Priority Development Project (PDP)
Storm Water Quality Management Plan (SWQMP)

Emerald Hills

VTM-PMT-326907 / SDP-PMT-3262906 / NDP / NUP (PRJ- 1107880)

☐ **Check if electing for offsite alternative compliance**

Engineer of Work:

Alisa S. Vialpando

Alisa Vialpando, REC # 47945
Provide Wet Signature and Stamp Above Line

Prepared For:

D.R. Horton
2280 Wardlow Circle, Suite 100
Corona, CA 92878
(888) 555-1212

Prepared By:

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

Date:

11/16/2024

Approved by: City of San Diego Date

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Project Name: Emerald Hills

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Acronyms

APN	Assessor's Parcel Number
ASBS	Area of Special Biological Significance
BMP	Best Management Practice
CEQA	California Environmental Quality Act
CGP	Construction General Permit
DCV	Design Capture Volume
DMA	Drainage Management Areas
ESA	Environmentally Sensitive Area
GLU	Geomorphic Landscape Unit
GW	Ground Water
HMP	Hydromodification Management Plan
HSG	Hydrologic Soil Group
HU	Harvest and Use
INF	Infiltration
LID	Low Impact Development
LUP	Linear Underground/Overhead Projects
MS4	Municipal Separate Storm Sewer System
N/A	Not Applicable
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
PDP	Priority Development Project
PE	Professional Engineer
POC	Pollutant of Concern
SC	Source Control
SD	Site Design
SDRWQCB	San Diego Regional Water Quality Control Board
SIC	Standard Industrial Classification
SWPPP	Stormwater Pollutant Protection Plan
SWQMP	Storm Water Quality Management Plan
TMDL	Total Maximum Daily Load
WMAA	Watershed Management Area Analysis
WPCP	Water Pollution Control Program
WQIP	Water Quality Improvement Plan

Certification Page

Project Name: Emerald Hills
Permit Application VTM-PMT-326907 / SDP-PMT-3262906 / NDP / NUP (PRJ- 1107880)

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 Storm Water Standards, which is based on the requirements of SDRWQCB Order No. R9-2013-0001 as amended by R9-2015-0001 and R9-2015-0100 (MS4 Permit).

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 Storm Water Standards. I certify that this PDP SWQMP has been completed to the best of my ability and accurately reflects the project being proposed and the applicable 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 PDP 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.

Alisa S. Vialpando

Engineer of Work's Signature

47945

PE#

12/31/2025

Expiration Date

Alisa S. Vialpando

Print Name

Hunsaker & Associates San Diego, Inc.

Company

11/16/2024

Date



Project Name: EMERALD HILLS

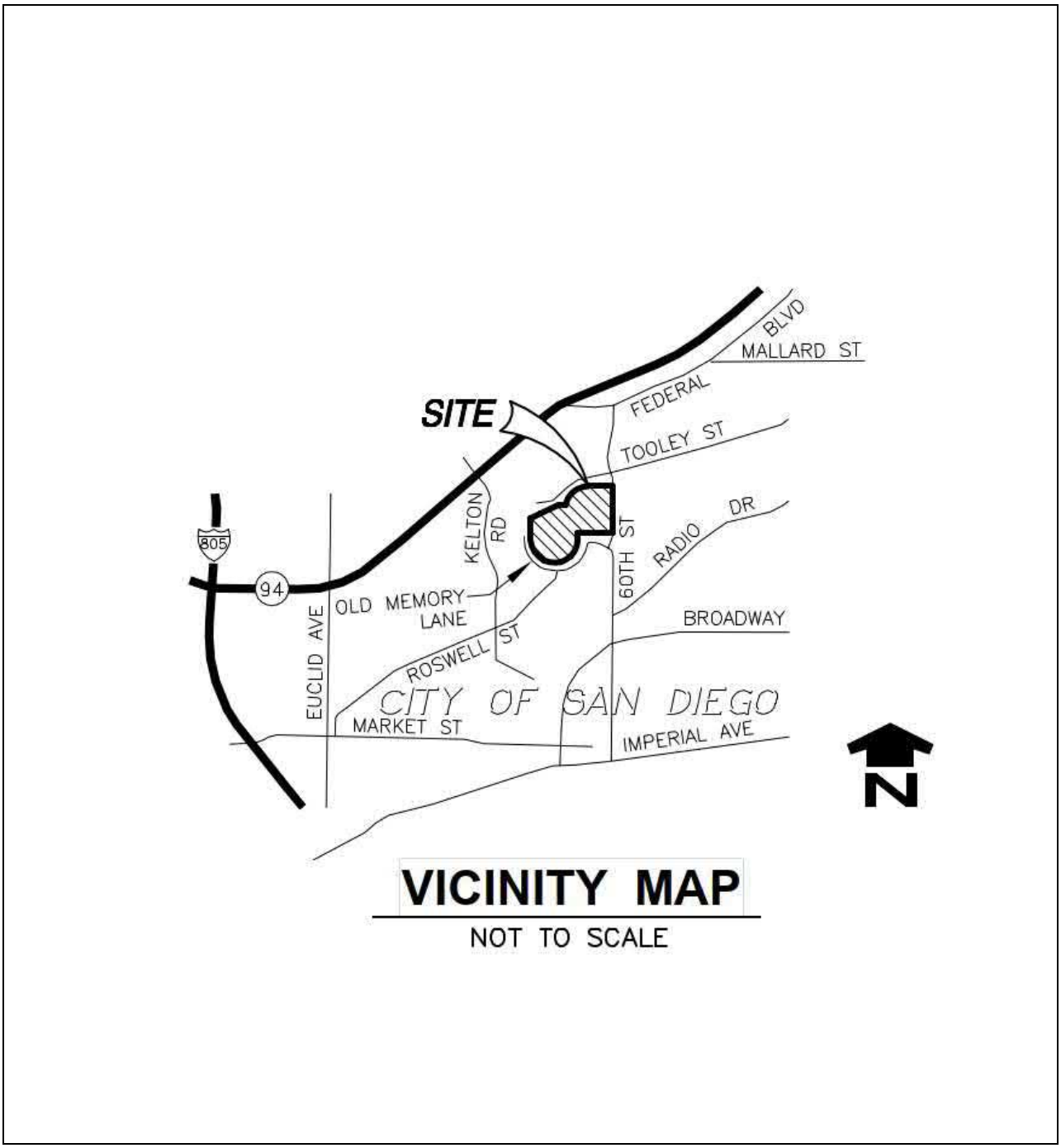
Submittal Record

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

Submittal Number	Date	Project Status	Changes
1	10/24/2023	☑ **Preliminary Design/Planning/CEQA** ☐ **Final Design**	**Initial Submittal**
2	02/08/2024	X **Preliminary Design/Planning/CEQA** ☐ **Final Design**	update the infiltration Feasibility letter
3	05/31/2024	X **Preliminary Design/Planning/CEQA** ☐ **Final Design**	Address City comments
4	11/06/2024	X **Preliminary Design/Planning/CEQA** ☐ **Final Design**	Add infiltration Feasibility Letter

Project Vicinity Map

Project Name: Emerald Hills
Permit Application VTM-PMT-326907 / SDP-PMT-3262906 / NDP / NUP (PRJ- 1107880)



City of San Diego Form DS-560 Storm Water Requirements Applicability Checklist

Attach DS-560 form.

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FORM
DS-560
September 2021

Stormwater Requirements Applicability Checklist

Project Address: East of 5706 old Memory Ln, San Diego, CA 92114 **Project Number:** PRJ- 1107880

SECTION 1: Construction Stormwater Best Management Practices (BMP) Requirements

All construction sites are required to implement construction BMPs per the performance standards in the Stormwater Standards Manual. Some sites are also required to obtain coverage under the State Construction General Permit (CGP)[1], administered by the California State Water Resources Control Board.

For all projects, complete Part A - If the project is required to submit a Stormwater Pollution Prevention Plan (SWPPP) or Water Pollution Control Plan (WPCP), continue to Part B.

PART A – Determine Construction Phase Stormwater Requirements

1. Is the project subject to California's statewide General National Pollutant Discharge Elimination System (NPDES) permit for Stormwater Discharges Associated with Construction Activities, also known as the State Construction General Permit (CGP)? (Typically projects with land disturbance greater than or equal to 1 acre.)

   ◉ Yes, SWPPP is required; skip questions 2-4. ○ No; proceed to the next question.

2. Does the project propose construction or demolition activity, including but not limited to, clearing, grading, grubbing, excavation, or any other activity resulting in ground disturbance and/or contact with stormwater?

   ○ Yes, WPCP is required; skip questions 3-4. ◉ No; proceed to the next question.

3. Does the project propose routine maintenance to maintain the original line and grade, hydraulic capacity, or original purpose of the facility? (Projects such as pipeline/utility replacement)

   ○ Yes, WPCP is required; skip question 4. ◉ No; proceed to the next question.

4. Does the project only include the following Permit types listed below?

   - Electrical Permit, Fire Alarm Permit, Fire Sprinkler Permit, Plumbing Permit, Sign Permit, Mechanical Permit, Spa Permit.
   - Individual Right of Way Permits that exclusively include only ONE of the following activities: water service, sewer lateral, or utility service.
   - Right of Way Permits with a project footprint less than 150 linear feet that exclusively include only ONE of the following activities: curb ramp, sidewalk and driveway apron replacement, potholing, curb and gutter replacement, and retaining wall encroachments.

   ☐ Yes, no document is required.

Check one of the boxes below and continue to Part B

◉ **If you checked "Yes" for question 1**, an SWPPP is REQUIRED – **continue to Part B**

○ **If you checked "No" for question 1 and checked "Yes" for question 2 or 3**, a WPCP is REQUIRED. If the project proposes less than 5,000 square feet of ground disturbance AND has less than a 5-foot elevation change over the entire project area, a Minor WPCP may be required instead. **Continue to Part B**

○ **If you check "No" for all questions 1-3 and checked "Yes" for question 4,** Part B does not apply, and no document is required. **Continue to Section 2.**

[1] More information on the City's construction BMP requirements as well as CGP requirements can be found at http://www.sandiego.gov/stormwater/regulations/index.shtml

CLEAR FORM

PART B – Determine Construction Site Priority

This prioritization must be completed within this form, noted on the plans, and included in the SWPPP or WPCP. The city reserves the right to adjust the priority of projects both before and after construction. Construction projects are assigned an inspection frequency based on if the project has a "high threat to water quality." The City has aligned the local definition of "high threat to water quality" to the risk determination approach of the State Construction General Permit (CGP). The CGP determines risk level based on project specific sediment risk and receiving water risk. Additional inspection is required for projects within the Areas of Special Biological Significance (ASBS) watershed. **NOTE:** The construction priority does **NOT** change construction BMP requirements that apply to projects; rather, it determines the frequency of inspections that will be conducted by city staff.

Complete Part B and continue to Section 2

☐ **1. ASBS**

A. Projects located in the ASBS watershed.

☑ **2. High Priority**

A. Projects that qualify as Risk Level 2 or Risk Level 3 per the Construction General Permit (CGP) and are not located in the ASBS watershed.
B. Projects that qualify as LUP Type 2 or LUP Type 3 per the CGP and are not located in the ASBS watershed.

☐ **3. Medium Priority**

A. Projects that are not located in an ASBS watershed or designated as a High priority site.
B. Projects that qualify as Risk Level 1 or LUP Type 1 per the CGP and are not located in an ASBS watershed.
C. WPCP projects (>5,000 square feet of ground disturbance) located within the Los Peñasquitos watershed management area.

☐ **4. Low Priority**

A. Projects not subject to a Medium or High site priority designation and are not located in an ASBS watershed.

Section 2: Construction Stormwater BMP Requirements

Additional information for determining the requirements is found in the Stormwater Standards Manual.

PART C – Determine if Not Subject to Permanent Stormwater Requirements

Projects that are considered maintenance or otherwise not categorized as "new development projects" or "redevelopment projects" according to the Stormwater Standards Manual are not subject to Permanent Stormwater BMPs.

- **If "yes" is checked for any number in Part C**: Proceed to Part F and check "Not Subject to Permanent Stormwater BMP Requirements."
- **If "no" is checked for all the numbers in Part C:** Continue to Part D.

1. Does the project only include interior remodels and/or is the project entirely within an existing enclosed structure and does not have the potential to contact stormwater?

   ○ Yes ◉ No

2. Does the project only include the construction of overhead or underground utilities without creating new impervious surfaces?

   ○ Yes ◉ No

3. Does the project fall under routine maintenance? Examples include but are not limited to roof or exterior structure surface replacement, resurfacing or reconfiguring surface parking lots or existing roadways without expanding the impervious footprint, and routine replacement of damaged pavement (grinding, overlay and pothole repair).

   ○ Yes ◉ No

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PART D – PDP Exempt Requirements

PDP Exempt projects are required to implement site design and source control BMPs.

- **If "yes" is checked for any questions in Part D**, continue to Part F and check the box labeled "PDP Exempt."
- **If "no" is checked for all questions in Part D**, continue to Part E.

1. Does the project ONLY include new or retrofit sidewalks, bicycle lanes, or trails that:
   - Are designed and constructed to direct stormwater runoff to adjacent vegetated areas, or other non-erodible permeable areas? Or;
   - Are designed and constructed to be hydraulically disconnected from paved streets and roads? Or;
   - Are designed and constructed with permeable pavements or surfaces in accordance with the Green Streets guidance in the City's Stormwater Standards manual?

   ○ Yes, PDP exempt requirements apply ◉ No, proceed to next question

2. Does the project ONLY include retrofitting or redeveloping existing paved alleys, streets or roads designed and constructed in accordance with the Green Streets guidance in the City's Stormwater Standards Manual?

   ○ Yes, PDP exempt requirements apply ◉ No, proceed to next question

PART E – Determine if Project is a Priority Development Project (PDP)

Projects that match one of the definitions below are subject to additional requirements, including preparation of a Stormwater Quality Management Plan (SWQMP).

- **If "yes" is checked for any number in Part E**, continue to Part F and check the box labeled "Priority Development Project."
- **If "no" is checked for every number in Part E**, continue to Part F and check the box labeled "Standard Development Project."

1. **New development that creates 10,000 square feet or more of impervious surfaces collectively over the project site.** This includes commercial, industrial, residential, mixed-use, and public development projects on public or private land. ◉ Yes ○ No

2. **Redevelopment project that creates and/or replaces 5,000 square feet or more of impervious surfaces on an existing site of 10,000 square feet or more of impervious surfaces.** This includes commercial, industrial, residential, mixed-use, and public development projects on public or private land. ○ Yes ◉ No

3. **New development or redevelopment of a restaurant.** Facilities that sell prepared foods and beverages for consumption, including stationary lunch counters and refreshment stands selling prepared foods and drinks for immediate consumption (Standard Industrial Classification (SIC) 5812), and where the land development creates and/or replaces 5,000 square feet or more of impervious surface. ○ Yes ◉ No

4. **New development or redevelopment on a hillside.** The project creates and/or replaces 5,000 square feet or more of impervious surface (collectively over the project site) and where the development will grade on any natural slope that is twenty-five percent or greater. ○ Yes ◉ No

5. **New development or redevelopment of a parking lot that creates and/or replaces 5,000 square feet or more of impervious surface (collectively over the project site).** ○ Yes ◉ No

6. **New development or redevelopment of streets, roads, highways, freeways, and driveways.** The project creates and/or replaces 5,000 square feet or more of impervious surface (collectively over the project site). ◉ Yes ○ No

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7. **New development or redevelopment discharging directly to an environmentally sensitive area.** The project creates and/or replaces 2,500 square feet of impervious surface (collectively over the project 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). ○ Yes ◉ No

8. **New development or redevelopment projects of retail gasoline outlet (RGO) that create and/or replaces 5,000 square feet of impervious surface.** The development project meets the following criteria: (a) 5,000 square feet or more or (b) has a projected Average Daily Traffic (ADT) of 100 or more vehicles per day. ○ Yes ◉ No

9. **New development or redevelopment projects of an automotive repair shop that creates and/or replaces 5,000 square feet or more of impervious surfaces.** Development projects categorized in any one of Standard Industrial Classification (SIC) codes 5013, 5014, 5541, 7532-7534 or 7536-7539. ○ Yes ◉ No

10. **Other Pollutant Generating Project.** These projects are not covered in any of the categories above but involve the disturbance of one or more acres of land and are expected to generate post-construction phase pollutants, including fertilizers and pesticides. This category does not include projects creating less than 5,000 square feet of impervious area and projects containing landscaping without a requirement for the regular use of fertilizers and pesticides (such as a slope stabilization project using native plants). Impervious area calculations need not include linear pathways for infrequent vehicle use, such as emergency maintenance access or bicycle and pedestrian paths if the linear pathways are built with pervious surfaces or if runoff from the pathway sheet flows to adjacent pervious areas. ○ Yes ◉ No

PART F – Select the appropriate category based on the outcomes of Part C through Part E

1. The project is **NOT SUBJECT TO PERMANENT STORMWATER REQUIREMENTS** ○ Yes ○ No

2. The project is a **STANDARD DEVELOPMENT PROJECT**. Site design and source control BMP requirements apply. See the Stormwater Standards Manual for guidance. ○ Yes ○ No

3. The Project is **PDP EXEMPT**. Site design and source control BMP requirements apply. Refer to the Stormwater Standards Manual for guidance. ○ Yes ○ No

4. The project is a **PRIORITY DEVELOPMENT PROJECT**. Site design, source control and structural pollutant control BMP requirements apply. Refer to the Stormwater Standards Manual for guidance on determining if the project requires hydromodification plan management. ○ Yes ◉ No

Name of Owner or Agent Alisa S. Vialpando **Title** President

Signature Alisa S. Vialpando **Date** 11/06/2024

CLEAR FORM

Project Name:

Applicability of Permanent, Post-Construction Storm Water BMP Requirements		Form I-1
Project Identification		
Project Name: Emerald hills		
Permit Application Number: VTM-PMT-326907 / SDP-PMT-3262906/PRJ- 1107880		Date: 05/31/2024
Determination of Requirements		
The purpose of this form is to identify permanent, post-construction requirements that apply to the project. This form serves as a short summary of applicable requirements, in some cases referencing separate forms that will serve as the backup for the determination of requirements. Answer each step below, starting with **Step 1** and progressing through each step until reaching "Stop". Refer to the manual sections and/or separate forms referenced in each step below.		
Step	**Answer**	**Progression**
Step 1: Is the project a "development project"? See Section 1.3 of the manual (Part 1 of Storm Water Standards) for guidance.	☑ Yes	Go to **Step 2**.
	☐ No	**Stop**. Permanent BMP requirements do not apply. No SWQMP will be required. Provide discussion below.
Discussion / justification if the project is not a "development project" (e.g., the project includes *only* interior remodels within an existing building):		
Step 2: Is the project a Standard Project, PDP, or PDP Exempt? To answer this item, see Section 1.4 of the manual in its entirety for guidance AND complete Form DS-560, Storm Water Requirements Applicability Checklist.	☐ Standard Project	**Stop.** Standard Project requirements apply
	☑ PDP	PDP requirements apply, including PDP SWQMP. Go to **Step 3**.
	☐ PDP Exempt	**Stop.** Standard Project requirements apply. Provide discussion and list any additional requirements below.
Discussion / justification, and additional requirements for exceptions to PDP definitions, if applicable:		

Project Name:

Form I-1 Page 2 of 2		
Step	**Answer**	**Progression**
Step 3. Is the project subject to earlier PDP requirements due to a prior lawful approval? See Section 1.10 of the manual (Part 1 of Storm Water Standards) for guidance.	☐ Yes	Consult the City Engineer to determine requirements. Provide discussion and identify requirements below. Go to **Step 4**.
	☑ No	BMP Design Manual PDP requirements apply. Go to **Step 4**.
Discussion / justification of prior lawful approval, and identify requirements (not required if prior lawful approval does not apply):		
Step 4. Do hydromodification control requirements apply? See Section 1.6 of the manual (Part 1 of Storm Water Standards) for guidance.	☑ Yes	PDP structural BMPs required for pollutant control (Chapter 5) and hydromodification control (Chapter 6). Go to **Step 5**.
	☐ No	**Stop**. PDP structural BMPs required for pollutant control (Chapter 5) only. Provide brief discussion of exemption to hydromodification control below.
Discussion / justification if hydromodification control requirements do not apply:		
Step 5. Does protection of critical coarse sediment yield areas apply? See Section 6.2 of the manual (Part 1 of Storm Water Standards) for guidance.	☐ Yes	Management measures required for protection of critical coarse sediment yield areas (Chapter 6.2). **Stop**.
	☑ No	Management measures not required for protection of critical coarse sediment yield areas. Provide brief discussion below. **Stop**.
Discussion / justification if protection of critical coarse sediment yield areas does not apply: There is no critical Coarse Sediment yield areas within the site.		

Project Name: Emerald Hills

NA

HMP Exemption Exhibit

Attach a HMP Exemption Exhibit that shows direct storm water runoff discharge from the project site to HMP exempt area. Include project area, applicable underground storm drain line and/or concrete lined channels, outfall information and exempt waterbody.
Reference applicable drawing number(s).

Exhibit must be provided on 11"x17" or larger paper.

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Project Name: Emerald Hills

Site Information Checklist For PDPs	Form I-3B
Project Summary Information	
Project Name	Emerald Hills
Project Address	East of 5706 Old Memory Ln San Diego, CA 92114
Assessor's Parcel Number(s) (APN(s))	543-340-02-00
Permit Application Number	VTM-PMT-326907 / SDP-PMT-3262906 / NDP / NUP (PRJ- 1107880)
Project Watershed	Select One: ☐ San Dieguito River ☐ Penasquitos ☐ Mission Bay ☐ San Diego River ☑ San Diego Bay ☐ Tijuana River
Hydrologic subarea name with Numeric Identifier up to two decimal places (9XX.XX)	Chollas, San Diego Mesa, Pueblo San Diego, 908.22
Project Area (total area of Assessor's Parcel(s) associated with the project or total area of the right-of-way)	31.18 Acres (1,358,401 Square Feet)
Area to be disturbed by the project (Project Footprint)	30.64 Acres (1,334,468 Square Feet)
Project Proposed Impervious Area (subset of Project Footprint)	14.36 Acres (625,726 Square Feet)
Project Proposed Pervious Area (subset of Project Footprint)	16.27 Acres (708,946 Square Feet)
Note: Proposed Impervious Area + Proposed Pervious Area = Area to be Disturbed by the Project. This may be less than the Project Area.	
The proposed increase or decrease in impervious area in the proposed condition as compared to the pre-project condition	85 %

Project Name: Emerald Hills

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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 site is largely unimproved, however there are two existing transmission towers, a two-story building, and a relatively level pad for equipment (presumably generators and outdoor storage). An approximately 3-4' tall berm, eroded and overgrown with vegetation, exists near the entrance.

Existing Land Cover Includes (select all that apply):

- ☑ Vegetative Cover
- ☑ Non-Vegetated Pervious Areas
- ☑ Impervious Areas

Description / Additional Information:

The site is largely consists of vegetative cover, however there are two existing transmission towers, a two-story building, and a relatively level pad for equipment (presumably generators and outdoor storage).

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:

- ☐ Groundwater Depth < 5 feet
- ☐ 5 feet < Groundwater Depth < 10 feet
- ☐ 10 feet < Groundwater Depth < 20 feet
- ☑ Groundwater Depth > 20 feet

Existing Natural Hydrologic Features (select all that apply):

- ☐ Watercourses
- ☐ Seeps
- ☐ Springs
- ☐ Wetlands
- ☑ None

Description / Additional Information:

Project Name: Emerald Hills

Form I-3B Page 3 of 11

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

Descriptions/Additional Information

The site topography is characterized by two broadly sloped knolls located in the northeast and southwest bisected with gorges that trend to northwest and southeast. The exisitng drainage conveyance is natural.
In its existing conditions, runoff from the property drains to three primary discharge locations. There's no run-on through the site, instead the onsite runoff merges with the offsite runoff outside the project boundary before reaching these discharge points.
The northeastern portion of the property encompasses 24% steep slopes. Surface flows from this area move easterly towards 60th Street and then drain northward to a depression at the northeast corner of the Dippers Street and 60th Street intersection (Node 400). From here, runoff enters an 18" RCP culvert running south beneath Dipper Street. Upon exiting the culvert (Node 401), runoff continues south in an open channel, merging with runoff from the northeastern offsite area. This combined flow then enters a 27" RCP culvert beneath Upland Street (Node 402) and discharges into an open channel (Node 403). This channel proceeds southwesterly to a 30" RCP culvert crossing 60th Street at Node 800. This culvert also gathers runoff from the southern section of the site's eastern boundary, which has steep slopes directing water towards 60th Street, as well as runoff from Upland Street and the southeastern offsite region. The collected runoff at Node 800 moves in the 30" RCP to Node 250, mingling with flows from the site's southeastern section, an area with steep slopes draining into a brow ditch. This ditch channels flows easterly, discharging onto 60th Street via an 18" culvert at the site's southeastern corner. From here, flows move south via the 60th Street curb and gutter, joined by offsite flows from Old Memory Ln and existing developments southeast of the site. This combined runoff enters an existing inlet at Node 250 on 60th Street, merging with flows from Node 800. The cumulative runoff then travels through a 36" RCP, discharging into an open channel via a headwall at Node 50. This channel continues for 0.31 miles south before emptying into Chollas Creek. The southwestern portion of the site features a steep slope and houses a pad for one of the transmission towers. Surface runoff from this section flows south towards an existing browditch, which runs west along the site's southern boundary. This ditch captures runoff, leading it into an 18" RCP via an existing headwall at Node 320. This flow then merges with offsite runoff originating from Old Memory Ln and the residential area situated southwest of the site (Node 300 and 350). The combined flow travels approximately 0.14 miles west through a 24" RCP (from Node 350), eventually discharging into an open channel located 379 feet from Luber St on Kelton Rd. From here, the channel moves in a northwesterly direction, ultimately emptying into the South Chollas Creek Channel. The northern portion of the site is characterized by a steep slope, a pad for an existing transmission tower, and a two-story building. Runoff from the eastern part of this subwatershed originates from the steep slope and flows towards an existing headwall. It then enters an 18" RCP at Node 100. This runoff moves approximately 860 ft through the existing storm drain system, merging with offsite runoff along the way, and eventually discharges into an open channel located 260' from Ballina Dr on Tooley St. Concurrently, flows from the remainder of this sub-watershed surface flow in a northern direction, ultimately joining this open channel at Nodes 600 and 700. This channel continues for about 740 feet before it discharges into the South Chollas Creek Channel. Refer to Appendix 1 in the Drainage Study for Emerald Hills.

Project Name: Emerald Hills

Form I-3B Page 4 of 11

Description of Proposed Site Development and Drainage Patterns

Project Description / Proposed Land Use and/or Activities:

The proposed development will create 123 single-family lots and five (5) private HOA open space lots, along with private roads, sidewalks, and public & private utility improvements. All existing broadcast towers and outbuildings on site will be removed as part of the development proposal. The project proposes widening and street improvements on 60th Street east of the site.
Onsite drainage improvements will include three on site water quality/ hydromodification basins with a storm drain system to safely convey runoff through the project to the biofiltration basins to address water quality, hydromodification and peak flow mitigation before discharging into the existing drainage system similar to existing conditions.

List/describe proposed impervious features of the project (e.g., buildings, roadways, parking lots, courtyards, athletic courts, other impervious features):

Buildings, roadways, driveways, sidewalks and hardscape

List/describe proposed pervious features of the project (e.g., landscape areas):

landscape and biofiltration basins

Does the project include grading and changes to site topography?

☑ Yes

☐ No

Description / Additional Information:

The site will be graded to accommodate the new development.

Project Name: Emerald Hills

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

☑ Yes

☐ No

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

Description / Additional Information:

In the proposed conditions, the site consists of three drainage areas. Each of these areas will have its runoff collected by proposed storm drain inlets and subsequently routed through the on-site storm drain system, leading to its associated biofiltration basin.
Runoff from the proposed graded slope adjacent to the site's northeastern boundary will flow easterly and will be collected via the proposed brow ditch. This will direct the flow to a proposed catch basin. Subsequently, this drainage will commingle with the drainage stemming from the 60th Street widening, which is set to be gathered by the proposed inlet at Node 450. This combined flow will be directed northeasterly through a proposed storm drainpipe, entering the existing 18" RCP culvert beneath Dipper Street. Here, it will merge with the offsite runoff that enters the existing 18" RCP culvert from the depression located northeast of the 60th Street and Dipper Street intersection at Node 400, mirroring the existing condition. The runoff's journey from Node 401 to Node 250 will align with existing flow patterns, detailed in Section 2 of the drainage report.
Runoff from the on-site eastern drainage area (200 Node series) will be collected by the proposed inlets and directed by the proposed storm drain system to the biofiltration/detention basin at Node 20. At this location, flow will be mitigated to a level below that of the existing conditions. This mitigated flow will then be conveyed via the proposed storm drain system to a curb outlet at 60th Street (Node 25), in a manner consistent with existing conditions. The runoff will subsequently travel south along the 60th Street curb and gutter system, eventually reaching the existing inlet at Node 250. From this point, it will commingle with the flows from Node 800 and discharge at Node 50, similar to existing condition. Runoff from the on-site western drainage area (300 Node series) will be collected by the proposed inlets and directed by the proposed storm drain system to the biofiltration/detention basin at Node 30. At this location, flow will be mitigated to a level below that of the existing conditions. This mitigated flow will then be conveyed via the proposed storm drain system to the existing 18" RCP crossing Old Memory Ln (Node 350), where it will commingle with the slope flows and offsite flows, similar to existing conditions.Runoff from the on-site northern drainage area (100 Node series) will be collected by the proposed inlets and directed by the proposed storm drain system to the biofiltration/ detention basin at Node 10. At this location, flow will be mitigated to a level below that of the existing conditions. This mitigated flow will then be conveyed via the proposed storm drain system to discharge into the existing depression area at node 150 (Node 100 in existing condition). In the proposed conditions, the flow patterns will remain similar, and the flows from the developed area will connect to the same existing offsite storm drainage network.

Project Name: Emerald Hills

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

- [x] Onsite storm drain inlets
- [ ] Interior floor drains and elevator shaft sump pumps
- [ ] Interior parking garages
- [ ] Need for future indoor & structural pest control
- [x] Landscape/outdoor pesticide use
- [ ] Pools, spas, ponds, decorative fountains, and other water features
- [ ] Food service
- [ ] Refuse areas
- [ ] Industrial processes
- [ ] Outdoor storage of equipment or materials
- [ ] Vehicle and equipment cleaning
- [ ] Vehicle/equipment repair and maintenance
- [ ] Fuel dispensing areas
- [ ] Loading docks
- [ ] Fire sprinkler test water
- [x] Miscellaneous drain or wash water
- [x] Plazas, sidewalks, and parking lots

Description/Additional Information:

Project Name: Emerald Hills

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Identification and Narrative of Receiving Water

Narrative describing flow path from discharge location(s), through urban storm conveyance system, to receiving creeks, rivers, and lagoons and ultimate discharge location to Pacific Ocean (or bay, lagoon, lake or reservoir, as applicable)

There are three discharge locations from the site:

POC 1: Discharge from BF-2-1 will be routed via an existing 18" RCP, moving northward to commingle with offsite flows. It will then continue northward to discharge into an open channel, which subsequently flows further north into the South Chollas Creek Channel.

POC-2: Discharge from BF-2-2 will exit via a curb outlet onto 60th Street and continue southward through the street's gutter until it is captured by an existing inlet. Here, the flow will merge with offsite flows and runoff from the proposed eastern area, which is conveyed by the existing 30" RCP. The combined runoff will then be directed through a 36" RCP, discharging into an open channel west of 60th Street. This channel extends for 0.31 miles to the south before it drains into Chollas Creek.

POC-3: Discharge from BF-2-3 will be routed via a proposed storm drain, first heading west and then south, to discharge into an existing 24" RCP west of Kelton Rd. Runoff from this discharge point will then flow northwesterly in an open channel west of the site, eventually reaching the South Chollas Creek channel.

Chollas Creek continues southwesterly, ultimately discharging into the San Diego Bay Shoreline near the Chollas Creek.

Provide a summary of all beneficial uses of receiving waters downstream of the project discharge locations

Non-contact water recreation (REC-2), Warm freshwater habitat (WARM), Wildlife habitat (WILD) and Contact water recreation (REC-1) .

Identify all ASBS (areas of special biological significance) receiving waters downstream of the project discharge locations

N ASBS downstream of the project discharge locations

Provide distance from project outfall location to impaired or sensitive receiving waters

220 feet from the curb outlet southeast of the site to the sensitive receiving water (SANGIS MHPA Areas), 710 feet from the depression area north of the site to thesensitive receiving water (SANGIS MHPA Areas) northwest of the site., and 710 feet southwest of the site where connecting to the 24 existing under Old Memory Ln to the sensitive receiving water (SANGIS MHPA Areas) west of the site.

Summarize information regarding the proximity of the permanent, post-construction storm water BMPs to the City's Multi-Habitat Planning Area and environmentally sensitive lands

The proposed BF-2-2 discharges to a curb outlet 220 feet from the sensitive receiving water (SANGIS MHPA Areas) southeast of the site, BF-2-1 discharges in depression north of the site 710 feet from the sensitive receiving water (SANGIS MHPA Areas) northwest of the site., BF-2-3 and BF-3-4 discharge into existing 24" RCP that travels 710 feet westerly to the sensitive receiving water (SANGIS MHPA Areas) west of the site.

Project Name: Emerald Hills

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Identification of Receiving Water Pollutants of Concern

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 and/or Highest Priority Pollutants from the WQIP for the impaired water bodies:

303(d) Impaired Water Body (Refer to Appendix K)	Pollutant(s)/Stressor(s) (Refer to Appendix K)	TMDLs/WQIP Highest Priority Pollutant (Refer to Table 1-4 in Chapter 1)
Chollas Creek	Benthic Community Effects, Bifenthrin , Copper, Cyfluthrin	
	Lambda, Cypermethrin, Dichlorvos, Indicator Bacteria	
	Lead, Malathion, Nitrogen, Oxygen, Dissolved	
	Trash, Zinc	
	Permethrin, Phosphorus, Pyrethroids, Total Dissolved Solids, Toxicity	
San Diego Bay Shoreline, near Chollas Creek	Benthic Community Effects, Sediment Toxicity	Indicator Bacteria;Dissolved Copper;
		Lead; and Zinc (wet weather).

Identification of Project Site Pollutants*

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

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

Pollutant	Not Applicable to the Project Site	Anticipated from the Project Site	Also a Receiving Water Pollutant of Concern
Sediment	☐	☐	☐
Nutrients	☐	☐	☐
Heavy Metals	☐	☐	☐
Organic Compounds	☐	☐	☐
Trash & Debris	☐	☐	☐
Oxygen Demanding Substances	☐	☐	☐
Oil & Grease	☐	☐	☐
Bacteria & Viruses	☐	☐	☐
Pesticides	☐	☐	☐

Project Name: Emerald Hills

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Hydromodification Management Requirements

Do hydromodification management requirements apply (see Section 1.6)?

☑ 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):

Note: If "No" answer has been selected the SWQMP must include an exhibit that shows the storm water conveyance system from the project site to an exempt water body. The exhibit should include details about the conveyance system and the outfall to the exempt water body.

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

Based on Section 6.2 and Appendix H does CCSYA exist on the project footprint or in the upstream area draining through the project footprint?

☐ Yes

☑ No

Discussion / Additional Information:

There is no CCSYA shown per WMAA

Project Name: Emerald Hills

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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.

Three POCs were analyzed in the pre and post developed conditions:

POC 1 receives runoff from two primary sources. First, it collects runoff from the northeast portion of the development, DMA 1, after this has been routed through the proposed biofiltration basin, BF-2-1, and its respective outlet structure. Second, it receives runoff from the graded slopes adjacent to the project's northern boundary, termed the Self-mitigating area SM-1. POC 1 is situated at the discharge point of a 24" RCP, located northwest of the intersection between Tooley Street and Ballina Drive. Runoff from this discharge point continues northward in an open channel north of the site to South Chollas Creek channel.

POC 2 tributary area consists of runoff from three primary sources. Firstly, it collects runoff from the east portion of the development, known as DMA 2, after this runoff is directed through the proposed biofiltration basin, BF-2-2, and its associated outlet structure. Secondly, the graded slopes adjacent to the project's eastern boundary, designated as the Self-mitigating area SM-3. Thirdly, POC 2 receives runoff from the graded slopes adjacent to the project's southern boundary, designated as the Self-mitigating area SM-2. POC 2 is situated at the discharge point f a 36" RCP, located southwest of the intersection between Old Memory Ln and 60th Street. Runoff from this discharge point continues southwesterly in an open channel south of the site to Chollas Creek.

POC 3 tributary area consists of runoff from three primary sources. Firstly, it collects runoff from the northwest and west portions of the development, known as DMA 3, after this runoff is directed through the proposed biofiltration basin, BF-2-3, and its associated outlet structure. Secondly, it gathers runoff from the proposed entrance at Old Memory Ln (DM-4). This is subsequently routed through the proprietary biofiltration BF-3-4. It's essential to note that BF-3-4 operates as a flow-based BMP with minimal flow control and volume storage, leading to its exclusion from the post-developed model. Consequently, DMA-4 has been modeled to flow directly into POC3, with the biofiltration basin BF-2-3 designed to offer additional flow control to accommodate this. Thirdly, POC 3 receives runoff from the graded slopes adjacent to the project's western boundary, designated as the Self-mitigating area SM-4. POC#3 is situated at the discharge point of a 24" RCP, located west of Kelton Rd. Runoff from this discharge point continues northwesterly in an open channel west of the site to South Chollas Creek channel.
The proposed improvements on 60th Street incorporate Green Street concepts, utilizing vegetated swales. The Green Street DMAs are exempt from HMP, and therefore, they were not included in either the pre- or post-development models.

Has a geomorphic assessment been performed for the receiving channel(s)?

☑ No, the low flow threshold is $0.1Q_2$ (default low flow threshold)

☐ Yes, the result is the low flow threshold is $0.1Q_2$

☐ Yes, the result is the low flow threshold is $0.3Q_2$

☐ Yes, the result is the low flow threshold is $0.5Q_2$

If a geomorphic assessment has been performed, provide title, date, and preparer:

Discussion / Additional Information: (optional)

Project Name: Emerald Hills

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Other Site Requirements and Constraints
When applicable, list other site requirements or constraints that will influence storm water management design, such as zoning requirements including setbacks and open space, or local codes governing minimum street width, sidewalk construction, allowable pavement types, and drainage requirements.
Optional Additional Information or Continuation of Previous Sections As Needed
This space provided for additional information or continuation of information from previous sections as needed.

Project Name: Emerald Hills

Source Control BMP Checklist for PDPs	Form I-4B

Source Control BMPs

All development projects must implement source control BMPs where applicable and feasible. See Chapter 4 and Appendix E of the BMP Design Manual (Part 1 of the Storm Water Standards) for information to implement source control BMPs shown in this checklist.

Answer each category below pursuant to the following.

- "Yes" means the project will implement the source control BMP as described in Chapter 4 and/or Appendix E of the BMP Design Manual. Discussion / justification is not required.
- "No" means the BMP is applicable to the project but it is not feasible to implement. Discussion / justification must be provided.
- "N/A" means the BMP is not applicable at the project site because the project does not include the feature that is addressed by the BMP (e.g., the project has no outdoor materials storage areas). Discussion / justification may be provided.

Source Control Requirement	Applied?		
4.2.1 Prevention of Illicit Discharges into the MS4	☑ Yes	☐ No	☐ N/A
Discussion / justification if 4.2.1 not implemented:			
4.2.2 Storm Drain Stenciling or Signage	☑ Yes	☐ No	☐ N/A
Discussion / justification if 4.2.2 not implemented:			
4.2.3 Protect Outdoor Materials Storage Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☐ Yes	☐ No	☑ N/A
Discussion / justification if 4.2.3 not implemented:			
4.2.4 Protect Materials Stored in Outdoor Work Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☐ Yes	☐ No	☑ N/A
Discussion / justification if 4.2.4 not implemented:			
4.2.5 Protect Trash Storage Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☐ Yes	☐ No	☑ N/A
Discussion / justification if 4.2.5 not implemented:			

Project Name: Emerald Hills

Form I-4B Page 2 of 2			
Source Control Requirement	**Applied?**		
4.2.6 Additional BMPs Based on Potential Sources of Runoff Pollutants (must answer for each source listed below)			
On-site storm drain inlets	☑ Yes	☐ No	☐ N/A
Interior floor drains and elevator shaft sump pumps	☐ Yes	☐ No	☑ N/A
Interior parking garages	☐ Yes	☐ No	☑ N/A
Need for future indoor & structural pest control	☐ Yes	☐ No	☑ N/A
Landscape/Outdoor Pesticide Use	☑ Yes	☐ No	☐ N/A
Pools, spas, ponds, decorative fountains, and other water features	☐ Yes	☐ No	☑ N/A
Food service	☐ Yes	☐ No	☑ N/A
Refuse areas	☐ Yes	☐ No	☑ N/A
Industrial processes	☐ Yes	☐ No	☑ N/A
Outdoor storage of equipment or materials	☐ Yes	☐ No	☑ N/A
Vehicle/Equipment Repair and Maintenance	☐ Yes	☐ No	☑ N/A
Fuel Dispensing Areas	☐ Yes	☐ No	☑ N/A
Loading Docks	☐ Yes	☐ No	☑ N/A
Fire Sprinkler Test Water	☐ Yes	☐ No	☑ N/A
Miscellaneous Drain or Wash Water	☑ Yes	☐ No	☐ N/A
Plazas, sidewalks, and parking lots	☑ Yes	☐ No	☐ N/A
SC-6A: Large Trash Generating Facilities	☐ Yes	☐ No	☑ N/A
SC-6B: Animal Facilities	☐ Yes	☐ No	☑ N/A
SC-6C: Plant Nurseries and Garden Centers	☐ Yes	☐ No	☑ N/A
SC-6D: Automotive Facilities	☐ Yes	☐ No	☑ N/A
Discussion / justification if 4.2.6 not implemented. Clearly identify which sources of runoff pollutants are discussed. Justification must be provided for all "No" answers shown above.			

Project Name: Emerald Hills

Site Design BMP Checklist for PDPs	Form I-5B

Site Design BMPs

All development projects must implement site design BMPs where applicable and feasible. See Chapter 4 and Appendix E of the BMP Design Manual (Part 1 of Storm Water Standards) for information to implement site design BMPs shown in this checklist.

Answer each category below pursuant to the following.

- "Yes" means the project will implement the site design BMP as described in Chapter 4 and/or Appendix E of the BMP Design Manual. Discussion / justification is not required.
- "No" means the BMP is applicable to the project but it is not feasible to implement. Discussion / justification must be provided.
- "N/A" means the BMP is not applicable at the project site because the project does not include the feature that is addressed by the BMP (e.g., the project site has no existing natural areas to conserve). Discussion / justification may be provided.

A site map with implemented site design BMPs must be included at the end of this checklist.

Site Design Requirement	Applied?		
4.3.1 Maintain Natural Drainage Pathways and Hydrologic Features	☑ Yes	☐ No	☐ N/A
Discussion / justification if 4.3.1 not implemented:			
1-1 Are existing natural drainage pathways and hydrologic features mapped on the site map?	☑ Yes	☐ No	☐ N/A
1-2 Are trees implemented? If yes, are they shown on the site map?	☐ Yes	☑ No	☐ N/A
1-3 Implemented trees meet the design criteria in 4.3.1 Fact Sheet (e.g. soil volume, maximum credit, etc.)?	☐ Yes	☐ No	☑ N/A
1-4 Is tree credit volume calculated using Appendix B.2.2.1 and SD-1 Fact Sheet in Appendix E?	☐ Yes	☐ No	☑ N/A
4.3.2 Have natural areas, soils and vegetation been conserved?	☑ Yes	☐ No	☐ N/A
Discussion / justification if 4.3.2 not implemented:			

Project Name: Emerald Hills

Form I-5B Page 2 of 4			
Site Design Requirement	**Applied?**		
4.3.3 Minimize Impervious Area	☑ Yes	☐ No	☐ N/A
Discussion / justification if 4.3.3 not implemented:			
4.3.4 Minimize Soil Compaction	☑ Yes	☐ No	☐ N/A
Discussion / justification if 4.3.4 not implemented:			
4.3.5 Impervious Area Dispersion	☑ Yes	☐ No	☐ N/A
Discussion / justification if 4.3.5 not implemented:			
5-1 Is the pervious area receiving runon from impervious area identified on the site map?	☐ Yes	☑ No	☐ N/A
5-2 Does the pervious area satisfy the design criteria in 4.3.5 Fact Sheet in Appendix E (e.g. maximum slope, minimum length, etc.)	☐ Yes	☑ No	☐ N/A
5-3 Is impervious area dispersion credit volume calculated using Appendix B.2.1.1 and 4.3.5 Fact Sheet in Appendix E?	☐ Yes	☑ No	☐ N/A

Project Name: Emerald Hills

Form I-5B Page 3 of 4			
Site Design Requirement	**Applied?**		
4.3.6 Runoff Collection	☑ Yes	☐ No	☐ N/A
Discussion / justification if 4.3.6 not implemented:			
6a-1 Are green roofs implemented in accordance with design criteria in 4.3.6A Fact Sheet? If yes, are they shown on the site map?	☐ Yes	☑ No	☐ N/A
6a-2 Is the green roof credit volume calculated using Appendix B.2.1.2 and 4.3.6A Fact Sheet in Appendix E?	☐ Yes	☑ No	☐ N/A
6b-1 Are permeable pavements implemented in accordance with design criteria in 4.3.6B Fact Sheet? If yes, are they shown on the site map?	☐ Yes	☑ No	☐ N/A
6b-2 Is the permeable pavement credit volume calculated using Appendix B.2.1.3 and 4.3.6B Fact Sheet in Appendix E?	☐ Yes	☑ No	☐ N/A
4.3.7 Landscaping with Native or Drought Tolerant Species	☑ Yes	☐ No	☐ N/A
Discussion / justification if 4.3.7 not implemented:			
4.3.8 Harvest and Use Precipitation	☐ Yes	☐ No	☑ N/A
Discussion / justification if 4.3.8 not implemented:			
8-1 Are rain barrels implemented in accordance with design criteria in 4.3.8 Fact Sheet? If yes, are they shown on the site map?	☐ Yes	☐ No	☑ N/A
8-2 Is the rain barrel credit volume calculated using Appendix B.2.2.2 and 4.3.8 Fact Sheet in Appendix E?	☐ Yes	☐ No	☑ N/A

Project Name: Emerald Hills

Form I-5B Page 4 of 4

Insert Site Map with all site design BMPs identified:

Please see attached DMA map on sheet 53

Project Name: Emerald Hills

Summary of PDP Structural BMPs	Form I-6

PDP Structural BMPs

All PDPs must implement structural BMPs for storm water pollutant control (see Chapter 5 of the BMP Design Manual, Part 1 of Storm Water Standards). 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 includes requiring the project owner or project owner's representative to certify construction of the structural BMPs (complete Form DS-563). PDP structural BMPs must be maintained into perpetuity (see Chapter 7 of the BMP 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 (page 3 of this form) 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 or separate.

STEP 1:
1a: After delineating the DMAs, break down pervious and impervious area.
1b: DCV for all other DMAs were calculated using worksheet B.2-1 or B.5.1
STEP 2:
2a: Harvest and use is infeasible according to Form I-7.
STEP 3:
3a: Using Form I-8 to conduct a prelim feasibility screening determined that no infiltration to be feasible.
3b: Biofiltration BMP and Proprietary Biofiltration BMPs chosen.
3c: Worksheets B.5-1 were used to size the Biofiltration BMPs.
3d: Worksheets B.6-1 were used to calculate treatment flow rates and size the Proprietary Biofiltration BMPs.
STEP 4:
4a: Proposed BMPs fit minimum footprint required. Project meets pollutant control standards.
STEP 5:
5a: N/A
STEP 6: SWQMP prepared as step 6.
STEP 7:Maintenance agreements associated with this project are also attached in this SWQMP.

(Continue on page 2 as necessary.)

Project Name: Emerald Hills

Form I-6 Page 2 of

(Continued from page 1)

Project Name: Emerald Hills

Form I-6 Page of (Copy as many as needed)	
Structural BMP Summary Information	
Structural BMP ID No. BF-2-1	
Construction Plan Sheet No.	
Type of Structural BMP: ☐ Retention by harvest and use (e.g. HU-1, cistern) ☐ 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 with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below) ☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below) ☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below) ☐ Detention pond or vault for hydromodification management ☐ Other (describe in discussion section below)	
Purpose: ☐ Pollutant control only ☐ Hydromodification control only ◉ Combined pollutant control and hydromodification control ☐ Pre-treatment/forebay for another structural BMP ☐ Other (describe in discussion section below)	
Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563	EOW for the project at the time of construction
Who will be the final owner of this BMP?	HOA (privately owned)
Who will maintain this BMP into perpetuity?	HOA (privately owned)
What is the funding mechanism for maintenance?	HOA dues

Project Name: Emerald Hills

Form I-6 Page of (Copy as many as needed)
Structural BMP ID No. BF-2-1
Construction Plan Sheet No.
Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs):

Project Name: Emerald Hills

Form I-6 Page of (Copy as many as needed)	
Structural BMP Summary Information	
Structural BMP ID No. BF-2-2	
Construction Plan Sheet No.	
Type of Structural BMP: ☐ Retention by harvest and use (e.g. HU-1, cistern) ☐ 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 with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below) ☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below) ☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below) ☐ Detention pond or vault for hydromodification management ☐ Other (describe in discussion section below)	
Purpose: ☐ Pollutant control only ☐ Hydromodification control only ● Combined pollutant control and hydromodification control ☐ Pre-treatment/forebay for another structural BMP ☐ Other (describe in discussion section below)	
Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563	EOW for the project at the time of construction
Who will be the final owner of this BMP?	HOA (privately owned)
Who will maintain this BMP into perpetuity?	HOA (privately owned)
What is the funding mechanism for maintenance?	HOA dues

Project Name: Emerald Hills

Form I-6 Page of (Copy as many as needed)
Structural BMP ID No. BF-2-2
Construction Plan Sheet No.
Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs):

Project Name: Emerald Hills

Form I-6 Page of (Copy as many as needed)	
Structural BMP Summary Information	
Structural BMP ID No. BF-2-3	
Construction Plan Sheet No.	
Type of Structural BMP: ☐ Retention by harvest and use (e.g. HU-1, cistern) ☐ 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 with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below) ☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below) ☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below) ☐ Detention pond or vault for hydromodification management ☐ Other (describe in discussion section below)	
Purpose: ☐ Pollutant control only ☐ Hydromodification control only ● Combined pollutant control and hydromodification control ☐ Pre-treatment/forebay for another structural BMP ☐ Other (describe in discussion section below)	
Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563	EOW for the project at the time of construction
Who will be the final owner of this BMP?	HOA (privately owned)
Who will maintain this BMP into perpetuity?	HOA (privately owned)
What is the funding mechanism for maintenance?	HOA dues

Project Name: Emerald Hills

Form I-6 Page of (Copy as many as needed)
Structural BMP ID No. BF-2-3
Construction Plan Sheet No.
Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs):

Project Name: Emerald Hills

Form I-6 Page of (Copy as many as needed)	
Structural BMP Summary Information	
Structural BMP ID No. BF-3-4	
Construction Plan Sheet No.	
Type of Structural BMP: ☐ Retention by harvest and use (e.g. HU-1, cistern) ☐ 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 with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below) ☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below) ☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below) ☐ Detention pond or vault for hydromodification management ☐ Other (describe in discussion section below)	
Purpose: ☑ Pollutant control only ☐ Hydromodification control only ☐ Combined pollutant control and hydromodification control ☐ Pre-treatment/forebay for another structural BMP ☐ Other (describe in discussion section below)	
Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563	EOW for the project at the time of construction
Who will be the final owner of this BMP?	HOA (privately owned)
Who will maintain this BMP into perpetuity?	HOA (privately owned)
What is the funding mechanism for maintenance?	HOA dues

Project Name: Emerald Hills

Form I-6 Page of (Copy as many as needed)
Structural BMP ID No. BF-3-4
Construction Plan Sheet No.
Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs):

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Attachment 1
Backup For PDP Pollutant Control BMPs

This is the cover sheet for Attachment 1.

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Project Name: Emerald Hills

Indicate which Items are Included:

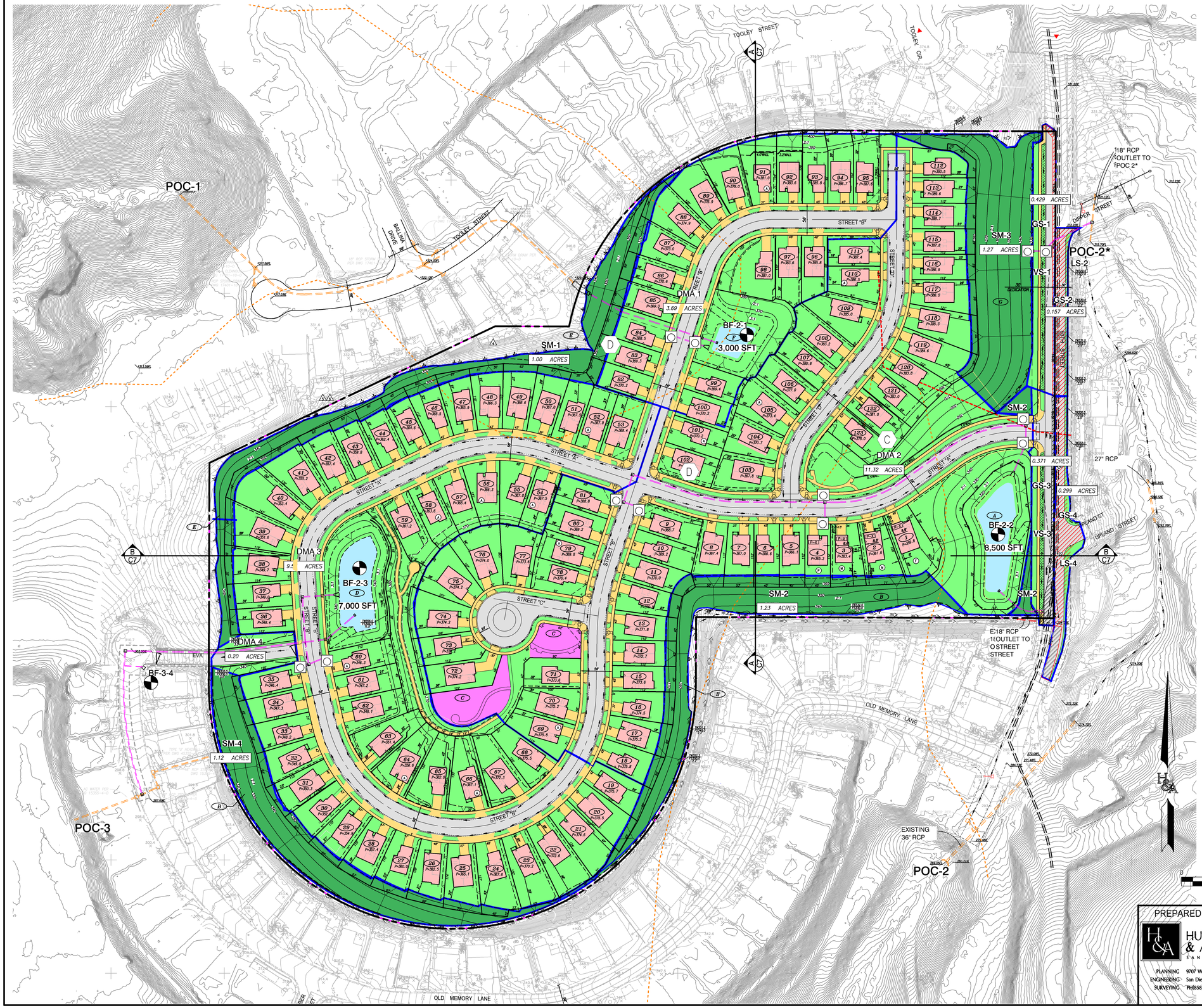
Attachment Sequence	Contents	Checklist
Attachment 1a	DMA Exhibit (Required) See DMA Exhibit Checklist.	◉ Included
Attachment 1b	Tabular Summary of DMAs Showing DMA ID matching DMA Exhibit, DMA Area, and DMA Type (Required)* *Provide table in this Attachment OR on DMA Exhibit in Attachment 1a	◉ Included on DMA Exhibit in Attachment 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	Infiltration Feasibility Information. Contents of Attachment 1d depend on the infiltration condition: • No Infiltration Condition: ○ Infiltration Feasibility Condition Letter (***Note: must be stamped and signed by licensed geotechnical engineer***) ○ Form I-8A (optional) ○ Form I-8B (optional) • Partial Infiltration Condition: ○ Infiltration Feasibility Condition Letter (***Note: must be stamped and signed by licensed geotechnical engineer***) ○ Form I-8A ○ Form I-8B • Full Infiltration Condition: ○ Form I-8A ○ Form I-8B ○ Worksheet C.4-3 ○ Form I-9 Refer to Appendices C and D of the BMP Design Manual for guidance.	◉ 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 and site design credit calculations	◉ Included

Project Name: Emerald Hills

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

The DMA Exhibit must identify:

- [x] Underlying hydrologic soil group
- [x] Approximate depth to groundwater
- [x] Existing natural hydrologic features (watercourses, seeps, springs, wetlands)
- [ ] Critical coarse sediment yield areas to be protected
- [x] Existing topography and impervious areas
- [x] Existing and proposed site drainage network and connections to drainage offsite
- [x] Proposed grading
- [x] Proposed impervious features
- [x] Proposed design features and surface treatments used to minimize imperviousness
- [x] 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)
- [x] Potential pollutant source areas and corresponding required source controls (see Chapter 4, Appendix E.1, and Form I-3B)
- [x] Structural BMPs (identify location, type of BMP, size/detail, and include cross-section)



LEGEND:

	SYMBOL:
PROJECT BOUNDARY	
DMA BOUNDARY	
DAYLIGHT	
PROPOSED STORM DRAIN	
EXISTING STORM DRAIN	
FLOW LINE	
SUBAREA ACREAGE	00.00 ACRES
DMA ICON	DMA 1
IMPERVIOUS - ROAD	
IMPERVIOUS - ROOF	
IMPERVIOUS - SIDEWALK. AN ADDITIONAL 120 SFT IS INCLUDED FOR EACH DRIVEWAY TO ACCOUNT FOR THE CONNECTION TO THE ROAD.	
OPEN SPACE (30% IMPERVIOUSNESS)	
LANDSCAPE AREA_PERVIOUS AREAS	
SELF-MITIGATING AREA - PERVIOUS AREA	
BASIN BOTTOM AREA	
INLET	
HYDROLOGIC SOIL TYPE	D
POINT OF COMPLIANCE	X
STRUCTURAL BMP	
HYDROLOGIC SOIL GROUP BOUNDARY	
EXISITING IMPERVIOUS TO BE REPLACED WITH PERVIOUS	
EXISITNG IMPERVIOUS TO BE RESURFACED| REPLACED	
EXISTING IMPERVIOUS TO NOT BE DISTURBED	
GREEN STREET SWALE	

SITE DESIGN BMPs:

SD-1 MAINTAIN NATURAL HYDROLOGIC FEATURES
SD-2 CONSERVE NATURAL AREAS, SOILS, VEGETATION
SD-3 MINIMIZE IMPERVIOUS AREAS
SD-4 MINIMIZE SOIL COMPACTION
SD-5 IMPERVIOUS AREA DISPERSION
SD-6 RUNOFF COLLECTION
SD-7 LANDSCAPING WITH NATIVE OR DROUGHT TOLERANT SPECIES

SOURCE CONTROL BMPs:

SC-1 PREVENTION OF ILLICIT DISCHARGES TO MS4
SC-2 STORM DRAIN STENCILING OR SIGNAGE
SC-6 ADDITIONAL BMPS BASED ON POTENTIAL SOURCES OF RUNOFF POLLUTANTS
SC-6A ON-SITE STORM DRAIN INLETS
SC-6E LANDSCAPE/OUTDOOR PESTICIDE USE
SC-6P MISCELLANEOUS DRAIN OR WASH WATER
SC-6Q PLAZAS, SIDEWALKS, AND PARKING LOTS

UNDERLYING SOIL GROUP : C & D
APPROXIMATE DEPTH TO GROUNDWATER > 20'
NO CRITICAL COARSE AREAS REQUIRE PRESERVATION

PREPARED BY:

HUNSAKER & ASSOCIATES SAN DIEGO, INC
PLANNING 9707 Waples Street
ENGINEERING San Diego, Ca 92121
SURVEYING PH(858)558-4500- FX(858)558-1414

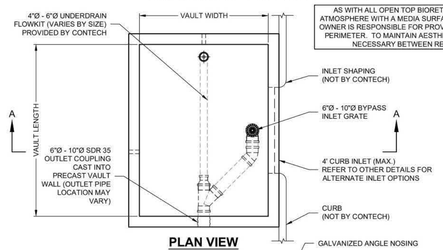
DMA MAP
EMERALD HILLS
CITY OF SAN DIEGO, CALIFORNIA

MAP 1 OF 1

W.O.#

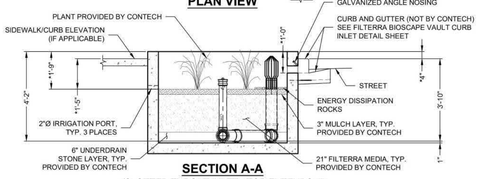
R:\1671\Hyd\SWQMP\CAD\1671 $DMA.dwg Jun-07-2024:16:31

DIMENSIONS PRECEDED BY " * " ARE CRITICAL AND MAY NOT BE MODIFIED WITHOUT CONSULTING CONTECH



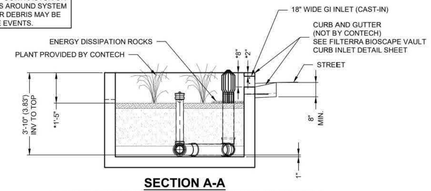
PLAN VIEW

AS WITH ALL OPEN TOP BIORETENTION SYSTEMS, FILTERRA BIOSCAPE IS OPEN TO THE ATMOSPHERE WITH A MEDIA SURFACE RECESSED BELOW FINISHED GRADE. CONTRACTOR OR OWNER IS RESPONSIBLE FOR PROVIDING ANY REQUIRED SAFETY MEASURES AROUND SYSTEM PERIMETER. TO MAINTAIN AESTHETICS, REMOVAL OF HEAVY STORMWATER DEBRIS MAY BE NECESSARY BETWEEN REGULAR FILTERRA SYSTEM MAINTENANCE EVENTS.



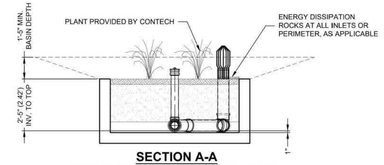
SECTION A-A

(SLOTTED THROAT INLET - TOP EXTENDS 4" ABOVE CURB FOR ADJACENT SIDEWALKS)



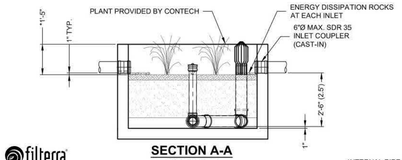
SECTION A-A

GREEN INFRASTRUCTURE INLET - TOP FLUSH WITH TOP OF CURB, NOT INTENDED FOR SIDEWALK APPLICATIONS



SECTION A-A

BASIN - CURB INLET OR PIPE INLETS OPTIONAL



SECTION A-A

PIPE INLET

INTERNAL PIPE CONFIGURATION MAY VARY DEPENDING ON VAULT SIZE.

FTBSVIB CONFIGURATION

(OPTIONS: BASIN "-B", GREEN INFRASTRUCTURE INLET "-I", PIPE INLET "-P", SLOTTED THROAT INLET "-T")

MEDIA BAY SIZE	VAULT SIZE (L x W)	LONG SIDE INLET DESIGNATION	SHORT SIDE INLET DESIGNATION	AVAILABILITY	MAX. OUTLET / BYPASS PIPE DIA.	MAX. BYPASS FLOW (CFS)	UNDERDRAIN PIPE DIA. (PERF)	MIN. NO. OF INLET PIPES (-P ONLY)
4 x 4	4 x 4	FTBSVIB0404	FTBSVIB0404	ALL	6" SDR 35	1.42	4" SDR 35	1
6 x 4	6 x 4	FTBSVIB0604	FTBSVIB0406	N/A CA	8" SDR 35	1.89	4" SDR 35	1
6.5 x 4	6.5 x 4	FTBSVIB06504	FTBSVIB0465	CA ONLY	8" SDR 35	1.89	4" SDR 35	1
7.83 x 4.5	7.83 x 4.5	FTBSVIB078045	FTBSVIB045078	DE,MD,NJ,PA,VA,WV ONLY	8" SDR 35	1.89	4" SDR 35	1
8 x 4	8 x 4	FTBSVIB0804	FTBSVIB0408	N/A DE,MD,NJ,PA,VA,WV	8" SDR 35	1.89	4" SDR 35	1
6 x 6	6 x 6	FTBSVIB0606	FTBSVIB0606	ALL	8" SDR 35	1.89	4" SDR 35	1
8 x 6	8 x 6	FTBSVIB0806	FTBSVIB0608	ALL	10" SDR 35	2.37	4" SDR 35	1
10 x 6	10 x 6	FTBSVIB1006	FTBSVIB0610	ALL	10" SDR 35	2.37	6" SDR 35	2
12 x 6	12 x 6	FTBSVIB1206	FTBSVIB0612	ALL	10" SDR 35	2.37	6" SDR 35	2
13 x 7	13 x 7	FTBSVIB1307	FTBSVIB0713	ALL	10" SDR 35	2.37	6" SDR 35	2
14 x 8	14 x 8	FTBSVIB1408[1]	N/A	ALL	10" SDR 35	2.37	6" SDR 35	3
16 x 8	16 x 8	FTBSVIB1608[1]	N/A	N/A OR, WA	10" SDR 35	2.37	6" SDR 35	3
15 x 9	15 x 9	FTBSVIB1509[1]	N/A	OR, WA ONLY	10" SDR 35	2.37	6" SDR 35	3
18 x 8	18 x 8	FTBSVIB1808[1]	N/A	CALL CONTECH	10" SDR 35	2.37	6" SDR 35	3
20 x 8	20 x 8	FTBSVIB2008[1]	N/A	CALL CONTECH	10" SDR 35	2.37	6" SDR 35	4
22 x 8	22 x 8	FTBSVIB2208[1]	N/A	CALL CONTECH	10" SDR 35	2.37	6" SDR 35	4

[1]UTILIZES (2) CURB OPENINGS WITH MIN 1' SPACING

N/A = NOT AVAILABLE

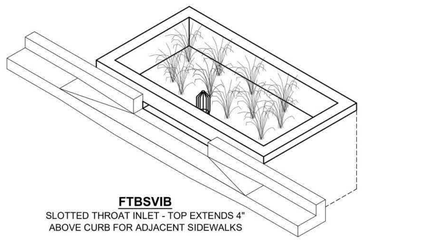
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FILTERRA BIOSCAPE VAULT INTERNAL BYPASS (FTBSVIB) CONFIGURATION DETAIL

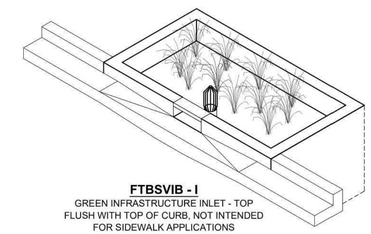
BF-3-4 FTBSIB-4-4

NOT TO SCALE



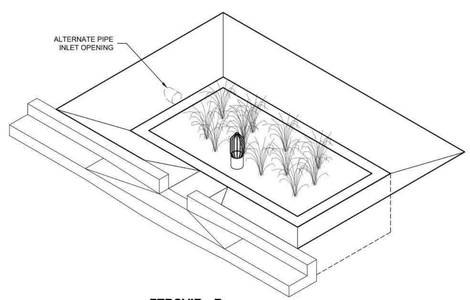
FTBSVIB

SLOTTED THROAT INLET - TOP EXTENDS 4" ABOVE CURB FOR ADJACENT SIDEWALKS



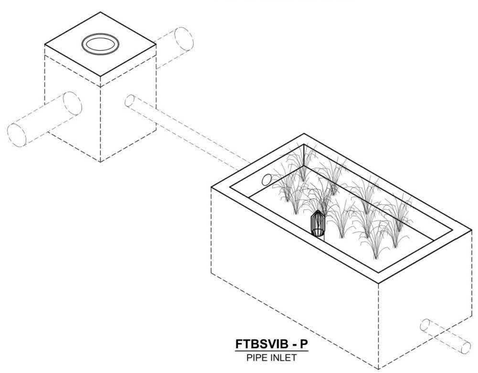
FTBSVIB - I

GREEN INFRASTRUCTURE INLET - TOP FLUSH WITH TOP OF CURB, NOT INTENDED FOR SIDEWALK APPLICATIONS



FTBSVIB - B

BASIN - CURB INLET OR PIPE INLET OPTIONAL



FTBSVIB - P

PIPE INLET

			DI 0.2	C 0.95	C 0.85	C 0.50
Available Filterra Box Sizes			Filterra	100%	Commercial	Residential
L (ft)	W (ft)	Filterra Surface Area (ft2)	Flow Rate, Q (ft3/sec)	Imperv. DA (acres)	max DA (acres)	max DA (acres)
4	4	16	0.0370	0.129	0.144	0.245

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FILTERRA BIOSCAPE VAULT INTERNAL BYPASS (FTBSVIB) SITE LAYOUTS

BF-3-4 FTBSIB-4-4

NOT TO SCALE

DMA SUMMARY (AREA BREAKDOWN)

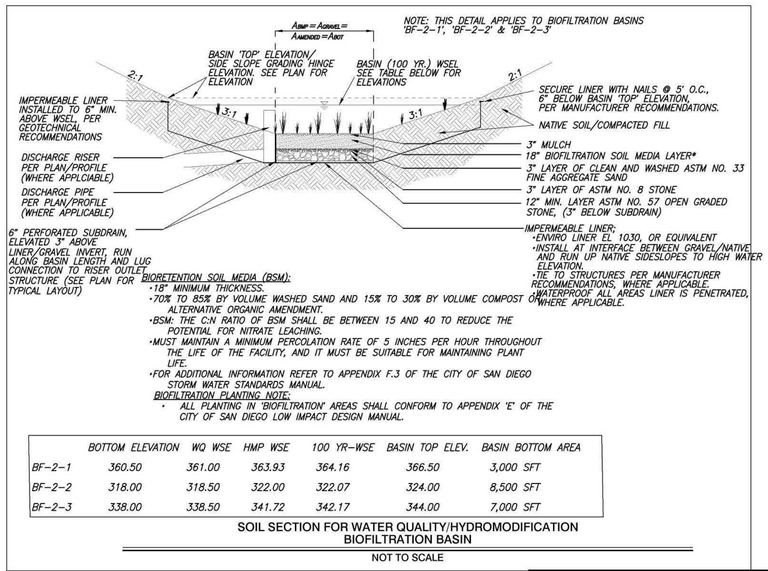
	Imp. RF	Pervious RF	% Imp	DMA 1 BASIN BF-2-1	Fraction of Total DCV	Imp Area	Pervious Area	Summation RF x A	DMA 2 BASIN BF-2-2	Fraction of Total DCV	Imp Area	Pervious Area	Summation RF x A
				(ac.)		(ac.)	(ac.)		(ac.)		(ac.)	(ac.)	
BASIN	0.90	0.10	0	0.07	0.01	0.00	0.07	0.01	0.20	0.00	0.00	0.20	0.02
LANDSCAPE AREA	0.90	0.10	0	1.59	0.08	0.00	1.59	0.16	4.74	0.08	0.00	4.74	0.47
RESIDENTIAL/PATIOS	0.90	0.30	100	1.11	0.50	1.11	0.00	1.00	3.17	0.47	3.17	0.00	2.85
ROAD	0.90	0.30	100	0.50	0.23	0.50	0.00	0.45	1.67	0.25	1.67	0.00	1.50
SIDEWALK\ DRIVEWAYS	0.90	0.30	100	0.42	0.19	0.42	0.00	0.38	1.24	0.18	1.24	0.00	1.12
OPEN SPACE	0.90	0.10	30	0.00	0.00	0.00	0.00	0.00	0.30	0.02	0.09	0.21	0.10
POC #				1					2				
				3.69	1.00	2.04	1.65	2.00	**11.32**	1.00	6.17	5.15	6.07
						55.2%	Weighted C =	**0.54**			54.5%	Weighted C =	**0.54**

	Imp. RF	Pervious RF	% Imp	DMA 3 BASIN BF-2-3	Fraction of Total DCV	Imp Area	Pervious Area	Summation RF x A	DMA 4 BF-3-4	Fraction of Total DCV	Imp Area	Pervious Area	Summation RF x A
				(ac.)		(ac.)	(ac.)		(ac.)		(ac.)	(ac.)	
BASIN	0.90	0.10	0	0.16	0.00	0.00	0.16	0.02	0.00	0.00	0.00	0.00	0.00
LANDSCAPE AREA	0.90	0.10	0	4.02	0.08	0.00	4.02	0.40	0.12	0.14	0.00	0.12	0.01
Roof\Patio	0.90	0.30	100	3.05	0.52	3.05	0.00	2.75	0.00	0.00	0.00	0.00	0.00
Road	0.90	0.30	100	1.18	0.20	1.18	0.00	1.06	0.08	0.86	0.08	0.00	0.07
SIDEWALK\ DRIVEWAYS	0.90	0.30	100	1.12	0.19	1.12	0.00	1.01	0.00	0.00	0.00	0.00	0.00
POC #				3					3				
				9.53	1.00	5.35	4.18	5.23	**0.20**	1.00	0.08	0.12	0.09
						56.1%	Weighted C =	**0.55**			40.2%	Weighted C =	**0.42**

	SM-2	SM-3	SM-4	SM-1
	(ac)	(ac)	(ac)	(ac)
BASIN	0.00	0.00	0.00	0.00
LANDSCAPE AREA	1.23	1.27	1.12	1.00
Roof\Patio	0.00	0.00	0.00	0.00
Road	0.00	0.00	0.00	0.00
SIDEWALK\ DRIVEWAYS	0.00	0.00	0.00	0.00
POC #	2	2	3	1
	1.23	**1.27**	**1.12**	**1.00**

Note: * 40% of the roof area has been added to the Roof\ Patio area to count for the future patio and flat work

**An additional 250 sft is included for each driveway to account for the connection to the road and walkways



	BOTTOM ELEVATION	WQ WSE	HMP WSE	100 YR-WSE	BASIN TOP ELEV.	BASIN BOTTOM AREA
BF-2-1	360.50	361.00	363.93	364.16	366.50	3,000 SFT
BF-2-2	318.00	318.50	322.00	322.07	324.00	8,500 SFT
BF-2-3	338.00	338.50	341.72	342.17	344.00	7,000 SFT

SOIL SECTION FOR WATER QUALITY/HYDROMODIFICATION BIOFILTRATION BASIN

NOT TO SCALE

PREPARED BY:

HUNSAKER & ASSOCIATES SAN DIEGO, INC

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

PROPOSED DMA MAP RENZULLI ESTATES

CITY OF SAN DIEGO, CALIFORNIA

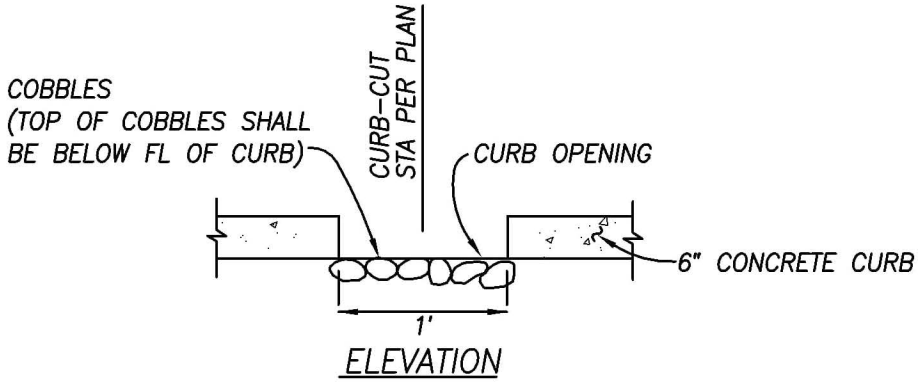
MAP 2 OF 2

W.O.# 3622-0022

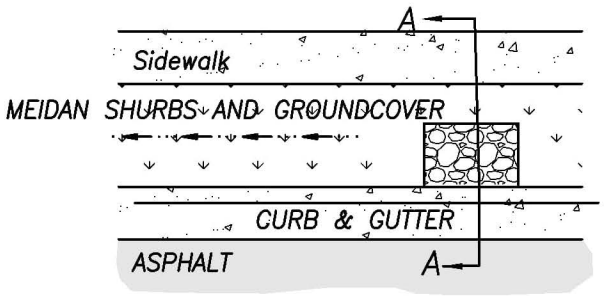
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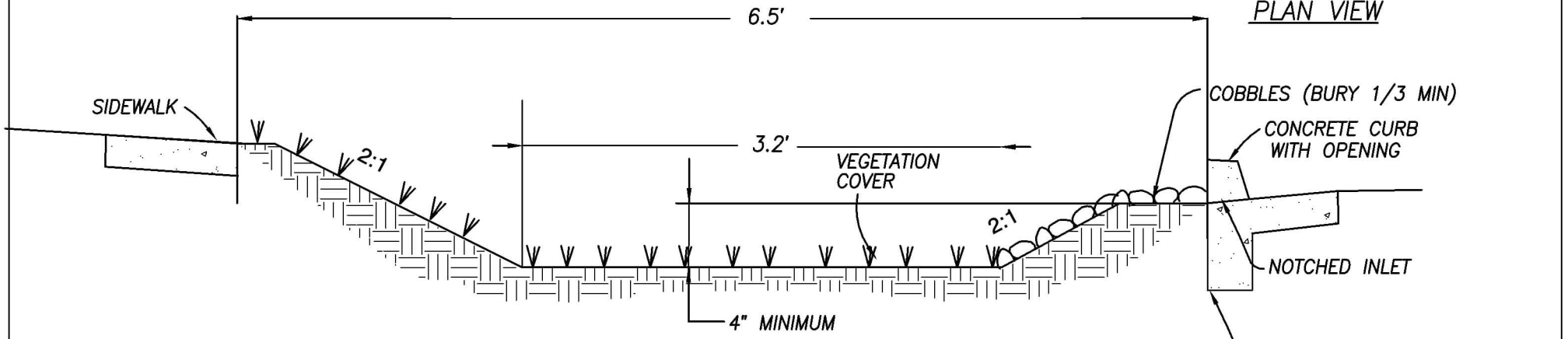
GREEN STREET DETAIL
CURB CUT WITH SWALE DETAIL



ELEVATION



PLAN VIEW



SECTION A–A

DETAIL–GREEN CURB–CUT

NOT TO SCALE

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Attachment 1c

Form I-7, Harvest and Use Feasibility Screening Checklist

Harvest and Use Feasibility Checklist	Worksheet B.3-1 : 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 hr toilet use per resident= 9.3 gal x 3 residents per unit x 123 units x 1.5 days = 5148 cft
688 cft, 36 hour landscape use/acre= 390 gls/ac x 11.96 ac= 4664.6 gals= 623.5 cf
Total anticipated 36 hr use = 1311.5 cft

3. Calculate the DCV using worksheet B-2.1.

DCV = 26,239 _____ (cubic feet)

[Provide a summary of calculations here]

0.25DCV = 6560 cubic feet

3a. Is the 36-hour demand greater than or equal to the DCV?	3b. Is the 36-hour demand greater than 0.25DCV but less than the full DCV?	3c. Is the 36-hour demand less than 0.25DCV?
☐ Yes ⇩ / ☑ No ⇨	☐ Yes ⇩ / ☑ No ⇨	☑ 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.

Attachment 1d
Infiltration Feasibility Condition Letter

GeoTek, Inc.
1384 Poinsettia Avenue, Suite A Vista, CA 92081-8505
(760) 599-0509 Office (760) 599-0593 Fax www.geotekusa.com

October 31, 2024
Project No. 3680-SD

D•R•Horton Los Angeles Holding Company, Inc.
2280 Wardlow Circle, Suite 100
Corona, California 92878

Attention: Dan Boyd

Subject: Infiltration Feasibility Condition Letter
Proposed Emerald Hills Development
North of Old Memory Lane
APN 543-340-02-00
San Diego, California

Dear Mr. Boyd,

In accordance with your request, we are providing this infiltration feasibility condition letter with respect to the proposed development at the subject site. This letter has been prepared in accordance with "The City of San Diego, Storm Water Standards" utilizing information provided in GeoTek's Preliminary Geotechnical Investigation, dated November 13, 2023. The following list provides the information requested in the "City of San Diego Storm Water Standards", Appendix C.1.1: Geotechnical and Investigation Requirements, Section C.1.1.

- The project is currently in the planning phase.
- The results of previous geotechnical analysis conducted in the project area are included in GeoTek's Preliminary Geotechnical Evaluation (GeoTek, 2023).
- The development status of the site is redevelopment of existing graded conditions to new grades.
- Design discussions regarding infiltration occurred in 2022 to the date of this report.
- Physical impairments for infiltration of stormwater that preclude full or partial infiltration include the presence of expansive onsite soils.
- Alternative designs have been considered, however locations without expansive soils cannot be determined.
- Site design BMP requirements were considered by the Civil Engineer in the overall design.

Conclusion

Based on the expansive soils of the site and the detrimental adverse impact of soil volume changes to movement sensitive structures, on-site storm water infiltration at the subject site is not recommended. A copy of the project's BMP DMA map provided by the project civil engineer was used as a base map and presented as Plate 1 Infiltration feasibility Map. The plate provides the locations of the proposed stormwater management basins, DMA Areas, and extent of expansive soils.

Closure

The opportunity to be of service is sincerely appreciated. If you should have any questions, please do not hesitate to call GeoTek.

Respectfully submitted,
GeoTek, Inc.





Christopher D. Livesey
CEG, 2733 Exp. 05/31/25
Vice President

Edwin R. Cunningham
RCE 81687, Exp. 03/31/26
Project Engineer

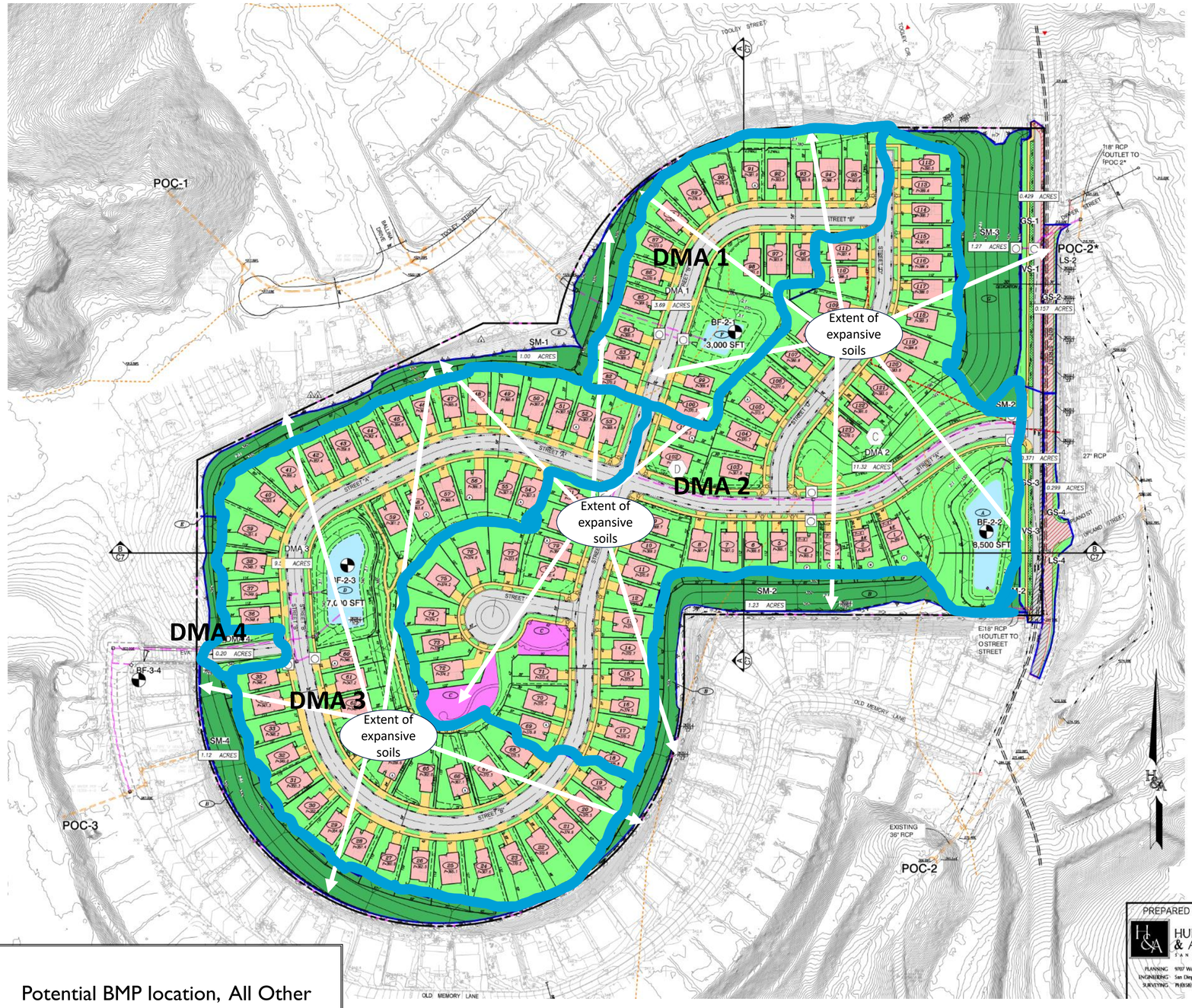
Enclosures: Appendix A – Select Laboratory Analysis Result
Plate 1 – Infiltration Feasibility Map

REFERENCES

GeoTek, Inc., In-house proprietary information.

Geotek, Inc. 2023, "Preliminary Geotechnical Evaluation, Proposed Emerald Hills Development, North of Old Memory Lane, APN 543-340-020-00, San Diego, California," GeoTek Project No. 3973-SD, dated November 13, 2023.

"City of San Diego Stormwater Standards" Effective date: August 15, 2024



LEGEND: SYMBOL:

- PROJECT BOUNDARY
- DMA BOUNDARY
- DAYLIGHT
- PROPOSED STORM DRAIN
- EXISTING STORM DRAIN
- FLOW LINE
- SUBAREA ACREAGE — 00.00 ACRES
- DMA ICON — DMA 1
- IMPERVIOUS - ROAD
- IMPERVIOUS - ROOF
- IMPERVIOUS - SIDEWALK
  AN ADDITIONAL 120 SFT IS INCLUDED FOR EACH DRIVEWAY TO ACCOUNT FOR THE CONNECTION TO THE ROAD.
- OPEN SPACE (30% IMPERVIOUSNESS)
- LANDSCAPE AREA_PERVIOUS AREAS
- SELF-MITIGATING AREA - PERVIOUS AREA
- BASIN BOTTOM AREA
- INLET
- HYDROLOGIC SOIL TYPE — D
- POINT OF COMPLIANCE — X
- STRUCTURAL BMP
- HYDROLOGIC SOIL GROUP BOUNDARY
- EXISITING IMPERVIOUS TO BE REPLACED WITH LANDSCAPE
- EXISITNG IMPERVIOUS TO BE RESURFACED| REPLACED
- EXISTING IMPERVIOUS TO NOT BE DISTURBED
- GREEN STREET SWALE

SITE DESIGN BMPs:

SD-1 MAINTAIN NATURAL HYDROLOGIC FEATURES
SD-2 CONSERVE NATURAL AREAS, SOILS, VEGETATION
SD-3 MINIMIZE IMPERVIOUS AREAS
SD-4 MINIMIZE SOIL COMPACTION
SD-5 IMPERVIOUS AREA DISPERSION
SD-6 RUNOFF COLLECTION
SD-7 LANDSCAPING WITH NATIVE OR DROUGHT TOLERANT SPECIES

SOURCE CONTROL BMPs:

SC-1 PREVENTION OF ILLICIT DISCHARGES TO MS4
SC-2 STORM DRAIN STENCILING OR SIGNAGE
SC-6 ADDITIONAL BMPS BASED ON POTENTIAL SOURCES OF RUNOFF POLLUTANTS
- SC-6A ON-SITE STORM DRAIN INLETS
- SC-6E LANDSCAPE/OUTDOOR PESTICIDE USE
- SC-6P MISCELLANEOUS DRAIN OR WASH WATER
- SC-6Q PLAZAS, SIDEWALKS, AND PARKING LOTS

UNDERLYING SOIL GROUP : C & D
APPROXIMATE DEPTH TO GROUNDWATER > 20'
NO CRITICAL COARSE AREAS REQUIRE PRESERVATION

PREPARED BY:
HUNSAKER & ASSOCIATES SAN DIEGO, INC
PLANNING ENGINEERING SURVEYING
9707 Waples Street San Diego, Ca 92121 PH(858)558-4500 FX(858)558-1414

DMA MAP
EMERALD HILLS
CITY OF SAN DIEGO, CALIFORNIA

MAP 1 OF 1

Legend

- Potential BMP location, All Other Areas Were Considered, and Partial/Full Infiltration Cannot be Performed.
- Extent of Expansive Soils (Extent of expansive soils)
- DMA Boundary

Single-Family Residential Development

Figure Adapted from *Site Plan (2023)*, Hunsaker & Associates

DR Horton
Emerald Hills
San Diego, California

PN: 3680-SD | *October, 2024*

Plate 1

Geotechnical Map

GEOTEK
1384 Poinsettia Avenue, Suite A
Vista, California 92081

Appendix A

Select Laboratory Analysis Results

GEOTEK

EXPANSION INDEX TEST

(ASTM D4829)

Project Name:	Emeral Hills	***Tested/ Checked By:***	***KP*** Lab No 3795
Project Number:	3680-SD	***Date Tested:***	10/3/2022
Project Location:	San Diego, CA	***Sample Source:***	TP-8 BB-1
		Sample Description:	Dark Brown Silty Sand

Ring Id: 12 Ring Dia. " : 4" Ring H 1"

Loading weight: 5516. grams

DENSITY DETERMINATION

A	Weight of compacted sample & ring	**764**
B	Weight of ring	370
C	Net weight of sample	394
D	Wet Density, lb / ft3 (C*0.3016)	118.8
E	Dry Density, lb / ft3 (D/1.F)	**107.7**

SATURATION DETERMINATION

	Wet Weight of sample & tare	**127.9**
	Dry Weight of sample & tare	**116.4**
	Tare	**4.8**
F	Initial Moisture Content, %	**10.3**
G	(E*F)	1110.1
H	(E/167.232)	0.64
I	(1.-H)	0.36
J	(62.4*I)	22.2
K	(G/J)= **L** % Saturation	**50.0**

READINGS			
DATE	TIME	READING	
10/3/2022	9:01	137	Initial
	9:11	137	10 min/Dry
	9:13	141	1 min/Wet
	9:18	147	5 min/Wet
10/4/2022	8:40	162	Random
	8:50	162	Final

FINAL MOISTURE			
Weight of wet sample & tare	Wt. of dry sample & tare	Tare	% Moisture
270	236	4.8	14.7%

EXPANSION INDEX = 25

Attachment 1d

Form I-8, Categorization of Infiltration Feasibility Condition

DMA Lot A

GEOTEK

Worksheet C.4-1: Categorization of Infiltration Feasibility Condition Based on Geotechnical Conditions[9]

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions	Worksheet C.4-1: Form I-8A[10]
Part 1 - Full Infiltration Feasibility Screening Criteria	
DMA(s) Being Analyzed: Lot "A"	Project Phase: Design
Test Borings P-4 and P-5	
Criteria 1: Infiltration Rate Screening	
1A	Is the mapped hydrologic soil group according to the NRCS Web Soil Survey or UC Davis Soil Web Mapper Type A or B and corroborated by available site soil data[11]? ☐ Yes; the DMA may feasibly support full infiltration. Answer "Yes" to Criteria 1 Result or continue to Step 1B if the applicant elects to perform infiltration testing. ☐ No; the mapped soil types are A or B but is not corroborated by available site soil data (continue to Step 1B). ☒ No; the mapped soil types are C, D, or "urban/unclassified" and is corroborated by available site soil data. Answer "No" to Criteria 1 Result. ☐ No; the mapped soil types are C, D, or "urban/unclassified" but is not corroborated by available site soil data (continue to Step 1B).
1B	Is the reliable infiltration rate calculated using planning phase methods from Table D.3-1? ☐ Yes; Continue to Step 1C. ☐ No; Skip to Step 1D.
1C	Is the reliable infiltration rate calculated using planning phase methods from Table D.3-1 greater than 0.5 inches per hour? ☐ Yes; the DMA may feasibly support full infiltration. Answer "Yes" to Criteria 1 Result. ☐ No; full infiltration is not required. Answer "No" to Criteria 1 Result.
1D	**Infiltration Testing Method.** Is the selected infiltration testing method suitable during the design phase (see Appendix D.3)? Note: Alternative testing standards may be allowed with appropriate rationales and documentation. ☐ Yes; continue to Step 1E. ☐ No; select an appropriate infiltration testing method.

[9] Note that it is not required to investigate each and every criterion in the worksheet, a single "no" answer in Part 1, Part 2, Part 3, or Part 4 determines a full, partial, or no infiltration condition.

[10] This form must be completed each time there is a change to the site layout that would affect the infiltration feasibility condition. Previously completed forms shall be retained to document the evolution of the site stormwater design.

[11] Available data includes site-specific sampling or observation of soil types or texture classes, such as obtained from borings or test pits necessary to support other design elements.

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions	Worksheet C.4-1: Form I-8A[10]
1E	**Number of Percolation/Infiltration Tests.** Does the infiltration testing method performed satisfy the minimum number of tests specified in Table D.3-2? ☐ Yes; continue to Step 1F. ☐ No; conduct appropriate number of tests.
IF	**Factor of Safety.** Is the suitable Factor of Safety selected for full infiltration design? See guidance in D.5; Tables D.5-1 and D.5-2; and Worksheet D.5-1 (Form I-9). ☐ Yes; continue to Step 1G. ☐ No; select appropriate factor of safety.
1G	**Full Infiltration Feasibility.** Is the average measured infiltration rate divided by the Factor of Safety greater than 0.5 inches per hour? ☐ Yes; answer "Yes" to Criteria 1 Result. ☐ No; answer "No" to Criteria 1 Result.
Criteria 1 Result	Is the estimated reliable infiltration rate greater than 0.5 inches per hour within the DMA where runoff can reasonably be routed to a BMP? ☐ Yes; the DMA may feasibly support full infiltration. Continue to Criteria 2. ☒ No; full infiltration is not required. Skip to Part 1 Result.

Summarize infiltration testing methods, testing locations, replicates, and results and summarize estimates of reliable infiltration rates according to procedures outlined in D.5. Documentation should be included in project geotechnical report.

Falling head percolation test borings were analyzed for infiltration rates based on the Porchet method. Test locations are presented on GeoTek's "Geotechnical Stormwater Evaluation, Proposed Emerald Hills Development, North of Old Memory Lane, APN 543-340-02-00, San Diego, California" Project Number 3680-SD, dated February 6, 2024.

Reliable infiltration rates for the purposes of stormwater filtration design may use 0.09 inches per hour and is less than 0.5 inches per hour.

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[10]	
2C	**Mitigation Measures.** Propose mitigation measures for each geologic/geotechnical hazard identified in Step 2B. Provide a discussion of geologic/geotechnical hazards that would prevent full infiltration BMPs that cannot be reasonably mitigated in the geotechnical report. See Appendix C.2.1.8 for a list of typically reasonable and typically unreasonable mitigation measures. Can mitigation measures be proposed to allow for full infiltration BMPs? If the question in Step 2 is answered "Yes," then answer "Yes" to Criteria 2 Result. If the question in Step 2C is answered "No," then answer "No" to Criteria 2 Result.	☐ Yes	☐ No
Criteria 2 Result	Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of geologic or geotechnical hazards that cannot be reasonably mitigated to an acceptable level?	☐ Yes	☒ No

Summarize findings and basis; provide references to related reports or exhibits.

Falling head percolation test borings were analyzed for infiltration rates based on the Porchet method. Test locations are presented on GeoTek's "Geotechnical Stormwater Evaluation, Proposed Emerald Hills Development, North of Old Memory Lane, APN 543-340-02-00, San Diego, California" Project Number 3680-SD, dated February 6, 2024.

Reliable infiltration rate of 0.09 inches per hour is present and less than 0.5 inches per hour.

Part 1 Result – Full Infiltration Geotechnical Screening [12]	Result
If answers to both Criteria 1 and Criteria 2 are "Yes", a full infiltration design is potentially feasible based on Geotechnical conditions only. If either answer to Criteria 1 or Criteria 2 is "No", a full infiltration design is not required.	☐ Full infiltration Condition ☒ Complete Part 2

[12] To be completed using gathered site information and best professional judgement considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by City Engineer to substantiate findings.

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[10]
Part 2 – Partial vs. No Infiltration Feasibility Screening Criteria		
DMA(s) Being Analyzed: Lot "A"		Project Phase: Design
Test Borings P-4 and P-5		
Criteria 3 : Infiltration Rate Screening		
3A	**NRCS Type C, D, or "urban/unclassified":** Is the mapped hydrologic soil group according to the NRCS Web Soil Survey or UC Davis Soil Web Mapper is Type C, D, or "urban/unclassified" and corroborated by available site soil data? ☐ Yes; the site is mapped as C soils and a reliable infiltration rate of 0.15 in/hr. is used to size partial infiltration BMPS. Answer "Yes" to Criteria 3 Result. ☒ Yes; the site is mapped as D soils or "urban/unclassified" and a reliable infiltration rate of 0.05 in/hr. is used to size partial infiltration BMPS. Answer "Yes" to Criteria 3 Result. ☐ No; infiltration testing is conducted (refer to Table D.3-1), continue to Step 3B.	
3B	**Infiltration Testing Result:** Is the reliable infiltration rate (i.e. average measured infiltration rate/2) greater than 0.05 in/hr. and less than or equal to 0.5 in/hr? ☒ Yes; the site may support partial infiltration. Answer "Yes" to Criteria 3 Result. ☐ No; the reliable infiltration rate (i.e. average measured rate/2) is less than 0.05 in/hr., partial infiltration is not required. Answer "No" to Criteria 3 Result.	
Criteria 3 Result	Is the estimated reliable infiltration rate (i.e., average measured infiltration rate/2) greater than or equal to 0.05 inches/hour and less than or equal to 0.5 inches/hour at any location within each DMA where runoff can reasonably be routed to a BMP? ☒ Yes; Continue to Criteria 4. ☐ No: Skip to Part 2 Result.	

Summarize infiltration testing and/or mapping results (i.e. soil maps and series description used for infiltration rate).

Falling head percolation test borings were analyzed for infiltration rates based on the Porchet method. Test locations are presented on GeoTek's "Geotechnical Stormwater Evaluation, Proposed Emerald Hills Development, North of Old Memory Lane, APN 543-340-02-00, San Diego, California" Project Number 3680-SD, dated February 6, 2024.

Reliable infiltration rates for the purposes of stormwater filtration design may use 0.10 inches per hour.

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[10]	
Criteria 4: Geologic/Geotechnical Screening			
4A	If all questions in Step 4A are answered "Yes," continue to Step 2B. For any "No" answer in Step 4A answer "No" to Criteria 4 Result, and submit an "Infiltration Feasibility Condition Letter" that meets the requirements in Appendix C.1.1. The geologic/geotechnical analyses listed in Appendix C.2.1 do not apply to the DMA because one of the following setbacks cannot be avoided and therefore result in the DMA being in a no infiltration condition. The setbacks must be the closest horizontal radial distance from the surface edge (at the overflow elevation) of the BMP.		
4A-1	Can the proposed partial infiltration BMP(s) avoid areas with existing fill materials greater than 5 feet thick?	☒ Yes	☐ No
4A-2	Can the proposed partial infiltration BMP(s) avoid placement within 10 feet of existing underground utilities, structures, or retaining walls?	☒ Yes	☐ No
4A-3	Can the proposed partial infiltration BMP(s) avoid placement within 50 feet of a natural slope (>25%) or within a distance of 1.5H from fill slopes where H is the height of the fill slope?	☒ Yes	☐ No
4B	When full infiltration is determined to be feasible, a geotechnical investigation report must be prepared that considers the relevant factors identified in Appendix C.2.1 If all questions in Step 4B are answered "Yes," then answer "Yes" to Criteria 4 Result. If there are any "No" answers continue to Step 4C.		
4B-1	**Hydroconsolidation.** Analyze hydroconsolidation potential per approved ASTM standard due to a proposed full infiltration BMP. Can partial infiltration BMPs be proposed within the DMA without increasing hydroconsolidation risks?	☐ Yes	☐ No
4B-2	**Expansive Soils.** Identify expansive soils (soils with an expansion index greater than 20) and the extent of such soils due to proposed full infiltration BMPs. Can partial infiltration BMPs be proposed within the DMA without increasing expansive soil risks?	☐ Yes	☒ No
4B-3	**Liquefaction**. If applicable, identify mapped liquefaction areas. Evaluate liquefaction hazards in accordance with Section 6.4.2 of the City of San Diego's Guidelines for Geotechnical Reports (2011). Liquefaction hazard assessment shall take into account any increase in groundwater elevation or groundwater mounding that could occur as a result of proposed infiltration or percolation facilities. Can partial infiltration BMPs be proposed within the DMA without increasing liquefaction risks?	☐ Yes	☐ No

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[10]	
4B-4	**Slope Stability**. If applicable, perform a slope stability analysis in accordance with the ASCE and Southern California Earthquake Center (2002) Recommended Procedures for Implementation of DMG Special Publication 117, Guidelines for Analyzing and Mitigating Landslide Hazards in California to determine minimum slope setbacks for full infiltration BMPs. See the City of San Diego's Guidelines for Geotechnical Reports (2011) to determine which type of slope stability analysis is required. Can partial infiltration BMPs be proposed within the DMA without increasing slope stability risks?	☐ Yes	☐ No
4B-5	**Other Geotechnical Hazards.** Identify site-specific geotechnical hazards not already mentioned (refer to Appendix C.2.1). Can partial infiltration BMPs be proposed within the DMA without increasing risk of geologic or geotechnical hazards not already mentioned?	☐ Yes	☐ No
4B-6	**Setbacks.** Establish setbacks from underground utilities, structures, and/or retaining walls. Reference applicable ASTM or other recognized standard in the geotechnical report. Can partial infiltration BMPs be proposed within the DMA using recommended setbacks from underground utilities, structures, and/or retaining walls?	☐ Yes	☐ No
4C	**Mitigation Measures.** Propose mitigation measures for each geologic/geotechnical hazard identified in Step 4B. Provide a discussion on geologic/geotechnical hazards that would prevent partial infiltration BMPs that cannot be reasonably mitigated in the geotechnical report. See Appendix C.2.1.8 for a list of typically reasonable and typically unreasonable mitigation measures. Can mitigation measures be proposed to allow for partial infiltration BMPs? If the question in Step 4C is answered "Yes," then answer "Yes" to Criteria 4 Result. If the question in Step 4C is answered "No," then answer "No" to Criteria 4 Result.	☐ Yes	☐ No
Criteria 4 Result	Can infiltration of greater than or equal to 0.05 inches/hour and less than or equal to 0.5 inches/hour be allowed without increasing the risk of geologic or geotechnical hazards that cannot be reasonably mitigated to an acceptable level?	☐ Yes	☒ No

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions	Worksheet C.4-1: Form I-8A[10]
Summarize findings and basis; provide references to related reports or exhibits. Falling head percolation test borings were analyzed for infiltration rates based on the Porchet method. Test locations are presented on GeoTek's "Geotechnical Stormwater Evaluation, Proposed Emerald Hills Development, North of Old Memory Lane, APN 543-340-02-00, San Diego, California" Project Number 3680-SD, dated February 6, 2024. Expansive soils are present on the site. Concentrated infiltration of surface waters is not recommended.	

Part 2 – Partial Infiltration Geotechnical Screening Result[13]	Result
If answers to both Criteria 3 and Criteria 4 are "Yes", a partial infiltration design is potentially feasible based on geotechnical conditions only. If answers to either Criteria 3 or Criteria 4 is "No", then infiltration of any volume is considered to be infeasible within the site.	☐ Partial Infiltration Condition ☒ No Infiltration Condition

[13] To be completed using gathered site information and best professional judgement considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by City Engineer to substantiate findings.

DMA Lot C

GEOTEK

Worksheet C.4-1: Categorization of Infiltration Feasibility Condition Based on Geotechnical Conditions[9]

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions	Worksheet C.4-1: Form I-8A[10]
Part 1 - Full Infiltration Feasibility Screening Criteria	
DMA(s) Being Analyzed: Lot C	Project Phase: Design
Test Borings P-8 and P-9	
Criteria 1: Infiltration Rate Screening	
1A	Is the mapped hydrologic soil group according to the NRCS Web Soil Survey or UC Davis Soil Web Mapper Type A or B and corroborated by available site soil data[11]? ☐ Yes; the DMA may feasibly support full infiltration. Answer "Yes" to Criteria 1 Result or continue to Step 1B if the applicant elects to perform infiltration testing. ☐ No; the mapped soil types are A or B but is not corroborated by available site soil data (continue to Step 1B). ☒ No; the mapped soil types are C, D, or "urban/unclassified" and is corroborated by available site soil data. Answer "No" to Criteria 1 Result. ☐ No; the mapped soil types are C, D, or "urban/unclassified" but is not corroborated by available site soil data (continue to Step 1B).
1B	Is the reliable infiltration rate calculated using planning phase methods from Table D.3-1? ☒ Yes; Continue to Step 1C. ☐ No; Skip to Step 1D.
1C	Is the reliable infiltration rate calculated using planning phase methods from Table D.3-1 greater than 0.5 inches per hour? ☐ Yes; the DMA may feasibly support full infiltration. Answer "Yes" to Criteria 1 Result. ☒ No; full infiltration is not required. Answer "No" to Criteria 1 Result.
1D	**Infiltration Testing Method.** Is the selected infiltration testing method suitable during the design phase (see Appendix D.3)? Note: Alternative testing standards may be allowed with appropriate rationales and documentation. ☐ Yes; continue to Step 1E. ☐ No; select an appropriate infiltration testing method.

[9] Note that it is not required to investigate each and every criterion in the worksheet, a single "no" answer in Part 1, Part 2, Part 3, or Part 4 determines a full, partial, or no infiltration condition.

[10] This form must be completed each time there is a change to the site layout that would affect the infiltration feasibility condition. Previously completed forms shall be retained to document the evolution of the site stormwater design.

[11] Available data includes site-specific sampling or observation of soil types or texture classes, such as obtained from borings or test pits necessary to support other design elements.

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions	Worksheet C.4-1: Form I-8A[10]
1E	**Number of Percolation/Infiltration Tests.** Does the infiltration testing method performed satisfy the minimum number of tests specified in Table D.3-2? ☐ Yes; continue to Step 1F. ☐ No; conduct appropriate number of tests.
IF	**Factor of Safety.** Is the suitable Factor of Safety selected for full infiltration design? See guidance in D.5; Tables D.5-1 and D.5-2; and Worksheet D.5-1 (Form I-9). ☐ Yes; continue to Step 1G. ☐ No; select appropriate factor of safety.
1G	**Full Infiltration Feasibility.** Is the average measured infiltration rate divided by the Factor of Safety greater than 0.5 inches per hour? ☐ Yes; answer "Yes" to Criteria 1 Result. ☐ No; answer "No" to Criteria 1 Result.
Criteria 1 Result	Is the estimated reliable infiltration rate greater than 0.5 inches per hour within the DMA where runoff can reasonably be routed to a BMP? ☐ Yes; the DMA may feasibly support full infiltration. Continue to Criteria 2. ☒ No; full infiltration is not required. Skip to Part 1 Result.

Summarize infiltration testing methods, testing locations, replicates, and results and summarize estimates of reliable infiltration rates according to procedures outlined in D.5. Documentation should be included in project geotechnical report.

Falling head percolation test borings were analyzed for infiltration rates based on the Porchet method. Test locations are presented on GeoTek's "Geotechnical Stormwater Evaluation, Proposed Emerald Hills Development, North of Old Memory Lane, APN 543-340-02-00, San Diego, California" Project Number 3680-SD, dated February 6, 2024.

Reliable infiltration rates for the purposes of stormwater filtration design may use 0.08 inches per hour and is less than 0.5 inches per hour.

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[10]	
2C	**Mitigation Measures.** Propose mitigation measures for each geologic/geotechnical hazard identified in Step 2B. Provide a discussion of geologic/geotechnical hazards that would prevent full infiltration BMPs that cannot be reasonably mitigated in the geotechnical report. See Appendix C.2.1.8 for a list of typically reasonable and typically unreasonable mitigation measures. Can mitigation measures be proposed to allow for full infiltration BMPs? If the question in Step 2 is answered "Yes," then answer "Yes" to Criteria 2 Result. If the question in Step 2C is answered "No," then answer "No" to Criteria 2 Result.	☐ Yes	☐ No
Criteria 2 Result	Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of geologic or geotechnical hazards that cannot be reasonably mitigated to an acceptable level?	☐ Yes	☒ No

Summarize findings and basis; provide references to related reports or exhibits.

Falling head percolation test borings were analyzed for infiltration rates based on the Porchet method. Test locations are presented on GeoTek's "Geotechnical Stormwater Evaluation, Proposed Emerald Hills Development, North of Old Memory Lane, APN 543-340-02-00, San Diego, California" Project Number 3680-SD, dated February 6, 2024.

Reliable infiltration rates for the purposes of stormwater filtration design is less than 0.05 inches per hour.

Part 1 Result – Full Infiltration Geotechnical Screening [12]	Result
If answers to both Criteria 1 and Criteria 2 are "Yes", a full infiltration design is potentially feasible based on Geotechnical conditions only. If either answer to Criteria 1 or Criteria 2 is "No", a full infiltration design is not required.	☐ Full infiltration Condition ☒ Complete Part 2

[12] To be completed using gathered site information and best professional judgement considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by City Engineer to substantiate findings.

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[10]
Part 2 – Partial vs. No Infiltration Feasibility Screening Criteria		
DMA(s) Being Analyzed: Lot "C"		Project Phase: Design
Test Borings P-8 and P-9		
Criteria 3 : Infiltration Rate Screening		
3A	**NRCS Type C, D, or "urban/unclassified":** Is the mapped hydrologic soil group according to the NRCS Web Soil Survey or UC Davis Soil Web Mapper is Type C, D, or "urban/unclassified" and corroborated by available site soil data? ☐ Yes; the site is mapped as C soils and a reliable infiltration rate of 0.15 in/hr. is used to size partial infiltration BMPS. Answer "Yes" to Criteria 3 Result. ☒ Yes; the site is mapped as D soils or "urban/unclassified" and a reliable infiltration rate of 0.05 in/hr. is used to size partial infiltration BMPS. Answer "Yes" to Criteria 3 Result. ☐ No; infiltration testing is conducted (refer to Table D.3-1), continue to Step 3B.	
3B	**Infiltration Testing Result:** Is the reliable infiltration rate (i.e. average measured infiltration rate/2) greater than 0.05 in/hr. and less than or equal to 0.5 in/hr? ☒ Yes; the site may support partial infiltration. Answer "Yes" to Criteria 3 Result. ☐ No; the reliable infiltration rate (i.e. average measured rate/2) is less than 0.05 in/hr., partial infiltration is not required. Answer "No" to Criteria 3 Result.	
Criteria 3 Result	Is the estimated reliable infiltration rate (i.e., average measured infiltration rate/2) greater than or equal to 0.05 inches/hour and less than or equal to 0.5 inches/hour at any location within each DMA where runoff can reasonably be routed to a BMP? ☒ Yes; Continue to Criteria 4. ☐ No: Skip to Part 2 Result.	

