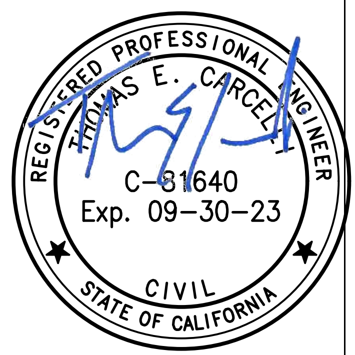
CITY OF CARLSBAD

PRIORITY DEVELOPMENT PROJECT (PDP)
PRELIMINARY STORM WATER QUALITY MANAGEMENT
PLAN (SWQMP)
FOR
VETERANS MEMORIAL PARK
PROJECT ID CUP2021-0014 DRAWING No.
(DWG________________________-_)

ENGINEER OF WORK:

Thomas Carcelli, P.E. RCE 81640



PREPARED FOR:

City of Carlsbad
1200 Carlsbad Village Dr.
Carlsbad, CA 92008
760-434-2820

PREPARED BY:

civTEC
999 Corporate Dr., Ste 100
Ladera Ranch, CA 92694
949-463-8822

DATE:
March 1, 2022

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CERTIFICATION PAGE

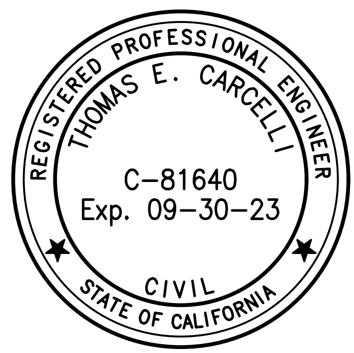
Project Name: Veterans Memorial Park

Project ID: CUP 2021-0014

I hereby declare that I am the Engineer in Responsible Charge of design of storm water BMPs for this project, and that I have exercised responsible charge over the design of the project as defined in Section 6703 of the Business and Professions Code, and that the design is consistent with the requirements of the BMP Design Manual, which is based on the requirements of SDRWQCB Order No. R9-2013-0001 (MS4 Permit) or the current Order.

I have read and understand that the City Engineer 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 SWQMP has been completed to the best of my ability and accurately reflects the project being proposed and the applicable source control and site design 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 SWQMP by the City Engineer 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.

Thomas Carcelli, P.E. RCE 81640 Exp. 9/30/23

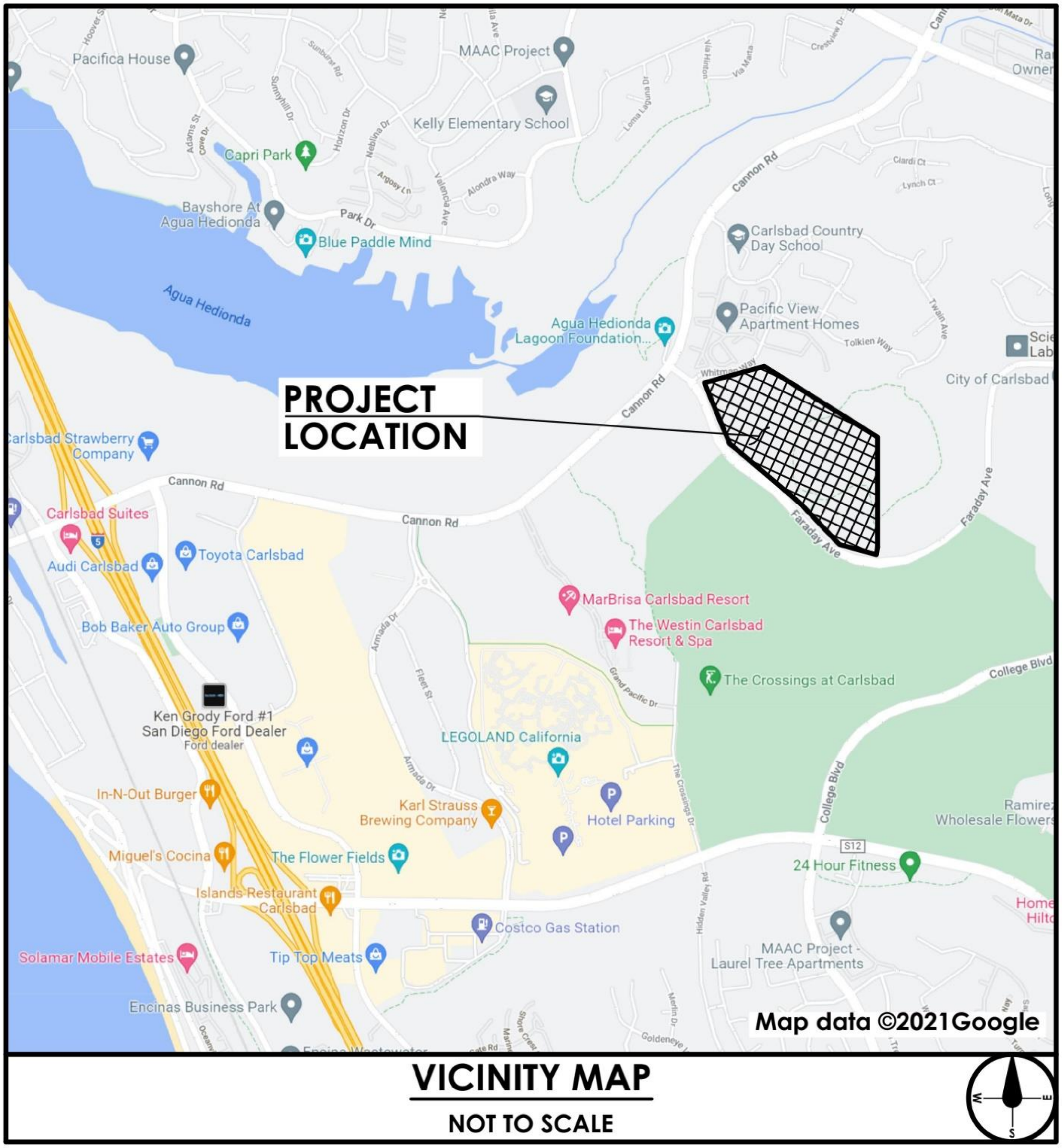


Thomas Carcelli, P.E.
Print Name

civTEC
Company

March 1, 2022
Date

PROJECT VICINITY MAP



City of Carlsbad	**STORM WATER STANDARDS QUESTIONNAIRE E-34**	***Development Services*** **Land Development Engineering** 1635 Faraday Avenue (760) 602-2750 www.carlsbadca.gov

INSTRUCTIONS:

To address post-development pollutants that may be generated from development projects, the city requires that new development and significant redevelopment priority projects incorporate Permanent Storm Water Best Management Practices (BMPs) into the project design per Carlsbad BMP Design Manual (BMP Manual). To view the BMP Manual, refer to the Engineering Standards (Volume 5).

This questionnaire must be completed by the applicant in advance of submitting for a development application (subdivision, discretionary permits and/or construction permits). The results of the questionnaire determine the level of storm water standards that must be applied to a proposed development or redevelopment project. Depending on the outcome, your project will either be subject to '**STANDARD PROJECT'** requirements, **'STANDARD PROJECT' with TRASH CAPTURE REQUIREMENTS**, or be subject to '**PRIORITY DEVELOPMENT PROJECT' (PDP)** requirements.

Your responses to the questionnaire represent an initial assessment of the proposed project conditions and impacts. City staff has responsibility for making the final assessment after submission of the development application. If staff determines that the questionnaire was incorrectly filled out and is subject to more stringent storm water standards than initially assessed by you, this will result in the return of the development application as incomplete. In this case, please make the changes to the questionnaire and resubmit to the city.

If you are unsure about the meaning of a question or need help in determining how to respond to one or more of the questions, please seek assistance from Land Development Engineering staff.

A completed and signed questionnaire must be submitted with each development project application. Only one completed and signed questionnaire is required when multiple development applications for the same project are submitted concurrently.

PROJECT INFORMATION	
PROJECT NAME: VETERANS MEMORIAL PARK	APN: 2122710300
ADDRESS: FARADAY AVE & WHITMAN WAY	
The project is (check one): ☒ New Development ☐ Redevelopment	
The total proposed disturbed area is: 1,617,458 ft² (37.1) acres	
The total proposed newly created and/or replaced impervious area is: 165,663 ft² (3.80) acres	
If your project is covered by an approved SWQMP as part of a larger development project, provide the project ID and the SWQMP # of the larger development project: Project ID N/A SWQMP #: N/A Then, go to Step 1 and follow the instructions. When completed, sign the form at the end and submit this with your application to the city.	

This Box for City Use Only

City Concurrence:	YES	NO	Date:	Project ID:
	☐	☐	By:	

STEP 1 TO BE COMPLETED FOR ALL PROJECTS		
To determine if your project is a "development project", please answer the following question:	YES	NO
Is your project LIMITED TO routine maintenance activity and/or repair/improvements to an existing building or structure that do not alter the size (See Section 1.3 of the BMP Design Manual for guidance)?	☐	☒
If you answered "yes" to the above question, provide justification below then **go to Step 6**, mark the box stating "my project is **not a 'development project'** and not subject to the requirements of the BMP manual" and complete applicant information. Justification/discussion: (e.g. the project includes only interior remodels within an existing building): If you answered "no" to the above question, the project is a '**development project**', **go to Step 2**.		

STEP 2 TO BE COMPLETED FOR ALL DEVELOPMENT PROJECTS		
To determine if your project is exempt from PDP requirements pursuant to MS4 Permit Provision E.3.b.(3), please answer the following questions:		
Is your project LIMITED to one or more of the following:	YES	NO
1. Constructing new or retrofitting paved sidewalks, bicycle lanes or trails that meet the following criteria: a) Designed and constructed to direct storm water runoff to adjacent vegetated areas, or other non-erodible permeable areas; OR b) Designed and constructed to be hydraulically disconnected from paved streets or roads; OR c) Designed and constructed with permeable pavements or surfaces in accordance with USEPA Green Streets guidance?	☐	☒
2. Retrofitting or redeveloping existing paved alleys, streets, or roads that are designed and constructed in accordance with the USEPA Green Streets guidance?	☐	☒
3. Ground Mounted Solar Array that meets the criteria provided in section 1.4.2 of the BMP manual?	☐	☒
If you answered "yes" to one or more of the above questions, provide discussion/justification below, then **go to Step 6**, mark the second box stating "my project is **EXEMPT** from PDP …" and complete applicant information. Discussion to justify exemption (e.g. the project redeveloping existing road designed and constructed in accordance with the USEPA Green Street guidance): If you answered "no" to the above questions, your project is not exempt from PDP, **go to Step 3**.		

STEP 3 TO BE COMPLETED FOR ALL NEW OR REDEVELOPMENT PROJECTS		
To determine if your project is a PDP, please answer the following questions (MS4 Permit Provision E.3.b.(1)):	YES	NO
1. Is your project a new development that creates 10,000 square feet or more of impervious surfaces collectively over the entire project site? *This includes commercial, industrial, residential, mixed-use, and public development projects on public or private land.*	☒	☐
2. Is your project a redevelopment project creating and/or replacing 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 surface? *This includes commercial, industrial, residential, mixed-use, and public development projects on public or private land.*	☐	☒
3. Is your project a new or redevelopment project that creates and/or replaces 5,000 square feet or more of impervious surface collectively over the entire project site and supports a restaurant? A restaurant is 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).	☐	☒
4. Is your project a new or redevelopment project that creates 5,000 square feet or more of impervious surface collectively over the entire project site and supports a hillside development project? A hillside development project includes development on any natural slope that is twenty-five percent or greater.	☒	☐
5. Is your project a new or redevelopment project that creates and/or replaces 5,000 square feet or more of impervious surface collectively over the entire project site and supports a parking lot? A parking lot is a land area or facility for the temporary parking or storage of motor vehicles used personally for business or for commerce.	☒	☐
6. Is your project a new or redevelopment project that creates and/or replaces 5,000 square feet or more of impervious street, road, highway, freeway or driveway surface collectively over the entire project site? *A street, road, highway, freeway or driveway is any paved impervious surface used for the transportation of automobiles, trucks, motorcycles, and other vehicles.*	☒	☐
7. Is your project a new or redevelopment project that creates and/or replaces 2,500 square feet or more of impervious surface collectively over the entire site, and discharges 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).**	☒	☐
8. Is your project a new development or redevelopment project that creates and/or replaces 5,000 square feet or more of impervious surface that supports an automotive repair shop? *An automotive repair shop is a facility that is categorized in any one of the following Standard Industrial Classification (SIC) codes: 5013, 5014, 5541, 7532-7534, or 7536-7539.*	☐	☒
9. Is your project a new development or redevelopment project that creates and/or replaces 5,000 square feet or more of impervious area that supports a retail gasoline outlet (RGO)? *This category includes RGO's that meet the following criteria: (a) 5,000 square feet or more or (b) a project Average Daily Traffic (ADT) of 100 or more vehicles per day.*	☐	☒
10. Is your project a new or redevelopment project that results in the disturbance of one or more acres of land and are expected to generate pollutants post construction?	☒	☐
11. Is your project located within 200 feet of the Pacific Ocean and (1) creates 2,500 square feet or more of impervious surface or (2) increases impervious surface on the property by more than 10%? (CMC 21.203.040)	☐	☒
If you answered "yes" to one or more of the above questions, your project is a **PDP**. If your project is a redevelopment project, **go to step 4**. If your project is a new project, **go to step 6,** check the first box stating, "My project is a **PDP** …" and complete applicant information. If you answered "no" to all of the above questions, your project is a '**STANDARD PROJECT'. Go to step 5**, complete the trash capture questions..		

* Environmentally Sensitive Areas 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 Resources Control Board (Water Quality Control Plan for the San Diego Basin (1994) and amendments); water bodies designated with the RARE beneficial use by the State Water Resources Control Board (Water Quality Control Plan for the San Diego Basin (1994) and amendments); areas designated as preserves or their equivalent under the Multi Species Conservation Program within the Cities and County of San Diego; Habitat Management Plan; and any other equivalent environmentally sensitive areas which have been identified by the City.

STEP 4
TO BE COMPLETED FOR REDEVELOPMENT PROJECTS THAT ARE PRIORITY DEVELOPMENT PROJECTS (PDP) ONLY

Complete the questions below regarding your redevelopment project (MS4 Permit Provision E.3.b.(2)):

Question	YES	NO
Does the redevelopment project result in the creation or replacement of impervious surface in an amount of less than 50% of the surface area of the previously existing development? Complete the percent impervious calculation below: Existing impervious area (A) = ____________________________ sq. ft. Total proposed newly created or replaced impervious area (B) = __________________________ sq. ft. Percent impervious area created or replaced (B/A)*100 = ___________%	☐	☐

If you answered "yes", the structural BMPs required for PDP apply only to the creation or replacement of impervious surface and not the entire development. **Go to step 6,** check the first box stating, "My project is a **PDP** …" and complete applicant information.

If you answered "no," the structural BMP's required for PDP apply to the entire development. **Go to step 6**, check the first box stating, "My project is a **PDP** …" and complete applicant information.

STEP 5
TO BE COMPLETED FOR STANDARD PROJECTS

Complete the question below regarding your Standard Project (SDRWQCB Order No. 2017-0077):

Question	YES	NO
Is the Standard Project within any of the following Priority Land Use (PLU) categories? R-23 (15-23 du/ac), R-30 (23-30 du/ac), PI (Planned Industrial), CF (Community Facilities), GC (General Commercial), L (Local Shopping Center), R (Regional Commercial), V-B (Village-Barrio), VC (Visitor Commercial), O (Office), VC/OS (Visitor Commercial/Open Space), PI/O (Planned Industrial/Office), or Public Transportation Station	☐	☐

If you answered "yes", the 'STANDARD PROJECT' is subject to **TRASH CAPTURE REQUIREMENTS. Go to step 6,** check the third box stating, "My project **is a 'STANDARD PROJECT' subject to TRASH CAPTURE REQUIREMENTS** …" and complete applicant information.

If you answered "no", your project is a 'STANDARD PROJECT'. Go to step 6, check the second box stating, "My project is a 'STANDARD PROJECT'…" and complete applicant information.

STEP 6
CHECK THE APPROPRIATE BOX AND COMPLETE APPLICANT INFORMATION

☒ My project **is a PDP** and must comply with **PDP** stormwater requirements of the BMP Manual. I understand I must prepare a Storm Water Quality Management Plan **(SWQMP)** per **E-35 template** for submittal at time of application.

☐ My project **is a 'STANDARD PROJECT'** OR **EXEMPT** from PDP and must only comply with '**STANDARD PROJECT'** stormwater requirements of the BMP Manual. As part of these requirements, I will submit a "*Standard Project Requirement Checklist Form E-36*" and incorporate low impact development strategies throughout my project.

☐ My project **is a 'STANDARD PROJECT' subject to TRASH CAPTURE REQUIREMENTS** and must comply with **TRASH CAPTURE REQUIREMENTS** of the BMP Manual. I understand I must prepare a **TRASH CAPTURE Storm Water Quality Management Plan (SWQMP)** per **E-35A template** for submittal at time of application.

Note: For projects that are close to meeting the PDP threshold, staff may require detailed impervious area calculations and exhibits to verify if 'STANDARD PROJECT' stormwater requirements apply.

☐ My project is **NOT a 'development project**' and is not subject to the requirements of the BMP Manual.

Applicant Information and Signature Box

Applicant Name: Thomas Carcelli, P.E. Applicant Title: PROJECT CIVIL ENGINEER

Applicant Signature: [signature] Date: Feb. 19, 2022

SITE INFORMATION CHECKLIST

Project Summary Information	
Project Name	Carlsbad Veterans Memorial Park
Project ID	
Project Address	Faraday Ave & Whitman Way
Assessor's Parcel Number(s) (APN(s))	2122710300
Project Watershed (Hydrologic Unit)	Carlsbad 904
Parcel Area	93.702 Acres (4,081,660 Square Feet)
Existing Impervious Area (subset of Parcel Area)	0 Acres (0 Square Feet)
Area to be disturbed by the project (Project Area)	37.1 Acres (1,617,458 Square Feet)
Project Proposed Impervious Area (subset of Project Area)	3.80 Acres (165,663 Square Feet)
Project Proposed Pervious Area (subset of Project Area)	33.3 Acres (1,451,795 Square Feet)
Note: Proposed Impervious Area + Proposed Pervious Area = Area to be Disturbed by the Project. This may be less than the Parcel Area.	

Description of Existing Site Condition and Drainage Patterns

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

☐ Existing development
☐ Previously graded but not built out
✓ ***Agricultural or other non-impervious use***
✓ ***Vacant, undeveloped/natural***

Description / Additional Information:

The existing site is mostly undisturbed. There are some natural trails running through the park with some concrete lined swales to facilitate drainage. As observed on Google Earth recent satellite photos, most of the existing site that will be graded with the proposed project is currently cleared and grubbed by the City to minimize weed buildup. The City does not have any record of any earth movement beyond the aforementioned clear and grub (mowing). The site currently requires minimal maintenance other than mowing as mentioned.

Existing Land Cover Includes (select all that apply):

✓ ***Vegetative Cover***
☐ Non-Vegetated Pervious Areas
☐ Impervious Areas

Description / Additional Information:

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

☐ NRCS Type A
☐ NRCS Type B
☐ NRCS Type C
✓ ***NRCS Type D***

Approximate Depth to Groundwater (GW):

☐ 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***

Description / Additional Information:

Description of Existing Site Topography and Drainage [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) describe existing constructed storm water conveyance systems, if applicable; and (3) is runoff from offsite conveyed through the site? if so, describe]:

The existing site drainage area conditions consist of natural terrain and grasslands that drain over the surface towards the southwest. Drainage is intercepted by concrete lined swales that run parallel to Faraday Avenue, directing the runoff towards 5 public storm drain culverts, passing beneath Faraday Avenue and discharging into the Crossing at Carlsbad Golf Course. The existing site slopes vary from 4% to 50%, ranging in elevation from 43 feet to 245 feet above mean sea level.

Description of Proposed Site Development and Drainage Patterns
Project Description / Proposed Land Use and/or Activities: The developed site will be a community park which will include: accessible trails, a community gathering area, restrooms, a reflective veterans memorial, as well as various play areas and a family oriented bike park.
List/describe proposed impervious features of the project (e.g., buildings, roadways, parking lots, courtyards, athletic courts, other impervious features): Of the disturbed 37.1 acres, approximately 3.8 acres will be developed with impervious surfaces. Parking lot will be paved with asphalt concrete while portions of the walks will be paved with concrete and pavers.
List/describe proposed pervious features of the project (e.g., landscape areas): Majority of walks/trails will be paved with pervious surfaces such as decomposed granite. The rest of site will be landscaped.
Does the project include grading and changes to site topography? ✓ ***Yes*** ☐ No Description / Additional Information: The development of the site will maintain a similar topography to the existing site, as well as maintain the existing drainage pattern. The proposed development will have slopes ranging from 1% to 50% and will have a very similar range in elevation to the existing conditions.
Does the project include changes to site drainage (e.g., installation of new storm water conveyance systems)? ✓ ***Yes*** ☐ No Description / Additional Information: The proposed site will include infrastructure to convey storm water through the newly graded site. The system will be composed primarily of above ground conveyances and stormwater quality treatment.

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

✓ ***<u>On-site storm drain inlets</u>***
☐ Interior floor drains and elevator shaft sump pumps
☐ Interior parking garages
☐ Need for future indoor & structural pest control
✓ ***<u>Landscape/Outdoor Pesticide Use</u>***
☐ 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
✓ ***<u>Fire Sprinkler Test Water</u>***
☐ Miscellaneous Drain or Wash Water
✓ ***<u>Plazas, sidewalks, and parking lots</u>***

Identification of Receiving Water Pollutants of Concern		
Describe path of storm water from the project site to the Pacific Ocean (or bay, lagoon, lake or reservoir, as applicable): The proposed drainage course will route on-site runoff southwest, draining into existing culverts passing beneath Faraday Avenue. The runoff will then flow northwest through natural overland flow towards the Agua Hedionda Creek, draining into the Agua Hedionda Lagoon, ultimately ending in the Pacific Ocean.		
List any 303(d) impaired water bodies 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 for the impaired water bodies:		
303(d) Impaired Water Body	**Pollutant(s)/Stressor(s)**	**TMDLs**
Agua Hedionda Creek	Benthic Community Effects, Bifenthrin, Chlorpyrifos, Cypermethrin, Indicator Bacteria, Malathion, Manganese, Nitrogen, Phosphorus, Selenium, Total Dissolved Solids, Toxicity	
Agua Hedionda Lagoon		

Identification of Project Site Pollutants			
Identify pollutants anticipated 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		X	
Nutrients		X	X
Heavy Metals		X	X
Organic Compounds	X		
Trash & Debris		X	
Oxygen Demanding Substances		X	X
Oil & Grease		X	
Bacteria & Viruses	X		X
Pesticides		X	X

TABLE B.6-1. Anticipated and Potential Pollutants Generated by Land Use Type

Priority Project Categories	General Pollutant Categories								
	Sediment	Nutrients	Heavy Metals	Organic Compounds	Trash & Debris	Oxygen Demanding Substances	Oil & Grease	Bacteria & Viruses	Pesticides
Detached Residential Development	X	X			X	X	X	X	X
Attached Residential Development	X	X			X	P(1)	P(2)	P	X
Commercial Development >one acre	P(1)	P(1)	X	P(2)	X	P(5)	X	P(3)	P(5)
Heavy Industry	X		X	X	X	X	X		
Automotive Repair Shops			X	X(4)(5)	X		X		
Restaurants					X	X	X	X	P(1)
Hillside Development >5,000 ft2	X	X			X	X	X		X
Parking Lots	P(1)	P(1)	X		X	P(1)	X		P(1)
Retail Gasoline Outlets			X	X	X	X	X		
Streets, Highways & Freeways	X	P(1)	X	X(4)	X	P(5)	X	X	P(1)

X = anticipated

P = potential

(1) A potential pollutant if landscaping exists onsite.

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

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

(4) Including petroleum hydrocarbons.

(5) Including solvents.

Trash Capture BMP Requirements
The project must meet the following Trash Capture BMP Requirements (see Section 4.4 of the BMP Design Manual): 1) The trash capture BMP is sized for a one-year, one-hour storm event or equivalent storm drain system, and 2) the trash capture BMP captures trash equal or greater to 5mm. Trash capture BMP will be included in the construction drawings including the sizing of the BMPs.

Hydromodification Management Requirements
Do hydromodification management requirements apply (see Section 1.6 of the BMP Design Manual)? ✓ ***Yes, hydromodification management flow control structural BMPs required.*** ☐ 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 for the watershed in which the project resides. Description / Additional Information (to be provided if a 'No' answer has been selected above):

Critical Coarse Sediment Yield Areas* *This Section only required if hydromodification management requirements apply

Based on the maps provided within the WMAA, do potential critical coarse sediment yield areas exist within the project drainage boundaries?

✓ ***Yes***

☐ No, No critical coarse sediment yield areas to be protected based on WMAA maps

If yes, have any of the optional analyses presented in Section 6.2 of the BMP Design Manual been performed?

☐ 6.2.1 Verification of Geomorphic Landscape Units (GLUs) Onsite

✓ ***6.2.2 Downstream Systems Sensitivity to Coarse Sediment***

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

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

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

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

✓ ***Critical coarse sediment yield areas exist but additional analysis has determined that protection is not required. Documentation attached in Attachment 2b of the SWQMP.***

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

Discussion / Additional Information:

Due to investigation provided within the “Attachment 2b: Management of Critical Coarse Sediment Yield Areas” no protection of onsite coarse sediment supply is required.

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. There are 5 points of compliance (POCs), all located on the west edge of the property, along Faraday Ave. the POCs have been identified on the Hydromodification Exhibit as POC 1, 2, 3, 4 and 5, corresponding to their related drainage subarea (see Attachment 2). POCs 1 and 3 consist of existing 30" RCP culverts, POCs 2 and 4 consist of an existing 18" RCP culvert and POC 4 consists of an existing 36" RCP culvert. All POCs direct flow towards the Agua Hedionda Creek and ultimately the Agua Hedionda Lagoon. For sizing of the hydromodification control BMP, the SDHM software was used to calculate the biofiltration areas required. Since the biofiltration area is proposed in each DMA, the software was run for each DMA rather than for each POC. The biofiltration area in each DMA was sized to address both Design Capture Volume (DCV) and the hydromodification management.
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)

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 City codes governing minimum street width, sidewalk construction, allowable pavement types, and drainage requirements. Storm water design is limited by the steep slope and the environmentally sensitive areas.
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.

STANDARD PROJECT REQUIREMENT CHECKLIST
E-36

City of Carlsbad

Development Services
Land Development Engineering
1635 Faraday Avenue
(760) 602-2750
www.carlsbadca.gov

Project Information	
Project Name:	Veterans Memorial Park
Project ID:	CUP 2021-0014, CIP 4609
DWG No. or Building Permit No.:	Not yet available

Baseline BMPs for Existing and Proposed Site Features

Complete the **Table 1 - Site Design Requirement** to document existing and proposed site features and the BMPs to be implemented for them. All BMPs must be implemented ***where applicable and feasible***. Applicability is generally assumed if a feature exists or is proposed.

BMPs must be implemented for **site design** features ***where feasible***. Leaving the box for a BMP unchecked means it will not be implemented (either partially or fully) either because it is inapplicable or infeasible. Explanations must be provided in the **area below**. The table provides specific instructions on when explanations are required.

Table 1 - Site Design Requirement

A. Existing Natural Site Features (see Fact Sheet BL-1)

1. Check the boxes below for each existing feature on the site.	*1. Select the BMPs to be implemented for each identified feature. Explain why any BMP not selected is infeasible in the area below.*	
	SD-G Conserve natural features	**SD-H** Provide buffers around waterbodies
☐ Natural waterbodies	☐	☐
☐ Natural storage reservoirs & drainage corridors	☐	--
☒ Natural areas, soils, & vegetation (incl. trees)	☒	--

B. BMPs for Common Impervious Outdoor Site Features (see Fact Sheet BL-2)

1. Check the boxes below for each proposed feature.	*2. Select the BMPs to be implemented for each proposed feature. If neither BMP **SD-B** nor **SD-I** is selected for a feature, explain why both BMPs are infeasible in the area below.*		
	SD-B Direct runoff to pervious areas	**SD-I** Construct surfaces from permeable materials	Minimize size of impervious areas
☐ Streets and roads	☐	☐	☒ *Check this box to confirm that all impervious areas on the site will be minimized where feasible.* *If this box is not checked, identify the surfaces that cannot be minimized in area below, and explain why it is infeasible to do so.*
☒ Sidewalks & walkways	☒	☒	
☒ Parking areas & lots	☒	☐	
☒ Driveways	☒	☐	
☒ Patios, decks, & courtyards	☒	☐	
☒ Hardcourt recreation areas	☒	☐	
☐ Other: _______________	☐	☐	

C. ☒ **BMPs for Rooftop Areas:** *Check this box if rooftop areas are proposed and select at least one BMP below.*
If no BMPs are selected, explain why they are infeasible in the area below. **(see Fact Sheet BL-3)**

☒ **SD-B** Direct runoff to pervious areas	☐ **SD-C** Install green roofs	☐ **SD-E** Install rain barrels

D. ☒ **BMPs for Landscaped Areas:** *Check this box if landscaping is proposed and select the BMP below* ☒ **SD-K Sustainable Landscaping** *If SD-K is not selected, explain why it is infeasible in the area below.*	**(see Fact Sheet BL-4)**
*Provide discussion/justification for site design BMPs that will **not** be implemented (either partially or fully):*	

Baseline BMPs for Pollutant-generating Sources

All development projects must complete **Table 2 - Source Control Requirement** to identify applicable requirements for documenting pollutant-generating sources/ features and source control BMPs.

BMPs must be implemented for **source control** features ***where feasible***. Leaving the box for a BMP unchecked means it will not be implemented (either partially or fully) either because it is inapplicable or infeasible. Explanations must be provided in the **area below**. The table provides specific instructions on when explanations are required.

Table 2 - Source Control Requirement

A. Management of Storm Water Discharges

1. Identify all proposed outdoor work areas below ☐ *Check here if none are proposed*	**2. Which BMPs will be used to prevent materials from contacting rainfall or runoff?** **(See Fact Sheet BL-5)** *Select all feasible BMPs for each work area*			**3. Where will runoff from the work area be routed?** **(See Fact Sheet BL-6)** *Select one or more option for each work area*		
	SC-A Overhead covering	**SC-B** Separation flows from adjacent areas	**SC-C** Wind protection	**SC-D** Sanitary sewer	**SC-E** Containment system	Other Storm-water BMPs
☒ Trash & Refuse Storage	☐	☒	☒	☐	☐	☒
☒ Materials & Equipment Storage	☒	☒	☒	☐	☐	☒
☐ Loading & Unloading	☐	☐	☐	☐	☐	☐
☐ Fueling	☐	☐	☐	☐	☐	☐
☐ Maintenance & Repair	☐	☐	☐	☐	☐	☐
☐ Vehicle & Equipment Cleaning	☐	☐	☐	☐	☐	☐
☐ Other: __________________	☐	☐	☐	☐	☐	☐

B. Management of Storm Water Discharges **(see Fact Sheet BL-7)**

Select one option for each feature below:

• Storm drain inlets and catch basins …	☐ are not proposed	☒ will be labeled with stenciling or signage to discourage dumping **(SC-F)**
• Interior work surfaces, floor drains & sumps …	☒ are not proposed	☐ will not discharge directly or indirectly to the MS4 or receiving waters
• Drain lines (e.g. air conditioning, boiler, etc.) …	☒ are not proposed	☐ will not discharge directly or indirectly to the MS4 or receiving waters
• Fire sprinkler test water …	☐ are not proposed	☒ will not discharge directly or indirectly to the MS4 or receiving waters

*Provide discussion/justification for source control BMPs that will **not** be implemented (either partially or fully):*

Form Certification	
This E-36 Form is intended to comply with applicable requirements of the city's BMP Design Manual. I certify that it 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 review of this form by City staff is confined to a review and does not relieve me as the person in charge of overseeing the selection and design of storm water BMPs for this project, of my responsibilities for project design.	
Preparer Signature:	Date: Feb. 19, 2022
Print preparer name: Thomas Carcelli, P.E.	

SUMMARY OF PDP STRUCTURAL BMPS

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 City at the completion of construction. This requires the project engineer to certify construction of the structural BMPs (see Section 1.12 of the BMP Design Manual). PDP structural BMPs mustbe maintained into perpetuity, and the City must confirm the maintenance (see Section 7 of theBMP Design Manual). Use this form 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 for each structural BMP within the project (copy the BMP summary information page as many times as needed to provide summary information for each individual structural BMP).
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 together or separate. Project site has Type D soils with 0.0 in/hr infiltration rate according to the project soils report, thus infiltration BMPs are not feasible. The strategy for this site is to utilize as much surface conveyance, treatment, and retention as possible, in order to preserve a natural watercourse. Permanent BMPs are to include biofiltration with underdrains to effectively address storm water pollution control and flow control for hydromodification management. The project site will utilize decomposed granite for walks wherever feasible as means for flow-through treatment and retention. Where vegetation areas are hydraulically separate from DMAs that contain permanent storm water BMPs are considered self-mitigating and are labeled as such on the DMA exhibit. [Continue on next page as necessary.]

[Continued from previous page – This page is reserved for continuation of description of general strategy for structural BMP implementation at the site.]

Structural BMP Summary Information [Copy this page as needed to provide information for each individual proposed structural BMP]
Structural BMP ID No. A
DWG Conceptual Grading Exhibit Sheet No. C-1.01
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)*** ☐ 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) ☐ 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)
Discussion (as needed): Biofiltration with underdrain is proposed to address both Design Capture Volume (DCV) and the hydromodification. The biofiltration area was sized to be at minimum 3% of the effective tributary area. Per Worksheet in Attachment 1, the size was verified for the required BMP performance. Once verified, the size was compared against the biofiltration area required to address hydromodification (per SDHM output in Attachment 2). The DCV controlled the sizing of the biofiltration, thus no adjustment or additional retention was required. **Required Areas:** **Min. required area for DCV: 593 sf** Min. required area for 3% of effective tributary area: 593 sf Min. required area for Hydromod.: 202 sf **Area provided per plan: 599 sf**

Structural BMP Summary Information **[Copy this page as needed to provide information for each individual proposed structural BMP]**
Structural BMP ID No. B
DWG Conceptual Grading Exhibit Sheet No. C-1.03
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)*** ☐ 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) ☐ 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)
Discussion (as needed): Biofiltration with underdrain is proposed to address both Design Capture Volume (DCV) and the hydromodification. The biofiltration area was sized to be at minimum 3% of the effective tributary area. Per Worksheet in Attachment 1, the size was verified for the required BMP performance. Once verified, the size was compared against the biofiltration area required to address hydromodification (per SDHM output in Attachment 2). The DCV controlled the sizing of the biofiltration, thus no adjustment or additional retention was required. **Required Areas:** **Min. required area for DCV: 242 sf** Min. required area for 3% of effective tributary area: 242 sf Min. required area for Hydromod.: 60 sf **Area provided per plan: 250 sf**

Structural BMP Summary Information **[Copy this page as needed to provide information for each individual proposed structural BMP]**
Structural BMP ID No. C
DWG <u>Conceptual Grading Exhibit</u> Sheet No. <u>C-1.03</u>
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) ✓ ***<u>Biofiltration (BF-1)</u>*** ☐ 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) ☐ Detention pond or vault for hydromodification management ☐ Other (describe in discussion section below)
Purpose: ☐ Pollutant control only ☐ Hydromodification control only ✓ ***<u>Combined pollutant control and hydromodification control</u>*** ☐ Pre-treatment/forebay for another structural BMP ☐ Other (describe in discussion section below)
Discussion (as needed): Biofiltration with underdrain is proposed to address both Design Capture Volume (DCV) and the hydromodification. The biofiltration area was sized to be at minimum 3% of the effective tributary area. Per Worksheet in Attachment 1, the size was verified for the required BMP performance. Once verified, the size was compared against the biofiltration area required to address hydromodification (per SDHM output in Attachment 2). The hydromodification controlled the sizing of the biofiltration, thus additional retention was needed. The soil media layer and gravel layer in the basin were increased to meet the hydromodification requirements. **<u>Required Areas:</u>** Min. required area for DCV: 463 sf Min. required area for 3% of effective tributary area: 463 sf **Min. required area for Hydromod.: 553 sf** **Area provided per plan: 582 sf**

Structural BMP Summary Information **[Copy this page as needed to provide information for each individual proposed structural BMP]**
Structural BMP ID No. D
DWG _Conceptual Grading Exhibit_ Sheet No. _C-1.03_
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)*** 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) 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)
Discussion (as needed): Biofiltration with underdrain is proposed to address both Design Capture Volume (DCV) and the hydromodification. The biofiltration area was sized to be at minimum 3% of the effective tributary area. Per Worksheet in Attachment 1, the size was verified for the required BMP performance. Once verified, the size was compared against the biofiltration area required to address hydromodification (per SDHM output in Attachment 2). The hydromodification controlled the sizing of the biofiltration, thus additional retention was needed. The soil media layer and gravel layer in the basin were increased to meet the hydromodification requirements. **Required Areas:** Min. required area for DCV: 583 sf Min. required area for 3% of effective tributary area: 583 sf **Min. required area for Hydromod.: 961 sf** **Area provided per plan: 1,080 sf**

Structural BMP Summary Information **[Copy this page as needed to provide information for each individual proposed structural BMP]**
Structural BMP ID No. E
DWG <u>Conceptual Grading Exhibit</u> Sheet No. <u>C-1.08</u>
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) ✓ ***<u>Biofiltration (BF-1)</u>*** 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) Detention pond or vault for hydromodification management Other (describe in discussion section below)
Purpose: Pollutant control only Hydromodification control only ✓ ***<u>Combined pollutant control and hydromodification control</u>*** Pre-treatment/forebay for another structural BMP Other (describe in discussion section below)
Discussion (as needed): Biofiltration with underdrain is proposed to address both Design Capture Volume (DCV) and the hydromodification. The biofiltration area was sized to be at minimum 3% of the effective tributary area. Per Worksheet in Attachment 1, the size was verified for the required BMP performance. Once verified, the size was compared against the biofiltration area required to address hydromodification (per SDHM output in Attachment 2). The DCV controlled the sizing of the biofiltration, thus no adjustment or additional retention was required. **<u>Required Areas:</u>** **Min. required area for DCV:** **3,907 sf** Min. required area for 3% of effective tributary area: 3,907 sf Min. required area for Hydromod.: 3,600 sf **Area provided per plan:** **4,028 sf**

Structural BMP Summary Information **[Copy this page as needed to provide information for each individual proposed structural BMP]**
Structural BMP ID No. F
DWG _Conceptual Grading Exhibit_ Sheet No. _C-1.08_
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)*** 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) 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)
Discussion (as needed): Biofiltration with underdrain is proposed to address both Design Capture Volume (DCV) and the hydromodification. The biofiltration area was sized to be at minimum 3% of the effective tributary area. Per Worksheet in Attachment 1, the size was verified for the required BMP performance. Once verified, the size was compared against the biofiltration area required to address hydromodification (per SDHM output in Attachment 2). The DCV controlled the sizing of the biofiltration, thus no adjustment or additional retention was required. **Required Areas:** **Min. required area for DCV:** **2,051 sf** Min. required area for 3% of effective tributary area: 2,051 sf Min. required area for Hydromod.: 2,025 sf **Area provided per plan:** **2,111 sf**

Structural BMP Summary Information **[Copy this page as needed to provide information for each individual proposed structural BMP]**
Structural BMP ID No. G
DWG _Conceptual Grading Exhibit_ Sheet No. _C-1.10_
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)*** ☐ 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) ☐ 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)
Discussion (as needed): Biofiltration with underdrain is proposed to address both Design Capture Volume (DCV) and the hydromodification. The biofiltration area was sized to be at minimum 3% of the effective tributary area. Per Worksheet in Attachment 1, the size was verified for the required BMP performance. Once verified, the size was compared against the biofiltration area required to address hydromodification (per SDHM output in Attachment 2). The hydromodification controlled the sizing of the biofiltration, thus additional retention was needed. The soil media layer and gravel layer in the basin were increased to meet the hydromodification requirements. **Required Areas:** Min. required area for DCV: 1,900 sf Min. required area for 3% of effective tributary area: 1,900 sf **Min. required area for Hydromod.: 2,025 sf** **Area provided per plan: 2,081 sf**

Structural BMP Summary Information **[Copy this page as needed to provide information for each individual proposed structural BMP]**
Structural BMP ID No. H
DWG _Conceptual Grading Exhibit_ Sheet No. _C-1.18_

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)***
- ☐ 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)
- ☐ 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)

Discussion (as needed):

Biofiltration with underdrain is proposed to address both Design Capture Volume (DCV) and the hydromodification. The biofiltration area was sized to be at minimum 3% of the effective tributary area. Per Worksheet in Attachment 1, the size was verified for the required BMP performance. Once verified, the size was compared against the biofiltration area required to address hydromodification (per SDHM output in Attachment 2). The DCV controlled the sizing of the biofiltration, thus no adjustment or additional retention was required.

Required Areas:

Min. required area for DCV:	**4,710 sf**
Min. required area for 3% of effective tributary area:	4,710 sf
Min. required area for Hydromod.:	4,624 sf
Area provided per plan:	**4,710 sf**

Structural BMP Summary Information
[Copy this page as needed to provide information for each individual proposed structural BMP]

Structural BMP ID No. I

DWG _Conceptual Grading Exhibit______Sheet No. _C-1.18_____

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)***
 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)
 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)

Discussion (as needed):

Biofiltration with underdrain is proposed to address both Design Capture Volume (DCV) and the hydromodification. The biofiltration area was sized to be at minimum 3% of the effective tributary area. Per Worksheet in Attachment 1, the size was verified for the required BMP performance. Once verified, the size was compared against the biofiltration area required to address hydromodification (per SDHM output in Attachment 2). The DCV controlled the sizing of the biofiltration, thus no adjustment or additional retention was required.

Required Areas:

Min. required area for DCV:	**116 sf**
Min. required area for 3% of effective tributary area:	116 sf
Min. required area for Hydromod.:	100 sf
Area provided per plan:	**140 sf**

Structural BMP Summary Information
[Copy this page as needed to provide information for each individual proposed structural BMP]

Structural BMP ID No. J

DWG _Conceptual Grading Exhibit______ Sheet No. _C-1.20_____

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)***
- 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)
- 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)

Discussion (as needed):

Biofiltration with underdrain is proposed to address both Design Capture Volume (DCV) and the hydromodification. The biofiltration area was sized to be at minimum 3% of the effective tributary area. Per Worksheet in Attachment 1, the size was verified for the required BMP performance. Once verified, the size was compared against the biofiltration area required to address hydromodification (per SDHM output in Attachment 2). The DCV controlled the sizing of the biofiltration, thus no adjustment or additional retention was required.

Required Areas:

Min. required area for DCV:	**85 sf**
Min. required area for 3% of effective tributary area:	85 sf
Min. required area for Hydromod.:	49 sf
Area provided per plan:	**89 sf**

Structural BMP Summary Information **[Copy this page as needed to provide information for each individual proposed structural BMP]**
Structural BMP ID No. K
DWG Conceptual Grading Exhibit Sheet No. C-1.20
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)*** 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) 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)
Discussion (as needed): Biofiltration with underdrain is proposed to address both Design Capture Volume (DCV) and the hydromodification. The biofiltration area was sized to be at minimum 3% of the effective tributary area. Per Worksheet in Attachment 1, the size was verified for the required BMP performance. Once verified, the size was compared against the biofiltration area required to address hydromodification (per SDHM output in Attachment 2). The hydromodification controlled the sizing of the biofiltration, thus additional retention was needed. The soil media layer and gravel layer in the basin were increased to meet the hydromodification requirements. **Required Areas:** Min. required area for DCV: 508 sf Min. required area for 3% of effective tributary area: 508 sf **Min. required area for Hydromod.: 757 sf** **Area provided per plan: 760 sf**

Structural BMP Summary Information [Copy this page as needed to provide information for each individual proposed structural BMP]
Structural BMP ID No. L
DWG Conceptual Grading Exhibit Sheet No. C-1.18
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)*** 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) 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)
Discussion (as needed): Biofiltration with underdrain is proposed to address both Design Capture Volume (DCV) and the hydromodification. The biofiltration area was sized to be at minimum 3% of the effective tributary area. Per Worksheet in Attachment 1, the size was verified for the required BMP performance. Once verified, the size was compared against the biofiltration area required to address hydromodification (per SDHM output in Attachment 2). The DCV controlled the sizing of the biofiltration, thus no adjustment or additional retention was required. **Required Areas:** **Min. required area for DCV: 77 sf** Min. required area for 3% of effective tributary area: 77 sf Min. required area for Hydromod.: 31 sf **Area provided per plan: 80 sf**

ATTACHMENT 1

BACKUP FOR PDP POLLUTANT CONTROL BMPS

This is the cover sheet for Attachment 1.

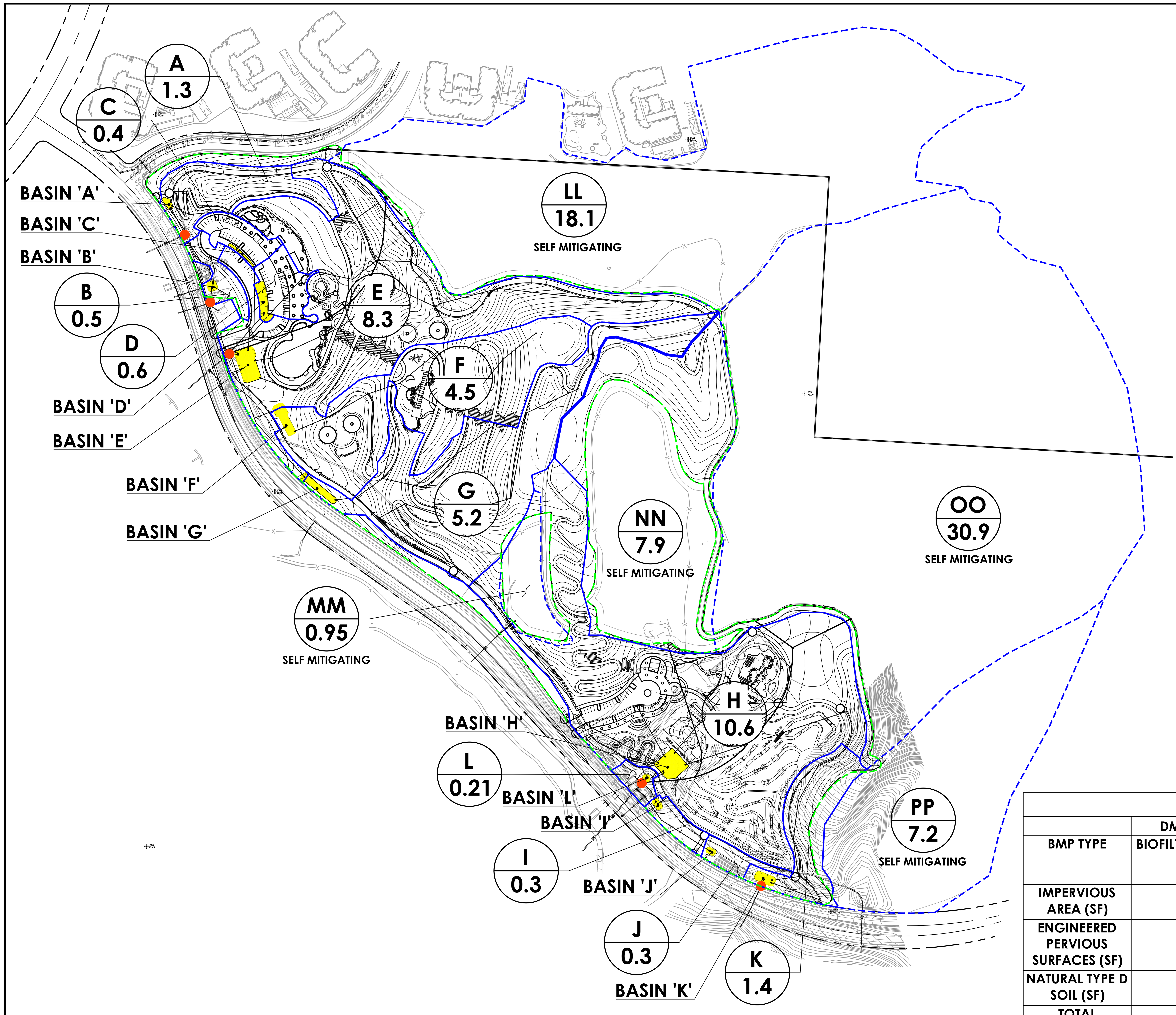
Check which Items are Included behind this cover sheet:

Attachment Sequence	**Contents**	**Checklist**
Attachment 1a	DMA Exhibit (Required) See DMA Exhibit Checklist on the back of this Attachment cover sheet. (24"x36" Exhibit typically required)	✓ ***Included***
Attachment 1b	Tabular Summary of DMAs Showing DMA ID matching DMA Exhibit, DMA Area, and DMA Type (Required)* *Provide table in this Attachment OR on DMA Exhibit in Attachment 1a	✓ ***Included on DMA Exhibit inAttachment 1a*** ☐ Included as Attachment 1b, separate from DMA Exhibit
Attachment 1c	Form I-7, Harvest and Use Feasibility Screening Checklist (Required unless the entire project will use infiltration BMPs) Refer to Appendix B.3-1 of the BMP Design Manual to complete Form I-7.	✓ ***Included*** ☐ Not included because the entire project will use infiltration BMPs
Attachment 1d	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 1e	Pollutant Control BMP Design Worksheets / Calculations (Required) Refer to Appendices B and E of the BMP Design Manual for structural pollutant control BMP design guidelines	✓ ***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 (if present)
- Existing topography and impervious areas
- 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
- 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)
- Structural BMPs (identify location and type of BMP)



LEGEND

- DMA BOUNDARY
- SELF-MITIGATING DMA
- LIMIT OF GRADING
- (A / 0.7) DMA DESIGNATION / ACREAGE
- POINT OF COMPLIANCE
- BIOFILTRATION BASIN FOOTPRINT

NOTE:

- ALL SOIL GROUP D.
- GROUNDWATER AT DEPTH EXCEEDING 30'±.
- DISTURBED AREA - 33.29 ACRES. (DMAs A, B, C, D, E, F, G, H, I, J & K)
- 85TH PERCENTILE 24 HOUR ISOPLUVIAL: 0.6 INCHES
- ALL DMAs INCLUDING SELF-MITIGATING AREAS ARE REQUIRED TO COMPLY WITH TRASH CAPTURE REQUIREMENTS. (TO BE DESIGNED DURING FINAL CONSTRUCTION DRAWING)
- PCCSYAs: A THRESHOLD CHANNEL ANALYSIS WAS CONDUCTED DOWNSTREAM AND UPSTREAM ON THE CHANNEL FROM THE MEDIAN POINT OF COMPLIANCE FOR THE SITE. THE ANALYSIS AND CALCULATION RESULTS FOR THE DOWNSTREAM AND UPSTREAM UN-LINED CHANNEL SHOW THAT THE CHANNEL DOES NOT DISPLAY CHARACTERISTICS THAT RESULT IN SIGNIFICANT BED LOAD MOVEMENT, THUS DOWNSTREAM CONDITIONS WILL NOT BE NEGATIVELY IMPACTED BY THE PROPOSED PROJECT. NO MITIGATION MEASURES FOR PROTECTION OF PCCSYAS ARE NECESSARY ONSITE

NOT FOR CONSTRUCTION

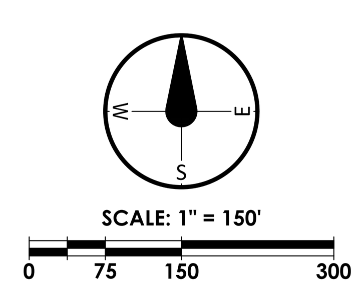
DMA TABLE

	DMA A	DMA B	DMA C	DMA D	DMA E
BMP TYPE	BIOFILTRATION	BIOFILTRATION	BIOFILTRATION	BIOFILTRATION	BIOFILTRATION
IMPERVIOUS AREA (SF)	6,422	3,430	16,056	20,102	47,192
ENGINEERED PERVIOUS SURFACES (SF)	5,980	0	0	0	37,162
NATURAL TYPE D SOIL (SF)	44,060	16,712	3,220	4,469	277,405
TOTAL DISTURBED AREA (SF)	56,462	20,142	19,276	24,571	361,759
DCV (CF)	988	403	771	971	6,512
BMP SIZE (SF)	599	250	582	1,080	4,028

DMA TABLE

	DMA F	DMA G	DMA H	DMA I	DMA J	DMA K	DMA L
BMP TYPE	BIOFILTRATION	BIOFILTRATION	BIOFILTRATION	BIOFILTRATION	BIOFILTRATION	BIOFILTRATION	BIOFILTRATION
IMPERVIOUS AREA (SF)	23,801	765	46,434	900	0	561	250
ENGINEERED PERVIOUS SURFACES (SF)	20,504	29,663	51,317	2,068	3,633	7,375	1,850
NATURAL TYPE D SOIL (SF)	150,941	195,673	363,979	9,468	8,130	52,530	7,050
TOTAL DISTURBED AREA (SF)	195,246	226,101	461,730	12,436	11,763	60,466	9,150
DCV (CF)	3,417	3,165	7,849	193	141	847	128
BMP SIZE (SF)	2,111	2,081	4,710	140	89	760	80

UNDERGROUND SERVICE ALERT
CALL: 811
TWO WORKING DAYS BEFORE YOU DIG



NO.	DATE	DESCRIPTION	BY

REVISIONS

REGISTERED PROFESSIONAL ENGINEER THOMAS E. CARCELLI C-81640 Exp. 09-30-23 CIVIL STATE OF CALIFORNIA

PREPARED BY:
civTEC CIVIL ENGINEERING CONSULTING
999 CORPORATE DR., SUITE 100
LADERA RANCH, CA 92694
p: 949.463.8822
e: tec@civtec.net

3/1/22
THOMAS E. CARCELLI, R.C.E. #81640

SCALE:	PER PLAN
DATE:	3/1/22
DRAWN BY:	STAFF
CHECKED BY:	TEC
PLOT DATE:	3/1/22

DMA EXHIBIT

VETERANS MEMORIAL PARK
SWQMP

CARLSBAD, CA

DRAWING NUMBER:
DMA-1
SHEET 1 OF 1
JN 101.176

Harvest and Use Feasibility Checklist	Form I-7

1. Is there a demand for harvested water (check all that apply) at the project site that is reliably present during the wet season?

☒ Toilet and urinal flushing
☒ Landscape irrigation
☐ Other:_______________

2. If there is a demand; estimate the anticipated average wet season demand over a period of 36 hours. Guidance for planning level demand calculations for toilet/urinal flushing and landscape irrigation is provided in Section B.3.2.

[Provide a summary of calculations here]

36 Hour Irrigation Demand = 32.9ac (1470gal/ac) = 48,363 gal = 6,465 ft^3
Reuse for toilets excluded from calculations due to predicted inconsistent/low toilet use during the wet season.

3. Calculate the DCV using worksheet B.2-1.

DCV = 161,517 (cubic feet)

3a. Is the 36 hour demand greater than or equal to the DCV? ☐ Yes / ☐ No ⇨	3b. Is the 36 hour demand greater than 0.25DCV but less than the full DCV? ☐ Yes / ☐ No ⇨	3c. Is the 36 hour demand less than 0.25DCV? ☒ Yes
⇩	⇩	⇩
Harvest and use appears to be feasible. Conduct more detailed evaluation and sizing calculations to confirm that DCV can be used at an adequate rate to meet drawdown criteria.	Harvest and use may be feasible. Conduct more detailed evaluation and sizing calculations to determine feasibility. Harvest and use may only be able to be used for a portion of the site, or (optionally) the storage may need to be upsized to meet long term capture targets while draining in longer than 36 hours.	Harvest and use is considered to be infeasible.

Is harvest and use feasible based on further evaluation?

☐ Yes, refer to Appendix E to select and size harvest and use BMPs.

☒ No, select alternate BMPs.

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?

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

Provide basis:

A report titled "Results of Infiltration Testing" was completed by Southern California Geotechnical on August 7, 2020. This report indicates that the on-site infiltration rate is 0.0 in/hr.

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

Criteria	Screening Question	Yes	No
2	**Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.	X	

Provide basis:

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 shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.	X	
Provide basis: 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 shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.	X	
Provide basis: 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		NO

*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 the City 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 shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.		X
Provide basis: A report titled "Results of Infiltration Testing" was completed by Southern California Geotechnical on August 7, 2020. This report indicates that the on-site infiltration rate is 0.0 in/hr. 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 shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.	X	
Provide basis: 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.			

<table>
<tr><th colspan="4">Form I-8 Page 4 of 4</th></tr>
<tr><th>Criteria</th><th>Screening Question</th><th>Yes</th><th>No</th></tr>
<tr><td>7</td><td>Can Infiltration in any appreciable quantity be allowed without posing significant risk for groundwater related concerns (shallow water table, storm water pollutants or other factors)? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td>X</td><td></td></tr>
<tr><td colspan="4">Provide basis:

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.</td></tr>
<tr><td>8</td><td>Can infiltration be allowed without violating downstream water rights? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td>X</td><td></td></tr>
<tr><td colspan="4">Provide basis:

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.</td></tr>
<tr><td>Part 2 Result*</td><td colspan="2">If all answers from row 5-8 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.</td><td>NO INFILTRATION</td></tr>
</table>

*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 the City to substantiate findings.

Automated Worksheet B.1: Calculation of Design Capture Volume (V2.0)

Category	#	Description	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	Units
Standard Drainage Basin Inputs	1	Drainage Basin ID or Name	A	B	C	D	E	F	G	H	I	J	unitless
	2	85th Percentile 24-hr Storm Depth	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	inches
	3	Impervious Surfaces Not Directed to Dispersion Area (C=0.90)	6,422	3,430	16,056	20,102	47,192	23,801	765	46,434	900	0	sq-ft
	4	Semi-Pervious Surfaces Not Serving as Dispersion Area (C=0.30)											sq-ft
	5	Engineered Pervious Surfaces Not Serving as Dispersion Area (C=0.10)	5,980	0	0	0	37,162	20,504	29,663	51,317	2,068	3,633	sq-ft
	6	Natural Type A Soil Not Serving as Dispersion Area (C=0.10)											sq-ft
	7	Natural Type B Soil Not Serving as Dispersion Area (C=0.14)											sq-ft
	8	Natural Type C Soil Not Serving as Dispersion Area (C=0.23)											sq-ft
	9	Natural Type D Soil Not Serving as Dispersion Area (C=0.30)	44,060	16,712	3,220	4,469	277,405	150,941	195,673	363,979	9,468	8,130	sq-ft
Dispersion Area, Tree Well & Rain Barrel Inputs (Optional)	10	Does Tributary Incorporate Dispersion, Tree Wells, and/or Rain Barrels?	No	No	No	No	No	No	No	No	No	No	yes/no
	11	Impervious Surfaces **Directed to Dispersion Area** per SD-B (Ci=0.90)											sq-ft
	12	Semi-Pervious Surfaces **Serving as Dispersion Area** per SD-B (Ci=0.30)											sq-ft
	13	Engineered Pervious Surfaces **Serving as Dispersion Area** per SD-B (Ci=0.10)											sq-ft
	14	Natural Type A Soil **Serving as Dispersion Area** per SD-B (Ci=0.10)											sq-ft
	15	Natural Type B Soil **Serving as Dispersion Area** per SD-B (Ci=0.14)											sq-ft
	16	Natural Type C Soil **Serving as Dispersion Area** per SD-B (Ci=0.23)											sq-ft
	17	Natural Type D Soil **Serving as Dispersion Area** per SD-B (Ci=0.30)											sq-ft
	18	Number of Tree Wells Proposed per SD-A											#
	19	Average Mature Tree Canopy Diameter											ft
	20	Number of Rain Barrels Proposed per SD-E											#
	21	Average Rain Barrel Size											gal
Initial Runoff Factor Calculation	22	Total Tributary Area	56,462	20,142	19,276	24,571	361,759	195,246	226,101	461,730	12,436	11,763	sq-ft
	23	Initial Runoff Factor for Standard Drainage Areas	0.35	0.40	0.80	0.79	0.36	0.35	0.28	0.34	0.31	0.24	unitless
	24	Initial Runoff Factor for Dispersed & Dispersion Areas	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	unitless
	25	Initial Weighted Runoff Factor	0.35	0.40	0.80	0.79	0.36	0.35	0.28	0.34	0.31	0.24	unitless
	26	Initial Design Capture Volume	988	403	771	971	6,512	3,417	3,165	7,849	193	141	cubic-feet
Dispersion Area Adjustments	27	Total Impervious Area Dispersed to Pervious Surface	0	0	0	0	0	0	0	0	0	0	sq-ft
	28	Total Pervious Dispersion Area	0	0	0	0	0	0	0	0	0	0	sq-ft
	29	Ratio of Dispersed Impervious Area to Pervious Dispersion Area	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	ratio
	30	Adjustment Factor for Dispersed & Dispersion Areas	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	ratio
	31	Runoff Factor After Dispersion Techniques	0.35	0.40	0.80	0.79	0.36	0.35	0.28	0.34	0.31	0.24	unitless
	32	Design Capture Volume After Dispersion Techniques	988	403	771	971	6,512	3,417	3,165	7,849	193	141	cubic-feet
Tree & Barrel Adjustments	33	Total Tree Well Volume Reduction	0	0	0	0	0	0	0	0	0	0	cubic-feet
	34	Total Rain Barrel Volume Reduction	0	0	0	0	0	0	0	0	0	0	cubic-feet
Results	35	Final Adjusted Runoff Factor	0.35	0.40	0.80	0.79	0.36	0.35	0.28	0.34	0.31	0.24	unitless
	36	Final Effective Tributary Area	19,762	8,057	15,421	19,411	130,233	68,336	63,308	156,988	3,855	2,823	sq-ft
	37	Initial Design Capture Volume Retained by Site Design Elements	0	0	0	0	0	0	0	0	0	0	cubic-feet
	38	Final Design Capture Volume Tributary to BMP	988	403	771	971	6,512	3,417	3,165	7,849	193	141	cubic-feet

No Warning Messages

Automated Worksheet B.1: Calculation of Design Capture Volume (V2.0)

Category	#	Description	i	ii	iii	iv	v	vi	vii	viii	ix	x	Units
Standard Drainage Basin Inputs	1	Drainage Basin ID or Name	K	L									unitless
	2	85th Percentile 24-hr Storm Depth	0.60	0.60									inches
	3	Impervious Surfaces Not Directed to Dispersion Area (C=0.90)	561	250									sq-ft
	4	Semi-Pervious Surfaces Not Serving as Dispersion Area (C=0.30)											sq-ft
	5	Engineered Pervious Surfaces Not Serving as Dispersion Area (C=0.10)	7,375	1,850									sq-ft
	6	Natural Type A Soil Not Serving as Dispersion Area (C=0.10)											sq-ft
	7	Natural Type B Soil Not Serving as Dispersion Area (C=0.14)											sq-ft
	8	Natural Type C Soil Not Serving as Dispersion Area (C=0.23)											sq-ft
	9	Natural Type D Soil Not Serving as Dispersion Area (C=0.30)	52,530	7,050									sq-ft
Dispersion Area, Tree Well & Rain Barrel Inputs (Optional)	10	Does Tributary Incorporate Dispersion, Tree Wells, and/or Rain Barrels?	No	No									yes/no
	11	Impervious Surfaces **Directed to Dispersion Area** per SD-B (Ci=0.90)											sq-ft
	12	Semi-Pervious Surfaces **Serving as Dispersion Area** per SD-B (Ci=0.30)											sq-ft
	13	Engineered Pervious Surfaces **Serving as Dispersion Area** per SD-B (Ci=0.10)											sq-ft
	14	Natural Type A Soil **Serving as Dispersion Area** per SD-B (Ci=0.10)											sq-ft
	15	Natural Type B Soil **Serving as Dispersion Area** per SD-B (Ci=0.14)											sq-ft
	16	Natural Type C Soil **Serving as Dispersion Area** per SD-B (Ci=0.23)											sq-ft
	17	Natural Type D Soil **Serving as Dispersion Area** per SD-B (Ci=0.30)											sq-ft
	18	Number of Tree Wells Proposed per SD-A											#
	19	Average Mature Tree Canopy Diameter											ft
	20	Number of Rain Barrels Proposed per SD-E											#
	21	Average Rain Barrel Size											gal
Initial Runoff Factor Calculation	22	Total Tributary Area	60,466	9,150	0	0	0	0	0	0	0	0	sq-ft
	23	Initial Runoff Factor for Standard Drainage Areas	0.28	0.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	unitless
	24	Initial Runoff Factor for Dispersed & Dispersion Areas	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	unitless
	25	Initial Weighted Runoff Factor	0.28	0.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	unitless
	26	Initial Design Capture Volume	847	128	0	0	0	0	0	0	0	0	cubic-feet
Dispersion Area Adjustments	27	Total Impervious Area Dispersed to Pervious Surface	0	0	0	0	0	0	0	0	0	0	sq-ft
	28	Total Pervious Dispersion Area	0	0	0	0	0	0	0	0	0	0	sq-ft
	29	Ratio of Dispersed Impervious Area to Pervious Dispersion Area	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	ratio
	30	Adjustment Factor for Dispersed & Dispersion Areas	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	ratio
	31	Runoff Factor After Dispersion Techniques	0.28	0.28	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	unitless
	32	Design Capture Volume After Dispersion Techniques	847	128	0	0	0	0	0	0	0	0	cubic-feet
Tree & Barrel Adjustments	33	Total Tree Well Volume Reduction	0	0	0	0	0	0	0	0	0	0	cubic-feet
	34	Total Rain Barrel Volume Reduction	0	0	0	0	0	0	0	0	0	0	cubic-feet
Results	35	Final Adjusted Runoff Factor	0.28	0.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	unitless
	36	Final Effective Tributary Area	16,930	2,562	0	0	0	0	0	0	0	0	sq-ft
	37	Initial Design Capture Volume Retained by Site Design Elements	0	0	0	0	0	0	0	0	0	0	cubic-feet
	38	Final Design Capture Volume Tributary to BMP	847	128	0	0	0	0	0	0	0	0	cubic-feet

No Warning Messages

Automated Worksheet B.2: Retention Requirements (V2.0)

Category	#	Description	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	Units
Basic Analysis	1	Drainage Basin ID or Name	A	B	C	D	E	F	G	H	I	J	unitless
	2	85th Percentile Rainfall Depth	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	inches
	3	Predominant NRCS Soil Type Within BMP Location	D	D	D	D	D	D	D	D	D	D	unitless
	4	Is proposed BMP location Restricted or Unrestricted for Infiltration Activities?	Restricted	Restricted	Restricted	Restricted	Restricted	Restricted	Restricted	Restricted	Restricted	Restricted	unitless
	5	Nature of Restriction	Soil Type	Soil Type	Soil Type	Soil Type	Soil Type	Soil Type	Soil Type	Soil Type	Soil Type	Soil Type	unitless
	6	Do Minimum Retention Requirements Apply to this Project?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	yes/no
	7	Are Habitable Structures Greater than 9 Stories Proposed?	No	No	No	No	No	No	No	No	No	No	yes/no
Advanced Analysis	8	Has Geotechnical Engineer Performed an Infiltration Analysis?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	yes/no
	9	Design Infiltration Rate Recommended by Geotechnical Engineer	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	in/hr
Result	10	Design Infiltration Rate Used To Determine Retention Requirements	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	in/hr
	11	Percent of Average Annual Runoff that Must be Retained within DMA	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	percentage
	12	Fraction of DCV Requiring Retention	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	ratio
	13	Required Retention Volume	20	8	15	19	130	68	63	157	4	3	cubic-feet

No Warning Messages

Automated Worksheet B.2: Retention Requirements (V2.0)

Category	#	Description	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	Units
Basic Analysis	1	Drainage Basin ID or Name	K	L	-	-	-	-	-	-	-	-	unitless
	2	85th Percentile Rainfall Depth	0.60	0.60	-	-	-	-	-	-	-	-	inches
	3	Predominant NRCS Soil Type Within BMP Location	D	D									unitless
	4	Is proposed BMP location Restricted or Unrestricted for Infiltration Activities?	Restricted	Restricted									unitless
	5	Nature of Restriction	Soil Type	Soil Type									unitless
	6	Do Minimum Retention Requirements Apply to this Project?	Yes	Yes									yes/no
	7	Are Habitable Structures Greater than 9 Stories Proposed?	No	No									yes/no
Advanced Analysis	8	Has Geotechnical Engineer Performed an Infiltration Analysis?	Yes	Yes									yes/no
	9	Design Infiltration Rate Recommended by Geotechnical Engineer	0.000	0.000									in/hr
Result	10	Design Infiltration Rate Used To Determine Retention Requirements	0.000	0.000	-	-	-	-	-	-	-	-	in/hr
	11	Percent of Average Annual Runoff that Must be Retained within DMA	4.5%	4.5%	-	-	-	-	-	-	-	-	percentage
	12	Fraction of DCV Requiring Retention	0.02	0.02	-	-	-	-	-	-	-	-	ratio
	13	Required Retention Volume	17	3	-	-	-	-	-	-	-	-	cubic-feet

No Warning Messages

Automated Worksheet B.3: BMP Performance (V2.0)

Category	#	Description	i	ii	iii	iv	v	vi	vii	viii	ix	x	Units
BMP Inputs	1	Drainage Basin ID or Name	A	B	C	D	E	F	G	H	I	J	sq-ft
	2	Design Infiltration Rate Recommended	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	in/hr
	3	Design Capture Volume Tributary to BMP	988	403	771	971	6,512	3,417	3,165	7,849	193	141	cubic-feet
	4	Is BMP Vegetated or Unvegetated?	Vegetated	Vegetated	Vegetated	Vegetated	Vegetated	Vegetated	Vegetated	Vegetated	Vegetated	Vegetated	unitless
	5	Is BMP Impermeably Lined or Unlined?	Lined	Lined	Lined	Lined	Lined	Lined	Lined	Lined	Lined	Lined	unitless
	6	Does BMP Have an Underdrain?	Underdrain	Underdrain	Underdrain	Underdrain	Underdrain	Underdrain	Underdrain	Underdrain	Underdrain	Underdrain	unitless
	7	Does BMP Utilize Standard or Specialized Media?	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	unitless
	8	Provided Surface Area	599	250	582	1,080	4,028	2,111	2,081	4,710	140	89	sq-ft
	9	Provided Surface Ponding Depth	12	12	12	12	12	12	12	12	12	12	inches
	10	Provided Soil Media Thickness	24	24	36	30	36	36	30	36	24	24	inches
	11	Provided Gravel Thickness (Total Thickness)	18	18	24	30	36	24	18	30	18	18	inches
	12	Underdrain Offset	3	3	3	3	3	3	3	3	3	3	inches
	13	Diameter of Underdrain or Hydromod Orifice (Select Smallest)	1.00	0.65	0.42	0.45	2.00	1.50	1.50	2.50	0.50	0.50	inches
	14	Specialized Soil Media Filtration Rate											in/hr
	15	Specialized Soil Media Pore Space for Retention											unitless
	16	Specialized Soil Media Pore Space for Biofiltration											unitless
	17	Specialized Gravel Media Pore Space											unitless
Retention Calculations	18	Volume Infiltrated Over 6 Hour Storm	0	0	0	0	0	0	0	0	0	0	cubic-feet
	19	Ponding Pore Space Available for Retention	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	unitless
	20	Soil Media Pore Space Available for Retention	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	unitless
	21	Gravel Pore Space Available for Retention (Above Underdrain)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	unitless
	22	Gravel Pore Space Available for Retention (Below Underdrain)	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	unitless
	23	Effective Retention Depth	2.40	2.40	3.00	2.70	3.00	3.00	2.70	3.00	2.40	2.40	inches
	24	Fraction of DCV Retained (Independent of Drawdown Time)	0.12	0.12	0.19	0.25	0.15	0.15	0.15	0.15	0.15	0.13	ratio
	25	Calculated Retention Storage Drawdown Time	120	120	120	120	120	120	120	120	120	120	hours
	26	Efficacy of Retention Processes	0.14	0.14	0.21	0.26	0.17	0.17	0.17	0.17	0.17	0.15	ratio
	27	Volume Retained by BMP (Considering Drawdown Time)	139	57	163	256	1,113	584	541	1,342	33	21	cubic-feet
	28	Design Capture Volume Remaining for Biofiltration	849	346	608	715	5,399	2,833	2,624	6,507	160	120	cubic-feet
Biofiltration Calculations	29	Max Hydromod Flow Rate through Underdrain	0.0539	0.0228	0.0111	0.0127	0.2712	0.1409	0.1279	0.4069	0.0135	0.0135	cfs
	30	Max Soil Filtration Rate Allowed by Underdrain Orifice	3.89	3.94	0.82	0.51	2.91	2.88	2.66	3.73	4.17	6.55	in/hr
	31	Soil Media Filtration Rate per Specifications	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	in/hr
	32	Soil Media Filtration Rate to be used for Sizing	3.89	3.94	0.82	0.51	2.91	2.88	2.66	3.73	4.17	5.00	in/hr
	33	Depth Biofiltered Over 6 Hour Storm	23.31	23.64	4.94	3.06	17.45	17.30	15.93	22.39	25.00	30.00	inches
	34	Ponding Pore Space Available for Biofiltration	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	unitless
	35	Soil Media Pore Space Available for Biofiltration	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	unitless
	36	Gravel Pore Space Available for Biofiltration (Above Underdrain)	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	unitless
	37	Effective Depth of Biofiltration Storage	22.80	22.80	27.60	28.80	32.40	27.60	24.00	30.00	22.80	22.80	inches
	38	Drawdown Time for Surface Ponding	3	3	15	24	4	4	5	3	3	2	hours
	39	Drawdown Time for Effective Biofiltration Depth	6	6	34	57	11	10	9	8	5	5	hours
	40	Total Depth Biofiltered	46.11	46.44	32.54	31.86	49.85	44.90	39.93	52.39	47.80	52.80	inches
	41	Option 1 - Biofilter 1.50 DCV: Target Volume	1,273	519	912	1,072	8,098	4,249	3,936	9,761	240	180	cubic-feet
	42	Option 1 - Provided Biofiltration Volume	1,273	519	912	1,072	8,098	4,249	3,936	9,761	240	180	cubic-feet
	43	Option 2 - Store 0.75 DCV: Target Volume	637	260	456	536	4,049	2,125	1,968	4,880	120	90	cubic-feet
	44	Option 2 - Provided Storage Volume	637	260	456	536	4,049	2,125	1,968	4,880	120	90	cubic-feet
	45	Portion of Biofiltration Performance Standard Satisfied	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	ratio
Result	46	Do Site Design Elements and BMPs Satisfy Annual Retention Requirements?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	yes/no
	47	Overall Portion of Performance Standard Satisfied (BMP Efficacy Factor)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	ratio
	48	**Deficit of Effectively Treated Stormwater**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	cubic-feet

No Warning Messages

Automated Worksheet B.3: BMP Performance (V2.0)

Category	#	Description	i	ii	iii	iv	v	vi	vii	viii	ix	x	Units
	1	Drainage Basin ID or Name	K	L	-	-	-	-	-	-	-	-	sq-ft
	2	Design Infiltration Rate Recommended	0.000	0.000	-	-	-	-	-	-	-	-	in/hr
	3	Design Capture Volume Tributary to BMP	847	128	-	-	-	-	-	-	-	-	cubic-feet
	4	Is BMP Vegetated or Unvegetated?	Vegetated	Vegetated									unitless
	5	Is BMP Impermeably Lined or Unlined?	Lined	Lined									unitless
	6	Does BMP Have an Underdrain?	Underdrain	Underdrain									unitless
	7	Does BMP Utilize Standard or Specialized Media?	Standard	Standard									unitless
	8	Provided Surface Area	760	80									sq-ft
BMP Inputs	9	Provided Surface Ponding Depth	12	12									inches
	10	Provided Soil Media Thickness	30	18									inches
	11	Provided Gravel Thickness (Total Thickness)	18	18									inches
	12	Underdrain Offset	3	3									inches
	13	Diameter of Underdrain or Hydromod Orifice (Select Smallest)	0.60	2.00									inches
	14	Specialized Soil Media Filtration Rate											in/hr
	15	Specialized Soil Media Pore Space for Retention											unitless
	16	Specialized Soil Media Pore Space for Biofiltration											unitless
	17	Specialized Gravel Media Pore Space											unitless
	18	Volume Infiltrated Over 6 Hour Storm	0	0	0	0	0	0	0	0	0	0	cubic-feet
	19	Ponding Pore Space Available for Retention	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	unitless
	20	Soil Media Pore Space Available for Retention	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	unitless
	21	Gravel Pore Space Available for Retention (Above Underdrain)	0.00	0.00	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	unitless
Retention Calculations	22	Gravel Pore Space Available for Retention (Below Underdrain)	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	unitless
	23	Effective Retention Depth	2.70	2.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	inches
	24	Fraction of DCV Retained (Independent of Drawdown Time)	0.20	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	ratio
	25	Calculated Retention Storage Drawdown Time	120	120	0	0	0	0	0	0	0	0	hours
	26	Efficacy of Retention Processes	0.22	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	ratio
	27	Volume Retained by BMP (Considering Drawdown Time)	187	17	0	0	0	0	0	0	0	0	cubic-feet
	28	Design Capture Volume Remaining for Biofiltration	660	111	0	0	0	0	0	0	0	0	cubic-feet
	29	Max Hydromod Flow Rate through Underdrain	0.0206	0.2011	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	cfs
	30	Max Soil Filtration Rate Allowed by Underdrain Orifice	1.17	108.62	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	in/hr
	31	Soil Media Filtration Rate per Specifications	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	in/hr
	32	Soil Media Filtration Rate to be used for Sizing	1.17	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	in/hr
	33	Depth Biofiltered Over 6 Hour Storm	7.01	30.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	inches
	34	Ponding Pore Space Available for Biofiltration	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	unitless
	35	Soil Media Pore Space Available for Biofiltration	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	unitless
	36	Gravel Pore Space Available for Biofiltration (Above Underdrain)	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	unitless
Biofiltration Calculations	37	Effective Depth of Biofiltration Storage	24.00	21.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	inches
	38	Drawdown Time for Surface Ponding	10	2	0	0	0	0	0	0	0	0	hours
	39	Drawdown Time for Effective Biofiltration Depth	21	4	0	0	0	0	0	0	0	0	hours
	40	Total Depth Biofiltered	31.01	51.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	inches
	41	Option 1 - Biofilter 1.50 DCV: Target Volume	990	167	0	0	0	0	0	0	0	0	cubic-feet
	42	Option 1 - Provided Biofiltration Volume	990	167	0	0	0	0	0	0	0	0	cubic-feet
	43	Option 2 - Store 0.75 DCV: Target Volume	495	83	0	0	0	0	0	0	0	0	cubic-feet
	44	Option 2 - Provided Storage Volume	495	83	0	0	0	0	0	0	0	0	cubic-feet
	45	Portion of Biofiltration Performance Standard Satisfied	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	ratio
	46	Do Site Design Elements and BMPs Satisfy Annual Retention Requirements?	Yes	Yes	-	-	-	-	-	-	-	-	yes/no
Result	47	Overall Portion of Performance Standard Satisfied (BMP Efficacy Factor)	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	ratio
	48	**Deficit of Effectively Treated Stormwater**	**0**	**0**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	cubic-feet

No Warning Messages

Automated Worksheet B.4: Reduced Size BMP Maintenance Interval (V2.0)

Category	#	Description	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	Units
Drainage Basin Info	1	Drainage Basin ID or Name	-	-	-	-	-	-	-	-	-	-	unitless
	2	Final Effective Tributary Area	-	-	-	-	-	-	-	-	-	-	sq-ft
	3	Provided BMP Surface Area	-	-	-	-	-	-	-	-	-	-	sq-ft
Biofiltration Clogging Inputs	4	Average Annual Precipitation											inches
	5	Load to Clog (default =2.0)											lb/sq-ft
	6	TSS Pretreatment Efficacy											yes/no
	7	Percentage "Commercial"											percentage
	8	Percentage "Education"											percentage
	9	Percentage "Industrial"											percentage
	10	Percentage "Low Traffic Areas"											percentage
	11	Percentage "Multi-Family Residential"											percentage
	12	Percentage "Roof Areas"											percentage
	13	Percentage "Single Family Residential"											percentage
	14	Percentage "Transportation"											percentage
	15	Percentage "Vacant/Open Space"											percentage
	16	Percentage "Steep Hillslopes"											percentage
Result	17	Total Percentage of Above Land Uses	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	percentage
	18	Average TSS Concentration for Tributary After Pretreatment	0	0	0	0	0	0	0	0	0	0	mg/L
	19	Average Annual Runoff Volume	0	0	0	0	0	0	0	0	0	0	cubic-feet
	20	Average Annual TSS Load	0	0	0	0	0	0	0	0	0	0	lb/yr
	21	Available Sediment Storage within BMP	0	0	0	0	0	0	0	0	0	0	lb
	22	Anticipated Major Maintenance Frequency	-	-	-	-	-	-	-	-	-	-	years

No Warning Messages

Automated Worksheet B.4: Reduced Size BMP Maintenance Interval (V2.0)

Category	#	Description	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	Units
Drainage Basin Info	1	Drainage Basin ID or Name	-	-	-	-	-	-	-	-	-	-	unitless
	2	Final Effective Tributary Area	-	-	-	-	-	-	-	-	-	-	sq-ft
	3	Provided BMP Surface Area	-	-	-	-	-	-	-	-	-	-	sq-ft
Biofiltration Clogging Inputs	4	Average Annual Precipitation											inches
	5	Load to Clog (default =2.0)											lb/sq-ft
	6	TSS Pretreatment Efficacy											yes/no
	7	Percentage "Commercial"											percentage
	8	Percentage "Education"											percentage
	9	Percentage "Industrial"											percentage
	10	Percentage "Low Traffic Areas"											percentage
	11	Percentage "Multi-Family Residential"											percentage
	12	Percentage "Roof Areas"											percentage
	13	Percentage "Single Family Residential"											percentage
	14	Percentage "Transportation"											percentage
	15	Percentage "Vacant/Open Space"											percentage
	16	Percentage "Steep Hillslopes"											percentage
Result	17	Total Percentage of Above Land Uses	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	percentage
	18	Average TSS Concentration for Tributary After Pretreatment	0	0	0	0	0	0	0	0	0	0	mg/L
	19	Average Annual Runoff Volume	0	0	0	0	0	0	0	0	0	0	cubic-feet
	20	Average Annual TSS Load	0	0	0	0	0	0	0	0	0	0	lb/yr
	21	Available Sediment Storage within BMP	0	0	0	0	0	0	0	0	0	0	lb
	22	Anticipated Major Maintenance Frequency	-	-	-	-	-	-	-	-	-	-	years

No Warning Messages

ATTACHMENT 2
BACKUP FOR PDP HYDROMODIFICATION CONTROL MEASURES

[This is the cover sheet for Attachment 2.]

Indicate which Items are Included behind this cover sheet:

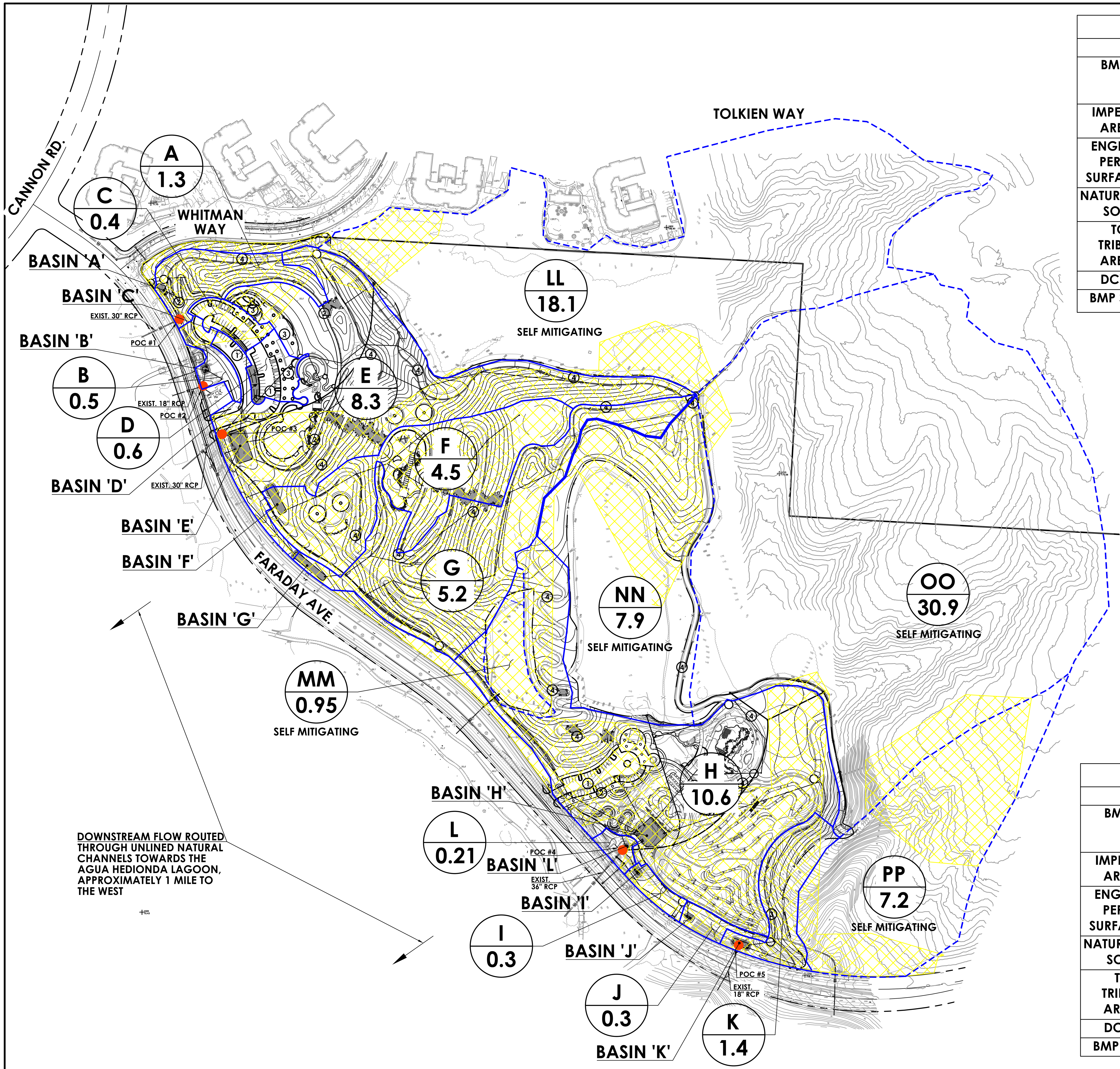
Attachment Sequence	**Contents**	**Checklist**
Attachment 2a	Hydromodification Management Exhibit (Required)	✓ ***Included*** See Hydromodification Management Exhibit Checklist on the back of this Attachment cover sheet.
Attachment 2b	Management of Critical Coarse Sediment Yield Areas (WMAA Exhibit is required, additional analyses are optional) See Section 6.2 of the BMP Design Manual.	✓ ***Exhibit showing project drainageboundaries marked on WMAA Critical Coarse Sediment Yield Area Map (Required)*** Optional analyses for Critical Coarse Sediment Yield Area Determination ☐ 6.2.1 Verification of Geomorphic Landscape Units Onsite ☐ 6.2.2 Downstream Systems Sensitivity to Coarse Sediment ☐ 6.2.3 Optional Additional Analysis of Potential Critical Coarse Sediment Yield Areas Onsite
Attachment 2c	Geomorphic Assessment of Receiving Channels (Optional) See Section 6.3.4 of the BMP Design Manual.	✓ ***Not performed*** ☐ Included
Attachment 2d	Flow Control Facility Design and Structural BMP Drawdown Calculations (Required) See Chapter 6 and Appendix G of the BMP Design Manual	✓ ***Included***
Attachment 2e	Slope Analysis (backup documentation for Flow Control)	✓ ***Included***

ATTACHMENT 2a
Hydromodification Management Exhibit

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 (if present)
- ✓ 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)



DMA TABLE

	DMA A	DMA B	DMA C	DMA D	DMA E	DMA F
BMP TYPE	BIOFILTRATION	BIOFILTRATION	BIOFILTRATION	BIOFILTRATION	BIOFILTRATION	BIOFILTRATION
IMPERVIOUS AREA (SF)	6,422	3,430	16,056	20,102	47,192	23,801
ENGINEERED PERVIOUS SURFACES (SF)	5,980	0	0	0	37,162	20,504
NATURAL TYPE D SOIL (SF)	44,060	16,712	3,220	4,469	277,405	150,941
TOTAL TRIBUTARY AREA (SF)	56,462	20,142	19,276	24,571	361,759	195,246
DCV (CF)	988	403	771	971	6,512	3,417
BMP SIZE (SF)	599	250	582	1,080	4,028	2,111

NOT FOR CONSTRUCTION

LEGEND

- DMA BOUNDARY (DISTURBED AREAS)
- SELF-MITIGATING DMA
- A / 0.7 — DMA DESIGNATION / ACREAGE
- POINT OF COMPLIANCE
- POTENTIAL CRITICAL COARSE SEDIMENT YIELD AREA

NOTE:

- ALL SOIL GROUP D.
- GROUNDWATER AT DEPTH EXCEEDING 30'±.
- PCCSYAs: A THRESHOLD CHANNEL ANALYSIS WAS CONDUCTED DOWNSTREAM AND UPSTREAM ON THE CHANNEL FROM THE MEDIAN POINT OF COMPLIANCE FOR THE SITE. THE ANALYSIS AND CALCULATION RESULTS FOR THE DOWNSTREAM AND UPSTREAM UN-LINED CHANNEL SHOW THAT THE CHANNEL DOES NOT DISPLAY CHARACTERISTICS THAT RESULT IN SIGNIFICANT BED LOAD MOVEMENT, THUS DOWNSTREAM CONDITIONS WILL NOT BE NEGATIVELY IMPACTED BY THE PROPOSED PROJECT. NO MITIGATION MEASURES FOR PROTECTION OF PCCSYAS ARE NECESSARY ONSITE.

