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

Lisbon Heights

622368

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

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

Engineer of Work:

Michael D. Schweitzer, P.E. No. 59658

Provide Wet Signature and Stamp Above Line

Prepared For:

Bay Vista Methodist Heights

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Date:

04/28/2020

Approved by: City of San Diego Date

The City of SAN DIEGO

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Project Name: Lisbon Heights

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Acronyms

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

Certification Page

Project Name:
Permit Application

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

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

Engineer of Work's Signature

59658

PE#

12/31/2021

Expiration Date

Michael D. Schweitzer

Print Name

SWS Engineering, Inc.

Company

04/28/2020

Date

Engineer's Stamp

Project Name: Lisbon Heights

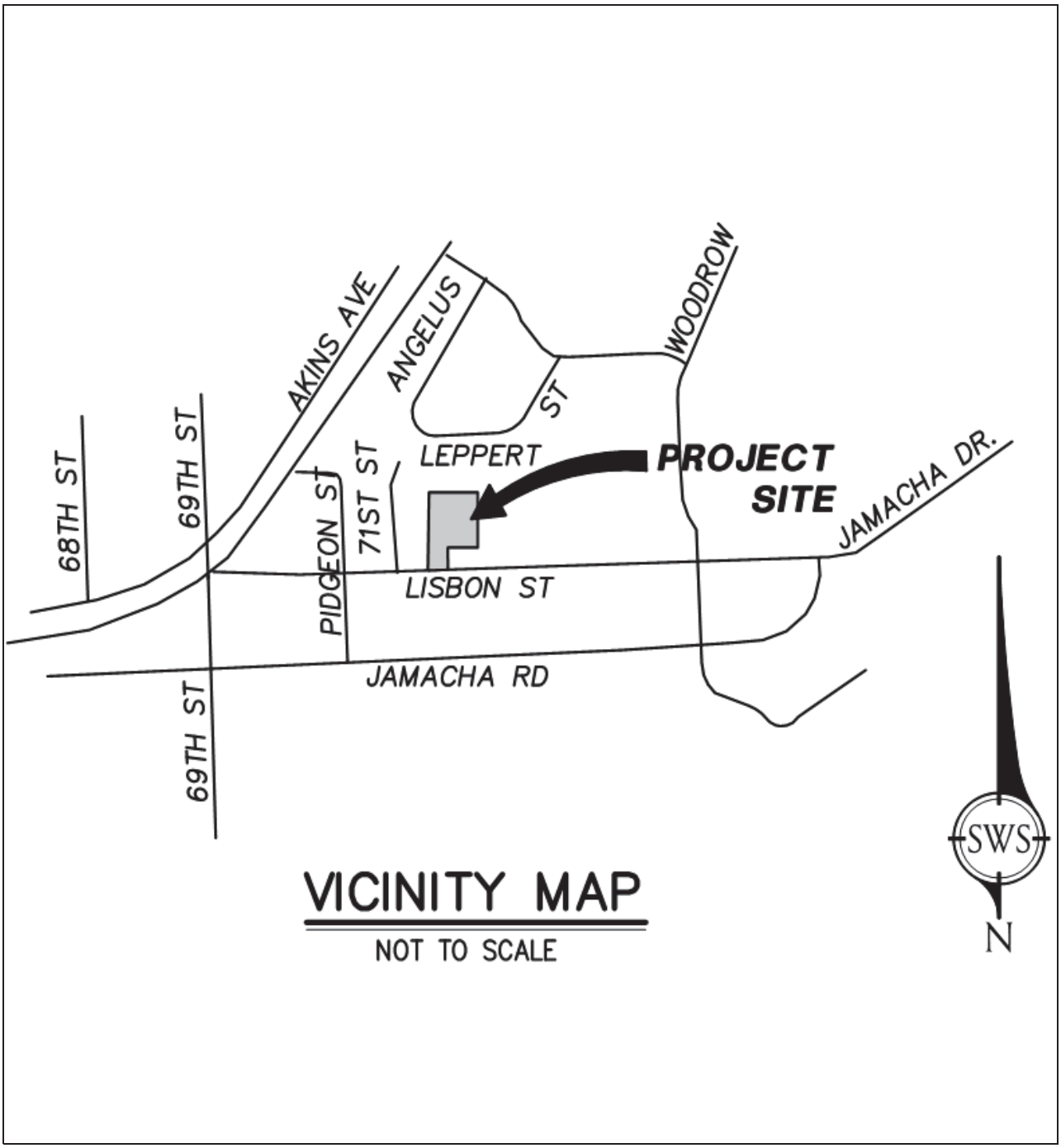
Submittal Record

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	09/27/2018	☑ Preliminary Design/Planning/CEQA ☐ Final Design	**Initial Submittal**
2	4/28/2020	☑ Preliminary Design/Planning/CEQA ☐ Final Design	2nd Submittal
3		☐ Preliminary Design/Planning/CEQA ☐ Final Design	
4		☐ Preliminary Design/Planning/CEQA ☐ Final Design	

Project Vicinity Map

Project Name: Lisbon Heights
Permit Application 622368



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

Attach DS-560 form.

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Applicability of Permanent, Post-Construction Storm Water BMP Requirements	Form I-1

Project Identification

Project Name: Lisbon Heights

Permit Application Number: 622368 | Date: 04/28/2020

Determination of Requirements

The purpose of this form is to identify permanent, post-construction requirements that apply to the project. This form serves as a short summary of applicable requirements, in some cases referencing separate forms that will serve as the backup for the determination of requirements.

Answer each step below, starting with **Step 1** and progressing through each step until reaching "Stop". Refer to the manual sections and/or separate forms referenced in each step below.

Step	Answer	Progression
Step 1: Is the project a "development project"? See Section 1.3 of the manual (Part 1 of Storm Water Standards) for guidance.	☑ Yes	Go to **Step 2**.
	☐ No	**Stop**. Permanent BMP requirements do not apply. No SWQMP will be required. Provide discussion below.

Discussion / justification if the project is not a "development project" (e.g., the project includes *only* interior remodels within an existing building):

Step 2: Is the project a Standard Project, PDP, or PDP Exempt? To answer this item, see Section 1.4 of the manual in its entirety for guidance AND complete Form DS-560, Storm Water Requirements Applicability Checklist.	☐ Standard Project	**Stop.** Standard Project requirements apply
	☑ PDP	PDP requirements apply, including PDP SWQMP. Go to **Step 3**.
	☐ PDP Exempt	**Stop.** Standard Project requirements apply. Provide discussion and list any additional requirements below.

Discussion / justification, and additional requirements for exceptions to PDP definitions, if applicable:

Project Name: Lisbon Heights

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

HMP Exemption Exhibit

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

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

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Project Name: Lisbon Heights

Site Information Checklist For PDPs	Form I-3B
Project Summary Information	
Project Name	Lisbon Heights
Project Address	7108 Lisbon St., San Diego
Assessor's Parcel Number(s) (APN(s))	581-050-01 & -06
Permit Application Number	
Project Watershed	Select One: ☐ San Dieguito River ☐ Penasquitos ☐ Mission Bay ☐ San Diego River ☑ San Diego Bay ☐ Tijuana River
Hydrologic subarea name with Numeric Identifier up to two decimal places (9XX.XX)	Chollas (908.22)
Project Area (total area of Assessor's Parcel(s) associated with the project or total area of the right-of-way)	3.71 Acres (161,450 Square Feet)
Area to be disturbed by the project (Project Footprint)	3.70 Acres (161,319 Square Feet)
Project Proposed Impervious Area (subset of Project Footprint)	1.75 Acres (76,408 Square Feet)
Project Proposed Pervious Area (subset of Project Footprint)	1.95 Acres (84,911 Square Feet)
Note: Proposed Impervious Area + Proposed Pervious Area = Area to be Disturbed by the Project. This may be less than the Project Area.	
The proposed increase or decrease in impervious area in the proposed condition as compared to the pre-project condition	100 %

Project Name: Lisbon Heights

Form I-3B Page 2 of 11
Description of Existing Site Condition and Drainage Patterns
Current Status of the Site (select all that apply): ☐ Existing development ☐ Previously graded but not built out ☐ Agricultural or other non-impervious use ☑ Vacant, undeveloped/natural Description / Additional Information: Natural vegetation
Existing Land Cover Includes (select all that apply): ☑ Vegetative Cover ☐ Non-Vegetated Pervious Areas ☐ Impervious Areas Description / Additional Information: Existing natural vegetation
Underlying Soil belongs to Hydrologic Soil Group (select all that apply): ☐ NRCS Type A ☐ NRCS Type B ☐ NRCS Type C ☑ NRCS Type D
Approximate Depth to Groundwater: ☐ Groundwater Depth < 5 feet ☐ 5 feet < Groundwater Depth < 10 feet ☐ 10 feet < Groundwater Depth < 20 feet ☑ Groundwater Depth > 20 feet
Existing Natural Hydrologic Features (select all that apply): ☐ Watercourses ☐ Seeps ☐ Springs ☐ Wetlands ☑ None Description / Additional Information:

Form I-3B Page 3 of 11
Description of Existing Site Topography and Drainage
How is storm water runoff conveyed from the site? At a minimum, this description should answer: 1. Whether existing drainage conveyance is natural or urban; 2. If runoff from offsite is conveyed through the site? If yes, quantification of all offsite drainage areas, design flows, and locations where offsite flows enter the project site and summarize how such flows are conveyed through the site; 3. Provide details regarding existing project site drainage conveyance network, including storm drains, concrete channels, swales, detention facilities, storm water treatment facilities, and natural and constructed channels; 4. Identify all discharge locations from the existing project along with a summary of the conveyance system size and capacity for each of the discharge locations. Provide summary of the pre-project drainage areas and design flows to each of the existing runoff discharge locations.
Descriptions/Additional Information
1. Existing drainage conveyance is natural sheet flow. 2. No runoff from offsite is conveyed through the site. 3. Existing run off conveyance consists of natural sheet flow over the native, vegetative surface of the site towards Lisbon St. Water discharges to Lisbon St. and travels along the gutter away from the site. 4. Discharge leaves the site at the south west corner adjacent to Lisbon St., where it sheet flows to the gutter along Lisbon St. and away from the site.

Form I-3B Page 4 of 11
Description of Proposed Site Development and Drainage Patterns
Project Description / Proposed Land Use and/or Activities: Proposed single family housing community
List/describe proposed impervious features of the project (e.g., buildings, roadways, parking lots, courtyards, athletic courts, other impervious features): Impervious features will include buildings (homes), driveways, and the access roadway.
List/describe proposed pervious features of the project (e.g., landscape areas): Pervious features will include landscaping area
Does the project include grading and changes to site topography? ☑ Yes ☐ No Description / Additional Information: Grading to accommodate roadways, building pads, and drainage.

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

☑ Yes

☐ No

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

Description / Additional Information:

Site drainage will be conveyed within the site by either underground storm drains or gutters along the access roadway. The water will go to one of two biofiltration basins for treatment and hydromodification. Once treated, water will discharge to the gutter along Lisbon St., as in the pre-development condition.

Q100 Pre-Development: 7.03 cfs

Q100 Post-Development: 7.81 cfs (without detention)

Q100 Post-Development: 7.03 cfs (with detention)

Detention Volume: 230 cf

Form I-3B Page 6 of 11

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

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

Description/Additional Information:

Form I-3B Page 7 of 11
Identification and Narrative of Receiving Water
Narrative describing flow path from discharge location(s), through urban storm conveyance system, to receiving creeks, rivers, and lagoons and ultimate discharge location to Pacific Ocean (or bay, lagoon, lake or reservoir, as applicable) Water discharges from the site and flows along the gutter of Lisbon St., from where it will eventually discharge to Paleta Creek. This creek discharges to the San Diego Bay Shoreline, Seventh Street Channel, which flows into the San Diego bay.
Provide a summary of all beneficial uses of receiving waters downstream of the project discharge locations Paleta Creek (Seventh St. Channel)*: REC!, REC2, WARM, WILD San Diego Bay*: BIOL, COMM, EST, IND, MAR, MIGR, NAV, RARE, REC1, REC2, SHELL, WILD *From California DOT Water Quality Planning Tool
Identify all ASBS (areas of special biological significance) receiving waters downstream of the project discharge locations N/A
Provide distance from project outfall location to impaired or sensitive receiving waters N/A
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

Form I-3B Page 8 of 11

Identification of Receiving Water Pollutants of Concern

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

303(d) Impaired Water Body (Refer to Appendix K)	Pollutant(s)/Stressor(s) (Refer to Appendix K)	TMDLs/WQIP Highest Priority Pollutant (Refer to Table 1-4 in Chapter 1)
Paleta Creek	Copper	Uncategorized
Paleta Creek	Lead	Heavy Metals
San Diego Bay	PCBs	Uncategorized
San Diego Bay Shoreline	Sediment Toxicity	Sediment
San Diego Bay Shoreline	Benthic Community Effects	Sediment

Identification of Project Site Pollutants*

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

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

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

Form I-3B Page 9 of 11

Hydromodification Management Requirements

Do hydromodification management requirements apply (see Section 1.6)?

☑ Yes, hydromodification management flow control structural BMPs required.

☐ No, the project will discharge runoff directly to existing underground storm drains discharging directly to water storage reservoirs, lakes, enclosed embayments, or the Pacific Ocean.

☐ No, the project will discharge runoff directly to conveyance channels whose bed and bank are concrete-lined all the way from the point of discharge to water storage reservoirs, lakes, enclosed embayments, or the Pacific Ocean.

☐ No, the project will discharge runoff directly to an area identified as appropriate for an exemption by the WMAA for the watershed in which the project resides.

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

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

Critical Coarse Sediment Yield Areas*

*This Section only required if hydromodification management requirements apply

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

☑ Yes

☐ No

Discussion / Additional Information:

Form I-3B Page 10 of 11
Flow Control for Post-Project Runoff*   ***This Section only required if hydromodification management requirements apply**
List and describe point(s) of compliance (POCs) for flow control for hydromodification management (see Section 6.3.1). For each POC, provide a POC identification name or number correlating to the project's HMP Exhibit and a receiving channel identification name or number correlating to the project's HMP Exhibit.   POC-1: Located at the southwestern property line where the storm drain system exits from the site toward the curb outlets which discharge to the gutter along Lisbon St.
Has a geomorphic assessment been performed for the receiving channel(s)?   ☑ No, the low flow threshold is $0.1Q_2$ (default low flow threshold)   ☐ Yes, the result is the low flow threshold is $0.1Q_2$ ☐ Yes, the result is the low flow threshold is $0.3Q_2$ ☐ Yes, the result is the low flow threshold is $0.5Q_2$ If a geomorphic assessment has been performed, provide title, date, and preparer:
Discussion / Additional Information: (optional)

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.
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: Lisbon Heights

Source Control BMP Checklist for PDPs	Form I-4B

Source Control BMPs

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

Answer each category below pursuant to the following.