Summarize infiltration testing and/or mapping results (i.e. soil maps and series description used for infiltration rate).

Falling head percolation test borings were analyzed for infiltration rates based on the Porchet method. Test locations are presented on GeoTek's "Geotechnical Stormwater Evaluation, Proposed Emerald Hills Development, North of Old Memory Lane, APN 543-340-02-00, San Diego, California" Project Number 3680-SD, dated February 6, 2024.

Reliable infiltration rates for the purposes of stormwater filtration design may use 0.08 inches per hour.

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[10]	
Criteria 4: Geologic/Geotechnical Screening			
4A	If all questions in Step 4A are answered "Yes," continue to Step 2B. For any "No" answer in Step 4A answer "No" to Criteria 4 Result, and submit an "Infiltration Feasibility Condition Letter" that meets the requirements in Appendix C.1.1. The geologic/geotechnical analyses listed in Appendix C.2.1 do not apply to the DMA because one of the following setbacks cannot be avoided and therefore result in the DMA being in a no infiltration condition. The setbacks must be the closest horizontal radial distance from the surface edge (at the overflow elevation) of the BMP.		
4A-1	Can the proposed partial infiltration BMP(s) avoid areas with existing fill materials greater than 5 feet thick?	☒ Yes	☐ No
4A-2	Can the proposed partial infiltration BMP(s) avoid placement within 10 feet of existing underground utilities, structures, or retaining walls?	☒ Yes	☐ No
4A-3	Can the proposed partial infiltration BMP(s) avoid placement within 50 feet of a natural slope (>25%) or within a distance of 1.5H from fill slopes where H is the height of the fill slope?	☒ Yes	☐ No
4B	When full infiltration is determined to be feasible, a geotechnical investigation report must be prepared that considers the relevant factors identified in Appendix C.2.1 If all questions in Step 4B are answered "Yes," then answer "Yes" to Criteria 4 Result. If there are any "No" answers continue to Step 4C.		
4B-1	**Hydroconsolidation.** Analyze hydroconsolidation potential per approved ASTM standard due to a proposed full infiltration BMP. Can partial infiltration BMPs be proposed within the DMA without increasing hydroconsolidation risks?	☐ Yes	☐ No
4B-2	**Expansive Soils.** Identify expansive soils (soils with an expansion index greater than 20) and the extent of such soils due to proposed full infiltration BMPs. Can partial infiltration BMPs be proposed within the DMA without increasing expansive soil risks?	☐ Yes	☒ No
4B-3	**Liquefaction**. If applicable, identify mapped liquefaction areas. Evaluate liquefaction hazards in accordance with Section 6.4.2 of the City of San Diego's Guidelines for Geotechnical Reports (2011). Liquefaction hazard assessment shall take into account any increase in groundwater elevation or groundwater mounding that could occur as a result of proposed infiltration or percolation facilities. Can partial infiltration BMPs be proposed within the DMA without increasing liquefaction risks?	☐ Yes	☐ No

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[10]	
4B-4	**Slope Stability**. If applicable, perform a slope stability analysis in accordance with the ASCE and Southern California Earthquake Center (2002) Recommended Procedures for Implementation of DMG Special Publication 117, Guidelines for Analyzing and Mitigating Landslide Hazards in California to determine minimum slope setbacks for full infiltration BMPs. See the City of San Diego's Guidelines for Geotechnical Reports (2011) to determine which type of slope stability analysis is required. Can partial infiltration BMPs be proposed within the DMA without increasing slope stability risks?	☐ Yes	☐ No
4B-5	**Other Geotechnical Hazards.** Identify site-specific geotechnical hazards not already mentioned (refer to Appendix C.2.1). Can partial infiltration BMPs be proposed within the DMA without increasing risk of geologic or geotechnical hazards not already mentioned?	☐ Yes	☐ No
4B-6	**Setbacks.** Establish setbacks from underground utilities, structures, and/or retaining walls. Reference applicable ASTM or other recognized standard in the geotechnical report. Can partial infiltration BMPs be proposed within the DMA using recommended setbacks from underground utilities, structures, and/or retaining walls?	☐ Yes	☐ No
4C	**Mitigation Measures.** Propose mitigation measures for each geologic/geotechnical hazard identified in Step 4B. Provide a discussion on geologic/geotechnical hazards that would prevent partial infiltration BMPs that cannot be reasonably mitigated in the geotechnical report. See Appendix C.2.1.8 for a list of typically reasonable and typically unreasonable mitigation measures. Can mitigation measures be proposed to allow for partial infiltration BMPs? If the question in Step 4C is answered "Yes," then answer "Yes" to Criteria 4 Result. If the question in Step 4C is answered "No," then answer "No" to Criteria 4 Result.	☐ Yes	☐ No
Criteria 4 Result	Can infiltration of greater than or equal to 0.05 inches/hour and less than or equal to 0.5 inches/hour be allowed without increasing the risk of geologic or geotechnical hazards that cannot be reasonably mitigated to an acceptable level?	☐ Yes	☒ No

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions	Worksheet C.4-1: Form I-8A[10]
Summarize findings and basis; provide references to related reports or exhibits. Falling head percolation test borings were analyzed for infiltration rates based on the Porchet method. Test locations are presented on GeoTek's "Geotechnical Stormwater Evaluation, Proposed Emerald Hills Development, North of Old Memory Lane, APN 543-340-02-00, San Diego, California" Project Number 3680-SD, dated February 6, 2024. Expansive soils are present on the site. Concentrated infiltration of surface waters is not recommended	

Part 2 – Partial Infiltration Geotechnical Screening Result[13]	Result
If answers to both Criteria 3 and Criteria 4 are "Yes", a partial infiltration design is potentially feasible based on geotechnical conditions only. If answers to either Criteria 3 or Criteria 4 is "No", then infiltration of any volume is considered to be infeasible within the site.	☐ Partial Infiltration Condition ☒ No Infiltration Condition

[13] To be completed using gathered site information and best professional judgement considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by City Engineer to substantiate findings.

DMA Lot D

GEOTEK

Worksheet C.4-1: Categorization of Infiltration Feasibility Condition Based on Geotechnical Conditions[9]

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[10]
Part 1 - Full Infiltration Feasibility Screening Criteria		
DMA(s) Being Analyzed: Lot D		Project Phase: Design
Test Borings P-6 and P-7		
Criteria 1: Infiltration Rate Screening		
1A	Is the mapped hydrologic soil group according to the NRCS Web Soil Survey or UC Davis Soil Web Mapper Type A or B and corroborated by available site soil data[11]? ☐ Yes; the DMA may feasibly support full infiltration. Answer "Yes" to Criteria 1 Result or continue to Step 1B if the applicant elects to perform infiltration testing. ☐ No; the mapped soil types are A or B but is not corroborated by available site soil data (continue to Step 1B). ☒ No; the mapped soil types are C, D, or "urban/unclassified" and is corroborated by available site soil data. Answer "No" to Criteria 1 Result. ☐ No; the mapped soil types are C, D, or "urban/unclassified" but is not corroborated by available site soil data (continue to Step 1B).	
1B	Is the reliable infiltration rate calculated using planning phase methods from Table D.3-1? ☒ Yes; Continue to Step 1C. ☐ No; Skip to Step 1D.	
1C	Is the reliable infiltration rate calculated using planning phase methods from Table D.3-1 greater than 0.5 inches per hour? ☐ Yes; the DMA may feasibly support full infiltration. Answer "Yes" to Criteria 1 Result. ☒ No; full infiltration is not required. Answer "No" to Criteria 1 Result.	
1D	**Infiltration Testing Method.** Is the selected infiltration testing method suitable during the design phase (see Appendix D.3)? Note: Alternative testing standards may be allowed with appropriate rationales and documentation. ☐ Yes; continue to Step 1E. ☐ No; select an appropriate infiltration testing method.	

[9] Note that it is not required to investigate each and every criterion in the worksheet, a single "no" answer in Part 1, Part 2, Part 3, or Part 4 determines a full, partial, or no infiltration condition.

[10] This form must be completed each time there is a change to the site layout that would affect the infiltration feasibility condition. Previously completed forms shall be retained to document the evolution of the site stormwater design.

[11] Available data includes site-specific sampling or observation of soil types or texture classes, such as obtained from borings or test pits necessary to support other design elements.

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions	Worksheet C.4-1: Form I-8A[10]
1E	**Number of Percolation/Infiltration Tests.** Does the infiltration testing method performed satisfy the minimum number of tests specified in Table D.3-2? ☐ Yes; continue to Step 1F. ☐ No; conduct appropriate number of tests.
IF	**Factor of Safety.** Is the suitable Factor of Safety selected for full infiltration design? See guidance in D.5; Tables D.5-1 and D.5-2; and Worksheet D.5-1 (Form I-9). ☐ Yes; continue to Step 1G. ☐ No; select appropriate factor of safety.
1G	**Full Infiltration Feasibility.** Is the average measured infiltration rate divided by the Factor of Safety greater than 0.5 inches per hour? ☐ Yes; answer "Yes" to Criteria 1 Result. ☐ No; answer "No" to Criteria 1 Result.
Criteria 1 Result	Is the estimated reliable infiltration rate greater than 0.5 inches per hour within the DMA where runoff can reasonably be routed to a BMP? ☐ Yes; the DMA may feasibly support full infiltration. Continue to Criteria 2. ☒ No; full infiltration is not required. Skip to Part 1 Result.

Summarize infiltration testing methods, testing locations, replicates, and results and summarize estimates of reliable infiltration rates according to procedures outlined in D.5. Documentation should be included in project geotechnical report.

Falling head percolation test borings were analyzed for infiltration rates based on the Porchet method. Test locations are presented on GeoTek's "Geotechnical Stormwater Evaluation, Proposed Emerald Hills Development, North of Old Memory Lane, APN 543-340-02-00, San Diego, California" Project Number 3680-SD, dated February 6, 2024.

Reliable infiltration rates for the purposes of stormwater filtration design may use 0.04 inches per hour.

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[10]	
2C	**Mitigation Measures.** Propose mitigation measures for each geologic/geotechnical hazard identified in Step 2B. Provide a discussion of geologic/geotechnical hazards that would prevent full infiltration BMPs that cannot be reasonably mitigated in the geotechnical report. See Appendix C.2.1.8 for a list of typically reasonable and typically unreasonable mitigation measures. Can mitigation measures be proposed to allow for full infiltration BMPs? If the question in Step 2 is answered "Yes," then answer "Yes" to Criteria 2 Result. If the question in Step 2C is answered "No," then answer "No" to Criteria 2 Result.	☐ Yes	☐ No
Criteria 2 Result	Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of geologic or geotechnical hazards that cannot be reasonably mitigated to an acceptable level?	☐ Yes	☒ No

Summarize findings and basis; provide references to related reports or exhibits.

Falling head percolation test borings were analyzed for infiltration rates based on the Porchet method. Test locations are presented on GeoTek's "Geotechnical Stormwater Evaluation, Proposed Emerald Hills Development, North of Old Memory Lane, APN 543-340-02-00, San Diego, California" Project Number 3680-SD, dated February 6, 2024.

Reliable infiltration rates for the purposes of stormwater filtration design is less than 0.04 inches per hour.

Part 1 Result – Full Infiltration Geotechnical Screening [12]	Result
If answers to both Criteria 1 and Criteria 2 are "Yes", a full infiltration design is potentially feasible based on Geotechnical conditions only. If either answer to Criteria 1 or Criteria 2 is "No", a full infiltration design is not required.	☐ Full infiltration Condition ☒ Complete Part 2

[12] To be completed using gathered site information and best professional judgement considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by City Engineer to substantiate findings.

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[10]
Part 2 – Partial vs. No Infiltration Feasibility Screening Criteria		
DMA(s) Being Analyzed: Lot "D"		Project Phase: Design
Test Borings P-6 and P-7		
Criteria 3 : Infiltration Rate Screening		
3A	**NRCS Type C, D, or "urban/unclassified":** Is the mapped hydrologic soil group according to the NRCS Web Soil Survey or UC Davis Soil Web Mapper is Type C, D, or "urban/unclassified" and corroborated by available site soil data? ☐ Yes; the site is mapped as C soils and a reliable infiltration rate of 0.15 in/hr. is used to size partial infiltration BMPS. Answer "Yes" to Criteria 3 Result. ☒ Yes; the site is mapped as D soils or "urban/unclassified" and a reliable infiltration rate of 0.05 in/hr. is used to size partial infiltration BMPS. Answer "Yes" to Criteria 3 Result. ☐ No; infiltration testing is conducted (refer to Table D.3-1), continue to Step 3B.	
3B	**Infiltration Testing Result:** Is the reliable infiltration rate (i.e. average measured infiltration rate/2) greater than 0.05 in/hr. and less than or equal to 0.5 in/hr? ☐ Yes; the site may support partial infiltration. Answer "Yes" to Criteria 3 Result. ☒ No; the reliable infiltration rate (i.e. average measured rate/2) is less than 0.05 in/hr., partial infiltration is not required. Answer "No" to Criteria 3 Result.	
Criteria 3 Result	Is the estimated reliable infiltration rate (i.e., average measured infiltration rate/2) greater than or equal to 0.05 inches/hour and less than or equal to 0.5 inches/hour at any location within each DMA where runoff can reasonably be routed to a BMP? ☐ Yes; Continue to Criteria 4. ☒ No: Skip to Part 2 Result.	
Summarize infiltration testing and/or mapping results (i.e. soil maps and series description used for infiltration rate). Falling head percolation test borings were analyzed for infiltration rates based on the Porchet method. Test locations are presented on GeoTek's "Geotechnical Stormwater Evaluation, Proposed Emerald Hills Development, North of Old Memory Lane, APN 543-340-02-00, San Diego, California" Project Number 3680-SD, dated February 6, 2024. Reliable infiltration rates for the purposes of stormwater filtration design may use 0.04 inches per hour and is less than 0.05 inches per hour.		

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[10]	
Criteria 4: Geologic/Geotechnical Screening			
4A	If all questions in Step 4A are answered "Yes," continue to Step 2B. For any "No" answer in Step 4A answer "No" to Criteria 4 Result, and submit an "Infiltration Feasibility Condition Letter" that meets the requirements in Appendix C.1.1. The geologic/geotechnical analyses listed in Appendix C.2.1 do not apply to the DMA because one of the following setbacks cannot be avoided and therefore result in the DMA being in a no infiltration condition. The setbacks must be the closest horizontal radial distance from the surface edge (at the overflow elevation) of the BMP.		
4A-1	Can the proposed partial infiltration BMP(s) avoid areas with existing fill materials greater than 5 feet thick?	☒ Yes	☐ No
4A-2	Can the proposed partial infiltration BMP(s) avoid placement within 10 feet of existing underground utilities, structures, or retaining walls?	☒ Yes	☐ No
4A-3	Can the proposed partial infiltration BMP(s) avoid placement within 50 feet of a natural slope (>25%) or within a distance of 1.5H from fill slopes where H is the height of the fill slope?	☒ Yes	☐ No
4B	When full infiltration is determined to be feasible, a geotechnical investigation report must be prepared that considers the relevant factors identified in Appendix C.2.1 If all questions in Step 4B are answered "Yes," then answer "Yes" to Criteria 4 Result. If there are any "No" answers continue to Step 4C.		
4B-1	**Hydroconsolidation.** Analyze hydroconsolidation potential per approved ASTM standard due to a proposed full infiltration BMP. Can partial infiltration BMPs be proposed within the DMA without increasing hydroconsolidation risks?	☐ Yes	☐ No
4B-2	**Expansive Soils.** Identify expansive soils (soils with an expansion index greater than 20) and the extent of such soils due to proposed full infiltration BMPs. Can partial infiltration BMPs be proposed within the DMA without increasing expansive soil risks?	☐ Yes	☒ No
4B-3	**Liquefaction**. If applicable, identify mapped liquefaction areas. Evaluate liquefaction hazards in accordance with Section 6.4.2 of the City of San Diego's Guidelines for Geotechnical Reports (2011). Liquefaction hazard assessment shall take into account any increase in groundwater elevation or groundwater mounding that could occur as a result of proposed infiltration or percolation facilities. Can partial infiltration BMPs be proposed within the DMA without increasing liquefaction risks?	☐ Yes	☐ No

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[10]	
4B-4	**Slope Stability**. If applicable, perform a slope stability analysis in accordance with the ASCE and Southern California Earthquake Center (2002) Recommended Procedures for Implementation of DMG Special Publication 117, Guidelines for Analyzing and Mitigating Landslide Hazards in California to determine minimum slope setbacks for full infiltration BMPs. See the City of San Diego's Guidelines for Geotechnical Reports (2011) to determine which type of slope stability analysis is required. Can partial infiltration BMPs be proposed within the DMA without increasing slope stability risks?	☐ Yes	☐ No
4B-5	**Other Geotechnical Hazards.** Identify site-specific geotechnical hazards not already mentioned (refer to Appendix C.2.1). Can partial infiltration BMPs be proposed within the DMA without increasing risk of geologic or geotechnical hazards not already mentioned?	☐ Yes	☐ No
4B-6	**Setbacks.** Establish setbacks from underground utilities, structures, and/or retaining walls. Reference applicable ASTM or other recognized standard in the geotechnical report. Can partial infiltration BMPs be proposed within the DMA using recommended setbacks from underground utilities, structures, and/or retaining walls?	☐ Yes	☐ No
4C	**Mitigation Measures.** Propose mitigation measures for each geologic/geotechnical hazard identified in Step 4B. Provide a discussion on geologic/geotechnical hazards that would prevent partial infiltration BMPs that cannot be reasonably mitigated in the geotechnical report. See Appendix C.2.1.8 for a list of typically reasonable and typically unreasonable mitigation measures. Can mitigation measures be proposed to allow for partial infiltration BMPs? If the question in Step 4C is answered "Yes," then answer "Yes" to Criteria 4 Result. If the question in Step 4C is answered "No," then answer "No" to Criteria 4 Result.	☐ Yes	☐ No
Criteria 4 Result	Can infiltration of greater than or equal to 0.05 inches/hour and less than or equal to 0.5 inches/hour be allowed without increasing the risk of geologic or geotechnical hazards that cannot be reasonably mitigated to an acceptable level?	☐ Yes	☒ No

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions	Worksheet C.4-1: Form I-8A[10]
Summarize findings and basis; provide references to related reports or exhibits. Falling head percolation test borings were analyzed for infiltration rates based on the Porchet method. Test locations are presented on GeoTek's "Geotechnical Stormwater Evaluation, Proposed Emerald Hills Development, North of Old Memory Lane, APN 543-340-02-00, San Diego, California" Project Number 3680-SD, dated February 6, 2024. Reliable infiltration rate is 0.04 inches per hour and is less than 0.05 inches per hour. Expansive soils are also present on the site. Concentrated infiltration of surface waters is not recommended.	

Part 2 – Partial Infiltration Geotechnical Screening Result[13]	Result
If answers to both Criteria 3 and Criteria 4 are "Yes", a partial infiltration design is potentially feasible based on geotechnical conditions only. If answers to either Criteria 3 or Criteria 4 is "No", then infiltration of any volume is considered to be infeasible within the site.	☐ Partial Infiltration Condition ☒ No Infiltration Condition

[13] To be completed using gathered site information and best professional judgement considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by City Engineer to substantiate findings.

Attachment 1e

Pollutant Control BMP Design Worksheets/Calculations

Emerald Hills

Biofiltration BMP DMA Calculations

	Imp. ??	Perviou?s ??	? Imp	DMA 1 BASIN BF-2-1	?ration of ?otal DC?	Imp Area	Perviou?s Area	S?mmation ??? A
				?a?.?:		?a?.?:	?a?.?:	
?ASIN	0.?0	0.?0	0	0.0?	0.0?	0.00	0.0?	0.0?
?ANDSCAPE A?EA	0.?0	0.?0	0	?.5?	0.0?	0.00	?.5?	0.??
?ESIDEN?IA??PA?IDS	0.?0	0.30	?00	?.??	0.50	?.??	0.00	?.00
?OAD	0.?0	0.30	?00	0.50	0.23	0.50	0.00	0.45
SIDE? A??D??E? A?S	0.?0	0.30	?00	0.42	0.??	0.42	0.00	0.3?
OPEN SPACE	0.?0	0.?0	30	0.00	0.00	0.00	0.00	0.00
POC ?				?				
				3.69	?.00	2.04	?.?5	2.00
						55.2?	? eighted C ?	0.54

	Imp. ??	Perviou?s ??	? Imp	DMA 2 BASIN BF-2-2	?ration of ?otal DC?	Imp Area	Perviou?s Area	S?mmation ??? A
				?a?.?:		?a?.?:	?a?.?:	
?ASIN	0.?0	0.?0	0	0.20	0.00	0.00	0.20	0.02
?ANDSCAPE A?EA	0.?0	0.?0	0	4.?4	0.0?	0.00	4.?4	0.4?
?ESIDEN?IA??PA?IDS	0.?0	0.30	?00	3.??	0.4?	3.??	0.00	2.?5
?OAD	0.?0	0.30	?00	?.??	0.25	?.??	0.00	?.50
SIDE? A??D??E? A?S	0.?0	0.30	?00	?.24	0.??	?.24	0.00	?.?2
OPEN SPACE	0.?0	0.?0	30	0.30	0.02	0.0?	0.2?	0.?0
POC ?				2				
				11.32	?.00	?.??	5.?5	?.0?
						54.5?	? eighted C ?	0.54

	Imp. ??	Perviou?s ??	? Imp	DMA 3 BASIN BF-2-3	?ration of ?otal DC?	Imp Area	Perviou?s Area	S?mmation ??? A
				?a?.?:		?a?.?:	?a?.?:	
?ASIN	0.?0	0.?0	0	0.??	0.00	0.00	0.??	0.02
?ANDSCAPE A?EA	0.?0	0.?0	0	4.02	0.0?	0.00	4.02	0.40
?oof?Patio	0.?0	0.30	?00	3.05	0.52	3.05	0.00	2.?5
?oad	0.?0	0.30	?00	?.??	0.20	?.??	0.00	?.0?
SIDE? A??D??E? A?S	0.?0	0.30	?00	?.?2	0.??	?.?2	0.00	?.0?
POC ?				3				
				9.53	?.00	5.35	4.??	5.23
						5?.??	? eighted C ?	0.55

	Imp. ??	Perviou?s ??	? Imp	DMA 4 BF-3-4	?ration of ?otal DC?	Imp Area	Perviou?s Area	S?mmation ??? A
				?a?.?:		?a?.?:	?a?.?:	
?ASIN	0.?0	0.?0	0	0.00	0.00	0.00	0.00	0.00
?ANDSCAPE A?EA	0.?0	0.?0	0	0.?2	0.?4	0.00	0.?2	0.0?
?oof?Patio	0.?0	0.30	?00	0.00	0.00	0.00	0.00	0.00
?oad	0.?0	0.30	?00	0.0?	0.??	0.0?	0.00	0.0?
SIDE? A??D??E? A?S	0.?0	0.30	?00	0.00	0.00	0.00	0.00	0.00
POC ?				3				
				0.20	?.00	0.0?	0.?2	0.0?
						40.2?	? eighted C ?	0.42

	SM-2	SM-3	SM-4	SM-1
	?a?:	?a?:	?a?:	?a?:
?ASIN	0.00	0.00	0.00	0.00
?ANDSCAPE A?EA	?.23	?.2?	?.?2	?.00
?oof?Patio	0.00	0.00	0.00	0.00
?oad	0.00	0.00	0.00	0.00
SIDE? A??D??E? A?S	0.00	0.00	0.00	0.00
POC ?	2	2	3	?
	1.23	1.27	1.12	1.00

The City of SAN DIEGO	Project Name	Emerlad Hills	
	BMP ID	BF-2-1	
Sizing Method for Pollutant Removal Criteria		**Worksheet B.5-1**	
1	Area draining to the BMP	160884.77	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.54	
3	85th percentile 24-hour rainfall depth	0.54	inches
4	Design capture volume [Line 1 x Line 2 x (Line 3/12)]	3922	cu. ft.
BMP Parameters			
5	Surface ponding [6 inch minimum, 12 inch maximum]	6	inches
6	Media thickness [18 inches minimum], also add mulch layer and washed ASTM 33 fine aggregate sand thickness to this line for sizing calculations	24	inches
7	Aggregate storage (also add ASTM No 8 stone) above underdrain invert (12 inches typical) – use 0 inches if the aggregate is not over the entire bottom surface area	12	inches
8	Aggregate storage below underdrain invert (3 inches minimum) – use 0 inches if the aggregate is not over the entire bottom surface area	3	inches
9	Freely drained pore storage of the media	0.2	in/in
10	Porosity of aggregate storage	0.4	in/in
11	Media filtration rate to be used for sizing (maximum filtration rate of 5 in/hr. with no outlet control; if the filtration rate is controlled by the outlet use the outlet controlled rate (includes infiltration into the soil and flow rate through the outlet structure) which will be less than 5 in/hr.)	2.79605276	in/hr.
Baseline Calculations			
12	Allowable routing time for sizing	6	hours
13	Depth filtered during storm [Line 11 x Line 12]	16.77631656	inches
14	Depth of Detention Storage [Line 5 + (Line 6 x Line 9) + (Line 7 x Line 10) + (Line 8 x Line 10)]	16.8	inches
15	Total Depth Treated [Line 13 + Line 14]	33.57631656	inches
Option 1 – Biofilter 1.5 times the DCV			
16	Required biofiltered volume [1.5 x Line 4]	5883	cu. ft.
17	Required Footprint [Line 16/ Line 15] x 12	2103	sq. ft.
Option 2 - Store 0.75 of remaining DCV in pores and ponding			
18	Required Storage (surface + pores) Volume [0.75 x Line 4]	2942	cu. ft.
19	Required Footprint [Line 18/ Line 14] x 12	2101	sq. ft.
Footprint of the BMP			
20	BMP Footprint Sizing Factor (Default 0.03 or an alternative minimum footprint sizing factor from Line 11 in Worksheet B.5-4)	0.03	
21	Minimum BMP Footprint [Line 1 x Line 2 x Line 20]	2615	sq. ft.
22	Footprint of the BMP = Maximum(Minimum(Line 17, Line 19), Line 21)	2615	sq. ft.
23	Provided BMP Footprint	3000	sq. ft.
24	Is Line 23 ≥ Line 22?	**Yes, Performance Standard is Met**	

The City of SAN DIEGO	Project Name	Emerlad Hills	
	BMP ID	BF-2-1	
Sizing Method for Volume Retention Criteria		**Worksheet B.5-2**	
1	Area draining to the BMP	160884.77	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.54	
3	85th percentile 24-hour rainfall depth	0.54	inches
4	Design capture volume [Line 1 x Line 2 x (Line 3/12)]	3922	cu. ft.
Volume Retention Requirement			
5	Measured infiltration rate in the DMA Note: When mapped hydrologic soil groups are used enter 0.10 for NRCS Type D soils and for NRCS Type C soils enter 0.30 When in no infiltration condition and the actual measured infiltration rate is unknown enter 0.0 if there are geotechnical and/or groundwater hazards identified in Appendix C or	0	in/hr.
6	Factor of safety	2	
7	Reliable infiltration rate, for biofiltration BMP sizing [Line 5 / Line 6]	0	in/hr.
8	Average annual volume reduction target (Figure B.5-2) When Line 7 > 0.01 in/hr. = Minimum (40, 166.9 x Line 7 +6.62) When Line 7 ≤ 0.01 in/hr. = 3.5%	3.5	%
9	Fraction of DCV to be retained (Figure B.5-3) When Line 8 > 8% = 0.0000013 x Line 8^3 - 0.000057 x Line 8^2 + 0.0086 x Line 8 - 0.014 When Line 8 ≤ 8% = 0.023	0.023	
10	Target volume retention [Line 9 x Line 4]	90	cu. ft.

The City of SAN DIEGO	Project Name	Emeral Hills	
	BMP ID	BF-2-1	

Volume Retention for No Infiltration Condition		Worksheet B.5-6	
1	Area draining to the biofiltration BMP	160884.77	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.54	
3	Effective impervious area draining to the BMP [Line 1 x Line 2]	87157	sq. ft.
4	Required area for Evapotranspiration [Line 3 x 0.03]	2615	sq. ft.
5	Biofiltration BMP Footprint	3000	sq. ft.

Landscape Area (must be identified on DS-3247)

		Identification	1	2	3	4	5
6	Landscape area that meet the requirements in SD-B and SD-F Fact Sheet (sq. ft.)						
7	Impervious area draining to the landscape area (sq. ft.)						
8	Impervious to Pervious Area ratio [Line 7/Line 6]		0.00	0.00	0.00	0.00	0.00
9	Effective Credit Area If (Line 8 >1.5, Line 6, Line 7/1.5]		0	0	0	0	0

10	Sum of Landscape area [sum of Line 9 Id's 1 to 5]	0	sq. ft.
11	Provided footprint for evapotranspiration [Line 5 + Line 10]	3000	sq. ft.

Volume Retention Performance Standard

12	Is Line 11 ≥ Line 4?	Volume Retention Performance Standard is Met	
13	Fraction of the performance standard met through the BMP footprint and/or landscaping [Line 11/Line 4]	1.15	
14	Target Volume Retention [Line 10 from Worksheet B.5.2]	90	cu. ft.
15	Volume retention required from other site design BMPs [(1-Line 13) x Line 14]	-13.53104926	cu. ft.

Site Design BMP

	Identification	Site Design Type	Credit	
16	1			cu. ft.
	2			cu. ft.
	3			cu. ft.
	4			cu. ft.
	5			cu. ft.
	Sum of volume retention benefits from other site design BMPs (e.g. trees; rain barrels etc.). [sum of Line 16 Credits for Id's 1 to 5] Provide documentation of how the site design credit is calculated in the PDP SWQMP.		0	cu. ft.
17	Is Line 16 ≥ Line 15?	Volume Retention Performance Standard is Met		

The City of SAN DIEGO	Project Name	Emerlad Hills	
	BMP ID	BF-2-2	
Sizing Method for Pollutant Removal Criteria		**Worksheet B.5-1**	
1	Area draining to the BMP	493033.98	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.54	
3	85th percentile 24-hour rainfall depth	0.54	inches
4	Design capture volume [Line 1 x Line 2 x (Line 3/12)]	11890	cu. ft.
BMP Parameters			
5	Surface ponding [6 inch minimum, 12 inch maximum]	6	inches
6	Media thickness [18 inches minimum], also add mulch layer and washed ASTM 33 fine aggregate sand thickness to this line for sizing calculations	24	inches
7	Aggregate storage (also add ASTM No 8 stone) above underdrain invert (12 inches typical) – use 0 inches if the aggregate is not over the entire bottom surface area	12	inches
8	Aggregate storage below underdrain invert (3 inches minimum) – use 0 inches if the aggregate is not over the entire bottom surface area	3	inches
9	Freely drained pore storage of the media	0.2	in/in
10	Porosity of aggregate storage	0.4	in/in
11	Media filtration rate to be used for sizing (maximum filtration rate of 5 in/hr. with no outlet control; if the filtration rate is controlled by the outlet use the outlet controlled rate (includes infiltration into the soil and flow rate through the outlet structure) which will be less than 5 in/hr.)	0.987	in/hr.
Baseline Calculations			
12	Allowable routing time for sizing	6	hours
13	Depth filtered during storm [Line 11 x Line 12]	5.922	inches
14	Depth of Detention Storage [Line 5 + (Line 6 x Line 9) + (Line 7 x Line 10) + (Line 8 x Line 10)]	16.8	inches
15	Total Depth Treated [Line 13 + Line 14]	22.722	inches
Option 1 – Biofilter 1.5 times the DCV			
16	Required biofiltered volume [1.5 x Line 4]	17835	cu. ft.
17	Required Footprint [Line 16/ Line 15] x 12	9419	sq. ft.
Option 2 - Store 0.75 of remaining DCV in pores and ponding			
18	Required Storage (surface + pores) Volume [0.75 x Line 4]	8918	cu. ft.
19	Required Footprint [Line 18/ Line 14] x 12	6370	sq. ft.
Footprint of the BMP			
20	BMP Footprint Sizing Factor (Default 0.03 or an alternative minimum footprint sizing factor from Line 11 in Worksheet B.5-4)	0.03	
21	Minimum BMP Footprint [Line 1 x Line 2 x Line 20]	7927	sq. ft.
22	Footprint of the BMP = Maximum(Minimum(Line 17, Line 19), Line 21)	7927	sq. ft.
23	Provided BMP Footprint	8500	sq. ft.
24	Is Line 23 ≥ Line 22?	**Yes, Performance Standard is Met**	

The City of SAN DIEGO	Project Name	Emerlad Hills	
	BMP ID	BF-2-2	
Sizing Method for Volume Retention Criteria		**Worksheet B.5-2**	
1	Area draining to the BMP	493033.98	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.54	
3	85th percentile 24-hour rainfall depth	0.54	inches
4	Design capture volume [Line 1 x Line 2 x (Line 3/12)]	11890	cu. ft.
Volume Retention Requirement			
5	Measured infiltration rate in the DMA Note: When mapped hydrologic soil groups are used enter 0.10 for NRCS Type D soils and for NRCS Type C soils enter 0.30 When in no infiltration condition and the actual measured infiltration rate is unknown enter 0.0 if there are geotechnical and/or groundwater hazards identified in Appendix C or	0	in/hr.
6	Factor of safety	2	
7	Reliable infiltration rate, for biofiltration BMP sizing [Line 5 / Line 6]	0	in/hr.
8	Average annual volume reduction target (Figure B.5-2) When Line 7 > 0.01 in/hr. = Minimum (40, 166.9 x Line 7 +6.62) When Line 7 ≤ 0.01 in/hr. = 3.5%	3.5	%
9	Fraction of DCV to be retained (Figure B.5-3) When Line 8 > 8% = 0.0000013 x Line 8^3 - 0.000057 x Line 8^2 + 0.0086 x Line 8 - 0.014 When Line 8 ≤ 8% = 0.023	0.023	
10	Target volume retention [Line 9 x Line 4]	273	cu. ft.

The City of SAN DIEGO	Project Name	Emeral Hills	
	BMP ID	BF-2-2	

Volume Retention for No Infiltration Condition		Worksheet B.5-6	
1	Area draining to the biofiltration BMP	493033.98	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.54	
3	Effective impervious area draining to the BMP [Line 1 x Line 2]	264227	sq. ft.
4	Required area for Evapotranspiration [Line 3 x 0.03]	7927	sq. ft.
5	Biofiltration BMP Footprint	8500	sq. ft.

Landscape Area (must be identified on DS-3247)

		Identification	1	2	3	4	5
6	Landscape area that meet the requirements in SD-B and SD-F Fact Sheet (sq. ft.)						
7	Impervious area draining to the landscape area (sq. ft.)						
8	Impervious to Pervious Area ratio [Line 7/Line 6]		0.00	0.00	0.00	0.00	0.00
9	Effective Credit Area If (Line 8 >1.5, Line 6, Line 7/1.5]		0	0	0	0	0

10	Sum of Landscape area [sum of Line 9 Id's 1 to 5]	0	sq. ft.
11	Provided footprint for evapotranspiration [Line 5 + Line 10]	8500	sq. ft.

Volume Retention Performance Standard

12	Is Line 11 ≥ Line 4?	Volume Retention Performance Standard is Met	
13	Fraction of the performance standard met through the BMP footprint and/or landscaping [Line 11/Line 4]	1.07	
14	Target Volume Retention [Line 10 from Worksheet B.5.2]	273	cu. ft.
15	Volume retention required from other site design BMPs [(1-Line 13) x Line 14]	-19.14324044	cu. ft.

Site Design BMP

	Identification	Site Design Type	Credit	
16	1			cu. ft.
	2			cu. ft.
	3			cu. ft.
	4			cu. ft.
	5			cu. ft.
	Sum of volume retention benefits from other site design BMPs (e.g. trees; rain barrels etc.). [sum of Line 16 Credits for Id's 1 to 5] Provide documentation of how the site design credit is calculated in the PDP SWQMP.		0	cu. ft.
17	Is Line 16 ≥ Line 15?	Volume Retention Performance Standard is Met		

The City of SAN DIEGO	Project Name	Emerlad Hills	
	BMP ID	BF-2-3	
Sizing Method for Pollutant Removal Criteria		**Worksheet B.5-1**	
1	Area draining to the BMP	415301.62	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.55	
3	85th percentile 24-hour rainfall depth	0.54	inches
4	Design capture volume [Line 1 x Line 2 x (Line 3/12)]	10258	cu. ft.
BMP Parameters			
5	Surface ponding [6 inch minimum, 12 inch maximum]	6	inches
6	Media thickness [18 inches minimum], also add mulch layer and washed ASTM 33 fine aggregate sand thickness to this line for sizing calculations	24	inches
7	Aggregate storage (also add ASTM No 8 stone) above underdrain invert (12 inches typical) – use 0 inches if the aggregate is not over the entire bottom surface area	12	inches
8	Aggregate storage below underdrain invert (3 inches minimum) – use 0 inches if the aggregate is not over the entire bottom surface area	3	inches
9	Freely drained pore storage of the media	0.2	in/in
10	Porosity of aggregate storage	0.4	in/in
11	Media filtration rate to be used for sizing (maximum filtration rate of 5 in/hr. with no outlet control; if the filtration rate is controlled by the outlet use the outlet controlled rate (includes infiltration into the soil and flow rate through the outlet structure) which will be less than 5 in/hr.)	1.198308326	in/hr.
Baseline Calculations			
12	Allowable routing time for sizing	6	hours
13	Depth filtered during storm [Line 11 x Line 12]	7.189849955	inches
14	Depth of Detention Storage [Line 5 + (Line 6 x Line 9) + (Line 7 x Line 10) + (Line 8 x Line 10)]	16.8	inches
15	Total Depth Treated [Line 13 + Line 14]	23.98984995	inches
Option 1 – Biofilter 1.5 times the DCV			
16	Required biofiltered volume [1.5 x Line 4]	15387	cu. ft.
17	Required Footprint [Line 16/ Line 15] x 12	7697	sq. ft.
Option 2 - Store 0.75 of remaining DCV in pores and ponding			
18	Required Storage (surface + pores) Volume [0.75 x Line 4]	7693	cu. ft.
19	Required Footprint [Line 18/ Line 14] x 12	5495	sq. ft.
Footprint of the BMP			
20	BMP Footprint Sizing Factor (Default 0.03 or an alternative minimum footprint sizing factor from Line 11 in Worksheet B.5-4)	0.03	
21	Minimum BMP Footprint [Line 1 x Line 2 x Line 20]	6838	sq. ft.
22	Footprint of the BMP = Maximum(Minimum(Line 17, Line 19), Line 21)	6838	sq. ft.
23	Provided BMP Footprint	7000	sq. ft.
24	Is Line 23 ≥ Line 22?	**Yes, Performance Standard is Met**	

The City of SAN DIEGO	Project Name	Emerlad Hills	
	BMP ID	BF-2-3	
Sizing Method for Volume Retention Criteria		**Worksheet B.5-2**	
1	Area draining to the BMP	415301.62	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.55	
3	85th percentile 24-hour rainfall depth	0.54	inches
4	Design capture volume [Line 1 x Line 2 x (Line 3/12)]	10258	cu. ft.
Volume Retention Requirement			
5	Measured infiltration rate in the DMA Note: When mapped hydrologic soil groups are used enter 0.10 for NRCS Type D soils and for NRCS Type C soils enter 0.30 When in no infiltration condition and the actual measured infiltration rate is unknown enter 0.0 if there are geotechnical and/or groundwater hazards identified in Appendix C or	0	in/hr.
6	Factor of safety	2	
7	Reliable infiltration rate, for biofiltration BMP sizing [Line 5 / Line 6]	0	in/hr.
8	Average annual volume reduction target (Figure B.5-2) When Line 7 > 0.01 in/hr. = Minimum (40, 166.9 x Line 7 +6.62) When Line 7 ≤ 0.01 in/hr. = 3.5%	3.5	%
9	Fraction of DCV to be retained (Figure B.5-3) When Line 8 > 8% = 0.0000013 x Line 8^3 - 0.000057 x Line 8^2 + 0.0086 x Line 8 - 0.014 When Line 8 ≤ 8% = 0.023	0.023	
10	Target volume retention [Line 9 x Line 4]	236	cu. ft.

The City of SAN DIEGO	Project Name	Emeral Hills
	BMP ID	BF-2-3

Volume Retention for No Infiltration Condition		Worksheet B.5-6	
1	Area draining to the biofiltration BMP	415301.62	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.55	
3	Effective impervious area draining to the BMP [Line 1 x Line 2]	227949	sq. ft.
4	Required area for Evapotranspiration [Line 3 x 0.03]	6838	sq. ft.
5	Biofiltration BMP Footprint	7000	sq. ft.

Landscape Area (must be identified on DS-3247)

		Identification	1	2	3	4	5
6	Landscape area that meet the requirements in SD-B and SD-F Fact Sheet (sq. ft.)						
7	Impervious area draining to the landscape area (sq. ft.)						
8	Impervious to Pervious Area ratio [Line 7/Line 6]		0.00	0.00	0.00	0.00	0.00
9	Effective Credit Area If (Line 8 >1.5, Line 6, Line 7/1.5]		0	0	0	0	0
10	Sum of Landscape area [sum of Line 9 Id's 1 to 5]				0		sq. ft.
11	Provided footprint for evapotranspiration [Line 5 + Line 10]				7000		sq. ft.

Volume Retention Performance Standard

12	Is Line 11 ≥ Line 4?	Volume Retention Performance Standard is Met	
13	Fraction of the performance standard met through the BMP footprint and/or landscaping [Line 11/Line 4]	1.02	
14	Target Volume Retention [Line 10 from Worksheet B.5.2]	236	cu. ft.
15	Volume retention required from other site design BMPs [(1-Line 13) x Line 14]	-4.718546494	cu. ft.

Site Design BMP

	Identification	Site Design Type	Credit	
16	1			cu. ft.
	2			cu. ft.
	3			cu. ft.
	4			cu. ft.
	5			cu. ft.
	Sum of volume retention benefits from other site design BMPs (e.g. trees; rain barrels etc.). [sum of Line 16 Credits for Id's 1 to 5] Provide documentation of how the site design credit is calculated in the PDP SWQMP.		0	cu. ft.
17	Is Line 16 ≥ Line 15?	Volume Retention Performance Standard is Met		

DMA 11: Design Capture Volume		Worksheet B-2.1			
□	□5th per□entile 24-hr storm depth from □ig□re □.□-□	d□	0.54	in□hes	□--- □rom □atest□□5th
2	Area tri□□tary to □MP □s□	A□	0.204	a□res	
3	Area □ eighted r□noff fa□tor □estimate □sing Appendi□ □.□.□ and □.2.□□	C□	0.42	□nitless	
4	Street trees vol□me red□□tion	□C□□	0.00	□□□i□-feet	□-- Ad□□stment□
5	□ain □arrels vol□me red□□tion	□C□□	0.00	□□□i□-feet	harvest and □se
□	Cal□□late DC□□ □B□30 □ C □ d □ A□- □C□ - □C□	DC□□	□□□	□□□i□-feet	

P□OP□□E□A□□ □□D□□□□A□□DN □□O□ -□H□□ S□□EN□ CA□C□ □A□□DN

DMA 4: Flow-thru Design Flows		Worksheet B.6-1		
□	DC□	DC□	□□□	□□□i□-feet
2	DC□ □etained	DC□ □etained	0.00	□□□i□-feet
3	DC□ □iofiltered	DC□ □iofiltered	0.00	□□□i□-feet
4	□.5 DC□ re□□iring flo□ -thr□ □□ine □ - □ine 2 - 0.□□□□ine 3□	DC□ flo□ -thr□	□□□	□□□i□-feet
5	Ad□□stment □a□tor □□ine 4 □ □ine□□	A□□	□.00	□nitless
□	Design rainfall intensity	i□	0.2	in□hr
□	Area tri□□tary to □MP□s□	A□	0.20	a□res
□	Area-□ eighted r□noff fa□tor □estimate □sing Appendi□ □.2□	C□	0.42	□nitless
□	Cal□□late □lo□ □ate □ A□ □□C □ i □ A□	□ □	0.0□□	□fs
□0	□reamtent □lo□ □ate □ □.5 □ □	□ □	0.02□	□fs

□□ Ad□□stment fa□tor shall □e estimated □onsidering only retention and
2□ □ol□me □ased □e.g., dry e□tended detention □asin□flo□ -thr□ treatment □ontrol
3□ Propietary □MPs, if □sed, shall provide □ertified treatment □apa□ity e□□al to or

The City of SAN DIEGO	Project Name	Emerlad Hills	
	BMP ID	BF-3-4	
Sizing Method for Volume Retention Criteria		**Worksheet B.5-2**	
1	Area draining to the BMP	8893.19	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.42	
3	85th percentile 24-hour rainfall depth	0.54	inches
4	Design capture volume [Line 1 x Line 2 x (Line 3/12)]	169	cu. ft.
Volume Retention Requirement			
5	Measured infiltration rate in the DMA Note: When mapped hydrologic soil groups are used enter 0.10 for NRCS Type D soils and for NRCS Type C soils enter 0.30 When in no infiltration condition and the actual measured infiltration rate is unknown enter 0.0 if there are geotechnical and/or groundwater hazards identified in Appendix C or	0	in/hr.
6	Factor of safety	2	
7	Reliable infiltration rate, for biofiltration BMP sizing [Line 5 / Line 6]	0	in/hr.
8	Average annual volume reduction target (Figure B.5-2) When Line 7 > 0.01 in/hr. = Minimum (40, 166.9 x Line 7 +6.62) When Line 7 ≤ 0.01 in/hr. = 3.5%	3.5	%
9	Fraction of DCV to be retained (Figure B.5-3) When Line 8 > 8% = 0.0000013 x Line 8^3 - 0.000057 x Line 8^2 + 0.0086 x Line 8 - 0.014 When Line 8 ≤ 8% = 0.023	0.023	
10	Target volume retention [Line 9 x Line 4]	4	cu. ft.

The City of SAN DIEGO	Project Name	Emeral Hills
	BMP ID	BF-3-4

Volume Retention for No Infiltration Condition		Worksheet B.5-6	
1	Area draining to the biofiltration BMP	8893.19	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.42	
3	Effective impervious area draining to the BMP [Line 1 x Line 2]	3752	sq. ft.
4	Required area for Evapotranspiration [Line 3 x 0.03]	113	sq. ft.
5	Biofiltration BMP Footprint	16	sq. ft.

Landscape Area (must be identified on DS-3247)

	Identification	1	2	3	4	5
6	Landscape area that meet the requirements in SD-B and SD-F Fact Sheet (sq. ft.)					
7	Impervious area draining to the landscape area (sq. ft.)					
8	Impervious to Pervious Area ratio [Line 7/Line 6]	0.00	0.00	0.00	0.00	0.00
9	Effective Credit Area If (Line 8 >1.5, Line 6, Line 7/1.5]	0	0	0	0	0

10	Sum of Landscape area [sum of Line 9 Id's 1 to 5]	0	sq. ft.
11	Provided footprint for evapotranspiration [Line 5 + Line 10]	16	sq. ft.

Volume Retention Performance Standard

12	Is Line 11 ≥ Line 4?	No, Proceed to Line 13	
13	Fraction of the performance standard met through the BMP footprint and/or landscaping [Line 11/Line 4]	0.14	
14	Target Volume Retention [Line 10 from Worksheet B.5.2]	4	cu. ft.
15	Volume retention required from other site design BMPs [(1-Line 13) x Line 14]	3.340017471	cu. ft.

Site Design BMP

	Identification	Site Design Type	Credit	
16	1	Additional retention provided in BF-2-3 that drains to the same	4.72	cu. ft.
	2			cu. ft.
	3			cu. ft.
	4			cu. ft.
	5			cu. ft.
	Sum of volume retention benefits from other site design BMPs (e.g. trees; rain barrels etc.). [sum of Line 16 Credits for Id's 1 to 5] Provide documentation of how the site design credit is calculated in the PDP SWQMP.		4.72	cu. ft.
17	Is Line 16 ≥ Line 15?	Volume Retention Performance Standard is Met		

DMA-STREET	EXISTING			PROPOSED		
	?otal ?a?.?	?mpervio?s ?a?.?	Pervio?s ?a?.?	?otal ?a?.?	Proposed and ?epla?ed ?mpervio?s ?a?.?	Pervio?s ?a?.?
?S-?-?0th Street	0.42?	0.04?	0.3?2	0.42?	0.???	0.240
?S-2-?0th Street	0.?5?	0.?5?	0.000	0.?5?	0.?25	0.032
?S-3-?0th Street	0.3??	0.0?0	0.30?	0.3??	0.???	0.??4
?S-4-?0th Street	0.2??	0.252	0.04?	0.2??	0.224	0.0?5

	?S-?	?S-3
Area drains to ?reen Street Element ?AC?	0.42?	0.3??
?MP Area ?A??	0.???	0.???
??noff ?a?tror	0.453	0.504
DC? ?C???	3??	3??
? ater ??ality ?lo? ?C?S?	0.03?	0.03?

Summary Table			
	VS-1- North	VS-1- South	VS-3
Q85th (cfs)	0.02	0.02	0.037
Velocity 85th (fps)	0.31	0.2	0.41
esiden e ime 5th min	10.1	20	11
Depth of flo 5th ft	0.02	0.03	0.03
Q10 Yr (cfs)	0.41	0.51	0.83
Velocity-10Yr (fps)	1.21	0.97	1.7
Depth of flo - 0 ft	0.1	0.15	0.14
Q100 Yr (cfs)	0.53	0.66	1.07
Velocity-100Yr (fps)	1.28	1.1	1.9
Depth of flo - 00 ft	0.12	0.17	0.16

Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Wednesday, May 8 2024

VS-1 North, Water Qulaity Flow

Trapezoidal

Bottom Width (ft)	3.20
Side Slopes (z:1)	2.00, 2.00
Total Depth (ft)	0.44
Invert Elev (ft)	10.00
Slope (%)	4.60
N-Value	0.050

Calculations

Compute by:	Known Q
Known Q (cfs)	0.02

Highlighted

Depth (ft)	0.02
Q (cfs)	0.020
Area (sqft)	0.06
Velocity (ft/s)	0.31
Wetted Perim (ft)	3.29
Crit Depth, Yc (ft)	0.02
Top Width (ft)	3.28
EGL (ft)	0.02

1ft\sec >

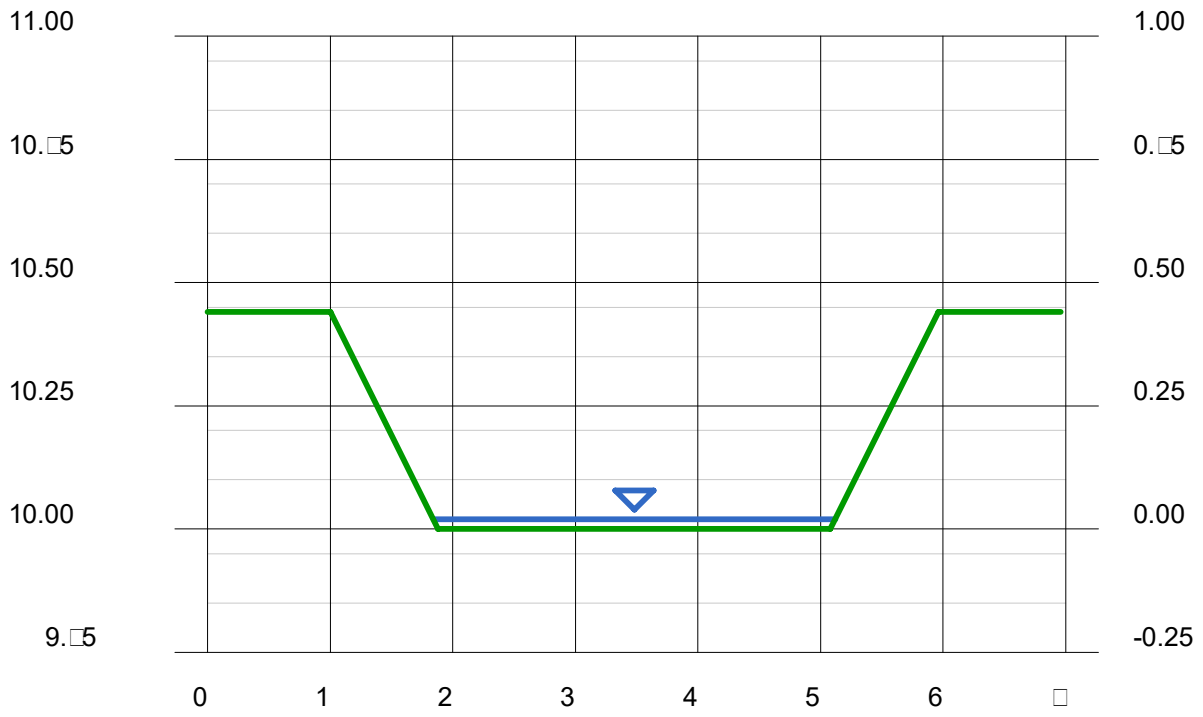
0.05 value was used for the roughness coefficient, or Manning's n value, for medium shrubs and ground cover in the swale.
To calculate the residence time (also known as travel time) in a vegetated swale, we need to use the equation:

$t = L/V$

where:
t = residence time in seconds,
L = flow length in feet,
V = flow velocity in feet per second.
Given:
L =187 Ft , V= 0.31 Ft\Sec
t= 603 sec = 10.1 min

Elev (ft) Depth (ft)

Section



Reach (ft)

Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Wednesday, May 8 2024

VS-1 North, 10 Year Peak Flow

Trapezoidal

Bottom Width (ft)	3.20
Side Slopes (z:1)	2.00, 2.00
Total Depth (ft)	0.44
Invert Elev (ft)	10.00
Slope (%)	4.60
N-Value	0.050

Calculations

Compute by:	Known Q
Known Q (cfs)	0.41

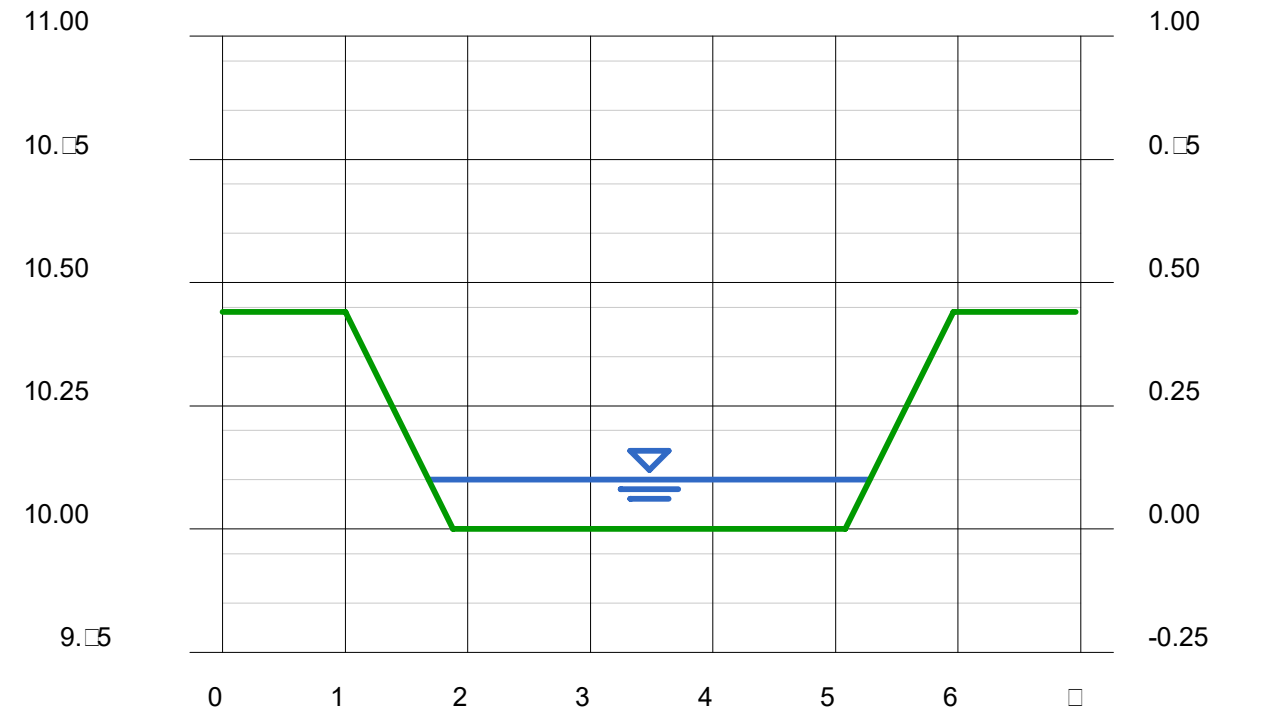
Highlighted

	Depth (ft)	0.10
	Q (cfs)	0.410
	Area (sqft)	0.34
3ft/sec >	Velocity (ft/s)	1.21
	Wetted Perim (ft)	3.65
	Crit Depth, Yc (ft)	0.08
	Top Width (ft)	3.60
	EGL (ft)	0.12

Peak Flow 10-Year calculation:
Q=CIA
Imp= 44% -> C= (0.9X0.44)+(0.4X0.56)= 0.62
Intensity= 3.4 inch
Area = 0.193 ac
Q= 0.41cfs

Elev (ft) Depth (ft)

Section



Reach (ft)

Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Thursday, May 9 2024

VS-1 North, 100 Year Peak Flow

Trapezoidal

Bottom Width (ft)	3.20
Side Slopes (z:1)	2.00, 2.00
Total Depth (ft)	0.44
Invert Elev (ft)	10.00
Slope (%)	4.60
N-Value	0.050

Highlighted

Depth (ft)	0.12
Q (cfs)	0.530
Area (sqft)	0.41
Velocity (ft/s)	1.28
Wetted Perim (ft)	3.64
Crit Depth, Yc (ft)	0.10
Top Width (ft)	3.68
EGL (ft)	0.15

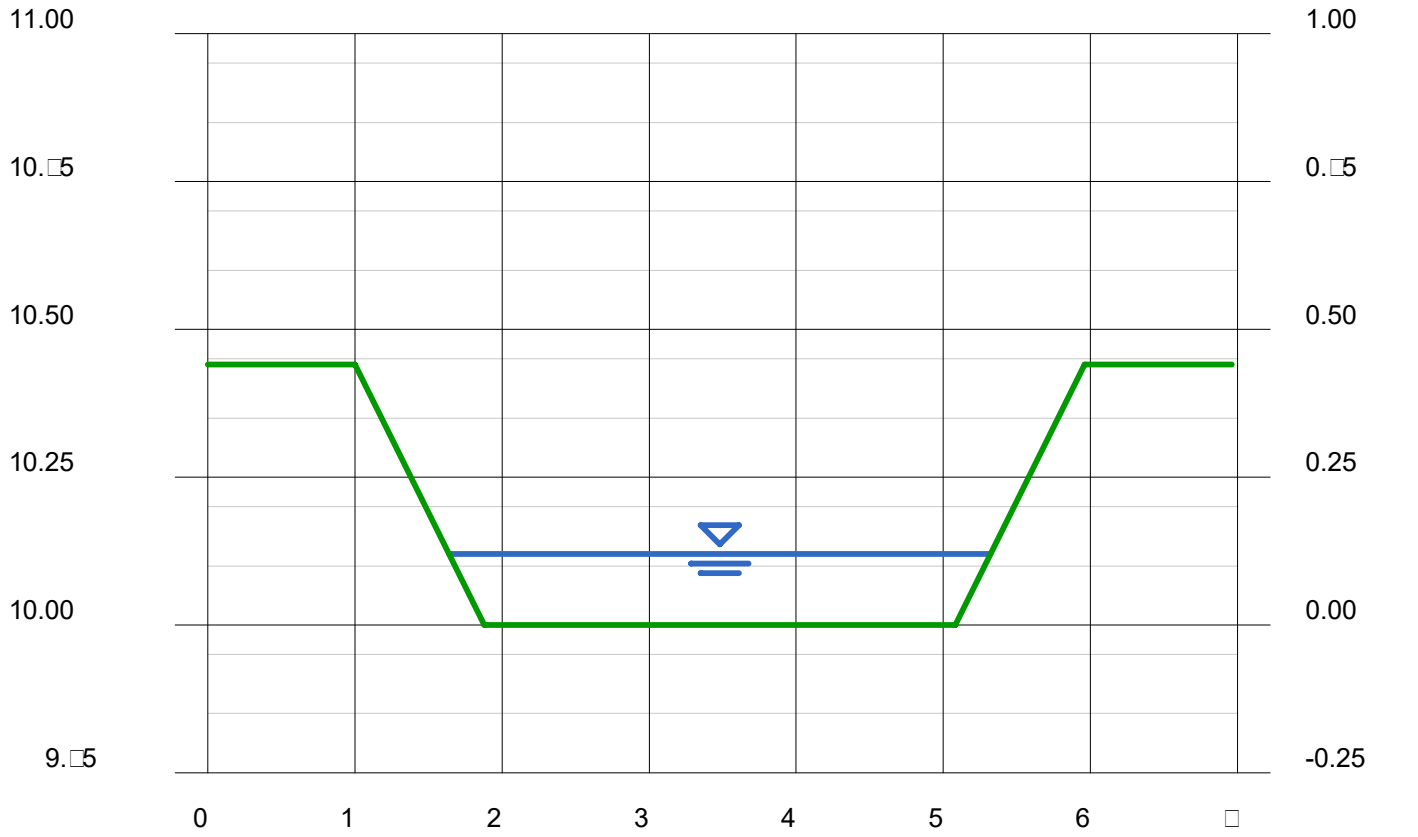
Calculations

Compute by:	Known Q
Known Q (cfs)	0.53

Peak Flow 100-Year calculation:
Q=CIA
Imp= 44% -> C= (0.9X0.44)+(0.4X0.56)= 0.62
Intensity= 4.4 inch
Area = 0.193 ac
Q= 0.53 cfs

Elev (ft) Depth (ft)

Section



Reach (ft)

Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Wednesday, May 8 2024

VS-1South, WQ

Trapezoidal

Bottom Width (ft)	3.20
Side Slopes (z:1)	2.00, 2.00
Total Depth (ft)	0.44
Invert Elev (ft)	10.00
Slope (%)	1.90
N-Value	0.050

1ft\sec >

Highlighted

Depth (ft)	0.03
(cfs)	0.020
Area (sqft)	0.10
Velocity (ft/s)	0.20
Wetted Perim (ft)	3.33
Crit Depth, Yc (ft)	0.02
Top Width (ft)	3.32
EGL (ft)	0.03

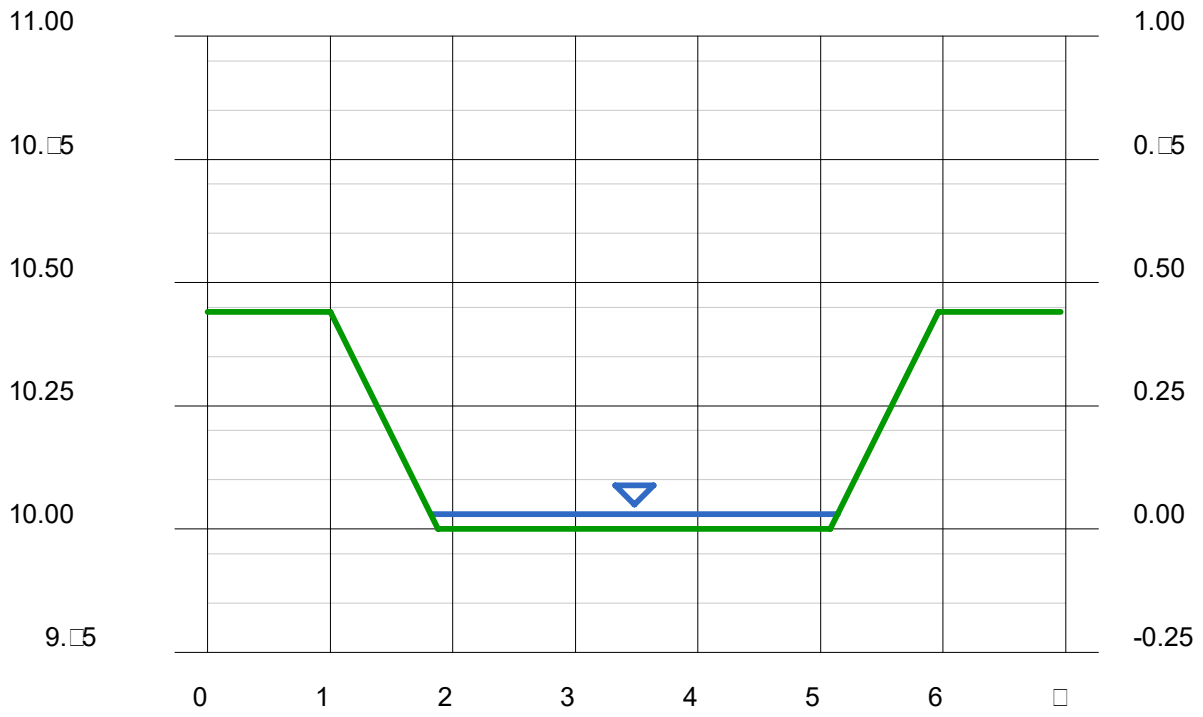
Calculations

Compute by:	Known
Known (cfs)	0.02

0.05 value was used for the roughness coefficient, or Manning's n value, for medium shrubs and ground cover in the swale.
To calculate the residence time (also known as travel time) in a vegetated swale, we need to use the equation:
$t = L/V$
where:
t = residence time in seconds,
L = flow length in feet,
V = flow velocity in feet per second.
Given:
L =240 Ft , V= 0.20 Ft\Sec
t= 1200 sec = 20 min

Elev (ft) Depth (ft)

Section



Reach (ft)

Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Wednesday, May 8 2024

VS-1South, 10 Year Peak Flow

Trapezoidal			Highlighted	
Bottom Width (ft)	3.20		Depth (ft)	0.15
Side Slopes (z:1)	2.00, 2.00		(cfs)	0.510
Total Depth (ft)	0.44		Area (sqft)	0.53
Invert Elev (ft)	10.00	3ft/sec >	Velocity (ft/s)	0.9
Slope (%)	1.90		Wetted Perim (ft)	3.8
N-Value	0.050		Crit Depth, Yc (ft)	0.10
			Top Width (ft)	3.80
			EGL (ft)	0.16

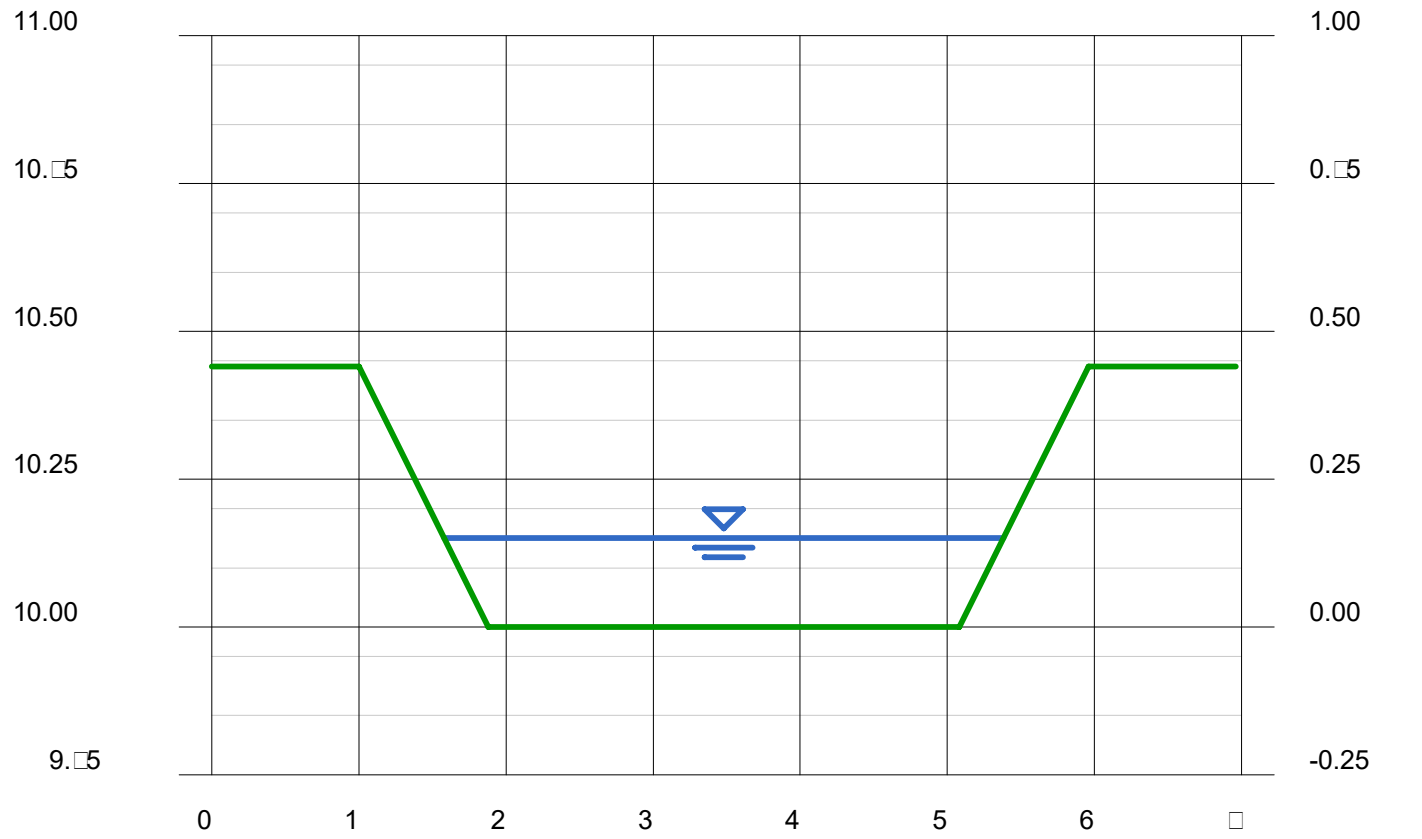
Calculations

Compute by:	Known Q
Known Q (cfs)	0.51

Peak Flow 10-Year calculation:
Q=CIA
Imp= 44% -> C= (0.9X0.44)+(0.4X0.56)= 0.62
Intensity= 3.4 inch
Area = 0.236 ac
Q= 0.51cfs

Elev (ft) Depth (ft)

Section



Reach (ft)

Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Thursday, May 9 2024

VS-1South, 100 Year Peak Flow

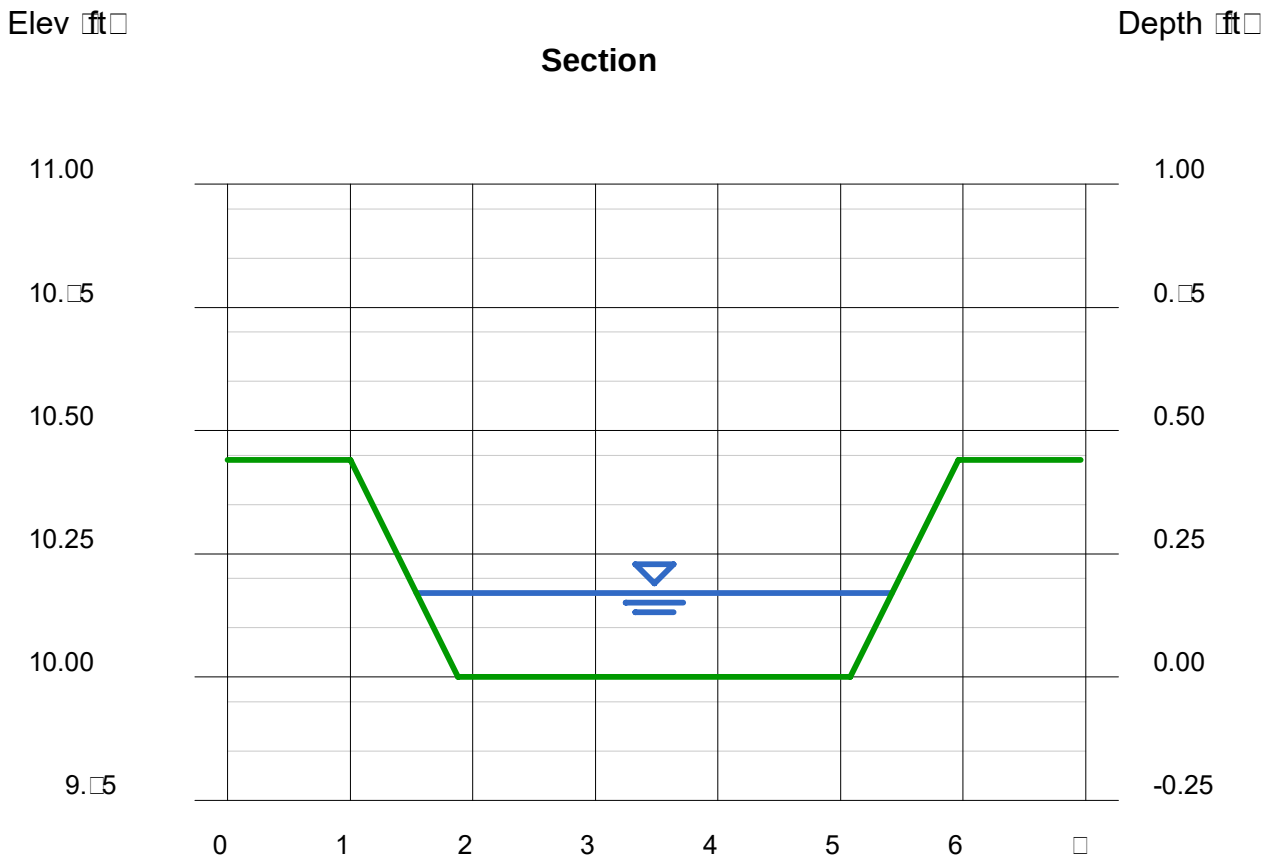
Trapezoidal	
Bottom Width (ft)	3.20
Side Slopes (z:1)	2.00, 2.00
Total Depth (ft)	0.44
Invert Elev (ft)	10.00
Slope (%)	1.90
N-Value	0.050

Highlighted	
Depth (ft)	0.10
Q (cfs)	0.660
Area (sqft)	0.60
Velocity (ft/s)	1.10
Wetted Perim (ft)	3.96
Crit Depth, Yc (ft)	0.11
Top Width (ft)	3.88
EGL (ft)	0.19

Calculations

Compute by:	Known Q
Known Q (cfs)	0.66

Peak Flow 100-Year calculation:
Q=CIA
Imp= 44% -> C= (0.9X0.44)+(0.4X0.56)= 0.62
Intensity= 3.4 inch
Area = 0.236 ac
Q= 0.66 cfs



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Wednesday, May 8 2024

VS-3, WQ

Trapezoidal		Highlighted	
Bottom Width (ft)	3.20	Depth (ft)	0.03
Side Slopes (z:1)	2.00, 2.00	Q (cfs)	0.040
Total Depth (ft)	0.44	Area (sqft)	0.10
Invert Elev (ft)	10.00	1 ft/sec > Velocity (ft/s)	0.41
Slope (%)	6.00	Wetted Perim (ft)	3.33
N-Value	0.050	Crit Depth, Yc (ft)	0.02
		Top Width (ft)	3.32
		EGL (ft)	0.03

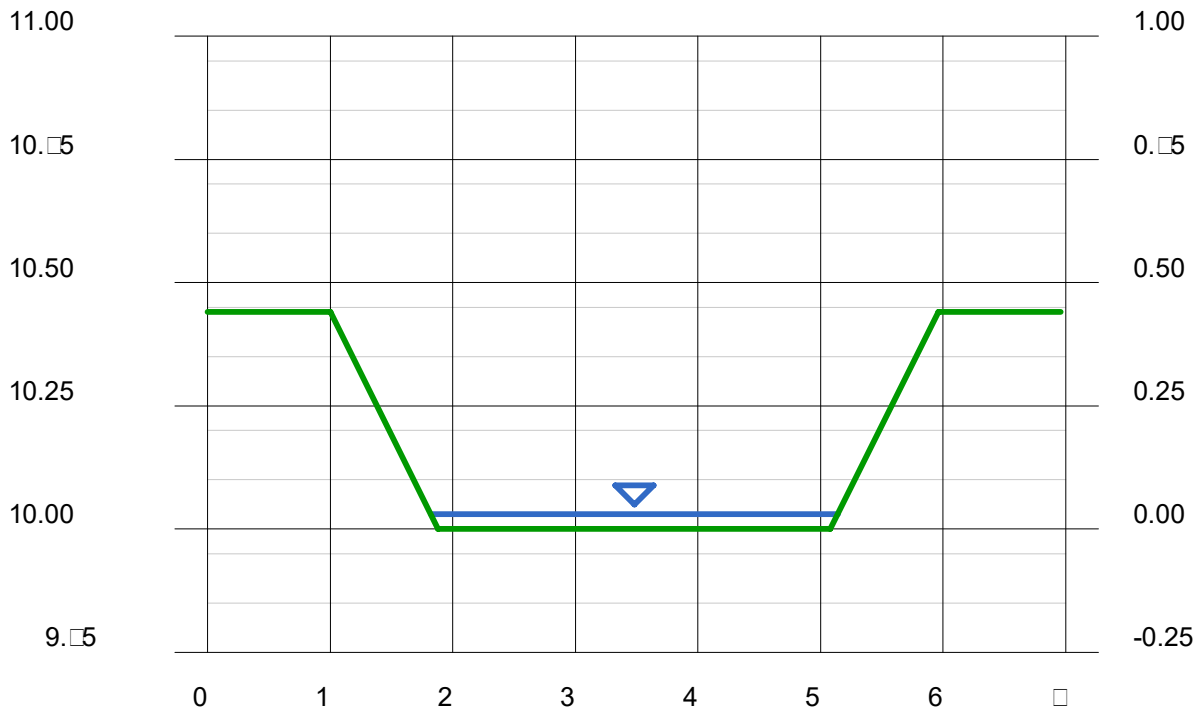
Calculations

Compute by: Known Q
Known Q (cfs) 0.04

0.05 value was used for the roughness coefficient, or Manning's n value, for medium shrubs and ground cover in the swale.
To calculate the residence time (also known as travel time) in a vegetated swale, we need to use the equation:
$t = L/V$
where:
t = residence time in seconds,
L = flow length in feet,
V = flow velocity in feet per second.
Given:
L =270 Ft , V= 0.41 Ft\Sec
t= 658 sec = 11 min

Elev (ft) Depth (ft)

Section



Reach (ft)

Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Wednesday, May 8 2024

VS-3, 10 Yr Peak flow

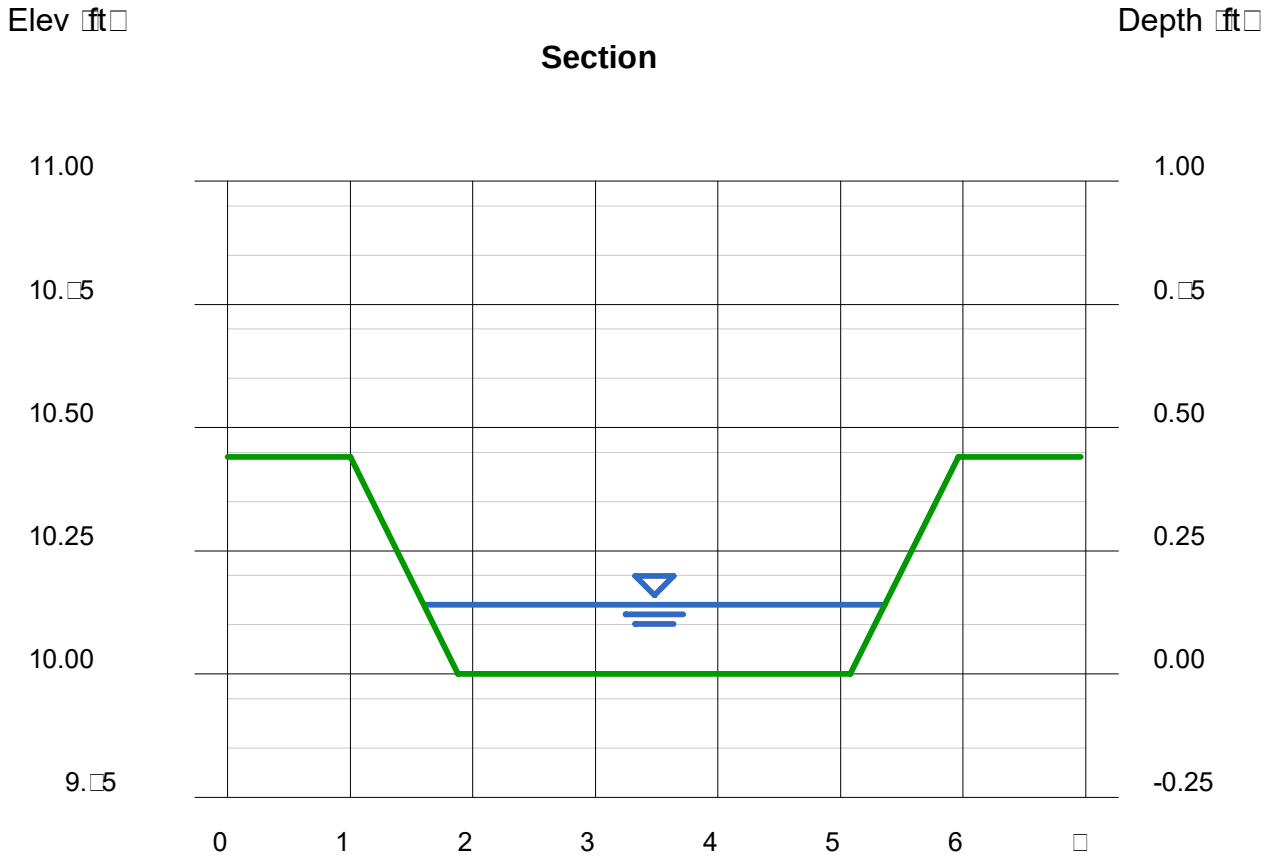
Trapezoidal	
Bottom Width (ft)	3.20
Side Slopes (z:1)	2.00, 2.00
Total Depth (ft)	0.44
Invert Elev (ft)	10.00
Slope (%)	6.00
N-Value	0.050

Highlighted		
Depth (ft)	0.14	
(cfs)	0.830	
Area (sqft)	0.49	
3ft/sec >	Velocity (ft/s)	1.70
	Wetted Perim (ft)	3.83
	Crit Depth, Yc (ft)	0.13
	Top Width (ft)	3.36
	EGL (ft)	0.19

Calculations

Compute by:	Known Q
Known Q (cfs)	0.83

Peak Flow 10-Year calculation:
Q=CIA
Imp= 51% -> C= (0.9X0.51)+(0.4X0.49)= 0.66
Intensity= 3.4 inch
Area = 0.371 ac
Q= 0.83 cfs



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Thursday, May 9 2024

VS-3, 100 Yr Peak flow

Trapezoidal

Bottom Width (ft)	3.20
Side Slopes (z:1)	2.00, 2.00
Total Depth (ft)	0.44
Invert Elev (ft)	10.00
Slope (%)	6.00
N-Value	0.050

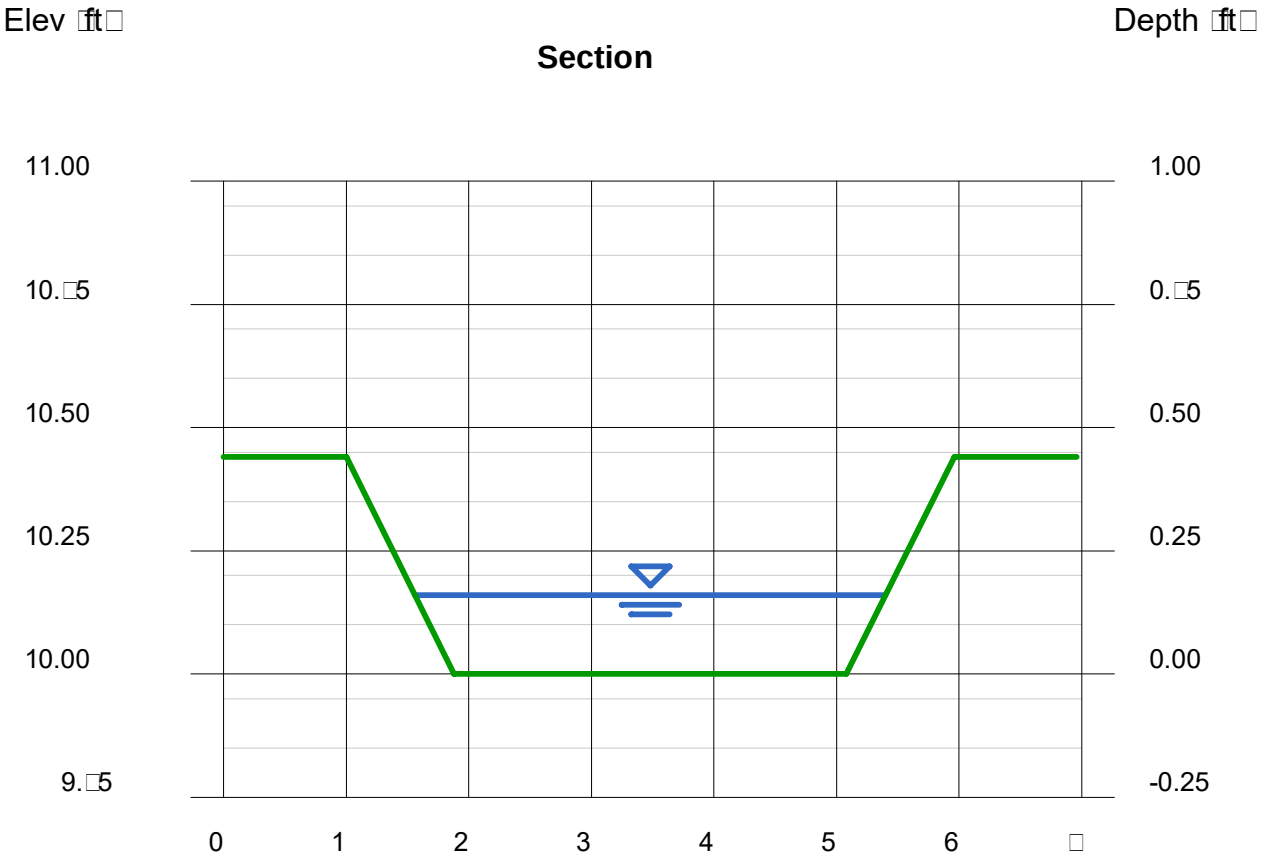
Calculations

Compute by:	Known Q
Known Q (cfs)	1.0

Highlighted

Depth (ft)	0.16
Q (cfs)	1.00
Area (sqft)	0.56
Velocity (ft/s)	1.90
Wetted Perim (ft)	3.92
Crit Depth, Yc (ft)	0.15
Top Width (ft)	3.84
EGL (ft)	0.22

Peak Flow 10-Year calculation:
Q=CIA
Imp= 51% -> C= (0.9X0.51)+(0.4X0.49)= 0.66
Intensity= 4.4 inch
Area = 0.371 ac
Q= 1.07 cfs



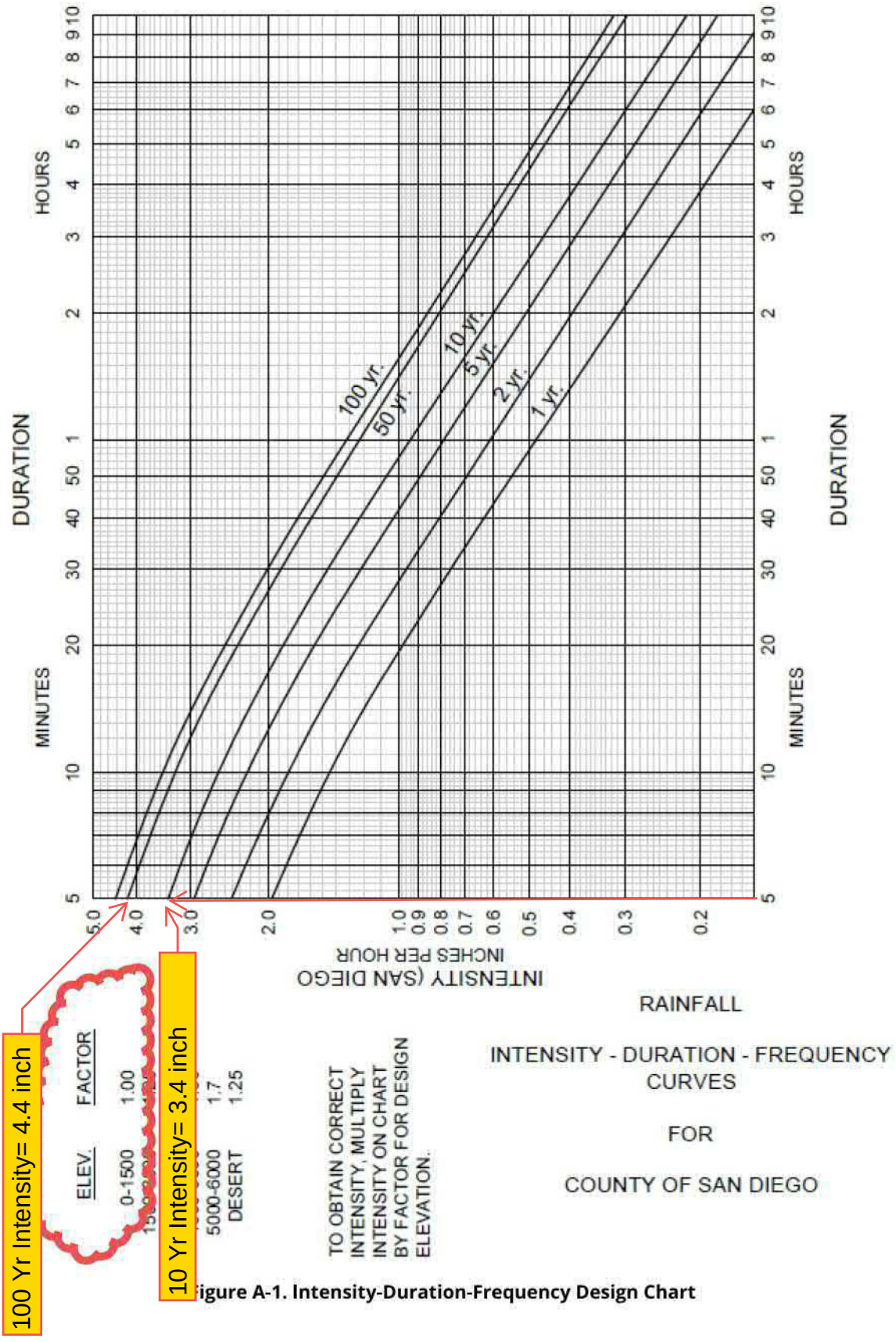


Figure A-1. Intensity-Duration-Frequency Design Chart

BF-3-4

Compact (high rate) Biofiltration BMP Checklist	Form I-10

Compact (high rate) biofiltration BMPs have a media filtration rate greater than 5 in/hr. and a media surface area smaller than 3% of contributing area times adjusted runoff factor. Compact biofiltration BMPs are typically proprietary BMPs that may qualify as biofiltration.

A compact biofiltration BMP may satisfy the pollutant control requirements for a DMA onsite in some cases. This depends on the characteristics of the DMA **and** the performance certification/data of the BMP. If the pollutant control requirements for a DMA are met onsite, then the DMA is not required to participate in an offsite storm water alternative compliance program to meet its pollutant control obligations.

An applicant using a compact biofiltration BMP to meet the pollutant control requirements onsite must complete Section 1 of this form and include it in the PDP SWQMP. A separate form must be completed for each DMA. In instances where the City Engineer does not agree with the applicant's determination, Section 2 of this form will be completed by the City and returned to the applicant.

Section 1: Biofiltration Criteria Checklist (Appendix F)

Refer to Part 1 of the Storm Water Standards to complete this section. When separate forms/worksheets are referenced below, the applicant must also complete these separate forms/worksheets (as applicable) and include in the PDP SWQMP. The criteria numbers below correspond to the criteria numbers in Appendix F.

Criteria	Answer	Progression
Criteria 1 and 3: What is the infiltration condition of the DMA? Refer to Section 5.4.2 and Appendix C of the BMP Design Manual (Part 1 of Storm Water Standards) for guidance. Applicant must complete and include the following in the PDP SWQMP submittal to support the feasibility determination: • Infiltration Feasibility Condition Letter; or • Worksheet C.4-1: Form I-8A and Worksheet C.4-2: Form I-8B. Applicant must complete and include all applicable sizing worksheets in the SWQMP submittal	○ Full Infiltration Condition	**Stop**. Compact biofiltration BMP is not allowed.
	○ Partial Infiltration Condition	Compact biofiltration BMP is only allowed, if the target volume retention is met onsite (Refer to Table B.5-1 in Appendix B.5). Use Worksheet B.5-2 in Appendix B.5 to estimate the target volume retention (Note: retention in this context means reduction). If the required volume reduction is achieved **proceed to Criteria 2**. If the required volume reduction is not achieved, compact biofiltration BMP is not allowed. **Stop**.
	◉ No Infiltration Condition	Compact biofiltration BMP is allowed if volume retention criteria in Table B.5-1 in Appendix B.5 for the no infiltration condition is met. Compliance with this criterion must be documented in the PDP SWQMP. If the criteria in Table B.5-1 is met **proceed to Criteria 2**. If the criteria in Table B.5-1 is not met, compact biofiltration BMP is not allowed. **Stop**.

Compact (high rate) Biofiltration BMP Checklist	Form I-10

Provide basis for Criteria 1 and 3:

Feasibility Analysis:

Summarize findings and include either infiltration feasibility condition letter or Worksheet C.4-1: Form I-8A and Worksheet C.4-2: Form I-8B in the PDP SWQMP submittal.

If Partial Infiltration Condition:

Provide documentation that target volume retention is met (include Worksheet B.5-2 in the PDP SWQMP submittal). Worksheet B.5-7 in Appendix B.5 can be used to estimate volume retention benefits from landscape areas.

If No Infiltration Condition:

Provide documentation that the volume retention performance standard is met (include Worksheet B.5-2 in the PDP SWQMP submittal) in the PDP SWQMP submittal. Worksheet B.5-6 in Appendix B.5 can be used to document that the performance standard is met.

Criteria	Answer	Progression
Criteria 2: Is the compact biofiltration BMP sized to meet the performance standard from the MS4 Permit? Refer to Appendix B.5 and Appendix F.2 of the BMP Design Manual (Part 1 of Storm Water Standards) for guidance.	◉ Meets Flow based Criteria	Use guidance from **Appendix F.2.2** to size the compact biofiltration BMP to meet the flow based criteria. Include the calculations in the PDP SWQMP. Use parameters for sizing consistent with manufacturer guidelines and conditions of its third party certifications (i.e. a BMP certified at a loading rate of 1 gpm/sq. ft. cannot be designed using a loading rate of 1.5 gpm/sq. ft.) **Proceed to Criteria 4.**
	○ Meets Volume based Criteria	Provide documentation that the compact biofiltration BMP has a total static (i.e. non-routed) storage volume, including pore-spaces and pre-filter detention volume (Refer to Appendix B.5 for a schematic) of at least 0.75 times the portion of the DCV not reliably retained onsite. **Proceed to Criteria 4.**
	○ Does not Meet either criteria	**Stop**. Compact biofiltration BMP is not allowed.

Provide basis for Criteria 2:

Provide documentation that the BMP meets the numeric criteria and is designed consistent with the manufacturer guidelines and conditions of its third-party certification (i.e., loading rate, etc., as applicable).

Criteria	Answer	Progression
Criteria 4: Does the compact biofiltration BMP meet the pollutant treatment performance standard for the projects most significant pollutants of concern? Refer to Appendix B.6 and Appendix F.1 of the BMP Design Manual (Part 1 of Storm Water Standards) for guidance.	◉ Yes, meets the TAPE certification.	Provide documentation that the compact BMP has an appropriate TAPE certification for the projects most significant pollutants of concern. **Proceed to Criteria 5.**
	○ Yes, through other third-party documentation	Acceptance of third-party documentation is at the discretion of the City Engineer. The City engineer will consider, (a) the data submitted; (b) representativeness of the data submitted; and (c) consistency of the BMP performance claims with pollutant control objectives in Table F.1-2 and Table F.1-1 while making this determination. If a compact biofiltration BMP is not accepted, a written explanation/ reason will be provided in Section 2. **Proceed to Criteria 5.**
	○ No	**Stop**. Compact biofiltration BMP is not allowed.

Provide basis for Criteria 4:

Provide documentation that identifies the projects most significant pollutants of concern and TAPE certification or other third party documentation that shows that the compact biofiltration BMP meets the pollutant treatment performance standard for the projects most significant pollutants of concern.

Please see attached.

Compact (high rate) Biofiltration BMP Checklist		Form I-10
Criteria	**Answer**	**Progression**
Criteria 5: Is the compact biofiltration BMP designed to promote appropriate biological activity to support and maintain treatment process? Refer to Appendix F of the BMP Design Manual (Part 1 of Storm Water Standards) for guidance.	◉ Yes	Provide documentation that the compact biofiltration BMP support appropriate biological activity. Refer to Appendix F for guidance. **Proceed to Criteria 6.**
	○ No	**Stop**. Compact biofiltration BMP is not allowed.

Provide basis for Criteria 5:

Provide documentation that appropriate biological activity is supported by the compact biofiltration BMP to maintain treatment process.

Stormwater enters the Filterra through a pipe, curb inlet, or sheet flow and ponds over the retreatment mulch layer, capturing heavy sediment and debris. Organics and microorganisms within the mulch trap and degrade metals and hydrocarbons. The mulch also provides water retention for the system's vegetation. Stormwater flows through engineered Filterra media which filters fine pollutants and nutrients. Organic material in the media removes dissolved metals and acts as a food source for root-zone microorganisms. Treated water exits through an underdrain pipe. Rootzone microorganisms digest and transform pollutants into forms easily absorbed by plants. Plant roots absorb stormwater and pollutants that were transformed by microorganisms, regenerating the media's pollutant removal capacity. The roots grow, provide a hospitable environment for the rootzone microorganisms and penetrate the media, maintaining hydraulic conductivity.The plant trunk and foliage utilize nutrients such as Nitrogen and Phosphorus for plant health, sequester heavy metals into the biomass, and provide evapotranspiration of residual water within the system.

Criteria	Answer	Progression
Criteria 6: Is the compact biofiltration BMP designed with a hydraulic loading rate to prevent erosion, scour and channeling within the BMP?	◉ Yes	Provide documentation that the compact biofiltration BMP is used in a manner consistent with manufacturer guidelines and conditions of its third-party certification. **Proceed to Criteria 7.**
	○ No	**Stop**. Compact biofiltration BMP is not allowed.

Provide basis for Criteria 6:

Provide documentation that the BMP meets the numeric criteria and is designed consistent with the manufacturer guidelines and conditions of its third-party certification (i.e., maximum tributary area, maximum inflow velocities, etc., as applicable).

Compact (high rate) Biofiltration BMP Checklist		Form I-10
Criteria	**Answer**	**Progression**
Criteria 7: Is the compact biofiltration BMP maintenance plan consistent with manufacturer guidelines and conditions of its third-party certification (i.e., maintenance activities, frequencies)?	○ Yes, and the compact BMP is privately owned, operated and not in the public right of way.	Submit a maintenance agreement that will also include a statement that the BMP will be maintained in accordance with manufacturer guidelines and conditions of third-party certification. **Stop**. The compact biofiltration BMP meets the required criteria.
	○ Yes, and the BMP is either owned or operated by the City or in the public right of way.	Approval is at the discretion of the City Engineer. The city engineer will consider maintenance requirements, cost of maintenance activities, relevant previous local experience with operation and maintenance of the BMP type, ability to continue to operate the system in event that the vending company is no longer operating as a business or other relevant factors while making the determination. **Stop**. Consult the City Engineer for a determination.
	○ No	**Stop**. Compact biofiltration BMP is not allowed.

Provide basis for Criteria 7:

Include copy of manufacturer guidelines and conditions of third-party certification in the maintenance agreement. PDP SWQMP must include a statement that the compact BMP will be maintained in accordance with manufacturer guidelines and conditions of third-party certification.

Compact (high rate) Biofiltration BMP Checklist	Form I-10
Section 2: Verification (For City Use Only)	
Is the proposed compact BMP accepted by the City Engineer for onsite pollutant control compliance for the DMA?	○ Yes ○ No, See explanation below
Explanation/reason if the compact BMP is not accepted by the City for onsite pollutant control compliance:	

WASHINGTON STATE DEPARTMENT OF ECOLOGY

September 2019

GENERAL USE LEVEL DESIGNATION FOR BASIC (TSS), ENHANCED, PHOSPHORUS & OIL TREATMENT

For

CONTECH Engineered Solutions Filterra®

Ecology's Decision:

Based on Contech's submissions, including the Final Technical Evaluation Reports, dated August 2019, March 2014, December 2009, and additional information provided to Ecology dated October 9, 2009, Ecology hereby issues the following use level designations:

1. A General Use Level Designation for Basic, Enhanced, Phosphorus, and Oil Treatment for the Filterra® system constructed with a minimum media thickness of 21 inches (1.75 feet), at the following water quality design hydraulic loading rates:

Treatment	Infiltration Rate (in/hr) for use in Sizing
Basic	175
Phosphorus	100
Oil	50
Enhanced	175

2. The Filterra is not appropriate for oil spill-control purposes.
3. Ecology approves Filterra systems for treatment at the hydraulic loading rates listed above, to achieve the maximum water quality design flow rate. Calculate the water quality design flow rates using the following procedures:

- Western Washington: for treatment installed upstream of detention or retention, the water quality design flow rate is the peak 15-minute flow rate as calculated using the latest version of the Western Washington Hydrology Model or other Ecology-approved continuous runoff model.
- Eastern Washington: For treatment installed upstream of detention or retention, the water quality design flow rate is the peak 15-minute flow rate as calculated using one of the three flow rate based methods described in Chapter 2.2.5 of the Stormwater Management Manual for Eastern Washington (SWMMEW) or local manual.
- Entire State: For treatment installed downstream of detention, the water quality design flow rate is the full 2-year release rate of the detention facility.

4. This General Use Level Designation has no expiration date, but Ecology may revoke or amend the designation, and is subject to the conditions specified below.

Ecology's Conditions of Use:

Filterra systems shall comply with these conditions shall comply with the following conditions:

1. Design, assemble, install, operate, and maintain the Filterra systems in accordance with applicable Contech Filterra manuals and this Ecology Decision.
2. The minimum size filter surface-area for use in Washington is determined by using the design water quality flow rate (as determined in this Ecology Decision, Item 3, above) and the Infiltration Rate from the table above (use the lowest applicable Infiltration Rate depending on the level of treatment required). Calculate the required area by dividing the water quality design flow rate (cu-ft/sec) by the Infiltration Rate (converted to ft/sec) to obtain required surface area (sq-ft) of the Filterra unit.
3. Each site plan must undergo Contech Filterra review before Ecology can approve the unit for site installation. This will ensure that design parameters including site grading and slope are appropriate for use of a Filterra unit.
4. Filterra media shall conform to the specifications submitted to and approved by Ecology and shall be sourced from Contech Engineered Solutions, LLC with no substitutions.
5. Maintenance includes removing trash, degraded mulch, and accumulated debris from the filter surface and replacing the mulch layer. Use inspections to determine the site-specific maintenance schedules and requirements. Follow maintenance procedures given in the most recent version of the Filterra Operation and Maintenance Manual.
6. Maintenance: The required maintenance interval for stormwater treatment devices is often dependent upon the degree of pollutant loading from a particular drainage basin. Therefore, Ecology does not endorse or recommend a "one size fits all" maintenance cycle for a particular model/size of manufactured treatment device.

    - Contech designs Filterra systems for a target maintenance interval of 6 months in the Pacific Northwest. Maintenance includes removing and replacing the mulch layer above the media along with accumulated sediment, trash, and captured organic materials therein, evaluating plant health, and pruning the plant if deemed necessary.
    - Conduct maintenance following manufacturer's guidelines.

7. Filterra systems come in standard sizes.

8. Install the Filterra in such a manner that flows exceeding the maximum Filterra operating rate are conveyed around the Filterra mulch and media and will not resuspend captured sediment.
9. Discharges from the Filterra units shall not cause or contribute to water quality standards violations in receiving waters.

Approved Alternate Configurations

Filterra Internal Bypass - Pipe (FTIB-P)

1. The Filterra® Internal Bypass – Pipe allows for piped-in flow from area drains, grated inlets, trench drains, and/or roof drains. Design capture flows and peak flows enter the structure through an internal slotted pipe. Filterra® inverted the slotted pipe to allow design flows to drop through to a series of splash plates that then disperse the design flows over the top surface of the Filterra® planter area. Higher flows continue to bypass the slotted pipe and convey out the structure.
2. To select a FTIB-P unit, the designer must determine the size of the standard unit using the sizing guidance described above.

Filterra Internal Bypass – Curb (FTIB-C)

1. The Filterra® Internal Bypass –Curb model (FTIB-C) incorporates a curb inlet, biofiltration treatment chamber, and internal high flow bypass in one single structure. Filterra® designed the FTIB-C model for use in a "Sag" or "Sump" condition and will accept flows from both directions along a gutter line. An internal flume tray weir component directs treatment flows entering the unit through the curb inlet to the biofiltration treatment chamber. Flows in excess of the water quality treatment flow rise above the flume tray weir and discharge through a standpipe orifice; providing bypass of untreated peak flows. Americast manufactures the FTIB-C model in a variety of sizes and configurations and you may use the unit on a continuous grade when a single structure providing both treatment and high flow bypass is preferred. The FTIB-C model can also incorporate a separate junction box chamber to allow larger diameter discharge pipe connections to the structure.
2. To select a FTIB-C unit, the designer must determine the size of the standard unit using the sizing guidance described above.

Filterra® Shallow

1. The Filterra Shallow provides additional flexibility for design engineers and designers in situations where various elevation constraints prevent application of a standard Filterra configuration. Engineers can design this system up to six inches shallower than any of the previous Filterra unit configurations noted above.
2. Ecology requires that the Filterra Shallow provide a media contact time equivalent to that of the standard unit. This means that with a smaller depth of media, the surface area must increase.
3. To select a Filterra Shallow System unit, the designer must first identify the size of the standard unit using the modeling guidance described above.
4. Once the size of the standard Filterra unit is established using the sizing technique described above, use information from the following table to select the appropriate size Filterra Shallow System unit.

Shallow Unit Basic, Enhanced, and Oil Treatment Sizing

Standard Depth	Equivalent Shallow Depth
4x4	4x6 or 6x4
4x6 or 6x4	6x6
4x8 or 8x4	6x8 or 8x6
6x6	6x10 or 10x6
6x8 or 8x6	6x12 or 12x6
6x10 or 10x6	13x7

Notes:
1. Shallow Depth Boxes are less than the standard depth of 3.5 feet but no less than 3.0 feet deep (TC to INV).

Applicant: Contech Engineered Solutions, LLC.

Applicant's Address: 11815 NE Glenn Widing Drive
Portland, OR 97220

Application Documents:

- State of Washington Department of Ecology Application for Conditional Use Designation, Americast (September 2006)
- Quality Assurance Project Plan Filterra® Bioretention Filtration System Performance Monitoring, Americast (April 2008)
- Quality Assurance Project Plan Addendum Filterra® Bioretention Filtration System Performance Monitoring, Americast (June 2008)
- Draft Technical Evaluation Report Filterra® Bioretention Filtration System Performance Monitoring, Americast (August 2009)
- Final Technical Evaluation Report Filterra® Bioretention Filtration System Performance Monitoring, Americast (December 2009)
- Technical Evaluation Report Appendices Filterra® Bioretention Filtration System Performance Monitoring, Americast, (August 2009)
- Memorandum to Department of Ecology Dated October 9, 2009 from Americast, Inc. and Herrera Environmental Consultants
- Quality Assurance Project Plan Filterra® Bioretention System Phosphorus treatment and Supplemental Basic and Enhanced Treatment Performance Monitoring, Americast (November 2011)
- Filterra® letter August 24, 2012 regarding sizing for the Filterra® Shallow System.
- University of Virginia Engineering Department Memo by Joanna Crowe Curran, Ph. D dated March 16, 2013 concerning capacity analysis of Filterra® internal weir inlet tray.
- Terraphase Engineering letter to Jodi Mills, P.E. dated April 2, 2013 regarding Terraflume Hydraulic Test, Filterra® Bioretention System and attachments.
- Technical Evaluation Report, Filterra® System Phosphorus Treatment and Supplemental Basic Treatment Performance Monitoring. March 27th, 2014.
- State of Washington Department of Ecology Application for Conditional Use Level Designation, Contech Engineered Solutions (May 2015)

- Quality Assurance Project Plan Filterra® Bioretention System, Contech Engineered Solutions (May 2015)
- Filterra Bioretention System Armco Avenue General Use Level Designation Technical Evaluation Report, Contech Engineered Solutions (August 2019)

Applicant's Use Level Request:

General Level Use Designation for Basic (175 in/hr), Enhanced (175 in/hr), Phosphorus (100 in/hr), and Oil Treatment (50 in/hr).

Applicant's Performance Claims:

Field-testing and laboratory testing show that the Filterra® unit is promising as a stormwater treatment best management practice and can meet Ecology's performance goals for basic, enhanced, phosphorus, and oil treatment.

Findings of Fact:

Field Testing 2015-2019

1. Contech completed field testing of a 4 ft. x 4 ft. Filterra® unit at one site in Hillsboro, Oregon from September 2015 to July 2019. Throughout the monitoring period a total of 24 individual storm events were sampled, of which 23 qualified for TAPE sampling criteria.
2. Contech encountered several unanticipated events and challenges that prevented them from collecting continuous flow and rainfall data. An analysis of the flow data from the sampled events, including both the qualifying and non-qualifying events, demonstrated the system treated over 99 % of the influent flows. Peak flows during these events ranged from 25 % to 250 % of the design flow rate of 29 gallons per minute.
3. Of the 23 TAPE qualified sample events, 13 met requirements for TSS analysis. Influent concentrations ranged from 20.8 mg/L to 83 mg/L, with a mean concentration of 46.3 mg/L. The UCL95 mean effluent concentration was 15.9 mg/L, meeting the 20 mg/L performance goal for Basic Treatment.
4. All 23 TAPE qualified sample events met requirements for dissolved zinc analysis. Influent concentrations range from 0.0384 mg/L to 0.2680 mg/L, with a mean concentration of 0.0807 mg/L. The LCL 95 mean percent removal was 62.9 %, meeting the 60 % performance goal for Enhanced Treatment.
5. Thirteen of the 23 TAPE qualified sample events met requirements for dissolved copper analysis. Influent concentrations ranged from 0.00543 mg/L to 0.01660 mg/L, with a mean concentration of 0.0103 mg/L. The LCL 95 mean percent removal was 41.2 %, meeting the 30 % performance goal for Enhanced Treatment.
6. Total zinc concentrations were analyzed for all 24 sample events. Influent EMCs for total zinc ranged from 0.048 mg/L to 5.290 mg/L with a median of 0.162 mg/L. Corresponding effluent EMCs for total zinc ranged from 0.015 mg/L to 0.067 mg/L with a median of

0.029 mg/L. Total event loadings for the study for total zinc were 316.85 g at the influent and 12.92 g at the effluent sampling location, resulting in a summation of loads removal efficiency of 95.9 %.

