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

17 On Voltaire - 4103 Voltaire Street

PTS 640598 (Voltaire Street SDP)

[Insert Drawing Number (if applicable) and Internal Order Number (if applicable)]

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

Engineer of Work:

Tyler G Lawson, PE #80356
Provide Wet Signature and Stamp Above Line

Prepared For:

CityMark Communities LLC
3818 Park Blvd
San Diego, CA 92103
(619) 231-1161

Prepared By:

Pasco, Laret, Suiter & Associates
535 N. Highway 101, Suite A
Solana Beach, CA 92075
Ph: (858) 259-8212

Date:
5/13/2020

Approved by: City of San Diego Date

The City of SAN DIEGO

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- Attachment 3: Structural BMP Maintenance Plan
    - Maintenance Agreement (Form DS-3247) (when applicable)
- Attachment 4: Copy of Plan Sheets Showing Permanent Storm Water BMPs
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- Attachment 6: Project's Geotechnical and Groundwater Investigation Report

Acronyms

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

Certification Page

Project Name: 17 on Voltaire
Permit Application PTS #640598

I hereby declare that I am the Engineer in Responsible Charge of design of storm water BMPs for this project, and that I have exercised responsible charge over the design of the project as defined in Section 6703 of the Business and Professions Code, and that the design is consistent with the requirements of the Storm Water Standards, which is based on the requirements of SDRWQCB Order No. R9-2013-0001 as amended by R9-2015-0001 and R9-2015-0100 (MS4 Permit).

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

Engineer of Work's Signature

80356

PE#

12/31/20

Expiration Date

Tyler G. Lawson

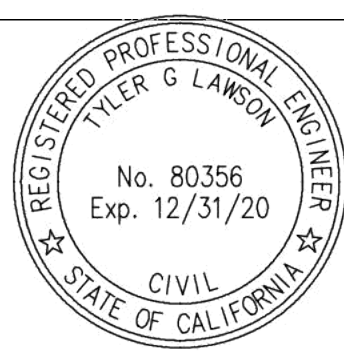
Print Name

Pasco, Laret, Suiter & Associates

Company

5/13/20

Date



Engineer's Stamp

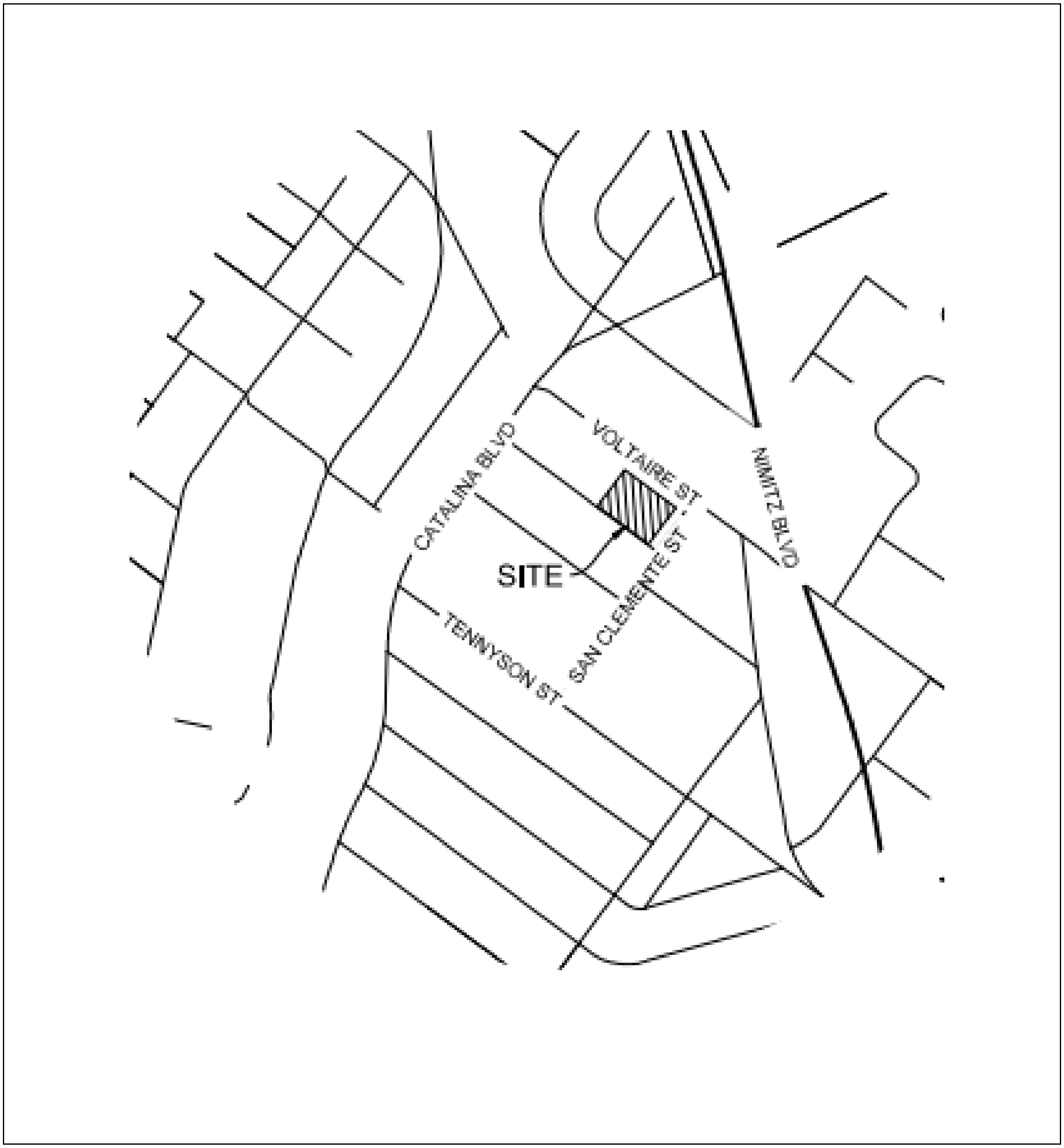
Submittal Record

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

Submittal Number	Date	Project Status	Changes
1	6/6/19	☑ Preliminary Design/Planning/CEQA ☐ Final Design	**Initial Submittal**
2	9/3/19	☑ Preliminary Design/Planning/CEQA ☐ Final Design	Initial Full SDP Submittal after Completeness Review
3	1/7/20	☑ Preliminary Design/Planning/CEQA ☐ Final Design	SDP Resubmittal and addressing Agency comments
4	3/16/20	☑ Preliminary Design/Planning/CEQA ☐ Final Design	SDP Resubmittal and addressing Agency comments
5	5/18/20	☑ Preliminary Design/Planning/CEQA ☐ Final Design	SDP Resubmittal and addressing Agency comments

Project Vicinity Map

Project Name: 4103 / 4111 VOLTAIRE STREET
Permit Application PTS 640598 (Voltaire Street SDP)



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

Attach DS-560 form.

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City of San Diego
Development Services
1222 First Ave., MS-302
San Diego, CA 92101
(619) 446-5000

Storm Water Requirements Applicability Checklist

FORM
DS-560
November 2018

Project Address: 4103 / 4111 Voltaire Street, San Diego, CA	Project Number: 640598

SECTION 1. Construction Storm Water BMP Requirements:

All construction sites are required to implement construction BMPs in accordance with the performance standards in the Storm Water Standards Manual. Some sites are additionally required to obtain coverage under the State Construction General Permit (CGP)[1] , which is administered by the State Regional Water Quality Control Board.

For all projects complete PART A: If project is required to submit a SWPPP or WPCP, continue to PART B.

PART A: Determine Construction Phase Storm Water Requirements.

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

☐ Yes; SWPPP required, skip questions 2-4 ☒ No; next question

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

☒ Yes; WPCP required, skip questions 3-4 ☐ No; next question

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

☐ Yes; WPCP required, skip question 4 ☒ No; next question

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

   ☐ Yes; no document required

Check one of the boxes below, and continue to PART B:

☐ If you checked "Yes" for question 1, **a SWPPP is REQUIRED. Continue to PART B**

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

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

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

PART B: Determine Construction Site Priority

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

Complete PART B and continued to Section 2

1. ☐ **ASBS**

a. Projects located in the ASBS watershed.

2. ☐ **High Priority**

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

b. Projects that qualify as LUP Type 2 or LUP Type 3 per the CGP and not located in the ASBS watershed.

3. ☐ **Medium Priority**

a. Projects that are not located in an ASBS watershed or designated as a High priority site.

b. Projects that qualify as Risk Level 1 or LUP Type 1 per the CGP and not located in an ASBS watershed.

c. WPCP projects (>5,000sf of ground disturbance) located within the Los Penasquitos watershed management area.

4. ☒ **Low Priority**

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

SECTION 2. Permanent Storm Water BMP Requirements.

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

PART C: Determine if Not Subject to Permanent Storm Water Requirements.

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

If "yes" is checked for any number in Part C, proceed to Part F and check "Not Subject to Permanent Storm Water BMP Requirements".

If "no" is checked for all of the numbers in Part C continue to Part D.

1.	Does the project only include interior remodels and/or is the project entirely within an existing enclosed structure and does not have the potential to contact storm water?	☐ Yes ☒ No
2.	Does the project only include the construction of overhead or underground utilities without creating new impervious surfaces?	☐ Yes ☒ No
3.	Does the project fall under routine maintenance? Examples include, but are not limited to: roof or exterior structure surface replacement, resurfacing or reconfiguring surface parking lots or existing roadways without expanding the impervious footprint, and routine replacement of damaged pavement (grinding, overlay, and pothole repair).	☐ Yes ☒ No

Clear Page 2

PART D: PDP Exempt Requirements.

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

If "yes" was checked for any questions in Part D, continue to Part F and check the box labeled "PDP Exempt."

If "no" was checked for all questions in Part D, continue to Part E.

1. Does the project ONLY include new or retrofit sidewalks, bicycle lanes, or trails that:

- **Are designed and constructed to direct storm water runoff to adjacent vegetated areas, or other non-erodible permeable areas? Or;**
- **Are designed and constructed to be hydraulically disconnected from paved streets and roads? Or;**
- **Are designed and constructed with permeable pavements or surfaces in accordance with the Green Streets guidance in the City's Storm Water Standards manual?**

☐ Yes; PDP exempt requirements apply ☒ No; next question

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

☐ Yes; PDP exempt requirements apply ☒ No; project not exempt.

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

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

If "yes" is checked for any number in PART E, continue to PART F and check the box labeled "Priority Development Project".

If "no" is checked for every number in PART E, continue to PART F and check the box labeled "Standard Development Project".

1.	**New Development that creates 10,000 square feet or more of impervious surfaces collectively over the project site.** This includes commercial, industrial, residential, mixed-use, and public development projects on public or private land.	☒ Yes ☐ No
2.	**Redevelopment project that creates and/or replaces 5,000 square feet or more of impervious surfaces on an existing site of 10,000 square feet or more of impervious surfaces.** This includes commercial, industrial, residential, mixed-use, and public development projects on public or private land.	☐ Yes ☒ No
3.	**New development or redevelopment of a restaurant.** Facilities that sell prepared foods and drinks for consumption, including stationary lunch counters and refreshment stands selling prepared foods and drinks for immediate consumption (SIC 5812), and where the land development creates and/or replace 5,000 square feet or more of impervious surface.	☐ Yes ☒ No
4.	**New development or redevelopment on a hillside.** The project creates and/or replaces 5,000 square feet or more of impervious surface (collectively over the project site) and where the development will grade on any natural slope that is twenty-five percent or greater.	☐ Yes ☒ No
5.	**New development or redevelopment of a parking lot that creates and/or replaces 5,000 square feet or more of impervious surface (collectively over the project site).**	☐ Yes ☒ No
6.	**New development or redevelopment of streets, roads, highways, freeways, and driveways.** The project creates and/or replaces 5,000 square feet or more of impervious surface (collectively over the project site).	☐ Yes ☒ No

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7.	**New development or redevelopment discharging directly to an Environmentally Sensitive Area.** The project creates and/or replaces 2,500 square feet of impervious surface (collectively over project site), and discharges directly to an Environmentally Sensitive Area (ESA). "Discharging directly to" includes flow that is conveyed overland a distance of 200 feet or less from the project to the ESA, or conveyed in a pipe or open channel any distance as an isolated flow from the project to the ESA (i.e. not commingled with flows from adjacent lands).	☐ Yes ☒ No
8.	**New development or redevelopment projects of a retail gasoline outlet (RGO) that create and/or replaces 5,000 square feet of impervious surface.** The development project meets the following criteria: (a) 5,000 square feet or more or (b) has a projected Average Daily Traffic (ADT) of 100 or more vehicles per day.	☐ Yes ☒ No
9.	**New development or redevelopment projects of an automotive repair shops that creates and/or replaces 5,000 square feet or more of impervious surfaces.** Development projects categorized in any one of Standard Industrial Classification (SIC) codes 5013, 5014, 5541, 7532-7534, or 7536-7539.	☐ Yes ☒ No
10.	**Other Pollutant Generating Project.** The project is not covered in the categories above, results in the disturbance of one or more acres of land and is expected to generate pollutants post construction, such as fertilizers and pesticides. This does not include projects creating less than 5,000 sf of impervious surface and where added landscaping does not require regular use of pesticides and fertilizers, such as slope stabilization using native plants. Calculation of the square footage of impervious surface need not include linear pathways that are for infrequent vehicle use, such as emergency maintenance access or bicycle pedestrian use, if they are built with pervious surfaces of if they sheet flow to surrounding pervious surfaces.	☐ Yes ☒ No

PART F: Select the appropriate category based on the outcomes of PART C through PART E.

1.	The project is **NOT SUBJECT TO PERMANENT STORM WATER REQUIREMENTS**.	☐
2.	The project is a **STANDARD DEVELOPMENT PROJECT**. Site design and source control BMP requirements apply. See the Storm Water Standards Manual for guidance.	☐
3.	The project is **PDP EXEMPT**. Site design and source control BMP requirements apply. See the Storm Water Standards Manual for guidance.	☐
4.	The project is a **PRIORITY DEVELOPMENT PROJECT**. Site design, source control, and structural pollutant control BMP requirements apply. See the Storm Water Standards Manual for guidance on determining if project requires a hydromodification plan management	☒

Bryan Knapp, PE #86542
Name of Owner or Agent *(Please Print)*

Senior Project Engineer
Title

Signature

06/07/2019
Date

Clear Page 4

Clear Form

Applicability of Permanent, Post-Construction Storm Water BMP Requirements		Form I-1
Project Identification		
Project Name: 17 ON VOLTAIRE - 4103 / 4111 VOLTAIRE STREET		
Permit Application Number: PTS 640598 (VOLTAIRE STREET SDP)		Date: 6/17/19
Determination of Requirements		
The purpose of this form is to identify permanent, post-construction requirements that apply to the project. This form serves as a short summary of applicable requirements, in some cases referencing separate forms that will serve as the backup for the determination of requirements. Answer each step below, starting with **Step 1** and progressing through each step until reaching "Stop". Refer to the manual sections and/or separate forms referenced in each step below.		
Step	**Answer**	**Progression**
Step 1: Is the project a "development project"? See Section 1.3 of the manual (Part 1 of Storm Water Standards) for guidance.	☑ Yes	Go to **Step 2**.
	☐ No	**Stop**. Permanent BMP requirements do not apply. No SWQMP will be required. Provide discussion below.
Discussion / justification if the project is not a "development project" (e.g., the project includes *only* interior remodels within an existing building):		
Step 2: Is the project a Standard Project, PDP, or PDP Exempt? To answer this item, see Section 1.4 of the manual in its entirety for guidance AND complete Form DS-560, Storm Water Requirements Applicability Checklist.	☐ Standard Project	**Stop.** Standard Project requirements apply
	☑ PDP	PDP requirements apply, including PDP SWQMP. Go to **Step 3**.
	☐ PDP Exempt	**Stop.** Standard Project requirements apply. Provide discussion and list any additional requirements below.
Discussion / justification, and additional requirements for exceptions to PDP definitions, if applicable:		

Project Name: 17 ON VOLTAIRE - 4103 / 4111 VOLTAIRE STREET

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

HMP Exemption Exhibit

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

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

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Project Name: 17 ON VOLTAIRE – 4103 / 4111 VOLTAIRE STREET

Site Information Checklist For PDPs	Form I-3B
Project Summary Information	
Project Name	17 ON VOLTAIRE - 4103 / 4111 VOLTAIRE STREET
Project Address	4103 / 4111 VOLTAIRE STREET SAN DIEGO, CA 92107
Assessor's Parcel Number(s) (APN(s))	449-251-05, -06, -07, & -08
Permit Application Number	PTS 640598
Project Watershed	Select One: ☐ San Dieguito River ☐ Penasquitos ☐ Mission Bay ☑ San Diego River ☐ San Diego Bay ☐ Tijuana River
Hydrologic subarea name with Numeric Identifier up to two decimal places (9XX.XX)	907.11
Project Area (total area of Assessor's Parcel(s) associated with the project or total area of the right-of-way)	0.598 Acres (26,059 Square Feet)
Area to be disturbed by the project (Project Footprint)	0.598 Acres (26,059 Square Feet)
Project Proposed Impervious Area (subset of Project Footprint)	0.491 Acres (21,400 Square Feet)
Project Proposed Pervious Area (subset of Project Footprint)	0.107 Acres (4,659 Square Feet)
Note: Proposed Impervious Area + Proposed Pervious Area = Area to be Disturbed by the Project. This may be less than the Project Area.	
The proposed increase or decrease in impervious area in the proposed condition as compared to the pre-project condition	134.7 %

Form I-3B Page 2 of 11
Description of Existing Site Condition and Drainage Patterns
Current Status of the Site (select all that apply): ☑Existing development ☐Previously graded but not built out ☐Agricultural or other non-impervious use ☐Vacant, undeveloped/natural Description / Additional Information: The (previously 4-parcel) currently 1-parcel site exists today with single-family residential development on the southern-most parcel, commercial development immediately adjacent, both with parking off the Alley to the west, and non-developed / vacant parcels to the north along Voltaire
Existing Land Cover Includes (select all that apply): ☑Vegetative Cover ☑Non-Vegetated Pervious Areas ☑Impervious Areas Description / Additional Information: The existing land cover consists of a community garden with vegetated cover, asphalt paving, buildings and non-vegetated cover.
Underlying Soil belongs to Hydrologic Soil Group (select all that apply): ☐NRCS Type A ☐NRCS Type B ☐NRCS Type C ☑NRCS Type D
Approximate Depth to Groundwater: ☐Groundwater Depth < 5 feet ☐5 feet < Groundwater Depth < 10 feet ☐10 feet < Groundwater Depth < 20 feet ☑Groundwater Depth > 20 feet
Existing Natural Hydrologic Features (select all that apply): ☐Watercourses ☐Seeps ☐Springs ☐Wetlands ☑None Description / Additional Information: No existing natural hydrologic features exist onsite

Project Name: 17 ON VOLTAIRE – 4103 / 4111 VOLTAIRE STREET

Form I-3B Page 3 of 11
Description of Existing Site Topography and Drainage
How is storm water runoff conveyed from the site? At a minimum, this description should answer: 1. Whether existing drainage conveyance is natural or urban; 2. If runoff from offsite is conveyed through the site? If yes, quantification of all offsite drainage areas, design flows, and locations where offsite flows enter the project site and summarize how such flows are conveyed through the site; 3. Provide details regarding existing project site drainage conveyance network, including storm drains, concrete channels, swales, detention facilities, storm water treatment facilities, and natural and constructed channels; 4. Identify all discharge locations from the existing project along with a summary of the conveyance system size and capacity for each of the discharge locations. Provide summary of the pre-project drainage areas and design flows to each of the existing runoff discharge locations.
Descriptions/Additional Information
1. The existing drainage is urban. 2. No offsite runoff runs through the site. 3. The site has a moderate slope where 75% of the site sheet flows storm water to the northeast to Voltaire Street and the southerly 25% of the site sheet flows storm water southeast to San Clemente Street where it discharges to the street curb and gutter and flows east to the curb return at San Clemente St. and Voltaire St. It then continues north to a public curb inlet located about 40 feet west of the curb return at Voltaire St. and Catalina Blvd. There does not appear to be any type of onsite, engineered drainage system, detention ponds, etc. 4. The discharge location of the site is the northeasterly most corner of the site. The peak storm water runoff was calculated using the rational method and determined to be: Qpre = 1.32 CFS; see the project drainage study included in Attachment 5 of this report for additional information.

Form I-3B Page 4 of 11
Description of Proposed Site Development and Drainage Patterns
Project Description / Proposed Land Use and/or Activities: The project proposes the demolition of the existing buildings and the development of the site with new multi-family residential buildings, commercial space, covered parking, and surface improvements typical of this type of development.
List/describe proposed impervious features of the project (e.g., buildings, roadways, parking lots, courtyards, athletic courts, other impervious features): The impervious areas include the roof, driveway, and concrete hardscape that will provide access to the building (i.e. walkways, etc.)
List/describe proposed pervious features of the project (e.g., landscape areas): The project proposes permeable paver parking spaces along the public Alley, landscape areas and biofiltration areas . The project proposes six (6) biofiltration (BF-1) basins that have been sized to treat the design capture volume (DCV) tributary to the planter as well as provide mitigation / detention to comply with hydromodification management requirements.
Does the project include grading and changes to site topography? ☑ Yes ☐ No Description / Additional Information: The project proposes to grade the site and construct pads and retaining walls to build the new structures. However, site drainage characteristics will remain consistent with the existing conditions, and the project discharges to Voltaire Street to the north as in the pre-developed condition.

Form I-3B Page 5 of 11
Does the project include changes to site drainage (e.g., installation of new storm water conveyance systems)? ☑ Yes ☐ No If yes, provide details regarding the proposed project site drainage conveyance network, including storm drains, concrete channels, swales, detention facilities, storm water treatment facilities, natural and constructed channels, and the method for conveying offsite flows through or around the proposed project site. Identify all discharge locations from the proposed project site along with a summary of the conveyance system size and capacity for each of the discharge locations. Provide a summary of pre and post-project drainage areas and design flows to each of the runoff discharge locations. Reference the drainage study for detailed calculations. Description / Additional Information: The new driveway and walkways will direct runoff via an onsite storm drain network to proposed at-grade biofiltration basins. The building roof drain systems will route all runoff generated to raised planter biofiltration basins located on the side of each building. The biofiltration basin will provide pollutant removal and hydromodification management compliance prior to discharging via private storm drain downstream or by means of a curb outlet that will convey to the public right-of-way. This is consistent with the existing drainage patterns as well as the Regional Water Quality Control Board MS4 Permit.

Form I-3B Page 6 of 11
Identify whether any of the following features, activities, and/or pollutant source areas will be present (select all that apply): ☑Onsite storm drain inlets ☑Interior floor drains and elevator shaft sump pumps ☑Interior parking garages ☑Need for future indoor & structural pest control ☑Landscape/outdoor pesticide use ☐Pools, spas, ponds, decorative fountains, and other water features ☐Food service ☐Refuse areas ☐Industrial processes ☐Outdoor storage of equipment or materials ☐Vehicle and equipment cleaning ☐Vehicle/equipment repair and maintenance ☐Fuel dispensing areas ☐Loading docks ☑Fire sprinkler test water ☐Miscellaneous drain or wash water ☐Plazas, sidewalks, and parking lots Description/Additional Information:

Form I-3B Page 7 of 11
Identification and Narrative of Receiving Water
Narrative describing flow path from discharge location(s), through urban storm conveyance system, to receiving creeks, rivers, and lagoons and ultimate discharge location to Pacific Ocean (or bay, lagoon, lake or reservoir, as applicable)
The new buildings and driveway/walkways will direct runoff via an onsite storm drain network to each proposed biofiltration basin and then discharge to the public right-of-way on Voltaire Street. Treated storm water leaving the site will then continue north to a public curb inlet located on the east side of Famosa Blvd. It is then routed through the public storm drain system along Nimitz Blvd, ultimately discharging through Sunset Cliffs Blvd to the San Diego River flood control channel and flows to the Pacific Ocean.
Provide a summary of all beneficial uses of receiving waters downstream of the project discharge locations
Beneficial uses of the San Diego River include IND, REC1, REC2, WARM, WILD, RARE, and potential beneficial uses include MUN
Identify all ASBS (areas of special biological significance) receiving waters downstream of the project discharge locations
No ASBS receiving waters downstream of the project discharge locations
Provide distance from project outfall location to impaired or sensitive receiving waters
No impaired or sensitive receiving waters downstream of project site per CA State Water Board CWA Section 303(d) list. Site discharge travels downstream to San Diego River and Pacific Ocean.
Summarize information regarding the proximity of the permanent, post-construction storm water BMPs to the City's Multi-Habitat Planning Area and environmentally sensitive lands
All permanent, post-construction storm water BMP's are located on the project site. According to City GIS data, the closest Multi-Habitat Planning Area is located in the San Diego River, which is ~1.5 miles downstream of the project.

Form I-3B Page 8 of 11

Identification of Receiving Water Pollutants of Concern

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

303(d) Impaired Water Body (Refer to Appendix K)	Pollutant(s)/Stressor(s) (Refer to Appendix K)	TMDLs/WQIP Highest Priority Pollutant (Refer to Table 1-4 in Chapter 1)
N/A	N/A	N/A

Identification of Project Site Pollutants*

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

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

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

Form I-3B Page 9 of 11
Hydromodification Management Requirements
Do hydromodification management requirements apply (see Section 1.6)? ☑ Yes, hydromodification management flow control structural BMPs required. ☐ No, the project will discharge runoff directly to existing underground storm drains discharging directly to water storage reservoirs, lakes, enclosed embayments, or the Pacific Ocean. ☐ No, the project will discharge runoff directly to conveyance channels whose bed and bank are concrete-lined all the way from the point of discharge to water storage reservoirs, lakes, enclosed embayments, or the Pacific Ocean. ☐ No, the project will discharge runoff directly to an area identified as appropriate for an exemption by the WMAA for the watershed in which the project resides. Description / Additional Information (to be provided if a 'No' answer has been selected above): Note: If "No" answer has been selected the SWQMP must include an exhibit that shows the storm water conveyance system from the project site to an exempt water body. The exhibit should include details about the conveyance system and the outfall to the exempt water body.
Critical Coarse Sediment Yield Areas* ***This Section only required if hydromodification management requirements apply**
Based on Section 6.2 and Appendix H does CCSYA exist on the project footprint or in the upstream area draining through the project footprint? ☐ Yes ☑ No Discussion / Additional Information:

Form I-3B Page 10 of 11
Flow Control for Post-Project Runoff*   ***This Section only required if hydromodification management requirements apply**
List and describe point(s) of compliance (POCs) for flow control for hydromodification management (see Section 6.3.1). For each POC, provide a POC identification name or number correlating to the project's HMP Exhibit and a receiving channel identification name or number correlating to the project's HMP Exhibit.   There is one Point of Compliance (POC) for the project at the NW corner of the site along Voltaire Street.
Has a geomorphic assessment been performed for the receiving channel(s)?   ☑ No, the low flow threshold is $0.1Q_2$ (default low flow threshold)   ☐ Yes, the result is the low flow threshold is $0.1Q_2$ ☐ Yes, the result is the low flow threshold is $0.3Q_2$ ☐ Yes, the result is the low flow threshold is $0.5Q_2$ If a geomorphic assessment has been performed, provide title, date, and preparer: N/A
Discussion / Additional Information: (optional)   Channel assessment has not been performed, 0.1Q2 has been assumed for the low flow threshold in the project's SWMM analysis.

Form I-3B Page 11 of 11
Other Site Requirements and Constraints
When applicable, list other site requirements or constraints that will influence storm water management design, such as zoning requirements including setbacks and open space, or local codes governing minimum street width, sidewalk construction, allowable pavement types, and drainage requirements. No other site constraints. Testing of onsite soils determined low permeability / ability to infiltrate water onsite. Thus, an impermeable liner is proposed for all BMP facilities and water will be routed offsite.
Optional Additional Information or Continuation of Previous Sections As Needed
This space provided for additional information or continuation of information from previous sections as needed. De Minimis DMA's per BMP Design Manual Section 5.2.2 DMA 7 is categorized and qualifies as a De Minimis area in accordance with the City's BMP Design Manual Section 5.2.2. The area consists of 250 SF of impervious area that discharges directly offsite, adjacent to the site boundary, and is infeasible to route to a BMP / raised planter for treatment. The de minimis area consists of less than 2.0% of the overall proposed hardscape onsite (see sheet 2 of Attachment 1a - DMA Exhibit). Thus, this area can be excluded from pollutant removal and hydromodification requirements.

Source Control BMP Checklist for PDPs	Form I-4B		
Source Control BMPs			
All development projects must implement source control BMPs where applicable and feasible. See Chapter 4 and Appendix E of the BMP Design Manual (Part 1 of the Storm Water Standards) for information to implement source control BMPs shown in this checklist. Answer each category below pursuant to the following. • "Yes" means the project will implement the source control BMP as described in Chapter 4 and/or Appendix E of the BMP Design Manual. Discussion / justification is not required. • "No" means the BMP is applicable to the project but it is not feasible to implement. Discussion / justification must be provided. • "N/A" means the BMP is not applicable at the project site because the project does not include the feature that is addressed by the BMP (e.g., the project has no outdoor materials storage areas). Discussion / justification may be provided.			
Source Control Requirement	**Applied?**		
4.2.1 Prevention of Illicit Discharges into the MS4	☑ Yes	☐ No	☐ N/A
Discussion / justification if 4.2.1 not implemented:			
4.2.2 Storm Drain Stenciling or Signage	☑ Yes	☐ No	☐ N/A
Discussion / justification if 4.2.2 not implemented:			
4.2.3 Protect Outdoor Materials Storage Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☐ Yes	☐ No	☑ N/A
Discussion / justification if 4.2.3 not implemented: No permanent outdoor materials storage areas to be protected			
4.2.4 Protect Materials Stored in Outdoor Work Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☐ Yes	☐ No	☑ N/A
Discussion / justification if 4.2.4 not implemented: No permanent materials stored in outdoor work areas to be protected			
4.2.5 Protect Trash Storage Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☑ Yes	☐ No	☐ N/A
Discussion / justification if 4.2.5 not implemented: Trash / recycling storage areas located within garage of each unit, covered and protected			

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

Site Design BMP Checklist for PDPs	Form I-5B		
Site Design BMPs			
All development projects must implement site design BMPs where applicable and feasible. See Chapter 4 and Appendix E of the BMP Design Manual (Part 1 of Storm Water Standards) for information to implement site design BMPs shown in this checklist. Answer each category below pursuant to the following. • "Yes" means the project will implement the site design BMP as described in Chapter 4 and/or Appendix E of the BMP Design Manual. Discussion / justification is not required. • "No" means the BMP is applicable to the project but it is not feasible to implement. Discussion / justification must be provided. • "N/A" means the BMP is not applicable at the project site because the project does not include the feature that is addressed by the BMP (e.g., the project site has no existing natural areas to conserve). Discussion / justification may be provided. A site map with implemented site design BMPs must be included at the end of this checklist.			
Site Design Requirement	**Applied?**		
4.3.1 Maintain Natural Drainage Pathways and Hydrologic Features	☐ Yes	☐ No	☑ N/A
Discussion / justification if 4.3.1 not implemented: No hydrologic features exist on site, therefore none are mapped or are to be maintained. Tree wells not proposed as part of this project.			
1-1 Are existing natural drainage pathways and hydrologic features mapped on the site map?	☐ Yes	☐ No	☑ N/A
1-2 Are trees implemented? If yes, are they shown on the site map?	☐ Yes	☐ No	☑ N/A
1-3 Implemented trees meet the design criteria in 4.3.1 Fact Sheet (e.g. soil volume, maximum credit, etc.)?	☐ Yes	☐ No	☑ N/A
1-4 Is tree credit volume calculated using Appendix B.2.2.1 and SD-1 Fact Sheet in Appendix E?	☐ Yes	☐ No	☑ N/A
4.3.2 Have natural areas, soils and vegetation been conserved?	☑ Yes	☐ No	☐ N/A
Discussion / justification if 4.3.2 not implemented:			

Project Name: 17 ON VOLTAIRE – 4103 / 4111 VOLTAIRE STREET

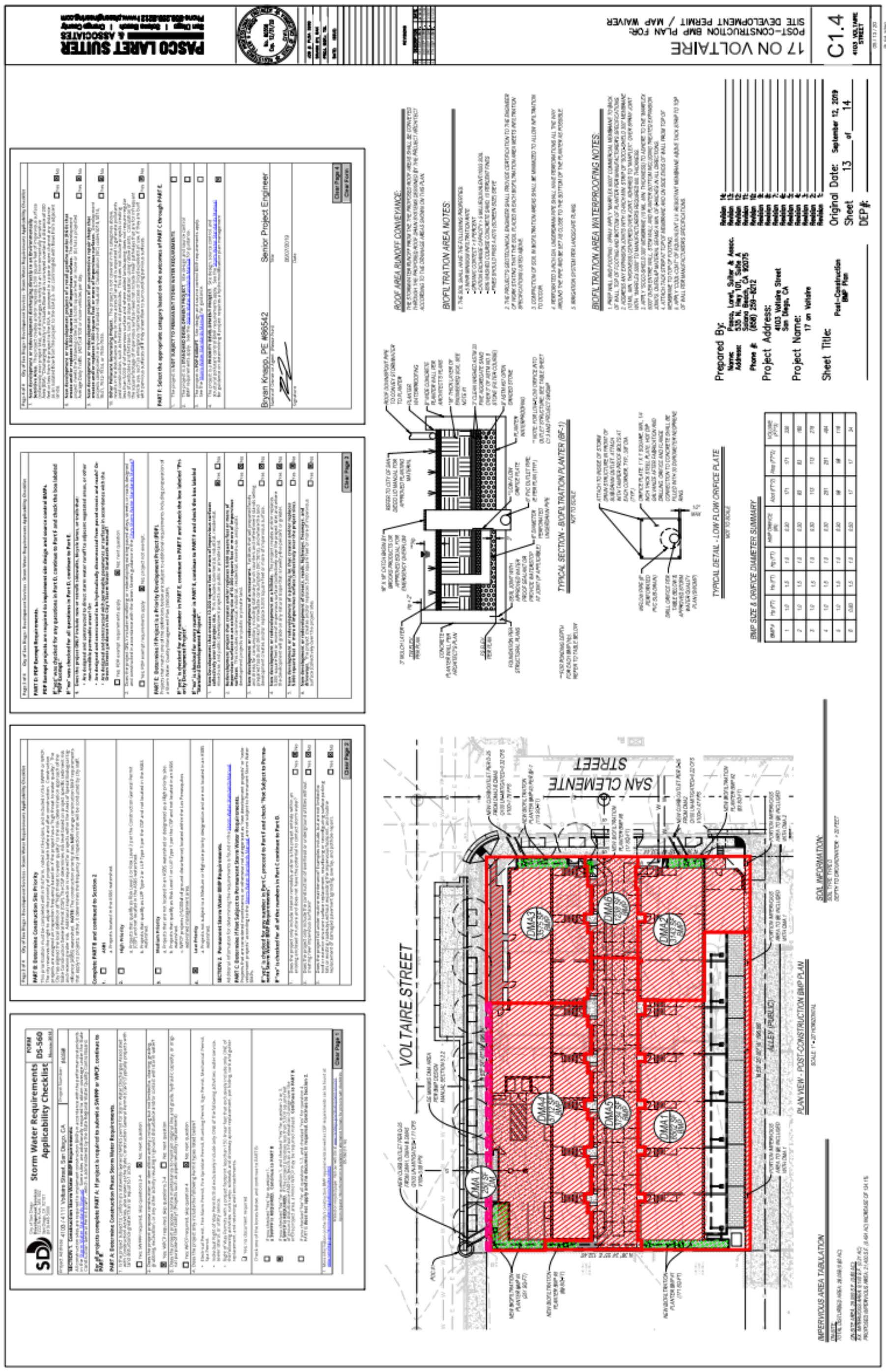
Form I-5B Page 2 of 4			
Site Design Requirement	**Applied?**		
4.3.3 Minimize Impervious Area	☐ Yes	☑ No	☐ N/A
Discussion / justification if 4.3.3 not implemented: Per site geotechnical study and testing of onsite soils, very low infiltration capabilities exist onsite. Thus, a pervious paver driveway was considered but ultimately concrete was chosen as no ability to capture and retain any runoff.			
4.3.4 Minimize Soil Compaction	☐ Yes	☑ No	☐ N/A
Discussion / justification if 4.3.4 not implemented: Soil compaction minimized to extent practical, however site consists of mainly building footprint and impervious driveway as infiltration is not recommended per geotech report. Thus, soil will be properly compacted to required densities to support proposed uses, with compaction minimized elsewhere as applicable.			
4.3.5 Impervious Area Dispersion	☐ Yes	☑ No	☐ N/A
Discussion / justification if 4.3.5 not implemented: Project site consists of mainly proposed structures / buildings as well as impervious PCC driveway. Raised BMP planters along the side of the building will accept roof drainage as it is impractical to route over landscaped area prior to entering BMP. No water quality credit has been taken for dispersion.			
5-1 Is the pervious area receiving runon from impervious area identified on the site map?	☐ Yes	☑ No	☐ N/A
5-2 Does the pervious area satisfy the design criteria in 4.3.5 Fact Sheet in Appendix E (e.g. maximum slope, minimum length, etc.)	☐ Yes	☑ No	☐ N/A
5-3 Is impervious area dispersion credit volume calculated using Appendix B.2.1.1 and 4.3.5 Fact Sheet in Appendix E?	☐ Yes	☑ No	☐ N/A

Form I-5B Page 3 of 4			
Site Design Requirement	Applied?		
4.3.6 Runoff Collection	☐ Yes	☑ No	☐ N/A
Discussion / justification if 4.3.6 not implemented: Permeable pavement is not recommended by the project geotechnical engineer unless accompanied by an impermeable liner and subdrain. Thus, it was not deemed practical on this project and is not proposed. Green roofs not proposed and no credit / volume reduction taken.			
6a-1 Are green roofs implemented in accordance with design criteria in 4.3.6A Fact Sheet? If yes, are they shown on the site map?	☐ Yes	☑ No	☐ N/A
6a-2 Is the green roof credit volume calculated using Appendix B.2.1.2 and 4.3.6A Fact Sheet in Appendix E?	☐ Yes	☑ No	☐ N/A
6b-1 Are permeable pavements implemented in accordance with design criteria in 4.3.6B Fact Sheet? If yes, are they shown on the site map?	☐ Yes	☑ No	☐ N/A
6b-2 Is the permeable pavement credit volume calculated using Appendix B.2.1.3 and 4.3.6B Fact Sheet in Appendix E?	☐ Yes	☑ No	☐ N/A
4.3.7 Landscaping with Native or Drought Tolerant Species	☑ Yes	☐ No	☐ N/A
Discussion / justification if 4.3.7 not implemented:			
4.3.8 Harvest and Use Precipitation	☐ Yes	☑ No	☐ N/A
Discussion / justification if 4.3.8 not implemented: Harvest and reuse has been deemed infeasible for this project and is not implemented.			
8-1 Are rain barrels implemented in accordance with design criteria in 4.3.8 Fact Sheet? If yes, are they shown on the site map?	☐ Yes	☑ No	☐ N/A
8-2 Is the rain barrel credit volume calculated using Appendix B.2.2.2 and 4.3.8 Fact Sheet in Appendix E?	☐ Yes	☑ No	☐ N/A

Project Name: 17 ON VOLTAIRE - 4103 / 4111 VOLTAIRE STREET

Form I-5B Page 4 of 4

Insert Site Map with all site design BMPs identified:



Summary of PDP Structural BMPs	Form I-6
PDP Structural BMPs	
All PDPs must implement structural BMPs for storm water pollutant control (see Chapter 5 of the BMP Design Manual, Part 1 of Storm Water Standards). Selection of PDP structural BMPs for storm water pollutant control must be based on the selection process described in Chapter 5. PDPs subject to hydromodification management requirements must also implement structural BMPs for flow control for hydromodification management (see Chapter 6 of the BMP Design Manual). Both storm water pollutant control and flow control for hydromodification management can be achieved within the same structural BMP(s). PDP structural BMPs must be verified by the City at the completion of construction. This includes requiring the project owner or project owner's representative to certify construction of the structural BMPs (complete Form DS-563). PDP structural BMPs must be maintained into perpetuity (see Chapter 7 of the BMP Design Manual). Use this form to provide narrative description of the general strategy for structural BMP implementation at the project site in the box below. Then complete the PDP structural BMP summary information sheet (page 3 of this form) for each structural BMP within the project (copy the BMP summary information page as many times as needed to provide summary information for each individual structural BMP).	
Describe the general strategy for structural BMP implementation at the site. This information must describe how the steps for selecting and designing storm water pollutant control BMPs presented in Section 5.1 of the BMP Design Manual were followed, and the results (type of BMPs selected). For projects requiring hydromodification flow control BMPs, indicate whether pollutant control and flow control BMPs are integrated or separate. The project site has been divided into seven (7) drainage management areas (DMAs) draining to six (6) different biofiltration BMP's, with one (1) de minimis area draining directly offsite. The type of structural BMP chosen for the project was based on the flow chart presented in Figures 5-1 and 5-2 of the City of San Diego Storm Water Standards Manual (October 2018). Using Form I-7 to determine feasibility of using capture and use techniques for the property, it was ultimately concluded harvest and use BMPs are considered infeasible. A feasibility study was then performed for infiltration and if infiltration would be feasible for the project's structural BMPs. The negative impacts associated with infiltration and retention were identified and documented in Form I-8A included in this SWQMP, as well as the site geotechnical investigation under separate cover. Based on site geologic conditions and at the recommendation of the geotech, the site is in a "No Infiltation" designation for storm water BMP design. (Continue on page 2 as necessary.)	

Form I-6 Page 2 of 12
(Continued from page 1) The project is proposing HMP-sized biofiltration basins for its PDP structural BMP. The biofiltration basin will integrate both pollutant control measures with flow control for hydromodification management. Each basin has been sized to demonstrate compliance with HMP requirements using the Environmental Protection Agency's (EPA) Storm Water Management Model (SWMM). Refer to Attachment 5 of this report for detailed information on the SWMM analysis including results and SWMM input parameters in addition to the project Hydrology Report prepared by Pasco, Laret, Suiter & Associates for additional information. An emergency overflow system consisting of a grated inlet located on an 18" x 18" outlet structure will mitigate and convey the 100-year, 6-hour storm event to pre-development conditions. All biofiltration basins are proposed to have an impermeable liner as a "No Infiltration" condition is recommended by the project geotechnical engineer.

ID: BMP #1

Project Name: 17 ON VOLTAIRE – 4103 / 4111 VOLTAIRE STREET

Form I-6 Page 1 of 12 (Copy as many as needed)	
Structural BMP Summary Information	
Structural BMP ID No. BMP 1 (BF-1)	
Construction Plan Sheet No. Sheet C1.1 - C1.3	
Type of Structural BMP: ☐ Retention by harvest and use (e.g. HU-1, cistern) ☐ Retention by infiltration basin (INF-1) ☐ Retention by bioretention (INF-2) ☐ Retention by permeable pavement (INF-3) ☐ Partial retention by biofiltration with partial retention (PR-1) ☑ Biofiltration (BF-1) ☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below) ☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below) ☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below) ☐ Detention pond or vault for hydromodification management ☐ Other (describe in discussion section below)	
Purpose: ☐ Pollutant control only ☐ Hydromodification control only ☑ Combined pollutant control and hydromodification control ☐ Pre-treatment/forebay for another structural BMP ☐ Other (describe in discussion section below)	
Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563	Tyler Lawson Pasco, Laret, Suiter & Associates
Who will be the final owner of this BMP?	CityMark Communities LLC
Who will maintain this BMP into perpetuity?	Property Management for CityMark Communities LLC
What is the funding mechanism for maintenance?	CityMark Communities LLC

Project Name: 17 ON VOLTAIRE - 4103 / 4111 VOLTAIRE STREET

Form I-6 Page 2 of 12 (Copy as many as needed)
Structural BMP ID No. BMP 1 (BF-1)
Construction Plan Sheet No. Sheet C1.1 - C1.3
Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs): BMP 1 is a 171 SF raised planter biofiltration basin located along Building #2. Refer to project DMA Exhibit for size of drainage area / portion of roof draining to planter and Attachment 1e for sizing worksheets with calculations, etc.

ID: BMP #2

Project Name: 17 ON VOLTAIRE – 4103 / 4111 VOLTAIRE STREET

Form I-6 Page 3 of 12 (Copy as many as needed)	
Structural BMP Summary Information	
Structural BMP ID No. BMP 2 (BF-1)	
Construction Plan Sheet No. Sheet C1.1 - C1.3	
Type of Structural BMP: ☐ Retention by harvest and use (e.g. HU-1, cistern) ☐ Retention by infiltration basin (INF-1) ☐ Retention by bioretention (INF-2) ☐ Retention by permeable pavement (INF-3) ☐ Partial retention by biofiltration with partial retention (PR-1) ☒ Biofiltration (BF-1) ☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below) ☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below) ☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below) ☐ Detention pond or vault for hydromodification management ☐ Other (describe in discussion section below)	
Purpose: ☐ Pollutant control only ☐ Hydromodification control only ☒ Combined pollutant control and hydromodification control ☐ Pre-treatment/forebay for another structural BMP ☐ Other (describe in discussion section below)	
Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563	Tyler Lawson Pasco, Laret, Suiter & Associates
Who will be the final owner of this BMP?	CityMark Communities LLC
Who will maintain this BMP into perpetuity?	Property Management for CityMark Communities LLC
What is the funding mechanism for maintenance?	CityMark Communities LLC

Project Name: 17 ON VOLTAIRE - 4103 / 4111 VOLTAIRE STREET

Form I-6 Page 4 of 12 (Copy as many as needed)
Structural BMP ID No. BMP 2 (BF-1)
Construction Plan Sheet No. Sheet C1.1 - C1.3
Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs): BMP 2 is an 83 SF raised planter biofiltration basin located along Building #2. Refer to project DMA Exhibit for size of drainage area / portion of roof draining to planter and Attachment 1e for sizing worksheets with calculations, etc.

Project Name: 17 ON VOLTAIRE – 4103 / 4111 VOLTAIRE STREET

Form I-6 Page 5 of 12 (Copy as many as needed)	
Structural BMP Summary Information	
Structural BMP ID No. BMP 3 (BF-1)	
Construction Plan Sheet No. Sheet C1.1 - C1.3	
Type of Structural BMP: ☐ Retention by harvest and use (e.g. HU-1, cistern) ☐ Retention by infiltration basin (INF-1) ☐ Retention by bioretention (INF-2) ☐ Retention by permeable pavement (INF-3) ☐ Partial retention by biofiltration with partial retention (PR-1) ☒ Biofiltration (BF-1) ☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below) ☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below) ☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below) ☐ Detention pond or vault for hydromodification management ☐ Other (describe in discussion section below)	
Purpose: ☐ Pollutant control only ☐ Hydromodification control only ☒ Combined pollutant control and hydromodification control ☐ Pre-treatment/forebay for another structural BMP ☐ Other (describe in discussion section below)	
Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563	Tyler Lawson Pasco, Laret, Suiter & Associates
Who will be the final owner of this BMP?	CityMark Communities LLC
Who will maintain this BMP into perpetuity?	Property Management for CityMark Communities LLC
What is the funding mechanism for maintenance?	CityMark Communities LLC

Project Name: 17 ON VOLTAIRE - 4103 / 4111 VOLTAIRE STREET

Form I-6 Page 6 of 12 (Copy as many as needed)
Structural BMP ID No. BMP 3 (BF-1)
Construction Plan Sheet No. Sheet C1.1 - C1.3
Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs): BMP 3 is an 113 SF raised planter biofiltration basin located along Building #1. Refer to project DMA Exhibit for size of drainage area / portion of roof draining to planter and Attachment 1e for sizing worksheets with calculations, etc.

Project Name: 17 ON VOLTAIRE – 4103 / 4111 VOLTAIRE STREET

Form I-6 Page 7 of 12 (Copy as many as needed)	
Structural BMP Summary Information	
Structural BMP ID No. BMP 4 (BF-1)	
Construction Plan Sheet No. Sheet C1.1 - C1.3	
Type of Structural BMP: ☐ Retention by harvest and use (e.g. HU-1, cistern) ☐ Retention by infiltration basin (INF-1) ☐ Retention by bioretention (INF-2) ☐ Retention by permeable pavement (INF-3) ☐ Partial retention by biofiltration with partial retention (PR-1) ☒ Biofiltration (BF-1) ☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below) ☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below) ☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below) ☐ Detention pond or vault for hydromodification management ☐ Other (describe in discussion section below)	
Purpose: ☐ Pollutant control only ☐ Hydromodification control only ☒ Combined pollutant control and hydromodification control ☐ Pre-treatment/forebay for another structural BMP ☐ Other (describe in discussion section below)	
Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563	Tyler Lawson Pasco, Laret, Suiter & Associates
Who will be the final owner of this BMP?	CityMark Communities LLC
Who will maintain this BMP into perpetuity?	Property Management for CityMark Communities LLC
What is the funding mechanism for maintenance?	CityMark Communities LLC

Project Name: 17 ON VOLTAIRE - 4103 / 4111 VOLTAIRE STREET

Form I-6 Page 8 of 12 (Copy as many as needed)
Structural BMP ID No. BMP 4 (BF-1)
Construction Plan Sheet No. Sheet C1.1 - C1.3
Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs): BMP 4 is an 251 SF raised planter biofiltration basin located along Building #1. Refer to project DMA Exhibit for size of drainage area / portion of roof draining to planter and Attachment 1e for sizing worksheets with calculations, etc. As mentioned in the subsequent I-6 forms, BMPs #5 and #6 are sized using alternative minimum footprint criterion for non-standard biofiltration BMPs. As such, these BMPs need to demonstrate a volume retention component in a "No Infiltration" condition in accordance with the City of San Diego BMP Design Manual. Worksheet B.5-6 is included in the project SWQMP for BMP #4 to demonstrate a volume retention surplus for BMP #4 due to the size of the footprint compared to the drainage area conveyed to it. This volume retention surplus covers the volume retention deficit for BMPs #5 and #6.

ID: BMP #5

Project Name: 17 ON VOLTAIRE – 4103 / 4111 VOLTAIRE STREET

Form I-6 Page 9 of 12 (Copy as many as needed)	
Structural BMP Summary Information	
Structural BMP ID No. BMP 5 (BF-1)	
Construction Plan Sheet No. Sheet C1.1 - C1.3	
Type of Structural BMP: ☐ Retention by harvest and use (e.g. HU-1, cistern) ☐ Retention by infiltration basin (INF-1) ☐ Retention by bioretention (INF-2) ☐ Retention by permeable pavement (INF-3) ☐ Partial retention by biofiltration with partial retention (PR-1) ☒ Biofiltration (BF-1) ☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below) ☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below) ☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below) ☐ Detention pond or vault for hydromodification management ☐ Other (describe in discussion section below)	
Purpose: ☐ Pollutant control only ☐ Hydromodification control only ☒ Combined pollutant control and hydromodification control ☐ Pre-treatment/forebay for another structural BMP ☐ Other (describe in discussion section below)	
Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563	Tyler Lawson Pasco, Laret, Suiter & Associates
Who will be the final owner of this BMP?	CityMark Communities LLC
Who will maintain this BMP into perpetuity?	Property Management for CityMark Communities LLC
What is the funding mechanism for maintenance?	CityMark Communities LLC

Project Name: 17 ON VOLTAIRE - 4103 / 4111 VOLTAIRE STREET

Form I-6 Page 10 of 12 (Copy as many as needed)
Structural BMP ID No. BMP 5 (BF-1)
Construction Plan Sheet No. Sheet C1.1 - C1.3
Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs): BMP 5 is an 69 SF raised planter biofiltration basin located along Building #1. Refer to project DMA Exhibit for size of drainage area / portion of roof draining to planter and Attachment 1e for sizing worksheets with calculations, etc. BMP 5 has been sized to comply with water quality using alternative minimum sizing per Worksheet B.5-4 (i.e. "Non-Standard" Biofiltration BMP sizing in accordance with City of San Diego BMP Design Manual Appendix B.5.2), as well as Worksheet B.5-1. Per Worksheet B.5-2 of the City of San Diego BMP Design Manual (included in Attachment 1 of this report), BMP 5 achieves a volume retention deficit of 15 cubic feet. This is further reduced to ~4.5 cubic feet using Worksheet B.5-6. As mentioned previously, the volume retention surplus achieved with BMP 4 (demonstrated in Worksheet B.5-6 for BMP 4) covers the volume retention deficit of BMPs 5 and 6.

Project Name: 17 ON VOLTAIRE – 4103 / 4111 VOLTAIRE STREET

Form I-6 Page 11 of 12 (Copy as many as needed)	
Structural BMP Summary Information	
Structural BMP ID No. BMP 6 (BF-1)	
Construction Plan Sheet No. Sheet C1.1 - C1.3	
Type of Structural BMP: ☐ Retention by harvest and use (e.g. HU-1, cistern) ☐ Retention by infiltration basin (INF-1) ☐ Retention by bioretention (INF-2) ☐ Retention by permeable pavement (INF-3) ☐ Partial retention by biofiltration with partial retention (PR-1) ☒ Biofiltration (BF-1) ☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below) ☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below) ☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below) ☐ Detention pond or vault for hydromodification management ☐ Other (describe in discussion section below)	
Purpose: ☐ Pollutant control only ☐ Hydromodification control only ☒ Combined pollutant control and hydromodification control ☐ Pre-treatment/forebay for another structural BMP ☐ Other (describe in discussion section below)	
Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563	Tyler Lawson Pasco, Laret, Suiter & Associates
Who will be the final owner of this BMP?	CityMark Communities LLC
Who will maintain this BMP into perpetuity?	Property Management for CityMark Communities LLC
What is the funding mechanism for maintenance?	CityMark Communities LLC

Project Name: 17 ON VOLTAIRE - 4103 / 4111 VOLTAIRE STREET

Form I-6 Page 12 of 12 (Copy as many as needed)
Structural BMP ID No. BMP 6 (BF-1)
Construction Plan Sheet No. Sheet C1.1 - C1.3
Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs): BMP 6 is a 17 SF at-grade biofiltration basin located along Building #1. Refer to project DMA Exhibit for size of drainage area / portion of roof draining to planter and Attachment 1e for sizing worksheets with calculations, etc. BMP 6 has been sized to comply with water quality using alternative minimum sizing per Worksheet B.5-4 (i.e. "Non-Standard" Biofiltration BMP sizing in accordance with City of San Diego BMP Design Manual Appendix B.5.2), as well as Worksheet B.5-1. In accordance with Worksheet B.5-2 of the City of San Diego BMP Design Manual (included in Attachment 1 of this report), BMP 6 achieves a volume retention deficit of 5 cubic feet. This is further reduced to ~2.5 cubic feet using Worksheet B.5-6. As mentioned previously, the volume retention surplus achieved with BMP 4 (demonstrated in Worksheet B.5-6 for BMP 4) covers the volume retention deficit of BMPs 5 and 6.

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Attachment 1
Backup For PDP Pollutant Control BMPs

This is the cover sheet for Attachment 1.

