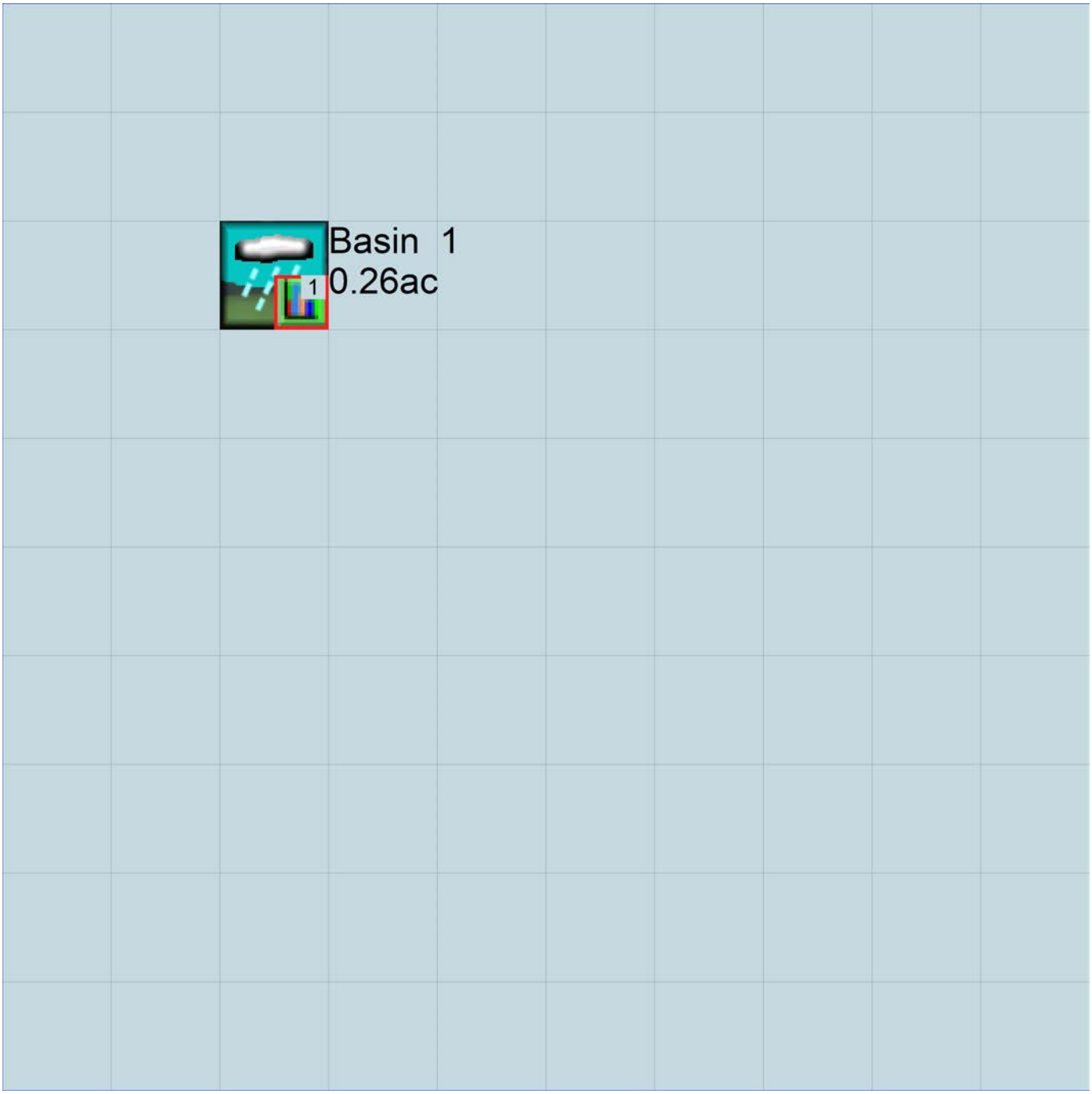
PERLND Changes

No PERLND changes have been made.

IMPLND Changes

No IMPLND changes have been made.

Appendix
Predeveloped Schematic



Mitigated Schematic



Predeveloped UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1964 10 01        END    2004 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                    UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM         26   16-2281 POC v.wdm
MESSU       25   Pre16-2281 POC v.MES
            27   Pre16-2281 POC v.L61
            28   Pre16-2281 POC v.L62
            30   POC16-2281 POC v1.dat
END FILES

OPN SEQUENCE
    INGRP               INDELT 00:60
      PERLND      11
      IMPLND       2
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Basin  1                   MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                          in  out           ***
   11      B,NatVeg,Moderate      1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   11         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags **************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
   11         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO
```

```
  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
   11         0    1    1    1    0    0    0    0    1    1    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
   11              0       3.7     0.055        80       0.1       2.5     0.915
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   11              0         0         2         2         0      0.05      0.05
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   11              0       0.6      0.04         1       0.3         0
  END PWAT-PARM4
  MON-LZETPARM
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   11       0.4  0.4  0.4  0.4  0.6  0.6  0.6  0.6  0.6  0.4  0.4  0.4
  END MON-LZETPARM
  MON-INTERCEP
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   11       0.1  0.1  0.1  0.1 0.06 0.06 0.06 0.06 0.06  0.1  0.1  0.1
  END MON-INTERCEP

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
               ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
   11              0         0      0.01         0       0.4      0.01         0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                     in  out           ***
    2      IMPERVIOUS-MOD         1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
    2         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
    2         0    0    4    0    0    0    1    9
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
    2         0    0    0    0    1
  END IWAT-PARM1
```

```
  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    2            100       0.1     0.011      0.08
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    2              0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    2              0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                 <--Area-->     <-Target->   MBLK   ***
<Name>   #                 <-factor->     <Name>   #   Tbl#   ***
Basin  1***
PERLND  11                      0.151     COPY   501     12
PERLND  11                      0.151     COPY   501     13
IMPLND   2                      0.112     COPY   501     15

******Routing******
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   12.1        DISPLY   1     INPUT  TIMSER 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<------------------><---> User T-series  Engl Metr LKFG           ***
                                      in  out                               ***
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ****************** PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                 ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
            FG FG FG FG  possible  exit  *** possible  exit      possible  exit
             *  *  *  *    *  *  *  *  *       *  *  *  *  *         ***
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->       ***
```

```
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                        ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit        for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1              PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1              IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    1              PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    1              IMPLND   1 999 EXTNL  PETINP

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
COPY   501 OUTPUT MEAN   1 1     12.1      WDM    501 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>            <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13

  MASS-LINK       15
IMPLND     IWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   15


END MASS-LINK

END RUN
```

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1964 10 01        END    2004 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                    UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM         26   16-2281 POC v.wdm
MESSU       25   Mit16-2281 POC v.MES
            27   Mit16-2281 POC v.L61
            28   Mit16-2281 POC v.L62
            30   POC16-2281 POC v1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:60
      PERLND      11
      IMPLND       2
      RCHRES       1
      RCHRES       2
      COPY         1
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Surface Biofilter  1        MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                          in  out           ***
   11      B,NatVeg,Moderate      1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   11         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags **************************** PIVL  PYR
```

```
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
   11         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
   11         0    1    1    1    0    0    0    0    1    1    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
   11              0       3.7     0.055        80       0.1       2.5     0.915
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   11              0         0         2         2         0      0.05      0.05
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   11             0       0.6      0.04         1       0.3         0
  END PWAT-PARM4
  MON-LZETPARM
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   11       0.4  0.4  0.4  0.4  0.6  0.6  0.6  0.6  0.6  0.4  0.4  0.4
  END MON-LZETPARM
  MON-INTERCEP
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   11       0.1  0.1  0.1  0.1 0.06 0.06 0.06 0.06 0.06  0.1  0.1  0.1
  END MON-INTERCEP

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
               ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
   11             0         0      0.01         0       0.4      0.01         0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                     in  out           ***
    2      IMPERVIOUS-MOD         1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
    2         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
    2         0    0    4    0    0    0    1    9
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
```

```
    2         0    0    0    0    1
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    2            100       0.1     0.011      0.08
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    2              0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    2              0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin  1***
PERLND  11                      0.126     RCHRES   1      2
PERLND  11                      0.126     RCHRES   1      3
IMPLND   2                      0.103     RCHRES   1      5

******Routing******
PERLND  11                      0.126     COPY     1     12
IMPLND   2                      0.103     COPY     1     15
PERLND  11                      0.126     COPY     1     13
RCHRES   1                          1     RCHRES   2      8
RCHRES   2                          1     COPY   501     17
RCHRES   1                          1     COPY   501     17
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   12.1        DISPLY   1     INPUT  TIMSER 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<------------------><---> User T-series  Engl Metr LKFG           ***
                                       in  out                              ***
    1     Surface Biofilte-004    3    1    1    1   28    0    1
    2     Biofilter  1            2    1    1    1   28    0    1
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
    1         1    0    0    0    0    0    0    0    0    0
    2         1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ****************** PIVL  PYR
```

```
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
    1         4    0    0    0    0    0    0    0    0    0    1    9
    2         4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                    ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
           FG FG FG FG  possible  exit  *** possible  exit      possible  exit
            *  *  *  *    *  *  *  *  *      *  *  *  *  *         ***
    1        0  1  0  0    4  5  6  0  0       0  0  0  0  0       2  2  2  2  2
    2        0  1  0  0    4  5  0  0  0       0  0  0  0  0       2  2  2  2  2
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->       ***
    1              1      0.01       0.0    1200.0       0.0       0.0
    2              2      0.01       0.0    1200.0       0.0       0.0
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                       ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit        for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><---><--->
    1            0         4.0  5.0  6.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    2            0         4.0  5.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
  FTABLE      2
   77    5
     Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.025964  0.000000  0.000000  0.000000
  0.063187  0.025896  0.000089  0.000000  0.000000
  0.126374  0.025503  0.000181  0.000000  0.000000
  0.189560  0.025113  0.000276  0.000000  0.000000
  0.252747  0.024727  0.000375  0.000000  0.000000
  0.315934  0.024343  0.000478  0.000000  0.000000
  0.379121  0.023962  0.000584  0.000000  0.000319
  0.442308  0.023584  0.000693  0.000000  0.000340
  0.505495  0.023209  0.000807  0.000000  0.000558
  0.568681  0.022837  0.000924  0.000000  0.000883
  0.631868  0.022468  0.001045  0.000000  0.001324
  0.695055  0.022102  0.001169  0.000000  0.001666
  0.758242  0.021739  0.001298  0.000000  0.001960
  0.821429  0.021378  0.001431  0.000000  0.002148
  0.884615  0.021021  0.001567  0.000000  0.002213
  0.947802  0.020666  0.001708  0.000000  0.002279
  1.010989  0.020315  0.001853  0.000000  0.002345
  1.074176  0.019966  0.002002  0.000000  0.002412
  1.137363  0.019621  0.002155  0.000000  0.002480
  1.200549  0.019278  0.002313  0.000000  0.002549
  1.263736  0.018938  0.002475  0.000000  0.002619
  1.326923  0.018601  0.002641  0.000000  0.002690
  1.390110  0.018267  0.002812  0.000000  0.002762
  1.453297  0.017936  0.002987  0.000000  0.002835
  1.516484  0.017608  0.003167  0.000000  0.002908
  1.579670  0.017283  0.003352  0.000000  0.002983
  1.642857  0.016961  0.003541  0.000000  0.003058
  1.706044  0.016642  0.003735  0.000000  0.003134
  1.769231  0.016325  0.004010  0.000000  0.003211
  1.832418  0.016012  0.004292  0.000000  0.003289
  1.895604  0.015702  0.004580  0.000000  0.003368
  1.958791  0.015394  0.004876  0.000000  0.003448
  2.021978  0.015090  0.005178  0.000000  0.003528
```

```
  2.085165  0.014788  0.005488  0.000000  0.003610
  2.148352  0.014489  0.005804  0.000000  0.003692
  2.211538  0.014193  0.006128  0.000000  0.003775
  2.274725  0.013901  0.006459  0.000000  0.003859
  2.337912  0.013611  0.006797  0.000000  0.003944
  2.401099  0.013324  0.007142  0.000000  0.004030
  2.464286  0.013040  0.007496  0.000000  0.004117
  2.527473  0.012758  0.007856  0.000000  0.004205
  2.590659  0.012480  0.008225  0.000000  0.004293
  2.653846  0.012205  0.008601  0.000000  0.004383
  2.717033  0.011933  0.008985  0.000000  0.004473
  2.780220  0.011663  0.009376  0.000000  0.004565
  2.843407  0.011397  0.009776  0.000000  0.004657
  2.906593  0.011133  0.010184  0.000000  0.004750
  2.969780  0.010873  0.010600  0.000000  0.004844
  3.032967  0.010615  0.011024  0.000000  0.004938
  3.096154  0.010360  0.011456  0.000000  0.005034
  3.159341  0.010109  0.011896  0.000000  0.005131
  3.222527  0.009860  0.012345  0.000000  0.005228
  3.285714  0.009614  0.012803  0.000000  0.005327
  3.348901  0.009371  0.013269  0.000000  0.005426
  3.412088  0.009131  0.013744  0.000000  0.005526
  3.475275  0.008894  0.014227  0.000000  0.005627
  3.538462  0.008659  0.014719  0.000000  0.005729
  3.601648  0.008428  0.015220  0.000000  0.005832
  3.664835  0.008200  0.015730  0.000000  0.005935
  3.728022  0.007974  0.016249  0.000000  0.006040
  3.791209  0.007752  0.016777  0.000000  0.006145
  3.854396  0.007532  0.017315  0.000000  0.006252
  3.917582  0.007316  0.017861  0.000000  0.006359
  3.980769  0.007102  0.018417  0.000000  0.006467
  4.043956  0.006891  0.018982  0.000000  0.006576
  4.107143  0.006684  0.019557  0.000000  0.006686
  4.170330  0.006479  0.020142  0.000000  0.006797
  4.233516  0.006277  0.020736  0.000000  0.006908
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  4.423077  0.005689  0.022576  0.000000  0.007249
  4.486264  0.005498  0.023210  0.000000  0.007364
  4.549451  0.005311  0.023853  0.000000  0.007480
  4.612637  0.005127  0.024506  0.000000  0.007597
  4.675824  0.004945  0.025170  0.000000  0.007715
  4.739011  0.004767  0.025844  0.000000  0.007833
  4.750000  0.004591  0.026610  0.000000  0.007833
  END FTABLE  2
  FTABLE      1
   17    6
     Depth      Area    Volume  Outflow1  Outflow2  Outflow3  Velocity  Travel
Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)     (cfs)   (ft/sec)
(Minutes)***
  0.000000  0.004591  0.000000  0.000000  0.000000  0.000120
  0.063187  0.026360  0.001653  0.000096  0.007833  0.000120
  0.126374  0.026759  0.003331  0.000437  0.007833  0.000240
  0.189560  0.027161  0.005035  0.000610  0.007833  0.000362
  0.252747  0.027566  0.006764  0.000745  0.007833  0.000485
  0.315934  0.027974  0.008519  0.000858  0.007833  0.000608
  0.379121  0.028384  0.010299  0.000958  0.007833  0.000732
  0.442308  0.028798  0.012106  0.001049  0.007833  0.000857
  0.505495  0.029214  0.013938  0.005457  0.007833  0.000983
  0.568681  0.029634  0.015798  0.191737  0.007833  0.001110
  0.631868  0.030056  0.017684  0.502780  0.007833  0.001238
  0.695055  0.030482  0.019596  0.878351  0.007833  0.001367
  0.758242  0.030910  0.021536  1.268988  0.007833  0.001496
  0.821429  0.031341  0.023502  1.625269  0.007833  0.001627
  0.884615  0.031775  0.025496  1.906900  0.007833  0.001758
  0.947802  0.032212  0.027518  2.097906  0.007833  0.001890
  1.000000  0.032576  0.029209  2.253120  0.007833  0.002000
  END FTABLE  1
END FTABLES
```

```
EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1              PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1              IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    1              PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    1              IMPLND   1 999 EXTNL  PETINP
WDM      2 PREC     ENGL    1              RCHRES   1     EXTNL  PREC
WDM      1 EVAP     ENGL    0.5            RCHRES   1     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.7            RCHRES   2     EXTNL  POTEV

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
RCHRES   2 HYDR   RO     1 1        1      WDM   1000 FLOW     ENGL      REPL
RCHRES   2 HYDR   O      1 1        1      WDM   1001 FLOW     ENGL      REPL
RCHRES   2 HYDR   O      2 1        1      WDM   1002 FLOW     ENGL      REPL
RCHRES   2 HYDR   STAGE  1 1        1      WDM   1003 STAG     ENGL      REPL
RCHRES   1 HYDR   STAGE  1 1        1      WDM   1004 STAG     ENGL      REPL
RCHRES   1 HYDR   O      1 1        1      WDM   1005 FLOW     ENGL      REPL
COPY     1 OUTPUT MEAN   1 1     12.1      WDM    701 FLOW     ENGL      REPL
COPY   501 OUTPUT MEAN   1 1     12.1      WDM    801 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>             <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK        2
PERLND     PWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    2

  MASS-LINK        3
PERLND     PWATER IFWO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    3

  MASS-LINK        5
IMPLND     IWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    5

  MASS-LINK        8
RCHRES     OFLOW  OVOL   2                 RCHRES         INFLOW IVOL
  END MASS-LINK    8

  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13

  MASS-LINK       15
IMPLND     IWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   15

  MASS-LINK       17
RCHRES     OFLOW  OVOL   1                 COPY           INPUT  MEAN
  END MASS-LINK   17


END MASS-LINK

END RUN
```

Predeveloped HSPF Message File

Mitigated HSPF Message File

Disclaimer

Legal Notice

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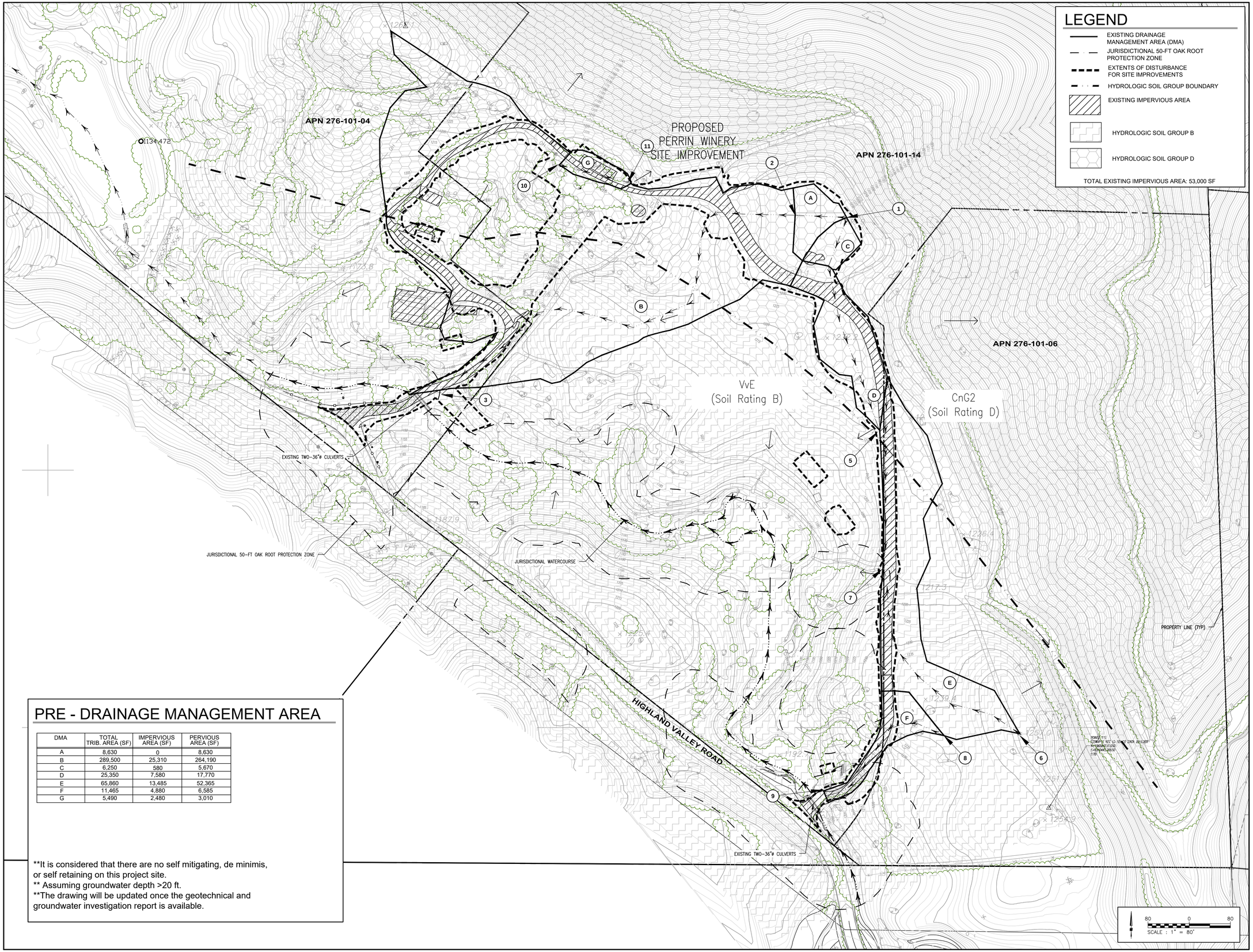
ATTACHMENT 2b HYDROMODIFICATION MANAGEMENT EXHIBITS



PRE - DRAINAGE MANAGEMENT AREA

DMA	TOTAL TRIB. AREA (SF)	IMPERVIOUS AREA (SF)	PERVIOUS AREA (SF)
A	8,630	0	8,630
B	289,500	25,310	264,190
C	6,250	580	5,670
D	25,350	7,580	17,770
E	65,860	13,485	52,365
F	11,465	4,880	6,585
G	5,490	2,480	3,010

**It is considered that there are no self mitigating, de minimis, or self retaining on this project site.
** Assuming groundwater depth >20 ft.
**The drawing will be updated once the geotechnical and groundwater investigation report is available.

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TEL: (707) 544-0784

PROJECT

PROPOSED WINERY PROJECT
16138 HIGHLAND VALLEY ROAD, ESCONDIDO, CA

REVISIONS

SHEET TITLE

PRE-DEVELOPMENT IMPERVIOUS AREA EXHIBIT

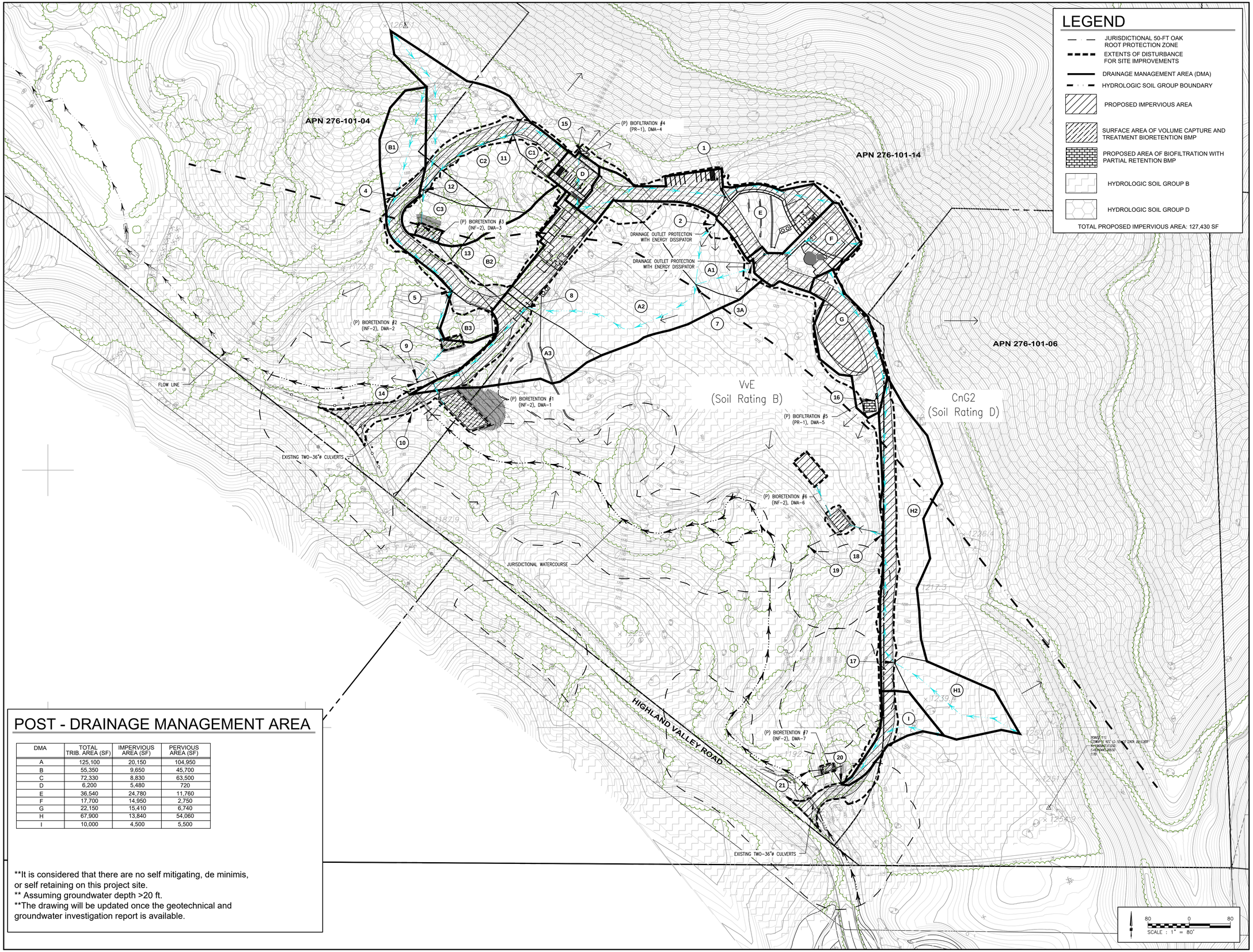
CHECKED BY: DM
DRAWN BY: WC
SCALE: AS SHOWN
DATE: NOVEMBER 8, 2019

PROJECT NO. 16-2281

1

FIGURE NO.

XrefS: E:\Ref - Topo - OVERALL.dwg X:\Ref - Google Aerial Photo Oak Ranch Winery Plan_Current.dwg 24x36 Winery Block.dwg 24x36 Hospitality Block.dwg Survey with Topo - OVERALL.dwg X:\Ref - Jurisdictional Delineation Map.dwg
Plot: 8, 2019 9:00:01 AM - Plotted By: Wendy Carl - Plotted By: Wendy Carl - Plot Date: May 13, 2019 at 08:39



POST - DRAINAGE MANAGEMENT AREA

DMA	TOTAL TRIB. AREA (SF)	IMPERVIOUS AREA (SF)	PERVIOUS AREA (SF)
A	125,100	20,150	104,950
B	55,350	9,650	45,700
C	72,330	8,830	63,500
D	6,200	5,480	720
E	36,540	24,780	11,760
F	17,700	14,950	2,750
G	22,150	15,410	6,740
H	67,900	13,840	54,060
I	10,000	4,500	5,500

**It is considered that there are no self mitigating, de minimis, or self retaining on this project site.
** Assuming groundwater depth >20 ft.
**The drawing will be updated once the geotechnical and groundwater investigation report is available.

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PROJECT

PROPOSED WINERY PROJECT
16138 HIGHLAND VALLEY ROAD, ESCONDIDO, CA

REVISIONS

SHEET TITLE

POST DEVELOPMENT IMPERVIOUS AREA EXHIBIT

CHECKED BY: DM
DRAWN BY: WC
SCALE: AS SHOWN
DATE: NOVEMBER 8, 2019
PROJECT NO. 16-2281

2
FIGURE NO.

XrefS: X:\5pf - Topo - OVERALL.dwg X:\Ref - Google Map Points Oak Ranch Winery Plan_Current.dwg 24x36 Winery 36pick.dwg 24x36 Hospitality36pick.dwg temp work Topo - OVERALL.dwg X:\Ref - Jurisdictional Delineation Map.dwg
Plot: 8, 2019 10:01 - Plotted By: Wendy Cahill (plotted from Wendy) - Pen Table: Arch 24 Color.ctb - Page Setup: Arch D

**It is considered that there are no self mitigating, de minimis, or self retaining on this project site.
** Assuming groundwater depth >20 ft.
**The drawing will be updated once the geotechnical and groundwater investigation report is available.

APN 276-101-04

APN 276-101-14

APN 276-101-06

(P) BIOFILTRATION #4 (PR-1), DMA-4

(P) BIORETENTION #3 (INF-2), DMA-3

DRAINAGE OUTLET PROTECTION WITH ENERGY DISSIPATOR

DRAINAGE OUTLET PROTECTION WITH ENERGY DISSIPATOR

(P) BIORETENTION #2 (INF-2), DMA-2

FLOW LINE

(P) BIORETENTION #1 (INF-2), DMA-1

(P) BIOFILTRATION #5 (PR-1), DMA-5

VvE
(Soil Rating B)

CnG2
(Soil Rating D)

(P) BIORETENTION #6 (INF-2), DMA-6

JURISDICTIONAL WATERCOURSE

(P) BIORETENTION #7 (INF-2), DMA-7

HIGHLAND VALLEY ROAD

SCALE : 1" = 80'

CALLOUT LEGEND

- JURISDICTIONAL 50-FT OAK ROOT PROTECTION ZONE
- EXTENTS OF DISTURBANCE FOR SITE IMPROVEMENTS
- DRAINAGE MANAGEMENT AREA (DMA)
- HYDROLOGIC SOIL GROUP BOUNDARY
- PROPOSED STORM DRAIN
- STORM DRAIN DROP INLET
- STORM DRAIN MANHOLE
- (A) AREA TRIBUTARY TO BMP
- SURFACE AREA OF VOLUME CAPTURE AND TREATMENT BIORETENTION BMP
- PROPOSED AREA OF BIOFILTRATION WITH PARTIAL RETENTION BMP
- HYDROLOGIC SOIL GROUP B
- HYDROLOGIC SOIL GROUP D
- POTENTIAL CRITICAL COARSE SEDIMENT YIELD AREA

STRUCTURE LEGEND

BMP	BASIN ID	DMA TO BMP	TOTAL TRIB. AREA (SF)	BMP AREA (SF)	IMPERVIOUS AREA (SF)	PERVIOUS AREA (SF)
(P) BIORETENTION #1		E	36,540		24,780	11,760
		F	17,700		14,950	2,750
		A	125,100		20,150	104,950
"Σ"	DMA-1	E,F,A	179,340	3,000	59,880	119,460
(P) BIORETENTION #2	DMA-2	B	55,350	800	9,650	45,700
(P) BIORETENTION #3	DMA-3	C	72,330	1,200	8,830	63,500
(P) BIOFILTRATION #4	DMA-4	D	6,200	200	5,480	720
(P) BIOFILTRATION #5	DMA-5	G	22,150	550	15,410	6,740
(P) BIORETENTION #6	DMA-6	H	67,900	950	13,840	54,060
(P) BIORETENTION #7	DMA-7	I	10,000	200	4,500	5,500

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PROJECT

PROPOSED WINERY PROJECT
16138 HIGHLAND VALLEY ROAD,
ESCONDIDO, CA

REVISIONS

SHEET TITLE

PROPOSED HYDROMODIFICATION EXHIBIT

CHECKED BY: DM
DRAWN BY: WC
SCALE: AS SHOWN
DATE: NOVEMBER 8, 2019

PROJECT NO. 16-2281

3

FIGURE NO.

XrefS: E:\5d - Topo - CIVIL\EXHIBIT.dwg Fri Mar - Google Map Points - Oak Branch Winery Plan_Current.dwg 24x36, Winery 36x24.dwg 24x36 Hospitality36x24.dwg temp work Topo - OVERALL.dwg 5 Plot - Jurisdictional Delineation Map.dwg
Plotted: 8/1/2019 9:01 AM by Wendy Cahill (Spectra Blue) - Johnson Marilaw - Plot Date: May 13, 2019 at 8:46 AM

ATTACHMENT 2c MANAGEMENT OF CRITICAL COARSE SEDIMENT YIELD AREAS

APN 276-101-04

APN 276-101-14

APN 276-101-06

(P) BIOFILTRATION #4
(PR-1), DMA-4

(P) BIORETENTION #3
(INF-2), DMA-3

(P) BIORETENTION #2
(INF-2), DMA-2

(P) BIORETENTION #1
(INF-2), DMA-1

(P) BIOFILTRATION #5
(PR-1), DMA-5

(P) BIORETENTION #6
(INF-2), DMA-6

(P) BIORETENTION #7
(INF-2), DMA-7

CRITICAL COARSE SEDIMENT YIELD
AREA (CCSYA) ENCROACHMENT
A3= 3,645 SF

TOTAL DISTURBED AREA 197,070 SF

FLOW LINE (TYP)

CRITICAL COARSE SEDIMENT YIELD
AREA (CCSYA) ENCROACHMENT
A2= 2,300 SF

JURISDICTIONAL 50-FT OAK ROOT PROTECTION ZONE (TYP)

JURISDICTIONAL WATERCOURSE

GRADING LIMITS (TYP)

CRITICAL COARSE SEDIMENT YIELD
AREA (CCSYA) ENCROACHMENT
A1= 5,745 SF

HIGHLAND VALLEY ROAD

80 0 80
SCALE : 1" = 80'

CALLOUT LEGEND

- JURISDICTIONAL 50-FT OAK ROOT PROTECTION ZONE
- EXTENTS OF DISTURBANCE FOR SITE IMPROVEMENTS
- PROPOSED STORM DRAIN
- STORM DRAIN DROP INLET
- STORM DRAIN MANHOLE
- PROPOSED IMPERVIOUS AREA
- SURFACE AREA OF VOLUME CAPTURE AND TREATMENT BIORETENTION BMP
- PROPOSED AREA OF BIOFILTRATION WITH PARTIAL RETENTION BMP
- ENCROACHED POTENTIAL CRITICAL COARSE SEDIMENT YIELD AREA
- POTENTIAL CRITICAL COARSE SEDIMENT YIELD AREA

TOTAL DISTURB AREA 197,070 SF
CCSYA AREA 1 = 5,745 SF (2.9%)
CCSYA AREA 2 = 2,300 SF (1.2%)
CCSYA AREA 3 = 3,645 SF (1.8%)
OVERALL SITE CCYSA ENCROACHMENT = 11,690 SF (5.9%)

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PROJECT

PROPOSED WINERY
PROJECT
16138 HIGHLAND
VALLEY ROAD,
ESCONDIDO, CA

REVISIONS

SHEET TITLE

ATTACHMENT 2C
CCSYA DISTURBANC
EXHIBIT

CHECKED BY: DM
DRAWN BY: WC
SCALE: AS SHOWN
DATE: NOVEMBER 8, 2019

PROJECT NO. 16-2281

1

FIGURE NO.

Xrefs: X-Ref - Topo - EXCERAL.dwg,X-Ref - Grading-dwg/Ranch Oak Roads Winery Plan_Current.dwg,24x36 Winery 3Dsub.dwg,24x36 Hospitality3Dsub.dwg,temp arch Topo - EXCERAL.dwg,X-Ref - Jurisdictional Delineation Mtg.dwg
Xrefs: 11/1/2019 - Plan Area/Land Plan/Plan Area - Winery.dwg, Model, Nic Avery - Plot Date: May 13, 2019 - 8:34 A

ATTACHMENT 3

Structural BMP Maintenance Information

This is the cover sheet for Attachment 3.

Indicate which Items are Included behind this cover sheet:

Attachment Sequence	Contents	Checklist
Attachment 3a	Structural BMP Maintenance Plan (Required)	☐ Included See Structural BMP Maintenance Information Checklist on the back of this Attachment cover sheet.
Attachment 3b	Draft Stormwater Maintenance Notification / Agreement (when applicable)	☐ Included ☐ Not Applicable

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

Attachment 3a must identify:

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

Attachment 3b: For all Structural BMPs, Attachment 3b must include a draft maintenance agreement in the County's standard format depending on the Category (PDP applicant to contact County staff to obtain the current maintenance agreement forms). Refer to Section 7.3 in the BMP Design Manual for a description of the different categories.

ATTACHMENT 3 STRUCTURAL BMP MAINTENANCE INFORMATION

This Section will be provided during the final design

ATTACHMENT 4

County of San Diego PDP Structural BMP Verification for Permitted Land Development Projects

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County of San Diego BMP Design Manual Verification Form	
Project Summary Information	
Project Name	Perrin Winery
Record ID (e.g., grading/improvement plan number)	**PDS2016-AD-16-023**
Project Address	16138 Highland Valley Road Escondido, CA 92025
Assessor's Parcel Number(s) (APN(s))	276-101-04, 276-101-14, 276-101-06
Project Watershed (Complete Hydrologic Unit, Area, and Subarea Name with Numeric Identifier)	TBA
Responsible Party for Construction Phase	
Developer's Name	
Address	
Email Address	
Phone Number	
Engineer of Work	DAMON MORELLI, P.E.
Engineer's Phone Number	707-544-0784
Responsible Party for Ongoing Maintenance	
Owner's Name(s)*	GREGORY L. PERRIN
Address	30318 LONGHORN DRIVE CANYON LAKE, CA 92587
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.	

County of San Diego BMP Design Manual Verification Form Page 2 of 4					
Stormwater Structural Pollutant Control & Hydromodification Control BMPs* (List all from SWQMP)					
Description/Type of Structural BMP	**Plan Sheet #**	**STRUCT-URAL BMP ID#**	**Maint-enance Category**	**Maintenance Agreement Recorded Doc #**	**Revisions**
Bioretention #1, INF-2	3	1	1		
Bioretention #2, INF-2	3	2	1		
Bioretention #3, INF-2	3	3	1		
Biofiltration #4, PR-1	3	4	1		
Biofiltration #5, PR-1	3	5	1		
Bioretention #6, INF-2	3	6	1		
Bioretention #7, INF-2	3	7	1		
*All Priority Development Projects (PDPs) require a Structural BMP					

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

County of San Diego BMP Design Manual Verification Form Page 3 of 4

Checklist for Applicant to submit to PDCI:

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

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

Please sign your name and seal.

Professional Engineer's Printed Name:

_____

Professional Engineer's Signed Name:

_____

[SEAL]

Date: _____

County of San Diego BMP Design Manual Verification Form Page 4 of 4

COUNTY - OFFICIAL USE ONLY:

For PDCI: Verification Package #: _____

PDCI Inspector: _____

Date Project has/expects to close: _____

Date verification received from EOW: _____

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

PDCI Inspector's Signature: _____ Date: _____

FOR WPP:

Date Received from PDCI: _____

WPP Submittal Reviewer: _____

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

List **acceptable** Structural BMPs:

WPP Reviewer's Signature: _____ Date: _____

ATTACHMENT 4 COUNTY OF SAN DIEGO PDP STRUCTURAL BMP VERIFICATION FOR PERMITTED DEVELOPMENT PROJECTS

This Section will be provided during the final design

ATTACHMENT 5

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

This is the cover sheet for Attachment 5.

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

The plans must identify:

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

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ATTACHMENT 5 COPY OF PLAN SHEETS SHOWING PERMANENT STORM WATER BMPs SOURCE CONTROL, AND SITE DESIGN

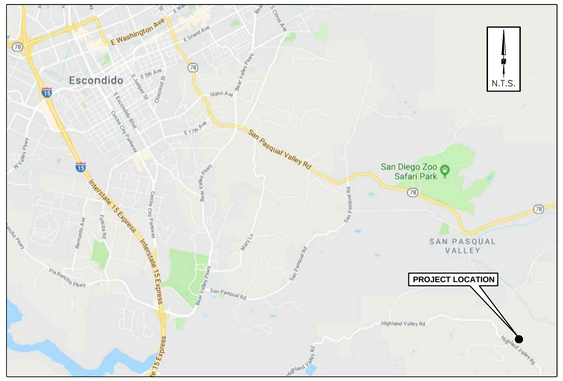
CONSTRUCTION DRAWINGS

FOR

PROPOSED WINERY PROJECT
PRELIMINARY GRADING PLANS
ESCONDIDO, CALIFORNIA

APN 276-101-14

LOCATION MAP



BENCHMARK

DESCRIPTION: 3" BRASS DISK BENCHMARK NUMBER 17984 IN SAN DIEGO COUNTY AT AN ELEVATION OF 1371.17.

DATUM: M.S.L.

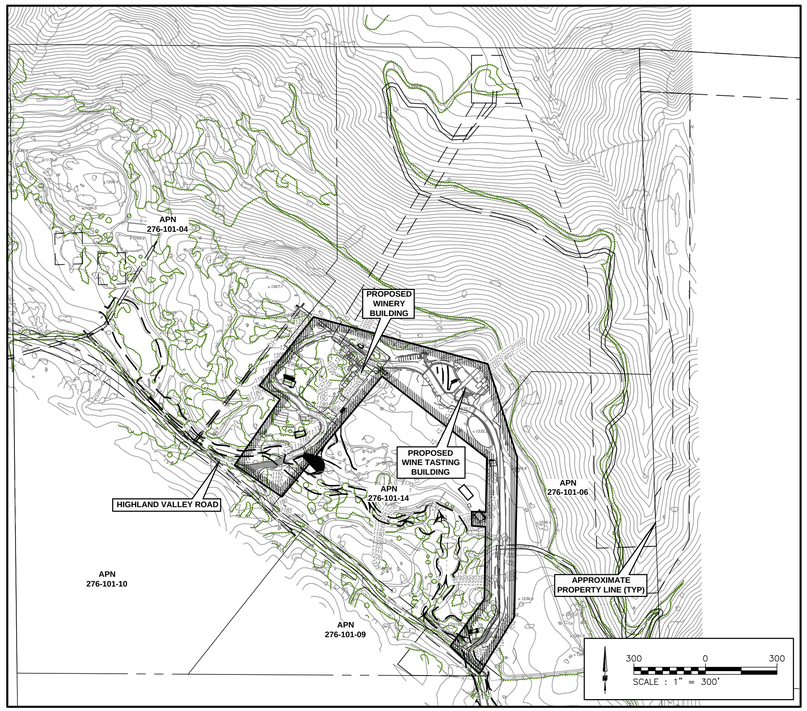
APPLICABLE BUILDING CODES

2016 CALIFORNIA BUILDING CODE, 201 CPC
2016 CALIFORNIA FIRE CODE WITH LOCAL AMENDMENTS
2016 CALIFORNIA MECHANICAL CODE
2016 CALIFORNIA ELECTRICAL CODE
2016 CALIFORNIA PLUMBING CODE
2016 CALIFORNIA ENERGY CODE

LEGEND

- CENTERLINE
- EXISTING EASEMENT LINE
- EXISTING FLOW LINE / POTENTIAL JURISDICTIONAL WATER
- PROPERTY LINE
- EXISTING FENCE
- EXISTING UNDERGROUND ELECTRIC LINE
- EXISTING OVERHEAD ELECTRIC
- EXISTING FENCE
- BUILDING WALL
- EXISTING STORM DRAIN PIPE / CULVERT
- EXISTING 50-FT OAK ROOT PROTECTION ZONE
- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- PROPOSED MAJOR CONTOUR
- PROPOSED MINOR CONTOUR
- PROPOSED DAYLIGHTING LINE
- PROPOSED GRADE BREAK
- PROPOSED SUBDRAIN
- PROPOSED ACCESS ROAD CENTERLINE
- LIMITS OF GRADING
- 1X2 VAULT
- CHRISTY BOX
- EXISTING TREE
- CENTERLINE MONUMENT
- FIRE HYDRANT
- STORM DRAIN INLET
- STORM DRAIN MANHOLE
- STORM DRAIN RIPRAP OUTFALL
- PROPOSED BIORETENTION BASIN
- PROPOSED BIOFILTRATION BASIN
- DRAINAGE PATTERN

VICINITY MAP



SHEET INDEX

000	TITLE SHEET
100	OVERALL SITE PLAN
200	PRELIMINARY GRADING AND DRAINAGE IMPROVEMENTS
201	PRELIMINARY GRADING AND DRAINAGE IMPROVEMENTS
202	PRELIMINARY GRADING AND DRAINAGE IMPROVEMENTS
203	PRELIMINARY GRADING AND DRAINAGE IMPROVEMENTS
204	PRELIMINARY GRADING AND DRAINAGE IMPROVEMENTS
205	PRELIMINARY GRADING AND DRAINAGE IMPROVEMENTS
206	CENTERLINE ROAD PROFILE

ABBREVIATIONS

AB	AGGREGATE BASE	L	LEFT
AD	ALGEBRAIC DIFFERENCE	LF	LINEAR FEET
AC	ASPHALT CONCRETE	LG	LIP OF GUTTER
AFF	ABOVE FINISH FLOOR	ME	MATCH EXISTING
AGG	AGGREGATE	MH	MANHOLE
BC	BEGINNING OF CURVE	MAX	MAXIMUM
BLDG	BUILDING	MIN	MINIMUM
BSL	BUILDING SETBACK LINE	NO.	NUMBER
BVC	BEGIN VERTICAL CURVE	(N)	NEW
CB	CATCH BASIN	NIC	NOT IN CONTRACT
CF	CURB FACE	NTS	NOT TO SCALE
CL	CENTER LINE	O.C.	OFF CENTER
CMP	CORRUGATED METAL PIPE	OH	OVERHEAD
CO	CLEAN OUT	(P)	PROPOSED
COMP	COMPACTION	PCC	PORTLAND CEMENT CONCRETE
CONC	CONCRETE	PD	PLANTER DRAIN
CP	CONTROL POINT	PCC	POINT ON COMPOUND CURVE
CPP	CORRUGATED PLASTIC PIPE	PRC	POINT ON REVERSE CURVE
CTRL	CONTROL	PVC	POLYVINYL CHLORIDE
DIA or Ø	DIAMETER	PVI	POINT OF VERTICAL INTERSECTION
DI	DRAIN INLET	R	RIGHT OR RADIUS
(E)	EXISTING	RCP	REINFORCED CONCRETE PIPE
EA	EACH	SCH	SCHEDULE
ELEC	ELECTRICAL	SD	STORM DRAIN
EC	END OF CURVE	SDCO	STORM DRAIN CLEANOUT
EG	EXISTING GROUND	SO	SIDE OPENING
EL	ELEVATION	STA	STATION
EP	EDGE OF PAVEMENT	SQ	SQUARE
ER	EDGE OF ROAD	TB	TOP OF BANK
EVC	END VERTICAL CURVE	TC	TOP OF CURB
FC	FC	TCS	TOP OF CONCRETE SURFACE
FNC	FENCE	TG	TOP GRADE
FF	FINISHED FLOOR	TOS	TOP OF SLOPE
FG	FINISH GRADE	TP	TOP OF PAVEMENT
FL	FLOW LINE	TW	TOP OF WALL
FND	FOUNDATION	TYP	TYPICAL
FS	FINISHED SURFACE	UP	UTILITY POLE
GALV	GALVANIZED	VEG	VEGETATION
G	GROUND	VC	VERTICAL CURVE
GB	GRADE BREAK	VY	VINEYARD
HDPE	HIGH DENSITY POLYETHYLENE		
IP	IRON PIPE		
INV	INVERT		
K	CURVE COEFFICIENT		

SIGHT DISTANCE

I, DAMON MORELLI, A REGISTERED CIVIL ENGINEER, CERTIFY THAT: THERE IS 600 FEET OF UNOBSTRUCTED INTERSECTIONAL SIGHT DISTANCE IN BOTH DIRECTIONS ALONG HIGHLAND VALLEY ROAD FROM THE EXISTING PRIVATE AND SOUTHERLY DRIVEWAYS MEASURED IN ACCORDANCE WITH THE METHODOLOGY DESCRIBED IN TABLE 5 OF THE MARCH 2012 COUNTY OF SAN DIEGO PUBLIC ROAD STANDARDS. THESE SIGHT DISTANCES EXCEED THE REQUIRED INTERSECTIONAL SIGHT DISTANCE REQUIREMENTS OF 600 FEET AS DESCRIBED IN TABLE 5 BASED ON A SPEED OF 55 MPH (UNPOSTED), WHICH I HAVE VERIFIED TO BE THE HIGHER OF THE PREVAILING SPEED OR MINIMUM DESIGN SPEED OF THE ROAD CLASSIFICATION. I HAVE EXERCISED RESPONSIBLE CHARGE FOR THE CERTIFICATION AS DEFINED IN SECTION 6703 OF THE PROFESSIONAL ENGINEERS ACT OF THE CALIFORNIA BUSINESS AND PROFESSIONS CODE. SAID LINES OF SIGHT FALL WITHIN THE EXISTING RIGHT-OF-WAY AND A CLEAR SPACE EASEMENT IS NOT REQUIRED.