PROPOSED IMPERVIOUS AREAS:

1. ASPHALT CONCRETE
2. CONCRETE
3. PAVERS

PROPOSED PERMEABLE PAVEMENT

4. DECOMPOSED GRANITE

DMA TABLE

	DMA G	DMA H	DMA I	DMA J	DMA K	DMA L
BMP TYPE	BIOFILTRATION	BIOFILTRATION	BIOFILTRATION	BIOFILTRATION	BIOFILTRATION	BIOFILTRATION
IMPERVIOUS AREA (SF)	765	46,434	900	0	561	250
ENGINEERED PERVIOUS SURFACES (SF)	29,663	51,317	2,068	3,633	7,375	1,850
NATURAL TYPE D SOIL (SF)	195,673	363,979	9,468	8,130	52,530	7,050
TOTAL TRIBUTARY AREA (SF)	226,101	461,730	12,436	11,763	60,466	9,150
DCV (CF)	3,165	7,849	193	141	847	128
BMP SIZE (SF)	2,081	4,710	140	89	760	80

UNDERGROUND SERVICE ALERT
CALL: 811
TWO WORKING DAYS BEFORE YOU DIG

SCALE: 1" = 150'
0 75 150 300

NO.	DATE	DESCRIPTION	BY

REVISIONS

REGISTERED PROFESSIONAL ENGINEER THOMAS E. CARCELLI C-81640 Exp. 09-30-23 CIVIL STATE OF CALIFORNIA

PREPARED BY:
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3/1/22
THOMAS E. CARCELLI, R.C.E. #81640

SCALE:	PER PLAN
DATE:	3/1/22
DRAWN BY:	STAFF
CHECKED BY:	TEC
PLOT DATE:	3/1/22

HYDROMODIFICATION MANAGEMENT EXHIBIT
VETERANS MEMORIAL PARK
SWQMP
CARLSBAD, CA

DRAWING NUMBER:
HM-1
SHEET 1 OF 1
JN 101.176

ATTACHMENT 2b
Management of Critical Coarse Sediment Yield Areas

Attachment 2b:
Management of Critical Coarse Sediment Yield Areas

Identification of CCSYAs

Potential Critical Coarse Sediment Yield Areas (PCCSYA) have been found within the project limits of the Veterans Memorial Park. The City of Carlsbad BMP Manual, Volume 5, 2021 Version (BMP Manual) requires the identification of areas on the PCCSYA map provided within the Carlsbad Watershed Management Area Analysis, dated 01/19/18 (WMAA) (see Figure 2b-A) and verification of onsite Geomorphic Landscape Units (GLUs) (see pages at end of this section), both of which are provided within this project SWQMP. Per the BMP Manual, projects in PCCSYAs must provide analysis of downstream un-lined receiving channels to determine if preservation of onsite coarse sediment supply is required.

Per the Drainage Management Area (DMA) Exhibit provided in Attachment 1 of the SWQMP, all existing onsite DMAs drain to reinforced concrete pipe (RCP) culverts running below Faraday Avenue. The runoff conveys coarse sediment to the un-lined channel west of Faraday Avenue. The runoff from the un-lined channel is discharged into the Agua Hedionda Lagoon, located approximately one mile northwest of the project site.

Refinement Options for PCCSYAs

For the PCCSYA study, the Carlsbad BMP Design Manual provides for potential relief from providing mitigation measures by satisfying one of the four criteria as shown that would remove “potential” from the designation (and one other regarding existing disturbance) and thus not require mitigation. The methodologies offered are:

- H.1.2.1 Depositional Analysis:

  This option requires analyses of the existing downstream system, where the downstream water system is shown to have a peak velocity of less than 3 feet per second during the design storm. However, it has been determined that the first downstream “unlined water of the state” is where this study needs to be conducted – so this option is not viable.

- H.1.2.2 Threshold Channel Analysis:

  This option requires study of the discharge to an existing “threshold channel” for “movement of the bed load” from the point of compliance (project discharge point) downstream to the tidal backwater (Aqua Hedionda Lagoon) and upstream 20 channel widths or to the start of the channel (grade control). This study has been performed and is shown on the following pages.

- H.1.2.3 Coarse Sediment Source Area Verification:

  This option requires the soils engineer to take field samples of the site within the PCCYSA area(s) and perform grain size analysis to determine if over 50% of the sample soil is fine-grained – e.g., over 50% by weight of the sample passes a no. 200 sieve (d < 0.074 mm). Unfortunately, a recent study by Southern California Geotechnical concluded that all but one sample site passed the criteria for fin-grained soils – so this option is not viable.

- H1.2.4 Verification of Geomorphic Landscape Units (GLUs):

  This option requires the soils engineer to confirm if any coarse bedrock (CB) or coarse sedimentary impermeable (CSI) is within the project area. Southern California Geotechnical concluded that GLU's that meet the coarse sedimentary impermeable designation are on site – so this option is not viable.

Conclusion

The cross-section of channel analyzed for this report lies to the southerly and westerly of the project site. This location serves as the most downstream point of the subarea identified as #1027 within the Agua Hedionda Watershed Management Plan. This location is the discharge point for approximately 1.60 square miles of drainage area, composed of an estimated 40.4% impervious areas, per the Agua Hedionda Watershed Management Plan (see Figure 2b-D). This channel location has a variable bottom width slope from southeast to northwest (see Figure 2b-C) and is heavily vegetated with well-established trees and shrubs.

The Threshold Channel Analysis was conducted downstream and upstream on the channel from the median point of compliance for the site. The analysis and calculation results for the downstream and upstream un-lined channel show that the channel does not display characteristics that result in significant bed load movement, thus downstream conditions will not be negatively impacted by the proposed project. No mitigation measures for protection of PCCSYAs are necessary onsite.

Worksheet H.7-1: Domain of Analysis

Domain of Analysis		Worksheet H.7-1
Use this form to document the domain of analysis		
Project Name: Veterans Memorial Park		
Project Tracking Number / Permit Application Number: CUP 2021-0014		
Part 1: Identify Domain of Analysis		
Project Location (at proposed storm water discharge point)		
1	Address:	T.B.D. N.E.C. of Faraday Ave. and Whitman Way
2	Latitude (decimal degrees):	33.14
3	Longitude (decimal degrees):	-117.30
4	Watershed:	Carlsbad
Basis for determining downstream limit: The downstream boundary is point where the channel below the project meets the most easterly tip of the Hedionda Lagoon. Here the channel satisfies three of the required criteria under Section H.7.2 in that the Lagoon can be considered a tidal backwater, the tributary watershed is met with at least an equal order tributary with the flow from Agua Hedionda Creek, and there is at least a 2-fold increase in drainage area.		
Channel length from discharge point to downstream limit:		2,360'+/-
Basis for determining upstream limit: From the BMP Manual the upstream limit is 20 channel top widths from the point of compliance or the first grade control is good condition. From the topography, the channel does not proceed for 20 top widths (~8,500 feet+/-) before it stops. The channel head is considered to be the first grade control.		
Channel length from discharge point to upstream limit:		3,690'+/-

Worksheet H.7-1; Page 2 of 2
Photo(s) Map or aerial photo of site. Include channel alignment and tributaries, project discharge point, upstream and downstream limits of analysis, ID number and boundaries of geomorphic channel units, and any other features used to determine limits (e.g. exempt water body, grade control) See Figures 2b-B, 2b-C, and 2b-D. ID Number is #1027 within the Agua Hedionda Watershed Management Plan.

Downstream Systems Requirements for Preservation of Coarse Sediment Supply				Form I-7
When it has been determined that potential critical coarse sediment yield areas exist within the project site, the next step is to determine whether downstream systems would be sensitive to reduction of coarse sediment yield from the project site. Use this form to document the evaluation of downstream systems requirements for preservation of coarse sediment supply.				
Project Name: VETERANS MEMORIAL PARK				
Project Tracking Number / Permit Application Number: CUP 2021-0014				
1	Will the project discharge runoff to a hardened MS4 system (pipe or lined channel) or an un-lined channel?	☑ Hardened MS4 system		Go to 2
		☐ Un-lined channel		Go to 4
2	Will the hardened MS4 system convey sediment (e.g., a concrete-lined channel with steep slope and cleansing velocity) or sink sediment (e.g., flat slopes, constrictions, treatment BMPs, or ponds with restricted outlets within the system will trap sediment and not allow conveyance of coarse sediment from the project site to an un-lined system).	☑ Convey		Go to 3
		☐ Sink		Go to 7
3	What kind of receiving water will the hardened MS4 system convey the sediment to?	☑ Un-lined channel		Go to 4
		☐ Lake ☐ Reservoir ☐ Bay		Go to 7
		☐ Lagoon ☐ Ocean		Go to 6
4	Is the un-lined channel impacted by deposition of sediment? This condition must be documented by the local agency.	☑ Yes		Go to 7
		☐ No		Go to 5
5	End – Preserve coarse sediment supply to protect un-lined channels from accelerated erosion due to reduction of coarse sediment yield from the project site unless further investigation determines the sediment is not critical to the receiving stream. Sediment that is critical to receiving streams is the sediment that is a significant source of bed material to the receiving stream (bed sediment supply) (see Section 6.2.3 and Appendix H.2 of the manual).			

6	End – Provide management measures for preservation of coarse sediment supply (protect beach sand supply).
7	End – Downstream system does not warrant preservation of coarse sediment supply, no measures for protection of critical coarse sediment yield areas onsite are necessary. Use the space below to describe the basis for this finding for the project.

See following pages for Threshold Channel Analysis.

H.1.2.2 Threshold Channel Analysis

The criteria for this study is to identify the downstream threshold channel and provide an analysis that there is no movement of bed load in the channel bottom. The City of Carlsbad BMP Manual defines a threshold channel as "a channel in which the channel boundary material has no significant movement during the design flow" and that the bed sediment typically consists of larger sediment and dense vegetation. Further the Manual states that channels "with bed material that can withstand a 10-year peak discharge without incipient motion." The following study will study the 10-year discharge movement within the threshold channel.

From the BMP Manual, the domain for analysis is defined by upstream and downstream boundaries as follows:

- From the point of compliance proceed downstream until reaching one of the following:
  - At least one reach downstream of the first grade-control point (preferably second downstream grade control location);
  - Tidal backwater/lentic (still water) waterbody;
  - Equal order tributary (Strahler 1952);
  - A 2-fold increase in drainage area.

  OR demonstrate sufficient flow attenuation through existing hydrologic modeling.
- From the point of compliance proceed upstream for 20 channel top widths OR to the first grade control in good condition, whichever comes first.

Upon review of the watershed and downstream channel, it can be concluded that the downstream boundary is point where the channel below the project meets the most easterly tip of the Hedionda Lagoon. Here the channel satisfies three of the criteria above in that the Lagoon can be considered a tidal backwater, the tributary watershed is met with at least an equal order tributary with the flow from Agua Hedionda Creek, and there is at least a 2-fold increase in drainage area. For the upstream boundary, from the topography the channel does not proceed for 20 top widths (~8,500 feet+/-) before it stops. The channel head is considered to be the first grade control.

The BMP Manual states "For a project to be exempt from coarse sediment supply requirements, the applicant must submit the following for approval to the [City Engineer]:

- Photographic documentation and/or grain size analysis used to determine the d50 of the bed material; <u>and</u>
- Calculations that show that the receiving water of concern meets the specific stream power criteria defined below or a finding from a geomorphologist that the stream channel has existing grade control structures that protect the stream channel from hydromodification impacts.

Please refer to Figure 2b-I for Photographic Documentation.

The following are the calculations for the Specific Stream Power.

Specific Stream Power

From the BMP Manual the calculation of the Specific Stream Power is from the following:

Equation H.7-2: Calculation of Specific Stream Power

$$Specific\ Stream\ Power = \frac{Total\ Stream\ Power}{Channel\ Width} = \frac{\gamma QS}{w}$$

Where:

γ: Specific Weight of Water (9810 N/m^3)
Q: Flow Rate (dominant discharge in many cases, m^3/sec)
S: Slope of Channel
w: Channel Width (meters)

For this study, the Q in the above equation is calculated from the following:

Equation H.7-5: Calculation of Q_{10} with Adjustment Factor for Watershed Imperviousness

$$Q_{10cfs} = AF * 18.2 * A^{0.87} * P^{0.77}$$

Where:

Q_{10cfs}: 10 year Flow Rate in cubic feet per second
AF: Adjustment Factor
A: Drainage Area in sq. miles
P: Mean Annual Precipitation in inches

The watershed imperviousness is taken from Figure 2.5 of the Agua Hedionda Watershed Management Plan and is 40.4% (see Figure 2b-D). Using this figure the Adjustment Factor (AF) is taken from Figure H.7-2 in the BMP Manual (see Figure 2b-E) and is 1.26.

The Drainage Area is taken from the USGS StreamStats website and is determined to be 1.6 square miles (see Figure 2b-F).

The Mean Annual Precipitation (P) is taken from nearest gage on the Western Regional Climate Center (WRCC) website and is determined to be 10.54 inches (see Figure 2b-G).

Therefore the $Q_{10cfs\ is}$:

Q_{10cfs} = 1.26 * * 18.2 * $1.6^{0.87}$ * $10.54^{0.77}$

= **211.6 cfs**

For the Specific Stream Power calculation:

DOWNSTREAM

γ	=	**9810** N/m^3	*given*
Q_{10cfs}	=	211.6 cfs * 0.0283 cf/m^3	
	=	**5.99 m^{3}s**	
S	=	(34.0 – 11.0) / 2,360	
	=	**0.010**	
		See figure 2b-C	
w	=	average of 5 sections (508' + 718' + 473' + 305' + 847') / 5	
	=	570 feet	
	=	**174 m**	
		See figure 2b-C	

Therefore the Specific Stream Power is:

Specific Stream Power	=	(γ * Q * S) / w
	=	(9810 * 5.99 * 0.010) / 174
	=	**3.4**

UPSTREAM

γ	=	**9810** N/m^3	*given*
Q_{10cfs}	=	211.6 cfs * 0.0283 cf/m^3	
	=	**5.99 m^{3}s**	
S	=	(78-34) / 3,690	
	=	**0.012**	
		See figure 2b-C	
w	=	average of 5 sections (545' + 506' + 457' + 331' + 295') / 5	
	=	427 feet	
	=	**130 m**	
		See figure 2b-C	

Therefore the Specific Stream Power is:

Specific Stream Power	=	(γ * Q * S) / w
	=	(9810 * 5.99 * 0.012) / 130
	=	**5.4**

From the BMP Manual, *"use results from Step 1 and Step 2; and Figure H.7-1 to determine if the receiving water meets the specific stream power criteria. Receiving water shall be considered meeting the specific stream power criteria when the point plotted based on results from Step 1 and Step 2 is below the solid line in Figure H.7-1."*

From Figure 2b-H showing Table H.7-1 from the BMP Manual, the median grain diameter (d_{50}) would have to be greater than approximately 0.22 mm (= $(5.4/16.7)^{1.33}$) to meet the specific stream power criteria for no required mitigation for CCSYAs.

A site investigation of the natural drainage course has been completed. Please see Figure 2b-I for photographs of the channel from various vantage points. The site investigation and pictures indicate dense vegetative cover throughout the entire channel below the project site. The vegetative cover is mature, dense, and fairly uniform. The vegetation in some areas is so dense that the drainage course was either difficult to access or not possible to access it all. The vegetation consists of mature grass and shrubs, trees, and rock formations.

Table 5-13 from the County of San Diego Drainage Design Manual (see Figure 2b-J) shows maximum permissible velocities for channels with various surfaces. The channel below the project can be classified as unreinforced vegetation, and the maximum permissible velocity to provide resistance to erosion is 5.0 ft/sec. This maximum permissible velocity is where the channel section will remain stable and not erode. (Note that due to the dense cover and mature vegetation the permissible velocity that the channel will encounter erosion is likely greater than 5.0 ft/sec.) An equivalent channel surface to a fully lined unreinforced vegetation channel with a maximum permissible average velocity of 5.0 ft/sec is an unlined bed surface of cobbles and shingles. Cobbles and shingles (rounded cobbles) generally are defined with a grain size from 64 to 256 millimeters. Based on this equivalency it can be inferred that the uniform vegetated natural channel in question has an equivalent grain size of at least 64 millimeters. This grain size is much greater than the minimum required median grain diameter (d_{50}) of 0.22 millimeters as defined in the Threshold of Stream Instability chart (Figure 2b-H) and the calculations in the preceding pages. Therefore, we can conclude that the channel in question falls below the specific stream power line in Figure 2b-H and no mitigation is required for the project for coarse sediment yield areas.

Potential Critical Coarse Sediment Yield Areas

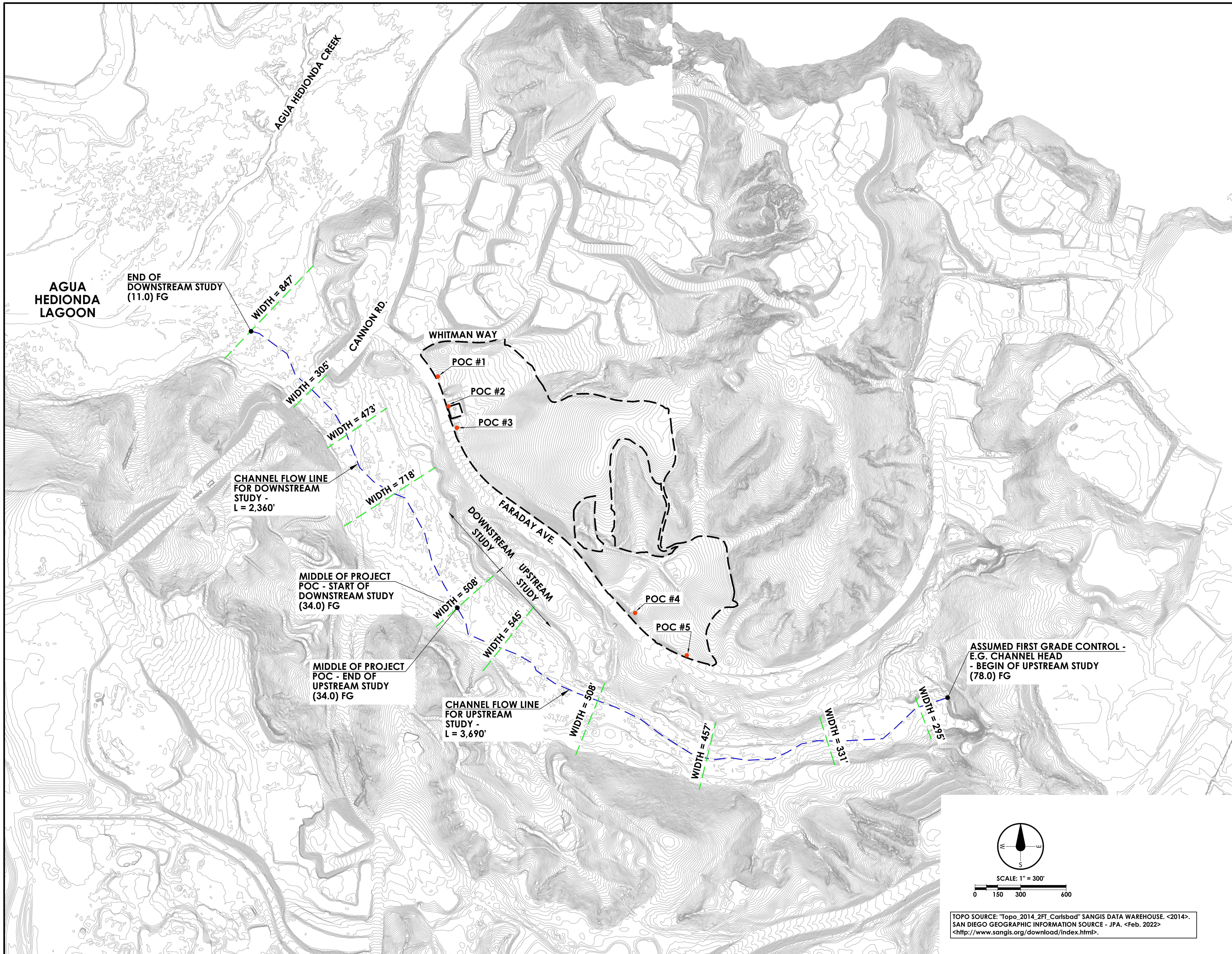
Carlsbad Watershed - HU 904.00, 211 mi2

Exhibit Date: Sept. 8, 2014

Geosyntec consultants

RICK ENGINEERING COMPANY

Figure 2b-B: Channel Investigation Location



NOT FOR CONSTRUCTION

SCALE: 1" = 300'
0 150 300 600

LEGEND

- PROJECT BOUNDARY (DISTURBED AREA)
- CHANNEL FLOW LINE FOR STUDY
- CHANNEL WIDTH FOR STUDY
- POINT OF COMPLIANCE

TOPO SOURCE: "Topo_2014_2FT_Carlsbad" SANGIS DATA WAREHOUSE. <2014>.
SAN DIEGO GEOGRAPHIC INFORMATION SOURCE - JPA. <Feb. 2022>
<http://www.sangis.org/download/index.html>.

Figure 2b-C

UNDERGROUND SERVICE ALERT
CALL: 811
TWO WORKING DAYS BEFORE YOU DIG

NO.	DATE	DESCRIPTION	BY

REVISIONS

REGISTERED PROFESSIONAL ENGINEER
THOMAS E. CARCELLI
C-81640
Exp. 09-30-23
CIVIL
STATE OF CALIFORNIA

PREPARED BY:
civTEC CIVIL ENGINEERING CONSULTING
999 CORPORATE DR., SUITE 100
LADERA RANCH, CA 92694
p: 949.463.8822
e: tec@civtec.net

2/15/22
THOMAS E. CARCELLI, R.C.E. #81640

SCALE:	PER PLAN
DATE:	2/15/22
DRAWN BY:	STAFF
CHECKED BY:	TEC
PLOT DATE:	2/15/22

CHANNEL SLOPE AND WIDTH ANALYSIS EXHIBIT
VETERANS MEMORIAL PARK SWQMP
CARLSBAD, CA

DRAWING NUMBER:
STR-1
SHEET 1 OF 1
JN 101.176

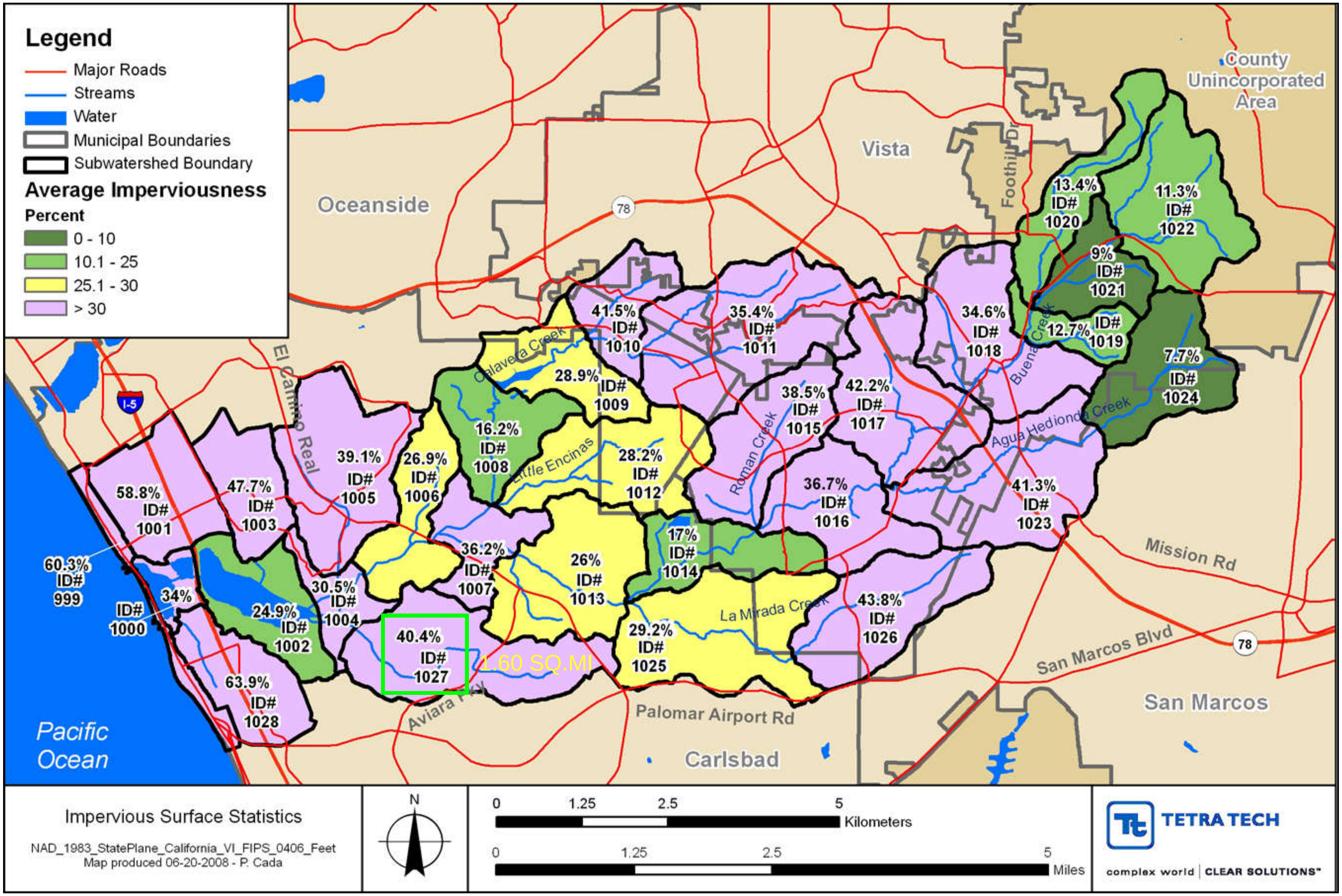


Figure 2-5. Percent Impervious Surface Cover for Each Subwatershed

Figure 2b-D

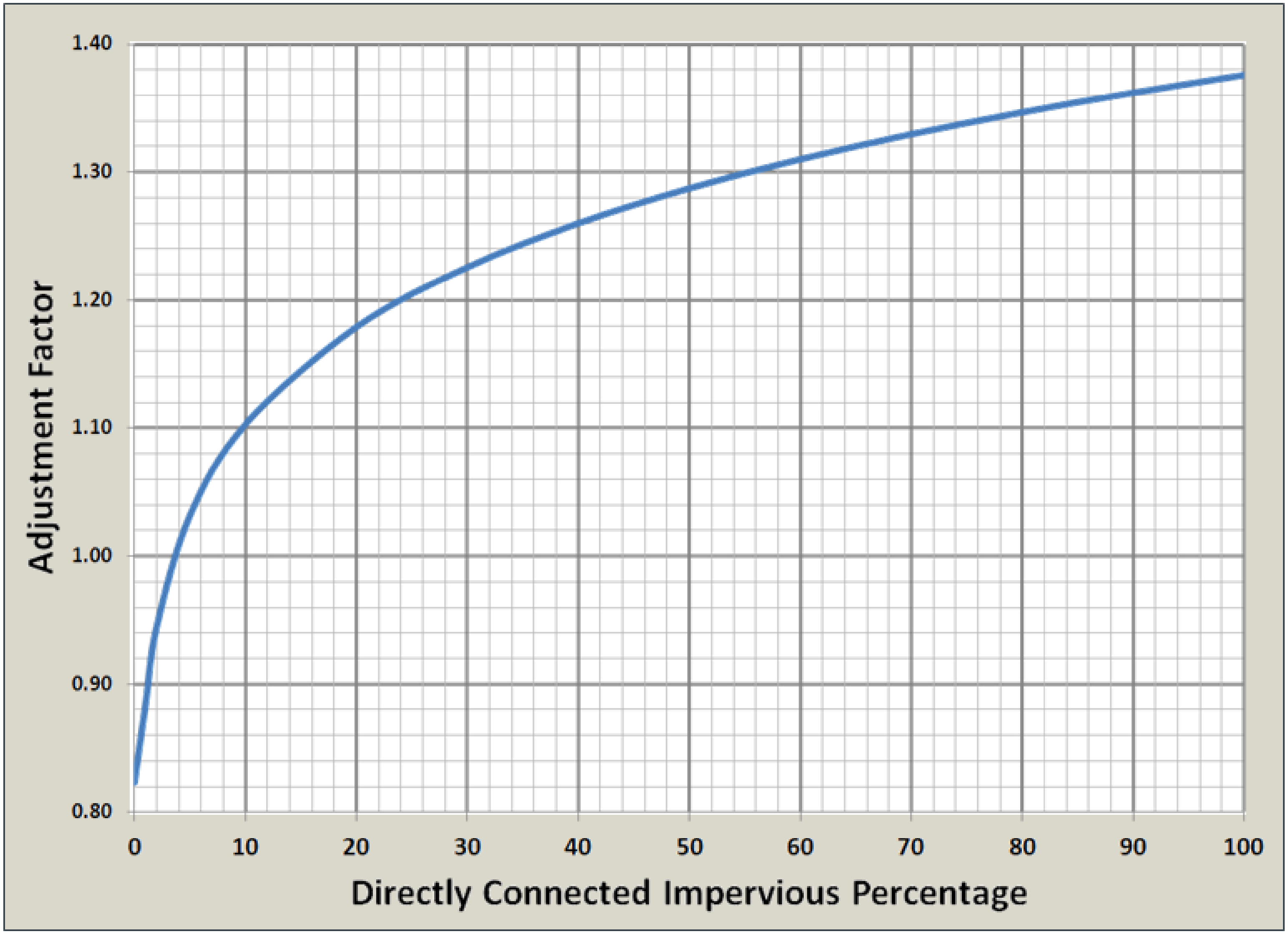


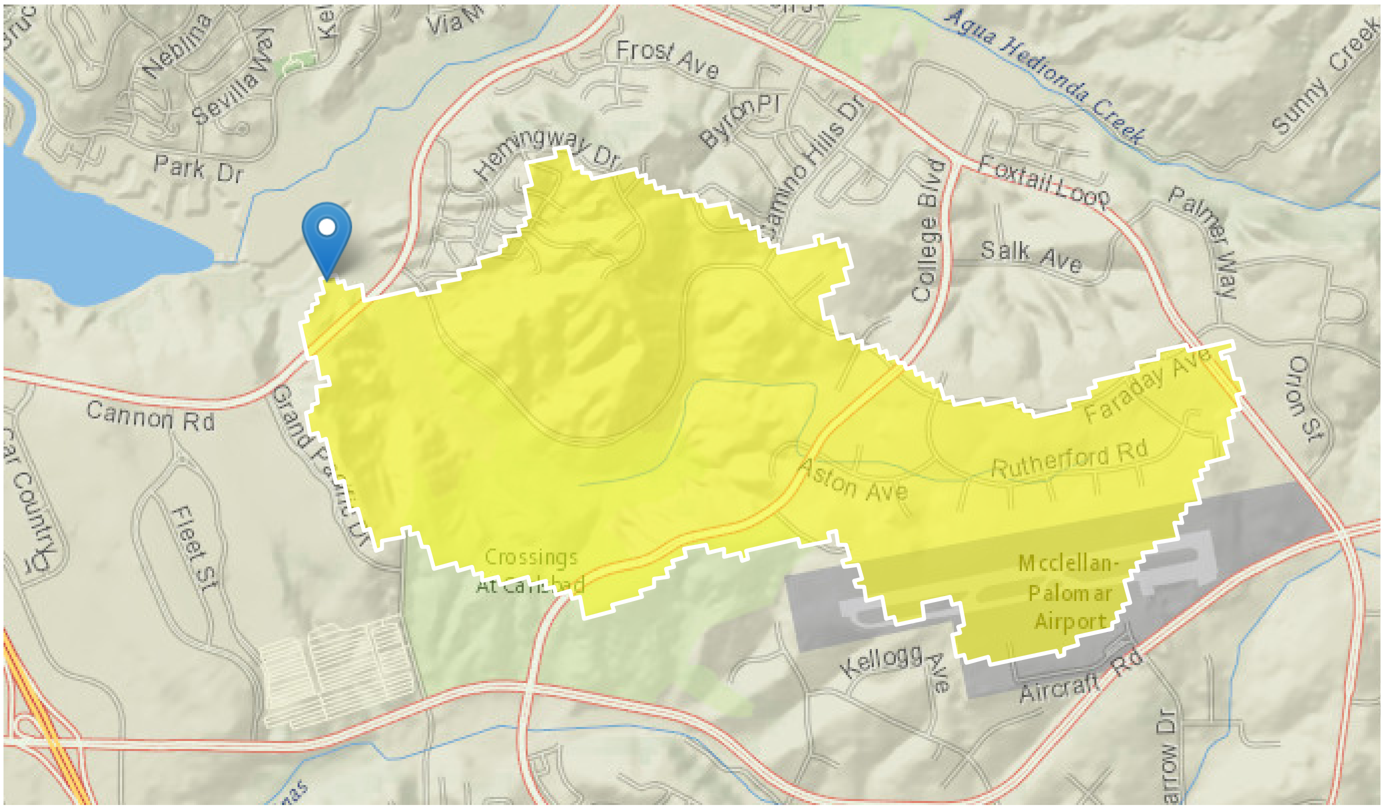
Figure H.7-2: Adjustment factor to account for imperviousness while estimating Q_{10}

Figure 2b-E

Figure 2b-F

StreamStats Report

Region ID: CA
Workspace ID: CA20220208215132774000
Clicked Point (Latitude, Longitude): 33.13863, -117.31042
Time: 2022-02-08 13:52:07 -0800



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	1.6	square miles

USGS Data Disclaimer: Unless otherwise stated, all data, metadata and related materials are considered to satisfy the quality standards relative to the purpose for which the data were collected. Although these data and associated metadata have been reviewed for accuracy and completeness and approved for release by the U.S. Geological Survey (USGS), no warranty expressed or implied is made regarding the display or utility of the data for other purposes, nor on all computer systems, nor shall the act of distribution constitute any such warranty.

Application Version: 4.6.2
StreamStats Services Version: 1.2.22
NSS Services Version: 2.1.2

OCEANSIDE MARINA, CALIFORNIA (046377)

Period of Record Monthly Climate Summary

Period of Record : 10/01/1909 to 06/09/2016

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	63.4	62.9	63.4	64.7	66.2	68.3	71.9	73.6	73.1	71.0	67.9	64.5	67.6
Average Min. Temperature (F)	44.2	45.4	47.5	50.5	54.7	58.3	62.2	63.0	60.8	55.6	48.6	44.4	52.9
Average Total Precipitation (in.)	2.16	2.11	1.64	0.91	0.23	0.08	0.03	0.09	0.22	0.45	1.04	1.57	10.54
Average Total SnowFall (in.)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average Snow Depth (in.)	0	0	0	0	0	0	0	0	0	0	0	0	0

Percent of possible observations for period of record.
Max. Temp.: 96.4% Min. Temp.: 96.2% Precipitation: 97.1% Snowfall: 97.3% Snow Depth: 97.3%
Check Station Metadata or Metadata graphics for more detail about data completeness.

Western Regional Climate Center, wrcc@dri.edu

Figure 2b-G

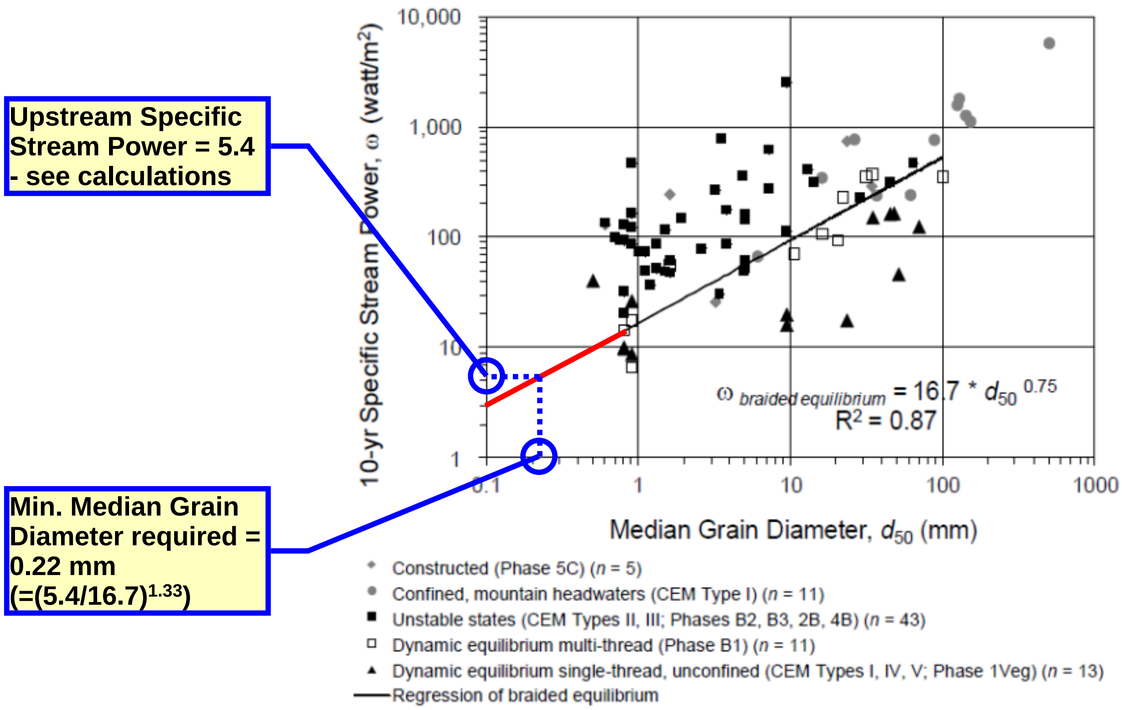


Figure H.7-1: Threshold of stream instability based on specific stream power and channel sediment diameter

Figure 2b-H

From Channel Upstream Begin Point - Looking Downstream at Natural Channel Below Project

Figure 2b-I


Channel Bottom Detail – typical

From Channel Downstream Outlet to Hedinoda Lagoon - Looking Upstream at Natural Channel Below Project

Table 5-13 Maximum Permissible Velocities for Lined and Unlined Channels

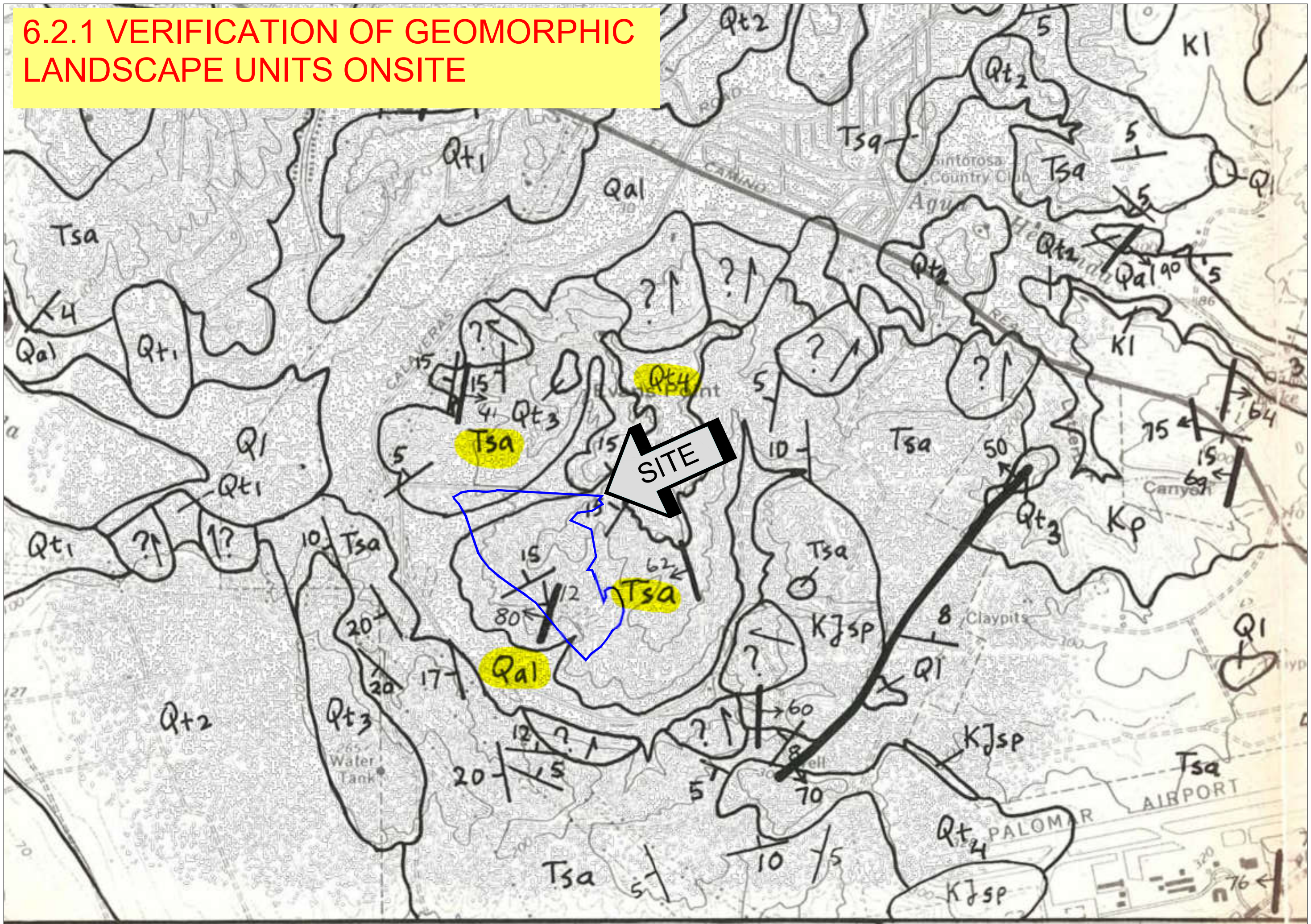
Material or Lining	Maximum Permissible Average Velocity* (ft/sec)
Natural and Improved Unlined Channels	
Fine Sand, Colloidal	1.50
Sandy Loam, Noncolloidal	1.75
Silt Loam, Noncolloidal	2.00
Alluvial Silts, Noncolloidal	2.00
Ordinary Firm Loam	2.50
Volcanic Ash	2.50
Stiff Clay, Very Colloidal	3.75
Alluvial Silts, Colloidal	3.75
Shales And Hardpans	6.00
Fine Gravel	2.50
Graded Loam To Cobbles When Noncolloidal	3.75
Graded Silts To Cobbles When Colloidal	4.00
Coarse Gravel, Noncolloidal	4.00
Cobbles And Shingles	5.00
Sandy Silt	2.00
Silty Clay	2.50
Clay	6.00
Poor Sedimentary Rock	10.0
Fully-Lined Channels	
Unreinforced Vegetation	5.0
Reinforced Turf	10.0
Loose Riprap	per Table 5-2
Grouted Riprap	25.0
Gabions	15.0
Soil Cement	15.0
Concrete	35.0

** Maximum permissible velocity listed here is basic guideline; higher design velocities may be used, provided appropriate technical documentation from manufacturer.*

Figure 2b-J

Verification of GLUs

6.2.1 VERIFICATION OF GEOMORPHIC LANDSCAPE UNITS ONSITE



MAP UNITS

Qal — Alluvium and colluvium. Unconsolidated silt, clay, sand and gravel.

Qb — Beach deposits: unconsolidated sand.

Ql — Lake, reservoir and pond deposits; partly submerged, unconsolidated clay, silt, sand and gravel.

Landslide deposits (includes headscarp area). See further California Division of Mines and Geology Open-File Report 95-04.

Qt1-4 — Terrace deposits; reddish brown, poorly bedded, poorly- to moderately-indurated sandstone, siltstone and conglomerate. Subscripts indicate relative level with 1 the lowest elevation (youngest age). The three lower levels have been correlated with the Bay Point Formation and the highest level with the Linda Vista Formation; see Kennedy (1975), Weber (1982), and Wilson (1972).

Tst — Stadium Conglomerate (Poway Group); poorly-bedded, poorly-to moderately-indurated, cobble conglomerate with coarse-grained sandstone matrix.

Tsa/Tt — Santiago Formation; light-colored, poorly-bedded, poorly-indurated, fine- to medium-grained sandstone interbedded with landslide-prone siltstone and claystone. Local coarse-grained sandstone and conglomerate. Renamed from Scripps Formation in the Encinitas (Tan, 1986) and Rancho Santa Fe (Tan, 1987) quadrangles. It interfingers with Torrey Sandstone.

Torrey Sandstone (La Jolla Group); light-colored, massive and thick-bedded, well-indurated, medium-to coarse-grained arkosic sandstone. Resistant to landsliding. It interfingers with Santiago Formation.

MAP SYMBOLS

Contact (boundary) between map units. Most boundaries are not exposed and are inferred.

Strike, and dip of inclined beds. Most bedding attitudes are estimated.

Horizontal beds.

Fault; dotted where concealed. Arrow and number indicate direction and amount of dip of exposed fault plane. U indicates upthrown side; D indicates downthrown side.

Strike, direction, and amount of dip of minor fault (shear joint) plane. Most fault displacements are less than 5 feet.

Landslide; arrows indicate general direction of movement. Both the headscarp area and debris deposit are included within the map symbol. Landslides are depicted prior to urban development. Only landslides larger than 300 feet across are shown on the map. For further information see California Division of Mines and Geology Open-File Report 95-04.

Questionable landslide.

Site boundary

SOURCE: "GEOLOGIC MAP OF THE OCEANSIDE, SAN LUIS REY, AND SAN MARCOS 7.5' QUADRANGLES, SAN DIEGO COUNTIY, CALIFORNIA" TAN AND KENNEDY, 1996

GEOLOGIC MAP

VETERANS MEMORIAL PARK

CARLSBAD, CALIFORNIA

SCALE: 1" = 2000'

DRAWN: DRK
CHKD: GKM

SCG PROJECT 19G109-2

PLATE 3

SOUTHERN CALIFORNIA GEOTECHNICAL

Map Unit	Map Name	Anticipated Grain size of Weathered Material	Bedrock or Sedimentary	Impermeable/ Permeable	Geology Grouping
Qvop10	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvop10a	San Diego 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvop11	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvop11a	San Diego 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvop12	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvop13	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvop2	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvop3	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvop4	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvop5	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvop6	San Diego 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvop7	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvop8	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvop9	San Diego 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Tsa	Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qof	Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qof1	Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qof2	Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Q	Jennings; CA	Coarse	Sedimentary	Permeable	CSP
Qa	Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qd	Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qf	Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qmb	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qop	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP

Table H.1-2: Land Cover Grouping for SanGIS Ecology-Vegetation Data Set

Id	SanGIS Legend	SanGIS Grouping	Land Cover Grouping
1	42000 Valley and Foothill Grassland	Grasslands, Vernal Pools, Meadows, and Other Herb Communities	Agricultural/Grass
2	42100 Native Grassland		Agricultural/Grass
3	42110 Valley Needlegrass Grassland		Agricultural/Grass
4	42120 Valley Sacaton Grassland		Agricultural/Grass
5	42200 Non-Native Grassland		Agricultural/Grass
6	42300 Wildflower Field	Grasslands, Vernal Pools, Meadows, and Other Herb Communities	Agriculture/Grass
7	42400 Foothill/Mountain Perennial Grassland		Agriculture/Grass
8	42470 Transmontane Dropseed Grassland		Agriculture/Grass
9	45000 Meadow and Seep		Agriculture/Grass
10	45100 Montane Meadow		Agriculture/Grass
11	45110 Wet Montane Meadow		Agriculture/Grass
12	45120 Dry Montane Meadows		Agriculture/Grass
13	45300 Alkali Meadows and Seeps		Agriculture/Grass
14	45320 Alkali Seep		Agriculture/Grass
15	45400 Freshwater Seep		Agriculture/Grass
16	46000 Alkali Playa Community		Agriculture/Grass
17	46100 Badlands/Mudhill Forbs		Agriculture/Grass
18	Non-Native Grassland		Agriculture/Grass
19	18000 General Agriculture		Agriculture/Grass
20	18100 Orchards and Vineyards	Non-Native Vegetation, Developed Areas, or Unvegetated Habitat	Agriculture/Grass
21	18200 Intensive Agriculture		Agriculture/Grass
22	18200 Intensive Agriculture - Dairies, Nurseries, Chicken Ranches		Agriculture/Grass
23	18300 Extensive Agriculture - Field/Pasture, Row Crops		Agriculture/Grass
24	18310 Field/Pasture		Agriculture/Grass
25	18310 Pasture		Agriculture/Grass
26	18320 Row Crops		Agriculture/Grass
27	12000 Urban/Developed		Developed
28	12000 Urban/Develpoed		Developed
29	81100 Mixed Evergreen Forest	Forest	Forest
30	81300 Oak Forest		Forest
31	81310 Coast Live Oak Forest		Forest
32	81320 Canyon Live Oak Forest		Forest
33	81340 Black Oak Forest		Forest

Id	SanGIS Legend	SanGIS Grouping	Land Cover Grouping
87	13110 Marine	Non-Native Vegetation, Developed Areas, or Unvegetated Habitat	Other
88	13111 Subtidal		Other
89	13112 Intertidal		Other
90	13121 Deep Bay		Other
91	13122 Intermediate Bay		Other
92	13123 Shallow Bay		Other
93	13130 Estuarine		Other
94	13131 Subtidal		Other
95	13133 Brackishwater		Other
96	13140 Freshwater	Non-Native Vegetation, Developed Areas, or Unvegetated Habitat	Other
97	13200 Non-Vegetated Channel, Floodway, Lakeshore Fringe		Other
98	13300 Saltpan/Mudflats		Other
99	13400 Beach		Other
100	21230 Southern Foredunes	Dune Community	Scrub/Shrub
101	22100 Active Desert Dunes		Scrub/Shrub
102	22300 Stabilized and Partially-Stabilized Desert Sand Field		Scrub/Shrub
103	24000 Stabilized Alkaline Dunes		Scrub/Shrub
104	29000 ACACIA SCRUB		Scrub/Shrub
105	63000 Riparian Scrubs	Riparian and Bottomland Habitat	Scrub/Shrub
106	63300 Southern Riparian Scrub		Scrub/Shrub
107	63310 Mule Fat Scrub		Scrub/Shrub
108	63310 Mulefat Scrub		Scrub/Shrub
109	63320 Southern Willow Scrub		Scrub/Shrub
110	63321 Arundo donnax Dominant/Southern Willow Scrub		Scrub/Shrub
111	63330 Southern Riparian Scrub		Scrub/Shrub
112	63400 Great Valley Scrub		Scrub/Shrub
113	63410 Great Valley Willow Scrub		Scrub/Shrub
114	63800 Colorado Riparian Scrub		Scrub/Shrub
115	63810 Tamarisk Scrub		Scrub/Shrub
116	63820 Arrowweed Scrub		Scrub/Shrub
117	31200 Southern Coastal Bluff Scrub	Scrub and Chaparral	Scrub/Shrub
118	32000 Coastal Scrub		Scrub/Shrub
119	32400 Maritime Succulent Scrub		Scrub/Shrub
120	32500 Diegan Coastal Sage Scrub		Scrub/Shrub

Id	SanGIS Legend	SanGIS Grouping	Land Cover Grouping
121	32510 Coastal form		Scrub/Shrub
122	32520 Inland form (> 1,000 ft. elevation)		Scrub/Shrub
123	32700 Riversidian Sage Scrub		Scrub/Shrub
124	32710 Riversidian Upland Sage Scrub		Scrub/Shrub
125	32720 Alluvial Fan Scrub		Scrub/Shrub
126	33000 Sonoran Desert Scrub		Scrub/Shrub
127	33100 Sonoran Creosote Bush Scrub		Scrub/Shrub
128	33200 Sonoran Desert Mixed Scrub		Scrub/Shrub
129	33210 Sonoran Mixed Woody Scrub		Scrub/Shrub
130	33220 Sonoran Mixed Woody and Succulent Scrub	Scrub and Chaparral	Scrub/Shrub
131	33230 Sonoran Wash Scrub		Scrub/Shrub
132	33300 Colorado Desert Wash Scrub		Scrub/Shrub
133	33600 Encelia Scrub		Scrub/Shrub
134	34000 Mojavean Desert Scrub		Scrub/Shrub
135	34300 Blackbush Scrub		Scrub/Shrub
136	35000 Great Basin Scrub		Scrub/Shrub
137	35200 Sagebrush Scrub		Scrub/Shrub
138	35210 Big Sagebrush Scrub		Scrub/Shrub
139	35210 Sagebrush Scrub		Scrub/Shrub
140	36110 Desert Saltbush Scrub		Scrub/Shrub
141	36120 Desert Sink Scrub		Scrub/Shrub
142	37000 Chaparral		Scrub/Shrub
143	37120 Southern Mixed Chaparral		Scrub/Shrub
144	37120 Southern Mixed Chapparal		Scrub/Shrub
145	37121 Granitic Southern Mixed Chaparral		Scrub/Shrub
146	37121 Southern Mixed Chaparral		Scrub/Shrub
147	37122 Mafic Southern Mixed Chaparral		Scrub/Shrub
148	37130 Northern Mixed Chaparral		Scrub/Shrub
149	37131 Granitic Northern Mixed Chaparral		Scrub/Shrub
150	37132 Mafic Northern Mixed Chaparral		Scrub/Shrub
151	37200 Chamise Chaparral		Scrub/Shrub
152	37210 Granitic Chamise Chaparral		Scrub/Shrub
153	37220 Mafic Chamise Chaparral		Scrub/Shrub
154	37300 Red Shank Chaparral		Scrub/Shrub

Id	SanGIS Legend	SanGIS Grouping	Land Cover Grouping
155	37400 Semi-Desert Chaparral		Scrub/Shrub
156	37500 Montane Chaparral		Scrub/Shrub
157	37510 Mixed Montane Chaparral		Scrub/Shrub
158	37520 Montane Manzanita Chaparral		Scrub/Shrub
159	37530 Montane Ceanothus Chaparral		Scrub/Shrub
160	37540 Montane Scrub Oak Chaparral		Scrub/Shrub
161	37800 Upper Sonoran Ceanothus Chaparral		Scrub/Shrub
162	37830 Ceanothus crassifolius Chaparral		Scrub/Shrub
163	37900 Scrub Oak Chaparral		Scrub/Shrub
164	37A00 Interior Live Oak Chaparral		Scrub/Shrub
165	37C30 Southern Maritime Chaparral		Scrub/Shrub
166	37G00 Coastal Sage-Chaparral Scrub		Scrub/Shrub
167	37K00 Flat-topped Buckwheat		Scrub/Shrub
168	39000 Upper Sonoran Subshrub Scrub	Scrub and Chaparral	Scrub/Shrub
169	Diegan Coastal Sage Scrub		Scrub/Shrub
170	Granitic Northern Mixed Chaparral		Scrub/Shrub
171	Southern Mixed Chaparral		Scrub/Shrub
172	11000 Non-Native Vegetation		Unknown
173	11000 Non-Native VegetionVegetation		Unknown
174	11200 Disturbed Wetland	Non-Native Vegetation, Developed Areas, or Unvegetated Habitat	Unknown
175	11300 Disturbed Habitat		Unknown
176	13000 Unvegetated Habitat		Unknown
177	Disturbed Habitat		Unknown

Table H.1-3: Potential Critical Coarse Sediment Yield Areas

GLU	Geology	Land Cover	Slope (%)
CB-Agricultural/Grass-3	Coarse Bedrock	Agricultural/Grass	20% - 40%
CB-Agricultural/Grass-4	Coarse Bedrock	Agricultural/Grass	>40%
CB-Forest-2	Coarse Bedrock	Forest	10 – 20%
CB-Forest-3	Coarse Bedrock	Forest	20% - 40%
CB-Forest-4	Coarse Bedrock	Forest	>40%
CB-Scrub/Shrub-4	Coarse Bedrock	Scrub/Shrub	>40%
CB-Unknown-4	Coarse Bedrock	Unknown	>40%
CSI-Agricultural/Grass-2	Coarse Sedimentary Impermeable	Agricultural/Grass	10 – 20%
CSI-Agricultural/Grass-3	Coarse Sedimentary Impermeable	Agricultural/Grass	20% - 40%
CSI-Agricultural/Grass-4	Coarse Sedimentary Impermeable	Agricultural/Grass	>40%
CSP-Agricultural/Grass-4	Coarse Sedimentary Permeable	Agricultural/Grass	>40%
CSP-Forest-3	Coarse Sedimentary Permeable	Forest	20% - 40%
CSP-Forest-4	Coarse Sedimentary Permeable	Forest	>40%
CSP-Scrub/Shrub-4	Coarse Sedimentary Permeable	Scrub/Shrub	>40%

GLU'S CONFIRMED
ON-SITE

ATTACHMENT 2d
Flow Control Facility Design and Structural BMP Drawdown Calculations

SDHM 3.1

PROJECT REPORT

General Model Information

Project Name:	Basin A
Site Name:	VETERANS
Site Address:	
City:	CARLSBAD
Report Date:	1/16/2022
Gage:	OCEANSID
Data Start:	10/01/1959
Data End:	09/30/2004
Timestep:	Hourly
Precip Scale:	1.000
Version Date:	2021/06/28

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 A

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
D,NatVeg,Steep	1.3
Pervious Total	1.3
Impervious Land Use	acre
Impervious Total	0
Basin Total	1.3

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Basin A

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
D,Urban,Steep	1.01
D,Urban,Flat	0.14
Pervious Total	1.15
Impervious Land Use	acre
IMPERVIOUS-FLAT	0.15
Impervious Total	0.15
Basin Total	1.3

Element Flows To:

Surface	Interflow	Groundwater
Surface iltration 1	Surface iltration 1	

Routing Elements
Predeveloped Routing

Mitigated Routing

Biofiltration 1

Bottom Length: 14.20 ft.
Bottom Width: 14.20 ft.
Material thickness of first layer: 0.25
Material type for first layer: Mulch
Material thickness of second layer: 2
Material type for second layer: ESM
Material thickness of third layer: 1.5
Material type for third layer: GRAVEL
Underdrain used
Underdrain Diameter (feet): 0.5
Orifice Diameter (in.): 1
Offset (in.): 3
Flow Through Underdrain (ac-ft.): 14.418
Total Outflow (ac-ft.): 18.47
Percent Through Underdrain: 78.06
Discharge Structure
Riser Height: 1 ft.
Riser Diameter: 36 in.
Notch Type: Rectangular
Notch Width: 0.670 ft.
Notch Height: 0.330 ft.
Element Flows To:
Outlet 1 Outlet 2

Biofilter Hydraulic Table

Stage(feet)	**Area(ac.)**	**Volume(ac-ft.)**	**Discharge(cfs)**	**Infilt(cfs)**
0.0000	0.0309	0.0000	0.0000	0.0000
0.0577	0.0309	0.0000	0.0000	0.0000
0.1154	0.0303	0.0001	0.0000	0.0000
0.1731	0.0298	0.0001	0.0000	0.0000
0.2308	0.0292	0.0002	0.0000	0.0000
0.2885	0.0286	0.0002	0.0000	0.0000
0.3462	0.0281	0.0003	0.0000	0.0000
0.4038	0.0275	0.0003	0.0000	0.0000
0.4615	0.0270	0.0004	0.0000	0.0000
0.5192	0.0264	0.0004	0.0000	0.0000
0.5769	0.0259	0.0005	0.0000	0.0000
0.6346	0.0254	0.0006	0.0000	0.0000
0.6923	0.0248	0.0006	0.0000	0.0000
0.7500	0.0243	0.0007	0.0000	0.0000
0.8077	0.0238	0.0008	0.0000	0.0000
0.8654	0.0233	0.0008	0.0000	0.0000
0.9231	0.0228	0.0009	0.0000	0.0000
0.9808	0.0223	0.0010	0.0000	0.0000
1.0385	0.0218	0.0011	0.0000	0.0000
1.0962	0.0213	0.0012	0.0000	0.0000
1.1538	0.0208	0.0013	0.0000	0.0000
1.2115	0.0204	0.0013	0.0000	0.0000
1.2692	0.0199	0.0014	0.0000	0.0000
1.3269	0.0194	0.0015	0.0000	0.0000
1.3846	0.0190	0.0016	0.0000	0.0000
1.4423	0.0185	0.0017	0.0044	0.0000

1.5000	0.0181	0.0018	0.0045	0.0000
1.5577	0.0176	0.0019	0.0046	0.0000
1.6154	0.0172	0.0021	0.0054	0.0000
1.6731	0.0167	0.0022	0.0061	0.0000
1.7308	0.0163	0.0023	0.0063	0.0000
1.7885	0.0159	0.0024	0.0064	0.0000
1.8462	0.0155	0.0025	0.0072	0.0000
1.9038	0.0151	0.0027	0.0076	0.0000
1.9615	0.0147	0.0028	0.0085	0.0000
2.0192	0.0143	0.0029	0.0089	0.0000
2.0769	0.0139	0.0031	0.0096	0.0000
2.1346	0.0135	0.0032	0.0100	0.0000
2.1923	0.0131	0.0034	0.0107	0.0000
2.2500	0.0127	0.0035	0.0110	0.0000
2.3077	0.0124	0.0037	0.0116	0.0000
2.3654	0.0120	0.0040	0.0120	0.0000
2.4231	0.0116	0.0042	0.0125	0.0000
2.4808	0.0113	0.0044	0.0128	0.0000
2.5385	0.0109	0.0046	0.0134	0.0000
2.5962	0.0106	0.0049	0.0136	0.0000
2.6538	0.0102	0.0051	0.0142	0.0000
2.7115	0.0099	0.0054	0.0144	0.0000
2.7692	0.0096	0.0056	0.0147	0.0000
2.8269	0.0093	0.0059	0.0148	0.0000
2.8846	0.0089	0.0062	0.0154	0.0000
2.9423	0.0086	0.0064	0.0164	0.0000
3.0000	0.0083	0.0067	0.0175	0.0000
3.0577	0.0080	0.0070	0.0186	0.0000
3.1154	0.0077	0.0073	0.0196	0.0000
3.1731	0.0074	0.0076	0.0207	0.0000
3.2308	0.0072	0.0079	0.0217	0.0000
3.2885	0.0069	0.0082	0.0227	0.0000
3.3462	0.0066	0.0086	0.0236	0.0000
3.4038	0.0063	0.0089	0.0245	0.0000
3.4615	0.0061	0.0092	0.0253	0.0000
3.5192	0.0058	0.0095	0.0262	0.0000
3.5769	0.0056	0.0099	0.0270	0.0000
3.6346	0.0053	0.0102	0.0278	0.0000
3.6923	0.0051	0.0106	0.0286	0.0000
3.7500	0.0049	0.0110	0.0294	0.0000
3.7500	0.0046	0.0110	0.0379	0.0000

Biofilter Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
3.7500	0.0309	0.0110	0.0000	0.0233	0.0000
3.8077	0.0315	0.0128	0.0000	0.0233	0.0000
3.8654	0.0321	0.0146	0.0000	0.0276	0.0000
3.9231	0.0327	0.0165	0.0000	0.0283	0.0000
3.9808	0.0333	0.0184	0.0000	0.0289	0.0000
4.0385	0.0339	0.0203	0.0000	0.0296	0.0000
4.0962	0.0345	0.0223	0.0000	0.0303	0.0000
4.1538	0.0351	0.0243	0.0000	0.0310	0.0000
4.2115	0.0358	0.0264	0.0000	0.0316	0.0000
4.2692	0.0364	0.0284	0.0000	0.0323	0.0000
4.3269	0.0370	0.0305	0.0000	0.0330	0.0000
4.3846	0.0377	0.0327	0.0000	0.0337	0.0000
4.4423	0.0383	0.0349	0.0074	0.0343	0.0000
4.5000	0.0390	0.0371	0.0505	0.0350	0.0000

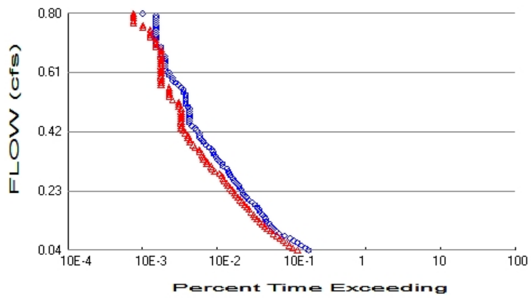
4.5577	0.0396	0.0394	0.1140	0.0357	0.0000
4.6154	0.0403	0.0417	0.1927	0.0364	0.0000
4.6731	0.0410	0.0440	0.2841	0.0370	0.0000
4.7308	0.0416	0.0464	0.3865	0.0377	0.0000
4.7885	0.0423	0.0488	0.6631	0.0379	0.0000
4.8462	0.0430	0.0513	1.3716	0.0379	0.0000
4.9038	0.0437	0.0538	2.3413	0.0379	0.0000
4.9615	0.0444	0.0563	3.5121	0.0379	0.0000
5.0192	0.0451	0.0589	4.8496	0.0379	0.0000
5.0769	0.0458	0.0615	6.3280	0.0379	0.0000
5.1346	0.0465	0.0642	7.9247	0.0379	0.0000
5.1923	0.0472	0.0669	9.6186	0.0379	0.0000
5.2500	0.0479	0.0697	11.388	0.0379	0.0000

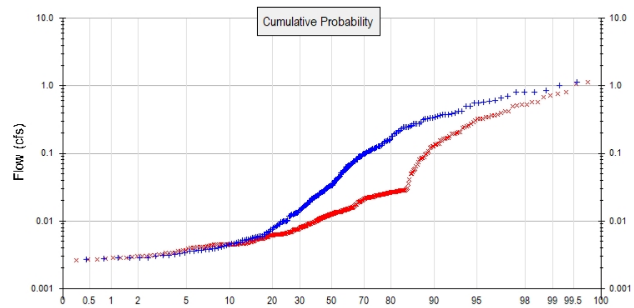
Surface iltration 1

Element Flows To:

Outlet 1	Outlet 2
	Biofiltration 1

Analysis Results
POC 1





+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 1.3
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 1.15
Total Impervious Area: 0.15

Flow Frequency Method: Cunnane

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.365806
5 year	0.608094
10 year	0.800015
25 year	1.017076

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.327002
5 year	0.521593
10 year	0.734824
25 year	1.075733

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0366	673	477	70	Pass
0.0443	607	410	67	Pass
0.0520	534	369	69	Pass
0.0597	477	336	70	Pass
0.0674	425	307	72	Pass
0.0751	376	277	73	Pass
0.0828	319	254	79	Pass
0.0906	266	224	84	Pass
0.0983	243	205	84	Pass
0.1060	228	187	82	Pass
0.1137	210	173	82	Pass
0.1214	200	163	81	Pass
0.1291	183	148	80	Pass
0.1368	177	135	76	Pass
0.1445	172	126	73	Pass
0.1523	158	122	77	Pass
0.1600	149	113	75	Pass
0.1677	143	106	74	Pass
0.1754	137	99	72	Pass
0.1831	127	92	72	Pass
0.1908	118	87	73	Pass
0.1985	106	81	76	Pass
0.2062	98	75	76	Pass
0.2139	91	70	76	Pass
0.2217	87	68	78	Pass
0.2294	84	63	75	Pass
0.2371	81	60	74	Pass
0.2448	78	56	71	Pass
0.2525	72	53	73	Pass
0.2602	68	49	72	Pass
0.2679	65	48	73	Pass
0.2756	60	46	76	Pass
0.2833	58	43	74	Pass
0.2911	56	37	66	Pass
0.2988	54	34	62	Pass
0.3065	48	33	68	Pass
0.3142	47	29	61	Pass
0.3219	43	29	67	Pass
0.3296	40	26	65	Pass
0.3373	38	26	68	Pass
0.3450	36	25	69	Pass
0.3528	35	23	65	Pass
0.3605	34	23	67	Pass
0.3682	31	20	64	Pass
0.3759	28	19	67	Pass
0.3836	26	17	65	Pass
0.3913	25	17	68	Pass
0.3990	23	16	69	Pass
0.4067	23	16	69	Pass
0.4144	23	15	65	Pass
0.4222	21	14	66	Pass
0.4299	20	13	65	Pass
0.4376	18	13	72	Pass

0.4453	17	13	76	Pass
0.4530	17	13	76	Pass
0.4607	17	13	76	Pass
0.4684	17	13	76	Pass
0.4761	17	13	76	Pass
0.4838	17	13	76	Pass
0.4916	17	13	76	Pass
0.4993	16	12	75	Pass
0.5070	15	12	80	Pass
0.5147	15	12	80	Pass
0.5224	15	10	66	Pass
0.5301	15	9	60	Pass
0.5378	15	9	60	Pass
0.5455	14	9	64	Pass
0.5532	14	9	64	Pass
0.5610	13	9	69	Pass
0.5687	12	7	58	Pass
0.5764	11	7	63	Pass
0.5841	10	7	70	Pass
0.5918	10	7	70	Pass
0.5995	9	7	77	Pass
0.6072	9	7	77	Pass
0.6149	8	7	87	Pass
0.6227	8	7	87	Pass
0.6304	8	7	87	Pass
0.6381	8	7	87	Pass
0.6458	8	7	87	Pass
0.6535	8	7	87	Pass
0.6612	8	7	87	Pass
0.6689	7	7	100	Pass
0.6766	7	7	100	Pass
0.6843	7	7	100	Pass
0.6921	7	6	85	Pass
0.6998	6	6	100	Pass
0.7075	6	6	100	Pass
0.7152	6	6	100	Pass
0.7229	6	5	83	Pass
0.7306	6	5	83	Pass
0.7383	6	5	83	Pass
0.7460	6	5	83	Pass
0.7537	6	4	66	Pass
0.7615	6	4	66	Pass
0.7692	6	3	50	Pass
0.7769	6	3	50	Pass
0.7846	6	3	50	Pass
0.7923	6	3	50	Pass
0.8000	4	3	75	Pass

Water Quality

Model Default Modifications

Total of 0 changes have been made.

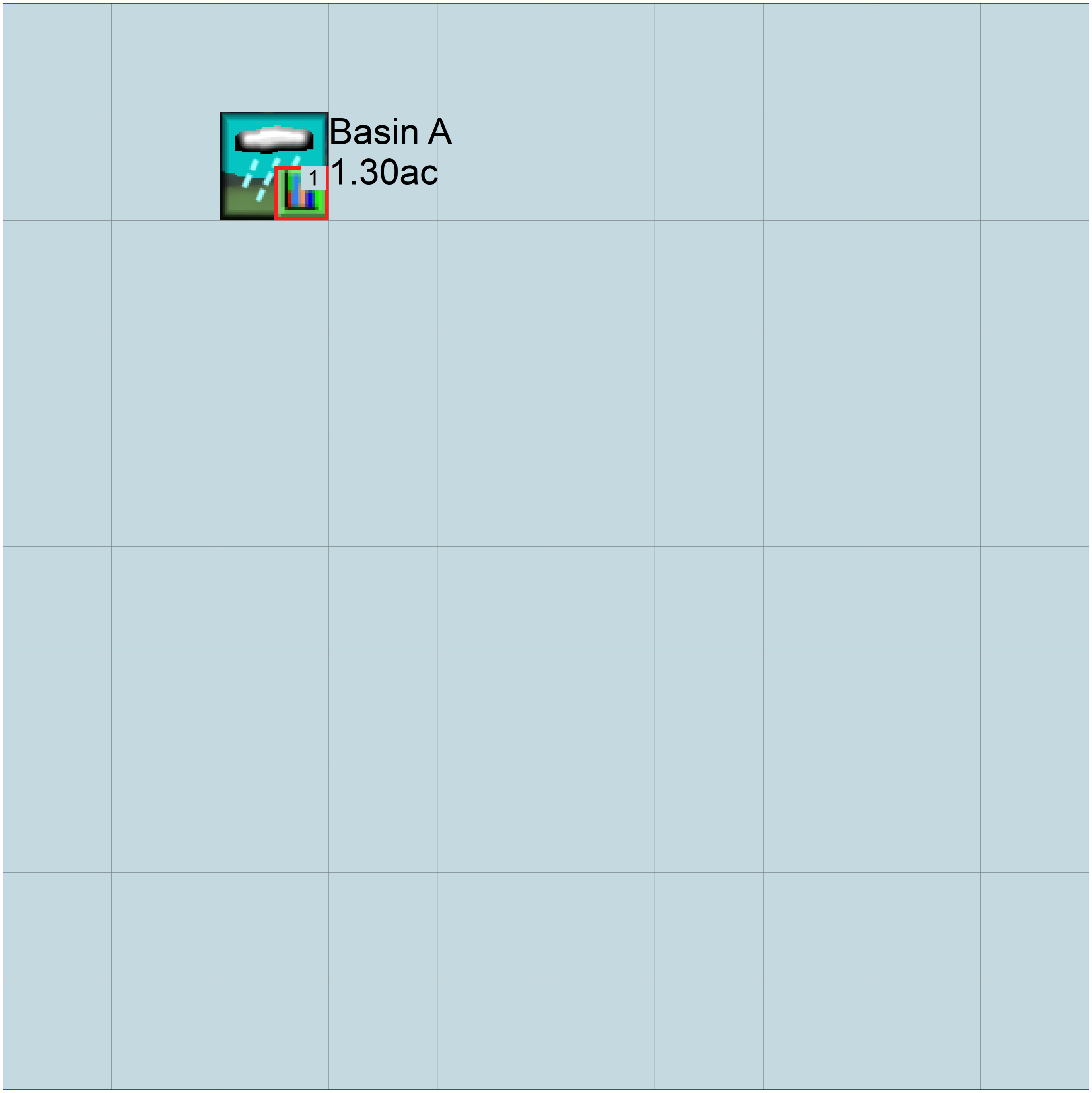
PERLND Changes

No PERLND changes have been made.

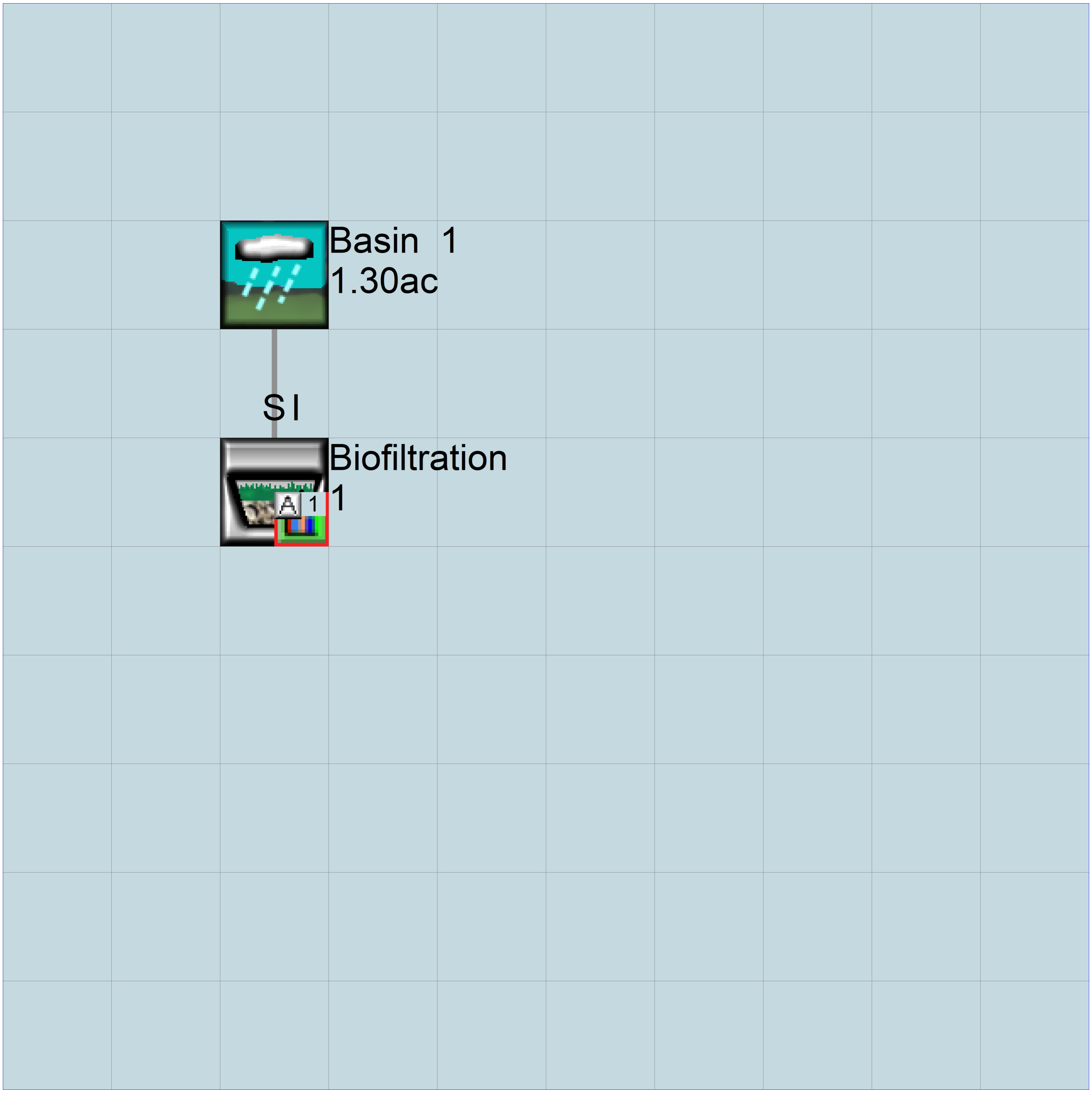
IMPLND Changes

No IMPLND changes have been made.

Appendix
Predeveloped Schematic



Mitigated Schematic



Predeveloped UCI File

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RUN

GLOBAL
  WWHM4 model simulation
  START       1959 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   Basin A-ALT.wdm
MESSU      25   PreBasin A-ALT.MES
           27   PreBasin A-ALT.L61
           28   PreBasin A-ALT.L62
           30   POCBasin A-ALT1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:60
      PERLND      30
      COPY       501
      DISPLY       1
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END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Basin A                    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           ***
   30      D,NatVeg,Steep         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 ***
   30         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  *********
   30         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 ***
   30         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
   30             0       2.7      0.02        75      0.15       2.5     0.915
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   30             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 ***
   30             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  ***
   30       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  ***
   30       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
   30             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            ***
  END GEN-INFO
  *** Section IWATER***

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

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
  END PRINT-INFO

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

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

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

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

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin A***
PERLND  30                        1.3     COPY   501     12
PERLND  30                        1.3     COPY   501     13

******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


END MASS-LINK

END RUN
```

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1959 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   Basin A-ALT.wdm
MESSU      25   MitBasin A-ALT.MES
           27   MitBasin A-ALT.L61
           28   MitBasin A-ALT.L62
           30   POCBasin A-ALT1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:60
      PERLND      48
      PERLND      46
      IMPLND       1
      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 iltration  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           ***
   48      D,Urban,Steep          1    1    1    1   27    0
   46      D,Urban,Flat           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 ***
   48         0    0    1    0    0    0    0    0    0    0    0    0
   46         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  *********
   48         0    0    4    0    0    0    0    0    0    0    0    0    1    9
   46         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 ***
   48         0    1    1    1    0    0    0    0    1    1    0
   46         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
   48              0       3.2      0.02        50      0.15       2.5     0.915
   46              0       3.8      0.03        50      0.05       2.5     0.915
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   48              0         0         2         2         0      0.05      0.05
   46              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 ***
   48              0       0.6      0.03         1       0.3         0
   46              0       0.6      0.03         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  ***
   48       0.6  0.6  0.6  0.6  0.7  0.7  0.7  0.7  0.7  0.6  0.6  0.6
   46       0.6  0.6  0.6  0.6  0.7  0.7  0.7  0.7  0.7  0.6  0.6  0.6
  END MON-LZETPARM
  MON-INTERCEP
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   48       0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1
   46       0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  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
   48              0         0      0.15         0         1      0.05         0
   46              0         0      0.15         0         1      0.05         0
  END PWAT-STATE1

END PERLND

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

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

```
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
    1         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     ***
    1         0    0    0    0    1
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    1            100      0.05     0.011       0.1
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    1              0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    1              0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin  1***
PERLND  48                        1.01     RCHRES   1      2
PERLND  48                        1.01     RCHRES   1      3
PERLND  46                        0.14     RCHRES   1      2
PERLND  46                        0.14     RCHRES   1      3
IMPLND   1                        0.15     RCHRES   1      5

******Routing******
PERLND  48                        1.01     COPY     1     12
PERLND  46                        0.14     COPY     1     12
IMPLND   1                        0.15     COPY     1     15
PERLND  48                        1.01     COPY     1     13
PERLND  46                        0.14     COPY     1     13
RCHRES   1                           1     RCHRES   2      8
RCHRES   2                           1     COPY   501     16
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 iltratio-006    2    1    1    1   28    0    1
    2     Biofiltration  1-005    1    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  0  0  0       0  0  0  0  0       2  2  2  2  2
    2        0  1  0  0    4  0  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       0.0       0.0       0.0
    2             2      0.01       0.0       0.0       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  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    2           0         4.0  0.0  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
   67    4
     Depth      Area    Volume  Outflow1 Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.030920  0.000000  0.000000
  0.057692  0.030920  0.000041  0.000000
  0.115385  0.030340  0.000084  0.000000
  0.173077  0.029765  0.000129  0.000000
  0.230769  0.029195  0.000176  0.000000
  0.288462  0.028631  0.000226  0.000000
  0.346154  0.028073  0.000277  0.000000
  0.403846  0.027520  0.000331  0.000000
  0.461538  0.026972  0.000387  0.000000
  0.519231  0.026430  0.000445  0.000000
  0.576923  0.025894  0.000506  0.000000
  0.634615  0.025363  0.000569  0.000000
  0.692308  0.024837  0.000635  0.000000
  0.750000  0.024317  0.000703  0.000000
  0.807692  0.023803  0.000774  0.000000
  0.865385  0.023294  0.000847  0.000000
  0.923077  0.022790  0.000923  0.000000
  0.980769  0.022292  0.001002  0.000000
```

1.038462	0.021800	0.001084	0.000000
1.096154	0.021313	0.001168	0.000000
1.153846	0.020831	0.001255	0.000000
1.211538	0.020355	0.001345	0.000000
1.269231	0.019885	0.001439	0.000000
1.326923	0.019420	0.001535	0.000000
1.384615	0.018960	0.001634	0.000000
1.442308	0.018506	0.001736	0.004434
1.500000	0.018058	0.001841	0.004531
1.557692	0.017615	0.001950	0.004579
1.615385	0.017177	0.002062	0.005403
1.673077	0.016745	0.002177	0.006116
1.730769	0.016319	0.002295	0.006336
1.788462	0.015898	0.002417	0.006446
1.846154	0.015482	0.002542	0.007240
1.903846	0.015072	0.002671	0.007637
1.961538	0.014668	0.002803	0.008457
2.019231	0.014269	0.002939	0.008867
2.076923	0.013875	0.003078	0.009620
2.134615	0.013487	0.003221	0.009996
2.192308	0.013105	0.003368	0.010679
2.250000	0.012728	0.003518	0.011020
2.307692	0.012356	0.003732	0.011646
2.365385	0.011990	0.003951	0.011958
2.423077	0.011630	0.004175	0.012538
2.480769	0.011275	0.004405	0.012828
2.538462	0.010925	0.004640	0.013370
2.596154	0.010581	0.004881	0.013641
2.653846	0.010243	0.005127	0.014152
2.711538	0.009910	0.005380	0.014407
2.769231	0.009583	0.005638	0.014656
2.826923	0.009261	0.005902	0.014780
2.884615	0.008944	0.006171	0.015420
2.942308	0.008633	0.006447	0.016382
3.000000	0.008328	0.006729	0.017460
3.057692	0.008028	0.007017	0.018561
3.115385	0.007733	0.007311	0.019642
3.173077	0.007444	0.007612	0.020687
3.230769	0.007161	0.007919	0.021692
3.288462	0.006883	0.008232	0.022658
3.346154	0.006611	0.008552	0.023586
3.403846	0.006344	0.008878	0.024481
3.461538	0.006082	0.009210	0.025345
3.519231	0.005826	0.009550	0.026181
3.576923	0.005576	0.009896	0.026993
3.634615	0.005331	0.010249	0.027784
3.692308	0.005091	0.010609	0.028557
3.750000	0.004857	0.010975	0.029441
3.750000	0.004629	0.014110	0.037924

END FTABLE 2
FTABLE 1
27 5

Depth (ft)	Area (acres)	Volume (acre-ft)	Outflow1 (cfs)	Outflow2 (cfs)	Velocity (ft/sec)	Travel Time*** (Minutes)***
0.000000	0.004629	0.000000	0.000000	0.000000		
0.057692	0.031506	0.001801	0.000000	0.023338		
0.115385	0.032098	0.003636	0.000000	0.027602		
0.173077	0.032695	0.005505	0.000000	0.028275		
0.230769	0.033297	0.007408	0.000000	0.028948		
0.288462	0.033906	0.009347	0.000000	0.029621		
0.346154	0.034519	0.011320	0.000000	0.030294		
0.403846	0.035138	0.013330	0.000000	0.030968		
0.461538	0.035763	0.015375	0.000000	0.031641		
0.519231	0.036393	0.017456	0.000000	0.032314		
0.576923	0.037028	0.019574	0.000000	0.032987		
0.634615	0.037669	0.021729	0.000000	0.033661		
0.692308	0.038316	0.023921	0.007434	0.034334		
0.750000	0.038968	0.026150	0.050484	0.035007		
0.807692	0.039625	0.028417	0.113994	0.035680		
0.865385	0.040288	0.030723	0.192688	0.036353		

```
  0.923077  0.040957  0.033066  0.284052  0.037027
  0.980769  0.041631  0.035449  0.386524  0.037700
  1.038462  0.042311  0.037870  0.663136  0.037924
  1.096154  0.042996  0.040331  1.371596  0.037924
  1.153846  0.043686  0.042831  2.341288  0.037924
  1.211538  0.044382  0.045372  3.512126  0.037924
  1.269231  0.045084  0.047952  4.849625  0.037924
  1.326923  0.045791  0.050574  6.327973  0.037924
  1.384615  0.046503  0.053236  7.924727  0.037924
  1.442308  0.047222  0.055940  9.618586  0.037924
  1.500000  0.047945  0.058685  11.38837  0.037924
  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     22 IRRG     ENGL    0.7       SAME PERLND  48     EXTNL  SURLI
WDM     22 IRRG     ENGL    0.7       SAME PERLND  46     EXTNL  SURLI
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   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        16
RCHRES     ROFLOW                                       COPY            INPUT  MEAN
  END MASS-LINK   16

  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

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SDHM 3.1

PROJECT REPORT

General Model Information

Project Name:	Basin B
Site Name:	VETERANS
Site Address:	
City:	CARLSBAD
Report Date:	1/16/2022
Gage:	OCEANSID
Data Start:	10/01/1959
Data End:	09/30/2004
Timestep:	Hourly
Precip Scale:	1.000
Version Date:	2021/06/28

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 B

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
D,NatVeg,Steep	0.46
Pervious Total	0.46
Impervious Land Use	acre
Impervious Total	0
Basin Total	0.46

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Basin B

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
D,Urban,Steep	0.38
Pervious Total	0.38
Impervious Land Use	acre
IMPERVIOUS-FLAT	0.08
Impervious Total	0.08
Basin Total	0.46

Element Flows To:

Surface	Interflow	Groundwater
Surface iltration 1	Surface iltration 1	

Routing Elements
Predeveloped Routing

Mitigated Routing

Biofiltration 1

Bottom Length:	7.70 ft.
Bottom Width:	7.70 ft.
Material thickness of first layer:	0.25
Material type for first layer:	Mulch
Material thickness of second layer:	2
Material type for second layer:	ESM
Material thickness of third layer:	1.5
Material type for third layer:	GRAVEL
Underdrain used	
Underdrain Diameter (feet):	0.5
Orifice Diameter (in.):	0.65
Offset (in.):	3
Flow Through Underdrain (ac-ft.):	5.992
Total Outflow (ac-ft.):	7.349
Percent Through Underdrain:	81.54

Discharge Structure

Riser Height:	1 ft.
Riser Diameter:	36 in.
Notch Type:	Rectangular
Notch Width:	0.670 ft.
Notch Height:	0.330 ft.