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Project Name: 17 ON VOLTAIRE - 4103 / 4111 VOLTAIRE STREET

Indicate which Items are Included:

Attachment Sequence	Contents	Checklist
Attachment 1a	DMA Exhibit (Required) See DMA Exhibit Checklist.	☐ Included
Attachment 1b	Tabular Summary of DMAs Showing DMA ID matching DMA Exhibit, DMA Area, and DMA Type (Required)* *Provide table in this Attachment OR on DMA Exhibit in Attachment 1a	☑ Included on DMA Exhibit in Attachment 1a ☐ Included as Attachment 1b, separate from DMA Exhibit
Attachment 1c	Form I-7, Harvest and Use Feasibility Screening Checklist (Required unless the entire project will use infiltration BMPs) Refer to Appendix B.3-1 of the BMP Design Manual to complete Form I-7.	☑ Included ☐ Not included because the entire project will use infiltration BMPs

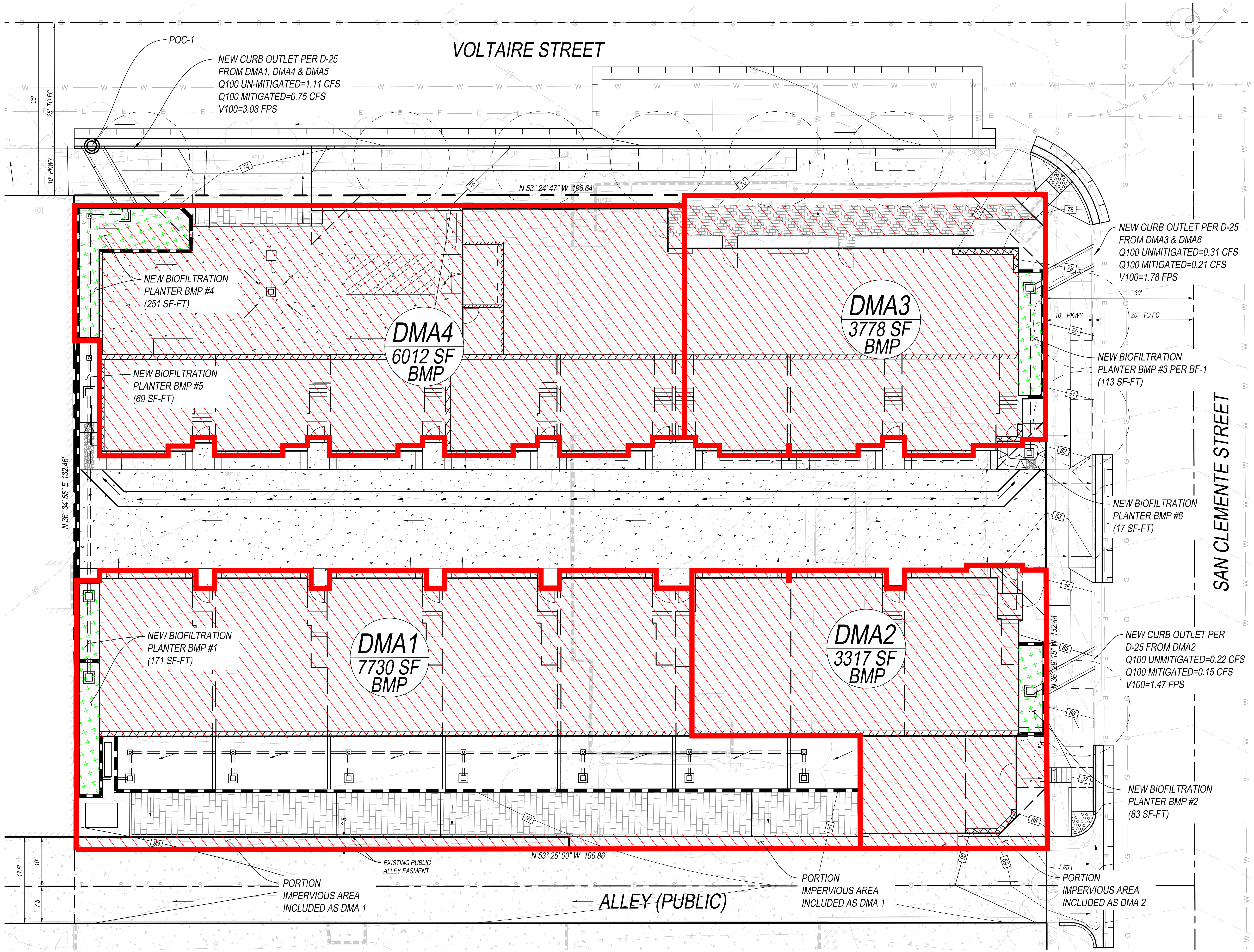
Attachment 1d	Infiltration Feasibility Information. Contents of Attachment 1d depend on the infiltration condition:
	• No Infiltration Condition:
	  ○ Infiltration Feasibility Condition Letter (*Note: must be stamped and signed by licensed geotechnical engineer*)
	  ○ Form I-8A (optional)
	  ○ Form I-8B (optional)
	• Partial Infiltration Condition:
	  ○ Infiltration Feasibility Condition Letter (*Note: must be stamped and signed by licensed geotechnical engineer*)
	  ○ Form I-8A
	  ○ Form I-8B
	• Full Infiltration Condition:
	  ○ Form I-8A
	  ○ Form I-8B
	  ○ Worksheet C.4-3
	  ○ Form I-9
	Refer to Appendices C and D of the BMP Design Manual for guidance.
		☑ Included
		☐ Not included because the entire project will use harvest and use BMPs

Attachment 1e	Pollutant Control BMP Design Worksheets / Calculations (Required) Refer to Appendices B and E of the BMP Design Manual for structural pollutant control BMP design guidelines and site design credit calculations	☑ Included

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

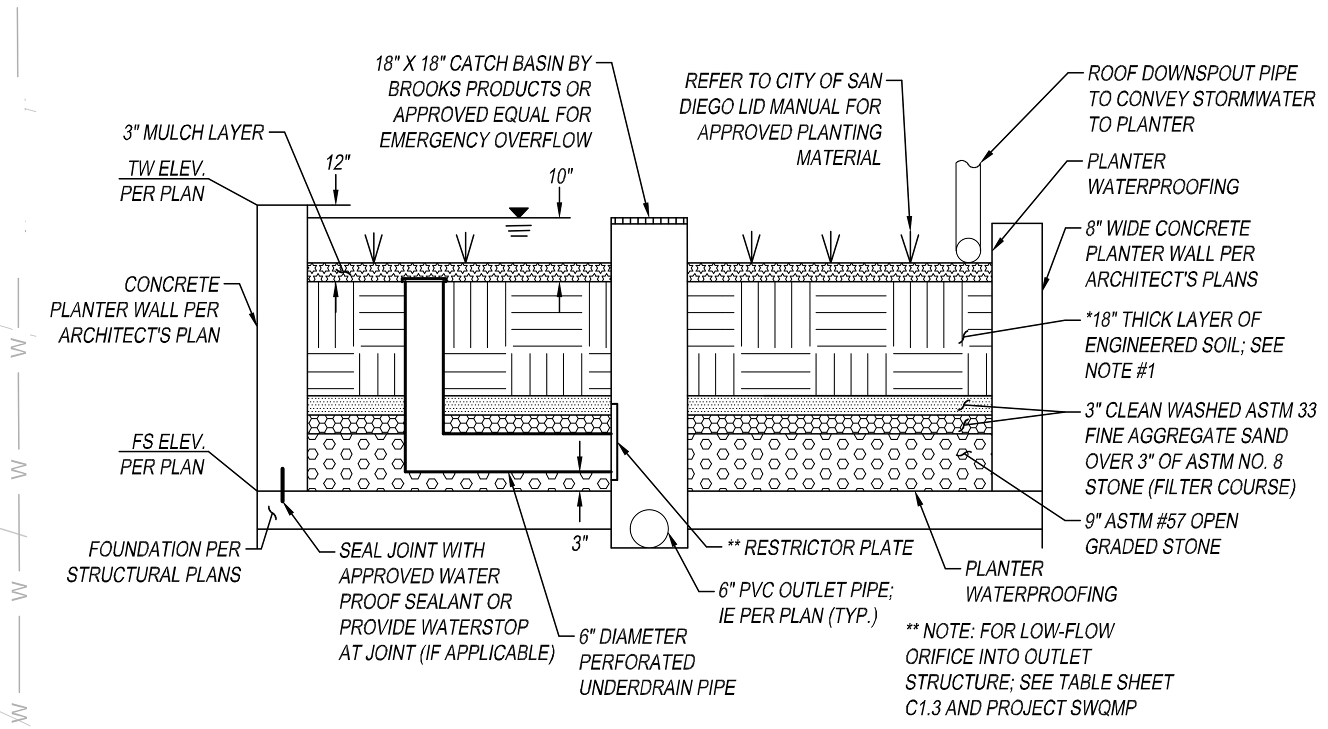
The DMA Exhibit must identify:

- ☑ Underlying hydrologic soil group
- ☑ Approximate depth to groundwater
- ☑ Existing natural hydrologic features (watercourses, seeps, springs, wetlands)
- ☑ Critical coarse sediment yield areas to be protected
- ☑ Existing topography and impervious areas
- ☑ Existing and proposed site drainage network and connections to drainage offsite
- ☑ Proposed grading
- ☑ Proposed impervious features
- ☑ Proposed design features and surface treatments used to minimize imperviousness
- ☑ Drainage management area (DMA) boundaries, DMA ID numbers, and DMA areas (square footage or acreage), and DMA type (i.e., drains to BMP, self-retaining, or self-mitigating)
- ☑ Potential pollutant source areas and corresponding required source controls (see Chapter 4, Appendix E.1, and Form I-3B)
- ☑ Structural BMPs (identify location, type of BMP, size/detail, and include cross-section)



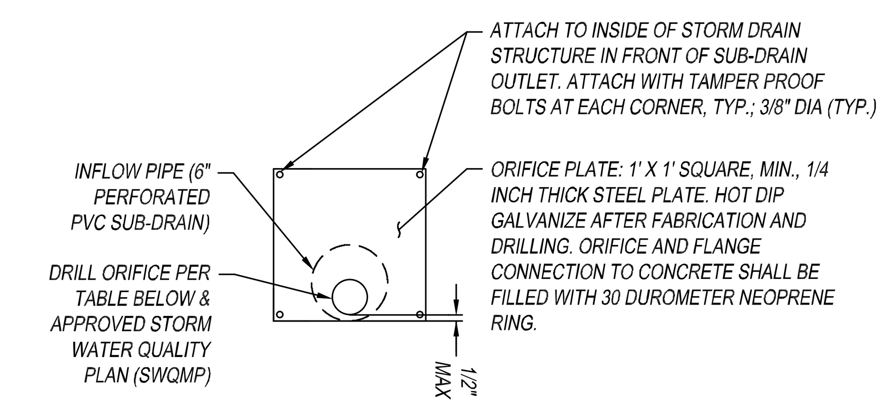
LEGEND

SUBJECT PROPERTY / SUBDIVISION BOUNDARY	
EXISTING RIGHT-OF-WAY / ADJACENT LOT LINE	
CENTERLINE OF ROAD	
PROPOSED MAJOR DRAINAGE BASIN BOUNDARY	
PROPOSED IMPERVIOUS AREA	
PROPOSED PERVIOUS PAVERS	
PROPOSED BIOFILTRATION AREA	



TYPICAL SECTION - BIOFILTRATION PLANTER (BF-1)

NOT TO SCALE



TYPICAL DETAIL - LOW FLOW ORIFICE PLATE

NOT TO SCALE

BMP SIZE & ORIFICE DIAMETER SUMMARY

BMP #	Hp (FT)	Hs (FT)	Hg (FT)	HMP ORIFICE (IN)	Abot (FT^2)	Atop (FT^2)	VOLUME (FT^3)
1	1.0	1.5	1.0	0.30	171	171	342
2	1.0	1.5	1.0	0.30	83	83	166
3	1.0	1.5	1.0	0.30	113	113	216
4	1.0	1.5	1.0	0.30	251	251	502
5	1.0	1.5	1.0	0.30	69	69	116
6	0.83	1.5	1.0	0.50	17	17	34

SWQMP DMA MAP

2ND FLOOR DRAINAGE AREAS

4103 VOLTAIRE STREET

SAN DIEGO, CA
PROJECT NUMBER: PE 3090
SCALE: 1"=10'
DATE: MARCH 13, 2020

SHEET 1 OF 1

HYDROLOGIC SOIL TYPE INFO

SOIL: TYPE D SOILS PER WEB SOIL SURVEY APPLICATION AVAILABLE THROUGH UNITED STATES DEPARTMENT OF AGRICULTURE

COARSE SEDIMENT YIELD

NO CRITICAL COARSE SEDIMENT YIELD AREAS TO BE PROTECTED. REFER TO PRIORITY DEVELOPMENT PROJECT SWQMP PREPARED BY PASCO, LARET, SUITER & ASSOCIATES

GROUNDWATER INFORMATION

GROUNDWATER ENCOUNTERED AT DEPTHS GREATER THAN 20'

NATURAL HYDROLOGIC FEATURES

NO NATURAL HYDROLOGIC FEATURES (WATERCOURSES, SEEPS, SPRINGS, WETLANDS) EXIST ON THE PROJECT SITE

TREATMENT CONTROL BMPS

BIOFILTRATION BASIN BF-1

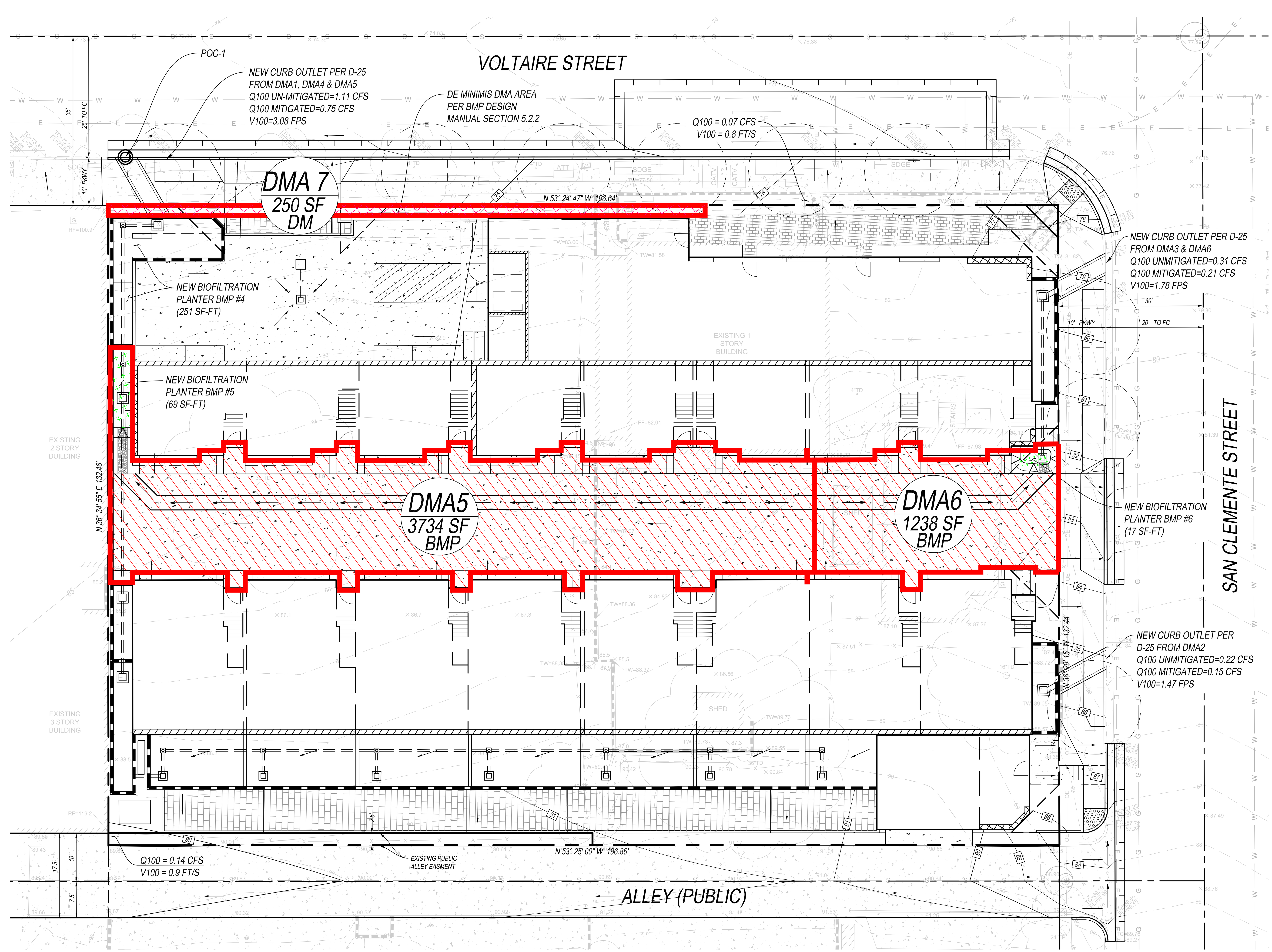
**RAISED PLANTER NOTE: ROOF DRAINAGE COLLECTED TO DISCHARGE TO SURFACE OF BIOFILTRATION PLANTER; PVC OUTLET DRAIN PIPE TO CONNECT DIRECTLY TO DOWNSTREAM CATCH BASIN OR DISCHARGE OFFSITE; THERE SHALL BE NO COMINGLING OF STORM WATER BETWEEN BIOFILTRATION / RAISED PLANTER AREAS

GRAPHIC SCALE 1" = 10'

10 0 10 20 30

PASCO LARET SUITER & ASSOCIATES
CIVIL ENGINEERING + LAND PLANNING + LAND SURVEYING
535 North Highway 101, Ste A, Solana Beach, CA 92075
ph 858.259.8212 | fx 858.259.4812 | plsaengineering.com

PLSA 3090-01



LEGEND

SUBJECT PROPERTY / SUBDIVISION BOUNDARY	
EXISTING RIGHT-OF-WAY / ADJACENT LOT LINE	
CENTERLINE OF ROAD	
PROPOSED MAJOR DRAINAGE BASIN BOUNDARY	
PROPOSED IMPERVIOUS AREA	
PROPOSED PERVIOUS PAVERS	
PROPOSED BIOFILTRATION AREA	
PROPOSED DE MINIMIS AREA PER CITY OF SAN DIEGO BMP DESIGN MANUAL SECTION 5.2.2	

PROJECT SITE AREA CALCULATIONS

TOTAL GROSS SITE AREA	26,059 SF
EXISTING IMPERVIOUS AREA	9,140 SF
EXISTING PERVIOUS AREA	16,919 SF
TOTAL AREA DISTURBED BY PROJECT	26,059 SF
TOTAL PROPOSED OR REPLACED IMPERVIOUS AREA	21,400 SF
DE MINIMIS PROPOSED / REPLACED IMPERVIOUS AREA	250 SF

POLLUTANT SOURCE AREAS

REFER TO FORM I-3B IN THE PROJECT SWQMP FOR POLLUTANT SOURCE AREAS OF CONCERN (NOT APPLICABLE TO THIS PROJECT AS FLOW-THRU TREATMENT BMP'S ARE NOT PROPOSED

REFER TO FORM I-4B IN THE PROJECT SWQMP FOR SOURCE CONTROL BMPS IDENTIFIED ON THIS PROJECT
4.2.1 PREVENTION OF ILLICIT DISCHARGES INTO THE MS4
4.2.2 STORM DRAIN STENCILING OR SIGNAGE
4.2.5 PROTECT TRASH STORAGE AREAS FROM RAINFALL, RUN-ON, RUNOFF, AND WIND DISPERSAL
4.2.6 ADDITIONAL BMPS IDENTIFIED:
- ONSITE STORM DRAIN INLETS
- INTERIOR FLOOR DRAINS
- NEED FOR FUTURE INDOOR & STRUCTURAL PEST CONTROL
- LANDSCAPE/OUTDOOR PESTICIDE USE
- FIRE SPRINKLER TEST WATER
- MISCELLANEOUS DRAIN OR WASH WATER
- PLAZAS, SIDEWALKS, AND PARKING LOTS

DE MINIMIS AREA (DMA 7)

TOTAL PROPOSED / REPLACED IMPERVOUS AREA	21,450 SF
DE MINIMIS DMA IMPERVIOUS AREA	250 SF (DMA 7)
% OVERALL PROPOSED HARDSCAPE	1.2%

SECTION 5.2.2 OF CITY OF SAN DIEGO BMP DESIGN MANUAL ALLOWS FOR DE MINIMIS DMA AREAS OF UP TO 250 SQUARE FEET. TOTAL DE MINIMIS DMA AREAS SHOULD REPRESENT LESS THAN 2.0 PERCENT OF THE TOTAL ADDED OR REPLACED IMPERVIOUS SURFACE OF THE PROJECT.

GRAPHIC SCALE 1" = 10'

10 0 10 20 30

SWQMP DMA MAP

GROUND FLOOR DRAINAGE AREAS

4103 VOLTAIRE STREET
SAN DIEGO, CA
PROJECT NUMBER: PTS 640598
SCALE: 1"=10'
DATE: MARCH 13, 2020

SHEET 2 OF 2

PASCO LARET SUITER & ASSOCIATES
CIVIL ENGINEERING + LAND PLANNING + LAND SURVEYING
535 North Highway 101, Ste A, Solana Beach, CA 92075
ph 858.259.8212 | fx 858.259.4812 | plsaengineering.com

PLSA 3090-01

Project Name: 17 ON VOLTAIRE - 4103 / 4111 VOLTAIRE STREET

Tabular Summary of DMAs								Worksheet B-1	
DMA Unique Identifier	Area (acres)	Impervious Area (acres)	% Imp	HSG	Area Weighted Runoff Coefficient	DCV (cubic feet)	Treated By (BMP ID)	Pollutant Control Type	Drains to (POC ID)
DMA 1	0.177	0.102	57	D	0.64	180	BMP 1	BF-1	1
DMA 2	0.076	0.076	87	D	0.82	110.5	BMP 2	BF-1	1
DMA 3	0.087	0.074	85	D	0.81	123.4	BMP 3	BF-1	1
DMA 4	0.138	0.131	95	D	0.87	215	BMP 4	BF-1	1
DMA 5	0.086	0.086	98	D	0.89	138.5	BMP 5	BF-1	1
DMA 6	0.028	0.028	99	D	0.89	45.9	BMP 6	BF-1	1
DMA 7	0.006	0.006	100	D	0.90	9.4	N/A	De Minimis	1
Summary of DMA Information (Must match project description and SWQMP Narrative)									
No. of DMAs	Total DMA Area (acres)	Total Impervious Area (acres)	% Imp		Area Weighted Runoff Coefficient	Total DCV (cubic feet)	Total Area Treated (acres)		No. of POCs
7	0.60	0.49	82		0.76	822.5	0.594		1

Where: DMA = Drainage Management Area; Imp = Imperviousness; HSG = Hydrologic Soil Group; DCV= Design Capture Volume; BMP = Best Management Practice; POC = Point of Compliance; ID = identifier; No. = Number

Harvest and Use Feasibility Checklist		Worksheet B.3-1 : Form I-7
1. Is there a demand for harvested water (check all that apply) at the project site that is reliably present during the wet season? ☑ Toilet and urinal flushing ☑ Landscape irrigation ☐ Other:___________		
2. If there is a demand; estimate the anticipated average wet season demand over a period of 36 hours. Guidance for planning level demand calculations for toilet/urinal flushing and landscape irrigation is provided in Section B.3.2. [Provide a summary of calculations here] Toilet / urinal flushing = 17.0 res. units x 4.0 residents / unit x 9.3 Gal / resident = 632 Gal for 1.0 commercial unit x ~10 employees x 7.0 Gal / employee = 70 Gal Landscape irrigation = 0.195 AC * 1,470 Gal / AC / 36 hr = 287 Gal Total = 632 Gal + 70 Gal + 287 Gal = 989 Gal = 132 Cu Ft		
3. Calculate the DCV using worksheet B-2.1. DCV = 723 (cubic feet) [Provide a summary of calculations here] DCV shown is total calculated for each DMA using worksheet B-2.1.		
3a. Is the 36-hour demand greater than or equal to the DCV? ☐ Yes ⇩ / ☑ No ⇨	3b. Is the 36-hour demand greater than 0.25DCV but less than the full DCV? ☐ Yes ⇩ / ☑ No ⇨	3c. Is the 36-hour demand less than 0.25DCV? ☑ Yes ⇩
Harvest and use appears to be feasible. Conduct more detailed evaluation and sizing calculations to confirm that DCV can be used at an adequate rate to meet drawdown criteria.	Harvest and use may be feasible. Conduct more detailed evaluation and sizing calculations to determine feasibility. Harvest and use may only be able to be used for a portion of the site, or (optionally) the storage may need to be upsized to meet long term capture targets while draining in longer than 36 hours.	Harvest and use is considered to be infeasible.
Is harvest and use feasible based on further evaluation? ☐ Yes, refer to Appendix E to select and size harvest and use BMPs. ☑ No, select alternate BMPs.		

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

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

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

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

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

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

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

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[10]	
2B-3	**Liquefaction**. If applicable, identify mapped liquefaction areas. Evaluate liquefaction hazards in accordance with Section 6.4.2 of the City of San Diego's Guidelines for Geotechnical Reports (2011 or most recent edition). Liquefaction hazard assessment shall take into account any increase in groundwater elevation or groundwater mounding that could occur as a result of proposed infiltration or percolation facilities. Can full infiltration BMPs be proposed within the DMA without increasing liquefaction risks?	☐ Yes	☐ No
2B-4	**Slope Stability**. If applicable, perform a slope stability analysis in accordance with the ASCE and Southern California Earthquake Center (2002) Recommended Procedures for Implementation of DMG Special Publication 117, Guidelines for Analyzing and Mitigating Landslide Hazards in California to determine minimum slope setbacks for full infiltration BMPs. See the City of San Diego's Guidelines for Geotechnical Reports (2011) to determine which type of slope stability analysis is required. Can full infiltration BMPs be proposed within the DMA without increasing slope stability risks?	☐ Yes	☐ No
2B-5	**Other Geotechnical Hazards.** Identify site-specific geotechnical hazards not already mentioned (refer to Appendix C.2.1). Can full infiltration BMPs be proposed within the DMA without increasing risk of geologic or geotechnical hazards not already mentioned?	☐ Yes	☐ No
2B-6	**Setbacks.** Establish setbacks from underground utilities, structures, and/or retaining walls. Reference applicable ASTM or other recognized standard in the geotechnical report. Can full infiltration BMPs be proposed within the DMA using established setbacks from underground utilities, structures, and/or retaining walls?	☐ Yes	☐ No

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

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

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

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

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

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[10]	
4B-3	**Liquefaction**. If applicable, identify mapped liquefaction areas. Evaluate liquefaction hazards in accordance with Section 6.4.2 of the City of San Diego's Guidelines for Geotechnical Reports (2011). Liquefaction hazard assessment shall take into account any increase in groundwater elevation or groundwater mounding that could occur as a result of proposed infiltration or percolation facilities. Can partial infiltration BMPs be proposed within the DMA without increasing liquefaction risks?	☐ Yes	☐ No
4B-4	**Slope Stability**. If applicable, perform a slope stability analysis in accordance with the ASCE and Southern California Earthquake Center (2002) Recommended Procedures for Implementation of DMG Special Publication 117, Guidelines for Analyzing and Mitigating Landslide Hazards in California to determine minimum slope setbacks for full infiltration BMPs. See the City of San Diego's Guidelines for Geotechnical Reports (2011) to determine which type of slope stability analysis is required. Can partial infiltration BMPs be proposed within the DMA without increasing slope stability risks?	☐ Yes	☐ No
4B-5	**Other Geotechnical Hazards.** Identify site-specific geotechnical hazards not already mentioned (refer to Appendix C.2.1). Can partial infiltration BMPs be proposed within the DMA without increasing risk of geologic or geotechnical hazards not already mentioned?	☐ Yes	☐ No
4B-6	**Setbacks.** Establish setbacks from underground utilities, structures, and/or retaining walls. Reference applicable ASTM or other recognized standard in the geotechnical report. Can partial infiltration BMPs be proposed within the DMA using recommended setbacks from underground utilities, structures, and/or retaining walls?	☐ Yes	☐ No
4C	**Mitigation Measures.** Propose mitigation measures for each geologic/geotechnical hazard identified in Step 4B. Provide a discussion on geologic/geotechnical hazards that would prevent partial infiltration BMPs that cannot be reasonably mitigated in the geotechnical report. See Appendix C.2.1.8 for a list of typically reasonable and typically unreasonable mitigation measures. Can mitigation measures be proposed to allow for partial infiltration BMPs? If the question in Step 4C is answered "Yes," then answer "Yes" to Criteria 4 Result. If the question in Step 4C is answered "No," then answer "No" to Criteria 4 Result.	☐ Yes	☐ No

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[10]	
Criteria 4 Result	Can infiltration of greater than or equal to 0.05 inches/hour and less than or equal to 0.5 inches/hour be allowed without increasing the risk of geologic or geotechnical hazards that cannot be reasonably mitigated to an acceptable level?	☐ Yes	☐ No

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

For the complete infiltration feasibility evaluation see NOVA Services Inc., geotechnical study (reference, *Report, Geotechnical Investigation, Proposed 17 on Voltaire Townhouses, Voltaire Street and San Clemente Street, San Diego, CA,* NOVA Services Inc., Project No. 2019147, August 02, 2019.)

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

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

DMA 1

Worksheet B.2-1: DCV				
Design Capture Volume				
1	85th percentile 24-hr storm depth from Figure B.1-1	d=	0.50	inches
2	Area Tributary to BMP (s)	A=	0.177	acres
3	Area Weighted runoff factor (estimate using Appendix B.1.1 and B.2.1)	C=	0.56	unitless
4	Trees Credit Volume	TCV=	0.00	cubic-feet
5	Rain Barrels Credit Volume	RCV=	0.00	cubic-feet
6	Calculate DCV = (3630 x C x d x A) - TCV - RCV	DCV=	**179.7**	cubic-feet

DMA 2

Worksheet B.2-1: DCV				
Design Capture Volume				
1	85th percentile 24-hr storm depth from Figure B.1-1	d=	0.50	inches
2	Area Tributary to BMP (s)	A=	0.076	acres
3	Area Weighted runoff factor (estimate using Appendix B.1.1 and B.2.1)	C=	0.80	unitless
4	Trees Credit Volume	TCV=	0.00	cubic-feet
5	Rain Barrels Credit Volume	RCV=	0.00	cubic-feet
6	Calculate DCV = (3630 x C x d x A) - TCV - RCV	DCV=	**110.5**	cubic-feet

DMA 3

Worksheet B.2-1: DCV				
Design Capture Volume				
1	85th percentile 24-hr storm depth from Figure B.1-1	d=	0.50	inches
2	Area Tributary to BMP (s)	A=	0.087	acres
3	Area Weighted runoff factor (estimate using Appendix B.1.1 and	C=	0.78	unitless
4	Trees Credit Volume	TCV=	0.00	cubic-feet
5	Rain Barrels Credit Volume	RCV=	0.00	cubic-feet
6	Calculate DCV = (3630 x C x d x A) - TCV - RCV	DCV=	**123.4**	cubic-feet

DMA 4

Worksheet B.2-1: DCV				
Design Capture Volume				
1	85th percentile 24-hr storm depth from Figure B.1-1	d=	0.50	inches
2	Area Tributary to BMP (s)	A=	0.138	acres
3	Area Weighted runoff factor (estimate using Appendix B.1.1 and	C=	0.86	unitless
4	Trees Credit Volume	TCV=	0.00	cubic-feet
5	Rain Barrels Credit Volume	RCV=	0.00	cubic-feet
6	Calculate DCV = (3630 x C x d x A) - TCV - RCV	DCV=	**215.1**	cubic-feet

DMA 5

Worksheet B.2-1: DCV				
Design Capture Volume				
1	85th percentile 24-hr storm depth from Figure B.1-1	d=	0.50	inches
2	Area Tributary to BMP (s)	A=	0.086	acres
3	Area Weighted runoff factor (estimate using Appendix B.1.1 and	C=	0.89	unitless
4	Trees Credit Volume	TCV=	0.00	cubic-feet
5	Rain Barrels Credit Volume	RCV=	0.00	cubic-feet
6	Calculate DCV = (3630 x C x d x A) - TCV - RCV	DCV=	**138.5**	cubic-feet

DMA 6

Worksheet B.2-1: DCV				
Design Capture Volume				
1	85th percentile 24-hr storm depth from Figure B.1-1	d=	0.50	inches
2	Area Tributary to BMP (s)	A=	0.028	acres
3	Area Weighted runoff factor (estimate using Appendix B.1.1 and	C=	0.89	unitless
4	Trees Credit Volume	TCV=	0.00	cubic-feet
5	Rain Barrels Credit Volume	RCV=	0.00	cubic-feet
6	Calculate DCV = (3630 x C x d x A) - TCV - RCV	DCV=	**45.9**	cubic-feet

DMA 7 (DE MINIMIS)

Worksheet B.2-1: DCV				
Design Capture Volume				
1	85th percentile 24-hr storm depth from Figure B.1-1	d=	0.50	inches
2	Area Tributary to BMP (s)	A=	0.006	acres
3	Area Weighted runoff factor (estimate using Appendix B.1.1 and	C=	0.90	unitless
4	Trees Credit Volume	TCV=	0.00	cubic-feet
5	Rain Barrels Credit Volume	RCV=	0.00	cubic-feet
6	Calculate DCV = (3630 x C x d x A) - TCV - RCV	DCV=	**9.4**	cubic-feet

The City of SAN DIEGO	Project Name	17 ON VOLTAIRE	
	BMP ID	BMP #1	
Sizing Method for Pollutant Removal Criteria		**Worksheet B.5-1**	
1	Area draining to the BMP	7730	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.56	
3	85th percentile 24-hour rainfall depth	0.50	inches
4	Design capture volume [Line 1 x Line 2 x (Line 3/12)]	180	cu. ft.
BMP Parameters			
5	Surface ponding [6 inch minimum, 12 inch maximum]	12	inches
6	Media thickness [18 inches minimum], also add mulch layer and washed ASTM 33 fine aggregate sand thickness to this line for sizing calculations	24	inches
7	Aggregate storage (also add ASTM No 8 stone) above underdrain invert (12 inches typical) – use 0 inches if the aggregate is not over the entire bottom surface area	9	inches
8	Aggregate storage below underdrain invert (3 inches minimum) – use 0 inches if the aggregate is not over the entire bottom surface area	3	inches
9	Freely drained pore storage of the media	0.2	in/in
10	Porosity of aggregate storage	0.4	in/in
11	Media filtration rate to be used for sizing (maximum filtration rate of 5 in/hr. with no outlet control; if the filtration rate is controlled by the outlet use the outlet controlled rate (includes infiltration into the soil and flow rate through the outlet structure) which will be less than 5 in/hr.)	1.088	in/hr.
Baseline Calculations			
12	Allowable routing time for sizing	6	hours
13	Depth filtered during storm [Line 11 x Line 12]	6.525	inches
14	Depth of Detention Storage [Line 5 + (Line 6 x Line 9) + (Line 7 x Line 10) + (Line 8 x Line 10)]	21.6	inches
15	Total Depth Treated [Line 13 + Line 14]	28.125	inches
Option 1 – Biofilter 1.5 times the DCV			
16	Required biofiltered volume [1.5 x Line 4]	270	cu. ft.
17	Required Footprint [Line 16/ Line 15] x 12	115	sq. ft.
Option 2 - Store 0.75 of remaining DCV in pores and ponding			
18	Required Storage (surface + pores) Volume [0.75 x Line 4]	135	cu. ft.
19	Required Footprint [Line 18/ Line 14] x 12	75	sq. ft.
Footprint of the BMP			
20	BMP Footprint Sizing Factor (Default 0.03 or an alternative minimum footprint sizing factor from Line 11 in Worksheet B.5-4)	0.03	
21	Minimum BMP Footprint [Line 1 x Line 2 x Line 20]	129	sq. ft.
22	Footprint of the BMP = Maximum(Minimum(Line 17, Line 19), Line 21)	129	sq. ft.
23	Provided BMP Footprint	171	sq. ft.
24	Is Line 23 ≥ Line 22?	**Yes, Performance Standard is Met**	

The City of SAN DIEGO	Project Name	17 ON VOLTAIRE	
	BMP ID	BMP #2	
Sizing Method for Pollutant Removal Criteria		**Worksheet B.5-1**	

1	Area draining to the BMP	3317	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.80	
3	85^{th} percentile 24-hour rainfall depth	0.50	inches
4	Design capture volume [Line 1 x Line 2 x (Line 3/12)]	110	cu. ft.
BMP Parameters			
5	Surface ponding [6 inch minimum, 12 inch maximum]	12	inches
6	Media thickness [18 inches minimum], also add mulch layer and washed ASTM 33 fine aggregate sand thickness to this line for sizing calculations	24	inches
7	Aggregate storage (also add ASTM No 8 stone) above underdrain invert (12 inches typical) – use 0 inches if the aggregate is not over the entire bottom surface area	9	inches
8	Aggregate storage below underdrain invert (3 inches minimum) – use 0 inches if the aggregate is not over the entire bottom surface area	3	inches
9	Freely drained pore storage of the media	0.2	in/in
10	Porosity of aggregate storage	0.4	in/in
11	Media filtration rate to be used for sizing (maximum filtration rate of 5 in/hr. with no outlet control; if the filtration rate is controlled by the outlet use the outlet controlled rate (includes infiltration into the soil and flow rate through the outlet structure) which will be less than 5 in/hr.)	2.241	in/hr.
Baseline Calculations			
12	Allowable routing time for sizing	6	hours
13	Depth filtered during storm [Line 11 x Line 12]	13.444	inches
14	Depth of Detention Storage [Line 5 + (Line 6 x Line 9) + (Line 7 x Line 10) + (Line 8 x Line 10)]	21.6	inches
15	Total Depth Treated [Line 13 + Line 14]	35.044	inches
Option 1 – Biofilter 1.5 times the DCV			
16	Required biofiltered volume [1.5 x Line 4]	166	cu. ft.
17	Required Footprint [Line 16/ Line 15] x 12	57	sq. ft.
Option 2 - Store 0.75 of remaining DCV in pores and ponding			
18	Required Storage (surface + pores) Volume [0.75 x Line 4]	83	cu. ft.
19	Required Footprint [Line 18/ Line 14] x 12	46	sq. ft.
Footprint of the BMP			
20	BMP Footprint Sizing Factor (Default 0.03 or an alternative minimum footprint sizing factor from Line 11 in Worksheet B.5-4)	0.03	
21	Minimum BMP Footprint [Line 1 x Line 2 x Line 20]	80	sq. ft.
22	Footprint of the BMP = Maximum(Minimum(Line 17, Line 19), Line 21)	80	sq. ft.
23	Provided BMP Footprint	83	sq. ft.
24	Is Line 23 ≥ Line 22?	**Yes, Performance Standard is Met**	

The City of SAN DIEGO		Project Name	17 ON VOLTAIRE	
		BMP ID	BMP #3	
Sizing Method for Pollutant Removal Criteria			**Worksheet B.5-1**	
1	Area draining to the BMP		3778	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)		0.78	
3	85^{th} percentile 24-hour rainfall depth		0.50	inches
4	Design capture volume [Line 1 x Line 2 x (Line 3/12)]		123	cu. ft.
BMP Parameters				
5	Surface ponding [6 inch minimum, 12 inch maximum]		12	inches
6	Media thickness [18 inches minimum], also add mulch layer and washed ASTM 33 fine aggregate sand thickness to this line for sizing calculations		24	inches
7	Aggregate storage (also add ASTM No 8 stone) above underdrain invert (12 inches typical) – use 0 inches if the aggregate is not over the entire bottom surface area		9	inches
8	Aggregate storage below underdrain invert (3 inches minimum) – use 0 inches if the aggregate is not over the entire bottom surface area		3	inches
9	Freely drained pore storage of the media		0.2	in/in
10	Porosity of aggregate storage		0.4	in/in
11	Media filtration rate to be used for sizing (maximum filtration rate of 5 in/hr. with no outlet control; if the filtration rate is controlled by the outlet use the outlet controlled rate (includes infiltration into the soil and flow rate through the outlet structure) which will be less than 5 in/hr.)		1.646	in/hr.
Baseline Calculations				
12	Allowable routing time for sizing		6	hours
13	Depth filtered during storm [Line 11 x Line 12]		9.875	inches
14	Depth of Detention Storage [Line 5 + (Line 6 x Line 9) + (Line 7 x Line 10) + (Line 8 x Line 10)]		21.6	inches
15	Total Depth Treated [Line 13 + Line 14]		31.475	inches
Option 1 – Biofilter 1.5 times the DCV				
16	Required biofiltered volume [1.5 x Line 4]		185	cu. ft.
17	Required Footprint [Line 16/ Line 15] x 12		71	sq. ft.
Option 2 - Store 0.75 of remaining DCV in pores and ponding				
18	Required Storage (surface + pores) Volume [0.75 x Line 4]		93	cu. ft.
19	Required Footprint [Line 18/ Line 14] x 12		51	sq. ft.
Footprint of the BMP				
20	BMP Footprint Sizing Factor (Default 0.03 or an alternative minimum footprint sizing factor from Line 11 in Worksheet B.5-4)		0.03	
21	Minimum BMP Footprint [Line 1 x Line 2 x Line 20]		89	sq. ft.
22	Footprint of the BMP = Maximum(Minimum(Line 17, Line 19), Line 21)		89	sq. ft.
23	Provided BMP Footprint		113	sq. ft.
24	Is Line 23 ≥ Line 22?	**Yes, Performance Standard is Met**		

The City of SAN DIEGO	Project Name	17 ON VOLTAIRE	
	BMP ID	BMP #4	
Sizing Method for Pollutant Removal Criteria		**Worksheet B.5-1**	

1	Area draining to the BMP	6012	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.86	
3	85th percentile 24-hour rainfall depth	0.5	inches
4	Design capture volume [Line 1 x Line 2 x (Line 3/12)]	215	cu. ft.
BMP Parameters			
5	Surface ponding [6 inch minimum, 12 inch maximum]	12	inches
6	Media thickness [18 inches minimum], also add mulch layer and washed ASTM 33 fine aggregate sand thickness to this line for sizing calculations	18	inches
7	Aggregate storage (also add ASTM No 8 stone) above underdrain invert (12 inches typical) – use 0 inches if the aggregate is not over the entire bottom surface area	12	inches
8	Aggregate storage below underdrain invert (3 inches minimum) – use 0 inches if the aggregate is not over the entire bottom surface area	3	inches
9	Freely drained pore storage of the media	0.2	in/in
10	Porosity of aggregate storage	0.4	in/in
11	Media filtration rate to be used for sizing (maximum filtration rate of 5 in/hr. with no outlet control; if the filtration rate is controlled by the outlet use the outlet controlled rate (includes infiltration into the soil and flow rate through the outlet structure) which will be less than 5 in/hr.)	0.759	in/hr.
Baseline Calculations			
12	Allowable routing time for sizing	6	hours
13	Depth filtered during storm [Line 11 x Line 12]	4.554	inches
14	Depth of Detention Storage [Line 5 + (Line 6 x Line 9) + (Line 7 x Line 10) + (Line 8 x Line 10)]	21.6	inches
15	Total Depth Treated [Line 13 + Line 14]	26.154	inches
Option 1 – Biofilter 1.5 times the DCV			
16	Required biofiltered volume [1.5 x Line 4]	323	cu. ft.
17	Required Footprint [Line 16/ Line 15] x 12	148	sq. ft.
Option 2 - Store 0.75 of remaining DCV in pores and ponding			
18	Required Storage (surface + pores) Volume [0.75 x Line 4]	162	cu. ft.
19	Required Footprint [Line 18/ Line 14] x 12	90	sq. ft.
Footprint of the BMP			
20	BMP Footprint Sizing Factor (Default 0.03 or an alternative minimum footprint sizing factor from Line 11 in Worksheet B.5-4)	0.03	
21	Minimum BMP Footprint [Line 1 x Line 2 x Line 20]	155	sq. ft.
22	Footprint of the BMP = Maximum(Minimum(Line 17, Line 19), Line 21)	155	sq. ft.
23	Provided BMP Footprint	251	sq. ft.
24	Is Line 23 ≥ Line 22?	**Yes, Performance Standard is Met**	

The City of SAN DIEGO	Project Name	17 ON VOLTAIRE	
	BMP ID	BMP #4	
Sizing Method for Volume Retention Criteria		**Worksheet B.5-2**	

1	Area draining to the BMP	6012	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.86	
3	85^{th} percentile 24-hour rainfall depth	0.5	inches
4	Design capture volume [Line 1 x Line 2 x (Line 3/12)]	215	cu. ft.
Volume Retention Requirement			
5	Measured infiltration rate in the DMA Note: When mapped hydrologic soil groups are used enter 0.10 for NRCS Type D soils and for NRCS Type C soils enter 0.30 When in no infiltration condition and the actual measured infiltration rate is unknown enter 0.0 if there are geotechnical and/or groundwater hazards identified in Appendix C or enter 0.05	0.1	in/hr.
6	Factor of safety	2	
7	Reliable infiltration rate, for biofiltration BMP sizing [Line 5 / Line 6]	0.05	in/hr.
8	Average annual volume reduction target (Figure B.5-2) When Line 7 > 0.01 in/hr. = Minimum (40, 166.9 x Line 7 +6.62) When Line 7 ≤ 0.01 in/hr. = 3.5%	15.0	%
9	Fraction of DCV to be retained (Figure B.5-3) When Line 8 > 8% = $0.0000013 \times \text{Line } 8^3 - 0.000057 \times \text{Line } 8^2 + 0.0086 \times \text{Line } 8 - 0.014$ When Line 8 ≤ 8% = 0.023	0.106	
10	Target volume retention [Line 9 x Line 4]	23	cu. ft.

The City of SAN DIEGO

		Project Name	17 ON VOLTAIRE
		BMP ID	BMP #4

Volume Retention for No Infiltration Condition						**Worksheet B.5-6**
1	Area draining to the biofiltration BMP				6012	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)				0.86	
3	Effective impervious area draining to the BMP [Line 1 x Line 2]				5170	sq. ft.
4	Required area for Evapotranspiration [Line 3 x 0.03]				155	sq. ft.
5	Biofiltration BMP Footprint				251	sq. ft.
Landscape Area (must be identified on DS-3247)						
	Identification	**1**	**2**	**3**	**4**	**5**
6	Landscape area that meet the requirements in SD-B and SD-F Fact Sheet (sq. ft.)					
7	Impervious area draining to the landscape area (sq. ft.)					
8	Impervious to Pervious Area ratio [Line 7/Line 6]	0.00	0.00	0.00	0.00	0.00
9	Effective Credit Area If (Line 8 >1.5, Line 6, Line 7/1.5]	0	0	0	0	0
10	Sum of Landscape area [sum of Line 9 Id's 1 to 5]				0	sq. ft.
11	Provided footprint for evapotranspiration [Line 5 + Line 10]				251	sq. ft.
Volume Retention Performance Standard						
12	Is Line 11 ≥ Line 4?	Volume Retention Performance Standard is Met				
13	Fraction of the performance standard met through the BMP footprint and/or landscaping [Line 11/Line 4]				1.62	
14	Target Volume Retention [Line 10 from Worksheet B.5.2]				23	cu. ft.
15	Volume retention required from other site design BMPs [(1-Line 13) x Line 14]				-14.26	cu. ft.
Site Design BMP						
	Identification	**Site Design Type**			**Credit**	
16	**1**					cu. ft.
	2					cu. ft.
	3					cu. ft.
	4					cu. ft.
	5					cu. ft.
	Sum of volume retention benefits from other site design BMPs (e.g. trees; rain barrels etc.). [sum of Line 16 Credits for Id's 1 to 5] Provide documentation of how the site design credit is calculated in the PDP SWQMP.				0	cu. ft.
17	Is Line 16 ≥ Line 15?	Volume Retention Performance Standard is Met				

The City of SAN DIEGO

	Project Name	17 ON VOLTAIRE	
	BMP ID	BMP #5	
Sizing Method for Pollutant Removal Criteria		**Worksheet B.5-1**	
1	Area draining to the BMP	3734	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.89	
3	85^{th} percentile 24-hour rainfall depth	0.5	inches
4	Design capture volume [Line 1 x Line 2 x (Line 3/12)]	138	cu. ft.
BMP Parameters			
5	Surface ponding [6 inch minimum, 12 inch maximum]	12	inches
6	Media thickness [18 inches minimum], also add mulch layer and washed ASTM 33 fine aggregate sand thickness to this line for sizing calculations	18	inches
7	Aggregate storage (also add ASTM No 8 stone) above underdrain invert (12 inches typical) – use 0 inches if the aggregate is not over the entire bottom surface area	12	inches
8	Aggregate storage below underdrain invert (3 inches minimum) – use 0 inches if the aggregate is not over the entire bottom surface area	3	inches
9	Freely drained pore storage of the media	0.2	in/in
10	Porosity of aggregate storage	0.4	in/in
11	Media filtration rate to be used for sizing (maximum filtration rate of 5 in/hr. with no outlet control; if the filtration rate is controlled by the outlet use the outlet controlled rate (includes infiltration into the soil and flow rate through the outlet structure) which will be less than 5 in/hr.)	3.286	in/hr.
Baseline Calculations			
12	Allowable routing time for sizing	6	hours
13	Depth filtered during storm [Line 11 x Line 12]	19.716	inches
14	Depth of Detention Storage [Line 5 + (Line 6 x Line 9) + (Line 7 x Line 10) + (Line 8 x Line 10)]	21.6	inches
15	Total Depth Treated [Line 13 + Line 14]	41.316	inches
Option 1 – Biofilter 1.5 times the DCV			
16	Required biofiltered volume [1.5 x Line 4]	208	cu. ft.
17	Required Footprint [Line 16/ Line 15] x 12	60	sq. ft.
Option 2 - Store 0.75 of remaining DCV in pores and ponding			
18	Required Storage (surface + pores) Volume [0.75 x Line 4]	104	cu. ft.
19	Required Footprint [Line 18/ Line 14] x 12	58	sq. ft.
Footprint of the BMP			
20	BMP Footprint Sizing Factor (Default 0.03 or an alternative minimum footprint sizing factor from Line 11 in Worksheet B.5-4)	0.014	
21	Minimum BMP Footprint [Line 1 x Line 2 x Line 20]	47	sq. ft.
22	Footprint of the BMP = Maximum(Minimum(Line 17, Line 19), Line 21)	58	sq. ft.
23	Provided BMP Footprint	69	sq. ft.
24	Is Line 23 ≥ Line 22?	**Yes, Performance Standard is Met**	

The City of SAN DIEGO	Project Name	17 ON VOLTAIRE	
	BMP ID	BMP #5	
Sizing Method for Volume Retention Criteria		**Worksheet B.5-2**	

1	Area draining to the BMP	3734	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.89	
3	85th percentile 24-hour rainfall depth	0.5	inches
4	Design capture volume [Line 1 x Line 2 x (Line 3/12)]	138	cu. ft.
Volume Retention Requirement			
5	Measured infiltration rate in the DMA Note: When mapped hydrologic soil groups are used enter 0.10 for NRCS Type D soils and for NRCS Type C soils enter 0.30 When in no infiltration condition and the actual measured infiltration rate is unknown enter 0.0 if there are geotechnical and/or groundwater hazards identified in Appendix C or enter 0.05	0.1	in/hr.
6	Factor of safety	2	
7	Reliable infiltration rate, for biofiltration BMP sizing [Line 5 / Line 6]	0.05	in/hr.
8	Average annual volume reduction target (Figure B.5-2) When Line 7 > 0.01 in/hr. = Minimum (40, 166.9 x Line 7 +6.62) When Line 7 ≤ 0.01 in/hr. = 3.5%	15.0	%
9	Fraction of DCV to be retained (Figure B.5-3) When Line 8 > 8% = 0.0000013 x Line 8^3 - 0.000057 x Line 8^2 + 0.0086 x Line 8 - 0.014 When Line 8 ≤ 8% = 0.023	0.106	
10	Target volume retention [Line 9 x Line 4]	15	cu. ft.

The City of SAN DIEGO	Project Name	Voltaire Street
	BMP ID	5

Alternative Minimum Footprint Sizing Factor for Non-Standard Biofiltration	Worksheet B.5-4

1	Area draining to the BMP	3734	sq. ft.
2	Adjusted Runoff Factor for drainage area (Refer to Appendix B.1 and B.2)	0.89	
3	Load to Clog (default value when using Appendix E fact sheets is 2.0)	3	lb/sq. ft.
4	Allowable Period to Accumulate Clogging Load (T_L) (default value is 10)	10	years

Volume Weighted EMC Calculation

Land Use	Fraction of Total DCV	TSS EMC (mg/L)	Product
Single Family Residential		123	0
Commercial		128	0
Industrial		125	0
Education (Municipal)		132	0
Transportation	1	78	78
Multi-family Residential		40	0
Roof Runoff		14	0
Low Traffic Areas		50	0
Open Space		216	0
Other, specify:			0
Other, specify:			0
Other, specify:			0

5	Volume Weighted EMC (sum of all products)	78	mg/L

Sizing Factor for Clogging

6	Adjustment for pretreatment measures Where: Line 6 = 0 if no pretreatment; Line 6 = 0.25 when pretreatment is included; Line 6 = 0.5 if the pretreatment has an active Washington State TAPE approval rating for “pre-treatment.”	0	
7	Average Annual Precipitation [Provide documentation of the data source in the discussion box; SanGIS has a GIS layer for average annual precipitation]	10	inches
8	Calculate the Average Annual Runoff (Line 7/12) x Line 1 x Line2	2769	cu-ft/yr
9	Calculate the Average Annual TSS Load (Line 8 x 62.4 x Line 5 x (1 – Line 6))/10^6	13	lb/yr
10	Calculate the BMP Footprint Needed (Line 9 x Line 4)/Line 3	45	sq. ft.
11	Calculate the Minimum Footprint Sizing Factor for Clogging [Line 10/ (Line 1 x Line 2)]	0.014	

Discussion:

Sizing factor of 1.4% used for BMP #5 for alternative minimum footprint sizing for non-standard biofiltration basins. This factor was used in Worksheet B.5-1.

The City of SAN DIEGO	Project Name	17 ON VOLTAIRE				
	BMP ID	BMP #5				

Volume Retention for No Infiltration Condition					Worksheet B.5-6	
1	Area draining to the biofiltration BMP				3734	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)				0.89	
3	Effective impervious area draining to the BMP [Line 1 x Line 2]				3323	sq. ft.
4	Required area for Evapotranspiration [Line 3 x 0.03]				100	sq. ft.
5	Biofiltration BMP Footprint				69	sq. ft.

Landscape Area (must be identified on DS-3247)

	Identification	1	2	3	4	5
6	Landscape area that meet the requirements in SD-B and SD-F Fact Sheet (sq. ft.)					
7	Impervious area draining to the landscape area (sq. ft.)					
8	Impervious to Pervious Area ratio [Line 7/Line 6]	0.00	0.00	0.00	0.00	0.00
9	Effective Credit Area If (Line 8 >1.5, Line 6, Line 7/1.5]	0	0	0	0	0
10	Sum of Landscape area [sum of Line 9 Id's 1 to 5]				0	sq. ft.
11	Provided footprint for evapotranspiration [Line 5 + Line 10]				69	sq. ft.

Volume Retention Performance Standard

12	Is Line 11 ≥ Line 4?	No, Proceed to Line 13	
13	Fraction of the performance standard met through the BMP footprint and/or landscaping [Line 11/Line 4]	0.69	
14	Target Volume Retention [Line 10 from Worksheet B.5.2]	15	cu. ft.
15	Volume retention required from other site design BMPs [(1-Line 13) x Line 14]	4.65	cu. ft.

Site Design BMP

	Identification	Site Design Type	Credit	
16	1	Volume Retention Surplus - BMP #4	4.65	cu. ft.
	2			cu. ft.
	3			cu. ft.
	4			cu. ft.
	5			cu. ft.
	Sum of volume retention benefits from other site design BMPs (e.g. trees; rain barrels etc.). [sum of Line 16 Credits for Id's 1 to 5] Provide documentation of how the site design credit is calculated in the PDP SWQMP.		4.65	cu. ft.
17	Is Line 16 ≥ Line 15?	Volume Retention Performance Standard is Met		

The City of SAN DIEGO	Project Name	17 ON VOLTAIRE	
	BMP ID	BMP #6	
Sizing Method for Pollutant Removal Criteria		**Worksheet B.5-1**	

1	Area draining to the BMP	1238	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.89	
3	85th percentile 24-hour rainfall depth	0.5	inches
4	Design capture volume [Line 1 x Line 2 x (Line 3/12)]	46	cu. ft.
BMP Parameters			
5	Surface ponding [6 inch minimum, 12 inch maximum]	10	inches
6	Media thickness [18 inches minimum], also add mulch layer and washed ASTM 33 fine aggregate sand thickness to this line for sizing calculations	18	inches
7	Aggregate storage (also add ASTM No 8 stone) above underdrain invert (12 inches typical) – use 0 inches if the aggregate is not over the entire bottom surface area	12	inches
8	Aggregate storage below underdrain invert (3 inches minimum) – use 0 inches if the aggregate is not over the entire bottom surface area	3	inches
9	Freely drained pore storage of the media	0.2	in/in
10	Porosity of aggregate storage	0.4	in/in
11	Media filtration rate to be used for sizing (maximum filtration rate of 5 in/hr. with no outlet control; if the filtration rate is controlled by the outlet use the outlet controlled rate (includes infiltration into the soil and flow rate through the outlet structure) which will be less than 5 in/hr.)	5	in/hr.
Baseline Calculations			
12	Allowable routing time for sizing	6	hours
13	Depth filtered during storm [Line 11 x Line 12]	30	inches
14	Depth of Detention Storage [Line 5 + (Line 6 x Line 9) + (Line 7 x Line 10) + (Line 8 x Line 10)]	19.6	inches
15	Total Depth Treated [Line 13 + Line 14]	49.6	inches
Option 1 – Biofilter 1.5 times the DCV			
16	Required biofiltered volume [1.5 x Line 4]	69	cu. ft.
17	Required Footprint [Line 16/ Line 15] x 12	17	sq. ft.
Option 2 - Store 0.75 of remaining DCV in pores and ponding			
18	Required Storage (surface + pores) Volume [0.75 x Line 4]	34	cu. ft.
19	Required Footprint [Line 18/ Line 14] x 12	21	sq. ft.
Footprint of the BMP			
20	BMP Footprint Sizing Factor (Default 0.03 or an alternative minimum footprint sizing factor from Line 11 in Worksheet B.5-4)	0.014	
21	Minimum BMP Footprint [Line 1 x Line 2 x Line 20]	15	sq. ft.
22	Footprint of the BMP = Maximum(Minimum(Line 17, Line 19), Line 21)	17	sq. ft.
23	Provided BMP Footprint	17	sq. ft.
24	Is Line 23 ≥ Line 22?	**Yes, Performance Standard is Met**	

The City of SAN DIEGO	Project Name	17 ON VOLTAIRE	
	BMP ID	BMP #6	
Sizing Method for Volume Retention Criteria		**Worksheet B.5-2**	

1	Area draining to the BMP	1238	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.89	
3	85^{th} percentile 24-hour rainfall depth	0.5	inches
4	Design capture volume [Line 1 x Line 2 x (Line 3/12)]	46	cu. ft.
Volume Retention Requirement			
5	Measured infiltration rate in the DMA Note: When mapped hydrologic soil groups are used enter 0.10 for NRCS Type D soils and for NRCS Type C soils enter 0.30 When in no infiltration condition and the actual measured infiltration rate is unknown enter 0.0 if there are geotechnical and/or groundwater hazards identified in Appendix C or enter 0.05	0.1	in/hr.
6	Factor of safety	2	
7	Reliable infiltration rate, for biofiltration BMP sizing [Line 5 / Line 6]	0.05	in/hr.
8	Average annual volume reduction target (Figure B.5-2) When Line 7 > 0.01 in/hr. = Minimum (40, 166.9 x Line 7 +6.62) When Line 7 ≤ 0.01 in/hr. = 3.5%	15.0	%
9	Fraction of DCV to be retained (Figure B.5-3) When Line 8 > 8% = $0.0000013 \times \text{Line } 8^3 - 0.000057 \times \text{Line } 8^2 + 0.0086 \times \text{Line } 8 - 0.014$ When Line 8 ≤ 8% = 0.023	0.106	
10	Target volume retention [Line 9 x Line 4]	5	cu. ft.

The City of SAN DIEGO	Project Name	17 ON VOLTAIRE
	BMP ID	BMP #6

Alternative Minimum Footprint Sizing Factor for Non-Standard Biofiltration			Worksheet B.5-4	
1	Area draining to the BMP		1238	sq. ft.
2	Adjusted Runoff Factor for drainage area (Refer to Appendix B.1 and B.2)		0.89	
3	Load to Clog (default value when using Appendix E fact sheets is 2.0)		3	lb/sq. ft.
4	Allowable Period to Accumulate Clogging Load (T_L) (default value is 10)		10	years
Volume Weighted EMC Calculation				
Land Use	**Fraction of Total DCV**	**TSS EMC (mg/L)**	**Product**	
Single Family Residential		123	0	
Commercial		128	0	
Industrial		125	0	
Education (Municipal)		132	0	
Transportation	1	78	78	
Multi-family Residential		40	0	
Roof Runoff		14	0	
Low Traffic Areas		50	0	
Open Space		216	0	
Other, specify:			0	
Other, specify:			0	
Other, specify:			0	
5	Volume Weighted EMC (sum of all products)		78	mg/L
Sizing Factor for Clogging				
6	Adjustment for pretreatment measures Where: Line 6 = 0 if no pretreatment; Line 6 = 0.25 when pretreatment is included; Line 6 = 0.5 if the pretreatment has an active Washington State TAPE approval rating for “pre-treatment.”		0	
7	Average Annual Precipitation [Provide documentation of the data source in the discussion box; SanGIS has a GIS layer for average annual precipitation]		10	inches
8	Calculate the Average Annual Runoff (Line 7/12) x Line 1 x Line2		918	cu-ft/yr
9	Calculate the Average Annual TSS Load (Line 8 x 62.4 x Line 5 x (1 – Line 6))/10^6		4	lb/yr
10	Calculate the BMP Footprint Needed (Line 9 x Line 4)/Line 3		15	sq. ft.
11	Calculate the Minimum Footprint Sizing Factor for Clogging [Line 10/ (Line 1 x Line 2)]		0.014	

Discussion:

Sizing factor of 1.4% used for BMP #6 for alternative minimum footprint sizing for non-standard biofiltration basins. This factor was used in Worksheet B.5-1.

The City of SAN DIEGO

Project Name	17 ON VOLTAIRE
BMP ID	BMP #6

Volume Retention for No Infiltration Condition						Worksheet B.5-6	
1	Area draining to the biofiltration BMP					1238	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)					0.89	
3	Effective impervious area draining to the BMP [Line 1 x Line 2]					1102	sq. ft.
4	Required area for Evapotranspiration [Line 3 x 0.03]					33	sq. ft.
5	Biofiltration BMP Footprint					17	sq. ft.
Landscape Area (must be identified on DS-3247)							
		Identification	**1**	**2**	**3**	**4**	**5**
6	Landscape area that meet the requirements in SD-B and SD-F Fact Sheet (sq. ft.)						
7	Impervious area draining to the landscape area (sq. ft.)						
8	Impervious to Pervious Area ratio [Line 7/Line 6]		0.00	0.00	0.00	0.00	0.00
9	Effective Credit Area If (Line 8 >1.5, Line 6, Line 7/1.5]		0	0	0	0	0
10	Sum of Landscape area [sum of Line 9 Id's 1 to 5]					0	sq. ft.
11	Provided footprint for evapotranspiration [Line 5 + Line 10]					17	sq. ft.
Volume Retention Performance Standard							
12	Is Line 11 ≥ Line 4?		No, Proceed to Line 13				
13	Fraction of the performance standard met through the BMP footprint and/or landscaping [Line 11/Line 4]					0.51	
14	Target Volume Retention [Line 10 from Worksheet B.5.2]					5	cu. ft.
15	Volume retention required from other site design BMPs [(1-Line 13) x Line 14]					2.45	cu. ft.
Site Design BMP							
	Identification	**Site Design Type**				**Credit**	
16	1	Volume Retention Surplus - BMP #4				2.45	cu. ft.
	2						cu. ft.
	3						cu. ft.
	4						cu. ft.
	5						cu. ft.
	Sum of volume retention benefits from other site design BMPs (e.g. trees; rain barrels etc.). [sum of Line 16 Credits for Id's 1 to 5] Provide documentation of how the site design credit is calculated in the PDP SWQMP.					2.45	cu. ft.
17	Is Line 16 ≥ Line 15?		Volume Retention Performance Standard is Met				

E.18 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 bioretention with underdrain components include:

- Inflow distribution mechanisms (e.g, perimeter flow spreader or filter strips)
- Energy dissipation mechanism for concentrated inflows (e.g., splash blocks or riprap)
- Shallow surface ponding for captured flows
- Side slope and basin bottom vegetation selected based on expected climate and ponding depth
- Non-floating mulch layer
- Media layer (planting mix or engineered media) capable of supporting vegetation growth
- Filter course layer (aka choking 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

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.
☐	Contributing tributary area shall 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 the City Engineer if the following conditions are met: 1) incorporate design features (e.g. flow spreaders) to minimizing short circuiting of flows in the BMP and 2) incorporate additional design features requested by the City Engineer for proper performance of the regional BMP.
☐	Finish grade of the facility is ≤ 2%.	Flatter surfaces reduce erosion and channelization within the facility.