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

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

Project Name: Lisbon Heights

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

Project Name: Lisbon Heights

Site Design BMP Checklist for PDPs	Form I-5B

Site Design BMPs

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

Answer each category below pursuant to the following.

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

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

Site Design Requirement	Applied?		
4.3.1 Maintain Natural Drainage Pathways and Hydrologic Features	☐ Yes	☐ No	☑ N/A
Discussion / justification if 4.3.1 not implemented: None present on site			
1-1 Are existing natural drainage pathways and hydrologic features mapped on the site map?	☐ Yes	☐ No	☑ N/A
1-2 Are trees implemented? If yes, are they shown on the site map?	☐ Yes	☐ No	☑ N/A
1-3 Implemented trees meet the design criteria in 4.3.1 Fact Sheet (e.g. soil volume, maximum credit, etc.)?	☐ Yes	☐ No	☑ N/A
1-4 Is tree credit volume calculated using Appendix B.2.2.1 and SD-1 Fact Sheet in Appendix E?	☐ Yes	☐ No	☑ N/A
4.3.2 Have natural areas, soils and vegetation been conserved?	☐ Yes	☑ No	☐ N/A
Discussion / justification if 4.3.2 not implemented: 100% of site is to be disturbed by construction; new, native vegetation to be provided at completion			

Project Name: Lisbon Heights

Form I-5B Page 2 of 4			
Site Design Requirement	Applied?		
4.3.3 Minimize Impervious Area	☑ Yes	☐ No	☐ N/A
Discussion / justification if 4.3.3 not implemented:			
4.3.4 Minimize Soil Compaction	☐ Yes	☑ No	☐ N/A
Discussion / justification if 4.3.4 not implemented: 100% site disturbance due to grading will effect compaction			
4.3.5 Impervious Area Dispersion	☑ Yes	☐ No	☐ N/A
Discussion / justification if 4.3.5 not implemented:			
5-1 Is the pervious area receiving runon from impervious area identified on the site map?	☐ Yes	☑ No	☐ N/A
5-2 Does the pervious area satisfy the design criteria in 4.3.5 Fact Sheet in Appendix E (e.g. maximum slope, minimum length, etc.)	☐ Yes	☑ No	☐ N/A
5-3 Is impervious area dispersion credit volume calculated using Appendix B.2.1.1 and 4.3.5 Fact Sheet in Appendix E?	☐ Yes	☑ No	☐ N/A

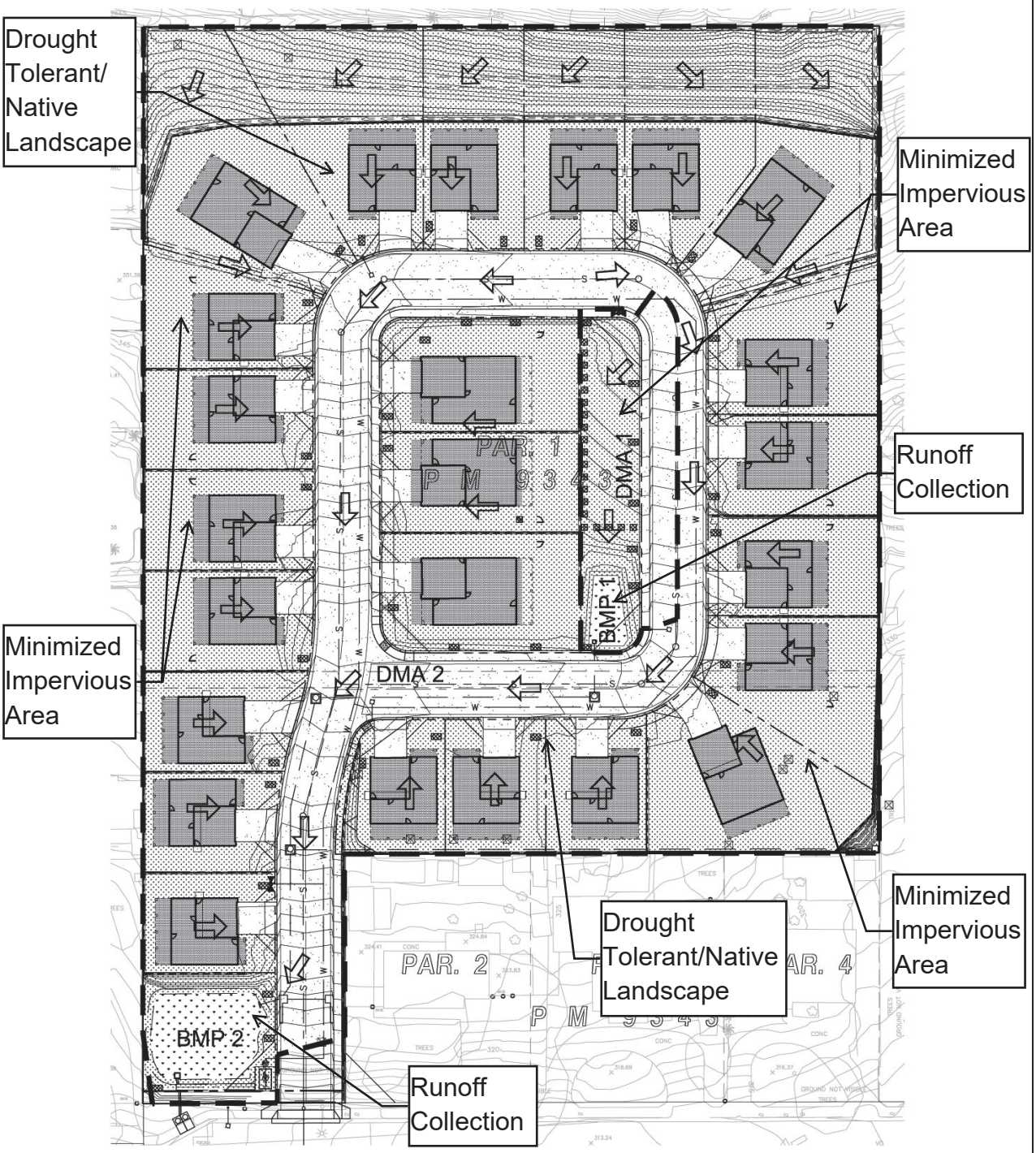
Project Name: Lisbon Heights

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

Project Name: Lisbon Heights

Form I-5B Page 4 of 4

Insert Site Map with all site design BMPs identified:



Project Name: Lisbon Heights

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 area being disturbed was measured and a required DCV was calculated. Harvest and Use was deemed not feasible. Site soil and geologic conditions dictate that infiltration is not possible at this site (see Geotechnical Report/Worksheet C.4-1).

Storm water will travel along the site gutter to one of two bioretention basins for collection and treatment. The water will discharge from the basins through a pipe system to the existing storm drain along Lisbon Street. The bioretention basins will provide both pollutant control and flow control BMPs.

(Continue on page 2 as necessary.)

(Continued from page 1)

Project Name: Lisbon Heights

Form I-6 Page 3 of 6 (Copy as many as needed)	
Structural BMP Summary Information	
Structural BMP ID No. BMP-1	
Construction Plan Sheet No. TM-02	
Type of Structural BMP: ☐ Retention by harvest and use (e.g. HU-1, cistern) ☐ Retention by infiltration basin (INF-1) ☐ Retention by bioretention (INF-2) ☐ Retention by permeable pavement (INF-3) ☐ Partial retention by biofiltration with partial retention (PR-1) ☑ Biofiltration (BF-1) ☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below) ☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below) ☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below) ☐ Detention pond or vault for hydromodification management ☐ Other (describe in discussion section below)	
Purpose: ☐ Pollutant control only ☐ Hydromodification control only ☑ Combined pollutant control and hydromodification control ☐ Pre-treatment/forebay for another structural BMP ☐ Other (describe in discussion section below)	
Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563	Michael D. Schweitzer, PE SWS Engineering, Inc. (760) 744-0011
Who will be the final owner of this BMP?	Bay Vista Methodist Heights 140 N. Escondido Blvd., Escondido, CA 92025
Who will maintain this BMP into perpetuity?	Bay Vista Methodist Heights 140 N. Escondido Blvd., Escondido, CA 92025
What is the funding mechanism for maintenance?	Property Owner to Maintain

Form I-6 Page 4 of 6 (Copy as many as needed)
Structural BMP ID No. BMP-1
Construction Plan Sheet No. TM-02
Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs):
The bioretention BMP is sized according to Section F of the Storm Water Standards Manual. Worksheet B.5-1 was completed to confirm that required water quality treatment levels were achieved. PCSWMM software was used to confirm that hydromodification requirements were met. Bioretention basin details including areas, ponding depth, media depth, storage depth and outflow, and orifice sizes are shown on the construction plan.

Project Name: Lisbon Heights

Form I-6 Page 5 of 6 (Copy as many as needed)	
Structural BMP Summary Information	
Structural BMP ID No. BMP-2	
Construction Plan Sheet No. TM-02	
Type of Structural BMP: ☐ Retention by harvest and use (e.g. HU-1, cistern) ☐ Retention by infiltration basin (INF-1) ☐ Retention by bioretention (INF-2) ☐ Retention by permeable pavement (INF-3) ☐ Partial retention by biofiltration with partial retention (PR-1) ☑ Biofiltration (BF-1) ☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below) ☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below) ☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below) ☐ Detention pond or vault for hydromodification management ☐ Other (describe in discussion section below)	
Purpose: ☐ Pollutant control only ☐ Hydromodification control only ☑ Combined pollutant control and hydromodification control ☐ Pre-treatment/forebay for another structural BMP ☐ Other (describe in discussion section below)	
Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563	Michael D. Schweitzer, PE SWS Engineering, Inc. (760) 744-0011
Who will be the final owner of this BMP?	Bay Vista Methodist Heights 140 N. Escondido Blvd., Escondido, CA 92025
Who will maintain this BMP into perpetuity?	Bay Vista Methodist Heights 140 N. Escondido Blvd., Escondido, CA 92025
What is the funding mechanism for maintenance?	Property Owner to Maintain

Form I-6 Page 6 of 6 (Copy as many as needed)
Structural BMP ID No. BMP-2
Construction Plan Sheet No. TM-02
Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs):
The bioretention BMP is sized according to Section F of the Storm Water Standards Manual. Worksheet B.5-1 was completed to confirm that required water quality treatment levels were achieved. PCSWMM software was used to confirm that hydromodification requirements were met. Bioretention basin details including areas, ponding depth, media depth, storage depth and outflow, and orifice sizes are shown on the construction plan.

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Attachment 1
Backup For PDP Pollutant Control BMPs

This is the cover sheet for Attachment 1.

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Project Name: Lisbon Heights

Indicate which Items are Included:

Attachment Sequence	Contents	Checklist
Attachment 1a	DMA Exhibit (Required) See DMA Exhibit Checklist.	☑ Included
Attachment 1b	Tabular Summary of DMAs Showing DMA ID matching DMA Exhibit, DMA Area, and DMA Type (Required)* *Provide table in this Attachment OR on DMA Exhibit in Attachment 1a	☑ Included on DMA Exhibit in Attachment 1a ☐ Included as Attachment 1b, separate from DMA Exhibit
Attachment 1c	Form I-7, Harvest and Use Feasibility Screening Checklist (Required unless the entire project will use infiltration BMPs) Refer to Appendix B.3-1 of the BMP Design Manual to complete Form I-7.	☑ Included ☐ Not included because the entire project will use infiltration BMPs
Attachment 1d	Infiltration Feasibility Information. Contents of Attachment 1d depend on the infiltration condition: • No Infiltration Condition: ○ Infiltration Feasibility Condition Letter (***Note: must be stamped and signed by licensed geotechnical engineer***) ○ Form I-8A (optional) ○ Form I-8B (optional) • Partial Infiltration Condition: ○ Infiltration Feasibility Condition Letter (***Note: must be stamped and signed by licensed geotechnical engineer***) ○ Form I-8A ○ Form I-8B • Full Infiltration Condition: ○ Form I-8A ○ Form I-8B ○ Worksheet C.4-3 ○ Form I-9 Refer to Appendices C and D of the BMP Design Manual for guidance.	☑ Included ☐ Not included because the entire project will use harvest and use BMPs
Attachment 1e	Pollutant Control BMP Design Worksheets / Calculations (Required) Refer to Appendices B and E of the BMP Design Manual for structural pollutant control BMP design guidelines and site design credit calculations	☑ Included

Project Name: Lisbon Heights

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

The DMA Exhibit must identify:

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

Harvest and Use Feasibility Checklist	Worksheet B.3-1 : Form I-7

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

☐ Toilet and urinal flushing
☑ Landscape irrigation
☐ Other:_____

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

3.70 AC x 1470 Gal/AC = 5439 Gal

5439 Gal x 1/(7.48 Gal/CF) = 727

3. Calculate the DCV using worksheet B-2.1.
DCV = 3456 (cubic feet)
[Provide a summary of calculations here]
DCV(1) CF + DCV(2) CF = DCV CF
56 CF + 436 CF = 492 CF

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.