(TO BE ACKNOWLEDGED WITH FINAL CONSTRUCTION DOCUMENTS)

EARTHWORK NOTES

1. ALL QUANTITIES SHOWN ON THIS PLAN ARE APPROXIMATE. CALCULATED EXCESS AND SHORTAGE ARE FROM FINISHED GRADE TO EXISTING GROUND. THE ACTUAL AMOUNT OF EARTH MOVED WILL VARY, DEPENDANT ON COMPACTION, CONSOLIDATION, STRIPPING REQUIREMENTS, AND THE CONTRACTORS METHOD OF OPERATION.
2. DUE TO THE INEXACT NATURE OF EARTHWORK ESTIMATING, THERE IS NO GUARANTEE OF THESE QUANTITIES. CONTRACTOR SHALL MAKE HIS OWN ESTIMATE FOR BID AND CONTRACT PURPOSES.
3. CONTRACTOR SHALL REFER TO THE PROJECT GEOTECHNICAL INVESTIGATION AND SUPPLEMENTAL INVESTIGATIONS FOR SPECIFIC SOILS INVESTIGATIONS AND FINDINGS.

ENGINEER'S ESTIMATE:

EARTHWORK:
CUT = 7000 CY
FILL = 2000 CY

NET EXPORT = 5000 CY

DISTURBED AREAS:
DISTURBED AREA = 4.52 ACRES

WATERS OF THE U.S. AND STATE

NOTICE: THE SUBJECT PROPERTY CONTAINS WETLANDS, A LAKE, A STREAM, AND/OR WATERS OF THE US AND/OR STATE WHICH MAY BE SUBJECT TO REGULATION BY STATE AND/OR FEDERAL AGENCIES, INCLUDING, BUT NOT LIMITED TO, THE REGIONAL WATER QUALITY CONTROL BOARD, U.S. ARMY CORP OF ENGINEERS AND THE CALIFORNIA DIVISION OF FISH AND WILDLIFE. IT IS THE APPLICANT'S RESPONSIBILITY TO CONSULT WITH EACH AGENCY TO DETERMINE IF A PERMIT, AGREEMENT OR OTHER APPROVAL IS REQUIRED AND TO OBTAIN ALL NECESSARY PERMITS, AGREEMENTS OR APPROVALS BEFORE COMMENCING ANY ACTIVITY WHICH COULD IMPACT THE WETLANDS, LAKE, STREAM, AND/OR WATERS OF THE STATE OR U.S. ON THE SUBJECT PROPERTY. THE AGENCY CONTACT INFORMATION IS PROVIDED BELOW.

U.S. ARMY CORP OF ENGINEERS: 915 WILSHIRE BLVD., SUITE 1101, LOS ANGELES, CA 90017; (213) 452-3333; HTTP://WWW.USACE.ARMY.MIL/

REGIONAL WATER QUALITY CONTROL BOARD: 2375 NORTHSIDE DRIVE, SUITE 100, SAN DIEGO, CA 92108; RB9_DREDGEFILL@WATERBOARDS.CA.GOV; HTTP://WWW.WATERBOARDS.CA.GOV/SANDIEGO/

CALIFORNIA DIVISION OF WILDLIFE: 3883 RUFFIN RD., SAN DIEGO, CA 92123; (858) 636-3160; ASKR5@WILDLIFE.CA.GOV; HTTP://WWW.DFG.CA.GOV/

PROJECT DIRECTORY

PROPERTY OWNER
GREGORY PERRIN
30318 LONGHORN DRIVE
CANYON LAKE, CA 92587

ARCHITECT
STRATA AP
23562 ARNOLD DRIVE
SONOMA, CA 95476
(707) 935-7944

CIVIL ENGINEER
EBA ENGINEERING
825 SONOMA AVE.
SANTA ROSA, CA 95404
(707) 544-0784

NOTE:

THIS PLAN IS PROVIDED TO ALLOW FOR FULL AND ADEQUATE DISCRETIONARY REVIEW OF A PROPOSED DEVELOPMENT PROJECT. THE PROPOERTY OWNER ACKNOWLEDGES THAT ACCEPTANCE OR APPROVAL OF THIS PLAN DOES NOT CONSTITUTE AN APPROVAL TO PERFORM ANY GRADING SHOWN HEREON, AND AGREES TO OBTAIN VALID GRADING PERMISSIONS BEFORE COMMENCING SUCH ACTIVITY.

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CONSULTANTS:

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825 SONOMA AVENUE
SUITE C
SANTA ROSA, CA 95404
TEL: (707) 544-0784

PROJECT

PROPOSED WINERY PROJECT
16138 HIGHLAND VALLEY ROAD,
ESCONDIDO, CA

REGISTERED PROFESSIONAL ENGINEER DAMON E. MORELLI No. C063621 EXP. 9-30-20 CIVIL STATE OF CALIFORNIA

PARCEL:
PAR 3, 56.45 AC TMK 276-101-14

REVISIONS

1	USE PERMIT SUBMITTAL #2	05.08.2018
2	USE PERMIT SUBMITTAL #3	04.30.2019
3	USE PERMIT FINAL SUBMITTAL	05.12.2020

SHEET TITLE

TITLE SHEET

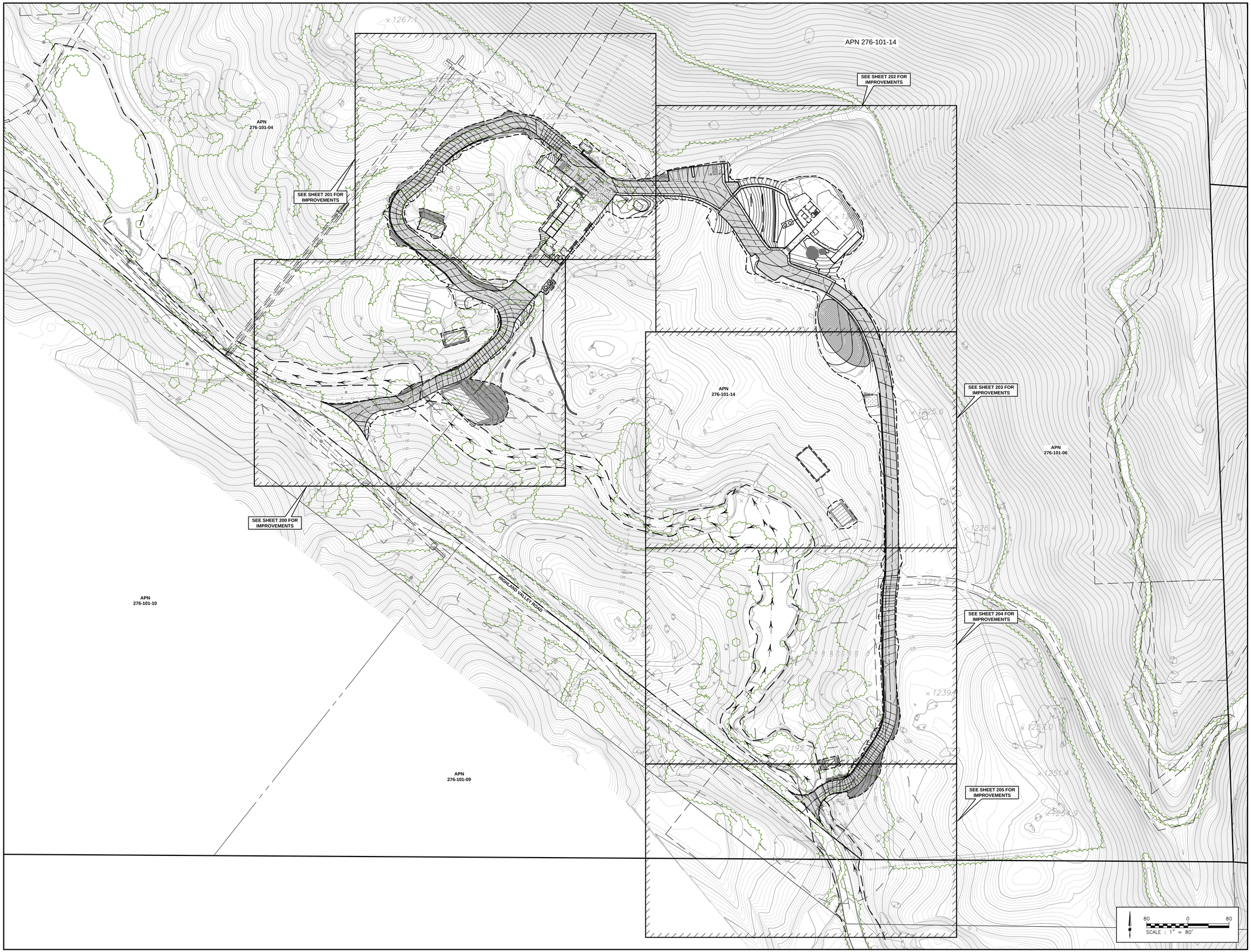
CHECKED BY: DM
DRAWN BY: TA
SCALE: AS SHOWN
DATE: MAY 12, 2020

PROJECT NO. 16-2281

000

DRAWING NO.

Xrefs: X-Ref - Topo - OVERALL.dwg X-Ref - Design.dwg X-Ref - Hatch.dwg X-Ref - JurisdictionalDelineation_Mtg.dwg X-Ref - Profiles.dwg
Xrefs: X-Ref - 100SCALE Scale Bar.dwg Plotted By: Plot Date: May 12, 2020 at 10:12



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PROJECT

PROPOSED WINERY PROJECT
16138 HIGHLAND VALLEY ROAD,
ESCONDIDO, CA

REGISTERED PROFESSIONAL ENGINEER
RAMON ERVIN MARTIN
No. C063621
EXP. 9-30-20
CIVIL
STATE OF CALIFORNIA

PARCEL:
PAR 3, 56.45 AC TMK 276-101-14

REVISIONS

1	USE PERMIT SUBMITTAL #2	05.08.2018
2	USE PERMIT SUBMITTAL #3	04.30.2019
3	USE PERMIT FINAL SUBMITTAL	05.12.2020

SHEET TITLE

OVERALL SITE PLAN

CHECKED BY: DM
DRAWN BY: SW
SCALE: AS SHOWN
DATE: MAY 12, 2020

PROJECT NO. 16-2281

100

DRAWING NO.

MATCH LINE - SEE SHEET 201

ESMT PER DOC 1982-0156199

ESMT PER DOC 1982-0050211

APN 276-101-04

EXISTING STRUCTURE

PROPOSED STORM DRAIN PIPING (TYP)

PROPOSED STORM DRAIN INLET (TYP)

PROPOSED BIORETENTION BASIN #2

50-FT OAK ROOT PROTECTION ZONE (TYP)

PROPOSED BUILDING STORAGE LEVEL FF 1180

PROPOSED 2,500 GAL. SEPTIC TANK

PROPOSED RETAINING WALL

PROPOSED TRENCH DRAIN

PROPOSED RETAINING WALL

20'x8' PARKING STALL (TYP)

CLEANOUT

DRIVEWAY CENTERLINE (TYP)

PROPOSED CONCRETE LINED V-DITCH PER CITY STD. (TYP)

PROPOSED PRIMARY HORIZONTAL PIT

PROPOSED RESERVED HORIZONTAL PIT

GRADING LIMITS 2H:1V MAX (TYP)

24' (TYP)

PROPERTY LINE (TYP)

TWO EXISTING 36"ø CULVERTS

APN 276-101-14

PROPOSED BIORETENTION BASIN #1

100-YR INUNDATION (TYP)

HIGHLAND VALLEY ROAD

PROPOSED FIRE HYDRANT

HIGHLAND VALLEY ROAD CENTERLINE

APN 276-101-10

~25' PAVEMENT

LEGEND

ASPHALT CONCRETE STRUCTURAL SECTION

SCALE : 1" = 20'

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TEL: (707) 544-0784

PROJECT

PROPOSED WINERY PROJECT 16138 HIGHLAND VALLEY ROAD, ESCONDIDO, CA

REGISTERED PROFESSIONAL ENGINEER — JAMES E. MARTIN — No. C063621 — EXP. 9-30-20 — CIVIL — STATE OF CALIFORNIA

PARCEL:

PAR 3, 56.45 AC TMK 276-101-14

REVISIONS

1	USE PERMIT SUBMITTAL #2	05.08.2018
2	USE PERMIT SUBMITTAL #3	04.30.2019
3	USE PERMIT FINAL SUBMITTAL	05.12.2020

SHEET TITLE

PRELIMINARY GRADING AND DRAINAGE PLAN

CHECKED BY: DM

DRAWN BY: TA

SCALE: AS SHOWN

DATE: MAY 12, 2020

PROJECT NO. 16-2281

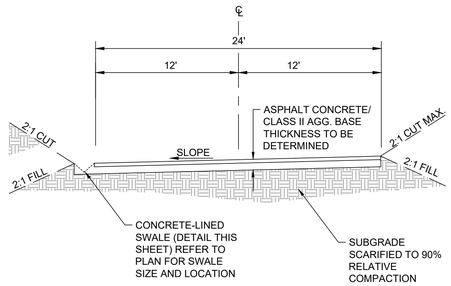
200

DRAWING NO.

Xrefs: X-Ref - Topo - OVERALL.dwg X-Ref - Design.dwg X-Ref - HIGHLAND Delineation Map.dwg X-Ref - Profiles.dwg
Xref - 5/29/2020 Time - Xrefs Bind Log File Argument.dwg Plot Date - May 12, 2020 at 10:13

LEGEND

- ASPHALT CONCRETE STRUCTURAL SECTION
- CONCRETE PAVING
- CONCRETE SIDEWALK



(A) TYPICAL PROPOSED PRIVATE ROAD SECTION

NOT TO SCALE

(E) FENCE (TO REMAIN)(TYP)
(E) VINEYARD ACCESS ROAD (TO REMAIN)(TYP)
ESMT PER DOC 2003-1258575
APN 276-101-04
ESMT PER DOC 2006-0106357
APN 276-101-14
ESMT PER DOC 2003-1258574
PROPERTY LINE (TYP)
PROPOSED DAYLIGHT LINE 2H:1V MAX (TYP)
PT: 9+35.19
PC: 9+93.05
PT: 10+54.58
DRIVEWAY CENTERLINE (TYP)
24' (TYP)
PROPOSED CURB
PROPOSED CONCRETE LINED V-DITCH PER CITY STD. (TYP)
PROPOSED STORM DRAIN PIPE (TYP)
PROPOSED BIOFILTRATION #4
(E) FENCE (TO REMAIN)(TYP)
PC: 8+14.04
PT: 8+13.99
PC: 7+63.54
PT: 7+46.61
PROPOSED STORM DRAIN INLET (TYP)
PROPOSED CONCRETE LINED V-DITCH PER CITY STD. (TYP)
PROPOSED BIORETENTION BASIN #3
PROPOSED BUILDING FF 1236
FS 1235.35
TC/FS 1235.68
FS 1235.68
FS 1235.42
TC/FS 1235.42
FS 1235.24
18' (TYP)
9' (TYP)
PC: 12+15.72
PT: 12+56.74
PROPOSED FIRE HYDRANT
FS 1235.62
PROPOSED ELEVATED HOUSING UNITS 1&2 (ELEVATION PER ARCHITECTS PLAN)
PROPOSED HOUSING UNIT 3 FF 1232
PROPOSED HOUSING UNIT 4 FF 1232
PROPOSED HOUSING UNITS 5&6 FF 1220
PROPOSED HOUSING UNITS 5&6 FF 1218
ROOF TOP PATIO FF 1208
PROPOSED BUILDING FERMENTATION LEVEL FF 1208
PROPOSED BUILDING CRUSH LEVEL FF 1236
PROPOSED CURB
FS 1230.93
FS 1231.53
TC 1232.71
FS 1232.21
TC 1232.83
FS 1232.13
TC/FS 1235.21
PS/TC 1236.00
FS/TC 1235.95
FS/TC 1238.00
PROPOSED RETAINING WALL
PROPOSED RETAINING WALL
MATCH LINE - SEE SHEET 202
MATCH LINE - SEE SHEET 200
SCALE : 1" = 20'

STRATA AP
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PROJECT

PROPOSED WINERY PROJECT
16138 HIGHLAND VALLEY ROAD, ESCONDIDO, CA

REGISTERED PROFESSIONAL ENGINEER
MARK E. MADER
No. C063621
EXP. 9-30-20
CIVIL
STATE OF CALIFORNIA

PARCEL:
PAR 3, 56.45 AC TMK 276-101-14

REVISIONS

1	USE PERMIT SUBMITTAL #2	05.08.2018
2	USE PERMIT SUBMITTAL #3	04.30.2019
3	USE PERMIT FINAL SUBMITTAL	05.12.2020

SHEET TITLE

PRELIMINARY GRADING AND DRAINAGE PLAN

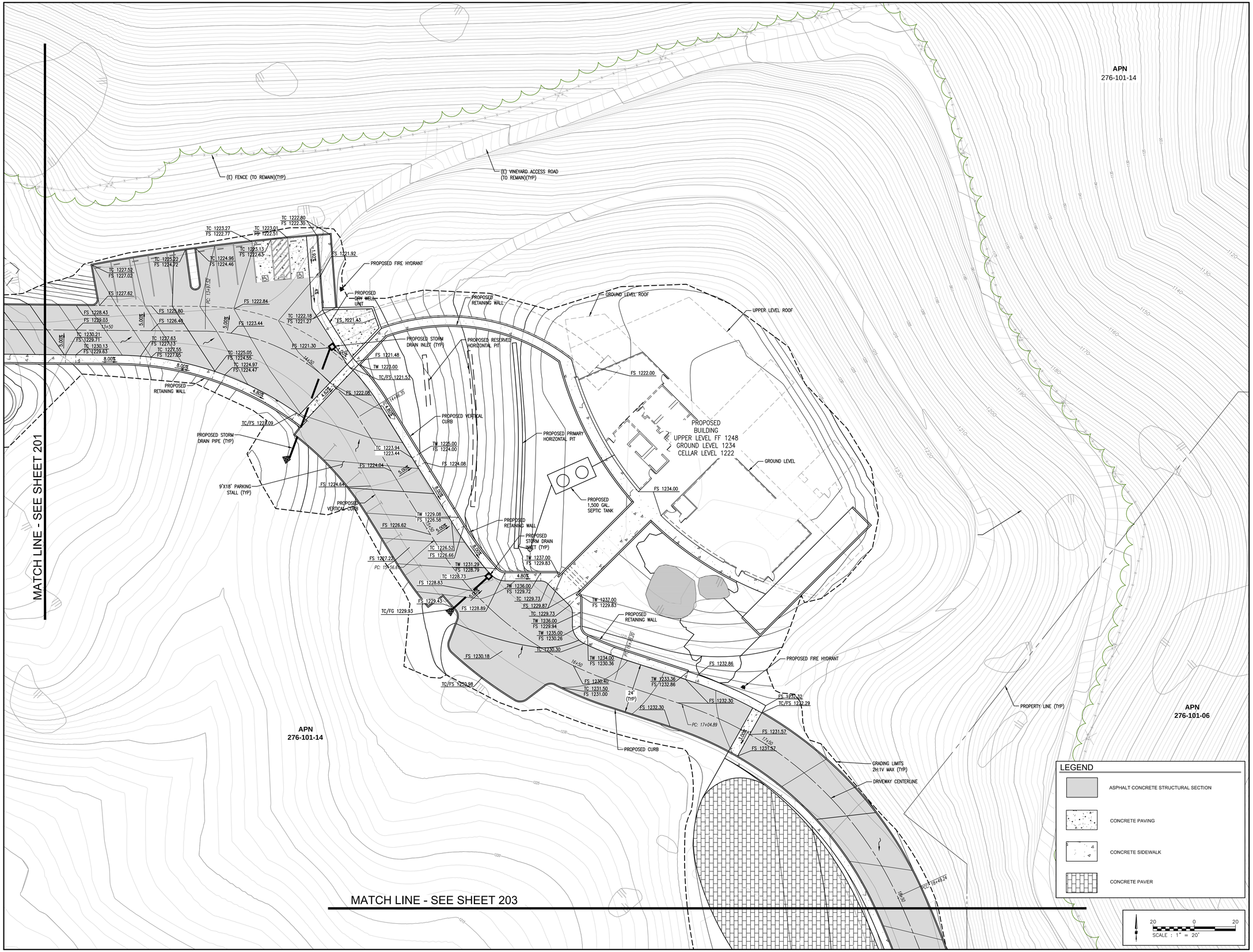
CHECKED BY: DM
DRAWN BY: TA
SCALE: AS SHOWN
DATE: MAY 12, 2020

PROJECT NO. 16-2281

201

DRAWING NO.

Xrefs: X-Ref - Topo - CNDFULL.dwg X-Ref - Design.dwg X-Ref - HSDtl.dwg X-Ref - Jurisdictional Delineation Map.dwg X-Ref - Profiles.dwg
Plot: 5/12/2020 Time: 8:04:17 AM User: jcruz Drawing: Plot Date: May 12, 2020 at 10:11



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PROJECT

PROPOSED WINERY PROJECT
16138 HIGHLAND VALLEY ROAD, ESCONDIDO, CA

REGISTERED PROFESSIONAL ENGINEER
DAVID MARTIN
No. C063621
EXP. 9-30-20
CIVIL
STATE OF CALIFORNIA

PARCEL:
PAR 3, 56.45 AC TMK 276-101-14

REVISIONS

1	USE PERMIT SUBMITTAL #2	05.08.2018
2	USE PERMIT SUBMITTAL #3	04.30.2019
3	USE PERMIT FINAL SUBMITTAL	05.12.2020

SHEET TITLE

PRELIMINARY GRADING AND DRAINAGE PLAN

CHECKED BY: DM
DRAWN BY: TA
SCALE: AS SHOWN
DATE: MAY 12, 2020

PROJECT NO. 16-2281

202

DRAWING NO.

Xrefs: E:\Ref - Topo - XSEWALL.dwg | X-Ref - Design.dwg | X-Ref - Hatch.dwg | X-Ref - Jurisdictional Delineation Map.dwg | X-Ref - Profiles.dwg
Plotted: 5/12/2020 - 9:41 AM by Tara Ayers | plot style: Improvements.ctb | by: Lisa Kay | 22x36 (E) | 1:20.4

MATCH LINE - SEE SHEET 202

PROPERTY LINE (TYP)

(E) FENCE
(TO REMAIN)(TYP)

PROPOSED STORM DRAIN
PIPE & INLET (TYP)

PROPOSED BIOFILTRATION #5

PT: 19+98.26

GRADING LIMITS
2H:1V MAX (TYP)

APN
276-101-14

DRIVEWAY CENTERLINE (TYP)

PT: 20+87.94

PC: 20+99.48

24'
(TYP)

A
201

PC: 21+67.10

PT: 22+06.52

PC: 22+68.29

PT: 22+87.06

PROPOSED VINEYARD
STORAGE

(E) VINEYARD ACCESS ROAD
(TO REMAIN)(TYP)

APN
276-101-06

100-YR INUNDATION (TYP)

EXISTING PUMP HOUSE

50-FT OAK ROOT
PROTECTION ZONE (TYP)

PROPOSED BIORETENTION
BASIN #6

MATCH LINE - SEE SHEET 204

LEGEND

- ASPHALT CONCRETE STRUCTURAL SECTION
- CONCRETE SIDEWALK
- CONCRETE PAVER

SCALE : 1" = 20'

Xrefs: X:\Ref - Topo - SURVEY_Dwg's-Ref - Design-dwg's-Ref - Hdrlic\dwg's-Ref - Jurisdictional Delineation Map.dwg's-Ref - Profiles.dwg
Plot: 12/09/2020 - Mark Arroyo/Last Saved By: Tim Date: May 11, 2020 at 15:13

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PROJECT

PROPOSED WINERY
PROJECT
16138 HIGHLAND
VALLEY ROAD,
ESCONDIDO, CA

REGISTERED PROFESSIONAL ENGINEER
TIMOTHY A. ARROYO
No. C063621
EXP. 9-30-20
CIVIL
STATE OF CALIFORNIA

PARCEL:
PAR 3, 56.45 AC TMK 276-101-14

REVISIONS

1	USE PERMIT SUBMITTAL #2	05.08.2018
2	USE PERMIT SUBMITTAL #3	04.30.2019
3	USE PERMIT FINAL SUBMITTAL	05.12.2020

SHEET TITLE

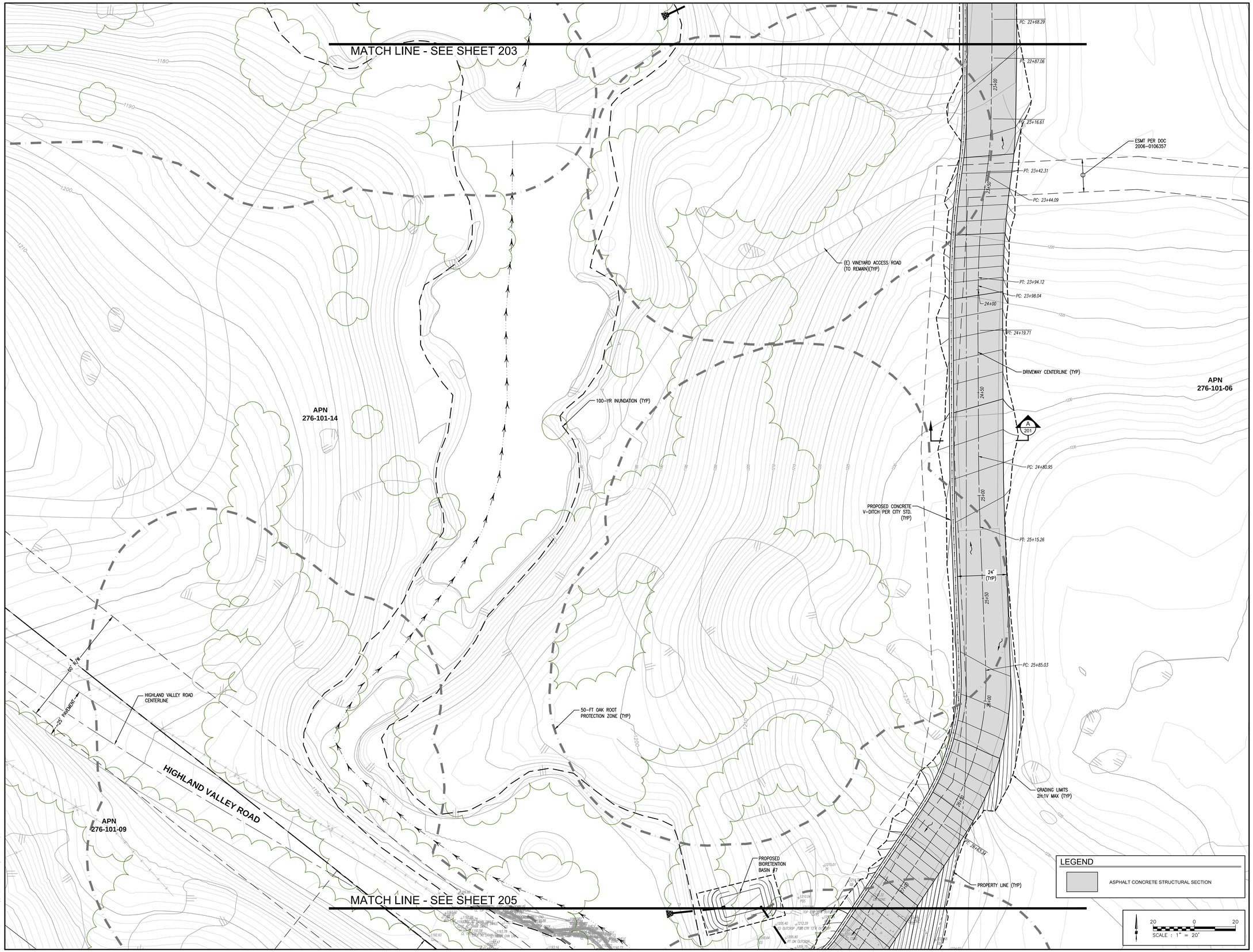
PRELIMINARY GRADING
AND DRAINAGE PLAN

CHECKED BY: DM
DRAWN BY: TA
SCALE: AS SHOWN
DATE: MAY 12, 2020

PROJECT NO. 16-2281

203

DRAWING NO.



STRATA AP
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ARCHITECTURE

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TEL: (707) 544-0784

PROJECT

PROPOSED WINERY PROJECT
16138 HIGHLAND VALLEY ROAD,
ESCONDIDO, CA

REGISTERED PROFESSIONAL ENGINEER
DAVID MARSH
No. C063621
EXP. 9-30-20
CIVIL
STATE OF CALIFORNIA

PARCEL:

PAR 3, 56.45 AC TMK 276-101-14

REVISIONS

1	USE PERMIT SUBMITTAL #2	05.08.2018
2	USE PERMIT SUBMITTAL #3	04.30.2019
3	USE PERMIT FINAL SUBMITTAL	05.12.2020

SHEET TITLE

PRELIMINARY GRADING AND DRAINAGE PLAN

CHECKED BY: DM
DRAWN BY: TA
SCALE: AS SHOWN
DATE: MAY 12, 2020

PROJECT NO. 16-2281

204

DRAWING NO.

Xrefs: X:\16f - Topo - OVERALL.dwg X-Ref - Design.dwg X-Ref - Hatch.dwg X-Ref - Jurisdictional Delineation Map.dwg X-Ref - Profiles.dwg
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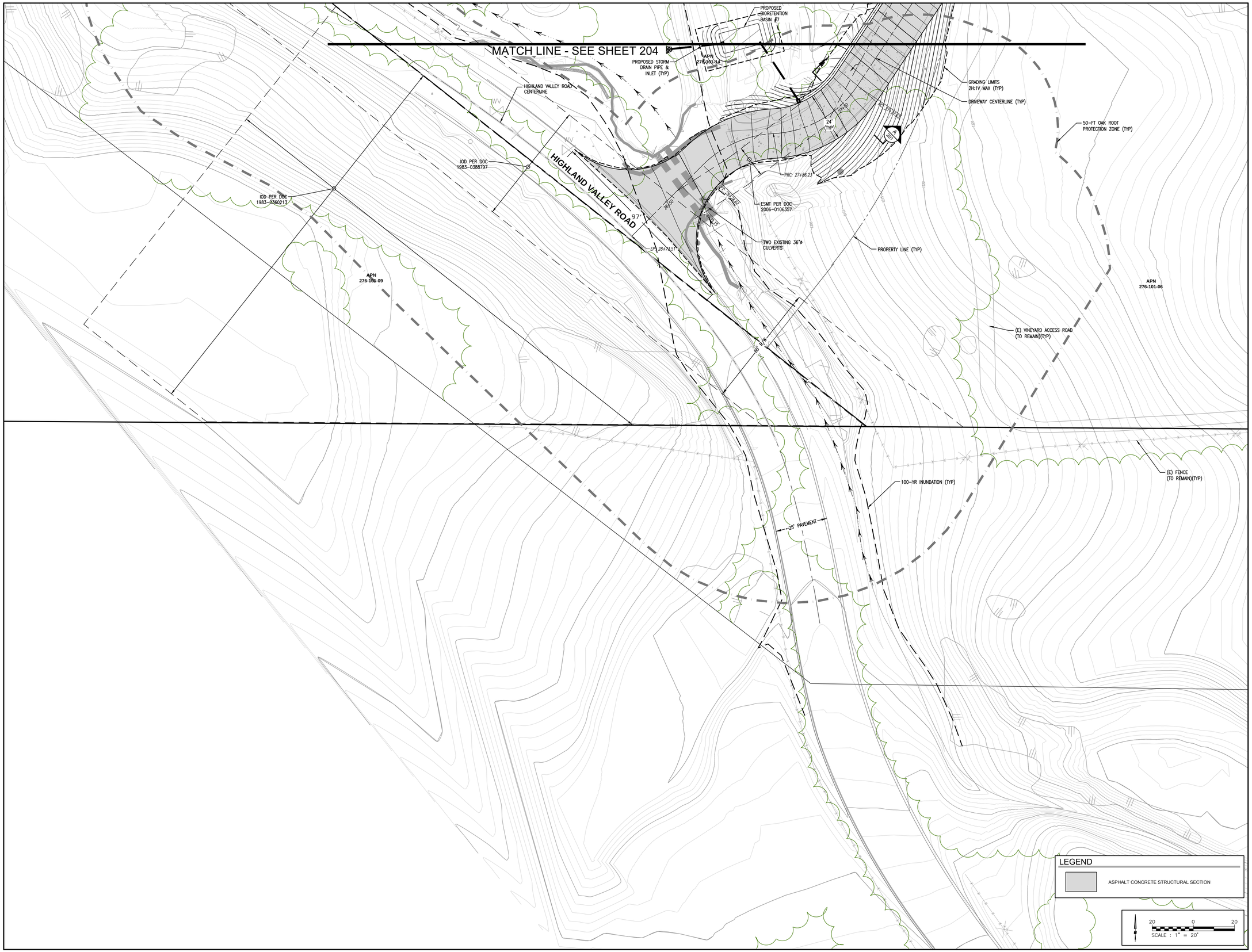

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PROJECT

PROPOSED WINERY PROJECT
16138 HIGHLAND VALLEY ROAD,
ESCONDIDO, CA

REGISTERED PROFESSIONAL ENGINEER
DAVID MARTINEZ
No. C063621
EXP. 9-30-20
CIVIL
STATE OF CALIFORNIA

PARCEL:
PAR 3, 56.45 AC TMK 276-101-14

REVISIONS

1	USE PERMIT SUBMITTAL #2	05.08.2018
2	USE PERMIT SUBMITTAL #3	04.30.2019
3	USE PERMIT FINAL SUBMITTAL	05.12.2020

SHEET TITLE

PRELIMINARY GRADING AND DRAINAGE PLAN

CHECKED BY: DM
DRAWN BY: TA
SCALE: AS SHOWN
DATE: MAY 12, 2020

PROJECT NO. 16-2281

205

DRAWING NO.

Xrefs: X-Ref - Topo - EXERALL.dwg X-Ref - Design.dwg X-Ref - Hatch.dwg X-Ref - Jurisdictional Delineation Map.dwg X-Ref - Profiles.dwg
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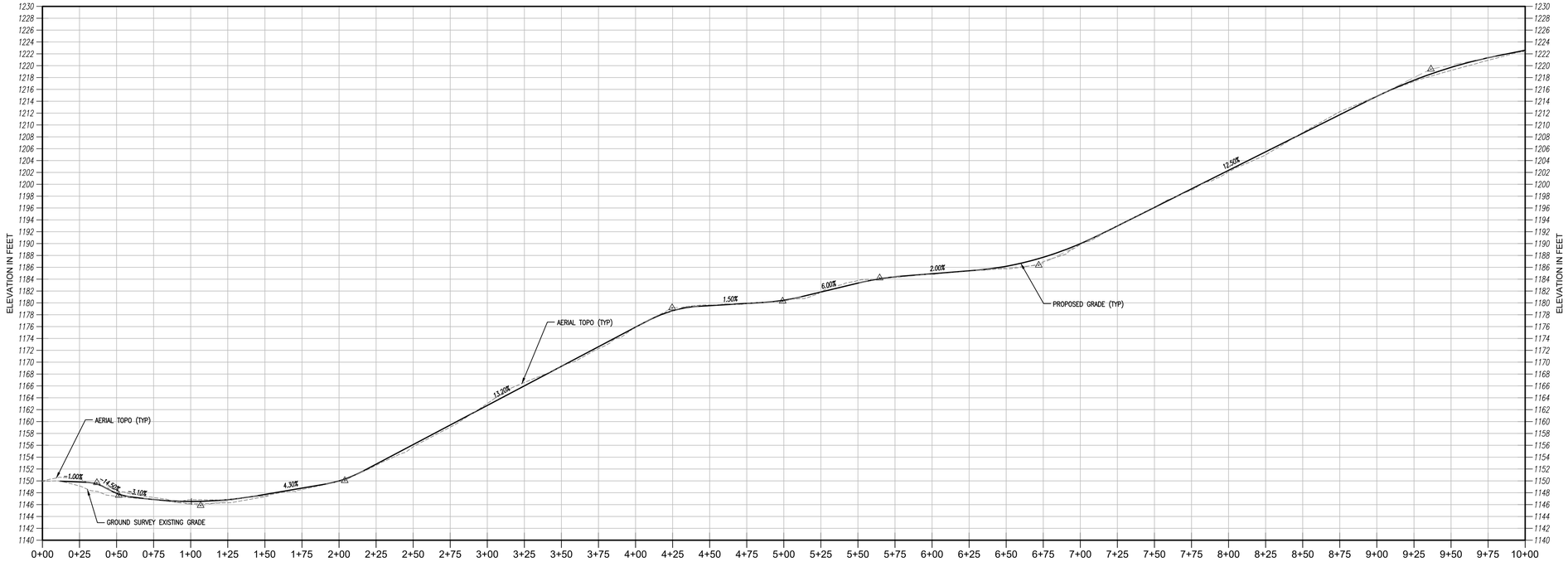
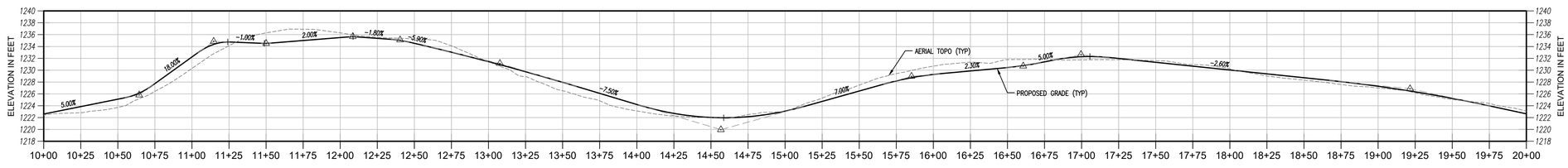


CENTERLINE ROAD PROFILE STA 0+00 TO 10+00

HORIZONTAL: 1" = 40'
VERTICAL: 1" = 10'



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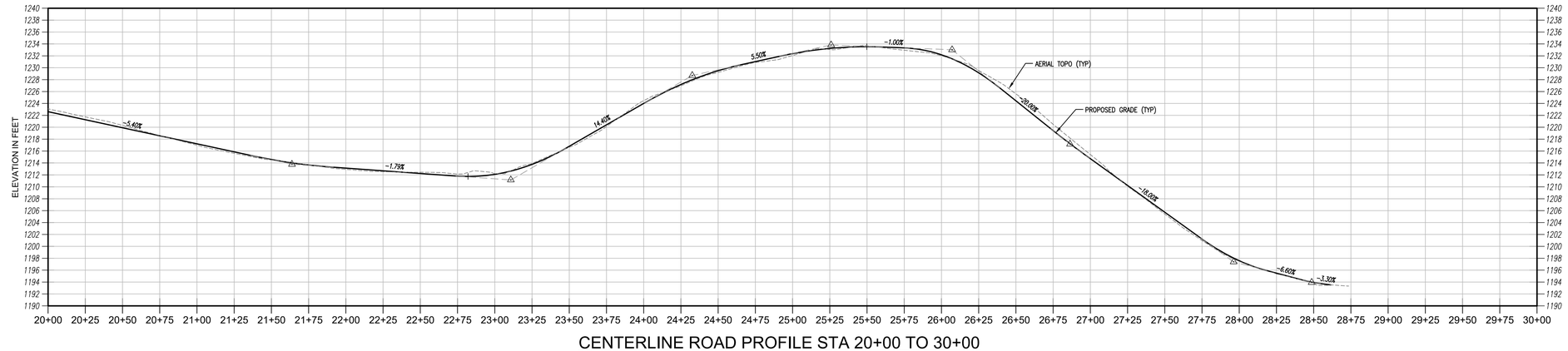

CENTERLINE ROAD PROFILE STA 20+00 TO 30+00

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VERTICAL: 1" = 10'

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PROJECT

PROPOSED WINERY PROJECT
16138 HIGHLAND VALLEY ROAD,
ESCONDIDO, CA

REGISTERED PROFESSIONAL ENGINEER
JAMES E. MILLER
No. C063621
EXP. 9-30-20
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REVISIONS

1	USE PERMIT SUBMITTAL #2	05.08.2018
2	USE PERMIT SUBMITTAL #3	04.30.2019
3	USE PERMIT FINAL SUBMITTAL	05.12.2020

SHEET TITLE

CENTERLINE ROAD PROFILE

CHECKED BY: DM
DRAWN BY: TA
SCALE: AS SHOWN
DATE: MAY 12, 2020

PROJECT NO. 16-2281

206

DRAWING NO.

Xrefs: S:\Ref Files - Topo - CIVIL\Dwg\Ref - Design Dwg\X-Ref - HIGH.dwg X-Ref - Jurisdictional Delineation Map.dwg X-Ref - Profiles.dwg
Plotted: 5/12/2020 - 9:44A By: Randy Ford (S:\Ref Files - Topo - CIVIL\Dwg\Ref - Design Dwg\X-Ref - HIGH.dwg) - Plot Scale: 1 = 1.0000 ft or 1 in.

ATTACHMENT 6

Copy of Project's Drainage Report

This is the cover sheet for Attachment 6.

If hardcopy or CD is not attached, the following information should be provided:

Title: Perrin Winery – CEQA Preliminary Drainage Report
Prepared By: EBA Engineering, Inc.
Date: NOVEMBER 8, 2019

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ATTACHMENT 6 COPY OF PROJECT DRAINAGE REPORT

CEQA PRELIMINARY DRAINAGE REPORT

PERRIN WINERY

RECORD ID: PDS2016-AD-16-023
APN 276-101-04, 276-101-14, 276-101-06
16138 Highland Valley Road
Escondido, CA 92025

Prepared By:

Damon Morelli, P.E. RCE 063621

REGISTERED PROFESSIONAL ENGINEER
DAMON ERIC MORELLI
No. C063621
EXP. 9-30-20
CIVIL
STATE OF CALIFORNIA

EBA ENGINEERING

EBA Engineering, Inc.
825 Sonoma Avenue, Suite C
Santa Rosa, CA 95404
(EBA Project No. 16-2281)

Prepared for:
Gregory L. Perrin
30318 Longhorn Drive
Canyon Lake, CA 92587
November 8, 2019

C-1

DECLARATION OF RESPONSIBLE CHARGE

DECLARATION OF RESPONDIBLE CHARGE

I, HEREBY 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 PROFESSION CODE, AND THAT THE DESIGN IS CONSISTENT WITH THE 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.

ENGINEER OF WORK

11/20/19

Damon Morelli, RCE 063621 DATE



TABLE OF CONTENTS

SECTION **PAGE**

DECLARATION OF RESPONSIBLE CHARGE **C-1**

1.0 PROJECT INFORMATION **1**

1.1 INTRODUCTION AND PRE-DEVEILOPMENT CONDITION 1

1.2 PROJECT VICINITY MAP 2

1.3 POST DEVELOPMENT CONDITION 2

1.4 OVERALL WATERSHED HYDROLOGY 3

1.5 100-YR FLOOD HAZARD AREA 4

1.6 PROJECT Q&A 4

2.0 HYDROLOGY CALCULATIONS AND BASIN SIZING **5**

2.1 HYDROLOGY AND HYDRAULIC CALCULATIONS 5

2.2 BASIN SIZING 9

3.0 CONCLUSION **9**

LIST OF APPENDICES

Appendix A
- Pre-Development Site Discharge Hydrology Map
- Post-Development Site Discharge Hydrology Map

Appendix B
- Pre-Development 100-Yr Watershed Hydrology Map
- Post-Development 100-Yr Watershed Hydrology Map

Appendix C
- Hydrology/Hydraulic Calculations
- County of San Diego Hydrologic Tables and Figures
- Hydrologic Soil Group Map
- Hydrograph and Basin Calculations

Appendix D
- FEMA Flood Zone Map

1.0 PROJECT INFORMATION

1.1 INTRODUCTION AND PREDEVELOPMENT SITE CONDITION

This CEQA Preliminary Drainage Study is prepared for the Perrin Winery project located at 16138 Highland Valley Road, Escondido, CA 92025 in Ramona Community Plan area, within unincorporated San Diego County, see the project vicinity map. The site APNs are 276-101-04, 276-101-14 , 276-101-06. The proposed improvements of winery facilities and buildings are in APN 276-101-05. The APNs 276-101-04 and 276-101-06 will only involve with access road improvements. The existing site is a single-family residence with over 22 acres of vineyard that would be retained. The site consists of existing concrete/unpaved onsite private road connected to Highland Valley Road at the east entrance and wraps around the project site along the mountain ridge and connected to Highland Valley Road at the west entrance. There is a seasonal creek that flows from east to west crossing both entrances along Highland Valley Road. There are two existing 36-inch culverts at each crossing. The majority site drainage runoff sheet flows in north to south direction towards vineyard area and ultimately flows to the seasonal creek located south of the site that runs along Highland Valley Road in southeast to northwest direction. See Predevelopment Site Discharge Hydrology Map in Appendix A for more detail. The project total disturbed area is 197,069 sf or 4.5 acres and the existing impervious area for this project is 1.22 acres or 27.1% of the site. The site drainage has been divided into 5 systems with subarea to be compared with the post development condition. Systems #1 through #4 drains to seasonal creek on the south side while System #5 drains to the other side of the hill. The runoff is calculated using rational method for each drainage area. Table 1 shows the predevelopment drainage area (A), runoff coefficient (C), time of concentration (Tc), rainfall intensity (I), peak runoff flow rate (Q_{100}) and discharge velocity (V_{100}) at the discharge point during 100-year storm event for each drainage system.

System #1

System #1 includes subarea A and B which drain from the north of the project site through the open area and ultimately discharges at the west entrance of the project site.

System #2

System #2 includes subarea C and D which drain from the north to southeast along the onsite private road and discharge through the open area at the northeast vineyard area that ultimately flows down to the lower seasonal creek.

System #3

System #3 includes subarea E located on the east area of the project site. The includes a partial hillside and along the onsite private road and discharge to sideslope concrete v-ditch which ultimately discharge to the lower seasonal creek.

System #4

System #4 include subarea F located at the north area of east entrance area. The runoff is discharged to the seasonal creek at the east entrance.

System #5

System #5 include a small subarea G on the north side of the site that discharges to the other side of the hill.

