County of San Diego

Stormwater Quality Management Plan (SWQMP)

For Priority Development Projects (PDPs)

Use for all PDPs (see Storm Water Intake Form, Part 4)

Priority Development Project

Project Information		Development type ☐ New development ☒ Redevelopment
Project Name	Bradley Avenue Convalescent Home	
Project Address	675 East Bradley Avenue, El Cajon, CA 92021	
Assessor's Parcel # (APN)	387-142-36-00	
Permit # / Record ID	PDS2021-MUP-85-053W2	
Project category (select one)	☒ Commercial	☐ Minor subdivision*
	☐ Industrial	☐ Major subdivision*
	☐ Single family residential lot	☐ Multi-family residential*
	*If residential, is a Homeowners Association (HOA) proposed? ☐ Yes ☐ No	

Project Applicant / Project Proponent		
Name	Mr. Thomas Jurbala	
Address	6 Hutton Centre Drive, Suite 400, Santa Ana, CA 92707	
Phone	(714) 241-5600	**Email:** thomasjurbala@lifegen.com

SWQMP Preparer		
Name	Kyle R. Koivuniemi, PE	
Company (if applicable)	Kimley-Horn and Associates, Incs.	
Address	1100 Town and Country Road, Suite 700, Orange, CA 92868	
Phone	(714) 939-1030	**Email:** kyle.koivuniemi@kimley-horn.com
PE Number (if applicable)	58449	

Preparer's Certification

I understand that the County of San Diego has adopted minimum requirements for managing urban runoff, including storm water, from land development activities, as described in the County of San Diego BMP Design Manual. The BMP Design Manual is a design manual for compliance with local County of San Diego Watershed Protection Ordinance (Sections 67.801 et seq.) and regional MS4 Permit (California Regional Water Quality Control Board San Diego Region Order No. R9-2013-0001, as amended by Order No. R9-2015-0001 and Order No. R9-2015-0100) requirements for storm water management.

This SWQMP is intended to comply with applicable requirements of the BMP Design Manual. I certify that it has been completed to the best of my ability and accurately reflects the project being proposed and the applicable BMPs proposed to minimize the potentially negative impacts of this project's land development activities on water quality. I understand and acknowledge that the plan check review of this SWQMP by County staff is confined to a review and does not relieve me as the person in charge of overseeing the selection and design of storm water BMPs for this project, of my responsibilities for project design.

Signature	**Date** April 2, 2024

COUNTY ACCEPTED

SWQMP Approved By: *Approval Date*:

**** NOTE* Approval does not constitute compliance with regulatory requirements.***

Scope of SWQMP Submittal (Required)

Select the option that describes the scope of this SWQMP Submittal. Document your selection as indicated.

SWQMP Scope	Required Documentation
☒ ***a. SWQMP addresses the entire project***	No additional documentation.
☐ ***b. SWQMP implements requirements of an earlier master SWQMP submittal***	Include a copy of the previous submittal as **Attachment 4**.
☐ ***c. First of multiple SWQMP submittals***	Identify below the elements addressed in this submittal and in future submittals.

(1) Elements addressed in current submittal (streets, common areas, first project phase, etc.):

(2) Elements to be addressed in future submittal(s) (individual lots, future project phases, etc.):

Submittal Record: List the dates of SWQMP and plan submittals and updates. Briefly describe key changes from previous versions. If responding to plan check comments, note this in the entry and attach the responses as applicable.

No.	Date	Summary of Changes
Preliminary Design / Planning / CEQA		
1	5/25/2021	Initial Submittal
2	10/25/2021	Revised SWQMP report per county comments
3	11/2/2022	Revised SWQMP report per county comments and site change to single dwy entrance
4	7/26/2023	Revised SWQMP report per site updates
5	4/2/2024	Revised SWQMP per county comments
Final Design		
1	Date	Initial Submittal
2	Date	Summary of Change
3	Date	Summary of Change
No.	Date	Summary of Change
Plan Changes		
1	Date	Initial Submittal
2	Date	Summary of Change
3	Date	Summary of Change
No.	Date	Summary of Change

General Directions

Note: These directions may be omitted from the print version of the SWQMP submittal.

① Scope of SWQMP Submittal and Submittal Record (inside front cover)

Use the ***Submittal Scope*** table to document the scope of activities covered under this SWQMP Form. Select one of the three options presented.

- ***SWQMP addresses the entire project***. If this SWQMP form addresses the entire project from start to finish, additional documentation of the project scope is not required.
- ***SWQMP implements requirements of an earlier master SWQMP submittal***. If this SWQMP Form implements requirements identified in an earlier master SWQMP Form, documentation of those earlier requirements must be provided. Include a copy of the previous submittal as **Attachment 4**.
- ***First of multiple SWQMP submittals***. If this is the first of multiple SWQMP submittals, use the spaces provided under Part c to identify and briefly describe which project elements are addressed in this submittal and which ones will be addressed in future submittals. For example, this PDP addresses only streets and roads, but individual lots will be documented in future submittals.

Use the ***Submittal Record*** table to list the dates of any updates to the SWQMP or construction plans. Briefly describe key changes from previous versions. If responding to plan check comments, note this in the entry and attach the responses as applicable.

② PDP SWQMP Submittal Checklist

The checklist on Page 1 summarizes the tables and attachments to be included with this PDP SWQMP submittal. It should be filled out after completing the remainder of the form. Tables and attachments with boxes already checked (☒) are required for all projects. All tables are required. The applicability of attachments not already checked will be identified during the completion of this form.

③ Attachment 1: Stormwater Intake Form

Submit a copy of your completed ***Storm Water Intake Form*** as **Attachment 1**.

④ Tables 1, 2, and 3: Baseline Site Design and Source Control BMPs

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

Table 2 Completion: Table 2 is not required for Small Residential Projects. Applicants <u>should check the box at the top of the table to confirm it does not apply.</u>

> *Small Residential Projects* are those requiring *either:* a Building Permit, Minor Residential Grading Permit, or Site Plan Permit for a single family home; *or* a Tentative Parcel Map Permit for up to 4 single family homes and a remainder parcel.

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

BMPs must be implemented for **Table 1** and **2** features ***where feasible***. Leaving the box for a BMP unchecked means it will not be implemented (either partially or fully) either because it is inapplicable or infeasible. Explanations must be provided in **Table 3**. Tables 1 and 2 both provide specific instructions on when explanations are required.

⑤ Attachment 5: Existing Site and Drainage Description

Complete **Attachment 5** to provide a description of (1) the existing pre-development condition of the site, and (2) existing and proposed drainage conditions for the site. If required, include a copy of the site Drainage Study with Attachment 5.

⑥ Structural Performance Standards

Determine which Structural Performance Standards apply to the PDP, where they apply, and which compliance strategies you will use to satisfy them. Record your selections in **Table 4** as follows.

Table 4, Part A.1, Selection of Standards: First select the standards that apply to the project.

- *Pollutant control plus hydromodification* — Select if the PDP is not exempt from hydromodification management requirements. It must satisfy both the Pollutant Control Performance Standard (BMPDM Section 2.2) and the Hydromodification Management Performance Standard (BMPDM Section 2.3).
- *Pollutant control only* — Select if the PDP is exempt from hydromodification management requirements per BMPDM Section 6.1. Document the exemption in **Attachment 9**.

Table 4, Part A.2, Application of Standards: Next indicate where on the site the standards apply.

- If this is a **New Development Project**, the standards apply to all impervious surfaces on the site.
- If this is a **Redevelopment Project**, their applicability will depend on the ratio of created or replaced impervious areas to existing impervious areas (see BMPDM Section 1.7). Complete the calculations in the table to determine your obligation. The **percent (%) impervious created or replaced (c)** is determined by dividing the **impervious area created or replaced (b)** by the **existing impervious area (a)** and multiplying the result by 100.
  - **If c is 50% or more**: The standards apply to all impervious surfaces on the site (a + b).
  - **If c is less than 50%**: The standards apply only to created or replaced impervious surfaces (b only).

Table 4, Part B.1: Summary of Required Attachments (1 through 5)

Use this part of the table to summarize which of Attachments 1 through 5 will be included with the SWQMP submittal. If you are completing an **electronic version** of this form, your selections will be automatically recorded based on your previous input. If you are completing a **hard copy** of this form, you must manually select Attachments 3 and 4 as applicable (see pages 4 and 6). Note that Attachments 1,2, and 5 are required for all projects.

Table 4, Part B.2: Selection of Compliance Strategies

Complete Part B.2 to document which compliance options will be used to satisfy the applicable standards for the site. Before doing so, you must determine which option will be used for each DMA. The following four potential design options are presented in detail in BMPDM Chapters 5 and 6.

1. **Self-mitigating DMAs** (BMPDM Section 5.2.1)
2. **De Minimis DMAs** (BMPDM Section 5.2.2)
3. **Self-retaining DMAs** (BMPDM Section 5.2.3)
4. **Structural BMPs**
   - Pollutant Control BMPs (BMPDM Sections 5.4)
   - Hydromodification BMPs (BMPDM Chapter 6)
   - Alternative Compliance Project (BMPDM Section 1.8)

Only one compliance option may be used per individual DMA. Regardless of which option is selected for any DMA, it must fully satisfy the applicable standard(s) determined in Part A.1.

On the left side of Part B, check the applicable boxes for each compliance option to be used.

⑦ Summary of Additional Required Attachments (6 through 12)

You must complete and submit each attachment identified for the compliance options selected. Applicable attachments are listed to the right of each compliance option. If you are completing an **electronic version** of this form, the required attachments for each design option will automatically be selected when you choose the compliance option. As noted above, these selections will also be recorded on the PDP SWQMP Submittal Checklist (Page 1). If you are completing a **hard copy** of this form, you will need to manually check the boxes for each applicable attachment on both pages.

Note that Attachment 9 (Critical Coarse Sediment Yield Areas) is required for all PDPs. If the PDP is exempt from hydromodification requirements, the exemption must be documented in Attachment 9.

⑧ Table 5: Critical Coarse Sediment Yield Area Requirements

Complete **Table 5** to select a compliance pathway for addressing Critical Coarse Sediment Yield Area (CCSYA) requirements for the PDP. See BMPDM Appendix H for additional description of requirements and options. Document Table 5 selections, including hydromodification management exemptions, in **Attachment 9**.

⑨ Tables 6 and 7: Temporary Construction Phase BMPs

Complete **Table 6** to document the minimum construction BMPs to be implemented for the project. Each BMP must be implemented ***where applicable and feasible***. At least one BMP must be selected for each construction activity listed in the table (except Erosion Control for Disturbed Slopes, which requires one BMP per season).

If applicable, use **Table 7** to describe why BMPs not selected in Table 6 are either infeasible or are only partially feasible. Justifications must be provided for all construction activity types for which NO BMPs were selected. If requested by County staff, also justify why specific individual BMPs were not selected.

⑩ Attachment 2: DMA Exhibits and Construction Plans

Exhibits and construction plan sets incorporating all applicable site features, activities, and BMPs identified in **Tables 1, 2, and 6** must be submitted as **Attachment 2 (DMA Exhibits and Construction Plan Sheets)**. See the Attachment 2 cover sheet for additional instructions.

PDP SWQMP Submittal Checklist

SWQMP Tables: All of the tables below must be completed.

SWQMP Attachments[1]: Use the checklist below to identify which attachments will be included with this submittal. Attachments with boxes already checked (☒) are required for all projects. The applicability of other attachments will be determined upon completing this form.

☒ Attachment 1: Storm Water Intake Form

☒ Attachment 2: DMA Exhibits and Construction Plan Sheets

☐ Attachment 3: Reserved for Future Use

☐ Attachment 4: Previous SWQMP Submittals

☒ Attachment 5: Existing Site and Drainage Description

☐ Attachment 6: Documentation of DMAs without Structural BMPs

☒ Attachment 7: Documentation of DMAs with Structural Pollutant Control BMPs

☒ Attachment 8: Documentation of DMAs with Structural Hydromodification Management BMPs

☒ Attachment 9: Management of Critical Coarse Sediment Yield Areas

☒ Attachment 10: BMP Installation Verification Form

☒ Attachment 11: BMP Maintenance Agreements and Plans

☐ Attachment 12: Documentation of Alternative Compliance Projects (ACPs)

After completing the remainder of this form, check the applicable SWQMP Attachment boxes to summarize your selections.

[1] All SWQMP Attachments are available at www.sandiego.gov/stormwater under the Development Resources tab, Submittal Templates.

Table 1 – Baseline BMPs for Existing and Proposed Site Features

A. BMPs for Existing Natural Site Features (See Fact Sheet BL-1)

1. Check the boxes below for each existing feature on the site.

2. Select the BMPs to be implemented for each identified feature. Explain why any BMP not selected is infeasible in Table 3.

	Conserve natural features (SD-G)	Provide buffers around waterbodies (SD-H)
☐ Natural waterbodies	☐	☐
☐ Natural storage reservoirs & drainage corridors	☐	---
☐ Natural areas, soils, & vegetation (incl. trees)	☐	---

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

1. Check the boxes below for each proposed feature.

*2. Select the BMPs to be implemented for each proposed feature. If neither BMP **SD-B** nor **SD-I** is selected for a feature, explain why both BMPs are infeasible in Table 3.*

	a. Direct runoff to pervious areas (SD-B)	b. Construct surfaces from permeable materials (SD-I)	c. Minimize the size of impervious areas
☐ Streets and roads	☐	☐	☐ *Check this box to confirm that all impervious areas on the site will be minimized where feasible.*
☒ Sidewalks & walkways	☒	☐	
☒ Parking areas & lots	☒	☐	*If this box is not checked, identify the surfaces that cannot be minimized in Table 3, and explain why it is infeasible to do so.*
☒ Driveways	☒	☐	
☒ Patios, decks, & courtyards	☒	☐	
☐ Hardcourt recreation areas	☐	☐	
☐ Other:	☐	☐	

C. ☒ **BMPs for Rooftop Areas:** *Check this box if rooftop areas are proposed and select at least one BMP below.* **(See Fact Sheet BL-3)**

If no BMPs are selected, explain why they are infeasible in Table 3.

1. Direct runoff to pervious areas (SD-B)	2. Install green roofs (SD-C)	3. Install rain barrels (SD-E)
☒	☐	☐

D. ☒ **BMPs for Landscaped Areas:** *Check this box if landscaping is proposed and select at least one BMP below.* **(See Fact Sheet BL-4)**

If no BMPs are selected, explain why they are infeasible in Table 3.

1. Sustainable Landscaping (SD-K)
☒

Note: All features and BMPs must be shown on applicable construction plans. See applicable Fact Sheets in Appendix C of the BMP Design Manual for additional information.

Note: Use Table 3 to explain BMP infeasibility or inapplicability, or to describe features or BMPs not listed in this table. Additional explanation may be required by the County.

Table 2 – Baseline BMPs for Pollutant-generating Sources

☐ If this is a **Small Residential Project**, check this box and skip the rest of this table.

A. Management of Stormwater Discharges

1. Identify all proposed outdoor work areas below (☐ *Check here if none are proposed*)	**2. Which BMPs will be used to prevent materials from contacting rainfall or runoff?** **(See Fact Sheet BL-5)** *(Select all feasible BMPs for each work area[2])*			**3. Where will runoff from the work area be routed?** **(See Fact Sheet BL-6)** *(Select one or more option for each work area)*			
	Overhead covering (rooftops, etc.) (SC-A)	**Separation of flows from adjacent areas (berms, etc.) (SC-B)**	**Wind protection (screens, etc.) (SC-C)**	**Sanitary sewer[3] (SC-D)**	**Containment system (SC-E)**	**Stormwater S-BMP or SSD-BMP[4]**	**Other[5]**
☒ Trash & Refuse Storage	☒	☒	☒	☐	☐	☒	☐
☒ Materials & Equipment Storage	☒	☒	☒	☐	☐	☒	☐
☒ Loading & Unloading	☒	☒	---	☐	☐	☒	☐
☐ Fueling	☐	☐	---	☐	☐	☐	☐
☐ Maintenance & Repair	☐	☐	---	☐	☐	☐	☐
☐ Vehicle & Equipment Cleaning	☐	☐	---	☐	☐	☐	☐
☐ Other:	☐	☐	---	☐	☐	☐	☐

B. Prevention of Non-stormwater Discharges **(See Fact Sheet BL-7)**

Select one option for each feature below:

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

Note: All outdoor features and BMPs in this table must be shown on applicable construction plans. See applicable Fact Sheets in Appendix C of the BMP Design Manual for additional information.

Note: Use Table 3 to explain BMP infeasibility or inapplicability, or to describe features or BMPs not listed in this table. Additional explanation may be required by the County.

[2] Each BMP is required where feasible. If none are selected for any feature, explain why they are infeasible in Table 3.

[3] Separate wastewater agency approvals may be required.

[4] Structural Treatment Control BMPs (S-BMPs) and Significant Site Design BMPs (SSD-BMPs) may not receive discharges from work areas that concentrate pollutants in a manner that will impair their functioning. Discharges from the proposed work area must also be included in DCV calculations for the applicable BMP.

[5] Describe other proposed options for managing stormwater discharges in Table 3.

Table 3 – Explanations and Justifications for Table 1 and 2 Baseline BMPs

☒ **Check here if no explanations or justifications for Table 1 or 2 BMPs are required.**

- **Required Justifications**: Provide explanations of BMP inapplicability and/or infeasibility as indicated per Tables 1 and 2.
- **If Requested**: Justify why specific BMPs will not be implemented or will only be partially implemented.
- **Additional Explanation**: Describe any proposed features and/or BMPs not listed in Tables 1 or 2.

BMP-Feature Combination		**Explanation**
Feature	Feature	Explanation
BMP	BMP	
Feature	Feature	Explanation
BMP	BMP	
Feature	Feature	Explanation
BMP	BMP	
Feature	Feature	Explanation
BMP	BMP	
Feature	Feature	Explanation
BMP	BMP	
Feature	Feature	Explanation
BMP	BMP	
Feature	Feature	Explanation
BMP	BMP	

Table 4: DMA Structural Compliance Strategies and Documentation

Part A – Selection and Application Structural Performance Standards

1. Selection of Standards (select one; see BMPDM Section 6.1)

☒ a. Pollutant control + hydromodification ☐ b. Pollutant control only (project is exempt from hydromodification requirements)

2. Application of Structural Performance Standards (select one; see BMPDM Section 1.7)

☐ **New Development Projects:** Standards apply to all impervious surfaces.

☒ **Redevelopment Projects:** Complete the calculations below. Select the applicable scenario based on the results.

a. Existing impervious area (ft²)	b. Impervious area created / replaced (ft²)	c. % Impervious created / replaced [(b/a)*100]
31,636 sf (0.73 ac)	82,244 sf (2.12 ac)	260%

☒ *Scenario 1: c is 50% or more*: Performance standards apply to all impervious surfaces (a + b).

☐ *Scenario 2: c is less than 50%*: Performance standards apply only to created or replaced impervious surfaces (b only).

Part B – Compliance Strategies and Required Attachments

1.*Complete and submit each of the applicable attachments on the right.*

Att. 1	Att. 2	Att. 3	Att. 4	Att. 5
Storm Water Intake Form ☒	DMA Exhibits and Construction Plan Sheets ☒	N/A ☒	Previous SWQMP Submittals (see inside cover) ☐	Existing Site and Drainage Description ☒

2. *Indicate each compliance strategy below that will be used for one or more DMAs on the site.*

	Att. 6 DMAs without Structural BMPs	Att. 7 DMAs w/ Structural Pollutant Control BMPs	Att. 8 DMAs w/ Structural Hydromod. BMPs	Att. 9 Critical Coarse Sediment Yield Areas	Att. 10 BMP Installation Verification Form	Att. 11 Maintenance Agreements/ Plans	Att. 12 Alternative Compliance Projects
☒Self-mitigating DMAs (BMPDM Section 5.2.1)	☒			☒			
☐De Minimis DMAs (BMPDM Section 5.2.2)	☐			☐			
☐Self-retaining DMAs (BMPDM Section 5.2.3)	☐			☐	☐		
Structural BMPs (select all that apply)							
☒Pollutant Control BMPs (BMPDM Section 5.4)		☒		☒	☒	☒	
☒Hydromodification Control BMPs (BMPDM Chapter 6)			☒	☒	☒	☒	
☐Alternative Compliance Project (BMPDM Section 1.8)				☐	☐	☐	☐

☒ **Please check this box after you complete this list. Corresponding attachments will be automatically selected on the right.**

- *Attachments 1, 2, and 5 are required for all projects.*

Table 5: Critical Coarse Sediment Yield Area (CCSYA) Requirements

- Identify one applicable compliance pathway for the PDP below.
- Document your selection in **Attachment 9**.

A. Hydromodification Management Exemption (BMPDM Sections 1.6 and 6.1)

☐ **PDP is Exempt from Hydromodification Management Requirements**

Select if hydromodification management exemption was selected in Table 4 Part A.1.

B. Watershed Management Area (WMAA) Mapping (BMPDM Appendix H.1.1.2)

☒ **WMAA mapping demonstrates the following:**

a. <5% of potential onsite CCYSAs will be impacted (built on or obstructed)

b. All potential upstream offsite CCYSAs will be bypassed

C. Resource Protection Ordinance (RPO) Methods (BMPDM Appendix H.1.1.1)

☐ **RPO Scenario 1: PDP is subject to and in compliance with RPO requirements**

a. Project requires one or more discretionary permits (RPO applicability is confirmed during discretionary review)

b. Onsite AND upstream offsite CCSYAs will be avoided and/or bypassed

☐ **RPO Scenario 2: PDP is entirely exempt/not subject to RPO requirements**[6]

a. Project does not require discretionary permits

b. Project will bypass all upstream offsite CCSYAs (no requirements for onsite CCSYAs)

D. No Net Impact Analysis (BMPDM Appendix H.4)

☐ **Project demonstrates no net impact to receiving waters**

[6] Does not include PDPs utilizing exemption(s) via RPO Section 86.604(e)(2)(cc) or 86.604(e)(3).

Table 6 –Minimum Construction Stormwater BMPs

Minimum Required BMPs by Activity Type Select all applicable activities and at least one BMP for each.	References Caltrans[7]	 County of San Diego	
☒ **Erosion Control for Disturbed Slopes** (choose at least 1 per season)			
☐ Vegetation Stabilization Planting[8] (Summer)	SS-2, SS-4		
☒ Hydraulic Stabilization Hydroseeding (Summer)	SS-4		
☐ Bonded Fiber Matrix or Stabilized Fiber Matrix[9] (Winter)	SS-3		
☒ Physical Stabilization Erosion Control Blanket (Winter)	SS-7		
☒ **Erosion control for disturbed flat areas (slope < 5%)**			
☒ County Standard Lot Perimeter Protection Detail	SC-2	PDS 659[10]	
☐ Use of Item A erosion control measures on flat areas	SS-3, SS-4, SS-7		
☐ County Standard Desilting Basin (must treat all site runoff)	SC-2	PDS 660[11]	
☐ Mulch, straw, wood chips, soil application	SS-6, SS-8		
☒ **Energy dissipation (required to control velocity for concentrated runoff or dewatering discharge)**			
☒ Energy Dissipater Outlet Protection	SS-10	RSD D-40[12]	
☒ **Sediment control for all disturbed areas**			
☒ Silt Fence	SC-1		
☐ Fiber Rolls (Straw Wattles)	SC-5		
☒ Gravel & Sand Bags	SC-6, SC-8		
☐ Dewatering Filtration	NS-2		
☒ Storm Drain Inlet Protection	SC-10		
☒ Engineered Desilting Basin (sized for 10-year flow)	SC-2		
☒ **Preventing offsite tracking of sediment**			
☒ Stabilized Construction Entrance	TC-1		
☒ Construction Road Stabilization	TC-2		
☒ Entrance/Exit Tire Wash	TC-3		
☒ Entrance/Exit Inspection & Cleaning Facility	TC-1		
☒ Street Sweeping and Vacuuming	SC-7		
☒ **Materials Management**			
☒ Material Delivery & Storage	WM-1		
☒ Spill Prevention and Control	WM-4		
☒ **Waste Management[13]**			
☒ Waste Management Concrete Waste Management	WM-8		
☒ Solid Waste Management	WM-5		
☒ Sanitary Waste Management	WM-9		
☒ Hazardous Waste Management	WM-6		

[7] See Caltrans 2017 Construction Site Best Management Practices (BMP) Manual available at: https://dot.ca.gov/programs/construction/storm-water-and-water-pollution-control/manuals-and-handbooks
[8] Planting or Hydroseeding may be installed between May 1st and August 15th. Slope irrigation must be in place and operable for slopes >3 feet. Vegetation must be watered and established prior to October 1st. A contingency physical BMP must be implemented by August 15th if vegetation is not established by that date. If landscaping is proposed, erosion control measures must also be used while landscaping is being established. Established vegetation must have a subsurface mat of intertwined mature roots with a uniform vegetative coverage of 70 percent of the natural vegetative coverage or more on all disturbed areas.
[9] All slopes over three feet must have established vegetative cover prior to final permit approval.
[10] County PDS 659. Standard Lot Perimeter Protection Design System (Bldg. Division)
[11] County PDS 660. County Standard Desilting Basin for Disturbed Areas of 1 Acre or Less Bldg. Division
[12] Regional Standard Drawing D-40 – Rip Rap Energy Dissipater (also acceptable for velocity reduction)
[13] Applicants are responsible to apply appropriate BMPs for specific wastes (e.g., BMP WM-8 for concrete).

Table 7 – Explanations and Justifications for Construction Phase BMPs

☒ **Check here if no explanations or justifications for Table 6 BMPs are required.**		
Justifications for Table 6 Temporary Construction Phase BMPs • **Required Justifications**: Justify all construction activity types for which NO BMPs were selected. • **If Requested**: Justify why specific individual BMPs were not selected. • **Additional Explanation**: Describe any proposed features and/or BMPs not listed in Table 6.		
Activity Type / BMP		**Explanation**
Activity Type	Activity Type	Explanation
BMP	BMP	
Activity Type	Activity Type	Explanation
BMP	BMP	
Activity Type	Activity Type	Explanation
BMP	BMP	
Activity Type	Activity Type	Explanation
BMP	BMP	
Activity Type	Activity Type	Explanation
BMP	BMP	
Activity Type	Activity Type	Explanation
BMP	BMP	
Activity Type	Activity Type	Explanation
BMP	BMP	

County of San Diego
Stormwater Quality Management Plan (SWQMP)
Attachment 1: Storm Water Intake Form for All Permit Applications

This form establishes Stormwater Quality Management Plan (SWQMP) requirements for Development Projects per Sections 67.809 and 67.811 of the County of San Diego Watershed Protection Ordinance (WPO). See ***Storm Water Intake Form Instructions*** for additional guidance and explanation of terms.

Part 1. Project Information	
Project Name:	Bradley Avenue Convalescent Home
Record ID (Permit) No(s):	PDS2021-MUP-85-053W2
Assessor's Parcel No(s):	387-142-36-00
Street Address (or Intersection):	675 E Bradley Avenue
City, State, Zip:	El Cajon, CA, 92021

Part 2. Applicant / Project Proponent Information	
Name:	Mr. Thomas Jurbala
Company:	Generations Healthcare
Street Address:	6 Hutton Centre Drive, Suite 400
City, State, Zip:	Santa Ana, CA, 92707
Phone Number	(714) 241-5600
Email:	thomasjurbala@lifegen.com

Part 3. Required Information for All Development Projects

Ⓐ	**1. Existing (pre-development) impervious surfaces (ft²)**	**2. Created or replaced impervious surfaces (ft²)**	**3. Total disturbed area (acres or ft²)**
	31,636 sf (0.73 ac)	82,244 sf (2.12 ac)	144,890 sf (3.33 ac)

Ⓑ		
	☒ Check here and provide a WDID# if this project is subject to the California Construction General Permit (Order No. 2009-0009-DWQ)[1]	**WDID # (if issued)**
		Not Issued Yet

For County Use Only	Reviewed By:	Review Date:
☐ Standard SWQMP	☐ PDP SWQMP	☐ Green Streets PDP Exemption SWQMP

[1] Available at: https://www.waterboards.ca.gov/water_issues/programs/stormwater/construction.html

Part 4. Priority Classification & SWQMP Form Selection

Ⓐ *If your project is the following … (select one)*	Ⓑ *You must complete …*
☐ **Standard Project** ☐ a. Project is East of the Pacific/Salton Sea Divide ☐ b. None of the PDP criteria below applies	➔ **Standard *SWQMP Form***
☒ **Priority Development Project (PDP)** ☐ 1. Project is part of an existing PDP**,** OR ☒ 2. Project does any of the following: ☒ a. Creates or replaces a total of 10,000 ft² or more of impervious surface ☐ b. Creates or replaces a combined total of 5,000 ft² or more of impervious surface within one or more of the following uses: (1) parking lots; (2) streets, roads, highways, freeways, and/or driveways; (3) restaurants; and (4) hillsides ☐ c. Creates or replaces a combined total of 5,000 ft² or more of impervious surface within one or more of the following uses: (1) automotive repair shops; and (2) retail gasoline outlets ☐ d. Discharges directly to an Environmentally Sensitive Area (ESA) AND creates or replaces 2,500 ft² or more of impervious surface ☒ e. Disturbs one or more acres of land (43,560 ft²) and is expected to generate pollutants post-construction ☒ f. Is a redevelopment project that creates or replaces 5,000 ft² or more of impervious surface on a site already having at least 10,000 ft² of impervious surface	➔ **PDP *SWQMP Form***
☐ **Green Streets PDP Exemption[2]**	➔ **Green *Streets PDP Exemption SWQMP Form***

Part 5. Applicant Signature

I have reviewed the information in this form, and it is true and correct to the best of my knowledge.

Applicant / Project Proponent Signature: KYLE KOIVUNTEMI PROFESSIONAL ENGINEER No. C 93243 CIVIL STATE OF CALIFORNIA

Date: 04/05/2024

- ***Upon completion*** *submit this form to the County.*
- ***If requested****, attach supporting documentation to justify selections made or exemptions claimed.*
- ***If this is a PDP that is part of a larger existing PDP****, you will be required to attach a copy of the existing SWQMP to the newer SWQMP submittal.*

[2] ***Green Streets PDP Exemption Projects*** are those claiming exemption from PDP classification per WPO Section 67.811(b)(2) because they consist exclusively of *either* 1) development of new sidewalks, bike lanes, and/or trails; *or* 2) improvements to existing roads, sidewalks, bike lanes, and/or trails.

2.0 General Requirements

- Attachment 2 consolidates exhibits and plans required for the entire project.
- Complete the table below to indicate which sub-attachments are included with the submittal. Sub-attachments that are not applicable can be excluded from the submittal.
- Unless otherwise stated, features and BMPs identified and described in each corresponding Attachment (6 through 9) must be shown on applicable DMA Exhibits and construction plans submitted for the project.

Sub-attachments	Requirement
☒ **2.1: DMA Exhibits**	All PDPs
☒ **2.2: Individual Structural BMP DMA Mapbook**	PDPs with structural BMPs
☒ **2.3: Construction Plan Sets**	All projects

2.1 DMA Exhibits

- DMA Exhibits must show all DMAs on the project site. Exhibits must include all applicable features identified in applicable SWQMP attachments.
- Exhibits may be prepared individually for the BMPs associated with each applicable SWQMP Attachment (6, 7, 8, and/or 9) or combined into one or more consolidated exhibits.
- Use this checklist to ensure required information is included on each exhibit (copy as needed).

DMA Exhibit ID #:	
A. Features required for all exhibits	
1. Existing Site Features	
☒ Underlying hydrologic soil group (A, B, C, D)	☒ Topography and impervious areas
☒ Approximate depth to groundwater	☒ Existing drainage network, directions, and offsite connections
☒ Natural hydrologic features	
2. Drainage Management Area (DMA) Information	
☒ Proposed drainage network, directions, and offsite connections	☒ DMA boundaries, ID numbers, areas, and type (structural BMP, de minimis, etc.)
3. Proposed Site Changes, Features, and BMPs	
☒ Proposed demolition and grading	☐ Construction BMPs[2]
☒ Group 1, 2, and 3 Features[1]	☒ Baseline source control BMPs
☐ Group 4 Features	☒ Baseline source control BMPs
B. Proposed Features and BMPs Specific to Individual SWQMP Attachments[3]	
☒ Attachment 6	☒ SSD-BMP impervious dispersion areas ☐ SSD-BMP tree wells
☒ Attachment 7	☒ Structural pollutant control BMPs
☒ Attachment 8	☒ Structural hydromodification management BMPs ☒ Point(s) of Compliance (POC) for hydromodification management ☒ Proposed drainage boundary and drainage area to each POC
☒ Attachment 9	☐ Onsite CCSYAs ☐ Bypass of onsite CCSYAs ☒ Bypass of upstream offsite CCSYAs

[1] Group 1-4 features and baseline BMPs from PDP SWQMP Tables 2 and 3.
[2] Minimum Construction Stormwater BMPs from PDP SWQMP Table 7.
[3] Identify the location, ID numbers, type, and size/detail of BMPs.

BRADLEY AVENUE

DMA AND BIOFILTRATION BASIN EXHIBIT

WATER QUALITY BASIN INSTALLATION NOTES:

1. 3 INCHES OF WELL-AGED, SHREDDED HARDWOOD MULCH.
2. AN UNDERDRAIN CLEANOUT WITH A MINIMUM 6-INCH DIAMETER AND LOCKABLE CAP IS PLACED EVERY 250 TO 300FEET AS REQUIRED BASED ON UNDERDRAIN LENGTH.
3. VEGETATION USED SHOULD BE SUITABLE FOR THE CLIMATE PER LANDSCAPE PLANS
4. FILTER COARSE IS A MINIMUM OF 6 INCHES PROVIDED IN TWO SEPARATE 3 INCH LAYERS. THE TOP LAYER SHALL BE MADE OF ASTM C33 CHOKER SAND AND THE BOTTOM LAYER BE OF ASTM NO. 8 AGGREGATE. MARKERS STAKES SHALL BE USED TO ENSURE UNIFORM LIFT THICKNESS.
5. AASHTO NO. 57 STONE OR CLASS 2 PERMEABLE PER CAL TRANS SPECIFICATION 68-1.025 IS RECOMMENDED FOR THE AGGREGATE STORAGE LAYER. WASHED, OPEN-GRADED CRUSHED ROCK MAY BE USED, HOWEVER, A 4 INCH MINIMUM WASHED PEA GRAVEL FILTER COURSE LAYER AT THE TOP OF THE CRUSHED ROCK IS REQUIRED.
6. IMPERMEABLE LINER SHALL BE INSTALLED WHEN THE BIOFILTRATION BASIN IS WITHIN 10 FEET OF RETAINING WALLS OR BUILDING FOUNDATIONS, OR AS RECOMMENDED BY THE SOILS ENGINEER, OR REQUIRED BY THESE PLANS. IMPERMEABLE LINER SHALL BE 30 MIL THICK (PER COUNTY OF SAN DIEGO GREEN STREETS DESIGN STANDARD DRAWING GS-3.00 AND COUNTY GREEN STREETS SUPPLEMENT TO CAL TRANS SPECIFICATIONS 20-11.08B) CONFIGURED TO ENTIRELY ENCOMPASS THE SIDES OF THE WATER QUALITY BASIN.
7. IMPERMEABLE LINER BE CONSTRUCTED IN COMPLIANCE WITH THE COUNTY OF SAN DIEGO GREEN STREETS SUPPLEMENT TO CAL TRANS SPECIFICATIONS 20-11.08B.
8. BIOFILTRATION SOIL MEDIA LAYER (BSM) SHALL CONSIST OF 60% TO 80% BY VOLUME SAND, UP TO 20% BY VOLUME TOPSOIL, AND UP 20% BY VOLUME COMPOST (PER COUNTY OF SAN DIEGO BMP DESIGN MANUAL SEPTEMBER 2020 APPENDIX F.2 SECTION 803-2 BLENDED BSM CRITERIA AND TESTING REQUIREMENTS) PLACED IN 6" LIFTS AND COMPACTED WITH WATER PRIOR TO THE NEXT LIFT. INITIAL PERMEABILITY SHALL BE 8" PER HOUR (WITH ASSUMED STABILIZED PERMEABILITY OF 5" PER HOUR).
9. THE AGGREGATE STORAGE LAYER SHALL BE COMPACTED IN ACCORDANCE WITH SOILS ENGINEER'S RECOMMENDATIONS.
10. OVERFLOW STRUCTURE TO HAVE A MINIMUM OF 12 INCHES OF FREEBOARD.
11. ALL LINER INSTALLATIONS, FIELD WELDING OF SEAMS, AND OBSERVATION OF SOIL MIX PLACEMENT SHALL REQUIRE SPECIAL INSPECTION BY THE PROJECT GEOTECHNICAL ENGINEER OR OTHER QUALIFIED PERSON. A LETTER CERTIFYING PROPER INSTALLATION SHALL BE PROVIDED TO THE ENGINEER OF RECORD TO ACCEPTANCE OF THE FACILITIES.
12. SPECIAL INSPECTION SHALL BE REQUIRED FOR CONSTRUCTION OF ALL BIOFILTRATION BASINS. INSPECTION SHALL BE PERFORMED BY A QUALIFIED INDIVIDUAL (SUCH AS: ENGINEER OF RECORD, QSD). INSPECTION SHALL INCLUDE:
    - VERIFICATION OF OVERALL DIMENSIONS PRIOR TO PLACEMENT OF MATERIALS;
    - PLACEMENT OF THE LINER, IF REQUIRED;AND SEAMS OR PENETRATIONS
    - PLACEMENT OF THE GRAVEL, FILTER MATERIALS, AND FILTER MEDIA;
    - ALL INLET AND OUTLET STRUCTURES INCLUDING UNDERDRAINS, IF REQUIRED.
    - CONTRACTOR SHALL TAKE PICTURES AT EACH STAGE OF INSTALLATION AND SUBMITTED TO ENGINEER FOR VERIFICATION OF INSTALL.

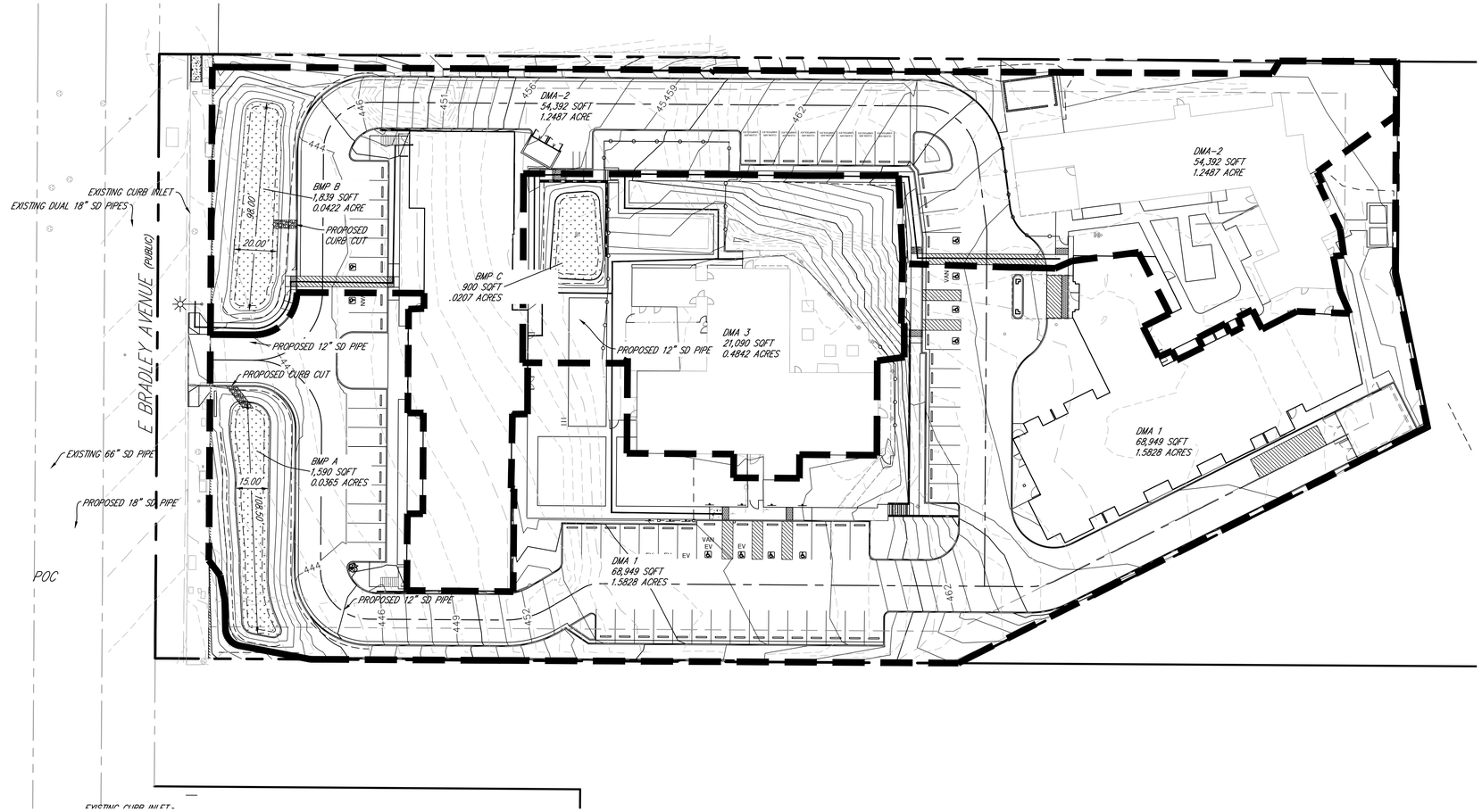
    INSPECTOR SHALL BE GIVEN A MINIMUM OF 48 HOURS PRIOR TO INSPECTION. UPON COMPLETION THE INSPECTOR SHALL PROVIDE A CERTIFICATION TO THE ENGINEER OF WORK.
13. PROPOSED MATERIALS, SUCH AS AGGREGATE, FILTER MATERIAL, AND FILTER MEDIA SHALL BE SUBMITTED TO THE ENGINEER OF WORK FOR APPROVAL.

SELF-MITIGATING DMAS:

- VEGETATION IN THE NATURAL OR LANDSCAPED AREA IS NATIVE AND/OR NON-NATIVE/NON-INVASIVE DROUGHT TOLERANT SPECIES THAT DO NOT REQUIRE REGULAR APPLICATION OF FERTILIZERS AND PESTICIDES.
- SOILS ARE UNDISTURBED NATIVE TOPSOIL OR DISTURBED SOILS THAT HAVE BEEN AMENDED AND AERATED TO PROMOTE WATER RETENTION CHARACTERISTICS EQUIVALENT TO UNDISTURBED NATIVE TOPSOIL.
- THE INCIDENTAL IMPERVIOUS AREAS ARE LESS THAN 5 PERCENT OF THE SELF-MITIGATING AREA.
- IMPERVIOUS AREA WITHIN THE SELF-MITIGATED AREA SHOULD NOT BE HYDRAULICALLY CONNECTED TO OTHER IMPERVIOUS AREAS UNLESS IT IS A STORM WATER CONVEYANCE SYSTEM (SUCH AS A BROW DITCH).
- THE SELF-MITIGATING AREA IS HYDRAULICALLY SEPARATE FROM DMAS THAT CONTAIN PERMANENT STORM WATER POLLUTANT CONTROL BMPS.

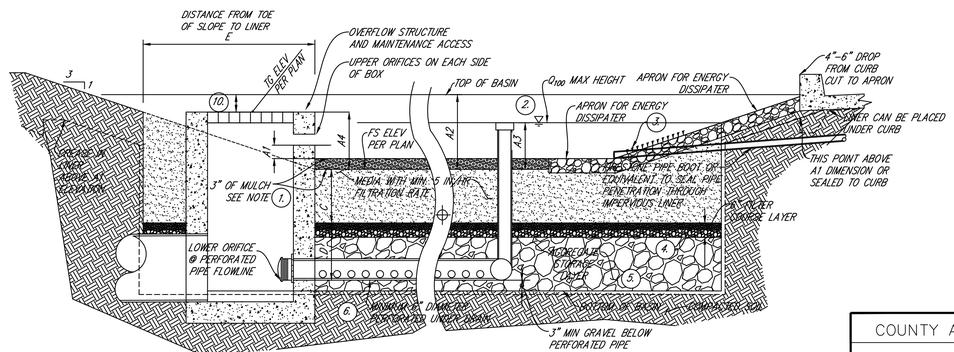
HYDROLOGIC SOIL GROUP

THE HYDROLOGICAL SOIL GROUP FOR THIS SITE IS TYPE D.



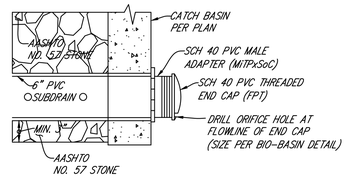
STRUCTURAL BIO-BASIN SUMMARY TABLE												
BMP NAME	TYPE OF BMP	EFFECTIVE AREA (SQFT)	A1 (INCH) WATER QUALITY	A2 (INCH) TOP OF BASIN	A3 (INCH) Q_{100} MAX HEIGHT	A4 (INCH) TOP OF RISER	C (INCH) MEDIA	D (INCH) GRAVEL	E (INCH) OFFSET	BOX RISER OVERFLOW STRUCTURE SIZE (INCHES)	ORIFICES DIAMETER UPPER (INCH)	ORIFICES DIAMETER LOWER (1/16 INCH)	IMPERMEABLE LINER ?
BMP-A	BIOFILTRATION	1,590	6	26	15	15	18	12	27	48X48	2X21	15	YES
BMP-B	BIOFILTRATION	1,839	6	24	13	12	18	12	27	48X48	1X36	17	YES
BMP-C	BIOFILTRATION	900	6	12	10	9	18	12	27	24X24	–	12	YES

DRAINAGE MANAGEMENT AREA							
DMA ID	DMA TYPE	OUTLET	IMPERVIOUS AREA (SQFT)	PERVIOUS AREA (SQFT)	TOTAL (SQFT)	TOTAL (ACRES)	% IMP
DMA-1	DRAINS TO BMP	BMP-1	47,865	21,084	68,949	1.583	69
DMA-2	DRAINS TO BMP	BMP-2	41,177	13,215	54,392	1.249	76
DMA-3	DRAINS TO BMP	BMP-3	12,221	8,869	21,090	0.484	58



BIOFILTRATION BASIN DETAIL

NOT TO SCALE



ORIFICE DETAIL

NOT TO SCALE

6" PVC PIPE PERFORATION LAYOUT DETAIL

NOT TO SCALE

Q:\23\23046\GRP\GP\cde.bmp

DETAIL
"NO DUMPING" AT CATCH BASINS

NOTE: ALL CATCH BASINS WITH GRATES SHALL BE STENCILED WITH CITY REQUIRED ITEM PER ABOVE DETAIL:

(DAS MANUFACTURING #SDO OR EQUIVALENT)

PERMANENT WATER QUALITY TREATMENT FACILITY

KEEPING OUR WATER WAYS CLEAN
MAINTAIN WITH CARE – NO MODIFICATIONS WITHOUT AGENCY APPROVAL

DETAIL
WATER QUALITY SIGN– PLACED AT EACH BIOFILTRATION BASIN

NOTE: ALL BIOFILTRATION AREAS WILL HAVE A SIGN POSTED TO BE VISIBLE AT ALL TIMES.

GRAPHIC SCALE IN FEET
0 15 30 60

COUNTY APPROVED CHANGES

DESCRIPTION:	APPROVED BY:	DATE:

PRIVATE CONTRACT

SHEET 8 | COUNTY OF SAN DIEGO DEPARTMENT OF PUBLIC WORKS | 9 SHEETS

GRADING PLAN FOR:

DMA AND BIOFILTRATION BASIN EXHIBIT

CALIFORNIA COORDINATE INDEX _____

APPROVED DIRECTOR OF PUBLIC WORKS
BY:

ENGINEER OF WORK
R.C.E.

GRADING PERMIT NO:

811 Know what's below. Call before you dig.

DIAL TOLL FREE 811
AT LEAST TWO DAYS BEFORE YOU DIG
UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA

REV.	SYMBOL	DESCRIPTION OF CHANGE	R.C.E.	DATE	P.D.E.	DATE

DESIGNED BY: SL DATE

DRAWN BY: SL DATE

CHECKED BY: KK DATE

NOT FOR CONSTRUCTION

ENGINEER'S SEAL

PREPARED BY:

KYLE KOIVUNIEMI, PE
REGISTERED ENGINEER

58449
RCE NUMBER

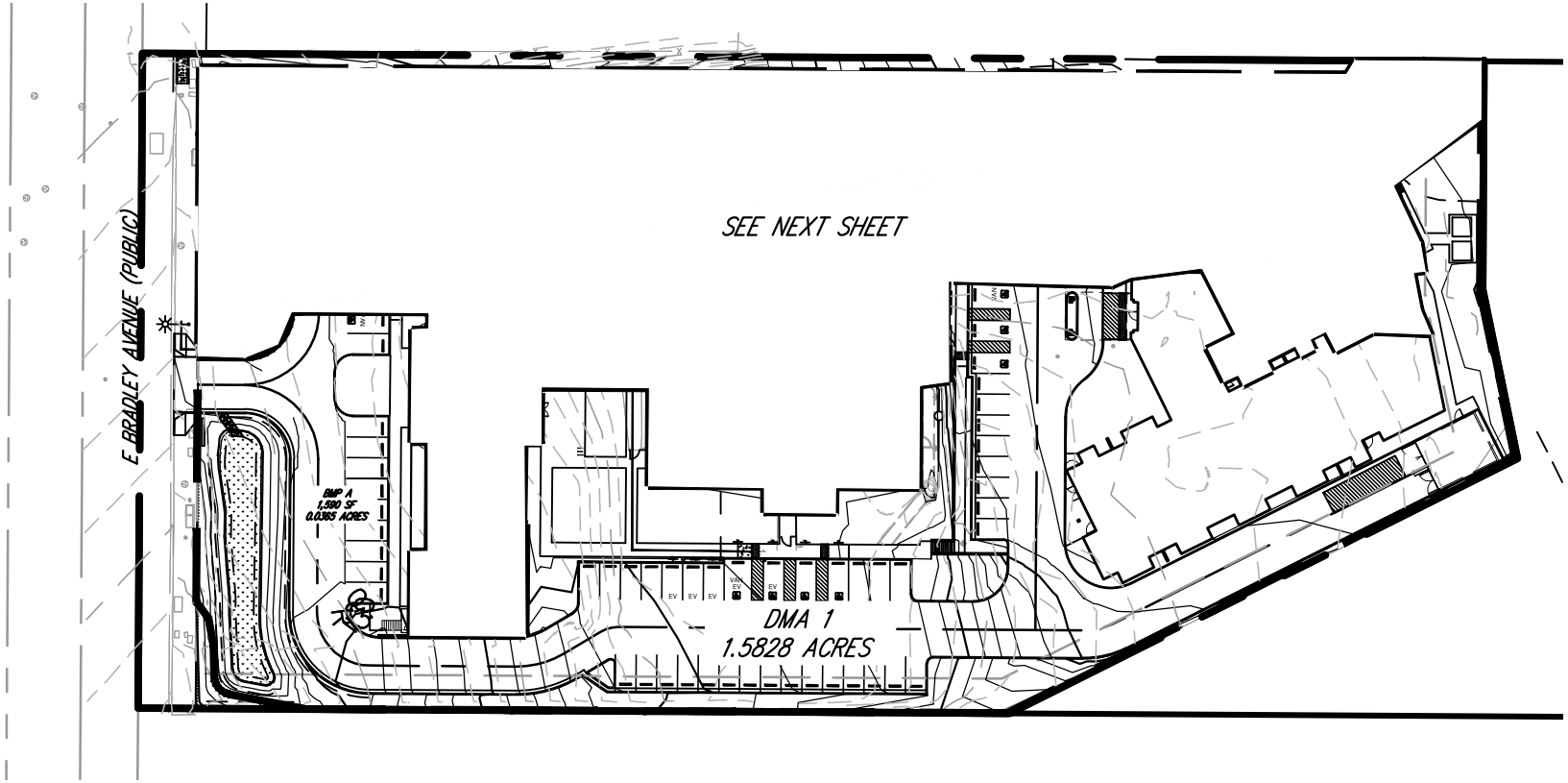
DATE REVISED:

2.2 Individual Structural BMP DMA Mapbook

- Use this page as a cover sheet for the Structural DMA Mapbook.
- An individual Structural DMA Mapbook must be submitted for any project site with one or more structural BMPs. One Mapbook is required for each unique subsequent owner with responsibility for maintenance of a Structural BMP. Mapbook exhibits will be incorporated as exhibits in Stormwater Maintenance Agreements (SWMAs) and Maintenance Notifications (MNs). See Attachment 11 for additional information on maintenance agreements. If the Mapbook has been provided for each subsequent owner in Attachment 11, they are not required here.
- Place each map on 8.5"x11" paper.
- Show at a minimum the DMA, Structural BMP, Assessor's parcel boundaries with parcel numbers, and any existing hydrologic features within the DMA.

☒	All Mapbooks are attached
☐	All Mapbooks are in Attachment 11

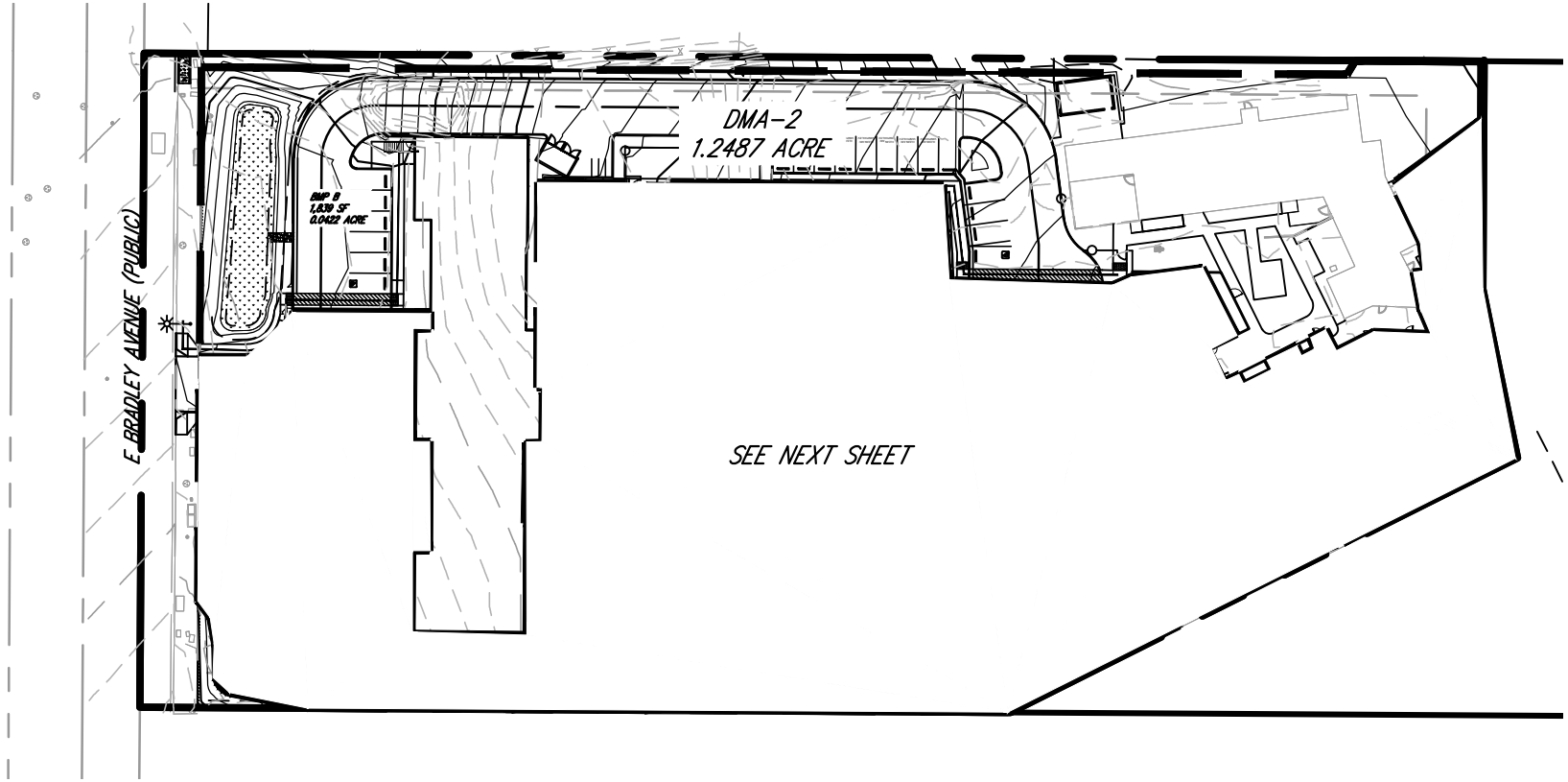
STRUCTURAL BIO-BASIN SUMMARY TABLE													
BMP NAME	TYPE OF BMP	EFFECTIVE AREA (SQFT)	A1 (INCH) WATER QUALITY	A2 (INCH) TOP OF BASIN	A3 (INCH) Q_{100} MAX HEIGHT	A4 (INCH) TOP OF RISER	C (INCH) MEDIA	D (INCH) GRAVEL	E (INCH) OFFSET	BOX RISER OVERFLOW STRUCTURE SIZE (INCHES)	ORIFICES DIAMETER		IMPERMEABLE LINER ?
											UPPER (INCH)	LOWER (1/16 INCH)	
BMP-A	BIOFILTRATION	1,590	6	26	15	15	18	12	27	48X48	2X21	15	YES



Kimley»Horn

1100 TOWN AND COUNTRY RD, ORANGE, CA 92868
PHONE: 714-939-1030

STRUCTURAL BIO-BASIN SUMMARY TABLE													
BMP NAME	TYPE OF BMP	EFFECTIVE AREA (SQFT)	A1 (INCH) WATER QUALITY	A2 (INCH) TOP OF BASIN	A3 (INCH) Q_{100} MAX HEIGHT	A4 (INCH) TOP OF RISER	C (INCH) MEDIA	D (INCH) GRAVEL	E (INCH) OFFSET	BOX RISER OVERFLOW STRUCTURE SIZE (INCHES)	ORIFICES DIAMETER		IMPERMEABLE LINER ?
											UPPER (INCH)	LOWER (1/16 INCH)	
BMP-B	BIOFILTRATION	1,839	6	24	13	12	18	12	27	48X48	1X36	17	YES



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1100 TOWN AND COUNTRY RD, ORANGE, CA 92868
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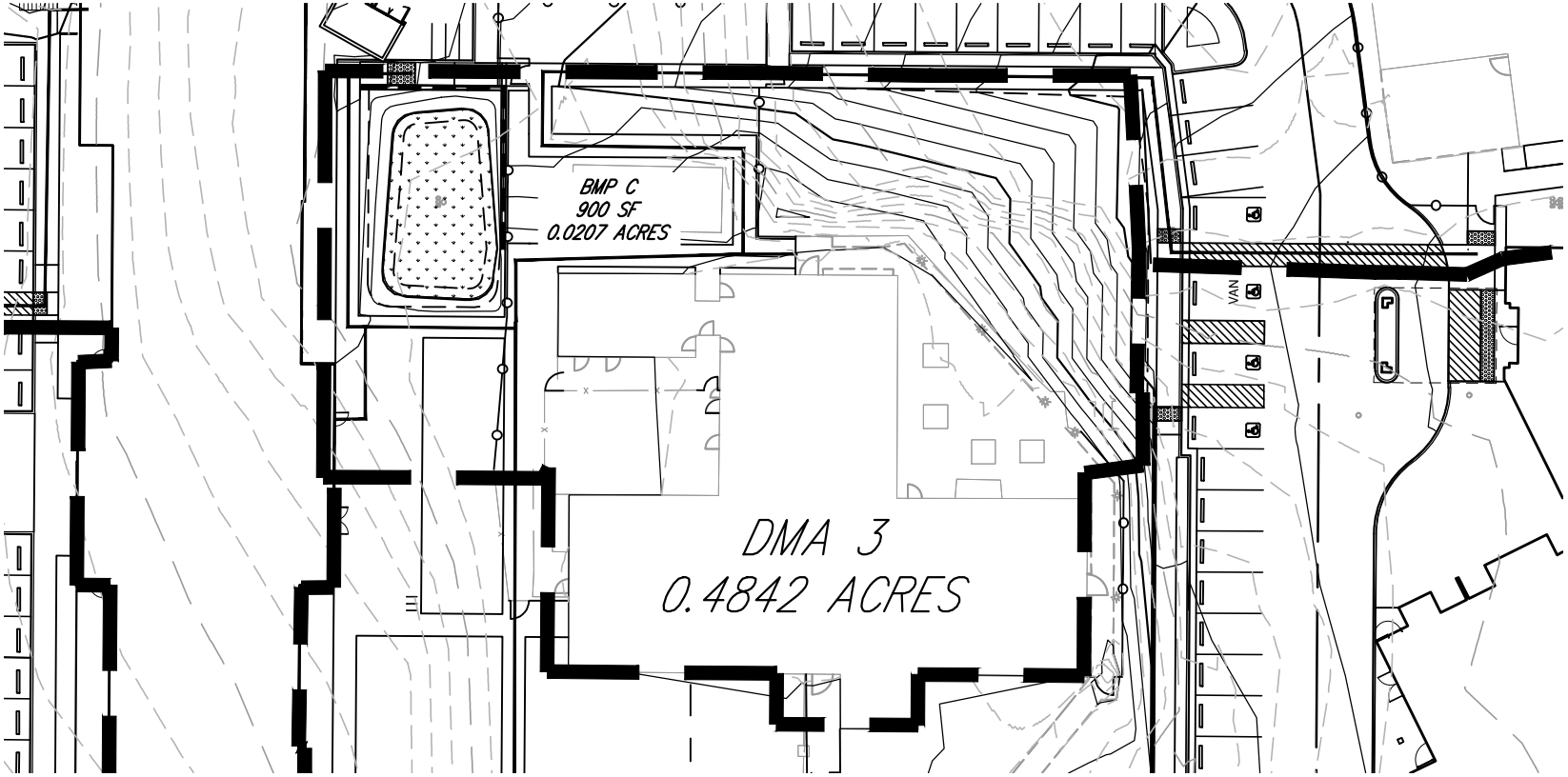
STRUCTURAL BIO-BASIN SUMMARY TABLE													
BMP NAME	TYPE OF BMP	EFFECTIVE AREA (SQFT)	A1 (INCH) WATER QUALITY	A2 (INCH) TOP OF BASIN	A3 (INCH) Q_{100} MAX HEIGHT	A4 (INCH) TOP OF RISER	C (INCH) MEDIA	D (INCH) GRAVEL	E (INCH) OFFSET	BOX RISER OVERFLOW STRUCTURE SIZE (INCHES)	ORIFICES DIAMETER		IMPERMEABLE LINER ?
											UPPER (INCH)	LOWER (1/16 INCH)	
BMP-C	BIOFILTRATION	900	6	12	10	9	18	12	27	24X24	-	12	YES



Kimley»Horn

1100 TOWN AND COUNTRY RD, ORANGE, CA 92868
PHONE: 714-939-1030

2.3 Construction Plan Sets

- DMAs, features, and BMPs identified and described in this attachment must also be shown on all applicable construction and landscape plans.
- As applicable, plan sheets must identify:
    - All features and BMPs identified in Sub-attachment 2.1 (DMA Exhibits).
    - The additional information listed below.
- Use this checklist to ensure required information is included on each plan (copy as needed).

Plan Type	**Grading**
Required Information[4]	
☐ Structural BMP(s) and Significant Site Design BMPs (if applicable) with ID numbers.	
☐ 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) and Significant Site Design BMPs (if applicable).	
☐ Signage indicating the location and boundary of structural BMP(s) as required by County staff.	
☐ How to access the structural BMP(s) to inspect and perform maintenance.	
☐ Features that are provided to facilitate inspection (e.g., observation ports, cleanouts, silt posts, or other features that allow the inspector to view necessary components of the structural BMP and compare to maintenance thresholds).	
☐ 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 (if available) 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 manufacturer model number must be provided. Photocopies of general brochures are not acceptable.	
☐ Include all source control and site design measures described in the SWQMP.	
☐ Include all construction BMPs described in the SWQMP.	

[4] For Building Permit Applications, refer to Form PDS 272, https://www.sandiegocounty.gov/content/dam/sdc/pds/docs/pds272.pdf

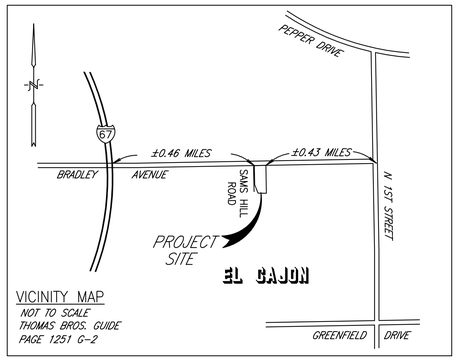
PLOT PLAN EXHIBIT

FOR BRADLEY COURT HEALTHCARE CENTER

MUP MODIFICATION

PDS2021-MUP-85-053W2

Aug 23, 2023



VICINITY MAP
NOT TO SCALE
THOMAS BROS. GUIDE
PAGE 1251 G-2

PROJECT INFORMATION

LANDOWNER :	EL CAJON REAL ESTATE, LLC 6 HUTTON CENTRE DRIVE, SUITE 400 SANTA ANA, CA 92707
REPRESENTATIVE:	MR. THOMAS JURBALA PHONE: E-MAIL: THOMASJURBALA@LIFEGEN.COM
SITE ADDRESS:	675 EAST BRADLEY AVENUE EL CAJON, CA 92021
APN:	387-142-36-00
LAND AREA:	GROSS AREA 3.40 ACRES/147,886.26 SF NET AREA 3.36 ACRES/146,465.97 SF
ZONING:	RU (RESIDENTIAL-URBAN)
PLANNING GROUP:	LAKESIDE PLANNING GROUP
FIRE DISTRICT:	SAN MIGUEL FIRE PROTECTION DISTRICT
SCHOOL DISTRICT:	GENERAL ELEMENTARY-CAJON VALLEY UNION HIGH SCHOOL-GROSSMONT UNION
WATER DISTRICT:	HELIX WATER DISTRICT
SEWER DISTRICT	PADRE DAM MUNICIPAL WATER DISTRICT
USE CLASSIFICATION:	HEALTHCARE/SKILLED NURSING/MUP
PRIMARY ACCESS:	BRADLEY AVENUE (SA 890)(A PUBLIC STREET) IS CLASSIFIED AS A 4.1B MAJOR ROAD.
LEGAL DESCRIPTION:	PARCEL B OF BC 86-0183
SOURCE OF TOPO:	AERIAL TOPOGRAPHY PREPARED BY AEROTECH MAPPING, INC. WITH CONTROL SURVEY BY EXCEL ENGINEERING.
BENCHMARK:	EC0263-EL CAJON, STREET CENTERLINE MONUMENT ON BRADLEY AVE. 48 FEET EAST OF MAGNOLIA, EL.=394.937

PROJECT TEAM CONSULTANTS

OWNER/APPLICANT:	MR. THOMAS JURBALA GEL CAJON REAL ESTATE, LLC 6 HUTTON CENTRE DRIVE, SUITE 400 SANTA ANA, CA 92707 PHONE: E-MAIL: THOMASJURBALA@LIFEGEN.COM
ARCHITECT:	MR. GREGG MAEDO GREGG MAEDO AND ASSOCIATES 321 NORTH RAMPART STREET, SUITE 101 ORANGE, CA 92868 PHONE: 714-937-1985
CIVIL ENGINEERING:	MR. KYLE KOIVUNIEMI, P.E. KIMLEY-HORN AND ASSOCIATES, INC. 1100 W TOWN AND COUNTRY RD, SUITE 700 ORANGE, CA 92782 PH (714) 939-1030 KYLE.KOIVUNIEMI@KIMLEY-HORN.COM
CONTRACTOR:	MR. STEVE L'HOMMEDIEU ARCO CONSTRUCTION CO. 900 N. ROCKHILL ROAD ST. LOUIS, MO 63119 SLHOMMEDIEU@ARCO1.COM
LANDSCAPE ARCHITECT:	MR. JAKE PATTON KSA DESIGN STUDIO 6150 WASHINGTON BLVD. CULVER CITY, CA 90232 PH (310) 574-4460 J,PATTON@KSA-LA.COM
GEOTECHNICAL ENGINEERING:	MR. ANDY GUATELLI GEOSOILS, INC. 5741 PALMER WAY CARLSBAD, CA 92010 PH 760-438-3155 AGUATELLI@GEOSOILSINC.COM

SHEET INDEX

BUILDING USE DESCRIPTION

BUILDING 1-SKILLED NURSING (EXISTING) TO REMAIN
SIZE: 6,950 SF/28 BEDS

BUILDING 2-SKILLED NURSING (EXISTING) TO REMAIN
SIZE: 6,500 SF/28 BEDS

BUILDING 3-SKILLED NURSING (PROPOSED)
SIZE: 10,613 SF/31 BEDS

BUILDING 4-ASSISTED LIVING (PROPOSED)
SIZE: 26,515 SF/66 BEDS

PARKING TABULATION

PARKING SPACES REQUIRED:
94 TOTAL BEDROOM X 0.33 (SPACES PER BED)= 31 SPACES
EMPLOYEE PARKING = 40 SPACES

TOTAL PARKING REQUIRED (40+31): 71 SPACES

PARKING PROVIDED:

STANDARD SPACES	49
CLEAN AIR/ELECTRICAL VEHICLE SPACE	8
ELECTRIC VEHICLE CHARGING SPACE	3
ACCESSIBLE ELECTRIC VEHICLE CHARGING SPACE	2
ACCESSIBLE PARKING SPACES	8
MOTORCYCLE PARKING SPACES	3
TOTAL PARKING PROVIDED:	73 SPACES

BICYCLE SPACES PROVIDED: TOTAL =3 SPACES

NOTE

ALL OUTDOOR LIGHTING AS A RESULT OF THIS PROJECT SHALL COMPLY WITH THE REQUIREMENTS SPECIFIED IN THE COUNTY LIGHT POLLUTION CODE WHICH COMMENCES AT SECTION 51.201 OF THE COUNTY CODE OF REGULATORY ORDINANCE.

DISTURBED AREA

3.10 ACRES/135,174 SQ. FT.

EARTHWORK

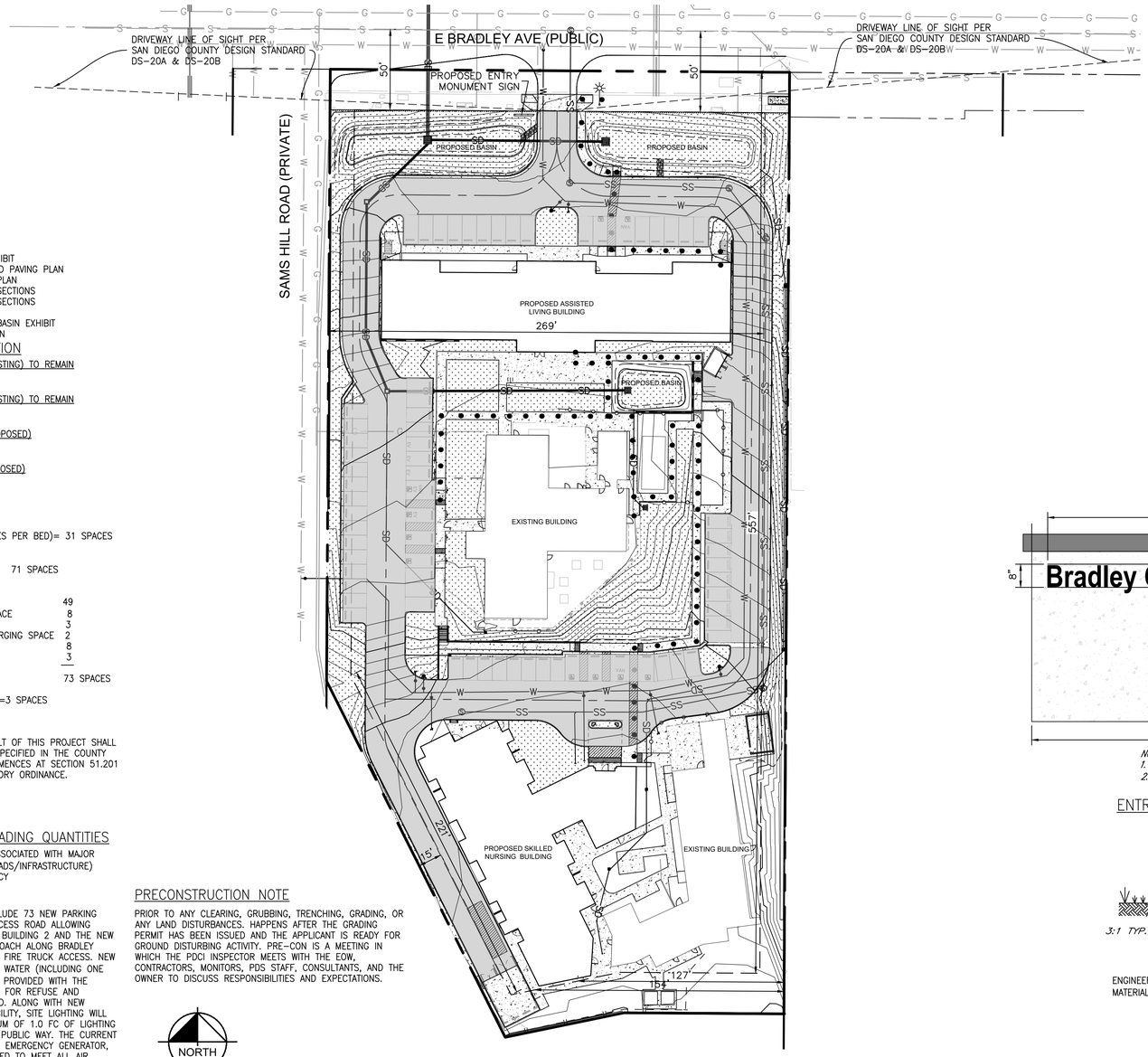
CUT VOLUME = 4,525 CY
FILL VOLUME = 4,525 CY
IMPORT = 0 CY

GRADING QUANTITIES

(ASSOCIATED WITH MAJOR ROADS/INFRASTRUCTURE)
0 CY

PROJECT DESCRIPTION

THE PROPOSED SITEWORK WILL INCLUDE 73 NEW PARKING SPACES, AND A NEW FIRE LANE ACCESS ROAD ALLOWING ACCESS TO THE REAR OF EXISTING BUILDING 2 AND THE NEW BUILDING 3. A NEW DRIVEWAY APPROACH ALONG BRADLEY AVENUE WILL BE PLACED FOR FULL FIRE TRUCK ACCESS. NEW SEWER, DOMESTIC WATER, AND FIRE WATER (INCLUDING ONE ADDITIONAL FIRE HYDRANT) WILL BE PROVIDED WITH THE SITEWORK. TWO TRASH ENCLOSURES FOR REFUSE AND RECYCLED GOODS WILL BE PROVIDED. ALONG WITH NEW LANDSCAPING THROUGHOUT THE FACILITY, SITE LIGHTING WILL BE INSTALLED TO PROVIDE A MINIMUM OF 1.0 FC OF LIGHTING ALONG ALL EGRESS PATHS TO THE PUBLIC WAY. THE CURRENT FACILITY IS SERVED BY AN EXISTING EMERGENCY GENERATOR, A NEW GENERATOR WILL BE PROVIDED TO MEET ALL AIR QUALITY REQUIREMENTS. ALL WORK OUTSIDE OF THE BUILDING ENVELOPS FALLS UNDER LOCAL JURISDICTION, WITH JOINT REVIEW AND OVERSIGHT BY HCAI ON SOME ITEMS SUCH AS BUILDING PAD CERTIFICATION, FIRE SERVICE INSTALLATION, ETC.