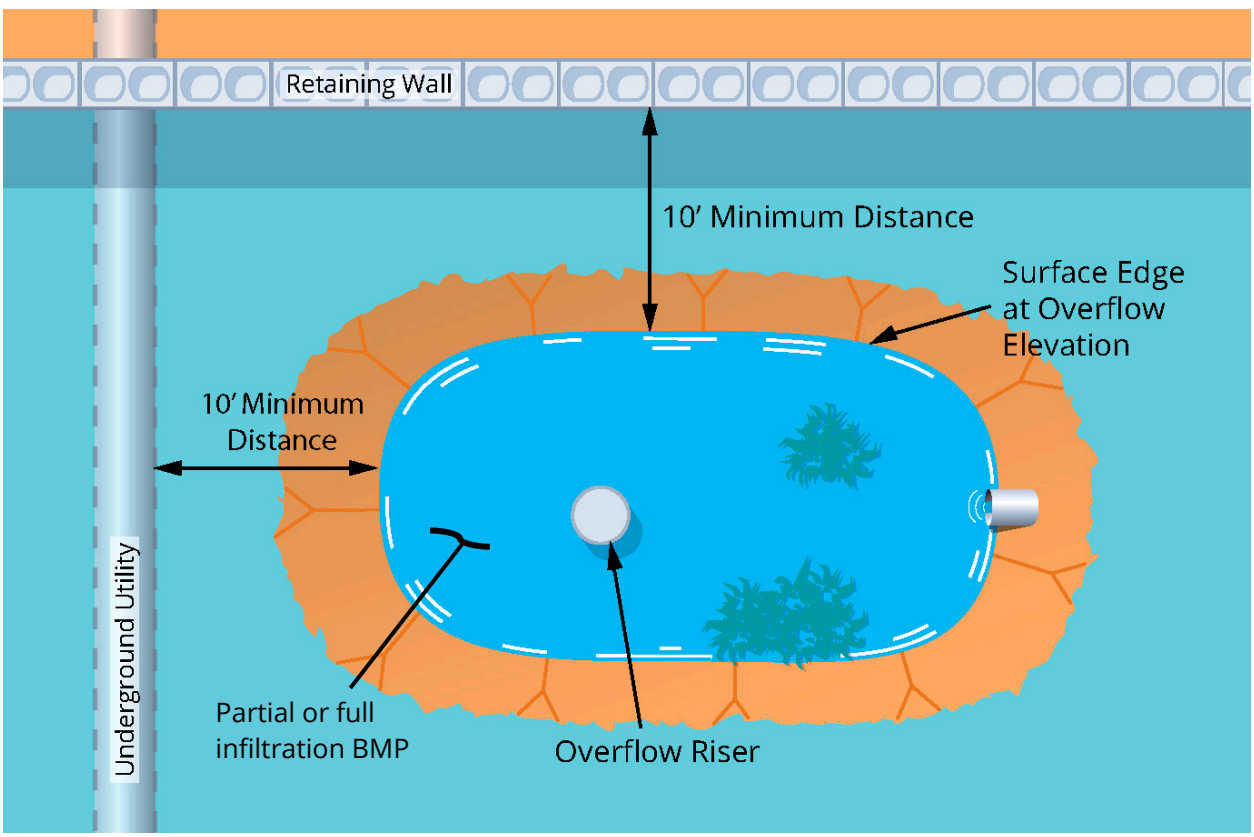
Is harvest and use feasible based on further evaluation?
☐ Yes, refer to Appendix E to select and size harvest and use BMPs.
☑ No, select alternate BMPs.

C.1 Simple Feasibility Criteria

When one of the following standard setbacks cannot be avoided, the applicant can classify the DMA as no infiltration condition provided an infiltration feasibility condition letter that meets the requirements in **Appendix C.1.1**. is included in the SWQMP submittal.

- Full and partial infiltration BMPs shall not be placed within existing fill materials greater than 5 feet thick; or
- Full and partial infiltration BMPs shall not be proposed within 10 feet (horizontal radial distance) of existing underground utilities, structures, or retaining walls; or
- Full and partial infiltration BMPs shall not be proposed within 50 feet of a natural slope (>25%) or within a distance of 1.5H from fill slopes where H is the height of the fill slope; or
- Full and partial infiltration BMPs shall not be proposed within 100 feet of contaminated soil or groundwater sites; or
- Other physical impairments (i.e., fire road egress, public safety considerations, etc.)

The setbacks must be the closest horizontal radial distance between the surface edge (at the overflow elevation) of the BMP to existing underground utilities, structures, retaining walls; or natural slopes; or fill slopes; or contaminated soil or groundwater site. The schematic for the setbacks is shown below.



C.1.1 Infiltration Feasibility Condition Letter

The geotechnical engineer shall provide an **Infiltration Feasibility Condition Letter** in the SWQMP to demonstrate that the DMA is in a no infiltration condition. The letter shall be stamped/signed by a licensed geotechnical engineer who prepared the letter.

The letter shall be submitted during the discretionary phase for private projects and during the initial project submittal to the Public Works Department for public projects. The letter shall at a minimum document:

- The phase of the project in which the geotechnical engineer first analyzed the site for infiltration feasibility.
- Results of previous geotechnical analyses conducted in the project area, if any.
- The development status of the site prior to the project application (i.e., new development with raw ungraded land, or redevelopment with existing graded conditions).
- The history of design discussions for the project footprint, resulting in the final design determination.
- Full/partial infiltration BMP standard setbacks to underground utilities, structures, retaining walls, fill slopes, and natural slopes applicable to the DMA that prevent full/partial infiltration.
- The physical impairments (i.e., fire road egress, public safety considerations, etc.) that prevent full/partial infiltration.
- The consideration of site design alternatives to achieve partial/full infiltration within the DMA.
- The extent site design BMPs requirements were included in the overall design.
- Conclusion or recommendation from the geotechnical engineer regarding the DMA's infiltration condition.
- An Exhibit for all applicable DMAs that clearly labels:
    - Proposed development areas and development type.
    - All applicable features and setbacks that prevent partial or full infiltration, including underground utilities, structures, retaining walls, fill slopes, natural slopes, and existing fill materials greater than 5 feet.
    - Potential locations for structural BMPs.
    - Areas where full/partial infiltration BMPs cannot be proposed.

Completion of **Worksheet C.4-1(Form I-8A) and/or Worksheet C.4-2 (Form I-8B)** is not required in instances where the applicant submits an infiltration feasibility condition letter that meets the requirements in this section.

May 1, 2020

SCST No. 180224N
Report No. 3

Cheryl Lee, CEO
Bay Vista Methodist Heights
140 North Escondido Boulevard
Escondido, California 92025

Subject: INFILTRATION FEASIBILITY
LISBON HEIGHTS
7106-7115 LISBON STREET
SAN DIEGO, CALIFORNIA

References: SCST, Inc. (2018), Geotechnical Investigation, Bay Vista Methodist Heights Development, 7108-7112 Lisbon Street, San Diego, California, SCST No. 180422N-1, July 19.

SWS Engineering, Inc. (2020), Lisbon Heights, Attachment 1A/2A, DMA/HMP Exhibit, April 28.

The City of San Diego (2018), The City of San Diego, Storm Water Standards, October 2018 Edition, Part 1: BMP Design Manual, Appendix C: Geotechnical and Groundwater Investigation Requirements.

Dear Ms. Lee:

SCST, LLC (SCST), an Atlas company, is pleased to submit this infiltration feasibility letter for the Lisbon Heights project. We utilized information from our geotechnical investigation (SCST, 2018) and the referenced DMA/HMP Exhibit (SWS Engineering, 2020) to prepare this letter. We assessed the infiltration characteristics of the subsurface soils at the site in accordance with the San Diego Regional BMP Design Manual. The following list provides the information requested in Appendix C of The City of San Diego Storm Water Standards (2018).

- The site was first analyzed for infiltration feasibility in the planning phase.
- Results of geotechnical analysis are presented in our referenced geotechnical investigation report (SCST, 2018).
- The development status of the site is new development with raw ungraded land.
- Design discussions are ongoing.
- The proximity to existing underground utilities and street improvements within the public right-of-way where BMPs are proposed is less than 10 feet, which exceeds the simple feasibility criteria for full and partial infiltration BMPs.

- We understand there are no physical impairments that would prevent full/partial infiltration.
- Design alternative discussions are ongoing.
- Site design BMP requirements are being considered by the Civil Engineer in the overall design.
- We recommend a no infiltration condition due to the tested infiltration rate of 0.0 inch/hour indicating a no infiltration condition, the proximity of existing underground utilities and street improvements within the public right-of-way, and the potential lateral migration of stormwater that cannot be mitigated to an acceptable level.

We appreciate the opportunity to be of continued service to you on this project. If you have any questions or require additional information, please call us at (619) 280-4321.

Respectfully submitted,
SCST, LLC

Thomas B. Canady, PE 50057
Principal Engineer

Emil Rudolph, PE GE 2767
Principal Engineer

TBC:ER:ds

(1) Addressee via e-mail: cheryl@bvmh.org
(1) Charles Davis via e-mail: cdavis@urbanwestdevelopment.net

Lisbon Heights
DCV Summary
11/1/2018

		DMA	
		1	2
	d (in)	0.54	0.54
	A (ac)	0.18	3.52
Area Weighted Runoff Factor			
Surface Type	*Runoff Factor*	*Area (sf)*	*Area (sf)*
Concrete/ Asphalt/Roofs	0.90	3032	73376
Unit Pavers (grouted)	0.90		
Decomposed Granite	0.30		
Cobbles or Crushed Aggregate	0.30		
Amended, Mulched Soils or Landscape	0.10	4972	79938
Permeable Pavement (Per B.2.1.3)	0.10		
Compacted Soil (e.g., unpaved parking)	0.30		
Natural (A Soil)	0.10		
Natural (B Soil)	0.14		
Natural (C Soil)	0.23		
Natural (D Soil)	0.30		
Total Area (sf)		8004	153314
Calculated C		0.40	0.48
DCV (cu ft)		**144**	**3312**

DMA - 1

Design Capture Volume		Worksheet B.2-1		
1	85th percentile 24-hr storm depth from Figure B.1-1	d=	0.54	inches
2	Area tributary to BMP (s)	A=	0.18	acres
3	Area weighted runoff factor (estimate using Appendix B.1.1 and B.2.1)	C=	0.40	unitless
4	Trees Credit Volume Note: In the SWQMP list the number of trees, size of each tree, amount of soil volume installed for each tree, contributing area to each tree and the inlet opening dimension for each tree.	TCV=		cubic-feet
5	Rain barrels Credit Volume Note: In the SWQMP list the number of rain barrels, size of each rain barrel and the use of the captured storm water runoff.	RCV=		cubic-feet
6	Calculate DCV = (3630 x C x d x A) – TCV - RCV	DCV=	144	cubic-feet

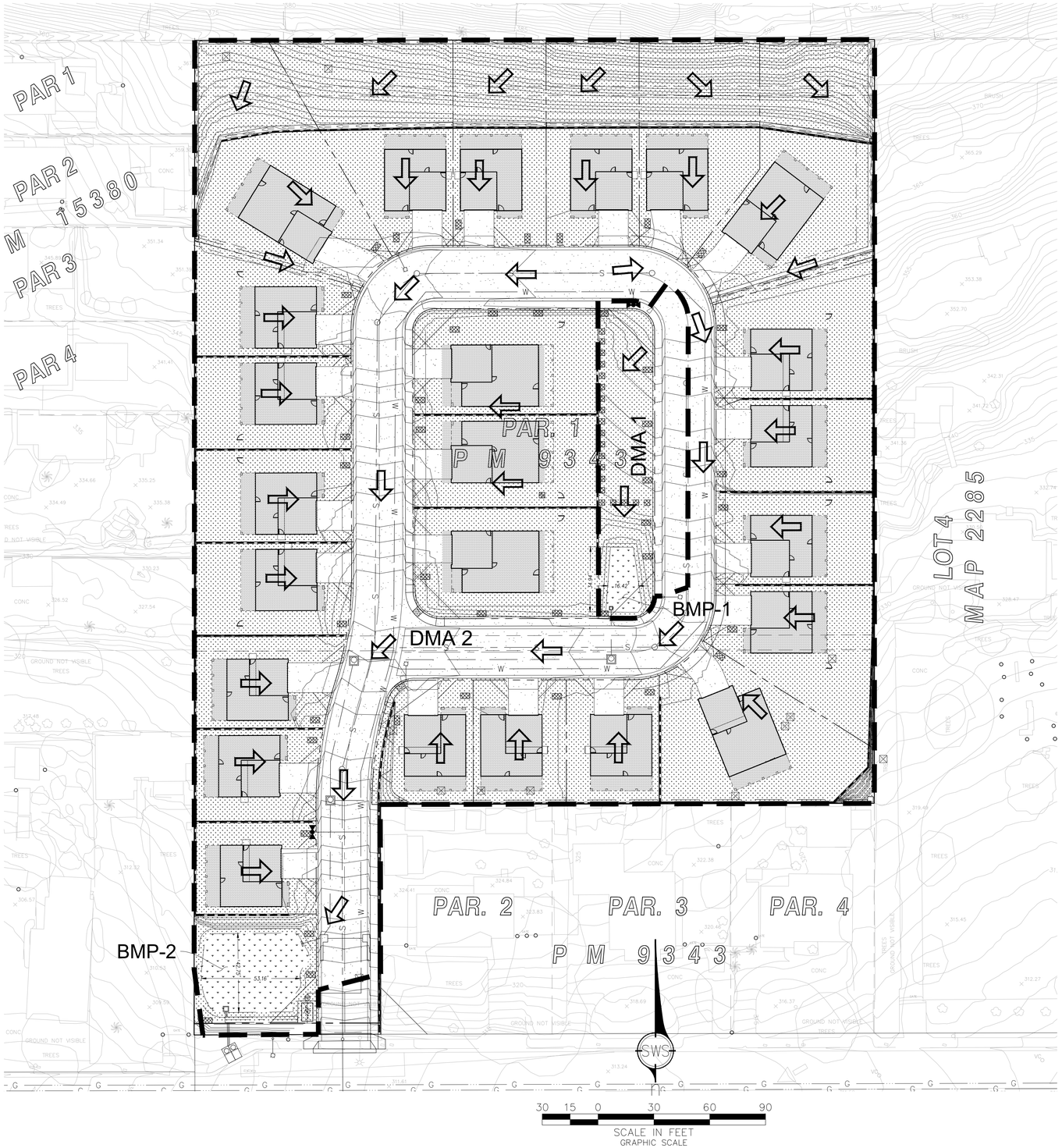
DMA-2

Design Capture Volume		Worksheet B.2-1		
1	85th percentile 24-hr storm depth from Figure B.1-1	d=	0.54	inches
2	Area tributary to BMP (s)	A=	3.52	acres
3	Area weighted runoff factor (estimate using Appendix B.1.1 and B.2.1)	C=	0.48	unitless
4	Trees Credit Volume Note: In the SWQMP list the number of trees, size of each tree, amount of soil volume installed for each tree, contributing area to each tree and the inlet opening dimension for each tree.	TCV=		cubic-feet
5	Rain barrels Credit Volume Note: In the SWQMP list the number of rain barrels, size of each rain barrel and the use of the captured storm water runoff.	RCV=		cubic-feet
6	Calculate DCV = (3630 x C x d x A) – TCV - RCV	DCV=	3312	cubic-feet