7. Total copper concentrations were analyzed for all 24 sample events. Influent EMCs for total copper ranged from 0.003 mg/L to 35.600 mg/L with a median value of 0.043 mg/L. Corresponding effluent EMCs for total copper ranged from 0.002 mg/L to 0.015 mg/L with a median of 0.004 mg/L. Total event loadings for total copper for the study were 1,810.06 g at the influent and 1.90 g at the effluent sampling location, resulting in a summation of loads removal efficiency of 99.9 %.

Field Testing 2013

1. Filterra completed field-testing of a 6.5 ft x 4 ft. unit at one site in Bellingham, Washington. Continuous flow and rainfall data collected from January 1, 2013 through July 23, 2013 indicated that 59 storm events occurred. Water quality data was obtained from 22 storm events. Not all the sampled storms produced information that met TAPE criteria for storm and/or water quality data.
2. The system treated 98.9 % of the total 8-month runoff volume during the testing period. Consequently, the system achieved the goal of treating 91 % of the volume from the site. Stormwater runoff bypassed Filterra treatment during four of the 59 storm events.
3. Of the 22 sampled events, 18 qualified for TSS analysis (influent TSS concentrations ranged from 25 to 138 mg/L). The data were segregated into sample pairs with influent concentration greater than and less than 100 mg/L. The UCL95 mean effluent concentration for the data with influent less than 100 mg/L was 5.2 mg/L, below the 20-mg/L threshold. Although the TAPE guidelines do not require an evaluation of TSS removal efficiency for influent concentrations below 100 mg/L, the mean TSS removal for these samples was 90.1 %. Average removal of influent TSS concentrations greater than 100 mg/L (three events) was 85 %. In addition, the system consistently exhibited TSS removal greater than 80 % at flow rates equivalent to a 100 in/hr infiltration rate and was observed at 150 in/hr.
4. Ten of the 22 sampled events qualified for TP analysis. Americast augmented the dataset using two sample pairs from previous monitoring at the site. Influent TP concentrations ranged from 0.11 to 0.52 mg/L. The mean TP removal for these twelve events was 72.6 %. The LCL95 mean percent removal was 66.0, well above the TAPE requirement of 50 %. Treatment above 50 % was evident at 100 in/hr infiltration rate and as high as 150 in/hr. Consequently, the Filterra test system met the TAPE Phosphorus Treatment goal at 100 in/hr. Influent ortho-P concentrations ranged from 0.005 to 0.012 mg/L; effluent ortho-P concentrations ranged from 0.005 to 0.013 mg/L. The reporting limit/resolution for the ortho-P test method is 0.01 mg/L, therefore the influent and effluent ortho-P concentrations were both at and near non-detect concentrations.

Field Testing 2008-2009

1. Filterra completed field-testing at two sites at the Port of Tacoma. Continuous flow and rainfall data collected during the 2008-2009 monitoring period indicated that 89 storm events occurred. The monitoring obtained water quality data from 27 storm events. Not all the sampled storms produced information that met TAPE criteria for storm and/or water quality data.
2. During the testing at the Port of Tacoma, 98.96 to 99.89 % of the annual influent runoff volume passed through the POT1 and POT2 test systems respectively. Stormwater runoff bypassed the POT1 test system during nine storm events and bypassed the POT2 test system during one storm event. Bypass volumes ranged from 0.13 % to 15.3% of the influent storm volume. Both test systems achieved the 91 % water quality treatment-goal over the 1-year monitoring period.
3. Consultants observed infiltration rates as high as 133 in/hr during the various storms. Filterra did not provide any paired data that identified percent removal of TSS, metals, oil, or phosphorus at an instantaneous observed flow rate.
4. The maximum storm average hydraulic loading rate associated with water quality data is <40 in/hr, with the majority of flow rates < 25 in/hr. The average instantaneous hydraulic loading rate ranged from 8.6 to 53 in/hr.
5. The field data showed a removal rate greater than 80 % for TSS with an influent concentration greater than 20 mg/L at an average instantaneous hydraulic loading rate up to 53 in/hr (average influent concentration of 28.8 mg/L, average effluent concentration of 4.3 mg/L).
6. The field data showed a removal rate generally greater than 54 % for dissolved zinc at an average instantaneous hydraulic loading rate up to 60 in/hr and an average influent concentration of 0.266 mg/L (average effluent concentration of 0.115 mg/L).
7. The field data showed a removal rate generally greater than 40 % for dissolved copper at an average instantaneous hydraulic loading rate up to 35 in/hr and an average influent concentration of 0.0070 mg/L (average effluent concentration of 0.0036 mg/L).
8. The field data showed an average removal rate of 93 % for total petroleum hydrocarbon (TPH) at an average instantaneous hydraulic loading rate up to 53 in/hr and an average influent concentration of 52 mg/L (average effluent concentration of 2.3 mg/L). The data also shows achievement of less than 15 mg/L TPH for grab samples. Filterra provided limited visible sheen data due to access limitations at the outlet monitoring location.
9. The field data showed low percentage removals of total phosphorus at all storm flows at an average influent concentration of 0.189 mg/L (average effluent concentration of 0.171 mg/L). We may relate the relatively poor treatment performance of the Filterra system at this location to influent characteristics for total phosphorus that are unique to the Port of Tacoma site. It appears that the Filterra system will not meet the 50 % removal performance goal when the majority of phosphorus in the runoff is expected to be in the dissolved form.

Laboratory Testing

1. Filterra performed laboratory testing on a scaled down version of the Filterra unit. The lab data showed an average removal from 83-91 % for TSS with influents ranging from 21 to 320 mg/L, 82-84 % for total copper with influents ranging from 0.94 to 2.3 mg/L, and 50-61 % for orthophosphate with influents ranging from 2.46 to 14.37 mg/L.
2. Filterra conducted permeability tests on the soil media.
3. Lab scale testing using Sil-Co-Sil 106 showed removals ranging from 70.1 % to 95.5 % with a median removal of 90.7 %, for influent concentrations ranging from 8.3 to 260 mg/L. Filterra ran these laboratory tests at an infiltration rate of 50 in/hr.
4. Supplemental lab testing conducted in September 2009 using Sil-Co-Sil 106 showed an average removal of 90.6 %. These laboratory tests were run at infiltration rates ranging from 25 to 150 in/hr for influent concentrations ranging from 41.6 to 252.5 mg/L. Regression analysis results indicate that the Filterra system's TSS removal performance is independent of influent concentration in the concentration rage evaluated at hydraulic loading rates of up to 150 in/hr.

Contact Information:

Applicant:
Jeremiah Lehman
Contech Engineered Solutions, LLC.
11815 Glenn Widing Dr
Portland, OR 97220
(503) 258-3136
jlehman@conteches.com

Applicant's Website: http://www.conteches.com

Ecology web link: http://www.ecy.wa.gov/programs/wq/stormwater/newtech/index.html

Ecology:
Douglas C. Howie, P.E.
Department of Ecology
Water Quality Program
(360) 407-6444
douglas.howie@ecy.wa.gov

Date	Revision
December 2009	GULD for Basic, Enhanced, and Oil granted, CULD for Phosphorus
September 2011	Extended CULD for Phosphorus Treatment
September 2012	Revised design storm discussion, added Shallow System.
January 2013	Revised format to match Ecology standards, changed Filterra contact information
February 2013	Added FTIB-P system
March 2013	Added FTIB-C system
April 2013	Modified requirements for identifying appropriate size of unit

June 2013	Modified description of FTIB-C alternate configuration
March 2014	GULD awarded for Phosphorus Treatment. GULD updated for a higher flow-rate for Basic Treatment.
June 2014	Revised sizing calculation methods
March 2015	Revised Contact Information
June 2015	CULD for Basic and Enhanced at 100 in/hr infiltration rate
September 2019	GULD for Basic and Enhanced at 175 in/hr infiltration rate

CONTECH®
ENGINEERED SOLUTIONS

Filterra®
High Performance Bioretention



The experts you need to solve your stormwater challenges



Contech is the leader in stormwater solutions, helping engineers, contractors and owners with infrastructure and land development projects throughout North America.

With our responsive team of stormwater experts, local regulatory expertise and flexible solutions, Contech is the trusted partner you can count on for stormwater management solutions.

Your Contech Team



STORMWATER CONSULTANT

It's my job to recommend the best solution to meet permitting requirements.



STORMWATER DESIGN ENGINEER

I work with consultants to design the best approved solution to meet your project's needs.



REGULATORY MANAGER

I understand the local stormwater regulations and what solutions will be approved.



SALES ENGINEER

I make sure our solutions meet the needs of the contractor during construction.

Contech is your partner in stormwater management solutions



Low Impact Development in a Small Footprint – Filterra®

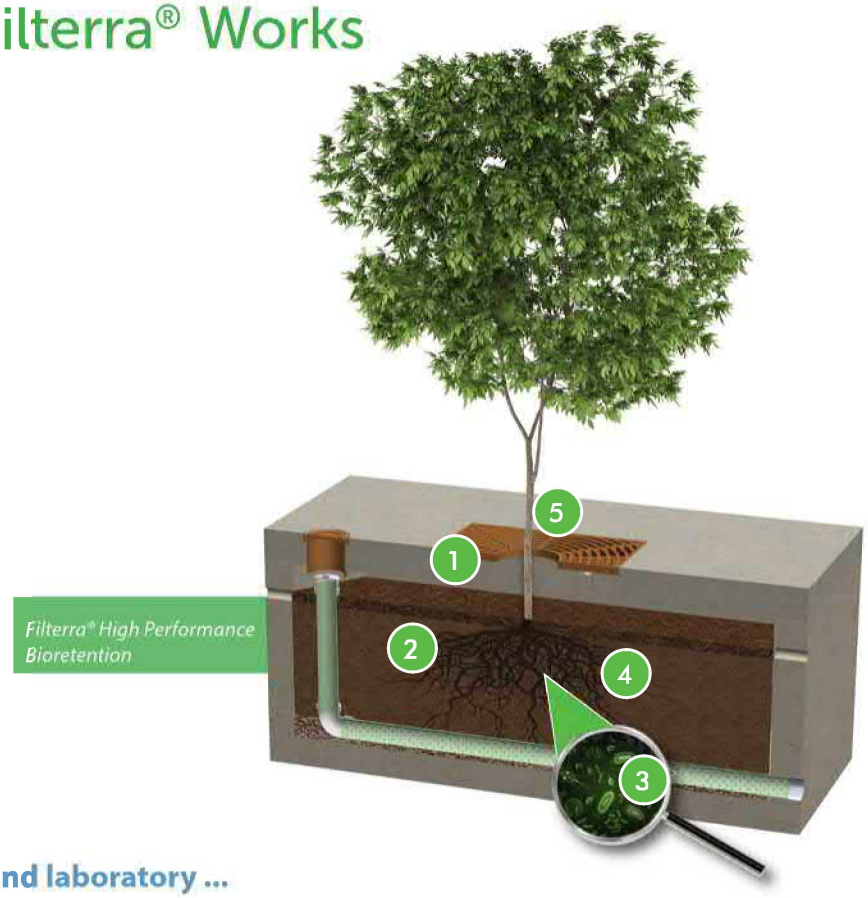
Filterra is an engineered high-performance bioretention system. While it operates similar to traditional bioretention, its high flow media allows for a reduction in footprint of up to 95% versus traditional bioretention practices. Filterra provides a Low Impact Development (LID) solution for tight, highly developed sites such as urban development projects, commercial parking lots, residential streets, and streetscapes. Its small footprint also reduces installation and life cycle costs versus traditional bioretention. Filterra can be configured in many different ways to enhance site aesthetics, integrate with other LID practices, or increase runoff reduction through infiltration below or downstream of the system.

At the Manchester Stormwater Park seen above, the Filterra systems surrounding the central courtyard allowed for the creation of a community space with parking, sidewalks, and benches in a quaint downtown area. A traditional bioretention system treating the same drainage area would have occupied the entire park area leaving no room for these amenities.

filterra®
Bioretention Systems

filterra® Bioscape

How the Filterra® Works



Tested in the field and laboratory ...

1. Stormwater enters the Filterra through a pipe, curb inlet, or sheet flow and ponds over the pretreatment mulch layer, capturing heavy sediment and debris. Organics and microorganisms within the mulch trap and degrade metals and hydrocarbons. The mulch also provides water retention for the system's vegetation.

2. Stormwater flows through engineered Filterra media which filters fine pollutants and nutrients. Organic material in the media removes dissolved metals and acts as a food source for root-zone microorganisms. Treated water exits through an underdrain pipe or infiltrates (if designed accordingly).

3. Rootzone microorganisms digest and transform pollutants into forms easily absorbed by plants.

4. Plant roots absorb stormwater and pollutants that were transformed by microorganisms, regenerating the media's pollutant removal capacity. The roots grow, provide a hospitable environment for the rootzone microorganisms and penetrate the media, maintaining hydraulic conductivity.

5. The plant trunk and foliage utilize nutrients such as Nitrogen and Phosphorus for plant health, sequester heavy metals into the biomass, and provide evapotranspiration of residual water within the system.



Plants and organic material are vital to the long term performance of bioretention systems

Using nature to facilitate Stormwater Management



Filterra® Features and Benefits

FEATURE	BENEFITS
High biofiltration media flow rate (up to 175"/hr+)	Greatly reduced footprint versus traditional bioretention and LID solutions
Filterra system is packaged, including all components necessary for system performance	Quality control for easy, fast and successful installation
Quick and easy maintenance	Low lifecycle costs
Variety of configurations and aesthetic options	Integrates easily into any site or landscape plan
Natural stormwater management processes featuring organics and vegetation	Meets Low Impact Development requirements and ensures long-term performance



The Filterra system can be configured with many different aesthetic options

Select Filterra® Approvals

Filterra is approved through numerous local, state and federal verification programs, including:

- New Jersey Department of Environmental Protection (NJ DEP)
- Washington Department of Ecology (GULD) – Basic, Enhanced, Phosphorus, and Oil
- Maryland Department of the Environment - Environmental Site Design (ESD)
- Texas Commission on Environmental Quality (TCEQ)
- Virginia Department of Environmental Quality (VA DEQ)
- Maine Department of Environmental Protection (ME DEP)
- Atlanta, GA Regional Commission
- Los Angeles County, CA - Alternate to Attachment H
- City of Portland, Oregon Bureau of Environmental Services
- North Carolina Department of Environmental Quality (NC DEQ)



Filterra® Performance Testing Results



APPLICATION TIPS

- The Filterra system has been tested under industry standard protocols and has proven its pollutant removal performance and system longevity.
- Contech invests significant resources in media blending calibration and product testing to ensure our media meets our strict performance specifications every time.
- Keep regulators and owners happy by selecting a product with predictable and proven maintenance longevity.



POLLUTANT OF CONCERN	MEDIAN REMOVAL EFFICIENCY	MEDIAN EFFLUENT CONCENTRATION (MG/L)
Total Suspended Solids (TSS)	86%	3.3
Total Phosphorus - TAPE (TP)	70%	0.05
Total Nitrogen (TN)	34%	0.54
Total Copper (TCu)	55%	0.004
Total Dissolved Copper	43%	0.003
Total Zinc (TZn)	56%	0.04
Total Dissolved Zinc	54%	0.1
Total Petroleum Hydrocarbons	87%	0.71

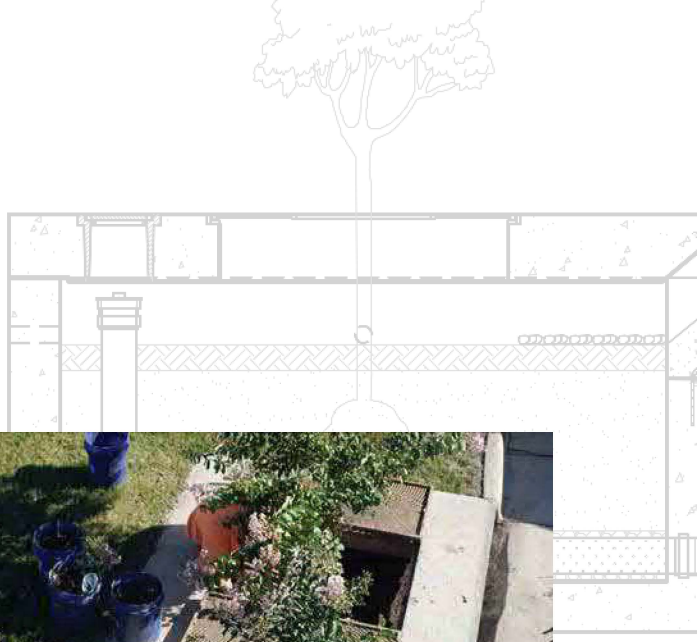
Each batch of Filterra® media has been extensively tested to ensure consistent performance every time.

Sources:
UVA (TARP) Field Study - 2006
Herrera (TAPE) Study - 2009
Herrera (TAPE) Study - 2014
NC State Study - 2015

Note: Some jurisdictions recognize higher removal rates. Contact your Contech Stormwater Consultant for performance expectations.

Field tested and performance verified

Filterra® Maintenance



Activation and vegetation selection guidance is included with every system.

With proper routine maintenance, the engineered media within the Filterra system should last as long as traditional bioretention media.

Maintenance is low-cost, low-tech and simple:

- Remove trash, sediment, and mulch
- Replace with a fresh 3" layer of mulch
- No confined space entry or special tools
- Easily performed by landscape contractor or facilities maintenance provider



Filterra offers high performance bioretention for advanced pollutant removal with easy maintenance.



Watch the Filterra Maintenance video at www.ContechES.com/filterra



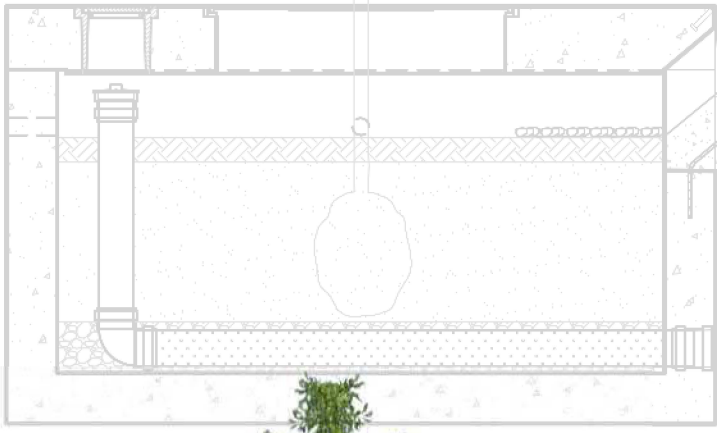
Plant health evaluation and pruning is important to encourage growth.

All stormwater treatment systems require maintenance for effective operation.

Filterra® Configurations

Multiple system configurations integrate with site hydraulic design and layout ...

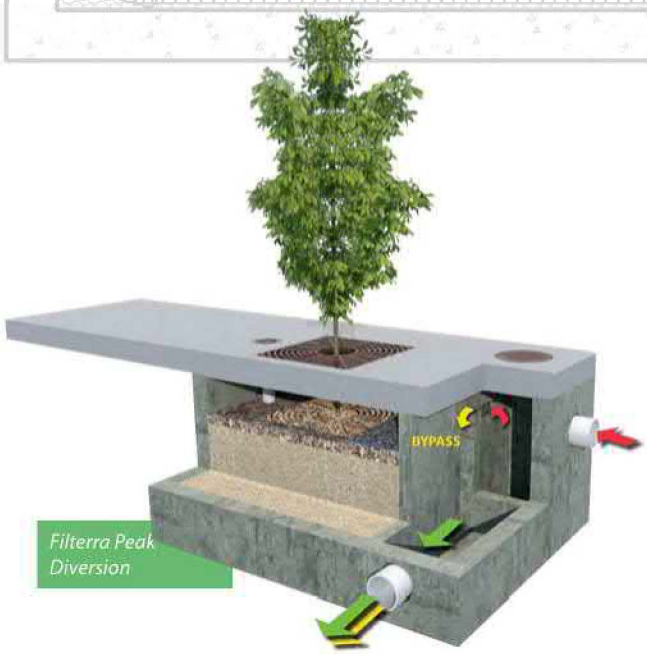
The Filterra is available in a variety of precast configurations as well as Filterra Bioscape, which can be installed directly into an excavated basin.





Filterra Offline

Bypass via downstream catch basin.



Filterra Peak Diversion



Filterra Internal Bypass Curb



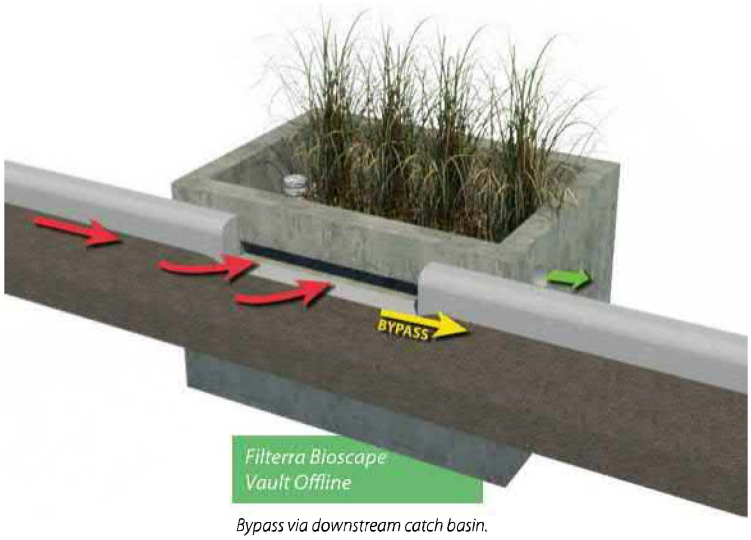
Filterra Sedimentation Chamber (Maryland Only)

Bypass via downstream catch basin.

**Additional configurations available, including offline - pipe, peak diversion - grate, and internal bypass curb-chamber.*

Multiple configurations allow for easy site integration

Filterra® Bioscape® Configurations



Filterra Bioscape Vault Offline

Bypass via downstream catch basin.



Filterra Bioscape Vault Basin

Bypass via upstream structure.
Multiple inlet options.

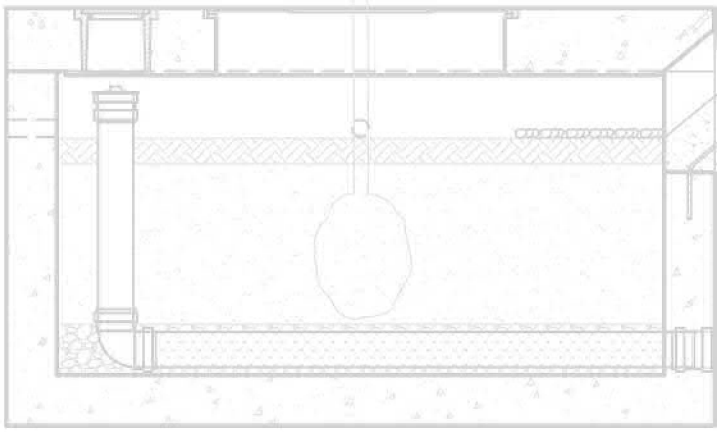


Filterra Bioscape

Bypass via upstream structure.
Multiple inlet options.

*Additional configurations available, including bioscape vault offline pipe.

Filterra® Aesthetic Options



Multiple aesthetic options to enhance the appearance and integrate with landscaping ...



Standard Tree Grate



Custom/Decorative Tree Grate



Full Grate with Grasses



Recessed Top Slab



Open Top Planter - Filterra Bioscape



Street Tree

An aesthetic solution to meet your bioretention needs

Filterra® Bioscape®







Large-scale Filterra that can be customized to your site ...

- Ideal for Filterra systems greater than 300 square feet
- Design with or without containment structure
- Incorporate infiltration directly below the system, where required
- Combine with upstream storage or downstream infiltration
- Use as an alternative to larger regional traditional bioretention systems
- Easily add pretreatment Hydrodynamic Separator for large-scale or heavy pollutant loading applications



A partner you can rely on



STORMWATER SOLUTIONS

PIPE SOLUTIONS

STRUCTURES SOLUTIONS

Few companies offer the wide range of high-quality stormwater resources you can find with us — state-of-the-art products, decades of expertise, and all the maintenance support you need to operate your system cost-effectively.

THE CONTECH WAY

Contech® Engineered Solutions provides innovative, cost-effective site solutions to engineers, contractors, and developers on projects across North America. Our portfolio includes bridges, drainage, erosion control, retaining wall, sanitary sewer and stormwater management products.

TAKE THE NEXT STEP

For more information: www.ContechES.com

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CONTECH® ENGINEERED SOLUTIONS

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FILTERRA® BIOSCAPE® ACTIVATION PACKAGE

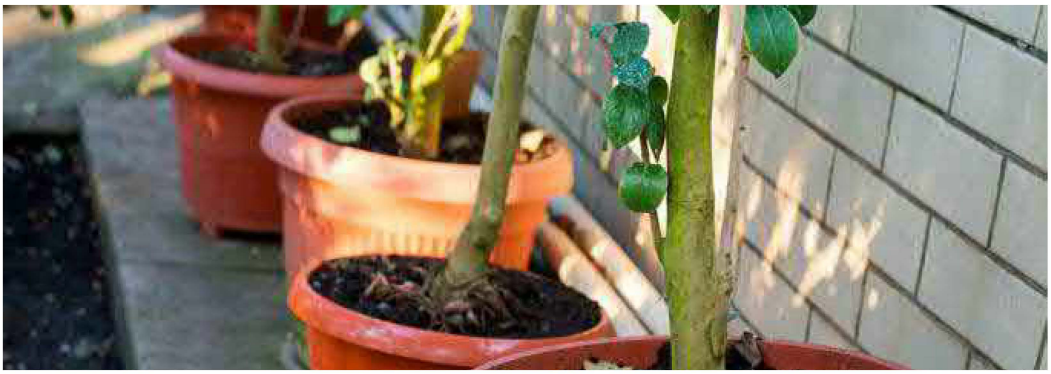
(No Precast Vaults Provided)

CONTECH® ENGINEERED SOLUTIONS

It is the purchaser's responsibility to Activate the Filterra Bioscape System and provide adequate measures to prevent construction related runoff from entering the Filterra Bioscape system.

Included with your purchase is Supervised Activation of the Filterra system by the manufacturer as well as a 1-year warranty from delivery of the system. The purchaser must ensure that the site is acceptable for Filterra Bioscape Activation. A checklist (included as page 2 of this document must be completed and submitted to the Contech Activation Coordinator. The minimum requirements for Filterra Bioscape Activation are as follows:

1. The purchaser must have sourced vegetation meeting the requirements outlined in "Plant Selection for Filterra Systems" below.
2. A pre-construction meeting is required to discuss site requirements, logistics planning and activation FAQ and red flags.
3. The site landscaping must be fully stabilized, i.e. full landscaping installed and some grass cover (not just straw and seed) is required to reduce sediment transport. Construction debris and materials should be removed from surrounding area.
4. Final paving must be completed. Final paving ensures that paving materials will not enter and contaminate the Filterra system during the paving process, and that the plant will receive runoff from the drainage area, assisting with plant survival for the Filterra system.
5. All immediate upstream and downstream structures should be placed with piping into the system already installed for connection during activation.



Plant Selection for Filterra® Bioscape® Systems

All Filterra systems require vegetation for proper long-term performance. As indicated in the Filterra Bioscape Activation Package, the Contractor is responsible for sourcing the proper vegetation prior to Supervised Activation. Contech or a Contech representative will supervise installation the vegetation during the Activation process.

Contractors must ensure the vegetation meets the following 3 requirements:

1. Select plant(s) as specified in the engineering plans and specifications AND that are listed on Contech's Configuration Specific Plant Lists.
2. All plants MUST be container-grown in nursery containers no larger than 15 gallons. Crated and/or Ball/Burlap plants are NOT permitted.
3. Quantities should be selected based on plant palette options found starting on page 3 of this document.

If Contech or Contech's representative shows up for Supervised Activation and any of the 3 requirements above are not met, Activation cannot be performed and the Contractor will be billed a $1,500 Unprepared Site fee*.

* *UNPREPARED SITE FEE NOTE: A charge of $1500.00 will be invoiced for each activation visit requested by customer where Contech determines that the site does not meet the conditions required for Activation AND/OR acceptable plants are not provided by the contractor.*

Filterra® Contractor Activation Checklist

Requested Activation Date: _____ System Designation: _____

Project Name: _____

Site Contact Name: _____ Site Contact Phone/Email: _____

Site Owner/End User Name: _____ Site Owner/End User Phone/Email: _____

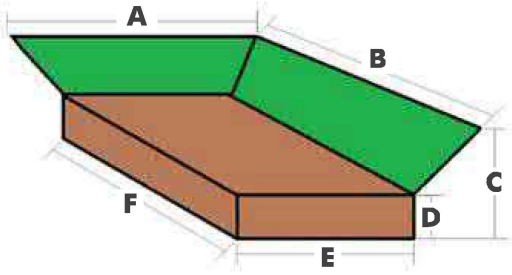
Please complete the following checklist, sign, date, and submit with your activation request to your Contech Project Consultant. Along with the checklist, fill out the as-built dimensions of the Filterra Bioscape system excavation(s), and attach photos of the Filterra Bioscape excavation(s). This information is essential to ensure the proper amount of material is provided.

Checklist:

- ☐ Upstream drainage area to Filterra Bioscape system is stabilized.
- ☐ Filterra Bioscape excavated per plan dimensions to bottom of Filterra underdrain stone depth. Surface area of media area must match order quantities.
- ☐ If additional depth of drain rock is required per site plans, additional drain rock is installed to the Filterra Bioscape underdrain pipe elevation.
- ☐ Excavation sides vertical from bottom of excavation to top of mulch (Approximately 34" when 6" underdrain is utilized).
- ☐ Excavation sides maximum slope 3:1 from top of mulch to finished grade.
- ☐ Side slopes above top of mulch elevation stabilized with sod or other slope stabilization.
- ☐ Bioscape Inlet (BSI) structure or other inlet/bypass structure installed and properly backfilled with maximum 3:1 slopes to top of mulch elevation.
- ☐ Inflow pipe(s) connected from BSI or other inlet structure to edge of Filterra Bioscape system excavation.
- ☐ Outflow pipe(s) connected from edge of Filterra Bioscape system excavation to downstream structure.
- ☐ Outflow pipe(s) are SDR35, properly sized per site plan underdrain pipe size(s).
- ☐ Excavation is dry and free from construction related sediment and debris.
- ☐ Bottom of excavation is properly scarified.
- ☐ Excavation is accessible by standard construction equipment.
- ☐ Plants have been purchased in accordance with the guidance in "Plant Selection for Filterra Bioscape Systems"
- ☐ Photos attached.

NOTE: Please ensure that all of the above conditions have been met prior to activation request. A mobilization fee (minimum $1000.00) applies for each activation visit requested by Customer where Contech determines that the site does not meet the above conditions suitable for activation.

As-Built Dimensions



A.	OVERALL EXCAVATION WIDTH:	_____FT
B.	OVERALL EXCAVATION LENGTH:	_____FT
C.	OVERALL EXCAVATION HEIGHT:	_____FT
D.	FILTERRA BED HEIGHT:	_____FT
E.	FILTERRA MEDIA BED WIDTH:	_____FT
F.	FILTERRA MEDIA BED LENGTH:	_____FT

Signature _____ Date _____

* *UNPREPARED SITE FEE NOTE: A charge of $1500.00 will be invoiced for each activation visit requested by customer where Contech determines that the site does not meet the conditions required for Activation AND/OR acceptable plants are not provided by the contractor.*

Filterra® Bioscape Plant Palettes

KEY: (refer to plant lists for species sizing)



A. EXTRA SMALL GRASS
- Up to 2′ mature spread
- 1-2 gallon typical (1 gal. minimum)

B. SMALL GRASS/SHRUB
- 2′-4′ mature spread
- 1-7 gallon typical

C. MEDIUM SHRUB
- 4′-6′ mature spread
- 1-7 gallon typical

D. LARGE SHRUB OR EXTRA LARGE SHRUB OR TREE
- 6′ mature spread and greater, 30′ max. mature height
- Up to 15 gallon maximum

NOTE: *For larger vaults and in-ground Filterra Bioscape systems, palettes can be scaled (i.e. Qty 6 of the 175 SF Palette can be used for a 1056 SF Filterra Bioscape).*

MIX & MATCH SUBSTITUTION OPTIONS:

1 Large Shrub or Extra Large Shrub or Tree
- 2 Medium Shrubs
- 4 Small Grass/SHrubs
- 12 Extra Small Grasses

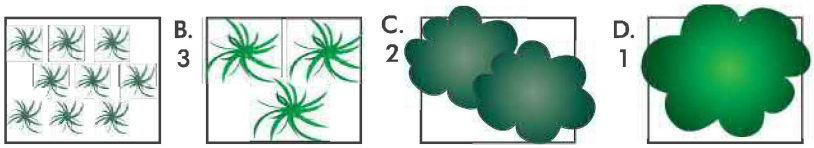
1 Medium Shrub
- 2 Small Grass/Shrubs
- 6 Extra Small Grasses

1 Small Grass/Shrub
- 3 Extra Small Grasses

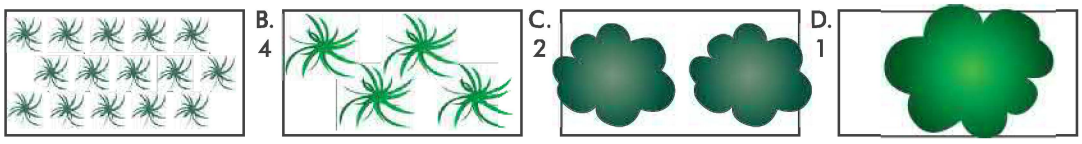
25 SF example



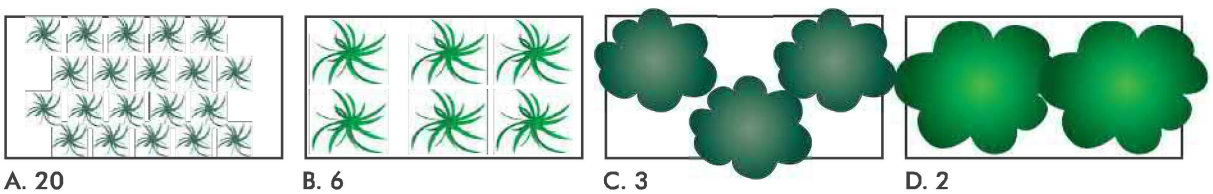
50 SF example



75 SF example

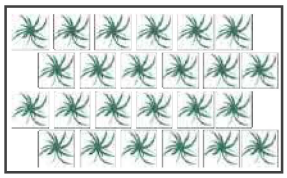


100 SF example

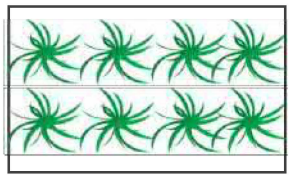


* *UNPREPARED SITE FEE NOTE: A charge of $1500.00 will be invoiced for each activation visit requested by customer where Contech determines that the site does not meet the conditions required for Activation AND/OR acceptable plants are not provided by the contractor.*

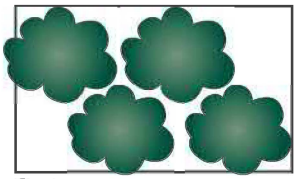
125 SF example



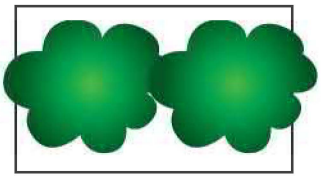
A. 24



B. 8

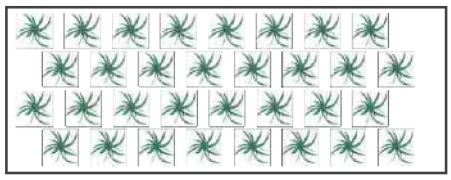


C. 4

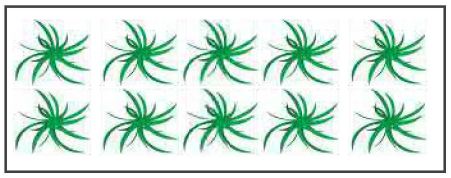


D. 2

150 SF example



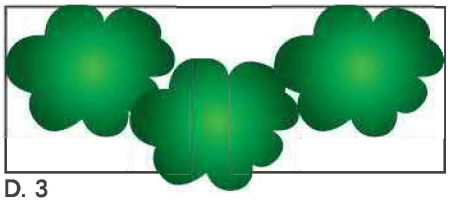
A. 32



B. 10

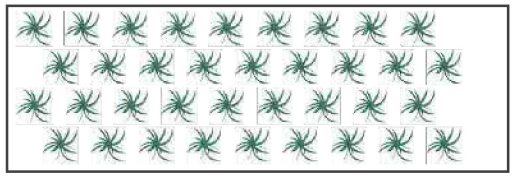


C. 5

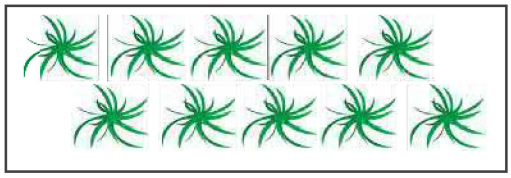


D. 3

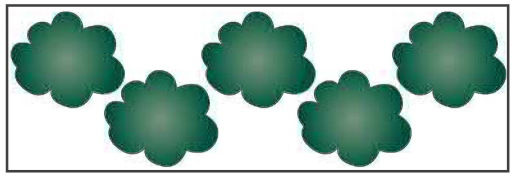
175 SF example



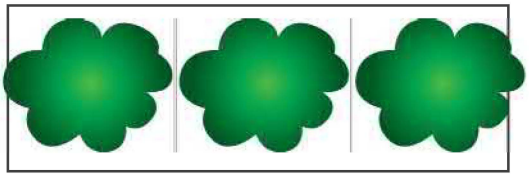
A. 36



B. 10



C. 5



D. 3

In some cases, Contech may consider alternate plant species as approved by the Product Manager. Please list the plant name in the space below and submit this sheet to your Contech Activation Coordinator. If the plant species is approved, either the Product Manager or the Activation Coordinator will sign the form and return to you for inclusion with your Activation Checklist.

Requested Plant Species: _____ Approved: _____

Date: _____

* *UNPREPARED SITE FEE NOTE: A charge of $1500.00 will be invoiced for each activation visit requested by customer where Contech determines that the site does not meet the conditions required for Activation AND/OR acceptable plants are not provided by the contractor.*

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CONTECH® ENGINEERED SOLUTIONS

filterra® Bioretention Systems
A Growing Idea in Stormwater Filtration

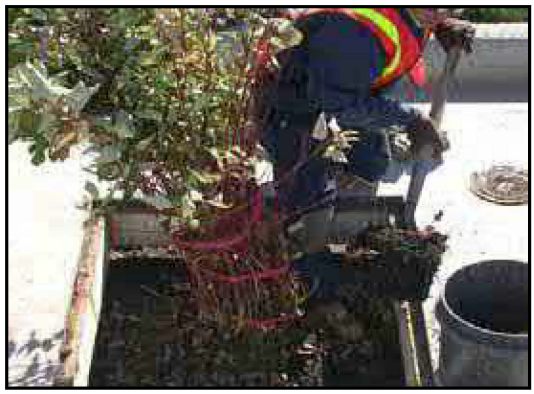
Filterra® Maintenance Steps



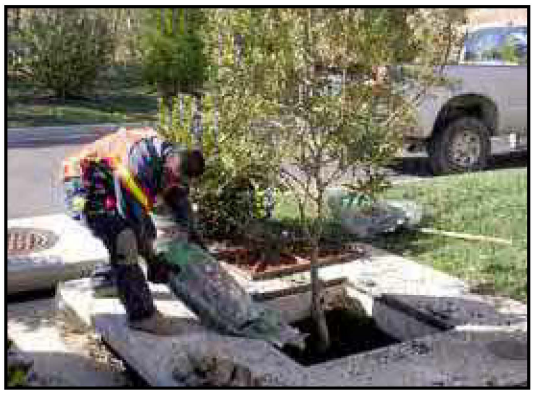
1. Inspection of Filterra and surrounding area



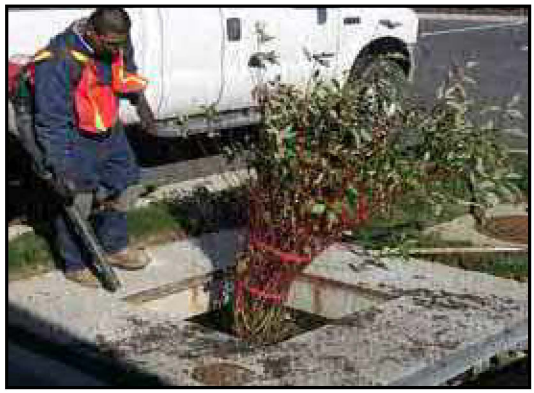
2. Removal of tree grate and erosion control stones



3. Removal of debris, trash and mulch



4. Mulch replacement



5. Clean area around Filterra



6. Complete paperwork and record plant height and width

Contech has created a network of Certified Maintenance Providers (CCMP's) to provide maintenance on Filterra systems. To find a CCMP in your area please visit www.conteches.com/maintenance

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Attachment 2
Backup for PDP Hydromodification Control Measures

This is the cover sheet for Attachment 2.

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

Project Name: Emerald Hills

Indicate which Items are Included:

Attachment Sequence	Contents	Checklist
Attachment 2a	Hydromodification Management Exhibit (Required)	☑ Included See Hydromodification Management Exhibit Checklist.
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 drainage boundaries 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 ☐ Submitted as separate stand-alone document
Attachment 2d	Flow Control Facility Design and Structural BMP Drawdown Calculations (Required) Overflow Design Summary for each structural BMP See Chapter 6 and Appendix G of the BMP Design Manual	☑ Included ☐ Submitted as separate stand-alone document

Project Name: Emerald Hills

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 OR provide a separate map showing that the project site is outside of any critical coarse sediment yield areas
- ☑ 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).

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ATTACHMENT 2a – Hydromodification Watershed Maps

LEGEND

- PROJECT BOUNDARY
- DRAINAGE AREA BOUNDARY
- FLOW DIRECTION
- 00.00 ACRES — SUBAREA ACREAGE
- DMA1-D — DMA #- SOIL TYPE
- POC-1 TRIBUTARY AREA-PERVIOUS
- POC-2 TRIBUTARY AREA-PERVIOUS
- POC-3 TRIBUTARY AREA-PERVIOUS
- D — HYDROLOGIC SOIL TYPE
- POC-1 — POINT OF COMPLIANCE
- HYDROLOGIC SOIL GROUP BOUNDARY
- EXISTING STORM DRAIN

NOTES:

1-EXISTING IMPERVIOUS AREAS WERE MODELED AS PERVIOUS IN THE PRE-DEVELOPED MODELS.

2-SOIL X: TRACE ESCARPMENTS WERE MODELED AS SOIL D IN BOTH PRE AND POST-DEVELOPED MODELS.

3-POC-2* WAS NOT ANALYZED SINCE THE TRIBUTARY AREA FOR THIS POC DECREASED. MOREOVER, NO IMPERVIOUS AREAS WERE PROPOSED FOR IT IN THE POST-DEVELOPED CONDITION. THIS POC DRAINS TO POC-2 AND WAS THEREFORE INCLUDED IN THE POC-2 ANALYSIS.

4-NO PCCSYA ON SITE PER WMAA MAP.

5-GROUNDWATER IS ANTICIPATED TO BE GREATER THAN 50 FEET BELOW SURFACE GRADES.

POC-1

24" RCP OUTLET TO POC 1

BALLINA DRIVE

TOOLEY STREET

STREET NAME

X

DMA1-D

7.56 ACRES

DMA2-D

10.66 ACRES

D

C

DMA2-D

2.14 ACRES

DMA2-C

DMA3-D

9.01 ACRES

18" RCP OUTLET TO POC 2*

POC-2*

DIP ST

STREET

27" RCP

UPLAND ST

18" RCP OUTLET TO STREET

24" RCP OUTLET TO POC 3

POC-3

36" RCP OUTLET TO POC 2

POC-2

OLD MEMORY LANE

LOBER STREET

0 80 160 240

SCALE 1" = 80'

PREPARED BY:

HUNSAKER & ASSOCIATES SAN DIEGO, INC

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

PRE-DEVELOPED CONDITION HYDROMODIFICATION MAP

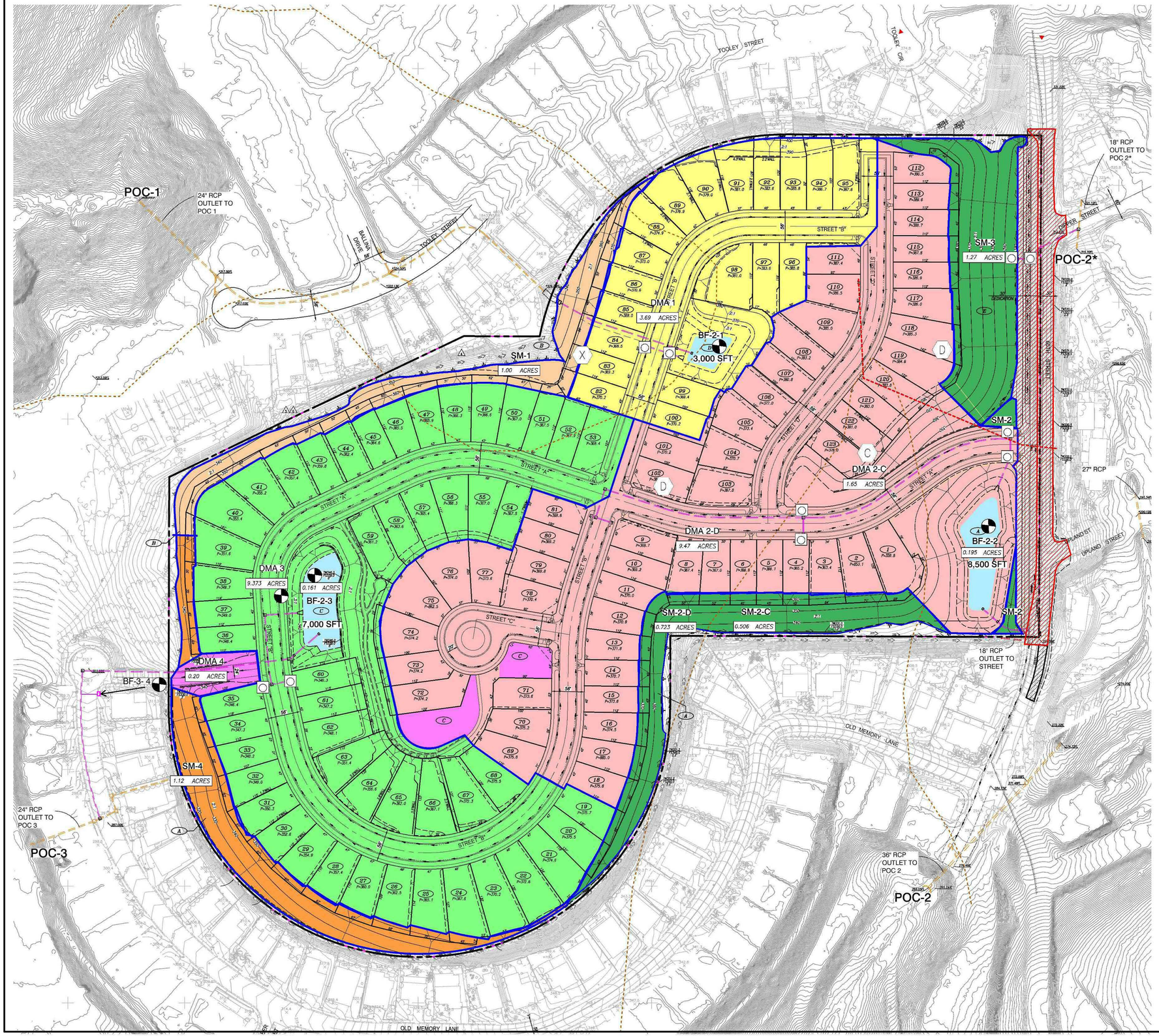
EMERALD HILLS

CITY OF SAN DIEGO, CALIFORNIA

MAP 1 OF 1

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LEGEND:	SYMBOL:
PROJECT BOUNDARY	
DMA BOUNDARY	
DAYLIGHT	
PROPOSED STORM DRAIN	
EXISTING STORM DRAIN	
FLOW LINE	
SUBAREA ACREAGE	00.00 ACRES
DMA ICON	DMA 1
DMA-2 TO POC2	
SELF-MITIGATING AREA - PERVIOUS AREA TO POC 2	
DMA-3 TO POC3	
SELF-MITIGATING AREA - PERVIOUS AREA TO POC 3	
DMA-4 TO POC3	
DMA-1 TO POC1	
SELF-MITIGATING AREA - PERVIOUS AREA TO POC 1	
BASIN BOTTOM AREA	
INLET	
HYDROLOGIC SOIL TYPE	D
POINT OF COMPLIANCE	POC-1
STRUCTURAL BMP	
HYDROLOGIC SOIL GROUP BOUNDARY	
GREEN STREET DMA - HMP EXEMPT	

NOTES:

1-EXISTING IMPERVIOUS AREAS WERE MODELED AS PERVIOUS IN THE PRE-DEVELOPED MODELS.

2-SOIL X: TRACE ESCARPMENTS WERE MODELED AS SOIL D IN BOTH PRE AND POST-DEVELOPED MODELS.

3-POC-2* WAS NOT ANALYZED SINCE THE TRIBUTARY AREA FOR THIS POC DECREASED. MOREOVER, NO IMPERVIOUS AREAS WERE PROPOSED FOR IT IN THE POST-DEVELOPED CONDITION. THIS POC DRAINS TO POC-2 AND WAS THEREFORE INCLUDED IN THE POC-2 ANALYSIS.

4-NO PCCSYA ON SITE PER WMAA MAP.

5-GROUNDWATER IS ANTICIPATED TO BE GREATER THAN 50 FEET BELOW SURFACE GRADES.

0 80 160 240

SCALE 1" =80'

PREPARED BY:

HUNSAKER & ASSOCIATES SAN DIEGO, INC

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

POST-DEVELOPED CONDITION HYDROMODIFICATION MAP

EMERALD HILLS

CITY OF SAN DIEGO, CALIFORNIA

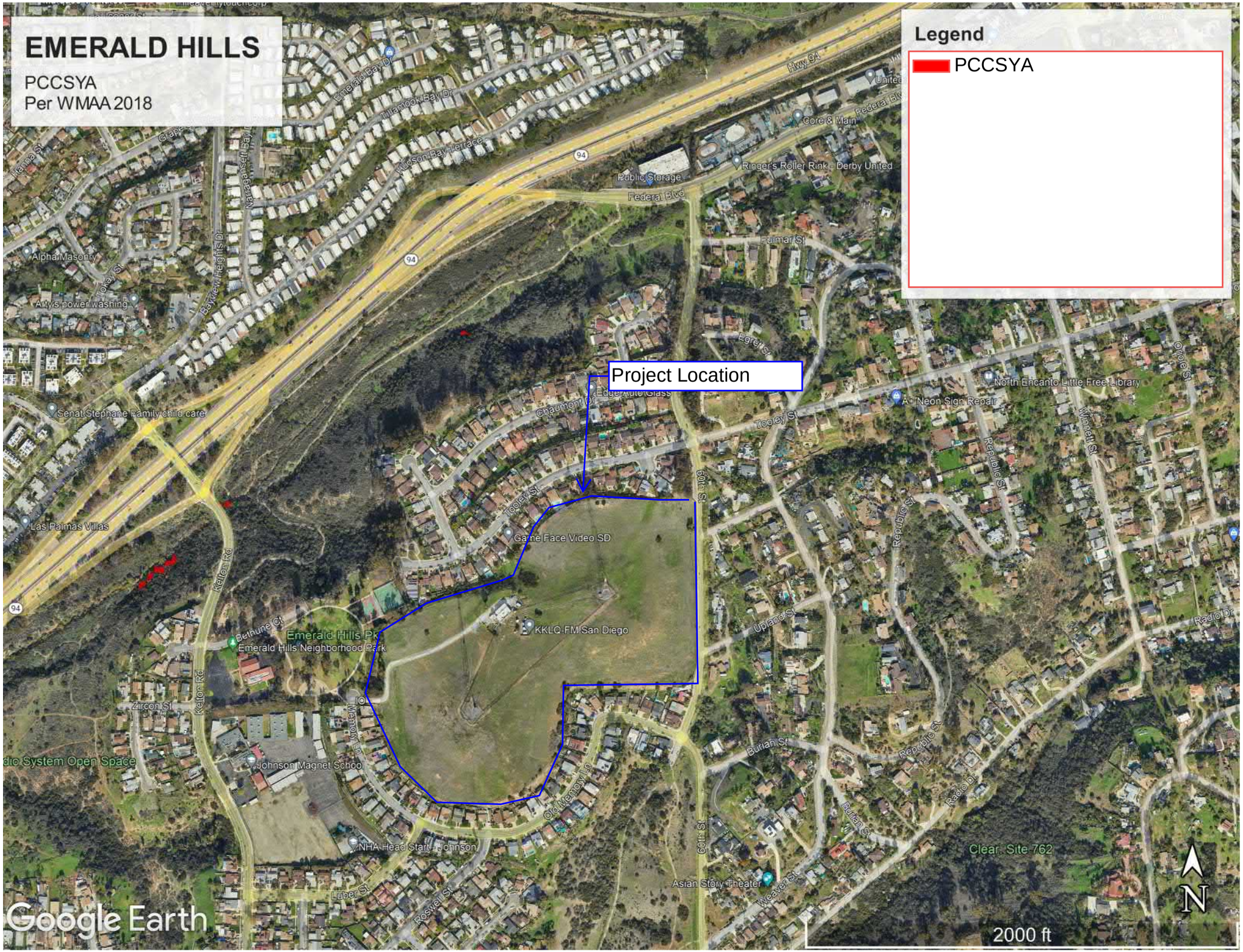
MAP 1 OF 1

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Attachment 2B

CCSYA MAP


EMERALD HILLS
PCCSYA
Per WMAA 2018
Legend
PCCSYA
Project Location
Emerald Hills Park
Emerald Hills Neighborhood Park
Johnson Magnet School
Game Face Video SD
KKLQ-FM San Diego
Las Palmas Villas
Senai Stephane Family child care
Alpha Masonry
Ally's power washing
Public Storage
Ringer's Roller Rink - Derby United
Core & Main
North Encanto Little Free Library
A-1 Neon Sign Repair
Asian Story Theater
NHA Head Start - Johnson
Clear: Site 762
Google Earth
2000 ft
N

Attachment 2D

FLOW CONTROL FACILITY DESIGN AND STRUCTURAL BMP DRAWDOWN CALCULATIONS

Hydromodification Management Plan

INTRODUCTION

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

SWMM MODEL DEVELOPMENT

Two (2) SWMM models were prepared for this study, one for the three points of compliance (POCs) in pre-developed conditions and one for the three POCs in the post-developed conditions. For the two (2) SWMM models, flow duration curves were prepared to demonstrate that the proposed biofiltration/detention basins footprint, storage and outlet structures will be sufficient to meet the current HMP requirements.

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

Evaporation for the site was modeled using average monthly values from the San Diego County hourly dataset. The site was modeled with hydrologic soil group C and D soils as determined from the USDA Survey Web-based Soil Survey Map. Other SWMM inputs for the sub-areas are discussed in the attachment to this document where the selection of the parameters is explained in detail.

POCs DISCUSSON

Three POCs were analyzed in the pre and post developed conditions.

POC 1 receives runoff from two primary sources. First, it collects runoff from the northeast portion of the development, DMA 1, after this has been routed through the proposed biofiltration basin, BF-2-1, and its respective outlet structure. Second, it receives runoff from the graded slopes adjacent to the project's northern boundary, termed the Self-mitigating area SM-1. POC 1 is situated at the discharge point of a 24" RCP, located northwest of the intersection between Cooley Street and Mallina Drive. Runoff from this discharge point continues northward in an open channel north of the site to South Chollas Creek Channel.

POC 2 tributary area consists of runoff from three primary sources. Firstly, it collects runoff from the east portion of the development, known as DMA 2, after this runoff is directed through the proposed biofiltration basin, BF-2-2, and its associated outlet structure. Secondly, the graded slopes adjacent to the project's eastern boundary, designated as the Self-mitigating area SM-3. Thirdly, POC 2 receives runoff from the graded slopes adjacent to the project's southern boundary, designated as the Self-mitigating area SM-2. POC 2 is situated at the discharge point

of a 3□□ □CP, lo□ated so□th□ est of the interse□tion □et□ een Old Memory □n and □0th Street. □□noff from this dis□harge point □ontin□es so□th□ esterly in an open □hannel so□th of the site to Chollas Cree□. □efore rea□hing POC 2, SM-3 drains to POC 2□, lo□ated at the dis□harge point of an e□isting □□□ □CP that □rosses Dipper Street, sit□ated east of □0th Street. □rom this dis□harge point, the r□noff flo□ s so□th□ ard in an open □hannel, rea□hing a 2□□ □CP that □rosses □ pland Street east of □0th Street. □t then □ontin□es via another open □hannel to an e□isting 30□ □CP □rossing □0th Street, □ hi□h is so□th of the pro□e□t, □efore □ltimately arriving at POC 2. Nota□ly, in the pre-developed state, the portion of POC 2 that drains to POC 2□ spans 3.23 a□res. □his area □ ill red□□e to □.2□ a□res in the post-developed □ondition. Additionally, the post-developed tri□□tary area for POC 2□ doesn□t feat□re any impervio□s s□rfa□es. D□e to these spe□ifi□s, a separate analysis for this POC □ asn□t deemed ne□essary. □nstead, the tri□□tary area for POC 2□ □ as in□orporated into the POC 2 analysis.

POC 3 tri□□tary area □onsists of r□noff from three primary so□r□es. □irstly, it □olle□ts r□noff from the north□ est and □ est portions of the development, □no□ n as DMA 3, after this r□noff is dire□ted thro□gh the proposed □iofiltration □asin, □□-2-3, and its asso□iated o□tlet str□□t□re. Se□ondly, it gathers r□noff from the proposed entran□e at Old Memory □n □DM-4□ □his is s□□se□□ently ro□ted thro□gh the proprietary □iofiltration □□-3-4. □t□s essential to note that □□-3-4 operates as a flo□ -□ased □MP □ ith minimal flo□ □ontrol and vol□me storage, leading to its e□□l□sion from the post-developed model. Conse□□ently, DMA-4 has □een modeled to flo□ dire□tly into POC3, □ ith the □iofiltration □asin □□-2-3 designed to offer additional flo□ □ontrol to a□□ommodate this. □hirdly, POC 3 re□eives r□noff from the graded slopes ad□a□ent to the pro□e□t□s □ estern □o□ndary, designated as the Self-mitigating area SM-4. POC□3 is sit□ated at the dis□harge point of a 24□ □CP, lo□ated □ est of □elton □d. □□noff from this dis□harge point □ontin□es north□ esterly in an open □hannel □ est of the site to So□th Chollas Cree□ □hannel.

□he proposed improvements on □0th Street in□orporate □ reen Street □on□epts, □tili□ing vegetated s□ ales. □he □reen Street DMAs are e□empt from HMP, and therefore, they □ ere not in□l□ded in either the pre- or post-development models.

Atta□hment 2a of this HMP St□dy provides detailed drainage e□hi□it for the post-developed □ondition.

BIOFILTRATION MODELING

Storm□ ater r□noff from the developed site □ ill □e □olle□ted □y the proposed storm drain system and ro□ted thro□gh three □iofiltration □asins, lo□ations of □asins □an □e fo□nd on the Post-developed Hydromodifi□ation Map. □he □asin □ as modeled □sing the □ioretention □□D mod□le □ ithin S□ MM. □he □ioretention mod□le □an model the □ndergro□nd gravel storage layer, □nderdrain □ ith an orifi□e plate, amended soil layer, and a s□rfa□e storage pond □p to the elevation of the invert of the □ottom orifi□e. A separate diversion and detention □asin □ ere □sed to model the portion of the storage pond □et□ een the □ase orifi□e invert elevations and the spill□ ay elevation from the □iofiltration □asin, a□□ording to the ass□mptions e□plained in the appendi□. On□e r□noff has □een ro□ted thro□gh the respe□tive □asin o□tlet str□□t□re, it is □onveyed via a storm drain pipe to ea□h POC.

Basin Discussion:

Flow control in the basin is achieved using multiple orifices on a concrete riser box. The size, number and location of the orifices are presented in the basin table below. The basin also contains an emergency overflow riser that is only utilized in storm events equal to or larger than the 100 year storm. Sizing and further peak flow discussion is in the Drainage Study for Emerald Hills.

Basin Table

	BF-2-1	BF-2-2	BF-2-3
Weir Height (ft)[1]	3.00	4	4.00
Weir Length (ft)	10	10	10
Amended Soil Depth (in)[2]	24	24	24
Aggregate Storage Depth (in)[3][4]	15	15	15
Riser. Dimensions (ft)	2x3	2x3	2x3
Top Orifice			
No. of Orifices	4	4	4
Diameter (in)	2	3	4
Invert Height (ft)[1]	2.4	2.4	2.4
Middle Orifice			
No. of Orifices	3	4	4
Diameter (in)	1.5	3	3
Invert Height (ft)[1]	2.0	2.0	2
Bottom Orifice			
No. of Orifices	1	2	1
Diameter (in)	1.5	2	2
Invert Height (ft)[1]	0.5	0.5	0.5
Sub-Drain Orifice			
No. of Orifices	1	1	1
Diameter (in)	2	2	2

[1]From finish grade

[2] Consists of 3" mulch, [3] Media, and 3" of ASTM 33 sand filter layer

[3][4] Consists of 3" ASTM No 8 Stone filter layer, [4] Aggregate Storage to the sub-drain invert and 3" aggregate under sub-drain

FLOW DURATION CURVE COMPARISON

The Flow Duration Curves (FDC) for the site were compared at POCs by exporting the hourly runoff time series results from SWMM to a spreadsheet. The FDC was compared between 10% of the pre-developed condition Q_2 based on accepting an assumption of high susceptibility for downstream channel erosion as required if no soils tests are completed up to the pre-developed condition Q_{10}. The Q_2 and Q_{10} were determined using a partial duration statistical analysis of the runoff time series in an Excel spreadsheet using the Cunnane plotting position method which is the preferred plotting methodology in the HMP Permit. As the SWMM Model is a statistical analysis based on the Weibull Plotting Position Method, the Weibull Method was also used within the spreadsheet to ensure that the results were similar to those obtained by the SWMM Model.

The range between 10% of Q_2 and Q_{10} was divided into 100 equal time intervals the number of hours that each flow rate was exceeded was counted from the hourly series. Additionally, the intermediate peaks with a return period T_i were obtained Q_i with i=3 to 10. For the purpose of the plot, the values were presented as percentage of time exceeded for each flow rate.

The FDC comparison at the POC s is illustrated in Figure in both normal and logarithmic scale.

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

SUMMARY & CONCLUSION

A summary of pre-developed and post-developed areas draining to the point of compliance (POC) is shown in the table below. The increase in area draining to POC 2 and 3 is attributed to grading and development of the property. The biofiltration basins are proposed to mitigate increased flow frequencies as a result of development.

Area Summary

	Pre-developed (AC)	Post-developed (AC)
POC 1	15.514	14.814
POC 2	12.102	13.115
POC 3	1.757	1.442
TOTAL	29.373	29.373

This study has demonstrated that the proposed Biofiltration footprint and proposed outlet structures at the Emerald Hills site is sufficient to meet the current HMP criteria if their cross-sections, volumes, and orifices recommended within this attachment are incorporated within the proposed project site.

KEY ASSUMPTIONS

1. D, and C Soils are representative of the existing conditions for most of the site.
2. Soil grade escarpments exist north of the site and modeled as soil D in pre and post - developed models.

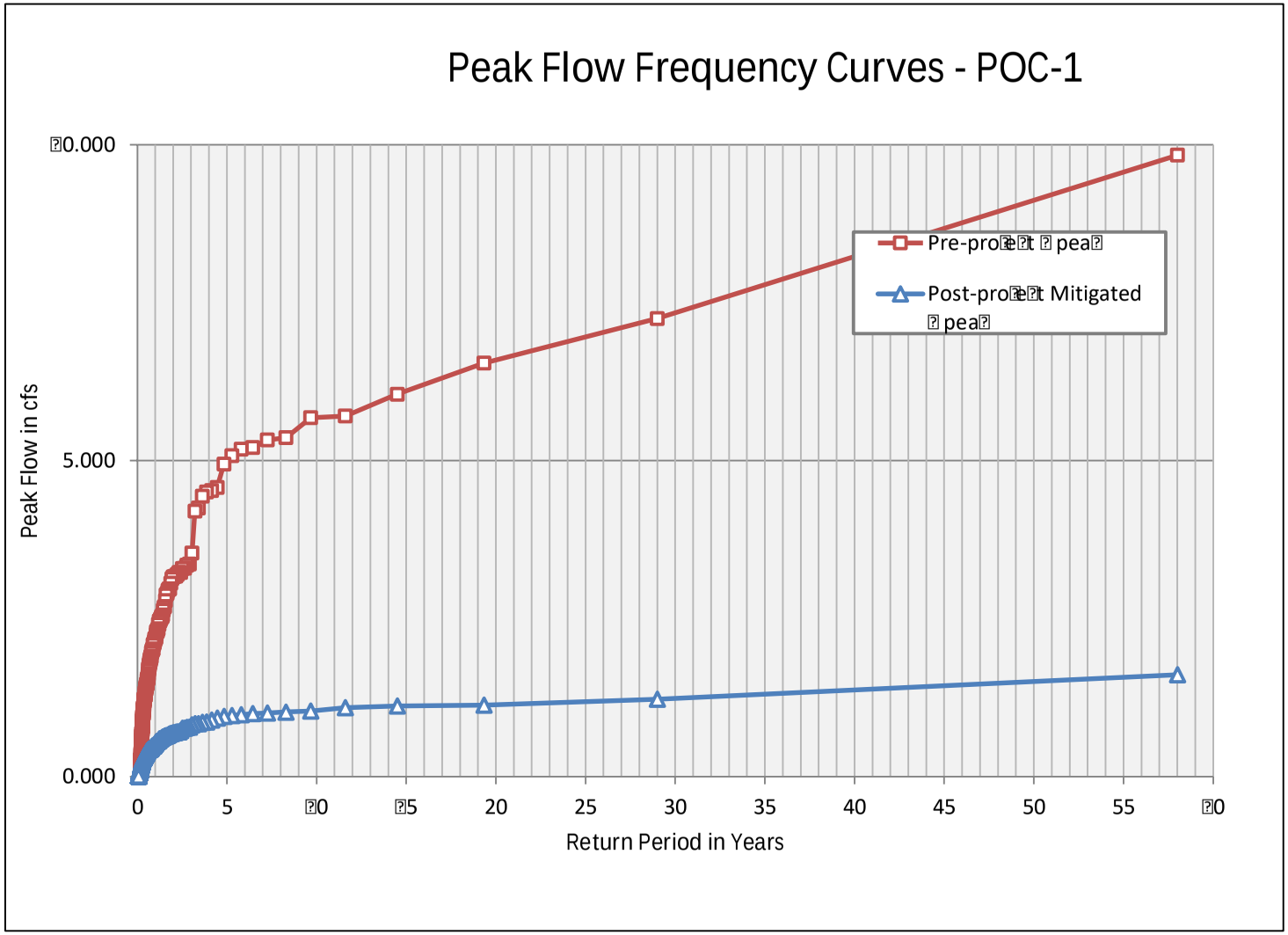
ATTACHMENTS

1. 2 to 10 Summary Table
2. Flow Duration Curve Analysis, Plots log and natural scales and Tables.
3. List of the 5 largest Peaks Pre-Development and Post-Development Conditions
4. Elevation vs. Area Curves and Elevations vs. Discharge Curves to be used in SWMM.
5. Bioretention Details
6. SWMM Input Data Existing and Proposed Models
7. SWMM Explanation of Significant Variables
8. SWMM Output Reports
9. Drawdown Calculations.
10. USDS Soil Map of Project Site

Attachment 1. Q2 to Q10 Summary Table

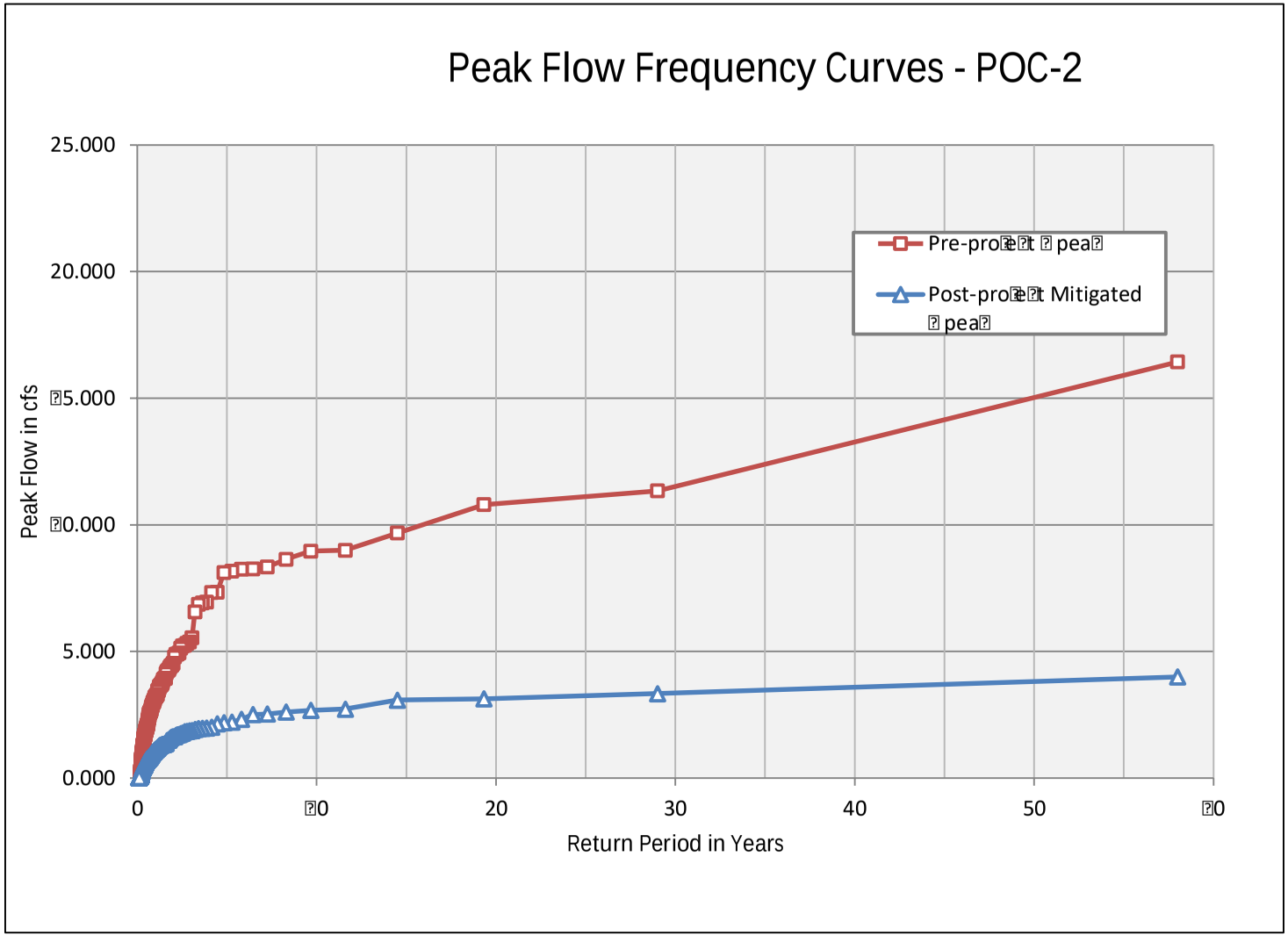
POC 1 -Emerald Hills
POC 1 Peak Flow Frequency Summary

Return Period	Pre-project Qpeak (cfs)	Post-project - Mitigated Q (cfs)	Reduction (cfs)
□□ □ 0.□□□ 2	0.3□□	0.0□0	0.24□
2-year	3.□□□	0.□□5	2.4□□
5-year	4.□□□	0.□□2	4.035
□0-year	5.□□4	□.04□	4.□3□


Peak Flow Frequency Curves - POC-1
0.000
5.000
0.000
Peak Flow in cfs
0
5
20
25
30
35
40
45
50
55
Return Period in Years
Pre-project peak
Post-project Mitigated peak

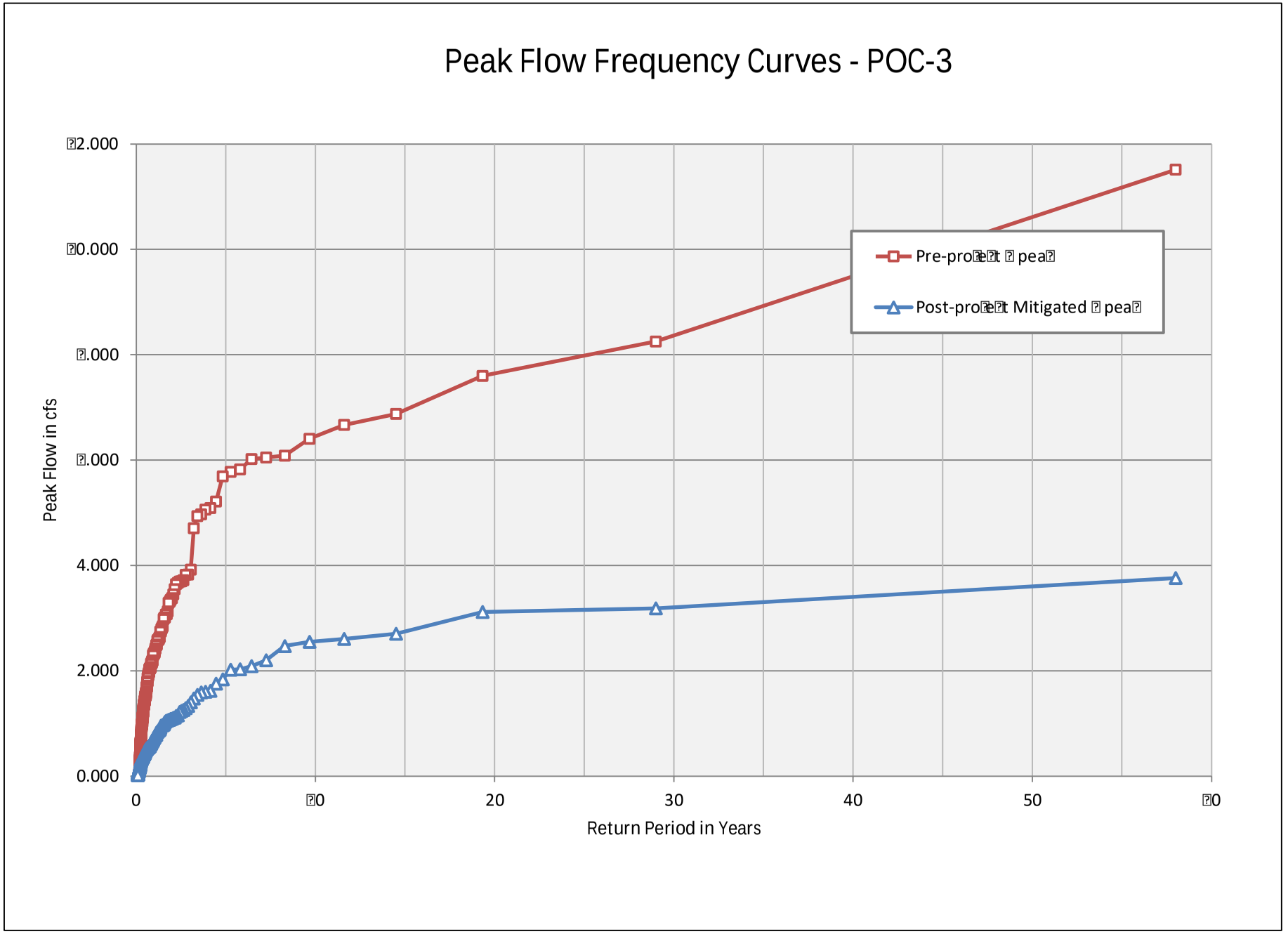
Emerald Hills POC2
Peak Flow Frequency Summary

Return Period	Pre-project Qpeak (cfs)	Post-project - Mitigated Q (cfs)	Reduction (cfs)
□□ □ 0.5□□ 2	0.453	0.20□	0.24□
2-year	4.530	2.0□□	2.4□□
5-year	□.□34	2.20□	5.□34
□0-year	□.□□□	2.□□□	□.2□□


Peak Flow Frequency Curves - POC-2
25.000
20.000
5.000
0.000
0
20
30
40
50
Peak Flow in cfs
Return Period in Years
Pre-pro t pea
Post-pro t Mitigated
pea

Emerald Hills POC3
Peak Flow Frequency Summary

Return Period	Pre-project Qpeak (cfs)	Post-project - Mitigated Q (cfs)	Reduction (cfs)
□□ □ 0.5□□ 2	0.33□	0.□□5	0.□43
2-year	3.3□□	□.□4□	□.43□
5-year	5.□22	□.□0□	3.□□3
□0-year	□.44□	2.55□	3.□□0


Peak Flow Frequency Curves - POC-3
Peak Flow in cfs
Return Period in Years
0.000
2.000
4.000
0
20
30
40
50
Pre-project peak
Post-project Mitigated peak

ATTACHMENT 2- Flow Duration Curve Analysis, Plot & Table

□lo□ d□ration □□rve shall not e□□eed the e□isting □onditions □y more than □0□ neither in pea□ flo□ nor d□ration.

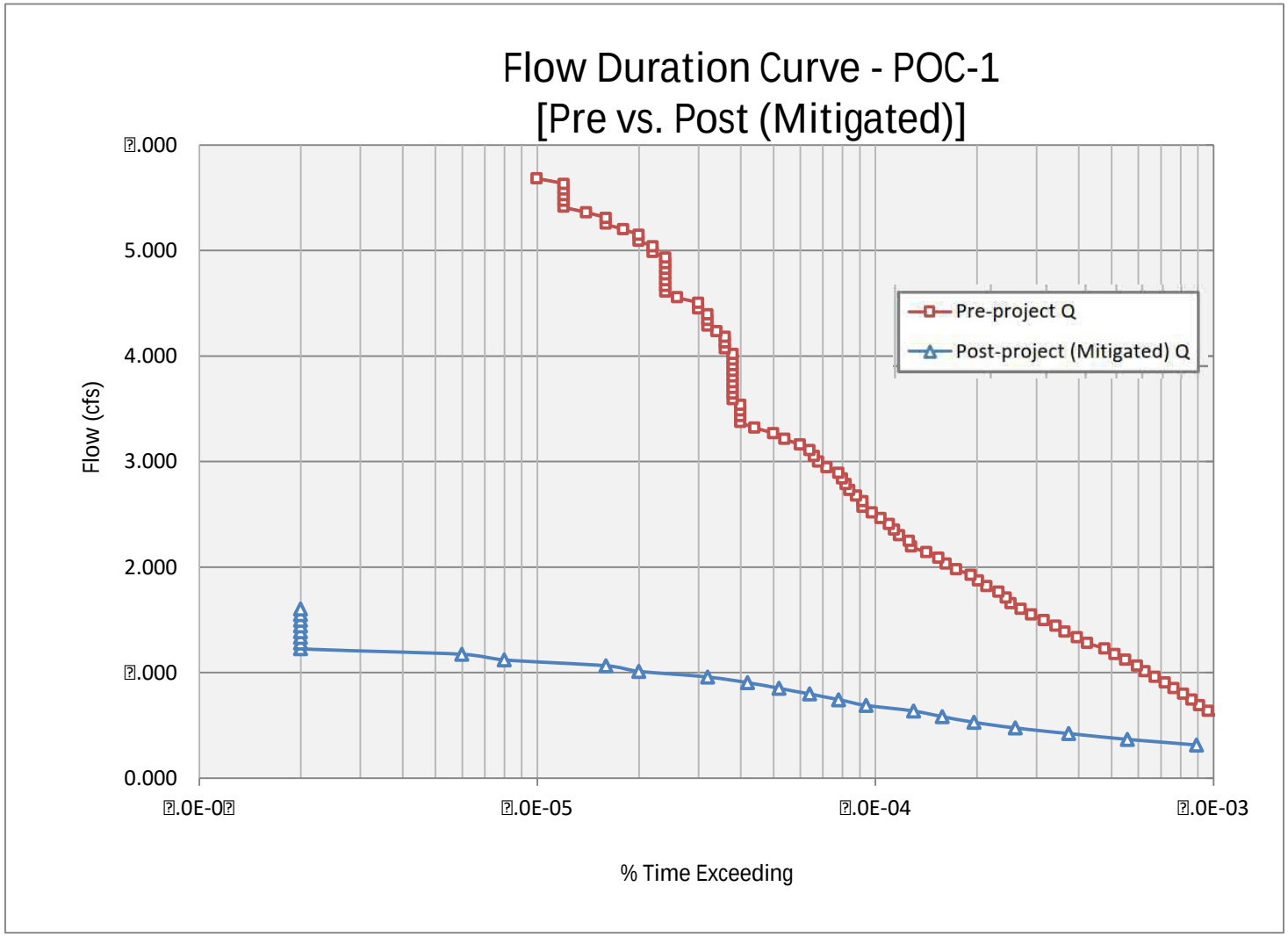
□he fig□re on the follo□ ing page ill□strates that the flo□ d□ration □□rve in post-development □onditions after the proposed □MPs is □elo□ the e□isting flo□ d□ration □□rve. □he flo□ d□ration □□rve ta□le follo□ ing the □□rve sho□ s that if the interval 0.□0□ 2 □ □ □0 is divided in □00 s□□-intervals, then a□the post development divided □y pre-development d□rations are never larger than □□0□ □the permit allo□ s □p to □□0□ □□and □□there are no more than □0 intervals in the range □0□□ -□□0□ □ hi□h □ o□ld imply an e□□ess over □0□ of the length of the □□rve □the permit allo□ s less than □0□ of e□□esses meas□red as □0□-□□0□ □.

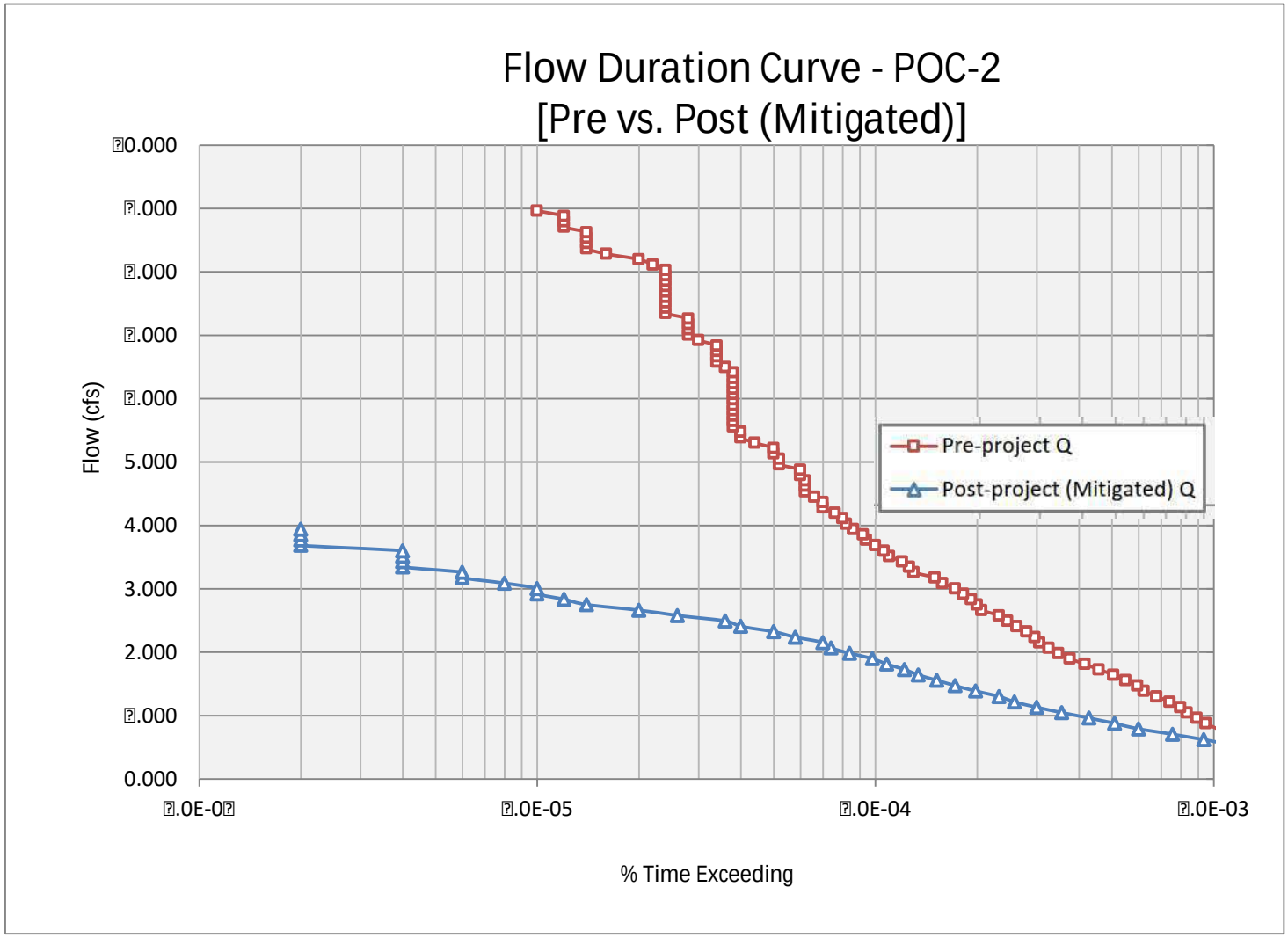
Conse□□ently, the design passes the hydromodifi□ation test.

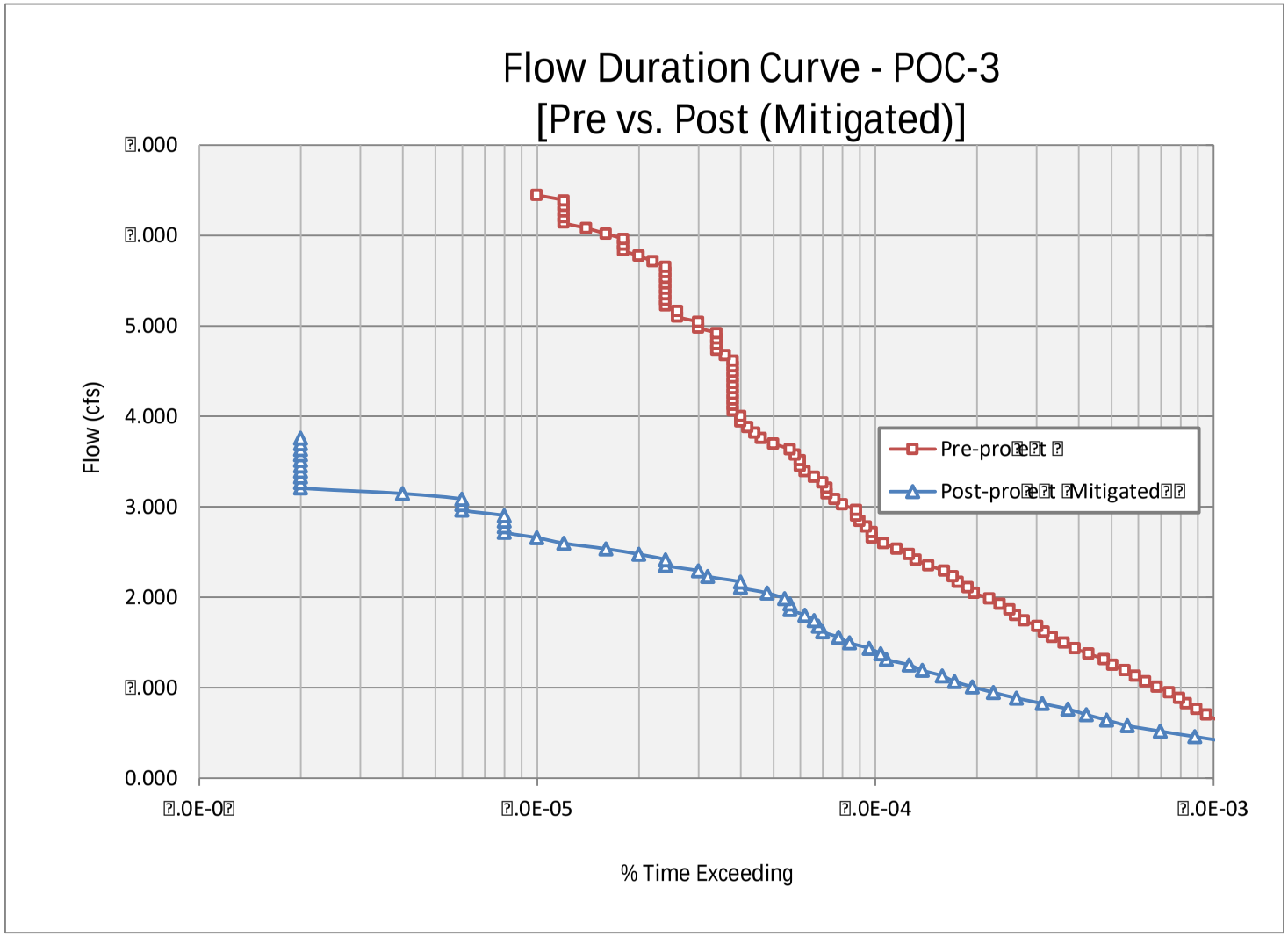
□t is important to note that the flo□ d□ration □□rve □an □e e□pressed in the □□□ a□is as per□entage of time, ho□rs per year, total n□m□er of ho□rs, or any other similar time varia□le. As those varia□les only differ □y a m□ltiplying □onstant, their plot in logarithmi□ s□ale is going to loo□ e□a□tly the same and □omplian□e □an □e o□served regardless of the varia□le sele□ted. □he sele□tion of a logarithmi□ s□ale in lie□ of the normal s□ale is preferred, as differen□es □et□ een the pre-development and post-development □□rves □an □e seen more □learly in the entire range of analysis. □oth graphi□s are presented for referen□e.

□n terms of the □y□ a□is, the pea□ flo□ val□e is the varia□le of □hoi□e. As an additional analysis performed □y H□ A, not only the range of analysis is □learly depi□ted □□0□ of □ 2 to □ □0 □□□t also all intermediate flo□ s are sho□ n □30□ of □ 2 , 50□ of □ 2 , □ 2 , □ 3 , □ 4 , □ 5 , □ □ , □ □ , □ □ and □ □ □in order to demonstrate □omplian□e at any range □ □ □ □ □□□ . □t m□st □e pointed o□t that one of the limitations of □oth the S□ MM and SDHM models is that the intermediate analysis is not performed □to o□tain □ i from i □ 2 to □0□

□he largest □n□ pea□ flo□ s are atta□hed in this appendi□, as □ ell as the val□es of □ ¡ □ ith a ret□rn period □i□, from i□2 to □0. □he □ i val□es are also added into the flo□ -d□ration plot.


Flow Duration Curve - POC-1
[Pre vs. Post (Mitigated)]
Flow (cfs)
5.000
4.000
3.000
2.000
0.000
.0E-05
.0E-04
.0E-03
% Time Exceeding
Pre-project Q
Post-project (Mitigated) Q


Flow Duration Curve - POC-2
[Pre vs. Post (Mitigated)]
Flow (cfs)
0.000
2.000
3.000
4.000
5.000
Pre-project Q
Post-project (Mitigated) Q
% Time Exceeding


Flow Duration Curve - POC-3
[Pre vs. Post (Mitigated)]
Flow (cfs)
5.000
4.000
3.000
2.000
0.000
.0E-05
.0E-04
.0E-03
% Time Exceeding
Pre-pro
Post-pro
Mitigated

Attachment 3- List of the “n” largest Peaks: Pre-Development and Post-Development Conditions

Emerald Hills	POC-1

Low-flow Threshold: ?0?

0.1xQ2 (Pre): 0.3?? ?fs

Q10 (Pre): 5.??4 ?fs

Ordinate #: ?00

Incremental Q (Pre): 0.053?? ?fs

Total Hourly Data: 50?4?? ho?rs

The proposed BMP: PASSED

Interval	Pre-project Flow (cfs)	Pre-project Hours	Pre-project % Time Exceeding	Post-project Hours	Post-project % Time Exceeding	Percentage	Pass/Fail
0	0.3??	??0	?.52E-03	44?	?.??E-04	5??	Pass
?	0.3?0	?0?	?.4?E-03	2??	5.5?E-04	3??	Pass
2	0.423	?5?	?.3?E-03	???	3.?3E-04	2??	Pass
3	0.4??	?0?	?.2?E-03	?30	2.5?E-04	2??	Pass
4	0.53?	5??	?.??2E-03	??	?.?5E-04	???	Pass
5	0.5?5	5??	?.03E-03	??	?.5?E-04	?5?	Pass
?	0.?3?	4?3	?.?3E-04	?5	?.30E-04	?3?	Pass
?	0.???2	455	?.0?E-04	4?	?.3?E-05	?0?	Pass
?	0.?4?	432	?.??E-04	3?	?.??E-05	??	Pass
?	0.???	40?	?.?4E-04	32	?.3?E-05	??	Pass
?0	0.?53	3?2	?.?2E-04	2?	5.??E-05	??	Pass
??	0.?0?	3?0	?.??E-04	2?	4.??E-05	??	Pass
?2	0.??0	33?	?.?0E-04	??	3.??E-05	5?	Pass
?3	?.0?4	3?4	?.2?E-04	?0	?.??E-05	3?	Pass
?4	?.0??	2??	5.?4E-04	?	?.?0E-05	3?	Pass
?5	?.?2?	2?5	5.4?E-04	4	?.??E-0?	??	Pass
??	?.??5	25?	5.?0E-04	3	5.??E-0?	??	Pass
??	?.22?	23?	4.??E-04	?	?.??E-0?	0?	Pass
??	?.2?2	2?2	4.23E-04	?	?.??E-0?	0?	Pass
??	?.33?	???	3.?5E-04	?	?.??E-0?	??	Pass
20	?.3?0	??2	3.?3E-04	?	?.??E-0?	??	Pass
2?	?.443	???	3.4?E-04	?	?.??E-0?	??	Pass
22	?.4??	?5?	3.?5E-04	?	?.??E-0?	??	Pass
23	?.55?	?45	2.??E-04	?	?.??E-0?	??	Pass
24	?.?05	?35	2.??E-04	?	?.??E-0?	??	Pass
25	?.?5?	?2?	2.5?E-04	0	0.00E?00	0?	Pass
2?	?.???2	?22	2.43E-04	0	0.00E?00	0?	Pass
2?	?.???	???	2.3?E-04	0	0.00E?00	0?	Pass
2?	?.???	?0?	2.?3E-04	0	0.00E?00	0?	Pass
2?	?.??3	?0?	2.0?E-04	0	0.00E?00	0?	Pass
30	?.?2?	??	?.??E-04	0	0.00E?00	0?	Pass
3?	?.??0	??	?.?3E-04	0	0.00E?00	0?	Pass
32	2.034	??	?.?2E-04	0	0.00E?00	0?	Pass
33	2.0??	??	?.54E-04	0	0.00E?00	0?	Pass
34	2.?4?	??	?.42E-04	0	0.00E?00	0?	Pass
35	2.??5	?4	?.2?E-04	0	0.00E?00	0?	Pass
3?	2.24?	?3	?.2?E-04	0	0.00E?00	0?	Pass
3?	2.302	5?	?.??E-04	0	0.00E?00	0?	Pass
3?	2.35?	5?	?.?4E-04	0	0.00E?00	0?	Pass
3?	2.4?0	55	?.?0E-04	0	0.00E?00	0?	Pass
40	2.4?3	52	?.04E-04	0	0.00E?00	0?	Pass
4?	2.5??	4?	?.??E-05	0	0.00E?00	0?	Pass
42	2.5??	4?	?.??E-05	0	0.00E?00	0?	Pass
43	2.?24	4?	?.??E-05	0	0.00E?00	0?	Pass
44	2.???	44	?.??E-05	0	0.00E?00	0?	Pass
45	2.?32	42	?.3?E-05	0	0.00E?00	0?	Pass
4?	2.???	4?	?.??E-05	0	0.00E?00	0?	Pass
4?	2.?3?	40	?.??E-05	0	0.00E?00	0?	Pass
4?	2.??3	3?	?.??E-05	0	0.00E?00	0?	Pass
4?	2.?4?	3?	?.??E-05	0	0.00E?00	0?	Pass
50	3.000	34	?.??E-05	0	0.00E?00	0?	Pass
5?	3.054	33	?.5?E-05	0	0.00E?00	0?	Pass
52	3.?0?	32	?.3?E-05	0	0.00E?00	0?	Pass
53	3.???	30	5.??E-05	0	0.00E?00	0?	Pass
54	3.2?5	2?	5.3?E-05	0	0.00E?00	0?	Pass
55	3.2??	25	4.??E-05	0	0.00E?00	0?	Pass
5?	3.322	22	4.3?E-05	0	0.00E?00	0?	Pass
5?	3.3??	20	3.??E-05	0	0.00E?00	0?	Pass
5?	3.430	20	3.??E-05	0	0.00E?00	0?	Pass
5?	3.4?3	20	3.??E-05	0	0.00E?00	0?	Pass
?0	3.53?	20	3.??E-05	0	0.00E?00	0?	Pass
??	3.5??	??	3.??E-05	0	0.00E?00	0?	Pass
?2	3.?44	??	3.??E-05	0	0.00E?00	0?	Pass
?3	3.???	??	3.??E-05	0	0.00E?00	0?	Pass
?4	3.?52	??	3.??E-05	0	0.00E?00	0?	Pass
?5	3.?0?	??	3.??E-05	0	0.00E?00	0?	Pass

Interval	Pre-project Flow (cfs)	Pre-project Hours	Pre-project % Time Exceeding	Post-project Hours	Post-project % Time Exceeding	Percentage	Pass/Fail
□□	3.□5□	□□	3.□□E-05	0	0.00E□00	0□	Pass
□□	3.□□3	□□	3.□□E-05	0	0.00E□00	0□	Pass
□□	3.□□□	□□	3.□□E-05	0	0.00E□00	0□	Pass
□□	4.020	□□	3.□□E-05	0	0.00E□00	0□	Pass
□0	4.0□4	□□	3.5□E-05	0	0.00E□00	0□	Pass
□□	4.□2□	□□	3.5□E-05	0	0.00E□00	0□	Pass
□2	4.□□□	□□	3.5□E-05	0	0.00E□00	0□	Pass
□3	4.235	□□	3.3□E-05	0	0.00E□00	0□	Pass
□4	4.2□□	□□	3.□□E-05	0	0.00E□00	0□	Pass
□5	4.342	□□	3.□□E-05	0	0.00E□00	0□	Pass
□□	4.3□□	□□	3.□□E-05	0	0.00E□00	0□	Pass
□□	4.450	□5	2.□□E-05	0	0.00E□00	0□	Pass
□□	4.503	□5	2.□□E-05	0	0.00E□00	0□	Pass
□□	4.55□	□3	2.5□E-05	0	0.00E□00	0□	Pass
□0	4.□□□	□2	2.3□E-05	0	0.00E□00	0□	Pass
□□	4.□□4	□2	2.3□E-05	0	0.00E□00	0□	Pass
□2	4.□□□	□2	2.3□E-05	0	0.00E□00	0□	Pass
□3	4.□□2	□2	2.3□E-05	0	0.00E□00	0□	Pass
□4	4.□2□	□2	2.3□E-05	0	0.00E□00	0□	Pass
□5	4.□□□	□2	2.3□E-05	0	0.00E□00	0□	Pass
□□	4.□33	□2	2.3□E-05	0	0.00E□00	0□	Pass
□□	4.□□□	□□	2.□□E-05	0	0.00E□00	0□	Pass
□□	5.040	□□	2.□□E-05	0	0.00E□00	0□	Pass
□□	5.0□4	□0	□.□□E-05	0	0.00E□00	0□	Pass
□0	5.□4□	□0	□.□□E-05	0	0.00E□00	0□	Pass
□□	5.20□	□	□.□□E-05	0	0.00E□00	0□	Pass
□2	5.255	□	□.□0E-05	0	0.00E□00	0□	Pass
□3	5.30□	□	□.□0E-05	0	0.00E□00	0□	Pass
□4	5.3□2	□	□.40E-05	0	0.00E□00	0□	Pass
□5	5.4□□	□	□.20E-05	0	0.00E□00	0□	Pass
□□	5.4□0	□	□.20E-05	0	0.00E□00	0□	Pass
□□	5.523	□	□.20E-05	0	0.00E□00	0□	Pass
□□	5.5□□	□	□.20E-05	0	0.00E□00	0□	Pass
□□	5.□3□	□	□.20E-05	0	0.00E□00	0□	Pass
□00	5.□□4	5	□.□□E-0□	0	0.00E□00	0□	Pass

Emerald Hills	POC-2

Low-flow Threshold: [illegible]

0.1xQ2 (Pre): 0.453 [illegible]fs

Q10 (Pre): [illegible].[illegible]

Ordinate #: [illegible]00

Incremental Q (Pre): 0.0[illegible]5[illegible]4 [illegible]fs

Total Hourly Data: 50[illegible]4[illegible] ho[illegible]rs

The proposed BMP: PASSED

Interval	Pre-project Flow (cfs)	Pre-project Hours	Pre-project % Time Exceeding	Post-project Hours	Post-project % Time Exceeding	Percentage	Pass/Fail
0	0.453	[illegible]45	[illegible].4[illegible]E-03	[illegible]52	[illegible].50E-03	[illegible]0[illegible][illegible]	Pass
[illegible]	0.53[illegible]	[illegible][illegible][illegible]	[illegible].35E-03	5[illegible]4	[illegible].[illegible]4E-03	[illegible]5[illegible]	Pass
2	0.[illegible]23	[illegible][illegible][illegible]	[illegible].23E-03	4[illegible][illegible]	[illegible].33E-04	[illegible][illegible][illegible]	Pass
3	0.[illegible]0[illegible]	5[illegible][illegible]	[illegible].[illegible]3E-03	3[illegible][illegible]	[illegible].54E-04	[illegible][illegible][illegible]	Pass
4	0.[illegible][illegible]4	5[illegible]5	[illegible].03E-03	300	5.[illegible][illegible]E-04	5[illegible][illegible]	Pass
5	0.[illegible][illegible][illegible]	4[illegible]4	[illegible].45E-04	255	5.0[illegible]E-04	54[illegible]	Pass
[illegible]	0.[illegible][illegible]4	44[illegible]	[illegible].[illegible][illegible]E-04	2[illegible]4	4.2[illegible]E-04	4[illegible][illegible]	Pass
[illegible]	[illegible].04[illegible]	4[illegible][illegible]	[illegible].32E-04	[illegible][illegible][illegible]	3.55E-04	43[illegible]	Pass
[illegible]	[illegible].[illegible]34	3[illegible][illegible]	[illegible].[illegible][illegible]E-04	[illegible]50	2.[illegible][illegible]E-04	3[illegible][illegible]	Pass
[illegible]	[illegible].2[illegible][illegible]	3[illegible][illegible]	[illegible].40E-04	[illegible]2[illegible]	2.5[illegible]E-04	35[illegible]	Pass
[illegible]0	[illegible].304	33[illegible]	[illegible].[illegible][illegible]E-04	[illegible][illegible][illegible]	2.3[illegible]E-04	34[illegible]	Pass
[illegible][illegible]	[illegible].3[illegible]0	3[illegible][illegible]	[illegible].20E-04	[illegible][illegible]	[illegible].[illegible][illegible]E-04	32[illegible]	Pass
[illegible]2	[illegible].4[illegible]5	2[illegible][illegible]	5.[illegible]4E-04	[illegible][illegible]	[illegible].[illegible][illegible]E-04	2[illegible][illegible]	Pass
[illegible]3	[illegible].5[illegible]0	2[illegible]5	5.4[illegible]E-04	[illegible][illegible]	[illegible].52E-04	2[illegible][illegible]	Pass
[illegible]4	[illegible].[illegible]45	253	5.05E-04	[illegible][illegible]	[illegible].34E-04	2[illegible][illegible]	Pass
[illegible]5	[illegible].[illegible]30	22[illegible]	4.5[illegible]E-04	[illegible][illegible]	[illegible].22E-04	2[illegible][illegible]	Pass
[illegible][illegible]	[illegible].[illegible][illegible]5	20[illegible]	4.[illegible]5E-04	54	[illegible].0[illegible]E-04	2[illegible][illegible]	Pass
[illegible][illegible]	[illegible].[illegible]00	[illegible][illegible][illegible]	3.[illegible]5E-04	4[illegible]	[illegible].[illegible][illegible]E-05	2[illegible][illegible]	Pass
[illegible][illegible]	[illegible].[illegible][illegible]	[illegible][illegible]4	3.4[illegible]E-04	42	[illegible].3[illegible]E-05	24[illegible]	Pass
[illegible][illegible]	2.0[illegible][illegible]	[illegible][illegible]3	3.25E-04	3[illegible]	[illegible].3[illegible]E-05	23[illegible]	Pass
20	2.[illegible]5[illegible]	[illegible]53	3.05E-04	35	[illegible].[illegible][illegible]E-05	23[illegible]	Pass
2[illegible]	2.24[illegible]	[illegible]4[illegible]	2.[illegible]5E-04	2[illegible]	5.[illegible][illegible]E-05	20[illegible]	Pass
22	2.32[illegible]	[illegible]40	2.[illegible][illegible]E-04	25	4.[illegible][illegible]E-05	[illegible][illegible][illegible]	Pass
23	2.4[illegible][illegible]	[illegible]3[illegible]	2.[illegible][illegible]E-04	20	3.[illegible][illegible]E-05	[illegible]5[illegible]	Pass
24	2.4[illegible][illegible]	[illegible]23	2.45E-04	[illegible][illegible]	3.5[illegible]E-05	[illegible]5[illegible]	Pass
25	2.5[illegible]2	[illegible][illegible][illegible]	2.3[illegible]E-04	[illegible]3	2.5[illegible]E-05	[illegible][illegible][illegible]	Pass
2[illegible]	2.[illegible][illegible][illegible]	[illegible]03	2.05E-04	[illegible]0	[illegible].[illegible][illegible]E-05	[illegible]0[illegible]	Pass
2[illegible]	2.[illegible]52	[illegible]00	[illegible].[illegible][illegible]E-04	[illegible]	[illegible].40E-05	[illegible][illegible]	Pass
2[illegible]	2.[illegible]3[illegible]	[illegible][illegible]	[illegible].[illegible][illegible]E-04	[illegible]	[illegible].20E-05	[illegible][illegible]	Pass
2[illegible]	2.[illegible]22	[illegible][illegible]	[illegible].[illegible][illegible]E-04	5	[illegible].[illegible][illegible]E-0[illegible]	5[illegible]	Pass
30	3.00[illegible]	[illegible][illegible]	[illegible].[illegible][illegible]E-04	5	[illegible].[illegible][illegible]E-0[illegible]	[illegible][illegible]	Pass
3[illegible]	3.0[illegible]2	[illegible][illegible]	[illegible].5[illegible]E-04	4	[illegible].[illegible][illegible]E-0[illegible]	5[illegible]	Pass
32	3.[illegible][illegible][illegible]	[illegible]5	[illegible].50E-04	3	5.[illegible][illegible]E-0[illegible]	4[illegible]	Pass
33	3.2[illegible]3	[illegible]5	[illegible].30E-04	3	5.[illegible][illegible]E-0[illegible]	5[illegible]	Pass
34	3.34[illegible]	[illegible]3	[illegible].2[illegible]E-04	2	3.[illegible][illegible]E-0[illegible]	3[illegible]	Pass
35	3.433	[illegible]0	[illegible].20E-04	2	3.[illegible][illegible]E-0[illegible]	3[illegible]	Pass
3[illegible]	3.5[illegible][illegible]	55	[illegible].[illegible]0E-04	2	3.[illegible][illegible]E-0[illegible]	4[illegible]	Pass
3[illegible]	3.[illegible]03	53	[illegible].0[illegible]E-04	2	3.[illegible][illegible]E-0[illegible]	4[illegible]	Pass
3[illegible]	3.[illegible][illegible][illegible]	50	[illegible].[illegible][illegible]E-05	[illegible]	[illegible].[illegible][illegible]E-0[illegible]	2[illegible]	Pass
3[illegible]	3.[illegible][illegible]4	4[illegible]	[illegible].3[illegible]E-05	[illegible]	[illegible].[illegible][illegible]E-0[illegible]	2[illegible]	Pass
40	3.[illegible]5[illegible]	4[illegible]	[illegible].[illegible][illegible]E-05	[illegible]	[illegible].[illegible][illegible]E-0[illegible]	2[illegible]	Pass
4[illegible]	3.[illegible]44	43	[illegible].5[illegible]E-05	[illegible]	[illegible].[illegible][illegible]E-0[illegible]	2[illegible]	Pass
42	4.02[illegible]	4[illegible]	[illegible].[illegible][illegible]E-05	0	0.00E[illegible]00	0[illegible]	Pass
43	4.[illegible][illegible]4	40	[illegible].[illegible][illegible]E-05	0	0.00E[illegible]00	0[illegible]	Pass
44	4.[illegible][illegible][illegible]	3[illegible]	[illegible].5[illegible]E-05	0	0.00E[illegible]00	0[illegible]	Pass
45	4.2[illegible]5	35	[illegible].[illegible][illegible]E-05	0	0.00E[illegible]00	0[illegible]	Pass
4[illegible]	4.3[illegible]0	35	[illegible].[illegible][illegible]E-05	0	0.00E[illegible]00	0[illegible]	Pass
4[illegible]	4.455	33	[illegible].5[illegible]E-05	0	0.00E[illegible]00	0[illegible]	Pass
4[illegible]	4.540	3[illegible]	[illegible].[illegible][illegible]E-05	0	0.00E[illegible]00	0[illegible]	Pass
4[illegible]	4.[illegible]25	3[illegible]	[illegible].[illegible][illegible]E-05	0	0.00E[illegible]00	0[illegible]	Pass
50	4.[illegible][illegible]0	3[illegible]	[illegible].[illegible][illegible]E-05	0	0.00E[illegible]00	0[illegible]	Pass
5[illegible]	4.[illegible][illegible]5	30	5.[illegible][illegible]E-05	0	0.00E[illegible]00	0[illegible]	Pass
52	4.[illegible][illegible][illegible]	30	5.[illegible][illegible]E-05	0	0.00E[illegible]00	0[illegible]	Pass
53	4.[illegible][illegible][illegible]	2[illegible]	5.[illegible][illegible]E-05	0	0.00E[illegible]00	0[illegible]	Pass
54	5.05[illegible]	2[illegible]	5.[illegible][illegible]E-05	0	0.00E[illegible]00	0[illegible]	Pass
55	5.[illegible]3[illegible]	25	4.[illegible][illegible]E-05	0	0.00E[illegible]00	0[illegible]	Pass
5[illegible]	5.22[illegible]	25	4.[illegible][illegible]E-05	0	0.00E[illegible]00	0[illegible]	Pass
5[illegible]	5.30[illegible]	22	4.3[illegible]E-05	0	0.00E[illegible]00	0[illegible]	Pass
5[illegible]	5.3[illegible][illegible]	20	3.[illegible][illegible]E-05	0	0.00E[illegible]00	0[illegible]	Pass
5[illegible]	5.4[illegible][illegible]	20	3.[illegible][illegible]E-05	0	0.00E[illegible]00	0[illegible]	Pass
[illegible]0	5.5[illegible]2	[illegible][illegible]	3.[illegible][illegible]E-05	0	0.00E[illegible]00	0[illegible]	Pass
[illegible][illegible]	5.[illegible]4[illegible]	[illegible][illegible]	3.[illegible][illegible]E-05	0	0.00E[illegible]00	0[illegible]	Pass
[illegible]2	5.[illegible]32	[illegible][illegible]	3.[illegible][illegible]E-05	0	0.00E[illegible]00	0[illegible]	Pass
[illegible]3	5.[illegible][illegible][illegible]	[illegible][illegible]	3.[illegible][illegible]E-05	0	0.00E[illegible]00	0[illegible]	Pass
[illegible]4	5.[illegible]02	[illegible][illegible]	3.[illegible][illegible]E-05	0	0.00E[illegible]00	0[illegible]	Pass
[illegible]5	5.[illegible][illegible][illegible]	[illegible][illegible]	3.[illegible][illegible]E-05	0	0.00E[illegible]00	0[illegible]	Pass