Element Flows To:

Outlet 1	Outlet 2

Biofilter Hydraulic Table

Stage(feet)	**Area(ac.)**	**Volume(ac-ft.)**	**Discharge(cfs)**	**Infilt(cfs)**
0.0000	0.0209	0.0000	0.0000	0.0000
0.0577	0.0209	0.0000	0.0000	0.0000
0.1154	0.0205	0.0001	0.0000	0.0000
0.1731	0.0200	0.0001	0.0000	0.0000
0.2308	0.0195	0.0001	0.0000	0.0000
0.2885	0.0191	0.0001	0.0000	0.0000
0.3462	0.0186	0.0002	0.0000	0.0000
0.4038	0.0182	0.0002	0.0000	0.0000
0.4615	0.0177	0.0003	0.0000	0.0000
0.5192	0.0173	0.0003	0.0000	0.0000
0.5769	0.0168	0.0004	0.0000	0.0000
0.6346	0.0164	0.0004	0.0000	0.0000
0.6923	0.0160	0.0005	0.0000	0.0000
0.7500	0.0156	0.0005	0.0000	0.0000
0.8077	0.0152	0.0006	0.0000	0.0000
0.8654	0.0148	0.0006	0.0000	0.0000
0.9231	0.0144	0.0007	0.0000	0.0000
0.9808	0.0140	0.0008	0.0000	0.0000
1.0385	0.0136	0.0009	0.0000	0.0000
1.0962	0.0132	0.0009	0.0000	0.0000
1.1538	0.0128	0.0010	0.0000	0.0000
1.2115	0.0124	0.0011	0.0000	0.0000
1.2692	0.0121	0.0012	0.0000	0.0000
1.3269	0.0117	0.0013	0.0000	0.0000
1.3846	0.0114	0.0014	0.0000	0.0000
1.4423	0.0110	0.0015	0.0013	0.0000

1.5000	0.0107	0.0016	0.0015	0.0000
1.5577	0.0103	0.0017	0.0015	0.0000
1.6154	0.0100	0.0018	0.0017	0.0000
1.6731	0.0097	0.0020	0.0019	0.0000
1.7308	0.0093	0.0021	0.0019	0.0000
1.7885	0.0090	0.0022	0.0019	0.0000
1.8462	0.0087	0.0024	0.0025	0.0000
1.9038	0.0084	0.0025	0.0026	0.0000
1.9615	0.0081	0.0026	0.0027	0.0000
2.0192	0.0078	0.0028	0.0032	0.0000
2.0769	0.0075	0.0030	0.0032	0.0000
2.1346	0.0072	0.0031	0.0033	0.0000
2.1923	0.0069	0.0033	0.0034	0.0000
2.2500	0.0067	0.0035	0.0036	0.0000
2.3077	0.0064	0.0037	0.0038	0.0000
2.3654	0.0061	0.0040	0.0041	0.0000
2.4231	0.0059	0.0042	0.0042	0.0000
2.4808	0.0056	0.0045	0.0045	0.0000
2.5385	0.0054	0.0048	0.0047	0.0000
2.5962	0.0051	0.0051	0.0049	0.0000
2.6538	0.0049	0.0054	0.0051	0.0000
2.7115	0.0047	0.0057	0.0052	0.0000
2.7692	0.0045	0.0060	0.0054	0.0000
2.8269	0.0042	0.0064	0.0058	0.0000
2.8846	0.0040	0.0067	0.0063	0.0000
2.9423	0.0038	0.0071	0.0068	0.0000
3.0000	0.0036	0.0074	0.0073	0.0000
3.0577	0.0034	0.0078	0.0078	0.0000
3.1154	0.0032	0.0082	0.0083	0.0000
3.1731	0.0030	0.0085	0.0087	0.0000
3.2308	0.0029	0.0089	0.0092	0.0000
3.2885	0.0027	0.0094	0.0096	0.0000
3.3462	0.0025	0.0098	0.0100	0.0000
3.4038	0.0024	0.0102	0.0103	0.0000
3.4615	0.0022	0.0106	0.0107	0.0000
3.5192	0.0020	0.0111	0.0112	0.0000
3.5769	0.0019	0.0116	0.0112	0.0000
3.6346	0.0018	0.0120	0.0112	0.0000
3.6923	0.0016	0.0125	0.0112	0.0000
3.7500	0.0015	0.0130	0.0112	0.0000
3.7500	0.0014	0.0130	0.0112	0.0000

Biofilter Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
3.7500	0.020938	0.013007	0.0000	0.0069	0.0000
3.8077	0.021420	0.014229	0.0000	0.0069	0.0000
3.8654	0.021909	0.015479	0.0000	0.0081	0.0000
3.9231	0.022402	0.016757	0.0000	0.0083	0.0000
3.9808	0.022901	0.018064	0.0000	0.0085	0.0000
4.0385	0.023406	0.019399	0.0000	0.0087	0.0000
4.0962	0.023916	0.020764	0.0000	0.0089	0.0000
4.1538	0.024432	0.022159	0.0000	0.0091	0.0000
4.2115	0.024953	0.023584	0.0000	0.0093	0.0000
4.2692	0.025480	0.025039	0.0000	0.0095	0.0000
4.3269	0.026012	0.026524	0.0000	0.0097	0.0000
4.3846	0.026550	0.028040	0.0000	0.0099	0.0000
4.4423	0.027093	0.029587	0.0074	0.0101	0.0000
4.5000	0.027642	0.031166	0.0505	0.0103	0.0000

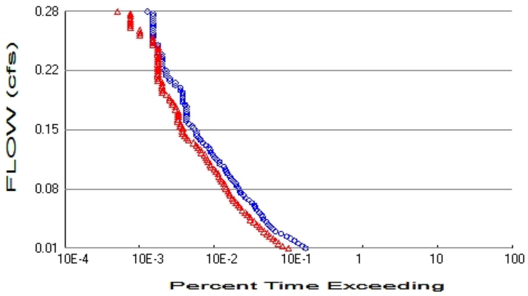
4.5577	0.028196	0.032777	0.1140	0.0105	0.0000
4.6154	0.028756	0.034420	0.1927	0.0107	0.0000
4.6731	0.029321	0.036095	0.2841	0.0109	0.0000
4.7308	0.029892	0.037803	0.3865	0.0111	0.0000
4.7885	0.030468	0.039545	0.6631	0.0112	0.0000
4.8462	0.031050	0.041319	1.3716	0.0112	0.0000
4.9038	0.031637	0.043127	2.3413	0.0112	0.0000
4.9615	0.032230	0.044970	3.5121	0.0112	0.0000
5.0192	0.032828	0.046846	4.8496	0.0112	0.0000
5.0769	0.033432	0.048758	6.3280	0.0112	0.0000
5.1346	0.034041	0.050704	7.9247	0.0112	0.0000
5.1923	0.034656	0.052686	9.6186	0.0112	0.0000
5.2500	0.035276	0.054703	11.388	0.0112	0.0000

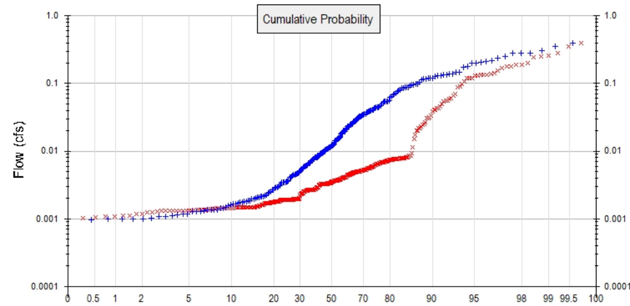
Surface iltration 1

Element Flows To:

Outlet 1	Outlet 2
	Biofiltration 1

Analysis Results
POC 1





+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 0.46
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0.38
Total Impervious Area: 0.08

Flow Frequency Method: Cunnane

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.129439
5 year	0.215172
10 year	0.283082
25 year	0.359889

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.119447
5 year	0.185919
10 year	0.253897
25 year	0.351867

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0129	669	393	58	Pass
0.0157	605	328	54	Pass
0.0184	534	290	54	Pass
0.0211	473	267	56	Pass
0.0239	423	244	57	Pass
0.0266	374	221	59	Pass
0.0293	314	205	65	Pass
0.0320	264	186	70	Pass
0.0348	243	171	70	Pass
0.0375	227	160	70	Pass
0.0402	209	149	71	Pass
0.0430	200	137	68	Pass
0.0457	182	122	67	Pass
0.0484	177	120	67	Pass
0.0511	172	110	63	Pass
0.0539	158	104	65	Pass
0.0566	149	95	63	Pass
0.0593	142	88	61	Pass
0.0621	137	83	60	Pass
0.0648	127	79	62	Pass
0.0675	117	73	62	Pass
0.0702	106	69	65	Pass
0.0730	98	65	66	Pass
0.0757	90	63	70	Pass
0.0784	87	61	70	Pass
0.0812	84	57	67	Pass
0.0839	81	55	67	Pass
0.0866	78	54	69	Pass
0.0893	72	50	69	Pass
0.0921	68	48	70	Pass
0.0948	65	46	70	Pass
0.0975	60	45	75	Pass
0.1003	58	42	72	Pass
0.1030	56	40	71	Pass
0.1057	54	36	66	Pass
0.1084	48	35	72	Pass
0.1112	47	33	70	Pass
0.1139	43	32	74	Pass
0.1166	40	31	77	Pass
0.1194	38	30	78	Pass
0.1221	36	27	75	Pass
0.1248	35	26	74	Pass
0.1275	34	24	70	Pass
0.1303	31	23	74	Pass
0.1330	28	21	75	Pass
0.1357	26	18	69	Pass
0.1385	25	17	68	Pass
0.1412	23	16	69	Pass
0.1439	23	15	65	Pass
0.1466	23	15	65	Pass
0.1494	21	15	71	Pass
0.1521	20	14	70	Pass
0.1548	18	14	77	Pass

0.1576	17	13	76	Pass
0.1603	17	13	76	Pass
0.1630	17	13	76	Pass
0.1657	17	13	76	Pass
0.1685	17	13	76	Pass
0.1712	17	12	70	Pass
0.1739	17	12	70	Pass
0.1767	16	11	68	Pass
0.1794	15	11	73	Pass
0.1821	15	10	66	Pass
0.1848	15	10	66	Pass
0.1876	15	9	60	Pass
0.1903	15	8	53	Pass
0.1930	14	8	57	Pass
0.1958	14	8	57	Pass
0.1985	12	8	66	Pass
0.2012	12	8	66	Pass
0.2040	10	7	70	Pass
0.2067	10	7	70	Pass
0.2094	9	7	77	Pass
0.2121	9	7	77	Pass
0.2149	9	7	77	Pass
0.2176	8	7	87	Pass
0.2203	8	7	87	Pass
0.2231	8	7	87	Pass
0.2258	8	7	87	Pass
0.2285	8	7	87	Pass
0.2312	8	7	87	Pass
0.2340	8	7	87	Pass
0.2367	7	7	100	Pass
0.2394	7	7	100	Pass
0.2422	7	7	100	Pass
0.2449	7	6	85	Pass
0.2476	6	6	100	Pass
0.2503	6	6	100	Pass
0.2531	6	6	100	Pass
0.2558	6	4	66	Pass
0.2585	6	4	66	Pass
0.2613	6	4	66	Pass
0.2640	6	3	50	Pass
0.2667	6	3	50	Pass
0.2694	6	3	50	Pass
0.2722	6	3	50	Pass
0.2749	6	3	50	Pass
0.2776	6	3	50	Pass
0.2804	6	3	50	Pass
0.2831	5	2	40	Pass

Water Quality

Model Default Modifications

Total of 0 changes have been made.

PERLND Changes

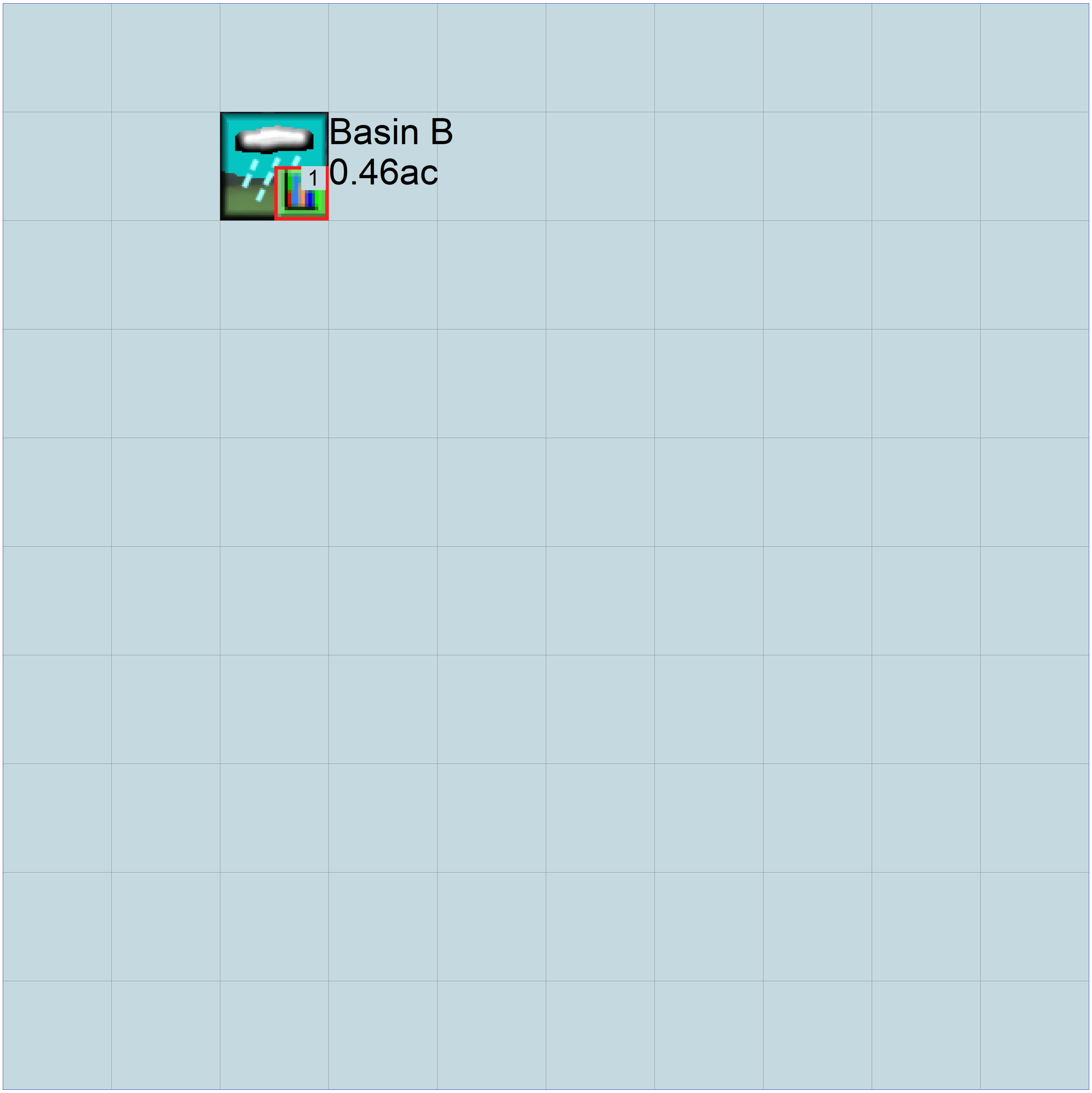
No PERLND changes have been made.

IMPLND Changes

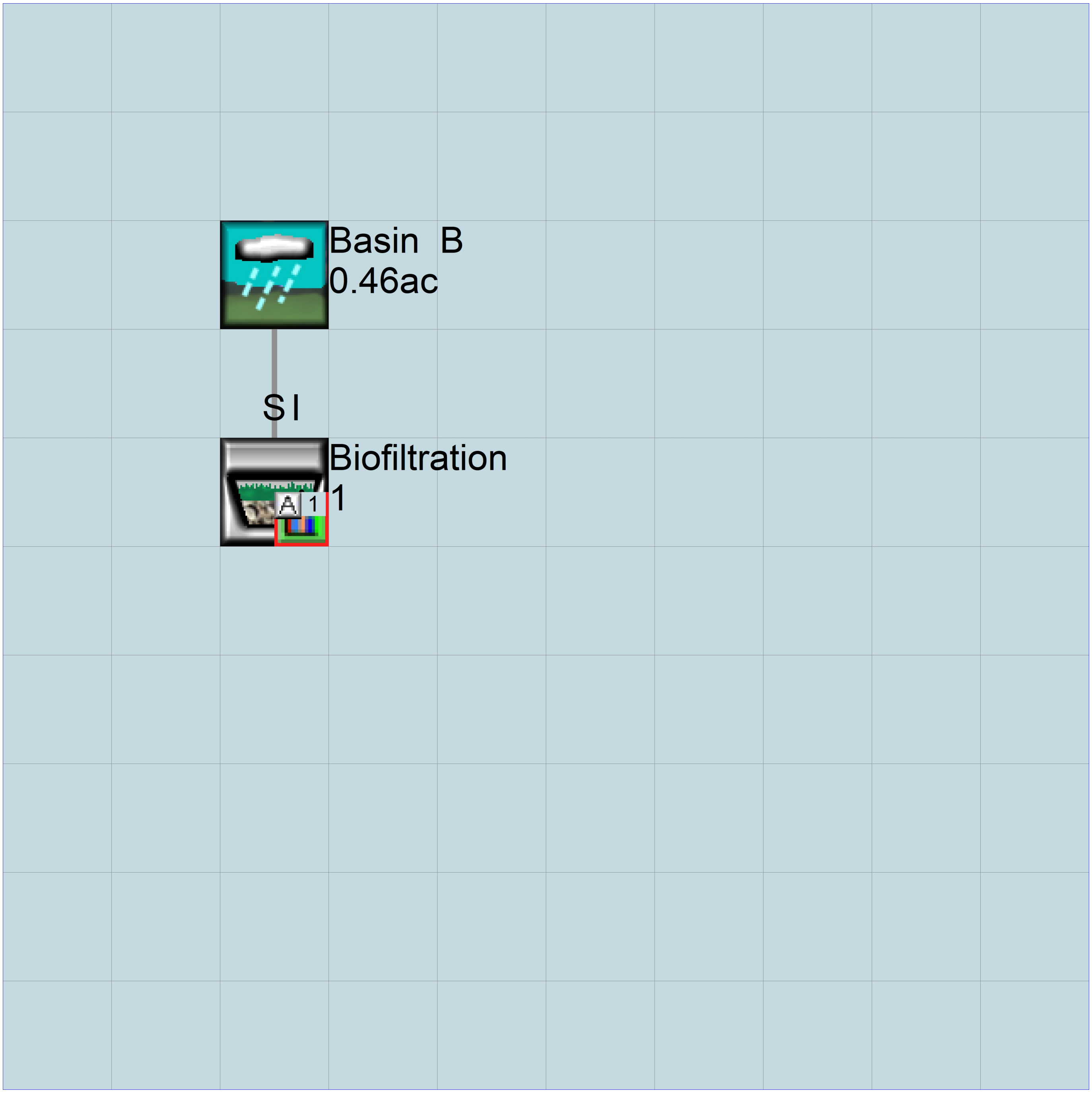
No IMPLND changes have been made.

Appendix

Predeveloped Schematic



Mitigated Schematic



Predeveloped UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1959 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   Basin B-ALT.wdm
MESSU      25   PreBasin B-ALT.MES
           27   PreBasin B-ALT.L61
           28   PreBasin B-ALT.L62
           30   POCBasin B-ALT1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:60
      PERLND      30
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Basin B                    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           ***
   30      D,NatVeg,Steep         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 ***
   30         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  *********
   30         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 ***
   30         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
   30              0       2.7      0.02        75      0.15       2.5     0.915
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   30              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 ***
   30              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  ***
   30       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  ***
   30       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
   30              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            ***
  END GEN-INFO
  *** Section IWATER***

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

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
  END PRINT-INFO

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

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

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

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

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin B***
PERLND  30                        0.46     COPY   501     12
PERLND  30                        0.46     COPY   501     13

******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


END MASS-LINK

END RUN
```

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1959 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   Basin B-ALT.wdm
MESSU      25   MitBasin B-ALT.MES
           27   MitBasin B-ALT.L61
           28   MitBasin B-ALT.L62
           30   POCBasin B-ALT1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:60
      PERLND      48
      IMPLND       1
      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 iltration  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           ***
   48      D,Urban,Steep           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 ***
   48         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  *********
   48         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 ***
   48         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
   48             0       3.2      0.02        50      0.15       2.5     0.915
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   48             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 ***
   48             0       0.6      0.03         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  ***
   48       0.6  0.6  0.6  0.6  0.7  0.7  0.7  0.7  0.7  0.6  0.6  0.6
  END MON-LZETPARM
  MON-INTERCEP
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   48       0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  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
   48             0         0      0.15         0         1      0.05         0
  END PWAT-STATE1

END PERLND

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

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

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

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

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    1            100      0.05     0.011       0.1
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    1             0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    1             0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                    <--Area-->     <-Target->   MBLK   ***
<Name>   #                    <-factor->     <Name>   #   Tbl#   ***
Basin  B***
PERLND  48                          0.38     RCHRES   1      2
PERLND  48                          0.38     RCHRES   1      3
IMPLND   1                          0.08     RCHRES   1      5

******Routing******
PERLND  48                          0.38     COPY     1     12
IMPLND   1                          0.08     COPY     1     15
PERLND  48                          0.38     COPY     1     13
RCHRES   1                             1     RCHRES   2      8
RCHRES   2                             1     COPY   501     16
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 iltratio-006    2    1    1    1   28    0    1
    2     Biofiltration  1-005    1    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  0  0  0       0  0  0  0  0       2  2  2  2  2
    2        0  1  0  0    4  0  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       0.0       0.0       0.0
    2             2      0.01       0.0       0.0       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  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    2          0         4.0  0.0  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
   67    4
     Depth      Area    Volume  Outflow1 Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.020938  0.000000  0.000000
  0.057692  0.020938  0.000025  0.000000
  0.115385  0.020460  0.000051  0.000000
  0.173077  0.019989  0.000081  0.000000
  0.230769  0.019522  0.000112  0.000000
  0.288462  0.019062  0.000146  0.000000
  0.346154  0.018606  0.000183  0.000000
  0.403846  0.018157  0.000222  0.000000
  0.461538  0.017713  0.000264  0.000000
  0.519231  0.017274  0.000309  0.000000
  0.576923  0.016841  0.000357  0.000000
  0.634615  0.016413  0.000408  0.000000
  0.692308  0.015991  0.000463  0.000000
  0.750000  0.015574  0.000520  0.000000
  0.807692  0.015163  0.000581  0.000000
  0.865385  0.014757  0.000645  0.000000
  0.923077  0.014357  0.000713  0.000000
  0.980769  0.013962  0.000785  0.000000
  1.038462  0.013573  0.000860  0.000000
  1.096154  0.013189  0.000939  0.000000
  1.153846  0.012811  0.001022  0.000000
  1.211538  0.012438  0.001109  0.000000
  1.269231  0.012071  0.001200  0.000000
  1.326923  0.011709  0.001295  0.000000
  1.384615  0.011353  0.001395  0.000000
  1.442308  0.011003  0.001499  0.001304
  1.500000  0.010657  0.001608  0.001467
  1.557692  0.010318  0.001721  0.001490
  1.615385  0.009984  0.001838  0.001692
  1.673077  0.009655  0.001961  0.001909
  1.730769  0.009332  0.002089  0.001932
  1.788462  0.009014  0.002221  0.001944
  1.846154  0.008702  0.002359  0.002525
```

1.903846	0.008395	0.002501	0.002647
1.961538	0.008094	0.002649	0.002709
2.019231	0.007798	0.002803	0.003246
2.076923	0.007508	0.002961	0.003247
2.134615	0.007223	0.003126	0.003321
2.192308	0.006944	0.003296	0.003357
2.250000	0.006671	0.003471	0.003639
2.307692	0.006402	0.003722	0.003779
2.365385	0.006140	0.003982	0.004081
2.423077	0.005883	0.004249	0.004232
2.480769	0.005631	0.004525	0.004516
2.538462	0.005385	0.004810	0.004658
2.596154	0.005144	0.005103	0.004921
2.653846	0.004909	0.005406	0.005053
2.711538	0.004679	0.005717	0.005180
2.769231	0.004455	0.006037	0.005361
2.826923	0.004236	0.006367	0.005778
2.884615	0.004023	0.006706	0.006282
2.942308	0.003816	0.007054	0.006805
3.000000	0.003614	0.007413	0.007319
3.057692	0.003417	0.007781	0.007813
3.115385	0.003226	0.008158	0.008284
3.173077	0.003040	0.008546	0.008733
3.230769	0.002860	0.008944	0.009161
3.288462	0.002685	0.009353	0.009571
3.346154	0.002516	0.009772	0.009964
3.403846	0.002353	0.010201	0.010343
3.461538	0.002194	0.010641	0.010708
3.519231	0.002042	0.011092	0.011151
3.576923	0.001895	0.011554	0.011151
3.634615	0.001753	0.012027	0.011151
3.692308	0.001617	0.012511	0.011151
3.750000	0.001486	0.013007	0.011151
3.750000	0.001361	0.013928	0.011151

END FTABLE 2
FTABLE 1
27 5

Depth (ft)	Area (acres)	Volume (acre-ft)	Outflow1 (cfs)	Outflow2 (cfs)	Velocity (ft/sec)	Travel Time*** (Minutes)***
0.000000	0.001361	0.000000	0.000000	0.000000		
0.057692	0.021420	0.001222	0.000000	0.006862		
0.115385	0.021909	0.002472	0.000000	0.008116		
0.173077	0.022402	0.003750	0.000000	0.008314		
0.230769	0.022901	0.005057	0.000000	0.008512		
0.288462	0.023406	0.006393	0.000000	0.008710		
0.346154	0.023916	0.007758	0.000000	0.008908		
0.403846	0.024432	0.009152	0.000000	0.009106		
0.461538	0.024953	0.010577	0.000000	0.009304		
0.519231	0.025480	0.012032	0.000000	0.009502		
0.576923	0.026012	0.013517	0.000000	0.009700		
0.634615	0.026550	0.015033	0.000000	0.009898		
0.692308	0.027093	0.016581	0.007434	0.010095		
0.750000	0.027642	0.018160	0.050484	0.010293		
0.807692	0.028196	0.019770	0.113994	0.010491		
0.865385	0.028756	0.021413	0.192688	0.010689		
0.923077	0.029321	0.023089	0.284052	0.010887		
0.980769	0.029892	0.024797	0.386524	0.011085		
1.038462	0.030468	0.026538	0.663136	0.011151		
1.096154	0.031050	0.028312	1.371596	0.011151		
1.153846	0.031637	0.030121	2.341288	0.011151		
1.211538	0.032230	0.031963	3.512126	0.011151		
1.269231	0.032828	0.033840	4.849625	0.011151		
1.326923	0.033432	0.035751	6.327973	0.011151		
1.384615	0.034041	0.037697	7.924727	0.011151		
1.442308	0.034656	0.039679	9.618586	0.011151		
1.500000	0.035276	0.041696	11.38837	0.011151		

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     22 IRRG     ENGL    0.7       SAME PERLND  48     EXTNL  SURLI
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   1004 FLOW     ENGL      REPL
RCHRES   2 HYDR   STAGE   1 1        1     WDM   1005 STAG     ENGL      REPL
RCHRES   1 HYDR   STAGE   1 1        1     WDM   1006 STAG     ENGL      REPL
RCHRES   1 HYDR   O       1 1        1     WDM   1007 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       16
RCHRES     ROFLOW                          COPY           INPUT  MEAN
  END MASS-LINK   16

  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

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Local (360)943-0304

www.clearcreeksolutions.com

SDHM 3.1

PROJECT REPORT

General Model Information

Project Name:	Basin C
Site Name:	VETERANS
Site Address:	
City:	CARLSBAD
Report Date:	1/17/2022
Gage:	OCEANSID
Data Start:	10/01/1959
Data End:	09/30/2004
Timestep:	Hourly
Precip Scale:	1.000
Version Date:	2021/06/28

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 C

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
D,NatVeg,Moderate	0.44
Pervious Total	0.44
Impervious Land Use	acre
Impervious Total	0
Basin Total	0.44

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Basin C

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
D,Urban,Flat	0.07
Pervious Total	0.07
Impervious Land Use	acre
IMPERVIOUS-FLAT	0.37
Impervious Total	0.37
Basin Total	0.44

Element Flows To:

Surface	Interflow	Groundwater
Surface iltration 1	Surface iltration 1	

Routing Elements
Predeveloped Routing

Mitigated Routing

Biofiltration 1

Bottom Length:		23.50 ft.
Bottom Width:		23.50 ft.
Material thickness of first layer:		0.25
Material type for first layer:		Mulch
Material thickness of second layer:		3
Material type for second layer:		ESM
Material thickness of third layer:		2
Material type for third layer:		GRAVEL
Underdrain used		
Underdrain Diameter (feet):		0.5
Orifice Diameter (in.):		0.42
Offset (in.):		3
Flow Through Underdrain (ac-ft.):		11.912
Total Outflow (ac-ft.):		13.36
Percent Through Underdrain:		89.16
Discharge Structure		
Riser Height:	1 ft.	
Riser Diameter:	36 in.	
Notch Type:	Rectangular	
Notch Width:	0.670 ft.	
Notch Height:	0.250 ft.	
Element Flows To:		
Outlet 1	Outlet 2	

Biofilter Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.0496	0.0000	0.0000	0.0000
0.0742	0.0490	0.0003	0.0000	0.0000
0.1484	0.0484	0.0006	0.0000	0.0000
0.2225	0.0477	0.0009	0.0000	0.0000
0.2967	0.0470	0.0012	0.0000	0.0000
0.3709	0.0464	0.0015	0.0000	0.0000
0.4451	0.0457	0.0018	0.0000	0.0000
0.5192	0.0450	0.0022	0.0000	0.0000
0.5934	0.0444	0.0025	0.0000	0.0000
0.6676	0.0437	0.0029	0.0000	0.0000
0.7418	0.0431	0.0032	0.0000	0.0000
0.8159	0.0425	0.0036	0.0000	0.0000
0.8901	0.0418	0.0040	0.0000	0.0000
0.9643	0.0412	0.0044	0.0000	0.0000
1.0385	0.0406	0.0048	0.0000	0.0000
1.1126	0.0400	0.0052	0.0000	0.0000
1.1868	0.0394	0.0056	0.0000	0.0000
1.2610	0.0388	0.0060	0.0000	0.0000
1.3352	0.0382	0.0065	0.0000	0.0000
1.4093	0.0376	0.0069	0.0002	0.0000
1.4835	0.0370	0.0074	0.0003	0.0000
1.5577	0.0364	0.0078	0.0007	0.0000
1.6319	0.0358	0.0083	0.0008	0.0000
1.7060	0.0352	0.0088	0.0011	0.0000
1.7802	0.0346	0.0093	0.0012	0.0000
1.8544	0.0341	0.0098	0.0014	0.0000

1.9286	0.0335	0.0103	0.0016	0.0000
2.0027	0.0329	0.0109	0.0017	0.0000
2.0769	0.0324	0.0114	0.0018	0.0000
2.1511	0.0318	0.0120	0.0020	0.0000
2.2253	0.0313	0.0125	0.0020	0.0000
2.2995	0.0307	0.0131	0.0022	0.0000
2.3736	0.0302	0.0137	0.0022	0.0000
2.4478	0.0296	0.0143	0.0024	0.0000
2.5220	0.0291	0.0149	0.0024	0.0000
2.5962	0.0286	0.0155	0.0025	0.0000
2.6703	0.0281	0.0161	0.0026	0.0000
2.7445	0.0276	0.0168	0.0027	0.0000
2.8187	0.0270	0.0174	0.0028	0.0000
2.8929	0.0265	0.0181	0.0029	0.0000
2.9670	0.0260	0.0188	0.0029	0.0000
3.0412	0.0255	0.0195	0.0030	0.0000
3.1154	0.0250	0.0202	0.0031	0.0000
3.1896	0.0245	0.0209	0.0031	0.0000
3.2637	0.0241	0.0219	0.0032	0.0000
3.3379	0.0236	0.0229	0.0033	0.0000
3.4121	0.0231	0.0239	0.0033	0.0000
3.4863	0.0226	0.0250	0.0034	0.0000
3.5604	0.0222	0.0261	0.0034	0.0000
3.6346	0.0217	0.0272	0.0035	0.0000
3.7088	0.0212	0.0283	0.0036	0.0000
3.7830	0.0208	0.0294	0.0036	0.0000
3.8571	0.0203	0.0306	0.0037	0.0000
3.9313	0.0199	0.0317	0.0038	0.0000
4.0055	0.0195	0.0329	0.0038	0.0000
4.0797	0.0190	0.0341	0.0038	0.0000
4.1538	0.0186	0.0353	0.0038	0.0000
4.2280	0.0182	0.0366	0.0039	0.0000
4.3022	0.0177	0.0378	0.0041	0.0000
4.3764	0.0173	0.0391	0.0042	0.0000
4.4505	0.0169	0.0404	0.0044	0.0000
4.5247	0.0165	0.0417	0.0046	0.0000
4.5989	0.0161	0.0431	0.0048	0.0000
4.6731	0.0157	0.0444	0.0049	0.0000
4.7473	0.0153	0.0458	0.0051	0.0000
4.8214	0.0149	0.0472	0.0053	0.0000
4.8956	0.0145	0.0486	0.0054	0.0000
4.9698	0.0142	0.0500	0.0056	0.0000
5.0440	0.0138	0.0515	0.0057	0.0000
5.1181	0.0134	0.0530	0.0059	0.0000
5.1923	0.0130	0.0545	0.0060	0.0000
5.2500	0.0127	0.0557	0.0107	0.0000

Biofilter Hydraulic Table

Stage(feet)	**Area(ac.)**	**Volume(ac-ft.)**	**Discharge(cfs)**	**To Amended(cfs)**	**Infilt(cfs)**
5.2500	0.0496	0.0557	0.0000	0.0107	0.0000
5.3242	0.0502	0.0594	0.0000	0.0107	0.0000
5.3984	0.0509	0.0631	0.0000	0.0107	0.0000
5.4725	0.0516	0.0669	0.0000	0.0107	0.0000
5.5467	0.0523	0.0708	0.0000	0.0107	0.0000
5.6209	0.0530	0.0747	0.0000	0.0107	0.0000
5.6951	0.0537	0.0786	0.0000	0.0107	0.0000
5.7692	0.0544	0.0826	0.0000	0.0107	0.0000
5.8434	0.0552	0.0867	0.0000	0.0107	0.0000

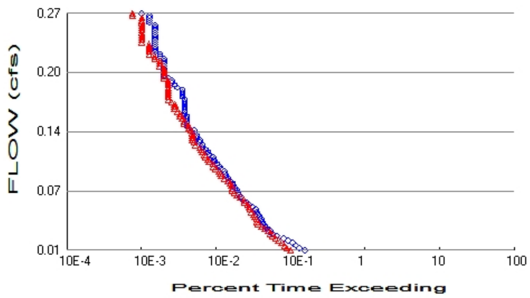
5.9176	0.0559	0.0908	0.0000	0.0107	0.0000
5.9918	0.0566	0.0950	0.0000	0.0107	0.0000
6.0659	0.0573	0.0992	0.0378	0.0107	0.0000
6.1401	0.0581	0.1035	0.1170	0.0107	0.0000
6.2143	0.0588	0.1078	0.2213	0.0107	0.0000
6.2885	0.0596	0.1122	0.5191	0.0107	0.0000
6.3626	0.0603	0.1167	1.4814	0.0107	0.0000
6.4368	0.0611	0.1212	2.8441	0.0107	0.0000
6.5110	0.0618	0.1257	4.5053	0.0107	0.0000
6.5852	0.0626	0.1304	6.4053	0.0107	0.0000
6.6593	0.0633	0.1350	8.4959	0.0107	0.0000
6.7335	0.0641	0.1397	10.732	0.0107	0.0000
6.7500	0.0643	0.1408	13.069	0.0107	0.0000

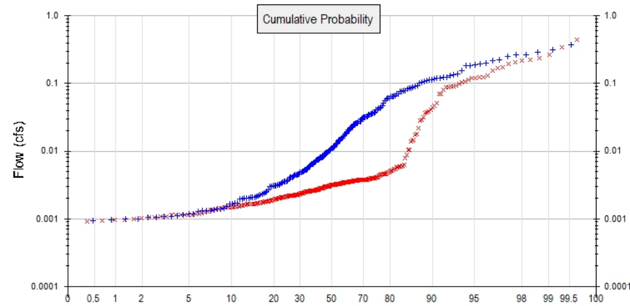
Surface iltration 1

Element Flows To:

Outlet 1	Outlet 2
	Biofiltration 1

Analysis Results
POC 1





+ Predeveloped   x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 0.44
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0.07
Total Impervious Area: 0.37

Flow Frequency Method: Cunnane

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.113464
5 year	0.196841
10 year	0.265579
25 year	0.321699

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.090257
5 year	0.170558
10 year	0.225974
25 year	0.347708

Duration Flows
The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0113	608	396	65	Pass
0.0139	520	351	67	Pass
0.0165	463	329	71	Pass
0.0191	419	301	71	Pass
0.0216	370	272	73	Pass
0.0242	319	248	77	Pass
0.0268	261	227	86	Pass
0.0293	227	212	93	Pass
0.0319	211	201	95	Pass
0.0345	194	178	91	Pass
0.0370	181	160	88	Pass
0.0396	173	146	84	Pass
0.0422	167	140	83	Pass
0.0447	159	138	86	Pass
0.0473	152	130	85	Pass
0.0499	145	126	86	Pass
0.0524	139	119	85	Pass
0.0550	133	112	84	Pass
0.0576	121	110	90	Pass
0.0601	110	105	95	Pass
0.0627	103	97	94	Pass
0.0653	92	95	103	Pass
0.0678	85	84	98	Pass
0.0704	80	75	93	Pass
0.0730	78	69	88	Pass
0.0755	76	66	86	Pass
0.0781	73	65	89	Pass
0.0807	68	64	94	Pass
0.0833	66	61	92	Pass
0.0858	61	58	95	Pass
0.0884	58	51	87	Pass
0.0910	54	47	87	Pass
0.0935	52	45	86	Pass
0.0961	51	44	86	Pass
0.0987	46	39	84	Pass
0.1012	45	37	82	Pass
0.1038	41	36	87	Pass
0.1064	38	32	84	Pass
0.1089	37	31	83	Pass
0.1115	36	29	80	Pass
0.1141	32	28	87	Pass
0.1166	31	26	83	Pass
0.1192	29	25	86	Pass
0.1218	26	24	92	Pass
0.1243	26	21	80	Pass
0.1269	24	20	83	Pass
0.1295	24	19	79	Pass
0.1320	22	19	86	Pass
0.1346	22	19	86	Pass
0.1372	20	19	95	Pass
0.1397	20	18	90	Pass
0.1423	17	17	100	Pass
0.1449	16	17	106	Pass

0.1475	16	15	93	Pass
0.1500	16	15	93	Pass
0.1526	16	14	87	Pass
0.1552	16	13	81	Pass
0.1577	15	13	86	Pass
0.1603	15	12	80	Pass
0.1629	15	11	73	Pass
0.1654	15	11	73	Pass
0.1680	15	11	73	Pass
0.1706	15	10	66	Pass
0.1731	15	9	60	Pass
0.1757	14	9	64	Pass
0.1783	14	9	64	Pass
0.1808	14	9	64	Pass
0.1834	14	9	64	Pass
0.1860	12	9	75	Pass
0.1885	11	9	81	Pass
0.1911	10	9	90	Pass
0.1937	10	9	90	Pass
0.1962	9	8	88	Pass
0.1988	8	8	100	Pass
0.2014	8	8	100	Pass
0.2039	8	8	100	Pass
0.2065	8	8	100	Pass
0.2091	8	7	87	Pass
0.2117	8	7	87	Pass
0.2142	8	7	87	Pass
0.2168	8	6	75	Pass
0.2194	7	6	85	Pass
0.2219	7	5	71	Pass
0.2245	6	5	83	Pass
0.2271	6	5	83	Pass
0.2296	6	5	83	Pass
0.2322	6	5	83	Pass
0.2348	6	4	66	Pass
0.2373	6	4	66	Pass
0.2399	6	4	66	Pass
0.2425	6	4	66	Pass
0.2450	6	4	66	Pass
0.2476	6	4	66	Pass
0.2502	6	4	66	Pass
0.2527	6	4	66	Pass
0.2553	5	4	80	Pass
0.2579	5	4	80	Pass
0.2604	5	4	80	Pass
0.2630	5	3	60	Pass
0.2656	4	3	75	Pass

Water Quality

Model Default Modifications

Total of 0 changes have been made.

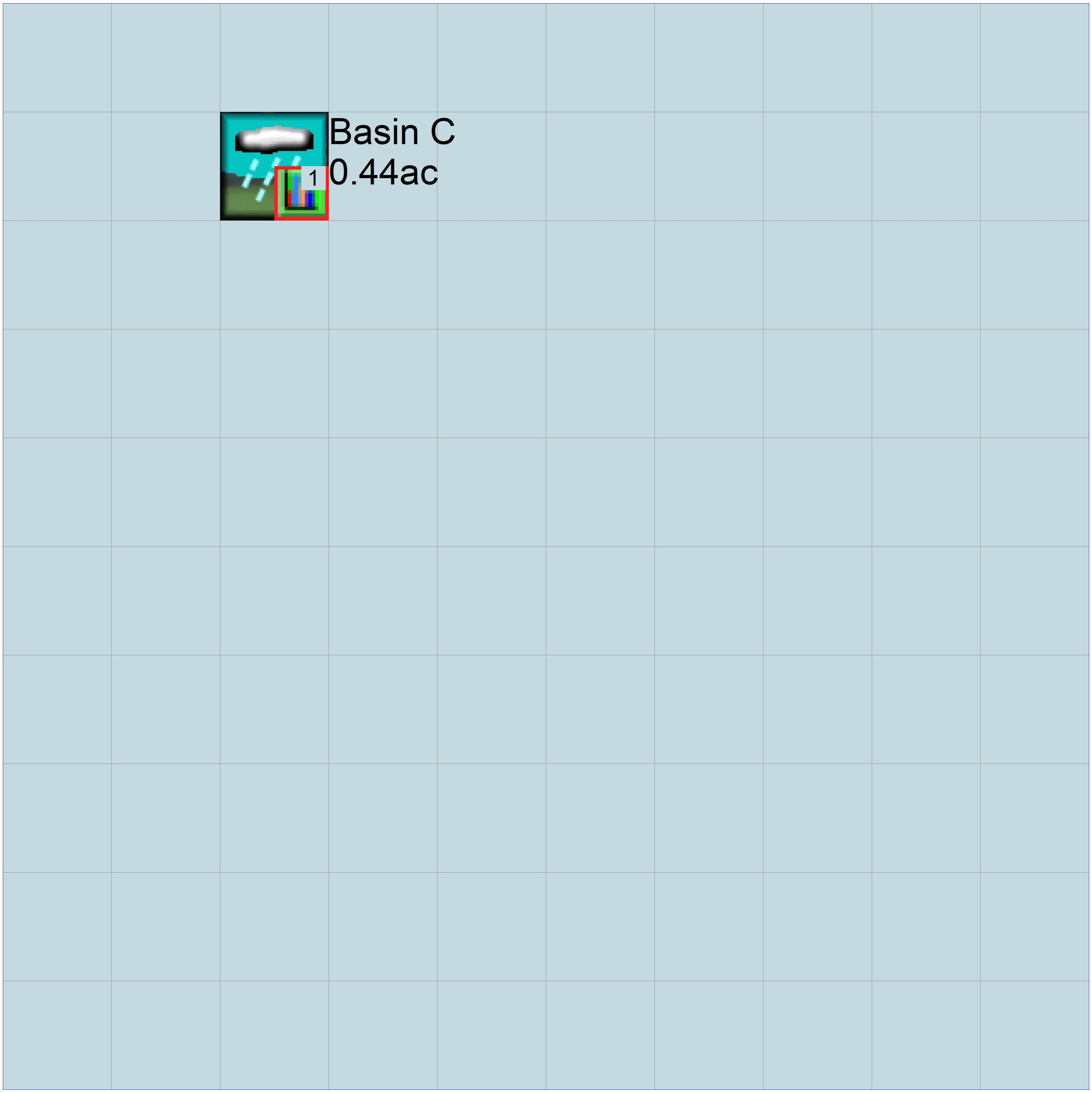
PERLND Changes

No PERLND changes have been made.

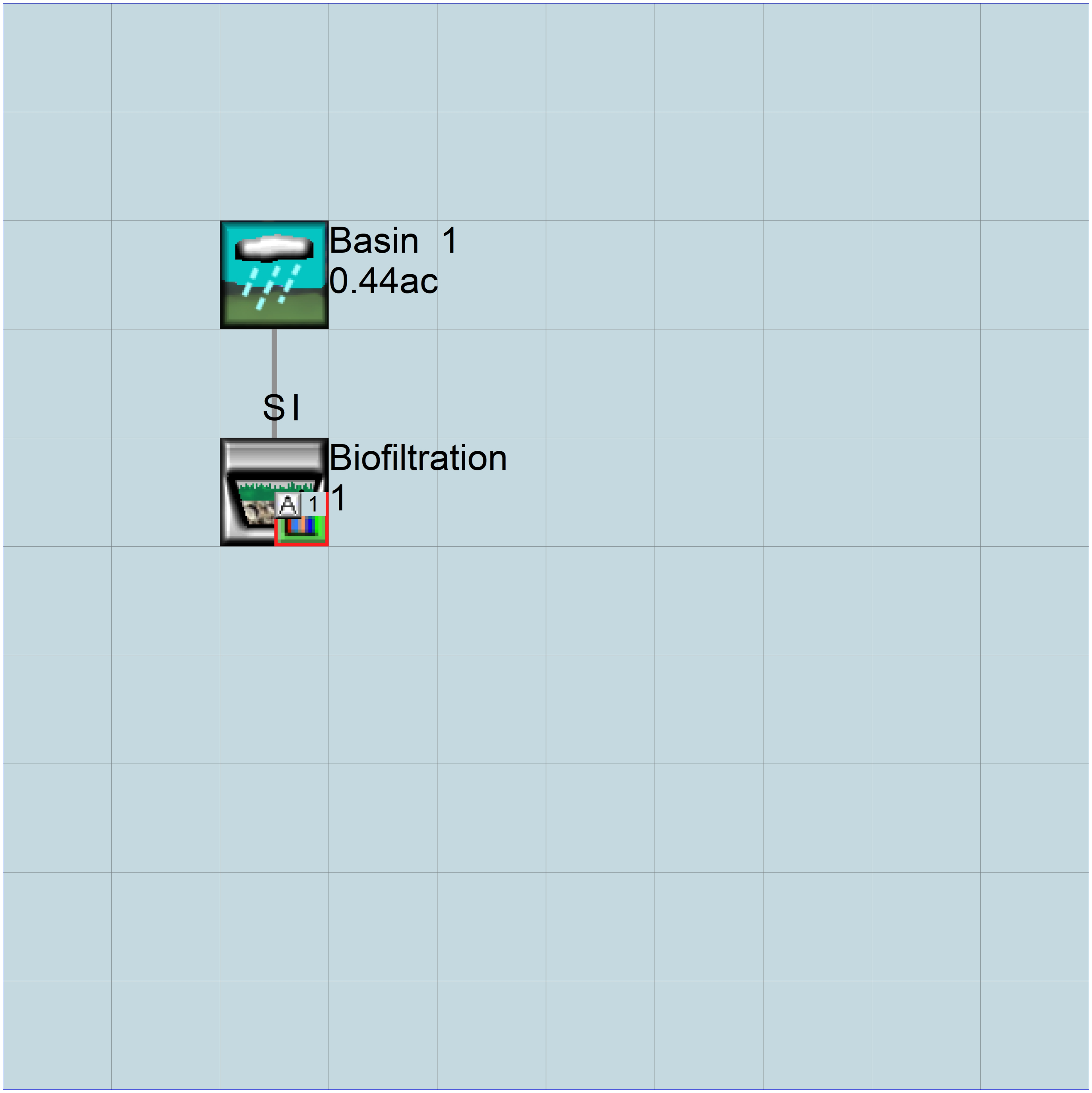
IMPLND Changes

No IMPLND changes have been made.

Appendix
Predeveloped Schematic



Mitigated Schematic



Predeveloped UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1959 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   Basin C-ALT.wdm
MESSU      25   PreBasin C-ALT.MES
           27   PreBasin C-ALT.L61
           28   PreBasin C-ALT.L62
           30   POCBasin C-ALT1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:60
      PERLND      29
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Basin C                    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           ***
  END GEN-INFO
  *** Section IWATER***

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

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
  END PRINT-INFO

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

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

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

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

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin C***
PERLND  29                        0.44     COPY   501     12
PERLND  29                        0.44     COPY   501     13

******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


END MASS-LINK

END RUN
```

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1959 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   Basin C-ALT.wdm
MESSU      25   MitBasin C-ALT.MES
           27   MitBasin C-ALT.L61
           28   MitBasin C-ALT.L62
           30   POCBasin C-ALT1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:60
      PERLND      46
      IMPLND       1
      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 iltration  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           ***
   46      D,Urban,Flat           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 ***
   46         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  *********
   46         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 ***
   46         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
   46              0       3.8      0.03        50      0.05       2.5     0.915
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   46              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 ***
   46              0       0.6      0.03         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  ***
   46       0.6  0.6  0.6  0.6  0.7  0.7  0.7  0.7  0.7  0.6  0.6  0.6
  END MON-LZETPARM
  MON-INTERCEP
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   46       0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  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
   46              0         0      0.15         0         1      0.05         0
  END PWAT-STATE1

END PERLND

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

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

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

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

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    1            100      0.05     0.011       0.1
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    1             0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    1             0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin  1***
PERLND  46                        0.07     RCHRES   1      2
PERLND  46                        0.07     RCHRES   1      3
IMPLND   1                        0.37     RCHRES   1      5

******Routing******
PERLND  46                        0.07     COPY     1     12
IMPLND   1                        0.37     COPY     1     15
PERLND  46                        0.07     COPY     1     13
RCHRES   1                           1     RCHRES   2      8
RCHRES   2                           1     COPY   501     16
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 iltratio-005    2    1    1    1   28    0    1
    2     Biofiltration  1-004    1    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  0  0  0        0  0  0  0  0       2  2  2  2  2
    2        0  1  0  0    4  0  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       0.0       0.0       0.0
    2             2      0.01       0.0       0.0       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  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    2           0         4.0  0.0  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
   72    4
     Depth      Area    Volume  Outflow1 Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.049558  0.000000  0.000000
  0.074176  0.049029  0.000286  0.000000
  0.148352  0.048353  0.000580  0.000000
  0.222527  0.047681  0.000883  0.000000
  0.296703  0.047014  0.001194  0.000000
  0.370879  0.046352  0.001513  0.000000
  0.445055  0.045694  0.001841  0.000000
  0.519231  0.045040  0.002177  0.000000
  0.593407  0.044391  0.002522  0.000000
  0.667582  0.043747  0.002876  0.000000
  0.741758  0.043107  0.003239  0.000000
  0.815934  0.042472  0.003611  0.000000
  0.890110  0.041841  0.003992  0.000000
  0.964286  0.041215  0.004382  0.000000
  1.038462  0.040593  0.004781  0.000000
  1.112637  0.039976  0.005190  0.000000
  1.186813  0.039364  0.005609  0.000000
  1.260989  0.038756  0.006037  0.000000
  1.335165  0.038152  0.006475  0.000000
  1.409341  0.037554  0.006923  0.000195
  1.483516  0.036959  0.007380  0.000293
  1.557692  0.036369  0.007848  0.000651
  1.631868  0.035784  0.008326  0.000829
  1.706044  0.035203  0.008814  0.001100
  1.780220  0.034627  0.009312  0.001235
  1.854396  0.034056  0.009821  0.001445
  1.928571  0.033489  0.010341  0.001550
  2.002747  0.032926  0.010871  0.001724
  2.076923  0.032368  0.011411  0.001810
  2.151099  0.031815  0.011963  0.001961
  2.225275  0.031266  0.012526  0.002036
  2.299451  0.030722  0.013099  0.002171
  2.373626  0.030182  0.013684  0.002239
```

2.447802	0.029647	0.014280	0.002362
2.521978	0.029116	0.014887	0.002424
2.596154	0.028590	0.015506	0.002538
2.670330	0.028068	0.016137	0.002595
2.744505	0.027551	0.016779	0.002702
2.818681	0.027039	0.017433	0.002756
2.892857	0.026531	0.018098	0.002857
2.967033	0.026028	0.018776	0.002907
3.041209	0.025529	0.019466	0.003003
3.115385	0.025034	0.020167	0.003051
3.189560	0.024545	0.020882	0.003143
3.263736	0.024059	0.021887	0.003189
3.337912	0.023579	0.022909	0.003277
3.412088	0.023103	0.023948	0.003320
3.486264	0.022631	0.025006	0.003405
3.560440	0.022164	0.026080	0.003447
3.634615	0.021702	0.027173	0.003528
3.708791	0.021244	0.028283	0.003569
3.782967	0.020790	0.029412	0.003648
3.857143	0.020342	0.030559	0.003687
3.931319	0.019897	0.031724	0.003763
4.005495	0.019458	0.032908	0.003763
4.079670	0.019022	0.034110	0.003763
4.153846	0.018592	0.035331	0.003816
4.228022	0.018166	0.036572	0.003903
4.302198	0.017744	0.037831	0.004051
4.376374	0.017327	0.039109	0.004224
4.450549	0.016915	0.040407	0.004406
4.524725	0.016507	0.041724	0.004588
4.598901	0.016103	0.043061	0.004768
4.673077	0.015705	0.044417	0.004942
4.747253	0.015310	0.045794	0.005112
4.821429	0.014921	0.047190	0.005277
4.895604	0.014536	0.048607	0.005437
4.969780	0.014155	0.050044	0.005593
5.043956	0.013779	0.051502	0.005745
5.118132	0.013407	0.052980	0.005893
5.192308	0.013040	0.054479	0.006039
5.250000	0.012678	0.056543	0.010704

END FTABLE 2
FTABLE 1
22 5

Depth (ft)	Area (acres)	Volume (acre-ft)	Outflow1 (cfs)	Outflow2 (cfs)	Velocity (ft/sec)	Travel Time*** (Minutes)***
0.000000	0.012678	0.000000	0.000000	0.000000		
0.074176	0.050242	0.003701	0.000000	0.010704		
0.148352	0.050931	0.007454	0.000000	0.010704		
0.222527	0.051625	0.011257	0.000000	0.010704		
0.296703	0.052322	0.015112	0.000000	0.010704		
0.370879	0.053025	0.019020	0.000000	0.010704		
0.445055	0.053732	0.022979	0.000000	0.010704		
0.519231	0.054443	0.026991	0.000000	0.010704		
0.593407	0.055159	0.031056	0.000000	0.010704		
0.667582	0.055880	0.035174	0.000000	0.010704		
0.741758	0.056605	0.039346	0.000000	0.010704		
0.815934	0.057335	0.043572	0.037773	0.010704		
0.890110	0.058069	0.047852	0.117010	0.010704		
0.964286	0.058808	0.052187	0.221314	0.010704		
1.038462	0.059552	0.056576	0.519072	0.010704		
1.112637	0.060299	0.061021	1.481383	0.010704		
1.186813	0.061052	0.065522	2.844150	0.010704		
1.260989	0.061809	0.070079	4.505316	0.010704		
1.335165	0.062571	0.074692	6.405271	0.010704		
1.409341	0.063337	0.079361	8.495944	0.010704		
1.483516	0.064107	0.084088	10.73215	0.010704		
1.500000	0.064279	0.085146	13.06851	0.010704		

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     22 IRRG     ENGL    0.7       SAME PERLND  46     EXTNL  SURLI
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   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       16
RCHRES     ROFLOW                          COPY           INPUT  MEAN
  END MASS-LINK   16

  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:	Basin D
Site Name:	VETERANS
Site Address:	
City:	CARLSBAD
Report Date:	1/17/2022
Gage:	OCEANSID
Data Start:	10/01/1959
Data End:	09/30/2004
Timestep:	Hourly
Precip Scale:	1.000
Version Date:	2021/06/28

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 D

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
D,NatVeg,Moderate	0.56
Pervious Total	0.56
Impervious Land Use	acre
Impervious Total	0
Basin Total	0.56

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Basin D

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
D,Urban,Flat	0.1
Pervious Total	0.1
Impervious Land Use	acre
IMPERVIOUS-FLAT	0.46
Impervious Total	0.46
Basin Total	0.56

Element Flows To:

Surface	Interflow	Groundwater
Surface iltration 1	Surface iltration 1	

Routing Elements
Predeveloped Routing

Mitigated Routing

Biofiltration 1

Bottom Length:	31.00 ft.
Bottom Width:	31.00 ft.
Material thickness of first layer:	0.25
Material type for first layer:	Mulch
Material thickness of second layer:	2.5
Material type for second layer:	ESM
Material thickness of third layer:	2.5
Material type for third layer:	GRAVEL
Underdrain used	
Underdrain Diameter (feet):	0.5
Orifice Diameter (in.):	0.45
Offset (in.):	3
Flow Through Underdrain (ac-ft.):	15.231
Total Outflow (ac-ft.):	17.07
Percent Through Underdrain:	89.23

Discharge Structure

Riser Height:	1 ft.
Riser Diameter:	36 in.
Notch Type:	Rectangular
Notch Width:	0.670 ft.
Notch Height:	0.250 ft.

Element Flows To:

Outlet 1 Outlet 2

Biofilter Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.0671	0.0000	0.0000	0.0000
0.0742	0.0665	0.0002	0.0000	0.0000
0.1484	0.0657	0.0005	0.0000	0.0000
0.2225	0.0649	0.0008	0.0000	0.0000
0.2967	0.0641	0.0010	0.0000	0.0000
0.3709	0.0633	0.0013	0.0000	0.0000
0.4451	0.0625	0.0016	0.0000	0.0000
0.5192	0.0618	0.0019	0.0000	0.0000
0.5934	0.0610	0.0021	0.0000	0.0000
0.6676	0.0603	0.0024	0.0000	0.0000
0.7418	0.0595	0.0027	0.0000	0.0000
0.8159	0.0588	0.0030	0.0000	0.0000
0.8901	0.0580	0.0033	0.0000	0.0000
0.9643	0.0573	0.0037	0.0000	0.0000
1.0385	0.0565	0.0040	0.0000	0.0000
1.1126	0.0558	0.0043	0.0000	0.0000
1.1868	0.0551	0.0046	0.0000	0.0000
1.2610	0.0543	0.0050	0.0000	0.0000
1.3352	0.0536	0.0053	0.0000	0.0000
1.4093	0.0529	0.0057	0.0002	0.0000
1.4835	0.0522	0.0060	0.0003	0.0000
1.5577	0.0515	0.0064	0.0007	0.0000
1.6319	0.0508	0.0068	0.0009	0.0000
1.7060	0.0501	0.0071	0.0012	0.0000
1.7802	0.0494	0.0075	0.0014	0.0000
1.8544	0.0487	0.0079	0.0016	0.0000

1.9286	0.0480	0.0083	0.0018	0.0000
2.0027	0.0474	0.0087	0.0020	0.0000
2.0769	0.0467	0.0091	0.0021	0.0000
2.1511	0.0460	0.0095	0.0022	0.0000
2.2253	0.0454	0.0100	0.0023	0.0000
2.2995	0.0447	0.0104	0.0025	0.0000
2.3736	0.0440	0.0108	0.0026	0.0000
2.4478	0.0434	0.0113	0.0027	0.0000
2.5220	0.0428	0.0117	0.0028	0.0000
2.5962	0.0421	0.0122	0.0029	0.0000
2.6703	0.0415	0.0127	0.0030	0.0000
2.7445	0.0408	0.0131	0.0031	0.0000
2.8187	0.0402	0.0138	0.0032	0.0000
2.8929	0.0396	0.0145	0.0033	0.0000
2.9670	0.0390	0.0151	0.0033	0.0000
3.0412	0.0384	0.0158	0.0034	0.0000
3.1154	0.0378	0.0165	0.0035	0.0000
3.1896	0.0371	0.0173	0.0036	0.0000
3.2637	0.0365	0.0180	0.0037	0.0000
3.3379	0.0360	0.0187	0.0037	0.0000
3.4121	0.0354	0.0195	0.0037	0.0000
3.4863	0.0348	0.0202	0.0038	0.0000
3.5604	0.0342	0.0210	0.0039	0.0000
3.6346	0.0336	0.0218	0.0041	0.0000
3.7088	0.0330	0.0225	0.0043	0.0000
3.7830	0.0325	0.0233	0.0045	0.0000
3.8571	0.0319	0.0242	0.0048	0.0000
3.9313	0.0313	0.0250	0.0050	0.0000
4.0055	0.0308	0.0258	0.0052	0.0000
4.0797	0.0302	0.0266	0.0054	0.0000
4.1538	0.0297	0.0275	0.0056	0.0000
4.2280	0.0292	0.0284	0.0058	0.0000
4.3022	0.0286	0.0292	0.0060	0.0000
4.3764	0.0281	0.0301	0.0062	0.0000
4.4505	0.0276	0.0310	0.0064	0.0000
4.5247	0.0270	0.0319	0.0065	0.0000
4.5989	0.0265	0.0329	0.0067	0.0000
4.6731	0.0260	0.0338	0.0069	0.0000
4.7473	0.0255	0.0347	0.0070	0.0000
4.8214	0.0250	0.0357	0.0072	0.0000
4.8956	0.0245	0.0367	0.0074	0.0000
4.9698	0.0240	0.0376	0.0075	0.0000
5.0440	0.0235	0.0386	0.0077	0.0000
5.1181	0.0230	0.0396	0.0078	0.0000
5.1923	0.0225	0.0407	0.0079	0.0000
5.2500	0.0221	0.0415	0.0123	0.0000

Biofilter Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
5.2500	0.0671	0.0415	0.0000	0.0123	0.0000
5.3242	0.0679	0.0465	0.0000	0.0123	0.0000
5.3984	0.0687	0.0515	0.0000	0.0123	0.0000
5.4725	0.0695	0.0566	0.0000	0.0123	0.0000
5.5467	0.0703	0.0618	0.0000	0.0123	0.0000
5.6209	0.0711	0.0671	0.0000	0.0123	0.0000
5.6951	0.0719	0.0724	0.0000	0.0123	0.0000
5.7692	0.0728	0.0777	0.0000	0.0123	0.0000
5.8434	0.0736	0.0832	0.0000	0.0123	0.0000

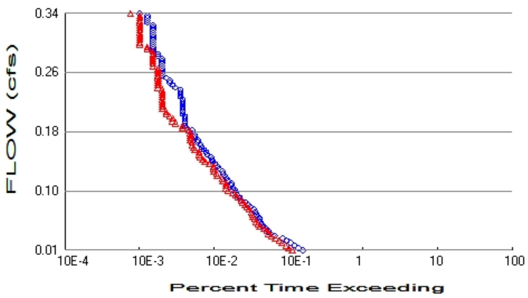
5.9176	0.0744	0.0887	0.0000	0.0123	0.0000
5.9918	0.0753	0.0942	0.0000	0.0123	0.0000
6.0659	0.0761	0.0998	0.0378	0.0123	0.0000
6.1401	0.0770	0.1055	0.1170	0.0123	0.0000
6.2143	0.0778	0.1113	0.2213	0.0123	0.0000
6.2885	0.0787	0.1171	0.5191	0.0123	0.0000
6.3626	0.0795	0.1229	1.4814	0.0123	0.0000
6.4368	0.0804	0.1289	2.8441	0.0123	0.0000
6.5110	0.0813	0.1349	4.5053	0.0123	0.0000
6.5852	0.0822	0.1409	6.4053	0.0123	0.0000
6.6593	0.0830	0.1470	8.4959	0.0123	0.0000
6.7335	0.0839	0.1532	10.732	0.0123	0.0000
6.7500	0.0841	0.1546	13.069	0.0123	0.0000

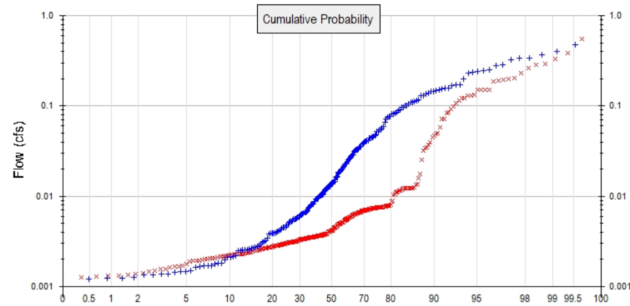
Surface iltration 1

Element Flows To:

Outlet 1	Outlet 2
	Biofiltration 1

Analysis Results
POC 1





+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 0.56
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0.1
Total Impervious Area: 0.46

Flow Frequency Method: Cunnane

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.144408
5 year	0.250525
10 year	0.338009
25 year	0.409435

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.108062
5 year	0.198235
10 year	0.288653
25 year	0.397173

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0144	615	445	72	Pass
0.0177	534	395	73	Pass
0.0210	475	363	76	Pass
0.0242	424	322	75	Pass
0.0275	373	295	79	Pass
0.0308	329	265	80	Pass
0.0341	262	231	88	Pass
0.0373	228	215	94	Pass
0.0406	213	202	94	Pass
0.0439	198	185	93	Pass
0.0471	181	163	90	Pass
0.0504	173	153	88	Pass
0.0537	167	145	86	Pass
0.0569	162	139	85	Pass
0.0602	153	131	85	Pass
0.0635	147	129	87	Pass
0.0667	141	125	88	Pass
0.0700	133	116	87	Pass
0.0733	122	109	89	Pass
0.0765	112	104	92	Pass
0.0798	105	97	92	Pass
0.0831	93	91	97	Pass
0.0863	87	82	94	Pass
0.0896	81	77	95	Pass
0.0929	78	71	91	Pass
0.0961	76	61	80	Pass
0.0994	73	58	79	Pass
0.1027	68	57	83	Pass
0.1060	67	57	85	Pass
0.1092	61	52	85	Pass
0.1125	59	51	86	Pass
0.1158	55	44	80	Pass
0.1190	52	43	82	Pass
0.1223	51	39	76	Pass
0.1256	46	39	84	Pass
0.1288	45	39	86	Pass
0.1321	41	34	82	Pass
0.1354	38	30	78	Pass
0.1386	37	28	75	Pass
0.1419	36	26	72	Pass
0.1452	32	25	78	Pass
0.1484	31	25	80	Pass
0.1517	29	22	75	Pass
0.1550	27	21	77	Pass
0.1582	26	20	76	Pass
0.1615	24	20	83	Pass
0.1648	24	19	79	Pass
0.1681	22	19	86	Pass
0.1713	22	19	86	Pass
0.1746	20	19	95	Pass
0.1779	20	18	90	Pass
0.1811	17	15	88	Pass
0.1844	16	15	93	Pass

0.1877	16	12	75	Pass
0.1909	16	11	68	Pass
0.1942	16	11	68	Pass
0.1975	16	10	62	Pass
0.2007	15	9	60	Pass
0.2040	15	9	60	Pass
0.2073	15	8	53	Pass
0.2105	15	8	53	Pass
0.2138	15	8	53	Pass
0.2171	15	8	53	Pass
0.2203	15	8	53	Pass
0.2236	14	8	57	Pass
0.2269	14	8	57	Pass
0.2302	14	8	57	Pass
0.2334	14	8	57	Pass
0.2367	12	7	58	Pass
0.2400	11	7	63	Pass
0.2432	10	7	70	Pass
0.2465	10	7	70	Pass
0.2498	9	7	77	Pass
0.2530	8	7	87	Pass
0.2563	8	7	87	Pass
0.2596	8	7	87	Pass
0.2628	8	7	87	Pass
0.2661	8	6	75	Pass
0.2694	8	6	75	Pass
0.2726	8	6	75	Pass
0.2759	8	6	75	Pass
0.2792	7	6	85	Pass
0.2824	7	6	85	Pass
0.2857	6	6	100	Pass
0.2890	6	5	83	Pass
0.2923	6	5	83	Pass
0.2955	6	4	66	Pass
0.2988	6	4	66	Pass
0.3021	6	4	66	Pass
0.3053	6	4	66	Pass
0.3086	6	4	66	Pass
0.3119	6	4	66	Pass
0.3151	6	4	66	Pass
0.3184	6	4	66	Pass
0.3217	6	4	66	Pass
0.3249	5	4	80	Pass
0.3282	5	4	80	Pass
0.3315	5	4	80	Pass
0.3347	5	4	80	Pass
0.3380	4	3	75	Pass

Water Quality

Model Default Modifications

Total of 0 changes have been made.

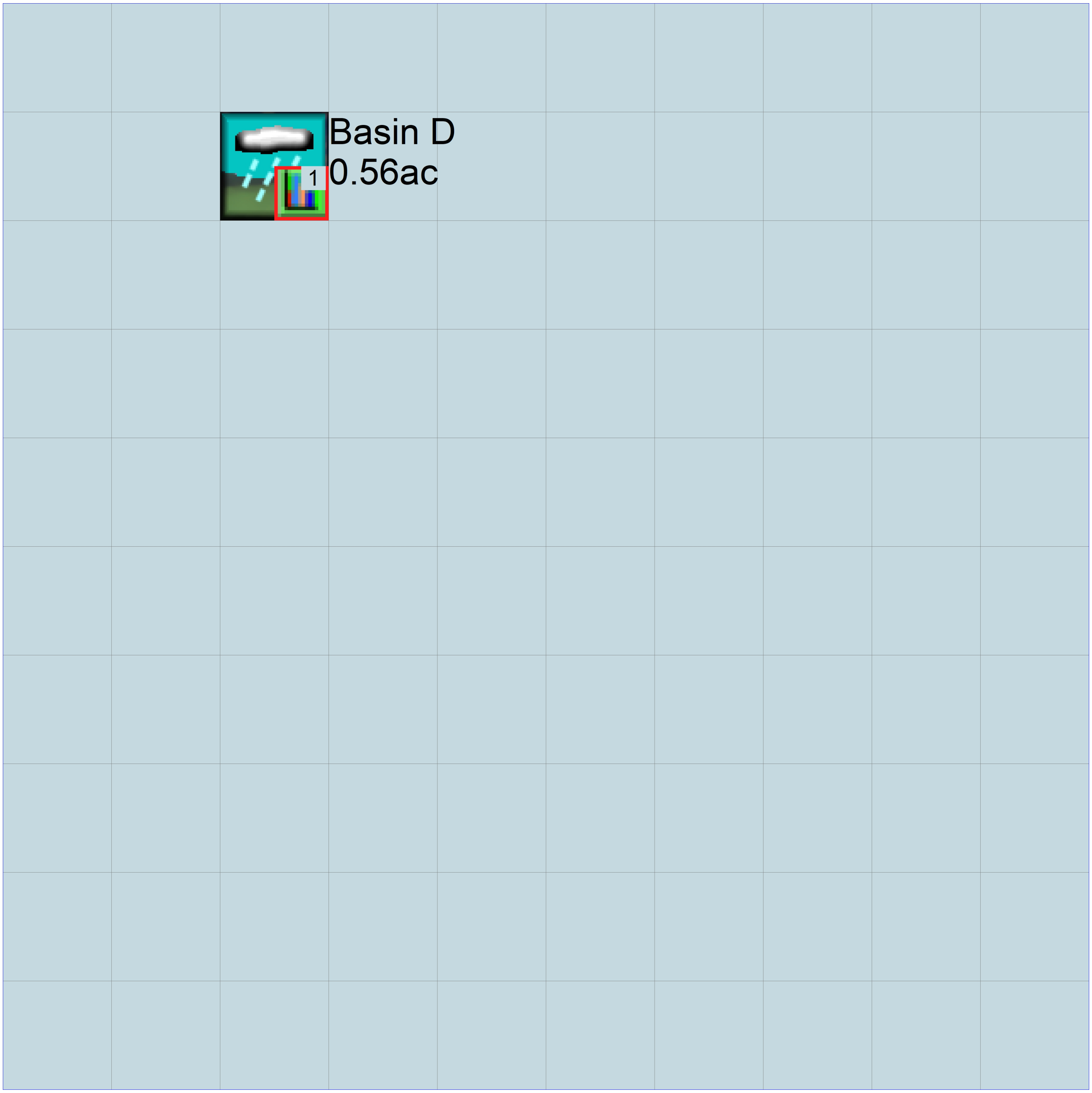
PERLND Changes

No PERLND changes have been made.

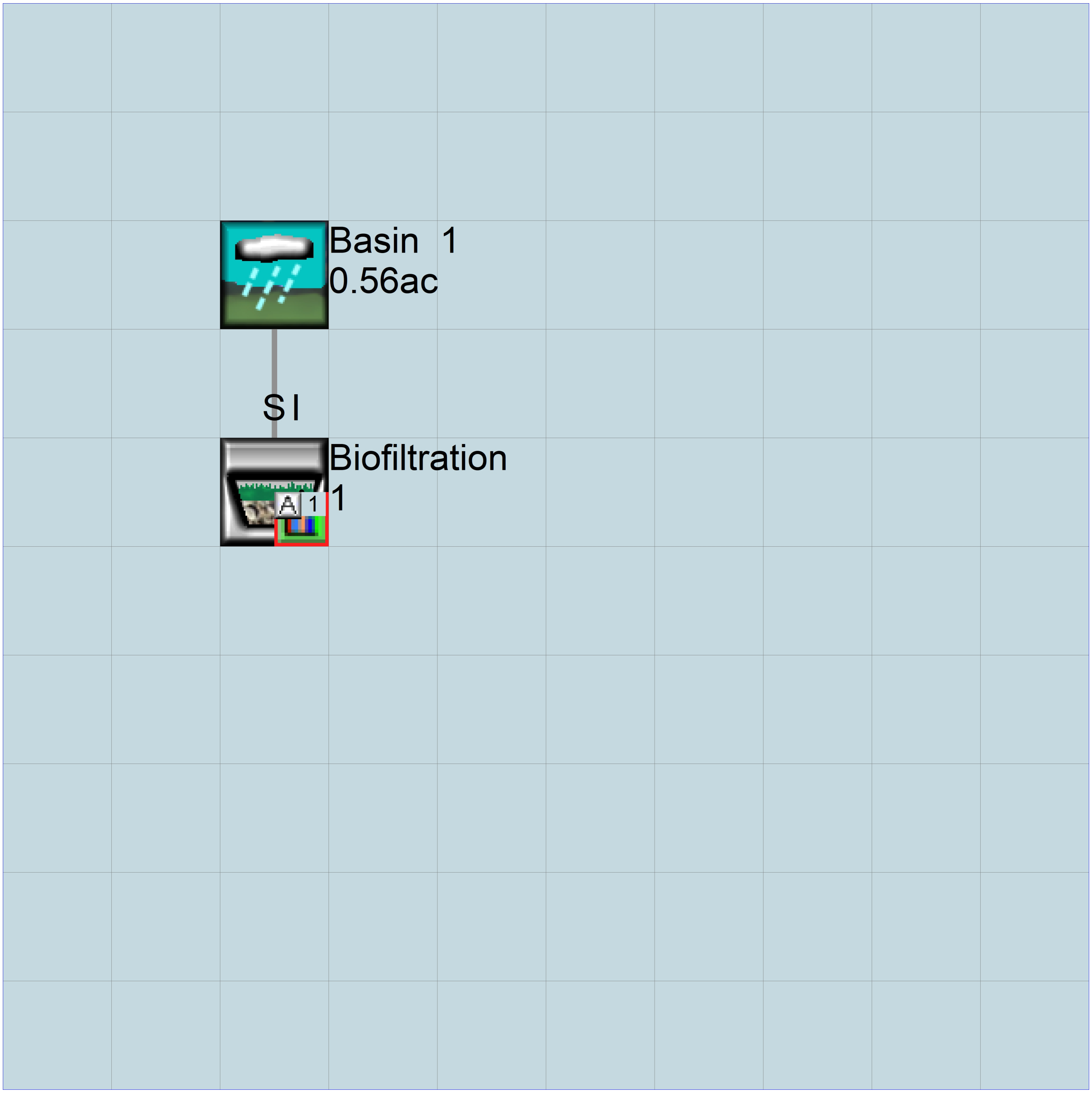
IMPLND Changes

No IMPLND changes have been made.

Appendix
Predeveloped Schematic



Mitigated Schematic



Predeveloped UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1959 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   Basin D-ALT.wdm
MESSU      25   PreBasin D-ALT.MES
           27   PreBasin D-ALT.L61
           28   PreBasin D-ALT.L62
           30   POCBasin D-ALT1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:60
      PERLND      29
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Basin D                     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            ***
  END GEN-INFO
  *** Section IWATER***

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

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
  END PRINT-INFO

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

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

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

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

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin D***
PERLND  29                        0.56     COPY   501     12
PERLND  29                        0.56     COPY   501     13

******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


END MASS-LINK

END RUN
```

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1959 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   Basin D-ALT.wdm
MESSU      25   MitBasin D-ALT.MES
           27   MitBasin D-ALT.L61
           28   MitBasin D-ALT.L62
           30   POCBasin D-ALT1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:60
      PERLND      46
      IMPLND       1
      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 iltration  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           ***
   46      D,Urban,Flat           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 ***
   46         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  *********
   46         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 ***
   46         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
   46             0       3.8      0.03        50      0.05       2.5     0.915
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   46             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 ***
   46             0       0.6      0.03         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  ***
   46       0.6  0.6  0.6  0.6  0.7  0.7  0.7  0.7  0.7  0.6  0.6  0.6
  END MON-LZETPARM
  MON-INTERCEP
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   46       0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  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
   46             0         0      0.15         0         1      0.05         0
  END PWAT-STATE1

END PERLND

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

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

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

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

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    1            100      0.05     0.011       0.1
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    1             0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    1             0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin  1***
PERLND  46                         0.1     RCHRES   1      2
PERLND  46                         0.1     RCHRES   1      3
IMPLND   1                        0.46     RCHRES   1      5

******Routing******
PERLND  46                         0.1     COPY     1     12
IMPLND   1                        0.46     COPY     1     15
PERLND  46                         0.1     COPY     1     13
RCHRES   1                           1     RCHRES   2      8
RCHRES   2                           1     COPY   501     16
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 iltratio-005    2    1    1    1   28    0    1
    2     Biofiltration  1-004    1    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  0  0  0       0  0  0  0  0       2  2  2  2  2
    2        0  1  0  0    4  0  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       0.0       0.0       0.0
    2             2      0.01       0.0       0.0       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  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    2           0         4.0  0.0  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
   72    4
     Depth      Area    Volume  Outflow1 Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.067077  0.000000  0.000000
  0.074176  0.066459  0.000248  0.000000
  0.148352  0.065667  0.000502  0.000000
  0.222527  0.064881  0.000760  0.000000
  0.296703  0.064099  0.001025  0.000000
  0.370879  0.063321  0.001294  0.000000
  0.445055  0.062548  0.001570  0.000000
  0.519231  0.061780  0.001851  0.000000
  0.593407  0.061016  0.002137  0.000000
  0.667582  0.060257  0.002429  0.000000
  0.741758  0.059502  0.002727  0.000000
  0.815934  0.058752  0.003031  0.000000
  0.890110  0.058006  0.003341  0.000000
  0.964286  0.057265  0.003656  0.000000
  1.038462  0.056529  0.003978  0.000000
  1.112637  0.055797  0.004305  0.000000
  1.186813  0.055069  0.004639  0.000000
  1.260989  0.054346  0.004978  0.000000
  1.335165  0.053628  0.005324  0.000000
  1.409341  0.052914  0.005676  0.000204
  1.483516  0.052205  0.006034  0.000307
  1.557692  0.051500  0.006399  0.000725
  1.631868  0.050800  0.006769  0.000933
  1.706044  0.050104  0.007147  0.001248
  1.780220  0.049413  0.007530  0.001405
  1.854396  0.048727  0.007920  0.001648
  1.928571  0.048045  0.008317  0.001769
  2.002747  0.047367  0.008720  0.001970
  2.076923  0.046694  0.009130  0.002070
  2.151099  0.046026  0.009547  0.002243
  2.225275  0.045362  0.009970  0.002330
  2.299451  0.044703  0.010401  0.002485
  2.373626  0.044048  0.010838  0.002563
```

2.447802	0.043398	0.011282	0.002705
2.521978	0.042752	0.011733	0.002776
2.596154	0.042111	0.012191	0.002907
2.670330	0.041475	0.012656	0.002973
2.744505	0.040843	0.013128	0.003096
2.818681	0.040216	0.013791	0.003158
2.892857	0.039593	0.014464	0.003274
2.967033	0.038974	0.015147	0.003332
3.041209	0.038361	0.015840	0.003442
3.115385	0.037751	0.016543	0.003497
3.189560	0.037147	0.017257	0.003603
3.263736	0.036546	0.017981	0.003655
3.337912	0.035951	0.018715	0.003701
3.412088	0.035360	0.019460	0.003724
3.486264	0.034773	0.020215	0.003810
3.560440	0.034191	0.020981	0.003895
3.634615	0.033614	0.021757	0.004074
3.708791	0.033041	0.022545	0.004292
3.782967	0.032473	0.023343	0.004523
3.857143	0.031909	0.024152	0.004754
3.931319	0.031350	0.024971	0.004980
4.005495	0.030795	0.025802	0.005199
4.079670	0.030245	0.026644	0.005411
4.153846	0.029699	0.027498	0.005615
4.228022	0.029158	0.028362	0.005812
4.302198	0.028622	0.029238	0.006003
4.376374	0.028090	0.030125	0.006188
4.450549	0.027563	0.031023	0.006368
4.524725	0.027040	0.031934	0.006543
4.598901	0.026522	0.032855	0.006713
4.673077	0.026008	0.033788	0.006879
4.747253	0.025499	0.034733	0.007041
4.821429	0.024994	0.035690	0.007200
4.895604	0.024494	0.036659	0.007355
4.969780	0.023998	0.037639	0.007507
5.043956	0.023507	0.038632	0.007657
5.118132	0.023021	0.039637	0.007804
5.192308	0.022539	0.040654	0.007949
5.250000	0.022062	0.042468	0.012288

END FTABLE 2

FTABLE 1

22 5

Depth (ft)	Area (acres)	Volume (acre-ft)	Outflow1 (cfs)	Outflow2 (cfs)	Velocity (ft/sec)	Travel Time*** (Minutes)***
0.000000	0.022062	0.000000	0.000000	0.000000		
0.074176	0.067876	0.005005	0.000000	0.012288		
0.148352	0.068680	0.010070	0.000000	0.012288		
0.222527	0.069488	0.015194	0.000000	0.012288		
0.296703	0.070301	0.020379	0.000000	0.012288		
0.370879	0.071119	0.025624	0.000000	0.012288		
0.445055	0.071940	0.030929	0.000000	0.012288		
0.519231	0.072767	0.036296	0.000000	0.012288		
0.593407	0.073598	0.041725	0.000000	0.012288		
0.667582	0.074434	0.047215	0.000000	0.012288		
0.741758	0.075274	0.052767	0.000000	0.012288		
0.815934	0.076118	0.058382	0.037773	0.012288		
0.890110	0.076968	0.064060	0.117010	0.012288		
0.964286	0.077821	0.069800	0.221314	0.012288		
1.038462	0.078680	0.075605	0.519072	0.012288		
1.112637	0.079543	0.081473	1.481383	0.012288		
1.186813	0.080410	0.087405	2.844150	0.012288		
1.260989	0.081282	0.093402	4.505316	0.012288		
1.335165	0.082158	0.099464	6.405271	0.012288		
1.409341	0.083039	0.105590	8.495944	0.012288		
1.483516	0.083925	0.111783	10.73215	0.012288		
1.500000	0.084122	0.113168	13.06851	0.012288		

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     22 IRRG     ENGL    0.7       SAME PERLND  46     EXTNL  SURLI
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   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       16
RCHRES     ROFLOW                          COPY           INPUT  MEAN
  END MASS-LINK   16

  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

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Local (360)943-0304

www.clearcreeksolutions.com

SDHM 3.1

PROJECT REPORT

General Model Information

Project Name:	Basin E
Site Name:	VETERANS
Site Address:	
City:	CARLSBAD
Report Date:	1/17/2022
Gage:	OCEANSID
Data Start:	10/01/1959
Data End:	09/30/2004
Timestep:	Hourly
Precip Scale:	1.000
Version Date:	2021/06/28

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 E

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
D,NatVeg,Steep	8.3
Pervious Total	8.3
Impervious Land Use	acre
Impervious Total	0
Basin Total	8.3

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Basin E

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
D,Urban,Steep	6.37
D,Urban,Flat	0.85
Pervious Total	7.22
Impervious Land Use	acre
IMPERVIOUS-FLAT	1.08
Impervious Total	1.08
Basin Total	8.3

Element Flows To:

Surface	Interflow	Groundwater
Surface iltration 1	Surface iltration 1	

Routing Elements
Predeveloped Routing

Mitigated Routing

Biofiltration 1

Bottom Length:	60.00 ft.
Bottom Width:	60.00 ft.
Material thickness of first layer:	0.25
Material type for first layer:	Mulch
Material thickness of second layer:	3
Material type for second layer:	ESM
Material thickness of third layer:	3
Material type for third layer:	GRAVEL
Underdrain used	
Underdrain Diameter (feet):	0.5
Orifice Diameter (in.):	2
Offset (in.):	3
Flow Through Underdrain (ac-ft.):	95.528
Total Outflow (ac-ft.):	117.379
Percent Through Underdrain:	81.38

Discharge Structure

Riser Height:	1 ft.
Riser Diameter:	36 in.
Notch Type:	Rectangular
Notch Width:	0.670 ft.
Notch Height:	0.250 ft.