The City of SAN DIEGO	Project Name	Lisbon Heights	
	BMP ID	BMP-1	
Sizing Method for Pollutant Removal Criteria		**Worksheet B.5-1**	
1	Area draining to the BMP	8004	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.4	
3	85th percentile 24-hour rainfall depth	0.54	inches
4	Design capture volume [Line 1 x Line 2 x (Line 3/12)]	144	cu. ft.
BMP Parameters			
5	Surface ponding [6 inch minimum, 12 inch maximum]	10	inches
6	Media thickness [18 inches minimum], also add mulch layer and washed ASTM 33 fine aggregate sand thickness to this line for sizing calculations	24	inches
7	Aggregate storage (also add ASTM No 8 stone) above underdrain invert (12 inches typical) – use 0 inches if the aggregate is not over the entire bottom surface area	12	inches
8	Aggregate storage below underdrain invert (3 inches minimum) – use 0 inches if the aggregate is not over the entire bottom surface area	3	inches
9	Freely drained pore storage of the media	0.2	in/in
10	Porosity of aggregate storage	0.4	in/in
11	Media filtration rate to be used for sizing (maximum filtration rate of 5 in/hr. with no outlet control; if the filtration rate is controlled by the outlet use the outlet controlled rate (includes infiltration into the soil and flow rate through the outlet structure) which will be less than 5 in/hr.)	5	in/hr.
Baseline Calculations			
12	Allowable routing time for sizing	6	hours
13	Depth filtered during storm [Line 11 x Line 12]	30	inches
14	Depth of Detention Storage [Line 5 + (Line 6 x Line 9) + (Line 7 x Line 10) + (Line 8 x Line 10)]	20.8	inches
15	Total Depth Treated [Line 13 + Line 14]	50.8	inches
Option 1 – Biofilter 1.5 times the DCV			
16	Required biofiltered volume [1.5 x Line 4]	216	cu. ft.
17	Required Footprint [Line 16/ Line 15] x 12	51	sq. ft.
Option 2 - Store 0.75 of remaining DCV in pores and ponding			
18	Required Storage (surface + pores) Volume [0.75 x Line 4]	108	cu. ft.
19	Required Footprint [Line 18/ Line 14] x 12	62	sq. ft.
Footprint of the BMP			
20	BMP Footprint Sizing Factor (Default 0.03 or an alternative minimum footprint sizing factor from Line 11 in Worksheet B.5-4)	0.03	
21	Minimum BMP Footprint [Line 1 x Line 2 x Line 20]	96	sq. ft.
22	Footprint of the BMP = Maximum(Minimum(Line 17, Line 19), Line 21)	96	sq. ft.
23	Provided BMP Footprint	561	sq. ft.
24	Is Line 23 ≥ Line 22?	**Yes, Performance Standard is Met**	

The City of SAN DIEGO	Project Name	Lisbon Heights	
	BMP ID	BMP-2	
Sizing Method for Pollutant Removal Criteria		**Worksheet B.5-1**	
1	Area draining to the BMP	153315	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.48	
3	85th percentile 24-hour rainfall depth	0.54	inches
4	Design capture volume [Line 1 x Line 2 x (Line 3/12)]	3312	cu. ft.
BMP Parameters			
5	Surface ponding [6 inch minimum, 12 inch maximum]	10	inches
6	Media thickness [18 inches minimum], also add mulch layer and washed ASTM 33 fine aggregate sand thickness to this line for sizing calculations	24	inches
7	Aggregate storage (also add ASTM No 8 stone) above underdrain invert (12 inches typical) – use 0 inches if the aggregate is not over the entire bottom surface area	12	inches
8	Aggregate storage below underdrain invert (3 inches minimum) – use 0 inches if the aggregate is not over the entire bottom surface area	3	inches
9	Freely drained pore storage of the media	0.2	in/in
10	Porosity of aggregate storage	0.4	in/in
11	Media filtration rate to be used for sizing (maximum filtration rate of 5 in/hr. with no outlet control; if the filtration rate is controlled by the outlet use the outlet controlled rate (includes infiltration into the soil and flow rate through the outlet structure) which will be less than 5 in/hr.)	5	in/hr.
Baseline Calculations			
12	Allowable routing time for sizing	6	hours
13	Depth filtered during storm [Line 11 x Line 12]	30	inches
14	Depth of Detention Storage [Line 5 + (Line 6 x Line 9) + (Line 7 x Line 10) + (Line 8 x Line 10)]	20.8	inches
15	Total Depth Treated [Line 13 + Line 14]	50.8	inches
Option 1 – Biofilter 1.5 times the DCV			
16	Required biofiltered volume [1.5 x Line 4]	4967	cu. ft.
17	Required Footprint [Line 16/ Line 15] x 12	1173	sq. ft.
Option 2 - Store 0.75 of remaining DCV in pores and ponding			
18	Required Storage (surface + pores) Volume [0.75 x Line 4]	2484	cu. ft.
19	Required Footprint [Line 18/ Line 14] x 12	1433	sq. ft.
Footprint of the BMP			
20	BMP Footprint Sizing Factor (Default 0.03 or an alternative minimum footprint sizing factor from Line 11 in Worksheet B.5-4)	0.03	
21	Minimum BMP Footprint [Line 1 x Line 2 x Line 20]	2208	sq. ft.
22	Footprint of the BMP = Maximum(Minimum(Line 17, Line 19), Line 21)	2208	sq. ft.
23	Provided BMP Footprint	2223	sq. ft.
24	Is Line 23 ≥ Line 22?	**Yes, Performance Standard is Met**	

LISBON HEIGHTS



LEGEND

- DMA BOUNDARY
- DRAINAGE FLOW DIRECTION (SURFACE)
- SD — STORM DRAIN PIPE

NOTES

SOILS GROUP – D

NO GROUNDWATER WAS OBSERVED IN THE TEST PITS. PER SOILS REPORT; GROUND WATER IS ANTICIPATED AT AN APPROXIMATE DEPTH BELOW 48FT.

NO EXISTING HYDROLOGIC FEATURES

CCYSA WITHIN THE PROJECT LIMITS

POTENTIAL POLLUTANTS – NUTRIENTS, TRASH & DEBRIS, OXYGEN DEMANDING SUBSTANCES, OIL & GREASE, BACTERIA & VIRUSES, PESTICIDES

PERMANENT POST–CONSTRUCTION BMP NOTES

1. OPERATION AND MAINTENANCE SHALL BE SECURED BY AN EXECUTED AND RECORDED STORM WATER MANAGEMENT AND DISCHARGE CONTROL MAINTENANCE AGREEMENT (SWMDCMA), OR ANOTHER MECHANISM APPROVED BY THE CITY ENGINEER, THAT ASSURES ALL PERMANENT BMP'S WILL BE MAINTAINED IN PERPETUITY, PER THE LAND DEVELOPMENT MANUAL, STORM WATER STANDARDS.
2. ANY MODIFICATION(S) TO THE PERMANENT POST CONSTRUCTION BMP DEVICES/STRUCTURES SHOWN ON PLAN REQUIRES A CONSTRUCTION CHANGE TO BE PROCESSED AND APPROVED THROUGH DEVELOPMENT SERVICES DEPARTMENT BY THE ENGINEER OF WORK. APPROVAL OF THE CONSTRUCTION CHANGE IS REQUIRED PRIOR TO CONSTRUCTION OF THE PERMANENT BMP.

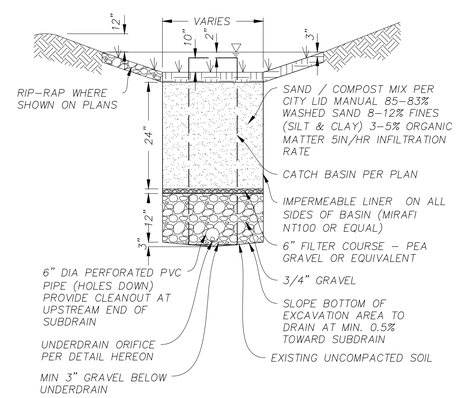
SITE DESIGN, SOURCE CONTROL AND POLLUTANT CONTROL BMP OPERATION + MAINTENANCE PROCEDURE

STORM WATER MANAGEMENT AND DISCHARGE CONTROL MAINTENANCE AGREEMENT APPROVAL NO.: 2136845

O&M RESPONSIBLE PARTY DESIGNEE: CASA FAMILIAR (PROPERTY OWNER)

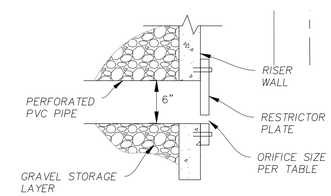
BMP DESCRIPTION	INSPECTION FREQUENCY	MAINTENANCE FREQUENCY	MAINTENANCE METHOD	QUANTITY	INCLUDED IN O&M MANUAL			SHEET NUMBER(S)
SITE DESIGN ELEMENTS			COVERED TRASH, MIN.	1	√	YES	NO	2
IMPERVIOUS AREA DISPERSION			IMPERMEABLE AREAS					
SOURCE CONTROL ELEMENTS			TRASH PICKUP, STREET SWEEPING	1	√	YES	NO	2
POLLUTANT CONTROL BMP(S) BIOFILTRATION BASIN (BF–1)	MONTHLY	MONTHLY & AFTER STORM	CLEAN CHAMBERS, TRASH, SEDIMENT, OUTLETS	2	√	YES	NO	2

HMP EXEMPT	NO
BMP–1 ORIFICE DIA.	3/8"
BMP–2 ORIFICE DIA.	7/8"



TYPICAL BIOFILTRATION DETAIL

NO SCALE



ORIFICE DETAIL

N.T.S.

BMP	AREA	X	Y	Z	ORIFICE SIZE
#1 (BF–1)	561 SF	10"	24"	12"	3/8"
#2 (BF–2)	2,223 SF	10"	24"	24"	7/8"

SUMMARY

SYMBOL	DESCRIPTION	DMA 1	DMA 2
	ROOFTOP	0 SF	36,234 SF
	IMPERVIOUS SURFACE	3,032 SF	37,142 SF
	PERVIOUS SURFACE	4,411 SF	77,104 SF
	BIOFILTRATION BASIN	561 SF	2,223 SF
	TOTAL	8,004 SF	152,703 SF
	TREATMENT	BMP 1 (BF–1)	BMP 2 (BF–1)

LISBON HEIGHTS

ATTACHMENT 1A/2A
DMA/HMP EXHIBIT

SWS ENGINEERING, INC.

CIVIL ENGINEERING • LAND PLANNING • SURVEYING

261 Autumn Drive, Suite 115
San Marcos, CA 92069
P: 760-744-0011 F: 760-744-0046

31045 Temecula Parkway, Suite 201
Temecula, CA 92592
P: 951-296-3407 F: 951-587-9451

DATE: May 01, 20 4:39pm by:MASSY/FATINI
FILE:Z:\Projects\2018\18-001\PROD\Reports\WQMP\18-001_WQMP.dwg

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: Lisbon Heights

Indicate which Items are Included:

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

Project Name: Lisbon Heights

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

The Hydromodification Management Exhibit must identify:

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

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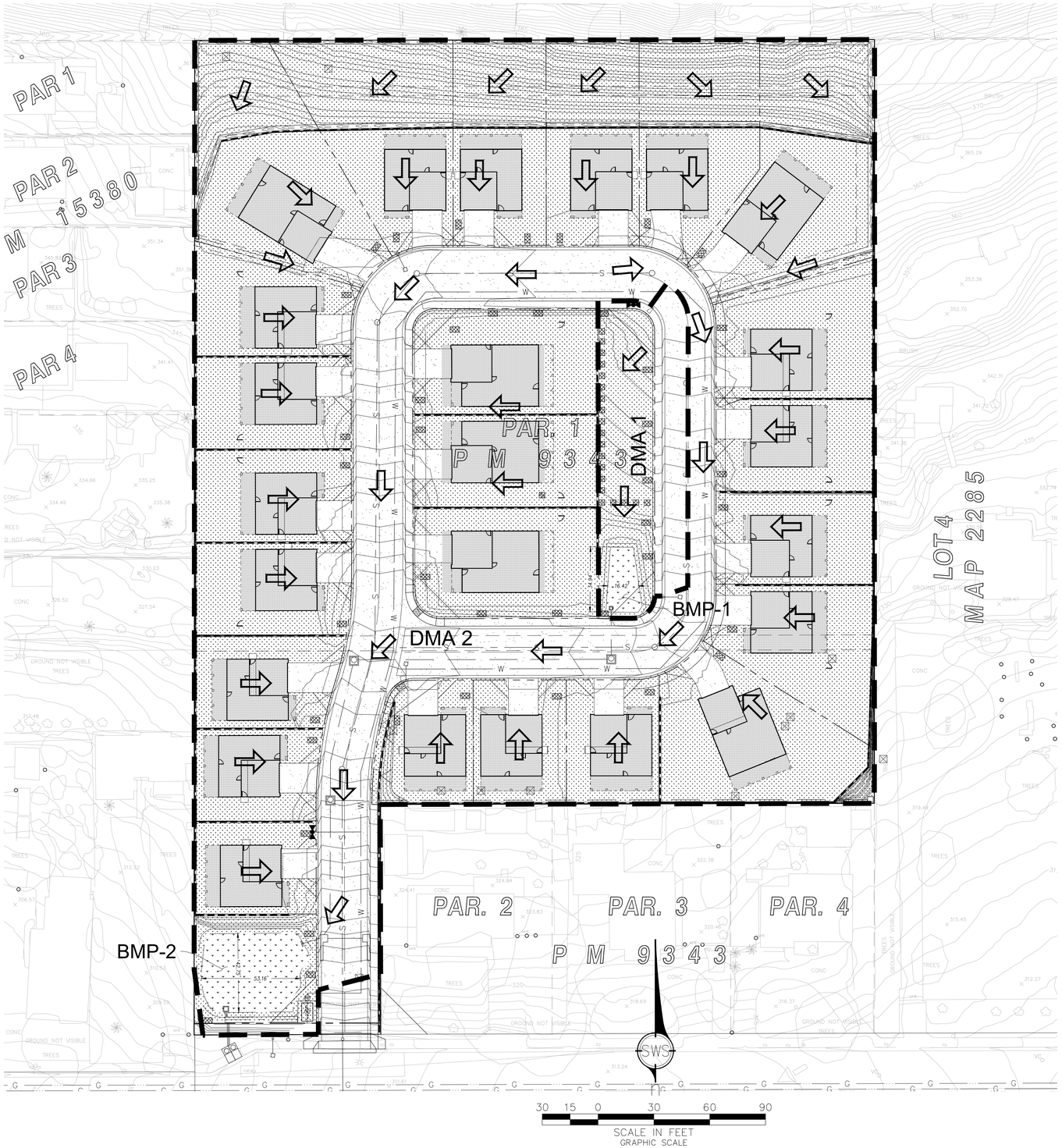
WMAA Critical Course Sediment Yield Area (CCSYA) Map

LISBON HEIGHTS



LEGEND

- DMA BOUNDARY
- DRAINAGE FLOW DIRECTION (SURFACE)
- SD — STORM DRAIN PIPE

NOTES

SOILS GROUP – D

NO GROUNDWATER WAS OBSERVED IN THE TEST PITS. PER SOILS REPORT; GROUND WATER IS ANTICIPATED AT AN APPROXIMATE DEPTH BELOW 48FT.

