The City of San Diego	**PRIORITY DEVELOPMENT PROJECT (PDP) STORM WATER QUALITY MANAGEMENT PLAN (SWQMP) FOR**

Strauss 5th & Walnut
Permit Application No. TBD
PTS_____
I.O. No. TBD

ENGINEER OF WORK:

FOR PLAN REVIEW ONLY

Andrew J. Kann, RCE 50940

PREPARED FOR:
City of San Diego
1222 First Avenue, MS 501
San Diego, CA 92101

PREPARED BY:

Omega Engineering Consultants, Inc.
4340 Viewridge Avenue, Suite B
San Diego, CA 92123
858-634-8620

DATE:
March 25, 2016

Approved by: City of San Diego Date

TABLE OF CONTENTS

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: **Strauss 5th & Walnut**
Permit Application Number: **TBD**

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.

PLAN CHECK ONLY

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

Andrew J. Kann

Print Name

Omega Engineering Consultants, Inc.

Company

Date

Engineer's Stamp

Project Name: Strauss 5th & Walnut

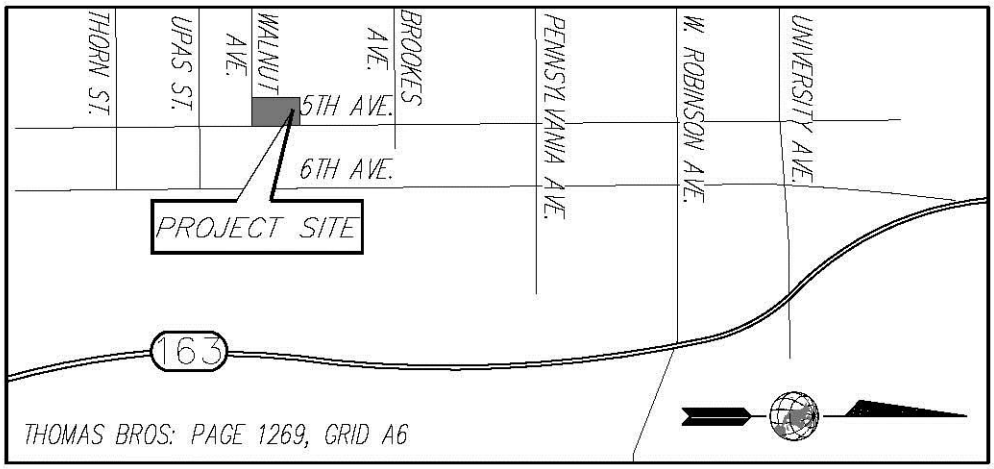
SUBMITTAL RECORD

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		◉ Preliminary Design/Planning/CEQA ○ Final Design	Initial Submittal
2	Enter a date.	○ Preliminary Design/Planning/CEQA ◉ Final Design	Click here to enter text.
3	Enter a date.	○ Preliminary Design/Planning/CEQA ◉ Final Design	Click here to enter text.
4	Enter a date.	◉ Preliminary Design/Planning/CEQA ○ Final Design	Click here to enter text.

PROJECT VICINITY MAP

Project Name: **Strauss 5th & Walnut**
Permit Application Number: **TBD**



VICINITY MAP

NOT TO SCALE

Project Name: Strauss 5th & Walnut

THE CITY OF SAN DIEGO	City of San Diego **Development Services** 1222 First Ave., MD-302 San Diego, CA 92101 (619) 446-5000	**Storm Water Requirements Applicability Checklist**	FORM **DS-560** February 2016

Project Address: 3500-3534 5th Avenue	Project Number *(for the City Use Only)*: Click here to enter 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 administrated by the State Water Resources 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.)

   ◉ 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 that results in ground disturbance and contact with storm water runoff?

   ◉ 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)

   ◉ 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 one of the following activities and associated curb/ sidewalk repair: water services, sewer lateral, storm drain lateral, or dry 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, curb and gutter replacement, and retaining wall encroachments.

   ☐ Yes; no document required

Check one of the boxes to the right, 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 processes 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 question 1-3, and checked "Yes" for question 4
PART B **does not apply and no document is required. Continue to Section 2.**

More information on the City's construction BMP requirements as well as CGP requirements can be found at:
www.sandiego.gov/stormwater/regulations/swguide/constructing.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 Stat e 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. A map of the ASBS watershed can he found here

2. ☐ High Priority

a. Projects 1 acre or more determined to be Risk Level 2 or Risk Level 3 per the Construction General Permit and not located in the ASBS watershed.

b. Projects 1 acre or more determined to be LUP Type 2 or LUP Type 3 per the Construction General Permit and not located in the ASBS watershed.

3. ☐ Medium Priority

a. Projects 1 acre or more but not subject to an ASBS or high priority designation.

b. Projects determined to be Risk Level 1 or LUP Type 1 per the Construction General Permit and not located in the ASBS watershed.

4. ☒ Low Priority

a. Projects not subject to ASBS, high or medium priority designation.

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

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?

   ◉ 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?

   ◉ No; PDP not exempt. PDP requirements apply.

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 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
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

Project Name: Strauss 5th & Walnut

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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
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 that creates 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 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 STORM WATER REQUIREMENTS**.	☐
2. The project is a **STANDARD 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 hydromodification management.	☒
Name of Owner or Agent *(Please Print)*: Mark Burt (Agent)	Title: Staff Engineer
Signature:	Date: March 24, 2016

Project Name: Strauss 5th & Walnut

Applicability of Permanent, Post-Construction Storm Water BMP Requirements (Storm Water Intake Form for all Development Permit Applications)	Form I-1

Project Identification

Project Name: Strauss 5th & Walnut	
Permit Application Number: TBD	Date: 3/25/16

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 Part 1 of Storm Water Standards 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 BMP Design Manual (Part 1 of Storm Water Standards) for guidance.	(●) Yes	Go to Step 2.
		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, Priority Development Project (PDP), or exception to PDP definitions? To answer this item, see Section 1.4 of the BMP Design Manual (Part 1 of Storm Water Standards) in its entirety for guidance, AND complete 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:		

Form I-1 Page 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 BMP Design Manual (Part 1 of Storm Water Standards) for guidance.	○ Yes	Consult the City Engineer to determine requirements. Provide discussion and identify requirements below. Go to Step 4.
	◉ No	BMP Design Manual PDP requirements apply. Go to Step 4.
Discussion / justification of prior lawful approval, and identify requirements (not required if prior lawful approval does not apply):		
Step 4. Do hydromodification control requirements apply? See Section 1.6 of the BMP Design Manual (Part 1 of Storm Water Standards) for guidance.	◉ Yes	PDP structural BMPs required for pollutant control (Chapter 5) and hydromodification control (Chapter 6). Go to Step 5.
	○ No	Stop. PDP structural BMPs required for pollutant control (Chapter 5) only. Provide brief discussion of exemption to hydromodification control below.
Discussion / justification if hydromodification control requirements do not apply:		
Step 5. Does protection of critical coarse sediment yield areas apply? See Section 6.2 of the BMP Design Manual (Part 1 of Storm Water Standards) for guidance.	○ Yes	Management measures required for protection of critical coarse sediment yield areas (Chapter 6.2). Stop.
	◉ No	Management measures not required for protection of critical coarse sediment yield areas. Provide brief discussion below. Stop.
Discussion / justification if protection of critical coarse sediment yield areas does not apply: Project is not within CCSYA		

Project Name: Strauss 5th & Walnut

Site Information Checklist For PDPs	Form I-3B
Project Summary Information	
Project Name	Strauss 5th & Walnut
Project Address	3500-3534 5th Avenue
Assessor's Parcel Number(s) (APN(s))	452-406-14, 15, 16, & 17
Permit Application Number	TBD
Project Watershed	Pueblo San Diego
Hydrologic subarea name with Numeric Identifier up to two decimal paces (9XX.XX)	908.21
Project Area (total area of Assessor's Parcel(s) associated with the project or total area of the right-of-way)	0.80 Acres
Area to be disturbed by the project (Project Footprint)	0.80 Acres
Project Proposed Impervious Area (subset of Project Footprint)	0.72 Acres
Project Proposed Pervious Area (subset of Project Footprint)	.08Acres
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.	The project decreases total site impervious area from 96.6% to 91.6%

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Description of Existing Site Condition and Drainage Patterns

Current Status of the Site (select all that apply):
☒ Existing development
☐ Previously graded but not built out
☐ Agricultural or other non-impervious use
☐ Vacant, undeveloped/natural
Description / Additional Information:

The project area is currently occupied by parking lots and two existing buildings.

Existing Land Cover Includes (select all that apply):
☐ Vegetative Cover
☐ Non-Vegetated Pervious Areas
☒ Impervious Areas
Description / Additional Information:

Underlying Soil belongs to Hydrologic Soil Group (select all that apply):
☐ NRCS Type A
☐ NRCS Type B
☐ NRCS Type C
☒ NRCS Type D

Approximate Depth to Groundwater (GW):

GW depth is Greater than 20 Feet.
Estimated to be greater than 100 fee to water table.

Existing Natural Hydrologic Features (select all that apply):
☐ Watercourses
☐ Seeps
☐ Springs
☐ Wetlands
☒ None
Description / Additional Information:
No natural features on site.

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.

Description / Additional Information:

1. Existing drainage is urban.
2. No offsite runoff is conveyed through the site.
3. The entire site drains to 5th Ave. to the east. All of the runoff then proceeds as gutter flow to a storm drain inlet on Fifth Ave. No storm water treatment or detention facilities exist on site.
4. The existing site is 0.80 acres and produces 4.67 cfs in the 100 year storm condition. The runoff produced by the site is conveyed overland to the curb on 5th Ave.

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 A muti-story apartment building with associated hardscape. The building will occupy a majority of the project area. There will also be several stories of underground parking.

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

Proposed impervious areas

- Building
- Walkways
- Driveways

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

Proposed pervious features

- Planters and landscape
- Bioretention areas

Does the project include grading and changes to site topography?

(●) Yes

( ) No

Description / Additional Information:

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

- Yes

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 site will have a new multi-story building that will drain to several Biofiltration BMPs. These BMP's will then discharge to the curb on Fifth Ave. at several locations along the property frontage. The entire project will drain to Fifth Ave. Due to a decrease in impervious area the site will discharge less to Fifth Ave. than what is currently existing. The 100 year discharge is 4.67 cfs and the proposed is 3.78 cfs.

The BMPs are integrated pollutant control and hydromodification control. Please see Attachment 2 for hydromodification.

Please see the drainage report (Attachment 5) for detailed calculations for flow production. Please see the DMA- Map (Attachment 1a &1b) for details on what part of the site each BMP treats.

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

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

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 discharge from the proposed site will flow on Fifth Ave. to a storm drain inlet where it enters the MS4 system. It will then flow to the San Diego Bay.
Provide a summary of all beneficial uses of receiving waters downstream of the project discharge locations. The Beneficial Uses for the San Diego Bay are as follows: BIOL, COMM, EST, IND, MAR, MIGR, NAV, RARE, REC1, REC2, SHELL, WILD
Identify all ASBS (areas of special biological significance) receiving waters downstream of the project discharge locations. No ASBS downstream
Provide distance from project outfall location to impaired or sensitive receiving waters. Approximately 1.3 miles to the San Diego Bay
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 N/A the area is urban.

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Identification of Receiving Water Pollutants of Concern

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

303(d) Impaired Water Body	Pollutant(s)/Stressor(s)	TMDLs/ WQIP Highest Priority Pollutant
San Diego Bay	PCBs	TMDL

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 BMP Design Manual (Part 1 of Storm Water Standards) Appendix B.6): **Biofiltration to be used**

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	○	◉	○

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Hydromodification Management Requirements

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

- (●) Yes, hydromodification management flow control structural BMPs required.
- ( ) No, the project will discharge runoff directly to existing underground storm drains discharging directly to water storage reservoirs, lakes, enclosed embayments, or the Pacific Ocean.
- ( ) No, the project will discharge runoff directly to conveyance channels whose bed and bank are concrete-lined all the way from the point of discharge to water storage reservoirs, lakes, enclosed embayments, or the Pacific Ocean.
- ( ) No, the project will discharge runoff directly to an area identified as appropriate for an exemption by the WMAA for the watershed in which the project resides.

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

Critical Coarse Sediment Yield Areas*

*This Section only required if hydromodification management requirements apply

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

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. The POC is the gutter of 5th Ave.
Has a geomorphic assessment been performed for the receiving channel(s)? (●) No, the low flow threshold is 0.1Q2 (default low flow threshold) ( ) Yes, the result is the low flow threshold is 0.1Q2 ( ) Yes, the result is the low flow threshold is 0.3Q2 ( ) Yes, the result is the low flow threshold is 0.5Q2 If a geomorphic assessment has been performed, provide title, date, and preparer:
Discussion / Additional Information: (optional)

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. N/A
Optional Additional Information or Continuation of Previous Sections As Needed
This space provided for additional information or continuation of information from previous sections as needed.

Project Name: Strauss 5th & Walnut

Source Control BMP Checklist for All Development Projects	Form I-4

Source Control BMPs

All development projects must implement source control BMPs SC-1 through SC-6 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?		
SC-1 Prevention of Illicit Discharges into the MS4	◉ Yes	○ No	○ N/A
Discussion / justification if SC-1 not implemented:			
SC-2 Storm Drain Stenciling or Signage	◉ Yes	○ No	○ N/A
Discussion / justification if SC-2 not implemented:			
SC-3 Protect Outdoor Materials Storage Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	○ Yes	○ No	◉ N/A
Discussion / justification if SC-3 not implemented: No outdoor storage areas proposed.			
SC-4 Protect Materials Stored in Outdoor Work Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	○ Yes	○ No	◉ N/A
Discussion / justification if SC-4 not implemented: No outdoor work areas proposed.			
SC-5 Protect Trash Storage Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	◉ Yes	○ No	○ N/A
Discussion / justification if SC-5 not implemented:			

Project Name: Strauss 5th & Walnut

Form I-4 Page 2 of 2			
Source Control Requirement	Applied?		
SC-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-related Uses	○ Yes	○ No	◉ N/A
Discussion / justification if SC-6 not implemented. Clearly identify which sources of runoff pollutants are discussed. Justification must be provided for all "No" answers shown above.			

Project Name: Strauss 5th & Walnut

Site Design BMP Checklist for All Development Projects	Form I-5

Site Design BMPs

All development projects must implement site design BMPs SD-1 through SD-8 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?		
SD-1 Maintain Natural Draiange Pathways and Hydrologic Features	○ Yes	○ No	◉ N/A
Discussion / justification if SD-1 not implemented: No natural hydrologic features or drainage pathways on site.			
1-1 Are existing natural drainage pathways and hydrologic features mapped on the site map?	○ Yes	○ No	◉ N/A
1-2 Are street trees implemented? If yes, are they shown on the site map?	○ Yes	○ No	◉ N/A
1-3 Implemented street trees meet the design criteria in SD-1 Fact Sheet (e.g. soil volume, maximum credit, etc.)?	○ Yes	○ No	◉ N/A
1-4 Is street tree credit volume calculated using Appendix B.2.2.1 and SD-1 Fact Sheet in Appendix E?	○ Yes	○ No	◉ N/A
SD-2 Have natural areas, soils and vegetation been conserved?	○ Yes	○ No	◉ N/A
Discussion / justification if SD-2 not implemented: No natural areas or vegetation currently on the existing site.			

Form I-5 Page 2 of 4			
Site Design Requirement	Applied?		
SD-3 Minimize Impervious Area	◉ Yes	○ No	○ N/A
Discussion / justification if SD-3 not implemented:			
SD-4 Minimize Soil Compaction	◉ Yes	○ No	○ N/A
Discussion / justification if SD-4 not implemented:			
SD-5 Impervious Area Dispersion	○ Yes	○ No	◉ N/A
Discussion / justification if SD-5 not implemented: Pervious area that the run-off is directed to is all Biofiltration basins.			
5-1 Is the pervious area receiving runon from impervious area identified on the site map?	○ Yes	◉ No	
5-2 Does the pervious area satisfy the design criteria in SD-5 Fact Sheet in Appendix E (e.g. maximum slope, minimum length, etc.)	○ Yes	◉ No	
5-3 Is impervious area dispersion credit volume calculated using Appendix B.2.1.1 and SD-5 Fact Sheet in Appendix E?	○ Yes	◉ No	

Project Name: Strauss 5th & Walnut

Form I-5 Page 3 of 4			
Site Design Requirement	Applied?		
SD-6 Runoff Collection	○ Yes	○ No	◉ N/A
Discussion / justification if SD-6 not implemented: Site collects runoff into Biofiltration basins. Small basin collection not implemented. Permeable pavement is not used because infiltration is not desired to protect underground parking structure and improvements.			
6a-1 Are green roofs implemented in accordance with design criteria in SD-6A Fact Sheet? If yes, are they shown on the site map?	○ Yes	◉ No	○ N/A
6a-2 Is green roof credit volume calculated using Appendix B.2.1.2 and SD-6A Fact Sheet in Appendix E?	○ Yes	○ No	◉ N/A
6b-1 Are permeable pavements implemented in accordance with design criteria in SD-6B Fact Sheet? If yes, are they shown on the site map?	○ Yes	◉ No	○ N/A
6b-2 Is permeable pavement credit volume calculated using Appendix B.2.1.3 and SD-6B Fact Sheet in Appendix E?	○ Yes	○ No	◉ N/A
SD-7 Landscaping with Native or Drought Tolerant Species	◉ Yes	○ No	○ N/A
Discussion / justification if SD-7 not implemented:			
SD-8 Harvesting and Using Precipitation	○ Yes	◉ No	○ N/A
Discussion / justification if SD-8 not implemented: No appreciable landscape demand. Currently no approved mechanisms and manufactured methods for reuse as toilet water.			
8-1 Are rain barrels implemented in accordance with design criteria in SD-8 Fact Sheet? If yes, are they shown on the site map?	○ Yes	◉ No	○ N/A
8-2 Is rain barrel credit volume calculated using Appendix B.2.2.2 and SD-8 Fact Sheet in Appendix E?	○ Yes	○ No	◉ N/A

Form I-5 Page 4 of 4
Insert Site Map with all site design BMPs identified:
See DMA Exhibit

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 steps of the BMP design manual were followed to select and design the pollutant control BMPs.

The first consideration was the feasibility of Harvest and Reuse. Upon our team's last discussion with city staff. There is no approved mechanism for using captured stormwater for toilet flushing. This along with very little landscaping results in Harvest and Reuse being considered infeasible.

The second consideration is the feasibility of infiltration. The site design has a multistory subterranean parking facility that extends past the building footprint. Feasible BMP areas are either located over or too close to the parking structure. Infiltration is considered infeasible due to the site's design. Based on a geotechnical investigation by Geocon Incorporated, Geocon recommends in their draft report that "Proper surface drainage will be important to future performance of the project.

With Infiltration and Harvesting both being infeasible. The project turns to Biofiltration. The project proposes 4 Biofiltration Basins that will also function as storage for hydromodification control. Therefore the proposed BMPs are integrated pollutant and hydromodification control.

(Continue on page 2 as necessary.)

Form I-6 Page 2 of 7
(Page reserved for continuation of description of general strategy for structural BMP implementation at the site)
(Continued from page 1)

Form I-6 Page 3 of 7 (Copy as many as needed)
Structural BMP Summary Information
Structural BMP ID No. BIO-1
Construction Plan Sheet No. TBD
Type of structural BMP: ○ Retention by harvest and use (HU-1) ○ Retention by infiltration basin (INF-1) ○ Retention by bioretention (INF-2) ○ Retention by permeable pavement (INF-3) ○ Partial retention by biofiltration with partial retention (PR-1) ◉ Biofiltration (BF-1) ○ Flow-thru treatment control 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 ○ Detention pond or vault for hydromodification management ○ Other (describe in discussion section below)
Purpose: Combined pollutant control and hydromodification control

Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563	Andrew J. Kann
Who will be the final owner of this BMP?	Owner
Who will maintain this BMP into perpetuity?	Owner
What is the funding mechanism for maintenance?	SWMDCMA (DS-3247) (To be provided in final engineering)

Form I-6 Page 4 of 7 (Copy as many as needed)
Structural BMP Summary Information
Structural BMP ID No. BIO-3
Construction Plan Sheet No. TBD
Type of structural BMP: ○ Retention by harvest and use (HU-1) ○ Retention by infiltration basin (INF-1) ○ Retention by bioretention (INF-2) ○ Retention by permeable pavement (INF-3) ○ Partial retention by biofiltration with partial retention (PR-1) ◉ Biofiltration (BF-1) ○ Flow-thru treatment control 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 ○ Detention pond or vault for hydromodification management ○ Other (describe in discussion section below)
Purpose: Combined pollutant control and hydromodification control

Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563	Andrew J. Kann
Who will be the final owner of this BMP?	Owner
Who will maintain this BMP into perpetuity?	Owner
What is the funding mechanism for maintenance?	SWMDCMA (DS-3247) (To be provided in final engineering)

Form I-6 Page 5 of 7 (Copy as many as needed)
Structural BMP Summary Information
Structural BMP ID No. BIO-4
Construction Plan Sheet No. TBD
Type of structural BMP: ○ Retention by harvest and use (HU-1) ○ Retention by infiltration basin (INF-1) ○ Retention by bioretention (INF-2) ○ Retention by permeable pavement (INF-3) ○ Partial retention by biofiltration with partial retention (PR-1) ◉ Biofiltration (BF-1) ○ Flow-thru treatment control 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 ○ Detention pond or vault for hydromodification management ○ Other (describe in discussion section below)
Purpose: Combined pollutant control and hydromodification control

Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563	Andrew J. Kann
Who will be the final owner of this BMP?	Owner
Who will maintain this BMP into perpetuity?	Owner
What is the funding mechanism for maintenance?	SWMDCMA (DS-3247) (To be provided in final engineering)

Form I-6 Page 6 of 7 (Copy as many as needed)
Structural BMP Summary Information
Structural BMP ID No. BIO-5
Construction Plan Sheet No. TBD
Type of structural BMP: ○ Retention by harvest and use (HU-1) ○ Retention by infiltration basin (INF-1) ○ Retention by bioretention (INF-2) ○ Retention by permeable pavement (INF-3) ○ Partial retention by biofiltration with partial retention (PR-1) ◉ Biofiltration (BF-1) ○ Flow-thru treatment control 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 ○ Detention pond or vault for hydromodification management ○ Other (describe in discussion section below)
Purpose: Combined pollutant control and hydromodification control

Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563	Andrew J. Kann
Who will be the final owner of this BMP?	Owner
Who will maintain this BMP into perpetuity?	Owner
What is the funding mechanism for maintenance?	SWMDCMA (DS-3247) (To be provided in final engineering)

Form I-6 Page 7 of 7 (Copy as many as needed)
Structural BMP ID No. BIO-1, BIO-3, BIO-4, & BIO-5
Construction Plan Sheet No. TBD

Biofiltration BMPs will consist of 18" select soil and 12" of "Rainstore3" made by Invisible Structures, Inc. The 12" of Rainstore3 is used in place of gravel to allow for more storage. This is shown in the calculations by allowing for more pore space. The Bioflitration BMPs will also be outfitted with low flow outlet orifices. The outlet orifices are sized per the hydromodification attachment.

Please see the DMA exhibit to see location and size of the Biofiltration basins. The DMA exhibit will also indicate the area treated by each BMP.

THE CITY OF SAN DIEGO	City of San Diego **Development Services** 1222 First Ave., MD-302 San Diego, CA 92101 (619) 446-5000	**Permanent BMP Construction** **Self-Certification Form**
		FORM DS-563 January 2016

Date Prepared: TBD	Project No.: Click here to enter text.
Project Applicant: Click here to enter text.	Phone: Click here to enter text.
Project Address: Click here to enter text.	
Project Engineer: Click here to enter text.	Phone: Click here to enter text.

The purpose of this form is to verify that the site improvements for the project, identified above, have been constructed in conformance with the approved Storm Water Quality Management Plan (SWQMP) documents and drawings.

This form must be completed by the engineer and submitted prior to final inspection of the construction permit. Completion and submittal of this form is required for all new development and redevelopment projects in order to comply with the City's Storm Water ordinances and NDPES Permit Order No. R9-2013-0001 as amended by R9-2015-0001 and R9-2015-0100. Final inspection for occupancy and/or release of grading or public improvement bonds may be delayed if this form is not submitted and approved by the City of San Diego.

CERTIFICATION:

As the professional in responsible charge for the design of the above project, I certify that I have inspected all constructed Low Impact Development (LID) site design, source control and structural BMP's required per the approved SWQMP and Construction Permit No. Click here to enter text.; and that said BMP's have been constructed in compliance with the approved plans and all applicable specifications, permits, ordinances and Order No. R9-2013-0001 as amended by R9-2015-0001 and R9-2015-0100 of the San Diego Regional Water Quality Control Board.

I understand that this BMP certification statement does not constitute an operation and maintenance verification.

Signature: _____

Date of Signature: _ Insert Date___

Printed Name: _Click here to enter text._

Title: _Click here to enter text._

Phone No. _Click here to enter text._

Engineer's Stamp

DS-563 (12-15)

ATTACHMENT 1
BACKUP FOR PDP POLLUTANT CONTROL BMPS

This is the cover sheet for Attachment 1.