Element Flows To:
Outlet 1 Outlet 2

Biofilter Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.1763	0.0000	0.0000	0.0000
0.0852	0.1757	0.0021	0.0000	0.0000
0.1703	0.1742	0.0043	0.0000	0.0000
0.2555	0.1727	0.0065	0.0000	0.0000
0.3407	0.1712	0.0087	0.0000	0.0000
0.4258	0.1698	0.0109	0.0000	0.0000
0.5110	0.1683	0.0132	0.0000	0.0000
0.5962	0.1668	0.0155	0.0000	0.0000
0.6813	0.1654	0.0178	0.0000	0.0000
0.7665	0.1639	0.0201	0.0000	0.0000
0.8516	0.1625	0.0225	0.0000	0.0000
0.9368	0.1611	0.0249	0.0000	0.0000
1.0220	0.1596	0.0273	0.0000	0.0000
1.1071	0.1582	0.0298	0.0000	0.0000
1.1923	0.1568	0.0323	0.0000	0.0000
1.2775	0.1554	0.0348	0.0042	0.0000
1.3626	0.1540	0.0373	0.0063	0.0000
1.4478	0.1526	0.0399	0.0152	0.0000
1.5330	0.1512	0.0425	0.0196	0.0000
1.6181	0.1498	0.0452	0.0263	0.0000
1.7033	0.1484	0.0478	0.0297	0.0000
1.7885	0.1470	0.0505	0.0348	0.0000
1.8736	0.1456	0.0533	0.0374	0.0000
1.9588	0.1443	0.0560	0.0416	0.0000
2.0440	0.1429	0.0588	0.0438	0.0000
2.1291	0.1416	0.0616	0.0474	0.0000

2.2143	0.1402	0.0645	0.0493	0.0000
2.2995	0.1389	0.0673	0.0526	0.0000
2.3846	0.1376	0.0703	0.0542	0.0000
2.4698	0.1362	0.0732	0.0572	0.0000
2.5549	0.1349	0.0762	0.0587	0.0000
2.6401	0.1336	0.0792	0.0615	0.0000
2.7253	0.1323	0.0822	0.0629	0.0000
2.8104	0.1310	0.0853	0.0655	0.0000
2.8956	0.1297	0.0884	0.0668	0.0000
2.9808	0.1284	0.0915	0.0692	0.0000
3.0659	0.1271	0.0947	0.0705	0.0000
3.1511	0.1258	0.0979	0.0728	0.0000
3.2363	0.1245	0.1011	0.0740	0.0000
3.3214	0.1233	0.1056	0.0762	0.0000
3.4066	0.1220	0.1102	0.0773	0.0000
3.4918	0.1207	0.1148	0.0795	0.0000
3.5769	0.1195	0.1194	0.0805	0.0000
3.6621	0.1183	0.1241	0.0826	0.0000
3.7473	0.1170	0.1289	0.0836	0.0000
3.8324	0.1158	0.1337	0.0856	0.0000
3.9176	0.1146	0.1385	0.0856	0.0000
4.0027	0.1133	0.1434	0.0856	0.0000
4.0879	0.1121	0.1483	0.0868	0.0000
4.1731	0.1109	0.1533	0.0873	0.0000
4.2582	0.1097	0.1583	0.0898	0.0000
4.3434	0.1085	0.1634	0.0937	0.0000
4.4286	0.1073	0.1685	0.0982	0.0000
4.5137	0.1061	0.1737	0.1028	0.0000
4.5989	0.1050	0.1789	0.1074	0.0000
4.6841	0.1038	0.1842	0.1119	0.0000
4.7692	0.1026	0.1895	0.1163	0.0000
4.8544	0.1015	0.1949	0.1205	0.0000
4.9396	0.1003	0.2003	0.1247	0.0000
5.0247	0.0992	0.2058	0.1286	0.0000
5.1099	0.0980	0.2113	0.1325	0.0000
5.1951	0.0969	0.2169	0.1363	0.0000
5.2802	0.0957	0.2225	0.1399	0.0000
5.3654	0.0946	0.2281	0.1435	0.0000
5.4505	0.0935	0.2339	0.1470	0.0000
5.5357	0.0924	0.2396	0.1503	0.0000
5.6209	0.0913	0.2454	0.1537	0.0000
5.7060	0.0902	0.2513	0.1569	0.0000
5.7912	0.0891	0.2572	0.1601	0.0000
5.8764	0.0880	0.2632	0.1632	0.0000
5.9615	0.0869	0.2692	0.1663	0.0000
6.0467	0.0858	0.2753	0.1693	0.0000
6.1319	0.0848	0.2814	0.1723	0.0000
6.2170	0.0837	0.2876	0.1753	0.0000
6.2500	0.0826	0.2900	0.2659	0.0000

Biofilter Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
6.2500	0.1763	0.2900	0.0000	0.2659	0.0000
6.3352	0.1778	0.3051	0.0000	0.2659	0.0000
6.4203	0.1793	0.3203	0.0000	0.2659	0.0000
6.5055	0.1808	0.3356	0.0000	0.2659	0.0000
6.5907	0.1823	0.3511	0.0000	0.2659	0.0000
6.6758	0.1838	0.3667	0.0000	0.2659	0.0000

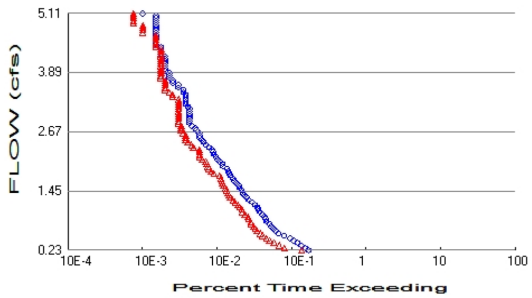
6.7610	0.1853	0.3824	0.0000	0.2659	0.0000
6.8462	0.1869	0.3983	0.0000	0.2659	0.0000
6.9313	0.1884	0.4142	0.0000	0.2659	0.0000
7.0165	0.1900	0.4304	0.0047	0.2659	0.0000
7.1016	0.1915	0.4466	0.0723	0.2659	0.0000
7.1868	0.1931	0.4630	0.1801	0.2659	0.0000
7.2720	0.1946	0.4795	0.3827	0.2659	0.0000
7.3571	0.1962	0.4961	1.3946	0.2659	0.0000
7.4423	0.1978	0.5129	2.9578	0.2659	0.0000
7.5275	0.1994	0.5298	4.9087	0.2659	0.0000
7.6126	0.2010	0.5469	7.1598	0.2659	0.0000
7.6978	0.2026	0.5641	9.6401	0.2659	0.0000
7.7500	0.2035	0.5747	12.281	0.2659	0.0000

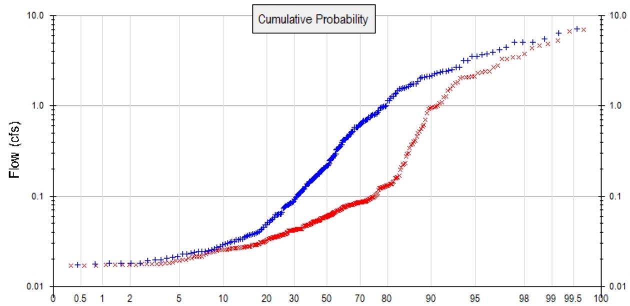
Surface iltration 1

Element Flows To:

Outlet 1	Outlet 2
	Biofiltration 1

Analysis Results
POC 1





+ Predeveloped   x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 8.3
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 7.22
Total Impervious Area: 1.08

Flow Frequency Method: Cunnane

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	2.33553
5 year	3.882449
10 year	5.107785
25 year	6.493642

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	2.04742
5 year	3.430715
10 year	4.759605
25 year	6.750633

Duration Flows
The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.2336	670	541	80	Pass
0.2828	606	318	52	Pass
0.3320	534	269	50	Pass
0.3813	473	230	48	Pass
0.4305	423	200	47	Pass
0.4797	376	182	48	Pass
0.5290	315	162	51	Pass
0.5782	264	150	56	Pass
0.6274	243	135	55	Pass
0.6767	227	129	56	Pass
0.7259	209	122	58	Pass
0.7751	200	114	57	Pass
0.8244	183	113	61	Pass
0.8736	177	105	59	Pass
0.9228	172	102	59	Pass
0.9721	158	94	59	Pass
1.0213	149	87	58	Pass
1.0705	142	85	59	Pass
1.1198	137	80	58	Pass
1.1690	127	75	59	Pass
1.2182	117	69	58	Pass
1.2675	106	65	61	Pass
1.3167	98	60	61	Pass
1.3660	91	57	62	Pass
1.4152	87	55	63	Pass
1.4644	84	53	63	Pass
1.5137	81	51	62	Pass
1.5629	78	48	61	Pass
1.6121	72	47	65	Pass
1.6614	68	46	67	Pass
1.7106	65	45	69	Pass
1.7598	60	43	71	Pass
1.8091	58	36	62	Pass
1.8583	56	33	58	Pass
1.9075	54	31	57	Pass
1.9568	48	30	62	Pass
2.0060	47	29	61	Pass
2.0552	43	28	65	Pass
2.1045	40	25	62	Pass
2.1537	38	23	60	Pass
2.2029	36	23	63	Pass
2.2522	35	23	65	Pass
2.3014	34	23	67	Pass
2.3506	31	19	61	Pass
2.3999	28	18	64	Pass
2.4491	26	16	61	Pass
2.4983	25	15	60	Pass
2.5476	23	15	65	Pass
2.5968	23	15	65	Pass
2.6461	23	14	60	Pass
2.6953	21	13	61	Pass
2.7445	20	13	65	Pass
2.7938	18	13	72	Pass

2.8430	17	12	70	Pass
2.8922	17	12	70	Pass
2.9415	17	12	70	Pass
2.9907	17	12	70	Pass
3.0399	17	12	70	Pass
3.0892	17	12	70	Pass
3.1384	17	12	70	Pass
3.1876	16	12	75	Pass
3.2369	15	12	80	Pass
3.2861	15	12	80	Pass
3.3353	15	12	80	Pass
3.3846	15	10	66	Pass
3.4338	15	10	66	Pass
3.4830	14	9	64	Pass
3.5323	14	8	57	Pass
3.5815	12	8	66	Pass
3.6307	12	8	66	Pass
3.6800	10	8	80	Pass
3.7292	10	8	80	Pass
3.7784	9	7	77	Pass
3.8277	9	7	77	Pass
3.8769	9	7	77	Pass
3.9262	8	7	87	Pass
3.9754	8	7	87	Pass
4.0246	8	7	87	Pass
4.0739	8	7	87	Pass
4.1231	8	7	87	Pass
4.1723	8	7	87	Pass
4.2216	8	7	87	Pass
4.2708	7	7	100	Pass
4.3200	7	7	100	Pass
4.3693	7	7	100	Pass
4.4185	7	6	85	Pass
4.4677	6	6	100	Pass
4.5170	6	6	100	Pass
4.5662	6	6	100	Pass
4.6154	6	6	100	Pass
4.6647	6	6	100	Pass
4.7139	6	4	66	Pass
4.7631	6	4	66	Pass
4.8124	6	4	66	Pass
4.8616	6	4	66	Pass
4.9108	6	3	50	Pass
4.9601	6	3	50	Pass
5.0093	6	3	50	Pass
5.0586	6	3	50	Pass
5.1078	4	3	75	Pass

Water Quality

Model Default Modifications

Total of 0 changes have been made.

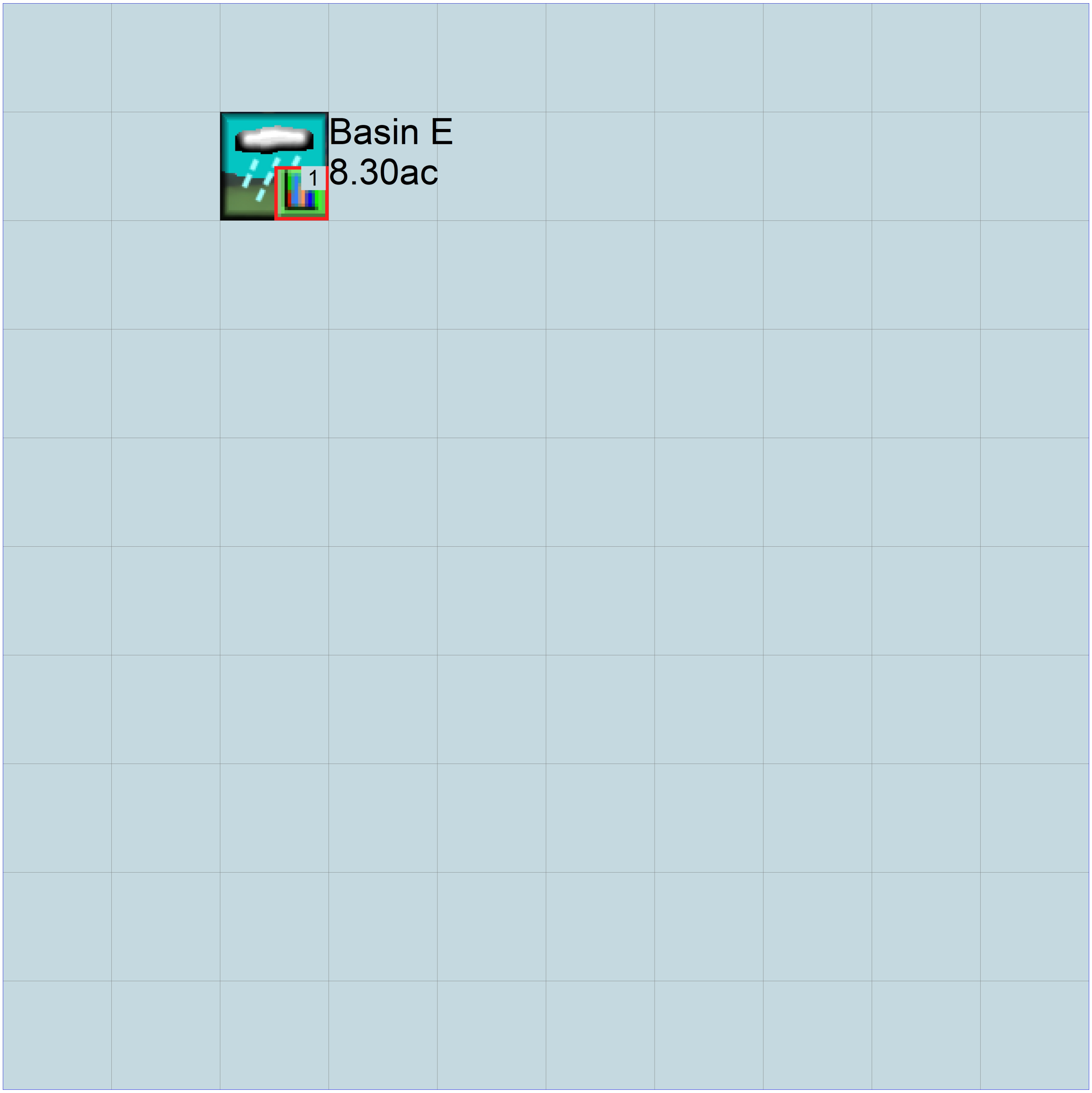
PERLND Changes

No PERLND changes have been made.

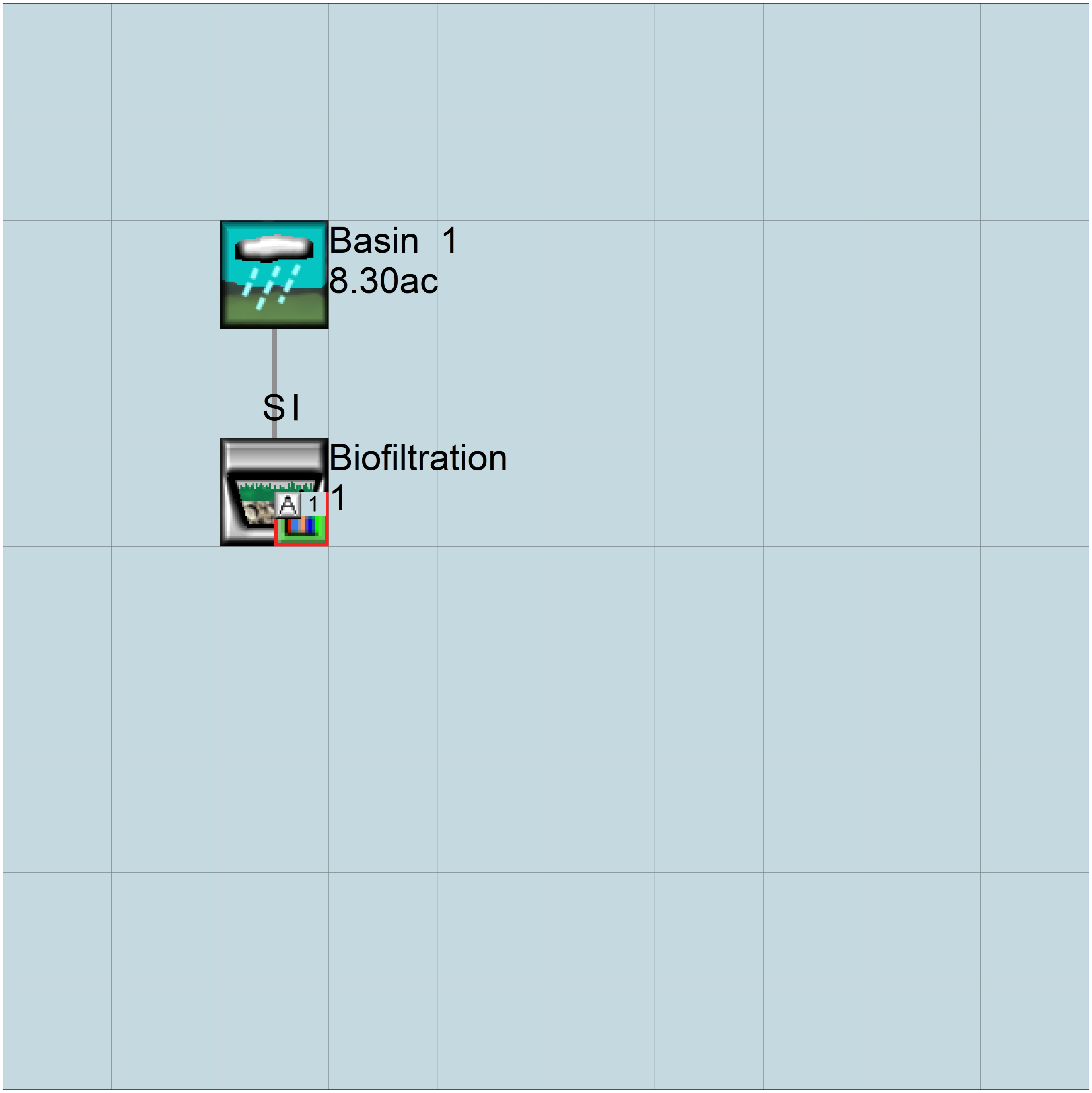
IMPLND Changes

No IMPLND changes have been made.

Appendix
Predeveloped Schematic



Mitigated Schematic



Predeveloped UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1959 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   Basin E-ALT.wdm
MESSU      25   PreBasin E-ALT.MES
           27   PreBasin E-ALT.L61
           28   PreBasin E-ALT.L62
           30   POCBasin E-ALT1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:60
      PERLND      30
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Basin E                     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           ***
   30      D,NatVeg,Steep         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 ***
   30         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  *********
   30         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 ***
   30         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
   30              0       2.7      0.02        75      0.15       2.5     0.915
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   30              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 ***
   30              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  ***
   30       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  ***
   30       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
   30              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           ***
  END GEN-INFO
  *** Section IWATER***

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

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
  END PRINT-INFO

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

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

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

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

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin E***
PERLND  30                         8.3     COPY   501     12
PERLND  30                         8.3     COPY   501     13

******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


END MASS-LINK

END RUN
```

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1959 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   Basin E-ALT.wdm
MESSU      25   MitBasin E-ALT.MES
           27   MitBasin E-ALT.L61
           28   MitBasin E-ALT.L62
           30   POCBasin E-ALT1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:60
      PERLND      48
      PERLND      46
      IMPLND       1
      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 iltration  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           ***
   48      D,Urban,Steep          1    1    1    1   27    0
   46      D,Urban,Flat           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 ***
   48         0    0    1    0    0    0    0    0    0    0    0    0
   46         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  *********
   48         0    0    4    0    0    0    0    0    0    0    0    0    1    9
   46         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 ***
   48         0    1    1    1    0    0    0    0    1    1    0
   46         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
   48              0       3.2      0.02        50      0.15       2.5     0.915
   46              0       3.8      0.03        50      0.05       2.5     0.915
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   48              0         0         2         2         0      0.05      0.05
   46              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 ***
   48              0       0.6      0.03         1       0.3         0
   46              0       0.6      0.03         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  ***
   48       0.6  0.6  0.6  0.6  0.7  0.7  0.7  0.7  0.7  0.6  0.6  0.6
   46       0.6  0.6  0.6  0.6  0.7  0.7  0.7  0.7  0.7  0.6  0.6  0.6
  END MON-LZETPARM
  MON-INTERCEP
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   48       0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1
   46       0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  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
   48              0         0      0.15         0         1      0.05         0
   46              0         0      0.15         0         1      0.05         0
  END PWAT-STATE1

END PERLND

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

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

```
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
    1         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     ***
    1         0    0    0    0    1
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    1            100      0.05     0.011       0.1
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    1             0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    1             0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin  1***
PERLND  48                        6.37     RCHRES   1      2
PERLND  48                        6.37     RCHRES   1      3
PERLND  46                        0.85     RCHRES   1      2
PERLND  46                        0.85     RCHRES   1      3
IMPLND   1                        1.08     RCHRES   1      5

******Routing******
PERLND  48                        6.37     COPY     1     12
PERLND  46                        0.85     COPY     1     12
IMPLND   1                        1.08     COPY     1     15
PERLND  48                        6.37     COPY     1     13
PERLND  46                        0.85     COPY     1     13
RCHRES   1                           1     RCHRES   2      8
RCHRES   2                           1     COPY   501     16
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 iltratio-005    2    1    1    1   28    0    1
    2     Biofiltration  1-004    1    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  0  0  0       0  0  0  0  0       2  2  2  2  2
    2        0  1  0  0    4  0  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       0.0       0.0       0.0
    2             2      0.01       0.0       0.0       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  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    2           0         4.0  0.0  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
   75    4
     Depth      Area    Volume  Outflow1 Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.176265  0.000000  0.000000
  0.085165  0.175687  0.002125  0.000000
  0.170330  0.174197  0.004277  0.000000
  0.255495  0.172712  0.006457  0.000000
  0.340659  0.171234  0.008664  0.000000
  0.425824  0.169762  0.010898  0.000000
  0.510989  0.168295  0.013160  0.000000
  0.596154  0.166835  0.015450  0.000000
  0.681319  0.165380  0.017769  0.000000
  0.766484  0.163932  0.020115  0.000000
  0.851648  0.162490  0.022490  0.000000
  0.936813  0.161053  0.024893  0.000000
  1.021978  0.159623  0.027325  0.000000
  1.107143  0.158198  0.029785  0.000000
  1.192308  0.156780  0.032275  0.000000
  1.277473  0.155368  0.034794  0.004208
  1.362637  0.153961  0.037342  0.006312
  1.447802  0.152561  0.039919  0.015203
```

1.532967	0.151166	0.042526	0.019648
1.618132	0.149778	0.045163	0.026326
1.703297	0.148395	0.047830	0.029665
1.788462	0.147019	0.050526	0.034815
1.873626	0.145649	0.053253	0.037390
1.958791	0.144284	0.056011	0.041633
2.043956	0.142926	0.058798	0.043755
2.129121	0.141573	0.061617	0.047429
2.214286	0.140227	0.064466	0.049266
2.299451	0.138886	0.067346	0.052553
2.384615	0.137552	0.070257	0.054196
2.469780	0.136223	0.073200	0.057199
2.554945	0.134901	0.076174	0.058701
2.640110	0.133584	0.079179	0.061484
2.725275	0.132274	0.082216	0.062875
2.810440	0.130969	0.085285	0.065481
2.895604	0.129671	0.088387	0.066784
2.980769	0.128378	0.091520	0.069244
3.065934	0.127091	0.094685	0.070473
3.151099	0.125811	0.097884	0.072809
3.236264	0.124536	0.101114	0.073976
3.321429	0.123268	0.105629	0.076205
3.406593	0.122005	0.110189	0.077319
3.491758	0.120749	0.114795	0.079454
3.576923	0.119498	0.119447	0.080521
3.662088	0.118254	0.124145	0.082574
3.747253	0.117015	0.128890	0.083600
3.832418	0.115782	0.133681	0.085579
3.917582	0.114556	0.138519	0.085579
4.002747	0.113335	0.143404	0.085579
4.087912	0.112121	0.148337	0.086754
4.173077	0.110912	0.153316	0.087341
4.258242	0.109709	0.158344	0.089803
4.343407	0.108513	0.163419	0.093691
4.428571	0.107322	0.168543	0.098154
4.513736	0.106137	0.173715	0.102787
4.598901	0.104959	0.178935	0.107400
4.684066	0.103786	0.184205	0.111914
4.769231	0.102619	0.189523	0.116296
4.854396	0.101459	0.194890	0.120541
4.939560	0.100304	0.200307	0.124651
5.024725	0.099155	0.205773	0.128634
5.109890	0.098013	0.211290	0.132500
5.195055	0.096876	0.216856	0.136256
5.280220	0.095745	0.222472	0.139912
5.365385	0.094621	0.228139	0.143475
5.450549	0.093502	0.233857	0.146952
5.535714	0.092389	0.239625	0.150348
5.620879	0.091283	0.245445	0.153670
5.706044	0.090182	0.251315	0.156923
5.791209	0.089087	0.257238	0.160111
5.876374	0.087998	0.263212	0.163239
5.961538	0.086916	0.269238	0.166311
6.046703	0.085839	0.275316	0.169332
6.131868	0.084768	0.281446	0.172311
6.217033	0.083703	0.287629	0.175268
6.250000	0.082645	0.312011	0.265885

END FTABLE 2
FTABLE 1
19 5

Depth (ft)	Area (acres)	Volume (acre-ft)	Outflow1 (cfs)	Outflow2 (cfs)	Velocity (ft/sec)	Travel Time*** (Minutes)***
0.000000	0.082645	0.000000	0.000000	0.000000		
0.085165	0.177764	0.015075	0.000000	0.265885		
0.170330	0.179269	0.030279	0.000000	0.265885		
0.255495	0.180779	0.045610	0.000000	0.265885		
0.340659	0.182296	0.061071	0.000000	0.265885		
0.425824	0.183819	0.076661	0.000000	0.265885		
0.510989	0.185347	0.092381	0.000000	0.265885		
0.596154	0.186882	0.108232	0.000000	0.265885		

```
  0.681319  0.188423  0.124213  0.000000  0.265885
  0.766484  0.189969  0.140326  0.004722  0.265885
  0.851648  0.191522  0.156571  0.072305  0.265885
  0.936813  0.193080  0.172948  0.180148  0.265885
  1.021978  0.194645  0.189458  0.382668  0.265885
  1.107143  0.196216  0.206102  1.394559  0.265885
  1.192308  0.197792  0.222880  2.957821  0.265885
  1.277473  0.199375  0.239792  4.908676  0.265885
  1.362637  0.200963  0.256840  7.159780  0.265885
  1.447802  0.202558  0.274022  9.640137  0.265885
  1.500000  0.203538  0.284621  12.28144  0.265885
  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     22 IRRG     ENGL    0.7       SAME PERLND  48     EXTNL  SURLI
WDM     22 IRRG     ENGL    0.7       SAME PERLND  46     EXTNL  SURLI
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   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        16
RCHRES     ROFLOW                          COPY            INPUT  MEAN
  END MASS-LINK    16

  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

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Local (360)943-0304

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SDHM 3.1

PROJECT REPORT

General Model Information

Project Name:	Basin F-ALT
Site Name:	VETERANS
Site Address:	
City:	CARLSBAD
Report Date:	3/1/2022
Gage:	OCEANSID
Data Start:	10/01/1959
Data End:	09/30/2004
Timestep:	Hourly
Precip Scale:	1.000
Version Date:	2021/06/28

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 F

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
D,NatVeg,Steep	4.5
Pervious Total	4.5
Impervious Land Use	acre
Impervious Total	0
Basin Total	4.5

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Basin F

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
D,Urban,Flat	0.47
D,Urban,Steep	3.47
Pervious Total	3.94
Impervious Land Use	acre
IMPERVIOUS-FLAT	0.55
Impervious Total	0.55
Basin Total	4.49

Element Flows To:

Surface	Interflow	Groundwater
Surface iltration 1	Surface iltration 1	

Routing Elements
Predeveloped Routing

Mitigated Routing

Biofiltration 1

Bottom Length:	45.00 ft.
Bottom Width:	45.00 ft.
Material thickness of first layer:	0.25
Material type for first layer:	Mulch
Material thickness of second layer:	3
Material type for second layer:	ESM
Material thickness of third layer:	2
Material type for third layer:	GRAVEL
Underdrain used	
Underdrain Diameter (feet):	0.5
Orifice Diameter (in.):	1.5
Offset (in.):	3
Flow Through Underdrain (ac-ft.):	50.929
Total Outflow (ac-ft.):	62.616
Percent Through Underdrain:	81.34

Discharge Structure

Riser Height:	1 ft.
Riser Diameter:	36 in.
Notch Type:	Rectangular
Notch Width:	0.670 ft.
Notch Height:	0.250 ft.

Element Flows To:
Outlet 1 Outlet 2

Biofilter Hydraulic Table

Stage(feet)	**Area(ac.)**	**Volume(ac-ft.)**	**Discharge(cfs)**	**Infilt(cfs)**
0.0000	0.1067	0.0000	0.0000	0.0000
0.0742	0.1059	0.0010	0.0000	0.0000
0.1484	0.1049	0.0021	0.0000	0.0000
0.2225	0.1039	0.0032	0.0000	0.0000
0.2967	0.1029	0.0043	0.0000	0.0000
0.3709	0.1019	0.0054	0.0000	0.0000
0.4451	0.1009	0.0065	0.0000	0.0000
0.5192	0.0999	0.0076	0.0000	0.0000
0.5934	0.0990	0.0088	0.0000	0.0000
0.6676	0.0980	0.0099	0.0000	0.0000
0.7418	0.0970	0.0111	0.0000	0.0000
0.8159	0.0961	0.0123	0.0000	0.0000
0.8901	0.0951	0.0135	0.0000	0.0000
0.9643	0.0941	0.0148	0.0000	0.0000
1.0385	0.0932	0.0160	0.0000	0.0000
1.1126	0.0922	0.0173	0.0000	0.0000
1.1868	0.0913	0.0186	0.0000	0.0000
1.2610	0.0904	0.0199	0.0000	0.0000
1.3352	0.0894	0.0212	0.0000	0.0000
1.4093	0.0885	0.0225	0.0000	0.0000
1.4835	0.0876	0.0239	0.0000	0.0000
1.5577	0.0867	0.0253	0.0000	0.0000
1.6319	0.0857	0.0267	0.0000	0.0000
1.7060	0.0848	0.0281	0.0000	0.0000
1.7802	0.0839	0.0295	0.0000	0.0000
1.8544	0.0830	0.0309	0.0000	0.0000

1.9286	0.0821	0.0324	0.0000	0.0000
2.0027	0.0812	0.0339	0.0000	0.0000
2.0769	0.0803	0.0354	0.0000	0.0000
2.1511	0.0795	0.0369	0.0000	0.0000
2.2253	0.0786	0.0384	0.0000	0.0000
2.2995	0.0777	0.0399	0.0000	0.0000
2.3736	0.0768	0.0415	0.0000	0.0000
2.4478	0.0760	0.0431	0.0000	0.0000
2.5220	0.0751	0.0447	0.0000	0.0000
2.5962	0.0743	0.0463	0.0000	0.0000
2.6703	0.0734	0.0480	0.0000	0.0000
2.7445	0.0726	0.0496	0.0000	0.0000
2.8187	0.0717	0.0513	0.0000	0.0000
2.8929	0.0709	0.0530	0.0000	0.0000
2.9670	0.0701	0.0547	0.0000	0.0000
3.0412	0.0692	0.0565	0.0000	0.0000
3.1154	0.0684	0.0582	0.0000	0.0000
3.1896	0.0676	0.0600	0.0000	0.0000
3.2637	0.0668	0.0625	0.0000	0.0000
3.3379	0.0660	0.0650	0.0000	0.0000
3.4121	0.0651	0.0676	0.0000	0.0000
3.4863	0.0643	0.0701	0.0000	0.0000
3.5604	0.0636	0.0727	0.0000	0.0000
3.6346	0.0628	0.0753	0.0000	0.0000
3.7088	0.0620	0.0780	0.0000	0.0000
3.7830	0.0612	0.0807	0.0000	0.0000
3.8571	0.0604	0.0834	0.0000	0.0000
3.9313	0.0596	0.0861	0.0000	0.0000
4.0055	0.0589	0.0889	0.0000	0.0000
4.0797	0.0581	0.0917	0.0000	0.0000
4.1538	0.0573	0.0945	0.0000	0.0000
4.2280	0.0566	0.0974	0.0000	0.0000
4.3022	0.0558	0.1003	0.0000	0.0000
4.3764	0.0551	0.1032	0.0000	0.0000
4.4505	0.0543	0.1061	0.0000	0.0000
4.5247	0.0536	0.1091	0.0000	0.0000
4.5989	0.0529	0.1121	0.0000	0.0000
4.6731	0.0522	0.1151	0.0000	0.0000
4.7473	0.0514	0.1182	0.0000	0.0000
4.8214	0.0507	0.1213	0.0000	0.0000
4.8956	0.0500	0.1244	0.0000	0.0000
4.9698	0.0493	0.1275	0.0000	0.0000
5.0440	0.0486	0.1307	0.0000	0.0000
5.1181	0.0479	0.1339	0.0000	0.0000
5.1923	0.0472	0.1372	0.0000	0.0000
5.2500	0.0465	0.1397	0.0000	0.0000

Biofilter Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
5.2500	0.1067	0.1397	0.0000	0.1365	0.0000
5.3242	0.1077	0.1477	0.0000	0.1365	0.0000
5.3984	0.1087	0.1557	0.0000	0.1365	0.0000
5.4725	0.1097	0.1638	0.0000	0.1365	0.0000
5.5467	0.1108	0.1720	0.0000	0.1365	0.0000
5.6209	0.1118	0.1802	0.0000	0.1365	0.0000
5.6951	0.1128	0.1886	0.0000	0.1365	0.0000
5.7692	0.1139	0.1970	0.0000	0.1365	0.0000
5.8434	0.1149	0.2055	0.0000	0.1365	0.0000

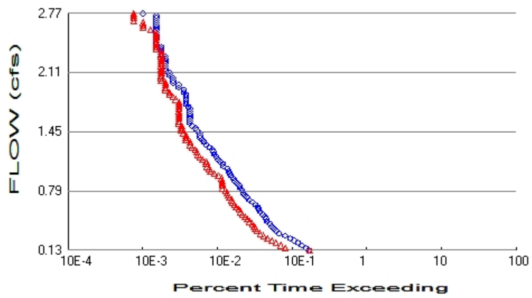
5.9176	0.1160	0.2140	0.0000	0.1365	0.0000
5.9918	0.1170	0.2227	0.0000	0.1365	0.0000
6.0659	0.1181	0.2314	0.0000	0.1365	0.0000
6.1401	0.1192	0.2402	0.0000	0.1365	0.0000
6.2143	0.1202	0.2491	0.0000	0.1365	0.0000
6.2885	0.1213	0.2580	0.0000	0.1365	0.0000
6.3626	0.1224	0.2671	0.0000	0.1365	0.0000
6.4368	0.1235	0.2762	0.0000	0.1365	0.0000
6.5110	0.1245	0.2854	0.0000	0.1365	0.0000
6.5852	0.1256	0.2947	0.0000	0.1365	0.0000
6.6593	0.1267	0.3040	0.0025	0.1365	0.0000
6.7335	0.1278	0.3135	0.0037	0.1365	0.0000
6.7500	0.1281	0.3156	0.0083	0.1365	0.0000

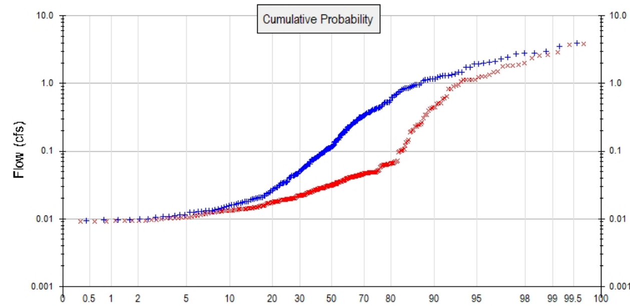
Surface iltration 1

Element Flows To:

Outlet 1	Outlet 2
	Biofiltration 1

Analysis Results
POC 1





+ Predeveloped   x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 4.5
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 3.94
Total Impervious Area: 0.55

Flow Frequency Method: Cunnane

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	1.266251
5 year	2.104942
10 year	2.769281
25 year	3.520649

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	1.082455
5 year	1.849101
10 year	2.628225
25 year	3.717425

Duration Flows
The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.1266	671	674	100	Pass
0.1533	606	321	52	Pass
0.1800	534	278	52	Pass
0.2067	474	241	50	Pass
0.2334	424	211	49	Pass
0.2601	374	185	49	Pass
0.2868	317	165	52	Pass
0.3135	264	149	56	Pass
0.3402	243	133	54	Pass
0.3669	227	127	55	Pass
0.3936	209	123	58	Pass
0.4203	200	116	58	Pass
0.4469	183	106	57	Pass
0.4736	177	99	55	Pass
0.5003	172	93	54	Pass
0.5270	158	85	53	Pass
0.5537	149	81	54	Pass
0.5804	142	77	54	Pass
0.6071	137	70	51	Pass
0.6338	127	67	52	Pass
0.6605	117	63	53	Pass
0.6872	106	61	57	Pass
0.7139	98	57	58	Pass
0.7406	91	55	60	Pass
0.7673	87	53	60	Pass
0.7940	84	51	60	Pass
0.8207	81	46	56	Pass
0.8473	78	46	58	Pass
0.8740	72	46	63	Pass
0.9007	68	46	67	Pass
0.9274	65	45	69	Pass
0.9541	60	41	68	Pass
0.9808	58	36	62	Pass
1.0075	56	32	57	Pass
1.0342	54	31	57	Pass
1.0609	48	29	60	Pass
1.0876	47	28	59	Pass
1.1143	43	28	65	Pass
1.1410	40	25	62	Pass
1.1677	38	23	60	Pass
1.1944	36	22	61	Pass
1.2211	35	21	60	Pass
1.2478	34	20	58	Pass
1.2744	31	18	58	Pass
1.3011	28	17	60	Pass
1.3278	26	17	65	Pass
1.3545	25	15	60	Pass
1.3812	23	15	65	Pass
1.4079	23	15	65	Pass
1.4346	23	14	60	Pass
1.4613	21	13	61	Pass
1.4880	20	13	65	Pass
1.5147	18	13	72	Pass

1.5414	17	12	70	Pass
1.5681	17	12	70	Pass
1.5948	17	12	70	Pass
1.6215	17	12	70	Pass
1.6482	17	12	70	Pass
1.6748	17	12	70	Pass
1.7015	17	12	70	Pass
1.7282	16	12	75	Pass
1.7549	15	12	80	Pass
1.7816	15	12	80	Pass
1.8083	15	11	73	Pass
1.8350	15	10	66	Pass
1.8617	15	9	60	Pass
1.8884	14	9	64	Pass
1.9151	14	8	57	Pass
1.9418	12	8	66	Pass
1.9685	12	8	66	Pass
1.9952	10	8	80	Pass
2.0219	10	7	70	Pass
2.0486	10	7	70	Pass
2.0753	9	7	77	Pass
2.1019	9	7	77	Pass
2.1286	8	7	87	Pass
2.1553	8	7	87	Pass
2.1820	8	7	87	Pass
2.2087	8	7	87	Pass
2.2354	8	7	87	Pass
2.2621	8	7	87	Pass
2.2888	8	7	87	Pass
2.3155	7	7	100	Pass
2.3422	7	7	100	Pass
2.3689	7	6	85	Pass
2.3956	7	6	85	Pass
2.4223	6	6	100	Pass
2.4490	6	6	100	Pass
2.4757	6	6	100	Pass
2.5023	6	6	100	Pass
2.5290	6	6	100	Pass
2.5557	6	6	100	Pass
2.5824	6	5	83	Pass
2.6091	6	4	66	Pass
2.6358	6	4	66	Pass
2.6625	6	4	66	Pass
2.6892	6	3	50	Pass
2.7159	6	3	50	Pass
2.7426	6	3	50	Pass
2.7693	4	3	75	Pass

Water Quality

Model Default Modifications

Total of 0 changes have been made.

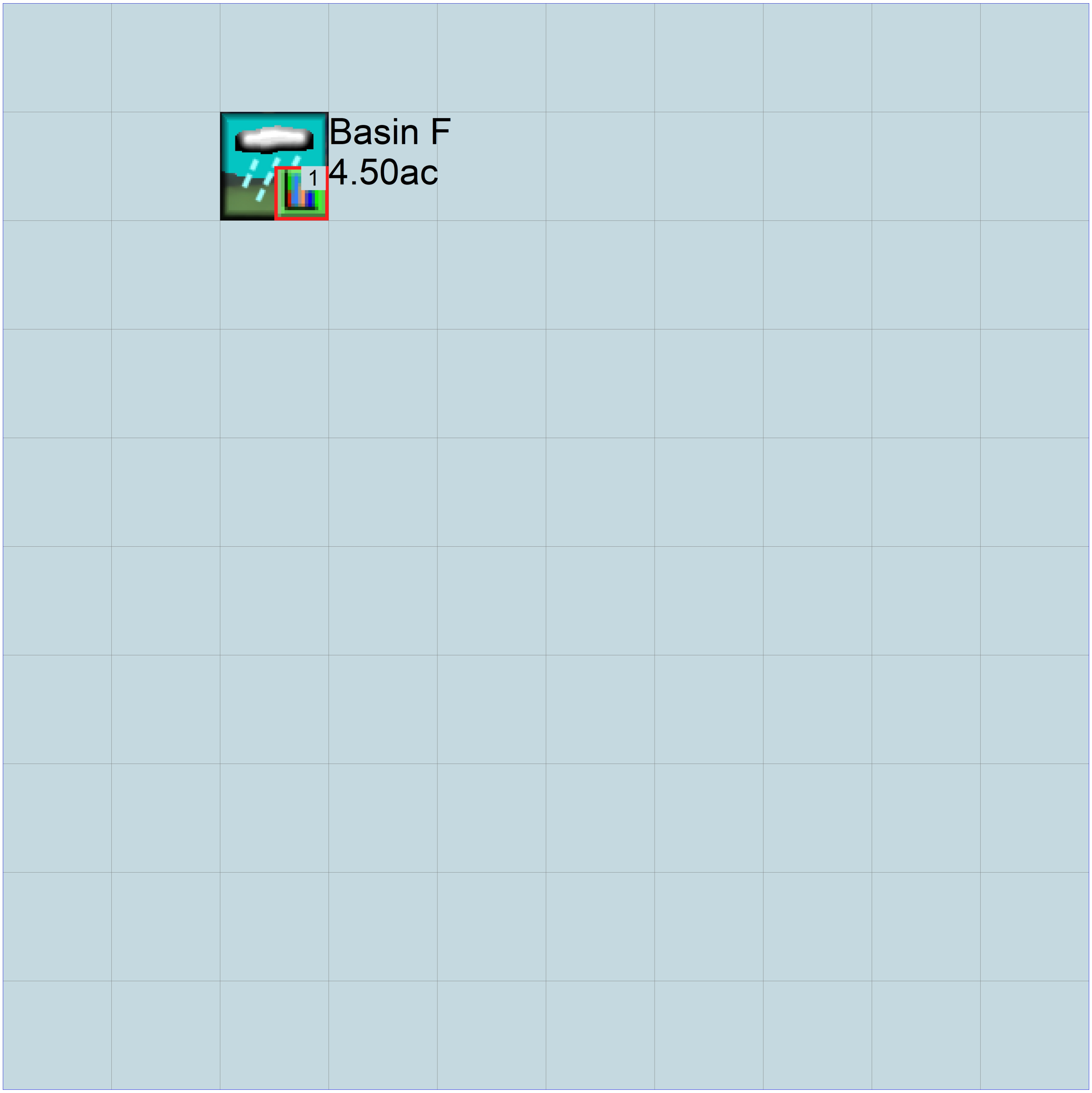
PERLND Changes

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       1959 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   Basin F-ALT.wdm
MESSU      25   PreBasin F-ALT.MES
           27   PreBasin F-ALT.L61
           28   PreBasin F-ALT.L62
           30   POCBasin F-ALT1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:60
      PERLND      30
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Basin F                     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           ***
   30      D,NatVeg,Steep         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 ***
   30         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  *********
   30         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 ***
   30         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
   30              0       2.7      0.02        75      0.15       2.5     0.915
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   30              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 ***
   30              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  ***
   30       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  ***
   30       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
   30              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           ***
  END GEN-INFO
  *** Section IWATER***

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

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
  END PRINT-INFO

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

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

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

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

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin F***
PERLND  30                         4.5     COPY   501     12
PERLND  30                         4.5     COPY   501     13

******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


END MASS-LINK

END RUN
```

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1959 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   Basin F-ALT.wdm
MESSU      25   MitBasin F-ALT.MES
           27   MitBasin F-ALT.L61
           28   MitBasin F-ALT.L62
           30   POCBasin F-ALT1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:60
      PERLND      46
      PERLND      48
      IMPLND       1
      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 iltration  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            ***
   46      D,Urban,Flat            1    1    1    1   27    0
   48      D,Urban,Steep           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 ***
   46         0    0    1    0    0    0    0    0    0    0    0    0
   48         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  *********
   46         0    0    4    0    0    0    0    0    0    0    0    0    1    9
   48         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 ***
   46         0    1    1    1    0    0    0    0    1    1    0
   48         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
   46              0       3.8      0.03        50      0.05       2.5     0.915
   48              0       3.2      0.02        50      0.15       2.5     0.915
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   46              0         0         2         2         0      0.05      0.05
   48              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 ***
   46              0       0.6      0.03         1       0.3         0
   48              0       0.6      0.03         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  ***
   46       0.6  0.6  0.6  0.6  0.7  0.7  0.7  0.7  0.7  0.6  0.6  0.6
   48       0.6  0.6  0.6  0.6  0.7  0.7  0.7  0.7  0.7  0.6  0.6  0.6
  END MON-LZETPARM
  MON-INTERCEP
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   46       0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1
   48       0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  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
   46              0         0      0.15         0         1      0.05         0
   48              0         0      0.15         0         1      0.05         0
  END PWAT-STATE1

END PERLND

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

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

```
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
    1         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     ***
    1         0    0    0    0    1
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    1            100      0.05     0.011       0.1
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    1             0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    1             0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin  1***
PERLND  46                        0.47     RCHRES   1      2
PERLND  46                        0.47     RCHRES   1      3
PERLND  48                        3.47     RCHRES   1      2
PERLND  48                        3.47     RCHRES   1      3
IMPLND   1                        0.55     RCHRES   1      5

******Routing******
PERLND  46                        0.47     COPY     1     12
PERLND  48                        3.47     COPY     1     12
IMPLND   1                        0.55     COPY     1     15
PERLND  46                        0.47     COPY     1     13
PERLND  48                        3.47     COPY     1     13
RCHRES   1                           1     RCHRES   2      8
RCHRES   2                           1     COPY   501     16
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 iltratio-005    2    1    1    1   28    0    1
    2     Biofiltration  1-004    1    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  0  0  0       0  0  0  0  0       2  2  2  2  2
    2        0  1  0  0    4  0  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       0.0       0.0       0.0
    2             2      0.01       0.0       0.0       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  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    2          0          4.0  0.0  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
   72    4
     Depth      Area    Volume  Outflow1 Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.106689  0.000000  0.000000
  0.074176  0.105904  0.001042  0.000000
  0.148352  0.104898  0.002100  0.000000
  0.222527  0.103897  0.003173  0.000000
  0.296703  0.102900  0.004262  0.000000
  0.370879  0.101908  0.005366  0.000000
  0.445055  0.100921  0.006487  0.000000
  0.519231  0.099938  0.007623  0.000000
  0.593407  0.098959  0.008776  0.000000
  0.667582  0.097986  0.009944  0.000000
  0.741758  0.097016  0.011129  0.000000
  0.815934  0.096052  0.012330  0.000000
  0.890110  0.095091  0.013548  0.000000
  0.964286  0.094136  0.014782  0.000000
  1.038462  0.093185  0.016033  0.000000
  1.112637  0.092238  0.017301  0.000000
  1.186813  0.091296  0.018585  0.000000
  1.260989  0.090359  0.019887  0.000000
```

1.335165	0.089426	0.021205	0.000000
1.409341	0.088497	0.022541	0.002492
1.483516	0.087573	0.023894	0.003738
1.557692	0.086654	0.025264	0.008298
1.631868	0.085739	0.026652	0.010578
1.706044	0.084829	0.028058	0.014029
1.780220	0.083924	0.029481	0.015755
1.854396	0.083022	0.030921	0.018433
1.928571	0.082126	0.032380	0.019772
2.002747	0.081234	0.033857	0.021986
2.076923	0.080346	0.035352	0.023093
2.151099	0.079464	0.036865	0.025013
2.225275	0.078585	0.038396	0.025974
2.299451	0.077711	0.039946	0.027694
2.373626	0.076842	0.041514	0.028554
2.447802	0.075977	0.043100	0.030126
2.521978	0.075117	0.044706	0.030913
2.596154	0.074262	0.046330	0.032371
2.670330	0.073411	0.047973	0.033100
2.744505	0.072564	0.049635	0.034466
2.818681	0.071722	0.051316	0.035149
2.892857	0.070885	0.053016	0.036438
2.967033	0.070052	0.054736	0.037083
3.041209	0.069223	0.056475	0.038307
3.115385	0.068400	0.058234	0.038920
3.189560	0.067580	0.060012	0.040088
3.263736	0.066766	0.062499	0.040673
3.337912	0.065955	0.065013	0.041793
3.412088	0.065150	0.067555	0.042353
3.486264	0.064349	0.070124	0.043429
3.560440	0.063552	0.072722	0.043968
3.634615	0.062760	0.075347	0.045006
3.708791	0.061973	0.078000	0.045525
3.782967	0.061190	0.080682	0.046529
3.857143	0.060412	0.083392	0.047031
3.931319	0.059638	0.086131	0.048003
4.005495	0.058869	0.088898	0.048003
4.079670	0.058104	0.091694	0.048003
4.153846	0.057344	0.094518	0.048673
4.228022	0.056588	0.097372	0.049780
4.302198	0.055837	0.100256	0.051666
4.376374	0.055091	0.103168	0.053879
4.450549	0.054349	0.106110	0.056200
4.524725	0.053611	0.109082	0.058526
4.598901	0.052879	0.112083	0.060813
4.673077	0.052150	0.115114	0.063041
4.747253	0.051427	0.118176	0.065206
4.821429	0.050707	0.121267	0.067308
4.895604	0.049993	0.124389	0.069350
4.969780	0.049283	0.127541	0.071336
5.043956	0.048577	0.130724	0.073272
5.118132	0.047876	0.133938	0.075164
5.192308	0.047180	0.137182	0.077022
5.250000	0.046488	0.151011	0.136529

END FTABLE 2
FTABLE 1
22 5

Depth (ft)	Area (acres)	Volume (acre-ft)	Outflow1 (cfs)	Outflow2 (cfs)	Velocity (ft/sec)	Travel Time*** (Minutes)***
0.000000	0.046488	0.000000	0.000000	0.000000		
0.074176	0.107703	0.007951	0.000000	0.136529		
0.148352	0.108721	0.015978	0.000000	0.136529		
0.222527	0.109744	0.024080	0.000000	0.136529		
0.296703	0.110771	0.032259	0.000000	0.136529		
0.370879	0.111803	0.040514	0.000000	0.136529		
0.445055	0.112840	0.048845	0.000000	0.136529		
0.519231	0.113881	0.057254	0.000000	0.136529		
0.593407	0.114926	0.065740	0.000000	0.136529		
0.667582	0.115977	0.074304	0.000000	0.136529		
0.741758	0.117031	0.082945	0.000000	0.136529		

```
  0.815934  0.118091  0.091666  0.037773  0.136529
  0.890110  0.119154  0.100464  0.117010  0.136529
  0.964286  0.120223  0.109342  0.221314  0.136529
  1.038462  0.121296  0.118300  0.519072  0.136529
  1.112637  0.122373  0.127337  1.481383  0.136529
  1.186813  0.123455  0.136454  2.844150  0.136529
  1.260989  0.124541  0.145652  4.505316  0.136529
  1.335165  0.125632  0.154930  6.405271  0.136529
  1.409341  0.126728  0.164290  8.495944  0.136529
  1.483516  0.127828  0.173731  10.73215  0.136529
  1.500000  0.128073  0.175840  13.06851  0.136529
  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     22 IRRG     ENGL    0.7       SAME PERLND  46     EXTNL  SURLI
WDM     22 IRRG     ENGL    0.7       SAME PERLND  48     EXTNL  SURLI
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   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        16
RCHRES     ROFLOW                                  COPY           INPUT  MEAN
  END MASS-LINK    16

  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:	Basin G-ALT
Site Name:	VETERANS
Site Address:	
City:	CARLSBAD
Report Date:	3/1/2022
Gage:	OCEANSID
Data Start:	10/01/1959
Data End:	09/30/2004
Timestep:	Hourly
Precip Scale:	1.000
Version Date:	2021/06/28

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 G

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
D,NatVeg,Steep	5.2
Pervious Total	5.2
Impervious Land Use	acre
Impervious Total	0
Basin Total	5.2

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Basin G

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
D,Urban,Flat	0.68
D,Urban,Steep	4.49
Pervious Total	5.17
Impervious Land Use	acre
IMPERVIOUS-FLAT	0.02
Impervious Total	0.02
Basin Total	5.19

Element Flows To:

Surface	Interflow	Groundwater
Surface iltration 1	Surface iltration 1	

Routing Elements
Predeveloped Routing

Mitigated Routing

Biofiltration 1

Bottom Length:	45.00 ft.
Bottom Width:	45.00 ft.
Material thickness of first layer:	0.25
Material type for first layer:	Mulch
Material thickness of second layer:	2.5
Material type for second layer:	ESM
Material thickness of third layer:	1.5
Material type for third layer:	GRAVEL
Underdrain used	
Underdrain Diameter (feet):	0.5
Orifice Diameter (in.):	1.5
Offset (in.):	3
Flow Through Underdrain (ac-ft.):	45.31
Total Outflow (ac-ft.):	59.059
Percent Through Underdrain:	76.72

Discharge Structure

Riser Height:	1 ft.
Riser Diameter:	36 in.
Notch Type:	Rectangular
Notch Width:	0.670 ft.
Notch Height:	0.250 ft.

Element Flows To:
Outlet 1 Outlet 2

Biofilter Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.1141	0.0000	0.0000	0.0000
0.0632	0.1138	0.0009	0.0000	0.0000
0.1264	0.1126	0.0018	0.0000	0.0000
0.1896	0.1113	0.0027	0.0000	0.0000
0.2527	0.1101	0.0036	0.0000	0.0000
0.3159	0.1089	0.0046	0.0000	0.0000
0.3791	0.1077	0.0056	0.0000	0.0000
0.4423	0.1065	0.0065	0.0000	0.0000
0.5055	0.1054	0.0075	0.0000	0.0000
0.5687	0.1042	0.0085	0.0000	0.0000
0.6319	0.1030	0.0096	0.0000	0.0000
0.6951	0.1019	0.0106	0.0000	0.0000
0.7582	0.1007	0.0117	0.0000	0.0000
0.8214	0.0996	0.0128	0.0000	0.0000
0.8846	0.0984	0.0138	0.0000	0.0000
0.9478	0.0973	0.0150	0.0000	0.0000
1.0110	0.0961	0.0161	0.0000	0.0000
1.0742	0.0950	0.0172	0.0000	0.0000
1.1374	0.0939	0.0184	0.0000	0.0000
1.2005	0.0928	0.0196	0.0000	0.0000
1.2637	0.0917	0.0208	0.0000	0.0000
1.3269	0.0906	0.0220	0.0000	0.0000
1.3901	0.0895	0.0232	0.0000	0.0000
1.4533	0.0884	0.0244	0.0000	0.0000
1.5165	0.0873	0.0257	0.0000	0.0000
1.5797	0.0863	0.0270	0.0000	0.0000

1.6429	0.0852	0.0283	0.0000	0.0000
1.7060	0.0841	0.0296	0.0000	0.0000
1.7692	0.0831	0.0310	0.0000	0.0000
1.8324	0.0821	0.0323	0.0000	0.0000
1.8956	0.0810	0.0337	0.0000	0.0000
1.9588	0.0800	0.0351	0.0000	0.0000
2.0220	0.0790	0.0365	0.0000	0.0000
2.0852	0.0779	0.0379	0.0000	0.0000
2.1484	0.0769	0.0394	0.0000	0.0000
2.2115	0.0759	0.0408	0.0000	0.0000
2.2747	0.0749	0.0423	0.0000	0.0000
2.3379	0.0739	0.0438	0.0000	0.0000
2.4011	0.0730	0.0454	0.0000	0.0000
2.4643	0.0720	0.0469	0.0000	0.0000
2.5275	0.0710	0.0485	0.0000	0.0000
2.5907	0.0700	0.0500	0.0000	0.0000
2.6538	0.0691	0.0517	0.0000	0.0000
2.7170	0.0681	0.0533	0.0000	0.0000
2.7802	0.0672	0.0556	0.0000	0.0000
2.8434	0.0662	0.0579	0.0000	0.0000
2.9066	0.0653	0.0602	0.0000	0.0000
2.9698	0.0644	0.0626	0.0000	0.0000
3.0330	0.0635	0.0649	0.0000	0.0000
3.0962	0.0626	0.0674	0.0000	0.0000
3.1593	0.0617	0.0698	0.0000	0.0000
3.2225	0.0608	0.0723	0.0000	0.0000
3.2857	0.0599	0.0748	0.0000	0.0000
3.3489	0.0590	0.0773	0.0000	0.0000
3.4121	0.0581	0.0799	0.0000	0.0000
3.4753	0.0572	0.0825	0.0000	0.0000
3.5385	0.0564	0.0851	0.0000	0.0000
3.6016	0.0555	0.0878	0.0000	0.0000
3.6648	0.0547	0.0905	0.0000	0.0000
3.7280	0.0538	0.0932	0.0000	0.0000
3.7912	0.0530	0.0959	0.0000	0.0000
3.8544	0.0521	0.0987	0.0000	0.0000
3.9176	0.0513	0.1015	0.0000	0.0000
3.9808	0.0505	0.1044	0.0000	0.0000
4.0440	0.0497	0.1072	0.0000	0.0000
4.1071	0.0489	0.1101	0.0000	0.0000
4.1703	0.0481	0.1131	0.0000	0.0000
4.2335	0.0473	0.1160	0.0000	0.0000
4.2500	0.0465	0.1168	0.0000	0.0000

Biofilter Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
4.2500	0.1141	0.1168	0.0000	0.1221	0.0000
4.3132	0.1153	0.1241	0.0000	0.1221	0.0000
4.3764	0.1166	0.1314	0.0000	0.1221	0.0000
4.4396	0.1178	0.1388	0.0000	0.1221	0.0000
4.5027	0.1191	0.1463	0.0000	0.1221	0.0000
4.5659	0.1203	0.1538	0.0000	0.1221	0.0000
4.6291	0.1216	0.1615	0.0000	0.1221	0.0000
4.6923	0.1229	0.1692	0.0000	0.1221	0.0000
4.7555	0.1241	0.1770	0.0000	0.1221	0.0000
4.8187	0.1254	0.1849	0.0000	0.1221	0.0000
4.8819	0.1267	0.1929	0.0000	0.1221	0.0000
4.9451	0.1280	0.2009	0.0000	0.1221	0.0000

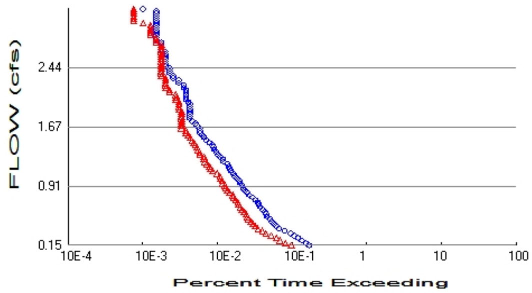
5.0082	0.1293	0.2090	0.0000	0.1221	0.0000
5.0714	0.1306	0.2172	0.0000	0.1221	0.0000
5.1346	0.1319	0.2255	0.0000	0.1221	0.0000
5.1978	0.1333	0.2339	0.0000	0.1221	0.0000
5.2610	0.1346	0.2424	0.0000	0.1221	0.0000
5.3242	0.1359	0.2509	0.0000	0.1221	0.0000
5.3874	0.1373	0.2596	0.0000	0.1221	0.0000
5.4505	0.1386	0.2683	0.0000	0.1221	0.0000
5.5137	0.1400	0.2771	0.0000	0.1221	0.0000
5.5769	0.1413	0.2860	0.0000	0.1221	0.0000
5.6401	0.1427	0.2949	0.0000	0.1221	0.0000
5.7033	0.1441	0.3040	0.0051	0.1221	0.0000
5.7500	0.1451	0.3107	0.0076	0.1221	0.0000

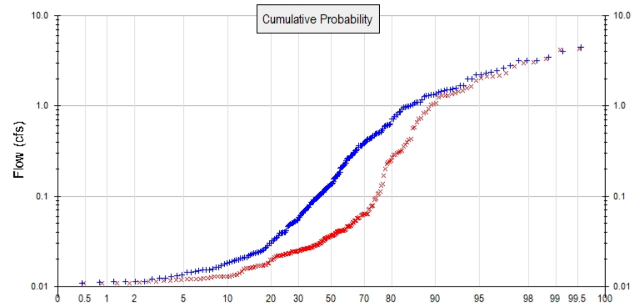
Surface iltration 1

Element Flows To:

Outlet 1	Outlet 2
	Biofiltration 1

Analysis Results
POC 1





+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 5.2
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 5.17
Total Impervious Area: 0.02

Flow Frequency Method: Cunnane

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	1.463223
5 year	2.432377
10 year	3.200058
25 year	4.068305

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	1.067108
5 year	2.104421
10 year	3.003428
25 year	4.216272

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.1463	670	387	57	Pass
0.1772	605	320	52	Pass
0.2080	534	273	51	Pass
0.2389	474	242	51	Pass
0.2697	424	208	49	Pass
0.3006	376	177	47	Pass
0.3314	315	158	50	Pass
0.3622	264	138	52	Pass
0.3931	243	126	51	Pass
0.4239	227	118	51	Pass
0.4548	209	111	53	Pass
0.4856	200	104	52	Pass
0.5165	183	99	54	Pass
0.5473	177	96	54	Pass
0.5782	172	90	52	Pass
0.6090	158	84	53	Pass
0.6399	149	80	53	Pass
0.6707	142	75	52	Pass
0.7015	137	74	54	Pass
0.7324	127	69	54	Pass
0.7632	117	65	55	Pass
0.7941	106	64	60	Pass
0.8249	98	57	58	Pass
0.8558	91	53	58	Pass
0.8866	87	51	58	Pass
0.9175	84	50	59	Pass
0.9483	81	46	56	Pass
0.9792	78	46	58	Pass
1.0100	72	44	61	Pass
1.0409	68	43	63	Pass
1.0717	65	39	60	Pass
1.1025	60	34	56	Pass
1.1334	58	32	55	Pass
1.1642	56	31	55	Pass
1.1951	54	29	53	Pass
1.2259	48	27	56	Pass
1.2568	47	26	55	Pass
1.2876	43	26	60	Pass
1.3185	40	23	57	Pass
1.3493	38	23	60	Pass
1.3802	36	22	61	Pass
1.4110	35	21	60	Pass
1.4418	34	20	58	Pass
1.4727	31	19	61	Pass
1.5035	28	18	64	Pass
1.5344	26	17	65	Pass
1.5652	25	16	64	Pass
1.5961	23	15	65	Pass
1.6269	23	15	65	Pass
1.6578	23	13	56	Pass
1.6886	21	13	61	Pass
1.7195	20	13	65	Pass
1.7503	18	13	72	Pass

1.7812	17	13	76	Pass
1.8120	17	13	76	Pass
1.8428	17	13	76	Pass
1.8737	17	13	76	Pass
1.9045	17	12	70	Pass
1.9354	17	12	70	Pass
1.9662	17	12	70	Pass
1.9971	16	12	75	Pass
2.0279	15	11	73	Pass
2.0588	15	11	73	Pass
2.0896	15	11	73	Pass
2.1205	15	9	60	Pass
2.1513	15	9	60	Pass
2.1821	14	8	57	Pass
2.2130	14	8	57	Pass
2.2438	12	8	66	Pass
2.2747	12	8	66	Pass
2.3055	10	8	80	Pass
2.3364	10	7	70	Pass
2.3672	9	7	77	Pass
2.3981	9	7	77	Pass
2.4289	9	7	77	Pass
2.4598	8	7	87	Pass
2.4906	8	7	87	Pass
2.5215	8	7	87	Pass
2.5523	8	7	87	Pass
2.5831	8	7	87	Pass
2.6140	8	7	87	Pass
2.6448	8	7	87	Pass
2.6757	7	7	100	Pass
2.7065	7	7	100	Pass
2.7374	7	7	100	Pass
2.7682	7	6	85	Pass
2.7991	6	6	100	Pass
2.8299	6	6	100	Pass
2.8608	6	5	83	Pass
2.8916	6	5	83	Pass
2.9224	6	5	83	Pass
2.9533	6	5	83	Pass
2.9841	6	5	83	Pass
3.0150	6	4	66	Pass
3.0458	6	3	50	Pass
3.0767	6	3	50	Pass
3.1075	6	3	50	Pass
3.1384	6	3	50	Pass
3.1692	6	3	50	Pass
3.2001	4	3	75	Pass

Water Quality

Model Default Modifications

Total of 0 changes have been made.

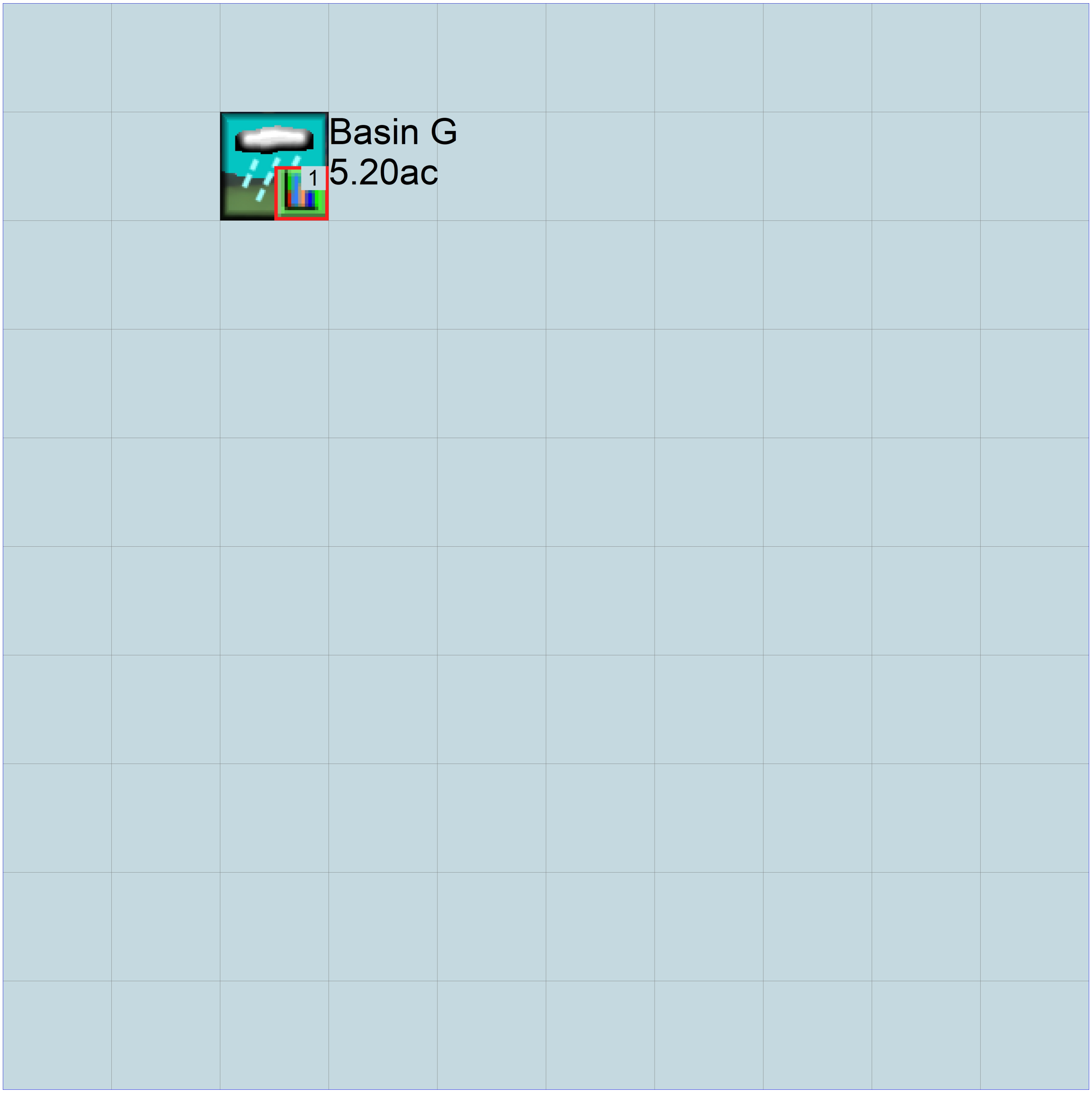
PERLND Changes

No PERLND changes have been made.

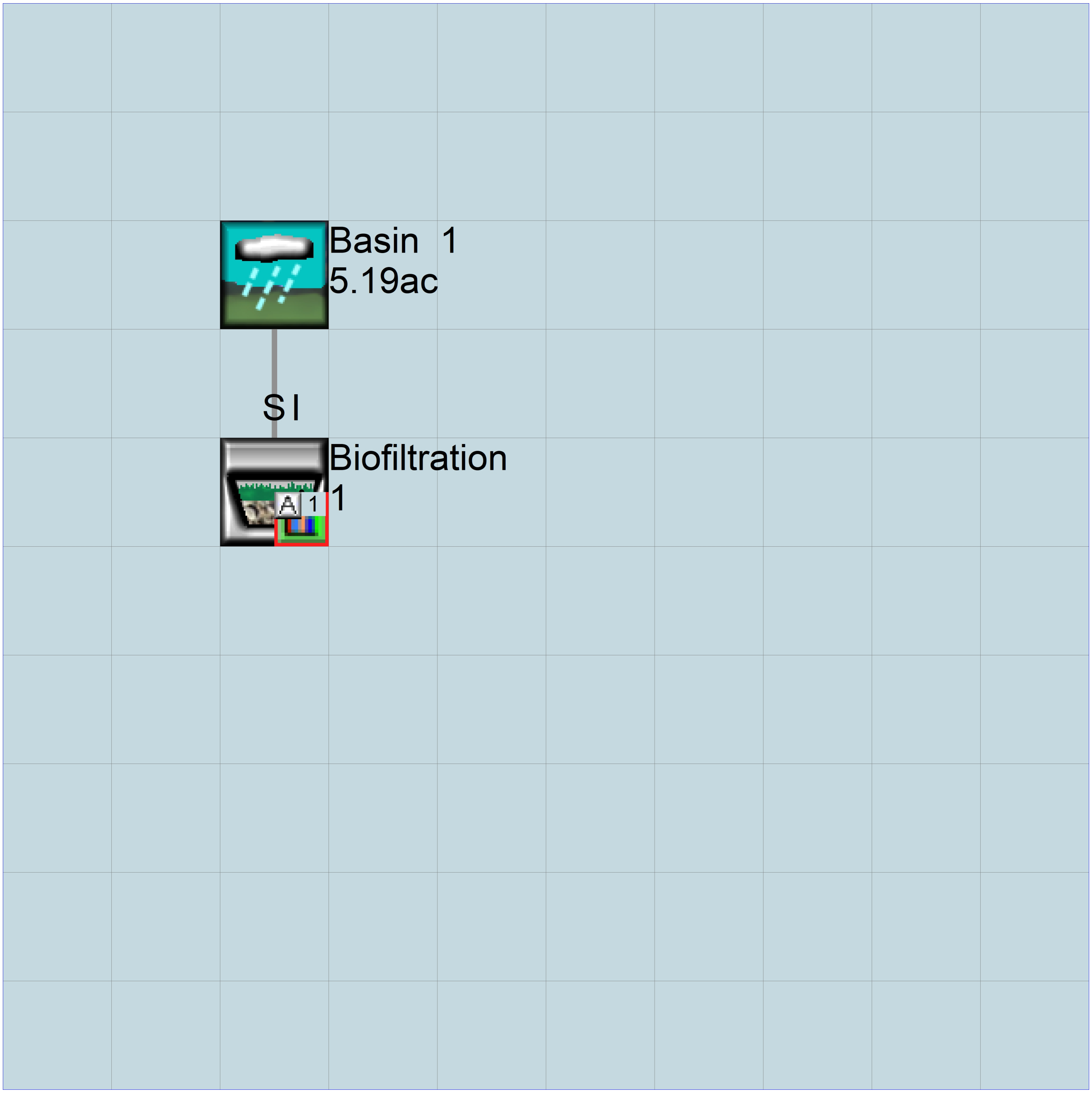
IMPLND Changes

No IMPLND changes have been made.

Appendix
Predeveloped Schematic



Mitigated Schematic



Predeveloped UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1959 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   Basin G-ALT.wdm
MESSU      25   PreBasin G-ALT.MES
           27   PreBasin G-ALT.L61
           28   PreBasin G-ALT.L62
           30   POCBasin G-ALT1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:60
      PERLND      30
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Basin G                   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           ***
   30      D,NatVeg,Steep         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 ***
   30         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  *********
   30         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 ***
   30         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
   30             0       2.7      0.02        75      0.15       2.5     0.915
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   30             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 ***
   30             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  ***
   30       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  ***
   30       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
   30             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           ***
  END GEN-INFO
  *** Section IWATER***

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

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
  END PRINT-INFO

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

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

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

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

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin G***
PERLND  30                         5.2     COPY   501     12
PERLND  30                         5.2     COPY   501     13

******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


END MASS-LINK

END RUN
```

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1959 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   Basin G-ALT.wdm
MESSU      25   MitBasin G-ALT.MES
           27   MitBasin G-ALT.L61
           28   MitBasin G-ALT.L62
           30   POCBasin G-ALT1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:60
      PERLND      46
      PERLND      48
      IMPLND       1
      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 iltration  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           ***
   46      D,Urban,Flat           1    1    1    1   27    0
   48      D,Urban,Steep          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 ***
   46         0    0    1    0    0    0    0    0    0    0    0    0
   48         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  *********
   46         0    0    4    0    0    0    0    0    0    0    0    0    1    9
   48         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 ***
   46         0    1    1    1    0    0    0    0    1    1    0
   48         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
   46              0       3.8      0.03        50      0.05       2.5     0.915
   48              0       3.2      0.02        50      0.15       2.5     0.915
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   46              0         0         2         2         0      0.05      0.05
   48              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 ***
   46              0       0.6      0.03         1       0.3         0
   48              0       0.6      0.03         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  ***
   46       0.6  0.6  0.6  0.6  0.7  0.7  0.7  0.7  0.7  0.6  0.6  0.6
   48       0.6  0.6  0.6  0.6  0.7  0.7  0.7  0.7  0.7  0.6  0.6  0.6
  END MON-LZETPARM
  MON-INTERCEP
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   46       0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1
   48       0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  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
   46              0         0      0.15         0         1      0.05         0
   48              0         0      0.15         0         1      0.05         0
  END PWAT-STATE1

END PERLND

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

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

```
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
    1         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     ***
    1         0    0    0    0    1
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    1            100      0.05     0.011       0.1
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    1             0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    1             0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin  1***
PERLND  46                        0.68     RCHRES   1      2
PERLND  46                        0.68     RCHRES   1      3
PERLND  48                        4.49     RCHRES   1      2
PERLND  48                        4.49     RCHRES   1      3
IMPLND   1                        0.02     RCHRES   1      5

******Routing******
PERLND  46                        0.68     COPY     1     12
PERLND  48                        4.49     COPY     1     12
IMPLND   1                        0.02     COPY     1     15
PERLND  46                        0.68     COPY     1     13
PERLND  48                        4.49     COPY     1     13
RCHRES   1                           1     RCHRES   2      8
RCHRES   2                           1     COPY   501     16
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 iltratio-009    2    1    1    1   28    0    1
    2     Biofiltration  1-008    1    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  0  0  0       0  0  0  0  0       2  2  2  2  2
    2        0  1  0  0    4  0  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       0.0       0.0       0.0
    2             2      0.01       0.0       0.0       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  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    2           0         4.0  0.0  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
   69    4
     Depth      Area    Volume  Outflow1 Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.114101  0.000000  0.000000
  0.063187  0.113781  0.000889  0.000000
  0.126374  0.112559  0.001792  0.000000
  0.189560  0.111344  0.002711  0.000000
  0.252747  0.110135  0.003645  0.000000
  0.315934  0.108932  0.004594  0.000000
  0.379121  0.107737  0.005559  0.000000
  0.442308  0.106547  0.006540  0.000000
  0.505495  0.105365  0.007536  0.000000
  0.568681  0.104189  0.008548  0.000000
  0.631868  0.103019  0.009576  0.000000
  0.695055  0.101857  0.010620  0.000000
  0.758242  0.100701  0.011680  0.000000
  0.821429  0.099551  0.012757  0.000000
  0.884615  0.098408  0.013850  0.000000
  0.947802  0.097272  0.014959  0.000000
  1.010989  0.096142  0.016086  0.000000
  1.074176  0.095019  0.017229  0.000000
```

1.137363	0.093902	0.018389	0.000000
1.200549	0.092792	0.019567	0.000000
1.263736	0.091689	0.020761	0.000000
1.326923	0.090592	0.021973	0.000000
1.390110	0.089502	0.023202	0.000000
1.453297	0.088418	0.024449	0.005079
1.516484	0.087341	0.025714	0.007619
1.579670	0.086271	0.026997	0.011273
1.642857	0.085207	0.028297	0.013100
1.706044	0.084150	0.029616	0.015801
1.769231	0.083099	0.030953	0.017151
1.832418	0.082055	0.032308	0.019319
1.895604	0.081018	0.033682	0.020403
1.958791	0.079987	0.035074	0.022253
2.021978	0.078963	0.036485	0.023178
2.085165	0.077945	0.037915	0.024819
2.148352	0.076934	0.039364	0.025640
2.211538	0.075930	0.040832	0.027131
2.274725	0.074932	0.042319	0.027877
2.337912	0.073941	0.043825	0.029255
2.401099	0.072957	0.045351	0.029944
2.464286	0.071979	0.046897	0.031231
2.527473	0.071007	0.048462	0.031874
2.590659	0.070042	0.050048	0.033086
2.653846	0.069084	0.051653	0.033692
2.717033	0.068133	0.053278	0.034841
2.780220	0.067188	0.055554	0.035416
2.843407	0.066249	0.057859	0.036511
2.906593	0.065317	0.060191	0.037059
2.969780	0.064392	0.062553	0.038107
3.032967	0.063474	0.064943	0.038631
3.096154	0.062562	0.067361	0.039638
3.159341	0.061656	0.069809	0.040142
3.222527	0.060757	0.072286	0.041112
3.285714	0.059865	0.074793	0.041597
3.348901	0.058980	0.077328	0.041901
3.412088	0.058101	0.079894	0.042053
3.475275	0.057228	0.082490	0.042821
3.538462	0.056362	0.085115	0.043206
3.601648	0.055503	0.087771	0.044637
3.664835	0.054651	0.090457	0.046608
3.728022	0.053805	0.093174	0.048788
3.791209	0.052965	0.095921	0.051019
3.854396	0.052132	0.098700	0.053229
3.917582	0.051306	0.101509	0.055388
3.980769	0.050487	0.104350	0.057485
4.043956	0.049674	0.107222	0.059520
4.107143	0.048867	0.110126	0.061496
4.170330	0.048067	0.113062	0.063422
4.233516	0.047274	0.116029	0.065326
4.250000	0.046488	0.126901	0.122116

END FTABLE 2

FTABLE 1

25 5

Depth (ft)	Area (acres)	Volume (acre-ft)	Outflow1 (cfs)	Outflow2 (cfs)	Velocity (ft/sec)	Travel Time*** (Minutes)***
0.000000	0.046488	0.000000	0.000000	0.000000		
0.063187	0.115332	0.007249	0.000000	0.122116		
0.126374	0.116569	0.014575	0.000000	0.122116		
0.189560	0.117812	0.021980	0.000000	0.122116		
0.252747	0.119063	0.029464	0.000000	0.122116		
0.315934	0.120320	0.037027	0.000000	0.122116		
0.379121	0.121583	0.044669	0.000000	0.122116		
0.442308	0.122853	0.052392	0.000000	0.122116		
0.505495	0.124130	0.060195	0.000000	0.122116		
0.568681	0.125413	0.068079	0.000000	0.122116		
0.631868	0.126703	0.076044	0.000000	0.122116		
0.695055	0.127999	0.084091	0.000000	0.122116		
0.758242	0.129303	0.092220	0.001669	0.122116		
0.821429	0.130612	0.100431	0.042592	0.122116		

```
  0.884615  0.131929  0.108726  0.110195  0.122116
  0.947802  0.133251  0.117104  0.196275  0.122116
  1.010989  0.134581  0.125566  0.315587  0.122116
  1.074176  0.135917  0.134112  0.921830  0.122116
  1.137363  0.137260  0.142742  1.897755  0.122116
  1.200549  0.138609  0.151458  3.131311  0.122116
  1.263736  0.139965  0.160259  4.571741  0.122116
  1.326923  0.141327  0.169146  6.183909  0.122116
  1.390110  0.142696  0.178119  7.938132  0.122116
  1.453297  0.144072  0.187179  9.806422  0.122116
  1.500000  0.145093  0.193932  11.76090  0.122116
  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     22 IRRG     ENGL    0.7       SAME PERLND  46     EXTNL  SURLI
WDM     22 IRRG     ENGL    0.7       SAME PERLND  48     EXTNL  SURLI
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   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        16
RCHRES     ROFLOW                                     COPY            INPUT  MEAN
  END MASS-LINK    16

  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:	Basin H-ALT
Site Name:	VETERANS
Site Address:	
City:	CARLSBAD
Report Date:	3/1/2022
Gage:	OCEANSID
Data Start:	10/01/1959
Data End:	09/30/2004
Timestep:	Hourly
Precip Scale:	1.000
Version Date:	2021/06/28

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 H

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
D,NatVeg,Steep	10.6
Pervious Total	10.6
Impervious Land Use	acre
Impervious Total	0
Basin Total	10.6

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Basin H

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
D,Urban,Flat	1.18
D,Urban,Steep	8.36
Pervious Total	9.54
Impervious Land Use	acre
IMPERVIOUS-FLAT	1.07
Impervious Total	1.07
Basin Total	10.61

Element Flows To:

Surface	Interflow	Groundwater
Surface iltration 1	Surface iltration 1	

Routing Elements
Predeveloped Routing

Mitigated Routing

Biofiltration 1

Bottom Length:	68.00 ft.
Bottom Width:	68.00 ft.
Material thickness of first layer:	0.25
Material type for first layer:	Mulch
Material thickness of second layer:	3
Material type for second layer:	ESM
Material thickness of third layer:	2.5
Material type for third layer:	GRAVEL
Underdrain used	
Underdrain Diameter (feet):	0.5
Orifice Diameter (in.):	2.5
Offset (in.):	3
Flow Through Underdrain (ac-ft.):	117.435
Total Outflow (ac-ft.):	142.41
Percent Through Underdrain:	82.46

Discharge Structure

Riser Height:	1 ft.
Riser Diameter:	36 in.
Notch Type:	Rectangular
Notch Width:	0.670 ft.
Notch Height:	0.250 ft.

Element Flows To:
Outlet 1 Outlet 2

Biofilter Hydraulic Table

Stage(feet)	**Area(ac.)**	**Volume(ac-ft.)**	**Discharge(cfs)**	**Infilt(cfs)**
0.0000	0.2006	0.0000	0.0000	0.0000
0.0797	0.2003	0.0026	0.0000	0.0000
0.1593	0.1988	0.0051	0.0000	0.0000
0.2390	0.1974	0.0077	0.0000	0.0000
0.3187	0.1959	0.0104	0.0000	0.0000
0.3984	0.1944	0.0130	0.0000	0.0000
0.4780	0.1929	0.0157	0.0000	0.0000
0.5577	0.1915	0.0184	0.0000	0.0000
0.6374	0.1900	0.0212	0.0000	0.0000
0.7170	0.1885	0.0239	0.0000	0.0000
0.7967	0.1871	0.0267	0.0000	0.0000
0.8764	0.1856	0.0296	0.0000	0.0000
0.9560	0.1842	0.0324	0.0000	0.0000
1.0357	0.1828	0.0353	0.0000	0.0000
1.1154	0.1813	0.0382	0.0000	0.0000
1.1951	0.1799	0.0411	0.0000	0.0000
1.2747	0.1785	0.0441	0.0000	0.0000
1.3544	0.1771	0.0471	0.0000	0.0000
1.4341	0.1757	0.0501	0.0000	0.0000
1.5137	0.1742	0.0532	0.0000	0.0000
1.5934	0.1728	0.0563	0.0000	0.0000
1.6731	0.1715	0.0594	0.0000	0.0000
1.7527	0.1701	0.0625	0.0000	0.0000
1.8324	0.1687	0.0657	0.0000	0.0000
1.9121	0.1673	0.0689	0.0000	0.0000
1.9918	0.1659	0.0721	0.0000	0.0000

2.0714	0.1646	0.0754	0.0000	0.0000
2.1511	0.1632	0.0787	0.0000	0.0000
2.2308	0.1618	0.0820	0.0000	0.0000
2.3104	0.1605	0.0853	0.0000	0.0000
2.3901	0.1591	0.0887	0.0000	0.0000
2.4698	0.1578	0.0921	0.0000	0.0000
2.5495	0.1565	0.0956	0.0000	0.0000
2.6291	0.1551	0.0990	0.0000	0.0000
2.7088	0.1538	0.1025	0.0000	0.0000
2.7885	0.1525	0.1061	0.0000	0.0000
2.8681	0.1512	0.1096	0.0000	0.0000
2.9478	0.1498	0.1132	0.0000	0.0000
3.0275	0.1485	0.1169	0.0000	0.0000
3.1071	0.1472	0.1205	0.0000	0.0000
3.1868	0.1459	0.1242	0.0000	0.0000
3.2665	0.1447	0.1294	0.0000	0.0000
3.3462	0.1434	0.1346	0.0000	0.0000
3.4258	0.1421	0.1398	0.0000	0.0000
3.5055	0.1408	0.1451	0.0000	0.0000
3.5852	0.1396	0.1504	0.0000	0.0000
3.6648	0.1383	0.1558	0.0000	0.0000
3.7445	0.1370	0.1612	0.0000	0.0000
3.8242	0.1358	0.1667	0.0000	0.0000
3.9038	0.1345	0.1722	0.0000	0.0000
3.9835	0.1333	0.1777	0.0000	0.0000
4.0632	0.1320	0.1833	0.0000	0.0000
4.1429	0.1308	0.1890	0.0000	0.0000
4.2225	0.1296	0.1947	0.0000	0.0000
4.3022	0.1284	0.2004	0.0000	0.0000
4.3819	0.1272	0.2062	0.0000	0.0000
4.4615	0.1259	0.2120	0.0000	0.0000
4.5412	0.1247	0.2179	0.0000	0.0000
4.6209	0.1235	0.2238	0.0000	0.0000
4.7005	0.1223	0.2298	0.0000	0.0000
4.7802	0.1211	0.2358	0.0000	0.0000
4.8599	0.1200	0.2419	0.0000	0.0000
4.9396	0.1188	0.2480	0.0000	0.0000
5.0192	0.1176	0.2542	0.0000	0.0000
5.0989	0.1164	0.2604	0.0000	0.0000
5.1786	0.1153	0.2666	0.0000	0.0000
5.2582	0.1141	0.2729	0.0000	0.0000
5.3379	0.1130	0.2793	0.0000	0.0000
5.4176	0.1118	0.2857	0.0000	0.0000
5.4973	0.1107	0.2921	0.0000	0.0000
5.5769	0.1095	0.2986	0.0000	0.0000
5.6566	0.1084	0.3052	0.0000	0.0000
5.7363	0.1073	0.3118	0.0000	0.0000
5.7500	0.1062	0.3129	0.0000	0.0000

Biofilter Hydraulic Table

Stage(feet)	**Area(ac.)**	**Volume(ac-ft.)**	**Discharge(cfs)**	**To Amended(cfs)**	**Infilt(cfs)**
5.7500	0.2006	0.3129	0.0000	0.3978	0.0000
5.8297	0.2021	0.3290	0.0000	0.3978	0.0000
5.9093	0.2036	0.3451	0.0000	0.3978	0.0000
5.9890	0.2051	0.3614	0.0000	0.3978	0.0000
6.0687	0.2066	0.3778	0.0000	0.3978	0.0000
6.1484	0.2082	0.3944	0.0000	0.3978	0.0000
6.2280	0.2097	0.4110	0.0000	0.3978	0.0000

6.3077	0.2112	0.4278	0.0000	0.3978	0.0000
6.3874	0.2128	0.4447	0.0000	0.3978	0.0000
6.4670	0.2143	0.4617	0.0000	0.3978	0.0000
6.5467	0.2158	0.4788	0.0000	0.3978	0.0000
6.6264	0.2174	0.4961	0.0000	0.3978	0.0000
6.7060	0.2190	0.5134	0.0000	0.3978	0.0000
6.7857	0.2205	0.5309	0.0000	0.3978	0.0000
6.8654	0.2221	0.5486	0.0000	0.3978	0.0000
6.9451	0.2237	0.5663	0.0000	0.3978	0.0000
7.0247	0.2252	0.5842	0.0000	0.3978	0.0000
7.1044	0.2268	0.6022	0.0000	0.3978	0.0000
7.1841	0.2284	0.6204	0.0000	0.3978	0.0000
7.2500	0.2297	0.6355	0.0142	0.3978	0.0000

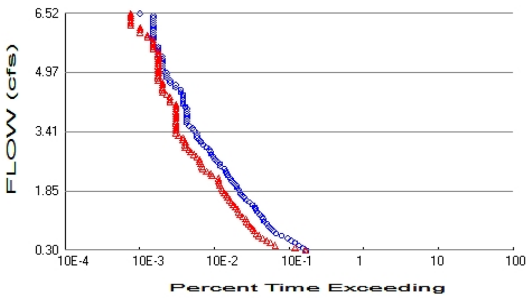
Surface iltration 1

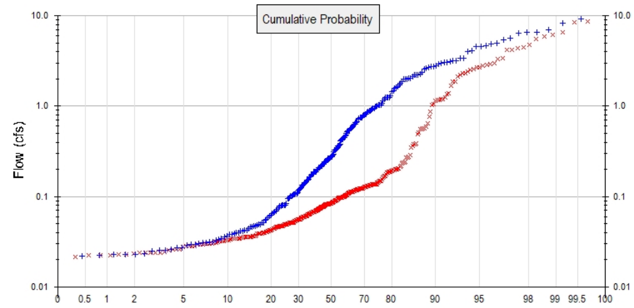
Element Flows To:

Outlet 1	Outlet 2
	Biofiltration 1

Analysis Results

POC 1





+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 10.6
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 9.54
Total Impervious Area: 1.07

Flow Frequency Method: Cunnane

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	2.982725
5 year	4.958308
10 year	6.523196
25 year	8.293084

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	2.315902
5 year	4.308723
10 year	6.033859
25 year	8.524385

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.2983	669	653	97	Pass
0.3612	605	477	78	Pass
0.4240	534	259	48	Pass
0.4869	473	222	46	Pass
0.5498	423	198	46	Pass
0.6127	376	175	46	Pass
0.6755	314	156	49	Pass
0.7384	264	144	54	Pass
0.8013	243	135	55	Pass
0.8642	227	129	56	Pass
0.9271	209	121	57	Pass
0.9899	200	113	56	Pass
1.0528	183	107	58	Pass
1.1157	177	104	58	Pass
1.1786	172	95	55	Pass
1.2414	158	86	54	Pass
1.3043	149	83	55	Pass
1.3672	142	81	57	Pass
1.4301	137	75	54	Pass
1.4930	127	71	55	Pass
1.5558	117	67	57	Pass
1.6187	106	63	59	Pass
1.6816	98	60	61	Pass
1.7445	91	58	63	Pass
1.8073	87	54	62	Pass
1.8702	84	51	60	Pass
1.9331	81	49	60	Pass
1.9960	78	47	60	Pass
2.0589	72	46	63	Pass
2.1217	68	45	66	Pass
2.1846	65	45	69	Pass
2.2475	60	37	61	Pass
2.3104	58	35	60	Pass
2.3732	56	31	55	Pass
2.4361	54	28	51	Pass
2.4990	48	27	56	Pass
2.5619	47	26	55	Pass
2.6248	43	25	58	Pass
2.6876	40	25	62	Pass
2.7505	38	23	60	Pass
2.8134	36	21	58	Pass
2.8763	35	19	54	Pass
2.9391	34	18	52	Pass
3.0020	31	16	51	Pass
3.0649	28	16	57	Pass
3.1278	26	16	61	Pass
3.1907	25	15	60	Pass
3.2535	23	15	65	Pass
3.3164	23	13	56	Pass
3.3793	23	12	52	Pass
3.4422	21	12	57	Pass
3.5051	20	12	60	Pass
3.5679	18	12	66	Pass

3.6308	17	12	70	Pass
3.6937	17	12	70	Pass
3.7566	17	12	70	Pass
3.8194	17	12	70	Pass
3.8823	17	12	70	Pass
3.9452	17	12	70	Pass
4.0081	17	12	70	Pass
4.0710	16	12	75	Pass
4.1338	15	12	80	Pass
4.1967	15	10	66	Pass
4.2596	15	10	66	Pass
4.3225	15	10	66	Pass
4.3853	15	9	60	Pass
4.4482	14	8	57	Pass
4.5111	14	8	57	Pass
4.5740	12	8	66	Pass
4.6369	12	8	66	Pass
4.6997	10	8	80	Pass
4.7626	10	7	70	Pass
4.8255	9	7	77	Pass
4.8884	9	7	77	Pass
4.9512	9	7	77	Pass
5.0141	8	7	87	Pass
5.0770	8	7	87	Pass
5.1399	8	7	87	Pass
5.2028	8	7	87	Pass
5.2656	8	7	87	Pass
5.3285	8	7	87	Pass
5.3914	8	7	87	Pass
5.4543	7	7	100	Pass
5.5171	7	7	100	Pass
5.5800	7	6	85	Pass
5.6429	7	6	85	Pass
5.7058	6	6	100	Pass
5.7687	6	6	100	Pass
5.8315	6	6	100	Pass
5.8944	6	5	83	Pass
5.9573	6	5	83	Pass
6.0202	6	4	66	Pass
6.0830	6	4	66	Pass
6.1459	6	4	66	Pass
6.2088	6	3	50	Pass
6.2717	6	3	50	Pass
6.3346	6	3	50	Pass
6.3974	6	3	50	Pass
6.4603	6	3	50	Pass
6.5232	4	3	75	Pass

Water Quality

Model Default Modifications

Total of 0 changes have been made.