NO EXISTING HYDROLOGIC FEATURES

CCYSA WITHIN THE PROJECT LIMITS

POTENTIAL POLLUTANTS – NUTRIENTS, TRASH & DEBRIS, OXYGEN DEMANDING SUBSTANCES, OIL & GREASE, BACTERIA & VIRUSES, PESTICIDES

PERMANENT POST–CONSTRUCTION BMP NOTES

1. OPERATION AND MAINTENANCE SHALL BE SECURED BY AN EXECUTED AND RECORDED STORM WATER MANAGEMENT AND DISCHARGE CONTROL MAINTENANCE AGREEMENT (SWMDCMA), OR ANOTHER MECHANISM APPROVED BY THE CITY ENGINEER, THAT ASSURES ALL PERMANENT BMP'S WILL BE MAINTAINED IN PERPETUITY, PER THE LAND DEVELOPMENT MANUAL, STORM WATER STANDARDS.
2. ANY MODIFICATION(S) TO THE PERMANENT POST CONSTRUCTION BMP DEVICES/STRUCTURES SHOWN ON PLAN REQUIRES A CONSTRUCTION CHANGE TO BE PROCESSED AND APPROVED THROUGH DEVELOPMENT SERVICES DEPARTMENT BY THE ENGINEER OF WORK. APPROVAL OF THE CONSTRUCTION CHANGE IS REQUIRED PRIOR TO CONSTRUCTION OF THE PERMANENT BMP.

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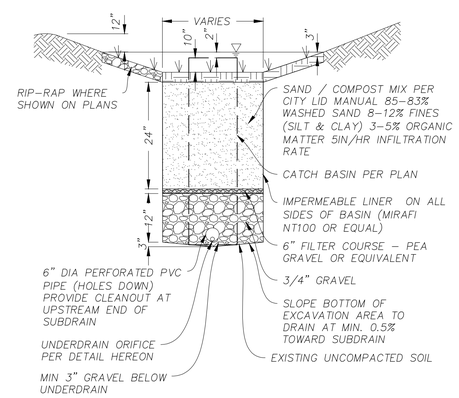
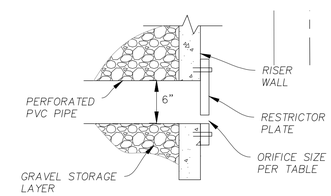


TYPICAL BIOFILTRATION DETAIL

NO SCALE



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LISBON HEIGHTS

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DATE: May 01, 20 4:39pm by:MASSY/FATINI
FILE:Z:\Projects\2018\18-001\PROD\Reports\WQMP\18-001_WQMP.dwg

HMP MEMO – Lisbon Heights
November 1, 2018

The proposed project was modeled using both the Environmental Protection Agency (EPA) Storm Water Management Model software with the PCSWMM overlay. SWMM models were prepared for the pre- and post-development condition. SWMM was used to model the biofiltration basin BMPs in each DMA.

The DMAs were modeled as one sub-catchments, which discharges to POC-1 in the pre-development condition. In the post-development condition, each DMA's sub-catchment discharges to its associated BMP sub-catchment modeled as a bio-retention LID, and then discharges to POC-1.

Runoff from the lot will drain into either the biofiltration basin or Modular Wetland System by sheet flow or roof/storm drains. Runoff from the 100-year storm event in the bioretention basins will overflow into catch basins that connect to the same underground storm drain system. This system connects to a 100-year storm detention tank for storage in this event, then a storm drain pipe and curb outlet discharges water to the gutter along Lisbon Street.

SWMM Modeling

Q2 and Q10 Determination

Q2 and Q10 were determined using a partial statistical analysis of the runoff time series and the Cunnane plotting position method. Q2 and Q10 were determined for the points of compliance POC-1.

Drain Coefficient for LID Module

The drain coefficient was calculated using the orifice size and LID area as described in Section G.1.5.3.4 of Appendix G of the County of San Diego BMP Design Manual dated February 26, 2016. The coefficient is determined using the following equation:

$$C = C_g \left(\frac{605}{A_{LID}}\right)\left(\frac{\pi D^2}{8}\right)\sqrt{\frac{g}{6}}$$, Where:

C_g is the orifice discharge coefficient, typically 0.60-0.65 for thin walled plates and higher for thicker walls
A_{LID} is the footprint area of the LID (ft^2)
D is the underdrain orifice diameter (in)
g is the gravitational constant (32.2 ft/s^2)

A "Drain Coefficient Calculations" are included as part of this report.

Drawdown Calculations

The drawdown time for each layer of the bioretention basin was calculated separately. The average depth or 'head' of each layer above the orifice was used in the orifice equation to determine the average discharge rate through the orifice for that layer. The average discharge rate for each layer was used to determine the drawdown time for that layer.

A "Drawdown Calculations" are included as part of this report.

Bioretention Basin Modeling

The bioretention basins were modeled using the biofiltration LID module within SWMM. The flow duration curves were compared using the hydromodification assessment tool within PCSWMM. The range between 10% of Q2 and Q10 was divided into 100 equal intervals, and the flow duration curves were compared at each interval to confirm that the post-development curve is within 110% of the pre-development curve. The project "passed" and satisfies this requirement at the point of compliance POC-1.

ATTACHMENTS

Pre-Development Map POC-1
Pre-Development Input Summary POC-1
Pre-Development Output Summary POC-1
Pre-Development Peak Flow Q2 thru Q10 for POC-1

Post-Development Map POC-1
Post-Development Input Summary POC-1
Post-Development Output Summary POC-1
Hydromodification Assessment Graph at POC-1

Orifice Calc for DMA-1
Orifice Calc for DMA-2

Drawdown Calculation Summary DMA-1
Drawdown Calculation Summary DMA-2

Elevation-Discharge Calculator DMA-1
Elevation-Discharge Calculator DMA-2

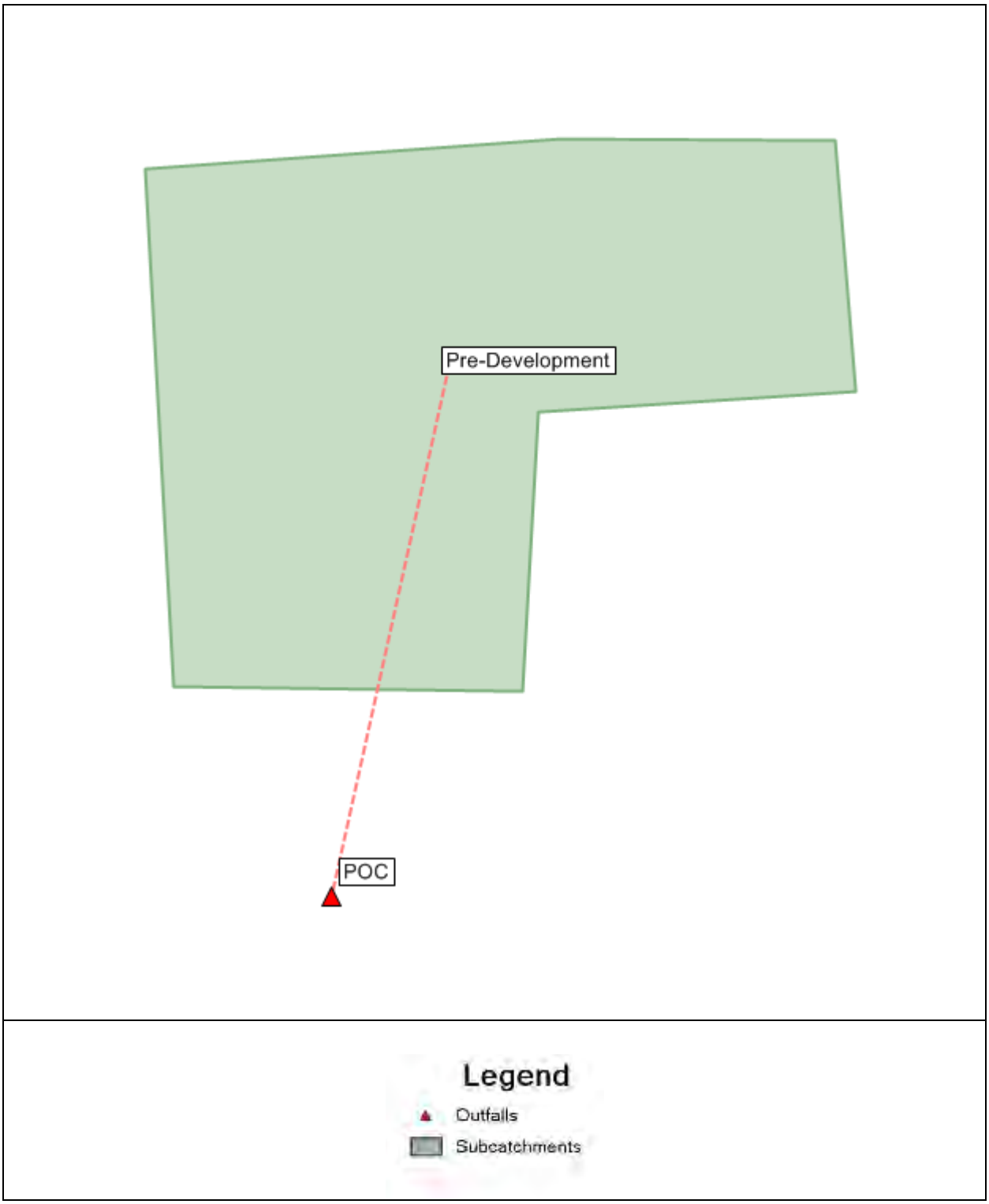
PCSWMM Input Data Table: Sub-catchments
PCSWMM Input Data Tables: LIDs

POC 1

PRE-DEVELOPMENT MAP

Pre-Development Condition – POC-1

Lisbon Heights



POC 1

PRE-DEVELOPMENT INPUT

```
[TITLE]


[OPTIONS]
;;Options            Value
;;------------------ ------------
FLOW_UNITS           CFS
INFILTRATION         GREEN_AMPT
FLOW_ROUTING         KINWAVE
START_DATE           08/28/1951
START_TIME           00:00:00
REPORT_START_DATE    08/28/1951
REPORT_START_TIME    00:00:00
END_DATE             05/23/2008
END_TIME             23:00:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          01:00:00
WET_STEP             00:15:00
DRY_STEP             04:00:00
ROUTING_STEP         60
ALLOW_PONDING        NO
INERTIAL_DAMPING     PARTIAL
VARIABLE_STEP        0.75
LENGTHENING_STEP     0
MIN_SURFAREA         0
NORMAL_FLOW_LIMITED  BOTH
SKIP_STEADY_STATE    NO
FORCE_MAIN_EQUATION  H-W
LINK_OFFSETS         DEPTH
MIN_SLOPE            0
MAX_TRIALS           8
HEAD_TOLERANCE       0.005
SYS_FLOW_TOL         5
LAT_FLOW_TOL         5
MINIMUM_STEP         0.5
THREADS              4

[EVAPORATION]
;;Type          Parameters
;;------------- ----------
MONTHLY      .06    .08    .11    .16    .18    .21    .21    .2     .16    .12    .08    .06
DRY_ONLY     NO

[RAINGAGES]
```

```
;;               Rain      Time   Snow   Data
;;Name           Type      Intrvl Catch  Source
;;-------------- --------- ------ ------ ----------
Oceanside        VOLUME    01:00  1.0    TIMESERIES Oceanside

[SUBCATCHMENTS]
;;                                                Total    Pcnt.             Pcnt.    Curb     Snow
;;Name           Raingage         Outlet           Area     Imperv   Width    Slope    Length   Pack
;;-------------- ---------------- ---------------- -------- -------- -------- -------- -------- --------
Pre-Development  Oceanside        POC              3.7034   0        320      3        0

[SUBAREAS]
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo    PctRouted
;;-------------- ---------- ---------- ---------- ---------- ---------- ---------- ----------
Pre-Development  0.012      0.1        0.05       0.1        25         OUTLET

[INFILTRATION]
;;Subcatchment   Suction    HydCon     IMDmax
;;-------------- ---------- ---------- ----------
Pre-Development  9          0.019      0.33

[OUTFALLS]
;;               Invert     Outfall      Stage/Table      Tide
;;Name           Elev.      Type         Time Series      Gate Route To
;;-------------- ---------- ------------ ---------------- ---- ----------------
POC              0          FREE                          NO

[TIMESERIES]
;;Name           Date       Time       Value
;;-------------- ---------- ---------- ----------
Oceanside        FILE "Z:\Projects\2018\18-001\PROD\Reports\WQMP\PCSWMM\Support Docs\oceanside.dat"

[REPORT]
INPUT      YES
CONTROLS   NO
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]

[MAP]
DIMENSIONS       -274.35          -17.475          503.35           366.975
UNITS            Feet

[COORDINATES]
```

```
;;Node           X-Coord          Y-Coord
;;-------------- ---------------- ----------------
POC              -121             -130.5

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

[POLYGONS]
;;Subcatchment   X-Coord          Y-Coord
;;-------------- ---------------- ----------------
Pre-Development  0                0
Pre-Development  -221             2.5
Pre-Development  -239             330.5
Pre-Development  24               349.5
Pre-Development  198              348.5
Pre-Development  211              189.5
Pre-Development  10               176.5
Pre-Development  0                0

[SYMBOLS]
;;Gage           X-Coord          Y-Coord
;;-------------- ---------------- ----------------
```

POC 1

PRE-DEVELOPMENT OUTPUT

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)

****
Element Count
****
Number of rain gages 1
Number of subcatchments ... 1
Number of nodes 1
Number of links 0
Number of pollutants 0
Number of land uses 0

****
Raingage Summary
****

Name	Data Source	Data Type	Recording Interval
Oceanside	Oceanside	VOLUME	60 min.