Project Name: Strauss 5th & Walnut

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
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
Attachment 1d	Form I-8, Categorization of Infiltration Feasibility Condition (Required unless the project will use harvest and use BMPs) Refer to Appendices C and D of the BMP Design Manual to complete Form I-8.	◉ Included
Attachment 1e	Pollutant Control BMP Design Worksheets / Calculations (Required) Refer to Appendices B and E of the BMP Design Manual for structural pollutant control BMP design guidelines and site design credit calculations	☒ Included

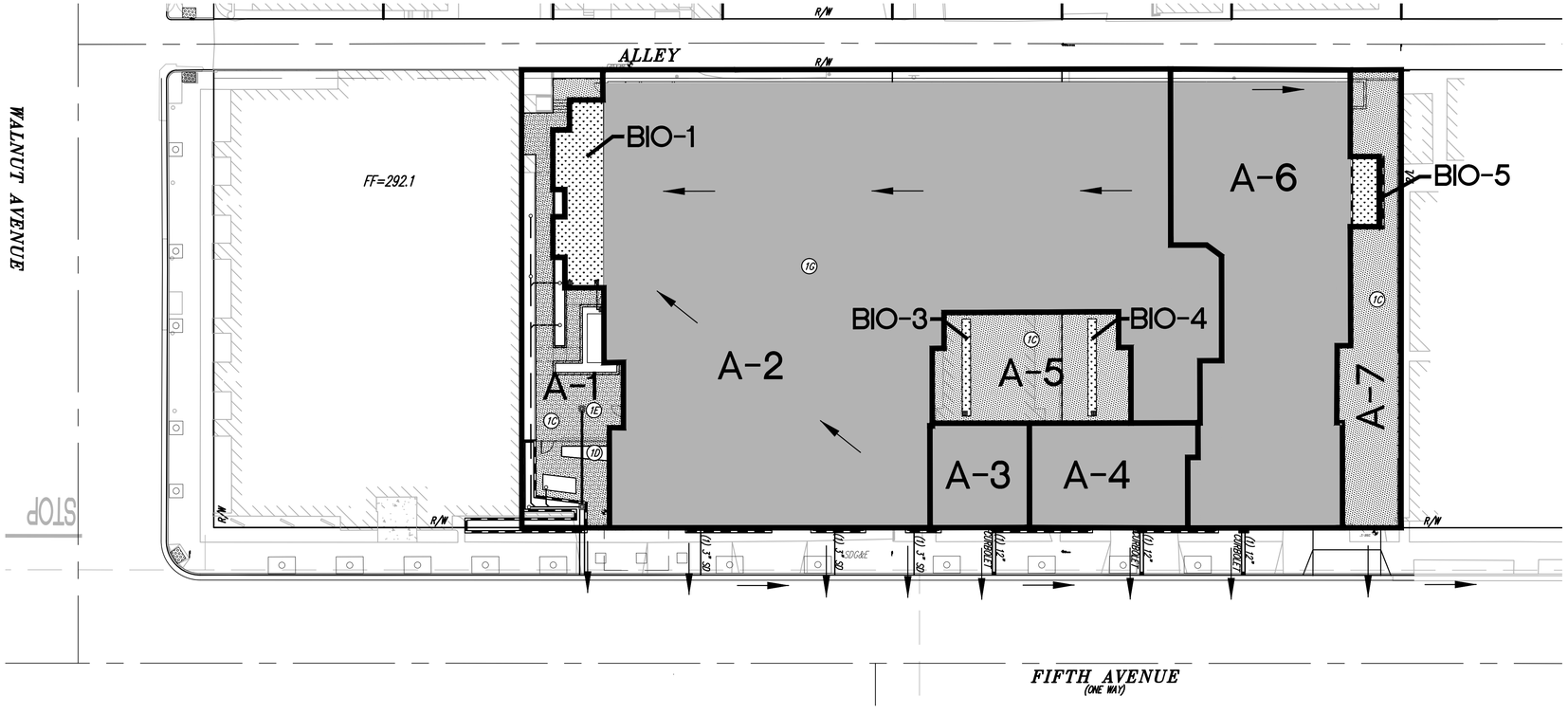
Project Name: Strauss 5th & Walnut

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, and size/detail)

5TH AND WALNUT
DMA EXHIBIT
ATTACHMENT 1a + 1b



LEGEND:

BASIN BOUNDARY	
DRAINAGE ARROWS	
DRAINAGE MANAGEMENT AREA NO.	A-#
INTEGRATED MANAGEMENT PRACTICE (IMP)	BIO-#
BUILDING AREA	
PAVEMENT AREA	
LANDSCAPED AREA	
BIOFILTRATION/PONDING AREA	

DMA DATA TABLE

DMA-NO.	TOT. AREA	IMPERVIOUS AREA	IMPERVIOUS %	DESIGN DCV	TYPE/TREATED BY
A-1	2,698 SF	1,619 SF	60.0%	–	DE MINIMUS AREA
A-2	19,782 SF	19,109 SF	96.6%	719 CF	BIO-1, BIOFILTRATION AREA
A-3	902 SF	902 SF	100%	34 CF	BIO-3, BIOFILTRATION AREA
A-4	1,471 SF	1,471 SF	100%	55 CF	BIO-4, BIOFILTRATION AREA
A-5	1,840 SF	1,696 SF	92.2%	–	DE MINIMUS AREA
A-6	6,323 SF	6,146 SF	97.2%	231 CF	BIO-5, BIOFILTRATION AREA
A-7	2,009 SF	2,009 SF	100%	–	DE MINIMUS AREA

STRUCTURAL BMP DATA TABLE

IMP-#	TREATING	REQUIRED FOOTPRINT**	FOOTPRINT GIVEN***	DESCRIPTION	DETAIL*
BIO-1	A-2	518 SF	671 SF	BIOFILTRATION BASIN	–
BIO-3	A-3	24 SF	72 SF	BIOFILTRATION BASIN	–
BIO-4	A-4	40 SF	72 SF	BIOFILTRATION BASIN	–
BIO-5	A-6	166 SF	174 SF	BIOFILTRATION BASIN	–

* DETAILS TO COME IN MINISTERIAL REVIEW

** REQUIRED FOOTPRINT FROM SIMPLE SIZING METHOD APPENDIX B.5 OF CITY OF SD STORMWATER STANDARDS MANUAL SEE CALCULATIONS SECTION FOR DETAILS OF BOTH DCV AND SIZING CALCULATIONS

*** GIVEN FOOTPRINT EXCEEDS WHAT IS REQUIRED FOR TREATMENT IN ORDER TO COMPLY WITH HYDROMODIFICATION WITHIN THE SAME BASINS

NOTES

1. UNDERLYING NRCS HYDROLOGIC SOIL GROUP FOR SITE IS TYPE D
2. GROUNDWATER DEPTH IS GREATER THAN 20 FEET. GROUNDWATER TABLE ESTIMATED TO BE IN EXCESS OF 100 FEET BELOW EXISTING GROUND. GROUNDWATER NOT CONSIDERED TO BE PRESENT.
3. NO EXISTING NATURAL HYDROLOGIC FEATURES
4. NO CRITICAL COARSE SEDIMENT YIELD AREAS ON SITE

SOURCE CONTROL BMP NOTES

ALL APPLICABLE SOURCE CONTROL BMPS SHALL BE UTILIZED

1.A. ALL ONSITE INLETS TO BE MARKED "NO DUMPING" OR SIMILAR AND ALL OPERATIONAL PRECAUTIONS TO AVOID NON STORM WATER DISCHARGE SHALL BE FOLLOWED PER THE CITY'S STORM WATER DESIGN MANUAL.

1.B. PROPOSED REFUSE AREA WILL REMAIN COVERED AND PROTECTED FROM WIND DISPERSAL. SIGNS SHALL BE PLACED WITH WORDS "DO NOT DUMP HAZARDOUS MATERIALS OR LIQUIDS HERE" OR SIMILAR. OWNER SHALL BE RESPONSIBLE TO KEEP THE AREA CLEAN OF LITTER AND SPILLS.

1.C. OWNER TO BE RESPONSIBLE FOR SWEEPING PLAZAS, SIDEWALKS, AND PARKING LOTS. THIS IS TO BE DONE REGULARLY AND AS NEEDED TO PREVENT ACCUMULATION OF LITTER AND DEBRIS.

1.D. ANY WATER FEATURE WILL BE DRAINED TO SEWER OR IT WILL BE DECHLORINATED BEFORE BEING DRAINED TO A BIOFILTRATION BASIN.

1.E. INTERIOR FLOOR AND GARAGE DRAINS WILL BE PLUMBED TO THE SANITARY SEWER

1.F. FIRE SPRINKLER TEST WATER SHALL BE DRAINED TO THE SANITARY SEWER

1.G. ROOFTOP EQUIPMENT WITH A POTENTIAL TO PRODUCE POLLUTANTS SHALL BE ROOFED OR HAVE SECONDARY CONTAINMENT

GRAPHICAL SCALE: 1" = 20'

0 10 20 40 60

OMEGA

OMEGA ENGINEERING CONSULTANTS
4340 VIEWRIDGE AVENUE, SUITE B
SAN DIEGO, CALIFORNIA 92123
PH:(858) 634-8620 FAX:(858) 634-8627

DMA EXHIBIT
ATTACHMENT 1a + 1b

Harvest and Use Feasibility Checklist	Form I-7

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

☐ Toilet and urinal flushing

☐ Landscape irrigation

☒ Other: Last time we checked there is no policy, mechanism, or approved standard in place for the city to approve the use of storm water as toilet flushing water. This check was for plumbing approval.

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.

No calculations necessary

3. Calculate the DCV using worksheet B-2.1.

DCV = _____ (cubic feet)

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

Is harvest and use feasible based on further evaluation?

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

☒ No, select alternate BMPs.

Categorization of Infiltration Feasibility Condition	**Form I-8**

Part 1 - Full Infiltration Feasibility Screening Criteria
Would infiltration of the full design volume be feasible from a physical perspective without any undesirable consequences that cannot be reasonably mitigated?

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

Provide basis:

N/A

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

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

Provide basis:

Surface infiltration can cause near surface seepage to the underground parking. Based on a geotechnical investigation by Geocon Incorporated, Geocon recommends in their draft report that "Proper surface drainage will be important to future performance of the project."

The subterranean parking extends past the building footprint and all of the proposed BMP locations are above or near the subterranean parking.

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

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

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

Form I-8 Page 3 of 4

Part 2 – Partial Infiltration vs. No Infiltration Feasibility Screening Criteria
Would infiltration of water in any appreciable amount be physically feasible without any negative consequences that cannot be reasonably mitigated?

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

Provide basis:

N/A

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

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

Provide basis:

Surface infiltration can cause near surface seepage to the underground parking. Based on a geotechnical investigation by Geocon Incorporated, Geocon recommends in their draft report that "Proper surface drainage will be important to future performance of the project.

The subterranean parking extends past the building footprint and all of the proposed BMP locations are above or near the subterranean parking.

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

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

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

Worksheet B.2-1 DCV

Design Capture Volume		Worksheet B.2-1		
1	85th percentile 24-hr storm depth from Figure B.1-1	d=	.5	inches
2	Area tributary to BMP (s)	A=	.65	acres
3	Area weighted runoff factor (estimate using Appendix B.1.1 and B.2.1)	C=	.88	unitless
4	Trees Credit Volume	TCV=	0	cubic-feet
5	Rain barrels Credit Volume	RCV=	0	cubic-feet
6	Calculate DCV = (3630 x C x d x A) – TCV - RCV	DCV=	1040	cubic-feet

- See Calculation table for DCVV of each treated basin.

DCV CALCULATIONS

DMA DATA TABLE

DMA No.	Area (sf)	Impervious %	Impervious C factor	Pervious C factor	C	Weighted Impervious Area	Weighted Pervious Area (sf)	Total Weighted Area (sf)	85th % storm depth (in)	Capture Volume (cf)
A-2	19,782	96.6	0.9	0.1	0.87	17,198	67	17,266	0.5	719
A-3	902	100.0	0.9	0.1	0.90	812	0	812	0.5	34
A-4	1,471	100.0	0.9	0.1	0.90	1,324	0	1,324	0.5	55
A-6	6,323	97.2	0.9	0.1	0.88	5,531	18	5,549	0.5	231
TOTAL	28,478	97.0	0.9	0.1	0.88	24,866	85	24,950	0.5	1,040

$$Total\ Weighted\ Area = (0.1 \times pervious\ area) + (1.0\ \times impervious\ area)$$

$$85th\ percentile\ Storm\ Depth\ from\ County\ Isopluvial\ Map$$

$$Capture\ Volume = Storm\ Depth\ \times Total\ Weighted\ Area$$

Simple Sizing for Biofiltration Expanded Sheet

		A-2	A-3	A-4	A-6	UNITS
1	Remaining DCV after implementing retention BMPs	719	34	55	231	cubic-feet
Partial Retention						
2	Infiltration rate from Worksheet D.5-1 if partial infiltration is feasible	0	0	0	0	in/hr.
3	Allowable drawdown time for aggregate storage below the underdrain	36	36	36	36	hours
4	Depth of runoff that can be infiltrated [Line 2 x Line 3]	0	0	0	0	inches
5	Aggregate pore space	0.94	0.94	0.94	0.94	in/in
6	Required depth of gravel below the underdrain [Line 4/ Line 5]	0	0	0	0	inches
7	Assumed surface area of the biofiltration BMP	670	72	72	662	sq-ft
8	Media retained pore space	0.1	0.1	0.1	0.1	in/in
9	Volume retained by BMP [[Line 4 + (Line 12 x Line 8)]/12] x Line 7	100.5	10.8	10.8	99.3	cubic-feet
10	DCV that requires biofiltration [Line 1 – Line 9]	619	23	44	132	cubic-feet
BMP Parameters						
11	Surface Ponding [6 inch minimum, 12 inch maximum]	6	6	6	6	inches
12	Media Thickness [18 inches minimum]	18	18	18	18	inches
13	Aggregate Storage above underdrain invert (12 inches typical) – use 0 inches for sizing if the aggregate is not over the entire bottom surface area	12	12	12	12	inches
14	Media available pore space	0.2	0.2	0.2	0.2	in/in
15	Media filtration rate to be used for sizing	5	5	5	5	in/hr.
Baseline Calculations						
16	Allowable Routing Time for sizing	6	6	6	6	hours
17	Depth filtered during storm [Line 15 x Line 16]	30	30	30	30	inches
18	Depth of Detention Storage [Line 11 + (Line 12 x Line 14) + (Line 13 x Line 5)]	20.88	20.88	20.88	20.88	inches
19	Total Depth Treated [Line 17 + Line 18]	50.88	50.88	50.88	50.88	inches
Option 1 – Biofilter 1.5 times the DCV						
20	Required biofiltered volume [1.5 x Line 10]	927.75	34.8	66.3	197.55	cubic-feet
21	Required Footprint [Line 20/ Line 19] x 12	219	8	16	47	sq-ft
Option 2 - Store 0.75 of remaining DCV in pores and ponding						
22	Required Storage (surface + pores) Volume [0.75 x Line 10]	463.88	17.40	33.15	98.78	cubic-feet
23	Required Footprint [Line 22/ Line 18] x 12	267	10	19	57	sq-ft
Footprint of the BMP						
24	Area draining to the BMP	19,782	902	1,471	6,323	sq-ft
25	Adjusted Runoff Factor for drainage area (Refer to Appendix B.1 and B.2)	0.87	0.90	0.90	0.88	
26	Minimum BMP Footprint [Line 24 x Line 25 x 0.03]	517.97	24.35	39.72	166.47	sq-ft
27	Footprint of the BMP Req. = Maximum(Minimum(Line 21, Line 23), Line 26)	518	24	40	166	sq-ft

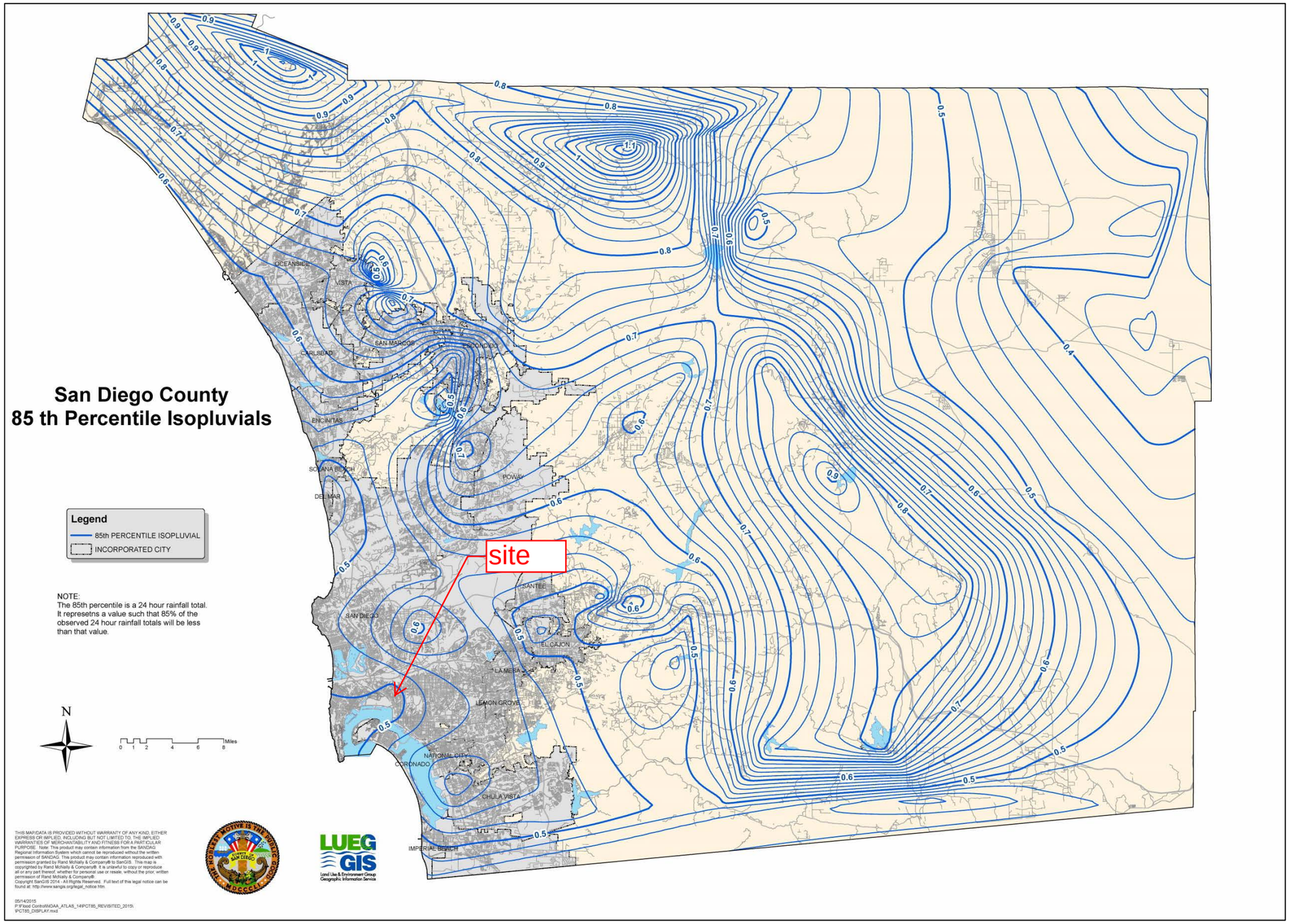


Figure B.1-1: 85th Percentile 24-hour Isopluvial Map

E.13. 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

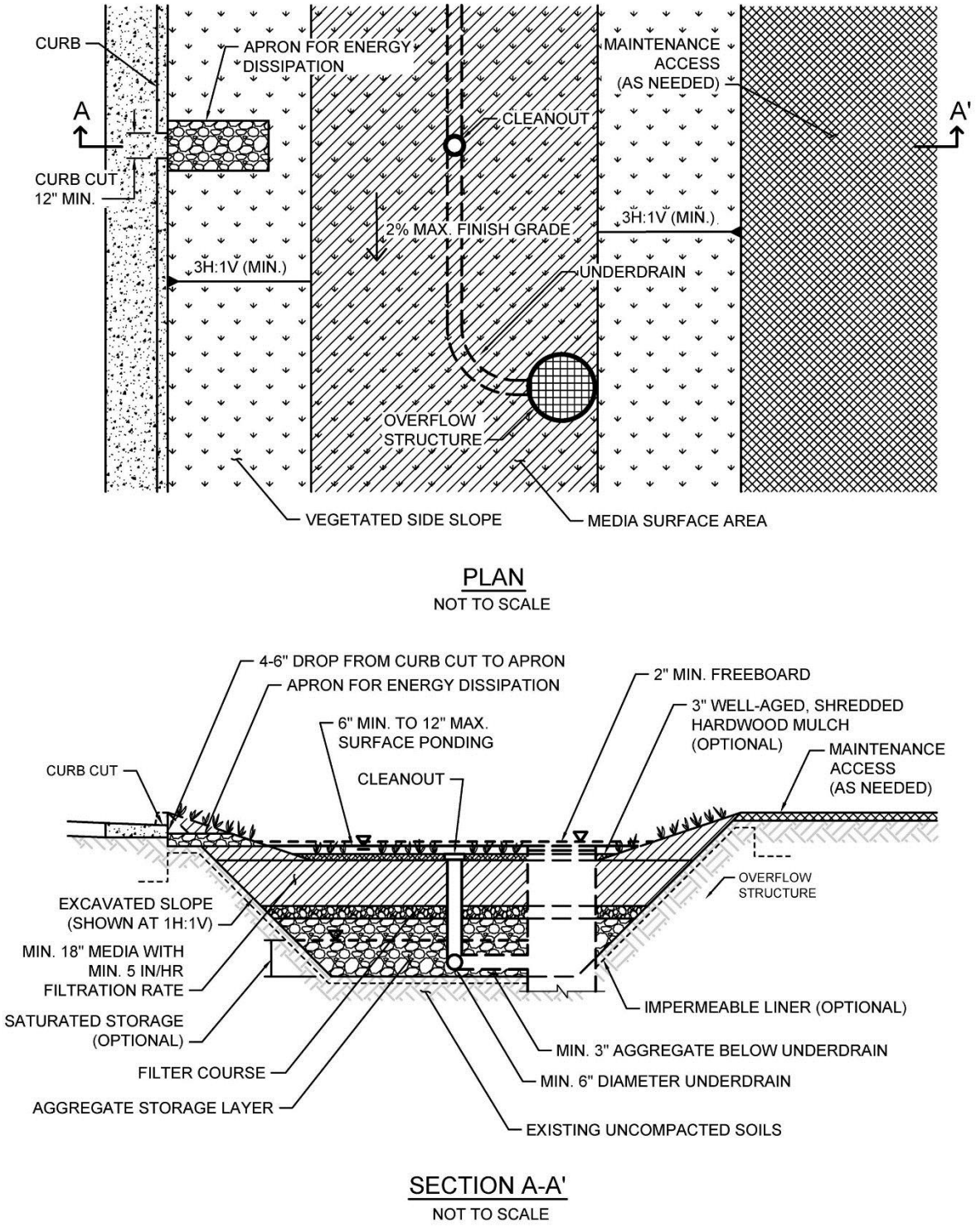


Figure E.13-E.13-1: Typical plan and Section view of a Biofiltration BMP

Design Adaptations for Project Goals

Biofiltration Treatment BMP for storm water pollutant control. The system is lined or un-lined to provide incidental infiltration, and an underdrain is provided at the bottom to carry away filtered runoff. This configuration is considered to provide biofiltration treatment via flow through the media layer. Storage provided above the underdrain within surface ponding, media, and aggregate storage is considered included in the biofiltration treatment volume. Saturated storage within the aggregate storage layer can be added to this design by raising the underdrain above the bottom of the aggregate storage layer or via an internal weir structure designed to maintain a specific water level elevation.

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

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:

	Siting and Design	Intent/Rationale
□	Placement observes geotechnical recommendations regarding potential hazards (e.g., slope stability, landslides, liquefaction zones) and setbacks (e.g., slopes, foundations, utilities).	Must not negatively impact existing site geotechnical concerns.
□	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.
Surface Ponding		

	Siting and Design	Intent/Rationale
□	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.
□	Surface ponding depth is ≥ 6 and ≤ 12 inches.	Surface ponding capacity lowers subsurface storage requirements. Deep surface ponding raises safety concerns. Surface ponding depth greater than 12 inches (for additional pollutant control or surface outlet structures or flow-control orifices) may be allowed at the discretion of 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/or flatter side slopes) and 3) potential for elevated clogging risk is considered.
□	A minimum of 2 inches of freeboard is provided.	Freeboard provides room for head over overflow structures and minimizes risk of uncontrolled surface discharge.
□	Side slopes are stabilized with vegetation and are = 3H:1V or shallower.	Gentler side slopes are safer, less prone to erosion, able to establish vegetation more quickly and easier to maintain.
Vegetation		
□	Plantings are suitable for the climate and expected ponding depth. A plant list to aid in selection can be found in Appendix E.20.	Plants suited to the climate and ponding depth are more likely to survive.
□	An irrigation system with a connection to water supply should be provided as needed.	Seasonal irrigation might be needed to keep plants healthy.
Mulch (Mandatory)		
□	A minimum of 3 inches of well-aged, shredded hardwood mulch that has been stockpiled or stored for at least 12 months is provided.	Mulch 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		

	Siting and Design	Intent/Rationale
□	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.4)	A filtration rate of at least 5 inches per hour allows soil to drain between events. The initial rate should be higher than long term target rate to account for clogging over time. However an excessively high initial rate can have a negative impact on treatment performance, therefore an upper limit is needed.
□	Media is a minimum 18 inches deep, meeting the following media specifications: Model biorention soil media specification provided in Appendix F.4 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. Use Worksheet B.5-1 Line 26 to estimate the minimum surface area required per this criteria.
□	Where receiving waters are impaired or have a TMDL for nutrients, the system is designed with nutrient sensitive media design (see fact sheet BF-2).	Potential for pollutant export is partly a function of media composition; media design must minimize potential for export of nutrients, particularly where receiving waters are impaired for nutrients.
Filter Course Layer		
□	A filter course is used to prevent migration of fines through layers of the facility. Filter fabric is not used.	Migration of media can cause clogging of the aggregate storage layer void spaces or subgrade and can result in poor water quality performance for turbidity and suspended solids. Filter fabric is more likely to clog.