Example Schematic Design – Plan and Section View

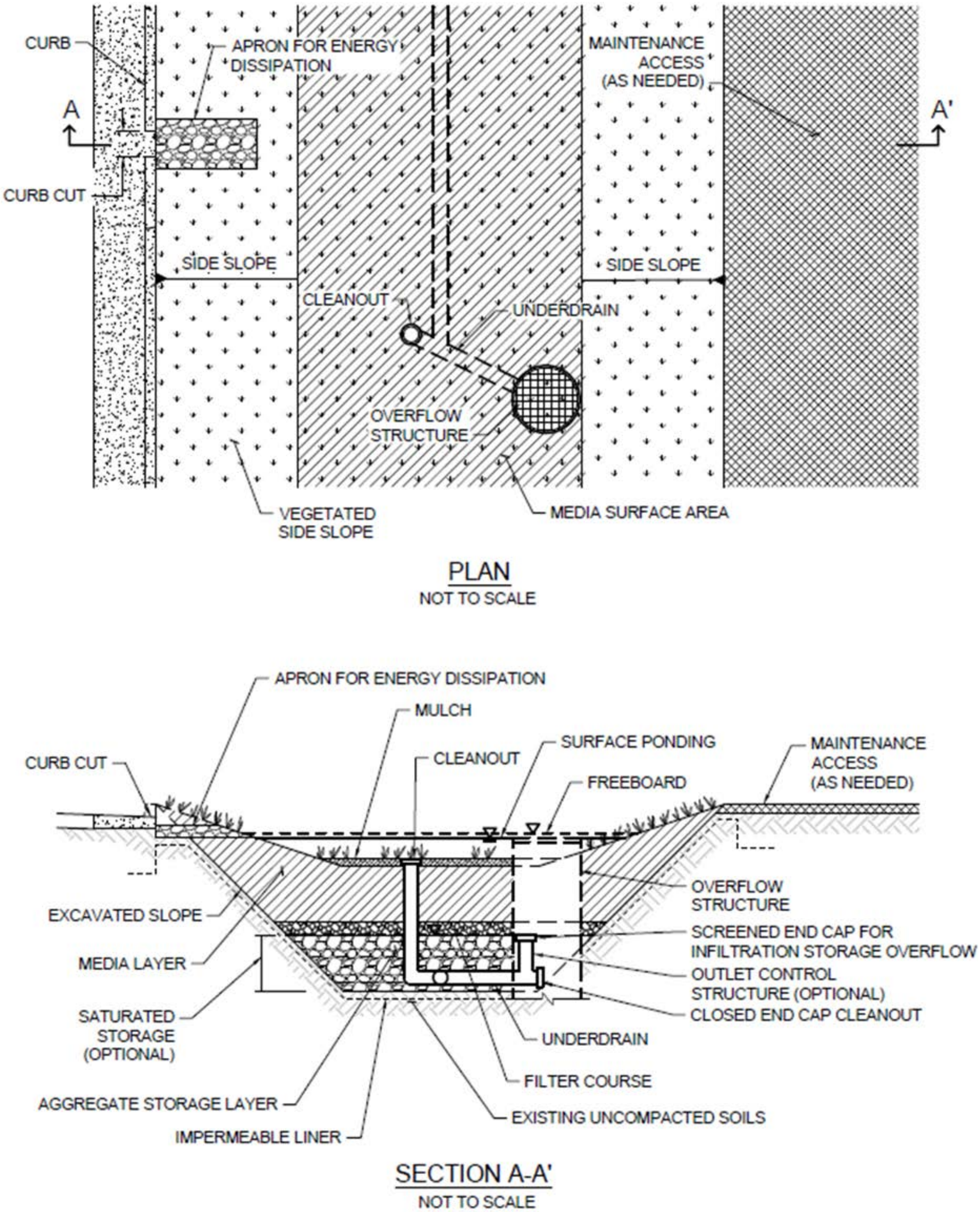


Figure E.18-1 : Typical Plan and Section View of a Biofiltration BMP

Recommended BMP Component Dimensions

BMP Component	Dimension	Intent/Rationale
Freeboard	≥ 2 inches	Freeboard provides room for head over overflow structures and minimizes risk of uncontrolled surface discharge.
Surface Ponding	≥ 6 and ≤ 12 inches	The minimum ponding depth is required so that the runoff is uniformly spread throughout the basin (minimizes the likelihood of short circuiting). Deep surface ponding raises safety concerns. When the BMP is adjoining walkways the minimum surface ponding depth can be reduced to 4 inches. 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 the City Engineer 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 3) potential for elevated clogging risk is evaluated (Worksheet B.5.4).
Ponding Area Side Slopes	3H:1V or shallower	Gentler side slopes are safer, less prone to erosion, able to establish vegetation more quickly and easier to maintain.
Mulch	≥ 3 inches	Mulch will suppress weeds and maintain moisture for plant growth.
Media Layer	≥ 18 inches	A deep media layer provides additional filtration and supports plants with deeper roots. Where the minimum depth of 18 inches is used, only shallow-rooted species shall be planted. A minimum 24-inch media layer shall typically be required to support vegetation, with a minimum 36-inch media layer depth required for trees.
Filter Course	6 inches	To reduce clogging potential, a two-layer filter course (aka choking stone system) is used consisting of one 3" layer of clean and washed ASTM 33 Fine Aggregate Sand overlying a 3" layer of ASTM No 8 Stone (Appendix F.4). This specification has been developed to maintain permeability while limiting the migration of media material into the stone reservoir and underdrain system.
Underdrain Diameter	≥ 8 inches	Minimum diameter required for maintenance by City crews. For privately maintained BMPs, a minimum underdrain diameter of 6 inches is allowed.
Cleanout Diameter	≥ 8 inches	Facilitates simpler cleaning, when needed. For privately maintained BMPs, cleanout diameter of 6 inches is allowed.

Deviations to the recommended BMP component dimensions may be approved at the discretion of the City Engineer if it is determined to be appropriate.

Design Criteria and Considerations

Bioretention with underdrain must meet the following design criteria. Deviations from the below criteria may be approved at the discretion of the City Engineer if it is determined to be appropriate:

	Design Criteria	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 the City Engineer if certified by a landscape architect or agronomist.
Vegetation		
□	Plantings are suitable for the climate and expected ponding depth. A plant list to aid in selection can be found in Appendix E.26.	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		
□	A minimum of 3 inches of well-aged, shredded hardwood mulch that has been stockpiled or stored for at least 12 months is provided.	Mulch will suppress weeds and maintain moisture for plant growth. Aging mulch kills pathogens and weed seeds and allows the beneficial microbes to multiply.
Media Layer		
□	Media maintains a minimum filtration rate of 5 in/hr. over lifetime of facility. Additional Criteria for media hydraulic conductivity described in the bioretention soil media model specification (Appendix F.3)	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.

	Design Criteria	Intent/Rationale
☐	Media shall be a minimum 18 inches deep for filtration purposes, with a minimum 24-inch media layer depth typically required to support vegetation and a minimum 36-inch media layer depth required for trees. Media shall meet the following specifications. Model bioretention soil media specification provided in Appendix F.3 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.	A deep media layer provides additional filtration and supports plants with deeper roots. Standard specifications shall be followed. For non-standard or proprietary designs, compliance with Appendix F.1 ensures that adequate treatment performance will be provided.
☐	Media surface area is 3% of contributing area times adjusted runoff factor or greater. Unless demonstrated that the BMP surface area can be smaller than 3%.	Greater surface area to tributary area ratios: a) maximizes volume retention as required by the MS4 Permit and b) decrease loading rates per square foot and therefore increase longevity. Adjusted runoff factor is to account for site design BMPs implemented upstream of the BMP (such as rain barrels, impervious area dispersion, etc.). Refer to Appendix B.2 guidance. Refer to Appendix B.5 for guidance to support use of smaller than 3% footprint..
☐	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 and can result in poor water quality performance for turbidity and suspended solids. Filter fabric is more likely to clog.
☐	Filter course is washed and free of fines.	Washing aggregate will help eliminate fines that could clog the facility and impede infiltration.
☐	To reduce clogging potential, a two-layer filter course (aka choking stone system) is used consisting of one 3” layer of clean and washed ASTM 33 Fine Aggregate Sand overlying a 3” layer of ASTM No 8 Stone (Appendix F.4).	This specification has been developed to maintain permeability while limiting the migration of media material into the stone reservoir and underdrain system.

	Design Criteria	Intent/Rationale
Aggregate Storage Layer		
☐	ASTM #57 open graded stone is used for the storage layer and a two layer filter course (detailed above) is used above this layer	This layer provides additional storage capacity. ASTM #8 stone provides an acceptable choking/bridging interface with the particles in ASTM #57 stone.
☐	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 18 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 8 inches.	Minimum diameter required for maintenance by City crews. For privately maintained BMPs, a minimum underdrain diameter of 6 inches is allowed.
☐	Underdrains are made of slotted, PVC pipe conforming to ASTM D 3034 or equivalent or corrugated, HDPE pipe conforming to AASHTO 252M or equivalent.	Slotted underdrains provide greater intake capacity, clog resistant drainage, and reduced entrance velocity into the pipe, thereby reducing the chances of solids migration.
☐	An underdrain cleanout with a minimum 8-inch diameter and lockable cap is placed every 50 feet as required based on underdrain length.	Properly spaced cleanouts will facilitate underdrain maintenance. For privately maintained BMPs, cleanout diameter of 6 inches is allowed.
☐	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 bioretention with underdrain for storm water pollutant control only (no flow control required), the following steps should be taken:

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

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Attachment 2
Backup for PDP Hydromodification Control Measures

This is the cover sheet for Attachment 2.

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

Project Name: 17 ON VOLTAIRE - 4103 / 4111 VOLTAIRE STREET

Indicate which Items are Included:

Attachment Sequence	Contents	Checklist
Attachment 2a	Hydromodification Management Exhibit (Required)	☑ Included See Hydromodification Management Exhibit Checklist.
Attachment 2b	Management of Critical Coarse Sediment Yield Areas (WMAA Exhibit is required, additional analyses are optional) See Section 6.2 of the BMP Design Manual.	☑ Exhibit showing project drainage boundaries marked on WMAA Critical Coarse Sediment Yield Area Map (Required) Optional analyses for Critical Coarse Sediment Yield Area Determination ☐ 6.2.1 Verification of Geomorphic Landscape Units Onsite ☐ 6.2.2 Downstream Systems Sensitivity to Coarse Sediment ☐ 6.2.3 Optional Additional Analysis of Potential Critical Coarse Sediment Yield Areas Onsite
Attachment 2c	Geomorphic Assessment of Receiving Channels (Optional) See Section 6.3.4 of the BMP Design Manual.	☑ Not Performed ☐ Included ☐ Submitted as separate stand-alone document
Attachment 2d	Flow Control Facility Design and Structural BMP Drawdown Calculations (Required) Overflow Design Summary for each structural BMP See Chapter 6 and Appendix G of the BMP Design Manual	☑ Included ☐ Submitted as separate stand-alone document

Project Name: 17 ON VOLTAIRE - 4103 / 4111 VOLTAIRE STREET

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

The Hydromodification Management Exhibit must identify:

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

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**RAISED PLANTER NOTE: ROOF DRAINAGE COLLECTED TO DISCHARGE TO SURFACE OF BIOFILTRATION PLANTER; PVC OUTLET DRAIN PIPE TO CONNECT DIRECTLY TO DOWNSTREAM CATCH BASIN OR DISCHARGE OFFSITE; THERE SHALL BE NO COMINGLING OF STORM WATER BETWEEN BIOFILTRATION / RAISED PLANTER AREAS

PROJECT DATA
SOIL TYPE : URBAN "D"
SLOPE CONDITION : MODERATE
PCCSYA : NOT LOCATED WITHIN SITE
GROUNDWATER DEPTH: >10'

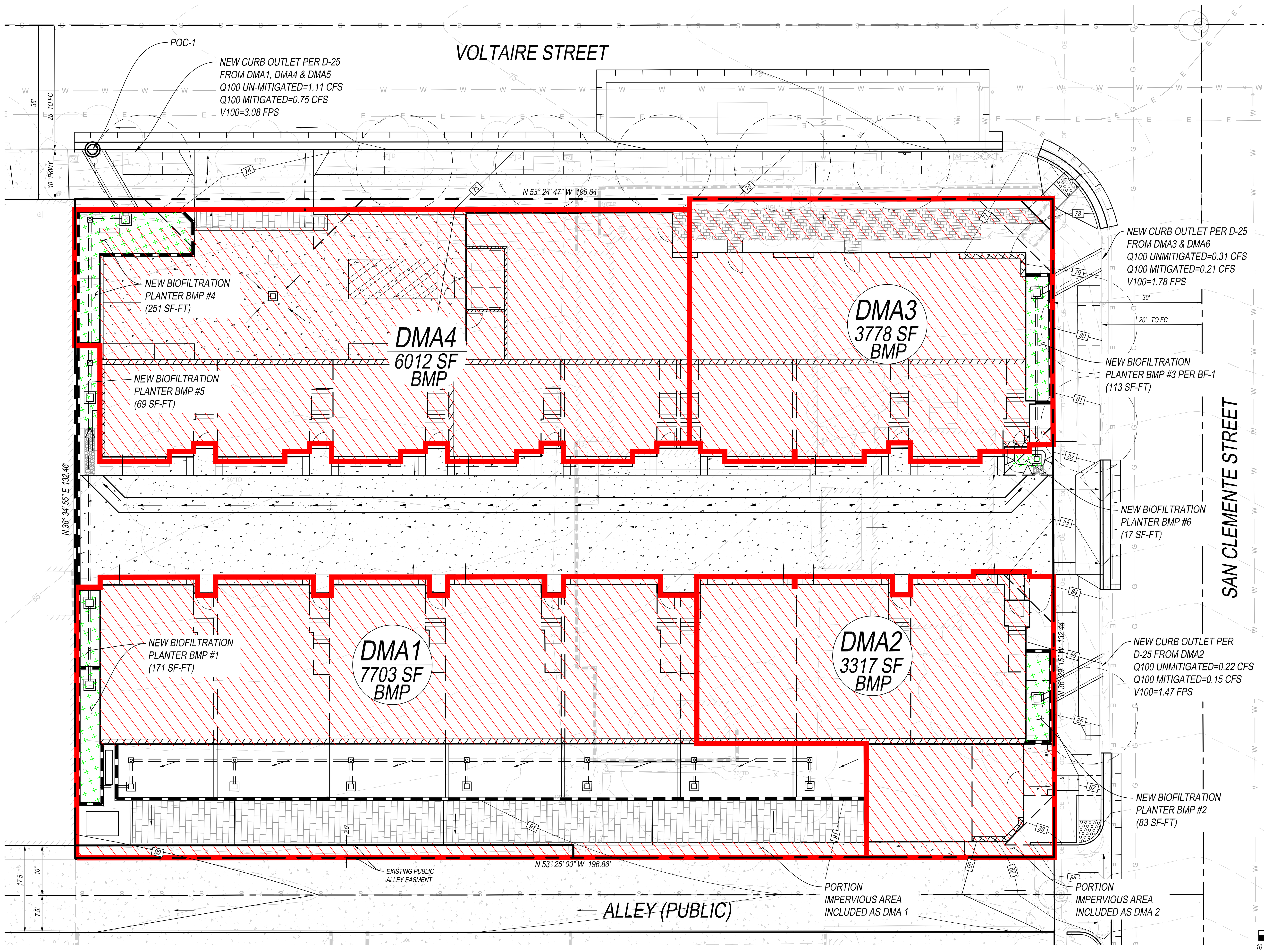
IMPERVIOUS AREA TABULATION

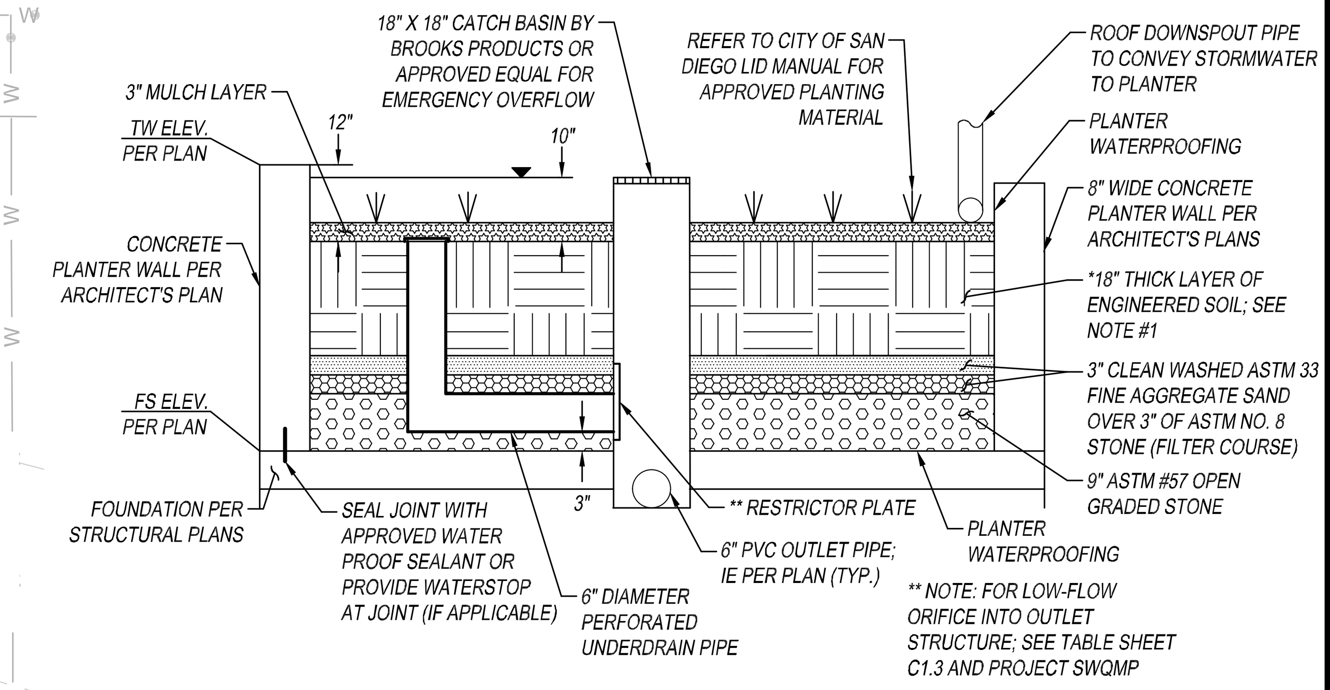
ON-SITE:
TOTAL DISTURBED AREA: 26,059 (0.60 AC)

ON-SITE AREA: 26,059 S.F. (0.60 AC):
EX. IMPERVIOUS AREA: 9,140 S.F. (0.21 AC)
PROPOSED IMPERVIOUS AREA: 21,400 S.F. (0.49 AC) INCREASE OF 134.1%

LEGEND

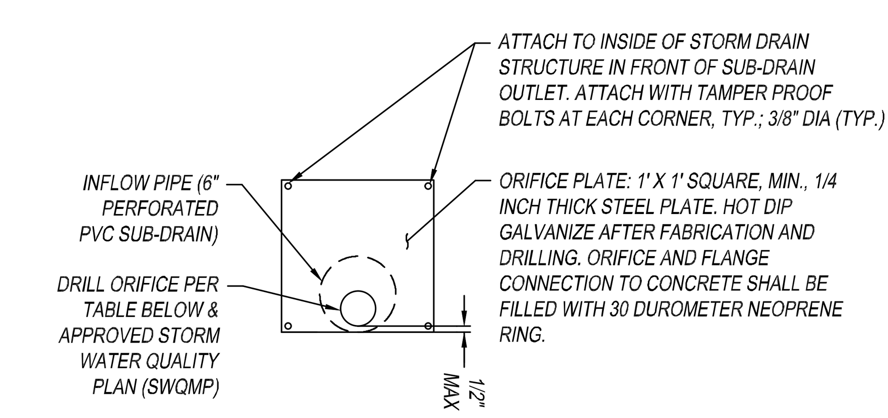
- SUBJECT PROPERTY / SUBDIVISION BOUNDARY
- EXISTING RIGHT-OF-WAY / ADJACENT LOT LINE
- CENTERLINE OF ROAD
- PROPOSED MAJOR DRAINAGE BASIN BOUNDARY
- PROPOSED IMPERVIOUS AREA
- PROPOSED PERVIOUS PAVERS
- PROPOSED BIOFILTRATION AREA





TYPICAL SECTION - BIOFILTRATION PLANTER (BF-1)

NOT TO SCALE



TYPICAL DETAIL - LOW FLOW ORIFICE PLATE

NOT TO SCALE

BMP SIZE & ORIFICE DIAMETER SUMMARY

BMP #	Hp (FT)	Hs (FT)	Hg (FT)	HMP ORIFICE (IN)	Abot (FT^2)	Atop (FT^2)	VOLUME (FT^3)
1	1.0	1.5	1.0	0.30	171	171	342
2	1.0	1.5	1.0	0.30	83	83	166
3	1.0	1.5	1.0	0.30	113	113	216
4	1.0	1.5	1.0	0.30	251	251	502
5	1.0	1.5	1.0	0.30	58	58	116
6	0.83	1.5	1.0	0.50	17	17	34

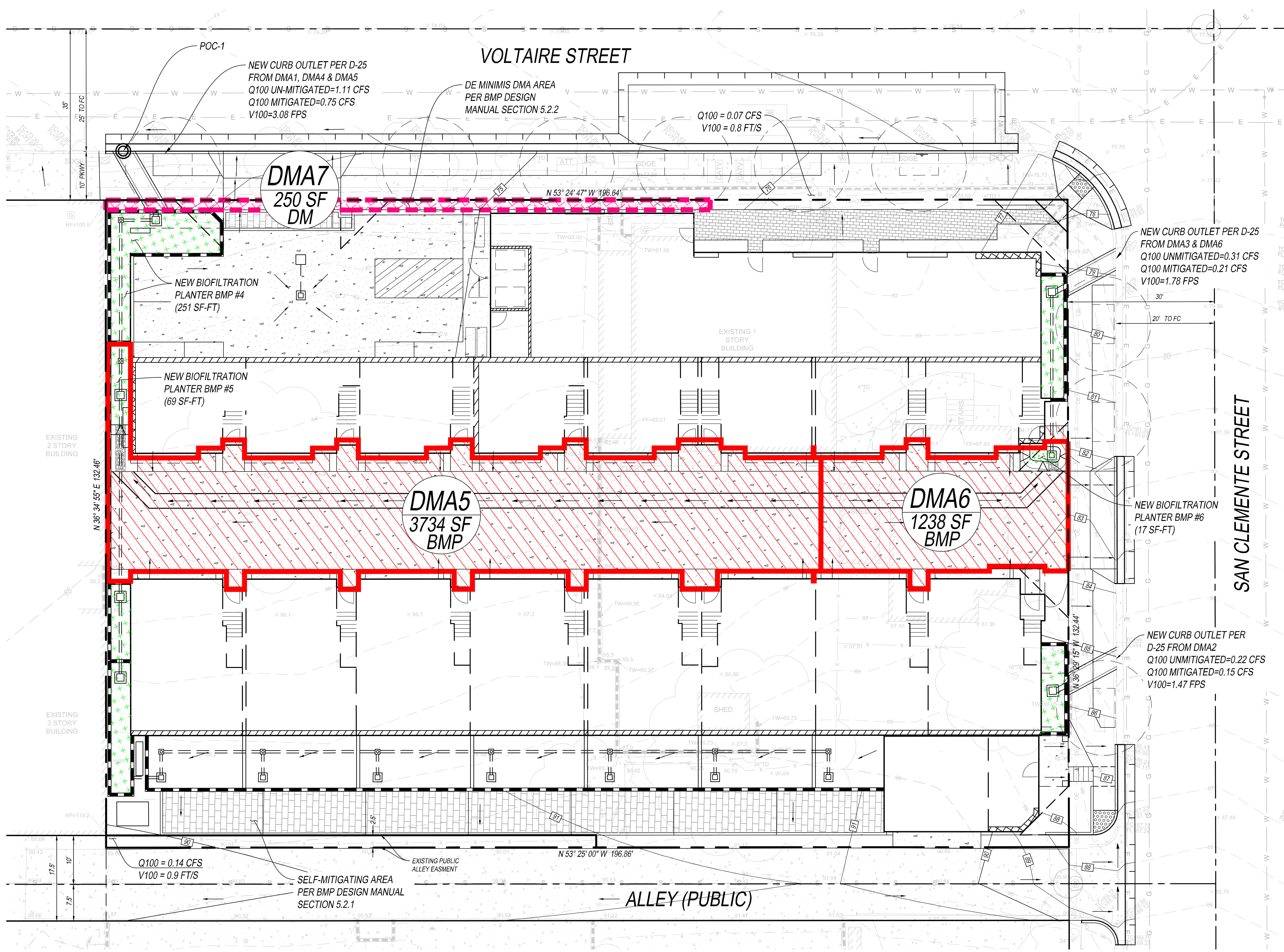
HYDROMODIFICATION EXHIBIT

2ND FLOOR DRAINAGE AREAS

4103 VOLTAIRE STREET

SAN DIEGO, CA
PROJECT NUMBER: PLSA 3090
SCALE: 1"=10' HORIZONTAL
DATE: JUNE 12, 2019

PASCO LARET SUITER & ASSOCIATES
CIVIL ENGINEERING + LAND PLANNING + LAND SURVEYING
535 North Highway 101, Ste A, Solana Beach, CA 92075
ph 858.259.8212 | fx 858.259.4812 | plsaengineering.com



LEGEND

- SUBJECT PROPERTY / SUBDIVISION BOUNDARY
- EXISTING RIGHT-OF-WAY / ADJACENT LOT LINE
- CENTERLINE OF ROAD
- PROPOSED MAJOR DRAINAGE BASIN BOUNDARY
- PROPOSED IMPERVIOUS AREA
- PROPOSED PERVIOUS PAVERS
- PROPOSED BIOFILTRATION AREA
- PROPOSED DE MINIMIS AREA PER CITY OF SAN DIEGO BMP DESIGN MANUAL SECTION 5.2.2

PROJECT SITE AREA CALCULATIONS

TOTAL GROSS SITE AREA	26,059 SF
EXISTING IMPERVIOUS AREA	9,140 SF
EXISTING PERVIOUS AREA	16,919 SF
TOTAL AREA DISTURBED BY PROJECT	26,059 SF
TOTAL PROPOSED OR REPLACED IMPERVIOUS AREA	21,400 SF
DE MINIMIS PROPOSED / REPLACED IMPERVIOUS AREA	250 SF

POLLUTANT SOURCE AREAS

REFER TO FORM I-3B IN THE PROJECT SWQMP FOR POLLUTANT SOURCE AREAS OF CONCERN (NOT APPLICABLE TO THIS PROJECT AS FLOW-THRU TREATMENT BMP'S ARE NOT PROPOSED

REFER TO FORM I-4B IN THE PROJECT SWQMP FOR SOURCE CONTROL BMPS IDENTIFIED ON THIS PROJECT
4.2.1 PREVENTION OF ILLICIT DISCHARGES INTO THE MS4
4.2.2 STORM DRAIN STENCILING OR SIGNAGE
4.2.5 PROTECT TRASH STORAGE AREAS FROM RAINFALL, RUN-ON, RUNOFF, AND WIND DISPERSAL
4.2.6 ADDITIONAL BMPS IDENTIFIED:
- ONSITE STORM DRAIN INLETS
- INTERIOR FLOOR DRAINS
- NEED FOR FUTURE INDOOR & STRUCTURAL PEST CONTROL
- LANDSCAPE/OUTDOOR PESTICIDE USE
- FIRE SPRINKLER TEST WATER
- MISCELLANEOUS DRAIN OR WASH WATER
- PLAZAS, SIDEWALKS, AND PARKING LOTS

DE MINIMIS AREA (DMA 7)

TOTAL PROPOSED / REPLACED IMPERVOUS AREA	21,400 SF
DE MINIMIS DMA IMPERVIOUS AREA	250 SF (DMA 7)
% OVERALL PROPOSED HARDSCAPE	1.2%

SECTION 5.2.2 OF CITY OF SAN DIEGO BMP DESIGN MANUAL ALLOWS FOR DE MINIMIS DMA AREAS OF UP TO 250 SQUARE FEET. TOTAL DE MINIMIS DMA AREAS SHOULD REPRESENT LESS THAN 2.0 PERCENT OF THE TOTAL ADDED OR REPLACED IMPERVIOUS SURFACE OF THE PROJECT.

GRAPHIC SCALE 1" = 10'
10 0 10 20 30

HYDROMODIFICATION EXHIBIT

GROUND FLOOR DRAINAGE AREAS

4103 VOLTAIRE STREET

SAN DIEGO, CA
PROJECT NUMBER: PLSA 3090
SCALE: 1"=10' HORIZONTAL
DATE: JUNE 12, 2019

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ph 858.259.8212 | fx 858.259.4812 | plsaengineering.com

PLSA 3090-01

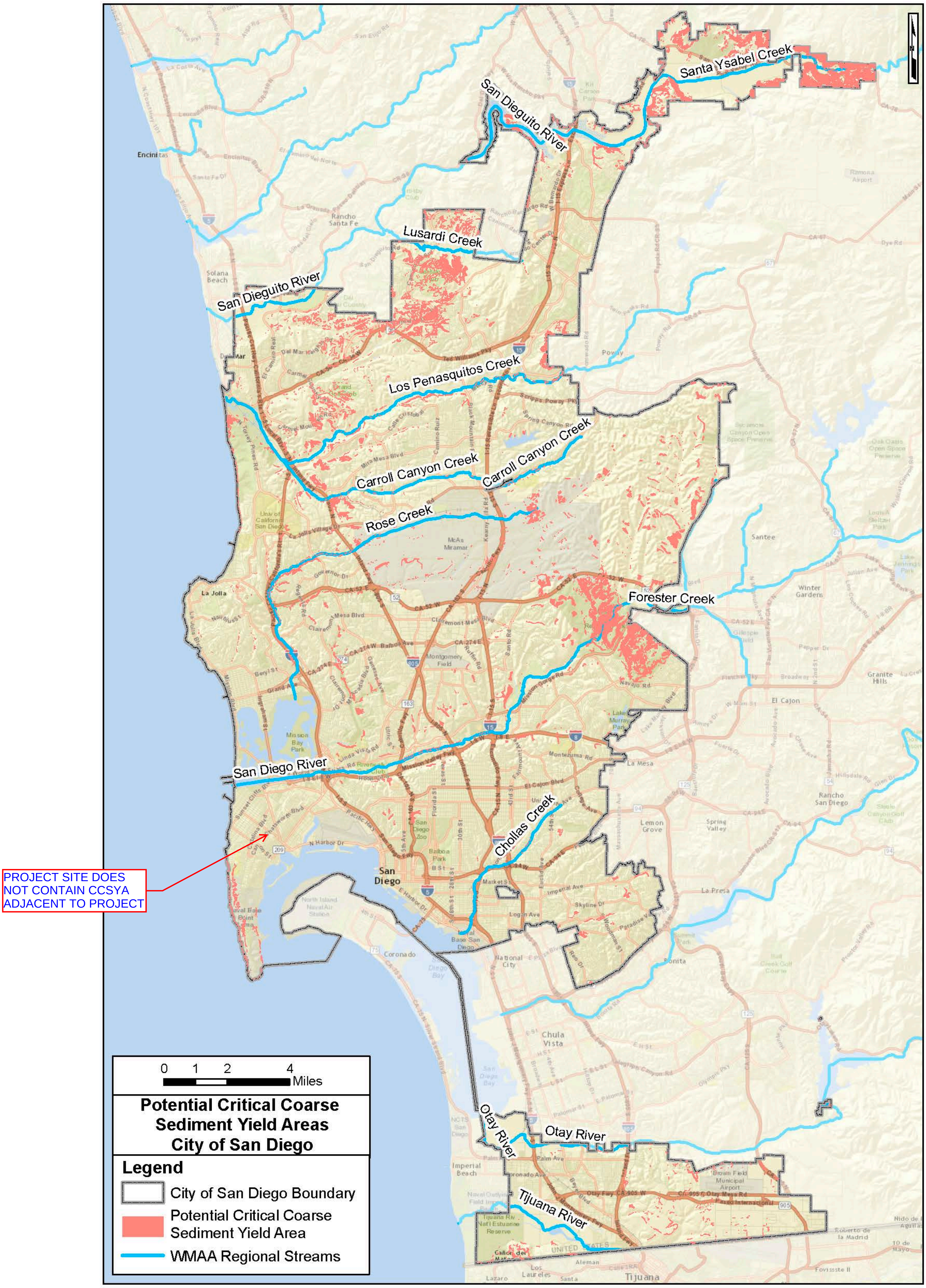


Figure H.9-1 : Potential Critical Coarse Sediment Yield Areas

17 ON VOLTAIRE
PLSA 3090
5/11/2020

Drawdown Time for Biofiltration BMP-1

Outlet Q:	0.0043 cfs	1.088 in/hr	*Based on the Low Flow Orifice (0.3 in)
BMP Percolation Rate:	5 in/hr	0.0001 ft/sec	
BMP Area:	171.0 sq-ft		
BMP Percolation Rate:	0.02 cfs		
Basin Volume:	330 cu-ft		
DCV/Average Q:	76663 secs	**21.30 Hours**	

Drawdown Time for Biofiltration BMP-2

Outlet Q:	0.0043 cfs	2.241 in/hr	*Based on the Low Flow Orifice (0.3 in)
BMP Percolation Rate:	5 in/hr	0.0001 ft/sec	
BMP Area:	83.0 sq-ft		
BMP Percolation Rate:	0.010 cfs		
Basin Volume:	160 cu-ft		
DCV/Average Q:	37211 secs	**10.34 Hours**	

Drawdown Time for Biofiltration BMP-3

Outlet Q:	0.0043 cfs	1.646 in/hr	*Based on the Low Flow Orifice (0.3 in)
BMP Percolation Rate:	5 in/hr	0.0001 ft/sec	
BMP Area:	113.0 sq-ft		
BMP Percolation Rate:	0.01 cfs		
Basin Volume:	218 cu-ft		
DCV/Average Q:	50660 secs	**14.07 Hours**	

Drawdown Time for Biofiltration BMP-4

Outlet Q:	0.0043 cfs	0.741 in/hr	*Based on the Low Flow Orifice (0.3 in)
BMP Percolation Rate:	5 in/hr	0.0001 ft/sec	
BMP Area:	251.0 sq-ft		
BMP Percolation Rate:	0.03 cfs		
Basin Volume:	484 cu-ft		
DCV/Average Q:	112529 secs	**31.26 Hours**	

Drawdown Time for Biofiltration BMP-5

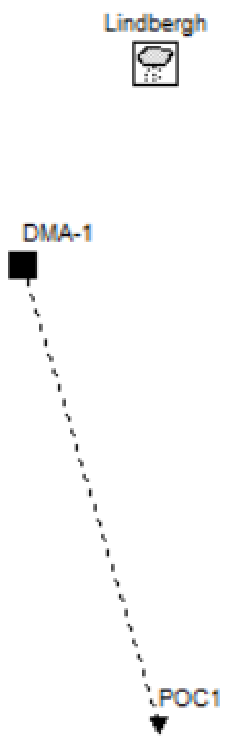
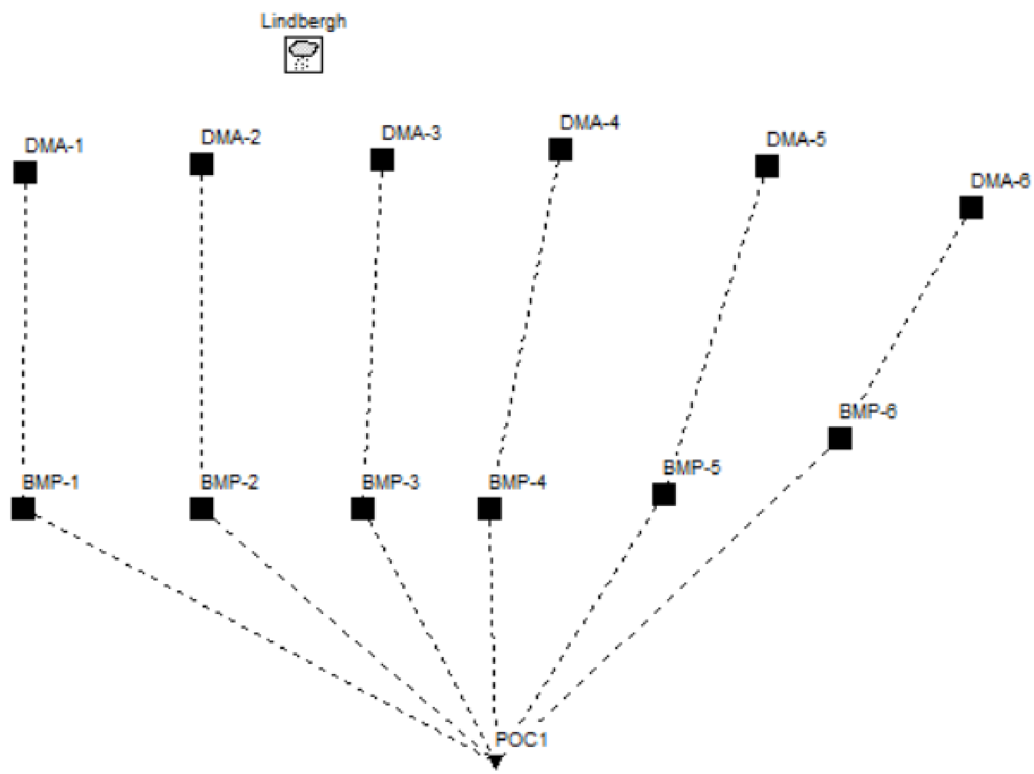
Outlet Q:	0.0043 cfs	3.206 in/hr	*Based on the Low Flow Orifice (0.3 in)
BMP Percolation Rate:	5 in/hr	0.0001 ft/sec	
BMP Area:	58.0 sq-ft		
BMP Percolation Rate:	0.01 cfs		
Basin Volume:	133 cu-ft		
DCV/Average Q:	30934 secs	**8.59 Hours**	

Drawdown Time for Biofiltration BMP-6

Outlet Q:	0.0119 cfs	30.350 in/hr	*Based on the Low Flow Orifice (0.5 in)
BMP Percolation Rate:	5 in/hr	0.0001 ft/sec	
BMP Area:	17.0 sq-ft		
BMP Percolation Rate:	0.00 cfs		
Basin Volume:	33 cu-ft		
DCV/Average Q:	2747 secs	**0.76 Hours**	

3090 Voltaire
8/15/2019

SWMM MODEL SCHEMATICS

PRE-PROJECT MODEL	POST-PROJECT MODEL
	

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3090 Voltaire
8/29/2019

SWMM INPUT

PRE-PROJECT

DMA	Basin	Area (ac)	Width (Area/Flow Length) (ft)	% Slope	% Impervious	% "A" Soils	% "C" Soils	% "D" Soils	Weighted Conductivity (in/hr):	Weighted Suction Head (in):	Weighted Initial Deficit:
1		0.55	190	8%	0%	0%	0%	100%	0.025	9.000	0.300
	Total:	**0.55**									

POST-PROJECT

DMA	BMP	DMA Area (ac)	Width (Area/Flow Length) (ft)	% Impervious	% Slope	% "A" Soils	% "C" Soils	% "D" Soils	Weighted Conductivity (in/hr):	Weighted Suction Head (in):	Weighted Initial Deficit:
1	1	0.14	149	100%	1%	0%	0%	100%	0.025	9.000	0.300
2	2	0.07	93	100%	1%	0%	0%	100%	0.025	9.000	0.300
3	3	0.08	91	100%	1%	0%	0%	100%	0.025	9.000	0.300
4	4	0.13	107	100%	1%	0%	0%	100%	0.025	9.000	0.300
5	5	0.08	263	100%	1%	0%	0%	100%	0.025	9.000	0.300
6	6	0.03	86	100%	1%	0%	0%	100%	0.025	9.000	0.300
BMP-1	1	0.00393	9	0%	0%	0%	0%	100%	0.025	9.000	0.300
BMP-2	2	0.00191	12	0%	0%	0%	0%	100%	0.025	9.000	0.300
BMP-3	3	0.00259	9	0%	0%	0%	0%	100%	0.025	9.000	0.300
BMP-4	4	0.00576	21	0%	0%	0%	0%	100%	0.025	9.000	0.300
BMP-5	5	0.00133	6	0%	0%	0%	0%	100%	0.025	9.000	0.300
BMP-6	6	0.00039	3	0%	0%	0%	0%	100%	0.025	9.000	0.300
	Total:	**0.55**									

Conductivity:		
D:	0.025	in/hr

Suction Head:		
D:	9	in

Initial Deficit	
D:	0.30

POC-1

```
[TITLE]
;;Project Title/Notes
3090 Voltaire
Pre-Project Condition

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

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

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

[EVAPORATION]
;;Data Source    Parameters
;;-------------- ----------------
MONTHLY          .03    .05    .08    .11    .13    .15    .15    .13    .11    .08    .04    .02
DRY_ONLY         NO

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

POC-1

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

[SUBCATCHMENTS]
;;Name           Rain Gage        Outlet           Area     %Imperv  Width    %Slope   CurbLen  SnowPack
;;-------------- ---------------- ---------------- -------- -------- -------- -------- -------- ----------------
DMA-1            Lindbergh        POC1             0.55     0        190      8        0

[SUBAREAS]
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo    PctRouted
;;-------------- ---------- ---------- ---------- ---------- ---------- ---------- ----------
DMA-1            0.012      0.056      0.05       0.1        25         OUTLET

[INFILTRATION]
;;Subcatchment   Suction    Ksat       IMD
;;-------------- ---------- ---------- ----------
DMA-1            9          0.025      0.3

[OUTFALLS]
;;Name           Elevation  Type       Stage Data       Gated    Route To
;;-------------- ---------- ---------- ---------------- -------- ----------------
;Basin 1
POC1             0          FREE                        NO

[TIMESERIES]
;;Name           Date       Time       Value
;;-------------- ---------- ---------- ----------
Lindbergh        FILE "J:\Active Jobs\3090 VOLTAIRE\CIVIL\REPORTS\SWQMP\Discretionary\SWMM\Rainfall\lindbergh\ccda_lindbergh.dat"

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

[TAGS]

[MAP]
DIMENSIONS 0.000 0.000 10000.000 10000.000
Units      None

[COORDINATES]
;;Node           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
POC1             1000.000           2500.000

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

[Polygons]
```

POC-1

```
;;Subcatchment   X-Coord            Y-Coord
;;-------------- ------------------ ------------------
DMA-1            0.000              6000.000

[SYMBOLS]
;;Gage           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
Lindbergh        1000.000           7500.000
```

POC-1

```
[TITLE]
;;Project Title/Notes
3090 Voltaire
Post-Project Condition

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

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

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

[EVAPORATION]
;;Data Source    Parameters
;;-------------- ----------------
MONTHLY          .03    .05    .08    .11    .13    .15    .15    .13    .11    .08    .04    .02
DRY_ONLY         NO

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

POC-1

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

[SUBCATCHMENTS]
;;Name           Rain Gage        Outlet           Area     %Imperv  Width    %Slope   CurbLen  SnowPack
;;-------------- ---------------- ---------------- -------- -------- -------- -------- -------- ----------------
DMA-1            Lindbergh        BMP-1            0.14     100      149      1        0
DMA-2            Lindbergh        BMP-2            .07      100      93       1        0
DMA-3            Lindbergh        BMP-3            0.08     100      91       1        0
DMA-4            Lindbergh        BMP-4            0.13     100      107      1        0
DMA-5            Lindbergh        BMP-5            0.08     100      263      1        0
DMA-6            Lindbergh        BMP-6            0.03     100      86       1        0
BMP-1            Lindbergh        POC1             0.00393  0        9        0        0
BMP-2            Lindbergh        POC1             0.00191  0        12       0        0
BMP-3            Lindbergh        POC1             0.00259  0        9        0        0
BMP-4            Lindbergh        POC1             0.00576  0        21       0        0
BMP-5            Lindbergh        POC1             0.00133  0        6        0        0
BMP-6            Lindbergh        POC1             0.00039  0        3        0        0

[SUBAREAS]
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo    PctRouted
;;-------------- ---------- ---------- ---------- ---------- ---------- ---------- ----------
DMA-1            0.012      0.06       0.05       0.1        25         OUTLET
DMA-2            0.012      0.06       0.05       0.1        25         OUTLET
DMA-3            0.012      0.06       0.05       0.1        25         OUTLET
DMA-4            0.012      0.06       0.05       0.1        25         OUTLET
DMA-5            0.012      0.06       0.05       0.1        25         OUTLET
DMA-6            0.012      0.06       0.05       0.1        25         OUTLET
BMP-1            0.012      0.06       0.05       0.1        25         OUTLET
BMP-2            0.012      0.06       0.05       0.1        25         OUTLET
BMP-3            0.012      0.06       0.05       0.1        25         OUTLET
BMP-4            0.012      0.06       0.05       0.1        25         OUTLET
BMP-5            0.012      0.06       0.05       0.1        25         OUTLET
BMP-6            0.012      0.06       0.05       0.1        25         OUTLET

[INFILTRATION]
;;Subcatchment   Suction    Ksat       IMD
;;-------------- ---------- ---------- ----------
DMA-1            9          0.025      0.3
DMA-2            9          0.025      0.3
DMA-3            9          0.025      0.3
DMA-4            9          0.025      0.3
DMA-5            9          0.025      0.3
DMA-6            9          0.025      0.3
BMP-1            9          0.025      0.3
BMP-2            9          0.025      0.3
BMP-3            9          0.025      0.3
BMP-4            9          0.025      0.3
BMP-5            9          0.025      0.3
BMP-6            9          0.025      0.3
```

POC-1

```
[LID_CONTROLS]
;;Name           Type/Layer Parameters
;;-------------- ---------- ----------
BMP-1            BC
BMP-1            SURFACE    12         0          0          0          5
BMP-1            SOIL       18         0.4        0.2        0.1        5          5          1.5
BMP-1            STORAGE    12         0.67       0          0
BMP-1            DRAIN      0.1724     0.5        0          6          0          0

BMP-2            BC
BMP-2            SURFACE    12         0          0          0          5
BMP-2            SOIL       18         0.4        0.2        0.1        5          5          1.5
BMP-2            STORAGE    12         0.67       0          0
BMP-2            DRAIN      0.3551     0.5        0          6          0          0

BMP-3            BC
BMP-3            SURFACE    12         0          0          0          5
BMP-3            SOIL       18         0.4        0.2        0.1        5          5          1.5
BMP-3            STORAGE    12         0.67       0          0
BMP-3            DRAIN      0.2608     0.5        0          6          0          0

BMP-4            BC
BMP-4            SURFACE    12         0          0          0          5
BMP-4            SOIL       18         0.4        0.2        0.1        5          5          1.5
BMP-4            STORAGE    12         0.67       0          0
BMP-4            DRAIN      0.1174     0.5        0          6          0          0

BMP-5            BC
BMP-5            SURFACE    12         0          0          0          5
BMP-5            SOIL       18         0.4        0.2        0.1        5          5          1.5
BMP-5            STORAGE    12         0.67       0          0
BMP-5            DRAIN      0.5082     0.5        0          6          0          0

BMP-6            BC
BMP-6            SURFACE    10         0          0          0          5
BMP-6            SOIL       18         0.4        0.2        0.1        5          5          1.5
BMP-6            STORAGE    12         0.67       0          0
BMP-6            DRAIN      4.8162     0.5        0          6          0          0

[LID_USAGE]
;;Subcatchment   LID Process      Number  Area       Width      InitSat    FromImp    ToPerv     RptFile                  DrainTo
FromPerv
;;-------------- ---------------- ------- ---------- ---------- ---------- ---------- ---------- ------------------------ ------------
---- ----------
BMP-1            BMP-1            1       171.19     0          0          100        0          *                        *
0
BMP-2            BMP-2            1       83.20      0          0          100        0          *                        *
0
BMP-3            BMP-3            1       112.82     0          0          100        0          *                        *
0
```

POC-1

```
BMP-4            BMP-4            1        250.91     0          0          100        0          *                        *
0
BMP-5            BMP-5            1        57.93      0          0          100        0          *                        *
0
BMP-6            BMP-6            1        16.99      0          0          100        0          *                        *
0

[OUTFALLS]
;;Name           Elevation  Type       Stage Data       Gated    Route To
;;-------------- ---------- ---------- ---------------- -------- ----------------
;Basin 1
POC1             0          FREE                        NO

[TIMESERIES]
;;Name           Date       Time       Value
;;-------------- ---------- ---------- ----------
Lindbergh        FILE "J:\Active Jobs\3090 VOLTAIRE\CIVIL\REPORTS\SWQMP\Discretionary\SWMM\Rainfall\lindbergh\ccda_lindbergh.dat"

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

[TAGS]

[MAP]
DIMENSIONS 0.000 0.000 10000.000 10000.000
Units      None

[COORDINATES]
;;Node           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
POC1             2363.014           2294.521

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

[Polygons]
;;Subcatchment   X-Coord            Y-Coord
;;-------------- ------------------ ------------------
DMA-1            -1010.274          6643.836
DMA-2            256.849            6712.329
DMA-3            1541.096           6746.575
DMA-4            2825.342           6815.068
DMA-5            4297.945           6695.205
DMA-6            5753.425           6386.986
BMP-1            -1027.397          4160.959
BMP-2            256.849            4160.959
BMP-3            1404.110           4160.959
```

POC-1

```
BMP-4            2311.644           4160.959
BMP-5            3561.644           4263.699
BMP-6            4811.644           4691.781

[SYMBOLS]
;;Gage           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
Lindbergh        1000.000           7500.000
```

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.013)
--------------------------------------------------------------

3090 Voltaire
Pre-Project Condition


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

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


**************************        Volume         Depth
Runoff Quantity Continuity     acre-feet        inches
**************************     ---------       -------
Total Precipitation ......        25.843       563.840
Evaporation Loss .........         0.542        11.815
Infiltration Loss ........        20.463       446.470
Surface Runoff ...........         5.249       114.513
Final Storage ............         0.000         0.000
Continuity Error (%) .....        -1.589


**************************        Volume        Volume
Flow Routing Continuity        acre-feet      10^6 gal
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         5.249         1.710
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........         5.249         1.710
Flooding Loss ............         0.000         0.000
```

```
  Evaporation Loss .........         0.000         0.000
  Exfiltration Loss ........         0.000         0.000
  Initial Stored Volume ....         0.000         0.000
  Final Stored Volume ......         0.000         0.000
  Continuity Error (%) .....         0.000


  ***************************
  Subcatchment Runoff Summary
  ***************************
```

Subcatchment	Total Precip in	Total Runon in	Total Evap in	Total Infil in	Imperv Runoff in	Perv Runoff in	Total Runoff in	Total Runoff 10^6 gal	Peak Runoff CFS	Runoff Coeff
DMA-1	563.84	0.00	11.82	446.47	0.00	114.51	114.51	1.71	0.72	0.203

```
  Analysis begun on:  Thu Aug 15 09:40:26 2019
  Analysis ended on:  Thu Aug 15 09:40:36 2019
  Total elapsed time: 00:00:10
```

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.013)
--------------------------------------------------------------

3090 Voltaire
Post-Project Condition


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

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


**************************        Volume         Depth
Runoff Quantity Continuity     acre-feet        inches
**************************     ---------       -------
Initial LID Storage ......         0.002         0.052
Total Precipitation ......        25.650       563.840
Evaporation Loss .........         4.630       101.781
Infiltration Loss ........         0.000         0.000
Surface Runoff ...........         2.519        55.375
LID Drainage .............        18.873       414.849
Final Storage ............         0.008         0.178
Continuity Error (%) .....        -1.470


**************************        Volume        Volume
Flow Routing Continuity        acre-feet      10^6 gal
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......        21.392         6.971
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
```

External Outflow	21.392	6.971
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.000
Continuity Error (%)	0.000	

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip in	Total Runon in	Total Evap in	Total Infil in	Imperv Runoff in	Perv Runoff in	Total Runoff in	Total Runoff 10^6 gal	Peak Runoff CFS	Runoff Coeff
DMA-1	563.84	0.00	84.99	0.00	487.16	0.00	487.16	1.85	0.19	0.864
DMA-2	563.84	0.00	84.69	0.00	487.67	0.00	487.67	0.93	0.10	0.865
DMA-3	563.84	0.00	84.89	0.00	487.32	0.00	487.32	1.06	0.11	0.864
DMA-4	563.84	0.00	85.39	0.00	486.48	0.00	486.48	1.72	0.18	0.863
DMA-5	563.84	0.00	83.72	0.00	489.56	0.00	489.56	1.06	0.11	0.868
DMA-6	563.84	0.00	83.85	0.00	489.40	0.00	489.40	0.40	0.04	0.868
BMP-1	563.84	17354.33	674.95	0.00	0.00	0.00	17239.09	1.84	0.20	0.962
BMP-2	563.84	17872.72	675.53	0.00	0.00	0.00	17758.23	0.92	0.09	0.963
BMP-3	563.84	15052.24	664.79	0.00	0.00	0.00	14948.19	1.05	0.11	0.957
BMP-4	563.84	10979.68	647.67	0.00	0.00	0.00	10893.11	1.70	0.19	0.944
BMP-5	563.84	29447.02	715.72	0.00	0.00	0.00	29289.29	1.06	0.11	0.976
BMP-6	563.84	37646.04	730.75	0.00	0.00	0.00	37480.26	0.40	0.04	0.981

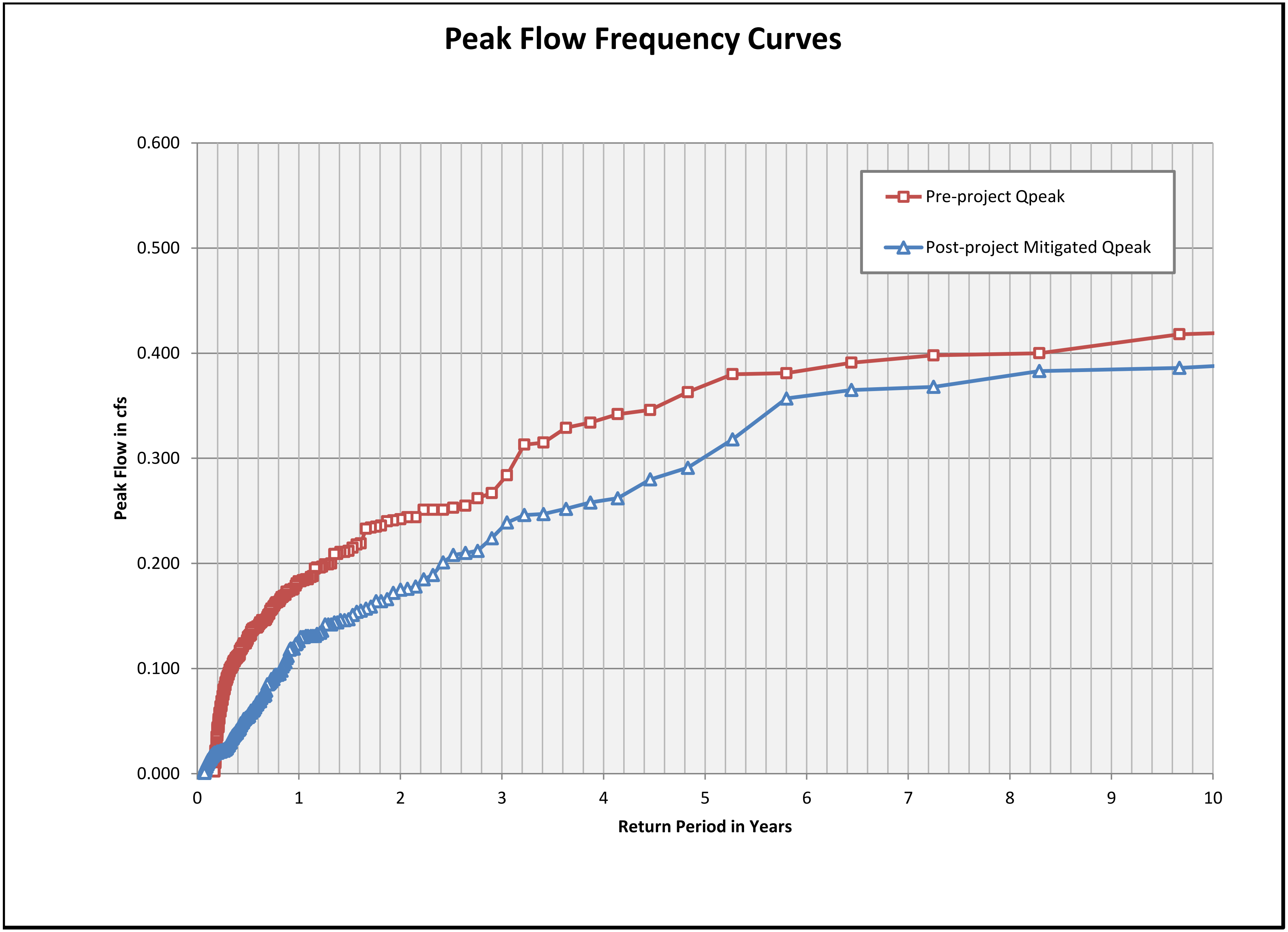
****
LID Performance Summary
****

Subcatchment	LID Control	Total Inflow in	Evap Loss in	Infil Loss in	Surface Outflow in	Drain Outflow in	Initial Storage in	Final Storage in	Continuity Error %
BMP-1	BMP-1	17918.17	674.98	0.00	2524.58	14715.22	1.80	5.65	-0.00
BMP-2	BMP-2	18436.56	675.55	0.00	1526.84	16231.95	1.80	4.52	-0.00
BMP-3	BMP-3	15616.08	664.81	0.00	1110.41	13838.38	1.80	4.69	-0.00
BMP-4	BMP-4	11543.52	647.68	0.00	752.00	10141.32	1.80	4.60	-0.00
BMP-5	BMP-5	30010.86	715.80	0.00	5212.47	24080.32	1.80	4.85	-0.00
BMP-6	BMP-6	38209.88	730.70	0.00	8341.73	29136.37	1.80	3.62	-0.00

Analysis begun on: Thu Aug 29 11:55:22 2019
Analysis ended on: Thu Aug 29 11:55:36 2019
Total elapsed time: 00:00:14

Peak Flow Frequency Summary

Return Period	Pre-project Qpeak (cfs)	Post-project - Mitigated Q (cfs)
LF = 0.1xQ2	0.024	0.018
2-year	0.242	0.175
5-year	0.370	0.301
10-year	0.419	0.388