****
Subcatchment Summary
****

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
Pre-Development	3.70	320.00	0.00	3.0000	Oceanside	POC

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
POC	OUTFALL	0.00	0.00	0.0	

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,

not just on results from each reporting time step.
****

****
Analysis Options
****
Flow Units ..... CFS
Process Models:
  Rainfall/Runoff ..... YES
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... NO
  Water Quality ..... NO
Infiltration Method ..... GREEN_AMPT
Starting Date 08/28/1951 00:00:00
Ending Date 05/23/2008 23:00:00
Antecedent Dry Days 0.0
Report Time Step 01:00:00
Wet Time Step 00:15:00
Dry Time Step 04:00:00

********** Runoff Quantity Continuity **********	Volume acre-feet ---	Depth inches ---
Total Precipitation	208.270	674.850
Evaporation Loss	9.600	31.108
Infiltration Loss	154.905	501.932
Surface Runoff	48.048	155.688
Final Storage	0.000	0.000
Continuity Error (%)	-2.057	

********** Flow Routing Continuity **********	Volume acre-feet ---	Volume 10^6 gal ---
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	48.048	15.657
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	48.048	15.657
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000

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

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip in	Total Runon in	Total Evap in	Total Infil in	Total Runoff in	Total Runoff 10^6 gal	Peak Runoff CFS	Runoff Coeff
Pre-Development	674.85	0.00	31.11	501.93	155.69	15.66	4.07	0.231

```
Analysis begun on:  Thu Nov 01 11:24:42 2018
Analysis ended on:  Thu Nov 01 11:24:51 2018
Total elapsed time: 00:00:09
```

POC 1

PRE-DEVELOPMENT PEAK FLOWS

.1Q2-Q10

Peak Flow Event List and Determination of Q2 thru Q10
Lisbon Heights - POC-1
Pre-Development Condition

Number of Years Analyzed, n = 57

Event Date	Peak Runoff (cfs)	Position, i	Probability, P	Period of Return (Years)
2/12/1992 17:00	1.233	57	0.99	1.01
2/18/1980 5:00	1.235	56	0.97	1.03
12/24/1988 23:00	1.238	55	0.95	1.05
2/23/2005 2:00	1.239	54	0.94	1.07
1/6/1979 4:55	1.249	53	0.92	1.09
3/11/1995 22:00	1.265	52	0.90	1.11
3/19/1981 19:55	1.285	51	0.88	1.13
2/8/1993 0:55	1.295	50	0.87	1.15
1/11/2005 1:55	1.303	49	0.85	1.18
1/18/1993 8:55	1.324	48	0.83	1.20
2/14/1998 16:55	1.33	47	0.81	1.23
3/15/1986 21:55	1.333	46	0.80	1.25
12/2/1961 7:55	1.353	45	0.78	1.28
2/4/1994 8:55	1.382	44	0.76	1.31
3/16/1963 23:55	1.384	43	0.74	1.34
4/27/1960 8:50	1.421	42	0.73	1.38
8/17/1977 2:20	1.431	41	0.71	1.41
1/6/2008 22:50	1.444	40	0.69	1.44
2/18/1993 11:50	1.449	39	0.67	1.48
2/14/1986 23:50	1.466	38	0.66	1.52
10/20/2004 8:50	1.481	37	0.64	1.56
1/16/1972 21:45	1.494	36	0.62	1.61
2/22/2008 4:40	1.494	35	0.60	1.65
11/15/1952 12:50	1.533	34	0.59	1.70
2/16/1980 17:45	1.563	33	0.57	1.75
2/27/1983 15:45	1.581	32	0.55	1.81
1/27/2008 15:45	1.597	31	0.53	1.87
1/29/1980 1:55	1.656	30	0.52	1.93
1/16/1978 20:20	1.684	29	0.50	2.00
2/17/1998 16:40	1.698	28	0.48	2.07
1/28/1983 23:40	1.759	27	0.47	2.15
11/11/1985 8:40	1.774	26	0.45	2.23
2/22/1998 16:55	1.832	25	0.43	2.33
12/29/1991 23:40	1.837	24	0.41	2.42
12/19/1970 2:40	1.843	23	0.40	2.53
11/22/1965 21:35	1.901	22	0.38	2.65
2/3/1998 16:30	1.94	21	0.36	2.78
3/2/1980 20:35	1.945	20	0.34	2.92
4/1/1958 14:40	1.954	19	0.33	3.08
2/10/1978 3:20	2.017	18	0.31	3.25
3/17/1982 10:35	2.125	17	0.29	3.45
10/29/2000 21:35	2.145	16	0.27	3.67
1/14/1993 3:35	2.155	15	0.26	3.92
1/16/1952 11:25	2.268	14	0.24	4.21
2/18/2005 20:30	2.302	13	0.22	4.54
3/1/1978 5:25	2.329	12	0.20	4.93
2/20/1980 21:25	2.33	11	0.19	5.40
10/27/2004 3:25	2.368	10	0.17	5.96
2/4/1958 2:25	2.563	9	0.15	6.65
2/25/1969 14:15	2.565	8	0.13	7.53
9/23/1986 22:30	2.571	7	0.12	8.67
2/25/2003 16:20	2.699	6	0.10	10.21
1/4/1995 17:05	3.371	5	0.08	12.43
1/15/1979 12:35	3.477	4	0.06	15.89
10/1/1983 1:05	3.646	3	0.05	22.00
1/4/1978 14:20	3.675	2	0.03	35.75
4/14/2003 16:05	4.057	1	0.01	95.33

Storm Event (year)	Flow (cfs)
2	1.68
3	1.95
4	2.19
5	2.33
6	2.38
7	2.56
8	2.57
9	2.60
10	2.68

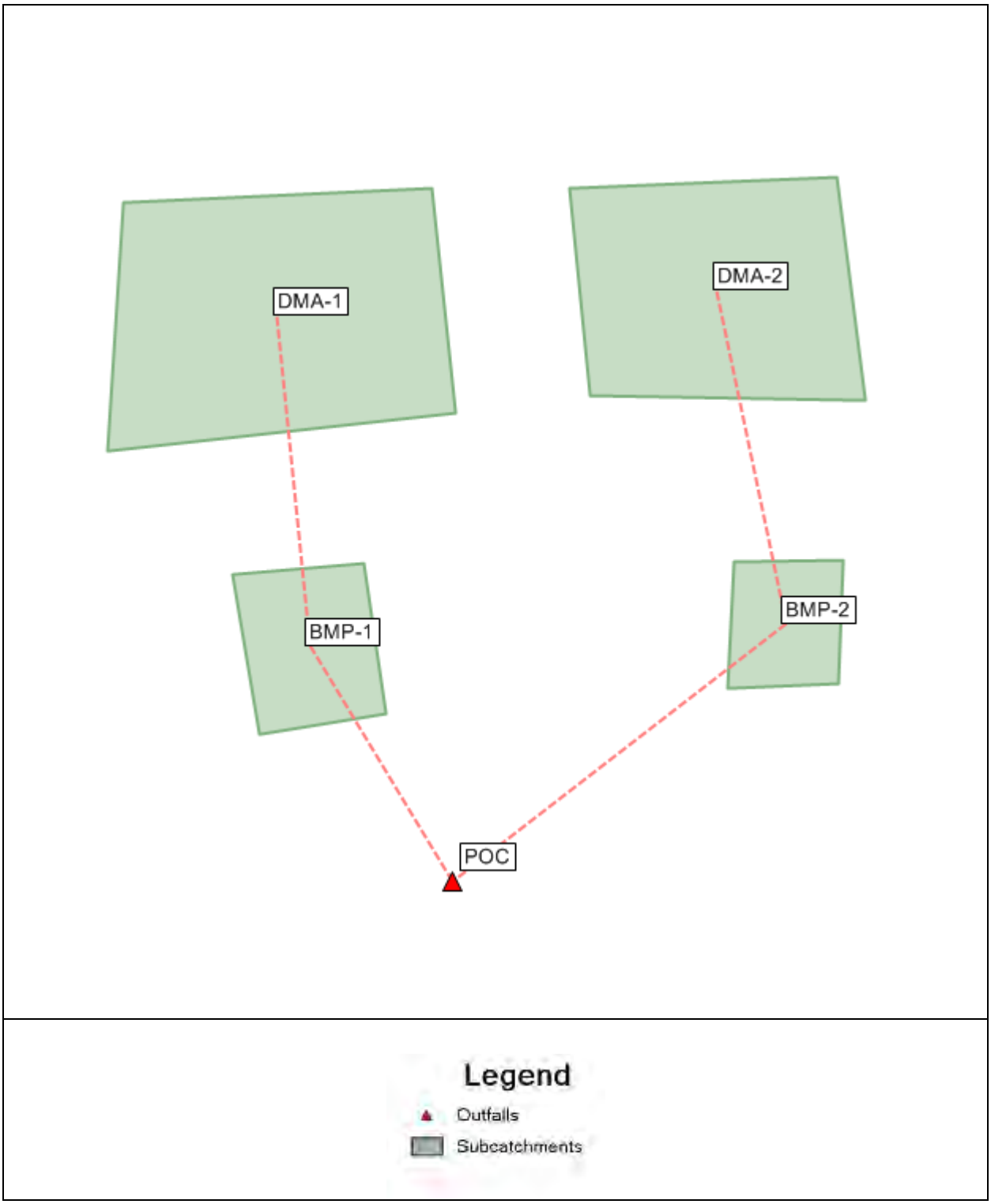
Probability, P	Position, i
0.50	29.00
0.33	19.47
0.25	14.70
0.20	11.84
0.17	9.93
0.14	8.57
0.13	7.55
0.11	6.76
0.10	6.12

POC 1

POST-DEVELOPMENT MAP

Post-Development Condition – POC-1

Lisbon Heights



POC 1

POST-DEVELOPMENT INPUT

```
[TITLE]


[OPTIONS]
;;Options            Value
;;------------------ ------------
FLOW_UNITS           CFS
INFILTRATION         GREEN_AMPT
FLOW_ROUTING         KINWAVE
START_DATE           08/28/1951
START_TIME           00:00:00
REPORT_START_DATE    08/28/1951
REPORT_START_TIME    00:00:00
END_DATE             05/23/2008
END_TIME             23:00:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          01:00:00
WET_STEP             00:15:00
DRY_STEP             04:00:00
ROUTING_STEP         60
ALLOW_PONDING        NO
INERTIAL_DAMPING     PARTIAL
VARIABLE_STEP        0.75
LENGTHENING_STEP     0
MIN_SURFAREA         0
NORMAL_FLOW_LIMITED  BOTH
SKIP_STEADY_STATE    NO
FORCE_MAIN_EQUATION  H-W
LINK_OFFSETS         DEPTH
MIN_SLOPE            0
MAX_TRIALS           8
HEAD_TOLERANCE       0.005
SYS_FLOW_TOL         5
LAT_FLOW_TOL         5
MINIMUM_STEP         0.5
THREADS              4

[EVAPORATION]
;;Type          Parameters
;;------------- ----------
MONTHLY      .06    .08    .11    .16    .18    .21    .21    .2     .16    .12    .08    .06
DRY_ONLY     NO

[RAINGAGES]
```

```
;;                Rain      Time   Snow   Data
;;Name            Type      Intrvl Catch  Source
;;-------------- --------- ------ ------ ----------
Oceanside         VOLUME    01:00  1.0    TIMESERIES Oceanside

[SUBCATCHMENTS]
;;                                                   Total    Pcnt.              Pcnt.    Curb     Snow
;;Name            Raingage          Outlet           Area     Imperv   Width    Slope    Length   Pack
;;-------------- ---------------- ---------------- -------- -------- -------- -------- -------- --------
BMP-1             Oceanside         POC              0.0129   0        15       0        0
BMP-2             Oceanside         POC              0.0651   0        42       0        0
DMA-1             Oceanside         BMP-1            0.1709   38       43       3        0
DMA-2             Oceanside         BMP-2            3.4546   48       320      3        0

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

[INFILTRATION]
;;Subcatchment   Suction    HydCon     IMDmax
;;-------------- ---------- ---------- ----------
BMP-1             1.5        0.3        0.3
BMP-2             1.5        0.3        0.3
DMA-1             9          0.019      0.33
DMA-2             9          0.019      0.33

[LID_CONTROLS]
;;                Type/Layer Parameters
;;-------------- ---------- ----------
BMP-1             BC
BMP-1             SURFACE    10         0          0          0          5
BMP-1             SOIL       24         0.4        0.2        0.1        5          5          1.5
BMP-1             STORAGE    12         0.67       0          0
BMP-1             DRAIN      0.0842     0.5        3          6

BMP-2             BC
BMP-2             SURFACE    10         0          0          0          5
BMP-2             SOIL       24         0.4        0.2        0.1        5          5          1.5
BMP-2             STORAGE    12         0.67       0          0
BMP-2             DRAIN      0.0907     0.5        3          6

[LID_USAGE]
```

```
;;Subcatchment   LID Process      Number  Area       Width      InitSatur  FromImprv  ToPerv     Report File                 Drai
;;-------------- ---------------- ------- ---------- ---------- ---------- ---------- ---------- --------------------------- ----
BMP-1            BMP-1            1       561.92     0          0          100        0
BMP-2            BMP-2            1       2835.75    0          0          100        0

[OUTFALLS]
;;               Invert     Outfall      Stage/Table      Tide
;;Name           Elev.      Type         Time Series      Gate Route To
;;-------------- ---------- ------------ ---------------- ---- ----------------
POC              0          FREE                          NO

[TIMESERIES]
;;Name           Date       Time       Value
;;-------------- ---------- ---------- ----------
Oceanside        FILE "Z:\Projects\2018\18-001\PROD\Reports\WQMP\PCSWMM\Support Docs\oceanside.dat"

[REPORT]
INPUT      YES
CONTROLS   NO
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]

[MAP]
DIMENSIONS       -362.95          -55.1            163.95           332.1
UNITS            Feet

[COORDINATES]
;;Node           X-Coord          Y-Coord
;;-------------- ---------------- ----------------
POC              -121             -130.5

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

[POLYGONS]
;;Subcatchment   X-Coord          Y-Coord
;;-------------- ---------------- ----------------
BMP-1            -260             63.5
BMP-1            -177             70.5
BMP-1            -163             -24.5
BMP-1            -243             -37.5
BMP-1            -260             63.5
```

```
BMP-2            57               71.5
BMP-2            126              72.5
BMP-2            123              -5.5
BMP-2            53               -8.5
BMP-2            57               71.5
DMA-1            -329             298.5
DMA-1            -134             307.5
DMA-1            -119             165.5
DMA-1            -339             141.5
DMA-1            -329             298.5
DMA-2            -47              307.5
DMA-2            122              314.5
DMA-2            140              173.5
DMA-2            -34              176.5
DMA-2            -47              307.5

[SYMBOLS]
;;Gage           X-Coord          Y-Coord
;;-------------- ---------------- ----------------
```

POC 1

POST-DEVELOPMENT OUTPUT

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)

****
Element Count
****
Number of rain gages 1
Number of subcatchments ... 4
Number of nodes 1
Number of links 0
Number of pollutants 0
Number of land uses 0

****
Raingage Summary
****

Name	Data Source	Data Type	Recording Interval
Oceanside	Oceanside	VOLUME	60 min.