1.2 PROJECT VINCINITY MAP

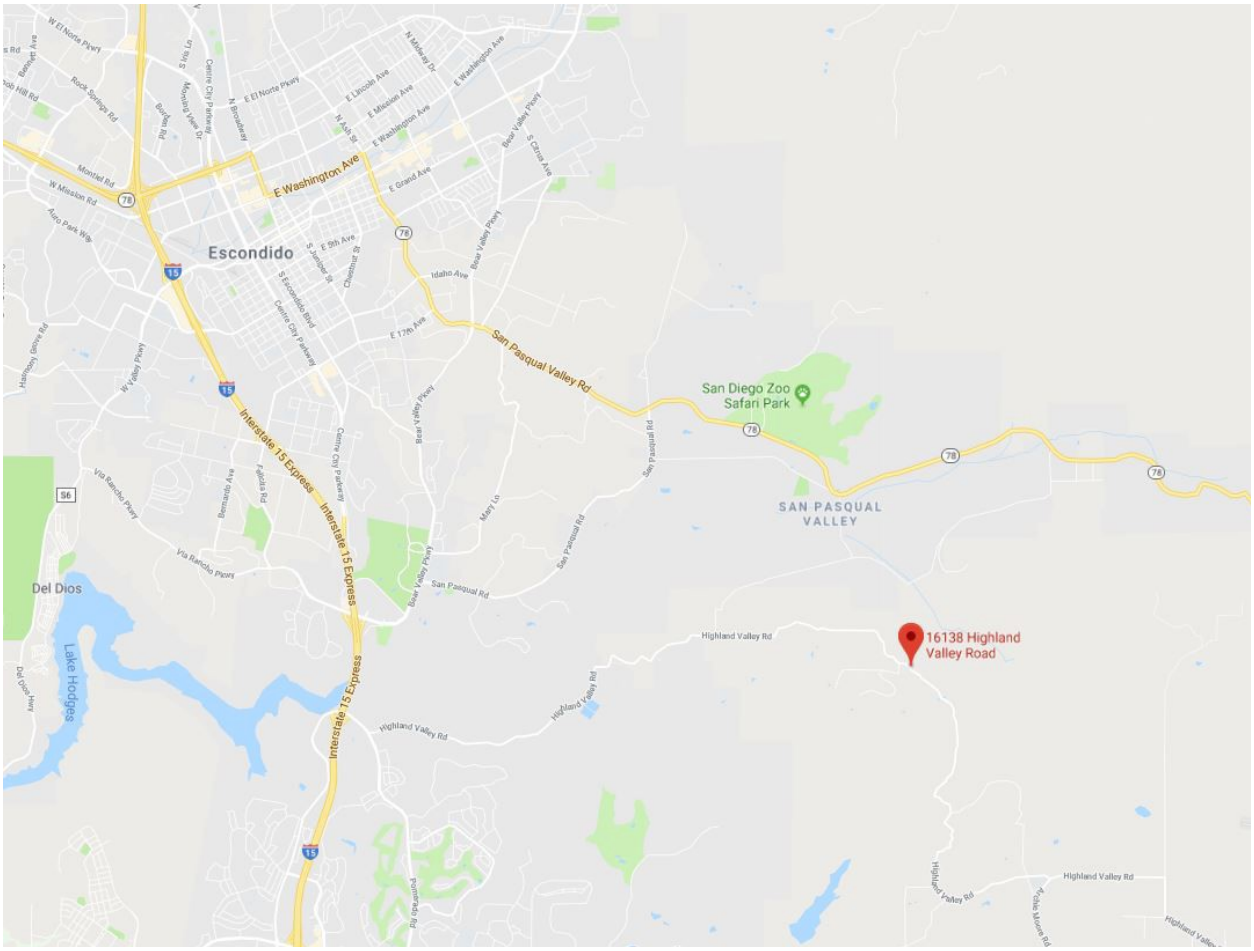


Figure 1 Project vicinity map

1.3 POST DEVELOPMENT CONDITION

The proposed project improvements consist of paved access road, a new winery facility, a crush pad, hospitality building, a climatized storage building, and parking. The proposed impervious area is approximately 2.92 acres or 64.6% of the disturbed area (see Post Development Site Discharge Hydrology Map in Appendix A). The runoff generated by rooftops of the buildings,

paved parking lot, paved access road, and other impervious areas will be routed to bioretention areas prior to exiting the site.

The proposed site drainage has been divided into 5 systems with subarea to be compared with the pre-development condition. Systems #1 through #4 drains to seasonal creek on the south side while System #5 drains to the other side of the hill. There is no change in drainage pattern between predevelopment and post development conditions. The summary table in Appendix C.7 shows the post development drainage area (A), runoff coefficient (C), time of concentration (Tc), rainfall intensity (I), peak runoff flow rate (Q_{100}) and discharge velocity (V_{100}) at the discharge point during 100-year storm event for each drainage system.

System #1

System #1 is divided into three subsystems #1A, #1B and #1C. System #1A includes subarea E, F, and A. Subarea E and F drain to each drop inlet then discharge back to drainage area A through the energy dissipator to be discharged at a non-erosive velocity. The runoff from Area A drains to catch basin then the underground piping system and to the bioretention basin #1 located at the west entrance.

System #1B include subarea B that collect the surface runoff from the hill side and along the paved road through the concrete V-ditch and drains to the drop inlet before discharging to the bioretention basin #2 for the subarea B. The drainage from the basin will be discharge to the lower creek.

System #1C includes subarea C which drain from the northwest open area to paved road and to catch basin then drain to bioretention basin #3 and ultimately discharges to the lower creek at the west entrance of the project site.

System #2

System #2 includes subarea G that drains from the north side to the vineyard area located at the northeast area of the project site. The runoff will be treated and capture at Biofiltration #5 with partial retention and will be sheet flow back to the lower which ultimately drains to the lower creek.

System #3

System #3 includes subarea H located on the east area of the project site and along the paved road. The existing sideslope concrete V-ditch that used to intercept the runoff will be abandoned and replaced with bioretention basin #6 at the nearby location. Once the runoff is mitigated the remaining runoff will be discharged to the lower creek.

System #4

System #4 include subarea I located at the south entrance area. The runoff is discharged to the seasonal creek at the east entrance.

System #5

System #5 include a parking lot subarea G on the north side of the site that discharges to the biofiltration #4 with partial retention and ultimately discharges to other side of the hill.

Each drainage system will mitigate the runoff to reduce the post-development peak runoff flow rate less than the pre-development conditions. The bioretention and biofiltration areas will treat and detain the runoff in order to mitigate potential hydromodification impacts. The proposed drainage system is adequate to handle 100-year storm event without flooding the site. The outlet points are located at the same or nearby the existing discharge locations. All outlet will be designed to discharge at a non-erosive velocity.

1.4 OVERALL WATERSHED HYDROLOGY

Predevelopment 100-year hydrology map shows the overall tributary watershed area of 706.5 acres producing runoff through the site entrances (see Figure HYD1 in Appendix B). Based on the hydrology calculation, the site has the peak flow rate (Q_{100}) approximately 845 cubic feet per second (cfs) through the site during the 100-yr storm event assuming all watersheds has hydrologic soil group "C". The post development hydrology map for the whole watershed area (see Figure HYD2 in Appendix B) calculated by adjusting the post development runoff coefficient (C) shows that the peak flow rate (Q_{100}) has increased to 849.0 cfs. The increase in the post development peak flow rate is considered to be insignificant when considered the overall watershed and assuming that the existing culverts would be able to handle the increased flow. However, the project will mitigate the post development peak runoff flow rate (Q_{100}) to be less or equal the predevelopment conditions at the same discharge point. Existing culverts improvements and/or restoration at both entrances may occur to ensure that the culverts are capable of handling such flow and the runoff will not flood the site.

1.5 100-YR FLOOD HAZARD AREA

The site is located in area of minimal flood hazard (Unshaded Zone X) as listed on FEMA FIRMette Map (see Attachment D). The 100-yr inundation line is defined based on the overall watershed hydrology and is shown on Pre-Development and Post Development Hydrology Map Figures. There will be no structures or buildings that may impede or redirect flood flow.

1.6 PROJECT Q&A

Here is the list of Q&A for project review and approval:
Q: Will the project substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site?

A: No. The drainage patterns will not be altered significantly in the post development condition. There is no alteration to a stream and a river that will increase erosion and siltation on- or off-site.

Q: Will the project substantially alter the existing drainage pattern of the site or area including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?

A: No. The overall drainage patterns will be maintained similar to the existing condition. There is no alteration of the course of a stream or river and the rate or amount of runoff will not significantly increase to cause flooding on- or off-site.

Q: Will the project create or contribute runoff water which will exceed the capacity of existing or planned storm water drainage systems?

A: No. The project will not create or contribute runoff water which will exceed the capacity of existing or planned storm water drainage systems.

Q: Will the project place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map, including County Floodplain Maps?

A: No. The project site is not located within a 100-year flood hazard area. See FEMA Flood Zone Map in Appendix D.

Q: Will the project place within a 100-year flood hazard area structures which would impede or redirect flood flows?

A: No. The project site is not located within a 100-year flood hazard area that will impede or redirect flood flows.

2.0 HYDROLOGY CALCULATIONS AND BASIN SIZING

2.1 HYDROLOGY AND HYDRAULIC CALCULATIONS

The proposed project will increase impervious surface from existing conditions that results in increasing stormwater runoff. The proposed bioretention basins and other stormwater drainage structures are designed to detain the increased runoff and to reduce any impacts on public drainage systems or downstream courses. The project will mitigate the increased runoff by a series of stormwater Best Management Practices (BMPs) as part of Hydro Modification Management Plan (HMP) requirements.

The calculations only compare stormwater runoff between the predevelopment condition and post development condition within the improvement areas. The drainage area outside the impacted areas are not considered. Using "Rational Method" for 6-hour 100-year storm, the flow rate (Q) is calculated at each control point.

Drainage Summary

	Pre-Development						Post-Development							Mitigated		Mitigation Method
	C_w	T_c	I	A_T	V_{100}	Q_{100}	C_w	T_c	I	A_T	V_{100}	Q_{100}	ΔQ	V_{100}	Q_{100}	
	(unitless)	(minutes)	(inch/hour)	(acre)	(ft/sec)	**(cfs)**	(unitless)	(minutes)	(inch/hour)	(acre)	(ft/sec)	**(cfs)**	(cfs)	(ft/sec)	**(cfs)**	
POC 1	0.39	23.46	3.40	4.16	11.49	**5.59**	0.55	22.26	3.52	4.12	11.49	**8.02**	2.43	10.52	**4.78**	**Bioretention. Please See Attached Basin Routing Worksheets.**
POC 2	0.52	15.03	4.53	1.14	9.13	**2.68**	0.45	17.09	4.17	1.27	8.74	**2.40**	-0.28	n/a	**n/a**	**Post Development Flow is Less Than Pre Development Flows. No Flow Mitigation required.**
POC 3	0.39	18.12	4.02	1.71	8.87	**2.69**	0.42	13.56	4.85	1.66	9.61	**3.41**	0.72	8.87	**2.52**	**Bioretention. Please See Attached Basin Routing Worksheets.**
POC 4	0.64	8.28	6.66	0.13	5.45	**0.53**	0.88	5.38	8.80	0.14	7.12	**1.10**	0.57	4.90	**0.40**	**Bioretention. Please See Attached Basin Routing Worksheets.**
POC 5	0.51	19.73	3.80	0.73	7.36	**1.40**	0.77	10.37	5.76	0.51	8.48	**2.25**	0.85	6.73	**1.04**	**Bioretention. Please See Attached Basin Routing Worksheets.**
POC 6	0.47	14.37	4.67	1.51	9.51	**3.28**	0.49	16.21	4.32	1.52	9.55	**3.20**	-0.08	n/a	**n/a**	**Post Development Flow is Less Than Pre Development Flows. No Flow Mitigation required.**
POC 7	0.61	9.85	5.96	0.26	6.54	**0.95**	0.62	8.78	6.41	0.23	6.59	**0.91**	-0.04	n/a	**n/a**	**Post Development Flow is Less Than Pre Development Flows. No Flow Mitigation required.**

Detail hydrology and hydraulic calculations can be found in Appendix C.

2.2 BASIN SIZING

The pond for each DMA was sized to allow storage for the 100-year storm to mitigate additional runoff due to the development of the site based on the pond storage routing analysis outlined in the San Diego County Hydraulic Design Manual, September 2014, Section 6. The routing calculations and resulting hydrographs can be found in Appendix C.

3.0 CONCLUSION

The proposed project improvements will not significantly alter the existing drainage patterns nor alter the course of the seasonal creek that flows through the site. Hydro Modification Plan (HMP), Best Management Practices (BMPs), and mitigation measures will be implemented to capture and reduce the peak runoff before it is discharged to ensure that there will be no damage to the downstream drainage facilities and drainage channels which could result in substantial erosion or siltation on- or off-site.

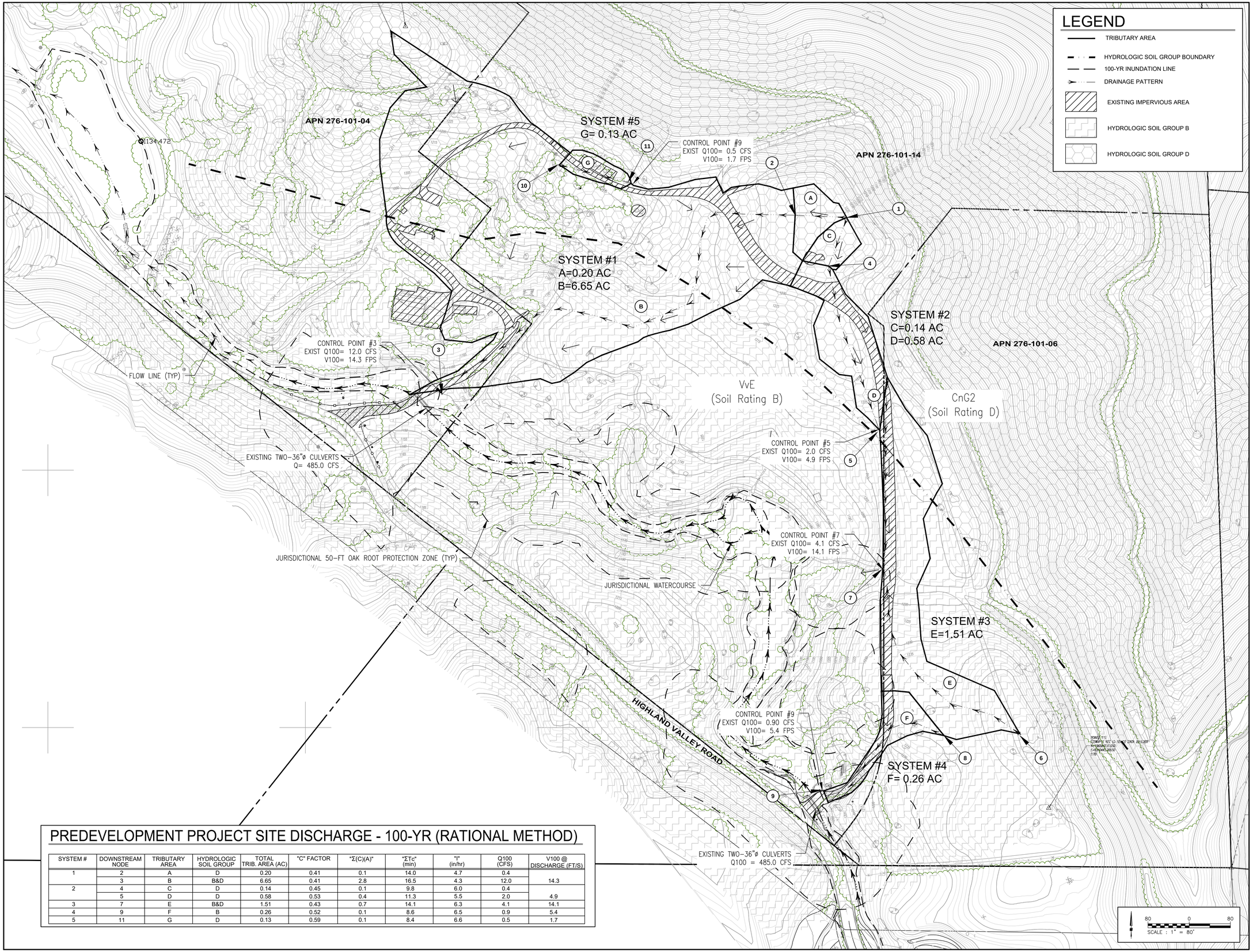
The final design of HMP, BMPs, onsite stormwater facilities will be presented in the final report.

APPENDIX A

SITE DISCHARGE HYDROLOGY MAPS

APPENDIX A.1

PRE-DEVELOPMENT SITE DISCHARGE HYDROLOGY MAP FOR CONDUIT AND CHANNEL ANALYSIS



PREDEVELOPMENT PROJECT SITE DISCHARGE - 100-YR (RATIONAL METHOD)

SYSTEM #	DOWNSTREAM NODE	TRIBUTARY AREA	HYDROLOGIC SOIL GROUP	TOTAL TRIB. AREA (AC)	"C" FACTOR	"Σ(C)(A)"	"ΣTc" (min)	"I" (in/hr)	Q100 (CFS)	V100 @ DISCHARGE (FT/S)
1	2	A	D	0.20	0.41	0.1	14.0	4.7	0.4	
	3	B	B&D	6.65	0.41	2.8	16.5	4.3	12.0	14.3
2	4	C	D	0.14	0.45	0.1	9.8	6.0	0.4	
	5	D	D	0.58	0.53	0.4	11.3	5.5	2.0	4.9
3	7	E	B&D	1.51	0.43	0.7	14.1	6.3	4.1	14.1
4	9	F	B	0.26	0.52	0.1	8.6	6.5	0.9	5.4
5	11	G	D	0.13	0.59	0.1	8.4	6.6	0.5	1.7

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PROJECT

PROPOSED WINERY
PROJECT
16138 HIGHLAND
VALLEY ROAD,
ESCONDIDO, CA

REVISIONS

SHEET TITLE

PRE-DEVELOPMENT
SITE DISCHARGE
HYDROLOGY MAP

CHECKED BY: DM
DRAWN BY: WC
SCALE: AS SHOWN
DATE: NOVEMBER 8, 2019

PROJECT NO. 16-2281

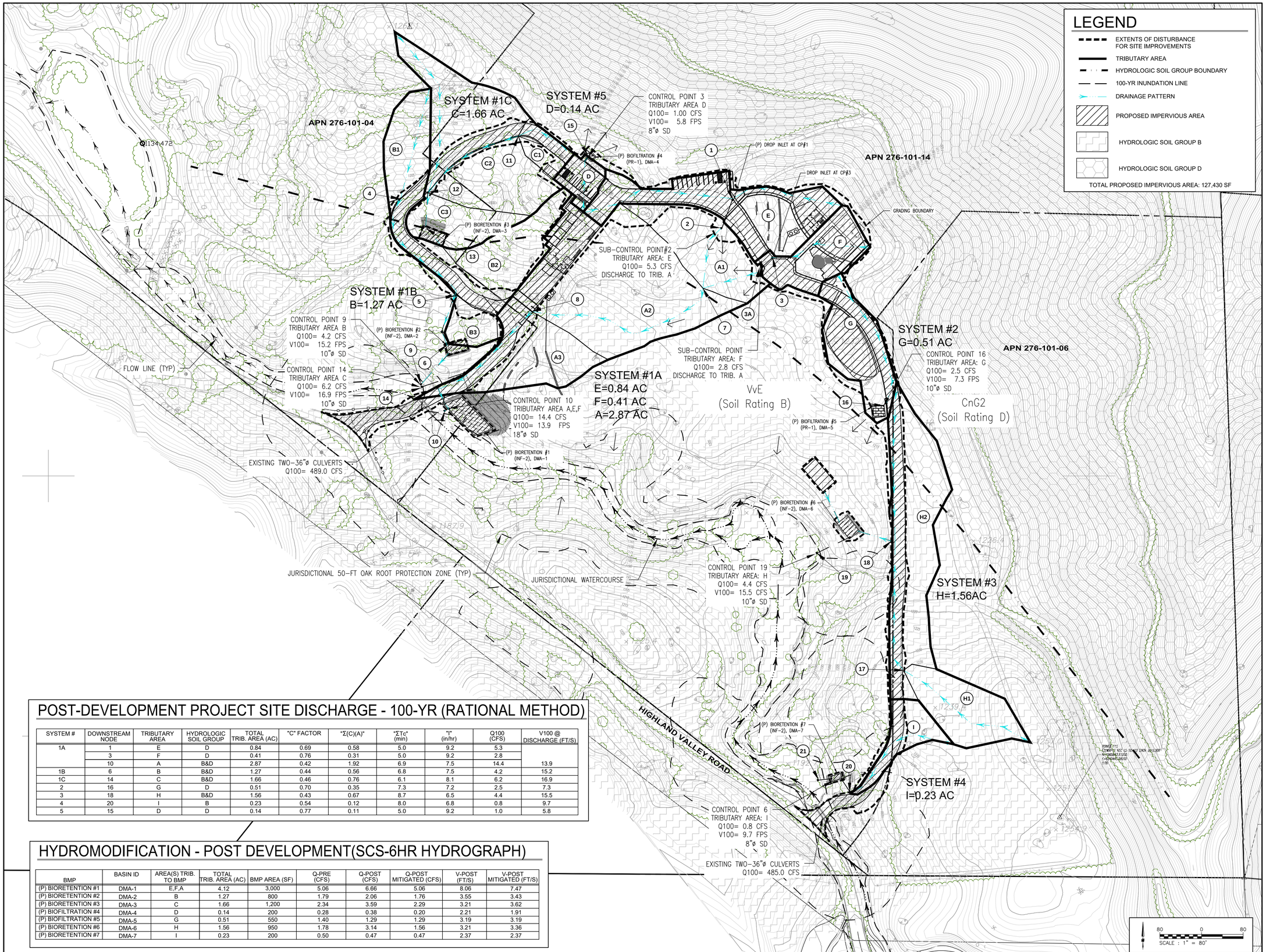
1

FIGURE NO.

Xrefs: X-Ref - Topo - OVERALL.dwg X-Ref - Design.dwg Points: Gis Ranch Winery Pnts_Current.dwg Z:\A16 Winery Plans\Block.dwg Z:\A16 Hospitality\Block.dwg temp xrefs Topo - OVERALL.dwg X-Ref - Jurisdictional Delineation Map.dwg
Plot: 5/29/2020 11:04a Wendy Cook P:\Planning\Winery - Planning Set.dwg Plot Date: May 13, 2020 at 10:41

APPENDIX A.2

POST-DEVELOPMENT SITE DISCHARGE HYDROLOGY MAP FOR CONDUIT AND CHANNEL ANALYSIS



POST-DEVELOPMENT PROJECT SITE DISCHARGE - 100-YR (RATIONAL METHOD)

SYSTEM #	DOWNSTREAM NODE	TRIBUTARY AREA	HYDROLOGIC SOIL GROUP	TOTAL TRIB. AREA (AC)	"C" FACTOR	"Σ(C)(A)"	"ΣTc" (min)	"I" (in/hr)	Q100 (CFS)	V100 @ DISCHARGE (FT/S)
1A	1	E	D	0.84	0.69	0.58	5.0	9.2	5.3	
	3	F	D	0.41	0.76	0.31	5.0	9.2	2.8	
	10	A	B&D	2.87	0.42	1.92	6.9	7.5	14.4	13.9
1B	6	B	B&D	1.27	0.44	0.56	6.8	7.5	4.2	15.2
1C	14	C	B&D	1.66	0.46	0.76	6.1	8.1	6.2	16.9
2	16	G	D	0.51	0.70	0.35	7.3	7.2	2.5	7.3
3	18	H	B&D	1.56	0.43	0.67	8.7	6.5	4.4	15.5
4	20	I	B	0.23	0.54	0.12	8.0	6.8	0.8	9.7
5	15	D	D	0.14	0.77	0.11	5.0	9.2	1.0	5.8

HYDROMODIFICATION - POST DEVELOPMENT(SCS-6HR HYDROGRAPH)

BMP	BASIN ID	AREA(S) TRIB. TO BMP	TOTAL TRIB. AREA (AC)	BMP AREA (SF)	Q-PRE (CFS)	Q-POST (CFS)	Q-POST MITIGATED (CFS)	V-POST (FT/S)	V-POST MITIGATED (FT/S)
(P) BIORETENTION #1	DMA-1	E,F,A	4.12	3,000	5.06	6.66	5.06	8.06	7.47
(P) BIORETENTION #2	DMA-2	B	1.27	800	1.79	2.06	1.76	3.55	3.43
(P) BIORETENTION #3	DMA-3	C	1.66	1,200	2.34	3.59	2.29	3.21	3.62
(P) BIOFILTRATION #4	DMA-4	D	0.14	200	0.28	0.38	0.20	2.21	1.91
(P) BIOFILTRATION #5	DMA-5	G	0.51	550	1.40	1.29	1.29	3.19	3.19
(P) BIORETENTION #6	DMA-6	H	1.56	950	1.78	3.14	1.56	3.21	3.36
(P) BIORETENTION #7	DMA-7	I	0.23	200	0.50	0.47	0.47	2.37	2.37

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PROJECT

PROPOSED WINERY PROJECT
16138 HIGHLAND VALLEY ROAD,
ESCONDIDO, CA

REVISIONS

SHEET TITLE

POST-DEVELOPMENT SITE DISCHARGE HYDROLOGY MAP

CHECKED BY: DM

DRAWN BY: WC

SCALE: AS SHOWN

DATE: NOVEMBER 8, 2019

PROJECT NO. 16-2281

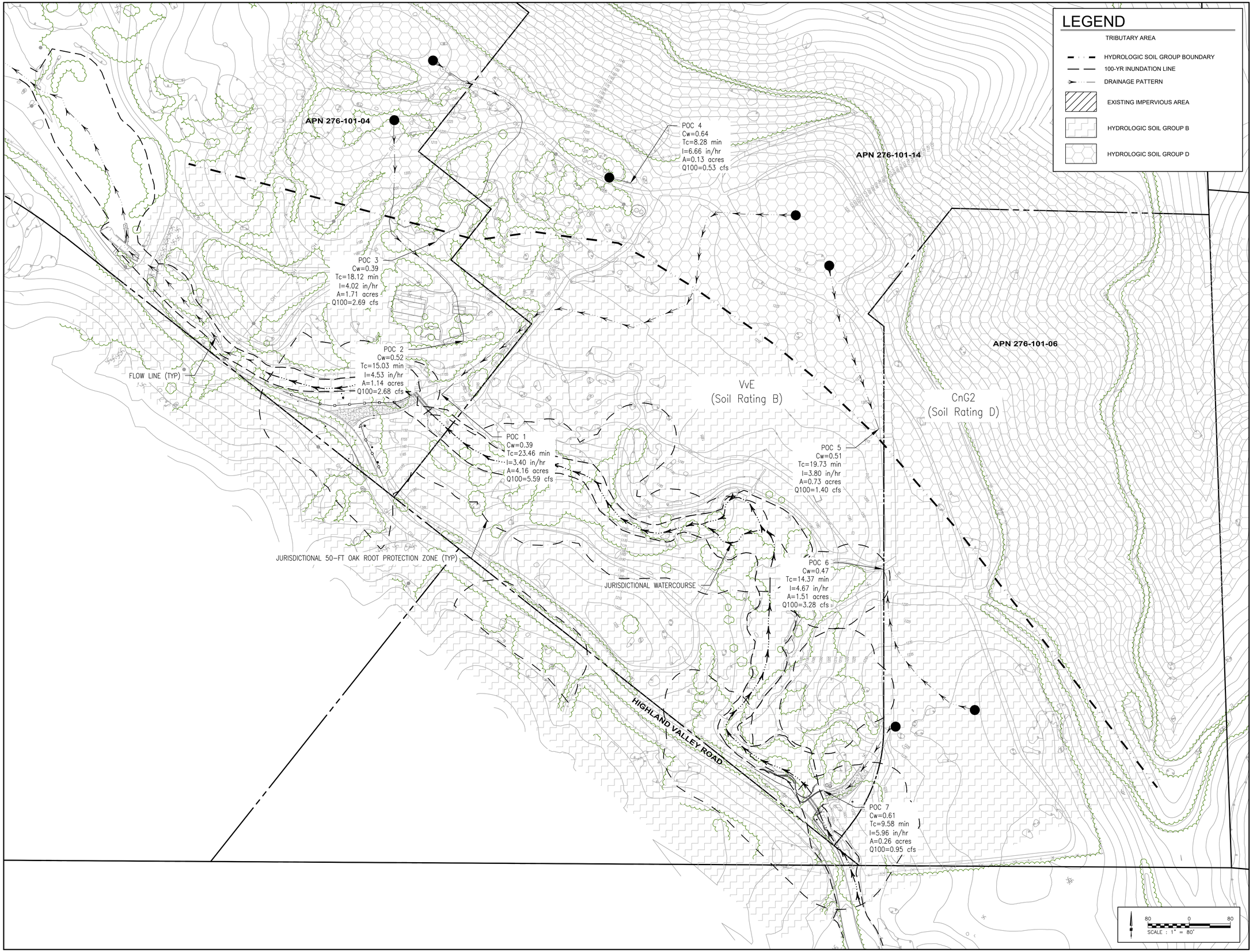
2

FIGURE NO.

Xrefs: h-Ref - Topo - CIVIL\ALL.dwg h-Ref - Design-eng\Rock Oak Ranch Winery Plan_Current.dwg 24x36 Winery 36x24.dwg 24x36 Hospitality36x24.dwg temp arch Topo - CIVIL\ALL.dwg h-Ref - Jurisdictional Delineation Map.dwg
Xrefs: 15 SEPTEMBER - Plans - Winery\Grading\Grading Plans - Winery - Summary Map.dwg Plot Date: May 13, 2020 at 08:44

APPENDIX A.3

POST-DEVELOPMENT SITE MAP FOR BASIN ROUTING ANALYSIS



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PROJECT

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PROJECT
16138 HIGHLAND
VALLEY ROAD,
ESCONDIDO, CA

REVISIONS

1	--	--
2	--	--
3	--	--

CONSTRUCTION DOCUMENTS

SHEET TITLE

PRE-DEVELOPMENT
BASIN ANALYSIS
HYDROLOGY MAP

CHECKED BY: DM
DRAWN BY: MM
SCALE: AS SHOWN
DATE: NOVEMBER 8, 2019

PROJECT NO. 16-2281

1

FIGURE NO.

Xrefs: Y-Xref -- Topo -- (NEW)ALL.dwg Y-Xref -- Design Dwg's Y-Xref -- Jurisdictional Delineation Map.dwg
Plots: 11/20/2019 - Steve Kay (Last Plotted By: Steve Kay) -- Plotted At: Wed, Nov 27, 2019 at 09:02

APPENDIX A.4

POST-DEVELOPMENT SITE MAP FOR BASIN ROUTING ANALYSIS

LEGEND

- EXTENTS OF DISTURBANCE FOR SITE IMPROVEMENTS
- TRIBUTARY AREA
- HYDROLOGIC SOIL GROUP BOUNDARY
- 100-YR INUNDATION LINE
- DRAINAGE PATTERN
- PROPOSED IMPERVIOUS AREA
- HYDROLOGIC SOIL GROUP B
- HYDROLOGIC SOIL GROUP D

TOTAL PROPOSED IMPERVIOUS AREA: 127,430 SF

APN 276-101-04

APN 276-101-14

APN 276-101-06

POC 4
Cw=0.88
Tc=5.38 min
I=8.80 in/hr
A=0.14 acres
Q100=1.10 cfs
Qmit=0.40 cfs

(P) BIOFILTRATION #4 (PR-1), DMA-4

(P) BIORETENTION #3 (INF-2), DMA-3

GRADING BOUNDARY

POC 3
Cw=0.42
Tc=13.56 min
I=4.85 in/hr
A=1.66 acres
Q100=3.41 cfs
Qmit=2.52 cfs

(P) BIORETENTION #2 (INF-2), DMA-2

POC 2
Cw=0.45
Tc=17.09 min
I=4.17 in/hr
A=1.27 acres
Q100=2.40 cfs

FLOW LINE (TYP)

POC 5
Cw=0.77
Tc=10.37 min
I=5.76 in/hr
A=0.51 acres
Q100=2.25 cfs
Qmit=1.04 cfs

VvE
(Soil Rating B)

CnG2
(Soil Rating D)

(P) BIOFILTRATION #5 (PR-1), DMA-5

(P) BIORETENTION #1 (INF-2), DMA-1

POC 1
Cw=0.55
Tc=22.26 min
I=3.52 in/hr
A=4.12 acres
Q100=8.02 cfs
Qmit=4.78 cfs

(P) BIORETENTION #6 (INF-2), DMA-6

JURISDICTIONAL 50-FT OAK ROOT PROTECTION ZONE (TYP)

POC 6
Cw=0.49
Tc=16.21 min
I=4.32 in/hr
A=1.52 acres
Q100=3.20 cfs

JURISDICTIONAL WATERCOURSE

(P) BIORETENTION #7 (INF-2), DMA-7

HIGHLAND VALLEY ROAD

POC 7
Cw=0.62
Tc=8.78 min
I=6.41 in/hr
A=0.23 acres
Q100=0.91 cfs

80 0 80
SCALE : 1" = 80'

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PROJECT

PROPOSED WINERY
PROJECT
16138 HIGHLAND
VALLEY ROAD,
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REVISIONS

1	--	--
2	--	--
3	--	--

CONSTRUCTION DOCUMENTS

SHEET TITLE

POST-DEVELOPMENT SITE DISCHARGE HYDROLOGY MAP

CHECKED BY: DM
DRAWN BY: WC
SCALE: AS SHOWN
DATE: NOVEMBER 8, 2019

PROJECT NO. 16-2281

2

FIGURE NO.

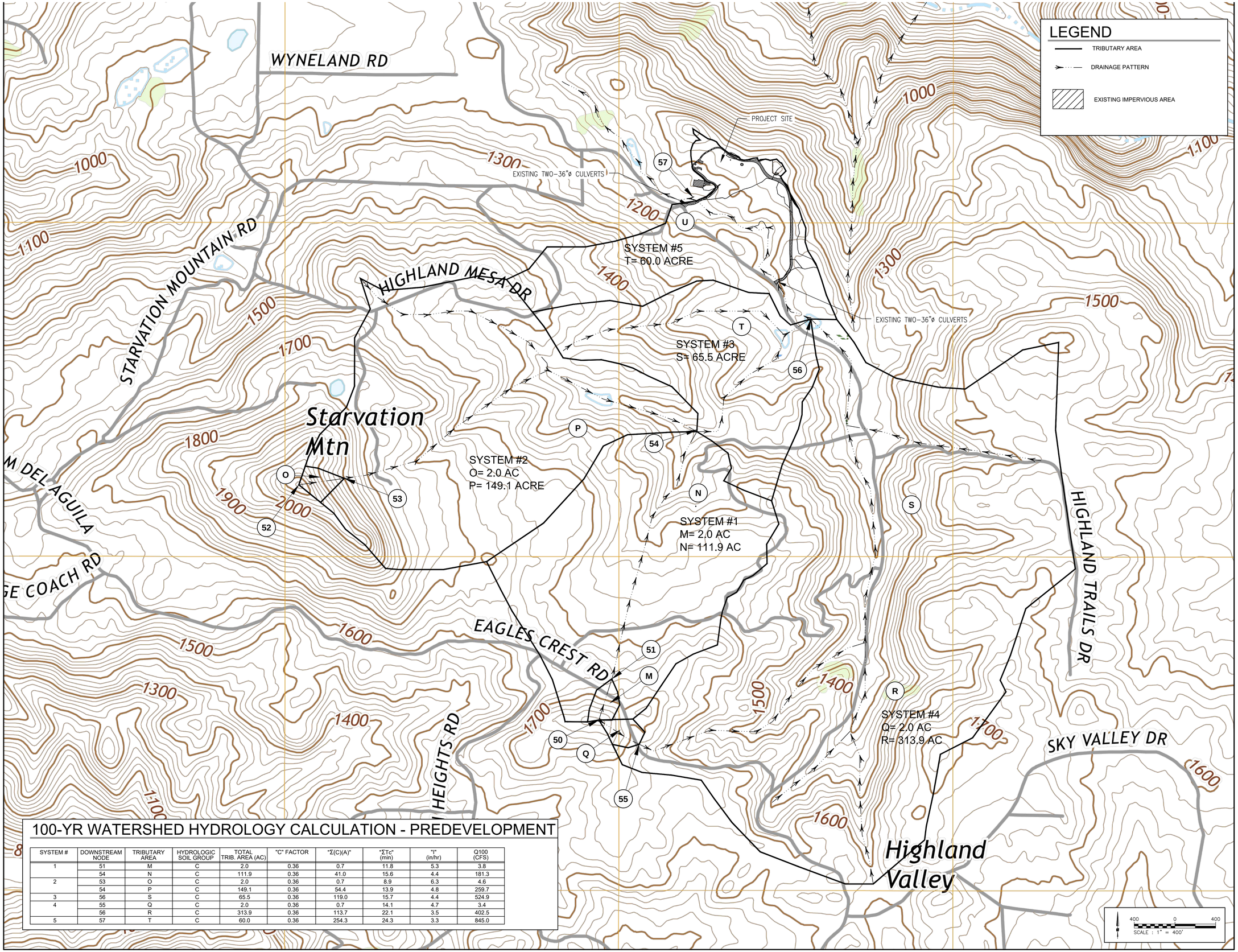
Xrefs: X-Ref - Topo - CivilXML.dwg X-Ref - Design Layers.dwg X-Ref - Jurisdictional Delineation Map.dwg
Plot: By: SDSU\Josh Stone Plotted: 11:07 PM on Nov 12, 2019 Plot Scale: Nov 12, 2019 at 09:01

APPENDIX B

100-YR WATERSHED HYDROLOGY MAPS

APPENDIX B.1

PRE-DEVELOPMENT 100-YR WATERSHED HYDROLOGY MAP



100-YR WATERSHED HYDROLOGY CALCULATION - PREDEVELOPMENT

SYSTEM #	DOWNSTREAM NODE	TRIBUTARY AREA	HYDROLOGIC SOIL GROUP	TOTAL TRIB. AREA (AC)	"C" FACTOR	"Σ(C)(A)"	"ΣTc" (min)	"I" (in/hr)	Q100 (CFS)
1	51	M	C	2.0	0.36	0.7	11.8	5.3	3.8
	54	N	C	111.9	0.36	41.0	15.6	4.4	181.3
2	53	O	C	2.0	0.36	0.7	8.9	6.3	4.6
	54	P	C	149.1	0.36	54.4	13.9	4.8	259.7
3	56	S	C	65.5	0.36	119.0	15.7	4.4	524.9
4	55	Q	C	2.0	0.36	0.7	14.1	4.7	3.4
	56	R	C	313.9	0.36	113.7	22.1	3.5	402.5
5	57	T	C	60.0	0.36	254.3	24.3	3.3	845.0

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PROJECT

PROPOSED WINERY
PROJECT
16138 HIGHLAND
VALLEY ROAD,
ESCONDIDO, CA

REVISIONS

SHEET TITLE
PREDEVELOPMENT
100-YR WATERSHED
HYDROLOGY MAP

CHECKED BY: DM
DRAWN BY: WC
SCALE: AS SHOWN
DATE: NOVEMBER 8, 2019

PROJECT NO. 16-2281

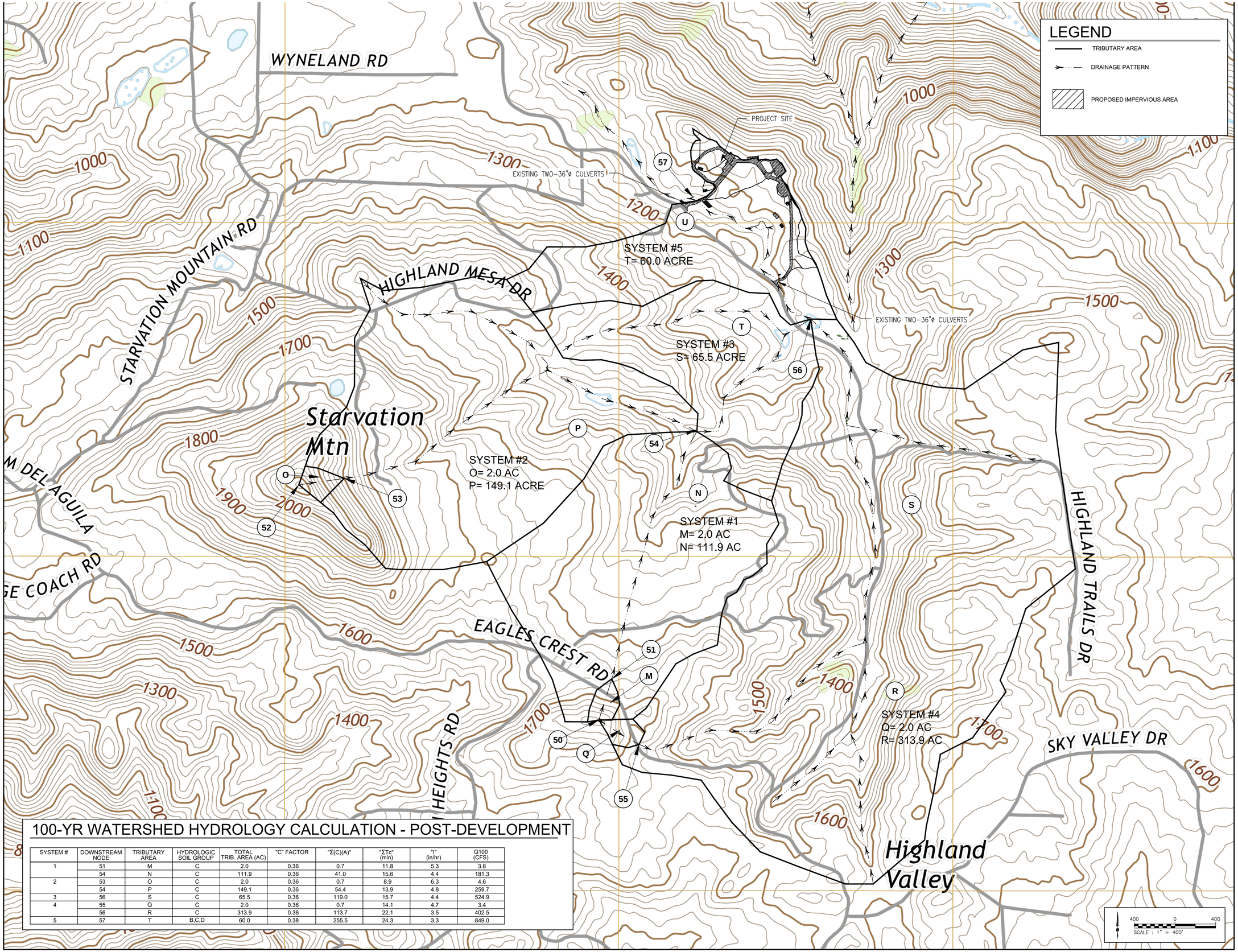
HYD1

FIGURE NO.

Xrefs: Y:\16-2281 - Topo - Highland Valley\16-2281 - Design Dwg\Permit Ckt Ranch Winery Plans_Current dwg\24x36 Hospitality\Stock dwg\Hosp and Topo - OVERALL.dwg 1:1 Y:\16-2281 - Topo - Highland Valley\16-2281 - Design Dwg\Permit Ckt Ranch Winery Plans_Current dwg\24x36 Hospitality\Stock dwg\Hosp and Topo - Jurisdictional Delineation Map.dwg
Date: 12/20/2021 Time: Mary Lou Plotted By: Mary Lou Plot Name: Ranch Winery - Hydrology Map.dwg

APPENDIX B.2

POST-DEVELOPMENT 100-YR WATERSHED HYDROLOGY MAP



100-YR WATERSHED HYDROLOGY CALCULATION - POST-DEVELOPMENT

SYSTEM #	DOWNSTREAM NODE	TRIBUTARY AREA	HYDROLOGIC SOIL GROUP	TOTAL TRIB. AREA (AC)	"C" FACTOR	"Σ(C)(A)"	"ΣTc" (min)	"I" (in/hr)	Q100 (CFS)
1	51	M	C	2.0	0.36	0.7	11.8	5.3	3.8
	54	N	C	111.9	0.36	41.0	15.6	4.4	181.3
2	53	O	C	2.0	0.36	0.7	8.9	6.3	4.6
	54	P	C	149.1	0.36	54.4	13.9	4.8	259.7
3	56	S	C	65.5	0.36	119.0	15.7	4.4	524.9
4	55	Q	C	2.0	0.36	0.7	14.1	4.7	3.4
	56	R	C	313.9	0.36	113.7	22.1	3.5	402.5
5	57	T	B,C,D	60.0	0.38	255.5	24.3	3.3	849.0

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PROJECT

PROPOSED WINERY
PROJECT
16138 HIGHLAND
VALLEY ROAD,
ESCONDIDO, CA

REVISIONS

SHEET TITLE
POST-DEVELOPMEN
100-YR HYDROLOG
MAP

CHECKED BY: DM
DRAWN BY: WC
SCALE: AS SHOWN
DATE: NOVEMBER 8, 2019

PROJECT NO. 16-2281

HYD2

FIGURE NO.

Xrefs: Y:\16_ Topo - \16\TRAIL.dwg Y:\16_ Design Dwg\Permit Ckt Ranch Winery Plan_Current dwg\24x36 Hospitality\Stock.dwg Stock.dwg and Topo - \16\TRAIL.dwg Y:\16_ Jurisdictional Delineation Map.dwg
Plot: 12/05/2020 Plan Plan\Land Use\Permit Plans\Winery - Hydrology Map.dwg Plot Size: ARCH D (36.00 x 24.00 Inches)

APPENDIX C

HYDROLOGY/HYDRAULIC CALCULATIONS

APPENDIX C.1

PRE-DEVELOPMENT HYDROLOGY/HYDRAULIC CALCULATIONS FOR CONDUIT AND CHANNEL ANALYSIS

Perrin Winery
16138 Highland Valley Road
Escondido, CA
Hydrology Calculations - Predevelopment Project Site Discharge Area
11/8/2019

Calculate Weighted C-Values (Predevelopment)

Assumptions:

1) Assume "Low Density Residential with 1.0DU/A" for pervious areas and "General Commercial" for impervious areas for runoff coefficients on Table 3-1 from County of San Diego Hydrology Manual (2003).

2) Use a C-value of 0.80 and 0.82 for impervious areas soil group B and D.

3) Use a C-value of 0.32 and 0.41 for pervious areas soil group B and D.

Tributary A: (Hydrologic Soil Group D)

pervious areas=	8628	sf
impervious areas =	0	sf
total area =	8628	sf

$C_{weighted}$= 0.41

Tributary B: (Hydrologic Soil Group B&D)

pervious areas=	107971	sf	Soil group B
impervious areas =	10779	sf	Soil group B
pervious areas=	156220	sf	Soil group D
impervious areas =	14530	sf	Soil group D
total area =	289500	sf	

$C_{weighted}$= 0.41

Tributary C: (Hydrologic Soil Group D)

pervious areas=	5669	sf
impervious areas =	577	sf
total area =	6246	sf

$C_{weighted}$= 0.45

Tributary D: (Hydrologic Soil Group D)

pervious areas=	17771	sf
impervious areas =	7579	sf
total area =	25350	sf

$C_{weighted}$= 0.53

Tributary E: (Hydrologic Soil Group B)

pervious areas=	42076	sf	Soil group B
impervious areas =	10333	sf	Soil group B
pervious areas=	10289	sf	Soil group D
impervious areas =	3164	sf	Soil group D
total area =	65863	sf	

$C_{weighted}$= 0.43

Tributary F: (Hydrologic Soil Group B)

pervious areas=	6583	sf
impervious areas =	4882	sf
total area =	11465	sf

$C_{weighted}$= 0.52

Tributary G: (Hydrologic Soil Group D)

pervious areas=	3013	sf
impervious areas =	2477	sf
total area =	5490	sf

$C_{weighted}$= 0.59

Perrin Winery
16138 Highland Valley Road
Escondido, CA
Hydrology Calculations - Predevelopment Project Site Discharge Area
11/8/2019

100-Yr Watershed Hydrology - Predevelopment Project Site Discharge Area

Assumptions:

1) Use "Overland Time Flow Nomograph" equation for initial time of concentration:

$$T = \frac{1.8\,(1.1-C)\sqrt{D}}{\sqrt[3]{S}}$$

Where Ti= Time of Concentration (Minutes)
C= Runoff Coefficient, Use C-Weighted for the system watershed
S= Slope (%)
D or L = Water Course Distance (Feet)
* Assume sheet flow length is 100 feet

2) Use "Time of Concentration" equation from Figure 3-4 of San Diego County Hydrology Manual

$$Tc = \left(\frac{11.9L^3}{\Delta E}\right)^{0.385}$$

Where Tc= Time of Concentration (Hour)
L= Water Course Distance (Miles)
ΔE= Change in Elevation (Feet)
A= Area (Acre)

3) Use "Rainfall Intensity" equation; $I = 7.44\,(P_{6})\,D^{-0.645}$

Where I= Rainfall Intensitty (in/hr)
P_6= ("3.5"), Rainfall Isopluvials 100-Yr 6-Hr ; See Isopluvial Map
D, (Tc)= Time of Concentration (Minutes)

	Tributary Area	Upstream Node	Downstream Node	A, (ac)	D, (ft)	C	(C)*(A)	Σ(CA)	ΔE, (ft)	S, (%)	Ti, (min)	Tc, (min)	ΣTc	v (ft/s)	I, (in/hr)	Q_{100}
System #1	A	1	2	0.20	100	0.41	0.1	0.1	1	1.0	12.4	1.6	14.0		4.7	0.4
	B	2	3	6.65	900	0.41	2.7	2.8	93	10.3		2.4	16.5	14.3	4.3	12.0
System #2*	C	1	4	0.14	100	0.45	0.1	0.1	3	2.5	8.6	1.1	9.8		6.0	0.4
	D	4	5	0.58	332	0.53	0.3	0.4	15	4.5		1.5	11.3	4.9	5.5	2.0
System #3	E	6	7	1.51	457	0.43	0.7	0.7	45	9.8	6.9	2.1	9.0	14.1	6.3	4.1
System #4*	F	8	9	0.26	300	0.52	0.1	0.1	45	14.8	8.0		8.0	5.4	6.8	0.9
System #5*	G	10	11	0.13	100	0.59	0.1	0.1	2	2.0	7.2	1.2	8.4	1.7	6.6	0.5

*Assume System #2, #4 and #5 sheet flow to natural watershed.