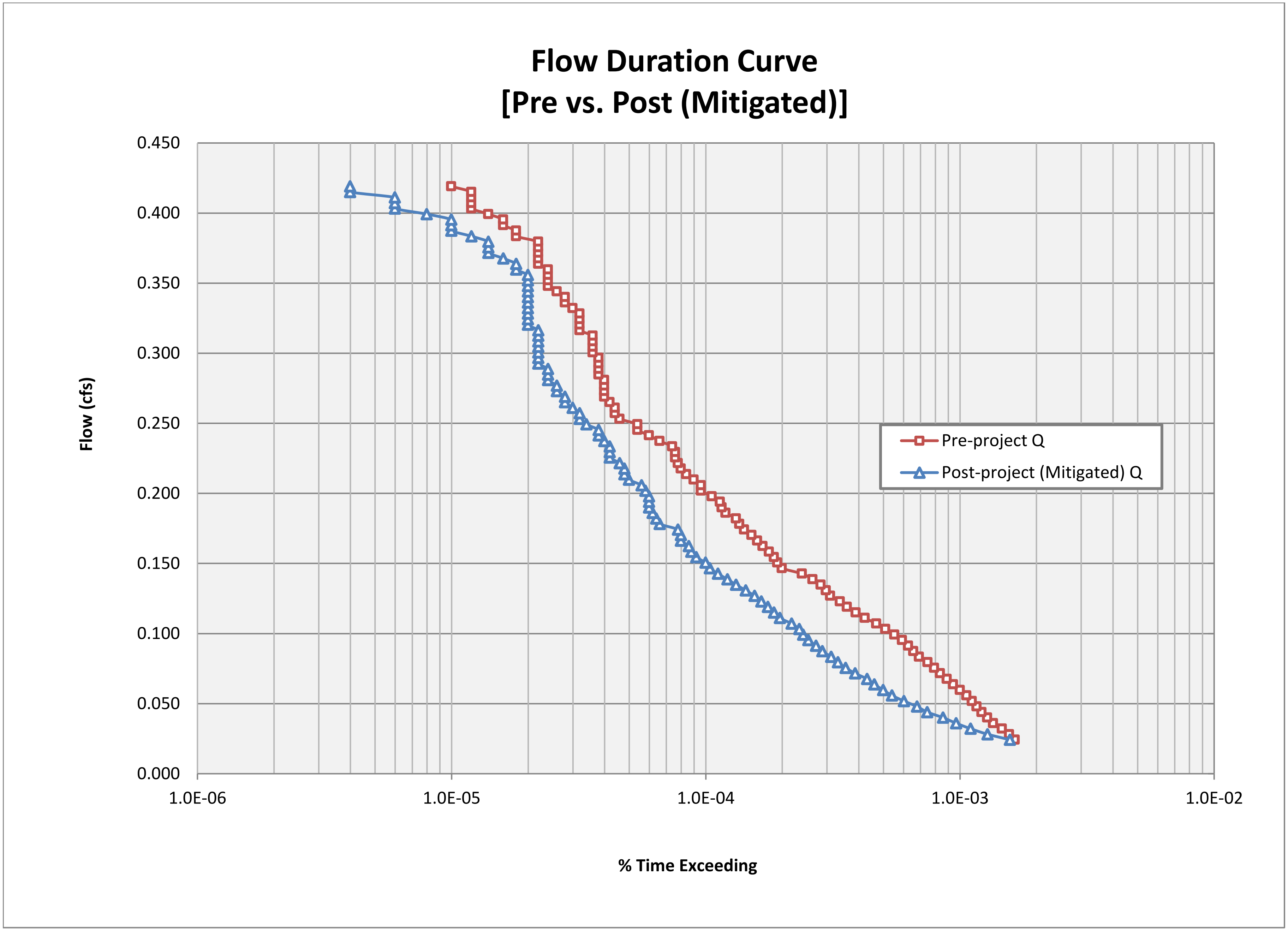
Peak Flow Frequency Curves
Pre-project Qpeak
Post-project Mitigated Qpeak
0.600
0.500
0.400
0.300
0.200
0.100
0.000
Peak Flow in cfs
0
1
2
3
4
5
6
7
8
9
10
Return Period in Years

Low-flow Threshold:	10%	
0.1xQ2 (Pre):	0.024	cfs
Q10 (Pre):	0.419	cfs
Ordinate #:	100	
Incremental Q (Pre):	0.00395	cfs
Total Hourly Data:	501471	hours

The proposed BMP: PASSED

Interval	Pre-project Flow (cfs)	Pre-project Hours	Pre-project % Time Exceeding	Post-project Hours	Post-project % Time Exceeding	Percentage	Pass/Fail
0	0.024	824	1.64E-03	788	1.57E-03	96%	Pass
1	0.028	784	1.56E-03	644	1.28E-03	82%	Pass
2	0.032	734	1.46E-03	552	1.10E-03	75%	Pass
3	0.036	677	1.35E-03	484	9.65E-04	71%	Pass
4	0.040	642	1.28E-03	430	8.57E-04	67%	Pass
5	0.044	610	1.22E-03	373	7.44E-04	61%	Pass
6	0.048	583	1.16E-03	340	6.78E-04	58%	Pass
7	0.052	559	1.11E-03	302	6.02E-04	54%	Pass
8	0.056	532.0000	1.06E-03	271	5.40E-04	51%	Pass
9	0.060	501	9.99E-04	250	4.99E-04	50%	Pass
10	0.064	472	9.41E-04	231	4.61E-04	49%	Pass
11	0.068	445	8.87E-04	216	4.31E-04	49%	Pass
12	0.072	419	8.36E-04	194	3.87E-04	46%	Pass
13	0.076	397	7.92E-04	178	3.55E-04	45%	Pass
14	0.079	374	7.46E-04	166	3.31E-04	44%	Pass
15	0.083	346	6.90E-04	156	3.11E-04	45%	Pass
16	0.087	329	6.56E-04	144	2.87E-04	44%	Pass
17	0.091	314	6.26E-04	136	2.71E-04	43%	Pass
18	0.095	297	5.92E-04	127	2.53E-04	43%	Pass
19	0.099	277	5.52E-04	121	2.41E-04	44%	Pass
20	0.103	255	5.09E-04	117	2.33E-04	46%	Pass
21	0.107	235	4.69E-04	109	2.17E-04	46%	Pass
22	0.111	212	4.23E-04	98	1.95E-04	46%	Pass
23	0.115	195	3.89E-04	93	1.85E-04	48%	Pass
24	0.119	180	3.59E-04	88	1.75E-04	49%	Pass
25	0.123	169	3.37E-04	83	1.66E-04	49%	Pass
26	0.127	155	3.09E-04	78	1.56E-04	50%	Pass
27	0.131	149	2.97E-04	72	1.44E-04	48%	Pass
28	0.135	142	2.83E-04	66	1.32E-04	46%	Pass
29	0.139	132	2.63E-04	61	1.22E-04	46%	Pass
30	0.143	120	2.39E-04	56	1.12E-04	47%	Pass
31	0.147	100	1.99E-04	52	1.04E-04	52%	Pass
32	0.151	96	1.91E-04	50	9.97E-05	52%	Pass
33	0.154	93	1.85E-04	46	9.17E-05	49%	Pass
34	0.158	89	1.77E-04	44	8.77E-05	49%	Pass
35	0.162	84	1.68E-04	43	8.57E-05	51%	Pass
36	0.166	80	1.60E-04	40	7.98E-05	50%	Pass
37	0.170	76	1.52E-04	40	7.98E-05	53%	Pass
38	0.174	71	1.42E-04	39	7.78E-05	55%	Pass
39	0.178	68	1.36E-04	33	6.58E-05	49%	Pass
40	0.182	66	1.32E-04	32	6.38E-05	48%	Pass
41	0.186	60	1.20E-04	31	6.18E-05	52%	Pass
42	0.190	58	1.16E-04	30	5.98E-05	52%	Pass
43	0.194	57	1.14E-04	30	5.98E-05	53%	Pass
44	0.198	53	1.06E-04	30	5.98E-05	57%	Pass
45	0.202	48	9.57E-05	29	5.78E-05	60%	Pass
46	0.206	48	9.57E-05	28	5.58E-05	58%	Pass
47	0.210	45	8.97E-05	25	4.99E-05	56%	Pass
48	0.214	42	8.38E-05	24	4.79E-05	57%	Pass
49	0.218	40	7.98E-05	24	4.79E-05	60%	Pass
50	0.222	39	7.78E-05	23	4.59E-05	59%	Pass
51	0.226	38	7.58E-05	21	4.19E-05	55%	Pass
52	0.230	38	7.58E-05	21	4.19E-05	55%	Pass
53	0.233	37	7.38E-05	21	4.19E-05	57%	Pass

Interval	Pre-project Flow (cfs)	Pre-project Hours	Pre-project % Time Exceeding	Post-project Hours	Post-project % Time Exceeding	Percentage	Pass/Fail
54	0.237	33	6.58E-05	20	3.99E-05	61%	Pass
55	0.241	30	5.98E-05	19	3.79E-05	63%	Pass
56	0.245	27	5.38E-05	19	3.79E-05	70%	Pass
57	0.249	27	5.38E-05	17	3.39E-05	63%	Pass
58	0.253	23	4.59E-05	16	3.19E-05	70%	Pass
59	0.257	22	4.39E-05	16	3.19E-05	73%	Pass
60	0.261	22	4.39E-05	15	2.99E-05	68%	Pass
61	0.265	21	4.19E-05	14	2.79E-05	67%	Pass
62	0.269	20	3.99E-05	14	2.79E-05	70%	Pass
63	0.273	20	3.99E-05	13	2.59E-05	65%	Pass
64	0.277	20	3.99E-05	13	2.59E-05	65%	Pass
65	0.281	20	3.99E-05	12	2.39E-05	60%	Pass
66	0.285	19	3.79E-05	12	2.39E-05	63%	Pass
67	0.289	19	3.79E-05	12	2.39E-05	63%	Pass
68	0.293	19	3.79E-05	11	2.19E-05	58%	Pass
69	0.297	19	3.79E-05	11	2.19E-05	58%	Pass
70	0.301	18	3.59E-05	11	2.19E-05	61%	Pass
71	0.305	18	3.59E-05	11	2.19E-05	61%	Pass
72	0.308	18	3.59E-05	11	2.19E-05	61%	Pass
73	0.312	18	3.59E-05	11	2.19E-05	61%	Pass
74	0.316	16	3.19E-05	11	2.19E-05	69%	Pass
75	0.320	16	3.19E-05	10	1.99E-05	63%	Pass
76	0.324	16	3.19E-05	10	1.99E-05	63%	Pass
77	0.328	16	3.19E-05	10	1.99E-05	63%	Pass
78	0.332	15	2.99E-05	10	1.99E-05	67%	Pass
79	0.336	14	2.79E-05	10	1.99E-05	71%	Pass
80	0.340	14	2.79E-05	10	1.99E-05	71%	Pass
81	0.344	13	2.59E-05	10	1.99E-05	77%	Pass
82	0.348	12	2.39E-05	10	1.99E-05	83%	Pass
83	0.352	12	2.39E-05	10	1.99E-05	83%	Pass
84	0.356	12	2.39E-05	10	1.99E-05	83%	Pass
85	0.360	12	2.39E-05	9	1.79E-05	75%	Pass
86	0.364	11	2.19E-05	9	1.79E-05	82%	Pass
87	0.368	11	2.19E-05	8	1.60E-05	73%	Pass
88	0.372	11	2.19E-05	7	1.40E-05	64%	Pass
89	0.376	11	2.19E-05	7	1.40E-05	64%	Pass
90	0.380	11	2.19E-05	7	1.40E-05	64%	Pass
91	0.383	9	1.79E-05	6	1.20E-05	67%	Pass
92	0.387	9	1.79E-05	5	9.97E-06	56%	Pass
93	0.391	8	1.60E-05	5	9.97E-06	63%	Pass
94	0.395	8	1.60E-05	5	9.97E-06	63%	Pass
95	0.399	7	1.40E-05	4	7.98E-06	57%	Pass
96	0.403	6	1.20E-05	3	5.98E-06	50%	Pass
97	0.407	6	1.20E-05	3	5.98E-06	50%	Pass
98	0.411	6	1.20E-05	3	5.98E-06	50%	Pass
99	0.415	6	1.20E-05	2	3.99E-06	33%	Pass
100	0.419	5	9.97E-06	2	3.99E-06	40%	Pass



Flow Duration Curve
[Pre vs. Post (Mitigated)]
Flow (cfs)
0.450
0.400
0.350
0.300
0.250
0.200
0.150
0.100
0.050
0.000
1.0E-06
1.0E-05
1.0E-04
1.0E-03
1.0E-02
% Time Exceeding
Pre-project Q
Post-project (Mitigated) Q

SWMM Model Flow Coefficient Calculation

BMP-1

PARAMETER	ABBREV.	Bio-Retention Cell LID BMP	
Ponding Depth	PD	12	in
Bioretention Soil Layer	S	18	in
Gravel Layer	G	12	in
TOTAL		3.5	ft
		42	in
Orifice Coefficient	c_g	0.6	--
Low Flow Orifice Diameter	D	0.3	in
Drain exponent	n	0.5	--
Flow Rate (volumetric)	Q	0.0044	cfs
Ponding Depth Surface Area	A_{PD}	171	ft^2
Bioretention Surface Area	$A_{S,} A_G$	171	ft^2
	$A_{S,} A_G$	0.0039	ac
Porosity of Bioretention Soil	n	1.00	-
Flow Rate (per unit area)	q	1.115	in/hr
Effective Ponding Depth	PD_{eff}	**12.00**	in
Flow Coefficient	C	**0.1724**	--

SWMM Model Flow Coefficient Calculation

BMP-2

PARAMETER	ABBREV.	Bio-Retention Cell LID BMP	
Ponding Depth	PD	12	in
Bioretention Soil Layer	S	18	in
Gravel Layer	G	12	in
TOTAL		3.5	ft
		42	in
Orifice Coefficient	c_g	0.6	--
Low Flow Orifice Diameter	D	0.3	in
Drain exponent	n	0.5	--
Flow Rate (volumetric)	Q	0.0044	cfs
Ponding Depth Surface Area	A_{PD}	83	ft^2
Bioretention Surface Area	$A_{S,} A_G$	83	ft^2
	$A_{S,} A_G$	0.0019	ac
Porosity of Bioretention Soil	n	1.00	-
Flow Rate (per unit area)	q	2.297	in/hr
Effective Ponding Depth	PD_{eff}	**12.00**	in
Flow Coefficient	C	**0.3551**	--

SWMM Model Flow Coefficient Calculation

BMP-3

PARAMETER	ABBREV.	Bio-Retention Cell LID BMP	
Ponding Depth	PD	12	in
Bioretention Soil Layer	S	18	in
Gravel Layer	G	12	in
TOTAL		3.5	ft
		42	in
Orifice Coefficient	c_g	0.6	--
Low Flow Orifice Diameter	D	0.3	in
Drain exponent	n	0.5	--
Flow Rate (volumetric)	Q	0.0044	cfs
Ponding Depth Surface Area	A_{PD}	113	ft^2
Bioretention Surface Area	$A_{S,}$ A_G	113	ft^2
	$A_{S,}$ A_G	0.0026	ac
Porosity of Bioretention Soil	n	1.00	-
Flow Rate (per unit area)	q	1.687	in/hr
Effective Ponding Depth	PD_{eff}	**12.00**	in
Flow Coefficient	C	**0.2608**	--

SWMM Model Flow Coefficient Calculation

BMP-4

PARAMETER	ABBREV.	Bio-Retention Cell LID BMP	
Ponding Depth	PD	12	in
Bioretention Soil Layer	S	18	in
Gravel Layer	G	12	in
TOTAL		3.5	ft
		42	in
Orifice Coefficient	c_g	0.6	--
Low Flow Orifice Diameter	D	0.3	in
Drain exponent	n	0.5	--
Flow Rate (volumetric)	Q	0.0044	cfs
Ponding Depth Surface Area	A_{PD}	251	ft^2
Bioretention Surface Area	$A_{S,} A_G$	251	ft^2
	$A_{S,} A_G$	0.0058	ac
Porosity of Bioretention Soil	n	1.00	-
Flow Rate (per unit area)	q	0.760	in/hr
Effective Ponding Depth	PD_{eff}	**12.00**	in
Flow Coefficient	C	**0.1174**	--

SWMM Model Flow Coefficient Calculation

BMP-5

PARAMETER	ABBREV.	Bio-Retention Cell LID BMP	
Ponding Depth	PD	12	in
Bioretention Soil Layer	S	18	in
Gravel Layer	G	12	in
TOTAL		3.5	ft
		42	in
Orifice Coefficient	c_g	0.6	--
Low Flow Orifice Diameter	D	0.3	in
Drain exponent	n	0.5	--
Flow Rate (volumetric)	Q	0.0044	cfs
Ponding Depth Surface Area	A_{PD}	58	ft^2
Bioretention Surface Area	$A_{S,}$ A_G	58	ft^2
	$A_{S,}$ A_G	0.0013	ac
Porosity of Bioretention Soil	n	1.00	-
Flow Rate (per unit area)	q	3.288	in/hr
Effective Ponding Depth	PD_{eff}	**12.00**	in
Flow Coefficient	C	**0.5082**	--

SWMM Model Flow Coefficient Calculation

BMP-6

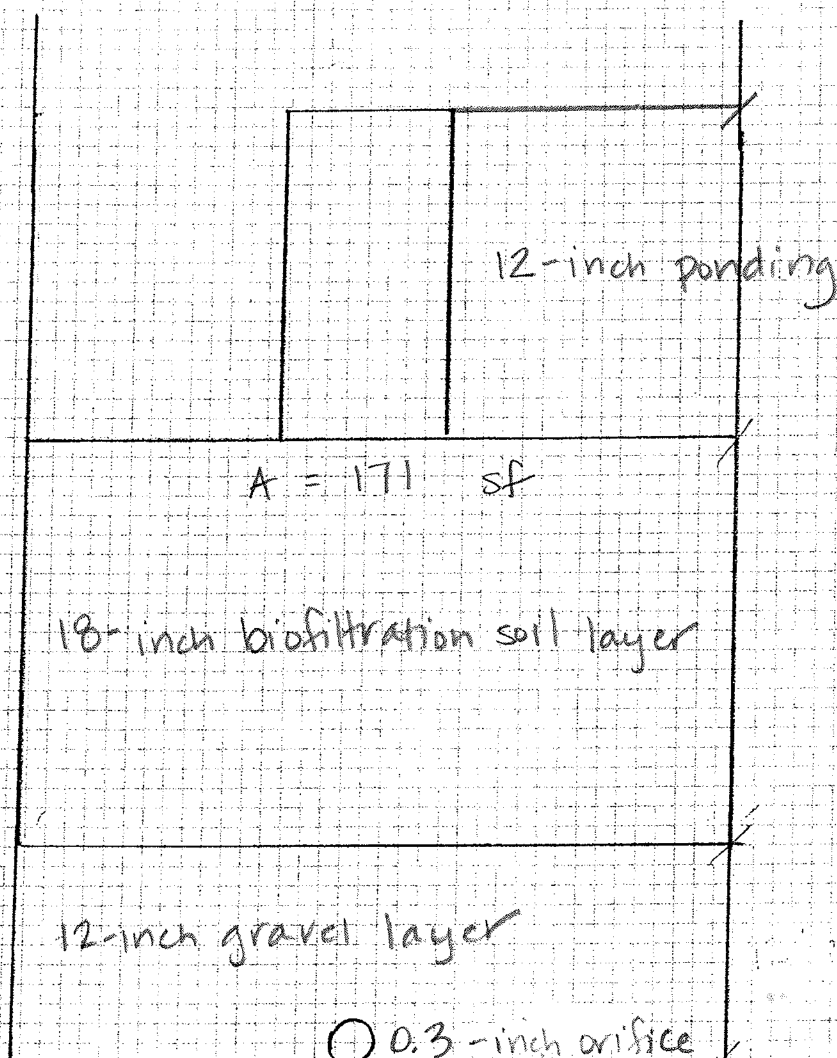
PARAMETER	ABBREV.	Bio-Retention Cell LID BMP	
Ponding Depth	PD	10	in
Bioretention Soil Layer	S	18	in
Gravel Layer	G	12	in
TOTAL		3.3	ft
		40	in
Orifice Coefficient	c_g	0.6	--
Low Flow Orifice Diameter	D	0.5	in
Drain exponent	n	0.5	--
Flow Rate (volumetric)	Q	0.0119	cfs
Ponding Depth Surface Area	A_{PD}	17	ft^2
Bioretention Surface Area	$A_{S,} A_G$	17	ft^2
	$A_{S,} A_G$	0.0004	ac
Porosity of Bioretention Soil	n	1.00	-
Flow Rate (per unit area)	q	30.365	in/hr
Effective Ponding Depth	PD_{eff}	**10.00**	in
Flow Coefficient	C	**4.8162**	--

PASCO LARET SUITER
& ASSOCIATES

Voltaire

Date 8/15/19 Job# 3090

HMP Biofiltration BMP - 1

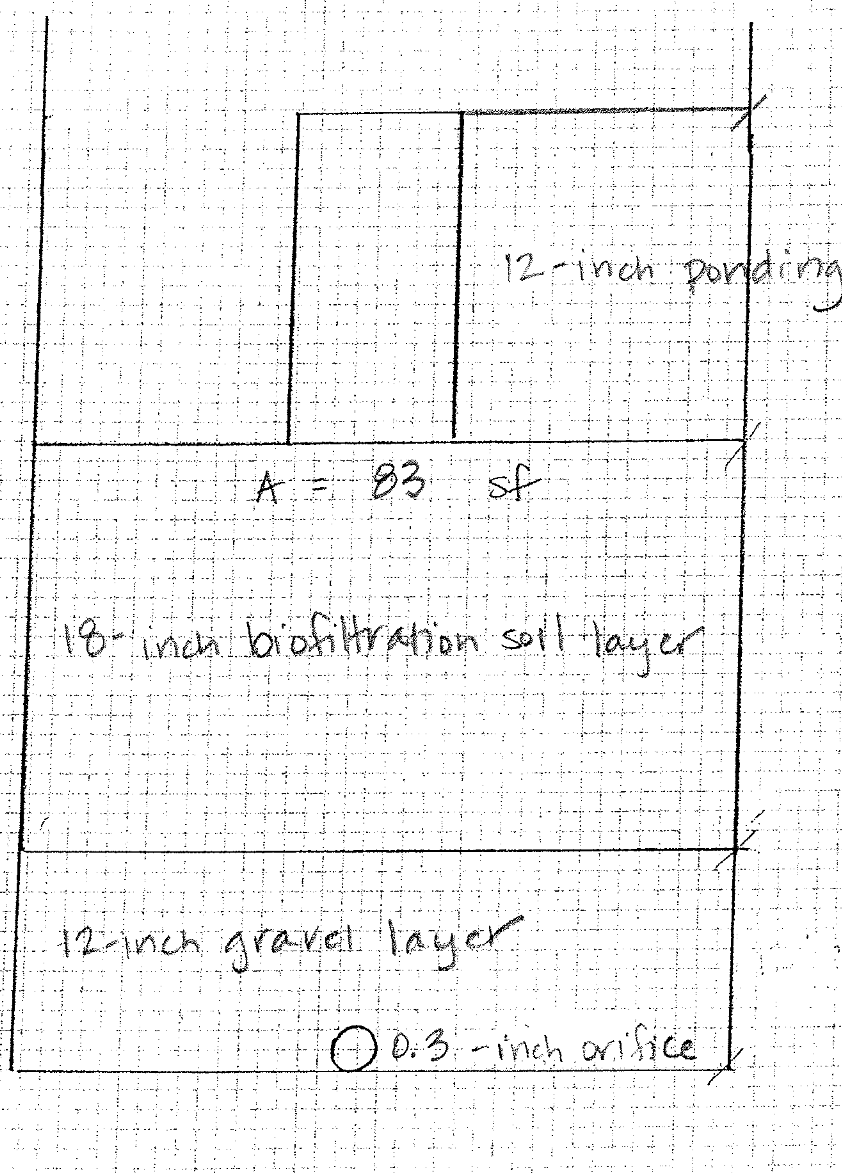


Not to scale

Voltaire

Date 8/15/19 Job# 3090

HMP Biofiltration BMP - 2



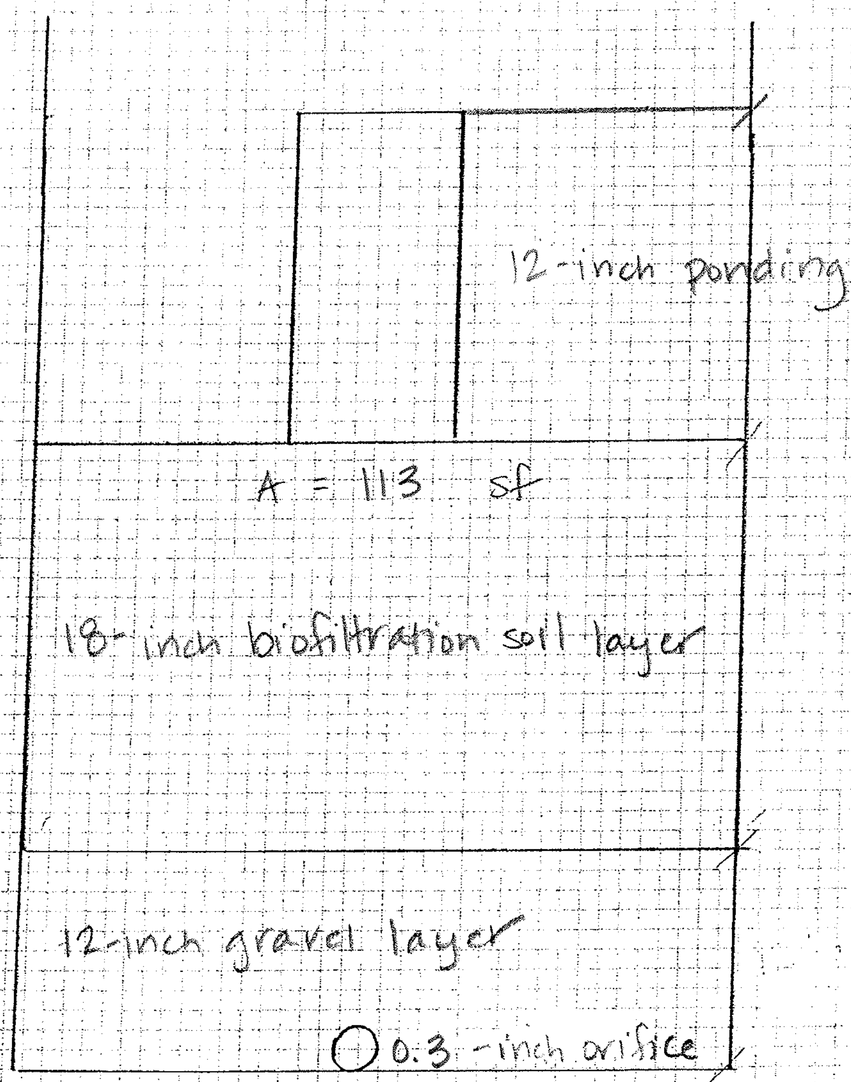
Not to scale.

PASCO LARET SUITER
& ASSOCIATES

Voltaire

Date 8/15/19 Job# 3090

HMP Biofiltration BMP-3



Not to scale

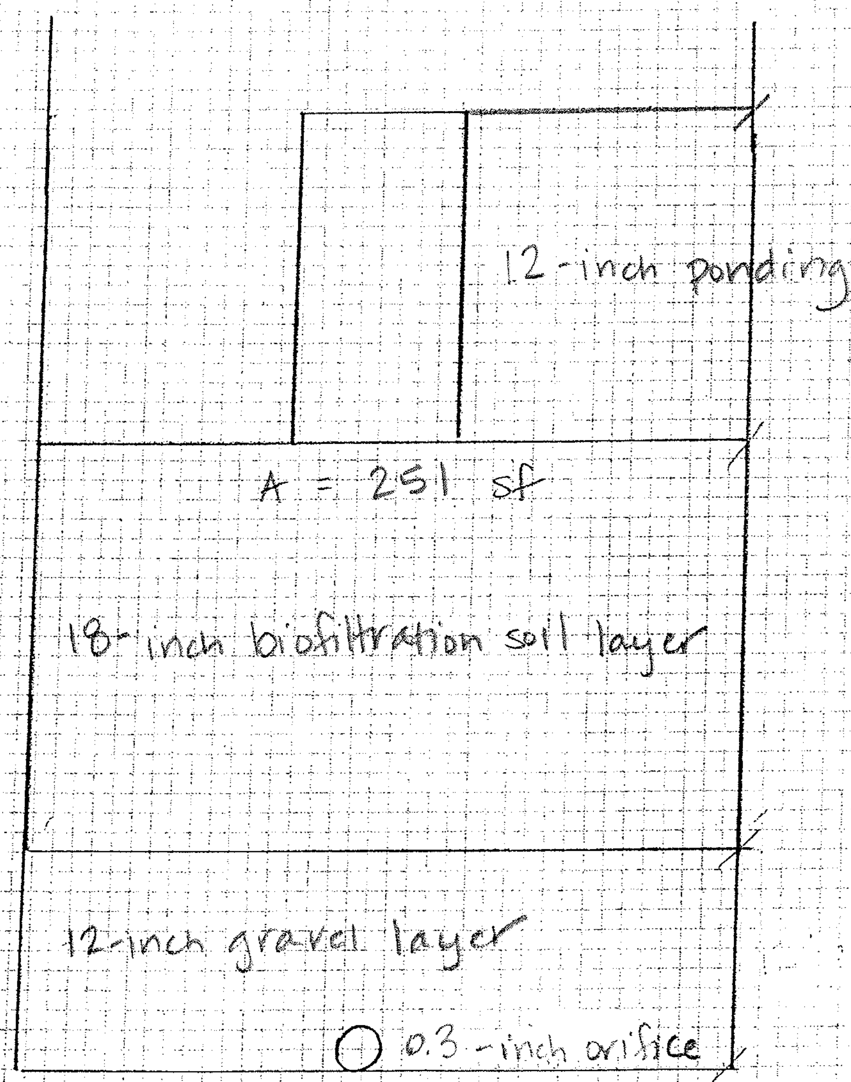
PASCO LARET SUITER & ASSOCIATES

Voltaire

Date 8/15/19

Job# 3090

HMP Biofiltration BMP - 4



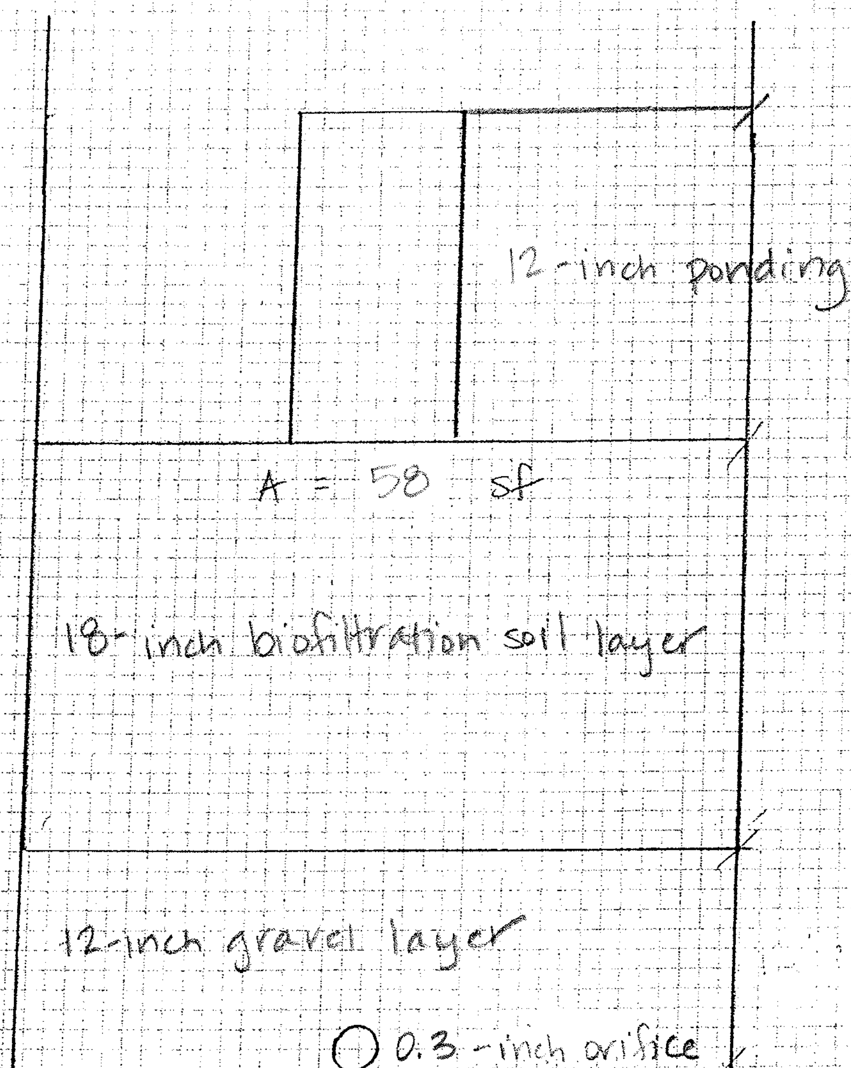
Not to scale

PASCO LARET SUITER
& ASSOCIATES

Voltaire

Date 8/15/19 Job# 3090

HMP Biofiltration BMP - 5



Not to scale

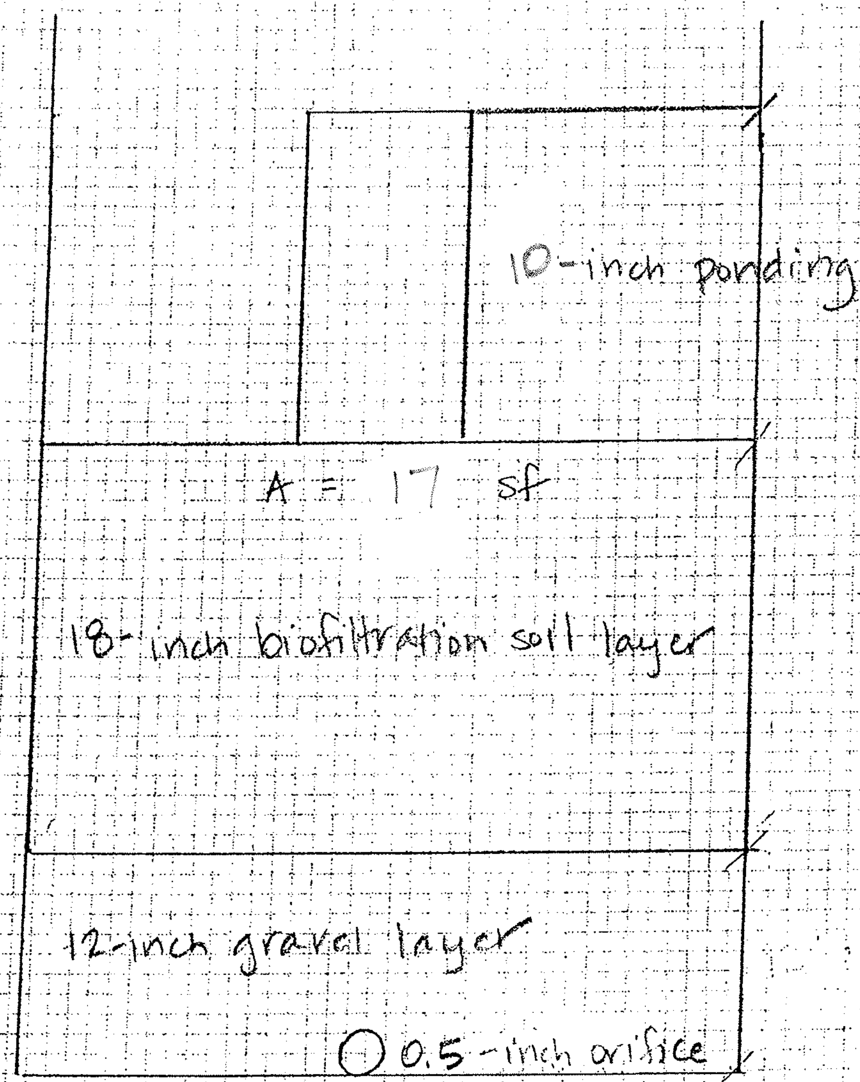
PASCO LARET SUITER
& ASSOCIATES

Voltaire

Date 8/29/19

Job# 3090

HMP Biofiltration BMP-6



ot to scale

Drawdown Calculation for BMP **1**

Project Name	Voltaire Street	
Project No	3090	
Surface Drawdown Time:	10.8	**hr**
Surface Area	**171**	**sq ft**
Underdrain Orifice Diameter: in	**0.3**	in
C:	**0.6**	
Surface Ponding (to invert of lowest surface discharge opening in outlet structure):	**1**	ft
Amended Soil Depth:	**1.5**	ft
Gravel Depth:	**1**	ft
Orifice Q =	**0.004**	cfs
Effective Depth	20.4	in
Infiltration controlled by orifice	1.115	in/hr

Drawdown Calculation for BMP **2**

Project Name Voltaire Street

Project No 3090

Surface Drawdown Time:	5.2	**hr**
Surface Area	**83**	**sq ft**
Underdrain Orifice Diameter: in	**0.3**	in
C:	**0.6**	
Surface Ponding (to invert of lowest surface discharge opening in outlet structure):	**1**	ft
Amended Soil Depth:	**1.5**	ft
Gravel Depth:	**1**	ft
Orifice Q =	**0.004**	cfs
Effective Depth	20.4	in
Infiltration controlled by orifice	2.296	in/hr

Drawdown Calculation for BMP **3**

Project Name Voltaire Street

Project No 3090

Surface Drawdown Time:	7.1	**hr**
Surface Area	**113**	**sq ft**
Underdrain Orifice Diameter: in	**0.3**	in
C:	**0.6**	
Surface Ponding (to invert of lowest surface discharge opening in outlet structure):	**1**	ft
Amended Soil Depth:	**1.5**	ft
Gravel Depth:	**1**	ft
Orifice Q =	**0.004**	cfs
Effective Depth	20.4	in
Infiltration controlled by orifice	1.687	in/hr

Drawdown Calculation for BMP	**4**	
Project Name	Voltaire Street	
Project No	3090	
Surface Drawdown Time:	15.8	**hr**
Surface Area	**251**	**sq ft**
Underdrain Orifice Diameter: in	**0.3**	in
C:	**0.6**	
Surface Ponding (to invert of lowest surface discharge opening in outlet structure):	**1**	ft
Amended Soil Depth:	**1.5**	ft
Gravel Depth:	**1**	ft
Orifice Q =	**0.004**	cfs
Effective Depth	20.4	in
Infiltration controlled by orifice	0.759	in/hr

Drawdown Calculation for BMP	**5**	
Project Name	Voltaire Street	
Project No	3090	
Surface Drawdown Time:	3.7	**hr**
Surface Area	**58**	**sq ft**
Underdrain Orifice Diameter: in	**0.3**	in
C:	**0.6**	
Surface Ponding (to invert of lowest surface discharge opening in outlet structure):	**1**	ft
Amended Soil Depth:	**1.5**	ft
Gravel Depth:	**1**	ft
Orifice Q =	**0.004**	cfs
Effective Depth	20.4	in
Infiltration controlled by orifice	3.286	in/hr

Drawdown Calculation for BMP **6**

Project Name Voltaire Street

Project No 3090

Surface Drawdown Time:	2.0	**hr**
Surface Area	**17**	**sq ft**
Underdrain Orifice Diameter: in	**0.5**	in
C:	**0.6**	
Surface Ponding (to invert of lowest surface discharge opening in outlet structure):	**0.83**	ft
Amended Soil Depth:	**1.5**	ft
Gravel Depth:	**1**	ft
Orifice Q =	**0.012**	cfs
Effective Depth	18.36	in
Infiltration controlled by orifice	30.334	in/hr
Infiltration controlled by media	5	in/hr

- Temperatures: Daily evaporation rates can be computed based on daily air temperature time series data using the Hargreaves method

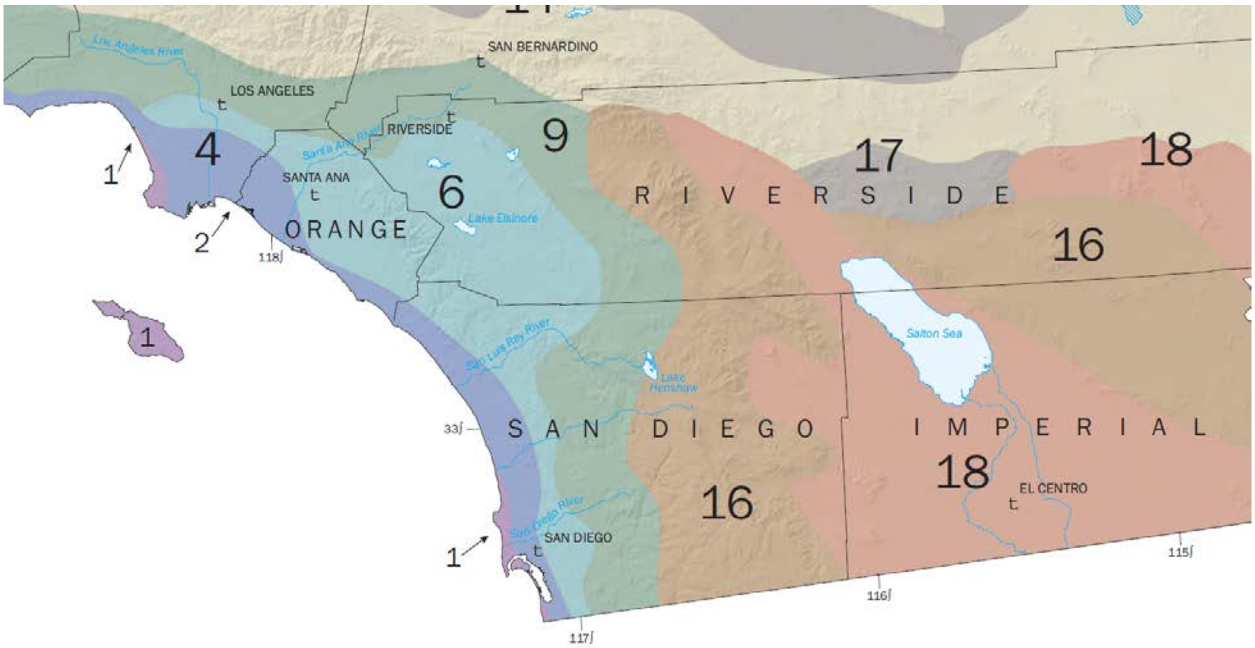


Figure G.1-2 : California Irrigation Management Information System "Reference Evapotranspiration Zones"

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

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

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

Attachment 3
Structural BMP Maintenance Information

This is the cover sheet for Attachment 3.

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Indicate which Items are Included:

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

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

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

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

The City of SAN DIEGO

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

CityMark Communities LLC
3818 Park Boulevard
San Diego, CA 92103

(THIS SPACE IS FOR RECORDER'S USE ONLY)

STORM WATER MANAGEMENT AND DISCHARGE CONTROL MAINTENANCE AGREEMENT

APPROVAL NUMBER:	ASSESSORS PARCEL NUMBER:	PROJECT NUMBER:
______	______	______

This agreement is made by and between the City of San Diego, a municipal corporation [City] and CityMark Communities LLC ______, the owner or duly authorized representative of the owner [Property Owner] of property located at

______
(PROPERTY ADDRESS)

and more particularly described as: ______
______
(LEGAL DESCRIPTION OF PROPERTY)

in the City of San Diego, County of San Diego, State of California.

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

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

Continued on Page 2

NOW, THEREFORE, the parties agree as follows:

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

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

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

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

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

See Attached Exhibit(s): ______________________________

____
(Owner Signature)

____
(Print Name and Title)

CityMark Communities, LLC
(Company/Organization Name)

____
(Date)

THE CITY OF SAN DIEGO

APPROVED:

____
(City Control Engineer Signature)

____
(Print Name)

____
(Date)

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

Reset Button Page 2

Attachment 4
Copy of Plan Sheets Showing Permanent Storm Water BMPs

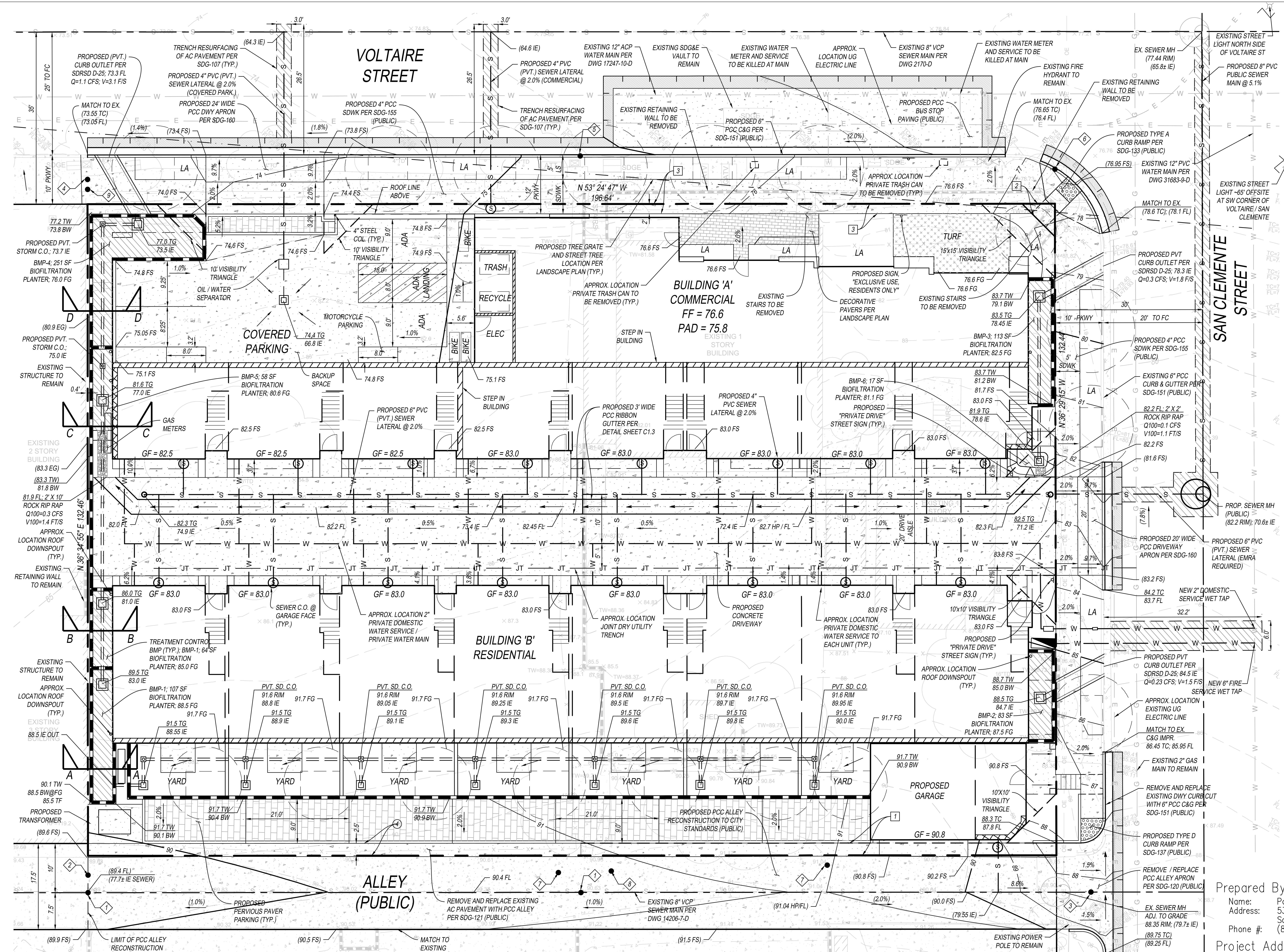
This is the cover sheet for Attachment 4.

Project Name: 17 ON VOLTAIRE - 4103 / 4111 VOLTAIRE STREET

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

The plans must identify:

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



PLAN VIEW - PRELIMINARY SITE DRAINAGE PLAN

SCALE: 1" = 10' HORIZONTAL

LEGEND

- SUBJECT PROPERTY / SUBDIVISION BOUNDARY
- EXISTING RIGHT-OF-WAY / ADJACENT LOT LINE
- CENTERLINE OF ROAD
- EXISTING EASEMENT
- PROPOSED EASEMENT
- PROPOSED 6" PCC CURB & GUTTER PER SDG-151 (PUBLIC)
- PROPOSED SAWCUT LINE
- EXISTING CONTOUR (320)
- PROPOSED CONTOUR (320)
- PROPOSED PERVIOUS PAVERS PER DETAIL SHEET C1.3
- PROPOSED PCC PAVEMENT
- EXISTING SEWER MAIN (SIZE PER PLAN) (S — S — S)
- EXISTING WATER MAIN (SIZE PER PLAN) (W — W — W)
- EXISTING GAS MAN (SIZE PER PLAN) (G — G — G)
- PROPOSED JOINT DRY UTILITY TRENCH LOCATION PER SDRSD M-24 (JT — JT)
- PROPOSED 2" WATER SERVICE, METER, AND BACKFLOW PER SDW-149 (SIZE TO BE VERIFIED BY PROJECT MEP) (W — W)
- PROPOSED 6" FIRE SERVICE AND PRIVATE RPDA PER SDW-105 (SIZE TO BE VERIFIED BY PROJECT MEP) (W — W)
- PROPOSED 4" PRIVATE SEWER LATERAL PER SDS-105 (S — S — S — S)
- PROPOSED TRENCH RESURFACING OF AC PAVEMENT PER SDG-107 (S — S — S)
- PROPOSED 6" SEWER CLEANOUT WITH 12" LID PER SDRSD SC-01
- PROPOSED 4' X 3' MANHOLE PER SDS-107
- FOUND SURVEY MONUMENT, AS NOTED
- ROCK RIP RAP (DIMENSIONS PER PLAN) PER SDRSD D-40; 1.1-FT THICK, NO. 2 BACKING

EASEMENT NOTES

(4) AN EXISTING PUBLIC ALLEY EASEMENT TO THE CITY OF SAN DIEGO, A MUNICIPAL CORPORATION, RECORDED MARCH 30, 2004 AS DOC #2004-0266068 OF OFFICIAL RECORDS

(7) AN EXISTING PERPETUAL AIR OR FLIGHT EASEMENT TO THE SAN DIEGO COUNTY REGIONAL AIRPORT AUTHORITY, ALSO REFERRED TO AS "AVIGATION RIGHTS", RECORDED FEBRUARY 7, 2008 AS DOCUMENT NO. 2008-0063093 OF OFFICIAL RECORDS (NOT PLOTTABLE)

[1] PROPOSED 2.5' OF ALLEY TO BE DEDICATED TO CITY OF SAN DIEGO

[2] PROPOSED DEDICATION TO THE CITY OF SAN DIEGO TO CONSTRUCT PEDESTRIAN CURB RAMP

[3] PROPOSED PUBLIC PEDESTRIAN ACCESS EASEMENT

- NO EASEMENTS TO BE VACATED
- ALL EASEMENTS PLOTTED IN ACCORDANCE WITH PTR PREPARED BY CHICAGO TITLE COMPANY DATED SEPTEMBER 6, 2019.

MONUMENT NOTES

<1> FOUND LEAD & DISK MARKED LS 2717 PER CR 19651

<2> FOUND LEAD & DISK MARKED RCE 1534 PER CR 19651

<3> FOUND LEAD & DISK MARKED LS 7632 PER CR 19651

<4> FOUND LEAD & DISK MARKED LS 7046 PER CR 25344

<5> FOUND LEAD & DISK MARKED LS 4068 PER CR 22075

<6> FOUND LEAD & DISK MARKED SAN DIEGO COUNTY ENGINEER PER CR 19651

<7> FOUND LEAD & DISK MARKED RCE 14778 PER CR 9010

<8> FOUND LEAD & DISK MARKED LS 2717, NO RECORD

<9> FOUND LEAD & DISK MARKED LS 7046 PER CR 25344

SITE NOTES

1. CONSTRUCT PCC SIDEWALK AS SHOWN PER PLAN PER SDG-155 & SDG-156; CONTRACTOR TO MAINTAIN EXISTING SIDEWALK SCORING PATTERN AND PRESERVE THE CONTRACTOR'S STAMP ADJACENT TO SAN CLEMENTE STREET
2. NO OBSTRUCTION INCLUDING SOLID WALLS IN THE VISIBILITY AREA SHALL EXCEED 3 FEET IN HEIGHT. PER SDMC SECTION 142.0409 (b)(2), PLANT MATERIAL, OTHER THAN TREES, LOCATED WITHIN VISIBILITY AREAS OR THE ADJACENT PUBLIC RIGHT-OF-WAY SHALL NOT EXCEED 36 INCHES IN HEIGHT, MEASURED FROM THE LOWEST GRADE ABUTTING THE PLANT MATERIAL TO THE TOP OF PLANT MATERIAL
3. PRIOR TO THE ISSUANCE OF ANY CONSTRUCTION PERMIT, THE OWNER/PERMITTEE SHALL ENTER INTO A MAINTENANCE AGREEMENT FOR THE ONGOING PERMANENT BMP MAINTENANCE, SATISFACTORY TO THE CITY ENGINEER.
4. ALL UTILITIES SHOWN HEREON PER BEST AVAILABLE RECORD INFORMATION.
5. NO PUBLIC WATER, SEWER, OR GENERAL UTILITY EASEMENTS EXIST ON THE SUBJECT PROPERTY.

WPCP NOTE

PRIOR TO THE ISSUANCE OF ANY CONSTRUCTION PERMIT, THE OWNER/PERMITTEE SHALL SUBMIT A WATER POLLUTION CONTROL PLAN (WPCP). THE WPCP SHALL BE PREPARED IN ACCORDANCE WITH THE GUIDELINES IN PART 2 CONSTRUCTION BMP STANDARDS CHAPTER 4 OF THE CITY'S STORM WATER STANDARDS.