	Siting and Design	Intent/Rationale
□	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.5).	This specification has been developed to maintain permeability while limiting the migration of media material into the stone reservoir and underdrain system.
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 12 inches wide, have a 4-6 inch reveal (drop) and an apron and energy dissipation as needed.	Inlets must not restrict flow and apron prevents blockage from vegetation as it grows in. Energy dissipation prevents erosion.
□	Underdrain outlet elevation should be a minimum of 3 inches above the bottom elevation of the aggregate storage layer.	A minimal separation from subgrade or the liner lessens the risk of fines entering the underdrain and can improve hydraulic performance by allowing perforations to remain unblocked.
□	Minimum underdrain diameter is 8 inches.	Smaller diameter underdrains are prone to clogging.
□	Underdrains should be affixed with an upturned elbow to an elevation at least 9 to 12 inches above the invert of the underdrain.	An upturned elbow reduces velocity in the underdrain pipe and can help reduce mobilization of sediments from the underdrain and media bed.

	Siting and Design	Intent/Rationale
□	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.
□	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:

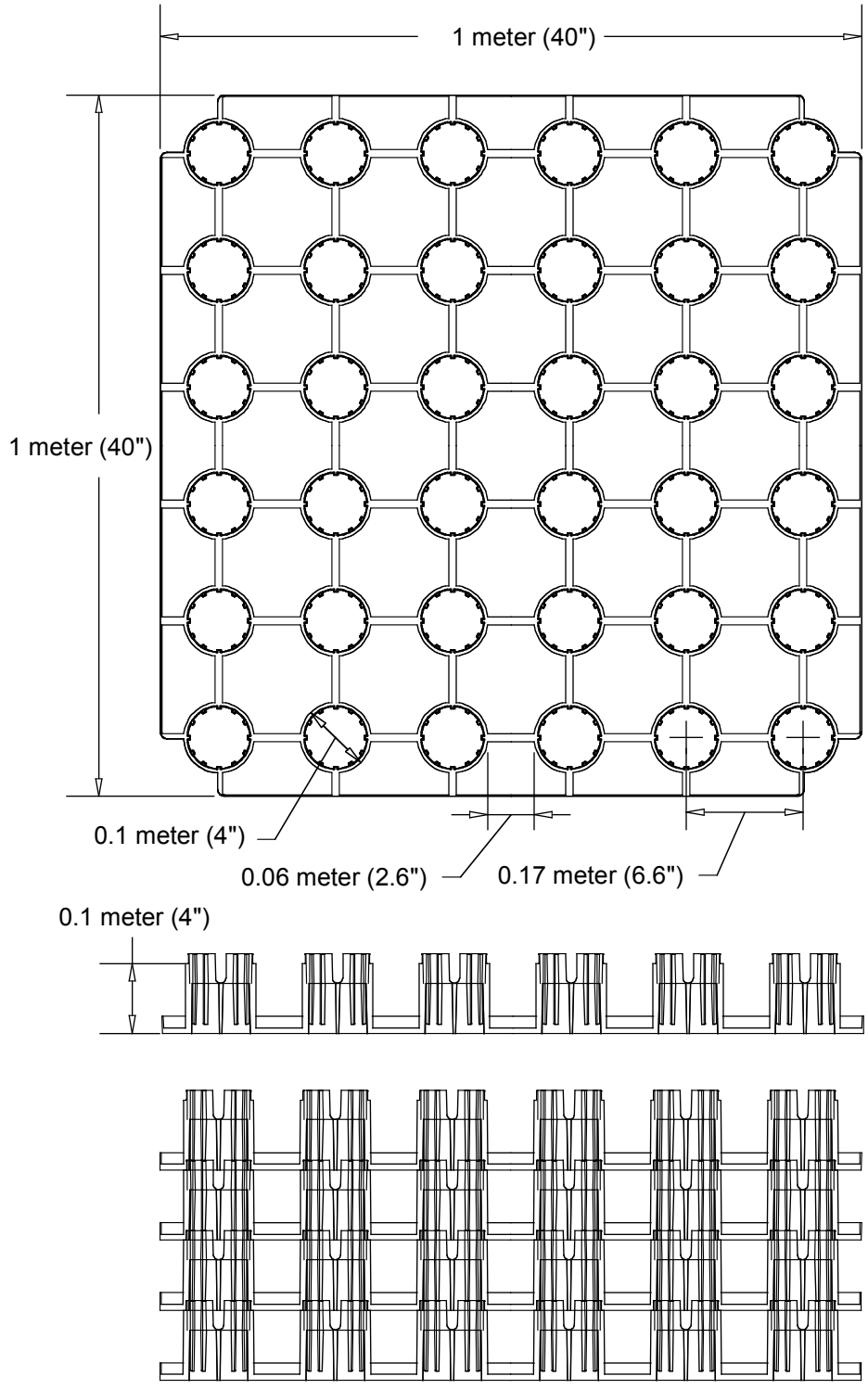
1. Verify that siting and design criteria have been met, including placement requirements, contributing tributary area, maximum side and finish grade slopes, and the recommended media surface area tributary ratio.
2. Calculate the DCV per Appendix B based on expected site design runoff for tributary 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 bioretention with underdrain cannot fully provide the flow rate and duration control required by this manual, an upstream or downstream structure with significant storage volume such as an underground vault can be used to provide remaining controls.
4. After bioretention with underdrain has been designed to meet flow control requirements, calculations must be completed to verify if storm water pollutant control requirements to treat the DCV have been met.

Rainstore3 Unit Dimensions



Rainstore3 Unit Detail

NOT TO SCALE

Single Rainstore3 injection molded unit geometry and dimensions

Invisible
Structures, Inc.
RS3detail.dwg

1600 Jackson St. Suite 310
Golden, Colorado 80401
800-233-1510 FAX: 800-233-1522
www.invisiblestructures.com 08/04

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: Strauss 5th & Walnut

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
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.
Attachment 2e	Vector Control Plan (Required when structural BMPs will not drain in 96 hours)	○ Included ◉ Not required because BMPs will drain in less than 96 hours

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

The Hydromodification Management Exhibit must identify:

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

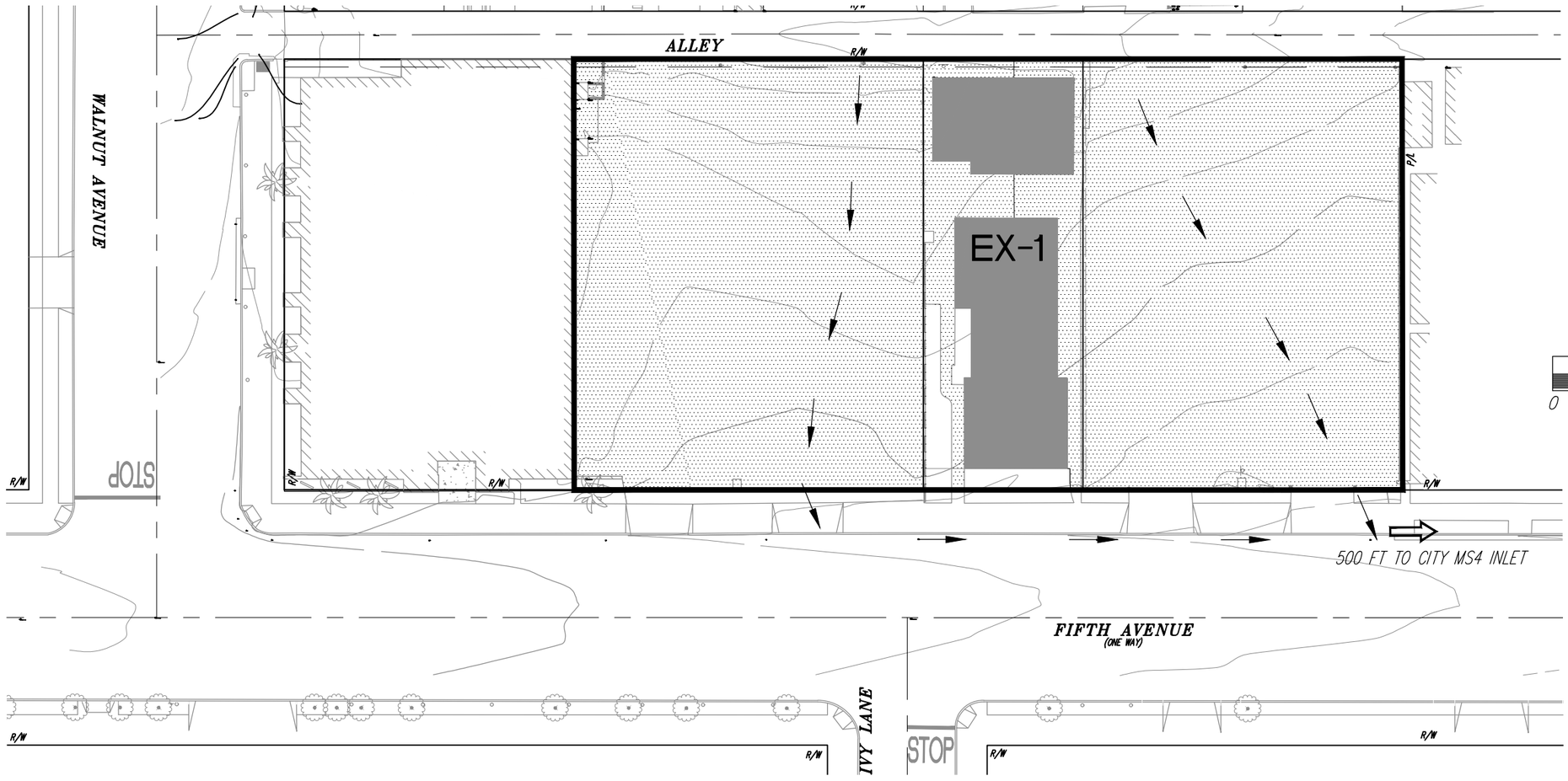
5TH AND WALNUT
EXISTING HMP EXHIBIT

NOTES

1. UNDERLYING NRCS HYDROLOGIC SOIL GROUP FOR SITE IS TYPE D
2. GROUNDWATER DEPTH IS GREATER THAN 20 FEET. GROUNDWATER TABLE ESTIMATED TO BE IN EXCESS OF 100 FEET BELOW EXISTING GROUND. GROUNDWATER NOT CONSIDERED TO BE PRESENT.
3. NO EXISTING NATURAL HYDROLOGIC FEATURES
4. NO CRITICAL COARSE SEDIMENT YIELD AREAS ON SITE

LEGEND:

- PROJECT BOUNDARY
- AREA LIMITS
- DRAINAGE DIRECTION ARROW
- IMPERVIOUS AREA
- BUILDING AREA
- PERVIOUS AREA
- BASIN NUMBER — EX-#



GRAPHICAL SCALE: 1" = 40'

0 20 40 80 120

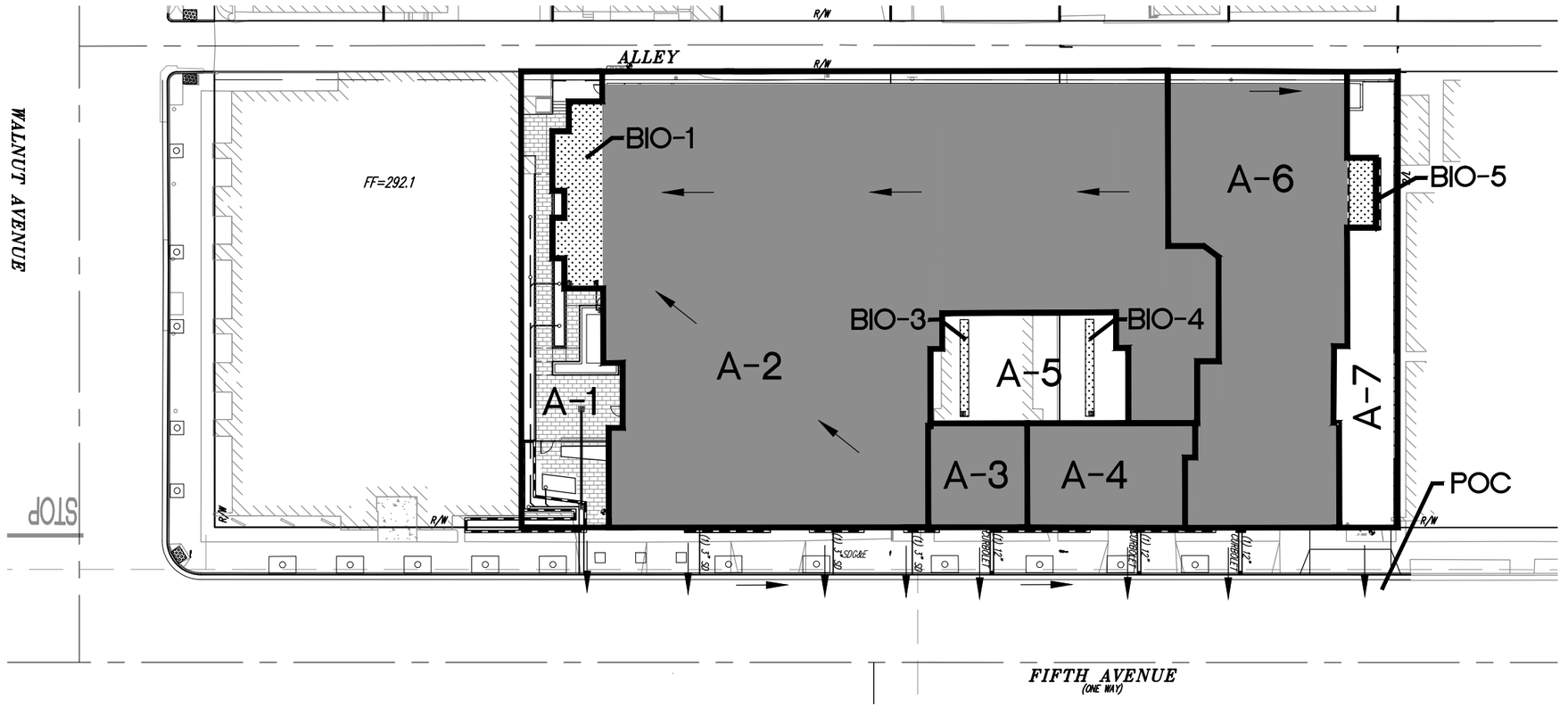
OMEGA ENGINEERING CONSULTANTS
4340 VIEWRIDGE AVENUE, SUITE B
SAN DIEGO, CALIFORNIA 92123
PH:(858) 634-8620 FAX:(858) 634-8627

ATTACHMENT-2a

5TH AND WALNUT
PROPOSED HMP EXHIBIT

LEGEND:

- *PROJECT BOUNDARY*
- *AREA LIMITS*
- *DRAINAGE DIRECTION ARROW*
- *BUILDING AREA*
- *BIOFILTRATION BASIN*



GRAPHICAL SCALE: 1" = 40'

0 20 40 80 120

NOTES

1. *UNDERLYING NRCS HYDROLOGIC SOIL GROUP FOR SITE IS TYPE D*
2. *GROUNDWATER DEPTH IS GREATER THAN 20 FEET. GROUNDWATER TABLE ESTIMATED TO BE IN EXCESS OF 100 FEET BELOW EXISTING GROUND. GROUNDWATER NOT CONSIDERED TO BE PRESENT.*
3. *NO EXISTING NATURAL HYDROLOGIC FEATURES*
4. *NO CRITICAL COARSE SEDIMENT YIELD AREAS ON SITE*
5. *SEE DMA EXHIBIT FOR BASIN DATA*

STRUCTURAL BMP DATA TABLE

IMP-#	TREATING	FOOTPRINT GIVEN	DESCRIPTION	DETAIL*
BIO-1	A-2	671 SF	BIOFILTRATION BASIN W/ RAINSTORE 3	–
BIO-3	A-3	72 SF	BIOFILTRATION BASIN W/ RAINSTORE 3	–
BIO-4	A-4	72 SF	BIOFILTRATION BASIN W/ RAINSTORE 3	–
BIO-5	A-6	174 SF	BIOFILTRATION BASIN W/ RAINSTORE 3	–

*BMPs ARE INTEGRATED POLLUTANT AND HYDROMODIFICATION CONTROL

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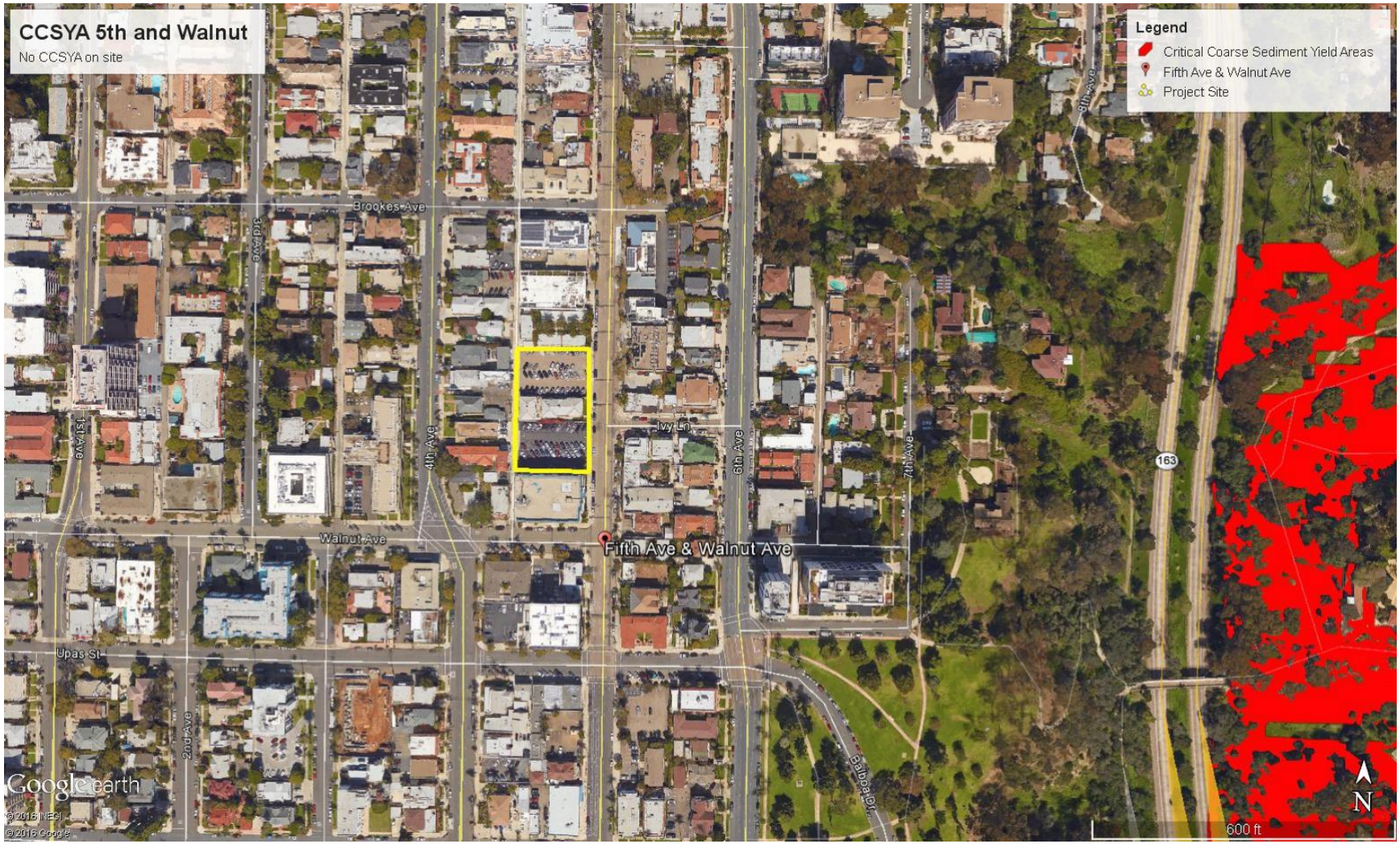
ATTACHMENT-2a