Perrin Winery
16138 Highland Valley Road
Escondido, CA
Hydrology Calculations - Predevelopment Project Site Discharge Area
11/8/2019

Determine t_c:

System #1

t_c @ Point of Concentration #2 *14 min*

Determine t_c from Line of Point 2 to 3:

Q @ Point 2=	0.4	cfs	
Estimated Q @ Point 3=	12.3	cfs	** Based on q_{avg} = 1.8 cfs/acre
Average Q in reach=	6.4	cfs	

Assume Triangular Channel Flow:

Q=	6.4	cfs	→ SEE CALCS, PG.
n=	0.035		
side slopes=	4:1		
slope=	0.103		
velocity=	6.15	fps	*** Per Channel Report, pg.
flow length=	900	ft	
travel time=	2.4	min	From POC #2 to #3

System #2

t_c @ Point of Concentration #4 *9.8 min*

Determine t_c from Line of Point 4 to 5:

Q @ Point 4=	0.4	cfs	
Estimated Q @ Point 5=	1.7	cfs	** Based on q_{avg} = 2 .3cfs/acre
Average Q in reach=	1.0	cfs	

Assume Triangular Channel Flow:

Q=	1.0	cfs	→ SEE CALCS, PG.
n=	0.035		
side slopes=	4:1		
slope=	0.045		
velocity=	3.62	fps	*** Per Channel Report, pg.
flow length=	332	ft	
travel time=	1.5	min	From POC #4 to #5

System #3

Tributary Area "E" Overland flow to Control Point #7

C weighted=	0.43		
A=	1.51	ac	
L=	457	ft	Use 100 ft Maximum Length for initial
ΔE	45	ft	;1257-1212
S=	9.8	%	
Ti=	6.9	min	from Figure 3-3 of the Hydrology Manual for natural
Tt=	2.1	min	from Figure 3-4 of the Hydrology Manual for natural
Total ΣTc=	9.0	min	
I=	6.3	in/hr	
Q=	**4.1**	cfs	

Perrin Winery
16138 Highland Valley Road
Escondido, CA
Hydrology Calculations
11/8/2019

Pre Development Channel Velocity at Discharge Locations

Control Point 3: 7 ft wide Trapezoidal Channel

Tributary Area: A+B

Assume Trapezoidal Channel

Q_{100}=	12.0	cfs	
Bottom Width=	48	in	
Sideslope=	1:1		
Total Depth=	1.5	ft	
n=	0.014		
slope=	0.1950		
flow depth=	0.20	ft	→ Per calcs, pg.
Velocity=	14.29	fps	

Control Point 5: 3 ft wide V-Ditch Channel

Tributary Area: C+D

Assume V-Ditch Channel

Q_{100}=	2.0	cfs	
Bottom Width=	N/A	in	
Sideslope=	2:1		
Total Depth=	1.5	ft	
n=	0.014		
slope=	0.0200		
flow depth=	0.45	ft	→ Per calcs, pg.
Velocity=	4.9	fps	

Control Point 7: 5 ft wide Trapezoidal Channel

Tributary Area: E

Assume 2:1 V-Ditch Channel

Q_{100}=	4.1	cfs	
Bottom Width=	0	in	
Sideslope=	1:1		
Total Depth=	1.5	ft	
n=	0.014		
slope=	0.1640		
flow depth=	0.54	ft	→ Per calcs, pg.
Velocity=	14.1	fps	

Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Wednesday, Feb 20 2019

Q @ System #1 POC #2 to #3

Triangular

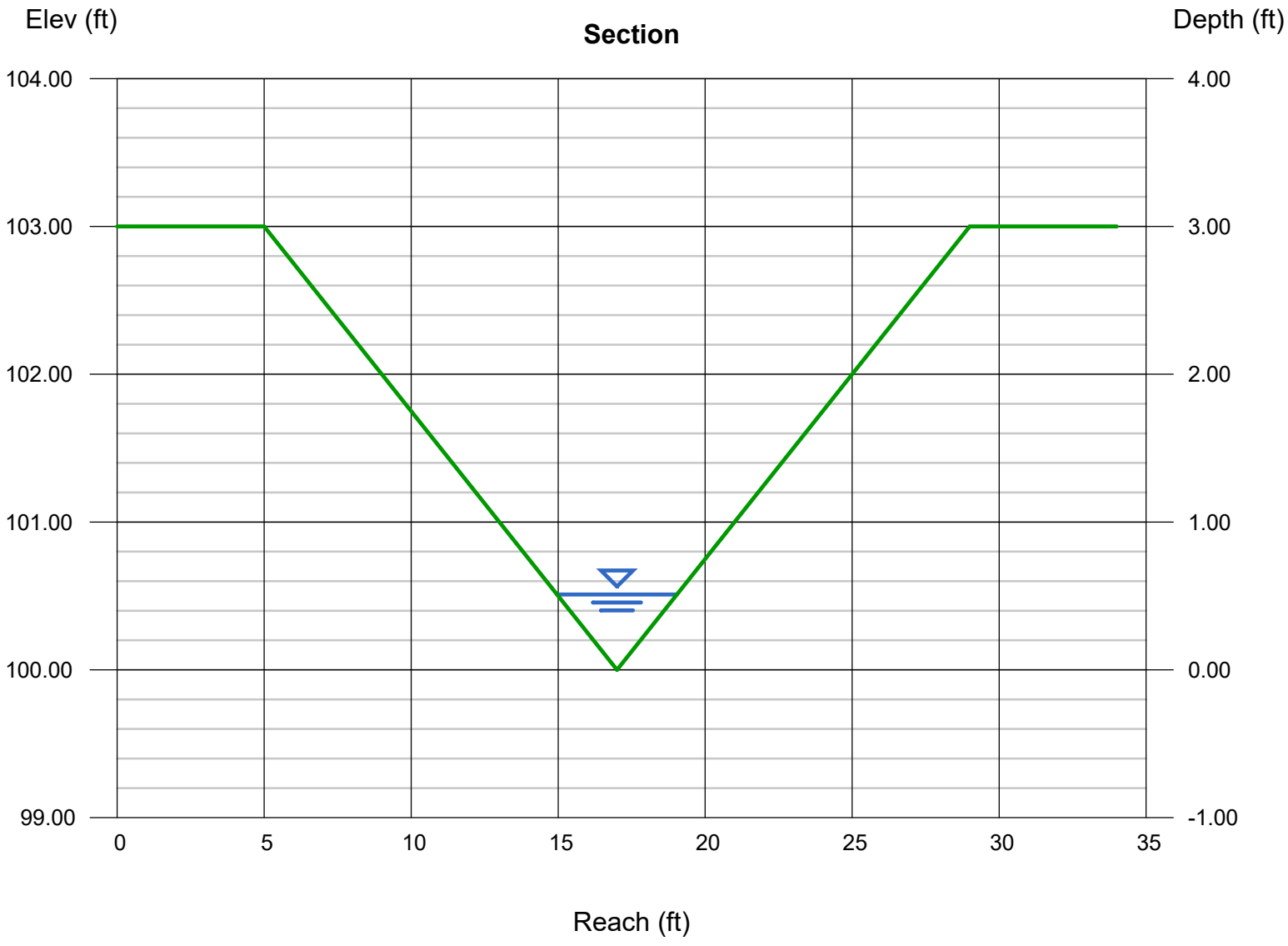
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 100.00
Slope (%)	= 10.30
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 6.40

Highlighted

Depth (ft)	= 0.51
Q (cfs)	= 6.400
Area (sqft)	= 1.04
Velocity (ft/s)	= 6.15
Wetted Perim (ft)	= 4.21
Crit Depth, Yc (ft)	= 0.70
Top Width (ft)	= 4.08
EGL (ft)	= 1.10



Channel Report

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Q @ System #2 POC #4 to #5

Triangular

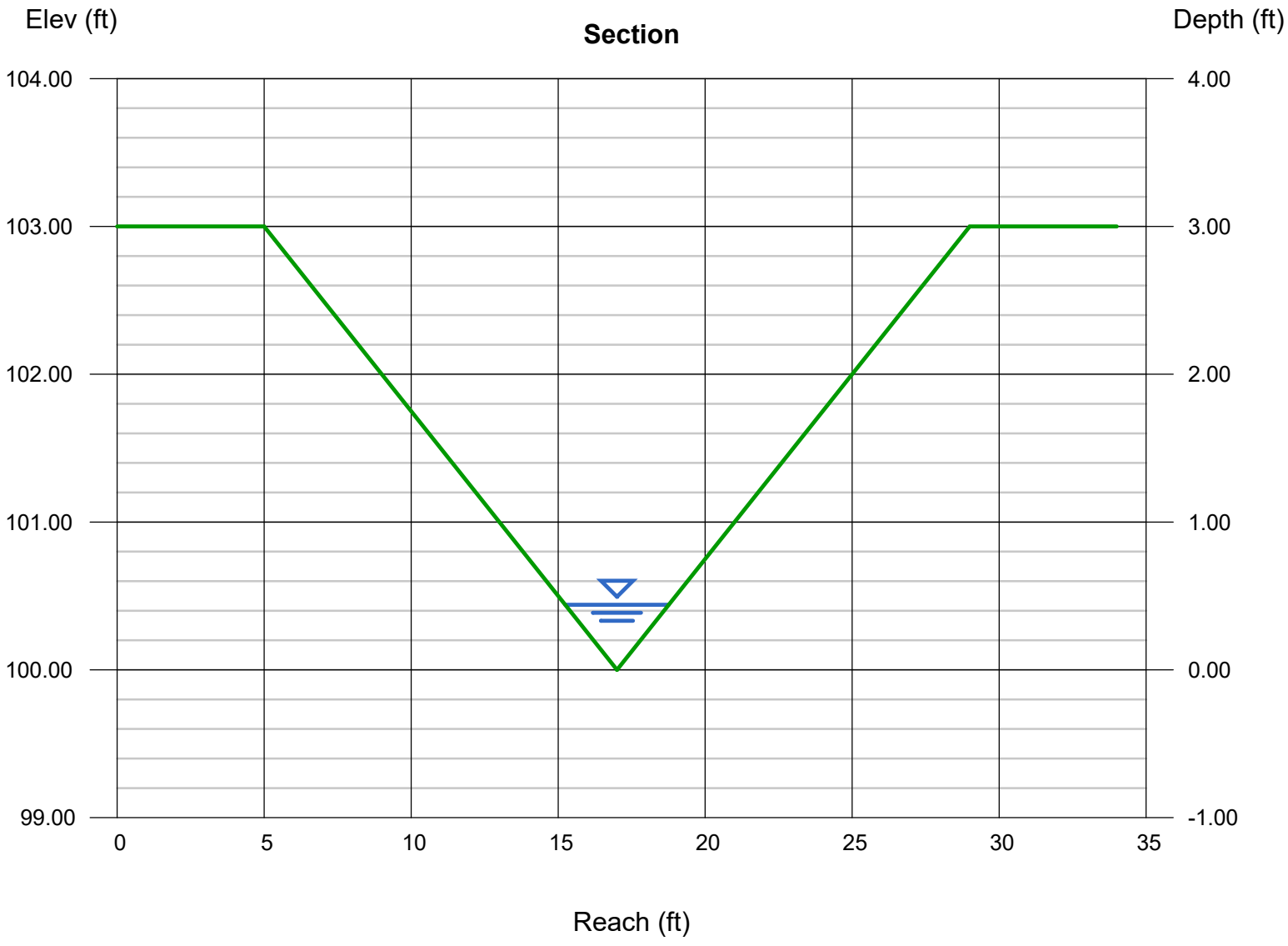
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 100.00
Slope (%)	= 4.50
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 2.80

Highlighted

Depth (ft)	= 0.44
Q (cfs)	= 2.800
Area (sqft)	= 0.77
Velocity (ft/s)	= 3.62
Wetted Perim (ft)	= 3.63
Crit Depth, Yc (ft)	= 0.50
Top Width (ft)	= 3.52
EGL (ft)	= 0.64



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Wednesday, Feb 20 2019

Exist Control Point 3

Trapezoidal

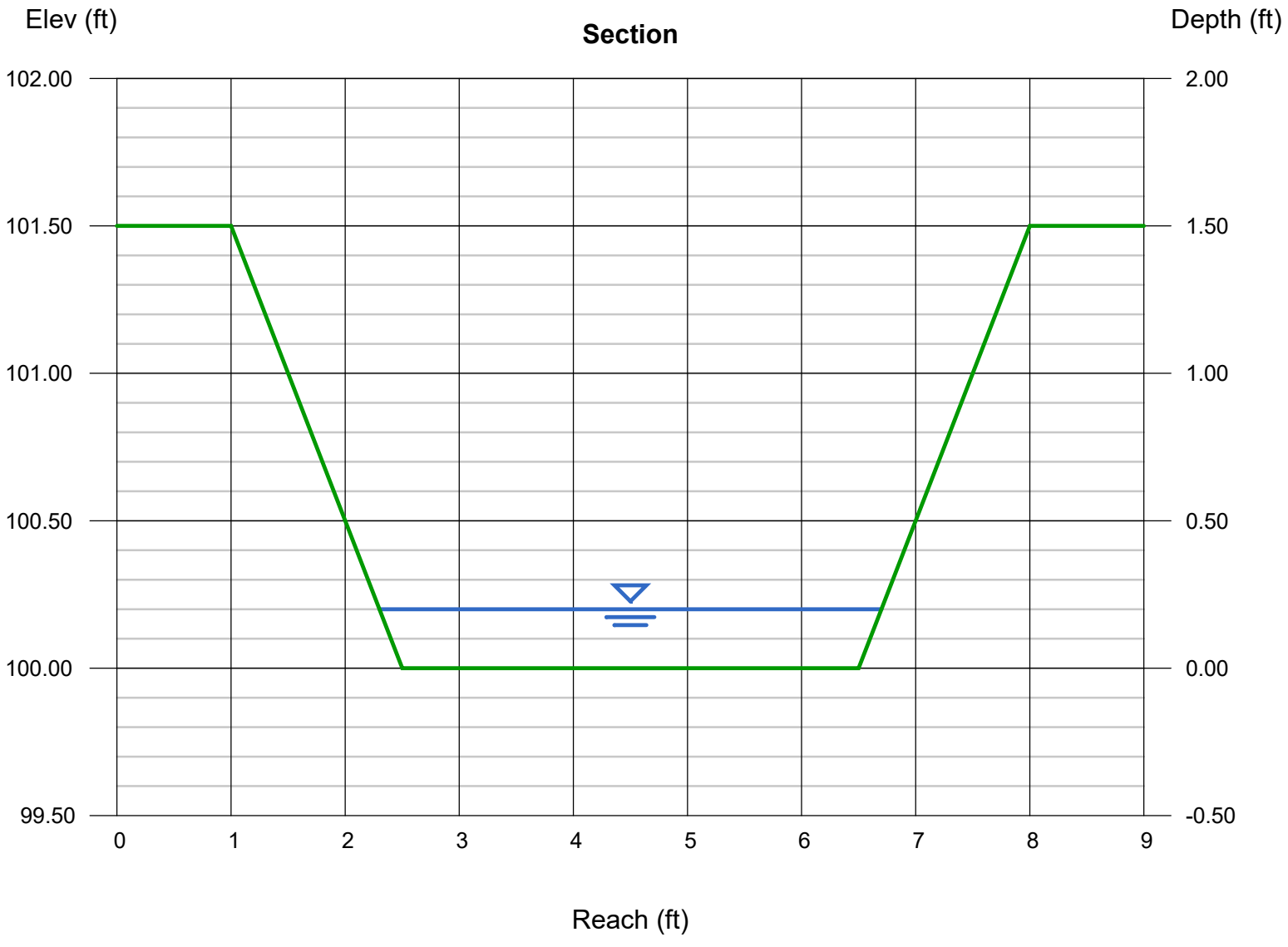
Bottom Width (ft)	= 4.00
Side Slopes (z:1)	= 1.00, 1.00
Total Depth (ft)	= 1.50
Invert Elev (ft)	= 100.00
Slope (%)	= 19.50
N-Value	= 0.014

Calculations

Compute by:	Known Q
Known Q (cfs)	= 12.00

Highlighted

Depth (ft)	= 0.20
Q (cfs)	= 12.00
Area (sqft)	= 0.84
Velocity (ft/s)	= 14.29
Wetted Perim (ft)	= 4.57
Crit Depth, Yc (ft)	= 0.62
Top Width (ft)	= 4.40
EGL (ft)	= 3.37



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Wednesday, Feb 20 2019

Exist Control Point 5

Triangular

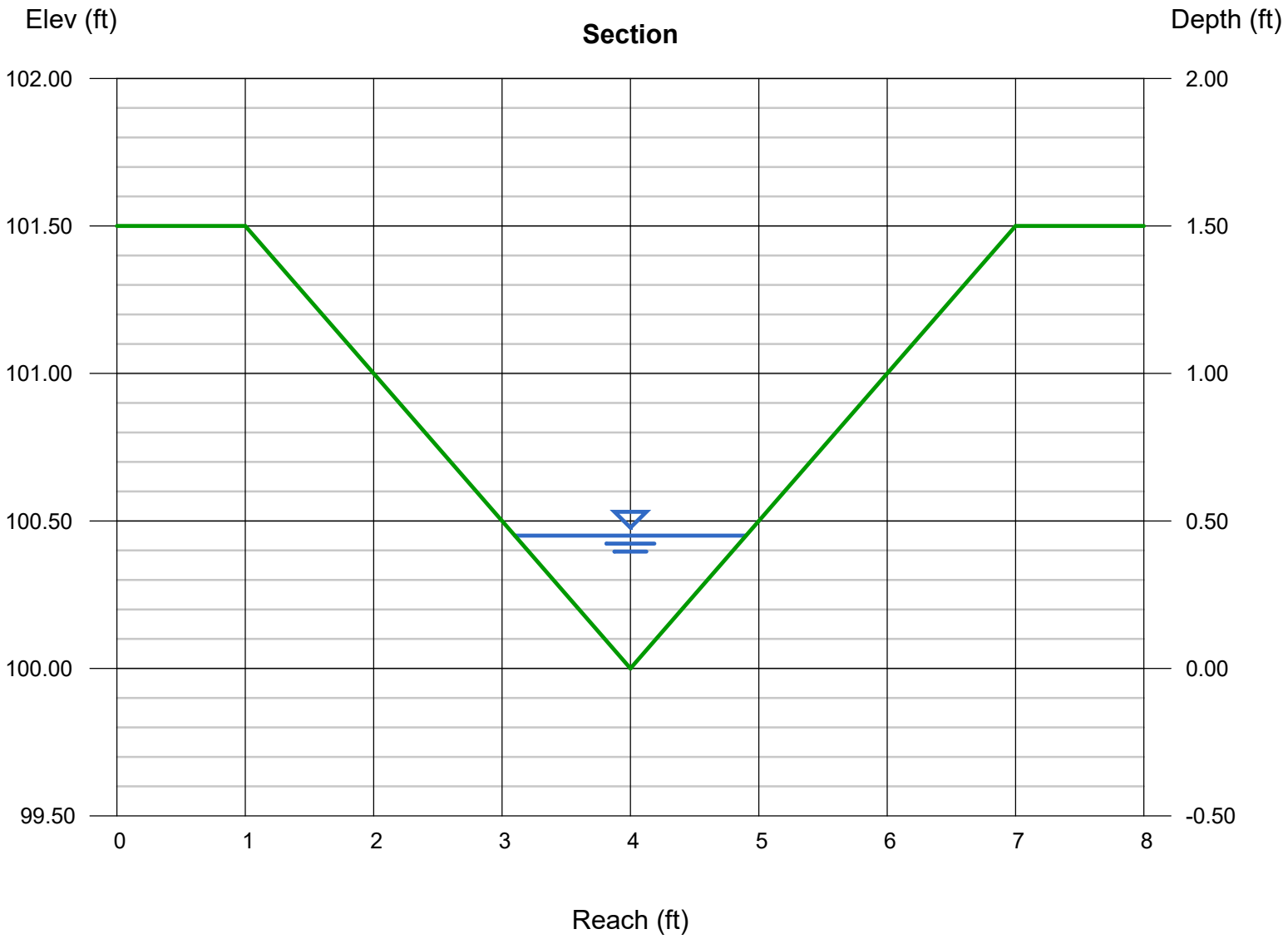
Side Slopes (z:1)	= 2.00, 2.00
Total Depth (ft)	= 1.50
Invert Elev (ft)	= 100.00
Slope (%)	= 2.00
N-Value	= 0.014

Calculations

Compute by:	Known Q
Known Q (cfs)	= 2.00

Highlighted

Depth (ft)	= 0.45
Q (cfs)	= 2.000
Area (sqft)	= 0.40
Velocity (ft/s)	= 4.94
Wetted Perim (ft)	= 2.01
Crit Depth, Yc (ft)	= 0.58
Top Width (ft)	= 1.80
EGL (ft)	= 0.83



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Wednesday, Feb 20 2019

Exist Control Point 7

Triangular

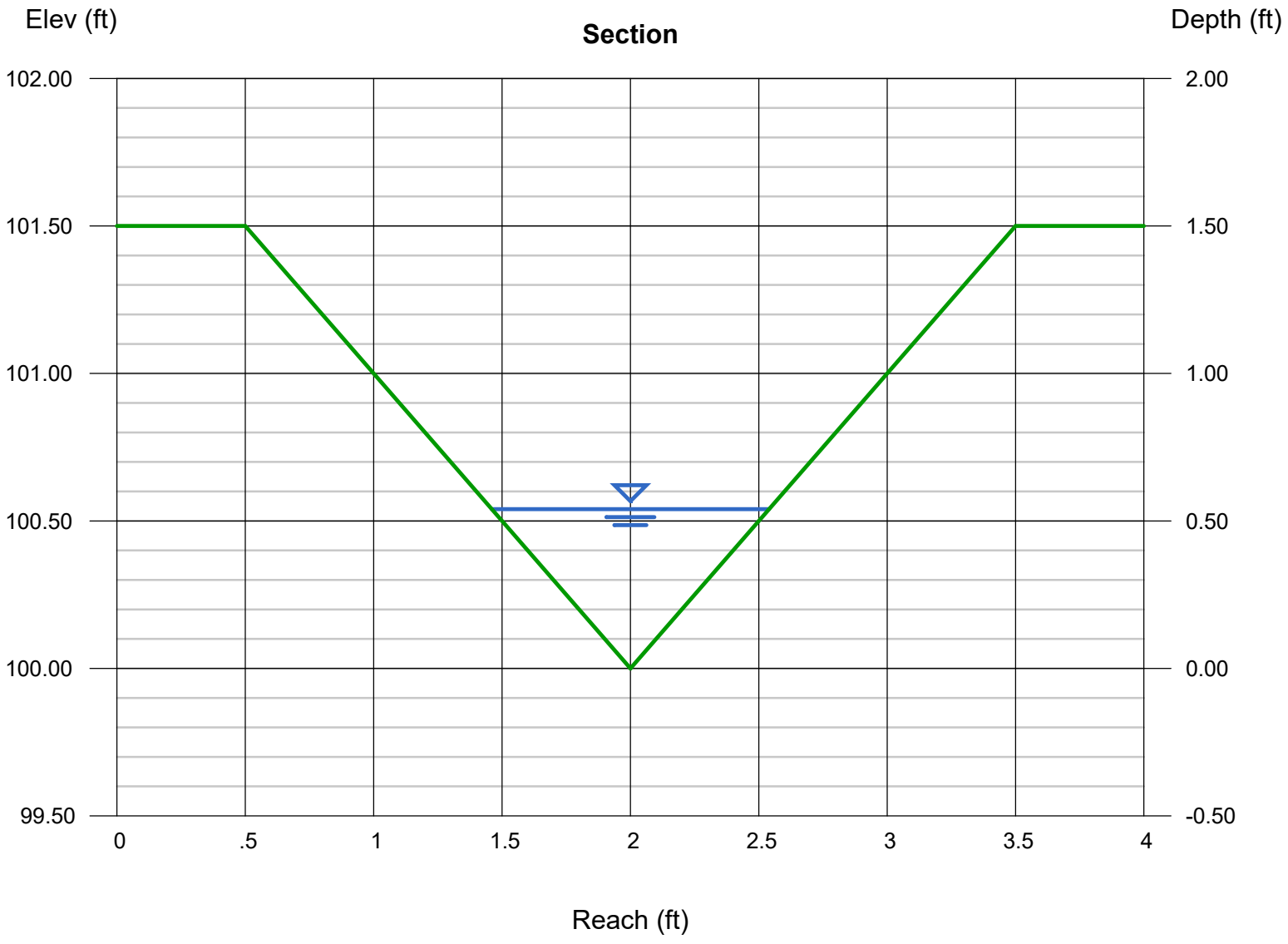
Side Slopes (z:1)	= 1.00, 1.00
Total Depth (ft)	= 1.50
Invert Elev (ft)	= 100.00
Slope (%)	= 16.40
N-Value	= 0.014

Calculations

Compute by:	Known Q
Known Q (cfs)	= 4.10

Highlighted

Depth (ft)	= 0.54
Q (cfs)	= 4.100
Area (sqft)	= 0.29
Velocity (ft/s)	= 14.06
Wetted Perim (ft)	= 1.53
Crit Depth, Yc (ft)	= 1.01
Top Width (ft)	= 1.08
EGL (ft)	= 3.61



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Wednesday, Feb 20 2019

Exist Control Point 9

Trapezoidal

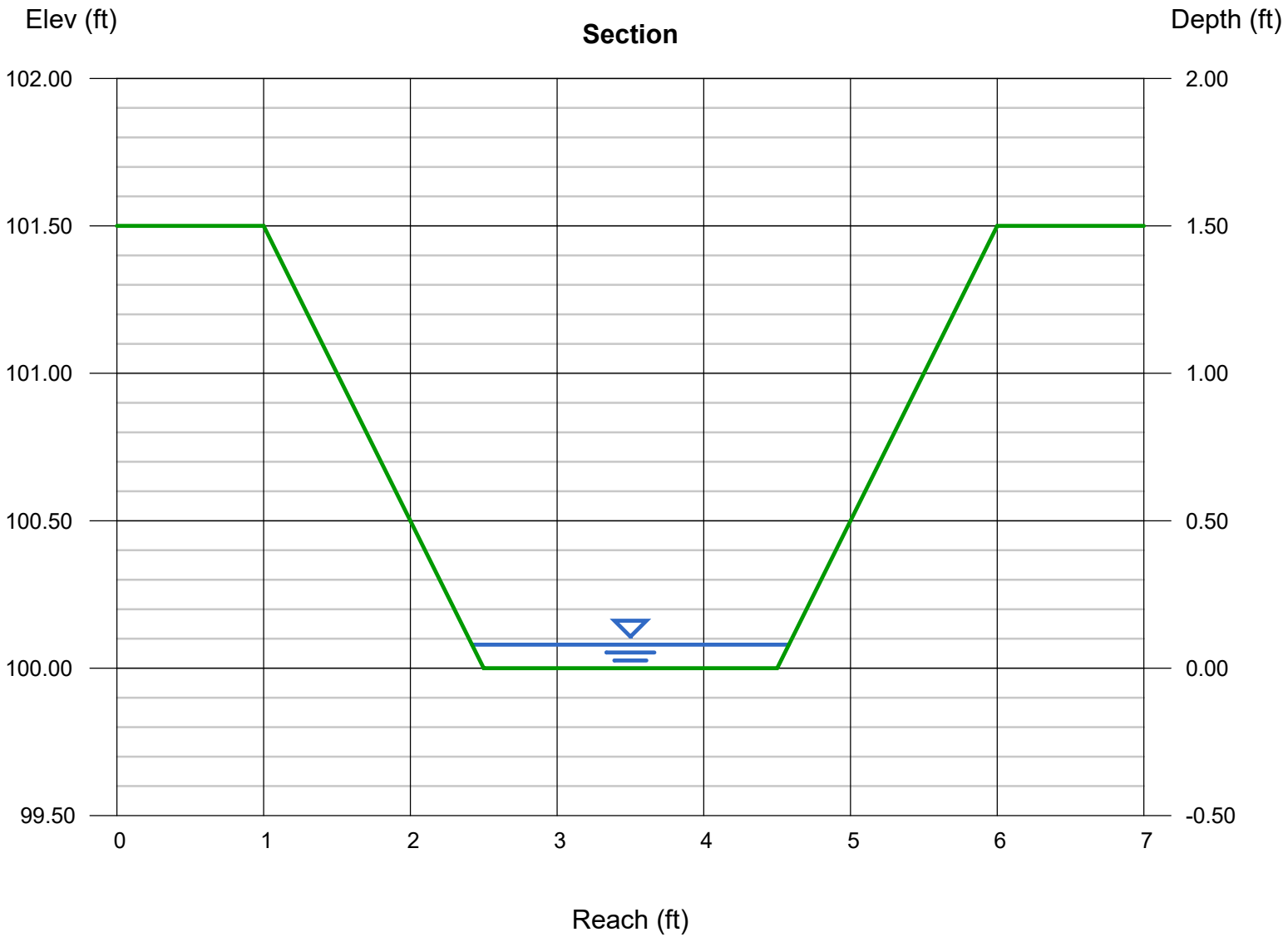
Bottom Width (ft)	= 2.00
Side Slopes (z:1)	= 1.00, 1.00
Total Depth (ft)	= 1.50
Invert Elev (ft)	= 100.00
Slope (%)	= 10.00
N-Value	= 0.014

Calculations

Compute by:	Known Q
Known Q (cfs)	= 0.90

Highlighted

Depth (ft)	= 0.08
Q (cfs)	= 0.900
Area (sqft)	= 0.17
Velocity (ft/s)	= 5.41
Wetted Perim (ft)	= 2.23
Crit Depth, Yc (ft)	= 0.18
Top Width (ft)	= 2.16
EGL (ft)	= 0.53



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Ex Control Point #11

Triangular

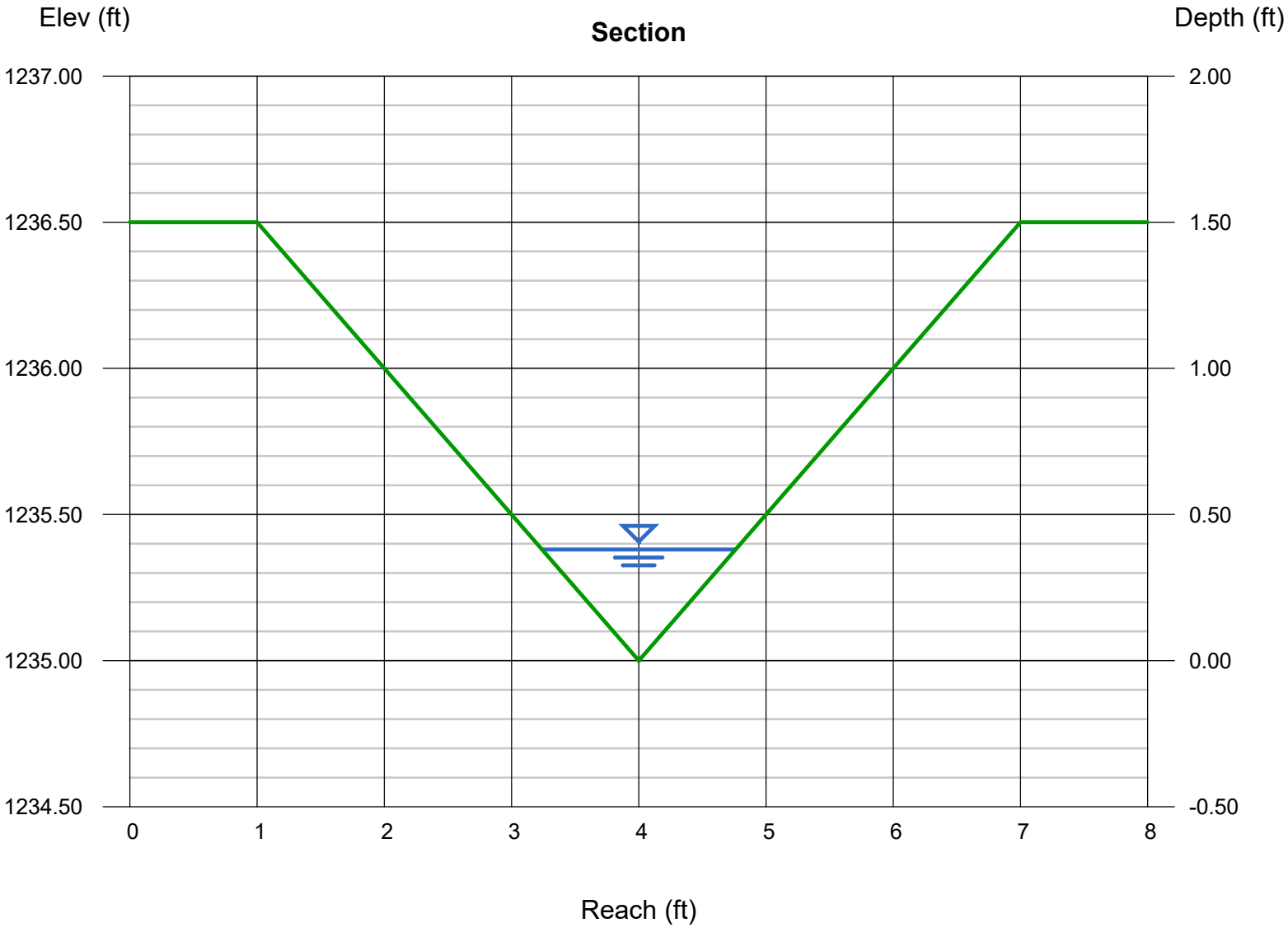
Side Slopes (z:1)	= 2.00, 2.00
Total Depth (ft)	= 1.50
Invert Elev (ft)	= 1235.00
Slope (%)	= 2.00
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 0.50

Highlighted

Depth (ft)	= 0.38
Q (cfs)	= 0.500
Area (sqft)	= 0.29
Velocity (ft/s)	= 1.73
Wetted Perim (ft)	= 1.70
Crit Depth, Yc (ft)	= 0.33
Top Width (ft)	= 1.52
EGL (ft)	= 0.43



APPENDIX C.2

POST-DEVELOPMENT HYDROLOGY/HYDRAULIC CALCULATIONS FOR CONDUIT AND CHANNEL ANALYSIS

Perrin Winery
16138 Highland Valley Road
Escondido, CA
Hydrology Calculations - Post Development Project Site Discharge Area
11/8/2019

Calculate Weighted C-Values - Post Development

Assumptions:

1) Assume "Low Density Residential with 1.0DU/A" for pervious areas and "General Commercial" for impervious areas for runoff coefficients on Table 3-1 from County of San Diego Hydrology Manual (2003).
2) Use a C-value of 0.80 and 0.82 for impervious areas soil group B and D.
3) Use a C-value of 0.32 and 0.41 for pervious areas soil group B and D.

Tributary A: (Hydrologic Soil Group B&D)

pervious areas=	68000	sf	Soil group B
impervious areas =	15651	sf	Soil group B
pervious areas=	36954	sf	Soil group D
impervious areas =	4500	sf	Soil group D
total area =	125105	sf	

$C_{weighted}$= 0.42

Tributary B: (Hydrologic Soil Group B&D)

pervious areas=	24348	sf	Soil group B
impervious areas =	7330	sf	Soil group B
pervious areas=	21352	sf	Soil group D
impervious areas =	2320	sf	Soil group D
total area =	55350	sf	

$C_{weighted}$= 0.44

Tributary C: (Hydrologic Soil Group D)

pervious areas=	63500	sf
impervious areas =	8830	sf
total area =	72330	sf

$C_{weighted}$= 0.46

Tributary D: (Hydrologic Soil Group D)

pervious areas=	720	sf
impervious areas =	5480	sf
total area =	6200	sf

$C_{weighted}$= 0.77

Tributary E: (Hydrologic Soil Group D)

pervious areas=	11758	sf
impervious areas =	24782	sf
total area =	36540	sf

$C_{weighted}$= 0.69

Tributary F: (Hydrologic Soil Group D)

pervious areas=	2749	sf
impervious areas =	14951	sf
total area =	17700	sf

$C_{weighted}$= 0.76

Tributary G: (Hydrologic Soil Group D)

pervious areas=	6740	sf

Tributary H: (Hydrologic Soil Group B)

pervious areas=	43728	sf	Soil group B

impervious areas =	15410	sf	impervious areas =	11316	sf	Soil group B
total area =	22150	sf	pervious areas=	10338	sf	Soil group D
			impervious areas =	2518	sf	Soil group D
			total area =	67900	sf	
$C_{weighted}$=	0.70		$C_{weighted}$=	0.43		

Tributary I: (Hydrologic Soil Group B)

pervious areas=	5500	sf
impervious areas =	4500	sf
total area =	10000	sf
		Acre
$C_{weighted}$=	0.54	

Overall Project Site Area=	8.7
Overall Cweighted=	0.50

Perrin Winery
16138 Highland Valley Road
Escondido, CA
Hydrology Calculations - Post Development Project Site Discharge Area
11/8/2019

Calculate Time of Concentration and Flow Rate - Post Development

Assumptions:
1) Use "Overland Time Flow Nomograph" equation for initial time of concentration:

$$T = \frac{1.8\,(1.1-C)\sqrt{D}}{\sqrt[3]{s}}$$

Where Ti= Time of Concentration (Minutes),
C= Runoff Coefficient, Use C-Weighted for the system watershed
S= Slope (%)
D or L = Water Course Distance (Feet)

2) Use "Time of Concentration" equation from Figure 3-4 of San Diego County Hydrology Manual

$$Tc = \left(\frac{11.9L^3}{\Delta E}\right)^{0.385}$$

Where Tc= Time of Concentration (Hour)
L= Water Course Distance (Miles)
ΔE= Change in Elevation (Feet)
A= Area (Acre)

3) Use "Rainfall Intensity" equation; $I = 7.44\,(P_{6})\,D^{-0.645}$
Where I= Rainfall Intensitty (in/hr)
P_6= ("3.5"), Rainfall Isopluvials 100-Yr 6-Hr ; See Isopluvial Map
D, (Tc)= Time of Concentration (Minutes)

	Tributary Area	Downstream Node	A, (ac)	D, (ft)	C	(C)*(A)	Σ(CA)	ΔE, (ft)	S, (%)	Ti, (min)	Tc, (min)	ΣTc	v (ft/s)	I, (in/hr)	Q_{100}
System #1	E	2	0.84	296	0.69	0.58	0.58	14.5	4.9	5.0		5.0		9.2	5.3
	F	3	0.41	196	0.76	0.31	0.31	5.0	2.6	5.0		5.0		9.2	2.8
	A	10	2.87	783	0.42	1.22	1.92	62.5	8.0		1.9	6.9	13.9	7.5	14.4
System #1B	B	6	1.27	564	0.44	0.56	0.56	81.0	14.4	5.0	1.8	6.8	15.2 at Point #9	7.5	4.2
System #1C	C	14	1.66	402	0.46	0.76	0.76	43.0	10.7	5.4	0.6	6.1	16.9	8.1	6.2
System #2	G	16	0.51	278	0.70	0.35	0.35	11.5	4.1	6.3	1.0	7.3	7.3	7.2	2.5
System #3	H	18	1.56	538	0.43	0.67	0.67	41.5	7.7	6.2	2.4	8.6	15.5 at Point #19	6.5	4.4
System #4	I	20	0.23	254	0.54	0.12	0.12	39.0	15.4	8.0		8.0	9.7 at Point #21	6.8	0.8
System #5	D	15	0.14	106	0.77	0.11	0.11	11.5	10.8	5.0		5.0	5.8	9.2	1.0

Perrin Winery
16138 Highland Valley Road
Escondido, CA
Hydrology Calculations - Post - Development Project Site Discharge Area
11/8/2019

Determine Time of Concentration, T_c and Flow Rate Q_{100}:

System #1A

Tributary Area "E" Overland flow to Drop Inlet at Control Point #1

C weighted=	0.69		
A=	0.84	ac	
L=	296	ft	Use 90 ft Maximum Length
ΔE	14.5	ft	;1236.0-1221.5
S=	4.9	%	
Ti=	4.1	min	Use 5 mins for Ti
I=	9.2	in/hr	
Q_E=	5.3	cfs	

Q100 @ Tributary Area E 5.3 cfs

Tributary Area "F" Overland flow to Drop Inlet at Control Point #3

C weighted=	0.76		
A=	0.41	ac	
L=	196	ft	Use 75 ft Maximum Length
ΔE	5	ft	;1234-1229
S=	2.6	%	
Ti=	3.9	min	Use 5 mins for Ti
I=	9.2	in/hr	
Qf=	2.8	cfs	

Q100 @ Tributary Area F 2.8 cfs

Tributary Area "A" Overland flow received runoff from subarea E&F and to Control Point #8 and ultimately discharges to seasonal creek @ POC#10

C weighted=	0.42		
Overall A=	2.87	ac	
Subarea A1, A=	0.576	ac	to Control Point #7
L=	125.0	ft	
ΔE	7	ft	;1218-1211
S=	5.6	%	

Junction Equation in Subarea A1 @ POC #7

$Q_{A1} = Q_F + (T_F/T_E) * Q_E$

$= 2.8 + (5/5) * 5.3$

=	8.2	cfs	; Tc and I are identical for each system
Use Tc=	5	mins	
v in natural channel=	4.08	ft/s	Assume Q_E=5.3, n=0.035, channel sideslope 4:1,
Tc_{A1}=	0.5	min	

Total ΣTc=	5.5	min	; Tc_E+Tc_{A1}
I_{A1}=	8.7	in/hr	
Σ(CA)=	0.9		; Subarea E+F+A1
Q_{A1}=	**8.2**	cfs	
Subarea A2, A=	1.65	ac	to Control Point #8
L=	374.0	ft	
ΔE	32	ft	;1211-1179
S=	8.6	%	
Time of Concentration A1 @ POC #7,Tc_{A1}=	**5.5**	min	
Q @ Point #7=	**8.2**	cfs	
Estimate Q @ POC #8, Assume q_{avg} =	2.5	cfs/acre	
$Q_{A2\ avg}$=	10.2	cfs	;Qb1+(3.0*A_{b2}/2)
v=	5.7	ft/s	Assume Q=10.2, n=0.035, channel sideslope 4:1,
Tt_{A2}=	1.1	min	; travel time to POC#8
ΣTc=	6.6	min	;Tc_{A1}+Tt_{A2}
I_{A2}=	7.7	in/hr	
Σ(CA)=	1.6		; Subarea E+F+A1+A2
Q_{A2}=	**12.7**	cfs	;Σ(CA)I
Check Qavg=	10.4	cfs	;Qb1+(Qb2-Qb1)/2 **OK**
Subarea A3, A=	0.65	ac	Flow in Pipe and Gutter to Control Point #9
L=	284.0	ft	
ΔE	23.5	ft	;1179-1155.5
S=	8.3	%	
Assume 12-Inch Pipe, v=	18.2	ft/s	;Assume Q=12.7cfs in pipe
Tt_{A3}=	0.3	min	
Total ΣTc=	6.9	min	;Tc_{A2}+Tt_{A3}
I_{A3}=	7.5	in/hr	
Σ(CA)=	1.9		
Q_{A3}=	**14.4**	cfs	
Discharge Velocity in Pipe @ POC #10=	13.9	ft/s	; Assume 18-inch pipe with 5% Slope

System #1B

Tributary Area "B"

Overland flow across natural subarea to V-ditch and Drop Inlet and discharge to seasonal creek at POC# 9

C weighted=	0.44		
Overall A=	1.27	ac	
Subarea B1, A=	0.34	ac	to Control Point #4
L=	218.0	ft	
ΔE	57.5	ft	;1252.0-1194.5
S=	26.4	%	
Ti=	5.0	min	from Figure 3-3 of the Hydrology Manual
Tc=	0.8	min	from Figure 3-4 of the Hydrology Manual
Total Time of Concentration, Ttb1=	5.8	min	Use 5 mins for time of concentration
I=	9.2	in/hr	

Qb1=	**1.4**	cfs		
Subarea B2, A=	0.77	ac	Concrete V-Ditch to Control Point #5	
L=	239.0	ft		
ΔE	13.5	ft	;1194.5-1181	
S=	5.6	%		
Assume q_{avg} =	3.0	cfs/acre		
Qb2=	2.5	cfs	;Qb1+(3.0*A_{b2}/2)	
v=	4.6	ft/s	from Figure 3-6 of the Hydrology Manual	
Ttb2=	0.9	min		
ΣTc=	6.7	min	;Ttb1+Ttb2	
Ib2=	7.6	in/hr		
Qb2=	**3.7**	cfs	;Σ(CA)I	
Check Qavg=	2.5	cfs	;Qb1+(Qb2-Qb1)/2	**OK**
Subarea B3, A=	0.16	ac	Pipe Flow to Control Point #6	
L=	107.0	ft		
ΔE	10	ft	;1181-1171	
S=	9.3	%		
Assume 10-Inch Pipe, v=	12.6	ft/s	;Assume Q=4.0cfs in pipe	
Tt3=	0.1	min		
Total ΣTc=	6.8	min		
Ib2=	7.5	in/hr		
Σ(CA)=	0.6			
Qb3=	**4.2**	cfs		
Q100 @ Tributary Area B	**4.2**	**cfs**		
Discharge Velocity in Pipe @ POC #9=	15.2	ft/s	; Assume 10-inch pipe with 15% Slope	

System #1C

Tributary Area "C" Overland flow across natural subarea and road V-ditch and flow through pipes and discharge to the lower creek bypassing culvert

C weighted=	0.46		
Overall A=	1.66	ac	
Subarea C1, A=	0.14	ac	to Control Point #11
L=	126.0	ft	Use 100 ft for Maximum Length
ΔE	12	ft	;1234.0-1222
S=	9.5	%	
Ti=	5.4	min	from Figure 3-3 of the Hydrology Manual
I=	8.7	in/hr	
Qc1=	**0.6**	cfs	
Subarea C2, A=	1.19	ac	;Concrete V-Ditch to Control Point #12
L=	209.0	ft	; Assume Q from V-ditch subarea is added to the pipe
ΔE	22	ft	;1222-1200
S=	10.5	%	
Assume q_{avg} =	3.5	cfs/acre	
$Qavg_{c2}$=	2.6	cfs	;Qc1+($q_{avg}Ac_2$/2)

v=	6.2	ft/s	from Figure 3-6 of the Hydrology Manual	
Time of Concentration @ C2,Ttc2=	0.6	min		
ΣTc=	6.0	min	;Ttc1+Ttc2	
I_{C2}=	8.2	in/hr		
Qc2=	**5.0**	cfs	;Σ(CA)I	
Check Qavg=	2.8	cfs	;Qc1+(Qc2-Qc1)/2	**OK**
Subarea C3, A=	0.33	ac	;Pipe Flow to Control Point #13	
L=	67.0	ft		
ΔE	9	ft	;1200-1191	
S=	13.4	%		
Assume 12-Inch Pipe, v=	15.4	ft/s	;Assume Q=5.0cfs in pipe	
Tt3=	0.1	min		
Total ΣTc=	6.1	min	;Ttc2+Tt3	
I_{C3}=	8.1	in/hr		
Σ(CA)=	0.8			
Q_{C3}=	**6.2**	cfs		

Q100 @ Tributary Area C **6.2 cfs**

V @ Discharge Point #14 to The Creek **16.9 ft/s** ; Assume 10-inch Pipe @ 15% slope

System #2

Tributary Area "G" Overland flow across road to catch basin @ POC #16 and return to sheet flow to natural area

C weighted=	0.70		
Overall A=	0.51	ac	
L=	278.0	ft	Use 90 ft for Maximum Length
ΔE	11.5	ft	;1236.0-1224.5
S=	4.1	%	
Ti=	6.3	min	
v in Gutter=	3.0	ft/s	;Assume Q=3.0 cfs in gutter pan per Figure 3-6 of the Hydrology Manual
Tt_G=	1.0	min	
Tc_G=	7.3	min	
I=	7.2	in/hr	
Q_G=	2.5	cfs	

V @ Discharge Point #16 **7.3 ft/s** ; Assume 10-Inch Pipe with 3% Slope

System #3

Tributary Area "H" Sideslope channel @ POC #18

C weighted=	0.43		
Overall A=	1.56	ac	
Subarea H1, A=	0.47	ac	to Control Point #17
L=	288.0	ft	Use 100 ft for Maximum Length
ΔE	21.5	ft	;1257.0--1232.5
S=	7.5	%	