PROPOSED ENCROACHMENT AGREEMENT TABLE

APPROVAL TYPE	DESCRIPTION
EMRA	THREE (3) - D-25 CURB OUTLET
EMRA	ONE (1) - 6" PRIVATE SEWER LATERAL CONNECTION TO PUBLIC MAIN
EMRA	TWO (2) - 4" PRIVATE SEWER LATERAL CONNECTION TO PUBLIC MAIN

**PRIOR TO ISSUANCE OF A RIGHT-OF-WAY CONSTRUCTION PERMIT, AN APPROVAL FOR THE ABOVE ITEMS, TO BE INCLUDED IN AN ENCROACHMENT MAINTENANCE AND REMOVAL AGREEMENT, MUST BE OBTAINED

GRAPHIC SCALE 1" = 10'

10 0 10 20 30

Prepared By:
Name: Pasco, Laret, Suiter & Assoc.
Address: 535 N. Hwy 101, Suite A
Solana Beach, CA 92075
Phone #: (858) 259-8212

Project Address:
4103 Voltaire Street
San Diego, CA

Project Name:
17 on Voltaire

Sheet Title:
Preliminary Site Drainage Plan

Revision 14:
Revision 13:
Revision 12:
Revision 11:
Revision 10:
Revision 9:
Revision 8:
Revision 7:
Revision 6:
Revision 5:
Revision 4:
Revision 3:
Revision 2:
Revision 1:

Original Date: September 12, 2019

Sheet 11 of 15

DEP#:

PASCO LARET SUITER & ASSOCIATES
San Diego | Solana Beach | Orange County
Phone 858.259.8212 | www.plsaengineering.com

REGISTERED PROFESSIONAL ENGINEER
TYLER G LAWSON
No. 80356
Exp. 12/31/20
CIVIL
STATE OF CALIFORNIA

JOB #: PLSA 3090
DRAWN BY: BAK
PROJ. MGR.: TGL
DATE: ISSUE:

REVISIONS

#	DESCRIPTION	DATE
1	1ST SDP SUBMIT.	9/19/19
2	2ND SDP SUBMIT.	1/15/20
3	3RD SDP SUBMIT.	3/30/20
4	4TH SDP SUBMIT.	5/13/20

17 ON VOLTAIRE

PRELIMINARY SITE DRAINAGE PLAN FOR:
SITE DEVELOPMENT PERMIT / MAP WAIVER

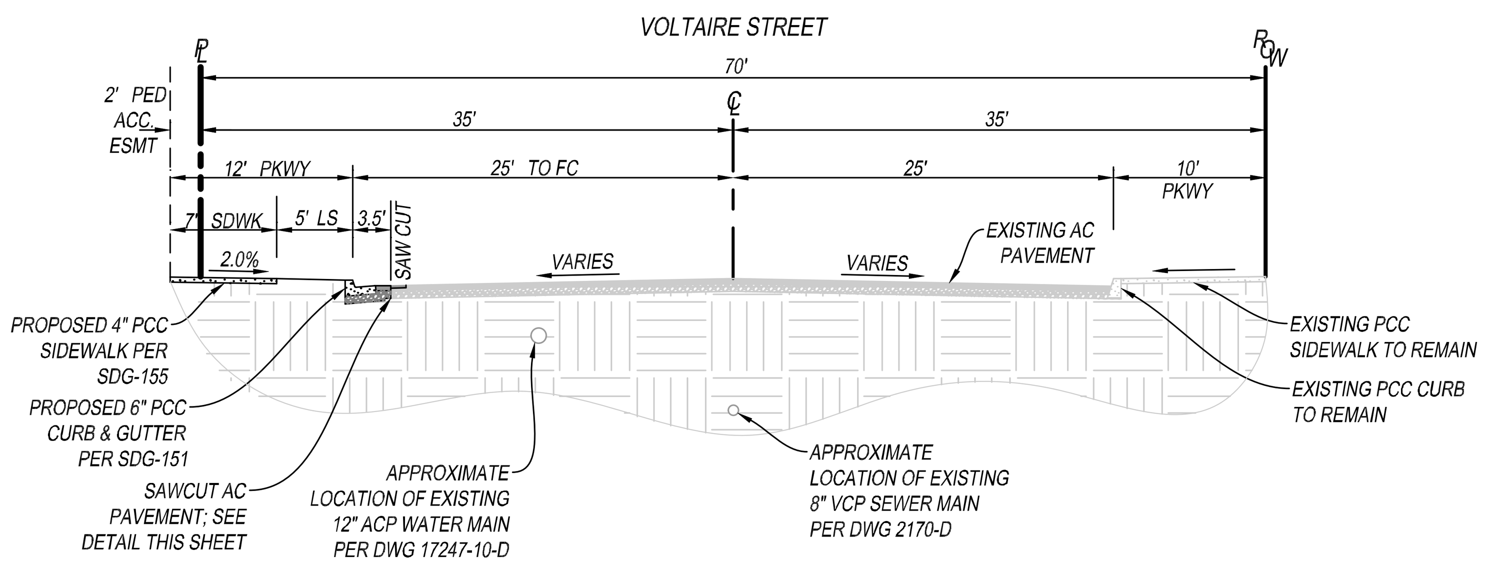
C1.2

4103 VOLTAIRE STREET

05 / 13 / 20

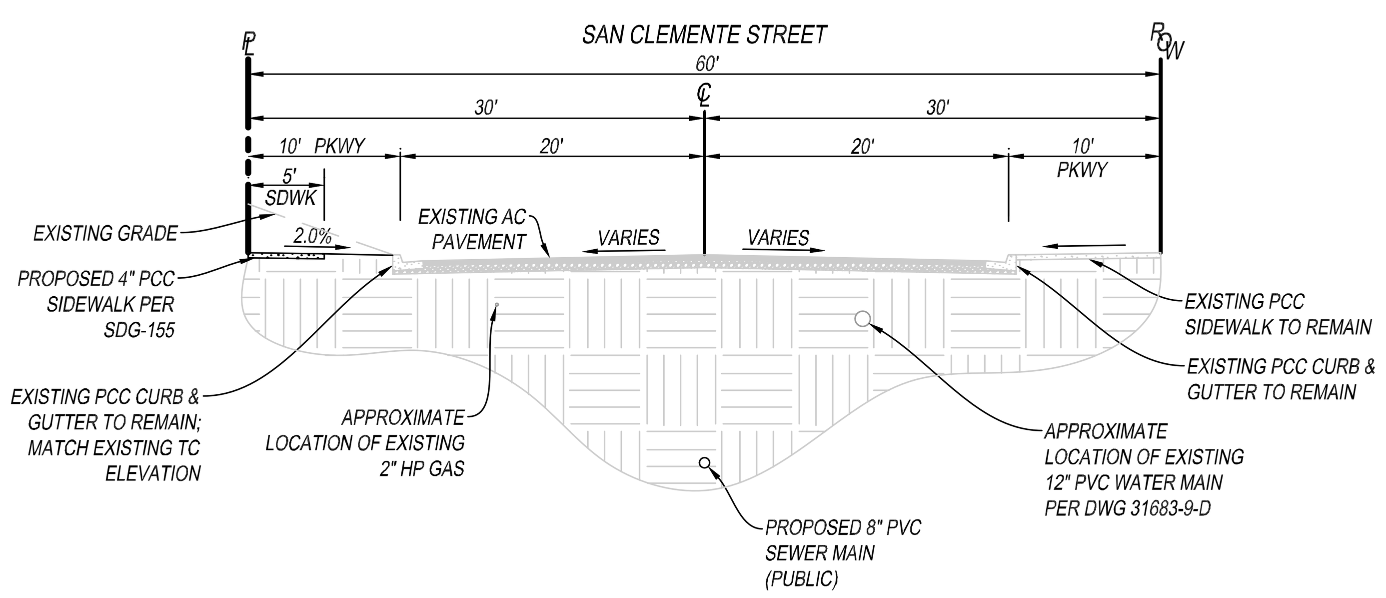
PLSA 3090

J:\ACTIVE JOBS\3090 VOLTAIRE\CIVIL\DRAWING\DISCRETIONARY PLANS\3090-CV-SDP-02-PGP.DWG



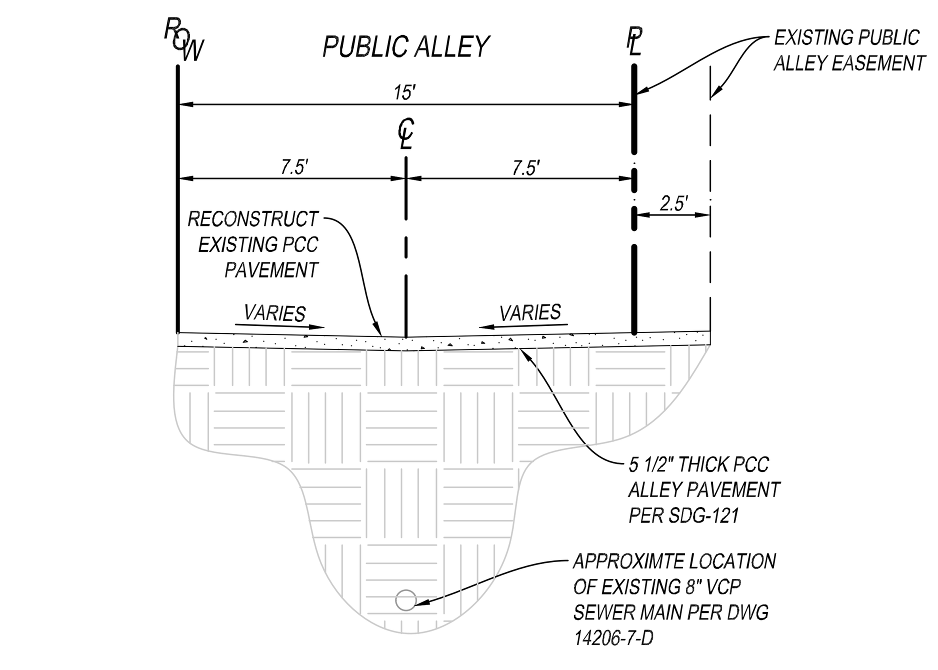
TYPICAL SECTION - VOLTAIRE STREET

NOT TO SCALE



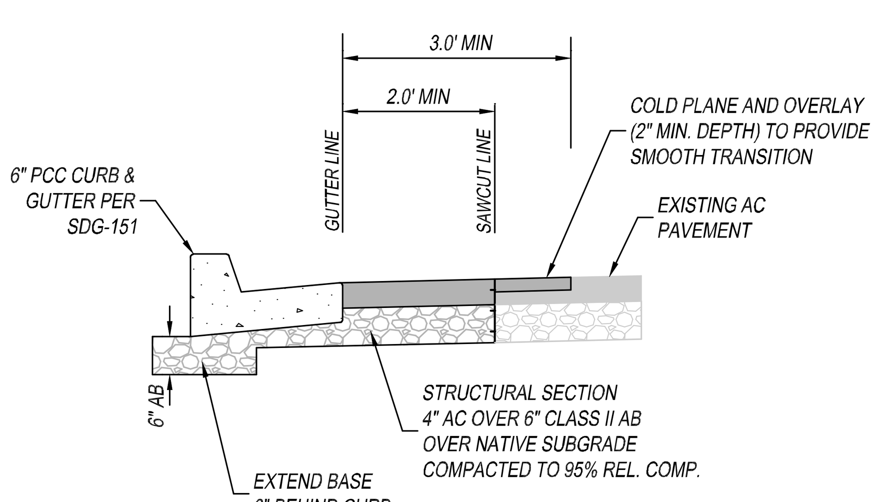
TYPICAL SECTION - SAN CLEMENTE STREET

NOT TO SCALE



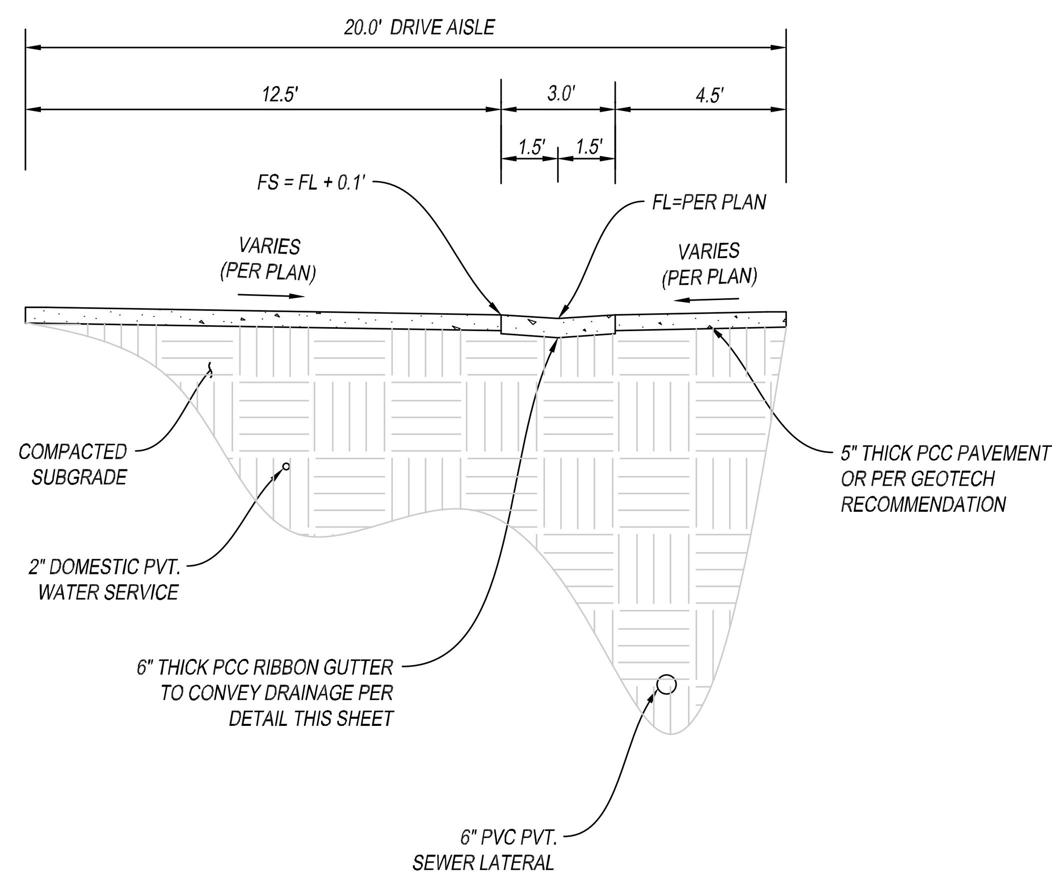
TYPICAL SECTION - PUBLIC ALLEY

NOT TO SCALE



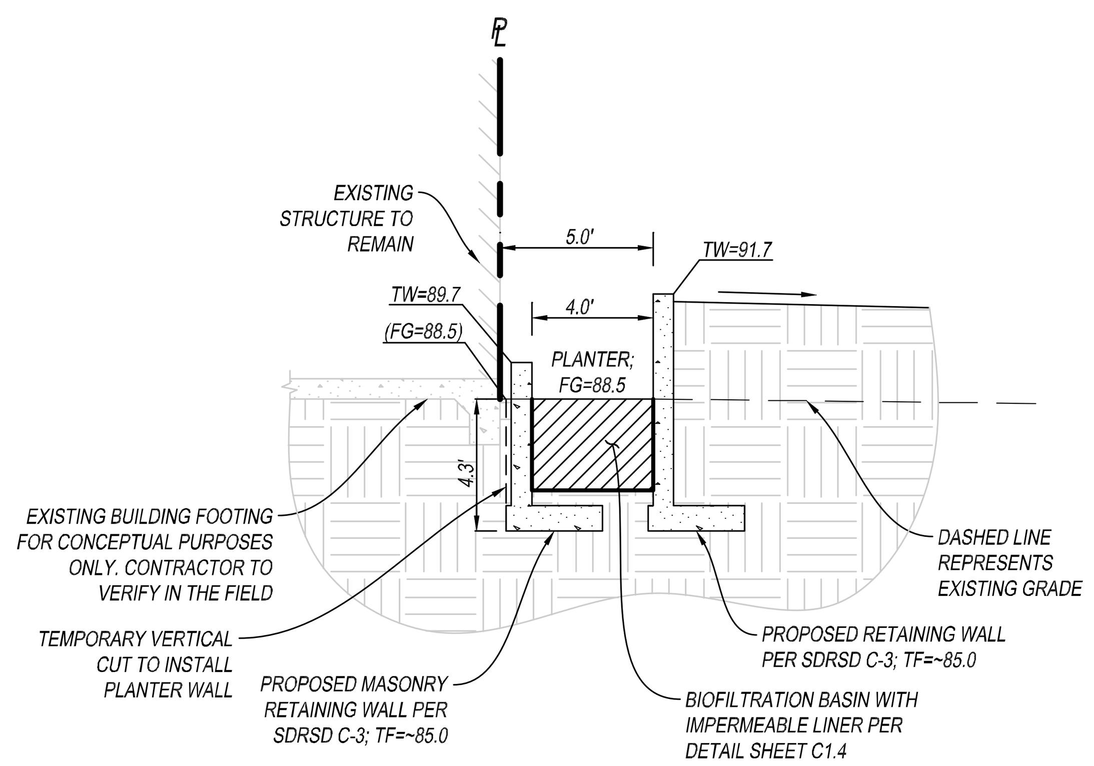
TYPICAL SECTION - SAWCUT AC PAVEMENT

NOT TO SCALE



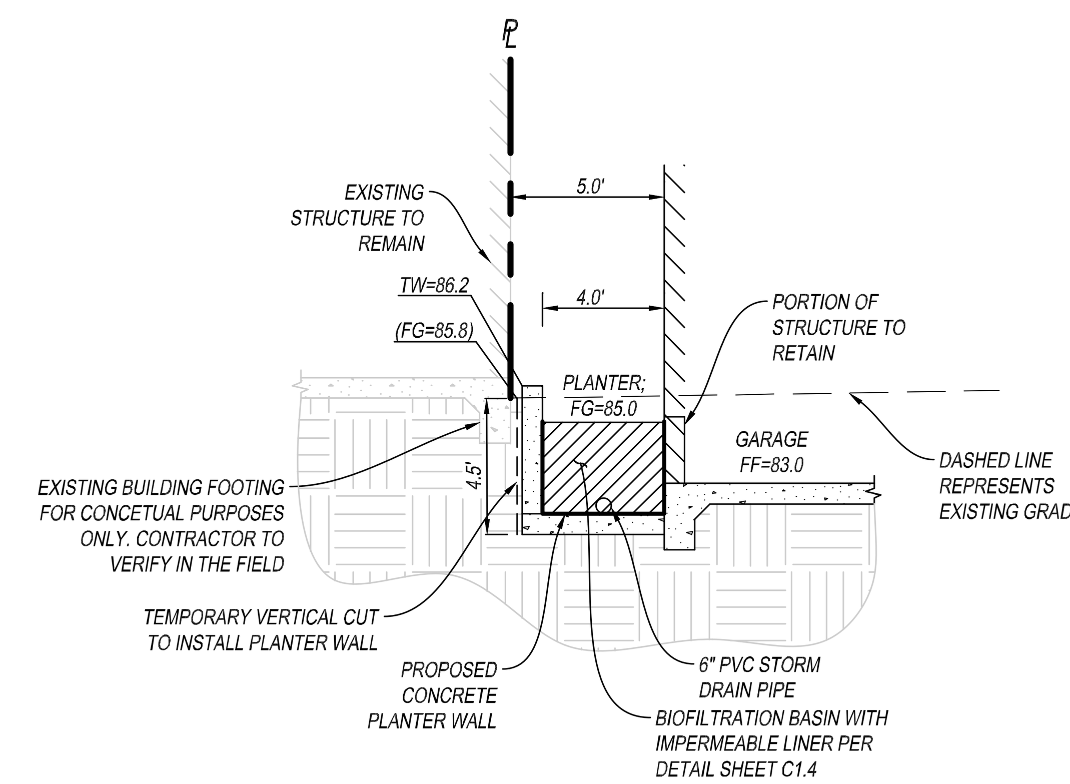
TYPICAL SECTION - PCC PAVEMENT DRIVEWAY

NOT TO SCALE



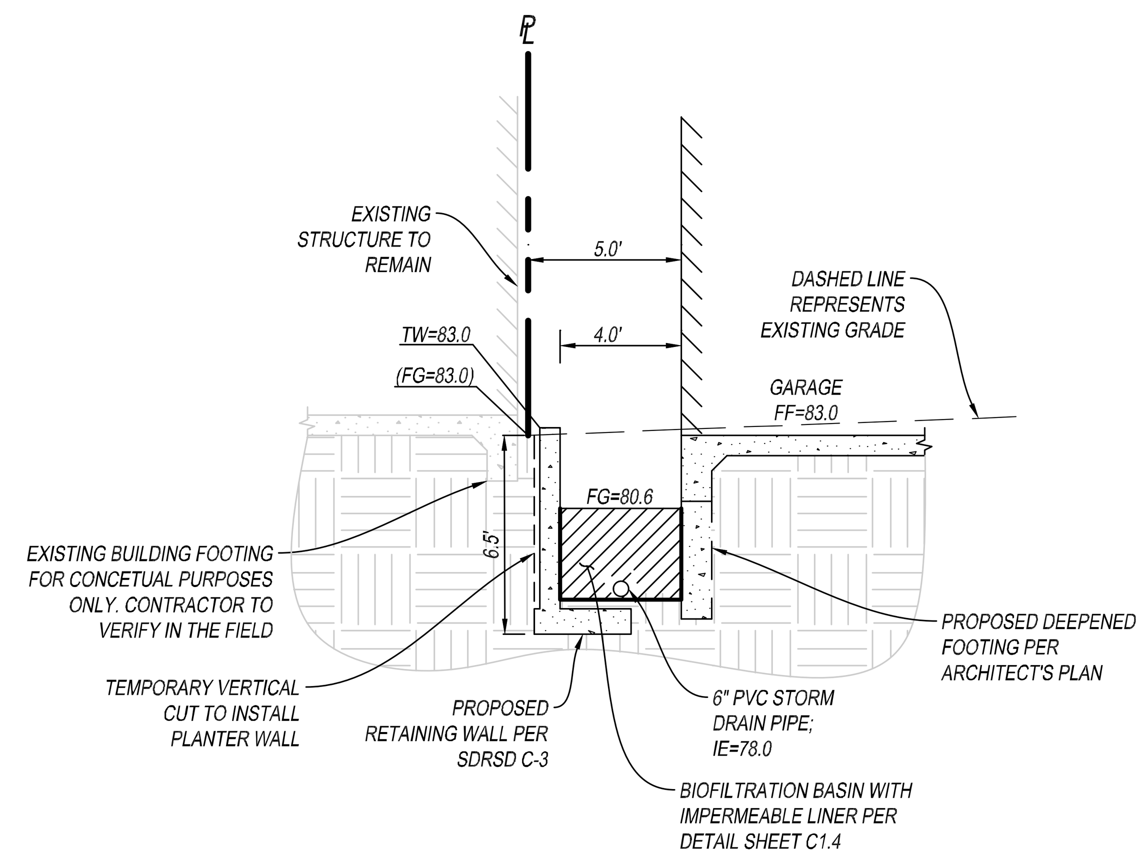
SECTION A-A

NOT TO SCALE



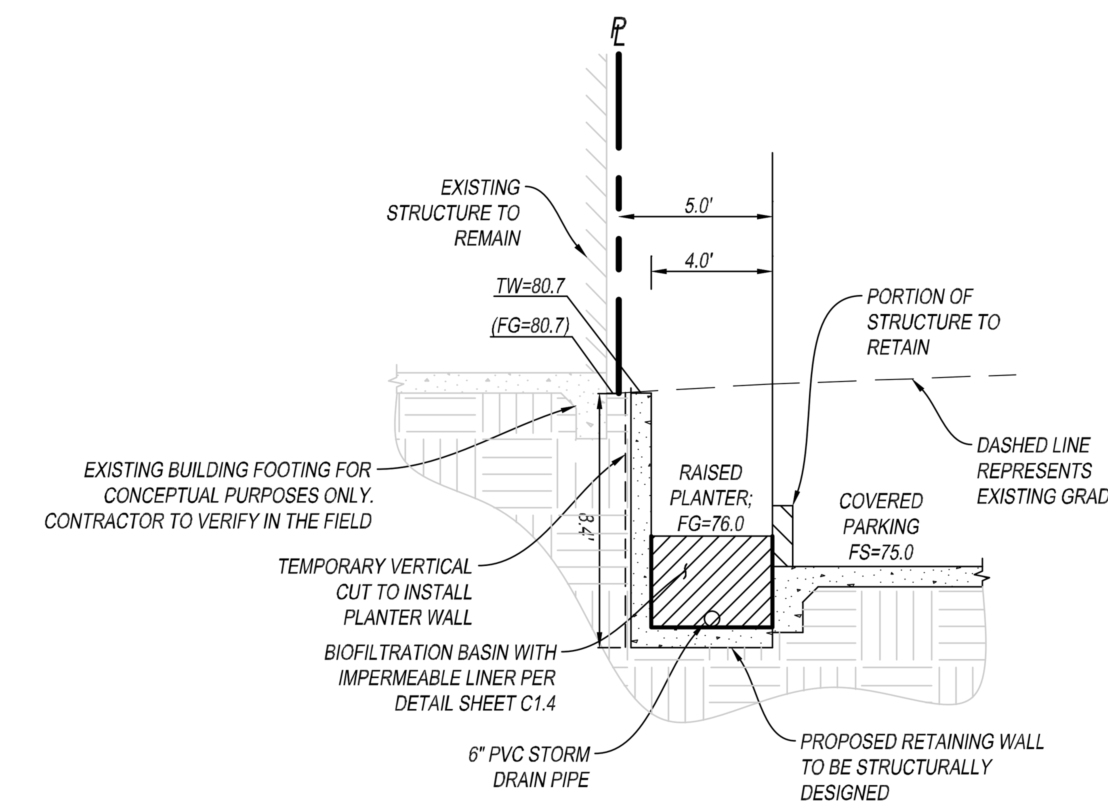
SECTION B-B

NOT TO SCALE



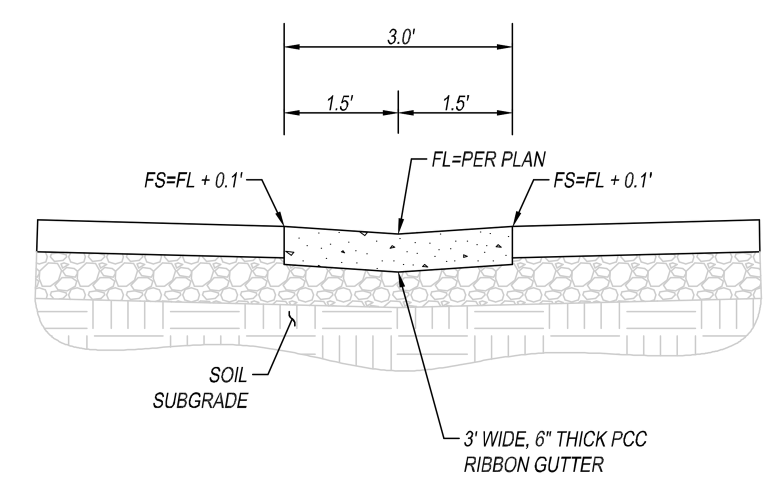
SECTION C-C

NOT TO SCALE



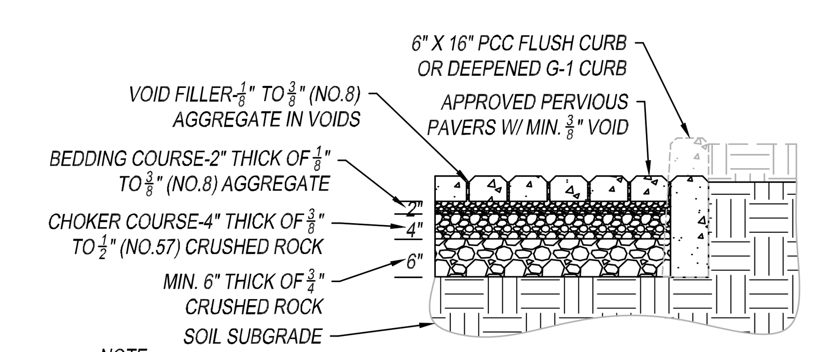
SECTION D-D

NOT TO SCALE



TYPICAL SECTION - PCC RIBBON GUTTER / DRAINAGE SWALE

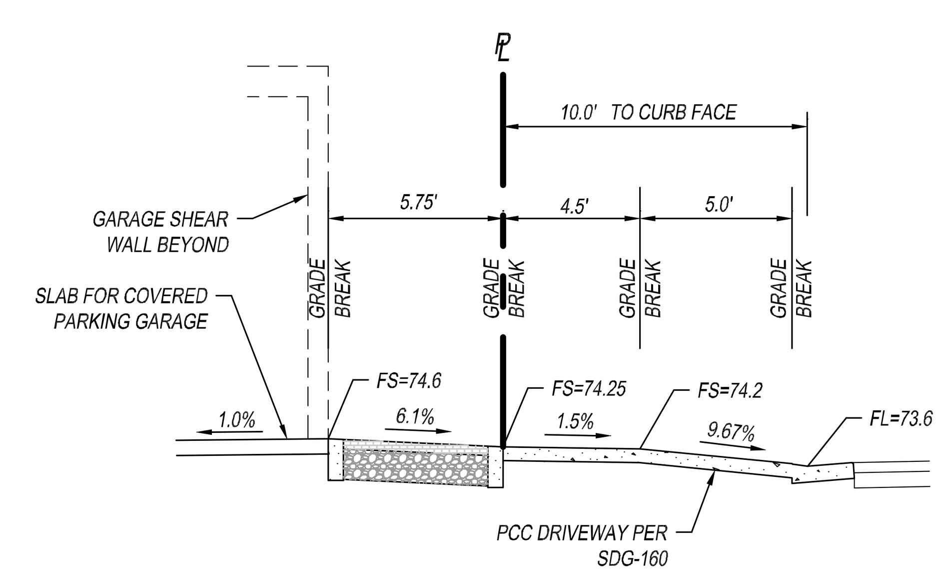
NOT TO SCALE



NOTE:
- -ALL AGGREGATE MUST BE CLEAN/WASHED AND FREE OF FINES (SAND, SILT, ETC.)
- -THE PAVERS SHALL NOT BE SEALED ONCE THE VOID FILLER HAS BEEN ADDED
- -EACH COURSE SHALL BE VIBRATORY COMPACTED BEFORE PLACEMENT OF NEXT COURSE
- -NO IMPERVIOUS LINER OR FILTER FABRIC IS TO BE USED
- -SPECIAL APPROVAL REQUIRED FOR USE IN HIGHLY EXPANSIVE SOIL-SUBDRAIN MAY BE REQUIRED

TYPICAL DETAIL - PERVIOUS PAVERS

NOT TO SCALE



TYPICAL SECTION - CL VOLTAIRE DRIVEWAY GRADIENT PROFILE

NOT TO SCALE

Prepared By:
Name: Pasco, Laret, Suiter & Assoc.
Address: 535 N. Hwy 101, Suite A, Solana Beach, CA 92075
Phone #: (858) 259-8212

Project Address:
4103 Voltaire Street
San Diego, CA

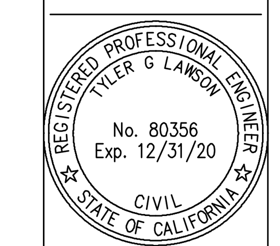
Project Name:
17 on Voltaire

Sheet Title:
Sections and Details

Revision 14:
Revision 13:
Revision 12:
Revision 11:
Revision 10:
Revision 9:
Revision 8:
Revision 7:
Revision 6:
Revision 5:
Revision 4:
Revision 3:
Revision 2:
Revision 1:

Original Date: September 12, 2019
Sheet 12 of 15
DEP#:

PASCO LARET SUITER & ASSOCIATES
San Diego | Solana Beach | Orange County
Phone 858.259.8212 | www.plsaengineering.com



JOB #: PLSA 3090
DRAWN BY: BAK
PROJ. MGR.: TGL
DATE: ISSUE:

REVISIONS

#	DESCRIPTION	DATE
1	1ST SDP SUBMIT	9/16/19
2	2ND SDP SUBMIT	1/15/20
3	3RD SDP SUBMIT	3/30/20
4	4TH SDP SUBMIT	5/13/20

17 ON VOLTAIRE

SECTIONS AND DETAILS FOR: SITE DEVELOPMENT PERMIT / MAP WAIVER

C1.3

4103 VOLTAIRE STREET

05 / 13 / 20

PLSA 3090

City of San Diego
Development Services
1222 First Ave., MS-302
San Diego, CA 92101
(619) 446-5000

Storm Water Requirements Applicability Checklist

FORM DS-560
November 2018

Project Address: 4103 / 4111 Voltaire Street, San Diego, CA | Project Number:

SECTION 1. Construction Storm Water BMP Requirements:

All construction sites are required to implement construction BMPs in accordance with the performance standards in the Storm Water Standards Manual. Some sites are additionally required to obtain coverage under the State Construction General Permit (CGP)[1], which is administered by the State Regional Water Quality Control Board.

For all projects complete PART A: If project is required to submit a SWPPP or WPCP, continue to PART B.

PART A: Determine Construction Phase Storm Water Requirements.

1. Is the project subject to California's statewide General NPDES permit for Storm Water Discharges Associated with Construction Activities, also known as the State Construction General Permit (CGP)? (Typically projects with land disturbance greater than or equal to 1 acre.)
   ☐ Yes; SWPPP required, skip questions 2-4 ☒ No; next question
2. Does the project propose construction or demolition activity, including but not limited to, clearing, grading, grubbing, excavation, or any other activity resulting in ground disturbance and/or contact with storm water?
   ☒ Yes; WPCP required, skip questions 3-4 ☐ No; next question
3. Does the project propose routine maintenance to maintain original line and grade, hydraulic capacity, or original purpose of the facility? (Projects such as pipeline/utility replacement)
   ☐ Yes; WPCP required, skip question 4 ☒ No; next question
4. Does the project only include the following Permit types listed below?
   - Electrical Permit, Fire Alarm Permit, Fire Sprinkler Permit, Plumbing Permit, Sign Permit, Mechanical Permit, Spa Permit.
   - Individual Right of Way Permits that exclusively include only ONE of the following activities: water service, sewer lateral, or utility service.
   - Right of Way Permits with a project footprint less than 150 linear feet that exclusively include only ONE of the following activities: curb ramp, sidewalk and driveway apron replacement, pot holing, curb and gutter replacement, and retaining wall encroachments.

   ☐ Yes; no document required

Check one of the boxes below, and continue to PART B:

☐ If you checked "Yes" for question 1, **a SWPPP is REQUIRED. Continue to PART B**

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

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

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

Printed on recycled paper. Visit our web site at www.sandiego.gov/development-services.
Upon request, this information is available in alternative formats for persons with disabilities.
DS-560 (11-18)

Clear Page 1

PART B: Determine Construction Site Priority

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

Complete PART B and continued to Section 2

1. ☐ **ASBS**
   a. Projects located in the ASBS watershed.
2. ☐ **High Priority**
   a. Projects that qualify as Risk Level 2 or Risk Level 3 per the Construction General Permit (CGP) and not located in the ASBS watershed.
   b. Projects that qualify as LUP Type 2 or LUP Type 3 per the CGP and not located in the ASBS watershed.
3. ☐ **Medium Priority**
   a. Projects that are not located in an ASBS watershed or designated as a High priority site.
   b. Projects that qualify as Risk Level 1 or LUP Type 1 per the CGP and not located in an ASBS watershed.
   c. WPCP projects (>5,000sf of ground disturbance) located within the Los Penasquitos watershed management area.
4. ☒ **Low Priority**
   a. Projects not subject to a Medium or High site priority designation and are not located in an ASBS watershed.

SECTION 2. Permanent Storm Water BMP Requirements.

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

PART C: Determine if Not Subject to Permanent Storm Water Requirements.
Projects that are considered maintenance, or otherwise not categorized as "new development projects" or "redevelopment projects" according to the Storm Water Standards Manual are not subject to Permanent Storm Water BMPs.

If "yes" is checked for any number in Part C, proceed to Part F and check "Not Subject to Permanent Storm Water BMP Requirements".

If "no" is checked for all of the numbers in Part C continue to Part D.

1. Does the project only include interior remodels and/or is the project entirely within an existing enclosed structure and does not have the potential to contact storm water? ☐ Yes ☒ No
2. Does the project only include the construction of overhead or underground utilities without creating new impervious surfaces? ☐ Yes ☒ No
3. Does the project fall under routine maintenance? Examples include, but are not limited to: roof or exterior structure surface replacement, resurfacing or reconfiguring surface parking lots or existing roadways without expanding the impervious footprint, and routine replacement of damaged pavement (grinding, overlay, and pothole repair). ☐ Yes ☒ No

Clear Page 2

PART D: PDP Exempt Requirements.

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

If "yes" was checked for any questions in Part D, continue to Part F and check the box labeled "PDP Exempt."

If "no" was checked for all questions in Part D, continue to Part E.

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

   ☐ Yes; PDP exempt requirements apply ☒ No; next question
2. Does the project ONLY include retrofitting or redeveloping existing paved alleys, streets or roads designed and constructed in accordance with the Green Streets guidance in the City's Storm Water Standards Manual?
   ☐ Yes; PDP exempt requirements apply ☒ No; project not exempt.

PART E: Determine if Project is a Priority Development Project (PDP).
Projects that match one of the definitions below are subject to additional requirements including preparation of a Storm Water Quality Management Plan (SWQMP).

If "yes" is checked for any number in PART E, continue to PART F and check the box labeled "Priority Development Project".

If "no" is checked for every number in PART E, continue to PART F and check the box labeled "Standard Development Project".

1. **New Development that creates 10,000 square feet or more of impervious surfaces collectively over the project site.** This includes commercial, industrial, residential, mixed-use, and public development projects on public or private land. ☒ Yes ☐ No
2. **Redevelopment project that creates and/or replaces 5,000 square feet or more of impervious surfaces on an existing site of 10,000 square feet or more of impervious surfaces.** This includes commercial, industrial, residential, mixed-use, and public development projects on public or private land. ☐ Yes ☒ No
3. **New development or redevelopment of a restaurant.** Facilities that sell prepared foods and drinks for consumption, including stationary lunch counters and refreshment stands selling prepared foods and drinks for immediate consumption (SIC 5812), and where the land development creates and/or replace 5,000 square feet or more of impervious surface. ☐ Yes ☒ No
4. **New development or redevelopment on a hillside.** The project creates and/or replaces 5,000 square feet or more of impervious surface (collectively over the project site) and where the development will grade on any natural slope that is twenty-five percent or greater. ☐ Yes ☒ No
5. **New development or redevelopment of a parking lot that creates and/or replaces 5,000 square feet or more of impervious surface (collectively over the project site).** ☐ Yes ☒ No
6. **New development or redevelopment of streets, roads, highways, freeways, and driveways.** The project creates and/or replaces 5,000 square feet or more of impervious surface (collectively over the project site). ☐ Yes ☒ No

Clear Page 3

7. **New development or redevelopment discharging directly to an Environmentally Sensitive Area.** The project creates and/or replaces 2,500 square feet of impervious surface (collectively over project site), and discharges directly to an Environmentally Sensitive Area (ESA). "Discharging directly to" includes flow that is conveyed overland a distance of 200 feet or less from the project to the ESA, or conveyed in a pipe or open channel any distance as an isolated flow from the project to the ESA (i.e. not commingled with flows from adjacent lands). ☐ Yes ☒ No
8. **New development or redevelopment projects of a retail gasoline outlet (RGO) that create and/or replaces 5,000 square feet of impervious surface.** The development project meets the following criteria: (a) 5,000 square feet or more or (b) has a projected Average Daily Traffic (ADT) of 100 or more vehicles per day. ☐ Yes ☒ No
9. **New development or redevelopment projects of an automotive repair shops that creates and/or replaces 5,000 square feet or more of impervious surfaces.** Development projects categorized in any one of Standard Industrial Classification (SIC) codes 5013, 5014, 5541, 7532-7534, or 7536-7539. ☐ Yes ☒ No
10. **Other Pollutant Generating Project.** The project is not covered in the categories above, results in the disturbance of one or more acres of land and is expected to generate pollutants post construction, such as fertilizers and pesticides. This does not include projects creating less than 5,000 sf of impervious surface and where added landscaping does not require regular use of pesticides and fertilizers, such as slope stabilization using native plants. Calculation of the square footage of impervious surface need not include linear pathways that are for infrequent vehicle use, such as emergency maintenance access or bicycle pedestrian use, if they are built with pervious surfaces of if they sheet flow to surrounding pervious surfaces. ☐ Yes ☒ No

PART F: Select the appropriate category based on the outcomes of PART C through PART E.

1. The project is **NOT SUBJECT TO PERMANENT STORM WATER REQUIREMENTS.** ☐
2. The project is a **STANDARD DEVELOPMENT PROJECT.** Site design and source control BMP requirements apply. See the Storm Water Standards Manual for guidance. ☐
3. The project is **PDP EXEMPT.** Site design and source control BMP requirements apply. See the Storm Water Standards Manual for guidance. ☐
4. The project is a **PRIORITY DEVELOPMENT PROJECT.** Site design, source control, and structural pollutant control BMP requirements apply. See the Storm Water Standards Manual for guidance on determining if project requires a hydromodification plan management ☒

Bryan Knapp, PE #86542 — Senior Project Engineer
Name of Owner or Agent (Please Print) — Title

Signature — Date: 06/07/2019

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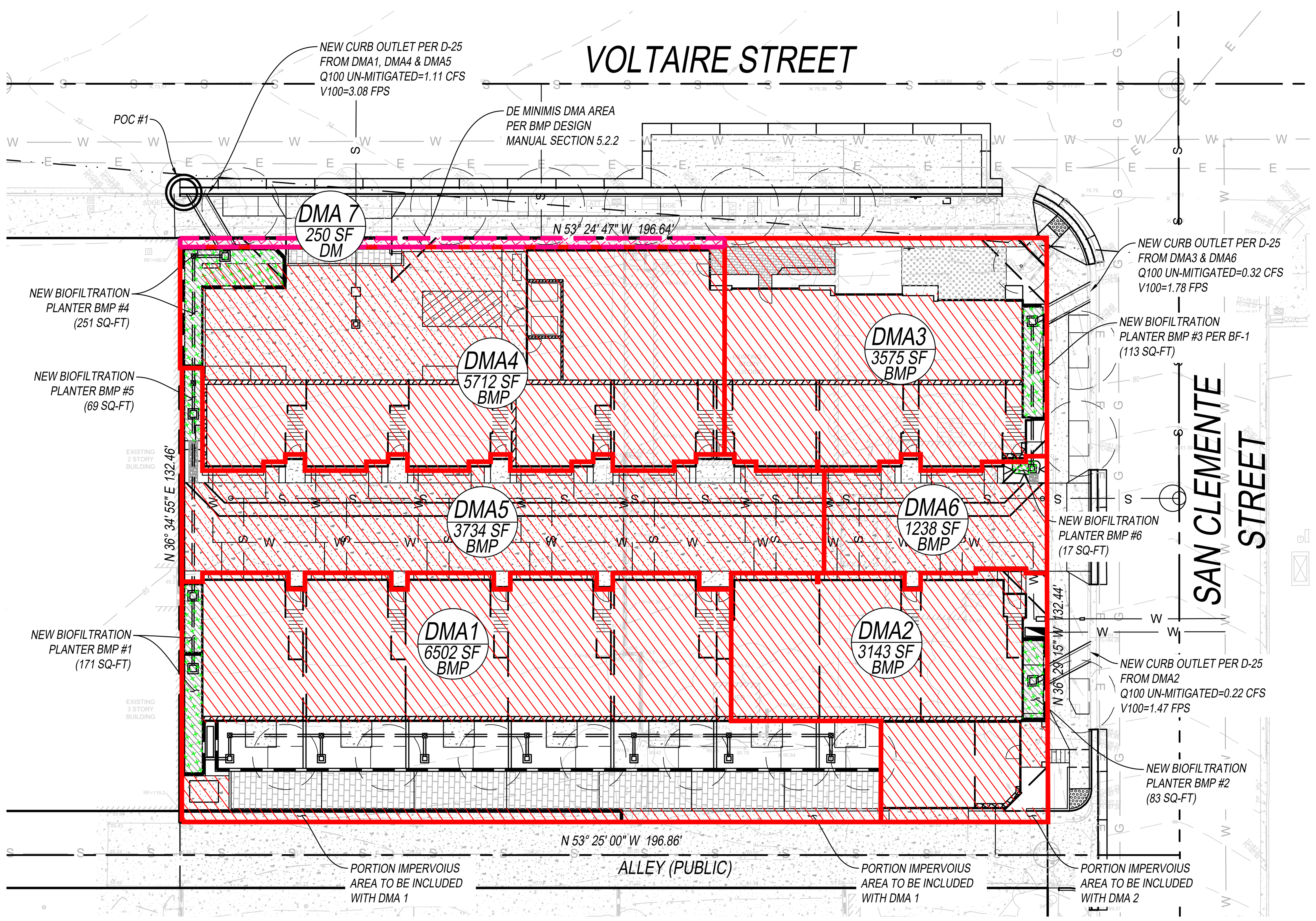
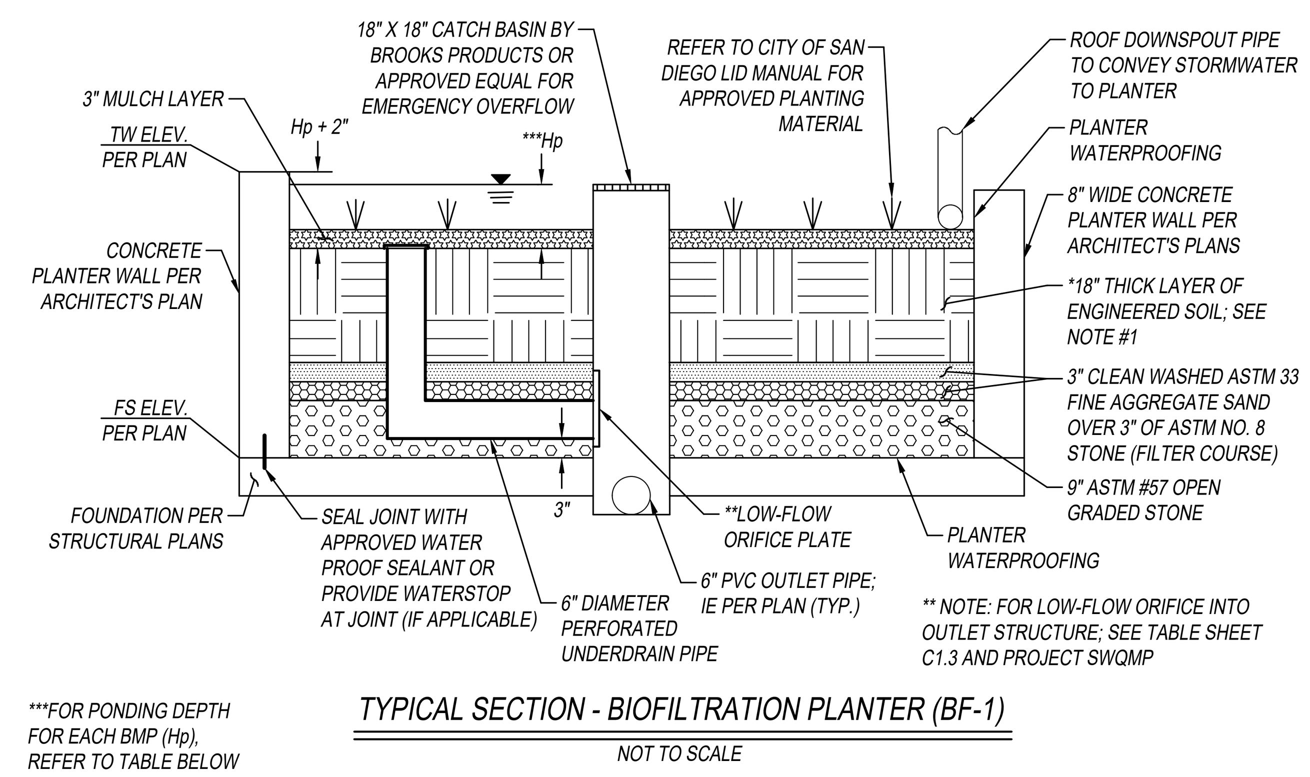
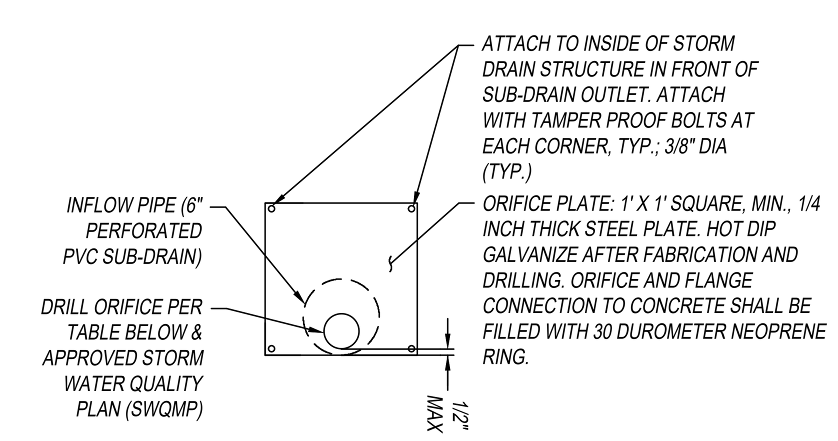


PLAN VIEW - POST-CONSTRUCTION BMP PLAN
SCALE: 1" = 20' HORIZONTAL



TYPICAL SECTION - BIOFILTRATION PLANTER (BF-1)
NOT TO SCALE



TYPICAL DETAIL - LOW FLOW ORIFICE PLATE
NOT TO SCALE

BMP SIZE & ORIFICE DIAMETER SUMMARY

BMP #	Hp (FT)	Hs (FT)	Hg (FT)	HMP ORIFICE (IN)	Abot (FT^2)	Atop (FT^2)	VOLUME (FT^3)
1	1.0	1.5	1.0	0.30	171	171	330
2	1.0	1.5	1.0	0.30	83	83	160
3	1.0	1.5	1.0	0.30	113	113	218
4	1.0	1.5	1.0	0.30	251	251	484
5	1.0	1.5	1.0	0.30	58	58	116
6	0.83	1.5	1.0	0.50	17	17	34

IMPERVIOUS AREA TABULATION

ON-SITE:
TOTAL DISTURBED AREA: 26,059 (0.60 AC)

ON-SITE AREA: 26,059 S.F. (0.60 AC)
EX. IMPERVIOUS AREA: 9,140 S.F. (0.21 AC)
PROPOSED IMPERVIOUS AREA: 21,400 S.F. (0.491 AC) INCREASE OF 134.1%

SOIL INFORMATION:

SOIL TYPE: TYPE D
DEPTH TO GROUNDWATER: > 20 FEET

ROOF AREA RUNOFF CONVEYANCE:

THE STORMWATER RUNOFF FROM THE THE PROPOSED ROOF AREAS SHALL BE CONVEYED THROUGH THE PROPOSED ROOF DRAIN SYSTEMS DESIGNED BY THE PROJECT ARCHITECT ACCORDING TO THE DRAINAGE AREAS SHOWN ON THIS PLAN.

BIOFILTRATION AREA NOTES:

1. THE SOIL SHALL HAVE THE FOLLOWING PROPERTIES:
   - 5 IN/HR MINIMUM INFILTRATION RATE
   - ORGANIC CONTECT > 5 PERCENT
   - CATION EXCHANGE CAPACITY > 5 MILLIEQUIVALENT/100G SOIL
   - 85% WASHED COURSE CONCRETE SAND, 10 PERCENT FINES
   - FINES SHOULD PASS A #270 (SCREEN SIZE) SIEVE
2. THE PROJECT'S GEOTECHNICAL ENGINEER SHALL PROVIDE CERTIFICATION TO THE ENGINEER OF WORK STATING THAT THE SOIL PLACED IN EACH BIOFILTRATION AREA MEETS INFILTRATION SPECIFICATIONS LISTED ABOVE.
3. COMPACTION OF SOIL IN BIOFILTRATION AREAS SHALL BE MINIMIZED TO ALLOW INFILTRATION TO OCCUR.
4. PERFORATED 3-INCH DIA. UNDERDRAIN PIPE SHALL HAVE PERFORATIONS ALL THE WAY AROUND THE PIPE AND BE SET AS CLOSE TO THE BOTTOM OF THE PLANTER AS POSSIBLE.
5. IRRIGATION SYSTEM PER LANDSCAPE PLANS.

BIOFILTRATION AREA WATERPROOFING NOTES:

1. PREP WALL AND FOOTING - SPRAY APPLY "MARFLEX 5000" COMMERCIAL MEMBRANE TO BACK OF WALL, TOP OF FOOTING AND BOTTOM OF PLANTER PER MANUFACTURER'S SPECIFICATIONS.
2. ADDRESS ANY EXPANSION JOINTS WITH 12-INCH MIN. STRIP OF "SOCO-SHIELD 300" MEMBRANE (10 MIL. MIN. THICKNESS) CENTERED OVER JOINT, ADHERED TO "MARFLEX". OVER SPRAY JOINT WITH "MARFLEX 5000" TO MANUFACTURER'S REQUIRED MIL THICKNESS.
3. APPLY "SOCO-SHIELD 300" MEMBRANE (10 MIL. MIN. THICKNESS) TO ADHERE TO THE "MARFLEX 5000" OVER ENTIRE WALL, STEM WALL AND PLANTER BOTTOM INCLUDING TREATED EXPANSION JOINTS. OVERLAP MATERIAL SEAMS A MIN. OF 6-INCHES IN ALL DIRECTIONS.
4. ATTACH TACK STRIP AT TOP OF MEMBRANE AND ON SIDE ENDS OF WALL FROM TOP OF MEMBRANE TO TOP OF FOOTING.
5. APPLY "COOL-COAT" OF EQUIVALENT U.V. RESISTANT MEMBRANE ABOVE TACK STRIP TO TOP OF WALL PER MANUFACTURER'S SPECIFICATIONS.

Prepared By:
Name: Pasco, Laret, Suiter & Assoc.
Address: 535 N. Hwy 101, Suite A, Solana Beach, CA 92075
Phone #: (858) 259-8212

Project Address: 4103 Voltaire Street, San Diego, CA

Project Name: 17 on Voltaire

Sheet Title: Post-Construction BMP Plan

Revision 14:
Revision 13:
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Revision 2:
Revision 1:

Original Date: September 12, 2019
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DEP#:

PASCO LARET SUITER & ASSOCIATES
San Diego | Solana Beach | Orange County
Phone 858.259.8212 | www.plsaengineering.com

REGISTERED PROFESSIONAL ENGINEER — TYLER G LAWSON — No. 80356 — Exp. 12/31/20 — CIVIL — STATE OF CALIFORNIA

JOB #: PLSA 3090
DRAWN BY: BAK
PROJ. MGR.: TGL
DATE: ISSUE:

REVISIONS

#	DESCRIPTION	DATE
1	1ST SDP SUBMIT.	9/19/19
2	2ND SDP SUBMIT.	1/15/20
3	3RD SDP SUBMIT.	3/30/20
4	4TH SDP SUBMIT.	5/13/20

17 ON VOLTAIRE
POST-CONSTRUCTION BMP PLAN FOR: SITE DEVELOPMENT PERMIT / MAP WAIVER

C1.4
4103 VOLTAIRE STREET
05 / 13 / 20
PLSA 3090

Attachment 5
Drainage Report

Attach project's drainage report. Refer to Drainage Design Manual to determine the reporting requirements.

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PRELIMINARY DRAINAGE STUDY

17 ON VOLTAIRE
4103 / 4111 VOLTAIRE STREET

PTS #: 640598 (VOLTAIRE STREET SDP)

APN: 533-233-19-00

4103 / 4111 Voltaire Street
San Diego, CA 92101

REGISTERED PROFESSIONAL ENGINEER
TYLER G LAWSON
No. 80356
Exp. 12/31/20
CIVIL
STATE OF CALIFORNIA

Prepared By:

Tyler G Lawson, P.E. RCE 80356 EXP: 12-31-20

Pasco Laret Suiter & Associates, Inc.
535 N. Highway 101, Suite A
Solana Beach, CA 92075

PASCO LARET SUITER
& ASSOCIATES
CIVIL ENGINEERING + LAND PLANNING + LAND SURVEYING

Prepared for:
CityMark Communities LLC
3818 Park Blvd
San Diego, CA 92103

March 2020

TABLE OF CONTENTS

1. INTRODUCTION

1.1 Project Description

The 0.60 acre site is located west of the intersection of San Clemente Street and Voltaire Street in San Diego, CA. The currently 4-parcel site exists today with single-family residential development on the southern-most parcel, commercial development immediately adjacent, both with parking off the Alley to the west, and non-developed / vacant parcels to the north along Voltaire. The proposed project includes the demolition of the existing buildings along with all on-site improvements and proposes two (2) new multi-family residential buildings with street-level commercial space, a shared access driveway, and covered parking. The project also includes new improvements around the building which include sidewalk, landscaping, new driveway cuts, and other surface improvements typical of this type of development.

The project is designed in accordance with the January 2017 Edition of the Drainage Design Manual, the 2016 San Diego Storm Water Standards Manual and complies with the Regional Water Quality Control Board Region 9 MS4 Permit, Order No. R9-2015-0100. The project does not propose work adjacent to federally regulated waters therefore Sections 401 and 404 of the Federal Clean Water Act (CWA) are not applicable.

1.2 Existing Conditions

The site appears to generally sheet flow storm water runoff from the southeast corner of the site to the northwest corner adjacent to Voltaire Street. No offsite drainage enters the property, as the existing surface improvements along the adjacent Voltaire Street and San Clemente Street prevent runoff from entering the site. The alley to the southwest is also an inverted crown, with surface water draining away from the subject property and continuing downstream. From the northwest corner of the site, water is discharged to the street gutter in the public right-of-way and continues northwest toward Catalina Boulevard. The storm water then continues north on Famosa Boulevard until it is collected by a public storm drain inlet located near the intersection of Whittier Street and Famosa Boulevard. It then continues north along Nimitz Boulevard, and ultimately discharges to the San Diego River Flood Control Channel. The peak storm water run-off was calculated using the rational method equation (Q=CiA) as shown in Equation A-1 of the City of San Diego Drainage Design Manual. The 4.4 in/hr intensity was determined from the City of San Diego Drainage Design Manual's Appendix H. using the minimum allowable time of concentration of 5 minutes. This resulted in a peak pre-project run-off for the site at Q = 1.32 CFS using a runoff coefficient of 0.50 based on commercial zoning and land use from Table A-1 in the 2017 Storm Water Standards Manual and the reduction described in Footnote 2 based on the existing site impervious area. Refer to the Appendix of this report for additional information.

1.3 Proposed Conditions

The project proposes the development of a new multi-family residential building and the surface improvements (i.e. asphalt paving and concrete sidewalk) to support the proposed building. The proposed drainage condition will remain unchanged as all water will be collected and routed to the curb and gutter on Voltaire Street adjacent to the northwest corner of the property. The project is a priority development project, therefore pollutant removal and hydromodification management measures are implemented to demonstrate compliance with the Regional MS4 Permit. In addition, site design measures for storm water runoff are proposed where feasible. The proposed project will result in an increase of impervious area and therefore will increase the post project peak runoff. The post project condition has been delineated by three (3) drainage management areas (DMA's) which are tributary to their respective sidewalk underdrain and curb outlet structures discharging to the public right-of-way. The roof runoff is collected and conveyed to raised planter biofiltration basins located on the side of the proposed structures. The post project flow of 1.86 CFS was calculated using the Rational Method Q=CiA where the intensity was derived from the San Diego Drainage Design Manual assuming a 5-minute time of concentration (Tc) which is the shortest Tc allowable. A table summarizing the pre-project and post-project peak flows is provided at the end of this study.

2. METHODOLOGY

The proposed project has been analyzed to determine the peak runoff flow for 100-year, 6-hour rainfall event using the Rational Method per the City of San Diego Drainage Design Manual (Section 1-102.3). The Runoff Coefficient, C, for the existing and proposed conditions were selected using Table A-1 in the Appendix A of the City of San Diego Drainage Design Manual. The time of concentration for all existing and proposed drainage areas were calculated using the minimum T_C of 5 min, which yields an intensity of 4.4 inches per hour in accordance with the City of San Diego's Intensity-Duration-Frequency Design Chart included as Figure A-1 in the City of San Diego Drainage Design Manual. A copy of this Figure has been added to Appendix 1 of this report as well for reference.

The proposed LID best management practices have been sized and located such that all runoff will be directed to landscape planters or through pervious areas where feasible before ultimately discharging to the downstream storm drain system.

2.1 Rational Method

As mentioned above, runoff from the project site was calculated for the 100-year, 6-hour storm event. Runoff was calculated using the Rational Method which is given by the following equation:

$$Q = C \times I \times A$$ Equation A-1 of City of SD Drainage Design Manual

Where:

Q = Flow rate in cubic feet per second (cfs)
C = Runoff coefficient (Determined from Table A-1 of City of SD Drainage Design Manual)
I = Rainfall Intensity in inches per hour (in/hr)
A = Drainage basin area in acres, (ac)

Rational Method calculations were performed using the City of San Diego Drainage Design Manual Equation A-1, as shown above.

2.2 Runoff Coefficient

The runoff coefficients for the project were used from Table A-1 from the City of San Diego Drainage Design Manual (January, 2017), using the Revised C Method for commercial use in the pre-developed condition (0.50) and the value shown in Table A-1 for Multi-Units land use for the post-developed project, which is 0.70.

2.3 Rainfall Intensity

Rainfall intensity was determined using the Rainfall Intensity-Duration-Frequency Curves shown in Section A.1.3 of the City of San Diego Drainage Design Manual (January, 2017). Based on a 5-minute time of concentration, an intensity of 4.4 inches per hour is used in accordance with Figure A-1.

2.4 Tributary Areas

Drainage basins are delineated in the Post-Project Hydrology Exhibit in Appendix 2 and graphically portray the tributary area for each drainage basin. Each drainage basin has been defined by the area being conveyed to each curb outlet location discharging from the property. Ultimately, runoff is all conveyed west along Voltaire Street and continues downstream toward Catalina Boulevard.

3. CALCULATIONS / RESULTS

3.1 Pre & Post Development Peak Flow Comparison

Below are a series of tables which summarize the calculations provided in the Appendix of this report.

SITE IMPERVIOUS AREA COMPOSITION					
	TOTAL IMPERVIOUS AREA (ACRES)	TOTAL PERVIOUS AREA (ACRES)	TOTAL PROJECT AREA (ACRES)	% IMPERVIOUS SURFACES	RUNOFF COEFFICIENT "C"
Existing	0.21	0.39	0.60	35.1%	0.50
Proposed	0.49	0.11	0.60	82.1%	0.70

Table 1. Runoff Coefficient "C" Comparison

The table above shows the difference in the runoff coefficient, "C", between the existing and proposed condition. For additional explanation on how each runoff coefficient was calculated, refer to Appendix 1 of this report.

EXISTING DRAINAGE FLOWS			
DRAINAGE AREA	DRAINAGE AREA (ACRES)	Q_{100} (CFS)	I_{100} (IN/HR)
EX-1	0.60	1.32	4.4

Table 2. Existing Condition Peak Drainage Flow Rates

Table 2 above lists the peak flow rates for the project site in the existing condition for the respective rainfall events.

PROPOSED DRAINAGE FLOWS			
DRAINAGE AREA	DRAINAGE AREA (ACRES)	Q_{100} (CFS)	I_{100} (IN/HR)
PR 1-5	0.60	1.86	4.4

Table 3. Proposed Condition Peak Drainage Flow Rates

The table above lists the peak flow rates for the project site for the proposed condition for the 100-year, 6-hour storm event. The table combines the three (3) drainage management areas and peak runoff produced at each discharge location from the property. As in the existing condition, all water discharging to the public right-of-way offsite eventually confluences near the northwest corner of the site and is conveyed west along Voltaire Street toward downstream public storm drain infrastructure.

PEAK DRAINAGE FLOW COMPARISON					
CONDITION	DRAINAGE AREA (ACRES)	Q_{100} (CFS)	V_{100} (FT/S)	V_{100} (CU-FT)	C
Existing	0.60	1.32	3.75	2,714	0.50
Proposed (Unmit)	0.60	1.86	3.92	3,800	0.70
Proposed (Mit)	0.60	1.32	3.75	-	0.70

Table 4. Proposed Condition Peak Drainage Flow Rates

Table 4 above shows a comparison between the peak flow rates and precipitation volume for the proposed condition and the existing condition.

3.2 Conclusion

As shown in Table 4, the project increases the peak runoff rate and runoff volume for the design storms analyzed when comparing the pre-project condition to the unmitigated post-project condition because the proposed development proposes additional impervious surfaces in addition to multi-unit residential land use. The increase in post-developed peak flows is mitigated by the proposed biofiltration basin planters, which are sized to provide detention volume while also complying with the Regional MS4 Permit requirements for hydromodification management. Thus, the project reduces peak flows generated to match the existing site condition, which will result in no negative impacts to downstream properties as a result of the proposed development. As the mitigated peak runoff produced is equal to the pre-developed condition, the receiving water system is capable of handling the project in its developed state as there is no increase in discharge leaving the site after it is detained.

Curb outlet structures are proposed to convey treated and detained runoff from the property, and are adequately sized to handle the peak flows. See Appendix 3 of this report for a summary of the detention / routing analysis completed for the entire site, showing the detained peak runoff, which is also referenced in the above Table 4.