ATTACHMENT 2b

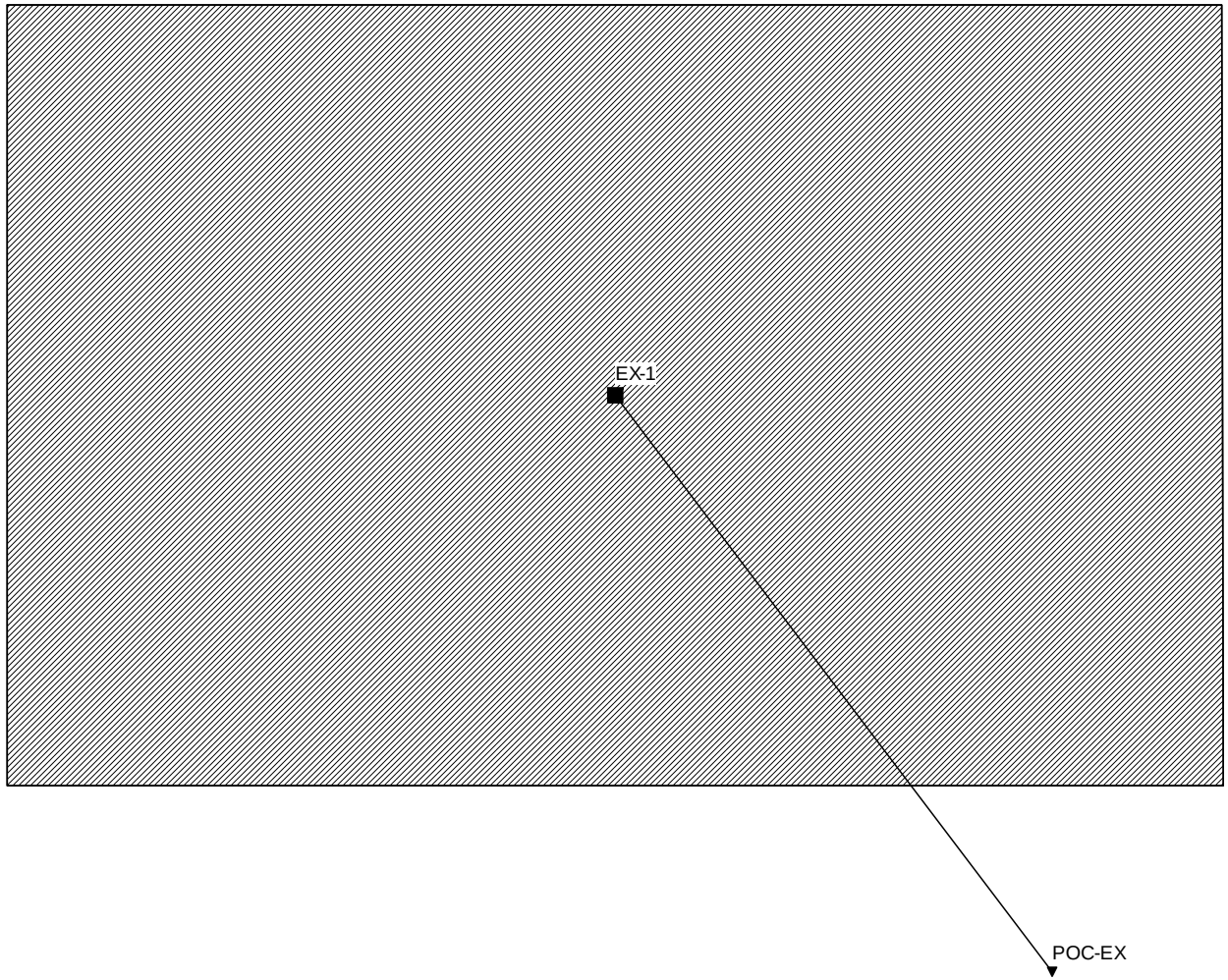
REGION 9

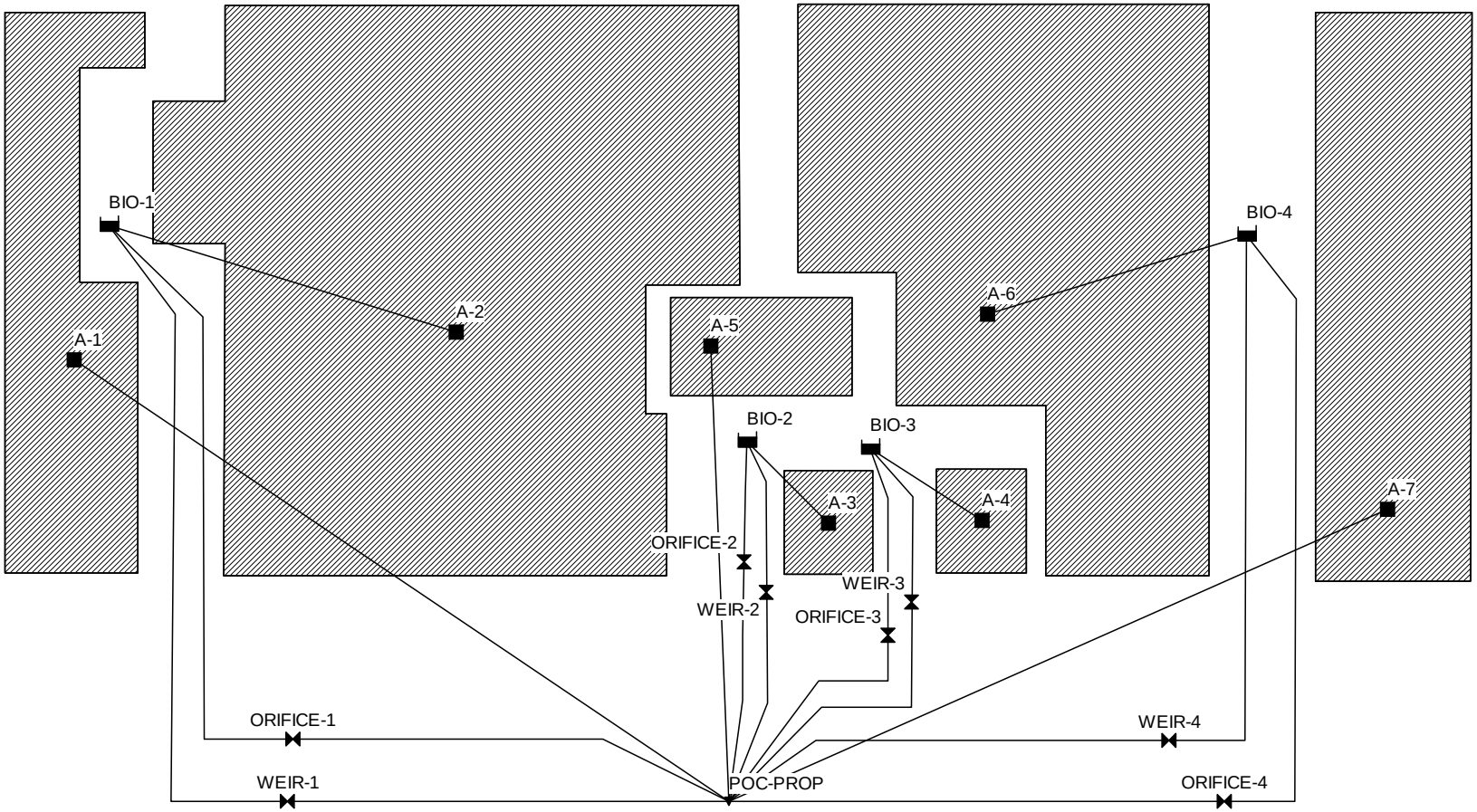
CRITICAL COURSE SEDIMENT YIELD AREA MAP



ATTACHMENT 2d

10/17/1948 01:00:00

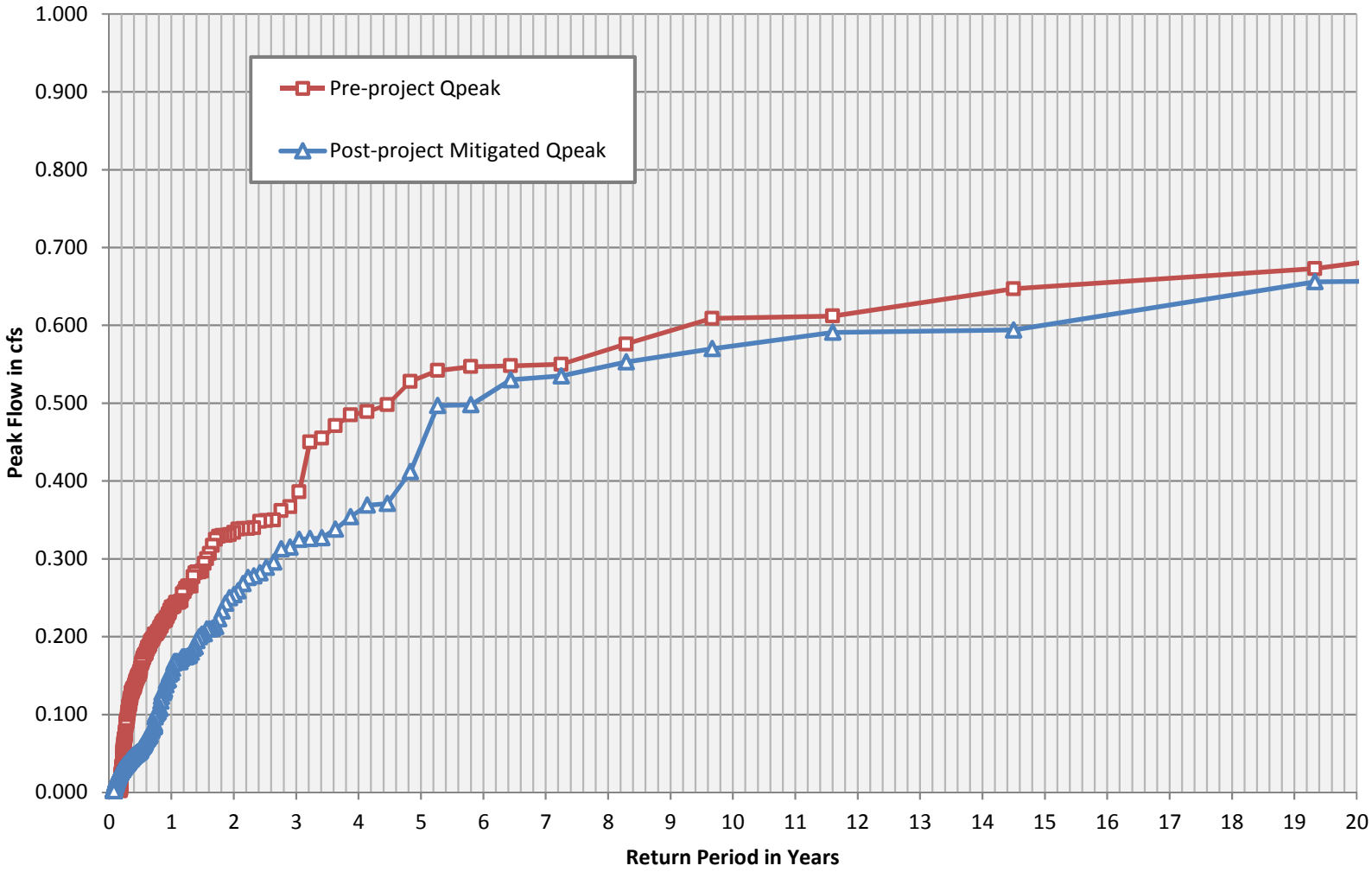



BIO-1
BIO-4
A-6
A-2
A-5
A-1
BIO-2
BIO-3
A-7
A-3
A-4
ORIFICE-2
WEIR-3
WEIR-2
ORIFICE-3
ORIFICE-1
WEIR-4
WEIR-1
POC-PROP
ORIFICE-4

Peak Flow Frequency Summary

Return Period	Pre-project Qpeak (cfs)	Post-project - Mitigated Q (cfs)
LF = 0.1xQ2	0.034	0.025
2-year	0.344	0.253
5-year	0.546	0.458
10-year	0.593	0.589

Peak Flow Frequency Curves

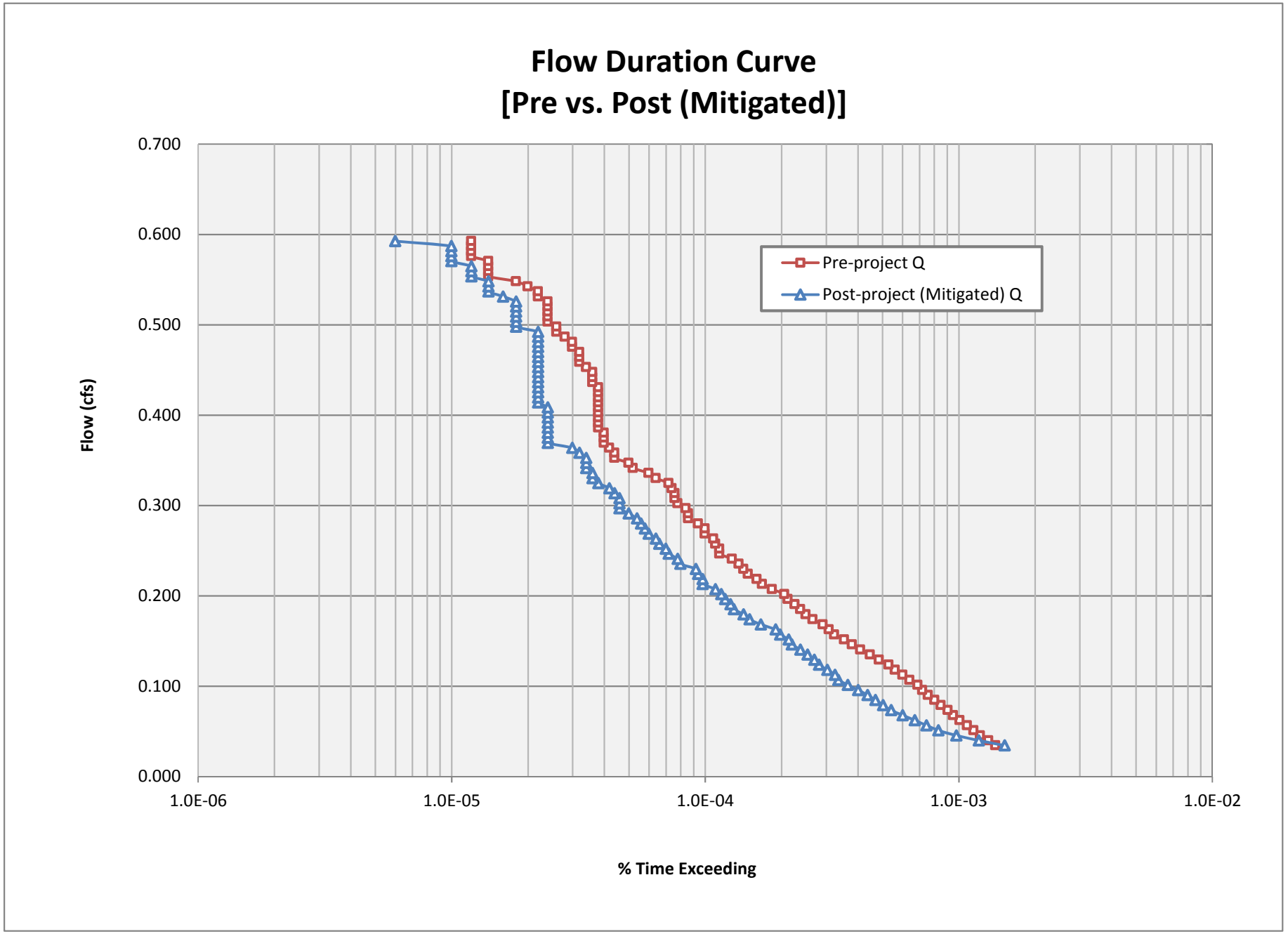


Low-flow Threshold:	10%	
0.1xQ2 (Pre):	0.034	cfs
Q10 (Pre):	0.593	cfs
Ordinate #:	100	
Incremental Q (Pre):	0.00558	cfs
Total Hourly Data:	501462	hours

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	0.034	699	1.39E-03	761	1.52E-03	109%	Pass
1	0.040	657	1.31E-03	601	1.20E-03	91%	Pass
2	0.046	609	1.21E-03	490	9.77E-04	80%	Pass
3	0.051	574	1.14E-03	416	8.30E-04	72%	Pass
4	0.057	541	1.08E-03	374	7.46E-04	69%	Pass
5	0.062	506	1.01E-03	336	6.70E-04	66%	Pass
6	0.068	476	9.49E-04	301	6.00E-04	63%	Pass
7	0.073	454	9.05E-04	271	5.40E-04	60%	Pass
8	0.079	426	8.50E-04	252	5.03E-04	59%	Pass
9	0.085	402	8.02E-04	235	4.69E-04	58%	Pass
10	0.090	379	7.56E-04	219	4.37E-04	58%	Pass
11	0.096	360	7.18E-04	201	4.01E-04	56%	Pass
12	0.101	345	6.88E-04	183	3.65E-04	53%	Pass
13	0.107	321	6.40E-04	168	3.35E-04	52%	Pass
14	0.113	301	6.00E-04	163	3.25E-04	54%	Pass
15	0.118	281	5.60E-04	152	3.03E-04	54%	Pass
16	0.124	265	5.28E-04	141	2.81E-04	53%	Pass
17	0.129	243	4.85E-04	135	2.69E-04	56%	Pass
18	0.135	224	4.47E-04	127	2.53E-04	57%	Pass
19	0.140	205	4.09E-04	119	2.37E-04	58%	Pass
20	0.146	190	3.79E-04	110	2.19E-04	58%	Pass
21	0.152	177	3.53E-04	107	2.13E-04	60%	Pass
22	0.157	162	3.23E-04	99	1.97E-04	61%	Pass
23	0.163	154	3.07E-04	95	1.89E-04	62%	Pass
24	0.168	146	2.91E-04	83	1.66E-04	57%	Pass
25	0.174	133	2.65E-04	75	1.50E-04	56%	Pass
26	0.180	125	2.49E-04	71	1.42E-04	57%	Pass
27	0.185	119	2.37E-04	65	1.30E-04	55%	Pass
28	0.191	113	2.25E-04	63	1.26E-04	56%	Pass
29	0.196	106	2.11E-04	60	1.20E-04	57%	Pass
30	0.202	103	2.05E-04	58	1.16E-04	56%	Pass
31	0.207	92	1.83E-04	55	1.10E-04	60%	Pass
32	0.213	84	1.68E-04	49	9.77E-05	58%	Pass
33	0.219	80	1.60E-04	49	9.77E-05	61%	Pass
34	0.224	74	1.48E-04	47	9.37E-05	64%	Pass
35	0.230	71	1.42E-04	46	9.17E-05	65%	Pass
36	0.235	68	1.36E-04	40	7.98E-05	59%	Pass
37	0.241	64	1.28E-04	39	7.78E-05	61%	Pass
38	0.247	57	1.14E-04	36	7.18E-05	63%	Pass
39	0.252	57	1.14E-04	35	6.98E-05	61%	Pass
40	0.258	55	1.10E-04	33	6.58E-05	60%	Pass
41	0.263	54	1.08E-04	32	6.38E-05	59%	Pass
42	0.269	50	9.97E-05	30	5.98E-05	60%	Pass
43	0.274	50	9.97E-05	29	5.78E-05	58%	Pass
44	0.280	47	9.37E-05	28	5.58E-05	60%	Pass
45	0.286	43	8.57E-05	27	5.38E-05	63%	Pass
46	0.291	43	8.57E-05	25	4.99E-05	58%	Pass
47	0.297	42	8.38E-05	23	4.59E-05	55%	Pass
48	0.302	39	7.78E-05	23	4.59E-05	59%	Pass
49	0.308	38	7.58E-05	23	4.59E-05	61%	Pass
50	0.314	38	7.58E-05	22	4.39E-05	58%	Pass
51	0.319	37	7.38E-05	21	4.19E-05	57%	Pass
52	0.325	36	7.18E-05	19	3.79E-05	53%	Pass
53	0.330	32	6.38E-05	18	3.59E-05	56%	Pass
54	0.336	30	5.98E-05	18	3.59E-05	60%	Pass

Interval	Pre-project Flow (cfs)	Pre-project Hours	Pre-project % Time Exceeding	Post-project Hours	Post-project % Time Exceeding	Percentage	Pass/Fail
55	0.341	26	5.18E-05	17	3.39E-05	65%	Pass
56	0.347	25	4.99E-05	17	3.39E-05	68%	Pass
57	0.353	22	4.39E-05	17	3.39E-05	77%	Pass
58	0.358	22	4.39E-05	16	3.19E-05	73%	Pass
59	0.364	21	4.19E-05	15	2.99E-05	71%	Pass
60	0.369	20	3.99E-05	12	2.39E-05	60%	Pass
61	0.375	20	3.99E-05	12	2.39E-05	60%	Pass
62	0.381	20	3.99E-05	12	2.39E-05	60%	Pass
63	0.386	19	3.79E-05	12	2.39E-05	63%	Pass
64	0.392	19	3.79E-05	12	2.39E-05	63%	Pass
65	0.397	19	3.79E-05	12	2.39E-05	63%	Pass
66	0.403	19	3.79E-05	12	2.39E-05	63%	Pass
67	0.408	19	3.79E-05	12	2.39E-05	63%	Pass
68	0.414	19	3.79E-05	11	2.19E-05	58%	Pass
69	0.420	19	3.79E-05	11	2.19E-05	58%	Pass
70	0.425	19	3.79E-05	11	2.19E-05	58%	Pass
71	0.431	19	3.79E-05	11	2.19E-05	58%	Pass
72	0.436	18	3.59E-05	11	2.19E-05	61%	Pass
73	0.442	18	3.59E-05	11	2.19E-05	61%	Pass
74	0.448	18	3.59E-05	11	2.19E-05	61%	Pass
75	0.453	17	3.39E-05	11	2.19E-05	65%	Pass
76	0.459	16	3.19E-05	11	2.19E-05	69%	Pass
77	0.464	16	3.19E-05	11	2.19E-05	69%	Pass
78	0.470	16	3.19E-05	11	2.19E-05	69%	Pass
79	0.475	15	2.99E-05	11	2.19E-05	73%	Pass
80	0.481	15	2.99E-05	11	2.19E-05	73%	Pass
81	0.487	14	2.79E-05	11	2.19E-05	79%	Pass
82	0.492	13	2.59E-05	11	2.19E-05	85%	Pass
83	0.498	13	2.59E-05	9	1.79E-05	69%	Pass
84	0.503	12	2.39E-05	9	1.79E-05	75%	Pass
85	0.509	12	2.39E-05	9	1.79E-05	75%	Pass
86	0.515	12	2.39E-05	9	1.79E-05	75%	Pass
87	0.520	12	2.39E-05	9	1.79E-05	75%	Pass
88	0.526	12	2.39E-05	9	1.79E-05	75%	Pass
89	0.531	11	2.19E-05	8	1.60E-05	73%	Pass
90	0.537	11	2.19E-05	7	1.40E-05	64%	Pass
91	0.542	10	1.99E-05	7	1.40E-05	70%	Pass
92	0.548	9	1.79E-05	7	1.40E-05	78%	Pass
93	0.554	7	1.40E-05	6	1.20E-05	86%	Pass
94	0.559	7	1.40E-05	6	1.20E-05	86%	Pass
95	0.565	7	1.40E-05	6	1.20E-05	86%	Pass
96	0.570	7	1.40E-05	5	9.97E-06	71%	Pass
97	0.576	6	1.20E-05	5	9.97E-06	83%	Pass
98	0.582	6	1.20E-05	5	9.97E-06	83%	Pass
99	0.587	6	1.20E-05	5	9.97E-06	83%	Pass
100	0.593	6	1.20E-05	3	5.98E-06	50%	Pass


Flow Duration Curve
[Pre vs. Post (Mitigated)]
0.700
0.600
0.500
0.400
0.300
0.200
0.100
0.000
Flow (cfs)
1.0E-06
1.0E-05
1.0E-04
1.0E-03
1.0E-02
% Time Exceeding
Pre-project Q
Post-project (Mitigated) Q

[TITLE]
;;Project Title/Notes

[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	00:00:00
REPORT_START_DATE	10/17/1948
REPORT_START_TIME	00:00:00
END_DATE	12/31/2005
END_TIME	06:00:00
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
INERTIAL_DAMPING	PARTIAL
NORMAL_FLOW_LIMITED	BOTH
FORCE_MAIN_EQUATION	H-W
VARIABLE_STEP	0.75
LENGTHENING_STEP	0
MIN_SURFAREA	12.557
MAX_TRIALS	8
HEAD_TOLERANCE	0.005
SYS_FLOW_TOL	5
LAT_FLOW_TOL	5
MINIMUM_STEP	0.5
THREADS	1

[EVAPORATION]

;;Data Source	Parameters
MONTHLY	0.062 0.747 0.114 0.15 0.176 0.19 0.197 0.186 0.15 0.114 0.08 0.062
DRY_ONLY	NO

[RAINGAGES]

;;Name	Format	Interval	SCF	Source
LINDBERGH	INTENSITY	1:00	1.0	TIMESERIES LINDBERGH

[SUBCATCHMENTS]

;;Name	Rain Gage	Outlet	Area	%Imperv	Width	%Slope	CurbLen	SnowPack
EX-1	LINDBERGH	POC-EX	0.803	0	300	5.2	0	
A-1	LINDBERGH	POC-PROP	0.062	76	10	2.0	0	
A-2	LINDBERGH	BIO-1	0.454	95.7	150	0.75	0	
A-3	LINDBERGH	BIO-2	0.026	100.0	25	0.75	0	
A-4	LINDBERGH	BIO-3	0.034	100.0	25	0.75	0	
A-5	LINDBERGH	POC-PROP	0.041	88.8	15	0.75	0	
A-6	LINDBERGH	BIO-4	0.145	97.2	150	0.75	0	
A-7	LINDBERGH	POC-PROP	0.046	100	15	1.0	0	

[SUBAREAS]

;;Subcatchment	N-Imperv	N-Perv	S-Imperv	S-Perv	PctZero	RouteTo	PctRouted
EX-1	0.012	0.13	0.05	0.10	25	OUTLET	
A-1	0.012	0.15	0.05	0.10	25	OUTLET	
A-2	0.012	0.15	0.05	0.10	25	OUTLET	
A-3	0.012	0.15	0.05	0.10	25	OUTLET	
A-4	0.012	0.15	0.05	0.10	25	OUTLET	
A-5	0.012	0.15	0.05	0.10	25	OUTLET	
A-6	0.012	0.15	0.05	0.10	25	OUTLET	
A-7	0.012	0.15	0.05	0.10	25	OUTLET	

[INFILTRATION]

;;Subcatchment	Suction	Ksat	IMD
EX-1	9.0	0.025	0.33
A-1	9.0	0.025	0.33
A-2	3.5	0.5	0.25
A-3	3.5	0.5	0.25
A-4	3.5	0.5	0.25
A-5	3.5	0.5	0.25
A-6	3.5	0.5	0.25
A-7	3.5	0.5	0.25

[OUTFALLS]

;;Name	Elevation	Type	Stage Data	Gated	Route To
POC-EX	0	FREE		NO	
POC-PROP	0	FREE		NO	

[STORAGE]

;;Name	Elev.	MaxDepth	InitDepth	Shape	Curve Name/Params	Fevap	Psi	Ksat	IMD
BIO-1	0	4.0	0	TABULAR	IMP-1	0	0		
BIO-2	0	4.0	0	TABULAR	IMP-2	0	0		
BIO-3	0	4.0	0	TABULAR	IMP-3	0	0		
BIO-4	0	4.0	0	TABULAR	IMP-4	0	0		

[ORIFICES]

;;Name	From Node	To Node	Type	Offset	Qcoeff	Gated	CloseTime
ORIFICE-1	BIO-1	POC-PROP	SIDE	0	0.52	NO	0
ORIFICE-2	BIO-2	POC-PROP	SIDE	0	0.52	NO	0
ORIFICE-4	BIO-4	POC-PROP	SIDE	0	0.52	NO	0
ORIFICE-3	BIO-3	POC-PROP	SIDE	0	0.52	NO	0

[WEIRS]

;;Name	From Node	To Node	Type	CrestHt	Qcoeff	Gated	EndCon	EndCoeff	Surcharge
WEIR-1	BIO-1	POC-PROP	TRANSVERSE	3.33	3.33	NO	0	0	YES
WEIR-2	BIO-2	POC-PROP	TRANSVERSE	3.33	3.33	NO	0	0	YES
WEIR-3	BIO-3	POC-PROP	TRANSVERSE	3.33	3.33	NO	0	0	YES
WEIR-4	BIO-4	POC-PROP	TRANSVERSE	3.33	3.33	NO	0	0	YES

[XSECTIONS]

;;Link	Shape	Geom1	Geom2	Geom3	Geom4	Barrels	Culvert
ORIFICE-1	CIRCULAR	0.035	0	0	0		
ORIFICE-2	CIRCULAR	0.0208	0	0	0		
ORIFICE-4	CIRCULAR	0.026	0	0	0		
ORIFICE-3	CIRCULAR	0.0208	0	0	0		
WEIR-1	RECT_OPEN	0.5	3	0	0		
WEIR-2	RECT_OPEN	0.5	3	0	0		
WEIR-3	RECT_OPEN	0.5	3	0	0		
WEIR-4	RECT_OPEN	0.5	3	0	0		

[CURVES]

;;Name	Type	X-Value	Y-Value
IMP-1	Storage	0	627
IMP-1		1	627
IMP-1		1.01	134
IMP-1		2.5	134
IMP-1		2.51	667
IMP-1		4	667
;			
IMP-2	Storage	0	66
IMP-2		1	66
IMP-2		1.01	14
IMP-2		2.5	14
IMP-2		2.51	70
IMP-2		4.0	70
;			
IMP-3	Storage	0	166
IMP-3		1	166
IMP-3		1.01	35
IMP-3		2.5	35
IMP-3		2.51	177
IMP-3		4.0	177
;			
IMP-4	Storage	0	166
IMP-4		1	166
IMP-4		1.01	35
IMP-4		2.5	35
IMP-4		2.51	177
IMP-4		4.0	177

[TIMESERIES]

;;Name	Date	Time	Value
LINDBERGH	10/17/1948	8:00	0.05
LINDBERGH	10/17/1948	9:00	0.05
LINDBERGH	10/17/1948	17:00	0.01
LINDBERGH	10/17/1948	20:00	0.04
LINDBERGH	10/17/1948	22:00	0.02
LINDBERGH	10/17/1948	23:00	0.02
LINDBERGH	10/18/1948	1:00	0.01
LINDBERGH	10/18/1948	2:00	0.06
LINDBERGH	10/18/1948	3:00	0.11
LINDBERGH	10/18/1948	4:00	0.19
LINDBERGH	10/18/1948	5:00	0.25
LINDBERGH	10/18/1948	6:00	0.12
LINDBERGH	10/18/1948	7:00	0.2

The rest of the rain gauge data has been omitted as it is 100+ pages long.The data can be found at Projectcleanwater.org

ATTACHMENT 3
STRUCTURAL BMP MAINTENANCE INFORMATION

This is the cover sheet for Attachment 3.