NORTH

GRAPHIC SCALE IN FEET
0 20 40 80

PRECONSTRUCTION NOTE

PRIOR TO ANY CLEARING, GRUBBING, TRENCHING, GRADING, OR ANY LAND DISTURBANCES. HAPPENS AFTER THE GRADING PERMIT HAS BEEN ISSUED AND THE APPLICANT IS READY FOR GROUND DISTURBING ACTIVITY. PRE-CON IS A MEETING IN WHICH THE PDCI INSPECTOR MEETS WITH THE EOW, CONTRACTORS, MONITORS, PDS STAFF, CONSULTANTS, AND THE OWNER TO DISCUSS RESPONSIBILITIES AND EXPECTATIONS.

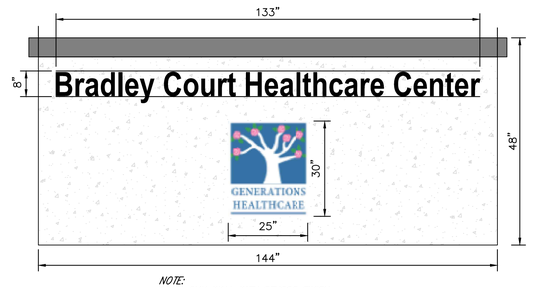
LEGENDS & SYMBOLS

- R/W
- PROPERTY LINE
- SD — EXISTING STORM DRAIN LINE
- RETAINING WALL
- STAIRS
- SS — EXISTING SANITARY SEWER LINE
- SEWER MANHOLE
- W — WATER SERVICE
- S — SEWER SERVICE
- PROP. PARKING LOT LIGHT
- W — EXIST. WATER LINE
- G — EXIST. GAS LINE
- A/C PAVEMENT
- DIRECTION OF FLOW

ZONE BOX

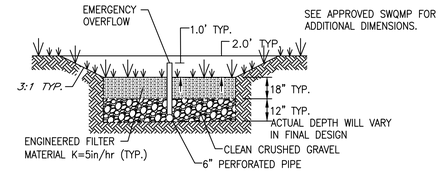
USE REGULATIONS		RU
ANIMAL REGULATIONS		Q
DEVELOPMENT REGULATIONS	DENSITY	--
	LOT SIZE	6000
	BUILDING TYPE	L
	MAXIMUM FLOOR AREA	--
	FLOOR AREA RATIO	--
	HEIGHT	G
	LOT COVERAGE	--
	SETBACK	K
	OPEN SPACE	A
SPECIAL AREA REGULATIONS		C

ASSESSORS PARCEL NUMBER:	387-142-36-00
COMMUNITY PLAN:	LAKESIDE
GENERAL PLAN DESIGNATION:	VILLAGE RESIDENTIAL (VR-24)
REGIONAL CATEGORY:	VILLAGE
LEGAL LOT INFO:	CERTIFICATE OF COMPLIANCE REC. 12/20/85 AS DOC. NO. 85-482296
DISCRETIONARY PERMIT #:	MUP P85-053W2



NOTE:
1. CMU WALL WITH STUCCO FINISH.
2. CONCRETE FOOTING / REBAR SIZE AND SPACING SHALL BE PER STRUCTURAL CALCULATIONS.

ENTRY MONUMENT WALL DETAIL
NOT TO SCALE



BIO-FILTRATION BASIN
TYPICAL SECTION
NOT TO SCALE

COUNTY APPROVED CHANGES		
DESCRIPTION:	APPROVED BY:	DATE:

PRIVATE CONTRACT

SHEET 1 | COUNTY OF SAN DIEGO DEPARTMENT OF PUBLIC WORKS | 9 SHEETS

GRADING PLAN FOR:

COVER SHEET

CALIFORNIA COORDINATE INDEX NAD83 - ZONE VI

APPROVED DIRECTOR OF PUBLIC WORKS BY:

ENGINEER OF WORK R.C.E.

GRADING PERMIT NO:

811 Know what's below. Call before you dig.
DIAL TOLL FREE 811
AT LEAST TWO DAYS BEFORE YOU DIG
UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA

REV.	SYMBOL	DESCRIPTION OF CHANGE	R.C.E.	DATE	P.D.E.	DATE

DESIGNED BY: SL DATE
DRAWN BY: SL DATE
CHECKED BY: KK DATE

ENGINEER'S SEAL

PREPARED BY:

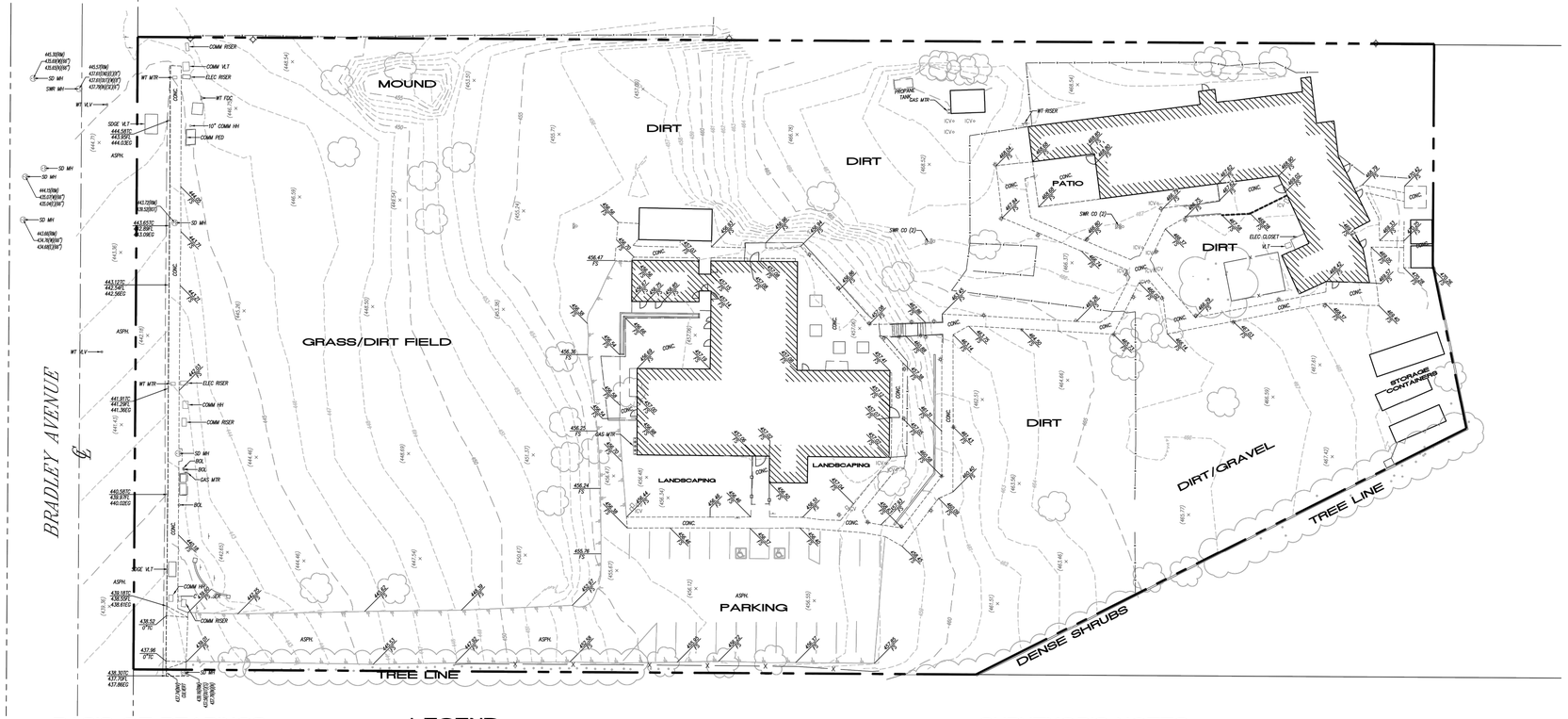
KYLE KOIVUNIEMI, PE
REGISTERED ENGINEER

58449
RCE NUMBER

DATE REVISED:

TOPOGRAPHIC SURVEY

CITY OF EL CAJON, COUNTY OF SAN DIEGO, STATE OF CALIFORNIA



BASIS OF BEARINGS

THE BEARINGS SHOWN HEREON ARE BASED ON STATIC GPS TIES TO TWO CONTINUOUS GPS STATIONS (CGPS) REFERRED TO AS "P472" AND "P475", BEING NORTH 28°20'18" EAST BASED ON POSITIONS PUBLISHED IN THE CALIFORNIA SPATIAL REFERENCE CENTER.

DATUM STATEMENT
THE COORDINATES SHOWN HEREON ARE BASED ON THE CALIFORNIA COORDINATE SYSTEM OF 1983 (CCS83) ZONE VI, RELATIVE TO THE NORTH AMERICAN DATUM OF 1983 (2017.50 EPOCH GPS ADJUSTMENT)

BENCHMARK

CITY OF EL CAJON BENCHMARK NUMBER "88"
ELEVATION: 458.13 FEET [DATUM: NAVD 88]
DESCRIPTION: STD BM T/C SOUTH END CURB RETURN AT SW CORNER MOLLISON & BRADLEY AVENUE.

SITE ADDRESS

THE BRADLEY COURT – REHABILITATION CENTER
675 E BRADLEY AVENUE, EL CAJON, CA 92021

DATE OF SURVEY

THE PROPERTY DESCRIBED ON THIS PLAT WAS SURVEYED JULY 05, 2023.

SURVEYOR'S STATEMENT

I HEREBY STATE THAT I AM A LICENSED LAND SURVEYOR OF THE STATE OF CALIFORNIA, THAT THIS MAP CONSISTING OF 1 SHEET REPRESENTS A TRUE AND COMPLETE SURVEY MADE BY ME OR UNDER MY DIRECTION IN JULY 05, 2023.

LICENSED LAND SURVEYOR
PETER EDWARD WEILBACHER
Exp. 06/30/24
NO. 8403
STATE OF CALIFORNIA

Jul 10 2023

PETER E. WEILBACHER, PLS 8403 — DATE:
EXPIRES 06-30-24

LEGEND

- RIGHT-OF-WAY LINE
- LOT/PARCEL LINE
- STREET CENTERLINE
- BOUNDARY LINE
- CONCRETE
- CURB
- BUILDING OVERHANG LINE
- LANE STRIPING
- EDGE OF ASPH PAVEMENT
- WALL
- CHAIN LINK FENCE
- IRON FENCE
- GRADE BREAK LINE
- CONCRETE SIDEWALK
- 1 FOOT CONTOUR INTERVAL
- 5 FOOT CONTOUR INTERVAL
- EXISTING BUILDING

ABOVE GROUND FEATURES
CONC – CONCRETE
ASPH – ASPHALT
AD – AREA DRAIN
BFP – BACKFLOW PREVENTOR
CB – CATCH BASIN
CO – CLEANOUT
DWY – DRIVEWAY
EP – EDGE OF PAVEMENT
FDC – FIRE DEPT. CONNECTION
GUY – GUY WIRE
HH – HANDHOLE
ICV – IRRIGATION CONTROL VALVE
MH – MANHOLE
MTR – METER
PED – PEDESTAL
PP – POWER POLE
SL – STREET LIGHT
TRANS – TRANSFORMER
VLT – VAULT
VLV – VALVE

UTILITIES
COMM – COMMUNICATION
SD – STORM DRAIN
SWR – SANITARY SEWER
WT – WATER

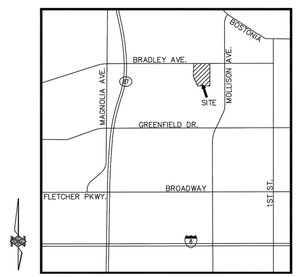
- VALVE
- OR ICV HH
- UTILITY MH
- SIGN
- POST
- POWER POLE
- BOLLARD
- TREE
- PALM
- GROUND LIGHT
- SEWER CLEANOUT
- WATER FDC
- ABOVE GROUND GAS METER
- HANDICAP STALL DECAL
- DOOR/GATED ACCESS

SURVEYOR'S NOTES

1. *THE PURPOSE OF THIS SURVEY IS TO LOCATE AND PREPARE A TOPOGRAPHIC SURVEY OF THE AREA SHOWN AS SPECIFIED BY THE CLIENT.*
2. *THIS SURVEY DOES NOT CONSTITUTE A TITLE SEARCH BY PBLA SURVEYING, INC. OR THE SURVEYOR TO DETERMINE OWNERSHIP OF THIS PARCEL OR TO VERIFY THE DESCRIPTIONS PROVIDED. PARCEL LINES ARE SHOWN AS REFERENCE PER RECORD INFORMATION AND DOES NOT CONSTITUTE OR PURPORT TO BE A BOUNDARY SURVEY.*
3. *BOUNDARY AREA SHOWN HEREON IS BASED ON A RECORD OF SURVEY NO. 1437, FILED FEBRUARY 24, 1947 IN FILE NO. 19128, AND PER A DEED RECORDED MARCH 03, 2020 AS DOCUMENT NO. 2020-0108713, BOTH IN THE OFFICE OF THE COUNTY RECORDER OF SAN DIEGO COUNTY, STATE OF CALIFORNIA.*

20 0 10 20 40 80

GRAPHIC SCALE
1 INCH = 20 FEET



VICINITY MAP
NOT TO SCALE

PREPARED FOR:	PREPARED BY:
Kimley»Horn	PBLA SURVEYING, INC.
© 2023 KIMLEY-HORN AND ASSOCIATES, INC.	Planning • Engineering • Surveying
1100 W TOWN AND COUNTRY ROAD, SUITE 700, ORANGE, CA 92868	981 CORPORATE CENTER DR., STE. 168
PHONE: 714-939-1030	POMONA, CALIF. 91768
WWW.KIMLEY-HORN.COM	(888) 714-9642 • (714)389-9191 FAX

DATE	BY	REVISION	APP'D
07/07/2023	DH	FIRST RELEASE	PW
07/10/2023	DH	SECOND RELEASE – SD PIPE SIZE EDIT	PW

JOB NO. 5001-787

SH. 1 of 1

811 Know what's below. Call before you dig.
DIAL TOLL FREE 811
AT LEAST TWO DAYS BEFORE YOU DIG
UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA

REV.	SYMBOL	DESCRIPTION OF CHANGE	R.C.E.	DATE	P.D.E.	DATE

DESIGNED BY: SL DATE
DRAWN BY: SL DATE
CHECKED BY: KK DATE

ENGINEER'S SEAL

PREPARED BY:

KYLE KOIVUNIEMI, PE — REGISTERED ENGINEER
58449 — RCE NUMBER

DATE REVISED:

COUNTY APPROVED CHANGES

DESCRIPTION:	APPROVED BY:	DATE:

PRIVATE CONTRACT

SHEET 2 | COUNTY OF SAN DIEGO DEPARTMENT OF PUBLIC WORKS | 9 SHEETS

GRADING PLAN FOR:

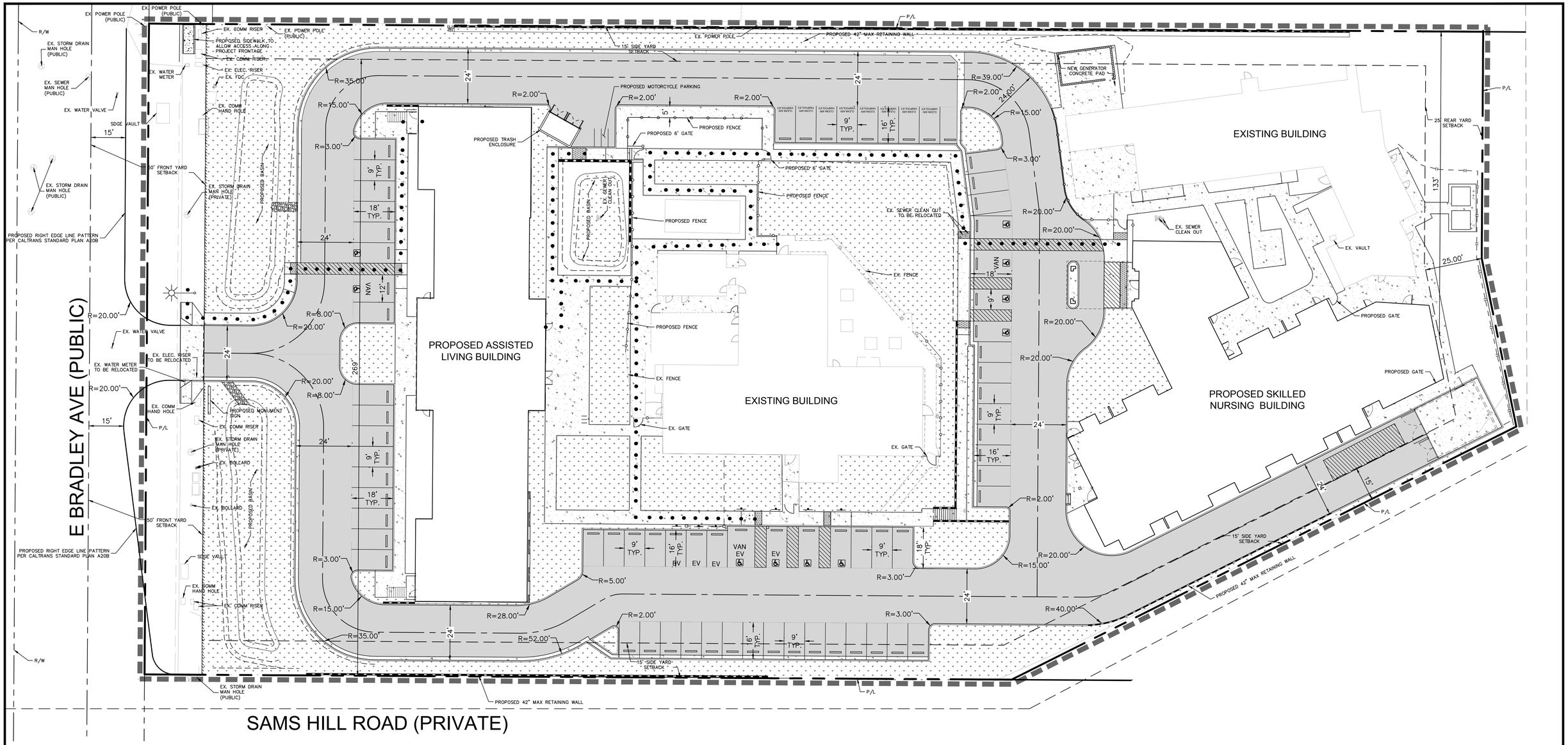
EXISTING CONDITIONS

CALIFORNIA COORDINATE INDEX

APPROVED DIRECTOR OF PUBLIC WORKS BY:

ENGINEER OF WORK R.C.E.

GRADING PERMIT NO:



LEGEND

- PROPERTY LINE
- CENTERLINE
- SETBACK LINE
- CIVIL LIMIT OF WORK LINE
- RETAINING WALL
- ACCESSIBLE PATH OF TRAVEL (DO NOT PAINT, FOR REFERENCE ONLY)

NORTH

GRAPHIC SCALE IN FEET
0 10 20 40

Know what's below. Call before you dig.
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AT LEAST TWO DAYS BEFORE YOU DIG
UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA

REV.	SYMBOL	DESCRIPTION OF CHANGE	R.C.E.	DATE	P.D.E.	DATE

DESIGNED BY: SL DATE
DRAWN BY: SL DATE
CHECKED BY: KK DATE

ENGINEER'S SEAL

PREPARED BY:
KYLE KOIVUNIEMI, PE — REGISTERED ENGINEER
58449 — RCE NUMBER

COUNTY APPROVED CHANGES

DESCRIPTION:	APPROVED BY:	DATE:

PRIVATE CONTRACT

SHEET 3 | COUNTY OF SAN DIEGO DEPARTMENT OF PUBLIC WORKS | 9 SHEETS

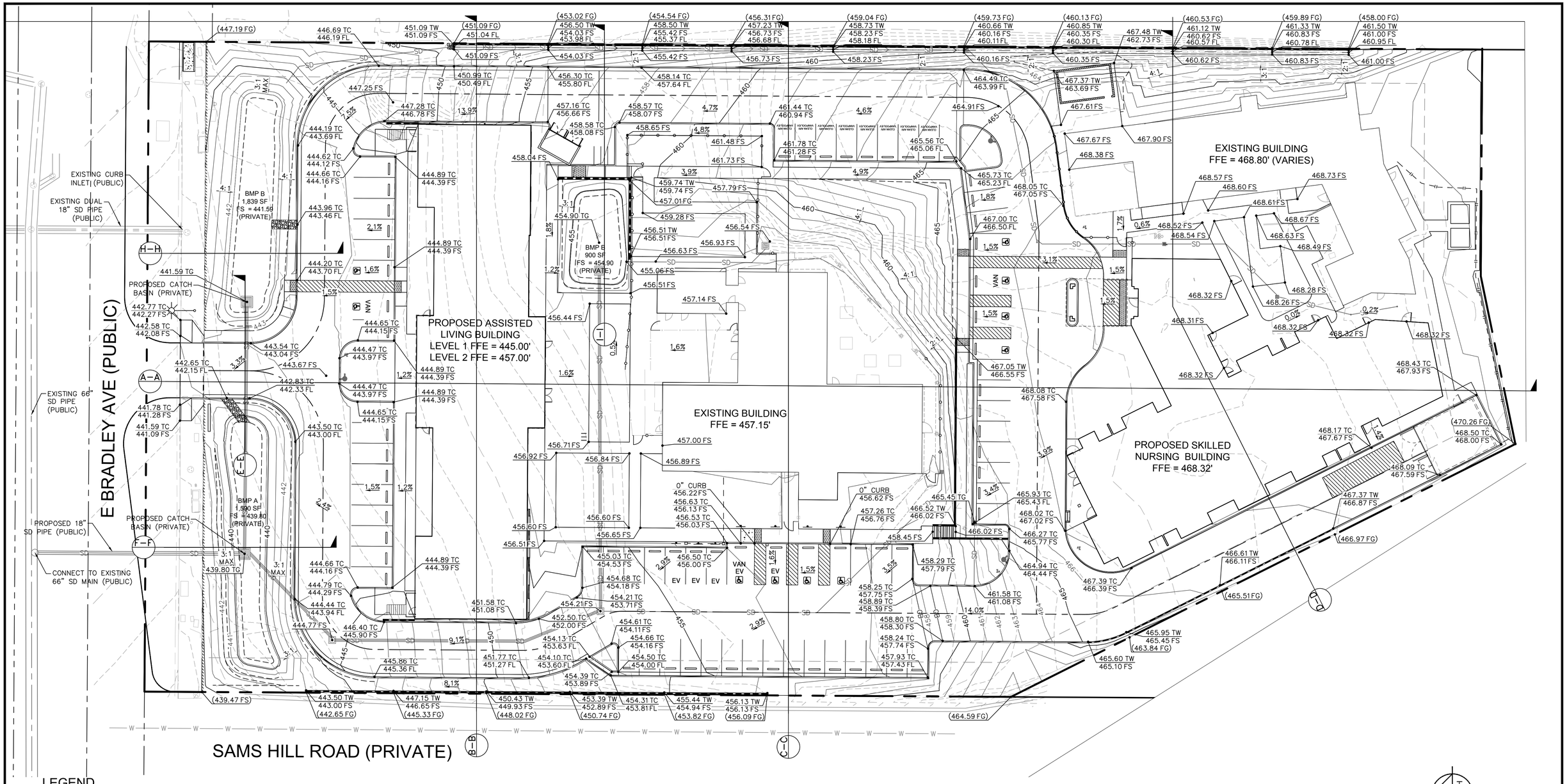
GRADING PLAN FOR:
HORIZONTAL CONTROL AND PAVING PLAN
CALIFORNIA COORDINATE INDEX

APPROVED
DIRECTOR OF PUBLIC WORKS
BY:

ENGINEER OF WORK
R.C.E.

GRADING PERMIT NO:

DATE REVISED:



LEGEND

- GRADING LIMITS OF WORK
- PROPERTY LINE
- CENTERLINE
- CIVIL LIMIT OF WORK LINE
- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- 749 — PROPOSED MINOR CONTOUR
- 750 — PROPOSED MAJOR CONTOUR
- PROPOSED RETAINING WALL BY OTHERS
- XXX.XX TC / XXX.XX FS — PROPOSED SPOT ELEVATION

TC = TOP OF CURB
FS = FINISHED SURFACE
TW = TOP OF WALL
BW = BOTTOM OF WALL
FFE = FINISHED FLOOR ELEV.

NORTH

GRAPHIC SCALE IN FEET
0 10 20 40

811 Know what's below. Call before you dig.
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AT LEAST TWO DAYS BEFORE YOU DIG
UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA

REV.	SYMBOL	DESCRIPTION OF CHANGE	R.C.E.	DATE	P.D.E.	DATE

DESIGNED BY: SL DATE
DRAWN BY: SL DATE
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ENGINEER'S SEAL

PREPARED BY:
KYLE KOIVUNIEMI, PE — REGISTERED ENGINEER
58449 — RCE NUMBER

COUNTY APPROVED CHANGES

DESCRIPTION:	APPROVED BY:	DATE:

PRIVATE CONTRACT

SHEET 4 | COUNTY OF SAN DIEGO DEPARTMENT OF PUBLIC WORKS | 9 SHEETS

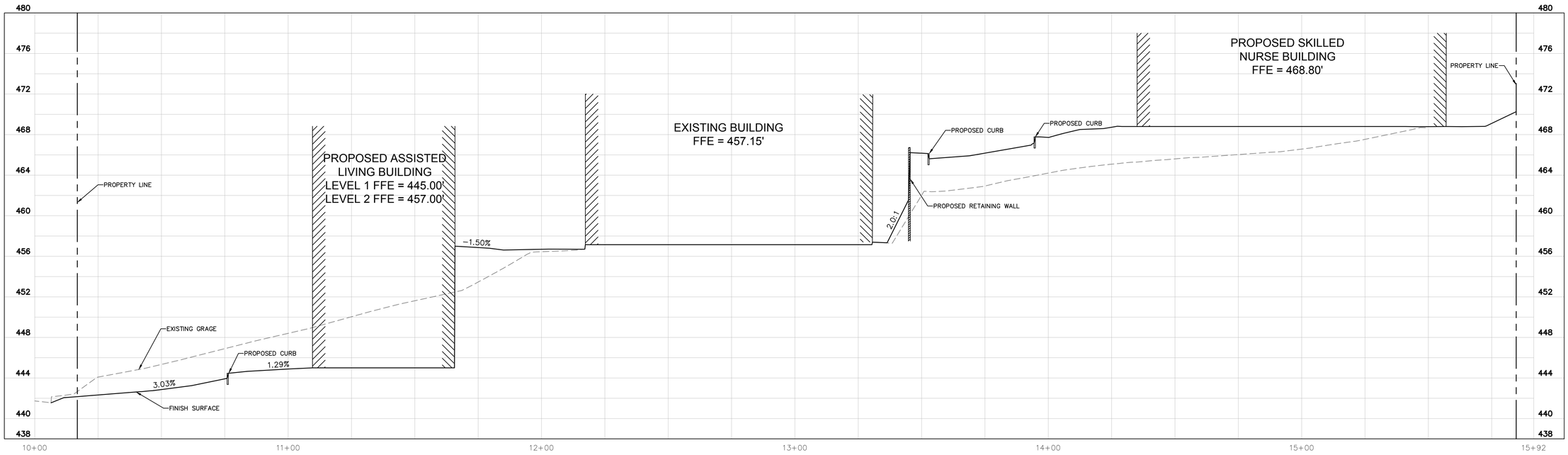
GRADING PLAN FOR:
GRADING AND DRAINAGE PLAN
CALIFORNIA COORDINATE INDEX

APPROVED
DIRECTOR OF PUBLIC WORKS
BY:

ENGINEER OF WORK
R.C.E.

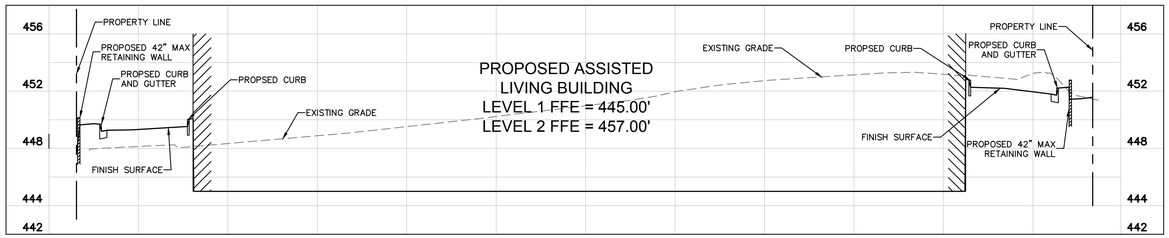
GRADING PERMIT NO:

DATE REVISED:



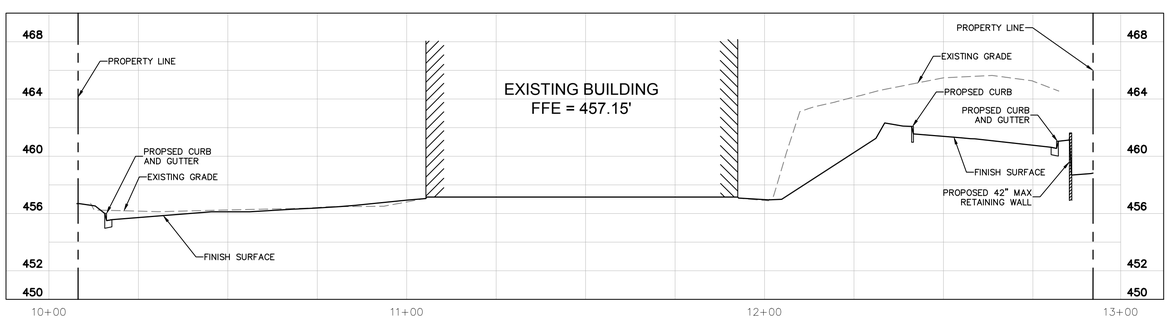
SECTION A-A:

SCALE: V: 1" = 5'
H: 1" = 20'



SECTION B-B:

SCALE: V: 1" = 5'
H: 1" = 20'



SECTION C-C:

SCALE: V: 1" = 5'
H: 1" = 20'

811 Know what's below. Call before you dig.
DIAL TOLL FREE 811
AT LEAST TWO DAYS BEFORE YOU DIG
UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA

REV.	SYMBOL	DESCRIPTION OF CHANGE	R.C.E.	DATE	P.D.E.	DATE

DESIGNED BY: SL DATE
DRAWN BY: SL DATE
CHECKED BY: KK DATE

ENGINEER'S SEAL

PREPARED BY:
KYLE KOIVUNIEMI, PE
REGISTERED ENGINEER
58449
RCE NUMBER

COUNTY APPROVED CHANGES

DESCRIPTION:	APPROVED BY:	DATE:

PRIVATE CONTRACT

SHEET 5 | COUNTY OF SAN DIEGO DEPARTMENT OF PUBLIC WORKS | 9 SHEETS

GRADING PLAN FOR:

SECTIONS

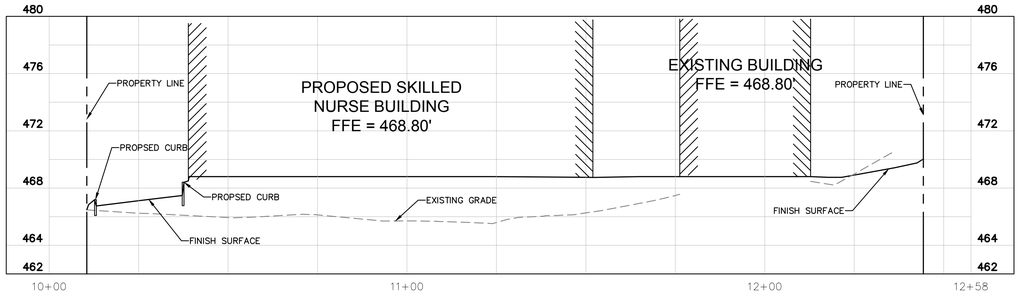
CALIFORNIA COORDINATE INDEX

APPROVED
DIRECTOR OF PUBLIC WORKS
BY:

ENGINEER OF WORK
R.C.E.

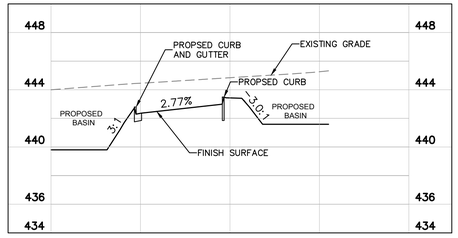
GRADING PERMIT NO:

DATE REVISED:



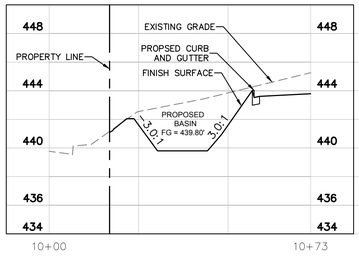
SECTION D-D:

SCALE: V: 1" = 5'
H: 1" = 20'



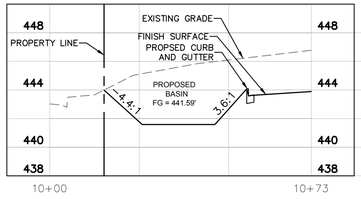
SECTION E-E:

SCALE: V: 1" = 5'
H: 1" = 20'



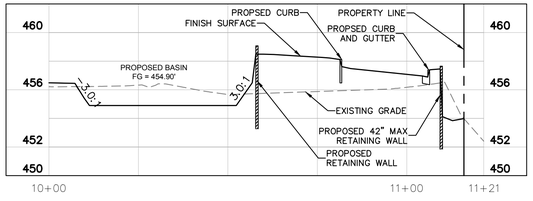
SECTION F-F:

SCALE: V: 1" = 5'
H: 1" = 20'



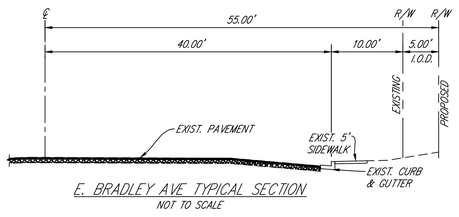
SECTION H-H:

SCALE: V: 1" = 5'
H: 1" = 20'

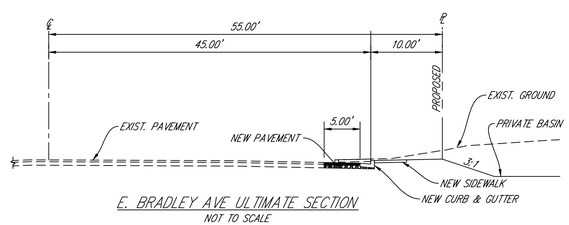


SECTION I-I:

SCALE: V: 1" = 5'
H: 1" = 20'



E. BRADLEY AVE TYPICAL SECTION
NOT TO SCALE



E. BRADLEY AVE ULTIMATE SECTION
NOT TO SCALE

811
Know what's **below.**
Call before you dig.
UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA

DIAL TOLL FREE
811
AT LEAST TWO DAYS
BEFORE YOU DIG

REV.	SYMBOL	DESCRIPTION OF CHANGE	R.C.E.	DATE	P.D.E.	DATE

DESIGNED BY: SL DATE
DRAWN BY: SL DATE
CHECKED BY: KK DATE

ENGINEER'S SEAL

PREPARED BY:

KYLE KOIVUNIEMI, PE
REGISTERED ENGINEER

58449
RCE NUMBER

COUNTY APPROVED CHANGES

DESCRIPTION:	APPROVED BY:	DATE:

PRIVATE CONTRACT

SHEET **6** | COUNTY OF SAN DIEGO DEPARTMENT OF PUBLIC WORKS | **9** SHEETS

GRADING PLAN FOR:

SECTIONS

CALIFORNIA COORDINATE INDEX

APPROVED
DIRECTOR OF PUBLIC WORKS
BY:

ENGINEER OF WORK
R.C.E.

GRADING PERMIT NO:

DATE REVISED:

ENGINEER'S NOTES:

1. FIRE ACCESS ROADWAY SHALL BE DESIGNED, CONSTRUCTED AND MAINTAINED TO MEET THE 94,000 POUND, ALL-WEATHER REQUIREMENT.
2. ALL VEGETATION AND OTHER OBSTRUCTIONS OVERHANGING A FIRE ACCESS ROADWAY SHALL BE MAINTAINED TO A CLEAR HEIGHT OF 13'-6".

LEGEND

- PROPERTY LINE
- CENTER LINE
- EASEMENT OR SETBACK LINE
- CIVIL LIMIT OF WORK LINE
- LIMITS OF FIRE TRUCK TURN
- CONCRETE SITEWALK PAVEMENT.
- HEAVY DUTY ASPHALT PAVEMENT.
- PROPOSED FIRE HYDRANT.
- FIRE LANE RED CURB

811 Know what's below. Call before you dig.

DIAL TOLL FREE
811
AT LEAST TWO DAYS BEFORE YOU DIG
UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA

REV.	SYMBOL	DESCRIPTION OF CHANGE	R.C.E.	DATE	P.D.E.	DATE

DESIGNED BY: SL DATE
DRAWN BY: SL DATE
CHECKED BY: KK DATE

ENGINEER'S SEAL

PREPARED BY:

KYLE KOIVUNIEMI, PE
REGISTERED ENGINEER
58449
RCE NUMBER

COUNTY APPROVED CHANGES

DESCRIPTION:	APPROVED BY:	DATE:

PRIVATE CONTRACT

SHEET 7 | COUNTY OF SAN DIEGO DEPARTMENT OF PUBLIC WORKS | 9 SHEETS

GRADING PLAN FOR:

AUTOTURN EXHIBIT

CALIFORNIA COORDINATE INDEX

APPROVED DIRECTOR OF PUBLIC WORKS BY:

ENGINEER OF WORK R.C.E.

GRADING PERMIT NO:

DATE REVISED:

BRADLEY AVENUE

DMA AND BIOFILTRATION BASIN EXHIBIT

WATER QUALITY BASIN INSTALLATION NOTES:

1. 3 INCHES OF WELL-AGED, SHREDDED HARDWOOD MULCH.
2. AN UNDERDRAIN CLEANOUT WITH A MINIMUM 6-INCH DIAMETER AND LOCKABLE CAP IS PLACED EVERY 250 TO 300FEET AS REQUIRED BASED ON UNDERDRAIN LENGTH.
3. VEGETATION USED SHOULD BE SUITABLE FOR THE CLIMATE PER LANDSCAPE PLANS
4. FILTER COARSE IS A MINIMUM OF 6 INCHES PROVIDED IN TWO SEPARATE 3 INCH LAYERS. THE TOP LAYER SHALL BE MADE OF ASTM C33 CHOKER SAND AND THE BOTTOM LAYER BE OF ASTM NO. 8 AGGREGATE. MARKERS STAKES SHALL BE USED TO ENSURE UNIFORM LIFT THICKNESS.
5. AASHTO NO. 57 STONE OR CLASS 2 PERMEABLE PER CAL TRANS SPECIFICATION 68-1.025 IS RECOMMENDED FOR THE AGGREGATE STORAGE LAYER. WASHED, OPEN-GRADED CRUSHED ROCK MAY BE USED, HOWEVER, A 4 INCH MINIMUM WASHED PEA GRAVEL FILTER COURSE LAYER AT THE TOP OF THE CRUSHED ROCK IS REQUIRED.
6. IMPERMEABLE LINER SHALL BE INSTALLED WHEN THE BIOFILTRATION BASIN IS WITHIN 10 FEET OF RETAINING WALLS OR BUILDING FOUNDATIONS, OR AS RECOMMENDED BY THE SOILS ENGINEER, OR REQUIRED BY THESE PLANS. IMPERMEABLE LINER SHALL BE 30 MIL THICK (PER COUNTY OF SAN DIEGO GREEN STREETS DESIGN STANDARD DRAWING GS-3.00 AND COUNTY GREEN STREETS SUPPLEMENT TO CAL TRANS SPECIFICATIONS 20-11.08B) CONFIGURED TO ENTIRELY ENCOMPASS THE SIDES OF THE WATER QUALITY BASIN.
7. IMPERMEABLE LINER BE CONSTRUCTED IN COMPLIANCE WITH THE COUNTY OF SAN DIEGO GREEN STREETS SUPPLEMENT TO CAL TRANS SPECIFICATIONS 20-11.08B.
8. BIOFILTRATION SOIL MEDIA LAYER (BSM) SHALL CONSIST OF 60% TO 80% BY VOLUME SAND, UP TO 20% BY VOLUME TOPSOIL, AND UP 20% BY VOLUME COMPOST (PER COUNTY OF SAN DIEGO BMP DESIGN MANUAL SEPTEMBER 2020 APPENDIX F.2 SECTION 803-2 BLENDED BSM CRITERIA AND TESTING REQUIREMENTS) PLACED IN 6" LIFTS AND COMPACTED WITH WATER PRIOR TO THE NEXT LIFT. INITIAL PERMEABILITY SHALL BE 8" PER HOUR (WITH ASSUMED STABILIZED PERMEABILITY OF 5" PER HOUR).
9. THE AGGREGATE STORAGE LAYER SHALL BE COMPACTED IN ACCORDANCE WITH SOILS ENGINEER'S RECOMMENDATIONS.
10. OVERFLOW STRUCTURE TO HAVE A MINIMUM OF 12 INCHES OF FREEBOARD.
11. ALL LINER INSTALLATIONS, FIELD WELDING OF SEAMS, AND OBSERVATION OF SOIL MIX PLACEMENT SHALL REQUIRE SPECIAL INSPECTION BY THE PROJECT GEOTECHNICAL ENGINEER OR OTHER QUALIFIED PERSON. A LETTER CERTIFYING PROPER INSTALLATION SHALL BE PROVIDED TO THE ENGINEER OF RECORD TO ACCEPTANCE OF THE FACILITIES.
12. SPECIAL INSPECTION SHALL BE REQUIRED FOR CONSTRUCTION OF ALL BIOFILTRATION BASINS. INSPECTION SHALL BE PERFORMED BY A QUALIFIED INDIVIDUAL (SUCH AS: ENGINEER OF RECORD, QSD). INSPECTION SHALL INCLUDE:
    - VERIFICATION OF OVERALL DIMENSIONS PRIOR TO PLACEMENT OF MATERIALS;
    - PLACEMENT OF THE LINER, IF REQUIRED;AND SEAMS OR PENETRATIONS
    - PLACEMENT OF THE GRAVEL, FILTER MATERIALS, AND FILTER MEDIA;
    - ALL INLET AND OUTLET STRUCTURES INCLUDING UNDERDRAINS, IF REQUIRED.
    - CONTRACTOR SHALL TAKE PICTURES AT EACH STAGE OF INSTALLATION AND SUBMITTED TO ENGINEER FOR VERIFICATION OF INSTALL.

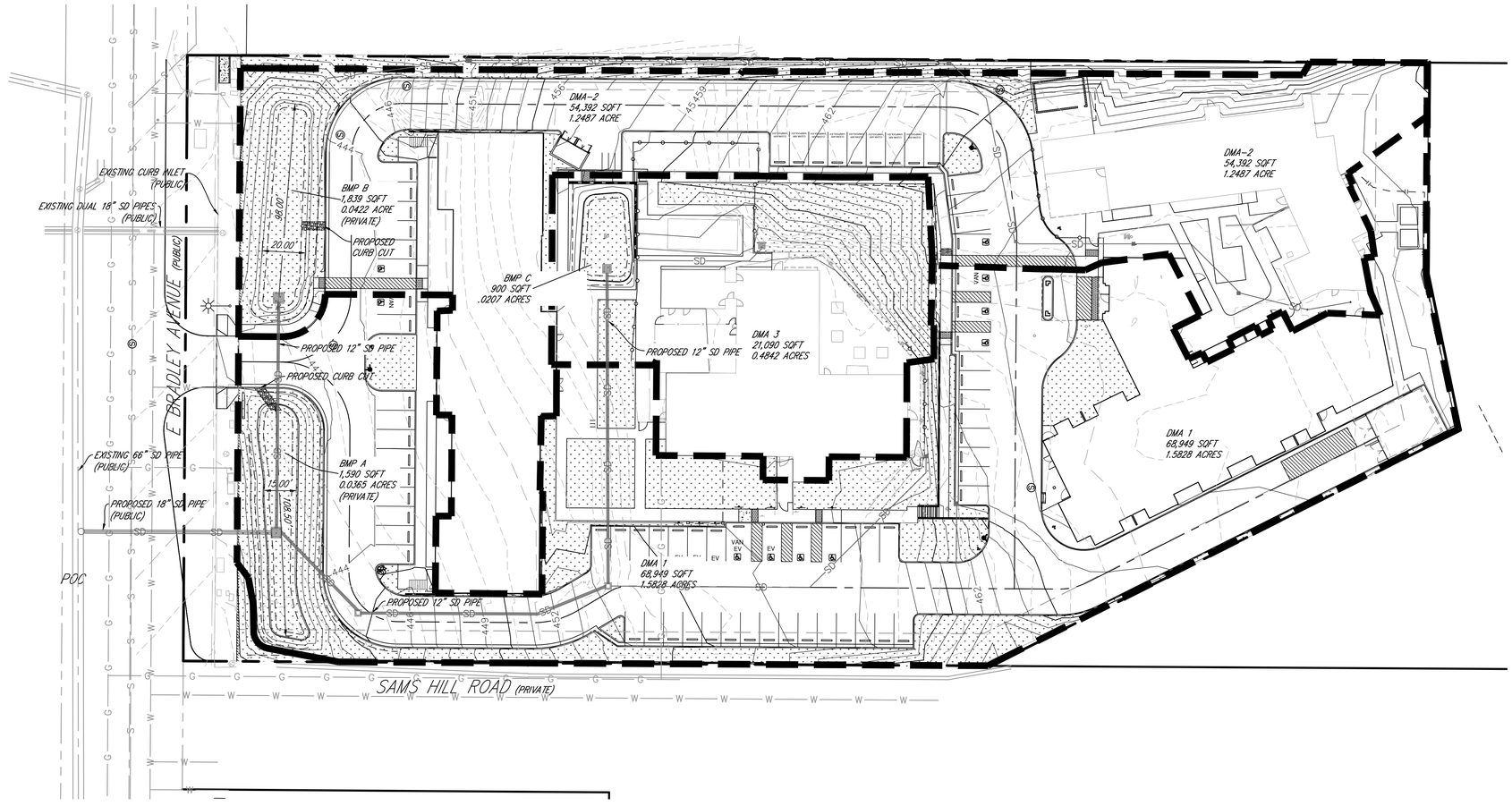
    INSPECTOR SHALL BE GIVEN A MINIMUM OF 48 HOURS PRIOR TO INSPECTION. UPON COMPLETION THE INSPECTOR SHALL PROVIDE A CERTIFICATION TO THE ENGINEER OF WORK.
13. PROPOSED MATERIALS, SUCH AS AGGREGATE, FILTER MATERIAL, AND FILTER MEDIA SHALL BE SUBMITTED TO THE ENGINEER OF WORK FOR APPROVAL.

SELF-MITIGATING DMAS:

- VEGETATION IN THE NATURAL OR LANDSCAPED AREA IS NATIVE AND/OR NON-NATIVE/NON-INVASIVE DROUGHT TOLERANT SPECIES THAT DO NOT REQUIRE REGULAR APPLICATION OF FERTILIZERS AND PESTICIDES.
- SOILS ARE UNDISTURBED NATIVE TOPSOIL, OR DISTURBED SOILS THAT HAVE BEEN AMENDED AND AERATED TO PROMOTE WATER RETENTION CHARACTERISTICS EQUIVALENT TO UNDISTURBED NATIVE TOPSOIL.
- THE INCIDENTAL IMPERVIOUS AREAS ARE LESS THAN 5 PERCENT OF THE SELF-MITIGATING AREA.
- IMPERVIOUS AREA WITHIN THE SELF-MITIGATED AREA SHOULD NOT BE HYDRAULICALLY CONNECTED TO OTHER IMPERVIOUS AREAS UNLESS IT IS A STORM WATER CONVEYANCE SYSTEM (SUCH AS A BROW DITCH).
- THE SELF-MITIGATING AREA IS HYDRAULICALLY SEPARATE FROM DMAS THAT CONTAIN PERMANENT STORM WATER POLLUTANT CONTROL BMPS.

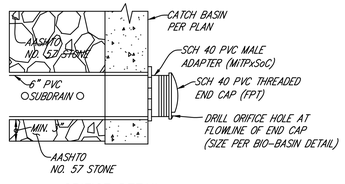
HYDROLOGIC SOIL GROUP

THE HYDROLOGICAL SOIL GROUP FOR THIS SITE IS TYPE D.



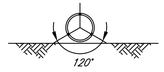
STRUCTURAL BIO-BASIN SUMMARY TABLE												
BMP NAME	TYPE OF BMP	EFFECTIVE AREA (SQFT)	A1 (INCH) WATER QUALITY	A2 (INCH) TOP OF BASIN	A3 (INCH) Q_{100} MAX HEIGHT	A4 (INCH) TOP OF RISER	C (INCH) MEDIA	D (INCH) GRAVEL	E (INCH) OFFSET	BOX RISER OVERFLOW STRUCTURE SIZE (INCHES)	ORIFICES DIAMETER UPPER (INCH)	ORIFICES DIAMETER LOWER (1/16 INCH)	IMPERMEABLE LINER ?
BMP-A	BIOFILTRATION	1,590	6	26	15	15	18	12	27	48X48	2X21	15	YES
BMP-B	BIOFILTRATION	1,839	6	24	13	12	18	12	27	48X48	1X36	17	YES
BMP-C	BIOFILTRATION	900	6	12	10	9	18	12	27	24X24	-	12	YES

DRAINAGE MANAGEMENT AREA							
DMA ID	DMA TYPE	OUTLET	IMPERVIOUS AREA (SQFT)	PERVIOUS AREA (SQFT)	TOTAL (SQFT)	TOTAL (ACRES)	% IMP
DMA-1	DRAINS TO BMP	BMP-1	47,865	21,084	68,949	1.583	69
DMA-2	DRAINS TO BMP	BMP-2	41,177	13,215	54,392	1.249	76
DMA-3	DRAINS TO BMP	BMP-3	12,221	8,869	21,090	0.484	58



ORIFICE DETAIL

NOT TO SCALE



6" PVC PIPE PERFORATION LAYOUT DETAIL

NOT TO SCALE

Q:\21\13046\GRP\GP\note.bmp

DETAIL
"NO DUMPING" AT CATCH BASINS

NOTE: ALL CATCH BASINS WITH GRATES SHALL BE STENCILED WITH CITY REQUIRED ITEM PER ABOVE DETAIL:

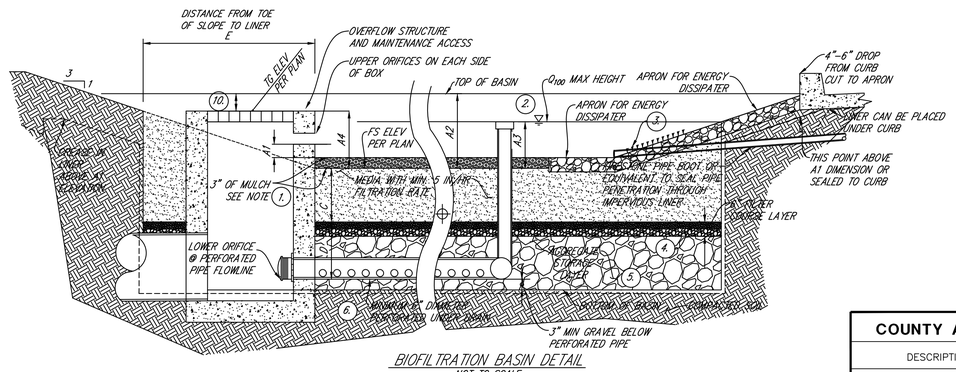
(DAS MANUFACTURING #SDO OR EQUIVALENT)

PERMANENT WATER QUALITY TREATMENT FACILITY

KEEPING OUR WATER WAYS CLEAN
MAINTAIN WITH CARE - NO MODIFICATIONS WITHOUT AGENCY APPROVAL

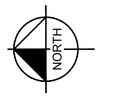
DETAIL
WATER QUALITY SIGN- PLACED AT EACH BIOFILTRATION BASIN

NOTE: ALL BIOFILTRATION AREAS WILL HAVE A SIGN POSTED TO BE VISIBLE AT ALL TIMES.



BIOFILTRATION BASIN DETAIL

NOT TO SCALE



GRAPHIC SCALE IN FEET
0 15 30 60

COUNTY APPROVED CHANGES		
DESCRIPTION:	APPROVED BY:	DATE:

PRIVATE CONTRACT

SHEET	COUNTY OF SAN DIEGO DEPARTMENT OF PUBLIC WORKS	SHEETS
8		9

GRADING PLAN FOR:

DMA AND BIOFILTRATION BASIN EXHIBIT

CALIFORNIA COORDINATE INDEX

APPROVED DIRECTOR OF PUBLIC WORKS BY:

ENGINEER OF WORK

R.C.E.

GRADING PERMIT NO:

811 Know what's below. Call before you dig.

DIAL TOLL FREE 811

AT LEAST TWO DAYS BEFORE YOU DIG

UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA

REV.	SYMBOL	DESCRIPTION OF CHANGE	R.C.E.	DATE	P.D.E.	DATE

DESIGNED BY: SL DATE

DRAWN BY: SL DATE

CHECKED BY: KK DATE

ENGINEER'S SEAL

PREPARED BY:

KYLE KOIVUNIEMI, PE
REGISTERED ENGINEER

58449
RCE NUMBER

DATE REVISED:

3.0 Cover Sheet and General Requirements

- Standard SWQMP Form Table 2 and PDP SWQMP Form Table 3 require the identification of pollutant-generating sources and associated BMPs for development projects.

- In some cases, County staff may request additional, more detailed documentation of source control BMP design details. If requested, applicants must submit a completed copy of this Source Control BMP Worksheet. This requirement can be satisfied either by submitting a copy of BMPDM Attachment E.1 (Source Control BMP Requirements) or equivalent documentation at the County's discretion.

- Submit this documentation using this cover sheet.

- Sources and BMPs must also be shown as applicable on DMA exhibits and construction plans (see Attachment 2).

Appendix

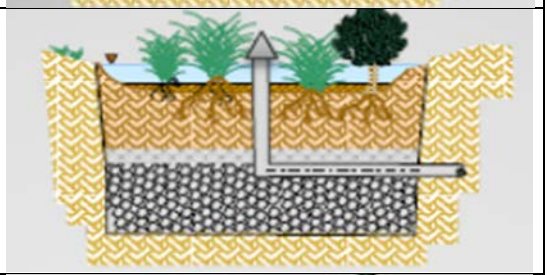
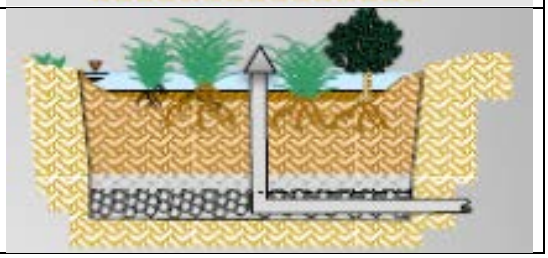
E

BMP Design Fact Sheets

Appendix E BMP Design Fact Sheets

The following fact sheets were developed to assist the project applicants with designing BMPs to meet the storm water obligations. The Fact Sheet Quick Guide on the next page summarizes the layout and type of information contained in each fact sheet.

BMP Comparison Table

BMP Type	Soil Media	Underdrain present?	Bottom Liner Present ?	Typical Design
Infiltration (INF-1)	Optional	No	No	
Bioretention (INF-2)	BSM	No	No	
Biofiltration with Partial Retention (PR-1)	BSM	Yes- Optional	No	
Biofiltration (BF-1)	BSM	Yes	Yes	

E.1 Fact Sheet Quick Guide

BF-1 Biofiltration (1)

Location: 43rd Street and Logan Avenue, San Diego, California (3)

MS4 Permit Category (2)
Biofiltration

Manual Category
Biofiltration

Applicable Performance Standard
Pollutant Control
Flow Control

Primary Benefits
Treatment

Description (4)

Biofiltration (Bioretention with underdrain) facilities are vegetated surface water systems that filter water through vegetation, and soil or engineered media prior to discharge via underdrain or overflow to the downstream conveyance system.

Fact Sheet Key	
1	Best Management Practice (BMP) Title
2	Categories, Standards, and Benefits
3	BMP Image
4	Main Content; Categories Include: •Description •Design Adaptations for Project Goals •Recommended Siting Criteria •Recommended BMP Component Dimensions •Design Criteria and Considerations •Conceptual Design and Sizing Approach for o Site Design o Storm Water Pollutant Control Only o Integrated Storm Water Pollutant Control and Flow Control •Maintenance Overview •Summary of Standard Inspection and Maintenance

E.2 Source Control BMP Requirements

Worksheet E.1-1: Source Control BMP Requirements

How to comply: Projects must comply with this requirement by implementing all source control BMPs listed in this section that are applicable and feasible for their project. Applicability must be determined through consideration of the development project's features and anticipated pollutant sources. Appendix E.2 provides guidance for identifying source control BMPs applicable to a project. The Standard and PDP SWQMP templates include sections that must be used to document compliance with source control BMP requirements.

How to use this worksheet:

1. Review Column 1 and identify which of these potential sources of storm water pollutants apply to your site. Check each box that applies.
2. Review Column 2 and incorporate all of the corresponding applicable BMPs in your project site plan.
3. Review Columns 3 and 4 and incorporate all of the corresponding applicable permanent controls and operational BMPs in a table in your project-specific storm water management report. Describe your specific BMPs in an accompanying narrative, and explain any special conditions or situations that required omitting BMPs or substituting alternatives.

If These Sources Will Be on the Project Site …	… Then Your SWQMP Must Consider These Source Control BMPs		
1 **Potential Sources of Runoff Pollutants**	2 **Permanent Controls—Show on Drawings**	3 **Permanent Controls—List in Table and Narrative**	4 **Operational BMPs—Include in Table and Narrative**
☒ **A.** Onsite storm drain inlets ☐ Not Applicable	☒ Locations of inlets.	☒ Mark all inlets with the words "No Dumping! Flows to Bay" or similar. See stencil template provided in Appendix I-4	☒ Maintain and periodically repaint or replace inlet markings. ☒ Provide storm water pollution prevention information to new site owners, lessees, or operators. ☐ See applicable operational BMPs in Fact Sheet SC-44, "Drainage System Maintenance," in the CASQA Storm Water Quality Handbooks at https://www.casqa.org/resources/bmp-handbooks ☒ Include the following in lease agreements: "Tenant shall not allow anyone to discharge anything to storm drains or to store or deposit materials so as to create a potential discharge to storm drains."

If These Sources Will Be on the Project Site …	… Then Your SWQMP must consider These Source Control BMPs		
1 **Potential Sources of Runoff Pollutants**	2 **Permanent Controls—Show on Drawings**	3 **Permanent Controls—List in Table and Narrative**	4 **Operational BMPs—Include in Table and Narrative**
❑ **B.** Interior floor drains and elevator shaft sump pumps ☒ Not Applicable		❑ State that interior floor drains and elevator shaft sump pumps will be plumbed to sanitary sewer.	❑ Inspect and maintain drains to prevent blockages and overflow.
❑ **C.** Interior parking garages ☒ Not Applicable		❑ State that parking garage floor drains will be plumbed to the sanitary sewer.	❑ Inspect and maintain drains to prevent blockages and overflow.
☒ **D1.** Need for future indoor & structural pest control ❑ Not Applicable		❑ Note building design features that discourage entry of pests.	☒ Provide Integrated Pest Management information to owners, lessees, and operators.

If These Sources Will Be on the Project Site …	… Then Your SWQMP must consider These Source Control BMPs		
1 **Potential Sources of Runoff Pollutants**	**2** **Permanent Controls—Show on Drawings**	**3** **Permanent Controls—List in Table and Narrative**	**4** **Operational BMPs—Include in Table and Narrative**
☒ **D2.** Landscape/ Outdoor Pesticide Use ❑ Not Applicable	☒ Show locations of existing trees or areas of shrubs and ground cover to be undisturbed and retained. ❑ Show self-retaining landscape areas, if any. ☒ Show storm water treatment facilities.	State that final landscape plans will accomplish all of the following. ☒ Preserve existing drought tolerant trees, shrubs, and ground cover to the maximum extent possible. ☒ Design landscaping to minimize irrigation and runoff, to promote surface infiltration where appropriate, and to minimize the use of fertilizers and pesticides that can contribute to storm water pollution. ☒ Where landscaped areas are used to retain or detain storm water, specify plants that are tolerant of periodic saturated soil conditions. ☒ Consider using pest-resistant plants, especially adjacent to hardscape. ☒ To ensure successful establishment, select plants appropriate to site soils, slopes, climate, sun, wind, rain, land use,	☒ Maintain landscaping using minimum or no pesticides. ❑ See applicable operational BMPs in Fact Sheet SC-41, "Building and Grounds Maintenance," in the CASQA Storm Water Quality Handbooks at https://www.casqa.org/resources/bmp-handbooks ❑ Provide IPM information to new owners, lessees and operators.

If These Sources Will Be on the Project Site …	… Then Your SWQMP must consider These Source Control BMPs		
1 **Potential Sources of Runoff Pollutants**	2 **Permanent Controls—Show on Drawings**	3 **Permanent Controls—List in Table and Narrative**	4 **Operational BMPs—Include in Table and Narrative**
❑ **E.** Pools, spas, ponds, decorative fountains, and other water features. ☒ Not Applicable	❑ Show location of water feature and a sanitary sewer cleanout in an accessible area within 10 feet.	❑ If the local municipality requires pools to be plumbed to the sanitary sewer, place a note on the plans and state in the narrative that this connection will be made according to local requirements.	❑ See applicable operational BMPs in Fact Sheet SC-72, "Fountain and Pool Maintenance," in the CASQA Storm Water Quality Handbooks at https://www.casqa.org/resources/bmp-handbooks
☒ **F.** Food service ❑ Not Applicable	☒ For restaurants, grocery stores, and other food service operations, show location (indoors or in a covered area outdoors) of a floor sink or other area for cleaning floor mats, containers, and equipment. ☒ On the drawing, show a note that this drain will be connected to a grease interceptor before discharging to the sanitary sewer.	☒ Describe the location and features of the designated cleaning area. ❑ Describe the items to be cleaned in this facility and how it has been sized to ensure that the largest items can be accommodated.	

If These Sources Will Be on the Project Site …	… Then Your SWQMP must consider These Source Control BMPs		
1 **Potential Sources of**	2 **Permanent Controls—Show on Drawings**	3 **Permanent Controls—List in Table and Narrative**	4 **Operational BMPs—Include in Table and Narrative**
☒ **G.** Refuse areas ☐ Not Applicable	☒ Show where site refuse and recycled materials will be handled and stored for pickup. See local municipal requirements for sizes and other details of refuse areas. ☒ If dumpsters or other receptacles are outdoors, show how the designated area will be covered, graded, and paved to prevent run-on and show locations of berms to prevent runoff from the area. Also show how the designated area will be protected from wind dispersal. ☒ Any drains from dumpsters, compactors, and tallow bin areas must be connected to a grease removal device before discharge to sanitary sewer.	☒ State how site refuse will be handled and provide supporting detail to what is shown on plans. ☒ State that signs will be posted on or near dumpsters with the words "Do not dump hazardous materials here" or similar.	☒ State how the following will be implemented: Provide adequate number of receptacles. Inspect receptacles regularly; repair or replace leaky receptacles. Keep receptacles covered. Prohibit/prevent dumping of liquid or hazardous wastes. Post "no hazardous materials" signs. Inspect and pick up litter daily and clean up spills immediately. Keep spill control materials available on- site. See Fact Sheet SC-34, "Waste Handling and Disposal" in the CASQA Storm Water Quality Handbooks at https://www.casqa.org/resources/bmp-handbooks

If These Sources Will Be on the Project Site …	… Then Your SWQMP must consider These Source Control BMPs		
1 **Potential Sources of Runoff Pollutants**	2 **Permanent Controls—Show on Drawings**	3 **Permanent Controls—List in Table and Narrative**	4 **Operational BMPs—Include in Table and Narrative Table and Narrative**
❑ **H.** Industrial processes. ☒ Not Applicable	❑ Show process area.	❑ If industrial processes are to be located onsite, state: "All process activities to be performed indoors. No processes to drain to exterior or to storm drain system."	❑ See Fact Sheet SC-10, "Non-Storm Water Discharges" in the CASQA Storm Water Quality Handbooks at https://www.casqa.org/resources/bmp-handbooks
❑ **I.** Outdoor storage of equipment or materials. (See rows J and K for source control measures for vehicle cleaning, repair, and maintenance.) ☒ Not Applicable	❑ Show any outdoor storage areas, including how materials will be covered. Show how areas will be graded and bermed to prevent run-on or runoff from area and protected from wind dispersal. ❑ Storage of non-hazardous liquids must be covered by a roof and/or drain to the sanitary sewer system, and be contained by berms, dikes, liners, or vaults. ❑ Storage of hazardous materials and wastes must be in compliance with the local hazardous materials ordinance and a Hazardous Materials Management Plan for the site.	❑ Include a detailed description of materials to be stored, storage areas, and structural features to prevent pollutants from entering storm drains. Where appropriate, reference documentation of compliance with the requirements of local Hazardous Materials Programs for: ▪ Hazardous Waste Generation ▪ Hazardous Materials Release Response and Inventory ▪ California Accidental Release Prevention Program ▪ Aboveground Storage Tank ▪ Uniform Fire Code Article 80 Section 103(b) & (c) 1991 ▪ Underground Storage Tank	❑ See the Fact Sheets SC-31, "Outdoor Liquid Container Storage" and SC-33, "Outdoor Storage of Raw Materials" in the CASQA Storm Water Quality Handbooks at https://www.casqa.org/resources/bmp-handbooks

If These Sources Will Be on the Project Site …	… Then Your SWQMP must consider These Source Control BMPs		
1 **Potential Sources of Runoff Pollutants**	2 **Permanent Controls—Show on Drawings**	3 **Permanent Controls—List in Table and Narrative**	4 **Operational BMPs—Include in Table and Narrative**
❑ **J.** Vehicle and Equipment Cleaning ☒ Not Applicable	❑ Show on drawings as appropriate: (1) Commercial/industrial facilities having vehicle /equipment cleaning needs must either provide a covered, bermed area for washing activities or discourage vehicle/equipment washing by removing hose bibs and installing signs prohibiting such uses. (2) Multi-dwelling complexes must have a paved, bermed, and covered car wash area (unless car washing is prohibited onsite and hoses are provided with an automatic shut- off to discourage such use). (3) Washing areas for cars, vehicles, and equipment must be paved, designed to prevent run-on to or runoff from the area, and plumbed to drain to the sanitary sewer. (4) Commercial car wash facilities must be designed such that no runoff from the facility is discharged to the storm drain system. Wastewater from the facility must discharge to the sanitary sewer, or a wastewater reclamation system must be installed.	❑ If a car wash area is not provided, describe measures taken to discourage onsite car washing and explain how these will be enforced.	Describe operational measures to implement the following (if applicable): ❑ Washwater from vehicle and equipment washing operations must not be discharged to the storm drain system. ❑ Car dealerships and similar may rinse cars with water only. ❑ See Fact Sheet SC-21, "Vehicle and Equipment Cleaning," in the CASQA Storm Water Quality Handbooks at https://www.casqa.org/resources/bmp-handbooks

If These Sources Will Be on the Project Site …	… Then Your SWQMP must consider These Source Control BMPs		
1 **Potential Sources of Runoff Pollutants**	2 **Permanent Controls—Show on Drawings**	3 **Permanent Controls—List in Table and Narrative**	4 **Operational BMPs—Include in Table and Narrative**
❑ **K.** Vehicle/Equipment Repair and Maintenance ☒ Not Applicable	❑ Accommodate all vehicle equipment repair and maintenance indoors. Or designate an outdoor work area and design the area to protect from rainfall, run-on runoff, and wind dispersal. ❑ Show secondary containment for exterior work areas where motor oil, brake fluid, gasoline, diesel fuel, radiator fluid, acid-containing batteries or other hazardous materials or hazardous wastes are used or stored. Drains must not be installed within the secondary containment areas. ❑ Add a note on the plans that states either (1) there are no floor drains, or (2) floor drains are connected to wastewater pretreatment systems prior to discharge to the sanitary sewer and an industrial waste discharge permit will be obtained.	❑ State that no vehicle repair or maintenance will be done outdoors, or else describe the required features of the outdoor work area. ❑ State that there are no floor drains or if there are floor drains, note the agency from which an industrial waste discharge permit will be obtained and that the design meets that agency's requirements. ❑ State that there are no tanks, containers or sinks to be used for parts cleaning or rinsing or, if there are, note the agency from which an industrial waste discharge permit will be obtained and that the design meets that agency's requirements.	In the report, note that all of the following restrictions apply to use the site: ❑ No person must dispose of, nor permit the disposal, directly or indirectly of vehicle fluids, hazardous materials, or rinsewater from parts cleaning into storm drains. ❑ No vehicle fluid removal must be performed outside a building, nor on asphalt or ground surfaces, whether inside or outside a building, except in such a manner as to ensure that any spilled fluid will be in an area of secondary containment. Leaking vehicle fluids must be contained or drained from the vehicle immediately. ❑ No person must leave unattended drip parts or other open containers containing vehicle fluid, unless such containers are in use or in an area of secondary containment.

If These Sources Will Be on the Project Site …	… Then Your SWQMP must consider These Source Control BMPs		
1 **Potential Sources of Runoff Pollutants**	2 **Permanent Controls—Show on Drawings**	3 **Permanent Controls—List in Table and Narrative**	4 **Operational BMPs—Include in Table and Narrative**
❑ **L.** Fuel Dispensing Areas ☒ Not Applicable	❑ Fueling areas[2] must have impermeable floors (i.e., portland cement concrete or equivalent smooth impervious surface) that are (1) graded at the minimum slope necessary to prevent ponding; and (2) separated from the rest of the site by a grade break that prevents run-on of storm water to the MEP. ❑ Fueling areas must be covered by a canopy that extends a minimum of ten feet in each direction from each pump. [Alternative: The fueling area must be covered and the cover's minimum dimensions must be equal to or greater than the area within the grade break or fuel dispensing area1.] The canopy [or cover] must not drain onto the fueling area.		❑ The property owner must dry sweep the fueling area routinely. ❑ See the Business Guide Sheet, "Automotive Service—Service Stations" in the CASQA Storm Water Quality Handbooks at https://www.casqa.org/resources/bmp-handbooks

[2] The fueling area must be defined as the area extending a minimum of 6.5 feet from the corner of each fuel dispenser or the length at which the hose and nozzle assembly may be operated plus a minimum of one foot, whichever is greater.

If These Sources Will Be on the Project Site …	… Then Your SWQMP must consider These Source Control BMPs		
1 **Potential Sources of Runoff Pollutants**	**2** **Permanent Controls—Show on Drawings**	**3** **Permanent Controls—List in Table and Narrative**	**4** **Operational BMPs—Include in Table and Narrative**
M. Loading Docks ☒ Not Applicable	❑ Show a preliminary design for the loading dock area, including roofing and drainage. Loading docks must be covered and/or graded to minimize run-on to and runoff from the loading area. Roof downspouts must be positioned to direct storm water away from the loading area. Water from loading dock areas should be drained to the sanitary sewer where feasible. Direct connections to storm drains from depressed loading docks are prohibited. ❑ Loading dock areas draining directly to the sanitary sewer must be equipped with a spill control valve or equivalent device, which must be kept closed during periods of operation. ❑ Provide a roof overhang over the loading area or install door skirts (cowling) at each bay that enclose the end of the trailer.		❑ Move loaded and unloaded items indoors as soon as possible. ❑ See Fact Sheet SC-30, "Outdoor Loading and Unloading," in the CASQA Storm Water Quality Handbooks at https://www.casqa.org/resources/bmp-handbooks

If These Sources Will Be on the Project Site …	… Then Your SWQMP must consider These Source Control BMPs		
1 **Potential Sources of Runoff Pollutants**	2 **Permanent Controls—Show on Drawings**	3 **Permanent Controls—List in Table and Narrative**	4 **Operational BMPs—Include in Table and Narrative**
☒ **N.** Fire Sprinkler Test Water ☐ Not Applicable		☒ Provide a means to drain fire sprinkler test water to the sanitary sewer.	☒ See the note in Fact Sheet SC-41, "Building and Grounds Maintenance," in the CASQA Storm Water Quality Handbooks at https://www.casqa.org/resources/bmp-handbooks
O. Miscellaneous Drain or Wash Water ☐ Boiler drain lines ☒ Condensate drain lines ☒ Rooftop equipment ☒ Drainage sumps ☒ Roofing, gutters, and trim ☐ Not Applicable		☐ Boiler drain lines must be directly or indirectly connected to the sanitary sewer system and may not discharge to the storm drain system. ☒ Condensate drain lines may discharge to landscaped areas if the flow is small enough that runoff will not occur. Condensate drain lines may not discharge to the storm drain system. ☒ Rooftop mounted equipment with potential to produce pollutants must be roofed and/or have secondary containment. ☒ Any drainage sumps onsite must feature a sediment sump to reduce the quantity of sediment in pumped water. ☒ Avoid roofing, gutters, and trim made of copper or other unprotected metals that may leach into runoff.	

If These Sources Will Be on the Project Site …	… Then Your SWQMP must consider These Source Control BMPs		
1 **Potential Sources of Runoff Pollutants**	2 **Permanent Controls—Show on Drawings**	3 **Permanent Controls—List in Table and Narrative**	4 **Operational BMPs—Include in Table and Narrative**
☒ **P.** Plazas, sidewalks, and parking lots. ☐ Not Applicable			☒ Plazas, sidewalks, and parking lots must be swept regularly to prevent the accumulation of litter and debris. Debris from pressure washing must be collected to prevent entry into the storm drain system. Washwater containing any cleaning agent or degreaser must be collected and discharged to the sanitary sewer and not discharged to a storm drain.