****
Subcatchment Summary
****

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
BMP-1	0.01	15.00	0.00	0.0000	Oceanside	POC
BMP-2	0.07	42.00	0.00	0.0000	Oceanside	POC
DMA-1	0.17	43.00	38.00	3.0000	Oceanside	BMP-1
DMA-2	3.45	320.00	48.00	3.0000	Oceanside	BMP-2

****
LID Control Summary
****

Subcatchment	LID Control	No. of Units	Unit Area	Unit Width	% Area Covered	% Imperv Treated
BMP-1	BMP-1	1	561.92	0.00	100.00	100.00
BMP-2	BMP-2	1	2835.75	0.00	100.00	100.00

```
************
Node Summary
************
                                          Invert      Max.    Ponded    External
Name                 Type                  Elev.     Depth      Area    Inflow
-----------------------------------------------------------------------------------
POC                  OUTFALL               0.00      0.00       0.0


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

****************
Analysis Options
****************
Flow Units ............... CFS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... NO
  Water Quality .......... NO
Infiltration Method ...... GREEN_AMPT
Starting Date ............ 08/28/1951 00:00:00
Ending Date .............. 05/23/2008 23:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 01:00:00
Wet Time Step ............ 00:15:00
Dry Time Step ............ 04:00:00


**************************        Volume         Depth
Runoff Quantity Continuity     acre-feet        inches
**************************     ---------       -------
Initial LID Storage ......         0.016         0.051
Total Precipitation ......       208.276       674.850
Evaporation Loss .........        26.028        84.335
Infiltration Loss ........        77.380       250.726
Surface Runoff ...........        37.687       122.113
LID Drainage .............        69.026       223.658
Final Storage ............         0.028         0.089
```

Continuity Error (%) ..... -0.892

Flow Routing Continuity	Volume acre-feet	Volume 10^6 gal
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	106.714	34.774
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	106.714	34.774
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.000
Continuity Error (%)	0.000	

Subcatchment Runoff Summary

Subcatchment	Total Precip in	Total Runon in	Total Evap in	Total Infil in	Total Runoff in	Total Runoff 10^6 gal	Peak Runoff CFS	Runoff Coeff
BMP-1	674.85	4365.74	951.24	0.00	4088.99	1.43	0.20	0.811
BMP-2	674.85	19338.01	1151.25	0.00	18860.44	33.34	4.08	0.942
DMA-1	674.85	0.00	52.73	299.75	329.54	1.53	0.20	0.488
DMA-2	674.85	0.00	62.56	253.96	364.42	34.18	4.03	0.540

LID Performance Summary

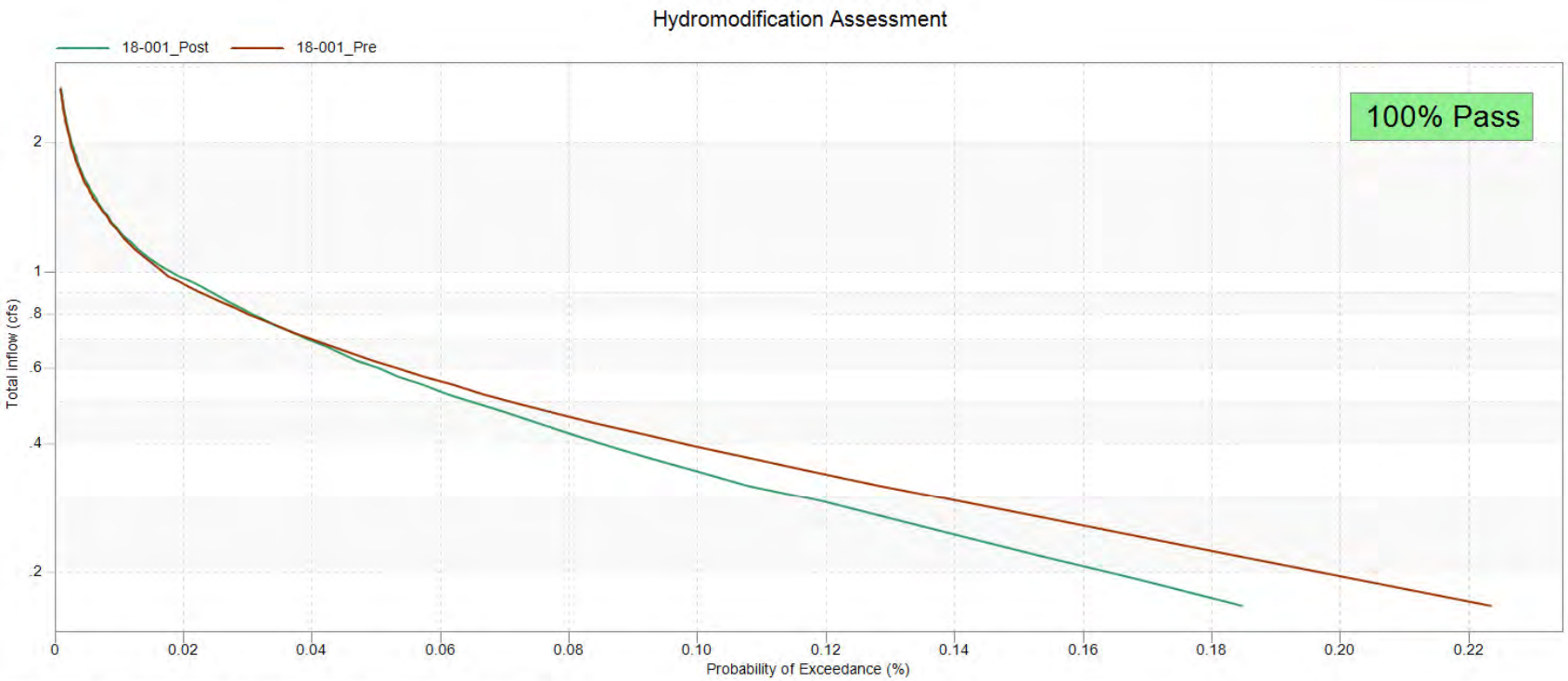
Subcatchment	LID Control	Total Inflow in	Evap Loss in	Infil Loss in	Surface Outflow in	Drain Outflow in	Initial Storage in	Final Storage in	Continuity Error %
BMP-1	BMP-1	5040.59	951.28	0.00	134.08	3955.09	2.40	2.65	-0.00
BMP-2	BMP-2	20012.86	1151.30	0.00	6920.64	11940.53	2.40	3.21	-0.00

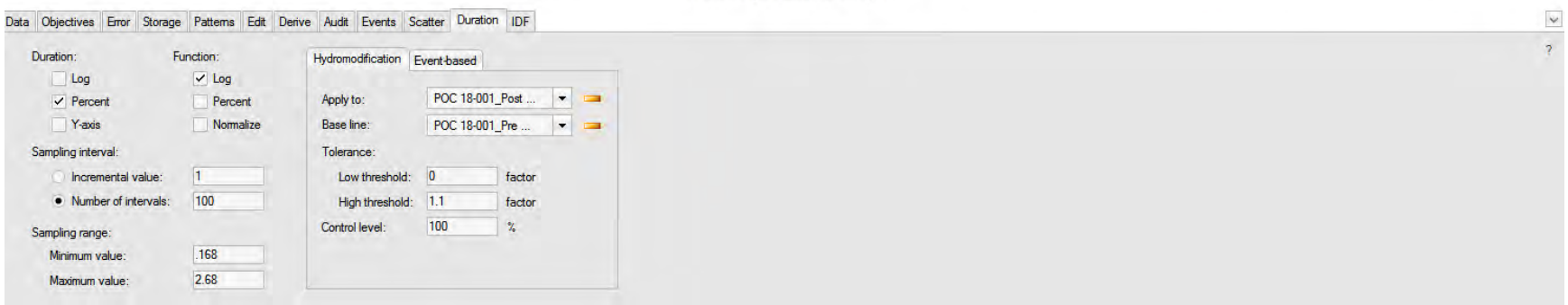
```
Analysis begun on:  Thu Nov 01 12:15:27 2018
Analysis ended on:  Thu Nov 01 12:15:39 2018
Total elapsed time: 00:00:12
```

POC 1

POST-DEVELOPMENT RESULTS

Hydromodification Assessment at POC-1





DMA 1 & 2

POST-DEVELOPMENT ORIFICE CALCULATIONS

Drain Coefficient Calculation Summary
Lisbon Heights

Orifice Diameter, D (in)		Cg	LID Area, A_{LID} (sf)	Drain Coefficient, C*
BF-1				
0.25	1/4	0.61	561	0.0374
0.375	3/8	0.61	561	0.0842
0.5	1/2	0.61	561	0.1496
0.5625	9/16	0.61	561	0.1894
0.625	5/8	0.61	561	0.2338
0.6875	11/16	0.61	561	0.2829
0.75	3/4	0.61	561	0.3366
0.8125	13/16	0.61	561	0.3951
0.875	7/8	0.61	561	0.4582
0.9375	15/16	0.61	561	0.5260
1.0	1	0.61	561	0.5985
1.0625	1-1/16	0.61	561	0.6756
1.125	1-1/8	0.61	561	0.7574
1.1875	1-3/16	0.61	561	0.8439
1.25	1-1/4	0.61	561	0.9351
1.3125	1-5/16	0.61	561	1.0309
1.375	1-3/8	0.61	561	1.1315
1.4375	1-7/16	0.61	561	1.2367
1.5	1-1/2	0.61	561	1.3465

$*C = Cg\ (605/A_{LID})\ (\pi D^2/8)\ \sqrt{(g/6)}$ per Section G.1.5.3.4 of Appendix G of the County of San Diego BMP Design Manual dated February 26, 2016

Drain Coefficient Calculation Summary
Lisbon Heights

Orifice Diameter, D (in)		Cg	LID Area, A_{LID} (sf)	Drain Coefficient, C*
BF-2				
0.25	1/4	0.61	2834	0.0074
0.5	1/2	0.61	2834	0.0296
0.5625	9/16	0.61	2834	0.0375
0.625	5/8	0.61	2834	0.0463
0.6875	11/16	0.61	2834	0.0560
0.75	3/4	0.61	2834	0.0666
0.8125	13/16	0.61	2834	0.0782
0.875	7/8	0.61	2834	0.0907
0.9375	15/16	0.61	2834	0.1041
1	1	0.61	2834	0.1185
1.0625	1-1/16	0.61	2834	0.1337
1.125	1-1/8	0.61	2834	0.1499
1.1875	1-3/16	0.61	2834	0.1671
1.25	1-1/4	0.61	2834	0.1851
1.3125	1-5/16	0.61	2834	0.2041
1.375	1-3/8	0.61	2834	0.2240
1.4375	1-7/16	0.61	2834	0.2448
1.5	1-1/2	0.61	2834	0.2666

***C = Cg $(605/A_{LID})$ $(\pi D^2/8)$ $\sqrt{(g/6)}$ per Section G.1.5.3.4 of Appendix G of the County of San Diego BMP Design Manual dated February 26, 2016**

DMA 1 & 2

POST-DEVELOPMENT DRAWDOWN CALCULATIONS

Drawdown Calculation Summary
Lisbon Heights

		BMP-1
Surface		
Average Discharge Rate	cfs	0.074
Ponding Depth	in	10
Bottom Area	sf	561
Top Area	sf	561
Drawdown Time	**hr**	**1.8**
Soil Layer		
Average Discharge Rate	cfs	0.0056
Thickness	in	24
Area	sf	561
Porosity		0.4
Field Capacity		0.2
Drawdown Time	**hr**	**11.1**
Gravel Layer		
Average Discharge Rate	cfs	0.0029
Thickness	in	12
Area	sf	561
Porosity		0.4
Drawdown Time	**hr**	**21.5**
TOTAL DRAWDOWN TIME	**hr**	**34.4**

Drawdown Calculation Summary
Lisbon Heights

		BMP-2
Surface		
Average Discharge Rate	cfs	0.0402
Ponding Depth	in	10
Bottom Area	sf	2834
Top Area	sf	2834
Drawdown Time	**hr**	**16.3**
Soil Layer		
Average Discharge Rate	cfs	0.0301
Thickness	in	24
Area	sf	2834
Porosity		0.4
Field Capacity		0.2
Drawdown Time	**hr**	**10.5**
Gravel Layer		
Average Discharge Rate	cfs	0.0153
Thickness	in	12
Area	sf	2834
Porosity		0.4
Drawdown Time	**hr**	**20.6**
TOTAL DRAWDOWN TIME	**hr**	**47.4**

DMA 1 & 2

POST-DEVELOPMENT ELEVATION-DISCHARGE CALCULATOR

ELEVATION-DISCHARGE CALCULATOR
BMP 1 - DISCHARGE THRU UNDERDRAIN ORIFICE
WEIR FLOW (1-'D-1' inches)
ORIFICE FLOW ('D' inches and over)

INPUT
Orifice Diameter, D = 0.3750 inches

CALCULATE
Weir Equation, Q = $3.0WH^{1.5}$
Orifice Equation, Q = $0.67A(2gH)^{0.5}$