Project Name: Strauss 5th & Walnut

Indicate which Items are Included:

Attachment Sequence	Contents	Checklist
Attachment 3a	Structural BMP Maintenance Thresholds and Actions (Required)	☒ Included See Structural BMP Maintenance Information Checklist.
Attachment 3b	Maintenance Agreement (Form DS-3247) (when applicable)	○ Included ◉ Not Applicable

Project Name: Strauss 5th & Walnut

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

Preliminary Design / Planning / CEQA level submittal:

- Attachment 3a must identify:

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

- Attachment 3b is not required for preliminary design / planning / CEQA level submittal.

Final Design level submittal:

Attachment 3a must identify:

☐ Specific maintenance indicators and actions for proposed structural BMP(s). This shall be based on Section 7.7 of the BMP Design Manual and enhanced to reflect actual proposed components of the structural BMP(s)
☐ How to access the structural BMP(s) to inspect and perform maintenance
☐ Features that are provided to facilitate inspection (e.g., observation ports, cleanouts, silt posts, or other features that allow the inspector to view necessary components of the structural BMP and compare to maintenance thresholds)
☐ Manufacturer and part number for proprietary parts of structural BMP(s) when applicable
☐ Maintenance thresholds 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)
☐ When applicable, frequency of bioretention soil media replacement
☐ Recommended equipment to perform maintenance
☐ When applicable, necessary special training or certification requirements for inspection and maintenance personnel such as confined space entry or hazardous waste management

Attachment 3b: For private entity operation and maintenance, Attachment 3b 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).

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

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

ATTACHMENT 4
COPY OF PLAN SHEETS SHOWING PERMANENT STORM WATER BMPS

This is the cover sheet for Attachment 4.

TO BE PROVIDED IN FINAL ENGINEERING

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

The plans must identify:

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

ATTACHMENT 5
DRAINAGE REPORT

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

Preliminary

HYDROLOGY REPORT

FOR

Strauss 5th & Walnut

3500-3534 5th Avenue
San Diego, CA 92103

March 25th, 2016

PTS: _____
IO: _____
DWG#: _____

Prepared By:

OMEGA Engineering Consultants
4340 Viewridge Ave, Suite B
San Diego, CA 92123
Ph: (858)634-8620

_____

Andrew J. Kann RCE 50940
Registration Expires 9-30-2017

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APPENDICES

SITE AND PROJECT DESCRIPTION

This Hydrology and Hydraulics report has been prepared as part of the grading plan set for the proposed building complex at the intersection of 5th Avenue and Walnut Avenue in San Diego. The structure and associated hardscape will cover the majority of the current site. See Figure No. 1 for Vicinity Map. See Figure 2 for the existing drainage limits. See Figure 3 for the proposed drainage limits.

The site does not affect any streams, rivers or wetlands, therefore a Section 404 or 401 CWA permit is not required.

METHODOLOGY

This drainage report has been prepared in accordance with current City of San Diego regulations and procedures. All of the proposed conduits and conveyances have been designed to intercept and convey the 100-year storm. The Modified Rational Method was used to compute the anticipated runoff. See the attached calculations for particulars. The following references have been used in preparation of this report:

(1) Handbook of Hydraulics, E.F. Brater & H.W. King, 6th Ed., 1976.
(2) Modern Sewer Design, American Iron & Steel Institute, 1st Ed., 1980.
(3) City of San Diego Drainage Design Manual, 1984

Culvert Design and Analysis

The storm drain culverts were sized using the K' values from King's Handbook Appendix 7-14, (Appendix 7.0 of this report). The following formula was used:

Q= (K'/n)*d^(8/3)*s^(0.5)

K'= Discharge Factor
d = Diameter of Condiuit (ft)
n = Manning's Coefficient
Q = Runoff Discharge (cfs)
s = Pipe Slope (ft/ft)

EXISTING CONDITIONS:

The existing site consists of a parking lot and two buildings that slopes to the east at 1-5%. The total area of the site is 0.80 acres. The runoff generated by the site drains via sheet flow and concentrated gutter flow off site to the curb face along the easterly side of 5th Avenue, which conveys the runoff to a City of San Diego storm drain inlet located at the southeasterly corner of the intersection of 5th Avenue and Brookes Avenue.

DEVELOPED CONDITIONS:

This project proposes the construction of a new multistory residential building with associated hardscape. The project will disturb 100% of the site and decrease the impervious area from 96.6% to 91.6%. This will decrease the runoff flow rates produced by the site from 4.67 cfs to 3.78 cfs for the 100-year storm . The proposed development shall modify drainage locally, but runoff shall maintain the existing flow path via the curb face to the City storm drain inlet at the southeasterly corner of 5th Avenue and Brookes Avenue.

EXISTING RUNOFF ANALYSIS:

The rational method was used for calculating peak flow rates for the 85th%, 10-year and 100-year storm. Analysis of the existing site breaks the area into two separate basins. Runoff coefficients in the range of 0.87-0.90 was used for the existing flow calculations.

See the attached calculations for details.

DEVELOPED RUNOFF ANALYSIS:

The rational method was used for calculating peak flow rates for the 85th%, and 100-year storm. Analysis of the redeveloped conditions breaks the site up into 7 sub basins, all of which have the minimum time of concentration allowed by the Modified Rational Method, 5-minutes.

Runoff coefficients in the range of 0.67 to 0.90 were used for the proposed site. Proposed drainage conduits will be PVC and were sized using Manning's 'n' coefficient of 0.013. The rational method calculations and the site generated runoff were computed in accordance with Appendix II of the City of San Diego Drainage Design Manual.

The site shall decrease impervious area and the generated peak flows for all rainfall events.

See the attached calculations for details.

RESULTS AND CONCLUSIONS

The redevelopment of the site shall result in a decrease in peak runoff volumes and flow rates for the 85th percentile event and the 100 year event. This is due to the decrease in impervious area of the site from 96.6% to 91.6% The result is a peak discharge flow rate that is 0.89 cfs lower than the existing condition.

It is the opinion of Omega Engineering Consultants that the project will not cause adverse effects to the downstream facilities or receiving waters. A separate Storm Water Quality Management Plan (SWQMP) has been prepared to discuss the water quality and hydromodification impacts for the proposed development.

BASIN	AREA (SF)	AREA (AC)	% Imp	"C" Value
EXISITNG				
EX-1.1	18,612	0.43	94.4%	0.87
EX-1.2	16,412	0.38	99.2%	0.90
EX. TOTAL	**35,024**	**0.80**	**96.6%**	
PROPOSED				
A-1	2,698	0.06	57.9%	0.67
A-2	19,782	0.45	93.5%	0.86
A-3	902	0.02	100.0%	0.90
A-4	1,471	0.03	100.0%	0.90
A-5	1,840	0.04	91.2%	0.85
A-6	6,323	0.15	94.1%	0.87
A-7	2,008	0.05	100.0%	0.90
PROP TOTAL	**35,024**	**0.80**	**91.6%**	

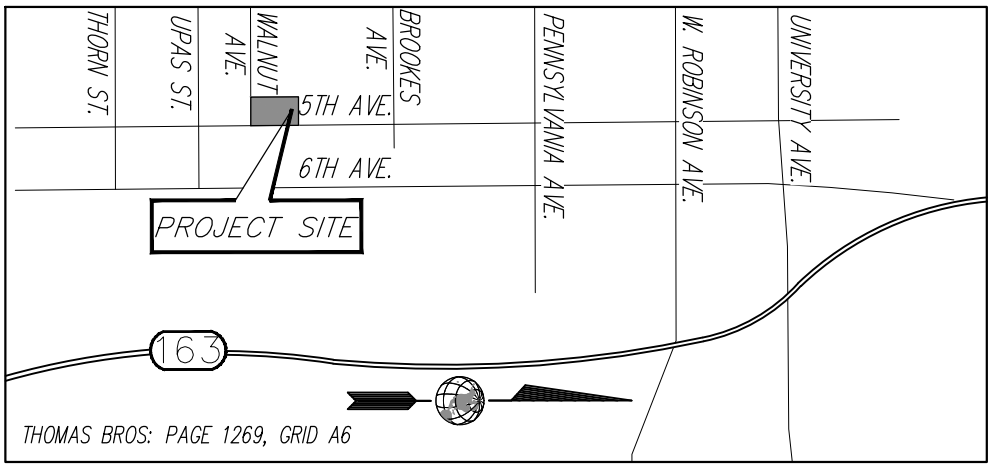
Basin Confluence	Symbol
(EX-1.1) : (EX-2.1)	ECP#1
A-1:A-2	CP#1
(A-1,A-2):(A-3)	CP#2
(A-1, A-2, A-3):(A-4)	CP#3
(A-1, A-2, A-3,A-4):(A-5)	CP#4
(A-1, A-2, A-3,A-4,A-5):(A-6)	CP#5
(A-1, A-2, A-3,A-4,A-5,A-6):(A-7)	CP#6

(A) "CP#1" Confluence Point Number 1

(B) C value for type 'D' bare ground is 0.35
C value for impervious surfaces is 0.9
Basins with mixed surface type use a weighted average
of these 2 values. (impervious% 0.9)+(pervious% x 0.35)
Example: Basin A-1, (0.93*0.9)+(0.07*0.35)=0.86

Sub-Basin	AREA Ac.	"C"	CA	L (ft) Travel	H (ft) (elev)	S(%) (avg.)	T_c min.	T_{tot} mins	I in/hr	Q cfs	Q_{tot} cfs	NOTES 85th % storm
EXISTING CONDITIONS												
EX-3.1	0.43	0.87	0.37	150	5.00	3.33	5.0	5.00	0.20	0.074	0.074	
EX-4.1	0.38	0.90	0.34	145	5.00	3.45	5.0	5.00	0.20	0.067	0.067	
ECP#3								**5.00**	**0.20**		**0.142**	
							Total Existing Runoff=				**0.142 CFS**	
PROPOSED CONDITIONS												
A-1	0.06	0.67	0.04	120	2.50	2.08	6.7	6.66	0.20	0.008	0.008	
A-2	0.45	0.86	0.39	115	1.50	1.30	5.0	5.00	0.20	0.078	0.078	
CP#1								**5.00**	**0.20**		**0.087**	
A-3	0.02	0.90	0.02	20	0.20	1.00	5.0	5.00	0.20	0.004	0.004	
CP#2								**5.00**	**0.20**		**0.091**	
A-4	0.03	0.90	0.03	20	0.20	1.00	5.0	5.00	0.20	0.006	0.006	
CP#3								**5.00**	**0.20**		**0.097**	
A-5	0.02	0.90	0.02	20	0.20	1.00	5.0	5.00	0.20	0.004	0.004	
CP#4								**5.00**	**0.20**		**0.100**	
A-6	0.03	0.90	0.03	40	0.40	1.00	5.0	5.00	0.20	0.006	0.006	
CP#5								**5.00**	**0.20**		**0.106**	
A-7	0.05	0.90	0.04	120	1.50	1.25	5.0	5.00	0.20	0.008	0.008	
CP#6								**5.00**	**0.20**		**0.115**	
							Total Developed Runoff=				**0.115 CFS**	

Sub-Basin	AREA Ac.	"C"	CA	L (ft) Travel	H (ft) (elev)	S(%) (avg.)	T_c min.	T_{tot} mins	I in/hr	Q cfs	Q_{tot} cfs	NOTES 100-Yr Storm
											P(6)	**2.5 Inches**
EXISTING CONDITIONS												
EX-3.1	0.43	0.87	0.37	150	5.00	3.33	5.0	5.00	6.59	2.446	2.446	
EX-4.1	0.38	0.90	0.34	145	5.00	3.45	5.0	5.00	6.59	2.223	2.223	
ECP#3								**5.00**	**6.59**		**4.669**	
								Total Existing Runoff=			**4.669**	**CFS**
PROPOSED CONDITIONS												
A-1	0.06	0.67	0.04	100	4.50	4.50	5.0	5.00	6.59	0.273	0.273	
A-2	0.45	0.86	0.39	115	1.50	1.30	5.0	5.00	6.59	2.585	2.585	
CP#1								**5.00**	**6.59**		**2.858**	
A-3	0.02	0.90	0.02	20	0.20	1.00	5.0	5.00	6.59	0.123	0.123	
CP#2								**5.00**	**6.59**		**2.981**	
A-4	0.03	0.90	0.03	20	0.20	1.00	5.0	5.00	6.59	0.200	0.200	
CP#3								**5.00**	**6.59**		**3.181**	
A-5	0.02	0.90	0.02	20	0.20	1.00	5.0	5.00	6.59	0.123	0.123	
CP#4								**5.00**	**6.59**		**3.304**	
A-6	0.03	0.90	0.03	40	0.40	1.00	5.0	5.00	6.59	0.200	0.200	
CP#5								**5.00**	**6.59**		**3.504**	
A-7	0.05	0.90	0.04	120	1.50	1.25	5.0	5.00	6.59	0.273	0.273	
CP#6								**5.00**	**6.59**		**3.777**	
								Total Developed Runoff=			**3.777**	**CFS**



VICINITY MAP

NOT TO SCALE

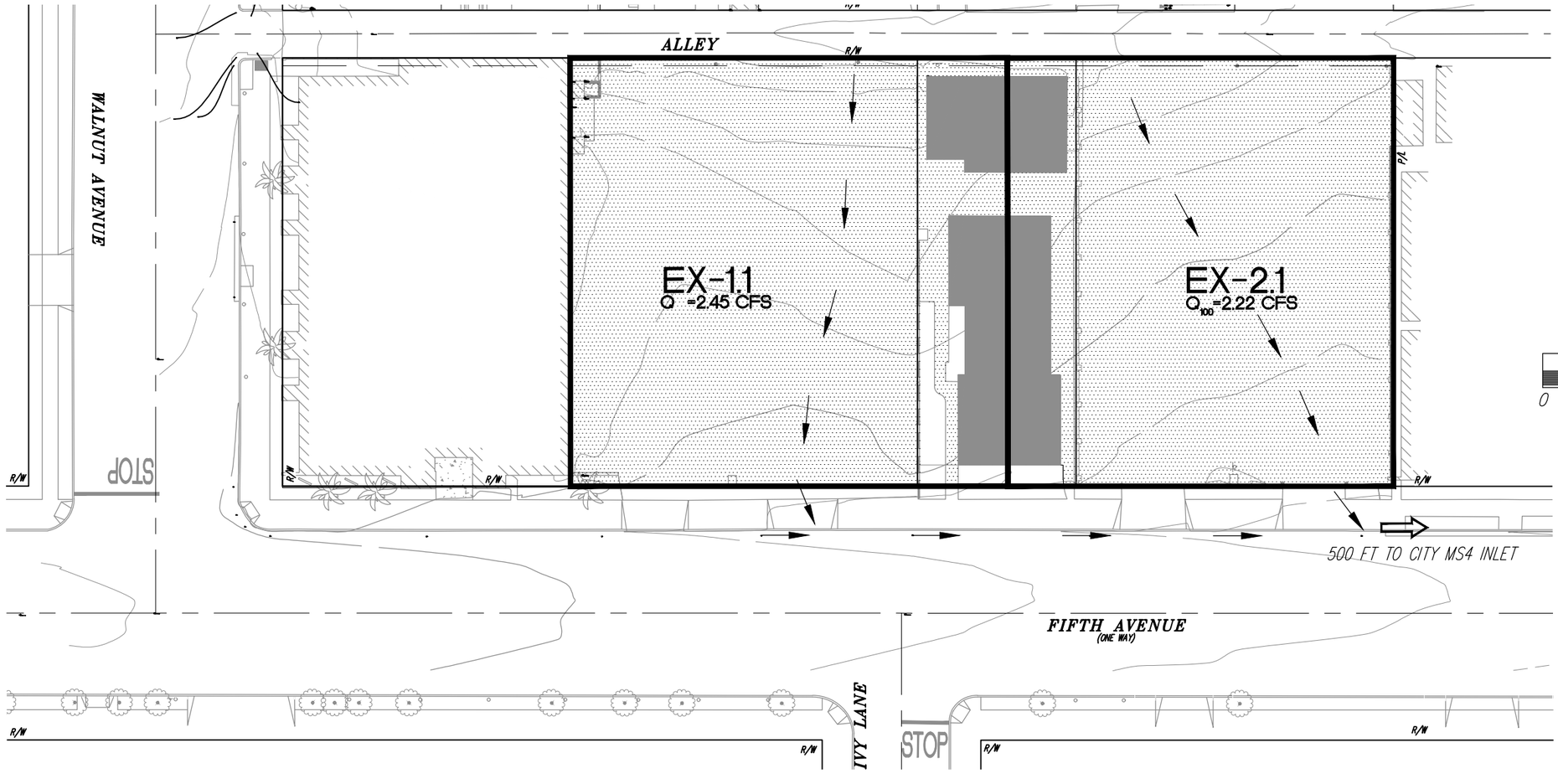
FIGURE 1

5TH AND WALNUT
EXISTING HYDROLOGY EXHIBIT

BASIN DATA TABLE					
BASIN	AREA (AC)	% IMP	% PER	SOIL TYPE	SLOPE CONDITION
EX-3.1	0.43	94.4	5.6	TYPE 'D'	SURFACE FLOW TO 5TH AVE
EX-4.1	0.38	99.2	0.8	TYPE 'D'	SURFACE FLOW TO 5TH AVE
TOTAL	0.81	96.7	3.3	TYPE 'D'	–

LEGEND:

- PROJECT BOUNDARY
- AREA LIMITS
- DRAINAGE DIRECTION ARROW
- IMPERVIOUS AREA
- BUILDING AREA
- PERVIOUS AREA
- BASIN NUMBER — EX-#



GRAPHICAL SCALE: 1" = 40'

0 20 40 80 120

OMEGA ENGINEERING CONSULTANTS
4340 VIEWRIDGE AVENUE, SUITE B
SAN DIEGO, CALIFORNIA 92123
PH:(858) 634-8620 FAX:(858) 634-8627

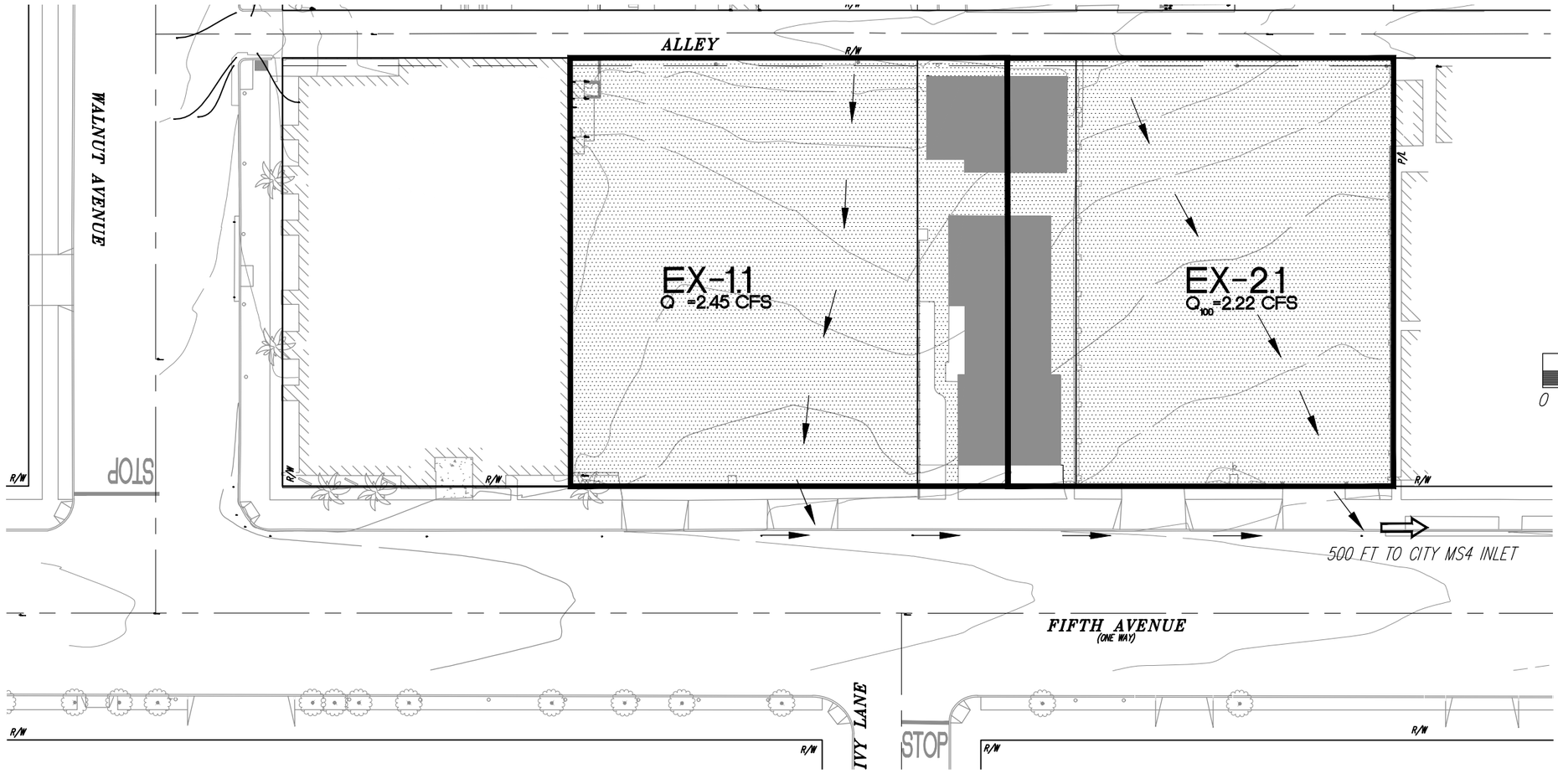
FIGURE 2

5TH AND WALNUT
EXISTING HYDROLOGY EXHIBIT

BASIN DATA TABLE					
BASIN	AREA (AC)	% IMP	% PER	SOIL TYPE	SLOPE CONDITION
EX-3.1	0.43	94.4	5.6	TYPE 'D'	SURFACE FLOW TO 5TH AVE
EX-4.1	0.38	99.2	0.8	TYPE 'D'	SURFACE FLOW TO 5TH AVE
TOTAL	0.81	96.7	3.3	TYPE 'D'	–

LEGEND:

- PROJECT BOUNDARY
- AREA LIMITS
- DRAINAGE DIRECTION ARROW
- IMPERVIOUS AREA
- BUILDING AREA
- PERVIOUS AREA
- BASIN NUMBER — EX-#



GRAPHICAL SCALE: 1" = 40'

0 20 40 80 120

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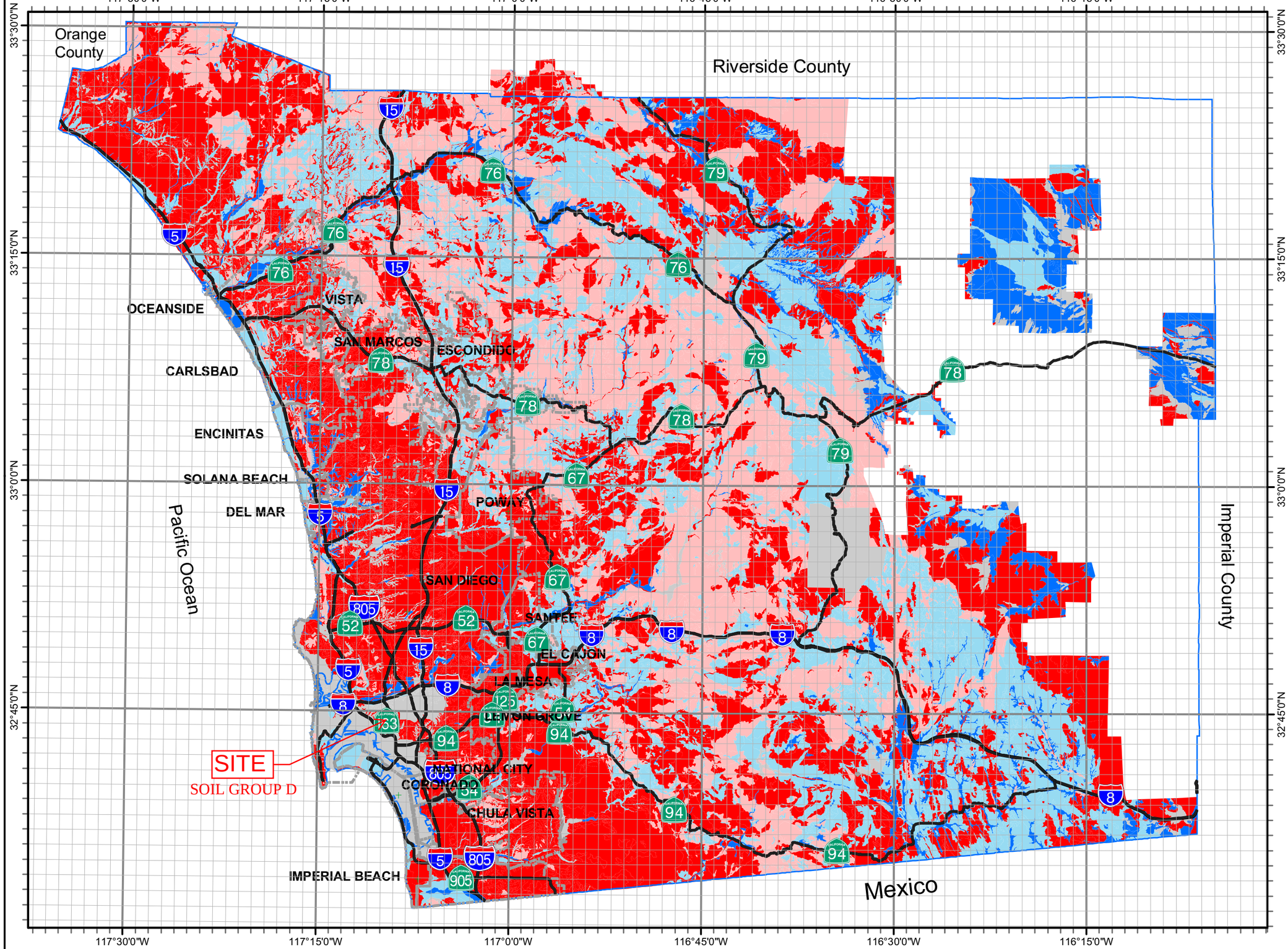
FIGURE 2