PERLND Changes

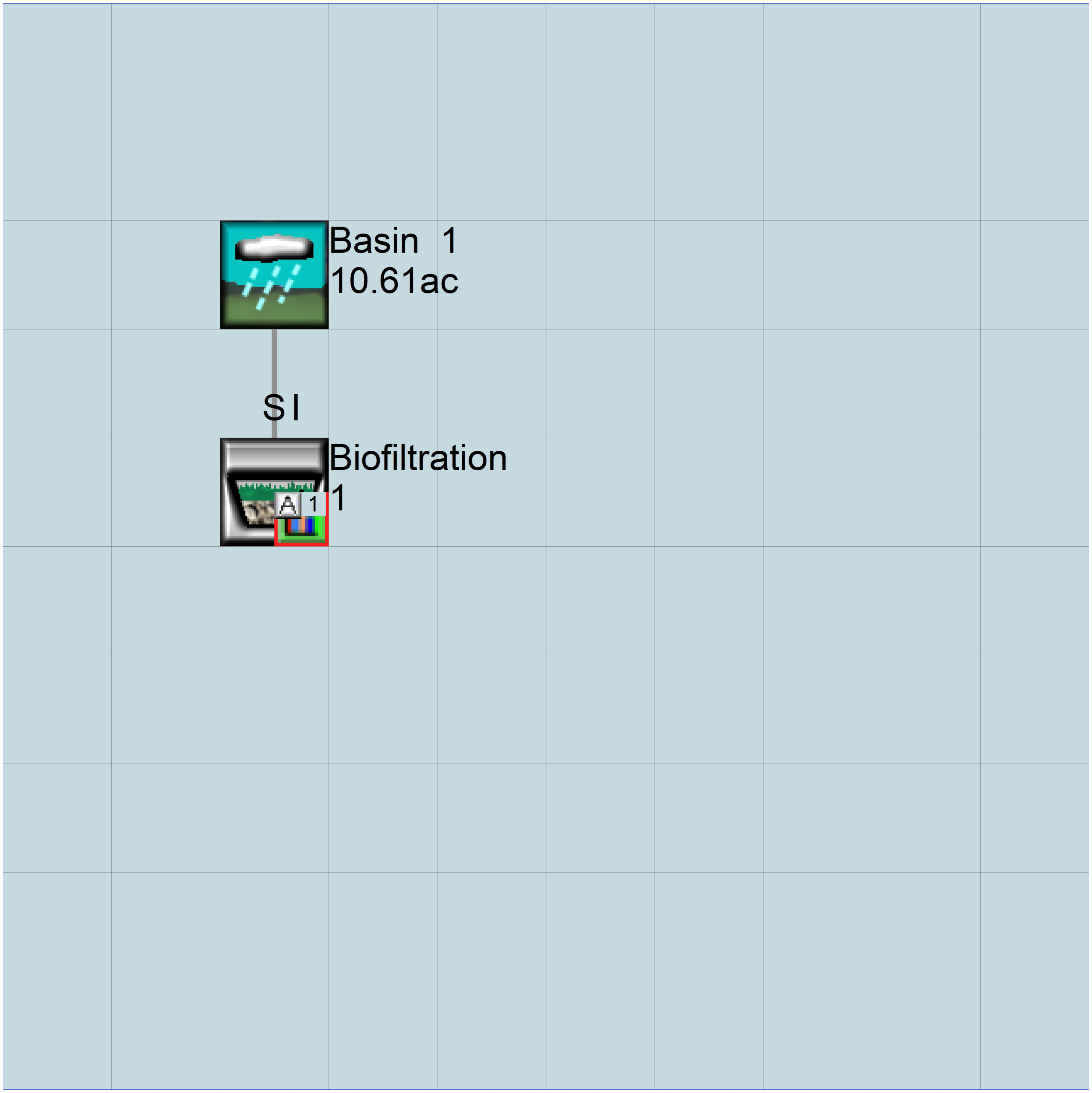
No PERLND changes have been made.

IMPLND Changes

No IMPLND changes have been made.

Appendix
Predeveloped Schematic

Mitigated Schematic



Predeveloped UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1959 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   Basin H-ALT.wdm
MESSU      25   PreBasin H-ALT.MES
           27   PreBasin H-ALT.L61
           28   PreBasin H-ALT.L62
           30   POCBasin H-ALT1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:60
      PERLND      30
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Basin H                     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           ***
   30      D,NatVeg,Steep         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 ***
   30         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  *********
   30         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 ***
   30         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
   30             0       2.7      0.02        75      0.15       2.5     0.915
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   30             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 ***
   30             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  ***
   30       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  ***
   30       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
   30             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           ***
  END GEN-INFO
  *** Section IWATER***

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

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
  END PRINT-INFO

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

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

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

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

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin H***
PERLND  30                        10.6     COPY   501     12
PERLND  30                        10.6     COPY   501     13

******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


END MASS-LINK

END RUN
```

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1959 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   Basin H-ALT.wdm
MESSU      25   MitBasin H-ALT.MES
           27   MitBasin H-ALT.L61
           28   MitBasin H-ALT.L62
           30   POCBasin H-ALT1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:60
      PERLND      46
      PERLND      48
      IMPLND       1
      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 iltration  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           ***
   46      D,Urban,Flat          1    1    1    1   27    0
   48      D,Urban,Steep         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 ***
   46         0    0    1    0    0    0    0    0    0    0    0    0
   48         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  *********
   46         0    0    4    0    0    0    0    0    0    0    0    0    1    9
   48         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 ***
   46         0    1    1    1    0    0    0    0    1    1    0
   48         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
   46              0       3.8      0.03        50      0.05       2.5     0.915
   48              0       3.2      0.02        50      0.15       2.5     0.915
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   46              0         0         2         2         0      0.05      0.05
   48              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 ***
   46              0       0.6      0.03         1       0.3         0
   48              0       0.6      0.03         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  ***
   46       0.6  0.6  0.6  0.6  0.7  0.7  0.7  0.7  0.7  0.6  0.6  0.6
   48       0.6  0.6  0.6  0.6  0.7  0.7  0.7  0.7  0.7  0.6  0.6  0.6
  END MON-LZETPARM
  MON-INTERCEP
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   46       0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1
   48       0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  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
   46              0         0      0.15         0         1      0.05         0
   48              0         0      0.15         0         1      0.05         0
  END PWAT-STATE1

END PERLND

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

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

```
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
    1         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     ***
    1         0    0    0    0    1
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    1            100      0.05     0.011       0.1
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    1             0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    1             0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin  1***
PERLND  46                        1.18     RCHRES   1      2
PERLND  46                        1.18     RCHRES   1      3
PERLND  48                        8.36     RCHRES   1      2
PERLND  48                        8.36     RCHRES   1      3
IMPLND   1                        1.07     RCHRES   1      5

******Routing******
PERLND  46                        1.18     COPY     1     12
PERLND  48                        8.36     COPY     1     12
IMPLND   1                        1.07     COPY     1     15
PERLND  46                        1.18     COPY     1     13
PERLND  48                        8.36     COPY     1     13
RCHRES   1                           1     RCHRES   2      8
RCHRES   2                           1     COPY   501     16
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 iltratio-005    2    1    1    1   28    0    1
   2     Biofiltration  1-004    1    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  0  0  0       0  0  0  0  0       2  2  2  2  2
   2        0  1  0  0    4  0  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       0.0       0.0       0.0
   2             2      0.01       0.0       0.0       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  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
   2           0          4.0  0.0  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    4
    Depth      Area    Volume  Outflow1 Velocity  Travel Time***
     (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
 0.000000  0.200600  0.000000  0.000000
 0.079670  0.200342  0.002551  0.000000
 0.159341  0.198847  0.005128  0.000000
 0.239011  0.197358  0.007732  0.000000
 0.318681  0.195874  0.010364  0.000000
 0.398352  0.194395  0.013023  0.000000
 0.478022  0.192922  0.015709  0.000000
 0.557692  0.191454  0.018423  0.000000
 0.637363  0.189991  0.021164  0.000000
 0.717033  0.188533  0.023933  0.000000
 0.796703  0.187081  0.026730  0.000000
 0.876374  0.185634  0.029555  0.000000
 0.956044  0.184192  0.032408  0.000000
 1.035714  0.182755  0.035290  0.000000
 1.115385  0.181323  0.038200  0.000000
 1.195055  0.179897  0.041138  0.000000
 1.274725  0.178476  0.044105  0.000000
 1.354396  0.177061  0.047100  0.000000
```

1.434066	0.175650	0.050125	0.000000
1.513736	0.174245	0.053179	0.014158
1.593407	0.172845	0.056261	0.021237
1.673077	0.171450	0.059373	0.032782
1.752747	0.170061	0.062515	0.038554
1.832418	0.168676	0.065685	0.047232
1.912088	0.167297	0.068886	0.051572
1.991758	0.165924	0.072116	0.058519
2.071429	0.164555	0.075376	0.061993
2.151099	0.163192	0.078666	0.067890
2.230769	0.161834	0.081987	0.070838
2.310440	0.160481	0.085337	0.076046
2.390110	0.159134	0.088718	0.078650
2.469780	0.157791	0.092130	0.083368
2.549451	0.156454	0.095572	0.085727
2.629121	0.155122	0.099045	0.090074
2.708791	0.153796	0.102549	0.092248
2.788462	0.152475	0.106083	0.096301
2.868132	0.151159	0.109649	0.098328
2.947802	0.149848	0.113246	0.102141
3.027473	0.148542	0.116875	0.104048
3.107143	0.147242	0.120535	0.107659
3.186813	0.145947	0.124227	0.109465
3.266484	0.144657	0.129378	0.112903
3.346154	0.143372	0.134573	0.114623
3.425824	0.142093	0.139812	0.117911
3.505495	0.140819	0.145096	0.119556
3.585165	0.139550	0.150424	0.122713
3.664835	0.138287	0.155797	0.124291
3.744505	0.137028	0.161215	0.127332
3.824176	0.135775	0.166679	0.128852
3.903846	0.134527	0.172187	0.131787
3.983516	0.133285	0.177742	0.133254
4.063187	0.132047	0.183342	0.136095
4.142857	0.130815	0.188987	0.137515
4.222527	0.129588	0.194679	0.139712
4.302198	0.128367	0.200417	0.144162
4.381868	0.127150	0.206201	0.150169
4.461538	0.125939	0.212032	0.156778
4.541209	0.124733	0.217910	0.163536
4.620879	0.123533	0.223834	0.170233
4.700549	0.122337	0.229806	0.176779
4.780220	0.121147	0.235825	0.183143
4.859890	0.119962	0.241891	0.189318
4.939560	0.118782	0.248005	0.195309
5.019231	0.117608	0.254166	0.201128
5.098901	0.116439	0.260376	0.206787
5.178571	0.115275	0.266633	0.212297
5.258242	0.114116	0.272939	0.217669
5.337912	0.112963	0.279293	0.222915
5.417582	0.111815	0.285696	0.228044
5.497253	0.110672	0.292148	0.233066
5.576923	0.109534	0.298649	0.237991
5.656593	0.108402	0.305199	0.242837
5.736264	0.107274	0.311798	0.247673
5.750000	0.106152	0.345814	0.397759

END FTABLE 2
FTABLE 1
20 5

Depth (ft)	Area (acres)	Volume (acre-ft)	Outflow1 (cfs)	Outflow2 (cfs)	Velocity (ft/sec)	Travel Time*** (Minutes)***
0.000000	0.106152	0.000000	0.000000	0.000000		
0.079670	0.202100	0.016042	0.000000	0.397759		
0.159341	0.203606	0.032203	0.000000	0.397759		
0.239011	0.205117	0.048485	0.000000	0.397759		
0.318681	0.206633	0.064887	0.000000	0.397759		
0.398352	0.208155	0.081410	0.000000	0.397759		
0.478022	0.209682	0.098054	0.000000	0.397759		
0.557692	0.211214	0.114821	0.000000	0.397759		
0.637363	0.212751	0.131710	0.000000	0.397759		

```
  0.717033  0.214294  0.148721  0.000000  0.397759
  0.796703  0.215841  0.165856  0.022519  0.397759
  0.876374  0.217394  0.183114  0.100231  0.397759
  0.956044  0.218953  0.200496  0.208669  0.397759
  1.035714  0.220516  0.218002  0.493813  0.397759
  1.115385  0.222085  0.235633  1.525598  0.397759
  1.195055  0.223659  0.253389  3.015257  0.397759
  1.274725  0.225238  0.271271  4.840657  0.397759
  1.354396  0.226823  0.289279  6.930820  0.397759
  1.434066  0.228412  0.307413  9.227398  0.397759
  1.500000  0.229732  0.322517  11.67452  0.397759
  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     22 IRRG     ENGL    0.7       SAME PERLND  46     EXTNL  SURLI
WDM     22 IRRG     ENGL    0.7       SAME PERLND  48     EXTNL  SURLI
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   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        16
RCHRES     ROFLOW                             COPY            INPUT  MEAN
  END MASS-LINK   16

  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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Local (360)943-0304

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SDHM 3.1

PROJECT REPORT

General Model Information

Project Name:	Basin I
Site Name:	VETERANS
Site Address:	
City:	CARLSBAD
Report Date:	1/17/2022
Gage:	OCEANSID
Data Start:	10/01/1959
Data End:	09/30/2004
Timestep:	Hourly
Precip Scale:	1.000
Version Date:	2021/06/28

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 I

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
D,NatVeg,Steep	0.29
Pervious Total	0.29
Impervious Land Use	acre
Impervious Total	0
Basin Total	0.29

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Basin I

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
D,Urban,Flat	0.27
Pervious Total	0.27
Impervious Land Use	acre
IMPERVIOUS-FLAT	0.02
Impervious Total	0.02
Basin Total	0.29

Element Flows To:

Surface	Interflow	Groundwater
Surface iltration 1	Surface iltration 1	

Routing Elements
Predeveloped Routing

Mitigated Routing

Biofiltration 1

Bottom Length:	10.00 ft.
Bottom Width:	10.00 ft.
Material thickness of first layer:	0.25
Material type for first layer:	Mulch
Material thickness of second layer:	2
Material type for second layer:	ESM
Material thickness of third layer:	1.5
Material type for third layer:	GRAVEL
Underdrain used	
Underdrain Diameter (feet):	0.5
Orifice Diameter (in.):	0.5
Offset (in.):	3
Flow Through Underdrain (ac-ft.):	2.933
Total Outflow (ac-ft.):	3.191
Percent Through Underdrain:	91.91

Discharge Structure

Riser Height:	1 ft.
Riser Diameter:	36 in.
Notch Type:	Rectangular
Notch Width:	0.670 ft.
Notch Height:	0.330 ft.

Element Flows To:
Outlet 1 Outlet 2

Biofilter Hydraulic Table

Stage(feet)	**Area(ac.)**	**Volume(ac-ft.)**	**Discharge(cfs)**	**Infilt(cfs)**
0.0000	0.0159	0.0000	0.0000	0.0000
0.0577	0.0159	0.0000	0.0000	0.0000
0.1154	0.0156	0.0001	0.0000	0.0000
0.1731	0.0153	0.0001	0.0000	0.0000
0.2308	0.0150	0.0002	0.0000	0.0000
0.2885	0.0147	0.0002	0.0000	0.0000
0.3462	0.0144	0.0003	0.0000	0.0000
0.4038	0.0141	0.0003	0.0000	0.0000
0.4615	0.0138	0.0004	0.0000	0.0000
0.5192	0.0136	0.0004	0.0000	0.0000
0.5769	0.0133	0.0005	0.0000	0.0000
0.6346	0.0130	0.0006	0.0000	0.0000
0.6923	0.0127	0.0006	0.0000	0.0000
0.7500	0.0125	0.0007	0.0000	0.0000
0.8077	0.0122	0.0008	0.0000	0.0000
0.8654	0.0120	0.0009	0.0000	0.0000
0.9231	0.0117	0.0009	0.0000	0.0000
0.9808	0.0114	0.0010	0.0000	0.0000
1.0385	0.0112	0.0011	0.0000	0.0000
1.0962	0.0109	0.0012	0.0000	0.0000
1.1538	0.0107	0.0013	0.0000	0.0000
1.2115	0.0104	0.0014	0.0000	0.0000
1.2692	0.0102	0.0015	0.0000	0.0000
1.3269	0.0100	0.0016	0.0000	0.0000
1.3846	0.0097	0.0017	0.0000	0.0000
1.4423	0.0095	0.0018	0.0006	0.0000

1.5000	0.0093	0.0019	0.0009	0.0000
1.5577	0.0090	0.0020	0.0013	0.0000
1.6154	0.0088	0.0021	0.0014	0.0000
1.6731	0.0086	0.0022	0.0017	0.0000
1.7308	0.0084	0.0023	0.0019	0.0000
1.7885	0.0082	0.0025	0.0021	0.0000
1.8462	0.0079	0.0026	0.0022	0.0000
1.9038	0.0077	0.0027	0.0024	0.0000
1.9615	0.0075	0.0029	0.0025	0.0000
2.0192	0.0073	0.0030	0.0027	0.0000
2.0769	0.0071	0.0031	0.0028	0.0000
2.1346	0.0069	0.0033	0.0029	0.0000
2.1923	0.0067	0.0034	0.0030	0.0000
2.2500	0.0065	0.0036	0.0031	0.0000
2.3077	0.0063	0.0038	0.0032	0.0000
2.3654	0.0061	0.0040	0.0033	0.0000
2.4231	0.0059	0.0043	0.0034	0.0000
2.4808	0.0058	0.0045	0.0035	0.0000
2.5385	0.0056	0.0047	0.0036	0.0000
2.5962	0.0054	0.0050	0.0037	0.0000
2.6538	0.0052	0.0052	0.0038	0.0000
2.7115	0.0051	0.0055	0.0039	0.0000
2.7692	0.0049	0.0058	0.0040	0.0000
2.8269	0.0047	0.0060	0.0040	0.0000
2.8846	0.0046	0.0063	0.0040	0.0000
2.9423	0.0044	0.0066	0.0042	0.0000
3.0000	0.0042	0.0069	0.0044	0.0000
3.0577	0.0041	0.0072	0.0047	0.0000
3.1154	0.0039	0.0075	0.0049	0.0000
3.1731	0.0038	0.0078	0.0052	0.0000
3.2308	0.0036	0.0081	0.0054	0.0000
3.2885	0.0035	0.0084	0.0057	0.0000
3.3462	0.0033	0.0088	0.0059	0.0000
3.4038	0.0032	0.0091	0.0061	0.0000
3.4615	0.0031	0.0094	0.0063	0.0000
3.5192	0.0029	0.0098	0.0065	0.0000
3.5769	0.0028	0.0101	0.0067	0.0000
3.6346	0.0027	0.0105	0.0069	0.0000
3.6923	0.0025	0.0109	0.0071	0.0000
3.7500	0.0024	0.0112	0.0074	0.0000
3.7500	0.0023	0.0112	0.0127	0.0000

Biofilter Hydraulic Table

Stage(feet)	**Area(ac.)**	**Volume(ac-ft.)**	**Discharge(cfs)**	**To Amended(cfs)**	**Infilt(cfs)**
3.7500	0.0159	0.0112	0.0000	0.0116	0.0000
3.8077	0.0162	0.0122	0.0000	0.0116	0.0000
3.8654	0.0165	0.0131	0.0000	0.0127	0.0000
3.9231	0.0168	0.0141	0.0000	0.0127	0.0000
3.9808	0.0171	0.0150	0.0000	0.0127	0.0000
4.0385	0.0174	0.0160	0.0000	0.0127	0.0000
4.0962	0.0177	0.0170	0.0000	0.0127	0.0000
4.1538	0.0180	0.0181	0.0000	0.0127	0.0000
4.2115	0.0183	0.0191	0.0000	0.0127	0.0000
4.2692	0.0186	0.0202	0.0000	0.0127	0.0000
4.3269	0.0190	0.0213	0.0000	0.0127	0.0000
4.3846	0.0193	0.0224	0.0000	0.0127	0.0000
4.4423	0.0196	0.0235	0.0074	0.0127	0.0000
4.5000	0.0200	0.0246	0.0505	0.0127	0.0000

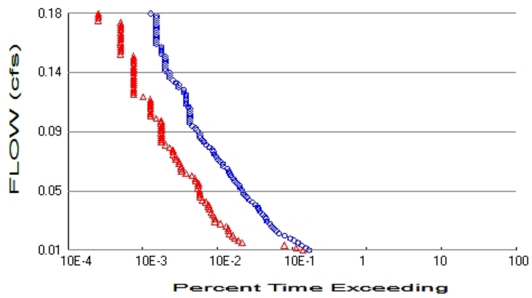
4.5577	0.0203	0.0258	0.1140	0.0127	0.0000
4.6154	0.0206	0.0270	0.1927	0.0127	0.0000
4.6731	0.0210	0.0282	0.2841	0.0127	0.0000
4.7308	0.0213	0.0294	0.3865	0.0127	0.0000
4.7885	0.0217	0.0306	0.6631	0.0127	0.0000
4.8462	0.0220	0.0319	1.3716	0.0127	0.0000
4.9038	0.0224	0.0332	2.3413	0.0127	0.0000
4.9615	0.0227	0.0345	3.5121	0.0127	0.0000
5.0192	0.0231	0.0358	4.8496	0.0127	0.0000
5.0769	0.0234	0.0371	6.3280	0.0127	0.0000
5.1346	0.0238	0.0385	7.9247	0.0127	0.0000
5.1923	0.0242	0.0399	9.6186	0.0127	0.0000
5.2500	0.0245	0.0413	11.388	0.0127	0.0000

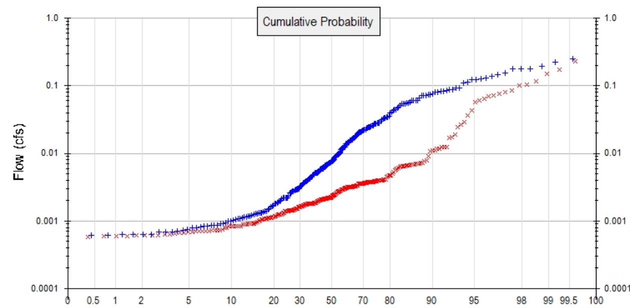
Surface iltration 1

Element Flows To:

Outlet 1	Outlet 2
	Biofiltration 1

Analysis Results
POC 1





+ Predeveloped   x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 0.29
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0.27
Total Impervious Area: 0.02

Flow Frequency Method: Cunnane

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.081603
5 year	0.135652
10 year	0.178465
25 year	0.226886

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.012456
5 year	0.075406
10 year	0.108878
25 year	0.177671

Duration Flows
The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0082	669	551	82	Pass
0.0099	605	449	74	Pass
0.0116	534	314	58	Pass
0.0133	473	84	17	Pass
0.0150	423	75	17	Pass
0.0168	373	67	17	Pass
0.0185	314	63	20	Pass
0.0202	264	57	21	Pass
0.0219	243	56	23	Pass
0.0236	227	55	24	Pass
0.0254	209	52	24	Pass
0.0271	200	44	22	Pass
0.0288	182	37	20	Pass
0.0305	177	37	20	Pass
0.0322	172	36	20	Pass
0.0340	158	34	21	Pass
0.0357	149	33	22	Pass
0.0374	142	31	21	Pass
0.0391	137	30	21	Pass
0.0408	127	30	23	Pass
0.0426	117	28	23	Pass
0.0443	106	25	23	Pass
0.0460	98	23	23	Pass
0.0477	91	23	25	Pass
0.0494	87	23	26	Pass
0.0512	84	23	27	Pass
0.0529	81	22	27	Pass
0.0546	78	22	28	Pass
0.0563	72	22	30	Pass
0.0580	68	20	29	Pass
0.0598	65	20	30	Pass
0.0615	60	18	30	Pass
0.0632	58	15	25	Pass
0.0649	56	13	23	Pass
0.0666	54	13	24	Pass
0.0684	48	13	27	Pass
0.0701	47	12	25	Pass
0.0718	43	12	27	Pass
0.0735	40	11	27	Pass
0.0753	38	11	28	Pass
0.0770	36	10	27	Pass
0.0787	35	10	28	Pass
0.0804	34	10	29	Pass
0.0821	31	9	29	Pass
0.0839	28	8	28	Pass
0.0856	26	7	26	Pass
0.0873	25	7	28	Pass
0.0890	23	7	30	Pass
0.0907	23	7	30	Pass
0.0925	23	7	30	Pass
0.0942	21	7	33	Pass
0.0959	20	7	35	Pass
0.0976	18	7	38	Pass

0.0993	17	7	41	Pass
0.1011	17	7	41	Pass
0.1028	17	6	35	Pass
0.1045	17	5	29	Pass
0.1062	17	5	29	Pass
0.1079	17	5	29	Pass
0.1097	17	5	29	Pass
0.1114	16	5	31	Pass
0.1131	15	5	33	Pass
0.1148	15	5	33	Pass
0.1165	15	5	33	Pass
0.1183	15	4	26	Pass
0.1200	15	3	20	Pass
0.1217	14	3	21	Pass
0.1234	14	3	21	Pass
0.1251	12	3	25	Pass
0.1269	12	3	25	Pass
0.1286	11	3	27	Pass
0.1303	10	3	30	Pass
0.1320	9	3	33	Pass
0.1337	9	3	33	Pass
0.1355	9	3	33	Pass
0.1372	8	3	37	Pass
0.1389	8	3	37	Pass
0.1406	8	3	37	Pass
0.1423	8	3	37	Pass
0.1441	8	3	37	Pass
0.1458	8	3	37	Pass
0.1475	8	3	37	Pass
0.1492	7	2	28	Pass
0.1509	7	2	28	Pass
0.1527	7	2	28	Pass
0.1544	7	2	28	Pass
0.1561	6	2	33	Pass
0.1578	6	2	33	Pass
0.1595	6	2	33	Pass
0.1613	6	2	33	Pass
0.1630	6	2	33	Pass
0.1647	6	2	33	Pass
0.1664	6	2	33	Pass
0.1681	6	2	33	Pass
0.1699	6	2	33	Pass
0.1716	6	2	33	Pass
0.1733	6	1	16	Pass
0.1750	6	1	16	Pass
0.1767	6	1	16	Pass
0.1785	5	1	20	Pass

Water Quality

Model Default Modifications

Total of 0 changes have been made.

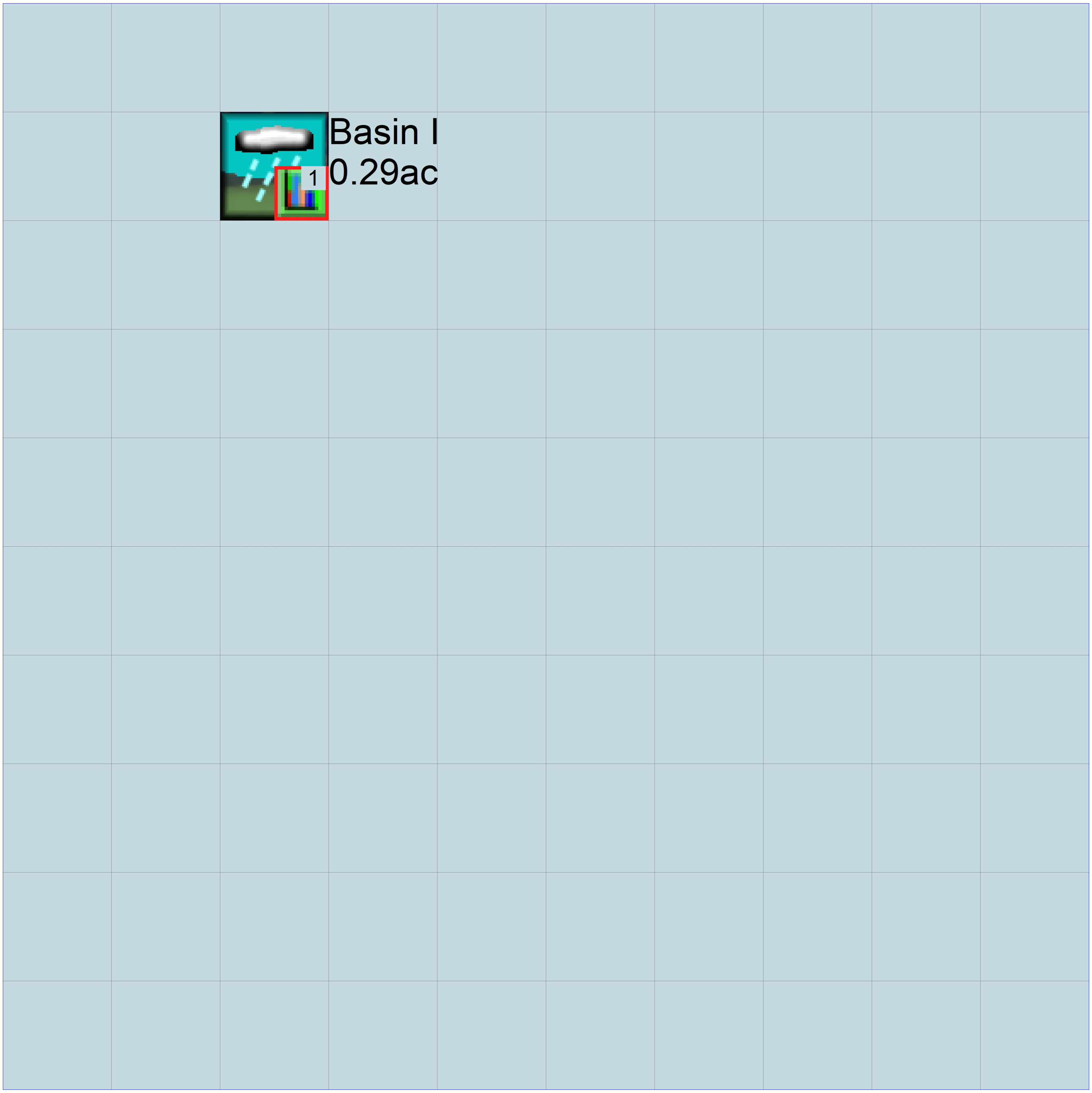
PERLND Changes

No PERLND changes have been made.

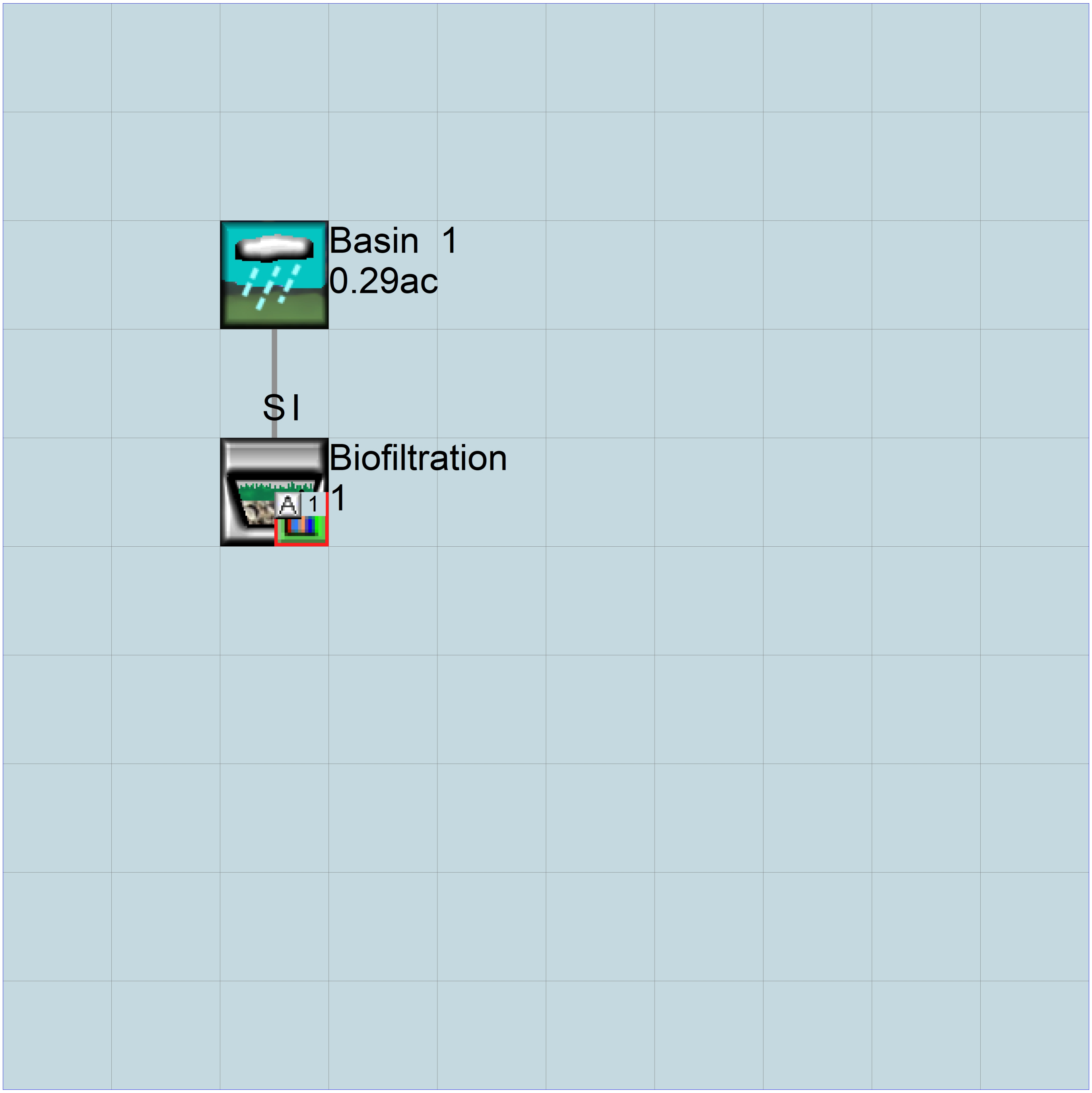
IMPLND Changes

No IMPLND changes have been made.

Appendix
Predeveloped Schematic



Mitigated Schematic



Predeveloped UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1959 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   Basin I-ALT.wdm
MESSU      25   PreBasin I-ALT.MES
           27   PreBasin I-ALT.L61
           28   PreBasin I-ALT.L62
           30   POCBasin I-ALT1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:60
      PERLND      30
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Basin I                    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           ***
   30      D,NatVeg,Steep         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 ***
   30         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  *********
   30         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 ***
   30         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
   30              0       2.7      0.02        75      0.15       2.5     0.915
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   30              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 ***
   30              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  ***
   30       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  ***
   30       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
   30              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           ***
  END GEN-INFO
  *** Section IWATER***

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

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
  END PRINT-INFO

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

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

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

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

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin I***
PERLND  30                        0.29     COPY   501     12
PERLND  30                        0.29     COPY   501     13

******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


END MASS-LINK

END RUN
```

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1959 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   Basin I-ALT.wdm
MESSU      25   MitBasin I-ALT.MES
           27   MitBasin I-ALT.L61
           28   MitBasin I-ALT.L62
           30   POCBasin I-ALT1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:60
      PERLND      46
      IMPLND       1
      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 iltration  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           ***
   46      D,Urban,Flat           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 ***
   46         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  *********
   46         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 ***
   46         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
   46              0       3.8      0.03        50      0.05       2.5     0.915
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   46              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 ***
   46              0       0.6      0.03         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  ***
   46       0.6  0.6  0.6  0.6  0.7  0.7  0.7  0.7  0.7  0.6  0.6  0.6
  END MON-LZETPARM
  MON-INTERCEP
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   46       0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  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
   46              0         0      0.15         0         1      0.05         0
  END PWAT-STATE1

END PERLND

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

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

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

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

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    1            100      0.05     0.011       0.1
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    1              0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    1              0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                    <--Area-->     <-Target->   MBLK   ***
<Name>   #                    <-factor->     <Name>   #   Tbl#   ***
Basin  1***
PERLND  46                          0.27     RCHRES   1      2
PERLND  46                          0.27     RCHRES   1      3
IMPLND   1                          0.02     RCHRES   1      5

******Routing******
PERLND  46                          0.27     COPY     1     12
IMPLND   1                          0.02     COPY     1     15
PERLND  46                          0.27     COPY     1     13
RCHRES   1                             1     RCHRES   2      8
RCHRES   2                             1     COPY   501     16
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 iltratio-005    2    1    1    1   28    0    1
    2     Biofiltration  1-004    1    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  0  0  0       0  0  0  0  0       2  2  2  2  2
    2        0  1  0  0    4  0  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       0.0       0.0       0.0
    2              2      0.01       0.0       0.0       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  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    2           0         4.0  0.0  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
   67    4
     Depth      Area    Volume  Outflow1 Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.015855  0.000000  0.000000
  0.057692  0.015855  0.000041  0.000000
  0.115385  0.015558  0.000084  0.000000
  0.173077  0.015264  0.000129  0.000000
  0.230769  0.014973  0.000176  0.000000
  0.288462  0.014685  0.000225  0.000000
  0.346154  0.014399  0.000277  0.000000
  0.403846  0.014116  0.000331  0.000000
  0.461538  0.013836  0.000388  0.000000
  0.519231  0.013559  0.000447  0.000000
  0.576923  0.013284  0.000508  0.000000
  0.634615  0.013012  0.000572  0.000000
  0.692308  0.012743  0.000639  0.000000
  0.750000  0.012477  0.000708  0.000000
  0.807692  0.012213  0.000780  0.000000
  0.865385  0.011952  0.000855  0.000000
  0.923077  0.011694  0.000932  0.000000
  0.980769  0.011439  0.001013  0.000000
  1.038462  0.011186  0.001096  0.000000
  1.096154  0.010936  0.001182  0.000000
  1.153846  0.010689  0.001271  0.000000
  1.211538  0.010445  0.001363  0.000000
  1.269231  0.010203  0.001458  0.000000
  1.326923  0.009964  0.001556  0.000000
  1.384615  0.009728  0.001658  0.000000
  1.442308  0.009495  0.001762  0.000578
  1.500000  0.009264  0.001870  0.000868
  1.557692  0.009036  0.001981  0.001253
  1.615385  0.008811  0.002096  0.001446
  1.673077  0.008589  0.002213  0.001727
  1.730769  0.008369  0.002335  0.001868
  1.788462  0.008152  0.002460  0.002094
  1.846154  0.007938  0.002588  0.002206
```

```
  1.903846  0.007727  0.002720  0.002400
  1.961538  0.007518  0.002855  0.002496
  2.019231  0.007313  0.002995  0.002668
  2.076923  0.007109  0.003138  0.002754
  2.134615  0.006909  0.003284  0.002911
  2.192308  0.006712  0.003435  0.002989
  2.250000  0.006517  0.003589  0.003134
  2.307692  0.006325  0.003808  0.003207
  2.365385  0.006135  0.004033  0.003342
  2.423077  0.005949  0.004263  0.003410
  2.480769  0.005765  0.004499  0.003538
  2.538462  0.005584  0.004740  0.003602
  2.596154  0.005405  0.004988  0.003723
  2.653846  0.005230  0.005241  0.003784
  2.711538  0.005057  0.005499  0.003899
  2.769231  0.004887  0.005764  0.003957
  2.826923  0.004720  0.006035  0.004014
  2.884615  0.004555  0.006312  0.004042
  2.942308  0.004393  0.006595  0.004189
  3.000000  0.004234  0.006884  0.004412
  3.057692  0.004078  0.007180  0.004664
  3.115385  0.003924  0.007482  0.004922
  3.173077  0.003773  0.007790  0.005178
  3.230769  0.003625  0.008105  0.005426
  3.288462  0.003480  0.008426  0.005666
  3.346154  0.003337  0.008754  0.005897
  3.403846  0.003197  0.009089  0.006121
  3.461538  0.003060  0.009430  0.006336
  3.519231  0.002926  0.009778  0.006545
  3.576923  0.002794  0.010133  0.006748
  3.634615  0.002666  0.010495  0.006946
  3.692308  0.002540  0.010864  0.007139
  3.750000  0.002416  0.011240  0.007360
  3.750000  0.002296  0.012289  0.012692
  END FTABLE  2
  FTABLE      1
   27    5
     Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
      (ft)   (acres) (acre-ft)    (cfs)     (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.002296  0.000000  0.000000  0.000000
  0.057692  0.016154  0.000923  0.000000  0.011574
  0.115385  0.016456  0.001864  0.000000  0.012692
  0.173077  0.016761  0.002822  0.000000  0.012692
  0.230769  0.017069  0.003798  0.000000  0.012692
  0.288462  0.017379  0.004792  0.000000  0.012692
  0.346154  0.017692  0.005803  0.000000  0.012692
  0.403846  0.018008  0.006833  0.000000  0.012692
  0.461538  0.018327  0.007881  0.000000  0.012692
  0.519231  0.018648  0.008948  0.000000  0.012692
  0.576923  0.018972  0.010033  0.000000  0.012692
  0.634615  0.019299  0.011137  0.000000  0.012692
  0.692308  0.019629  0.012260  0.007434  0.012692
  0.750000  0.019961  0.013402  0.050484  0.012692
  0.807692  0.020296  0.014563  0.113994  0.012692
  0.865385  0.020634  0.015744  0.192688  0.012692
  0.923077  0.020975  0.016944  0.284052  0.012692
  0.980769  0.021318  0.018164  0.386524  0.012692
  1.038462  0.021664  0.019404  0.663136  0.012692
  1.096154  0.022013  0.020664  1.371596  0.012692
  1.153846  0.022365  0.021944  2.341288  0.012692
  1.211538  0.022719  0.023245  3.512126  0.012692
  1.269231  0.023076  0.024566  4.849625  0.012692
  1.326923  0.023436  0.025907  6.327973  0.012692
  1.384615  0.023799  0.027270  7.924727  0.012692
  1.442308  0.024164  0.028653  9.618586  0.012692
  1.500000  0.024532  0.030058  11.38837  0.012692
  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     22 IRRG     ENGL    0.7       SAME PERLND  46     EXTNL  SURLI
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   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       16
RCHRES     ROFLOW                          COPY           INPUT  MEAN
  END MASS-LINK   16

  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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Local (360)943-0304

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SDHM 3.1

PROJECT REPORT

General Model Information

Project Name:	Basin J
Site Name:	VETERANS
Site Address:	
City:	CARLSBAD
Report Date:	1/17/2022
Gage:	OCEANSID
Data Start:	10/01/1959
Data End:	09/30/2004
Timestep:	Hourly
Precip Scale:	1.000
Version Date:	2021/06/28

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 J

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
D,NatVeg,Steep	0.27
Pervious Total	0.27
Impervious Land Use	acre
Impervious Total	0
Basin Total	0.27

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Basin J

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
D,Urban,Flat	0.27
Pervious Total	0.27
Impervious Land Use	acre
Impervious Total	0
Basin Total	0.27

Element Flows To:

Surface	Interflow	Groundwater
Surface iltration 1	Surface iltration 1	

Routing Elements
Predeveloped Routing

Mitigated Routing

Biofiltration 1

Bottom Length:	7.00 ft.
Bottom Width:	7.00 ft.
Material thickness of first layer:	0.25
Material type for first layer:	Mulch
Material thickness of second layer:	2
Material type for second layer:	ESM
Material thickness of third layer:	1.5
Material type for third layer:	GRAVEL
Underdrain used	
Underdrain Diameter (feet):	0.5
Orifice Diameter (in.):	0.5
Offset (in.):	3
Flow Through Underdrain (ac-ft.):	2.233
Total Outflow (ac-ft.):	2.593
Percent Through Underdrain:	86.12

Discharge Structure

Riser Height:	1 ft.
Riser Diameter:	36 in.
Notch Type:	Rectangular
Notch Width:	0.670 ft.
Notch Height:	0.330 ft.

Element Flows To:
Outlet 1 Outlet 2

Biofilter Hydraulic Table

Stage(feet)	**Area(ac.)**	**Volume(ac-ft.)**	**Discharge(cfs)**	**Infilt(cfs)**
0.0000	0.0124	0.0000	0.0000	0.0000
0.0577	0.0124	0.0000	0.0000	0.0000
0.1154	0.0121	0.0000	0.0000	0.0000
0.1731	0.0118	0.0001	0.0000	0.0000
0.2308	0.0116	0.0001	0.0000	0.0000
0.2885	0.0113	0.0001	0.0000	0.0000
0.3462	0.0111	0.0001	0.0000	0.0000
0.4038	0.0108	0.0002	0.0000	0.0000
0.4615	0.0106	0.0002	0.0000	0.0000
0.5192	0.0103	0.0002	0.0000	0.0000
0.5769	0.0101	0.0003	0.0000	0.0000
0.6346	0.0099	0.0003	0.0000	0.0000
0.6923	0.0096	0.0004	0.0000	0.0000
0.7500	0.0094	0.0004	0.0000	0.0000
0.8077	0.0092	0.0004	0.0000	0.0000
0.8654	0.0090	0.0005	0.0000	0.0000
0.9231	0.0087	0.0005	0.0000	0.0000
0.9808	0.0085	0.0006	0.0000	0.0000
1.0385	0.0083	0.0006	0.0000	0.0000
1.0962	0.0081	0.0007	0.0000	0.0000
1.1538	0.0079	0.0007	0.0000	0.0000
1.2115	0.0077	0.0008	0.0000	0.0000
1.2692	0.0075	0.0009	0.0000	0.0000
1.3269	0.0073	0.0009	0.0000	0.0000
1.3846	0.0071	0.0010	0.0000	0.0000
1.4423	0.0069	0.0011	0.0011	0.0000

1.5000	0.0067	0.0011	0.0011	0.0000
1.5577	0.0065	0.0012	0.0011	0.0000
1.6154	0.0063	0.0013	0.0013	0.0000
1.6731	0.0061	0.0014	0.0015	0.0000
1.7308	0.0059	0.0014	0.0016	0.0000
1.7885	0.0057	0.0015	0.0016	0.0000
1.8462	0.0056	0.0016	0.0020	0.0000
1.9038	0.0054	0.0017	0.0020	0.0000
1.9615	0.0052	0.0018	0.0020	0.0000
2.0192	0.0050	0.0019	0.0022	0.0000
2.0769	0.0049	0.0020	0.0022	0.0000
2.1346	0.0047	0.0021	0.0024	0.0000
2.1923	0.0045	0.0022	0.0025	0.0000
2.2500	0.0044	0.0023	0.0027	0.0000
2.3077	0.0042	0.0025	0.0028	0.0000
2.3654	0.0041	0.0026	0.0029	0.0000
2.4231	0.0039	0.0028	0.0030	0.0000
2.4808	0.0038	0.0030	0.0031	0.0000
2.5385	0.0036	0.0032	0.0032	0.0000
2.5962	0.0035	0.0033	0.0033	0.0000
2.6538	0.0033	0.0035	0.0034	0.0000
2.7115	0.0032	0.0037	0.0035	0.0000
2.7692	0.0031	0.0039	0.0035	0.0000
2.8269	0.0029	0.0041	0.0036	0.0000
2.8846	0.0028	0.0043	0.0038	0.0000
2.9423	0.0027	0.0045	0.0041	0.0000
3.0000	0.0026	0.0048	0.0044	0.0000
3.0577	0.0024	0.0050	0.0046	0.0000
3.1154	0.0023	0.0052	0.0049	0.0000
3.1731	0.0022	0.0054	0.0052	0.0000
3.2308	0.0021	0.0057	0.0054	0.0000
3.2885	0.0020	0.0059	0.0057	0.0000
3.3462	0.0019	0.0062	0.0059	0.0000
3.4038	0.0018	0.0064	0.0061	0.0000
3.4615	0.0017	0.0067	0.0063	0.0000
3.5192	0.0016	0.0070	0.0065	0.0000
3.5769	0.0015	0.0072	0.0067	0.0000
3.6346	0.0014	0.0075	0.0069	0.0000
3.6923	0.0013	0.0078	0.0071	0.0000
3.7500	0.0012	0.0081	0.0074	0.0000
3.7500	0.0011	0.0081	0.0092	0.0000

Biofilter Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
3.7500	0.012359	0.008093	0.0000	0.0057	0.0000
3.8077	0.012623	0.008814	0.0000	0.0057	0.0000
3.8654	0.012889	0.009550	0.0000	0.0067	0.0000
3.9231	0.013158	0.010301	0.0000	0.0069	0.0000
3.9808	0.013430	0.011068	0.0000	0.0070	0.0000
4.0385	0.013705	0.011851	0.0000	0.0072	0.0000
4.0962	0.013982	0.012649	0.0000	0.0074	0.0000
4.1538	0.014262	0.013464	0.0000	0.0075	0.0000
4.2115	0.014545	0.014295	0.0000	0.0077	0.0000
4.2692	0.014831	0.015143	0.0000	0.0079	0.0000
4.3269	0.015119	0.016006	0.0000	0.0080	0.0000
4.3846	0.015410	0.016887	0.0000	0.0082	0.0000
4.4423	0.015704	0.017785	0.0074	0.0083	0.0000
4.5000	0.016001	0.018699	0.0505	0.0085	0.0000

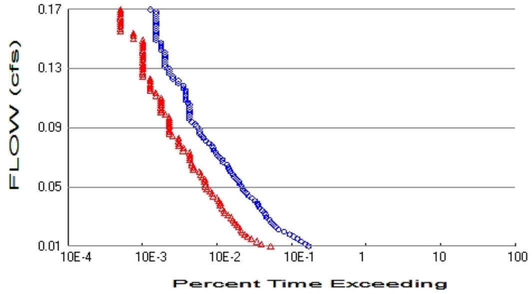
4.5577	0.016300	0.019631	0.1140	0.0087	0.0000
4.6154	0.016602	0.020580	0.1927	0.0088	0.0000
4.6731	0.016907	0.021547	0.2841	0.0090	0.0000
4.7308	0.017215	0.022531	0.3865	0.0092	0.0000
4.7885	0.017525	0.023533	0.6631	0.0092	0.0000
4.8462	0.017838	0.024553	1.3716	0.0092	0.0000
4.9038	0.018154	0.025592	2.3413	0.0092	0.0000
4.9615	0.018473	0.026648	3.5121	0.0092	0.0000
5.0192	0.018794	0.027723	4.8496	0.0092	0.0000
5.0769	0.019118	0.028817	6.3280	0.0092	0.0000
5.1346	0.019445	0.029929	7.9247	0.0092	0.0000
5.1923	0.019775	0.031061	9.6186	0.0092	0.0000
5.2500	0.020107	0.032211	11.388	0.0092	0.0000

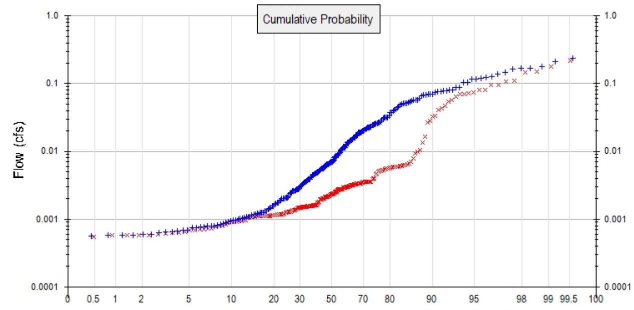
Surface iltration 1

Element Flows To:

Outlet 1	Outlet 2
	Biofiltration 1

Analysis Results
POC 1





+ Predeveloped   x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 0.27
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0.27
Total Impervious Area: 0

Flow Frequency Method: Cunnane

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.075975
5 year	0.126297
10 year	0.166157
25 year	0.211239

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.028487
5 year	0.081274
10 year	0.122617
25 year	0.183634

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0076	669	206	30	Pass
0.0092	605	156	25	Pass
0.0108	534	135	25	Pass
0.0124	473	114	24	Pass
0.0140	423	101	23	Pass
0.0156	374	92	24	Pass
0.0172	314	85	27	Pass
0.0188	264	82	31	Pass
0.0204	243	77	31	Pass
0.0220	227	73	32	Pass
0.0236	209	68	32	Pass
0.0252	200	65	32	Pass
0.0268	182	61	33	Pass
0.0284	177	55	31	Pass
0.0300	172	50	29	Pass
0.0316	158	49	31	Pass
0.0332	149	46	30	Pass
0.0348	142	44	30	Pass
0.0364	137	44	32	Pass
0.0380	127	42	33	Pass
0.0396	117	40	34	Pass
0.0412	106	35	33	Pass
0.0428	98	34	34	Pass
0.0444	91	32	35	Pass
0.0460	87	29	33	Pass
0.0476	84	28	33	Pass
0.0492	81	28	34	Pass
0.0508	78	27	34	Pass
0.0524	72	27	37	Pass
0.0540	68	25	36	Pass
0.0556	65	24	36	Pass
0.0572	60	23	38	Pass
0.0588	58	19	32	Pass
0.0605	56	19	33	Pass
0.0621	54	18	33	Pass
0.0637	48	18	37	Pass
0.0653	47	17	36	Pass
0.0669	43	17	39	Pass
0.0685	40	17	42	Pass
0.0701	38	17	44	Pass
0.0717	36	14	38	Pass
0.0733	35	14	40	Pass
0.0749	34	12	35	Pass
0.0765	31	12	38	Pass
0.0781	28	12	42	Pass
0.0797	26	12	46	Pass
0.0813	25	10	40	Pass
0.0829	23	9	39	Pass
0.0845	23	9	39	Pass
0.0861	23	9	39	Pass
0.0877	21	9	42	Pass
0.0893	20	9	45	Pass
0.0909	18	9	50	Pass

0.0925	17	9	52	Pass
0.0941	17	9	52	Pass
0.0957	17	8	47	Pass
0.0973	17	7	41	Pass
0.0989	17	7	41	Pass
0.1005	17	7	41	Pass
0.1021	17	7	41	Pass
0.1037	16	7	43	Pass
0.1053	15	7	46	Pass
0.1069	15	7	46	Pass
0.1085	15	6	40	Pass
0.1101	15	6	40	Pass
0.1117	15	5	33	Pass
0.1133	14	5	35	Pass
0.1149	14	5	35	Pass
0.1165	12	5	41	Pass
0.1181	12	5	41	Pass
0.1197	10	5	50	Pass
0.1213	10	4	40	Pass
0.1229	9	4	44	Pass
0.1245	9	4	44	Pass
0.1261	9	4	44	Pass
0.1277	8	4	50	Pass
0.1293	8	4	50	Pass
0.1309	8	4	50	Pass
0.1325	8	4	50	Pass
0.1341	8	4	50	Pass
0.1357	8	4	50	Pass
0.1373	8	4	50	Pass
0.1389	7	4	57	Pass
0.1405	7	4	57	Pass
0.1421	7	4	57	Pass
0.1437	7	4	57	Pass
0.1453	6	4	66	Pass
0.1469	6	3	50	Pass
0.1485	6	3	50	Pass
0.1501	6	3	50	Pass
0.1517	6	2	33	Pass
0.1533	6	2	33	Pass
0.1549	6	2	33	Pass
0.1565	6	2	33	Pass
0.1581	6	2	33	Pass
0.1598	6	2	33	Pass
0.1614	6	2	33	Pass
0.1630	6	2	33	Pass
0.1646	6	2	33	Pass
0.1662	5	2	40	Pass

Water Quality

Model Default Modifications

Total of 0 changes have been made.

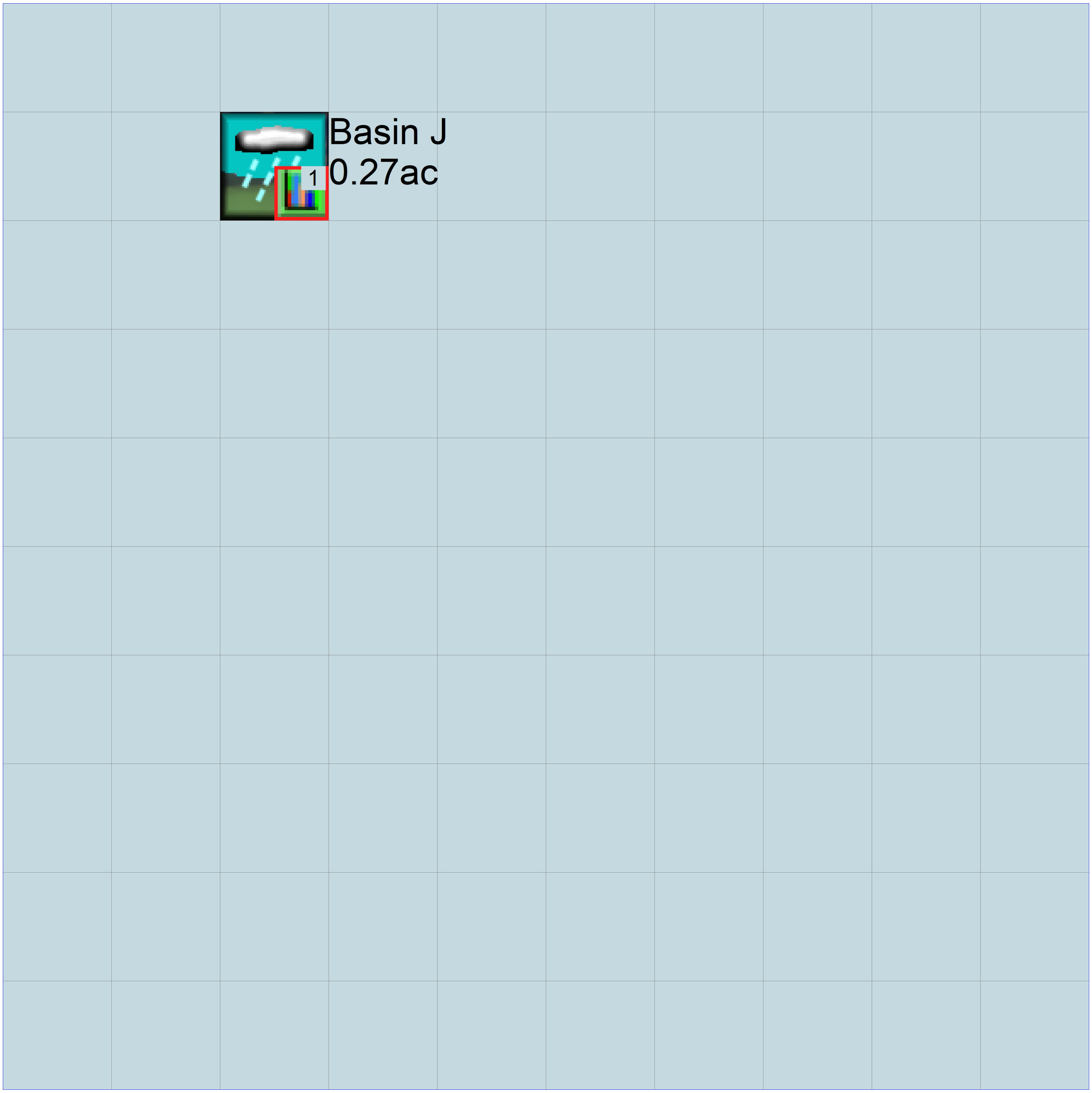
PERLND Changes

No PERLND changes have been made.

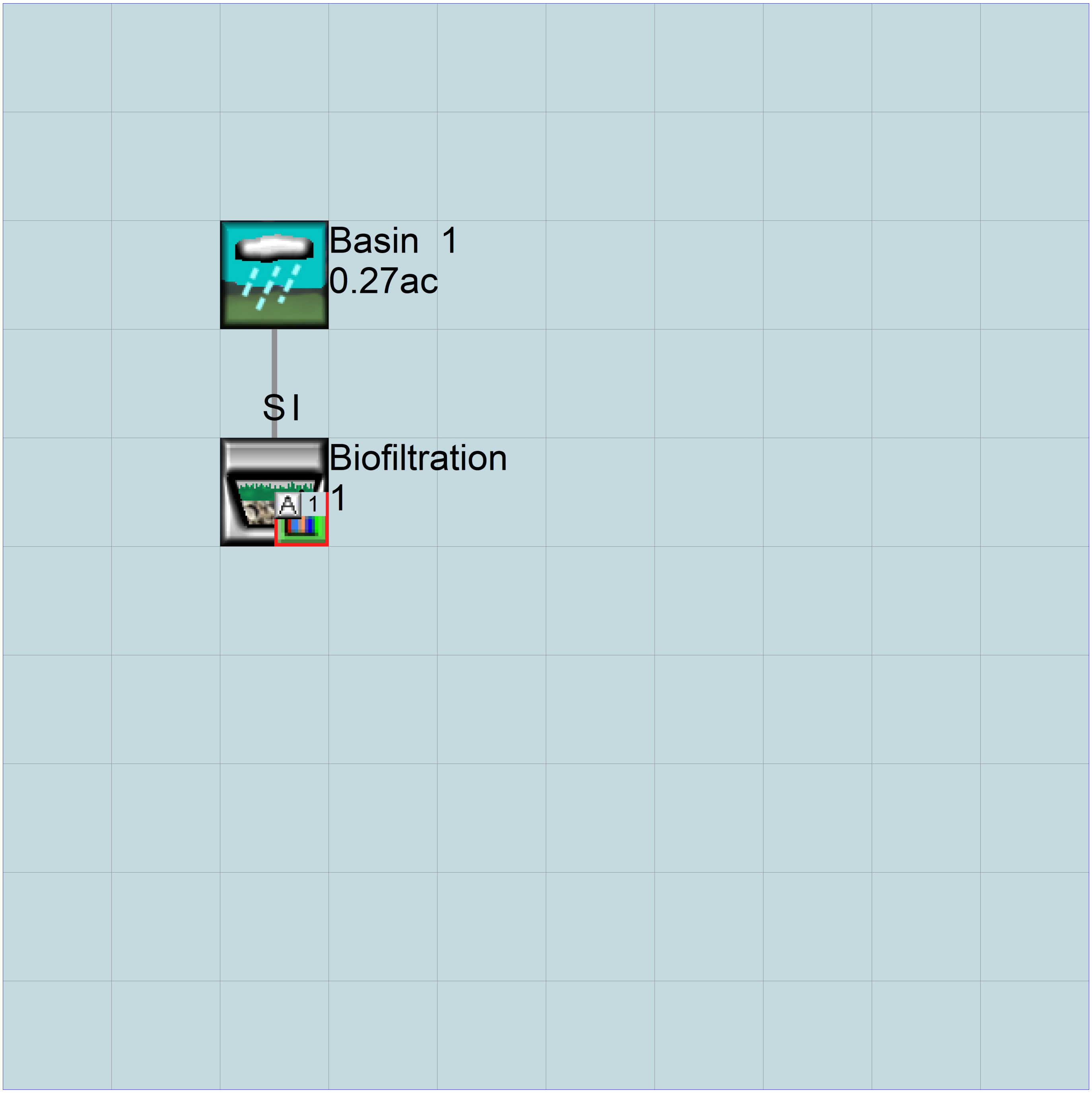
IMPLND Changes

No IMPLND changes have been made.

Appendix
Predeveloped Schematic



Mitigated Schematic



Predeveloped UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1959 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   Basin J-ALT.wdm
MESSU      25   PreBasin J-ALT.MES
           27   PreBasin J-ALT.L61
           28   PreBasin J-ALT.L62
           30   POCBasin J-ALT1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:60
      PERLND      30
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Basin J                     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           ***
   30      D,NatVeg,Steep         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 ***
   30         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  *********
   30         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 ***
   30         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
   30              0       2.7      0.02        75      0.15       2.5     0.915
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   30              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 ***
   30              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  ***
   30       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  ***
   30       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
   30              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           ***
  END GEN-INFO
  *** Section IWATER***

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

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
  END PRINT-INFO

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

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

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

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

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin J***
PERLND  30                        0.27     COPY   501     12
PERLND  30                        0.27     COPY   501     13

******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


END MASS-LINK

END RUN
```

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1959 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   Basin J-ALT.wdm
MESSU      25   MitBasin J-ALT.MES
           27   MitBasin J-ALT.L61
           28   MitBasin J-ALT.L62
           30   POCBasin J-ALT1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:60
      PERLND      46
      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 iltration  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           ***
   46      D,Urban,Flat           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 ***
   46         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  *********
```

```
   46          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 ***
   46          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
   46               0       3.8      0.03        50      0.05       2.5     0.915
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   46               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 ***
   46               0       0.6      0.03         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  ***
   46       0.6  0.6  0.6  0.6  0.7  0.7  0.7  0.7  0.7  0.6  0.6  0.6
  END MON-LZETPARM
  MON-INTERCEP
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   46       0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  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
   46               0         0      0.15         0         1      0.05         0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                      in  out           ***
  END GEN-INFO
  *** Section IWATER***

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

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
  END PRINT-INFO

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

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
```

```
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
  END IWAT-PARM2

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

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

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin  1***
PERLND  46                        0.27     RCHRES   1      2
PERLND  46                        0.27     RCHRES   1      3

******Routing******
PERLND  46                        0.27     COPY     1     12
PERLND  46                        0.27     COPY     1     13
RCHRES   1                           1     RCHRES   2      8
RCHRES   2                           1     COPY   501     16
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 iltratio-005    2    1    1    1   28    0    1
    2     Biofiltration  1-004    1    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  0  0  0      0  0  0  0  0      2  2  2  2  2
    2         0  1  0  0    4  0  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       0.0       0.0       0.0
    2             2      0.01       0.0       0.0       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  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    2           0          4.0  0.0  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
   67    4
     Depth      Area    Volume  Outflow1 Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.012359  0.000000  0.000000
  0.057692  0.012359  0.000020  0.000000
  0.115385  0.012099  0.000042  0.000000
  0.173077  0.011840  0.000065  0.000000
  0.230769  0.011585  0.000090  0.000000
  0.288462  0.011332  0.000116  0.000000
  0.346154  0.011083  0.000145  0.000000
  0.403846  0.010835  0.000174  0.000000
  0.461538  0.010591  0.000206  0.000000
  0.519231  0.010350  0.000240  0.000000
  0.576923  0.010111  0.000275  0.000000
  0.634615  0.009875  0.000312  0.000000
  0.692308  0.009641  0.000351  0.000000
  0.750000  0.009411  0.000393  0.000000
  0.807692  0.009183  0.000436  0.000000
  0.865385  0.008958  0.000481  0.000000
  0.923077  0.008735  0.000529  0.000000
  0.980769  0.008516  0.000579  0.000000
  1.038462  0.008299  0.000631  0.000000
  1.096154  0.008085  0.000685  0.000000
  1.153846  0.007873  0.000742  0.000000
  1.211538  0.007665  0.000801  0.000000
  1.269231  0.007459  0.000862  0.000000
  1.326923  0.007256  0.000926  0.000000
  1.384615  0.007055  0.000993  0.000000
  1.442308  0.006858  0.001062  0.001077
  1.500000  0.006663  0.001134  0.001117
  1.557692  0.006471  0.001208  0.001137
  1.615385  0.006282  0.001286  0.001313
  1.673077  0.006095  0.001366  0.001486
  1.730769  0.005911  0.001448  0.001563
  1.788462  0.005730  0.001534  0.001601
  1.846154  0.005552  0.001623  0.001978
  1.903846  0.005376  0.001714  0.001993
  1.961538  0.005203  0.001809  0.002001
  2.019231  0.005033  0.001906  0.002160
  2.076923  0.004866  0.002007  0.002240
  2.134615  0.004701  0.002111  0.002416
  2.192308  0.004539  0.002218  0.002505
  2.250000  0.004380  0.002328  0.002673
  2.307692  0.004224  0.002486  0.002757
  2.365385  0.004070  0.002647  0.002912
  2.423077  0.003920  0.002814  0.002990
```

```
  2.480769  0.003772  0.002985  0.003135
  2.538462  0.003626  0.003162  0.003207
  2.596154  0.003484  0.003343  0.003342
  2.653846  0.003344  0.003529  0.003410
  2.711538  0.003207  0.003720  0.003538
  2.769231  0.003072  0.003916  0.003540
  2.826923  0.002941  0.004117  0.003603
  2.884615  0.002812  0.004324  0.003809
  2.942308  0.002686  0.004535  0.004072
  3.000000  0.002563  0.004753  0.004354
  3.057692  0.002442  0.004975  0.004634
  3.115385  0.002324  0.005203  0.004908
  3.173077  0.002209  0.005437  0.005170
  3.230769  0.002097  0.005676  0.005422
  3.288462  0.001987  0.005921  0.005664
  3.346154  0.001880  0.006172  0.005896
  3.403846  0.001776  0.006428  0.006120
  3.461538  0.001675  0.006691  0.006336
  3.519231  0.001576  0.006959  0.006545
  3.576923  0.001481  0.007233  0.006748
  3.634615  0.001388  0.007514  0.006946
  3.692308  0.001297  0.007800  0.007139
  3.750000  0.001210  0.008093  0.007360
  3.750000  0.001125  0.008855  0.009216
  END FTABLE  2
  FTABLE      1
   27    5
     Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
      (ft)   (acres) (acre-ft)    (cfs)      (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.001125  0.000000  0.000000  0.000000
  0.057692  0.012623  0.000721  0.000000  0.005671
  0.115385  0.012889  0.001457  0.000000  0.006707
  0.173077  0.013158  0.002208  0.000000  0.006871
  0.230769  0.013430  0.002975  0.000000  0.007035
  0.288462  0.013705  0.003758  0.000000  0.007198
  0.346154  0.013982  0.004556  0.000000  0.007362
  0.403846  0.014262  0.005371  0.000000  0.007525
  0.461538  0.014545  0.006202  0.000000  0.007689
  0.519231  0.014831  0.007050  0.000000  0.007853
  0.576923  0.015119  0.007913  0.000000  0.008016
  0.634615  0.015410  0.008794  0.000000  0.008180
  0.692308  0.015704  0.009692  0.007434  0.008343
  0.750000  0.016001  0.010606  0.050484  0.008507
  0.807692  0.016300  0.011538  0.113994  0.008671
  0.865385  0.016602  0.012487  0.192688  0.008834
  0.923077  0.016907  0.013454  0.284052  0.008998
  0.980769  0.017215  0.014438  0.386524  0.009161
  1.038462  0.017525  0.015440  0.663136  0.009216
  1.096154  0.017838  0.016460  1.371596  0.009216
  1.153846  0.018154  0.017499  2.341288  0.009216
  1.211538  0.018473  0.018555  3.512126  0.009216
  1.269231  0.018794  0.019630  4.849625  0.009216
  1.326923  0.019118  0.020724  6.327973  0.009216
  1.384615  0.019445  0.021836  7.924727  0.009216
  1.442308  0.019775  0.022967  9.618586  0.009216
  1.500000  0.020107  0.024118  11.38837  0.009216
  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     22 IRRG      ENGL    0.7       SAME PERLND  46     EXTNL  SURLI
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   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        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       16
RCHRES     ROFLOW                          COPY           INPUT  MEAN
  END MASS-LINK   16

  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:	Basin K-ALT
Site Name:	VETERANS
Site Address:	
City:	CARLSBAD
Report Date:	3/1/2022
Gage:	OCEANSID
Data Start:	10/01/1959
Data End:	09/30/2004
Timestep:	Hourly
Precip Scale:	1.000
Version Date:	2021/06/28

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 K

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
D,NatVeg,Steep	1.4
Pervious Total	1.4
Impervious Land Use	acre
Impervious Total	0
Basin Total	1.4

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Basin K

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
D,Urban,Flat	0.17
D,Urban,Steep	1.21
Pervious Total	1.38
Impervious Land Use	acre
IMPERVIOUS-FLAT	0.01
Impervious Total	0.01
Basin Total	1.39

Element Flows To:

Surface	Interflow	Groundwater
Surface iltration 1	Surface iltration 1	

Routing Elements

Predeveloped Routing

Mitigated Routing

Biofiltration 1

Bottom Length:	27.50 ft.
Bottom Width:	27.50 ft.
Material thickness of first layer:	0.25
Material type for first layer:	Mulch
Material thickness of second layer:	2.5
Material type for second layer:	ESM
Material thickness of third layer:	1.5
Material type for third layer:	GRAVEL
Underdrain used	
Underdrain Diameter (feet):	0.5
Orifice Diameter (in.):	0.6
Offset (in.):	3
Flow Through Underdrain (ac-ft.):	11.756
Total Outflow (ac-ft.):	16.25
Percent Through Underdrain:	72.35

Discharge Structure

Riser Height:	1 ft.
Riser Diameter:	36 in.
Notch Type:	Rectangular
Notch Width:	0.670 ft.
Notch Height:	0.330 ft.

Element Flows To:
Outlet 1 Outlet 2

Biofilter Hydraulic Table

Stage(feet)	**Area(ac.)**	**Volume(ac-ft.)**	**Discharge(cfs)**	**Infilt(cfs)**
0.0000	0.0490	0.0000	0.0000	0.0000
0.0632	0.0488	0.0002	0.0000	0.0000
0.1264	0.0482	0.0003	0.0000	0.0000
0.1896	0.0477	0.0005	0.0000	0.0000
0.2527	0.0471	0.0007	0.0000	0.0000
0.3159	0.0465	0.0009	0.0000	0.0000
0.3791	0.0460	0.0010	0.0000	0.0000
0.4423	0.0454	0.0012	0.0000	0.0000
0.5055	0.0448	0.0014	0.0000	0.0000
0.5687	0.0443	0.0016	0.0000	0.0000
0.6319	0.0437	0.0018	0.0000	0.0000
0.6951	0.0432	0.0020	0.0000	0.0000
0.7582	0.0426	0.0022	0.0000	0.0000
0.8214	0.0421	0.0024	0.0000	0.0000
0.8846	0.0416	0.0027	0.0000	0.0000
0.9478	0.0410	0.0029	0.0000	0.0000
1.0110	0.0405	0.0031	0.0000	0.0000
1.0742	0.0400	0.0033	0.0000	0.0000
1.1374	0.0394	0.0035	0.0000	0.0000
1.2005	0.0389	0.0038	0.0000	0.0000
1.2637	0.0384	0.0040	0.0000	0.0000
1.3269	0.0379	0.0043	0.0000	0.0000
1.3901	0.0374	0.0045	0.0000	0.0000
1.4533	0.0369	0.0047	0.0000	0.0000
1.5165	0.0364	0.0050	0.0000	0.0000
1.5797	0.0358	0.0053	0.0000	0.0000

1.6429	0.0354	0.0055	0.0000	0.0000
1.7060	0.0349	0.0058	0.0000	0.0000
1.7692	0.0344	0.0061	0.0000	0.0000
1.8324	0.0339	0.0063	0.0000	0.0000
1.8956	0.0334	0.0066	0.0000	0.0000
1.9588	0.0329	0.0069	0.0000	0.0000
2.0220	0.0324	0.0072	0.0000	0.0000
2.0852	0.0319	0.0075	0.0000	0.0000
2.1484	0.0315	0.0078	0.0000	0.0000
2.2115	0.0310	0.0081	0.0000	0.0000
2.2747	0.0305	0.0084	0.0000	0.0000
2.3379	0.0301	0.0087	0.0000	0.0000
2.4011	0.0296	0.0090	0.0000	0.0000
2.4643	0.0292	0.0093	0.0000	0.0000
2.5275	0.0287	0.0096	0.0000	0.0000
2.5907	0.0283	0.0100	0.0000	0.0000
2.6538	0.0278	0.0103	0.0000	0.0000
2.7170	0.0274	0.0106	0.0000	0.0000
2.7802	0.0269	0.0111	0.0000	0.0000
2.8434	0.0265	0.0116	0.0000	0.0000
2.9066	0.0261	0.0121	0.0000	0.0000
2.9698	0.0256	0.0126	0.0000	0.0000
3.0330	0.0252	0.0131	0.0000	0.0000
3.0962	0.0248	0.0136	0.0000	0.0000
3.1593	0.0244	0.0141	0.0000	0.0000
3.2225	0.0239	0.0146	0.0000	0.0000
3.2857	0.0235	0.0151	0.0000	0.0000
3.3489	0.0231	0.0157	0.0000	0.0000
3.4121	0.0227	0.0162	0.0000	0.0000
3.4753	0.0223	0.0168	0.0000	0.0000
3.5385	0.0219	0.0173	0.0000	0.0000
3.6016	0.0215	0.0179	0.0000	0.0000
3.6648	0.0211	0.0184	0.0000	0.0000
3.7280	0.0207	0.0190	0.0000	0.0000
3.7912	0.0203	0.0196	0.0000	0.0000
3.8544	0.0200	0.0202	0.0000	0.0000
3.9176	0.0196	0.0208	0.0000	0.0000
3.9808	0.0192	0.0214	0.0000	0.0000
4.0440	0.0188	0.0220	0.0000	0.0000
4.1071	0.0185	0.0226	0.0000	0.0000
4.1703	0.0181	0.0233	0.0000	0.0000
4.2335	0.0177	0.0239	0.0000	0.0000
4.2500	0.0174	0.0241	0.0000	0.0000

Biofilter Hydraulic Table

Stage(feet)	**Area(ac.)**	**Volume(ac-ft.)**	**Discharge(cfs)**	**To Amended(cfs)**	**Infilt(cfs)**
4.2500	0.0490	0.0241	0.0000	0.0195	0.0000
4.3132	0.0496	0.0272	0.0000	0.0195	0.0000
4.3764	0.0501	0.0303	0.0000	0.0195	0.0000
4.4396	0.0507	0.0335	0.0000	0.0195	0.0000
4.5027	0.0513	0.0367	0.0000	0.0195	0.0000
4.5659	0.0519	0.0400	0.0000	0.0195	0.0000
4.6291	0.0525	0.0433	0.0000	0.0195	0.0000
4.6923	0.0531	0.0466	0.0000	0.0195	0.0000
4.7555	0.0537	0.0500	0.0000	0.0195	0.0000
4.8187	0.0543	0.0534	0.0000	0.0195	0.0000
4.8819	0.0549	0.0569	0.0000	0.0195	0.0000
4.9451	0.0556	0.0604	0.0000	0.0195	0.0000

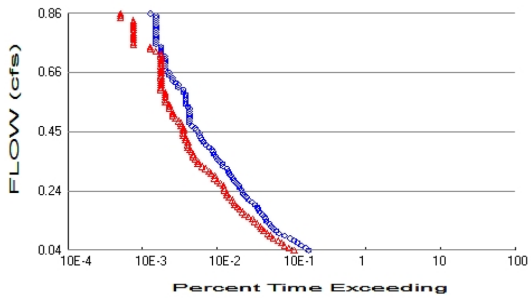
5.0082	0.0562	0.0639	0.0000	0.0195	0.0000
5.0714	0.0568	0.0675	0.0000	0.0195	0.0000
5.1346	0.0574	0.0711	0.0000	0.0195	0.0000
5.1978	0.0581	0.0747	0.0000	0.0195	0.0000
5.2610	0.0587	0.0784	0.0000	0.0195	0.0000
5.3242	0.0593	0.0822	0.0000	0.0195	0.0000
5.3874	0.0600	0.0859	0.0000	0.0195	0.0000
5.4505	0.0606	0.0897	0.0000	0.0195	0.0000
5.5137	0.0613	0.0936	0.0000	0.0195	0.0000
5.5769	0.0619	0.0975	0.0000	0.0195	0.0000
5.6401	0.0626	0.1014	0.0000	0.0195	0.0000
5.7033	0.0632	0.1054	0.0008	0.0195	0.0000
5.7500	0.0637	0.1083	0.0012	0.0195	0.0000

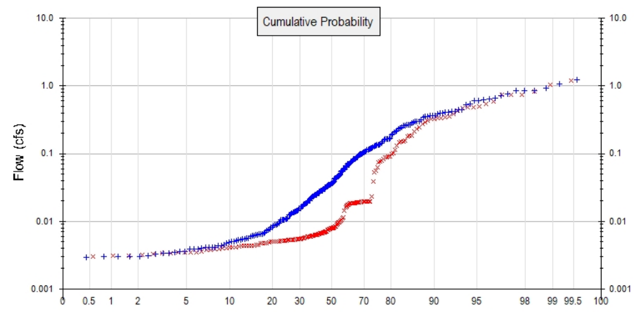
Surface iltration 1

Element Flows To:

Outlet 1	Outlet 2
	Biofiltration 1

Analysis Results
POC 1





+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1

Total Pervious Area:	1.4
Total Impervious Area:	0

Mitigated Landuse Totals for POC #1

Total Pervious Area:	1.38
Total Impervious Area:	0.01

Flow Frequency Method: Cunnane

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.393945
5 year	0.654871
10 year	0.861554
25 year	1.095313

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.274806
5 year	0.499918
10 year	0.748673
25 year	1.064759

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0394	673	426	63	Pass
0.0477	608	362	59	Pass
0.0560	534	318	59	Pass
0.0643	475	288	60	Pass
0.0726	427	261	61	Pass
0.0809	380	225	59	Pass
0.0892	317	205	64	Pass
0.0975	266	188	70	Pass
0.1058	246	168	68	Pass
0.1141	227	157	69	Pass
0.1224	210	150	71	Pass
0.1307	200	138	69	Pass
0.1391	182	125	68	Pass
0.1474	177	119	67	Pass
0.1557	172	105	61	Pass
0.1640	160	94	58	Pass
0.1723	149	86	57	Pass
0.1806	142	80	56	Pass
0.1889	137	74	54	Pass
0.1972	127	68	53	Pass
0.2055	118	67	56	Pass
0.2138	106	64	60	Pass
0.2221	98	58	59	Pass
0.2304	91	53	58	Pass
0.2387	87	53	60	Pass
0.2470	84	50	59	Pass
0.2553	81	49	60	Pass
0.2636	78	48	61	Pass
0.2719	72	44	61	Pass
0.2802	68	40	58	Pass
0.2885	65	37	56	Pass
0.2968	61	37	60	Pass
0.3051	58	33	56	Pass
0.3134	56	31	55	Pass
0.3218	54	28	51	Pass
0.3301	48	25	52	Pass
0.3384	47	22	46	Pass
0.3467	43	22	51	Pass
0.3550	40	20	50	Pass
0.3633	38	19	50	Pass
0.3716	36	19	52	Pass
0.3799	35	18	51	Pass
0.3882	34	17	50	Pass
0.3965	31	16	51	Pass
0.4048	28	16	57	Pass
0.4131	26	16	61	Pass
0.4214	25	15	60	Pass
0.4297	24	15	62	Pass
0.4380	23	14	60	Pass
0.4463	23	14	60	Pass
0.4546	21	14	66	Pass
0.4629	20	14	70	Pass
0.4712	18	13	72	Pass

0.4795	17	13	76	Pass
0.4878	17	12	70	Pass
0.4961	17	11	64	Pass
0.5045	17	10	58	Pass
0.5128	17	10	58	Pass
0.5211	17	10	58	Pass
0.5294	17	9	52	Pass
0.5377	16	9	56	Pass
0.5460	15	9	60	Pass
0.5543	15	8	53	Pass
0.5626	15	8	53	Pass
0.5709	15	8	53	Pass
0.5792	15	8	53	Pass
0.5875	14	8	57	Pass
0.5958	14	7	50	Pass
0.6041	12	7	58	Pass
0.6124	12	7	58	Pass
0.6207	11	7	63	Pass
0.6290	10	7	70	Pass
0.6373	10	7	70	Pass
0.6456	9	7	77	Pass
0.6539	9	7	77	Pass
0.6622	8	7	87	Pass
0.6705	8	7	87	Pass
0.6789	8	7	87	Pass
0.6872	8	7	87	Pass
0.6955	8	7	87	Pass
0.7038	8	7	87	Pass
0.7121	8	7	87	Pass
0.7204	7	7	100	Pass
0.7287	7	6	85	Pass
0.7370	7	5	71	Pass
0.7453	7	5	71	Pass
0.7536	6	3	50	Pass
0.7619	6	3	50	Pass
0.7702	6	3	50	Pass
0.7785	6	3	50	Pass
0.7868	6	3	50	Pass
0.7951	6	3	50	Pass
0.8034	6	3	50	Pass
0.8117	6	3	50	Pass
0.8200	6	3	50	Pass
0.8283	6	3	50	Pass
0.8366	6	3	50	Pass
0.8449	6	2	33	Pass
0.8532	6	2	33	Pass
0.8616	5	2	40	Pass

Water Quality

Model Default Modifications

Total of 0 changes have been made.