Ti=	6.2	min	from Figure 3-3 of the Hydrology Manual
Tt_{H1}=	1.7	min	Travel Time from Figure 3-4 of the Hydrology Manual
Tc_{H1}=	7.8	min	Total Time of Concentration @ POC #17
I=	6.9	in/hr	
Q_{H1}=	**1.4**	cfs	
Subarea H2, A=	1.09	ac	;Concrete V-Ditch to Control Point #12
L=	250.0	ft	; Assume Q from V-ditch subarea is added to the pipe
ΔE	20	ft	;1232.5-1212.5
S=	8.0	%	
Assume q_{avg} =	2.5	cfs/acre	
$Qavg_{H2}$=	2.8	cfs	;$Q_{H1}+(q_{avg}A_{H2}/2)$
v=	5.5	ft/s	from Figure 3-6 of the Hydrology Manual
Time of Concentration @ H2,Tt_{H2}=	0.8	min	
ΣTc=	8.6	min	;$Tt_{H1}+Tt_{H2}$
I_{H2}=	6.5	in/hr	
Q_{H2}=	**4.4**	cfs	;Σ(CA)I
Check Qavg=	2.9	cfs	;$Q_{H1}+(Q_{H2}-Q_{H1})/2$ **OK**

Q100 @ Tributary Area H 4.4 cfs

V @ Discharge Point #19 15.5 ft/s ; Assume 10-inch Pipe @ 15% slope

System #4

Tributary Area "I" Overland flow across road V-ditch and to catch basin @ POC #20

C weighted=	0.54		
Overall A=	0.23	ac	
L=	254.0	ft	Use 100 ft for Maximum Length @ 5% Slope 1DU/ac
ΔE	39	ft	;1241.0-1202.0
S=	15.4	%	
Ti=	8.0	min	from Figure 3-3 of the Hydrology Manual, Use 5 min for Ti
I=	6.8	in/hr	
Q_i=	0.8	cfs	

V @ Discharge Point #21 9.7 ft/s ; Assume 8-Inch Pipe with 15% Slope

System #5

Tributary Area "D" Overland flow across parking lot and road V-ditch to POC #15

C weighted=	0.77		
Overall A=	0.14	ac	
L=	106.0	ft	Use 60 ft for Maximum Length
ΔE	1	ft	;1236.0-1235
S=	0.9	%	
Ti=	4.1	min	from Table 3-2 of the Hydrology Manual, Use 5 min
I=	9.2	in/hr	
Q_D=	**1.0**	cfs	

V @ Discharge Point #15 **5.8 ft/s** ; Assume 8-Inch Pipe with 3% Slope

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Q in Pipe @ Area D POC #15

Circular

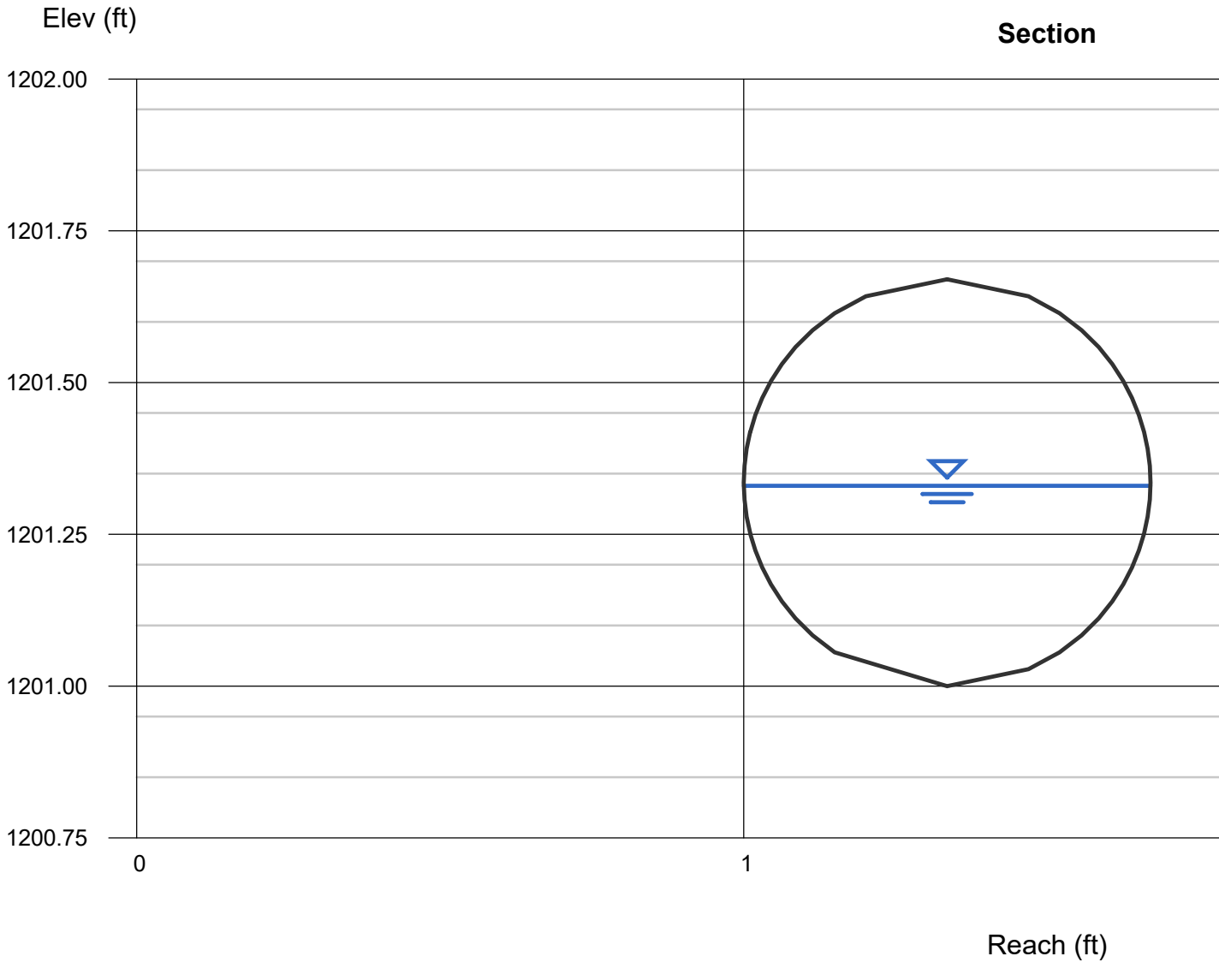
Diameter (ft)	= 0.67
Invert Elev (ft)	= 1201.00
Slope (%)	= 3.00
N-Value	= 0.013

Calculations

Compute by:	Known Q
Known Q (cfs)	= 1.00

Highlighted

Depth (ft)	= 0.33
Q (cfs)	= 1.000
Area (sqft)	= 0.17
Velocity (ft/s)	= 5.75
Wetted Perim (ft)	= 1.05
Crit Depth, Yc (ft)	= 0.48
Top Width (ft)	= 0.67
EGL (ft)	= 0.84



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Wednesday, Feb 27 2019

Q in Pipe @ Area G POC #16

Circular

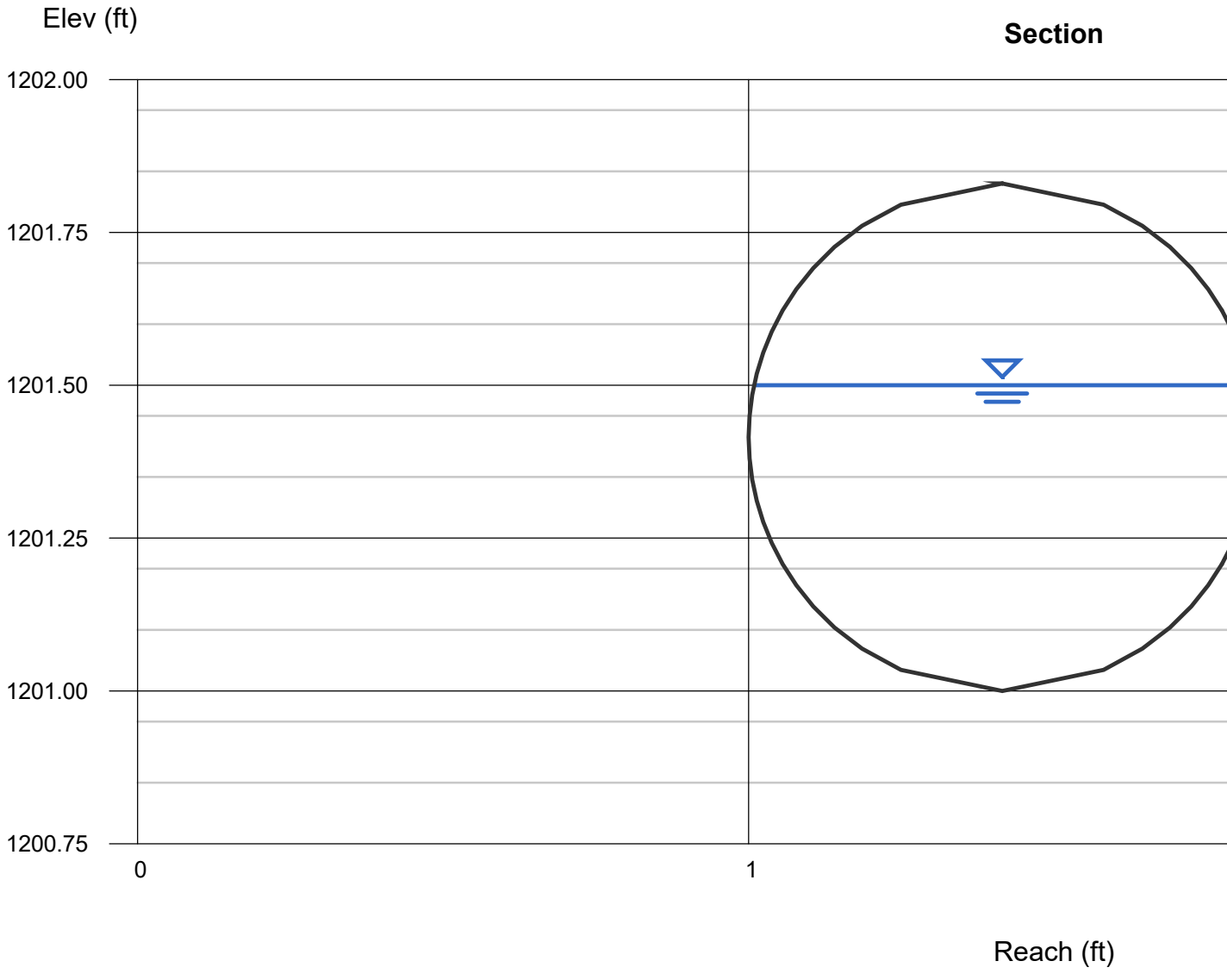
Diameter (ft)	= 0.83
Invert Elev (ft)	= 1201.00
Slope (%)	= 3.00
N-Value	= 0.013

Calculations

Compute by:	Known Q
Known Q (cfs)	= 2.50

Highlighted

Depth (ft)	= 0.50
Q (cfs)	= 2.500
Area (sqft)	= 0.34
Velocity (ft/s)	= 7.32
Wetted Perim (ft)	= 1.48
Crit Depth, Yc (ft)	= 0.71
Top Width (ft)	= 0.81
EGL (ft)	= 1.33



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Saturday, Feb 23 2019

Q in Pipe @ Area H POC #19

Circular

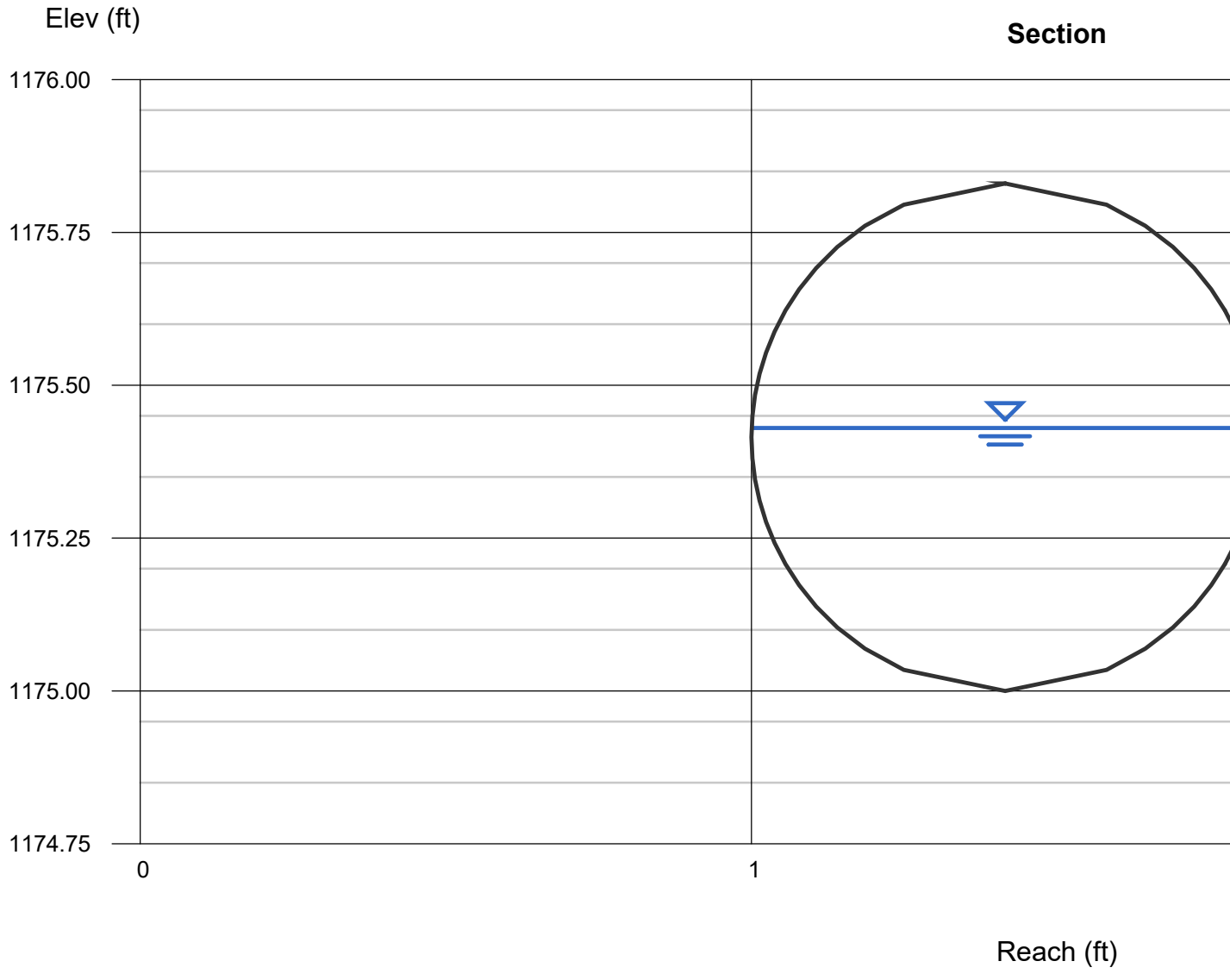
Diameter (ft)	= 0.83
Invert Elev (ft)	= 1175.00
Slope (%)	= 15.00
N-Value	= 0.013

Calculations

Compute by:	Known Q
Known Q (cfs)	= 4.40

Highlighted

Depth (ft)	= 0.43
Q (cfs)	= 4.400
Area (sqft)	= 0.28
Velocity (ft/s)	= 15.49
Wetted Perim (ft)	= 1.34
Crit Depth, Yc (ft)	= 0.81
Top Width (ft)	= 0.83
EGL (ft)	= 4.16



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Thursday, Feb 21 2019

Q in Pipe @ Area I POC #21

Circular

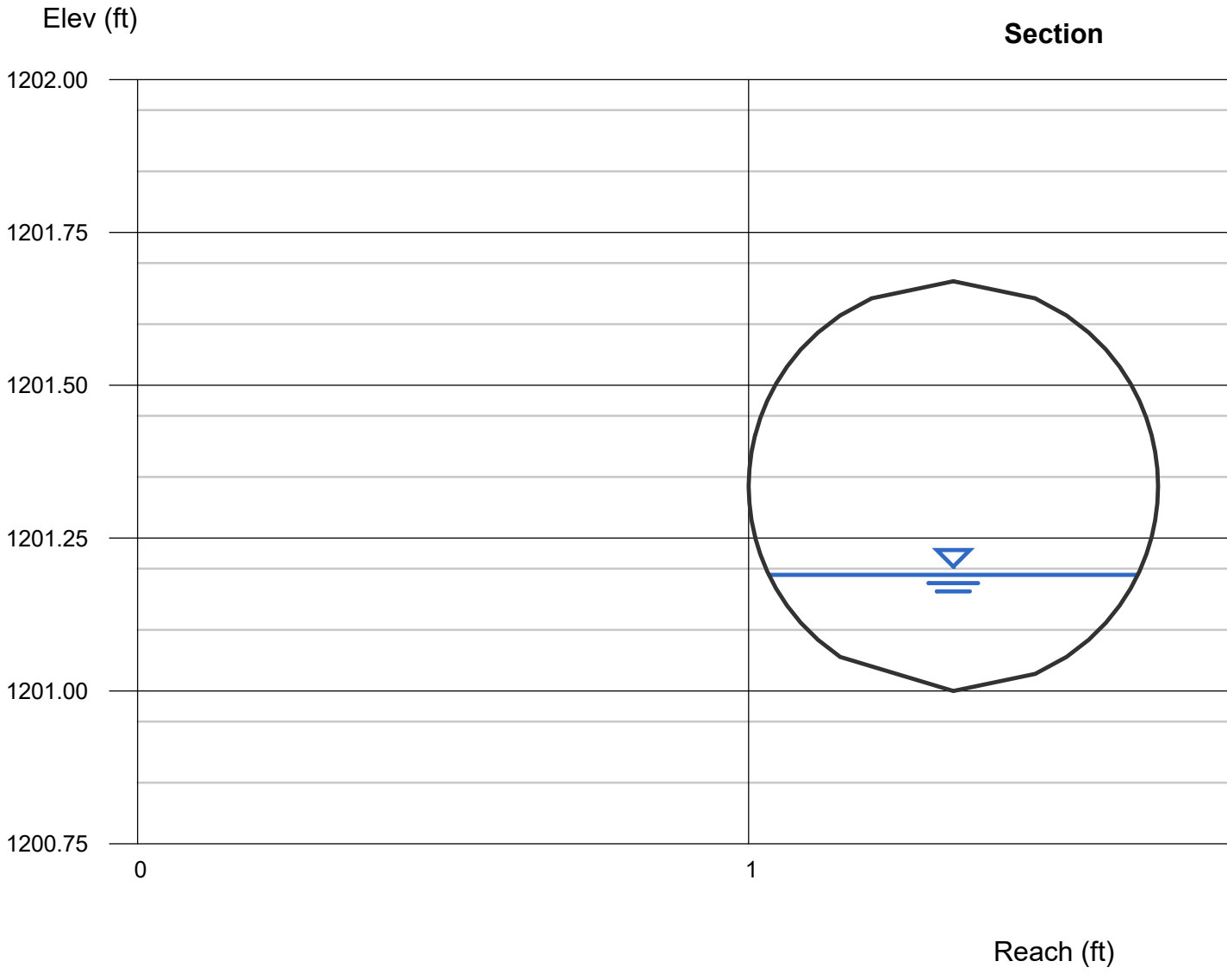
Diameter (ft)	= 0.67
Invert Elev (ft)	= 1201.00
Slope (%)	= 15.00
N-Value	= 0.013

Calculations

Compute by:	Known Q
Known Q (cfs)	= 0.80

Highlighted

Depth (ft)	= 0.19
Q (cfs)	= 0.800
Area (sqft)	= 0.08
Velocity (ft/s)	= 9.69
Wetted Perim (ft)	= 0.75
Crit Depth, Yc (ft)	= 0.43
Top Width (ft)	= 0.60
EGL (ft)	= 1.65



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Monday, Feb 25 2019

Q in Pipe @ Subarea A3 POC #10

Circular

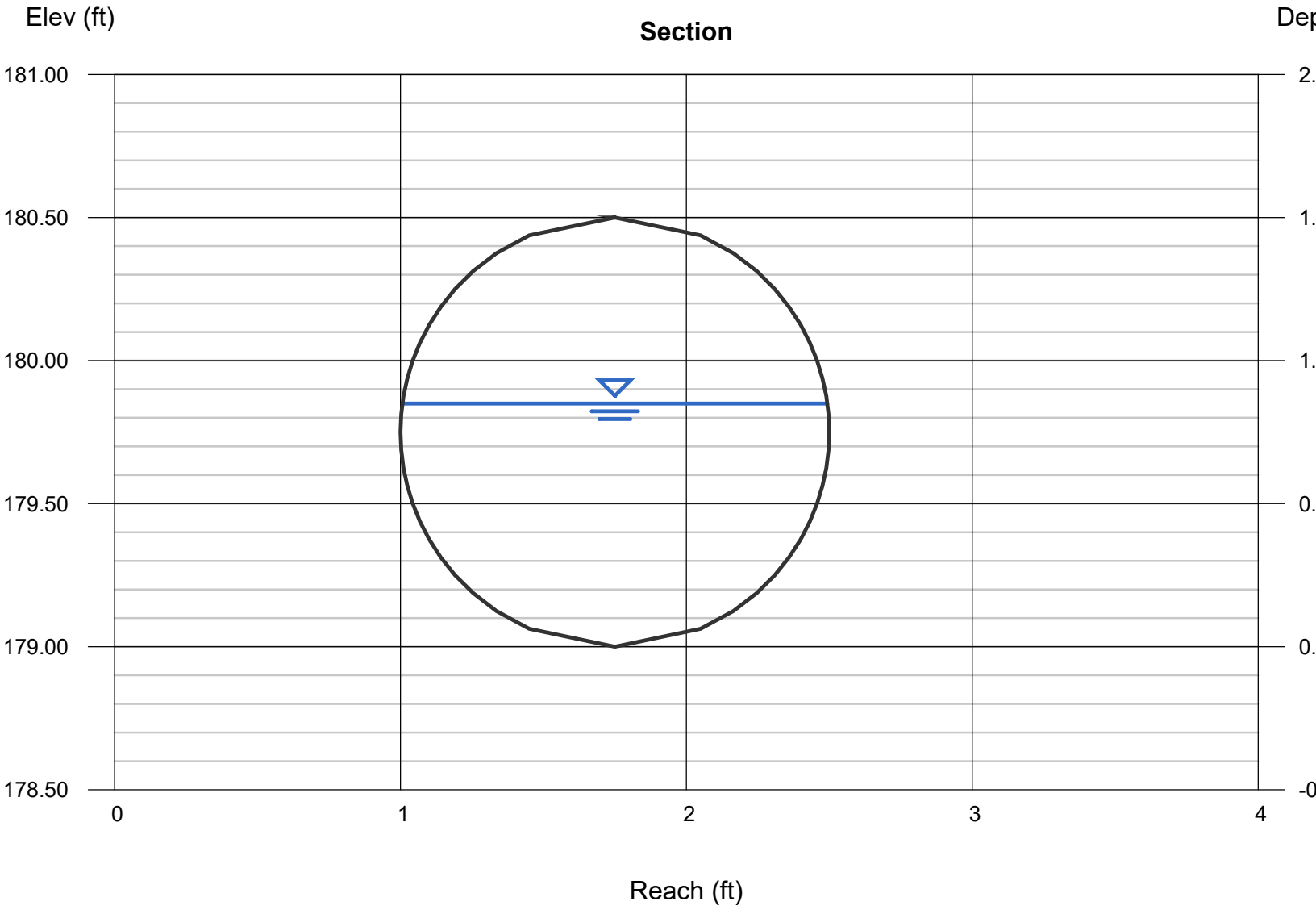
Diameter (ft)	= 1.50
Invert Elev (ft)	= 1179.00
Slope (%)	= 5.00
N-Value	= 0.013

Calculations

Compute by:	Known Q
Known Q (cfs)	= 14.40

Highlighted

Depth (ft)	= 0.85
Q (cfs)	= 14.40
Area (sqft)	= 1.03
Velocity (ft/s)	= 13.93
Wetted Perim (ft)	= 2.56
Crit Depth, Yc (ft)	= 1.40
Top Width (ft)	= 1.49
EGL (ft)	= 3.87



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Monday, Feb 18 2019

Q in Pipe @ Subarea C3 POC #14

Circular

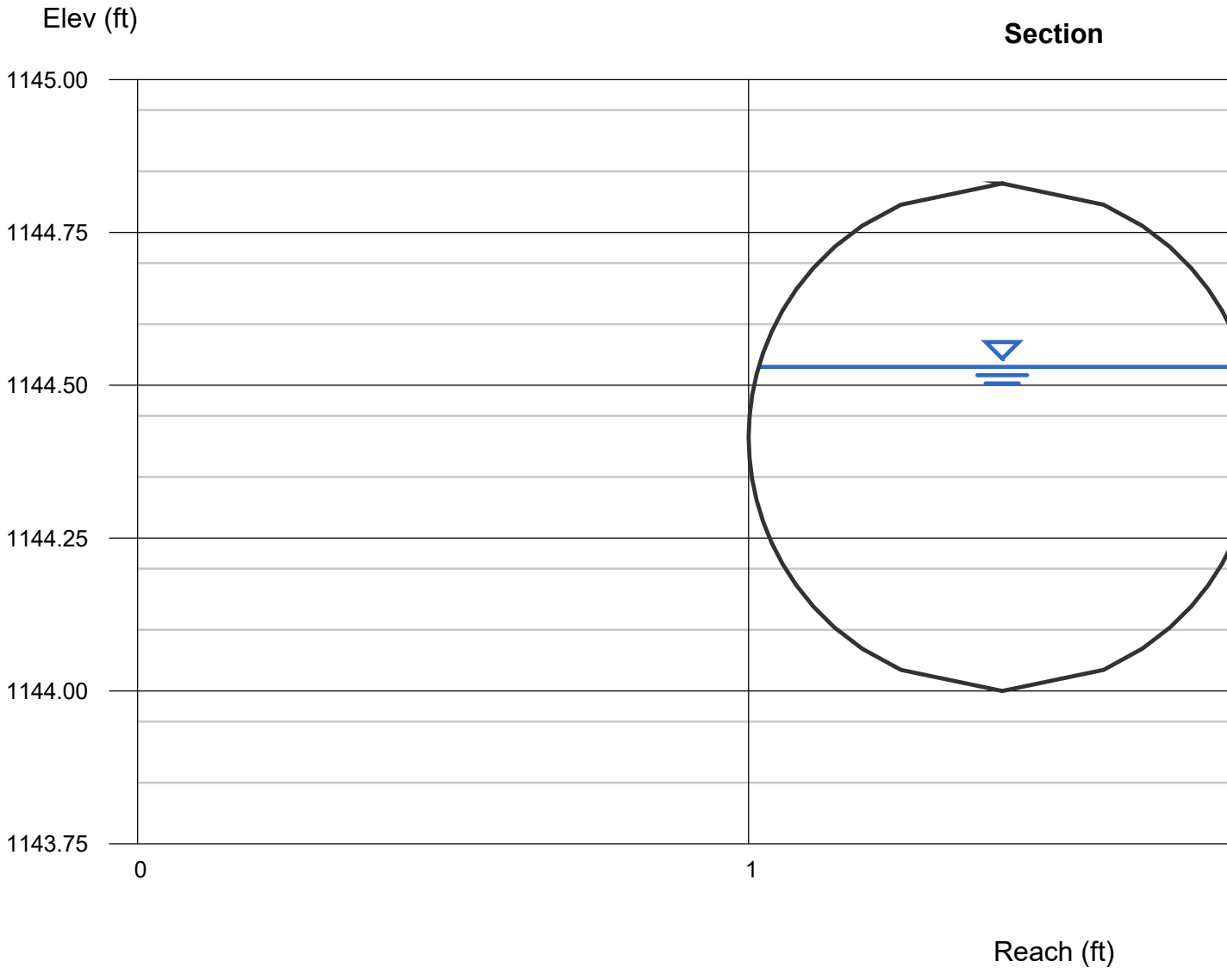
Diameter (ft)	= 0.83
Invert Elev (ft)	= 1144.00
Slope (%)	= 15.00
N-Value	= 0.013

Calculations

Compute by:	Known Q
Known Q (cfs)	= 6.20

Highlighted

Depth (ft)	= 0.53
Q (cfs)	= 6.200
Area (sqft)	= 0.37
Velocity (ft/s)	= 16.95
Wetted Perim (ft)	= 1.54
Crit Depth, Yc (ft)	= 0.83
Top Width (ft)	= 0.80
EGL (ft)	= 5.00



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Monday, Feb 18 2019

Q @ Subarea A1 to POC #7

Triangular

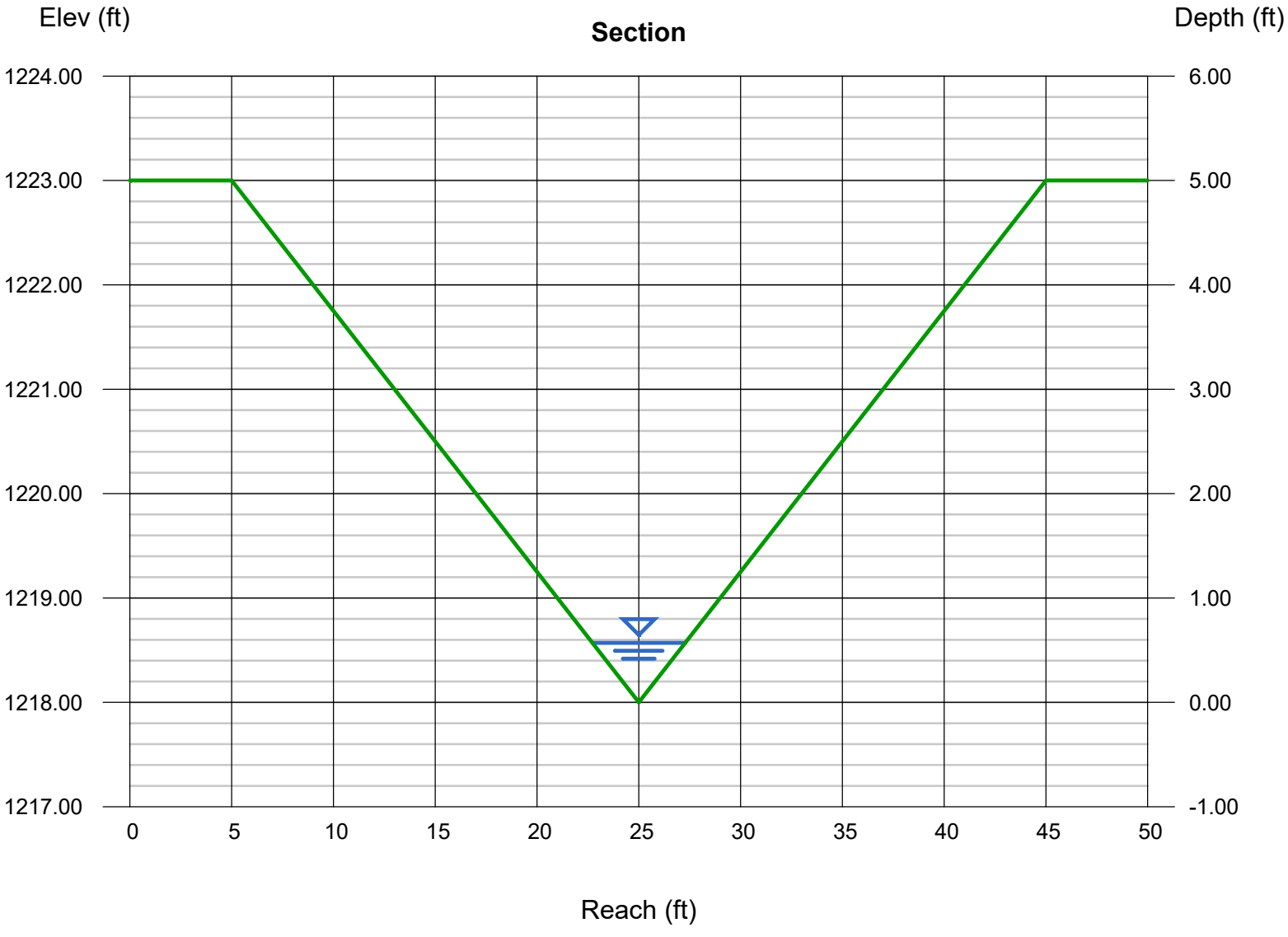
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 5.00
Invert Elev (ft)	= 1218.00
Slope (%)	= 5.60
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 5.30

Highlighted

Depth (ft)	= 0.57
Q (cfs)	= 5.300
Area (sqft)	= 1.30
Velocity (ft/s)	= 4.08
Wetted Perim (ft)	= 4.70
Crit Depth, Yc (ft)	= 0.65
Top Width (ft)	= 4.56
EGL (ft)	= 0.83



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Saturday, Feb 23 2019

Q @ Subarea A2 to POC #8

Triangular

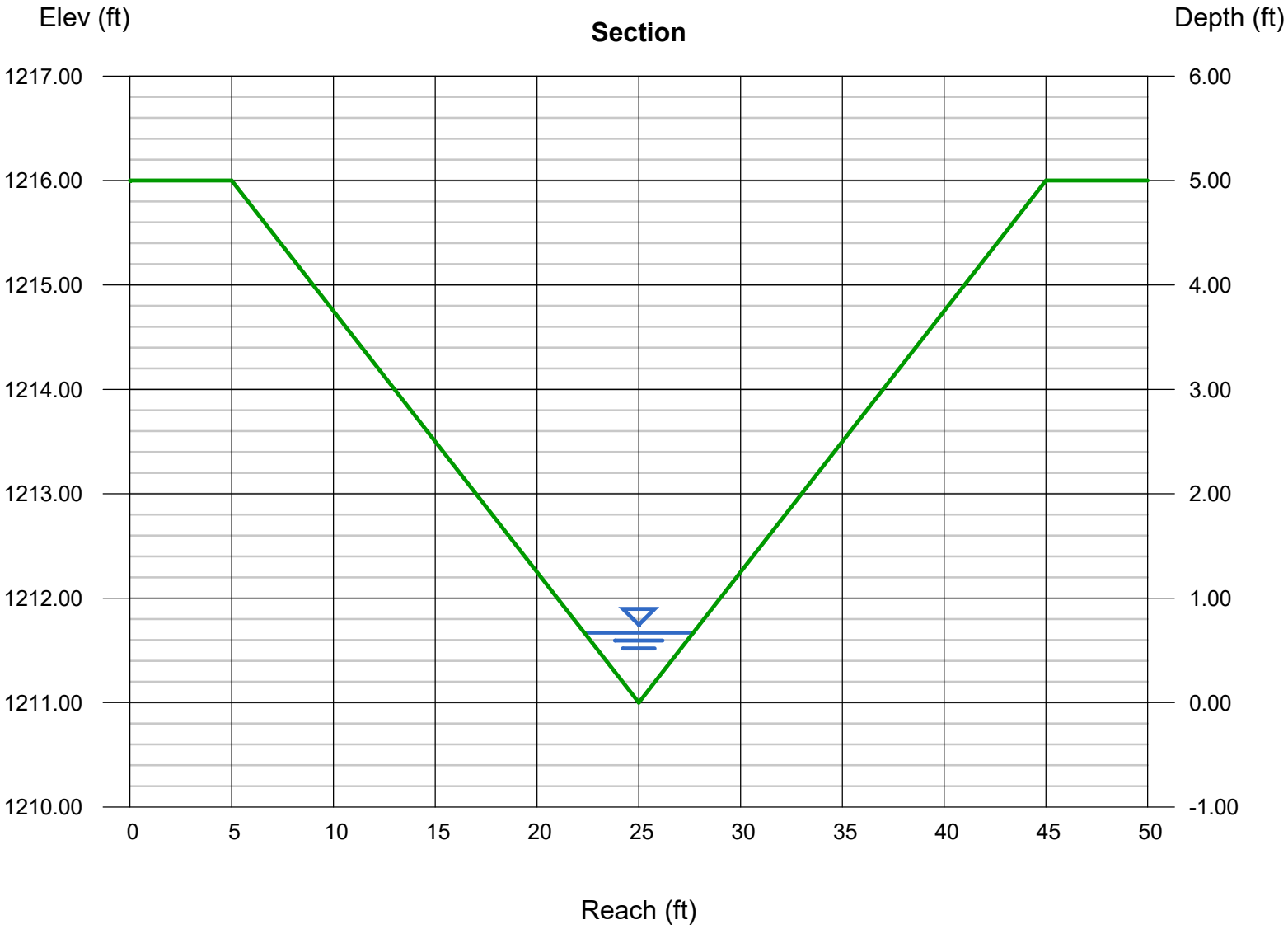
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 5.00
Invert Elev (ft)	= 1211.00
Slope (%)	= 8.60
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 10.20

Highlighted

Depth (ft)	= 0.67
Q (cfs)	= 10.20
Area (sqft)	= 1.80
Velocity (ft/s)	= 5.68
Wetted Perim (ft)	= 5.52
Crit Depth, Yc (ft)	= 0.84
Top Width (ft)	= 5.36
EGL (ft)	= 1.17



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Monday, Feb 25 2019

Q in Pipe @ Subarea B3 POC #9

Circular

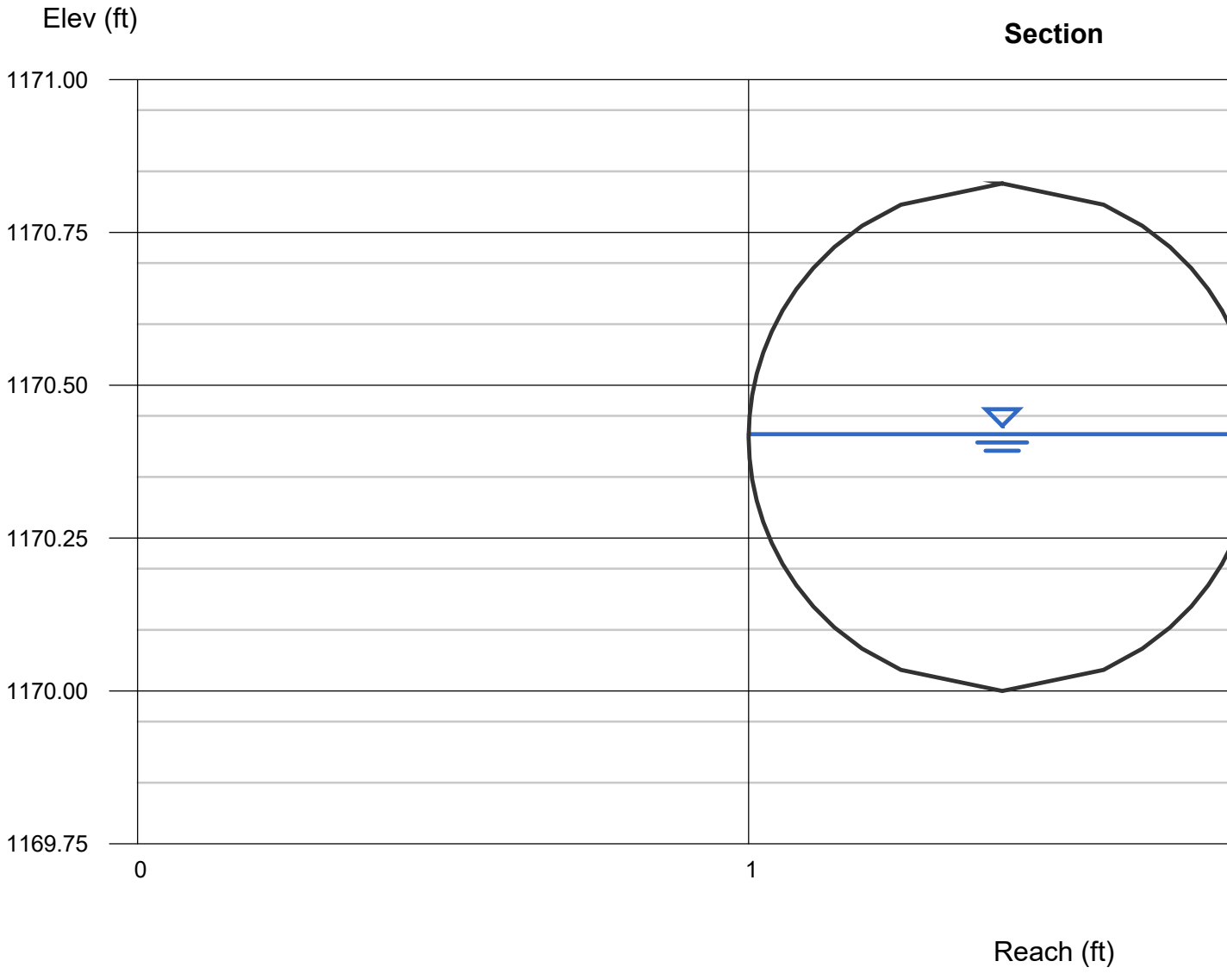
Diameter (ft)	= 0.83
Invert Elev (ft)	= 1170.00
Slope (%)	= 15.00
N-Value	= 0.013

Calculations

Compute by:	Known Q
Known Q (cfs)	= 4.20

Highlighted

Depth (ft)	= 0.42
Q (cfs)	= 4.200
Area (sqft)	= 0.28
Velocity (ft/s)	= 15.25
Wetted Perim (ft)	= 1.32
Crit Depth, Yc (ft)	= 0.81
Top Width (ft)	= 0.83
EGL (ft)	= 4.04



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Monday, Feb 18 2019

Q in Pipe @ Subarea C3 POC #9

Circular

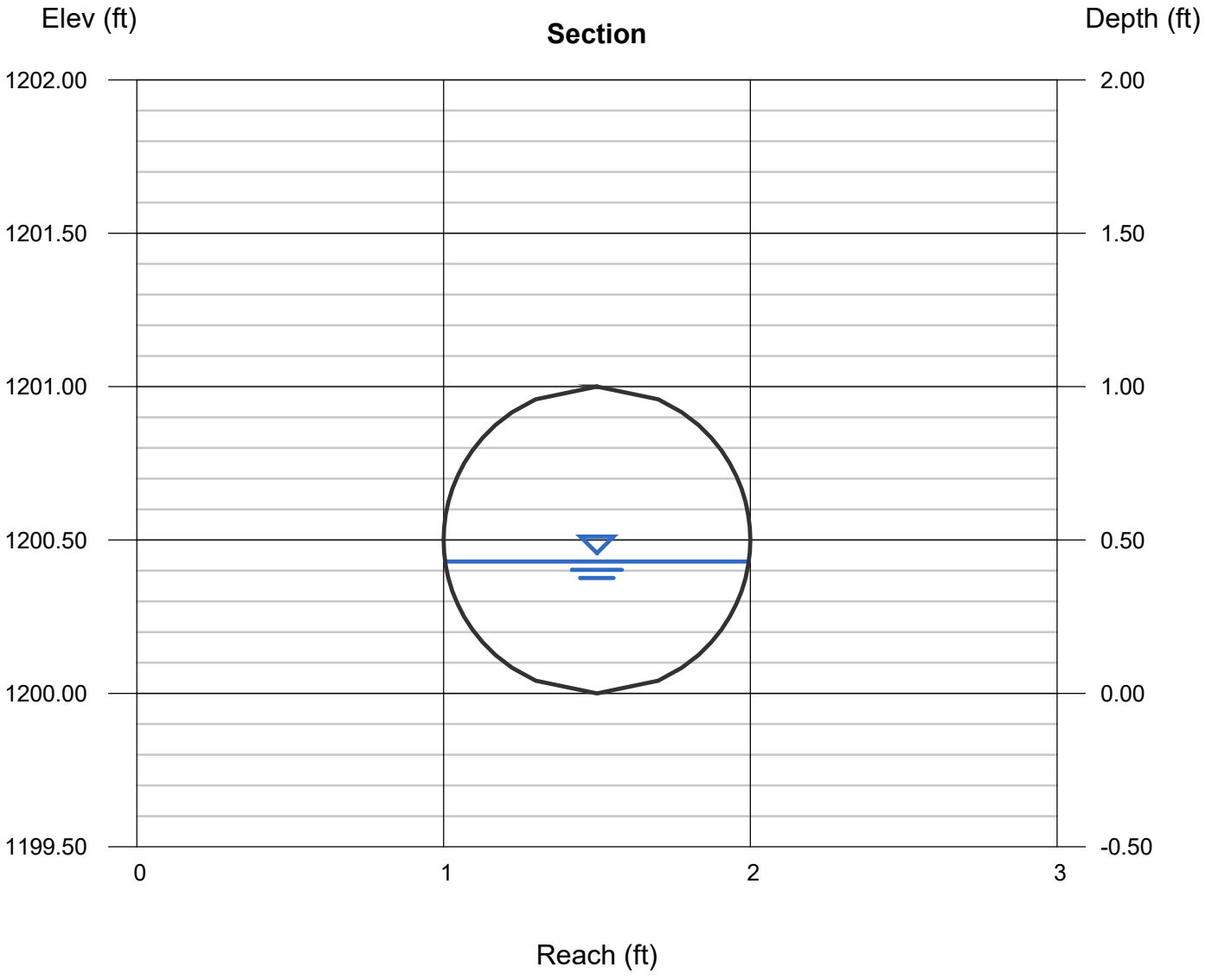
Diameter (ft)	= 1.00
Invert Elev (ft)	= 1200.00
Slope (%)	= 13.40
N-Value	= 0.013

Calculations

Compute by:	Known Q
Known Q (cfs)	= 5.00

Highlighted

Depth (ft)	= 0.43
Q (cfs)	= 5.000
Area (sqft)	= 0.33
Velocity (ft/s)	= 15.37
Wetted Perim (ft)	= 1.43
Crit Depth, Yc (ft)	= 0.92
Top Width (ft)	= 0.99
EGL (ft)	= 4.10



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Monday, Feb 18 2019

Q in Pipe @ Subarea C3 POC #13

Circular

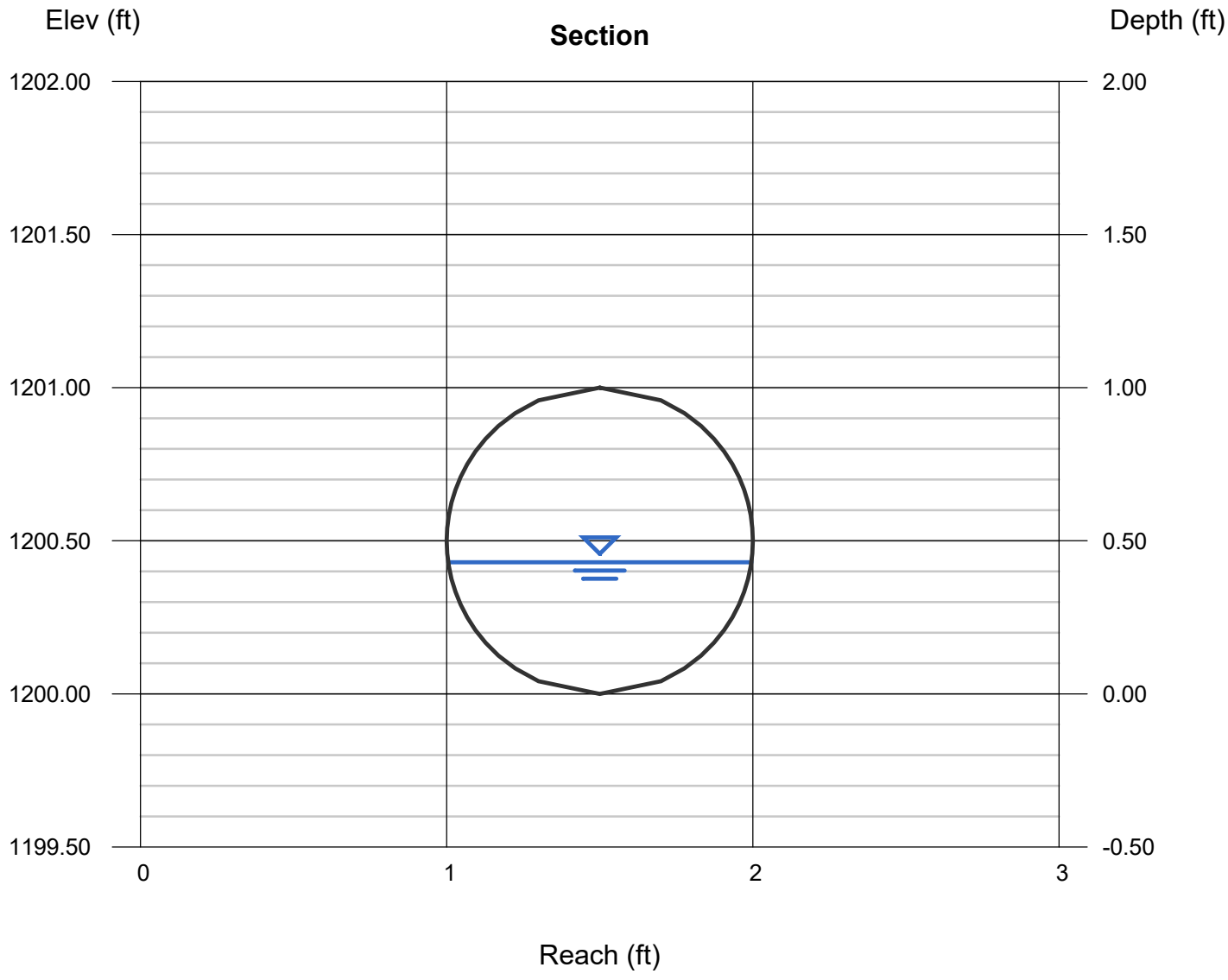
Diameter (ft)	= 1.00
Invert Elev (ft)	= 1200.00
Slope (%)	= 13.40
N-Value	= 0.013