E.14 BF-1 Biofiltration

Location: 43rd Street and Logan Avenue, San Diego, California

MS4 Permit Category
Biofiltration

Manual Category
Biofiltration

Applicable Performance Standard
Pollutant Control
Flow Control

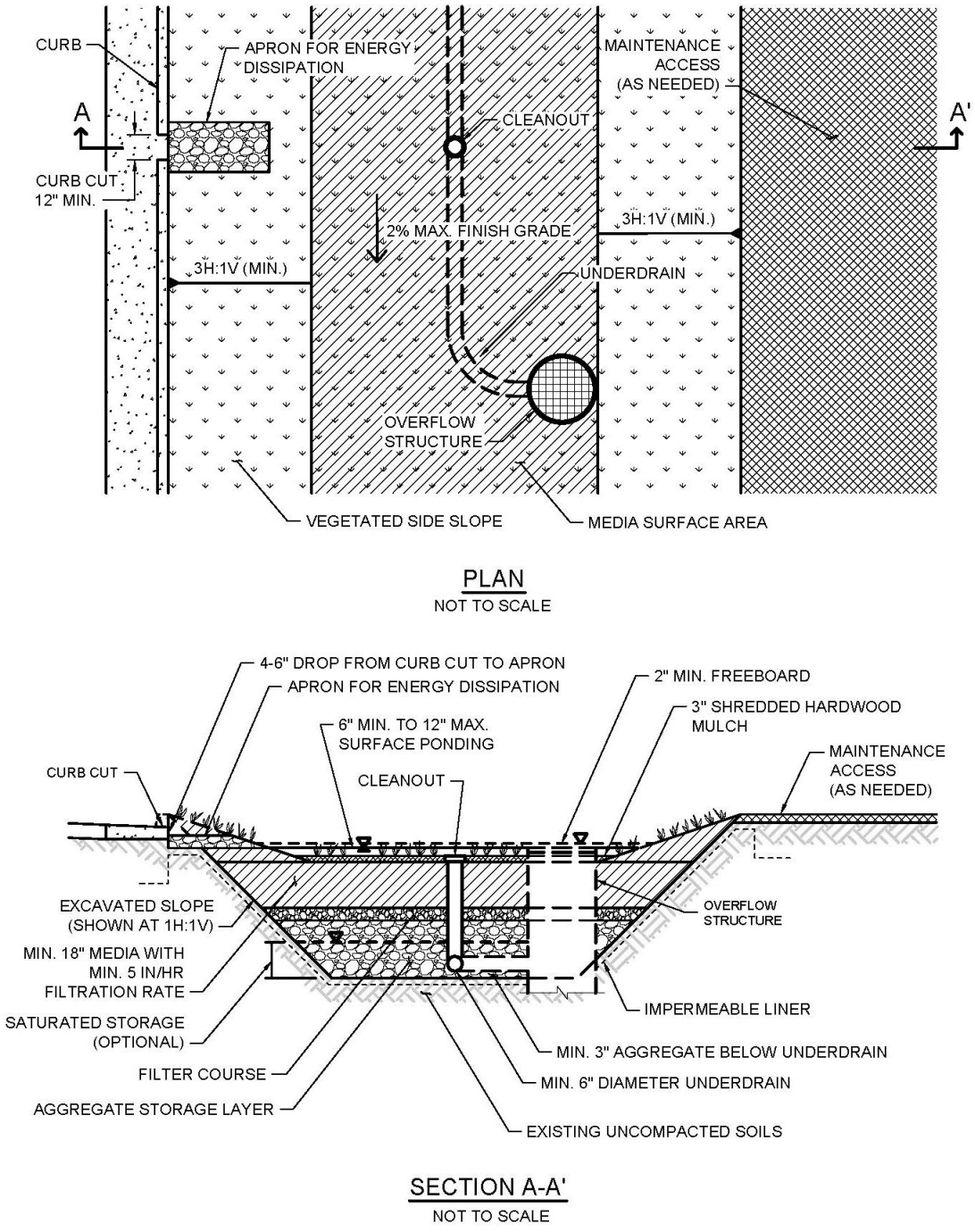
Primary Benefits
Treatment
Volume Reduction (Incidental)
Peak Flow Attenuation (Optional)

Description

Biofiltration (Bioretention with underdrain) facilities are vegetated surface water systems that filter water through vegetation, and soil or engineered media prior to discharge via underdrain or overflow to the downstream conveyance system. Bioretention with underdrain facilities are commonly incorporated into the site within parking lot landscaping, along roadsides, and in open spaces. Because these types of facilities have limited or no infiltration, they are typically designed to provide enough hydraulic head to move flows through the underdrain connection to the storm drain system. Treatment is achieved through filtration, sedimentation, sorption, biochemical processes and plant uptake.

Typical biofiltration components include:

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



Typical plan and Section view of a Biofiltration BMP

Design Adaptations for Project Goals

Biofiltration Treatment BMP for storm water pollutant control. The system is lined or un-lined to provide incidental infiltration, and an underdrain is provided at the bottom to carry away filtered runoff. This configuration is considered to provide biofiltration treatment via flow through the media

layer. Storage provided above the underdrain within surface ponding, media, and aggregate storage is considered included in the biofiltration treatment volume. Saturated storage within the aggregate storage layer can be added to this design by raising the underdrain above the bottom of the aggregate storage layer or via an internal weir structure designed to maintain a specific water level elevation.

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

Recommended Siting Criteria

	Siting Criteria	*Intent/Rationale*
☐	Placement observes geotechnical recommendations regarding potential hazards (e.g., slope stability, landslides, liquefaction zones) and setbacks (e.g., slopes, foundations, utilities).	Must not negatively impact existing site geotechnical concerns.
☐	An impermeable liner or other hydraulic restriction layer is included if site constraints indicate that infiltration or lateral flows should not be allowed.	Lining prevents storm water from impacting groundwater and/or sensitive environmental or geotechnical features. Incidental infiltration, when allowable, can aid in pollutant removal and groundwater recharge.
☐	The thickness of the Impermeable Liner shall be 30 MIL per County Green Streets Design Standard Drawing GS-3.00 and County Green Streets Supplement to Caltrans Specifications 20-11.08B.	Considerations when choosing an Impermeable Liner may include placement methods, media and underlying soil characteristics, and intended design life among others.
☐	Contributing tributary area must be ≤ 5 acres (≤ 1 acre preferred).	Bigger BMPs require additional design features for proper performance. Contributing tributary area greater than 5 acres may be allowed at the discretion of County staff if the following conditions are met: 1) incorporate design features (e.g. flow spreaders) to minimize short circuiting of flows in the BMP and 2) incorporate additional design features requested by County staff for proper performance of the regional BMP.

Siting Criteria		*Intent/Rationale*
☐	Finish grade of the facility is ≤ 2%.	Flatter surfaces reduce erosion and channelization within the facility.

Design Criteria and Considerations

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

Siting and Design		*Intent/Rationale*
Surface Ponding		
☐	Surface ponding is limited to a 24-hour drawdown time.	Surface ponding limited to 24 hour for plant health. Surface ponding drawdown time greater than 24-hours but less than 96 hours may be allowed at the discretion of County staff if certified by a landscape architect or agronomist.
☐	Surface ponding depth is ≥ 6 and ≤ 12 inches.	Surface ponding capacity lowers subsurface storage requirements. Deep surface ponding raises safety concerns. Surface ponding depth greater than 12 inches (for additional pollutant control or surface outlet structures or flow-control orifices) may be allowed at the discretion of County staff if the following conditions are met: 1) surface ponding depth drawdown time is less than 24 hours; and 2) safety issues and fencing requirements are considered (typically ponding greater than 18" will require a fence and/or flatter side slopes) and 3) potential for elevated clogging risk is considered.
☐	A minimum of 2 inches of freeboard is provided.	Freeboard provides room for head over overflow structures and minimizes risk of uncontrolled surface discharge.
☐	Side slopes are stabilized with vegetation and are = 3H:1V or shallower.	Gentler side slopes are safer, less prone to erosion, able to establish vegetation more quickly and easier to maintain.

	Siting and Design	*Intent/Rationale*
Vegetation		
☐	Plantings are suitable for the climate and expected ponding depth. A plant list to aid in selection can be found in Appendix F.	Plants suited to the climate and ponding depth are more likely to survive.
☐	An irrigation system with a connection to water supply should be provided as needed.	Seasonal irrigation might be needed to keep plants healthy.
Mulch (Mandatory)		
☐	3 inches of well-aged, shredded hardwood mulch.	Mulch will suppress weeds and maintain moisture for plant growth.
Media Layer		
☐	Media maintains a minimum filtration rate of 5 in/hr over lifetime of facility. An initial filtration rate of 8 to 12 in/hr is recommended to allow for clogging over time; the initial filtration rate should not exceed 12 inches per hour.	A filtration rate of at least 5 inches per hour allows soil to drain between events. The initial rate should be higher than long term target rate to account for clogging over time. However an excessively high initial rate can have a negative impact on treatment performance, therefore an upper limit is needed.
☐	Media is a minimum 18 inches deep, meeting either of these two media specifications: Appendix F.2 Biofiltration Soil Media (BSM) **or** County of San Diego Low Impact Development Handbook: Appendix G -Bioretention Soil Specification (June 2014, unless superseded by more recent edition). Alternatively, for proprietary designs and custom media mixes not meeting the media specifications, the media meets the pollutant treatment performance criteria in Section F.1.1.	A deep media layer provides additional filtration and supports plants with deeper roots. Standard specifications must be followed. For non-standard or proprietary designs, compliance with F.1.1 ensures that adequate treatment performance will be provided.

Siting and Design		*Intent/Rationale*
☐	Media surface area is 3% of contributing area times adjusted runoff factor or greater. Unless demonstrated that the BMP surface area can be smaller than 3%.	Greater surface area to tributary area ratios: a) maximizes volume retention as required by the MS4 Permit and b) decrease loading rates per square foot and therefore increase longevity. Adjusted runoff factor is to account for site design BMPs implemented upstream of the BMP (such as rain barrels, impervious area dispersion, etc.). Refer to Appendix B guidance. If media surface area is under 3% of contributing area, refer to Sediment Loading calculations in Appendix B.
☐	Where receiving waters are impaired or have a TMDL for nutrients, the system is designed with nutrient sensitive media design (see fact sheet BF-2).	Potential for pollutant export is partly a function of media composition; media design must minimize potential for export of nutrients, particularly where receiving waters are impaired for nutrients.
Filter Course Layer		
☐	A filter course is used to prevent migration of fines through layers of the facility. Filter fabric is not used.	Migration of media can cause clogging of the aggregate storage layer void spaces or subgrade. Filter fabric is more likely to clog.
☐	Filter course is a minimum of 6 inches thick provided in two separate 3 inch layers. The top layer shall be made of ASTM C33 choker sand and the bottom layer shall be of ASTM No. 8 aggregate. Marker stakes shall be used to ensure uniform lift thickness.	To prevent reduction of the available storage volume that would lead to clogging of the underdrain and native soil beneath the BMP.
☐	Filter course is washed and free of fines.	Washing aggregate will help eliminate fines that could clog the facility and impede infiltration.
☐	Filter course calculations assessing suitability for particle migration prevention have been completed.	Gradation relationship between layers can evaluate factors (e.g., bridging, permeability, and uniformity) to determine if particle sizing is appropriate or if an intermediate layer is needed.

	Siting and Design	***Intent/Rationale***
Aggregate Storage Layer		
☐	Class 2 Permeable per Caltrans specification 68-1.025 is recommended for the storage layer. Washed, open-graded crushed rock may be used, however a 4-6 inch washed pea gravel filter course layer at the top of the crushed rock is required.	Washing aggregate will help eliminate fines that could clog the aggregate storage layer void spaces or subgrade.
☐	The depth of aggregate provided (12-inch typical) and storage layer configuration is adequate for providing conveyance for underdrain flows to the outlet structure.	Proper storage layer configuration and underdrain placement will minimize facility drawdown time.
Inflow, Underdrain, and Outflow Structures		
☐	Inflow, underdrains and outflow structures are accessible for inspection and maintenance.	Maintenance will prevent clogging and ensure proper operation of the flow control structures.
☐	Inflow velocities are limited to 3 ft/s or less or use energy dissipation methods. (e.g., riprap, level spreader) for concentrated inflows.	High inflow velocities can cause erosion, scour and/or channeling.
☐	Curb cut inlets are at least 12 inches wide, have a 4-6 inch reveal (drop) and an apron and energy dissipation as needed.	Inlets must not restrict flow and apron prevents blockage from vegetation as it grows in. Energy dissipation prevents erosion.
☐	Underdrain outlet elevation should be a minimum of 3 inches above the bottom elevation of the aggregate storage layer.	A minimal separation from subgrade or the liner lessens the risk of fines entering the underdrain and can improve hydraulic performance by allowing perforations to remain unblocked.
☐	Minimum underdrain diameter is 6 inches.	Smaller diameter underdrains are prone to clogging.
Inflow, Underdrain, and Outflow Structures		
☐	Underdrains are made of slotted, PVC pipe conforming to ASTM D 3034 or equivalent or corrugated, HDPE pipe conforming to AASHTO 252M or equivalent.	Slotted underdrains provide greater intake capacity, clog resistant drainage, and reduced entrance velocity into the pipe, thereby reducing the chances of solids migration.

Siting and Design		*Intent/Rationale*
☐	An underdrain cleanout with a minimum 6-inch diameter and lockable cap is placed every 250 to 300 feet as required based on underdrain length.	Properly spaced cleanouts will facilitate underdrain maintenance.
☐	Overflow is safely conveyed to a downstream storm drain system or discharge point Size overflow structure to pass 100-year peak flow for on-line infiltration basins and water quality peak flow for off-line basins.	Planning for overflow lessens the risk of property damage due to flooding.

Conceptual Design and Sizing Approach for Storm Water Pollutant Control Only

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

1. Verify that siting and design criteria have been met, including placement requirements, contributing tributary area, maximum side and finish grade slopes, and the recommended media surface area tributary ratio.
2. Calculate the DCV per Appendix B based on expected site design runoff for tributary areas.
3. Use the sizing worksheet presented in Appendix B.5 to size biofiltration BMPs.

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

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

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

4. After bioretention with underdrain has been designed to meet flow control requirements, calculations must be completed to verify if storm water pollutant control requirements to treat the DCV have been met.

Maintenance Overview

Normal Expected Maintenance. Biofiltration requires routine maintenance to: remove accumulated materials such as sediment, trash or debris; maintain vegetation health; maintain infiltration capacity of the media layer; replenish mulch; and maintain integrity of side slopes, inlets, energy dissipators, and outlets. A summary table of standard inspection and maintenance indicators is provided within this Fact Sheet.

Non-Standard Maintenance or BMP Failure. If any of the following scenarios are observed, the BMP is not performing as intended to protect downstream waterways from pollution and/or erosion. Corrective maintenance, increased inspection and maintenance, BMP replacement, or a different BMP type will be required.

- The BMP is not drained between storm events. Surface ponding longer than approximately 24 hours following a storm event may be detrimental to vegetation health, and surface ponding longer than approximately 96 hours following a storm event poses a risk of vector (mosquito) breeding. Poor drainage can result from clogging of the media layer, filter course, aggregate storage layer, underdrain, or outlet structure. The specific cause of the drainage issue must be determined and corrected.
- Sediment, trash, or debris accumulation greater than 25% of the surface ponding volume within one month. This means the load from the tributary drainage area is too high, reducing BMP function or clogging the BMP. This would require pretreatment measures within the tributary area draining to the BMP to intercept the materials. Pretreatment components, especially for sediment, will extend the life of components that are more expensive to replace such as media, filter course, and aggregate layers.
- Erosion due to concentrated storm water runoff flow that is not readily corrected by 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 County reviewer shall be contacted prior to any additional repairs or reconstruction.

Other Special Considerations. Biofiltration is a vegetated structural BMP. Vegetated structural BMPs that are constructed in the vicinity of, or connected to, an existing jurisdictional water or wetland could inadvertently result in creation of expanded waters or wetlands. As such, vegetated structural BMPs have the potential to come under the jurisdiction of the United States Army Corps of Engineers, SDRWQCB, California Department of Fish and Wildlife, or the United States Fish and Wildlife Service. This could result in the need for specific resource agency permits and costly mitigation to perform maintenance of the structural BMP. Along with proper placement of a structural

BMP, routine maintenance is key to preventing this scenario.

Sediment Loading. Consider the effects of BMP design and tributary area land uses on the clogging potential of the BMP. Complete the sediment loading analysis included in Appendix F.

Summary of Standard Inspection and Maintenance

The property owner is responsible to ensure inspection, operation and maintenance of permanent BMPs on their property unless responsibility has been formally transferred to an agency, community facilities district, homeowners association, property owners association, or other special district.

Maintenance frequencies listed in this table are average/typical frequencies. Actual maintenance needs are site-specific, and maintenance may be required more frequently. Maintenance must be performed whenever needed, based on maintenance indicators presented in this table. The BMP owner is responsible for conducting regular inspections to see when maintenance is needed based on the maintenance indicators. During the first year of operation of a structural BMP, inspection is recommended at least once prior to August 31 and then monthly from September through May. Inspection during a storm event is also recommended. After the initial period of frequent inspections, the minimum inspection and maintenance frequency can be determined based on the results of the first year inspections.

Threshold/Indicator	Maintenance Action	Inspection and 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.

Threshold/Indicator	Maintenance Action	Inspection and Maintenance Frequency
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. • 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 County reviewer 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 County reviewer 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.

Threshold/Indicator	Maintenance Action	Inspection and Maintenance Frequency
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-hour drawdown criteria due to release rates controlled by an orifice installed on the underdrain, the County reviewer shall be contacted to determine a solution. A different BMP type, or a Vector Management Plan prepared with concurrence from the County of San Diego Department of Environmental Health, may be required.	• 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.
Underdrain clogged	Clear blockage.	Inspect if standing water is observed for longer than 24-96 hours following a storm event. Maintain when needed.

"25% full" is defined as ¼ of the depth from the design bottom elevation to the crest of the outflow structure (e.g., if the height to the outflow opening is 12 inches from the bottom elevation, then the materials must be removed when there is 3 inches of accumulation – this should be marked on the outflow structure).

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5.0 General Requirements

- Each Priority Development Project (PDP) must provide a description of existing site conditions and proposed changes to them, including changes to topography and drainage.
- Has a **Drainage Report** has been prepared for the PDP?

  ☒ **Yes**

  - Review of the Drainage Report must be concurrent with the PDP SWQMP.
  - Include the summary page of the Drainage Report with this cover page, and provide the following information:

    Title: HYDROLOGY/ HYDRAULICS STUDY For the Bradley Avenue Convalescent Home, 675 E. Bradley Ave. El Cajon, CA 92021
    APN: 387-142-36-00

    Prepared By: Kimley-Horn

    Date: April 4, 2024

  - Do not complete the rest of this attachment (also exclude these additional pages from your submittal). Additional documentation of site and drainage conditions is not required unless requested by County staff.

  ☐ **No** -- Complete and submit the remainder of this attachment below.

5.1 Description of Existing Site Condition

Provide the requested information below for the project site in its existing condition.

a. Current Site Status

Select all that apply to any portion of the site.

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

b. Existing Land Cover

Provide the area (in acres or square feet) within all applicable categories of land cover below. The total area should equal that of the entire project site.

	Area *(acres or ft²)*
☐ Vegetative Cover	Click here to enter text.
☐ Non-Vegetated Pervious Areas	Click here to enter text.
☐ Impervious Areas	Click here to enter text.

c. Underlying Soil

Select all soil groups that are present on the site.

NRCS Hydrologic Soil Group(s)			
Type A	Type B	Type C	Type D
☐	☐	☐	☐

5.2 Description of Existing Site Drainage

Describe how storm water runoff is conveyed from the site. At a minimum, address the following:

- Is the existing drainage conveyance ☐ **natural** or ☐ **urban**?
- Is runoff from offsite conveyed through the site? ☐ **Yes** ☐ **No**
  If **yes**, quantify all offsite drainage areas, design flows, and locations where offsite flows enter the project site, and summarize how such flows are conveyed through the site.
- Describe the existing project site drainage conveyance network (including any existing storm drains, concrete channels, swales, detention facilities, storm water treatment facilities, natural or constructed channels).
- Identify all discharge locations from the existing project site along with a summary of conveyance system size and capacity for each of the discharge locations. Summarize the pre-project drainage areas and design flows to each of the existing runoff discharge locations.
- Provide additional information as necessary or requested to describe the site drainage.

Description (add pages as necessary to provide all requested information).

Click here to enter text.

5.3 Description of Proposed Site Development

Provide a general description of the proposed site development, including at a minimum the information requested below. Add pages as necessary.

a. Project description/ Proposed land use and/or activities (project location, development type, size, numbers of units, etc.)
Click here to enter text.

b. List/describe proposed impervious features of the project (e.g., buildings, roadways, parking lots, courtyards, athletic courts, other impervious features).
Click here to enter text.

c. List/describe proposed pervious features of the project (e.g., landscape areas):
Click here to enter text.

d. Does the project include grading and changes to site topography? ☐ **Yes** ☐ **No**
*If **yes**, describe below.*
Click here to enter text.

5.4 Description of Proposed Site Drainage

A. Changes to Site Drainage -- Does the project include changes to site drainage (e.g., installation of new storm water conveyance systems)? ☐ **Yes** ☐ **No**

If **yes**:

- Describe (1) the proposed project site drainage conveyance network (including storm drains, concrete channels, swales, detention facilities, storm water treatment facilities, natural or constructed channels), and (2) 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.

Description (add pages as necessary to provide all requested information).
Click here to enter text.

Bradley Avenue Convalescent Home

Hydrology & Hydraulics Report

El Cajon, CA

June 10, 2024

Prepared for:
Generations Healthcare
6 Hutton Centre Drive, Suite 400
Santa Ana, CA 92707

Prepared by:

Kimley-Horn and Associates, Inc.
1100 W Town and Country, Suite 700
Orange, CA 92868
714-939-1030

KHA Project # 194306001

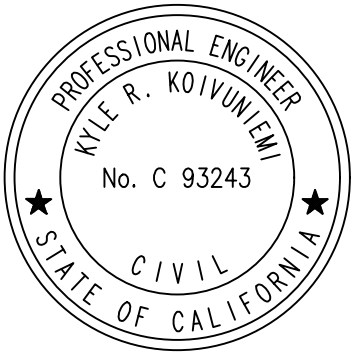
Declaration of Responsible Charge

I hereby declare that I am the Engineer of Work for this project. That I have exercised responsible charge over the design of the project as defined in Section 6703 of the Business and Professions code, and that the design is consistent with current standards.

I understand that the check of project drawings and specifications by the City of San Diego is confined to a review only and does not relieve me, as Engineer of Work, of my responsibilities for project design.

06/10/2024

Kyle R. Koivuniemi, P.E. # 58449 Date



Contents

Attachments:

Attachment 1: Figures & Tables

Attachment 2: Watershed Information

Hydrologic Basin Map

Rainfall Isopluvial Maps

Soil Group Map

Pre-Developed Drainage Map

Post Development Drainage Map

Attachment 3: Modified Rational Method Runoff Calculations

3a. AES Pre Development Calculations

3b. AES Post Development Calculations

Attachment 4: Hydraulics

4a. WSPG Calculations

Attachment 5: FEMA Floodplains/Floodways

Attachment 6: Off-site References

6a. Sheets Plans for Construction of Bradley Avenue Widening, City of El Cajon Drawing No. 14608, dated August 9, 2023.

6b. Bradley Avenue Widening Drainage Report references (Proposed On-Site Hydrology Map, Table D-1, Table D-1a, Stormcad exhibit, Stormcad profile reports) dated November 2019 completed by Dokken Engineering.

1. PROJECT DESCRIPTION

a. Purpose of Study

The purpose of this study is to support the site redevelopment plans for an existing commercial property located in the jurisdictional boundary of the County of San Diego. This study will demonstrate that the post-development 100-year peak runoff will not exceed existing peak runoff rates.

b. Project Description

The existing site composed of two skilled nursing facilities, a provided parking lot, and landscape area. The project fronts onto East Bradley Avenue and Sams Hill Road.

The project proposes to retain the two existing buildings and add two new healthcare buildings at the northern and southern portion of the site. The proposed sitework will include 73 new parking spaces, and a new fire lane access road allowing access to the rear of existing Building 2 and the new Building 3. A new driveway approach along Bradley Avenue will be placed for full fire truck access. New sewer, domestic water, and fire water (including one additional fire hydrant) will be provided with the sitework. Two trash enclosures for refuse and recycled goods will be provided. Along with new landscaping throughout the facility, site lighting will be installed to provide a minimum of 1.0 FC of lighting along all egress paths to the public way. The current facility is served by an existing emergency generator, a new generator will be provided to meet all air quality requirements. All work outside of the building envelops falls under local jurisdiction, with joint review and oversight by HCAi on some items such as Building Pad Certification, Fire Service Installation, etc. All necessary utilities (storm, sewer, etc.) will be installed as part of the project.

Normal uses of such a development will generate storm water runoff with the potential to carry pollutants to off-site tributaries. Biofiltration basins are planned to be incorporated throughout the site to treat and detain runoff from impervious and landscaped areas.

2. VICINITY MAP

The project is located at the East Bradley Avenue just southeast of the intersection of Sams Hill Road and East Bradley Avenue, in the county of San Diego, California.

3. DESCRIPTION OF WATERSHED

a. Pre-Developed Topography and Drainage Patterns

The site is an existing low-density commercial site composed of two skilled nursing facilities, a provided parking lot, and landscape area. The project fronts onto East Bradley Avenue. The project is bounded by onto East Bradley Avenue and Sams Hill Road to the southeast site. The property drains primarily by overland flow to two existing curb inlets located near the northeast corner of the site and northwest of the site along East Bradley Avenue. The project area can be split into 2 major drainage areas P6 and P9. These drainage areas are also reflected in the Drainage Report from the Bradley Ave Widening Project included in Attachment 6.

Drainage area P6 discharges to the existing catch basin near the northeast corner of the sites. This existing public curb inlet accepts runoff from drainage area P6. Drainage area P6 consists of the easter perimeter of the project site, neighboring properties to the east and the southern half of E Bradley Ave. Once the runoff enters the existing curb inlet, it is then piped to north via dual 18" storm drain pipes to the existing 66" pipe that runs within East Bradley Ave. Drainage area P9 makes up most of the project site and sheet flows to E Bradley Avenue. Drainage area P9 also includes the southern half of E Bradley Avenue as shown on the Existing Development Drainage Map. Runoff is collected in an existing curb inlet northwest of the site. This curb inlet also accepts runoff from drainage area P10 as shown in Attachment 6. Once the runoff enters the existing curb inlet, it is then piped to north via a 24" storm drain pipe to the existing 66" pipe.

The Point of Compliance, POC, will be at the connection between the existing 24" and existing 66" storm drain pipes, as described above. The soil type of the entire project site is Soil Type D.

The impervious square footage of the site was estimated based on aerial photography and detailed aerial topographic mapping to be approximately 22% of the site. The runoff coefficient is selected based on soil type and %IMPER. From table 3-1 "RUNOFF COEFFICIENTS FOR URBAN AREA", the runoff coefficient of 25% imperviousness and Soil Type D will be used in the pre-development runoff calculations.

A pre-developed drainage map can be found as Attachment 2 in this report.

b. Post-Development Topography and Drainage Patterns

The project proposes to retain the two existing buildings and add two new healthcare buildings at the northern and southern portion of the site. Along with the

additional new buildings the project proposes to add reconfigured parking spaces, drive isles, various patio areas and walkways throughout the site. As part of this project, associated improvements will include the south, the west, and the east parking lot with three bio-filtration basins BMP-A, BMP-B, BMP-C. BMP C will be used only for pollution control and flow control, while BMPs-A&B will used for pollution control and hydromodification control. All runoff from the existing and proposed areas sheet flow to a bio-filtration basin or to a curb and gutter where it then enters a bio-filtration basin by curb inlet curb-cut. Post-developed onsite runoff that was collected by the bio-filtration basins will be piped via a proposed 18" storm drain to the existing 66" pipe along East Bradley Ave at what is identified as the discharge point and continues downstream where it will confluence with the 24" storm drain pipe from the existing curb inlet northeast of the site, otherwise known as the POC. Offsite runoff will continue to sheetflow to their existing discharge points as described in the section above.

The total impervious area of the proposed onsite design is 101,263 sf over a site tributary area of 144,890 sf which results in a percent imperviousness of the site of 69%. The runoff coefficient is selected based on soil type and %IMPER. From table 3-1 "RUNOFF COEFFICIENTS FOR URBAN AREA", the runoff coefficient of 65% imperviousness and Soil Type D will be used in the post- development runoff calculations.

A post-developed drainage map can be found as Attachment 2 in this report.

c. Hydrologic Unit Contribution

The project site is located in the El Cajon Hydrologic Sub Area of the Lower San Diego Hydrologic Area of the San Diego Hydrologic Unit (907.13). The project is tributary to a public storm drain system that discharges to the San Diego River.

A map showing the project location with respect to the hydrologic basin areas can be found in Attachment 2 in this report.

4. METHODOLOGY

This report is prepared in accordance with the 2003 San Diego County Hydrology Manual (Hydrology Manual). Based on the overall tributary study area, calculations are based on the Rational Method. This report also refers to the calculations included in the "Bradley Avenue Widening Drainage Report" dated November 2019. This report was used to determined the additional runoff being conveyed to the existing public catch basins and pipes that impact the hydraulics of the underground storm drain system. The report was also used to determine a peak flow rate per acre for drainage area P9. This allowable peak

flow rate is used to confirm the project proposed conditions does not exceed the peak flow rates utilized to design the public storm drain system along East Bradley Avenue.

a. Hydrology Software

The "San Diego County Rational Hydrology Program" by Hydrosoft AES Engineering Software, Version 18.0, refereed hereafter as "AES", was used to develop the rational method calculations. This program specifically utilizes the methods prescribed in the County of San Diego Hydrology Manual and is one of the approved programs for the use in the San Diego County area.

b. Soils Type Determination

The soils type for the project was assumed as soil type D.

c. Isopluvial Value Determination

The isopluvial values for the 100-year 6 hour and 24-hour storm events were determined by plotting the project's location on the respective exhibits from Appendix B of the Hydrology Manual.

d. CEQA Requirements

- The proposed project would not substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site. No significant alteration of any stream or river will occur on this site due to grading operations. All defined drainage channels are due to erosive effects of high velocity runoff from the uphill slopes. The development of the site will help mitigate further erosion downstream.
- The proposed project does not create or contribute runoff water which would exceed the capacity of existing or planned storm water drainage systems. The flows from the project leave the site at less than predeveloped rates per the mitigated flow rates shown.
- The proposed project does not place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map, including County Floodplain Maps. No housing is proposed and no FIRM-identified flood hazard areas are located on the parcel.

- The proposed project does not place structures within a 100-year flood hazard area which would impede or redirect flood flows. No FIRM identified flood hazard areas are located on the parcel.

- The proposed project does not expose people or structures to a significant risk of loss, injury or death involving flooding as a result of the failure of a levee or dam. No levees or dams are proposed and all runoff is being mitigated in properly designed flow control basins with redundancies. This will be noted in the conclusion.

e. Existing Public Storm Drain Flow Rates

The calculation was completed in Water Surface Pressure Gradient for Windowns (WSPGW) software to compare impacts to the hydraulic gradeline in the existing 66" RCP. The flow rates used in the WSPG analysis were obtained from the Dokken Bradley Avenue Widening Project report and adjusted based on the flows calculated in Section 5. Table 1 below provides a summary of the flow rate sources and references. Refer to Attachment 6 for a visual representation of these flow rates and reference pages from the Bradley Avenue Widening Project report.

Summary of Bradley Avenue Widening Project Flow Data

Table 1: Bradley Ave Widening Project Flow Data

Lateral	Station	Flow (cfs)	Source Page	Notes
66" RCP	86+54.32	302.05	Stormcad Profile Report - C28a – C31 – c32	Total flow from StormCAD pipe model
66" RCP	85+89.80 North	7.51	Table D-1	Runoff for watershed P5b nodes 81 to 38
66" RCP	85+89.80 South	9.52	Table D-1	Runoff for watershed P6e nodes 89 to 40
66" RCP	83+85.95 South	13.80	Table D-1	Runoff for watershed P7-P8 node 41 to 90
66" RCP	82+99.95 south	15.24	Table D-1b	Runoff for junction at node 46

5. CALCULATIONS

a. Determination of Drainage Area Parameters

The drainage area parameters are determined by delineating the extents and flow direction of runoff from each of the pre and post development drainage areas and measuring the respective changes in elevation, flow length and drainage area acreage. Proposed drainage areas were delineated for the worst-case scenario and assumes that 100-year flows bypass the low flow catch basins on grade located upstream of the biofiltration basin. See Attachments 1 and 2 of this report for the respective drainage area exhibits.

b. Runoff Coefficient

The runoff coefficients for each of the drainage areas are determined by AES by comparing the drainage area imperviousness and soil type to Table 3-1 of the Hydrology Manual. For this project, the land use is based on the average %IMPER, which is between 0% to 80%. Undisturbed Natural Terrain (Natural), Low Density Residential (2.0 DU/Acre or less), Medium Density Residential (7.3 DU/Acre or less), and Medium Density Residential (14.5 DU/Acre or less) are assumed for the pre- and the post-development conditions and the values for the respective soil types are used. Table 3-1 is included in the AES software and the values are chosen based on the program input parameters.

c. Manning Roughness Coefficient

Four values for the Manning Roughness Coefficient are used in the hydrology calculations. One for the overland flow travel time calculations, second for the pipe flow friction factor, and fourth for gutter flow calculations.

For fairly regular sections, the value for the roughness coefficient is taken from the Hydraulic Design Manual Table A-5. It is assumed that minor streams in this classification are some grass and weeds, light brush. The Manning's n factor for these classes of streams is 0.04.

For the closed conduit calculations, the value for the roughness coefficient is taken from the Hydraulic Design Manual Table A-2. It is assumed that pipe material of Smooth Plastic Pipe (HPDE and PVC), Spiral Rib Pipe, Reinforced Concrete Pipe (RCP), or a similar material will be used on the project. The Manning's n factor for this class of pipe material is 0.013.

For the gutter flow calculations, a value of 0.04 is used for existing conditions and 0.015 is used for proposed conditions. This is taken from the hydraulic design manual, Table A-1. It is conservatively assumed that the gutter sections are bare soil/grass for existing conditions and concrete for proposed conditions.

d. Rational Method Calculation Summary

The peak runoff values for the 100-year storm are calculated according to the Hydrology Manual rational method. The calculations are performed using the AES software. These calculations were completed for the runoff the discharges at the project's property lines. A summary of the calculations are summarized in the table below:

Summary Pre and Post Peak 100-Year Runoff

Table 2: Q100 Analysis Results

Pre-Developed				Post-Developed			
Node #	Area (Acres)	Tc (Min)	Q_{100} (cfs)	Node #	Area (Acres)	Tc (Min)	Q_{100} (cfs)
101	0.06	5.0	0.15	101	0	-	0
104	0.17	11.92	0.24	104	0.05	8.63	0.09
Subarea 6 Subtotal	*0.23*	-	*0.39*	*Subarea 6 Subtotal*	*0.05*	-	*0.09*
202	3.22	8.90	7.74	202	1.32	8.23	2.38
				206	0.48	6.48	1.01
				209	1.59	14.57	1.99
				401	0.01	5.05	0.03
Subarea 9 Subtotal	*3.22*	-	*7.74*	*Subarea 9 Subtotal*	*3.40*	-	*5.41*

*Note 1: Drainage Area runoff calculations included above only include the onsite areas and offsite areas that confluence with onsite areas prior to runoff discharging at the property line.

The onsite project area is part of drainage areas 6 and 9 as shown in the Bradley Avenue Widening Drainage Report excerpts included in Attachment 6. Most of the onsite project lies within drainage area 9 in existing conditions. Since the project is proposing to isolate the onsite area and discharge directly tot the existing 66" pipe along East Bradley Avenue, the peak flow rates at the discharge points for drainage area 6 and 9 as shown in the Bradley Avenue Drainage Report were also completed. The existing conditions peak flow rates are obtained from the Bradley Avenue Drainage Report. The proposed conditions peak flow rates for the portions of runoff from drainage areas 6 and 9 that extend beyond the project's property lines were calculated by subtracting the existing peak flow rates in table 1 above from the Bradley Avenue Drainage Report peak flow rates. Table 3 below summarizes these calculations.

Table 3: Peak Flow Rate Comparison to Bradley Avenue Widening Road Drainage Report Analysis

Drainage Area	Bradley Report		Updated Bradley Report Post-Developed	
	Discharge Node	Q_{100} (cfs)	Discharge Node	Q_{100} (cfs)
6	40	9.50	40	9.22
9, 10	46	15.24	301	5.41
			46	7.53

The analysis summarized in Table 1 shows that the proposed peak flow rates are less than pre-development flows. In addition, Table 2 shows that the updated proposed peak flow rates from the project site will not exceed that which was planned and shown in the Bradley Drainage Report included in Attachment 6. Both of these analyses show that the project is able to meet pre-development conditions requirements and thus does not require additional detention. The project is required to meet hydromodification requirements as shown in the project specific Stormwater Quality Management Plan prepared by Kimley-Horn. AES data and output files can be found in Attachment 3 of this report.

e. Post-Developed Impact on Storm Drain Pipe in Bradley Avenue

The point of discharge for the post-developed condition is where a proposed 18-inch storm drain line, which is carrying stormwater from the proposed site, connects with the existing 66-inch storm drain in Bradley Avenue. This point of discharge lies approximately 148 feet upstream along the 66-inch storm drain pipe from the project Point of Comparison (POC). The pre-developed POC is a specific point where stormwater flows that are generated from the subject property confluences with the existing 66-inch storm drain line and provides a common point when comparing pre- versus post- development.

The re-direction on-site flows upstream to the point of discharge adds this flow in the 66-inch storm drain along this 148-foot stretch of pipe. A hydraulic analysis to study the impact of this additional flow on the existing 66-inch pipe was performed using the WSPGW (Water Surface Pressure Gradient for Windows). WSPGW is a program that computes and plots uniform and non-uniform steady flow water surface profiles and pressure gradients in open channels or closed conduits with regular or irregular cross-sections. The Bradley Widening Drainage Report excerpts and plans are included in Attachment 6. The WSPGW calculations are included in Attachment 4. The additional runoff causes the 100-year HGL to rise

by approximately 0.18 feet. The overall impact for a 100-year storm scenario is very minimal as the pipe continues to be in an open flow condition for a 100-year storm. Therefore, the diversion of the onsite flow upstream from the POC a distance of 148-feet is acceptable.

6. FEMA FLOODPLAIN DATA

The proposed site lies within a Flood Zone "X', which defines the area determined to be outside the 500-year flood and protected by levee from 100- year flood. FEMA Firmette is in Attachment 5.

7. CONCLUSION

Based on the results of this report, the project does not increase the 100-year peak flow rate of the mitigated stormwater discharge from the site as post-developed flows are lower than those of pre-development flows. The project meets the County of San Diego standards for peak flow control and therefore can be concluded that this project will not negatively impact the existing downstream storm drainage facilities.

This project does not sit within a 100-year flood hazard zone as mapped on the federal Flood Insurance Rate maps for this area.

- Although the project reroutes much of the surface flow from Bradley Ave that would be collected by the existing curb inlet northwest of the site to being directly piped to the existing 66" pipe. The proposed project does not substantially alter the existing drainage pattern of the site and area discharging to the existing 66" pipe. The minor alteration of the runoff does not substantially increase the rate or amount of runoff in a manner which would result in flooding on- or off-site. No significant alteration of any stream or river will occur on this site due to this project. All defined drainage channels are due to erosive effects of high velocity runoff from the uphill slopes.

- The proposed project does not create or contribute runoff water which would exceed the capacity of existing or planned storm water drainage systems. The flows from the project leave the site at less than predeveloped rates shown above.

- The proposed project does not place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map, including County Floodplain Maps. No housing is proposed and no FIRM identified flood hazard areas are located on the parcel.

- The proposed project does not place structures within a 100-year flood hazard area which would impede or redirect flood flows. No FIRM identified flood hazard areas are located on the parcel.

- The proposed project does not expose people or structures to a significant risk of loss, injury or death involving flooding as a result of the failure of a levee or dam. No levees or dams are proposed and all runoff is being mitigated in properly designed flow control basins with redundancies. This will be noted in the conclusion.

8. REFERENCES

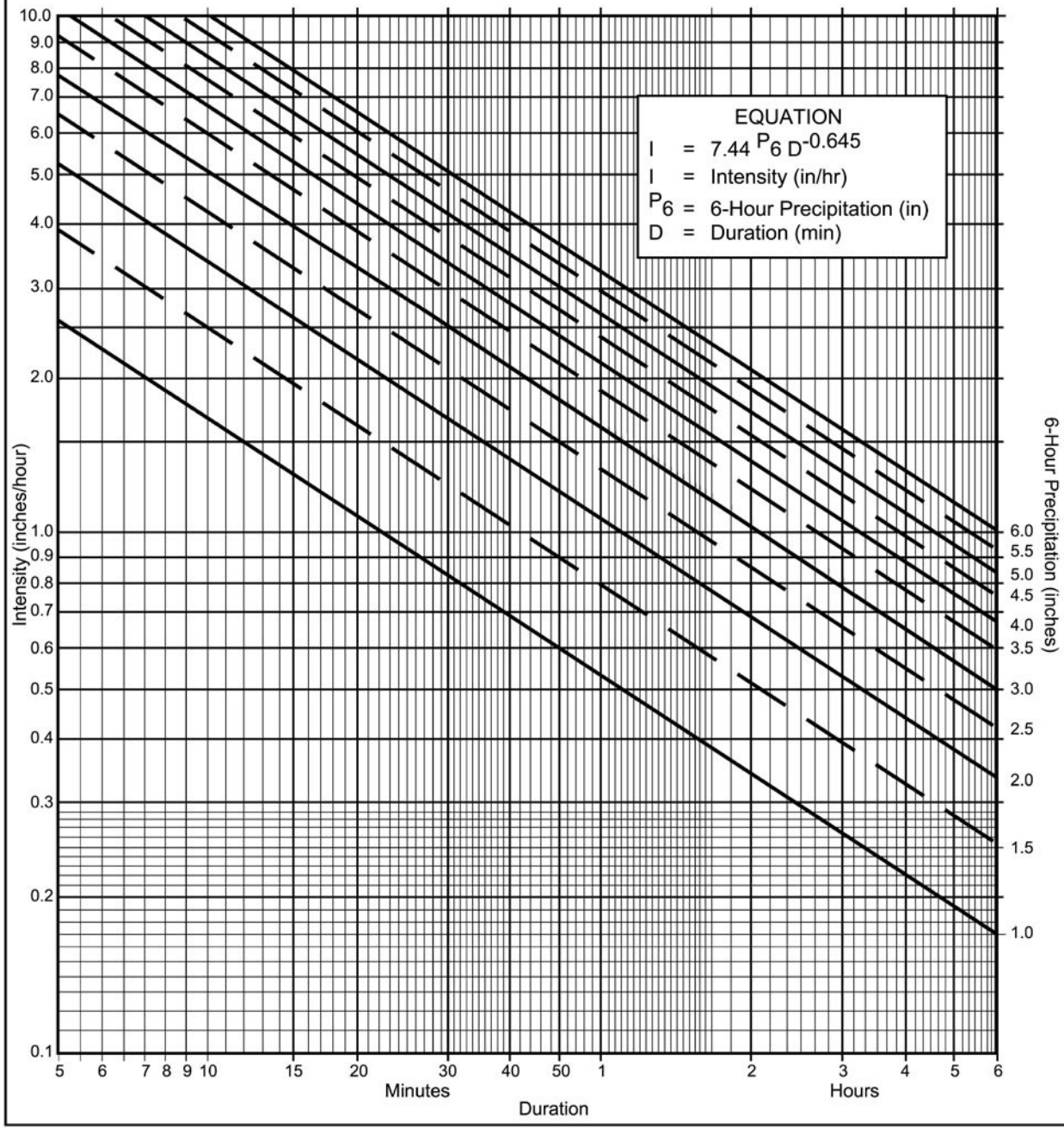
County of San Diego Hydrology Manual, June 2003

San Diego County Hydraulic Design Manual, September 2014

Bradley Avenue Widening, City of El Cajon Drawing No. 14608, August 9, 2023

Bradley Avenue Widening Drainage Report, November 2019

ATTACHMENT 1: Figures & Tables



Directions for Application:

(1) From precipitation maps determine 6 hr and 24 hr amounts for the selected frequency. These maps are included in the County Hydrology Manual (10, 50, and 100 yr maps included in the Design and Procedure Manual).

(2) Adjust 6 hr precipitation (if necessary) so that it is within the range of 45% to 65% of the 24 hr precipitation (not applicaple to Desert).

(3) Plot 6 hr precipitation on the right side of the chart.

(4) Draw a line through the point parallel to the plotted lines.

(5) This line is the intensity-duration curve for the location being analyzed.

Application Form:

(a) Selected frequency _____ year

(b) P_6 = _____ in., P_{24} = _____, $\frac{P_6}{P_{24}}$ = _____ %(2)

(c) Adjusted P_6(2) = _____ in.

(d) t_x = _____ min.

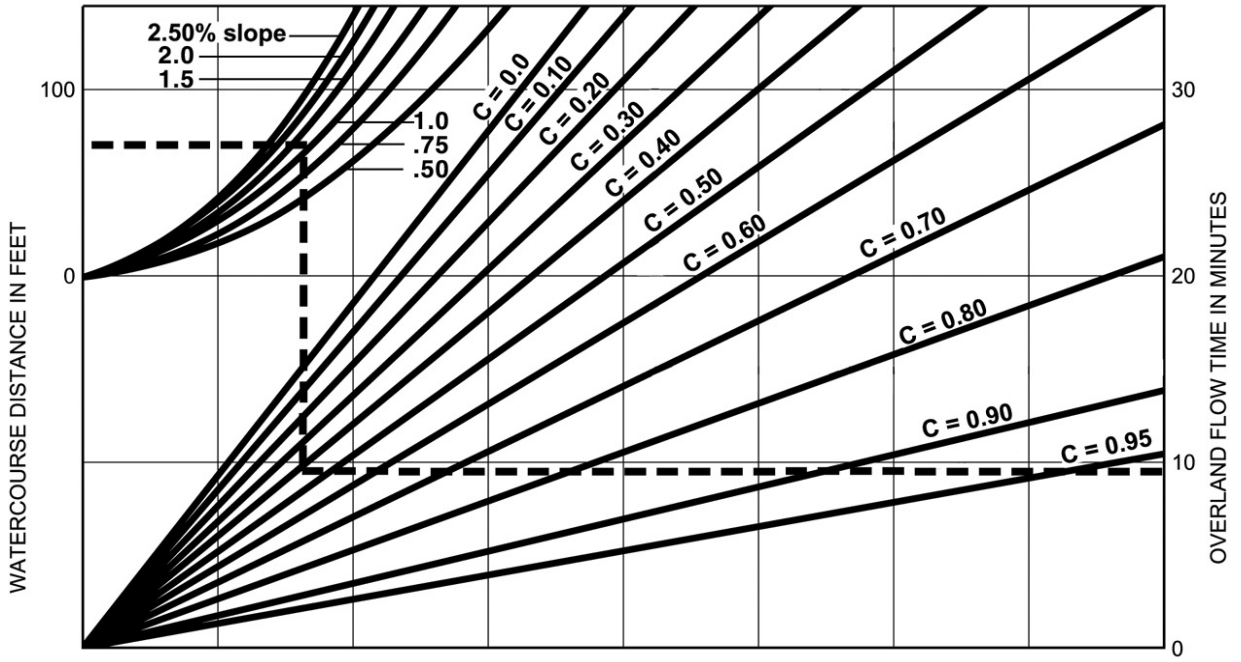
(e) I = _____ in./hr.

Note: This chart replaces the Intensity-Duration-Frequency curves used since 1965.

P6	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6
Duration	I	I	I	I	I	I	I	I	I	I	I
5	2.63	3.95	5.27	6.59	7.90	9.22	10.54	11.86	13.17	14.49	15.81
7	2.12	3.18	4.24	5.30	6.36	7.42	8.48	9.54	10.60	11.66	12.72
10	1.68	2.53	3.37	4.21	5.05	5.90	6.74	7.58	8.42	9.27	10.11
15	1.30	1.95	2.59	3.24	3.89	4.54	5.19	5.84	6.49	7.13	7.78
20	1.08	1.62	2.15	2.69	3.23	3.77	4.31	4.85	5.39	5.93	6.46
25	0.93	1.40	1.87	2.33	2.80	3.27	3.73	4.20	4.67	5.13	5.60
30	0.83	1.24	1.66	2.07	2.49	2.90	3.32	3.73	4.15	4.56	4.98
40	0.69	1.03	1.38	1.72	2.07	2.41	2.76	3.10	3.45	3.79	4.13
50	0.60	0.90	1.19	1.49	1.79	2.09	2.39	2.69	2.98	3.28	3.58
60	0.53	0.80	1.06	1.33	1.59	1.86	2.12	2.39	2.65	2.92	3.18
90	0.41	0.61	0.82	1.02	1.23	1.43	1.63	1.84	2.04	2.25	2.45
120	0.34	0.51	0.68	0.85	1.02	1.19	1.36	1.53	1.70	1.87	2.04
150	0.29	0.44	0.59	0.73	0.88	1.03	1.18	1.32	1.47	1.62	1.76
180	0.26	0.39	0.52	0.65	0.78	0.91	1.04	1.18	1.31	1.44	1.57
240	0.22	0.33	0.43	0.54	0.65	0.76	0.87	0.98	1.08	1.19	1.30
300	0.19	0.28	0.38	0.47	0.56	0.66	0.75	0.85	0.94	1.03	1.13
360	0.17	0.25	0.33	0.42	0.50	0.58	0.67	0.75	0.84	0.92	1.00

Intensity-Duration Design Chart - Template

FIGURE 3-1



EXAMPLE:

Given: Watercourse Distance (D) = 70 Feet
Slope (s) = 1.3%
Runoff Coefficient (C) = 0.41
Overland Flow Time (T) = 9.5 Minutes

$$T = \frac{1.8\,(1.1-C)\sqrt{D}}{\sqrt[3]{s}}$$

SOURCE: Airport Drainage, Federal Aviation Administration, 1965

FIGURE

3-3

Rational Formula - Overland Time of Flow Nomograph

Table 3-1
RUNOFF COEFFICIENTS FOR URBAN AREAS

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

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

Table 3-2

MAXIMUM OVERLAND FLOW LENGTH (L_M) & INITIAL TIME OF CONCENTRATION (T_i)

Element*	DU/ Acre	.5%		1%		2%		3%		5%		10%	
		L_M	T_i	L_M	T_i	L_M	T_i	L_M	T_i	L_M	T_i	L_M	T_i
Natural		50	13.2	70	12.5	85	10.9	100	10.3	100	8.7	100	6.9
LDR	1	50	12.2	70	11.5	85	10.0	100	9.5	100	8.0	100	6.4
LDR	2	50	11.3	70	10.5	85	9.2	100	8.8	100	7.4	100	5.8
LDR	2.9	50	10.7	70	10.0	85	8.8	95	8.1	100	7.0	100	5.6
MDR	4.3	50	10.2	70	9.6	80	8.1	95	7.8	100	6.7	100	5.3
MDR	7.3	50	9.2	65	8.4	80	7.4	95	7.0	100	6.0	100	4.8
MDR	10.9	50	8.7	65	7.9	80	6.9	90	6.4	100	5.7	100	4.5
MDR	14.5	50	8.2	65	7.4	80	6.5	90	6.0	100	5.4	100	4.3
HDR	24	50	6.7	65	6.1	75	5.1	90	4.9	95	4.3	100	3.5
HDR	43	50	5.3	65	4.7	75	4.0	85	3.8	95	3.4	100	2.7
N. Com		50	5.3	60	4.5	75	4.0	85	3.8	95	3.4	100	2.7
G. Com		50	4.7	60	4.1	75	3.6	85	3.4	90	2.9	100	2.4
O.P./Com		50	4.2	60	3.7	70	3.1	80	2.9	90	2.6	100	2.2
Limited I.		50	4.2	60	3.7	70	3.1	80	2.9	90	2.6	100	2.2
General I.		50	3.7	60	3.2	70	2.7	80	2.6	90	2.3	100	1.9

*See Table 3-1 for more detailed description

Table A-1 Average Manning Roughness Coefficients for Pavement and Gutters[1]

Concrete Gutter[2]	0.015
Concrete Pavement	
Float Finish	0.014
Broom Finish	0.016
Concrete Gutter with Asphalt Pavement	
Smooth Finish	0.013
Rough Texture	0.015
Asphalt Pavement	
Smooth Finish	0.013
Rough Texture	0.016

Based on FHWA HEC-22.

[1] Based on materials and workmanship required by standard specifications.
[2] Increase roughness coefficient in gutters with mild slopes where sediment might accumulate by 0.020.

Table A-2 Average Manning Roughness Coefficients for Closed Conduits[3]

Reinforced Concrete Pipe (RCP)	0.013
Corrugated Metal Pipe and Pipe Arch	
2-3/8 x 1/2 inch Corrugations	
Unlined	0.024
Half Lined	
Full Flow	0.018
d/D>=0.60	0.016
d/D<0.60	0.013
Fully Lined	0.013
3 x 1 inch Corrugations	0.027
6 x 2 inch Corrugations	0.032
Spiral Rib Pipe	0.013
Helically Wound Pipe	
18-inch	0.015
24-inch	0.017
30-inch	0.019
36-inch	0.021
42-inch	0.022
48-inch	0.023
Plastic Pipe (HPDE and PVC)	
Smooth	0.013
Corrugated	0.024
Vitrified Clay Pipe	0.014
Cast-Iron Pipe (Uncoated)	0.013
Steel Pipe	0.011
Brick	0.017
Cast-In-Place Concrete Pipe	
Rough Wood Forms	0.017
Smooth Wood or Steel Forms	0.014

[3] Based on materials and workmanship required by standard specifications.

Table A-5

Table A-5 Average Manning Roughness Coefficients for Natural Channels

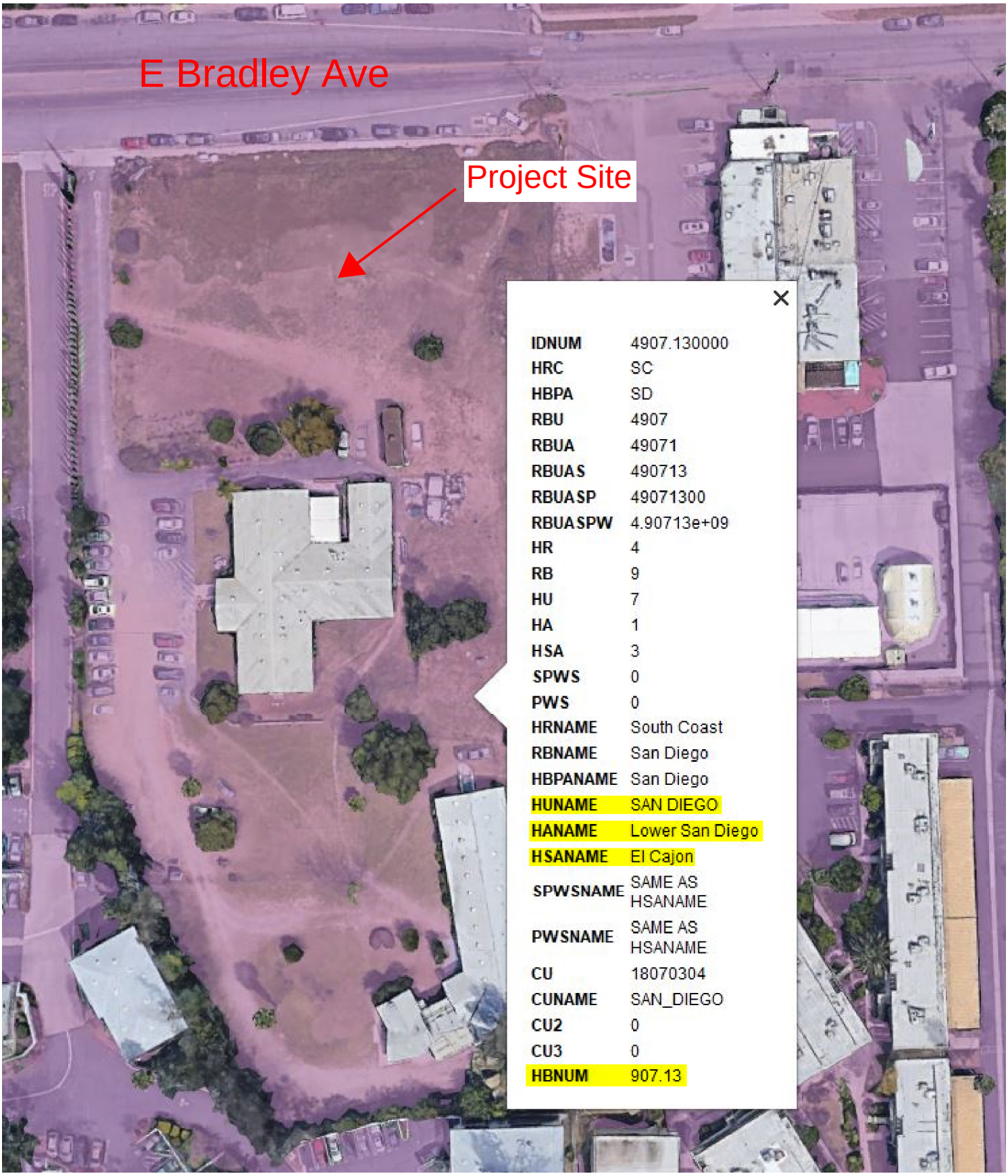
Minor Streams (Surface Width at Flood Stage < 100 ft)

Fairly Regular Section	
(A) Some Grass and Weeds, Little or No Brush	0.030
(B) Dense Growth of Weeds, Depth of Flow Materially Greater Than Weed Height	0.040
(C) Some Weeds, Light Brush on Banks	0.040
(D) Some Weeds, Heavy Brush on Banks	0.060
(E) For Trees within Channel with Branches Submerged at High Stage, Increase All Above Values By	0.015
Irregular Section, with Pools, Slight Channel Meander	
Channels (A) to (E) Above, Increase All Values By	0.015
Mountain Streams; No Vegetation in Channel, Banks Usually Steep, Trees and Brush along Banks Submerged at High Stage	
(A) Bottom, Gravel, Cobbles and Few Boulders	0.050
(B) Bottom, Cobbles with Large Boulders	0.060

Flood Plains (Adjacent To Natural Streams)

Pasture, No Brush	
(A) Short Grass	0.030
(B) High Grass	0.040
Cultivated Areas	
(A) No Crop	0.040
(B) Mature Row Crops	0.040
(C) Mature Field Crops	0.050
Heavy Weeds, Scattered Brush	0.050
Light Brush and Trees	0.060
Medium To Dense Brush	0.090
Dense Willows	0.170
Cleared Land with Tree Stumps, 100-150 Per Acre	0.060
Heavy Stand of Timber, Little Undergrowth	
(A) Flood Depth below Branches	0.110
(B) Flood Depth Reaches Branches	0.140

ATTACHMENT 2: Watershed Information


E Bradley Ave
Project Site
IDNUM 4907.130000
HRC SC
HBPA SD
RBU 4907
RBUA 49071
RBUAS 490713
RBUASP 49071300
RBUASPW 4.90713e+09
HR 4
RB 9
HU 7
HA 1
HSA 3
SPWS 0
PWS 0
HRNAME South Coast
RBNAME San Diego
HBPANAME San Diego
HUNAME SAN DIEGO
HANAME Lower San Diego
HSANAME El Cajon
SPWSNAME SAME AS HSANAME
PWSNAME SAME AS HSANAME
CU 18070304
CUNAME SAN_DIEGO
CU2 0
CU3 0
HBNUM 907.13

County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 6 Hours

Isopluvial (inches)

Orange County

Riverside County

Imperial County

Pacific Ocean

Mexico

BRADLEY AVENUE
SAY i6 = 2.7 in
SITE

OCEANSIDE
VISTA
CARLSBAD
ESCONDIDO
ENCINITAS
SOLANA BEACH
DEL MAR
POWAY
S.D. COUNTY
SANTEE
SAN DIEGO
EL CAJON
LA MESA
LEMON GROVE
CORONADO
SD
CHULA VISTA
IMPERIAL BEACH

117°30' 117°15' 117°00' 116°45' 116°30' 116°15'
33°30' 33°15' 33°00' 32°45' 32°30'

DPW GIS
Department of Public Works
Geographic Information Services

SanGIS
We Have San Diego Covered!

N W E S

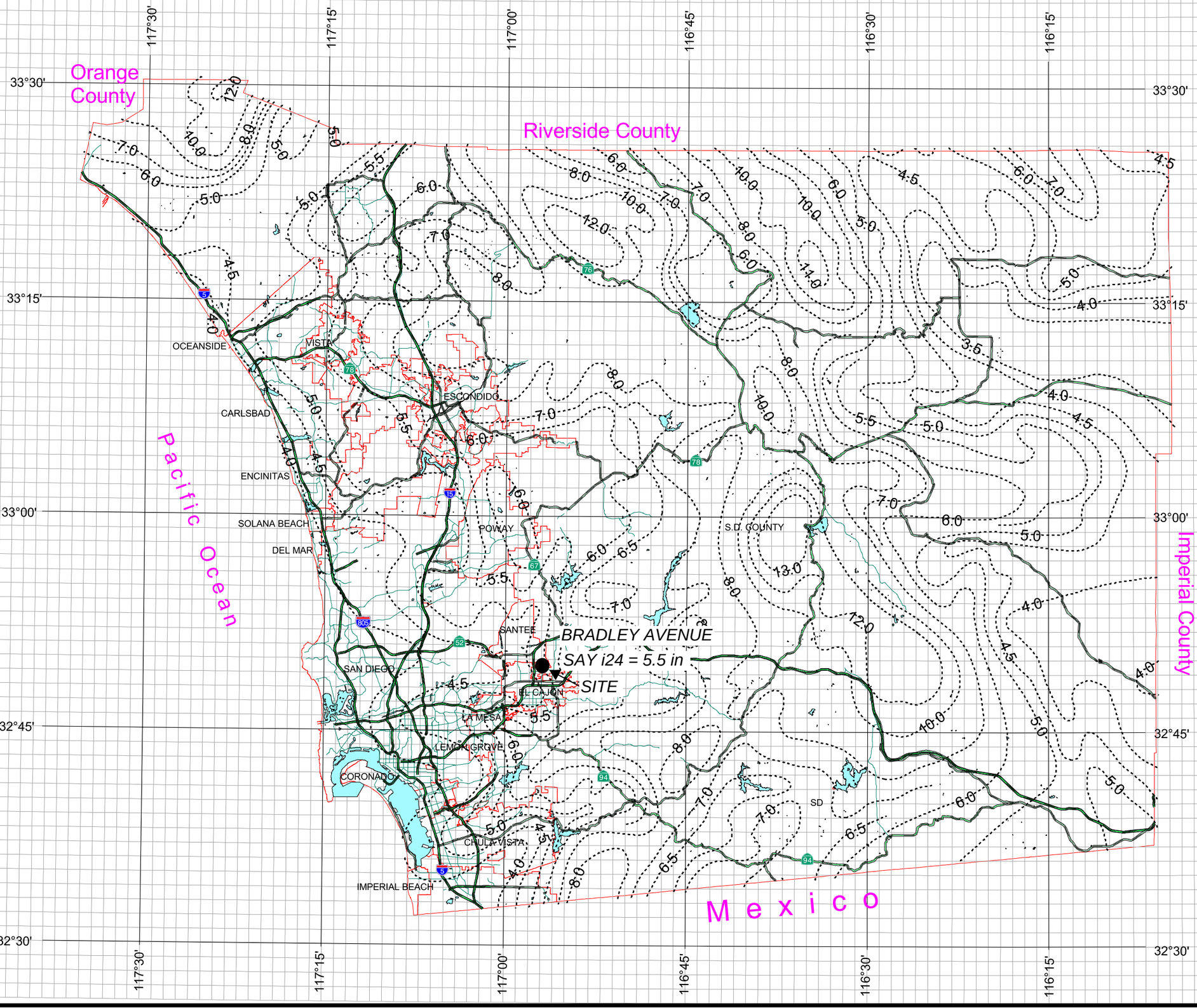
3 0 3 Miles

County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 24 Hours

Isopluvial (inches)



DPW GIS
Department of Public Works
Geographic Information Services

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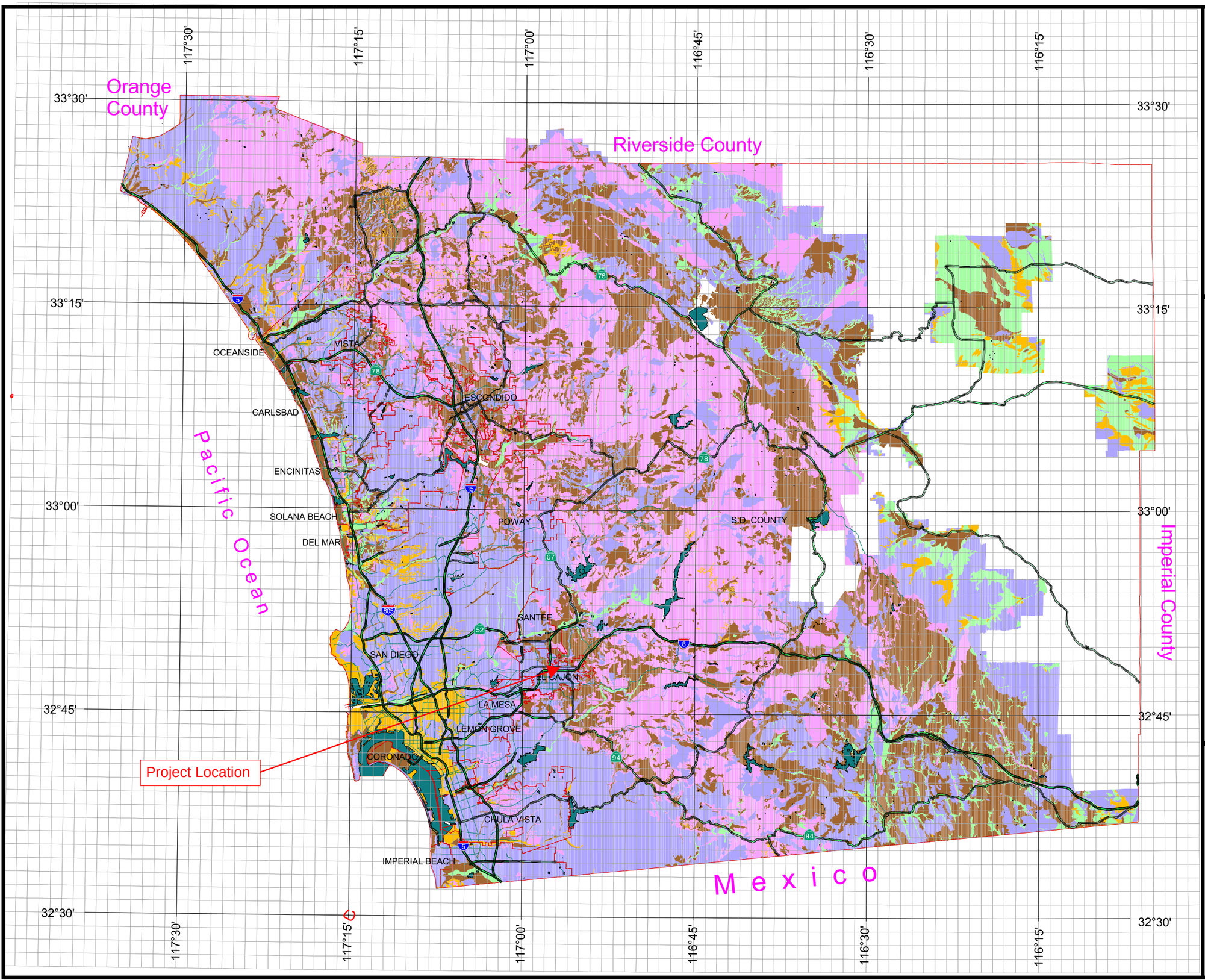
N
W E
S

3 0 3 Miles

County of San Diego Hydrology Manual

Soil Hydrologic Groups



Legend

Soil Groups

- Group A
- Group B
- Group C
- Group D
- Undetermined
- Data Unavailable

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Geographic Information Services

SanGIS
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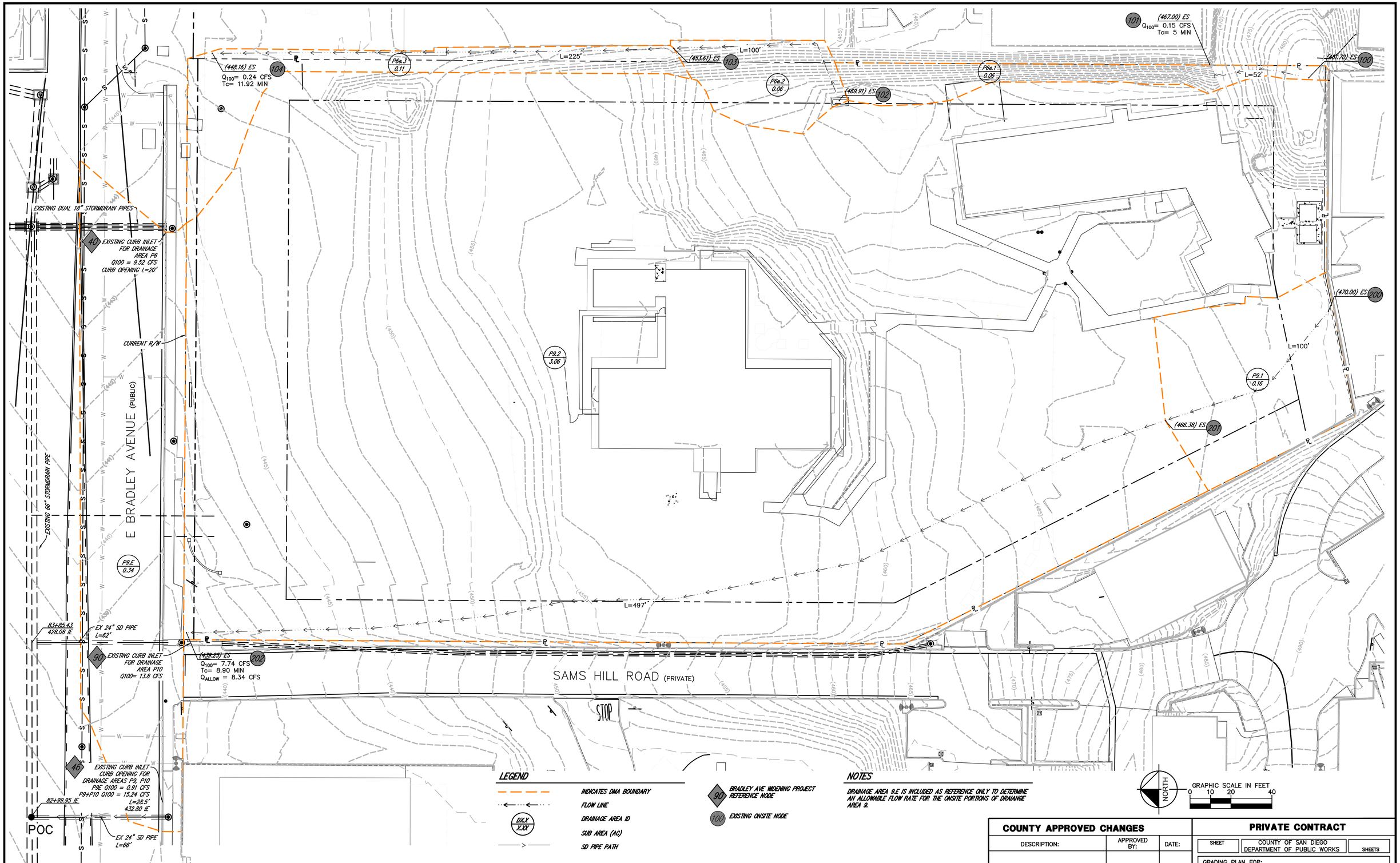
N
W E
S

3 0 3 Miles



811 Know what's below. Call before you dig.

DIAL TOLL FREE 811

AT LEAST TWO DAYS BEFORE YOU DIG

UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA

DATE REVISED:

REV.	SYMBOL	DESCRIPTION OF CHANGE	R.C.E.	DATE	P.D.E.	DATE

DESIGNED BY: LAC DATE

DRAWN BY: LAC DATE

CHECKED BY: KK DATE

ENGINEER'S SEAL

PREPARED BY:

KYLE KOIVUNIEMI, PE — REGISTERED ENGINEER

58449 — RCE NUMBER

COUNTY APPROVED CHANGES

DESCRIPTION:	APPROVED BY:	DATE:

PRIVATE CONTRACT

SHEET | COUNTY OF SAN DIEGO DEPARTMENT OF PUBLIC WORKS | SHEETS

GRADING PLAN FOR:

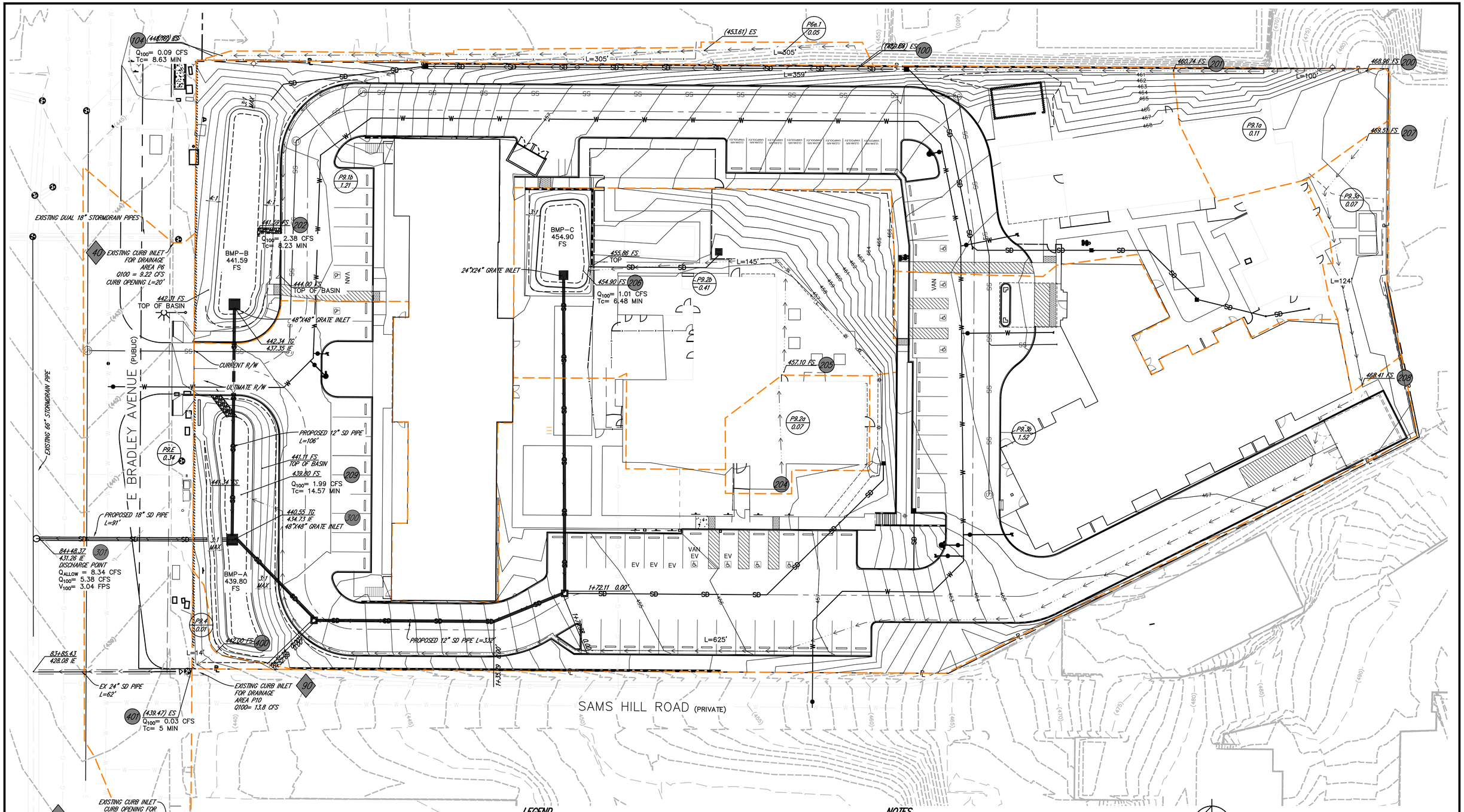
BRADLEY AVENUE CONVALESCENT HOME
PRE-DEVELOPMENT HYDROLOGY MAP

CALIFORNIA COORDINATE INDEX

APPROVED
DIRECTOR OF PUBLIC WORKS
BY:

ENGINEER OF WORK
R.C.E.