APPENDICES

County of San Diego Hydrology Manual Soil Hydrologic Group



Legend

- Major Roads
- Incorporated City Bdy

HYDROLOGIC SOIL GROUP

- Hydrologic Group Undefined
- Hydrologic Group A
- Hydrologic Group B
- Hydrologic Group C
- Hydrologic Group D
- No Soil Data

Note: Soil Data Source
USDA/NRCS
SSURGO Soils 2007

N

31.5 0 3 Miles

ORANGE COUNTY

RIVERSIDE COUNTY

IMPERIAL COUNTY

PACIFIC OCEAN

OCEANSIDE

CARLSBAD

VISTA

SAN MARCOS

ESCONDIDO

SOLANA BEACH

DEL MAR

SAN DIEGO

CORONADO

IMPERIAL BEACH

MEXICO

85th Percentile Precipitation
Isopluvial Map
Rainfall in Inches

DRAFT
6/27/01

SITE

Map datum: July 02, 2003

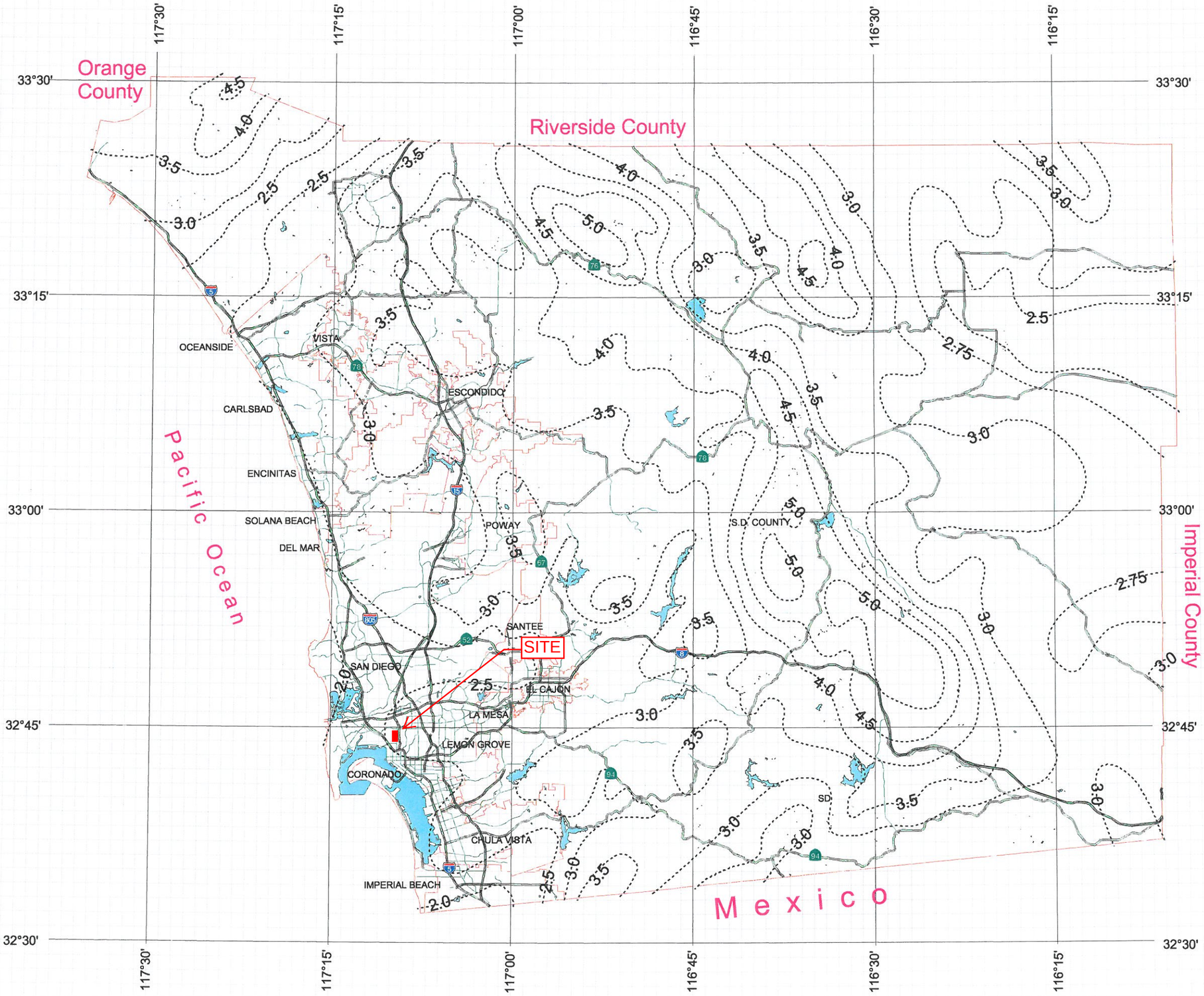
SanGIS
We Know San Diego County

County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 6 Hours

Isopluvial (inches)



DPW GIS
Department of Public Works Geographic Information Services

SanGIS
We Have San Diego Covered!

N
W E
S

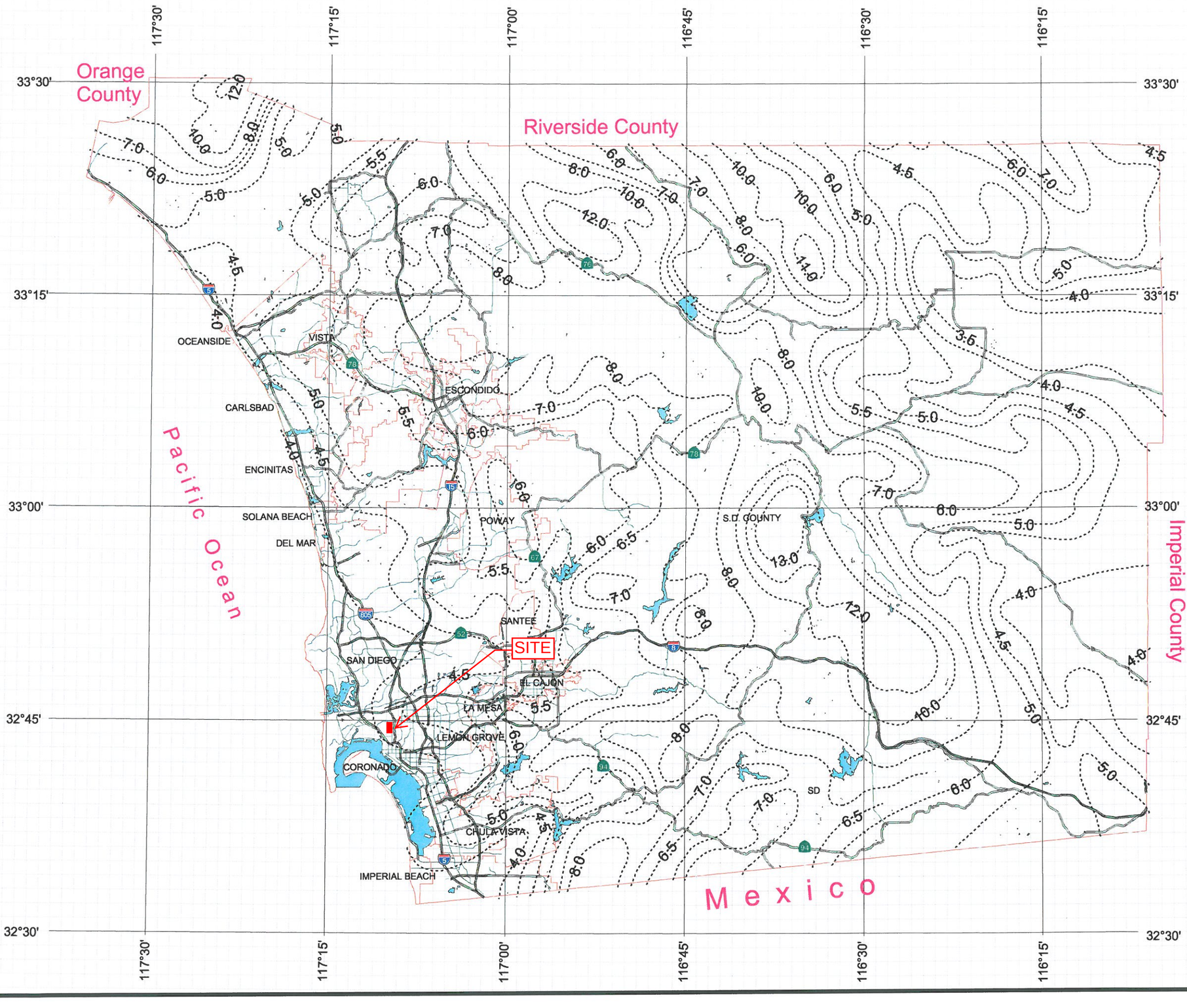
3 0 3 Miles

County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 24 Hours

Isopluvial (inches)

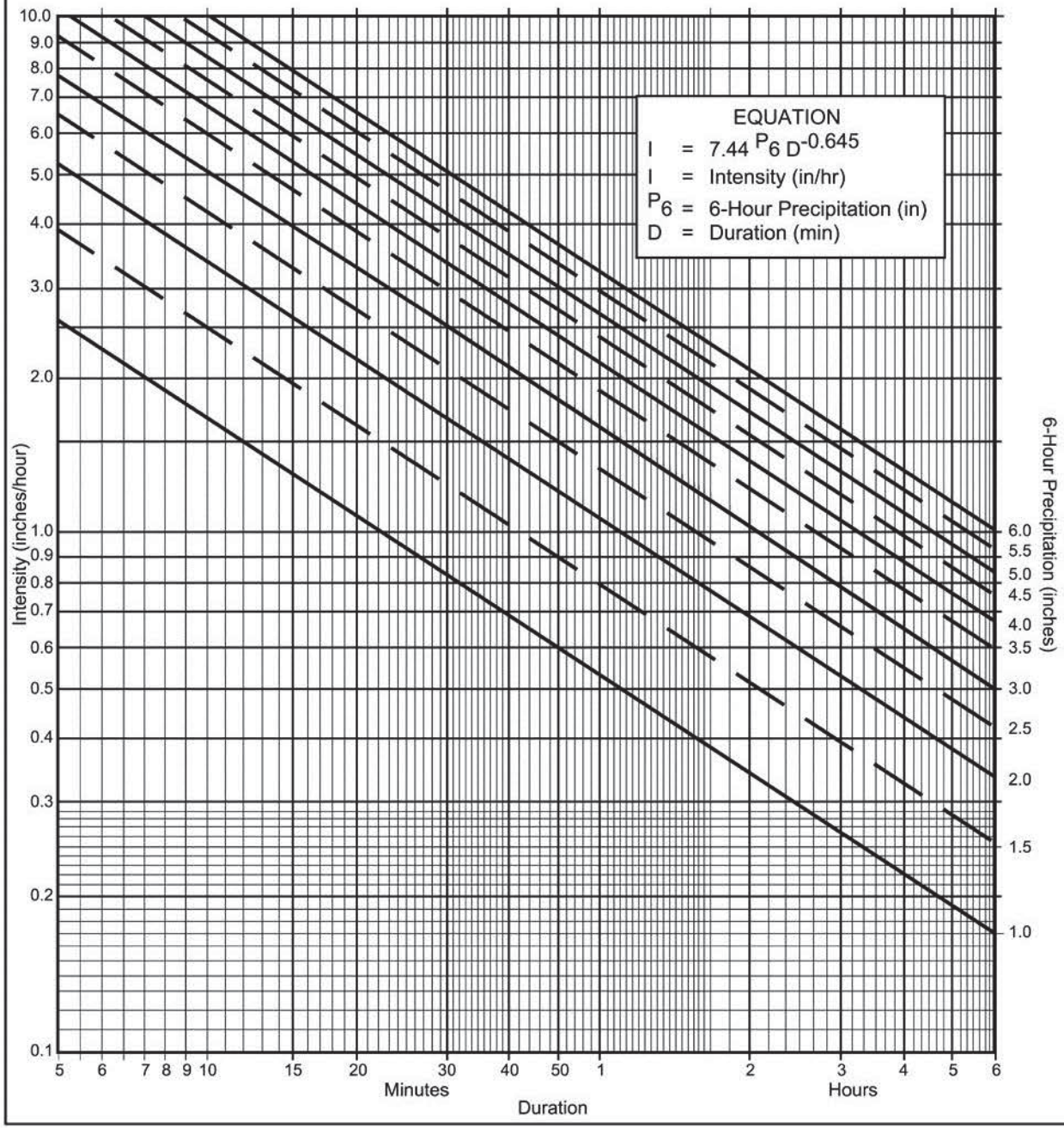


DPW GIS
Department of Public Works
Geographic Information Services

SanGIS
We Have San Diego Covered!

N
W E
S

3 0 3 Miles



Directions for Application:

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

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

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

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

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

Application Form:

(a) Selected frequency 100 year

(b) P_6 = 2.5 in., P_{24} = 4.4, $\frac{P_6}{P_{24}}$ = 56 %(2)

(c) Adjusted P_6(2) = N/A in.

(d) t_x = --- min.

(e) I = --- in./hr.

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

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

Intensity-Duration Design Chart - Template

TABLE 2

RUNOFF COEFFICIENTS (RATIONAL METHOD)

DEVELOPED AREAS (URBAN)

Land Use	Coefficient, C Soil Type (1)
Residential:	D
Single Family	.55
Multi-Units	.70
Mobile Homes	.65
Rural (lots greater than 1/2 acre)	.45
Commercial (2) 80% Impervious	.85
Industrial (2) 90% Impervious	.95

NOTES:

(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 no 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 = $\frac{50}{80}$ x 0.85 = 0.53

Table 7-4. For Determining the Area a of the Cross Section of a Circular Conduit Flowing Part Full

Let $\frac{\text{depth of water}}{\text{diameter of channel}} = \frac{D}{d}$ and C_a = the tabulated value. Then $a = C_a d^2$.

$\frac{D}{d}$	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
.0	.0000	.0013	.0037	.0069	.0105	.0147	.0192	.0242	.0294	.0350
.1	.0409	.0470	.0534	.0600	.0668	.0739	.0811	.0885	.0961	.1039
.2	.1118	.1199	.1281	.1365	.1449	.1535	.1623	.1711	.1800	.1890
.3	.1982	.2074	.2167	.2260	.2355	.2450	.2546	.2642	.2739	.2836
.4	.2934	.3032	.3130	.3229	.3328	.3428	.3527	.3627	.3727	.3827
.5	.393	.403	.413	.423	.433	.443	.453	.462	.472	.482
.6	.492	.502	.512	.521	.531	.540	.550	.559	.569	.578
.7	.587	.596	.605	.614	.623	.632	.640	.649	.657	.666
.8	.674	.681	.689	.697	.704	.712	.719	.725	.732	.738
.9	.745	.750	.756	.761	.766	.771	.775	.779	.782	.784

Table 7-14. Values of K' for Circular Channels in the Formula

$$Q = \frac{K'}{n} d^{8/3} s^{1/2}$$

D = depth of water d = diameter of channel

$\frac{D}{d}$	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
.0		.00007	.00031	.00074	.00138	.00222	.00328	.00455	.00604	.00775
.1	.00967	.0118	.0142	.0167	.0195	.0225	.0257	.0291	.0327	.0366
.2	.0406	.0448	.0492	.0537	.0585	.0634	.0686	.0738	.0793	.0849
.3	.0907	.0966	.1027	.1089	.1153	.1218	.1284	.1352	.1420	.1490
.4	.1561	.1633	.1705	.1779	.1854	.1929	.2005	.2082	.2160	.2238
.5	.232	.239	.247	.255	.263	.271	.279	.287	.295	.303
.6	.311	.319	.327	.335	.343	.350	.358	.366	.373	.380
.7	.388	.395	.402	.409	.416	.422	.429	.435	.441	.447
.8	.453	.458	.463	.468	.473	.477	.481	.485	.488	.491
.9	.494	.496	.497	.498	.498	.498	.496	.494	.489	.483
1.0	.463									

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.

This is a Draft Report

GEOTECHNICAL INVESTIGATION

STRAUSS FIFTH AVENUE APARTMENTS
SAN DIEGO, CALIFORNIA

PREPARED FOR

DANUBE PROPERTIES INCORPORATED
SAN DIEGO, CALIFORNIA

MARCH 27, 2015
PROJECT NO. G1815-11-01

Project No. G1815-11-01
March 27, 2015

Danube Properties Incorporated
2055 Third Avenue, Suite 200
San Diego, California 92101

Attention: Mr. Don Clauson

Subject: GEOTECHNICAL INVESTIGATION
STRAUSS FIFTH AVENUE APARTMENTS
SAN DIEGO, CALIFORNIA

Dear Mr. Clauson:

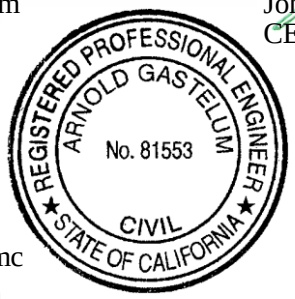
In accordance with your authorization of our Proposal No. LG-15061, dated February 24, 2015, we herein submit the results of our geotechnical investigation for the subject project. We performed our investigation to evaluate the underlying soil and geologic conditions and potential geologic hazards and to assist in the design of the proposed building and improvements. The accompanying report presents the results of our study and conclusions and recommendations pertaining to the geotechnical aspects of the proposed project. The site is considered suitable for the proposed building and improvements provided the recommendations of this report are incorporated into the design and construction of the planned project.

Should you have questions regarding this report, or if we may be of further service, please contact the undersigned at your convenience.

Very truly yours,

GEOCON INCORPORATED

Arnold Gastelum
RCE 81553



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GEOTECHNICAL INVESTIGATION

1. PURPOSE AND SCOPE

This report presents the results of our geotechnical investigation for the proposed new apartment building over subterranean parking levels in the Hillcrest neighborhood of San Diego, California (see Vicinity Map, Figure 1). The purpose of this geotechnical investigation is to evaluate the surface and subsurface soil conditions, general site geology, and to identify geotechnical constraints that may impact the planned improvements to the property. In addition, this report provides 2013 CBC seismic design criteria; grading recommendations; shoring, tie-back, and soil nail wall recommendations; building foundation and concrete slab-on-grade recommendations; concrete flatwork, preliminary rigid pavement recommendations; retaining wall, and lateral load recommendations; and discussion regarding the local geologic hazards including faulting and seismic shaking.

This report is limited to the area proposed for the construction of the new development and associated improvements as shown on the Geologic Map, Figure 2. We used a topographic map prepared by Omega Land Surveying Incorporated for the base of the Geologic Map.

The scope of this investigation included the review of readily available published and unpublished geologic literature (see List of References), drilling four exploratory borings to a maximum depth of about 61 feet, soil sampling, laboratory testing, engineering analyses, and preparation of this geotechnical investigation report. Appendix A presents the exploratory boring logs and details of the field investigation. Appendix B presents details of the laboratory tests and a summary of the test results.

2. SITE AND PROJECT DESCRIPTION

The roughly ¾-acre site is located in a mixed use neighborhood. The site is bound by a 3-story office building with address 3500 Fifth Avenue to the south; an alleyway and residential buildings to the west; residential and retail buildings to the north; and Fifth Avenue on the east. The subject site currently consists of a one and two story apartment building located in the center portion of the subject site with two on-grade parking lots to the north and south of the apartment building. The asphalt concrete parking lots can be accessed from Fifth Avenue to the east and the alleyway to the west. The property slopes gently to the east roughly 4 to 5 feet with drainage sheet flowing toward Fifth Avenue.

The Strauss Fifth Avenue Apartments development will consist of a five-story apartment building with three to four levels of subterranean parking. The building will also contain a workout center, leasing office, pool, and on-grade space adjacent to the existing office building. The excavations for

the subterranean parking will be vertical from the edges of the property and will not extend below the existing western alleyway, sidewalks along Fifth Avenue or the office building to the south.

The locations and descriptions of the site and proposed development are based discussions with you and observations during our field investigation. If project details vary significantly from those described herein, Geocon Incorporated should be contacted to evaluate the necessity for review and revision of this report.

3. GEOLOGIC SETTING

The site is located in a coastal plain environment within the southern portion of the Peninsular Ranges Geomorphic Province of southern California. The Peninsular Ranges is a geologic and geomorphic province that extends from the Imperial Valley to the Pacific Ocean and from the Transverse Ranges to the north and into Baja California to the south. The coastal plain of San Diego County is underlain by a thick sequence of relatively undisturbed and non-conformable sedimentary rocks that thicken to the west and range in age from Upper Cretaceous through the Pleistocene with intermittent deposition. The sedimentary units are deposited on bedrock Cretaceous- to Jurassic-age igneous and metavolcanic rocks. Geomorphically, the coastal plain is characterized by a series of twenty-one, stair-stepped marine terraces, which are younger to the west and have been dissected by west flowing rivers that drain the Peninsular Ranges to the east. The coastal plain is a relatively stable block that is dissected by relatively few faults consisting of the potentially active La Nacion Fault Zone and the active Rose Canyon Fault Zone. The Peninsular Ranges Province is also dissected by the Elsinore Fault Zone that is associated with and sub-parallel to the San Andreas Fault Zone, which is the plate boundary between the Pacific and North American Plates.

Marine and non-marine Pleistocene- and Pliocene-age shallow sedimentary units, consisting of Very Old Paralic Deposits (Unit 9) unconformably overlying the San Diego Formation, make up the geologic units present on the site. Geomorphically, the site is located on a marine terrace (Linda Vista) that has been dissected to the east by a canyon drainage east of Sixth Avenue likely formed during the Pleistocene-age. The surface elevations slope gently to the east toward the canyon drainage which flows through Balboa Park and into the San Diego Bay to the south. The terrace deposit is approximately 25 to 30 feet thick on site at an approximate elevation of 261 to 263 feet MSL overlying the San Diego Formation reported to be several hundred feet thick.

4. SOIL AND GEOLOGIC CONDITIONS

Our field investigation indicates the site is underlain by one surficial soil type (consisting of undocumented fill) and two geologic units (consisting of Very Old Paralic Deposits and the San Diego Formation). The boring logs presented in Appendix A and the Geologic Map, Figure 2, show the occurrence, distribution, and description of each unit encountered during our field investigation.

Figure 3 presents a Geologic Cross-Section showing the underlying geology conditions. The surficial soil and geologic units are described herein in order of increasing age.

4.1 Undocumented Fill (Qudf)

We encountered undocumented fill in exploratory Borings B-1 through B-3 to a maximum depth of approximately 4 feet below existing ground surface. The fill generally consists of medium dense, reddish brown to dark brown, silty to clayey sand with varying amounts of gravel. The undocumented fill is considered unsuitable for support of the proposed building. We expect the fill materials will be removed during excavations to achieve finish grade elevations for the subterranean parking garage. Undocumented fill exposed at finish grade will require processing to support hardscape improvements. The fill material can be reused as properly compacted new fill if relatively free from vegetation, debris, and contaminants.

4.2 Very Old Paralic Deposits (Qvop)

Middle to early Pleistocene-age Very Old Paralic Deposits underlies the undocumented fill. Very Old Paralic Deposits consists of very dense, moderately cemented, reddish-brown to yellowish-brown, silty to clayey, fine- to coarse-grained sandstone with zones of gravel and cobble. In general, the deposits possess a "very low" to "low" expansion potential (Expansion Index of 50 or less) and suitable shear strengths. Very Old Paralic Deposits are considered suitable for the support of compacted fill and/or structural loads. Excavations within this unit will likely encounter difficult digging conditions and oversize material may be generated.