Interval	Pre-project Flow (cfs)	Pre-project Hours	Pre-project % Time Exceeding	Post-project Hours	Post-project % Time Exceeding	Percentage	Pass/Fail
??	?.0?3	??	3.??E-05	0	0.00E?00	0?	Pass
??	?.?5?	??	3.??E-05	0	0.00E?00	0?	Pass
??	?.243	??	3.??E-05	0	0.00E?00	0?	Pass
??	?.32?	??	3.??E-05	0	0.00E?00	0?	Pass
?0	?.4?3	??	3.??E-05	0	0.00E?00	0?	Pass
??	?.4??	??	3.5?E-05	0	0.00E?00	0?	Pass
?2	?.5?3	??	3.3?E-05	0	0.00E?00	0?	Pass
?3	?.???	??	3.3?E-05	0	0.00E?00	0?	Pass
?4	?.?54	??	3.3?E-05	0	0.00E?00	0?	Pass
?5	?.?3?	??	3.3?E-05	0	0.00E?00	0?	Pass
??	?.?24	?5	2.??E-05	0	0.00E?00	0?	Pass
??	?.00?	?4	2.??E-05	0	0.00E?00	0?	Pass
??	?.0?4	?4	2.??E-05	0	0.00E?00	0?	Pass
??	?.???	?4	2.??E-05	0	0.00E?00	0?	Pass
?0	?.2?5	?4	2.??E-05	0	0.00E?00	0?	Pass
??	?.350	?2	2.3?E-05	0	0.00E?00	0?	Pass
?2	?.435	?2	2.3?E-05	0	0.00E?00	0?	Pass
?3	?.520	?2	2.3?E-05	0	0.00E?00	0?	Pass
?4	?.?05	?2	2.3?E-05	0	0.00E?00	0?	Pass
?5	?.??0	?2	2.3?E-05	0	0.00E?00	0?	Pass
??	?.??5	?2	2.3?E-05	0	0.00E?00	0?	Pass
??	?.???	?2	2.3?E-05	0	0.00E?00	0?	Pass
??	?.?4?	?2	2.3?E-05	0	0.00E?00	0?	Pass
??	?.03?	?2	2.3?E-05	0	0.00E?00	0?	Pass
?0	?.???	??	2.??E-05	0	0.00E?00	0?	Pass
??	?.20?	?0	?.??E-05	0	0.00E?00	0?	Pass
?2	?.2??	?	?.?0E-05	0	0.00E?00	0?	Pass
?3	?.3??	?	?.40E-05	0	0.00E?00	0?	Pass
?4	?.45?	?	?.40E-05	0	0.00E?00	0?	Pass
?5	?.542	?	?.40E-05	0	0.00E?00	0?	Pass
??	?.?2?	?	?.40E-05	0	0.00E?00	0?	Pass
??	?.??2	?	?.20E-05	0	0.00E?00	0?	Pass
??	?.???	?	?.20E-05	0	0.00E?00	0?	Pass
??	?.??2	?	?.20E-05	0	0.00E?00	0?	Pass
?00	?.???	5	?.??E-0?	0	0.00E?00	0?	Pass

Emerald Hills	POC-3

Low-flow Threshold: [illegible]0[illegible]

0.1xQ2 (Pre): 0.33[illegible] [illegible]fs

Q10 (Pre): [illegible].44[illegible] [illegible]fs

Ordinate #: [illegible]00

Incremental Q (Pre): 0.0[illegible][illegible]0 [illegible]fs

Total Hourly Data: 50[illegible]4[illegible] ho[illegible]rs

The proposed BMP: PASSED

Interval	Pre-project Flow (cfs)	Pre-project Hours	Pre-project % Time Exceeding	Post-project Hours	Post-project % Time Exceeding	Percentage	Pass/Fail
0	0.33[illegible]	[illegible][illegible]3	[illegible].5[illegible]E-03	[illegible][illegible][illegible]	[illegible].[illegible]3E-03	[illegible]05[illegible]	Pass
[illegible]	0.3[illegible][illegible]	[illegible]0[illegible]	[illegible].4[illegible]E-03	5[illegible]5	[illegible].[illegible]5E-03	[illegible][illegible][illegible]	Pass
2	0.4[illegible]0	[illegible]53	[illegible].30E-03	44[illegible]	[illegible].[illegible][illegible]E-04	[illegible][illegible][illegible]	Pass
3	0.52[illegible]	[illegible]0[illegible]	[illegible].2[illegible]E-03	34[illegible]	[illegible].[illegible][illegible]E-04	5[illegible][illegible]	Pass
4	0.5[illegible]2	55[illegible]	[illegible].[illegible][illegible]E-03	2[illegible][illegible]	5.5[illegible]E-04	50[illegible]	Pass
5	0.[illegible]43	5[illegible][illegible]	[illegible].03E-03	242	4.[illegible]3E-04	4[illegible][illegible]	Pass
[illegible]	0.[illegible]04	4[illegible][illegible]	[illegible].5[illegible]E-04	2[illegible][illegible]	4.2[illegible]E-04	44[illegible]	Pass
[illegible]	0.[illegible][illegible][illegible]	44[illegible]	[illegible].[illegible][illegible]E-04	[illegible][illegible][illegible]	3.[illegible][illegible]E-04	42[illegible]	Pass
[illegible]	0.[illegible]2[illegible]	4[illegible][illegible]	[illegible].30E-04	[illegible]5[illegible]	3.[illegible][illegible]E-04	3[illegible][illegible]	Pass
[illegible]	0.[illegible][illegible][illegible]	3[illegible][illegible]	[illegible].[illegible]2E-04	[illegible]3[illegible]	2.[illegible][illegible]E-04	33[illegible]	Pass
[illegible]0	0.[illegible]4[illegible]	3[illegible][illegible]	[illegible].40E-04	[illegible][illegible]2	2.23E-04	30[illegible]	Pass
[illegible][illegible]	[illegible].0[illegible]0	34[illegible]	[illegible].[illegible]0E-04	[illegible][illegible]	[illegible].[illegible]3E-04	2[illegible][illegible]	Pass
[illegible]2	[illegible].0[illegible][illegible]	3[illegible]5	[illegible].2[illegible]E-04	[illegible][illegible]	[illegible].[illegible][illegible]E-04	2[illegible][illegible]	Pass
[illegible]3	[illegible].[illegible]32	2[illegible]4	5.[illegible][illegible]E-04	[illegible][illegible]	[illegible].5[illegible]E-04	2[illegible][illegible]	Pass
[illegible]4	[illegible].[illegible][illegible]3	2[illegible]4	5.4[illegible]E-04	[illegible][illegible]	[illegible].3[illegible]E-04	25[illegible]	Pass
[illegible]5	[illegible].254	252	5.03E-04	[illegible]3	[illegible].2[illegible]E-04	25[illegible]	Pass
[illegible][illegible]	[illegible].3[illegible]5	23[illegible]	4.[illegible]5E-04	54	[illegible].0[illegible]E-04	23[illegible]	Pass
[illegible][illegible]	[illegible].3[illegible][illegible]	2[illegible]4	4.2[illegible]E-04	52	[illegible].04E-04	24[illegible]	Pass
[illegible][illegible]	[illegible].43[illegible]	[illegible][illegible]5	3.[illegible][illegible]E-04	4[illegible]	[illegible].5[illegible]E-05	25[illegible]	Pass
[illegible][illegible]	[illegible].4[illegible][illegible]	[illegible][illegible][illegible]	3.[illegible][illegible]E-04	42	[illegible].3[illegible]E-05	23[illegible]	Pass
20	[illegible].5[illegible]0	[illegible][illegible][illegible]	3.33E-04	3[illegible]	[illegible].[illegible][illegible]E-05	23[illegible]	Pass
2[illegible]	[illegible].[illegible]2[illegible]	[illegible]5[illegible]	3.[illegible]5E-04	35	[illegible].[illegible][illegible]E-05	22[illegible]	Pass
22	[illegible].[illegible][illegible]2	[illegible]5[illegible]	3.0[illegible]E-04	34	[illegible].[illegible][illegible]E-05	23[illegible]	Pass
23	[illegible].[illegible]43	[illegible]3[illegible]	2.[illegible]5E-04	33	[illegible].5[illegible]E-05	24[illegible]	Pass
24	[illegible].[illegible]04	[illegible]30	2.5[illegible]E-04	3[illegible]	[illegible].[illegible][illegible]E-05	24[illegible]	Pass
25	[illegible].[illegible][illegible]5	[illegible]25	2.4[illegible]E-04	2[illegible]	5.5[illegible]E-05	22[illegible]	Pass
2[illegible]	[illegible].[illegible]2[illegible]	[illegible][illegible][illegible]	2.33E-04	2[illegible]	5.5[illegible]E-05	24[illegible]	Pass
2[illegible]	[illegible].[illegible][illegible][illegible]	[illegible]0[illegible]	2.[illegible][illegible]E-04	2[illegible]	5.3[illegible]E-05	25[illegible]	Pass
2[illegible]	2.04[illegible]	[illegible][illegible]	[illegible].[illegible]5E-04	24	4.[illegible][illegible]E-05	24[illegible]	Pass
2[illegible]	2.[illegible][illegible]0	[illegible]4	[illegible].[illegible][illegible]E-04	20	3.[illegible][illegible]E-05	2[illegible][illegible]	Pass
30	2.[illegible][illegible][illegible]	[illegible][illegible]	[illegible].[illegible]5E-04	20	3.[illegible][illegible]E-05	23[illegible]	Pass
3[illegible]	2.232	[illegible]5	[illegible].[illegible]0E-04	[illegible][illegible]	3.[illegible][illegible]E-05	[illegible][illegible][illegible]	Pass
32	2.2[illegible]3	[illegible]0	[illegible].[illegible]0E-04	[illegible]5	2.[illegible][illegible]E-05	[illegible][illegible][illegible]	Pass
33	2.354	[illegible]2	[illegible].44E-04	[illegible]2	2.3[illegible]E-05	[illegible][illegible][illegible]	Pass
34	2.4[illegible]5	[illegible][illegible]	[illegible].32E-04	[illegible]2	2.3[illegible]E-05	[illegible][illegible][illegible]	Pass
35	2.4[illegible][illegible]	[illegible]3[illegible]	[illegible].2[illegible]E-04	[illegible]0	[illegible].[illegible][illegible]E-05	[illegible][illegible][illegible]	Pass
3[illegible]	2.53[illegible]	5[illegible]	[illegible].[illegible][illegible]E-04	[illegible]	[illegible].[illegible]0E-05	[illegible]4[illegible]	Pass
3[illegible]	2.5[illegible][illegible]	53	[illegible].0[illegible]E-04	[illegible]	[illegible].20E-05	[illegible][illegible][illegible]	Pass
3[illegible]	2.[illegible][illegible]0	4[illegible]	[illegible].[illegible][illegible]E-05	5	[illegible].[illegible][illegible]E-0[illegible]	[illegible]0[illegible]	Pass
3[illegible]	2.[illegible]2[illegible]	4[illegible]	[illegible].[illegible][illegible]E-05	4	[illegible].[illegible][illegible]E-0[illegible]	[illegible][illegible]	Pass
40	2.[illegible][illegible]2	4[illegible]	[illegible].3[illegible]E-05	4	[illegible].[illegible][illegible]E-0[illegible]	[illegible][illegible]	Pass
4[illegible]	2.[illegible]43	45	[illegible].[illegible][illegible]E-05	4	[illegible].[illegible][illegible]E-0[illegible]	[illegible][illegible]	Pass
42	2.[illegible]04	44	[illegible].[illegible][illegible]E-05	4	[illegible].[illegible][illegible]E-0[illegible]	[illegible][illegible]	Pass
43	2.[illegible][illegible]5	44	[illegible].[illegible][illegible]E-05	3	5.[illegible][illegible]E-0[illegible]	[illegible][illegible]	Pass
44	3.02[illegible]	40	[illegible].[illegible][illegible]E-05	3	5.[illegible][illegible]E-0[illegible]	[illegible][illegible]	Pass
45	3.0[illegible][illegible]	3[illegible]	[illegible].5[illegible]E-05	3	5.[illegible][illegible]E-0[illegible]	[illegible][illegible]	Pass
4[illegible]	3.[illegible]4[illegible]	3[illegible]	[illegible].[illegible][illegible]E-05	2	3.[illegible][illegible]E-0[illegible]	[illegible][illegible]	Pass
4[illegible]	3.2[illegible]0	3[illegible]	[illegible].[illegible][illegible]E-05	[illegible]	[illegible].[illegible][illegible]E-0[illegible]	3[illegible]	Pass
4[illegible]	3.2[illegible][illegible]	35	[illegible].[illegible][illegible]E-05	[illegible]	[illegible].[illegible][illegible]E-0[illegible]	3[illegible]	Pass
4[illegible]	3.332	33	[illegible].5[illegible]E-05	[illegible]	[illegible].[illegible][illegible]E-0[illegible]	3[illegible]	Pass
50	3.3[illegible]3	3[illegible]	[illegible].[illegible][illegible]E-05	[illegible]	[illegible].[illegible][illegible]E-0[illegible]	3[illegible]	Pass
5[illegible]	3.454	30	5.[illegible][illegible]E-05	[illegible]	[illegible].[illegible][illegible]E-0[illegible]	3[illegible]	Pass
52	3.5[illegible]5	30	5.[illegible][illegible]E-05	[illegible]	[illegible].[illegible][illegible]E-0[illegible]	3[illegible]	Pass
53	3.5[illegible][illegible]	2[illegible]	5.[illegible][illegible]E-05	[illegible]	[illegible].[illegible][illegible]E-0[illegible]	3[illegible]	Pass
54	3.[illegible]3[illegible]	2[illegible]	5.5[illegible]E-05	[illegible]	[illegible].[illegible][illegible]E-0[illegible]	4[illegible]	Pass
55	3.[illegible][illegible][illegible]	25	4.[illegible][illegible]E-05	[illegible]	[illegible].[illegible][illegible]E-0[illegible]	4[illegible]	Pass
5[illegible]	3.[illegible][illegible]0	23	4.5[illegible]E-05	[illegible]	[illegible].[illegible][illegible]E-0[illegible]	4[illegible]	Pass
5[illegible]	3.[illegible]2[illegible]	22	4.3[illegible]E-05	0	0.00E[illegible]00	0[illegible]	Pass
5[illegible]	3.[illegible][illegible]2	2[illegible]	4.[illegible][illegible]E-05	0	0.00E[illegible]00	0[illegible]	Pass
5[illegible]	3.[illegible]43	20	3.[illegible][illegible]E-05	0	0.00E[illegible]00	0[illegible]	Pass
[illegible]0	4.004	20	3.[illegible][illegible]E-05	0	0.00E[illegible]00	0[illegible]	Pass
[illegible][illegible]	4.0[illegible]5	[illegible][illegible]	3.[illegible][illegible]E-05	0	0.00E[illegible]00	0[illegible]	Pass
[illegible]2	4.[illegible]2[illegible]	[illegible][illegible]	3.[illegible][illegible]E-05	0	0.00E[illegible]00	0[illegible]	Pass
[illegible]3	4.[illegible][illegible][illegible]	[illegible][illegible]	3.[illegible][illegible]E-05	0	0.00E[illegible]00	0[illegible]	Pass
[illegible]4	4.24[illegible]	[illegible][illegible]	3.[illegible][illegible]E-05	0	0.00E[illegible]00	0[illegible]	Pass
[illegible]5	4.3[illegible]0	[illegible][illegible]	3.[illegible][illegible]E-05	0	0.00E[illegible]00	0[illegible]	Pass

Interval	Pre-project Flow (cfs)	Pre-project Hours	Pre-project % Time Exceeding	Post-project Hours	Post-project % Time Exceeding	Percentage	Pass/Fail
□□	4.3□□	□□	3.□□E-05	0	0.00E□00	0□	Pass
□□	4.432	□□	3.□□E-05	0	0.00E□00	0□	Pass
□□	4.4□3	□□	3.□□E-05	0	0.00E□00	0□	Pass
□□	4.554	□□	3.□□E-05	0	0.00E□00	0□	Pass
□0	4.□□5	□□	3.□□E-05	0	0.00E□00	0□	Pass
□□	4.□□□	□□	3.5□E-05	0	0.00E□00	0□	Pass
□2	4.□3□	□□	3.3□E-05	0	0.00E□00	0□	Pass
□3	4.□□□	□□	3.3□E-05	0	0.00E□00	0□	Pass
□4	4.□5□	□□	3.3□E-05	0	0.00E□00	0□	Pass
□5	4.□2□	□□	3.3□E-05	0	0.00E□00	0□	Pass
□□	4.□□2	□5	2.□□E-05	0	0.00E□00	0□	Pass
□□	5.043	□5	2.□□E-05	0	0.00E□00	0□	Pass
□□	5.□04	□3	2.5□E-05	0	0.00E□00	0□	Pass
□□	5.□□5	□3	2.5□E-05	0	0.00E□00	0□	Pass
□0	5.22□	□2	2.3□E-05	0	0.00E□00	0□	Pass
□□	5.2□□	□2	2.3□E-05	0	0.00E□00	0□	Pass
□2	5.34□	□2	2.3□E-05	0	0.00E□00	0□	Pass
□3	5.40□	□2	2.3□E-05	0	0.00E□00	0□	Pass
□4	5.4□0	□2	2.3□E-05	0	0.00E□00	0□	Pass
□5	5.532	□2	2.3□E-05	0	0.00E□00	0□	Pass
□□	5.5□3	□2	2.3□E-05	0	0.00E□00	0□	Pass
□□	5.□54	□2	2.3□E-05	0	0.00E□00	0□	Pass
□□	5.□□5	□□	2.□□E-05	0	0.00E□00	0□	Pass
□□	5.□□□	□0	□.□□E-05	0	0.00E□00	0□	Pass
□0	5.□3□	□	□.□□E-05	0	0.00E□00	0□	Pass
□□	5.□□□	□	□.□□E-05	0	0.00E□00	0□	Pass
□2	5.□5□	□	□.□□E-05	0	0.00E□00	0□	Pass
□3	□.020	□	□.□0E-05	0	0.00E□00	0□	Pass
□4	□.0□2	□	□.40E-05	0	0.00E□00	0□	Pass
□5	□.□43	□	□.20E-05	0	0.00E□00	0□	Pass
□□	□.204	□	□.20E-05	0	0.00E□00	0□	Pass
□□	□.2□5	□	□.20E-05	0	0.00E□00	0□	Pass
□□	□.32□	□	□.20E-05	0	0.00E□00	0□	Pass
□□	□.3□□	□	□.20E-05	0	0.00E□00	0□	Pass
□00	□.44□	5	□.□□E-0□	0	0.00E□00	0□	Pass

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

Elevation vs. Area

For the portion of the flow diverted in the FloCD Control to the receiving detention basin, a pond is used to route the hydrographs. The elevation vs area curve in the model is calculated in Excel and imported into the model at a 0.05 ft interval range.

Elevation vs Discharge

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

The orifices have been selected to maximize their size while still restricting flows to conform to the required 90% of the 2 event flow as mandated in the final Hydromodification Management Plan by Brown and Caldwell, dated March 2011. While we acknowledge that these orifices are small, to increase the size of these outlets would impact the basins ability to restrict flows beneath the HMP thresholds, thus preventing the SMP from conformance with HMP requirements.

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

Emerald Hills BF 2-1

Discharge vs Elevation Table

ottom orifice diameter	.5 "	op orifice diameter	2 "
Number		Number	4
Cg-lo	0.	Cg-lo	0.
invert elev	0.50 ft	invert elev	2.40 ft
Middle orifice diameter	.5 "	Emergency eir	
number of orif	3	invert	3.0 ft
Cg-middle	0.	eir length ft	0.00 ft
invert elev	2.00 ft	iser o	23

h (ft)	H/D-low -	H/D-mid -	H/D-top -	H/D-peak -	Qlow-orif (cfs)	Qlow-weir (cfs)	Qtot-low (cfs)	Qmid-orif (cfs)	Qmid-weir (cfs)	Qtot-med (cfs)	Qtop-orif (cfs)	Qtop-weir (cfs)	Qtot-top (cfs)	Qpeak-top (cfs)	Qtot (cfs)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
0.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
0.35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
0.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
0.45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
0.55	0.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.003
0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
0.5	.20	0.00	0.00	0.00	0.02	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
0.0	.0	0.00	0.00	0.00	0.02	0.03	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.022
0.5	2.00	0.00	0.00	0.00	0.03	0.03	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02
0.0	2.40	0.00	0.00	0.00	0.03	0.04	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02
0.5	2.0	0.00	0.00	0.00	0.03	0.04	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.032
0.0	3.20	0.00	0.00	0.00	0.03	0.04	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.035
0.5	3.0	0.00	0.00	0.00	0.04	0.05	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03
.00	4.00	0.00	0.00	0.00	0.04	0.0	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.040
.05	4.40	0.00	0.00	0.00	0.04	0.	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.042
.0	4.0	0.00	0.00	0.00	0.04	0.20	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.044
.5	5.20	0.00	0.00	0.00	0.05	0.35	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04
.20	5.0	0.00	0.00	0.00	0.05	0.5	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04
.25	.00	0.00	0.00	0.00	0.05	0.5	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.050
.30	.40	0.00	0.00	0.00	0.05	.4	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.052
.35	.0	0.00	0.00	0.00	0.05	2.	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.053
.40	.20	0.00	0.00	0.00	0.05	3.	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.055
.45	.0	0.00	0.00	0.00	0.0	4.4	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05
.50	.00	0.00	0.00	0.00	0.0	.	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05
.55	.40	0.00	0.00	0.00	0.0	.34	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
.0	.0	0.00	0.00	0.00	0.0	.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
.5	.20	0.00	0.00	0.00	0.0	4.44	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03
.0	.0	0.00	0.00	0.00	0.0	.5	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04
.5	0.00	0.00	0.00	0.00	0.0	23.	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05
.0	0.40	0.00	0.00	0.00	0.0	2.	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
.5	0.0	0.00	0.00	0.00	0.0	3.	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
.0	.20	0.00	0.00	0.00	0.0	45.3	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
.5	.0	0.00	0.00	0.00	0.0	55.4	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2.00	2.00	0.00	0.00	0.00	0.0	.	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02
2.05	2.40	0.40	0.00	0.00	0.0	0.	0.0	0.00	0.00	0.0	0.00	0.00	0.00	0.00	0.02
2.0	2.0	0.0	0.00	0.00	0.0	.3	0.0	0.03	0.03	0.03	0.00	0.00	0.00	0.00	0.04
2.5	3.20	.20	0.00	0.00	0.0	4.3	0.0	0.05	0.0	0.05	0.00	0.00	0.00	0.00	0.2
2.20	3.0	.0	0.00	0.00	0.0	34.2	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.44
2.25	4.00	2.00	0.00	0.00	0.0	5.32	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.5
2.30	4.40	2.40	0.00	0.00	0.0	4.4	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.0
2.35	4.0	2.0	0.00	0.00	0.0	24.	0.0	0.0	0.2	0.0	0.00	0.00	0.00	0.00	0.0
2.40	5.20	3.20	0.00	0.00	0.0	24.43	0.0	0.0	0.2	0.0	0.00	0.00	0.00	0.00	0.0
2.45	5.0	3.0	0.30	0.00	0.0	2.5	0.0	0.0	0.4	0.0	0.00	0.0	0.0	0.00	0.20
2.50	.00	4.00	0.0	0.00	0.0	32.30	0.0	0.2	0.20	0.2	0.0	0.05	0.05	0.00	0.25
2.55	.40	4.40	0.0	0.00	0.0	35.25	0.0	0.3	0.33	0.3	0.0	0.0	0.0	0.00	0.30
2.0	.0	4.0	.20	0.00	0.0	42.3	0.0	0.3	0.5	0.3	0.5	0.0	0.5	0.00	0.34
2.5	.20	5.20	.50	0.00	0.0	45.4	0.0	0.4	.04	0.4	0.0	0.2	0.2	0.00	0.3
2.0	.0	5.0	.0	0.00	0.0	54.4	0.0	0.4	.	0.4	0.20	0.2	0.20	0.00	0.43
2.5	.00	.00	2.0	0.00	0.0	.25	0.0	0.5	2.4	0.5	0.22	0.2	0.22	0.00	0.45
2.0	.40	.40	2.40	0.00	0.0	.55	0.0	0.5	4.40	0.5	0.24	0.3	0.24	0.00	0.4
2.5	.0	.0	2.0	0.00	0.0	.35	0.0	0.0	.5	0.0	0.2	0.32	0.2	0.00	0.50
2.0	.20	.20	3.00	0.00	0.0	4.0	0.0	0.0	.54	0.0	0.2	0.32	0.2	0.00	0.533
2.5	.0	.0	3.30	0.00	0.0	5.0	0.0	0.0	3.4	0.0	0.2	0.33	0.2	0.00	0.554
3.00	20.00	.00	3.0	0.00	0.0	0.0	0.0	0.0	.54	0.0	0.3	0.3	0.3	0.00	0.5
3.05	20.40	.40	3.0	0.00	0.0	20.55	0.0	0.0	25.03	0.0	0.32	0.4	0.32	0.00	0.5
3.0	20.0	.0	4.20	0.00	0.0	33.3	0.0	0.0	33.	0.0	0.34	0.0	0.34	0.00	0.0
3.5	2.20	.20	4.50	0.00	0.0	4.3	0.0	0.0	43.32	0.0	0.35	.05	0.35	0.00	0.33
3.20	2.0	.0	4.0	0.00	0.0	32.	0.0	0.0	55.4	0.0	0.3	.2	0.3	0.00	0.5
3.25	22.00	0.00	5.0	0.00	0.0	.	0.0	0.20	0.2	0.20	0.3	2.4	0.3	0.00	0.0
3.30	22.40	0.40	5.40	0.00	0.0	.3	0.0	0.20	.	0.20	0.3	3.3	0.3	0.00	0.0
3.35	22.0	0.0	5.0	0.00	0.0	2.	0.0	0.20	0.5	0.20	0.40	5.45	0.40	0.00	0.02
3.40	23.20	.20	.00	0.00	0.0	23.0	0.0	0.2	3.	0.2	0.4	.	0.4	0.00	0.0
3.45	23.0	.0	.30	0.00	0.0	2.2	0.0	0.2	.24	0.2	0.42	0.4	0.42	0.00	0.34
3.50	24.00	2.00	.0	0.00	0.0	2.0	0.0	0.22	20.34	0.22	0.43	4.0	0.43	0.00	0.50
3.55	24.40	2.40	.20	0.00	0.0	30.4	0.0	0.22	242.0	0.22	0.44	.3	0.44	0.00	0.5
3.0	24.0	2.0	.20	0.00	0.0	33.54	0.0	0.22	2.0	0.22	0.45	2.	0.45	0.00	0.0
3.5	25.20	3.20	.50	0.00	0.0	30.3	0.0	0.23	343.0	0.23	0.4	33.	0.4	0.00	0.04
3.0	25.0	3.0	.0	0.00	0.0	35.3	0.0	0.23	404.	0.23	0.4	43.35	0.4	0.00	0.0
3.5	2.00	4.00	.0	0.0	0.0	432.	0.0	0.23	4.4	0.23	0.4	54.0	0.4	0.3	.4
3.0	2.40	4.40	.40	0.2	0.0	4.0	0.0	0.24	554.52	0.24	0.4	.5	0.4	.05	.
3.5	2.0	4.0	.0	0.0	0.0	50.	0.0	0.24	44.30	0.24	0.50	4.0	0.50	.3	2.4
3.0	2.20	5.20	.00	0.24	0.0	54.	0.0	0.24	45.2	0.24	0.5	03.	0.5	2.	3.4
3.5	2.0	5.0	.30	0.30	0.0	500.2	0.0	0.25	5.4	0.25	0.52	2.45	0.52	4.	5.03
4.00	2.00	.00	.20	0.3	0.0	35.0	0.0	0.25	4.0	0.25	0.53	52.5	0.53	5.4	.3
4.05	2.40	.40	.20	0.42	0.0	45.3	0.0	0.25	25.4	0.25	0.53	2.	0.53	.	.
4.0	2.0	.0	0.20	0.4	0.0	32.0	0.0	0.2	2.2	0.2	0.54	2.55	0.54	.42	.33
4.5	2.20	.20	0.50	0.54	0.0	0.0	0.0	0.2	455.4	0.2	0.55	25.34	0.55	0.05	0.0
4.20	2.0	.0	0.0	0.0	0.0	42.3	0.0	0.2	4.	0.2	0.5	302.	0.5	.	2.

h (ft)	H/D-low -	H/D-mid -	H/D-top -	H/D-peak -	Qlow-orif (cfs)	Qlow-weir (cfs)	Qtot-low (cfs)	Qmid-orif (cfs)	Qmid-weir (cfs)	Qtot-med (cfs)	Qtop-orif (cfs)	Qtop-weir (cfs)	Qtot-top (cfs)	Qpeak-top (cfs)	Qtot (cfs)
4.25	30.00	□□.00	□□.□0	0.□□	0.□2	□0□□.□□	0.□2	0.2□	□□5□.□4	0.2□	0.5□	354.□2	0.5□	□3.5□	□4.532
4.30	30.40	□□.40	□□.40	0.□2	0.□2	□□4□.55	0.□2	0.2□	20□□.□4	0.2□	0.5□	4□2.25	0.5□	□5.4□	□□.43□
4.35	30.□0	□□.□0	□□.□0	0.□□	0.□2	□042□.□□	0.□2	0.2□	2344.05	0.2□	0.5□	4□□.□□	0.5□	□□.45	□□.424
4.40	3□.20	□□.20	□2.00	0.□4	0.□2	□□□50.3□	0.□2	0.2□	2□22.5□	0.2□	0.5□	55□.0□	0.5□	□□.50	20.4□□
4.45	3□.□0	□□.□0	□2.30	0.□0	0.□2	□□□□0.3□	0.□2	0.2□	2□2□.□2	0.2□	0.□0	□33.□□	0.□0	2□.□3	22.□25
4.50	32.00	20.00	□2.□0	0.□□	0.□2	□2□□□.23	0.□2	0.2□	325□.□5	0.2□	0.□□	□24.□□	0.□□	23.□3	24.□35
4.55	32.40	20.40	□2.□0	□.02	0.□2	□3554.52	0.□2	0.2□	3□□□.□5	0.2□	0.□□	□2□.34	0.□□	2□.□0	2□.□□4
4.□0	32.□0	20.□0	□3.20	□.0□	0.□2	□444□.□2	0.□2	0.2□	40□□.□2	0.2□	0.□2	□3□.03	0.□2	2□.43	2□.4□□
4.□5	33.20	2□.20	□3.50	□.□4	0.□2	□53□5.□3	0.□2	0.2□	443□.3□	0.2□	0.□3	□0□3.5□	0.□3	30.□3	3□.□□4
4.□0	33.□0	2□.□0	□3.□0	□.20	0.□2	□□355.□2	0.□2	0.2□	4□□□.0□	0.2□	0.□4	□200.□2	0.□4	33.30	34.35□
4.□5	34.00	22.00	□4.□0	□.2□	0.□2	□□3□□.0□	0.□2	0.30	53□□.□3	0.30	0.□4	□35□.□□	0.□4	35.□3	3□.□□0
4.□0	34.40	22.40	□4.40	□.32	0.□2	□□4□□.40	0.□2	0.30	5□33.□□	0.30	0.□5	□5□□.□5	0.□5	3□.42	3□.4□0
4.□5	34.□0	22.□0	□4.□0	□.3□	0.□2	□□□0□.□2	0.□2	0.30	□5□3.34	0.30	0.□□	□□□□.30	0.□□	4□.0□	42.□4□
4.□0	35.20	23.20	□5.00	□.44	0.□3	20□□□.25	0.□3	0.30	□□3□.□□	0.30	0.□□	□□□□.□0	0.□□	43.□□	44.□□□
4.□5	35.□0	23.□0	□5.30	□.50	0.□3	2203□.□□	0.□3	0.3□	□□0□.□3	0.3□	0.□□	2□□4.0□	0.□□	4□.54	4□.□4□
5.00	3□.00	24.00	□5.□0	□.5□	0.□3	23343.0□	0.□3	0.3□	□52□.□□	0.3□	0.□□	234□.□□	0.□□	4□.3□	50.4□□
5.05	3□.40	24.40	□5.□0	□.□2	0.□3	24□0□.5□	0.□3	0.3□	□2□□.□3	0.3□	0.□□	2□05.□□	0.□□	52.23	53.35□
5.□0	3□.□0	24.□0	□□.20	□.□□	0.□3	2□□3□.24	0.□3	0.3□	□0□2□.□3	0.3□	0.□□	2□□3.3□	0.□□	55.□□	5□.2□5
5.□5	3□.20	25.20	□□.50	□.□4	0.□3	2□□34.2□	0.□3	0.32	□□0□□.0□	0.32	0.□0	3□□4.□3	0.□0	5□.□4	5□.2□□
5.20	3□.□0	25.□0	□□.□0	□.□0	0.□3	2□□□□.□□	0.□3	0.32	□□□5□.□2	0.32	0.□0	350□.3□	0.□0	□□.□□	□2.32□
5.25	3□.00	2□.00	□□.□0	□.□□	0.□3	30□2□.2□	0.□3	0.32	□2□□4.□2	0.32	0.□□	3□□0.4□	0.□□	□4.2□	□5.423
5.30	3□.40	2□.40	□□.40	□.□2	0.□3	32533.□3	0.□3	0.32	□4040.33	0.32	0.□2	423□.05	0.□2	□□.3□	□□.5□□
5.35	3□.□0	2□.□0	□□.□0	□.□□	0.□3	343□2.□□	0.□3	0.33	□5□□5.□2	0.33	0.□2	4□4□.5□	0.□2	□0.5□	□□.□□0
5.40	3□.20	2□.20	□□.00	2.04	0.□3	3□□□□.□5	0.□3	0.33	□□404.□3	0.33	0.□3	50□4.□5	0.□3	□3.□□	□5.00□
5.45	3□.□0	2□.□0	□□.30	2.□0	0.□3	3□□04.20	0.□3	0.33	□□□00.□5	0.33	0.□4	5555.20	0.□4	□□.0□	□□.2□□
5.50	40.00	2□.00	□□.□0	2.□□	0.□3	40□2□.45	0.□3	0.33	□□0□□.24	0.33	0.□4	□05□.□0	0.□4	□0.42	□□.□2□
5.55	40.40	2□.40	□□.□0	2.22	0.□3	42223.□□	0.□3	0.34	2053□.□□	0.34	0.□5	□□00.05	0.□5	□3.□□	□5.0□□
5.□0	40.□0	2□.□0	□□.20	2.2□	0.□3	444□□.□□	0.□3	0.34	220□□.2□	0.34	0.□5	□□□□.□2	0.□5	□□.2□	□□.440
5.□5	4□.20	2□.20	□□.50	2.34	0.□4	4□□□0.52	0.□4	0.34	23□2□.□5	0.34	0.□□	□□□5.□4	0.□□	□0.□□	□□.□□4
5.□0	4□.□0	2□.□0	□□.□0	2.40	0.□4	4□0□□.5□	0.□4	0.34	254□2.□□	0.34	0.□□	□455.2□	0.□□	□4.□□	□5.433
5.□5	42.00	30.00	20.□0	2.4□	0.□4	5□52□.□3	0.□4	0.35	2□2□□.□4	0.35	0.□□	□□5□.2□	0.□□	□□.□4	□□.□□□
5.□0	42.40	30.40	20.40	2.52	0.□4	540□2.3□	0.□4	0.35	2□23□.□□	0.35	0.□□	□□0□.22	0.□□	□0□.34	□02.□02
5.□5	42.□0	30.□0	20.□0	2.5□	0.□4	5□□5□.□□	0.□4	0.35	3□2□□.□3	0.35	0.□□	□0□04.□□	0.□□	□04.□□	□0□.252
5.□0	43.20	3□.20	2□.00	2.□4	0.□4	5□52□.33	0.□4	0.35	3345□.□2	0.35	0.□□	□□55□.4□	0.□□	□0□.□□	□0□.□44
5.□5	43.□0	3□.□0	2□.30	2.□0	0.□4	□2403.□□	0.□4	0.3□	35□3□.□□	0.3□	0.□0	□245□.3□	0.□0	□□2.3□	□□3.□□□
□.00	44.00	32.00	2□.□0	2.□□	0.□4	□53□0.2□	0.□4	0.3□	3□□33.□□	0.3□	0.□0	□340□.35	0.□0	□□□.□5	□□□.453

Emerald Hills Stage Storage					
??-2-?					
depth	area	area ?a??	elevation	vol?me ??f?	vol?me ?a?ft?
0.00	3000	0.0??	3?0.5	0	0
0.05	3035	0.0?0	3?0.55	?50.?	0.0034?3
0.?0	30??	0.0?0	3?0.?	303.5	0.00????
0.?5	3?04	0.0??	3?0.?5	45?.?	0.0?050?
0.20	3?3?	0.0?2	3?0.?	??3.?	0.0?40??
0.25	3??3	0.0?3	3?0.?5	???.?	0.0????3
0.30	320?	0.0?4	3?0.?	?3?.?	0.02?3?4
0.35	3242	0.0?4	3?0.?5	?0?2.3	0.0250?5
0.40	32??	0.0?5	3?0.?	?255.2	0.02???5
0.45	33??	0.0??	3?0.?5	?4??.?	0.0325??
0.50	3345	0.0??	3??	?5??.3	0.03?4?5
0.55	33?0	0.0??	3??.05	??54.4	0.0402?5
0.?0	34?4	0.0??	3??.?	??24.2	0.044??4
0.?5	344?	0.0??	3??.?5	20?5.?	0.04???2
0.?0	34?3	0.0?0	3??.2	22??.?	0.0520?
0.?5	35??	0.0??	3??.25	2444.?	0.05??0?
0.?0	3552	0.0?2	3??.3	2?20.?	0.0?0??5
0.?5	35??	0.0?2	3??.35	2???.3	0.0?42?2
0.?0	3?2?	0.0?3	3??.4	2???.5	0.0??3??
0.?5	3?5?	0.0?4	3??.45	3???.4	0.0?25?5
?.00	3??0	0.0?5	3??.5	3345.0	0.0?????
?.05	3?2?	0.0??	3??.55	3530.4	0.0??04?
?.?0	3??5	0.0??	3??.?	3???.?	0.0?534?
?.?5	3?02	0.0??	3??.?5	3?0?.?	0.0????
?.20	3?3?	0.0??	3??.?	40??.?	0.0?40??
?.25	3???	0.0??	3??.?5	42?0.?	0.0??504
?.30	3??4	0.0?0	3??.?	44?5.?	0.?02???
?.35	3?5?	0.0??	3??.?5	4??2.3	0.?0?4?
?.40	3???	0.0?2	3??.?	4??0.?	0.??204?
?.45	402?	0.0?2	3??.?5	50??.?	0.????4?
?.50	40?4	0.0?3	3?2	52?3.4	0.?2?2?
?.55	4?0?	0.0?4	3?2.05	54??.5	0.?25??5
?.?0	4?3?	0.0?5	3?2.?	5??3.5	0.?30?04
?.?5	4???	0.0??	3?2.?5	5?0?.3	0.?354?5
?.?0	42?3	0.0??	3?2.2	????.0	0.?402?
?.?5	4250	0.0??	3?2.25	?322.?	0.?45?4?
?.?0	42??	0.0??	3?2.3	?53?.0	0.?5004?
?.?5	4325	0.0??	3?2.35	??5?.4	0.?54??
?.?0	43?2	0.?00	3?2.4	????.5	0.?5????
?.?5	4400	0.?0?	3?2.45	????.?	0.??5004
2.00	443?	0.?02	3?2.5	?40?.5	0.??00??
2.05	44??	0.?03	3?2.55	??3?.4	0.??5??2
2.?0	45??	0.?04	3?2.?	??5?.2	0.??0354
2.?5	455?	0.?05	3?2.?5	?0?3.?	0.??55?2
2.20	45??	0.?0?	3?2.?	?3?2.0	0.??0???
2.25	4?3?	0.?0?	3?2.?5	?542.?	0.??????
2.30	4???	0.?0?	3?2.?	???5.?	0.20?4?4
2.35	4???	0.?0?	3?2.?5	?0?0.?	0.20??5?
2.40	4?5?	0.?0?	3?2.?	?24?.?	0.2?22??
2.45	4???	0.??0	3?2.?5	?4??.?	0.2?????
2.50	4?3?	0.???	3?3	??2?.5	0.2233?3
2.55	4???	0.??2	3?3.05	???0.5	0.22???
2.?0	4???	0.??3	3?3.?	?02?5.4	0.2345?4
2.?5	4??0	0.??4	3?3.?5	?04?2.4	0.240??4
2.?0	5000	0.??5	3?3.2	?0???.4	0.245???
2.?5	5040	0.???	3?3.25	?0??2.4	0.25???2
2.?0	50?0	0.???	3?3.3	??2?5.4	0.25?4?
2.?5	5?20	0.???	3?3.35	??4?0.4	0.2?3324
2.?0	5???	0.???	3?3.4	???2?.4	0.2??225
2.?5	520?	0.???	3?3.45	?????.5	0.2?5???
3.00	524?	0.?20	3?3.5	?224?.5	0.2????4
3.05	52?4	0.?2?	3?3.55	?25?0.?	0.2??204

depth	area	area □a□□	elevation	vol□me □□f□	vol□me □a□ft□
3.□0	532□	0.□22	3□3.□	□2□□5.□	0.2□32□4
3.□5	53□0	0.□23	3□3.□5	□3043.3	0.2□□434
3.20	54□3	0.□24	3□3.□	□33□2.□	0.305□22
3.25	545□	0.□25	3□3.□5	□35□4.□	0.3□□□□
3.30	54□□	0.□2□	3□3.□	□3□5□.5	0.3□□□4□
3.35	5542	0.□2□	3□3.□5	□4□34.5	0.3244□4
3.40	55□5	0.□2□	3□3.□	□44□2.□	0.330□□
3.45	5□2□	0.□2□	3□3.□5	□4□□3.0	0.33□305
3.50	5□□□	0.□30	3□4	□4□□5.5	0.343□□
3.55	5□□4	0.□3□	3□4.05	□52□0.□	0.350324
3.□0	5□5□	0.□32	3□4.□	□554□.□	0.35□□0□
3.□5	5□00	0.□33	3□4.□5	□5□35.□	0.3□354□
3.□0	5□43	0.□34	3□4.2	□□□2□.□	0.3□0223
3.□5	5□□□	0.□35	3□4.25	□□420.□	0.3□□□54
3.□0	5□2□	0.□3□	3□4.3	□□□□5.5	0.3□3□35
3.□5	5□□2	0.□3□	3□4.35	□□0□3.0	0.3□05□5
3.□0	□0□5	0.□3□	3□4.4	□□3□2.□	0.3□□445
3.□5	□05□	0.□3□	3□4.45	□□□□4.5	0.4043□4
4.00	□□0□	0.□40	3□4.5	□□□□□.5	0.4□□352
4.05	□□4□	0.□4□	3□4.55	□□224.□	0.4□□3□□
4.□0	□□□3	0.□42	3□4.□	□□533.2	0.4254□3
4.□5	□23□	0.□43	3□4.□5	□□□44.0	0.4325□□
4.20	□2□4	0.□44	3□4.□	□□□5□.0	0.43□□□5
4.25	□330	0.□45	3□4.□5	□□4□2.4	0.44□024
4.30	□3□□	0.□4□	3□4.□	□□□□0.0	0.4543□□
4.35	□422	0.□4□	3□4.□5	20□□0.0	0.4□□□□□
4.40	□4□□	0.□4□	3□4.□	20432.2	0.4□□05□
4.45	□5□3	0.□50	3□4.□5	20□5□.□	0.4□□50□
4.50	□55□	0.□5□	3□5	2□0□3.5	0.4□40□□
4.55	□□05	0.□52	3□5.05	2□4□2.□	0.4□□5□□
4.□0	□□5□	0.□53	3□5.□	2□□44.0	0.4□□□3
4.□5	□□□□	0.□54	3□5.□5	220□□.□	0.50□□33
4.□0	□□42	0.□55	3□5.2	224□3.□	0.5□454□
4.□5	□□□□	0.□5□	3□5.25	22□5□.□	0.5223□□
4.□0	□□34	0.□5□	3□5.3	230□2.4	0.530□2□
4.□5	□□□0	0.□5□	3□5.35	23435.3	0.53□□□□
4.□0	□□25	0.□5□	3□5.4	23□□0.4	0.545□22
4.□5	□□□□	0.□□0	3□5.45	24□2□.□	0.553□□□
5.00	□0□□	0.□□□	3□5.5	244□□.5	0.5□□□2□
5.05	□0□□	0.□□2	3□5.55	24□2□.□	0.5□000□
5.□0	□□□4	0.□□3	3□5.□	25□□4.□	0.5□□□4□
5.□5	□□□3	0.□□4	3□5.□5	2554□.0	0.5□□34□
5.20	□2□2	0.□□□	3□5.□	25□00.4	0.5□45□□
5.25	□2□0	0.□□□	3□5.□5	2□2□2.2	0.□02□□□
5.30	□30□	0.□□□	3□5.□	2□□2□.4	0.□□□25□
5.35	□35□	0.□□□	3□5.□5	2□□□3.□	0.□□□□□□
5.40	□40□	0.□□0	3□5.□	2□3□2.2	0.□2□□5
5.45	□455	0.□□□	3□5.□5	2□□33.□	0.□3□□□
5.50	□504	0.□□2	3□□	2□□0□	□
5.55	□553	0.□□3	3□□.05	2□4□4.2	0.□53□0□
5.□0	□□0□	0.□□5	3□□.□	2□□□3.0	0.□□2□04
5.□5	□□50	0.□□□	3□□.□5	2□244.3	0.□□□35□
5.□0	□□□□	0.□□□	3□□.2	2□□2□.0	0.□□0□□□
5.□5	□□4□	0.□□□	3□□.25	300□4.2	0.□□□03□
5.□0	□□□□	0.□□□	3□□.3	30402.□	0.□□□□52
5.□5	□□45	0.□□0	3□□.35	30□□3.□	0.□0□□2□
5.□0	□□□4	0.□□□	3□□.4	3□□□□.3	0.□□5□□□
5.□5	□□42	0.□□2	3□□.45	3□5□3.2	0.□2505
□.00	□□□□	0.□□3	3□□.5	3□□□□	□

Emerald Hills BF 2-2

Discharge vs Elevation Table

Bottom orifice diameter:	2 "	Top orifice diameter:	3 "
Number:	2	Number:	4
Cg-low:	0.60	Cg-low:	0.60
invert elev:	0.50 ft	invert elev:	2.40 ft
Middle orifice diameter:	3 "	Emergency weir:	
number of orifi:	4	Invert:	4.00 ft
Cg-middle:	0.60	weir length (ft):	20.00 ft
invert elev:	2.00 ft	Riser Box:	2x3

h (ft)	H/D-low -	H/D-mid -	H/D-top -	H/D-peak -	Qlow-orif (cfs)	Qlow-weir (cfs)	Qtot-low (cfs)	Qmid-orif (cfs)	Qmid-weir (cfs)	Qtot-med (cfs)	Qtop-orif (cfs)	Qtop-weir (cfs)	Qtot-top (cfs)	Qpeak-top (cfs)	Qtot (cfs)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
0.35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
0.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
0.45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
0.55	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
0.60	0.60	0.00	0.00	0.00	0.03	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.024
0.65	0.60	0.00	0.00	0.00	0.00	0.05	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.050
0.70	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.003
0.75	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
0.80	0.80	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
0.85	2.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
0.90	2.40	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.020
0.95	2.60	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.020
1.00	3.00	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.030
1.05	3.30	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.040
1.10	3.60	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.054
1.15	3.80	0.00	0.00	0.00	0.00	0.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
1.20	4.20	0.00	0.00	0.00	0.00	0.34	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
1.25	4.50	0.00	0.00	0.00	0.00	0.52	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.004
1.30	4.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
1.35	5.00	0.00	0.00	0.00	0.00	1.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
1.40	5.40	0.00	0.00	0.00	0.00	1.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.003
1.45	5.80	0.00	0.00	0.00	0.20	2.03	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
1.50	6.00	0.00	0.00	0.00	0.20	3.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.205
1.55	6.30	0.00	0.00	0.00	0.20	5.42	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.200
1.60	6.60	0.00	0.00	0.00	0.22	7.40	0.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.205
1.65	6.80	0.00	0.00	0.00	0.22	9.00	0.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.220
1.70	7.20	0.00	0.00	0.00	0.23	10.30	0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.230
1.75	7.50	0.00	0.00	0.00	0.23	11.74	0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.230
1.80	7.80	0.00	0.00	0.00	0.24	12.96	0.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.230
1.85	8.10	0.00	0.00	0.00	0.24	12.40	0.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.240
1.90	8.40	0.00	0.00	0.00	0.25	34.20	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.245
1.95	8.80	0.00	0.00	0.00	0.25	42.40	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.250
2.00	9.00	0.00	0.00	0.00	0.25	50.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.254
2.05	9.30	0.20	0.00	0.00	0.20	53.22	0.20	0.00	0.02	0.02	0.00	0.00	0.00	0.00	0.205
2.10	9.60	0.40	0.00	0.00	0.20	60.20	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.320
2.15	9.80	0.80	0.00	0.00	0.20	60.40	0.20	0.05	0.03	0.03	0.00	0.00	0.00	0.00	0.400
2.20	10.20	0.80	0.00	0.00	0.20	70.00	0.20	0.20	0.22	0.22	0.00	0.00	0.00	0.00	0.485
2.25	10.50	1.00	0.00	0.00	0.20	72.00	0.20	0.34	0.32	0.32	0.00	0.00	0.00	0.00	0.500
2.30	10.80	1.20	0.00	0.00	0.20	75.34	0.20	0.40	0.43	0.40	0.00	0.00	0.00	0.00	0.602
2.35	11.20	1.40	0.00	0.00	0.20	110.0	0.20	0.40	0.53	0.40	0.00	0.00	0.00	0.00	0.640
2.40	11.40	1.60	0.00	0.00	0.20	20.20	0.20	0.50	0.63	0.50	0.00	0.00	0.00	0.00	0.702
2.45	11.80	1.80	0.20	0.00	0.20	23.24	0.20	0.55	0.00	0.55	0.02	0.02	0.00	0.00	0.750
2.50	12.00	2.00	0.40	0.00	0.30	25.55	0.30	0.50	0.00	0.50	0.00	0.00	0.00	0.00	0.840
2.55	12.30	2.20	0.60	0.00	0.30	30.52	0.30	0.63	0.63	0.63	0.05	0.63	0.63	0.00	0.000
2.60	12.60	2.40	0.80	0.00	0.30	32.33	0.30	0.00	0.00	0.00	0.20	0.22	0.22	0.00	0.000
2.65	12.80	2.60	1.00	0.00	0.30	40.32	0.30	0.00	0.00	0.00	0.34	0.32	0.32	0.00	0.320
2.70	13.20	2.80	1.20	0.00	0.30	40.52	0.30	0.63	0.00	0.63	0.40	0.43	0.40	0.00	0.442
2.75	13.50	3.00	1.40	0.00	0.30	53.00	0.30	0.00	0.00	0.00	0.40	0.53	0.40	0.00	0.530
2.80	13.80	3.20	1.60	0.00	0.32	100.40	0.32	0.00	0.00	0.00	0.50	0.63	0.50	0.00	0.602
2.85	14.80	3.40	1.80	0.00	0.32	105.00	0.32	0.02	0.04	0.02	0.55	0.00	0.55	0.00	0.000
2.90	14.40	3.60	2.00	0.00	0.33	105.00	0.33	0.05	0.03	0.05	0.50	0.00	0.50	0.00	0.000
2.95	14.80	3.80	2.20	0.00	0.33	104.05	0.33	0.00	0.20	0.00	0.63	0.00	0.63	0.00	0.002
3.00	15.00	4.00	2.40	0.00	0.33	104.05	0.33	0.00	0.40	0.00	0.00	0.00	0.00	0.00	0.004
3.05	15.30	4.20	2.60	0.00	0.34	105.04	0.34	0.02	0.00	0.02	0.00	0.00	0.00	0.00	0.005
3.10	15.60	4.40	2.80	0.00	0.34	1004.63	0.34	0.05	2.50	0.05	0.03	0.00	0.03	0.00	2.020
3.15	15.80	4.60	3.00	0.00	0.34	1302.63	0.34	0.00	3.34	0.00	0.00	0.00	0.00	0.00	2.005
3.20	16.20	4.80	3.20	0.00	0.35	1440.00	0.35	0.00	4.40	0.00	0.00	0.00	0.00	0.00	2.032
3.25	16.50	5.00	3.40	0.00	0.35	1502.00	0.35	0.02	5.05	0.02	0.02	0.04	0.02	0.00	2.060
3.30	16.80	5.20	3.60	0.00	0.35	1654.00	0.35	0.04	0.00	0.04	0.05	0.03	0.05	0.00	2.240
3.35	17.80	5.40	3.80	0.00	0.36	1830.25	0.36	0.00	0.02	0.00	0.20	0.00	0.00	0.00	2.202
3.40	17.40	5.60	4.00	0.00	0.36	2000.52	0.36	0.00	3.20	0.00	0.00	0.40	0.00	0.00	2.343
3.45	17.80	5.80	4.20	0.00	0.36	2323.30	0.36	0.00	0.00	0.00	0.02	0.00	0.02	0.00	2.302
3.50	18.00	6.00	4.40	0.00	0.36	2542.36	0.36	0.03	2.43	0.03	0.05	2.50	0.05	0.00	2.440
3.55	18.30	6.20	4.60	0.00	0.36	2000.80	0.36	0.05	2.00	0.05	0.00	3.34	0.00	0.00	2.400
3.60	18.60	6.40	4.80	0.00	0.36	302.05	0.36	0.00	33.22	0.00	0.00	4.40	0.00	0.00	2.535
3.65	18.80	6.60	5.00	0.00	0.36	3300.02	0.36	0.00	40.00	0.00	0.02	5.05	0.02	0.00	2.500
3.70	19.20	6.80	5.20	0.00	0.36	3500.00	0.36	0.20	40.00	0.20	0.04	0.00	0.04	0.00	2.625
3.75	19.50	7.00	5.40	0.00	0.36	3000.02	0.36	0.23	0.00	0.23	0.00	0.20	0.00	0.00	2.000
3.80	19.80	7.20	5.60	0.00	0.36	4220.00	0.36	0.24	0.00	0.24	0.00	3.20	0.00	0.00	2.002
3.85	20.00	7.40	5.80	0.00	0.36	4500.04	0.36	0.20	5.03	0.20	0.00	0.00	0.00	0.00	2.055
3.90	20.40	7.60	6.00	0.00	0.36	4053.00	0.36	0.20	0.50	0.20	0.03	2.43	0.03	0.00	2.000
3.95	20.80	7.80	6.20	0.00	0.36	5352.00	0.36	0.30	0.40	0.30	0.05	2.00	0.05	0.00	2.630
4.00	20.00	8.00	6.40	0.00	0.36	5005.03	0.36	0.32	0.05	0.32	0.00	33.22	0.00	0.00	2.000
4.05	20.30	8.20	6.60	0.00	0.40	6225.00	0.40	0.33	02.00	0.33	0.00	40.00	0.00	0.00	3.200
4.10	20.80	8.40	6.80	0.00	0.40	0003.00	0.40	0.35	000.00	0.35	0.20	40.00	0.20	0.05	4.000
4.15	20.80	8.60	7.00	0.00	0.40	0200.43	0.40	0.30	200.00	0.30	0.23	0.00	0.23	0.03	4.030
4.20	22.20	8.80	7.20	0.24	0.40	0045.02	0.40	0.30	250.30	0.30	0.24	00.00	0.24	2.00	8.003

h (ft)	H/D-low -	H/D-mid -	H/D-top -	H/D-peak -	Qlow-orif (cfs)	Qlow-weir (cfs)	Qtot-low (cfs)	Qmid-orif (cfs)	Qmid-weir (cfs)	Qtot-med (cfs)	Qtop-orif (cfs)	Qtop-weir (cfs)	Qtot-top (cfs)	Qpeak-top (cfs)	Qtot (cfs)
4.25	22.50	?.00	?.40	0.30	0.4?	?3??3.3?	0.4?	?.40	2??.55	?.40	?.2?	?5.?3	?.2?	4.??	?.235
4.30	22.?0	?.20	?.?0	0.3?	0.4?	???3.?3	0.4?	?.42	32?.?5	?.42	?.2?	?0?.50	?.2?	5.4?	?.5?2
4.35	23.?0	?.40	?.?0	0.42	0.4?	?54?.??	0.4?	?.43	3??.2?	?.43	?.30	???.4?	?.30	?.?0	?0.042
4.40	23.40	?.?0	?.00	0.4?	0.42	?02??.??	0.42	?.45	420.45	?.45	?.32	?3?.?5	?.32	?.42	??.?0?
4.45	23.?0	?.?0	?.20	0.54	0.42	?0?25.?3	0.42	?.4?	4?4.?3	?.4?	?.33	??2.??	?.33	?0.05	?3.2??
4.50	24.00	?0.00	?.40	0.?0	0.42	????0.?0	0.42	?.4?	534.??	?.4?	?.35	???.?0	?.35	??.??	?5.02?
4.55	24.30	?0.20	?.?0	0.??	0.43	?245?.?2	0.43	?.50	5??.5?	?.50	?.3?	2??.??	?.3?	?3.5?	??.??3
4.?0	24.?0	?0.40	?.?0	0.?2	0.43	?32?3.2?	0.43	?.5?	??0.??	?.5?	?.3?	250.3?	?.3?	?5.4?	??.?0?
4.?5	24.?0	?0.?0	?.00	0.??	0.43	?4?53.??	0.43	?.53	?4?.03	?.53	?.40	2??.55	?.40	??.45	20.??0
4.?0	25.20	?0.?0	?.20	0.?4	0.43	?50??.03	0.43	?.54	?34.0?	?.54	?.42	32?.?5	?.42	??.50	22.???
4.?5	25.50	??.00	?.40	0.?0	0.44	??03?.02	0.44	?.5?	?2?.?2	?.5?	?.43	3??.2?	?.43	2?.?3	25.05?
4.?0	25.?0	??.20	?.?0	0.??	0.44	??04?.42	0.44	?.5?	?02?.?0	?.5?	?.45	420.45	?.45	23.?3	2?.2??
4.?5	2?.?0	??.40	?.?0	?.02	0.44	???02.02	0.44	?.5?	??3?.0?	?.5?	?.4?	4?4.?3	?.4?	2?.?0	2?.5??
4.?0	2?.40	??.?0	?0.00	?.0?	0.44	??2?4.??	0.44	?.?0	?253.??	?.?0	?.4?	534.??	?.4?	2?.43	3?.?5?
4.?5	2?.?0	??.?0	?0.20	?.?4	0.45	203??.2?	0.45	?.?2	?3??.24	?.?2	?.50	5??.5?	?.50	30.?3	34.3?3
5.00	2?.00	?2.00	?0.40	?.20	0.45	2??03.?2	0.45	?.?3	?5??.?3	?.?3	?.5?	??0.??	?.5?	33.30	3?.???
5.05	2?.30	?2.20	?0.?0	?.2?	0.45	22??4.03	0.45	?.?4	????.?5	?.?4	?.53	?4?.03	?.53	35.?3	3?.45?
5.?0	2?.?0	?2.40	?0.?0	?.32	0.45	24224.2?	0.45	?.??	??25.??	?.??	?.54	?34.0?	?.54	3?.42	42.0?2
5.?5	2?.?0	?2.?0	??.00	?.3?	0.4?	25?2?.34	0.4?	?.??	????.?4	?.??	?.5?	?2?.?2	?.5?	4?.0?	44.?52
5.20	2?.20	?2.?0	??.20	?.44	0.4?	2?0?2.54	0.4?	?.??	2??0.4?	?.??	?.5?	?02?.?0	?.5?	43.??	4?.4?0
5.25	2?.50	?3.00	??.40	?.50	0.4?	2??24.??	0.4?	?.?0	23??.??	?.?0	?.5?	??3?.0?	?.5?	4?.54	50.2?5
5.30	2?.?0	?3.20	??.?0	?.5?	0.4?	30225.?3	0.4?	?.??	25??.??	?.??	?.?0	?253.??	?.?0	4?.3?	53.?3?
5.35	2?.?0	?3.40	??.?0	?.?2	0.4?	3????.42	0.4?	?.?3	2??2.?0	?.?3	?.?2	?3??.24	?.?2	52.23	5?.04?
5.40	2?.40	?3.?0	?2.00	?.??	0.4?	33?42.02	0.4?	?.?4	3053.00	?.?4	?.?3	?5??.?3	?.?3	55.??	5?.???
5.45	2?.?0	?3.?0	?2.20	?.?4	0.4?	354?2.0?	0.4?	?.?5	330?.34	?.?5	?.?4	????.?5	?.?4	5?.?4	?2.0??
5.50	30.00	?4.00	?2.40	?.?0	0.4?	3?35?.?0	0.4?	?.??	35?2.4?	?.??	?.??	??25.??	?.??	??.??	?5.0?3
5.55	30.30	?4.20	?2.?0	?.??	0.4?	3?33?.?5	0.4?	?.??	3??3.23	?.??	?.??	????.?4	?.??	?4.2?	??.???
5.?0	30.?0	?4.40	?2.?0	?.?2	0.4?	4?3??.??	0.4?	?.??	4??2.44	?.??	?.??	2??0.4?	?.??	??.3?	??.350
5.?5	30.?0	?4.?0	?3.00	?.??	0.4?	43544.??	0.4?	?.?0	45?0.?5	?.?0	?.?0	23??.??	?.?0	?0.5?	?4.5?3
5.?0	3?.20	?4.?0	?3.20	2.04	0.4?	45???.??	0.4?	?.?2	4?5?.?4	?.?2	?.??	25??.??	?.??	?3.??	??.?24
5.?5	3?.50	?5.00	?3.40	2.?0	0.4?	4??03.??	0.4?	?.?3	522?.44	?.?3	?.?3	2??2.?0	?.?3	??.0?	??.?32
5.?0	3?.?0	?5.20	?3.?0	2.??	0.4?	5052?.??	0.4?	?.?4	5?2?.2?	?.?4	?.?4	3053.00	?.?4	?0.42	?4.4??
5.?5	32.?0	?5.40	?3.?0	2.22	0.4?	5303?.??	0.4?	?.??	?03?.0?	?.??	?.?5	330?.34	?.?5	?3.??	??.??0
5.?0	32.40	?5.?0	?4.00	2.2?	0.4?	55?4?.44	0.4?	?.??	?4?4.??	?.??	?.??	35?2.4?	?.??	??.2?	??.33?
5.?5	32.?0	?5.?0	?4.20	2.34	0.4?	5?3?4.5?	0.4?	?.??	??3?.?3	?.??	?.??	3??3.23	?.??	?0.??	?4.?30
?.00	33.00	??.00	?4.40	2.40	0.50	????4.5?	0.50	?.??	?42?.??	?.??	?.??	4??2.44	?.??	?4.??	??.3??

Emerald Hills Stage Storage					
??-2-2					
depth	area	area ?a??	elevation	vol?me ??f?	vol?me ?a?ft?
0.00	?500	0.??5	3??	0	0
0.05	?5?0	0.???	3??.05	42?.?	0.00????
0.?0	??3?	0.???	3??.?	?5?.0	0.0????3
0.?5	??0?	0.200	3??.?5	?2?0.?	0.02??3
0.20	????	0.202	3??.2	??2?.?	0.03????
0.25	??4?	0.203	3??.25	2???.?	0.04???3
0.30	????	0.205	3??.3	2??2.?	0.05???
0.35	????	0.20?	3??.35	30?0.4	0.0?025?
0.40	?05?	0.20?	3??.4	35??.5	0.0?0??3
0.45	??2?	0.2?0	3??.45	3???.?	0.0??05
0.50	????	0.2??	3??.5	4424.3	0.?0?5??
0.55	?2??	0.2?3	3??.55	4??5.?	0.??2??4
0.?0	?33?	0.2?4	3??.?	5350.?	0.?22?4
0.?5	?40?	0.2??	3??.?5	5???.5	0.?335??
0.?0	?4??	0.2??	3??.?	?2??.5	0.?44434
0.?5	?54?	0.2??	3??.?5	????.?	0.?5535
0.?0	???5	0.22?	3??.?	?24?.?	0.???34?
0.?5	???5	0.222	3??.?5	??2?.?	0.???424
0.?0	??55	0.224	3??.?	?2?4.?	0.???5??
0.?5	??24	0.22?	3??.?5	??04.0	0.??????
?.00	???4	0.22?	3??	????.0	0.2???34
?.05	????	0.22?	3??.05	???3.5	0.222532
?.?0	?003?	0.230	3??.?	?0??3.?	0.2340?4
?.?5	?0??2	0.232	3??.?5	?0???.4	0.2455??
?.20	?0??4	0.234	3??.2	??204.?	0.25?22?
?.25	?025?	0.235	3??.25	????5.?	0.2???5?
?.30	?032?	0.23?	3??.3	?2230.5	0.2?0??4
?.35	?0402	0.23?	3??.35	?2?4?.?	0.2?2??2
?.40	?04?4	0.240	3??.4	?32?0.?	0.304?53
?.45	?054?	0.242	3??.45	?3???.2	0.3?????
?.50	?0?20	0.244	3??.5	?4325.4	0.32???5
?.55	?0??2	0.245	3??.55	?4?5?.2	0.34?0??
?.?0	?0??5	0.24?	3??.?	?53?4.?	0.3534??
?.?5	?0?3?	0.24?	3??.?5	?5?34.?	0.3?5?0?
?.?0	?0??0	0.250	3??.?	??4??.3	0.3??2?
?.?5	?0??2	0.252	3??.?5	??025.?	0.3?0?54
?.?0	??055	0.254	3??.?	??5??.5	0.40350?
?.?5	???2?	0.255	3??.?5	???3?.?	0.4??232
?.?0	??200	0.25?	3??.?	?????.3	0.42?04?
?.?5	??2?2	0.25?	3??.?5	??25?.?	0.44??44
2.00	??345	0.2?0	320	?????.5	0.454?24
2.05	??420	0.2?2	320.05	203?5.?	0.4????
2.?0	??4??	0.2?4	320.?	20?5?.5	0.4???42
2.?5	??5??	0.2??	320.?5	2?535.2	0.4?43?
2.20	???4?	0.2??	320.2	22???5.?	0.50??05
2.25	???22	0.2??	320.25	22????.?	0.52????
2.30	?????	0.2??	320.3	232??.?	0.534??5
2.35	????2	0.2?3	320.35	23????.?	0.54????
2.40	???4?	0.2?4	320.4	244?5.?	0.5????
2.45	?2023	0.2??	320.45	250?4.3	0.5?5?2?
2.50	?20??	0.2??	320.5	25???.4	0.5??4??
2.55	?2??4	0.2??	320.55	2?2?4.2	0.?03402
2.?0	?224?	0.2??	320.?	2????4.?	0.????4??
2.?5	?2325	0.2?3	320.?5	2?50?.?	0.?3?522
2.?0	?2400	0.2?5	320.?	2??2?.2	0.?45??2
2.?5	?24?5	0.2??	320.?5	2??4?.?	0.?5????
2.?0	?255?	0.2??	320.?	2?3?4.?	0.??435?
2.?5	?2?2?	0.2?0	320.?5	30004.2	0.????0?
2.?0	?2?0?	0.2?2	320.?	30?3?.3	0.?0333?
2.?5	?2????	0.2?3	320.?5	3?2?4.3	0.????5?
3.00	?2?52	0.2?5	32?	3????5.0	0.?32???
3.05	?2?30	0.2??	32?.05	3255?.?	0.?4?4?5

depth	area	area □a□□	elevation	vol□me □□f□	vol□me □a□ft□
3.□0	□300□	0.2□□	32□.□	3320□.0	0.□□235□
3.□5	□30□□	0.300	32□.□5	33□□0.4	0.□□□32□
3.20	□3□□5	0.302	32□.2	345□□.□	0.□□23□4
3.25	□3243	0.304	32□.25	35□□□.□	0.□0□55
3.30	□332□	0.30□	32□.3	35□4□.0	0.□22□□□
3.35	□33□□	0.30□	32□.35	3□50□.0	0.□3□□3□
3.40	□34□□	0.30□	32□.4	3□□□0.□	0.□5355□
3.45	□355□	0.3□□	32□.45	3□□5□.□	0.□□□0□2
3.50	□3□34	0.3□3	32□.5	3□53□.5	0.□□4□□□
3.55	□3□□2	0.3□5	32□.55	3□220.2	0.□003□□
3.□0	□3□□0	0.3□□	32□.□	3□□0□.□	0.□□□□55
3.□5	□3□□□	0.3□□	32□.□5	405□□.2	0.□3202□
3.□0	□3□4□	0.320	32□.□	4□2□4.□	0.□4□□□3
3.□5	□4025	0.322	32□.□5	4□□□3.□	0.□□404□
3.□0	□4□03	0.324	32□.□	42□□□.□	0.□□0□□
3.□5	□4□□□	0.32□	32□.□5	43404.2	0.□□□423
3.□0	□42□0	0.32□	32□.□	44□□5.2	□.0□2□4□
3.□5	□433□	0.32□	32□.□5	44□30.2	□.02□□5□
4.00	□44□□	0.33□	322	4554□.0	□.045□□□
4.05	□44□□	0.333	322.05	4□2□□.□	□.0□2255
4.□0	□45□□	0.335	322.□	4□□□□.□	□.0□□□42
4.□5	□4□5□	0.33□	322.□5	4□□2□.□	□.0□5□2□
4.20	□4□40	0.33□	322.2	4□4□4.□	□.□□25□4
4.25	□4□2□	0.340	322.25	4□203.□	□.□2□5□
4.30	□4□02	0.342	322.3	4□□4□.□	□.□4□□□□
4.35	□4□□3	0.344	322.35	50□□3.□	□.□□3□□
4.40	□50□4	0.34□	322.4	5□445.0	□.□□□0□5
4.45	□5□45	0.34□	322.45	52200.2	□.□□□352
4.50	□522□	0.350	322.5	52□5□.5	□.2□5□□3
4.55	□530□	0.35□	322.55	53□22.□	□.23330□
4.□0	□53□□	0.353	322.□	544□0.2	□.250□23
4.□5	□54□□	0.355	322.□5	552□□.□	□.2□□□32
4.□0	□5550	0.35□	322.□	5□03□.□	□.2□□435
4.□5	□5□3□	0.35□	322.□5	5□□□□.□	□.30433
4.□0	□5□□2	0.3□□	322.□	5□□00.2	□.3223□□
4.□5	□5□□3	0.3□3	322.□5	5□3□□.□	□.3404
4.□0	□5□□4	0.3□4	322.□	5□□□□.5	□.35□5□4
4.□5	□5□55	0.3□□	322.□5	5□□□5.2	□.3□□□42
5.00	□□03□	0.3□□	323	□0□□5.0	□.3□5202
5.05	□□□20	0.3□0	323.05	□□5□□.□	□.4□3□5□
5.□0	□□204	0.3□2	323.□	□23□□.0	□.43220□
5.□5	□□2□□	0.3□4	323.□5	□3□□□.3	□.450□5□
5.20	□□3□□	0.3□□	323.2	□40□5.□	□.4□□5□□
5.25	□□455	0.3□□	323.25	□4□3□.4	□.4□□43□
5.30	□□53□	0.3□0	323.3	□5□□□.3	□.50□3□5
5.35	□□□23	0.3□2	323.35	□□4□0.3	□.52□40□
5.40	□□□0□	0.3□4	323.4	□□323.□	□.54553□
5.45	□□□□□	0.3□5	323.45	□□□□□.0	□.5□4□□□
5.50	□□□□4	0.3□□	323.5	□□003	2
5.55	□□□5□	0.3□□	323.55	□□□4□.4	□.□035
5.□0	□□042	0.3□□	323.□	□0□□□.5	□.□230□3
5.□5	□□□2□	0.3□3	323.□5	□□552.□	□.□42□23
5.□0	□□2□0	0.3□5	323.□	□24□□.□	□.□□232□
5.□5	□□2□4	0.3□□	323.□5	□32□3.□	□.□□2□32
5.□0	□□3□□	0.3□□	323.□	□4□40.4	□.□0203
5.□5	□□4□□	0.40□	323.□5	□50□□.4	□.□22025
5.□0	□□545	0.403	323.□	□5□□□.□	□.□42□□□
5.□5	□□□2□	0.405	323.□5	□□□□5.□	□.□□2304
□.00	□□□□3	0.40□	324	□□□4□	2

Emerald Hills BF 2-3

Discharge vs Elevation Table

ottom orifice diameter	2 "	op orifice diameter	4 "
Nmber		Nmber	4
Cg-lo	0.60	Cg-lo	0.60
invert elev	0.50 ft	invert elev	2.40 ft
Middle orifice diameter	3 "	Emergency eir	
nmber of orif	4	invert	4.50 ft
Cg-middle	0.60	eirength ft	20.00 ft
invert elev	2.00 ft	iser o	283

h (ft)	H/D-low -	H/D-mid -	H/D-top -	H/D-peak -	Qlow-orif (cfs)	Qlow-weir (cfs)	Qtot-low (cfs)	Qmid-orif (cfs)	Qmid-weir (cfs)	Qtot-med (cfs)	Qtop-orif (cfs)	Qtop-weir (cfs)	Qtot-top (cfs)	Qpeak-top (cfs)	Qtot (cfs)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
0.35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
0.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
0.45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
0.55	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.003
0.60	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.002
0.65	0.60	0.00	0.00	0.00	0.03	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.025
0.70	0.70	0.00	0.00	0.00	0.04	0.04	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.037
0.75	0.75	0.00	0.00	0.00	0.04	0.05	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.044
0.80	0.80	0.00	0.00	0.00	0.05	0.05	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.050
0.85	2.80	0.00	0.00	0.00	0.05	0.05	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.055
0.90	2.40	0.00	0.00	0.00	0.05	0.05	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.060
0.95	2.80	0.00	0.00	0.00	0.05	0.05	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.065
1.00	3.00	0.00	0.00	0.00	0.05	0.05	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.070
1.05	3.30	0.00	0.00	0.00	0.05	0.05	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.073
1.10	3.60	0.00	0.00	0.00	0.05	0.05	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.078
1.15	3.80	0.00	0.00	0.00	0.05	0.12	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.080
1.20	4.20	0.00	0.00	0.00	0.05	0.14	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.084
1.25	4.50	0.00	0.00	0.00	0.05	0.21	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.090
1.30	4.80	0.00	0.00	0.00	0.05	0.41	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.090
1.35	5.80	0.00	0.00	0.00	0.05	0.12	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.094
1.40	5.40	0.00	0.00	0.00	0.05	0.13	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.098
1.45	5.80	0.00	0.00	0.00	0.05	0.13	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.098
1.50	6.00	0.00	0.00	0.00	0.05	0.14	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.102
1.55	6.30	0.00	0.00	0.00	0.05	2.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.105
1.60	6.60	0.00	0.00	0.00	0.05	3.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.108
1.65	6.80	0.00	0.00	0.00	0.05	4.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.110
1.70	7.20	0.00	0.00	0.00	0.05	7.53	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.113
1.75	7.50	0.00	0.00	0.00	0.05	8.40	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.115
1.80	7.80	0.00	0.00	0.00	0.05	10.84	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.118
1.85	8.10	0.00	0.00	0.00	0.05	23.20	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.125
2.00	9.00	0.00	0.00	0.00	0.06	20.00	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.126
2.05	9.30	0.20	0.00	0.00	0.06	30.20	0.06	0.00	0.02	0.02	0.00	0.00	0.00	0.00	0.148
2.10	9.60	0.40	0.00	0.00	0.06	34.84	0.06	0.00	0.07	0.07	0.00	0.00	0.00	0.00	0.185
2.15	9.80	0.80	0.00	0.00	0.06	45.80	0.06	0.05	0.13	0.13	0.00	0.00	0.00	0.00	0.254
2.20	10.20	0.80	0.00	0.00	0.06	54.34	0.06	0.21	0.22	0.22	0.00	0.00	0.00	0.00	0.350
2.25	10.50	1.00	0.00	0.00	0.06	64.34	0.06	0.34	0.32	0.32	0.00	0.00	0.00	0.00	0.438
2.30	10.80	1.20	0.00	0.00	0.06	75.20	0.06	0.40	0.43	0.40	0.00	0.00	0.00	0.00	0.542
2.35	11.20	1.40	0.00	0.00	0.06	81.53	0.06	0.47	0.53	0.47	0.00	0.00	0.00	0.00	0.597
2.40	11.40	1.60	0.00	0.00	0.06	103.00	0.06	0.50	0.63	0.50	0.00	0.00	0.00	0.00	0.647
2.45	11.80	1.80	0.05	0.00	0.06	118.42	0.06	0.55	0.68	0.55	0.00	0.02	0.02	0.00	0.703
2.50	12.00	2.00	0.30	0.00	0.06	138.20	0.06	0.59	0.74	0.59	0.00	0.04	0.04	0.00	0.759
2.55	12.30	2.20	0.45	0.00	0.06	158.20	0.06	0.63	0.83	0.63	0.00	0.06	0.06	0.00	0.834
2.60	12.60	2.40	0.60	0.00	0.06	178.84	0.06	0.67	0.92	0.67	0.02	0.08	0.10	0.00	0.913
2.65	12.80	2.60	0.75	0.00	0.06	200.50	0.06	0.71	1.01	0.71	0.04	0.10	0.14	0.00	0.991
2.70	13.20	2.80	0.90	0.00	0.06	234.42	0.06	0.75	1.13	0.75	0.05	0.12	0.17	0.00	1.075
2.75	13.50	3.00	1.05	0.00	0.06	250.80	0.06	0.79	1.22	0.79	0.06	0.14	0.20	0.00	1.175
2.80	13.80	3.20	1.20	0.00	0.06	300.23	0.06	0.83	1.32	0.83	0.08	0.16	0.24	0.00	1.274
2.85	14.80	3.40	1.35	0.00	0.06	330.20	0.06	0.87	1.44	0.87	0.09	0.18	0.27	0.00	1.374
2.90	14.40	3.60	1.50	0.00	0.06	360.44	0.06	0.95	1.53	0.91	0.10	0.20	0.30	0.00	1.475
2.95	14.80	3.80	1.65	0.00	0.06	424.62	0.06	0.99	1.64	0.95	0.11	0.22	0.33	0.00	1.575
3.00	15.00	4.00	1.80	0.00	0.06	464.42	0.06	1.00	1.74	0.99	0.12	0.24	0.36	0.00	1.675
3.05	15.30	4.20	1.95	0.00	0.06	520.52	0.06	1.02	1.85	1.02	0.13	0.26	0.39	0.00	1.775
3.10	15.60	4.40	2.10	0.00	0.06	560.42	0.06	1.05	2.50	1.05	0.25	0.28	0.53	0.00	2.375
3.15	15.80	4.60	2.25	0.00	0.06	584.40	0.06	1.07	3.34	1.07	0.32	0.32	0.64	0.00	2.445
3.20	16.20	4.80	2.40	0.00	0.06	620.84	0.06	1.09	4.40	1.09	0.33	0.33	0.66	0.00	2.520
3.25	16.50	5.00	2.55	0.00	0.06	660.03	0.06	1.02	5.05	1.02	0.34	0.34	0.68	0.00	2.600
3.30	16.20	5.20	2.70	0.00	0.06	700.34	0.06	1.04	5.20	1.04	0.40	0.40	0.80	0.00	2.680
3.35	16.80	5.40	2.85	0.00	0.06	745.52	0.06	1.06	10.20	1.06	0.50	0.50	1.00	0.00	2.854
3.40	17.40	5.60	3.00	0.00	0.06	805.52	0.06	1.08	13.20	1.08	0.50	0.50	1.00	0.00	2.924
3.45	17.80	5.80	3.15	0.00	0.06	845.45	0.06	1.10	17.20	1.10	0.50	0.50	1.00	0.00	2.993
3.50	18.00	6.00	3.30	0.00	0.06	920.20	0.06	1.13	20.43	1.13	0.55	0.55	1.10	0.00	3.090
3.55	18.30	6.20	3.45	0.00	0.06	930.80	0.06	1.15	25.22	1.15	0.55	0.55	1.10	0.00	3.020
3.60	18.60	6.40	3.60	0.00	0.06	954.83	0.06	1.17	33.22	1.17	0.64	2.82	3.46	0.00	3.080
3.65	18.80	6.60	3.75	0.00	0.06	1050.00	0.06	1.19	40.80	1.19	0.80	2.30	3.10	0.00	3.353
3.70	19.20	6.80	3.90	0.00	0.06	1104.53	0.06	1.21	48.22	1.21	0.82	2.82	3.64	0.00	3.924
3.75	19.50	7.00	4.05	0.00	0.06	1154.20	0.06	1.23	50.00	1.23	0.84	3.20	4.04	0.00	4.284
3.80	19.80	7.20	4.20	0.00	0.06	1203.80	0.06	1.24	60.22	1.24	0.80	3.60	4.40	0.00	4.333
3.85	20.80	7.40	4.35	0.00	0.06	1225.50	0.06	1.26	65.83	1.26	0.84	4.00	4.84	0.00	4.394
3.90	20.40	7.60	4.50	0.00	0.06	1240.50	0.06	1.26	80.50	1.26	0.86	5.02	5.88	0.00	4.440
3.95	20.80	7.80	4.65	0.00	0.20	1260.05	0.20	1.30	90.43	1.30	2.00	2.30	4.30	0.00	3.504
4.00	21.00	8.00	4.80	0.00	0.20	1280.20	0.20	1.32	130.55	2.32	2.05	2.05	4.10	0.00	3.554
4.05	21.30	8.20	4.85	0.00	0.20	1302.84	0.20	1.33	142.20	2.33	2.00	2.30	4.30	0.00	3.604
4.10	21.80	8.40	5.00	0.00	0.20	1335.52	0.20	1.35	160.80	2.35	2.02	4.00	6.02	0.00	3.702
4.15	21.80	8.60	5.25	0.00	0.20	1304.80	0.20	1.37	200.22	2.37	2.05	2.30	4.35	0.00	4.002
4.20	22.20	8.80	5.40	0.02	0.20	1302.20	0.20	1.37	250.37	2.37	2.00	2.00	4.00	0.05	4.225

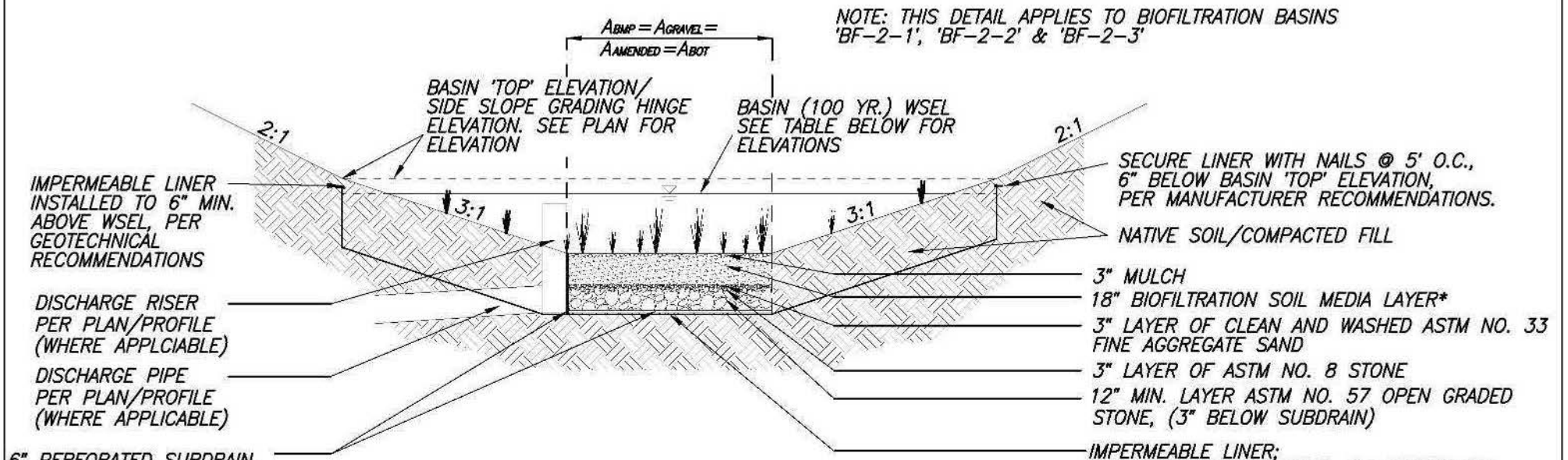
h (ft)	H/D-low -	H/D-mid -	H/D-top -	H/D-peak -	Qlow-orif (cfs)	Qlow-weir (cfs)	Qtot-low (cfs)	Qmid-orif (cfs)	Qmid-weir (cfs)	Qtot-med (cfs)	Qtop-orif (cfs)	Qtop-weir (cfs)	Qtot-top (cfs)	Qpeak-top (cfs)	Qtot (cfs)
4.25	22.50	?.00	5.55	0.??	0.20	4?5?.??	0.20	?.40	2??.55	?.40	2.22	25.5?	2.22	?.?3	5.?5?
4.30	22.?0	?.20	5.?0	0.24	0.2?	445?.??	0.2?	?.42	32?.?5	?.42	2.25	30.?4	2.25	2.??	?.?52
4.35	23.?0	?.40	5.?5	0.30	0.2?	4??4.0?	0.2?	?.43	3??.2?	?.43	2.2?	3?.?5	2.2?	4.??	?.0?5
4.40	23.40	?.?0	?.00	0.3?	0.2?	5?0?.0?	0.2?	?.45	420.45	?.45	2.3?	44.00	2.3?	5.4?	?.444
4.45	23.?0	?.?0	?.?5	0.42	0.2?	54?2.5?	0.2?	?.4?	4?4.?3	?.4?	2.35	52.?0	2.35	?.?0	?0.???
4.50	24.00	?0.00	?.30	0.4?	0.2?	5?35.30	0.2?	?.4?	534.??	?.4?	2.3?	??.34	2.3?	?.42	?2.4?3
4.55	24.30	?0.20	?.45	0.54	0.2?	?22?.0?	0.2?	?.50	5??.5?	?.50	2.4?	??.?5	2.4?	?0.05	?4.???
4.?0	24.?0	?0.40	?.?0	0.?0	0.2?	??4?.?3	0.2?	?.5?	??0.??	?.5?	2.44	?3.?3	2.44	??.??	?5.?3?
4.?5	24.?0	?0.?0	?.?5	0.??	0.22	?0??.?4	0.22	?.53	?4?.03	?.53	2.4?	??.?3	2.4?	?3.5?	??.??2
4.?0	25.20	?0.?0	?.?0	0.?2	0.22	?534.5?	0.22	?.54	?34.0?	?.54	2.50	??2.??	2.50	?5.4?	??.?3?
4.?5	25.50	??.00	?.05	0.??	0.22	?0?5.5?	0.22	?.5?	?2?.?2	?.5?	2.52	?2?.??	2.52	??.45	2?.?5?
4.?0	25.?0	??.20	?.20	0.?4	0.22	?520.??	0.22	?.5?	?0?2.?0	?.5?	2.55	?4?.?2	2.55	??.50	23.?4?
4.?5	2?.?0	??.40	?.35	0.?0	0.22	?05?.0?	0.22	?.5?	??3?.0?	?.5?	2.5?	???.55	2.5?	2?.?3	2?.0??
4.?0	2?.40	??.?0	?.50	0.??	0.22	??0?.34	0.22	?.?0	?253.??	?.?0	2.??	???.?3	2.??	23.?3	2?.2??
4.?5	2?.?0	??.?0	?.?5	?.02	0.22	?0?0?.?3	0.22	?.?2	?3??.24	?.?2	2.?4	2??.?4	2.?4	2?.?0	30.5?3
5.00	2?.00	?2.00	?.?0	?.0?	0.22	?0?0?.??	0.22	?.?3	?5??.?3	?.?3	2.??	245.24	2.??	2?.43	32.?52
5.05	2?.30	?2.20	?.?5	?.?4	0.23	??442.02	0.23	?.?4	????.?5	?.?4	2.??	2???.?4	2.??	30.?3	35.3??
5.?0	2?.?0	?2.40	?.?0	?.20	0.23	?2??2.??	0.23	?.??	??25.??	?.??	2.?2	3?0.02	2.?2	33.30	3?.?05
5.?5	2?.?0	?2.?0	?.25	?.2?	0.23	?2??3.??	0.23	?.??	????.?4	?.??	2.?5	34?.0?	2.?5	35.?3	40.4?5
5.20	2?.20	?2.?0	?.40	?.32	0.23	?354?.2?	0.23	?.??	2??0.4?	?.??	2.??	3??.5?	2.??	3?.42	43.?0?
5.25	2?.50	?3.00	?.55	?.3?	0.23	?43?2.4?	0.23	?.?0	23??.??	?.?0	2.?0	43?.?0	2.?0	4?.0?	45.???
5.30	2?.?0	?3.20	?.?0	?.44	0.23	?5??2.?2	0.23	?.??	25??.??	?.??	2.?3	4??.??	2.?3	43.??	4?.544
5.35	2?.?0	?3.40	?.?5	?.50	0.23	?5?4?.??	0.23	?.?3	2??2.?0	?.?3	2.?5	53?.??	2.?5	4?.54	5?.34?
5.40	2?.40	?3.?0	?.00	?.5?	0.23	???2?.0?	0.23	?.?4	3053.00	?.?4	2.??	5??.23	2.??	4?.3?	54.20?
5.45	2?.?0	?3.?0	?.?5	?.?2	0.24	??3?.0?	0.24	?.?5	330?.34	?.?5	2.?0	?4?.3?	2.?0	52.23	5?.?23
5.50	30.00	?4.00	?.30	?.??	0.24	?????.?0	0.24	?.??	35?2.4?	?.??	2.?3	??5.30	2.?3	55.??	?0.0??
5.55	30.30	?4.20	?.45	?.?4	0.24	?????.?3	0.24	?.??	3??3.23	?.??	2.?5	???.4?	2.?5	5?.?4	?3.???
5.?0	30.?0	?4.40	?.?0	?.?0	0.24	20???.34	0.24	?.??	4??2.44	?.??	2.??	??3.?0	2.??	??.??	??.??3
5.?5	30.?0	?4.?0	?.?5	?.??	0.24	2?0??2.43	0.24	?.?0	45?0.?5	?.?0	3.00	?45.52	3.00	?4.2?	??.30?
5.?0	3?.20	?4.?0	?.?0	?.?2	0.24	22???.50	0.24	?.?2	4?5?.?4	?.?2	3.02	?034.03	3.02	??.3?	?2.4??
5.?5	3?.50	?5.00	?0.05	?.??	0.24	2405?.??	0.24	?.?3	522?.44	?.?3	3.05	??2?.??	3.05	?0.5?	?5.?00
5.?0	3?.?0	?5.20	?0.20	2.04	0.24	252?0.?5	0.24	?.?4	5?2?.2?	?.?4	3.0?	?230.??	3.0?	?3.??	??.??0
5.?5	32.?0	?5.40	?0.35	2.?0	0.25	2?5?.0?	0.25	?.??	?03?.0?	?.??	3.?0	?33?.4?	3.?0	??.0?	?2.2??
5.?0	32.40	?5.?0	?0.50	2.??	0.25	2???24.?2	0.25	?.??	?4?4.??	?.??	3.?2	?455.??	3.?2	?0.42	?5.?5?
5.?5	32.?0	?5.?0	?0.?5	2.22	0.25	2???2.2?	0.25	?.??	??3?.?3	?.??	3.?4	?5??.??	3.?4	?3.??	??.0?2
?.00	33.00	??.00	?0.?0	2.2?	0.25	305?2.25	0.25	?.??	?42?.??	?.??	3.??	????2.23	3.??	??.2?	?2.5??

Emerald Hills Stage Storage					
??-2-3					
depth	area	area ?a??	elevation	vol?me ??f?	vol?me ?a?ft?
0.00	?000	0.???	33?	0	0
0.05	?0?2	0.??2	33?.05	35?.?	0.00?0??
0.?0	??24	0.??4	33?.?	?0?.2	0.0??2?2
0.?5	????	0.??5	33?.?5	?0?4.0	0.024425
0.20	?24?	0.???	33?.2	?424.?	0.032??
0.25	?3??	0.???	33?.25	????.?	0.04?0?5
0.30	?3?3	0.???	33?.3	2?55.?	0.04?4?2
0.35	?435	0.???	33?.35	252?.?	0.05????
0.40	?4??	0.??2	33?.4	2???.4	0.0??5?
0.45	?55?	0.??4	33?.45	32?5.?	0.0?520?
0.50	??2?	0.??5	33?.5	3?55.3	0.0?3??3
0.55	???3	0.???	33?.55	403?.?	0.0?2???
0.?0	??45	0.???	33?.?	4423.?	0.?0?55?
0.?5	??0?	0.???	33?.?5	4??2.4	0.??04??
0.?0	????	0.???	33?.?	5204.3	0.???4?4
0.?5	??32	0.??2	33?.?5	55??.3	0.?2?543
0.?0	???4	0.??4	33?.?	5???.4	0.?3???2
0.?5	?05?	0.??5	33?.?5	?3??.?	0.?4???3
0.?0	????	0.???	33?.?	??03.0	0.?5????
0.?5	???0	0.???	33?.?5	?2?0.5	0.??552?
?.00	?242	0.???	33?	??2?.0	0.??4?54
?.05	?302	0.???	33?.05	?034.?	0.??444?
?.?0	?3?3	0.??2	33?.?	?45?.2	0.??40?4
?.?5	?423	0.??3	33?.?5	???0.?	0.203?4?
?.20	?4?4	0.??5	33?.2	?2?3.?	0.2?335?
?.25	?544	0.???	33?.25	????.3	0.223?24
?.30	??05	0.???	33?.3	?0?4?.0	0.232???
?.35	???5	0.???	33?.35	?05??.?	0.242???
?.40	??2?	0.200	33?.4	??0?4.5	0.252?5?
?.45	????	0.202	33?.45	??452.3	0.2?2?0?
?.50	??4?	0.203	33?.5	????3.?	0.2?302?
?.55	??0?	0.204	33?.55	?233?.0	0.2?32??
?.?0	????	0.20?	33?.?	?2??3.?	0.2?34??
?.?5	?02?	0.20?	33?.?5	?3233.?	0.303?04
?.?0	?0??	0.20?	33?.?	?3???.?	0.3?420?
?.?5	??4?	0.2?0	33?.?5	?4?42.5	0.324???
?.?0	?20?	0.2??	33?.?	?4?0?.5	0.335204
?.?5	?2?0	0.2?3	33?.?5	?50?3.5	0.345?0?
?.?0	?330	0.2?4	33?.?	?552?.4	0.35?4?4
?.?5	?3??	0.2??	33?.?5	?5???.5	0.3??22?
2.00	?45?	0.2??	340	??4??.5	0.3??042
2.05	?453	0.2??	340.05	???40.?	0.3?????
2.?0	?45?	0.2??	340.?	??4?2.?	0.3???44
2.?5	?45?	0.2??	340.?5	????5.?	0.4?05??
2.20	?4??	0.2??	340.2	??35?.?	0.42?45?
2.25	?4?3	0.2??	340.25	???3?.?	0.4323??
2.30	?4??	0.2??	340.3	??305.0	0.443??2
2.35	?4??	0.2??	340.35	?????.4	0.45404?
2.40	?4??	0.2??	340.4	2025?.?	0.4?4???
2.45	?4?3	0.2??	340.45	20?25.4	0.4?5??
2.50	?4??	0.2??	340.5	2????.?	0.4????5
2.55	?4??	0.2??	340.55	2???3.0	0.4??543
2.?0	?4?0	0.2??	340.?	22?4?.?	0.50?423
2.?5	?4?3	0.2??	340.?5	22?2?.0	0.5??30?
2.?0	?4?5	0.2??	340.?	230?5.2	0.530??3
2.?5	?4??	0.2??	340.?5	235??.5	0.54?0?2
2.?0	?4?0	0.2??	340.?	24044.0	0.55???4
2.?5	?4?3	0.2??	340.?5	245??.?	0.5?2???
2.?0	?4?5	0.2??	340.?	24??3.2	0.5?3???
2.?5	?4??	0.2??	340.?5	254??.?	0.5?4???
3.00	?500	0.2??	34?	25?43.0	0.5?55??
3.05	?540	0.2??	34?.05	2?4??.0	0.?0?4??

depth	area	area □a□□	elevation	vol□me □□f□	vol□me □a□ft□
3.□0	□5□0	0.220	34□.□	2□□□□.0	0.□□□4□
3.□5	□□20	0.22□	34□.□5	2□3□□.0	0.□2□4□□
3.20	□□□0	0.222	34□.2	2□□5□.0	0.□3□555
3.25	□□00	0.223	34□.25	2□343.0	0.□50□□□
3.30	□□40	0.224	34□.3	2□□2□.0	0.□□□□23
3.35	□□□0	0.225	34□.35	2□3□□.0	0.□□302□
3.40	□□20	0.225	34□.4	2□□0□.0	0.□□42□5
3.45	□□□0	0.22□	34□.45	302□□.0	0.□□55□□
3.50	□□00	0.22□	34□.5	30□□3.0	0.□0□□□
3.55	□□40	0.22□	34□.55	3□2□□.0	0.□□□2□□
3.□0	□□□0	0.22□	34□.□	3□□□□.0	0.□2□□2□
3.□5	□0020	0.230	34□.□5	322□□.0	0.□4□20□
3.□0	□00□0	0.23□	34□.□	32□□□.0	0.□52□32
3.□5	□0□00	0.232	34□.□5	332□3.0	0.□□4302
3.□0	□0□40	0.233	34□.□	33□□□.0	0.□□5□□□
3.□5	□0□□0	0.234	34□.□5	3430□.0	0.□□□5□
3.□0	□0220	0.235	34□.□	34□□□.0	0.□□□2□□
3.□5	□02□0	0.23□	34□.□5	3532□.0	0.□□□042
4.00	□0300	0.23□	342	35□43.0	0.□22□42
4.05	□03□□	0.23□	342.05	3□35□.5	0.□34□
4.□0	□0422	0.23□	342.□	3□□□□.□	0.□4□□2□
4.□5	□04□3	0.24□	342.□5	3□40□.□	0.□5□□25
4.20	□0544	0.242	342.2	3□□2□.4	0.□□0□□3
4.25	□0□05	0.243	342.25	3□45□.□	0.□□2□3□
4.30	□0□□□	0.245	342.3	3□□□□.□	0.□□503□
4.35	□0□2□	0.24□	342.35	3□522.□	0.□0□3□□
4.40	□0□□□	0.24□	342.4	400□0.□	0.□□□□□5
4.45	□0□4□	0.24□	342.45	40□0□.5	0.□320□3
4.50	□0□□0	0.250	342.5	4□□45.5	0.□445□□
4.55	□0□□□	0.252	342.55	4□□□2.5	0.□5□□2□
4.□0	□□032	0.253	342.□	42242.□	0.□□□□5□
4.□5	□□0□3	0.255	342.□5	42□□5.□	0.□□2455
4.□0	□□□54	0.25□	342.□	4335□.□	0.□□5223
4.□5	□□2□5	0.25□	342.□5	43□□□.□	□.00□0□□
4.□0	□□2□□	0.25□	342.□	444□3.4	□.020□□□
4.□5	□□33□	0.2□0	342.□5	4503□.□	□.033□4□
4.□0	□□3□□	0.2□2	342.□	45□0□.□	□.04□□□5
4.□5	□□45□	0.2□3	342.□5	4□□□□.5	□.0□0□□3
5.00	□□520	0.2□4	343	4□□53.0	□.0□330□
5.05	□□5□4	0.2□□	343.05	4□330.3	□.0□□555
5.□0	□□□2□	0.2□□	343.□	4□□□0.4	□.0□□□□□
5.□5	□□□□2	0.2□□	343.□5	4□4□3.□	□.□□325
5.20	□□□3□	0.2□□	343.2	4□0□□.□	□.□2□□□
5.25	□□□□0	0.2□□	343.25	4□□□□.□	□.□40□□2
5.30	□□□44	0.2□2	343.3	5025□.□	□.□53□5□
5.35	□□□□□	0.2□3	343.35	50□5□.□	□.□□□3□2
5.40	□□□52	0.2□4	343.4	5□44□.4	□.□□□0□
5.45	□200□	0.2□□	343.45	5204□.3	□.□□4□2
5.50	□20□0	0.2□□	343.5	52□4□	□
5.55	□2□□4	0.2□□	343.55	53252.3	□.22250□
5.□0	□2□□□	0.2□□	343.□	53□5□.4	□.23□442
5.□5	□2222	0.2□□	343.□5	544□□.□	□.25044
5.□0	□22□□	0.2□2	343.□	550□□.□	□.2□45
5.□5	□2330	0.2□3	343.□5	55□□□.□	□.2□□□2□
5.□0	□23□4	0.2□4	343.□	5□3□4.□	□.2□2□05
5.□5	□243□	0.2□□	343.□5	5□□35.□	□.30□05□
5.□0	□24□2	0.2□□	343.□	5□55□.4	□.32□35□
5.□5	□254□	0.2□□	343.□5	5□□□4.3	□.335□2□
□.00	□2□00	0.2□□	344	5□□□3	□

ATTACHMENT 5 – Bioretention Details

NOTE: THIS DETAIL APPLIES TO BIOFILTRATION BASINS 'BF-2-1', 'BF-2-2' & 'BF-2-3'



BIORETENTION SOIL MEDIA (BSM):

- 18" MINIMUM THICKNESS.
- 70% TO 85% BY VOLUME WASHED SAND AND 15% TO 30% BY VOLUME COMPOST OR ALTERNATIVE ORGANIC AMENDMENT.
- BSM: THE C:N RATIO OF BSM SHALL BE BETWEEN 15 AND 40 TO REDUCE THE POTENTIAL FOR NITRATE LEACHING.
- MUST MAINTAIN A MINIMUM PERCOLATION RATE OF 5 INCHES PER HOUR THROUGHOUT THE LIFE OF THE FACILITY, AND IT MUST BE SUITABLE FOR MAINTAINING PLANT LIFE.
- FOR ADDITIONAL INFORMATION REFER TO APPENDIX F.3 OF THE CITY OF SAN DIEGO STORM WATER STANDARDS MANUAL.

BIOFILTRATION PLANTING NOTE:

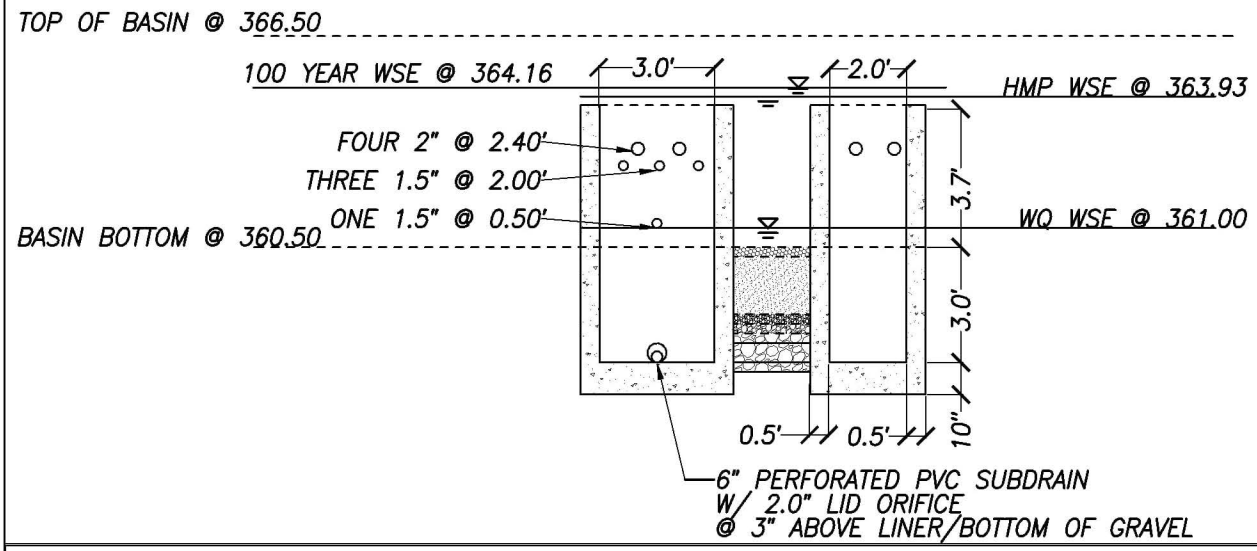
- ALL PLANTING IN 'BIOFILTRATION' AREAS SHALL CONFORM TO APPENDIX 'E' OF THE CITY OF SAN DIEGO LOW IMPACT DESIGN MANUAL.