GRADING PERMIT NO:



LEGEND

- INDICATES DMA BOUNDARY
- FLOW LINE
- D.X / X.XX — DRAINAGE AREA ID / SUB AREA (AC)
- SD PIPE PATH
- BRADLEY AVE. WIDENING PROJECT REFERENCE NODE
- EXISTING ONSITE NODE

NOTES

DRAINAGE AREA 9.E IS INCLUDED AS REFERENCE ONLY TO DETERMINE AN ALLOWABLE FLOW RATE FOR THE ONSITE PORTIONS OF DRAINAGE AREA 9.

NORTH

GRAPHIC SCALE IN FEET
0 10 20 40

COUNTY APPROVED CHANGES

DESCRIPTION:	APPROVED BY:	DATE:

PRIVATE CONTRACT

SHEET | COUNTY OF SAN DIEGO DEPARTMENT OF PUBLIC WORKS | SHEETS

GRADING PLAN FOR:

BRADLEY AVENUE CONVALESCENT HOME
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BY:

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R.C.E.

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REV.	SYMBOL	DESCRIPTION OF CHANGE	R.C.E.	DATE	P.D.E.	DATE

DESIGNED BY: LAC DATE
DRAWN BY: LAC DATE
CHECKED BY: KK DATE

ENGINEER'S SEAL

PREPARED BY:

KYLE KOIVUNIEMI, PE — REGISTERED ENGINEER
58449 — RCE NUMBER

DATE REVISED:

ATTACHMENT 3: Modified Rational Method Runoff Calculations

3a. AES Pre Development Calculations

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

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
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              Ver. 18.0 Release Date: 07/01/2011  License ID 1499

                              Analysis prepared by:

                         Kimley-Horn and Associates, Inc.
                                765 The City Drive
                                    Suite 200
                                 Orange, CA 92868

 ************************ DESCRIPTION OF STUDY ************************
* Bradley Apartments                                                  *
* 100-Year Existing Conditions                                        *
* Kimley-Horn                                                         *
 **********************************************************************

  FILE NAME: BRADE.DAT
  TIME/DATE OF STUDY: 16:36 04/03/2024
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   2.700
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

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

**************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    101.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==========================================================================
  LAWNS, GOLF COURSES, ETC. GOOD COVER RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  80
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    52.00
  UPSTREAM ELEVATION(FEET) =    481.70
  DOWNSTREAM ELEVATION(FEET) =    467.00
  ELEVATION DIFFERENCE(FEET) =     14.70
```

```
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.519
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.114
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.15
  TOTAL AREA(ACRES) =      0.06   TOTAL RUNOFF(CFS) =      0.15

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    103.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  LAWNS, GOLF COURSES, ETC. GOOD COVER RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  80
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    469.91
  DOWNSTREAM ELEVATION(FEET) =    453.61
  ELEVATION DIFFERENCE(FEET) =     16.30
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.267
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.150
  SUBAREA RUNOFF(CFS) =      0.13
  TOTAL AREA(ACRES) =      0.06   TOTAL RUNOFF(CFS) =      0.13

****************************************************************************
  FLOW PROCESS FROM NODE    103.00 TO NODE    104.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =    453.61
  DOWNSTREAM NODE ELEVATION(FEET) =    448.16
  CHANNEL LENGTH THRU SUBAREA(FEET) =   225.00
  "V" GUTTER WIDTH(FEET) =   5.00   GUTTER HIKE(FEET) =  0.050
  PAVEMENT LIP(FEET) =  0.010   MANNING'S N = .0450
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.01000
  MAXIMUM DEPTH(FEET) =   5.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.061
  LAWNS, GOLF COURSES, ETC. GOOD COVER RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  80
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      0.21
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.66
  AVERAGE FLOW DEPTH(FEET) =   0.08   FLOOD WIDTH(FEET) =    8.98
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =   5.66   Tc(MIN.) =   11.92
  SUBAREA AREA(ACRES) =    0.11       SUBAREA RUNOFF(CFS) =    0.16
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        0.2         PEAK FLOW RATE(CFS) =       0.24

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.08   FLOOD WIDTH(FEET) =    9.70
  FLOW VELOCITY(FEET/SEC.) =   0.69   DEPTH*VELOCITY(FT*FT/SEC) =   0.06
  LONGEST FLOWPATH FROM NODE    102.00 TO NODE    104.00 =     325.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    201.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  RESIDENTIAL (2.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .4900
  SOIL CLASSIFICATION IS "D"
```

```
  S.C.S. CURVE NUMBER (AMC II) =  85
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    470.00
  DOWNSTREAM ELEVATION(FEET) =    466.38
  ELEVATION DIFFERENCE(FEET) =      3.62
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    7.027
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    96.55
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.712
  SUBAREA RUNOFF(CFS) =      0.45
  TOTAL AREA(ACRES) =      0.16   TOTAL RUNOFF(CFS) =      0.45

****************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =    466.38
  DOWNSTREAM NODE ELEVATION(FEET) =    439.25
  CHANNEL LENGTH THRU SUBAREA(FEET) =   497.00
  "V" GUTTER WIDTH(FEET) =   5.00   GUTTER HIKE(FEET) =  0.050
  PAVEMENT LIP(FEET) =  0.010   MANNING'S N = .0130
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.01000
  MAXIMUM DEPTH(FEET) =   5.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.904
  RESIDENTIAL (2.9 DU/AC OR LESS) RUNOFF COEFFICIENT = .4900
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  85
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      4.13
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.42
  AVERAGE FLOW DEPTH(FEET) =   0.13   FLOOD WIDTH(FEET) =   18.15
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =   1.87   Tc(MIN.) =    8.90
  SUBAREA AREA(ACRES) =    3.06       SUBAREA RUNOFF(CFS) =    7.35
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.490
  TOTAL AREA(ACRES) =        3.2         PEAK FLOW RATE(CFS) =       7.74

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.16   FLOOD WIDTH(FEET) =   24.18
  FLOW VELOCITY(FEET/SEC.) =   4.92   DEPTH*VELOCITY(FT*FT/SEC) =   0.77
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    202.00 =     597.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        3.2  TC(MIN.) =      8.90
  PEAK FLOW RATE(CFS)   =       7.74
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

ATTACHMENT 3: Modified Rational Method Runoff Calculations

3b. AES Post Development Calculations

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

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
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              Ver. 18.0 Release Date: 07/01/2011  License ID 1499

                              Analysis prepared by:

                          Kimley-Horn and Associates, Inc.
                                 765 The City Drive
                                     Suite 200
                                  Orange, CA 92868

 ************************ DESCRIPTION OF STUDY ************************
* BRADLEY                                                             *
* PROPOSED CONDITIONS 100-YEAR                                        *
* KIMLEY-HORN                                                         *
 **********************************************************************

  FILE NAME: BRADP.DAT
  TIME/DATE OF STUDY: 17:59 04/03/2024
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   2.700
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

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

**************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    104.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==========================================================================
  LAWNS, GOLF COURSES, ETC. GOOD COVER RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  80
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   305.00
  UPSTREAM ELEVATION(FEET) =    459.84
  DOWNSTREAM ELEVATION(FEET) =    448.16
  ELEVATION DIFFERENCE(FEET) =     11.68
```

```
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    8.629
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =   100.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.003
  SUBAREA RUNOFF(CFS) =      0.09
  TOTAL AREA(ACRES) =      0.05   TOTAL RUNOFF(CFS) =      0.09

****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    201.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  LAWNS, GOLF COURSES, ETC. POOR COVER RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  89
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    470.20
  DOWNSTREAM ELEVATION(FEET) =    460.74
  ELEVATION DIFFERENCE(FEET) =      9.46
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.384
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.077
  SUBAREA RUNOFF(CFS) =      0.23
  TOTAL AREA(ACRES) =      0.11   TOTAL RUNOFF(CFS) =      0.23

****************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =    460.74
  DOWNSTREAM NODE ELEVATION(FEET) =    441.59
  CHANNEL LENGTH THRU SUBAREA(FEET) =   359.00
  "V" GUTTER WIDTH(FEET) =   5.00   GUTTER HIKE(FEET) =  0.050
  PAVEMENT LIP(FEET) =  0.010   MANNING'S N = .0150
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.01000
  MAXIMUM DEPTH(FEET) =   5.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.158
  LAWNS, GOLF COURSES, ETC. POOR COVER RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  89
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      1.33
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.24
  AVERAGE FLOW DEPTH(FEET) =   0.09   FLOOD WIDTH(FEET) =   10.91
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =   1.85   Tc(MIN.) =    8.23
  SUBAREA AREA(ACRES) =    1.21       SUBAREA RUNOFF(CFS) =    2.18
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        1.3         PEAK FLOW RATE(CFS) =       2.38

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.11   FLOOD WIDTH(FEET) =   15.01
  FLOW VELOCITY(FEET/SEC.) =   3.53   DEPTH*VELOCITY(FT*FT/SEC) =   0.39
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    202.00 =     459.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    204.00 TO NODE    205.00 IS CODE =  22
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  LAWNS, GOLF COURSES, ETC. POOR COVER RUNOFF COEFFICIENT = .3500
```

```
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  89
  USER SPECIFIED Tc(MIN.) =    5.000
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.114
  SUBAREA RUNOFF(CFS) =      0.17
  TOTAL AREA(ACRES) =      0.07   TOTAL RUNOFF(CFS) =      0.17

****************************************************************************
  FLOW PROCESS FROM NODE    205.00 TO NODE    206.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =    457.10
  DOWNSTREAM NODE ELEVATION(FEET) =    454.90
  CHANNEL LENGTH THRU SUBAREA(FEET) =   145.00
  "V" GUTTER WIDTH(FEET) =   5.00   GUTTER HIKE(FEET) =  0.050
  PAVEMENT LIP(FEET) =  0.010   MANNING'S N = .0150
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.01000
  MAXIMUM DEPTH(FEET) =   5.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.019
  LAWNS, GOLF COURSES, ETC. POOR COVER RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  89
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      0.61
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.63
  AVERAGE FLOW DEPTH(FEET) =   0.09   FLOOD WIDTH(FEET) =   10.19
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =   1.48   Tc(MIN.) =    6.48
  SUBAREA AREA(ACRES) =    0.41       SUBAREA RUNOFF(CFS) =    0.86
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        0.5         PEAK FLOW RATE(CFS) =       1.01

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.10   FLOOD WIDTH(FEET) =   13.32
  FLOW VELOCITY(FEET/SEC.) =   1.82   DEPTH*VELOCITY(FT*FT/SEC) =   0.18
  LONGEST FLOWPATH FROM NODE    204.00 TO NODE    206.00 =     504.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    207.00 TO NODE    208.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  LAWNS, GOLF COURSES, ETC. POOR COVER RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  89
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   124.00
  UPSTREAM ELEVATION(FEET) =    469.51
  DOWNSTREAM ELEVATION(FEET) =    468.41
  ELEVATION DIFFERENCE(FEET) =      1.10
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =   11.370
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    65.48
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.188
  SUBAREA RUNOFF(CFS) =      0.10
  TOTAL AREA(ACRES) =      0.07   TOTAL RUNOFF(CFS) =      0.10

****************************************************************************
  FLOW PROCESS FROM NODE    208.00 TO NODE    209.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
```

```
==============================================================================
  UPSTREAM NODE ELEVATION(FEET) =    468.41
  DOWNSTREAM NODE ELEVATION(FEET) =    439.80
  CHANNEL LENGTH THRU SUBAREA(FEET) =   625.00
  "V" GUTTER WIDTH(FEET) =   5.00   GUTTER HIKE(FEET) =  0.050
  PAVEMENT LIP(FEET) =  0.010   MANNING'S N = .0130
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.01000
  MAXIMUM DEPTH(FEET) =   5.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.568
  LAWNS, GOLF COURSES, ETC. POOR COVER RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  89
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      1.06
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.25
  AVERAGE FLOW DEPTH(FEET) =   0.08   FLOOD WIDTH(FEET) =    9.22
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =   3.20   Tc(MIN.) =   14.57
  SUBAREA AREA(ACRES) =    1.52       SUBAREA RUNOFF(CFS) =    1.90
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        1.6         PEAK FLOW RATE(CFS) =       1.99

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.10   FLOOD WIDTH(FEET) =   13.32
  FLOW VELOCITY(FEET/SEC.) =   3.57   DEPTH*VELOCITY(FT*FT/SEC) =   0.36
  LONGEST FLOWPATH FROM NODE    207.00 TO NODE    209.00 =     749.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    400.00 TO NODE    401.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==============================================================================
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .4100
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  82
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    14.00
  UPSTREAM ELEVATION(FEET) =    442.00
  DOWNSTREAM ELEVATION(FEET) =    439.47
  ELEVATION DIFFERENCE(FEET) =      2.53
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.157
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.114
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.03
  TOTAL AREA(ACRES) =      0.01   TOTAL RUNOFF(CFS) =      0.03
==============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        0.0  TC(MIN.) =      2.16
  PEAK FLOW RATE(CFS)   =       0.03
==============================================================================
==============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

ATTACHMENT 4: Hydraulics

4a. WSPG Calculations

```
T1 Bradley Terraces                                                    0
T2 Existing Conditions 100-Yr
T3 Kimley-Horn
SO   7923.680 419.930  1                          424.888
R    8298.950 426.600  1      .013                                .000    .000 0
JX   8300.950 426.610  1  2   .013   15.240          426.610         90.0         .000
R    8384.950 427.530  1      .013                                .000    .000 0
JX   8386.950 427.550  1  2   .013   13.800          429.650         90.0         .000
R    8588.300 432.830  1      .013                                .000    .000 0
JX   8591.300 432.840  1  3  3.013    7.510    9.520 432.840 432.840-90.0 90.0    .000
R    8654.320 433.840  1      .013                                .000    .000 0
SH   8654.320 433.840  1                          433.840
CD   1  4   1    .000   5.500     .000  .000  .000   .00
CD   2  4   1    .000   2.000     .000  .000  .000   .00
CD   3  4   2    .000   1.500     .000  .000  .000   .00
Q           302.050   .0
```

Program Package Serial Number: 7152

WATER SURFACE PROFILE LISTING Date: 6-10-2024 Time: 3:32:15

Bradley Terraces
Existing Conditions 100-Yr
Kimley-Horn

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
7923.681	419.930	3.737	423.667	348.12	20.25	6.37	430.04	.00	5.01	5.13	5.500	.000	.00	1 .0
153.945	.0178					.0160	2.46	3.74	1.95	3.65	.013	.00	.00	PIPE
8077.626	422.666	3.842	426.508	348.12	19.64	5.99	432.50	.00	5.01	5.05	5.500	.000	.00	1 .0
116.530	.0178					.0146	1.70	3.84	1.85	3.65	.013	.00	.00	PIPE
8194.156	424.737	4.016	428.754	348.12	18.73	5.45	434.20	.00	5.01	4.88	5.500	.000	.00	1 .0
64.883	.0178					.0131	.85	4.02	1.69	3.65	.013	.00	.00	PIPE
8259.039	425.891	4.206	430.097	348.12	17.86	4.95	435.05	.00	5.01	4.67	5.500	.000	.00	1 .0
39.911	.0178					.0118	.47	4.21	1.54	3.65	.013	.00	.00	PIPE
8298.950	426.600	4.416	431.016	348.12	17.03	4.50	435.52	.00	5.01	4.38	5.500	.000	.00	1 .0
JUNCT STR	.0050					.0128	.03	4.42	1.39		.013	.00	.00	PIPE
8300.950	426.610	3.812	430.422	332.88	18.94	5.57	435.99	.00	4.95	5.07	5.500	.000	.00	1 .0
84.000	.0110					.0152	1.28	3.81	1.79	4.27	.013	.00	.00	PIPE
8384.950	427.530	3.668	431.198	332.88	19.78	6.07	437.27	.00	4.95	5.18	5.500	.000	.00	1 .0
JUNCT STR	.0100					.0177	.04	3.67	1.93		.013	.00	.00	PIPE
8386.949	427.550	3.331	430.881	319.08	21.20	6.98	437.86	.00	4.88	5.38	5.500	.000	.00	1 .0
15.991	.0262					.0192	.31	3.33	2.23	3.03	.013	.00	.00	PIPE
8402.940	427.969	3.360	431.329	319.08	20.98	6.84	438.17	.00	4.88	5.36	5.500	.000	.00	1 .0

Bradley Terraces
Existing Conditions 100-Yr
Kimley-Horn

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS) / SF Ave	Vel Head / HF	Energy Grd.El. / SE Dpth	Super Elev / Froude N	Critical Depth / Norm Dp	Flow Top Width / "N"	Height/ Dia.-FT / X-Fall	Base Wt or I.D. / ZR	ZL	No Wth Prs/Pip / Type Ch
57.664	.0262				.0179	1.03	3.36	2.20	3.03	.013		.00	.00	PIPE
8460.604	429.481	3.499	432.981	319.08	20.01	6.22	439.20	.00	4.88	5.29	5.500	.000	.00	1 .0
40.158	.0262				.0158	.64	3.50	2.03	3.03	.013		.00	.00	PIPE
8500.763	430.534	3.648	434.182	319.08	19.08	5.65	439.83	.00	4.88	5.20	5.500	.000	.00	1 .0
29.237	.0262				.0141	.41	3.65	1.87	3.03	.013		.00	.00	PIPE
8530.000	431.301	3.807	435.108	319.08	18.19	5.14	440.24	.00	4.88	5.08	5.500	.000	.00	1 .0
21.656	.0262				.0126	.27	3.81	1.72	3.03	.013		.00	.00	PIPE
8551.656	431.869	3.978	435.847	319.08	17.34	4.67	440.52	.00	4.88	4.92	5.500	.000	.00	1 .0
15.896	.0262				.0112	.18	3.98	1.58	3.03	.013		.00	.00	PIPE
8567.553	432.286	4.164	436.450	319.08	16.53	4.25	440.69	.00	4.88	4.72	5.500	.000	.00	1 .0
11.199	.0262				.0101	.11	4.16	1.44	3.03	.013		.00	.00	PIPE
8578.752	432.580	4.369	436.949	319.08	15.76	3.86	440.81	.00	4.88	4.45	5.500	.000	.00	1 .0
6.978	.0262				.0091	.06	4.37	1.30	3.03	.013		.00	.00	PIPE
8585.729	432.763	4.601	437.364	319.08	15.03	3.51	440.87	.00	4.88	4.07	5.500	.000	.00	1 .0
2.570	.0262				.0084	.02	4.60	1.16	3.03	.013		.00	.00	PIPE
8588.300	432.830	4.875	437.705	319.08	14.33	3.19	440.89	.00	4.88	3.49	5.500	.000	.00	1 .0
JUNCT STR	.0033				.0081	.02	4.88	1.00		.013		.00	.00	PIPE
8591.300	432.840	5.877	438.717	302.05	12.71	2.51	441.23	.00	4.78	.00	5.500	.000	.00	1 .0

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS) / SF Ave	Vel Head / HF	Energy Grd.El. / SE Dpth	Super Elev / Froude N	Critical Depth / Norm Dp	Flow Top Width / "N"	Height/Dia.-FT / X-Fall	Base Wt or I.D. / ZR	ZL	No Wth Prs/Pip / Type Ch
8639.819	433.610	5.500	439.110	302.05	12.71	2.51	441.62	.00	4.78	.00	5.500	.000	.00	1 .0
14.501	.0159					.0076	.11	5.50	.00	3.44	.013	.00	.00	PIPE
8654.320	433.840	5.334	439.174	302.05	12.83	2.55	441.73	.00	4.78	1.88	5.500	.000	.00	1 .0
48.520	.0159					.0080	.39	5.88	.00	3.44	.013	.00	.00	PIPE

```
T1 Bradley Terraces                                                    0
T2 Proposed Conditions 100-Yr
T3 Kimley-Horn
SO   7923.680 419.930  1                          424.888
R    8298.950 426.600  1      .013                              .000    .000 0
JX   8300.950 426.610  1  2   .013    7.530          426.610     90.0         .000
R    8384.950 427.530  1      .013                              .000    .000 0

JX   8386.950 427.550  1  2   .013   13.800          429.650     90.0         .000
R    8447.620 429.170  1      .013                              .000    .000 0

JX   8449.120 429.180  1  4   .013    8.340          431.260     90.0         .000
R    8588.300 432.830  1      .013                              .000    .000 0
JX   8591.300 432.840  1  3  3.013    7.510    9.220 432.840 432.840-90.0 90.0    .000
R    8654.320 433.840  1      .013                              .000    .000 0
SH   8654.320 433.840  1                          433.840
CD   1  4   1    .000   5.500     .000  .000  .000   .00
CD   2  4   1    .000   2.000     .000  .000  .000   .00
CD   3  4   2    .000   1.500     .000  .000  .000   .00
CD   4  4   1    .000   1.500     .000  .000  .000   .00
Q           302.050   .0
```

Program Package Serial Number: 7152

WATER SURFACE PROFILE LISTING Date: 6-10-2024 Time: 3:34: 0

Bradley Terraces
Proposed Conditions 100-Yr
Kimley-Horn

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
7923.680	419.930	3.728	423.658	348.45	20.32	6.41	430.07	.00	5.02	5.14	5.500	.000	.00	1 .0
26.785	.0178					.0167	.45	3.73	1.96	3.65	.013	.00	.00	PIPE
7950.465	420.406	3.738	424.144	348.45	20.26	6.38	430.52	.00	5.02	5.13	5.500	.000	.00	1 .0
201.030	.0178					.0157	3.16	3.74	1.95	3.65	.013	.00	.00	PIPE
8151.495	423.979	3.904	427.883	348.45	19.32	5.80	433.68	.00	5.02	4.99	5.500	.000	.00	1 .0
92.982	.0178					.0140	1.31	3.90	1.79	3.65	.013	.00	.00	PIPE
8244.478	425.632	4.084	429.715	348.45	18.42	5.27	434.98	.00	5.02	4.81	5.500	.000	.00	1 .0
54.473	.0178					.0126	.69	4.08	1.64	3.65	.013	.00	.00	PIPE
8298.950	426.600	4.280	430.880	348.45	17.56	4.79	435.67	.00	5.02	4.57	5.500	.000	.00	1 .0
JUNCT STR	.0050					.0127	.03	4.28	1.49		.013	.00	.00	PIPE
8300.950	426.610	3.978	430.588	340.92	18.53	5.33	435.92	.00	4.98	4.92	5.500	.000	.00	1 .0
84.000	.0110					.0141	1.19	3.98	1.69	4.37	.013	.00	.00	PIPE
8384.950	427.530	3.848	431.378	340.92	19.21	5.73	437.10	.00	4.98	5.04	5.500	.000	.00	1 .0
JUNCT STR	.0100					.0163	.03	3.85	1.80		.013	.00	.00	PIPE
8386.950	427.550	3.480	431.030	327.12	20.64	6.62	437.65	.00	4.92	5.30	5.500	.000	.00	1 .0
19.875	.0267					.0175	.35	3.48	2.10	3.06	.013	.00	.00	PIPE
8406.825	428.081	3.535	431.615	327.12	20.27	6.38	438.00	.00	4.92	5.27	5.500	.000	.00	1 .0

Bradley Terraces
Proposed Conditions 100-Yr
Kimley-Horn

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS) / SF Ave	Vel Head / HF	Energy Grd.El. / SE Dpth	Super Elev / Froude N	Critical Depth / Norm Dp	Flow Top Width / "N"	Height/ Dia.-FT / X-Fall	Base Wt or I.D. / ZR	ZL	No Wth Prs/Pip / Type Ch
40.795	.0267				.0162	.66	3.53	2.04	3.06	.013		.00	.00	PIPE
8447.620	429.170	3.686	432.856	327.12	19.33	5.80	438.66	.00	4.92	5.17	5.500	.000	.00	1 .0
JUNCT STR	.0067				.0162	.02	3.69	1.88		.013		.00	.00	PIPE
8449.121	429.180	3.464	432.644	318.78	20.22	6.35	438.99	.00	4.87	5.31	5.500	.000	.00	1 .0
12.020	.0262				.0170	.20	3.46	2.07	3.03	.013		.00	.00	PIPE
8461.141	429.495	3.499	432.994	318.78	19.99	6.21	439.20	.00	4.87	5.29	5.500	.000	.00	1 .0
39.969	.0262				.0158	.63	3.50	2.03	3.03	.013		.00	.00	PIPE
8501.109	430.543	3.647	434.190	318.78	19.06	5.64	439.83	.00	4.87	5.20	5.500	.000	.00	1 .0
29.126	.0262				.0141	.41	3.65	1.87	3.03	.013		.00	.00	PIPE
8530.235	431.307	3.806	435.113	318.78	18.17	5.13	440.24	.00	4.87	5.08	5.500	.000	.00	1 .0
21.571	.0262				.0125	.27	3.81	1.72	3.03	.013		.00	.00	PIPE
8551.807	431.873	3.977	435.850	318.78	17.33	4.66	440.51	.00	4.87	4.92	5.500	.000	.00	1 .0
15.840	.0262				.0112	.18	3.98	1.58	3.03	.013		.00	.00	PIPE
8567.646	432.288	4.163	436.452	318.78	16.52	4.24	440.69	.00	4.87	4.72	5.500	.000	.00	1 .0
11.156	.0262				.0101	.11	4.16	1.44	3.03	.013		.00	.00	PIPE
8578.803	432.581	4.369	436.949	318.78	15.75	3.85	440.80	.00	4.87	4.45	5.500	.000	.00	1 .0
6.945	.0262				.0091	.06	4.37	1.30	3.03	.013		.00	.00	PIPE
8585.748	432.763	4.600	437.363	318.78	15.02	3.50	440.87	.00	4.87	4.07	5.500	.000	.00	1 .0

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS) / SF Ave	Vel Head / HF	Energy Grd.El. / SE Dpth	Super Elev / Froude N	Critical Depth / Norm Dp	Flow Top Width / "N"	Height/ Dia.-FT / X-Fall	Base Wt or I.D. / ZR	ZL	No Wth Prs/Pip / Type Ch
2.552	.0262				.0084	.02	4.60	1.16	3.03	.013	.00	.00	PIPE	
8588.300	432.830	4.874	437.704	318.78	14.32	3.18	440.89	.00	4.87	3.49	5.500	.000	.00	1 .0
JUNCT STR	.0033				.0081	.02	4.87	1.00		.013	.00	.00	PIPE	
8591.300	432.840	5.866	438.706	302.05	12.71	2.51	441.22	.00	4.78	.00	5.500	.000	.00	1 .0
47.031	.0159				.0080	.38	5.87	.00	3.44	.013	.00	.00	PIPE	
8638.331	433.586	5.500	439.086	302.05	12.71	2.51	441.60	.00	4.78	.00	5.500	.000	.00	1 .0
15.989	.0159				.0075	.12	5.50	.00	3.44	.013	.00	.00	PIPE	
8654.320	433.840	5.312	439.152	302.05	12.85	2.56	441.72	.00	4.78	2.00	5.500	.000	.00	1 .0

```
T1 Bradley Terraces                                                    0
T2 Node 206-300, 100-Year
T3 Kimley-Horn
SO       .000 434.730  1                          436.253
R      51.280 437.498  1      .013                              .000 -45.000 0
JX     52.690 437.574  1  1   .013     .001          437.574          .0         .000
R     135.790 442.059  1      .013                              .000 -22.000 0
R     170.380 443.926  1      .013                              .000 -68.000 0
JX    172.110 444.020  1  1   .013     .010          444.020         22.0         .000
R     318.000 452.650  1      .013                              .000    .000 0
SH    318.000 452.650  1                          452.650
CD   1  4   1    .000   1.000     .000  .000  .000   .00
Q             1.010   .0
```

Program Package Serial Number: 7152

WATER SURFACE PROFILE LISTING Date: 6-10-2024 Time: 3:41: 1

Bradley Terraces
Node 206-300, 100-Year
Kimley-Horn

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS) / SF Ave	Vel Head / HF	Energy Grd.El. / SE Dpth	Super Elev / Froude N	Critical Depth / Norm Dp	Flow Top Width / "N"	Height/ Dia.-FT / X-Fall	Base Wt or I.D. / ZR	ZL	No Wth Prs/Pip / Type Ch
.000	434.730	1.523	436.253	1.02	1.30	.03	436.28	.00	.42	.00	1.000	.000	.00	1 .0
9.912	.0540					.0008	.01	1.52	.00	.24	.013	.00	.00	PIPE
9.912	435.265	1.000	436.265	1.02	1.30	.03	436.29	.00	.42	.00	1.000	.000	.00	1 .0
1.675	.0540					.0008	.00	1.00	.00	.24	.013	.00	.00	PIPE
11.587	435.355	.907	436.263	1.02	1.36	.03	436.29	.00	.42	.58	1.000	.000	.00	1 .0
.956	.0540					.0007	.00	.91	.21	.24	.013	.00	.00	PIPE
12.544	435.407	.853	436.260	1.02	1.43	.03	436.29	.00	.42	.71	1.000	.000	.00	1 .0
.775	.0540					.0008	.00	.85	.25	.24	.013	.00	.00	PIPE
13.319	435.449	.809	436.258	1.02	1.50	.03	436.29	.00	.42	.79	1.000	.000	.00	1 .0
.667	.0540					.0009	.00	.81	.28	.24	.013	.00	.00	PIPE
13.986	435.485	.770	436.255	1.02	1.57	.04	436.29	.00	.42	.84	1.000	.000	.00	1 .0
.588	.0540					.0010	.00	.77	.32	.24	.013	.00	.00	PIPE
14.574	435.517	.735	436.252	1.02	1.65	.04	436.29	.00	.42	.88	1.000	.000	.00	1 .0
.441	.0540					.0011	.00	.74	.35	.24	.013	.00	.00	PIPE
15.015	435.540	.703	436.243	1.02	1.73	.05	436.29	.00	.42	.91	1.000	.000	.00	1 .0
HYDRAULIC JUMP														
15.015	435.540	.237	435.778	1.02	7.16	.80	436.57	.00	.42	.85	1.000	.000	.00	1 .0

Bradley Terraces
Node 206-300, 100-Year
Kimley-Horn

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS) / SF Ave	Vel Head / HF	Energy Grd.El. / SE Dpth	Super Elev / Froude N	Critical Depth / Norm Dp	Flow Top Width / "N"	Height/Dia.-FT / X-Fall	Base Wt or I.D. / ZR	ZL / Type Ch	No Wth Prs/Pip
36.265	.0540				.0540	1.96	.24	3.08	.24	.013		.00	.00	PIPE
51.280	437.498	.237	437.735	1.02	7.16	.80	438.53	.00	.42	.85	1.000	.000	.00	1 .0
JUNCT STR	.0539				.0540	.08	.24	3.08		.013		.00	.00	PIPE
52.690	437.574	.237	437.811	1.02	7.16	.80	438.61	.00	.42	.85	1.000	.000	.00	1 .0
54.138	.0540				.0540	2.92	.24	3.08	.24	.013		.00	.00	PIPE
106.828	440.496	.237	440.733	1.02	7.16	.80	441.53	.00	.42	.85	1.000	.000	.00	1 .0
28.962	.0540				.0540	1.56	.24	3.08	.24	.013		.00	.00	PIPE
135.790	442.059	.237	442.296	1.02	7.16	.80	443.09	.00	.42	.85	1.000	.000	.00	1 .0
15.940	.0540				.0540	.86	.24	3.08	.24	.013		.00	.00	PIPE
151.730	442.919	.237	443.156	1.02	7.16	.80	443.95	.00	.42	.85	1.000	.000	.00	1 .0
18.650	.0540				.0551	1.03	.24	3.08	.24	.013		.00	.00	PIPE
170.380	443.926	.235	444.161	1.02	7.27	.82	444.98	.00	.42	.85	1.000	.000	.00	1 .0
JUNCT STR	.0543				.0577	.10	.23	3.15		.013		.00	.00	PIPE
172.110	444.020	.231	444.251	1.01	7.38	.85	445.10	.00	.42	.84	1.000	.000	.00	1 .0
102.296	.0592				.0592	6.05	.23	3.22	.23	.013		.00	.00	PIPE
274.406	450.071	.231	450.302	1.01	7.38	.85	451.15	.00	.42	.84	1.000	.000	.00	1 .0
18.456	.0592				.0575	1.06	.23	3.22	.23	.013		.00	.00	PIPE
292.862	451.163	.234	451.397	1.01	7.23	.81	452.21	.00	.42	.85	1.000	.000	.00	1 .0

Bradley Terraces
Node 206-300, 100-Year
Kimley-Horn

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
9.642	.0592					.0523	.50	.23	3.14	.23	.013	.00	.00	PIPE
302.504	451.733	.242	451.975	1.01	6.89	.74	452.71	.00	.42	.86	1.000	.000	.00	1 .0
4.387	.0592					.0458	.20	.24	2.94	.23	.013	.00	.00	PIPE
306.891	451.993	.250	452.243	1.01	6.57	.67	452.91	.00	.42	.87	1.000	.000	.00	1 .0
2.737	.0592					.0400	.11	.25	2.75	.23	.013	.00	.00	PIPE
309.628	452.155	.259	452.413	1.01	6.27	.61	453.02	.00	.42	.88	1.000	.000	.00	1 .0
1.923	.0592					.0350	.07	.26	2.57	.23	.013	.00	.00	PIPE
311.551	452.269	.268	452.536	1.01	5.97	.55	453.09	.00	.42	.89	1.000	.000	.00	1 .0
1.444	.0592					.0306	.04	.27	2.41	.23	.013	.00	.00	PIPE
312.994	452.354	.277	452.631	1.01	5.70	.50	453.13	.00	.42	.89	1.000	.000	.00	1 .0
1.116	.0592					.0268	.03	.28	2.25	.23	.013	.00	.00	PIPE
314.110	452.420	.287	452.707	1.01	5.43	.46	453.16	.00	.42	.90	1.000	.000	.00	1 .0
.889	.0592					.0235	.02	.29	2.11	.23	.013	.00	.00	PIPE
314.999	452.473	.297	452.769	1.01	5.18	.42	453.19	.00	.42	.91	1.000	.000	.00	1 .0
.711	.0592					.0205	.01	.30	1.97	.23	.013	.00	.00	PIPE
315.710	452.515	.307	452.821	1.01	4.94	.38	453.20	.00	.42	.92	1.000	.000	.00	1 .0
.573	.0592					.0180	.01	.31	1.85	.23	.013	.00	.00	PIPE

Bradley Terraces
Node 206-300, 100-Year
Kimley-Horn

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
316.283	452.548	.318	452.866	1.01	4.71	.34	453.21	.00	.42	.93	1.000	.000	.00	1 .0
.463	.0592					.0157	.01	.32	1.73	.23	.013	.00	.00	PIPE
316.746	452.576	.329	452.905	1.01	4.49	.31	453.22	.00	.42	.94	1.000	.000	.00	1 .0
.371	.0592					.0138	.01	.33	1.62	.23	.013	.00	.00	PIPE
317.117	452.598	.341	452.938	1.01	4.28	.28	453.22	.00	.42	.95	1.000	.000	.00	1 .0
.292	.0592					.0121	.00	.34	1.51	.23	.013	.00	.00	PIPE
317.409	452.615	.353	452.968	1.01	4.08	.26	453.23	.00	.42	.96	1.000	.000	.00	1 .0
.224	.0592					.0106	.00	.35	1.41	.23	.013	.00	.00	PIPE
317.634	452.628	.365	452.994	1.01	3.89	.24	453.23	.00	.42	.96	1.000	.000	.00	1 .0
.166	.0592					.0093	.00	.37	1.32	.23	.013	.00	.00	PIPE
317.800	452.638	.378	453.016	1.01	3.71	.21	453.23	.00	.42	.97	1.000	.000	.00	1 .0
.112	.0592					.0082	.00	.38	1.23	.23	.013	.00	.00	PIPE
317.912	452.645	.392	453.037	1.01	3.54	.19	453.23	.00	.42	.98	1.000	.000	.00	1 .0
.066	.0592					.0072	.00	.39	1.15	.23	.013	.00	.00	PIPE
317.978	452.649	.406	453.055	1.01	3.37	.18	453.23	.00	.42	.98	1.000	.000	.00	1 .0
.022	.0592					.0063	.00	.41	1.08	.23	.013	.00	.00	PIPE
318.000	452.650	.422	453.072	1.01	3.21	.16	453.23	.00	.42	.99	1.000	.000	.00	1 .0

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T1 Bradley Terraces                                                    0
T2 Proposed Node 202-301
T3 Kimley-Horn
SO       .000 431.260  1                          432.856
R      89.500 434.720  1      .013                                .000 -90.000 0
JX     93.500 434.730  2  1  0.013    1.010    1.990 434.730 434.730 45.0   .0    .000
R     199.000 437.350  2      .013                                .000    .000 1
SH    199.000 437.350  2                          437.350
CD   1  4   1    .000   1.500     .000  .000  .000   .00
CD   2  4   1    .000   1.000     .000  .000  .000   .00
Q             2.380   .0
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WATER SURFACE PROFILE LISTING Date: 6-10-2024 Time: 3:37:36

Bradley Terraces
Proposed Node 202-301
Kimley-Horn

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS) / SF Ave	Vel Head / HF	Energy Grd.El. / SE Dpth	Super Elev / Froude N	Critical Depth / Norm Dp	Flow Top Width / "N"	Height/ Dia.-FT / X-Fall	Base Wt or I.D. / ZR	ZL	No Wth Prs/Pip / Type Ch
.000	431.260	1.596	432.856	5.38	3.04	.14	433.00	.00	.89	.00	1.500	.000	.00	1 .0
3.850	.0387				.0026	.01	1.60	.00	.52	.013	.00	.00	PIPE	
3.850	431.409	1.500	432.909	5.38	3.04	.14	433.05	.00	.89	.00	1.500	.000	.00	1 .0
1.364	.0387				.0024	.00	1.50	.00	.52	.013	.00	.00	PIPE	
5.214	431.462	1.447	432.909	5.38	3.08	.15	433.06	.00	.89	.55	1.500	.000	.00	1 .0
HYDRAULIC JUMP														
5.214	431.462	.525	431.986	5.38	9.77	1.48	433.47	.00	.89	1.43	1.500	.000	.00	1 .0
26.555	.0387				.0370	.98	.52	2.78	.52	.013	.00	.00	PIPE	
31.768	432.488	.533	433.021	5.38	9.56	1.42	434.44	.00	.89	1.44	1.500	.000	.00	1 .0
21.989	.0387				.0337	.74	.53	2.69	.52	.013	.00	.00	PIPE	
53.758	433.338	.552	433.890	5.38	9.12	1.29	435.18	.00	.89	1.45	1.500	.000	.00	1 .0
10.669	.0387				.0295	.31	.55	2.52	.52	.013	.00	.00	PIPE	
64.427	433.751	.572	434.322	5.38	8.69	1.17	435.50	.00	.89	1.46	1.500	.000	.00	1 .0
6.735	.0387				.0259	.17	.57	2.35	.52	.013	.00	.00	PIPE	
71.162	434.011	.592	434.603	5.38	8.29	1.07	435.67	.00	.89	1.47	1.500	.000	.00	1 .0
4.737	.0387				.0227	.11	.59	2.20	.52	.013	.00	.00	PIPE	
75.899	434.194	.614	434.808	5.38	7.90	.97	435.78	.00	.89	1.48	1.500	.000	.00	1 .0

Bradley Terraces
Proposed Node 202-301
Kimley-Horn

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS) / SF Ave	Vel Head / HF	Energy Grd.El. / SE Dpth	Super Elev / Froude N	Critical Depth / Norm Dp	Flow Top Width / "N"	Height/ Dia.-FT / X-Fall	Base Wt or I.D. / ZR	ZL	No Wth Prs/Pip / Type Ch
79.410	434.330	.636	434.966	5.38	7.54	.88	435.85	.00	.89	1.48	1.500	.000	.00	1 .0
2.685	.0387				.0175	.05	.64	1.91	.52	.013	.00	.00		PIPE
82.095	434.434	.660	435.094	5.38	7.19	.80	435.90	.00	.89	1.49	1.500	.000	.00	1 .0
2.080	.0387				.0154	.03	.66	1.79	.52	.013	.00	.00		PIPE
84.175	434.514	.684	435.198	5.38	6.85	.73	435.93	.00	.89	1.49	1.500	.000	.00	1 .0
1.618	.0387				.0135	.02	.68	1.67	.52	.013	.00	.00		PIPE
85.793	434.577	.710	435.287	5.38	6.53	.66	435.95	.00	.89	1.50	1.500	.000	.00	1 .0
1.246	.0387				.0119	.01	.71	1.55	.52	.013	.00	.00		PIPE
87.039	434.625	.737	435.362	5.38	6.23	.60	435.96	.00	.89	1.50	1.500	.000	.00	1 .0
.946	.0387				.0105	.01	.74	1.45	.52	.013	.00	.00		PIPE
87.985	434.661	.765	435.426	5.38	5.94	.55	435.97	.00	.89	1.50	1.500	.000	.00	1 .0
.689	.0387				.0092	.01	.76	1.35	.52	.013	.00	.00		PIPE
88.675	434.688	.794	435.482	5.38	5.66	.50	435.98	.00	.89	1.50	1.500	.000	.00	1 .0
.467	.0387				.0081	.00	.79	1.25	.52	.013	.00	.00		PIPE
89.142	434.706	.825	435.532	5.38	5.40	.45	435.98	.00	.89	1.49	1.500	.000	.00	1 .0
.268	.0387				.0072	.00	.83	1.16	.52	.013	.00	.00		PIPE
89.410	434.717	.858	435.575	5.38	5.15	.41	435.99	.00	.89	1.48	1.500	.000	.00	1 .0
3.510	.0387				.0199	.07	.61	2.05	.52	.013	.00	.00		PIPE

Bradley Terraces
Proposed Node 202-301
Kimley-Horn

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS) / SF Ave	Vel Head / HF	Energy Grd.El. / SE Dpth	Super Elev / Froude N	Critical Depth / Norm Dp	Flow Top Width / "N"	Height/ Dia.-FT / X-Fall	Base Wt or I.D. / ZR	ZL	No Wth Prs/Pip / Type Ch
89.500	434.720	.894	435.614	5.38	4.90	.37	435.99	.00	.89	1.47	1.500	.000	.00	1 .0
JUNCT STR	.0025					.0052	.02	.89	1.00		.013	.00	.00	PIPE
93.500	434.730	1.523	436.253	2.38	3.03	.14	436.40	.00	.66	.00	1.000	.000	.00	1 .0
25.750	.0248					.0044	.11	1.52	.00	.45	.013	.00	.00	PIPE
119.250	435.369	1.000	436.369	2.38	3.03	.14	436.51	.00	.66	.00	1.000	.000	.00	1 .0
2.695	.0248					.0041	.01	1.00	.00	.45	.013	.00	.00	PIPE
121.945	435.436	.907	436.344	2.38	3.18	.16	436.50	.00	.66	.58	1.000	.000	.00	1 .0
HYDRAULIC JUMP														
121.945	435.436	.454	435.891	2.38	6.85	.73	436.62	.00	.66	1.00	1.000	.000	.00	1 .0
12.745	.0248					.0248	.32	.45	2.05	.45	.013	.00	.00	PIPE
134.690	435.753	.454	436.207	2.38	6.85	.73	436.94	.00	.66	1.00	1.000	.000	.00	1 .0
33.052	.0248					.0239	.79	.45	2.05	.45	.013	.00	.00	PIPE
167.742	436.574	.465	437.039	2.38	6.65	.69	437.73	.00	.66	1.00	1.000	.000	.00	1 .0
13.670	.0248					.0215	.29	.46	1.96	.45	.013	.00	.00	PIPE
181.412	436.913	.482	437.396	2.38	6.34	.62	438.02	.00	.66	1.00	1.000	.000	.00	1 .0
6.555	.0248					.0190	.12	.48	1.82	.45	.013	.00	.00	PIPE

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WATER SURFACE PROFILE LISTING Date: 6-10-2024 Time: 3:37:36

Bradley Terraces
Proposed Node 202-301
Kimley-Horn

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS) / SF Ave	Vel Head / HF	Energy Grd.El. / SE Dpth	Super Elev / Froude N	Critical Depth / Norm Dp	Flow Top Width / "N"	Height/ Dia.-FT / X-Fall	Base Wt or I.D. / ZR	ZL	No Wth Prs/Pip / Type Ch
187.966	437.076	.501	437.577	2.38	6.05	.57	438.14	.00	.66	1.00	1.000	.000	.00	1 .0
3.987	.0248				.0167	.07	.50	1.70	.45	.013		.00	.00	PIPE
191.953	437.175	.520	437.695	2.38	5.77	.52	438.21	.00	.66	1.00	1.000	.000	.00	1 .0
2.644	.0248				.0147	.04	.52	1.58	.45	.013		.00	.00	PIPE
194.597	437.241	.540	437.781	2.38	5.50	.47	438.25	.00	.66	1.00	1.000	.000	.00	1 .0
1.804	.0248				.0130	.02	.54	1.47	.45	.013		.00	.00	PIPE
196.401	437.285	.561	437.847	2.38	5.24	.43	438.27	.00	.66	.99	1.000	.000	.00	1 .0
1.227	.0248				.0115	.01	.56	1.37	.45	.013		.00	.00	PIPE
197.628	437.316	.584	437.900	2.38	5.00	.39	438.29	.00	.66	.99	1.000	.000	.00	1 .0
.794	.0248				.0101	.01	.58	1.27	.45	.013		.00	.00	PIPE
198.422	437.336	.607	437.943	2.38	4.77	.35	438.30	.00	.66	.98	1.000	.000	.00	1 .0
.439	.0248				.0090	.00	.61	1.17	.45	.013		.00	.00	PIPE
198.862	437.347	.633	437.979	2.38	4.54	.32	438.30	.00	.66	.96	1.000	.000	.00	1 .0
.138	.0248				.0079	.00	.63	1.09	.45	.013		.00	.00	PIPE
199.000	437.350	.660	438.010	2.38	4.33	.29	438.30	.00	.66	.95	1.000	.000	.00	1 .0

ATTACHMENT 5: FEMA Floodplains/Floodways

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations (BFEs) shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) Zone 11. The **horizontal datum** was NAD83, GRS1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov/ or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242** or visit its website at http://www.ngs.noaa.gov/.

Base map information shown on this FIRM was provided in digital format by the USDA National Agriculture Imagery Program (NAIP). this information was photogrammetrically compiled at a scale of 1:24,000 from aerial photography dated 2009.

This map reflects more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables *in the Flood Insurance Study report (which contains authoritative hydraulic data)* may reflect stream channel distances that differ from what is shown on this map.

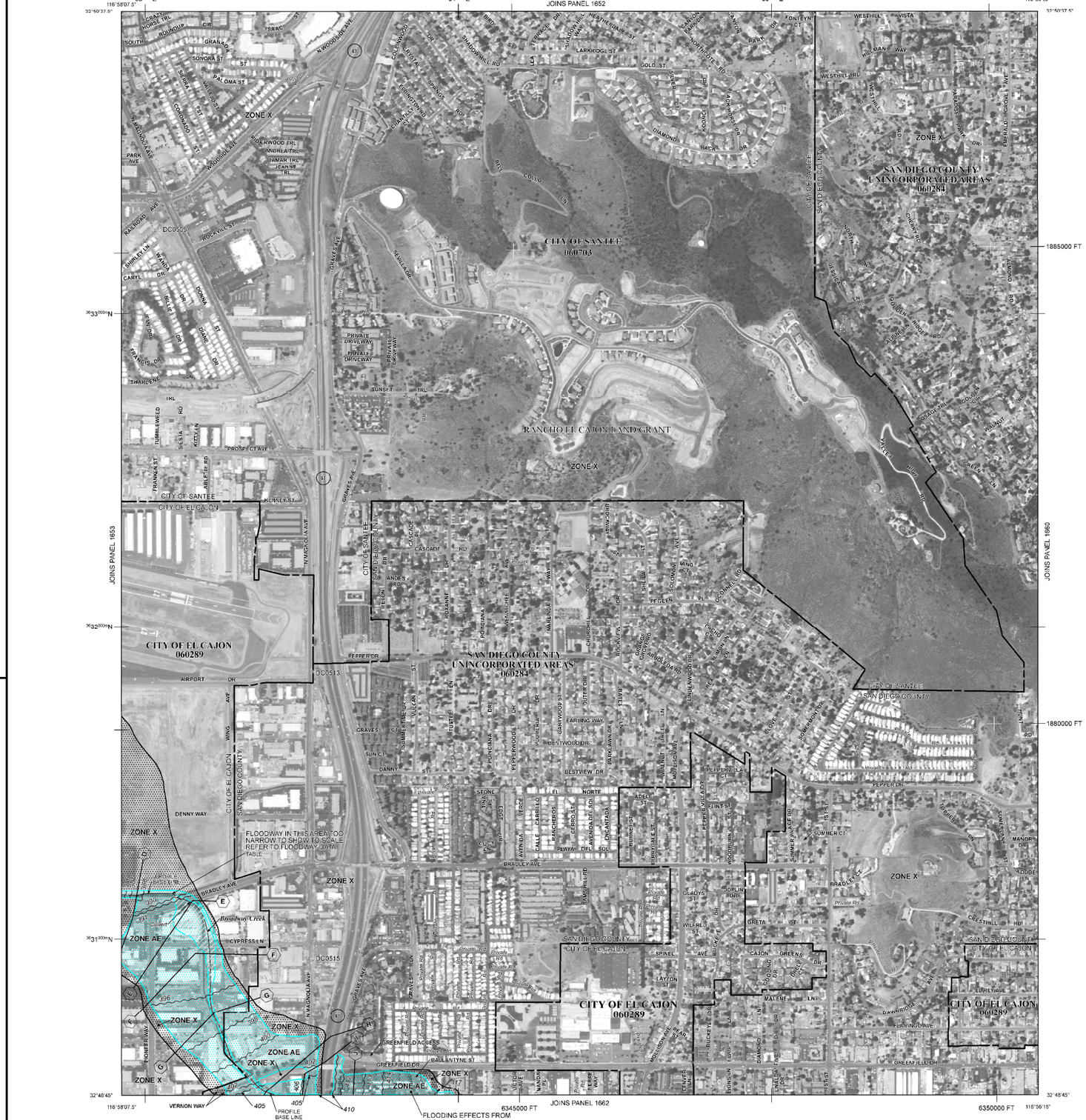
Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

Contact the **FEMA Map Service Center** at 1-877-FEMA MAP (1-877-336-2627) for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study report, and/or digital versions of this map. The FEMA Map Service Center may also be reached by Fax at 1-800-358-9620 and its website at http://msc.fema.gov/.

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip/.

The **"profile base lines"** depicted on this map represent the hydraulic modeling baselines that match the flood profiles in the FIS report. As a result of improved topographic data, the "profile base line", in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.



LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Areas to be protected from 1% annual chance flood event by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

	1% annual chance floodplain boundary
	0.2% annual chance floodplain boundary
	Floodway boundary
	Zone D boundary
	CBRS and OPA boundary
	Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities
513 (EL 987)	Base Flood Elevation line and value; elevation in feet* / Base Flood Elevation value where uniform within zone; elevation in feet*
A — A	Cross section line
23 — 23	Transect line
97°07'30", 32°22'30"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
4475000mE	1000-meter Universal Transverse Mercator grid ticks, zone 11
6000000 FT	5000-foot grid values: California State Plane coordinate system, Zone VI (FIPSZONE = 406), Lambert projection
DX5510	Bench mark (see explanation in Notes to Users section of this FIRM panel)
M1.5	River Mile

* Referenced to the North American Vertical Datum of 1988

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
June 19, 1997

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
May 16, 2012 – to update corporate limits, to add roads and road names, to incorporate previously issued Letters of Map Revision, and to update map elevations to North American Vertical Datum of 1988.

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

250 0 250 500 750 1,000 FEET
75 0 125 250 METERS

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1654G

FIRM

FLOOD INSURANCE RATE MAP

SAN DIEGO COUNTY, CALIFORNIA AND INCORPORATED AREAS

PANEL 1654 OF 2375

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
EL CAJON, CITY OF	060289	1654	G
SAN DIEGO COUNTY	060284	1654	G
SANTEE, CITY OF	060703	1654	G

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER 06073C1654G

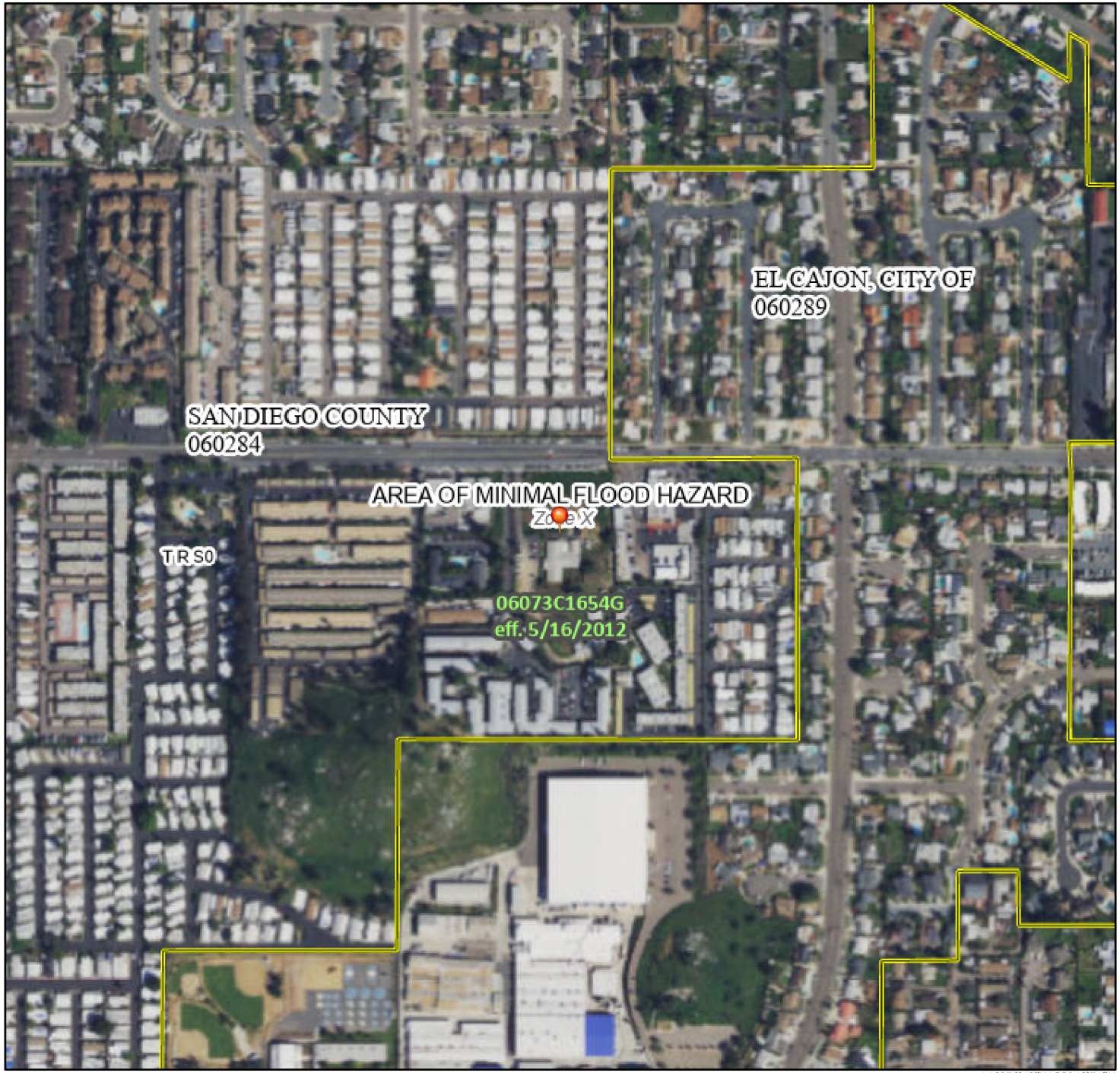
MAP REVISED MAY 16, 2012

Federal Emergency Management Agency

National Flood Hazard Layer FIRMette

FEMA

116°57'27"W 32°49'22"N



116°56'49"W 32°48'51"N

Feet 1:6,000

0 250 500 1,000 1,500 2,000

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 5/26/2021 at 2:50 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

ATTACHMENT 6: Off-site Hydraulic Calculations

6a. Sheets Plans for Construction of Bradley Avenue Widening, City of El Cajon Drawing No. 14608, dated August 9, 2023.

-1 0 1 2 3 4 5 6 7 8 9 10

FOR REDUCED PLANS
ORIGINAL SCALE IS IN INCHES

	BY	DATE
DESIGNED	A. NADERHOFF	3/24/20
CHECKED	R. TORRES	3/24/20

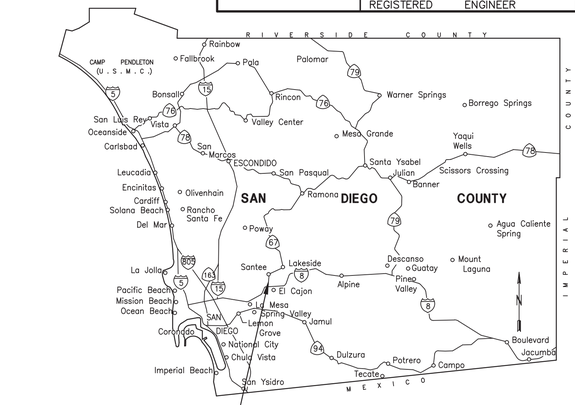
REGISTERED PROFESSIONAL ENGINEER
Robert J Torres
No. C71378
Exp. 12-31-2023
STATE OF CALIFORNIA

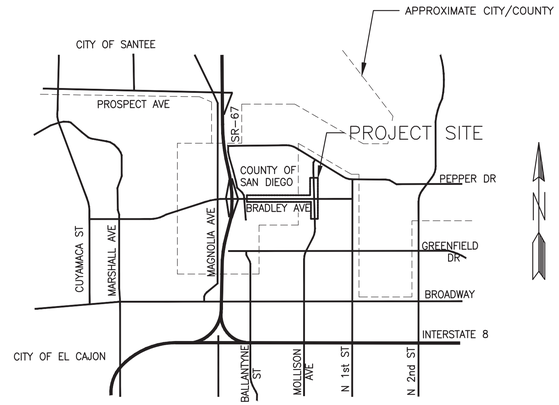
REGISTERED ENGINEER — 8/9/2023 DATE

INDEX OF SHEETS

COUNTY OF SAN DIEGO, CALIFORNIA
DEPARTMENT OF PUBLIC WORKS

PLANS FOR CONSTRUCTION OF BRADLEY AVENUE WIDENING RS 1171 In The Vicinity of El Cajon LENGTH = 0.50 MILES





VICINITY MAP
NO SCALE

THE CITY OF EL CAJON MUST BE NOTIFIED PRIOR TO THE START OF ANY TRAFFIC CONTROL, DEMOLITION OR CONSTRUCTION ACTIVITIES WITHIN ITS JURISDICTION. CALL THE CITY PUBLIC WORKS DEPARTMENT AT 619–441–1653 AT REQUEST TO BE CONNECTED WITH THE CITY PUBLIC WORKS INSPECTOR AND THE CITY STORM WATER INSPECTOR. NOTIFICATION VIA E–MAIL IS ACCEPTABLE AT:
STORMWATER@CITYOFELCAJON.US
PWINSPECTION@CITYOFELCAJON.US

GENERAL NOTES:

ATTENTION IS DIRECTED TO THE POSSIBLE EXISTENCE OF UNDERGROUND UTILITY FACILITIES NOT KNOWN OR IN A LOCATION DIFFERENT FROM THAT WHICH IS SHOWN ON THE PLANS OR IN THE SPECIAL PROVISIONS. THE CONTRACTOR SHALL TAKE STEPS TO ASCERTAIN THE EXACT LOCATION OF ALL UNDERGROUND FACILITIES PRIOR TO PERFORMING WORK THAT MAY DAMAGE SUCH FACILITIES OR INTERFERE WITH THEIR SERVICE. FORTY–EIGHT HOURS BEFORE EXCAVATING, THE CONTRACTOR SHALL VERIFY THE LOCATION OF UNDERGROUND FACILITIES BY CONTACTING UNDERGROUND SERVICE ALERT AT TELEPHONE 1–800–422–4133.

OPERATORS OF GRAVITY SEWER SYSTEMS AND CERTAIN OTHER UTILITIES, WHO ARE NOT MEMBERS OF UNDERGROUND SERVICE ALERT, MUST BE INDIVIDUALLY CONTACTED.

COUNTY OF SAN DIEGO DPW DESIGN SECTION
REVIEWED BY: _____ DATE _____

CITY OF EL CAJON JOB NO. 3417
CITY OF EL CAJON DRAWING NO. 14608

CITY OF EL CAJON
ENGINEERING DEPARTMENT
Mario Sanchez Digitally signed by Mario Sanchez Date: 2023.08.10 07:42:35 -07'00' DATE _____
CITY ENGINEER

RECOMMENDED BY: Jim Bolz Digitally signed by Jim Bolz Date: 2023.08.10 12:18:26 -07'00' DATE _____
Hanger, Christopher Digitally signed by Hanger, Christopher Date: 2023.08.14 09:51:14 -07'00' DATE _____

APPROVED BY: William Morgan Digitally signed by William Morgan Date: 2023.08.29 15:28:57 -07'00' DATE _____
William P. Morgan, County Engineer

COUNTY OF SAN DIEGO
DEPARTMENT OF PUBLIC WORKS
5500 OVERLAND AVENUE, SAN DIEGO, CA 92123-1295

	REVISIONS	BY	APPROVED	DATE

COORDINATE INDEX
238 N. 1779 E.
CONST. COMPL. _____
FIELD REVISIONS _____

BRADLEY AVENUE WIDENING
In The Vicinity of EL CAJON
TITLE SHEET

SCALE: HOR. NONE VERT. NONE
W.A. 1003030 R.S. RS 1171
SHEET 01 OF 116 SHEETS

N:\Projects\C10005\ED_Plans\C-5401-T01.dwg Thursday, Aug. 10 2023 6:08am anaderho

-1 0 1 2 3 4 5 6 7 8 9 10

FOR REDUCED PLANS
ORIGINAL SCALE IS IN INCHES

REGISTERED PROFESSIONAL ENGINEER
Robert J Torres
No. C71378
Exp. 12-31-2023
STATE OF CALIFORNIA

	BY	DATE
DESIGNED	A. NADERHOFF	3/24/20
CHECKED	R. TORRES	3/24/20

8/9/2023
REGISTERED ENGINEER DATE

PROJECT STANDARD SPECIFICATIONS

STATE OF CALIFORNIA STANDARD SPECIFICATIONS, 2015

PROJECT STANDARD PLANS

SAN DIEGO COUNTY DESIGN STANDARDS (SDCDS), October 2012

DS-07, DS-10, DS-12, DS-13A, DS-13D, DS-13G, DS-21(A-F), DS-22

SAN DIEGO REGIONAL STANDARD DRAWINGS (SDRSD), December 2015

C-1, D-1, D-2, D-7, D-8, D-9, D-11A, D-11B, D-12, D-13, D-22, D-25, D-60, D-61, D-62, D-63, D-75, E-1, E-2, G-1, G-2, G-5, G-6, G-7, G-9, G-10, G-12, G-13, G-14A, G-14B, G-14D, G-14E (Mod), G-14G, G-30, L-3, M-1, M-2, M-45, SP-3, SP-9, TC-4, TC-21

CALTRANS STANDARD PLANS (CTSP), 2018

A3A, A3B, A3C, A10A, RSP A10B, A20A, A20B, A20C, A20D, A24A, A24D, A24E, A73B, A81A, A81B, RSP A85, B0-3, B2-3, B3-9, B15-2, B15-3, B15-5, B15-10, D73B, D73F, D73G, D77A, D77B, D-80, D-82, ES-1A, ES-1B, RSP ES-1C, ES-3A, RSP ES-3C, ES-4A, ES-4B, ES-4C, ES-4D, ES-4E, RSP ES-5A, RSP ES-5B, ES-5C, ES-5D, RSP ES-7F, ES-70, T2, T13, T56, T57, T58, T62

CITY OF EL CAJON IMPROVEMENT STANDARDS, 1987

FS-10

WATER AGENCIES' STANDARDS (WAS), 2014

WF-01, WI-02, WI-03, WP-08, WS-01, WS-02, WS-03, WS-05

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION (SPPWC), 2012

225-2

SURVEY NOTES

HORIZONTAL CONTROL

ALL BEARINGS, DISTANCES, STATIONS AND COORDINATES ARE GRID AND BASED ON CALIFORNIA COORDINATE SYSTEM, ZONE 6, NAD 83 (1991.35) DATUM. 1SR ORDER PROJECT CONTROL POINT '151WCCS1' PER ROS 16959 AND PROJECT POINTS 'BA XP3', 'PDC FP2'. 'BA FP35', AND 'PDC FP1' PER FIELDBOOK R1792 WERE USED TO CONTROL THE SURVEY HORIZONTALLY.

AT STATION '151WCCS1':
N = 1878415.8738
E = 6349217.4362
ELEV = 787.28
λ = -0°22'47.99" AT THE COMBINATION FACTOR = 0.99996187
GROUND DISTANCE = GRID DISTANCE / COMBINATION FACTOR

BENCH MARKS

DESIGNATION: EL CAJON #88

DESCRIPTION: STANDARD 3" BRASS DISC

LOCATION: STD BM T/C SOUTH END OF CURB RETURN AT SOUTHWEST CORNER OF MOLLISON & BRADLEY AVE

ELEVATION: 458.135

DATUM: NAVD 88

MONUMENTS

PRIOR TO CONSTRUCTION, THE COUNTY OF SAN DIEGO FIELD SURVEYS SECTION SHALL BE NOTIFIED REGARDING ANY CONTROL, MONUMENTS, OR BENCHMARKS THAT MAY BE DESTROYED BY CONSTRUCTION.

NOTE:

ALL DS-21(A-D) CURB RAMPS MUST HAVE 3'x4' TRUNCATED DOMES, PER DS-21F

PERMANENT WATER POLLUTION CONTROL BMP'S

1. SITE DESIGN BMP'S	SEE SHEETS 6-15, 44-50
2. SOURCE CONTROL BMP'S	SEE SHEETS 44-50
3. TREATMENT CONTROL BMP'S	SEE SHEETS 6-15, 44-50

Basis of Bearings Coordinate System Zone 6 NAD 83 California

LEGEND OF IMPROVEMENTS

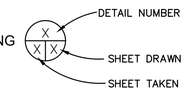
SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
	CENTERLINE		EXIST CITY STREET LIGHT
	DWY CENTERLINE		EXIST POWER POLE LIGHT
	SAWCUT LINE		EXIST CURB INLET
	RIGHT OF WAY		EXIST RCP
	TCE		REMOVE EXIST UTILITY
	CUT/FILL LINE	TV	EXIST TELEVISION LINE
	SOUNDWALL	T	EXIST TELEPHONE LINE
	RETAINING CURB	E	EXIST ELECTRICAL LINE
	ESA	W	EXIST WATER LINE
	CONCRETE	G	EXIST GAS LINE
	AC ON AB	S	EXIST SEWER LINE
	PLANE AC PAVEMENT,AC PAVEMENT (ROADWAY)	WV	EXIST WATER VALVE
	PLANE AC PAVEMENT,AC PAVEMENT (DRIVEWAY)	GV	EXIST GAS VALVE
	PAVEMENT REMOVAL	WM	EXIST WATER METER
	CELLULAR BLOCK (PRECAST)		EXIST DRAINAGE/SEWER MANHOLE
	BIOSWALE/RAIN GARDEN		EXIST SDGE POWER POLE/CABLE
	TRAFFIC PLASTIC DRUM		EXIST FIRE HYDRANT
	TYPE III BARRICADE		PROPOSED RCP
	SIGN	FR	TEMPORARY FIBER ROLL
	TYPE G CURB AND GUTTER	GBB	TEMPORARY GRAVEL BAG
	TYPE A CURB RAMPS		WOOD FENCE
	CITY STREET LIGHT		TEMPORARY INLET PROTECTION
	CURB INLET TYPE A-1		TEMPORARY DROP INLET PROTECTION
	CURB INLET TYPE B-1		TEMPORARY CONCRETE WASHOUT
	CURB INLET TYPE B		
	CURB INLET TYPE B-2		
C	CLEANOUT TYPE A-4, A-7, A-8		
	HGL		
	EXIST CURB AND GUTTER		
	EXIST CURB RAMP		

ABBREVIATIONS

ABBREVIATION	DESCRIPTION
AASHTO	AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS
APN	ASSESOR'S PARCEL NUMBER
BSW	BACK OF SIDEWALK
CFS	CUBIC FEET PER SECOND
C&G	CURB & GUTTER
CL	CENTERLINE
CMPA	CORRUGATED METAL PIPE ARM
CTSP	CALTRANS STANDARD PLAN
EDGE	EDGE OF CONCRETE
FPS	FEET PER SECOND
FT	FOOT
GB	GRADE BREAK
HGL	HYDRAULIC GRADE LINE
IE	INVERT ELEVATION
NTS	NOT TO SCALE
PVC	POLYVINYL CHLORIDE
PVI	POINT OF VERTICAL INTERSECTION PAVEMENT

ABBREVIATION	DESCRIPTION
P#	STORM DRAIN PIPE IDENTIFICATION NUMBER
RC	RELATIVE COMPACTION
RG	RAIN GARDEN
RS	ROAD SURVEY
SDCDS	SAN DIEGO COUNTY DESIGN STANDARD
SDRSD	SAN DIEGO REGIONAL STANDARD DRAWING
SPPWC	STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION
T	TANGENT
TC	TOP OF CURB
TD	TOP OF DIKE
TPD	TEMPORARY PLASTIC DRUM
WAS	WATER AGENCIES' STANDARDS
WPC	WATER POLLUTION CONTROL

DETAIL DRAWING



KEY MAP
1"=100'

COUNTY OF SAN DIEGO
DEPARTMENT OF PUBLIC WORKS
5500 OVERLAND AVENUE, SAN DIEGO, CA 92123-1295

REVISIONS	BY	APPROVED	DATE

COORDINATE INDEX
238 N. 1779 E.
CONST. COMPL.
FIELD REVISIONS

BRADLEY AVENUE WIDENING
In The Vicinity of EL CAJON
NOTES, LEGEND, AND PLAN OVERVIEW

SCALE: HOR. NONE VERT. NONE
W.A. 1003030 R.S. RS 1171
SHEET 02 OF 116 SHEETS

N:\Projects\1C1005\ED_Plans\C-SH02-AB01.dwg Monday, Nov. 20 2023 5:45pm onaderho

FOR REDUCED PLANS
ORIGINAL SCALE IS IN INCHES

PLANS	BY	DATE
DESIGNED	A. NADERHOFF	3/24/20
CHECKED	R. TORRES	3/24/20

REGISTERED PROFESSIONAL ENGINEER
Robert J Torres
No. C71378
Exp. 12-31-2023
STATE OF CALIFORNIA

REGISTERED ENGINEER — 8/9/2023 DATE

MATCH LINE 79+00
SEE SHEET 53

79+23.68 @ 43.47L
RECONSTRUCT CURB INLET TYPE B-1
(L=21', X=4.83', Y=4')
INSTALL CURB INLET BASKET
66" RCP
SEE DETAIL A 51 / A C 52

ADJUST CLEANOUT TO GRADE

S 89°35'13" E
2082.48'

Stormcad Node K
Invert 419.93
Starting HGL=
424.89

BRADLEY AVE
RS 1171

Exist DUAL 48" CMP
PROTECT IN PLACE

Exist 3" GAS
Exist 8" SEWER
Exist 8" WATER
Exist ELECTRIC
Exist TELEVISION
Exist TELECOM

Stormcad Node L
Station ~82+99.95
Invert= 426.61
Stormcad HGL =
426.61+4.96= 431.57

83+85.93 @ 19.60L
CLEANOUT – TYPE A7
SDRSD D-9

Stormcad Node L-2
Station 83+85.95
427.54 INV

24" per survey

P10

Node 90
Qexisting=Qproposed=13.8 cfs

83+87.01, 46.11R
???

Exist INLET
INSTALL CURB INLET BASKET
SEE DETAIL A 52

Junction 46
Qexisting=15.24 cfs
Qproposed = 7.53 cfs

83+87.01 @ 48.61R
CLEANOUT – TYPE A4
CONNECT TO Exist INLET
SDRSD D-9
SEE DETAIL B 52

Exist INLET

INSTALL CURB INLET BASKET
SEE DETAIL A 52

Dbl 18" RCP

CONC CHANNEL

MATCH LINE 84+25
SEE SHEET 55

Concrete Pipe

???

PLAN

NOTES:

1. WATER MAIN TO BE ENCASED PER WAS WP-08.
2. STENCIL "NO DUMPING! DRAWS TO WATERWAYS" PER COUNTY OF SAN DIEGO BMP MANUAL APPENDIX I.4 STRUCTURAL BMP LABEL TEMPLATE. TO BE STENCILED BY OTHERS.
3. PROVIDE CONCRETE BLANKET PROTECTION ON SEWER PER SPPWC 225-2

STORM DRAIN DATA

NUMBER	BEARING/DELTA	RADIUS	LENGTH	REMARKS
L18	N00°57'35"W	–	62.21'	24" RCP (1350-D)

Basis of Bearings
California Coordinate System Zone 6
NAD 83

0 20' 40'

N:\Projects\1C1005\ER_Plans\C-SH53-PPRSD04.dwg Monday, Nov. 20 2023 9:48pm anaderho

COUNTY OF SAN DIEGO
DEPARTMENT OF PUBLIC WORKS
5500 OVERLAND AVENUE, SAN DIEGO, CA 92123-1295

REVISIONS	BY	APPROVED	DATE

COORDINATE INDEX
238 N. 1779 E.
CONST. COMPL.
FIELD REVISIONS

BRADLEY AVENUE WIDENING
In The Vicinity of EL CAJON
PLAN AND PROFILE - STORM DRAIN

SCALE: HOR. 1"=20' VERT. 1"=4'
W.A. 1003030 R.S. RS 1171
SHEET 54 OF 116 SHEETS

NOTES:

2 STENCIL "NO DUMPING! DRAWS TO WATERWAYS" PER COUNTY OF SAN DIEGO BMP MANUAL APPENDIX I.4 STRUCTURAL BMP LABEL TEMPLATE. TO BE STENCILED BY OTHERS.