4.3 San Diego Formation (Tsd)

Pliocene-age San Diego Formation underlies the Very Old Paralic Deposits. We encountered the San Diego Formation at depths ranging from approximately 26 to 32 feet below the existing ground surface or at approximate elevations of 260.5 to 262.5 feet MSL. The San Diego Formation consists of very dense, weakly cemented, silty, fine-grained sandstone. In general, the deposit possesses a "very low" to "low" expansion potential (Expansion Index of 50 or less) and suitable shear strengths. The San Diego Formation is considered suitable for support of structural loads. Excavations in this unit will likely require moderate to heavy effort with conventional heavy-duty equipment, and oversize materials may be generated in localized areas if cemented zones are encountered. Some areas of caving sand may also be encountered within the San Diego Formation.

5. GROUNDWATER

We did not encounter groundwater or seepage during the site investigation. We expect the groundwater table would be in excess of 100 to 150 feet below existing ground. We do not expect groundwater or seepage to be encountered during construction of the proposed development.

However, it is not uncommon for seepage conditions to exist within the near surface elevations or develop where none previously existed. Seepage is dependent on seasonal precipitation, irrigation, land use, among other factors, and varies as a result. Proper surface drainage will be important to future performance of the project.

6. GEOLOGIC HAZARDS

6.1 Geologic Hazard Category

The City of San Diego Seismic Safety Study, Geologic Hazards and Faults, Map Sheet 21 defines the site with a *Hazard Category 52 Other Terrain: Other level areas, gently sloping to steep terrain, favorable geologic structure. Low risk.*

6.2 Faulting and Seismicity

Review of the referenced geologic materials and our knowledge of the general area indicate that the site is not underlain by active, potentially active, or inactive faulting. An active fault is defined by the California Geological Survey (CGS) as a fault showing evidence for activity within the last 11,000 years. The site is not located within State of California Earthquake Fault Zone. In addition to our background review, the site is not mapped in the vicinity of geologic hazards such as landslides or liquefaction areas. The potentially active fault Florida Canyon Fault is located approximately 1 mile to the east and the potentially active Texas Street Fault is located approximately 1½ miles to the east. These faults will not affect site development of the project.

According to the computer program *EZ-FRISK* (Version 7.62), six known active faults are located within a search radius of 50 miles from the property. We used the 2008 USGS fault database that provides several models and combinations of fault data to evaluate the fault information. Based on this database, the nearest known active fault is the Newport-Inglewood/Rose Canyon Faults, located approximately 1 mile west of the site and is the dominant source of potential ground motion. Earthquakes that might occur on the Newport-Inglewood/Rose Canyon Faults or other faults within the southern California and northern Baja California area are potential generators of significant ground motion at the site. The estimated deterministic maximum earthquake magnitude and peak ground acceleration for the Newport-Inglewood/Rose Canyon Faults are 7.5 and 0.60g, respectively. Table 6.2.1 lists the estimated maximum earthquake magnitude and peak ground acceleration for the most dominant faults in relationship to the site location. We calculated peak ground acceleration (PGA) using Boore-Atkinson (2008) NGA USGS 2008, Campbell-Bozorgnia (2008) NGA USGS 2008, and Chiou-Youngs (2007) NGA USGS 2008 acceleration-attenuation relationships. The subject site can be classified as Site Class C.

TABLE 6.2.1
DETERMINISTIC SPECTRA SITE PARAMETERS

Fault Name	Distance from Site (miles)	Maximum Earthquake Magnitude (Mw)	Peak Ground Acceleration		
			Boore-Atkinson 2008 (g)	Campbell-Bozorgnia 2008 (g)	Chiou-Youngs 2007 (g)
Newport-Inglewood	1	7.5	0.51	0.47	0.60
Rose Canyon	1	6.9	0.47	0.47	0.56
Coronado Bank	13	7.4	0.20	0.16	0.19
Palos Verdes Connected	13	7.7	0.22	0.17	0.22
Elsinore	40	7.85	0.11	0.08	0.10
Earthquake Valley	45	6.8	0.06	0.05	0.04

We used the computer program *EZ-FRISK* to perform a probabilistic seismic hazard analysis. The computer program *EZ-FRISK* operates under the assumption that the occurrence rate of earthquakes on each mappable Quaternary fault is proportional to the faults slip rate. The program accounts for fault rupture length as a function of earthquake magnitude, and site acceleration estimates are made using the earthquake magnitude and distance from the site to the rupture zone. The program also accounts for uncertainty in each of following: (1) earthquake magnitude, (2) rupture length for a given magnitude, (3) location of the rupture zone, (4) maximum possible magnitude of a given earthquake, and (5) acceleration at the site from a given earthquake along each fault. By calculating the expected accelerations from considered earthquake sources, the program calculates the total average annual expected number of occurrences of site acceleration greater than a specified value. We utilized acceleration-attenuation relationships suggested by Boore-Atkinson (2008) NGA USGS, Campbell-Bozorgnia (2008) NGA USGS, and Chiou-Youngs (2007) NGA USGS 2008 in the analysis. Table 6.2.2 presents the site-specific probabilistic seismic hazard parameters including acceleration-attenuation relationships and the probability of exceedence.

TABLE 6.2.2
PROBABILISTIC SEISMIC HAZARD PARAMETERS

Probability of Exceedence	Peak Ground Acceleration		
	Boore-Atkinson, 2008 (g)	Campbell-Bozorgnia, 2008 (g)	Chiou-Youngs, 2007 (g)
2% in a 50 Year Period	0.57	0.56	0.68
5% in a 50 Year Period	0.35	0.35	0.40
10% in a 50 Year Period	0.22	0.22	0.23

The California Geologic Survey (CGS) has a program that calculates the ground motion for a 10 percent of probability of exceedence in 50 years based on an average of several attenuation

relationships. Table 6.2.3 presents the calculated results from the *Probabilistic Seismic Hazards Mapping Ground Motion* Page from the CGS website.

TABLE 6.2.3
PROBABILISTIC SITE PARAMETERS FOR SELECTED FAULTS
CALIFORNIA GEOLOGIC SURVEY

Calculated Acceleration (g) Firm Rock	Calculated Acceleration (g) Soft Rock	Calculated Acceleration (g) Alluvium
0.27	0.29	0.33

While listing peak accelerations is useful for comparison of potential effects of fault activity in a region, other considerations are important in seismic design, including the frequency and duration of motion and the soil conditions underlying the site. Seismic design of the structures should be evaluated in accordance with the California Building Code (CBC) guidelines currently adopted by the City of San Diego.

6.3 Ground Rupture

Ground surface rupture occurs when movement along a fault is sufficient to cause a gap or rupture where the upper edge of the fault zone intersects the earth surface. The potential for ground rupture is considered to be negligible due to the absence of active faults at the subject site.

6.4 Seiches and Tsunamis

Seiches are free or standing-wave oscillations of an enclosed water body that continue, pendulum fashion, after the original driving forces have dissipated. Seiches usually propagate in the direction of longest axis of the basin. The potential of seiches to occur is considered to be very low due to the absence of a nearby inland body of water.

A tsunami is a series of long-period waves generated in the ocean by a sudden displacement of large volumes of water. Causes of tsunamis may include underwater earthquakes, volcanic eruptions, or offshore slope failures. The first-order driving force for locally generated tsunamis offshore southern California is expected to be tectonic deformation from large earthquakes. Wave heights and run-up elevations from tsunamis along the San Diego Coast have historically fallen within the normal range of the tides. The site is located approximately 4½ miles from the Pacific Ocean at an elevation of approximately 290 feet above Mean Sea Level; therefore, the risk of tsunamis affecting the site is negligible.

6.5 Liquefaction

Liquefaction typically occurs when a site is located in a zone with seismic activity, onsite soil is cohesionless or silt/clay with low plasticity, groundwater is encountered within 50 feet of the surface, and soil relative densities are less than about 70 percent. If the four of the previous criteria are met, a seismic event could result in a rapid pore-water pressure increase from the earthquake-generated ground accelerations. Seismically induced settlement may occur whether the potential for liquefaction exists or not. The potential for liquefaction and seismically induced settlement occurring within the site soil is considered very low due to the dense nature of the Very Old Paralic Deposits and San Diego Formation.

6.6 Landslides

Based on observations during our field investigation and review of published geologic maps for the site vicinity, it is our opinion that potential landslides are not present at the subject property or at a location that could impact the proposed development.

7. CONCLUSIONS AND RECOMMENDATIONS

7.1 General

7.1.1 From a geotechnical engineering standpoint, it is our opinion that the site is suitable for development of the five-story apartment building with up to four levels of subterranean parking provided the recommendations presented herein are implemented in design and construction of the project.

7.1.2 With the exception of possible moderate to strong seismic shaking, no significant geologic hazards were observed or are known to exist on the site that would adversely affect the proposed project.

7.1.3 Our field investigation indicates the site is underlain by undocumented fill overlying Very Old Paralic Deposits and the San Diego Formation. The undocumented fill is not considered suitable for the support of the building structure. We expect the proposed subterranean garage finish grade elevations will be within the Very Old Paralic Deposits or the San Diego Formation.

7.1.4 The Very Old Paralic Deposits and the San Diego Formation are considered suitable for the support of compacted fill and settlement-sensitive structures.

7.1.5 Undocumented fill exposed at finish grade surrounding the building structure that will support new surface improvements will require the processing prior to placement of compacted fill or improvements.

7.1.6 We did not encounter groundwater or seepage during our field investigation. We do not expect groundwater or seepage to be encountered during construction of the proposed development.

7.1.7 The proposed structure can be supported on conventional shallow foundations founded in Very Old Paralic Deposits or the San Diego Formation.

7.2 Excavation and Soil Conditions

7.2.1 Excavation of the undocumented fill, the Very Old Paralic Deposits, and the San Diego Formation should generally be possible with moderate to heavy effort using conventional, heavy-duty equipment during grading and trenching operations. We expect very heavy effort with possible refusal for excavations into moderately cemented layers and gravel and cobble portions of the Very Old Paralic Deposits. Cemented layers within the San Diego

Formations are expected to be localized. Sidewall instability may be encountered where the cohesion of the materials is very low.

7.2.2 The soil encountered in our field investigation is predominately considered to be "non-expansive" (expansion index of 20 or less) as defined by 2013 California Building Code (CBC) Section 1803.5.3. Table 7.2.1 presents soil classifications based on the expansion index. Based on the results of our laboratory testing, presented in Appendix B, and observations during drilling operations, we expect the on-site materials will possess a "very low" to "low" expansion potential (Expansion Index of 50 or less).

TABLE 7.2.1
EXPANSION CLASSIFICATION BASED ON EXPANSION INDEX

Expansion Index (EI)	Expansion Classification	2013 CBC Expansion Classification
0 – 20	Very Low	Non-Expansive
21 – 50	Low	Expansive
51 – 90	Medium	
91 – 130	High	
Greater Than 130	Very High	

7.2.3 We performed laboratory tests on samples of the site materials to evaluate the percentage of water-soluble sulfate content. Appendix B presents the results from the laboratory water-soluble sulfate content tests. The test results indicate that on-site materials at the locations tested possess "Not Applicable" and "S0" sulfate exposure to concrete structures, as defined by 2013 CBC Section 1904 and ACI 318-08 Sections 4.2 and 4.3. The presence of water-soluble sulfates is not a visually discernible characteristic. Therefore, other soil samples from the site could yield different concentrations. Additionally, over time landscaping activities (i.e. addition of fertilizers and other soil nutrients) may affect the concentration. We should perform additional laboratory tests to evaluate the soil at existing grade subsequent to the grading operations.

7.2.4 We tested samples for potential of hydrogen (pH) and resistivity laboratory tests to aid in evaluating the corrosion potential to subsurface metal structures. The laboratory test results are presented in Appendix B.

7.2.5 Geocon Incorporated does not practice in the field of corrosion engineering. Therefore, further evaluation by a corrosion engineer may be performed if improvements that could be susceptible to corrosion are planned.

7.3 Seismic Design Criteria

7.3.1 We used the computer program *U.S. Seismic Design Maps*, provided by the USGS. Table 7.3.1 summarizes site-specific design criteria obtained from the 2013 California Building Code (CBC; Based on the 2012 International Building Code [IBC] and ASCE 7-10), Chapter 16 Structural Design, Section 1613 Earthquake Loads. The short spectral response uses a period of 0.2 second. The building structure and improvements should be designed using a Site Class C. We evaluated the Site Class based blow counts, unconfined compression tests, the discussion in Section 1613.3.2 of the 2013 CBC, and Table 20.3-1 of ASCE 7-10. The values presented in Table 7.3.1 are for the risk-targeted maximum considered earthquake (MCE_R).

TABLE 7.3.1
2013 CBC SEISMIC DESIGN PARAMETERS

Parameter	Value	2013 CBC Reference
Site Class	C	Table 1613.3.2
MCE_R Ground Motion Spectral Response Acceleration – Class B (short), S_S	1.154g	Figure 1613..3.1(1)
MCE_R Ground Motion Spectral Response Acceleration – Class B (1 sec), S_1	0.444g	Figure 1613.3.1(2)
Site Coefficient, F_A	1.000	Table 1613.3.3(1)
Site Coefficient, F_V	1.356	Table 1613.3.3(2)
Site Class Modified MCE_R Spectral Response Acceleration (short), S_{MS}	1.154g	Section 1613.3.3 (Eqn 16-37)
Site Class Modified MCE_R Spectral Response Acceleration – (1 sec), S_{M1}	0.602g	Section 1613.3.3 (Eqn 16-38)
5% Damped Design Spectral Response Acceleration (short), S_{DS}	0.769g	Section 1613.3.4 (Eqn 16-39)
5% Damped Design Spectral Response Acceleration (1 sec), S_{D1}	0.401g	Section 1613.3.4 (Eqn 16-40)

7.3.2 Table 7.3.2 presents additional seismic design parameters for projects located in Seismic Design Categories of D through F in accordance with ASCE 7-10 for the mapped maximum considered geometric mean (MCE_G).

TABLE 7.3.2
2013 CBC SITE ACCELERATION DESIGN PARAMETERS

Parameter	Value	ASCE 7-10 Reference
Mapped MCE_G Peak Ground Acceleration, PGA	0.508g	Figure 22-7
Site Coefficient, F_{PGA}	1.000	Table 11.8-1

Site Class Modified MCE_G Peak Ground Acceleration, PGA_M	0.508g	Section 11.8.3 (Eqn 11.8-1)

7.3.3 Conformance to the criteria in Tables 7.3.1 and 7.3.2 for seismic design does not constitute any kind of guarantee or assurance that significant structural damage or ground failure will not occur if a maximum level earthquake occurs. The primary goal of seismic design is to protect life and not to avoid all damage, since such design may be economically prohibitive.

7.4 Grading

7.4.1 A pre-construction conference with the city inspector, owner, general contractor, civil engineer, and soil engineer in attendance should be held at the site prior to the beginning of grading operations. Special soil handling requirements can be discussed at that time.

7.4.2 Earthwork should be observed and compacted fill tested by representatives of Geocon Incorporated.

7.4.3 Grading of the site should commence with the demolition of existing structures, pavement, removal of existing improvements, vegetation, and deleterious debris. Deleterious debris should be exported from the site and should not be mixed with the fill. Existing underground improvements within the proposed structure area should be removed and relocated.

7.4.4 Based on our field investigation, we expect excavations for the planned apartment building and subterranean parking garage will expose Very Old Paralic Deposits and/or the San Diego Formation. The excavations can be performed to finish grade for the subterranean parking level without performing additional grading operations. If the bottom of the excavation is disturbed during excavation and export operations, then processing and compaction of the finish grade soils will be required.

7.4.5 Undocumented fill soil will likely be exposed in areas of surface improvements surrounding the building. The upper 12 inches of the undocumented fill should be scarified, moisture conditioned as necessary, and properly compacted. The actual extent of processing should be evaluated in the field by a representative of Geocon Incorporated.

7.4.6 Fill and backfill materials should be compacted to a dry density of at least 90 percent of the laboratory maximum dry density near to slightly above optimum moisture content as determined by ASTM Test Method D 1557. The upper 12 inches of fill beneath pavement

areas should be compacted to a dry density of at least 95 percent of the laboratory maximum dry density near to slightly above optimum moisture content shortly before paving operations.

7.5 Excavation Slopes, Shoring, and Tiebacks

7.5.1 The recommendations herein are provided for stable excavations and are submitted to the shoring and structural engineers to design a shoring system for the proposed excavations. The contractor should construct the temporary shoring system as designed by the project shoring engineer. The stability of the excavations is dependent on the design and construction of the shoring system. Therefore, Geocon Incorporated cannot be responsible for site safety and the stability of the proposed excavations. It is the responsibility of the contractor to provide a safe excavation during the construction of the proposed project.

7.5.2 Temporary slopes should be made in conformance with OSHA requirements. Undocumented fill should be considered a Type C soil, compacted fill should be considered a Type B soil (Type C soil if seepage is encountered) and the Very Old Paralic and San Diego Formation should be considered a Type A soil (Type B soil if seepage, groundwater, or cohesionless soil is encountered) in accordance with OSHA requirements. In general, no special shoring requirements will be necessary if temporary excavations will be less than 4 feet in height. Temporary excavations greater than 4 feet in height, however, should be sloped at an appropriate inclination. These excavations should not be allowed to become saturated or to dry appreciably. Surcharge loads should not be permitted to a distance equal to the height of the excavation from the top of the excavation. The top of the excavation should be a minimum of 15 feet from the edge of existing improvements. Excavations steeper than those recommended or closer than 15 feet from an existing surface improvement should be shored in accordance with applicable OSHA codes and regulations.

7.5.3 The design of temporary shoring is governed by soil and groundwater conditions and by the depth and width of the excavated area. Continuous support of the excavation face can be provided by a system of soldier piles and wood lagging. Excavations exceeding 15 feet may require tie back anchors or internal bracing to provide additional wall restraint.

7.5.4 In general, ground conditions are moderately suited to soldier pile and tieback anchor construction techniques. However, localized gravel, cobble, and cemented material will likely be encountered in the existing materials that could be difficult to drill. Additionally, relatively clean sands may be encountered within the existing materials that may result in some raveling of the unsupported excavation.

7.5.5 For level backfill conditions behind the shoring system, temporary tied-back shoring should be designed using a lateral pressure envelope acting on the back of the shoring and applying a pressure equal to 30H, 20H, or 25H, for a triangular, rectangular, or trapezoidal distribution, respectively, where H is the height, in feet, of the shoring (resulting pressure in pounds per square foot) as shown in Figure 4. These values are based on estimated maximum wall heights of approximately 40 feet. Triangular distribution should be used for cantilevered shoring and the trapezoidal and rectangular distribution should be used for multi-braced systems such as tieback anchors and rakers. The project shoring engineer should determine the applicable soil distribution for the design of the temporary shoring system. Additional lateral earth pressure due to the surcharging effects of adjacent structures, soil, or traffic loads should be considered, where appropriate, during design of the shoring system.

7.5.6 Passive soil pressure resistance for embedded portions of soldier piles can be based upon an equivalent passive soil fluid weight of 500 + 375D, where D is the depth of embedment (resulting in pounds per square foot), as shown on Figure 5. The passive resistance can be assumed to act over a width of three pile diameters. Typically, soldier piles are embedded a minimum of 0.5 times the maximum height of the excavation (this depth is to include footing excavations) if tieback anchors are not employed. The project structural engineer should determine the actual embedment depth.

7.5.7 Lateral movement of shoring is associated with vertical ground settlement outside of the excavation. Therefore, it is essential that the soldier pile and raker/tieback system only allow limited amounts of lateral displacement. Earth pressures acting on a lagging wall can result in the movement of the shoring toward the excavation and result in ground subsidence outside of the excavation. Consequently, horizontal movements of the shoring wall should be accurately monitored and recorded during excavation and anchor construction.

7.5.8 Survey points should be established at the top and at least one intermediate point between the top of the pile and the base of the excavation at least 20 percent of the soldier piles. These points should be monitored on a regular basis during excavation work.

7.5.9 The shoring system should be designed to limit horizontal soldier pile movement to a maximum of 1 inch. The amount of horizontal deflection can be assumed to be essentially zero along the Active Zone and Effective Zone boundary. The magnitude of movement for intermediate depths and distances from the shoring wall can be linearly interpolated. Higher values of horizontal movement can be allowed if properly incorporated into the design of the shoring. The project civil and/or shoring engineer should determine the

allowable amount of horizontal movement associated with the shoring system that could affect the existing utilities and structures.

7.5.10 If tieback anchor system is used, the tiebacks employed in shoring should be designed such that anchors fully penetrate the Active Zone behind the shoring. The Active Zone can be considered the wedge of soil from the face of the shoring to a plane extending upward from the base of the excavation at a 30-degree angle from vertical, as shown on Figure 6. Normally, tieback anchors are contractor-designed and installed, and there are numerous anchor construction methods available.

7.5.11 Experience has shown that the use of pressure grouting during formation of the bonded portion of the anchor will increase the soil-grout bond stress. A pressure grouting tube should be installed during the construction of the tieback. Post grouting should be performed if adequate capacity cannot be obtained by other construction methods. Non-shrinkage grout should be used for the construction of the tieback anchors.

7.5.12 Anchor capacity is a function of construction method, depth of anchor, batter, diameter of the bonded section, and the length of the bonded section. Table 7.5.1 presents the strength parameters to evaluate anchor capacity.

TABLE 7.5.1
RECOMMENDED SHEAR STRENGTH PARAMETERS FOR TIEBACK ANCHOR DESIGN

Description	Cohesion	Friction Angle
Undocumented Fill	150 psf	28 degrees
Very Old Paralic Deposits and San Diego Formation	350 psf	30 degrees

7.5.13 Grout should only be placed in the anchor's bonded section (effective zone) prior to testing or the unbonded section should be covered with PVC pipe. Anchors should be proof tested to at least 130 percent of the anchor's design working load. Following a successful proof test, the anchors should be locked off at approximately 80 percent of the anchor's allowable working load. Anchor test failure criteria should be established in project plans and specifications. Anchor test failure criteria should be based upon a maximum allowable displacement at 130 percent of the anchor's working load (anchor creep) and a maximum residual displacement within the anchor following stressing. Anchor stressing should only be conducted after sufficient hydration has occurred within the anchor grout. Anchors that fail to meet project specified test criteria should be locked off at an appropriate load and

additional anchors should be constructed. The shoring engineer should evaluate what the maximum load can be applied to the tieback anchors such that the loads are not exceeded during the testing procedures.

7.5.14 Lagging or shotcrete facing should keep pace with excavation and anchor construction. The excavation should not be advanced deeper than three feet below the bottom of lagging at any time. These unlagged gaps of up to three feet should only be allowed to stand for short periods of time in order to decrease the probability of soil sloughing and caving. Backfilling should be conducted when necessary between the back of lagging and excavation sidewalls to reduce sloughing in this zone. Further, the excavation should not be advanced further than four feet below a row of tiebacks prior to those tiebacks being proof tested and locked off.

7.5.15 An accurate survey of existing utilities and other underground structures adjacent to the shoring wall should be conducted. The survey should include both locations and depths of existing utilities. Locations of anchors should be adjusted as necessary during the design and construction process so as to accommodate existing and proposed utilities.

7.5.16 The condition of existing buildings, streets, sidewalks, and other structures around the perimeter of the planned excavation should be documented prior to the start of shoring and excavation work. Special attention should be given to documenting existing cracks or other indications of differential settlement within these adjacent structures, pavements and other improvements. Any underground utilities sensitive to settlement should be videotaped prior to construction to check the integrity of pipes. In addition, monitoring points should be established indicating location and elevation around the excavation and upon existing buildings. These points should be monitored on a regular basis during construction.

7.5.17 Tieback anchors within the City of San Diego right-of-way should be properly detentioned and removed where steel does not exist within the upper 20 feet from the existing grade. The *Notice – Land Development Review/Shoring in City Right-Of-Way*, prepared by the City of San Diego, dated July 1, 2003 should be reviewed and incorporated into the design of the tieback anchors. Procedures for removal of tieback anchors include unscrewing tendons using special couplings, use of explosives, or heat induction. Geocon Incorporated should be consulted if other methods of removal are planned.

7.6 Soil Nail Wall

7.6.1 As an alternative to temporary shoring, a soil nail wall can be used. Soil nail walls consist of installing closely spaced steel bars (nails) into a slope or excavation in a top-down construction sequence. Following installation of a horizontal row of nails drains,

waterproofing, and wall reinforcing steel are placed and shotcrete applied to create a final wall.

7.6.2 The soil nail wall should be designed by an engineer familiar with the design of soil nail walls.

7.6.3 In general, ground conditions are moderately to well suited for soil nail construction techniques. However, gravel, cobble, and cemented zones could be encountered within the existing materials that could be difficult to drill. In addition, relatively clean sand may be encountered within the materials that may result in some raveling of the unsupported excavation.

7.6.4 A wall drain system should be incorporated into the design of the soil nail wall. The existing soil should be considered corrosive. Corrosion protection should be provided for the nails if the wall will be a permanent structure.

7.6.5 Testing of the soil nails should be performed in accordance with the guidelines of the Federal Highway Administration or similar guidelines. At least two verification tests should be performed to confirm design assumptions for each soil/rock type encountered. Verification tests nails should be sacrificial and should not be used to support the proposed wall. The bond length should be adjusted to allow for pullout testing of the verification nails to evaluate the ultimate bond stress. A minimum of 5 percent of the production nails should also be proof tested. Geocon Incorporated should perform observation of soil nail installation and soil nail testing during the construction operations.

7.6.6 In addition to verification and proof testing, at least two pullout tests should be performed at the discretion of the soil engineer to check the geotechnical design parameters. During testing, the nail should be loaded incrementally until failure of the soil-grout bond or until the stress imposed on the nail reaches 80 percent of the bar yield strength. The bonded length should be confirmed prior to testing.