	BOTTOM ELEVATION	WQ WSE	HMP WSE	100 YR-WSE	BASIN TOP ELEV.	BASIN BOTTOM AREA
BF-2-1	360.50	361.00	363.93	364.16	366.50	3,000 SFT
BF-2-2	318.00	318.50	322.00	322.07	324.00	8,500 SFT
BF-2-3	338.00	338.50	341.72	342.17	344.00	7,000 SFT

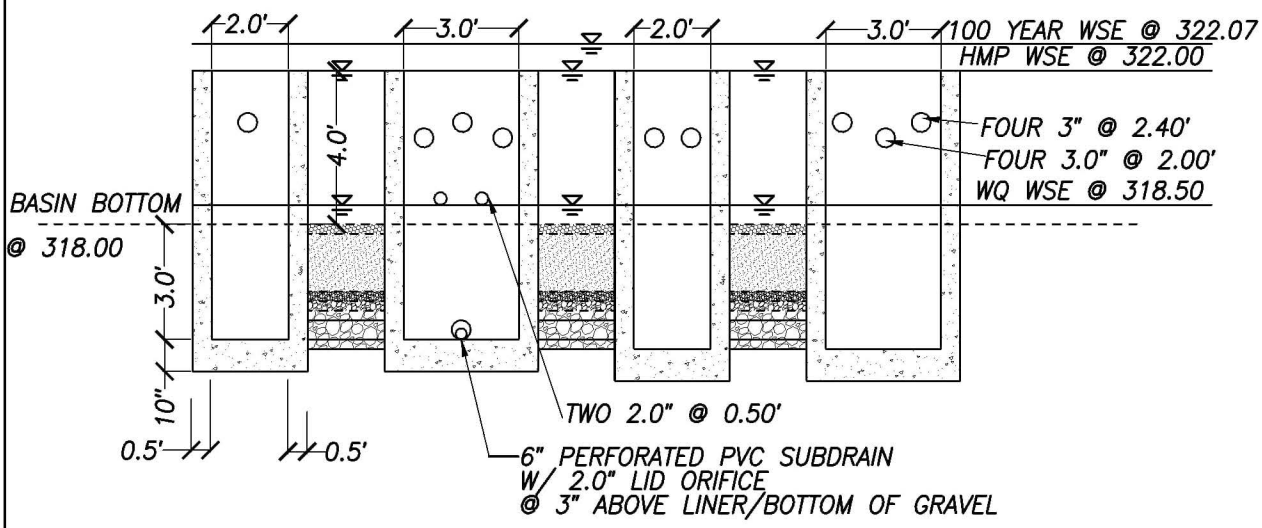
SOIL SECTION FOR WATER QUALITY/HYDROMODIFICATION BIOFILTRATION BASIN

NOT TO SCALE

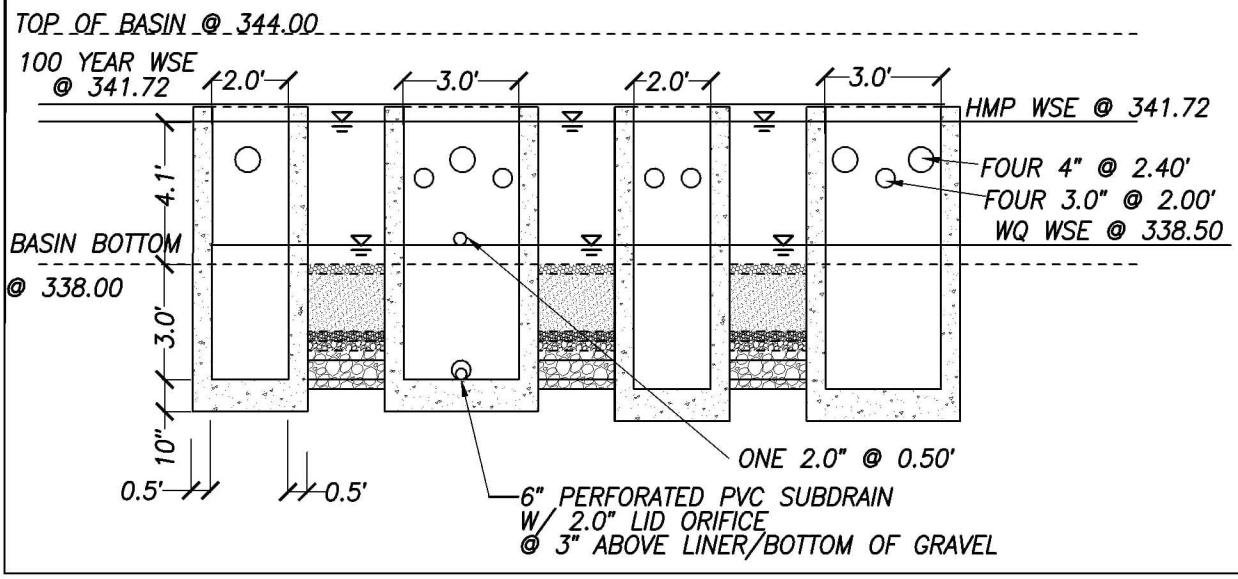
PRIVATE BIOFILTRATION BASIN BF-2-1

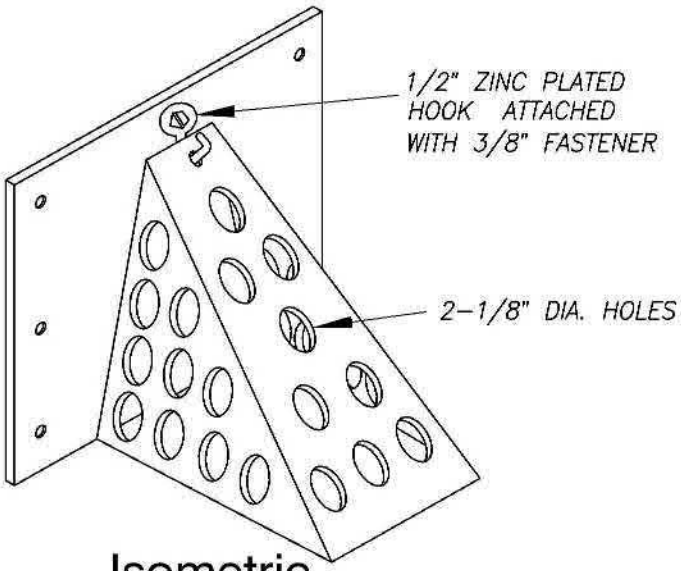


PRIVATE BIOFILTRATION BASIN BF-2-2

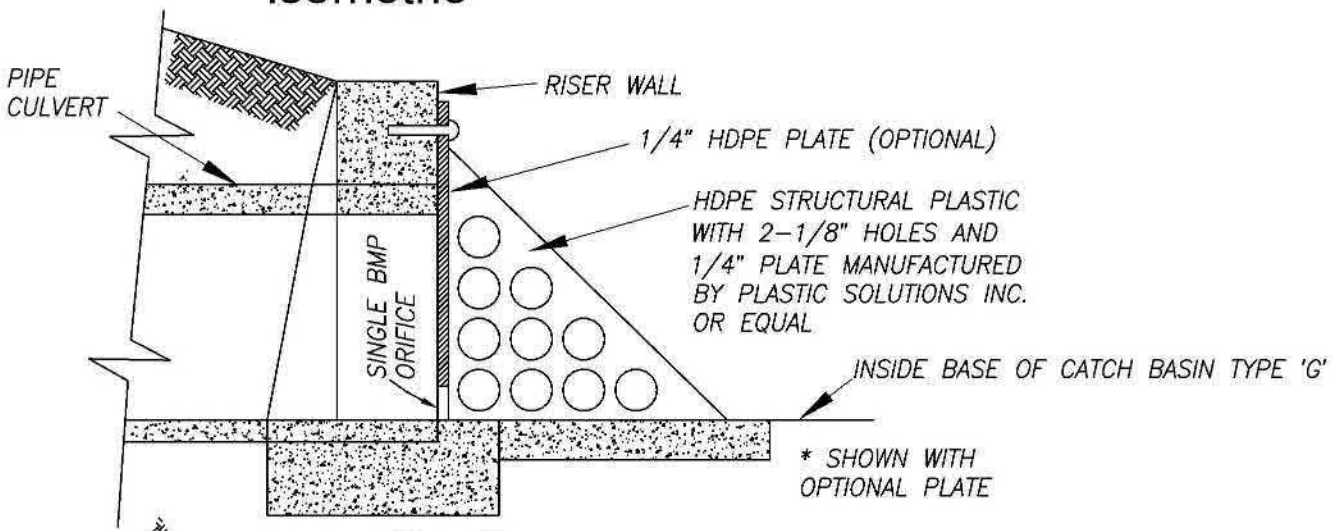


PRIVATE BIOFILTRATION BASIN BF-2-3

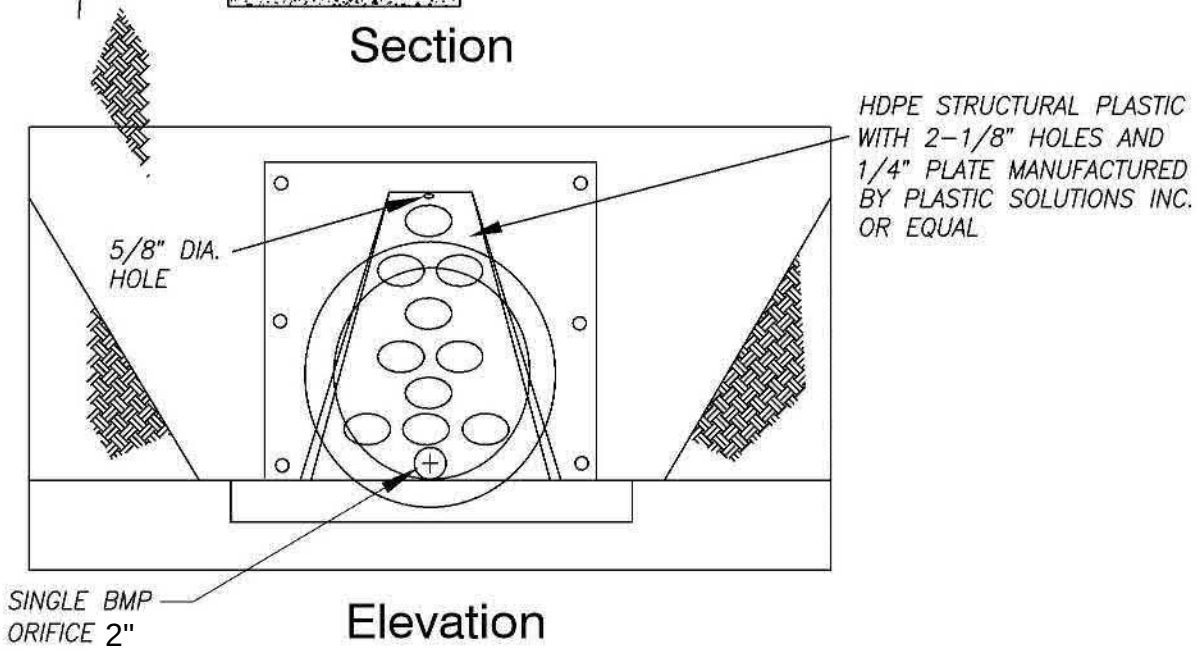




Isometric



Section



Elevation

DEBRIS CAGE FOR RISER

NO SCALE

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

- Climate File: Daily evaporation rates can be read from an external climate file, and monthly pan coefficients can be specified
- Monthly Averages: A set of monthly average values is input by the user
- Temperatures: Daily evaporation rates can be computed based on daily air temperature time series data using the Hargreaves method

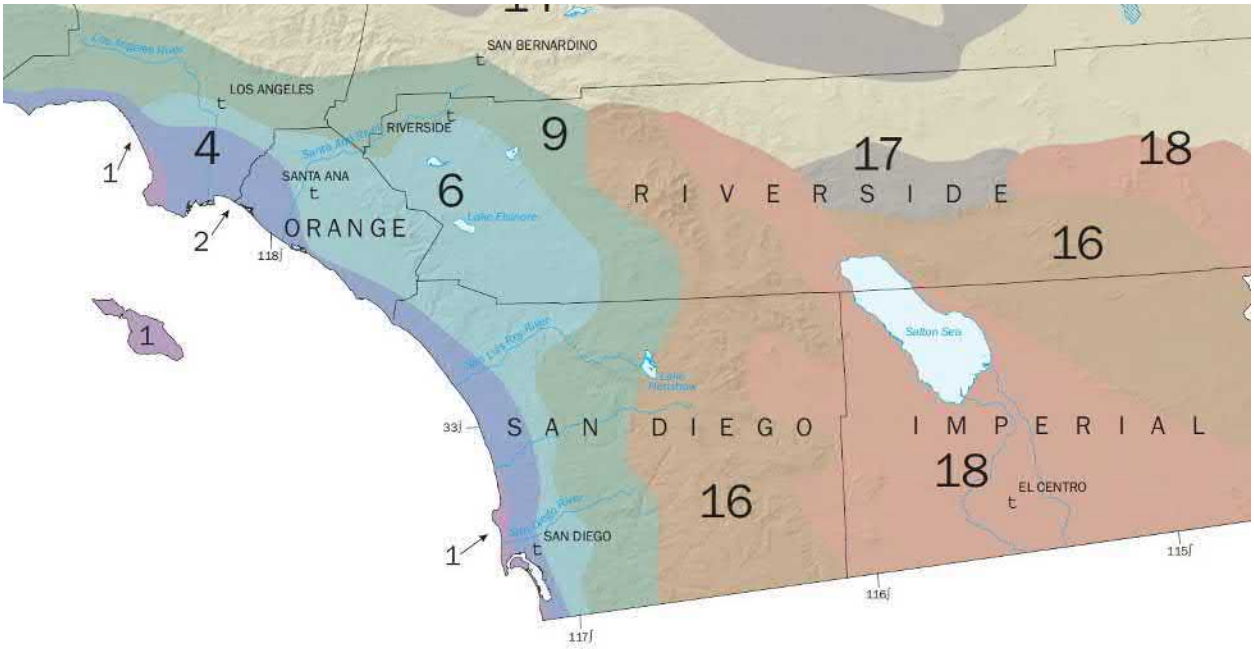


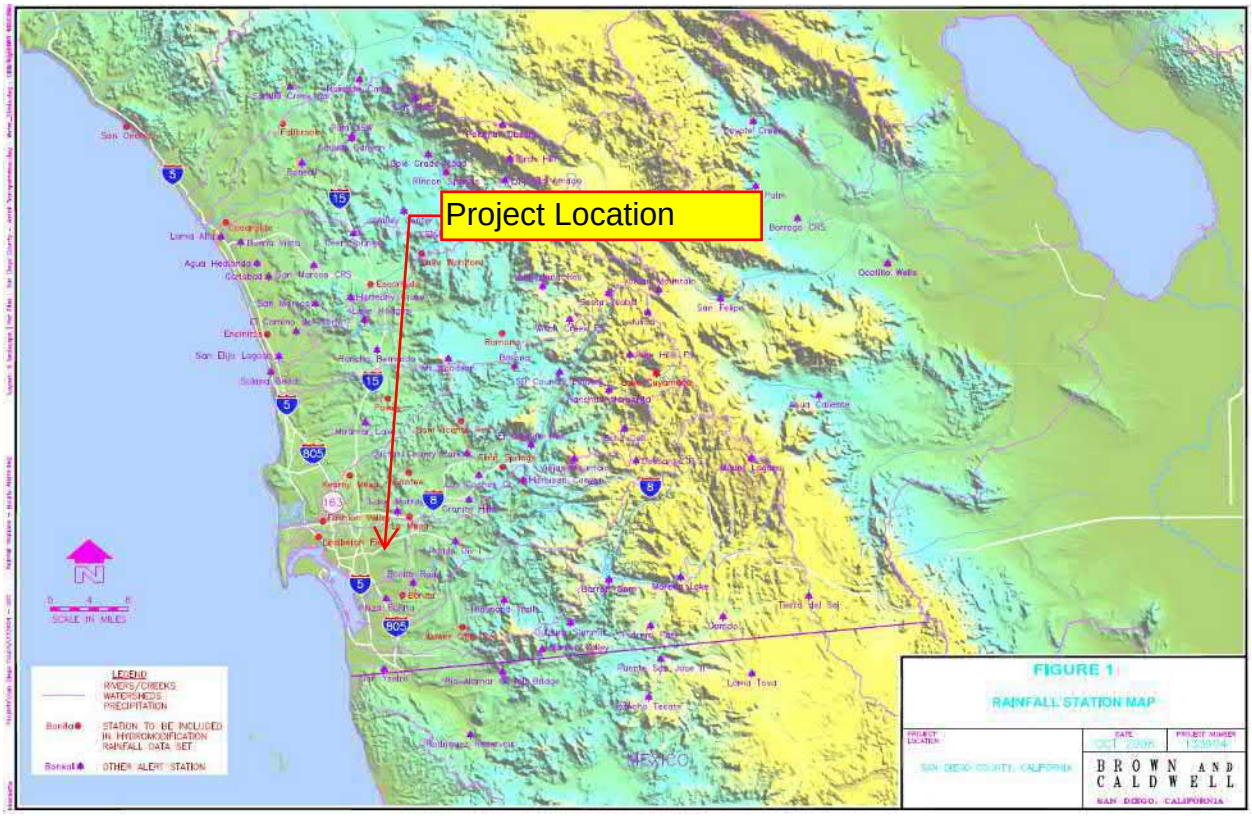
Figure G.1-2 : California Irrigation Management Information System "Reference Evapotranspiration Zones"

Table G.1-1: Monthly Average Reference Evapotranspiration by ETo Zone (inches/month and inches/day) for use in SWMM Models for Hydromodification Management Studies in San Diego County CIMIS Zones 1, 4, 6, 9, and 16 (See CIMIS ETo Zone Map)

	January	February	March	April	May	June	July	August	September	October	November	December
Zone	in/ month	in/ month	in/ month	in/ month	in/ month	in/ month	in/ month	in/ month	in/ month	in/ month	in/ month	in/ month
1	0.93	1.4	2.48	3.3	4.03	4.5	4.65	4.03	3.3	2.48	1.2	0.62
4	1.86	2.24	3.41	4.5	5.27	5.7	5.89	5.58	4.5	3.41	2.4	1.86
6	1.86	2.24	3.41	4.8	5.58	6.3	6.51	6.2	4.8	3.72	2.4	1.86
9	2.17	2.8	4.03	5.1	5.89	6.6	7.44	6.82	5.7	4.03	2.7	1.86
16	1.55	2.52	4.03	5.7	7.75	8.7	9.3	8.37	6.3	4.34	2.4	1.55

	January	February	March	April	May	June	July	August	September	October	November	December
Days	31	28	31	30	31	30	31	31	30	31	30	31
Zone	in/day	in/day	in/day	in/day	in/day	in/day	in/day	in/day	in/day	in/day	in/day	in/day
1	0.030	0.050	0.080	0.110	0.130	0.150	0.150	0.130	0.110	0.080	0.040	0.020
4	0.060	0.080	0.110	0.150	0.170	0.190	0.190	0.180	0.150	0.110	0.080	0.060
6	0.060	0.080	0.110	0.160	0.180	0.210	0.210	0.200	0.160	0.120	0.080	0.060
9	0.070	0.100	0.130	0.170	0.190	0.220	0.240	0.220	0.190	0.130	0.090	0.060
16	0.050	0.090	0.130	0.190	0.250	0.290	0.300	0.270	0.210	0.140	0.080	0.050

Appendix G: Guidance for Continuous Simulation and Hydromodification Management Sizing Factors



G.1.4.2 Rainfall Loss Parameters for SWMM

In SWMM, rainfall loss parameters (parameters that describe processes occurring when rainfall lands on pervious lands and impervious lands) are entered in the "subcatchment" module. In addition to specifying parameters, the SWMM user must also select an infiltration model and the LID manual where applicable. The latest version (SWMM 5.1.008, released April 2015) is available for download, along with detailed documentation and supporting information, at

http://www.epa.gov/nrmrl/wswrd/wq/models/swmm/

The SWMM Manual provides details regarding the hydrologic input parameters and summary tables of possible ranges of these parameters. For SWMM studies for hydromodification management in San Diego, hydrology parameters shall fall within the range provided in the SWMM Manual. The program help file is another source of information for typical values and additional guidance. Further, users should confirm that values are consistent within the acceptable range stated in the BMP Design Manual. Some of the parameters depend on the selection of the infiltration model. For consistency across the San Diego region, SWMM users shall use the Green-Ampt infiltration model for hydromodification management studies. Table G.1-4 presents SWMM subcatchment and infiltration parameters for use in hydromodification management studies in the San Diego region. The LID module requires an additional set of parameters and these are described below.

Table G.1-4: Subcatchment Parameters for SWMM Studies for Hydromodification Management in San Diego

SWMM Parameter Name	Unit	Range	Use in San Diego
Name X-Coordinate Y-Coordinate Description Tag Rain Gage Outlet	N/A	N/A – project-specific	Project-specific
Area	acres (ac)	Project-specific	Project-specific
Width	feet (ft)	Project-specific	Project-specific
% Slope	percent (%)	Project-specific	Project-specific
% Imperv	percent (%)	Project-specific	Project-specific
N-imperv	--	0.011 – 0.024 presented in Table A.6 of SWMM Manual	default use 0.012, otherwise provide documentation supporting other value used
N-Perv	--	0.05 – 0.80 presented in Table A.6 of SWMM Manual	default use 0.10, otherwise provide documentation supporting other value used
Dstore-Imperv	inches	0.05 – 0.10 inches presented in Table A.5 of SWMM Manual	0.05
Dstore-Perv	inches	0.10 – 0.30 inches presented in Table A.5 of SWMM Manual	0.10
%ZeroImperv	percent	0% – 100%	25%

SWMM Parameter Name	Unit	Range	Use in San Diego
	(%)		
Subarea routing	--	OUTLET IMPERVIOUS PERVIOUS	Project-specific, typically OUTLET
Percent Routed	%	0% – 100%	Project-specific, typically 100%
Infiltration	Method	HORTON GREEN_AMPT CURVE_NUMBER	GREEN_AMPT
Suction Head (Green-Ampt)	Inches	1.93 – 12.60 presented in Table A.2 of SWMM Manual	Hydrologic Soil Group A: 1.5 Hydrologic Soil Group B: 3.0 Hydrologic Soil Group C: 6.0 Hydrologic Soil Group D: 9.0
Conductivity (Green-Ampt)	Inches per hour	0.01 – 4.74 presented in Table A.2 of SWMM Manual by soil texture class 0.00 – ≥0.45 presented in Table A.3 of SWMM Manual by hydrologic soil group	Hydrologic Soil Group A: 0.3 Hydrologic Soil Group B: 0.2 Hydrologic Soil Group C: 0.1 Hydrologic Soil Group D: 0.025 Note: reduce conductivity by 25% in the post-project condition when native soils will be compacted. Conductivity may also be reduced by 25% in the pre-development condition model for redevelopment areas that are currently concrete or asphalt but must be modeled according to their underlying soil characteristics. For fill soils in post-project condition, see Section G.1.4.3.
Initial Deficit (Green-Ampt)		The difference between soil porosity and initial moisture content. Based on the values provided in Table A.2 of SWMM Manual, the range for completely dry soil would be 0.097 to 0.375	Hydrologic Soil Group A: 0.33 Hydrologic Soil Group B: 0.32 Hydrologic Soil Group C: 0.31 Hydrologic Soil Group D: 0.30 Note: in long-term continuous simulation, this value is not important as the soil will reach equilibrium after a few storm events regardless of the initial moisture content specified.
Groundwater	yes/no	yes/no	NO
LID Controls			Project Specific
Snow Pack Land Uses Initial Buildup Curb Length			Not applicable to hydromodification management studies

A schematic of the basic SWMM setup for hydromodification management studies is shown below, with the LID module is shown as a feature within the hydrology computational block. Surface water hydrology is distinguished from groundwater, however the groundwater module is not typically used in hydromodification management studies.

The rainfall and climatology input time series data are used to generate surface runoff which in turn is hydraulically routed through the collection system and storage/treatment facilities. The figure includes the following terms in the water balance equation:

– Pre-Developed Condition

```
[TITLE]
;;Project Title/Notes
Emerald Hills
HMP Modeling
Pre-development Condition

[OPTIONS]
;;Option             Value
FLOW_UNITS           CFS
INFILTRATION         GREEN_AMPT
FLOW_ROUTING         KINWAVE
LINK_OFFSETS         DEPTH
MIN_SLOPE            0
ALLOW_PONDING        NO
SKIP_STEADY_STATE    NO

START_DATE           10/17/1948
START_TIME           08:00:00
REPORT_START_DATE    10/17/1948
REPORT_START_TIME    08:00:00
END_DATE             12/31/2005
END_TIME             23:00:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          01:00:00
WET_STEP             00:15:00
DRY_STEP             04:00:00
ROUTING_STEP         0:01:00
RULE_STEP            00:00:00

INERTIAL_DAMPING     PARTIAL
NORMAL_FLOW_LIMITED  BOTH
FORCE_MAIN_EQUATION  H-W
VARIABLE_STEP        0.75
LENGTHENING_STEP     0
MIN_SURFAREA         12.557
MAX_TRIALS           8
HEAD_TOLERANCE       0.005
SYS_FLOW_TOL         5
LAT_FLOW_TOL         5
MINIMUM_STEP         0.5
THREADS              1

[EVAPORATION]
;;Data Source    Parameters
;;-------------- ----------------
MONTHLY          0.06   0.08   0.11   0.16   0.18   0.21   0.21   0.2    0.16   0.12   0.08   0.06
DRY_ONLY         NO

[RAINGAGES]
;;Name           Format    Interval SCF      Source
```

```
;;-------------- --------- ------ ------ ----------
Lindbergh        INTENSITY 1:00     1.0      TIMESERIES Lindbergh

[SUBCATCHMENTS]
;;Name           Rain Gage        Outlet           Area     %Imperv  Width    %Slope   CurbLen  SnowPack
;;-------------- ---------------- ---------------- -------- -------- -------- -------- -------- ----------------
DMA1-D           Lindbergh        POC1             7.564    0        860      12.1     0
DMA2-C           Lindbergh        POC2             2.139    0        185      10.02    0
DMA2-D           Lindbergh        POC2             10.663   0        1023     9.78     0
DMA3-D           Lindbergh        POC3             9.007    0        646      11.1     0

[SUBAREAS]
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo    PctRouted
;;-------------- ---------- ---------- ---------- ---------- ---------- ---------- ----------
DMA1-D           0.012      0.10       0.05       0.1        25         OUTLET
DMA2-C           0.012      0.10       0.05       0.1        25         OUTLET
DMA2-D           0.012      0.10       0.05       0.1        25         OUTLET
DMA3-D           0.012      0.10       0.05       0.1        25         OUTLET

[INFILTRATION]
;;Subcatchment   Suction    Ksat       IMD
;;-------------- ---------- ---------- ----------
DMA1-D           9          0.025      0.3
DMA2-C           6          0.1        0.31
DMA2-D           9          0.025      0.3
DMA3-D           9          0.025      0.3

[OUTFALLS]
;;Name           Elevation  Type       Stage Data       Gated    Route To
;;-------------- ---------- ---------- ---------------- -------- ----------------
POC1             0          FREE                        NO
POC2             0          FREE                        NO
POC3             0          FREE                        NO

[TIMESERIES]
;;Name           Date       Time       Value
;;-------------- ---------- ---------- ----------
TS-Poway         FILE "R:\1207\Hyd\SWMP\TM\ARCHIVE\CALCS\HMP\poway.dat"
;
Lindberg         FILE "R:\1671\Hyd\HMP\Calcs\Rainfall\LbergRain.txt"
;
Lindbergh        FILE "R:\1671\Hyd\HMP\Calcs\Rainfall\LbergRain.txt"

[REPORT]
;;Reporting Options
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]

[MAP]
```

```
DIMENSIONS 0.000 0.000 10000.000 10000.000
Units      None

[COORDINATES]
;;Node           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
POC1             500.527            4004.215
POC2             4747.102           4151.739
POC3             8102.041           4102.041

[VERTICES]
;;Link           X-Coord            Y-Coord
;;-------------- ------------------ ------------------

[Polygons]
;;Subcatchment   X-Coord            Y-Coord
;;-------------- ------------------ ------------------
DMA1-D           515.371            5985.533
DMA2-C           4276.673           5768.535
DMA2-D           5597.549           5709.908
DMA3-D           8244.898           5959.184

[SYMBOLS]
;;Gage           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
Lindbergh        3419.389           7249.737
```

– POST-Developed Condition

```
[TITLE]
;;Project Title/Notes
Emerald Hills
HMP Modeling
Post-development Condition

[OPTIONS]
;;Option             Value
FLOW_UNITS           CFS
INFILTRATION         GREEN_AMPT
FLOW_ROUTING         KINWAVE
LINK_OFFSETS         DEPTH
MIN_SLOPE            0
ALLOW_PONDING        NO
SKIP_STEADY_STATE    NO

START_DATE           10/17/1948
START_TIME           08:00:00
REPORT_START_DATE    10/17/1948
REPORT_START_TIME    08:00:00
END_DATE             12/31/2005
END_TIME             23:00:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          01:00:00
WET_STEP             00:15:00
DRY_STEP             04:00:00
ROUTING_STEP         0:01:00
RULE_STEP            00:00:00

INERTIAL_DAMPING     PARTIAL
NORMAL_FLOW_LIMITED  BOTH
FORCE_MAIN_EQUATION  H-W
VARIABLE_STEP        0.75
LENGTHENING_STEP     0
MIN_SURFAREA         12.557
MAX_TRIALS           8
HEAD_TOLERANCE       0.005
SYS_FLOW_TOL         5
LAT_FLOW_TOL         5
MINIMUM_STEP         0.5
THREADS              1

[EVAPORATION]
;;Data Source    Parameters
;;-------------- ----------------
MONTHLY          0.05   0.09   0.13   0.19   0.25   0.29   0.3    0.27   0.21   0.14   0.08   0.05
DRY_ONLY         NO

[RAINGAGES]
;;Name           Format    Interval SCF      Source
```

```
;;-------------- --------- ------ ------ ----------
;Renzulli Estates
Lindbergh        INTENSITY 1:00     1.0      TIMESERIES Lindbergh

[SUBCATCHMENTS]
;;Name           Rain Gage        Outlet           Area     %Imperv  Width    %Slope   CurbLen  SnowPack
;;-------------- ---------------- ---------------- -------- -------- -------- -------- -------- ----------------
DMA1-D           Lindbergh        BF-2-1           3.625    56.3     218      2        0
DMA3-D           Lindbergh        BF-2-3           9.373    57.1     135      2.5      0
DMA2-D           Lindbergh        BF-2-2           9.472    55.5     127      3.5      0
BF-2-1           Lindbergh        DIV1             0.069    0        54       0.1      0
BF-2-2           Lindbergh        DIV2             0.1951   0        39       0.1      0
BF-2-3           Lindbergh        DIV3             0.161    0        60       0.1      0
;Proposed Self Mitigating Slopes to POC-1
SM-1             Lindbergh        POC1             1.002    0        1149     50       0
SM-2-D           Lindbergh        POC2             0.723    0        350      50       0
SM-3             Lindbergh        POC2             1.268    0        177      50       0
DMA2-C           Lindbergh        BF-2-2           1.651    55.5     127      3.5      0
SM-2-C           Lindbergh        POC2             0.506    0        275      42.5     0
DMA6             Lindbergh        poc3             0.204    40.2     60       13.61    0
SM-4             Lindbergh        poc3             1.124    0        393      50       0

[SUBAREAS]
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo    PctRouted
;;-------------- ---------- ---------- ---------- ---------- ---------- ---------- ----------
DMA1-D           0.012      0.10       0.05       0.1        25         OUTLET
DMA3-D           0.012      0.10       0.05       0.1        25         OUTLET
DMA2-D           0.012      0.10       0.05       0.1        25         OUTLET
BF-2-1           0.012      0.10       0.05       0.1        25         OUTLET
BF-2-2           0.012      0.10       0.05       0.1        25         OUTLET
BF-2-3           0.012      0.10       0.05       0.1        25         OUTLET
SM-1             0.012      0.10       0.05       0.1        25         OUTLET
SM-2-D           0.012      0.10       0.05       0.1        25         OUTLET
SM-3             0.012      0.10       0.05       0.1        25         OUTLET
DMA2-C           0.012      0.10       0.05       0.1        25         OUTLET
SM-2-C           0.012      0.10       0.05       0.1        25         OUTLET
DMA6             0.012      0.10       0.05       0.1        25         OUTLET
SM-4             0.012      0.10       0.05       0.1        25         OUTLET

[INFILTRATION]
;;Subcatchment   Suction    Ksat       IMD
;;-------------- ---------- ---------- ----------
DMA1-D           9          0.01875    0.3
DMA3-D           9          0.01875    0.3
DMA2-D           9          0.01875    0.3
BF-2-1           1.5        0.3        0.33
BF-2-2           1.5        0.3        0.33
BF-2-3           1.5        0.3        0.33
SM-1             9          0.01875    0.3
SM-2-D           9          .01875     0.3
SM-3             9          0.01875    0.3
DMA2-C           6          0.075      0.31
```

```
SM-2-C           6          0.075      0.31
DMA6             9          0.01875    0.3
SM-4             9          0.01875    0.3

[LID_CONTROLS]
;;Name           Type/Layer Parameters
;;-------------- ---------- ----------
BF-2-1           BC
BF-2-1           SURFACE    6.35       0.0        0.0        0          5
BF-2-1           SOIL       24         0.4        0.2        0.1        5          5          1.5
BF-2-1           STORAGE    15         0.67       0          0
BF-2-1           DRAIN      0.4367     0.5        3          6          0          0

BF-2-2           BC
BF-2-2           SURFACE    6.25       0.0        0          1.0        5
BF-2-2           SOIL       24         0.4        0.2        0.1        5          5          1.5
BF-2-2           STORAGE    15         0.67       0.05       0
BF-2-2           DRAIN      0.0867     0.5        3          6          0          0

BF-2-3           BC
BF-2-3           SURFACE    6.27       0.0        0          1.0        5
BF-2-3           SOIL       24         0.4        0.2        0.1        5          5          1.5
BF-2-3           STORAGE    15         0.67       0.05       0
BF-2-3           DRAIN      0.1871     0.5        3          6          0          0

[LID_USAGE]
;;Subcatchment   LID Process      Number  Area       Width      InitSat    FromImp    ToPerv     RptFile                  DrainTo          FromPerv
;;-------------- ---------------- ------- ---------- ---------- ---------- ---------- ---------- ------------------------ ---------------- ----------
BF-2-1           BF-2-1           1       3000       0          0          100        0          *                        *                100

BF-2-2           BF-2-2           1       8500       0          0          100        0          *                        *                100

BF-2-3           BF-2-3           1       7000       0          0          100        0          *                        *                100


[OUTFALLS]
;;Name           Elevation  Type       Stage Data       Gated    Route To
;;-------------- ---------- ---------- ---------------- -------- ----------------
POC1             0          FREE                        NO
POC2             0          FREE                        NO
POC3             0          FREE                        NO

[DIVIDERS]
;;Name           Elevation  Diverted Link    Type       Parameters
;;-------------- ---------- ---------------- ---------- ----------
DIV1             0          ByPASS1          CUTOFF     0.1942     0          0          0          0
DIV2             0          Bypass2          CUTOFF     0.1942     0          0          0          0
DIV3             0          Bypass3          CUTOFF     0.1942     0          0          0          0

[STORAGE]
;;Name           Elev.    MaxDepth   InitDepth  Shape      Curve Name/Params            N/A      Fevap    Psi      Ksat     IMD
;;-------------- -------- ---------- ---------- ---------- ---------------------------- -------- --------          -------- --------
```

```
STOR1           0       5.5       0         TABULAR    HMP-1                     0       0
STOR2           0       5         0         TABULAR    HMP-2                     0       0
STOR3           0       5         0         TABULAR    HMP-3                     0       0

[CONDUITS]
;;Name           From Node        To Node          Length     Roughness  InOffset   OutOffset  InitFlow   MaxFlow
;;-------------- ---------------- ---------------- ---------- ---------- ---------- ---------- ---------- ----------
Bypass1         DIV1             STOR1            400        0.01       0          0          0          0
Lowflow1        DIV1             POC1             100        0.013      0          0          0          0
Bypass2         DIV2             STOR2            400        0.01       0          0          0          0
Lowflow2        DIV2             POC2             100        0.013      0          0          0          0
Bypass3         DIV3             STOR3            400        0.01       0          0          0          0
Lowflow3        DIV3             POC3             100        0.013      0          0          0          0

[OUTLETS]
;;Name           From Node        To Node          Offset     Type            QTable/Qcoeff    Qexpon     Gated
;;-------------- ---------------- ---------------- ---------- --------------- ---------------- ---------- --------
Midflow1        STOR1            POC1             0          TABULAR/DEPTH   BF-2-1-Riser                NO
Midflow2        STOR2            POC2             0          TABULAR/DEPTH   BF-2-2                      NO
Midflow3        STOR3            POC3             0          TABULAR/DEPTH   BF-2-3                      NO

[XSECTIONS]
;;Link           Shape        Geom1            Geom2      Geom3      Geom4      Barrels    Culvert
;;-------------- ------------ ---------------- ---------- ---------- ---------- ---------- ----------
Bypass1         DUMMY        0                0          0          0          1
Lowflow1        DUMMY        0                0          0          0          1
Bypass2         DUMMY        0                0          0          0          1
Lowflow2        DUMMY        0                0          0          0          1
Bypass3         DUMMY        0                0          0          0          1
Lowflow3        DUMMY        0                0          0          0          1

[CURVES]
;;Name           Type       X-Value    Y-Value
;;-------------- ---------- ---------- ----------
BF-2-1-Riser    Rating     0.00       0.000
BF-2-1-Riser               0.05       0.003
BF-2-1-Riser               0.10       0.010
BF-2-1-Riser               0.15       0.018
BF-2-1-Riser               0.20       0.022
BF-2-1-Riser               0.25       0.026
BF-2-1-Riser               0.30       0.029
BF-2-1-Riser               0.35       0.032
BF-2-1-Riser               0.40       0.035
BF-2-1-Riser               0.45       0.037
BF-2-1-Riser               0.50       0.040
BF-2-1-Riser               0.55       0.042
BF-2-1-Riser               0.60       0.044
BF-2-1-Riser               0.65       0.046
BF-2-1-Riser               0.70       0.048
BF-2-1-Riser               0.75       0.050
BF-2-1-Riser               0.80       0.052
BF-2-1-Riser               0.85       0.053
```

BF-2-1-Riser	0.90	0.055
BF-2-1-Riser	0.95	0.057
BF-2-1-Riser	1.00	0.058
BF-2-1-Riser	1.05	0.060
BF-2-1-Riser	1.10	0.061
BF-2-1-Riser	1.15	0.063
BF-2-1-Riser	1.20	0.064
BF-2-1-Riser	1.25	0.065
BF-2-1-Riser	1.30	0.067
BF-2-1-Riser	1.35	0.068
BF-2-1-Riser	1.40	0.069
BF-2-1-Riser	1.45	0.071
BF-2-1-Riser	1.50	0.072
BF-2-1-Riser	1.55	0.082
BF-2-1-Riser	1.60	0.104
BF-2-1-Riser	1.65	0.129
BF-2-1-Riser	1.70	0.144
BF-2-1-Riser	1.75	0.156
BF-2-1-Riser	1.80	0.167
BF-2-1-Riser	1.85	0.177
BF-2-1-Riser	1.90	0.186
BF-2-1-Riser	1.95	0.208
BF-2-1-Riser	2.00	0.251
BF-2-1-Riser	2.05	0.310
BF-2-1-Riser	2.10	0.364
BF-2-1-Riser	2.15	0.399
BF-2-1-Riser	2.20	0.431
BF-2-1-Riser	2.25	0.459
BF-2-1-Riser	2.30	0.485
BF-2-1-Riser	2.35	0.509
BF-2-1-Riser	2.40	0.533
BF-2-1-Riser	2.45	0.554
BF-2-1-Riser	2.50	0.575
BF-2-1-Riser	2.55	0.595
BF-2-1-Riser	2.60	0.615
BF-2-1-Riser	2.65	0.633
BF-2-1-Riser	2.70	0.651
BF-2-1-Riser	2.75	0.669
BF-2-1-Riser	2.80	0.686
BF-2-1-Riser	2.85	0.702
BF-2-1-Riser	2.90	0.719
BF-2-1-Riser	2.95	0.734
BF-2-1-Riser	3.00	0.750
BF-2-1-Riser	3.05	0.765
BF-2-1-Riser	3.10	0.780
BF-2-1-Riser	3.15	0.794
BF-2-1-Riser	3.20	0.808
BF-2-1-Riser	3.25	1.194
BF-2-1-Riser	3.30	1.889
BF-2-1-Riser	3.35	2.784
BF-2-1-Riser	3.40	3.841
BF-2-1-Riser	3.45	5.038

```
BF-2-1-Riser                3.50       6.360
BF-2-1-Riser                3.55       7.796
BF-2-1-Riser                3.60       9.338
BF-2-1-Riser                3.65       10.978
BF-2-1-Riser                3.70       12.711
BF-2-1-Riser                3.75       14.532
BF-2-1-Riser                3.80       16.438
BF-2-1-Riser                3.85       18.424
BF-2-1-Riser                3.90       20.487
BF-2-1-Riser                3.95       22.625
BF-2-1-Riser                4.00       24.835
BF-2-1-Riser                4.05       27.114
BF-2-1-Riser                4.10       29.461
BF-2-1-Riser                4.15       31.874
BF-2-1-Riser                4.20       34.351
BF-2-1-Riser                4.25       36.890
BF-2-1-Riser                4.30       39.490
BF-2-1-Riser                4.35       42.149
BF-2-1-Riser                4.40       44.867
BF-2-1-Riser                4.45       47.641
BF-2-1-Riser                4.50       50.471
BF-2-1-Riser                4.55       53.356
BF-2-1-Riser                4.60       56.295
BF-2-1-Riser                4.65       59.286
BF-2-1-Riser                4.70       62.329
BF-2-1-Riser                4.75       65.423
BF-2-1-Riser                4.80       68.566
BF-2-1-Riser                4.85       71.760
BF-2-1-Riser                4.90       75.001
BF-2-1-Riser                4.95       78.291
BF-2-1-Riser                5.00       81.628
BF-2-1-Riser                5.05       85.011
BF-2-1-Riser                5.10       88.440
BF-2-1-Riser                5.15       91.914
BF-2-1-Riser                5.20       95.433
BF-2-1-Riser                5.25       98.996
BF-2-1-Riser                5.30       102.602
BF-2-1-Riser                5.35       106.252
BF-2-1-Riser                5.40       109.944
BF-2-1-Riser                5.45       113.678
BF-2-1-Riser                5.50       117.453
;
BF-2-2           Rating     0.00       0.000
BF-2-2                      0.05       0.007
BF-2-2                      0.10       0.024
BF-2-2                      0.15       0.050
BF-2-2                      0.20       0.073
BF-2-2                      0.25       0.087
BF-2-2                      0.30       0.099
BF-2-2                      0.35       0.110
BF-2-2                      0.40       0.120
BF-2-2                      0.45       0.129
```

BF-2-2	0.50	0.138
BF-2-2	0.55	0.146
BF-2-2	0.60	0.154
BF-2-2	0.65	0.161
BF-2-2	0.70	0.168
BF-2-2	0.75	0.174
BF-2-2	0.80	0.181
BF-2-2	0.85	0.187
BF-2-2	0.90	0.193
BF-2-2	0.95	0.199
BF-2-2	1.00	0.205
BF-2-2	1.05	0.210
BF-2-2	1.10	0.215
BF-2-2	1.15	0.221
BF-2-2	1.20	0.226
BF-2-2	1.25	0.231
BF-2-2	1.30	0.236
BF-2-2	1.35	0.240
BF-2-2	1.40	0.245
BF-2-2	1.45	0.250
BF-2-2	1.50	0.254
BF-2-2	1.55	0.275
BF-2-2	1.60	0.326
BF-2-2	1.65	0.401
BF-2-2	1.70	0.495
BF-2-2	1.75	0.600
BF-2-2	1.80	0.682
BF-2-2	1.85	0.740
BF-2-2	1.90	0.792
BF-2-2	1.95	0.856
BF-2-2	2.00	0.947
BF-2-2	2.05	1.060
BF-2-2	2.10	1.189
BF-2-2	2.15	1.328
BF-2-2	2.20	1.442
BF-2-2	2.25	1.530
BF-2-2	2.30	1.612
BF-2-2	2.35	1.688
BF-2-2	2.40	1.760
BF-2-2	2.45	1.828
BF-2-2	2.50	1.894
BF-2-2	2.55	1.956
BF-2-2	2.60	2.017
BF-2-2	2.65	2.075
BF-2-2	2.70	2.132
BF-2-2	2.75	2.187
BF-2-2	2.80	2.240
BF-2-2	2.85	2.292
BF-2-2	2.90	2.343
BF-2-2	2.95	2.392
BF-2-2	3.00	2.441
BF-2-2	3.05	2.488

```
BF-2-2                    3.10       2.535
BF-2-2                    3.15       2.580
BF-2-2                    3.20       2.625
BF-2-2                    3.25       2.669
BF-2-2                    3.30       2.712
BF-2-2                    3.35       2.755
BF-2-2                    3.40       2.797
BF-2-2                    3.45       2.838
BF-2-2                    3.50       2.878
BF-2-2                    3.55       3.291
BF-2-2                    3.60       4.011
BF-2-2                    3.65       4.931
BF-2-2                    3.70       6.013
BF-2-2                    3.75       7.235
BF-2-2                    3.80       8.582
BF-2-2                    3.85       10.042
BF-2-2                    3.90       11.607
BF-2-2                    3.95       13.271
BF-2-2                    4.00       15.028
BF-2-2                    4.05       16.873
BF-2-2                    4.10       18.801
BF-2-2                    4.15       20.810
BF-2-2                    4.20       22.896
BF-2-2                    4.25       25.056
BF-2-2                    4.30       27.288
BF-2-2                    4.35       29.589
BF-2-2                    4.40       31.958
BF-2-2                    4.45       34.393
BF-2-2                    4.50       36.891
BF-2-2                    4.55       39.451
BF-2-2                    4.60       42.072
BF-2-2                    4.65       44.752
BF-2-2                    4.70       47.490
BF-2-2                    4.75       50.285
BF-2-2                    4.80       53.136
BF-2-2                    4.85       56.041
BF-2-2                    4.90       58.999
BF-2-2                    4.95       62.011
BF-2-2                    5.00       65.073
BF-2-2                    5.05       68.187
BF-2-2                    5.10       71.350
BF-2-2                    5.15       74.563
BF-2-2                    5.20       77.824
BF-2-2                    5.25       81.132
BF-2-2                    5.30       84.488
BF-2-2                    5.35       87.890
BF-2-2                    5.40       91.337
BF-2-2                    5.45       94.830
BF-2-2                    5.50       98.368
;
BF-2-3          Rating    0.00       0.000
BF-2-3                    0.05       0.003
```

BF-2-3	0.10	0.012
BF-2-3	0.15	0.025
BF-2-3	0.20	0.036
BF-2-3	0.25	0.044
BF-2-3	0.30	0.050
BF-2-3	0.35	0.055
BF-2-3	0.40	0.060
BF-2-3	0.45	0.065
BF-2-3	0.50	0.069
BF-2-3	0.55	0.073
BF-2-3	0.60	0.077
BF-2-3	0.65	0.080
BF-2-3	0.70	0.084
BF-2-3	0.75	0.087
BF-2-3	0.80	0.090
BF-2-3	0.85	0.094
BF-2-3	0.90	0.097
BF-2-3	0.95	0.099
BF-2-3	1.00	0.102
BF-2-3	1.05	0.105
BF-2-3	1.10	0.108
BF-2-3	1.15	0.110
BF-2-3	1.20	0.113
BF-2-3	1.25	0.115
BF-2-3	1.30	0.118
BF-2-3	1.35	0.120
BF-2-3	1.40	0.123
BF-2-3	1.45	0.125
BF-2-3	1.50	0.127
BF-2-3	1.55	0.146
BF-2-3	1.60	0.195
BF-2-3	1.65	0.268
BF-2-3	1.70	0.359
BF-2-3	1.75	0.463
BF-2-3	1.80	0.542
BF-2-3	1.85	0.598
BF-2-3	1.90	0.648
BF-2-3	1.95	0.713
BF-2-3	2.00	0.811
BF-2-3	2.05	0.938
BF-2-3	2.10	1.089
BF-2-3	2.15	1.260
BF-2-3	2.20	1.445
BF-2-3	2.25	1.638
BF-2-3	2.30	1.774
BF-2-3	2.35	1.889
BF-2-3	2.40	1.995
BF-2-3	2.45	2.095
BF-2-3	2.50	2.190
BF-2-3	2.55	2.280
BF-2-3	2.60	2.366
BF-2-3	2.65	2.449

BF-2-3	2.70	2.529
BF-2-3	2.75	2.606
BF-2-3	2.80	2.681
BF-2-3	2.85	2.754
BF-2-3	2.90	2.824
BF-2-3	2.95	2.893
BF-2-3	3.00	2.960
BF-2-3	3.05	3.026
BF-2-3	3.10	3.090
BF-2-3	3.15	3.153
BF-2-3	3.20	3.214
BF-2-3	3.25	3.274
BF-2-3	3.30	3.333
BF-2-3	3.35	3.391
BF-2-3	3.40	3.448
BF-2-3	3.45	3.504
BF-2-3	3.50	3.559
BF-2-3	3.55	3.614
BF-2-3	3.60	3.667
BF-2-3	3.65	4.092
BF-2-3	3.70	4.825
BF-2-3	3.75	5.757
BF-2-3	3.80	6.852
BF-2-3	3.85	8.085
BF-2-3	3.90	9.444
BF-2-3	3.95	10.916
BF-2-3	4.00	12.493
BF-2-3	4.05	14.168
BF-2-3	4.10	15.936
BF-2-3	4.15	17.792
BF-2-3	4.20	19.731
BF-2-3	4.25	21.751
BF-2-3	4.30	23.848
BF-2-3	4.35	26.018
BF-2-3	4.40	28.261
BF-2-3	4.45	30.573
BF-2-3	4.50	32.952
BF-2-3	4.55	35.396
BF-2-3	4.60	37.905
BF-2-3	4.65	40.475
BF-2-3	4.70	43.106
BF-2-3	4.75	45.796
BF-2-3	4.80	48.544
BF-2-3	4.85	51.348
BF-2-3	4.90	54.208
BF-2-3	4.95	57.123
BF-2-3	5.00	60.091
BF-2-3	5.05	63.111
BF-2-3	5.10	66.183
BF-2-3	5.15	69.306
BF-2-3	5.20	72.478
BF-2-3	5.25	75.700

```
BF-2-3                     5.30       78.970
BF-2-3                     5.35       82.287
BF-2-3                     5.40       85.651
BF-2-3                     5.45       89.062
BF-2-3                     5.50       92.519
;
;BF-1-1 Storage Curve
HMP-1            Storage   0.00       3345
HMP-1                      0.05       3380
HMP-1                      0.10       3414
HMP-1                      0.15       3449
HMP-1                      0.20       3483
HMP-1                      0.25       3518
HMP-1                      0.30       3552
HMP-1                      0.35       3587
HMP-1                      0.40       3621
HMP-1                      0.45       3656
HMP-1                      0.50       3690
HMP-1                      0.55       3727
HMP-1                      0.60       3765
HMP-1                      0.65       3802
HMP-1                      0.70       3839
HMP-1                      0.75       3877
HMP-1                      0.80       3914
HMP-1                      0.85       3951
HMP-1                      0.90       3989
HMP-1                      0.95       4026
HMP-1                      1.00       4064
HMP-1                      1.05       4101
HMP-1                      1.10       4138
HMP-1                      1.15       4176
HMP-1                      1.20       4213
HMP-1                      1.25       4250
HMP-1                      1.30       4288
HMP-1                      1.35       4325
HMP-1                      1.40       4362
HMP-1                      1.45       4400
HMP-1                      1.50       4437
HMP-1                      1.55       4477
HMP-1                      1.60       4517
HMP-1                      1.65       4558
HMP-1                      1.70       4598
HMP-1                      1.75       4638
HMP-1                      1.80       4678
HMP-1                      1.85       4718
HMP-1                      1.90       4759
HMP-1                      1.95       4799
HMP-1                      2.00       4839
HMP-1                      2.05       4879
HMP-1                      2.10       4919
HMP-1                      2.15       4960
HMP-1                      2.20       5000
```

HMP-1	2.25	5040
HMP-1	2.30	5080
HMP-1	2.35	5120
HMP-1	2.40	5161
HMP-1	2.45	5201
HMP-1	2.50	5241
HMP-1	2.55	5284
HMP-1	2.60	5327
HMP-1	2.65	5370
HMP-1	2.70	5413
HMP-1	2.75	5456
HMP-1	2.80	5499
HMP-1	2.85	5542
HMP-1	2.90	5585
HMP-1	2.95	5628
HMP-1	3.00	5671
HMP-1	3.05	5714
HMP-1	3.10	5757
HMP-1	3.15	5800
HMP-1	3.20	5843
HMP-1	3.25	5886
HMP-1	3.30	5929
HMP-1	3.35	5972
HMP-1	3.40	6015
HMP-1	3.45	6058
HMP-1	3.50	6101
HMP-1	3.55	6147
HMP-1	3.60	6193
HMP-1	3.65	6238
HMP-1	3.70	6284
HMP-1	3.75	6330
HMP-1	3.80	6376
HMP-1	3.85	6422
HMP-1	3.90	6467
HMP-1	3.95	6513
HMP-1	4.00	6559
HMP-1	4.05	6605
HMP-1	4.10	6651
HMP-1	4.15	6696
HMP-1	4.20	6742
HMP-1	4.25	6788
HMP-1	4.30	6834
HMP-1	4.35	6880
HMP-1	4.40	6925
HMP-1	4.45	6971
HMP-1	4.50	7017
HMP-1	4.55	7066
HMP-1	4.60	7114
HMP-1	4.65	7163
HMP-1	4.70	7212
HMP-1	4.75	7260
HMP-1	4.80	7309

```
HMP-1                       4.85        7358
HMP-1                       4.90        7407
HMP-1                       4.95        7455
HMP-1                       5.00        7504
HMP-1                       5.05        7553
HMP-1                       5.10        7601
HMP-1                       5.15        7650
HMP-1                       5.20        7699
HMP-1                       5.25        7747
HMP-1                       5.30        7796
HMP-1                       5.35        7845
HMP-1                       5.40        7894
HMP-1                       5.45        7942
HMP-1                       5.50        7991
;
;BF-1-2 Storage Curve
HMP-2             Storage   0.00        9197
HMP-2                       0.05        9267
HMP-2                       0.10        9336
HMP-2                       0.15        9406
HMP-2                       0.20        9476
HMP-2                       0.25        9546
HMP-2                       0.30        9615
HMP-2                       0.35        9685
HMP-2                       0.40        9755
HMP-2                       0.45        9824
HMP-2                       0.50        9894
HMP-2                       0.55        9967
HMP-2                       0.60        10039
HMP-2                       0.65        10112
HMP-2                       0.70        10184
HMP-2                       0.75        10257
HMP-2                       0.80        10329
HMP-2                       0.85        10402
HMP-2                       0.90        10474
HMP-2                       0.95        10547
HMP-2                       1.00        10620
HMP-2                       1.05        10692
HMP-2                       1.10        10765
HMP-2                       1.15        10837
HMP-2                       1.20        10910
HMP-2                       1.25        10982
HMP-2                       1.30        11055
HMP-2                       1.35        11127
HMP-2                       1.40        11200
HMP-2                       1.45        11272
HMP-2                       1.50        11345
HMP-2                       1.55        11420
HMP-2                       1.60        11496
HMP-2                       1.65        11571
HMP-2                       1.70        11646
HMP-2                       1.75        11722
```

HMP-2	1.80	11797
HMP-2	1.85	11872
HMP-2	1.90	11948
HMP-2	1.95	12023
HMP-2	2.00	12099
HMP-2	2.05	12174
HMP-2	2.10	12249
HMP-2	2.15	12325
HMP-2	2.20	12400
HMP-2	2.25	12475
HMP-2	2.30	12551
HMP-2	2.35	12626
HMP-2	2.40	12701
HMP-2	2.45	12777
HMP-2	2.50	12852
HMP-2	2.55	12930
HMP-2	2.60	13008
HMP-2	2.65	13087
HMP-2	2.70	13165
HMP-2	2.75	13243
HMP-2	2.80	13321
HMP-2	2.85	13399
HMP-2	2.90	13478
HMP-2	2.95	13556
HMP-2	3.00	13634
HMP-2	3.05	13712
HMP-2	3.10	13790
HMP-2	3.15	13869
HMP-2	3.20	13947
HMP-2	3.25	14025
HMP-2	3.30	14103
HMP-2	3.35	14181
HMP-2	3.40	14260
HMP-2	3.45	14338
HMP-2	3.50	14416
HMP-2	3.55	14497
HMP-2	3.60	14578
HMP-2	3.65	14659
HMP-2	3.70	14740
HMP-2	3.75	14821
HMP-2	3.80	14902
HMP-2	3.85	14983
HMP-2	3.90	15064
HMP-2	3.95	15145
HMP-2	4.00	15226
HMP-2	4.05	15307
HMP-2	4.10	15388
HMP-2	4.15	15469
HMP-2	4.20	15550
HMP-2	4.25	15631
HMP-2	4.30	15712
HMP-2	4.35	15793

```
HMP-2                       4.40       15874
HMP-2                       4.45       15955
HMP-2                       4.50       16036
HMP-2                       4.55       16120
HMP-2                       4.60       16204
HMP-2                       4.65       16288
HMP-2                       4.70       16371
HMP-2                       4.75       16455
HMP-2                       4.80       16539
HMP-2                       4.85       16623
HMP-2                       4.90       16707
HMP-2                       4.95       16791
HMP-2                       5.00       16874
HMP-2                       5.05       16958
HMP-2                       5.10       17042
HMP-2                       5.15       17126
HMP-2                       5.20       17210
HMP-2                       5.25       17294
HMP-2                       5.30       17378
HMP-2                       5.35       17461
HMP-2                       5.40       17545
HMP-2                       5.45       17629
HMP-2                       5.50       17713
;
HMP-3             Storage   0.00       7621
HMP-3                       0.05       7683
HMP-3                       0.10       7745
HMP-3                       0.15       7807
HMP-3                       0.20       7869
HMP-3                       0.25       7932
HMP-3                       0.30       7994
HMP-3                       0.35       8056
HMP-3                       0.40       8118
HMP-3                       0.45       8180
HMP-3                       0.50       8242
HMP-3                       0.55       8302
HMP-3                       0.60       8363
HMP-3                       0.65       8423
HMP-3                       0.70       8484
HMP-3                       0.75       8544
HMP-3                       0.80       8605
HMP-3                       0.85       8665
HMP-3                       0.90       8726
HMP-3                       0.95       8786
HMP-3                       1.00       8847
HMP-3                       1.05       8907
HMP-3                       1.10       8967
HMP-3                       1.15       9028
HMP-3                       1.20       9088
HMP-3                       1.25       9149
HMP-3                       1.30       9209
HMP-3                       1.35       9270
```

HMP-3	1.40	9330
HMP-3	1.45	9391
HMP-3	1.50	9451
HMP-3	1.55	9453
HMP-3	1.60	9456
HMP-3	1.65	9458
HMP-3	1.70	9461
HMP-3	1.75	9463
HMP-3	1.80	9466
HMP-3	1.85	9468
HMP-3	1.90	9471
HMP-3	1.95	9473
HMP-3	2.00	9476
HMP-3	2.05	9478
HMP-3	2.10	9480
HMP-3	2.15	9483
HMP-3	2.20	9485
HMP-3	2.25	9488
HMP-3	2.30	9490
HMP-3	2.35	9493
HMP-3	2.40	9495
HMP-3	2.45	9498
HMP-3	2.50	9500
HMP-3	2.55	9540
HMP-3	2.60	9580
HMP-3	2.65	9620
HMP-3	2.70	9660
HMP-3	2.75	9700
HMP-3	2.80	9740
HMP-3	2.85	9780
HMP-3	2.90	9820
HMP-3	2.95	9860
HMP-3	3.00	9900
HMP-3	3.05	9940
HMP-3	3.10	9980
HMP-3	3.15	10020
HMP-3	3.20	10060
HMP-3	3.25	10100
HMP-3	3.30	10140
HMP-3	3.35	10180
HMP-3	3.40	10220
HMP-3	3.45	10260
HMP-3	3.50	10300
HMP-3	3.55	10361
HMP-3	3.60	10422
HMP-3	3.65	10483
HMP-3	3.70	10544
HMP-3	3.75	10605
HMP-3	3.80	10666
HMP-3	3.85	10727
HMP-3	3.90	10788
HMP-3	3.95	10849

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HMP-3                       4.00       10910
HMP-3                       4.05       10971
HMP-3                       4.10       11032
HMP-3                       4.15       11093
HMP-3                       4.20       11154
HMP-3                       4.25       11215
HMP-3                       4.30       11276
HMP-3                       4.35       11337
HMP-3                       4.40       11398
HMP-3                       4.45       11459
HMP-3                       4.50       11520
HMP-3                       4.55       11574
HMP-3                       4.60       11628
HMP-3                       4.65       11682
HMP-3                       4.70       11736
HMP-3                       4.75       11790
HMP-3                       4.80       11844
HMP-3                       4.85       11898
HMP-3                       4.90       11952
HMP-3                       4.95       12006
HMP-3                       5.00       12060
HMP-3                       5.05       12114
HMP-3                       5.10       12168
HMP-3                       5.15       12222
HMP-3                       5.20       12276
HMP-3                       5.25       12330
HMP-3                       5.30       12384
HMP-3                       5.35       12438
HMP-3                       5.40       12492
HMP-3                       5.45       12546
HMP-3                       5.50       12600

[TIMESERIES]
;;Name           Date       Time       Value
;;-------------- ---------- ---------- ----------
Lindbergh        FILE "R:\1671\Hyd\HMP\Calcs\Rainfall\LbergRain.txt"

[REPORT]
;;Reporting Options
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]

[MAP]
DIMENSIONS 0.000 0.000 10000.000 10000.000
Units      None

[COORDINATES]
;;Node           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
```

```
POC1             890.411           2139.094
POC2             5526.870          2592.202
POC3             10171.790         2007.233
DIV1             5.269             4151.739
DIV2             5210.748          4014.752
DIV3             10210.748         4014.752
STOR1            2081.138          4172.813
STOR2            7381.454          4035.827
STOR3            12381.454         4035.827

[VERTICES]
;;Link           X-Coord           Y-Coord
;;-------------- ----------------- -----------------

[Polygons]
;;Subcatchment   X-Coord           Y-Coord
;;-------------- ----------------- -----------------
DMA1-D           -386.136          6202.532
DMA1-D           -386.136          6202.532
DMA1-D           -480.972          6202.532
DMA1-D           -480.972          6202.532
DMA1-D           -480.972          6202.532
DMA3-D           9810.127          6925.859
DMA2-D           4426.606          5963.303
BF-2-1           -244.123          5045.208
BF-2-2           4974.182          4879.518
BF-2-3           9918.626          5750.452
SM-1             2349.676          3237.743
SM-2-D           3784.404          4380.734
SM-3             3788.427          2224.231
DMA2-C           5849.910          6112.116
SM-2-C           3394.495          3142.202
DMA6             8815.552          6437.613
DMA6             8815.552          6437.613
SM-4             8833.635          4159.132

[SYMBOLS]
;;Gage           X-Coord           Y-Coord
;;-------------- ----------------- -----------------
Lindbergh        3419.389          7249.737
```

ATTACHMENT 7- SWMM Explanation of Significant Variables

In the prior section the viewer can view the associated input and output parameters within the EPA-SWMM Model in both pre-development and post-development conditions. Each portion, i.e., sub-catchments, outfalls, storage units, LID controls for the bio-retention cells, ponding on top of the bio-retention modeled as a storage unit, weir as a discharge, and outfalls (point of compliance), are also shown.

Variables for modeling are associated with typical recommended values by the EPA-SWMM model, typical values found in technical literature such as Maidment's Handbook of Hydrology. Recommended values for the SWMM model have been attained from the interim Orange County criteria established for their SWMM calibration. Currently, no recommended values have been established by the San Diego County HMP Permit for the SWMM Model.

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

Some values incorporated within the SWMM model have been determined from the professional experience of HDA using conservative assumption that have a tendency to increase the size of the needed BMP and also generate a long-term runoff as a percentage of rainfall similar to those measured in gage stations in Southern California by the USGS.

Description of model parameters and assumptions:

N-Imperv – Manning's N for impervious surfaces
0.012 (typical)
N-Perv – Manning's N for pervious surfaces
0.05 (typical)
Dstore-Imperv – Depth of depression storage on impervious area (in)
0.02 (typical)
Dstore-Perv – Depth of depression storage on pervious area (in)
0.1 (typical)
Zero-Imperv – Percentage of impervious area with no depression storage (%)
25 (typical)
Suction Head – Soil capillary suction head (in)
Conductivity – Soil saturated hydraulic conductivity (in/hr)
-25% of these values if subcatchment is graded/compacted
Initial Deficit – Initial moisture deficit (fraction)

Soil Type	Suction Head	Conductivity	Initial Deficit
A	4.5	0.3	0.33
B	3	0.2	0.32
C	2	0.1	0.31
D	1	0.025	0.3

NOTE: These values are based on City of San Diego's BMP Manual in Appendix G.

EXPLANATION OF SELECTED VARIABLES

Parameters for the pre- and post-developed models in□l□de soil types C □ D in a□□ordan□e □ ith the San Diego Co□nty Hydrology Man□al and the □S□S Soil S□rvey Map □atta□hed at the end of this appendi□□ S□□tion head, □ond□□tivity and initial defi□it □orresponds to average val□es e□pe□ted for the soil types, a□□ording to City □MP Design Man□al.

Sele□tion of a □inemati□ Approa□h□ As the □ontin□o□s model is □ased on ho□rly rainfall, and the time of □on□entration for the pre-development and post-development □onditions is signifi□antly smaller than □0 min□tes, pre□ise ro□ting of the flo□ s thro□gh the impervio□s s□rfa□es, the □nderdrain pipe system, and the dis□harge pipe □ as □onsidered □nne□essary. □he tr□n□ation error of the pre□ipitation into ho□rly steps is m□□h more signifi□ant than the pre□ise ro□ting in a system □ here the time of □on□entration is m□□h smaller than □ ho□r.

S□□-□at□hments □□-□

□he area of Prop-□ □ □□-□ m□st □e e□□al to the area of the development tri□□tary to that parti□□lar □io-retention fa□ility. □hree de□imal pla□es □ ere given regarding the areas of the □io-retention to ins□re that the area □sed □y the program for the □□D s□□ro□tine □orresponds e□a□tly □ ith these tri□□taries.

LID Control Editor: Explanation of Significant Variables

N A ON

Height

he storage depth varia le ithin the S MM model is representative of the storage vol me provided in the va lt.

Seepage ate

he seepage rate is dire tly inp t from the geote hni al report.

Clogging fa tor

A logging fa tor as not sed 0 indi ates that there is no logging ass med ithin the model he reason for this is related to the fairness of a omparison ith the SDHM model and the HMP si ing ta les a logging fa tor as not onsidered, and instead, a onservative val e of infiltration as re ommended.

O E EN ON

Storage Depth

he storage depth varia le ithin the S MM model is representative of the storage vol me provided eneath the engineered soil and m l h omponents of the iofiltration fa ility. his storage vol me is omprised of a gravel lo ated ed eneath a layer of engineered soil and a 0.25 foot 3-in h layer of lands aping m l h.

Porosity

A porosity val e of 0.4 has een sele ted for the model. he amended soil is to e highly sandy in ontent in order to have a sat rated hydra li ond tivity of appro imately 5 in hr.

H A onsiders s h a val e to e slightly high ho ever, in order to omply ith the HMP Permit, the val e re ommended y the Copermittees for the porosity of amended soil is 0.4, per Appendi A of the inal Hydromodifi ation Management Plan y ro n Cald ell, dated Mar h 20 .

oid atio

he ratio of the void vol me divided y the soil vol me is dire tly related to porosity as n -n As the nderdrain layer is omposed of gravel, a porosity val e of 0.4 has een sele ted, hi h res lts in a void ratio of 0.4 -0.4 0. for the gravel detention layer.

Clogging fa tor

A logging fa tor as not sed 0 indi ates that there is no logging ass med ithin the model he reason for this is related to the fairness of a omparison ith the SDHM model and the HMP si ing ta les a logging fa tor as not onsidered, and instead, a onservative val e of infiltration as re ommended.

Drain flow coefficient

The flow coefficient in the SWMM Model is the coefficient needed to transform the orifice equation into a general power law equation of the form

$$q = C(H - H_D)^n \qquad (1)$$

where q is the peak flow in in/hr, n is the exponent (typically 0.5 for orifice equation), H D is the elevation of the centroid of the orifice in inches (assumed equal to the invert of the orifice for small orifices and in our design equal to 0) and H is the depth of the water in inches.

The general orifice equation can be expressed as

$$Q = \frac{\pi}{4} c_g \frac{D^2}{144} \sqrt{2g \frac{(H - H_D)}{12}} \qquad (2)$$

where Q is the peak flow in cfs, D is the diameter in inches, Cg is the typical discharge coefficient for orifices (0.60-0.63 for thin walls and around 0.75-0.80 for thick walls), g is the acceleration of gravity in ft/s^2, and H and H D are defined above and are also used in inches in Equation (2).

Cutoff flow

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

Note:

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

BIORETENTION 1

Basin BF-2-1

PARAMETER	ABBREV.	Bio-Retention	
□ □ Ponding Depth	PD	□	in
□ioretention Soil □ayer	S	24	in
□ravel □ayer	□	□2	in
□O□A□		3.5	ft
		42	in
Orifi□e Coeffi□ient	$□_g$	0.□	--
□o□ □lo□ Orifi□e Diameter	D	2	in
Drain □□lo□ □e□ponent	n	0.5	--
Ponding Depth S□rfa□e Area	A_{PD}	3345	ft^2
□ioretention S□rfa□e Area	$A_{S,}$ $A_{□}$	3000	ft^2
Modelled □□D S□rfa□e □ □asin □ottom	$A_{□□D}$	0.0□□□□	a□
Effe□tive Ponding Depth	PD_{eff}	6.35	in
□lo□ Coeffi□ient	C	0.4367	--
□lo□ □ate □per □nit area□	□	2.□□□	in□hr
Ma□. □lo□ □ate thr□ □o□ □lo□ Orifi□e□vol□metri□□	□ □□,Ma□.	0.□□4□□	□fs
□ioretention Soil Media Design Per□olation □ate		5	in□hr
Ma□. □lo□ □ate □hr□ □SM	□ □SM,ma□	0.34□22	C□S
Storage □nit□C□toff □lo□	□ C□toff	0.□□42	C□S

Max. Flow Rate thru Low F

governs

□.5.□ □ine □□□ 2.□□□ in□hr

□ □iofiltration Soil □ayer □ □□"media□3" sand AS□M 33□ 3" M□l□h
□□□ ravel □ayer □ 3" AS□M□□ □ □" □ravel a□ove the invert

BIORETENTION 2

Basin BF-2-2

PARAMETER	ABBREV.	Bio-Retention Cell	
□ □ Ponding Depth	PD	□	in
□ioretention Soil □ayer	S	24	in
□ravel □ayer	□	□2	in
□O□A□		3.5	ft
		42	in
Orifi□e Coeffi□ient	$□_g$	0.□	--
□o□ □lo□ Orifi□e Diameter	D	2	in
Drain □□lo□ □e□ponent	n	0.5	--
Ponding Depth S□rfa□e Area	A_{PD}	□□□□	ft^2
□ioretention S□rfa□e Area	A_S, $A_□$	□500	ft^2
Modelled □□D S□rfa□e □ □asin □ottom	$A_{□□D}$	0.□□5□3	a□
Effe□tive Ponding Depth	PD_{eff}	6.25	in
□lo□ Coeffi□ient	C	0.1541	--
□lo□ □ate □per □nit area□	□	0.□□□	in□hr
Ma□. □lo□ □ate thr□ □o□ □lo□ Orifi□e□vol□metri□□	$□_{□□,Ma□.}$	0.□□4□□	□fs
□ioretention Soil Media Design Per□olation □ate		5	in□hr
Ma□. □lo□ □ate □hr□ □SM	$□_{□SM,ma□}$	0.□□3□0	C□S
Storage □nit□C□toff □lo□	$□_{C□toff}$	0.□□42	C□S

Max. Flow Rate thru Low

governs

□.5.□ □ine □□□ 0.□□□ in□hr

□ □iofiltration Soil □ayer □ □□"media□3" sand AS□M 33□ 3" M□l□h

□□□ ravel □ayer □ 3" AS□M□□ □ □" □ravel a□ove the invert

BIORETENTION 3

Basin BF-2-3

PARAMETER	ABBREV.	Bio-Retention Cell	
Ponding Depth	PD		in
ioretention Soil ayer	S	24	in
ravel ayer		2	in
OA		3.5	ft
		42	in
Orifie Coeffiient	$_g$	0.	--
o lo Orifie Diameter	D	2	in
Drain lo e ponent	n	0.5	--
Ponding Depth Srfae Area	A_{PD}	2	ft^2
ioretention Srfae Area	A_S, $A_$	000	ft^2
Modelled D Srfae asin ottom	A_{D}	0.00 0	a
Effetive Ponding Depth	PD_{eff}	6.27	in
lo Coeffiient	C	0.1871	--
lo ate per nit area		.4	in hr
Ma. lo ate thr o lo Orifie vol metri	$_{,Ma.}$	0.4	fs
ioretention Soil Media Design Perolation ate		5	in hr
Ma. lo ate hr SM	$_{SM,ma}$	0.00	CS
Storage nit Ctoff lo	$_{Ctoff}$	0.42	CS

Max. Flow Rate thru Low governs

.5. ine . in hr

iofiltration Soil ayer "media 3" sand ASM 33 3" M lh
ravel ayer 3" ASM " ravel a ove the invert

ATTACHMENT 8 - SWMM Output Report (Existing and Proposed Models)

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.014)

Emerald Hills
HMP Modeling
Pre-development Condition

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

****
Analysis Options
****
Flow Units ..... CFS
Process Models:
  Rainfall/Runoff ..... YES
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... NO
  Water Quality ..... NO
Infiltration Method ..... GREEN_AMPT
Starting Date 10/17/1948 08:00:00
Ending Date 12/31/2005 23:00:00
Antecedent Dry Days 0.0
Report Time Step 01:00:00
Wet Time Step 00:15:00
Dry Time Step 04:00:00

Runoff Quantity Continuity	Volume acre-feet	Depth inches
Total Precipitation	1380.139	563.840
Evaporation Loss	45.064	18.410
Infiltration Loss	1121.985	458.374
Surface Runoff	233.503	95.395
Final Storage	0.000	0.000
Continuity Error (%)	-1.479	

Flow Routing Continuity	Volume acre-feet	Volume 10^6 gal
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	233.503	76.090
Groundwater Inflow	0.000	0.000

RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	233.503	76.090
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.000
Continuity Error (%)	0.000	

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip in	Total Runon in	Total Evap in	Total Infil in	Imperv Runoff in	Perv Runoff in	Total Runoff in	Total Runoff 10^6 gal	Peak Runoff CFS	Runoff Coeff
DMA1-D	563.84	0.00	19.42	450.58	0.00	102.97	102.97	21.15	9.85	0.183
DMA2-C	563.84	0.00	3.97	532.94	0.00	28.36	28.36	1.65	2.67	0.050
DMA2-D	563.84	0.00	19.56	452.46	0.00	100.70	100.70	29.16	13.80	0.179
DMA3-D	563.84	0.00	19.63	454.21	0.00	98.67	98.67	24.13	11.55	0.175

Analysis begun on: Sun Oct 22 15:01:48 2023
Analysis ended on: Sun Oct 22 15:02:14 2023
Total elapsed time: 00:00:26

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.014)
--------------------------------------------------------------

Emerald Hills
HMP Modeling
Post-development Condition

WARNING 04: minimum elevation drop used for Conduit Bypass1
WARNING 04: minimum elevation drop used for Conduit Lowflow1
WARNING 04: minimum elevation drop used for Conduit Bypass2
WARNING 04: minimum elevation drop used for Conduit Lowflow2
WARNING 04: minimum elevation drop used for Conduit Bypass3
WARNING 04: minimum elevation drop used for Conduit Lowflow3

*****************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
*****************************************************

***************
Analysis Options
***************
Flow Units ............... CFS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Infiltration Method ...... GREEN_AMPT
Flow Routing Method ...... KINWAVE
Starting Date ............ 10/17/1948 08:00:00
Ending Date .............. 12/31/2005 23:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 01:00:00
Wet Time Step ............ 00:15:00
Dry Time Step ............ 04:00:00
Routing Time Step ........ 60.00 sec


*************************        Volume         Depth
Runoff Quantity Continuity     acre-feet        inches
*************************     ---------       -------
Initial LID Storage ......         0.085         0.035
Total Precipitation ......      1380.144       563.840
Evaporation Loss .........       200.027        81.718
Infiltration Loss ........       625.691       255.618
Surface Runoff ...........       207.120        84.616
```

LID Drainage	354.805	144.951
Final Storage	0.247	0.101
Continuity Error (%)	-0.555	

Flow Routing Continuity	Volume acre-feet	Volume 10^6 gal
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	561.926	183.112
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	561.874	183.095
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.000
Continuity Error (%)	0.009	

Highest Flow Instability Indexes

All links are stable.

Routing Time Step Summary

Minimum Time Step	:	60.00 sec
Average Time Step	:	60.00 sec
Maximum Time Step	:	60.00 sec
Percent in Steady State	:	0.00
Average Iterations per Step	:	1.00
Percent Not Converging	:	0.00

Subcatchment Runoff Summary

Subcatchment	Total Precip in	Total Runon in	Total Evap in	Total Infil in	Imperv Runoff in	Perv Runoff in	Total Runoff in	Total Runoff 10^6 gal	Peak Runoff CFS	Runoff Coeff
DMA1-D	563.84	0.00	74.46	187.55	255.04	50.64	305.68	30.09	4.83	0.542
DMA3-D	563.84	0.00	81.37	190.27	251.90	42.32	294.23	74.88	11.06	0.522
DMA2-D	563.84	0.00	79.24	196.24	245.57	44.92	290.49	74.71	11.22	0.515
BF-2-1	563.84	16059.17	1125.52	11.64	0.00	16048.82	15483.49	29.01	4.55	0.931

BF-2-2	563.84	16404.19	953.53	2385.80	0.00	0.00	13628.35	72.20	13.40	0.803
BF-2-3	563.84	17129.05	940.02	1964.42	0.00	17116.28	14786.22	64.64	10.41	0.836
SM-1	563.84	0.00	19.08	413.95	0.00	139.93	139.93	3.81	1.32	0.248
SM-2-D	563.84	0.00	19.32	415.15	0.00	136.46	136.46	2.68	0.96	0.242
SM-3	563.84	0.00	19.84	418.08	0.00	130.34	130.34	4.49	1.71	0.231
DMA2-C	563.84	0.00	65.49	230.59	253.45	18.47	271.91	12.19	2.12	0.482
SM-2-C	563.84	0.00	5.31	512.32	0.00	50.43	50.43	0.69	0.61	0.089
DMA6	563.84	0.00	54.95	248.84	187.40	80.02	267.42	1.48	0.27	0.474
SM-4	563.84	0.00	19.47	416.37	0.00	134.39	134.39	4.10	1.49	0.238

****
LID Performance Summary
****

Subcatchment	LID Control	Total Inflow in	Evap Loss in	Infil Loss in	Surface Outflow in	Drain Outflow in	Initial Storage in	Final Storage in	Continuity Error %
BF-2-1	BF-2-1	16643.43	1127.55	0.00	2557.24	12955.93	2.40	5.60	-0.00
BF-2-2	BF-2-2	16968.03	953.41	2385.49	5092.23	8534.30	2.40	5.49	-0.00
BF-2-3	BF-2-3	17712.92	941.66	1954.02	4234.39	10580.17	2.40	5.54	-0.00

****
Node Depth Summary
****

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days	Time of Max Occurrence hr:min	Reported Max Depth Feet
POC1	OUTFALL	0.00	0.00	0.00	0	00:00	0.00
POC2	OUTFALL	0.00	0.00	0.00	0	00:00	0.00
POC3	OUTFALL	0.00	0.00	0.00	0	00:00	0.00
DIV1	DIVIDER	0.00	0.00	0.00	0	00:00	0.00
DIV2	DIVIDER	0.00	0.00	0.00	0	00:00	0.00
DIV3	DIVIDER	0.00	0.00	0.00	0	00:00	0.00
STOR1	STORAGE	0.00	2.93	2.93	6263	02:22	2.87
STOR2	STORAGE	0.01	3.50	3.50	6263	02:24	3.41
STOR3	STORAGE	0.01	3.22	3.22	6263	02:17	3.19

****
Node Inflow Summary
****

	Maximum Lateral Inflow	Maximum Total Inflow	Time of Max Occurrence	Lateral Inflow Volume	Total Inflow Volume	Flow Balance Error

Node	Type	CFS	CFS	days	hr:min	10^6 gal	10^6 gal	Percent
POC1	OUTFALL	1.32	1.64	6263	01:01	3.81	32.8	0.000
POC2	OUTFALL	3.27	4.11	6263	01:01	7.86	80	0.000
POC3	OUTFALL	1.76	3.77	6263	02:01	5.58	70.2	0.000
DIV1	DIVIDER	4.55	4.55	6263	01:16	29	29	0.000
DIV2	DIVIDER	13.40	13.40	6263	01:16	72.2	72.2	0.000
DIV3	DIVIDER	10.41	10.41	6263	01:16	64.6	64.6	0.000
STOR1	STORAGE	0.00	4.35	6263	01:16	0	4.55	0.035
STOR2	STORAGE	0.00	13.21	6263	01:16	0	24.1	0.036
STOR3	STORAGE	0.00	10.21	6263	01:16	0	18.3	0.036

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 ft3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 ft3	Max Pcnt Full	Time of Max Occurrence days	hr:min	Maximum Outflow CFS
STOR1	0.016	0	0	0	12.971	43	6263	02:21	0.73
STOR2	0.068	0	0	0	41.109	64	6263	02:23	2.88
STOR3	0.080	0	0	0	29.299	60	6263	02:16	3.23

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CFS	Max Flow CFS	Total Volume 10^6 gal
POC1	3.47	0.07	1.64	32.815
POC2	6.24	0.09	4.11	80.049
POC3	5.94	0.09	3.77	70.217
System	5.22	0.25	3.77	183.082

****
Link Flow Summary

****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days	hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
Bypass1	DUMMY	4.35	6263	01:16			
Lowflow1	DUMMY	0.19	6263	00:51			
Bypass2	DUMMY	13.21	6263	01:16			
Lowflow2	DUMMY	0.19	1187	20:15			
Bypass3	DUMMY	10.21	6263	01:16			
Lowflow3	DUMMY	0.19	1237	07:54			
Midflow1	DUMMY	0.73	6263	02:22			
Midflow2	DUMMY	2.88	6263	02:24			
Midflow3	DUMMY	3.23	6263	02:17			

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Mon Oct 23 13:45:14 2023
Analysis ended on: Mon Oct 23 13:46:13 2023
Total elapsed time: 00:00:59

ATTACHMENT 9 - Drying Time of the Surface Layer of Bio-retention cells

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

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

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

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

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

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

BF-2-1		S Drain	0.42	fs
Elevation	A CS	D C	D H	otal
0.00	0.04	50.	.500	.3
0.05	0.04	52.	0.2	5.
0.0	0.04	54.3	0.22	5.4
0.5	0.04	5.0	0.223	5.42
0.20	0.04	5.	0.22	5.20
0.25	0.04	5.5	.000	4.
0.30	0.04	.2	0.23	3.
0.35	0.04	2.	2.000	3.4
0.40	0.04	4.	0.23	.4
0.45	0.04	.4	0.23	.5
0.50	0.04	.	0.23	.2
0.55	0.0	.	0.235	.03
0.0	0.204	.	0.22	0.0
0.5	0.22	3.3	0.225	0.5
0.0	0.2	5.0	0.223	0.34
0.5	0.220	.	0.22	0.2
0.0	0.223	.5	0.220	.0
0.5	0.22	0.2	0.220	.
0.0	0.22	.	0.2	.4
0.5	0.232	3.	0.2	.24
.00	0.234	5.4	0.2	.02
.05	0.23	.3	0.2	.0
.0	0.23	.2	0.220	.5
.5	0.240	.0	0.220	.3
.20	0.242	2.	0.220	.4
.25	0.244	4.	0.22	.2
.30	0.24	.	0.22	.0
.35	0.24	.5	0.222	.4
.40	0.24	200.4	0.223	.2
.45	0.25	202.2	0.223	.03
.50	0.252	204.	0.224	.
.55	0.254	20.0	0.225	.5
.0	0.255	20.	0.225	.3
.5	0.25	20.	0.22	.4
.0	0.25	2.	0.22	5.
.5	0.20	23.4	0.22	5.
.0	0.2	25.3	0.22	5.4
.5	0.22	2.2	0.22	5.23
.0	0.24	.0	0.230	5.00
.5	0.25	220.	0.23	4.
2.00	0.2	222.	0.22	4.54
2.05	0.2	224.	0.2	4.3
2.0	0.2	22.	0.203	4.0
2.5	0.323	22.	0.02	3.
2.20	0.33	230.	0.0	3.0
2.25	0.350	232.	0.02	3.5
2.30	0.3	234.	0.0	3.33
2.35	0.3	23.	0.05	3.5
2.40	0.30	23.	0.00	2.
2.45	0.402	240.	0.50	2.0
2.50	0.44	243.0	0.42	2.5

BF-2-1		S Drain	0.42	fs
Elevation	A CS	D C	D H	otal
2.55	0.504	245.0	0.2	2.50
2.0	0.55	24.0	0.0	2.3
2.5	0.54	24.0	0.04	2.2
2.0	0.25	25.0	0.00	2.4
2.5	0.53	253.0	0.00	2.03
2.0	0.00	255.0	0.002	.03
2.5	0.004	25.0	0.000	.03
2.0	0.02	25.0	0.00	.03
2.5	0.04	2.0	0.00	.03
3.00	0.00	23.	0.04	.53
3.05	0.00	25.3	0.02	.44
3.0	0.0	2.4	0.00	.35
3.5	0.02	2..	0.00	.2
3.20	0.04	2..	0.00	.0
3.25	0.03	23.	0.00	.0
3.30	0.00	2.0	0.00	0.0
3.35	0.00	2.2	0.05	0.0
3.40	0.03	20.3	0.05	0.2
3.45	0.02	22.5	0.04	0.4
3.50	0.44	24.	0.03	0.5
3.55	0.5	2..	0.02	0.5
3.0	0.04	2..	0.02	0.4
3.5	0.00	2..	0.00	0.40
3.0	.002	23.2	0.00	0.32
3.5	.3	25.4	0.04	0.2
3.0	2.03	2..5	0.033	0.2
3.5	2.00	2..0	0.024	0.0
3.0	4.035	30.0	0.00	0.05
3.5	5.232	304.0	0.004	0.03
4.00	.554	30.2	0.002	0.02
4.05	.000	30.5	0.000	0.00
4.0	.532	30.0	0.00	0.0
4.5	.002	33.0	0.00	0.0
4.20	2.005	35.4	0.00	0.0
4.25	4.02	3..0	0.00	0.0
4.30	.032	3..0	0.005	0.0
4.35	.000	322.2	0.005	0.0
4.40	20.000	324.5	0.004	0.0
4.45	22.000	32.0	0.004	0.0
4.50	25.020	32.0	0.003	0.05
4.55	2.300	33.4	0.003	0.05
4.0	2.50	333.0	0.003	0.05
4.5	32.00	33.0	0.003	0.04
4.0	34.545	33.3	0.003	0.04
4.5	3.004	340.5	0.002	0.04
4.0	3.004	342.0	0.002	0.04
4.5	42.343	345.0	0.002	0.03
4.0	45.000	34.4	0.002	0.03
4.5	4.035	34.0	0.002	0.03
5.00	50.000	352.0	0.002	0.03
5.05	53.550	354.5	0.002	0.02

BF-2-1		S Drain	0.42	fs
Elevation	A CS	D C	D H	otal
5.0	5.4	35.	0.002	0.02
5.5	5.40	35.4	0.002	0.02
5.20	2.523	3.	0.002	0.02
5.25	5.	34.2	0.002	0.02
5.30	.	3.	0.00	0.02
5.35	.54	3.	0.00	0.0
5.40	5.	3.5	0.00	0.0
5.45	.45	34.0	0.00	0.0
5.50	.22	3.4	0.00	0.0
5.55	5.205	3.	0.00	0.0
5.0	.34	3.3	0.00	0.0
5.5	2.0	33.	0.00	0.0
5.0	5.2	3.2	0.00	0.0
5.5	.0	3.	0.00	0.0
5.0	02.	3.0	0.00	0.00
5.5	0.44	33.5	0.00	0.00
5.0	0.3	35.	0.00	0.00
5.5	3.	3.3	0.00	0.00
.00	.4			

BF-2-2		S Drain	0.42	fs
Elevation	A CS	D C	D H	otal
0.00	0.4	42.	.500	2.2
0.05	0.4	430.2	0.5	25.22
0.0	0.4	433.	0.20	24.
0.5	0.4	43.2	0.25	23.
0.20	0.4	440.	0.30	23.3
0.25	0.4	444.2	.000	22.3
0.30	0.4	44.	0.40	2.3
0.35	0.4	45.	2.000	2.0
0.40	0.4	454.	0.50	.0
0.45	0.4	45.	0.55	.44
0.50	0.4	4.	0.4	.
0.55	0.20	4.5	0.	.4
0.0	0.2	4.	0.53	.52
0.5	0.244	42.0	0.53	5.
0.0	0.2	45.5	0.42	5.44
0.5	0.2	4.0	0.43	4.
0.0	0.24	42.5	0.44	4.50
0.5	0.304	4.0	0.43	4.05
0.0	0.34	4.5	0.42	3.2
0.5	0.324	43.0	0.4	3.
.00	0.332	4.5	0.40	2.
.05	0.340	500.	0.404	2.3
.0	0.34	503.	0.3	.
.5	0.355	50.4	0.33	.5
.20	0.32	5.0	0.3	.
.25	0.3	54.	0.34	0.
.30	0.35	5.3	0.3	0.3
.35	0.3	52.	0.3	0.0
.40	0.3	525.5	0.34	.3
.45	0.33	52.2	0.3	.2
.50	0.3	532.	0.3	.
.55	0.404	53.4	0.3	.52
.0	0.40	540.0	0.34	.5
.5	0.45	543.	0.32	.
.0	0.420	54.3	0.30	.43
.5	0.425	550.	0.35	.0
.0	0.430	554.	0.35	.
.5	0.435	55.2	0.355	.35
.0	0.43	5.	0.353	.00
.5	0.444	55.4	0.352	5.5
2.00	0.44	5.	0.344	5.2
2.05	0.4	52.	0.322	4.5
2.0	0.520	5.	0.2	4.3
2.5	0.5	50.4	0.25	4.34
2.20	0.	54.2	0.2	4.0
2.25	0.5	5.0	0.	3.
2.30	0.	5.	0.2	3.
2.35	0.34	55.5	0.2	3.4
2.40	0.	5.3	0.3	3.32
2.45	.05	03.0	0.53	3.
2.50	.42	0.	0.4	3.0

BF-2-2		□ S□□ Drain□	0.□□42	□fs
Elevation	□ A□□ □C□S□	D□ □C□□	D□ □H□□	□otal □
2.55	□.254	□□0.□	0.□2□	2.□□
2.□0	□.3□3	□□4.3	0.□□□	2.□4
2.□5	□.522	□□□.□	0.□0□	2.□2
2.□0	□.□3□	□2□.□	0.□03	2.5□
2.□5	□.□24	□25.□	0.0□□	2.4□
2.□0	□.□0□	□2□.4	0.0□5	2.3□
2.□5	□.□□2	□33.2	0.0□2	2.2□
2.□0	□.□54	□3□.□	0.0□□	2.□2
2.□5	2.022	□40.□	0.0□□	2.03
3.00	2.0□□	□44.□	0.0□4	□.□5
3.05	2.□5□	□4□.5	0.0□3	□.□□
3.□0	2.2□□	□52.4	0.0□□	□.□□
3.□5	2.2□□	□5□.3	0.0□□	□.□0
3.20	2.32□	□□0.2	0.0□□	□.□2
3.25	2.3□□	□□4.□	0.0□□	□.54
3.30	2.434	□□□.0	0.0□5	□.4□
3.35	2.4□□	□□□.□	0.0□4	□.3□
3.40	2.53□	□□5.□	0.0□3	□.3□
3.45	2.5□□	□□□.□	0.0□2	□.24
3.50	2.□35	□□3.□	0.0□□	□.□□
3.55	2.□□3	□□□.□	0.0□□	□.□0
3.□0	2.□2□	□□□.5	0.0□0	□.03
3.□5	2.□□5	□□5.4	0.0□□	0.□□
3.□0	2.□□□	□□□.3	0.0□□	0.□□
3.□5	2.□□3	□03.2	0.0□□	0.□2
3.□0	2.□0□	□0□.□	0.0□□	0.□5
3.□5	2.□4□	□□□.0	0.0□□	0.□□
3.□0	2.□□□	□□4.□	0.0□□	0.□2
3.□5	3.032	□□□.□	0.0□5	0.55
4.00	3.0□3	□22.□	0.0□□	0.4□
4.05	3.4□5	□2□.□	0.053	0.43
4.□0	4.205	□30.□	0.044	0.3□
4.□5	5.□25	□35.0	0.03□	0.33
4.20	□.20□	□3□.0	0.030	0.2□
4.25	□.42□	□43.□	0.025	0.2□
4.30	□.□□□	□4□.□	0.022	0.24
4.35	□0.23□	□5□.2	0.0□□	0.22
4.40	□□.□02	□55.2	0.0□□	0.20
4.45	□3.4□□	□5□.3	0.0□5	0.□□
4.50	□5.222	□□3.3	0.0□3	0.□□
4.55	□□.0□□	□□□.4	0.0□2	0.□5
4.□0	□□.□□5	□□□.4	0.0□□	0.□4
4.□5	2□.004	□□5.5	0.0□0	0.□3
4.□0	23.0□0	□□□.5	0.00□	0.□2
4.□5	25.250	□□3.□	0.00□	0.□□
4.□0	2□.4□2	□□□.□	0.00□	0.□0
4.□5	2□.□□4	□□□.□	0.00□	0.□0
4.□0	32.□52	□□5.□	0.00□	0.0□
4.□5	34.5□□	□□□.□	0.00□	0.0□
5.00	3□.0□5	□03.□	0.00□	0.0□
5.05	3□.□45	□0□.□	0.005	0.0□

BF-2-2		S Drain	0.42	fs
Elevation	A CS	D C	D H	otal
5.0	42.2	2.3	0.005	0.0
5.5	44.4	.5	0.005	0.0
5.20	4.5	20.	0.005	0.05
5.25	50.40	24.	0.004	0.05
5.30	53.330	2.	0.004	0.05
5.35	5.235	33.2	0.004	0.04
5.40	5..4	3..4	0.004	0.04
5.45	2.205	4.	0.004	0.03
5.50	5.2	45.	0.004	0.03
5.55	.3	50.0	0.003	0.03
5.0	.544	54.2	0.003	0.02
5.5	4.5	5.4	0.003	0.02
5.0	.0	2.	0.003	0.02
5.5	.32	.	0.003	0.0
5.0	4.2	.0	0.003	0.0
5.5	.04	5.2	0.003	0.0
5.0	.532	.4	0.003	0.0
5.5	5.024	3.	0.003	0.00
.00	.52			

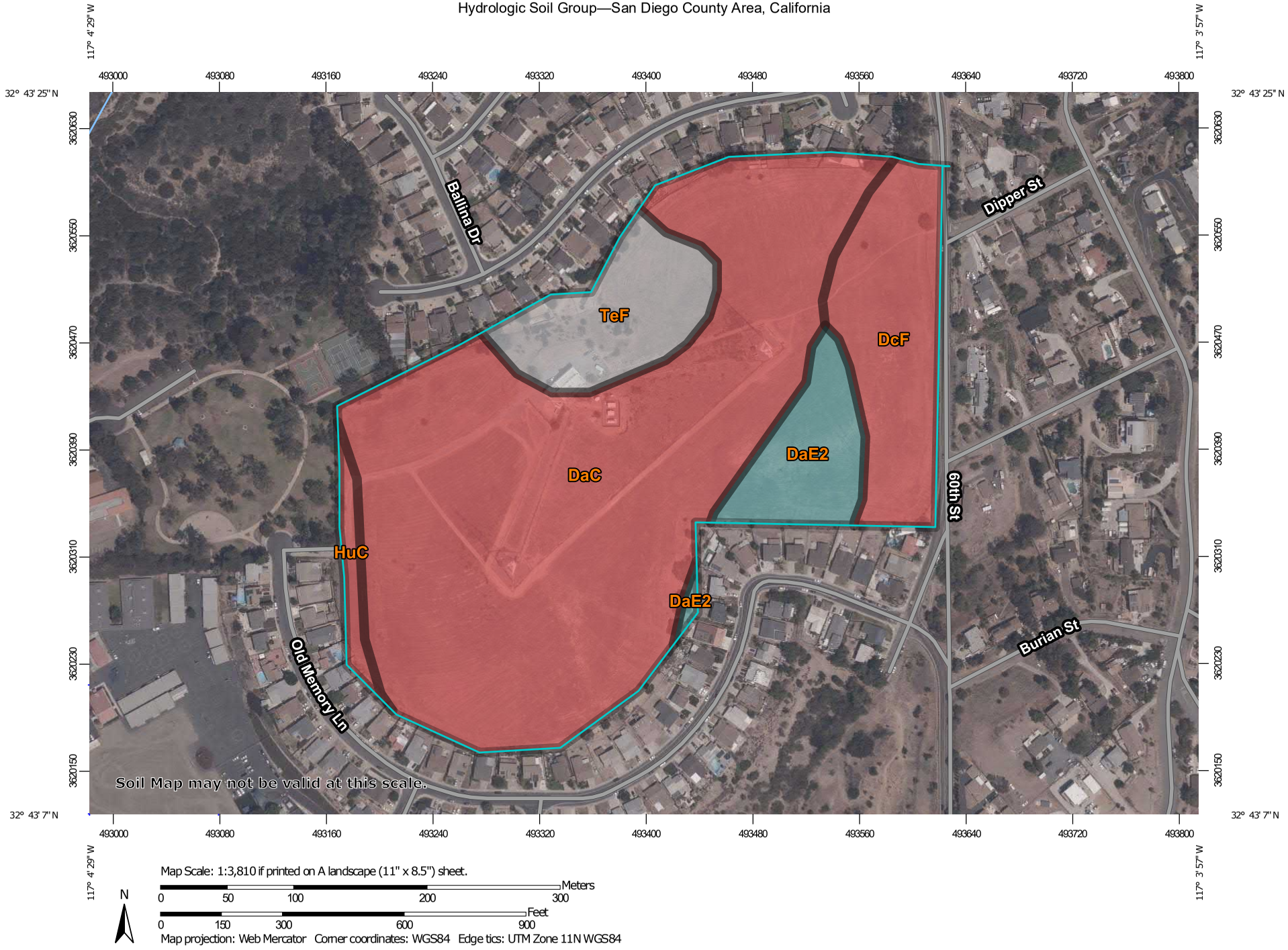
BF-2-3		S Drain	0.42	fs
Elevation	A C S	D C	D H	otal
0.00	0.4	35.0	.500	25.0
0.05	0.4	354.	0.50	24.20
0.0	0.4	35.0	0.52	23.0
0.5	0.4	30.0	0.50	23.0
0.20	0.4	34.0	0.52	22.0
0.25	0.4	33.0	.000	22.5
0.30	0.4	30.2	0.52	20.5
0.35	0.4	33.3	2.000	20.2
0.40	0.4	33.4	0.53	0.2
0.45	0.4	33.5	0.543	0.0
0.50	0.4	32.0	0.543	0.54
0.55	0.00	35.0	0.53	0.00
0.0	0.20	33.0	0.50	0.4
0.5	0.20	33.0	0.404	5.00
0.0	0.23	35.0	0.40	5.4
0.5	0.23	33.0	0.45	5.00
0.0	0.244	40.2	0.452	4.54
0.5	0.24	404.3	0.44	4.0
0.0	0.254	40.4	0.44	3.5
0.5	0.25	40.5	0.43	3.2
.00	0.23	43.0	0.433	2.00
.05	0.20	40.0	0.430	2.34
.0	0.20	40.0	0.42	0.00
.5	0.25	422.0	0.425	0.4
.20	0.20	425.0	0.423	0.05
.25	0.20	420.0	0.42	0.3
.30	0.25	430.0	0.40	0.2
.35	0.20	434.0	0.40	.0
.40	0.20	430.0	0.40	.3
.45	0.24	440.0	0.405	.0
.50	0.20	443.0	0.404	.54
.55	0.20	440.0	0.403	.3
.0	0.302	440.0	0.402	.0
.5	0.304	452.0	0.40	.30
.0	0.30	455.0	0.40	.0
.5	0.30	450.0	0.400	.4
.0	0.32	402.0	0.400	.0
.5	0.34	405.0	0.400	5.0
.0	0.30	400.0	0.400	5.25
.5	0.30	400.0	0.400	4.4
2.00	0.32	402.0	0.300	4.43
2.05	0.340	402.0	0.300	4.04
2.0	0.30	402.0	0.300	3.0
2.5	0.42	403.0	0.250	3.3
2.20	0.553	403.0	0.200	3.0
2.25	0.5	403.2	0.000	2.0
2.30	0.3	403.3	0.002	2.0
2.35	0.002	403.5	0.000	2.53
2.40	0.42	403.0	0.050	2.3
2.45	0.0	403.0	0.03	2.22
2.50	.005	403.0	0.023	2.0

BF-2-3		S Drain	0.42	fs
Elevation	A CS	D C	D H	otal
2.55	.32	4 4.0	0.0	.
2.0	.23	4 4.	0.0	.5
2.5	.454	4 4.2	0.05	.5
2.0	.3	4 4.3	0.0	.
2.5	.32	4 4.4	0.0	.5
2.0	.	4 4.	0.05	.52
2.5	2.03	4 4.	0.02	.4
2.0	2.	4 4.	0.05	.40
2.5	2.2	4 4.	0.05	.34
3.00	2.34	4 .0	0.054	.2
3.05	2.44	4 .0	0.053	.23
3.0	2.5	4 0.0	0.05	.
3.5	2.43	4 2.0	0.050	.2
3.20	2.23	4 4.0	0.04	.0
3.25	2.0	4 .0	0.04	.02
3.30	2.5	4 .0	0.04	0.
3.35	2.4	4 0.0	0.04	0.3
3.40	3.0	4 2.0	0.045	0.
3.45	3.0	4 4.0	0.044	0.4
3.50	3.54	4 .0	0.043	0.0
3.55	3.220	4 .0	0.043	0.5
3.0	3.24	500.0	0.042	0.
3.5	3.34	502.0	0.04	0.
3.0	3.40	504.0	0.04	0.3
3.5	3.4	50.0	0.040	0.5
3.0	3.52	50.0	0.040	0.55
3.5	3.55	50.0	0.03	0.5
3.0	3.42	52.0	0.03	0.4
3.5	3.	54.0	0.03	0.43
4.00	3.54	5 .5	0.03	0.3
4.05	3.0	5 .	0.03	0.35
4.0	3.	522.	0.03	0.3
4.5	4.2	525.	0.03	0.2
4.20	5.0	52.	0.02	0.25
4.25	5.55	53.	0.023	0.22
4.30	.04	534.	0.0	0.20
4.35	.20	53.	0.0	0.
4.40	.3	540.	0.04	0.
4.45	.0	544.0	0.03	0.5
4.50	2.	54.0	0.0	0.3
4.55	4.32	550.	0.00	0.2
4.0	.30	553.	0.00	0.
4.5	.	55.2	0.00	0.0
4.0	.2	55.2	0.00	0.0
4.5	2.45	52.3	0.00	0.0
4.0	24.042	55.3	0.00	0.0
4.5	2.23	5 .4	0.00	0.0
4.0	2.455	5 .4	0.005	0.0
4.5	30.	54.5	0.005	0.0
5.00	33.4	5 .3	0.005	0.0
5.05	35.5	50.0	0.004	0.05

BF-2-3		S Drain	0.42	fs
Elevation	A CS	D C	D H	otal
5.0	3.0	52.	0.004	0.05
5.5	40.	55.4	0.004	0.05
5.20	43.300	5.	0.004	0.04
5.25	45.0	50.	0.003	0.04
5.30	4.3	53.5	0.003	0.04
5.35	5.542	5.2	0.003	0.03
5.40	54.402	5.	0.003	0.03
5.45	5.3	0.	0.003	0.03
5.50	0.25	04.3	0.003	0.02
5.55	3.305	0.0	0.003	0.02
5.0	.3	0.	0.002	0.02
5.5	.500	2.4	0.002	0.02
5.0	2.2	5.	0.002	0.0
5.5	5.4	.	0.002	0.0
5.0	.4	20.5	0.002	0.0
5.5	2.4	23.3	0.002	0.0
5.0	5.4	25.	0.002	0.00
5.5	.25	2.	0.002	0.00
.00	2.3			

Attachment 10- USGS Soil Map of Project Site

Hydrologic Soil Group—San Diego County Area, California



MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: San Diego County Area, California
Survey Area Data: Version 15, May 27, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Aug 22, 2018—Aug 31, 2018

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
DaC	Diablo clay, 2 to 9 percent slopes	D	22.1	67.5%
DaE2	Diablo clay, 15 to 30 percent slopes, eroded, warm MAAT	C	2.4	7.4%
DcF	Diablo-Urban land complex, 15 to 50 percent slopes	D	4.4	13.5%
HuC	Huerhuero-Urban land complex, 2 to 9 percent slopes	D	0.6	1.9%
TeF	Terrace escarpments		3.2	9.7%
Totals for Area of Interest			**32.7**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Attachment 3
Structural BMP Maintenance Information

This is the cover sheet for Attachment 3.

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Project Name: Emerald Hills

Indicate which Items are Included:

Attachment Sequence	Contents	Checklist
Attachment 3	Maintenance Agreement (Form DS-3247) (when applicable)	☒ Included ☐ Not applicable

Project Name:

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

Attachment 3: For private entity operation and maintenance, Attachment 3 must include a Storm Water Management and Discharge Control Maintenance Agreement (Form DS-3247). The following information must be included in the exhibits attached to the maintenance agreement:

- [X] Vicinity map
- [X] Site design BMPs for which DCV reduction is claimed for meeting the pollutant control obligations.
- [X] BMP and HMP location and dimensions
- [X] BMP and HMP specifications/cross section/model
- [X] Maintenance recommendations and frequency
- [X] LID features such as (permeable paver and LS location, dim, SF).

The City of SAN DIEGO

RECORDING REQUESTED BY:
THE CITY OF SAN DIEGO AND
WHEN RECORDED MAIL TO:

(THIS SPACE IS FOR RECORDER'S USE ONLY)

STORM WATER MANAGEMENT AND DISCHARGE CONTROL MAINTENANCE AGREEMENT

APPROVAL NUMBER:	ASSESSORS PARCEL NUMBER:	PROJECT NUMBER:
	543-340-02-00	

This agreement is made by and between the City of San Diego, a municipal corporation [City] and D.R. HORTON, the owner or duly authorized representative of the owner [Property Owner] of property located at 5706 Old Memory Ln, San Diego, CA 92114 (PROPERTY ADDRESS) and more particularly described as: _____ (LEGAL DESCRIPTION OF PROPERTY) in the City of San Diego, County of San Diego, State of California.

Property Owner is required pursuant to the City of San Diego Municipal Code, Chapter 4, Article 3, Division 3, Chapter 14, Article 2, Division 2, and the Land Development Manual, Storm Water Standards to enter into a Storm Water Management and Discharge Control Maintenance Agreement [Maintenance Agreement] for the installation and maintenance of Permanent Storm Water Best Management Practices [Permanent Storm Water BMP's] prior to the issuance of construction permits. The Maintenance Agreement is intended to ensure the establishment and maintenance of Permanent Storm Water BMP's onsite, as described in the attached exhibit(s), the project's Storm Water Quality Management Plan [SWQMP] and Grading and/or Improvement Plan Drawing No(s), or Building Plan Project No(s): TBD.

Property Owner wishes to obtain a building or engineering permit according to the Grading and/or Improvement Plan Drawing No(s) or Building Plan Project No(s): TBD.

Continued on Page 2

NOW, THEREFORE, the parties agree as follows:

1. Property Owner shall have prepared, or if qualified, shall prepare an Operation and Maintenance Procedure [OMP] for Permanent Storm Water BMP's, satisfactory to the City, according to the attached exhibit(s), consistent with the Grading and/or Improvement Plan Drawing No(s), or Building Plan Project No(s): _____.

2. Property Owner shall install, maintain and repair or replace all Permanent Storm Water BMP's within their property, according to the OMP guidelines as described in the attached exhibit(s), the project's SWQMP and Grading and/or Improvement Plan Drawing No(s), or Building Plan Project No(s) _____.

3. Property Owner shall maintain operation and maintenance records for at least five (5) years. These records shall be made available to the City for inspection upon request at any time.

This Maintenance Agreement shall commence upon execution of this document by all parties named hereon, and shall run with the land.

Executed by the City of San Diego and by Property Owner in San Diego, California.

See Attached Exhibit(s): _____

_____
(Owner Signature)

_____
(Print Name and Title)

_____
(Company/Organization Name)

_____
(Date)

THE CITY OF SAN DIEGO

APPROVED:

_____
(City Control Engineer Signature)

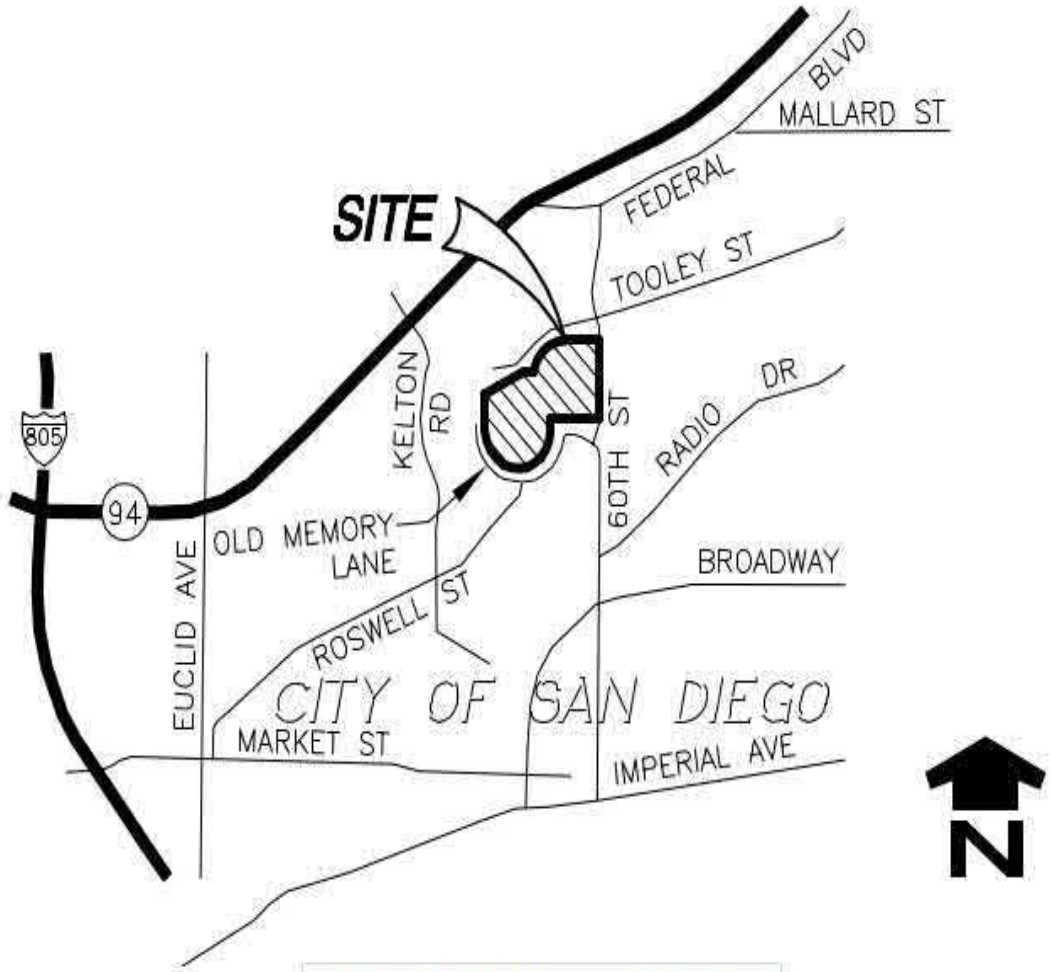
_____
(Print Name)

_____
(Date)

NOTE: ALL SIGNATURES MUST INCLUDE NOTARY ACKNOWLEDGMENTS PER CIVIL CODE SEC. 1180 ET.SEQ.

EXHIBIT 'A'

EMERALD HILLS VICINITY MAP

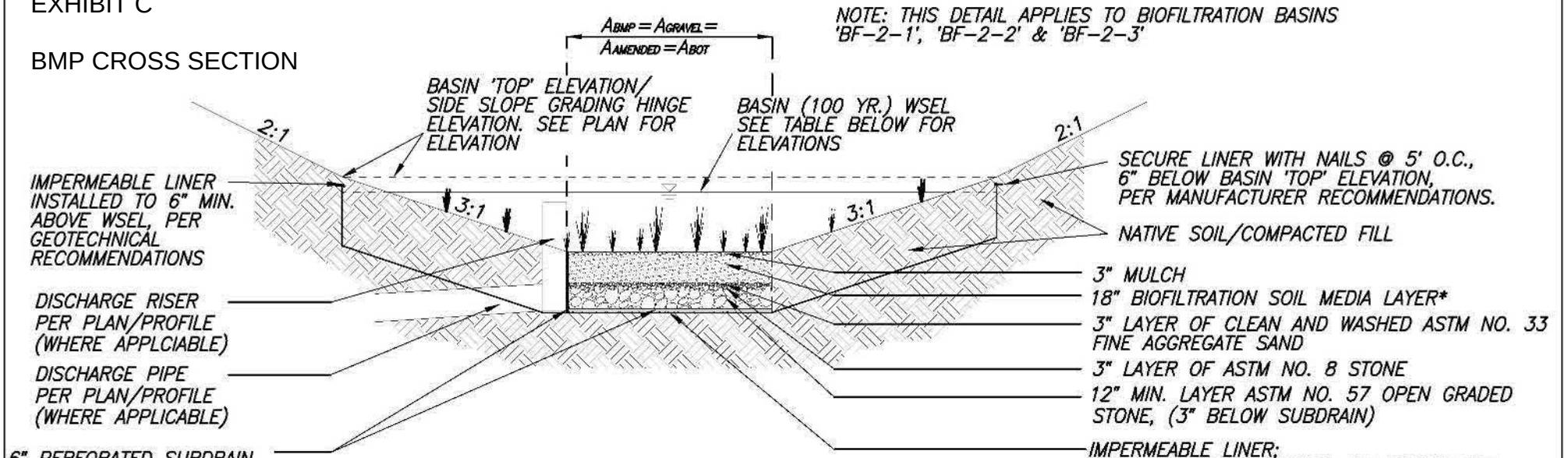


VICINITY MAP

NOT TO SCALE

EXHIBIT C

BMP CROSS SECTION



BIORETENTION SOIL MEDIA (BSM):

- 18" MINIMUM THICKNESS.
- 70% TO 85% BY VOLUME WASHED SAND AND 15% TO 30% BY VOLUME COMPOST OR ALTERNATIVE ORGANIC AMENDMENT.
- BSM: THE C:N RATIO OF BSM SHALL BE BETWEEN 15 AND 40 TO REDUCE THE POTENTIAL FOR NITRATE LEACHING.
- MUST MAINTAIN A MINIMUM PERCOLATION RATE OF 5 INCHES PER HOUR THROUGHOUT THE LIFE OF THE FACILITY, AND IT MUST BE SUITABLE FOR MAINTAINING PLANT LIFE.
- FOR ADDITIONAL INFORMATION REFER TO APPENDIX F.3 OF THE CITY OF SAN DIEGO STORM WATER STANDARDS MANUAL.