4 SEWER MAIN TO BE ENCASED BY OTHERS

5 SUPPORT VCP SEWER PIPE WHILE TRENCHING FOR DRAINAGE PIPE

6 CAUTION: FORMER HAZARDOUS WASTE SITE PER SDRSD SP-09

STORM DRAIN DATA				
NUMBER	BEARING/DELTA	RADIUS	LENGTH	REMARKS
L19	S89°36'33"E	–	192.65'	36" RCP (1350-D)
L20	S89°36'33"E	–	144.74'	36" RCP (1350-D)
L26	N52°37'37"E	–	25.80'	18" RCP (1350-D)
L27	S00°23'27"W	–	57.12'	18" RCP (1350-D)

FOR REDUCED PLANS
ORIGINAL SCALE IS IN INCHES

REGISTERED PROFESSIONAL ENGINEER
Robert J Torres
No. C71378
Exp. 12-31-2023
STATE OF CALIFORNIA

PLANS	BY	DATE
DESIGNED	A. NADERHOFF	3/24/20
CHECKED	R. TORRES	3/24/20

REGISTERED ENGINEER — 8/9/2023 DATE

Approximate proposed connection Sta 84+48.37 Inv= 429.180 Lateral inv= 431.26

Slope = 0.0262

Nodes 38 Qexisting=Qproposed= 7.51 cfs

Stormcad Node M Station 85+89.80 Invert 432.84

Qproposed= 8.34cfs

Node 40 Qexisting= 9.52 cfs Q proposed= 9.22 cfs

StormCAD node O Station 86+54.32 Qexisting=Qproposed = 302.05 cfs

85+89.80 @ 41.25L
CURB INLET TYPE A-1
(L=21')
INSTALL CURB INLET BASKET
SEE DETAIL H/51 A/52

RAIN GARDEN (RG-8) BF-1
TYPE A WITHOUT STEP OUT ZONE
SEE DETAIL A/54

87+81.46 @ 81.00L
CLEANOUT
8" SUB-DRAIN

88+23.96 @ 105.50L
CLEANOUT
8" SUB-DRAIN

88+23.96 @ 81.00L
CLEANOUT
8" SUB-DRAIN
8" SUB-DRAIN IE 444.79

88+47.19 @ 49.00L
CLEANOUT
8" SUB-DRAIN
IE 445.04

RAIN GARDEN (RG-9) BF-1
TYPE-A WITHOUT STEP OUT ZONE
SEE DETAIL A/54

88+76.00 @ 41.25L
CURB INLET – TYPE A-1
(L=12')
WITH CURB INLET BASKET
SDRSD D-2
SEE DETAIL H/51 A/52

RAIN GARDEN (RG-10) BF-1
WITHOUT STEP OUT ZONE
SEE DETAIL A/54

BURNET ST
N 0023'02" E
228.05'

ADJUST CLEANOUT TO GRADE
ADJUST CLEANOUT TO GRADE
ADJUST CLEANOUT TO GRADE
STORM DRAIN CONNECTION
SEE DETAIL C/51

88+53.10 @ 23.45L
CLEANOUT – TYPE A4
SDRSD D-9

Exist 8" WATER
Exist 2" GAS
Exist 8" SEWER

S 89°36'33" E
924.56'

BRADLEY AVE
RS 1171

RAIN GARDEN (RG-13) BF-1
WITH STEP OUT ZONE
SEE DETAIL A/54

89+79.50 @ 23.83R
CONCRETE LUG
SDRSD D-63
CONNECT TO P15 AT 90° ANGLE
8" SUB-DRAIN IE 441.1
8" SUB-DRAIN

85+89.80 @ 42.39R
RECONSTRUCT CURB INLET TYPE B-1
(L=21', X=4.83', Y=4')
INSTALL CURB INLET BASKET
SEE DETAIL A/51 A/C/52

CITY OF EL CAJON
COUNTY OF
SAN DIEGO

88+53.21 @ 38.75R
CURB INLET-TYPE B-1
(L=12', X=4.83', Y=4')
WITH CURB INLET BASKET
SDRSD D-2
SEE SHT 41 AND 42 FOR
RETAINING CURB DETAIL
SEE DETAIL A/51/52

CITY OF EL CAJON
COUNTY OF
SAN DIEGO

MATCH LINE 84+25
SEE SHEET 54

MATCH LINE 90+00
SEE SHEET 56

Basis of Bearings California Coordinate System Zone 6 NAD 83

0 20' 40'

PLAN

8" SEWER IE 441.91
6" WATER IE 442.69
8" SEWER LATERAL ABANDONED WITH HOME DEMO IE 442.35
CURB INLET – TYPE A-4
88+54.10, 23.49' Lt
RIM 447.57
CATV
ELECTRICAL
OG
FG
S=2.30%
S=2.31%
IE 433.84
IE 438.27
IE 438.39
PIPE –P11
L=737.20'
36" RCP
Q_{100}=88.11 CFS
V_{100}=12.47 FPS

PROFILE - PIPES P11

COUNTY OF SAN DIEGO
DEPARTMENT OF PUBLIC WORKS
5500 OVERLAND AVENUE, SAN DIEGO, CA 92123-1295

REVISIONS	BY	APPROVED	DATE

COORDINATE INDEX
238 N. 1779 E.
CONST. COMPL.
FIELD REVISIONS

BRADLEY AVENUE WIDENING
In The Vicinity of EL CAJON
PLAN AND PROFILE - STORM DRAIN

SCALE: HOR. 1"=20' VERT. 1"=4'
W.A. 1003030 R.S. RS 1171
SHEET 55 OF 116 SHEETS

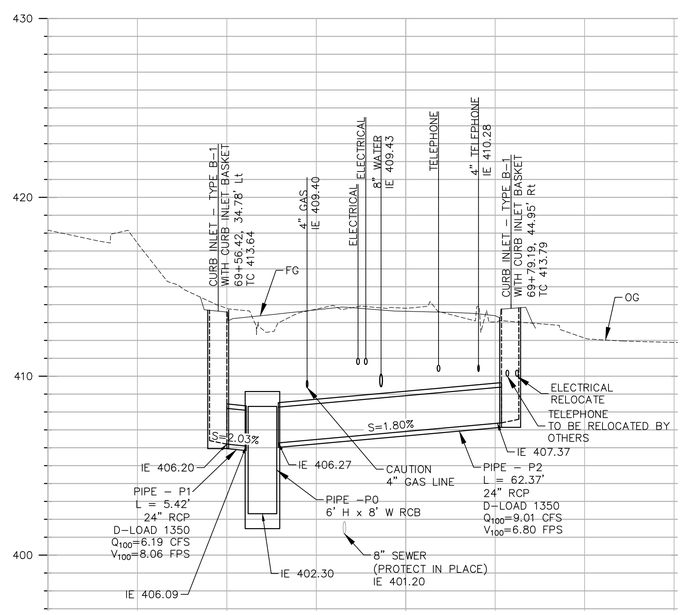
N:\Projects\C1005\ED_Plans\C-SH54-PRRS005.dwg Monday, Nov. 20 2023 9:53pm onaderho

FOR REDUCED PLANS
ORIGINAL SCALE IS IN INCHES

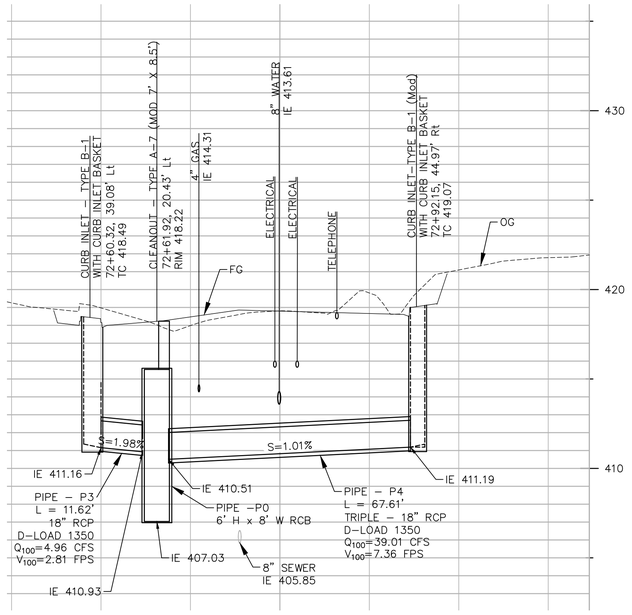
PLANS	BY	DATE
DESIGNED	A. NADERHOFF	3/24/20
CHECKED	R. TORRES	3/24/20

REGISTERED PROFESSIONAL ENGINEER
Robert J Torres
No. C71378
Exp. 12-31-2023
STATE OF CALIFORNIA

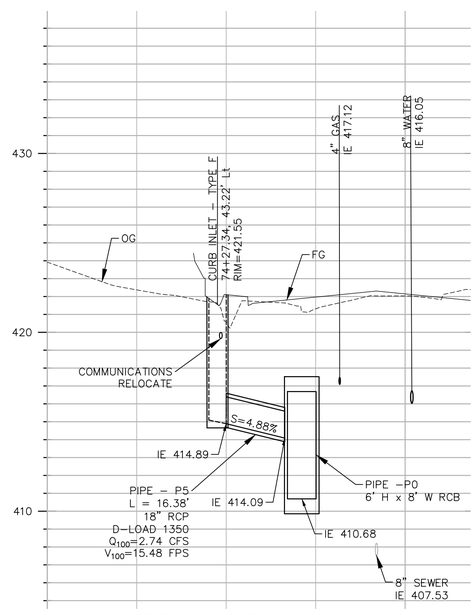
8/9/2023
REGISTERED ENGINEER — DATE



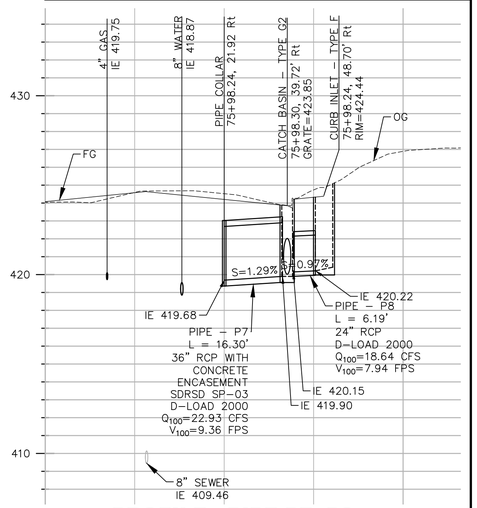
PROFILE - PIPE P1 & P2



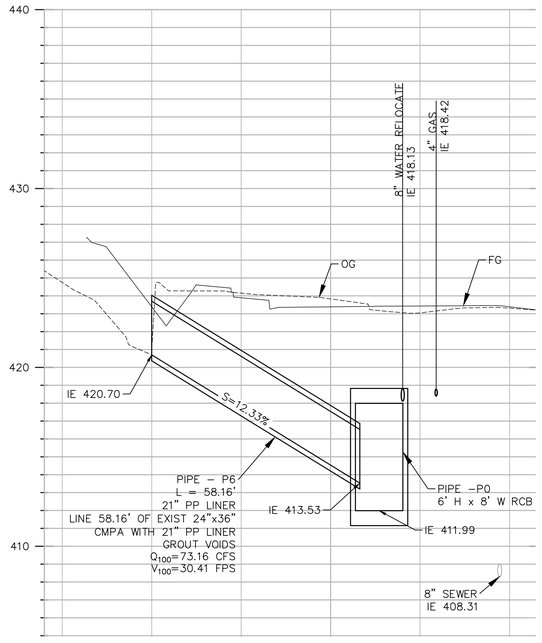
PROFILE - PIPE P3 & P4



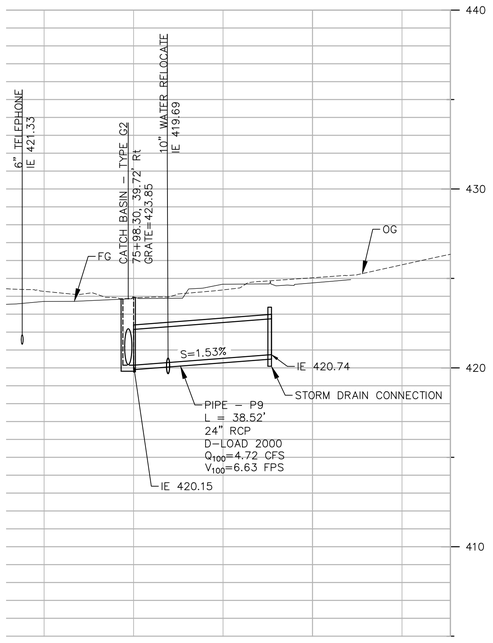
PROFILE - PIPE P5



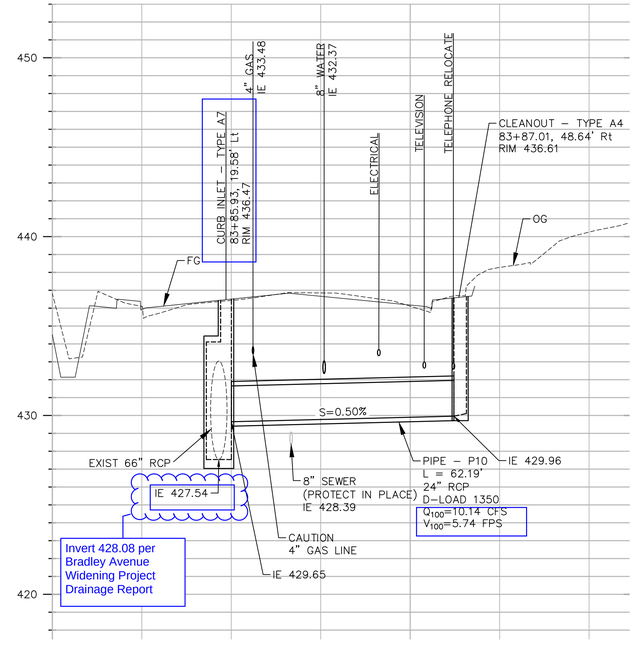
PROFILE - PIPE P7, P8



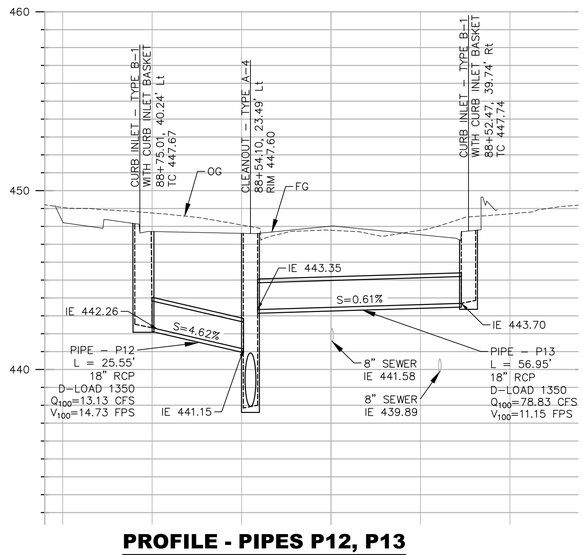
PROFILE - PIPE P6



PROFILE - PIPE P9



PROFILE - PIPE P10



PROFILE - PIPES P12, P13

COUNTY OF SAN DIEGO
DEPARTMENT OF PUBLIC WORKS
5500 OVERLAND AVENUE, SAN DIEGO, CA 92123-1295

REVISIONS	BY	APPROVED	DATE

COORDINATE INDEX
238 N. 1779 E.
CONST. COMPL. _____
FIELD REVISIONS _____

BRADLEY AVENUE WIDENING
In The Vicinity of EL CAJON
PLAN AND PROFILE - STORM DRAIN

SCALE: HOR. 1"=20' VERT. 1"=4'
W.A. 1003030 R.S. RS 1171
SHEET 58 OF 116 SHEETS

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ATTACHMENT 6: Off-site Hydrologic References

6b. Bradley Avenue Widening Drainage Report references (Proposed On-Site Hydrology Map, Table D-1, Table D-1a, Stormcad exhibit, Stormcad profile reports) dated November 2019 completed by Dokken Engineering.

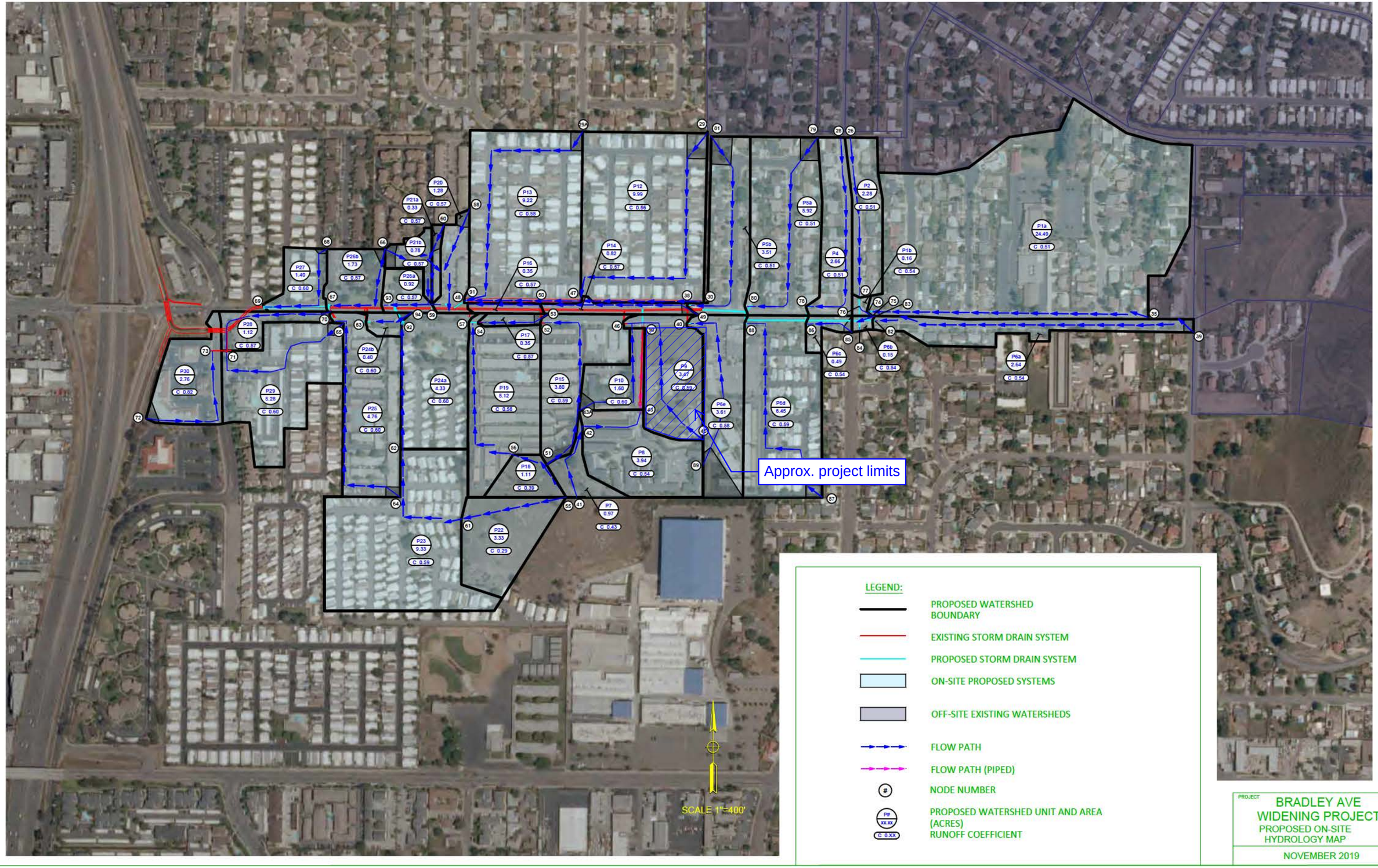

P20
1.28
C 0.57
P21a
0.33
C 0.57
P13
9.22
C 0.58
P12
9.99
C 0.56
P2
2.28
C 0.51
P5a
5.92
C 0.51
P1a
24.49
C 0.51
P21b
0.76
C 0.57
P14
0.82
C 0.57
P5b
3.51
C 0.51
P4
2.66
C 0.51
P1b
0.16
C 0.54
P26b
1.73
C 0.57
P27
1.40
C 0.60
P16
0.36
C 0.57
P26a
0.92
C 0.57
P28
1.12
C 0.57
P17
0.35
C 0.57
P6c
0.49
C 0.54
P6b
0.15
C 0.54
P6a
2.64
C 0.54
P24b
0.40
C 0.60
P30
2.76
C 0.82
P24a
4.33
C 0.65
P19
5.12
C 0.58
P15
3.80
C 0.59
P10
1.60
C 0.60
P9
3.47
C 0.59
P29
5.28
C 0.60
P25
4.76
C 0.60
P6d
6.45
C 0.59
P6e
3.61
C 0.58
P18
1.11
C 0.39
P8
3.94
C 0.54
P7
0.97
C 0.43
P22
3.33
C 0.29
P23
9.33
C 0.59
Approx. project limits
SCALE 1"=400'
LEGEND:
PROPOSED WATERSHED BOUNDARY
EXISTING STORM DRAIN SYSTEM
PROPOSED STORM DRAIN SYSTEM
ON-SITE PROPOSED SYSTEMS
OFF-SITE EXISTING WATERSHEDS
FLOW PATH
FLOW PATH (PIPED)
NODE NUMBER
PROPOSED WATERSHED UNIT AND AREA (ACRES)
RUNOFF COEFFICIENT
PROJECT
BRADLEY AVE WIDENING PROJECT
PROPOSED ON-SITE HYDROLOGY MAP
NOVEMBER 2019

TABLE D-1 : FLOW RATES FOR PROPOSED ON-SITE WATERSHEDS

Major Watershed	Drainage Sub-area	Drainage System	Drainage Area		Initial Flow					Travel Time						Tc(50)	Tc(100)	50-yr P6	100-Yr P6	50-yr Intensity	100-Yr Intensity	Runoff Coefficient C	CA	∑(CA)	Q(50-yr)	Q(100-yr)
			(ft^2)	(acres)	L (ft)	D (ft)	ΔE (ft)	S %	Ti (min)	L (ft)	S (ft/ft)	V (50)	V (100)	Tt (50)	Tt (100)	(min)	(min)		(in)		(in/hr)				cfs	cfs
P1a	35 to 74	Street Flow - Gutter	1,066,852	24.49	-	-	40.0	-	-	1272	0.031	9.10	9.49	2 33	2 23	12.21	12.04	2.25	2.65	3 33	3 96	0.51	12.37	20.06	**66.83**	**79.43**
P1b	75 to 76	Street Flow - Gutter	6 912	0.16	75	75	1 0	1 33	7.95	-	-	-	-	-	-	7 95	7 95	2.25	2.65	4.40	5.18	0.54	0.09	0 09	**0.38**	**0.44**
P2	26 to 77	Street Flow - Gutter	99,183	2.28	-	-	14.0	-	-	719	0.019	4 36	4.53	2.75	2 65	14.15	13.95	2.25	2.65	3 03	3 60	0.51	1.15	2 03	**6.14**	**7.30**
P4	28 to 78	Street Flow - Gutter	115,849	2.66	-	-	15.0	-	-	926	0.016	4 34	4.53	3 56	3.41	17.82	17.48	2.25	2.65	2 61	3.11	0.51	1.35	2 91	**7.60**	**9.06**
P5a-initial	79 to 80	Initial sub-area	8,498	0.20	130	75	-	1 83	7.57	-	-	-	-	-	-	7 57	7 57	2.25	2.65	4 54	5 34	0.51	0.10	0.10	0.45	0.53
P5a	79 to 80	Street Flow - Gutter	249,340	5.72	982	-	18.0	1 83	-	907	0.018	4.47	4.62	3 38	3 27	10.95	10.84	2.25	2.65	3 57	4 24	0.51	2.90	3 00	**10.72**	**12.71**
P5b-initial	81 to 38	Initial sub-area	11,988	0.28	158	75	-	1 86	7.54	-	-	-	-	-	-	7 54	7 54	2.25	2.65	4 55	5 36	0.51	0.14	0.14	0.64	0.75
P5b	81 to 38	Street Flow - Gutter	140,758	3.23	968	-	18.0	1 86	-	893	0.019	4.10	4.28	3.63	3.48	11.17	11.02	2.25	2.65	3.53	4.19	0.51	1.65	1.79	**6.32**	**7.51**
P6a-initial	39 to 82	Initial sub-area	2 583	0.06	58	-	-	2 81	7.59	-	-	-	-	-	-	7 59	7 59	2.25	2.65	4 53	5 33	0.58	0.03	0 03	0.15	0.18
P6a	39 to 82	Street Flow - Gutter	112,373	2.58	1468	-	28.0	1 91	-	1410	0.019	3.78	3.90	6 22	6 03	13.81	13.62	2.25	2.65	3 08	3 66	0.54	1.38	1.42	**4.36**	**5.18**
P6b	83 to 84	Street Flow - Gutter	6,429	0.15	102	95	3 5	3.44	6.25	7	0.034	-	-	0 04	0 04	6 29	6 29	2.25	2.65	5.11	6 02	0.54	0.08	0 08	**0.41**	**0.48**
P6c-initial	85 to 86	Initial sub-area	1,849	0.04	45	45	-	2 53	5.00	-	-	-	-	-	-	5 00	5 00	2.25	2.65	5 93	6 98	0.54	0.02	0 02	0.14	0.16
P6c	85 to 86	Street Flow - Gutter	19,444	0.45	217	-	5 5	2 53	-	172	0.025	3 65	3.71	0.79	0.77	5.79	5.77	2.25	2.65	5.40	6 36	0.54	0.24	0 26	**1.42**	**1.68**
P6d-initial	87 to 88	Initial sub-area	4,055	0.09	92	92	-	2 82	6.49	-	-	-	-	-	-	6.49	6.49	2.25	2.65	5 01	5 90	0.59	0.06	0 06	0.28	0.33
P6d	87 to 88	Street Flow - street	276,999	6.36	1064	-	30.0	2 82	-	972	0.028	3 35	3.49	4 84	4 64	11.33	11.13	2.25	2.65	3 50	4.17	0.59	3.77	3 83	**13.39**	**15.95**
P6e-initial	89 to 40	Initial sub-area	23,791	0.55	86	86	-	3 22	6.29	-	-	-	-	-	-	6 29	6 29	2.25	2.65	5.11	6 02	0.58	0.32	0 32	1.62	1.90
P6e	89 to 40	Street Flow - street	133,496	3.06	776	-	25.0	3 22	-	690	0.032	3 22	3.39	3 57	3 39	9 86	9 68	2.25	2.65	3 83	4 56	0.58	1.77	2 09	**7.99**	**9.52**
P7	41 to 42	Natural Hillside	42 050	0.97	358	100	80.0	22.35	5.00	258	0.223	-	-	0 88	0 88	5 88	5 88	2.25	2.65	5 34	6 29	0.43	0.42	0.40	2.15	2.54
P8	42 to 43	Street Flow - Gutter	171,559	3.94	-	-	10.0	-	-	303	0.033	5.19	5.36	0 97	0 94	6 86	6 82	2.25	2.65	4 84	5.71	0.54	2.13	2 53	12 25	14.47
P8-A	43 to 90	Pipe Flow	-	-	-	-	20.0	-	-	411	0.049	12.55	13.15	0 55	0 52	7.40	7 34	2.25	2.65	4 60	5.45	-	-	2 53	**11.66**	**13.80**
P9	45 to 46	Overland Flow - Sheet	150,986	3.47	757	100	30.0	3 96	5.92	657	0.040	-	-	3.79	3.79	9.71	9.71	2.25	2.65	3 86	4 55	0.59	2.03	2 03	**7.85**	**9.25**
P10-initial	43A to 46	Initial sub-area	4,047	0.09	79	79	-	3 24	6.28	-	-	-	-	-	-	6 28	6 28	2.25	2.65	5.12	6 03	0.60	0.06	0 06	0.29	0.34
P10	43A to 46	Street Flow - Gutter	65,499	1.50	617	-	20.0	3 24	15.10	538	0.032	4 66	4.81	1 92	1 86	8 20	8.14	2.25	2.65	4 31	5.10	0.60	0.90	0 96	**4.13**	**4.88**
Junction at Node 46 - See Tables D-1a and D-1b																**9.71**	**9.71**			**3.86**	**4.55**			**2.99**	**12.75**	**15.24**
P12-initial	29 to 47	Initial sub-area	10,498	0.24	147	65	-	1.19	7.71	-	-	-	-	-	-	7.71	7.71	2.25	2.65	4.48	5 28	0.56	0.13	0.13	0.60	0.71
P12	29 to 47	Street Flow - Gutter	424 724	9.75	1263	-	15.0	1.19	-	1198	0.012	3 80	3.99	5 25	5 00	12.96	12.71	2.25	2.65	3 21	3 82	0.56	5.41	5 55	**17.78**	**21.21**
P13-initial	29A to 91	Initial sub-area	4,593	0.11	101	101	-	0 82	8.19	-	-	-	-	-	-	8.19	8.19	2.25	2.65	4 31	5 08	0.58	0.06	0 06	0.27	0.31
P13	29A to 91	Street Flow - Gutter	396,889	9.11	1221	-	10.0	0 82	-	1120	0.008	3.18	3.34	5 87	5 59	14.06	13.78	2.25	2.65	3 04	3 63	0.58	5.31	5 37	**16.35**	**19.51**
P14-initial	49 to 50	Initial sub-area	2,173	0.08	87	75	-	1.13	5.00	-	-	-	-	-	-	5 00	5 00	2.25	2.65	5 93	6 98	0.57	0.05	0 05	0.27	0.32
P14	49 to 50	Street Flow - Gutter	33,585	0.77	707	-	8 0	1.13	-	632	0.011	2 68	2.75	3 93	3 83	8 93	8 83	2.25	2.65	4 08	4 84	0.57	0.44	0.49	**1.98**	**2.35**
P15-initial	51 to 52	Initial sub-area	5,807	0.13	150	-	-	7 35	5.44	-	-	-	-	-	-	5.44	5.44	2.25	2.65	5 61	6 61	0.59	0.08	0 08	0.44	0.52
P15	51 to 52	Street Flow - Brow Ditch	159,678 36	3.67	859	-	65.0	7 56	-	709	0.076	7 22	7.53	1 64	1 57	7 08	7 01	2.25	2.65	4.74	5 61	0.59	2.16	2 23	**10.59**	**12.55**
P16-initial	53 to 48	Initial sub-area	836	0.02	53	53	-	1 34	5.00	-	-	-	-	-	-	5 00	5 00	2.25	2.65	5 93	6 98	0.57	0.01	0 01	0.06	0.08
P16	53 to 48	Street Flow - Gutter	15,256	0.35	318	-	5 0	1 57	-	265	0.016	2 89	2.93	1 53	1 51	6 53	6 51	2.25	2.65	4 99	5 89	0.57	0.20	0 21	**1.05**	**1.24**
P17-initial	53 to 54	Initial sub-area	1,666	0.04	69	69	-	1 96	5.00	-	-	-	-	-	-	5 00	5 00	2.25	2.65	5 93	6 98	0.57	0.02	0 02	0.13	0.15
P17	53 to 54	Street Flow - Gutter	15,191	0.35	324	-	5 0	1 54	-	255	0.015	2 84	2.88	1 50	1.48	6 50	6.48	2.25	2.65	5 01	5 91	0.57	0.20	0 22	**1.10**	**1.30**
P18	55 to 56	Natural Hillside	48,196	1.11	325	100	80.0	24.64	5.00	225	0.246	-	-	0.75	0.75	5.75	5.75	2.25	2.65	5.42	6 38	0.39	0.43	0.43	2.33	2.74
P19	56 to 57	Street Flow - Brow Ditch	223,199	5.12	-	-	45.0	-	-	780	0.058	7 36	7.69	1.77	1 69	7 52	7.44	2.25	2.65	4 56	5.40	0.58	2.98	3.41	**15.54**	**18.42**
P20-initial	58 to 59	Initial sub-area	3,952	0.09	87	-	-	0 90	8.56	-	-	-	-	-	-	8 56	8 56	2.25	2.65	4.19	4 94	0.57	0.05	0 05	0.22	0.26
P20	58 to 59	Street Flow - Gutter	51,814	1.19	527	-	5 0	0 95	-	440	0.009	2 26	2.32	3 25	3.16	11.81	11.72	2.25	2.65	3.41	4 03	0.57	0.68	0.73	**2.49**	**2.94**
P21a-initial	60 to 59	Initial sub-area	5,310	0.12	134	70	-	1 35	8.05	64	-	-	-	0 51	0 51	8 56	8 56	2.25	2.65	4.19	4 93	0.57	0.07	0 07	0.29	0.34
P21a	60 to 59	Earthen Swale	9 144	0.21	364	-	5 0	1 37	-	294	0.014	1 09	1.14	4.49	4 30	13.06	12.86	2.25	2.65	3.19	3 80	0.57	0.12	0.19	**0.60**	**0.72**
P21b-initial	66 to 59	Initial sub-area	5,023	0.12	52	52	-	1 21	8.19	-	-	-	-	-	-	8.19	8.19	2.25	2.65	4 31	5 08	0.57	0.07	0 07	0.28	0.33
P21b	66 to 59	Street Flow - Gutter	34,166	0.78	414	-	5 0	1 21	-	362	0.012	2.44	2.51	2.47	2.40	10.66	10.59	2.25	2.65	3 64	4 30	0.57	0.45	0 51	**1.87**	**2.21**
Junction at Node 59 - See Tables D-1c and D-1d																**11.81**	**11.72**			**3.41**	**4.03**			**1.24**	**4.23**	**5.01**
P22	55 to 61	Natural Hillside	145,222	3.33	487	100	116 0	23.81	5.07	387	0.238	-	-	1 22	1 22	6 29	6 29	2.25	2.65	5.11	6 02	0.29	0.97	0 97	4.95	5.83
P23	61 to 62	Street Flow - Gutter	406,367	9.33	-	-	10.0	-	-	574	0.017	5 00	5.22	1 91	1 83	8 20	8.12	2.25	2.65	4 31	5.11	0.59	5.54	6 51	28 05	33 25
P24a	62 to 93	Open Channel Flow	188 700	4.33	-	-	8 0	-	-	573	0.014	8 95	9.38	1 07	1 02	9 27	9.14	2.25	2.65	3 98	4.73	0.60	2.60	9.11	**36.27**	**43.11**
P24b-initial	94 to 63	Initial sub-area	1,441	0.03	63	63	-	2 00	5.00	-	-	-	-	-	-	5 00	5 00	2.25	2.65	5 93	6 98	0.60	0.02	0 02	0.12	0.14
P24b	94 to 63	Street Flow - Gutter	16 000	0.37	183	-	-	2 00	-	120	0.022	3.42	3.48	0 59	0 58	5 59	5 58	2.25	2.65	5 52	6 51	0.60	0.22	0 24	**1.33**	**1.56**
P25-initial	64 to 65	Initial sub-area	3,054	0.07	81	81	-	0.77	8.27	-	-	-	-	-	-	8 27	8 27	2.25	2.65	4 29	5 05	0.60	0.04	0 04	0.18	0.21
P25	64 to 65	Street Flow - Brow Ditch	204,230	4.69	985	-	8 0	0 81	-	904	0.008	2 95	3.10	5.11	4 86	13.38	13.13	2.25	2.65	3.14	3.75	0.60	2.81	2 86	**8.97**	**10.69**
P26a	59 to 93	Street Flow - Gutter	39,891	0.92	-	-	-	2 20	-	219	0.022	4.71	4.90	0.78	0.75	12.58	12.47	2.25	2.65	3 27	3 87	0.57	0.52	1.76	**5.77**	**6.83**
P26b-initial	66 to 67	Initial sub-area	2,540	0.06	75	75	-	5.14	5.97	-	-	-	-	-	-	5 97	5 97	2.25	2.65	5 29	6 23	0.57	0.03	0 03	0.18	0.21
P26b	66 to 67	Street Flow - Gutter	72,842	1.67	459	-	25.0	5.45	-	384	0.054	5 91	6.08	1 08	1 05	7 05	7 02	2.25	2.65	4.75	5 61	0.57	0.95	0 99	4.68	5.53
P27-initial	68 to 69	Initial sub-area	1,031	0.02	43	43	-	1 52	7.38	-	-	-	-	-	-	7 38	7 38	2.25	2.65	4 61	5.43	0.60	0.01	0 01	0.07	0.08
P27	68 to 69	Street Flow - Brow Ditch	59 910	1.38	525	0	8 0	1 52	-	482	0.015	2 89	3.02	2.78	2 66	10.16	10.04	2.25	2.65	3.75	4.45	0.60	0.83	0 84	**3.15**	**3.74**
P28-initial	70 to 71	Initial sub-area	2,199	0.05	44	44	-	1 00	5.00	-	-	-	-	-	-	5 00	5 00	2.25	2.65	5 93	6 98	0.57	0.03	0 03	0.17	0.20
P28	70 to 71	Street Flow - Gutter	46,678	1.07	601	-	6 0	1 00	-	557	0.010	2 36	2.45	3 93	3.79	8 93	8.79	2.25	2.65	4 08	4 85	0.57	0.61	0 64	**2.61**	**3.10**
P29-initial	65 to 71	Initial sub-area	3,875	0.09	88	88	-	0 83	8.17	-	-	-	-	-	-	8.17	8.17	2.25	2.65	4 32	5 09	0.60	0.05	0 05	0.23	0.27
P29	65 to 71	Street Flow - Brow Ditch	226,190	5.19	724	-	6 0	0 83	-	636	0.008	3.15	3.30	3 36	3 21	11.53	11.38	2.25	2.65	3.46	4.11	0.60	3.12	3.17	**10.96**	**13.02**
Junction at Node 71 - See Existing On-site Tables C-1k and C-1l																**11.53**	**11.38**			**3.46**	**4.11**			**3.81**	**13.17**	**15.64**
P30-initial	72 to 73	Initial sub-area	2,941	0.07	59	59	-	0 62	5.00	-	-	-	-	-	-	5 00	5 00	2.25	2.65	5 93	6 98	0.82	0.06	0 06	0.33	0.39
P30	72 to 73	Street Flow - Gutter	117,333	2.69	646	-	4 0	0 62	-	587	0.006	2 55	2.65	3 84	3 69	8 84	8 69	2.25	2.65	4.11	4 89	0.82	2.21	2 26	**9.30**	**11.07**

TABLE D-1a : Junction at node 46 - 50-Year

System	Q (cfs)	Tc (min)	I (in/hr)	Q_{T1} (cfs)	Q_{T2} (cfs)	Q (cfs)
P10	4.13	8 20	4 31	10.76	12.75	12.75
P9	7.85	9.71	5.12			

TABLE D-1b : Junction at node 46 - 100-Year

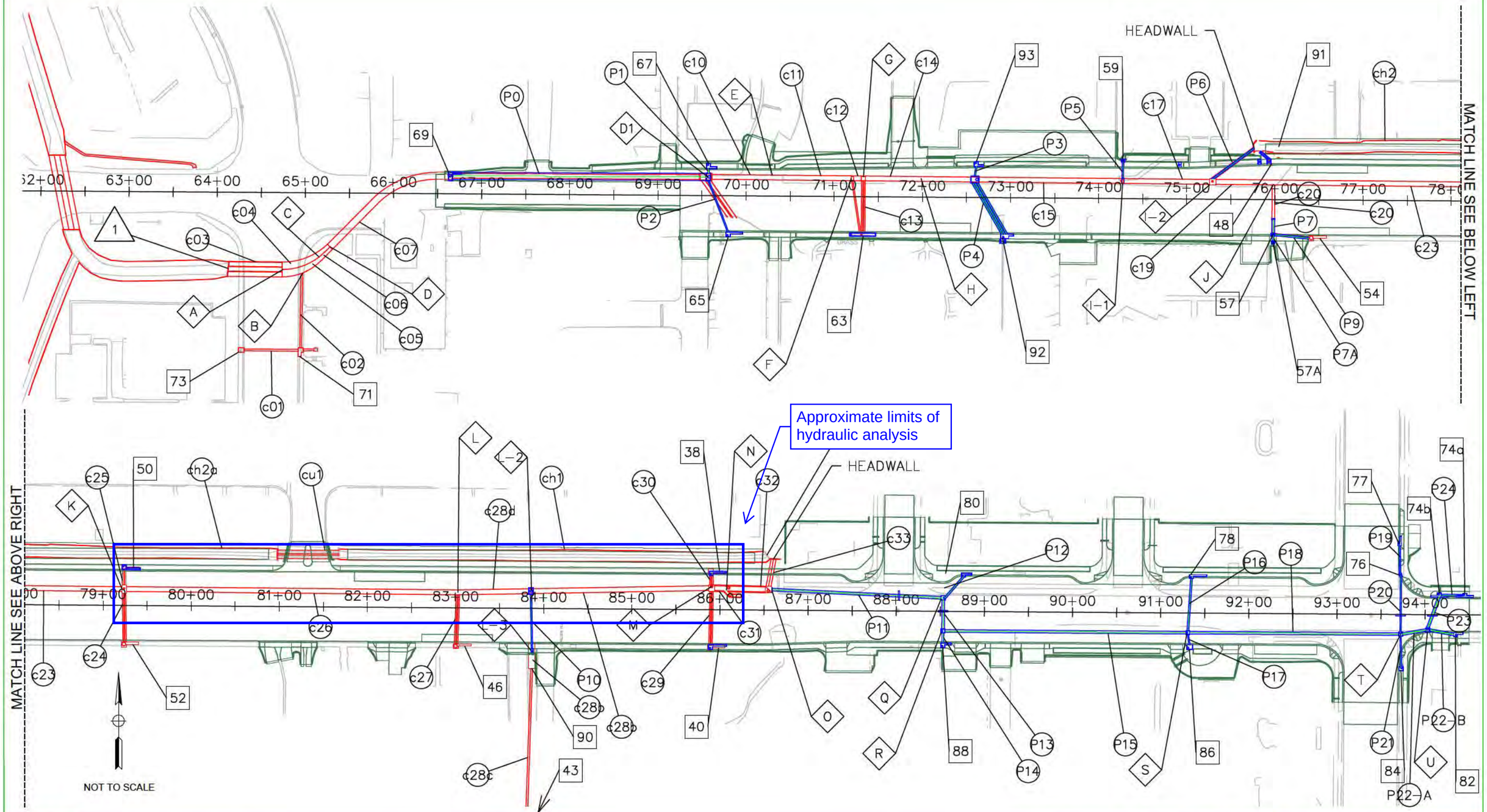
System	Q (cfs)	Tc (min)	I (in/hr)	Q_{T1} (cfs)	Q_{T2} (cfs)	Q (cfs)
P10	9.25	9.71	4 55	15.07	15.24	15.24
P9	4.88	8.14	5.10			

TABLE D-1c : Junction at node 59 - 50-Year

System	Q (cfs)	Tc (min)	I (in/hr)	Q_{T1} (cfs)	Q_{T2} (cfs)	Q (cfs)
P21b	1.87	10.66	3 64	4.11	4.23	4.23
P20	2.49	11.81	3.41			

TABLE D-1d : Junction at node 59 - 100-Year

System	Q (cfs)	Tc (min)	I (in/hr)	Q_{T1} (cfs)	Q_{T2} (cfs)	Q (cfs)
P21b	2.21	10.59	4 30	4.86	5.01	5.01
P20	2.94	11.72	4 03			



LEGEND:

- CONDUIT/CHANNEL
- INLET
- TRANSITION/MANHOLE
- PROJECT OUTFALL

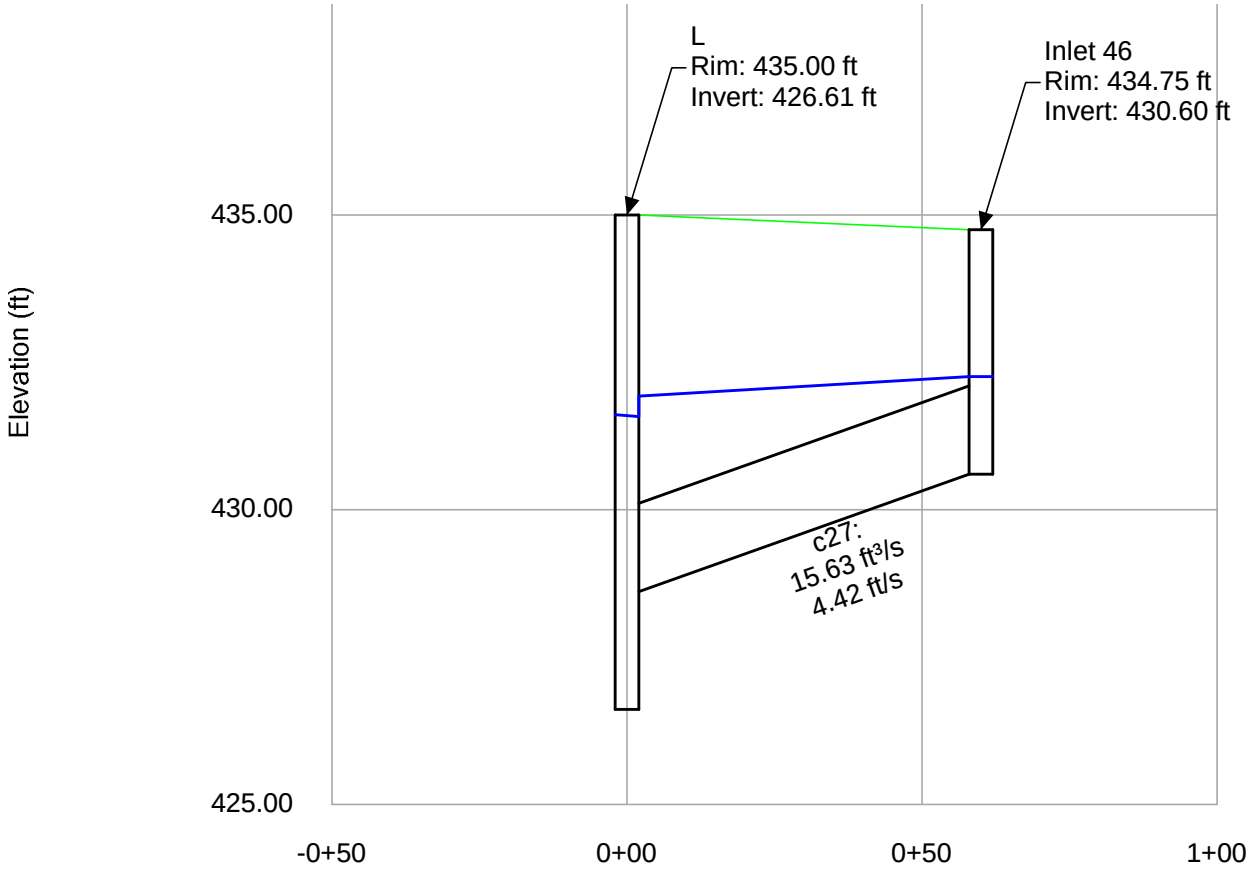
DOKKEN ENGINEERING
1450 FRAZEE ROAD
SUITE 100
SAN DIEGO, CA 92108
(858) 514-8277

BRADLEY AVE WIDENING PROJECT

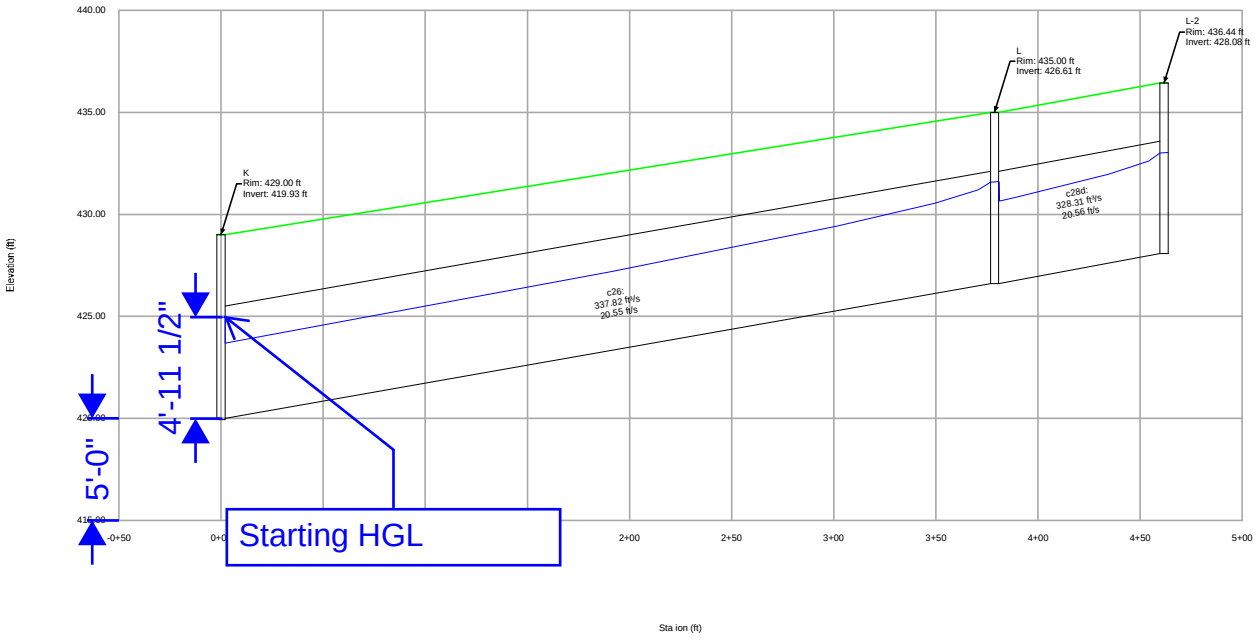
STORMCAD EXHIBIT

PROPOSED STORM DRAIN

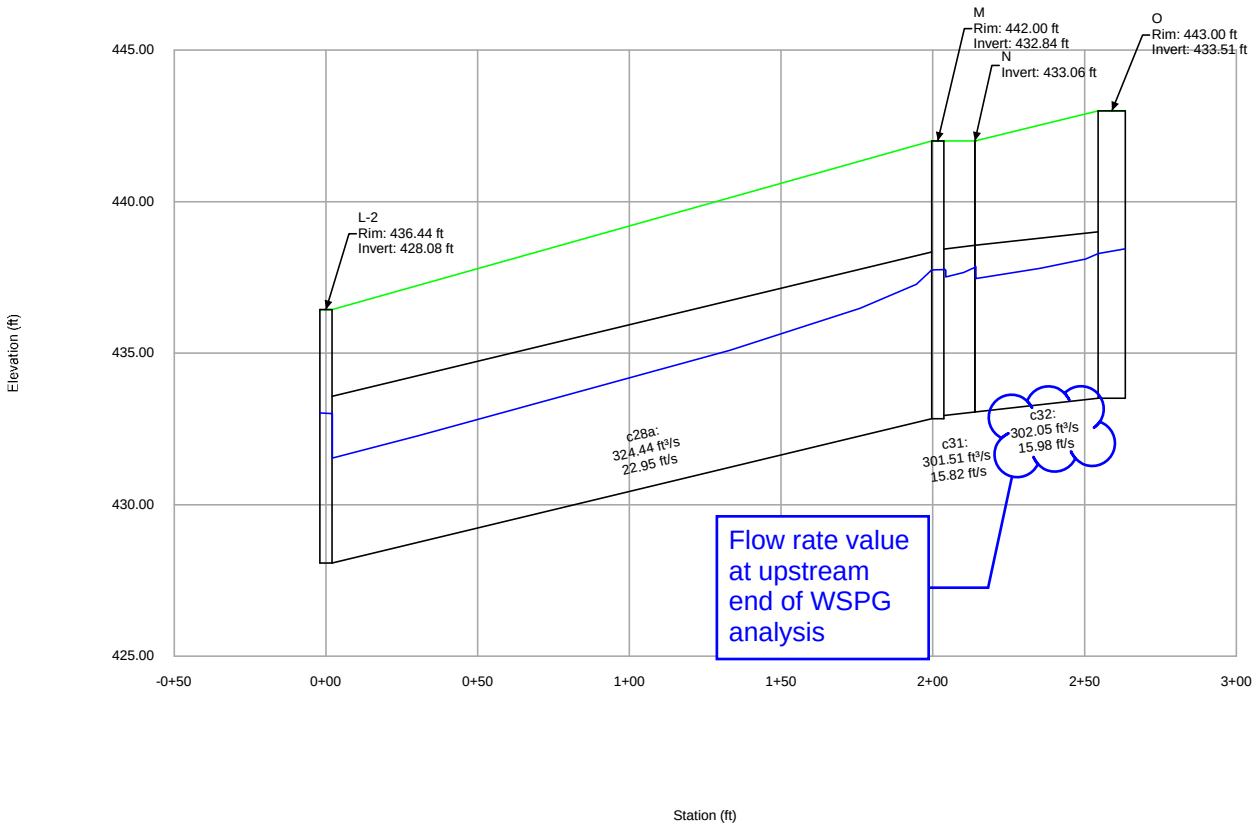
Profile Report
Engineering Profile - Profile - c27
(1841_Stormcad_proposed_November2019.stsw)



Profile Report
Engineering Profile - Profile - c26 - c28d
(1841_Stormcad_proposed_November2019.stsw)



Profile Report
Engineering Profile - Profile - c28a - c31 - c32
(1841_Stormcad_proposed_November2019.stsw)



7.0 General Requirements

- Submit this cover page and all required Sub-attachments for all structural BMPs proposed for the project.
- See the BMPDM sections and appendices listed under "BMPDM Design Resources" in the table below for additional explanation of design requirements. Constructed features must fully satisfy the requirements described in these resources, and any other guidance identified by the County.
- PDPs subject to hydromodification management requirements must also implement structural BMPs for flow control for hydromodification management. Completion of SWQMP Attachment 8 is also required for these BMPs.
- DMA Exhibits and Construction Plans: DMAs, features, and BMPs identified and described in this attachment must be shown on DMA Exhibits and all applicable construction plans submitted for the project. See Attachment 2 for additional instruction on exhibits and plans.
- Structural BMP Certification. All structural BMPs documented this attachment and in Attachment 8 must be certified by a registered engineer in Sub-attachment 7.1.
- Structural BMP Verification. Structural BMP installation must be verified by the County at the completion of construction. Applicants must complete an Installation Verification Form (Attachment 10).

Sub-attachments (check all that are completed)	**Requirement**	**BMPDM Design Resources**
☒ **7.1: Preparer's Certification**	Required	• N/A
☒ **7.2: Structural BMP Strategy**	Required	• BMPDM Sections 5.1., 5.3, 5.4, and Chapter 6 • BMPDM Appendix E (pages E-78 through E-210)
☒ **7.3: Structural BMP Checklist(s)**	Required	
☒ **7.4: Stormwater Pollutant Control Worksheet Calculations**	Required	• BMPDM Appendix B
☐ **7.5: Identification and Narrative of Receiving Water and Pollutants of Concern**	Required if flow-thru BMPs are proposed	• N/A

7.1 Engineer of Work Certification for Structural BMPs

Project Name Bradley Avenue Convalescent Home
Permit Application Number PDS2021-MUP-85-053W2

CERTIFICATION

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

I certify that this PDP SWQMP has been completed to the best of my ability and accurately reflects the project being proposed and the applicable BMPs proposed to minimize the potentially negative impacts of this project's land development activities on water quality. I understand and acknowledge that the plan check review of this PDP SWQMP by County staff is confined to a review and does not relieve me, as the Engineer in Responsible Charge of design of structural storm water BMPs for this project, of my responsibilities for their design.

☒ In addition to the structural pollutant control BMPs described in this attachment, this certification applies to the Structural Hydromodification Management BMPs described in Attachment 8 (check if applicable).

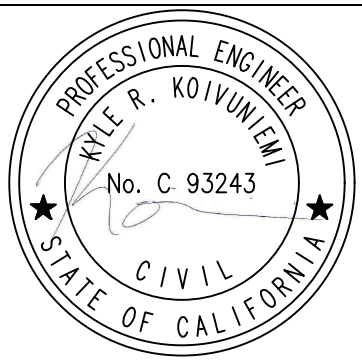
58449 12/31/2024
Engineer of Work's Signature, PE Number & Expiration Date

Kyle Koivuniemi, PE
Print Name

Kimley-Horn
Company

4-2-2024
Date

Engineer's Seal:



7.2 Structural BMP Strategy

7.2.1 Narrative Strategy (Continue description on subsequent pages as necessary)

Describe the general strategy for structural BMP implementation at the project site. For pollutant control BMPs, your description must address the key points outlined in Section 5.1 of the BMP Design Manual, and the type of BMPs selected. For projects requiring hydromodification flow control BMPs, indicate whether pollutant control and flow control BMPs are integrated or separate.

The general strategy for structural BMP implementation on this project follows the steps outlined in the BMP manual (Manual) section 5.1 which refers to sections in appendix B of the Manual.

Step 1. Determine DCV per Appendix B.1

The first step in performing storm water pollutant control calculations is to calculate the Design Capture Volume (DCV). The DCV represents the volume of storm water runoff that must be retained and/or biofiltered in order to satisfy pollutant control requirements. The DCV is calculated through use of the automated worksheet (Worksheet B.1) which is part of the workbook provided by the County for this purpose:

(https://www.sandiegocounty.gov/content/dam/sdc/dpw/WATERSHED_PROTECTION_PROGRAM/watershedpdf/Dev_Sup/County_BMPDM_PC_Worksheet.xlsx) (County Workbook).

A. Determine rainfall depth per Appendix B.1.1.

The rainfall depth (D) used to calculate the DCV is determined through examination of the 85th percentile, 24-hour isopluvial map provided in Figure B.1-1 of the BMP Manual. The isopluvial map represents rainfall depths as blue line work provided at 0.02" intervals. Appropriate rainfall depths are determined by plotting the project location on the map, examining adjacent rainfall depths, and interpolating an appropriate depth to the nearest hundredth of an inch. The result is then entered into the appropriate field on Worksheet B.1.

B. Delineate tributary areas per Appendix B.1.2.

The entire project site is divided up into distinct tributary areas to each point of discharge from the site. All areas of the site that are intended to be developed with buildings or site improvements are delineated by their tributary area and available space to construct structural BMPs. BMPs must be sized to treat the DCV from the total area draining to the BMP, including any offsite or onsite areas that comingle with project runoff draining to the BMP. To minimize offsite flows treated by project BMPs, upgradient flows from offsite areas and self-treating cut and fill slopes are diverted around the developed portions of the project.

C. Determine runoff factors per Appendix B.1.3.

Runoff factors (C) represent the ratio of storm water runoff over rainfall that is anticipated for a particular surface type. Impervious surfaces typically have high runoff factors (0.90) as nearly all rainfall is converted into runoff. Pervious surfaces typically have low runoff factors (0.10) as much of the rainfall is retained in natural surface features. For each of the DMAs draining to structural BMPs, each DMA area is evaluated for the relative quantities of impervious surfaces (roofs, concrete, asphalt, etc.) and pervious surfaces (amended soils, landscaped areas, mulched areas).

The respective areas are entered into Worksheet B.1 (County Workbook), and the worksheet calculates the respective weighted runoff factor. Dispersion Area Runoff Factor Adjustments are not considered for this project.

A. Determine site design volume reductions per Appendix B.1.4

Site design volume reductions (R) account for the effects of incorporating non-structural BMPs such as tree wells and rain barrels into the site design. Effective use of these site design elements can significantly reduce and/or completely eliminate the DCV requiring treatment through structural BMP strategies. Tree wells designed per the SD-A fact sheet provide the volume reductions to the DCV of up to 420 cf/tree (30-fot tree canopy). Rain barrels provide less substantial effects. Due to the nature of this project, the use of volume reductions is not considered.

Step 2. Determine Retention Requirements Appendix B.2

The second step in performing storm water pollutant control calculations is to determine the retention requirements for each drainage area. Retention requirements are calculated through use of the automated Worksheet B.2 (County Workbook).

A. Determine if capture and use analysis is required per Appendix B.2.1

Projects that propose habitable structures over 9 stories tall are required to perform a capture and use analysis to identify whether the DCV from the project site can be utilized for onsite toilet flushing and/or irrigation within 36 hours of the storm. This project does not propose this type of development, therefore Capture and Use is not required.

B. Evaluate infiltration restrictions per Appendix B.2.2

Infiltration Restrictions are listed in table B.2-1 of the Manual. Restriction elements are divided into Mandatory Considerations and Optional Considerations. Mandatory Considerations include elements that may pose a significant risk to human health and safety. These elements must always be evaluated and discretion regarding the setbacks is not permitted, unless supported by the recommendations of a geotechnical engineer. None of the mandatory considerations are applicable to this project. Optional considerations include elements that are not necessarily associated with human health and safety, so analysis is not mandated. Even though not mandated, none of the optional considerations are applicable to this project.

C. Determine design infiltration rate per Appendix B.2.3

The design infiltration rate for each drainage area must be determined though either a basic or advanced analysis. The basic analysis allows for the use of a default design infiltration rate based on the predominant NRCS soil type present within the proposed BMP footprint. The basic analysis is not permitted for BMPs that lack an underdrain. The advanced analysis allows for a geotechnical engineer to assign a more specific design infiltration rate based on field testing. Table B.2-3 of the Manual identifies the design infiltration rates that can be used for each analysis. For this project, all of the proposed BMPs are located in areas of type D soil and have infiltration restrictions due to the infiltrations and proximity to slopes and buildings, therefore all proposed BMPs will be lined with an underdrain.

D. Determine retention requirements per Appendix B.2.4

Since infiltration is not being used and the BMPs are lined with an underdrain, retentions requirements do not apply.

Step 3. Determine BMP Performance per Appendix B.3

The third step in performing stormwater pollutant control calculations is to design a structural BMP with the characteristics that provide stormwater treatment for the DCV and meet the minimum retention requirements for the drainage area.

A. Identify proposed BMP characteristics per Appendix B.3.1

The performance of a BMP is a function of its retention and biofiltration processes, which are directly related to the proposed BMP geometry and design components. BMP geometries identify the area and depth over which retention and/or biofiltration processes occur. Critical

BMP geometries include: BMP surface area, surface ponding depth, biofiltration soil media depth, gravel depth, underdrain depth, underdrain diameter and underdrain offset. BMP components dictate how retention and biofiltration processes occur over the BMP footprint. Critical BMP components include: vegetation vs no vegetation, standard biofiltration soil media vs non-standard biofiltration soil media, impermeable liner vs no impermeable liner, underdrain vs no underdrain, and design infiltration rates. By default, these BMPs must be sized to provide a surface area that is equal to at least 3% of the tributary effective impervious area. If a smaller BMP surface area is desired, the application must include additional calculations determining the required maintenance interval required to maintain BMP effectiveness. This project does not propose BMPs smaller than the 3% limit. The BMPs proposed for storm water compliance is biofiltration BMPs. For this project the site layout, soil characteristics, and maintenance requirements were considered against the advantages and disadvantages of each of the common BMP options.

B. Calculate retention processes per Appendix B.3.2

BMP retention processes include infiltration and evapotranspiration occurring within the BMP.

Part 1) Is to determine the amount of infiltration in a 6 hour storm event.

Located on the county spreadsheet B.3 Line 18 is located the infiltration over a 6 hour time frame, some basins may not be infiltrating and those basins will have a “zero” listed in line 18.

Part 2) Of this section is in reference to the retention capacity of the bmp.

This item is characterized in the county’s spreadsheet as well in terms of an efficiency of retention listed on line item 25.

C. Calculated biofiltration processes per Appendix B.3.3

Any portion of the DCV that has not been retained within site design or structural BMP elements must be biofiltered. BMP biofiltration processes include filtration, sedimentation, sorption, biochemical processes and/or vegetative uptake. This section presents how to calculate the biofiltration processes occurring within the proposed BMP.

Part 1) Determine the filtration rate (in/hr) of the proposed BMP.

This is the rate at which storm water biofilters though the BMP and exits through the underdrain. Filtration rates can be governed by characteristics of the biofiltration soil media or by flow restrictions experienced due to the design of the BMP underdrain/orifice. The soil infiltration rate can be seen in the County’s spreadsheet on B.3 Line item 30. Since the proposed structural BMPs A, B & C are also being used for hydromodification control, the orifice size is governed by the hydromodification requirements needed for this site.

Part 2) Determine the volume of biofiltration occurring within the BMP during a 6 hour storm event. This volume is a function of the BMP filtration rate, BMP surface area, and the rainfall duration as shown below. The item can be found in the County’s spreadsheet in B.3 from ((item 33)/12) * Line 8 and is built into the spreadsheet to check for efficiency.

Part 3) Determine the static biofiltration capacity of the BMP assuming it is entirely full.

This volume is a function of the BMP surface area and the effective biofiltration depth. This is located from Worksheet B.3 line 37 * Line 8

Part 4) Determine the drawdown time (hours) for surface ponding.

This is the ponding depth divided by the sum of the design infiltration rate and BMP filtration rate. Surface ponding depths of 24 hours or less are typically required; however, longer drawdown times up to 96 hours may be proposed if supported by a landscape architect/agronomist and no safety hazards are anticipated due to excessive ponding. Surface

ponding drawdown times over 96 hours are not permitted due to vector concerns. This item is located on worksheet B.3 item 11.

Part 5) Determine the efficacy of the biofiltration processes by the BMP.

This value represents the portion of the pollutant control standard that is satisfied through the biofiltration processes of the BMP. There are two options available for establishing the biofiltration performance standard. Applications may select the option of their choice. Option 1 requires that the BMP treat 1.5 times the portion of the DCV not reliably retained onsite (assuming a 6 hour routing period). Option 2 requires that the BMP treat 1.0 times the portion of the DCV not reliably retained onsite; and additionally check that the system has a total static (i.e., non-routed) storage volume, including pore spaces and pre-filter detention volume, equal to at least 0.75 times the portion of the DCV not reliably retained onsite. For option of 1.5 times the DCV see worksheet B.3 Line item 41. For option of 1.0 times the DCV with a static volume of 0.75 DCV see worksheet B.3 Line item 43. Both items are calculated and the minimum value between the two is chosen to be used in the calculations.

D. Satisfaction of pollutant control requirements per Appendix B.3.4

The performance of a BMP with respect to the pollutant control performance standards is referred to as the BMP efficacy. Worksheet B.3 Line item 47 is the efficiency; if the efficiency is not as least 100% then changes to sizing parameter will need to be considered.

E. Satisfaction of minimum retention requirements per Appendix B.3.5

Minimum retention requirements can be satisfied by demonstration that all the retention elements incorporated within the drainage area (rain barrels, tree wells, dispersion areas, and BMPs) retain a volume of water that is greater than or equal to what is required. Worksheet B.1 will provide areas that have been incorporated into any retention volumes for rain barrels and or tree wells (this project uses neither of these for this portion of the project). The remaining retention requirements are on Worksheet B.2 Retention Requirements. When incorporated into worksheet B.3 a box is Labeled as “YES” or “NO” to determine if the requirements have been met. For this project all items are to be reflective of “YES” in the box.

7.2.2 Structural BMP Summary Table (Complete for all proposed structural BMPs)

- List and provide the information requested below for all pollutant control and hydromodification management BMPs proposed for the project.
- For each BMP listed, complete the Structural BMP Checklist on the next page. Copy the Checklist as many times as needed.

BMP ID #	DMA #	DMA Area (ft^2)	Structural BMP Type							Permit # and Sheet #
			Harvest and Use	Infiltration	Unlined Biofiltration	Lined Biofiltration	Flow-thru treatment	Hydromodification Management[1]	Other	
BMP-A	DMA-1	68,949	☐	☐	☐	☒	☐	☒	☐	PDS2021-MUP-85-053W2, SHT 3
BMP-B	DMA-2	54,392	☐	☐	☐	☒	☐	☒	☐	PDS2021-MUP-85-053W2, SHT 3
BMP-C	DMA-3	21,090	☐	☐	☐	☒	☐	☒	☐	PDS2021-MUP-85-053W2, SHT 3
			☐	☐	☐	☐	☐	☐	☐	
			☐	☐	☐	☐	☐	☐	☐	
			☐	☐	☐	☐	☐	☐	☐	
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			☐	☐	☐	☐	☐	☐	☐	
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			☐	☐	☐	☐	☐	☐	☐	
			☐	☐	☐	☐	☐	☐	☐	
			☐	☐	☐	☐	☐	☐	☐	

---

[1] Hydromodification Management BMPs must be accompanied by BMPs that provide pollutant control.

Copy and Paste table here for additional BMPs

7.3 Structural BMP Checklist (Complete once for each proposed structural BMP)

Structural BMP ID #	BMP-A	**Permit # and Sheet #**	PDS2021-MUP-85-053W2, SHT 3

BMP Type

Infiltration
- ☐ Infiltration basin (INF-1)
- ☐ Bioretention (INF-2)
- ☐ Permeable pavement (INF-3)

Unlined Biofiltration
- ☐ Biofiltration with partial retention (PR-1)

Lined Biofiltration
- ☒ Biofiltration (BF-1)
- ☐ Nutrient Sensitive Media Design (BF-2)
- ☐ Proprietary Biofiltration (BF-3)

Harvest and Use
- ☐ Cistern (HU-1)

Flow-thru Treatment (describe below)
- ☐ With prior lawful approval to meet earlier PDP requirements
- ☐ Pre-treatment/forebay for an onsite retention or biofiltration BMP[2]
- ☐ With alternative compliance

Hydromodification Management[3]
- ☒ Detention pond or vault

☐ **Other** (describe below)

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

BMP Verification (See BMPDM Section 8.3)

Provide name and contact information for the party responsible to sign BMP verification forms	Kyle Koivuniemi, PE Kimley-Horn 714-939-1030

BMP Ownership and Maintenance (See BMPDM Section 7.3 and Attachment 11)

BMP Maintenance Category	Cat. 1 ☐	Cat. 2 ☒	Cat. 3 ☐	Cat. 4 ☐
Final owner of BMP	☐ HOA	☒ Property Owner	☐ County	
	☐ Other (describe):			
Maintenance of BMP into perpetuity	☐ HOA	☒ Property Owner	☐ County	
	☐ Other (describe):			

Discussion (As needed; Continue on subsequent pages as necessary)

This BMP is a biofiltration unit sized and designed to provide stormwater treatment, hydromodification mitigation, and flood control peak flow mitigation functions.

[2] Indicate which onsite retention or biofiltration BMP the pre-treatment/forebay serves.

[3] Hydromodification Management BMPs must be accompanied by BMPs that provide pollutant control.

7.3 Structural BMP Checklist (Complete once for each proposed structural BMP)

Structural BMP ID #	BMP-B	**Permit # and Sheet #**	PDS2021-MUP-85-053W2, SHT 3

BMP Type

Infiltration
- ☐ Infiltration basin (INF-1)
- ☐ Bioretention (INF-2)
- ☐ Permeable pavement (INF-3)

Unlined Biofiltration
- ☐ Biofiltration with partial retention (PR-1)

Lined Biofiltration
- ☒ Biofiltration (BF-1)
- ☐ Nutrient Sensitive Media Design (BF-2)
- ☐ Proprietary Biofiltration (BF-3)

Harvest and Use
- ☐ Cistern (HU-1)

Flow-thru Treatment (describe below)
- ☐ With prior lawful approval to meet earlier PDP requirements
- ☐ Pre-treatment/forebay for an onsite retention or biofiltration BMP[2]
- ☐ With alternative compliance

Hydromodification Management[3]
- ☒ Detention pond or vault

☐ **Other** (describe below)

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

BMP Verification (See BMPDM Section 8.3)

Provide name and contact information for the party responsible to sign BMP verification forms	Kyle Koivuniemi, PE Kimley-Horn 714-939-1030

BMP Ownership and Maintenance (See BMPDM Section 7.3 and Attachment 11)

BMP Maintenance Category	Cat. 1 ☐	Cat. 2 ☒	Cat. 3 ☐	Cat. 4 ☐
Final owner of BMP	☐ HOA	☒ Property Owner	☐ County	
	☐ Other (describe):			
Maintenance of BMP into perpetuity	☐ HOA	☒ Property Owner	☐ County	
	☐ Other (describe):			

Discussion (As needed; Continue on subsequent pages as necessary)

This BMP is a biofiltration unit sized and designed to provide stormwater treatment, hydromodification mitigation, and flood control peak flow mitigation functions.

[2] Indicate which onsite retention or biofiltration BMP the pre-treatment/forebay serves.

[3] Hydromodification Management BMPs must be accompanied by BMPs that provide pollutant control.

7.3 Structural BMP Checklist (Complete once for each proposed structural BMP)

Structural BMP ID #	BMP-C	**Permit # and Sheet #**	PDS2021-MUP-85-053W2, SHT 3

BMP Type

Infiltration
- ☐ Infiltration basin (INF-1)
- ☐ Bioretention (INF-2)
- ☐ Permeable pavement (INF-3)

Unlined Biofiltration
- ☐ Biofiltration with partial retention (PR-1)

Lined Biofiltration
- ☒ Biofiltration (BF-1)
- ☐ Nutrient Sensitive Media Design (BF-2)
- ☐ Proprietary Biofiltration (BF-3)

Harvest and Use
- ☐ Cistern (HU-1)

Flow-thru Treatment (describe below)
- ☐ With prior lawful approval to meet earlier PDP requirements
- ☐ Pre-treatment/forebay for an onsite retention or biofiltration BMP[2]
- ☐ With alternative compliance

Hydromodification Management[3]
- ☒ Detention pond or vault

☐ **Other** (describe below)

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

BMP Verification (See BMPDM Section 8.3)

Provide name and contact information for the party responsible to sign BMP verification forms	Kyle Koivuniemi, PE Kimley-Horn 714-939-1030

BMP Ownership and Maintenance (See BMPDM Section 7.3 and Attachment 11)

BMP Maintenance Category	Cat. 1 ☐	Cat. 2 ☒	Cat. 3 ☐	Cat. 4 ☐
Final owner of BMP	☐ HOA	☒ Property Owner	☐ County	
	☐ Other (describe):			
Maintenance of BMP into perpetuity	☐ HOA	☒ Property Owner	☐ County	
	☐ Other (describe):			

Discussion (As needed; Continue on subsequent pages as necessary)

This BMP is a biofiltration unit sized and designed to provide stormwater treatment, hydromodification mitigation, and flood control peak flow mitigation functions.

[2] Indicate which onsite retention or biofiltration BMP the pre-treatment/forebay serves.

[3] Hydromodification Management BMPs must be accompanied by BMPs that provide pollutant control.

7.4 Storm Water Pollutant Control Worksheet Calculations

- Use this page as a cover sheet for the submittal of any required worksheets below.
- Complete the checklist to identify which BMPDM Appendix B (Storm Water Pollutant Control Hydrologic Calculations and Sizing Methods) worksheets are included with this attachment.
- See BMPDM Appendix B for an explanation of the applicability of individual worksheets and detailed guidance on their completion.