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APPENDIX 1

PRE-PROJECT & POST-PROJECT HYDROLOGY

CALCULATIONS AND SUPPORT MATERIAL

17 ON VOLTAIRE
PLSA 3090
3/11/2020

PRE-PROJECT HYDROLOGY									
Drainage Area	Area Description	Total Area (Ac)	Total Area (sq-ft)	Total Impervious Area (Sq-Ft)	% Impervious	% Pervious	Weighted Runoff Coefficient	Peak Runoff Q: (CFS)	Peak Runoff Volume: (cu-ft)
EX-1	**Existing Site**	**0.60**	**26059**	**9140**	**35%**	**65%**	0.50	1.33	2714
Totals:		**0.60**	**26059**				**0.50**	**1.33**	**2714**

POST-PROJECT HYDROLOGY									
BMP Location	Basin Description	Total Area (Ac)	Total Area (sq-ft)	Total Impervious Area (Sq-Ft)	% Impervious	% Pervious	Weighted Runoff Coefficient	Peak Runoff Q: (CFS)	Peak Runoff Volume: (cu-ft)
PR-1	**OUTLET-1**	**0.3564**	**15525**	-	-	-	**0.70**	1.11	2264
PR-2	**OUTLET-2**	**0.100**	**4375**	-	-	-	**0.70**	0.31	638
PR-3	**OUTLET-3**	**0.0731**	**3185**	-	-	-	**0.70**	0.23	464
PR-4	**SELF-TREATING**	**0.0459**	**2000**	-	-	-	**0.70**	0.14	292
PR-5	**DE MINIMIS**	**0.0224**	**974**	-	-	-	**0.70**	0.07	142
Totals:		**0.60**	**26059**				**0.70**	**1.86**	**3800**

100 Yr Storm at 5 Min TC		
Intensity:	4.40	in/hr
Precip:	2.50	in

Runoff Coefficient	
Pre-Project	0.5
Post-Project	0.70

Table A-1. Runoff Coefficients for Rational Method

Land Use	Runoff Coefficient (C) Soil Type [1]
Residential:	
Single Family	0.55
Multi-Units	0.70
Mobile Homes	0.65
Rural (lots greater than ½ acre)	0.45
Commercial [2]	
80% Impervious	0.85
Industrial [2]	
90% Impervious	0.95

Note:
[1] Type D soil to be used for all areas.
[2] Where actual conditions deviate significantly from the tabulated imperviousness values of 80% or 90%, the values given for coefficient C, may be revised by multiplying 80% or 90% by the ratio of actual imperviousness to the tabulated imperviousness. However, in case shall the final coefficient be less than 0.50. For example: Consider commercial property on D soil.

Actual imperviousness = 50%
Tabulated imperviousness = 80%
Revised C = (50/80) x 0.85 = 0.53

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

A.1.3. Rainfall Intensity

The rainfall intensity (I) is the rainfall in inches per hour (in/hr.) for a duration equal to the T_C for a selected storm frequency. Once a particular storm frequency has been selected for design and a T_C calculated for the drainage area, the rainfall intensity can be determined from the Intensity-Duration-Frequency Design Chart (Figure A-1).

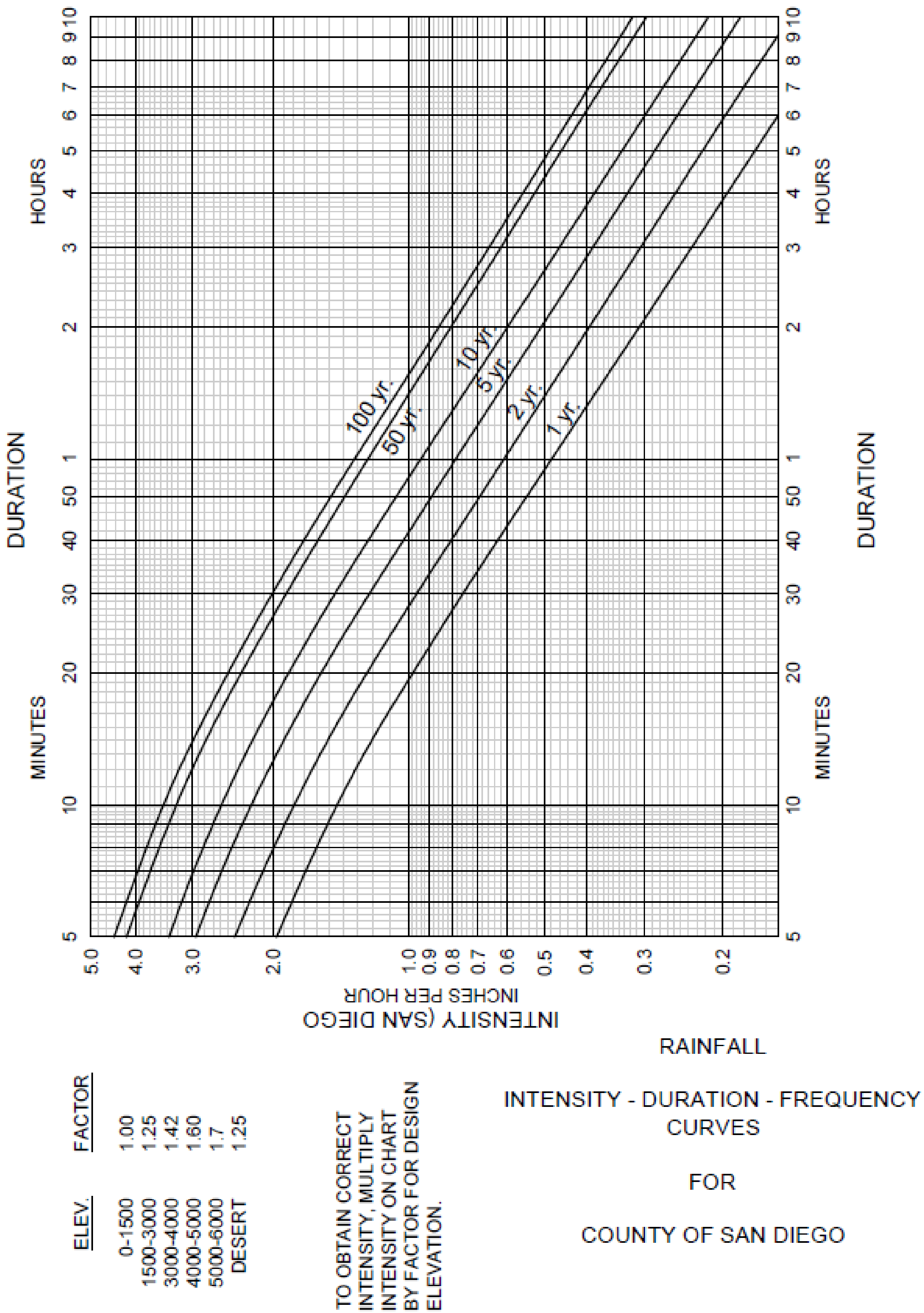

Figure A-1. Intensity-Duration-Frequency Design Chart

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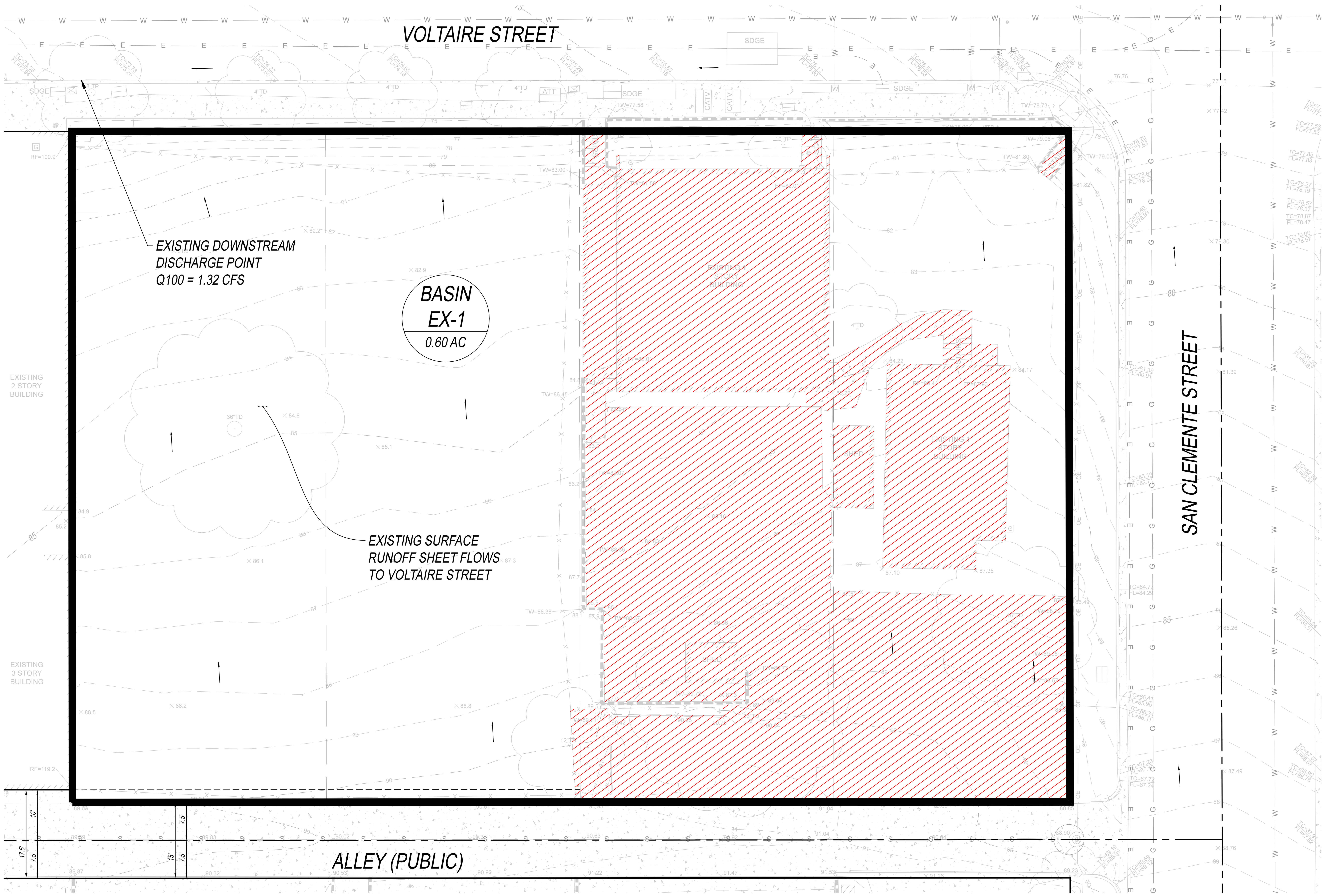
APPENDIX 2

EXISTING & PROPOSED

DRAINAGE EXHIBITS

EXISTING HYDROLOGY EXHIBIT

17 ON VOLTAIRE - 4103 VOLTAIRE STREET



PRE-DEVELOPMENT HYDROLOGY NODE MAP

SCALE: 1" = 10' HORIZONTAL

LEGEND

- SUBJECT PROPERTY / SUBDIVISION BOUNDARY
- EXISTING RIGHT-OF-WAY / ADJACENT LOT LINE
- CENTERLINE OF ROAD
- EXISTING CONTOUR
- EXISTING FLOW DIRECTION
- EXISTING MAJOR DRAINAGE BASIN BOUNDARY
- EXISTING IMPERVIOUS AREA

BASIN A - AREA CALCULATIONS

TOTAL BASIN AREA	26,059 SF (0.598 AC)
BASIN EXISTING IMPERVIOUS AREA	9,140 SF (0.210 AC)
BASIN EXISTING PERVIOUS AREA	16,919 SF (0.388 AC)
% IMPERVIOUS	35.1%
*Cn	0.50

*ASSUME TYPE D SOILS; EXISTING LAND USE IS COMMERCIAL AT 35.1% IMPERVIOUS AREA. RUNOFF COEFFICIENT OF 0.50 USED IN ACCORDANCE WITH THE REVISED C METHOD DESCRIBED IN APPENDIX A OF CITY OF SAN DIEGO DRAINAGE DESIGN MANUAL

GRAPHIC SCALE 1" = 10'

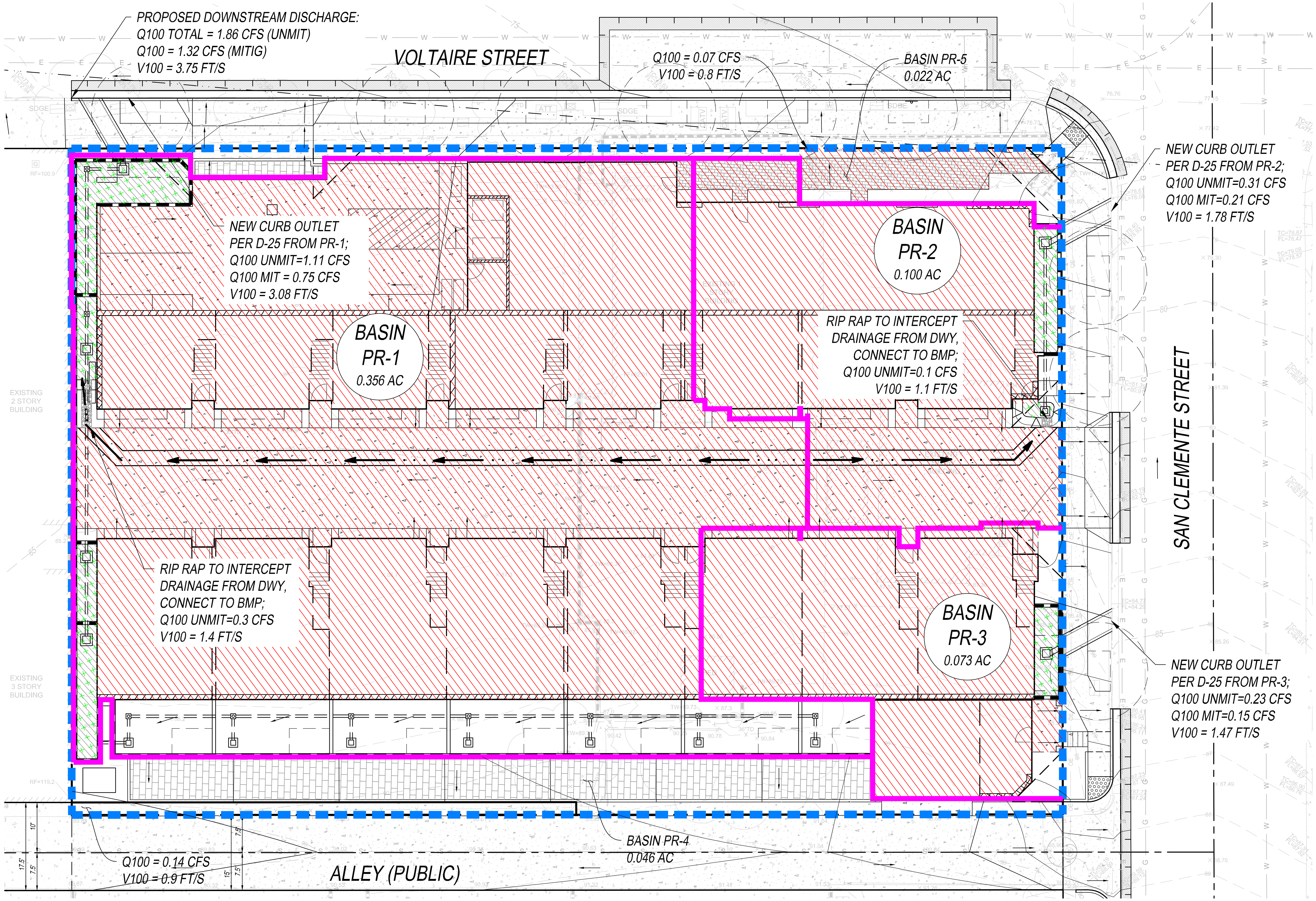
10 0 10 20 30

PASCO LARET SUITER & ASSOCIATES
CIVIL ENGINEERING + LAND PLANNING + LAND SURVEYING
535 North Highway 101, Ste A, Solana Beach, CA 92075
ph 858.259.8212 | fx 858.259.4812 | plsaengineering.com

PLSA 2235-02

PROPOSED HYDROLOGY EXHIBIT

4103 - 4111 VOLTAIRE STREET



POST-DEVELOPMENT HYDROLOGY NODE MAP

SCALE: 1" = 10' HORIZONTAL

LEGEND

- SUBJECT PROPERTY / SUBDIVISION BOUNDARY
- EXISTING RIGHT-OF-WAY / ADJACENT LOT LINE
- CENTERLINE OF ROAD
- EXISTING CONTOUR
- PROPOSED PATH OF TRAVEL
- PROPOSED MAJOR DRAINAGE BASIN BOUNDARY
- PROPOSED MINOR DRAINAGE BASIN BOUNDARY
- PROPOSED IMPERVIOUS AREA
- PROPOSED BIOFILTRATION BASIN

BASIN PR-1 - AREA CALCULATIONS

TOTAL BASIN AREA	15,510 SF (0.356 AC)
*Cn	0.70
Q100 UNMITIGATED	= C*I*A
Q100 UNMITIGATED	= (0.70)*(4.40 IN/HR)*(0.356 AC) = 1.11 CFS
V100 FROM CURB OUTLET	3.08 FT / S

*ASSUME TYPE D SOILS; EXISTING LAND USE IS MULTI-UNIT RESIDENTIAL. RUNOFF COEFFICIENT OF 0.70 USED IN ACCORDANCE WITH APPENDIX A OF CITY OF SAN DIEGO DRAINAGE DESIGN MANUAL

BASIN PR-2 - AREA CALCULATIONS

TOTAL BASIN AREA	4,445 SF (0.102 AC)
*Cn	0.70
Q100 UNMITIGATED	0.32 CFS
V100 FROM CURB OUTLET	1.78 FT / S

*ASSUME TYPE D SOILS; EXISTING LAND USE IS MULTI-UNIT RESIDENTIAL. RUNOFF COEFFICIENT OF 0.70 USED IN ACCORDANCE WITH APPENDIX A OF CITY OF SAN DIEGO DRAINAGE DESIGN MANUAL

BASIN PR-3 - AREA CALCULATIONS

TOTAL BASIN AREA	3,135 SF (0.072 AC)
*Cn	0.70
Q100 UNMITIGATED	0.22 CFS
V100 FROM CURB OUTLET	1.47 FT / S

*ASSUME TYPE D SOILS; EXISTING LAND USE IS MULTI-UNIT RESIDENTIAL. RUNOFF COEFFICIENT OF 0.70 USED IN ACCORDANCE WITH APPENDIX A OF CITY OF SAN DIEGO DRAINAGE DESIGN MANUAL

GRAPHIC SCALE 1" = 10'

10 0 10 20 30

PASCO LARET SUITER & ASSOCIATES
CIVIL ENGINEERING + LAND PLANNING + LAND SURVEYING
535 North Highway 101, Ste A, Solana Beach, CA 92075
ph 858.259.8212 | fx 858.259.4812 | plsaengineering.com

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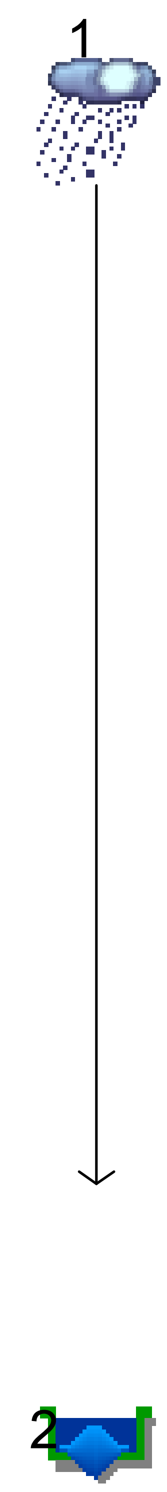
APPENDIX 3

DETENTION AND ROUTING ANALYSIS

Watershed Model Schematic

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020



Project: 100-YR.gpw	Tuesday, 01 / 7 / 2020

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Manual	1.860	5	245	3,948	------	------	------	100-Year Inflow
2	Reservoir	1.318	5	245	3,892	1	103.93	1,393	<no description>

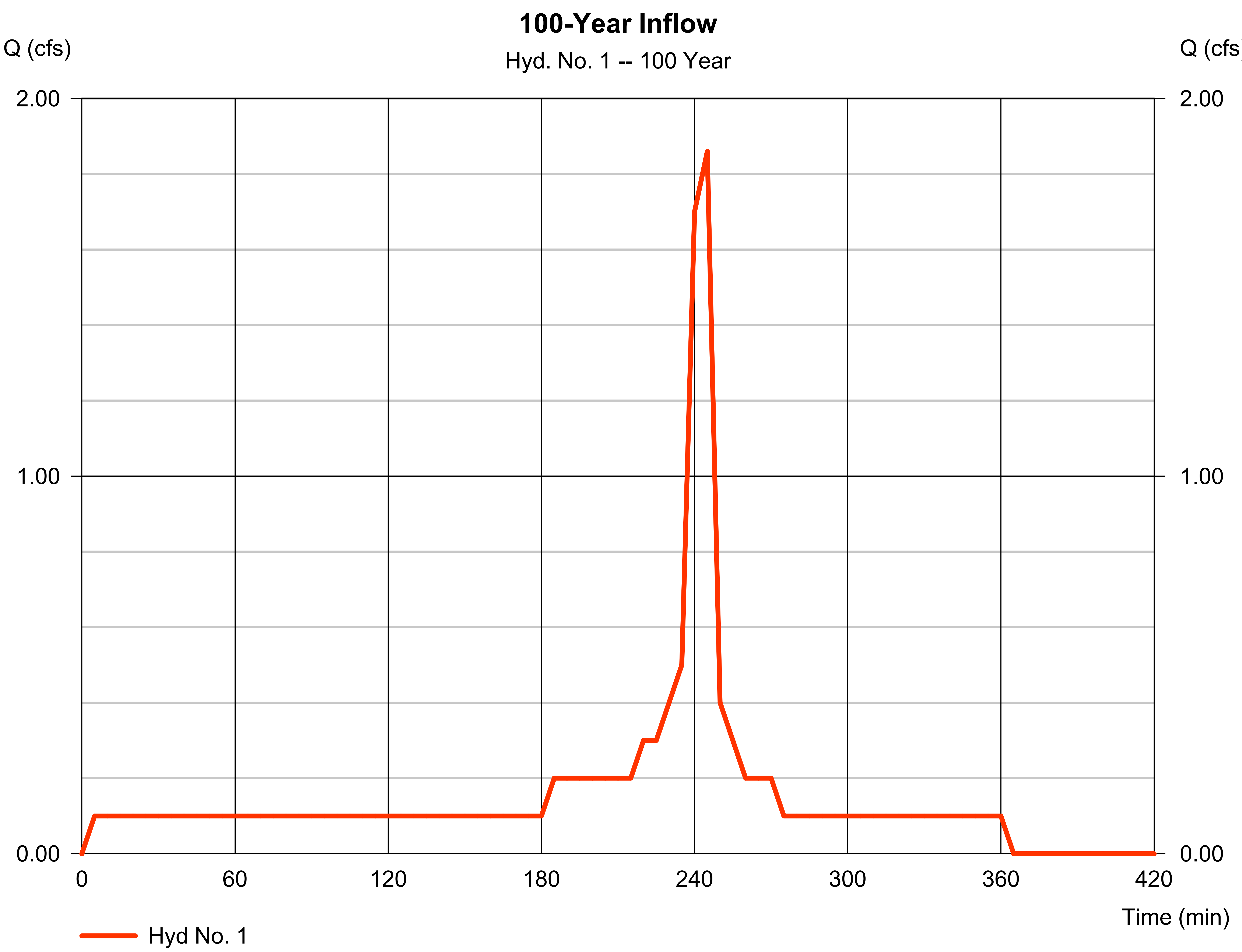
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 01 / 7 / 2020

Hyd. No. 1

100-Year Inflow

Hydrograph type	= Manual	Peak discharge	= 1.860 cfs
Storm frequency	= 100 yrs	Time to peak	= 245 min
Time interval	= 5 min	Hyd. volume	= 3,948 cuft



Hydrograph Report

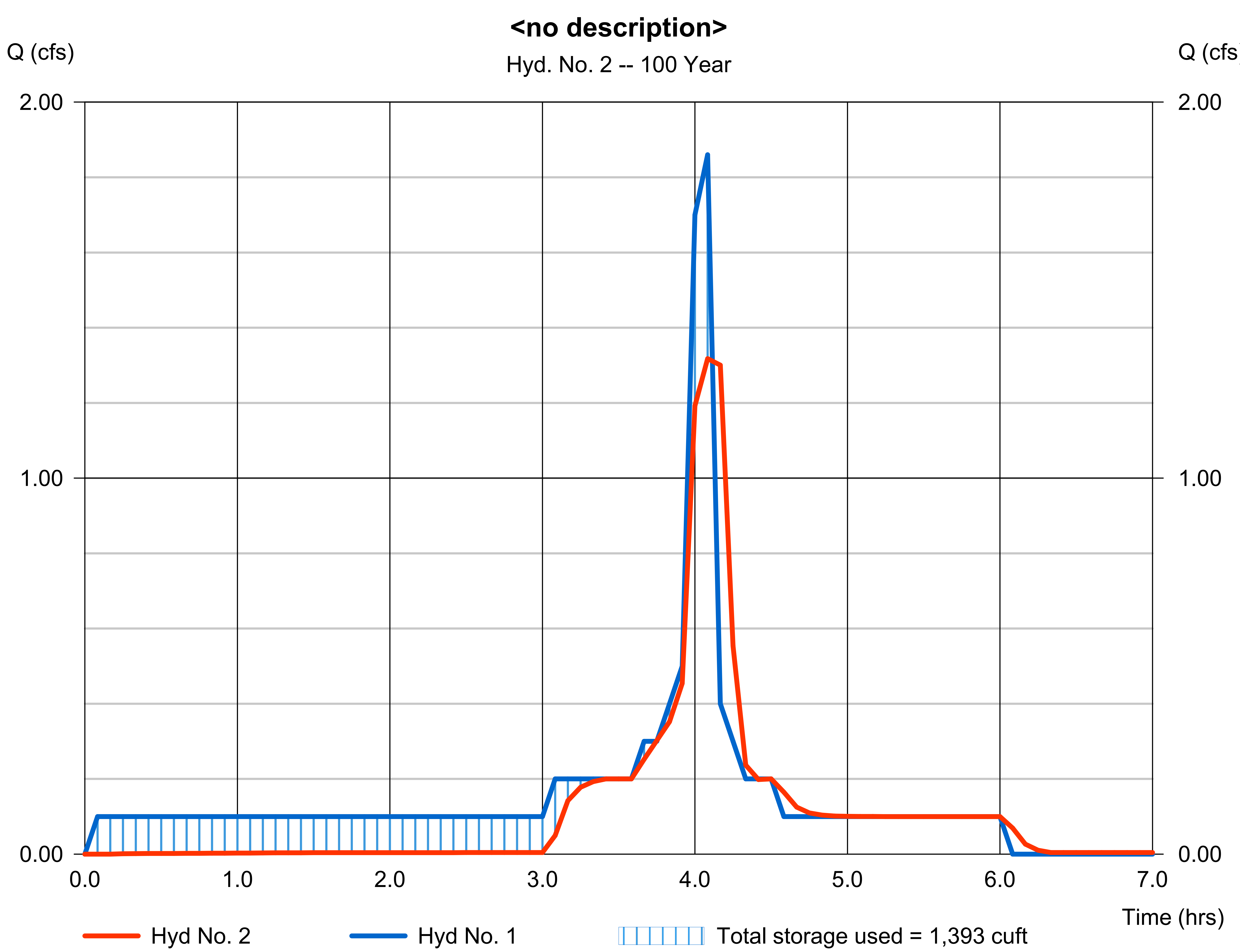
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 01 / 7 / 2020

Hyd. No. 2

<no description>

Hydrograph type	= Reservoir	Peak discharge	= 1.318 cfs
Storm frequency	= 100 yrs	Time to peak	= 4.08 hrs
Time interval	= 5 min	Hyd. volume	= 3,892 cuft
Inflow hyd. No.	= 1 - 100-Year Inflow	Max. Elevation	= 103.93 ft
Reservoir name	= All Site BMPs	Max. Storage	= 1,393 cuft

Storage Indication method used.



Attachment 6
Geotechnical and Groundwater Investigation Report

Attach project's geotechnical and groundwater investigation report. Refer to Appendix C.4 to determine the reporting requirements.

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REPORT
GEOTECHNICAL INVESTIGATION

Proposed 17 on Voltaire Townhouses
Voltaire Street and San Clemente Street, San Diego, CA

PREPARED FOR

CityMark Communities, LLC
3818 Park Boulevard
San Diego, CA 92103

PREPARED BY

NOVA Services, Inc.
4373 Viewridge Avenue, Suite B
San Diego, CA 92123

August 2, 2019
NOVA Project 2019147

CityMark Communities, LLC
3818 Park Boulevard
San Diego, CA 92103

August 2, 2019
NOVA Project 2019147

Attention: Rich Gustafson

Subject: Report
Geotechnical Investigation
Proposed 17 on Voltaire Townhouses
Voltaire Street and San Clemente Street, San Diego, California

Dear Mr. Gustafson:

NOVA Services, Inc. (NOVA) is pleased to present herewith the above-referenced report. The report was completed by NOVA for CityMark Communities, LLC (CityMark) in accordance with NOVA's proposal dated July 2, 2019, as authorized on that date.

NOVA appreciates the opportunity to be of continued support to CityMark and its commitment to the San Diego area. If you have any questions regarding the content of this report or if we may be of assistance in any way, please do not hesitate to call.

Sincerely,

NOVA Services, Inc.

Wail Mokhtar
Senior Project Manager

Melissa Stayner, P.G., C.E.G.
Senior Geologist

CERTIFIED ENGINEERING GEOLOGIST MELISSA STAYNER 2707 STATE OF CALIFORNIA

John F. O'Brien, P.E., G.E.
Principal Geotechnical Engineer

REGISTERED PROFESSIONAL ENGINEER JOHN F. O'BRIEN 651 EXPIRES 3-31-2021 GEOTECHNICAL STATE OF CALIFORNIA

Hillary A. Price
Project Geologist

REPORT
GEOTECHNICAL INVESTIGATION

Proposed 17 on Voltaire Townhouses
Voltaire Street and San Clemente Street, San Diego, California

TABLE OF CONTENTS

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1.0 INTRODUCTION

1.1 Terms of Reference

This report presents the findings of a preliminary geotechnical investigation by NOVA Services, Inc. (NOVA) for a mixed townhouse and commercial development now known as *17 on Voltaire*. The development will be sited on a parcel located at Voltaire and San Clemente Streets in San Diego.

The work reported herein was completed by NOVA for CityMark Communities, LLC in accordance with NOVA's proposal dated July 2, 2019, as authorized on that date. Figure 1-1 provides a graphic that depicts the site vicinity.

Figure 1-1. Vicinity Map

1.2 Geotechnical Work by Others

This site and the planned development thereon have been the object of a prior geotechnical study by Allied Earth Technology (reference, *Soil Investigation, Proposed Mixed-Use Apartment/Retail Complex Site, Southwest Corner of Voltaire Street And San Clemente St., San Diego, California*, Allied Earth Technology, Project 07-116B7, July 25, 2007, hereinafter 'AET 2007').

The work reported herein utilizes the indications of the test trenches completed by AET for the subsurface exploration. The recommendations provided herein supersede those provided in AET 2007.

1.3 Objectives, Scope, and Limitations of This Work

1.3.1 Objectives

The objectives of the work reported herein are twofold, as described below.

1. Objective 1, Geotechnical. Characterize the occurrence of subsurface soil and formational rock to supplement the findings of AET 2007, thereafter providing recommendations for geotechnical-related development, including foundations and earthwork.

2. Objective 2, Infiltration. Conduct percolation testing sufficient to identify requirements for development of permanent stormwater infiltration Best Management Practices ('BMPs').

1.3.2 Scope

In order to accomplish the above objectives, NOVA undertook the task-based scope of work described below.

1. Task 1, Background Review. Reviewed available background data regarding the site area, including geotechnical reports, topographic maps, geologic data, fault maps and reports, and preliminary development plans for the project. No structural information was available.

2. Task 2, Subsurface Exploration. The exploration included the following subtasks.

    - *Subtask 2-1, Reconnaissance*. Prior to undertaking any invasive work, NOVA conducted a site reconnaissance, including layout of subsurface explorations used to determine subsurface conditions. Underground Service Alert (USA) and a private utility locator were notified for underground utility mark-out services.

    - *Subtask 2-2, Coordination.* NOVA coordinated with CityMark regarding access and scheduling for the drilling.

    - *Subtask 2-3, Engineering Borings.* NOVA retained a specialty subcontractor to drill, log, and sample two (2) hollow-stem auger borings. A NOVA geologist directed the drilling and sampling using ASTM methods.

    - *Subtask 2-4, Percolation Testing.* A single hollow stem auger boring was located in a prospective Drainage Management Area ('DMA'). The boring was extended to about 5.5 feet below ground surface. Thereafter, the boring was converted to a well and percolation testing conducted in accordance with the City of San Diego Storm Water Standards, Part 1 BMP Design Manual, October 2018 edition.

    - *Subtask 2-5, Closure*. The completed borings and percolation test well were backfilled with drill cuttings and the area of work cleaned following drilling/testing.

3. Task 3, Laboratory Testing. Laboratory testing was conducted on representative samples of soils recovered from the engineering borings.

4. Task 4, Engineering Evaluation. The findings of Tasks 1-3 were utilized to support geotechnical evaluations relevant to the planned new construction.

5. Task 5, Reporting. Submittal of this report concludes the scope of work described in NOVA's proposal. The report provides the findings of the subsurface investigation and recommendations for foundation design, earthwork and development of stormwater infiltration BMPs.

1.3.3 Limitations

The recommendations included in this report are not final. These recommendations are developed by NOVA using judgment and opinion and based upon the limited information available from the borings. NOVA can finalize its recommendations only by observing actual subsurface conditions revealed during construction. NOVA cannot assume responsibility or liability for the report's recommendations if NOVA does not perform construction observation.

This report does not address any environmental assessment or investigation for the presence or absence of hazardous or toxic materials in the soil, groundwater, or surface water within or beyond the site.

Appendix A to this report provides important additional guidance regarding the use and limitations of this report. This information should be reviewed by all users of the report.

1.4 Understood Use of This Report

NOVA expects that the findings and recommendations provided herein will be utilized in decision-making by CityMark and its design Team regarding geotechnical-related design and construction of the planned development.

NOVA's recommendations are based on its current understanding and assumptions regarding project development. Effective use of this report should include review by NOVA of the final design. Such review is important for both (i) conformance with the recommendations provided herein, and (ii) consistency with NOVA's understanding of the planned development.

1.5 Report Organization

The remainder of this report is organized as abstracted below.

- Section 2 reviews available project information.
- Section 3 describes the field investigation and laboratory testing.
- Section 4 describes the surface and subsurface conditions.
- Section 5 reviews geologic, soil and siting-related hazards common to this area of California, considering each for its potential to affect construction and long-term use of the development.
- Section 6 provides recommendations for earthwork and foundation design.
- Section 7 provides recommendations for development of stormwater infiltration BMPs.
- Section 8 provides recommendations for use of permeable pavers.
- Section 9 provides recommendations for development of pavements
- Section 10 lists the principal references utilized in the development of the report.

Figures and tables are embedded in the text of the report at the point which they are referenced. Plate 1, provided immediately following the text of this report, shows the location of field work in larger scale.

The report is supported by four appendices. Appendix A provides guidance regarding the use and limitations of this report. Appendix B presents logs of NOVA's borings & AET trench logs. Appendix C provides the records of the laboratory testing. Appendix D provides an Infiltration Feasibility Condition Letter and Worksheet C.4-1: Form I-8A.

2.0 BACKGROUND

2.1 Site Description

2.1.1 Location

The residential townhouse and commercial development are proposed to be constructed on four parcels located southwest of the intersection of Voltaire Street and San Clemente Street in San Diego (hereinafter, also referenced as 'the site'). The site is bounded to the north by Voltaire Street, to the east by San Clemente Street, to the south by an alleyway, and to the west by commercial and residential development.

Figure 2-1 depicts the site location and limits.

Figure 2-1. Site Location and Limits

2.1.2 Current and Past Site Use

The site is comprised of a collection of four parcels with the following APNs: 449-251-05, -06, -07 and -08-00. The eastern parcels are currently occupied by a pet care business and a surfboard repair business. The western parcels are vacant, used by the neighborhood as community gardens.

Aerial photos from 1964 and 1972 indicate that there were residential structures across this property. By 1980, the structures on the western half of the property are not visible, and the existing buildings are shown in their current configuration on the eastern portion of the site. The gardens on the western portion of the site were planted around 2012.

2.2 Planned Development

2.2.1 General

NOVA's understanding of current planning for the development is based upon review of:

1. Architectural documentation developed by The McKinley Associates (reference, *17 on Voltaire, CityMark, Architectural Submittal Package,* The McKinley Associates, Inc., 14 June 2019, hereinafter 'TMA 2019').

2. Civil Plans developed by Pasco Laret Suiter& Associates (reference, *17 on Voltaire, Site Development Permit/Map waver,* Pasco Laret Suiter& Associates, 7 June 2019, hereinafter 'PLSA 2019').

TMA 2019 indicates planning for a proposed residential townhouse and commercial development that will include the construction of two 3-story townhouse buildings and commercial space. The buildings will accommodate a total of 17 townhouses, ranging from 1,375 sf to 1,662 sf. Commercial space will be about 2,879 sf. The development will provide parking for 44 vehicles in a partially below-grade basement garage.

Figure 2-2 shows an elevation view of the development, depicting the manner by which the buildings will be adapted to the existing groundform.

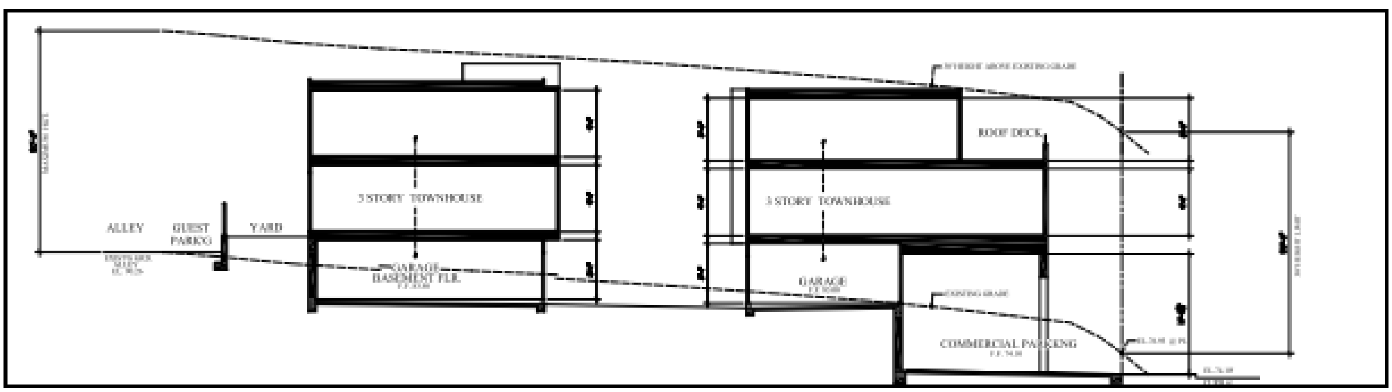

Figure 2-2. Representative Building Section
(source: TMA 2019)

2.2.2 Structural

Structural information regarding the planned additions is not yet available. However, it is expected that foundation loads will be relatively light, characteristic of this genre of residential construction.

2.2.3 Potential for Earthwork

Development of the site will include demolition of the existing structures, trees, and pavement as well as removal or relocation of existing utilities. Detailed planning regarding civil development of the site and related earthwork was not available for review by NOVA. However, based on cursory review it appears that earthwork will be limited to performing the required excavations to achieve pad grades, but is expected to result in a net export.

The majority of earthwork for this project will include cutting pads to grade, and constructing and backfilling retaining walls.

2.2.4 Stormwater

The *Preliminary Site Drainage Plan* prepared by Pasco Laret Suiter & Associates (PLSA 2019) indicates the use of biofiltration planters on the eastern and western sides of the proposed buildings. Permeable pavers are also indicated between Buildings A and B, as well as along the southern property boundary adjacent to the alley.

3.0 SUBSURFACE EXPLORATION AND LABORATORY TESTING

3.1 Overview

The subsurface exploration was completed on July 11th and 12th, 2019. The work included drilling and sampling of two engineering borings (referenced as 'B-1' and 'B-2') and conducting one percolation test ('P-1'). This work supplements the initial exploration of the site by excavation of five test trenches ('T-1' through 'T-5'), as reported in AET 2007.

The engineering borings were completed by a specialty subcontractor working under the surveillance of a NOVA geologist. Figure 3-1 presents a plan view of the development, indicating the location of the subsurface exploration by NOVA and that reported in AET 2007. Plate 1, provided immediately following the text of this report, shows the location of this work in larger scale.

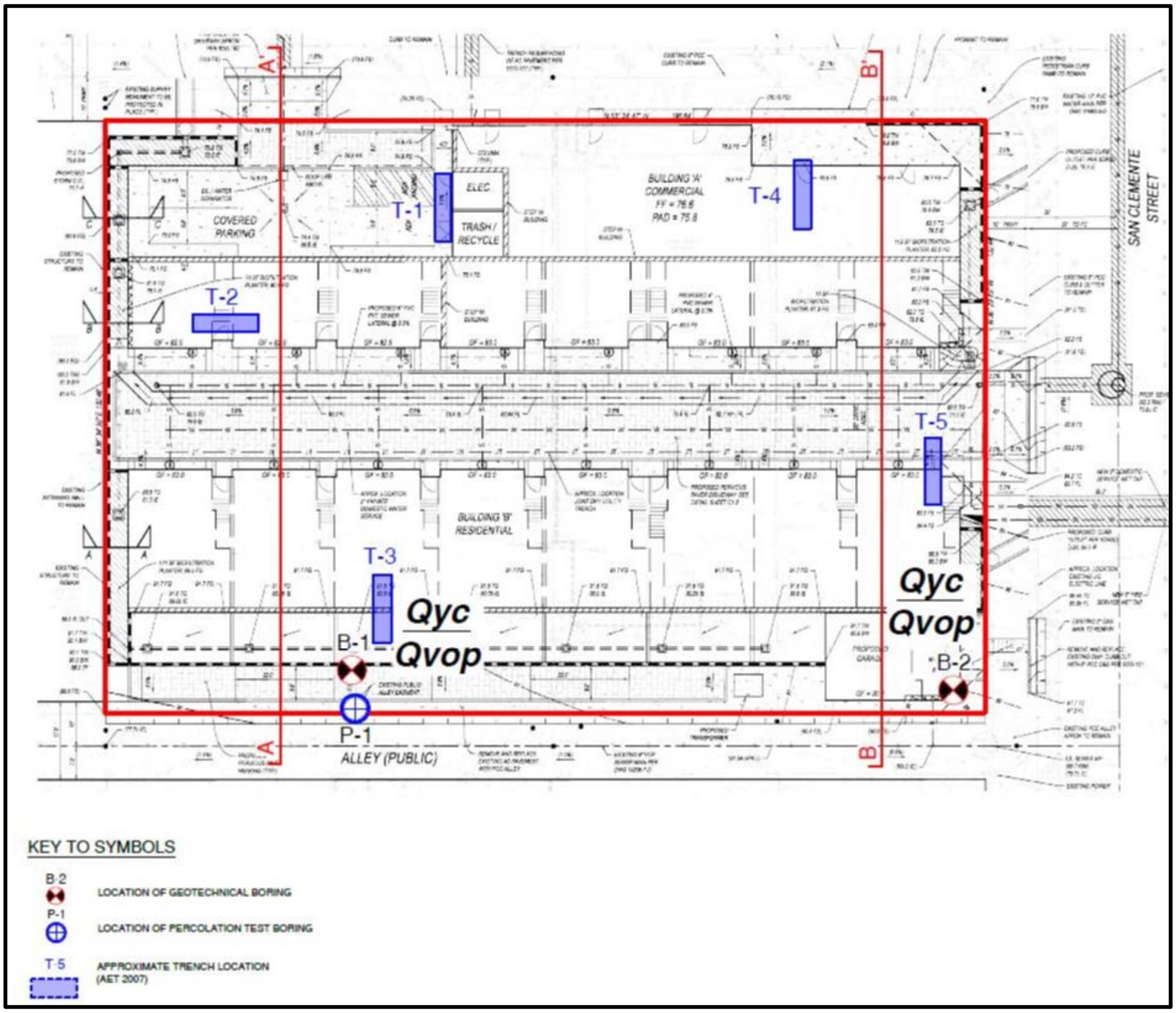

Figure 3-1. Location of Engineering Borings, Test Trenches, and Percolation Test

The remainder of this section provides detail regarding the engineering borings (Section 3.2), test pits by others (Section 3.3), percolation testing (Section 3.4) and related laboratory testing (Section 3.5).

3.2 Engineering Borings by NOVA

3.2.1 General

Two (2) hollow-stem auger borings were drilled to depths of 17 feet and 19.5 feet below ground surface (bgs) on July 11th and 12th, 2019. The borings were drilled under the surveillance of a NOVA geologist. Samples recovered from the borings were delivered to NOVA's materials laboratory for analysis.

The engineering borings were advanced by a truck-mounted drilling rig utilizing hollow-stem auger drilling equipment. Boring locations were determined in the field by the NOVA geologist. Elevations of the ground surface at the boring locations were estimated. Table 3-1 provides an abstract of the engineering borings.

Table 3-1. Abstract of the Engineering Borings

Boring Reference	Approximate Ground Surface Elevation (feet, msl)	Total Depth Below Ground Surface (feet)	Elevation at Completion (feet, msl)	Depth to Formation (feet)
B-1	+89	17	+72	3.5
B-2	+89	19.5	+69.5	2.5

Notes to Table 3-1:
1. Elevations are approximate and should be reviewed
2. 'Formation' is the Very Old Paralics (Qvop, formerly the 'Bay Point Formation')

Figure 3-2 (following page) depicts drilling operations on July 11.

3.2.2 Logging and Sampling

The geologist directed sampling and maintained a log of the subsurface materials that were encountered. Both disturbed and relatively undisturbed samples were recovered from the borings as described below.

1. The Modified California sampler ('ring sampler', after ASTM D 3550) was driven using a 140-pound hammer falling for 30 inches with a total penetration of 18 inches, recording blow counts for each 6 inches of penetration.
2. The Standard Penetration Test sampler ('SPT', after ASTM D 1586) was driven in the same manner as the ring sampler, recording blow counts in the same fashion. SPT blow counts for the final 12 inches of penetration comprise the SPT 'N' value, an index of soil strength and compressibility.
3. Bulk samples were recovered from the near subsurface.

3.2.3 Closure

On completion, the borings were backfilled with soil cuttings. The area was cleaned and left as close to the original condition as practical.

Figure 3-2. Drilling Operations, July 11, 2019

3.3 Review of Test Trenches by Others

AET 2007 reported the findings of a series of five backhoe-excavated test trenches. The approximate locations of these trenches are depicted on Figure 3-1. Table 3-2 provides an abstract of the test trenches.

Table 3-2. Abstract of the Test Trenches Reported in AET 2007

Trench Reference	Total Depth Below Ground Surface (feet)	Depth to Formation (feet)
T-1	12	4
T-2	10	2
T-3	7	4.5
T-4	5	3
T-5	5	2

Notes to Table 3-2:
1. 'Formation' is the Very Old Paralics (Qvop, formerly the 'Bay Point Formation')
2. AET 2007 does not estimate ground elevations at the test trenches.
3. No groundwater reported in any of the test trenches.
4. Refusal of the Case 580D excavator with 24" bucket on dense, cemented sandstone in T-3, T-4, T-5.

As may be seen by comparison of Table 3-2 with Table 3-1, AET 2007 reports subsurface conditions similar to that encountered by the NOVA borings. A veneer of colluvium typically three feet to four feet in thickness overlies dense formational sandstones.

3.4 Percolation Testing

3.4.1 General

NOVA directed the excavation and construction of one (1) percolation test well following the recommendations for percolation testing presented in the City of San Diego Storm Water Standards, Part 1 BMP Design Manual, October 2018 edition. The percolation test location is shown on Figure 3-1.

3.4.2 Drilling

The boring for the well was drilled with an 8-inch hollow stem auger to a depth of 5.5 feet bgs. Field measurements were taken to confirm that the boring was excavated to approximately 8-inches in diameter. The boring was logged by a NOVA geologist, who observed and recorded exposed soil cuttings and the boring conditions.

3.4.3 Conversion to Percolation Well

Once the boring was drilled to the desired depth, the boring was converted to a percolation test well by placing an approximately 2-inch layer of ¾-inch gravel on the bottom, then extending 3-inch diameter Schedule 40 perforated PVC pipe to the ground surface. The ¾-inch gravel was used to partially fill the annular space around the perforated pipe below the existing finish grade to minimize the potential of soil caving.

3.4.4 Percolation Testing

The percolation test well was pre-soaked by filling the hole with water to at least 5 times the hole's radius. In the test well, the pre-soak water did not percolate at least 6 inches into the soil unit within 25 minutes; therefore, the hole was filled to the ground surface elevation and testing commenced the following day, within a 26-hour window.

Water levels were then recorded every 30 minutes for six hours, or until the water percolation stabilized after each reading (minimum of 12 readings). At the beginning of each half-hour test period, the water level was filled to approximately the same starting water level of the previous tests in order to maintain a near-constant head during the entire testing period.

Table 3-3 abstracts the indications of the percolation testing.

Table 3-3. Abstract of the Percolation/Infiltration Testing

Boring	Approximate Ground Elev. (feet, msl)	Depth of Test (feet)	Approximate Test Elev. (feet, msl)	Percolation Rate (inches/hour)	Infiltration Rate (inches/hour)	Design Infiltration Rate (in/hour, F=2*)
P-1	+89	5.5	83.5	1.92	0.08	0.04

Notes: (1) elevation is approximate
(2) the referenced geologic unit is Very Old Paralic Deposits (Qvop).

3.4.5 Closure

At the conclusion of the percolation testing, the PVC pipe was removed and the resulting hole was backfilled with soil cuttings and patched to match the existing surfacing.

3.5 Laboratory Testing

3.5.1 General

Soil samples recovered from the engineering borings were transferred to NOVA's geotechnical laboratory where a geotechnical engineer reviewed the soil samples and the field logs. Representative soil samples were selected and tested in NOVA's materials laboratory to check visual classifications and to determine pertinent engineering properties. The laboratory program included visual classifications of all soil samples as well as index testing in general accordance with ASTM standards.

Records of the geotechnical laboratory testing by NOVA are provided in Appendix C.

3.5.2 Compaction

AET 2007 reports testing two bulk samples of the colluvium that mantles the site to determine the moisture-density relationship after ASTM D 1557. This testing is abstracted on Table 3-4 (following page).

Table 3-4. Abstract of Compaction Testing After ASTM D 157 Reported in AET 2007

Test Trench	Depth (feet)	Soil Description	Maximum Dry Density, γ_D (lb/ft^3)	Optimum Moisture Content, *w* (Pct Dry Weight)
T-3	2.5	Brown/gray sandy clay (SC)	122	11.5
T-4	1.5	Brown silty sand (SM)	124	9.5

3.5.3 Expansion Potential

AET 2007 reports testing after ASTM D 4829 to determine expansion index (EI) of the clayey fraction of the colluvium that mantles the site. This testing indicates EI = 71, indicating a soil with 'Medium' expansion potential.

3.5.4 Plasticity

The visual classifications were supplemented by index testing to determine plasticity. Atterberg limits testing after ASTM D 4318 of the clayey fraction of the colluvium (Boring 1, 1-5 feet to 3 feet depth) indicated a liquid limit (LL) of LL = 33 and a plasticity index (PI) of PI = 20. As is summarized below, this sample was shown to have 45% by weight silt and clay-sized soils.

3.5.5 Soil Gradation

Mechanical gradation of two soil samples is summarized below.

Table 3-5. Abstract of the Gradation Testing

Boring	Depth (feet)	Soil Description	Percent by weight Finer Than the U.S. No. 200 Sieve	Classification After ASTM D 2487
B-1	1.5 - 3	Colluvium: Olive/gray sandy clay to clayey sand	45	SC-CL
B-2	5 – 7	Brown silty sandstone	26	SM

3.5.6 Corrosion Potential

Resistivity, sulfate content and chloride contents were determined to estimate the potential corrosivity of on-site soils. These chemical tests were performed on a representative sample of the near-surface soils by Clarkson Laboratory and Supply, Inc.

The testing indicated low levels of soluble sulfates and chlorides in soils, but the soils are potentially severely corrosive to buried metals based on resistivity measurements. Section 6 discusses the indications of the chemical testing in more detail.

4.0 SUBSURFACE CONDITIONS

4.1 Geologic Setting

4.1.1 Regional

The site is located in the coastal portion of the Peninsular Range geomorphic province. This geomorphic province encompasses an area that extends approximately 900 miles from the Transverse Ranges and the Los Angeles Basin south to the southern tip of Baja California. The province varies in width from approximately 30 to 100 miles.

This area of the Province has undergone several episodes of marine inundation and subsequent marine regression (coastline changes) throughout the last 54 million years. These events have resulted in the deposition of a thick sequence of marine and nonmarine sedimentary rocks on the basement igneous rocks of the Southern California Batholith and metamorphic rocks.

The western portion of the province in San Diego County that includes the site area is underlain by Quaternary-age surficial deposits which are in turn underlain by sedimentary rocks of Late Cretaceous, Eocene, and Pliocene age. The Tertiary and Quaternary sedimentary rocks were deposited on upper Cretaceous sedimentary rocks in a basin known as the San Diego embayment. The most abundant rocks in the embayment are gently folded and faulted Eocene marine, lagoonal and nonmarine rocks.

Accelerated fluvial erosion during periods of heavy rainfall, along with the lowering of base sea level during Quaternary times, resulted in the rolling hills, mesas, and deeply incised canyons which characterize the landforms in western San Diego County.

4.1.2 Site Specific

Geologic units encountered during the subsurface investigation include colluvium (Qyc) and Very Old Paralic deposits (Qvop). The colluvial soils were deposited by gravity, and occur along the lower reaches of most hillsides in the area. These deposits are characteristically loose sandy clay, clayey sand, and silty sand. Cobbles and occasional boulders can also be encountered.

The Very Old Paralic deposits (Qvop) are mapped to occur widely in this portion of San Diego (see Figure 4-1, following page). These late to middle Pleistocene-aged deposits consist mainly of strandline, beach, estuarine and colluvial deposits composed of siltstone, sandstone and conglomerate. Variations in soil type represent episodes of deposition in offshore bar, estuarine and nearshore terrestrial and marine abrasion platform environments during that time. Differently numbered paralic deposits (evident by review of Figure 4-1) designate different ages and elevations of abrasion platforms.

The paralic deposits are competent as a foundation material, of relatively higher strength and low compressibility. Many of the monumental civil structures in San Diego are founded on this unit.

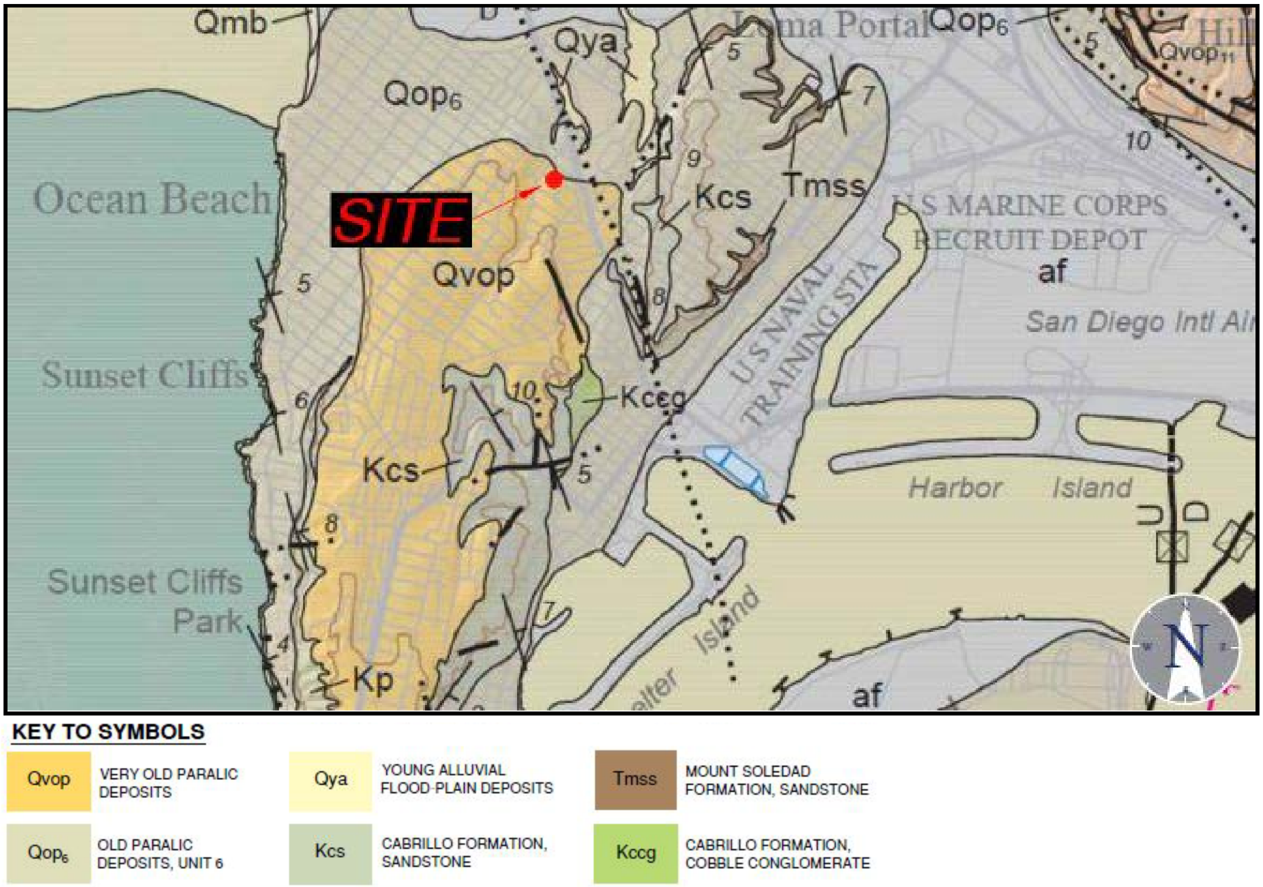

Figure 4-1. Geologic Mapping of the Site Vicinity

4.2 Site-Specific Conditions

4.2.1 Surface

The four parcels that comprise the site include both undeveloped and developed land. The eastern parcels are currently occupied by a pet care business and a surfboard repair business. The western parcels are undeveloped, occupied by neighborhood community gardens.

Elevations across the site onsite range from about +92 feet mean sea level (msl) along the southerly property line, to about +82 msl along the northerly property line paralleling Voltaire Street. There is a low slope approximately 3 to 4 feet in height fronting Voltaire Street.

Figure 4-2 (following page) provides a photograph depicting surface conditions.

Figure 4-2. Surface Conditions Looking South from Voltaire Street

4.2.2 Subsurface

For the purposes of this report, the subsurface may be generalized to occur as the sequence of soil and rock described below.

1. Unit 1, Colluvium. The site is covered by a mantle of colluvial deposits (Qyc) approximately 3 to 4.5 feet in thickness. The colluvium is a somewhat heterogeneous mix of clayey sands and sandy clays of medium dense/stiff consistency. Zones with a higher clay fraction exhibit Medium expansion potential.

2. Unit 2, Paralics. Beneath the colluvium, the site is underlain by Quaternary-aged Very Old Paralic deposits (Qvop). The unit is a well-cemented sandstone of very dense consistency, characterized by Standard Penetration Test ('SPT,' after ASTM D 1586) blow counts ('N', blows/foot) of $N \geq 50$.