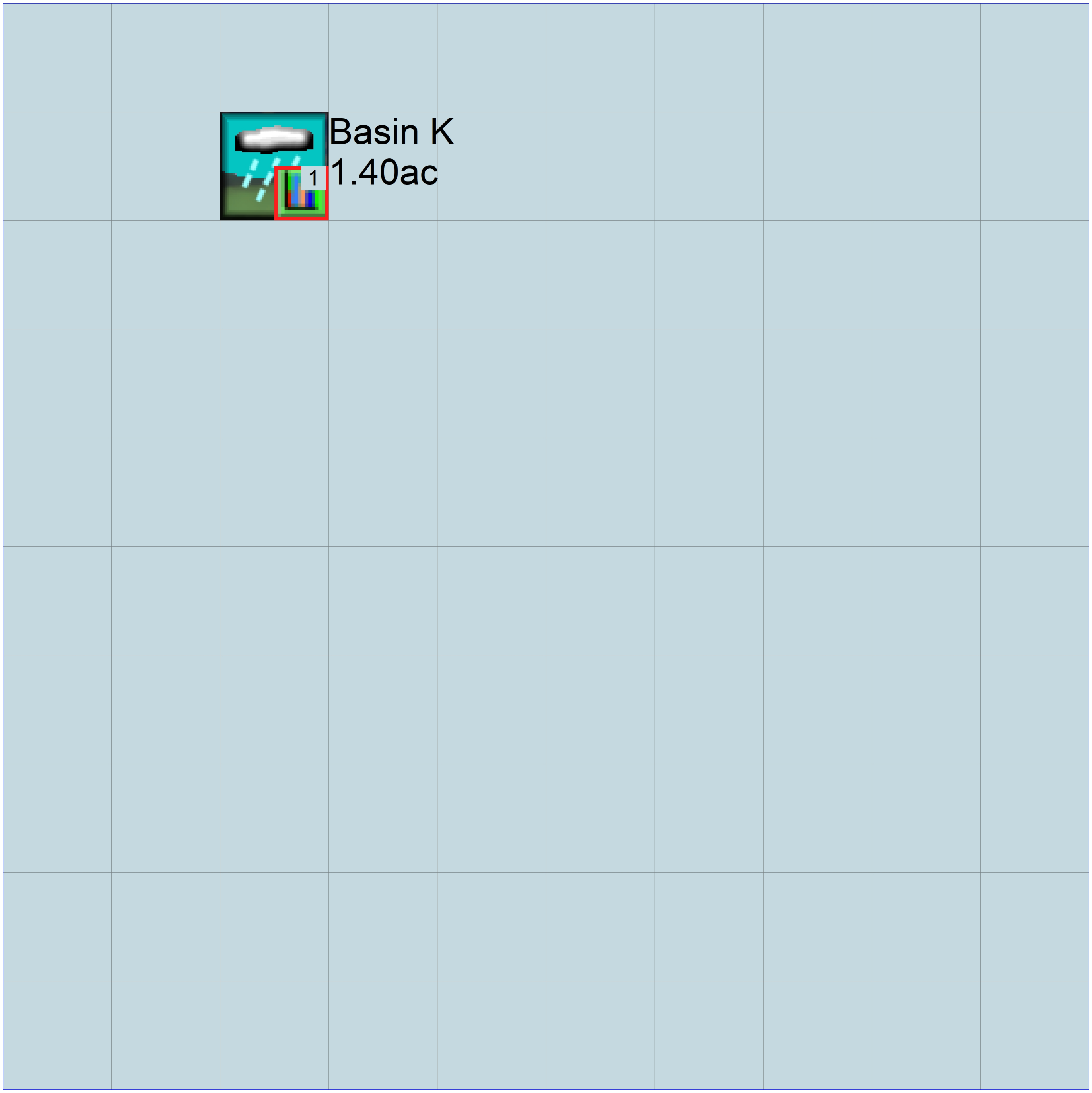
PERLND Changes

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       1959 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   Basin K-ALT.wdm
MESSU      25   PreBasin K-ALT.MES
           27   PreBasin K-ALT.L61
           28   PreBasin K-ALT.L62
           30   POCBasin K-ALT1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:60
      PERLND      30
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Basin K                     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           ***
   30      D,NatVeg,Steep         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 ***
   30         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  *********
   30         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 ***
   30         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
   30              0       2.7      0.02        75      0.15       2.5     0.915
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   30              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 ***
   30              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  ***
   30        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  ***
   30        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
   30              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           ***
  END GEN-INFO
  *** Section IWATER***

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

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
  END PRINT-INFO

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

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

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

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

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin K***
PERLND  30                         1.4     COPY   501     12
PERLND  30                         1.4     COPY   501     13

******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


END MASS-LINK

END RUN
```

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1959 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   Basin K-ALT.wdm
MESSU      25   MitBasin K-ALT.MES
           27   MitBasin K-ALT.L61
           28   MitBasin K-ALT.L62
           30   POCBasin K-ALT1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:60
      PERLND      46
      PERLND      48
      IMPLND       1
      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 iltration  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            ***
   46      D,Urban,Flat            1    1    1    1   27    0
   48      D,Urban,Steep           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 ***
   46         0    0    1    0    0    0    0    0    0    0    0    0
   48         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  *********
   46         0    0    4    0    0    0    0    0    0    0    0    0    1    9
   48         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 ***
   46         0    1    1    1    0    0    0    0    1    1    0
   48         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
   46              0       3.8      0.03        50      0.05       2.5     0.915
   48              0       3.2      0.02        50      0.15       2.5     0.915
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   46              0         0         2         2         0      0.05      0.05
   48              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 ***
   46              0       0.6      0.03         1       0.3         0
   48              0       0.6      0.03         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  ***
   46       0.6  0.6  0.6  0.6  0.7  0.7  0.7  0.7  0.7  0.6  0.6  0.6
   48       0.6  0.6  0.6  0.6  0.7  0.7  0.7  0.7  0.7  0.6  0.6  0.6
  END MON-LZETPARM
  MON-INTERCEP
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   46       0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1
   48       0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  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
   46              0         0      0.15         0         1      0.05         0
   48              0         0      0.15         0         1      0.05         0
  END PWAT-STATE1

END PERLND

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

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

```
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
    1         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     ***
    1         0    0    0    0    1
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    1            100      0.05     0.011       0.1
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    1              0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    1              0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin  1***
PERLND  46                        0.17     RCHRES   1      2
PERLND  46                        0.17     RCHRES   1      3
PERLND  48                        1.21     RCHRES   1      2
PERLND  48                        1.21     RCHRES   1      3
IMPLND   1                        0.01     RCHRES   1      5

******Routing******
PERLND  46                        0.17     COPY     1     12
PERLND  48                        1.21     COPY     1     12
IMPLND   1                        0.01     COPY     1     15
PERLND  46                        0.17     COPY     1     13
PERLND  48                        1.21     COPY     1     13
RCHRES   1                           1     RCHRES   2      8
RCHRES   2                           1     COPY   501     16
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 iltratio-005    2    1    1    1   28    0    1
    2     Biofiltration  1-004    1    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  0  0  0       0  0  0  0  0       2  2  2  2  2
    2        0  1  0  0    4  0  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       0.0       0.0       0.0
    2             2      0.01       0.0       0.0       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  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    2           0         4.0  0.0  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
   69    4
     Depth      Area    Volume  Outflow1 Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.048973  0.000000  0.000000
  0.063187  0.048821  0.000166  0.000000
  0.126374  0.048243  0.000336  0.000000
  0.189560  0.047668  0.000509  0.000000
  0.252747  0.047096  0.000686  0.000000
  0.315934  0.046527  0.000866  0.000000
  0.379121  0.045962  0.001050  0.000000
  0.442308  0.045400  0.001237  0.000000
  0.505495  0.044841  0.001428  0.000000
  0.568681  0.044286  0.001623  0.000000
  0.631868  0.043734  0.001821  0.000000
  0.695055  0.043185  0.002023  0.000000
  0.758242  0.042640  0.002229  0.000000
  0.821429  0.042098  0.002438  0.000000
  0.884615  0.041559  0.002651  0.000000
  0.947802  0.041023  0.002869  0.000000
  1.010989  0.040491  0.003090  0.000000
  1.074176  0.039962  0.003315  0.000000
```

1.137363	0.039436	0.003544	0.000000
1.200549	0.038914	0.003776	0.000000
1.263736	0.038395	0.004013	0.000000
1.326923	0.037879	0.004254	0.000000
1.390110	0.037367	0.004499	0.000000
1.453297	0.036858	0.004748	0.000813
1.516484	0.036352	0.005001	0.001219
1.579670	0.035849	0.005259	0.001804
1.642857	0.035350	0.005520	0.002096
1.706044	0.034854	0.005786	0.002528
1.769231	0.034361	0.006056	0.002744
1.832418	0.033872	0.006330	0.003091
1.895604	0.033386	0.006609	0.003264
1.958791	0.032903	0.006891	0.003560
2.021978	0.032424	0.007179	0.003708
2.085165	0.031948	0.007470	0.003971
2.148352	0.031475	0.007766	0.004102
2.211538	0.031005	0.008067	0.004341
2.274725	0.030539	0.008372	0.004460
2.337912	0.030076	0.008682	0.004681
2.401099	0.029616	0.008996	0.004791
2.464286	0.029160	0.009315	0.004997
2.527473	0.028707	0.009638	0.005100
2.590659	0.028257	0.009966	0.005294
2.653846	0.027811	0.010299	0.005391
2.717033	0.027368	0.010636	0.005575
2.780220	0.026928	0.011109	0.005667
2.843407	0.026491	0.011589	0.005842
2.906593	0.026058	0.012076	0.005929
2.969780	0.025628	0.012569	0.006097
3.032967	0.025201	0.013069	0.006181
3.096154	0.024778	0.013576	0.006342
3.159341	0.024358	0.014090	0.006423
3.222527	0.023941	0.014610	0.006578
3.285714	0.023528	0.015138	0.006656
3.348901	0.023118	0.015672	0.006704
3.412088	0.022711	0.016213	0.006728
3.475275	0.022307	0.016762	0.006851
3.538462	0.021907	0.017317	0.006913
3.601648	0.021510	0.017880	0.007142
3.664835	0.021116	0.018450	0.007457
3.728022	0.020726	0.019027	0.007806
3.791209	0.020339	0.019611	0.008163
3.854396	0.019955	0.020203	0.008517
3.917582	0.019575	0.020802	0.008862
3.980769	0.019197	0.021408	0.009198
4.043956	0.018824	0.022022	0.009523
4.107143	0.018453	0.022643	0.009839
4.170330	0.018086	0.023272	0.010148
4.233516	0.017722	0.023908	0.010452
4.250000	0.017361	0.025690	0.019539

END FTABLE 2
FTABLE 1
25 5

Depth (ft)	Area (acres)	Volume (acre-ft)	Outflow1 (cfs)	Outflow2 (cfs)	Velocity (ft/sec)	Travel Time*** (Minutes)***
0.000000	0.017361	0.000000	0.000000	0.000000		
0.063187	0.049555	0.003113	0.000000	0.019539		
0.126374	0.050141	0.006263	0.000000	0.019539		
0.189560	0.050730	0.009449	0.000000	0.019539		
0.252747	0.051323	0.012674	0.000000	0.019539		
0.315934	0.051919	0.015935	0.000000	0.019539		
0.379121	0.052518	0.019235	0.000000	0.019539		
0.442308	0.053120	0.022572	0.000000	0.019539		
0.505495	0.053726	0.025948	0.000000	0.019539		
0.568681	0.054335	0.029362	0.000000	0.019539		
0.631868	0.054947	0.032815	0.000000	0.019539		
0.695055	0.055563	0.036306	0.008848	0.019539		
0.758242	0.056182	0.039836	0.058483	0.019539		
0.821429	0.056804	0.043406	0.131471	0.019539		

```
  0.884615  0.057429  0.047015  0.221825  0.019539
  0.947802  0.058058  0.050664  0.326680  0.019539
  1.010989  0.058690  0.054352  0.459651  0.019539
  1.074176  0.059326  0.058081  1.065894  0.019539
  1.137363  0.059964  0.061849  2.041819  0.019539
  1.200549  0.060606  0.065659  3.275375  0.019539
  1.263736  0.061252  0.069509  4.715805  0.019539
  1.326923  0.061900  0.073399  6.327973  0.019539
  1.390110  0.062552  0.077331  8.082195  0.019539
  1.453297  0.063207  0.081304  9.950486  0.019539
  1.500000  0.063694  0.084268  11.90497  0.019539
  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     22 IRRG     ENGL    0.7       SAME PERLND  46     EXTNL  SURLI
WDM     22 IRRG     ENGL    0.7       SAME PERLND  48     EXTNL  SURLI
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   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        16
RCHRES     ROFLOW                                COPY           INPUT  MEAN
  END MASS-LINK   16

  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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Local (360)943-0304

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SDHM 3.1

PROJECT REPORT

General Model Information

Project Name:	Basin L
Site Name:	VETERANS
Site Address:	
City:	CARLSBAD
Report Date:	2/5/2022
Gage:	OCEANSID
Data Start:	10/01/1959
Data End:	09/30/2004
Timestep:	Hourly
Precip Scale:	1.000
Version Date:	2021/06/28

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 L

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
D,NatVeg,Steep	0.21
Pervious Total	0.21
Impervious Land Use	acre
Impervious Total	0
Basin Total	0.21

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Basin L

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
D,Urban,Moderate	0.04
D,Urban,Steep	0.16
Pervious Total	0.2
Impervious Land Use	acre
IMPERVIOUS-FLAT	0.01
Impervious Total	0.01
Basin Total	0.21

Element Flows To:

Surface	Interflow	Groundwater
Surface iltration 1	Surface iltration 1	

Routing Elements
Predeveloped Routing

Mitigated Routing

Biofiltration 1

Bottom Length:	5.50 ft.
Bottom Width:	5.50 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:	1.5
Material type for third layer:	GRAVEL
Underdrain used	
Underdrain Diameter (feet):	0.5
Orifice Diameter (in.):	2
Offset (in.):	3
Flow Through Underdrain (ac-ft.):	2.247
Total Outflow (ac-ft.):	2.705
Percent Through Underdrain:	83.06

Discharge Structure

Riser Height:	1 ft.
Riser Diameter:	36 in.
Notch Type:	Rectangular
Notch Width:	0.670 ft.
Notch Height:	0.330 ft.

Element Flows To:
Outlet 1 Outlet 2

Biofilter Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.0088	0.0000	0.0000	0.0000
0.0522	0.0087	0.0000	0.0000	0.0000
0.1044	0.0085	0.0000	0.0000	0.0000
0.1566	0.0083	0.0000	0.0000	0.0000
0.2088	0.0081	0.0000	0.0000	0.0000
0.2610	0.0079	0.0000	0.0000	0.0000
0.3132	0.0077	0.0000	0.0000	0.0000
0.3654	0.0075	0.0001	0.0000	0.0000
0.4176	0.0074	0.0001	0.0000	0.0000
0.4698	0.0072	0.0001	0.0000	0.0000
0.5220	0.0070	0.0001	0.0000	0.0000
0.5742	0.0068	0.0001	0.0000	0.0000
0.6264	0.0066	0.0001	0.0000	0.0000
0.6786	0.0065	0.0001	0.0000	0.0000
0.7308	0.0063	0.0001	0.0000	0.0000
0.7830	0.0061	0.0001	0.0000	0.0000
0.8352	0.0060	0.0002	0.0000	0.0000
0.8874	0.0058	0.0002	0.0000	0.0000
0.9396	0.0056	0.0002	0.0000	0.0000
0.9918	0.0055	0.0002	0.0000	0.0000
1.0440	0.0053	0.0002	0.0000	0.0000
1.0962	0.0052	0.0002	0.0000	0.0000
1.1484	0.0050	0.0003	0.0000	0.0000
1.2005	0.0049	0.0003	0.0000	0.0000
1.2527	0.0047	0.0003	0.0000	0.0000
1.3049	0.0046	0.0003	0.0000	0.0000

1.3571	0.0044	0.0004	0.0000	0.0000
1.4093	0.0043	0.0004	0.0011	0.0000
1.4615	0.0041	0.0004	0.0013	0.0000
1.5137	0.0040	0.0004	0.0013	0.0000
1.5659	0.0039	0.0005	0.0015	0.0000
1.6181	0.0037	0.0005	0.0016	0.0000
1.6703	0.0036	0.0005	0.0018	0.0000
1.7225	0.0035	0.0005	0.0020	0.0000
1.7747	0.0034	0.0006	0.0023	0.0000
1.8269	0.0032	0.0006	0.0025	0.0000
1.8791	0.0031	0.0007	0.0025	0.0000
1.9313	0.0030	0.0007	0.0049	0.0000
1.9835	0.0029	0.0008	0.0054	0.0000
2.0357	0.0028	0.0008	0.0060	0.0000
2.0879	0.0027	0.0009	0.0064	0.0000
2.1401	0.0025	0.0009	0.0064	0.0000
2.1923	0.0024	0.0010	0.0064	0.0000
2.2445	0.0023	0.0010	0.0064	0.0000
2.2967	0.0022	0.0011	0.0064	0.0000
2.3489	0.0021	0.0012	0.0064	0.0000
2.4011	0.0020	0.0012	0.0064	0.0000
2.4533	0.0019	0.0013	0.0064	0.0000
2.5055	0.0018	0.0013	0.0064	0.0000
2.5577	0.0017	0.0014	0.0064	0.0000
2.6099	0.0017	0.0015	0.0064	0.0000
2.6621	0.0016	0.0016	0.0064	0.0000
2.7143	0.0015	0.0016	0.0064	0.0000
2.7665	0.0014	0.0017	0.0064	0.0000
2.8187	0.0013	0.0018	0.0064	0.0000
2.8709	0.0012	0.0019	0.0064	0.0000
2.9231	0.0012	0.0019	0.0064	0.0000
2.9753	0.0011	0.0020	0.0064	0.0000
3.0275	0.0010	0.0021	0.0064	0.0000
3.0797	0.0009	0.0022	0.0064	0.0000
3.1319	0.0009	0.0023	0.0064	0.0000
3.1841	0.0008	0.0024	0.0064	0.0000
3.2363	0.0008	0.0025	0.0064	0.0000
3.2500	0.0007	0.0025	0.0064	0.0000

Biofilter Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
3.2500	0.008752	0.002489	0.0000	0.0035	0.0000
3.3022	0.008953	0.002951	0.0000	0.0035	0.0000
3.3544	0.009156	0.003423	0.0000	0.0043	0.0000
3.4066	0.009361	0.003907	0.0000	0.0045	0.0000
3.4588	0.009568	0.004401	0.0000	0.0046	0.0000
3.5110	0.009778	0.004906	0.0000	0.0047	0.0000
3.5632	0.009990	0.005422	0.0000	0.0048	0.0000
3.6154	0.010204	0.005949	0.0000	0.0049	0.0000
3.6676	0.010420	0.006487	0.0000	0.0051	0.0000
3.7198	0.010639	0.007036	0.0000	0.0052	0.0000
3.7720	0.010860	0.007598	0.0000	0.0053	0.0000
3.8242	0.011083	0.008170	0.0000	0.0054	0.0000
3.8764	0.011309	0.008755	0.0000	0.0055	0.0000
3.9286	0.011536	0.009351	0.0018	0.0057	0.0000
3.9808	0.011766	0.009959	0.0334	0.0058	0.0000
4.0330	0.011998	0.010579	0.0847	0.0059	0.0000
4.0852	0.012233	0.011212	0.1498	0.0060	0.0000

4.1374	0.012469	0.011856	0.2261	0.0062	0.0000
4.1896	0.012708	0.012514	0.3123	0.0063	0.0000
4.2418	0.012950	0.013183	0.4072	0.0064	0.0000
4.2940	0.013193	0.013865	0.7164	0.0064	0.0000
4.3462	0.013439	0.014561	1.3716	0.0064	0.0000
4.3984	0.013687	0.015268	2.2396	0.0064	0.0000
4.4505	0.013937	0.015989	3.2754	0.0064	0.0000
4.5027	0.014189	0.016723	4.4521	0.0064	0.0000
4.5549	0.014444	0.017471	5.7497	0.0064	0.0000
4.6071	0.014701	0.018231	7.1510	0.0064	0.0000
4.6593	0.014960	0.019005	8.6400	0.0064	0.0000
4.7115	0.015221	0.019793	10.201	0.0064	0.0000
4.7500	0.015416	0.020382	11.819	0.0064	0.0000

Surface iltration 1

Element Flows To:

Outlet 1	Outlet 2
	Biofiltration 1

Analysis Results

POC 1

Model Default Modifications

Total of 0 changes have been made.

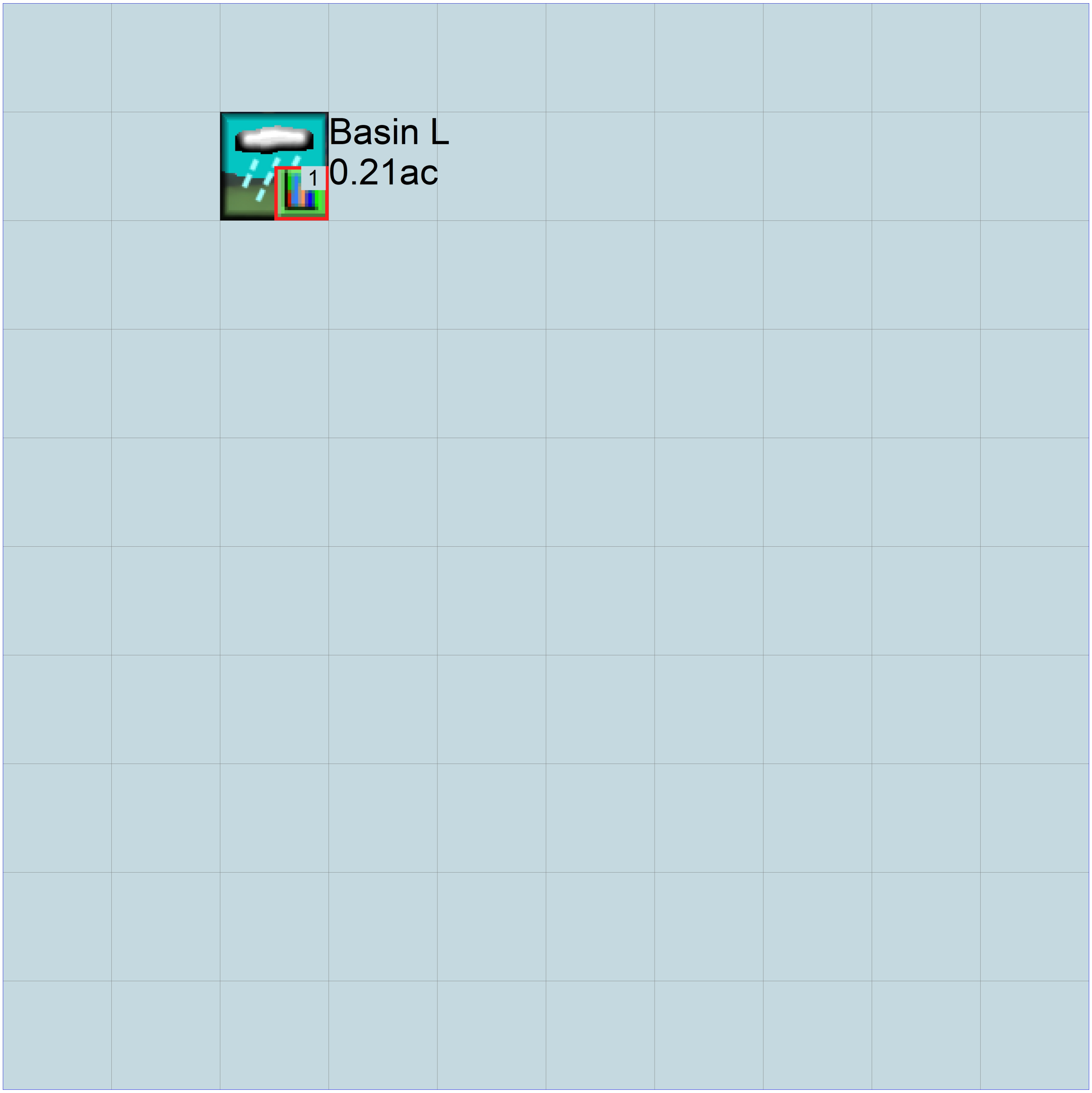
PERLND Changes

No PERLND changes have been made.

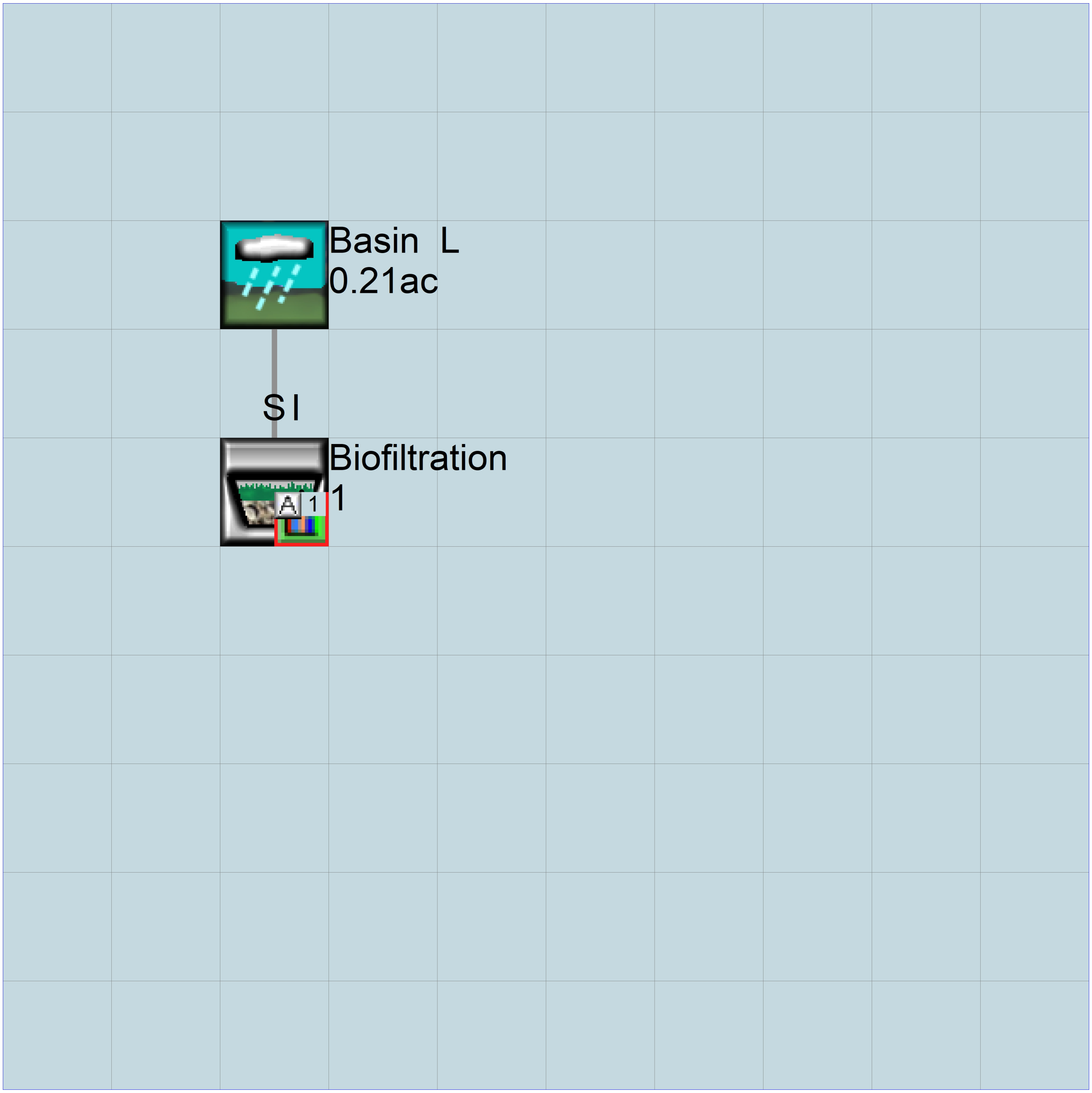
IMPLND Changes

No IMPLND changes have been made.

Appendix
Predeveloped Schematic



Mitigated Schematic



Predeveloped UCI File

Mitigated UCI File

Predeveloped HSPF Message File

Mitigated HSPF Message File

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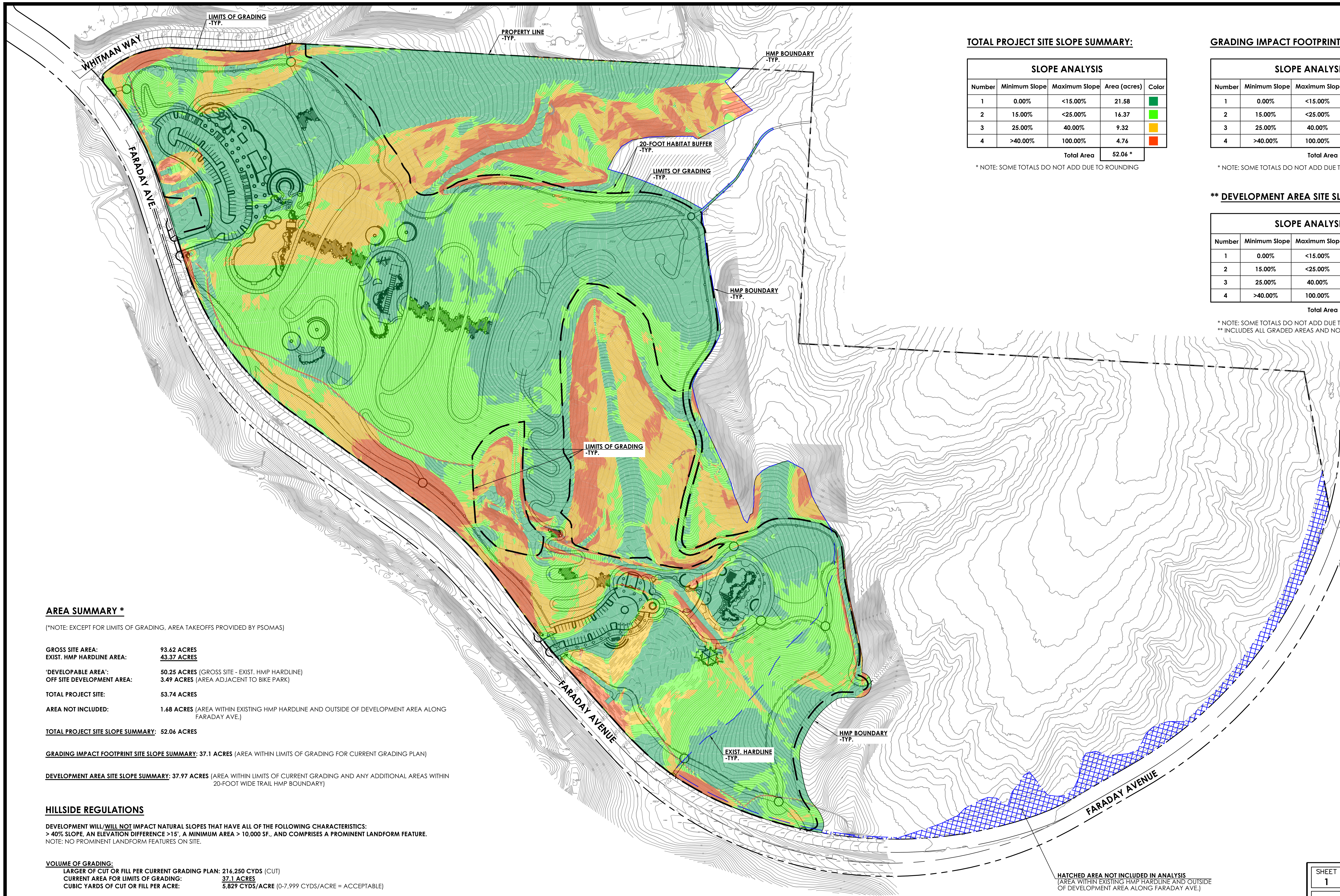
ATTACHMENT 2e
Slope Analysis (backup documentation for Flow Control)



TOTAL PROJECT SITE SLOPE SUMMARY:

SLOPE ANALYSIS

Number	Minimum Slope	Maximum Slope	Area (acres)	Color
1	0.00%	<15.00%	21.58	
2	15.00%	<25.00%	16.37	
3	25.00%	40.00%	9.32	
4	>40.00%	100.00%	4.76	
		Total Area	52.06 *	

* NOTE: SOME TOTALS DO NOT ADD DUE TO ROUNDING

GRADING IMPACT FOOTPRINT SITE SLOPE SUMMARY:

SLOPE ANALYSIS

Number	Minimum Slope	Maximum Slope	Area (acres)	Color
1	0.00%	<15.00%	16.13	
2	15.00%	<25.00%	13.96	
3	25.00%	40.00%	5.11	
4	>40.00%	100.00%	1.91	
		Total Area	37.11*	

* NOTE: SOME TOTALS DO NOT ADD DUE TO ROUNDING

** DEVELOPMENT AREA SITE SLOPE SUMMARY:

SLOPE ANALYSIS

Number	Minimum Slope	Maximum Slope	Area (acres)	Color
1	0.00%	<15.00%	16.52	
2	15.00%	<25.00%	14.10	
3	25.00%	40.00%	5.34	
4	>40.00%	100.00%	2.00	
		Total Area	37.97 *	

* NOTE: SOME TOTALS DO NOT ADD DUE TO ROUNDING
** INCLUDES ALL GRADED AREAS AND NON-GRADED BUFFERS

AREA SUMMARY *

(*NOTE: EXCEPT FOR LIMITS OF GRADING, AREA TAKEOFFS PROVIDED BY PSOMAS)

GROSS SITE AREA: **93.62 ACRES**
EXIST. HMP HARDLINE AREA: **43.37 ACRES**

'DEVELOPABLE AREA': **50.25 ACRES** (GROSS SITE - EXIST. HMP HARDLINE)
OFF SITE DEVELOPMENT AREA: **3.49 ACRES** (AREA ADJACENT TO BIKE PARK)

TOTAL PROJECT SITE: **53.74 ACRES**

AREA NOT INCLUDED: **1.68 ACRES** (AREA WITHIN EXISTING HMP HARDLINE AND OUTSIDE OF DEVELOPMENT AREA ALONG FARADAY AVE.)

TOTAL PROJECT SITE SLOPE SUMMARY: 52.06 ACRES

GRADING IMPACT FOOTPRINT SITE SLOPE SUMMARY: 37.1 ACRES (AREA WITHIN LIMITS OF GRADING FOR CURRENT GRADING PLAN)

DEVELOPMENT AREA SITE SLOPE SUMMARY: 37.97 ACRES (AREA WITHIN LIMITS OF CURRENT GRADING AND ANY ADDITIONAL AREAS WITHIN 20-FOOT WIDE TRAIL HMP BOUNDARY)

HILLSIDE REGULATIONS

DEVELOPMENT WILL/WILL NOT IMPACT NATURAL SLOPES THAT HAVE ALL OF THE FOLLOWING CHARACTERISTICS:
> 40% SLOPE, AN ELEVATION DIFFERENCE >15', A MINIMUM AREA > 10,000 SF., AND COMPRISES A PROMINENT LANDFORM FEATURE.
NOTE: NO PROMINENT LANDFORM FEATURES ON SITE.

VOLUME OF GRADING:
LARGER OF CUT OR FILL PER CURRENT GRADING PLAN: 216,250 CYDS (CUT)
CURRENT AREA FOR LIMITS OF GRADING: 37.1 ACRES
CUBIC YARDS OF CUT OR FILL PER ACRE: 5,829 CYDS/ACRE (0-7,999 CYDS/ACRE = ACCEPTABLE)

CivTEC CIVIL ENGINEERING CONSULTING
999 CORPORATE DR., SUITE 100
LADERA RANCH, CA 92694
p: 949.463.8822
e: tec@civtec.net

January 29, 2022

SHEET	CITY OF CARLSBAD	SHEETS
1	PARKS & RECREATION DEPARTMENT	1

VETERANS MEMORIAL PARK
SLOPE ANALYSIS - EXISTING SLOPES

	PROJECT NO.	DRAWING NO.
	CIP 4609	

ATTACHMENT 3
Structural BMP Maintenance Information

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

Preliminary Design/Planning/CEQA level submittal:

Attachment 3 must identify:

- ✓ Typical maintenance indicators and actions for proposed structural BMP(s) based on Section 7.7 of the BMP Design Manual

Final Design level submittal:

Attachment 3 must identify:

- ☐ Specific maintenance indicators and actions for proposed structural BMP(s). This shall 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 for BMPs subject to siltation or heavy trash(e.g., silt level posts or other markings shall be included in all BMP components that will trap and store sediment, trash, and/or debris, so that the inspector may determine how full the BMP is, and the maintenance personnel may determine where the bottom of the BMP is . If required, posts or other markings shall be indicated and described on structural BMP plans.)
- ☐ 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

TABLE 7-2. Maintenance Indicators and Actions for Vegetated BMPs

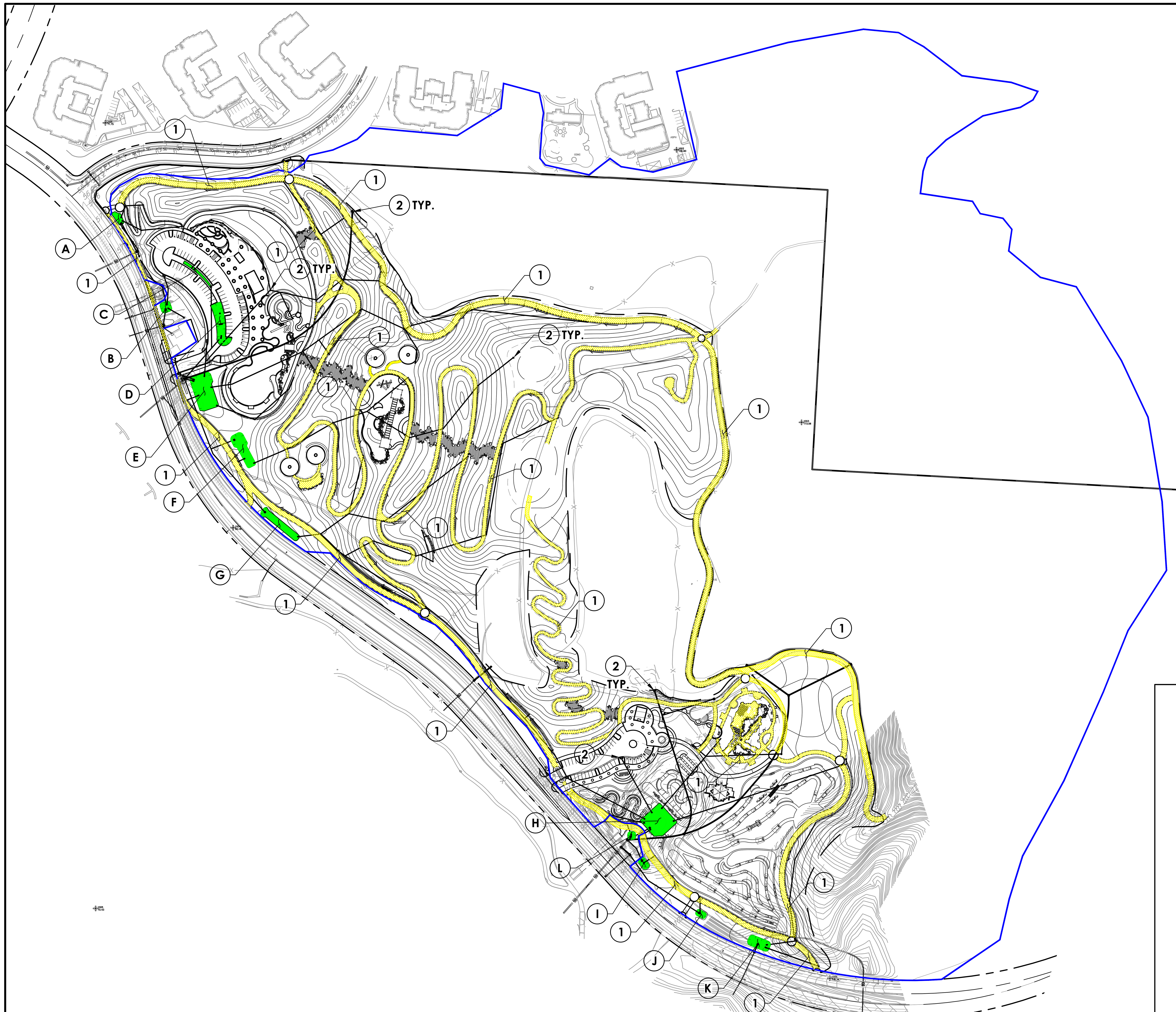
Typical Maintenance Indicator(s) for Vegetated BMPs	Maintenance Actions
Accumulation of sediment, litter, or debris	Remove and properly dispose of accumulated materials, without damage to the vegetation.
Poor vegetation establishment	Re-seed, re-plant, or re-establish vegetation per original plans.
Overgrown vegetation	Mow or trim as appropriate, but not less than the design height of the vegetation per original plans when applicable (e.g. a vegetated swale may require a minimum vegetation height).
Erosion due to concentrated irrigation flow	Repair/re-seed/re-plant eroded areas and adjust the irrigation system.
Erosion due to concentrated storm water runoff flow	Repair/re-seed/re-plant eroded areas, and make appropriate corrective measures such as adding erosion control blankets, adding stone at flow entry points, or minor re-grading to restore proper drainage according to the original plan. If the issue is not corrected by restoring the BMP to the original plan and grade, the City Engineer shall be contacted prior to any additional repairs or reconstruction.
Standing water in vegetated swales used for pretreatment and/or site design BMPs	Make appropriate corrective measures such as adjusting irrigation system, removing obstructions of debris or invasive vegetation, loosening or replacing top soil to allow for better infiltration, or minor re-grading for proper drainage. If the issue is not corrected by restoring the BMP to the original plan and grade, the City Engineer shall be contacted prior to any additional repairs or reconstruction.
Standing water in bioretention, biofiltration with partial retention, or biofiltration areas, or flow-through planter boxes* for longer than 96 hours following a storm event**	Make appropriate corrective measures such as inspecting/unclogging orifice opening, adjusting irrigation system, removing obstructions of debris or invasive vegetation, clearing underdrains (where applicable), or repairing/replacing clogged or compacted soils.
Obstructed inlet or outlet structure	Clear obstructions.
Damage to structural components such as weirs, inlet or outlet structures	Repair or replace as applicable.

*Vegetated swales and flow-through planter boxes in regards to flow-thru treatment control BMPs are not options as structural BMPs. Carlsbad has not adopted an Alternative Compliance Program.

**These BMPs typically include a surface ponding layer as part of their function which may take 96 hours to drain following a storm event.

ATTACHMENT 4
City standard Single Sheet BMP (SSBMP) Exhibit

[Use the City’s standard Single Sheet BMP Plan.]



LEGEND

WATERSHED BOUNDARY

BMP BASIN SIGNAGE

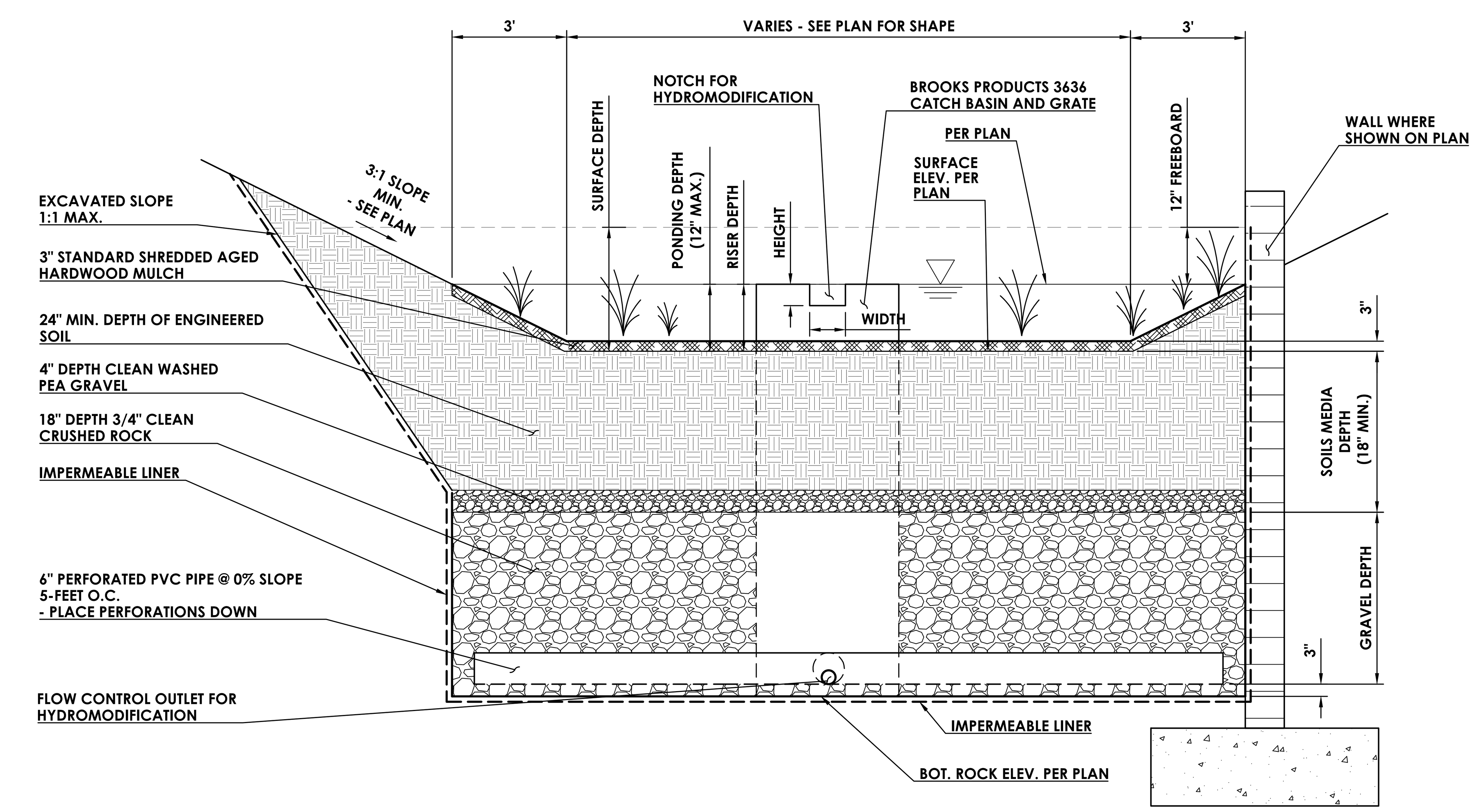
All BMP signage shall be installed for each structural BMP basin (INF-1, INF-2, PR-1, and BF-1). Signage size shall be no smaller than 18" by 12" (landscape orientation), constructed of durable materials, permanently mounted and in a visible location.

PERMANENT WATER QUALITY TREATMENT FACILITY
KEEPING OUR WATERWAYS CLEAN *MAINTAIN WITH CARE - NO MODIFICATIONS WITHOUT AGENCY APPROVAL*

CATCH BASIN STENCILING

BMP TABLE

BMP ID	BMP TYPE	SYMBOL	CASQA NO.	QUANTITY	DRAWING NO.	SHEET NO.(S)	INSPECTION FREQUENCY	MAINTENANCE FREQUENCY
TREATMENT CONTROL								
A-L	BIOFILTRATION		BF-1	12 EA	CONCEPTUAL GRADING EXHIBIT	C-1.01-C-1.20	SEMI-ANNUALLY	ANNUALLY
HYDROMODIFICATION & TREATMENT CONTROL								
1	PERVIOUS PAVEMENT		TC-10	159,600 SF	CONCEPTUAL GRADING EXHIBIT	C-1.01-C-1.20	SEMI-ANNUALLY	ANNUALLY
SOURCE CONTROL								
2	STENCILS	NO DUMPING - DRAINS TO WATERWAYS	SD-13	4 EA	CONCEPTUAL GRADING EXHIBIT	C-1.03, C-1.08, C-1.15	SEMI-ANNUALLY	AS NEEDED OR AT MINIMUM EVERY 5 YEARS



BIOFILTRATION AREA WITH UNDERDRAIN

BMP NOTES:

1. THESE BMPS ARE MANDATORY TO BE INSTALLED PER MANUFACTURER'S RECOMMENDATIONS AND/OR THESE PLANS.
2. NO CHANGES TO THE PROPOSED BMPS ON THIS SHEET WITHOUT PRIOR APPROVAL FROM THE CITY ENGINEER.
3. NO SUBSTITUTIONS TO THE MATERIAL OR TYPES OR PLANTING TYPES WITHOUT PRIOR APPROVAL FROM THE CITY ENGINEER.
4. NO OCCUPANCY WILL BE GRANTED UNTIL THE CITY INSPECTION STAFF HAS INSPECTED THIS PROJECT FOR APPROPRIATE BMP CONSTRUCTION AND INSTALLATION.
5. REFER TO MAINTENANCE AGREEMENT DOCUMENT.
6. SEE PROJECT SWQMP FOR ADDITIONAL INFORMATION.

BMP CONSTRUCTION AND INSPECTION NOTES:

THE EOW WILL VERIFY THAT PERMANENT BMPS ARE CONSTRUCTED AND OPERATING IN COMPLIANCE WITH THE APPLICABLE REQUIREMENTS. PRIOR TO OCCUPANCY THE EOW MUST PROVIDE:

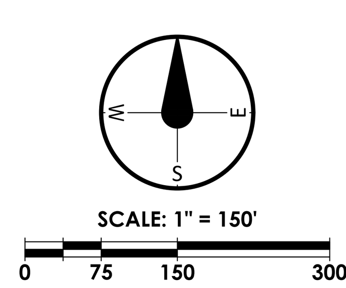
1. PHOTOGRAPHS OF THE INSTALLATION OF PERMANENT BMPS PRIOR TO CONSTRUCTION, DURING CONSTRUCTION, AND AT FINAL INSTALLATION.
2. A WET STAMPED LETTER VERIFYING THAT PERMANENT BMPS ARE CONSTRUCTED AND OPERATING PER THE REQUIREMENTS OF THE APPROVED PLANS.
3. PHOTOGRAPHS TO VERIFY THAT PERMANENT WATER QUALITY TREATMENT SIGNAGE HAS BEEN INSTALLED.

PRIOR TO RELEASE OF SECURITIES, THE DEVELOPER IS RESPONSIBLE FOR ENSURING THE PERMANENT BMPS HAVE NOT BEEN REMOVED OR MODIFIED BY THE NEW HOMEOWNER OR HOA WITHOUT THE APPROVAL OF THE CITY ENGINEER.

PARTY RESPONSIBLE FOR MAINTENANCE:

NAME CITY OF CARLSBAD PARKS & RECREATION DEPARTMENT
ADDRESS 799 PINE AVE. SUITE 200
CARLSBAD, CA 92008
CONTACT T.B.D.
PHONE NO. 442-339-2826

UNDERGROUND SERVICE ALERT
CALL: 811
TWO WORKING DAYS BEFORE YOU DIG



NO.	DATE	DESCRIPTION	BY

REVISIONS

REGISTERED PROFESSIONAL ENGINEER THOMAS E. CARCELLI C-81640 Exp. 09-30-23 CIVIL STATE OF CALIFORNIA

PREPARED BY:
civTEC CIVIL ENGINEERING CONSULTING
999 CORPORATE DR., SUITE 100
LADERA RANCH, CA 92694
p: 949.463.8822
e: tec@civtec.net

3/1/22
THOMAS E. CARCELLI, R.C.E. #81640

SCALE:	PER PLAN
DATE:	3/1/22
DRAWN BY:	STAFF
CHECKED BY:	TEC
PLOT DATE:	3/1/22

SINGLE SHEET BMP EXHIBIT
VETERANS MEMORIAL PARK
SWQMP
CARLSBAD, CA

DRAWING NUMBER:
SSBMP-1
SHEET 1 OF 1
JN 101.176

NOT FOR CONSTRUCTION

ATTACHMENT 5
Geotechnical Report

GEOTECHNICAL INVESTIGATION
VETERANS MEMORIAL PARK
Faraday Avenue at Whitman Way
Carlsbad, California
for
RJM Design Group

SOUTHERN
CALIFORNIA
GEOTECHNICAL
A California Corporation

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

August 7, 2020

RJM Design Group
31591 Camino Capistrano
San Juan Capistrano, California 92675

Attention: Mr. Eric Chastain, LLA, LEED AP
Principal Landscape Architect

Proposal No.: 19G109-2

Subject: Geotechnical Investigation
Proposed Veterans Memorial Park
Faraday Avenue at Whitman Way
Carlsbad, California

Dear Mr. Chastain:

In accordance with your request, we have conducted a geotechnical investigation at the subject site. We are pleased to present this report summarizing the conclusions and recommendations developed from our investigation.

We sincerely appreciate the opportunity to be of service on this project. We look forward to providing additional consulting services during the course of the project. If we may be of further assistance in any manner, please contact our office.

Respectfully Submitted,

SOUTHERN CALIFORNIA GEOTECHNICAL, INC.

Gregory K. Mitchell, GE 2364
Principal Engineer

Robert G. Trazo, GE 2655
Principal Engineer

Distribution: (1) Addressee

22885 Savi Ranch Parkway ▼ Suite E ▼ Yorba Linda ▼ California ▼ 92887
voice: (714) 685-1115 ▼ fax: (714) 685-1118 ▼ www.socalgeo.com

TABLE OF CONTENTS

1.0 EXECUTIVE SUMMARY

Presented below is a brief summary of the conclusions and recommendations of this investigation. Since this summary is not all inclusive, it should be read in complete context with the entire report.

Geotechnical Design Considerations

- The extreme northern portion of the site is underlain by relatively deep alluvial soils. The remainder of the site is underlain by a relatively shallow layer of colluvium, which is underlain by Santiago formation sandstone and siltstone.
- Mapping performed by the County of San Diego indicates that the northern portion of the subject site is located within a liquefaction hazard zone. Therefore, one boring was extended to a depth of 50± feet below the existing site grades.
- The liquefaction analysis indicates a total settlement of 3.3± inches at Boring No. B-1. The liquefaction-induced differential settlements are conservatively estimated to be in the range of 1.6 to 2.2± inches. Assuming that these settlements occur across a distance of 50± feet, an angular distortion of 0.004± inches per inch would result.
- The proposed building areas are generally underlaying by medium expansive alluvial and colluvial soils that possess low to moderate strengths and a potential for hydrocollapse.
- Where new buildings are supported on shallow foundations and slabs-on-grade, remedial grading will be necessary to remove the upper portion of the near-surface native colluvial soils and replace these materials as compacted structural fill.
- Shallow drilled piers may be used to support shade structures, canopies, etc., to minimize remedial grading.

Site Preparation Recommendations

- Remedial grading is recommended to be performed within the proposed building areas in order to remove the upper portion of the existing low strength alluvial and colluvial soils. The soils present within the proposed building areas should be overexcavated to a depth of 5 feet below existing grade and to a depth of at least 3 feet below proposed building pad subgrade elevation. The northern restroom building should be overexcavated to a depth of at least 5 feet below proposed pad grade. The proposed foundation influence zones should also be overexcavated to a depth of at least 3 feet below proposed foundation bearing grade.
- After the recommended overexcavation has been completed, the resulting subgrade soils should be evaluated by the geotechnical engineer to identify any additional soils that should be overexcavated. The resulting subgrade should then be scarified to a depth of 12 inches, thoroughly moisture conditioned to 2 to 4 percent above optimum moisture content, and recompacted to at least 90 percent of the ASTM D-1557 maximum dry density. The previously excavated soils may then be replaced as compacted structural fill.
- The subgrade soils within new flatwork, parking areas, bocce ball courts, playgrounds, etc., are recommended to be scarified to a depth of 12± inches, moisture conditioned to 2 to 4 percent above optimum, and recompacted to at least 90 percent of the ASTM D-1557 maximum dry density.
- Due to the presence of medium expansive soils, consideration should be given to placing a 12 to 24-inch thick layer of very low expansive soils below the new flatwork.

Building Foundations

- Conventional shallow foundations, supported in newly placed compacted fill.
- 2,000 lbs/ft^2 maximum allowable soil bearing pressure.
- Reinforcement consisting of at least six (6) No. 5 rebars (3 top and 3 bottom) in strip footings, due to the liquefaction potential and expansive potential of the on-site soils. Additional reinforcement may be necessary for structural considerations.
- Structurally connect any isolated footings in both perpendicular directions within structures underlain by potentially liquefiable alluvium.

Pole Foundations

- Structures incorporating isolated poles, such as trellises, shade structures and light poles may be supported on shallow drilled pier foundations, supported in newly placed compacted fill.
- 3,000 lbs/ft^2 maximum allowable end-bearing pressure.
- Minimum embedment: 5 feet below adjacent grade; 2 feet below grade for fencing.

Building Floor Slabs

- Conventional Slab-on-Grade, 4½ inches thick.
- Minimum slab thickness 6 inches for buildings underlain by potentially liquefiable alluvial soils, such as the northern restroom building.
- Reinforcement consisting of No. 4 bars at 16-inches on center in both directions due to the expansion potential of the on-site soils. The actual floor slab reinforcement should be determined by the structural engineer.

Pavements

ASPHALT PAVEMENTS (R = 15)			
Materials	Thickness (inches)		
	Auto Parking (TI = 4.0)	Auto Drive Lanes (TI = 5.0)	Light Truck Traffic (TI = 6.0)
Asphalt Concrete	3	3	3½
Aggregate Base	6	9	11
Compacted Subgrade	12	12	12

PORTLAND CEMENT CONCRETE PAVEMENTS (R = 15)			
Materials	Thickness (inches)		
	Automobile Parking and Drive Areas (TI = 4.0 to 5.0)	Truck Traffic Areas (TI =6.0)	Fire Lane (TI = 6.5)
PCC	5	5½	6
Compacted Subgrade (95% minimum compaction)	12	12	12

2.0 SCOPE OF SERVICES

The scope of services performed for this project was in accordance with our Proposal No. 18P372R, dated October 30, 2018. The scope of services included a visual site reconnaissance, subsurface exploration, field and laboratory testing, and geotechnical engineering analysis to provide criteria for preparing the design of the structure foundations, structure floor slabs, and parking lot pavements along with site preparation recommendations and construction considerations for the proposed development. Based on the location of the subject site, this investigation also included a site-specific liquefaction evaluation. The evaluation of the environmental aspects of this site was beyond the scope of services for this geotechnical investigation.

3.0 SITE AND PROJECT DESCRIPTION

3.1 Site Conditions

The overall site is located at the southeast corner of Whitman Way and Faraday Avenue in Carlsbad, California. The overall site is bounded to the west and south by Faraday Avenue and to the north by Whitman Way, vacant land, and existing single-family residential tracts. The general location of the site is illustrated on the Site Location Map, enclosed as Plate 1 of this report.

The subject site consists of the westernmost 48± acres of Veteran's Memorial Park. Based on information from the client, the eastern portion of Veteran's Memorial Park is an existing preserve. The park is currently unimproved with dirt trails that are utilized for hiking and/or biking. This area of the park consists of gently sloping terrain with groundcover comprised of heavy native grass, weeds, shrubs with areas of dense large trees.

Topographic information was obtained from a plan provided by the client. Based on this plan, topography within the proposed development area consists of rolling hills. Site grades range from elevation 222± feet mean sea level (msl) in the east-central area to 44± feet msl in the northwestern area of the site.

3.2 Proposed Development

Based on the site plan provided to our office, the subject site will be developed with active and passive amenities, open space areas, public art, trails, utilities, parking, playgrounds, a bocce ball court, restrooms, and maintenance facilities. It is also expected that the park will include lighting, trellis shade structures and fencing. The primary structures will include a restroom and catering support structure located in the northwestern region of the site, a Veterans Memorial in the central region of the site, and a second restroom building located in the southern region of the site.

Detailed structural information was not available at the time of this report. It is assumed that any new buildings at the subject site will be single story structures of wood frame or masonry block construction. Based on the assumed construction, maximum column and wall loads are expected to be on the order of 30 kips and 1 to 3 kips per linear foot, respectively. It is assumed that the proposed structures will be supported on shallow foundations and concrete slab on grade floors.

Grading plans for the proposed development were not available at the time of this report. The proposed development is not expected to include any significant amounts of below-grade construction such as basements or crawl spaces. Based on the existing site topography and assuming a relatively balanced site, cuts and fills of up to 5± feet are expected to be required.

4.0 SUBSURFACE EXPLORATION

4.1 Scope of Exploration/Sampling Methods

The subsurface exploration conducted for this project consisted of five (5) borings advanced to depths of 15 to 50± feet below the existing site grades. The 50-foot deep boring was advanced at the site as part of the liquefaction evaluation. All of the borings were logged during drilling by a member of our staff.

The borings were advanced with hollow-stem augers, by a limited access track-mounted drilling rig. Representative bulk and relatively undisturbed soil samples were taken during drilling. Relatively undisturbed soil samples were taken with a split barrel "California Sampler" containing a series of one inch long, 2.416± inch diameter brass rings. This sampling method is described in ASTM Test Method D-3550. In-situ samples were also taken using a 1.4± inch inside diameter split spoon sampler, in general accordance with ASTM D-1586. Both of these samplers are driven into the ground with successive blows of a 140-pound weight falling 30 inches. The blow counts obtained during driving are recorded for further analysis. Bulk samples were collected in plastic bags to retain their original moisture content. The relatively undisturbed ring samples were placed in molded plastic sleeves that were then sealed and transported to our laboratory.

The approximate locations of the borings are indicated on the Boring Location Plan, included as Plate 2 in Appendix A of this report. The Boring Logs, which illustrate the conditions encountered at the boring locations, as well as the results of some of the laboratory testing, are included in Appendix B.

4.2 Geotechnical Conditions

Alluvium

Native alluvium was encountered at the ground surface at Boring No. B-1. The alluvium consists of medium dense clayey fine sands and stiff to very stiff fine sandy clays extending to a depth of 32± feet. Boring No. B-1 encountered medium dense clayey fine sands and silty fine sands extending from a depth of 32± feet to at least the maximum depth explored of 50± feet.

Colluvium

Native colluvium was encountered at the ground surface at Boring Nos. B-3 through B-5. The colluvium consists of medium dense silty fine sands and stiff fine sandy clays extending to depths of 2½ to 3½± feet.

Bedrock

Bedrock of the Santiago Formation was encountered at the ground surface at Boring No. B-2 and beneath the colluvium at Borings Nos. B-3 through B-5, extending to a depth of at least 15± feet. The bedrock consists of interbedded medium dense to very dense silty fine-grained sandstone and fine-grained sandy siltstone with very stiff to hard clayey siltstone. The bedrock was weakly cemented and friable with iron oxide staining throughout.

Groundwater

Groundwater was encountered during drilling at Boring No. B-1 at a depth of 43± feet. A delayed water level reading was taken after 4 hours. However, the boring caved to a depth of 37½± feet. Based on the depth of the water encountered during drilling, the moisture contents of the recovered soil samples, and the caving conditions, the depth to the static groundwater table is considered to have existed at a depth of approximately 43± feet below existing site grades, at the time of the subsurface investigation.

SCG reviewed the water level data was obtained from the California Department of Water Resources website, http://www.water.ca.gov/waterdatalibrary/. However, the nearest monitoring well on record is located approximately 5.5 miles north of the site. Therefore, this groundwater data would not represent the groundwater at the subject site. SCG also reviewed groundwater information provided on California State Water Resources Control Board (SWRCB) Geotracker website https://geotracker.waterboards.ca.gov/. The nearest groundwater monitoring well is located 1.7± miles to the southeast of the subject site. The water level readings within this monitoring well indicate a groundwater level of 3.9± feet below the ground surface. This well is approximately at an elevation of 198± msl. Another groundwater monitoring well is located 1.8± miles southeast of the subject site. The water level readings in this monitoring well indicate a groundwater level of 22± feet below the ground surface. This well is at an elevation of approximately 300± feet msl.

4.3 Geologic Conditions

The subject site is located within the Peninsular Ranges province. The Peninsular Ranges province consists of several northwesterly-trending ranges in the southwestern California. The province is truncated to the north by the east-west trending Transverse Ranges. Prior to the mid-Mesozoic, the region was covered by seas and thick marine sedimentary and volcanic sequences were deposited. The bedrock geology that dominates the elevated areas of the Peninsular Ranges consists of high-grade metamorphic rocks intruded by Mesozoic plutons. During the Cretaceous, extensive mountain building occurred during the emplacement of the southern California batholith. The Peninsular Ranges have been significantly disrupted by Tertiary and Quaternary strike-slip faulting along the Elsinore and San Jacinto faults. This tectonic activity has resulted in the present terrain.

The primary available reference applicable to the subject site is the Geologic Map of the Oceanside, San Luis Rey, and San Marcos 7.5′ Quadrangles, San Diego County, California, by Siang S. Tan and Michael P. Kennedy, 1996. A portion of this map indicating the location of the subject site is included as Plate 3 in Appendix A of this report.

This map indicates that the site is underlain by two geologic units. The first geologic unit is the Holocene-age alluvium and colluvium deposits (Map Symbol Qal) located in a minor portion of the northwestern area of the site. This unit is described as unconsolidated silt, clay, sand and gravel. The second geologic unit is the Tertiary-age Santiago Formation (Map Symbol Tsa) underlying the majority of the subject site. The Santiago Formation consists of light-colored, poorly-bedded, poorly-indurated, fine- to medium-grained sandstone interbedded with siltstone and claystone with localized coarse-grained sandstone and conglomerate. Bedding attitudes on this map indicate that the beds strike generally northeast-southwest, dipping 12 to 15 degrees downward to the northwest. A minor fault (shear joint) plane is depicted on this map near the western boundary of the site. The minor fault plane generally strike northeast-southwest, dipping 80 degrees to the northwest. Three questionable landslides are also mapped 700 to 1,200± feet south-southeast of the subject site. These questionable landslides are located within the Santiago Formation.

Based on the conditions encountered during drilling, the subsurface conditions are similar to the mapped geologic conditions. Holocene-age alluvial soils consisting of clayey sands and sandy clays were encountered in the northwestern area of the site at Boring No. B-1. Santiago Formation bedrock consisting of silty fine-grained sandstone, fine-grained sandy siltstone, and clayey siltstone were encountered below the shallow colluvial soils in the remaining areas of the site.

SCG previously conducted superficial geologic mapping at the subject site. The results of this mapping were presented in our Report No. 19G109-1, dated July 15, 2019. Excerpts from this report are presented below:

<u>Geologic Mapping</u>

As part of this investigation, SCG performed surficial geologic mapping at the subject site. It should be noted that no subsurface investigation was performed as part of this investigation. The geologic mapping was limited to surficial exposure and expression of geologic units and features. Due to the recent rainfall, the site was covered with heavy native grass and weed growth which obscured the near-surface alluvial soils. Bedrock was only exposed in six (6) limited areas throughout the site.

Based on the bedrock exposed at the outcrops at the subject site, it is our opinion that the site is underlain by massive silty fine-grained sandstone with localized interbedded fine-grained sandstone and conglomerate of the Santiago Formation (Map Symbol Tsa). The geologic conditions at the site are generally consistent with the mapped geologic conditions. The bedding attitudes in the Santiago Formation in south-central area of the site generally strike northwest-southeast and dip 15 degrees to the northeast and the bedding attitudes in the Santiago Formation in the eastern area of the site generally strike southeast-southwest and dip 18 to 19 degrees to the northwest. As noted previously, a minor fault (shear joint) plane is mapped near the western boundary of the subject site. However, based on surface observations at the time of the geologic mapping, no evidence of surface expression of faults (i.e. fault scarps, fault line scarps, or displacement in the near surface soils) is present on the subject site. Three questionable landslides are also mapped south-southeast of the subject site. Based on the surface observations at the time of the geologic mapping, no evidence of surface expression of landslides (i.e. head scarps, minor scarps, crown cracks, radial cracks, etc.) is present on the subject site.

Fault Rupture Hazard

Currently, there is no published Alquist-Priolo Earthquake Fault Zone Map for the San Luis Rey Quadrangle. Therefore, the CGS has not mapped any active or potentially active faults with potential surface fault rupture in the San Luis Rey Quadrangle.

The nearest fault zone is the Rose Canyon Fault Zone (RCFZ) located 5.8± miles west of the subject site. The RCFZ is a right-lateral strike-slip fault. The RCFZ has a total length of 30 km with a slip rate ranging from 1.1 to 5 mm/yr. The interval between surface ruptures ranges between 1,200 and 3,000 years (scec.org).

An active fault is defined by the State of California under the Alquist-Priolo Act of 1972 as a fault which has displaced earth materials during the Holocene Epoch (11,000± years). The Santiago Formation bedrock that underlies the subject site is indicated to be Middle Eocene-Tertiary age (45± million years). Therefore, even though this bedrock unit may exhibit indicators of faulting near the subject site, the faulting may be ancient and may not be active.

Based on the age of the bedrock and the lack of surface expression at the subject site, the minor fault mapped outside the western boundary of the subject site is considered to be inactive.

Landslide Hazard

Based on the surficial geologic mapping conducted by SCG, there is no evidence of surface expressions for landslides at the subject site. In addition, there were no mapped landslides at the subject site and there were no indicators of landslides during the aerial photograph review.

Conclusions and Recommendations

Research of available maps indicates that the subject site is not located within an Alquist-Priolo Earthquake Fault Zone. A minor fault (shear joint) plane is mapped on the western boundary of the subject site. This minor fault (shear joint) is not associated with any known active fault. Based on our observations of the ground surface at the time of the surficial geologic mapping and the historic aerial photograph review, the minor fault (shear joint) does not show surface expression (i.e. fault scarps or fault line scarps). This fault is not identified on the Alquist-Priolo Earthquake Fault Zone map. Therefore, the possibility of significant fault rupture on the site is considered to be low.

There are no mapped landslides on the subject site, no evidence for landslides observed during the surficial geologic mapping, and no evidence for landslides during the historical aerial photograph review. Therefore, the possibility of an active landslide at the subject site is considered low.

5.0 LABORATORY TESTING

The soil samples recovered from the subsurface exploration were returned to our laboratory for further testing to determine selected physical and engineering properties of the soils. The tests are briefly discussed below. It should be noted that the test results are specific to the actual samples tested, and variations could be expected at other locations and depths.

Classification

All recovered soil samples were classified using the Unified Soil Classification System (USCS), in accordance with ASTM D-2488. Field identifications were then supplemented with additional visual classifications and/or by laboratory testing. The USCS classifications are shown on the Boring Logs and are periodically referenced throughout this report.

Density and Moisture Content

The density has been determined for selected relatively undisturbed ring samples. These densities were determined in general accordance with the method presented in ASTM D-2937. The results are recorded as dry unit weight in pounds per cubic foot. The moisture contents are determined in accordance with ASTM D-2216 and are expressed as a percentage of the dry weight. These test results are presented on the Boring Logs.

Consolidation

Selected soil samples have been tested to determine their consolidation potential, in accordance with ASTM D-2435. The testing apparatus is designed to accept either natural or remolded samples in a one-inch high ring, approximately 2.416 inches in diameter. Each sample is then loaded incrementally in a geometric progression and the resulting deflection is recorded at selected time intervals. Porous stones are in contact with the top and bottom of the sample to permit the addition or release of pore water. The samples are typically inundated with water at an intermediate load to determine their potential for collapse or heave. The results of the consolidation testing are plotted on Plates C-1 through C-4 in Appendix C of this report.

Maximum Dry Density and Optimum Moisture Content

A representative bulk sample has been tested for its maximum dry density and optimum moisture content. The results have been obtained using the Modified Proctor procedure, per ASTM D-1557 and are presented on Plate C-5 in Appendix C of this report. These tests are generally used to compare the in-situ densities of undisturbed field samples, and for later compaction testing. Additional testing of other soil types or soil mixes may be necessary at a later date.

Soluble Sulfates

A representative sample of the near-surface soils were submitted to a subcontracted analytical laboratory for determination of soluble sulfate content. Soluble sulfates are naturally present in soils, and if the concentration is high enough, can result in degradation of concrete which comes into contact with these soils. The results of the soluble sulfate testing are presented below, and are discussed further in a subsequent section of this report.

Sample Identification	Soluble Sulfates (%)	Sulfate Classification
B-1 @ 0 to 5 feet	0.013	Not Applicable (S0)

Corrosivity Testing

A representative bulk sample of the near-surface soils were submitted to a subcontracted corrosion engineering laboratory to determine if the near-surface soils possess corrosive characteristics with respect to common construction materials. The corrosivity testing included a determination of the electrical resistivity, pH, and chloride and nitrate concentrations of the soils, as well as other tests. The results of some of these tests are presented below.

Sample Identification	Saturated Resistivity (ohm-cm)	pH	Chlorides (mg/kg)	Nitrates (mg/kg)
B-1 @ 0 to 5 feet	1,080	7.5	47	49

Expansion Index

The expansion potential of the on-site soils was determined in general accordance with ASTM D-4829. The testing apparatus is designed to accept a 4-inch diameter, 1-in high, remolded sample. The sample is initially remolded to 50± 1 percent saturation and then loaded with a surcharge equivalent to 144 pounds per square foot. The sample is then inundated with water and allowed to swell against the surcharge. The resultant swell or consolidation is recorded after a 24-hour period. The results of the EI testing are as follows:

Sample Identification	Expansion Index	Expansive Potential
B-1 @ 0 to 5 feet	68	Medium

6.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the results of our review, field exploration, laboratory testing and geotechnical analysis, the proposed development is considered feasible from a geotechnical standpoint. The recommendations contained in this report should be taken into the design, construction, and grading considerations.

The recommendations are contingent upon all grading and foundation construction activities being monitored by the geotechnical engineer of record. The recommendations are provided with the assumption that an adequate program of client consultation, construction monitoring, and testing will be performed during the final design and construction phases to verify compliance with these recommendations. Maintaining Southern California Geotechnical, Inc., (SCG) as the geotechnical consultant from the beginning to the end of the project will provide continuity of services. The geotechnical engineering firm providing testing and observation services shall assume the responsibility of Geotechnical Engineer of Record.

The Grading Guide Specifications, included as Appendix D, should be considered part of this report, and should be incorporated into the project specifications. The contractor and/or owner of the development should bring to the attention of the geotechnical engineer any conditions that differ from those stated in this report, or which may be detrimental for the development.

6.1 Seismic Design Considerations

The subject site is located in an area which is subject to strong ground motions due to earthquakes. The performance of a site specific seismic hazards analysis was beyond the scope of this investigation. However, numerous faults capable of producing significant ground motions are located near the subject site. Due to economic considerations, it is not generally considered reasonable to design a structure that is not susceptible to earthquake damage. Therefore, significant damage to structures may be unavoidable during large earthquakes. The proposed structures should, however, be designed to resist structural collapse and thereby provide reasonable protection from serious injury, catastrophic property damage and loss of life.

Faulting and Seismicity

Research of available maps indicates that the subject site is not located within an Alquist-Priolo Earthquake Fault Zone. Therefore, the possibility of significant fault rupture on the site is considered to be low.

Seismic Design Parameters

The 2019 California Building Code (CBC) provides procedures for earthquake resistant structural design that include considerations for on-site soil conditions, occupancy, and the configuration of the structure including the structural system and height. The seismic design parameters presented below are based on the soil profile and the proximity of known faults with respect to the subject site.

Based on standards in place at the time of this report, the proposed development is expected to be designed in accordance with the requirements of the 2019 edition of the California Building Code (CBC), which was adopted on January 1, 2020.

The 2019 CBC Seismic Design Parameters have been generated using the SEAOC/OSHPD Seismic Design Maps Tool, a web-based software application available at the website www.seismicmaps.org. This software application calculates seismic design parameters in accordance with several building code reference documents, including ASCE 7-16, upon which the 2019 CBC is based. The application utilizes a database of risk-targeted maximum considered earthquake (MCE_R) site accelerations at 0.01-degree intervals for each of the code documents. The tables below were created using data obtained from the application. The output generated from this program is included as Plate E-1 in Appendix E of this report.

The 2019 CBC requires that a site-specific ground motion study be performed in accordance with Section 11.4.8 of ASCE 7-16 for Site Class D sites with a mapped S_1 value greater than 0.2. However, Section 11.4.8 of ASCE 7-16 also indicates an exception to the requirement for a site-specific ground motion hazard analysis for certain structures on Site Class D sites. The commentary for Section 11 of ASCE 7-16 (Page 534 of Section C11 of ASCE 7-16) indicates that "In general, this exception effectively limits the requirements for site-specific hazard analysis to very tall and or flexible structures at Site Class D sites." Based on our understanding of the proposed development, the seismic design parameters presented below were calculated assuming that the exception in Section 11.4.8 applies to the proposed structure at this site. However, the structural engineer should verify that this exception is applicable to the proposed structures. Based on the exception, the spectral response accelerations presented below were calculated using the site coefficients (F_a and F_v) from Tables 1613.2.3(1) and 1613.2.3(2) presented in Section 16.4.4 of the 2019 CBC.

2019 CBC SEISMIC DESIGN PARAMETERS

Parameter		Value
Mapped Spectral Acceleration at 0.2 sec Period	S_S	1.004
Mapped Spectral Acceleration at 1.0 sec Period	S_1	0.365
Site Class	---	D*
Site Modified Spectral Acceleration at 0.2 sec Period	S_{MS}	1.205
Site Modified Spectral Acceleration at 1.0 sec Period	S_{M1}	0.706
Design Spectral Acceleration at 0.2 sec Period	S_{DS}	0.803
Design Spectral Acceleration at 1.0 sec Period	S_{D1}	0.471

*The 2019 CBC requires that Site Class F be assigned to any profile containing soils vulnerable to potential failure or collapse under seismic loading, such as liquefiable soils. For Site Class F, the site *coefficients* are to be determined in accordance with Section 11.4.7 of ASCE 7-16. However, Section 20.3.1 of ASCE 7-16 indicates that for sites with structures having a fundamental period of vibration equal to or less than 0.5 seconds, the site coefficient factors (F_a and F_v) may be determined using the standard procedures. The seismic design parameters tabulated above were calculated using the site coefficient factors for Site Class D, assuming that the fundamental period of the structures is less than 0.5 seconds. However, the results of the liquefaction evaluation indicate that the subject site is underlain by potentially liquefiable soils. Therefore, if the proposed structures have a fundamental period greater than 0.5 seconds, a site-specific seismic hazards analysis will be required and additional subsurface exploration will be necessary. Additional subsurface exploration and laboratory testing should be performed at the time of the design-level geotechnical investigation to confirm that this is a Site Class D site.

It should be noted that the site coefficient F_v and the parameters S_{M1} and S_{D1} were not included in the SEAOC/OSHPD Seismic Design Maps Tool output for the 2019 CBC. We calculated these parameters-based on Table 1613.2.3(2) in Section 16.4.4 of the 2019 CBC using the value of S_1 obtained from the Seismic Design Maps Tool, assuming that a site-specific ground motion hazards analysis is not required for the proposed buildings at this site.

Ground Motion Parameters

For the purposes of the liquefaction analysis performed for this study, we utilized a site acceleration consistent with maximum considered earthquake ground motions, as required by the 2019 CBC. The peak ground acceleration (PGA) was determined in accordance with Section 11.8.3 of ASCE 7-16. The parameter PGA_M is the maximum considered earthquake geometric mean (MCE_G) PGA, multiplied by the appropriate site coefficient from Table 11.8-1 of ASCE 7-16. The web-based software application SEAOC/OSHPD Seismic Design Maps Tool (described in the previous section) was used to determine PGA_M, which is 0.527g. A portion of the program output is included as Plate E-1 of this report. An associated earthquake magnitude was obtained from the USGS Unified Hazard Tool, Interactive Deaggregation application available on the USGS website. The deaggregated modal magnitude is 6.67, based on the peak ground acceleration and soil classification D.

Liquefaction

The Liquefaction Hazard Map, published by San Diego County, indicates that the extreme northern portion of the subject site is located within a liquefaction hazard zone. The majority of the site is not located within a liquefaction hazard zone. Based on this mapping, and the subsurface conditions encountered at the borings, the scope of this investigation included a detailed liquefaction evaluation in order to determine the site-specific liquefaction potential.

Liquefaction is the loss of strength in generally cohesionless, saturated soils when the pore-water pressure induced in the soil by a seismic event becomes equal to or exceeds the overburden pressure. The primary factors which influence the potential for liquefaction include groundwater table elevation, soil type and plasticity characteristics, relative density of the soil, initial confining pressure, and intensity and duration of ground shaking. The depth within which the occurrence of liquefaction may impact surface improvements is generally identified as the upper 50 feet below the existing ground surface. Liquefaction potential is greater in saturated, loose, poorly graded fine sands with a mean (d_{50}) grain size in the range of 0.075 to 0.2 mm (Seed and Idriss, 1971). Non-sensitive clayey (cohesive) soils which possess a plasticity index of at least 18 (Bray and Sancio, 2006) are generally not considered to be susceptible to liquefaction, nor are those soils which are above the historic static groundwater table.

The liquefaction analysis was conducted in accordance with the requirements of Special Publication 117A (CDMG, 2008), and currently accepted practice (SCEC, 1997). The liquefaction potential of the subject site was evaluated using the empirical method developed by Boulanger and Idriss (Boulanger and Idriss, 2008). This method predicts the earthquake-induced liquefaction potential of the site based on a given design earthquake magnitude and peak ground acceleration at the subject site. This procedure essentially compares the cyclic resistance ratio (CRR) [the cyclic stress ratio required to induce liquefaction for a cohesionless soil stratum at a given depth] with the earthquake-induced cyclic stress ratio (CSR) at that depth from a specified design earthquake (defined by a peak ground surface acceleration and an associated earthquake moment magnitude). CRR is determined as a function of the corrected SPT N-value $(N_1)_{60\text{-}cs}$, adjusted for fines content. The factor of safety against liquefaction is defined as CRR/CSR. Based on Special Publication 117A, a factor of safety of at least 1.3 is required in order to demonstrate that a given soil stratum is non-liquefiable. Additionally, in accordance with Special Publication 117A, clayey soils which do not meet the criteria for liquefiable soils defined by Bray and Sancio (2006), loose soils with a plasticity index (PI) less than 12 and moisture content greater than 85% of the liquid limit, are considered to be insusceptible to liquefaction. Non-sensitive soils with a PI greater than 18 are also considered non-liquefiable.

The liquefaction analysis procedure is tabulated on the spreadsheet forms included in Appendix F of this report. The liquefaction analysis was performed for Boring No. B-1, which was advanced to a depth of 50± feet. The liquefaction potential was analyzed at the boring location utilizing a PGA_M of 0.527g related to a 6.67 magnitude seismic event. The liquefaction evaluation was performed using a historic high groundwater depth of 37.5 feet.

If liquefiable soils are identified, the potential settlements that could occur as a result of liquefaction are determined using the equation for volumetric strain due to post-cyclic reconsolidation (Yoshimine et. al, 2006). This procedure uses an empirical relationship between the induced cyclic shear strain and the corrected N-value to determine the expected volumetric strain of saturated sands subjected to earthquake shaking. This analysis is also documented on the spreadsheets included in Appendix F.

Conclusions and Recommendations

The liquefaction analysis has identified potentially liquefiable soils at Boring No. B-1. The liquefiable materials are present in a several layers between depths of 37.5 and 50± feet. Soils which are located above the historic high groundwater table (37.5 feet), or possess factors of safety in excess of 1.3, are considered non-liquefiable. Settlement analyses were conducted for each of the potentially liquefiable strata.

Based on the settlement analysis (also tabulated on the spreadsheets in Appendix F) a total dynamic (liquefaction induced) settlement of 3.3± inches could be expected at Boring No. B-1. The associated differential settlement is estimated to be on the order of 1.6 to 2.2± inches. The estimated differential settlement could be assumed to occur across a distance of 50 feet, indicating a maximum angular distortion of less than 0.004± inches per inch.

It should be noted that the potentially liquefiable alluvial soils are only located in the north and northwestern regions of the site. As shown on Plate 3, the Geologic Map, the majority of the site is underlain by Santiago formation bedrock which is non-liquefiable. Special design considerations related to liquefaction-induced settlements will only be required for shallow foundations located within the area of the site that is underlain by the alluvial soils.

Based on our understanding of the proposed development, it is considered feasible to support the proposed structure on shallow foundations. Such a foundation system can be designed to resist the effects of the anticipated differential settlements, to the extent that the structure would not catastrophically fail. Designing the proposed structure to remain completely undamaged during a seismic event that could occur once every 2475 years (the code-specified return period used in the liquefaction analysis) is not considered to be economically feasible. Based on this understanding, the use of a shallow foundation system is considered to be the most economical means of supporting the proposed structures.

In order to support the proposed structures on shallow foundations (such as spread footings) the structural engineer should verify that the structure would not catastrophically fail due to the predicted dynamic differential settlements. Any utility connections to the structures should be designed to withstand the estimated differential settlements. It should also be noted that minor to moderate repairs, including re-leveling, restoration of utility connections, repair of damaged drywall and stucco, etc., would likely be required after occurrence of the liquefaction-induced settlements.

The use of a shallow foundation system, as described in this report, is typical for buildings of this type, where they are underlain the extent of liquefiable soils encountered at this site. The post-liquefaction damage that could occur within the buildings proposed for this site will also be typical of similar buildings in the vicinity of this project. However, if the owner determines that this level of potential damage is not acceptable, other geotechnical and structural options are available, including the use of ground improvement or mat foundations.

6.2 Geotechnical Design Considerations

General

Most of the site is underlain by a thin layer of colluvium, which is underlain at relatively shallow depth by Santiago formation bedrock. The notable exception to this is the northwestern corner of the site, in the vicinity of our Boring No. B-1. In this area, the site is underlain by native alluvial soils extending to a depth of more than 50± feet.

The near surface alluvium and colluvium possesses moderate strengths. The results of laboratory testing indicate that the upper 3 to 4± feet of these soils possess a potential for moderate consolidation and hydrocollapse. Based on these conditions, it is recommended that remedial grading be performed within the areas of the proposed structures. For structures supported on isolated pole foundations, such as canapés or playgrounds, the foundations may consist of shallow drilled piers, extended through the existing alluvium/colluvium into the native Santiago formation bedrock or medium dense alluvium below.

As discussed in a previous section of this report, potentially liquefiable soils were identified at Boring No. B-1, drilled in the northwestern region of the site. Therefore, special grading and foundation design recommendations will apply to the proposed pavilion/restroom/catering support building. The presence of the recommended layer of newly placed compacted structural fill above these liquefiable soils will help to reduce any surface manifestations that could occur as a result of liquefaction. The foundation and floor slab design recommendations presented in the subsequent sections of this report also contain recommendations to provide additional rigidity in order to reduce the potential effects of differential settlement that could occur as a result of liquefaction.

Settlement

The proposed remedial grading will remove the existing compressible alluvium/colluvium from within the proposed building areas. Alternatively, the foundations may be extended through the surface of colluvial soils into the Santiago formation bedrock below. The underlying native materials possess relatively high strengths and will not be excessively compressible under the new foundation loads. Therefore, following completion of the recommended remedial grading, post-construction static settlements are expected to be within tolerable limits.

Expansion

Laboratory testing performed on a representative sample of the near-surface soils indicates that these materials are medium expansive (EI = 68). Based on the presence of expansive soils at this site, special design and construction considerations are warranted. All building pad and flatwork subgrade soils should be properly moisture conditioned and maintained at adequate moisture content throughout the construction process. Further recommendations concerning the expansive soils are presented in subsequent sections of this report. It is recommended that additional expansion index testing be conducted at the completion of rough grading to verify the expansion potential of the as-graded structure pads.

Soluble Sulfates

The results of the soluble sulfate testing indicate that the selected sample of the on-site soils contains a concentration of soluble sulfates that corresponds to Class S0 with respect to the American Concrete Institute (ACI) Publication 318-14 Building Code Requirements for Structural Concrete and Commentary, Section 4.3. Therefore, specialized concrete mix designs are not considered to be necessary, with regard to sulfate protection purposes. It is, however, recommended that additional soluble sulfate testing be conducted at the completion of rough grading to verify the soluble sulfate concentrations of the soils which are present at finished grade.

Corrosion Potential

The results of laboratory testing indicate that a representative sample of the on-site soils possesses a saturated resistivity value of 1,080 ohm-cm, and a pH value of 7.5. This test result has been evaluated in accordance with guidelines published by the Ductile Iron Pipe Research Association (DIPRA). The DIPRA guidelines consist of a point system by which characteristics of the soils are used to quantify the corrosivity characteristics of the site. Sulfides, and redox potential are factors that are also used in the evaluation procedure. We have evaluated the corrosivity characteristics of the on-site soils using resistivity, pH, and moisture content. Based on these factors, and utilizing the DIPRA procedure, the on-site soils are considered to be highly corrosive to ductile iron pipe. Therefore, polyethylene encasement or some other appropriate method of protection will be required for iron pipes. Since SCG does not practice in the area of corrosion engineering, the client may also wish to contact a corrosion engineer to provide a more thorough evaluation.