7.6.7 Table 7.6.1 presents the soil strength parameters to incorporate in the design of the soil nail walls.

TABLE 7.6.1
SOIL STRENGTH PARAMETERS FOR SOIL NAIL WALLS

Description	Cohesion	Friction Angle	Ultimate Bond Stress
Undocumented Fill	150 psf	28 degrees	15 psi
Very Old Paralic Deposits and San Diego Formation	350 psf	30 degrees	20 psi

7.7 Conventional Shallow Foundations

7.7.1 The proposed structure can be supported on a conventional shallow foundation system bearing on Very Old Paralic Deposits or the San Diego Formation. Foundations for the structures should consist of continuous strip footings and/or isolated spread footings. Continuous footings should be at least 12 inches wide and extend at least 24 inches below lowest adjacent pad grade. Isolated spread footings should have a minimum width of 24 inches and depth of 24 inches.

7.7.2 Steel reinforcement for continuous footings should consist of at least four No. 5 steel reinforcing bars placed horizontally in the footings; two near the top and two near the bottom. Steel reinforcement for the spread footings should be designed by the project structural engineer. A wall/column footing dimension detail is presented on Figure 7.

7.7.3 The minimum reinforcement recommended herein is based on soil characteristics only (EI of 50 or less) and is not intended to replace reinforcement required for structural considerations.

7.7.4 The recommended allowable bearing capacity for foundations with minimum dimensions described herein is 9,000 psf for footings bearing in the Very Old Paralic Deposits or the San Diego Formation. The allowable soil bearing pressure may be increased by an additional 500 psf for each additional foot of depth and 300 psf for each additional foot of width, to a maximum allowable bearing capacity of 13,000 psf for footings bearing in formational materials. The values presented herein are for dead plus live loads and may be increased by one-third when considering transient loads due to wind or seismic forces. These values are based on an excavation depth of 40 feet.

7.7.5 We estimate the total and differential settlements under the imposed allowable loads are estimated to be ½ inch using an 8-foot square foundation. We estimate the total and differential settlements under the imposed allowable loads are estimated to be1 inch using a 14-foot square foundation

7.7.6 Where buildings or other improvements are planned near the top of a slope steeper than 3:1 (horizontal to vertical), special foundations and/or design considerations are recommended due to the tendency for lateral soil movement to occur. Building and retaining wall footings should be deepened such that the bottom outside edge of the footing is at least 7 feet horizontally from the face of the slope.

7.7.7 Foundation excavations should be observed by the geotechnical engineer (a representative of Geocon Incorporated) prior to the placement of reinforcing steel to check that the exposed soil conditions are similar to those expected and that they have been extended to the appropriate bearing strata. Foundation modifications may be required if unexpected soil conditions are encountered.

7.7.8 The San Diego Formation consists of sandy material. Typically, foundation excavations within the sandy portion of the San Diego Formation dry relatively quickly and the material deposits into the bottom of the footing excavations. Forming of the foundations or temporary slopes with extra concrete being placed may be required.

7.8 Concrete Slabs-on-Grade

7.8.1 Interior concrete slabs-on-grade for the parking structure should be at least 5 inches thick. As a minimum, reinforcement for slabs-on-grade should consist of No. 4 reinforcing bars placed at 18 inches on center in both horizontal directions.

7.8.2 The concrete slab-on-grade recommendations are based on soil support characteristics only. The project structural engineer should evaluate the structural requirements of the concrete slabs for supporting equipment and storage loads.

7.8.3 Slabs that may receive moisture-sensitive floor coverings or may be used to store moisture-sensitive materials should be underlain by a vapor retarder. The vapor retarder design should be consistent with the guidelines presented in the American Concrete Institute's (ACI) *Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials* (ACI 302.2R-06). The vapor retarder used should be specified by the project architect or developer based on the type of floor covering that will be installed and if the structure will possess a humidity controlled environment.

7.8.4 The bedding sand thickness should be determined by the project foundation engineer, architect, and/or developer. However, we should be contacted to provide recommendations if the bedding sand is thicker than 6 inches. It is common to see 3 inches of sand below the concrete slab-on-grade for 5-inch-thick slabs in the southern California area. The

foundation design engineer should provide appropriate concrete mix design criteria and curing measures to assure proper curing of the slab by reducing the potential for rapid moisture loss and subsequent cracking and/or slab curl. We suggest that the foundation design engineer present the concrete mix design and proper curing methods on the foundation plans. It is critical that the foundation contractor understands and follows the recommendations presented on the foundation plans.

7.8.5 To control the location and spread of concrete shrinkage cracks, crack control joints should be provided. The crack control joints should be created while the concrete is still fresh using a grooving tool, or shortly thereafter using saw cuts. The structural engineer should take into consideration criteria of the American Concrete Institute when establishing crack control spacing patterns.

7.8.6 Special subgrade presaturation is not deemed necessary prior to placing concrete; however, the exposed foundation and slab subgrade soil should be moisturized to maintain a moist condition as would be expected in any such concrete placement.

7.8.7 Where exterior flatwork abuts the structure at entrant or exit areas, the exterior slab should be dowelled into the structure's foundation stemwall. This recommendation is intended to reduce the potential for differential elevations that could result from differential settlement or minor heave of the flatwork. Dowelling details should be designed by the project structural engineer.

7.8.8 Geocon Incorporated should be consulted to provide additional design parameters as required by the structural engineer.

7.9 Concrete Flatwork

7.9.1 Exterior concrete flatwork not subject to vehicular traffic should be constructed in accordance with the recommendations herein. Slab panels should be a minimum of 4 inches thick and, when in excess of 8 feet square, should be reinforced with 6 x 6 - W2.9/W2.9 (6 x 6 - 6/6) welded wire mesh or No. 3 reinforcing bars at 18 inches on center in both directions to reduce the potential for cracking. In addition, concrete flatwork should be provided with crack control joints to reduce and/or control shrinkage cracking. Crack control spacing should be determined by the project structural engineer based upon the slab thickness and intended usage. Criteria of the American Concrete Institute (ACI) should be taken into consideration when establishing crack control spacing. Subgrade soil for exterior slabs not subjected to vehicle loads should be compacted in accordance with criteria presented in the grading section prior to concrete placement.

Subgrade soil should be properly compacted and the moisture content of subgrade soil should be checked prior to placing concrete.

7.9.2 Even with the incorporation of the recommendations within this report, the exterior concrete flatwork has a likelihood of experiencing some uplift due to potentially expansive soil beneath grade; therefore, the steel reinforcement should overlap continuously in flatwork to reduce the potential for vertical offsets within flatwork. Additionally, flatwork should be structurally connected to the curbs, where possible, to reduce the potential for offsets between the curbs and the flatwork.

7.9.3 Where exterior flatwork abuts the structure at entrant or exit points, the exterior slab should be dowelled into the structure's foundation stemwall. This recommendation is intended to reduce the potential for differential elevations that could result from differential settlement or minor heave of the flatwork. Dowelling details should be designed by the project structural engineer.

7.9.4 The recommendations presented herein are intended to reduce the potential for cracking of slabs and foundations as a result of differential movement. However, even with the incorporation of the recommendations presented herein, foundations and slabs-on-grade will still crack. The occurrence of concrete shrinkage cracks is independent of the soil supporting characteristics. Their occurrence may be reduced and/or controlled by limiting the slump of the concrete, the use of crack control joints and proper concrete placement and curing. Literature provided by the Portland Concrete Association (PCA) and American Concrete Institute (ACI) present recommendations for proper concrete mix, construction, and curing practices, and should be incorporated into project construction.

7.10 Preliminary Rigid Pavement Recommendations

7.10.1 We understand the alleyway may be removed and replaced during the construction operations. A rigid Portland Cement concrete (PCC) pavement section should be placed in driveway entrance aprons areas. We calculated the rigid pavement section 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 parameters presented in Table 7.10.1.

TABLE 7.10.1
RIGID PAVEMENT DESIGN PARAMETERS

Design Parameter	Design Value
Modulus of subgrade reaction, k	100 pci
Modulus of rupture for concrete, M_R	500 psi
Traffic Category, TC	C
Average daily truck traffic, ADTT	100

7.10.2 Based on the criteria presented herein, the PCC pavement sections should have a minimum thickness as presented in Table 7.10.2.

TABLE 8.9.2
RIGID PAVEMENT RECOMMENDATIONS

Location	Portland Cement Concrete (inches)
Driveway entrances and Aprons (TC=C)	7.0

7.10.3 The PCC pavement should be placed over subgrade soil that is 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 3,000 psi (pounds per square inch).

7.10.4 A thickened edge or integral curb should be constructed on the outside of concrete slabs subjected to wheel loads. The thickened edge should be 1.2 times the slab thickness or a minimum thickness of 2 inches, whichever results in a thicker edge, and taper back to the recommended slab thickness 4 feet behind the face of the slab (e.g., a 7-inch-thick slab would have a 9-inch-thick edge). Reinforcing steel will not be necessary within the concrete for geotechnical purposes with the possible exception of dowels at construction joints as discussed herein.

7.10.5 To control the location and spread of concrete shrinkage cracks, crack-control joints (weakened plane joints) should be included in the design of the concrete pavement slab. Crack-control joints should not exceed 30 times the slab thickness with a maximum spacing of 15 feet for the 7-inch-thick slabs and should be sealed with an appropriate sealant to prevent the migration of water through the control joint to the subgrade materials. The depth of the crack-control joints should be determined by the referenced ACI report.

7.10.6 To provide load transfer between adjacent pavement slab sections, a butt-type construction joint should be constructed. The butt-type joint should be thickened by at least 20 percent at the edge and taper back at least 4 feet from the face of the slab. As an alternative to the butt-type construction joint, dowelling can be used between construction joints for pavements of 7 inches or thicker. As discussed in the referenced ACI guide, dowels should consist of smooth, 1-inch-diameter reinforcing steel 14 inches long embedded a minimum of 6 inches into the slab on either side of the construction joint. Dowels should be located at the midpoint of the slab, spaced at 12 inches on center and lubricated to allow joint movement while still transferring loads. In addition, tie bars should be installed at the as recommended in Section 3.8.3 of the referenced ACI guide. The structural engineer should provide other alternative recommendations for load transfer.

7.10.7 We should be contacted to provide additional pavement recommendations, if required.

7.11 Retaining Walls

7.11.1 Retaining walls not restrained at the top and having a level backfill surface should be designed for an active soil pressure equivalent to the pressure exerted by a fluid density of 35 pounds per cubic foot (pcf). Where the backfill will be inclined at 2:1 (horizontal to vertical), an active soil pressure of 50 pcf is recommended. Soil with an expansion index (EI) of greater than 50 should not be used as backfill material behind retaining walls.

7.11.2 Unrestrained walls are those that are allowed to rotate more than 0.001H (where H equals the height of the retaining portion of the wall) at the top of the wall. Where walls are restrained from movement at the top, an additional uniform pressure of 7H psf should be added to the active soil pressure for walls 10 feet high or less. The active pressure should be increased to 13H for the portion of the walls higher than 10 feet. For retaining walls subject to vehicular loads within a horizontal distance equal to two-thirds the wall height, a surcharge equivalent to 2 feet of fill soil should be added. Loads from the adjacent housing structures should be incorporated into the design of the subterranean garage retaining wall, if applicable.

7.11.3 The use of drainage openings through the base of the wall (weep holes) is not recommended where the seepage could be a nuisance or otherwise adversely affect the property adjacent to the base of the wall. The recommendations herein assume a properly compacted granular (EI of 50 or less) free-draining backfill material with no hydrostatic forces or imposed surcharge load. Figure 8 presents a typical retaining wall drain detail. Figure 9 presents a soldier pile wall drainage details. If conditions different than those described are expected, or if specific drainage details are desired, Geocon Incorporated should be contacted for additional recommendations.

7.11.4 The structural engineer should determine the seismic design category for the project. If the project possesses a seismic design category of D, E, or F, the proposed retaining walls should be designed with seismic lateral pressure. A seismic load of 19H should be used for design on walls that support more than 6 feet of backfill in accordance with Section 1803.5.12 of the 2013 CBC. The seismic load is dependent on the retained height where H is the height of the wall, in feet, and the calculated loads result in pounds per square foot (psf) exerted at the base of the wall and zero at the top of the wall. We used the peak site acceleration, PGA_M, of 0.508g calculated from ASCE 7-10 Section 11.8.3 and applied a pseudo-static coefficient of 0.3.

7.11.5 The recommendations presented herein are generally applicable to the design of rigid concrete or masonry retaining walls having a maximum height of 15 feet. In the event that walls higher than 15 feet or other types of walls (such as crib-type walls) are planned, Geocon Incorporated should be consulted for additional recommendations.

7.11.6 Unrestrained walls will move laterally when backfilled and loading is applied. The amount of lateral deflection is dependent on the wall height, the type of soil used for backfill, and loads acting on the wall. The retaining walls and improvements above the retaining walls should be designed to incorporate an appropriate amount of lateral deflection as determined by the structural engineer.

7.12 Lateral Loading

7.12.1 To resist lateral loads, a passive pressure exerted by an equivalent fluid weight of 350 pounds per cubic foot (pcf) should be used for the design of footings or shear keys poured neat in compacted fill. The passive pressure assumes a horizontal surface extending at least 5 feet, or three times the surface generating the passive pressure, whichever is greater. The upper 12 inches of material in areas not protected by floor slabs or pavement should not be included in design for passive resistance.

7.12.2 If friction is to be used to resist lateral loads, an allowable coefficient of friction between soil and concrete of 0.4 should be used for design.

7.13 Site Drainage and Moisture Protection

7.13.1 Adequate site drainage is critical to reduce the potential for differential soil movement, erosion and subsurface seepage. Under no circumstances should water be allowed to pond adjacent to footings and improvements. The site should be graded and maintained such that surface drainage is directed away from structures in accordance with 2013 CBC 1804.3 or other applicable standards. In addition, surface drainage should be directed away from the

top of slopes into swales or other controlled drainage devices. Roof and pavement drainage should be directed into conduits that carry runoff away from the proposed structure.

7.13.2 In the case of basement walls or building walls retaining landscaping areas, a water-proofing system should be used on the wall and joints, and a Miradrain drainage panel (or similar) should be placed over the waterproofing. A perforated drainpipe of schedule 40 or better should be installed at the base of the wall below the floor slab and drained to an appropriate discharge area. Accordion-type pipe is not acceptable. The project architect or civil engineer should provide detailed specifications on the plans for all waterproofing and drainage.

7.13.3 Underground utilities should be leak free. Utility and irrigation lines should be checked periodically for leaks, and detected leaks should be repaired promptly. Detrimental soil movement could occur if water is allowed to infiltrate the soil for prolonged periods of time.

7.13.4 Landscaping planters adjacent to paved areas are not recommended due to the potential for surface or irrigation water to infiltrate the pavement's subgrade and base course. We recommend that area drains to collect excess irrigation water and transmit it to drainage structures or impervious above-grade planter boxes be used. In addition, where landscaping is planned adjacent to the pavement, we recommend construction of a cutoff wall along the edge of the pavement that extends at least 6 inches below the bottom of the base materials.

7.13.5 If detention basins, bioswales, retention basins, water infiltration, low impact development (LID), or storm water management devices are being considered, Geocon Incorporated should be retained to provide recommendations pertaining to the geotechnical aspects of possible impacts and design.

7.13.6 If not properly constructed, there is a potential for distress to improvements and properties located hydrologically down gradient or adjacent to these devices. Factors such as the amount of water to be detained, its residence time, and soil permeability have an important effect on seepage transmission and the potential adverse impacts that may occur if the storm water management features are not properly designed and constructed. We have not performed a hydrogeology study at the site. Down-gradient and adjacent structures may be subjected to seeps, movement of foundations and slabs, or other impacts as a result of water infiltration if incorporated into the storm water management devices.

7.13.7 Storm water management devices should be properly constructed to prevent water infiltration and lined with an impermeable liner (e.g. High-density polyethylene, HDPE,

with a thickness of about 30 mil or equivalent Polyvinyl Chloride, PVC, liner). The devices should also be installed in accordance with the manufacturer's recommendations.

7.14 Grading and Foundation Plan Review

7.14.1 Geocon Incorporated should review the final grading and foundation plans prior to finalization to check their compliance with the recommendations of this report and evaluate the need for additional comments, recommendations, and/or analyses.

LIMITATIONS AND UNIFORMITY OF CONDITIONS

1. The firm that performed the geotechnical investigation for the project should be retained to provide testing and observation services during construction to provide continuity of geotechnical interpretation and to check that the recommendations presented for geotechnical aspects of site development are incorporated during site grading, construction of improvements, and excavation of foundations. If another geotechnical firm is selected to perform the testing and observation services during construction operations, that firm should prepare a letter indicating their intent to assume the responsibilities of project geotechnical engineer of record. A copy of the letter should be provided to the regulatory agency for their records. In addition, that firm should provide revised recommendations concerning the geotechnical aspects of the proposed development, or a written acknowledgement of their concurrence with the recommendations presented in our report. They should also perform additional analyses deemed necessary to assume the role of Geotechnical Engineer of Record.

2. The recommendations of this report pertain only to the site investigated and are based upon the assumption that the soil conditions do not deviate from those disclosed in the investigation. If any variations or undesirable conditions are encountered during construction, or if the proposed construction will differ from that anticipated herein, Geocon Incorporated should be notified so that supplemental recommendations can be given. The evaluation or identification of the potential presence of hazardous or corrosive materials was not part of the scope of services provided by Geocon Incorporated.

3. This report is issued with the understanding that it is the responsibility of the owner or his representative to ensure that the information and recommendations contained herein are brought to the attention of the architect and engineer for the project and incorporated into the plans, and the necessary steps are taken to see that the contractor and subcontractors carry out such recommendations in the field.

4. The findings of this report are valid as of the present date. However, changes in the conditions of a property can occur with the passage of time, whether they be due to natural processes or the works of man on this or adjacent properties. In addition, changes in applicable or appropriate standards may occur, whether they result from legislation or the broadening of knowledge. Accordingly, the findings of this report may be invalidated wholly or partially by changes outside our control. Therefore, this report is subject to review and should not be relied upon after a period of three years.

APPENDIX A

FIELD INVESTIGATION

Fieldwork for our geotechnical investigation included a site visit, subsurface exploration, and soil sampling. The approximate locations of the exploratory borings are shown on the Geologic Map, Figure 2. Boring logs are presented in figures following the text in this appendix. We located the borings in the field using a measuring tape and existing reference points. Therefore, actual boring locations may deviate slightly.

We performed our subsurface exploration on March 5 and 6, 2015, and included the drilling and sampling of existing soils with a CME 85 drill rig equipped with 8-inch hollow-stem augers. We obtained samples during our subsurface exploration using a California split-spoon sampler. The California sampler has an inside diameter of 2.5 inches and an outside diameter of 2.875 inches. Up to 18 rings are placed inside the sampler that is 2.4 inches in diameter and 1 inch in height. We obtained ring samples in moisture-tight containers at appropriate intervals and transported them to the laboratory for testing. We also obtained disturbed bulk soil samples from the borings for laboratory testing. The type of sample is noted on the exploratory boring logs.

The samplers were driven 12 inches into the bottom of the excavations with the use of an automatic down-hole hammer. The sampler is driven into the bottom of the excavation by dropping a 140-pound hammer from height of 30-inches. Blow counts are recorded for every 6 inches the sampler is driven. The penetration resistances shown on the boring logs are shown in terms of blows per foot. The values indicated on the boring logs are the sum of the last 12 inches the sampler was driven. An approximate value is calculated in term of blows per foot or the final 6-inch interval is reported. These values are not to be taken as N-values, adjustments have not been applied.

The soil conditions encountered in the borings were visually examined, classified and logged in general accordance with the American Society for Testing and Materials (ASTM) Practice for Description and Identification of Soils (Visual-Manual Procedure D 2488). Figures A-1 through A-4 present the logs of the exploratory borings. The logs depict the various soil types encountered and indicate the depths at which samples were obtained. The elevations shown on the boring logs were determined using a topographic map provided by Omega Land Surveying, Incorporated.

A copy of the County of San Diego Department of Environmental Health Geotechnical Boring Construction Permit has been included.

APPENDIX B

LABORATORY TESTING

We performed the laboratory tests in accordance with the currently accepted versions of the generally accepted American Society for Testing Materials (ASTM) procedures or other suggested procedures. We tested selected soil samples for their in-place density and moisture content, maximum dry density and optimum moisture content, shear strength, expansion index, water-soluble sulfate, pH and resistivity, chloride ion content, and unconfined compressive strength. The results of our laboratory tests are presented on Tables B-I through B-VII and on the boring logs in Appendix A.

TABLE B-I
SUMMARY OF LABORATORY MAXIMUM DRY DENSITY AND OPTIMUM MOISTURE CONTENT TEST RESULTS
ASTM D 1557

Sample No.	Depth (feet)	Description	Maximum Dry Density (pcf)	Optimum Moisture Content (% dry wt.)
B1-8	30-35	Light olive brown, Silty, fine SAND	121.4	11.7

TABLE B-II
SUMMARY OF LABORATORY DIRECT SHEAR TEST RESULTS
ASTM D 3080

Sample No.	Depth (feet)	Geologic Unit	Dry Density (pcf)	Moisture Content (%)		Unit Peak [Ultimate[1]] Cohesion (psf)	Angle of Peak [Ultimate[1]] Shear Resistance (degrees)
				Initial	Final		
B1-7	30	Tsd	93.5	16.1	29.6	350 [350]	30 [30]
B1-11	45	Tsd	83.0	11.2	34.9	325 [325]	30 [30]
B2-2	10	Qvop	107.6	11.9	19.1	625 [225]	29 [29]
B3-6	15	Qvop	109.8	11.4	17.1	350 [350]	30 [30]

[1] Ultimate at end of test at 0.2 inch deflection

TABLE B-III
SUMMARY OF LABORATORY EXPANSION INDEX TEST RESULTS
ASTM D 4829

Sample No.	Depth (feet)	Geologic Unit	Moisture Content (%)		Dry Density (pcf)	Expansion Index	Expansion Classification	2013 CBC Expansion Classification
			Before Test	After Test				
B1-8	30-35	Tsd	9.7	19.0	106.9	12	Very Low	Non-Expansive
B3-10	40-45	Tsd	10.8	20.3	105.3	7	Very Low	Non-Expansive
B4-3	10-15	Qvop	9.5	18.7	109.3	14	Very Low	Non-Expansive

TABLE B-IV
SUMMARY OF LABORATORY WATER-SOLUBLE SULFATE TEST RESULTS
CALIFORNIA TEST NO. 417

Sample No.	Depth (Feet)	Water-Soluble Sulfate (%)	Sulfate Severity	Sulfate Class
B1-8	30-35	0.004	Not Applicable	S0
B3-10	40-45	0.006	Not Applicable	S0
B4-3	10-15	0.005	Not Applicable	S0

TABLE B-V
SUMMARY OF LABORATORY pH AND RESISTIVITY TEST RESULTS
CALIFORNIA TEST NO. 643

Sample No.	Depth (Feet)	Geologic Unit	pH	Minimum Resistivity (ohm-centimeters)
B1-8	30-35	Tsd	7.80	3,300

TABLE B-VI
SUMMARY OF LABORATORY WATER-SOLUBLE CHLORIDE ION CONTENT TEST RESULTS
AASHTO TEST NO. T 291

Sample No.	Chloride Ion Content (%)	Chloride Ion Content (ppm)
B1-8	0.008	81
B4-3	0.008	81

TABLE B-VII
SUMMARY OF IN-SITU UNCONFINED COMPRESSIVE STRENGTH TEST RESULTS
ASTM D 1558

Sample No.	Depth (feet)	Geologic Unit	Hand Penetrometer Reading, Unconfined Compression Strength (tsf)	Undrained Shear Strength (ksf)
B1-1	5	Qvop	3.5	3.5
B1-3	10	Qvop	3.5	3.5
B1-5	20	Qvop	4.0	4.0
B1-7	30	Tsd	3.5	3.5
B1-9	35	Tsd	3.5	3.5
B1-10	40	Tsd	4.0	4.0
B1-11	45	Tsd	3.5	3.5
B1-14	60	Tsd	4.5	4.5
B2-1	5	Qvop	4.5	4.5
B2-5	35	Tsd	3.0	3.0
B2-6	40	Tsd	4.5	4.5
B2-7	45	Tsd	4.0	4.0
B3-3	2.5	Qudf	4.0	4.0
B3-4	5	Qvop	4.5	4.5
B3-5	10	Qvop	3.5	3.5
B3-6	15	Qvop	4.5	4.5
B3-9	40	Tsd	4.5	4.5
B4-1	5	Qvop	4.5	4.5
B4-2	10	Qvop	4.5	4.5
B4-5	20	Qvop	3.5	3.5
B4-7	30	Qvop	4.0	4.0
B4-8	35	Tsd	4.0	4.0
B4-9	40	Tsd	4.5	4.5
B4-10	45	Tsd	4.5	4.5
B4-11	50	Tsd	4.5	4.5
B4-12	55	Tsd	3.0	3.0
B4-13	60	Tsd	4.5	4.5

LIST OF REFERENCES

1. *2013 California Building Code, California Code of Regulations, Title 24, Part 2, based on the 2012 International Building Code,* prepared by California Building Standards Commission, dated July, 2013.

2. *ACI 318-11, Building Code Requirements for Structural Concrete and Commentary,* prepared by the American Concrete Institute, dated August, 2011.

3. *ACI 330-08, Guide for the Design and Construction of Concrete Parking Lots,* prepared by the American Concrete Institute, dated June, 2008.

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