   The paralics extend to well below the depths explored in the borings. Figure 4-3 (following page) provides a photograph of a representative sample of this sandstone.

4.2.3 Groundwater

Groundwater was not encountered in either of the borings by NOVA or in the test trenches reported in AET 2007. Groundwater likely first occurs at depths greater than 30 feet below ground surface.

Infiltrating storm water from prolonged wet periods can 'perch' atop localized zones of lower permeability soil that exist above the static groundwater level. Localized perched groundwater conditions may also develop once site development is complete and landscape irrigation commences.

4.2.4 Surface Water

NOVA did not observe any evidence of seeps, springs, surface staining or eroded areas that would suggest the recent problems with surface water on the site.

Figure 4-3. Unit 2 Very Old Paralic Sandstone

4.3 Subsurface Conditions Following Development

4.3.1 General

Figure 4-4 and Figure 4-5 (following page) provide cross-sections across the pad, and present the position of Unit 1 colluvium and Unit 2 paralics relative to the proposed grades for the site's development.

Larger scale views of Figure 4-4 and Figure 4-5 are provided on Plate 2 following the text of this report, while the cross-section locations are presented on Plate 1.

4.3.2 Excavation Characteristics

The Unit 1 colluvium will be readily excavated by earthwork equipment usual for developments of this nature. AET 2007 reported that the Unit 2 paralics refused the 24" bucket of a Case 580D excavator on dense sandstone of Unit 2 in test trenches T-3, T-4, T-5 at depths of about 5 to 7 feet (about 3 to four feet penetration into Unit 2). Two test trenches (T-1, T-2) were excavated to 12 feet depth without refusal. This finding suggests special excavation techniques may be necessary at certain locations.

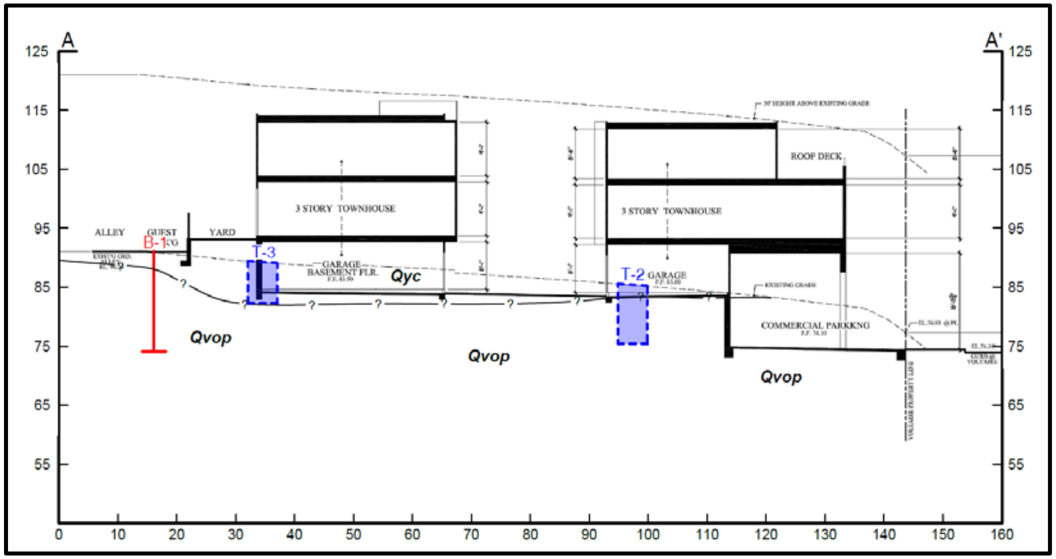

Figure 4-4. North-South Cross Section A-A'

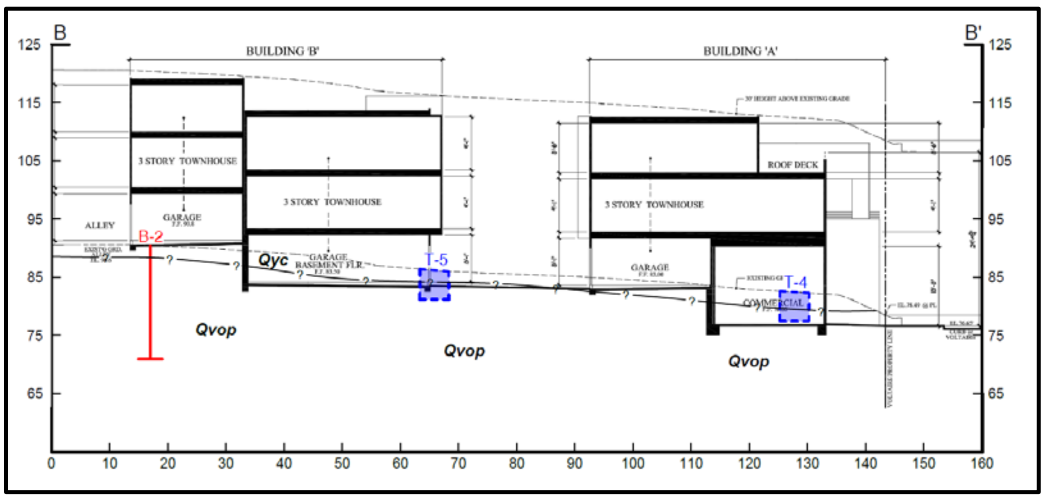

Figure 4-5. North-South Cross Section B-B'

5.0 REVIEW OF GEOLOGIC, SOIL AND SITING HAZARDS

5.1 Overview

This section provides a review of geologic, soil and siting-related hazards common to this region of California, considering each for its potential to affect the planned development.

The primary hazard identified by this review is that the site is at risk for moderate-to-severe ground shaking in response to large-magnitude earthquakes during the lifetime of the planned development. This circumstance is common to all civil works in this area of California. While strong ground motion could affect the site, there is no risk of liquefaction or related seismic phenomena.

The following subsections describe NOVA's review of geologic, soil and siting hazards.

5.2 Geologic Hazards

5.2.1 Strong Ground Motion

The site is located in a seismically active area, as is the majority of southern California, and the potential for strong ground motion is considered significant during the design life of the proposed structure. Major known active faults in the region consist generally of *en echelon*, northwest striking, right-lateral, strike-slip faults. These include the San Andreas, Elsinore, and San Jacinto faults located east of the site; and, the Rose Canyon, San Clemente, San Diego Trough, and Agua Blanca-Coronado Bank faults located to the west of the site. San Diego's tectonic setting includes north and northwest striking fault zones, the most prominent and active of which is the Rose Canyon fault zone, located approximately 2.5 miles east of the site.

Fault segments within the Rose Canyon fault zone can generate an earthquake with a moment magnitude (MW) of up to MW = 7.2. A web-based analytical tool was used to estimate a corresponding risk-based Peak Ground Acceleration (PGA_M) of $PGA_M \sim 0.7$ g.

5.2.2 Fault Rupture and Seismic Hazard

The site is not located in a designated Alquist-Priolo earthquake fault zone, a state-zoned area that surrounds the surface trace of an active fault, considered to be areas most likely for fault rupture. The nearest earthquake fault zone is the Silver Strand section of the Rose Canyon Fault, about 2.5 miles east of the site.

Review of the City of San Diego's 2008 *Seismic Safety Study* indicates the site is located within an area defined as '*…. gently sloping to steep terrain, favorable geologic structure, low risk.* The portion of the earthquake hazard mapping within the Seismic Safety Study that includes the site is reproduced as Figure 5-1 (following page).

As may be seen by review of Figure 5-1, the site is located about 350 feet to the west of the potentially active Point Loma Fault.

In consideration of the foregoing, NOVA considers the risk of fault rupture at this site to be low.

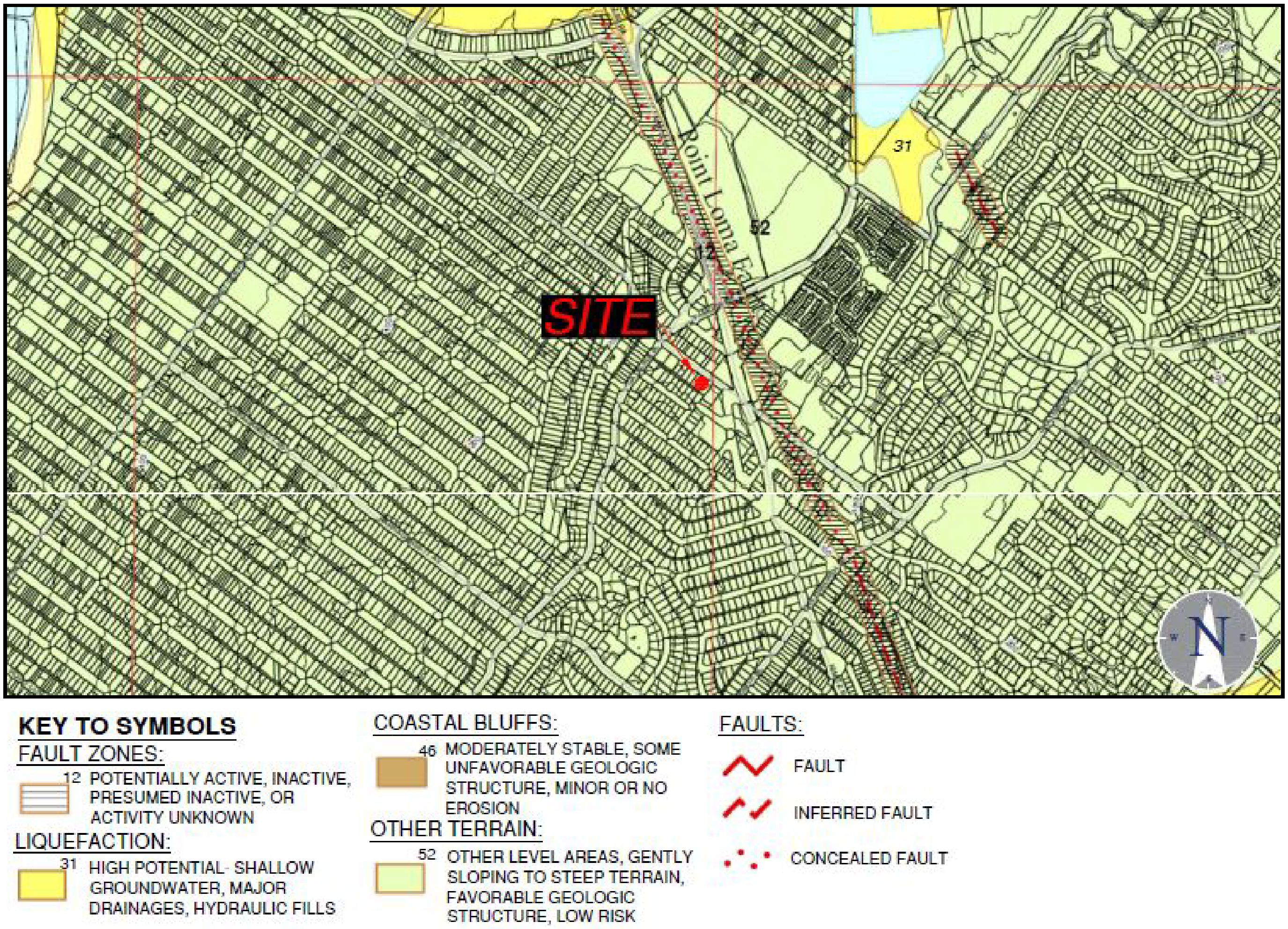

Figure 5-1. Seismic Safety Mapping of the Site Area
(source: *Seismic Safety Study*, City of San Diego, 4/3/2008)

5.2.3 Landslide

As used herein, 'landslide' describes downslope displacement of a mass of rock, soil, and/or debris by sliding, flowing, or falling. Such mass earth movements are greater than about 10 feet thick and larger than 300 feet across. Landslides typically include cohesive block glides and disrupted slumps that are formed by translation or rotation of the slope materials along one or more slip surfaces. These mass displacements can also include similarly larger-scale, but more narrowly confined modes of mass wasting such as rock topples, mud flows and debris flows.

The causes of classic landslides start with a preexisting condition- characteristically, a plane of weak soil or rock- inherent within the rock or soil mass. Thereafter, movement may be precipitated by earthquakes, wet weather, and changes to the structure or loading conditions on a slope (e.g., by erosion, cutting, filling, release of water from broken pipes, etc.). Rainfall is the most common trigger for landslide events. In the San Diego area, landsliding has also been precipitated by larger-scale earthwork, by destabilizing slopes by the cutting and/or filling on existing adverse geologic structure.

In assessment of this hazard, NOVA conducted a geologic reconnaissance and reviewed aerial photography for indications of landslide instability at the site. This review indicated no evidence of active or dormant landsliding.

Clues to the landslide hazard for an area can also be obtained by review of mapping that depicts both historic landslides and landslide-prone geology/topography. Figure 5-2 reproduces such mapping for the site area. The mapping indicates that the site is in an area judged ‘generally susceptible’ to landsliding, but maps no existing or questionable landslides.

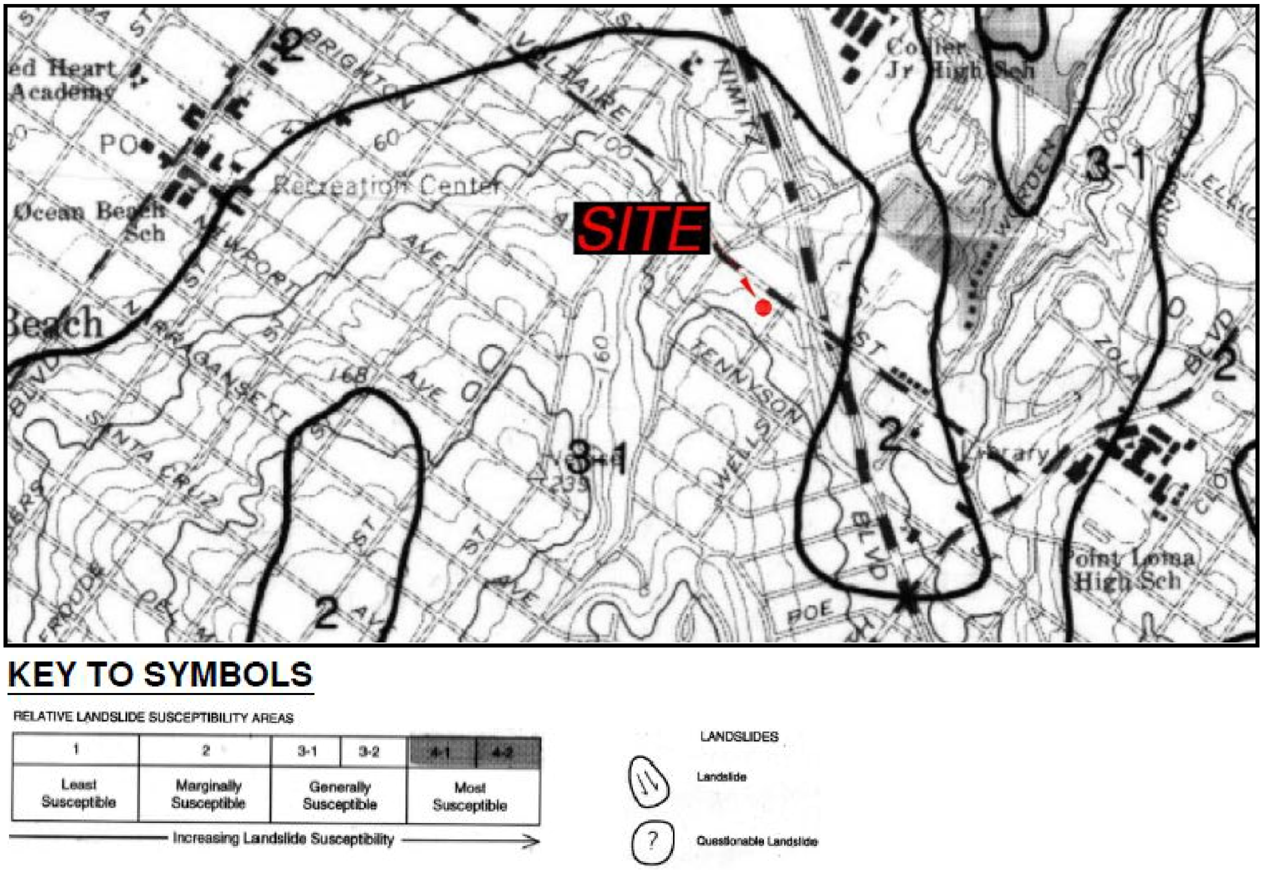

Figure 5-2. Mapping of Landslide Susceptibility in the Site Area

The above mapping is consistent with that published in the 2008 *Seismic Safety Study* by the City of San Diego and reproduced herein as Figure 5-1. The City of San Diego identifies the area of the development as including “…*gently sloping to steep terrain, favorable geologic structure, low risk.*”

In consideration of the indications of the geologic investigations, review of published mapping, and review of aerial photography, NOVA considers the landslide hazard at the site to be low for the site and the surrounding area.

5.3 Soil Hazards

5.3.1 Embankment Stability

As used herein, ‘embankment stability’ is intended to mean the safety of localized natural or man-made embankments against failure. Unlike landslides described above, embankment stability can include smaller scale slope failures such as erosion-related washouts and more subtle, less evident processes such as soil creep.

No new slopes are planned as part of the future site development and there are no existing embankment slopes on the site, such that there is no concern regarding embankment stability at the residence.

5.3.2 Seismic

Liquefaction

‘Liquefaction’ refers to the loss of soil strength during a seismic event. The phenomenon is observed in areas that include geologically ‘younger’ soils (i.e., soils of Holocene age), shallow water table (less than about 60 feet depth), and cohesionless (i.e., sandy and silty) soils of looser consistency. The seismic ground motions increase soil water pressures, decreasing grain-to-grain contact among the soil particles, which causes the soils to lose strength. The very dense, cemented and geologically ‘older’ subsurface units at this site have no potential for liquefaction.

Seismically Induced Settlement

Apart from liquefaction, a strong seismic event can induce settlement within loose to moderately dense, unsaturated granular soils. Neither the Unit 1 colluvium nor the dense Unit 2 paralics will be affected by seismically induced settlement.

5.3.3 Expansive Soil

Expansive soils are characterized by their ability to undergo significant volume changes (shrinking or swelling) due to variations in moisture content, the magnitude of which is related to both clay content and plasticity index. These volume changes can be damaging to structures. Nationally, the annual value of real estate damage caused by expansive soils is exceeded only by that caused by insects.

The soils have been characterized by testing to determine Expansion Index (‘EI’ after ASTM D 4829). EI has been adopted by the California Building Code (‘CBC’, Section 1803.5.3) for characterization of expansive soils. Table 5-1 summarizes the qualitative descriptors of expansion potential based upon EI.

Table 5-1. Qualitative Descriptors of Expansion Potential Based upon EI

Expansion Index (‘EI’), ASTM D 4829	Expansion Potential, ASTM D 4829	Expansion Classification, 2016 CBC
0 to 20	Very Low	Non-Expansive
21 to 50	Low	Expansive
51 to 90	Medium	
91 to 130	High	
>130	Very high	

The Unit 1 colluvium includes a limited thickness (less than about 2 feet) of clayey soils near its contact with the Unit 2 paralics. AET 2007 reports that this Unit 1 soil tested with 'Medium' expansion potential and meeting the criterion of CBC 2016 for expansive soil. It should be noted that medium expansive materials are not suitable for use as fill or for retaining wall backfill.

The Unit 2 paralics are characteristically sandy, with very low to low expansion potential. This Unit is suitable for use as fill and backfill.

5.3.4 Hydro-Collapsible Soils

Hydro-collapsible soils are common in the arid climates of the western United States in specific depositional environments- principally, in areas of young alluvial fans, debris flow sediments, and loess (wind-blown sediment) deposits. These soils are characterized by low *in situ* density, low moisture contents, and relatively high unwetted strength.

The soil grains of hydro-collapsible soils were initially deposited in a loose state (i.e., high initial 'void ratio') and thereafter lightly bonded by water sensitive binding agents (e.g., clay particles, low-grade cementation, etc.). While relatively strong in a dry state, the introduction of water into these soils causes the binding agents to fail. Destruction of the bonds/binding causes relatively rapid densification and volume loss (collapse) of the soil. This change is manifested at the ground surface as subsidence or settlement. Ground settlements from the wetting can be damaging to structures and civil works. Human activities that can facilitate soil collapse include irrigation, water impoundment, changes to the natural drainage, disposal of wastewater, etc.

The consistency and geologic age of the Unit 1 colluvium and Unit 2 sandstones are such that these materials are not potentially hydro-collapsible.

5.3.5 Corrosivity

The near-surface soils were tested to show low levels of sulfates and chlorides. The potential for sulfate attack to embedded concrete is negligible. The potential for corrosion of embedded metals is relatively low; however, the soils are potentially severely corrosive to buried metals based on resistivity measurements. The indications of this testing are discussed in more detail in Section 6.

5.4 Siting Hazards

5.4.1 Effect on Adjacent Properties

The proposed project will not affect the structural integrity of adjacent properties or existing public improvements and street right-of-ways located adjacent to the site if the recommendations of this report are incorporated into project design.

5.4.2 Flood

The site is not located within a FEMA-designated flood zone. FIRM Panel No 06073C1880G, effective on 05/16/2012, maps the site area as an '…*area of minimal flood hazard*.' Figure 5-3 (following page) reproduces flood mapping of the site area by FEMA.

5.4.3 Tsunami

Tsunami is a term that describes a series of fast-moving, long-period ocean waves caused by earthquakes or volcanic eruptions. The altitude and distance of the site from the ocean preclude this threat. Figure 5-4 shows the site in relation to mapped estimates of tsunami inundation (red-shaded areas) in the site vicinity.

Figure 5-3. Flood Hazard Mapping of the Site Area
(source: adapted from FEMA 2012)

Figure 5-4. Tsunami Inundation Mapping of the Site Vicinity
(source: adapted from California Geological Survey2009)

5.4.4 Seiche

Seiches are standing waves that develop in an enclosed or partially enclosed body of water such as lakes or reservoirs. Harbors or inlets can also develop seiches. Most commonly caused by strong winds and rapid atmospheric pressure changes, seiches can be effected by seismic events and tsunamis.

The altitude and distance of the site from San Diego bay preclude this threat.

6.0 EARTHWORK AND FOUNDATIONS

6.1 General

6.1.1 Review of Site Hazards

Section 5 provides review of geologic, soil and siting-related hazards that may affect the planned development. The primary hazard identified by that review is that the site is at risk for moderate-to-severe ground shaking in response to large-magnitude earthquakes during the lifetime of the planned development. This circumstance is common to all civil works in this area of California. While strong ground motion could affect the site, there is no risk of liquefaction or related seismic phenomena.

Section 6.2 provides seismic design parameters. Section 6.4 addresses maintenance of the site groundform in development of new construction

6.1.2 Effect on Adjacent Properties

The proposed development is suitable for its site and not affect the structural integrity of adjacent properties or existing public improvements and street right-of-ways located adjacent to the site if the recommendations of this report are incorporated into project design.

6.1.3 Review and Surveillance

The subsections following provide geotechnical recommendations for the planned development as it is now understood. NOVA should review the grading plan, foundation plan, and geotechnical-related specifications as they become available to confirm that the recommendations presented in this report have been incorporated into the plans prepared for the project.

All earthwork related to site and foundation preparation should be completed under the observation of NOVA, the Geotechnical Engineer of Record (GEOR) for this work.

6.2 Seismic Design Parameters

6.2.1 Site Class

Though the depth of soil information available for this site is limited, the deeper geology of the site area is well understood. The site and all of this area of San Diego is underlain by a variety of dense sedimentary rock to great depth, such that the site is classified as Site Class C per ASCE 7-16 (Table 20.3-1).

6.2.2 Seismic Design Parameters

Table 6-1 (following page) provides seismic design parameters for the site in accordance with ASCE 7-16.

Table 6-1. Seismic Design Parameters, ASCE 7-16

Parameter	Value
Site Soil Class	C
Site Latitude (decimal degrees)	32.742760
Site Longitude (decimal degrees)	-117.234065
Site Coefficient, F_a	1.2
Site Coefficient, F_v	1.5
Mapped Short Period Spectral Acceleration, S_S	1.313 g
Mapped One-Second Period Spectral Acceleration, S_1	0.453 g
Short Period Spectral Acceleration Adjusted For Site Class, S_{MS}	1.576 g
One-Second Period Spectral Acceleration Adjusted For Site Class, S_{M1}	0.679 g
Design Short Period Spectral Acceleration, S_{DS}	1.051 g
Design One-Second Period Spectral Acceleration, S_{D1}	0.453 g

source: *ASCE 7 Hazard Tool*, found at https://asce7hazardtool.online/

6.3 Corrosivity and Sulfates

6.3.1 General

Electrical resistivity, chloride content, and pH level are all indicators of the soil's tendency to corrode ferrous metals. Water-soluble sulfates are used as an index of the potential for sulfate attack to concrete. These chemical tests were performed on a representative sample of the near-surface soils. The results of the testing to assess corrosion potential are tabulated in Table 6-2. Records of the testing are provided in Appendix C.

Table 6-2. Summary of Corrosivity Testing of the Near Surface Soil

Parameter	Units	Value
pH	standard unit	6.9
Resistivity	Ω-cm	540
Water-Soluble Chloride	ppm	280
Water Soluble Sulfate	ppm	150

6.3.2 Metals

Caltrans considers a soil to be corrosive to embedded metals if one or more of the following conditions exist for representative soil and/or water samples taken at the site:

- chloride concentration is 500 parts per million (ppm) or greater;
- sulfate concentration is 2,000 ppm (0.2%) or greater; or,
- the pH is 5.5 or less.

Based on the Caltrans criteria, the site soils would not be considered 'corrosive' to embedded metals.

Appendix C provides records of the chemical testing that include estimates of the life expectancy of buried metal culverts of varying gauge.

In addition to the above parameters, the risk of soil corrosivity buried metals is considered by determination of electrical resistivity (ρ). Soil resistivity may be used to express the corrosivity of soil only in unsaturated soils. Corrosion of buried metal is an electrochemical process in which the amount of metal loss due to corrosion is directly proportional to the flow of DC electrical current from the metal into the soil. As the resistivity of the soil decreases, the corrosivity generally increases.

A common qualitative correlation (cited in Romanoff 1989, NACE 2007) between soil resistivity and corrosivity to ferrous metals is tabulated below.

Table 6-3. Soil Resistivity and Corrosion Potential

Minimum Soil Resistivity (Ω-cm)	Qualitative Corrosion Potential
0 to 2,000	Severe
2,000 to 10,000	Moderate
10,000 to 30,000	Mild
Over 30,000	Not Likely

Despite the relatively benign environment for corrosivity indicated by pH and water-soluble chlorides, the resistivity testing suggests that design should consider that the soils may be severely corrosive to embedded ferrous metals.

Typical recommendations for mitigation of such corrosion potential in embedded ferrous metals include:

- a high-quality protective coating such as an 18-mil plastic tape, extruded polyethylene, coal tar enamel, or Portland cement mortar;
- electrical isolation from above grade ferrous metals and other dissimilar metals by means of dielectric fittings in utilities and exposed metal structures breaking grade; and,
- steel and wire reinforcement within concrete having contact with the site soils should have at least 2 inches of concrete cover.

If extremely sensitive ferrous metals are expected to be placed in contact with the site soils, it may be desirable to consult a corrosion specialist regarding choosing the construction materials and/or protection design for the objects of concern.

6.3.3 Sulfate Attack

As shown in Table 6-2, the soil sample tested indicated water-soluble sulfate (SO_4) content of 150 parts per million (‘ppm,’ 0.015% by weight). Testing reported in AET 2007 indicates SO_4 content of 136 ppm. With SO_4 < 0.10 percent by weight, the American Concrete Institute (ACI) 318-08 considers a soil to have no potential (S0) for sulfate attack.

Table 6-4 reproduces the Exposure Categories considered by ACI.

Table 6-4. Exposure Categories and Requirements for Water-Soluble Sulfates

Exposure Category	Class	Water-Soluble Sulfate (SO_4) In Soil (percent by weight)	Cement Type (ASTM C150)	Max Water-Cement Ratio	Min. f'_c (psi)
Not Applicable	S0	$SO_4 < 0.10$	-	-	-
Moderate	S1	$0.10 \le SO_4 < 0.20$	II	0.50	4,000
Severe	S2	$0.20 \le SO_4 \le 2.00$	V	0.45	4,500
Very severe	S3	$SO_4 > 2.0$	V + pozzolan	0.45	4,500

Adapted from: ACI 318-08, Building Code Requirements for Structural Concrete

6.3.4 Limitations

Testing to determine several chemical parameters that indicate a potential for soils to be corrosive to or attack construction materials are traditionally completed by the Geotechnical Engineer, comparing testing results with a variety of indices regarding corrosion potential. NOVA does not practice in the field of corrosion protection, since this is not specifically a geotechnical issue. Should you require more information, a specialty corrosion consultant should be retained to address these issues.

6.4 Earthwork

6.4.1 General

Earthwork should be performed in accordance with Section 300 of the most recent approved edition of the "*Standard Specifications for Public Works Construction*" and "*Regional Supplement Amendments*."

6.4.2 Select Fill

Materials

All fill should be Select Fill, a mineral soil free of organics and toxic or regulated constituents, with the characteristics listed below:

- at least 40 percent by weight finer than ¼-inch in size;
- cohesionless, classified as GW, GM, SW, SM or SC after ASTM D 2487;
- maximum particle size of 4 inches; and,
- expansion index (EI) of less than 50 (i.e., EI < 50, after ASTM D 4829).

Only the sandy portions of the Unit 1 soil will conform to the above criteria. The moderately expansive clayey portions of the Unit 1 will not conform to these criteria and should not be used as fill or backfill. Mixing of the onsite soils to create a suitable soil maybe required. The mixed soils should be tested by NOVA to verify suitability prior to use. The Unit 2 paralics can be processed to meet the criteria for Select Fill.

Placement

Compact Select Fill to a minimum of 90 percent relative compaction after ASTM D1557 (the 'modified Proctor') following moisture conditioning to at least 2% above the optimum moisture.

Fill should be placed in loose lifts no thicker than the ability of the compaction equipment to thoroughly densify the lift. For most smaller, hand-operated equipment (tampers, walked behind compactors, etc.) will be limited to on the order of 4 inches or less. Vibratory equipment should be used to densify the cohesionless Select Fill that will be used for this work.

6.4.3 Site Preparation

At the outset of site work the Contractor should establish construction Best Management Practices ('BMPs') to prevent erosion of graded/excavated areas until such time as permanent drainage and erosion control measures have been installed.

Prior to the start of earthwork, the site should be cleared of structures, vegetation and related root systems, and existing pavement. The deleterious materials should be disposed of in approved off-site locations.

Any existing utilities which are to be abandoned should either be (i) excavated and the trenches backfilled; or, (ii) the lines completely filled with sand-cement slurry.

6.4.4 Foundation Preparation

Ground Supported Slab

The ground supported slab at the first level of the structures may be supported on either of the conditions listed below.

- *Condition 1, Select Fill.* Constructed following removal of the Unit 1 colluvium backfilling up to finish pad grade with Select Fill that conforms with Section 6.4.2.

- *Condition 2, Unit 2 Paralics.* Constructed following removal of the Unit 1 colluvium.

Grading for Buildings Supported on Shallow Foundations

Where the Unit 1 colluvium is not removed from the foundation level beneath structures, the Unit 1 colluvium should be removed to contact with the level of the Unit 2 sandstones if shallow foundations are to be employed for support of the structures. This removal should extend at least five feet outside the building limits or to the property line, whichever is less. Thereafter, excavation should be backfilled with soil that conforms to the "Select Fill" criteria of Section 6.4.2. As an alternative, a controlled low strength material (CLSM, sometimes referenced as 'flowable fill') can be used.

Grading for Buildings with a Cut and Fill Transitions

Where building pads are underlain by a combination of fill and Unit 2 Sandstone ('cut and fill transition'), all areas of the ground supported slabs and foundations should be underlain by no less than two feet of Select Fill.

Cuts in the Unit 2 should be extended to a depth of 2 feet below the design building pad and all foundation elevations and be replaced with soil that meets the criteria for Select Fill (Section 6.4.3). Areas requiring such cuts should be completed using the steps described below.

1. *Step 1, Over-Excavate*. Over-excavate the Unit 2 Sandstone to a depth of 2 feet below the pad and footing elevation to at least 3 feet laterally outside the building limits.

2. *Step 2, Select Fill.* Fill to the base of the ground level slab with Select Fill placed and densified per Section 6.4.3, extending this fill to at least 3 feet outside the building limits.

An alternative to undercutting the cut portion of the pad is to deepen all foundations into the Unit 2 paralics.

CLSM

Over excavated areas or other excavations can be backfilled up to the bottom of the design footing elevation with a CLSM that develops a minimum unconfined compressive strength of 30 psi. A two-sack slurry mix should meet this criterion. If employed, the CLSM should conform to material requirements identified in Section 19-3 of the Caltrans Standard Specifications (latest edition). The Caltrans specification for the gradation of CLSM aggregate is reproduced below as Table 6-5.

Table 6-5. Gradation for CLSM Fill Aggregate

U.S. Standard Sieve Size	Percent Passing by Weight
1½ inch	100
1 inch	80 to 100
¾ inch	60 to 100
3/8 inch	50 to 100
No. 4	40 to 80
No. 8	10 to 40

Source: Caltrans 2015, Section 19-3.02G

6.4.5 Trenching and Backfilling for Utilities

Excavation for utility trenches must be performed in conformance with OSHA regulations contained in 29 CFR Part 1926.

Utility trench excavations have the potential to degrade the properties of the adjacent soils. Utility trench walls that are allowed to move laterally will reduce the bearing capacity and increase settlement of adjacent footings and overlying slabs.

Backfill for utility trenches is as important as the original subgrade preparation or engineered fill placed to support either a foundation or slab. Backfill for utility trenches must be placed to meet the project specifications for the Select Fill.

Compaction testing should be performed for every 20 cubic yards of backfill placed or each lift within 30 lineal feet of trench, whichever is less.

Backfill of utility trenches should not be placed with water standing in the trench. If granular material is used for the backfill, the material should have a gradation that will filter protect the backfill material from the adjacent soils. If this gradation is not available, a geosynthetic non-woven filter fabric should be used to reduce the potential for the migration of fines into the backfill material.

6.4.6 Flatwork

Prior to casting exterior flatwork, the upper one foot of subgrade soils should be removed and replaced with "Select" fill, moisture conditioned and recompacted, as recommended in Section 6.4.5. Concrete slabs for pedestrian traffic or landscaping should be at least four (4) inches thick.

6.5 Shallow Foundations

6.5.1 General

Structures can be supported on shallow foundations embedded in either compacted fill or the Unit 2 sandstone provided the earthwork is completed as described in Section 6.4. The following subsections provide recommendations for shallow foundations. It is recommended that all foundation elements, including any grade beams, be reinforced top and bottom. The actual reinforcement should be designed by the Structural Engineer.

6.5.1 Shallow Foundations Supported on Compacted Fill

Minimum Dimensions and Reinforcing

Continuous footings should be at least 24 inches wide and have a minimum embedment of 24 inches below lowest adjacent grade. Isolated square or rectangular footings should be a minimum of 30 inches wide, embedded at least 24 inches below surrounding grade.

Allowable Contact Stress

Continuous and isolated footings constructed as described in the preceding sections and supported on compacted fill may be designed using an allowable (net) contact stress of 2,500 pounds per square foot (psf). An allowable increase of 500 psf for each additional 12 inches in depth may be utilized, if desired.

In no case should the maximum allowable contact stress should be greater than 4,000 psf. The maximum bearing value applies to combined dead and sustained live loads (DL + LL). The allowable bearing pressure may be increased by one-third when considering transient live loads, including seismic and wind forces.

Lateral Resistance

Resistance to lateral loads will be provided by a combination of (i) friction between the soils and foundation interface; and, (ii) passive pressure acting against the vertical portion of the footings. Passive pressure may be calculated at 250 psf per foot of depth. A frictional coefficient of 0.35 may be used. No reduction is necessary when combining frictional and passive resistance.

Settlement

Structure supported on shallow foundations as recommended above will settle on the order of 0.5 inch or less, with about 50% of this settlement occurring during the construction period.

Angular distortion due to differential settlement of adjacent, unevenly loaded footings should be less than 1 inch in 40 feet (i.e., Δ/L less than 1:480).

6.5.2 Shallow Foundations Supported on Unit 2 sandstones

Isolated and Continuous Foundations

The Unit 2 sandstones will provide high-capacity foundation support for shallow foundations.

Isolated Foundations

Isolated foundations for interior columns may be designed for an allowable contact stress of 5,500 psf for dead and commonly applied live loads (DL+LL). These foundation units should have a minimum width of 30 inches, embedded a minimum of 24 inches into sound Unit 2 sandstones. This bearing value may be increased by one-third for transient loads such as wind and seismic.

Continuous Foundations

Continuous foundations may be designed for an allowable contact stress of 5,000 psf for dead and commonly applied live loads (DL+LL). These footings must be a minimum of 24 inches in width and embedded a minimum of 24 inches into the Unit 2 sandstones.

This bearing value may be increased by one-third for transient loads such as wind and seismic.

Resistance to Lateral Loads

Lateral loads to shallow foundations cast ‘neat’ against Unit 2 sandstones may be resisted by passive earth pressure against the face of the footing, calculated as a fluid density of 400 psf per foot of depth, neglecting the upper 1 foot of soil below surrounding grade in this calculation. Additionally, a coefficient of friction of 0.35 between soil and the concrete base of the footing may be used with dead loads.

Settlement

Supported as recommended above, the structure will settle on the order of 0.5 inch or less. This movement will occur elastically, as dead load (DL) and permanent live loads (LL) are applied.

In usual circumstance, about 50% of this settlement will occur during the construction period. Angular distortion due to differential settlement of adjacent, unevenly loaded footings should be less than 1 inch in 40 feet (i.e., Δ/L less than 1:480).

6.6 Conventionally Reinforced Concrete Slabs

The ground level of the garage structures may employ conventional on-grade (ground-supported) slab designed using a modulus of subgrade reaction (k) of 120 pounds per cubic inch (i.e., k = 120 pci) for compacted fill and180 pci for Unit 2 Sandstones.

The actual slab thickness and reinforcement should be designed by the Structural Engineer. NOVA recommends the slab be a minimum 6 inches thick, reinforced by at least #3 bars placed at 16 inches on center each way within the middle third of the slabs by supporting the steel on chairs or concrete blocks ("dobies").

Minor cracking of concrete after curing due to drying and shrinkage is normal. Cracking is aggravated by a variety of factors, including high water/cement ratio, high concrete temperature at the time of placement, small nominal aggregate size, and rapid moisture loss due during curing. The use of low-slump concrete or low water/cement ratios can reduce the potential for shrinkage cracking.

To reduce the potential for excessive cracking, concrete slabs-on-grade should be provided with construction or 'weakened plane' joints at frequent intervals. Joints should be laid out to form approximately square panels and never exceeding a length to width ratio of 1.5 to 1. Proper joint spacing and depth are essential to effective control of random cracking. Joints are commonly spaced at distances equal to 24 to 30 times the slab thickness. Joint spacing that is greater than 15 feet should include the use of load transfer devices (dowels or diamond plates). Contraction/control joints should be established to a depth of ¼ the slab thickness as depicted in Figure 6-1 (following page).

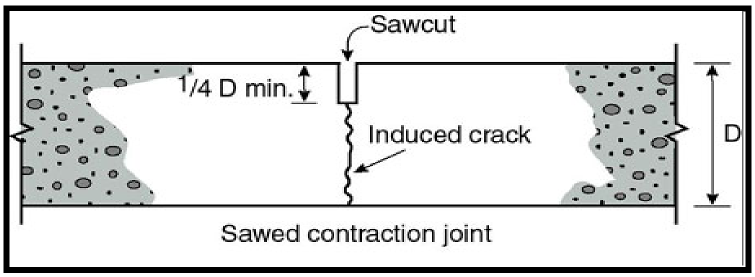

Figure 6-1. Sawed Contraction Joint

6.7 Underslab Capillary Break and Vapor Retarder

6.7.1 Design Responsibility

Soil moisture vapor that penetrates ground-supported concrete slabs can result in damage to moisture-sensitive floors, some floor sealers, or sensitive equipment in direct contact with the floor. It is not the responsibility of the geotechnical consultant to provide recommendations for design to address this concern. This responsibility usually falls to the Architect. Decisions regarding the appropriate design are principally driven by the nature of the building space above the slab, floor coverings, anticipated penetrations, concerns for mold or soil gas, and a variety of other environmental, aesthetic and materials factors known only to the Architect.

6.7.2 Capillary Break

Design for a capillary break ('sand layer') should be determined in accordance with ACI Publication 302 "*Guide for Concrete Floor and Slab Construction*."

A "capillary break" may consist of a 4-inch thick layer of compacted, well-graded sand should be placed below the floor slab. This porous fill should be clean coarse sand or sound, durable gravel with not more than 5 percent coarser than the 1-inch sieve or more than 10 percent finer than the No. 4 sieve, such as AASHTO Coarse Aggregate No. 57.

6.7.3 Vapor Barrier

General

A variety of specialty polyethylene (polyolefin)-based vapor retarding products are available to retard moisture transmission into and through concrete slabs. This remainder of this section provides an overview of design and installation guidance, and considers the use of vapor retarders in the building construction in the San Diego area.

Detail to support selection of vapor retarders and to address the issue of moisture transmission into and through concrete slabs is provided in a variety of publications by the American Society for Testing and Materials (ASTM) and the American Concrete Institute (ACI). A partial listing of those publications is provided below.

- ASTM E1745-97 (2009). *Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs*
- ASTM E154-88 (2005). *Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover*
- ASTM E96-95 (2005). *Standard Test Methods for Water Vapor Transmission of Materials*
- ASTM E1643-98 (2009). *Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs*
- ACI 302.2R-06. *Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials*

Design

Vapor retarders employed for ground supported slabs in the San Diego are commonly specified as minimum 10 mil polyolefin plastic that conforms to the requirements of ASTM E1745 as a Class A vapor retarder (i.e., a maximum vapor permeance of 0.1 perms, minimum 45 lb/in tensile strength and 2,200 grams puncture resistance). Among the commercial products that meet this requirement are the series of Yellow Guard® vapor retarders vended by Poly-America, L.P.; the Perminator® products by W. R. Meadows; and, Stego®Wrap products by Stego Industries, LLC.

The person responsible for design of the vapor barrier should consult with product vendors to ensure selection of the vapor retarder that best meets the project requirements. For example, concrete slabs with particularly sensitive floor coverings may require lower permeance or other performance-related factors other than are specified by the ASTM E1745 class rating.

Installation

The performance of vapor retarders is particularly sensitive to the quality of installation. Installation should be performed in accordance with the vendor's recommendations under full-time surveillance.

6.8 Control of Moisture Around Foundations

6.8.1 General

Design for the structure should include care to control accumulations of moisture around and below foundations. Such design will require coordination from among the Design Team; at a minimum to include the Architect, the Civil Engineer, and the Landscape Architect.

6.8.2 Erosion and Moisture Control During Construction

Surface water should be controlled during construction, via berms, gravel/sandbags, silt fences, straw wattles, siltation basins, positive surface grades, or other methods to avoid damage to the finish work or adjoining properties.

The Contractor should take measures to prevent erosion of graded areas until such time as permanent drainage and erosion control measures have been installed. After grading, all excavated surfaces should exhibit positive drainage and elimination of areas where water might pond.

6.8.3 Design

Design for the areas around foundations should be undertaken with a view to the maintenance of an environment that encourages constant moisture conditions in the foundation soils following construction. Roof and surface drainage, landscaping, and utility connections should be designed to limit the potential for infiltration and/or releases of moisture beneath structures.

NOVA does not recommend planting trees, flowers or shrubs closer than five (5) feet from foundations. Planters and other surface features which could retain water in areas adjacent to the building should be sealed. Sprinkler systems should not be installed within 5 feet of foundations or floor slabs.

Rainfall to roofs should be collected in gutters and discharged in a controlled manner through downspouts designed to drain away from foundations. Downspouts, roof drains or scuppers should discharge to approved drainage facilities away from buildings.

Proper surface drainage will be required to minimize the potential of water seeking the level of the bearing soils under foundations and pavements. In areas where sidewalks or paving do not immediately adjoin the structure, protective slopes should be provided with a minimum grade (away from the structure) of approximately 2 percent for at least 10 feet from perimeter walls. A minimum gradient of 1 percent is recommended in hardscape areas. Drainage should be directed to approved drainage facilities.

6.9 Retaining Walls

6.9.1 General

As is discussed in Section 2, no structural plan is currently available. However, it is expected that retaining walls will be required as design adapts the new structures to the existing groundform. Section 2 (Figure 2-2) indicates retaining walls will be used to develop below-grade parking areas. The following subsections provide guidance for design of retaining walls.

6.9.2 Shallow Foundations

Retaining walls should be developed on ground prepared in accordance with the criteria provided in Section 6.4. Design criteria for continuous shallow foundations is provided in Section 6.5.

6.9.3 Lateral Earth Pressures

Table 6-6 provides recommendations for lateral soil and groundwater wall loading to below-grade walls with level backfill for varying conditions of wall yield.

Table 6-6. Lateral Earth Pressures to Below Grade Walls

Condition	Equivalent Fluid Pressure (psf/foot) for Approved Backfill Notes A, B	
	Level Backfill	2:1 Backfill Sloping Upwards
Active	35	60
At Rest	55	100
Passive	350	300

Note A: Select Fill or similar imported soil.
Note B: assumes wall includes appropriate drainage and no hydrostatic pressure.

If footings or other surcharge loads are located a short distance outside the wall, these influences should be added to the lateral stress considered in the design of the wall.

6.9.4 Seismic

The seismic load increment should be calculated as a uniform 11H psf (with H the height of the wall in feet).

6.9.5 Resistance to Lateral Loads

Lateral loads to wall foundations will be resisted by a combination of frictional and passive resistance as described below.

- Frictional Resistance. A coefficient of friction of 0.35 between the soil and base of the footing.
- Passive Resistance. Passive soil pressure against the face of footings or shear keys will accumulate at an equivalent fluid weight of 250 pounds per cubic foot (pcf). The upper 12 inches of material in areas not protected by floor slabs or pavement should not be included in calculations of passive resistance.

6.9.6 Wall Drainage

The recommended equivalent fluid pressures provided in the preceding subsection assume that constantly functioning drainage systems are installed between walls and soil backfill to prevent the uncontrolled buildup of hydrostatic pressures and lateral stresses in excess of those stated.

Design for wall drainage may include the use of pre-engineered wall drainage panels or a properly compacted granular free-draining backfill.

6.9.7 Elevator Pits

The buildings may include elevators. Elevators may require pits that extend below the lowest level. Design for the elevator pit walls should consider the circumstances and conditions described below.

1. Wall Yield. NOVA expects that proper function of the elevator pit should not allow yielding of

the elevator pit walls. As such, walls should be designed to resist 'at rest' lateral soil pressures and seismic pressures provided above, also allowing for any structural surcharge.

2. Construction. Design of the elevator pit walls should include consideration for surcharge conditions that will occur during and after construction.

6.10 Temporary Excavations

6.10.1 Regulatory

Temporary slopes may be required for excavations during grading. All temporary excavations should comply with applicable safety ordinances. The safety of all excavations is solely the responsibility of the Contractor and should be evaluated during construction as the excavation progresses.

Based on the data interpreted from the borings, the design of temporary slopes in the Unit 1 soils may assume California Occupational Safety and Health Administration (Cal/OSHA) Soil Type C for planning purposes. The design of temporary slopes in the Unit 2 sandstones may assume Cal/OSHA Soil Type B for planning purposes.

6.10.2 Unbraced Excavations

As a matter of practice, temporary excavations 3 feet deep or less can be made vertically. Deeper temporary excavations in Unit 2 should be laid back no steeper than ¾: 1 (horizontal: vertical).

The faces of unbraced temporary slopes should be inspected daily by the Contractor's Competent Person before personnel are allowed to enter the excavation. Any zones of potential instability, sloughing or rattling should be brought to the attention of the Geotechnical Engineer-of-Record (GEOR) and corrective action implemented before personnel began working in the excavation.

Excavated soil should not be stockpiled behind temporary excavations within a distance equal to the depth of the excavation. The GEOR should be notified if other surcharge loads are anticipated so that lateral load criteria can be developed for the specific situation. If temporary slopes are to be maintained during wet weather, berms are recommended along the tops of slope to prevent storm water run on from affecting the exposed slopes.

7.0 STORMWATER INFILTRATION

7.1 Overview

Based upon the indications of the field exploration and laboratory testing reported herein, NOVA has evaluated the site as abstracted below after guidance contained in the City of San Diego Storm Water Standards, Part 1 BMP Design Manual, October 2018 edition (hereafter, 'the BMP Manual').

Section 3.4 provides a description of the field work undertaken to complete the testing. Figure 3-1 depicts the location of the testing. This section provides the results of that testing and related recommendations for management of stormwater in conformance with the BMP Manual.

As is well-established by the BMP Manual, the feasibility of stormwater infiltration is principally dependent on geotechnical and hydrogeologic conditions at the project site. As is described in Section 4, the site is underlain by dense sandstones of Very Old Paralics deposits (Qvop). This geologic unit is widely demonstrated in this area to have poor infiltration characteristics. The relatively low measured infiltration rate (see Section 7.2) reflects this characteristic.

This section provides NOVA's assessment of the feasibility of stormwater infiltration BMPs utilizing the information developed by the field exploration described in Section 3, as well as other elements of the site assessment. The section provides NOVA's judgment that the site is not feasible for development of permanent stormwater infiltration BMPs.

7.2 Infiltration Rate

The percolation rate of a soil profile is not the same as its infiltration rate ('I'). Therefore, the measured/calculated field percolation rate was converted to an estimated infiltration rate utilizing the Porchet Method in accordance with guidance contained in the BMP Manual. Table 7-1 provides a summary of the infiltration rate determined by the percolation testing.

Table 7-1. Infiltration Rate Determined by Percolation Testing

Boring	Approximate Ground Elev. (feet, msl)	Depth of Test (feet)	Approximate Test Elev. (feet, msl)	Percolation Rate (inches/hour)	Infiltration Rate (inches/hour)	Design Infiltration Rate (in/hour, F=2*)
P-1	+89	5.5	83.5	1.92	0.08	0.04

Notes: (1) 'F' indicates 'Factor of Safety' (2) elevations are approximate and should be reviewed

As may be seen by review of Table 7-1, a factor of safety (F) is applied to the infiltration rate (I) determined by the percolation testing. This factor of safety, at least F = 2 in local practice, considers the nature and variability of subsurface materials, as well as the natural tendency of infiltration structures to become less efficient with time. The calculated infiltration rate after applying F = 2 is I = 0.04 inches per hour. Full and partial BMPs are not required on sites with infiltration rates of less than 0.05 inches per hour.

7.3 Review of Geotechnical Feasibility Criteria

7.3.1 Overview

Section C.2.1 of Appendix C of the BMP Manual provides seven factors that should be considered by the project geotechnical professional while assessing the feasibility of infiltration related to geotechnical conditions. These factors are listed below.

- C.2.1.1 Soil and Geologic Conditions
- C.2.1.2 Settlement and Volume Change
- C.2.1.3 Slope Stability
- C.2.1.4 Utility Considerations
- C.2.1.5 Groundwater Mounding
- C.2.1.6 Retaining Walls and Foundations
- C.2.1.7 Other Factors

The above geotechnical feasibility criteria are reviewed in the following subsections.

7.3.2 Soil and Geologic Conditions

The soil borings and percolation test boring completed for this assessment disclose the sequence of soil units described below.

1. Unit 1, Colluvium. The site is covered by a mantle of 3 to 4.5 feet of clayey and sandy colluvium of medium dense consistency. Testing to determine expansion potential reported in AET 2007 shows the clayey zones of this unit to have Medium expansion potential after ASTM D 4829.

2. Unit 2, Paralics. The colluvium is underlain by dense sandstones of the Quaternary-aged Very Old Paralic deposits (Qvop). The unit is characteristically silty sandstone of very dense consistency. The locally extensive paralic deposits extend beyond the maximum depth explored by this work.

7.3.3 Settlement and Volume Change

The clayey fraction of the Unit 1 colluvium has Medium expansion potential, prone to swelling upon wetting and shrinkage upon drying. Introduction of water to this unit could create damaging foundation movement.

7.3.4 Slope Stability

Embankment stability for this site is not a constraint to BMPs.

7.3.5 Utilities

Stormwater infiltration BMPs should not be sited within 10 feet of underground utilities.

7.3.6 Groundwater Mounding

In consideration of the low measured percolation rates, it is likely that groundwater mounding will occur if stormwater infiltration is attempted in any scale. Groundwater mounding will likely result in damaging groundwater mounding during wet periods, affecting utilities, pavements, flat work, and foundations.

7.3.7 Retaining Walls and Foundations

The *Preliminary Site Drainage Plan* (PLSA 2019) indicates biofiltration planters will be attached to the proposed buildings on the eastern and western edges. These basins should be lined to mitigate seepage of water directly under the slab and building foundations.

Permeable pavers are also shown on the plan between buildings A and B as well as the area south of building B. Due to the proximity of the pavers to slabs, footings, and retaining walls, that the areas below the pavers be lined and drained into the storm drain system.

Though structural design is incomplete, it is expected that retaining walls will be planned for the project to adapt the development to the existing groundform and to create below-grade parking areas. Both retaining walls and shallow foundations could be affected by groundwater mounding associated with attempts to infiltrate stormwater.

7.3.8 Other Factors

The site has limited space to achieve the minimum setbacks from foundations, retaining walls, and possibly underground utilities.

7.4 Suitability of the Site for Stormwater Infiltration

It is NOVA's judgment that the site is not suitable for development of stormwater infiltration BMPs. This judgment is based upon consideration of the variety of factors detailed above; most significantly, the low design infiltration rate (I) of I = 0.04 inches per hour and related potential for groundwater mounding.

Appendix D provides completed forms related to stormwater infiltration.

8.0 PERMEABLE PAVERS

8.1 Overview

The recommendations for interlocking concrete pavers provided herein have been developed in general conformance with S*tructural Design of Interlocking Concrete Pavement for Roads and Parking Lots* Interlocking Concrete Pavement Institute (ICPI), Technical Specification No. 4, May 2011.

8.2 Planned Use of Pavers

Concrete pavers are a product that substitutes for a conventional asphalt concrete or concrete structural section. By review of the civil plans it appears that permeable pavers are proposed at several areas within the project.

8.3 Recommendations

8.3.1 General

Concrete paver units should be at least 80 millimeters (3 ⅛-inches) thick for vehicular concrete pavers. Interlocking concrete pavement can be constructed by placing the concrete paver units over a 1-inch bedding sand layer generally conforming to ASTM C-33 sand.

8.3.2 Bedding and Joint Sand Gradation

Table 8-1 summarizes bedding sand gradation recommendations and recommended joint sand gradation. The joint sand should comply with ASTM C144 with a maximum 100 percent passing the No. 16 sieves and no more than 5 percent passing the No. 200 sieve.

Bedding sand may be used as joint sand; however, additional effort may be required due to its coarser gradation.

Table 8-1. Gradation of Sand for Paver Systems

Sieve Size	Percent Passing	
	Bedding Sand	Joint Sand
3/8 – inch	100	-
No. 4	95 - 100	100
No. 8	80 - 100	95 - 100
No. 16	50 - 85	70 - 100
No. 30	25 - 60	40 - 75
No. 50	5 - 30	20 - 40
No. 100	0 - 10	10 - 25
No. 200	0 - 1	0 - 5

8.3.3 Base and Subgrade

The bedding sand should be underlain with at least 10-inches of Class II base compacted to at least 95 percent of the maximum dry density at or slightly above optimum moisture content as determined by ASTM D 1557.

The upper 12 inches of the subgrade soil should be scarified; moisture conditioned as necessary, and compacted to a dry density of at least 95 percent of the laboratory maximum dry density at or slightly above optimum moisture content as determined by ASTM D 1557.

8.3.4 Control of Infiltration

An impermeable liner (e.g., 30-mil PVC or equivalent) should be placed surrounding the pavers to prevent soil subgrade saturation and lateral water migration. The liner should extend up to the top of the aggregate base layer and adhered to the edge restraint.

Water retained by the liner can be collected by a subdrain. The lined subgrade soils should be sloped at least one percent towards the subdrain. A 4-inch diameter, Schedule 40, perforated PVC pipe encapsulated with Caltrans Class II permeable base (or equivalent) should be suitable as a subdrain. This piping should connect to solid PVC pipe to convey the stormwater to a suitable outlet structure, i.e. area drain or storm drain structure.

Figure 8-1 depicts a design to control infiltrating surface water that reflects the above recommendations.

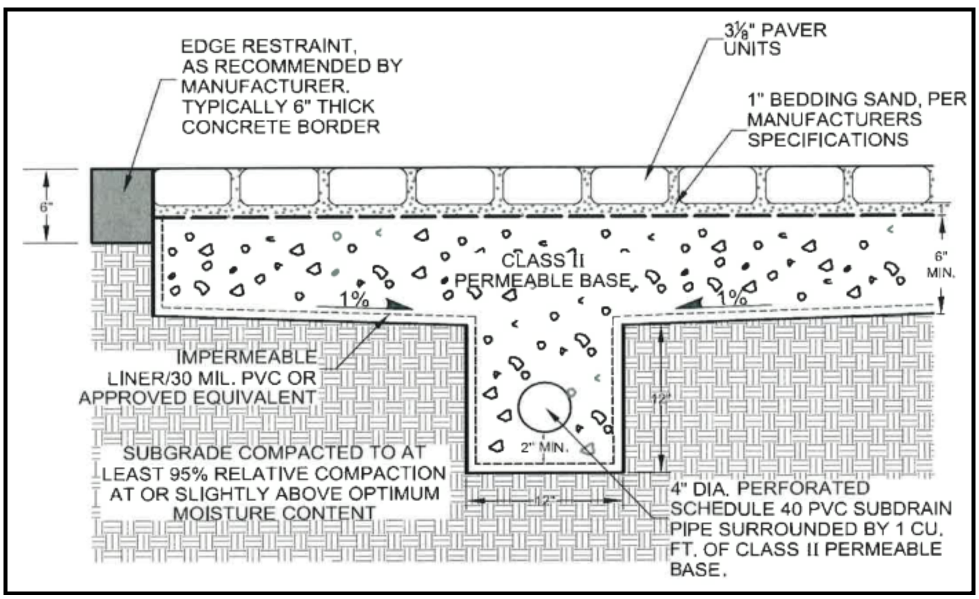

Figure 8-1. Design to Control Infiltration

8.3.5 Installation

Concrete paver installation should be performed in accordance with the manufacturer's and ICPI guidelines. Stable edge restraints such as concrete edge bands and curbs are essential to maintain horizontal interlock while the paver units are subjected to repeated vehicular loads.

8.3.6 Edge Restraint

The edge restraint may consist of a concrete pavement section. Other edge restraint recommendations can be found in the ICPI technical guidelines.

A concrete edge restraint pavement section may be designed in general conformance with the procedure recommended by the American Concrete Institute report ACI 330R-08 *Guide for Design and Construction of Concrete Parking Lots* using the following parameters:

Modulus of subgrade reaction, k = 100 pci
Modulus of rupture for concrete, MR= 500 psi
Traffic Category = B
Average daily truck traffic, ADTT (assumed) = 30

Based on the criteria presented above, concrete pavement should consist of a minimum of 6 inches of PCC placed over subgrade soil compacted to a dry density of at least 95 percent of the laboratory maximum dry density near to slightly above optimum moisture content. This pavement section is based on a minimum concrete compressive strength of approximately 3,200 psi (pounds per square inch).

No reinforcing steel will be necessary within the concrete for geotechnical purposes.