Only a low level (47 mg/kg) of chlorides was detected in the sample submitted for corrosivity testing. In general, soils possessing chloride concentrations in excess of 350 to 500 parts per million (ppm) are considered to be corrosive with respect to steel reinforcement within reinforced concrete. Based on the lack of any significant chlorides in the tested sample, the site is considered to have a C1 chloride exposure in accordance with the American Concrete Institute (ACI) Publication 318 Building Code Requirements for Structural Concrete and Commentary. Therefore, a specialized concrete mix design for reinforced concrete for protection against chloride exposure is not considered warranted.

Shrinkage/Subsidence

Based on the results of the laboratory testing, removal and recompaction of the loose near-surface alluvial/colluvial soils, extending to depths of 5 to 6± feet, is estimated to result in an average shrinkage of 10 to 16 percent. Shrinkage or bulking of less than 5 percent is expected to occur where Santiago formation bedrock materials are excavated and replaced as compacted fill. It should be noted that these shrinkage estimates are based on the results of dry density testing performed on small-diameter samples of the existing soils taken at the boring locations. If a more accurate and precise shrinkage estimate is desired, SCG can perform a shrinkage study involving several excavated test-pits where in-place densities are determined using in-situ testing methods instead of laboratory density testing on small-diameter samples. Please contact SCG for details and a cost estimate regarding a shrinkage study, if desired.

Minor ground subsidence is expected to occur in the soils below the zone of removal, due to settlement and machinery working. The subsidence is estimated to be 0.1± feet. This estimate may be used for grading in areas that are underlain by native alluvial or colluvial soils.

These estimates are based on previous experience and the subsurface conditions encountered at the boring locations. The actual amount of subsidence is expected to be variable and will be dependent on the type of machinery used, repetitions of use, and dynamic effects, all of which are difficult to assess precisely.

Grading and Foundation Plan Review

No detailed grading or foundation plans were available at the time of this report. It is therefore recommended that we be provided with copies of the preliminary plans, when they become available, for review with regard to the conclusions, recommendations, and assumptions contained within this report.

6.3 Site Grading Recommendations

The grading recommendations presented below are based on the subsurface conditions encountered at the boring locations and our understanding of the proposed development. We recommend that all grading activities be completed in accordance with the Grading Guide Specifications included as Appendix D of this report, unless superseded by site-specific recommendations presented below.

Site Stripping and Demolition

Initial site preparation should include stripping of any existing surficial vegetation and organic materials. Based on conditions observed at the time of the field exploration, stripping of only minor native grass and weed growth may be necessary within the western half of the subject site. Any organic material should be disposed of off-site. Removal of any trees should include all of the associated root masses. The actual extent of site stripping should be determined by the geotechnical engineer at the time of grading, based on the organic content and the stability of the encountered materials.

Treatment of Existing Soils: Building Pads

It is recommended that remedial grading be performed within the proposed building areas to remove the collapsible/compressible near-surface native alluvium and colluvium. The proposed building areas should be overexcavated to a depth of at least 5 feet below existing grade, and to a depth of at least 3 feet below proposed pad grade. Buildings that are underlain by potentially liquefiable alluvium, such as the northern restroom building, should be overexcavated to a depth of 5 feet below proposed pad grade. These recommendations apply to the building pads associated with the restrooms and catering support structures. Any similar structures (potentially including the proposed veterans memorial) to be supported on conventional shallow foundations and a concrete slab on grade floor should also be prepared in this manner.

Within the influence zones of the new foundations, the overexcavation should extend to a depth of at least 3 feet below proposed foundation bearing grade. The overexcavation should extend at least 5 feet beyond the building perimeter, and to an extent equal to the depth of new fill below the foundation bearing grade. If the proposed structures incorporate any exterior columns (such as for a building canopy or overhang) the overexcavation should also encompass these areas.

Following completion of the overexcavation, the subgrade soils within the new building areas should be evaluated by the geotechnical engineer to verify their suitability to serve as the structural fill subgrade, as well as to support the foundation loads of the new structures. This evaluation should include proofrolling and probing to identify any soft, loose or otherwise unstable soils that must be removed. Some localized areas of deeper excavation may be required if loose, porous, or low density native soils are encountered at the base of the overexcavation.

Based on conditions encountered at the exploratory boring locations, some zones of moist to very moist soils will be encountered at or near the base of the recommended overexcavation. Stabilization of the exposed overexcavation subgrade soils is expected to be necessary. Scarification and air drying of these materials may be sufficient to obtain a stable subgrade. However, if highly unstable soils are identified, and if the construction schedule does not allow for delays associated with drying, mechanical stabilization, usually consisting of coarse crushed stone or geotextile, could be necessary. In this event, the geotechnical engineer should be contacted for supplementary recommendations.

After a suitable overexcavation subgrade has been achieved, the exposed soils should be scarified to a depth of 12 inches, and moisture conditioned to at least 2 to 4 percent above optimum moisture content, and recompacted to at least 90 percent of the ASTM D-1557 maximum dry density. The previously excavated soils may then be replaced as compacted structural fill.

Treatment of Existing Soils: New Pole Foundation Areas

Some of the new improvements including fencing, lighting, shade structures and trellises will require new foundations. As discussed in a subsequent section of this report, it is recommended that these improvements be supported on drilled pier foundations, extending through the surficial fill soils. Therefore, no significant remedial grading is considered warranted within these new foundation areas.

Treatment of Existing Soils: Bocce Ball Courts

Remedial grading should be performed within the proposed bocce court areas in order to remove the surficial alluvium/colluvium, and to create a more uniform subgrade condition. It is recommended that the existing soils within the area of the proposed bocce ball courts be overexcavated to a depth of 1 foot below proposed subgrade elevation. Following completion of the overexcavation, the subgrade soils within the field areas should be evaluated by the geotechnical engineer to verify their suitability to serve as the structural fill subgrade. This evaluation should include proofrolling and probing to identify any soft, loose or otherwise unstable soils that must be removed. Some localized areas of deeper excavation may be required if loose, porous, or low density fill soils are encountered at the base of the overexcavation.

Based on conditions encountered at the exploratory boring locations, some zones of very moist soils may be encountered at or near the base of the recommended overexcavation. Stabilization of the exposed overexcavation subgrade soils may be necessary. Scarification and air drying of these materials may be sufficient to obtain a stable subgrade. However, if highly unstable soils are identified, and if the construction schedule does not allow for delays associated with drying, mechanical stabilization, usually consisting of coarse crushed stone or geotextile, could be necessary. In this event, the geotechnical engineer should be contacted for supplementary recommendations.

After a suitable overexcavation subgrade has been achieved, the exposed soils should be scarified to a depth of at least 12 inches, and moisture conditioned to 2 to 4 percent above optimum moisture content, and recompacted to at least 90 percent of the ASTM D-1557 maximum dry density. It is recommended that the bocce court areas be raised to grade with imported select structural fill, possessing an expansion index no greater than 20.

Any remedial grading and site preparation activities within the area of the proposed bocce ball courts should also be in accordance with any relevant specifications of the synthetic turf/bocce court surface manufacturer.

Treatment of Existing Soils: Parking and Drive Areas

Based on economic considerations, overexcavation of the existing potentially compressible soils in the new parking and drive areas is not considered warranted, with the exception of areas where lower strength, or unstable, soils are identified by the geotechnical engineer during grading.

Subgrade preparation in the new parking and drive areas should initially consist of removal of all soils disturbed during stripping and demolition operations. The geotechnical engineer should then evaluate the subgrade to identify any areas of additional unsuitable soils. The subgrade soils should then be scarified to a depth of 12± inches, moisture conditioned to 2 to 4 percent above optimum moisture content, and recompacted to at least 90 percent of the ASTM D-1557 maximum dry density.

The grading recommendations presented above for the proposed parking and drive areas assume that the owner and/or developer can tolerate minor amounts of settlement within the proposed parking areas. The grading recommendations presented above do not completely mitigate the extent of the compressible native soils that may be present in the parking and drive areas. As such, settlement and associated pavement distress could occur. Typically, repair of such distressed areas involves significantly lower costs than completely mitigating these soils at the time of construction. If the owner cannot tolerate the risk of such settlements, the parking and drive areas should overexcavated to provide a new layer of structural fill at least 2 feet in thickness.

Treatment of Existing Soils: Retaining Walls and Site Walls

The existing soils within the areas of any proposed retaining walls (less than 5 feet of retained height) should be overexcavated to a depth of 3 feet below foundation bearing grade and replaced as compacted structural fill, as discussed above for the proposed building pads. The foundation subgrade soils within the areas of any proposed non-retaining site walls should also be overexcavated to a depth of 3 feet below proposed foundation bearing grade. For both types of walls, the overexcavation subgrade soils should be evaluated by the geotechnical engineer prior to scarifying, moisture conditioning and recompacting the upper 12 inches of exposed subgrade soils. The previously excavated soils may then be replaced as compacted structural fill.

If any walls retaining more than 5 feet of soil are proposed for this site, the geotechnical engineer should be contacted to provide supplementary remedial grading recommendations.

Treatment of Existing Soils: Flatwork

The proposed development is expected to include some areas of new Portland cement concrete flatwork. Based on conditions encountered at the boring locations, it is expected that these areas of flatwork will be underlain by moist to very moist medium expansive soils. The presence of these soils possesses a minor risk of heave and damage to new flatwork, which will be relatively lightly loaded. Based on economic considerations, flatwork is typically constructed immediately over medium expansive soils. However, if the owner desires protection against heaving of flatwork, a layer of very low expansive select structural fill could be placed below the flatwork areas. Typically, this layer of select fill is 1 to 2 feet in thickness.

Subgrade preparation in the new flatwork areas should initially consist of removal of all soils disturbed during stripping and demolition operations. The geotechnical engineer should then evaluate the subgrade to identify any areas of additional unsuitable soils. The subgrade soils should then be scarified to a depth of 12± inches, moisture conditioned to 2 to 4 percent above optimum, and recompacted to at least 90 percent of the ASTM D-1557 maximum dry density. Based on the presence of variable strength fill soils throughout the site, it is expected that some isolated areas of additional overexcavation may be required to remove zones of lower strength, unsuitable soils.

These flatwork subgrade preparation recommendations may also be used for areas of new exterior rubberized play surfacing and areas of new flagstone, subject to any applicable manufacturer's recommendations.

Fill Placement

- Fill soils should be placed in thin (6± inches), near-horizontal lifts, moisture conditioned to 2 to 4 percent above the optimum moisture content and compacted.
- On-site soils may be used for fill provided they are cleaned of any debris to the satisfaction of the geotechnical engineer. Some drying of the on-site soils will likely be necessary in order to achieve a moisture content suitable for compaction as structural fill. All fill should conform with the recommendations presented in the Grading Guide Specifications, included as Appendix D.
- All grading and fill placement activities should be completed in accordance with the requirements of the 2019 CBC and the grading code of the city of Carlsbad.
- All fill soils should be compacted to at least 90 percent of the ASTM D-1557 maximum dry density. Fill soils should be well mixed.
- Compaction tests should be performed periodically by the geotechnical engineer as random verification of compaction and moisture content. These tests are intended to aid the contractor. Since the tests are taken at discrete locations and depths, they may not be indicative of the entire fill and therefore should not relieve the contractor of his responsibility to meet the job specifications.

Imported Structural Fill

All imported structural fill should consist of very low expansive (EI < 20), well graded soils possessing at least 10 percent fines (that portion of the sample passing the No. 200 sieve). Additional specifications for structural fill are presented in the Grading Guide Specifications, included as Appendix D.

Utility Trench Backfill

In general, all utility trench backfill should be compacted to at least 90 percent of the ASTM D-1557 maximum dry density. As an alternative, a clean sand (minimum Sand Equivalent of 30) may be placed within trenches and compacted in place (jetting or flooding is not recommended). It is recommended that materials in excess of 3 inches in size not be used for utility trench backfill. Compacted trench backfill should conform to the requirements of the local grading code, and more restrictive requirements may be indicated by the city of Carlsbad. All utility trench backfills should be witnessed by the geotechnical engineer. The trench backfill soils should be compaction tested where possible; probed and visually evaluated elsewhere.

Utility trenches which parallel a footing, and extending below a 1h:1v plane projected from the outside edge of the footing should be backfilled with structural fill soils, compacted to at least 90 percent of the ASTM D-1557 standard. Pea gravel backfill should not be used for these trenches.

6.4 Construction Considerations

Excavation Considerations

The near-surface soils generally consist of silty clays and sandy clays. These materials are not expected to be subject to significant caving within shallow excavations. If caving does occur within shallow excavations, flattened excavation slopes are expected to be sufficient to provide excavation stability. Deeper excavations will require some form of external stabilization such as shoring or bracing. Maintaining adequate moisture content within the near-surface soils will improve excavation stability. Temporary excavation slopes should be no steeper than 1.5h:1v. All excavation activities on this site should be conducted in accordance with Cal-OSHA regulations. Excavations into the Santiago formation bedrock can be sloped at 1h:1v.

We were able to extend borings 15 feet into the Santiago formation bedrock using a conventional hollow-stem auger drill rig. Therefore it is expected that conventional grading equipment will be adequate to excavate the bedrock materials at depths of up to 15± feet. However, due to the density of the bedrock, slower production rates should be expected. If excavations more than 15 feet into bedrock are required, additional studies may be necessary to evaluate the excavation characteristics of the deeper bedrock materials.

Expansive Soils

The near-surface soils at this site are potentially expansive. Therefore, care should be given to proper moisture conditioning of all on-site soils to a moisture content of 2 to 4 percent above the Modified Proctor optimum during site grading. All imported fill soils should have low expansive characteristics. In addition to adequately moisture conditioning the subgrade soils and fill soils during grading, special care must be taken to maintain moisture content of these soils at 2 to 4 percent above the Modified Proctor optimum. This will require the contractor to frequently moisture condition these soils throughout the grading process, unless grading occurs during a period of relatively wet weather.

Due to the presence of expansive soils at this site, provisions should be made to limit the potential for surface water to penetrate the soils immediately adjacent to the structures. These provisions should include directing surface runoff into rain gutters and area drains, reducing the extent of landscaped areas around the structures, and sloping the ground surface away from the buildings. Where possible, it is recommended that landscaped planters not be located immediately adjacent to the buildings. If landscaped planters around the buildings are necessary, it is recommended that drought tolerant plants or a drip irrigation system be utilized, to minimize the potential for deep moisture penetration around the structures. Presented below is a list of additional soil moisture control recommendations that should be considered by the owner, developer, and civil engineer:

- Ponding and areas of low flow gradients in unpaved walkways, grass and planter areas should be avoided. In general, minimum drainage gradients of 2 percent should be maintained in unpaved areas.

- Bare soil within five feet of proposed structures should be sloped at a minimum five percent gradient away from the structure (about three inches of fall in five feet), or the same area could be paved with a minimum surface gradient of one percent. Pavement is preferable.
- Decorative gravel ground cover tends to provide a reservoir for surface water and may hide areas of ponding or poor drainage. Decorative gravel is, therefore, not recommended and should not be utilized for landscaping unless equipped with a subsurface drainage system designed by a licensed landscape architect.
- Positive drainage devices, such as graded swales, paved ditches, and catch basins should be installed at appropriate locations within the area of proposed development.
- Concrete walks and flatwork should not obstruct the free flow of surface water to the appropriate drainage devices.
- Area drains should be recessed below grade to allow free flow of water into the drain. Concrete or brick flatwork joints should be sealed with mortar or flexible mastic.
- Gutter and downspout systems should be installed to capture all discharge from roof areas. Downspouts should discharge directly into a pipe or paved surface system to be conveyed offsite.
- Enclosed planters adjoining, or in close proximity to proposed structures, should be sealed at the bottom and provided with subsurface collection systems and outlet pipes.
- Depressed planters should be raised with soil to promote runoff (minimum drainage gradient two percent or five percent, see above), and/or equipped with area drains to eliminate ponding.
- Drainage outfall locations should be selected to avoid erosion of slopes and/or properly armored to prevent erosion of graded surfaces. No drainage should be directed over or towards adjoining slopes.
- All drainage devices should be maintained on a regular basis, including frequent observations during the rainy season to keep the drains free of leaves, soil and other debris.
- Landscape irrigation should conform to the recommendations of the landscape architect and should be performed judiciously to preclude either soaking or excessive drying of the foundation soils. This should entail regular watering during the drier portions of the year and little or no irrigation during the rainy season. Automatic sprinkler systems should, therefore, be switched to manual operation during the rainy season. Good irrigation practice typically requires frequent application of limited quantities of water that are sufficient to sustain plant growth, but do not excessively wet the soils. Ponding and/or run-off of irrigation water are indications of excessive watering.

Other provisions, as determined by the landscape architect or civil engineer, may also be appropriate.

Moisture Sensitive Subgrade Soils

Most of the near-surface soils possess appreciable silt and clay content and will become unstable if exposed to significant moisture infiltration or disturbance by construction traffic. In addition, based on their granular content, some of the on-site soils will be susceptible to erosion. Therefore, the site should be graded to prevent ponding of surface water and to prevent water from running into excavations.

As discussed in Section 6.3 of this report, unstable subgrade soils will likely be encountered at the base of the overexcavations within the proposed building areas. The extent of unstable subgrade soils will to a large degree depend on methods used by the contractor to avoid adding additional moisture to these soils or disturbing soils which already possess high moisture contents. If grading occurs during a period of relatively wet weather, an increase in subgrade instability should also be expected. If unstable subgrade conditions are encountered, it is recommended that only track-mounted vehicles be used for fill placement and compaction.

If the construction schedule dictates that site grading will occur during a period of wet weather, allowances should be made for costs and delays associated with drying the on-site soils or import of a less moisture sensitive fill material. Grading during wet or cool weather may also increase the depth of overexcavation in the pad areas as well as the need for and or the thickness of the crushed stone stabilization layer, discussed in Section 6.3 of this report.

Groundwater

The static groundwater table at this site is considered to exist at a depth in excess of 30± feet. Therefore, groundwater is not expected to impact grading or foundation construction activities. Perched water may be encountered within sandy seams in the bedrock or alluvium. It is expected that minor perched water can be removed with sump pumps.

6.5 Shallow Foundation Design and Construction – New Buildings

Based on the preceding grading recommendations, it is assumed that the new building pads will be underlain by new structural fill soils used to replace the existing compressible/collapsible native colluvial soil. These structural fill soils are expected to extend to a depth of at least 3 feet below proposed foundation bearing grade. Based on this subsurface profile, and the design considerations presented in Section 6.1 of this report, the proposed buildings may be supported on conventional shallow foundations.

Building Foundation Design Parameters

New square and rectangular footings may be designed as follows:

- Maximum, net allowable soil bearing pressure: 2,000 lbs/ft^2.
- Minimum wall/column footing width: 14 inches/24 inches.
- Minimum longitudinal steel reinforcement within strip footings: Six (6) No. 5 rebars (3 top and 3 bottom), due to the expansive potential of the encountered soils, as well as the potential for liquefaction-induced settlements.
- Within the northern restroom area, where potentially liquefiable soils exist, it is recommended that all isolated foundations be connected in both perpendicular directions to adjacent foundations. This is typically accomplished using grade beams, designed by the structural engineer.
- Minimum foundation embedment: 12 inches into suitable structural fill soils, and at least 24 inches below adjacent exterior grade. Interior column footings may be placed immediately beneath the floor slab.

- It is recommended that the perimeter building foundations be continuous across all exterior doorways. Any flatwork adjacent to the exterior doors should be doweled into the perimeter foundations in a manner determined by the structural engineer.

The allowable bearing pressure presented above may be increased by 1/3 when considering short duration wind or seismic loads. The minimum steel reinforcement recommended above is based on standard geotechnical practice. Additional rigidity may be necessary for structural considerations, or to resist the effects of the liquefaction-induced differential settlements, as discussed in Section 6.1. The actual design of the foundations should be determined by the structural engineer.

Foundation Construction

The foundation subgrade soils should be evaluated at the time of overexcavation, as discussed in Section 6.3 of this report. It is further recommended that the foundation subgrade soils be evaluated by the geotechnical engineer immediately prior to steel or concrete placement. Soils suitable for direct foundation support should consist of newly placed structural fill, compacted to at least 90 percent of the ASTM D-1557 maximum dry density. Any unsuitable materials should be removed to a depth of suitable bearing compacted structural fill, with the resulting excavations backfilled with compacted fill soils. As an alternative, lean concrete slurry (500 to 1,500 psi) may be used to backfill such isolated overexcavations.

The foundation subgrade soils should also be properly moisture conditioned to 2 to 4 percent above the Modified Proctor optimum, to a depth of at least 12 inches below bearing grade. Since it is typically not feasible to increase the moisture content of the floor slab and foundation subgrade soils once rough grading has been completed, care should be taken to maintain the moisture content of the building pad subgrade soils throughout the construction process.

Estimated Foundation Settlements

Post-construction total and differential static settlements of shallow foundations designed and constructed in accordance with the previously presented recommendations are estimated to be less than 1.0 and 0.5 inches, respectively. Differential movements are expected to occur over a 30-foot span, thereby resulting in an angular distortion of less than 0.002 inches per inch. These settlements do not include the liquefaction-induced settlements discussed in Section 6.1 of this report.

Lateral Load Resistance

Lateral load resistance will be developed by a combination of friction acting at the base of foundations and slabs and the passive earth pressure developed by footings below grade. The following friction and passive pressure may be used to resist lateral forces:

- Passive Earth Pressure: 250 lbs/ft^3
- Friction Coefficient: 0.25

These are allowable values and include a factor of safety. When combining friction and passive resistance, the passive pressure component should be reduced by one-third. These values assume that footings will be poured directly against compacted structural fill. The maximum allowable passive pressure is 2,500 lbs/ft^2.

6.6 Drilled Pier Foundation Design and Construction

As discussed previously, the proposed improvements may include shade structures, permanent fencing, lighting and trellises. Such structures are typically supported on isolated pole foundations. It is recommended that these improvements be supported on drilled pier foundations to reduce the need for any remedial grading and to limit the effect of the medium expansive soils that exist at this site. These foundations may be designed as follows:

- Maximum, net allowable soil bearing pressure: 3,000 lbs/ft^2.
- Minimum pier diameter: 18 inches, 12 inches for fencing.
- Minimum pier embedment: 5 feet below adjacent exterior grade; 2 feet below adjacent exterior grade for fencing.

Non-structural fencing, such as chain link fence, is not required to be supported on drilled piers. The fence post foundations should extend to a depth of at least 18 inches.

The allowable bearing pressure presented above may be increased by 1/3 when considering short duration wind or seismic loads. The actual design of the foundations should be determined by the structural engineer.

Drilled Pier Construction

Minimum pier shaft diameters should be 18 inches (12 inches for fencing) to help eliminate arching of concrete and possible void formation within the piers. On-center pier spacing should be at least four (4) times the pier diameter at the bearing surface to eliminate an overlapping stress influence. At a minimum, a pier spacing equivalent to three (3) times the pier diameter could be utilized, with an associated 20 percent reduction in allowable capacities. Based on the conditions encountered at the boring locations, minor caving of the drilled pier excavations may occur. If caving or groundwater intrusion does occur during drilling, casing or liners will be required.

Prior to the placement of concrete, a clean-out bucket should be used to ensure that excess materials in the bottom of the pier have been sufficiently removed and that the dimensions of the pier are correct. Concrete should be place using a tremie pipe whenever the distance of fall is greater than five (5) feet. Concrete should be placed at about a 6-inch slump when long reinforcing steel is used. It is recommended that the pier construction be performed in accordance with American Concrete Institute documents (ACI 336, I-79 and ACI 336-3R-72, revised 1985). In the event that casing is required, a sufficient head of concrete (minimum of 5 feet) should be maintained in the casing as the casing is being removed to prevent the intrusion of caving soils in the pier.

It is recommended that the bearing materials at each drilled pier location be evaluated by the geotechnical engineer prior to placing steel or concrete.

<u>Lateral Load Resistance</u>

Lateral load resistance will be developed by a combination of friction acting at the base of foundations and slabs and the passive earth pressure developed by footings below grade. The following friction and passive pressure may be used to resist lateral forces:

- Passive Earth Pressure: 250 lbs/ft^3
- Friction Coefficient: 0.25

These are allowable values, and include a factor of safety. The passive pressure may be increased by one-third for transient loads, but should not be doubled. Due to the presence of existing undocumented fill soils, the upper 12 inches of the soil subgrade should be neglected when determining the passive resistance. When combining friction and passive resistance, the passive pressure component should be reduced by one-third. These values assume that footings will be poured directly against compacted, low expansive, structural fill. The maximum allowable passive pressure is 2500 lbs/ft^2.

6.7 Floor Slab Design and Construction

Subgrades which will support new floor slabs should be prepared in accordance with the recommendations contained in the *Site Grading Recommendations* section of this report. Based on the anticipated grading which will occur at this site, and based on the design considerations presented in Section 6.1 of this report, the floors of the proposed buildings may be constructed as conventional slabs-on-grade supported on newly placed structural fill, extending to a depth of at least 3 feet below finished pad grade. Based on geotechnical considerations, the floor slabs may be designed as follows:

- Minimum slab thickness: 4½ inches. Building floor slabs underlain by potentially liquefiable native alluvium (such as the restroom in the northwestern region of the site) should be at least 6 inches in thickness.

- Minimum slab reinforcement: No. 4 bars at 16-inches on-center, in both directions, due to presence of potentially liquefiable soils and expansive soils, at this site. The actual floor slab reinforcement should be determined by the structural engineer, based upon the imposed loading, and the potential liquefaction-induced settlements.

- The foundation/slab system may be designed using an effective plasticity index of 20.

- Slab underlayment: If moisture sensitive floor coverings will be used or if vapor transmission into the area above the building slab is problematic, then minimum slab underlayment should consist of a moisture vapor barrier constructed below the entire area of the proposed slab. The moisture vapor barrier should meet or exceed the Class A rating as defined by ASTM E 1745-97 and have a permeance rating less than 0.01 perms as described in ASTM E 96-95 and ASTM E 154-88. A polyolefin material such as 15-mil Stego

Wrap Vapor barrier or equivalent will meet these specifications. The moisture vapor barrier should be properly constructed in accordance with all applicable manufacturer specifications. Given that a rock free subgrade is anticipated and that a capillary break is not required, sand below the barrier is not required. The need for sand and/or the amount of sand above the moisture vapor barrier should be specified by the structural engineer or concrete contractor. The selection of sand above the barrier is not a geotechnical engineering issue and hence outside our purview. Where moisture sensitive floor coverings are not anticipated, the vapor barrier may be eliminated.

- Moisture condition the floor slab subgrade soils to 2 to 4 percent above the Modified Proctor optimum moisture content, to a depth of 12 inches. The moisture content of the floor slab subgrade soils should be verified by the geotechnical engineer within 24 hours prior to concrete placement.

- Proper concrete curing techniques should be utilized to reduce the potential for slab curling or the formation of excessive shrinkage cracks.

The actual design of the floor slab should be completed by the structural engineer to verify adequate thickness and reinforcement.

6.8 Exterior Flatwork Design and Construction

Subgrades which will support new exterior slabs-on-grade for patios and sidewalks should be prepared in accordance with the recommendations contained in Section 6.3 of this report. Based on these recommendations, the exterior flatwork will be supported on existing native soils that have been scarified and moisture conditioned to a depth of 12 inches and recompacted to 90 percent of the ASTM D-1557 maximum dry density, or newly placed structural fill. The owner and/or developer should be aware that flatwork constructed over medium expansive soils may be subject to movements and minor distress due to heaving of the underlying expansive soils. If such movements are not acceptable, consideration should be given to the use of a low expansive layer of structural fill beneath the flatwork, as discussed in Section 6.3 of this report. Based on geotechnical considerations, exterior slabs on grade which are not subjected to any vehicular traffic may be designed as follows:

- Minimum slab thickness: 4½ inches

- Minimum slab reinforcement: No. 4 bars at 18 inches on center, in both directions.

- Moisture condition the flatwork subgrade soils to 2 to 4 percent above the optimum moisture content, to a depth of at least 12 inches.

- Proper concrete curing techniques should be utilized to reduce the potential for slab curling or the formation of excessive shrinkage cracks.

- Control joints should be provided at a maximum spacing of 8 feet on center in two directions for slabs and at 6 feet on center for sidewalks. Control joints are intended to direct cracking.

- Expansion or felt joints should be used at the interface of exterior slabs on grade and any fixed structures to permit relative movement.

- Where the flatwork is adjacent to a landscape planter or another area with exposed soil, it should incorporate a turned-down edge. This turned-down edge should be at least 12 inches in depth and 6 inches in width. The turned-down edge should incorporate longitudinal steel reinforcement consisting of at least one No. 4 bar.

- Flatwork which is constructed immediately adjacent to the new structures should be dowelled into the perimeter foundations in a manner determined by the structural engineer.

- Some cracking of exterior flatwork at this site should be expected, due to the presence of expansive soils.

These flatwork design and construction recommendations may also be used for concrete slabs to be placed in areas of new exterior rubberized play surfacing and areas of new flagstone, subject to any applicable manufacturer's recommendations.

6.9 Retaining Wall Design and Construction

Although not indicated on the site plan, some small (less than 5 feet in height) retaining walls may be required to facilitate the new site grades. The parameters recommended for use in the design of these walls are presented below.

Retaining Wall Design Parameters

Based on the soil conditions encountered at the boring locations, the following parameters may be used in the design of new retaining walls for this site. The on-site soils generally consist of potentially expansive alluvium or colluvium. These materials are not considered suitable for use as retaining wall backfill. Therefore, it is recommended that imported very low to non-expansive soils be used for retaining wall backfill. Typically, silty sands are used for this purpose. Such materials are expected to possess an internal angle of friction of at least 30 degrees when compacted to at least 90 percent of the ASTM D-1557 maximum dry density.

If desired, SCG could provide design parameters for an alternative select backfill material behind the retaining walls. The use of select backfill material could result in lower lateral earth pressures. In order to use the design parameters for the imported select fill, this material must be placed within the entire active failure wedge. This wedge is defined as extending from the heel of the retaining wall upwards at an angle of approximately 60° from horizontal. If select backfill material behind the retaining wall is desired, SCG should be contacted for supplementary recommendations.

<u>RETAINING WALL DESIGN PARAMETERS</u>

Design Parameter		Soil Type
		Imported Silty Sand
Internal Friction Angle (ϕ)		30°
Unit Weight		125 lbs/ft^3
Equivalent Fluid Pressure:	Active Condition (level backfill)	42 lbs/ft^3
	Active Condition (2h:1v backfill)	67 lbs/ft^3
	At-Rest Condition (level backfill)	63 lbs/ft^3

The walls should be designed using a soil-footing coefficient of friction of 0.25 and an equivalent passive pressure of 250 lbs/ft^3. The structural engineer should incorporate appropriate factors of safety in the design of the retaining walls.

The active earth pressure may be used for the design of retaining walls that do not directly support structures or support soils that in turn support structures and which will be allowed to deflect. The at-rest earth pressure should be used for walls that will not be allowed to deflect such as those which will support foundation bearing soils, or which will support foundation loads directly.

Where the soils on the toe side of the retaining wall are not covered by a "hard" surface such as a structure or pavement, the upper 1 foot of soil should be neglected when calculating passive resistance due to the potential for the material to become disturbed or degraded during the life of the structure.

<u>Seismic Lateral Earth Pressures</u>

In addition to the lateral earth pressures presented in the previous section, retaining walls which are more than 6 feet in height should be designed for a seismic lateral earth pressure, in accordance with the 2019 CBC. Based on the current site plan, it is not expected that any walls in excess of 6 feet in height will be required for this project. If any such walls are proposed, our office should be contacted for supplementary design recommendations.

<u>Retaining Wall Foundation Design</u>

The retaining wall foundations should be supported within newly placed compacted structural fill, extending to a depth of at least 3 feet below proposed foundation bearing grade. Foundations to support new retaining walls should be designed in accordance with the general Foundation Design Parameters presented in a previous section of this report.

Backfill Material

The on-site soils are not considered suitable for use as retaining wall backfill. All retaining wall backfill soils should consist of imported low expansive sands or silty sands. All backfill material placed within 3 feet of the back wall face should have a particle size no greater than 3 inches. The retaining wall backfill materials should be well graded.

It is recommended that a minimum 1 foot thick layer of free-draining granular material (less than 5 percent passing the No. 200 sieve) be placed against the face of the retaining walls. This material should extend from the top of the retaining wall footing to within 1 foot of the ground surface on the back side of the retaining wall. This material should be approved by the geotechnical engineer. In lieu of the 1 foot thick layer of free-draining material, a properly installed prefabricated drainage composite such as the MiraDRAIN 6000XL (or approved equivalent), which is specifically designed for use behind retaining walls, may be used. If the layer of free-draining material is not covered by an impermeable surface, such as a structure or pavement, a 12-inch thick layer of a low permeability soil should be placed over the backfill to reduce surface water migration to the underlying soils. The layer of free draining granular material should be separated from the backfill soils by a suitable geotextile, approved by the geotechnical engineer.

All retaining wall backfill should be placed and compacted under engineering controlled conditions in the necessary layer thicknesses to ensure an in-place density between 90 and 93 percent of the maximum dry density as determined by the Modified Proctor test (ASTM D1557). Care should be taken to avoid over-compaction of the soils behind the retaining walls, and the use of heavy compaction equipment should be avoided.

Subsurface Drainage

As previously indicated, the retaining wall design parameters are based upon drained backfill conditions. Consequently, some form of permanent drainage system will be necessary in conjunction with the appropriate backfill material. Subsurface drainage may consist of either:

- A weep hole drainage system typically consisting of a series of 4-inch diameter holes in the wall situated slightly above the ground surface elevation on the exposed side of the wall and at an approximate 8-foot on-center spacing. The weep holes should include a 2 cubic foot pocket of open graded gravel, surrounded by an approved geotextile fabric, at each weep hole location.

- A 4-inch diameter perforated pipe surrounded by 2 cubic feet of gravel per linear foot of drain placed behind the wall, above the retaining wall footing. The gravel layer should be wrapped in a suitable geotextile fabric to reduce the potential for migration of fines. The footing drain should be extended to daylight or tied into a storm drainage system.

6.10 Pavement Design Parameters

Site preparation in the pavement area should be completed as previously recommended in the *Site Grading Recommendations* section of this report. The subsequent pavement recommendations assume proper drainage and construction monitoring and are based on either PCA or CALTRANS design parameters for a twenty (20) year design period. However, these designs also assume a routine pavement maintenance program to obtain the anticipated 20-year pavement service life.

Pavement Subgrades

It is anticipated that the new pavements will be supported on the existing soils that have been scarified, moisture conditioned, and recompacted. These materials generally consist of silty clays and sandy clays or newly placed engineered fill soils of similar composition. These materials are expected to exhibit poor pavement support characteristics, with estimated R-values of 15 to 25. Since R-value testing was not included in the scope of services for the current project, the subsequent pavement designs are based upon a conservatively assumed R-value of 15. Any fill material imported to the site should have support characteristics equal to or greater than that of the on-site soils and be placed and compacted under engineering controlled conditions.

Asphaltic Concrete

Presented below are the recommended thicknesses for new flexible pavement structures consisting of asphaltic concrete over a granular base. The pavement designs are based on the traffic indices (TI's) indicated. The client and/or civil engineer should verify that these TI's are representative of the anticipated traffic volumes. If the client and/or civil engineer determine that the expected traffic volume will exceed the applicable traffic index, we should be contacted for supplementary recommendations. The design traffic indices equate to the following approximate daily traffic volumes over a 20-year design life, assuming six operational traffic days per week.

Traffic Index	No. of Heavy Trucks per Day
4.0	0
5.0	1
6.0	3

For the purpose of the traffic volumes indicated above, a truck is defined as a 5-axle tractor trailer unit with one 8-kip axle and two 32-kip tandem axles. All of the traffic indices allow for 1,000 automobiles per day.

ASPHALT PAVEMENTS (R = 15)			
Materials	Thickness (inches)		
	Auto Parking (TI = 4.0)	Auto Drive Lanes (TI = 5.0)	Light Truck Traffic (TI = 6.0)
Asphalt Concrete	3	3	3½
Aggregate Base	6	9	11
Compacted Subgrade	12	12	12

The aggregate base course should be compacted to at least 95 percent of the ASTM D-1557 maximum dry density. The asphaltic concrete should be compacted to at least 95 percent of the Marshall maximum density, as determined by ASTM D-2726. The aggregate base course may consist of crushed aggregate base (CAB) or crushed miscellaneous base (CMB), which is a recycled gravel, asphalt and concrete material. The gradation, R-Value, Sand Equivalent, and Percentage Wear of the CAB or CMB should comply with appropriate specifications contained in the current edition of the "Greenbook" Standard Specifications for Public Works Construction.

Portland Cement Concrete

The preparation of the subgrade soils within Portland cement concrete pavement areas should be performed as previously described for proposed asphalt pavement areas. The minimum recommended thicknesses for the Portland Cement Concrete pavement sections are as follows:

PORTLAND CEMENT CONCRETE PAVEMENTS (R = 15)			
Materials	Thickness (inches)		
	Automobile Parking and Drive Areas (TI = 4.0 to 5.0)	Truck Traffic Areas (TI =6.0)	Fire Lane (TI = 6.5)
PCC	5	5½	6
Compacted Subgrade (95% minimum compaction)	12	12	12

The concrete should have a 28-day compressive strength of at least 3,000 psi. Reinforcing within all pavements should be designed by the structural engineer. The maximum joint spacing within all of the PCC pavements is recommended to be equal to or less than 30 times the pavement thickness. The actual joint spacing and reinforcing of the Portland cement concrete pavements should be determined by the structural engineer.

7.0 GENERAL COMMENTS

This report has been prepared as an instrument of service for use by the client, in order to aid in the evaluation of this property and to assist the architects and engineers in the design and preparation of the project plans and specifications. This report may be provided to the contractor(s) and other design consultants to disclose information relative to the project. However, this report is not intended to be utilized as a specification in and of itself, without appropriate interpretation by the project architect, civil engineer, and/or structural engineer. The reproduction and distribution of this report must be authorized by the client and Southern California Geotechnical, Inc. Furthermore, any reliance on this report by an unauthorized third party is at such party's sole risk, and we accept no responsibility for damage or loss which may occur. The client(s)' reliance upon this report is subject to the Engineering Services Agreement, incorporated into our proposal for this project.

The analysis of this site was based on a subsurface profile interpolated from limited discrete soil samples. While the materials encountered in the project area are considered to be representative of the total area, some variations should be expected between boring locations and sample depths. If the conditions encountered during construction vary significantly from those detailed herein, we should be contacted immediately to determine if the conditions alter the recommendations contained herein.

This report has been based on assumed or provided characteristics of the proposed development. It is recommended that the owner, client, architect, structural engineer, and civil engineer carefully review these assumptions to ensure that they are consistent with the characteristics of the proposed development. If discrepancies exist, they should be brought to our attention to verify that they do not affect the conclusions and recommendations contained herein. We also recommend that the project plans and specifications be submitted to our office for review to verify that our recommendations have been correctly interpreted.

The analysis, conclusions, and recommendations contained within this report have been promulgated in accordance with generally accepted professional geotechnical engineering practice. No other warranty is implied or expressed.

8.0 REFERENCES

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APPENDIX A

SOURCE: USGS TOPOGRAPHIC MAP OF THE SAN LUIS REY QUADRANGLE, SAN DIEGO COUNTY, CALIFORNIA, 2018

SITE LOCATION MAP	
VETERANS MEMORIAL PARK	
CARLSBAD, CALIFORNIA	
SCALE: 1" = 2000'	SOUTHERN CALIFORNIA GEOTECHNICAL
DRAWN: RB CHKD: RGT	
SCG PROJECT 19G109-2	
PLATE 1	

GEOTECHNICAL LEGEND

- APPROXIMATE BORING LOCATON
- SANTIAGO FORMATION (Tsa) OUTCROP
- 15 STRIKE AND DIP
- 85 JOINTING

NOTE: SURFICIAL GEOLOGIC UNITS OBSCURED BY VEGETATION EXCEPT IN EXPOSED OUTCROP AREAS.

NOTE: BASE MAP PREPARED BY CLIENT

BORING LOCATION PLAN

VETERANS MEMORIAL PARK

CARLSBAD, CALIFORNIA

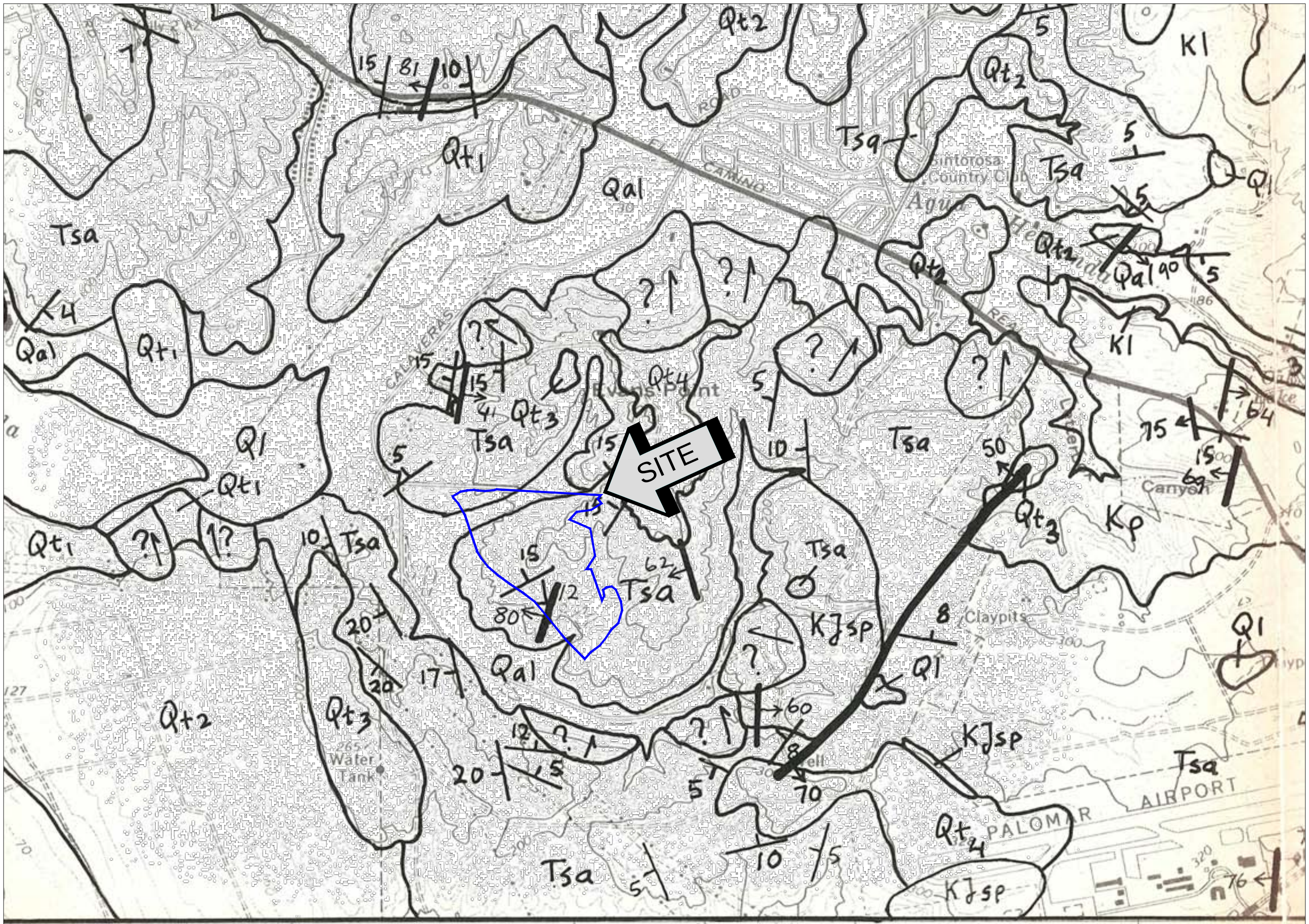
SCALE: 1" = 200'

DRAWN: DRK
CHKD: GKM

SCG PROJECT
19G109-2

PLATE 2

SOUTHERN CALIFORNIA GEOTECHNICAL



MAP UNITS

Symbol	Description
Qal	Alluvium and colluvium Unconsolidated silt, clay, sand and gravel.
Qb	Beach deposits: unconsolidated sand.
Ql	Lake, reservoir and pond deposits; partly submerged, unconsolidated clay, silt, sand and gravel.
↓↓?	Landslide deposits (includes headscarp area). See further California Division of Mines and Geology Open-File Report 95-04.
Qt1-4	Terrace deposits; reddish brown, poorly bedded, poorly- to moderately-indurated sandstone, siltstone and conglomerate. Subscripts indicate relative level with 1 the lowest elevation (youngest age). The three lower levels have been correlated with the Bay Point Formation and the highest level with the Linda Vista Formation; see Kennedy (1975), Weber (1982), and Wilson (1972).
Tst	Stadium Conglomerate (Poway Group); poorly-bedded, poorly-to moderately-indurated, cobble conglomerate with coarse-grained sandstone matrix.
Tsa / Tt	Santiago Formation; light-colored, poorly-bedded, poorly-indurated, fine- to medium-grained sandstone interbedded with landslide-prone siltstone and claystone. Local coarse-grained sandstone and conglomerate. Renamed from Scripps Formation in the Encinitas (Tan, 1986) and Rancho Santa Fe (Tan, 1987) quadrangles. It interfingers with Torrey Sandstone. Torrey Sandstone (La Jolla Group); light-colored, massive and thick-bedded, well-indurated, medium-to coarse-grained arkosic sandstone. Resistant to landsliding. It interfingers with Santiago Formation.

MAP SYMBOLS

Symbol	Description
(line)	Contact (boundary) between map units. Most boundaries are not exposed and are inferred.
5	Strike, and dip of inclined beds. Most bedding attitudes are estimated.
⊕	Horizontal beds.
82 U D	Fault; dotted where concealed. Arrow and number indicate direction and amount of dip of exposed fault plane. U indicates upthrown side; D indicates downthrown side.
70	Strike, direction, and amount of dip of minor fault (shear joint) plane. Most fault displacements are less than 5 feet.
(circle with arrows)	Landslide; arrows indicate general direction of movement. Both the headscarp area and debris deposit are included within the map symbol. Landslides are depicted prior to urban development. Only landslides larger than 300 feet across are shown on the map. For further information see California Division of Mines and Geology Open-File Report 95-04.
(circle with ?)	Questionable landslide.
(blue line)	Site boundary

SOURCE: "GEOLOGIC MAP OF THE OCEANSIDE, SAN LUIS REY, AND SAN MARCOS 7.5' QUADRANGLES, SAN DIEGO COUNTIY, CALIFORNIA" TAN AND KENNEDY, 1996

GEOLOGIC MAP

VETERANS MEMORIAL PARK

CARLSBAD, CALIFORNIA

SCALE: 1" = 2000'

DRAWN: DRK
CHKD: GKM

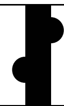
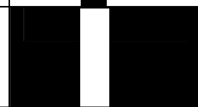
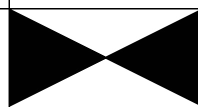
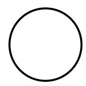
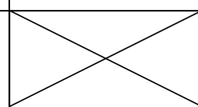
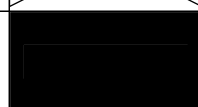
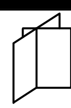
SCG PROJECT
19G109-2

PLATE 3

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL

APPENDIX B

BORING LOG LEGEND

SAMPLE TYPE	GRAPHICAL SYMBOL	SAMPLE DESCRIPTION
AUGER		SAMPLE COLLECTED FROM AUGER CUTTINGS, NO FIELD MEASUREMENT OF SOIL STRENGTH. (DISTURBED)
CORE		ROCK CORE SAMPLE: TYPICALLY TAKEN WITH A DIAMOND-TIPPED CORE BARREL. TYPICALLY USED ONLY IN HIGHLY CONSOLIDATED BEDROCK.
GRAB		SOIL SAMPLE TAKEN WITH NO SPECIALIZED EQUIPMENT, SUCH AS FROM A STOCKPILE OR THE GROUND SURFACE. (DISTURBED)
CS		CALIFORNIA SAMPLER: 2-1/2 INCH I.D. SPLIT BARREL SAMPLER, LINED WITH 1-INCH HIGH BRASS RINGS. DRIVEN WITH SPT HAMMER. (RELATIVELY UNDISTURBED)
NSR		NO RECOVERY: THE SAMPLING ATTEMPT DID NOT RESULT IN RECOVERY OF ANY SIGNIFICANT SOIL OR ROCK MATERIAL.
SPT		STANDARD PENETRATION TEST: SAMPLER IS A 1.4 INCH INSIDE DIAMETER SPLIT BARREL, DRIVEN 18 INCHES WITH THE SPT HAMMER. (DISTURBED)
SH		SHELBY TUBE: TAKEN WITH A THIN WALL SAMPLE TUBE, PUSHED INTO THE SOIL AND THEN EXTRACTED. (UNDISTURBED)
VANE		VANE SHEAR TEST: SOIL STRENGTH OBTAINED USING A 4 BLADED SHEAR DEVICE. TYPICALLY USED IN SOFT CLAYS-NO SAMPLE RECOVERED.

COLUMN DESCRIPTIONS

DEPTH: Distance in feet below the ground surface.

SAMPLE: Sample Type as depicted above.

BLOW COUNT: Number of blows required to advance the sampler 12 inches using a 140 lb hammer with a 30-inch drop. 50/3” indicates penetration refusal (>50 blows) at 3 inches. WH indicates that the weight of the hammer was sufficient to push the sampler 6 inches or more.

POCKET PEN.: Approximate shear strength of a cohesive soil sample as measured by pocket penetrometer.

GRAPHIC LOG: Graphic Soil Symbol as depicted on the following page.

DRY DENSITY: Dry density of an undisturbed or relatively undisturbed sample in lbs/ft^3.

MOISTURE CONTENT: Moisture content of a soil sample, expressed as a percentage of the dry weight.

LIQUID LIMIT: The moisture content above which a soil behaves as a liquid.

PLASTIC LIMIT: The moisture content above which a soil behaves as a plastic.

PASSING #200 SIEVE: The percentage of the sample finer than the #200 standard sieve.

UNCONFINED SHEAR: The shear strength of a cohesive soil sample, as measured in the unconfined state.

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
			GRAPH	LETTER	
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		(LITTLE OR NO FINES)		GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
		(APPRECIABLE AMOUNT OF FINES)		GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	SAND AND SANDY SOILS	CLEAN SANDS		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
		(LITTLE OR NO FINES)		SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	SANDS WITH FINES		SM	SILTY SANDS, SAND - SILT MIXTURES
		(APPRECIABLE AMOUNT OF FINES)		SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

BORING NO. B-1

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

JOB NO.: 19G109-2	DRILLING DATE: 7/16/20	WATER DEPTH: 43 feet
PROJECT: Veterans Park	DRILLING METHOD: Hollow Stem Auger	CAVE DEPTH: 37½ feet
LOCATION: Carlsbad, California	LOGGED BY: Daryl Kas	READING TAKEN: 4 Hours After Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
					ALLUVIUM Gray Brown Clayey fine Sand to fine Sandy Clay, medium dense to stiff-moist							
	X	12					11					EI = 68 @ 0 to 5 feet
	X	14					12					
5					Gray Brown to Dark Gray Brown Silty fine Sand thinly interbedded with Clayey fine Sand, medium dense-moist to very moist							
	X	10					12					
					Gray Brown Clayey fine Sand, loose-very moist							
	X	8					14					
10												
					Gray Brown Clayey fine Sand to fine Sandy Clay, medium dense to very stiff-very moist							
	X	16					16	34	11	48		
15												
	X	16					20	44	18	53		
20												
					Light Gray Clayey fine Sand, medium dense-moist to very moist							
	X	10					14			36		
25												
	X	10					13			37		
30												
					Light Brown Silty fine Sand, trace Clay, occasional 1-inch fine Sandy Clay lenses, medium dense-moist to very moist							
	X	11					12			31		

TBL 19G109-2.GPJ SOCALGEO.GDT 8/7/20

BORING NO. B-1

JOB NO.: 19G109-2
PROJECT: Veterans Park
LOCATION: Carlsbad, California

DRILLING DATE: 7/16/20
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Daryl Kas

WATER DEPTH: 43 feet
CAVE DEPTH: 37½ feet
READING TAKEN: 4 Hours After Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION (Continued)	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
					Light Brown Silty fine Sand, trace Clay, occasional 1-inch fine Sandy Clay lenses, medium dense-moist to very moist							
					Gray Brown Clayey fine Sand, medium dense-moist to very moist							
	X	11					14			38		
40												
					Gray Brown Silty fine Sand, little Silt, medium dense-very moist to wet							
	X	11					16			27		Groundwater @ 43'
45												
	X	18					22			24		
50												
					Boring Terminated at 50'							

TBL 19G109-2.GPJ SOCALGEO.GDT 8/7/20

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-2

JOB NO.: 19G109-2
PROJECT: Veterans Park
LOCATION: Carlsbad, California

DRILLING DATE: 7/16/20
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Daryl Kas

WATER DEPTH: Dry
CAVE DEPTH: 12 feet
READING TAKEN: At Completion

SURFACE ELEVATION: MSL

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
					SANTIAGO FORMATION (Tsa): Light Gray Silty fine to coarse-grained Sandstone, friable, weakly-cemented, trace Iron oxide staining, dense-moist							
		62				108	10					
		93			Light Gray to Light Brown thinly interbedded friable Silty fine-grained Sandstone and Clayey Siltstone, weakly-cemented, Iron oxide staining, very dense-moist to very moist	117	14					
5		50/4"				115	13					
		50/2"				107	12					
		50/2"			Light Gray fine-grained Sandstone, friable, weakly-cemented, dense-dry to damp	82	3					
10												
					Light Gray Silty fine-grained Sandstone, friable, weakly-cemented, very dense-damp							
		50/5"					8					
15												

Boring Terminated at 15'

TBL 19G109-2.GPJ SOCALGEO.GDT 8/7/20

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-3

JOB NO.: 19G109-2
PROJECT: Veterans Park
LOCATION: Carlsbad, California

DRILLING DATE: 7/16/20
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Daryl Kas

WATER DEPTH: Dry
CAVE DEPTH: 13 feet
READING TAKEN: At Completion

FIELD RESULTS					DESCRIPTION	LABORATORY RESULTS						COMMENTS
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	SURFACE ELEVATION: MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	
					COLLUVIUM (Qc): Dark Gray Brown Silty fine Sand, little Clay, medium dense-moist to very moist							
	X	26					12					
					SANTIAGO FORMATION (Tsa): Light Gray Silty fine-grained Sandstone, weakly-cemented, friable, medium dense-moist to very moist		12					
	X	50/4"			Light Gray Silty fine-grained Sandstone with thinly interbedded gray brown Clayey Siltstone, Iron oxide staining, friable, weakly-cemented, very dense-very moist		13					
5												
	X	50/5"			Light Gray Silty fine-grained Sandstone, Iron oxide staining, friable, weakly-cemented, very dense-damp to very moist		14					
	X	50/5"					12					
10												
	X	50/5"					7					
15												
					Boring Terminated at 15'							

TEST BORING LOG

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-4

JOB NO.: 19G109-2	DRILLING DATE: 7/16/20	WATER DEPTH: Dry
PROJECT: Veterans Park	DRILLING METHOD: Hollow Stem Auger	CAVE DEPTH: 11 feet
LOCATION: Carlsbad, California	LOGGED BY: Daryl Kas	READING TAKEN: At Completion

FIELD RESULTS					DESCRIPTION	LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	SURFACE ELEVATION: MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
	X	18			COLLUVIUM (Qc): Light Brown Silty fine Sand, medium dense-very moist	94	18					
	X	30			Dark Gray Brown fine Sandy Clay, some Silt, mottled, stiff-moist	93	14					
5	X	40			SANTIAGO FORMATION (Tsa): Gray Silty fine-grained Sandstone, friable, weakly-cemented, trace Iron oxide staining, medium dense-very moist	109	15					
	X	31			Light Gray to Gray fine Sandy Siltstone interbedded with Clayey Siltstone, Iron oxide staining, weakly-cemented, friable, stiff-very moist to wet	107	16					
10	X	37				110	22					
	X	27			Light Gray to Gray Silty fine-grained Sandstone interbedded with fine Sandy Siltstone, weakly-cemented, friable, Iron oxide staining, medium dense-wet		20					
15					Boring Terminated at 15'							

TBL 19G109-2.GPJ SOCALGEO.GDT 8/7/20

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-5

JOB NO.: 19G109-2
PROJECT: Veterans Park
LOCATION: Carlsbad, California

DRILLING DATE: 7/16/20
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Daryl Kas

WATER DEPTH: Dry
CAVE DEPTH: 12 feet
READING TAKEN: At Completion

SURFACE ELEVATION: MSL

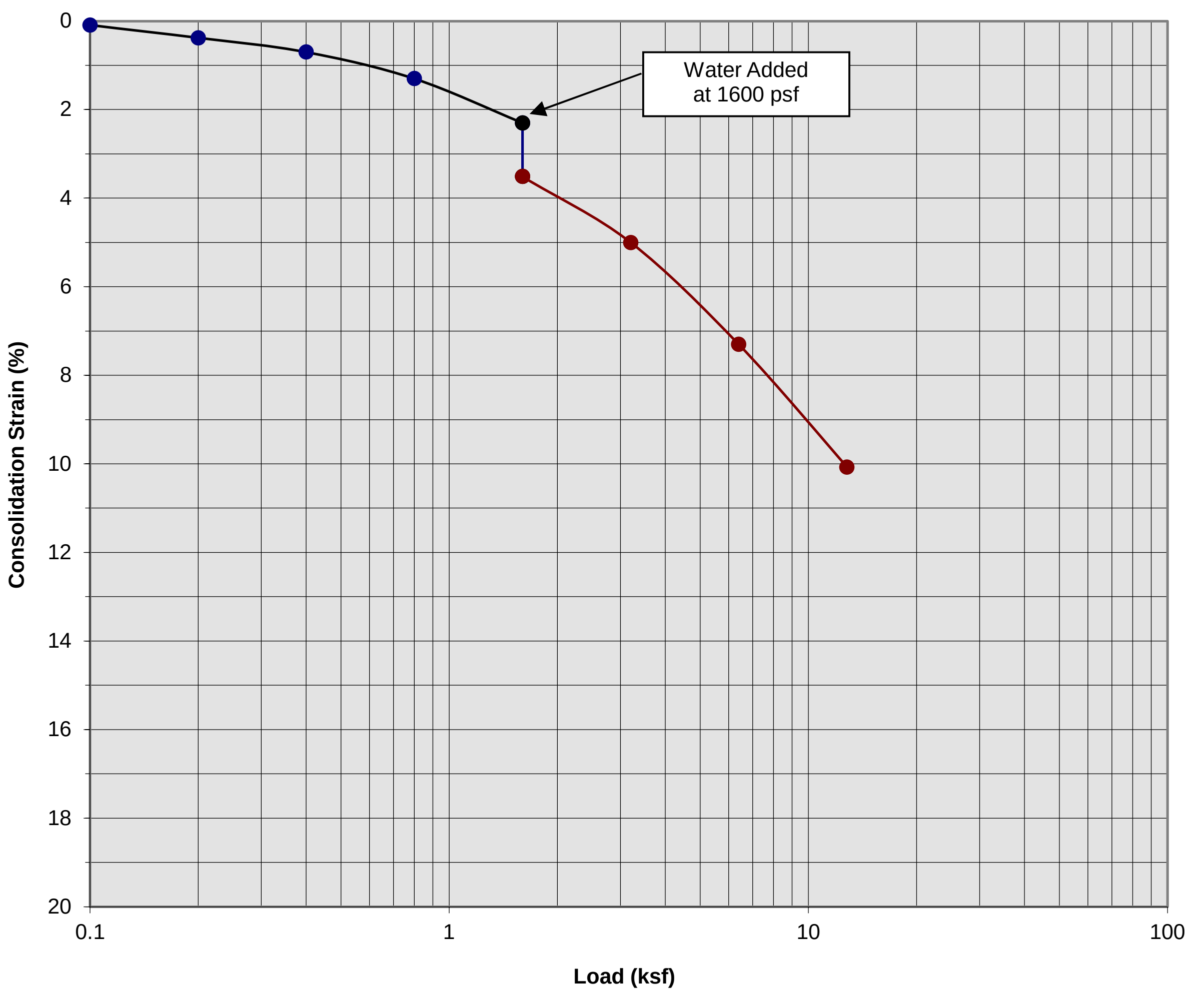
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
					COLLUVIUM (Qc): Light Gray Brown Silty fine Sand, medium dense-damp							
		26			Dark Gray Brown fine Sandy Clay, very stiff- damp to moist	102	6					
		36				108	14					
					SANTIAGO FORMATION (Tsa): Gray Clayey Siltstone, Iron oxide staining, friable, weakly-cemented, dense to very stiff-very moist							
5		50			Light Gray interbedded Silty fine-grained Sandstone with Clayey Siltstone, Iron oxide staining, friable, weakly-cemented, dense to very stiff-very moist	101	17					
		65				109	18					
		66			Gray to Light Gray interbedded fine Sandy Siltstone and Clayey Siltstone, Iron oxide staining, friable, weakly-cemented, very stiff to very dense-very moist	110	18					
10												
		55					22					
15												

Boring Terminated at 15'

TBL 19G109-2.GPJ SOCALGEO.GDT 8/7/20

APPENDIX C

Consolidation/Collapse Test Results



Classification: Colluvium: Light Brown Silty fine Sand

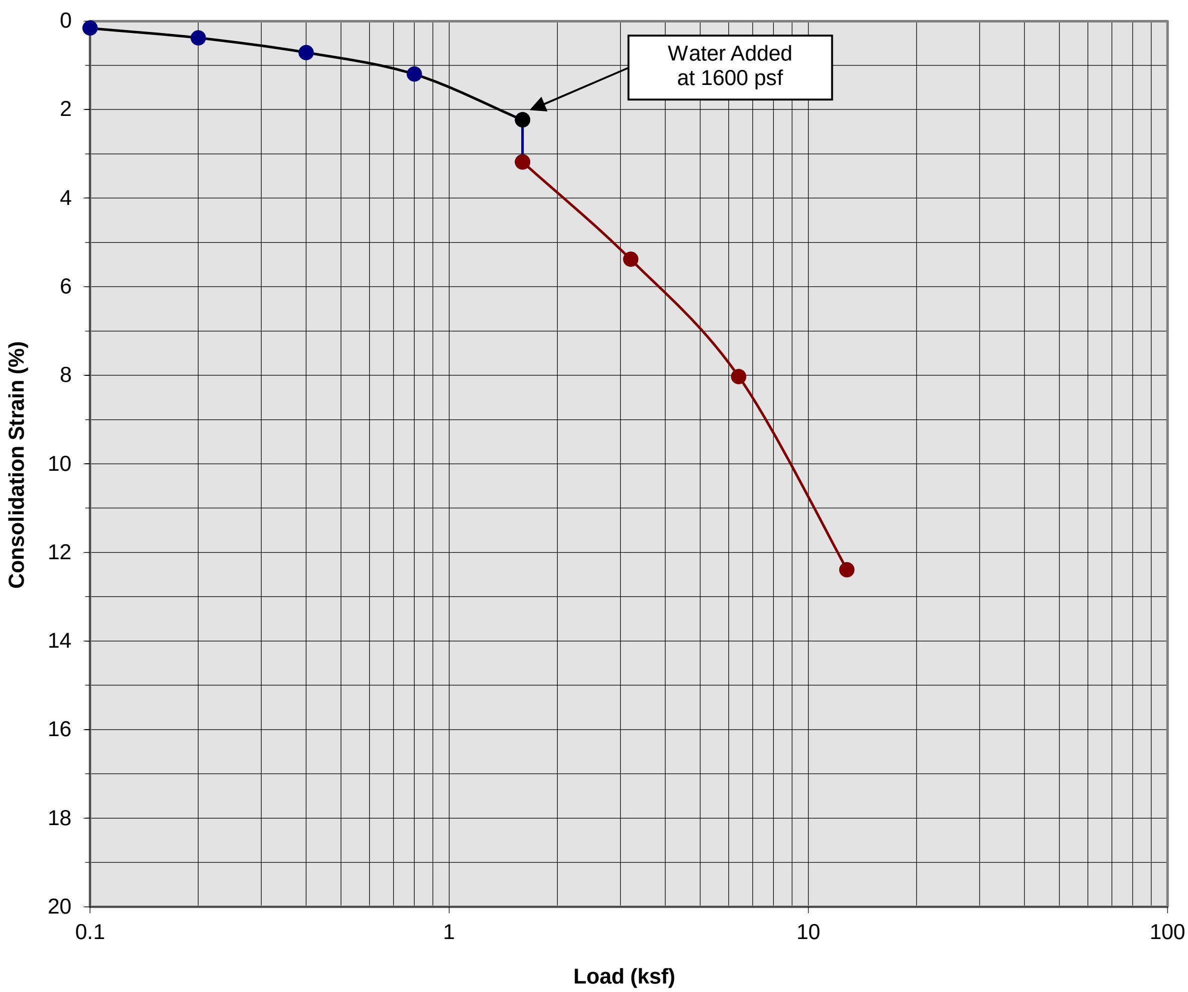
Boring Number:	B-4	Initial Moisture Content (%)	19
Sample Number:	---	Final Moisture Content (%)	24
Depth (ft)	1 to 2	Initial Dry Density (pcf)	93.8
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	103.7
Specimen Thickness (in)	1.0	Percent Collapse (%)	1.21

Veterans Park
Carlsbad, California
Project No. 19G109-2

PLATE C- 1

SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Consolidation/Collapse Test Results



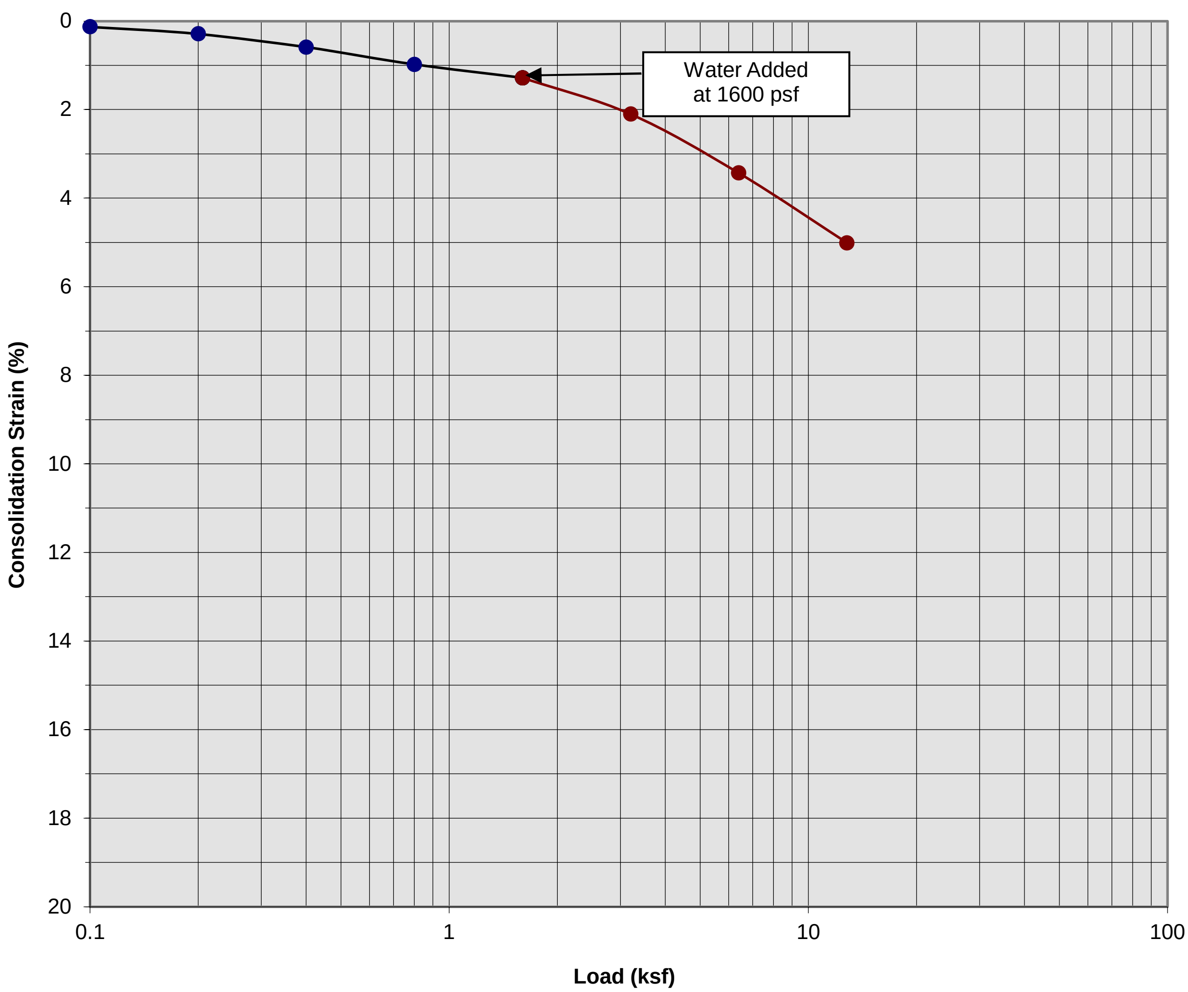
Classification: Colluvium: Dark Gray Brown fine Sandy Clay, some Silt

Boring Number:	B-4	Initial Moisture Content (%)	13
Sample Number:	---	Final Moisture Content (%)	20
Depth (ft)	3 to 4	Initial Dry Density (pcf)	92.8
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	105.0
Specimen Thickness (in)	1.0	Percent Collapse (%)	0.95

Veterans Park
Carlsbad, California
Project No. 19G109-2
PLATE C- 2

SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Consolidation/Collapse Test Results



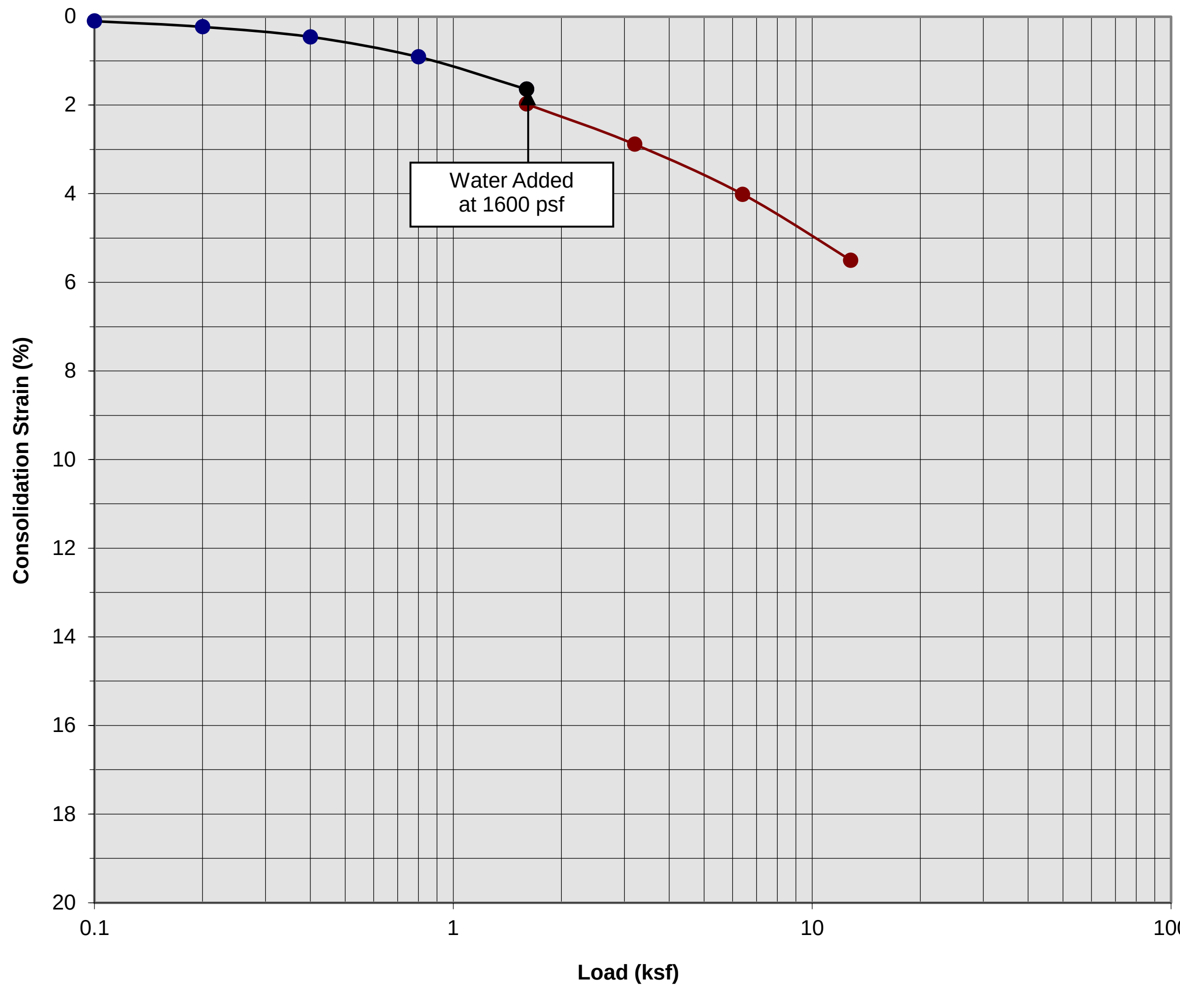
Classification: BEDROCK: Gray Silty fine grained Sandstone

Boring Number:	B-4	Initial Moisture Content (%)	15
Sample Number:	---	Final Moisture Content (%)	17
Depth (ft)	5 to 6	Initial Dry Density (pcf)	109.3
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	114.6
Specimen Thickness (in)	1.0	Percent Collapse (%)	0.00

Veterans Park
Carlsbad, California
Project No. 19G109-2
PLATE C- 3

SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Consolidation/Collapse Test Results

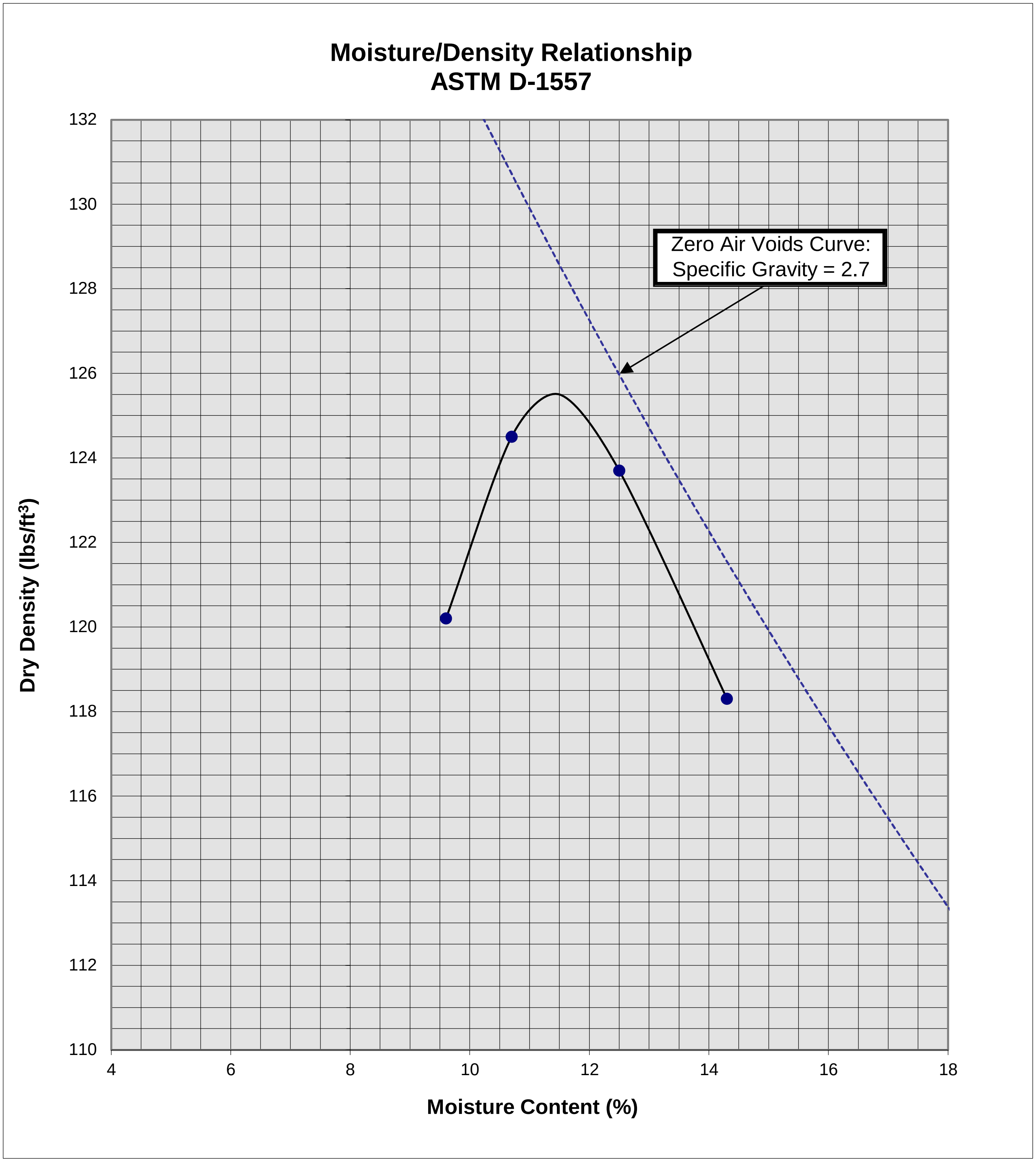


Classification: BEDROCK: Light Gray fine grained Sandy Siltstone

Boring Number:	B-4	Initial Moisture Content (%)	16
Sample Number:	---	Final Moisture Content (%)	18
Depth (ft)	7 to 8	Initial Dry Density (pcf)	106.5
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	113.4
Specimen Thickness (in)	1.0	Percent Collapse (%)	0.33

Veterans Park
Carlsbad, California
Project No. 19G109-2
PLATE C- 4

SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation



Soil ID Number	B-1 @ 0-5'
Optimum Moisture (%)	11.5
Maximum Dry Density (pcf)	125.5
Soil Classification	Gray Brown Clayey fine Sand to fine Sandy Clay

Veterans Park
Carlsbad, California
Project No. 19G109-2
PLATE C-5

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

APPENDIX D

GRADING GUIDE SPECIFICATIONS

These grading guide specifications are intended to provide typical procedures for grading operations. They are intended to supplement the recommendations contained in the geotechnical investigation report for this project. Should the recommendations in the geotechnical investigation report conflict with the grading guide specifications, the more site specific recommendations in the geotechnical investigation report will govern.

General

- The Earthwork Contractor is responsible for the satisfactory completion of all earthwork in accordance with the plans and geotechnical reports, and in accordance with city, county, and applicable building codes.

- The Geotechnical Engineer is the representative of the Owner/Builder for the purpose of implementing the report recommendations and guidelines. These duties are not intended to relieve the Earthwork Contractor of any responsibility to perform in a workman-like manner, nor is the Geotechnical Engineer to direct the grading equipment or personnel employed by the Contractor.

- The Earthwork Contractor is required to notify the Geotechnical Engineer of the anticipated work and schedule so that testing and inspections can be provided. If necessary, work may be stopped and redone if personnel have not been scheduled in advance.

- The Earthwork Contractor is required to have suitable and sufficient equipment on the job-site to process, moisture condition, mix and compact the amount of fill being placed to the approved compaction. In addition, suitable support equipment should be available to conform with recommendations and guidelines in this report.

- Canyon cleanouts, overexcavation areas, processed ground to receive fill, key excavations, subdrains and benches should be observed by the Geotechnical Engineer prior to placement of any fill. It is the Earthwork Contractor's responsibility to notify the Geotechnical Engineer of areas that are ready for inspection.

- Excavation, filling, and subgrade preparation should be performed in a manner and sequence that will provide drainage at all times and proper control of erosion. Precipitation, springs, and seepage water encountered shall be pumped or drained to provide a suitable working surface. The Geotechnical Engineer must be informed of springs or water seepage encountered during grading or foundation construction for possible revision to the recommended construction procedures and/or installation of subdrains.

Site Preparation

- The Earthwork Contractor is responsible for all clearing, grubbing, stripping and site preparation for the project in accordance with the recommendations of the Geotechnical Engineer.

- If any materials or areas are encountered by the Earthwork Contractor which are suspected of having toxic or environmentally sensitive contamination, the Geotechnical Engineer and Owner/Builder should be notified immediately.

- Major vegetation should be stripped and disposed of off-site. This includes trees, brush, heavy grasses and any materials considered unsuitable by the Geotechnical Engineer.

- Underground structures such as basements, cesspools or septic disposal systems, mining shafts, tunnels, wells and pipelines should be removed under the inspection of the Geotechnical Engineer and recommendations provided by the Geotechnical Engineer and/or city, county or state agencies. If such structures are known or found, the Geotechnical Engineer should be notified as soon as possible so that recommendations can be formulated.

- Any topsoil, slopewash, colluvium, alluvium and rock materials which are considered unsuitable by the Geotechnical Engineer should be removed prior to fill placement.

- Remaining voids created during site clearing caused by removal of trees, foundations basements, irrigation facilities, etc., should be excavated and filled with compacted fill.

- Subsequent to clearing and removals, areas to receive fill should be scarified to a depth of 10 to 12 inches, moisture conditioned and compacted

- The moisture condition of the processed ground should be at or slightly above the optimum moisture content as determined by the Geotechnical Engineer. Depending upon field conditions, this may require air drying or watering together with mixing and/or discing.

<u>Compacted Fills</u>

- Soil materials imported to or excavated on the property may be utilized in the fill, provided each material has been determined to be suitable in the opinion of the Geotechnical Engineer. Unless otherwise approved by the Geotechnical Engineer, all fill materials shall be free of deleterious, organic, or frozen matter, shall contain no chemicals that may result in the material being classified as “contaminated,” and shall be very low to non-expansive with a maximum expansion index (EI) of 50. The top 12 inches of the compacted fill should have a maximum particle size of 3 inches, and all underlying compacted fill material a maximum 6-inch particle size, except as noted below.

- All soils should be evaluated and tested by the Geotechnical Engineer. Materials with high expansion potential, low strength, poor gradation or containing organic materials may require removal from the site or selective placement and/or mixing to the satisfaction of the Geotechnical Engineer.

- Rock fragments or rocks less than 6 inches in their largest dimensions, or as otherwise determined by the Geotechnical Engineer, may be used in compacted fill, provided the distribution and placement is satisfactory in the opinion of the Geotechnical Engineer.

- Rock fragments or rocks greater than 12 inches should be taken off-site or placed in accordance with recommendations and in areas designated as suitable by the Geotechnical Engineer. These materials should be placed in accordance with Plate D-8 of these Grading Guide Specifications and in accordance with the following recommendations:

    - Rocks 12 inches or more in diameter should be placed in rows at least 15 feet apart, 15 feet from the edge of the fill, and 10 feet or more below subgrade. Spaces should be left between each rock fragment to provide for placement and compaction of soil around the fragments.

    - Fill materials consisting of soil meeting the minimum moisture content requirements and free of oversize material should be placed between and over the rows of rock or concrete. Ample water and compactive effort should be applied to the fill materials as they are placed in order that all of the voids between each of the fragments are filled and compacted to the specified density.

- Subsequent rows of rocks should be placed such that they are not directly above a row placed in the previous lift of fill. A minimum 5-foot offset between rows is recommended.

- To facilitate future trenching, oversized material should not be placed within the range of foundation excavations, future utilities or other underground construction unless specifically approved by the soil engineer and the developer/owner representative.

- Fill materials approved by the Geotechnical Engineer should be placed in areas previously prepared to receive fill and in evenly placed, near horizontal layers at about 6 to 8 inches in loose thickness, or as otherwise determined by the Geotechnical Engineer for the project.

- Each layer should be moisture conditioned to optimum moisture content, or slightly above, as directed by the Geotechnical Engineer. After proper mixing and/or drying, to evenly distribute the moisture, the layers should be compacted to at least 90 percent of the maximum dry density in compliance with ASTM D-1557-78 unless otherwise indicated.

- Density and moisture content testing should be performed by the Geotechnical Engineer at random intervals and locations as determined by the Geotechnical Engineer. These tests are intended as an aid to the Earthwork Contractor, so he can evaluate his workmanship, equipment effectiveness and site conditions. The Earthwork Contractor is responsible for compaction as required by the Geotechnical Report(s) and governmental agencies.

- Fill areas unused for a period of time may require moisture conditioning, processing and recompaction prior to the start of additional filling. The Earthwork Contractor should notify the Geotechnical Engineer of his intent so that an evaluation can be made.

- Fill placed on ground sloping at a 5-to-1 inclination (horizontal-to-vertical) or steeper should be benched into bedrock or other suitable materials, as directed by the Geotechnical Engineer. Typical details of benching are illustrated on Plates D-2, D-4, and D-5.

- Cut/fill transition lots should have the cut portion overexcavated to a depth of at least 3 feet and rebuilt with fill (see Plate D-1), as determined by the Geotechnical Engineer.

- All cut lots should be inspected by the Geotechnical Engineer for fracturing and other bedrock conditions. If necessary, the pads should be overexcavated to a depth of 3 feet and rebuilt with a uniform, more cohesive soil type to impede moisture penetration.

- Cut portions of pad areas above buttresses or stabilizations should be overexcavated to a depth of 3 feet and rebuilt with uniform, more cohesive compacted fill to impede moisture penetration.

- Non-structural fill adjacent to structural fill should typically be placed in unison to provide lateral support. Backfill along walls must be placed and compacted with care to ensure that excessive unbalanced lateral pressures do not develop. The type of fill material placed adjacent to below grade walls must be properly tested and approved by the Geotechnical Engineer with consideration of the lateral earth pressure used in the design.

Foundations

- The foundation influence zone is defined as extending one foot horizontally from the outside edge of a footing, and proceeding downward at a ½ horizontal to 1 vertical (0.5:1) inclination.

- Where overexcavation beneath a footing subgrade is necessary, it should be conducted so as to encompass the entire foundation influence zone, as described above.

- Compacted fill adjacent to exterior footings should extend at least 12 inches above foundation bearing grade. Compacted fill within the interior of structures should extend to the floor subgrade elevation.

Fill Slopes

- The placement and compaction of fill described above applies to all fill slopes. Slope compaction should be accomplished by overfilling the slope, adequately compacting the fill in even layers, including the overfilled zone and cutting the slope back to expose the compacted core

- Slope compaction may also be achieved by backrolling the slope adequately every 2 to 4 vertical feet during the filling process as well as requiring the earth moving and compaction equipment to work close to the top of the slope. Upon completion of slope construction, the slope face should be compacted with a sheepsfoot connected to a sideboom and then grid rolled. This method of slope compaction should only be used if approved by the Geotechnical Engineer.

- Sandy soils lacking in adequate cohesion may be unstable for a finished slope condition and therefore should not be placed within 15 horizontal feet of the slope face.

- All fill slopes should be keyed into bedrock or other suitable material. Fill keys should be at least 15 feet wide and inclined at 2 percent into the slope. For slopes higher than 30 feet, the fill key width should be equal to one-half the height of the slope (see Plate D-5).

- All fill keys should be cleared of loose slough material prior to geotechnical inspection and should be approved by the Geotechnical Engineer and governmental agencies prior to filling.

- The cut portion of fill over cut slopes should be made first and inspected by the Geotechnical Engineer for possible stabilization requirements. The fill portion should be adequately keyed through all surficial soils and into bedrock or suitable material. Soils should be removed from the transition zone between the cut and fill portions (see Plate D-2).

Cut Slopes

- All cut slopes should be inspected by the Geotechnical Engineer to determine the need for stabilization. The Earthwork Contractor should notify the Geotechnical Engineer when slope cutting is in progress at intervals of 10 vertical feet. Failure to notify may result in a delay in recommendations.

- Cut slopes exposing loose, cohesionless sands should be reported to the Geotechnical Engineer for possible stabilization recommendations.

- All stabilization excavations should be cleared of loose slough material prior to geotechnical inspection. Stakes should be provided by the Civil Engineer to verify the location and dimensions of the key. A typical stabilization fill detail is shown on Plate D-5.

- Stabilization key excavations should be provided with subdrains. Typical subdrain details are shown on Plates D-6.