Worksheet	Requirement
☒ Worksheet B.1 Calculation of Design Capture Volume (DCV)	Required
☒ Worksheet B.2 Retention Requirements	Required
☒ Worksheet B.3 BMP Performance	Required
☐ Worksheet B.4 Major Maintenance Intervals for Reduced-sized BMPs	If applicable
☐ Other worksheets	As required

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

Category	#	Description	*i*	*ii*	*iii*	Units
Standard Drainage Basin Inputs	1	Drainage Basin ID or Name	DMA-1	DMA-2	DMA-3	unitless
	2	85th Percentile 24-hr Storm Depth	0.48	0.48	0.48	inches
	3	Impervious Surfaces Not Directed to Dispersion Area (C=0.90)	47,865	41,177	12,221	sq-ft
	4	Semi-Pervious Surfaces Not Serving as Dispersion Area (C=0.30)				sq-ft
	5	Engineered Pervious Surfaces Not Serving as Dispersion Area (C=0.10)	16,778	9,827	8,869	sq-ft
	6	Natural Type A Soil Not Serving as Dispersion Area (C=0.10)				sq-ft
	7	Natural Type B Soil Not Serving as Dispersion Area (C=0.14)				sq-ft
	8	Natural Type C Soil Not Serving as Dispersion Area (C=0.23)	4,306	3,388		sq-ft
	9	Natural Type D Soil Not Serving as Dispersion Area (C=0.30)				sq-ft
Dispersion Area, Tree Well & Rain Barrel Inputs (Optional)	10	Does Tributary Incorporate Dispersion, Tree Wells, and/or Rain Barrels?	No	No	No	yes/no
	11	Impervious Surfaces **Directed to Dispersion Area** per SD-B (Ci=0.90)				sq-ft
	12	Semi-Pervious Surfaces **Serving as Dispersion Area** per SD-B (Ci=0.30)				sq-ft
	13	Engineered Pervious Surfaces **Serving as Dispersion Area** per SD-B (Ci=0.10)				sq-ft
	14	Natural Type A Soil **Serving as Dispersion Area** per SD-B (Ci=0.10)				sq-ft
	15	Natural Type B Soil **Serving as Dispersion Area** per SD-B (Ci=0.14)				sq-ft
	16	Natural Type C Soil **Serving as Dispersion Area** per SD-B (Ci=0.23)				sq-ft
	17	Natural Type D Soil **Serving as Dispersion Area** per SD-B (Ci=0.30)				sq-ft
	18	Number of Tree Wells Proposed per SD-A				#
	19	Average Mature Tree Canopy Diameter				ft
	20	Number of Rain Barrels Proposed per SD-E				#
	21	Average Rain Barrel Size				gal
Initial Runoff Factor Calculation	22	Total Tributary Area	68,949	54,392	21,090	sq-ft
	23	Initial Runoff Factor for Standard Drainage Areas	0.66	0.71	0.56	unitless
	24	Initial Runoff Factor for Dispersed & Dispersion Areas	0.00	0.00	0.00	unitless
	25	Initial Weighted Runoff Factor	0.66	0.71	0.56	unitless
	26	Initial Design Capture Volume	1,820	1,545	472	cubic-feet
Dispersion Area Adjustments	27	Total Impervious Area Dispersed to Pervious Surface	0	0	0	sq-ft
	28	Total Pervious Dispersion Area	0	0	0	sq-ft
	29	Ratio of Dispersed Impervious Area to Pervious Dispersion Area	n/a	n/a	n/a	ratio
	30	Adjustment Factor for Dispersed & Dispersion Areas	1.00	1.00	1.00	ratio
	31	Runoff Factor After Dispersion Techniques	0.66	0.71	0.56	unitless
	32	Design Capture Volume After Dispersion Techniques	1,820	1,545	472	cubic-feet
Tree & Barrel Adjustments	33	Total Tree Well Volume Reduction	0	0	0	cubic-feet
	34	Total Rain Barrel Volume Reduction	0	0	0	cubic-feet
Results	35	Final Adjusted Runoff Factor	0.66	0.71	0.56	unitless
	36	Final Effective Tributary Area	45,506	38,618	11,810	sq-ft
	37	Initial Design Capture Volume Retained by Site Design Elements	0	0	0	cubic-feet
	38	Final Design Capture Volume Tributary to BMP	1,820	1,545	472	cubic-feet

No Warning Messages

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

Category	#	Description	*i*	*ii*	*iii*	Units
Basic Analysis	1	Drainage Basin ID or Name	DMA-1	DMA-2	DMA-3	unitless
	2	85th Percentile Rainfall Depth	0.48	0.48	0.48	inches
	3	Predominant NRCS Soil Type Within BMP Location	D	D	D	unitless
	4	Is proposed BMP location Restricted or Unrestricted for Infiltration Activities?	Restricted	Restricted	Restricted	unitless
	5	Nature of Restriction	Soil Type	Soil Type	Soil Type	unitless
	6	Do Minimum Retention Requirements Apply to this Project?	Yes	Yes	Yes	yes/no
	7	Are Habitable Structures Greater than 9 Stories Proposed?	No	No	No	yes/no
Advanced Analysis	8	Has Geotechnical Engineer Performed an Infiltration Analysis?	No	No	No	yes/no
	9	Design Infiltration Rate Recommended by Geotechnical Engineer				in/hr
Result	10	Design Infiltration Rate Used To Determine Retention Requirements	0.000	0.000	0.000	in/hr
	11	Percent of Average Annual Runoff that Must be Retained within DMA	4.5%	4.5%	4.5%	percentage
	12	Fraction of DCV Requiring Retention	0.02	0.02	0.02	ratio
	13	Required Retention Volume	36	31	9	cubic-feet

No Warning Messages

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

Category	#	Description	*i*	*ii*	*iii*	Units
BMP Inputs	1	Drainage Basin ID or Name	DMA-1	DMA-2	DMA-3	sq-ft
	2	Design Infiltration Rate Recommended	0.000	0.000	0.000	in/hr
	3	Design Capture Volume Tributary to BMP	1,820	1,545	472	cubic-feet
	4	Is BMP Vegetated or Unvegetated?	Vegetated	Vegetated	Vegetated	unitless
	5	Is BMP Impermeably Lined or Unlined?	Lined	Lined	Lined	unitless
	6	Does BMP Have an Underdrain?	Underdrain	Underdrain	Underdrain	unitless
	7	Does BMP Utilize Standard or Specialized Media?	Standard	Standard	Standard	unitless
	8	Provided Surface Area	1,590	1,839	900	sq-ft
	9	Provided Surface Ponding Depth	6	6	6	inches
	10	Provided Soil Media Thickness	18	18	18	inches
	11	Provided Gravel Thickness (Total Thickness)	15	15	15	inches
	12	Underdrain Offset	3	3	3	inches
	13	Diameter of Underdrain or Hydromod Orifice (Select Smallest)	0.94	1.06	0.75	inches
	14	Specialized Soil Media Filtration Rate				in/hr
	15	Specialized Soil Media Pore Space for Retention				unitless
	16	Specialized Soil Media Pore Space for Biofiltration				unitless
	17	Specialized Gravel Media Pore Space				unitless
Retention Calculations	18	Volume Infiltrated Over 6 Hour Storm	0	0	0	cubic-feet
	19	Ponding Pore Space Available for Retention	0.00	0.00	0.00	unitless
	20	Soil Media Pore Space Available for Retention	0.05	0.05	0.05	unitless
	21	Gravel Pore Space Available for Retention (Above Underdrain)	0.00	0.00	0.00	unitless
	22	Gravel Pore Space Available for Retention (Below Underdrain)	0.40	0.40	0.40	unitless
	23	Effective Retention Depth	2.10	2.10	2.10	inches
	24	Fraction of DCV Retained (Independent of Drawdown Time)	0.15	0.21	0.33	ratio
	25	Calculated Retention Storage Drawdown Time	120	120	120	hours
	26	Efficacy of Retention Processes	0.17	0.23	0.33	ratio
	27	Volume Retained by BMP (Considering Drawdown Time)	311	355	157	cubic-feet
	28	Design Capture Volume Remaining for Biofiltration	1,509	1,190	315	cubic-feet
Biofiltration Calculations	29	Max Hydromod Flow Rate through Underdrain	0.0399	0.0507	0.0255	cfs
	30	Max Soil Filtration Rate Allowed by Underdrain Orifice	1.08	1.19	1.22	in/hr
	31	Soil Media Filtration Rate per Specifications	5.00	5.00	5.00	in/hr
	32	Soil Media Filtration Rate to be used for Sizing	1.08	1.19	1.22	in/hr
	33	Depth Biofiltered Over 6 Hour Storm	6.51	7.15	7.33	inches
	34	Ponding Pore Space Available for Biofiltration	1.00	1.00	1.00	unitless
	35	Soil Media Pore Space Available for Biofiltration	0.20	0.20	0.20	unitless
	36	Gravel Pore Space Available for Biofiltration (Above Underdrain)	0.40	0.40	0.40	unitless
	37	Effective Depth of Biofiltration Storage	14.40	14.40	14.40	inches
	38	Drawdown Time for Surface Ponding	6	5	5	hours
	39	Drawdown Time for Effective Biofiltration Depth	13	12	12	hours
	40	Total Depth Biofiltered	20.91	21.55	21.73	inches
	41	Option 1 - Biofilter 1.50 DCV: Target Volume	2,263	1,785	473	cubic-feet
	42	Option 1 - Provided Biofiltration Volume	2,263	1,785	473	cubic-feet
	43	Option 2 - Store 0.75 DCV: Target Volume	1,132	893	236	cubic-feet
	44	Option 2 - Provided Storage Volume	1,132	893	236	cubic-feet
	45	Portion of Biofiltration Performance Standard Satisfied	1.00	1.00	1.00	ratio
Result	46	Do Site Design Elements and BMPs Satisfy Annual Retention Requirements?	Yes	Yes	Yes	yes/no
	47	Overall Portion of Performance Standard Satisfied (BMP Efficacy Factor)	1.00	1.00	1.00	ratio
	48	**Deficit of Effectively Treated Stormwater**	**0**	**0**	**0**	cubic-feet

No Warning Messages

7.5 Identification and Narrative of Receiving Water and Pollutants of Concern

- Complete this sub-attachment *only if flow-thru treatment BMPs are implemented onsite* in lieu of retention or biofiltration BMPs. Unless excepted because of a Prior Lawful Approval[4], PDPs must also participate in an alternative compliance program[5].

A. General Description

Describe flow path of storm water from the project site discharge location(s), through urban storm conveyance systems as applicable, to receiving creeks, rivers, and lagoons as applicable, and ultimate discharge to the Pacific Ocean (or bay, lagoon, lake or reservoir, as applicable).

B. Water Body Impairments and Priorities

List any 303(d) impaired water bodies[6] within the path of storm water from the project site to the Pacific Ocean (or bay, lagoon, lake or reservoir, as applicable), identify the pollutant(s)/stressor(s) causing impairment, and identify any TMDLs and/or Highest Priority Pollutants from the WQIP for the impaired water bodies:

303(d) Impaired Water Body	Pollutant(s)/Stressor(s)	TMDLs / WQIP Highest Priority Pollutant

C. Identification of Project Site Pollutants

Identify pollutants expected from the project site based on all proposed use(s) of the site (see BMP Design Manual Appendix J.5)

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	☐	☐	☐

[4] See BMPDM Appendix L: Prior Lawful Approval Requirements and Guidance.
[5] See SWQMP Attachment 12 (Alternative Compliance Projects) and BMPDM Appendix J (Offsite Alternative Compliance Requirements and Guidance).
[6] The current list of Section 303(d) impaired water bodies can be found at: https://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2014_2016.shtml

8.0 General Requirements

- Completion of this attachment is required for all PDPs subject to hydromodification management requirements (see PDP SWQMP Form Table 5). Do not submit this attachment if exempt from Hydromodification Management requirements. Document the PDP exemption in Attachment 9.
- Submit this cover page and all required Sub-attachments for all structural hydromodification management BMPs proposed for the project.
- Constructed features must fully satisfy the requirements described in applicable BMPDM sections and appendices, and any other guidance identified by the County.
- DMA Exhibits and Construction Plans: DMAs, features, and BMPs identified and described in this attachment must be shown on DMA Exhibits and all applicable construction plans submitted for the project. See Attachment 2 for additional instruction on exhibits and plans.
- Structural BMP Certification. All structural hydromodification management BMPs documented this attachment must be certified by a registered engineer in Attachment 7, Sub-attachment 7.1.
- Structural BMP Verification. BMP installation must be verified by the County at the completion of construction. Applicants must complete an Installation Verification Form (Attachment 10).

Sub-attachments (check all that are completed)
☒ **8.1: Flow Control Facility Design** (required)[1] Submit using ☒ the Sub-attachment 8.1 cover sheet provided, or ☐ as a separate stand-alone document labeled Sub-attachment 8.1.
☒ **8.2: Hydromodification Management Points of Compliance** (required) Complete the table provided in Sub-attachment 8.2.
8.3: Geomorphic Assessment of Receiving Channels 1. Has a geomorphic assessment been performed for the receiving channel(s)? ☒ No, the low flow threshold is 0.1Q2 (default low flow threshold)
☐ Yes (provide the information below): Low flow threshold: ☐ 0.1Q2 ☐ 0.3Q2 ☐ 0.5Q2
Title: Date: Preparer:
Submit using ☐ the Sub-attachment 8.3 cover sheet provided, or ☐ as a separate stand-alone document labeled Sub-attachment 8.3.
8.4: Vector Control Plan (required if BMPs will not drain in less than 96 hours) ☐ Included with this attachment ☒ Not required

[1] Including Structural BMP Drawdown Calculations and Overflow Design Summary. See BMPDM Chapter 6 and Appendix G for additional design guidance.

8.1 Flow Control Facility Design

Insert Flow Control Facility Design behind this cover page or submit as a separate stand-alone document labeled Sub-attachment 8.1.

8.2 Hydromodification Management Points of Compliance

- List and describe all points of compliance (POCs) for flow control for hydromodification management.
- For each POC, provide a POC identification name or number, and a receiving channel identification name or number correlating to the project's HMP Exhibit (see Attachment 2).

POC name or #	Channel name or #	POC Description
POC-1	Public storm drain system leading to the San Diego River	The POC is located at the connection between the existing 66" pipe along East Bradley Ave and the 24" pipe from the curb inlet that collects surface runoff in East Bradley Ave.

Table of Contents

INTRODUCTION

This report provides Hydromodification and Water Quality design based on LID (Low Impact Development) principles for a redevelopment of an existing site composed of two skilled nursing facilities, a provided parking lot, and landscape area. The project fronts onto East Bradley Avenue and Sams Hill Road in San Diego County, California. The project proposes to retain the two existing buildings and add two new healthcare buildings at the northern and southern portion of the site. Along with the newly constructed buildings, the project proposes to add reconfigured parking spaces, drive isles and various patio areas and walkways throughout the site.

The Hydromodification and Water Quality calculations were performed utilizing continuous simulation analysis to size the storm water treatment and control facilities. Storm Water Management Model (SWMM) version 5.1 distributed by USEPA is the basis of all calculations within this report. SWMM output file was used to generate peak flow recurrence frequencies and flow duration series statistics based on an assigned rain gauge for pre-development, unmitigated post-development flows and post-development mitigated flows to determine compliance with the State Water Resources Control Board Order 2009-0009-DWQ and the County wide Model BMP design Manual dated September 15, 2020 and Hydromodification Management Plan (HMP) requirements.

The proposed tributary area is approximately 3.326 acres and this project is planned to retain the two existing buildings and add two new healthcare buildings at the northern and southern portion of the site. Along with the newly constructed buildings, the project proposes to add reconfigured parking spaces, drive isles and various patio areas and walkways throughout the site. There is one point of compliance (POC) in the analysis located at the North-West corner of the site with-in the existing 66in stormdrain pipe in Bradley Ave.

The Hydromodification and Water Quality system proposed for this project is 3 biofiltration basin with one point of compliance. This system detains storm water in the bio-filtration basin which filters storm water through plant roots and a biologically active soil and gravel storage area below the surface and then releases it into the existing storm drain along E Bradley Avenue. The resulting mitigated outflows are shown to be equal to or less than all continuously simulated storms based on the historical data collected from the Santee rain gage.

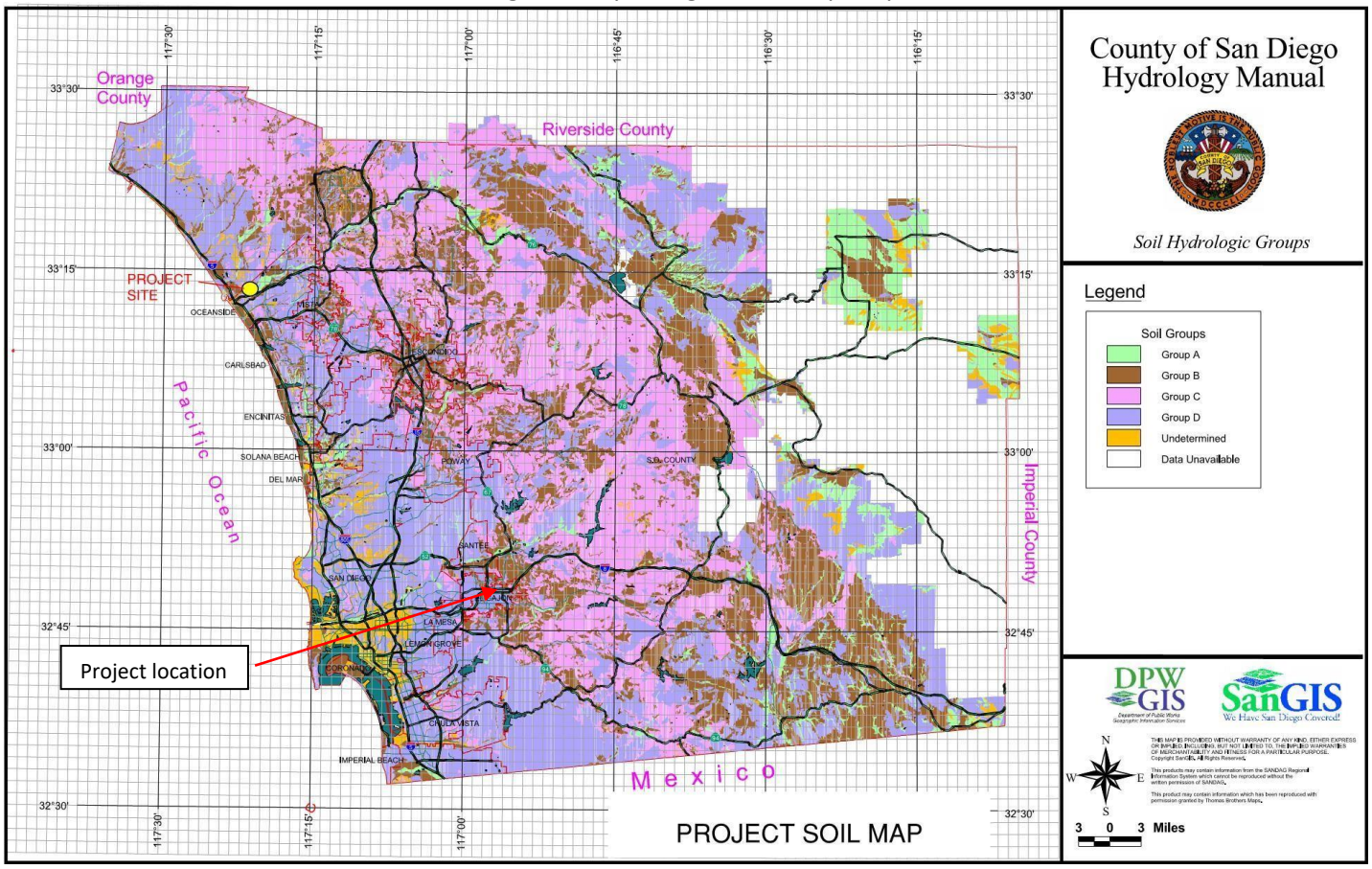
Low Flow Threshold

A downstream channel assessment has not been completed for this project and therefore the low flow threshold utilized for the system analysis is 10% of 2-year storm event (0.1Q2). This will be used as the low flow threshold to meet peak flow frequency and flow duration controls.

Soil type

Based on Figure C.1 taken from Model BMP Design Manual San Diego Region Appendices dated June 2015, the soil type of this project is assumed as soil type D. See Figure 1 below. Therefore, the SWMM sub-catchments were based on infiltration rate of soil type D.

Figure-1. Hydrologic Soil Group Map



SECTION I. MODEL SETUP

Pre-development Model Setup

The SWMM model for this projects pre-development site is analyzed using historical rain gauge data. The Santee gauge is utilized for this project. That data provides continuous precipitation input to a sub-catchment with its outfall based on the contributing basins imperviousness.

The imperviousness parameter in SWMM is the amount of effective or directly connected impervious area. The effective impervious area is the impervious area that drains directly to the Stormwater conveyance system. The pre-development condition is an existing low-density commercial site composed of two skilled nursing facilities, a provided parking lot, and landscape area.

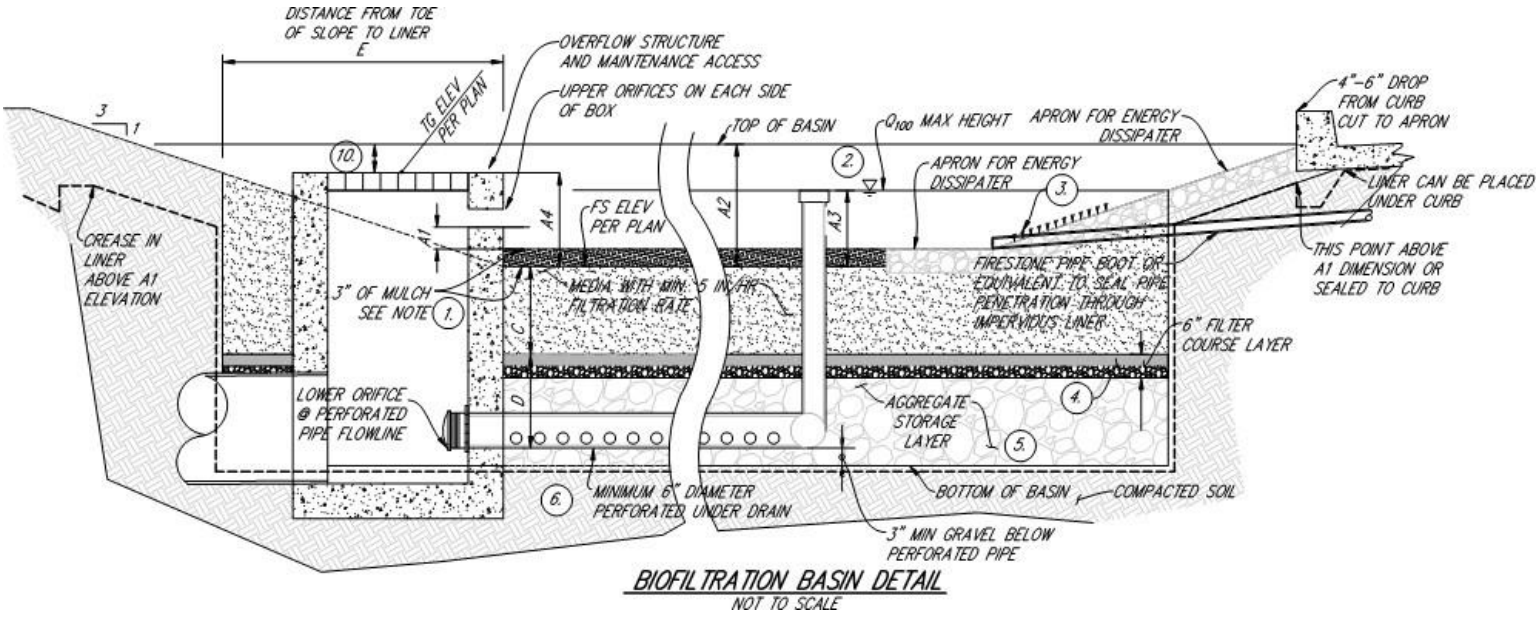
Post-Development Model Setup

The post-development areas are divided into 3 DMAs (Drainage Management Areas) based on topography, soil type and hydraulic systems. Figure 3 (on the next page) shows the delineation of each DMA.

Bioretention sections are similar in configuration as seen in figure-1 below. The bottom elevation for each is assumed at 0 ft within the LID editor. The variations of the two systems consist of the minimum width that each is constructed to. Figure-1 below demonstrates a 6' minimum width for bioretention basins. The bioretention basins utilize the BMP manual's default value of 5.0 in/hr for surface infiltration rates follow SWMM's default values listed in the help file under "Soil Characteristics".

The assumed manning's number for the post-developed conditions is based off well-maintained landscape areas with medium trees and shrubs. Thus, an N-value of 0.1 is used for this analysis.

Figure-2. Typical
Biofiltration Section



STRUCTURAL BIO-BASIN SUMMARY TABLE													
BMP NAME	TYPE OF BMP	EFFECTIVE AREA (SQFT)	A1 (INCH) WATER QUALITY	A2 (INCH) TOP OF BASIN	A3 (INCH) Q_{100} MAX HEIGHT	A4 (INCH) TOP OF RISER	C (INCH) MEDIA	D (INCH) GRAVEL	E (INCH) OFFSET	BOX RISER OVERFLOW STRUCTURE SIZE (INCHES)	ORIFICES DIAMETER		IMPERMEABLE LINER ?
											UPPER (INCH)	LOWER (1/16 INCH)	
BMP-A	BIOFILTRATION	1,590	6	26	15	15	18	12	27	48X48	2X21	15	YES
BMP-B	BIOFILTRATION	1,839	6	24	13	12	18	12	27	48X48	1X36	17	YES
BMP-C	BIOFILTRATION	900	6	12	10	9	18	12	27	24X24	-	12	YES

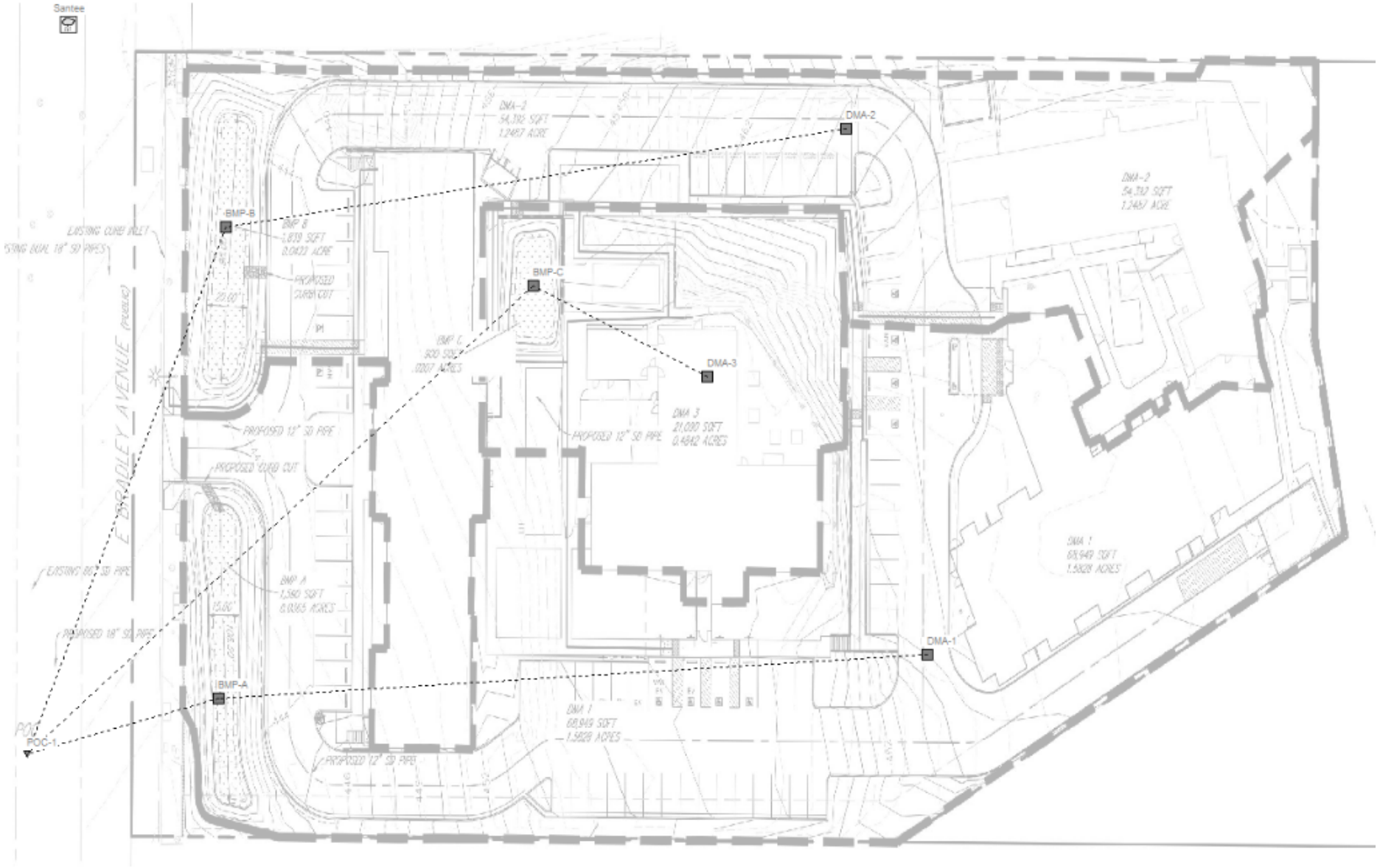


Fig.3 – SWMM Post-Development with Mitigation Model

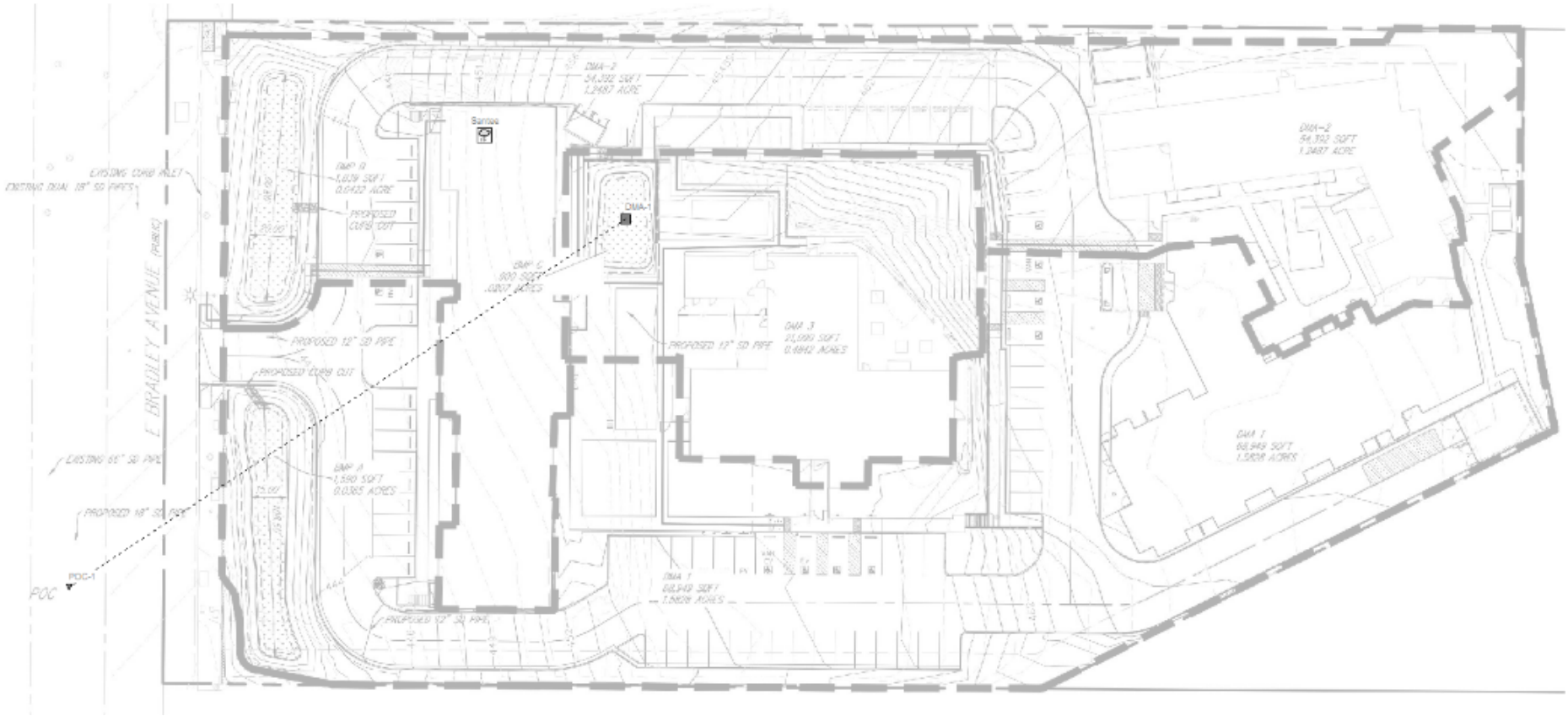


Fig.4 – SWMM Pre-Development Model

Pre-Development Basin Areas & Post-Development (DMAs)

Basin areas and DMAs provide an important framework for feasibility screening, BMP prioritization and storm water management system configuration. Both Basin Areas and DMAs are defined based on drainage patterns of the site and the BMPs to which they drain. Below is a summarization of Basins and DMAs within this study, excluding any LID area that resides within its boundary:

PRE-DEVELOPMENT SUBCATCHMENT

SUBCATCHMENTS				
Name	Outlet	Area	Width	%Slope
DMA-1	POC-1	3.3262	268.6	0.5
	Total	3.3262		

POST-DEVELOPMENT SUBCATCHMENT

SUBCATCHMENTS					
Name	Outlet	Area (ac.)	% IMP	Width	%Slope
BMP-A	POC-1	0.036501	0	20.00	0
BMP-B	POC-1	0.04222	0	25.00	0
BMP-C	POC-1	0.02066	0	10.34	0
DMA-1	BMP-A	1.5828	75	125	5
DMA-2	BMP-B	1.2487	75	125	5
DMA-3	BMP-C	0.48416	60	50	1
	Total	3.3262			

SECTION II. SYSTEM REPRESENTATION

SWMM is a distributed model, which means that a study area can be subdivided into any number of irregular sub-catchments to best capture the effect that spatial variability in topography, drainage pathways, land cover, and soil characteristics have on runoff generation. For modeling of Hydromodification calculations, there are four main system representations: Rain gage, Sub-catchment (contributing basin or LID area), Nodes and Links.

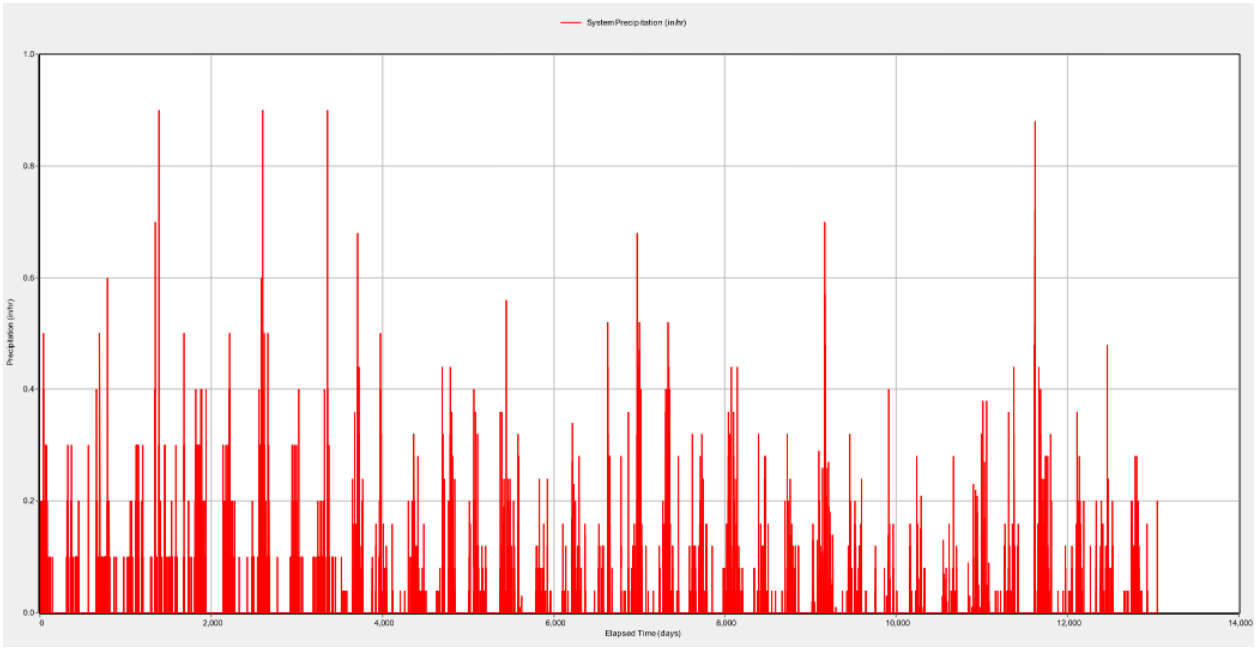


Fig. 5 – Time series rain data, which corresponds to runoff estimates for each of the 508,080 time steps (each date and hour) of the 35-year simulation period. (Inches/hour vs. elapsed time)

Rain Gauge

The properties of a rain gauge describe the source and format of the precipitation data that are applied to the study area. In this project, the rainfall data consist of a long-term rainfall record stored in a user-defined Time Series labeled as “Santee” rain gauge station. The Santee rain station was chosen due to its data quality and its location to the project site.

The rain gauge supplies precipitation data for one or more sub-catchment areas in a study region taken from the Project Clean Water website (www.projectcleanwater.org). This data file contains rainfall intensity, hourly-recorded time interval, and the dates of recorded precipitation each hour. The Santee rain data has approximately 35 years of hourly precipitation data from 01/03/1973 to 09/26/2008 and generates 35 years of hourly runoff estimates, which corresponds to runoff estimates for each of the 508,080 time steps (each date and hour) of the 35 year simulation period.

Sub-catchment (contributing basin or LID area)
A basin is modeled using a sub-catchment object, which contains some of the following properties:

The rate of stormwater runoff and volume depends directly on the precipitation magnitude and its spatial and temporal distribution over the catchment. Each sub-catchment in SWMM is linked to a rain gauge object that describes the format and source of the rainfall input for the sub-catchment.

Area
This area is bounded by the sub-catchment boundary. Its value is determined directly from maps or field surveys of the site or by using SWMM's Auto-length tool when the sub-catchment is drawn to scale on SWMM's study area map. This Project is divided into several sub-catchments based on its outfall.

Width
Width can be defined as the sub-catchment's area divided by the length of the longest overland flow path that water can travel. When there are several such paths, one would use an average of their lengths to compute a width. If overland flow is visualized as running down –slope off an idealized, rectangular catchment, then the width of the sub-catchment is the physical width of overland flow.

In natural areas, true overland flow can only occur for distances of about 500 feet before it begins to consolidate into a small stream flow. In post-development, the true overland flow can be very short before it is collected into open channels. A maximum overland flow of 500 ft is appropriate for a non-urban catchment, while the typical overland flow length is appropriate for non-urban catchments; the typical overland flow length is the length from the back of a representative lot to the center of the street for urban catchments. If the overland flow length varies greatly within a sub-catchment, then an area-weighted average should be used.

Slope
This is the slope of the land surface over which runoff flows and is the same for both the pervious and impervious surfaces. It is the slope of what one considers being the overland flow path or its area-weighted average if there are several paths in the sub-catchment.

Imperviousness
This is the percentage of sub-catchment area covered by impervious surfaces such as sidewalks and roadways or whatever surfaces that rainfall cannot infiltrate.

Roughness Coefficient
The roughness coefficient N-Pervious default number =0.15 for Pre- and Post-development was used for this calculation. This value results in a more conservative approach than the actual N-value.

Infiltration Model
The pre-development area was divided a single basin. Site delineation can be found in Figure-2 on the next page.

For the purpose of this study, the site is assumed to have 0% of impervious surface area. The site is considered a natural vacant land, giving the site characteristics, a manning's value of 0.15 is used.

The pre-development condition is an existing low-density commercial site composed of two skilled nursing facilities, a provided parking lot, and landscape area. In the model, clay soil was used for the post-development condition and the pre-development condition for a conservative approach (yield to a higher runoff). Infiltration of rainfall from the pervious area of a sub-catchment into the unsaturated upper soil zone can be described using three different infiltration models: Horton, Green-Ampt, and Curve Number. The Green-Ampt method was chosen to calculate the infiltration of the pervious areas based on the availability of data for this project. It is invoked when editing the infiltration property of a sub-catchment.

The conductivity in the Post-Project is reduced by 25% due to compaction.

Table 1 – Soil Infiltration Parameter

SWMM Parameter Name	Unit	Range	Use in San Diego
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 – Ç0.45 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. 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: 0.30 Hydrologic Soil Group B: 0.31 Hydrologic Soil Group C: 0.32 Hydrologic Soil Group D: 0.33 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

Source: Model BMP Design Manual San Diego Region Appendices, September 15, 2020

LID controls
Utilizing LID controls within a SWMM project is a two-step process that:

- Creates a set of scale-independent LID controls that can be deployed throughout the study area,
- Assign any desired mix and sizing of these controls to designated sub-catchments.

The LID for this project is a Modular Wetlands system unit. That unit is handled by the SWQMP and will not be modeled in this SWMM model.

SECTION III. CONTINUOUS SIMULATION OPTIONS

Simulation Dates
These dates determine the starting and ending dates/times of a simulation and are chosen based on the rain data availability.

Start analysis on 01/03/1973
Start Reporting on 01/03/1973
End Analysis on 09/26/2008

Time Steps
The Time Steps establish the length of the time steps used for runoff computation, routing computation and results reporting. Time steps are specified in days and hours: minutes: seconds except for flow routing which is entered as decimal seconds.

Climatology
-Evaporation Data

The available monthly evaporation data for project area was obtained from the California Irrigation Management Information System "Reference Evapotranspiration Zones" brochure and map (CIMIS ETo Zone Map), prepared by California Department of Water Resources, dated January 2012. Project site falls in "Zone 6" South Coast Inland Plains based on CIMIS ETo Zone map.

Table 2 – Zone 6 Monthly Evaporation data (in/day)

January	February	March	April	May	June
0.060	0.080	0.110	0.160	0.180	0.210
July	August	September	October	November	December
0.210	0.200	0.160	0.120	0.080	0.060

SECTION IV. RUNNING THE SIMULATION

In general, the Run time will depend on the complexity of the watershed being modeled, the routing method used, and the size of the routing time step used. The larger the time steps, the faster the simulation, but the less detailed the results.

Model Results

SWMM's Status Report summarizes overall results for the 35-yr simulation. The runoff continuity error is -1.09 % and the flow routing continuity error is 0.00%. When a run completes successfully, the mass continuity errors for runoff, flow routing, and pollutant routing will be displayed in the Run Status window. These errors represent the percent difference between initial storage + total inflow and final storage + total outflow for the entire drainage system. If they exceed some reasonable level, such as 10 percent, then the validity of the analysis results must be questioned. The most common reasons for an excessive continuity error are computational time steps that are too long or conduits that are too short.

In addition to the system continuity error, the Status Report produced by a run will list those nodes of the drainage network that have the largest flow continuity errors. If the error for a node is excessive, then one should first consider if the node in question is of importance to the purpose of the simulation. If it is, then further study is warranted to determine how the error might be reduced.

The SWMM program ranks the partial duration series, the exceedance frequency and the return period. They are computed using the Weibull formula for plotting position. See the flow duration curve and peak flow frequency on the following pages.

SECTION V. RESULT ANALYSIS

Development of the Flow Duration Statistics

The flow duration statistics are also developed directly from the SWMM binary output file. It should be noted right from the start that the "durations" that we are talking about in this section have nothing to do with the "storm durations" presented in the peak flow statistics section. Other than using the same sequence of letters for the word, the two concepts have nothing to do with each other and the reader is cautioned not to confuse the two. The goal of the flow duration statistics is to determine, for the flow rates that fall within the hydromorphologically significant range, the length of time that each of those flow rates occur. Since the amount of sediment transported by a river or stream is proportional to the velocity of the water flowing and the length of time that velocity of flow acts on the sediment, knowing the velocity and length of time for each flow rate is very useful.

Methodology

The methodology for determining the flow duration curves comes from a document developed by the U.S. Geological Survey (USGS). The first stop on the journey to find this document was a link to the USGS water site (http://www.usgs.gov/water/). This link is found in Appendix E (SDHMP Continuous Simulation Modeling Primer), found in the County Hydromodification Management Plan[1]. On this web site a search for "Flow Duration Curves" leads to USGS Publication 1542-A, Flow-duration curves, by James K. Searcy 1959 (http://pubs.er.usgs.gov/publication/wsp1542A). In this publication the development of the flow duration curves is discussed in detail.

In Pub 1542-A, beginning on page 7 an example problem is used to illustrate the compilation of data used to create the flow duration plots. A completed form 9-217-c form shows the monthly tabulation of flow rates for Bowie Creek near Hattiesburg, Miss. For each flow range the number of readings is tabulated and then the total number of each flow rate is totaled for the year. It should be noted that while this example is for a stream with a minimum flow rate of 100cfs, for the purposes of run-off studies in Southern California the minimum flow rate of zero (0) cfs is the common low flow value. Once each of the year's data has been compiled the summary numbers from each year are transferred to form 9-217-d. On this form the total number of each flow rate is again totaled and the percentage of time exceeded calculated (as will be explained later under the discussion of our calculations). Once the data has been compiled a graph of Discharge Rate vs. Percent Time Exceeded is developed. As will be explained in the next section, the use of these curves leads to the amount of time each particular flow can be expected to occur (based on historical data).

How to Read the Graphs[2]

Figure 1 shows a flow duration curve for a hypothetical development. The three curves show what percentage of the time a range of flow rates are exceeded for three different conditions: pre-project, post-project and post-project with storm water mitigation. Under pre-project conditions the minimum geomorphologically significant flow rate is 0.131cfs (assumed) and as read from the graph, flows would equal or exceed this value about 0.23% of the time (or about 20 hours per year) (0.0023 x 365days x 24 hour/day). For post-project conditions, this flow rate would occur more often – above 0.40% of the time (or above 40 hours per year) (0.0040 x 365days x 24 hour/day). This increase in the duration of the geomorphologically significant flow after development illustrates why duration control is closely linked to protecting creeks from accelerated erosion.

[1] FINAL HYDROMODIFICATION MANAGEMENT PLAN, Prepared for County of San Diego, California, March 2011, by Brown and Caldwell Engineering of San Diego. (http://www.projectcleanwater.org/images/stories/Docs/LDS/HMP/0311_SD_HMP_wAppendices.pdf)

[2] The graph and the explanation were taken directly from Appendix E of the Hydromodification Plan

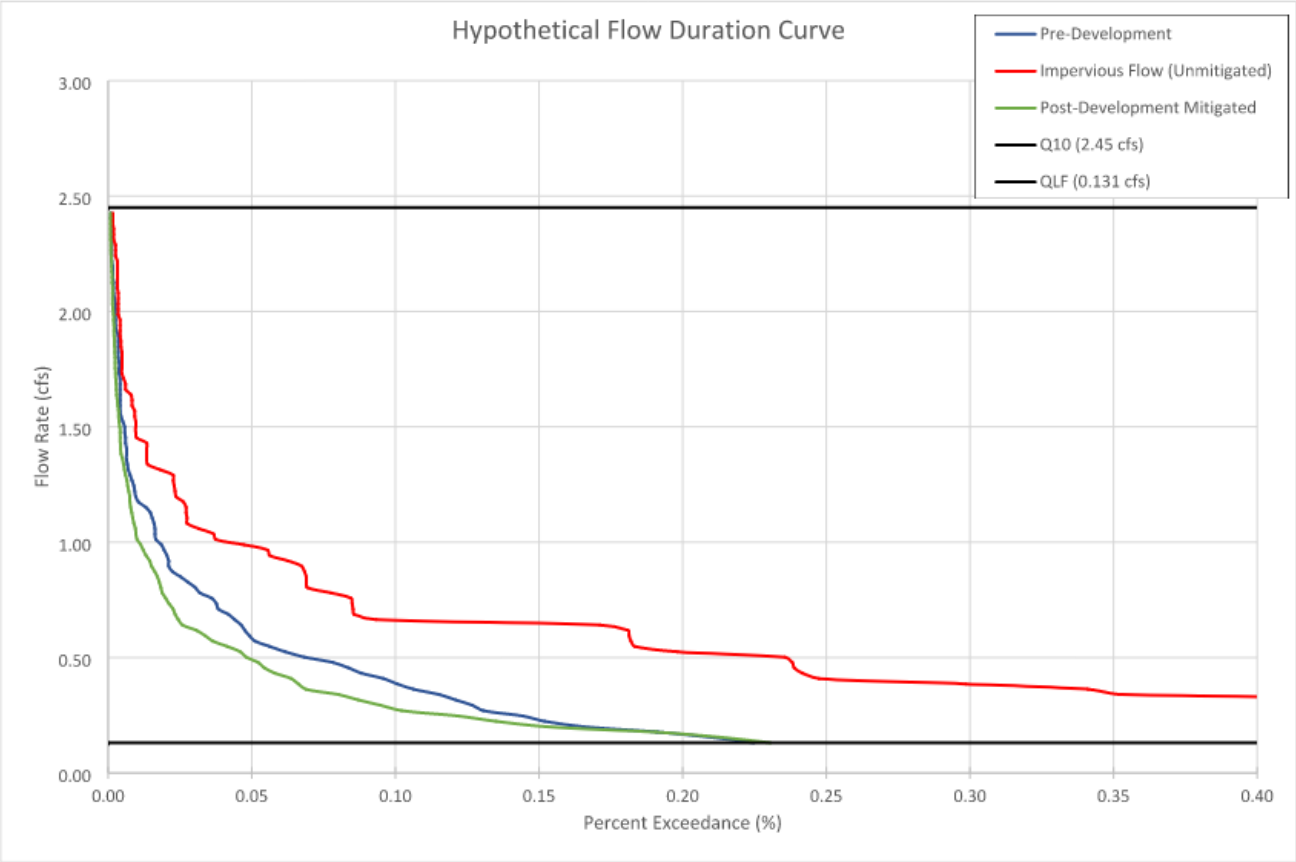


Figure 6. Flow Duration Series Statistics for a Hypothetical Development Scenario

Development of Flow Duration Curves

The first step in developing the flow duration curves is to count the number of occurrences of each flow rate. This is done by first rounding every non-zero flow value to an appropriate number of decimal places (say two places). This in effect groups each flow into closely related values or "bins" as they are referred to in publication 9-217d. Then the entire runoff record is queried for each value and the number of each value counted. The next step is to enter the results of the query into a grid patterned after form 9-217d. The data is entered in ascending order starting with the lowest flow first. The grid is composed of four columns. They are (from left to right) Discharge Rate, Number of **Periods (count),** Total Periods Exceeding (the total number of periods equal to or exceeding this value), and Percent Time Exceeded. Starting at the top row (row 1), the flow rate (which is often times zero) is entered with the corresponding number of times that value was found. The next column is the total number of values greater than or equal to that flow rate. For the first flow rate point, by definition all flow rate values are greater than or equal to this value, therefore the total number of runoff records of the rainfall record is entered here. The final column which is the percent of time exceeded is calculated by dividing the total periods exceeded by the total number of periods in the study. For the first row this number should be 100%.

For the next row (row 2), the flow rate, and the flow rate count are entered. The total number of periods exceeding for row 2 is calculated by subtracting Number of Periods of row 1 from the Total Periods Exceeding of line 1. This result is entered in the Total Periods Exceeding on row 2. As was the case for line 1, the final column is calculated by dividing the total periods exceeded by the total number of periods in the study. For the second row this number should be something less than 100% and continually decrease as we move down the chart. If all the calculations are correct, then everything should zero out on the last line of the calculations.

The final step in developing the flow duration curves is to make a plot of the Discharge Rate vs. the Percent Time Exceeded. For the purposes of this report, the first value corresponding to the zero flow rate is not plotted allowing the graph to be focused on the actual flow rate values.

The Flow Duration Analysis

The Peak Flow Statistics analysis is composed of the following series of files:

1. The Flow Duration Plot
2. Comparison of the Un-Mitigated Flow Duration Curve to the Pre-Development Curve (Pass/Fail)
3. Comparison of the Mitigated Flow Duration Curve to the Pre-Development Curve (Pass/Fail)
4. The calculations for the Pre-Development flow duration curve development (Pre-Development Table)
5. The calculations for the Mitigated flow duration curve development (Post-Development Table)

The Flow Duration Plot

The Flow Duration Curves Plot is the plotting of all two (pre and mitigated) sets of Discharge Rate vs. the Percent Time Exceeded data point pair lists. In addition to these curves horizontal lines are plotted corresponding to the Q_{10} and Q_{lf} (low flow threshold) values. Within the geomorphologically significant range ($Q_{10} - Q_{lf}$) one can see a visual representation of the relative positions of the flow duration curves. The flow duration curves are compared in an East/West (horizontal) direction to compare post development Discharge Rates to pre-development Discharge Rates. The pre- development curve is plotted in blue and the mitigated curve is plotted in green. As long as the post development curve lies to the left of the pre-development curve (mostly[3]), the project meets the peak flow hydromodification requirements.

Pass/Fail comparison of the curves

The next two sets of data are the point by point comparison of the post-development curve(s) and the pre-development curve. The Pass/Fail table is helpful in determining compliance since the plotted lines can be difficult to see at the scales suitable for use in a report. Each point on the post- development curve has a corresponding “Y” value (Flow Rate), and “X” value (% Time Exceeded). For each point on the post development curve, the “Y” value is used to interpolate the corresponding Percent Time Exceeded (X) value from the pre-development curve. Then the Post-development Percent Time Exceeded value is compared to the pre-development Percent Time Exceeded value. Based on the relative values of each point, pass/fail criteria are determined point by point.

[3] See hydromodification limits for exceedance of pre-development values

The first column is the zero based number of the point. The next two columns show the post development "X" and "Y" values. The next column shows the value interpolated between the two bounding points on the pre-development curve. The next three columns show the true or false values of the comparison of the two "X" values. The last column shows the resultant pass or fail status of the point. There are three ways a point can pass. They are:

1. Q_{post} being outside of the geomorphologically significant range Q_{lf} to Q_{10}
2. Q_{post} being less than Q_{pre}
3. Q_{post} being less than 110% of the value of Q_{pre} if the point is between Q_{lf} and Q_{10}

There are two ways that a point can fail. They are:

1. Q_{post} being greater than 110% of Q_{pre} if the point is between Q_{lf} and Q_{10}
2. If more than 10% of the points are between 100% and 110% of Q_{pre} for the points between Q_{lf} and Q_{10}

A quick scan down the last column will quickly tell if there are any points that fail.

Plan Check Suggestions

As was described under the peak flow section, it is the responsibility of the reviewing agency to confirm that the data sets presented are valid results from consistent calculations, and that any and all results can be duplicated by manual methods and achieve the same results. In light of these goals, the plan checker is invited to consider the following tasks as part of the plan check process.

Verify the Flow Rate Counts

For each of the pre, un-mitigate and mitigated flow duration tables, a few randomly selected flow value counts should be checked against the values taken directly from the SWMM file. This can be done by opening the corresponding SWMM file, selecting the outfall node, selecting Report>Table>By Object, Setting the time format to Date/Time, selecting the appropriate node value, and clicking the OK button to generate a table of the date/time/Total Inflow values. Next step is to click in the left most header row of the SWMM table which will select the entire table. Now from the main menu select Edit>Copy To>Clipboard. Now open a new blank sheet in MS Excel (or suitable spread sheet program) select cell A1 and paste the results from the clipboard into the spread sheet. Now sort the values based on the Total Inflow column. This will group all the flow values together enabling the number of occurrences of each value to be counted. At this point a few (or all) of the counts can be verified.

Manually Verify That the Percent Exceeded Values are Correctly Calculated

The discharge rates and counts are confirmed as was described above. The top row should be the smallest runoff value (0.00cfs usually). Total Periods Exceeding of the first line should be the total number of rainfall records in the study. The percentage of Time Exceeding should be the total periods exceeding divided by the total number of rainfall records in the study (100% for the first line). For each successive discharge rate, the total periods exceeding for the current line should be the total periods exceeding from the line above minus the number of periods from the line above. The number of periods and the number of periods exceeding should zero out at the last line.

Compare Plotted Curves to Table Data

Randomly check a few of the plotted points against the values verified above.

Verify by Observation that the plotted values of Q_{10} and Q_{lf} are reasonable
Verify that the correct values for each of these return periods are plotted correctly on the graph.

Development of the Peak Flow Statistics

The peak flow statistics are developed directly from the binary output file produced by the SWMM program. The site is modeled three ways, Pre-Development, Post-Development-Unmitigated, and Post-Development-Mitigated. For each of these files a specific time period differentiating distinct storms is chosen. The SWMM results are extracted and each flow value is queried. The majority of the values for Southern California sites are zero flow. As each successive record is read, as soon as a non-zero value is read the time and flow value of that record are recorded as the beginning of an event. The first record is automatically recorded as the "tentative" peak value. As each successive non-zero value is read and the successive flow value is compared to the peak value and the greater value is retained as the peak value of the storm. As soon as a successive number of zero values equal to the predetermined storm separation value, then the time value of the last non-zero value is recorded as the end of the storm, the duration of the storm is the difference between the end time and the start time, and the peak value is recorded as the highest flow value between the start and end times.

Once the entire SWMM output file is read, all of the distinct storm events will have been recorded in a special list. The storms will be in the order of their occurrence. To develop the peak flow statistics table the first step is to sort the storms in descending order of the peak flow value. Once the list is sorted then the relative rank of each storm is assigned with the highest ranking storm being the storm with the highest peak flow. There are several methods that can be used to determine which storm should be ranked above another equally valued storm. For the purposes of these studies an Ordinal ranking is used so that each storm has a unique rank number. Where two or more storms have equal flow values, the earlier storm is assigned the higher rank. This is done consistently throughout the storm record. Since we are only looking at peak flow statistics, it is assumed that the relative ranking of individual (but equal) storms is irrelevant to the calculations.

The exceedance frequency and return period are both computed using the Weibull formula for plotting position. Therefore, for a specific event the exceedance frequency F and the return period in years T are calculated using the following equations[4]:

$F=m/(n_R+1)$ and $T=n+1/m$

where m is the event's rank, n_R is the total number of events and n is the number of years under analysis.

Once the Peak flow statistics table is complete, a plot of Return Frequency vs. peak flow is created. All three conditions (pre, post and mitigated) are plotted on the same plot.

The Peak Flow Statistics Analysis

The Peak Flow Statistics analysis is composed of the following series of files:

1. The Peak Flow Frequency Plot
2. The Comparison of the Un-Mitigated Peak Flow Curve to the Pre-Development Curve (Pass/Fail)
3. The Comparison of the Mitigated Conditions Curve to the Pre-Development Curve (Pass/Fail)
4. The Peak Flow Statistics Calculation for the Pre-Development Curve.
5. The Peak Flow Statistics Calculation for the Mitigated Curve.

The Peak Flow Frequency Plot

The Peak Flow Frequency Curves are the plotting of all two (Pre and Mitigated) sets of return Period vs peak flow data point pair lists. In addition to these curves horizontal lines are plotted corresponding to the Q_{10}, Q_5, Q_2 and Q_{lf} (low flow threshold) values. Within the geomorphologically significant range (Q_{10} – Q_{lf}) one can see a visual representation of the relative positions of the peak flow curves. The peak flow curves are compared in a North/South (vertical) direction to compare post development peak flows to pre-development flows. The Pre-Development curve is plotted in blue and the mitigated curve is plotted in green. As long as the post development curve lies below the pre-development curve (mostly[5]), the project meets the peak flow hydromodification requirements.

Pass/Fail comparison of the curves

The next two sets of data are the point by point comparison of the post-development curve(s) and the pre-development curve. The Pass/Fail table is helpful in determining compliance since the plotted lines can be difficult to see at the scales suitable for use in a report. Each point on the post- development curve has a corresponding "X" value (Recurrence Interval), and "Y" value (Peak Flow). For each point on the post development curve, the "X" value is used to interpolate the corresponding peak flow value from the pre-development curve. Then the Post-development peak flow value is compared to the pre-development peak flow value. Based on the relative values of each point, pass/fail criteria are determined point by point.

For each set of data, the upper right hand header value shows the name of the file being displayed (ex. peakFlowPassFailMitigated.TXT). The first line of the file also shows this value. The next line shows the time stamp of the file that is being analyzed. The time stamps of all of the report files should be within a minute or two of each other, otherwise there may have been tampering with the files. Each report run creates and prints all of the files and reports at one time so all the time stamps should be very close. It should be noted that the SWMM.out files will not have related time stamps since each file is developed independently.

[4] Pg 169-170 STORM WATER MANAGEMENT MODEL APPLICATIONS MANUAL, EPA/600/R-09/000 July 2009

[5] See hydromodification limits for exceedance of pre-development values

The first column is the zero based number of the point. The next two columns show the post development "X" and "Y" values. The next column shows the value interpolated between the two bounding points on the pre-development curve. The next two columns show the true or false values of the comparison of the two "Y" values. The last column shows the resultant pass or fail status of the point. There are three ways a point can pass. They are:

1. Point is outside of the geomorphologically significant range $Q_{10} - Q_{lf}$
2. Q_{post} being less than Q_{pre}
3. Q_{post} being less than 110% of the value of Q_{pre}

There are three ways that a point can fail. They are:

1. Q_{post} being greater than 110% of Q_{pre} if the point is between Q_{lf} and Q_{10}
2. If more than 10% of the points are between 100% and 110% of Q_{pre} for the points between Q_5 and Q_{10}
3. If the frequency interval for points > 100% of Q_{pre} is greater than 1 year for the points between Q_5 and Q_{10}

A quick scan down the last column will quickly tell if there are any points that fail.

The Peak Flow Statistics Calculations

There are two sets of data for the Peak Flow Statistics calculations (Pre-Development and Mitigated). As was previously discussed, each storm listed was determined by reading the flow values directly from the binary output file from the SWMM program. The storms were then sorted in descending order of peak flow values. Then each storm was assigned a unique rank, then the Frequency and Return Period were calculated using Weibull formulas. Every discharge value for the entire rainfall record is listed in each of these lists. It should be noted that the derivation of these peak flow statistics values use full precision (i.e. no rounding off) of the SWMM output values. Since the precision of the calculations may not be the same as the SWMM program uses, and also the assignment of rank to values of equal peak flow value may differ slightly from the way SWMM calculates the tables, minor variances in the data values and/or the order of storms can be expected.

Finally, as was previously stated, the values of the Return Period were plotted vs. the peak flow values to develop the peak flow frequency curves.

Plan Check Suggestions

As it is the responsibility of the reviewing agency, any and all methods should be considered to verify that the SWMM analysis adequately models the site as far as hydrologic discharge is concerned, and that the data sets presented are valid results from consistent calculations, and that any and all results can be duplicated by manual methods and achieve the same results. In light of these goals, the plan checker is invited to consider the following tasks as part of the plan check process.

Verify A Few Random Storm Statistics

For each of the Pre and Mitigated peak flow statistics tables, a few randomly selected storms should be checked against the values taken directly from the SWMM file. This can be done by opening the corresponding SWMM file, selecting the outfall node, selecting Report>Table>By Object, Setting the time format to Date/Time, selecting the appropriate node value, and clicking the OK button to generate a table of the date/time/Total Inflow values. Now scroll down the list to the start date and time of the randomly selected storm. Verify that the start date, end date, and the highest flow value between the start and end date correspond to the values shown in the statistics table. Do this for a few storm to verify that the data corresponds to the SWMM output file. Verify by hand a few of the frequency and return period values.

Compare Plotted Curves to Table Data

Randomly check a few of the plotted points against the values found in the Peak Flow Frequency Tables.

Verify by Observation that the values of Q10, Q2 and Qlf are reasonable.

For each value shown on the reports, verify that the value shown for say Q10 is in between the next higher return period and the next lower period. Also verify that the correct values for each of these return periods are plotted correctly on the peak flow frequency graph.

Manually Verify That the Pass/Fail Table Is Correctly Calculated

Select at random several points on each of the pass/fail tables to verify that the values for post X/Y and interpolated Y look reasonable. Also check that the various test results are shown accurately in the chart and also the final pass/fail result looks accurate.

VI. SUMMARY AND CONCLUSION

Hydromodification calculations were performed utilizing continuous simulation to size storm water control facilities. SWMM (Storm Water Management Model) version 5.2 distributed by USEPA was used to generate computed peak flow recurrence and flow duration series statistics.

There are several tributary areas planned as commercial use treated by 3 biofiltration BMPS on Bradley Avenue Convalescent labeled as BMP-# (Best Management Practices) with a total tributary area of approximately 3.326 acres. The areas were grouped based on its outfall and were analyzed for pre-development and mitigated post-development conditions.

The analyzed SWMM runs attached show that the proposed bio-filtration facilities provided with variety of orifice flow control at the base of the gravel storage configured as shown in Post-Development Hydromodification Management Exhibit for Bradley Avenue Convalescent Home and Figure2 is in compliance with the HMP and BMP Manual.

Bradley Avenue Convalescent Home

On POC-1, The flow duration curve on the following page shows the existing condition 19.7 hours/year (0.225%×365days×24 hour/day = 19.7 hours/year).

With the proposed square footage of LID areas, orifices acting as the low flow restrictors as shown in Post-Development Hydromodification Management Exhibit for Bradley Avenue Convalescent Home and Figure 2 the duration of the flow is 20.2 hours/year (0.231%×365days×24 hour/day =20.2 hours/year). This flow duration is lower than the 110% of the existing condition. Therefore, this study has demonstrated that the proposed optimized bio-filtration basin is sufficient to meet the current HMP and BMP criteria.

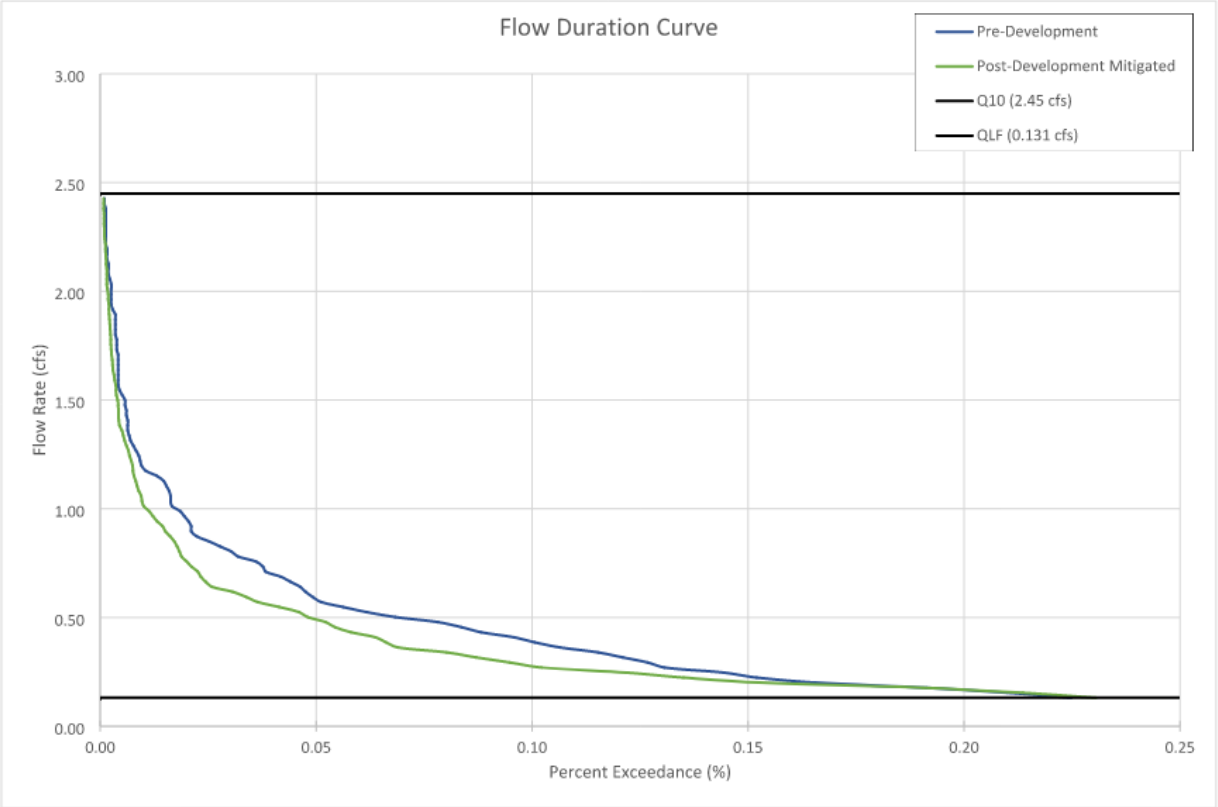


Figure 7 – Flow Duration Curves for POC-1

STATISTICS ANALYSIS OF THE SWMM FILES FOR:

DISCHARGE NODE: POC-1

ANALYSIS DE TAILS

Stream Susceptibility to Channel Erosion: High
Low Flow Threshold = (0.1)Q2 = (0.1)1.310 = Qlf = 0.1310 (cfs)
Flow Control Upper Limit = Q10 = 2.450 (cfs)
Assumed time between storms (hours): 24

PRE -DEVELOPMEN T SWMM FILE

SWMM file name: K:\ORA_LDEV\194564001- Bradley Terraces\Reports & Calculations\WQMP\Calculations\EPA SWMM\Pre-Development\20073BradleyPRE.out
SWMM file time stamp: 7/30/2023 7:46 PM
Selected Node to Analyze: POC-1

POST-DEVELOPMENT MITIGATED SWMM FILE

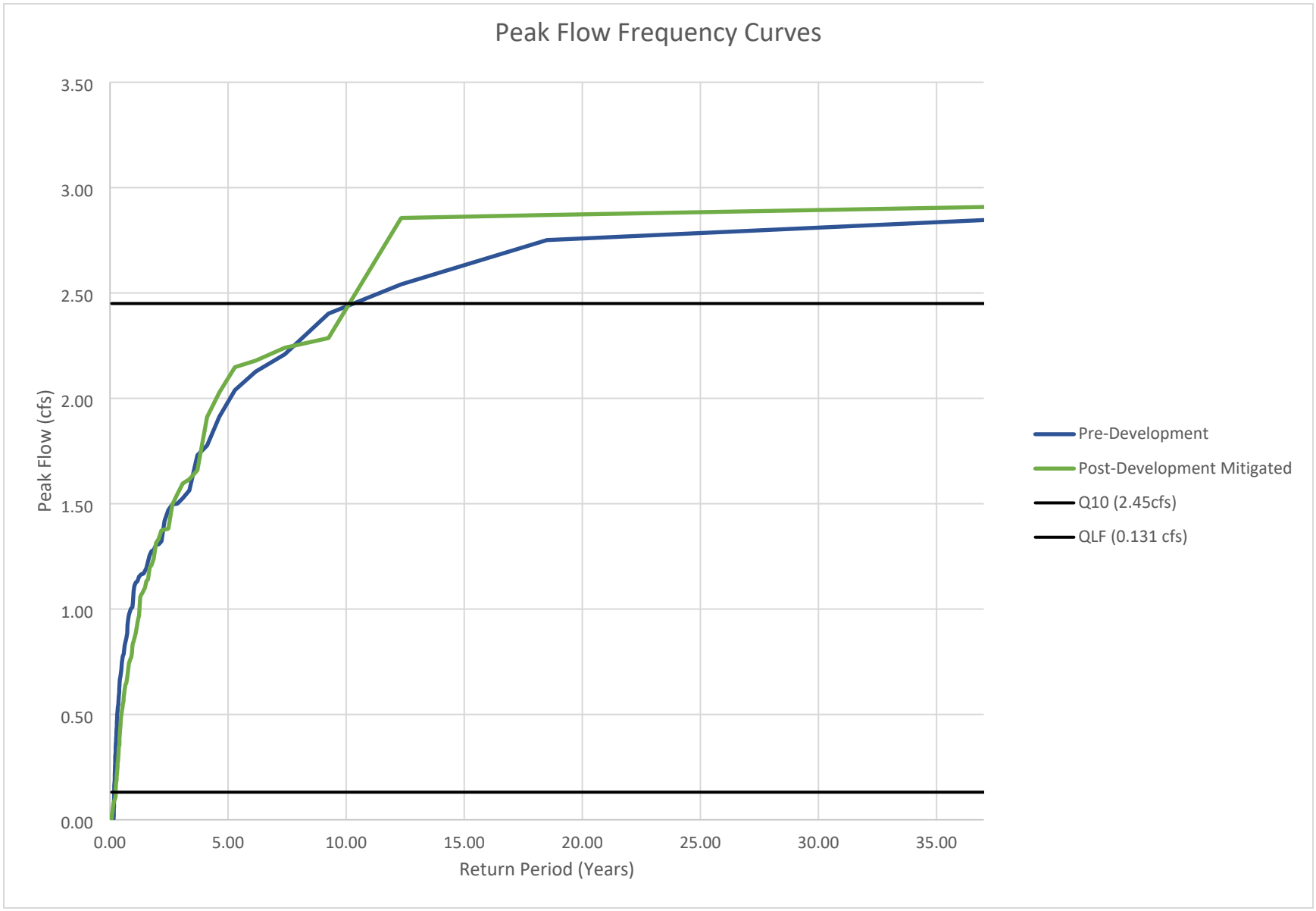
SWMM file name: K:\ORA_LDEV\194564001- Bradley Terraces\Reports & Calculations\WQMP\Calculations\EPA SWMM\Post-Development\20073BradleyPost-6.out
SWMM file time stamp: 7/57/2023 7:57 PM
Selected Node to Analyze: POC-1

MITIGATED CONDITION S RESULTS

For the Mitigated Conditions:
Peak Flow Conditions PASS
Flow Duration Conditions PASS

The Mitigated Conditions peak flow frequency curve is composed of 551 points. Of the points, 3 point(s) are above the flow control upper limit (Q10 = 2.45 (cfs)), 331 point(s) are below the low flow threshold value (Qlf = 0.131 (cfs)). Of the points within the flow control range (Qlf to Q10), 201 point(s) have a lower peak flow rate than pre-development conditions, and 16 point(s) have a peak flow that exceeds the pre-development by less than 10%. These points all pass. There are no points that failed, therefore the peak flow requirements have been met.

The Mitigated Conditions flow duration curve is composed of 100 flow bins (points). Each point represents the number of hours where the discharge was equal to or greater than the discharge value, but less than the next greater discharge value. Within the flow control range, comparing the post-development flow duration curve to the pre-development flow duration curve, 2 post-development curve point(s) have a flow duration that exceeds the pre-development by less than 10%, and 98 point have a lower flow duration than pre-development conditions. These points all pass. There are no points that failed, therefore the flow duration requirements have been met.