8.3.7 Maintenance

A maintenance schedule consisting of inspecting the pavement sections should be established. Periodic removal, replacement, and re-leveling of individual pavers may be required.

9.0 PAVEMENTS

9.1 Overview

9.1.1 General

The structural design of pavement sections depends primarily on anticipated traffic conditions, subgrade soils, and construction materials. For the purposes of the preliminary evaluation provided in this section, NOVA has assumed a Traffic Index (TI) of 5.0 for passenger car parking, and 6.0 for the driveways. These traffic indices should be confirmed by the project civil engineer prior to final design.

9.1.2 Design to Limit Infiltration

The surface grades of pavements and related design features to limit infiltration should conform with the concepts discussed in Section 7.

An important consideration with the design and construction of pavements is surface and subsurface drainage. Where standing water develops, either on the pavement surface or within the base course, softening of the subgrade and other problems related to the deterioration of the pavement can be expected.

Furthermore, good drainage should minimize the risk of the subgrade materials becoming saturated over a long period of time. The following recommendations should be considered to limit the amount of excess moisture, which can reach the subgrade soils:

- site grading at a minimum 2% grade away from the pavements;
- compaction of any utility trenches for landscaped areas to the same criteria as the pavement subgrade;
- sealing all landscaped areas in or adjacent to pavements to minimize or prevent moisture migration to subgrade soils near pavements; and,
- concrete curbs bordering landscaped areas should have a deepened edge to provide a cutoff for moisture flow beneath pavements (generally, the edge of the curb can be extended an additional twelve inches below the base of the curb).

9.1.3 Maintenance

Preventative maintenance should be planned and provided for. Preventative maintenance activities are intended to slow the rate of pavement deterioration and to preserve the pavement investment. Preventative maintenance consists of both localized maintenance (e.g. crack sealing and patching) and global maintenance (e.g. surface sealing). Preventative maintenance is usually the first priority when implementing a planned pavement maintenance program and provides the highest return on investment for pavements.

9.1.4 Review and Surveillance

The Geotechnical Engineer-of-Record should review the planning and design for pavement to confirm that the recommendations presented in this report have been incorporated into the plans prepared for the project. The preparation of subgrades for roadways should be observed on a full-time basis by a representative of the Geotechnical Engineer-of-Record.

9.2 Pavement Subgrade Preparation

Remedial grading for paved areas should consist oif removing the upper 12 inches of the Unit 1, compacting the bottom of the removals to at least 90% relative compaction after ASTM D 1557 (the 'modified Proctor'). The removed soils should be replaced with "Select" fill and densified to at least 95% relative compaction after ASTM D 1557 (the 'modified Proctor').

After the completion of compaction/densification, areas to receive pavements should be proof-rolled. A loaded dump truck or similar should be used to aid in identifying localized soft or unsuitable material. Any soft or unsuitable materials encountered during this proof-rolling should be removed, replaced with an approved backfill, and compacted. The Geotechnical Engineer can provide alternative options such as using geogrid and/or geotextile to stabilize the subgrade at the time of construction, if necessary.

Construction should be managed such that preparation of the subgrade immediately precedes placement of the base course. Proper drainage of the paved areas should be provided to reduce moisture infiltration to the subgrade.

The preparation of roadway and parking area subgrades should be observed on a full-time basis by a representative of NOVA to confirm that any unsuitable materials have been removed and that the subgrade is suitable for support of the proposed driveways and parking areas, after ASTM D1557.

9.3 Flexible Pavements

The structural design of flexible pavement depends primarily on anticipated traffic conditions, subgrade soils, and construction materials. Table 9-1 provides preliminary flexible pavement sections using an assumed R-value of 25.

Table 9-1. Preliminary Pavement Sections, R = 25

Area	Subgrade R-Value	Traffic Index	Asphalt Thickness (in)	Base Course Thickness (in)
Auto Parking	25	5	4.0	6.0
Roadways/Fire Lane/Driveways	25	6	4.0	7.5

1. The above sections assume properly prepared subgrade consisting of at least 12 inches of subgrade compacted to a minimum of 95% relative compaction after ASTM D1557, with EI <50.

2. The aggregate base materials should be placed at a minimum of 95% relative compaction after ASTM D1557.

9.4 Rigid Pavements

9.4.1 General

Concrete pavement sections should be developed in the same manner as undertaken for all other slabs and pavements: removal of the Unit 1 and replacement of that material in an engineered manner as described in Section 9.2.

Concrete pavement sections consisting of 7 inches of Portland cement concrete over a base course of 6 inches and a properly prepared subgrade support a wide range of traffic indices.

Where rigid pavements are used, the concrete should be obtained from an approved mix design with the minimum properties of Table 9-2.

Table 9-2. Recommended Concrete Requirements

Property	Recommended Requirement
Compressive Strength @ 28 days	3,250 psi minimum
Strength Requirements	ASTM C94
Minimum Cement Content	5.5 sacks/cu. yd.
Cement Type	Type I Portland
Concrete Aggregate	ASTM C33 and CalTrans Section 703
Aggregate Size	1-inch maximum
Maximum Water Content	0.50 lb/lb of cement
Maximum Allowable Slump	4 inches

9.4.2 Jointing and Reinforcement

Longitudinal and transverse joints should be provided as needed in concrete pavements for expansion/contraction and isolation. Sawed joints should be cut within 24-hours of concrete placement, and should be a minimum of 25% of slab thickness plus 1/4 inch. All joints should be sealed to prevent entry of foreign material and doweled where necessary for load transfer.

Load transfer devices, such as dowels or keys are recommended at joints in the paving to reduce possible offsets. Where dowels cannot be used at joints accessible to wheel loads, pavement thickness should be increased by 25 percent at the joints and tapered to regular thickness in 5 feet.

10.0 REFERENCES

10.1 Site Specific

10.1.1 Design

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10.1.2 Previous Geotechnical

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10.3 Site Setting

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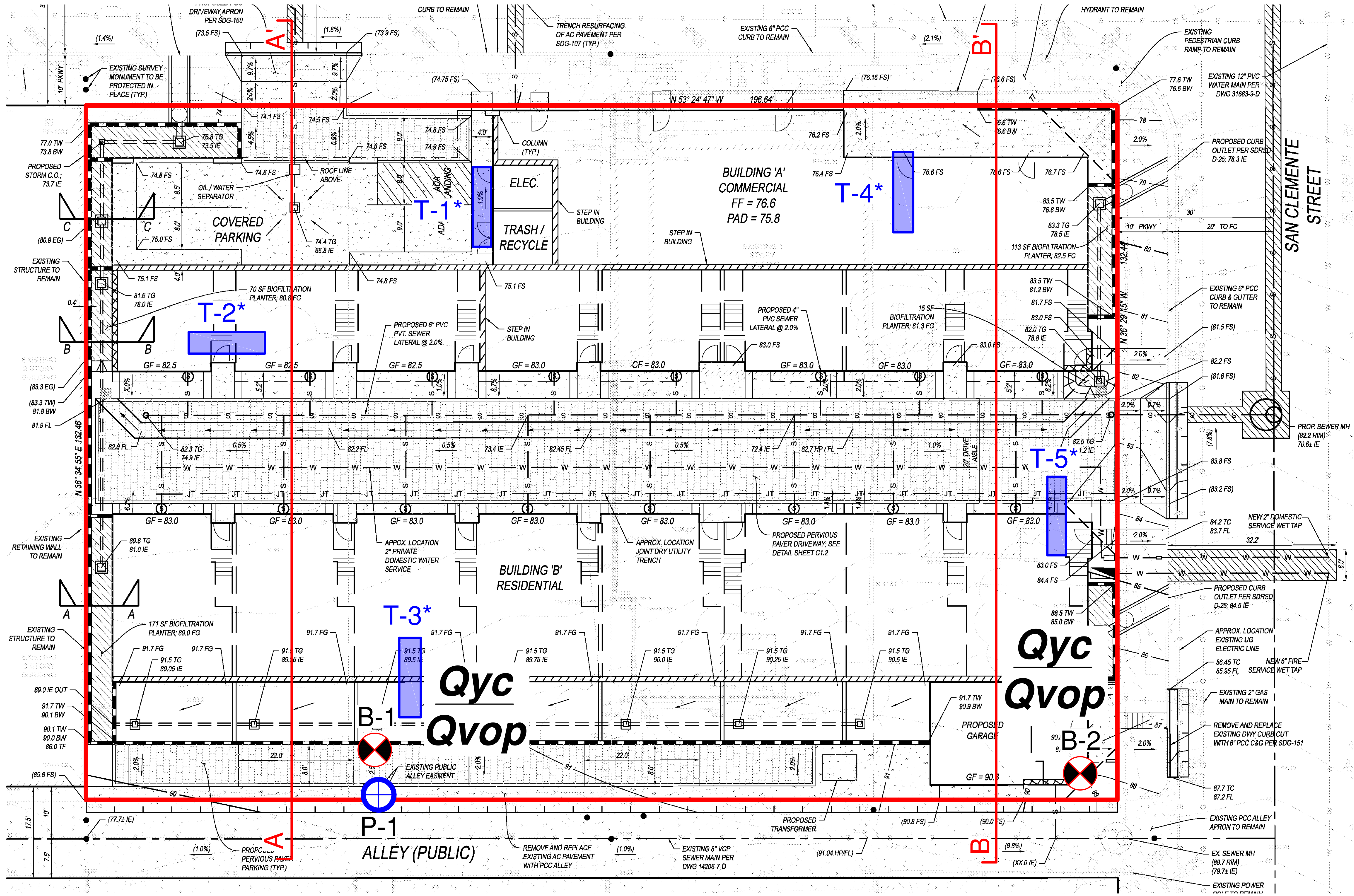
PLATES

Plate 1: Subsurface Investigation Map

Plate 2: Geologic Cross Sections Map

NOVA



KEY TO SYMBOLS

Qyc	YOUNG COLLUVIAL DEPOSITS
Qvop	VERY OLD PARALIC DEPOSITS
B-2	LOCATION OF GEOTECHNICAL BORING
P-1	LOCATION OF PERCOLATION TEST BORING
T-5	APPROXIMATE TRENCH LOCATION (AET 2007) *ASTERISKED WHERE PROJECTED
?	GEOLOGIC CONTACT INFERRED WERE NOT ENCOUNTERED
B B'	GEOLOGIC CROSS SECTION

NOVA
4373 VIEWRIDGE AVENUE, SUITE B
SAN DIEGO, CALIFORNIA

858-292-7575
858-292-7570 (FAX)

WWW.USA-NOVA.COM

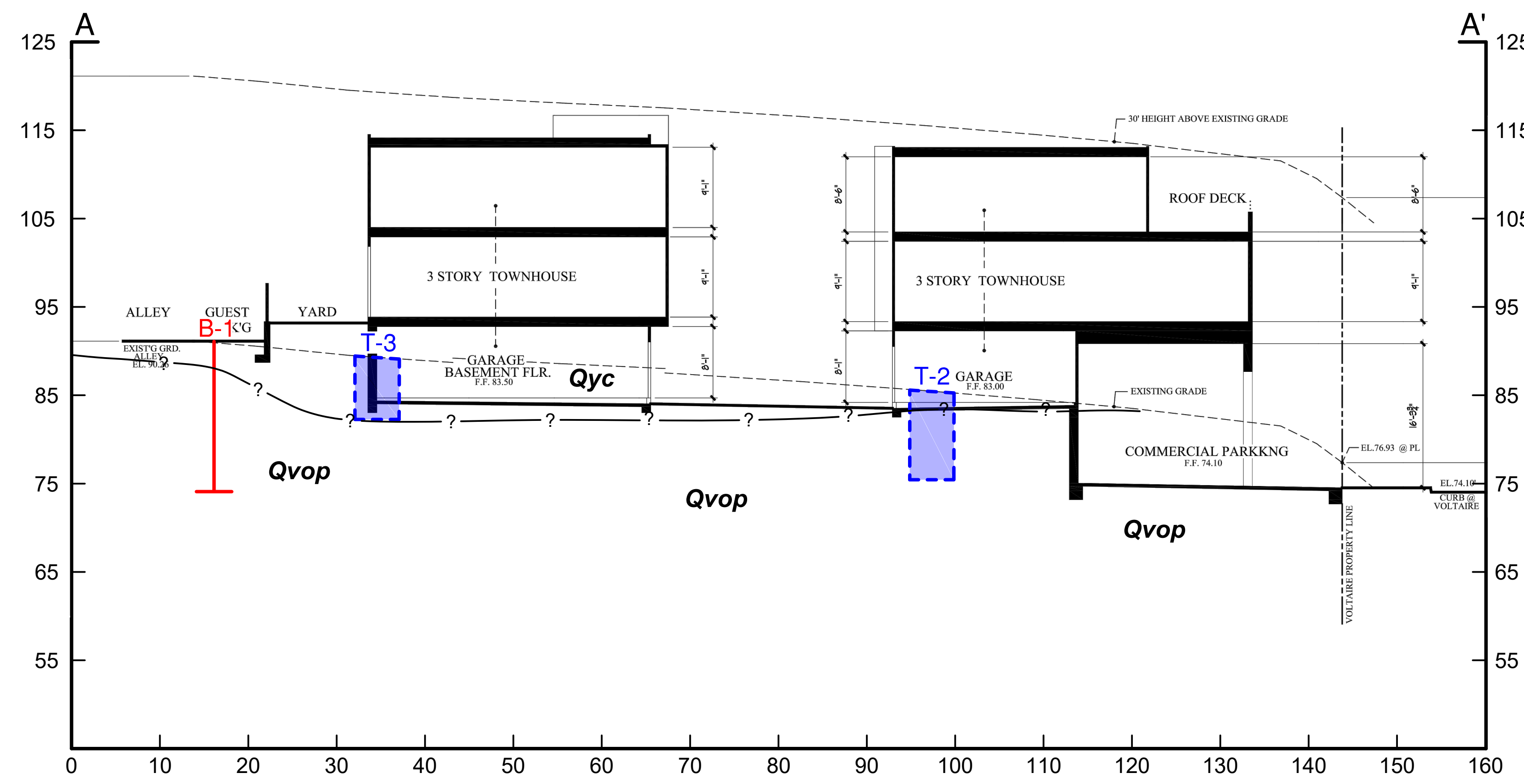
VOLTAIRE
4103 VOLATAIRE ST
SAN DIEGO, CA

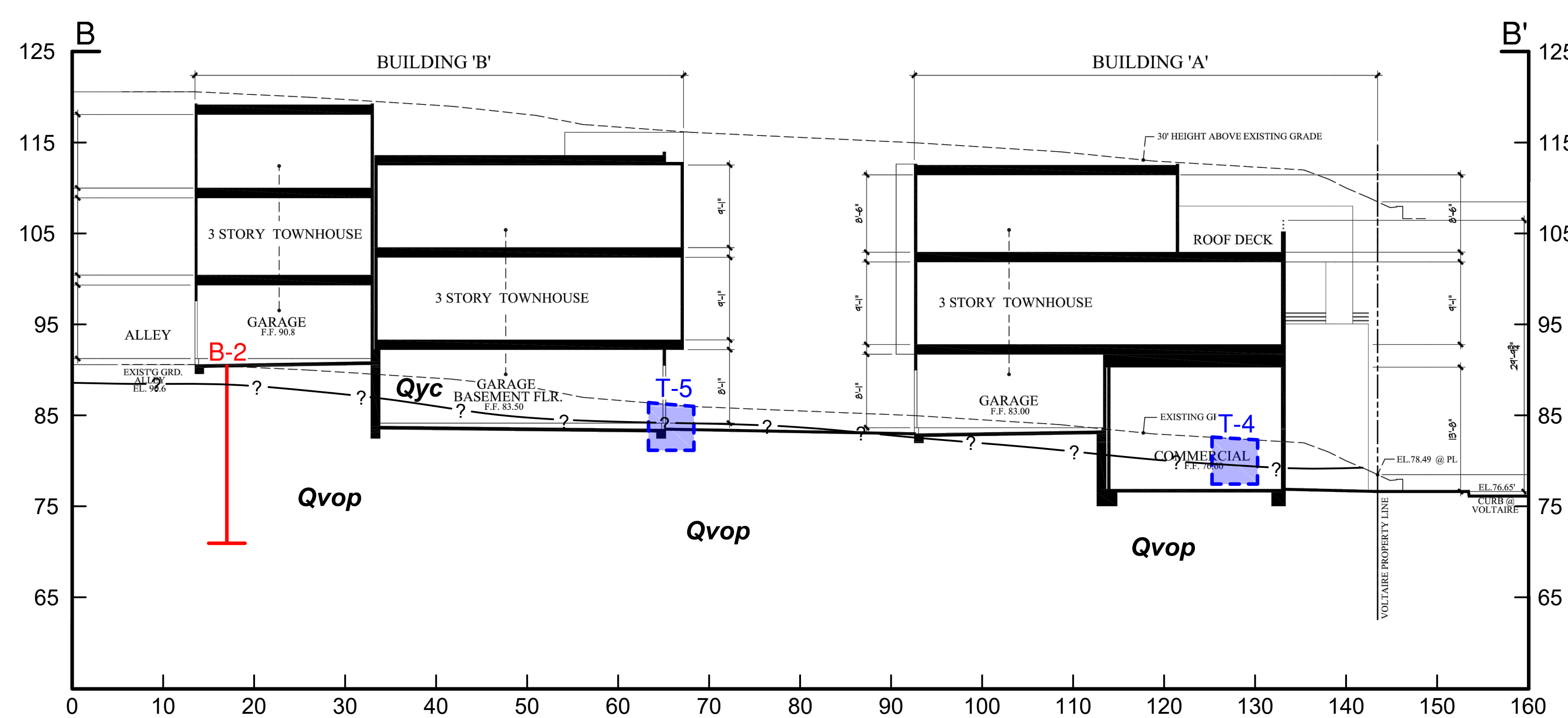
PROJECT NO:	2019147
DATE:	AUG 2019
DRAWN BY:	HM
REVIEWED BY:	WM

SUBSURFACE INVESTIGATION MAP

0 20 40

PLATE 1





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Qyc	YOUNG COLLUVIAL DEPOSITS
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SAN DIEGO, CALIFORNIA

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858-292-7570 (FAX)

WWW.USA-NOVA.COM

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GEOLOGIC CROSS SECTION MAP

N W E S

0 20 40

PLATE 2

APPENDIX A

USE OF THE GEOTECHNICAL REPORT

NOVA

Important Information About Your

Geotechnical Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

The following information is provided to help you manage your risks.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared *solely* for the client. No one except you should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you* — should apply the report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

A Geotechnical Engineering Report Is Based on A Unique Set of Project-Specific Factors

Geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical engineering report that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,
- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that existed at the time the study was performed. *Do not rely on a geotechnical engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ—sometimes significantly—from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are *Not* Final

Do not overrely on the construction recommendations included in your report. *Those recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations only by observing actual subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's recommendations if that engineer does not perform construction observation.*

A Geotechnical Engineering Report Is Subject to Misinterpretation

Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Lower that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Contractors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure contractors have sufficient time* to perform additional study. Only then might you be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and contractors do not recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations" many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform a *geoenvironmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical engineering report does not usually relate any geoenvironmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own geoenvironmental information, ask your geotechnical consultant for risk management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, a number of mold prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; ***none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.***

Rely, on Your ASFE-Member Geotechncial Engineer for Additional Assistance

Membership in ASFE/The Best People on Earth exposes geotechnical engineers to a wide array of risk management techniques that can be of genuine benefit for everyone involved with a construction project. Confer with you ASFE-member geotechnical engineer for more information.

ASFE
The Best People on Earth

8811 Colesville Road/Suite G106, Silver Spring, MD 20910
Telephone: 301/565-2733 Facsimile: 301/589-2017
e-mail: info@asfe.org www.asfe.org

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APPENDIX B

LOGS OF BORINGS AND TRENCHES

BORING LOG B-1

DATE EXCAVATED:	JULY 11, 2019	**EQUIPMENT:**	IR A300
EXCAVATION DESCRIPTION:	8-INCH DIAMETER AUGER BORING	**GPS COORD.:**	N/A
GROUNDWATER DEPTH:	GROUNDWATER NOT ENCOUNTERED	**ELEVATION:**	± 89 FT MSL

LAB TEST ABBREVIATIONS

CR	CORROSIVITY
MD	MAXIMUM DENSITY
DS	DIRECT SHEAR
EI	EXPANSION INDEX
AL	ATTERBERG LIMITS
SA	SIEVE ANALYSIS
RV	RESISTANCE VALUE
CN	CONSOLIDATION
SE	SAND EQUIVALENT

DEPTH (FT)	GRAPHIC LOG	BULK SAMPLE	CAL/SPT SAMPLE	SOIL CLASS. (USCS)	BLOWS PER 12-INCHES	SOIL DESCRIPTION *SUMMARY OF SUBSURFACE CONDITIONS* *(USCS; COLOR, MOISTURE, DENSITY, GRAIN SIZE, OTHER)*	LABORATORY	REMARKS
0				SM		**COLLUVIUM (Qyc):** *SILTY SAND; BROWN, DRY, MEDIUM DENSE, FINE GRAINED*		
				SC-CL	19	*CLAYEY SAND-SANDY CLAY; OLIVE GRAY MOTTLED BROWN, DAMP TO MOIST, MEDIUM DENSE-STIFF TO VERY STIFF, FINE GRAINED*	AL SA	
				SM	50/3"	**VERY OLD PARALIC DEPOSITS (Qvop):** *SILTY SANDSTONE; ORANGE BROWN, DRY TO DAMP, VERY DENSE, FINE GRAINED*		
5					50/5.5"			
						LIGHT YELLOW BROWN	SA	
					50/5.5"	*GRAY CLAYSTONE LENSE*		
10				SM-ML	50/5"	*SILTY SANDSTONE-SANDY SILTSTONE; GRAY BROWN, DAMP, VERY DENSE-HARD, FINE GRAINED*		
						SOME CLAY		
					55			
15				SM	56	*SILTY SANDSTONE; GRAY BROWN, DAMP, VERY DENSE, FINE GRAINED*		
						BORING TERMINATED AT 17 FT. NO GROUNDWATER ENCOUNTERED. NO CAVING.		
20								
25								
30								

KEY TO SYMBOLS

▼/▽	GROUNDWATER / STABILIZED	#	ERRONEOUS BLOW COUNT
⊠	BULK SAMPLE	*	NO SAMPLE RECOVERY
◫	SPT SAMPLE (ASTM D1586)	———	GEOLOGIC CONTACT
■	CAL. MOD. SAMPLE (ASTM D3550)	— — —	SOIL TYPE CHANGE

17 ON VOLTAIRE
VOLTAIRE STREET AND SAN CLEMENTE STREET
SAN DIEGO, CALIFORNIA

LOGGED BY:	DEM	DATE:	AUG 2019
REVIEWED BY:	BMH	PROJECT NO.:	2019147

NOVA

APPENDIX B.1

BORING LOG B-2

DATE EXCAVATED: JULY 11, 2019 — **EQUIPMENT:** IR A300

EXCAVATION DESCRIPTION: 8-INCH DIAMETER AUGER BORING — **GPS COORD.:** N/A

GROUNDWATER DEPTH: GROUNDWATER NOT ENCOUNTERED — **ELEVATION:** ± 89 FT MSL

LAB TEST ABBREVIATIONS

CR	CORROSIVITY
MD	MAXIMUM DENSITY
DS	DIRECT SHEAR
EI	EXPANSION INDEX
AL	ATTERBERG LIMITS
SA	SIEVE ANALYSIS
RV	RESISTANCE VALUE
CN	CONSOLIDATION
SE	SAND EQUIVALENT

DEPTH (FT)	GRAPHIC LOG	BULK SAMPLE	CAL/SPT SAMPLE	SOIL CLASS. (USCS)	BLOWS PER 12-INCHES	SOIL DESCRIPTION *SUMMARY OF SUBSURFACE CONDITIONS* *(USCS; COLOR, MOISTURE, DENSITY, GRAIN SIZE, OTHER)*	LABORATORY	REMARKS
0						*2 INCHES OF ASPHALT CONCRETE OVER 10 INCHES OF AGGREGATE BASE*		
		⊠	CAL. MOD.	SM-SC	75	**COLLUVIUM (Qyc):** *SILTY CLAYEY SAND; DARK ORANGE BROWN, DAMP, VERY DENSE, FINE TO MEDIUM GRAINED*		
		⊠	SPT	SM	50/5.5"	**VERY OLD PARALIC DEPOSITS (Qvop):** *SILTY SANDSTONE; ORANGE BROWN, DAMP, VERY DENSE, FINE GRAINED*		
5			CAL. MOD.		50/3.5"	*ORANGE BROWN MOTTLED WITH LIGHT BROWN*		
		⊠					CR	
10			SPT		50/5.5"			
15		⊠	SPT		55	*LIGHT BROWN*		
			CAL. MOD.		50/4"			
			SPT		61			
20						*BORING TERMINATED AT 19.5 FT. NO GROUNDWATER ENCOUNTERED. NO CAVING.*		
25								
30								

KEY TO SYMBOLS

▼/▽	GROUNDWATER / STABILIZED	#	ERRONEOUS BLOW COUNT
⊠	BULK SAMPLE	*	NO SAMPLE RECOVERY
◿	SPT SAMPLE (ASTM D1586)	———	GEOLOGIC CONTACT
■	CAL. MOD. SAMPLE (ASTM D3550)	— — —	SOIL TYPE CHANGE

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SAN DIEGO, CALIFORNIA

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LOGGED BY:	DEM	DATE:	AUG 2019
REVIEWED BY:	BMH	PROJECT NO.: 2019147	APPENDIX B.2

PERCOLATION BORING LOG P-1

DATE EXCAVATED:	JULY 11, 2019	**EQUIPMENT:**	IR A300
EXCAVATION DESCRIPTION:	8-INCH DIAMETER AUGER BORING	**GPS COORD.:**	N/A
GROUNDWATER DEPTH:	GROUNDWATER NOT ENCOUNTERED	**ELEVATION:**	± 89 FT MSL

LAB TEST ABBREVIATIONS

CR	CORROSIVITY
MD	MAXIMUM DENSITY
DS	DIRECT SHEAR
EI	EXPANSION INDEX
AL	ATTERBERG LIMITS
SA	SIEVE ANALYSIS
RV	RESISTANCE VALUE
CN	CONSOLIDATION
SE	SAND EQUIVALENT

DEPTH (FT)	GRAPHIC LOG	BULK SAMPLE	CAL/SPT SAMPLE	SOIL CLASS. (USCS)	BLOWS PER 12-INCHES	**SOIL DESCRIPTION** *SUMMARY OF SUBSURFACE CONDITIONS (USCS; COLOR, MOISTURE, DENSITY, GRAIN SIZE, OTHER)*	LABORATORY	REMARKS
0				SM		**COLLUVIUM (Qyc):** *SILTY SAND; BROWN, DRY, MEDIUM DENSE, FINE GRAINED*		
				SC-CL		*CLAYEY SAND-SANDY CLAY; OLIVE GRAY MOTTLED BROWN, DAMP TO MOIST, MEDIUM DENSE-STIFF TO VERY STIFF, FINE GRAINED*		
				SM		**VERY OLD PARALIC DEPOSITS (Qvop):** *SILTY SANDSTONE; ORANGE BROWN, DRY TO DAMP, VERY DENSE, FINE GRAINED*		
5								
						BORING TERMINATED AT 5.5 FT AND CONVERTED TO A PERCOLATION WELL.		
10								
15								
20								
25								
30								

KEY TO SYMBOLS

▼/▽	GROUNDWATER / STABILIZED	#	ERRONEOUS BLOW COUNT
☒	BULK SAMPLE	*	NO SAMPLE RECOVERY
◩	SPT SAMPLE (ASTM D1586)	———	GEOLOGIC CONTACT
■	CAL. MOD. SAMPLE (ASTM D3550)	— — —	SOIL TYPE CHANGE

17 ON VOLTAIRE
VOLTAIRE STREET AND SAN CLEMENTE STREET
SAN DIEGO, CALIFORNIA

LOGGED BY:	DEM	DATE:	AUG 2019
REVIEWED BY:	BMH	PROJECT NO.: 2019147	

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APPENDIX B.3

TRENCH LOG SHEET

TRENCH NO. 1

FT.		DESCRIPTION	SOIL TYPE
0		Brown, very dry, loose	SILTY FINE SAND (SM)
1			
2	①	Very light brown	
3	②	Light brown, moist, medium dense (colluvium)	CLAYEY SAND (SC) 9.6* 109.9*
4		Light brown, moist, medium dense (Bay Point Formation)	SILTY FINE SAND (SM)
5	③		
6			
7			
8			
9		Dense	
10			
11			
12			

BOTTOM OF TRENCH (NO REFUSAL)

LEGEND

* – Indicates in-situ density test

○ – Indicates representative sample

Project No. 07-1268B7

Figure No. 3

TRENCH LOG SHEET

TRENCH NO. 2

FT.	DESCRIPTION	SOIL TYPE
0	Brown, very dry, loose	SILTY FINE SAND (SM)
1	(collivium)	
2		
3	Light brown, moist, medium dense (Bay Point Formation)	SILTY FINE SAND (SM)
4		
5	Dense	
6		
7		
8		
9	Very dense	
10		

BOTTOM OF TRENCH (NO REFUSAL)

TRENCH LOG SHEET

TRENCH NO. 3

FT.		DESCRIPTION	SOIL TYPE
0 1		Brown, very dry, loose	SILTY FINE SAND (SM)
2 3 4	①	Light brown/gray, moist dense (colluvium)	CLAYEY SAND (SC)
5 6 7		Light brown, damp, dense Very dense	SILTY FINE SAND (SM)

BOTTOM OF TRENCH (REFUSAL ON DENSE FORMATION)

Project No. 07-1268B7

Figure No. 5

TRENCH LOG SHEET

TRENCH NO. 4

FT.	DESCRIPTION	SOIL TYPE
0 1 2 3	Brown, dry, loose (colluvium) ① Medium dense	SILTY SANDS (SM) 11.0*107.3*86.5%*
4 5	Light reddish brown, moist, dense, cemented (Bay Point Formation) ②	SILTY FINE SAND (SM)

Bottom of Trench (Refusal in dense formational soil)

TRENCH LOG SHEET

TRENCH NO. 5

FT.	DESCRIPTION	SOIL TYPE
0 1 2	Light brown, dry, loose (colluvium) ①	SILTY SANDS (SM)
3 4 5	Light brown/medium gray moist, dense (Bay Point Formation) Cemented ② Very dense	SILTY SANDS (SM)

Bottom of Trench (Refusal in dense formational soil)

APPENDIX C

RECORDS OF LABORATORY TESTING

NOVA

Laboratory tests were performed in accordance with the generally accepted American Society for Testing and Materials (ASTM) test methods or suggested procedures. Brief descriptions of the tests performed are presented below:

- **CLASSIFICATION:** *Field classifications were verified in the laboratory by visual examination. The final soil classifications are in accordance with the Unified Soils Classification System and are presented on the exploration logs in Appendix B.*
- **ATTERBERG LIMITS (ASTM D 4318):** *Tests were performed on selected representative fine-grained soil samples to evaluate the liquid limit, plastic limit, and plasticity index in general accordance with ASTM D 4318. These test results were utilized to evaluate the soil classification in accordance with the Unified Soil Classification System.*
- **CORROSIVITY TEST (CAL. TEST METHOD 417, 422, 643):** *Soil PH, and minimum resistivity tests were performed on a representative soil sample in general accordance with test method CT 643. The sulfate and chloride content of the selected sample were evaluated in general accordance with CT 417 and CT 422, respectively.*
- **GRADATION ANALYSIS (ASTM C 136 and/or ASTM D422):** *Tests were performed on selected representative soil samples in general accordance with ASTM D422. The grain size distributions of selected samples were determined in accordance with ASTM C 136 and/or ASTM D422. The results of the tests are summarized on Appendix C.3 and Appendix C.4.*

NOVA
4373 VIEWRIDGE AVENUE, SUITE B
SAN DIEGO, CALIFORNIA
PHONE: 858-292-7575 FAX: 858-292-7570

LAB TEST SUMMARY

17 ON VOLTAIRE
VOLTAIRE STREET AND SAN CLEMENTE STREET
SAN DIEGO, CALIFORNIA

BY: HP	DATE: AUG 2019	PROJECT: 2019147	APPENDIX: C.1

Atterberg Limits (ASTM D4318)

Sample Location	Sample Depth (ft.)	Liquid Limit, LL	Plastic Limit, PL	Plasticity Index, PI	USCS (% Finer than No. 40)
B-1	1.5 - 3	33	13	20	CL

Corrosivity (Cal. Test Method 417,422,643)

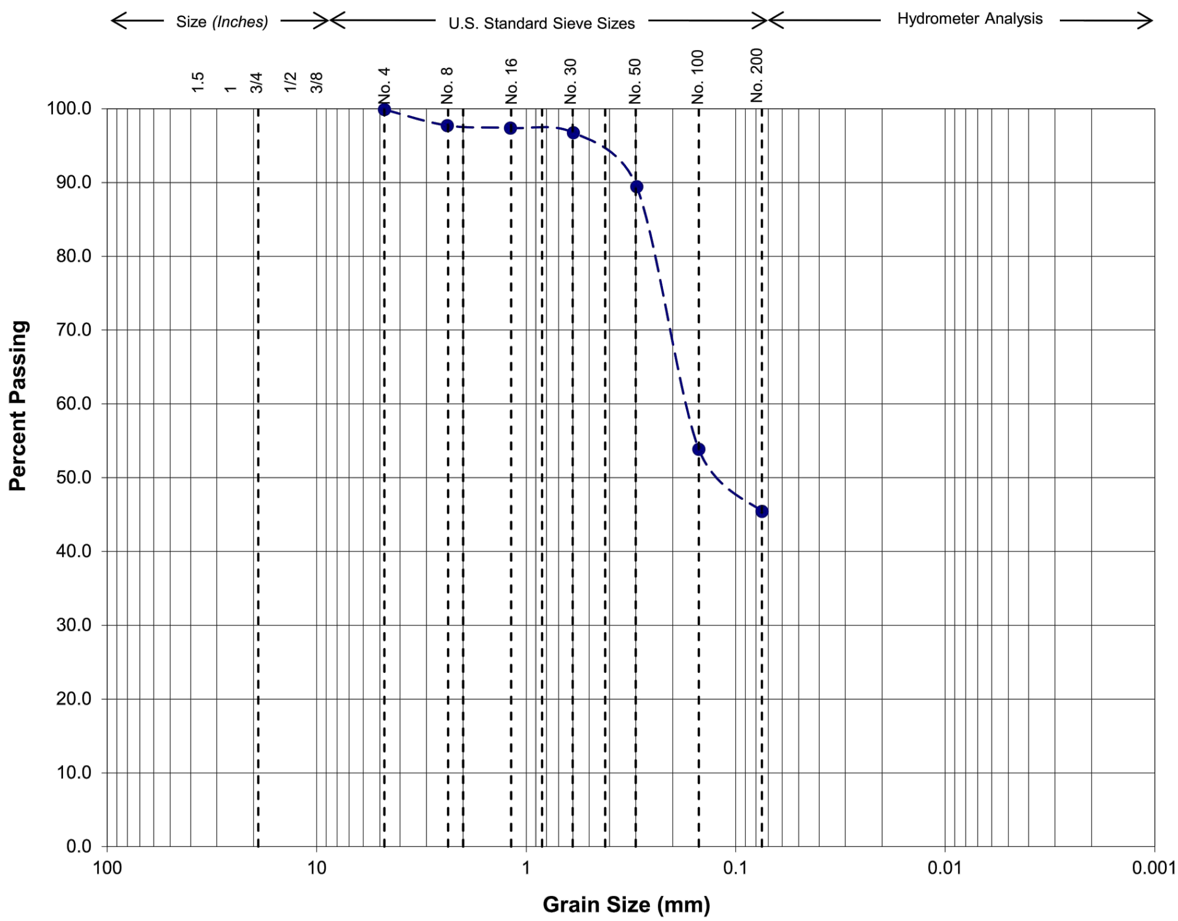
Sample Location	Sample Depth (ft.)	pH	Resistivity (Ohm-cm)	Sulfate Content (ppm)	Sulfate Content (%)	Chloride Content (ppm)	Chloride Content (%)
B-2	8 - 10	6.9	540	150	0.015	280	0.028

NOVA
4373 VIEWRIDGE AVENUE, SUITE B
SAN DIEGO, CALIFORNIA
PHONE: 858-292-7575 FAX: 858-292-7570

LAB TEST RESULTS

17 ON VOLTAIRE
VOLTAIRE STREET AND SAN CLEMENTE STREET
SAN DIEGO, CALIFORNIA

BY: HP	DATE: AUG 2019	PROJECT: 2019147	APPENDIX: C.2



Gravel		Sand			Silt or Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample Location: B-1

Depth (ft): 1.5 - 3

USCS Soil Type: SC-CL

Passing No. 200 (%): 45

NOVA
4373 VIEWRIDGE AVENUE, SUITE B
SAN DIEGO, CALIFORNIA
PHONE: 858-292-7575 FAX: 858-292-7570

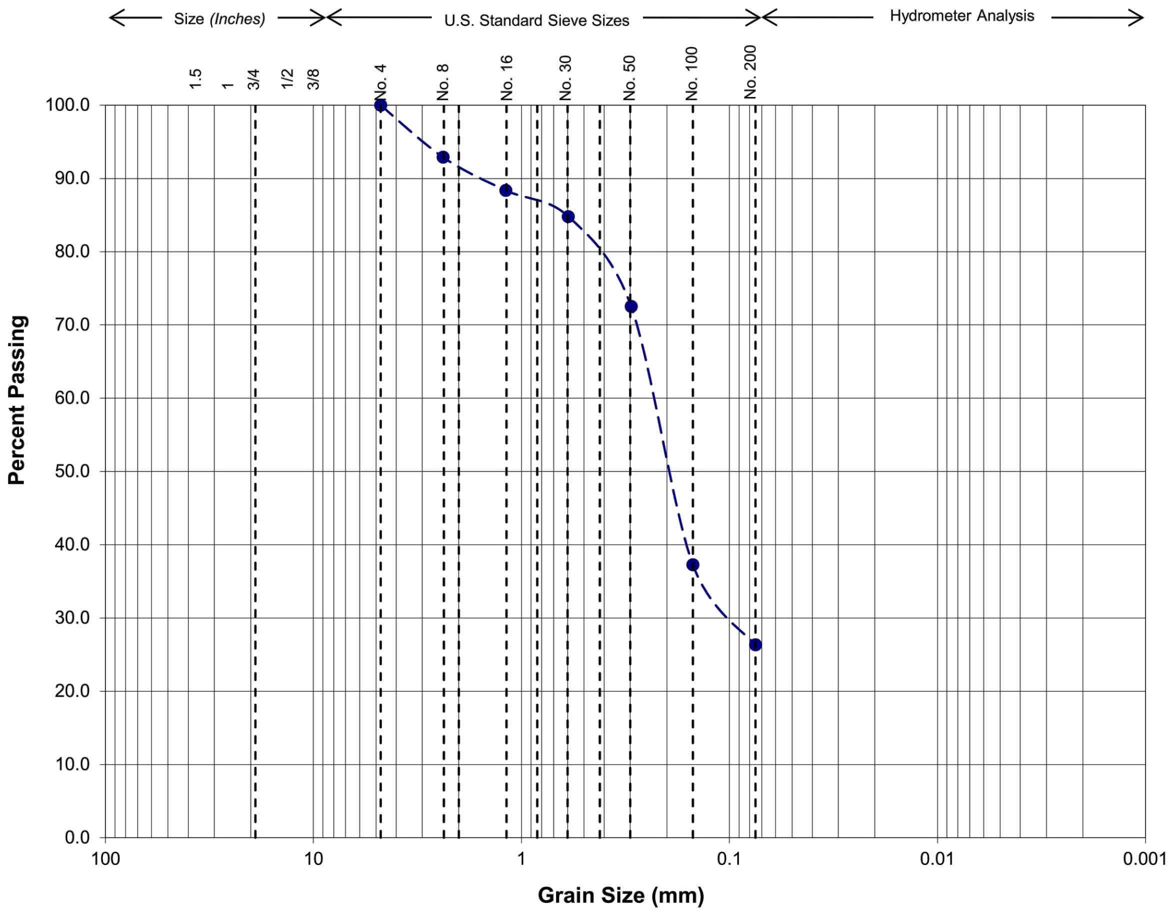
GRADATION ANALYSIS TEST RESULTS

17 ON VOLTAIRE

VOLTAIRE STREET AND SAN CLEMENTE STREET

SAN DIEGO, CALIFORNIA

BY: HP	DATE: AUG 2019	PROJECT: 2019147	APPENDIX: C.3



Gravel		Sand			Silt or Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample Location: B-2

Depth (ft): 5 - 7

USCS Soil Type: SM

Passing No. 200 (%): 26

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4373 VIEWRIDGE AVENUE, SUITE B
SAN DIEGO, CALIFORNIA
PHONE: 858-292-7575 FAX: 858-292-7570

GRADATION ANALYSIS TEST RESULTS

17 ON VOLTAIRE
VOLTAIRE STREET AND SAN CLEMENTE STREET
SAN DIEGO, CALIFORNIA

BY: HP	DATE: AUG 2019	PROJECT: 2019147	APPENDIX: C.4

APPENDIX D

STORMWATER INFILTRATION

(Infiltration Feasibility Condition Letter and Worksheet C.4-1: Form I-8A)

NOVA

NOVA

GEOTECHNICAL ■ MATERIALS ■ SPECIAL INSPECTIONS

SBE ■ SLBE ■ SCOOP

4373 Viewridge Avenue, Ste. B
San Diego, CA 92123
858.292.7575

CityMark Communities, LLC
3818 Park Boulevard
San Diego, CA 92103

August 02, 2019
NOVA Project No. 2019147

Attention Mr. Rich Gustafson

Subject: Assessment of Infiltration Feasibility
Proposed 17 on Voltaire Townhomes
Voltaire Street and San Clemente Street, San Diego, California

References: See Attachment.

Dear Mr. Gustafson:

The intent of this letter is to address the infiltration conditions and related feasibility for permanent stormwater Best Management Practices (‘stormwater BMPs’) for drainage management areas (DMAs) at the above-referenced site.

This letter has been prepared by NOVA Services, Inc. (NOVA) for CityMark Communities, LLC. NOVA is retained by CityMark Communities as Geotechnical Engineer-of-Record (GEOR) for the project.

Background

Current Site Use

The site is comprised of a collection of four parcels with the following APNs: 449-251-05, -06, -07 and -08-00. The eastern parcels are currently occupied by a pet care business and a surfboard repair business. The western parcels are vacant, used by the neighborhood as community gardens.

Review of aerial photography dating to 1994 indicates that the eastern parcels have been developed since at least 1994. The western parcels have been vacant since 2012, when the gardens were planted.

Planned Development

NOVA’s understanding of current planning for the development is based upon review of architectural documentation developed by The McKinley Associates (TMA 2019).

TMA 2019 indicates planning for a proposed residential townhouse and commercial development that will include the construction of two 3-story townhouse buildings and commercial space. The buildings will accommodate a total of 17 townhouses, ranging from 1,375 sf to 1,662 sf. Commercial space will be about 2,879 sf. The development will provide for parking for 44 vehicles in a partially below-grade basement garage. Figure 1 shows an elevation view of the development, depicting the manner by which the buildings will be adapted to the existing groundform.

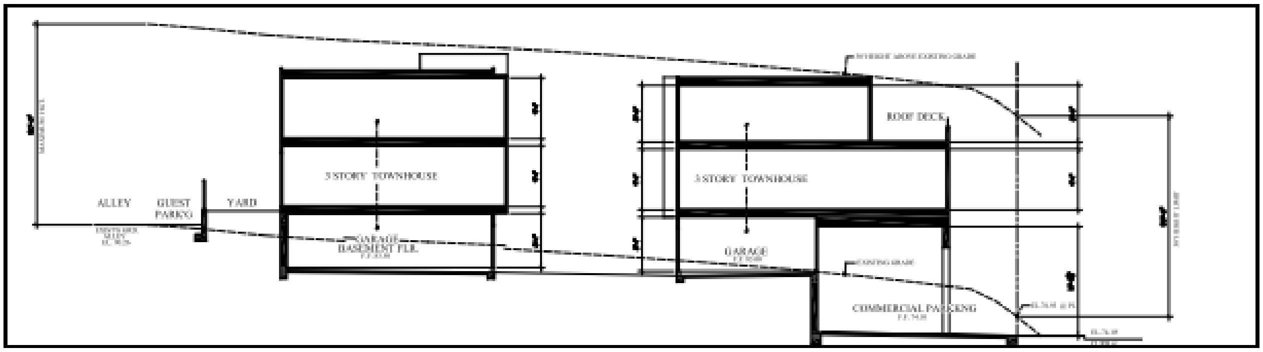

Figure 1. Elevation View of the Proposed Structure
(source: *TMA 2019)*

Proposed DMA

As the project plans are conceptual, permanent stormwater infiltration Best Management Practices (‘stormwater BMP’) locations are not identified. Figure 2 depicts the tested location.

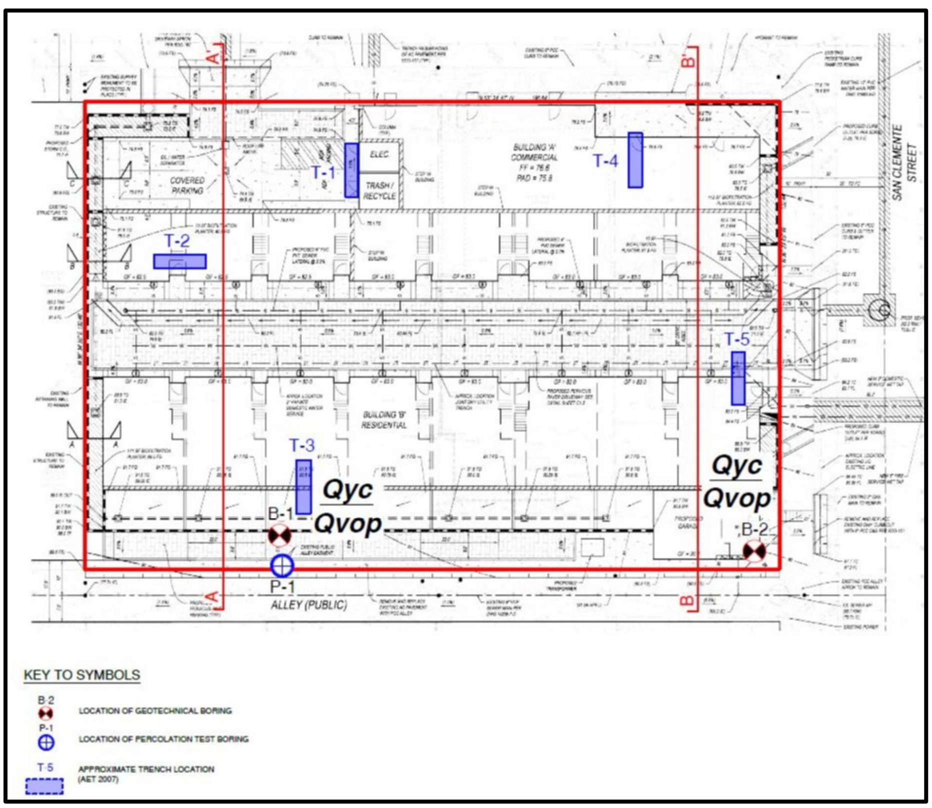

Figure 2. Percolation Test and Engineering Boring Locations
(source: adapted from *SDA 2019)*

Percolation Testing by NOVA

This site and the planned development have been the object of a prior geotechnical study by Allied Earth Technology (AET 2007). NOVA's work follows initial exploration of the site by excavation of five test trenches. Percolation testing was not completed by AET.

NOVA conducted percolation testing in the preliminary stages of planning for the site's development on July 11, 2019 and July 12, 2019. Testing was completed in accordance with procedures detailed in the referenced City of San Diego Storm Water Standards, Part 1 BMP Design Manual, October 2018 edition (San Diego 2018).

One percolation test boring ('P-1') was drilled to a depth of 5.5 feet below ground surface (bgs), into the formational soils. An exploratory engineering boring ('B-1') was drilled to 17 feet bgs near P-1. Table 1 summarizes the infiltration rate determined by the percolation testing at P-1.

Table 1. Infiltration Rate Determined by Percolation Testing

Boring	Approximate Ground Elevation (feet, msl)	Depth of Test (feet)	Approximate Test Elevation (feet, msl)	Infiltration Rate (inches/hour)	Design Infiltration Rate (in/hour, F=2*)
P-1	+89	5.5	+83.5	0.08	0.04

Notes: (1) 'F' indicates 'Factor of Safety' (2) elevations are approximate.

As may be seen by review of Table 1, a factor of safety (F) is applied to the infiltration rate (I) determined by the percolation testing. This factor of safety, at least F = 2 in local practice, considers the nature and variability of subsurface materials, as well as the natural tendency of infiltration structures to become less efficient with time. The calculated infiltration rate after applying F = 2 is I = 0.04 inches per hour. Full and partial BMPs are not required on sites with infiltration rates of less than 0.05 inches per hour.

Review of Geotechnical Feasibility Criteria

Overview

Section C.2.1 of Appendix C of the BMP Manual provides seven factors that should be considered by the project geotechnical professional while assessing the feasibility of infiltration related to geotechnical conditions. These factors are listed below.

- C.2.1.1 Soil and Geologic Conditions
- C.2.1.2 Settlement and Volume Change
- C.2.1.3 Slope Stability
- C.2.1.4 Utility Considerations
- C.2.1.5 Groundwater Mounding

- C.2.1.6 Retaining Walls and Foundations
- C.2.1.7 Other Factors

The above geotechnical feasibility criteria are reviewed in the following subsections.

Soil and Geologic Conditions

The soil borings and percolation test boring completed for this assessment disclose the sequence of soil units described below.

1. Unit 1, Colluvium. The site is covered by a mantle of 3 to 4.5 feet of clayey and sandy colluvium of medium dense consistency. Testing to determine expansion potential reported in AET 2007 shows the clayey zones of this unit to have Medium expansion potential after ASTM D 4829.

2. Unit 2, Paralics. The colluvium is underlain by dense sandstones of the Quaternary-aged Very Old Paralic deposits (Qvop). The unit is characteristically silty sandstone of very dense consistency. The locally extensive paralic deposits extend beyond the maximum depth explored by this work.

Settlement and Volume Change

The Unit 1 colluvium has Medium expansion potential, prone to swelling upon wetting and shrinkage upon drying. Introduction of water to this unit could create damaging foundation movement.

Slope Stability

Embankment stability for this site is not a constraint to BMPs.

Utilities

Stormwater infiltration BMPs should not be sited within 10 feet of underground utilities.

Groundwater Mounding

In consideration of the low measured percolation rates, it is likely that groundwater mounding will occur if stormwater infiltration is attempted in any scale. Groundwater mounding will likely result in damaging groundwater mounding during wet periods, affecting utilities, pavements, flat work, and foundations.

Retaining Wall and Foundations

Though structural design is incomplete, it is expected that retaining walls will be planned for the project to adapt the development to the existing groundform and to create below grade parking areas. Both retaining walls and shallow foundations could be affected by groundwater mounding associated with attempts to infiltrate stormwater.

Other Factors

The site has limited space to achieve the minimum setbacks from foundations, retaining walls, and possibly underground utilities.

Recommendation for 'No Infiltration'

It is NOVA's judgment that the site is not suitable for development of stormwater infiltration BMPs. This judgment is based upon consideration of the variety of factors detailed above; most significantly, the low design infiltration rate (I) of I = 0.04 inches per hour and related potential for groundwater mounding.

Closure

NOVA appreciates the opportunity to be of continued support to CityMark and its commitment to the San Diego area. Should you have any questions regarding this letter or other matters, please contact the undersigned at (858) 292-7575.

Sincerely,
NOVA Services, Inc.

Wail Mokhtar
Project Manager

Hillary A. Price
Staff Geologist

John F. O'Brien, P.E., G.E.
Principal Geotechnical Engineer

REGISTERED PROFESSIONAL ENGINEER
JOHN F. O'BRIEN
651
EXPIRES 3-31-2021
GEOTECHNICAL
STATE OF CALIFORNIA

ATTACHMENT

REFERENCES

1. AET 2007. *Soil Investigation, Proposed Mixed Use Apartment/Retail Complex Site, Southwest Corner of Voltaire Street And San Clemente St., San Diego, California,* Allied Earth Technology, Project 07-116B7, July 25, 2007.

2. San Diego 2018. *The City of San Diego Storm Water Standards, Part 1 BMP Design Manual,* October 2018 Edition, The City of San Diego.

3. TMA 2019. *17 on Voltaire, CityMark, Architectural Submittal Package,* The McKinley Associates, Inc., 14 June 2019.

4. NOVA 2019. *Report, Geotechnical Investigation, Proposed 17 on Voltaire Townhomes, Voltaire Street and San Clemente Street, San Diego, California,* NOVA Services, Inc., NOVA Project No. 2019147, August 02, 2019.

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

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

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

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

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

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

<table>
<tr><th colspan="2">Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions</th><th colspan="2">Worksheet C.4-1: Form I-8A[10]</th></tr>
<tr><td colspan="4">Criteria 2: Geologic/Geotechnical Screening</td></tr>
<tr><td>2A</td><td colspan="3">If all questions in Step 2A are answered “Yes,” continue to Step 2B.

For any “No” answer in Step 2A answer “No” to Criteria 2, and submit an “Infiltration Feasibility Condition Letter” that meets the requirements in Appendix C.1.1. The geologic/geotechnical analyses listed in Appendix C.2.1 do not apply to the DMA because one of the following setbacks cannot be avoided and therefore result in the DMA being in a no infiltration condition. The setbacks must be the closest horizontal radial distance from the surface edge (at the overflow elevation) of the BMP.</td></tr>
<tr><td>2A-1</td><td>Can the proposed full infiltration BMP(s) avoid areas with existing fill materials greater than 5 feet thick below the infiltrating surface?</td><td>☐ Yes</td><td>☐ No</td></tr>
<tr><td>2A-2</td><td>Can the proposed full infiltration BMP(s) avoid placement within 10 feet of existing underground utilities, structures, or retaining walls?</td><td>☐ Yes</td><td>☐ No</td></tr>
<tr><td>2A-3</td><td>Can the proposed full infiltration BMP(s) avoid placement within 50 feet of a natural slope (>25%) or within a distance of 1.5H from fill slopes where H is the height of the fill slope?</td><td>☐ Yes</td><td>☐ No</td></tr>
<tr><td>2B</td><td colspan="3">When full infiltration is determined to be feasible, a geotechnical investigation report must be prepared that considers the relevant factors identified in Appendix C.2.1.

If all questions in Step 2B are answered “Yes,” then answer “Yes” to Criteria 2 Result.
If there are “No” answers continue to Step 2C.</td></tr>
<tr><td>2B-1</td><td>Hydroconsolidation. Analyze hydroconsolidation potential per approved ASTM standard due to a proposed full infiltration BMP.

Can full infiltration BMPs be proposed within the DMA without increasing hydroconsolidation risks?</td><td>☐ Yes</td><td>☐ No</td></tr>
<tr><td>2B-2</td><td>Expansive Soils. Identify expansive soils (soils with an expansion index greater than 20) and the extent of such soils due to proposed full infiltration BMPs.

Can full infiltration BMPs be proposed within the DMA without increasing expansive soil risks?</td><td>☐ Yes</td><td>☐ No</td></tr>
</table>

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[10]	
2B-3	**Liquefaction**. If applicable, identify mapped liquefaction areas. Evaluate liquefaction hazards in accordance with Section 6.4.2 of the City of San Diego's Guidelines for Geotechnical Reports (2011 or most recent edition). Liquefaction hazard assessment shall take into account any increase in groundwater elevation or groundwater mounding that could occur as a result of proposed infiltration or percolation facilities. Can full infiltration BMPs be proposed within the DMA without increasing liquefaction risks?	☐ Yes	☐ No
2B-4	**Slope Stability**. If applicable, perform a slope stability analysis in accordance with the ASCE and Southern California Earthquake Center (2002) Recommended Procedures for Implementation of DMG Special Publication 117, Guidelines for Analyzing and Mitigating Landslide Hazards in California to determine minimum slope setbacks for full infiltration BMPs. See the City of San Diego's Guidelines for Geotechnical Reports (2011) to determine which type of slope stability analysis is required. Can full infiltration BMPs be proposed within the DMA without increasing slope stability risks?	☐ Yes	☐ No
2B-5	**Other Geotechnical Hazards.** Identify site-specific geotechnical hazards not already mentioned (refer to Appendix C.2.1). Can full infiltration BMPs be proposed within the DMA without increasing risk of geologic or geotechnical hazards not already mentioned?	☐ Yes	☐ No
2B-6	**Setbacks.** Establish setbacks from underground utilities, structures, and/or retaining walls. Reference applicable ASTM or other recognized standard in the geotechnical report. Can full infiltration BMPs be proposed within the DMA using established setbacks from underground utilities, structures, and/or retaining walls?	☐ Yes	☐ No

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

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

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

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

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

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[10]	
4B-3	**Liquefaction**. If applicable, identify mapped liquefaction areas. Evaluate liquefaction hazards in accordance with Section 6.4.2 of the City of San Diego's Guidelines for Geotechnical Reports (2011). Liquefaction hazard assessment shall take into account any increase in groundwater elevation or groundwater mounding that could occur as a result of proposed infiltration or percolation facilities. Can partial infiltration BMPs be proposed within the DMA without increasing liquefaction risks?	☐ Yes	☐ No
4B-4	**Slope Stability**. If applicable, perform a slope stability analysis in accordance with the ASCE and Southern California Earthquake Center (2002) Recommended Procedures for Implementation of DMG Special Publication 117, Guidelines for Analyzing and Mitigating Landslide Hazards in California to determine minimum slope setbacks for full infiltration BMPs. See the City of San Diego's Guidelines for Geotechnical Reports (2011) to determine which type of slope stability analysis is required. Can partial infiltration BMPs be proposed within the DMA without increasing slope stability risks?	☐ Yes	☐ No
4B-5	**Other Geotechnical Hazards.** Identify site-specific geotechnical hazards not already mentioned (refer to Appendix C.2.1). Can partial infiltration BMPs be proposed within the DMA without increasing risk of geologic or geotechnical hazards not already mentioned?	☐ Yes	☐ No
4B-6	**Setbacks.** Establish setbacks from underground utilities, structures, and/or retaining walls. Reference applicable ASTM or other recognized standard in the geotechnical report. Can partial infiltration BMPs be proposed within the DMA using recommended setbacks from underground utilities, structures, and/or retaining walls?	☐ Yes	☐ No
4C	**Mitigation Measures.** Propose mitigation measures for each geologic/geotechnical hazard identified in Step 4B. Provide a discussion on geologic/geotechnical hazards that would prevent partial infiltration BMPs that cannot be reasonably mitigated in the geotechnical report. See Appendix C.2.1.8 for a list of typically reasonable and typically unreasonable mitigation measures. Can mitigation measures be proposed to allow for partial infiltration BMPs? If the question in Step 4C is answered "Yes," then answer "Yes" to Criteria 4 Result. If the question in Step 4C is answered "No," then answer "No" to Criteria 4 Result.	☐ Yes	☐ No

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[10]	
Criteria 4 Result	Can infiltration of greater than or equal to 0.05 inches/hour and less than or equal to 0.5 inches/hour be allowed without increasing the risk of geologic or geotechnical hazards that cannot be reasonably mitigated to an acceptable level?	☐ Yes	☐ No
Summarize findings and basis; provide references to related reports or exhibits. For the complete infiltration feasibility evaluation see NOVA Services Inc., geotechnical study (reference, *Report, Geotechnical Investigation, Proposed 17 on Voltaire Townhouses, Voltaire Street and San Clemente Street, San Diego, CA,* NOVA Services Inc., Project No. 2019147, August 02, 2019.)			

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

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