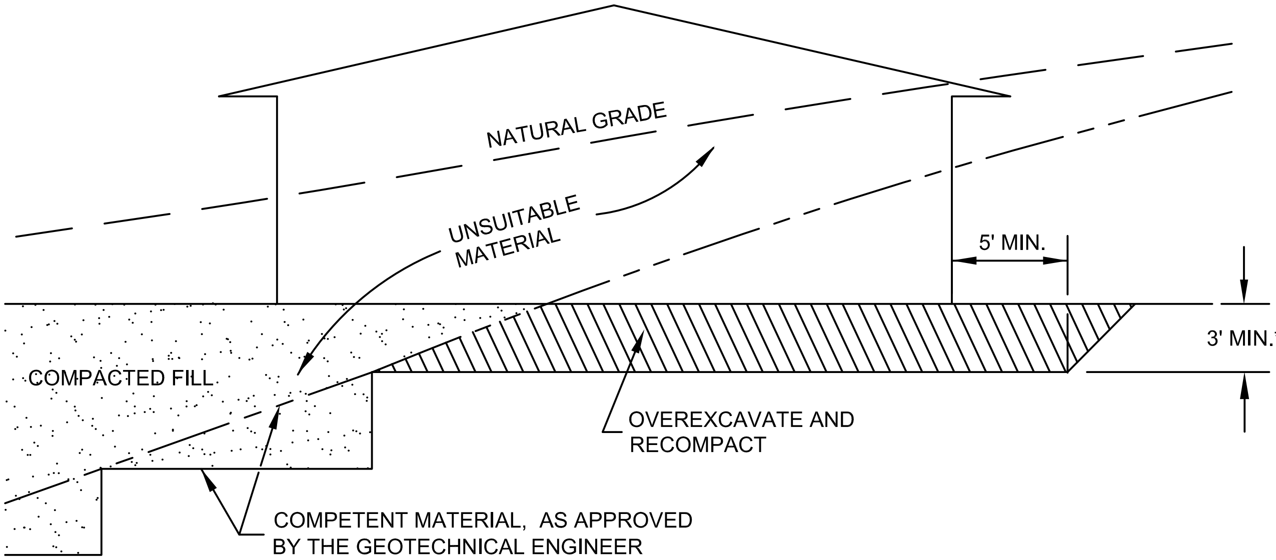
Subdrains

- Subdrains may be required in canyons and swales where fill placement is proposed. Typical subdrain details for canyons are shown on Plate D-3. Subdrains should be installed after approval of removals and before filling, as determined by the Soils Engineer.

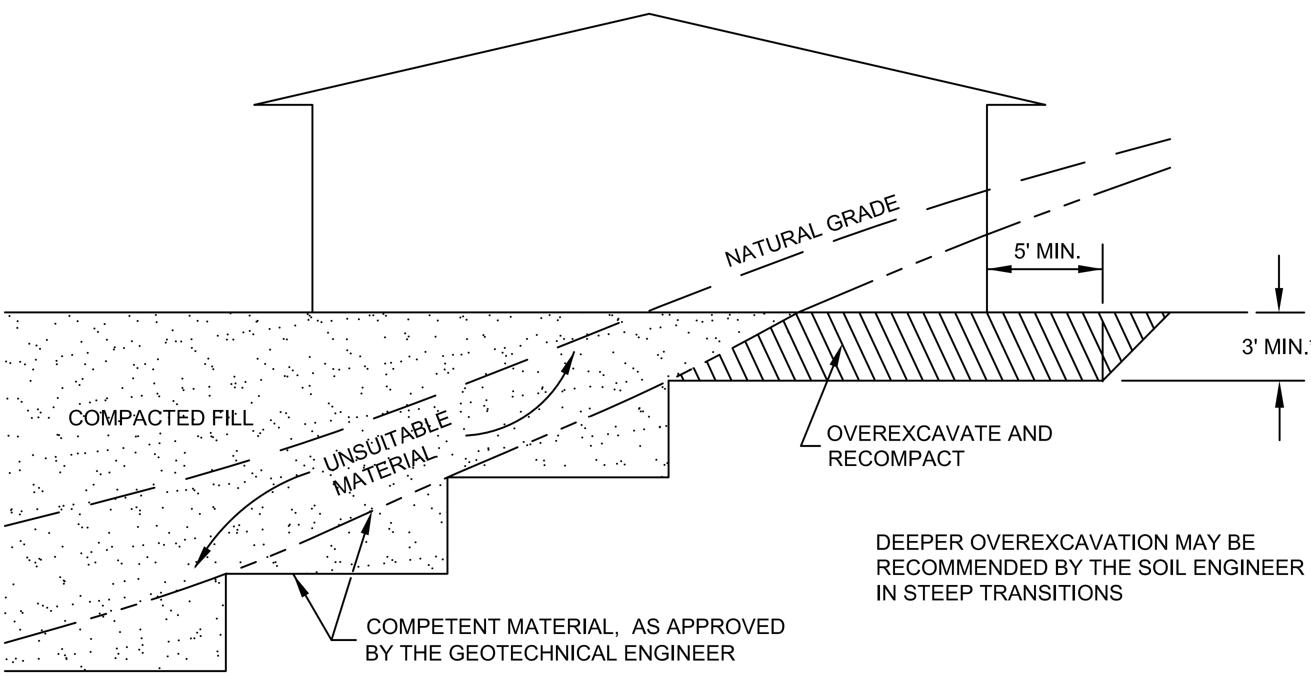
- Plastic pipe may be used for subdrains provided it is Schedule 40 or SDR 35 or equivalent. Pipe should be protected against breakage, typically by placement in a square-cut (backhoe) trench or as recommended by the manufacturer.

- Filter material for subdrains should conform to CALTRANS Specification 68-1.025 or as approved by the Geotechnical Engineer for the specific site conditions. Clean ¾-inch crushed rock may be used provided it is wrapped in an acceptable filter cloth and approved by the Geotechnical Engineer. Pipe diameters should be 6 inches for runs up to 500 feet and 8 inches for the downstream continuations of longer runs. Four-inch diameter pipe may be used in buttress and stabilization fills.

CUT LOT



CUT/FILL LOT (TRANSITION)



*SEE TEXT OF REPORT FOR SPECIFIC RECOMMENDATION.
ACTUAL DEPTH OF OVEREXCAVATION MAY BE GREATER.

TRANSITION LOT DETAIL

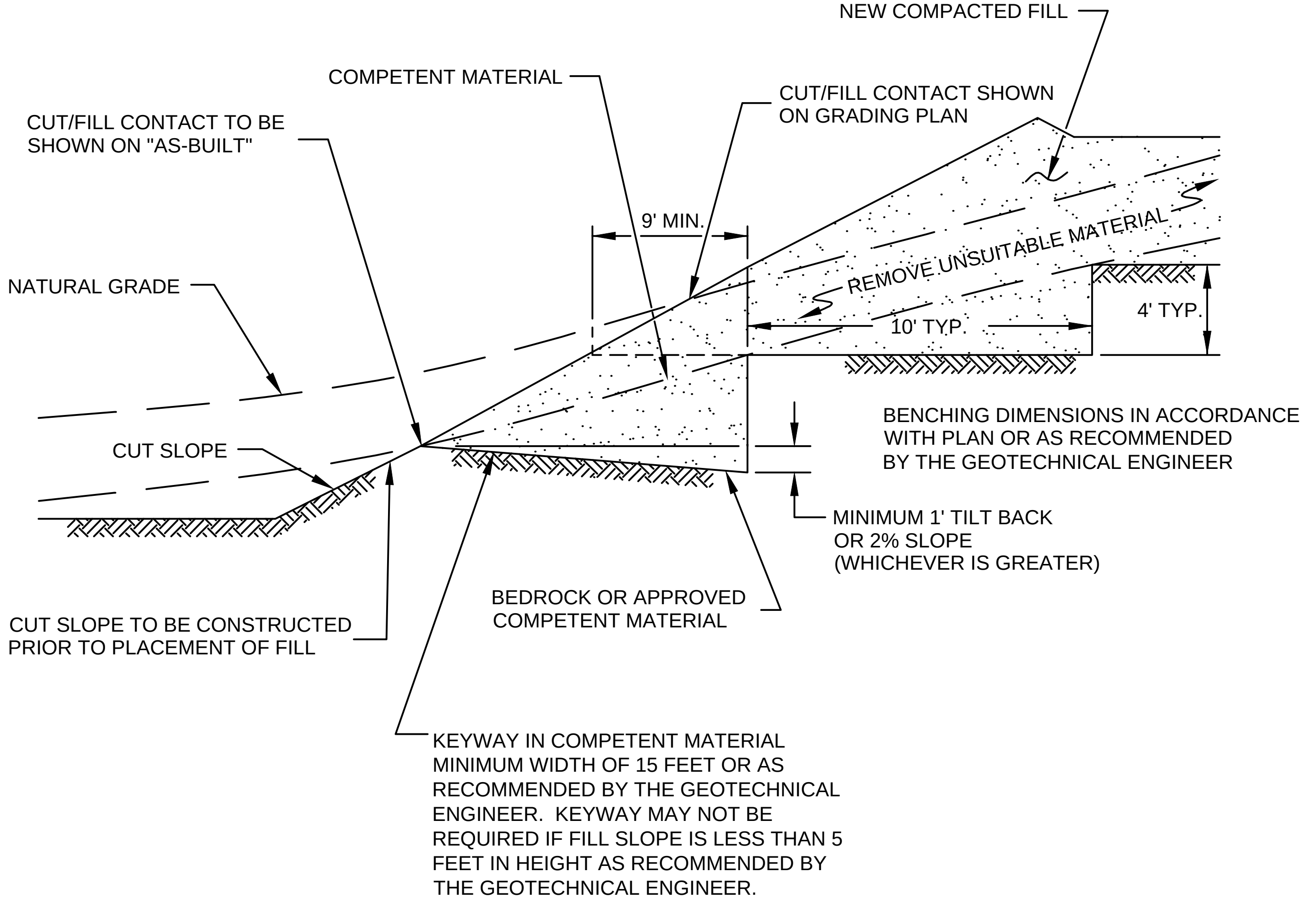
GRADING GUIDE SPECIFICATIONS

NOT TO SCALE

DRAWN: JAS
CHKD: GKM

PLATE D-1

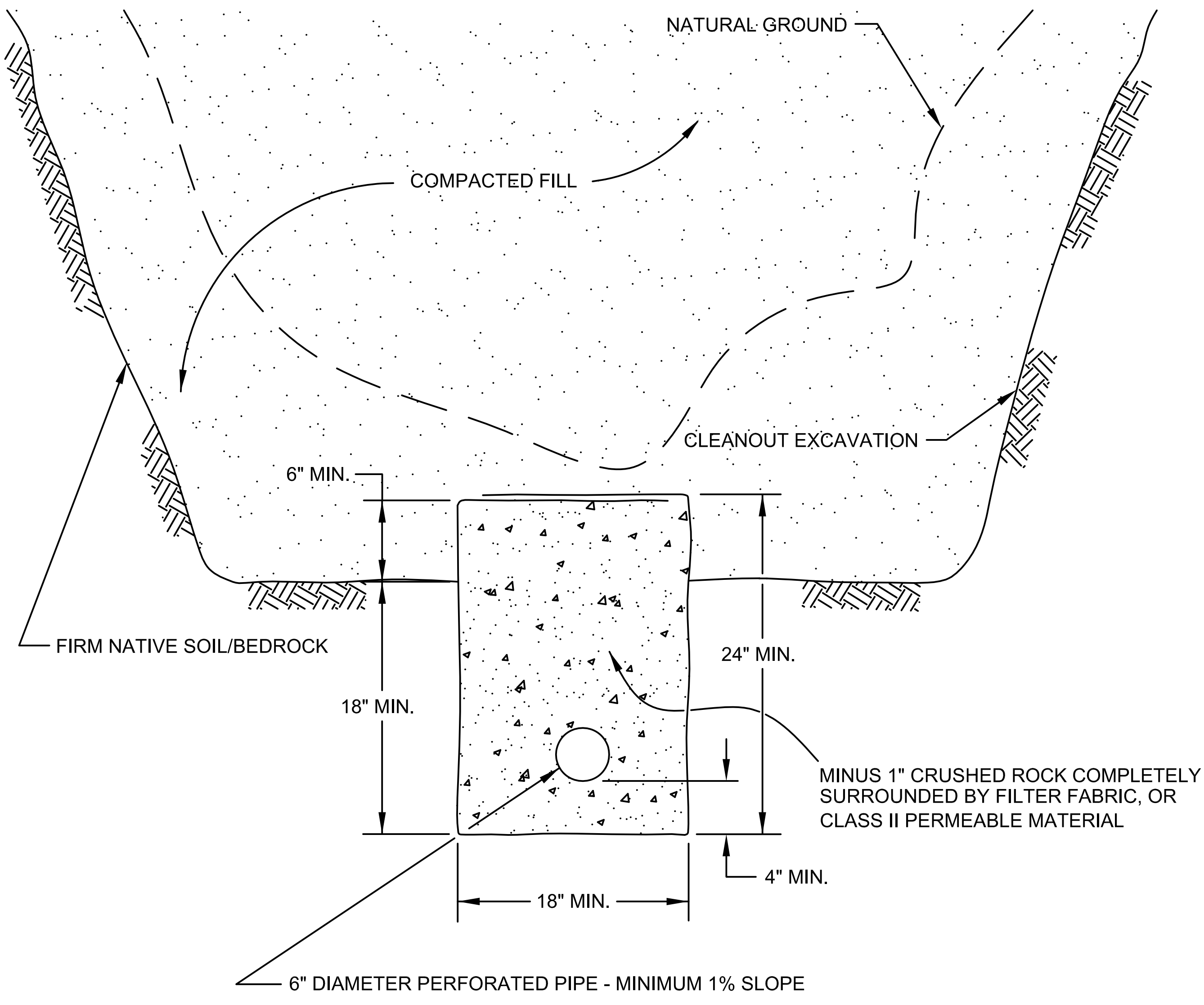
SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL



FILL ABOVE CUT SLOPE DETAIL

GRADING GUIDE SPECIFICATIONS

NOT TO SCALE	SOUTHERN CALIFORNIA GEOTECHNICAL
DRAWN: JAS CHKD: GKM	
PLATE D-2	



PIPE MATERIAL	DEPTH OF FILL OVER SUBDRAIN
ADS (CORRUGATED POLETHYLENE)	8
TRANSITE UNDERDRAIN	20
PVC OR ABS: SDR 35	35
SDR 21	100

SCHEMATIC ONLY
NOT TO SCALE

CANYON SUBDRAIN DETAIL

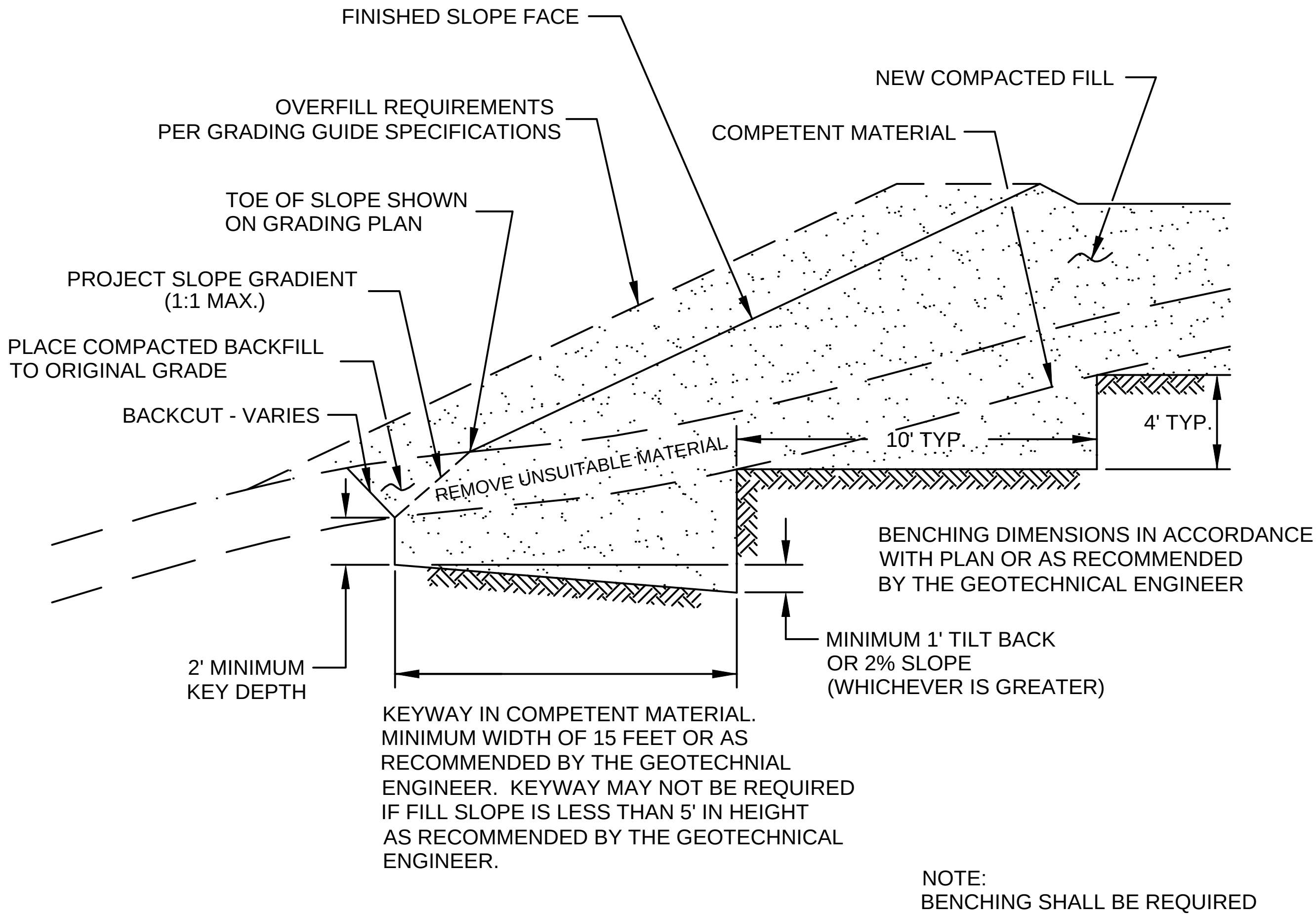
GRADING GUIDE SPECIFICATIONS

NOT TO SCALE

DRAWN: JAS
CHKD: GKM

PLATE D-3

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL



NOTE:
BENCHING SHALL BE REQUIRED WHEN NATURAL SLOPES ARE EQUAL TO OR STEEPER THAN 5:1 OR WHEN RECOMMENDED BY THE GEOTECHNICAL ENGINEER.

FILL ABOVE NATURAL SLOPE DETAIL

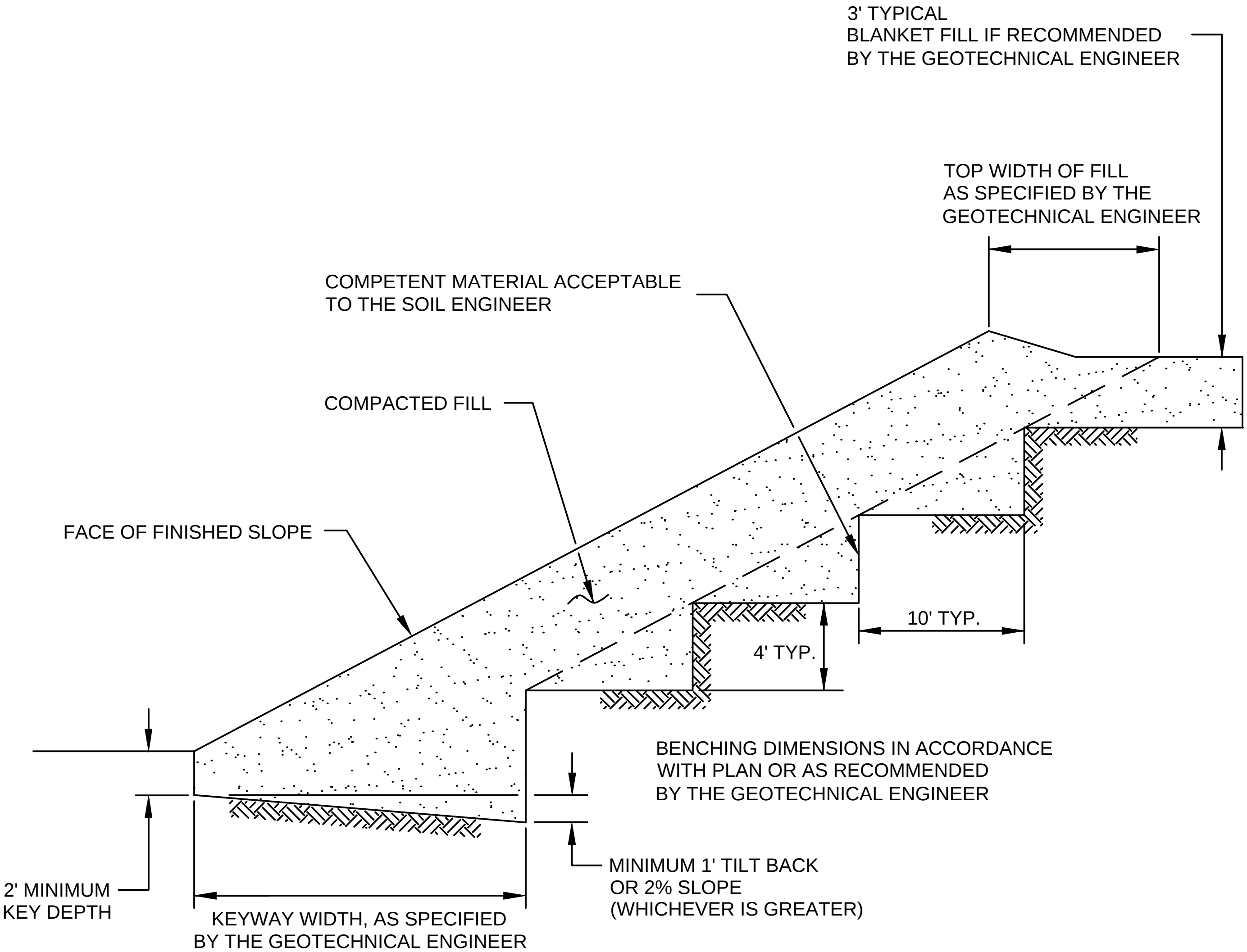
GRADING GUIDE SPECIFICATIONS

NOT TO SCALE

DRAWN: JAS
CHKD: GKM

PLATE D-4

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL



STABILIZATION FILL DETAIL

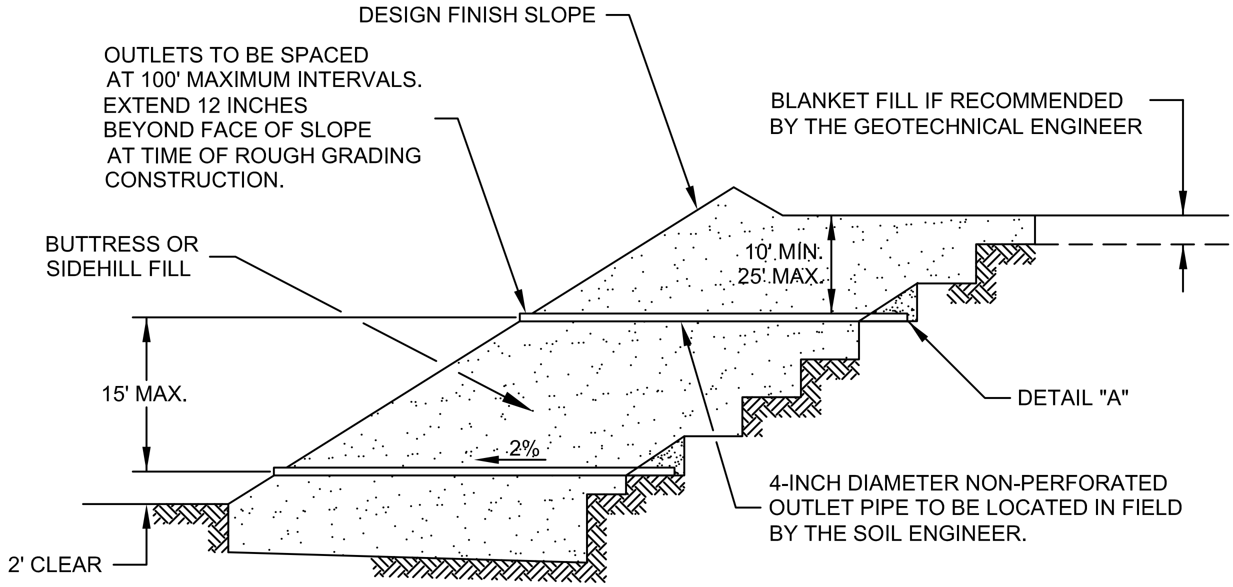
GRADING GUIDE SPECIFICATIONS

NOT TO SCALE

DRAWN: JAS
CHKD: GKM

PLATE D-5

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL



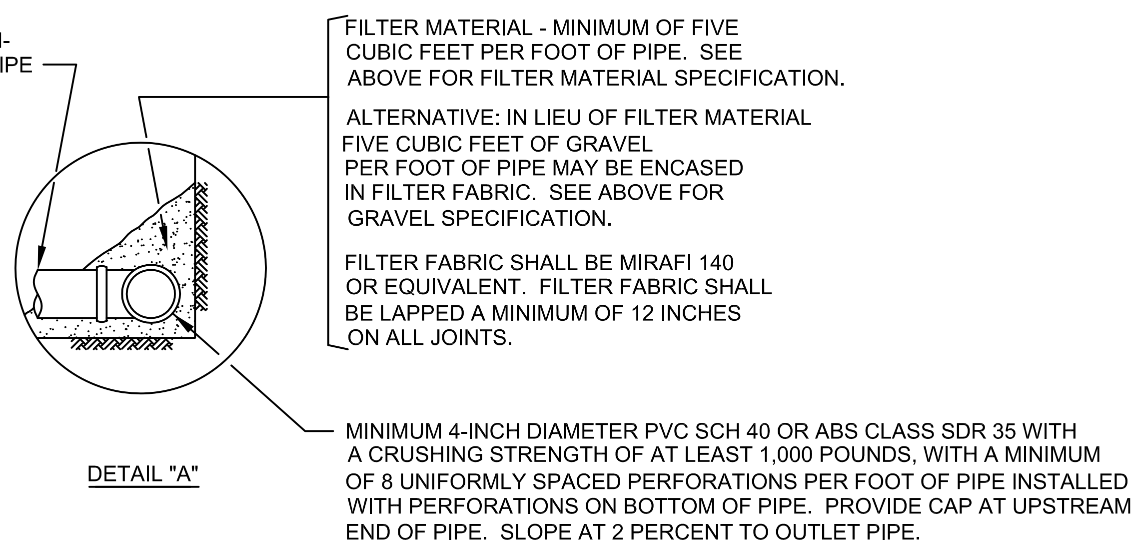
"FILTER MATERIAL" TO MEET FOLLOWING SPECIFICATION OR APPROVED EQUIVALENT: (CONFORMS TO EMA STD. PLAN 323)

SIEVE SIZE	PERCENTAGE PASSING
1"	100
3/4"	90-100
3/8"	40-100
NO. 4	25-40
NO. 8	18-33
NO. 30	5-15
NO. 50	0-7
NO. 200	0-3

"GRAVEL" TO MEET FOLLOWING SPECIFICATION OR APPROVED EQUIVALENT:

SIEVE SIZE	MAXIMUM PERCENTAGE PASSING
1 1/2"	100
NO. 4	50
NO. 200	8

SAND EQUIVALENT = MINIMUM OF 50



DETAIL "A"

NOTES:
1. TRENCH FOR OUTLET PIPES TO BE BACKFILLED WITH ON-SITE SOIL.

SLOPE FILL SUBDRAINS

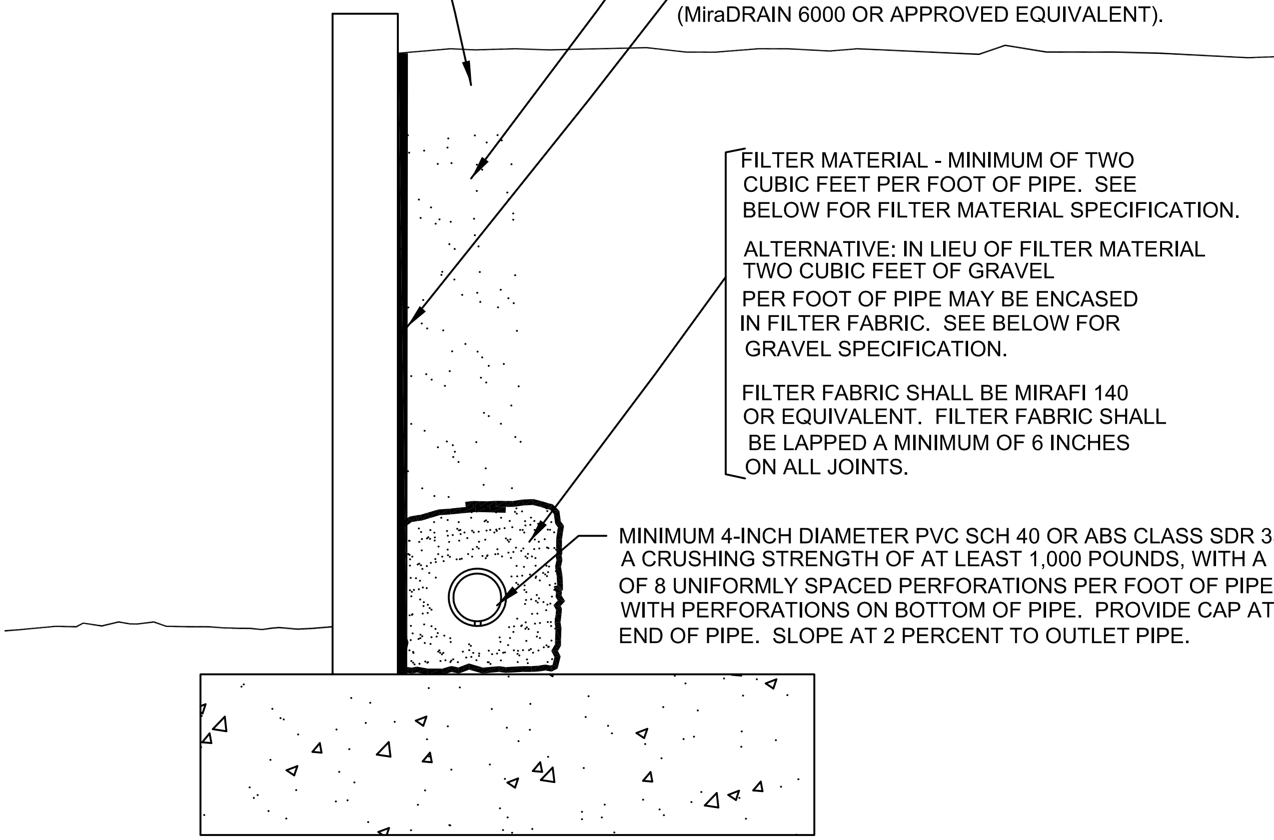
GRADING GUIDE SPECIFICATIONS

NOT TO SCALE

DRAWN: JAS
CHKD: GKM

PLATE D-6

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL



"FILTER MATERIAL" TO MEET FOLLOWING SPECIFICATION OR APPROVED EQUIVALENT: (CONFORMS TO EMA STD. PLAN 323)

SIEVE SIZE	PERCENTAGE PASSING
1"	100
3/4"	90-100
3/8"	40-100
NO. 4	25-40
NO. 8	18-33
NO. 30	5-15
NO. 50	0-7
NO. 200	0-3

"GRAVEL" TO MEET FOLLOWING SPECIFICATION OR APPROVED EQUIVALENT:

SIEVE SIZE	MAXIMUM PERCENTAGE PASSING
1 1/2"	100
NO. 4	50
NO. 200	8

SAND EQUIVALENT = MINIMUM OF 50

RETAINING WALL BACKDRAINS

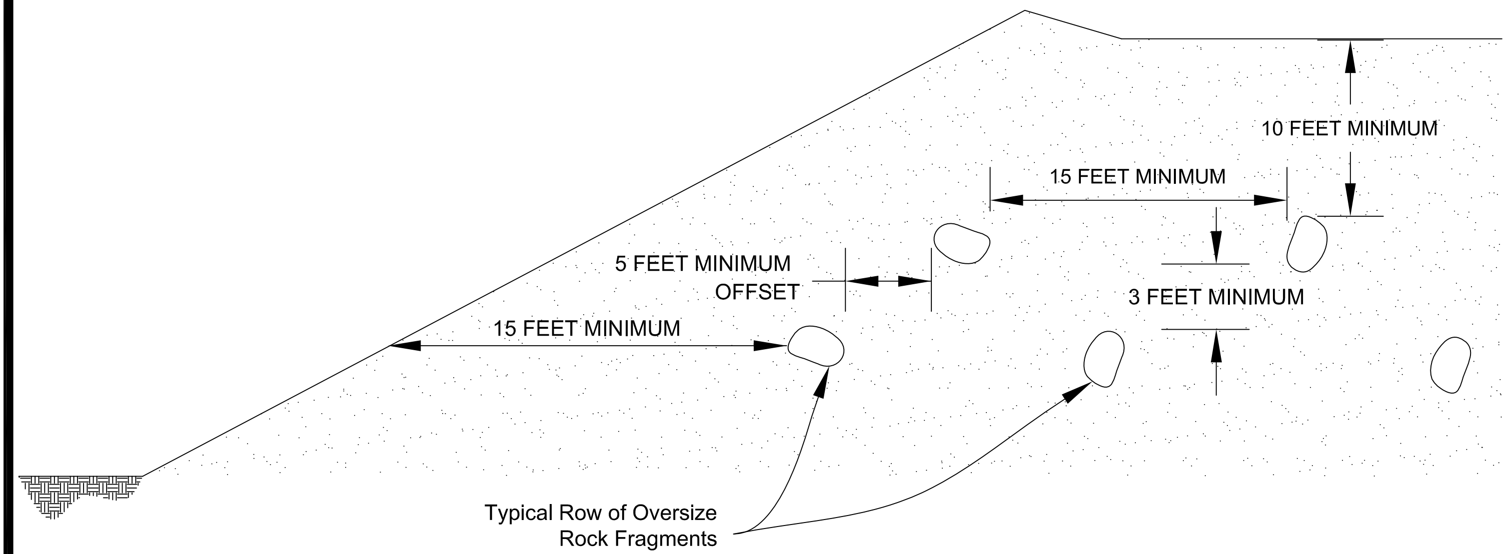
GRADING GUIDE SPECIFICATIONS

NOT TO SCALE

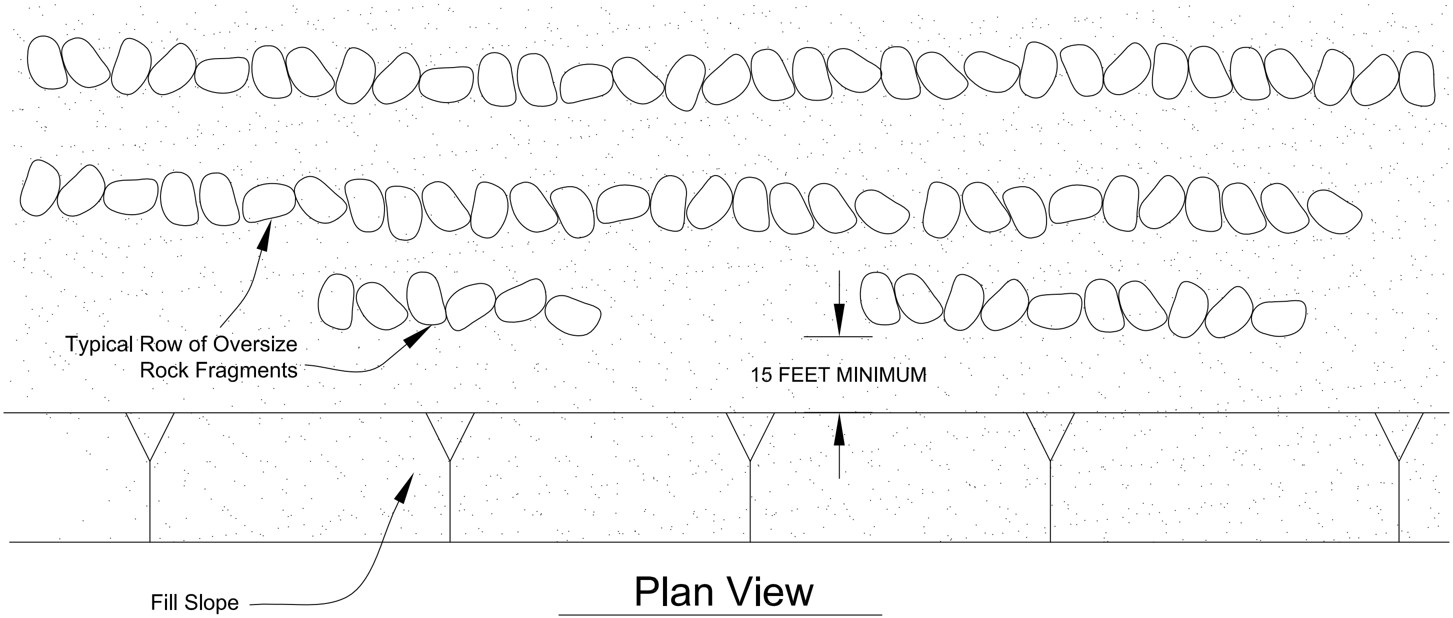
DRAWN: JAS
CHKD: GKM

PLATE D-7

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL



Section View



Plan View

PLACEMENT OF OVERSIZED MATERIAL

GRADING GUIDE SPECIFICATIONS

NOT TO SCALE

DRAWN: PM
CHKD: GKM

PLATE D-8

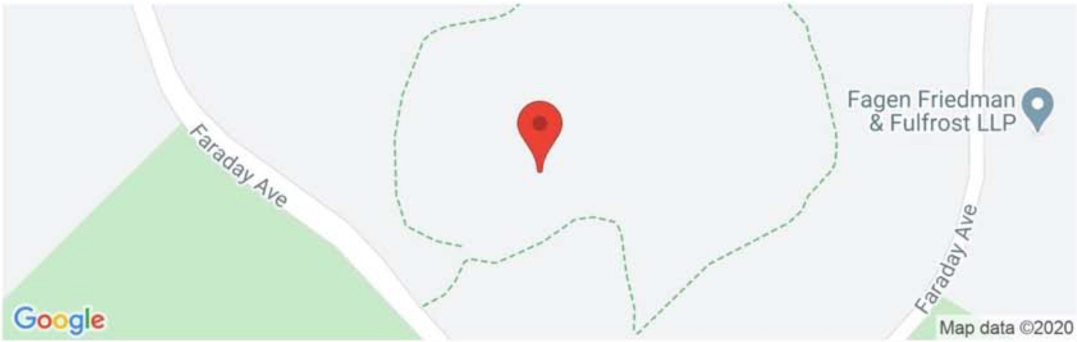
SoCalGeo

SOUTHERN CALIFORNIA GEOTECHNICAL

APPENDIX E

OSHPD

Latitude, Longitude: 33.13589095, -117.30070677



Date	7/31/2020, 4:01:16 PM
Design Code Reference Document	ASCE7-16
Risk Category	III
Site Class	D - Default (See Section 11.4.3)

Type	Value	Description
S_S	1.004	MCE_R ground motion. (for 0.2 second period)
S_1	0.365	MCE_R ground motion. (for 1.0s period)
S_{MS}	1.205	Site-modified spectral acceleration value
S_{M1}	null -See Section 11.4.8	Site-modified spectral acceleration value
S_{DS}	0.803	Numeric seismic design value at 0.2 second SA
S_{D1}	null -See Section 11.4.8	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	null -See Section 11.4.8	Seismic design category
F_a	1.2	Site amplification factor at 0.2 second
F_v	null -See Section 11.4.8	Site amplification factor at 1.0 second
PGA	0.439	MCE_G peak ground acceleration
F_{PGA}	1.2	Site amplification factor at PGA
PGA_M	0.527	Site modified peak ground acceleration
T_L	8	Long-period transition period in seconds
SsRT	1.004	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	1.12	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	1.5	Factored deterministic acceleration value. (0.2 second)
S1RT	0.365	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	0.403	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	0.6	Factored deterministic acceleration value. (1.0 second)
PGAd	0.5	Factored deterministic acceleration value. (Peak Ground Acceleration)
C_{RS}	0.897	Mapped value of the risk coefficient at short periods
C_{R1}	0.908	Mapped value of the risk coefficient at a period of 1 s

SOURCE: SEAOC/OSHPD Seismic Design Maps Tool
<https://seismicmaps.org/>

SEISMIC DESIGN PARAMETERS - 2019 CBC

VETERANS MEMORIAL PARK

CARLSBAD, CALIFORNIA

DRAWN: RB
CHKD: RGT

SCG PROJECT
19G109-2

PLATE E-1

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL

APPENDIX F

LIQUEFACTION EVALUATION

Project Name	Veterans Memorial Park
Project Location	Carlsbad, CA
Project Number	19G109-2
Engineer	PM
Boring No.	B-1

MCE_G Design Acceleration	0.527	(g)
Design Magnitude	6.67	
Historic High Depth to Groundwater	37.5	(ft)
Depth to Groundwater at Time of Drilling	43	(ft)
Borehole Diameter	6	(in)

Sample Depth (ft)	Depth to Top of Layer (ft)	Depth to Bottom of Layer (ft)	Depth to Midpoint (ft)	Uncorrected SPT N-Value	Unit Weight of Soil (pcf)	Fines Content (%)	Energy Correction	C_B	C_S	C_N	Rod Length Correction	$(N_1)_{60}$	$(N_1)_{60CS}$	Overburden Stress (σ_o) (psf)	Eff. Overburden Stress (Hist. Water) (σ_o') (psf)	Eff. Overburden Stress (Curr. Water) (σ_o') (psf)	Stress Reduction Coefficient (r_d)	MSF	KS	Cyclic Resistance Ratio (M=7.5)	Cyclic Resistance Ratio (M=6.67)	Cyclic Stress Ratio Induced by Design Earthquake	Factor of Safety	Comments
							(1)	(2)	(3)	(4)	(5)	(6)	(7)				(8)	(9)	(10)	(11)	(12)	(13)		
7	0	37.5	18.8		120		1.3	1.05	1.1	0.95	0.75	0.0	0.0	2250	2250	2250	0.92	1.03	1	0.06	0.06	N/A	N/A	Above Water Table
39.5	37.5	42	39.8	11	120	38	1.3	1.05	1.114	0.68	1	11.4	17.0	4770	4630	4770	0.80	1.12	0.91	0.17	0.18	0.28	0.62	**Liquefiable**
44.5	42	43	42.5	11	120	27	1.3	1.05	1.11	0.66	1	11.0	16.2	5100	4788	5100	0.78	1.11	0.9	0.17	0.17	0.29	0.59	**Liquefiable**
44.5	43	47	45	11	120	27	1.3	1.05	1.108	0.65	1	10.8	16.0	5400	4932	5275	0.77	1.11	0.9	0.16	0.16	0.29	0.57	**Liquefiable**
49.5	47	50	48.5	18	120	24	1.3	1.05	1.202	0.68	1	20.2	25.2	5820	5134	5477	0.74	1.22	0.85	0.30	0.31	0.29	1.07	**Liquefiable**

Notes:

(1) Energy Correction for N_{90} of automatic hammer to standard N_{60}

(2) Borehole Diameter Correction (Skempton, 1986)

(3) Correction for split-spoon sampler with room for liners, but liners are absent, (Seed et al., 1984, 2001)

(4) Overburden Correction, Caluclated by Eq. 39 (Boulanger and Idriss, 2008)

(5) Rod Length Correction for Samples <10 m in depth

(6) N-value corrected for energy, borehole diameter, sampler with absent liners, rod length, and overburden

(7) N-value corrected for fines content per Eqs. 75 and 76 (Boulanger and Idriss, 2008)

(8) Stress Reduction Coefficient calculated by Eq. 22 (Boulanger and Idriss, 2008)

(9) Magnitude Scaling Factor calculated by Eqns. A.8 & A.10 (Boulanger and Idriss, 2014)

(10) Overburden Correction Factor calcuated by Eq. 54 (Boulanger and Idriss, 2008)

(11) Calcuated by Eq. 70 (Boulanger and Idriss, 2008)

(12) Calcuated by Eq. 72 (Boulanger and Idriss, 2008)

(13) Calcuated by Eq. 25 (Boulanger and Idriss, 2008)

LIQUEFACTION INDUCED SETTLEMENTS

Project Name	Veterans Memorial Park
Project Location	Carlsbad, CA
Project Number	19G109-2
Engineer	PM

Boring No. B-1

Sample Depth (ft)	Depth to Top of Layer (ft)	Depth to Bottom of Layer (ft)	Depth to Midpoint (ft)	$(N_1)_{60}$	DN for fines cont	$(N_1)_{60\text{-}CS}$	Liquefaction Factor of Safety	Limiting Shear Strain γ_{min}	Parameter Fα	Maximum Shear Strain γ_{max}	Height of Layer		Vertical Reconsolidation Strain ε_v		Total Deformation of Layer (in)	Comments
				(1)	(2)	(3)	(4)	(5)	(6)	(7)			(8)			
7	0	37.5	18.8	0.0	0.0	0.0	N/A	0.50	0.95	0.00	37.50		0.000		0.00	Above Water Table
39.5	37.5	42	39.8	11.4	5.6	17.0	0.62	0.22	0.67	0.22	4.50		0.026		1.42	**Liquefiable**
44.5	42	43	42.5	11.0	5.2	16.2	0.59	0.24	0.70	0.24	1.00		0.027		0.33	**Liquefiable**
44.5	43	47	45	10.8	5.2	16.0	0.57	0.25	0.71	0.25	4.00		0.027		1.32	**Liquefiable**
49.5	47	50	48.5	20.2	5.0	25.2	1.07	0.09	0.22	0.03	3.00		0.007		0.26	**Liquefiable**
											Total Deformation (in)				3.32	

Notes:

(1) $(N_1)_{60}$ calculated previously for the individual layer

(2) Correction for fines content per Equation 76 (Boulanger and Idriss, 2008)

(3) Corrected $(N_1)_{60}$ for fines content

(4) Factor of Safety against Liquefaction, calculated previously for the individual layer

(5) Calcuated by Eq. 86 (Boulanger and Idriss, 2008)

(6) Calcuated by Eq. 89 (Boulanger and Idriss, 2008)

(7) Calcuated by Eqs. 90, 91, and 92 (Boulanger and Idriss, 2008)

(8) Volumetric Strain Induced in a Liquefiable Layer, Calcuated by Eq. 96 (Boulanger and Idriss, 2008)
(Strain N/A if Factor of Safety against Liquefaction > 1.3)

August 7, 2020

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

RJM Design Group
31591 Camino Capistrano
San Juan Capistrano, California 92675

Attention: Mr. Eric Chastain, LLA, LEED AP
Principal Landscape Architect

Project No.: **19G109-3**

Subject: **Results of Infiltration Testing**
Proposed Veterans Memorial Park
Faraday Avenue at Whitman Way
Carlsbad, California

References: Surficial Geologic Mapping, Proposed Veterans Memorial Park, Faraday Avenue at Whitman Way, Carlsbad, California, Prepared for RJM Design Group, by Southern California Geotechnical, Inc. (SCG), SCG Project No. 19G109-1, dated July 15, 2019.

Geotechnical Investigation, Proposed Veterans Memorial Park, Faraday Avenue at Whitman Way, Carlsbad, California, prepared for RJM Design Group, by Southern California Geotechnical, Inc. (SCG), SCG Project No. 19G109-2, dated August 7, 2020.

Mr. Chastain:

In accordance with your request, we have conducted infiltration testing at the subject site. We are pleased to present this report summarizing the results of the infiltration testing and our design recommendations.

Scope of Services

The scope of services performed for this project was in general accordance with our Proposal No. 18P372R, dated October 30, 2018. The scope of services included site reconnaissance, subsurface exploration, field testing, and engineering analysis to determine the infiltration rates of the onsite soils. The infiltration testing was performed in general accordance with the County of San Diego, Low Impact Development Handbook – Stormwater Management Strategies – Appendix F dated July 2014. San Diego County allows for infiltration testing in small-diameter borings using the falling head method.

Site and Project Description

The overall site is located at the southeast corner of Whitman Way and Faraday Avenue in Carlsbad, California. The overall site is bounded to the west and south by Faraday Avenue and to the north by Whitman Way, vacant land, and existing single-family residential tracts. The general location of the site is illustrated on the Site Location Map, enclosed as Plate 1 of this report.

The subject site consists of the westernmost 48± acres of Veteran's Memorial Park. Based on information from the client, the eastern portion of Veteran's Memorial Park is an existing preserve. The park is currently unimproved with dirt trails that are utilized for hiking and/or biking. This area of the park consists of gently sloping terrain with groundcover comprised of heavy native grass, weeds, shrubs with areas of dense large trees.

Topographic information was obtained from a plan provided by the client. Based on this plan, topography within the proposed development area consists of rolling hills. Site grades range from elevation 222± feet mean sea level (msl) in the east-central area to 44± feet msl in the northwestern area of the site.

Proposed Development

Based on the site plan provided to our office, the subject site will be developed with active and passive amenities, open space areas, public art, trails, utilities, parking, playgrounds, a bocce ball court, restrooms, and maintenance facilities. It is also expected that the park will include lighting, trellis shade structures and fencing. The primary structures will include a restroom and catering support structure located in the northwestern region of the site, a Veterans Memorial in the central region of the site, and a second restroom building located in the southern region of the site.

We understand that the proposed development may include on-site infiltration to dispose of storm water. Based on the current site layout and conversations with the client, the proposed infiltration systems may consist of relatively shallow bioswales or basins located around the perimeter of the site. The bottom of the proposed bioswales or relatively shallow basins will likely extend to depths of 8± feet below the existing site grades.

Concurrent Study

SCG recently conducted a geotechnical investigation at the subject site, referenced above. As a part of this study, five (5) borings were advanced to depths of 15 to 50± feet below existing site grades. Native alluvium was encountered at the ground surface at Boring No. B-1. The alluvium consists of medium dense clayey fine sands and stiff to very stiff fine sandy clayey extending to a depth of 32± feet. Boring No. B-1 encountered medium dense clayey fine sands and silty fine sands extending from 32± feet to the maximum depth explored of 50± feet. Native colluvium was encountered at the ground surface at Boring Nos. B-3 through B-5. The colluvium consists of medium dense silty fine sands and stiff fine sandy clays extending to depths of 2½ to 3½± feet. Bedrock of the Santiago Formation was encountered at the ground surface to beneath the colluvium at Borings Nos. B-2 through B-5. The bedrock consists of interbedded medium dense to very dense silty fine-grained sandstone and fine-grained sandy siltstone with very stiff to hard clayey siltstone. The bedrock was weakly cemented and friable with iron oxide staining throughout.

Groundwater

Groundwater was encountered during drilling at Boring No. B-1 at a depth of 43± feet. However, the boring caved to a depth of 37½± feet. Based on the depth of the water encountered during drilling, the moisture contents of the recovered soil samples, and the caving conditions, the depth to the static groundwater table is considered to have existed at a depth of approximately 43± feet below existing site grades, at the time of the subsurface investigation.

SCG reviewed water level data obtained from the California Department of Water Resources website, http://www.water.ca.gov/waterdatalibrary/, and the California State Water Resources Control Board (SWRCB) Geotracker website https://geotracker.waterboards.ca.gov/. However, the nearest monitoring wells on record are located approximately 1.7 to 5.5± miles away from the site. Therefore, this groundwater data would not represent the groundwater at the subject site and is considered irrelevant.

Subsurface Exploration

Scope of Exploration

The subsurface exploration conducted for the infiltration testing consisted of three (3) infiltration test borings, advanced to depths of 8± feet below the existing site grades. The infiltration borings were advanced using a truck-mounted drilling rig, equipped with 8-inch diameter hollow stem augers and were logged during drilling by a member of our staff. The approximate locations of the infiltration test borings (identified as I-1 through I-3) are indicated on the Infiltration Test Location Plan, enclosed as Plate 2 of this report.

Upon the completion of the infiltration borings, the bottom of each test boring was covered with 2± inches of clean ¾-inch gravel. A sufficient length of 3-inch-diameter perforated PVC casing was then placed into each test hole so that the PVC casing extended from the bottom of the test hole to the ground surface. Clean ¾-inch gravel was then installed in the annulus surrounding the PVC casing.

Geotechnical Conditions

Alluvium

Native alluvium was encountered at the ground surface of Infiltration Boring No. I-1, extending to at least the maximum explored depth of 8± feet. The near-surface alluvium consisted of stiff fine sandy clays with some silt, extending to a depth of 5¾± feet. At depths greater than 5¾± feet, the alluvial soils consist of stiff clayey fine to medium sands with trace iron oxide staining.

Colluvium

Colluvial soils were encountered during the drilling of Infiltration Boring No. I-3, extending to a depth of 5½± feet below the ground surface these materials consist of medium stiff fine sandy clays with some silt and mottling.

Bedrock

Bedrock of the Santiago Formation was encountered beneath the ground surface at Infiltration Boring No. I-2 and beneath the colluvium at Infiltration Boring No I-3. The bedrock consists of medium dense fine sandy siltstone interbedded with stiff clayey siltstone extending to at least the maximum explored depth of 8 feet. The bedrock is friable and weakly cemented.

Infiltration Testing

The infiltration testing was performed in general accordance with the County of San Diego, Low Impact Development Handbook – Stormwater Management Strategies – Appendix F dated July 2014.

Pre-soaking

The first phase of the infiltration testing consisted of pre-soaking all of the infiltration test holes one day prior to infiltration testing. The pre-soaking process consisted of filling each test boring with clear water so that the water level reaches a level of at least 5 times the hole's radius above the gravel at the bottom of the holes. Pre-soaking was considered complete after all of the water had percolated through each test hole or after 15 hours since initiating the pre-soak.

Infiltration Testing

SCG performed the infiltration testing the day following the pre-soaking process. Each test hole was filled with water to a depth of at least 5 times the hole's radius above the gravel at the bottom of each test hole. Readings were taken at 30-minute intervals for a total of 6 hours at each of the test locations. The water level readings are presented on the spreadsheets enclosed with this report. The infiltration rates for each of the timed intervals are also tabulated on the spreadsheets.

The infiltration rates from the test are tabulated in inches per hour. In accordance with the typically accepted practice, it is recommended that the most conservative reading from the latter part of the infiltration tests be used as the design infiltration rate. The rates are summarized below:

Infiltration Test No.	Depth (feet)	Soil Description	Infiltration Rate (inches/hour)
I-1	8.0	Gray Brown Clayey fine to medium Sand	0.0
I-2	8.0	Light Gray Silty fine to medium grained Sandstone	0.0
I-3	8.0	Light Gray to Gray fine-grained Siltstone, trace medium Sand	0.0

Laboratory Testing

Moisture Content

The moisture contents for the recovered soil samples were determined in accordance with ASTM D-2216 and are expressed as a percentage of the dry weight. These test results are presented on the Boring Logs.

Grain Size Analysis

The grain size distribution of selected soils collected from the base of each infiltration test boring have been determined using a range of wire mesh screens. These tests were performed in general accordance with ASTM D-422 and/or ASTM D-1140. The weight of the portion of the sample retained on each screen is recorded and the percentage finer or coarser of the total weight is calculated. The results of these tests are presented on Plates C-1 through C-3 of this report.

Design Recommendations

Three (3) infiltration tests were performed at the subject site. As noted above, the infiltration rates at these locations was 0.0 inches per hour. The major factors affecting the lack infiltration at these borings is the presence of bedrock and clays as well as very moist soils at the test depths. **Based on the lack of infiltration at the depths tested, infiltration is not considered feasible for this site.**

Although infiltration is not considered feasible at this site, the client may desire to use storm water disposal systems that do not rely on infiltration at this site. The design of storm water disposal systems should be performed by the project civil engineer, in accordance with the City of Carlsbad and/or County of San Diego guidelines. It is recommended any such systems be designed and constructed to facilitate removal of silt and clay, or other deleterious materials from any water that may enter the system. The presence of such materials would decrease the flow rates through the system.

Location of Storm Water Disposal Systems

Although no significant infiltration occurred at the test locations, the use of on-site storm water disposal systems which may introduce stormwater into the near surface soils carries a risk of creating adverse geotechnical conditions. Increasing the moisture content of the soil can cause the soil to lose internal shear strength and increase its compressibility, resulting in a change in the designed engineering properties. Overlying structures and pavements in areas where water is introduced into the on-site soils could potentially be damaged due to saturation of subgrade soils. Systems that introduce water into the near surface soils at this site should be located at least 25 feet away from any structures, including retaining walls. Even with this provision of locating the infiltration systems at least 25 feet from the buildings, it is possible that infiltrating water into the subsurface soils could have an adverse effect on the proposed or existing structures. It should also be noted that utility trenches which happen to collect storm water can also serve as conduits to transmit storm water toward the structure, depending on the slope of the utility trench. Therefore, consideration should also be given to the proposed locations of underground utilities which may pass near the proposed infiltration systems.

General Comments

This report has been prepared as an instrument of service for use by the client in order to aid in the evaluation of this property and to assist the architects and engineers in the design and preparation of the project plans and specifications. This report may be provided to the contractor(s) and other design consultants to disclose information relative to the project. However, this report is not intended to be utilized as a specification in and of itself, without appropriate interpretation by the project architect, structural engineer, and/or civil engineer. The design of the proposed storm water infiltration system is the responsibility of the civil engineer. The role of the geotechnical engineer is limited to determination of infiltration rate only. By using the design infiltration rate contained herein, the civil engineer agrees to indemnify, defend, and hold harmless the geotechnical engineer for all aspects of the design and performance of the proposed storm water infiltration system. The reproduction and distribution of this report must be authorized by the client and Southern California Geotechnical, Inc. Furthermore, any reliance on this report by an unauthorized third party is at such party's sole risk, and we accept no responsibility for damage or loss which may occur. The analysis of this site was based on a subsurface profile interpolated from limited discrete soil samples. While the materials encountered in the project area are considered to be representative of the total area, some variations should be expected between boring locations and testing depths. If the conditions encountered during construction vary significantly from those detailed herein, we should be contacted immediately to determine if the conditions alter the recommendations contained herein.

This report has been based on assumed or provided characteristics of the proposed development. It is recommended that the owner, client, architect, structural engineer, and civil engineer carefully review these assumptions to ensure that they are consistent with the characteristics of the proposed development. If discrepancies exist, they should be brought to our attention to verify that they do not affect the conclusions and recommendations contained herein. We also recommend that the project plans and specifications be submitted to our office for review to verify that our recommendations have been correctly interpreted. The analysis, conclusions, and recommendations contained within this report have been promulgated in accordance with generally accepted professional geotechnical engineering practice. No other warranty is implied or expressed.

Closure

We sincerely appreciate the opportunity to be of service on this project. We look forward to providing additional consulting services during the course of the project. If we may be of further assistance in any manner, please contact our office.

Respectfully Submitted,

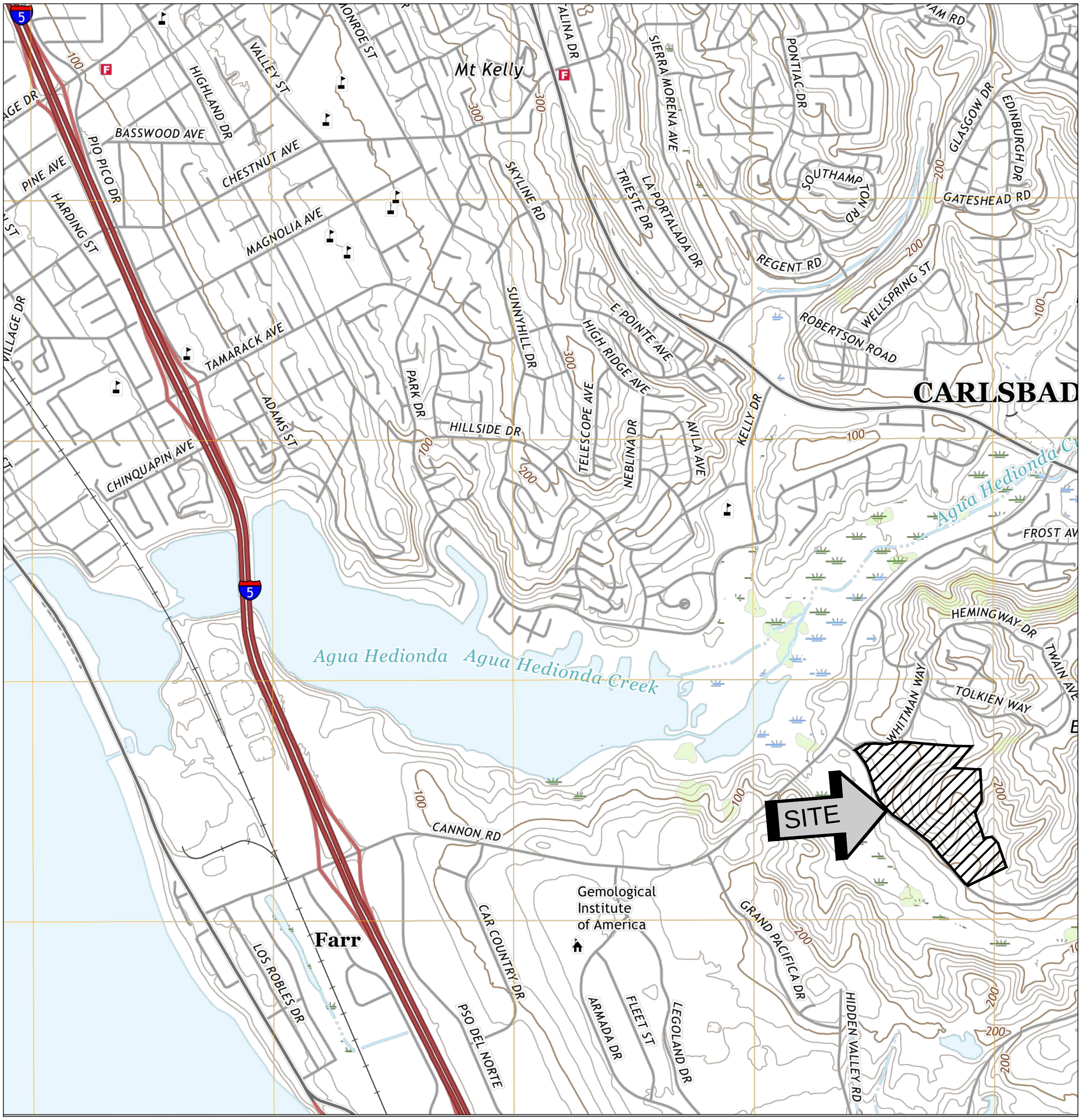
SOUTHERN CALIFORNIA GEOTECHNICAL, INC.

Ryan Bremer
Staff Geologist

Gregory K. Mitchell, GE 2364
Principal Engineer

Distribution: (1) Addressee

Enclosures: Plate 1 - Site Location Map
Plate 2 - Infiltration Test Location Plan
Boring Log Legend and Logs (5 pages)
Infiltration Test Results Spreadsheets (3 pages)
Grain Size Distribution Graphs (3 pages)



SOURCE: USGS TOPOGRAPHIC MAP OF THE
SAN LUIS REY QUADRANGLE, SAN DIEGO COUNTY,
CALIFORNIA, 2018

SITE LOCATION MAP	
VETERANS MEMORIAL PARK	
CARLSBAD, CALIFORNIA	
SCALE: 1" = 2000'	SOUTHERN CALIFORNIA GEOTECHNICAL
DRAWN: RB CHKD: RGT	
SCG PROJECT 19G109-3	
PLATE 1	

GEOTECHNICAL LEGEND

- APPROXIMATE INFILTRATION TEST LOCATION
- APPROXIMATE BORING LOCATON (SCG PROJECT NO. 19G109-2)
- WATER QUALITY TREATMENT AREAS

NOTE: BASE MAP PREPARED BY CLIENT

INFILTRATION TEST LOCATION PLAN

VETERANS MEMORIAL PARK

CARLSBAD, CALIFORNIA

SCALE: 1" = 200'

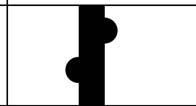
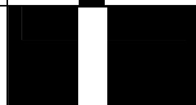
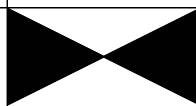
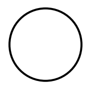
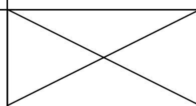
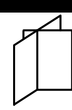
DRAWN: DRK
CHKD: GKM

SCG PROJECT 19G109-3

PLATE 2

SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL

BORING LOG LEGEND

SAMPLE TYPE	GRAPHICAL SYMBOL	SAMPLE DESCRIPTION
AUGER		SAMPLE COLLECTED FROM AUGER CUTTINGS, NO FIELD MEASUREMENT OF SOIL STRENGTH. (DISTURBED)
CORE		ROCK CORE SAMPLE: TYPICALLY TAKEN WITH A DIAMOND-TIPPED CORE BARREL. TYPICALLY USED ONLY IN HIGHLY CONSOLIDATED BEDROCK.
GRAB		SOIL SAMPLE TAKEN WITH NO SPECIALIZED EQUIPMENT, SUCH AS FROM A STOCKPILE OR THE GROUND SURFACE. (DISTURBED)
CS		CALIFORNIA SAMPLER: 2-1/2 INCH I.D. SPLIT BARREL SAMPLER, LINED WITH 1-INCH HIGH BRASS RINGS. DRIVEN WITH SPT HAMMER. (RELATIVELY UNDISTURBED)
NSR		NO RECOVERY: THE SAMPLING ATTEMPT DID NOT RESULT IN RECOVERY OF ANY SIGNIFICANT SOIL OR ROCK MATERIAL.
SPT		STANDARD PENETRATION TEST: SAMPLER IS A 1.4 INCH INSIDE DIAMETER SPLIT BARREL, DRIVEN 18 INCHES WITH THE SPT HAMMER. (DISTURBED)
SH		SHELBY TUBE: TAKEN WITH A THIN WALL SAMPLE TUBE, PUSHED INTO THE SOIL AND THEN EXTRACTED. (UNDISTURBED)
VANE		VANE SHEAR TEST: SOIL STRENGTH OBTAINED USING A 4 BLADED SHEAR DEVICE. TYPICALLY USED IN SOFT CLAYS-NO SAMPLE RECOVERED.

COLUMN DESCRIPTIONS

DEPTH: Distance in feet below the ground surface.

SAMPLE: Sample Type as depicted above.

BLOW COUNT: Number of blows required to advance the sampler 12 inches using a 140 lb hammer with a 30-inch drop. 50/3" indicates penetration refusal (>50 blows) at 3 inches. WH indicates that the weight of the hammer was sufficient to push the sampler 6 inches or more.

POCKET PEN.: Approximate shear strength of a cohesive soil sample as measured by pocket penetrometer.

GRAPHIC LOG: Graphic Soil Symbol as depicted on the following page.

DRY DENSITY: Dry density of an undisturbed or relatively undisturbed sample in lbs/ft^3.

MOISTURE CONTENT: Moisture content of a soil sample, expressed as a percentage of the dry weight.

LIQUID LIMIT: The moisture content above which a soil behaves as a liquid.

PLASTIC LIMIT: The moisture content above which a soil behaves as a plastic.

PASSING #200 SIEVE: The percentage of the sample finer than the #200 standard sieve.

UNCONFINED SHEAR: The shear strength of a cohesive soil sample, as measured in the unconfined state.

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
			GRAPH	LETTER	
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. I-1

JOB NO.: 19G109-3	DRILLING DATE: 7/16/20	WATER DEPTH: Dry
PROJECT: Veterans Park	DRILLING METHOD: Hollow Stem Auger	CAVE DEPTH: ---
LOCATION: Carlsbad, California	LOGGED BY: Daryl Kas	READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
					ALLUVIUM: Dark Gray fine Sandy Clay, some Silt, stiff-very moist							
	X	14					18					
5												
					Gray Brown Clayey fine to medium Sand, trace Iron oxide staining, stiff-very moist							
	X	18					22					

Boring Terminated at 8'

TBL 19G109-3.GPJ SOCALGEO.GDT 8/7/20

TEST BORING LOG **PLATE B-1**

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. I-2

JOB NO.: 19G109-3
PROJECT: Veterans Park
LOCATION: Carlsbad, California

DRILLING DATE: 7/16/20
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Daryl Kas

WATER DEPTH: Dry
CAVE DEPTH: ---
READING TAKEN: At Completion

FIELD RESULTS					DESCRIPTION	LABORATORY RESULTS						COMMENTS
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	SURFACE ELEVATION: MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	
					SANTIAGO FORMATION (Tsa): Light Gray to Gray Clayey Siltstone interbedded with fine Sandy Siltstone, weakly-cemented, friable, stiff to medium dense-moist to very moist							
	X	19					13					
5												
					Light Gray Silty fine to medium-grained Sandstone, weakly-cemented, friable, medium dense-very moist to wet							
	X	23					21					

Boring Terminated at 8'

TBL 19G109-3.GPJ SOCALGEO.GDT 8/7/20

TEST BORING LOG

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. I-3

JOB NO.: 19G109-3
PROJECT: Veterans Park
LOCATION: Carlsbad, California

DRILLING DATE: 7/16/20
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Daryl Kas

WATER DEPTH: Dry
CAVE DEPTH: ---
READING TAKEN: At Completion

FIELD RESULTS					DESCRIPTION	LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	SURFACE ELEVATION: MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
					COLLUVIUM (Qc): Dark Gray fine Sandy Clay, some Silt, mottled, medium stiff-very moist							
	X	9					21					
5					SANTIAGO FORMATION (Tsa): Light Gray to Gray fine-grained Sandy Siltstone, trace medium sand, weakly-cemented, friable, Iron oxide staining, medium dense-very moist							
	X	28					18					

Boring Terminated at 8'

TBL 19G109-3.GPJ SOCALGEO.GDT 8/7/20

TEST BORING LOG

INFILTRATION CALCULATIONS

Project Name	Proposed Veterans Memorial Park
Project Location	Carlsbad, California
Project Number	19G109-3
Engineer	Ryan Bremer

Test Hole Radius	4	(in)
Test Depth	8.0	(ft)

Infiltration Test Hole	I-1

Interval Number		Time	Time Interval (min)	Water Depth (ft)	Change in Water Level (ft)	Average Head Height (ft)	Infiltration Rate Q (in/hr)	
1	Initial	9:18 AM	30.0	5.72	0.00	2.28	0.00	Infiltration Testing
	Final	9:48 AM		5.72				
2	Initial	9:48 AM	30.0	5.72	0.00	2.28	0.00	
	Final	10:18 AM		5.72				
3	Initial	10:18 AM	30.0	5.72	0.00	2.28	0.00	
	Final	10:48 AM		5.72				
4	Initial	10:48 AM	30.0	5.72	0.00	2.28	0.00	
	Final	11:18 AM		5.72				
5	Initial	11:18 AM	30.0	5.72	0.00	2.28	0.00	
	Final	11:48 AM		5.72				
6	Initial	11:48 AM	30.0	5.72	0.00	2.28	0.00	
	Final	12:18 PM		5.72				
7	Initial	12:18 PM	30.0	5.72	0.00	2.28	0.00	
	Final	12:48 PM		5.72				
8	Initial	12:48 PM	30.0	5.72	0.00	2.28	0.00	
	Final	1:18 PM		5.72				
9	Initial	1:18 PM	30.0	5.72	0.00	2.28	0.00	
	Final	1:48 PM		5.72				
10	Initial	1:48 PM	30.0	5.72	0.00	2.28	0.00	
	Final	2:18 PM		5.72				
11	Initial	2:18 PM	30.0	5.72	0.00	2.28	0.00	
	Final	2:48 PM		5.72				
12	Initial	2:48 PM	30.0	5.72	0.00	2.28	0.00	
	Final	3:18 PM		5.72				

Per County Standards, Infiltration Rate calculated as follows:

$$Q = \frac{\Delta H(60r)}{\Delta t(r + 2H_{avg})}$$

Where: Q = Infiltration Rate (in inches per hour)
ΔH = Change in Height (Water Level) over the time interval
r = Test Hole (Borehole) Radius
Δt = Time Interval
H_{avg} = Average Head Height over the time interval

INFILTRATION CALCULATIONS

Project Name	Proposed Veterans Memorial Park
Project Location	Carlsbad, California
Project Number	19G109-3
Engineer	Ryan Bremer

Test Hole Radius	4	(in)
Test Depth	8.0	(ft)

Infiltration Test Hole	I-2

Interval Number		Time	Time Interval (min)	Water Depth (ft)	Change in Water Level (ft)	Average Head Height (ft)	Infiltration Rate Q (in/hr)	
1	Initial	9:11 AM	30.0	5.51	0.00	2.49	0.00	Infiltration Testing
	Final	9:41 AM		5.51				
2	Initial	9:41 AM	30.0	5.51	0.01	2.49	0.02	
	Final	10:11 AM		5.52				
3	Initial	10:11 AM	30.0	5.52	0.02	2.47	0.03	
	Final	10:41 AM		5.54				
4	Initial	10:41 AM	30.0	5.54	0.01	2.46	0.02	
	Final	11:11 AM		5.55				
5	Initial	11:11 AM	30.0	5.55	0.00	2.45	0.00	
	Final	11:41 AM		5.55				
6	Initial	11:41 AM	30.0	5.55	0.00	2.45	0.00	
	Final	12:11 PM		5.55				
7	Initial	12:11 PM	30.0	5.55	0.01	2.45	0.02	
	Final	12:41 PM		5.56				
8	Initial	12:41 PM	30.0	5.56	0.00	2.44	0.00	
	Final	1:11 PM		5.56				
9	Initial	1:11 PM	30.0	5.56	0.01	2.44	0.02	
	Final	1:41 PM		5.57				
10	Initial	1:41 PM	30.0	5.57	0.00	2.43	0.00	
	Final	2:11 PM		5.57				
11	Initial	2:11 PM	30.0	5.57	0.01	2.43	0.02	
	Final	2:41 PM		5.58				
12	Initial	2:41 PM	30.0	5.58	0.00	2.42	0.00	
	Final	3:11 PM		5.58				

Per County Standards, Infiltration Rate calculated as follows:

$$Q = \frac{\Delta H(60r)}{\Delta t(r + 2H_{avg})}$$

Where:
- Q = Infiltration Rate (in inches per hour)
- ΔH = Change in Height (Water Level) over the time interval
- r = Test Hole (Borehole) Radius
- Δt = Time Interval
- H_{avg} = Average Head Height over the time interval

INFILTRATION CALCULATIONS

Project Name	Proposed Veterans Memorial Park
Project Location	Carlsbad, California
Project Number	19G109-3
Engineer	Ryan Bremer

Test Hole Radius	4	(in)
Test Depth	8.0	(ft)

Infiltration Test Hole	I-3

Interval Number		Time	Time Interval (min)	Water Depth (ft)	Change in Water Level (ft)	Average Head Height (ft)	Infiltration Rate Q (in/hr)	
1	Initial	9:25 AM	30.0	5.22	0.01	2.78	0.01	Infiltration Testing
	Final	9:55 AM		5.23				
2	Initial	9:55 AM	30.0	5.23	0.02	2.76	0.03	
	Final	10:25 AM		5.25				
3	Initial	10:25 AM	30.0	5.25	0.03	2.74	0.04	
	Final	10:55 AM		5.28				
4	Initial	10:55 AM	30.0	5.28	0.04	2.70	0.06	
	Final	11:25 AM		5.32				
5	Initial	11:25 AM	30.0	5.32	0.03	2.67	0.04	
	Final	11:55 AM		5.35				
6	Initial	11:55 AM	30.0	5.35	0.02	2.64	0.03	
	Final	12:25 PM		5.37				
7	Initial	12:25 PM	30.0	5.37	0.03	2.62	0.04	
	Final	12:55 PM		5.40				
8	Initial	12:55 PM	30.0	5.40	0.02	2.59	0.03	
	Final	1:25 PM		5.42				
9	Initial	1:25 PM	30.0	5.42	0.02	2.57	0.03	
	Final	1:55 PM		5.44				
10	Initial	1:55 PM	30.0	5.44	0.02	2.55	0.03	
	Final	2:25 PM		5.46				
11	Initial	2:25 PM	30.0	5.46	0.02	2.53	0.03	
	Final	2:55 PM		5.48				
12	Initial	2:55 PM	30.0	5.48	0.02	2.51	0.03	
	Final	3:25 PM		5.50				

Per County Standards, Infiltration Rate calculated as follows:

$$Q = \frac{\Delta H(60r)}{\Delta t(r + 2H_{avg})}$$

Where: Q = Infiltration Rate (in inches per hour)

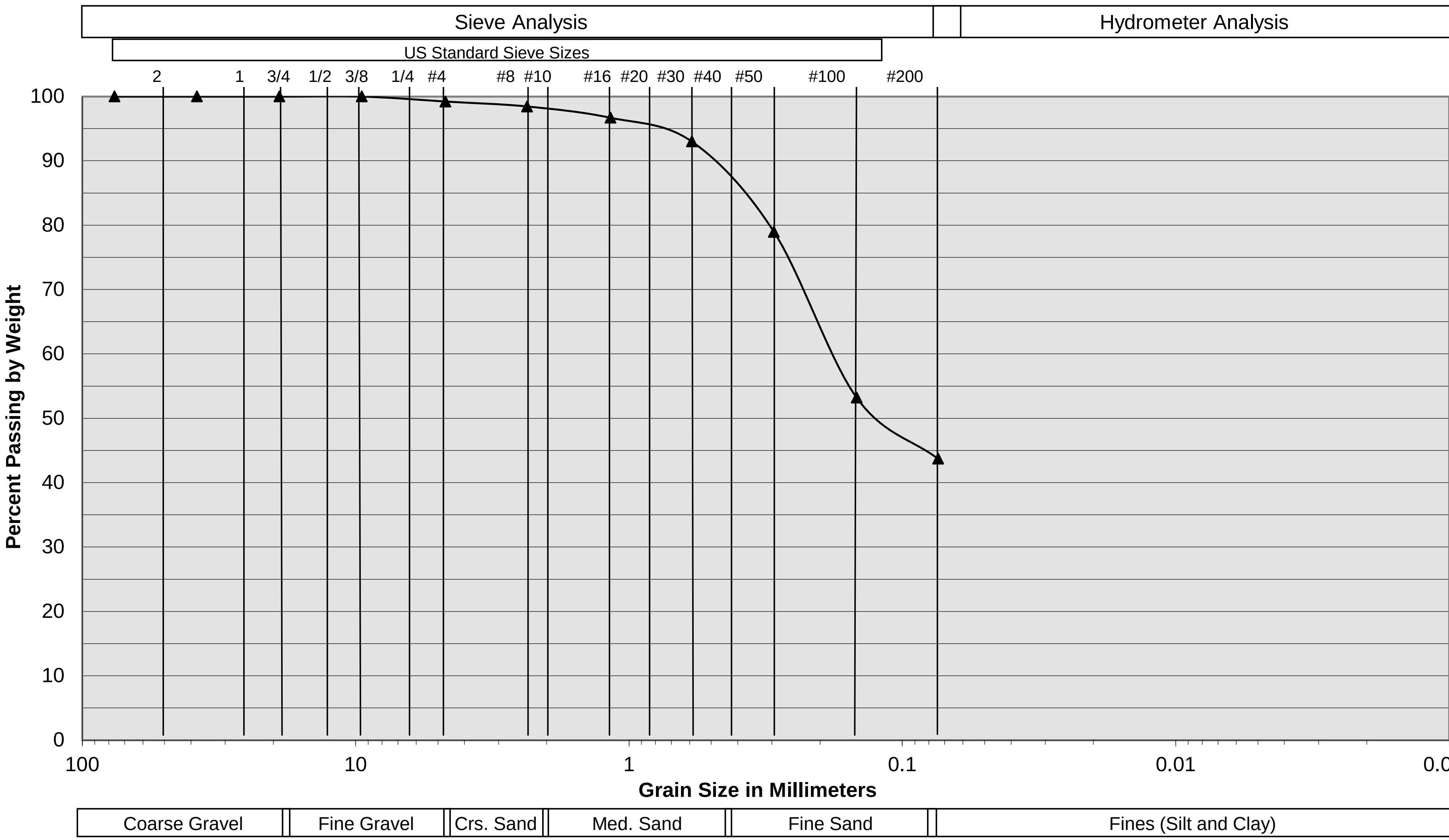
ΔH = Change in Height (Water Level) over the time interval

r = Test Hole (Borehole) Radius

Δt = Time Interval

H_{avg} = Average Head Height over the time interval

Grain Size Distribution



Sample Description	I-1 @ 6½ to 8 feet
Soil Classification	Gray Brown Clayey fine to medium Sand

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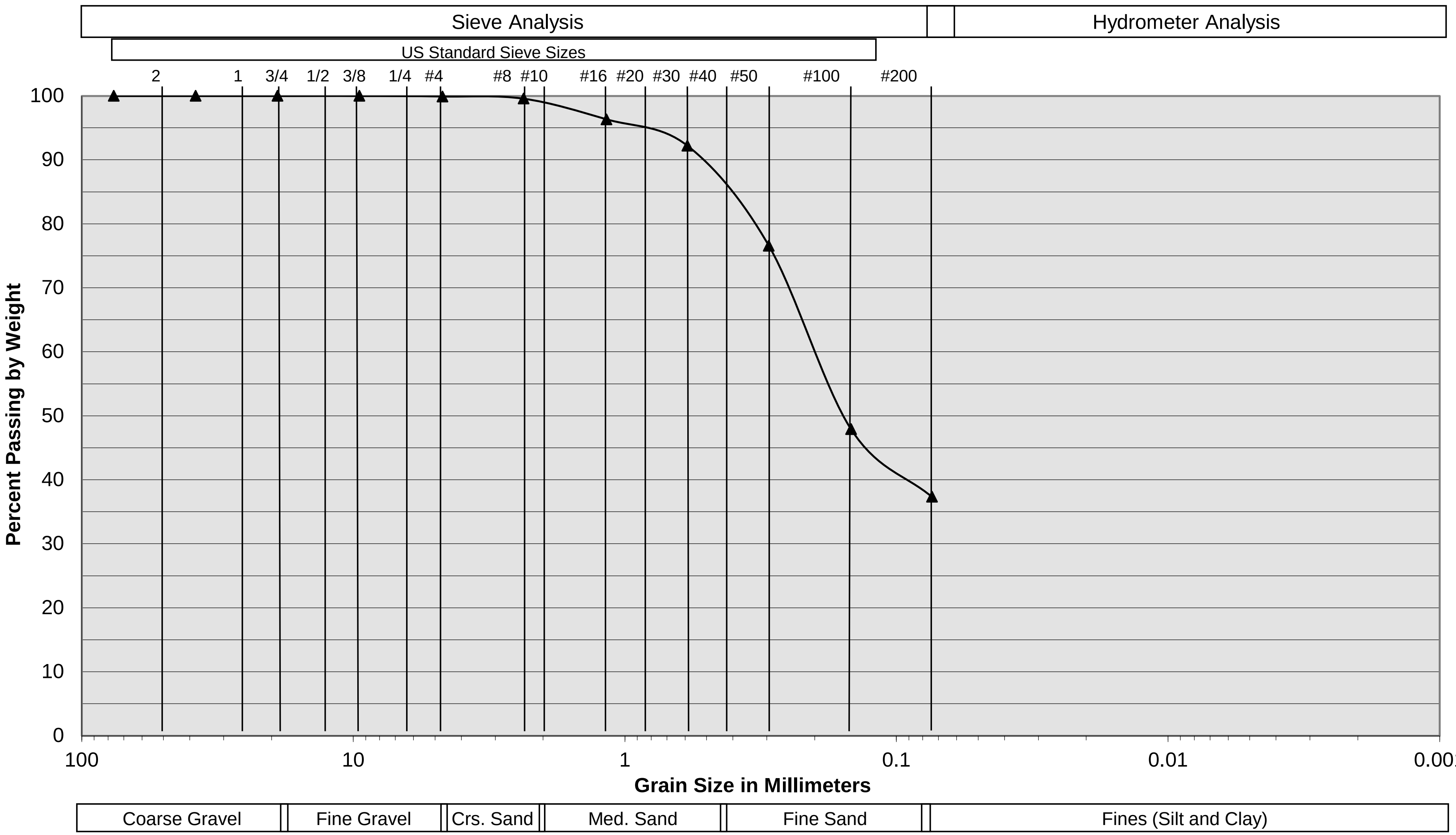
Grain Size Distribution



Sample Description	I-2 @ 6½ to 8 feet
Soil Classification	Light Gray Silty fine to medium grained Sandstone

Veteran's Park
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PLATE C- 2

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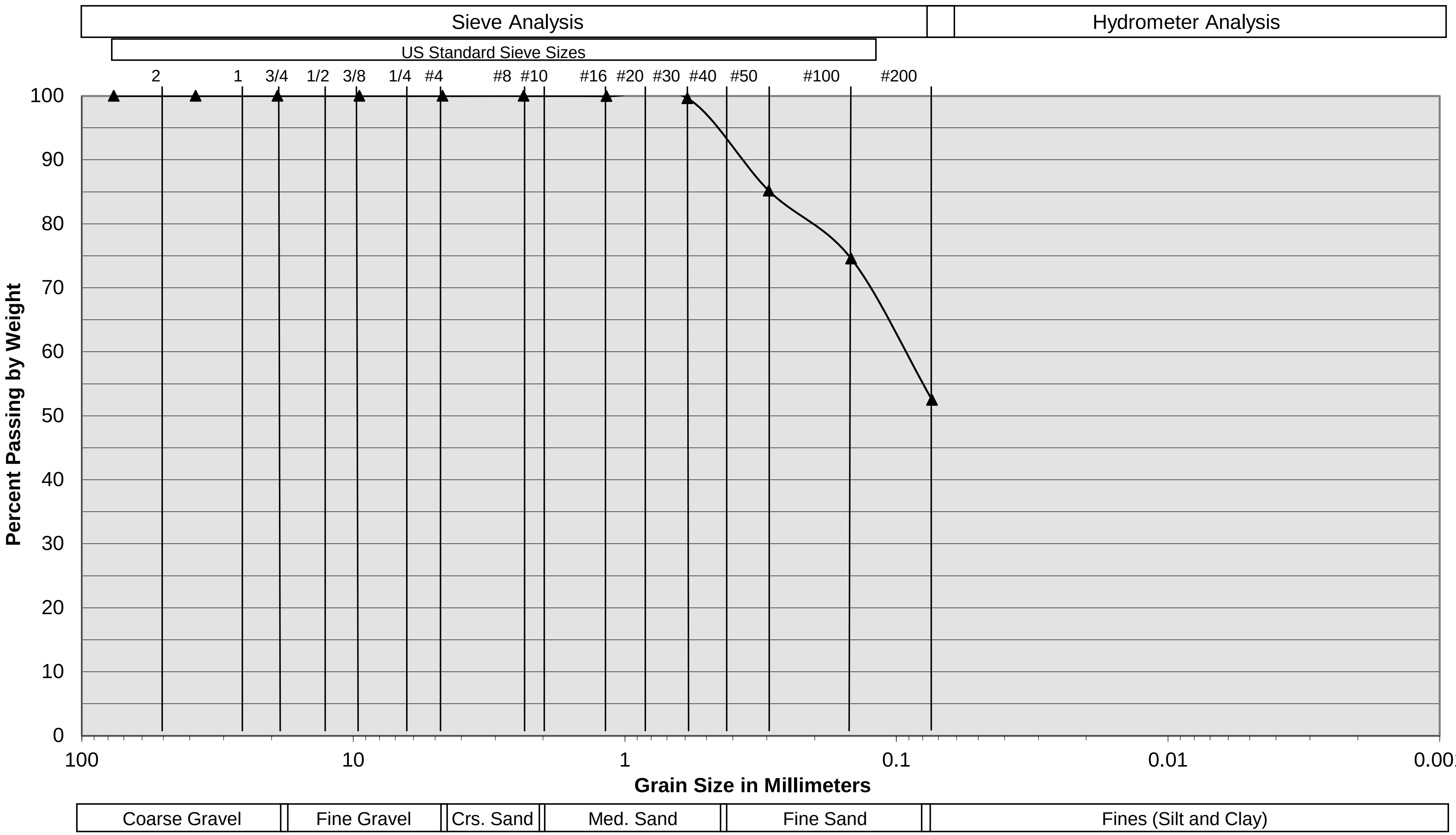
Grain Size Distribution



Sample Description	I-3 @ 6½ to 8 feet
Soil Classification	Light Gray to Gray fine grained Siltstone, trace medium Sand

Veteran's Park
Carlsbad, CA
Project No. 19G109-3
PLATE C- 3

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