Calculations

Compute by:	Known Q
Known Q (cfs)	= 5.00

Highlighted

Depth (ft)	= 0.43
Q (cfs)	= 5.000
Area (sqft)	= 0.33
Velocity (ft/s)	= 15.37
Wetted Perim (ft)	= 1.43
Crit Depth, Yc (ft)	= 0.92
Top Width (ft)	= 0.99
EGL (ft)	= 4.10



APPENDIX C.3

PRE-DEVELOPMENT 100-YR OVERALL WATERSEHD HYDROLOGY CALCULATIONS

Perrin Winery
16138 Highland Valley Road
Escondido, CA
Hydrology Calculations - 100-Yr Watershed Predevelopment
11/8/2019

100-Yr Watershed Hydrology - Predevelopment

Assumptions:

1) Use "Overland Time Flow Nomograph" equation for initial time of concentration:

$$T = \frac{1.8\,(1.1-C)\sqrt{D}}{\sqrt[3]{S}}$$

Where Ti= Time of Concentration (Minutes)
C= Runoff Coefficient,
S= Slope (%)
D or L = Water Course Distance (Feet)

2) Use "Time of Concentration" equation from Figure 3-4 of San Diego County Hydrology Manual

$$Tc = \left(\frac{11.9L^3}{\Delta E}\right)^{0.385}$$

Where Tc= Time of Concentration (Hour)
L= Water Course Distance (Miles)
ΔE= Change in Elevation (Feet)
A= Area (Acre)

3)Assume soil hydrologic group "C" for offsite watershed runoff with low density residential (LDR) with less than 1.0 DU/A (C=0.36 per Table 3-1 on San Diego County Hydrology. Manual)

4) Use "Rainfall Intensity" equation; $I = 7.44\,(P_{6})\,D^{-0.645}$

Where I= Rainfall Intensitty (in/hr)
P_6= ("3.5"), Rainfall Isopluvials 100-Yr 6-Hr ; See Isopluvial Map
D, (Tc)= Time of Concentration (Minutes)

	Tributary Area	Upstream Node	Downstream Node	A, (ac)	D, (ft)	C	(C)*(A)	Σ(CA)	ΔE, (ft)	S, (%)	Ti, (min)	Tc, (min)	ΣTc	v (ft/s)	I, (in/hr)	Q_{100}
System #1	M	50	51	2.0	423	0.36	0.7	0.7	80	18.9	10.3	1.6	11.8		5.3	3.8
	N	51	54	111.9	2605	0.36	40.3	41.0	305	11.7		3.8	15.6	11.48	4.4	181.3
System #2	O	52	53	2.0	450	0.36	0.7	0.7	215	47.8	7.8	1.1	8.9		6.3	4.6
	P	53	54	149.1	3898	0.36	53.7	54.4	545	14.0		4.9	13.9	13.15	4.8	259.7
System #3	S	54	56	65.5	1739	0.36	23.6	119.0	140	8.1		1.8	15.7	16.01	4.4	524.9
System #4	Q	50	55	2.0	463	0.36	0.7	0.7	60	13.0	12.2	1.9	14.1		4.7	3.4
	R	55	56	313.9	6028	0.36	113.0	113.7	465	7.7		7.9	22.1	12.67	3.5	402.5
System #5	T	56	57	60.0	1943	0.36	21.6	254.3	65	3.3		2.3	24.3	14.26	3.3	845.0

Perrin Winery
16138 Highland Valley Road
Escondido, CA
Hydrology Calculations - Predevelopment Supporting Calculations
11/8/2019

Determine t_c:

System #1

t_c @ Point of Concentration #51 11.8 min

Determine t_c from Line of Point 51 to 54:

Q @ Point 50=	3.8	cfs	
Estimated Q @ Point 2=	113.9	cfs	** Based on q_{avg} = 1 cfs/acre
Average Q in reach=	58.9	cfs	

Assume Triangular Channel Flow:

Q=	58.9	cfs	→ SEE CALCS, PG.
n=	0.035		
side slopes=	2:1		
slope=	0.117		
velocity=	11.48	fps	*** Per Channel Report, pg.
flow length=	2,605	ft	
travel time=	3.8	min	From POC #50 to #52

System #2

t_c @ Point of Concentration #53= 8.9 min

Determine t_c from Point 53 to 54:

Q @ Point 51=	4.6	cfs	
Estimated Q @ Point 52=	151.1	cfs	** Based on q_{avg} = 1 cfs/acre
Average Q in reach=	77.8	cfs	

Assume Triangular Channel Flow:

Q=	77.8	cfs	
n=	0.035		
side slopes=	2:1		
slope=	0.140		
velocity=	13.15	fps	*** Per Channel Report, pg.
flow length=	3,898	ft	
travel time=	4.9	min	From POC #53 to #54

System #3

Junction Equation @ POC #54

Q_{T1}= Q1+(Tc2/Tc1)*Q2
= 181.2+(13.9/15.6)*259.7
= 411.9 cfs

Q_{T2}= Q2+(I1/I2)*Q1
= 259.7+(4.4/4.8)*181.2
= 427.7 cfs

Use Q2 for larger Q; Use Tc2

t_c @ Point of Concentration #54= 13.9 min

Determine t_c from Point 54 to 56:

Q @ Point 54= 427.7 cfs

Estimated Q @ Point 56= 330.5 cfs ** Based on q_{avg} = 1 cfs/acre

Average Q in reach= 379.1 cfs

Assume Triangular Channel Flow:

Q=	379.1	cfs
n=	0.035	
side slopes=	2:1	
slope=	0.081	
velocity=	16.01	fps
flow length=	1739	ft
travel time=	1.8	min

*** Per Channel Report, pg.

System #4

t_c @ Point of Concentration 55= 1.9 min

Determine t_c from Point 55 to 56:

Q @ Point 55= 3.4 cfs

Estimated Q @ Point 56= 315.9 cfs ** Based on 1 cfs/acre

Average Q in reach= 159.6 cfs

Assume Triangular Channel Flow:

Q=	159.6	cfs
n=	0.035	
side slopes=	2:1	
slope=	0.077	
velocity=	12.67	fps

*** Per Channel Report, pg.

flow length=	6028	ft
travel time=	7.9	min

System #5

Junction Equation @ POC #56

Q_{T3}= Q3+(Tc3/Tc4)*Q4
= 524.9+(15.7/22.1)*402.5
= 810.9 cfs

Q_{T4}= Q4+(I4/I3)*Q3
= 402.5+(3.5/4.4)*524.9
= 823.6 cfs

Use Q4 for larger Q; Use Tc4

t_c @ Point of Concentration #56= 22.1 min

Determine t_c from Point 56 to 57:

Q @ Point 54= 823.6 cfs

Estimated Q @ Point 57= 706.4 cfs ** Based on q_{avg} = 1 cfs/acre

Average Q in reach= 765.0 cfs

Assume Triangular Channel Flow:

Q=	765.0	cfs	
n=	0.035		
side slopes=	2:1		
slope=	0.033		
velocity=	14.26	fps	*** Per Channel Report, pg.
flow length=	1943	ft	
travel time=	2.3	min	

Channel Report

Q @ System #1 POC #51 to #54

Triangular

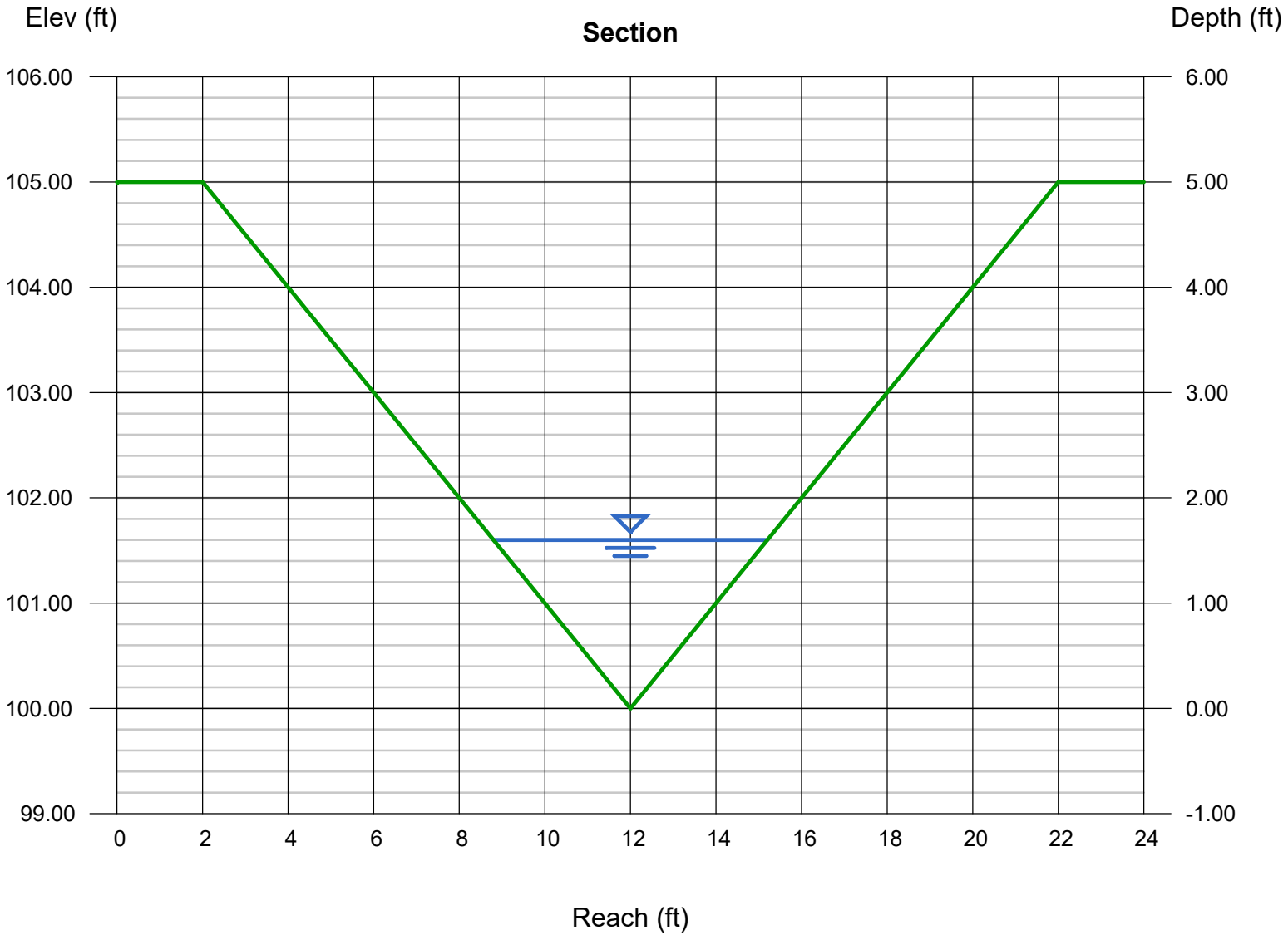
Side Slopes (z:1)	= 2.00, 2.00
Total Depth (ft)	= 5.00
Invert Elev (ft)	= 100.00
Slope (%)	= 11.70
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 58.80

Highlighted

Depth (ft)	= 1.60
Q (cfs)	= 58.80
Area (sqft)	= 5.12
Velocity (ft/s)	= 11.48
Wetted Perim (ft)	= 7.16
Crit Depth, Yc (ft)	= 2.22
Top Width (ft)	= 6.40
EGL (ft)	= 3.65



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Tuesday, Feb 12 2019

Q @ System #2 POC #53 to #54

Triangular

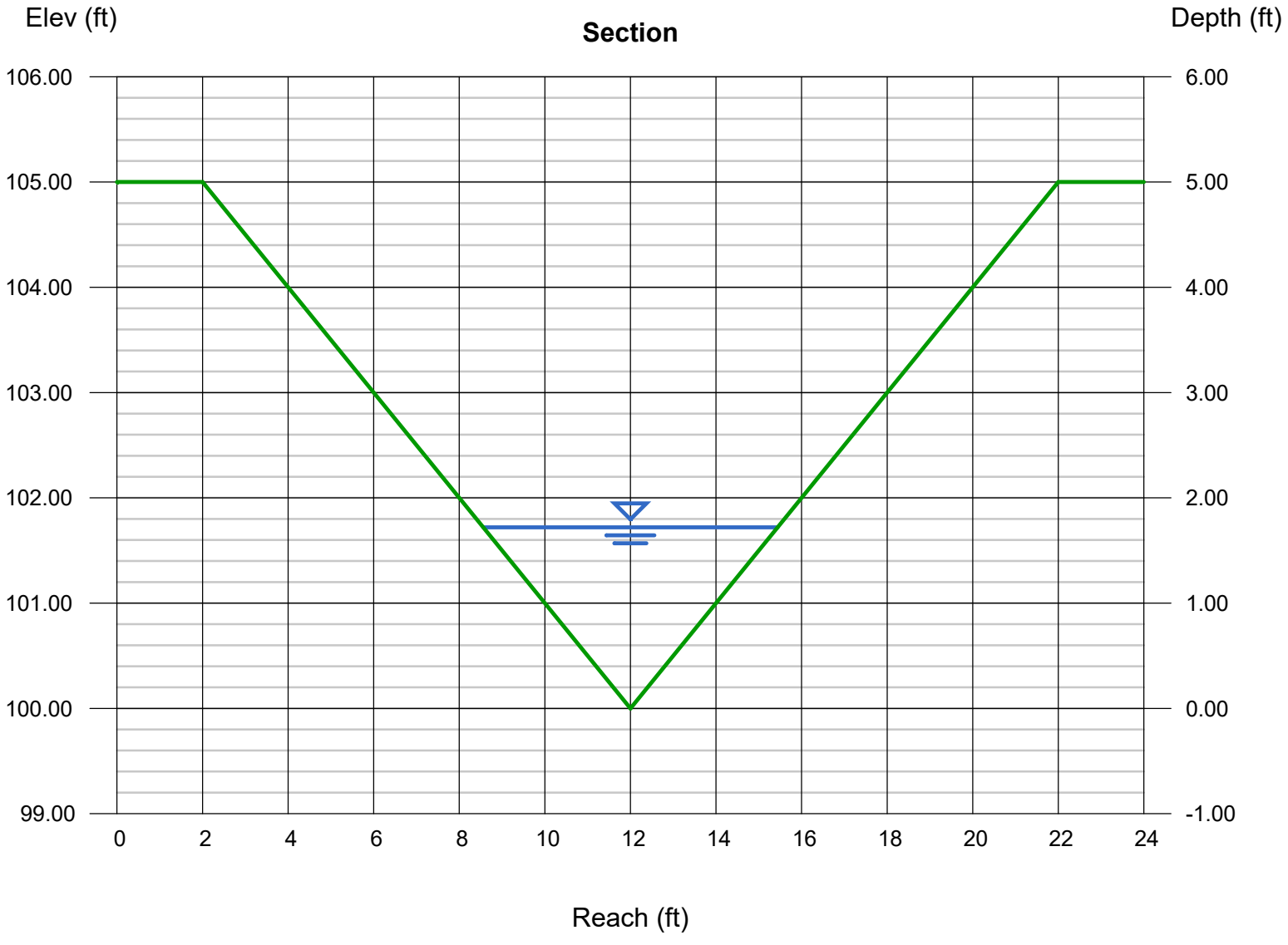
Side Slopes (z:1)	= 2.00, 2.00
Total Depth (ft)	= 5.00
Invert Elev (ft)	= 100.00
Slope (%)	= 14.00
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 77.80

Highlighted

Depth (ft)	= 1.72
Q (cfs)	= 77.80
Area (sqft)	= 5.92
Velocity (ft/s)	= 13.15
Wetted Perim (ft)	= 7.69
Crit Depth, Yc (ft)	= 2.49
Top Width (ft)	= 6.88
EGL (ft)	= 4.41



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Tuesday, Feb 12 2019

Q @ System #3 POC #54 to #56

Triangular

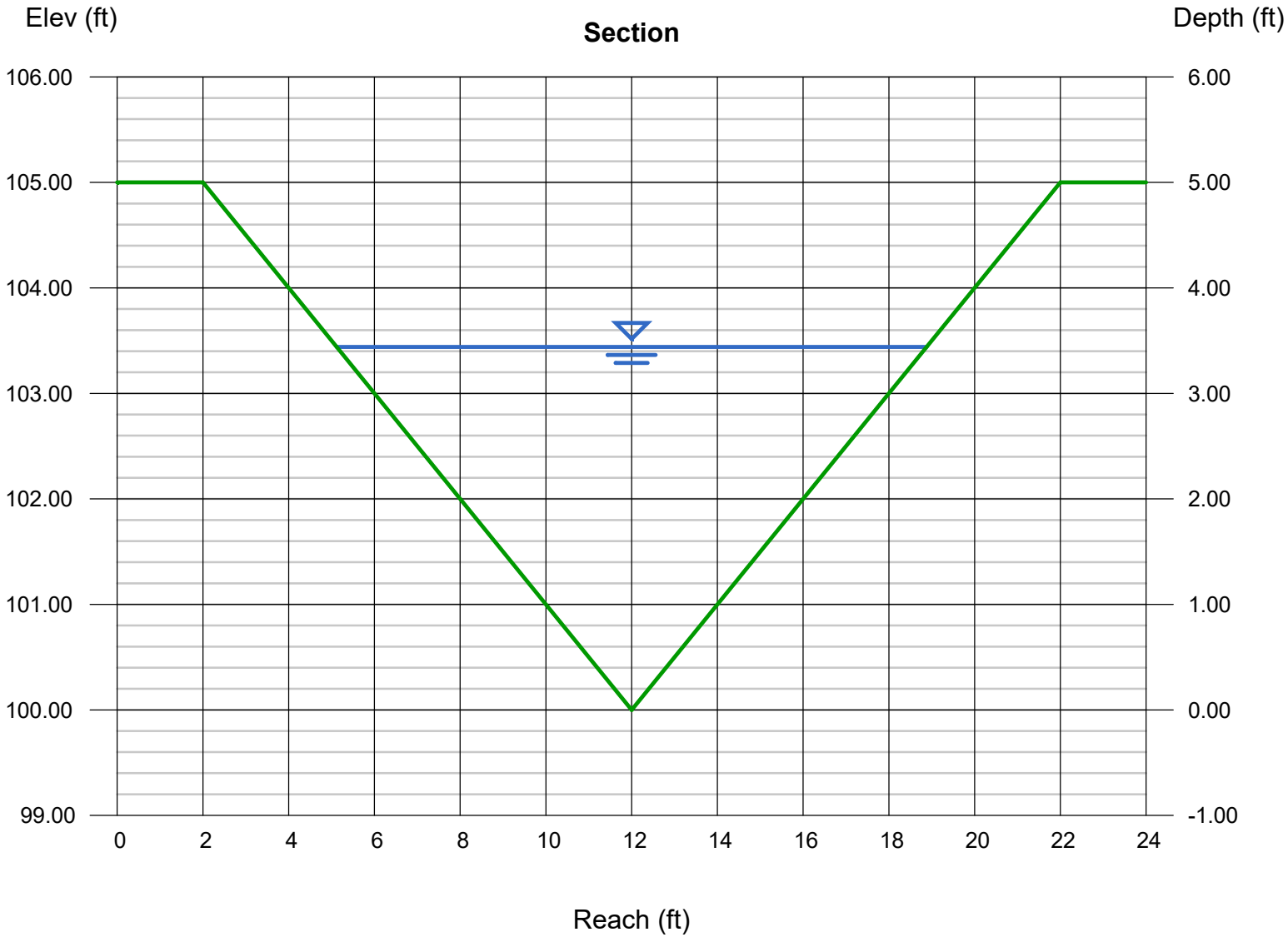
Side Slopes (z:1)	= 2.00, 2.00
Total Depth (ft)	= 5.00
Invert Elev (ft)	= 100.00
Slope (%)	= 8.10
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 378.90

Highlighted

Depth (ft)	= 3.44
Q (cfs)	= 378.90
Area (sqft)	= 23.67
Velocity (ft/s)	= 16.01
Wetted Perim (ft)	= 15.38
Crit Depth, Yc (ft)	= 4.68
Top Width (ft)	= 13.76
EGL (ft)	= 7.42



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Tuesday, Feb 12 2019

Q @ System #4 POC #55 to #56

Triangular

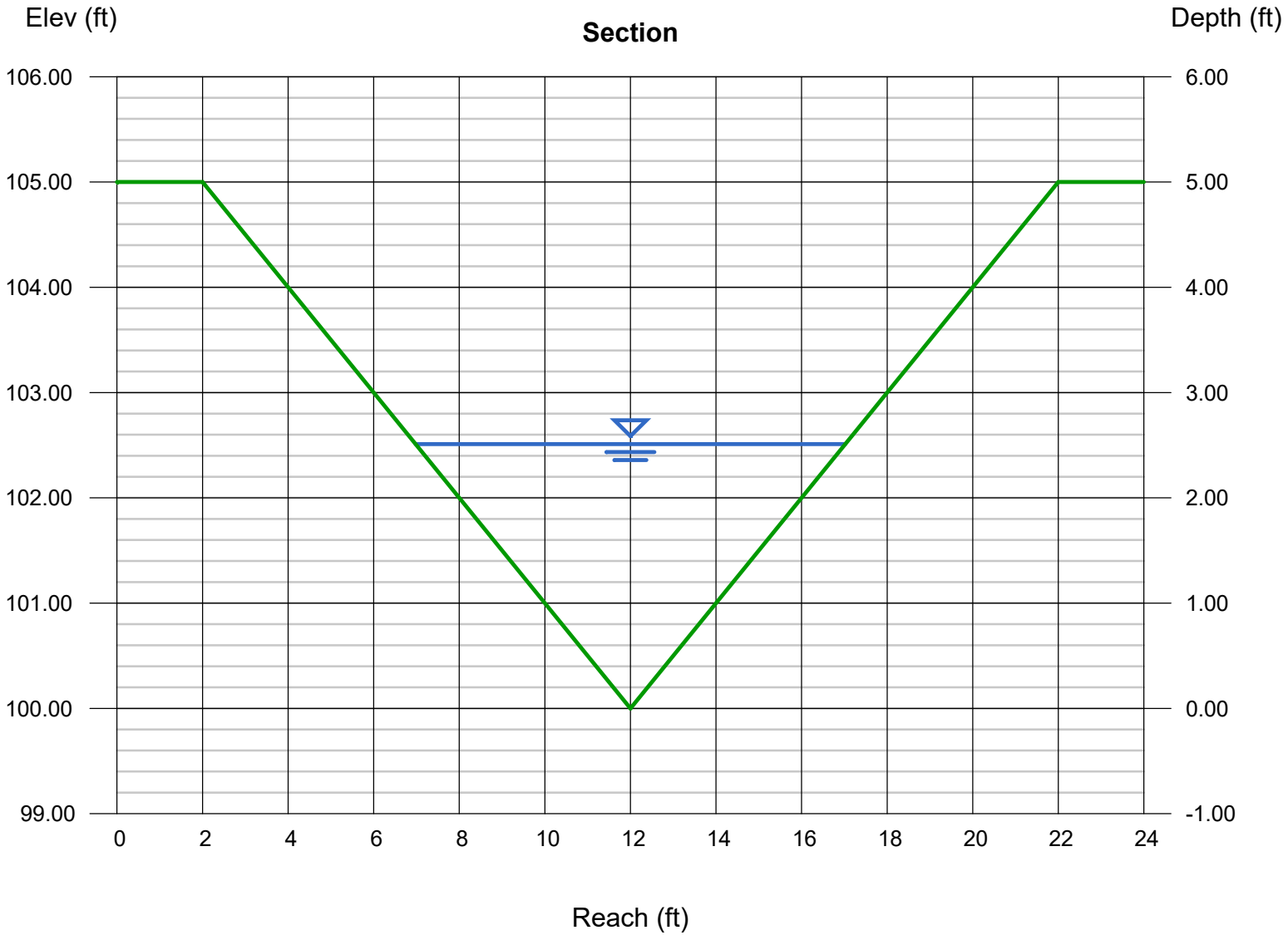
Side Slopes (z:1)	= 2.00, 2.00
Total Depth (ft)	= 5.00
Invert Elev (ft)	= 100.00
Slope (%)	= 7.70
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 159.60

Highlighted

Depth (ft)	= 2.51
Q (cfs)	= 159.60
Area (sqft)	= 12.60
Velocity (ft/s)	= 12.67
Wetted Perim (ft)	= 11.23
Crit Depth, Yc (ft)	= 3.31
Top Width (ft)	= 10.04
EGL (ft)	= 5.00



Channel Report

Q @ System #5 POC #56 to #57

Triangular

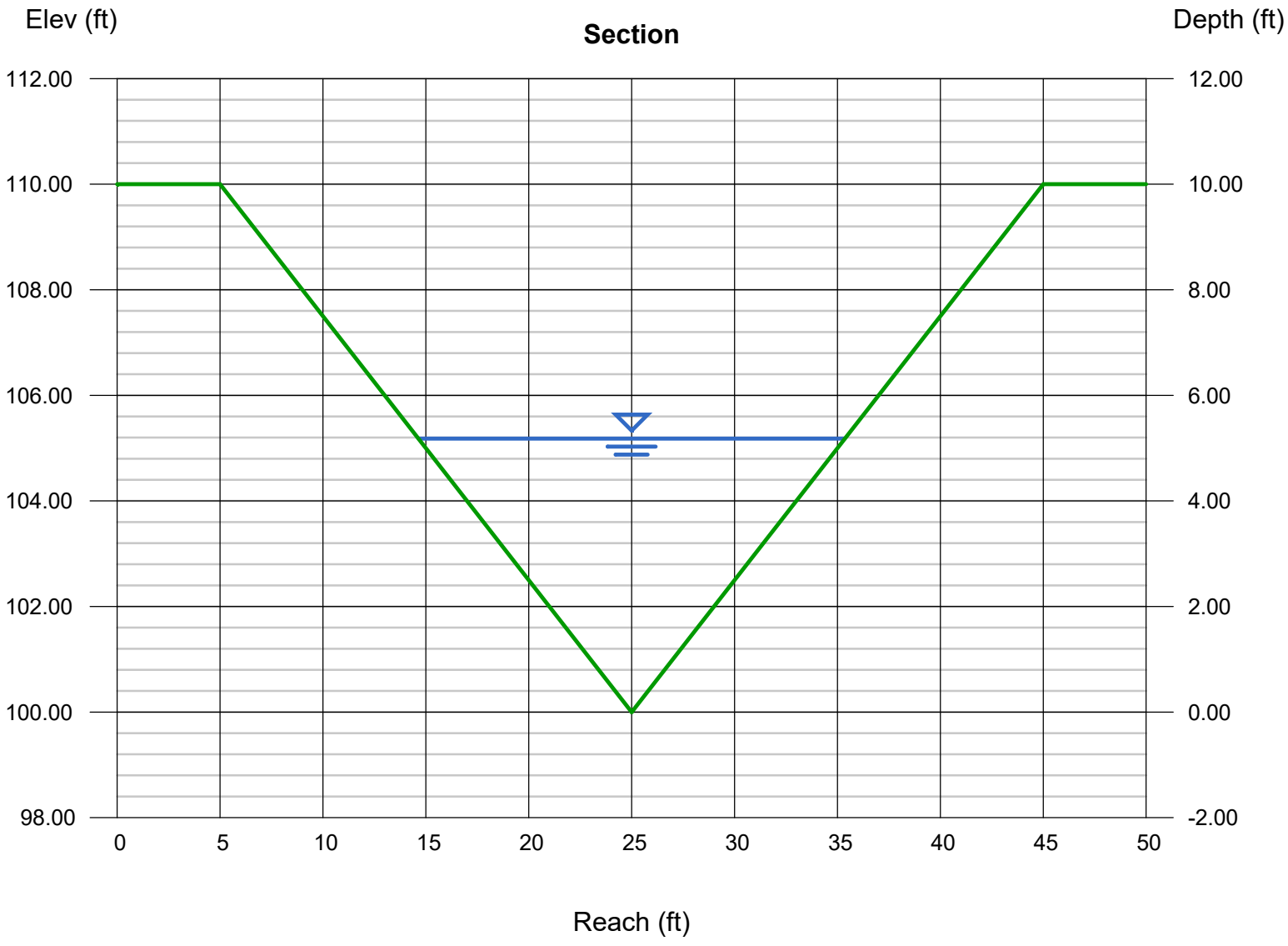
Side Slopes (z:1)	= 2.00, 2.00
Total Depth (ft)	= 10.00
Invert Elev (ft)	= 100.00
Slope (%)	= 3.30
N-Value	= 0.033

Calculations

Compute by:	Known Q
Known Q (cfs)	= 765.00

Highlighted

Depth (ft)	= 5.18
Q (cfs)	= 765.00
Area (sqft)	= 53.67
Velocity (ft/s)	= 14.26
Wetted Perim (ft)	= 23.17
Crit Depth, Yc (ft)	= 6.20
Top Width (ft)	= 20.72
EGL (ft)	= 8.34



APPENDIX C.4

POST-DEVELOPMENT 100-YR OVERALL WATERSEHD HYDROLOGY CALCULATIONS

Perrin Winery
16138 Highland Valley Road
Escondido, CA
Hydrology Calculations - 100-Yr Watershed Post-Development
11/8/2019

100-Yr Watershed Hydrology - Post-Development

Assumptions:

1) Use "Overland Time Flow Nomograph" equation for initial time of concentration:

$$T = \frac{1.8\,(1.1-C)\sqrt{D}}{\sqrt[3]{s}}$$

Where Ti= Time of Concentration (Minutes)
C= Runoff Coefficient,
S= Slope (%)
D or L = Water Course Distance (Feet)

2) Use "Time of Concentration" equation from Figure 3-4 of San Diego County Hydrology Manual

$$Tc = \left(\frac{11.9L^3}{\Delta E}\right)^{0.385}$$

Where Tc= Time of Concentration (Hour)
L= Water Course Distance (Miles)
ΔE= Change in Elevation (Feet)
A= Area (Acre)

3)Assume soil hydrologic group "C" for offsite watershed runoff with low density residential (LDR) with less than 1.0 DU/A (C=0.36 per Table 3-1 on San Diego County Hydrology. Manual)

3A) Assume post-development C-Weighted of 0.48 over 9.5 acres of overall project site area (see post-development of C-weighted calculations on page)

System #5 Post Development
runoff coefficient = (0.36*(60-8.7)+(0.50*8.7))/60
= **0.38**

4) Use "Rainfall Intensity" equation; $I = 7.44\,(P_6)\,D^{-0.645}$
Where I= Rainfall Intensitty (in/hr)
P_6= ("3.5"), Rainfall Isopluvials 100-Yr 6-Hr ; See Isopluvial Map
D, (Tc)= Time of Concentration (Minutes)

	Tributary Area	Upstream Node	Downstream Node	A, (ac)	D, (ft)	C	(C)*(A)	Σ(CA)	ΔE, (ft)	S, (%)	Ti, (min)	Tc, (min)	ΣTc	v (ft/s)	I, (in/hr)	Q_{100}
System #1	M	50	51	2.0	423	0.36	0.7	0.7	80	18.9	10.3	1.6	11.8		5.3	3.8
	N	51	54	111.9	2605	0.36	40.3	41.0	305	11.7		3.8	15.6	11.48	4.4	181.3
System #2	O	52	53	2.0	450	0.36	0.7	0.7	215	47.8	7.8	1.1	8.9		6.3	4.6
	P	53	54	149.1	3898	0.36	53.7	54.4	545	14.0		4.9	13.9	13.15	4.8	259.7
System #3	S	54	56	65.5	1739	0.36	23.6	119.0	140	8.1		1.8	15.7	16.01	4.4	524.9
System #4	Q	50	55	2.0	463	0.36	0.7	0.7	60	13.0	12.2	1.9	14.1		4.7	3.4
	R	55	56	313.9	6028	0.36	113.0	113.7	465	7.7		7.9	22.1	12.67	3.5	402.5
System #5	T	56	57	60.0	1943	**0.38**	22.8	255.5	65	3.3		2.3	24.3	14.26	3.3	**849.0**

**** The Q_{100} from pre-development to post-development has increased from 845.0 cfs to 849.0 cfs.**

Perrin Winery
16138 Highland Valley Road
Escondido, CA
Hydrology Calculations - Post-Development Supporting Calculations
11/8/2019

Determine t_c:

System #1

t_c @ Point of Concentration #51 11.8 min

Determine t_c from Line of Point 51 to 54:

Q @ Point 50=	3.8	cfs	
Estimated Q @ Point 2=	113.9	cfs	** Based on q_{avg} = 1 cfs/acre
Average Q in reach=	58.9	cfs	

Assume Triangular Channel Flow:

Q=	58.9	cfs	→ SEE CALCS, PG.
n=	0.035		
side slopes=	2:1		
slope=	0.117		
velocity=	11.48	fps	*** Per Channel Report, pg.
flow length=	2,605	ft	
travel time=	3.8	min	From POC #50 to #52

System #2

t_c @ Point of Concentration #53= 8.9 min

Determine t_c from Point 53 to 54:

Q @ Point 51=	4.6	cfs	
Estimated Q @ Point 52=	151.1	cfs	** Based on q_{avg} = 1 cfs/acre
Average Q in reach=	77.8	cfs	

Assume Triangular Channel Flow:

Q=	77.8	cfs	
n=	0.035		
side slopes=	2:1		
slope=	0.140		
velocity=	13.15	fps	*** Per Channel Report, pg.
flow length=	3,898	ft	
travel time=	4.9	min	From POC #53 to #54

System #3

Junction Equation @ POC #54

Q_{T1}= Q1+(Tc2/Tc1)*Q2
= 181.2+(13.9/15.6)*259.7
= 411.9 cfs

Q_{T2}= Q2+(I1/I2)*Q1
= 259.7+(4.4/4.8)*181.2
= 427.7 cfs

Use Q2 for larger Q; Use Tc2

t_c @ Point of Concentration #54= 13.9 min

Determine t_c from Point 54 to 56:

Q @ Point 54= 427.7 cfs

Estimated Q @ Point 56= 330.5 cfs ** Based on q_{avg} = 1 cfs/acre

Average Q in reach= 379.1 cfs

Assume Triangular Channel Flow:

Q=	379.1	cfs
n=	0.035	
side slopes=	2:1	
slope=	0.081	
velocity=	16.01	fps
flow length=	1739	ft
travel time=	1.8	min

*** Per Channel Report, pg.

System #4

t_c @ Point of Concentration 55= 1.9 min

Determine t_c from Point 55 to 56:

Q @ Point 55= 3.4 cfs

Estimated Q @ Point 56= 315.9 cfs ** Based on 1 cfs/acre

Average Q in reach= 159.6 cfs

Assume Triangular Channel Flow:

Q=	159.6	cfs
n=	0.035	
side slopes=	2:1	
slope=	0.077	
velocity=	12.67	fps

*** Per Channel Report, pg.

flow length=	6028	ft
travel time=	7.9	min

System #5

Junction Equation @ POC #56

Q_{T3}= Q3+(Tc3/Tc4)*Q4
= 524.9+(15.7/22.1)*402.5
= 810.9 cfs

Q_{T4}= Q4+(I4/I3)*Q3
= 402.5+(3.5/4.4)*524.9
= 823.6 cfs

Use Q4 for larger Q; Use Tc4

t_c @ Point of Concentration #56= 22.1 min

Determine t_c from Point 56 to 57:

Q @ Point 54= 823.6 cfs

Estimated Q @ Point 57= 706.4 cfs ** Based on q_{avg} = 1 cfs/acre

Average Q in reach= 765.0 cfs

Assume Triangular Channel Flow:

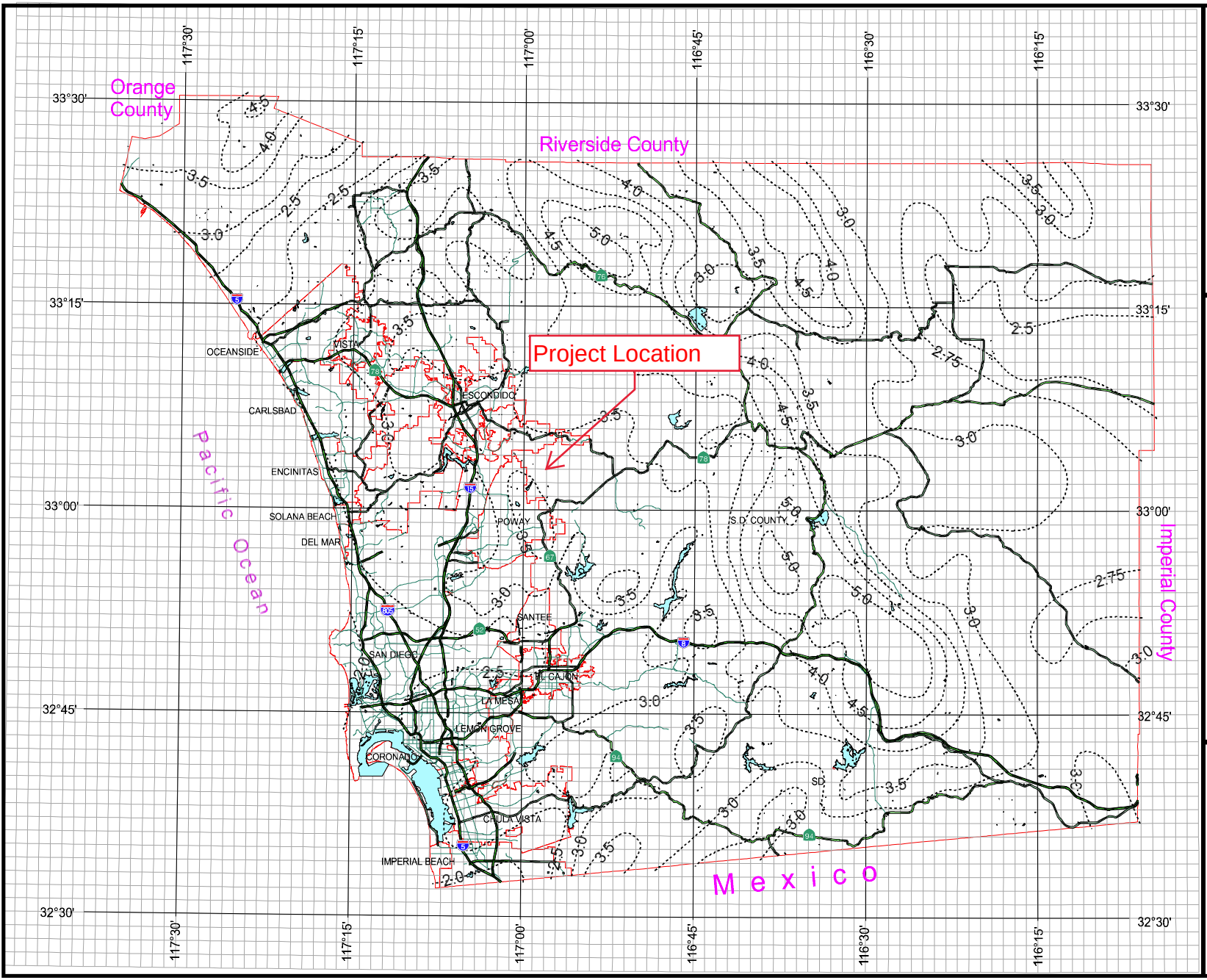
Q=	765.0	cfs	
n=	0.035		
side slopes=	2:1		
slope=	0.033		
velocity=	14.26	fps	*** Per Channel Report, pg.
flow length=	1943	ft	
travel time=	2.3	min	

APPENDIX C.5

COUNTY OF SAN DIEGO HYDROLOGIC TABLES AND FIGURES

County of San Diego Hydrology Manual

Rainfall Isopluvials



100 Year Rainfall Event - 6 Hours

Isopluvial (inches)

Lat:33o3'
Long: 116o58'
P6 = 3.5

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Department of Public Works Geographic Information Services

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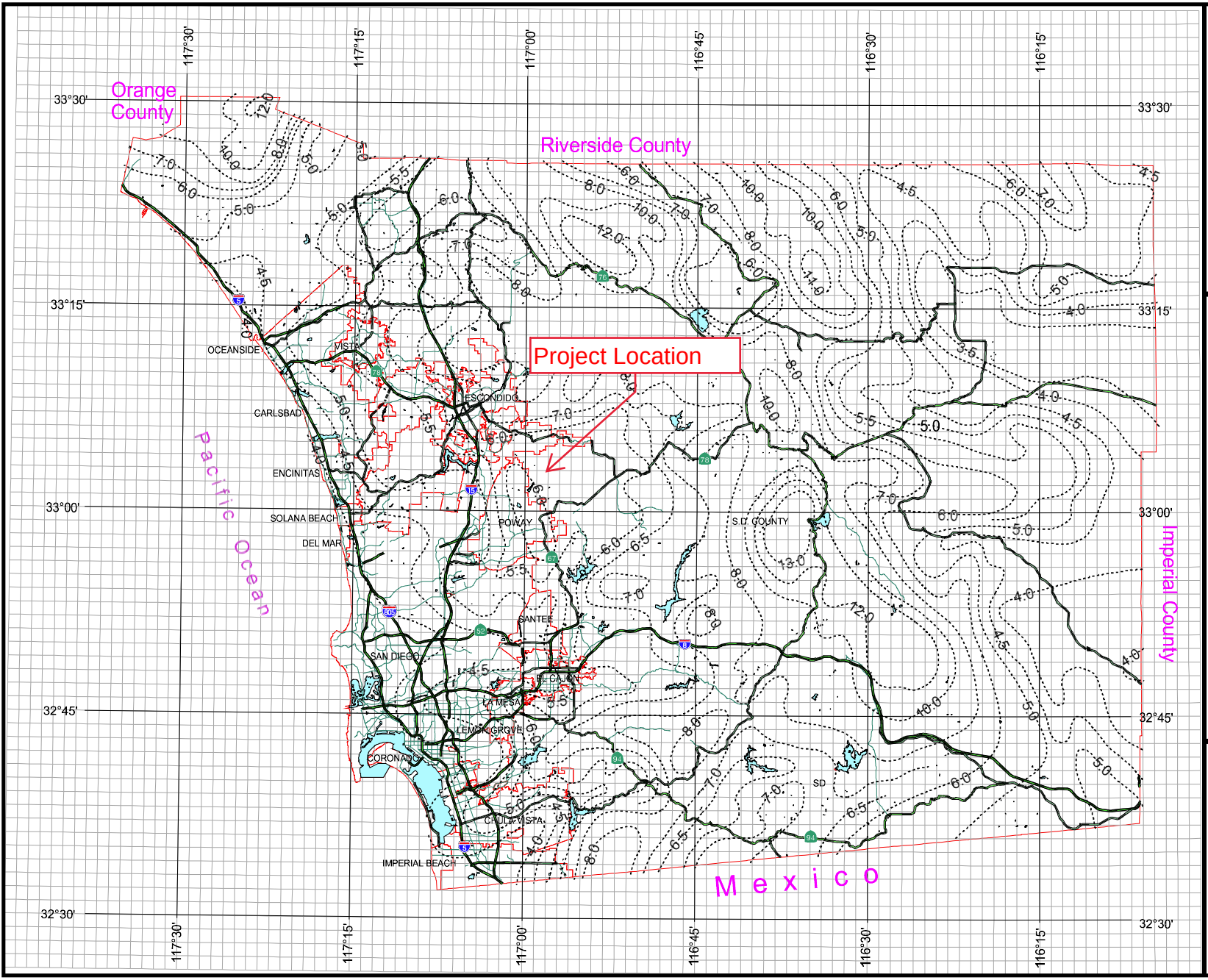
3 0 3 Miles

County of San Diego Hydrology Manual

Rainfall Isopluvials



100 Year Rainfall Event - 24 Hours

Isopluvial (inches)

Lat:33o3'
Long: 116o58'
P24 = 6.0 in

DPW GIS
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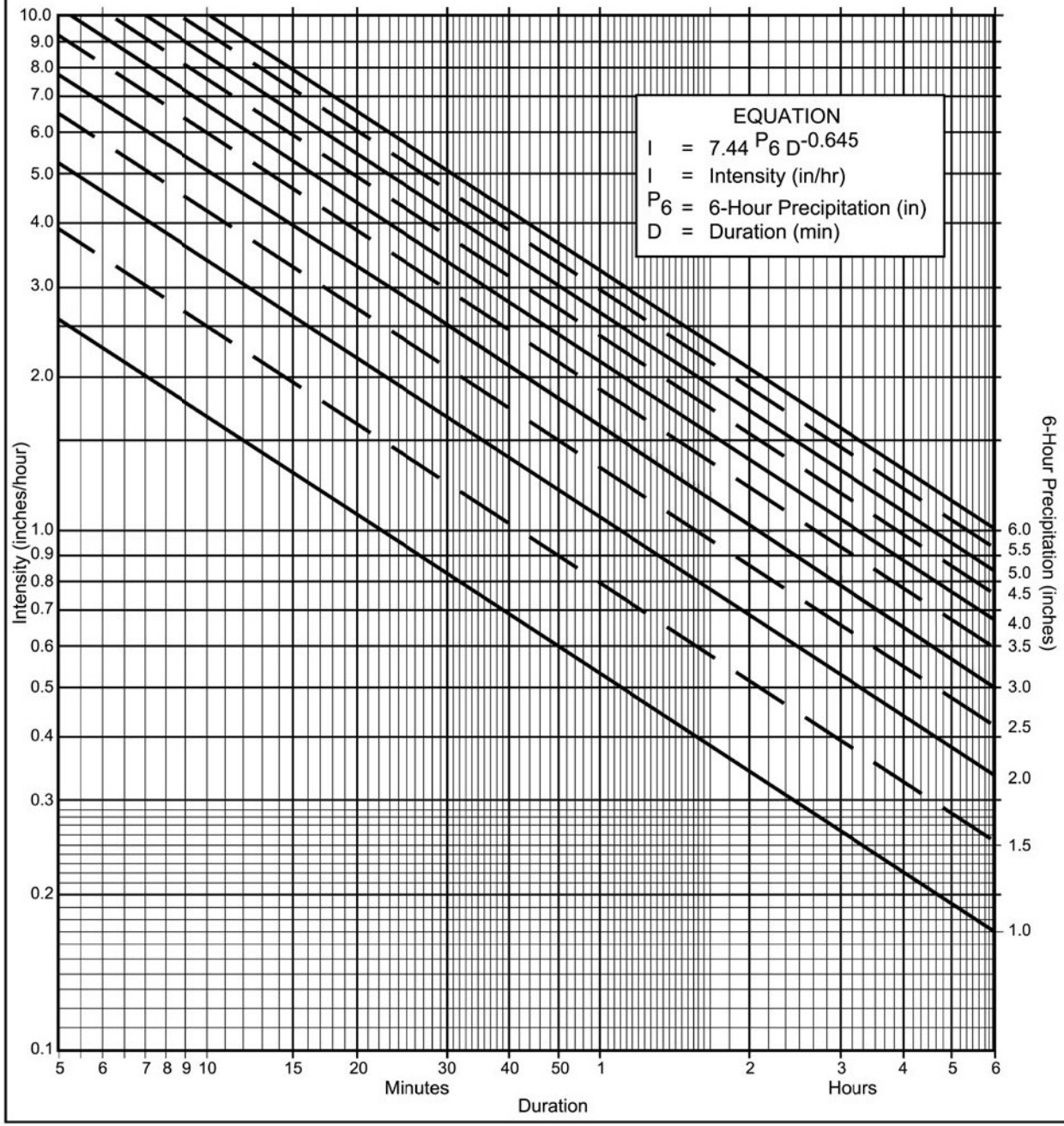


Directions for Application:

(1) From precipitation maps determine 6 hr and 24 hr amounts for the selected frequency. These maps are included in the County Hydrology Manual (10, 50, and 100 yr maps included in the Design and Procedure Manual).