Peak Flow Frequency Curves
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
Peak Flow (cfs)
0.00
5.00
10.00
15.00
20.00
25.00
30.00
35.00
Return Period (Years)
Pre-Development
Post-Development Mitigated
Q10 (2.45cfs)
QLF (0.131 cfs)

Compare Post-Development Curve to Pre-Development Curve

Flow Control Upper Limit (cfs)	2.45
Flow Control Lower Limit (cfs)	0.131

Pass/Fail Summary Table	
Pass - Qpost Above Q10	3
Pass - Qpost <= Qpre	201
Pass - Qpost <= 110% Qpre	16
Pass - Qpost Below QLF (0.131 cfs)	331
Total	551

Post PT #	Return Period (Yr)	Post-Development Q (cfs)	Pre-Development Q (cfs)	Qpost <= Qpre	Qpost <= 110% Qpre	Pass/Fail
1	37.00	2.91	2.85	FALSE	TRUE	Pass - Qpost Above Q10
2	18.50	2.87	2.75	FALSE	TRUE	Pass - Qpost Above Q10
3	12.33	2.86	2.54	FALSE	FALSE	Pass - Qpost Above Q10
4	9.25	2.29	2.40	TRUE	TRUE	Pass - Qpost <= Qpre
5	7.40	2.24	2.21	FALSE	TRUE	Pass - Qpost <= 110% Qpre
6	6.17	2.18	2.13	FALSE	TRUE	Pass - Qpost <= 110% Qpre
7	5.29	2.15	2.04	FALSE	TRUE	Pass - Qpost <= 110% Qpre
8	4.63	2.03	1.91	FALSE	TRUE	Pass - Qpost <= 110% Qpre
9	4.11	1.91	1.78	FALSE	TRUE	Pass - Qpost <= 110% Qpre
10	3.70	1.66	1.73	TRUE	TRUE	Pass - Qpost <= Qpre
11	3.36	1.62	1.56	FALSE	TRUE	Pass - Qpost <= 110% Qpre
12	3.08	1.60	1.53	FALSE	TRUE	Pass - Qpost <= 110% Qpre
13	2.85	1.55	1.50	FALSE	TRUE	Pass - Qpost <= 110% Qpre
14	2.64	1.50	1.50	TRUE	TRUE	Pass - Qpost <= Qpre
15	2.47	1.38	1.47	TRUE	TRUE	Pass - Qpost <= Qpre
16	2.31	1.38	1.42	TRUE	TRUE	Pass - Qpost <= Qpre
17	2.18	1.37	1.32	FALSE	TRUE	Pass - Qpost <= 110% Qpre
18	2.06	1.33	1.31	FALSE	TRUE	Pass - Qpost <= 110% Qpre
19	1.95	1.31	1.31	FALSE	TRUE	Pass - Qpost <= 110% Qpre
20	1.85	1.24	1.28	TRUE	TRUE	Pass - Qpost <= Qpre
21	1.76	1.21	1.28	TRUE	TRUE	Pass - Qpost <= Qpre
22	1.68	1.20	1.26	TRUE	TRUE	Pass - Qpost <= Qpre
23	1.61	1.14	1.23	TRUE	TRUE	Pass - Qpost <= Qpre
24	1.54	1.13	1.19	TRUE	TRUE	Pass - Qpost <= Qpre
25	1.48	1.10	1.19	TRUE	TRUE	Pass - Qpost <= Qpre
26	1.42	1.09	1.17	TRUE	TRUE	Pass - Qpost <= Qpre
27	1.37	1.08	1.17	TRUE	TRUE	Pass - Qpost <= Qpre
28	1.32	1.07	1.17	TRUE	TRUE	Pass - Qpost <= Qpre
29	1.28	1.06	1.16	TRUE	TRUE	Pass - Qpost <= Qpre
30	1.23	0.97	1.15	TRUE	TRUE	Pass - Qpost <= Qpre
31	1.19	0.95	1.15	TRUE	TRUE	Pass - Qpost <= Qpre
32	1.16	0.95	1.13	TRUE	TRUE	Pass - Qpost <= Qpre
33	1.12	0.95	1.13	TRUE	TRUE	Pass - Qpost <= Qpre
34	1.09	0.89	1.13	TRUE	TRUE	Pass - Qpost <= Qpre
35	1.06	0.88	1.12	TRUE	TRUE	Pass - Qpost <= Qpre
36	1.03	0.86	1.11	TRUE	TRUE	Pass - Qpost <= Qpre

37	1.00	0.85	1.09	TRUE	TRUE	Pass - Qpost <= Qpre
38	0.97	0.84	1.03	TRUE	TRUE	Pass - Qpost <= Qpre
39	0.95	0.83	1.01	TRUE	TRUE	Pass - Qpost <= Qpre
40	0.93	0.79	1.01	TRUE	TRUE	Pass - Qpost <= Qpre
41	0.90	0.77	1.00	TRUE	TRUE	Pass - Qpost <= Qpre
42	0.88	0.77	1.00	TRUE	TRUE	Pass - Qpost <= Qpre
43	0.86	0.76	1.00	TRUE	TRUE	Pass - Qpost <= Qpre
44	0.84	0.76	0.99	TRUE	TRUE	Pass - Qpost <= Qpre
45	0.82	0.76	0.98	TRUE	TRUE	Pass - Qpost <= Qpre
46	0.80	0.74	0.97	TRUE	TRUE	Pass - Qpost <= Qpre
47	0.79	0.74	0.97	TRUE	TRUE	Pass - Qpost <= Qpre
48	0.77	0.74	0.95	TRUE	TRUE	Pass - Qpost <= Qpre
49	0.76	0.74	0.94	TRUE	TRUE	Pass - Qpost <= Qpre
50	0.74	0.74	0.92	TRUE	TRUE	Pass - Qpost <= Qpre
51	0.73	0.68	0.89	TRUE	TRUE	Pass - Qpost <= Qpre
52	0.71	0.68	0.87	TRUE	TRUE	Pass - Qpost <= Qpre
53	0.70	0.68	0.87	TRUE	TRUE	Pass - Qpost <= Qpre
54	0.69	0.65	0.86	TRUE	TRUE	Pass - Qpost <= Qpre
55	0.67	0.65	0.86	TRUE	TRUE	Pass - Qpost <= Qpre
56	0.66	0.64	0.85	TRUE	TRUE	Pass - Qpost <= Qpre
57	0.65	0.64	0.84	TRUE	TRUE	Pass - Qpost <= Qpre
58	0.64	0.63	0.84	TRUE	TRUE	Pass - Qpost <= Qpre
59	0.63	0.62	0.84	TRUE	TRUE	Pass - Qpost <= Qpre
60	0.62	0.62	0.83	TRUE	TRUE	Pass - Qpost <= Qpre
61	0.61	0.61	0.82	TRUE	TRUE	Pass - Qpost <= Qpre
62	0.60	0.60	0.81	TRUE	TRUE	Pass - Qpost <= Qpre
63	0.59	0.60	0.80	TRUE	TRUE	Pass - Qpost <= Qpre
64	0.58	0.58	0.79	TRUE	TRUE	Pass - Qpost <= Qpre
65	0.57	0.56	0.79	TRUE	TRUE	Pass - Qpost <= Qpre
66	0.56	0.56	0.78	TRUE	TRUE	Pass - Qpost <= Qpre
67	0.55	0.56	0.78	TRUE	TRUE	Pass - Qpost <= Qpre
68	0.54	0.55	0.78	TRUE	TRUE	Pass - Qpost <= Qpre
69	0.54	0.54	0.78	TRUE	TRUE	Pass - Qpost <= Qpre
70	0.53	0.53	0.77	TRUE	TRUE	Pass - Qpost <= Qpre
71	0.52	0.53	0.76	TRUE	TRUE	Pass - Qpost <= Qpre
72	0.51	0.52	0.76	TRUE	TRUE	Pass - Qpost <= Qpre
73	0.51	0.51	0.76	TRUE	TRUE	Pass - Qpost <= Qpre
74	0.50	0.51	0.74	TRUE	TRUE	Pass - Qpost <= Qpre
75	0.49	0.51	0.74	TRUE	TRUE	Pass - Qpost <= Qpre
76	0.49	0.51	0.74	TRUE	TRUE	Pass - Qpost <= Qpre
77	0.48	0.50	0.71	TRUE	TRUE	Pass - Qpost <= Qpre
78	0.47	0.49	0.71	TRUE	TRUE	Pass - Qpost <= Qpre
79	0.47	0.49	0.71	TRUE	TRUE	Pass - Qpost <= Qpre
80	0.46	0.48	0.70	TRUE	TRUE	Pass - Qpost <= Qpre
81	0.46	0.47	0.70	TRUE	TRUE	Pass - Qpost <= Qpre
82	0.45	0.47	0.69	TRUE	TRUE	Pass - Qpost <= Qpre
83	0.45	0.46	0.69	TRUE	TRUE	Pass - Qpost <= Qpre
84	0.44	0.44	0.68	TRUE	TRUE	Pass - Qpost <= Qpre

85	0.44	0.43	0.68	TRUE	TRUE	Pass - Qpost <= Qpre
86	0.43	0.43	0.67	TRUE	TRUE	Pass - Qpost <= Qpre
87	0.43	0.43	0.67	TRUE	TRUE	Pass - Qpost <= Qpre
88	0.42	0.42	0.67	TRUE	TRUE	Pass - Qpost <= Qpre
89	0.42	0.41	0.67	TRUE	TRUE	Pass - Qpost <= Qpre
90	0.41	0.41	0.66	TRUE	TRUE	Pass - Qpost <= Qpre
91	0.41	0.40	0.66	TRUE	TRUE	Pass - Qpost <= Qpre
92	0.40	0.39	0.64	TRUE	TRUE	Pass - Qpost <= Qpre
93	0.40	0.36	0.64	TRUE	TRUE	Pass - Qpost <= Qpre
94	0.39	0.35	0.62	TRUE	TRUE	Pass - Qpost <= Qpre
95	0.39	0.35	0.62	TRUE	TRUE	Pass - Qpost <= Qpre
96	0.39	0.35	0.60	TRUE	TRUE	Pass - Qpost <= Qpre
97	0.38	0.35	0.60	TRUE	TRUE	Pass - Qpost <= Qpre
98	0.38	0.35	0.60	TRUE	TRUE	Pass - Qpost <= Qpre
99	0.37	0.35	0.59	TRUE	TRUE	Pass - Qpost <= Qpre
100	0.37	0.34	0.59	TRUE	TRUE	Pass - Qpost <= Qpre
101	0.37	0.34	0.58	TRUE	TRUE	Pass - Qpost <= Qpre
102	0.36	0.34	0.57	TRUE	TRUE	Pass - Qpost <= Qpre
103	0.36	0.31	0.57	TRUE	TRUE	Pass - Qpost <= Qpre
104	0.36	0.31	0.56	TRUE	TRUE	Pass - Qpost <= Qpre
105	0.35	0.31	0.56	TRUE	TRUE	Pass - Qpost <= Qpre
106	0.35	0.30	0.56	TRUE	TRUE	Pass - Qpost <= Qpre
107	0.35	0.30	0.55	TRUE	TRUE	Pass - Qpost <= Qpre
108	0.34	0.30	0.54	TRUE	TRUE	Pass - Qpost <= Qpre
109	0.34	0.28	0.54	TRUE	TRUE	Pass - Qpost <= Qpre
110	0.34	0.28	0.54	TRUE	TRUE	Pass - Qpost <= Qpre
111	0.33	0.28	0.53	TRUE	TRUE	Pass - Qpost <= Qpre
112	0.33	0.27	0.53	TRUE	TRUE	Pass - Qpost <= Qpre
113	0.33	0.27	0.53	TRUE	TRUE	Pass - Qpost <= Qpre
114	0.32	0.27	0.52	TRUE	TRUE	Pass - Qpost <= Qpre
115	0.32	0.27	0.52	TRUE	TRUE	Pass - Qpost <= Qpre
116	0.32	0.26	0.52	TRUE	TRUE	Pass - Qpost <= Qpre
117	0.32	0.25	0.51	TRUE	TRUE	Pass - Qpost <= Qpre
118	0.31	0.25	0.51	TRUE	TRUE	Pass - Qpost <= Qpre
119	0.31	0.24	0.51	TRUE	TRUE	Pass - Qpost <= Qpre
120	0.31	0.23	0.51	TRUE	TRUE	Pass - Qpost <= Qpre
121	0.31	0.23	0.51	TRUE	TRUE	Pass - Qpost <= Qpre
122	0.3	0.23	0.49	TRUE	TRUE	Pass - Qpost <= Qpre
123	0.3	0.23	0.49	TRUE	TRUE	Pass - Qpost <= Qpre
124	0.3	0.22	0.48	TRUE	TRUE	Pass - Qpost <= Qpre
125	0.3	0.22	0.48	TRUE	TRUE	Pass - Qpost <= Qpre
126	0.29	0.21	0.47	TRUE	TRUE	Pass - Qpost <= Qpre
127	0.29	0.21	0.47	TRUE	TRUE	Pass - Qpost <= Qpre
128	0.29	0.21	0.47	TRUE	TRUE	Pass - Qpost <= Qpre
129	0.29	0.21	0.45	TRUE	TRUE	Pass - Qpost <= Qpre
130	0.28	0.20	0.43	TRUE	TRUE	Pass - Qpost <= Qpre
131	0.28	0.20	0.43	TRUE	TRUE	Pass - Qpost <= Qpre
132	0.28	0.20	0.43	TRUE	TRUE	Pass - Qpost <= Qpre

133	0.28	0.20	0.43	TRUE	TRUE	Pass - Qpost <= Qpre
134	0.28	0.19	0.43	TRUE	TRUE	Pass - Qpost <= Qpre
135	0.27	0.19	0.41	TRUE	TRUE	Pass - Qpost <= Qpre
136	0.27	0.19	0.41	TRUE	TRUE	Pass - Qpost <= Qpre
137	0.27	0.19	0.41	TRUE	TRUE	Pass - Qpost <= Qpre
138	0.27	0.18	0.41	TRUE	TRUE	Pass - Qpost <= Qpre
139	0.27	0.18	0.40	TRUE	TRUE	Pass - Qpost <= Qpre
140	0.26	0.18	0.39	TRUE	TRUE	Pass - Qpost <= Qpre
141	0.26	0.18	0.39	TRUE	TRUE	Pass - Qpost <= Qpre
142	0.26	0.18	0.39	TRUE	TRUE	Pass - Qpost <= Qpre
143	0.26	0.18	0.38	TRUE	TRUE	Pass - Qpost <= Qpre
144	0.26	0.18	0.38	TRUE	TRUE	Pass - Qpost <= Qpre
145	0.26	0.18	0.38	TRUE	TRUE	Pass - Qpost <= Qpre
146	0.25	0.17	0.37	TRUE	TRUE	Pass - Qpost <= Qpre
147	0.25	0.17	0.37	TRUE	TRUE	Pass - Qpost <= Qpre
148	0.25	0.16	0.37	TRUE	TRUE	Pass - Qpost <= Qpre
149	0.25	0.16	0.37	TRUE	TRUE	Pass - Qpost <= Qpre
150	0.25	0.16	0.36	TRUE	TRUE	Pass - Qpost <= Qpre
151	0.25	0.16	0.36	TRUE	TRUE	Pass - Qpost <= Qpre
152	0.24	0.15	0.36	TRUE	TRUE	Pass - Qpost <= Qpre
153	0.24	0.13	0.36	TRUE	TRUE	Pass - Qpost <= Qpre
154	0.24	0.13	0.35	TRUE	TRUE	Pass - Qpost <= Qpre
155	0.24	0.11	0.35	TRUE	TRUE	Pass - Qpost <= Qpre
156	0.24	0.11	0.34	TRUE	TRUE	Pass - Qpost <= Qpre
157	0.24	0.11	0.32	TRUE	TRUE	Pass - Qpost <= Qpre
158	0.23	0.11	0.32	TRUE	TRUE	Pass - Qpost <= Qpre
159	0.23	0.10	0.32	TRUE	TRUE	Pass - Qpost <= Qpre
160	0.23	0.10	0.32	TRUE	TRUE	Pass - Qpost <= Qpre
161	0.23	0.10	0.32	TRUE	TRUE	Pass - Qpost <= Qpre
162	0.23	0.10	0.31	TRUE	TRUE	Pass - Qpost <= Qpre
163	0.23	0.10	0.31	TRUE	TRUE	Pass - Qpost <= Qpre
164	0.23	0.10	0.31	TRUE	TRUE	Pass - Qpost <= Qpre
165	0.22	0.10	0.30	TRUE	TRUE	Pass - Qpost <= Qpre
166	0.22	0.10	0.30	TRUE	TRUE	Pass - Qpost <= Qpre
167	0.22	0.10	0.30	TRUE	TRUE	Pass - Qpost <= Qpre
168	0.22	0.10	0.29	TRUE	TRUE	Pass - Qpost <= Qpre
169	0.22	0.10	0.28	TRUE	TRUE	Pass - Qpost <= Qpre
170	0.22	0.10	0.27	TRUE	TRUE	Pass - Qpost <= Qpre
171	0.22	0.10	0.27	TRUE	TRUE	Pass - Qpost <= Qpre
172	0.22	0.10	0.27	TRUE	TRUE	Pass - Qpost <= Qpre
173	0.21	0.10	0.26	TRUE	TRUE	Pass - Qpost <= Qpre
174	0.21	0.10	0.26	TRUE	TRUE	Pass - Qpost <= Qpre
175	0.21	0.10	0.26	TRUE	TRUE	Pass - Qpost <= Qpre
176	0.21	0.10	0.26	TRUE	TRUE	Pass - Qpost <= Qpre
177	0.21	0.10	0.25	TRUE	TRUE	Pass - Qpost <= Qpre
178	0.21	0.10	0.24	TRUE	TRUE	Pass - Qpost <= Qpre
179	0.21	0.10	0.24	TRUE	TRUE	Pass - Qpost <= Qpre
180	0.21	0.10	0.24	TRUE	TRUE	Pass - Qpost <= Qpre

181	0.2	0.10	0.21	TRUE	TRUE	Pass - Qpost <= Qpre
182	0.2	0.10	0.21	TRUE	TRUE	Pass - Qpost <= Qpre
183	0.2	0.10	0.21	TRUE	TRUE	Pass - Qpost <= Qpre
184	0.2	0.10	0.21	TRUE	TRUE	Pass - Qpost <= Qpre
185	0.2	0.10	0.20	TRUE	TRUE	Pass - Qpost <= Qpre
186	0.2	0.10	0.20	TRUE	TRUE	Pass - Qpost <= Qpre
187	0.2	0.10	0.20	TRUE	TRUE	Pass - Qpost <= Qpre
188	0.2	0.10	0.19	TRUE	TRUE	Pass - Qpost <= Qpre
189	0.2	0.10	0.19	TRUE	TRUE	Pass - Qpost <= Qpre
190	0.19	0.09	0.18	TRUE	TRUE	Pass - Qpost <= Qpre
191	0.19	0.09	0.18	TRUE	TRUE	Pass - Qpost <= Qpre
192	0.19	0.09	0.18	TRUE	TRUE	Pass - Qpost <= Qpre
193	0.19	0.09	0.18	TRUE	TRUE	Pass - Qpost <= Qpre
194	0.19	0.09	0.18	TRUE	TRUE	Pass - Qpost <= Qpre
195	0.19	0.09	0.18	TRUE	TRUE	Pass - Qpost <= Qpre
196	0.19	0.09	0.18	TRUE	TRUE	Pass - Qpost <= Qpre
197	0.19	0.09	0.18	TRUE	TRUE	Pass - Qpost <= Qpre
198	0.19	0.09	0.17	TRUE	TRUE	Pass - Qpost <= Qpre
199	0.19	0.09	0.17	TRUE	TRUE	Pass - Qpost <= Qpre
200	0.19	0.09	0.17	TRUE	TRUE	Pass - Qpost <= Qpre
201	0.18	0.09	0.16	TRUE	TRUE	Pass - Qpost <= Qpre
202	0.18	0.09	0.16	TRUE	TRUE	Pass - Qpost <= Qpre
203	0.18	0.09	0.16	TRUE	TRUE	Pass - Qpost <= Qpre
204	0.18	0.09	0.15	TRUE	TRUE	Pass - Qpost <= Qpre
205	0.18	0.09	0.15	TRUE	TRUE	Pass - Qpost <= Qpre
206	0.18	0.09	0.15	TRUE	TRUE	Pass - Qpost <= Qpre
207	0.18	0.09	0.14	TRUE	TRUE	Pass - Qpost <= Qpre
208	0.18	0.09	0.13	TRUE	TRUE	Pass - Qpost <= Qpre
209	0.18	0.09	0.12	TRUE	TRUE	Pass - Qpost <= Qpre
210	0.18	0.09	0.12	TRUE	TRUE	Pass - Qpost <= Qpre
211	0.18	0.09	0.12	TRUE	TRUE	Pass - Qpost <= Qpre
212	0.17	0.09	0.09	TRUE	TRUE	Pass - Qpost <= Qpre
213	0.17	0.09	0.09	TRUE	TRUE	Pass - Qpost <= Qpre
214	0.17	0.09	0.09	TRUE	TRUE	Pass - Qpost <= Qpre
215	0.17	0.09	0.09	TRUE	TRUE	Pass - Qpost <= Qpre
216	0.17	0.09	0.09	FALSE	TRUE	Pass - Qpost <= 110% Qpre
217	0.17	0.09	0.08	FALSE	TRUE	Pass - Qpost <= 110% Qpre
218	0.17	0.09	0.08	FALSE	TRUE	Pass - Qpost <= 110% Qpre
219	0.17	0.09	0.08	FALSE	TRUE	Pass - Qpost <= 110% Qpre
220	0.17	0.09	0.08	FALSE	TRUE	Pass - Qpost <= 110% Qpre
221	0.17	0.09	0.08	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
222	0.17	0.09	0.08	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
223	0.17	0.09	0.07	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
224	0.17	0.09	0.06	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
225	0.16	0.09	0.05	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
226	0.16	0.08	0.05	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
227	0.16	0.08	0.05	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
228	0.16	0.08	0.05	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)

229	0.16	0.08	0.04	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
230	0.16	0.08	0.04	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
231	0.16	0.08	0.04	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
232	0.16	0.08	0.04	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
233	0.16	0.08	0.04	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
234	0.16	0.08	0.02	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
235	0.16	0.08	0.02	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
236	0.16	0.08	0.02	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
237	0.16	0.08	0.02	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
238	0.16	0.08	0.02	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
239	0.15	0.08	0.01	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
240	0.15	0.08	0.01	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
241	0.15	0.08	0.01	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
242	0.15	0.08	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
243	0.15	0.08	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
244	0.15	0.08	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
245	0.15	0.08	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
246	0.15	0.08	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
247	0.15	0.08	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
248	0.15	0.08	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
249	0.15	0.08	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
250	0.15	0.08	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
251	0.15	0.08	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
252	0.15	0.08	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
253	0.15	0.08	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
254	0.15	0.08	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
255	0.15	0.08	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
256	0.14	0.08	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
257	0.14	0.08	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
258	0.14	0.08	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
259	0.14	0.08	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
260	0.14	0.08	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
261	0.14	0.08	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
262	0.14	0.08	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
263	0.14	0.08	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
264	0.14	0.07	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
265	0.14	0.07	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
266	0.14	0.07	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
267	0.14	0.07	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
268	0.14	0.07	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
269	0.14	0.07	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
270	0.14	0.07	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
271	0.14	0.07	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
272	0.14	0.07	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
273	0.14	0.07	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
274	0.14	0.07	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
275	0.13	0.07	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
276	0.13	0.07	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)

277	0.13	0.07	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
278	0.13	0.07	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
279	0.13	0.07	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
280	0.13	0.07	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
281	0.13	0.07	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
282	0.13	0.07	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
283	0.13	0.07	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
284	0.13	0.07	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
285	0.13	0.07	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
286	0.13	0.07	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
287	0.13	0.06	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
288	0.13	0.06	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
289	0.13	0.06	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
290	0.13	0.06	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
291	0.13	0.06	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
292	0.13	0.06	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
293	0.13	0.06	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
294	0.13	0.06	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
295	0.13	0.06	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
296	0.13	0.06	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
297	0.12	0.06	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
298	0.12	0.06	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
299	0.12	0.06	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
300	0.12	0.06	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
301	0.12	0.06	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
302	0.12	0.06	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
303	0.12	0.06	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
304	0.12	0.06	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
305	0.12	0.06	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
306	0.12	0.06	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
307	0.12	0.06	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
308	0.12	0.06	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
309	0.12	0.06	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
310	0.12	0.06	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
311	0.12	0.06	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
312	0.12	0.06	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
313	0.12	0.06	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
314	0.12	0.06	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
315	0.12	0.06	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
316	0.12	0.06	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
317	0.12	0.06	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
318	0.12	0.06	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
319	0.12	0.05	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
320	0.12	0.05	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
321	0.12	0.05	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
322	0.11	0.05	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
323	0.11	0.05	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
324	0.11	0.05	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)

325	0.11	0.05	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
326	0.11	0.05	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
327	0.11	0.05	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
328	0.11	0.05	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
329	0.11	0.05	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
330	0.11	0.05	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
331	0.11	0.05	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
332	0.11	0.05	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
333	0.11	0.05	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
334	0.11	0.05	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
335	0.11	0.05	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
336	0.11	0.05	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
337	0.11	0.05	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
338	0.11	0.05	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
339	0.11	0.05	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
340	0.11	0.05	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
341	0.11	0.05	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
342	0.11	0.05	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
343	0.11	0.04	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
344	0.11	0.04	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
345	0.11	0.04	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
346	0.11	0.04	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
347	0.11	0.04	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
348	0.11	0.04	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
349	0.11	0.04	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
350	0.11	0.04	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
351	0.11	0.04	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
352	0.11	0.04	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
353	0.1	0.04	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
354	0.1	0.04	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
355	0.1	0.04	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
356	0.1	0.04	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
357	0.1	0.04	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
358	0.1	0.04	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
359	0.1	0.04	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
360	0.1	0.04	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
361	0.1	0.04	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
362	0.1	0.04	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
363	0.1	0.04	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
364	0.1	0.04	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
365	0.1	0.04	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
366	0.1	0.04	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
367	0.1	0.04	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
368	0.1	0.04	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
369	0.1	0.04	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
370	0.1	0.04	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
371	0.1	0.04	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
372	0.1	0.04	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)

373	0.1	0.04	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
374	0.1	0.04	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
375	0.1	0.04	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
376	0.1	0.04	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
377	0.1	0.04	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
378	0.1	0.04	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
379	0.1	0.04	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
380	0.1	0.04	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
381	0.1	0.04	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
382	0.1	0.04	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
383	0.1	0.04	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
384	0.1	0.04	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
385	0.1	0.04	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
386	0.1	0.04	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
387	0.1	0.04	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
388	0.1	0.03	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
389	0.1	0.03	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
390	0.09	0.03	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
391	0.09	0.03	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
392	0.09	0.03	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
393	0.09	0.03	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
394	0.09	0.03	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
395	0.09	0.03	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
396	0.09	0.03	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
397	0.09	0.03	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
398	0.09	0.03	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
399	0.09	0.03	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
400	0.09	0.03	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
401	0.09	0.03	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
402	0.09	0.03	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
403	0.09	0.03	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
404	0.09	0.03	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
405	0.09	0.03	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
406	0.09	0.03	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
407	0.09	0.03	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
408	0.09	0.03	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
409	0.09	0.03	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
410	0.09	0.03	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
411	0.09	0.03	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
412	0.09	0.03	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
413	0.09	0.03	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
414	0.09	0.03	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
415	0.09	0.03	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
416	0.09	0.03	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
417	0.09	0.03	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
418	0.09	0.03	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
419	0.09	0.03	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
420	0.09	0.03	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)

421	0.09	0.03	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
422	0.09	0.03	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
423	0.09	0.03	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
424	0.09	0.03	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
425	0.09	0.03	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
426	0.09	0.03	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
427	0.09	0.03	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
428	0.09	0.03	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
429	0.09	0.03	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
430	0.09	0.03	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
431	0.09	0.03	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
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434	0.09	0.03	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
434	0.09	0.03	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
435	0.09	0.03	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
436	0.08	0.03	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
437	0.08	0.03	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
438	0.08	0.03	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
439	0.08	0.03	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
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441	0.08	0.03	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
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443	0.08	0.03	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
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445	0.08	0.03	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
446	0.08	0.03	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
447	0.08	0.03	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
448	0.08	0.02	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
449	0.08	0.02	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
450	0.08	0.02	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
451	0.08	0.02	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
452	0.08	0.02	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
453	0.08	0.02	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
454	0.08	0.02	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
455	0.08	0.02	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
456	0.08	0.02	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
457	0.08	0.02	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
458	0.08	0.02	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
459	0.08	0.02	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
460	0.08	0.02	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
461	0.08	0.02	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
462	0.08	0.02	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
463	0.08	0.02	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
464	0.08	0.02	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
465	0.08	0.02	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
466	0.08	0.02	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
467	0.08	0.02	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
468	0.08	0.02	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)

469	0.08	0.02	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
470	0.08	0.02	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
471	0.08	0.02	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
472	0.08	0.02	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
473	0.08	0.02	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
474	0.08	0.02	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
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476	0.08	0.02	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
477	0.08	0.02	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
478	0.08	0.02	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
479	0.08	0.02	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
480	0.08	0.02	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
481	0.08	0.02	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
482	0.08	0.02	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
483	0.08	0.02	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
484	0.08	0.02	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
485	0.08	0.02	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
486	0.08	0.02	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
487	0.08	0.02	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
488	0.08	0.02	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
489	0.08	0.01	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
490	0.08	0.01	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
491	0.08	0.01	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
492	0.08	0.01	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
493	0.08	0.01	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
494	0.07	0.01	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
495	0.07	0.01	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
496	0.07	0.01	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
497	0.07	0.01	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
498	0.07	0.01	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
499	0.07	0.01	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
500	0.07	0.01	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
501	0.07	0.01	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
502	0.07	0.01	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
503	0.07	0.01	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
504	0.07	0.01	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
505	0.07	0.01	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
506	0.07	0.01	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
507	0.07	0.01	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
508	0.07	0.01	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
509	0.07	0.01	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
510	0.07	0.01	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
511	0.07	0.01	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
512	0.07	0.01	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
513	0.07	0.01	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
514	0.07	0.01	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
515	0.07	0.01	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
516	0.07	0.01	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)

517	0.07	0.01	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
518	0.07	0.01	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
519	0.07	0.01	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
520	0.07	0.01	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
521	0.07	0.01	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
522	0.07	0.01	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
523	0.07	0.01	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
524	0.07	0.01	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
525	0.07	0.01	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
526	0.07	0.01	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
527	0.07	0.01	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
528	0.07	0.01	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
529	0.07	0.01	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
530	0.07	0.01	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
531	0.07	0.01	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
532	0.07	0.01	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
533	0.07	0.01	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
534	0.07	0.01	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
535	0.07	0.01	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
536	0.07	0.01	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
537	0.07	0.01	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
538	0.07	0.01	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
539	0.07	0.00	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
540	0.07	0.00	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
541	0.07	0.00	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
542	0.07	0.00	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
543	0.07	0.00	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
544	0.07	0.00	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
545	0.07	0.00	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
546	0.07	0.00	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
547	0.07	0.00	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
548	0.07	0.00	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
549	0.07	0.00	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
550	0.07	0.00	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)
551	0.07	0.00	0.00	FALSE	FALSE	Pass - Qpost Below QLF (0.131 cfs)

Peak Flow Frequency Table Values (Pre-Development)

Rank	Start Date	Duration (hr)	Peak (cfs)	Frequency (%)	Return Period (Yr)
1	2/16/1980	108.00	2.85	0.41	37.00
2	10/27/2004	35.00	2.75	0.82	18.50
3	10/22/1976	4.00	2.54	1.23	12.33
4	3/12/1982	2.00	2.40	1.64	9.25
5	2/7/1998	22.00	2.21	2.05	7.40
6	3/1/1983	81.00	2.13	2.46	6.17
7	9/10/1976	5.00	2.04	2.87	5.29
8	2/6/1992	7.00	1.91	3.28	4.63
9	1/28/1980	27.00	1.78	3.69	4.11
10	2/2/1998	13.00	1.73	4.10	3.70
11	3/6/1975	3.00	1.56	4.51	3.36
12	2/27/1991	40.00	1.53	4.92	3.08
13	1/31/1979	25.00	1.50	5.33	2.85
14	2/11/1973	15.00	1.50	5.74	2.64
15	11/20/1983	11.00	1.47	6.15	2.47
16	2/13/1998	10.00	1.42	6.56	2.31
17	2/15/1992	4.00	1.32	6.97	2.18
18	3/24/1983	5.00	1.31	7.38	2.06
19	2/19/2007	10.00	1.31	7.79	1.95
20	8/17/1977	8.00	1.28	8.20	1.85
21	3/6/1992	3.00	1.28	8.61	1.76
22	12/4/1974	5.00	1.26	9.02	1.68
23	1/31/1993	4.00	1.23	9.43	1.61
24	2/22/2004	14.00	1.19	9.84	1.54
25	1/12/1993	40.00	1.19	10.25	1.48
26	2/13/1973	4.00	1.17	10.66	1.42
27	12/9/2004	3.00	1.17	11.07	1.37
28	1/15/1993	83.00	1.17	11.48	1.32
29	2/15/1986	10.00	1.16	11.89	1.28
30	12/28/1977	17.00	1.15	12.30	1.23
31	3/4/1978	24.00	1.15	12.70	1.19
32	1/6/1993	57.00	1.13	13.11	1.16
33	2/14/1995	4.00	1.13	13.52	1.12
34	4/23/1980	3.00	1.13	13.93	1.09
35	2/18/1993	30.00	1.12	14.34	1.06
36	2/10/1982	14.00	1.11	14.75	1.03
37	2/21/2000	5.00	1.09	15.16	1.00
38	2/8/1993	20.00	1.03	15.57	0.97
39	4/18/1995	2.00	1.01	15.98	0.95
40	3/14/1982	5.00	1.01	16.39	0.93
41	1/4/1995	13.00	1.00	16.80	0.90
42	1/9/1980	52.00	1.00	17.21	0.88
43	12/28/2004	35.00	1.00	17.62	0.86
44	1/29/1983	4.00	0.99	18.03	0.84
45	2/16/1998	12.00	0.98	18.44	0.82

46	5/1/1978	2.00	0.97	18.85	0.80
47	10/19/2004	26.00	0.97	19.26	0.79
48	10/28/1974	23.00	0.95	19.67	0.77
49	11/11/1985	8.00	0.94	20.08	0.76
50	2/24/2003	3.00	0.92	20.49	0.74
51	1/14/1978	16.00	0.89	20.90	0.73
52	2/10/1978	5.00	0.87	21.31	0.71
53	3/11/1995	23.00	0.87	21.72	0.70
54	3/2/1992	5.00	0.86	22.13	0.69
55	12/18/1984	41.00	0.86	22.54	0.67
56	3/1/1981	23.00	0.85	22.95	0.66
57	2/8/1976	24.00	0.84	23.36	0.65
58	3/20/1973	5.00	0.84	23.77	0.64
59	11/14/1993	4.00	0.84	24.18	0.63
60	4/13/2003	3.00	0.83	24.59	0.62
61	1/25/1995	20.00	0.82	25.00	0.61
62	2/27/1978	67.00	0.81	25.41	0.60
63	12/4/1987	2.00	0.80	25.82	0.59
64	10/18/2004	2.00	0.79	26.23	0.58
65	3/26/1991	33.00	0.79	26.64	0.57
66	2/27/1983	7.00	0.78	27.05	0.56
67	12/7/1986	3.00	0.78	27.46	0.55
68	2/11/2003	28.00	0.78	27.87	0.54
69	2/12/1978	27.00	0.77	28.28	0.54
70	2/20/2005	66.00	0.77	28.69	0.53
71	3/11/1973	6.00	0.76	29.10	0.52
72	1/11/2001	33.00	0.76	29.51	0.51
73	4/1/1982	6.00	0.75	29.92	0.51
74	1/9/1978	27.00	0.74	30.33	0.50
75	11/11/1978	24.00	0.74	30.74	0.49
76	3/21/1983	2.00	0.74	31.15	0.49
77	11/25/1983	4.00	0.71	31.56	0.48
78	2/9/1981	14.00	0.71	31.97	0.47
79	11/22/1996	2.00	0.70	32.38	0.47
80	12/17/1978	36.00	0.70	32.79	0.46
81	3/6/1980	10.00	0.69	33.20	0.46
82	1/9/2005	18.00	0.69	33.61	0.45
83	2/5/1976	56.00	0.69	34.02	0.45
84	3/13/1996	5.00	0.68	34.43	0.44
85	1/7/2008	5.00	0.68	34.84	0.44
86	2/22/1998	29.00	0.67	35.25	0.43
87	1/27/2008	9.00	0.67	35.66	0.43
88	1/1/1997	29.00	0.67	36.07	0.42
89	3/4/2005	7.00	0.67	36.48	0.42
90	2/14/1980	15.00	0.66	36.89	0.41
91	4/21/1988	7.00	0.66	37.30	0.41
92	3/19/1991	56.00	0.64	37.70	0.40

93	1/16/1979	2.00	0.63	38.11	0.40
94	2/5/1978	7.00	0.62	38.52	0.39
95	12/3/1983	3.00	0.60	38.93	0.39
96	3/5/1995	17.00	0.60	39.34	0.39
97	12/11/1984	13.00	0.60	39.75	0.38
98	5/8/1977	4.00	0.59	40.16	0.38
99	1/17/1990	3.00	0.59	40.57	0.37
100	2/12/1992	12.00	0.58	40.98	0.37
101	1/3/2005	24.00	0.58	41.39	0.37
102	4/15/1976	2.00	0.57	41.80	0.36
103	2/26/2004	2.00	0.56	42.21	0.36
104	3/15/1986	28.00	0.56	42.62	0.36
105	1/8/1998	4.00	0.56	43.03	0.35
106	11/25/1985	21.00	0.55	43.44	0.35
107	4/20/1988	7.00	0.55	43.85	0.35
108	3/11/1978	5.00	0.54	44.26	0.34
109	2/17/1994	4.00	0.54	44.67	0.34
110	1/10/1995	6.00	0.54	45.08	0.34
111	1/4/1987	3.00	0.53	45.49	0.33
112	11/24/1978	14.00	0.53	45.90	0.33
113	1/16/1978	9.00	0.53	46.31	0.33
114	3/10/1975	27.00	0.52	46.72	0.32
115	1/26/1999	12.00	0.52	47.13	0.32
116	4/2/1974	8.00	0.51	47.54	0.32
117	1/7/1974	19.00	0.51	47.95	0.32
118	3/8/1973	6.00	0.51	48.36	0.31
119	2/7/1978	5.00	0.51	48.77	0.31
120	12/29/1976	9.00	0.51	49.18	0.31
121	1/4/1974	17.00	0.50	49.59	0.31
122	3/22/1973	5.00	0.49	50.00	0.30
123	11/4/1987	23.00	0.48	50.41	0.30
124	3/17/1982	38.00	0.48	50.82	0.30
125	3/18/2002	2.00	0.47	51.23	0.30
126	3/19/1981	8.00	0.47	51.64	0.29
127	1/11/2005	8.00	0.47	52.05	0.29
128	3/28/1979	13.00	0.45	52.46	0.29
129	1/19/1973	5.00	0.45	52.87	0.29
130	3/18/1983	3.00	0.43	53.28	0.28
131	1/18/1979	13.00	0.43	53.69	0.28
132	10/11/1987	2.00	0.43	54.10	0.28
133	3/14/1975	2.00	0.43	54.51	0.28
134	11/23/1973	6.00	0.42	54.92	0.28
135	3/28/1973	2.00	0.41	55.33	0.27
136	1/6/1979	7.00	0.41	55.74	0.27
137	1/19/1980	3.00	0.41	56.15	0.27
138	4/7/1978	2.00	0.40	56.56	0.27
139	3/22/2005	3.00	0.40	56.97	0.27

140	12/16/1987	17.00	0.39	57.38	0.26
141	2/28/2007	2.00	0.39	57.79	0.26
142	3/14/2003	26.00	0.38	58.20	0.26
143	3/10/1980	2.00	0.38	58.61	0.26
144	3/24/1994	18.00	0.38	59.02	0.26
145	2/11/1978	5.00	0.37	59.43	0.26
146	1/14/1990	4.00	0.37	59.84	0.25
147	2/8/1994	3.00	0.37	60.25	0.25
148	12/9/2007	2.00	0.37	60.66	0.25
149	1/5/1992	18.00	0.36	61.07	0.25
150	2/8/1983	7.00	0.36	61.48	0.25
151	10/26/1991	5.00	0.36	61.89	0.25
152	3/20/1992	3.00	0.36	62.30	0.24
153	4/7/1999	2.00	0.35	62.70	0.24
154	12/25/1988	4.00	0.35	63.11	0.24
155	3/24/1998	2.00	0.34	63.52	0.24
156	12/7/1992	3.00	0.32	63.93	0.24
157	12/25/2003	2.00	0.32	64.34	0.24
158	2/2/1985	2.00	0.32	64.75	0.23
159	10/20/1979	4.00	0.32	65.16	0.23
160	2/28/2006	3.00	0.32	65.57	0.23
161	3/13/1973	2.00	0.31	65.98	0.23
162	1/27/1983	11.00	0.31	66.39	0.23
163	12/30/1981	4.00	0.31	66.80	0.23
164	11/24/1984	5.00	0.30	67.21	0.23
165	12/16/1984	2.00	0.30	67.62	0.22
166	2/18/1994	3.00	0.30	68.03	0.22
167	1/23/2008	3.00	0.29	68.44	0.22
168	9/3/1976	2.00	0.28	68.85	0.22
169	1/16/1995	2.00	0.27	69.26	0.22
170	4/4/2006	5.00	0.27	69.67	0.22
171	3/5/1981	6.00	0.27	70.08	0.22
172	3/6/1973	13.00	0.27	70.49	0.22
173	5/2/1980	2.00	0.26	70.90	0.21
174	1/12/1995	7.00	0.26	71.31	0.21
175	3/12/2006	3.00	0.26	71.72	0.21
176	2/2/1983	3.00	0.25	72.13	0.21
177	1/26/1997	8.00	0.24	72.54	0.21
178	1/5/1978	22.00	0.24	72.95	0.21
179	2/18/2005	5.00	0.24	73.36	0.21
180	1/28/1982	4.00	0.23	73.77	0.21
181	12/19/2002	3.00	0.21	74.18	0.20
182	4/28/1980	12.00	0.21	74.59	0.20
183	3/27/1998	3.00	0.21	75.00	0.20
184	3/8/1975	3.00	0.20	75.41	0.20
185	3/1/1976	4.00	0.20	75.82	0.20
186	12/5/1998	26.00	0.20	76.23	0.20

187	2/14/2008	3.00	0.19	76.64	0.20
188	3/26/1975	2.00	0.19	77.05	0.20
189	10/30/1996	2.00	0.18	77.46	0.20
190	3/12/1986	4.00	0.18	77.87	0.19
191	3/6/2001	2.00	0.18	78.28	0.19
192	11/1/1974	3.00	0.18	78.69	0.19
193	1/8/1995	4.00	0.18	79.10	0.19
194	1/1/1982	26.00	0.18	79.51	0.19
195	11/29/1985	4.00	0.18	79.92	0.19
196	12/27/1984	9.00	0.18	80.33	0.19
197	3/8/1974	5.00	0.17	80.74	0.19
198	10/31/1987	4.00	0.17	81.15	0.19
199	12/26/1977	10.00	0.17	81.56	0.19
200	1/7/2005	3.00	0.17	81.97	0.19
201	2/6/1973	2.00	0.16	82.38	0.18
202	12/29/1991	3.00	0.16	82.79	0.18
203	4/18/1981	2.00	0.15	83.20	0.18
204	4/12/1999	3.00	0.15	83.61	0.18
205	12/8/1984	3.00	0.15	84.02	0.18
206	4/4/1990	3.00	0.14	84.43	0.18
207	2/3/2008	3.00	0.13	84.84	0.18
208	1/1/1977	3.00	0.12	85.25	0.18
209	3/28/2006	4.00	0.12	85.66	0.18
210	12/5/1997	2.00	0.12	86.07	0.18
211	2/26/2001	27.00	0.11	86.48	0.18
212	1/31/1996	2.00	0.09	86.89	0.17
213	2/3/1975	2.00	0.09	87.30	0.17
214	3/1/1979	4.00	0.09	87.70	0.17
215	1/17/1988	2.00	0.09	88.11	0.17
216	3/25/1989	2.00	0.08	88.52	0.17
217	1/7/1992	2.00	0.08	88.93	0.17
218	4/10/1998	2.00	0.08	89.34	0.17
219	4/26/1994	2.00	0.08	89.75	0.17
220	2/22/2008	3.00	0.08	90.16	0.17
221	3/30/1998	2.00	0.08	90.57	0.17
222	2/24/1993	2.00	0.07	90.98	0.17
223	11/30/2007	4.00	0.06	91.39	0.17
224	9/25/1986	2.00	0.06	91.80	0.17
225	1/21/1982	4.00	0.05	92.21	0.16
226	3/16/1977	2.00	0.05	92.62	0.16
227	3/3/1976	3.00	0.05	93.03	0.16
228	2/10/1992	2.00	0.04	93.44	0.16
229	3/7/1994	4.00	0.04	93.85	0.16
230	2/12/2005	4.00	0.04	94.26	0.16
231	2/22/2007	2.00	0.04	94.67	0.16
232	3/21/2006	2.00	0.04	95.08	0.16
233	1/29/1981	2.00	0.02	95.49	0.16

234	3/22/1975	2.00	0.02	95.90	0.16
235	2/23/1979	2.00	0.02	96.31	0.16
236	4/20/1983	2.00	0.02	96.72	0.16
237	12/11/2004	2.00	0.02	97.13	0.16
238	12/9/1996	2.00	0.01	97.54	0.16
239	3/10/1986	2.00	0.01	97.95	0.15
240	4/14/1998	2.00	0.01	98.36	0.15
241	2/23/2000	2.00	0.00	98.77	0.15
242	1/15/1997	2.00	0.00	99.18	0.15
243	10/30/2000	2.00	0.00	99.59	0.15

Peak Flow Frequency Table Values (Post-Development)

Rank	Start Date	Duration (hr)	Peak (cfs)	Frequency (%)	Return Period (Yr)
1	2/13/1980	233.50	2.91	0.18	37.00
2	10/22/1976	30.80	2.87	0.36	18.50
3	10/27/2004	59.00	2.86	0.54	12.33
4	2/2/1998	168.80	2.29	0.72	9.25
5	3/12/1982	192.80	2.24	0.91	7.40
6	9/10/1976	40.50	2.18	1.09	6.17
7	2/6/1992	38.50	2.15	1.27	5.29
8	2/26/1983	194.80	2.03	1.45	4.63
9	1/28/1980	86.50	1.91	1.63	4.11
10	2/27/1991	71.50	1.66	1.81	3.70
11	1/31/1979	79.00	1.62	1.99	3.36
12	3/6/1975	153.80	1.60	2.17	3.08
13	12/4/1974	34.80	1.55	2.36	2.85
14	8/16/1977	39.80	1.50	2.54	2.64
15	11/20/1983	36.50	1.38	2.72	2.47
16	1/31/1993	27.00	1.38	2.90	2.31
17	2/11/1973	77.80	1.37	3.08	2.18
18	2/13/1998	284.00	1.33	3.26	2.06
19	2/19/2007	43.30	1.31	3.44	1.95
20	2/15/1986	36.80	1.24	3.62	1.85
21	10/26/1974	102.50	1.21	3.80	1.76
22	2/13/1995	51.00	1.20	3.99	1.68
23	1/3/1995	69.30	1.14	4.17	1.61
24	11/11/1985	57.80	1.13	4.35	1.54
25	2/8/1982	88.50	1.10	4.53	1.48
26	2/18/1993	59.80	1.09	4.71	1.42
27	1/5/1993	115.30	1.08	4.89	1.37
28	2/21/2000	83.80	1.07	5.07	1.32
29	12/28/2004	56.50	1.06	5.25	1.28
30	10/17/2004	109.50	0.97	5.43	1.23
31	1/14/1978	90.80	0.95	5.62	1.19
32	2/4/1976	161.30	0.95	5.80	1.16
33	1/7/1980	175.30	0.95	5.98	1.12
34	3/6/1980	37.80	0.89	6.16	1.09
35	2/21/2004	57.80	0.88	6.34	1.06
36	2/12/1992	95.50	0.86	6.52	1.03
37	2/5/1978	227.50	0.85	6.70	1.00
38	11/21/1996	40.80	0.84	6.88	0.97
39	2/28/1981	63.30	0.83	7.07	0.95
40	2/8/1981	49.00	0.79	7.25	0.93
41	2/24/2003	86.30	0.77	7.43	0.90
42	2/18/2005	150.80	0.77	7.61	0.88
43	5/8/1977	49.00	0.76	7.79	0.86
44	3/4/2005	34.80	0.76	7.97	0.84
45	12/29/1976	41.00	0.76	8.15	0.82

46	3/12/1996	49.00	0.74	8.33	0.80
47	2/17/1994	58.30	0.74	8.51	0.79
48	12/18/1984	62.00	0.74	8.70	0.77
49	3/3/1995	92.30	0.74	8.88	0.76
50	1/4/1987	82.30	0.74	9.06	0.74
51	12/4/1987	27.50	0.68	9.24	0.73
52	2/7/1993	57.80	0.68	9.42	0.71
53	12/25/1977	111.50	0.68	9.60	0.70
54	11/24/1985	53.00	0.65	9.78	0.69
55	2/27/1978	184.80	0.65	9.96	0.67
56	3/11/1995	43.50	0.64	10.14	0.66
57	3/2/1992	48.80	0.64	10.33	0.65
58	1/12/1993	175.50	0.63	10.51	0.64
59	3/21/1983	107.50	0.62	10.69	0.63
60	1/4/1974	134.00	0.62	10.87	0.62
61	4/13/2003	45.00	0.61	11.05	0.61
62	4/22/1980	46.80	0.60	11.23	0.60
63	4/30/1978	34.50	0.60	11.41	0.59
64	3/6/1992	69.80	0.58	11.59	0.58
65	11/24/1978	38.50	0.56	11.78	0.57
66	3/11/1978	52.50	0.56	11.96	0.56
67	3/19/1991	79.80	0.56	12.14	0.55
68	12/10/1984	49.30	0.55	12.32	0.54
69	4/1/1982	34.00	0.54	12.50	0.54
70	12/16/1987	42.50	0.53	12.68	0.53
71	2/10/2003	86.80	0.53	12.86	0.52
72	11/11/1993	101.80	0.52	13.04	0.51
73	12/30/1981	95.00	0.51	13.22	0.51
74	10/20/1979	35.30	0.51	13.41	0.50
75	10/11/1987	45.00	0.51	13.59	0.49
76	1/5/1979	51.30	0.51	13.77	0.49
77	12/4/2004	193.50	0.50	13.95	0.48
78	3/25/1991	74.50	0.49	14.13	0.47
79	12/3/1992	118.00	0.49	14.31	0.47
80	3/1/1976	70.50	0.48	14.49	0.46
81	1/9/1978	58.30	0.47	14.67	0.46
82	11/11/1978	87.30	0.47	14.86	0.45
83	1/26/2008	49.00	0.46	15.04	0.45
84	1/23/1995	75.50	0.44	15.22	0.44
85	12/31/1996	82.50	0.43	15.40	0.44
86	1/7/2005	119.50	0.43	15.58	0.43
87	4/16/1995	87.50	0.43	15.76	0.43
88	1/5/2008	75.50	0.42	15.94	0.42
89	4/20/1988	71.50	0.41	16.12	0.42
90	1/3/2005	55.50	0.41	16.30	0.41
91	2/26/2004	43.50	0.40	16.49	0.41
92	1/13/1990	120.30	0.39	16.67	0.40

93	4/2/1974	31.80	0.36	16.85	0.40
94	11/22/1973	95.00	0.35	17.03	0.39
95	12/17/1978	83.50	0.35	17.21	0.39
96	12/6/1986	63.80	0.35	17.39	0.39
97	11/4/1987	48.00	0.35	17.57	0.38
98	3/27/1979	63.80	0.35	17.75	0.38
99	1/10/2001	65.00	0.35	17.93	0.37
100	3/25/1989	29.80	0.34	18.12	0.37
101	11/30/2007	51.80	0.34	18.30	0.37
102	1/25/1999	82.30	0.34	18.48	0.36
103	3/19/1981	31.80	0.31	18.66	0.36
104	11/17/1986	29.80	0.31	18.84	0.36
105	11/10/1976	34.50	0.31	19.02	0.35
106	1/17/1988	39.80	0.30	19.20	0.35
107	4/28/1980	37.00	0.30	19.38	0.35
108	9/25/1986	31.00	0.30	19.57	0.34
109	4/4/2006	39.50	0.28	19.75	0.34
110	3/6/1994	37.50	0.28	19.93	0.34
111	2/14/2008	31.30	0.28	20.11	0.33
112	2/27/2006	38.00	0.27	20.29	0.33
113	12/24/1988	38.80	0.27	20.47	0.33
114	10/26/1991	28.00	0.27	20.65	0.32
115	10/30/1996	28.50	0.27	20.83	0.32
116	1/15/1979	109.80	0.26	21.01	0.32
117	9/25/2008	27.50	0.25	21.20	0.32
118	1/5/1992	79.00	0.25	21.38	0.31
119	1/25/1997	39.80	0.24	21.56	0.31
120	3/14/2003	59.80	0.23	21.74	0.31
121	12/26/1984	46.30	0.23	21.92	0.31
122	1/10/1995	70.50	0.23	22.10	0.30
123	3/24/1994	36.00	0.23	22.28	0.30
124	1/8/1998	59.30	0.22	22.46	0.30
125	9/3/1976	24.80	0.22	22.64	0.30
126	2/3/2008	34.00	0.21	22.83	0.29
127	3/24/1998	194.80	0.21	23.01	0.29
128	3/20/1992	79.80	0.21	23.19	0.29
129	3/11/1973	85.30	0.21	23.37	0.29
130	3/7/1974	43.50	0.20	23.55	0.28
131	2/11/2005	64.50	0.20	23.73	0.28
132	11/24/1984	29.30	0.20	23.91	0.28
133	1/27/1983	69.00	0.20	24.09	0.28
134	3/17/1983	67.80	0.19	24.28	0.28
135	1/16/1973	78.50	0.19	24.46	0.27
136	3/1/1979	28.80	0.19	24.64	0.27
137	1/20/1982	48.50	0.19	24.82	0.27
138	11/24/1983	28.00	0.18	25.00	0.27
139	12/7/1984	28.80	0.18	25.18	0.27

140	4/12/1976	58.00	0.18	25.36	0.26
141	12/18/1977	33.30	0.18	25.54	0.26
142	11/17/1973	80.80	0.18	25.72	0.26
143	4/18/1981	28.80	0.18	25.91	0.26
144	11/27/1975	43.80	0.18	26.09	0.26
145	1/17/1980	53.80	0.18	26.27	0.26
146	2/2/1983	52.30	0.17	26.45	0.25
147	12/27/1992	62.50	0.17	26.63	0.25
148	12/25/2003	54.80	0.16	26.81	0.25
149	3/10/1980	32.80	0.16	26.99	0.25
150	3/28/2006	30.30	0.16	27.17	0.25
151	3/8/1986	145.00	0.16	27.36	0.25
152	2/7/1986	40.50	0.15	27.54	0.24
153	12/22/1994	83.30	0.13	27.72	0.24
154	3/20/1973	66.50	0.13	27.90	0.24
155	11/29/1985	39.00	0.11	28.08	0.24
156	3/15/1986	51.80	0.11	28.26	0.24
157	3/21/1995	70.80	0.11	28.44	0.24
158	4/7/1978	30.30	0.11	28.62	0.23
159	12/3/1983	26.50	0.10	28.80	0.23
160	3/5/1981	40.50	0.10	28.99	0.23
161	4/11/1999	30.50	0.10	29.17	0.23
162	2/25/1981	27.80	0.10	29.35	0.23
163	1/1/1977	40.00	0.10	29.53	0.23
164	3/22/2005	52.80	0.10	29.71	0.23
165	2/5/1983	79.50	0.10	29.89	0.22
166	3/19/1994	46.50	0.10	30.07	0.22
167	1/7/1995	31.30	0.10	30.25	0.22
168	11/28/2002	45.00	0.10	30.43	0.22
169	11/12/2003	30.00	0.10	30.62	0.22
170	11/7/2002	61.30	0.10	30.80	0.22
171	1/28/1981	111.80	0.10	30.98	0.22
172	2/3/1975	64.30	0.10	31.16	0.22
173	2/23/1993	32.50	0.10	31.34	0.21
174	3/22/1975	25.50	0.10	31.52	0.21
175	12/4/1998	48.80	0.10	31.70	0.21
176	3/4/1973	125.00	0.10	31.88	0.21
177	11/1/1974	42.80	0.10	32.07	0.21
178	2/2/1988	38.30	0.10	32.25	0.21
179	4/15/1976	26.00	0.10	32.43	0.21
180	12/16/1984	24.50	0.10	32.61	0.21
181	12/7/2007	64.30	0.10	32.79	0.20
182	11/21/1978	26.80	0.10	32.97	0.20
183	3/6/2001	38.80	0.10	33.15	0.20
184	4/28/2005	27.00	0.10	33.33	0.20
185	12/15/2002	66.00	0.10	33.51	0.20
186	2/7/1994	52.30	0.10	33.70	0.20

187	12/23/1995	23.00	0.10	33.88	0.20
188	12/5/1997	72.80	0.10	34.06	0.20
189	2/2/1985	57.00	0.10	34.24	0.20
190	1/23/2008	26.80	0.09	34.42	0.19
191	5/22/2006	24.30	0.09	34.60	0.19
192	11/27/1981	71.80	0.09	34.78	0.19
193	1/1/1974	26.30	0.09	34.96	0.19
194	12/31/2005	69.00	0.09	35.14	0.19
195	1/28/2005	26.50	0.09	35.33	0.19
196	1/26/2001	36.00	0.09	35.51	0.19
197	12/28/1991	70.50	0.09	35.69	0.19
198	10/6/1977	29.80	0.09	35.87	0.19
199	11/28/1998	34.30	0.09	36.05	0.19
200	7/31/1991	24.30	0.09	36.23	0.19
201	1/30/1986	58.80	0.09	36.41	0.18
202	3/24/1977	40.50	0.09	36.59	0.18
203	12/12/1975	44.00	0.09	36.78	0.18
204	3/30/1978	72.80	0.09	36.96	0.18
205	2/22/1979	54.50	0.09	37.14	0.18
206	11/24/1988	62.00	0.09	37.32	0.18
207	2/22/2008	68.00	0.09	37.50	0.18
208	4/14/1988	25.50	0.09	37.68	0.18
209	12/19/2002	64.00	0.09	37.86	0.18
210	9/25/1997	29.00	0.09	38.04	0.18
211	4/1/1999	27.50	0.09	38.22	0.18
212	4/20/2007	26.50	0.09	38.41	0.17
213	10/31/1987	42.80	0.09	38.59	0.17
214	2/17/1990	42.00	0.09	38.77	0.17
215	1/15/1995	61.00	0.09	38.95	0.17
216	4/4/1990	21.30	0.09	39.13	0.17
217	1/31/1996	51.30	0.09	39.31	0.17
218	2/27/2007	42.00	0.09	39.49	0.17
219	2/9/1992	33.30	0.09	39.67	0.17
220	12/24/1983	74.00	0.09	39.86	0.17
221	11/26/1997	29.00	0.09	40.04	0.17
222	3/26/1973	77.50	0.09	40.22	0.17
223	12/2/1985	34.80	0.09	40.40	0.17
224	3/4/1996	23.50	0.09	40.58	0.17
225	3/21/2006	22.50	0.09	40.76	0.16
226	4/10/1998	34.00	0.08	40.94	0.16
227	2/18/2006	42.80	0.08	41.12	0.16
228	3/26/1992	46.80	0.08	41.30	0.16
229	1/3/1991	36.00	0.08	41.49	0.16
230	3/25/1982	29.50	0.08	41.67	0.16
231	6/5/1993	23.80	0.08	41.85	0.16
232	2/4/1999	39.80	0.08	42.03	0.16
233	3/28/1990	25.00	0.08	42.21	0.16

234	12/9/1996	66.50	0.08	42.39	0.16
235	2/9/1975	39.50	0.08	42.57	0.16
236	4/29/1983	58.50	0.08	42.75	0.16
237	1/30/1978	30.30	0.08	42.93	0.16
238	3/28/1982	47.80	0.08	43.12	0.16
239	2/24/1996	92.30	0.08	43.30	0.15
240	11/12/1983	47.50	0.08	43.48	0.15
241	5/1/1980	33.80	0.08	43.66	0.15
242	3/17/2002	21.30	0.08	43.84	0.15
243	2/23/2001	131.00	0.08	44.02	0.15
244	11/19/1990	31.80	0.08	44.20	0.15
245	1/31/1990	21.00	0.08	44.38	0.15
246	4/6/1999	52.80	0.08	44.57	0.15
247	3/25/1975	34.80	0.08	44.75	0.15
248	12/9/1985	59.30	0.08	44.93	0.15
249	12/20/1986	24.80	0.08	45.11	0.15
250	10/29/2000	27.80	0.08	45.29	0.15
251	4/17/2000	24.30	0.08	45.47	0.15
252	2/22/2007	20.80	0.08	45.65	0.15
253	11/13/1997	24.80	0.08	45.83	0.15
254	1/10/1982	27.30	0.08	46.01	0.15
255	3/5/2000	30.80	0.08	46.20	0.15
256	12/19/1990	55.00	0.08	46.38	0.14
257	3/25/1980	24.30	0.08	46.56	0.14
258	3/14/1975	24.00	0.08	46.74	0.14
259	5/5/2005	20.30	0.08	46.92	0.14
260	4/18/1996	20.50	0.08	47.10	0.14
261	4/19/1983	48.30	0.08	47.28	0.14
262	12/5/1996	26.00	0.08	47.46	0.14
263	2/23/1977	41.30	0.08	47.64	0.14
264	12/31/2004	19.80	0.07	47.83	0.14
265	11/18/1983	21.30	0.07	48.01	0.14
266	12/11/1993	21.50	0.07	48.19	0.14
267	1/21/1996	31.80	0.07	48.37	0.14
268	3/10/2006	67.50	0.07	48.55	0.14
269	2/18/2004	19.00	0.07	48.73	0.14
270	1/3/1978	95.50	0.07	48.91	0.14
271	11/8/1998	22.50	0.07	49.09	0.14
272	4/24/1994	101.80	0.07	49.28	0.14
273	1/28/1982	31.30	0.07	49.46	0.14
274	1/25/1994	76.00	0.07	49.64	0.14
275	1/2/1990	22.00	0.07	49.82	0.13
276	2/24/1983	25.80	0.07	50.00	0.13
277	10/14/2006	21.80	0.07	50.18	0.13
278	12/10/2006	18.50	0.07	50.36	0.13
279	3/2/1974	43.00	0.07	50.54	0.13
280	10/17/1984	19.50	0.07	50.72	0.13

281	12/17/1991	47.50	0.07	50.91	0.13
282	4/13/1998	52.00	0.07	51.09	0.13
283	3/26/1993	64.30	0.07	51.27	0.13
284	9/22/1987	30.30	0.07	51.45	0.13
285	2/29/1988	45.30	0.07	51.63	0.13
286	1/24/1979	33.00	0.07	51.81	0.13
287	3/31/1992	30.50	0.06	51.99	0.13
288	5/24/1977	21.30	0.06	52.17	0.13
289	3/25/1999	22.50	0.06	52.36	0.13
290	1/9/1973	28.80	0.06	52.54	0.13
291	3/13/1991	18.50	0.06	52.72	0.13
292	12/20/1997	34.00	0.06	52.90	0.13
293	1/5/1988	19.30	0.06	53.08	0.13
294	2/3/1994	35.80	0.06	53.26	0.13
295	5/11/1998	42.80	0.06	53.44	0.13
296	2/27/1997	34.80	0.06	53.62	0.13
297	2/6/1973	50.80	0.06	53.80	0.12
298	10/28/1987	22.00	0.06	53.99	0.12
299	1/9/1991	17.50	0.06	54.17	0.12
300	1/28/1998	28.30	0.06	54.35	0.12
301	1/2/1998	57.30	0.06	54.53	0.12
302	11/23/2001	32.80	0.06	54.71	0.12
303	4/15/1978	19.30	0.06	54.89	0.12
304	1/15/1997	39.50	0.06	55.07	0.12
305	2/3/2004	27.50	0.06	55.25	0.12
306	3/26/1981	33.30	0.06	55.43	0.12
307	2/4/1990	17.50	0.06	55.62	0.12
308	1/28/2002	41.30	0.06	55.80	0.12
309	3/16/1977	21.80	0.06	55.98	0.12
310	1/29/2007	34.30	0.06	56.16	0.12
311	12/5/1978	16.00	0.06	56.34	0.12
312	6/9/1990	36.50	0.06	56.52	0.12
313	3/2/2004	21.30	0.06	56.70	0.12
314	4/6/1986	22.30	0.06	56.88	0.12
315	12/16/2006	24.80	0.06	57.07	0.12
316	10/18/2005	27.80	0.06	57.25	0.12
317	11/7/1979	19.00	0.06	57.43	0.12
318	12/19/1987	19.50	0.06	57.61	0.12
319	12/8/1991	35.80	0.05	57.79	0.12
320	1/30/1973	16.00	0.05	57.97	0.12
321	12/18/1992	15.80	0.05	58.15	0.12
322	2/23/1987	77.50	0.05	58.33	0.11
323	12/14/1993	26.00	0.05	58.51	0.11
324	12/1/1973	16.80	0.05	58.70	0.11
325	2/28/1973	21.50	0.05	58.88	0.11
326	3/21/1980	15.80	0.05	59.06	0.11
327	1/2/2004	17.80	0.05	59.24	0.11

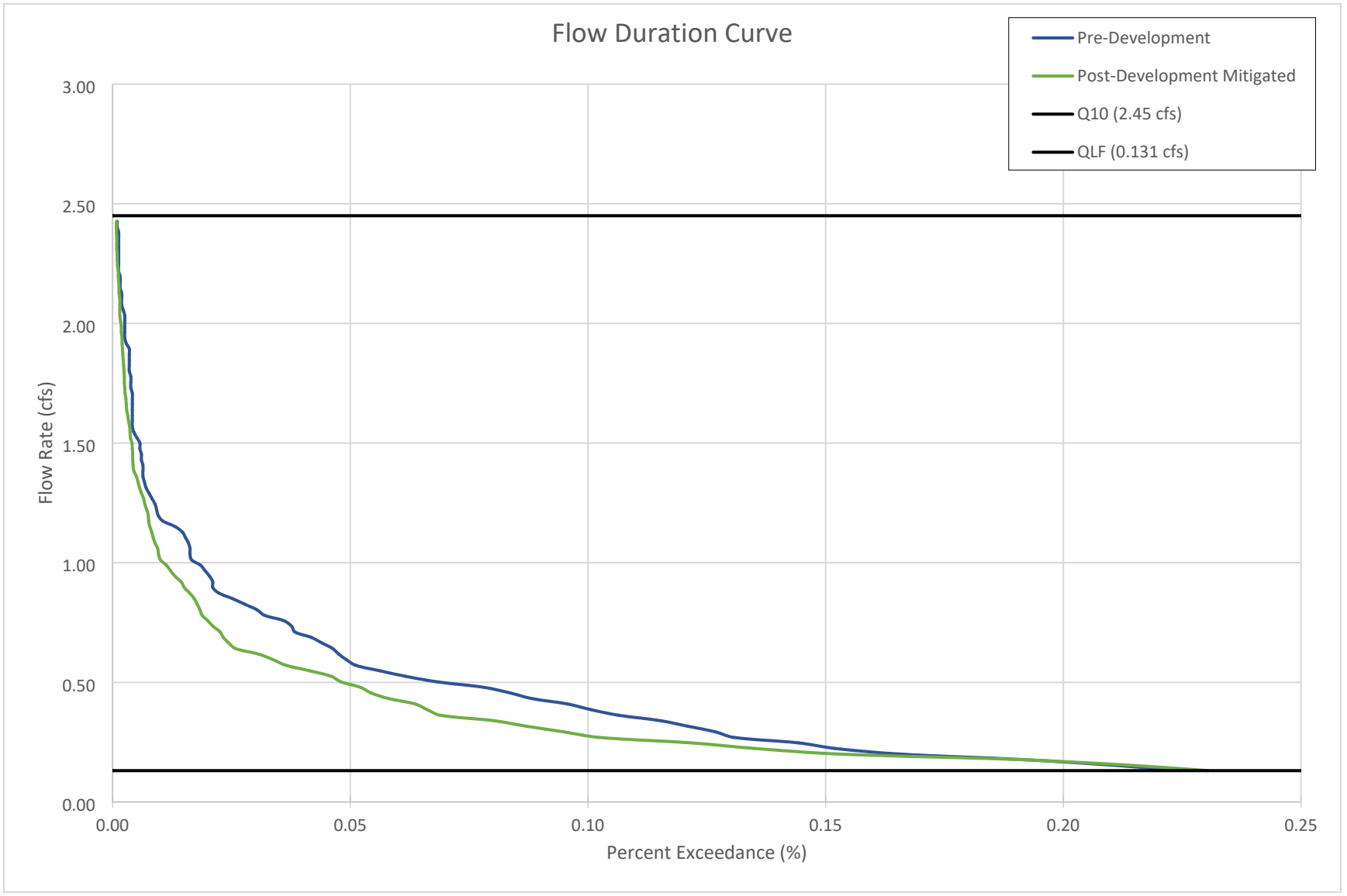
328	7/23/1974	16.00	0.05	59.42	0.11
329	3/11/1990	15.50	0.05	59.60	0.11
330	2/11/2000	40.00	0.05	59.78	0.11
331	1/23/1997	18.00	0.05	59.96	0.11
332	2/3/1973	16.30	0.05	60.14	0.11
333	11/26/1990	15.30	0.05	60.33	0.11
334	4/18/1983	21.00	0.05	60.51	0.11
335	12/1/1998	19.80	0.05	60.69	0.11
336	1/19/1983	17.00	0.05	60.87	0.11
337	12/22/2006	14.00	0.05	61.05	0.11
338	11/22/1993	17.80	0.05	61.23	0.11
339	12/27/2006	20.80	0.05	61.41	0.11
340	2/9/1989	28.50	0.05	61.59	0.11
341	3/15/1999	31.00	0.05	61.78	0.11
342	12/20/2001	26.00	0.05	61.96	0.11
343	1/5/1989	41.80	0.04	62.14	0.11
344	1/3/1992	24.30	0.04	62.32	0.11
345	11/28/2001	33.50	0.04	62.50	0.11
346	4/2/1981	21.00	0.04	62.68	0.11
347	1/5/1982	18.30	0.04	62.86	0.11
348	11/8/1984	14.30	0.04	63.04	0.11
349	5/12/1977	15.50	0.04	63.22	0.11
350	12/21/1988	15.00	0.04	63.41	0.11
351	1/30/1975	14.50	0.04	63.59	0.11
352	11/27/2006	14.80	0.04	63.77	0.11
353	4/3/1987	17.30	0.04	63.95	0.10
354	11/10/2000	34.50	0.04	64.13	0.10
355	11/4/1979	43.00	0.04	64.31	0.10
356	10/27/2000	16.80	0.04	64.49	0.10
357	1/20/1974	18.00	0.04	64.67	0.10
358	12/28/1974	33.80	0.04	64.86	0.10
359	12/28/2002	26.50	0.04	65.04	0.10
360	10/30/1992	15.00	0.04	65.22	0.10
361	12/1/1978	19.50	0.04	65.40	0.10
362	1/21/1995	14.00	0.04	65.58	0.10
363	1/28/1977	14.30	0.04	65.76	0.10
364	1/2/1993	16.80	0.04	65.94	0.10
365	1/3/1973	37.50	0.04	66.12	0.10
366	1/5/1984	15.50	0.04	66.30	0.10
367	11/30/1993	11.80	0.04	66.49	0.10
368	3/15/1991	19.00	0.04	66.67	0.10
369	1/16/1984	12.50	0.04	66.85	0.10
370	1/14/1998	49.30	0.04	67.03	0.10
371	12/2/2001	38.50	0.04	67.21	0.10
372	11/16/2003	13.50	0.04	67.39	0.10
373	12/15/1988	34.50	0.04	67.57	0.10
374	3/17/2006	34.30	0.04	67.75	0.10

375	12/5/1994	19.30	0.04	67.93	0.10
376	11/17/1987	17.00	0.04	68.12	0.10
377	12/19/1998	30.80	0.04	68.30	0.10
378	1/16/1996	17.80	0.04	68.48	0.10
379	1/28/1985	14.50	0.04	68.66	0.10
380	4/2/1977	16.30	0.04	68.84	0.10
381	1/19/1978	27.00	0.04	69.02	0.10
382	3/18/1980	19.30	0.04	69.20	0.10
383	10/7/1983	14.80	0.04	69.38	0.10
384	3/8/2000	27.00	0.04	69.57	0.10
385	1/7/1985	22.80	0.04	69.75	0.10
386	3/5/1998	19.00	0.04	69.93	0.10
387	1/12/1981	15.50	0.04	70.11	0.10
388	6/18/1975	15.30	0.03	70.29	0.10
389	2/4/1989	38.00	0.03	70.47	0.10
390	11/21/1984	34.50	0.03	70.65	0.09
391	12/19/2007	14.00	0.03	70.83	0.09
392	10/23/1992	26.30	0.03	71.01	0.09
393	12/21/1979	28.00	0.03	71.20	0.09
394	11/14/1988	17.50	0.03	71.38	0.09
395	4/17/2004	13.50	0.03	71.56	0.09
396	11/27/1976	10.30	0.03	71.74	0.09
397	1/9/1975	9.80	0.03	71.92	0.09
398	1/4/2003	19.00	0.03	72.10	0.09
399	11/22/1974	10.30	0.03	72.28	0.09
400	11/29/1997	19.50	0.03	72.46	0.09
401	1/1/1983	13.00	0.03	72.64	0.09
402	3/21/1978	46.00	0.03	72.83	0.09
403	2/14/2001	14.80	0.03	73.01	0.09
404	3/27/1985	32.30	0.03	73.19	0.09
405	1/9/1979	9.80	0.03	73.37	0.09
406	2/15/1973	9.80	0.03	73.55	0.09
407	4/9/1980	20.00	0.03	73.73	0.09
408	4/1/1980	22.00	0.03	73.91	0.09
409	9/19/1989	12.80	0.03	74.09	0.09
410	12/11/2007	11.80	0.03	74.28	0.09
411	11/1/1995	13.30	0.03	74.46	0.09
412	12/26/1979	9.30	0.03	74.64	0.09
413	11/18/1994	11.80	0.03	74.82	0.09
414	1/12/1997	14.00	0.03	75.00	0.09
415	10/28/1981	12.00	0.03	75.18	0.09
416	12/23/1977	9.30	0.03	75.36	0.09
417	3/16/1975	9.00	0.03	75.54	0.09
418	1/4/1997	10.80	0.03	75.72	0.09
419	4/21/2001	15.00	0.03	75.91	0.09
420	2/15/1982	9.00	0.03	76.09	0.09
421	1/21/2008	23.80	0.03	76.27	0.09