BIOFILTRATION PLANTING NOTE:

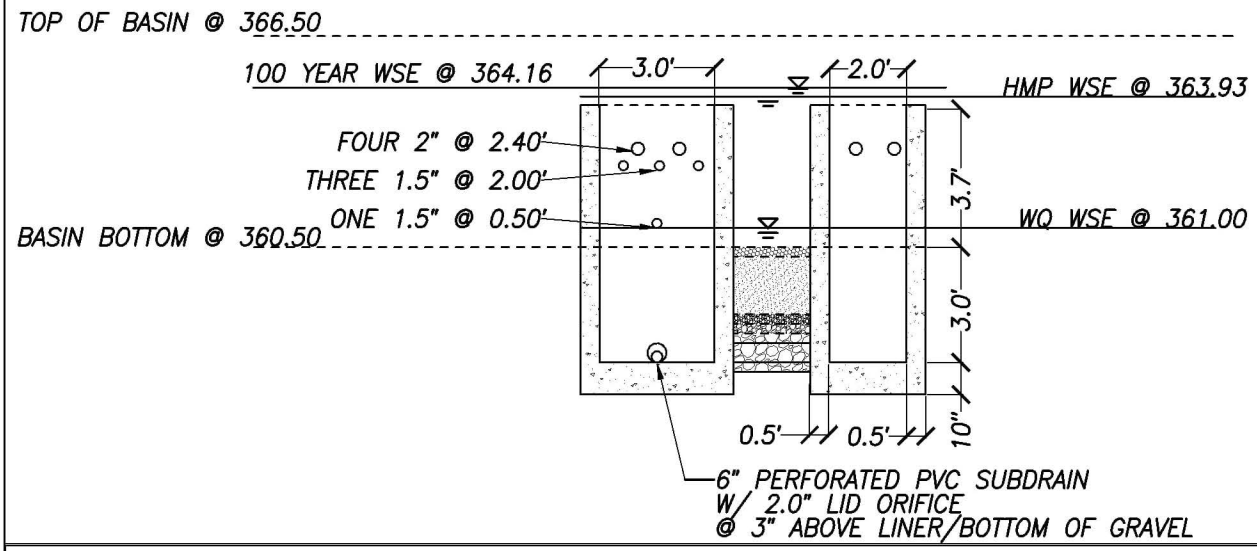
- ALL PLANTING IN 'BIOFILTRATION' AREAS SHALL CONFORM TO APPENDIX 'E' OF THE CITY OF SAN DIEGO LOW IMPACT DESIGN MANUAL.

	BOTTOM ELEVATION	WQ WSE	HMP WSE	100 YR-WSE	BASIN TOP ELEV.	BASIN BOTTOM AREA
BF-2-1	360.50	361.00	363.93	364.16	366.50	3,000 SFT
BF-2-2	318.00	318.50	322.00	322.07	324.00	8,500 SFT
BF-2-3	338.00	338.50	341.72	342.17	344.00	7,000 SFT

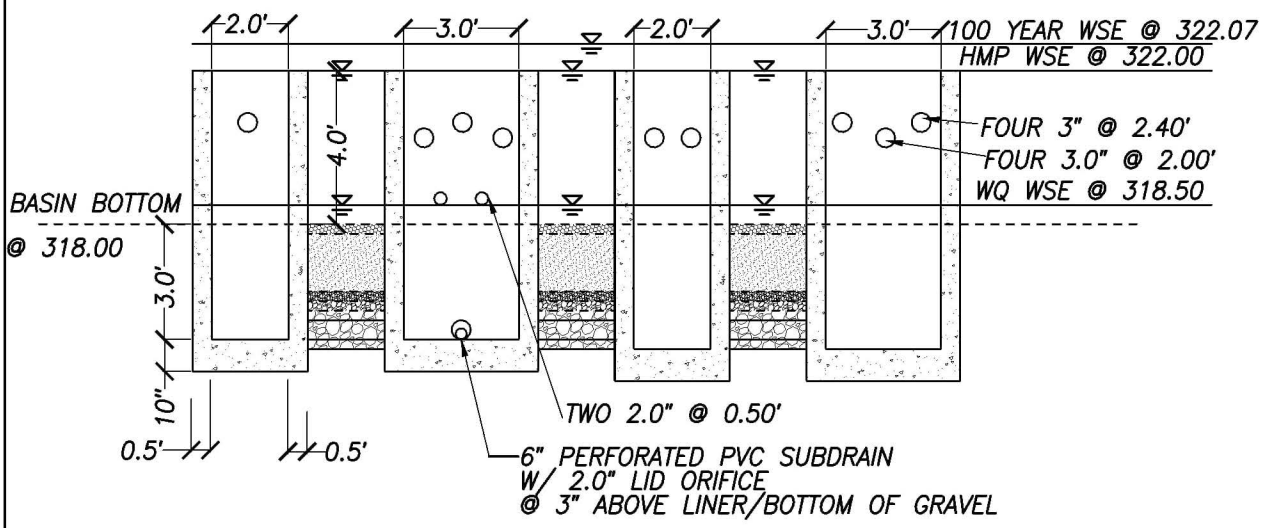
SOIL SECTION FOR WATER QUALITY/HYDROMODIFICATION BIOFILTRATION BASIN

NOT TO SCALE

PRIVATE BIOFILTRATION BASIN BF-2-1



PRIVATE BIOFILTRATION BASIN BF-2-2



PRIVATE BIOFILTRATION BASIN BF-2-3

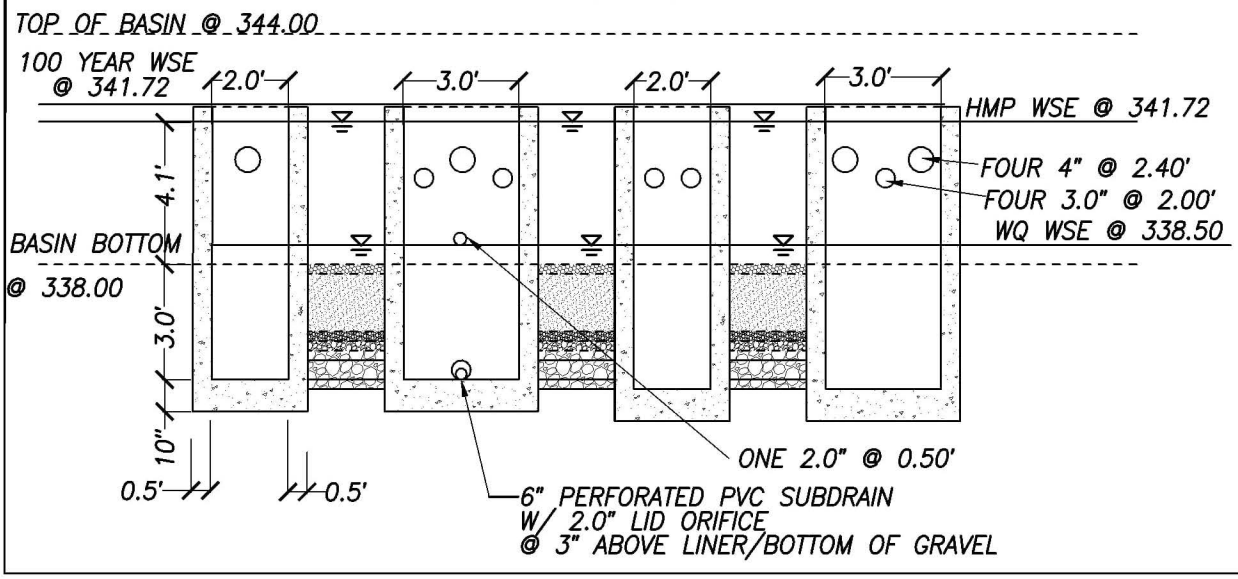


EXHIBIT 'D'

MAINTENANCE RECOMMENDATIONS AND FREQUENCY

SITE DESIGN, SOURCE CONTROL AND POLLUTANT CONTROL BMP OPERATION + MAINTENANCE PROCEDURE							
STORM WATER MANAGEMENT AND DISCHARGE CONTROL MAINTENANCE AGREEMENT APPROVAL NO.: TBD							
O&M RESPONSIBLE PARTY DESIGNEE: PROPERTY OWNDER:							
BMP DESCRIPTION	**INSPECTION FREQUENCY**	**MAINTENANCE FREQUENCY**	**MAINTENANCE METHOD**	**QUANTITY**	**INCLUDED IN O&M MANUAL**		**SHEET NUMBERS**
POLLUTANT CONTROL BMP(S)							
DESCRIPTION: PROPRIETARY BIOFILTRATION UNIT	BI-ANNUAL	6-12 MONTHS AS NEEDED	REPLCMNT OF SOIL MATERIAL REMOVE DEBRIS AS NEEDED	2	YES		
DESCRIPTION: PROPRIETARY BIOFILTRATION UNIT	SEE TABLE BELOW			2	YES		

BIOFILTRATION

Threshold/Indicator	Maintenance Action	Typical Maintenance Frequency
Accumulation of sediment, litter, or debris	Remove and properly dispose of accumulated materials, without damage to the vegetation or compaction of the media layer.	• Inspect monthly. If the BMP is 25% full* or more in one month, increase inspection frequency to monthly plus after every 0.1-inch or larger storm event. • Remove any accumulated materials found at each inspection.
Obstructed inlet or outlet structure	Clear blockage.	• Inspect monthly and after every 0.5-inch or larger storm event. • Remove any accumulated materials found at each inspection.
Damage to structural components such as weirs, inlet or outlet structures	Repair or replace as applicable	• Inspect annually. • Maintain when needed.
Poor vegetation establishment	Re-seed, re-plant, or re-establish vegetation per original plans.	• Inspect monthly. • Maintain when needed.
Dead or diseased vegetation	Remove dead or diseased vegetation, re-seed, re-plant, or re-establish vegetation per original plans.	• Inspect monthly. • Maintain when needed.
Overgrown vegetation	Mow or trim as appropriate.	• Inspect monthly. • Maintain when needed.
2/3 of mulch has decomposed, or mulch has been removed	Remove decomposed fraction and top off with fresh mulch to a total depth of 3 inches.	• Inspect monthly.

EXHIBIT 'D'

MAINTENANCE RECOMMENDATIONS AND FREQUENCY

BIOFILTRATION

Threshold/Indicator	Maintenance Action	Typical Maintenance Frequency
		• Replenish mulch annually, or more frequently when needed based on inspection.
Erosion due to concentrated irrigation flow	Repair/re-seed/re-plant eroded areas and adjust the irrigation system.	• Inspect monthly. • Maintain when needed.
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.	• Inspect after every 0.5-inch or larger storm event. If erosion due to storm water flow has been observed, increase inspection frequency to after every 0.1-inch or larger storm event. • Maintain when needed. 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 BMP for longer than 24 hours following a storm event Surface ponding longer than approximately 24 hours following a storm event may be detrimental to vegetation health	Make appropriate corrective measures such as adjusting irrigation system, removing obstructions of debris or invasive vegetation, clearing underdrains, or repairing/replacing clogged or compacted soils.	• Inspect monthly and after every 0.5-inch or larger storm event. If standing water is observed, increase inspection frequency to after every 0.1-inch or larger storm event. • Maintain when needed.
Presence of mosquitos/larvae For images of egg rafts, larva, pupa, and adult mosquitos, see http://www.mosquito.org/biology	If mosquitos/larvae are observed: first, immediately remove any standing water by dispersing to nearby landscaping; second, make corrective measures as applicable to restore BMP drainage to prevent standing water. If mosquitos persist following corrective measures to remove standing water, or if the BMP design does not meet the 96-	• Inspect monthly and after every 0.5-inch or larger storm event. If mosquitos are observed, increase inspection frequency to after every 0.1-inch or larger storm event. • Maintain when needed.

The following inspection and maintenance activities shall be performed and completed as indicated.

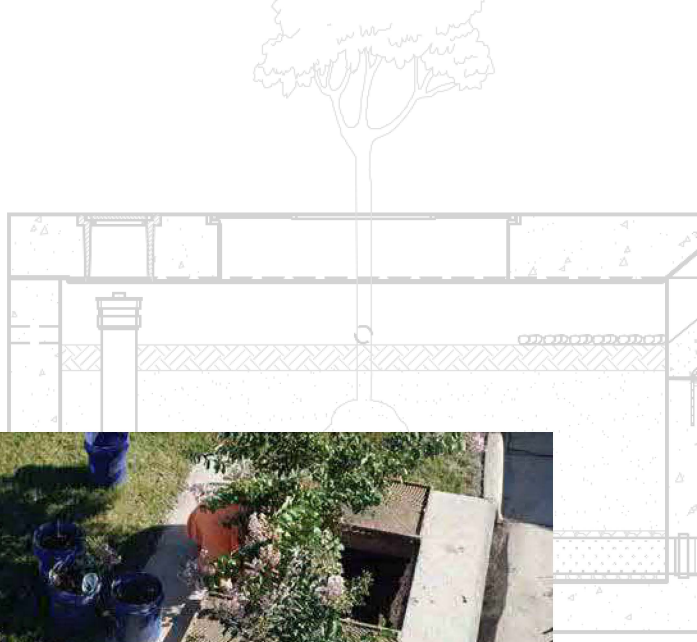
Maintenance Program for Inlet Stenciling

Inspection Frequency/Indications:	Regular Maintenance Inspections ❑ Before wet season begins (September); ❑ After wet season (April).
Maintenance Indications	**Maintenance Activities**
❑ Inlet stenciling/signage begins to weather or fade	❑ Re-stamp signage
❑ Broken or damaged structure	❑ Repair or replace signage structure

Maintenance Program for Modular Filterra Biofiltration Units

Inspection Frequency/Indications:	Regular Maintenance Inspections ❑ Monthly during wet season ❑ Annually before wet season (September) Performance Inspection ❑ 72 hrs after rainfall events greater than 0.5 in.
Maintenance Indications	**Maintenance Activities**
❑ Excessive trash, debris, or sediment in unit. (i.e., sump is 85 percent full or sump is 50 percent full during two consecutive monthly inspections)	❑ Remove trash and debris within 15 days. Empty unit when the unit is 85 percent full or 50 percent full during two consecutive monthly inspections, or annually in May.
❑ Presence of trash and debris in weir box.	❑ Remove trash and debris while onsite conducting inspection
❑ When standing water in sump is observed during annual and performance inspection.	❑ If standing water cannot be removed or remains through the wet season, notify vector control.
❑ Minor structural damage (i.e., screen becomes clogged, damaged or loose)	❑ Clean screen, re-fasten screen if appropriate.
❑ Cracked or fatigued neoprene vector seals	❑ Replace damaged seal
❑ Major damage to structures (i.e., holes in screen, large debris, damage to housing or weir box)	❑ Immediately consult with engineer and manufacturer=s representative to develop a course of action and effect repairs prior to the wet season.
Waste Disposal	Sediment, other pollutants, and all other waste shall be properly disposed of in a licensed landfill or by another appropriate disposal method in accordance with local, state, and federal regulations.

Filterra® Maintenance



Activation and vegetation selection guidance is included with every system.

With proper routine maintenance, the engineered media within the Filterra system should last as long as traditional bioretention media.

Maintenance is low-cost, low-tech and simple:

- Remove trash, sediment, and mulch
- Replace with a fresh 3" layer of mulch
- No confined space entry or special tools
- Easily performed by landscape contractor or facilities maintenance provider



Filterra offers high performance bioretention for advanced pollutant removal with easy maintenance.



Watch the Filterra Maintenance video at www.ContechES.com/filterra



Plant health evaluation and pruning is important to encourage growth.

All stormwater treatment systems require maintenance for effective operation.

Why Maintain?

All stormwater treatment systems require maintenance for effective operation. This necessity is often incorporated in your property's permitting process as a legally binding BMP maintenance agreement. Other reasons to maintain are:

- Avoiding legal challenges from your jurisdiction's maintenance enforcement program.
- Prolonging the expected lifespan of your Filterra® media.
- Avoiding more costly media replacement.
- Helping reduce pollutant loads leaving your property.

Simple maintenance of the Filterra® Bioscape® is required to continue effective pollutant removal from stormwater runoff before discharge into downstream waters. This procedure will also extend the longevity of the living biofilter system. The unit will recycle and accumulate pollutants within the biomass, but is also subjected to other materials entering the inlet. This may include trash, silt and leaves etc. which will be contained above the mulch layer. Too much silt may inhibit the Filterra's flow rate, which is the reason for site stabilization before activation. Regular replacement of the mulch stops accumulation of such sediment.

When to Maintain?

Maintenance visits are typically scheduled seasonally; the spring visit aims to clean up after winter loads including salts and sands while the fall visit helps the system by removing excessive leaf litter.

It has been found that in regions which receive between 30-50 inches of annual rainfall, (2) two visits are generally recommended; In regions with less rainfall often only (1) one visit per annum is sufficient. Varying land uses can affect maintenance frequency; e.g. some fast food restaurants require more frequent trash removal. Contributing drainage areas which are subject to new development wherein the recommended erosion and sediment control measures have not been implemented may require additional maintenance visits.

Some sites may be subjected to extreme sediment or trash loads, requiring more frequent maintenance visits. This is the reason for detailed notes of maintenance actions per unit, helping the Manufacturer and Owner predict future maintenance frequencies, reflecting individual site conditions.

Owners must promptly notify the maintenance provider of any damage to the plant(s), which constitute(s) an integral part of the bioretention technology.

Exclusion of Services

Clean up due to major contamination such as oils, chemicals, toxic spills, etc. will result in additional costs and are not included as part of the Final Site Assessment (if applicable). Should a major contamination event occur the Owner must block off the outlet pipe of the Filterra® (where the cleaned runoff drains to, such as drop inlet) and block off the throat of the Filterra®. The Supplier should be informed immediately.

Maintainenance Visit Summary

Maintenance visits are typically scheduled seasonally; the spring visit aims to clean up after winter loads including salts and sands while the fall visit helps the system by removing excessive leaf litter.

1. Inspection of Filterra® Bioscape® and surrounding area
2. Removal of erosion control stones
3. Removal of debris, trash and mulch
4. Removal and disposal of erosion control sock from system perimeter (should be completed at 6 month or 12 month maintenance depending upon site characteristics). A new erosion control sock is no longer needed after the first year.
5. Mulch replacement
6. Plant health evaluation and pruning or replacement as necessary
7. Clean area around Filterra®
8. Complete paperwork

Plant Care for Filterra® Systems

After Activation, the Contractor is responsible for proper care of the vegetation until the site is handed over to the Owner. After that, it is the Site Owner's responsibility to care for the vegetation. Contech recommends the following care for the plants:

1. To prevent transplant shock (especially if planting takes place in the hot season), it may be necessary to prune some of the foliage to compensate for reduced root uptake capacity. This is accomplished by pruning away some of the smaller secondary branches or a main scaffold branch if there are too many. Too much foliage relative to the root ball can dehydrate and damage the plant.
2. Plant staking may be required.
3. With all trees/shrubs, remove dead, diseased, crossed/rubbing, sharply crotched branches or branches growing excessively long or in wrong direction compared to majority of branches.
4. Contech recommends irrigation of the Filterra® Vegetation. The following guidance will help to ensure the vegetation is properly irrigated.

Irrigation Recommendations:

- Each Filterra® system must receive adequate irrigation to ensure survival of the living system during periods of drier weather.
- Irrigation sources include rainfall runoff from downspouts and/or gutter flow, applied water through the tree grate or in some cases from an irrigation system with emitters installed during construction.
- At Activation: Apply about one (cool climates) to two (warm climates) gallons of water per inch of trunk diameter over the root ball.
- During Establishment: In common with all plants, each Filterra® plant will require more frequent watering during the establishment period. One inch of applied water per week for the first three months is recommended for cooler climates (2 to 3 inches for warmer climates). If the system is receiving rainfall runoff from the drainage area, then irrigation may not be needed. Inspection of the soil moisture content can be evaluated by gently brushing aside the mulch layer and feeling the soil. Be sure to replace the mulch when the assessment is complete. Irrigate as needed**.
- Established Plants: Established plants have fully developed root systems and can access the entire water column in the media. Therefore irrigation is less frequent but requires more applied water when performed. For a mature system assume 3.5 inches of available water within the media matrix. Irrigation demand can be estimated as 1" of irrigation demand per week. Therefore if dry periods exceed 3 weeks, irrigation may be required.

*** Five gallons per square yard approximates 1 inch of water. Therefore for a 6' x 6 foot Filterra® approximately 20-60 gallons of applied water is needed. To ensure even distribution of water it needs to be evenly sprinkled over the entire surface of the filter bed, with special attention to make sure the root ball is completely wetted. NOTE: if needed, measure the time it takes to fill a five gallon bucket to estimate the applied water flow rate. Then calculate the time needed to irrigate the Filterra®, For example is the flow rate of the sprinkler is 5 gallons/minute then it would take 12 minutes to irrigate a 6'x6' filter.*

Plant Replacement:

In some cases, plants will require replacement. Please follow the procedures below to ensure a properly functioning Filterra® system.

1. Remove the existing plant, and leave as much of the Filterra® media in place as possible.
2. Select a replacement per the Filterra® Bioscape® Activation Package.
3. Prior to removing the plant from the container, ensure the soil moisture is sufficient to maintain the integrity of the root ball. If needed, pre-wet the container plant.
4. Cut away any roots which are growing out of the container drain holes.
5. Plant(s) should be carefully removed from the pot by gently pounding on the sides of the container with the fist to loosen root ball. Then carefully slide out. Do not lift plant(s) by trunk as this can break roots and cause soil to fall off. Extract the root ball in a horizontal position and support it to prevent it from breaking apart. Alternatively, the pot can be cut away to minimize root ball disturbance.
6. Excavate a hole with a diameter 4" greater than the root ball, gently place the plant(s).
7. Plant the tree/shrub/grass with the top of the root ball 1" above surrounding media to allow for settling.
8. All plants should have the main stem centered in the tree grate (where applicable) upon completion of installation.
9. Reinstall or add mulch to a depth of 3" per Contech's mulch specifications for Filterra® systems.

Maintenance Visit Procedure

Keep sufficient documentation of maintenance actions to predict location specific maintenance frequencies and needs. An example Maintenance Report is included in this manual.

1. Inspection of Filterra and surrounding area

- Record individual unit before maintenance with photograph (numbered). Record on Maintenance Report (see example in this document) the following:

Record on Maintenance Report the following:

Standing Water	yes | no
Is Bypass Clear	yes | no

If yes answered to any of these observations, record with close-up photograph (numbered).

2. Removal of erosion control stones

- Set aside erosion control stones for reuse after mulch has been replaced.
- Dig out silt (if any) and mulch and remove trash & foreign items.

Record on Maintenance Report the following:

Is scour present around the inlet areas? yes | no

If answering yes, consider adding additional erosion control stone.

3. Removal of debris, trash and mulch

- After removal of mulch and debris, measure distance from the top of the Filterra engineered media soil to the top of the top slab. Compare the measured distance to the distance shown on the approved Contract Drawings for the system. Add Filterra media (not top soil or other) to bring media up as needed to distance indicated on drawings.

Record on Maintenance Report the following:

Silt/Clay	yes | no
Bypass Clear	yes | no
Leaves	yes | no
# of Buckets Removed	_____

4. Removal and Disposal of Erosion Control Sock

- Remove and dispose of erosion control sock if site conditions allow (site should be fully stabilized). Erosion control sock is no longer needed after 1-year post activation.

5. Mulch Replacement

- Add mulch evenly across entire system to a depth of three inches.

6. Vegetation health evaluation and pruning

- Examine the vegetation health and replace if necessary. Prune vegetation to encourage growth in the correct directions. Since Filterra® Bioscape® systems can contain many plants, only notation of individual damaged or unhealthy plants is necessary.
  - » Record on Maintenance Report the following:
  - » Vegetation Health
  - » Vegetation Damage

Document damaged or unhealthy plants with photographs.

7. Clean side slopes and area around the Filterra Bioscape system

- Remove all trash and debris to be disposed of appropriately.

8. Complete paperwork

- Complete Maintenance Report. Some jurisdictions require submission of maintenance reports in accordance with approvals. It is the responsibility of the owner to comply with local regulations.



Maintenance Tools, Safety Equipment and Supplies

Ideal tools include: camera, bucket, shovel, broom, pruners, hoe/rake, and tape measure. Appropriate Personal Protective Equipment (PPE) should be used in accordance with local or company procedures. This may include impervious gloves where the type of trash is unknown, high visibility clothing, barricades when working in close proximity to traffic and safety hats, glasses, and shoes.

Most visits require minor trash removal and a full replacement of mulch. Mulch should be a double shredded, hardwood variety.

Maintenance Checklist

Drainage System Failure	Problem	Conditions to Check	Condition that Should Exist	Actions
Inlet	Excessive sediment or trash accumulation.	Accumulated sediments or trash impair free flow of water into Filterra.	Inlet should be free of obstructions allowing free distributed flow of water into Filterra.	Sediments and/or trash should be removed.
Mulch Cover	Trash and floatable debris accumulation.	Excessive trash and/or debris accumulation.	Minimal trash or other debris on mulch cover.	Trash and debris should be removed and mulch cover raked level. Ensure bark nugget mulch is not used.
Mulch Cover	"Ponding" of water on mulch cover.	"Ponding" in unit could be indicative of clogging due to excessive fine sediment accumulation or spill of petroleum oils.	Stormwater should drain freely and evenly through mulch cover.	Recommend contact manufacturer and replace mulch as a minimum.
Vegetation	Plants not growing or in poor condition.	Soil/mulch too wet, evidence of spill. Incorrect plant selection. Pest infestation. Vandalism to plants.	Plants should be healthy and pest free.	Contact manufacturer for advice.
Vegetation	Plant growth excessive.	Plants should be appropriate to the species and location of Filterra.		Trim/prune plants in accordance with typical landscaping and safety needs.
Maintenance is ideally to be performed twice annually.				

Filterra Inspection & Maintenance Log

Filterra System Size/Model:_____ **Location:** _____

Date	Mulch & Debris Removed	Depth of Mulch Added	Mulch Brand	Vegetation Species	Issues with System	Comments
1/1/17	*5 – 5 gal Buckets*	*3"*	*Lowe's Premium Brown Mulch*	*Galaxy Magnolia*	*- Standing water in downstream structure*	*- Removed blockage in downstream structure*

CONTECH® ENGINEERED SOLUTIONS

filterra® Bioretention Systems
A Growing Idea in Stormwater Filtration

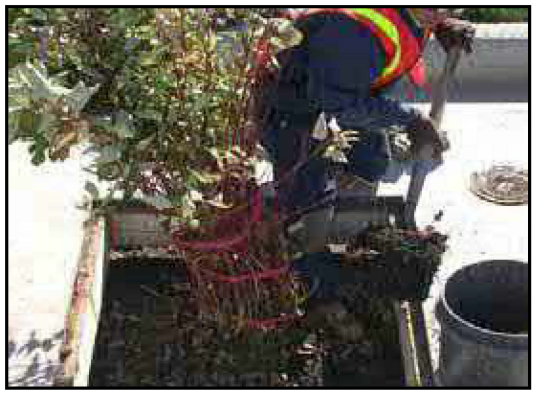
Filterra® Maintenance Steps



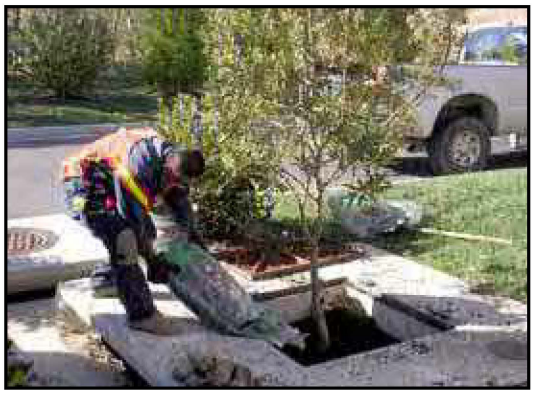
1. Inspection of Filterra and surrounding area



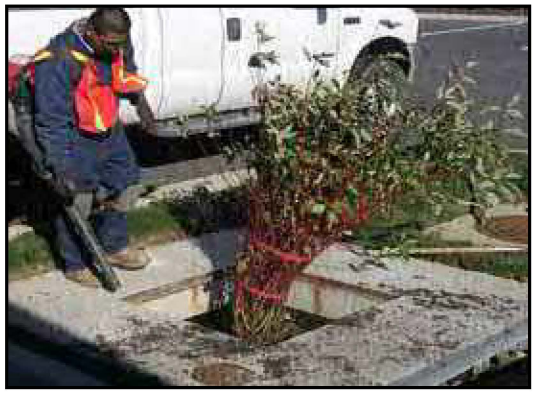
2. Removal of tree grate and erosion control stones



3. Removal of debris, trash and mulch



4. Mulch replacement



5. Clean area around Filterra



6. Complete paperwork and record plant height and width

Contech has created a network of Certified Maintenance Providers (CCMP's) to provide maintenance on Filterra systems. To find a CCMP in your area please visit www.conteches.com/maintenance

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Project Name:

Attachment 4
Copy of Plan Sheets Showing Permanent Storm Water BMPs

This is the cover sheet for Attachment 4.

Project Name:

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

The plans must identify:

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

VESTING TENTATIVE MAP 3262907 / SITE DEVELOPMENT PERMIT 3262906
NEIGHBORHOOD DEVELOPMENT PERMIT 3273605 / NEIGHBORHOOD USE PERMIT 3286476

EMERALD HILLS

CITY OF SAN DIEGO, CALIFORNIA

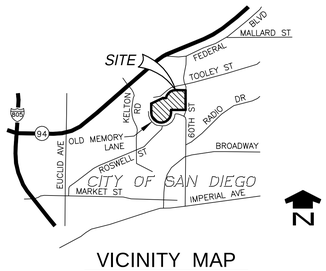
LEGEND

- SUBDIVISION BOUNDARY
- EXISTING PROPERTY DATA — LOT 270 / 46'
- PROPOSED LOT LINE WITH DIMENSION
- PROPOSED EASEMENT LINE
- PROPOSED LOT NUMBER — 7
- PROPOSED PAD ELEVATION — P=340.0
- PROPOSED FINISHED FLOOR ELEVATION — FF=340.7
- PROPOSED ARCH. PLAN TYPE — P-3
- PROPOSED CENTERLINE STREET ELEVATION — 886.0
- PROPOSED STREET GRADE — 2.5%
- PROPOSED SPOT ELEVATION — 844.0
- EXISTING CONTOURS — 840
- PROPOSED CONTOURS — 870
- PROPOSED SLOPE BANK (2: 1 MAX) — 2:1
- LIMITS OF PROPOSED GRADING
- PROPOSED RETAINING WALL
- PROPOSED BROW DITCH
- PROPOSED PUBLIC SEWER MAIN WITH MANHOLE
- EXISTING PUBLIC SEWER MAIN WITH MANHOLE
- PROPOSED PUBLIC WATER MAIN — W
- PROPOSED FIRE HYDRANT
- EXISTING PUBLIC WATER MAIN W/ FIRE HYDRANT — W
- PROPOSED STORM DRAIN
- EXISTING STORM DRAIN
- PROPOSED STREET LIGHT
- EXISTING STREET LIGHT
- EXISTING EASEMENT LABEL — 1
- PROPOSED EASEMENT LABEL — 1
- LIMITS OF WORK LINE
- PROPOSED AFFORDABLE UNIT — A
- PROPOSED MODEL HOME LOT — M
- PROPOSED MODEL HOME PARKING — P
- DESIGN NOTE CALLOUT — 1

LOT SUMMARY AREA

LOT NO.	LOT AREA (SF)
1	8,314
2	6,838
3	6,167
4	5,040
5	5,040
6	5,040
7	5,496
8	6,139
9	5,411
10	5,040
11	5,480
12	5,375
13	5,277
14	5,040
15	5,040
16	5,613
17	5,704
18	5,682
19	5,974
20	6,538
21	6,809
22	7,771
23	7,701
24	7,723
25	6,924
26	6,360
27	6,187
28	6,216
29	6,230
30	5,803
31	5,906
32	5,813
33	5,301
34	5,205
35	5,366
36	5,040
37	5,085
38	6,732
39	7,975
40	9,172
41	7,693
42	6,335
43	5,656
44	5,600
45	5,040
46	5,765
47	5,713
48	5,829
49	6,074
50	6,173
51	5,496
52	5,040
53	5,587
54	5,080
55	5,645
56	5,637
57	5,332
58	5,512
59	6,439
60	5,075
61	5,088
62	6,073
63	6,925
64	6,933
65	7,169

LOT NO.	LOT AREA (SF)
66	7,261
67	6,848
68	5,801
69	5,894
70	5,445
71	5,270
72	7,031
73	5,706
74	7,350
75	7,025
76	7,306
77	6,337
78	5,074
79	5,031
80	5,000
81	5,008
82	5,003
83	5,082
84	6,160
85	5,398
86	5,578
87	6,154
88	7,127
89	6,995
90	6,755
91	6,931
92	5,841
93	5,685
94	5,882
95	6,174
96	5,007
97	5,451
98	8,820
99	5,044
100	5,000
101	5,000
102	5,474
103	6,605
104	5,578
105	6,274
106	5,472
107	5,170
108	5,693
109	6,828
110	5,113
111	5,010
112	5,622
113	5,040
114	5,040
115	5,040
116	5,040
117	6,082
118	7,103
119	7,513
120	5,923
121	5,040
122	5,118
123	5,650
TOTAL LOTS	123
MAXIMUM	9,172
MINIMUM	5,000
RES. AVG LOT	5,954
TOTAL SF	732,378.0
TOTAL AC	16.813



VICINITY MAP

NOT TO SCALE

GRADING TABULATIONS

1. TOTAL AMOUNT OF SITE TO BE GRADED: 30.2 ACRES; 98% OF SITE
2. AMOUNT OF CUT: 176,400 CY
3. MAXIMUM DEPTH OF CUT: 36 FEET
4. AMOUNT OF FILL: 176,400 CY
5. MAXIMUM DEPTH OF FILL 27 FEET
6. MAXIMUM HEIGHT OF FILL SLOPES: 31 FEET, 2:1 MAX.
7. MAXIMUM HEIGHT OF CUT SLOPE: 33 FEET, 2:1 MAX.
8. AMOUNT OF IMPORT/EXPORT: 0 CY
9. RETAINING/CRIB WALLS LENGTH: 3340 FEET
10. RETAINING/CRIB WALL HEIGHT: 11.5 FEET

PROJECT AREA SUMMARY

DESCRIPTION	ACREAGE
PVT. OPEN SPACE LOTS	7.95
PUBLIC STREETS	6.42
SINGLE FAMILY LOTS	16.81
TOTAL	31.18

PARKING SUMMARY

REQUIRED		
NO. UNITS	SPACES REQD / UNIT (PER SDMC TABLE 142-05B)	TOTAL REQ.
123	2 SPACE / UNIT	246

PROVIDED	
TYPE	SPACES
GARAGE	246
TOTAL	246

PVT. OPEN SPACE LOT AREA SUMMARY

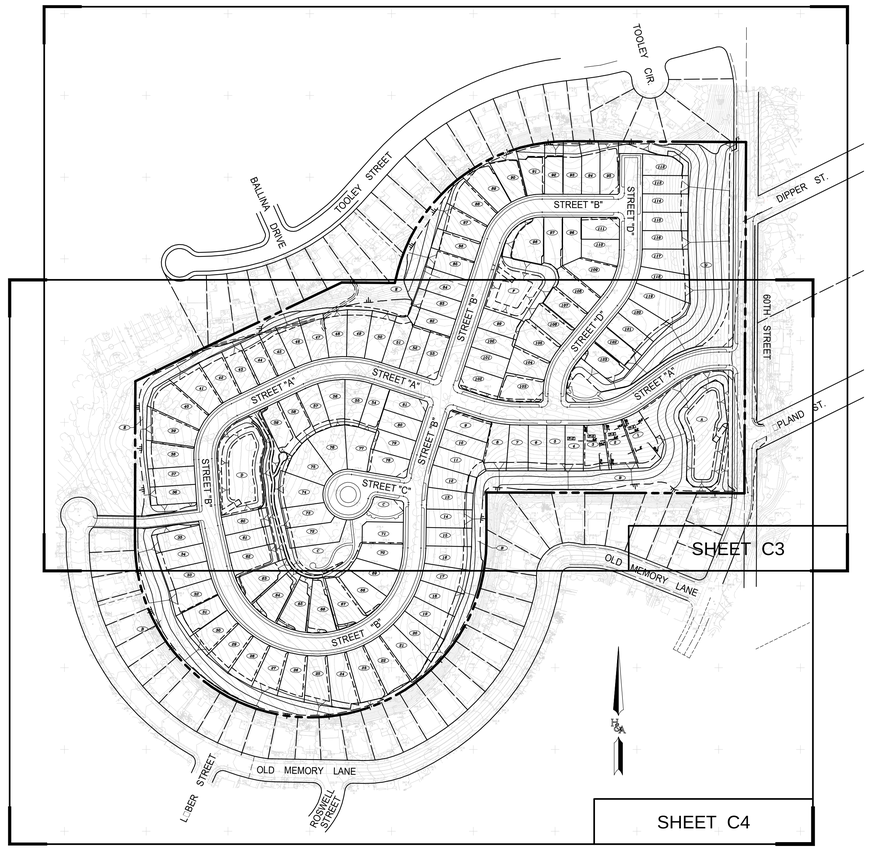
LOT NO.	LOT AREA
A	0.51
B	2.55
C	0.76
D	0.56
E	1.26
F	0.44
G	1.88
TOTAL AC	7.95

ARCHITECTURAL SUMMARY

PLAN	DISCRIPTION	LIVING AREA	NO. UNITS	UNIT MIX	AFFORDABLE UNITS
1.1342	3 BEDROOM	1,342 SF	26	21%	4
2.1992	4 BEDROOM	1,992 SF	29	24%	3
3.2057	4 BEDROOM	2,057 SF	33	27%	3
4.2516	5 BEDROOM	2,516 SF	35	28%	3
TOTAL			123	100%	13

NEIGHBORHOOD DEVELOPMENT PERMIT DEVELOPMENT INCENTIVE

DEVELOPMENT REGULATION			PROPOSED DEVIATION
MINIMUM LOT DIMENSIONS RS-1-7	LOT WIDTH	SDMC TABLE 131-04D PERMITS A MINIMUM LOT WIDTH OF 50 FEET	PROPOSED DEVIATION TO ALLOW A MINIMUM LOT WIDTH OF 45 FEET FOR LOTS: 2-7, 10-16, 33-37, 45, 51, 52, 54, 58, 60, 61, 82, 83, 85, 92-94, 96, 97, 112-116, 121 & 122
	STREET FRONTAGE	SDMC TABLE 131-04D PERMITS A MINIUM STREET FRONTAGE OF 50 FEET	PROPOSED DEVIATION TO ALLOW A MINIMUM STREET FRONTAGE OF 42 FEET FOR LOTS: 1-8, 10, 11, 14-42, 44-52, 54, 58, 60, 61, 77-80, 82, 83, 85-97, 79-101, 104, 105, 107, 108 & 113-122
	LOT WIDTH (CORNER)	SDMC TABLE 131-04D PERMITS A MINIMUM LOT WIDTH (CORNER) OF 55 FEET	PROPOSED DEVIATION TO ALLOW A MINIMUM LOT WIDTH (CORNER) OF 48 FEET LOTS: 9, 53, 78, 81, 95 & 111



SHEET KEY MAP

NOT TO SCALE

NEIGHBORHOOD DEVELOPMENT PERMIT DEVIATION

DEVELOPMENT REGULATION		PROPOSED DEVIATION
GENERAL FENCE REGULATIONS ALL ZONES	SDMC 142.0310(c)(1)(A) SOLID FENCES LOCATED ON THE FRONT OR STREET SIDE PROPERTY LINE SHALL NOT EXCEED 3 FEET IN HEIGHT	PROPOSED DEVIATION TO ALLOW 6 FOOT FENCES TO BE LOCATED ON THE STREET SIDE PROPERTY LINE FOR LOTS: 9, 53, 78, 81, 95, 102, 103 & 111
DRIVEWAY WIDTH REQUIREMENTS	SDMC 142.0560(j)(3) LIMITS DRIVEWAY CUTS ON RESIDENTIAL PROPERTY TO 40% OF THE LOT FRONTAGE	PROJECT PROPOSES 16-FOOT-WIDE DRIVEWAYS WITH A 3-FOOT FLARE ON EACH SIDE FOR A TOTAL OF A 22-FOOT-WIDE DEPRESSED WIDTH. PER SDMC SECTION 142.0560(j)(1), TABLE 42-05N, THE MINIMUM REQUIRED AND MAXIMUM ALLOWED DRIVEWAY WIDTH (OUTSIDE A PARKING IMPACT OVERLAY ZONE) FOR A DETACHED SINGLE DWELLING UNIT (LOT WIDTHS 50-FEET OR LESS) THE MINIMUM REQUIRED, AND MAXIMUM ALLOWED DRIVEWAY WIDTHS ARE 12-FEET AND 20-FEET, RESPECTIVELY. ADDITIONALLY, PER SDMC SECTION 142.0560(j)(1), TABLE 142-05M, FOR A DETACHED SINGLE DWELLING UNIT (LOT WIDTHS GREATER THAN 50-FEET) THE MINIMUM REQUIRED, AND MAXIUM ALLOWED DRIVEWAY WIDTHS ARE 12-FEET AND 25-FEET, RESPECTIVELY. HOWEVER, PER STANDARD DRAWING SDG-164, THAT IS REFERRED TO IN LDC142.0560(j)(3), THE PROPOSED 22-FOOT-WIDE CURB OPENING (16-FOOT-WIDE DRIVEWAY PLUS 3-FOOT FLARE ON EACH SIDE) ON ANY LOTS LESS THAN 55-FEET WIDE (XX OF THE 123 TOTAL SINGLE-FAMILY RESIDENTIAL LOTS IN THIS SUBDIVISION WOULD EXCEED THE 40% MAXIMUM FRONTAGE FOR A CURB OPENING IMPOSED BY THAT STANDARD DRAWING, LOTS: 1-11, 13-97, 99-101, 104-108 & 112-123).

GENERAL DESIGN NOTES

1. GRADING SHOWN HEREON IS PRELIMINARY AND MAY BE SUBJECT TO MINOR REFINEMENTS IN FINAL DESIGN. FINAL GRADING PLANS WILL CONFORM TO THE APPROVED PERMIT AND EXHIBITS.
2. DRAINAGE FACILITIES TO BE CONSTRUCTED PER CITY OF SAN DIEGO STANDARDS.
3. ALL LENGTHS, DISTANCES, LOT DIMENSIONS AND CURVE RADII ARE APPROXIMATE.
4. ALL UTILITIES SHALL BE UNDERGROUND AND EASEMENTS PROVIDED AS NECESSARY.
5. ALL ON-SITE WATER AND SEWER FACILITIES SHOWN ON THIS DRAWING ARE PUBLIC AND SHALL BE DESIGNED TO MEET THE REQUIREMENTS OF THE CURRENT CITY WATER & SEWER FACILITY DESIGN GUIDELINES SHALL BE REVIEWED AS PART OF THE BUILDING PERMIT PLAN CHECK.
6. THERE ARE NO PROPOSED OR EXISTING BUS/TRANSIT STATIONS OR STOPS.
7. INDIVIDUAL TRASH PICKUP IS PROPOSED AS PART OF THIS PROJECT.
8. BUILDING ADDRESS NUMBERS SHALL BE VISIBLE AND LEGIBLE FROM THE STREET OR ROAD FRONTING THE PROPERTY. (PER UFC 901.4.4).
9. IMPROVEMENTS SUCH AS DRIVEWAYS, UTILITIES, DRAINS AND WATER AND SEWER LATERALS SHALL BE DESIGNED SO AS TO NOT PROHIBIT THE PLACEMENT OF STREET TREES, ALL TO THE SATISFACTION OF THE CITY MANAGER.
10. CALIFORNIA BUILDING CODE CONSTRUCTION TYPE TO BE DETERMINED AT BUILDING PERMIT.
    FIRE SPRINKLERS: FULL NFPA-13 FIRE SPRINKLER SYSTEM.
    NUMBER OF STORIES: 2-STORY.
11. CALIFORNIA BUILDING CODE OCCUPANCY GROUP TO BE DETERMINED AT BUILDING PERMIT.
12. NO TREES OR SHRUBS EXCEEDING THREE FEET IN HEIGHT AT MATURITY SHALL BE INSTALLED WITHIN TEN FEET OF ANY SEWER FACILITY AND FIVE FEET OF ANY WATER.
13. FIRE ACCESS ROADWAY SIGNS OR RED CURBS WILL BE PROVIDED IN ACCORDANCE WITH BFLS POLICY A-96-1. TEMPORARY STREET SIGNS WILL BE PROVIDED IN ACCORDANCE WITH UFC 901.4.5
14. ALL DRAIN SYSTEMS NOT LOCATED IN A PUBLIC STREET OR PUBLIC DRAINAGE EASEMENTS SHALL BE PRIVATE.
15. ADEQUATE NOISE ATTENUATION WILL BE PROVIDED TO ENSURE AN INTERIOR NOISE LEVEL OF 45 dB CNEL FOR ALL SLEEPING ROOMS AND AN INTERIOR NOISE LEVEL OF 50dB FOR ALL OTHER INDOOR AREAS.
16. NO OBSTRUCTION INCLUDING SOLID WALLS IN THE VISIBILITY AREA SHALL EXCEED 3 FEET IN HEIGHT. PLANT MATERIAL, OTHER THAN TREES, WITHIN THE PUBLIC RIGHT-OF-WAY THAT IS LOCATED WITHIN VISIBILITY AREAS SHALL NOT EXCEED 24 INCHES IN HEIGHT
17. PRIOR TO THE ISSUANCE OF ANY CONSTRUCTION PERMIT, THE OWNER/PERMITTEE SHALL ENTER INTO A MAINTENANCE AGREEMENT FOR THE ONGOING PERMANENT BMP MAINTENANCE SATISFACTORY TO THE CITY ENGINEER.
18. PRIOR TO THE ISSUANCE OF ANY CONSTRUCTION PERMIT, THE OWNER/PERMITTEES SHALL INCORPORATE ANY CONSTRUCTION BEST MANAGEMENT PRACTICES NECESSARY TO COMPLY WITH CHAPTER 14, ARTICLE 2, DIVISION 1 (GRADING REGULATIONS) OF THE SAN DIEGO MUNICIPAL CODE, INTO THE CONSTRUCTION PLANS OR SPECIFICATIONS.
19. PRIOR TO THE ISSUANCE OF ANY CONSTRUCTION PERMIT, THE APPLICANT SHALL SUBMIT A TECHNICAL REPORT THAT WILL BE SUBJECT TO FINAL REVIEW AND APPROVAL BY THE CITY ENGINEER, BASED ON THE STORM WATER STANDARDS IN EFFECT AT THE TIME OF THE CONSTRUCTION PERMIT ISSUANCE
20. DEVELOPMENT OF THIS PROJECT SHALL COMPLY WITH ALL STORM WATER CONSTRUCTION REQUIREMENTS OF THE STATE CONSTRUCTION GENERAL PERMIT, ORDER NO, 2009-0090WQ, OR SUBSEQUENT ORDER, AND THE MUNICIPAL STORM WATER PERMIT, ORDER NO. R9-2013-0001, OR SUBSEQUENT ORDER. IN ACCORDANCE WITH ORDER NO. 2009-0090WQ, OR SUBSEQUENT ORDER, A RISK LEVEL DETERMINATION SHALL BE CALCULATED FOR THE SITE AND A STORM WATER POLLUTION PREVENTION PLAN (SWPPP) SHALL BE IMPLEMENTED CONCURRENTLY WITH THE COMMENCEMENT OF GRADING ACTIVITIES.
21. PRIOR TO THE ISSUANCE OF A GRADING OR A CONSTRUCTION PERMIT, A COPY OF THE NOTICE OF INTENT (NOI) WITH A VALID WASTE DISCHARGE ID NUMBER (WDID#) SHALL BE SUBMITTED TO THE CITY OF SAN DIEGO AS A PROOF OF THE ENROLLMENT UNDER THE CONSTRUCTION GENERAL PERMIT. WHEN OWNERSHIP OF THE ENTIRE SITE OR PORTIONS OF THE SITE CHANGES PRIOR TO FILING OF THE NOTICE OF TERMINATION (NOT) A REVISED NOI SHALL BE SUBMITTED ELECTRONICALLY TO THE STATE WATER RESOURCES BOARD IN ACCORDANCE WITH THE PROVISIONS AS SET FORTH IN SECTION II.C OF ORDER NO 2009-0009-DWQ AND A COPY SHALL BE SUBMITTED TO THE CITY.
22. ALL BEARINGS AND DISTANCES ARE LOCATED AND SHOWN ON C8.
23. NO PRIVATE IMPROVEMENTS (INCLUDING LANDSCAPING, ENHANCED PAVING, PRIVATE UTILITIES, OR STRUCTURES OF ANY KIND) THAT COULD INHIBIT THE MAINTENANCE, REPAIR, OR REPLACEMENT OF PUBLIC UTILITIES, MAY BE INSTALLED, CONSTRUCTED, OR LOCATED WITHIN THE LIMITS OF A PUBLIC WATER, SEWER OR GENERAL UTILITY EASEMENT WITHOUT A CITY APPROVED AND COUNTY RECORDED ENCROACHMENT AND MAINTENANCE REMOVAL AGREEMENT (EMRA).
24. ALL WATER LINES SERVING THIS DEVELOPMENT (INCLUDING DOMESTIC, IRRIGATION, AND FIRE) MUST PASS THROUGH A PERMITTED, PRIVATE, ABOVE GROUND, BACKFLOW PREVENTION DEVICE (BFPD).
25. THE OWNER/PERMITEE SHALL BE RESPONSIBLE FOR ANY DAMAGE CAUSED TO CITY OF SAN DIEGO WATER AND SEWER FACILITIES IN THE VICINITY OF THE PROJECT SITE, DUE TO THE CONSTRUCTION ACTIVITIES ASSOCIATED WITH THIS PROJECT, IN ACCORDANCE WITH MUNICIPAL CODE SECTION 142.0607. IN THE EVENT ANY SUCH FACILITY LOSES INTEGRITY THEN, THE OWNER/PERMITTEE SHALL REPAIR OR RECONSTRUCT ANY DAMAGED PUBLIC WATER AND SEWER FACILITY IN A MANNER SATISFACTORY TO THE PUBLIC UTILITIES DIRECTOR AND CITY ENGINEER.
26. NO PUBLIC WATER, SEWER OR GENERAL UTILITY EASEMENTS CURRENTLY EXIST ON THE SUBJECT PROPERTY.
27. THIS PROJECT IS A MULTIPLE "UNIT" SUBDIVISION. IT IS THE INTENT THAT MULTIPLE FINAL MAPS BE FILED PURSUANT TO SECTION 66456.1 OF THE SUBDIVISION MAP ACT. THE FINAL MAP MAY CONSIST OF ONE OR MORE MULTIPLE LOTS AS SHOWN ON THIS TENATIVE MAP.
28. A FINAL MAP SHALL BE FILED AT THE COUNTY RECORDER'S OFFICE PRIOR TO THE EXPIRATION OF THE TENTATIVE MAP, IF APPROVED.
29. NO OBSTRUCTION INCLUDING SOLID WALLS IN THE VISIBILITY AREA SHALL EXCEED 3 FEET IN HEIGHT. PER SDMC SECTION 142.0409 (B)(2), PLANT MATERIAL, OTHER THAN TREES, LOCATED WITHIN VISIBILITY AREAS OR THE ADJACENT PUBLIC RIGHT-OF-WAY SHALL NOT EXCEED 36 INCHES IN HEIGHT, MEASURED FROM THE LOWEST GRADE ABUTTING THE PLANT MATERIAL TO THE TOP OF THE PLANT MATERIAL.
30. EXISTING BUILDINGS/STRUCTURES: AN EXISTING 2-STORY TRANSMITTER BUILDING IS LOCATED ON-SITE, DATE OF CONSTRUCTION 1948-1949. TWO EXISTING TRANSMITSSION TOWERS ARE LOCATED ON-SITE. ALL EXISTING BUILDING AND STRUCTURES ARE TO BE REMOVED.
31. NO EXISTING LOW INCOME UNITS ARE LOCATED ON-SITE.
32. APPROVEAL FROM THE CALIFORNIA DEPARTMENT OF HEALTH SERVICES - DRINKING WATER FIELD OPERATIONS BRANCH WILL BE PROVIDED IN FINAL ENGINEERING FOR WATER AND SEWER SEPARATIONS LESS THAN 10 FEET.

DEVELOPMENT SUMMARY

THE PROPOSED 31.18 ACRE DEVELOPMENT SITE, APN 543-340-02-00 IS LOCATED AT 5702 OLD MEMORY LANE IN THE ENCANTO NEIGHBORHOODS COMMUNITY PLAN. THE PROPERTY IS PRESENTLY OCCUPIED BY EXISTING BROADCAST TOWERS AND TRANSMITTER BUILDING. THE CURRENT DEVELOPMENT PROPOSAL CONSISTS OF THE CONSTRUCTION OF 123 SINGLE-FAMILY LOTS AND 7 PRIVATE HOA OPEN SPACE LOTS, ALONG WITH PUBLIC ROAD AND PUBLIC & PRIVATE UTILITY IMPROVEMENTS. ALL EXISTING BROADCAST TOWERS AND OUTBUILDINGS ON SITE WILL BE REMOVED AS PART OF THE DEVELOPMENT PROPOSAL. THE CURRENT PROJECT REQUIRES A VESTING TENTATIVE MAP (VTM), A SITE DEVELOPMENT PERMIT (SDP) FOR ENVIRONMENTALLY SENSITIVE LANDS, NEIGHBORHOOD DEVELOPMENT PERMIT AND NEIGHBORHOOD USE PERMIT.

GENERAL NOTES

1. SITE AREA DATA:
   GROSS SITE AREA: 31.18 ACRES
   NET SITE AREA: 24.87 ACRES (GROSS AREA - ROW DEDICATIONS)
2. TOTAL NUMBER OF EXISTING/PROPOSED LOTS:
   EXISTING LOTS: 1
   PROPOSED LOTS: 130 (123 RESIDENTIAL + 7 HOA OPEN SPACE LOTS)
3. TOTAL NUMBER OF PROPOSED UNITS: 123 SINGLE FAMILY (13 UNITS ARE AFFORDABLE)
4. COMMUNITY PLAN: ENCANTO NEIGHBORHOODS
5. COMMUNITY PLAN LAND USE DESIGNATION:
   EXISTING/PROPOSED: RESIDENTIAL VERY LOW 0-4 DU/AC
6. ZONING:
   EXISTING: RS-1-2
   PROPOSED: RS-1-2
7. OVERLAY ZONES: AIRPORT LAND USE COMPATIBILITY OVERLAY ZONE
8. DENSITY PROPOSED:
   GROSS SITE DENSITY: 3.9 DU/AC (123 UNITS/31.18 AC)
9. APN: 543-340-02-00
10. AVERAGE DAILY TRIPS: 1230 (123 UNITS X 10 TRIPS)
11. GEO HAZARD ZONE: 52
12. NAD 27 COORDINATE INDEX: 203-1748
    NAD 83 COORDINATE INDEX: 1843-6309

TOPO SOURCE

THE TOPOGRAPHIC MAPPING REFLECTED HEREON WAS COMPILED BY AERIAL PHOTOGRAMMETRY METHODS CONDUCTED BY R.J. LUNG AND ASSOCIATES FLOWN ON APRIL 4, 2021 TOGETHER WITH CONVENTIONAL SURVEYING METHODS CONDUCTED BY HUNSAKER AND ASSOCIATES SAN DIEGO, INC. AND FIELD VERIFIED ON FEBRUARY 8, 2024.

MAPPING & MONUMENTATION

A FINAL MAP SHALL BE FILED AT THE COUNTY RECORDER'S OFFICE PRIOR TO THE EXPIRATION OF THE TENTATIVE MAP. A DETAILED PROCEDURE OF SURVEY SHALL BE SHOWN ON THE FINAL MAP AND ALL PROPERTY CORNERS SHALL BE MARKED WITH DURABLE SURVEY MONUMENTS.

BASIS OF BEARINGS

THE BASIS OF BEARINGS FOR THIS TENTATIVE MAP IS THE CALIFORNIA COORDINATE SYSTEM, CCS83, ZONE 6, EPOCH 1991.35 AND IS DETERMINED BY G.P.S. MEASUREMENTS AND WERE ESTABLISHED FROM G.P.S. STATION 1173 AND G.P.S. STATION 1181 PER ROS 14492. THE BEARING FROM G.P.S. STATION 1173 TO G.P.S STATION 1181 IS N80°42'55"W, QUOTED BEARINGS FROM REFERENCE MAPS OR DEEDS MAY OR MAY NOT BE IN TERMS OF SAID SYSTEM. THE COMBINED GRID FACTOR AT G.P.S. STATION 1173 IS 1.00000025. GRID DISTANCE X COMBINED GRID FACTOR. ELEVATION AT G.P.S. STATION 1173 IS 287.33' NGVD29.

BENCH MARK / DATUM

CITY OF SAN DIEGO BRASS PLUG IN THE TOP OF CURB AT THE SOUTHEAST CORNER OF THE INTERSECTION OF LUBER STREET AND OLD MEMORY LANE.
ELEV. 315.558'

DATUM: MSL CITY OF SAN DIEGO

LAND SURVEYOR

PER SECTION 66424.5(A) OF THE SUBDIVISION MAP ACT, A TENTATIVE MAP NEED NOT BE BASED UPON AN ACCURATE OR DETAILED FINAL SURVEY OF THE PROPERTY. THE LINES AND INFORMATION REFERENCED HEREON DO NOT CONSTITUTE A BOUNDARY SURVEY OF THE PROJECT. IT IS UNDERSTOOD THAT FURTHER APPROVED CONSTRUCTION PERMITTING BEYOND THE TENTATIVE MAP WILL BE NECESSARY. THE TOPOGRAPHIC INFORMATION AND GEODETIC REFERNCES REFLECTED HEREON WERE CONDUCTED UNDER MY SUPERVISION.

6-10-2024

JIMMY J. ELMORE P.L.S. 8483 DATE
HUNSAKER & ASSOCIATES SAN DIEGO, INC.

LICENSED LAND SURVEYOR JIMMY J. ELMORE L.S. 8483 STATE OF CALIFORNIA

ENGINEER

HUNSAKER & ASSOCIATES SD,INC.
9707 WAPLES STREET
SAN DIEGO, CA 92121
(858) 558-4500

6/10/24

ALISA S. VIALPANDO R.C.E. 47945 DATE

REGISTERED PROFESSIONAL ENGINEER ALISA S. VIALPANDO C 47945 CIVIL STATE OF CALIFORNIA

PREPARED BY:

HUNSAKER & ASSOCIATES SAN DIEGO, INC

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

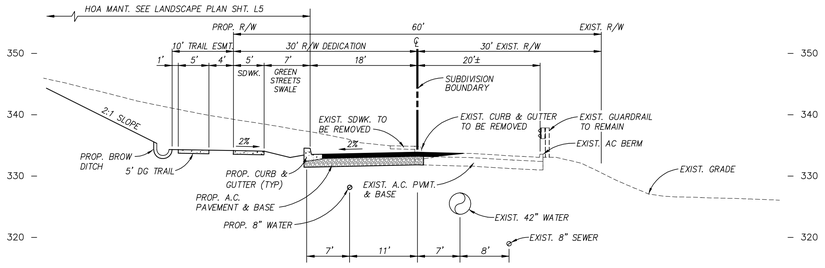
REVISIONS	DATE	BY
ORIGINAL	11/20/23	HAA
REV. PER CITY COMMENTS	2/08/24	HAA
REV. PER CITY COMMENTS	6/10/24	HAA

VESTING TENTATIVE MAP
GRADING AND DRAINAGE PLAN
EMERALD HILLS
CITY OF SAN DIEGO, CALIFORNIA

SHEET C1

W.O. 1375-0238

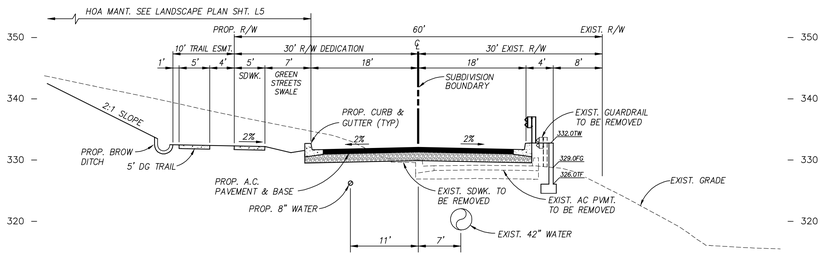
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STA. 10+50

60TH STREET
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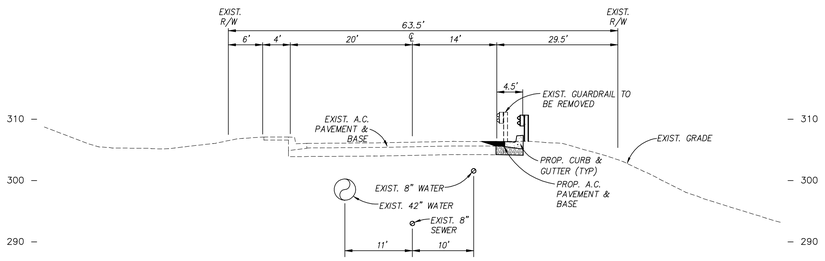
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STA. 14+00

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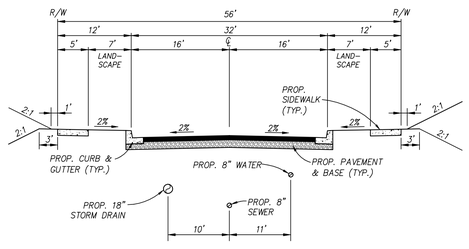
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STA. 19+00

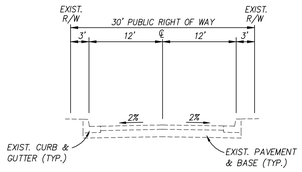
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RESIDENTIAL LOCAL STREET (PUBLIC)
STREETS "A" TO "D"

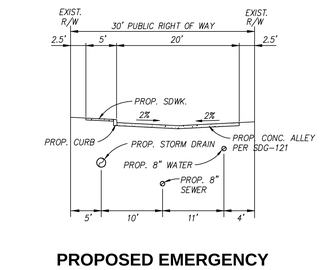
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EXIST. PROPERTY ACCESS AT NORTH END OF OLD MEMORY LANE

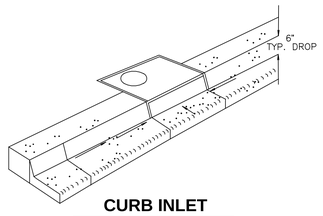
EXISTING ACCESS PUBLIC IMPROVEMENTS

NOT TO SCALE



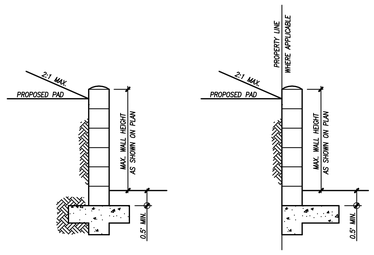
PROPOSED EMERGENCY VEHICLE ACCESS

NOT TO SCALE



CURB INLET

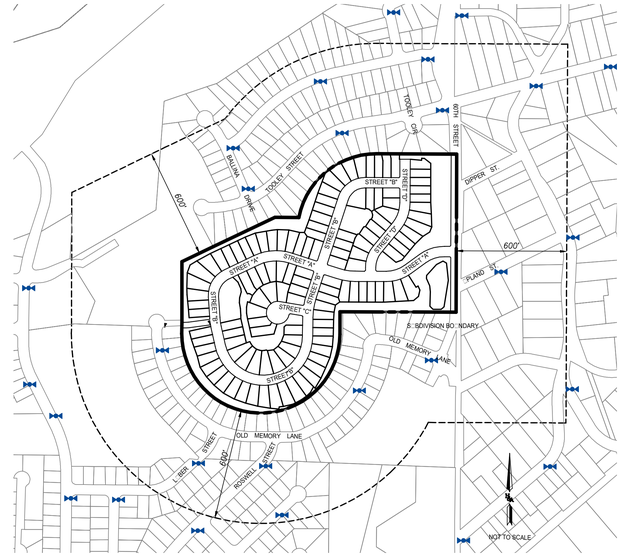
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TYPICAL RETAINING WALL

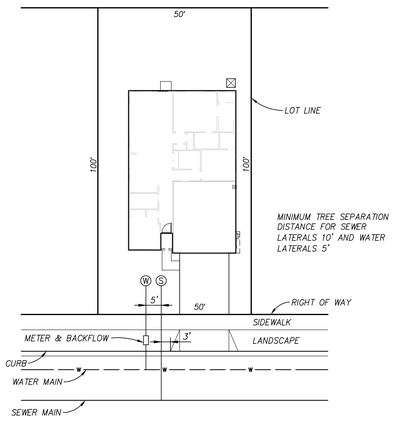
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NOTES:
1. **RETAINING WALL HEIGHT WITHIN THE FRONT YARD SETBACK SHALL NOT EXCEED 3 FEET, PURSUANT TO SDMC, SECTION 142.0340 (C).**
3. **RETAINING WALLS SHALL BLEND WITH THE SITE PURSUANT TO SDMC, SECTION 142.0340.**



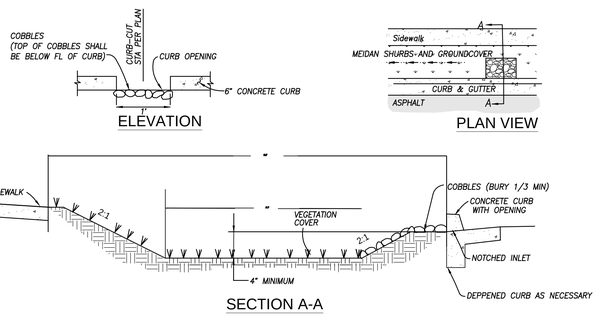
EXIST. FIRE HYDRANTS

NOT TO SCALE



TYPICAL LATERAL DETAIL

NOT TO SCALE



DETAIL-GREEN CURB-CUT

NOT TO SCALE

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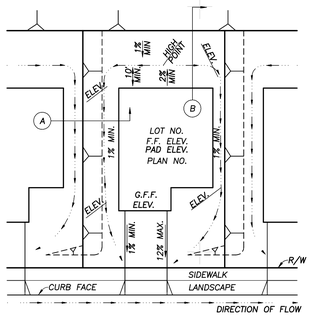
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9707 Waples Street
San Diego, Ca 92121
PH(858)558-4500 FX(858)558-1414

STREET SECTIONS / DETAILS
EMERALD HILLS
CITY OF SAN DIEGO, CALIFORNIA

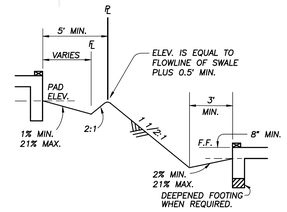
SHEET
C2

W.O. 1375-0238



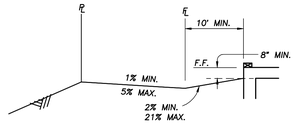
TYPICAL LOT DRAINAGE

NOT TO SCALE



SECTION "A-A"

NOT TO SCALE



SECTION "B-B"

NOT TO SCALE

DESIGN NOTES

1. REMOVE EX. MANHOLE & RELOCATE
2. 24" CONCRETE EVA DRIVEWAY
3. RCP STORM DRAIN PUBLIC
4. 8" PVC WATER PUBLIC
5. 8" PVC SEWER PUBLIC
6. 4'x4' FILTERRA INLET TYPE UNIT
7. WATER POC
8. SEWER POC
9. STORM DRAIN POC
10. EVA SWING GATE WITH KNOX BOX
11. SIGHT DISTANCE TRIANGLES
12. TRANSITION AC PAVEMENT COMFORT. NOT BASED ON CALTRANS STANDARD
13. CURB AND GUTTER
14. ADDITIONAL 7' PARKWAY
15. STORM DRAIN PRIVATE
16. EXIST. TWO-STORY TRANSMITTER BUILDING TO BE REMOVED
17. EXIST. UTILITY POLE TO REMAIN
18. LIMIT OF WORK LINE
19. PROP. PVT. 10' MOUNTABLE APRON WITH EWRA
20. PROP. PLANTABLE AREA
21. VISIBILITY AREA NO OBJECTS HIGHER THAN 24"

PROPOSED EASEMENTS

1. 15' PRIVATE STORM DRAIN
2. 10' PUBLIC TRAIL



NO TEMPORARY OR PERMANENT CONSTRUCTION IMPACTS TO CITY FEE-OWNED PROPERTY.

NO TEMPORARY ACCESS ACROSS OR ON CITY FEE-OWNED PROPERTY DURING CONSTRUCTION

NO REMEDIAL GRADING SUB-SURFACE INFRASTRUCTURE OR ENCROACHMENT ON CITY FEE-OWNED PROPERTY.

SEE SHEET NO. C4

PREPARED BY:

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

VESTING TENTATIVE MAP / TOPO MAP / GRADING AND DRAINAGE PLAN

EMERALD HILLS

CITY OF SAN DIEGO, CALIFORNIA

SHEET C3

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SEE SHEET NO. C3



DESIGN NOTES

1. REMOVE EX. MANHOLE & RELOCATE
2. 24' CONCRETE EVA DRIVEWAY
3. RCP STORM DRAIN PUBLIC
4. 8" PVC WATER PUBLIC
5. 8" PVC SEWER PUBLIC
6. 4'x4' FILTERRA INLET TYPE UNIT
7. WATER POC
8. SEWER POC
9. STORM DRAIN POC
10. EVA SWING GATE WITH KNOX BOX
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14. ADDITIONAL 7' PARKWAY
15. STORM DRAIN PRIVATE
16. EXIST. TWO-STORY TRANSMITTER BUILDING TO BE REMOVED
17. EXIST. UTILITY POLE TO REMAIN
18. LIMIT OF WORK LINE
19. PROP. PVT. 10' MOUNTABLE APRON WITH EMRA
20. PROP. PLANTABLE AREA
21. VISIBILITY AREA NO OBJECTS HIGHER THAN 24"

PROPOSED EASEMENTS

1. 15' PRIVATE STORM DRAIN
2. 10' PUBLIC TRAIL

PREPARED BY:

HUNSAKER & ASSOCIATES SAN DIEGO, INC

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

VESTING TENTATIVE MAP / TOPO MAP / GRADING AND DRAINAGE PLAN

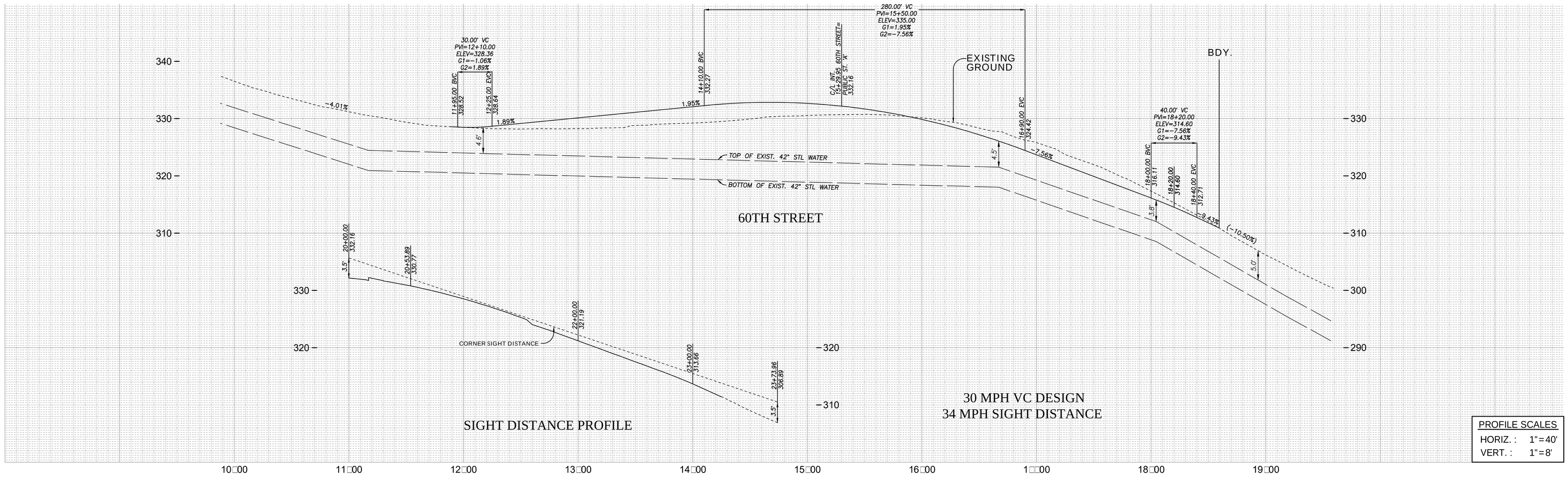
EMERALD HILLS

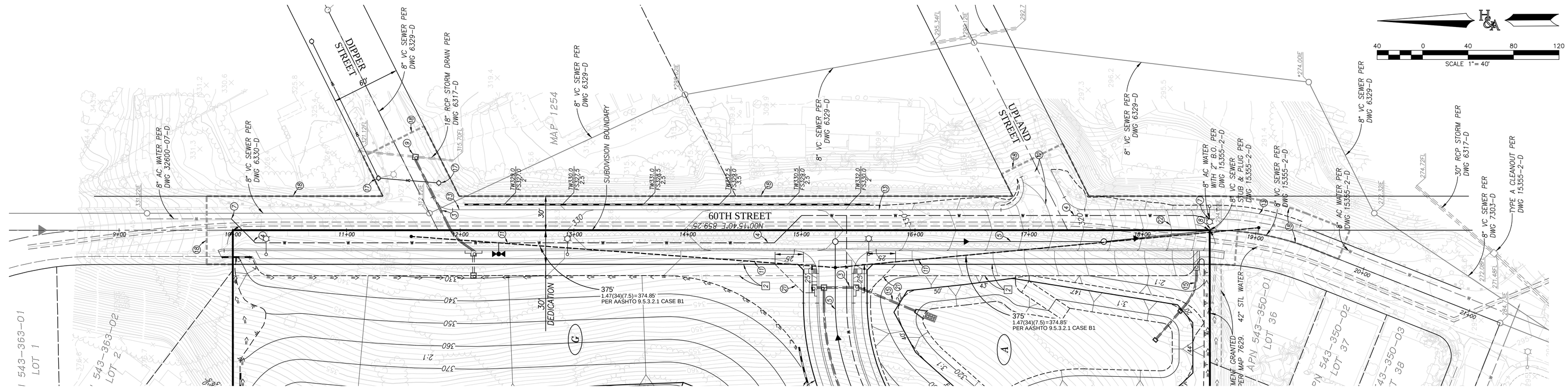
CITY OF SAN DIEGO, CALIFORNIA

SHEET C4

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60TH STREET

DESIGN NOTES

1. REMOVE EX. MANHOLE & RELOCATE
2. 24' CONCRETE EVA DRIVEWAY
3. RCP STORM DRAIN PUBLIC
4. 8" PVC WATER PUBLIC
5. 8" PVC SEWER PUBLIC
6. 4'x4' FILTERRA INLET TYPE UNIT
7. WATER POC
8. SEWER POC
9. STORM DRAIN POC
10. EVA SWING GATE WITH KNOX BOX
11. SIGHT DISTANCE TRIANGLES
12. TRANSITION AC PAVEMENT COMFORT NOT BASED ON CALTRANS STANDARD
13. CURB AND GUTTER
14. ADDITIONAL 3' PARKWAY
15. STORM DRAIN PRIVATE
16. EXIST. TWO-STORY TRANSMITTER BUILDING TO BE REMOVED
17. EXIST. UTILITY POLE TO REMAIN
18. LIMIT OF WORK LINE
19. PROP. PVT. 10' MOUNTABLE APRON WITH EMRA
20. PROP. PLANTABLE AREA
21. VISIBILITY AREA NO OBJECTS HIGHER THAN 24"

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1. 15' PRIVATE STORM DRAIN
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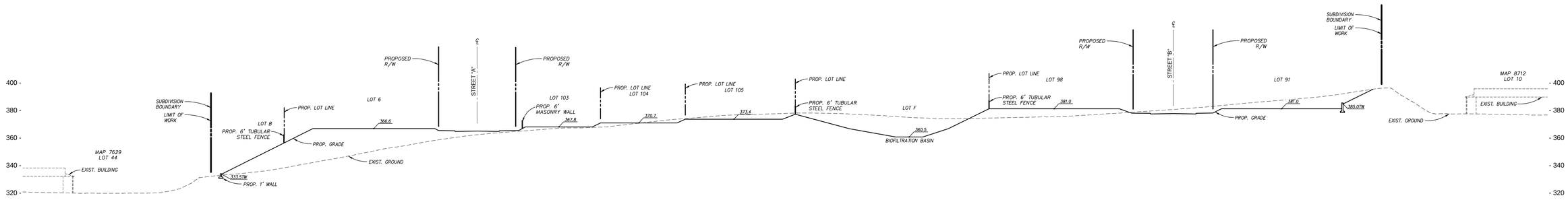
60TH STREET PLAN / PROFILE

EMERALD HILLS

CITY OF SAN DIEGO, CALIFORNIA

SHEET C6

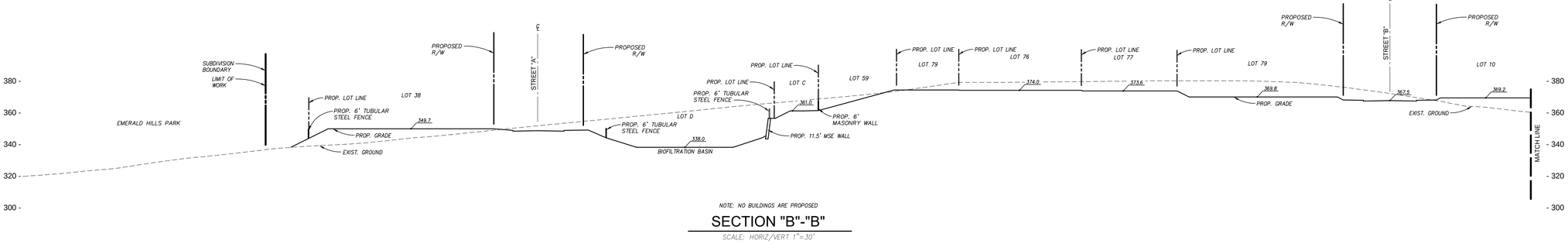
W.O. 1375-0238



NOTE: NO BUILDINGS ARE PROPOSED

SECTION "A"-"A"

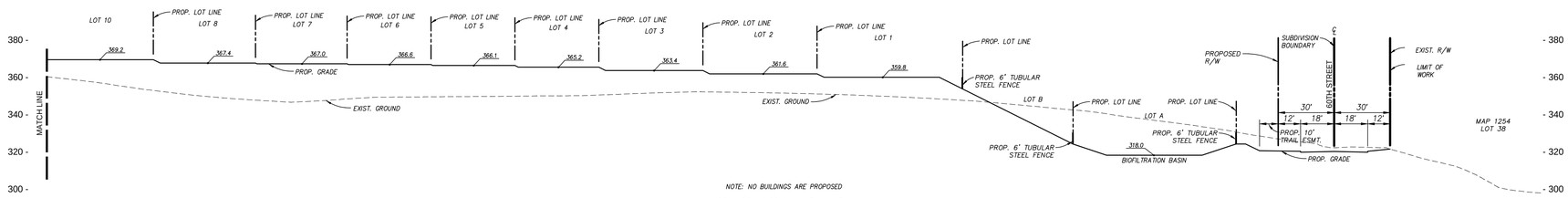
SCALE: HORIZ/VERT 1"=30'



NOTE: NO BUILDINGS ARE PROPOSED

SECTION "B"-"B"

SCALE: HORIZ/VERT 1"=30'



NOTE: NO BUILDINGS ARE PROPOSED

SECTION "B"-"B"

SCALE: HORIZ/VERT 1"=30'

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PLANNING 9707 Waples Street
ENGINEERING San Diego, Ca 92121
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SITE SECTIONS

EMERALD HILLS

CITY OF SAN DIEGO, CALIFORNIA

SHEET

C7

W.O. 1375-0238

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Project Name:

Attachment 5
Drainage Report

Attach project's drainage report. Refer to Drainage Design Manual to determine the reporting requirements.

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EMERALD HILLS
DRAINAGE ST□DY

VTM-PMT-326907 / SDP-PMT-3262906/NDP/NUP (PRJ-1107880)

City of San Diego, CA
APN. 543-340-02-00

Prepared by:
Hunsaker □ Associates - San Diego, Inc.
9□0□ Waples Street
San Diego, CA 92121
Telephone: □858□558-4500

Prepared for:
D.R. Horton
2280 Wardlow Circle, Suite 100
Corona, CA 928□8
□888□555-1212

Preparation□Revision Date:
May 31, 2024



Alisa S. Vialpando 05/31/2024

Alisa S. Vialpando, RCE □4□945 Date
Hunsaker □ Associates
San Diego, Inc.

Contents

1 Scope 1
2 Existing Conditions 1
3 Proposed Conditions 3
4 Methodology 5
4.1 Hydrology 5
4.2 Detention 6
5 Results and Conclusions 8
6 Appendices 9

List of Appendices

Appendix 1 – Hydrology Calculations and Exhibits

Appendix 2 – Detention Analysis

Appendix 3 – Soil Information

Appendix 4- FEMA FIRMette and FIRM Panel

1 Scope

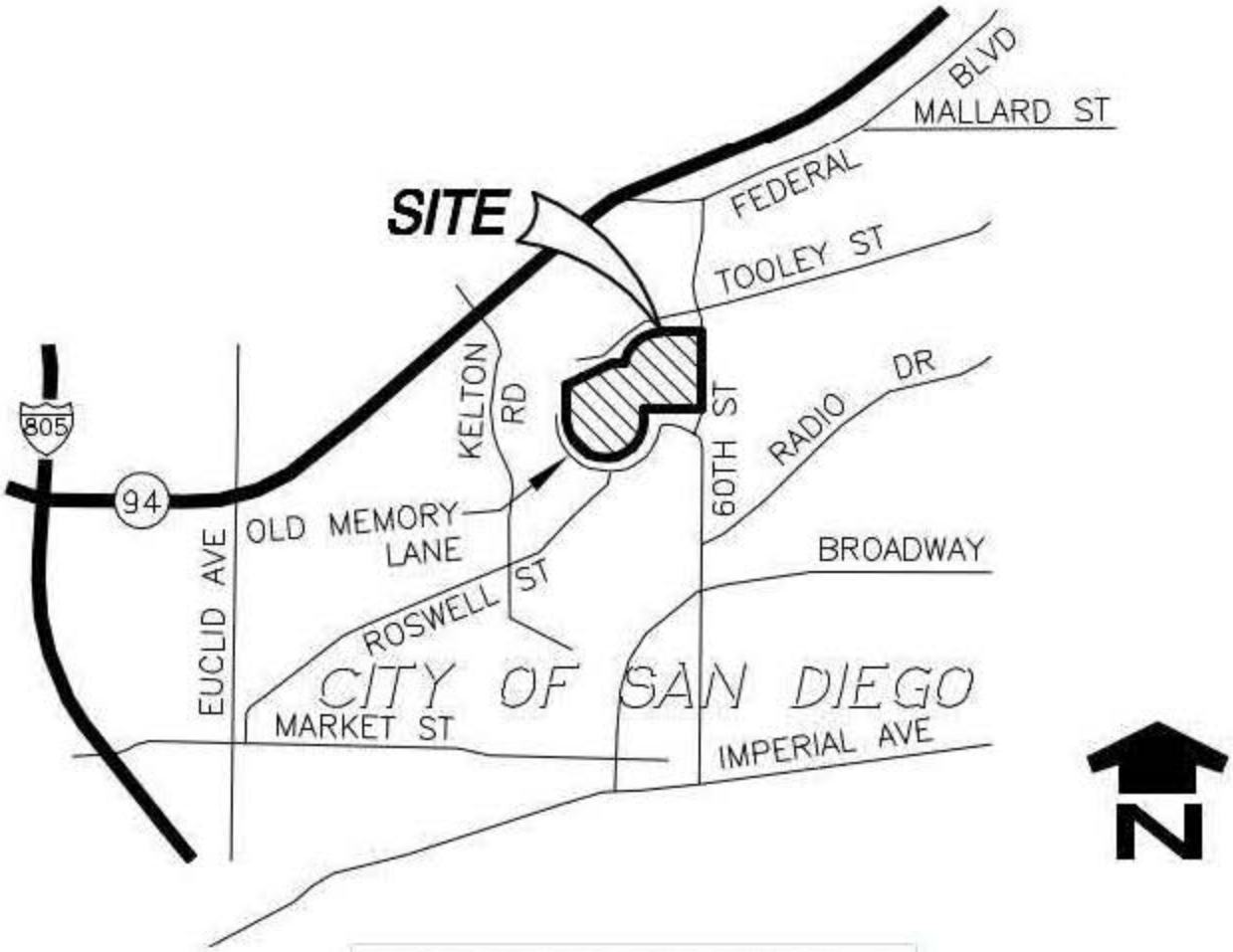
The purpose of this study is to provide hydrologic and hydraulic calculations in support of the Emerald Hills project, a proposed development that will create 123 single-family lots and five (5) private HOA open space lots in the City of San Diego, California. This report aims to quantify the proposed runoff for the 100-year frequency storm event and will present calculations demonstrating that the attenuation of post-developed flows, managed through three onsite biofiltration basins, will not exceed pre-developed flows. Treatment of storm water runoff from the site is addressed in a separate report titled "Priority Development Project Storm Water Quality Management Plan for Emerald Hills," prepared by Hunsaker and Associates, SD, and dated October 2023.

2 Existing Conditions

Emerald Hills is a roughly 31.18-acre site, located in the City of San Diego, California. The property is bounded to the south-southwest by residential property along Old Memory Lane and to the north by Tooley Street, bounded to the east by 60th Street, and bounded along portions of the west by Emerald Hills Park. The site is largely unimproved, however there are two existing transmission towers, a two-story building, and a relatively level pad for equipment (presumably generators and outdoor storage). An approximately 3-4' tall berm, eroded and overgrown with vegetation, exists near the entrance. Please see the vicinity map below.

The site topography is characterized by two broadly sloped knolls located in the northeast and southwest bisected with gorges that trend to northwest and southeast. In its existing conditions, runoff from the property drains to three primary discharge locations. There's no run-on through the site, instead the onsite runoff merges with the offsite runoff outside the project boundary before reaching these discharge points.

The northeastern portion of the property encompasses 24% steep slopes. Surface flows from this area move easterly towards 60th Street and then drain northward to a depression at the northeast corner of the Dippers Street and 60th Street intersection (Node 400). From here, runoff enters an 18" RCP culvert running south beneath Dipper Street. Upon exiting the culvert (Node 401), runoff continues south in an open channel, merging with runoff from the northeastern offsite area. This combined flow then enters a 24" RCP culvert beneath Upland Street (Node 402) and discharges into an open channel (Node 403). This channel proceeds southwesterly to a 30" RCP culvert crossing 60th Street at Node 800. This culvert also gathers runoff from the southern section of the site's eastern boundary, which has steep slopes directing water towards



VICINITY MAP

NOT TO SCALE

60th Street, as well as runoff from □pland Street and the southeastern offsite region. The collected runoff at Node 800 moves in the 30□RCP to Node 250, mingling with flows from the site's southeastern section, an area with steep slopes draining into a brow ditch. This ditch channels flows easterly, discharging onto 60th Street via an 18□ culvert at the site□s southeastern corner. From here, flows move south via the 60th Street curb and gutter, joined by offsite flows from Old Memory Ln and existing developments southeast of the site. This combined runoff enters an existing inlet at Node 250 on 60th Street, merging with flows from Node 800. The cumulative runoff then travels through a 36□RCP, discharging into an open channel via a headwall at Node 50. This channel continues for 0.31 miles south before emptying into Chollas Creek.

The southwestern portion of the site features a steep slope and houses a pad for one of the transmission towers. Surface runoff from this section flows south towards an existing browditch, which runs west along the site's southern boundary. This ditch captures runoff, leading it into an 18□RCP via an existing headwall at Node 320. This flow then merges with offsite runoff originating from Old Memory Ln and the residential area situated southwest of the site □Node 300 and 350□. The combined flow travels approximately 0.14 miles west through a 24□RCP □from Node 350□, eventually discharging into an open channel located 3□9 feet from Luber St on Kelton Rd. From here, the channel moves in a northwesterly direction, ultimately emptying into the South Chollas Creek Channel.

The northern portion of the site is characterized by a steep slope, a pad for an existing transmission tower, and a two-story building. Runoff from the eastern part of this sub-watershed originates from the steep slope and flows towards an existing headwall. It then enters an 18□RCP at Node 100. This runoff moves approximately 860 ft through the existing storm drain system, merging with offsite runoff along the way, and eventually discharges into an open channel located 260' from Ballina Dr on Tooley St. Concurrently, flows from the remainder of this sub-watershed surface flow in a northern direction, ultimately joining this open channel at Nodes 600 and □00. This channel continues for about □40 feet before it discharges into the South Chollas Creek Channel. Refer to Appendix 1 for the Hydrology Map of Existing Conditions and the associated hydrologic analysis.

The project drains into Chollas Creek and is part of the Pueblo San Diego Hydrologic □nit, within the San Diego Mesa Hydrologic Area and the Chollas Hydrologic Sub-area □908.22□. The site is not located within any designated special flood hazard areas according to FIRMette 060□3C1902G, effective as of 5□16□2012. Refer to Appendix 4 for FEMA FIRMette and FIRM Panel.

According to the □nited States Department of Agriculture □□SDA□website, the majority of the project site is characterized by soil type "D," with a minor portion being soil type "C". However, for the purpose of this analysis, soil type "D" has been assumed for the entire site in accordance with the "City of San Diego □Drainage Design Manual □Section A.1.2: January 201□ Edition." Type "D" soils are categorized as having a slow infiltration rate when thoroughly wet. Refer to Appendix 3 for Soil Map.

3 Proposed Conditions

The proposed development will create 123 single-family lots and five □5□private HOA open space lots, along with private roads, sidewalks, and public □ private utility improvements. All existing broadcast towers and outbuildings on site will be removed as part of the development proposal. The project proposes widening and street improvements on 60th Street east of the site.

Onsite drainage improvements will include three on site water □uality□hydromodification basins with a storm drain system to safely convey runoff through the project to the biofiltration basins to address water □uality, hydromodification and peak flow mitigation before discharging into the existing drainage system similar to existing conditions.

Drainage Routing and Improvements:

In the proposed conditions, the site consists of three drainage areas. Each of these areas will have its runoff collected by proposed storm drain inlets and subse□uently routed through the on-site storm drain system, leading to its associated biofiltration basin.

Runoff from the proposed graded slope adjacent to the site□s northeastern boundary will flow easterly and will be collected via the proposed brow ditch. This will direct the flow to a proposed catch basin. Subse□uently, this drainage will commingle with the drainage stemming from the 60th Street widening, which is set to be gathered by the proposed inlet at Node 450. This combined flow will be directed northeasterly through a proposed storm drainpipe, entering the existing 18□RCP culvert beneath Dipper Street. Here, it will merge with the offsite runoff that enters the existing 18□RCP culvert from the depression located northeast of the 60th Street and Dipper Street intersection at Node 400, mirroring the existing condition. The runoff's journey from Node 401 to Node 250 will align with existing flow patterns, detailed in Section 2 of this report.

Runoff from the on-site eastern drainage area (200 Node series) will be collected by the proposed inlets and directed by the proposed storm drain system to the biofiltration/detention basin at Node 20. At this location, flow will be mitigated to a level below that of the existing conditions. This mitigated flow will then be conveyed via the proposed storm drain system to a curb outlet at 60th Street (Node 25), in a manner consistent with existing conditions. The runoff will subsequently travel south along the 60th Street curb and gutter system, eventually reaching the existing inlet at Node 250. From this point, it will commingle with the flows from Node 800 and discharge at Node 50, similar to existing condition.

Runoff from the on-site western drainage area (300 Node series) will be collected by the proposed inlets and directed by the proposed storm drain system to the biofiltration/detention basin at Node 30. At this location, flow will be mitigated to a level below that of the existing conditions. This mitigated flow will then be conveyed via the proposed storm drain system to the existing 18" RCP crossing Old Memory Ln (Node 350), where it will commingle with the slope flows and offsite flows, similar to existing conditions.

Runoff from the on-site northern drainage area (100 Node series) will be collected by the proposed inlets and directed by the proposed storm drain system to the biofiltration/detention basin at Node 10. At this location, flow will be mitigated to a level below that of the existing conditions. This mitigated flow will then be conveyed via the proposed storm drain system to discharge into the existing depression area at node 150 (Node 100 in existing condition).

In the proposed conditions, the flow patterns will remain similar, and the flows from the developed area will connect to the same existing offsite storm drainage network. The proposed biofiltration/detention basins will mitigate the impact of minor area diversion due to the proposed development and the increase in impervious areas on site. According to calculations, the attenuated peak discharge in the proposed conditions will be less than the peak discharge in the existing conditions.

Pollution Control and Hydromodification Flow Control of the overall site will be addressed in the separate report "The Priority Development Project Storm Water Quality Management Plan (SWQMP) for Emerald Hills" dated October 2023 prepared by Hunsaker & Associates San Diego Inc.

The Emerald Hills project will not necessitate seeking regulatory permits from the U.S. Army Corps of Engineers (USACE) under Section 404 of the federal Clean Water Act (CWA) or the Section 401 Water Quality Certification.

4 Methodology

4.1 Hydrology

The City of San Diego Drainage Design Manual, dated January 201□, re□uires that the Modified Rational Method be used for hydrologic analysis of a watershed up to, but not exceeding, 1.0 s□uare-mile □640 acres□. The 100-year storm event peak flow rates have been computed in this report to meet the City of San Diego□s criteria.

The Rational Method computer program developed by Advanced Engineering Software □AES 2015□was used for this study because it satisfies the City of San Diego□s design criteria Computer Software Package □ AES-2015

Design Storm □100-Year for detention

Land □se □ Single Family

Soil Type - Hydrologic soil group D was assumed for all areas. Group D soils have very slow infiltration rates when thoroughly wetted. Consisting chiefly of clay soils with a high swelling potential, soils with a high permanent water table, soils with clay pan or clay layer at or near the surface, and shallow soils over nearly impervious materials, Group D soils have a very slow rate of water transmission.

Runoff Coefficient □ In accordance with the City of San Diego design criteria, a runoff coefficient of 0.55 was used for Single Family area, 0.45 for the pervious areas, 0.90 for the roads.

Rainfall Intensity - Based on time-intensity criteria per City of San Diego

Method of Analysis □ The Rational Method is the most widely used hydrologic model for estimating peak runoff rates. Applied to small urban and semi-urban areas with drainage areas less than 1.0 s□uare mile, the Rational Method relates storm rainfall intensity, a runoff coefficient, and drainage area to peak runoff rate. This relationship is expressed by the e□uation:

-

□ □ CIA, where:

□ □ The peak runoff rate in cubic feet per second at the point of analysis.

C □ A runoff coefficient representing the area - averaged ratio of runoff to rainfall intensity.

I □ The time-averaged rainfall intensity in inches per hour corresponding to the time of concentration.

A □ The drainage basin area in acres.

To perform a node-link study, the total watershed area is divided into subareas which discharge at designated nodes.

The procedure for the subarea summation model is as follows:

(1) Subdivide the watershed into an initial subarea (generally 1 lot) and subsequent subareas, which are generally less than 10 acres in size. Assign upstream and downstream node numbers to each subarea.

(2) Estimate an initial T_c by using the appropriate nomograph or overland flow velocity estimation.

(3) Using the initial T_c, determine the corresponding values of I. Then C I A.

(4) Using , estimate the travel time between this node and the next by Manning's equation as applied to the particular channel or conduit linking the two nodes. Then, repeat the calculation for based on the revised intensity (which is a function of the revised time of concentration).

The nodes are joined together by links, which may be street gutter flows, drainage swales, drainage ditches, pipe flow, or various channel flows. The AES-2015 computer subarea menu is as follows:

SUBAREA HYDROLOGIC PROCESS (Codes)

1. Confluence analysis at node.
2. Initial subarea analysis (including time of concentration calculation).
3. Pipeflow travel time (computer estimated).
4. Pipeflow travel time (user specified).
5. Trapezoidal channel travel time.
6. Street flow analysis through subarea.
7. User - specified information at node.
8. Addition of subarea runoff to main line.
9. V-gutter flow through area.
10. Copy main stream data to memory bank
11. Confluence main stream data with a memory bank
12. Clear a memory bank

At the confluence point of two or more basins, the following procedure is used to combine peak flow rates to account for differences in the basins' times of concentration. This adjustment is based on the assumption that each basin's hydrographs are triangular in shape.

(1) If the collection streams have the same times of concentration, then the values are directly summed,

$$p = a + b \quad T_p = T_a = T_b$$

(2) If the collection streams have different times of concentration, the smaller of the tributary Q values may be adjusted as follows:

(i) The most frequent case is where the collection stream with the longer time of concentration has the larger Q. The smaller Q value is adjusted by the ratio of rainfall intensities.

$$Q_p = Q_a + Q_b (I_a / I_b) \quad T_p = T_a$$

(ii) In some cases, the collection stream with the shorter time of concentration has the larger Q. Then the smaller Q is adjusted by a ratio of the T values.

$$Q_p = Q_b + Q_a (T_b / T_a) \quad T_p = T_b$$

4.2 Detention

To ensure effective flood control, we have addressed the increased peak flow rates at the site's outfall location by designing three proposed basins. These basins' mitigation processes were modeled using RickRatHydro as input for EPA SWMM 5.1.

The hydrology calculations discussed in Section 4.1 have provided us with peak flow rates, time of concentration, watershed area, and average runoff factor.100 Yr- 6 Hour rainfall depth has been determined using the County Isopluvial maps. These parameters were input into a separate program called RickRatHydro, which generated inflow hydrographs for each basin. Subsequently, these hydrographs were imported into EPA SWMM 5.1 and routed through the proposed basins using an iterative approach that involved outlet structures.

This process continued until the resulting flow rate at the outfall matched or was less than that of the existing conditions, and the water surface elevation remained at least 1 foot below the top of the basin. The proposed biofiltration systems BF-2-1, BF-2-2 and BF-2-3 are designed to serve multiple purposes, including pollutant control, hydromodification control, and detention of the 100-year storm event flows.

The detention basin routing calculations adhere to the San Diego County guidelines for conjunctive use facilities dated January 2020. It's important to note that the storage volume for flood control is separate from the volume provided for pollutant control, and volume infiltrated is not considered as part of the volume for flood control.

5 Results and Conclusions

The following tabulates the proposed peak flow rates and attenuated flow rates for the project hydrology.

TABLE 1 - Summary of Rational Method Hydrologic Analysis Results

Existing				Proposed					
Node E	Area A	Q cfs	C min	Node P	Area A	Q cfs	Q cfs	C min Mitigated	Peak flow difference E-P CFS
100	5.0	0.00	13.30	150	5.0	0.05	2.50	0.00	4.00
200	2.0	3.00	0.00	200	1.2	2.33	2.33	5.43	0.35
300	0.0	3.00	5.00	300	1.4	2.34	2.34	9.00	0.00
OOA to POC 1	0.0	13.00		OOA to POC 1	0.0	13.02	0.204	-	6.09
400 POC 2	25.0	40.02	0.00	400 POC 2	23.4	45.40	45.40	00.00	3.42
500 POC 2	12.0	104.00	12.40	500 POC 2	12.0	00.00	12.00	12.50	11.90
350 POC3	15.5	24.00	12.03	350 POC3	00.4	20.50	00.54	0.00	0.53
Total	002	000.05			000.3	000.4	000.24		20.00

Runoff rates before flood attenuation

Runoff rates after flood attenuation

Please note that the discrepancy of 0.7 acres in the studied area is attributed to the rounding done by AES

As illustrated above, due to the attenuation provided by the three basins, the peak flow to each discharge point is reduced, resulting in a total reduction of 29.61 cfs to Chollas Creek compared to existing conditions.

Final storm drain, inlets and rip rap design details will be provided in the final engineering stage of development.

Conclusions

The project does not increase runoff in the 100-year storm event when utilizing onsite flood attenuation.

Since there will be no increase in runoff, there will be no negative impacts to downstream drainage facilities.

Please see our separate Storm Water uality Management Report that provides mitigation for all onsite stormwater uality impacts, as well as hydromodification management.

Project Name:

Attachment 6
Geotechnical and Groundwater Investigation Report

Attach project's geotechnical and groundwater investigation report. Refer to Appendix C.4 to determine the reporting requirements.

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GEOTEK

PRELIMINARY GEOTECHNICAL EVALUATION
FOR
PROPOSED EMERALD HILLS DEVELOPMENT
APN 543-340-02-00
NORTH OF OLD MEMEORY LANE
SAN DIEGO, CALIFORNIA

PREPARED FOR

D.R. HORTON LOS ANGELES HOLDING COMPANY, INC
2280 WARDLOW CIRCLE, SUITE 100
CORONA, CALIFORNIA 92878

PREPARED BY

GEOTEK, INC.
1384 POINSETTIA AVENUE, SUITE A
VISTA, CALIFORNIA 92081

PROJECT NO. 3680-SD **OCTOBER 13, 2022**

GeoTek, Inc.
1384 Poinsettia Avenue, Suite A Vista, CA 92081-8505
(760) 599-0509 Office (760) 599-0593 Fax www.geotekusa.com

October 13, 2022
Project No. 3680-SD

D•R•Horton Los Angeles Holding Company, Inc.
2280 Wardlow Circle, Suite 100
Corona, California 92878

Attention: Mr. Dan Boyd

Subject: **Preliminary Geotechnical Evaluation**
Proposed Emerald Hills Development
North of Old Memory lane
APN 543-340-02-00
San Diego, California

Dear Mr. Boyd:

GeoTek, Inc. (GeoTek) is pleased to provide herein the results of a preliminary geotechnical evaluation for the subject project. This report presents the results of GeoTek's evaluation and provides preliminary geotechnical recommendations for earthwork, foundation design, and construction. Based upon review, site development appears feasible from a geotechnical viewpoint provided that the recommendations included herein are incorporated into the design and construction phases of site development.

The opportunity to be of service is sincerely appreciated. If you should have any questions, please do not hesitate to call GeoTek.

Respectfully submitted,
GeoTek, Inc.

Christopher D. Livesey
CEG 2733
Associate Vice President

Edwin R. Cunningham
RCE 81687
Project Engineer

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Figure 2 – Geotechnical Map

Appendix A – Logs of Exploration and Geotechnical Stormwater Forms
Appendix B – Results of Laboratory Testing
Appendix C – I-8 & I-9 Forms
Appendix D – General Earthwork Grading Guidelines

1. PURPOSE AND SCOPE OF SERVICES

The purpose of this study was to evaluate the geotechnical conditions of the project site. Services provided for this study included the following:

- Research and review of available geologic and geotechnical data, and general information pertinent to the site.
- Excavation of eleven exploratory test pits and collection of bulk soil samples for subsequent laboratory testing.
- Excavation of three auger drilled test holes for subsequent percolation testing.
- Laboratory testing of the soil samples collected during the field investigation.
- Compilation of this geotechnical report which presents GeoTek's findings of pertinent site geotechnical conditions and geotechnical recommendations for site development.

2. SITE DESCRIPTION AND PROPOSED DEVELOPMENT

2.1 SITE DESCRIPTION

A mailing address is not available; however, the parcel is identified as County of San Diego Assessor's Parcel Number 543-340-02-00. The address of 5706 Memory Lane, San Diego, California may be used to readily locate the project as this address is noted on Google Maps® as being adjacent to a private driveway leading into the site (See Figure 1). The site is an irregular-shaped property consisting of approximately 31.2 acres in the City of San Diego, California. The property is bounded to the south/southwest by residential property along Old Memory Lane and to the north by Tooley Street, bounded to the east by 60th Street, and bounded along portions of the west by Emerald Hills Park. The site is largely unimproved, however there are two existing transmission towers, a two-story building, and a relatively level pad for equipment (presumably generators and outdoor storage). An approximately 3-4' tall berm, eroded and overgrown with vegetation, exists near the entrance.

Based on our reconnaissance and a review of topographic maps, site topography is characterized by two broadly sloped knolls located in the northeast and southwest bisected with gorges that trend to northwest and southeast.

2.2 PROPOSED DEVELOPMENT

Based on the "Design Base Map" prepared by Hunsaker & Associates, it is our understanding that the proposed development will consist of 124 single-family homes and interior streets. Additionally, assumed improvements consist of earthwork improvements to existing grades to construct level or terraced building pads, underground utilities, hardscape, as well as, landscape improvements.

It is anticipated that the residential buildings will be of wood frame construction and will be supported by conventional shallow foundations (continuous and isolated pad) and a conventional slab on-grade or raised-wood floor. For the purposes of this report, it is assumed maximum column and wall loads will be approximately 25 kips and 2 kips per foot, respectively. Once actual loads are known that information should be provided to GeoTek to determine if modifications to the recommendations presented in this report are warranted.

As site planning progresses and additional or revised plans become available, they should be provided to GeoTek for review and comment. If plans vary significantly, additional geotechnical field exploration, laboratory testing and engineering analyses may be necessary to provide specific earthwork recommendations and geotechnical design parameters for actual site development plans.

3. FIELD EXPLORATION AND LABORATORY TESTING

3.1 FIELD EXPLORATION

GeoTek's field study, was conducted on September 19th and 20th, 2022 and consisted of a site reconnaissance and excavation of eleven exploratory test pits with a rubber tracked CAT 305.5E (mini) excavator. Test pits TP-1 through TP-11 were excavated to depths ranging between 5 and 10 feet below existing grade. A potable nuclear gauge densometer was utilized to obtain in-situ moisture and dry density values. Based on the data, the results indicate low densities are a result of air gap between the gauge and bottom (ie, the area was not flat, but rather irregular from the excavator's bucket). In addition to the test pits, excavation of three auger borings, P-1 through P-3, where drilled to a depth of about three feet below grade for percolation testing. A representative from GeoTek visually logged the test pits, collected loose bulk soil samples for

laboratory analysis, and transported the samples to GeoTek's laboratory. Percolation tests were performed the following day. Approximate locations of the exploratory test pits and percolation test holes are presented on the Geotechnical Map, Figure 2. A description of material encountered in the test pits is included in Appendix A.

3.2 PERCOLATION TESTING

Three percolation borings (Borings P-1 through P-3) were excavated to a depth of approximately 36 inches below the existing ground surface. The boring bottom and side walls were scarified and cleaned as feasible of potential drilling fines adhered to the boring walls. The test hole was then filled with potable water to pre-soak. Following overnight pre-soaking, the test holes were filled with water and the drop in water level was recorded every 30 minutes. The test was continued for a minimum of twelve readings and the final reading was used in the calculation of the infiltration rate. The field data was converted to an infiltration rate via the Porchet method. Over the lifetime of the storm water disposal areas, the infiltration rates may be affected by silt build up and biological activities, as well as local variations in near surface soil conditions. The rates presented below do not include a factor of safety, the BMP designer should include appropriate factors of safety in their design.

INFILTRATION TEST RESULTS		
Test No.	Approximate Boring Depth (Inches)	Infiltration Rate (Inches per hour)
P-1	36	0.14
P-2	36	0.78
P-3	36	0.00

Copies of the percolation data sheets and infiltration conversion sheets (Porchet Method) are included in Appendix A.

3.3 LABORATORY TESTING

Laboratory testing was performed on bulk soil samples collected during the field explorations. The purpose of the laboratory testing was to evaluate their physical and chemical properties for use in engineering design and analysis. Results of the laboratory testing program, along with a brief description and relevant information regarding testing procedures, are included in Appendix B.

4. GEOLOGIC AND SOILS CONDITIONS

4.1 REGIONAL SETTING

The subject property is located in the Peninsular Ranges geomorphic province. The Peninsular Ranges province is one of the largest geomorphic units in western North America. It extends roughly 975 miles from the north and northeasterly adjacent the Transverse Ranges geomorphic province to the peninsula of Baja California. This province varies in width from about 30 to 100 miles. It is bounded on the west by the Pacific Ocean, on the south by the Gulf of California and on the east by the Colorado Desert Province.

The Peninsular Ranges are essentially a series of northwest-southeast oriented fault blocks. Several major fault zones are found in this province. The Elsinore Fault zone and the San Jacinto Fault zones trend northwest-southeast and are found in the near the middle of the province. The San Andreas Fault zone borders the northeasterly margin of the province. The Newport-Inglewood-Rose Canyon Fault zone meanders the southwest margin of the province. No faults are shown in the immediate site vicinity on the map reviewed for the area.

4.2 EARTH MATERIALS

A brief description of the earth materials encountered during the current subsurface exploration is presented in the following sections. Based on the field observations and review of published geologic maps the subject site is locally underlain by a relatively thin layer of colluvium over Mission Valley Formation.

4.2.1 Hydrological Classification

The site is mapped as 85% Diablo, 10% Altamont, 3% Linne, and 2% Olivenhain (UCDavis, 1997). The hydrologic classification of the units are a Group "D". The mapped hydrological unit is consistent with infiltration analysis performed on the site, with exception to location P-2, which is considered to be a local outlier and should not be relied upon.

4.2.2 Quaternary-age Colluvium (Map Symbol Qcol)

Quaternary alluvium was encountered all test pits and ranged in thickness between two to eight feet thick. The colluvium consisted of sandy clay, damp to very moist, medium stiff, with some cobbles.

4.2.3 Tertiary-age Santiago Formation (Map Symbol Tsa)

Tertiary-age Mission Valley Formation was encountered beneath the colluvium in all test pits, to the full depth of exploration. This material consisted of fine to medium sandstone, light tan brown to greyish white with orange oxidization in color, moist, and dense to very dense. Six of

the test pits (TP-1, -2, -3, -9, -10, & -11) reached refusal before the maximum reach of the equipment.

4.3 SURFACE WATER AND GROUNDWATER

4.3.1 Surface Water

Surface water was not observed during the recent site exploration. If encountered during earthwork construction, surface water on this site will most likely be the result of precipitation. Overall site area drainage is in a southwestern direction. Provisions for surface drainage will need to be accounted for by the project civil engineer.

4.3.2 Groundwater

No groundwater was encountered during exploration of the subject site. Groundwater is anticipated to be greater than 50 feet below surface grades. Based on the anticipated depth of removals, groundwater is not anticipated to be a factor in site development. Localized perched groundwater may be present but is also not anticipated to be a factor in site development.