(2) Adjust 6 hr precipitation (if necessary) so that it is within the range of 45% to 65% of the 24 hr precipitation (not applicaple to Desert).

(3) Plot 6 hr precipitation on the right side of the chart.

(4) Draw a line through the point parallel to the plotted lines.

(5) This line is the intensity-duration curve for the location being analyzed.

Application Form:

(a) Selected frequency 100 year

(b) P_6 = 3.5 in., P_{24} = 6.0, $\frac{P_6}{P_{24}}$ = 58.3 %(2)

(c) Adjusted P_6(2) = 3.5 in.

(d) t_x = ** min. ** See Calculations Section

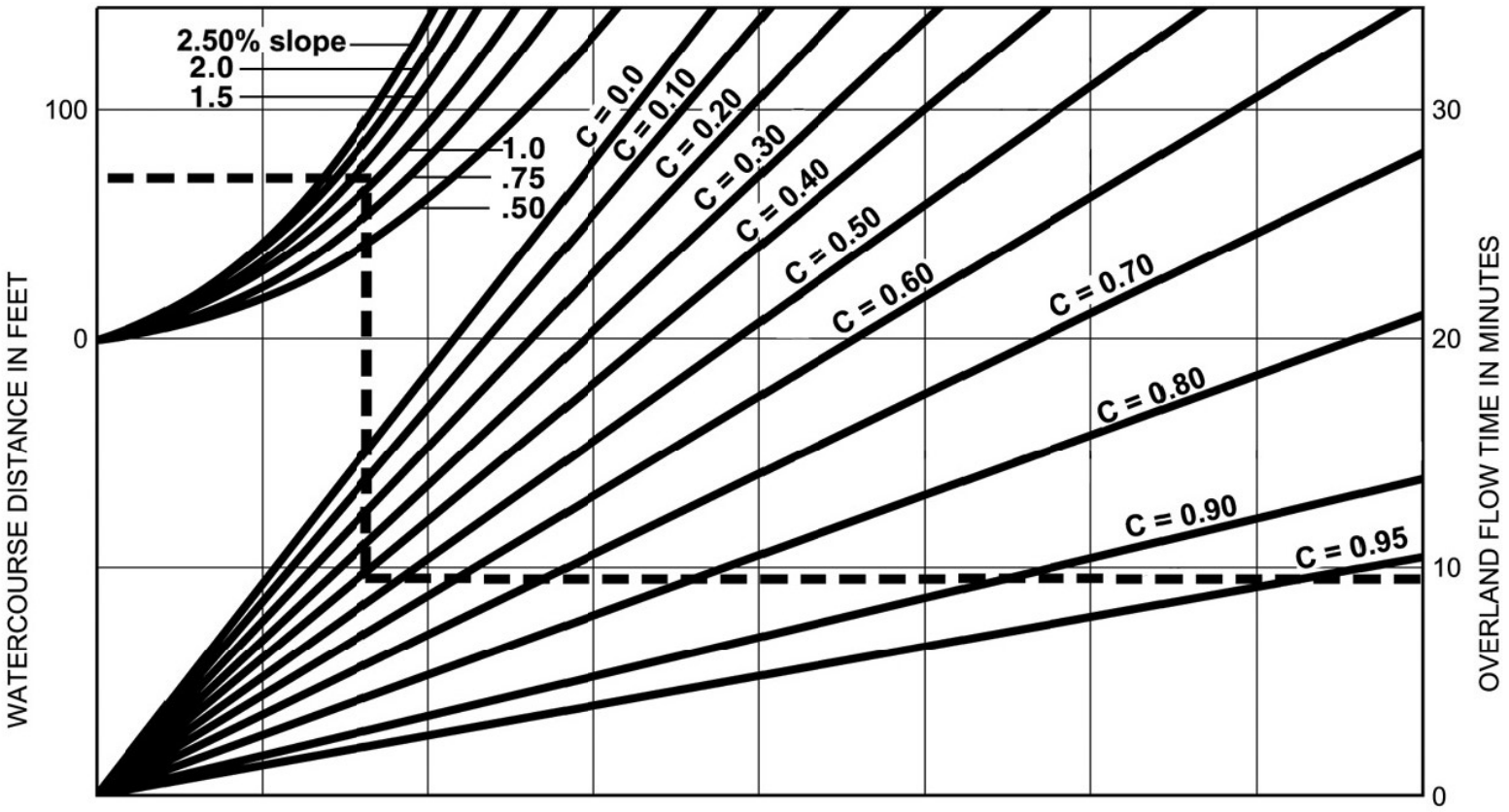
(e) I = ** in./hr.

Note: This chart replaces the Intensity-Duration-Frequency curves used since 1965.

P6	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6
Duration	I	I	I	I	I	I	I	I	I	I	I
5	2.63	3.95	5.27	6.59	7.90	9.22	10.54	11.86	13.17	14.49	15.81
7	2.12	3.18	4.24	5.30	6.36	7.42	8.48	9.54	10.60	11.66	12.72
10	1.68	2.53	3.37	4.21	5.05	5.90	6.74	7.58	8.42	9.27	10.11
15	1.30	1.95	2.59	3.24	3.89	4.54	5.19	5.84	6.49	7.13	7.78
20	1.08	1.62	2.15	2.69	3.23	3.77	4.31	4.85	5.39	5.93	6.46
25	0.93	1.40	1.87	2.33	2.80	3.27	3.73	4.20	4.67	5.13	5.60
30	0.83	1.24	1.66	2.07	2.49	2.90	3.32	3.73	4.15	4.56	4.98
40	0.69	1.03	1.38	1.72	2.07	2.41	2.76	3.10	3.45	3.79	4.13
50	0.60	0.90	1.19	1.49	1.79	2.09	2.39	2.69	2.98	3.28	3.58
60	0.53	0.80	1.06	1.33	1.59	1.86	2.12	2.39	2.65	2.92	3.18
90	0.41	0.61	0.82	1.02	1.23	1.43	1.63	1.84	2.04	2.25	2.45
120	0.34	0.51	0.68	0.85	1.02	1.19	1.36	1.53	1.70	1.87	2.04
150	0.29	0.44	0.59	0.73	0.88	1.03	1.18	1.32	1.47	1.62	1.76
180	0.26	0.39	0.52	0.65	0.78	0.91	1.04	1.18	1.31	1.44	1.57
240	0.22	0.33	0.43	0.54	0.65	0.76	0.87	0.98	1.08	1.19	1.30
300	0.19	0.28	0.38	0.47	0.56	0.66	0.75	0.85	0.94	1.03	1.13
360	0.17	0.25	0.33	0.42	0.50	0.58	0.67	0.75	0.84	0.92	1.00

Intensity-Duration Design Chart - Template

FIGURE 3-1



EXAMPLE:

Given: Watercourse Distance (D) = 70 Feet
Slope (s) = 1.3%
Runoff Coefficient (C) = 0.41
Overland Flow Time (T) = 9.5 Minutes

$$T = \frac{1.8\,(1.1\text{-}C)\sqrt{D}}{\sqrt[3]{s}}$$

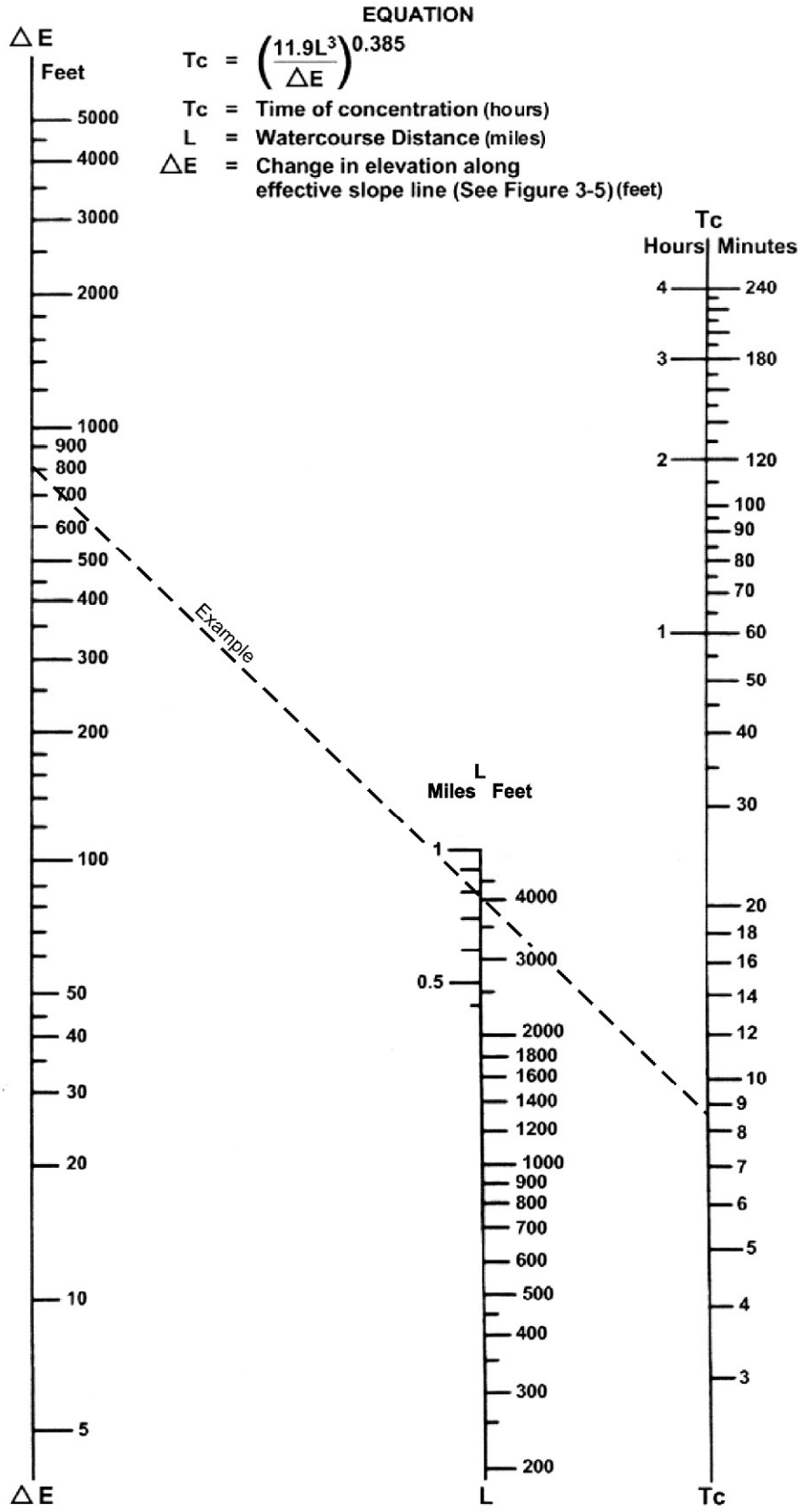
** See Calculations Section

SOURCE: Airport Drainage, Federal Aviation Administration, 1965

FIGURE

3-3

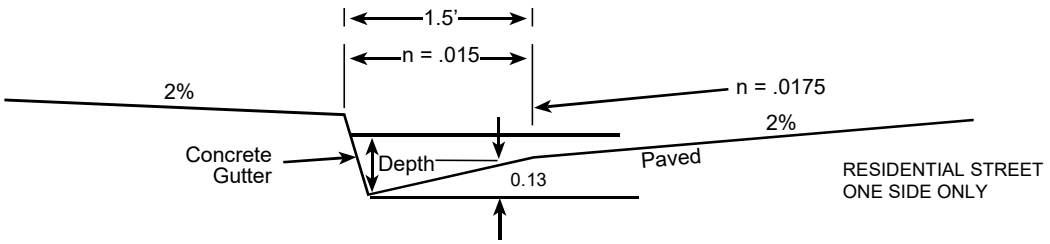
Rational Formula - Overland Time of Flow Nomograph

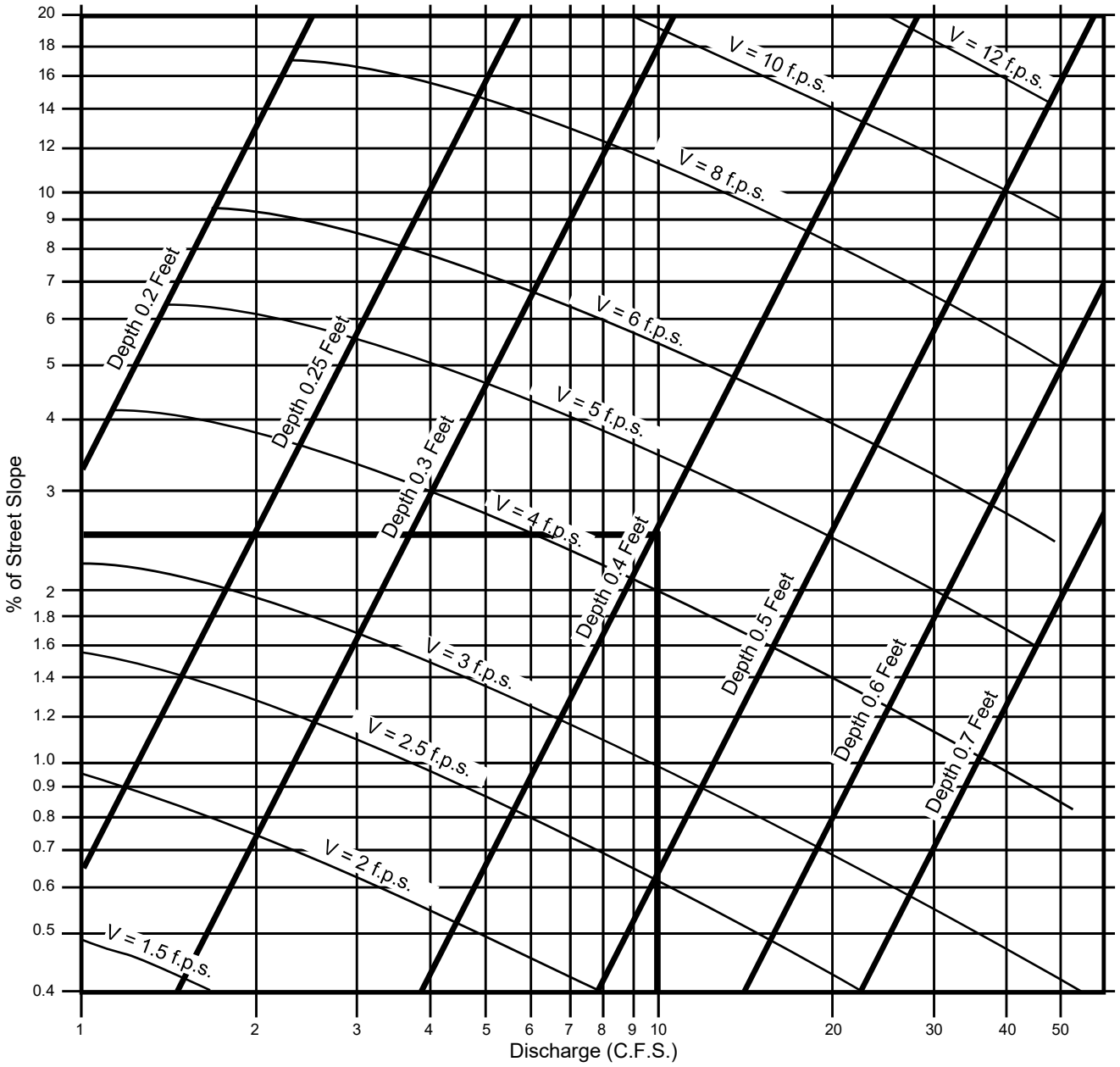


SOURCE: California Division of Highways (1941) and Kirpich (1940)

FIGURE 3-4

Nomograph for Determination of
Time of Concentration (Tc) or Travel Time (Tt) for Natural Watersheds





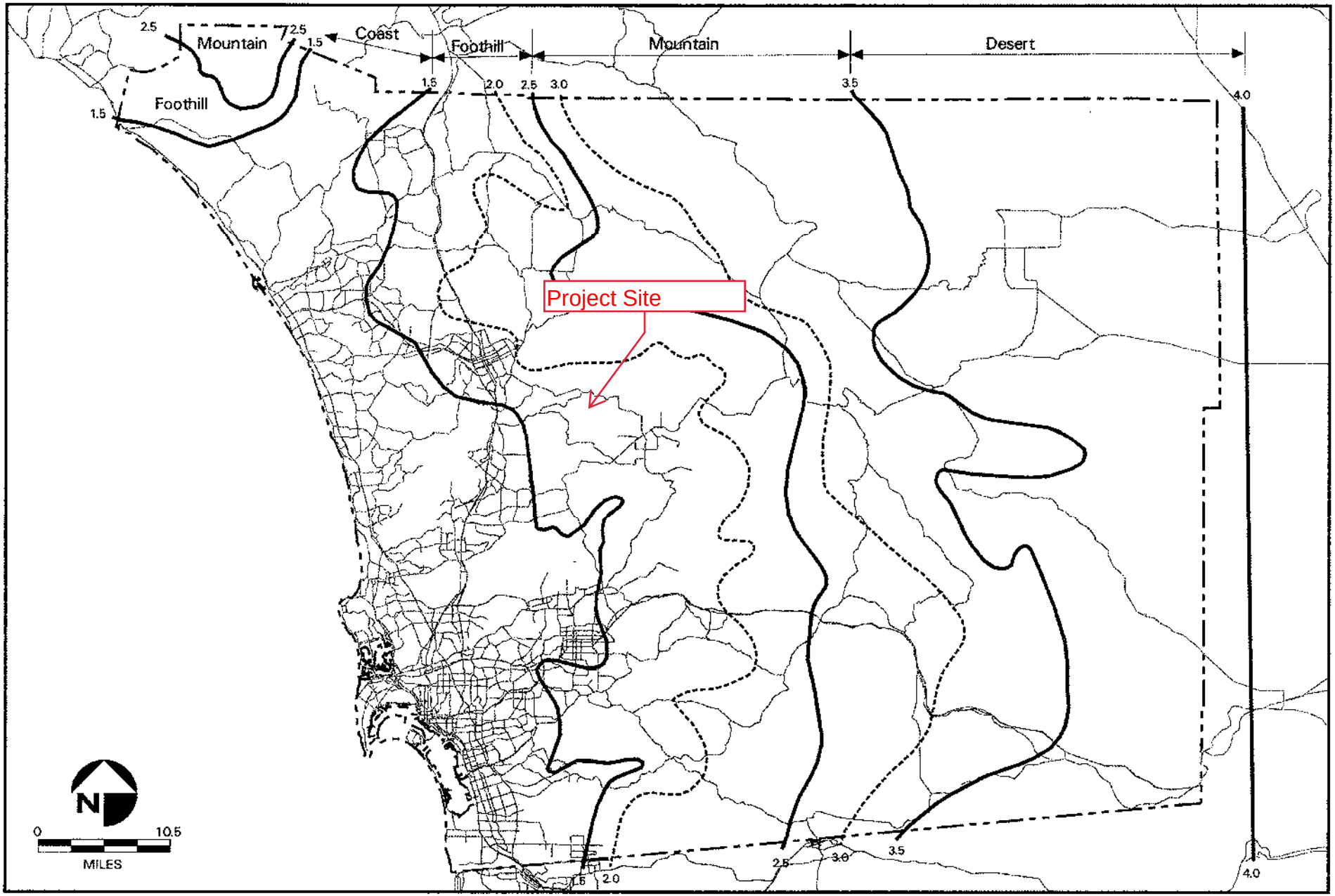
EXAMPLE:
Given: Q = 10 S = 2.5%
Chart gives: Depth = 0.4, Velocity = 4.4 f.p.s.

SOURCE: San Diego County Department of Special District Services Design Manual

Gutter and Roadway Discharge - Velocity Chart

FIGURE

3-6



County of San Diego Hydrology Manual

Precipitation Zone Numbers (PZN)

FIGURE

C-1

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Table 4-2
RUNOFF CURVE NUMBERS[1] FOR PZN CONDITION = 2.0

Cover Description	Cover Treatment or Practice[2]	Hydrologic Condition[3]	Average Percent Impervious Area[4]	Curve Numbers for Hydrologic Soil Groups: A	B	C	D
Developing urban areas and newly graded areas (pervious areas only, no vegetation)				77	86	91	94
Impervious areas: Paved parking lots, roofs, and driveways (excluding right-of-way)				98	98	98	98
Residential districts by average lot size:[4]							
1/8 acre or less (town houses)			65%	77	85	90	92
1/4 acre			38%	61	75	83	87
1/3 acre			30%	57	72	81	86
1/2 acre			25%	54	70	80	85
1 acre			20%	51	68	79	84
2 acres			12%	46	65	77	82
Streets and roads	Paved; curbs and storm drains (excluding right-of-way)			98	98	98	98
	Paved; open ditches (including right-of-way)			83	89	92	93
	Gravel (including right-of-way)			76	85	89	91
	Hard surface (including right-of-way)			74	84	90	92
	Dirt (including right-of-way)			72	82	87	89
Urban districts[4]	Commercial and business		85%	89	92	94	95
	Industrial		72%	81	88	91	93
Western desert urban areas:							
Natural desert landscaping (pervious areas only)[5]				63	77	85	88
Artificial desert landscaping (impervious weed barrier, desert shrub with 1- to 2-inch sand or gravel mulch and basin borders)				96	96	96	96

Table 4-2 (Continued)
RUNOFF CURVE NUMBERS[1] FOR PZN CONDITION = 2.0

Cover Description	Cover Treatment or Practice[2]	Hydrologic Condition[3]	Average Percent Impervious Area[4]	Curve Numbers for Hydrologic Soil Groups: A	B	C	D
Close-seeded legumes or rotated pasture	Straight row	Poor		66	77	85	89
		Good		58	72	81	85
	Contoured	Poor		64	75	83	85
		Good		55	69	78	83
	Contoured and terraced	Poor		63	73	80	83
		Good		51	67	76	80
Cultivated land	Without conservation treatment			72	81	88	91
	With conservation treatment			62	71	78	81
Fallow	Bare soil			77	86	91	94
	Crop residue cover	Poor		76	85	90	92
		Good		74	83	88	90
Farmsteads (buildings, lanes, driveways, and surrounding lots)				59	74	82	86
Irrigated pasture		Poor		58	74	83	87
		Fair		44	65	77	82
		Good		33	58	72	79
Orchards (deciduous)			(see glossary description)				
Orchards (evergreen)		Poor		57	73	82	86
		Fair		44	65	77	82
		Good		33	58	72	79
Row crops	Straight row	Poor		72	81	88	91
		Good		67	78	85	89
	Contoured	Poor		70	79	84	88
		Good		65	75	82	86

Table 4-2 (Continued)
RUNOFF CURVE NUMBERS[1] FOR PZN CONDITION = 2.0

Cover Description	Cover Treatment or Practice[2]	Hydrologic Condition[3]	Average Percent Impervious Area[4]	Curve Numbers for Hydrologic Soil Groups: A	B	C	D
Small grain	Straight row	Poor		65	76	84	88
		Good		63	75	83	87
	Contoured	Poor		63	74	82	85
		Good		61	73	81	84
Vineyards[6]	Disked			76	85	90	92
	Annual grass or legume cover	Poor		65	78	85	89
		Fair		50	69	79	84
		Good		38	61	74	80
Annual grass (Dryland pasture)		Poor		67	78	86	89
		Fair		50	69	79	84
		Good		38	61	74	80
Barren				78	86	91	93
Meadow		Poor		63	77	85	88
		Fair		51	70	80	84
		Good		30	58	72	78
Open space (lawns, parks, golf courses, cemeteries, etc.)[7]	Grass cover <50%	Poor		68	79	86	89
	Grass cover 50% to 75%	Fair		49	69	79	84
	Grass cover >75%	Good		39	61	74	80
Pasture or range land		Poor		68	79	86	89
		Fair		49	69	79	84
		Good		39	61	74	80
Perennial grass		Poor		67	79	86	89
		Fair		50	69	79	84
		Good		38	61	74	80

Table 4-2 (Continued)
RUNOFF CURVE NUMBERS[1] FOR PZN CONDITION = 2.0

Cover Description	Cover Treatment or Practice[2]	Hydrologic Condition[3]	Average Percent Impervious Area[4]	Curve Numbers for Hydrologic Soil Groups: A	B	C	D
Turf[8]		Poor		58	74	83	87
		Fair		44	65	77	82
		Good		33	58	72	79
Water surfaces (during floods)				97	98	99	99
Broadleaf chaparral		Poor		53	70	80	85
		Fair		40	63	75	81
		Good		31	57	71	78
Desert shrub–major plants include saltbush, greasewood, creosotebush, blackbrush, bursage, palo verde, mesquite, and cactus		Poor		63	77	85	88
		Fair		55	72	81	86
		Good		49	68	79	84
Herbaceous–mixture of grass, weeds, and low-growing brush, with brush the minor element		Poor		[9]	80	87	93
		Fair		[9]	71	81	89
		Good		[9]	62	74	85
Narrowleaf chaparral		Poor		71	82	88	91
		Fair		55	72	81	86
Oak-aspen–mountain brush mixture of oak brush, aspen, mountain mahogany, bitter brush, maple, and other brush		Poor		[9]	66	74	79
		Fair		[9]	48	57	63
		Good		[9]	30	41	48
Open brush		Poor		62	76	84	88
		Fair		46	66	77	83
		Good		41	63	75	81

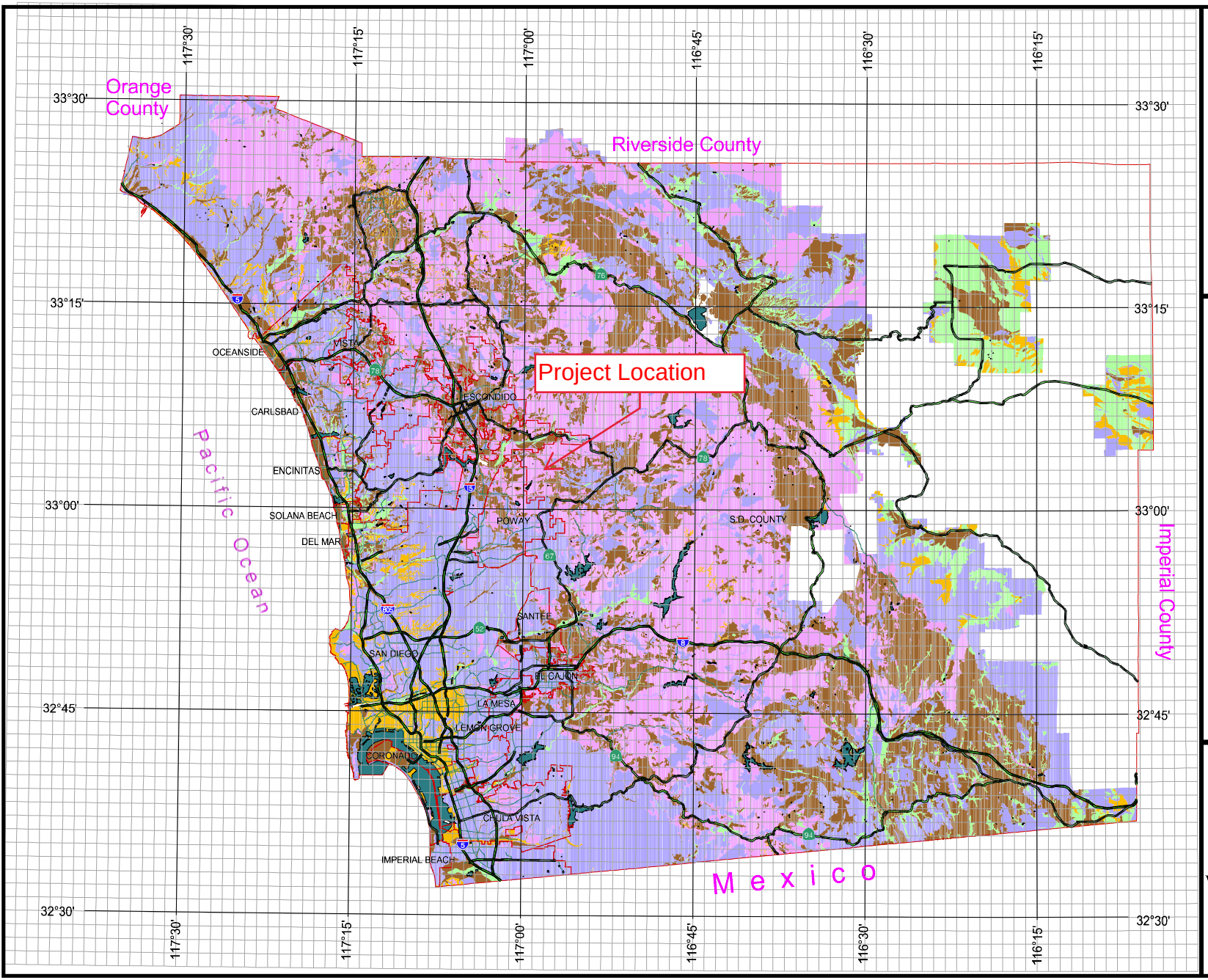
Table 4-2 (Continued)
RUNOFF CURVE NUMBERS[1] FOR PZN CONDITION = 2.0

Cover Description	Cover Treatment or Practice[2]	Hydrologic Condition[3]	Average Percent Impervious Area[4]	Curve Numbers for Hydrologic Soil Groups: A	B	C	D
Pinyon-juniper–pinyon, juniper, or both; grass understory		Poor		[9]	75	85	89
		Fair		[9]	58	73	80
		Good		[9]	41	61	71
Sagebrush with grass understory		Poor		[9]	67	80	85
		Fair		[9]	51	63	70
		Good		[9]	35	47	55
Wood or forest land		Thin stand, poor cover		45	66	77	83
		Good cover		25	55	70	77
Woods (woodland)		Poor		45	66	77	83
		Fair		36	60	73	79
		Good		28	55	70	77
Woodland-grass combination		Poor		57	73	82	86
		Fair		44	65	77	82
		Good		33	58	72	79

[1] Average runoff condition, and $I_a = 0.2S$.
[2] Hydrologic practices described as "straight row" and "contoured" are defined in the glossary.
[3] For definition of hydrologic condition, see Tables 4-3, 4-4, and 4-5.
[4] The average percent impervious area shown was used to develop the composite CNs. Other assumptions are as follows: impervious areas are directly connected to the drainage system, impervious areas have a CN of 98, and pervious areas are considered equivalent to open space in good hydrologic condition. If the impervious area is not directly connected, the NRCS method has an adjustment to reduce the effect.
[5] Composite CNs for natural desert landscaping should be computed based on the impervious area percentage (CN = 98) and the pervious area CN. The pervious area CNs are assumed equivalent to desert shrub in poor hydrologic condition.
[6] See glossary.
[7] CNs shown are equivalent to those of pasture. Composite CNs may be computed for other combinations of open space cover type.
[8] Includes lawns, cemeteries, golf courses and parks with ground cover of mowed and irrigated perennial grass.
[9] CNs for Group A have not been developed.

APPENDIX C.6

HYDROLOGIC SOIL GROUP MAP



County of San Diego Hydrology Manual

Soil Hydrologic Groups

Legend

Soil Groups

- Group A
- Group B
- Group C
- Group D
- Undetermined
- Data Unavailable

Lat:33o3'
Long: 116o58'
Soil Group: B & D
*see additional Hydrologic Soil Group Map for more information.

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Map Scale: 1:2,880 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 40 80 160 240

Feet: 0 100 200 400 600

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features

- Streams and Canals

Transportation

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

Background

- Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: San Diego County Area, California
Survey Area Data: Version 12, Sep 13, 2017

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

Date(s) aerial images were photographed: Dec 31, 2009—Mar 11, 2017

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
CnG2	Cieneba-Fallbrook rocky sandy loams, 30 to 65 percent slopes, eroded	D	5.9	25.3%
VvE	Vista rocky coarse sandy loam, 15 to 30 percent slopes	B	17.4	74.7%
Totals for Area of Interest			**23.3**	**100.0%**

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Aggregation is the process by which a set of component attribute values is reduced to a single value that represents the map unit as a whole.

A map unit is typically composed of one or more "components". A component is either some type of soil or some nonsoil entity, e.g., rock outcrop. For the attribute being aggregated, the first step of the aggregation process is to derive one attribute value for each of a map unit's components. From this set of component attributes, the next step of the aggregation process derives a single value that represents the map unit as a whole. Once a single value for each map unit is derived, a thematic map for soil map units can be rendered. Aggregation must be done because, on any soil map, map units are delineated but components are not.

For each of a map unit's components, a corresponding percent composition is recorded. A percent composition of 60 indicates that the corresponding component typically makes up approximately 60% of the map unit. Percent composition is a critical factor in some, but not all, aggregation methods.

The aggregation method "Dominant Condition" first groups like attribute values for the components in a map unit. For each group, percent composition is set to the sum of the percent composition of all components participating in that group. These groups now represent "conditions" rather than components. The attribute value associated with the group with the highest cumulative percent composition is returned. If more than one group shares the highest cumulative percent composition, the corresponding "tie-break" rule determines which value should be returned. The "tie-break" rule indicates whether the lower or higher group value should be returned in the case of a percent composition tie. The result returned by this aggregation method represents the dominant condition throughout the map unit only when no tie has occurred.

Component Percent Cutoff: None Specified

Components whose percent composition is below the cutoff value will not be considered. If no cutoff value is specified, all components in the database will be considered. The data for some contrasting soils of minor extent may not be in the database, and therefore are not considered.

Tie-break Rule: Higher

The tie-break rule indicates which value should be selected from a set of multiple candidate values, or which value should be selected in the event of a percent composition tie.

APPENDIX C.7

HYDROGRAPH AND BASIN CALCULATIONS FOR BASIN ROUTING

Drainage Summary																
	Pre-Development						**Post-Development**							**Mitigated**		Mitigation Method
	C_w	T_c	I	A_T	V_{100}	**Q_{100}**	C_w	T_c	I	A_T	V_{100}	**Q_{100}**	ΔQ	V_{100}	**Q_{100}**	
	(unitless)	(minutes)	(inch/hour)	(acre)	(ft/sec)	**(cfs)**	(unitless)	(minutes)	(inch/hour)	(acre)	(ft/sec)	**(cfs)**	(cfs)	(ft/sec)	**(cfs)**	
POC 1	0.39	23.46	3.40	4.16	11.49	**5.59**	0.55	22.26	3.52	4.12	11.49	**8.02**	2.43	10.52	**4.78**	**Bioretention. Please See Attached Basin Routing Worksheets.**
POC 2	0.52	15.03	4.53	1.14	9.13	**2.68**	0.45	17.09	4.17	1.27	8.74	**2.40**	-0.28	n/a	**n/a**	**Post Development Flow is Less Than Pre Development Flows. No Flow Mitigation required.**
POC 3	0.39	18.12	4.02	1.71	8.87	**2.69**	0.42	13.56	4.85	1.66	9.61	**3.41**	0.72	8.87	**2.52**	**Bioretention. Please See Attached Basin Routing Worksheets.**
POC 4	0.64	8.28	6.66	0.13	5.45	**0.53**	0.88	5.38	8.80	0.14	7.12	**1.10**	0.57	4.90	**0.40**	**Bioretention. Please See Attached Basin Routing Worksheets.**
POC 5	0.51	19.73	3.80	0.73	7.36	**1.40**	0.77	10.37	5.76	0.51	8.48	**2.25**	0.85	6.73	**1.04**	**Bioretention. Please See Attached Basin Routing Worksheets.**
POC 6	0.47	14.37	4.67	1.51	9.51	**3.28**	0.49	16.21	4.32	1.52	9.55	**3.20**	-0.08	n/a	**n/a**	**Post Development Flow is Less Than Pre Development Flows. No Flow Mitigation required.**
POC 7	0.61	9.85	5.96	0.26	6.54	**0.95**	0.62	8.78	6.41	0.23	6.59	**0.91**	-0.04	n/a	**n/a**	**Post Development Flow is Less Than Pre Development Flows. No Flow Mitigation required.**

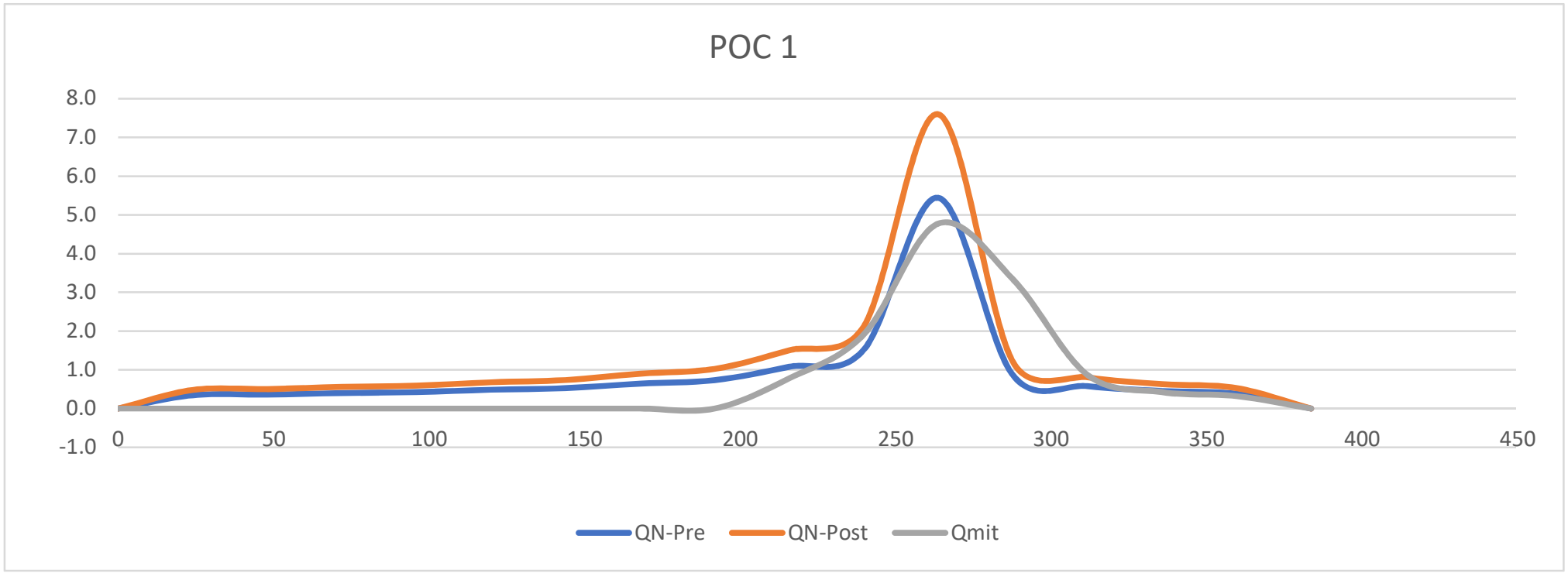
Velocities assume a 12inch pipe falling at 5% slope.

Pre-Development

	Area Impervious	Area Landscaping	Runoff Coefficient Impervious	Runoff Coefficient Landscaping	**Runoff Coefficient Weighted**	Time of Concentration Initial	Elevation at Top of Watercourse	Elevation at Bottom of Watercourse	Elevation Change	Distance of Watercourse	Time of Concentration Travel	Time of Concentration Total	Precipitation 100 year 6 Hour	**Intensity 100 year**	**Area Total**	**Volumetric Flow Pre-Development**
Abbr.	A_i	A_L	C_i	c_L	C_w	T_i	E_T	E_B	ΔE	D	T_T	T_C	P_6	I_{100}	A_T	Q_o
Units	(acres)	(acres)	(unitless)	(unitless)	**(unitless)**	(minutes)	(feet)	(feet)	(feet)	(feet)	(minutes)	(minutes)	(inch)	**(inch/hour)**	**(acres)**	**(cubic feet per second)**
Source	(See Plan)	(See Plan)	(Table 3-1)	(Table 3-1)	$\frac{[(A_i*C_i)+(A_l*C_l)]}{(A_i+A_L)}$	(table 3-2)	(See Plan)	(See Plan)	(E_T-E_B)	(See Plan)	$\frac{(1.8*(1.1-C)*D^{1/2})}{(\Delta E*100/D)^{1/3}}$ (Figure 3-3)	T_i+T_T	(Figure 3-1)	$7.44*P_6*T_C^{-0.645}$ (Figure 3-1)	A_i+A_L	$C_w*I_{100}*A_T$
POC 1	0.31	3.84	0.95	0.35	**0.39**	5.8	1,238	1,148	90	899	17.66	23.46	3.5	**3.40**	**4.16**	**5.59**
POC 2	0.32	0.82	0.95	0.35	**0.52**	5.0	1,228	1,169	59	486	10.03	15.03	3.5	**4.53**	**1.14**	**2.68**
POC 3	0.12	1.59	0.95	0.35	**0.39**	5.8	1,256	1,189	67	516	12.32	18.12	3.5	**4.02**	**1.71**	**2.69**
POC 4	0.06	0.07	0.95	0.35	**0.64**	5.0	1,236	1,234	2	43	3.28	8.28	3.5	**6.66**	**0.13**	**0.53**
POC 5	0.19	0.54	0.95	0.35	**0.51**	7.0	1,236	1,224	12	333	12.73	19.73	3.5	**3.80**	**0.73**	**1.40**
POC 6	0.29	1.22	0.95	0.35	**0.47**	5.8	1,248	1,191	57	357	8.57	14.37	3.5	**4.67**	**1.51**	**3.28**
POC 7	0.11	0.15	0.95	0.35	**0.61**	5.0	1,234	1,199	35	200	4.85	9.85	3.5	**5.96**	**0.26**	**0.95**

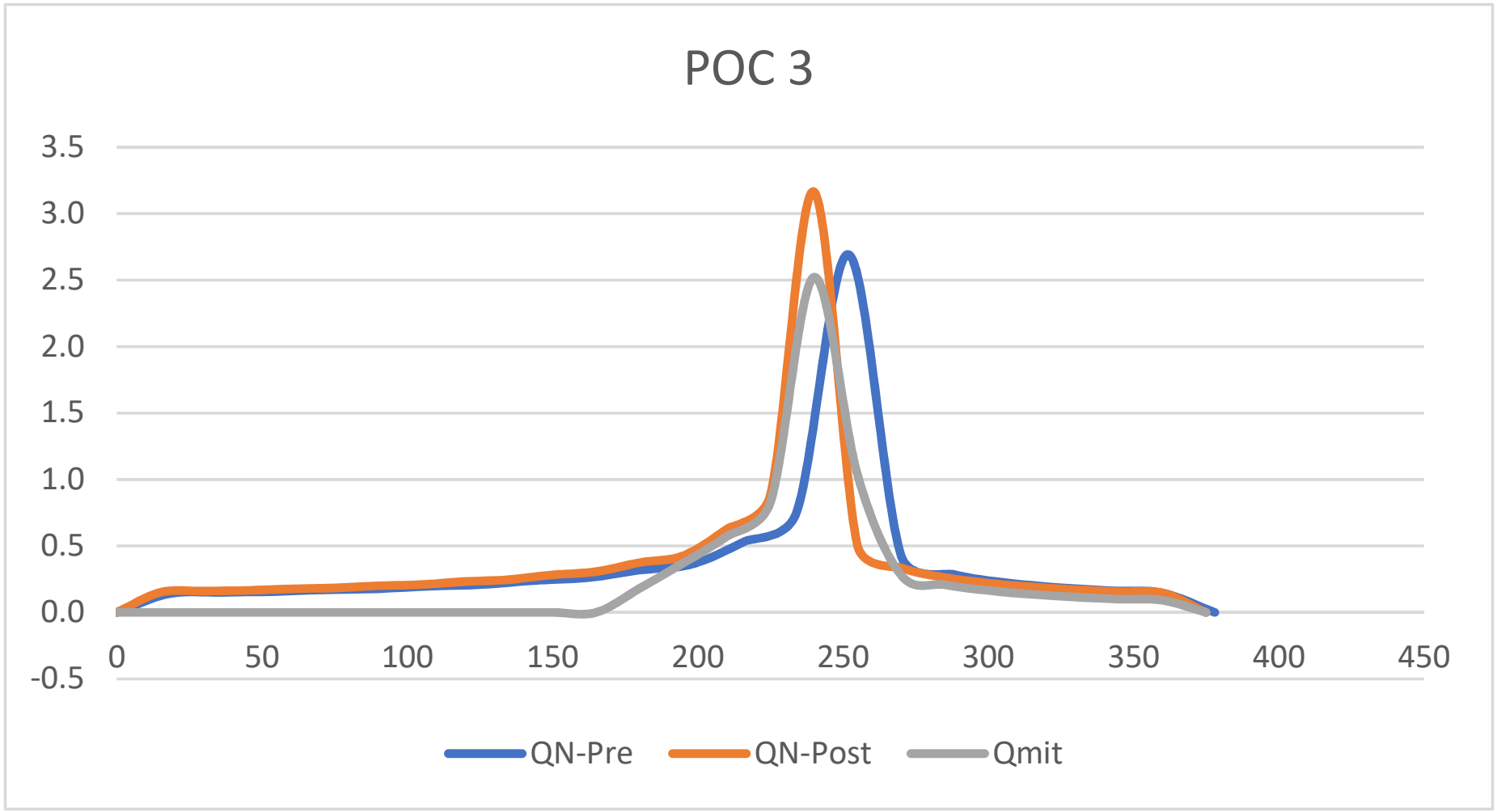
Post-Development

	Area Impervious	Area Landscaping	Runoff Coefficient Impervious	Runoff Coefficient Landscaping	**Runoff Coefficient Weighted**	Time of Concentration Initial	Elevation at Top of Watercourse	Elevation at Bottom of Watercourse	Elevation Change	Distance of Watercourse	Time of Concentration Travel	Time of Concentration Total	Precipitation 100 year 6 Hour	**Intensity 100 year**	**Area Total**	**Volumetric Flow Post-Development**
Abbr.	A_i	A_L	C_i	c_L	C_w	T_i	E_T	E_B	ΔE	D	T_T	T_C	P_6	I_{100}	A_T	Q_P
Units	(acres)	(acres)	(unitless)	(unitless)	**(unitless)**	(minutes)	(feet)	(feet)	(feet)	(feet)	(minutes)	(minutes)	(inch)	**(inch/hour)**	**(acres)**	**(cubic feet per second)**
Source	(See Plan)	(See Plan)	(Table 3-1)	(Table 3-1)	$\frac{[(A_i*C_i)+(A_l*C_l)]}{(A_i+A_L)}$	(table 3-2)	(See Plan)	(See Plan)	(E_T-E_B)	(See Plan)	$\frac{(1.8*(1.1-C)*D^{1/2})}{(\Delta E*100/D)^{1/3}}$ (Figure 3-3)	T_i+T_T	(Figure 3-1)	$7.44*P_6*T_C^{-0.645}$ (Figure 3-1)	A_i+A_L	$C_w*I_{100}*A_T$
POC 1	1.39	2.72	0.95	0.35	**0.55**	6.4	1,233	1,148	85	1,048	15.86	22.26	3.5	**3.52**	**4.12**	**8.02**
POC 2	0.22	1.05	0.95	0.35	**0.45**	5.6	1,218	1,169	49	466	11.49	17.09	3.5	**4.17**	**1.27**	**2.40**
POC 3	0.20	1.46	0.95	0.35	**0.42**	5.8	1,254	1,189	65	309	7.76	13.56	3.5	**4.85**	**1.66**	**3.41**
POC 4	0.13	0.02	0.95	0.35	**0.88**	5.0	1,236	1,235	1	6	0.38	5.38	3.5	**8.80**	**0.14**	**1.10**
POC 5	0.35	0.16	0.95	0.35	**0.77**	5.0	1,230	1,224	6	179	5.37	10.37	3.5	**5.76**	**0.51**	**2.25**
POC 6	0.35	1.17	0.95	0.35	**0.49**	5.0	1,247	1,191	56	510	11.21	16.21	3.5	**4.32**	**1.52**	**3.20**
POC 7	0.10	0.13	0.95	0.35	**0.62**	5.0	1,233	1,199	34	152	3.78	8.78	3.5	**6.41**	**0.23**	**0.91**