422	3/3/2003	17.30	0.03	76.45	0.09
423	11/10/1994	13.50	0.03	76.63	0.09
424	12/8/2003	10.00	0.03	76.81	0.09
425	4/9/1978	8.80	0.03	76.99	0.09
426	2/1/1984	9.30	0.03	77.17	0.09
427	12/20/1975	8.80	0.03	77.36	0.09
428	1/25/1973	8.80	0.03	77.54	0.09
429	4/23/2007	9.80	0.03	77.72	0.09
430	3/9/1978	8.80	0.03	77.90	0.09
431	10/20/1984	8.80	0.03	78.08	0.09
432	3/21/2007	12.00	0.03	78.26	0.09
434	4/4/1980	8.30	0.03	78.62	0.09
434	4/4/1978	8.30	0.03	78.62	0.09
435	5/11/1982	17.30	0.03	78.80	0.09
436	4/26/2002	14.80	0.03	78.99	0.08
437	11/16/1994	9.00	0.03	79.17	0.08
438	4/1/2004	11.50	0.03	79.35	0.08
439	5/13/1995	10.80	0.03	79.53	0.08
440	1/7/1975	8.30	0.03	79.71	0.08
441	12/18/1988	22.50	0.03	79.89	0.08
442	4/21/1985	12.00	0.03	80.07	0.08
443	12/1/1983	8.00	0.03	80.25	0.08
444	9/6/2002	14.00	0.03	80.43	0.08
445	1/1/2000	16.50	0.03	80.62	0.08
446	1/24/1983	8.00	0.03	80.80	0.08
447	10/10/1986	9.80	0.03	80.98	0.08
448	3/31/1975	8.00	0.02	81.16	0.08
449	11/6/1977	11.00	0.02	81.34	0.08
450	2/23/1973	8.00	0.02	81.52	0.08
451	4/16/2003	14.80	0.02	81.70	0.08
452	11/18/1981	9.00	0.02	81.88	0.08
453	9/14/1976	7.80	0.02	82.07	0.08
454	2/28/2000	11.30	0.02	82.25	0.08
455	2/3/1984	7.50	0.02	82.43	0.08
456	2/11/1979	7.80	0.02	82.61	0.08
457	12/17/1997	10.50	0.02	82.79	0.08
458	11/29/2004	8.00	0.02	82.97	0.08
459	2/19/1975	7.80	0.02	83.15	0.08
460	3/11/1991	8.50	0.02	83.33	0.08
461	1/25/1996	7.80	0.02	83.51	0.08
462	2/10/1997	8.30	0.02	83.70	0.08
463	2/26/1993	20.30	0.02	83.88	0.08
464	5/6/1995	22.50	0.02	84.06	0.08
465	12/19/1993	7.30	0.02	84.24	0.08
466	1/20/1999	22.30	0.02	84.42	0.08
467	5/23/2008	13.80	0.02	84.60	0.08
468	10/22/1987	9.50	0.02	84.78	0.08

469	2/15/1987	14.50	0.02	84.96	0.08
470	12/27/1996	14.50	0.02	85.14	0.08
471	2/14/1987	11.00	0.02	85.33	0.08
472	2/9/1985	27.30	0.02	85.51	0.08
473	12/12/1992	7.80	0.02	85.69	0.08
474	4/4/1999	6.30	0.02	85.87	0.08
475	12/29/1987	14.00	0.02	86.05	0.08
476	12/9/1983	6.80	0.02	86.23	0.08
477	10/27/1979	7.30	0.02	86.41	0.08
478	3/19/2005	12.00	0.02	86.59	0.08
479	1/28/1996	27.50	0.02	86.78	0.08
480	2/21/1996	15.50	0.02	86.96	0.08
481	11/8/1987	6.80	0.02	87.14	0.08
482	2/20/2008	6.50	0.02	87.32	0.08
483	2/9/1999	6.50	0.02	87.50	0.08
484	3/14/1981	7.30	0.02	87.68	0.08
485	5/2/2003	25.50	0.02	87.86	0.08
486	12/3/1984	11.00	0.02	88.04	0.08
487	3/31/1974	7.80	0.02	88.22	0.08
488	3/11/1999	9.00	0.02	88.41	0.08
489	12/20/1995	5.80	0.01	88.59	0.08
490	5/16/1995	5.00	0.01	88.77	0.08
491	2/17/1997	5.30	0.01	88.95	0.08
492	1/24/2001	5.50	0.01	89.13	0.08
493	11/26/1989	10.30	0.01	89.31	0.08
494	4/3/1997	8.50	0.01	89.49	0.07
495	9/26/1982	17.00	0.01	89.67	0.07
496	12/22/1996	5.30	0.01	89.86	0.07
497	11/3/2003	18.30	0.01	90.04	0.07
498	4/24/2002	8.00	0.01	90.22	0.07
499	11/14/1987	5.80	0.01	90.40	0.07
500	11/29/1996	5.80	0.01	90.58	0.07
501	5/20/1975	7.50	0.01	90.76	0.07
502	9/24/1999	8.00	0.01	90.94	0.07
503	11/16/1984	5.50	0.01	91.12	0.07
504	11/26/1994	5.50	0.01	91.30	0.07
505	12/13/1995	5.30	0.01	91.49	0.07
506	5/20/1981	7.30	0.01	91.67	0.07
507	10/1/1981	7.00	0.01	91.85	0.07
508	3/13/1979	5.50	0.01	92.03	0.07
509	9/7/1975	6.80	0.01	92.21	0.07
510	12/11/1991	3.50	0.01	92.39	0.07
511	4/14/2006	17.00	0.01	92.57	0.07
512	7/31/1976	6.80	0.01	92.75	0.07
513	7/27/1976	6.80	0.01	92.93	0.07
514	12/23/1988	3.50	0.01	93.12	0.07
515	1/18/1984	3.50	0.01	93.30	0.07

516	4/23/1990	6.80	0.01	93.48	0.07
517	4/18/1985	6.30	0.01	93.66	0.07
518	12/21/2007	3.50	0.01	93.84	0.07
519	1/12/1998	4.30	0.01	94.02	0.07
520	12/28/1988	3.50	0.01	94.20	0.07
521	12/19/2006	3.50	0.01	94.38	0.07
522	1/18/1998	4.00	0.01	94.57	0.07
523	4/12/1983	6.30	0.01	94.75	0.07
524	10/11/1981	5.50	0.01	94.93	0.07
525	4/6/1998	5.80	0.01	95.11	0.07
526	4/6/1984	5.30	0.01	95.29	0.07
527	5/27/1981	5.30	0.01	95.47	0.07
528	1/9/2001	5.30	0.01	95.65	0.07
529	4/7/2001	10.80	0.01	95.83	0.07
530	3/24/2002	3.80	0.01	96.01	0.07
531	1/31/1999	2.80	0.01	96.20	0.07
532	10/25/1989	3.80	0.01	96.38	0.07
533	6/16/1995	40.30	0.01	96.56	0.07
534	2/20/1985	4.00	0.01	96.74	0.07
535	12/29/1973	4.00	0.01	96.92	0.07
536	4/25/1978	3.80	0.01	97.10	0.07
537	12/11/2003	2.80	0.01	97.28	0.07
538	4/26/2006	21.50	0.01	97.46	0.07
539	5/22/1992	3.00	0.00	97.64	0.07
540	10/23/1991	3.30	0.00	97.83	0.07
541	4/2/1998	2.50	0.00	98.01	0.07
542	2/12/1996	3.30	0.00	98.19	0.07
543	1/23/1983	2.30	0.00	98.37	0.07
544	10/26/1996	2.80	0.00	98.55	0.07
545	5/16/1981	2.80	0.00	98.73	0.07
546	5/5/1998	4.80	0.00	98.91	0.07
547	8/18/1983	2.00	0.00	99.09	0.07
548	3/16/2002	2.00	0.00	99.28	0.07
549	2/22/1977	1.50	0.00	99.46	0.07
550	2/8/1990	1.30	0.00	99.64	0.07
551	10/29/1991	1.00	0.00	99.82	0.07


Flow Duration Curve
Pre-Development
Post-Development Mitigated
Q10 (2.45 cfs)
QLF (0.131 cfs)
3.00
2.50
2.00
1.50
1.00
0.50
0.00
Flow Rate (cfs)
0.00
0.05
0.10
0.15
0.20
0.25
Percent Exceedance (%)

Compare Post-Development Curve to Pre-Development Curve

Flow Control Upper Limit (cfs)	2.45
Flow Control Lower Limit (cfs)	0.131

Pass/Fail Summary Table	
Pass: Post Duration <= 110% of Pre Duration	2
Pass: Post Duration <= Pre Duration	98
Total	100

Bin	Flow Rate (cfs)	Post-Development % Exceed	Pre-Development % Exceed	%Exceed Post <= %Exceed Pre	%Exceed Post <= 110% %Exceed Pre	Pass/Fail
1	0.13	0.23	0.22	FALSE	TRUE	Pass: Post Duration <= 110% of Pre Duration
2	0.15	0.21	0.21	FALSE	TRUE	Pass: Post Duration <= 110% of Pre Duration
3	0.18	0.19	0.19	TRUE	TRUE	Pass: Post Duration <= Pre Duration
4	0.20	0.15	0.17	TRUE	TRUE	Pass: Post Duration <= Pre Duration
5	0.22	0.14	0.15	TRUE	TRUE	Pass: Post Duration <= Pre Duration
6	0.25	0.12	0.14	TRUE	TRUE	Pass: Post Duration <= Pre Duration
7	0.27	0.10	0.13	TRUE	TRUE	Pass: Post Duration <= Pre Duration
8	0.29	0.09	0.13	TRUE	TRUE	Pass: Post Duration <= Pre Duration
9	0.32	0.09	0.12	TRUE	TRUE	Pass: Post Duration <= Pre Duration
10	0.34	0.08	0.12	TRUE	TRUE	Pass: Post Duration <= Pre Duration
11	0.36	0.07	0.11	TRUE	TRUE	Pass: Post Duration <= Pre Duration
12	0.39	0.07	0.10	TRUE	TRUE	Pass: Post Duration <= Pre Duration
13	0.41	0.06	0.10	TRUE	TRUE	Pass: Post Duration <= Pre Duration
14	0.43	0.06	0.09	TRUE	TRUE	Pass: Post Duration <= Pre Duration
15	0.46	0.05	0.08	TRUE	TRUE	Pass: Post Duration <= Pre Duration
16	0.48	0.05	0.08	TRUE	TRUE	Pass: Post Duration <= Pre Duration
17	0.50	0.05	0.07	TRUE	TRUE	Pass: Post Duration <= Pre Duration
18	0.53	0.05	0.06	TRUE	TRUE	Pass: Post Duration <= Pre Duration
19	0.55	0.04	0.06	TRUE	TRUE	Pass: Post Duration <= Pre Duration
20	0.57	0.04	0.05	TRUE	TRUE	Pass: Post Duration <= Pre Duration
21	0.59	0.03	0.05	TRUE	TRUE	Pass: Post Duration <= Pre Duration
22	0.62	0.03	0.05	TRUE	TRUE	Pass: Post Duration <= Pre Duration
23	0.64	0.03	0.05	TRUE	TRUE	Pass: Post Duration <= Pre Duration
24	0.66	0.02	0.04	TRUE	TRUE	Pass: Post Duration <= Pre Duration
25	0.69	0.02	0.04	TRUE	TRUE	Pass: Post Duration <= Pre Duration
26	0.71	0.02	0.04	TRUE	TRUE	Pass: Post Duration <= Pre Duration
27	0.73	0.02	0.04	TRUE	TRUE	Pass: Post Duration <= Pre Duration
28	0.76	0.02	0.04	TRUE	TRUE	Pass: Post Duration <= Pre Duration
29	0.78	0.02	0.03	TRUE	TRUE	Pass: Post Duration <= Pre Duration
30	0.80	0.02	0.03	TRUE	TRUE	Pass: Post Duration <= Pre Duration
31	0.83	0.02	0.03	TRUE	TRUE	Pass: Post Duration <= Pre Duration
32	0.85	0.02	0.03	TRUE	TRUE	Pass: Post Duration <= Pre Duration
33	0.87	0.02	0.02	TRUE	TRUE	Pass: Post Duration <= Pre Duration
34	0.90	0.02	0.02	TRUE	TRUE	Pass: Post Duration <= Pre Duration
35	0.92	0.01	0.02	TRUE	TRUE	Pass: Post Duration <= Pre Duration
36	0.94	0.01	0.02	TRUE	TRUE	Pass: Post Duration <= Pre Duration
37	0.97	0.01	0.02	TRUE	TRUE	Pass: Post Duration <= Pre Duration
38	0.99	0.01	0.02	TRUE	TRUE	Pass: Post Duration <= Pre Duration
39	1.01	0.01	0.02	TRUE	TRUE	Pass: Post Duration <= Pre Duration
40	1.04	0.01	0.02	TRUE	TRUE	Pass: Post Duration <= Pre Duration
41	1.06	0.01	0.02	TRUE	TRUE	Pass: Post Duration <= Pre Duration
42	1.08	0.01	0.02	TRUE	TRUE	Pass: Post Duration <= Pre Duration
43	1.10	0.01	0.02	TRUE	TRUE	Pass: Post Duration <= Pre Duration
44	1.13	0.01	0.01	TRUE	TRUE	Pass: Post Duration <= Pre Duration
45	1.15	0.01	0.01	TRUE	TRUE	Pass: Post Duration <= Pre Duration
46	1.17	0.01	0.01	TRUE	TRUE	Pass: Post Duration <= Pre Duration
47	1.20	0.01	0.01	TRUE	TRUE	Pass: Post Duration <= Pre Duration
48	1.22	0.01	0.01	TRUE	TRUE	Pass: Post Duration <= Pre Duration
49	1.24	0.01	0.01	TRUE	TRUE	Pass: Post Duration <= Pre Duration

50	1.27	0.01	0.01	TRUE	TRUE	Pass: Post Duration <= Pre Duration
51	1.29	0.01	0.01	TRUE	TRUE	Pass: Post Duration <= Pre Duration
52	1.31	0.01	0.01	TRUE	TRUE	Pass: Post Duration <= Pre Duration
53	1.34	0.01	0.01	TRUE	TRUE	Pass: Post Duration <= Pre Duration
54	1.36	0.01	0.01	TRUE	TRUE	Pass: Post Duration <= Pre Duration
55	1.38	0.00	0.01	TRUE	TRUE	Pass: Post Duration <= Pre Duration
56	1.41	0.00	0.01	TRUE	TRUE	Pass: Post Duration <= Pre Duration
57	1.43	0.00	0.01	TRUE	TRUE	Pass: Post Duration <= Pre Duration
58	1.45	0.00	0.01	TRUE	TRUE	Pass: Post Duration <= Pre Duration
59	1.48	0.00	0.01	TRUE	TRUE	Pass: Post Duration <= Pre Duration
60	1.50	0.00	0.01	TRUE	TRUE	Pass: Post Duration <= Pre Duration
61	1.52	0.00	0.01	TRUE	TRUE	Pass: Post Duration <= Pre Duration
62	1.55	0.00	0.00	TRUE	TRUE	Pass: Post Duration <= Pre Duration
63	1.57	0.00	0.00	TRUE	TRUE	Pass: Post Duration <= Pre Duration
64	1.59	0.00	0.00	TRUE	TRUE	Pass: Post Duration <= Pre Duration
65	1.62	0.00	0.00	TRUE	TRUE	Pass: Post Duration <= Pre Duration
66	1.64	0.00	0.00	TRUE	TRUE	Pass: Post Duration <= Pre Duration
67	1.66	0.00	0.00	TRUE	TRUE	Pass: Post Duration <= Pre Duration
68	1.68	0.00	0.00	TRUE	TRUE	Pass: Post Duration <= Pre Duration
69	1.71	0.00	0.00	TRUE	TRUE	Pass: Post Duration <= Pre Duration
70	1.73	0.00	0.00	TRUE	TRUE	Pass: Post Duration <= Pre Duration
71	1.75	0.00	0.00	TRUE	TRUE	Pass: Post Duration <= Pre Duration
72	1.78	0.00	0.00	TRUE	TRUE	Pass: Post Duration <= Pre Duration
73	1.80	0.00	0.00	TRUE	TRUE	Pass: Post Duration <= Pre Duration
74	1.82	0.00	0.00	TRUE	TRUE	Pass: Post Duration <= Pre Duration
75	1.85	0.00	0.00	TRUE	TRUE	Pass: Post Duration <= Pre Duration
76	1.87	0.00	0.00	TRUE	TRUE	Pass: Post Duration <= Pre Duration
77	1.89	0.00	0.00	TRUE	TRUE	Pass: Post Duration <= Pre Duration
78	1.92	0.00	0.00	TRUE	TRUE	Pass: Post Duration <= Pre Duration
79	1.94	0.00	0.00	TRUE	TRUE	Pass: Post Duration <= Pre Duration
80	1.96	0.00	0.00	TRUE	TRUE	Pass: Post Duration <= Pre Duration
81	1.99	0.00	0.00	TRUE	TRUE	Pass: Post Duration <= Pre Duration
82	2.01	0.00	0.00	TRUE	TRUE	Pass: Post Duration <= Pre Duration
83	2.03	0.00	0.00	TRUE	TRUE	Pass: Post Duration <= Pre Duration
84	2.06	0.00	0.00	TRUE	TRUE	Pass: Post Duration <= Pre Duration
85	2.08	0.00	0.00	TRUE	TRUE	Pass: Post Duration <= Pre Duration
86	2.10	0.00	0.00	TRUE	TRUE	Pass: Post Duration <= Pre Duration
87	2.13	0.00	0.00	TRUE	TRUE	Pass: Post Duration <= Pre Duration
88	2.15	0.00	0.00	TRUE	TRUE	Pass: Post Duration <= Pre Duration
89	2.17	0.00	0.00	TRUE	TRUE	Pass: Post Duration <= Pre Duration
90	2.19	0.00	0.00	TRUE	TRUE	Pass: Post Duration <= Pre Duration
91	2.22	0.00	0.00	TRUE	TRUE	Pass: Post Duration <= Pre Duration
92	2.24	0.00	0.00	TRUE	TRUE	Pass: Post Duration <= Pre Duration
93	2.26	0.00	0.00	TRUE	TRUE	Pass: Post Duration <= Pre Duration
94	2.29	0.00	0.00	TRUE	TRUE	Pass: Post Duration <= Pre Duration
95	2.31	0.00	0.00	TRUE	TRUE	Pass: Post Duration <= Pre Duration
96	2.33	0.00	0.00	TRUE	TRUE	Pass: Post Duration <= Pre Duration
97	2.36	0.00	0.00	TRUE	TRUE	Pass: Post Duration <= Pre Duration
98	2.38	0.00	0.00	TRUE	TRUE	Pass: Post Duration <= Pre Duration
99	2.40	0.00	0.00	TRUE	TRUE	Pass: Post Duration <= Pre Duration
100	2.43	0.00	0.00	TRUE	TRUE	Pass: Post Duration <= Pre Duration

Pre-Development Flow Duration Table Summary at Project Discharge Point

Bin #	Discharge Rate (cfs)	Number of Periods	Total Periods Exceeding	Percent Exceeded
1	0.13	46	704	0.225
2	0.15	59	658	0.210
3	0.18	81	599	0.191
4	0.20	42	518	0.165
5	0.22	24	476	0.152
6	0.25	43	452	0.144
7	0.27	12	409	0.131
8	0.29	18	397	0.127
9	0.32	18	379	0.121
10	0.34	28	361	0.115
11	0.36	18	333	0.106
12	0.39	15	315	0.101
13	0.41	24	300	0.096
14	0.43	14	276	0.088
15	0.46	17	262	0.084
16	0.48	31	245	0.078
17	0.50	21	214	0.068
18	0.53	17	193	0.062
19	0.55	16	176	0.056
20	0.57	6	160	0.051
21	0.59	5	154	0.049
22	0.62	4	149	0.048
23	0.64	7	145	0.046
24	0.66	7	138	0.044
25	0.69	11	131	0.042
26	0.71	2	120	0.038
27	0.73	5	118	0.038
28	0.76	13	113	0.036
29	0.78	5	100	0.032
30	0.80	8	95	0.030
31	0.83	8	87	0.028
32	0.85	9	79	0.025
33	0.87	4	70	0.022
34	0.90	0	66	0.021
35	0.92	2	66	0.021
36	0.94	3	64	0.020
37	0.97	3	61	0.019
38	0.99	6	58	0.019
39	1.01	1	52	0.017
40	1.04	0	51	0.016
41	1.06	1	51	0.016
42	1.08	2	50	0.016
43	1.10	2	48	0.015
44	1.13	5	46	0.015
45	1.15	8	41	0.013
46	1.17	3	33	0.011
47	1.20	1	30	0.010
48	1.22	1	29	0.009
49	1.24	2	28	0.009
50	1.27	2	26	0.008
51	1.29	2	24	0.008
52	1.31	1	22	0.007

53	1.34	1	21	0.007
54	1.36	0	20	0.006
55	1.38	0	20	0.006
56	1.41	1	20	0.006
57	1.43	0	19	0.006
58	1.45	1	19	0.006
59	1.48	0	18	0.006
60	1.50	2	18	0.006
61	1.52	2	16	0.005
62	1.55	1	14	0.004
63	1.57	0	13	0.004
64	1.59	0	13	0.004
65	1.62	0	13	0.004
66	1.64	0	13	0.004
67	1.66	0	13	0.004
68	1.68	0	13	0.004
69	1.71	1	13	0.004
70	1.73	0	12	0.004
71	1.75	0	12	0.004
72	1.78	1	12	0.004
73	1.80	0	11	0.004
74	1.82	0	11	0.004
75	1.85	0	11	0.004
76	1.87	0	11	0.004
77	1.89	2	11	0.004
78	1.92	1	9	0.003
79	1.94	0	8	0.003
80	1.96	0	8	0.003
81	1.99	0	8	0.003
82	2.01	0	8	0.003
83	2.03	1	8	0.003
84	2.06	1	7	0.002
85	2.08	0	6	0.002
86	2.10	0	6	0.002
87	2.13	1	6	0.002
88	2.15	0	5	0.002
89	2.17	0	5	0.002
90	2.19	1	5	0.002
91	2.22	0	4	0.001
92	2.24	0	4	0.001
93	2.26	0	4	0.001
94	2.29	0	4	0.001
95	2.31	0	4	0.001
96	2.33	0	4	0.001
97	2.36	0	4	0.001
98	2.38	1	4	0.001
99	2.40	0	3	0.001
100	2.43	3	3	0.001

Post-Development Flow Duration Table Summary at Project Discharge Point

Bin #	Discharge Rate (cfs)	Number of Periods	Total Periods Exceeding	Percent Exceeded
1	0.13	212	2888	0.231
2	0.15	289	2676	0.214
3	0.18	476	2387	0.191
4	0.20	219	1911	0.153
5	0.22	166	1692	0.135
6	0.25	246	1526	0.122
7	0.27	92	1280	0.102
8	0.29	97	1188	0.095
9	0.32	86	1091	0.087
10	0.34	143	1005	0.080
11	0.36	33	862	0.069
12	0.39	31	829	0.066
13	0.41	71	798	0.064
14	0.43	46	727	0.058
15	0.46	27	681	0.054
16	0.48	52	654	0.052
17	0.50	26	602	0.048
18	0.53	57	576	0.046
19	0.55	63	519	0.041
20	0.57	33	456	0.036
21	0.59	38	423	0.034
22	0.62	61	385	0.031
23	0.64	18	324	0.026
24	0.66	14	306	0.024
25	0.69	9	292	0.023
26	0.71	18	283	0.023
27	0.73	14	265	0.021
28	0.76	15	251	0.020
29	0.78	6	236	0.019
30	0.80	7	230	0.018
31	0.83	8	223	0.018
32	0.85	12	215	0.017
33	0.87	14	203	0.016
34	0.90	8	189	0.015
35	0.92	16	181	0.014
36	0.94	12	165	0.013
37	0.97	11	153	0.012
38	0.99	16	142	0.011
39	1.01	5	126	0.010
40	1.04	2	121	0.010
41	1.06	7	119	0.009
42	1.08	5	112	0.009
43	1.10	4	107	0.009
44	1.13	5	103	0.008
45	1.15	3	98	0.008

46	1.17	1	95	0.008
47	1.20	4	94	0.008
48	1.22	5	90	0.007
49	1.24	3	85	0.007
50	1.27	6	82	0.007
51	1.29	5	76	0.006
52	1.31	4	71	0.006
53	1.34	4	67	0.005
54	1.36	7	63	0.005
55	1.38	2	56	0.004
56	1.41	1	54	0.004
57	1.43	0	53	0.004
58	1.45	1	53	0.004
59	1.48	1	52	0.004
60	1.50	4	51	0.004
61	1.52	1	47	0.004
62	1.55	1	46	0.004
63	1.57	3	45	0.004
64	1.59	2	42	0.003
65	1.62	3	40	0.003
66	1.64	1	37	0.003
67	1.66	1	36	0.003
68	1.68	2	35	0.003
69	1.71	1	33	0.003
70	1.73	1	32	0.003
71	1.75	0	31	0.002
72	1.78	1	31	0.002
73	1.80	1	30	0.002
74	1.82	1	29	0.002
75	1.85	1	28	0.002
76	1.87	1	27	0.002
77	1.89	1	26	0.002
78	1.92	0	25	0.002
79	1.94	2	25	0.002
80	1.96	0	23	0.002
81	1.99	2	23	0.002
82	2.01	2	21	0.002
83	2.03	0	19	0.002
84	2.06	0	19	0.002
85	2.08	0	19	0.002
86	2.10	2	19	0.002
87	2.13	0	17	0.001
88	2.15	1	17	0.001
89	2.17	1	16	0.001
90	2.19	0	15	0.001
91	2.22	2	15	0.001
92	2.24	1	13	0.001

93	2.26	0	12	0.001
94	2.29	1	12	0.001
95	2.31	0	11	0.001
96	2.33	0	11	0.001
97	2.36	1	11	0.001
98	2.38	0	10	0.001
99	2.40	0	10	0.001
100	2.43	10	10	0.001

END OF STATISTICS ANALYSIS

```
[PRE-DEVELOPMENT]
;;Project Title/Notes
  Drawdown Time:  6 hours

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

START_DATE           01/03/1973
START_TIME           12:00:00
REPORT_START_DATE    01/03/1973
REPORT_START_TIME    12:00:00
END_DATE             09/26/2008
END_TIME             16:00:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          01:00:00
WET_STEP             01:00:00
DRY_STEP             01:00:00
ROUTING_STEP         0:01:00
RULE_STEP            00:00:00

INERTIAL_DAMPING     PARTIAL
NORMAL_FLOW_LIMITED  BOTH
FORCE_MAIN_EQUATION  D-W
VARIABLE_STEP        0.75
LENGTHENING_STEP     0
MIN_SURFAREA         12.566
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   0.20   0.16   0.12   0.008  0.06
DRY_ONLY         NO

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

```
;;-------------- --------- ------ ------ ----------
Santee           INTENSITY 1:00     1.0      FILE       "K:\ORA_LDEV\194564001- Bradley Terraces\Reports & Calculations\WQMP\Calculations\EPA SWMM\Rainfall
Data\Santee ALERT Station.dat" Santee     IN

[SUBCATCHMENTS]
;;Name           Rain Gage        Outlet           Area     %Imperv  Width    %Slope   CurbLen  SnowPack
;;-------------- ---------------- ---------------- -------- -------- -------- -------- -------- ----------------
DMA-1            Santee           POC-1            3.3262   0        268.628  4.5      0

[SUBAREAS]
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo    PctRouted
;;-------------- ---------- ---------- ---------- ---------- ---------- ---------- ----------
DMA-1            0.012      .03        0.05       0.1        25         OUTLET

[INFILTRATION]
;;Subcatchment   Param1     Param2     Param3     Param4     Param5
;;-------------- ---------- ---------- ---------- ---------- ----------
DMA-1            9          .025       0.30

[LID_CONTROLS]
;;Name           Type/Layer Parameters
;;-------------- ---------- ----------
BMP-A            BC
BMP-A            SURFACE    6          0          0          0          5
BMP-A            SOIL       21         0.4        0.2        0.1        5          5          1.5
BMP-A            STORAGE    12         0.67       0          0          NO
BMP-A            DRAIN      0.186532736404728 0.5        3          6          0          0

BMP-B            BC
BMP-B            SURFACE    6          0          0          0          5
BMP-B            SOIL       21         0.4        0.2        0.1        5          5          1.5
BMP-B            STORAGE    12         0.67       0          0          NO
BMP-B            DRAIN      0.189624087067851 0.5        3          6          0          0

BMP-C            BC
BMP-C            SURFACE    6          0          0          0          5
BMP-C            SOIL       21         0.4        0.2        0.1        5          5          1.5
BMP-C            STORAGE    12         0.67       0          0          NO
BMP-C            DRAIN      0.208112145837404 0.5        3          6          0          0

[LID_USAGE]
;;Subcatchment   LID Process      Number  Area       Width      InitSat    FromImp    ToPerv     RptFile                  DrainTo          FromPerv
;;-------------- ---------------- ------- ---------- ---------- ---------- ---------- ---------- ------------------------ ---------------- ----------

[OUTFALLS]
;;Name           Elevation  Type       Stage Data       Gated    Route To
;;-------------- ---------- ---------- ---------------- -------- ----------------
POC-1            0          FREE                        NO

[REPORT]
```

```
;;Reporting Options
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]

[MAP]
DIMENSIONS -4469.274 0.000 14469.274 10000.000
Units      None

[COORDINATES]
;;Node           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
POC-1            -3553.073          2569.832

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

[Polygons]
;;Subcatchment   X-Coord            Y-Coord
;;-------------- ------------------ ------------------
DMA-1            2949.721           6860.335

[SYMBOLS]
;;Gage           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
Santee           1318.436           7821.229


[BACKDROP]
FILE       "K:\ORA_LDEV\194564001- Bradley Terraces\Reports & Calculations\WQMP\Calculations\EPA SWMM\WQMP Exhibit.jpg"
DIMENSIONS -4469.274 352.190 14469.274 9647.810
```

```
[POST-DEVELOPMENT]
;;Project Title/Notes
  Drawdown Time:  6 hours

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

START_DATE           01/03/1973
START_TIME           12:00:00
REPORT_START_DATE    01/03/1973
REPORT_START_TIME    12:00:00
END_DATE             09/26/2008
END_TIME             16:00:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          00:15:00
WET_STEP             00:15:00
DRY_STEP             00:15:00
ROUTING_STEP         0:00:30
RULE_STEP            00:00:00

INERTIAL_DAMPING     PARTIAL
NORMAL_FLOW_LIMITED  BOTH
FORCE_MAIN_EQUATION  D-W
VARIABLE_STEP        0.75
LENGTHENING_STEP     0
MIN_SURFAREA         12.566
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   0.20   0.16   0.12   0.008  0.06
DRY_ONLY         NO

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

```
;;-------------- --------- ------ ------ ----------
Santee           INTENSITY 1:00     1.0      FILE       "K:\ORA_LDEV\194564001- Bradley Terraces\Reports & Calculations\WQMP\Calculations\EPA SWMM\_Rainfall
Data\Santee ALERT Station.dat" Santee     IN

[SUBCATCHMENTS]
;;Name           Rain Gage        Outlet           Area     %Imperv  Width    %Slope   CurbLen  SnowPack
;;-------------- ---------------- ---------------- -------- -------- -------- -------- -------- ----------------
BMP-B            Santee           POC-1            .04222   0        25       0        0
BMP-A            Santee           POC-1            .036501  0        20       0        0
BMP-C            Santee           poc-1            .02066   0        10.34    0        0
DMA-1            Santee           BMP-A            1.5463   75       125      5        0
DMA-2            Santee           BMP-B            1.2065   75       125      5        0
DMA-3            Santee           BMP-C            .4635    60       50       1        0

[SUBAREAS]
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo    PctRouted
;;-------------- ---------- ---------- ---------- ---------- ---------- ---------- ----------
BMP-B            0.012      .15        0.05       0.1        25         OUTLET
BMP-A            0.012      .15        0.05       0.1        25         OUTLET
BMP-C            0.012      .15        0.05       0.1        25         OUTLET
DMA-1            0.012      0.15       0.05       0.1        25         OUTLET
DMA-2            0.012      .15        0.05       0.1        25         OUTLET
DMA-3            0.012      0.15       0.05       0.1        25         OUTLET

[INFILTRATION]
;;Subcatchment   Param1     Param2     Param3     Param4     Param5
;;-------------- ---------- ---------- ---------- ---------- ----------
BMP-B            9          0.025      0.30
BMP-A            9          0.025      0.30
BMP-C            9          0.025      0.30
DMA-1            9          0.025      0.30
DMA-2            9          0.025      0.30
DMA-3            9          0.025      0.30

[LID_CONTROLS]
;;Name           Type/Layer Parameters
;;-------------- ---------- ----------
BMP-A            BC
BMP-A            SURFACE    6          0          0          0          5
BMP-A            SOIL       21         0.4        0.2        0.1        5          5          1.5
BMP-A            STORAGE    12         0.67       0          0          NO
BMP-A            DRAIN      0.181033991 0.5        3          6          0          0

BMP-B            BC
BMP-B            SURFACE    6          0          0          0          5
BMP-B            SOIL       21         0.4        0.2        0.1        5          5          1.5
BMP-B            STORAGE    12         0.67       0          0          NO
BMP-B            DRAIN      0.2010438747851 0.5        3          6          0          0

BMP-C            BC
```

```
BMP-C            SURFACE    6          0          0          0          5
BMP-C            SOIL       21         0.4        0.2        0.1        5          5          1.5
BMP-C            STORAGE    12         0.67       0          0          NO
BMP-C            DRAIN      0.208112145837404 0.5        3          6          0          0

[LID_USAGE]
;;Subcatchment   LID Process      Number  Area       Width      InitSat    FromImp    ToPerv     RptFile                  DrainTo          FromPerv
;;-------------- ---------------- ------- ---------- ---------- ---------- ---------- ---------- ------------------------ ---------------- ----------
BMP-B            BMP-B            1       1839.10    0          0          0          0          *                        *                0
BMP-A            BMP-A            1       1589.98    0          0          0          0          *                        *                0
BMP-C            BMP-C            1       899.95     0          0          0          0          *                        *                0

[OUTFALLS]
;;Name           Elevation  Type       Stage Data       Gated    Route To
;;-------------- ---------- ---------- ---------------- -------- ----------------
POC-1            0          FREE                        NO

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

[TAGS]

[MAP]
DIMENSIONS -2500.000 0.000 12500.000 10000.000
Units      None

[COORDINATES]
;;Node           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
POC-1            -2011.173          2044.693

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

[Polygons]
;;Subcatchment   X-Coord            Y-Coord
;;-------------- ------------------ ------------------
BMP-B            89.385             7631.285
BMP-A            11.173             2636.872
BMP-C            3363.128           7005.587
DMA-1            7541.899           3094.972
DMA-2            6681.564           8681.564
DMA-3            5206.704           6044.693

[SYMBOLS]
;;Gage           X-Coord            Y-Coord
```

```
;;-------------- ------------------ ------------------
Santee           -1564.246          9765.363


[BACKDROP]
FILE       "K:\ORA_LDEV\194564001- Bradley Terraces\Reports & Calculations\WQMP\Calculations\EPA SWMM\WQMP Exhibit.jpg"
DIMENSIONS -2500.000 0.000 12500.000 10000.000
```

8.3 Geomorphic Assessment of Receiving Water Channels

Insert Geomorphic Assessment behind this cover page or submit as a separate stand-alone document labeled Sub-attachment 8.3.

No Geomorphic assessment has been performed for this project. Calculations assume the default of receiving channel is of high sensitivity to erosion and compare developed hydromodification discharges to 10% of the predevelopment Q2 flows.

8.4 Vector Control Plan

Insert Vector Control Plan behind this cover page or submit as a separate stand-alone document labeled Sub-attachment 8.4.

All drainage detention facilities on this project are designed to drawdown in less than 96 hour and therefore no vector control plan is required.

9.0 General Requirements

- Complete the table below to indicate which compliance pathway was selected in PDP SWQMP Table 6. Include the corresponding sub-attachment with your SWQMP submittal. Other sub-attachments do not need to be included.
- See the BMPDM sections and appendices listed under "BMPDM Design Resources" for additional explanation of design requirements. Constructed features must fully satisfy the requirements described in these resources, and any other guidance identified by the County.
- DMA Exhibits and Construction Plans: CCSYAs and applicable BMPs identified and described in this attachment must be shown on DMA Exhibits and all applicable construction plans submitted for the project. See Attachment 2 for additional instruction on exhibits and plans.

Sub-attachments	BMPDM Design Resources
☐ **9.1: Documentation of Hydromodification Management Exemption**[1]	Section 1.6
☒ **9.2: Watershed Management Area Analysis (WMAA) Mapping**[1]	Appendix H.1.1.2
☐ **9.3: Resource Protection Ordinance (RPO) Methods**	Appendix H.1.1.1
☐ **9.4: No Net Impact Analysis**	Appendix H.4

[1] The San Diego County Regional comprehensive WMAA mapping data can be found on the Project Clean Water website here: http://www.projectcleanwater.org/download/wmaa_attc_data/

9.1 Documentation of Hydromodification Management Exemption (BMPDM Section 1.6)

- If the PDP is exempt from hydromodification management requirements (see Table 4 Part A.1 of the PDP SWQMP), use this Sub-attachment to document the exemption.
- Select the type of exemption below that applies and provide an explanation of the selection, including maps or other applicable documentation. Additional documentation may be requested by County staff.

Exemption Type per BMPDM Figure 1-2 (select one)
☐ a. The proposed project will discharge runoff directly to existing underground storm drains discharging directly to water storage reservoirs, lakes, enclosed embayments, or the Pacific Ocean.
☐ b. The proposed 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.
☐ c. The proposed project will discharge runoff directly to an area identified by the County as appropriate for an exemption by the WMAA for the watershed in which the project resides[2].
Explanation (add or attach pages as necessary)

[2] This option must include an analysis of the project using the methodology presented in Attachment E of the Regional Watershed Management Area Analysis.

9.2 Watershed Management Area Analysis (WMAA) Mapping (BMPDM Appendix H.1.1.2)

Watershed Management Area Analysis (WMAA) mapping is a simple way to screen projects to determine the presence of onsite or offsite upstream Potential Critical Coarse Sediment Yield Areas (PCCSYAs). The San Diego County Regional WMAA mapping data can be found on the Project Clean Water website here: http://www.projectcleanwater.org/download/wmaa_attc_data/ .[3]

- Based on the WMAA map and the proposed project design, demonstrate below that both of the following conditions apply to the PDP:

  (a) Less than 5% of PCCSYAs will be impacted (built on or obstructed) by the PDP, and

  (b) All upstream offsite PCCYSAs will be bypassed (see BMPDM Appendix H.3).

A. Mapping Results -- At a minimum, show: (1) the project footprint, (2) areas of proposed development, (3) impacted onsite PCCSYAs, (4) offsite tributary areas[4], and (5) bypass of upstream offsite PCCSYAs.

[3] Applicants may refine initial mapping results using options identified in BMPDM Appendix H.1.2.
[4] Tributary areas must be shown to demonstrate that upstream offsite PCCSYAs do not exist. If bypassing these areas, only the bypass should be shown.

B. Explanation -- Provide documentation as needed to demonstrate that (1) impacts to PCCSYAs are below 5%, and (2) upstream offsite PCCYSAs are effectively bypassed. Add pages as necessary.

By observation of the mapping results, it can be seen that there are no areas of PCCSYAs within the project boundary.

By observation of the mapping, the nearest PCCSYAs to the project site are across Interstate 15 to the east, and on the opposite site of the neighboring development to the west. No areas of PCCSY are tributary to the project site.

9.3 Resource Protection Ordinance (RPO) Methods (BMPDM Appendix H.1.1.1)

- Either of two Resource Protection Ordinance (RPO) methods may also be used to demonstrate compliance with CCSYA requirements. Select either option and document the selection below:

☐ **RPO Scenario 1: PDP is subject to and in compliance with RPO requirements**[5]

- **Select** if the project requires one or more discretionary permits;
- **Demonstrate** that onsite AND upstream offsite CCSYAs will be avoided and/or bypassed.

☐ **RPO Scenario 2: PDP is entirely exempt/not subject to RPO requirements**[6]

- **Select** if the project does not require discretionary permits;
- **Demonstrate** that all upstream offsite CCSYAs will be bypassed[7].

A. Mapping Results -- At a minimum, show as applicable: (1) the project footprint, (2) areas of proposed development, (3) locations of onsite and upstream offsite CCSYAs, and (4) bypass of all identified CCSYAs.

[5] RPO applicability is normally confirmed during discretionary review. Check with your project manager if you're not sure of your status.
[6] Does not include PDPs utilizing exemption(s) via RPO Section 86.604(e)(2)(cc) or 86.604(e)(3).
[7] This scenario does not impose requirements for onsite CCSYAs.

B. Explanation -- Provide documentation as needed to demonstrate that (1) onsite CCSYAs are avoided and bypassed [if applicable], and (2) upstream offsite CCYSAs are effectively bypassed. Add pages as necessary.

9.4 No Net Impact Analysis (BMPDM Appendix H.4)

- When impacts to CCSYAs cannot be avoided or effectively bypassed, applicants must demonstrate that their project generates no net impact to the receiving water per the performance metrics identified in BMPDM Appendix H.4.
- Use the space below to document that the PDP will generate no net impact to any receiving water.

No Net Impact Analysis (add or attach pages as necessary)

This form must be accepted by the County prior to the release of construction permits or granting of occupancy for applicable portions of a Priority Development Project (PDP). Its purpose is to provide documentation of the final installation of permanent Best Management Practices (BMPs) used to satisfy Structural Performance Standards for the development project. Compliance with these standards reduces the discharge of pollutants and flows from the completed project site. Applicable standards may be satisfied using Structural BMPs (S-BMPs), Significant Site Design BMPs (SSD-BMPs), or both. Applicants are responsible for providing all requested information.

PART 1 PROJECT INFORMATION

A. Project Summary Information	
Project Name	Bradley Avenue Convalenscent Home
Record ID (e.g. grading/improvement plan number, building permit)	
Project Address	675 East Bradley Avenue, El Cajon, CA 92021
Assessor's Parcel Number(s) APN(s)	APN: 387-142-36-00
Project Watershed (Hydrologic Unit, Area, and Subarea Name with Numeric Identifier)	San Diego HU, Lower San Diego HA, El Cajon HAS 907.13
B. Owner Information	
Name	Mr. Thomas Jurbala
Address	6 Hutton Centre Drive, Suite 400, Santa Ana, CA 92707
Email Address	thomasjurbala@lifegen.com
Phone Number	(714) 241-5600

COUNTY – OFFICIAL USE ONLY	
INTAKE ID#	
ACCEPTANCE ID#	

****THIS PAGE IS FOR PARTIAL VERIFICATIONS ONLY ****

If final grade release or granting of occupancy is being requested for only a portion of the Priority Development Project (PDP) please fill out the table below. Include ALL of the Structural BMPs and/or Significant Site Design BMPs for the entire project in the table. **Include a mark-up of the DMA map from the approved SWQMP with this Verification package that clearly shows which DMAs you are submitting for approval and which DMAs have already been accepted (if any).**

DMA #	APN or Lot #	BMP ID #	WPP Acceptance Date (If applicable)	WPP Acceptance ID# (If applicable, e.g. 20/21-001)

PART 2 BMP INVENTORY INFORMATION

Use this table to document Structural BMPs (S-BMPs) and Significant Site Design BMPs (SSD-BMPs) for the PDP. All DMAs that are not self-mitigating or de minimis must have at least one Structural BMP or Significant Site Design BMP.

- In **Part A** list all Structural BMPs (including both Pollutant Control and/or Hydromodification as applicable) by DMA.
- Complete **Part B** for all DMAs that contain only Significant Site Design BMPs. SSD-BMPs are Site Design BMPs (SD-BMPs) that are sized and constructed to satisfy Structural Performance Standards for a DMA.
- The information provided for each BMP in the table must match that provided in the Stormwater Quality Management Plan (SWQMP), construction plans, maintenance agreements, and other relevant project documentation.

DMA #	BMP Information			Maintenance Category (1, 2, 3, or 4)	Maintenance Agreement Recorded DOC #	Construction Plan Sheet #	Landscape Plan Sheet #	FOR DPW-WPP USE ONLY
	Quantity	Description/Type of Structural BMP	BMP ID #					
A. Structural BMPs (S-BMPs)								
DMA 1	1	Biofiltration	BMP A	2	TBD			
DMA 2	1	Biofiltration	BMP B	2	TBD			
DMA 3	1	Biofiltration	BMP C	2	TBD			
Add rows as needed. Click into the last column in the row below this, then press TAB to add a new row.								
B. Significant Site Design BMPs (SSD-BMPs)								
		Choose an item.		Choose				
		Choose an item.		Choose				
		Choose an item.		Choose				
		Choose an item.		Choose				
		Choose an item.		Choose				
		Choose an item.		Choose				
Add rows as needed. Click into the last column in the row below this, then press TAB to add a new row.								

PART 3 REQUIRED ATTACHMENTS

For the permanent BMPs listed in Part 2, submit the following to the County inspector along with this Verification form as a package (check all that are attached):

☐ **PHOTOGRAPHS:** Final construction photos of every permanent BMP listed in Part 2 are required. Final photos must be recent and be labeled with the date and a BMP Identifier. Additional photographs illustrating proper construction of the BMPs are recommended to be included and may be requested by WPP prior to acceptance of this Verification (e.g. excavation depths, liners, hydromodification orifices, Biofiltration Soil Media (BSM), vegetation, mulch).

☐ **MAINTENANCE AGREEMENTS:** Copies of approved and recorded Storm Water Maintenance Agreements (SWMA), Category 1 Maintenance Notification Agreements (MN), or Encroachment Maintenance and Removal Agreements (EMRA) for all S-BMPs.

Note: Significant Site Design (SSD) BMPs and most Category 4 BMPs do not require recorded maintenance agreements.

☐ **CONSTRUCTION PLANS:** Submit electronic and/or 11" X 17" hard copies of the current approved Construction Plan sheets for the Record ID(s) listed on Page 1:

- ☐ Grading Plans
- ☐ Improvement Plans
- ☐ Precise Grading Plan
- ☐ Building Plan (Applicable BMP Sheets only)
- ☐ Other (Please specify) _____

For each Construction Plan, the sheets submitted must incorporate all of the following:

- A BMP Table on Sheet 1, AND
- A plan detail cross-section of each verified as-built BMP, AND
- The location of each verified as-built BMP

☐ **LANDSCAPE PLANS**: If the PDP includes vegetated BMPs and has a Landscape Plan, submit the following:

- ☐ Final Landscape Plans
- ☐ Proof of Irrigation Installed (if applicable)

PART 4 PREPARER'S CERTIFICATION

By signing below, I certify that the BMP(s) listed in Part 2 of this Verification Form have been constructed and are in substantial conformance with the approved plans and applicable regulations. I understand the County reserves the right to inspect the above BMPs to verify compliance with the approved plans and Watershed Protection Ordinance (WPO). Should it be determined that the BMPs were not constructed to plan or code, corrective actions may be necessary before permits can be closed.

Note: Structural BMPs must be certified by a licensed professional engineer.

Please sign and, if applicable, provide your seal below.

Preparer's Name:	Kyle Koivuniemi, PE
Email Address:	Kyle.koivuniemi@kimley-horn.com
Phone Number:	714-939-1030
Preparer's Signature:	
Date:	

[SEAL]

PROJECT RECORD ID: _____

COUNTY - OFFICIAL USE ONLY

County Inspector Approval:

***NOTE: The County approved SWQMP document and any Addendums or Revisions must be included with this BMP Installation Verification submittal package.**

- ☐ DPW Private Development Construction Inspection (PDCI)
- ☐ PDS Building
- ☐ DGS
- ☐ DPR

By signing below, the County Inspector concurs that every BMP listed in Part 2 of this BMP Installation Verification form has been installed per plan.

Inspector Name: _____

Inspector's Signature: _____ Date: _____

DPW Watershed Protection Program (WPP) Acceptance:

Date Received: _____

WPP Reviewer: _____

WPP Reviewer concurs that the BMPs accepted in **Part 2** above may be entered into County inventory.

WPP Reviewer's Signature: _____ Date: _____

Enter Acceptance ID# on page 1.

NOTES:

11.0 Cover Sheet and General Requirements

- All Structural BMPs must have a plan and mechanism to ensure on-going maintenance. Use the table below to document the types of agreements to be submitted for the PDP and submit them under cover of this sheet.
- See BMPDM Section 7.3 for a description of maintenance categories and responsibilities. Note that since Category 3 and 4 BMPs are County-maintained, they do not require maintenance agreements.

a. Applicability of Maintenance Agreements

Check the boxes below to indicate which types of agreements are included with this attachment.

☐ **Maintenance Notification Agreement for Category 1 Stormwater Structural BMPs**

- Exhibit A: Project Site Map; and a Map for each BMP and its Drainage Management Area (DMA).
- Exhibit B: BMP Maintenance Plan (see below)

CATEGORY 1 MAINTENANCE AGREEMENTS ARE RECORDED PRIOR TO OCCUPANCY.

☒ **Storm Water Facilities Maintenance Agreement (SWMA) (Category 2 BMPs)**

- Exhibit A: Legal Description of Property
- Exhibit B: BMP Maintenance Program (see below)
- Exhibit C: BMP Locations

CATEGORY 2 MAINTENANCE AGREEMENTS ARE RECORDED PRIOR TO PERMIT ISSUANCE.

Maintenance agreement templates and instructions are available on the County's website: www.sandiegocounty.gov/stormwater under the Development Resources tab, Submittal Templates.

b. Maintenance Plan Requirements

Maintenance plans should include the following:

☒ Specific **maintenance indicators and actions** for proposed structural BMP(s). These must be based on maintenance indicators presented in BMP Design Manual Fact Sheets in Appendix E and enhanced to reflect actual proposed components of the structural BMP(s).

☒ **Access** to inspect and perform maintenance on the structural BMP(s).

☒ Features 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.

Exhibit A: Legal Description of Property

LEGAL DESCRIPTION
Real property in the unincorporated area of the County of San Diego, State of California, described as follows:

ALL THAT PORTION OF TRACT "A" OF MONSERATE RANCHO, IN THE COUNTY OF SAN DIEGO, STATE OF CALIFORNIA, ACCORDING TO MAP THEREOF ON FILE IN THE OFFICE OF COUNTY RECORDING TO MAP THEREOF ON FILE IN THE OFFICE OF COUNTY RECORDER OF SAN DIEGO COUNTY, IN BOOK 1, PAGE 108 OF PATENTS, DESCRIBED AS FOLLOWS:

BEGINNING AT THE INTERSECTION OF THE CENTER LINE OF VIA BELMONTE AND THE CENTER LINE OF VIA DE TODOS SANTOS, IN PALA MESA VILLAGE UNIT NO. 1, ACCORDING TO MAP THEREOF NO. 5494, FILED IN THE OFFICE OF THE COUNTY RECORDER OF SAN DIEGO COUNTY, BEING A POINT ON A 500.00 FOOT RADIUS CURVE, CONCAVE EASTERLY IN SAID CENTER LINE OF VIA DE TODOS SANTOS: THENCE ALONG A RADIUS OF SAID CURVE, SOUTH 60°22'30" EAST, 30.00 FEET TO A 470.00 FOOT RADIUS CURVE IN THE EASTERLY LINE OF VIA DE TODOS SANTOS, BEING THE TRUE POINT OF BEGINNING AND BEING THE BEGINNING OF A TANGENT 175.27 FOOT RADIUS CURVE, CONCAVE NORTHERLY, ALSO BEING THE MOST WESTERLY CORNER OF LAND DESCRIBED IN DEED TO DEAN J. MILLER, RECORDED MAY 27, 1965 AS INSTRUMENT NO. 94867 OF OFFICIAL RECORDS; THENCE ALONG THE SOUTHERLY BOUNDARY OF SAID LAND, EASTERLY ALONG SAID CURVE, THROUGH AN ANGLE OF 70°59'35" - RECORD 70°59'55" - A DISTANCE OF 217.17 FEET - RECORD 217.19 FEET - 1 THENCE TANGENT TO SAID CURVE, NORTH 48°37'55" FEET, 22.81 FEET - RECORD 25.81 FEET- TO THE BEGINNING OF A TANGENT 200.00 FOOT RADIUS CURVE, CONCAVE SOUTHERLY; THENCE EASTERLY ALONG SAID CURVE, THROUGH AN ANGLE OF 42°07'15" - RECORD 40°36'55" - A DISTANCE OF 147.03 FEET -RECORD 141.77 FEET - 1 THENCE TANGENT TO SAID CURVE, SOUTH 89°14'50" EAST, 222.99 FEET TO THE WESTERLY BOUNDARY OF THE LAND DESCRIBED IN DEED TO THE STATE OF CALIFORNIA - XI-SD-77-G, RECORDED NOVEMBER 23, 1948, AS INSTRUMENT NO. 116540 OF OFFICIAL RECORDS; THENCE ALONG SAID WESTERLY BOUNDARY SOUTH 0°45'10" WEST 849.57 FEET TO THE MOST NORTHERLY CORNER OF THE LAND DESCRIBED IN DEED TO THE RENDALE COMPANY, RECORDED NOVEMBER 1, 1963 AS INSTRUMENT NO. 196272 OF OFFICIAL RECORDS; THENCE ALONG THE NORTHWESTERLY LINE OF SAID LAND, SOUTH 44°25'30" WEST, 308.50 FEET TO THE MOST WESTERLY CORNER OF SAID LAND; THENCE ALONG THE SOUTHWESTERLY LINE THEREOF, SOUTH 45°34'30" EAST, 103.58 FEET TO THE NORTHWESTERLY BOUNDARY OF SAID STATE OF CALIFORNIA LAND; THENCE ALONG SAID NORTHWESTERLY BOUNDARY SOUTH 44°25'30" WEST, 422.69 FEET TO THE MOST EASTERLY CORNER OF SAID VIA DE TODOS SANTOS AS SHOWN ON SAID MAP NO. 5494; THENCE ALONG THE NORTHEASTERLY AND EASTERLY BOUNDARY OF SAID MAP AS FOLLOWS:

WESTERLY ALONG A TANGENT 25.00 FOOT RADIUS CURVE, CONCAVE NORTHERLY THROUGH AN ANGLE OF 90° A DISTANCE OF 39.27 FEET; TANGENT TO SAID CURVE, NORTH 45°34'30" WEST, 118.30 FEET TO A TANGENT 270.00 FOOT RADIUS CURVE, CONCAVE NORTHEASTERLY, NORTHWESTERLY ALONG SAID CURVE THROUGH AN ANGLE OF 46°19' A DISTANCE OF 218.26 FEET; TANGENT TO SAID CURVE, NORTH 0°44'30" EAST, 856.39 FEET TO A TANGENT 470.00 FOOT RADIUS CURVE, CONCAVE EASTERLY: AND NORTHERLY ALONG SAID CURVE, THROUGH AN ANGLE OF 28°53' A DISTANCE OF 236.93 FEET TO THE TRUE POINT OF BEGINNING. EXCEPT THEREFROM THAT PORTION LYING SOUTHERLY AND EASTERLY OF THE NORTHERLY AND WESTERLY LINE OF LAND DESCRIBED IN A DEED

TO THE STATE OF CALIFORNIA FOR FREEWAY PURPOSES, RECORDED DECEMBER 21, 1972 AS INSTRUMENT NO. 338995 OF OFFICIAL RECORDS, SAID NORTHERLY AND WESTERLY LINE BEING DESCRIBED AS FOLLOWS:

BEGINNING AT THE MOST EASTERLY CORNER OF VIA DE TODOS SANTOS AS SHOWN ON MAP NO. 5494 OF PALA MESA VILLAGE, UNIT NO. 1, FILED IN THE OFFICE OF THE COUNTY RECORDER'S OFFICE NOVEMBER 12, 1964, BEING A POINT IN THE WESTERLY BOUNDARY OF LAND DESCRIBED IN DEED TO THE STATE OF CALIFORNIA, RECORDED NOVEMBER 23, 1948 AS INSTRUMENT NO. 116540; THENCE ALONG THE EASTERLY BOUNDARY OF SAID MAP NO. 5494 AS FOLLOWS: -1- WESTERLY FROM A TANGENT WHICH BEARS SOUTH 44°55'38" WEST, ALONG A CURVE CONCAVE NORTHERLY HAVING A RADIUS OF 25.00 FEET, THROUGH A CENTRAL ANGLE OF 90°00'00", AN ARC DISTANCE OF 39.27 FEET; -2- TANGENT TO SAID CURVE NORTH 45°04'22" WEST, 117.42 FEET; -3- NORTHWESTERLY ALONG A TANGENT CURVE CONCAVE NORTHEASTERLY HAVING A RADIUS OF 270.46 FEET, THROUGH A CENTRAL ANGLE OF 46°23'17", AN ARC DISTANCE OF 218.97 FEET; -4- TANGENT TO SAID CURVE NORTH 1°18'55" EAST, 276.13 FEET; TO THE TRUE POINT OF BEGINNING OF THE HEREIN DESCRIBED LINE, THENCE -5- LEAVING THE EASTERLY BOUNDARY OF SAID MAP NO. 5494, SOUTH 70°46'49" EAST, 97.57 FEET TO POINT "A" OF THIS DESCRIPTION; THENCE -6- NORTH 19°13'11" EAST TO THE NORTHERLY LINE OF PARCEL 1.

APN: 125-050-54-00

Order Number: NCS-918593-SD

First American Title

Exhibit B: BMP Maintenance Plan

BF-1
Biofiltration

BMP MAINTENANCE FACT SHEET
FOR
STRUCTURAL BMP BF-1 BIOFILTRATION

Biofiltration facilities are vegetated surface water systems that filter water through vegetation, and soil or engineered media prior to discharge via underdrain or overflow to the downstream conveyance system. Biofiltration facilities have limited or no infiltration. They are typically designed to provide enough hydraulic head to move flows through the underdrain connection to the storm drain system. Typical biofiltration components include:

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

Normal Expected Maintenance

Biofiltration requires routine maintenance to: remove accumulated materials such as sediment, trash or debris; maintain vegetation health; maintain infiltration capacity of the media layer; replenish mulch; and maintain integrity of side slopes, inlets, energy dissipators, and outlets. A summary table of standard inspection and maintenance indicators is provided within this Fact Sheet.

Non-Standard Maintenance or BMP Failure

If any of the following scenarios are observed, the BMP is not performing as intended to protect downstream waterways from pollution and/or erosion. Corrective maintenance, increased inspection and maintenance, BMP replacement, or a different BMP type will be required.

- The BMP is not drained between storm events. Surface ponding longer than approximately 24 hours following a storm event may be detrimental to vegetation health, and surface ponding longer than approximately 96 hours following a storm event poses a risk of vector (mosquito) breeding. Poor drainage can result from clogging of the media layer, filter course, aggregate storage layer, underdrain, or outlet structure. The specific cause of the drainage issue must be determined and corrected.
- Sediment, trash, or debris accumulation greater than 25% of the surface ponding volume within one month. This means the load from the tributary drainage area is too high, reducing BMP function or clogging the BMP. This would require pretreatment measures within the tributary area draining to the BMP to intercept the materials. Pretreatment components, especially for sediment, will extend the life of components that are more expensive to replace such as media, filter course, and aggregate layers.
- Erosion due to concentrated storm water runoff flow that is not readily corrected by 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.

Other Special Considerations

Biofiltration is a vegetated structural BMP. Vegetated structural BMPs that are constructed in the vicinity of, or connected to, an existing jurisdictional water or wetland could inadvertently result in creation of expanded waters or wetlands. As such, vegetated structural BMPs have the potential to come under the jurisdiction of the United States Army Corps of Engineers, SDRWQCB, California Department of Fish and Wildlife, or the United States Fish and Wildlife Service. This could result in the need for specific resource agency permits and costly mitigation to perform maintenance of the structural BMP. Along with proper placement of a structural BMP, **routine maintenance is key to preventing this scenario**.

SUMMARY OF STANDARD INSPECTION AND MAINTENANCE FOR BF-1 BIOFILTRATION		
The property owner is responsible to ensure inspection, operation and maintenance of permanent BMPs on their property unless responsibility has been formally transferred to an agency, community facilities district, homeowners association, property owners association, or other special district. Maintenance frequencies listed in this table are average/typical frequencies. Actual maintenance needs are site-specific, and maintenance may be required more frequently. Maintenance must be performed whenever needed, based on maintenance indicators presented in this table. The BMP owner is responsible for conducting regular inspections to see when maintenance is needed based on the maintenance indicators. During the first year of operation of a structural BMP, inspection is recommended at least once prior to August 31 and then monthly from September through May. Inspection during a storm event is also recommended. After the initial period of frequent inspections, the minimum inspection and maintenance frequency can be determined based on the results of the first year inspections.		
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. • Maintenance when needed.
Poor vegetation establishment	Re-seed, re-plant, or re-establish vegetation per original plans.	• Inspect monthly. • Maintenance when needed.
Dead or diseased vegetation	Remove dead or diseased vegetation, re-seed, re-plant, or re-establish vegetation per original plans.	• Inspect monthly. • Maintenance when needed.
Overgrown vegetation	Mow or trim as appropriate.	• Inspect monthly. • Maintenance 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. • Replenish mulch annually, or more frequently when needed based on inspection.

*"25% full" is defined as ¼ of the depth from the design bottom elevation to the crest of the outflow structure (e.g., if the height to the outflow opening is 12 inches from the bottom elevation, then the materials must be removed when there is 3 inches of accumulation – this should be marked on the outflow structure).

SUMMARY OF STANDARD INSPECTION AND MAINTENANCE FOR BF-1 BIOFILTRATION (Continued from previous page)		
Threshold/Indicator	**Maintenance Action**	**Typical Maintenance Frequency**
Erosion due to concentrated irrigation flow	Repair/re-seed/re-plant eroded areas and adjust the irrigation system.	• Inspect monthly. • Maintenance 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. • Maintenance 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. • Maintenance 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-hour drawdown criteria due to release rates controlled by an orifice installed on the underdrain, the [City Engineer] shall be contacted to determine a solution. A different BMP type, or a Vector Management Plan prepared with concurrence from the County of San Diego Department of Environmental Health, may be required.	• 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. • Maintenance when needed.
Underdrain clogged	Clear blockage.	• Inspect if standing water is observed for longer than 24-96 hours following a storm event. • Maintenance when needed.

References

American Mosquito Control Association.
http://www.mosquito.org/
California Storm Water Quality Association (CASQA). 2003. Municipal BMP Handbook.
https://www.casqa.org/resources/bmp-handbooks/municipal-bmp-handbook
County of San Diego. 2014. Low Impact Development Handbook.
http://www.sandiegocounty.gov/content/sdc/dpw/watersheds/susmp/lid.html
San Diego County Copermittees. 2016. Model BMP Design Manual, Appendix E, Fact Sheet BF-1.
http://www.projectcleanwater.org/index.php?option=com_content&view=article&id=250&Itemid=220

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BF-1
Biofiltration

Date:	Inspector:	BMP ID No.: BMP-A
Permit No.:	APN(s):	
Property / Development Name:	Responsible Party Name and Phone Number:	
Property Address of BMP:	Responsible Party Address:	

INSPECTION AND MAINTENANCE CHECKLIST FOR BF-1 BIOFILTRATION PAGE 1 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Accumulation of sediment, litter, or debris Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Remove and properly dispose of accumulated materials, without damage to the vegetation ☐ If sediment, litter, or debris accumulation exceeds 25% of the surface ponding volume within one month (25% full*), add a forebay or other pre-treatment measures within the tributary area draining to the BMP to intercept the materials. ☐ Other / Comments:		
Poor vegetation establishment Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Re-seed, re-plant, or re-establish vegetation per original plans ☐ Other / Comments:		

*"25% full" is defined as ¼ of the depth from the design bottom elevation to the crest of the outflow structure (e.g., if the height to the outflow opening is 12 inches from the bottom elevation, then the materials must be removed when there is 3 inches of accumulation – this should be marked on the outflow structure).

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Biofiltration

Date:	Inspector:	BMP ID No.: BMP-A
Permit No.:	APN(s):	

INSPECTION AND MAINTENANCE CHECKLIST FOR BF-1 BIOFILTRATION PAGE 2 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Dead or diseased vegetation Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Remove dead or diseased vegetation, re-seed, re-plant, or re-establish vegetation per original plans ☐ Other / Comments:		
Overgrown vegetation Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Mow or trim as appropriate ☐ Other / Comments:		
2/3 of mulch has decomposed, or mulch has been removed Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Remove decomposed fraction and top off with fresh mulch to a total depth of 3 inches ☐ Other / Comments:		

Date:	Inspector:	BMP ID No.: BMP-A
Permit No.:	APN(s):	

INSPECTION AND MAINTENANCE CHECKLIST FOR BF-1 BIOFILTRATION PAGE 3 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Erosion due to concentrated irrigation flow Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Repair/re-seed/re-plant eroded areas and adjust the irrigation system ☐ Other / Comments:		
Erosion due to concentrated storm water runoff flow Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ 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 ☐ Other / Comments:		

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Biofiltration

Date:	Inspector:	BMP ID No.: BMP-A
Permit No.:	APN(s):	

INSPECTION AND MAINTENANCE CHECKLIST FOR BF-1 BIOFILTRATION PAGE 4 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Obstructed inlet or outlet structure Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Clear blockage ☐ Other / Comments:		
Underdrain clogged (inspect underdrain if standing water is observed for longer than 24-96 hours following a storm event) Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Clear blockage ☐ Other / Comments:		
Damage to structural components such as weirs, inlet or outlet structures Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Repair or replace as applicable ☐ Other / Comments:		

BF-1
Biofiltration

Date:	Inspector:	BMP ID No.: BMP-A
Permit No.:	APN(s):	

INSPECTION AND MAINTENANCE CHECKLIST FOR BF-1 BIOFILTRATION PAGE 5 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Standing water in BMP for longer than 24-96 hours following a storm event* Surface ponding longer than approximately 24 hours following a storm event may be detrimental to vegetation health Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ 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 ☐ Other / Comments:		
Presence of mosquitos/larvae For images of egg rafts, larva, pupa, and adult mosquitos, see http://www.mosquito.org/biology Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Apply corrective measures to remove standing water in BMP when standing water occurs for longer than 24-96 hours following a storm event.** ☐ Other / Comments:		

*Surface ponding longer than approximately 24 hours following a storm event may be detrimental to vegetation health, and surface ponding longer than approximately 96 hours following a storm event poses a risk of vector (mosquito) breeding. Poor drainage can result from clogging of the media layer, filter course, aggregate storage layer, underdrain, or outlet structure. The specific cause of the drainage issue must be determined and corrected.

**If mosquitos persist following corrective measures to remove standing water, or if the BMP design does not meet the 96-hour drawdown criteria due to release rates controlled by an orifice installed on the underdrain, the [City Engineer] shall be contacted to determine a solution. A different BMP type, or a Vector Management Plan prepared with concurrence from the County of San Diego Department of Environmental Health, may be required.

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Biofiltration

Date:	Inspector:	BMP ID No.: BMP-B
Permit No.:	APN(s):	
Property / Development Name:	Responsible Party Name and Phone Number:	
Property Address of BMP:	Responsible Party Address:	

INSPECTION AND MAINTENANCE CHECKLIST FOR BF-1 BIOFILTRATION PAGE 1 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Accumulation of sediment, litter, or debris Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Remove and properly dispose of accumulated materials, without damage to the vegetation ☐ If sediment, litter, or debris accumulation exceeds 25% of the surface ponding volume within one month (25% full*), add a forebay or other pre-treatment measures within the tributary area draining to the BMP to intercept the materials. ☐ Other / Comments:		
Poor vegetation establishment Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Re-seed, re-plant, or re-establish vegetation per original plans ☐ Other / Comments:		

*"25% full" is defined as ¼ of the depth from the design bottom elevation to the crest of the outflow structure (e.g., if the height to the outflow opening is 12 inches from the bottom elevation, then the materials must be removed when there is 3 inches of accumulation – this should be marked on the outflow structure).

BF-1
Biofiltration

Date:	Inspector:	BMP ID No.: BMP-B
Permit No.:	APN(s):	

INSPECTION AND MAINTENANCE CHECKLIST FOR BF-1 BIOFILTRATION PAGE 2 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Dead or diseased vegetation Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Remove dead or diseased vegetation, re-seed, re-plant, or re-establish vegetation per original plans ☐ Other / Comments:		
Overgrown vegetation Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Mow or trim as appropriate ☐ Other / Comments:		
2/3 of mulch has decomposed, or mulch has been removed Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Remove decomposed fraction and top off with fresh mulch to a total depth of 3 inches ☐ Other / Comments:		

Date:	Inspector:	BMP ID No.: BMP-B
Permit No.:	APN(s):	

INSPECTION AND MAINTENANCE CHECKLIST FOR BF-1 BIOFILTRATION PAGE 3 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Erosion due to concentrated irrigation flow Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Repair/re-seed/re-plant eroded areas and adjust the irrigation system ☐ Other / Comments:		
Erosion due to concentrated storm water runoff flow Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ 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 ☐ Other / Comments:		

Date:	Inspector:	BMP ID No.: BMP-B
Permit No.:	APN(s):	

INSPECTION AND MAINTENANCE CHECKLIST FOR BF-1 BIOFILTRATION PAGE 4 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Obstructed inlet or outlet structure Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Clear blockage ☐ Other / Comments:		
Underdrain clogged (inspect underdrain if standing water is observed for longer than 24-96 hours following a storm event) Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Clear blockage ☐ Other / Comments:		
Damage to structural components such as weirs, inlet or outlet structures Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Repair or replace as applicable ☐ Other / Comments:		

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Biofiltration

Date:	Inspector:	BMP ID No.: BMP-B
Permit No.:	APN(s):	

INSPECTION AND MAINTENANCE CHECKLIST FOR BF-1 BIOFILTRATION PAGE 5 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Standing water in BMP for longer than 24-96 hours following a storm event* Surface ponding longer than approximately 24 hours following a storm event may be detrimental to vegetation health Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ 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 ☐ Other / Comments:		
Presence of mosquitos/larvae For images of egg rafts, larva, pupa, and adult mosquitos, see http://www.mosquito.org/biology Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Apply corrective measures to remove standing water in BMP when standing water occurs for longer than 24-96 hours following a storm event.** ☐ Other / Comments:		

*Surface ponding longer than approximately 24 hours following a storm event may be detrimental to vegetation health, and surface ponding longer than approximately 96 hours following a storm event poses a risk of vector (mosquito) breeding. Poor drainage can result from clogging of the media layer, filter course, aggregate storage layer, underdrain, or outlet structure. The specific cause of the drainage issue must be determined and corrected.

**If mosquitos persist following corrective measures to remove standing water, or if the BMP design does not meet the 96-hour drawdown criteria due to release rates controlled by an orifice installed on the underdrain, the [City Engineer] shall be contacted to determine a solution. A different BMP type, or a Vector Management Plan prepared with concurrence from the County of San Diego Department of Environmental Health, may be required.

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Biofiltration

Date:	Inspector:	BMP ID No.: BMP-C
Permit No.:	APN(s):	
Property / Development Name:	Responsible Party Name and Phone Number:	
Property Address of BMP:	Responsible Party Address:	

INSPECTION AND MAINTENANCE CHECKLIST FOR BF-1 BIOFILTRATION PAGE 1 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Accumulation of sediment, litter, or debris Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Remove and properly dispose of accumulated materials, without damage to the vegetation ☐ If sediment, litter, or debris accumulation exceeds 25% of the surface ponding volume within one month (25% full*), add a forebay or other pre-treatment measures within the tributary area draining to the BMP to intercept the materials. ☐ Other / Comments:		
Poor vegetation establishment Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Re-seed, re-plant, or re-establish vegetation per original plans ☐ Other / Comments:		

*"25% full" is defined as ¼ of the depth from the design bottom elevation to the crest of the outflow structure (e.g., if the height to the outflow opening is 12 inches from the bottom elevation, then the materials must be removed when there is 3 inches of accumulation – this should be marked on the outflow structure).

BF-1
Biofiltration

Date:	Inspector:	BMP ID No.: BMP-C
Permit No.:	APN(s):	

INSPECTION AND MAINTENANCE CHECKLIST FOR BF-1 BIOFILTRATION PAGE 2 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Dead or diseased vegetation Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Remove dead or diseased vegetation, re-seed, re-plant, or re-establish vegetation per original plans ☐ Other / Comments:		
Overgrown vegetation Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Mow or trim as appropriate ☐ Other / Comments:		
2/3 of mulch has decomposed, or mulch has been removed Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Remove decomposed fraction and top off with fresh mulch to a total depth of 3 inches ☐ Other / Comments:		

Date:	Inspector:	BMP ID No.: BMP-C
Permit No.:	APN(s):	

INSPECTION AND MAINTENANCE CHECKLIST FOR BF-1 BIOFILTRATION PAGE 3 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Erosion due to concentrated irrigation flow Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Repair/re-seed/re-plant eroded areas and adjust the irrigation system ☐ Other / Comments:		
Erosion due to concentrated storm water runoff flow Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ 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 ☐ Other / Comments:		

BF-1
Biofiltration

Date:	Inspector:	BMP ID No.: BMP-C
Permit No.:	APN(s):	

INSPECTION AND MAINTENANCE CHECKLIST FOR BF-1 BIOFILTRATION PAGE 4 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Obstructed inlet or outlet structure Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Clear blockage ☐ Other / Comments:		
Underdrain clogged (inspect underdrain if standing water is observed for longer than 24-96 hours following a storm event) Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Clear blockage ☐ Other / Comments:		
Damage to structural components such as weirs, inlet or outlet structures Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Repair or replace as applicable ☐ Other / Comments:		

BF-1
Biofiltration

Date:	Inspector:	BMP ID No.: BMP-C
Permit No.:	APN(s):	

INSPECTION AND MAINTENANCE CHECKLIST FOR BF-1 BIOFILTRATION PAGE 5 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Standing water in BMP for longer than 24-96 hours following a storm event* Surface ponding longer than approximately 24 hours following a storm event may be detrimental to vegetation health Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ 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 ☐ Other / Comments:		
Presence of mosquitos/larvae For images of egg rafts, larva, pupa, and adult mosquitos, see http://www.mosquito.org/biology Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Apply corrective measures to remove standing water in BMP when standing water occurs for longer than 24-96 hours following a storm event.** ☐ Other / Comments:		

*Surface ponding longer than approximately 24 hours following a storm event may be detrimental to vegetation health, and surface ponding longer than approximately 96 hours following a storm event poses a risk of vector (mosquito) breeding. Poor drainage can result from clogging of the media layer, filter course, aggregate storage layer, underdrain, or outlet structure. The specific cause of the drainage issue must be determined and corrected.

**If mosquitos persist following corrective measures to remove standing water, or if the BMP design does not meet the 96-hour drawdown criteria due to release rates controlled by an orifice installed on the underdrain, the [City Engineer] shall be contacted to determine a solution. A different BMP type, or a Vector Management Plan prepared with concurrence from the County of San Diego Department of Environmental Health, may be required.

Exhibit C: Project Site Vicinity Map