4.4 EARTHQUAKE HAZARDS

4.4.1 Surface Fault Rupture

The geologic structure of the entire southern California area is dominated mainly by northwest-trending faults associated with the San Andreas system. The site is not in a seismically active region. No active or potentially active fault is known to exist at this site nor is the site situated within an *"Alquist-Priolo"* Earthquake Fault Zone or a Special Studies Zone (Bryant and Hart, 2007). The nearest known active fault is the Newport Inglewood-Rose Canyon fault located about 4.5 miles to the west-southwest of the site.

A strand of the La Nacion Fault System is reported as potentially transecting the eastern margin of the project area (Kennedy and Tan, 2007). The La Nacion Fault System is characterized by a series of generally west dipping, en-echelon (stepping over in parallel), north-south trending, moderate to high angle normal faults that extend from the US-Mexico border northward through much of southeast San Diego. Based on our review of digitally interactive geologic maps on the USGS website, the strand of the La Nacion Fault shown on Figure 2 is presented along 60th street. The stepover strand to the west is approximately 1,000 feet from the site. An interactive digital map with a satellite imagery base map presented by the United State Geological Survey utilizing Kennedy and Tan's 2007 map shows the map to be misaligned with the underlying satellite imagery. If corrected, the La Nacion Fault would be translocated to the approximate alignment depicted on Figure 2. Based on a review of Alquist-Priolo fault lines on their interactive web browser, identified the strand of the La Nacion fault transecting the site. During GeoTek's due

diligence phase of work, a digital map with GPS ability was utilized to locate the fault strand a slight linear erosional feature was observed and thought to be associated with the La Nacion fault, however test pit TP-9 was advanced across this feature and a fault was not identified.

Previous studies have presented radiocarbon evidence that the fault system has not been active within the last 13,375 ± 275 years (Hart, 1974, Elliot and Hart, 1977). Based on the California Geological Survey, the La Nacion Fault is not considered to be an active fault nor does the property reside in an "Alquist-Priolo" fault zone or City of San Diego Fault Hazard Zone. Based on our review of available information, the La Nacion Fault system, in our opinion, does not pose a design constraint to the proposed development.

4.4.2 Liquefaction/Seismic Settlement

Liquefaction describes a phenomenon in which cyclic stresses, produced by earthquake-induced ground motion, create excess pore pressures in relatively cohesionless soils. These soils may thereby acquire a high degree of mobility, which can lead to lateral movement, sliding, consolidation and settlement of loose sediments, sand boils and other damaging deformations. This phenomenon occurs only below the water table, but, after liquefaction has developed, the effects can propagate upward into overlying non-saturated soil as excess pore water dissipates.

The factors known to influence liquefaction potential include soil type and grain size, relative density, groundwater level, confining pressures, and both intensity and duration of ground shaking. In general, materials that are susceptible to liquefaction are loose, saturated granular soils having low fines content under low confining pressures.

The liquefaction potential and seismic settlement potential on this site is considered negligible due to the apparent density of the underlying formation and lack of a shallow groundwater table.

4.4.3 Other Seismic Hazards

The potential for landslides and rockfall is considered negligible. The potential for secondary seismic hazards such as seiche and tsunami is remote due to site elevation and distance from an open body of water.

5. CONCLUSIONS AND RECOMMENDATIONS

5.1 GENERAL

Development of the site appears feasible from a geotechnical viewpoint provided that the following recommendations are incorporated in the design and construction phases of the

development. The following sections present general recommendations for currently anticipated site development plans.

5.2 EARTHWORK CONSIDERATIONS

5.2.1 General

Earthwork and grading should be performed in accordance with the applicable grading ordinances of the City of San Diego, the 2019 (or current) California Building Code (CBC), and recommendations contained in this report. The Grading Guidelines included in Appendix D outline general procedures and do not anticipate all site-specific situations. In the event of conflict, the recommendations presented in the text of this report should supersede those contained in Appendix D.

5.2.2 Site Clearing and Preparation

Site preparation should start with removal of deleterious materials, vegetations, trees/shrubs, and existing improvements in conflict with the proposed improvement areas. These materials should be disposed of properly off site. Any existing underground improvements, utilities and trench backfill should also be removed or be further evaluated as part of site development operations.

5.2.3 Remedial Grading

Prior to placement of fill materials and in all structural areas, the upper variable, potentially compressible materials should be removed. Removals should include at a minimum all colluvium and one to two feet of weathered Mission Valley Formation. Based on the explored locations, and average removal depth of five to seven feet from existing grades may be anticipated, but does not include stabilization fill keys. The bottom of the removals should be observed by a GeoTek representative prior to processing the bottom for receiving placement of compacted fills. Depending on actual field conditions encountered during grading, locally deeper and/or shallower areas of removal may be necessary.

Prior to fill placement, the bottom of all removals should be scarified to a minimum depth of six (6) inches, moisture conditioned to slightly above optimum moisture content, and then compacted to at least 90% of the soil's maximum dry density as determined by ASTM D1557 test procedures. The resultant voids from remedial grading/over-excavation should be filled with materials placed in general accordance with Section 5.2.5 Engineered Fill of this report.

5.2.4 Cut/Fill Transition Lots

Grading may result in a cut/fill transition at the proposed building pad finish grades. If a geologic contact of Mission Valley bedrock against fills is encountered at finish pad grades, the cut portion

should be over-excavated a minimum of three feet or one third the thickness of the fill underlying the building footprint below pad grades and replaced with engineered fill.

5.2.5 Engineered Fill

Onsite materials are generally considered suitable for reuse as engineered fill provided they are free from vegetation, roots, debris, and rock/concrete or hard lumps greater than six (6) inches in maximum dimension. The earthwork contractor should have the proposed excavated materials to be used as engineered fill at this project approved by the soils engineer prior to placement.

Engineered fill materials should be moisture conditioned to at or above optimum moisture content and compacted in horizontal lifts not exceeding 8 inch in loose thickness to a minimum relative compaction of 90% as determined by ASTM D1557 test procedures.

If fill is being placed on slopes steeper than 5:1 (horizontal : vertical), the fill should be properly benched into the existing slopes and a sufficient size keyway shall be constructed in accordance with grading guidelines presented in Appendix D.

5.2.6 Slope Construction

An engineering geologist should observe all cut slopes. Cut slopes should expose competent bedrock. If adverse structure or unsuitable materials are exposed and identified in the cut slopes, stabilization fills may be recommended.

Where fill is to be placed against sloping ground with gradients of 5:1 (horizontal:vertical) or steeper, the sloping ground surface should be benched to provide horizontal surfaces for fill placement. A keyway should be constructed at the toe of the fill slope areas into dense natural material and in accordance with Plate G-3, Appendix D.

The base of the keyways and benches should be sloped back into the hillside at a gradient of at least two percent. The base of the benches should be evaluated by a representative of GeoTek prior to processing. Upon approval, the exposed materials should be moistened to at least the optimum moisture content and densified to a relative compaction of at least 90 percent (ASTM D1557). Details showing slope construction are presented in Appendix D.

Fill slopes should be overfilled during construction and then cut back to expose compacted soil. A suitable alternative would be to compact the slopes during construction and then roll the final slope to provide a dense, erosion resistant surface.

Back drains should be installed in the keyways in accordance with the recommendations outlined in Appendix D.

5.2.7 Excavation Characteristics

Excavations in the onsite materials can generally be accomplished with heavy-duty earthmoving or excavating equipment in good operating condition. The colluvium and upper zone of the Mission Valley Formation is anticipated to be rippable with conventional heavy earth moving equipment in good working order.

5.2.8 Shrinkage and Bulking

Several factors will impact earthwork balancing on the site, including undocumented fill shrinkage, trench spoil from utilities and footing excavations, as well as the accuracy of topography.

Shrinkage and bulking are largely dependent upon the degree of compactive effort achieved during construction. For planning purposes, a shrinkage factor of 5 percent may be considered for colluvial sources. For excavations in the sandstone, a bulking factor of 10 percent may be considered. Subsidence should not be a factor on the subject site due to the presence of bedrock if removals are completed as recommended.

5.2.9 Trench Excavations and Backfill

Temporary excavations within the onsite materials should be stable at 1:1 inclinations for short durations during construction, and where cuts do not exceed 10 feet in height. Temporary cuts to a maximum height of 4 feet can be excavated vertically.

Trench excavations should conform to Cal-OSHA regulations. The contractor should have a competent person, per OSHA requirements, on site during construction to observe conditions and to make the appropriate recommendations.

Utility trench backfill should be compacted to at least 90% relative compaction of the maximum dry density as determined by ASTM D1557 test procedures. Under-slab trenches should also be compacted to project specifications.

Onsite materials may not be suitable for use as bedding material but should be suitable as backfill provided particles larger than 6± inches are removed.

Compaction should be achieved with a mechanical compaction device. Ponding or jetting of trench backfill is not recommended. If backfill soils have dried out, they should be thoroughly moisture conditioned prior to placement in trenches.

5.3 DESIGN RECOMMENDATIONS

5.3.1 Stormwater Infiltration

Many factors control infiltration of surface waters into the subsurface, such as consistency of native soils and bedrock, geologic structure, fill consistency, material density differences, and existing groundwater conditions.

The hydrological unit as mapped by the USDA is a group "D". Percolation testing and infiltration analysis indicates that the site consistent as a hydrological group D.

Discussions were performed with the BMP design team, regarding proposed locations. No reasonable alternative design location is feasible, from the locations presented on Figure 2.

GeoTek does not recommend full or partial infiltration. Proposed basins are located within a distance 1.5 times the height of a slope. We recommend filtration of stormwater in lieu of infiltration.

City of San Diego, Storm Water Standards, Worksheets C.4-1: Form I-8A, I-8B, and I-9 are presented in Appendix C.

5.3.2 Foundation Design Criteria

Preliminary foundation design criteria, in general conformance with the 2019 CBC, are presented herein. These are typical design criteria and are not intended to supersede the design by the structural engineer. The preliminary recommendations are presented below.

Based on visual classification of materials encountered onsite and as verified by laboratory testing, site soils are anticipated to exhibit a "very low" (EI < 20) and "low" (21$\leq$ EI $\leq$ 49) expansion index per ASTM D4829. Additional laboratory testing should be performed at the time of supplemental geotechnical evaluations and upon completion of site grading to verify the expansion potential and plasticity index of the subgrade soils. The following criteria for design of foundations are preliminary. Additional laboratory testing of the samples obtained during grading should be performed and final recommendations should be based on as-graded soil conditions.

DESIGN PARAMETERS FOR CONVENTIONALLY REINFORCED SHALLOW FOUNDATIONS		
DESIGN PARAMETER	DESIGN PARAMETERS FOR TYPICAL 2-STORY FOUNDATION	DESIGN PARAMETERS FOR TYPICAL 2-STORY FOUNDATION
Expansion Potential	"Very Low" Expansion Potential (EI ≤ 20)	"Low" Expansion Potential (21 ≤ EI ≤ 50)
Foundation Embedment Depth or Minimum Perimeter Beam Depth (inches below lowest adjacent finished grade)	18 - Inches	24 - Inches
Minimum Foundation Width for continuous / perimeter footings	15 - Inches	15 - Inches
Minimum Foundation Width for isolated / column footings*	24 – Inches (Square)	24 – Inches (Square)
Minimum Slab Thickness (actual)	4.0 inches	4.0 inches
Minimum Slab Reinforcing	6" x 6" – W.1.4/W1.4 welded wire fabric, or No. 3 rebar 18" on-center, each way, placed in the middle one-third of the slab thickness	No. 3 rebar 18" on-center, each way, placed in the middle one-third of the slab thickness
Minimum Footing Reinforcement	Two No. 4 reinforcing bars, one top and one bottom	Two No. 4 reinforcing bars, one top and one bottom
Pre-saturation of Subgrade Soil (percent of optimum moisture content)	Minimum 100% to a depth of 12 inches	Minimum 110% to a depth of 18 inches

It should be noted that the above recommendations are based on soil support characteristics only. The structural engineer should design the slab and beam reinforcement based on actual loading conditions.

The following recommendations should be implemented into the design:

- An allowable bearing capacity of 2,000 pounds per square foot (psf) may be considered for design of continuous and perimeter footings that meet the depth and width requirements in the table above. This value may be increased by 300 psf for each additional 12 inches in depth and 300 psf for each additional 12 inches in width to a maximum value of 3,000 psf. Additionally, an increase of one-third may be applied when considering short-term live loads (e.g., seismic and wind loads). It may be possible to utilize a higher allowable soil bearing pressure for foundations directly

supported by bedrock. The determination of an allowable soil bearing pressure on bedrock should be determined once foundation loads and elevations are known.

- Structural foundations may be designed in accordance with 2019 CBC, and to withstand a total settlement of 1 inch and maximum differential settlement of one-half of the total settlement over a horizontal distance of 40 feet. Seismically induced settlement is considered to be minimal.

- The passive earth pressure may preliminarily be computed as an equivalent fluid having a density of 350 psf per foot of depth, to a maximum earth pressure of 2,000 psf for footings founded on engineered fill. A coefficient of friction between soil and concrete of 0.30 may be used with dead load forces. When combining passive pressure and frictional resistance, the passive pressure component should be reduced by one-third.

- A grade beam should be utilized across large entrances. The beam should be a minimum of 12 inches wide and be at the same elevation as the bottom of the adjoining footings.

5.3.3 Under Slab Moisture Membrane

A moisture and vapor retarding system should be placed below slabs-on-grade where moisture migration through the slab is undesirable. Guidelines for these are provided in the 2019 California Green Building Standards Code (CALGreen) Section 4.505.2 and the 2019 CBC Section 1907.1

It should be realized that the effectiveness of the vapor retarding membrane can be adversely impacted as a result of construction related punctures (e.g., stake penetrations, tears, punctures from walking on the vapor retarder placed atop the underlying aggregate layer, etc.). These occurrences should be limited as much as possible during construction. Thicker membranes are generally more resistant to accidental puncture that thinner ones. Products specifically designed for use as moisture/vapor retarders may also be more puncture resistant. Although the CBC specifies a 6-mil vapor retarder membrane, it is GeoTek's opinion that a minimum 10 mil membrane with joints properly overlapped and sealed should be considered, unless otherwise specified by the slab design professional.

Moisture and vapor retarding systems are intended to provide a certain level of resistance to vapor and moisture transmission through the concrete, but do not eliminate it. The acceptable level of moisture transmission through the slab is to a large extent based on the type of flooring used and environmental conditions. Ultimately, the vapor retarding system should be comprised of suitable elements to limit migration of water and reduce transmission of water vapor through

the slab to acceptable levels. The selected elements should have suitable properties (i.e., thickness, composition, strength, and permeability) to achieve the desired performance level.

Moisture retarders can reduce, but not eliminate, moisture vapor rise from the underlying soils up through the slab. Moisture retarder systems should be designed and constructed in accordance with applicable American Concrete Institute, Portland Cement Association, Post-Tensioning Concrete Institute, ASTM and California Building Code requirements and guidelines.

GeoTek does not practice in the field of moisture vapor transmission evaluation/migration since that practice is not a geotechnical discipline. Therefore, GeoTek recommends that a qualified person, such as the flooring contractor, structural engineer, architect, and/or other experts specializing in moisture control within the building be consulted to evaluate the general and specific moisture and vapor transmission paths and associated potential impact on the proposed construction. That person (or persons) should provide recommendations relative to the slab moisture and vapor retarder systems and for migration of potential adverse impact of moisture vapor transmission on various components of the structures, as deemed appropriate. In addition, the recommendations in this report and GeoTek's services in general are not intended to address mold prevention; since GeoTek, along with geotechnical consultants in general, do not practice in the area of mold prevention. If specific recommendations addressing potential mold issues are desired, then a professional mold prevention consultant should be contacted.

5.3.4 Miscellaneous Foundation Recommendations

- To reduce moisture penetration beneath the slab on grade areas, utility trenches should be backfilled with engineered fill, lean concrete, or concrete slurry where they intercept the perimeter footing or thickened slab edge.

- Spoils from the footing excavations should not be placed in the slab-on-grade areas unless properly moisture-conditioned, compacted and tested. The excavations should be free of loose/sloughed materials and be neatly trimmed at the time of concrete placement.

5.3.5 Foundation Setbacks

Where applicable, the following setbacks should apply to all foundations. Any improvements not conforming to these setbacks may be subject to lateral movements and/or differential settlements:

- The outside bottom edge of all footings should be set back a minimum of H/3 (where H is the slope height) from the face of any descending slope. The setback should be at least 7 feet and need not exceed 40 feet.

- The bottom of all footings for structures near retaining walls should be deepened so as to extend below a 1:1 projection upward from the bottom inside edge of the wall stem. This applies to the existing retaining walls along the perimeter if they are to remain.

- The bottom of any existing foundations for structures should be deepened to extend below a 1:1 projection upward from the bottom of the nearest excavation.

5.3.6 Seismic Design Parameters

The site is located at approximately 32.7214 degrees west latitude and -117.0708 degrees north longitude. Site spectral accelerations (Ss and S1), for 0.2 and 1.0 second periods for a risk targeted two (2) percent probability of exceedance in 50 years (MCER) were determined using the web interface provided by SEAOC/OSHPD (https://seismicmaps.org) to access the USGS Seismic Design Parameters. Due to the very apparent density of the underlying sandstone, a Site Class "C" is considered appropriate for this site. The results, based on ASCE 7-16 and the 2019 CBC, are presented in the following table:

SITE SEISMIC PARAMETERS	
Mapped 0.2 sec Period Spectral Acceleration, S_S	0.994g
Mapped 1.0 sec Period Spectral Acceleration, S_1	0.345g
Site Coefficient for Site Class "C", F_a	1.2
Site Coefficient for Site Class "C", F_v	1.5
Maximum Considered Earthquake (MCE_R) Spectral Response Acceleration for 0.2 Second, S_{MS}	1.192g
Maximum Considered Earthquake (MCE_R) Spectral Response Acceleration for 1.0 Second, S_{M1}	0.518g
5% Damped Design Spectral Response Acceleration Parameter at 0.2 Second, S_{DS}	0.795g
5% Damped Design Spectral Response Acceleration Parameter at 1 second, S_{D1}	0.345g
Site Modified Peak Ground Acceleration (PGA_M)	0.527g
Seismic Design Category	D
Risk Category	II

5.3.7 Soil Sulfate Content and Corrosivity

Corrosion analysis is forthcoming.

5.3.8 Preliminary Pavement Design

Traffic indices have not been provided during this stage of site planning. In addition, site conditions have not been graded to a final design to evaluate specific pavement subgrade conditions. Therefore, the structural sections based on a variety of traffic indices and an assumed R-value of 25 are presented below.

PRELIMINARY ASPHALT PAVEMENT STRUCTURAL SECTION FOR ON-SITE STREETS				
Design Criteria	Traffic Index	R-Value	Asphaltic Concrete (AC) Thickness (inches)	Aggregate Base (AB) Thickness (inches)
Local Street	4	25	4.0	6.0
Local Street	5	25	5.0	8.0

As noted in the City of San Diego Standard Specifications, actual structural pavement design is to be determined by the geotechnical engineer's testing (R-Value) of the subgrade. Thus, the actual R-Value of the subgrade soils can only be determined at the completion of grading for street subgrades and the above values are subject to change based laboratory testing of the as-graded soils near subgrade elevations.

Asphalt concrete and aggregate base should conform to current Caltrans Standard Specifications Section 39 and 26-1.02, respectively. As an alternative, asphalt concrete can conform to Section 203-6 of the current Standard Specifications for Public Work (Green Book). Crushed aggregate base or crushed miscellaneous base can conform to Section 200-2.2 and 200-2.4 of the Green Book, respectively. Pavement base should be compacted to at least 95 percent of the ASTM D1557 laboratory maximum dry density as determined by ASTM D 1557 test procedures

All pavement installation, including preparation and compaction of subgrade, compaction of base material, placement and rolling of asphaltic concrete, should be done in accordance with the City of Oceanside specifications, and under the observation and testing of GeoTek and a City Inspector where required. Jurisdictional minimum compaction requirements in excess of the aforementioned minimums may govern.

5.3.9 Portland Cement Concrete (PCC)

As an option, Portland Cement concrete (PCC) pavements could also be used at the site for the pavement areas. Based on the traffic loading provided, the following recommended minimum PCC pavement section is provided for these areas:

6 Inches Portland Cement Concrete (PCC) over
6 Inches Aggregate Base (AB) over
12-inches compacted subgrade to 95% per ASTM D 1557

For the PCC options, it is recommended concrete having a minimum 28-day flexural strength of 650 psi be used. A maximum joint spacing of 15 feet is also recommended.

5.4 RETAINING WALL DESIGN AND CONSTRUCTION

5.4.1 General Design Criteria

Preliminary grading plans are not yet available. If retaining walls are added at a later date, the recommendations presented herein may apply to typical masonry or concrete vertical retaining walls to a maximum height of 6 feet. The 2019 CBC only requires the additional earthquake induced lateral force be considered on retaining walls in excess of six (6) feet in height. Therefore, additional review and recommendations should be requested for higher walls.

Retaining wall foundations embedded a minimum of 18 inches into engineered fill or dense formational materials should be designed using an allowable bearing capacity of 2,000 psf. This value may be increased by 300 psf for each additional 12 inches in depth and 300 psf for each additional 12 inches in width to a maximum value of 3,000 psf. An increase of one-third may be applied when considering short-term live loads (e.g., seismic and wind loads). The passive earth pressure may be computed as an equivalent fluid having a density of 350 psf per foot of depth, to a maximum earth pressure of 3,500 psf. A coefficient of friction between soil and concrete of 0.35d may be used with dead load forces. When combining passive pressure and frictional resistance, the passive pressure component should be reduced by one-third.

An equivalent fluid pressure approach may be used to compute the horizontal active pressure against the wall. The appropriate fluid unit weights are given in the table below for specific slope gradients of retained materials of non-expansive soils. Based on laboratory analysis, some on site soils are suitable for use of retaining wall backfill, however some selective grading may be desired to separate expansive from non-expansive soils.

Surface Slope of Retained Materials (H:V)	Equivalent Fluid Pressure (PCF) Select Backfill*
Level	40
2:1	65

*Select backfill should consist of approved materials with an EI≤20 and should be provided throughout the active zone.

The above equivalent fluid weights do not include other superimposed loading conditions such as expansive soil, vehicular traffic, structures, seismic conditions or adverse geologic conditions.

5.4.2 Restrained Retaining Walls

Any retaining wall that will be restrained prior to placing backfill or walls that have male or reentrant corners should be designed for at-rest soil conditions using an equivalent fluid pressure of 65 pcf (select backfill), plus any applicable surcharge loading. For areas having male or reentrant corners, the restrained wall design should extend a minimum distance equal to twice the height of the wall laterally from the corner, or as otherwise determined by the structural engineer.

5.4.3 Seismic Induced Incremental Design Parameters

Additional lateral forces can be induced on retaining walls during an earthquake. For level backfill and a Site Class "C", the minimum earthquake-induced force (F_{eq}) should be $13H^2$ (lbs/linear foot of wall) for cantilever walls and $25H^2$ for restrained Retaining Walls. This force can be assumed to act at a distance of 0.6H above the base of the wall, where "H" is the height of the retaining wall measured from the base of the footing (in feet). The 2019 CBC only requires the additional earthquake induced lateral force be considered on retaining walls in excess of six (6) feet in height; however, the additional force may be applied in design of lesser walls at the discretion of the wall designer.

5.4.4 Wall Backfill and Drainage

Wall backfill should include a minimum one (1) foot wide section of ¾ to 1-inch clean crushed rock (or approved equivalent). The rock should be placed immediately adjacent to the back of wall and extend up from the backdrain to within approximately 12 inches of finish grade. The upper 12 inches should consist of compacted onsite materials. If the walls are designed using the "select" backfill design parameters, then the "select" materials shall be placed within the active zone as defined by a 1:1 (H:V) projection from the back of the retaining wall footing up to the retained surface behind the wall. Presence of other materials might necessitate revision to the parameters provided and modification of wall designs.

The backfill materials should be placed in lifts no greater than 8-inches in thickness and compacted to a minimum of 90% of the maximum dry density as determined in accordance with ASTM Test Method D 1557. Proper surface drainage needs to be provided and maintained. Water should not be allowed to pond behind retaining walls. Waterproofing of site walls should be performed where moisture migration through the wall is undesirable.

Retaining walls should be provided with an adequate pipe and gravel back drain system to reduce the potential for hydrostatic pressures to develop. A 4-inch diameter perforated collector pipe (Schedule 40 PVC, or approved equivalent) in a minimum of one (1) cubic foot per lineal foot of 3/8 to one (1) inch clean crushed rock or equivalent, wrapped in filter fabric should be placed near the bottom of the backfill and be directed (via a solid outlet pipe) to an appropriate disposal area.

As an alternative to the drain, rock and fabric, a pre-manufactured wall drainage product (example: Mira Drain 6000 or approved equivalent) may be used behind the retaining wall. The wall drainage product should extend from the base of the wall to within two (2) feet of the ground surface. The subdrain should be placed in direct contact with the wall drainage product.

Drain outlets should be maintained over the life of the project and should not be obstructed or plugged by adjacent improvements.

6. CONCRETE FLATWORK

6.1 GENERAL CONCRETE FLATWORK

6.1.1 Exterior Concrete Slabs and Sidewalks

Exterior concrete slabs, sidewalks and driveways should be designed using a four-inch minimum thickness. Some shrinkage and cracking of the concrete should be anticipated because of typical mix designs and curing practices typically utilized in construction.

Sidewalks and driveways may be under the jurisdiction of the governing agency. If so, jurisdictional design and construction criteria would apply, if more restrictive than the recommendations presented in this report.

Subgrade soils should be pre-moistened prior to placing concrete. The subgrade soils below exterior slabs, sidewalks, driveways, etc. should be pre-saturated to:

- For very low expansive soils, 100 percent of the optimum moisture content to a depth of 12 inches.

- For low expansive soils, 110 percent of the optimum moisture content to a depth of 12 inches.

All concrete installation, including preparation and compaction of subgrade, should be done in accordance with the City of San Diego specifications, and under the observation and testing of GeoTek, Inc. and a City inspector, if necessary.

6.1.2 Concrete Performance

Concrete cracks should be expected. These cracks can vary from sizes that are essentially unnoticeable to more than 1/8 inch in width. Most cracks in concrete, while unsightly, do not significantly impact long-term performance. While it is possible to take measures (proper concrete mix, placement, curing, control joints, etc.) to reduce the extent and size of cracks that occur, some cracking will occur despite the best efforts to minimize it. Concrete undergoes chemical processes that are dependent on a wide range of variables, which are difficult, at best, to control. Concrete, while seemingly a stable material, is subject to internal expansion and contraction due to external changes over time.

One of the simplest means to control cracking is to provide weakened control joints for cracking to occur along. These do not prevent cracks from developing; they simply provide a relief point for the stresses that develop. These joints are a widely accepted means to control cracks but are not always effective. Control joints are more effective the more closely spaced they are. GeoTek, Inc. suggests that control joints be placed in two directions and located a distance apart approximately equal to 24 to 36 times the slab thickness.

7. POST CONSTRUCTION CONSIDERATIONS

7.1 LANDSCAPE MAINTENANCE AND PLANTING

Water has been shown to weaken the inherent strength of soil, and slope stability is significantly reduced by overly wet conditions. Positive surface drainage away from graded slopes should be maintained and only the amount of irrigation necessary to sustain plant life should be provided for planted slopes. Controlling surface drainage and runoff and maintaining a suitable vegetation cover can minimize erosion. Plants selected for landscaping should be lightweight, deep-rooted types that require little water and are capable of surviving the prevailing climate.

Overwatering should be avoided. The soils should be maintained in a solid to semi-solid state as defined by the materials Atterberg Limits. Care should be taken when adding soil amendments to avoid excessive watering. Leaching as a method of soil preparation prior to planting is not recommended. An abatement program to control ground-burrowing rodents should be implemented and maintained. This is critical as burrowing rodents can decreased the long-term performance of slopes.

It is common for planting to be placed adjacent to structures in planter or lawn areas. This will result in the introduction of water into the ground adjacent to the foundation. This type of landscaping should be avoided. If used, then extreme care should be exercised with regard to the irrigation and drainage in these areas. Waterproofing of the foundation and/or subdrains may be warranted and advisable. GeoTek could discuss these issues, if desired, when plans are made available.

7.2 DRAINAGE

The need to maintain proper surface drainage and subsurface systems cannot be overly emphasized. Positive site drainage should be maintained at all times. Drainage should not flow uncontrolled down any descending slope. Water should be directed away from foundations and not allowed to pond or seep into the ground adjacent to the footings. Site drainage should conform to Section 1804.4 of the 2019 CBC. Roof gutters and downspouts should discharge onto paved surfaces sloping away from the structure or into a closed pipe system which outfalls to the street gutter pan or directly to the storm drain system. Pad drainage should be directed toward approved areas and not be blocked by other improvements.

7.3 PLAN REVIEW AND CONSTRUCTION OBSERVATIONS

GeoTek recommends that site grading, specifications, retaining wall/shoring plans and foundation plans be reviewed by this office prior to construction to check for conformance with the recommendations of this report. Additional recommendations may be necessary based on these reviews. It is also recommended that GeoTek representatives be present during site grading and foundation construction to check for proper implementation of the geotechnical recommendations. The owner/developer should have GeoTek's representative perform at least the following duties:

- Observe site clearing and grubbing operations for proper removal of unsuitable materials.
- Observe and bottom of removals prior to fill placement.
- Evaluate the suitability of on-site and import materials for fill placement and collect soil samples for laboratory testing when necessary.

- Observe the fill for uniformity during placement, including utility trenches.
- Observe and test the fill for field density and relative compaction.
- Observe and probe foundation excavations to confirm suitability of bearing materials.

If requested, a construction observation and compaction report can be provided by GeoTek, which can comply with the requirements of the governmental agencies having jurisdiction over the project. GeoTek recommends that these agencies be notified prior to commencement of construction so that necessary grading permits can be obtained.

8. LIMITATIONS

The scope of this evaluation is limited to the area explored that is shown on the Geotechnical Map (Figure 2). This evaluation does not and should in no way be construed to encompass any areas beyond the specific area of proposed construction as indicated to us by the client. The scope is based on GeoTek's understanding of the project and the client's needs, GeoTek's proposal (Proposal No. P-0100521-SDCO1) dated August 25th, 2022, and geotechnical engineering standards normally used on similar projects in this region.

The materials observed on the project site appear to be representative of the area; however, soil and bedrock materials vary in character between excavations and natural outcrops, or conditions exposed during site construction. Site conditions may vary due to seasonal changes or other factors. GeoTek, Inc. assumes no responsibility or liability for work, testing or recommendations performed or provided by others.

Since GeoTek's recommendations are based on the site conditions observed and encountered, and laboratory testing, GeoTek's conclusions and recommendations are professional opinions that are limited to the extent of the available data. Observations during construction are important to allow for any change in recommendations found to be warranted. These opinions have been derived in accordance with current standards of practice and no warranty is expressed or implied. Standards of practice are subject to change with time.

9. SELECTED REFERENCES

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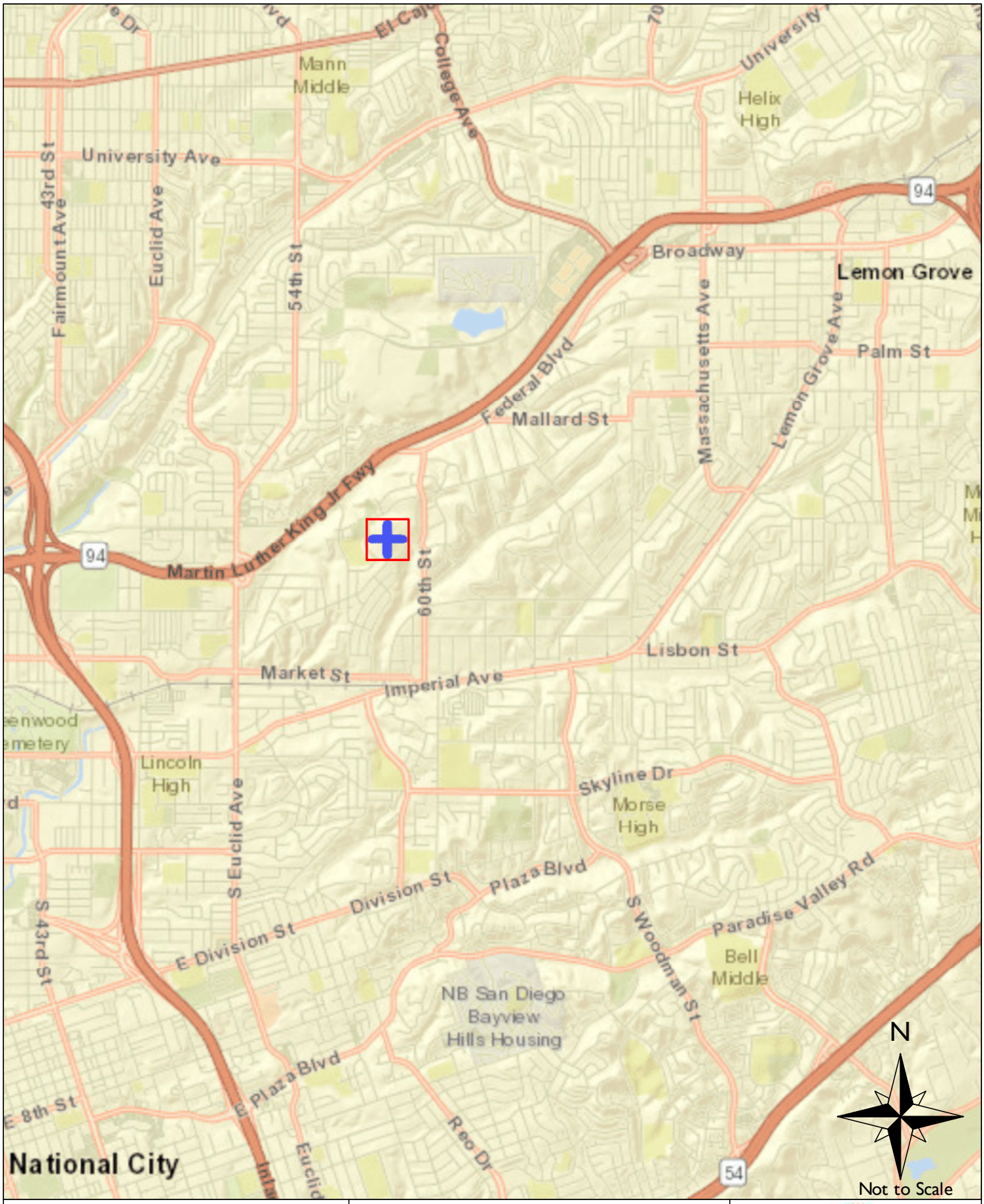
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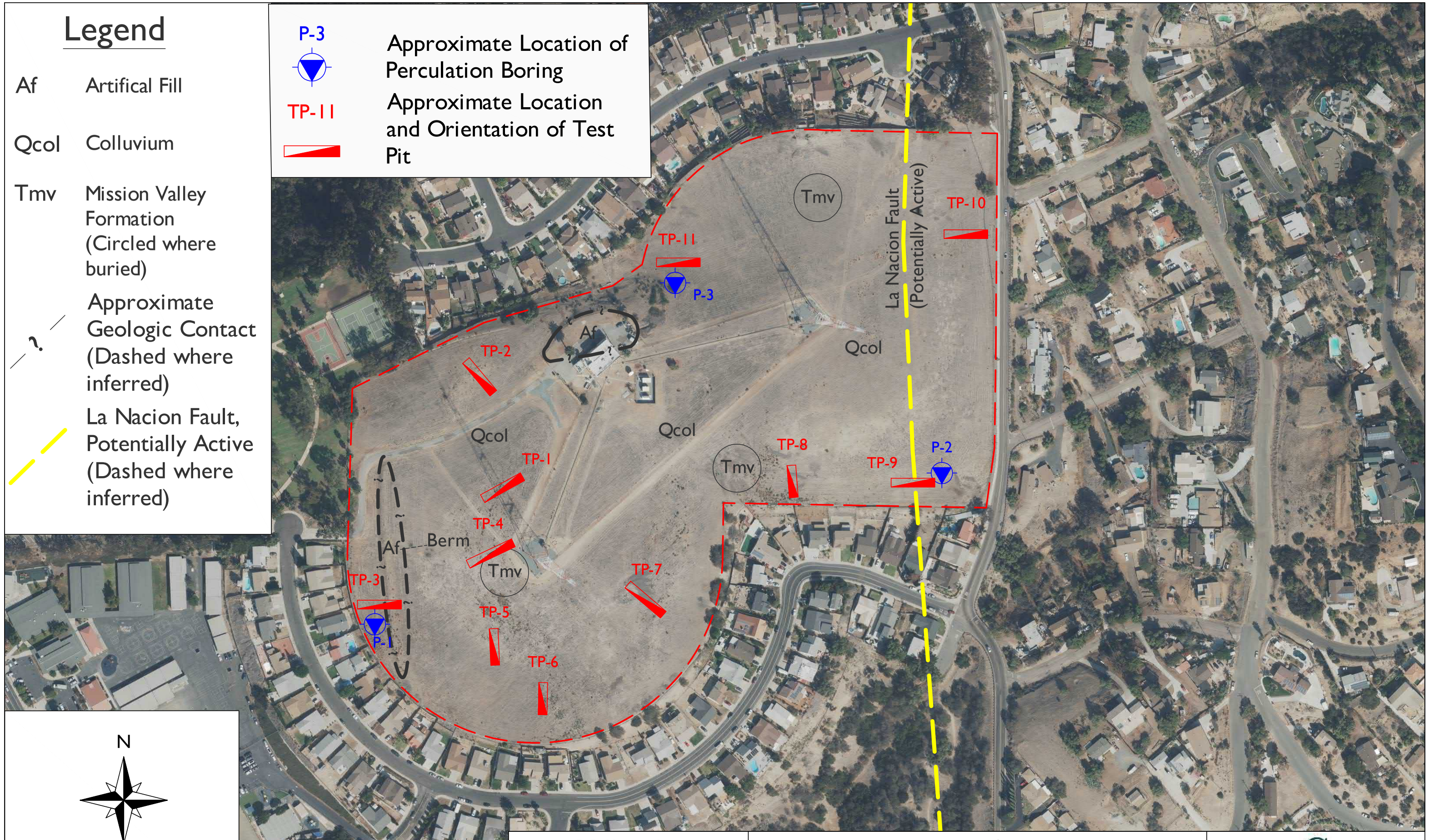
D.R. Horton, Inc. Emerald Hills Project APN: 543-340-02 San Diego, Ca 92114	Figure 1 Site Location	GEOTEK 1384 Poinsettia Avenue, Suite A Vista, California 92081
PN: 3680-SD | DATE: April 2021		

Legend

Af	Artifical Fill
Qcol	Colluvium
Tmv	Mission Valley Formation (Circled where buried)
	Approximate Geologic Contact (Dashed where inferred)
	La Nacion Fault, Potentially Active (Dashed where inferred)

P-3 — Approximate Location of Perculation Boring

TP-11 — Approximate Location and Orientation of Test Pit



N

Scale: 1" = 200'

0 100 200 400

Imagery from USGS, 2014

D.R. Horton, Inc.
Emerald Hills Project
APN: 543-340-02
San Diego, California 92114

PN: 3680-SD | DATE: September 2022

Figure 2

Geotechnical Map

GEOTEK
1384 Poinsettia Avenue, Suite A
Vista, California 92081

APPENDIX A

LOGS OF EXPLORATION

AND

INFILTRATION WORKSHEETS

GEOTEK

A - FIELD TESTING AND SAMPLING PROCEDURES

Bulk Samples (Large)
These samples are normally large bags of earth materials over 20 pounds in weight collected from the field by means of hand digging or exploratory cuttings.

B – BORING/TRENCH LOG LEGEND

The following abbreviations and symbols often appear in the classification and description of soil and rock on the logs of borings/trenches:

SOILS

USCS	Unified Soil Classification System
f-c	Fine to coarse
f-m	Fine to medium

GEOLOGIC

B: Attitudes	Bedding: strike/dip
J: Attitudes	Joint: strike/dip

C: Contact line

……..	Dashed line denotes USCS material change
———	Solid Line denotes unit / formational change
———	Thick solid line denotes end of boring/trench

(Additional denotations and symbols are provided on the log of borings/trenches)

GeoTek, Inc.

LOG OF EXPLORATORY TRENCH

CLIENT:	DR Horton	**DRILLER:**	Luna Construction	**LOGGED BY:**	CH
PROJECT NAME:	Emerald Hills	**DRILL METHOD:**	1.5' bucket	**OPERATOR:**	Sal
PROJECT NO.:	3680-SD	**HAMMER:**	-	**RIG TYPE:**	Mini-Excavator
LOCATION:	San Diego, CA	**ELEVATION:**	371 ft	**DATE:**	9/19/2022

TRENCH NO.: TP-1

Depth (ft)	SAMPLES: Sample Type	SAMPLES: Blows/ 6 in	SAMPLES: Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Laboratory Testing: Dry Density (pcf)	Laboratory Testing	Laboratory Testing: Others
			BB-1		**Coluvvium (Qcol)** Sandy CLAY with silt, dark brown, dry to slightly moist with depth, medium stiff, probed 2 inches				
5					**Misson Valley Formation (Tmv)** Fine to medium SANDSTONE, gray brown, moist, medium to very dense with depth, slightly weathered, probed < 1 inch				
			S-1		Practical refusal with bucket				
					HOLE TERMINATED AT 8 FEET Practical refusal at 8 feet No groundwater encountered Backfilled with soil cuttings				
10									
15									
20									
25									
30									

LEGEND

Sample type: ---Ring ---SPT ---Small Bulk ---Large Bulk ---Water Table

Lab testing: AL = Atterberg Limits; EI = Expansion Index; SA = Sieve Analys; RV = R-Value Test; SR = Sulfate/Resisitivity Test; SH = Shear Test; CO = Consolidatic; MD = Maximum Density

GeoTek, Inc.

LOG OF EXPLORATORY TRENCH

CLIENT:	DR Horton	**DRILLER:**	Luna Construction	**LOGGED BY:**	CH
PROJECT NAME:	Emerald Hills	**DRILL METHOD:**	1.5' bucket	**OPERATOR:**	Sal
PROJECT NO.:	3680-SD	**HAMMER:**	-	**RIG TYPE:**	Mini-Excavator
LOCATION:	San Diego, CA	**ELEVATION:**	354 ft	**DATE:**	9/19/2022

TRENCH NO.: TP-2

Depth (ft)	SAMPLES: Sample Type	SAMPLES: Blows/ 6 in	SAMPLES: Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Laboratory Testing: Dry Density (pcf)	Laboratory Testing:	Laboratory Testing: Others
					Quaternary Colluvium (Qcol) Sandy CLAY, dark brown, slightly moist, stiff, probed 1.5 inch, some cobbles				
					Misson Valley Formation (Tmv) SANDSTONE, white gray, moist, very dense, slightly weathered, probed < 1 inch				
5			S-1		Bucket scrapes and practical refusal				
					HOLE TERMINATED AT 5 FEET Practical refusal at 5 feet No groundwater encountered Backfilled with soil cuttings				
10									
15									
20									
25									
30									

LEGEND

Sample type: ---Ring ---SPT ---Small Bulk ---Large Bulk ---Water Table

Lab testing: AL = Atterberg Limits; EI = Expansion Index; SA = Sieve Analys; RV = R-Value Test; SR = Sulfate/Resisitivity Test; SH = Shear Test; CO = Consolidatic; MD = Maximum Density

GeoTek, Inc.

LOG OF EXPLORATORY TRENCH

CLIENT:	DR Horton	**DRILLER:**	Luna Construction	**LOGGED BY:**	CH
PROJECT NAME:	Emerald Hills	**DRILL METHOD:**	1.5' bucket	**OPERATOR:**	Sal
PROJECT NO.:	3680-SD	**HAMMER:**	-	**RIG TYPE:**	Mini-Excavator
LOCATION:	San Diego, CA	**ELEVATION:**	325 ft	**DATE:**	9/19/2022

TRENCH NO.: TP-3

Depth (ft)	SAMPLES: Sample Type	SAMPLES: Blows/ 6 in	SAMPLES: Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Laboratory Testing: Dry Density (pcf)	Laboratory Testing:	Laboratory Testing: Others
					Quaternary Colluvium (Qcol)				
				CL	Sandy CLAY, dark brown, sligthly moist, stiff, probes 1.5 inches				
			BB-1	SC	Clayey fine to medium SAND, light orange brown, moist to very moist, very dense				
5					Probes < 1 inch	23.2	95		
					Misson Valley Formation (Tmv)				
					SANDSTONE, white gray, leads to refusal				
					HOLE TERMINATED AT 8 FEET				
10					Practical refusal at 8 feet No groundwater encountered Backfilled with soil cuttings				
15									
20									
25									
30									

LEGEND

Sample type: ---Ring ---SPT ---Small Bulk ---Large Bulk ---Water Table

Lab testing: AL = Atterberg Limits; EI = Expansion Index; SA = Sieve Analys; RV = R-Value Test; SR = Sulfate/Resisitivity Test; SH = Shear Test; CO = Consolidatic; MD = Maximum Density

GeoTek, Inc.

LOG OF EXPLORATORY TRENCH

CLIENT:	DR Horton	**DRILLER:**	Luna Construction	**LOGGED BY:**	CH
PROJECT NAME:	Emerald Hills	**DRILL METHOD:**	1.5' bucket	**OPERATOR:**	Sal
PROJECT NO.:	3680-SD	**HAMMER:**	-	**RIG TYPE:**	Mini-Excavator
LOCATION:	San Diego, CA	**ELEVATION:**	369 ft	**DATE:**	9/19/2022

TRENCH NO.: TP-4

Depth (ft)	SAMPLES: Sample Type	SAMPLES: Blows/ 6 in	SAMPLES: Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Laboratory Testing: Dry Density (pcf)	Laboratory Testing:	Laboratory Testing: Others
					Quaternary Colluvium (Qcol) Sandy CLAY, dark brown, dry, stiff Clayey fine to medium SAND with silt, light orange brown, slightly moist with white chunks of sand, probes 1.5 inches				
5					Sandy CLAY, dark brown, moist, medium stiff	15.2	98		
			S-1		**Misson Valley Formation (Tmv)** SANDSTONE, white olive brown, slightly moist, very dense				
10					Mini-ex reaches max arm length, practical refusal				
					HOLE TERMINATED AT 10 FEET Practical refusal at 10 feet No groundwater encountered Backfilled with soil cuttings				
15									
20									
25									
30									

LEGEND

Sample type: ---Ring ---SPT ---Small Bulk ---Large Bulk ---Water Table

Lab testing: AL = Atterberg Limits; EI = Expansion Index; SA = Sieve Analys; RV = R-Value Test; SR = Sulfate/Resisitivity Test; SH = Shear Test; CO = Consolidatic; MD = Maximum Density

GeoTek, Inc.

LOG OF EXPLORATORY TRENCH

CLIENT:	DR Horton	**DRILLER:**	Luna Construction	**LOGGED BY:**	CH
PROJECT NAME:	Emerald Hills	**DRILL METHOD:**	1.5' bucket	**OPERATOR:**	Sal
PROJECT NO.:	3680-SD	**HAMMER:**	-	**RIG TYPE:**	Mini-Excavator
LOCATION:	San Diego, CA	**ELEVATION:**	358 ft	**DATE:**	9/19/2022

TRENCH NO.: TP-5

Depth (ft)	SAMPLES: Sample Type	SAMPLES: Blows/ 6 in	SAMPLES: Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Laboratory Testing: Dry Density (pcf)	Laboratory Testing:	Laboratory Testing: Others
					Quaternary Colluvium (Qcol)				
				CL	Sandy CLAY, dark brown, dry very stiff				
				SC	Clayey medium to coarse SAND, light brown, some white specks, very moist, medium dense				
5			S-1		**Misson Valley Formation (Tmv)**				
					SANDSTONE, white, very moist, very dense with depth, slightly weathered	20.3	93		
10					Practical refusal				
					HOLE TERMINATED AT 10 FEET				
					Practical refusal at 10 feet No groundwater encountered Backfilled with soil cuttings				
15									
20									
25									
30									

LEGEND

Sample type: ---Ring ---SPT ---Small Bulk ---Large Bulk ---Water Table

Lab testing: AL = Atterberg Limits; EI = Expansion Index; SA = Sieve Analys; RV = R-Value Test; SR = Sulfate/Resisitivity Test; SH = Shear Test; CO = Consolidatic; MD = Maximum Density

GeoTek, Inc.

LOG OF EXPLORATORY TRENCH

CLIENT:	DR Horton	**DRILLER:**	Luna Construction	**LOGGED BY:**	CH
PROJECT NAME:	Emerald Hills	**DRILL METHOD:**	1.5' bucket	**OPERATOR:**	Sal
PROJECT NO.:	3680-SD	**HAMMER:**	-	**RIG TYPE:**	Mini-Excavator
LOCATION:	San Diego, CA	**ELEVATION:**	361 ft	**DATE:**	9/19/2022

TRENCH NO.: TP-6

Depth (ft)	SAMPLES: Sample Type	SAMPLES: Blows/ 6 in	SAMPLES: Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Laboratory Testing: Dry Density (pcf)	Laboratory Testing:	Laboratory Testing: Others
					Quaternary Colluvium (Qcol) Sandy CLAY, dark brown, moist, medium stiff				
5					**Misson Valley Formation (Tmv)** Fine to medium SANDSTONE, white, light brown, very moist, very dense with depth, slightly weathered	20.2	98		
10					Practical refusal				
					HOLE TERMINATED AT 10 FEET Practical refusal at 10 feet No groundwater encountered Backfilled with soil cuttings				
15									
20									
25									
30									

LEGEND

Sample type: ---Ring ---SPT ---Small Bulk ---Large Bulk ---Water Table

Lab testing: AL = Atterberg Limits; EI = Expansion Index; SA = Sieve Analys; RV = R-Value Test; SR = Sulfate/Resisitivity Test; SH = Shear Test; CO = Consolidatic; MD = Maximum Density

GeoTek, Inc.

LOG OF EXPLORATORY TRENCH

CLIENT:	DR Horton	**DRILLER:**	Luna Construction	**LOGGED BY:**	CH
PROJECT NAME:	Emerald Hills	**DRILL METHOD:**	1.5' bucket	**OPERATOR:**	Sal
PROJECT NO.:	3680-SD	**HAMMER:**	-	**RIG TYPE:**	Mini-Excavator
LOCATION:	San Diego, CA	**ELEVATION:**	377 ft	**DATE:**	9/19/2022

TRENCH NO.: TP-7

Depth (ft)	SAMPLES: Sample Type	SAMPLES: Blows/ 6 in	SAMPLES: Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Laboratory Testing: Dry Density (pcf)	Laboratory Testing	Laboratory Testing: Others
					Quaternary Colluvium (Qcol) Sandy CLAY, dark brown, moist, very stiff, probes < 1.5 inches				
5			S-1		**Misson Valley Formation (Tmv)** SANDSTONE and some clays, reddish brown, very moist, very dense, probes < 1 inch, becomes more white at 5 feet				
10					Practical refusal				
					HOLE TERMINATED AT 10 FEET Practical refusal at 10 feet No groundwater encountered Backfilled with soil cuttings				
15									
20									
25									
30									

LEGEND

Sample type: ---Ring ---SPT ---Small Bulk ---Large Bulk ---Water Table

Lab testing: AL = Atterberg Limits; EI = Expansion Index; SA = Sieve Analys; RV = R-Value Test; SR = Sulfate/Resisitivity Test; SH = Shear Test; CO = Consolidatic; MD = Maximum Density

GeoTek, Inc.

LOG OF EXPLORATORY TRENCH

CLIENT:	DR Horton	**DRILLER:**	Luna Construction	**LOGGED BY:**	CH
PROJECT NAME:	Emerald Hills	**DRILL METHOD:**	1.5' bucket	**OPERATOR:**	Sal
PROJECT NO.:	3680-SD	**HAMMER:**	-	**RIG TYPE:**	Mini-Excavator
LOCATION:	San Diego, CA	**ELEVATION:**	339 ft	**DATE:**	9/19/2022

TRENCH NO.: TP-8

Depth (ft)	SAMPLES: Sample Type	SAMPLES: Blows/ 6 in	SAMPLES: Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Laboratory Testing: Dry Density (pcf)	Laboratory Testing	Laboratory Testing: Others
0			BB-1		**Quaternary Colluvium (Qcol)** Sandy CLAY, dark brown, dry to moist with depth, medium stiff, probed < 2 inches				
5									
					Misson Valley Formation (Tmv) SANDSTONE, olive brown, slightly moist, very dense				
10					Practical refusal				
					HOLE TERMINATED AT 10 FEET Practical refusal at 10 feet No groundwater encountered Backfilled with soil cuttings				
15									
20									
25									
30									

LEGEND

Sample type: ---Ring ---SPT ---Small Bulk ---Large Bulk ---Water Table

Lab testing: AL = Atterberg Limits; EI = Expansion Index; SA = Sieve Analys; RV = R-Value Test; SR = Sulfate/Resisitivity Test; SH = Shear Test; CO = Consolidatic; MD = Maximum Density

GeoTek, Inc.

LOG OF EXPLORATORY TRENCH

CLIENT:	DR Horton	**DRILLER:**	Luna Construction	**LOGGED BY:**	CH
PROJECT NAME:	Emerald Hills	**DRILL METHOD:**	1.5' bucket	**OPERATOR:**	Sal
PROJECT NO.:	3680-SD	**HAMMER:**	-	**RIG TYPE:**	Mini-Excavator
LOCATION:	San Diego, CA	**ELEVATION:**	348 ft	**DATE:**	9/19/2022

TRENCH NO.: TP-9

Depth (ft)	SAMPLES: Sample Type	SAMPLES: Blows/ 6 in	SAMPLES: Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Laboratory Testing: Dry Density (pcf)	Laboratory Testing:	Laboratory Testing: Others
					Quaternary Colluvium (Qcol) CLAY with some sand, dry to moist, very stiff, probes < 1 inch				
					Misson Valley Formation (Tmv) SANDSTONE, white to tan, moist, very dense, slightly weathered	16.2	97.2		
5					Bucket scrapes, practical refusal				
					HOLE TERMINATED AT 7 FEET Practical refusal at 7 feet No groundwater encountered Backfilled with soil cuttings				
10									
15									
20									
25									
30									

LEGEND

Sample type: ---Ring ---SPT ---Small Bulk ---Large Bulk ---Water Table

Lab testing: AL = Atterberg Limits; EI = Expansion Index; SA = Sieve Analys; RV = R-Value Test; SR = Sulfate/Resisitivity Test; SH = Shear Test; CO = Consolidatic; MD = Maximum Density

GeoTek, Inc.

LOG OF EXPLORATORY TRENCH

CLIENT:	DR Horton	**DRILLER:**	Luna Construction	**LOGGED BY:**	CH
PROJECT NAME:	Emerald Hills	**DRILL METHOD:**	1.5' bucket	**OPERATOR:**	Sal
PROJECT NO.:	3680-SD	**HAMMER:**	-	**RIG TYPE:**	Mini-Excavator
LOCATION:	San Diego, CA	**ELEVATION:**	359 ft	**DATE:**	9/19/2022

TRENCH NO.: TP-10

Depth (ft)	SAMPLES: Sample Type	SAMPLES: Blows/ 6 in	SAMPLES: Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Laboratory Testing: Dry Density (pcf)	Laboratory Testing	Laboratory Testing: Others
					Quaternary Colluvium (Qcol) CLAY, dark brown, moist with depth, medium stiff				
5					**Misson Valley Formation (Tmv)** SANDSTONE, white to light tan brown, moist to very moist, very dense Practical refusal, bucket scrapes				
					HOLE TERMINATED AT 6 FEET Practical refusal at 6 feet No groundwater encountered Backfilled with soil cuttings				
10									
15									
20									
25									
30									

LEGEND

Sample type: ---Ring ---SPT ---Small Bulk ---Large Bulk ---Water Table

Lab testing: AL = Atterberg Limits; EI = Expansion Index; SA = Sieve Analys; RV = R-Value Test; SR = Sulfate/Resisitivity Test; SH = Shear Test; CO = Consolidatic; MD = Maximum Density

GeoTek, Inc.

LOG OF EXPLORATORY TRENCH

CLIENT:	DR Horton	**DRILLER:**	Luna Construction	**LOGGED BY:**	CH
PROJECT NAME:	Emerald Hills	**DRILL METHOD:**	1.5' bucket	**OPERATOR:**	Sal
PROJECT NO.:	3680-SD	**HAMMER:**	-	**RIG TYPE:**	Mini-Excavator
LOCATION:	San Diego, CA	**ELEVATION:**	347 ft	**DATE:**	9/19/2022

TRENCH NO.: TP-11

Depth (ft)	SAMPLES: Sample Type	SAMPLES: Blows/ 6 in	SAMPLES: Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Laboratory Testing: Dry Density (pcf)	Laboratory Testing:	Laboratory Testing: Others
					Quaternary Colluvium (Qcol) Sandy CLAY, dark brown, moist, stiff				
					Clayey SAND, dark brown, moist to very moist, medium dense to very dense, probes < 2 inches				
5					**Misson Valley Formation (Tmv)** SANDSTONE, white to tan, moist, very dense				
					Bucket scrapes, practical refusal				
					HOLE TERMINATED AT 8 FEET				
10					Practical refusal at 8 feet No groundwater encountered Backfilled with soil cuttings				
15									
20									
25									
30									

LEGEND

Sample type: ---Ring ---SPT ---Small Bulk ---Large Bulk ---Water Table

Lab testing: AL = Atterberg Limits; EI = Expansion Index; SA = Sieve Analys; RV = R-Value Test; SR = Sulfate/Resisitivity Test; SH = Shear Test; CO = Consolidatic; MD = Maximum Density

PERCOLATION DATA SHEET

Project: Emerald Hills **Job No.:** 3680-SD.

Test Hole No.: P-1 **Tested By:** CH, **Date:** 9/20/22.

Depth of Hole As Drilled: 36" **Before Test:** 36" **After Test:** 36".

Reading No.	Time	Time Interval (Min)	Total Depth of Hole (Inches)	Initial Water Level (Inches)	Final Water Level (Inches)	Δ In Water Level (Inches)		Comments
1	6:00	30	28	13	16	3		
2	6:30	30	28	13	14	1		
3	7:00	30	28	14	16	2		
4	7:30	30	28	14	16	2		
5	8:00	30	28	14	16	2		
6	8:30	30	28	15	16	1		
7	9:00	30	28	15	16	1		
8	9:30	30	28	15.25	16	0.75		
9	10:00	30	28	14.5	16	1.5		
10	10:30	30	28	14.25	16	1.75		
11	11:00	30	28	14.75	16	1.25		
12	11:30	30	28	15	16	1		

Client: D.R. Horton
Project: Emerald Hills
Project No: 3680-SD
Date: 9/20/2022

Boring No. P-1

Infiltration Rate (Porchet Method)

Time Interval, Δt =	30
Final Depth to Water, D_F =	16.00
Test Hole Radius, r =	3.00
Initial Depth to Water, D_O =	15
Total Test Hole Depth, D_T =	36

Equation - $I_t = \dfrac{\Delta H\,(60r)}{\Delta t\,(r+2H_{avg})}$

$H_O = D_T - D_O$ =	21.00
$H_F = D_T - D_F$ =	20.00
$\Delta H = \Delta D = H_O - H_F$ =	1.00
$Havg = (H_O+H_F)/2$ =	20.50

I_t = 0.14 **Inches per Hour**

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PERCOLATION DATA SHEET

Project: Emerald Hills **Job No.:** 3680-SD.

Test Hole No.: P-2 **Tested By:** CH, **Date:** 9/20/22.

Depth of Hole As Drilled: 36" **Before Test:** 36" **After Test:** 36".

Reading No.	Time	Time Interval (Min)	Total Depth of Hole (Inches)	Initial Water Level (Inches)	Final Water Level (Inches)	Δ In Water Level (Inches)		Comments
1	6:10	30	31	10	16	0		
2	6:40	30	31	10	16	6		
3	7:10	30	31	11	16.25	5.25		
4	7:40	30	31	11.25	16.25	5		
5	8:10	30	31	12	18	6		
6	8:40	30	31	12.25	18.5	6.25		
7	9:10	30	31	13	18.5	5.5		
8	9:40	30	31	13.75	19.25	5.5		
9	10:10	30	31	13.25	19	5.75		
10	10:40	30	31	14	19.5	5.5		
11	11:10	30	31	14.25	19.5	5.25		
12	11:40	30	31	14.75	20	5.25		

Client: D.R. Horton

Project: Emerald Hills

Project No: 3680-SD

Date: 9/20/2022

Boring No. P-2

Infiltration Rate (Porchet Method)

Time Interval, Δt =	30
Final Depth to Water, D_F =	20.00
Test Hole Radius, r =	3.00
Initial Depth to Water, D_O =	14.75
Total Test Hole Depth, D_T =	36

Equation - $I_t = \dfrac{\Delta H\,(60r)}{\Delta t\,(r+2H_{avg})}$

$H_O = D_T - D_O$ =	21.25
$H_F = D_T - D_F$ =	16.00
$\Delta H = \Delta D = H_O - H_F$ =	5.25
$Havg = (H_O+H_F)/2$ =	18.63

I_t = 0.78 **Inches per Hour**

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PERCOLATION DATA SHEET

Project: Emerald Hills **Job No.:** 3680-SD.

Test Hole No.: P-3 **Tested By:** CH, **Date:** 9/20/22.

Depth of Hole As Drilled: 36" **Before Test:** 36" **After Test:** 36".

Reading No.	Time	Time Interval (Min)	Total Depth of Hole (Inches)	Initial Water Level (Inches)	Final Water Level (Inches)	Δ In Water Level (Inches)		Comments
1	6:20	30	28	10	13	0		
2	6:50	30	28	10	13	3		
3	7:20	30	28	11	13	2		
4	7:50	30	28	11	13	2		
5	8:20	30	28	11.25	13	1.75		
6	8:50	30	28	12	13	1		
7	9:20	30	28	11.75	13	1.25		
8	9:50	30	28	12.25	13	0.75		
9	10:20	30	28	12	13	1		
10	10:50	30	28	13	13	0		
11	11:20	30	28	13	13	0		
12	11:50	30	28	13	13	0		

Client: D.R. Horton

Project: Emerald Hills

Project No: 3680-SD

Date: 9/20/2022

Boring No. P-3

Infiltration Rate (Porchet Method)

Time Interval, Δt =	30
Final Depth to Water, D_F =	13.00
Test Hole Radius, r =	3.00
Initial Depth to Water, D_O =	13
Total Test Hole Depth, D_T =	36

Equation - $I_t = \dfrac{\Delta H\,(60r)}{\Delta t\,(r+2H_{avg})}$

$H_O = D_T - D_O$ =	23.00
$H_F = D_T - D_F$ =	23.00
$\Delta H = \Delta D = H_O - H_F$ =	0.00
$Havg = (H_O+H_F)/2$ =	23.00

I_t = 0.00 **Inches per Hour**

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APPENDIX B

RESULTS OF LABORATORY TESTING

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SUMMARY OF LABORATORY TESTING

Identification and Classification

Soils were identified visually in general accordance with the standard practice for description and identification of soils (ASTM D 2488). The soil identifications and classifications are shown on the Logs of Exploration in Appendix A.

Moisture Density Modified Proctor

Laboratory testing was performed on one sample collected during the subsurface exploration for compaction characteristics. The laboratory maximum dry density and optimum moisture content for the soil was determined in general accordance with ASTM Test Method D 1557 procedures. The test results are graphically presented in Appendix B.

Expansion Index Test

Expansion Index testing was performed on one sample collected during the subsurface exploration. The expansion index was determined in general accordance with ASTM Test Method D 4829 procedures. The test results are presented in Appendix B.

Full Corrosion Suite

A full corrosion series was performed in general accordance with several ASTM Test Methods on representative samples collected during the subsurface exploration. The samples were obtained from Test Pit TP-6 and TP-7 and tested by HDR.

Percent of Soil Passing No 200 Sieve

The amount of soil finer than No. 200 sieve was determined for samples collected from the site. The tests were performed in general accordance with ASTM D 1140. The test results are presented in Appendix B.

Direct Shear

Shear testing was performed in a direct shear machine of the strain-control type in general accordance with ASTM Test Method D 3080 procedures. The rate of deformation is approximately 0.025 inches per minute. The samples were sheared under varying confining loads to determine the coulomb shear strength parameters, angle of internal friction and cohesion. One test was performed on a bulk sample that was remolded to approximately 90 percent of the maximum dry density as determined by ASTM D 1557. The results of the testing are graphically presented in Appendix B.

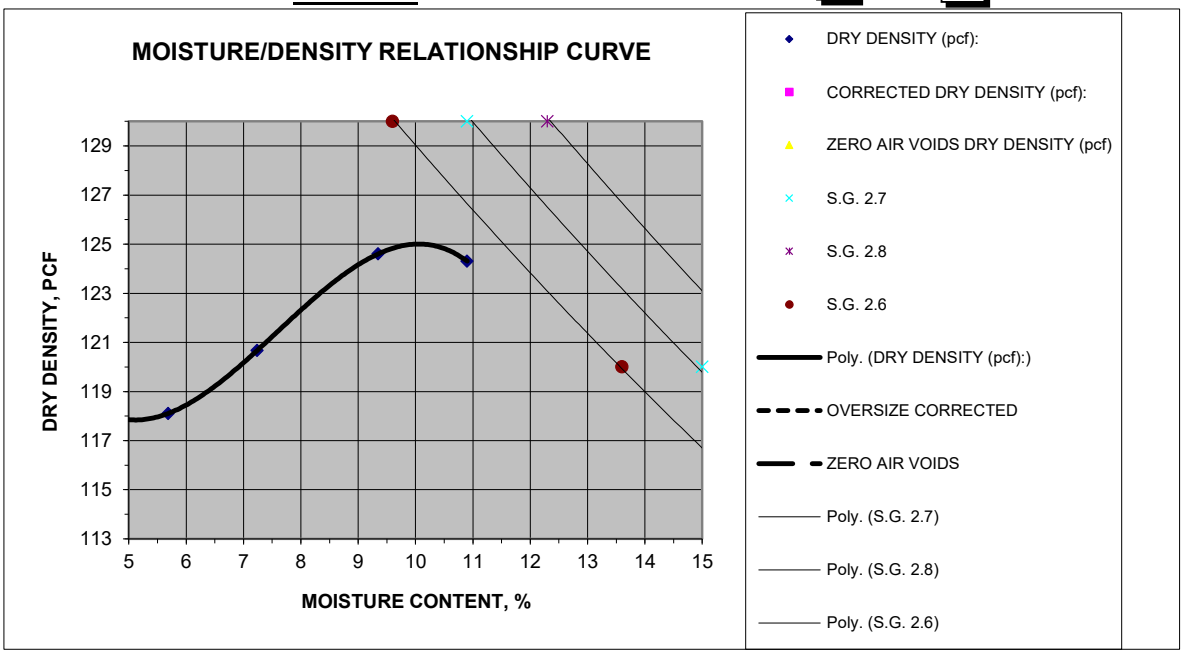
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MOISTURE/DENSITY RELATIONSHIP

Client:	DR Horton	**Job No.:**	3680-SD
Project:	Emerald Hills	**Lab No.:**	3795
Location:	San Diego, CA		
Material Type:	Light Brown Silty Sand		
Material Supplier:	-		
Material Source:	-		
Sample Location:	TP-1 BB-1		
	-		
Sampled By:	CH	**Date Sampled:**	9/19/2022
Received By:	CH	**Date Received:**	9/19/2022
Tested By:	KP	**Date Tested:**	9/30/2022
Reviewed By:	-	**Date Reviewed:**	-

Test Procedure: ASTM D1557 **Method:** A

Oversized Material (%): 0.0 **Correction Required:** [ ] yes [x] no



MOISTURE DENSITY RELATIONSHIP VALUES

Maximum Dry Density, pcf	125.0	**@ Optimum Moisture, %**	10.0
Corrected Maximum Dry Density, pcf		**@ Optimum Moisture, %**	

MATERIAL DESCRIPTION

Grain Size Distribution:

	% Gravel (retained on No. 4)
	% Sand (Passing No. 4, Retained on No. 200)
	% Silt and Clay (Passing No. 200)

Atterberg Limits:

	Liquid Limit, %
	Plastic Limit, %
	Plasticity Index, %

Classification:

Unified Soils Classification:

AASHTO Soils Classification:

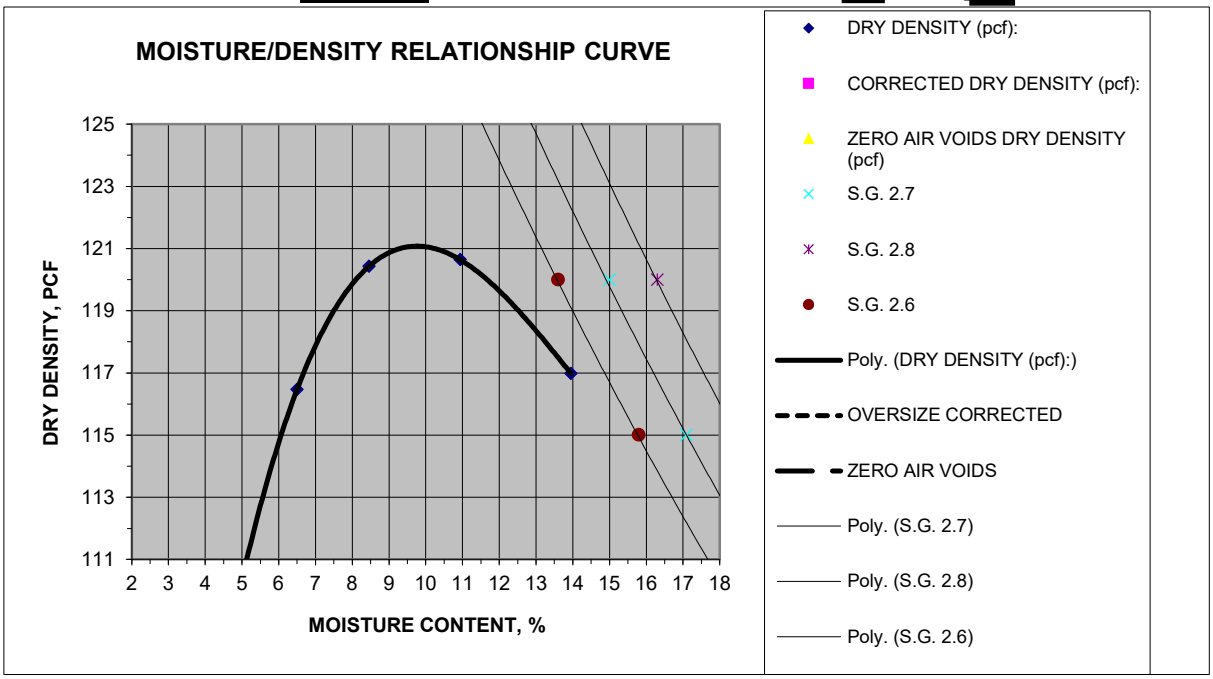
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MOISTURE/DENSITY RELATIONSHIP

Client:	DR Horton	**Job No.:**	3680-SD
Project:	Emerald Hills	**Lab No.:**	3795
Location:	San Diego, CA		
Material Type:	Dark Brown Silty Clayey Fine Sand		
Material Supplier:	-		
Material Source:	-		
Sample Location:	TP-3		
	-		
Sampled By:	CH	**Date Sampled:**	9/19/2022
Received By:	CH	**Date Received:**	9/19/2022
Tested By:	KP	**Date Tested:**	9/29/2022
Reviewed By:	-	**Date Reviewed:**	-

Test Procedure: ASTM D1557 **Method:** A

Oversized Material (%): 0.0 **Correction Required:** [ ] yes [x] no



MOISTURE DENSITY RELATIONSHIP VALUES

Maximum Dry Density, pcf	121.0	**@ Optimum Moisture, %**	10.0
Corrected Maximum Dry Density, pcf		**@ Optimum Moisture, %**	

MATERIAL DESCRIPTION

Grain Size Distribution:

	% Gravel (retained on No. 4)
	% Sand (Passing No. 4, Retained on No. 200)
	% Silt and Clay (Passing No. 200)

Classification:

Unified Soils Classification:

Atterberg Limits:

	Liquid Limit, %
	Plastic Limit, %
	Plasticity Index, %

EXPANSION INDEX TEST

(ASTM D4829)

Project Name:	Emeral Hills	***Tested/ Checked By:***	***KP*** Lab No 3795
Project Number:	3680-SD	***Date Tested:***	10/3/2022
Project Location:	San Diego, CA	***Sample Source:***	TP-1 BB-1
		Sample Description:	Dark Brown Silty Sand

Ring Id: 12 Ring Dia. " : 4" Ring H 1"

Loading weight: 5516. grams

DENSITY DETERMINATION

A	Weight of compacted sample & ring	**773**
B	Weight of ring	370
C	Net weight of sample	403
D	Wet Density, lb / ft3 (C*0.3016)	121.5
E	Dry Density, lb / ft3 (D/1.F)	**110.8**

SATURATION DETERMINATION

	Wet Weight of sample & tare	**168.4**
	Dry Weight of sample & tare	**154**
	Tare	**4.8**
F	Initial Moisture Content, %	**9.7**
G	(E*F)	1069.8
H	(E/167.232)	0.66
I	(1.-H)	0.34
J	(62.4*I)	21.0
K	(G/J)= **L** % Saturation	**50.8**

READINGS			
DATE	TIME	READING	
10/3/2022	13:05	128	Initial
	13:15	128	10 min/Dry
	13:16	129	1 min/Wet
	13:21	134	5 min/Wet
10/4/2022	9:03	142	Random
	9:08	142	Final

FINAL MOISTURE			
Weight of wet sample & tare	Wt. of dry sample & tare	Tare	% Moisture
213	182.9	4.8	16.9%

EXPANSION INDEX = 14

GEOTEK

EXPANSION INDEX TEST

(ASTM D4829)

Project Name:	Emeral Hills	***Tested/ Checked By:***	***KP*** Lab No 3795
Project Number:	3680-SD	***Date Tested:***	10/3/2022
Project Location:	San Diego, CA	***Sample Source:***	TP-8 BB-1
		Sample Description:	Dark Brown Silty Sand

Ring Id: 12 Ring Dia. " : 4" Ring H 1"

Loading weight: 5516. grams

DENSITY DETERMINATION

A	Weight of compacted sample & ring	**764**
B	Weight of ring	370
C	Net weight of sample	394
D	Wet Density, lb / ft3 (C*0.3016)	118.8
E	Dry Density, lb / ft3 (D/1.F)	**107.7**

SATURATION DETERMINATION

	Wet Weight of sample & tare	**127.9**
	Dry Weight of sample & tare	**116.4**
	Tare	**4.8**
F	Initial Moisture Content, %	**10.3**
G	(E*F)	1110.1
H	(E/167.232)	0.64
I	(1.-H)	0.36
J	(62.4*I)	22.2
K	(G/J)= **L** % Saturation	**50.0**

READINGS			
DATE	TIME	READING	
10/3/2022	9:01	137	Initial
	9:11	137	10 min/Dry
	9:13	141	1 min/Wet
	9:18	147	5 min/Wet
10/4/2022	8:40	162	Random
	8:50	162	Final

FINAL MOISTURE			
Weight of wet sample & tare	Wt. of dry sample & tare	Tare	% Moisture
270	236	4.8	14.7%

EXPANSION INDEX = 25

-200 WASH

Date:	10/5/2022		
W.O.:	3680-SD	sample ID	TP-7 S-1
Client:	DR Horton	depth	5'
Project:	Emerald Hills		

Sieve Size	Particle Diameter		Wt. Retained	Wt. Passing	% Passing	Specs
	in.	mm.				
#200	0.0029	0.074	112.6	156.8	58.2%	

Dry Weight	269.4	
Soak Time	40	Minutes

APPENDIX C

I-8 AND I-9 FORMS

GEOTEK

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions[1]	Worksheet C.4-1: Form I-8A[2]
Part 1 - Full Infiltration Feasibility Screening Criteria	
DMA(s) Being Analyzed:	Project Phase:
Eastern □asin	Planning Phase
Criteria 1: Infiltration Rate Screening	
1A	Is the mapped hydrologic soil group according to the NRCS Web Soil Survey or UC Davis Soil Web Mapper Type A or B and corroborated by available site soil data[3]? ○ Yes; the DMA may feasibly support full infiltration. Answer "Yes" to Criteria 1 Result or continue to Step 1B if the applicant elects to perform infiltration testing. ○ No; the mapped soil types are A or B but is not corroborated by available site soil data (continue to Step 1B). ● No; the mapped soil types are C, D, or "urban/unclassified" and is corroborated by available site soil data. Answer "No" to Criteria 1 Result. ○ No; the mapped soil types are C, D, or "urban/unclassified" but is not corroborated by available site soil data (continue to Step 1B).
1B	Is the reliable infiltration rate calculated using planning phase methods from Table D.3-1? ● Yes; Continue to Step 1C. ○ No; Skip to Step 1D.
1C	Is the reliable infiltration rate calculated using planning phase methods from Table D.3-1 greater than 0.5 inches per hour? ○ Yes; the DMA may feasibly support full infiltration. Answer "Yes" to Criteria 1 Result. ● No; full infiltration is not required. Answer "No" to Criteria 1 Result.
1D	**Infiltration Testing Method.** Is the selected infiltration testing method suitable during the design phase (see Appendix D.3)? Note: Alternative testing standards may be allowed with appropriate rationales and documentation. ● Yes; continue to Step 1E. ○ No; select an appropriate infiltration testing method.

[1] Note that it is not required to investigate each and every criterion in the worksheet, a single "no" answer in Part 1, Part 2, Part 3, or Part 4 determines a full, partial, or no infiltration condition.

[2] This form must be completed each time there is a change to the site layout that would affect the infiltration feasibility condition. Previously completed forms shall be retained to document the evolution of the site storm water design.

[3] Available data includes site-specific sampling or observation of soil types or texture classes, such as obtained from borings or test pits necessary to support other design elements.

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions	Worksheet C.4-1: Form I-8A[2]
1E	**Number of Percolation/Infiltration Tests.** Does the infiltration testing method performed satisfy the minimum number of tests specified in Table D.3-2? (●) Yes; continue to Step 1F. ( ) No; conduct appropriate number of tests.
IF	**Factor of Safety.** Is the suitable Factor of Safety selected for full infiltration design? See guidance in D.5; Tables D.5-1 and D.5-2; and Worksheet D.5-1 (Form I-9). (●) Yes; continue to Step 1G. ( ) No; select appropriate factor of safety.
1G	**Full Infiltration Feasibility.** Is the average measured infiltration rate divided by the Factor of Safety greater than 0.5 inches per hour? ( ) Yes; answer "Yes" to Criteria 1 Result. (●) No; answer "No" to Criteria 1 Result.
Criteria 1 Result	Is the estimated reliable infiltration rate greater than 0.5 inches per hour within the DMA where runoff can reasonably be routed to a BMP? ( ) Yes; the DMA may feasibly support full infiltration. Continue to Criteria 2. (●) No; full infiltration is not required. Skip to Part 1 Result.

Summarize infiltration testing methods, testing locations, replicates, and results and summarize estimates of reliable infiltration rates according to procedures outlined in D.5. Documentation should be included in project geotechnical report.

Small diameter □ore hole testing and infiltration analysis □y the POr□het method. □he test □ as performed □ ithin the proposed □asin lo□ation and res□lted in an infiltration rate of 0.□4 in□hes per ho□r. See □ eo□e□□ preliminary geote□hni□al report Proposed Emerald Hills Development, North of Old Memory lane, APN 543-340-02-00, San Diego, California" PN 3□□0-SD, dated O□to□er □3, 2022

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[2]	
Criteria 2: Geologic/Geotechnical Screening			
2A	If all questions in Step 2A are answered "Yes," continue to Step 2B. For any "No" answer in Step 2A answer "No" to Criteria 2, and submit an "Infiltration Feasibility Condition Letter" that meets the requirements in Appendix C.1.1. The geologic/geotechnical analyses listed in Appendix C.2.1 do not apply to the DMA because one of the following setbacks cannot be avoided and therefore result in the DMA being in a no infiltration condition. The setbacks must be the closest horizontal radial distance from the surface edge (at the overflow elevation) of the BMP.		
2A-1	Can the proposed full infiltration BMP(s) avoid areas with existing fill materials greater than 5 feet thick below the infiltrating surface?	◉ Yes	○ No
2A-2	Can the proposed full infiltration BMP(s) avoid placement within 10 feet of existing underground utilities, structures, or retaining walls?	◉ Yes	○ No
2A-3	Can the proposed full infiltration BMP(s) avoid placement within 50 feet of a natural slope (>25%) or within a distance of 1.5H from fill slopes where H is the height of the fill slope?	○ Yes	◉ No
2B	When full infiltration is determined to be feasible, a geotechnical investigation report must be prepared that considers the relevant factors identified in Appendix C.2.1. If all questions in Step 2B are answered "Yes," then answer "Yes" to Criteria 2 Result. If there are "No" answers continue to Step 2C.		
2B-1	**Hydroconsolidation.** Analyze hydroconsolidation potential per approved ASTM standard due to a proposed full infiltration BMP. Can full infiltration BMPs be proposed within the DMA without increasing hydroconsolidation risks?	○ Yes	○ No
2B-2	**Expansive Soils.** Identify expansive soils (soils with an expansion index greater than 20) and the extent of such soils due to proposed full infiltration BMPs. Can full infiltration BMPs be proposed within the DMA without increasing expansive soil risks?	○ Yes	○ No

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[2]	
2B-3	**Liquefaction**. If applicable, identify mapped liquefaction areas. Evaluate liquefaction hazards in accordance with Section 6.4.2 of the City of San Diego's Guidelines for Geotechnical Reports (2011 or most recent edition). Liquefaction hazard assessment shall take into account any increase in groundwater elevation or groundwater mounding that could occur as a result of proposed infiltration or percolation facilities. Can full infiltration BMPs be proposed within the DMA without increasing liquefaction risks?	○ Yes	◉ No
2B-4	**Slope Stability**. If applicable, perform a slope stability analysis in accordance with the ASCE and Southern California Earthquake Center (2002) Recommended Procedures for Implementation of DMG Special Publication 117, Guidelines for Analyzing and Mitigating Landslide Hazards in California to determine minimum slope setbacks for full infiltration BMPs. See the City of San Diego's Guidelines for Geotechnical Reports (2011) to determine which type of slope stability analysis is required. Can full infiltration BMPs be proposed within the DMA without increasing slope stability risks?	○ Yes	◉ No
2B-5	**Other Geotechnical Hazards.** Identify site-specific geotechnical hazards not already mentioned (refer to Appendix C.2.1). Can full infiltration BMPs be proposed within the DMA without increasing risk of geologic or geotechnical hazards not already mentioned?	○ Yes	◉ No
2B-6	**Setbacks.** Establish setbacks from underground utilities, structures, and/or retaining walls. Reference applicable ASTM or other recognized standard in the geotechnical report. Can full infiltration BMPs be proposed within the DMA using established setbacks from underground utilities, structures, and/or retaining walls?	◉ Yes	◉ No

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[2]	
2C	**Mitigation Measures.** Propose mitigation measures for each geologic/geotechnical hazard identified in Step 2B. Provide a discussion of geologic/geotechnical hazards that would prevent full infiltration BMPs that cannot be reasonably mitigated in the geotechnical report. See Appendix C.2.1.8 for a list of typically reasonable and typically unreasonable mitigation measures. Can mitigation measures be proposed to allow for full infiltration BMPs? If the question in Step 2 is answered "Yes," then answer "Yes" to Criteria 2 Result. If the question in Step 2C is answered "No," then answer "No" to Criteria 2 Result.	○ Yes	○ No
Criteria 2 Result	Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of geologic or geotechnical hazards that cannot be reasonably mitigated to an acceptable level?	○ Yes	● No

Summarize findings and basis; provide references to related reports or exhibits.

Small diameter □ore hole testing and infiltration analysis □y the POr□het method. □he test □ as performed □ ithin the proposed □asin lo□ation and res□lted in an infiltration rate of 0.□4 in□hes per ho□r. See □ eo□e□□s preliminary geote□hni□al report Proposed Emerald Hills Development, North of Old Memory lane, APN 543-340-02-00, San Diego, California" PN 3□□0-SD, dated O□to□er □3, 2022

Part 1 Result – Full Infiltration Geotechnical Screening [4]	Result
If answers to both Criteria 1 and Criteria 2 are "Yes", a full infiltration design is potentially feasible based on Geotechnical conditions only. If either answer to Criteria 1 or Criteria 2 is "No", a full infiltration design is not required.	○ Full infiltration Condition ● Complete Part 2

[4] To be completed using gathered site information and best professional judgement considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by City Engineer to substantiate findings.

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions	Worksheet C.4-1: Form I-8A[2]
Part 2 – Partial vs. No Infiltration Feasibility Screening Criteria	
DMA(s) Being Analyzed:	Project Phase:
□ estern □asin	Planning Phase
Criteria 3 : Infiltration Rate Screening	
3A	**NRCS Type C, D, or "urban/unclassified":** Is the mapped hydrologic soil group according to the NRCS Web Soil Survey or UC Davis Soil Web Mapper is Type C, D, or "urban/unclassified" and corroborated by available site soil data? ○ Yes; the site is mapped as C soils and a reliable infiltration rate of 0.15 in/hr. is used to size partial infiltration BMPS. Answer "Yes" to Criteria 3 Result. ● Yes; the site is mapped as D soils or "urban/unclassified" and a reliable infiltration rate of 0.05 in/hr. is used to size partial infiltration BMPS. Answer "Yes" to Criteria 3 Result. ○ No; infiltration testing is conducted (refer to Table D.3-1), continue to Step 3B.
3B	**Infiltration Testing Result:** Is the reliable infiltration rate (i.e. average measured infiltration rate/2) greater than 0.05 in/hr. and less than or equal to 0.5 in/hr? ● Yes; the site may support partial infiltration. Answer "Yes" to Criteria 3 Result. ○ No; the reliable infiltration rate (i.e. average measured rate/2) is less than 0.05 in/hr., partial infiltration is not required. Answer "No" to Criteria 3 Result.
Criteria 3 Result	Is the estimated reliable infiltration rate (i.e., average measured infiltration rate/2) greater than or equal to 0.05 inches/hour and less than or equal to 0.5 inches/hour at any location within each DMA where runoff can reasonably be routed to a BMP? ● Yes; Continue to Criteria 4. ○ No: Skip to Part 2 Result.
Summarize infiltration testing and/or mapping results (i.e. soil maps and series description used for infiltration rate). Small diameter □ore hole testing and infiltration analysis □y the POr□het method. □he test □ as performed □ ithin the proposed □asin lo□ation and res□lted in an infiltration rate of 0.□4 in□hes per ho□r. See □ eo□e□□s preliminary geote□hni□al report Proposed Emerald Hills Development, North of Old Memory lane, APN 543-340-02-00, San Diego, California" PN 3□□0-SD, dated O□to□er □3, 2022	

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[2]	
Criteria 4: Geologic/Geotechnical Screening			
4A	If all questions in Step 4A are answered "Yes," continue to Step 2B. For any "No" answer in Step 4A answer "No" to Criteria 4 Result, and submit an "Infiltration Feasibility Condition Letter" that meets the requirements in Appendix C.1.1. The geologic/geotechnical analyses listed in Appendix C.2.1 do not apply to the DMA because one of the following setbacks cannot be avoided and therefore result in the DMA being in a no infiltration condition. The setbacks must be the closest horizontal radial distance from the surface edge (at the overflow elevation) of the BMP.		
4A-1	Can the proposed partial infiltration BMP(s) avoid areas with existing fill materials greater than 5 feet thick?	◉ Yes	○ No
4A-2	Can the proposed partial infiltration BMP(s) avoid placement within 10 feet of existing underground utilities, structures, or retaining walls?	◉ Yes	○ No
4A-3	Can the proposed partial infiltration BMP(s) avoid placement within 50 feet of a natural slope (>25%) or within a distance of 1.5H from fill slopes where H is the height of the fill slope?	○ Yes	◉ No
4B	When full infiltration is determined to be feasible, a geotechnical investigation report must be prepared that considers the relevant factors identified in Appendix C.2.1. If all questions in Step 4B are answered "Yes," then answer "Yes" to Criteria 4 Result. If there are any "No" answers continue to Step 4C.		
4B-1	**Hydroconsolidation.** Analyze hydroconsolidation potential per approved ASTM standard due to a proposed full infiltration BMP. Can partial infiltration BMPs be proposed within the DMA without increasing hydroconsolidation risks?	○ Yes	○ No
4B-2	**Expansive Soils.** Identify expansive soils (soils with an expansion index greater than 20) and the extent of such soils due to proposed full infiltration BMPs. Can partial infiltration BMPs be proposed within the DMA without increasing expansive soil risks?	○ Yes	○ No
4B-3	**Liquefaction**. If applicable, identify mapped liquefaction areas. Evaluate liquefaction hazards in accordance with Section 6.4.2 of the City of San Diego's Guidelines for Geotechnical Reports (2011). Liquefaction hazard assessment shall take into account any increase in groundwater elevation or groundwater mounding that could occur as a result of proposed infiltration or percolation facilities. Can partial infiltration BMPs be proposed within the DMA without increasing liquefaction risks?	○ Yes	○ No

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[2]	
4B-4	**Slope Stability**. If applicable, perform a slope stability analysis in accordance with the ASCE and Southern California Earthquake Center (2002) Recommended Procedures for Implementation of DMG Special Publication 117, Guidelines for Analyzing and Mitigating Landslide Hazards in California to determine minimum slope setbacks for full infiltration BMPs. See the City of San Diego's Guidelines for Geotechnical Reports (2011) to determine which type of slope stability analysis is required. Can partial infiltration BMPs be proposed within the DMA without increasing slope stability risks?	○ Yes	◉ No
4B-5	**Other Geotechnical Hazards.** Identify site-specific geotechnical hazards not already mentioned (refer to Appendix C.2.1). Can partial infiltration BMPs be proposed within the DMA without increasing risk of geologic or geotechnical hazards not already mentioned?	○ Yes	◉ No
4B-6	**Setbacks.** Establish setbacks from underground utilities, structures, and/or retaining walls. Reference applicable ASTM or other recognized standard in the geotechnical report. Can partial infiltration BMPs be proposed within the DMA using recommended setbacks from underground utilities, structures, and/or retaining walls?	○ Yes	◉ No
4C	**Mitigation Measures.** Propose mitigation measures for each geologic/geotechnical hazard identified in Step 4B. Provide a discussion on geologic/geotechnical hazards that would prevent partial infiltration BMPs that cannot be reasonably mitigated in the geotechnical report. See Appendix C.2.1.8 for a list of typically reasonable and typically unreasonable mitigation measures. Can mitigation measures be proposed to allow for partial infiltration BMPs? If the question in Step 4C is answered "Yes," then answer "Yes" to Criteria 4 Result. If the question in Step 4C is answered "No," then answer "No" to Criteria 4 Result.	○ Yes	◉ No
Criteria 4 Result	Can infiltration of greater than or equal to 0.05 inches/hour and less than or equal to 0.5 inches/hour be allowed without increasing the risk of geologic or geotechnical hazards that cannot be reasonably mitigated to an acceptable level?	○ Yes	● No

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions	Worksheet C.4-1: Form I-8A[2]

Summarize findings and basis; provide references to related reports or exhibits.

Small diameter □ore hole testing and infiltration analysis □y the POr□het method. □he test □ as performed □ ithin the proposed □asin lo□ation and res□lted in an infiltration rate of 0.□4 in□hes per ho□r. See □ eo□e□□s preliminary geote□hni□al report Proposed Emerald Hills Development, North of Old Memory lane, APN 543-340-02-00, San Diego, California" PN 3□□0-SD, dated O□to□er □3, 2022

Part 2 – Partial Infiltration Geotechnical Screening Result[5]	Result
If answers to both Criteria 3 and Criteria 4 are "Yes", a partial infiltration design is potentially feasible based on geotechnical conditions only. If answers to either Criteria 3 or Criteria 4 is "No", then infiltration of any volume is considered to be infeasible within the site.	◯ Partial Infiltration Condition ● No Infiltration Condition

[5] To be completed using gathered site information and best professional judgement considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by City Engineer to substantiate findings.

Categorization of Infiltration Feasibility Condition based on Groundwater and Water Balance Conditions		Worksheet C.4-2: Form I-8B[2]
Part 1 - Full Infiltration Feasibility Screening Criteria		
DMA(s) Being Analyzed:		Project Phase:
□ estern □asin		Planning Phase
Criteria 1: Groundwater Screening		
1A	**Groundwater Depth.** Is the depth to seasonally high groundwater tables (normal high depth during the wet season) beneath the base of any full infiltration BMP greater than 10 feet? ● Yes; continue to Step 1B. ○ No; The depth to groundwater is less than or equal to 10 feet, but site layout changes or reasonable mitigation measures can be proposed to support full infiltration BMPs. Continue to step 1B. ○ No; The depth to groundwater is less than or equal to 10 feet and site layout changes or reasonable mitigation measures cannot be proposed to support full infiltration BMPs. Answer "No" for Criteria 1 Result.	
1B	**Contaminated Soil/Groundwater.** Are proposed full infiltration BMPs at least 250 feet away from contaminated soil or groundwater sites? This can be confirmed using GeoTracker (geotracker.waterboards.ca.gov) to identify open contaminated sites. The setbacks must be the closest horizontal radial distance from the surface edge (at the overflow elevation) of the BMP. ● Yes; continue to Step 1C. ○ No; However, site layout changes or reasonable mitigation measures can be proposed to support full infiltration BMPs. Continue to Step 1C. ○ No; Site layout changes or reasonable mitigation measures cannot be proposed to support full infiltration BMPs. Answer "No" to Criteria 1 Result.	

[1] Note that it is not required to investigate each and every criterion in the worksheet, a single "no" answer in Part 1, Part 2, part 3, or Part 4 determines a full, partial, or no infiltration condition.

[2] This form must be completed each time there is a change to the site layout that would affect the infiltration feasibility condition. Previously completed forms shall be retained to document the evolution of the site storm water design.

Categorization of Infiltration Feasibility Condition based on Groundwater and Water Balance Conditions	Worksheet C.4-2: Form I-8B[2]
1C	**Inadequate Soil Treatment Capacity.** Are full infiltration BMPs proposed in DMA soils that have adequate soil treatment capacity? The DMA has adequate soil treatment capacity if **ALL** of the following criteria (detailed in C.2.2.1) for all soil layers beneath the infiltrating surface are met: • USDA texture class is sandy loam or loam or silt loam or silt or sandy clay loam or clay loam or silty clay loam or sandy clay or silty clay or clay; and • Cation Exchange Capacity (CEC) greater than 5 milliequivalents/100g; and • Soil organic matter is greater than 1%; and • Groundwater table is equal to or greater than 10 feet beneath the base of the full infiltration BMP. ○ Yes; continue to Step 1D. ○ No; However, site layout changes or reasonable mitigation measures can be proposed to support full infiltration BMPs. Continue to Step 1D. ● No; Site layout changes or reasonable mitigation measures cannot be proposed to support full infiltration BMPs. Answer "No" to Criteria 1 Result.
1D	**Other Groundwater Contamination Hazards.** Are there site-specific groundwater contamination hazards not already mentioned (refer to Appendix C.2.2) that can be reasonably mitigated to support full infiltration BMPs? ○ Yes; there are other contamination hazards identified that can be mitigated. Answer "Yes" to Criteria 1 Result. ○ No; there are other contamination hazards identified that cannot be mitigated. Answer "No" to Criteria 1 Result. ○ N/A; no contamination hazards are identified. Answer "Yes" to Criteria 1 Result.
Criteria 1 Result	Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of groundwater contamination that cannot be reasonably mitigated to an acceptable level? See Appendix C.2.2.8 for a list of typically reasonable and typically unreasonable mitigation measures. ○ Yes; Continue to Part 1, Criteria 2. ● No; Continue to Part 1 Result.

Categorization of Infiltration Feasibility Condition based on Groundwater and Water Balance Conditions	Worksheet C.4-2: Form I-8B[2]

Summarize groundwater quality and any mitigation measures proposed. Documentation should focus on groundwater table, mapped soil types and contaminated site locations.

Mapped soil is a hydrologi□al type "D".
Small diameter □ore hole testing and infiltration analysis □y the Por□het method. □he test □ as performed □ ithin the proposed □asin lo□ation and res□lted in an infiltration rate of 0.□4 in□hes per ho□r. See □eo□e□□s preliminary geote□hni□al report Proposed Emerald Hills Development, North of Old Memory lane, APN 543-340-02-00, San Diego, California" PN 3□□0-SD, dated O□to□er □3, 2022

Categorization of Infiltration Feasibility Condition based on Groundwater and Water Balance Conditions	Worksheet C.4-2: Form I-8B[2]
Criteria 2: Water Balance Screening	
2A	**Ephemeral Stream Setback.** Does the proposed full infiltration BMP meet both the following? • The full infiltration BMP is located at least 250 feet away from an ephemeral stream; **AND** • The bottom surface of the full infiltration BMP is at a depth 20 feet or greater from seasonally high groundwater tables. ○ Yes; Answer "Yes" to Criteria 2 Result. ● No; Continue to Step 2B.
2B	**Mitigation Measures.** Can site layout changes be proposed to support full infiltration BMPs? ○ Yes; the site can be reconfigured to mitigate potential water balance issues. Answer "Yes" to Criteria 2 Result. ● No; the site cannot be reconfigured to mitigate potential water balance issues. Continue to Step 2C and provide discussion.
2C	**Additional studies.** Do additional studies support full infiltration BMPs? In the event that water balance effects are used to reject full infiltration (anticipated to be rare), additional analysis shall be completed and documented by a qualified professional indicating the site-specific information evaluated and the technical basis for this finding. ○ Yes; Answer "Yes" to Criteria 2 Result. ● No; Answer "No" to Criteria 2 Result.
Criteria 2 Result	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? ○ Yes; Continue to Part 1 Result. ● No; Continue to Part 1 Result.

Categorization of Infiltration Feasibility Condition based on Groundwater and Water Balance Conditions	Worksheet C.4-2: Form I-8B[2]

Summarize potential water balance effects. Documentation should focus on mapping and soil data regarding proximity to ephemeral streams and groundwater depth.

Small diameter □ore hole testing and infiltration analysis □y the Por□het method. □he test □ as performed □ ithin the proposed □asin lo□ation and res□lted in an infiltration rate of 0.□4 in□hes per ho□r, not .05 in□hes per ho□r.
See □eo□e□s preliminary geote□hni□al report Proposed Emerald Hills Development, North of Old Memory lane, APN 543-340-02-00, San Diego, California"

Part 1 – Full Infiltration Groundwater and Water Balance Screening Result[3]	Result
If answers to Criteria 1 and 2 are "Yes", a full infiltration design is potentially feasible. The feasibility screening category is Full Infiltration based on groundwater conditions.	
If answer to Criteria 1 or Criteria 2 is "No", infiltration may be possible to some extent but would not generally be feasible or desirable to achieve a "full infiltration" design based on groundwater conditions. Proceed to Part 2.	○ Full Infiltration ● Complete Part 2

[3] To be completed using gathered site information and best professional judgement considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by City Engineer to substantiate findings.

Categorization of Infiltration Feasibility Condition based on Groundwater and Water Balance Conditions	Worksheet C.4-2: Form I-8B[2]
Part 2 – Partial vs. No Infiltration Feasibility Screening Criteria	
DMA(s) Being Analyzed:	Project Phase:
□ estern □asin	Planning Phase

Criteria 3: Groundwater Screening

Contaminated Soil/Groundwater. Are partial infiltration BMPs proposed at least 100 feet away from contaminated soil or groundwater sites? This can be confirmed using GeoTracker (geotracker.waterboards.ca.gov) to identify open contaminated sites. This criterion is intentionally a smaller radius than full infiltration, as the potential quantity of infiltration from partial infiltration BMPs is smaller.

- (●) Yes; Answer "Yes" to Criteria 3 Result.
- ( ) No; However, site layout changes can be proposed to avoid contaminated soils or soils that lack adequate treatment capacity. Select "Yes" to Criteria 3 Result. It is a requirement for the SWQMP preparer to identify potential mitigation measures.
- ( ) No; Contaminated soils or soils that lack adequate treatment capacity cannot be avoided and partial infiltration BMPs are not feasible. Select "No" to Criteria 3 Result.

Criteria 3 Result: Can infiltration of greater than or equal to 0.05 inches/hour and less than or equal to 0.5 inches/hour be allowed without increasing risk of groundwater contamination that cannot be reasonably mitigated to an acceptable level?

- (●) Yes; Continue to Part 2, Criteria 4.
- ( ) No; Skip to Part 2 Result.

Summarize findings and basis. Documentation should focus on mapped soil types and contaminated site locations.

Mapped soil is a hydrologi□al type "D".
Small diameter □ore hole testing and infiltration analysis □y the Por□het method. □he test □ as performed □ ithin the proposed □asin lo□ation and res□lted in an infiltration rate of 0.□4 in□hes per ho□r. See □eo□e□s preliminary geote□hni□al report Proposed Emerald Hills Development, North of Old Memory lane, APN 543-340-02-00, San Diego, California" PN 3□□0-SD, dated O□to□er □3, 2022

Categorization of Infiltration Feasibility Condition based on Groundwater and Water Balance Conditions	Worksheet C.4-2: Form I-8B[2]

Criteria 4: Water Balance Screening

Additional studies. In the event that water balance effects are used to reject partial infiltration (anticipated to be rare), a qualified professional must provide an analysis of the incremental effects of partial infiltration BMPs on the water balance compared to incidental infiltration under a no infiltration scenario (e.g. precipitation, irrigation, etc.).

Criteria 4 Result: Can infiltration of greater than or equal to 0.05 inches/hour and less than or equal to 0.5 inches/hour be allowed without causing potential water balance issues such as change of seasonality of ephemeral streams?

(●) Yes: Continue to Part 2 Result.

( ) No: Continue to Part 2 Result.

Summarize potential water balance effects. Documentation should focus on mapping and soil data regarding proximity to ephemeral streams and groundwater depth.

Part 2 – Partial Infiltration Groundwater and Water Balance Screening Result[4]	Result
If answers to Criteria 3 and Criteria 4 are "Yes", a partial infiltration design is potentially feasible. The feasibility screening category is Partial Infiltration based on groundwater and water balance conditions. If answer to Criteria 3 or Criteria 4 is "No", then infiltration of any volume is considered to be infeasible within the site. The feasibility screening category is No Infiltration based on groundwater or water balance condition.	(●) Partial Infiltration Condition ( ) No Infiltration Condition

[4] To be completed using gathered site information and best professional judgement considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by City Engineer to substantiate findings.

Factor of Safety and Design Infiltration Rate Worksheet			Worksheet D.5-1: Form I-9		
Factor Category		Factor Description	Assigned Weight (w)	Factor Value (v)	Product (p) p = w x v
A	Suitability Assessment	Soil assessment methods	0.25	3	.□5
		Predominant soil texture	0.25	3	.□5
		Site soil variability	0.25	□	.25
		Depth to groundwater / impervious layer	0.25	□	.25
		Suitability Assessment Safety Factor, $S_A = \Sigma p$			2
B	Design	Level of pretreatment/ expected sediment loads	0.5		
		Redundancy/resiliency	0.25		
		Compaction during construction	0.25		
		Design Safety Factor, $S_B = \Sigma p$			
Combined Safety Factor, $S_{total} = S_A \times S_B$ [Minimum of 2 and Maximum of 9]					
Observed Infiltration Rate, inch/hr., $K_{observed}$ (corrected for test-specific bias) Note: This worksheet is only applicable when the observed infiltration rate is greater than or equal to 1 inch/hr.					0.□4
Design Infiltration Rate, in/hr., $K_{design} = K_{observed} / S_{total}$ Note: If the estimated design infiltration rate is less than or equal to 0.5 inch/hr. then the applicant may choose to implement partial infiltration BMPs.					

Supporting Data

Briefly describe infiltration test and provide reference to test forms:

Small diameter □ore hole testing and infiltration analysis □y the POr□het method. □he test □ as performed □ ithin the proposed □asin lo□ation and res□lted in an infiltration rate of 0.□4 in□hes per ho□r. See □eo□e□s preliminary geote□hni□al report Proposed Emerald Hills Development, North of Old Memory lane, APN 543-340-02-00, San Diego, California" PN 3□□0-SD, dated O□to□er □3, 2022

Note: Worksheet D.5-1: Form I-9 is only applicable to design BMPs in "full infiltration condition". This form is not applicable for categorization of infiltration feasibility (Worksheet C.4-1: Form I-8) and/or for designing BMPs in "partial infiltration condition" or "no infiltration condition".

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions[1]	Worksheet C.4-1: Form I-8A[2]
Part 1 - Full Infiltration Feasibility Screening Criteria	
DMA(s) Being Analyzed:	Project Phase:
Eastern □asin	Planning Phase
Criteria 1: Infiltration Rate Screening	
1A	Is the mapped hydrologic soil group according to the NRCS Web Soil Survey or UC Davis Soil Web Mapper Type A or B and corroborated by available site soil data[3]? ○ Yes; the DMA may feasibly support full infiltration. Answer "Yes" to Criteria 1 Result or continue to Step 1B if the applicant elects to perform infiltration testing. ○ No; the mapped soil types are A or B but is not corroborated by available site soil data (continue to Step 1B). ● No; the mapped soil types are C, D, or "urban/unclassified" and is corroborated by available site soil data. Answer "No" to Criteria 1 Result. ○ No; the mapped soil types are C, D, or "urban/unclassified" but is not corroborated by available site soil data (continue to Step 1B).
1B	Is the reliable infiltration rate calculated using planning phase methods from Table D.3-1? ● Yes; Continue to Step 1C. ○ No; Skip to Step 1D.
1C	Is the reliable infiltration rate calculated using planning phase methods from Table D.3-1 greater than 0.5 inches per hour? ○ Yes; the DMA may feasibly support full infiltration. Answer "Yes" to Criteria 1 Result. ● No; full infiltration is not required. Answer "No" to Criteria 1 Result.
1D	**Infiltration Testing Method.** Is the selected infiltration testing method suitable during the design phase (see Appendix D.3)? Note: Alternative testing standards may be allowed with appropriate rationales and documentation. ● Yes; continue to Step 1E. ○ No; select an appropriate infiltration testing method.

[1] Note that it is not required to investigate each and every criterion in the worksheet, a single "no" answer in Part 1, Part 2, Part 3, or Part 4 determines a full, partial, or no infiltration condition.

[2] This form must be completed each time there is a change to the site layout that would affect the infiltration feasibility condition. Previously completed forms shall be retained to document the evolution of the site storm water design.

[3] Available data includes site-specific sampling or observation of soil types or texture classes, such as obtained from borings or test pits necessary to support other design elements.

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions	Worksheet C.4-1: Form I-8A[2]
1E	**Number of Percolation/Infiltration Tests.** Does the infiltration testing method performed satisfy the minimum number of tests specified in Table D.3-2? (●) Yes; continue to Step 1F. ( ) No; conduct appropriate number of tests.
IF	**Factor of Safety.** Is the suitable Factor of Safety selected for full infiltration design? See guidance in D.5; Tables D.5-1 and D.5-2; and Worksheet D.5-1 (Form I-9). (●) Yes; continue to Step 1G. ( ) No; select appropriate factor of safety.
1G	**Full Infiltration Feasibility.** Is the average measured infiltration rate divided by the Factor of Safety greater than 0.5 inches per hour? ( ) Yes; answer "Yes" to Criteria 1 Result. (●) No; answer "No" to Criteria 1 Result.
Criteria 1 Result	Is the estimated reliable infiltration rate greater than 0.5 inches per hour within the DMA where runoff can reasonably be routed to a BMP? ( ) Yes; the DMA may feasibly support full infiltration. Continue to Criteria 2. (●) No; full infiltration is not required. Skip to Part 1 Result.

Summarize infiltration testing methods, testing locations, replicates, and results and summarize estimates of reliable infiltration rates according to procedures outlined in D.5. Documentation should be included in project geotechnical report.

Small diameter □ore hole testing and infiltration analysis □y the Por□het method. □he test □ as performed □ ithin the proposed □asin lo□ation and res□lted in an infiltration rate of 0.□□ in□hes per ho□r, 0.3□ □ ith a fa□tor of safety of 2.
See □eo□e□□s preliminary geote□hni□al report Proposed Emerald Hills Development, North of Old Memory lane, APN 543-340-02-00, San Diego, California"

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[2]	
Criteria 2: Geologic/Geotechnical Screening			
2A	If all questions in Step 2A are answered "Yes," continue to Step 2B. For any "No" answer in Step 2A answer "No" to Criteria 2, and submit an "Infiltration Feasibility Condition Letter" that meets the requirements in Appendix C.1.1. The geologic/geotechnical analyses listed in Appendix C.2.1 do not apply to the DMA because one of the following setbacks cannot be avoided and therefore result in the DMA being in a no infiltration condition. The setbacks must be the closest horizontal radial distance from the surface edge (at the overflow elevation) of the BMP.		
2A-1	Can the proposed full infiltration BMP(s) avoid areas with existing fill materials greater than 5 feet thick below the infiltrating surface?	◉ Yes	○ No
2A-2	Can the proposed full infiltration BMP(s) avoid placement within 10 feet of existing underground utilities, structures, or retaining walls?	◉ Yes	○ No
2A-3	Can the proposed full infiltration BMP(s) avoid placement within 50 feet of a natural slope (>25%) or within a distance of 1.5H from fill slopes where H is the height of the fill slope?	○ Yes	◉ No
2B	When full infiltration is determined to be feasible, a geotechnical investigation report must be prepared that considers the relevant factors identified in Appendix C.2.1. If all questions in Step 2B are answered "Yes," then answer "Yes" to Criteria 2 Result. If there are "No" answers continue to Step 2C.		
2B-1	**Hydroconsolidation.** Analyze hydroconsolidation potential per approved ASTM standard due to a proposed full infiltration BMP. Can full infiltration BMPs be proposed within the DMA without increasing hydroconsolidation risks?	○ Yes	○ No
2B-2	**Expansive Soils.** Identify expansive soils (soils with an expansion index greater than 20) and the extent of such soils due to proposed full infiltration BMPs. Can full infiltration BMPs be proposed within the DMA without increasing expansive soil risks?	○ Yes	○ No

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[2]	
2B-3	**Liquefaction**. If applicable, identify mapped liquefaction areas. Evaluate liquefaction hazards in accordance with Section 6.4.2 of the City of San Diego's Guidelines for Geotechnical Reports (2011 or most recent edition). Liquefaction hazard assessment shall take into account any increase in groundwater elevation or groundwater mounding that could occur as a result of proposed infiltration or percolation facilities. Can full infiltration BMPs be proposed within the DMA without increasing liquefaction risks?	○ Yes	◉ No
2B-4	**Slope Stability**. If applicable, perform a slope stability analysis in accordance with the ASCE and Southern California Earthquake Center (2002) Recommended Procedures for Implementation of DMG Special Publication 117, Guidelines for Analyzing and Mitigating Landslide Hazards in California to determine minimum slope setbacks for full infiltration BMPs. See the City of San Diego's Guidelines for Geotechnical Reports (2011) to determine which type of slope stability analysis is required. Can full infiltration BMPs be proposed within the DMA without increasing slope stability risks?	○ Yes	◉ No
2B-5	**Other Geotechnical Hazards.** Identify site-specific geotechnical hazards not already mentioned (refer to Appendix C.2.1). Can full infiltration BMPs be proposed within the DMA without increasing risk of geologic or geotechnical hazards not already mentioned?	○ Yes	◉ No
2B-6	**Setbacks.** Establish setbacks from underground utilities, structures, and/or retaining walls. Reference applicable ASTM or other recognized standard in the geotechnical report. Can full infiltration BMPs be proposed within the DMA using established setbacks from underground utilities, structures, and/or retaining walls?	◉ Yes	◉ No

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[2]	
2C	**Mitigation Measures.** Propose mitigation measures for each geologic/geotechnical hazard identified in Step 2B. Provide a discussion of geologic/geotechnical hazards that would prevent full infiltration BMPs that cannot be reasonably mitigated in the geotechnical report. See Appendix C.2.1.8 for a list of typically reasonable and typically unreasonable mitigation measures. Can mitigation measures be proposed to allow for full infiltration BMPs? If the question in Step 2 is answered "Yes," then answer "Yes" to Criteria 2 Result. If the question in Step 2C is answered "No," then answer "No" to Criteria 2 Result.	○ Yes	○ No
Criteria 2 Result	Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of geologic or geotechnical hazards that cannot be reasonably mitigated to an acceptable level?	○ Yes	● No

Summarize findings and basis; provide references to related reports or exhibits.