POC 1
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
-1.0
0
50
100
150
200
250
300
350
400
450
QN-Pre
QN-Post
Qmit

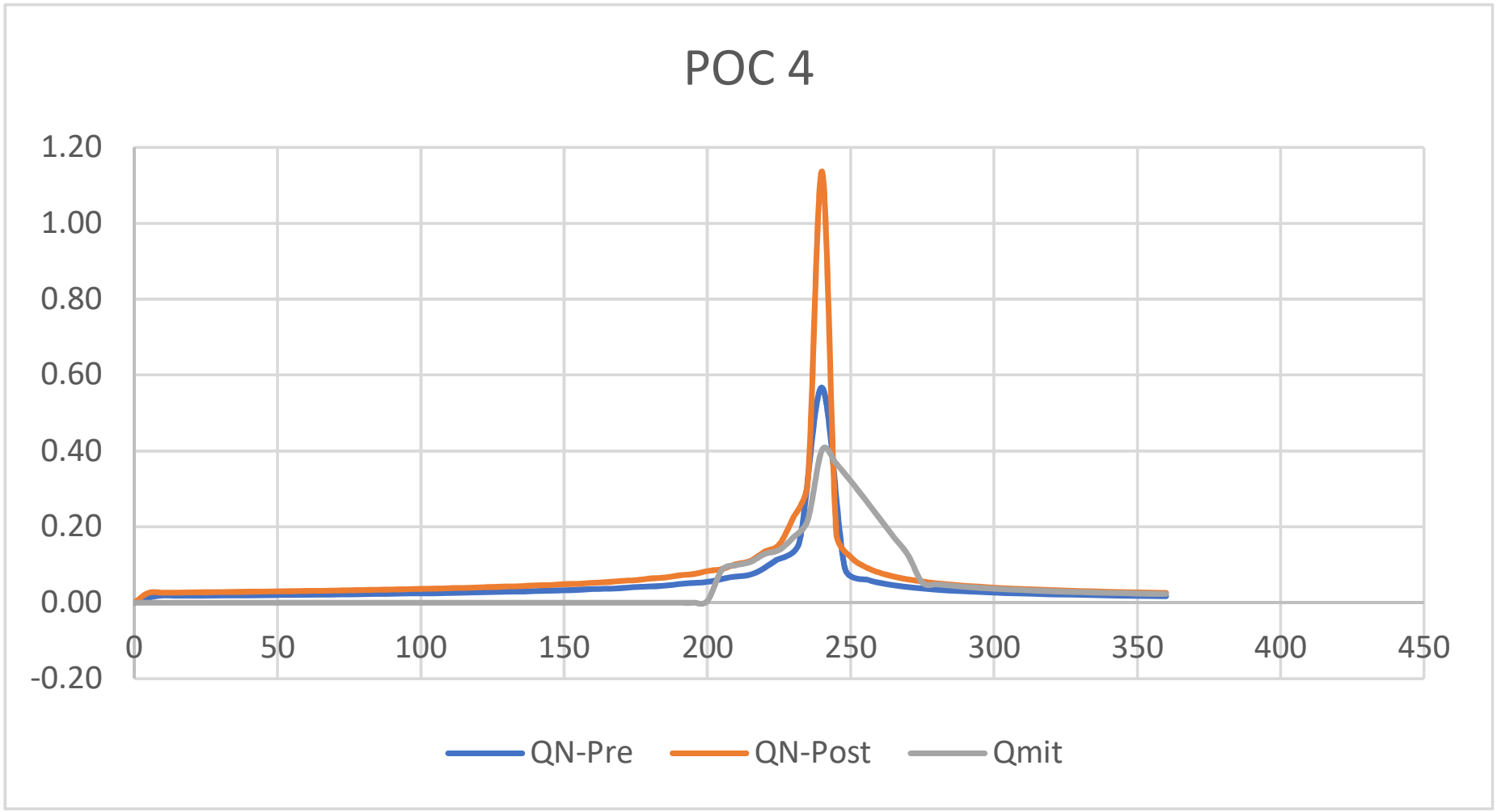
		Pre			Post (Unmitigated)		
Block Number	Time	Total Rainfall For Block N	Rainfall for Block N	Volumetric Flow for Block N	Total Rainfall For Block N	Rainfall for Block N	Volumetric Flow for Block N
N	T	$P_{T(N)}$	P_N	$Q_{N\text{-}Pre}$	$P_{T(N)}$	P_N	$Q_{N\text{-}Post}$
(Unitless)	(Minutes)	(Inches)	(Inches)	(cfs)	(Inches)	(Inches)	(cfs)
-	$N*T_c$	$0.124P_6(NT_c)^{0.355}$	$P_{T(N)}-P_{T(N-1)}$	$60C_wA_TP_N/T_c$	$0.124P_6(NT_c)^{0.355}$	$P_{T(N)}-P_{T(N-1)}$	$60C_wA_TP_N/T_c$
0	0	0	0	0	0	0	0
1	24	1.34	1.34	5.4	1.34	1.34	7.6
2	48	1.72	0.37	1.5	1.72	0.37	2.1
3	72	1.98	0.27	1.1	1.98	0.27	1.5
4	96	2.19	0.21	0.9	2.19	0.21	1.2
5	120	2.37	0.18	0.7	2.37	0.18	1.0
6	144	2.53	0.16	0.6	2.53	0.16	0.9
7	168	2.68	0.14	0.6	2.68	0.14	0.8
8	192	2.81	0.13	0.5	2.81	0.13	0.7
9	216	2.93	0.12	0.5	2.93	0.12	0.7
10	240	3.04	0.11	0.5	3.04	0.11	0.6
11	264	3.14	0.10	0.4	3.14	0.10	0.6
12	288	3.24	0.10	0.4	3.24	0.10	0.6
13	312	3.33	0.09	0.4	3.33	0.09	0.5
14	336	3.42	0.09	0.4	3.42	0.09	0.5
15	360	3.51	0.08	0.3	3.51	0.08	0.5

Block Number	Time	Pre-Development Flow (thru)	Post-Development Flow (Inflow)	I_n+I_{n+1}	Infiltration Flow	Riser Out Flow (Mitigated Flow)	Stored Volume	$2S_n/\Delta t-O_n$	$2s_{n+1}/\Delta t+O_{n+1}$	Water Surface Elevation
N	T	Q_{N-Pre}	Q_{N-Post}		Q_{infil}	Q_{mit}	S_n			EL_{WS}
-	(Minutes)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(ft^3)	(cfs)	(cfs)	(ft)
Table 1	-	Table 1	Table 1	$Q_{N-Post}+Q_{(N+1)Post}$	Infiltration Rate x Basin Area	$C_{Orifice}*A_{Riser}(2g*Head_{Riser})^{1/2}$	$S_{n-1}+Q_{N-Post}-Q_{infil}-Q_{out}$	$2S_n/(T_N-T_{n-1})-Q_{infil(n-1)}-Q_{out(n-1)}$	$(2S_n/\Delta t-O_n)+(I_n+I_{n+1})$	Interpolate Basin Matrix for S_n
0	0	0.0	0.0	0.5	0.21	0.00	0.00	0.00	0.48	0.00
15	24	0.3	0.5	1.0	0.21	0.00	392.25	0.34	1.32	0.33
14	48	0.4	0.5	1.1	0.21	0.00	817.18	0.93	1.99	0.68
12	72	0.4	0.6	1.2	0.21	0.00	1321.17	1.63	2.78	1.10
11	96	0.4	0.6	1.3	0.21	0.00	1873.81	2.39	3.66	1.56
9	120	0.5	0.7	1.4	0.21	0.00	2551.15	3.33	4.75	2.13
8	144	0.5	0.7	1.6	0.21	0.00	3310.85	4.39	6.03	2.76
6	168	0.6	0.9	1.9	0.21	0.00	4306.11	5.77	7.70	3.94
5	192	0.7	1.0	2.5	0.21	0.00	5481.43	7.40	9.93	4.75
3	216	1.1	1.5	3.6	0.21	0.78	7347.67	10.00	13.62	5.37
2	240	1.5	2.1	9.7	0.21	1.91	8977.17	11.48	21.20	5.92
1	264	5.4	7.6	8.8	0.21	4.78	16865.25	21.30	30.11	8.55
4	288	0.9	1.2	2.0	0.21	3.34	11425.56	10.88	12.90	6.73
7	312	0.6	0.8	1.4	0.21	0.87	7480.11	6.84	8.28	5.42
10	336	0.5	0.6	1.2	0.21	0.42	6834.57	8.41	9.57	5.20
13	360	0.4	0.5	0.5	0.21	0.32	6686.85	8.66	9.18	5.15
0	384	0.0	0.0	0.0	0.21	0.00	5925.00	7.70	7.70	4.90


POC 3
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
0
50
100
150
200
250
300
350
400
450
QN-Pre
QN-Post
Qmit

Pre					Post (Unmitigated)				
Block Number	Time	Total Rainfall For Block N	Rainfall for Block N	Volumetric Flow for Block N	Block Number	Time	Total Rainfall For Block N	Rainfall for Block N	Volumetric Flow for Block N
N	T	$P_{T(N)}$	P_N	$Q_{N\text{-}Pre}$	N	T	$P_{T(N)}$	P_N	$Q_{N\text{-}Post}$
(Unitless)	(Minutes)	(Inches)	(Inches)	(cfs)	(Unitless)	(Minutes)	(Inches)	(Inches)	(cfs)
-	$N*T_c$	$0.124P_6(NT_c)^{0.355}$	$P_{T(N)}-P_{T(N-1)}$	$60C_wA_TP_N/T_c$	-	$N*T_c$	$0.124P_6(NT_c)^{0.355}$	$P_{T(N)}-P_{T(N-1)}$	$60C_wA_TP_N/T_c$
0	0	0	0	0	0	0	0	0	0
1	18	1.21	1.21	2.7	1	15	1.14	1.14	3.2
2	36	1.55	0.34	0.8	2	30	1.45	0.32	0.9
3	54	1.79	0.24	0.5	3	45	1.68	0.22	0.6
4	72	1.98	0.19	0.4	4	60	1.86	0.18	0.5
5	90	2.14	0.16	0.4	5	75	2.01	0.15	0.4
6	108	2.29	0.14	0.3	6	90	2.14	0.13	0.4
7	126	2.42	0.13	0.3	7	105	2.26	0.12	0.3
8	144	2.53	0.12	0.3	8	120	2.37	0.11	0.3
9	162	2.64	0.11	0.2	9	135	2.48	0.10	0.3
10	180	2.74	0.10	0.2	10	150	2.57	0.09	0.3
11	198	2.84	0.09	0.2	11	165	2.66	0.09	0.2
12	216	2.93	0.09	0.2	12	180	2.74	0.08	0.2
13	234	3.01	0.08	0.2	13	195	2.82	0.08	0.2
14	252	3.09	0.08	0.2	14	210	2.90	0.08	0.2
15	270	3.17	0.08	0.2	15	225	2.97	0.07	0.2
16	288	3.24	0.07	0.2	16	240	3.04	0.07	0.2
17	306	3.31	0.07	0.2	17	255	3.10	0.07	0.2
18	324	3.38	0.07	0.2	18	270	3.17	0.06	0.2
19	342	3.44	0.07	0.1	19	285	3.23	0.06	0.2
20	360	3.51	0.06	0.1	20	300	3.29	0.06	0.2
					21	315	3.34	0.06	0.2
					22	330	3.40	0.06	0.2
					23	345	3.45	0.05	0.2
					24	360	3.51	0.05	0.1

Pre-DevelopBlock Number	Pre-Develop. Time	Pre-Development Flow (thru)	Post-Develop. Block Number	Post-Develop. Time	Post-Development Flow (Inflow)	I_n+I_{n+1}	Infiltration Flow	Riser Out Flow (Mitigated Flow)	Stored Volume	$2S_n/\Delta t-O_n$	$2s_{n+1}/\Delta t+O_{n+1}$	Water Surface Elevation
N	T	Q_{N-Pre}	N	T	Q_{N-Post}		Q_{infil}	Q_{mit}	S_n			EL_{WS}
-	(Minutes)	(cfs)	-	(Minutes)	(cfs)	(cfs)	(cfs)	(cfs)	(ft^3)	(cfs)	(cfs)	(ft)
Table 1	-	Table 1	Table 1	-	Table 1	$Q_{N-Post}+Q_{(N+1)Post}$	Infiltration Rate x Basin Area	$C_{Oriface}*A_{Riser}(2g*Head_{Riser})^{1/2}$	$S_{n-1}+Q_{N-Post}-Q_{infil}-Q_{out}$	$2S_n/(T_N-T_{n-1})-Q_{infil(n-1)}-Q_{out(n-1)}$	$(2S_n/\Delta t-O_n)+(I_n+I_{n+1})$	Interpolate Basin Matrix for S_n
0	0	0.0	0	0	0.0	0.2	0.06	0.00	0.00	0.00	0.15	0.00
20	18	0.1	23	15	0.2	0.3	0.06	0.00	85.76	0.14	0.45	0.27
18	36	0.2	21	30	0.2	0.3	0.06	0.00	179.92	0.34	0.67	0.56
17	54	0.2	20	45	0.2	0.3	0.06	0.00	278.81	0.56	0.91	0.87
15	72	0.2	18	60	0.2	0.4	0.06	0.00	388.47	0.81	1.17	1.21
14	90	0.2	17	75	0.2	0.4	0.06	0.00	504.31	1.07	1.45	1.58
12	108	0.2	15	90	0.2	0.4	0.06	0.00	634.57	1.35	1.76	1.98
11	126	0.2	14	105	0.2	0.4	0.06	0.00	773.34	1.66	2.11	2.42
9	144	0.2	12	120	0.2	0.5	0.06	0.00	932.70	2.02	2.50	2.91
8	162	0.3	11	135	0.2	0.5	0.06	0.00	1104.72	2.40	2.93	3.72
6	180	0.3	9	150	0.3	0.6	0.06	0.00	1309.21	2.85	3.44	4.56
5	198	0.4	8	165	0.3	0.7	0.06	0.00	1535.16	3.36	4.04	4.84
3	216	0.5	6	180	0.4	0.8	0.06	0.18	1822.44	3.99	4.80	5.20
2	234	0.8	5	195	0.4	1.1	0.06	0.37	1994.17	4.20	5.25	5.42
1	252	2.7	3	210	0.6	1.5	0.06	0.57	2174.08	4.40	5.91	5.64
4	270	0.4	2	225	0.9	4.0	0.06	0.83	2404.77	4.72	8.77	5.93
7	288	0.3	1	240	3.2	3.7	0.06	2.52	4458.80	9.03	12.69	8.50
10	306	0.2	4	255	0.5	0.8	0.06	1.04	2591.70	3.18	4.02	6.16
13	324	0.2	7	270	0.3	0.6	0.06	0.28	1912.70	3.16	3.76	5.32
16	342	0.2	10	285	0.3	0.5	0.06	0.21	1846.85	3.77	4.25	5.23
19	360	0.1	13	300	0.2	0.4	0.06	0.16	1808.38	3.76	4.17	5.19
0	378	0.0	16	315	0.2	0.4	0.06	0.14	1782.67	3.74	4.10	5.15
			19	330	0.2	0.3	0.06	0.12	1764.04	3.73	4.05	5.13
			22	345	0.2	0.3	0.06	0.10	1749.80	3.72	4.02	5.11
			24	360	0.1	0.1	0.06	0.09	1742.00	3.72	3.86	5.10
			0	375	0.0	0.0	0.06	0.00	1610.00	3.43	3.43	4.94


POC 4
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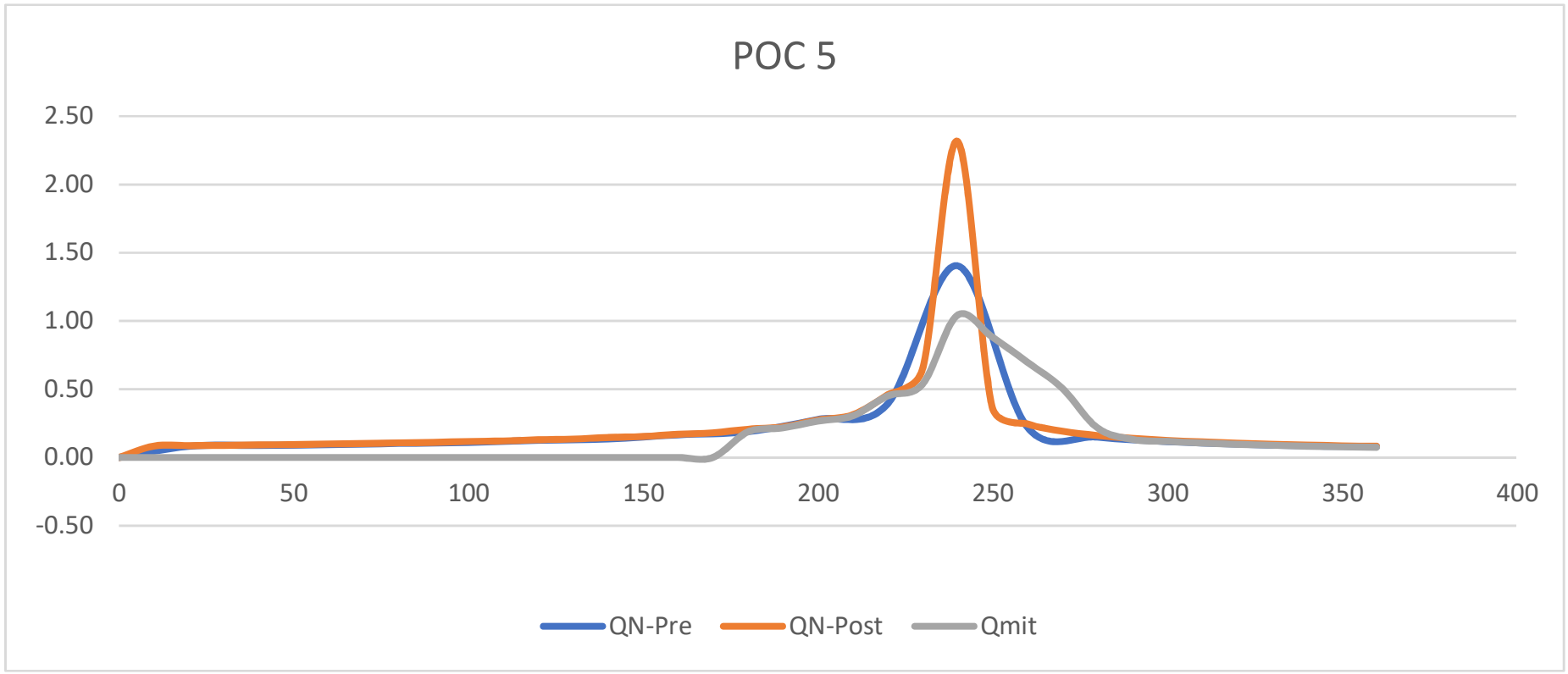
1.00
0.80
0.60
0.40
0.20
0.00
-0.20
0
50
100
150
200
250
300
350
400
450
QN-Pre
QN-Post
Qmit

Pre					Post (Unmitigated)				
Block Number	Time	Total Rainfall For Block N	Rainfall for Block N	Volumetric Flow for Block N	Block Number	Time	Total Rainfall For Block N	Rainfall for Block N	Volumetric Flow for Block N
N	T	$P_{T(N)}$	P_N	$Q_{N\text{-}Pre}$	N	T	$P_{T(N)}$	P_N	$Q_{N\text{-}Post}$
(Unitless)	(Minutes)	(Inches)	(Inches)	(cfs)	(Unitless)	(Minutes)	(Inches)	(Inches)	(cfs)
-	$N*T_c$	$0.124P_6(NT_c)^{0.355}$	$P_{T(N)}-P_{T(N-1)}$	$60C_wA_TP_N/T_c$	-	$N*T_c$	$0.124P_6(NT_c)^{0.355}$	$P_{T(N)}-P_{T(N-1)}$	$60C_wA_TP_N/T_c$
0	0	0	0	0.00	0	0	0	0	0.00
1	8	0.91	0.91	0.57	1	5	0.77	0.77	1.14
2	16	1.16	0.25	0.16	2	10	0.98	0.21	0.32
3	24	1.34	0.18	0.11	3	15	1.14	0.15	0.22
4	32	1.49	0.14	0.09	4	20	1.26	0.12	0.18
5	40	1.61	0.12	0.08	5	25	1.36	0.10	0.15
6	48	1.72	0.11	0.07	6	30	1.45	0.09	0.13
7	56	1.81	0.10	0.06	7	35	1.53	0.08	0.12
8	64	1.90	0.09	0.05	8	40	1.61	0.07	0.11
9	72	1.98	0.08	0.05	9	45	1.68	0.07	0.10
10	80	2.06	0.08	0.05	10	50	1.74	0.06	0.09
11	88	2.13	0.07	0.04	11	55	1.80	0.06	0.09
12	96	2.19	0.07	0.04	12	60	1.86	0.06	0.08
13	104	2.26	0.06	0.04	13	65	1.91	0.05	0.08
14	112	2.32	0.06	0.04	14	70	1.96	0.05	0.08
15	120	2.37	0.06	0.04	15	75	2.01	0.05	0.07
16	128	2.43	0.06	0.03	16	80	2.06	0.05	0.07
17	136	2.48	0.05	0.03	17	85	2.10	0.04	0.07
18	144	2.53	0.05	0.03	18	90	2.14	0.04	0.06
19	152	2.58	0.05	0.03	19	95	2.19	0.04	0.06
20	160	2.63	0.05	0.03	20	100	2.23	0.04	0.06
21	168	2.68	0.05	0.03	21	105	2.26	0.04	0.06
22	176	2.72	0.04	0.03	22	110	2.30	0.04	0.06
23	184	2.76	0.04	0.03	23	115	2.34	0.04	0.05
24	192	2.81	0.04	0.03	24	120	2.37	0.04	0.05
25	200	2.85	0.04	0.03	25	125	2.41	0.03	0.05
26	208	2.89	0.04	0.02	26	130	2.44	0.03	0.05
27	216	2.93	0.04	0.02	27	135	2.48	0.03	0.05
28	224	2.96	0.04	0.02	28	140	2.51	0.03	0.05
29	232	3.00	0.04	0.02	29	145	2.54	0.03	0.05
30	240	3.04	0.04	0.02	30	150	2.57	0.03	0.05
31	248	3.07	0.04	0.02	31	155	2.60	0.03	0.04
32	256	3.11	0.03	0.02	32	160	2.63	0.03	0.04
33	264	3.14	0.03	0.02	33	165	2.66	0.03	0.04
34	272	3.18	0.03	0.02	34	170	2.69	0.03	0.04
35	280	3.21	0.03	0.02	35	175	2.71	0.03	0.04
36	288	3.24	0.03	0.02	36	180	2.74	0.03	0.04
37	296	3.27	0.03	0.02	37	185	2.77	0.03	0.04
38	304	3.30	0.03	0.02	38	190	2.80	0.03	0.04
39	312	3.33	0.03	0.02	39	195	2.82	0.03	0.04
40	320	3.36	0.03	0.02	40	200	2.85	0.03	0.04
41	328	3.39	0.03	0.02	41	205	2.87	0.03	0.04
42	336	3.42	0.03	0.02	42	210	2.90	0.02	0.04
43	344	3.45	0.03	0.02	43	215	2.92	0.02	0.04
44	352	3.48	0.03	0.02	44	220	2.94	0.02	0.04
45	360	3.51	0.03	0.02	45	225	2.97	0.02	0.03
					46	230	2.99	0.02	0.03
					47	235	3.01	0.02	0.03
					48	240	3.04	0.02	0.03
					49	245	3.06	0.02	0.03
					50	250	3.08	0.02	0.03
					51	255	3.10	0.02	0.03
					52	260	3.12	0.02	0.03
					53	265	3.15	0.02	0.03
					54	270	3.17	0.02	0.03
					55	275	3.19	0.02	0.03
					56	280	3.21	0.02	0.03
					57	285	3.23	0.02	0.03
					58	290	3.25	0.02	0.03
					59	295	3.27	0.02	0.03
					60	300	3.29	0.02	0.03
					61	305	3.31	0.02	0.03
					62	310	3.33	0.02	0.03
					63	315	3.34	0.02	0.03
					64	320	3.36	0.02	0.03
					65	325	3.38	0.02	0.03
					66	330	3.40	0.02	0.03
					67	335	3.42	0.02	0.03
					68	340	3.44	0.02	0.03
					69	345	3.45	0.02	0.03
					70	350	3.47	0.02	0.03
					71	355	3.49	0.02	0.03
					72	360	3.51	0.02	0.03

Pre-Develop Block Number	Pre-Develop. Time	Pre-Development Flow (thru)	Post-Develop. Block Number	Post-Develop. Time	Post-Development Flow (Inflow)	I_n+I_{n+1}	Infiltration Flow	Riser Out Flow (Mitigated Flow)	Stored Volume	$2S_n/\Delta t-O_n$	$2s_{n+1}/\Delta t+O_{n+1}$	Water Surface Elevation
N	T	Q_{N-Pre}	N	T	Q_{N-Post}		Q_{infil}	Q_{mit}	S_n			EL_{WS}
-	(Minutes)	(cfs)	-	(Minutes)	(cfs)	(cfs)	(cfs)	(cfs)	(ft^3)	(cfs)	(cfs)	(ft)
Table 1	-	Table 1	Table 1	-	Table 1	$Q_{N-Post}+Q_{(N+1)Post}$	Infiltration Rate x Basin Area	$C_{Orifice}*A_{Riser}(2g*Head_{Riser})^{1/2}$	$S_{n-1}+Q_{N-Post}-Q_{infil}-Q_{out}$	$2S_n/(T_N-T_{n-1})-Q_{infil(n-1)}-Q_{out(n-1)}$	$(2S_n/\Delta t-O_n)+(I_n+I_{n+1})$	Interpolate Basin Matrix for S_n
0	0	0.00	0	0	0.00	0.03	0.003	0.00	0.00	0.00	0.03	0.00
44	8	0.02	71	5	0.03	0.05	0.003	0.00	6.94	0.04	0.10	0.09
42	16	0.02	69	10	0.03	0.05	0.003	0.00	14.03	0.09	0.14	0.18
41	24	0.02	68	15	0.03	0.05	0.003	0.00	21.19	0.14	0.19	0.26
39	32	0.02	66	20	0.03	0.05	0.003	0.00	28.51	0.19	0.24	0.36
38	40	0.02	65	25	0.03	0.06	0.003	0.00	35.91	0.24	0.29	0.45
36	48	0.02	63	30	0.03	0.06	0.003	0.00	43.48	0.29	0.34	0.54
35	56	0.02	62	35	0.03	0.06	0.003	0.00	51.14	0.34	0.40	0.64
33	64	0.02	60	40	0.03	0.06	0.003	0.00	58.98	0.39	0.45	0.74
32	72	0.02	59	45	0.03	0.06	0.003	0.00	66.91	0.44	0.50	0.84
30	80	0.02	57	50	0.03	0.06	0.003	0.00	75.05	0.50	0.56	0.94
29	88	0.02	56	55	0.03	0.06	0.003	0.00	83.29	0.55	0.61	1.04
27	96	0.02	54	60	0.03	0.06	0.003	0.00	91.74	0.61	0.67	1.15
26	104	0.02	53	65	0.03	0.06	0.003	0.00	100.31	0.67	0.73	1.25
24	112	0.03	51	70	0.03	0.06	0.003	0.00	109.12	0.72	0.79	1.36
23	120	0.03	50	75	0.03	0.07	0.003	0.00	118.06	0.78	0.85	1.48
21	128	0.03	48	80	0.03	0.07	0.003	0.00	127.25	0.85	0.91	1.59
20	136	0.03	47	85	0.03	0.07	0.003	0.00	136.59	0.91	0.98	1.71
18	144	0.03	45	90	0.03	0.07	0.003	0.00	146.22	0.97	1.04	1.83
17	152	0.03	44	95	0.04	0.07	0.003	0.00	156.00	1.04	1.11	1.95
15	160	0.04	42	100	0.04	0.07	0.003	0.00	166.11	1.10	1.18	2.08
14	168	0.04	41	105	0.04	0.08	0.003	0.00	176.39	1.17	1.25	2.20
12	176	0.04	39	110	0.04	0.08	0.003	0.00	187.04	1.24	1.32	2.34
11	184	0.04	38	115	0.04	0.08	0.003	0.00	197.89	1.32	1.40	2.47
9	192	0.05	36	120	0.04	0.08	0.003	0.00	209.16	1.39	1.47	2.61
8	200	0.05	35	125	0.04	0.08	0.003	0.00	220.66	1.47	1.55	2.76
6	208	0.07	33	130	0.04	0.09	0.003	0.00	232.63	1.55	1.63	2.91
5	216	0.08	32	135	0.04	0.09	0.003	0.00	244.87	1.63	1.72	3.10
3	224	0.11	30	140	0.05	0.09	0.003	0.00	257.68	1.72	1.81	3.35
2	232	0.16	29	145	0.05	0.10	0.003	0.00	270.79	1.80	1.90	3.62
1	240	0.57	27	150	0.05	0.10	0.003	0.00	284.57	1.89	1.99	3.89
4	248	0.09	26	155	0.05	0.10	0.003	0.00	298.72	1.99	2.09	4.17
7	256	0.06	24	160	0.05	0.11	0.003	0.00	313.68	2.09	2.20	4.47
10	264	0.05	23	165	0.05	0.11	0.003	0.00	329.09	2.19	2.30	4.57
13	272	0.04	21	170	0.06	0.12	0.003	0.00	345.50	2.30	2.42	4.65
16	280	0.03	20	175	0.06	0.12	0.003	0.00	362.48	2.41	2.54	4.74
19	288	0.03	18	180	0.06	0.13	0.003	0.00	380.75	2.54	2.67	4.83
22	296	0.03	17	185	0.07	0.14	0.003	0.00	399.76	2.66	2.80	4.92

25	304	0.03	15	190	0.07	0.15	0.003	0.00	420.49	2.80	2.95	5.03
28	312	0.02	14	195	0.08	0.16	0.003	0.00	442.24	2.95	3.10	5.14
31	320	0.02	12	200	0.08	0.17	0.003	0.00	466.46	3.11	3.28	5.26
34	328	0.02	11	205	0.09	0.19	0.003	0.09	490.73	3.26	3.45	5.38
37	336	0.02	9	210	0.10	0.21	0.003	0.10	494.61	3.21	3.42	5.40
40	344	0.02	8	215	0.11	0.24	0.003	0.11	497.18	3.21	3.46	5.41
43	352	0.02	6	220	0.13	0.29	0.003	0.13	504.52	3.25	3.54	5.45
45	360	0.02	5	225	0.15	0.38	0.003	0.14	511.12	3.28	3.65	5.48
			3	230	0.22	0.54	0.003	0.17	536.15	3.43	3.97	5.61
			2	235	0.32	1.45	0.003	0.22	578.71	3.68	5.14	5.82
			1	240	1.14	1.32	0.003	0.40	853.36	5.47	6.78	7.19
			4	245	0.18	0.30	0.003	0.37	785.88	4.83	5.13	6.85
			7	250	0.12	0.22	0.003	0.32	711.48	4.37	4.59	6.48
			10	255	0.09	0.17	0.003	0.27	642.77	3.96	4.14	6.14
			13	260	0.08	0.15	0.003	0.22	583.96	3.62	3.77	5.84
			16	265	0.07	0.13	0.003	0.17	536.94	3.35	3.48	5.61
			19	270	0.06	0.12	0.003	0.13	502.56	3.17	3.29	5.44
			22	275	0.06	0.11	0.003	0.05	480.89	3.08	3.18	5.33
			25	280	0.05	0.10	0.003	0.05	479.54	3.14	3.24	5.32
			28	285	0.05	0.09	0.003	0.04	478.44	3.14	3.23	5.32
			31	290	0.04	0.09	0.003	0.04	477.51	3.14	3.22	5.31
			34	295	0.04	0.08	0.003	0.04	476.73	3.13	3.22	5.31
			37	300	0.04	0.08	0.003	0.04	476.05	3.13	3.21	5.31
			40	305	0.04	0.07	0.003	0.03	475.46	3.13	3.20	5.30
			43	310	0.04	0.07	0.003	0.03	474.94	3.13	3.20	5.30
			46	315	0.03	0.07	0.003	0.03	474.48	3.13	3.19	5.30
			49	320	0.03	0.06	0.003	0.03	474.06	3.13	3.19	5.30
			52	325	0.03	0.06	0.003	0.03	473.69	3.12	3.19	5.29
			55	330	0.03	0.06	0.003	0.03	473.35	3.12	3.18	5.29
			58	335	0.03	0.06	0.003	0.03	473.03	3.12	3.18	5.29
			61	340	0.03	0.06	0.003	0.03	472.75	3.12	3.18	5.29
			64	345	0.03	0.05	0.003	0.02	472.48	3.12	3.18	5.29
			67	350	0.03	0.05	0.003	0.02	472.24	3.12	3.17	5.29
			70	355	0.03	0.05	0.003	0.02	472.01	3.12	3.17	5.29
			72	360	0.03	0.03	0.003	0.02	471.87	3.12	3.15	5.28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1.00
0.50
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-0.50
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QN-Pre
QN-Post
Qmit

Pre					Post (Unmitigated)				
Block Number	Time	Total Rainfall For Block N	Rainfall for Block N	Volumetric Flow for Block N	Block Number	Time	Total Rainfall For Block N	Rainfall for Block N	Volumetric Flow for Block N
N	T	$P_{T(N)}$	P_N	$Q_{N\text{-}Pre}$	N	T	$P_{T(N)}$	P_N	$Q_{N\text{-}Post}$
-	(Minutes)	(Inches)	(Inches)	(cfs)	-	(Minutes)	(Inches)	(Inches)	(cfs)
-	$N*T_c$	$0.124P_6(NT_c)^{0.355}$	$P_{T(N)}-P_{T(N-1)}$	$60C_wA_TP_N/T_c$	-	$N*T_c$	$0.124P_6(NT_c)^{0.355}$	$P_{T(N)}-P_{T(N-1)}$	$60C_wA_TP_N/T_c$
0	0	0	0	0	0	0	0	0	0
1	20	1.26	1.26	1.4	1	10	0.98	0.98	2.3
2	40	1.61	0.35	0.4	2	20	1.26	0.27	0.6
3	60	1.86	0.25	0.3	3	30	1.45	0.19	0.5
4	80	2.06	0.20	0.2	4	40	1.61	0.16	0.4
5	100	2.23	0.17	0.2	5	50	1.74	0.13	0.3
6	120	2.37	0.15	0.2	6	60	1.86	0.12	0.3
7	140	2.51	0.13	0.1	7	70	1.96	0.10	0.2
8	160	2.63	0.12	0.1	8	80	2.06	0.10	0.2
9	180	2.74	0.11	0.1	9	90	2.14	0.09	0.2
10	200	2.85	0.10	0.1	10	100	2.23	0.08	0.2
11	220	2.94	0.10	0.1	11	110	2.30	0.08	0.2
12	240	3.04	0.09	0.1	12	120	2.37	0.07	0.2
13	260	3.12	0.09	0.1	13	130	2.44	0.07	0.2
14	280	3.21	0.08	0.1	14	140	2.51	0.07	0.2
15	300	3.29	0.08	0.1	15	150	2.57	0.06	0.1
16	320	3.36	0.08	0.1	16	160	2.63	0.06	0.1
17	340	3.44	0.07	0.1	17	170	2.69	0.06	0.1
18	360	3.51	0.07	0.1	18	180	2.74	0.06	0.1
					19	190	2.80	0.05	0.1
					20	200	2.85	0.05	0.1
					21	210	2.90	0.05	0.1
					22	220	2.94	0.05	0.1
					23	230	2.99	0.05	0.1
					24	240	3.04	0.05	0.1
					25	250	3.08	0.04	0.1
					26	260	3.12	0.04	0.1
					27	270	3.17	0.04	0.1
					28	280	3.21	0.04	0.1
					29	290	3.25	0.04	0.1
					30	300	3.29	0.04	0.1
					31	310	3.33	0.04	0.1
					32	320	3.36	0.04	0.1
					33	330	3.40	0.04	0.1
					34	340	3.44	0.04	0.1
					35	350	3.47	0.04	0.1
					36	360	3.51	0.03	0.1

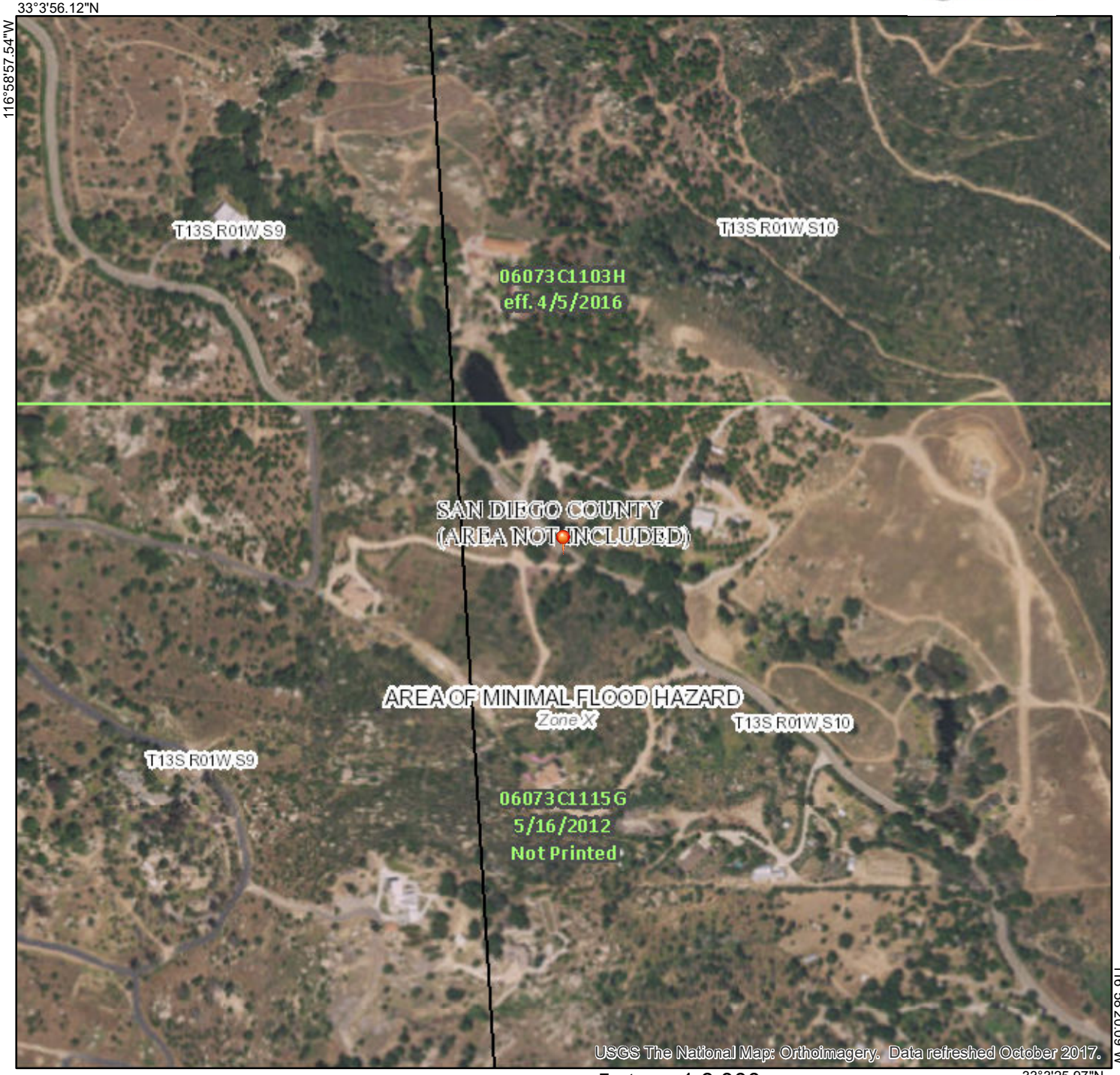
Pre-Develop Block Number	Pre-Develop. Time	Pre-Development Flow (thru)	Post-Develop. Block Number	Post-Develop. Time	Post-Development Flow (Inflow)	I_n+I_{n+1}	Infiltration Flow	Riser Out Flow (Mitigated Flow)	Stored Volume	$2S_n/\Delta t-O_n$	$2s_{n+1}/\Delta t+O_{n+1}$	Water Surface Elevation
N	T	Q_{N-Pre}	N	T	Q_{N-Post}		Q_{infil}	Q_{mit}	S_n			EL_{WS}
-	(Minutes)	(cfs)	-	(Minutes)	(cfs)	(cfs)	(cfs)	(cfs)	(ft^3)	(cfs)	(cfs)	(ft)
Table 1	-	Table 1	Table 1	-	Table 1	$Q_{N-Post}+Q_{(N+1)Post}$	Infiltration Rate x Basin Area	$C_{Oriface}*A_{Riser}(2g*Head_{Riser})^{1/2}$	$S_{n-1}+Q_{N-Post}-Q_{infil}-Q_{out}$	$2S_n/(T_N-T_{n-1})-Q_{infil(n-1)}-Q_{out(n-1)}$	$(2S_n/\Delta t-O_n)+(I_n+I_{n+1})$	Interpolate Basin Matrix for S_n
0	0	0.00	0	0	0.00	0.08	0.008	0.00	0.00	0.00	0.08	0.00
17	20	0.08	35	10	0.08	0.17	0.008	0.00	45.67	0.14	0.32	0.21
15	40	0.09	33	20	0.09	0.18	0.008	0.00	93.32	0.30	0.48	0.42
14	60	0.09	32	30	0.09	0.18	0.008	0.00	142.04	0.47	0.65	0.65
12	80	0.10	30	40	0.09	0.19	0.008	0.00	193.05	0.64	0.82	0.88
11	100	0.11	29	50	0.09	0.19	0.008	0.00	245.32	0.81	1.00	1.12
9	120	0.13	27	60	0.10	0.20	0.008	0.00	300.32	0.99	1.19	1.37
8	140	0.14	26	70	0.10	0.21	0.008	0.00	356.81	1.18	1.39	1.62
6	160	0.17	24	80	0.11	0.22	0.008	0.00	416.61	1.38	1.60	1.89
5	180	0.19	23	90	0.11	0.23	0.008	0.00	478.25	1.59	1.81	2.17
3	200	0.28	21	100	0.12	0.24	0.008	0.00	543.98	1.81	2.04	2.47
2	220	0.39	20	110	0.12	0.25	0.008	0.00	612.01	2.03	2.28	2.78
1	240	1.40	18	120	0.13	0.26	0.008	0.00	685.30	2.28	2.54	3.18
4	260	0.22	17	130	0.13	0.28	0.008	0.00	761.61	2.53	2.81	3.74
7	280	0.15	15	140	0.15	0.30	0.008	0.00	844.94	2.81	3.11	4.35
10	300	0.12	14	150	0.15	0.32	0.008	0.00	932.43	3.10	3.42	4.62
13	320	0.10	12	160	0.17	0.35	0.008	0.00	1029.96	3.43	3.78	4.80
16	340	0.09	11	170	0.18	0.39	0.008	0.00	1133.67	3.77	4.16	4.99
18	360	0.08	9	180	0.21	0.43	0.008	0.19	1253.21	4.17	4.60	5.20
			8	190	0.22	0.50	0.008	0.22	1271.26	4.04	4.54	5.24
			6	200	0.27	0.59	0.008	0.27	1301.17	4.11	4.70	5.29
			5	210	0.31	0.77	0.008	0.30	1324.04	4.14	4.91	5.33
			3	220	0.46	1.10	0.008	0.45	1411.79	4.39	5.50	5.49
			2	230	0.65	2.96	0.008	0.54	1524.70	4.62	7.59	5.70
			1	240	2.32	2.68	0.008	1.04	2587.97	8.08	10.77	7.63
			4	250	0.37	0.61	0.008	0.88	2179.32	6.22	6.83	6.89
			7	260	0.25	0.44	0.008	0.70	1793.18	5.09	5.53	6.19
			10	270	0.19	0.35	0.008	0.51	1484.74	4.24	4.60	5.62
			13	280	0.16	0.30	0.008	0.22	1272.51	3.73	4.03	5.24
			16	290	0.14	0.27	0.008	0.13	1220.88	3.84	4.11	5.14
			19	300	0.13	0.24	0.008	0.12	1211.80	3.90	4.14	5.13
			22	310	0.11	0.22	0.008	0.11	1204.85	3.89	4.11	5.12
			25	320	0.10	0.20	0.008	0.10	1199.34	3.88	4.09	5.11
			28	330	0.10	0.19	0.008	0.09	1194.84	3.88	4.07	5.10
			31	340	0.09	0.18	0.008	0.08	1191.08	3.87	4.05	5.09
			34	350	0.09	0.17	0.008	0.08	1187.89	3.87	4.04	5.08
			36	360	0.08	0.08	0.008	0.07	1186.01	3.87	3.95	5.08

APPENDIX D

FEMA FLOOD ZONE MAP

National Flood Hazard Layer FIRMette

FEMA



Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 / 17.5 Cross Sections with 1% Annual Chance / Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 7/31/2018 at 1:45:38 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

Comparison of Flood Hazard

Effective & Preliminary Flood Hazards

FEMA

Effective



Preliminary



Effective	
POI Longitude/Latitude	-116.9757, 33.0616
Effective FIRM Panel	06073C1115G
Effective Date	5/16/2012
Flood Zone	X
Static BFE*	Not Available
Flood Depth	Not Available
Vertical Datum	Not Available

Preliminary	
POI Longitude/Latitude	-116.9757, 33.0616
Preliminary FIRM Panel	06073C1115G
Preliminary Issue Date	1/1/1900
Flood Zone	Not Available
Estimated Static BFE*	Not Available
Estimated Flood Depth	Not Available
Vertical Datum	Not Available

* A **Base Flood Elevation** is the expected elevation of flood water during the 1% annual chance storm event. Structures below the estimated water surface elevation may experience flooding during a base flood event.

Hazard Level	Flood Hazard Zone
High Flood Hazard	**AE, A, AH, AO, VE and V Zones.** Properties in these flood zones have a 1% chance of flooding each year. This represents a 26% chance of flooding over the life of a 30-year mortgage.
Moderate Flood Hazard	**Shaded Zone X.** Properties in the moderate flood risk areas also have a chance of flooding from storm events that have a less than 1% chance of occuring each year. Moderate flood risk indicates an area that may be provided flood risk reduction due to a flood control system or an area that is prone to flooding during a 0.2% annual chance storm event. These areas may have been indicated as areas of shallow flooding by your community.
	Unshaded Zone X. Properties on higher ground and away from local flooding sources have a reduced flood risk when compared to the Moderate and High Flood Risk categories. Structures in these areas may be affected by larger storm events, in excess of the 0.2% annual chance storm event.
Low Flood Hazard	**Insurance Note:** High Risk Areas are called 'Special Flood Hazard Areas' and flood insurance is mandatory for federally backed mortgage holders. Properties in Moderate and Low Flood Risk areas may purchase flood insurance at a lower-cost rate, known as Preferred Risk Policies. See your local insurance agent or visit https://www.fema.gov/national-flood-insurance-program for more information.

Disclaimer: This report is for informational purposes only and is not authorized for official use. The positional accuracy may be compromised in some areas. Please contact your local floodplain administrator for more information or go to msc.fema.gov to view an official copy of the Flood Insurance Rate Maps.

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

7/31/2018 1:13:48 PM

ATTACHMENT 7

Copy of Project's Geotechnical and Groundwater Investigation Report

This is the cover sheet for Attachment 7.

If hardcopy or CD is not attached, the following information should be provided:

Title:
Prepared By:
Date:

This page was left intentionally blank.

ATTACHMENT 7 COPY OF PROJECT'S GEOTECHINICAL AND GROUNDWATER INVESTIGATION REPORT

This Section will be provided during the final design