Small diameter □ore hole testing and infiltration analysis □y the Por□het method. □he test □ as performed □ ithin the proposed □asin lo□ation and res□lted in an infiltration rate of 0.□□ in□hes per ho□r, 0.3□ □ ith a fa□tor of safety of 2.
See □ eo□e□□s preliminary geote□hni□al report Proposed Emerald Hills Development, North of Old Memory lane, APN 543-340-02-00, San Diego, California"

Part 1 Result – Full Infiltration Geotechnical Screening [4]	Result
If answers to both Criteria 1 and Criteria 2 are "Yes", a full infiltration design is potentially feasible based on Geotechnical conditions only. If either answer to Criteria 1 or Criteria 2 is "No", a full infiltration design is not required.	○ Full infiltration Condition ● Complete Part 2

[4] To be completed using gathered site information and best professional judgement considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by City Engineer to substantiate findings.

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[2]
Part 2 – Partial vs. No Infiltration Feasibility Screening Criteria		
DMA(s) Being Analyzed:		Project Phase:
Eastern Basin		Planning Phase
Criteria 3 : Infiltration Rate Screening		
3A	**NRCS Type C, D, or "urban/unclassified":** Is the mapped hydrologic soil group according to the NRCS Web Soil Survey or UC Davis Soil Web Mapper is Type C, D, or "urban/unclassified" and corroborated by available site soil data? ○ Yes; the site is mapped as C soils and a reliable infiltration rate of 0.15 in/hr. is used to size partial infiltration BMPS. Answer "Yes" to Criteria 3 Result. ● Yes; the site is mapped as D soils or "urban/unclassified" and a reliable infiltration rate of 0.05 in/hr. is used to size partial infiltration BMPS. Answer "Yes" to Criteria 3 Result. ○ No; infiltration testing is conducted (refer to Table D.3-1), continue to Step 3B.	
3B	**Infiltration Testing Result:** Is the reliable infiltration rate (i.e. average measured infiltration rate/2) greater than 0.05 in/hr. and less than or equal to 0.5 in/hr? ● Yes; the site may support partial infiltration. Answer "Yes" to Criteria 3 Result. ○ No; the reliable infiltration rate (i.e. average measured rate/2) is less than 0.05 in/hr., partial infiltration is not required. Answer "No" to Criteria 3 Result.	
Criteria 3 Result	Is the estimated reliable infiltration rate (i.e., average measured infiltration rate/2) greater than or equal to 0.05 inches/hour and less than or equal to 0.5 inches/hour at any location within each DMA where runoff can reasonably be routed to a BMP? ● Yes; Continue to Criteria 4. ○ No: Skip to Part 2 Result.	
Summarize infiltration testing and/or mapping results (i.e. soil maps and series description used for infiltration rate). Small diameter bore hole testing and infiltration analysis by the PORchet method. The test was performed within the proposed basin location and resulted in an infiltration rate of 0.24 inches per hour. See Leo Cheng's preliminary geotechnical report Proposed Emerald Hills Development, North of Old Memory lane, APN 543-340-02-00, San Diego, California" PN 3000-SD, dated October 3, 2022		

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[2]	
Criteria 4: Geologic/Geotechnical Screening			
4A	If all questions in Step 4A are answered "Yes," continue to Step 2B. For any "No" answer in Step 4A answer "No" to Criteria 4 Result, and submit an "Infiltration Feasibility Condition Letter" that meets the requirements in Appendix C.1.1. The geologic/geotechnical analyses listed in Appendix C.2.1 do not apply to the DMA because one of the following setbacks cannot be avoided and therefore result in the DMA being in a no infiltration condition. The setbacks must be the closest horizontal radial distance from the surface edge (at the overflow elevation) of the BMP.		
4A-1	Can the proposed partial infiltration BMP(s) avoid areas with existing fill materials greater than 5 feet thick?	◉ Yes	○ No
4A-2	Can the proposed partial infiltration BMP(s) avoid placement within 10 feet of existing underground utilities, structures, or retaining walls?	◉ Yes	○ No
4A-3	Can the proposed partial infiltration BMP(s) avoid placement within 50 feet of a natural slope (>25%) or within a distance of 1.5H from fill slopes where H is the height of the fill slope?	○ Yes	◉ No
4B	When full infiltration is determined to be feasible, a geotechnical investigation report must be prepared that considers the relevant factors identified in Appendix C.2.1. If all questions in Step 4B are answered "Yes," then answer "Yes" to Criteria 4 Result. If there are any "No" answers continue to Step 4C.		
4B-1	**Hydroconsolidation.** Analyze hydroconsolidation potential per approved ASTM standard due to a proposed full infiltration BMP. Can partial infiltration BMPs be proposed within the DMA without increasing hydroconsolidation risks?	○ Yes	○ No
4B-2	**Expansive Soils.** Identify expansive soils (soils with an expansion index greater than 20) and the extent of such soils due to proposed full infiltration BMPs. Can partial infiltration BMPs be proposed within the DMA without increasing expansive soil risks?	○ Yes	○ No
4B-3	**Liquefaction**. If applicable, identify mapped liquefaction areas. Evaluate liquefaction hazards in accordance with Section 6.4.2 of the City of San Diego's Guidelines for Geotechnical Reports (2011). Liquefaction hazard assessment shall take into account any increase in groundwater elevation or groundwater mounding that could occur as a result of proposed infiltration or percolation facilities. Can partial infiltration BMPs be proposed within the DMA without increasing liquefaction risks?	○ Yes	○ No

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[2]	
4B-4	**Slope Stability**. If applicable, perform a slope stability analysis in accordance with the ASCE and Southern California Earthquake Center (2002) Recommended Procedures for Implementation of DMG Special Publication 117, Guidelines for Analyzing and Mitigating Landslide Hazards in California to determine minimum slope setbacks for full infiltration BMPs. See the City of San Diego's Guidelines for Geotechnical Reports (2011) to determine which type of slope stability analysis is required. Can partial infiltration BMPs be proposed within the DMA without increasing slope stability risks?	○ Yes	◉ No
4B-5	**Other Geotechnical Hazards.** Identify site-specific geotechnical hazards not already mentioned (refer to Appendix C.2.1). Can partial infiltration BMPs be proposed within the DMA without increasing risk of geologic or geotechnical hazards not already mentioned?	○ Yes	◉ No
4B-6	**Setbacks.** Establish setbacks from underground utilities, structures, and/or retaining walls. Reference applicable ASTM or other recognized standard in the geotechnical report. Can partial infiltration BMPs be proposed within the DMA using recommended setbacks from underground utilities, structures, and/or retaining walls?	○ Yes	◉ No
4C	**Mitigation Measures.** Propose mitigation measures for each geologic/geotechnical hazard identified in Step 4B. Provide a discussion on geologic/geotechnical hazards that would prevent partial infiltration BMPs that cannot be reasonably mitigated in the geotechnical report. See Appendix C.2.1.8 for a list of typically reasonable and typically unreasonable mitigation measures. Can mitigation measures be proposed to allow for partial infiltration BMPs? If the question in Step 4C is answered "Yes," then answer "Yes" to Criteria 4 Result. If the question in Step 4C is answered "No," then answer "No" to Criteria 4 Result.	○ Yes	◉ No
Criteria 4 Result	Can infiltration of greater than or equal to 0.05 inches/hour and less than or equal to 0.5 inches/hour be allowed without increasing the risk of geologic or geotechnical hazards that cannot be reasonably mitigated to an acceptable level?	○ Yes	● No

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions	Worksheet C.4-1: Form I-8A[2]

Summarize findings and basis; provide references to related reports or exhibits.

Small diameter □ore hole testing and infiltration analysis □y the Por□het method. □he test □ as performed □ ithin the proposed □asin lo□ation and res□lted in an infiltration rate of 0.□□ in□hes per ho□r, 0.3□ □ ith a fa□tor of safety of 2.
See □ eo□e□□ preliminary geote□hni□al report Proposed Emerald Hills Development, North of Old Memory lane, APN 543-340-02-00, San Diego, California"

Part 2 – Partial Infiltration Geotechnical Screening Result[5]	Result
If answers to both Criteria 3 and Criteria 4 are "Yes", a partial infiltration design is potentially feasible based on geotechnical conditions only. If answers to either Criteria 3 or Criteria 4 is "No", then infiltration of any volume is considered to be infeasible within the site.	◯ Partial Infiltration Condition ● No Infiltration Condition

[5] To be completed using gathered site information and best professional judgement considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by City Engineer to substantiate findings.

Categorization of Infiltration Feasibility Condition based on Groundwater and Water Balance Conditions		Worksheet C.4-2: Form I-8B[2]
Part 1 - Full Infiltration Feasibility Screening Criteria		
DMA(s) Being Analyzed:		Project Phase:
Eastern Basin		Planning Phase
Criteria 1: Groundwater Screening		
1A	**Groundwater Depth.** Is the depth to seasonally high groundwater tables (normal high depth during the wet season) beneath the base of any full infiltration BMP greater than 10 feet? ● Yes; continue to Step 1B. ○ No; The depth to groundwater is less than or equal to 10 feet, but site layout changes or reasonable mitigation measures can be proposed to support full infiltration BMPs. Continue to step 1B. ○ No; The depth to groundwater is less than or equal to 10 feet and site layout changes or reasonable mitigation measures cannot be proposed to support full infiltration BMPs. Answer "No" for Criteria 1 Result.	
1B	**Contaminated Soil/Groundwater.** Are proposed full infiltration BMPs at least 250 feet away from contaminated soil or groundwater sites? This can be confirmed using GeoTracker (geotracker.waterboards.ca.gov) to identify open contaminated sites. The setbacks must be the closest horizontal radial distance from the surface edge (at the overflow elevation) of the BMP. ● Yes; continue to Step 1C. ○ No; However, site layout changes or reasonable mitigation measures can be proposed to support full infiltration BMPs. Continue to Step 1C. ○ No; Site layout changes or reasonable mitigation measures cannot be proposed to support full infiltration BMPs. Answer "No" to Criteria 1 Result.	

[1] Note that it is not required to investigate each and every criterion in the worksheet, a single "no" answer in Part 1, Part 2, part 3, or Part 4 determines a full, partial, or no infiltration condition.

[2] This form must be completed each time there is a change to the site layout that would affect the infiltration feasibility condition. Previously completed forms shall be retained to document the evolution of the site storm water design.

Categorization of Infiltration Feasibility Condition based on Groundwater and Water Balance Conditions	Worksheet C.4-2: Form I-8B[2]
1C	**Inadequate Soil Treatment Capacity.** Are full infiltration BMPs proposed in DMA soils that have adequate soil treatment capacity? The DMA has adequate soil treatment capacity if **ALL** of the following criteria (detailed in C.2.2.1) for all soil layers beneath the infiltrating surface are met: • USDA texture class is sandy loam or loam or silt loam or silt or sandy clay loam or clay loam or silty clay loam or sandy clay or silty clay or clay; and • Cation Exchange Capacity (CEC) greater than 5 milliequivalents/100g; and • Soil organic matter is greater than 1%; and • Groundwater table is equal to or greater than 10 feet beneath the base of the full infiltration BMP. ○ Yes; continue to Step 1D. ○ No; However, site layout changes or reasonable mitigation measures can be proposed to support full infiltration BMPs. Continue to Step 1D. ● No; Site layout changes or reasonable mitigation measures cannot be proposed to support full infiltration BMPs. Answer "No" to Criteria 1 Result.
1D	**Other Groundwater Contamination Hazards.** Are there site-specific groundwater contamination hazards not already mentioned (refer to Appendix C.2.2) that can be reasonably mitigated to support full infiltration BMPs? ○ Yes; there are other contamination hazards identified that can be mitigated. Answer "Yes" to Criteria 1 Result. ○ No; there are other contamination hazards identified that cannot be mitigated. Answer "No" to Criteria 1 Result. ○ N/A; no contamination hazards are identified. Answer "Yes" to Criteria 1 Result.
Criteria 1 Result	Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of groundwater contamination that cannot be reasonably mitigated to an acceptable level? See Appendix C.2.2.8 for a list of typically reasonable and typically unreasonable mitigation measures. ○ Yes; Continue to Part 1, Criteria 2. ● No; Continue to Part 1 Result.

Categorization of Infiltration Feasibility Condition based on Groundwater and Water Balance Conditions	Worksheet C.4-2: Form I-8B[2]

Summarize groundwater quality and any mitigation measures proposed. Documentation should focus on groundwater table, mapped soil types and contaminated site locations.

Mapped soil is a hydrologi□al type "D".
Small diameter □ore hole testing and infiltration analysis □y the Por□het method. □he test □ as performed □ ithin the proposed □asin lo□ation and res□lted in an infiltration rate of 0.□□ in□hes per ho□r, 0.3□ □ ith a fa□tor of safety of 2.
See □eo□e□□s preliminary geote□hni□al report Proposed Emerald Hills Development, North of Old Memory lane, APN 543-340-02-00, San Diego, California" PN 3□□0-SD, dated O□to□er □3, 2022

Categorization of Infiltration Feasibility Condition based on Groundwater and Water Balance Conditions	Worksheet C.4-2: Form I-8B[2]
Criteria 2: Water Balance Screening	
2A	**Ephemeral Stream Setback.** Does the proposed full infiltration BMP meet both the following? • The full infiltration BMP is located at least 250 feet away from an ephemeral stream; **AND** • The bottom surface of the full infiltration BMP is at a depth 20 feet or greater from seasonally high groundwater tables. ○ Yes; Answer "Yes" to Criteria 2 Result. ● No; Continue to Step 2B.
2B	**Mitigation Measures.** Can site layout changes be proposed to support full infiltration BMPs? ○ Yes; the site can be reconfigured to mitigate potential water balance issues. Answer "Yes" to Criteria 2 Result. ● No; the site cannot be reconfigured to mitigate potential water balance issues. Continue to Step 2C and provide discussion.
2C	**Additional studies.** Do additional studies support full infiltration BMPs? In the event that water balance effects are used to reject full infiltration (anticipated to be rare), additional analysis shall be completed and documented by a qualified professional indicating the site-specific information evaluated and the technical basis for this finding. ○ Yes; Answer "Yes" to Criteria 2 Result. ● No; Answer "No" to Criteria 2 Result.
Criteria 2 Result	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? ○ Yes; Continue to Part 1 Result. ● No; Continue to Part 1 Result.

Categorization of Infiltration Feasibility Condition based on Groundwater and Water Balance Conditions	Worksheet C.4-2: Form I-8B[2]

Summarize potential water balance effects. Documentation should focus on mapping and soil data regarding proximity to ephemeral streams and groundwater depth.

Small diameter □ore hole testing and infiltration analysis □y the Por□het method. □he test □ as performed □ ithin the proposed □asin lo□ation and res□lted in an infiltration rate of 0.□□ in□hes per ho□r, 0.3□ □ ith a fa□tor of safety of 2.
See □eo□e□□s preliminary geote□hni□al report Proposed Emerald Hills Development, North of Old Memory lane, APN 543-340-02-00, San Diego, California"

Part 1 – Full Infiltration Groundwater and Water Balance Screening Result[3]	Result
If answers to Criteria 1 and 2 are "Yes", a full infiltration design is potentially feasible. The feasibility screening category is Full Infiltration based on groundwater conditions.	
If answer to Criteria 1 or Criteria 2 is "No", infiltration may be possible to some extent but would not generally be feasible or desirable to achieve a "full infiltration" design based on groundwater conditions. Proceed to Part 2.	○ Full Infiltration ● Complete Part 2

[3] To be completed using gathered site information and best professional judgement considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by City Engineer to substantiate findings.

Categorization of Infiltration Feasibility Condition based on Groundwater and Water Balance Conditions	Worksheet C.4-2: Form I-8B[2]
Part 2 – Partial vs. No Infiltration Feasibility Screening Criteria	
DMA(s) Being Analyzed:	Project Phase:
Eastern □asin	Planning Phase

Criteria 3: Groundwater Screening

Contaminated Soil/Groundwater. Are partial infiltration BMPs proposed at least 100 feet away from contaminated soil or groundwater sites? This can be confirmed using GeoTracker (geotracker.waterboards.ca.gov) to identify open contaminated sites. This criterion is intentionally a smaller radius than full infiltration, as the potential quantity of infiltration from partial infiltration BMPs is smaller.

- (●) Yes; Answer "Yes" to Criteria 3 Result.
- ( ) No; However, site layout changes can be proposed to avoid contaminated soils or soils that lack adequate treatment capacity. Select "Yes" to Criteria 3 Result. It is a requirement for the SWQMP preparer to identify potential mitigation measures.
- ( ) No; Contaminated soils or soils that lack adequate treatment capacity cannot be avoided and partial infiltration BMPs are not feasible. Select "No" to Criteria 3 Result.

Criteria 3 Result: Can infiltration of greater than or equal to 0.05 inches/hour and less than or equal to 0.5 inches/hour be allowed without increasing risk of groundwater contamination that cannot be reasonably mitigated to an acceptable level?

- (●) Yes; Continue to Part 2, Criteria 4.
- ( ) No; Skip to Part 2 Result.

Summarize findings and basis. Documentation should focus on mapped soil types and contaminated site locations.

Mapped soil is a hydrologi□al type "D".
Small diameter □ore hole testing and infiltration analysis □y the Por□het method. □he test □ as performed □ ithin the proposed □asin lo□ation and res□lted in an infiltration rate of 0.□□ in□hes per ho□r, 0.3□ □ ith a fa□tor of safety of 2.
See □ eo□e□□ preliminary geote□hni□al report Proposed Emerald Hills Development, North of Old Memory lane, APN 543-340-02-00, San Diego, California" PN 3□□0-SD, dated O□to□er □3, 2022

Categorization of Infiltration Feasibility Condition based on Groundwater and Water Balance Conditions	Worksheet C.4-2: Form I-8B[2]

Criteria 4: Water Balance Screening

Additional studies. In the event that water balance effects are used to reject partial infiltration (anticipated to be rare), a qualified professional must provide an analysis of the incremental effects of partial infiltration BMPs on the water balance compared to incidental infiltration under a no infiltration scenario (e.g. precipitation, irrigation, etc.).

Criteria 4 Result: Can infiltration of greater than or equal to 0.05 inches/hour and less than or equal to 0.5 inches/hour be allowed without causing potential water balance issues such as change of seasonality of ephemeral streams?

(●) Yes: Continue to Part 2 Result.

( ) No: Continue to Part 2 Result.

Summarize potential water balance effects. Documentation should focus on mapping and soil data regarding proximity to ephemeral streams and groundwater depth.

Part 2 – Partial Infiltration Groundwater and Water Balance Screening Result[4]	Result
If answers to Criteria 3 and Criteria 4 are "Yes", a partial infiltration design is potentially feasible. The feasibility screening category is Partial Infiltration based on groundwater and water balance conditions. If answer to Criteria 3 or Criteria 4 is "No", then infiltration of any volume is considered to be infeasible within the site. The feasibility screening category is No Infiltration based on groundwater or water balance condition.	(●) Partial Infiltration Condition ( ) No Infiltration Condition

[4] To be completed using gathered site information and best professional judgement considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by City Engineer to substantiate findings.

Factor of Safety and Design Infiltration Rate Worksheet			Worksheet D.5-1: Form I-9		
Factor Category		Factor Description	Assigned Weight (w)	Factor Value (v)	Product (p) p = w x v
A	Suitability Assessment	Soil assessment methods	0.25	3	.□5
		Predominant soil texture	0.25	3	.□5
		Site soil variability	0.25	□	.25
		Depth to groundwater / impervious layer	0.25	□	.25
		Suitability Assessment Safety Factor, $S_A = \Sigma p$			2
B	Design	Level of pretreatment/ expected sediment loads	0.5		
		Redundancy/resiliency	0.25		
		Compaction during construction	0.25		
		Design Safety Factor, $S_B = \Sigma p$			
Combined Safety Factor, $S_{total} = S_A \times S_B$ [Minimum of 2 and Maximum of 9]					
Observed Infiltration Rate, inch/hr., $K_{observed}$ (corrected for test-specific bias) Note: This worksheet is only applicable when the observed infiltration rate is greater than or equal to 1 inch/hr.					0.□□
Design Infiltration Rate, in/hr., $K_{design} = K_{observed} / S_{total}$ Note: If the estimated design infiltration rate is less than or equal to 0.5 inch/hr. then the applicant may choose to implement partial infiltration BMPs.					

Supporting Data

Briefly describe infiltration test and provide reference to test forms:

Small diameter □ore hole testing and infiltration analysis □y the POr□het method. □he test □ as performed □ ithin the proposed □asin lo□ation and res□lted in an infiltration rate of 0.□4 in□hes per ho□r. See □eo□e□s preliminary geote□hni□al report Proposed Emerald Hills Development, North of Old Memory lane, APN 543-340-02-00, San Diego, California" PN 3□□0-SD, dated O□to□er □3, 2022

Note: Worksheet D.5-1: Form I-9 is only applicable to design BMPs in "full infiltration condition". This form is not applicable for categorization of infiltration feasibility (Worksheet C.4-1: Form I-8) and/or for designing BMPs in "partial infiltration condition" or "no infiltration condition".

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions[1]		Worksheet C.4-1: Form I-8A[2]
Part 1 - Full Infiltration Feasibility Screening Criteria		
DMA(s) Being Analyzed:		Project Phase:
Northern Basin		Planning Phase
Criteria 1: Infiltration Rate Screening		
1A	Is the mapped hydrologic soil group according to the NRCS Web Soil Survey or UC Davis Soil Web Mapper Type A or B and corroborated by available site soil data[3]? ○ Yes; the DMA may feasibly support full infiltration. Answer "Yes" to Criteria 1 Result or continue to Step 1B if the applicant elects to perform infiltration testing. ○ No; the mapped soil types are A or B but is not corroborated by available site soil data (continue to Step 1B). ● No; the mapped soil types are C, D, or "urban/unclassified" and is corroborated by available site soil data. Answer "No" to Criteria 1 Result. ○ No; the mapped soil types are C, D, or "urban/unclassified" but is not corroborated by available site soil data (continue to Step 1B).	
1B	Is the reliable infiltration rate calculated using planning phase methods from Table D.3-1? ● Yes; Continue to Step 1C. ○ No; Skip to Step 1D.	
1C	Is the reliable infiltration rate calculated using planning phase methods from Table D.3-1 greater than 0.5 inches per hour? ○ Yes; the DMA may feasibly support full infiltration. Answer "Yes" to Criteria 1 Result. ● No; full infiltration is not required. Answer "No" to Criteria 1 Result.	
1D	**Infiltration Testing Method.** Is the selected infiltration testing method suitable during the design phase (see Appendix D.3)? Note: Alternative testing standards may be allowed with appropriate rationales and documentation. ● Yes; continue to Step 1E. ○ No; select an appropriate infiltration testing method.	

[1] Note that it is not required to investigate each and every criterion in the worksheet, a single "no" answer in Part 1, Part 2, Part 3, or Part 4 determines a full, partial, or no infiltration condition.

[2] This form must be completed each time there is a change to the site layout that would affect the infiltration feasibility condition. Previously completed forms shall be retained to document the evolution of the site storm water design.

[3] Available data includes site-specific sampling or observation of soil types or texture classes, such as obtained from borings or test pits necessary to support other design elements.

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions	Worksheet C.4-1: Form I-8A[2]
1E	**Number of Percolation/Infiltration Tests.** Does the infiltration testing method performed satisfy the minimum number of tests specified in Table D.3-2? (●) Yes; continue to Step 1F. ( ) No; conduct appropriate number of tests.
IF	**Factor of Safety.** Is the suitable Factor of Safety selected for full infiltration design? See guidance in D.5; Tables D.5-1 and D.5-2; and Worksheet D.5-1 (Form I-9). (●) Yes; continue to Step 1G. ( ) No; select appropriate factor of safety.
1G	**Full Infiltration Feasibility.** Is the average measured infiltration rate divided by the Factor of Safety greater than 0.5 inches per hour? ( ) Yes; answer "Yes" to Criteria 1 Result. (●) No; answer "No" to Criteria 1 Result.
Criteria 1 Result	Is the estimated reliable infiltration rate greater than 0.5 inches per hour within the DMA where runoff can reasonably be routed to a BMP? ( ) Yes; the DMA may feasibly support full infiltration. Continue to Criteria 2. (●) No; full infiltration is not required. Skip to Part 1 Result.

Summarize infiltration testing methods, testing locations, replicates, and results and summarize estimates of reliable infiltration rates according to procedures outlined in D.5. Documentation should be included in project geotechnical report.

Small diameter □ore hole testing and infiltration analysis □y the Por□het method. □he test □ as performed □ ithin the proposed □asin lo□ation and res□lted in an infiltration rate of 0.00 in□hes per ho□r. See □eo□e□□s preliminary geote□hni□al report Proposed Emerald Hills Development, North of Old Memory lane, APN 543-340-02-00, San Diego, California"

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[2]	
Criteria 2: Geologic/Geotechnical Screening			
2A	If all questions in Step 2A are answered "Yes," continue to Step 2B. For any "No" answer in Step 2A answer "No" to Criteria 2, and submit an "Infiltration Feasibility Condition Letter" that meets the requirements in Appendix C.1.1. The geologic/geotechnical analyses listed in Appendix C.2.1 do not apply to the DMA because one of the following setbacks cannot be avoided and therefore result in the DMA being in a no infiltration condition. The setbacks must be the closest horizontal radial distance from the surface edge (at the overflow elevation) of the BMP.		
2A-1	Can the proposed full infiltration BMP(s) avoid areas with existing fill materials greater than 5 feet thick below the infiltrating surface?	◉ Yes	○ No
2A-2	Can the proposed full infiltration BMP(s) avoid placement within 10 feet of existing underground utilities, structures, or retaining walls?	◉ Yes	○ No
2A-3	Can the proposed full infiltration BMP(s) avoid placement within 50 feet of a natural slope (>25%) or within a distance of 1.5H from fill slopes where H is the height of the fill slope?	○ Yes	◉ No
2B	When full infiltration is determined to be feasible, a geotechnical investigation report must be prepared that considers the relevant factors identified in Appendix C.2.1. If all questions in Step 2B are answered "Yes," then answer "Yes" to Criteria 2 Result. If there are "No" answers continue to Step 2C.		
2B-1	**Hydroconsolidation.** Analyze hydroconsolidation potential per approved ASTM standard due to a proposed full infiltration BMP. Can full infiltration BMPs be proposed within the DMA without increasing hydroconsolidation risks?	○ Yes	○ No
2B-2	**Expansive Soils.** Identify expansive soils (soils with an expansion index greater than 20) and the extent of such soils due to proposed full infiltration BMPs. Can full infiltration BMPs be proposed within the DMA without increasing expansive soil risks?	○ Yes	○ No

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[2]	
2B-3	**Liquefaction**. If applicable, identify mapped liquefaction areas. Evaluate liquefaction hazards in accordance with Section 6.4.2 of the City of San Diego's Guidelines for Geotechnical Reports (2011 or most recent edition). Liquefaction hazard assessment shall take into account any increase in groundwater elevation or groundwater mounding that could occur as a result of proposed infiltration or percolation facilities. Can full infiltration BMPs be proposed within the DMA without increasing liquefaction risks?	○ Yes	◉ No
2B-4	**Slope Stability**. If applicable, perform a slope stability analysis in accordance with the ASCE and Southern California Earthquake Center (2002) Recommended Procedures for Implementation of DMG Special Publication 117, Guidelines for Analyzing and Mitigating Landslide Hazards in California to determine minimum slope setbacks for full infiltration BMPs. See the City of San Diego's Guidelines for Geotechnical Reports (2011) to determine which type of slope stability analysis is required. Can full infiltration BMPs be proposed within the DMA without increasing slope stability risks?	○ Yes	◉ No
2B-5	**Other Geotechnical Hazards.** Identify site-specific geotechnical hazards not already mentioned (refer to Appendix C.2.1). Can full infiltration BMPs be proposed within the DMA without increasing risk of geologic or geotechnical hazards not already mentioned?	○ Yes	◉ No
2B-6	**Setbacks.** Establish setbacks from underground utilities, structures, and/or retaining walls. Reference applicable ASTM or other recognized standard in the geotechnical report. Can full infiltration BMPs be proposed within the DMA using established setbacks from underground utilities, structures, and/or retaining walls?	◉ Yes	◉ No

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[2]	
2C	**Mitigation Measures.** Propose mitigation measures for each geologic/geotechnical hazard identified in Step 2B. Provide a discussion of geologic/geotechnical hazards that would prevent full infiltration BMPs that cannot be reasonably mitigated in the geotechnical report. See Appendix C.2.1.8 for a list of typically reasonable and typically unreasonable mitigation measures. Can mitigation measures be proposed to allow for full infiltration BMPs? If the question in Step 2 is answered "Yes," then answer "Yes" to Criteria 2 Result. If the question in Step 2C is answered "No," then answer "No" to Criteria 2 Result.	○ Yes	○ No
Criteria 2 Result	Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of geologic or geotechnical hazards that cannot be reasonably mitigated to an acceptable level?	○ Yes	● No

Summarize findings and basis; provide references to related reports or exhibits.

Small diameter □ore hole testing and infiltration analysis □y the Por□het method. □he test □ as performed □ ithin the proposed □asin lo□ation and res□lted in an infiltration rate of 0.00 in□hes per ho□r. See □eo□e□□s preliminary geote□hni□al report Proposed Emerald Hills Development, North of Old Memory lane, APN 543-340-02-00, San Diego, California"

Part 1 Result – Full Infiltration Geotechnical Screening [4]	Result
If answers to both Criteria 1 and Criteria 2 are "Yes", a full infiltration design is potentially feasible based on Geotechnical conditions only. If either answer to Criteria 1 or Criteria 2 is "No", a full infiltration design is not required.	○ Full infiltration Condition ● Complete Part 2

[4] To be completed using gathered site information and best professional judgement considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by City Engineer to substantiate findings.

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[2]
Part 2 – Partial vs. No Infiltration Feasibility Screening Criteria		
DMA(s) Being Analyzed:		Project Phase:
Northern Basin		Planning Phase
Criteria 3 : Infiltration Rate Screening		
3A	**NRCS Type C, D, or "urban/unclassified":** Is the mapped hydrologic soil group according to the NRCS Web Soil Survey or UC Davis Soil Web Mapper is Type C, D, or "urban/unclassified" and corroborated by available site soil data? ○ Yes; the site is mapped as C soils and a reliable infiltration rate of 0.15 in/hr. is used to size partial infiltration BMPS. Answer "Yes" to Criteria 3 Result. ● Yes; the site is mapped as D soils or "urban/unclassified" and a reliable infiltration rate of 0.05 in/hr. is used to size partial infiltration BMPS. Answer "Yes" to Criteria 3 Result. ○ No; infiltration testing is conducted (refer to Table D.3-1), continue to Step 3B.	
3B	**Infiltration Testing Result:** Is the reliable infiltration rate (i.e. average measured infiltration rate/2) greater than 0.05 in/hr. and less than or equal to 0.5 in/hr? ● Yes; the site may support partial infiltration. Answer "Yes" to Criteria 3 Result. ○ No; the reliable infiltration rate (i.e. average measured rate/2) is less than 0.05 in/hr., partial infiltration is not required. Answer "No" to Criteria 3 Result.	
Criteria 3 Result	Is the estimated reliable infiltration rate (i.e., average measured infiltration rate/2) greater than or equal to 0.05 inches/hour and less than or equal to 0.5 inches/hour at any location within each DMA where runoff can reasonably be routed to a BMP? ● Yes; Continue to Criteria 4. ○ No: Skip to Part 2 Result.	
Summarize infiltration testing and/or mapping results (i.e. soil maps and series description used for infiltration rate). Small diameter bore hole testing and infiltration analysis by the Porchet method. The test was performed within the proposed basin location and resulted in an infiltration rate of 0.00 inches per hour. See Geocon's preliminary geotechnical report Proposed Emerald Hills Development, North of Old Memory lane, APN 543-340-02-00, San Diego, California"		

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[2]	
Criteria 4: Geologic/Geotechnical Screening			
4A	If all questions in Step 4A are answered "Yes," continue to Step 2B. For any "No" answer in Step 4A answer "No" to Criteria 4 Result, and submit an "Infiltration Feasibility Condition Letter" that meets the requirements in Appendix C.1.1. The geologic/geotechnical analyses listed in Appendix C.2.1 do not apply to the DMA because one of the following setbacks cannot be avoided and therefore result in the DMA being in a no infiltration condition. The setbacks must be the closest horizontal radial distance from the surface edge (at the overflow elevation) of the BMP.		
4A-1	Can the proposed partial infiltration BMP(s) avoid areas with existing fill materials greater than 5 feet thick?	◉ Yes	○ No
4A-2	Can the proposed partial infiltration BMP(s) avoid placement within 10 feet of existing underground utilities, structures, or retaining walls?	◉ Yes	○ No
4A-3	Can the proposed partial infiltration BMP(s) avoid placement within 50 feet of a natural slope (>25%) or within a distance of 1.5H from fill slopes where H is the height of the fill slope?	○ Yes	◉ No
4B	When full infiltration is determined to be feasible, a geotechnical investigation report must be prepared that considers the relevant factors identified in Appendix C.2.1. If all questions in Step 4B are answered "Yes," then answer "Yes" to Criteria 4 Result. If there are any "No" answers continue to Step 4C.		
4B-1	**Hydroconsolidation.** Analyze hydroconsolidation potential per approved ASTM standard due to a proposed full infiltration BMP. Can partial infiltration BMPs be proposed within the DMA without increasing hydroconsolidation risks?	○ Yes	○ No
4B-2	**Expansive Soils.** Identify expansive soils (soils with an expansion index greater than 20) and the extent of such soils due to proposed full infiltration BMPs. Can partial infiltration BMPs be proposed within the DMA without increasing expansive soil risks?	○ Yes	○ No
4B-3	**Liquefaction**. If applicable, identify mapped liquefaction areas. Evaluate liquefaction hazards in accordance with Section 6.4.2 of the City of San Diego's Guidelines for Geotechnical Reports (2011). Liquefaction hazard assessment shall take into account any increase in groundwater elevation or groundwater mounding that could occur as a result of proposed infiltration or percolation facilities. Can partial infiltration BMPs be proposed within the DMA without increasing liquefaction risks?	○ Yes	○ No

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[2]	
4B-4	**Slope Stability**. If applicable, perform a slope stability analysis in accordance with the ASCE and Southern California Earthquake Center (2002) Recommended Procedures for Implementation of DMG Special Publication 117, Guidelines for Analyzing and Mitigating Landslide Hazards in California to determine minimum slope setbacks for full infiltration BMPs. See the City of San Diego's Guidelines for Geotechnical Reports (2011) to determine which type of slope stability analysis is required. Can partial infiltration BMPs be proposed within the DMA without increasing slope stability risks?	○ Yes	◉ No
4B-5	**Other Geotechnical Hazards.** Identify site-specific geotechnical hazards not already mentioned (refer to Appendix C.2.1). Can partial infiltration BMPs be proposed within the DMA without increasing risk of geologic or geotechnical hazards not already mentioned?	○ Yes	◉ No
4B-6	**Setbacks.** Establish setbacks from underground utilities, structures, and/or retaining walls. Reference applicable ASTM or other recognized standard in the geotechnical report. Can partial infiltration BMPs be proposed within the DMA using recommended setbacks from underground utilities, structures, and/or retaining walls?	○ Yes	◉ No
4C	**Mitigation Measures.** Propose mitigation measures for each geologic/geotechnical hazard identified in Step 4B. Provide a discussion on geologic/geotechnical hazards that would prevent partial infiltration BMPs that cannot be reasonably mitigated in the geotechnical report. See Appendix C.2.1.8 for a list of typically reasonable and typically unreasonable mitigation measures. Can mitigation measures be proposed to allow for partial infiltration BMPs? If the question in Step 4C is answered "Yes," then answer "Yes" to Criteria 4 Result. If the question in Step 4C is answered "No," then answer "No" to Criteria 4 Result.	○ Yes	◉ No
Criteria 4 Result	Can infiltration of greater than or equal to 0.05 inches/hour and less than or equal to 0.5 inches/hour be allowed without increasing the risk of geologic or geotechnical hazards that cannot be reasonably mitigated to an acceptable level?	○ Yes	● No

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions	Worksheet C.4-1: Form I-8A[2]
Summarize findings and basis; provide references to related reports or exhibits. Small diameter □ore hole testing and infiltration analysis □y the Por□het method. □he test □ as performed □ ithin the proposed □asin lo□ation and res□lted in an infiltration rate of 0.00 in□hes per ho□r. See □eo□e□□s preliminary geote□hni□al report Proposed Emerald Hills velopment, North of Old Memory lane, APN 543-340-02-00, San Diego, California"	

Part 2 – Partial Infiltration Geotechnical Screening Result[5]	Result
If answers to both Criteria 3 and Criteria 4 are "Yes", a partial infiltration design is potentially feasible based on geotechnical conditions only. If answers to either Criteria 3 or Criteria 4 is "No", then infiltration of any volume is considered to be infeasible within the site.	○ Partial Infiltration Condition ● No Infiltration Condition

[5] To be completed using gathered site information and best professional judgement considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by City Engineer to substantiate findings.

Categorization of Infiltration Feasibility Condition based on Groundwater and Water Balance Conditions		Worksheet C.4-2: Form I-8B[2]
Part 1 - Full Infiltration Feasibility Screening Criteria		
DMA(s) Being Analyzed:		Project Phase:
Northern Basin		Planning Phase
Criteria 1: Groundwater Screening		
1A	**Groundwater Depth.** Is the depth to seasonally high groundwater tables (normal high depth during the wet season) beneath the base of any full infiltration BMP greater than 10 feet? ● Yes; continue to Step 1B. ○ No; The depth to groundwater is less than or equal to 10 feet, but site layout changes or reasonable mitigation measures can be proposed to support full infiltration BMPs. Continue to step 1B. ○ No; The depth to groundwater is less than or equal to 10 feet and site layout changes or reasonable mitigation measures cannot be proposed to support full infiltration BMPs. Answer "No" for Criteria 1 Result.	
1B	**Contaminated Soil/Groundwater.** Are proposed full infiltration BMPs at least 250 feet away from contaminated soil or groundwater sites? This can be confirmed using GeoTracker (geotracker.waterboards.ca.gov) to identify open contaminated sites. The setbacks must be the closest horizontal radial distance from the surface edge (at the overflow elevation) of the BMP. ● Yes; continue to Step 1C. ○ No; However, site layout changes or reasonable mitigation measures can be proposed to support full infiltration BMPs. Continue to Step 1C. ○ No; Site layout changes or reasonable mitigation measures cannot be proposed to support full infiltration BMPs. Answer "No" to Criteria 1 Result.	

[1] Note that it is not required to investigate each and every criterion in the worksheet, a single "no" answer in Part 1, Part 2, part 3, or Part 4 determines a full, partial, or no infiltration condition.

[2] This form must be completed each time there is a change to the site layout that would affect the infiltration feasibility condition. Previously completed forms shall be retained to document the evolution of the site storm water design.

Categorization of Infiltration Feasibility Condition based on Groundwater and Water Balance Conditions	Worksheet C.4-2: Form I-8B[2]
1C	**Inadequate Soil Treatment Capacity.** Are full infiltration BMPs proposed in DMA soils that have adequate soil treatment capacity? The DMA has adequate soil treatment capacity if **ALL** of the following criteria (detailed in C.2.2.1) for all soil layers beneath the infiltrating surface are met: • USDA texture class is sandy loam or loam or silt loam or silt or sandy clay loam or clay loam or silty clay loam or sandy clay or silty clay or clay; and • Cation Exchange Capacity (CEC) greater than 5 milliequivalents/100g; and • Soil organic matter is greater than 1%; and • Groundwater table is equal to or greater than 10 feet beneath the base of the full infiltration BMP. ○ Yes; continue to Step 1D. ○ No; However, site layout changes or reasonable mitigation measures can be proposed to support full infiltration BMPs. Continue to Step 1D. ● No; Site layout changes or reasonable mitigation measures cannot be proposed to support full infiltration BMPs. Answer "No" to Criteria 1 Result.
1D	**Other Groundwater Contamination Hazards.** Are there site-specific groundwater contamination hazards not already mentioned (refer to Appendix C.2.2) that can be reasonably mitigated to support full infiltration BMPs? ○ Yes; there are other contamination hazards identified that can be mitigated. Answer "Yes" to Criteria 1 Result. ○ No; there are other contamination hazards identified that cannot be mitigated. Answer "No" to Criteria 1 Result. ○ N/A; no contamination hazards are identified. Answer "Yes" to Criteria 1 Result.
Criteria 1 Result	Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of groundwater contamination that cannot be reasonably mitigated to an acceptable level? See Appendix C.2.2.8 for a list of typically reasonable and typically unreasonable mitigation measures. ○ Yes; Continue to Part 1, Criteria 2. ● No; Continue to Part 1 Result.

Categorization of Infiltration Feasibility Condition based on Groundwater and Water Balance Conditions	Worksheet C.4-2: Form I-8B[2]

Summarize groundwater quality and any mitigation measures proposed. Documentation should focus on groundwater table, mapped soil types and contaminated site locations.

Mapped soil type is "D".

Small diameter □ore hole testing and infiltration analysis □y the Por□het method. □he test □ as performed □ ithin the proposed □asin lo□ation and res□lted in an infiltration rate of 0.00 in□hes per ho□r. See □eo□e□□s preliminary geote□hni□al report Proposed Emerald Hills Development, North of Old Memory lane, APN 543-340-02-00, San Diego, California" PN 3□□0-SD, dated O□to□er □3, 2022

Categorization of Infiltration Feasibility Condition based on Groundwater and Water Balance Conditions	Worksheet C.4-2: Form I-8B[2]
Criteria 2: Water Balance Screening	
2A	**Ephemeral Stream Setback.** Does the proposed full infiltration BMP meet both the following? • The full infiltration BMP is located at least 250 feet away from an ephemeral stream; **AND** • The bottom surface of the full infiltration BMP is at a depth 20 feet or greater from seasonally high groundwater tables. ○ Yes; Answer "Yes" to Criteria 2 Result. ● No; Continue to Step 2B.
2B	**Mitigation Measures.** Can site layout changes be proposed to support full infiltration BMPs? ○ Yes; the site can be reconfigured to mitigate potential water balance issues. Answer "Yes" to Criteria 2 Result. ● No; the site cannot be reconfigured to mitigate potential water balance issues. Continue to Step 2C and provide discussion.
2C	**Additional studies.** Do additional studies support full infiltration BMPs? In the event that water balance effects are used to reject full infiltration (anticipated to be rare), additional analysis shall be completed and documented by a qualified professional indicating the site-specific information evaluated and the technical basis for this finding. ○ Yes; Answer "Yes" to Criteria 2 Result. ● No; Answer "No" to Criteria 2 Result.
Criteria 2 Result	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? ○ Yes; Continue to Part 1 Result. ● No; Continue to Part 1 Result.

Categorization of Infiltration Feasibility Condition based on Groundwater and Water Balance Conditions	Worksheet C.4-2: Form I-8B[2]

Summarize potential water balance effects. Documentation should focus on mapping and soil data regarding proximity to ephemeral streams and groundwater depth.

Small diameter □ore hole testing and infiltration analysis □y the Por□het method. □he test □ as performed □ ithin the proposed □asin lo□ation and res□lted in an infiltration rate of 0.00 in□hes per ho□r. See □ eo□e□s preliminary geote□hni□al report Proposed Emerald Hills Development, North of Old Memory lane, APN 543-340-02-00, San Diego, California"

Part 1 – Full Infiltration Groundwater and Water Balance Screening Result[3]	Result
If answers to Criteria 1 and 2 are "Yes", a full infiltration design is potentially feasible. The feasibility screening category is Full Infiltration based on groundwater conditions.	
If answer to Criteria 1 or Criteria 2 is "No", infiltration may be possible to some extent but would not generally be feasible or desirable to achieve a "full infiltration" design based on groundwater conditions. Proceed to Part 2.	○ Full Infiltration ● Complete Part 2

[3] To be completed using gathered site information and best professional judgement considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by City Engineer to substantiate findings.

Categorization of Infiltration Feasibility Condition based on Groundwater and Water Balance Conditions	Worksheet C.4-2: Form I-8B[2]
Part 2 – Partial vs. No Infiltration Feasibility Screening Criteria	
DMA(s) Being Analyzed:	Project Phase:
Northern Basin	Planning Phase

Criteria 3: Groundwater Screening

Contaminated Soil/Groundwater. Are partial infiltration BMPs proposed at least 100 feet away from contaminated soil or groundwater sites? This can be confirmed using GeoTracker (geotracker.waterboards.ca.gov) to identify open contaminated sites. This criterion is intentionally a smaller radius than full infiltration, as the potential quantity of infiltration from partial infiltration BMPs is smaller.

- (●) Yes; Answer "Yes" to Criteria 3 Result.
- ( ) No; However, site layout changes can be proposed to avoid contaminated soils or soils that lack adequate treatment capacity. Select "Yes" to Criteria 3 Result. It is a requirement for the SWQMP preparer to identify potential mitigation measures.
- ( ) No; Contaminated soils or soils that lack adequate treatment capacity cannot be avoided and partial infiltration BMPs are not feasible. Select "No" to Criteria 3 Result.

Criteria 3 Result: Can infiltration of greater than or equal to 0.05 inches/hour and less than or equal to 0.5 inches/hour be allowed without increasing risk of groundwater contamination that cannot be reasonably mitigated to an acceptable level?

- (●) Yes; Continue to Part 2, Criteria 4.
- ( ) No; Skip to Part 2 Result.

Summarize findings and basis. Documentation should focus on mapped soil types and contaminated site locations.

Mapped soil type is "D".

Small diameter bore hole testing and infiltration analysis by the Porchet method. The test was performed within the proposed basin location and resulted in an infiltration rate of 0.00 inches per hour. See Geotechnical preliminary geotechnical report Proposed Emerald Hills Development, North of Old Memory lane, APN 543-340-02-00, San Diego, California" PN 3[illegible]0-SD, dated October 3, 2022

Categorization of Infiltration Feasibility Condition based on Groundwater and Water Balance Conditions	Worksheet C.4-2: Form I-8B[2]

Criteria 4: Water Balance Screening

Additional studies. In the event that water balance effects are used to reject partial infiltration (anticipated to be rare), a qualified professional must provide an analysis of the incremental effects of partial infiltration BMPs on the water balance compared to incidental infiltration under a no infiltration scenario (e.g. precipitation, irrigation, etc.).

Criteria 4 Result: Can infiltration of greater than or equal to 0.05 inches/hour and less than or equal to 0.5 inches/hour be allowed without causing potential water balance issues such as change of seasonality of ephemeral streams?

(●) Yes: Continue to Part 2 Result.

( ) No: Continue to Part 2 Result.

Summarize potential water balance effects. Documentation should focus on mapping and soil data regarding proximity to ephemeral streams and groundwater depth.

Part 2 – Partial Infiltration Groundwater and Water Balance Screening Result[4]	Result
If answers to Criteria 3 and Criteria 4 are "Yes", a partial infiltration design is potentially feasible. The feasibility screening category is Partial Infiltration based on groundwater and water balance conditions. If answer to Criteria 3 or Criteria 4 is "No", then infiltration of any volume is considered to be infeasible within the site. The feasibility screening category is No Infiltration based on groundwater or water balance condition.	(●) Partial Infiltration Condition ( ) No Infiltration Condition

[4] To be completed using gathered site information and best professional judgement considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by City Engineer to substantiate findings.

Factor of Safety and Design Infiltration Rate Worksheet			Worksheet D.5-1: Form I-9		
Factor Category		Factor Description	Assigned Weight (w)	Factor Value (v)	Product (p) p = w x v
A	Suitability Assessment	Soil assessment methods	0.25	3	.□5
		Predominant soil texture	0.25	3	.□5
		Site soil variability	0.25	□	.25
		Depth to groundwater / impervious layer	0.25	□	.25
		Suitability Assessment Safety Factor, $S_A = \Sigma p$			2
B	Design	Level of pretreatment/ expected sediment loads	0.5		
		Redundancy/resiliency	0.25		
		Compaction during construction	0.25		
		Design Safety Factor, $S_B = \Sigma p$			
Combined Safety Factor, $S_{total} = S_A \times S_B$ [Minimum of 2 and Maximum of 9]					
Observed Infiltration Rate, inch/hr., $K_{observed}$ (corrected for test-specific bias) Note: This worksheet is only applicable when the observed infiltration rate is greater than or equal to 1 inch/hr.					0.00
Design Infiltration Rate, in/hr., $K_{design} = K_{observed} / S_{total}$ Note: If the estimated design infiltration rate is less than or equal to 0.5 inch/hr. then the applicant may choose to implement partial infiltration BMPs.					

Supporting Data

Briefly describe infiltration test and provide reference to test forms:

Small diameter □ore hole testing and infiltration analysis □y the Por□het method. □he test □as performed □ithin the proposed □asin lo□ation and res□lted in an infiltration rate of 0.00 in□hes per ho□r. See □eo□e□□s preliminary geote□hni□al report Proposed Emerald Hills Development, North of Old Memory lane, APN 543-340-02-00, San Diego, California"

Note: Worksheet D.5-1: Form I-9 is only applicable to design BMPs in "full infiltration condition". This form is not applicable for categorization of infiltration feasibility (Worksheet C.4-1: Form I-8) and/or for designing BMPs in "partial infiltration condition" or "no infiltration condition".

APPENDIX D

GENERAL EARTHWORK GRADING GUIDELINES

GEOTEK

GENERAL GRADING GUIDELINES

Guidelines presented herein are intended to address general construction procedures for earthwork construction. Specific situations and conditions often arise which cannot reasonably be discussed in general guidelines, when anticipated these are discussed in the text of the report. Often unanticipated conditions are encountered which may necessitate modification or changes to these guidelines. It is our hope that these will assist the contractor to more efficiently complete the project by providing a reasonable understanding of the procedures that would be expected during earthwork and the testing and observation used to evaluate those procedures.

General

Grading should be performed to at least the minimum requirements of governing agencies, the California Building Code, CBC (2019) and the guidelines presented below.

Preconstruction Meeting

A preconstruction meeting should be held prior to site earthwork. Any questions the contractor has regarding our recommendations, general site conditions, apparent discrepancies between reported and actual conditions and/or differences in procedures the contractor intends to use should be brought up at that meeting. The contractor (including the main onsite representative) should review our report and these guidelines in advance of the meeting. Any comments the contractor may have regarding these guidelines should be brought up at that meeting.

Grading Observation and Testing

1. Observation of the fill placement should be provided by our representative during grading. Verbal communication during the course of each day will be used to inform the contractor of test results. The contractor should receive a copy of the "Daily Field Report" indicating results of field density tests that day. If our representative does not provide the contractor with these reports, our office should be notified.
2. Testing and observation procedures are, by their nature, specific to the work or area observed and location of the tests taken, variability may occur in other locations. The contractor is responsible for the uniformity of the grading operations; our observations and test results are intended to evaluate the contractor's overall level of efforts during grading. The contractor's personnel are the only individuals participating in all aspect of site work. Compaction testing and observation should not be considered as relieving the contractor's responsibility to properly compact the fill.
3. Cleanouts, processed ground to receive fill, key excavations, and subdrains should be observed by our representative prior to placing any fill. It will be the contractor's responsibility to notify our representative or office when such areas are ready for observation.
4. Density tests may be made on the surface material to receive fill, as considered warranted by this firm.
5. In general, density tests would be made at maximum intervals of two feet of fill height or every 1,000 cubic yards of fill placed. Criteria will vary depending on soil conditions and size of the fill. More frequent testing may be performed. In any case, an adequate number of field density tests should be made to evaluate the required compaction and moisture content is generally being obtained.

6. Laboratory testing to support field test procedures will be performed, as considered warranted, based on conditions encountered (e.g. change of material sources, types, etc.) Every effort will be made to process samples in the laboratory as quickly as possible and in progress construction projects are our first priority. However, laboratory workloads may cause in delays and some soils may require a **minimum of 48 to 72 hours to complete test procedures**. Whenever possible, our representative(s) should be informed in advance of operational changes that might result in different source areas for materials.
7. Procedures for testing of fill slopes are as follows:
   a) Density tests should be taken periodically during grading on the flat surface of the fill, three to five feet horizontally from the face of the slope.
   b) If a method other than over building and cutting back to the compacted core is to be employed, slope compaction testing during construction should include testing the outer six inches to three feet in the slope face to determine if the required compaction is being achieved.
8. Finish grade testing of slopes and pad surfaces should be performed after construction is complete.

Site Clearing

1. All vegetation, and other deleterious materials, should be removed from the site. If material is not immediately removed from the site it should be stockpiled in a designated area(s) well outside of all current work areas and delineated with flagging or other means. Site clearing should be performed in advance of any grading in a specific area.
2. Efforts should be made by the contractor to remove all organic or other deleterious material from the fill, as even the most diligent efforts may result in the incorporation of some materials. This is especially important when grading is occurring near the natural grade. All equipment operators should be aware of these efforts. Laborers may be required as root pickers.
3. Nonorganic debris or concrete may be placed in deeper fill areas provided the procedures used are observed and found acceptable by our representative. Typical procedures are similar to those indicated on Plate G-4.

Treatment of Existing Ground

1. Following site clearing, all surficial deposits of alluvium and colluvium as well as weathered or creep effected bedrock, should be removed (see Plates G-1, G-2 and G-3) unless otherwise specifically indicated in the text of this report.
2. In some cases, removal may be recommended to a specified depth (e.g. flat sites where partial alluvial removals may be sufficient). The contractor should not exceed these depths unless directed otherwise by our representative.
3. Groundwater existing in alluvial areas may make excavation difficult. Deeper removals than indicated in the text of the report may be necessary due to saturation during winter months.
4. Subsequent to removals, the natural ground should be processed to a depth of six inches, moistened to near optimum moisture conditions and compacted to fill standards.
5. Exploratory back hoe or dozer trenches still remaining after site removal should be excavated and filled with compacted fill if they can be located.

Subdrainage

1. Subdrainage systems should be provided in canyon bottoms prior to placing fill, and behind buttress and stabilization fills and in other areas indicated in the report. Subdrains should conform to schematic diagrams G-1 and G-5, and be acceptable to our representative.
2. For canyon subdrains, runs less than 500 feet may use six-inch pipe. Typically, runs in excess of 500 feet should have the lower end as eight-inch minimum.
3. Filter material should be clean, 1/2 to 1-inch gravel wrapped in a suitable filter fabric. Class 2 permeable filter material per California Department of Transportation Standards tested by this office to verify its suitability, may be used without filter fabric. A sample of the material should be provided to the Soils Engineer by the contractor at least two working days before it is delivered to the site. The filter should be clean with a wide range of sizes.
4. Approximate delineation of anticipated subdrain locations may be offered at 40-scale plan review stage. During grading, this office would evaluate the necessity of placing additional drains.
5. All subdrainage systems should be observed by our representative during construction and prior to covering with compacted fill.
6. Subdrains should outlet into storm drains where possible. Outlets should be located and protected. The need for backflow preventers should be assessed during construction.
7. Consideration should be given to having subdrains located by the project surveyors.

Fill Placement

1. Unless otherwise indicated, all site soil and bedrock may be reused for compacted fill; however, some special processing or handling may be required (see text of report).
2. Material used in the compacting process should be evenly spread, moisture conditioned, processed, and compacted in thin lifts six (6) to eight (8) inches in compacted thickness to obtain a uniformly dense layer. The fill should be placed and compacted on a nearly horizontal plane, unless otherwise found acceptable by our representative.
3. If the moisture content or relative density varies from that recommended by this firm, the contractor should rework the fill until it is in accordance with the following:
   a) Moisture content of the fill should be at or above optimum moisture. Moisture should be evenly distributed without wet and dry pockets. Pre-watering of cut or removal areas should be considered in addition to watering during fill placement, particularly in clay or dry surficial soils. The ability of the contractor to obtain the proper moisture content will control production rates.
   b) Each six-inch layer should be compacted to at least 90 percent of the maximum dry density in compliance with the testing method specified by the controlling governmental agency. In most cases, the testing method is ASTM Test Designation D 1557.
4. Rock fragments less than eight inches in diameter may be utilized in the fill, provided:
   a) They are not placed in concentrated pockets;
   b) There is a sufficient percentage of fine-grained material to surround the rocks;
   c) The distribution of the rocks is observed by, and acceptable to, our representative.
5. Rocks exceeding eight (8) inches in diameter should be taken off site, broken into smaller fragments, or placed in accordance with recommendations of this firm in areas designated suitable for rock disposal (see Plate G-4). On projects where significant large quantities of oversized materials are anticipated, alternate guidelines for placement may be included. If

significant oversize materials are encountered during construction, these guidelines should be requested.

6. In clay soil, dry or large chunks or blocks are common. If in excess of eight (8) inches minimum dimension, then they are considered as oversized. Sheepsfoot compactors or other suitable methods should be used to break up blocks. When dry, they should be moisture conditioned to provide a uniform condition with the surrounding fill.

Slope Construction

1. The contractor should obtain a minimum relative compaction of 90 percent out to the finished slope face of fill slopes. This may be achieved by either overbuilding the slope and cutting back to the compacted core, or by direct compaction of the slope face with suitable equipment.
2. Slopes trimmed to the compacted core should be overbuilt by at least three (3) feet with compaction efforts out to the edge of the false slope. Failure to properly compact the outer edge results in trimming not exposing the compacted core and additional compaction after trimming may be necessary.
3. If fill slopes are built "at grade" using direct compaction methods, then the slope construction should be performed so that a constant gradient is maintained throughout construction. Soil should not be "spilled" over the slope face nor should slopes be "pushed out" to obtain grades. Compaction equipment should compact each lift along the immediate top of slope. Slopes should be back rolled or otherwise compacted at approximately every 4 feet vertically as the slope is built.
4. Corners and bends in slopes should have special attention during construction as these are the most difficult areas to obtain proper compaction.
5. Cut slopes should be cut to the finished surface. Excessive undercutting and smoothing of the face with fill may necessitate stabilization.

Keyways, Buttress and Stabilization Fills

Keyways are needed to provide support for fill slope and various corrective procedures.

1. Side-hill fills should have an equipment-width key at their toe excavated through all surficial soil and into competent material and tilted back into the hill (Plates G-2, G-3). As the fill is elevated, it should be benched through surficial soil and slopewash, and into competent bedrock or other material deemed suitable by our representatives (See Plates G-1, G-2, and G-3).
2. Fill over cut slopes should be constructed in the following manner:
   a) All surficial soils and weathered rock materials should be removed at the cut-fill interface.
   b) A key at least one and one-half (1.5) equipment width wide (or as needed for compaction), and tipped at least one (1) foot into slope, should be excavated into competent materials and observed by our representative.
   c) The cut portion of the slope should be excavated prior to fill placement to evaluate if stabilization is necessary. The contractor should be responsible for any additional earthwork created by placing fill prior to cut excavation. (see Plate G-3 for schematic details.)
3. Daylight cut lots above descending natural slopes may require removal and replacement of the outer portion of the lot. A schematic diagram for this condition is presented on Plate G-2.

4. A basal key is needed for fill slopes extending over natural slopes. A schematic diagram for this condition is presented on Plate G-2.
5. All fill slopes should be provided with a key unless within the body of a larger overall fill mass. Please refer to Plate G-3 for specific guidelines.

Anticipated buttress and stabilization fills are discussed in the text of the report. The need to stabilize other proposed cut slopes will be evaluated during construction. Plate G-5 shows a schematic of buttress construction.

1. All backcuts should be excavated at gradients of 1:1 or flatter. The backcut configuration should be determined based on the design, exposed conditions, and need to maintain a minimum fill width and provide working room for the equipment.
2. On longer slopes, backcuts and keyways should be excavated in maximum 250 feet long segments. The specific configurations will be determined during construction.
3. All keys should be a minimum of two (2) feet deep at the toe and slope toward the heel at least one foot or two (2%) percent, whichever is greater.
4. Subdrains are to be placed for all stabilization slopes exceeding 10 feet in height. Lower slopes are subject to review. Drains may be required. Guidelines for subdrains are presented on Plate G-5.
5. Benching of backcuts during fill placement is required.

Lot Capping

1. When practical, the upper three (3) feet of material placed below finish grade should be comprised of the least expansive material available. Preferably, highly and very highly expansive materials should not be used. We will attempt to offer advice based on visual evaluations of the materials during grading, but it must be realized that laboratory testing is needed to evaluate the expansive potential of soil. Minimally, this testing takes two (2) to four (4) days to complete.
2. Transition lots (cut and fill) both per plan and those created by remedial grading (e.g. lots above stabilization fills, along daylight lines, above natural slopes, etc.) should be capped with a minimum three foot thick compacted fill blanket.
3. Cut pads should be observed by our representative(s) to evaluate the need for overexcavation and replacement with fill. This may be necessary to reduce water infiltration into highly fractured bedrock or other permeable zones, and/or due to differing expansive potential of materials beneath a structure. The overexcavation should be at least three feet. Deeper overexcavation may be recommended in some cases.

ROCK PLACEMENT AND ROCK FILL GUIDELINES

If large quantities of oversize material would be generated during grading, it's likely that such materials may require special handling for burial. Although alternatives may be developed in the field, the following methods of rock disposal are recommended on a preliminary basis.

Limited Larger Rock

When materials encountered are principally soil with limited quantities of larger rock fragments or boulders, placement in windrows is recommended. The following procedures should be applied:

1. Oversize rock (greater than 8 inches) should be placed in windrows.
    a) Windrows are rows of single file rocks placed to avoid nesting or clusters of rock.

b) Each adjacent rock should be approximately the same size (within ~one foot in diameter).

c) The maximum rock size allowed in windrows is four feet

2. A minimum vertical distance of three feet between lifts should be maintained. Also, the windrows should be offset from lift to lift. Rock windrows should not be closer than 15 feet to the face of fill slopes and sufficient space must be maintained for proper slope construction (see Plate G-4).

3. Rocks greater than eight inches in diameter should not be placed within seven feet of the finished subgrade for a roadway or pads and should be held below the depth of the lowest utility. This will allow easier trenching for utility lines.

4. Rocks greater than four feet in diameter should be broken down, if possible, or they may be placed in a dozer trench. Each trench should be excavated into the compacted fill a minimum of one foot deeper than the largest diameter of rock.

a) The rock should be placed in the trench and granular fill materials (SE>30) should be flooded into the trench to fill voids around the rock.

b) The over size rock trenches should be no closer together than 15 feet from any slope face.

c) Trenches at higher elevation should be staggered and there should be a minimum of four feet of compacted fill between the top of the one trench and the bottom of the next higher trench.

d) It would be necessary to verify 90 percent relative compaction in these pits. A 24 to 72 hour delay to allow for water dissipation should be anticipated prior to additional fill placement.

Structural Rock Fills

If the materials generated for placement in structural fills contains a significant percentage of material more than six (6) inches in one dimension, then placement using conventional soil fill methods with isolated windrows would not be feasible. In such cases the following could be considered:

1. Mixes of large rock or boulders may be placed as rock fill. They should be below the depth of all utilities both on pads and in roadways and below any proposed swimming pools or other excavations. If these fills are placed within seven (7) feet of finished grade, they may affect foundation design.

2. Rock fills are required to be placed in horizontal layers that should **not exceed two feet in thickness, or the maximum rock size present, which ever is less**. All rocks exceeding two feet should be broken down to a smaller size, windrowed (see above), or disposed of in non-structural fill areas. Localized larger rock up to 3 feet in largest dimension may be placed in rock fill as follows:

a) individual rocks are placed in a given lift so as to be roughly 50% exposed above the typical surface of the fill ,

b) loaded rock trucks or alternate compactors are worked around the rock on all sides to the satisfaction of the soil engineer,

c) the portion of the rock above grade is covered with a second lift.

3. Material placed in each lift should be well graded. No unfilled spaces (voids) should be permitted in the rock fill.

Compaction Procedures

Compaction of rock fills is largely procedural. The following procedures have been found to generally produce satisfactory compaction.

1. Provisions for routing of construction traffic over the fill should be implemented.
   a) Placement should be by rock trucks crossing the lift being placed and dumping at its edge.
   b) The trucks should be routed so that each pass across the fill is via a different path and that all areas are uniformly traversed.
   c) The dumped piles should be knocked down and spread by a large dozer (D-8 or larger suggested). (Water should be applied before and during spreading.)

2. Rock fill should be generously watered (sluiced)
   a) Water should be applied by water trucks to the:
      i) dump piles,
      ii) front face of the lift being placed and,
      iii) surface of the fill prior to compaction.
   b) No material should be placed without adequate water.
   c) The number of water trucks and water supply should be sufficient to provide constant water.
   d) Rock fill placement should be suspended when water trucks are unavailable:
      i) for more than 5 minutes straight, or,
      ii) for more than 10 minutes/hour.

3. In addition to the truck pattern and at the discretion of the soil engineer, large, rubber tired compactors may be required.
   a) The need for this equipment will depend largely on the ability of the operators to provide complete and uniform coverage by wheel rolling with the trucks.
   b) Other large compactors will also be considered by the soil engineer provided that required compaction is achieved.

4. Placement and compaction of the rock fill is largely procedural. Observation by trenching should be made to check:
   a) the general segregation of rock size,
   b) for any unfilled spaces between the large blocks, and
   c) the matrix compaction and moisture content.

5. Test fills may be required to evaluate relative compaction of finer grained zones or as deemed appropriate by the soil engineer.
   a) A lift should be constructed by the methods proposed, as proposed

6. Frequency of the test trenching is to be at the discretion of the soil engineer. Control areas may be used to evaluate the contractor's procedures.

7. A minimum horizontal distance of 15 feet should be maintained from the face of the rock fill and any finish slope face. At least the outer 15 feet should be built of conventional fill materials.

Piping Potential and Filter Blankets

Where conventional fill is placed over rock fill, the potential for piping (migration) of the fine grained material from the conventional fill into rock fills will need to be addressed.
The potential for particle migration is related to the grain size comparisons of the materials present and in contact with each other. Provided that 15 percent of the finer soil is larger than the effective

pore size of the coarse soil, then particle migration is substantially mitigated. This can be accomplished with a well-graded matrix material for the rock fill and a zone of fill similar to the matrix above it. The specific gradation of the fill materials placed during grading must be known to evaluate the need for any type of filter that may be necessary to cap the rock fills. This, unfortunately, can only be accurately determined during construction.

In the event that poorly graded matrix is used in the rock fills, properly graded filter blankets 2 to 3 feet thick separating rock fills and conventional fill may be needed. As an alternative, use of two layers of filter fabric (Mirafi 700 x or equivalent) could be employed on top of the rock fill. In order to mitigate excess puncturing, the surface of the rock fill should be well broken down and smoothed prior to placing the filter fabric. The first layer of the fabric may then be placed and covered with relatively permeable fill material (with respect to overlying material) 1 to 2 feet thick. The relative permeable material should be compacted to fill standards. The second layer of fabric should be placed and conventional fill placement continued.

Subdrainage

Rock fill areas should be tied to a subdrainage system. If conventional fill is placed that separates the rock from the main canyon subdrain, then a secondary system should be installed. A system consisting of an adequately graded base (3 to 4 percent to the lower side) with a collector system and outlets may suffice.

Additionally, at approximately every 25 foot vertical interval, a collector system with outlets should be placed at the interface of the rock fill and the conventional fill blanketing a fill slope.

Monitoring

Depending upon the depth of the rock fill and other factors, monitoring for settlement of the fill areas may be needed following completion of grading. Typically, if rock fill depths exceed 40 feet, monitoring would be recommend prior to construction of any settlement sensitive improvements. Delays of 3 to 6 months or longer can be expected prior to the start of construction.

UTILITY TRENCH CONSTRUCTION AND BACKFILL

Utility trench excavation and backfill is the contractor's responsibility. The geotechnical consultant typically provides periodic observation and testing of these operations. While efforts are made to make sufficient observations and tests to verify that the contractors' methods and procedures are adequate to achieve proper compaction, it is typically impractical to observe all backfill procedures. As such, it is critical that the contractor use consistent backfill procedures.

Compaction methods vary for trench compaction and experience indicates many methods can be successful. However, procedures that "worked" on previous projects may or may not prove effective on a given site. The contractor(s) should outline the procedures proposed, so that we may discuss them **prior** to construction. We will offer comments based on our knowledge of site conditions and experience.

1. Utility trench backfill in slopes, structural areas, in streets and beneath flat work or hardscape should be brought to at least optimum moisture and compacted to at least 90 percent of the laboratory standard. Soil should be moisture conditioned prior to placing in the trench.

2. Flooding and jetting are not typically recommended or acceptable for native soils. Flooding or jetting may be used with select sand having a Sand Equivalent (SE) of 30 or higher. This is typically limited to the following uses:
   a) shallow (12 + inches) under slab interior trenches and,
   b) as bedding in pipe zone.

   The water should be allowed to dissipate prior to pouring slabs or completing trench compaction.
3. Care should be taken not to place soils at high moisture content within the upper three feet of the trench backfill in street areas, as overly wet soils may impact subgrade preparation. Moisture may be reduced to 2% below optimum moisture in areas to be paved within the upper three feet below sub grade.
4. Sand backfill should not be allowed in exterior trenches adjacent to and within an area extending below a 1:1 projection from the outside bottom edge of a footing, unless it is similar to the surrounding soil.
5. Trench compaction testing is generally at the discretion of the geotechnical consultant. Testing frequency will be based on trench depth and the contractor's procedures. A probing rod would be used to assess the consistency of compaction between tested areas and untested areas. If zones are found that are considered less compact than other areas, this would be brought to the contractor's attention.

JOB SAFETY

General

Personnel safety is a primary concern on all job sites. The following summaries are safety considerations for use by all our employees on multi-employer construction sites. On ground personnel are at highest risk of injury and possible fatality on grading construction projects. The company recognizes that construction activities will vary on each site and that job site safety is the contractor's responsibility. However, it is, imperative that all personnel be safety conscious to avoid accidents and potential injury.

In an effort to minimize risks associated with geotechnical testing and observation, the following precautions are to be implemented for the safety of our field personnel on grading and construction projects.

1. Safety Meetings: Our field personnel are directed to attend the contractor's regularly scheduled safety meetings.
2. Safety Vests: Safety vests are provided for and are to be worn by our personnel while on the job site.
3. Safety Flags: Safety flags are provided to our field technicians; one is to be affixed to the vehicle when on site, the other is to be placed atop the spoil pile on all test pits.

In the event that the contractor's representative observes any of our personnel not following the above, we request that it be brought to the attention of our office.

Test Pits Location, Orientation and Clearance

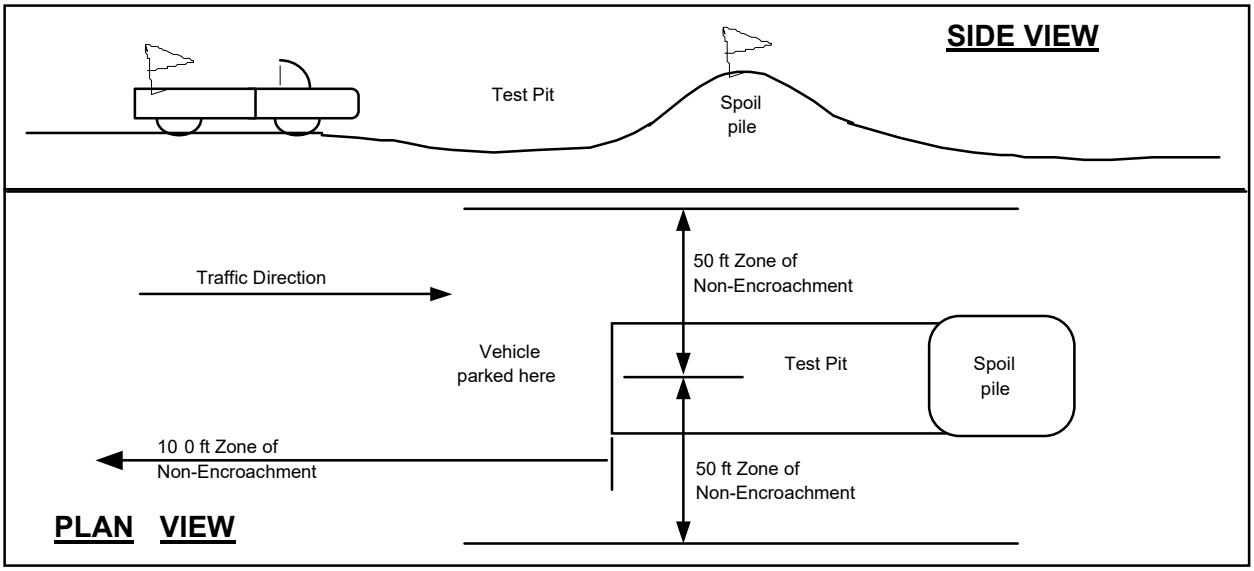
The technician is responsible for selecting test pit locations. The primary concern is the technician's safety. However, it is necessary to take sufficient tests at various locations to obtain a representative sampling of the fill. As such, efforts will be made to coordinate locations with the grading contractors authorized representatives (e.g. dump man, operator, supervisor, grade checker, etc.),

and to select locations following or behind the established traffic pattern, preferably outside of current traffic. The contractors authorized representative should direct excavation of the pit and safety during the test period. Again, safety is the paramount concern.

Test pits should be excavated so that the spoil pile is placed away from oncoming traffic. The technician's vehicle is to be placed next to the test pit, opposite the spoil pile. This necessitates that the fill be maintained in a drivable condition. Alternatively, the contractor may opt to park a piece of equipment in front of test pits, particularly in small fill areas or those with limited access.

A zone of non-encroachment should be established for all test pits (see diagram below). No grading equipment should enter this zone during the test procedure. The zone should extend outward to the sides approximately 50 feet from the center of the test pit and 100 feet in the direction of traffic flow. This zone is established both for safety and to avoid excessive ground vibration, which typically decreases test results.

TEST PIT SAFETY PLAN



Slope Tests

When taking slope tests, the technician should park their vehicle directly above or below the test location on the slope. The contractor's representative should effectively keep all equipment at a safe operation distance (e.g. 50 feet) away from the slope during testing.

The technician is directed to withdraw from the active portion of the fill as soon as possible following testing. The technician's vehicle should be parked at the perimeter of the fill in a highly visible location.

Trench Safety

It is the contractor's responsibility to provide safe access into trenches where compaction testing is needed. Trenches for all utilities should be excavated in accordance with CAL-OSHA and any other applicable safety standards. Safe conditions will be required to enable compaction testing of the trench backfill.

All utility trench excavations in excess of 5 feet deep, which a person enters, are to be shored or laid back. Trench access should be provided in accordance with OSHA standards. Our personnel are directed not to enter any trench by being lowered or "riding down" on the equipment.

Our personnel are directed not to enter any excavation which;

1. is 5 feet or deeper unless shored or laid back,
2. exit points or ladders are not provided,
3. displays any evidence of instability, has any loose rock or other debris which could fall into the trench, or
4. displays any other evidence of any unsafe conditions regardless of depth.

If the contractor fails to provide safe access to trenches for compaction testing, our company policy requires that the soil technician withdraws and notifies their supervisor. The contractor's representative will then be contacted in an effort to affect a solution. All backfill not tested due to safety concerns or other reasons is subject to reprocessing and/or removal.

Procedures

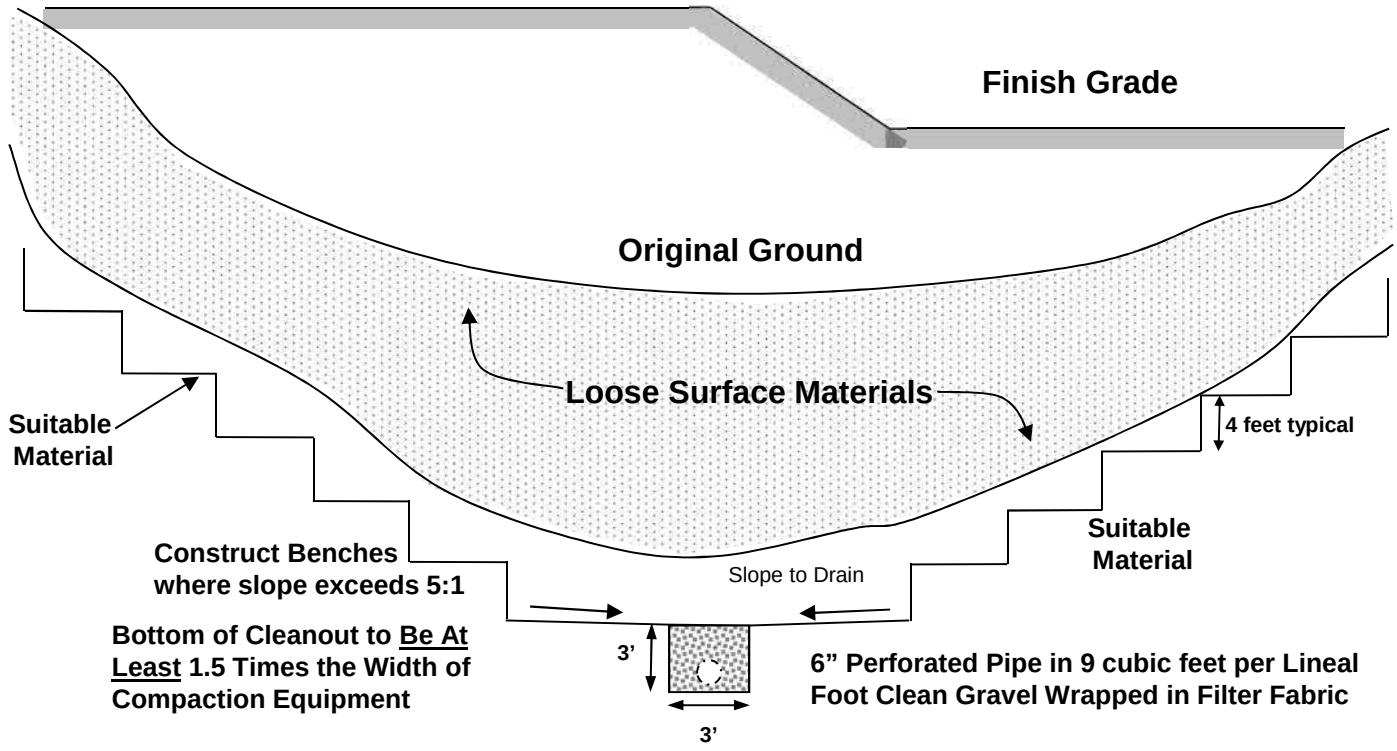
In the event that the technician's safety is jeopardized or compromised as a result of the contractor's failure to comply with any of the above, the technician is directed to inform both the developer's and contractor's representatives. If the condition is not rectified, the technician is required, by company policy, to immediately withdraw and notify their supervisor. The contractor's representative will then be contacted in an effort to affect a solution. No further testing will be performed until the situation is rectified. Any fill placed in the interim can be considered unacceptable and subject to reprocessing, recompaction or removal.

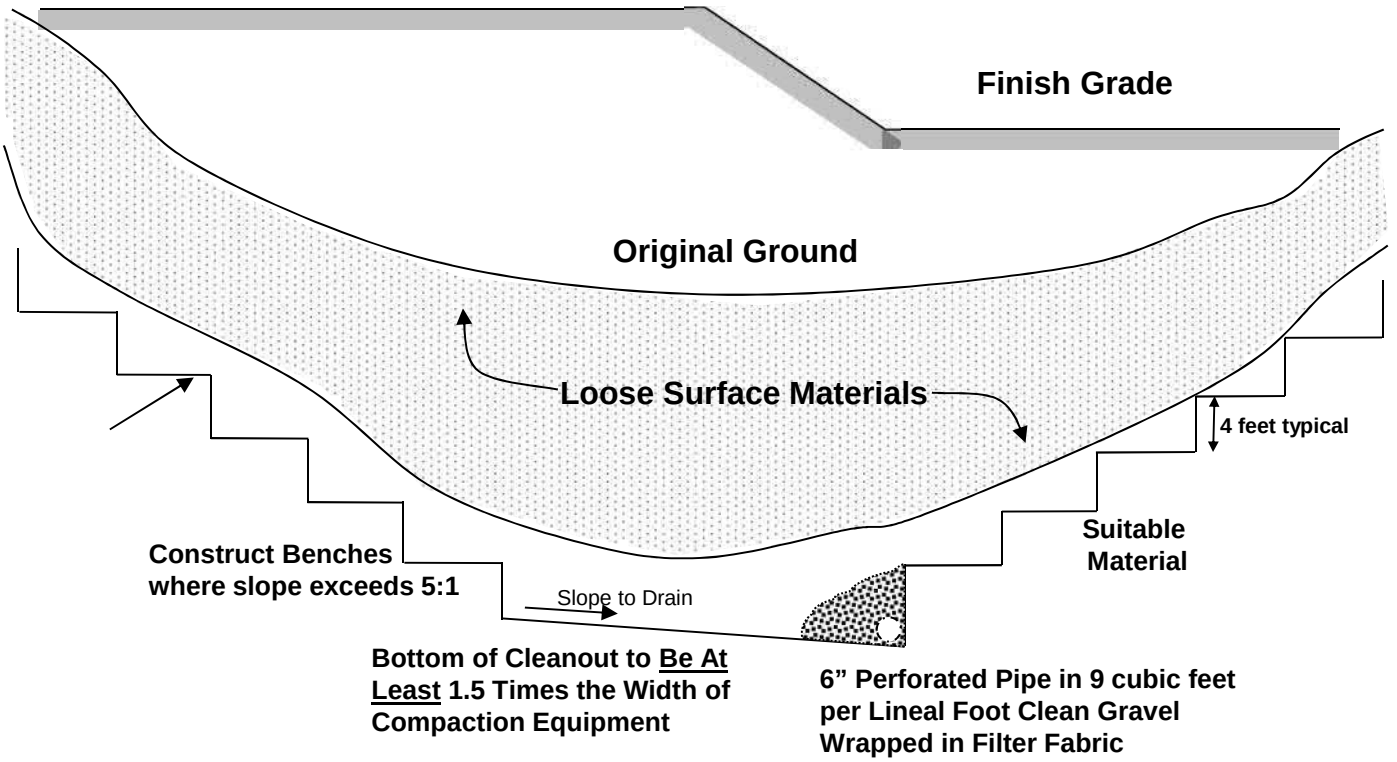
In the event that the soil technician does not comply with the above or other established safety guidelines, we request that the contractor bring this to technician's attention and notify our project manager or office. Effective communication and coordination between the contractors' representative and the field technician(s) is strongly encouraged in order to implement the above safety program and safety in general.

The safety procedures outlined above should be discussed at the contractor's safety meetings. This will serve to inform and remind equipment operators of these safety procedures particularly the zone of non-encroachment.

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ALTERNATES





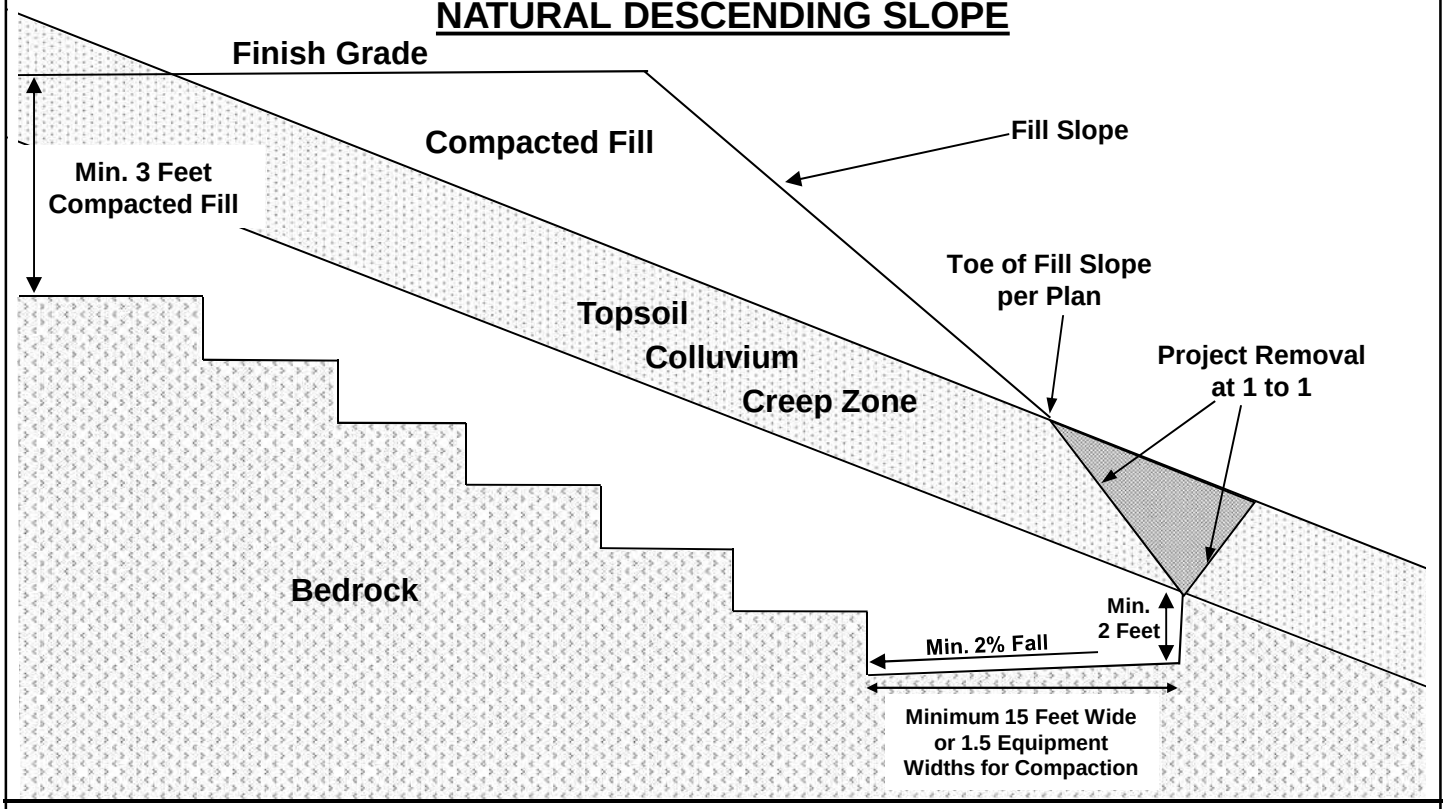
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TYPICAL CANYON CLEANOUT

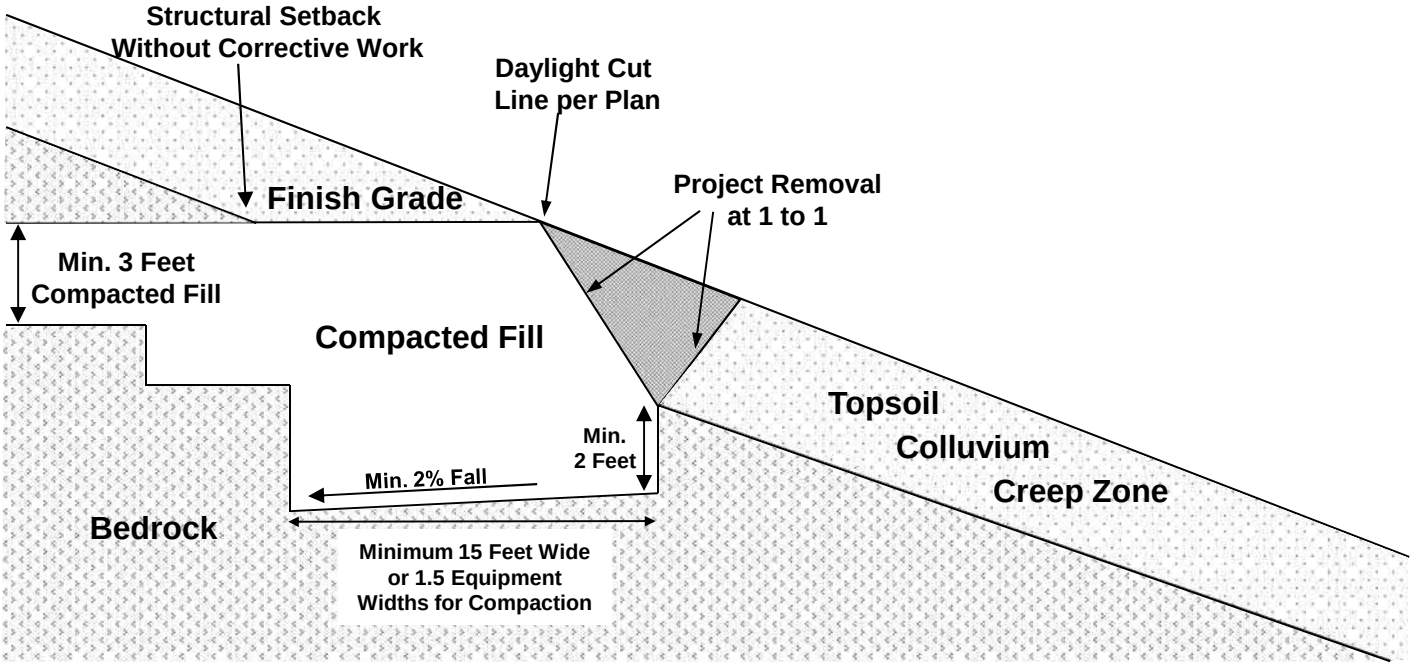
STANDARD GRADING GUIDELINES

PLATE G-1

TYPICAL FILL SLOPE OVER NATURAL DESCENDING SLOPE



DAYLIGHT CUT AREA OVER NATURAL DESCENDING SLOPE



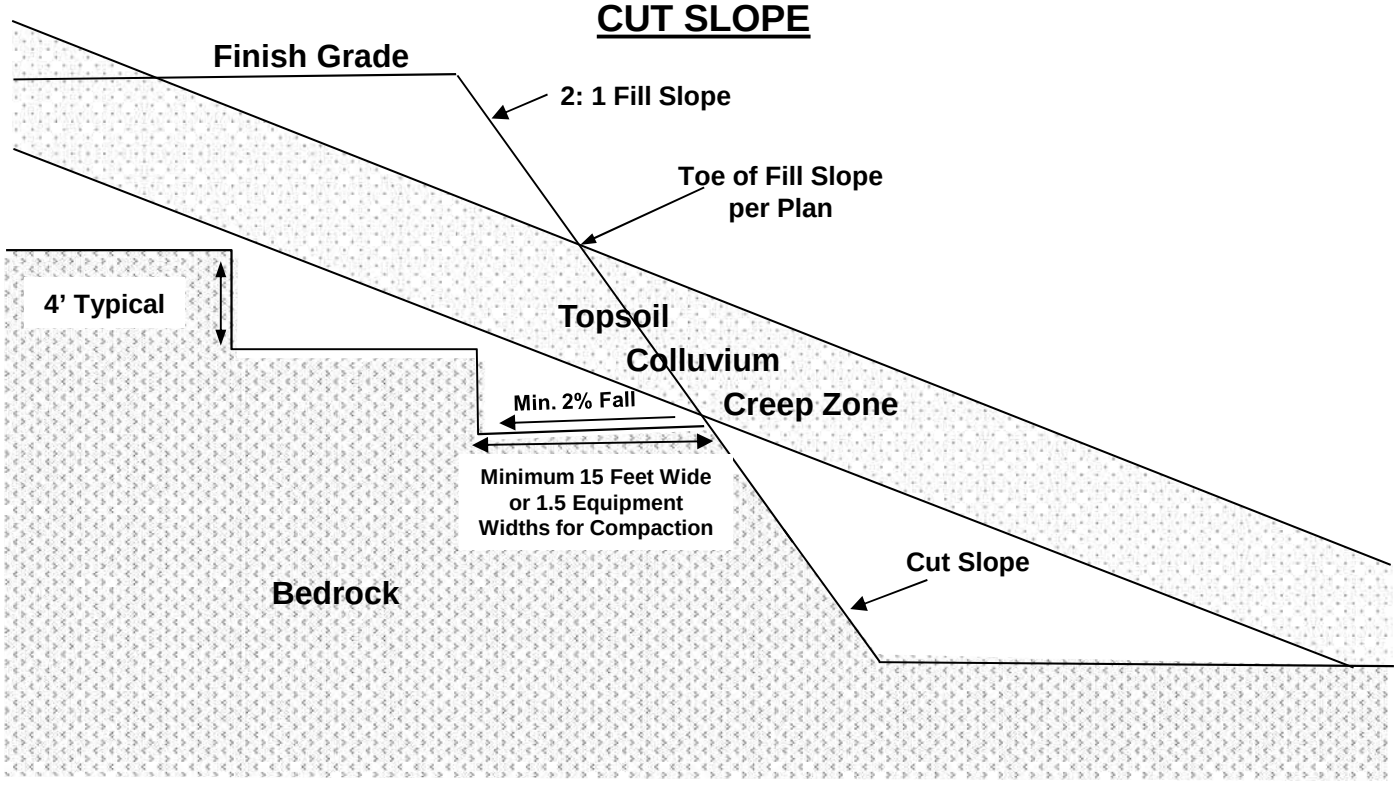
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TREATMENT ABOVE NATURAL SLOPES

STANDARD GRADING GUIDELINES

PLATE G-2

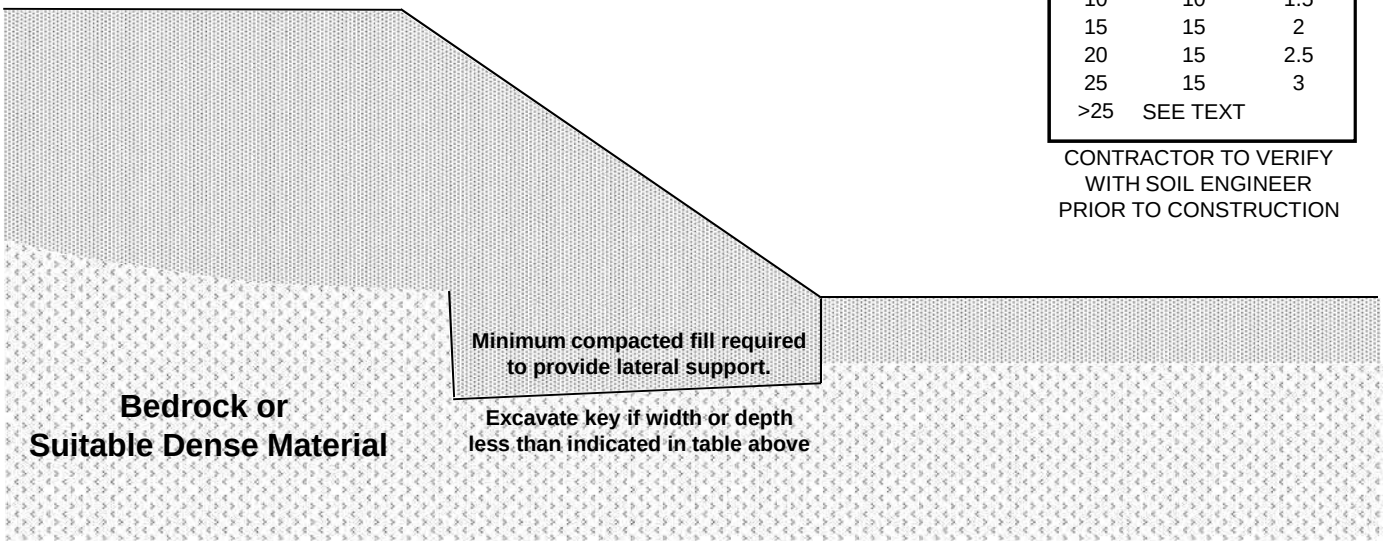
TYPICAL FILL SLOPE OVER CUT SLOPE



TYPICAL FILL SLOPE

SLOPE HEIGHT	MIN. KEY WIDTH	MIN. KEY DEPTH
5	7	1
10	10	1.5
15	15	2
20	15	2.5
25	15	3
>25	SEE TEXT	

CONTRACTOR TO VERIFY WITH SOIL ENGINEER PRIOR TO CONSTRUCTION



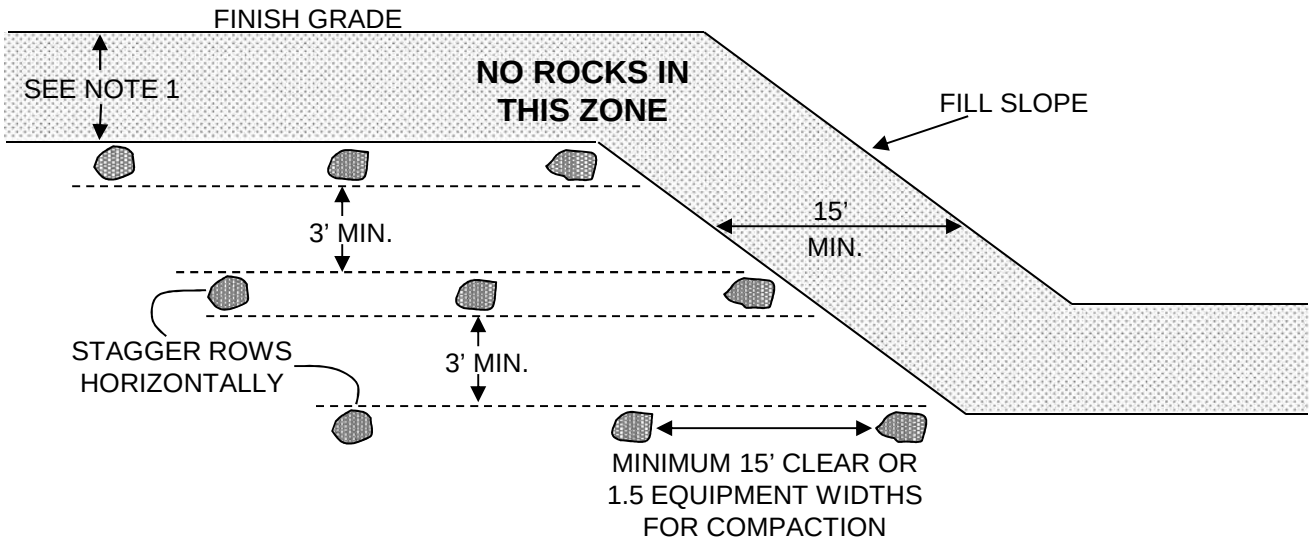
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COMMON FILL SLOPE KEYS

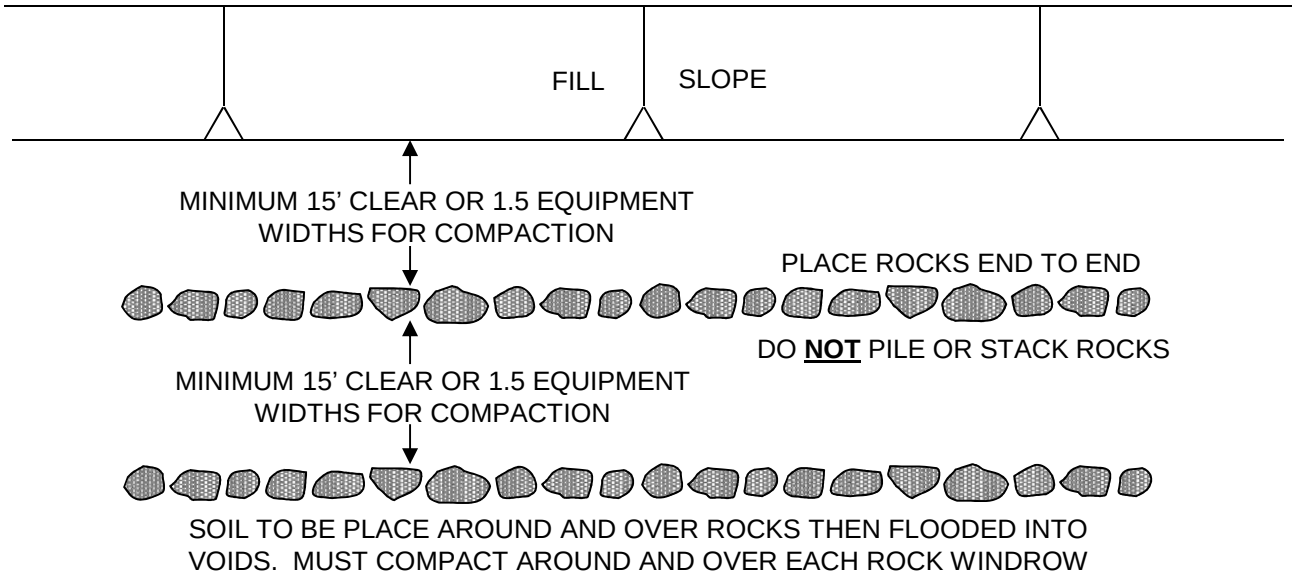
STANDARD GRADING GUIDELINES

PLATE G-3

CROSS SECTIONAL VIEW



PLAN VIEW



NOTES:

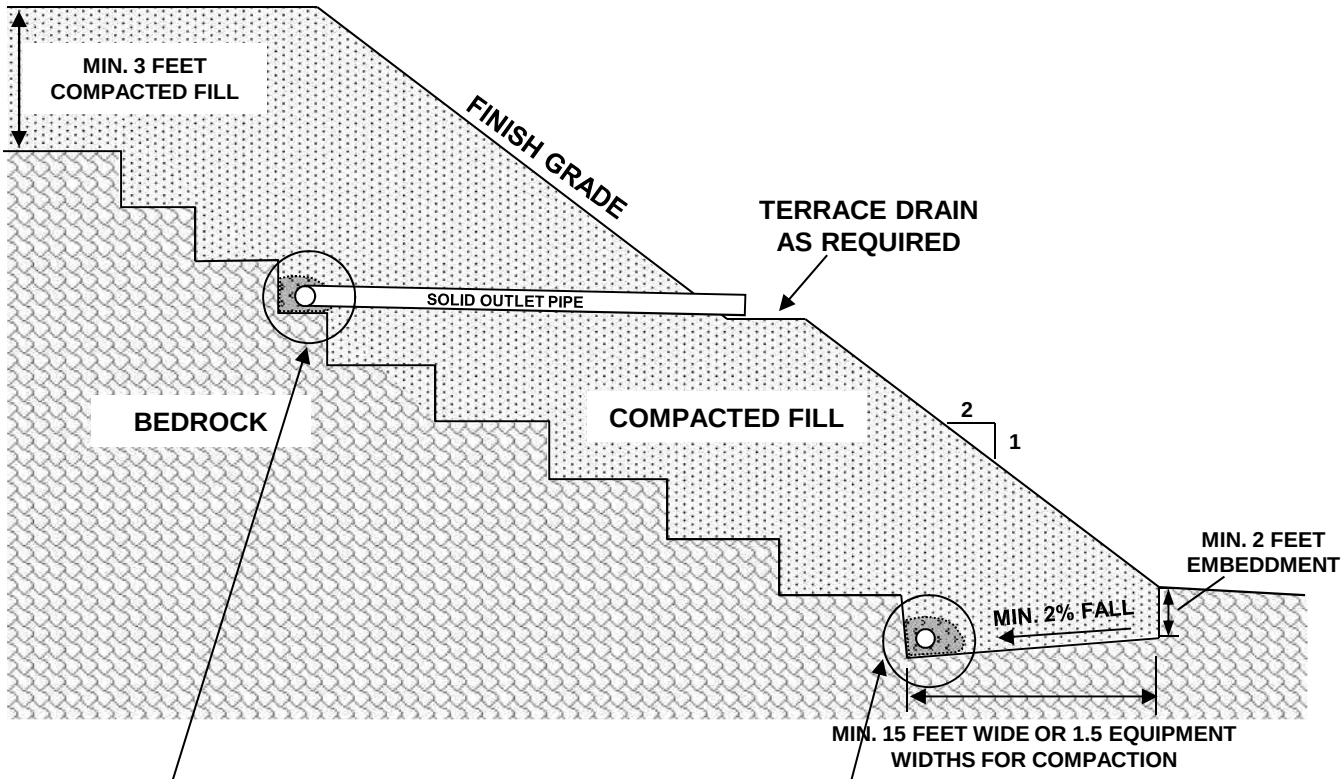
1) SOIL FILL OVER WINDROW SHOULE BE 7 FEET OR PER JURISDUICTIONAL STANDARDS AND SUFFICIENT FOR FUTURE EXCAVATIONS TO AVOID ROCKS
2) MAXIMUM ROCK SIZE IN WINDROWS IS 4 FEET MINIMUM DIAMETER
3) SOIL AROUND WINDROWS TO BE SANDY MATERIAL SUBJECT TO SOIL ENGINEER ACCEPTANCE
4) SPACING AND CLEARANCES MUST BE SUFFICIENT TO ALLOW FOR PROPER COMPACTION
5) INDIVDUAL LARGE ROCKS MAY BE BURIED IN PITS.

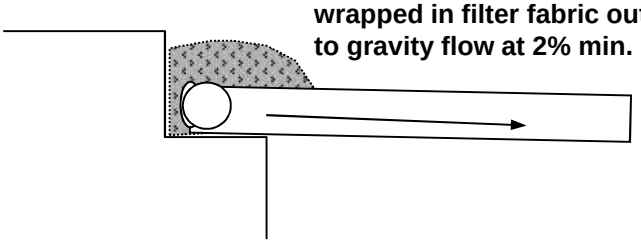
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ROCK BURIAL DETAILS

STANDARD GRADING GUIDELINES

PLATE G-4





4" or 6" Perforated Pipe in 6 cubic feet per lineal foot clean gravel wrapped in filter fabric outlet pipe to gravity flow at 2% min.



6" Perforated Pipe in 6 cubic feet per lineal foot clean gravel wrapped in filter fabric outlet pipe to gravity flow

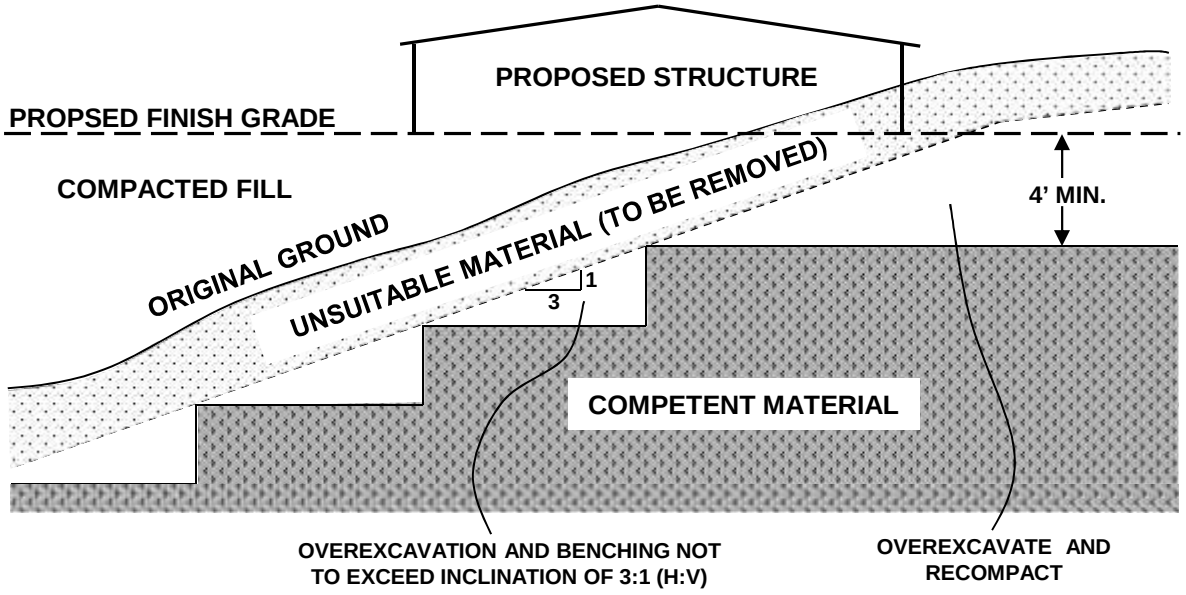
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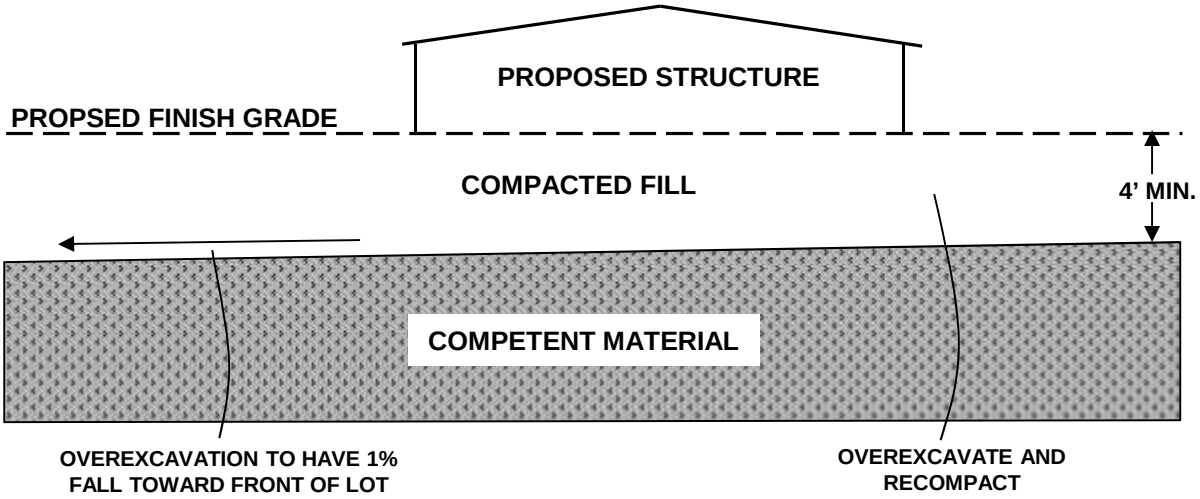
Typical Buttress and Stabilization Fill

PLATE G-5

TRANSITION LOT



UNDERCUT LOT



Notes:
1. Removed/overexcavated soils should be recompacted in accordance with recommendations included in the text of the report.
2. Location of cut/fill transition should verified in the field during site grading.