ELEVATION (in)	DISCHARGE (cfs)		EFFECTIVE HEIGHT H (in)	ORIFICE AREA (sq ft)	WEIR LENGTH (ft)
1	0.0011		0.8125	0.0008	0.00
2	0.0016		1.8125	0.0008	0.00
3	0.0020		2.8125	0.0008	0.00
4	0.0023		3.8125	0.0008	0.00
5	0.0026		4.8125	0.0008	0.00
6	0.0029	Gravel	5.8125	0.0008	0.00
7	0.0031		6.8125	0.0008	0.00
8	0.0033		7.8125	0.0008	0.00
9	0.0035		8.8125	0.0008	0.00
10	0.0037		9.8125	0.0008	0.00
11	0.0039		10.8125	0.0008	0.00
12	0.0041		11.8125	0.0008	0.00
13	0.0043		12.8125	0.0008	0.00
14	0.0044		13.8125	0.0008	0.00
15	0.0046		14.8125	0.0008	0.00
16	0.0047		15.8125	0.0008	0.00
17	0.0049		16.8125	0.0008	0.00
18	0.0050		17.8125	0.0008	0.00
19	0.0052		18.8125	0.0008	0.00
20	0.0053		19.8125	0.0008	0.00
21	0.0054		20.8125	0.0008	0.00
22	0.0056	Soil	21.8125	0.0008	0.00
23	0.0057		22.8125	0.0008	0.00
24	0.0058		23.8125	0.0008	0.00
25	0.0059		24.8125	0.0008	0.00
26	0.0060		25.8125	0.0008	0.00
27	0.0062		26.8125	0.0008	0.00
28	0.0063		27.8125	0.0008	0.00
29	0.0064		28.8125	0.0008	0.00
30	0.0065		29.8125	0.0008	0.00
31	0.0066		30.8125	0.0008	0.00
32	0.0067		31.8125	0.0008	0.00
33	0.0068		32.8125	0.0008	0.00
34	0.0069		33.8125	0.0008	0.00
35	0.0070		34.8125	0.0008	0.00
36	0.0071		35.8125	0.0008	0.00
37	0.0072		36.8125	0.0008	0.00
38	0.0073		37.8125	0.0008	0.00
39	0.0074	Water	38.8125	0.0008	0.00
40	0.0075		39.8125	0.0008	0.00
41	0.0076		40.8125	0.0008	0.00
42	0.0077		41.8125	0.0008	0.00
43	0.0078		42.8125	0.0008	0.00
44	0.0079		43.8125	0.0008	0.00
45	0.0080		44.8125	0.0008	0.00
46	0.0081		45.8125	0.0008	0.00
47	0.0081		46.8125	0.0008	0.00
48	0.0082		47.8125	0.0008	0.00
49	0.0083		48.8125	0.0008	0.00
50	0.0084		49.8125	0.0008	0.00
51	0.0085		50.8125	0.0008	0.00
52	0.0086		51.8125	0.0008	0.00
53	0.0087		52.8125	0.0008	0.00
54	0.0087		53.8125	0.0008	0.00
55	0.0088		54.8125	0.0008	0.00
56	0.0089		55.8125	0.0008	0.00
57	0.0090		56.8125	0.0008	0.00
58	0.0091		57.8125	0.0008	0.00
59	0.0091		58.8125	0.0008	0.00
60	0.0092		59.8125	0.0008	0.00

ELEVATION-DISCHARGE CALCULATOR
BMP 2 - DISCHARGE THRU UNDERDRAIN ORIFICE
WEIR FLOW (1-'D-1' inches)
ORIFICE FLOW ('D' inches and over)

INPUT
Orifice Diameter, D = 0.8750 inches

CALCULATE
Weir Equation, Q = $3.0WH^{1.5}$
Orifice Equation, Q = $0.67A(2gH)^{0.5}$

ELEVATION (in)	DISCHARGE (cfs)		EFFECTIVE HEIGHT H (in)	ORIFICE AREA (sq ft)	WEIR LENGTH (ft)
1	0.0049		0.5625	0.0042	0.00
2	0.0081		1.5625	0.0042	0.00
3	0.0104		2.5625	0.0042	0.00
4	0.0122		3.5625	0.0042	0.00
5	0.0138		4.5625	0.0042	0.00
6	0.0153	Gravel	5.5625	0.0042	0.00
7	0.0166		6.5625	0.0042	0.00
8	0.0178		7.5625	0.0042	0.00
9	0.0190		8.5625	0.0042	0.00
10	0.0200		9.5625	0.0042	0.00
11	0.0211		10.5625	0.0042	0.00
12	0.0220		11.5625	0.0042	0.00
13	0.0230		12.5625	0.0042	0.00
14	0.0239		13.5625	0.0042	0.00
15	0.0247		14.5625	0.0042	0.00
16	0.0256		15.5625	0.0042	0.00
17	0.0264		16.5625	0.0042	0.00
18	0.0272		17.5625	0.0042	0.00
19	0.0279		18.5625	0.0042	0.00
20	0.0287		19.5625	0.0042	0.00
21	0.0294		20.5625	0.0042	0.00
22	0.0301	Soil	21.5625	0.0042	0.00
23	0.0308		22.5625	0.0042	0.00
24	0.0315		23.5625	0.0042	0.00
25	0.0321		24.5625	0.0042	0.00
26	0.0328		25.5625	0.0042	0.00
27	0.0334		26.5625	0.0042	0.00
28	0.0340		27.5625	0.0042	0.00
29	0.0346		28.5625	0.0042	0.00
30	0.0352		29.5625	0.0042	0.00
31	0.0358		30.5625	0.0042	0.00
32	0.0364		31.5625	0.0042	0.00
33	0.0370		32.5625	0.0042	0.00
34	0.0375		33.5625	0.0042	0.00
35	0.0381		34.5625	0.0042	0.00
36	0.0387		35.5625	0.0042	0.00
37	0.0392		36.5625	0.0042	0.00
38	0.0397		37.5625	0.0042	0.00
39	0.0402	Water	38.5625	0.0042	0.00
40	0.0408		39.5625	0.0042	0.00
41	0.0413		40.5625	0.0042	0.00
42	0.0418		41.5625	0.0042	0.00
43	0.0423		42.5625	0.0042	0.00
44	0.0428		43.5625	0.0042	0.00
45	0.0433		44.5625	0.0042	0.00
46	0.0437		45.5625	0.0042	0.00
47	0.0442		46.5625	0.0042	0.00
48	0.0447		47.5625	0.0042	0.00
49	0.0452		48.5625	0.0042	0.00
50	0.0456		49.5625	0.0042	0.00
51	0.0461		50.5625	0.0042	0.00
52	0.0465		51.5625	0.0042	0.00
53	0.0470		52.5625	0.0042	0.00
54	0.0474		53.5625	0.0042	0.00
55	0.0479		54.5625	0.0042	0.00
56	0.0483		55.5625	0.0042	0.00
57	0.0487		56.5625	0.0042	0.00
58	0.0492		57.5625	0.0042	0.00
59	0.0496		58.5625	0.0042	0.00
60	0.0500		59.5625	0.0042	0.00

PCSWMM INPUT DATA TABLES:

SUB-CATCHMENTS & LIDS

PCSWMM INPUT VALUES
SUBCATCHMENTS

	SUBCATCHMENT VALUES - DMA			SUBCATCHMENT VALUES - BMP	
	POC-1			POC-1	
	PRE-DEV	DMA-1	DMA-2	BF-1	BF-2
Soil type	A (D)	A (D)	A (D)	A	A
Attributes					
Area (ac)	3.7034	0.1709	3.4546	0.0129	0.0651
Area (sf)	161319	7443	150481	561	2834
Width (ft)	320	43	320	15	42
Slope (%)	3	3	3	0	0
Impervious %	0	38	48	0	0
N Imperv	0.012	0.012	0.012	0.012	0.012
N Perv	0.1	0.1	0.1	0.1	0.1
Dstore Imperv (in)	0.05	0.05	0.05	0.05	0.05
Dstore Perv(in)	0.1	0.1	0.1	0.1	0.1
Zero Imperv (%)	25	25	25	25	25
Subarea Routing	OUTLET	OUTLET	OUTLET	OUTLET	OUTLET
Percent Routed	100	100	100	100	100
Curb Length	0	0	0	0	0
Snow Pack	-	-	-	-	-
LID Controls	0	0	0	0	0
Groundwater	NO	NO	NO	NO	NO
Erosion	NO	NO	NO	NO	NO
Infiltration (Green_Ampt)					
Suction Head	9	9	9	1.5	1.5
Conductivity	0.019	0.019	0.019	0.3	0.3
Initial Deficit	0.33	0.33	0.33	0.3	0.3

PCSWMM INPUT VALUES
LID CONTROLS

	BIORETEIONTION VALUES	
	POC-1	
	BF-1	BF-2
LID Usage Editor		
Number of Replicate Units	1	1
LID Occupies Full Subcatchment?	Y	Y
Area (sf)	561	2834
% Subcatchment Occupied	100	100
Top Width of Overland Flow Surface (Ft)	0	0
% Initially Saturated	0	0
% of Impervious Area Treated	100	100
LID Control Editor - Bioretention Cell - Surface		
Storage Depth (in)	10	10
Vegetation Volume Fraction	0	0
Surface Roughness (Mannings n)	0	0
Surface Slope (%)	0	0
LID Control Editor - Bioretention Cell - Soil		
Thickness (in)	24	24
Porosity (volume fraction)	0.4	0.4
Field Capacity (volume fraction)	0.2	0.2
Wilting Point (volume fraction)	0.1	0.1
Conductivity (in/hr)	5	5
Conductivity Slope	5	5
Suction Head (in)	1.5	1.5
LID Control Editor - Bioretention Cell - Storage		
Height (in)	12	12
Void Ratio (Voids/Solids)	0.67	0.67
Conductivity (in/hr) *[use "0" if the LID unit has an impermeable bottom]*	0	0
Clogging Factor	0	0
LID Control Editor - Bioretention Cell - Underdrain		
Drain Coefficient (in/hr)	0.084	0.0907
Drain Exponent	0.5	0.5
Drain Offset Height (in)	3	3
Orifice Diameter (in)	3/8	7/8

Attachment 3
Structural BMP Maintenance Information

This is the cover sheet for Attachment 3.

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Project Name: Lisbon Heights

Indicate which Items are Included:

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

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

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

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

Attachment 4
Copy of Plan Sheets Showing Permanent Storm Water BMPs

This is the cover sheet for Attachment 4.

TENTATIVE TRACT MAP
#2225121, 24 LOTS

GENERAL NOTES

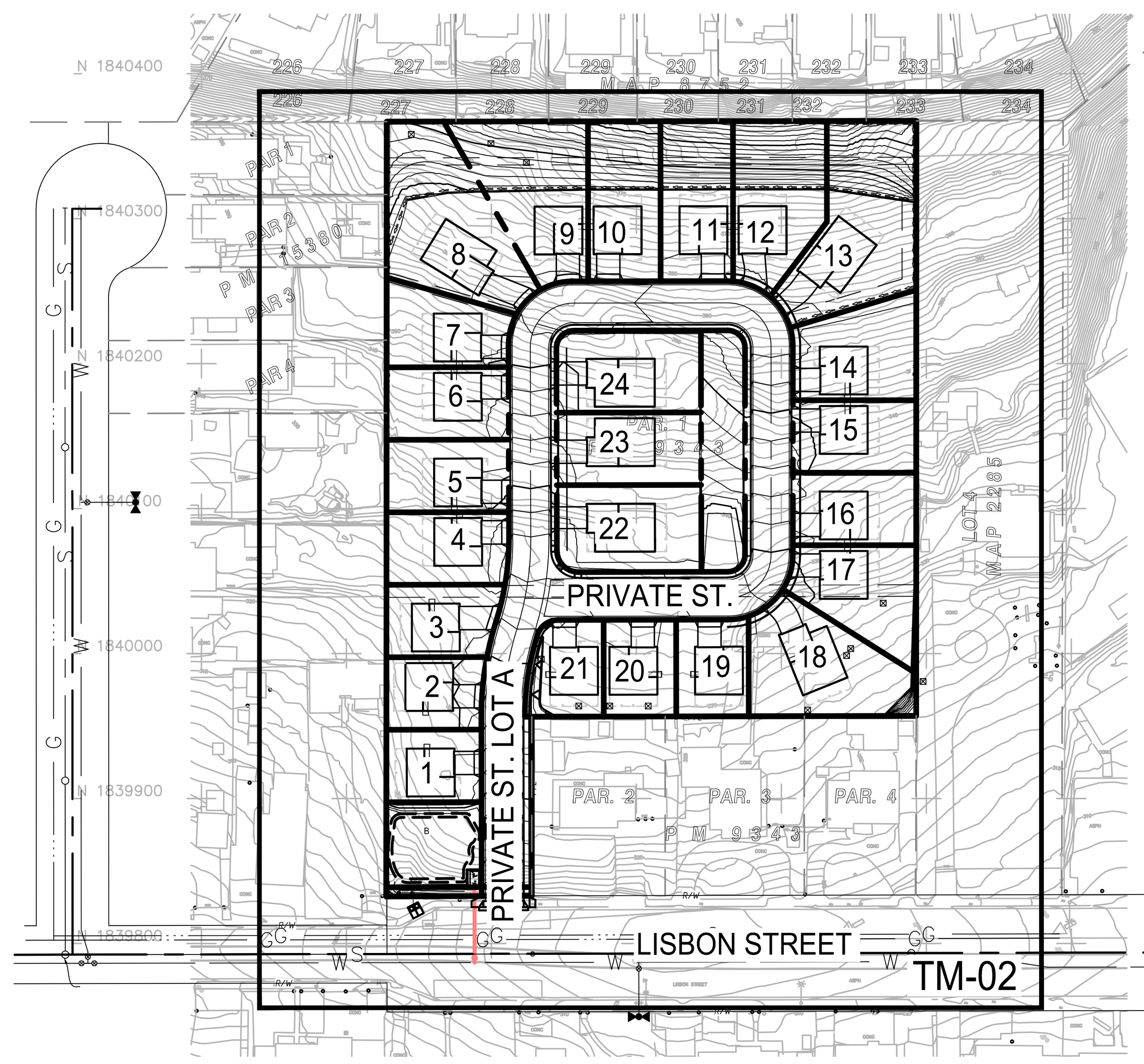
1. TOTAL NUMBER OF UNITS: 24 RESIDENTIAL UNITS
2. GROSS AREA: 3.73 ACRES
3. GRADING SHALL BE IN CONFORMANCE WITH CITY OF SAN DIEGO ORDINANCE.
4. 28'–32' PRIVATE DRIVE
5. ALL SEWER, WATER, STORMDRAIN SHALL BE INSTALLED WITHIN PRIVATE DRIVE, EXCEPT WHERE OTHERWISE SHOWN.
6. FLAT PADS ARE SHOWN SHALL BE GRADED TO DRAIN AT 1% MIN.
7. PROPOSED PRIVATE DRIVE SHALL BE IN CONFORMANCE WITH CITY OF SAN DIEGO PRIVATE STREET STANDARDS.
8. STREET SIGHTING DISTANCE AT INTERSECTION AND CURVES SHALL BE PER CALTRANS HIGHWAY DESIGN MANUAL.
9. PUBLIC SIDEWALKS AND RAMPS SHALL CONFORM TO AMERICAN DISABILITY ACT (ADA) REQUIREMENTS.
10. ALL ROADS SHALL BE MAINTAINED WITH A VERTICAL CLEARANCE OF 13'–6".
11. ALL PROPOSED UTILITIES SHALL BE UNDERGROUND.
12. HOA SHALL MAINTAIN ALL PUBLIC FIRE REQUIREMENTS – SIGNAGE & PAINTING.
13. ALL DWELLINGS SHALL BE AUTOMATIC FIRE SPRINKLE PER NFPA 13D.
14. THE (SWPPP STORM WATER POLLUTION PREVENTION PLAN WILL ADDRESS CONSTRUCTION DUST CONTROL, STREET CLEANING AND EROSION CONTROL MEASURES DURING CONSTRUCTION.
15. PRIOR TO THE ISSUANCE OF ANY CONSTRUCTION PERMIT HE SUBDIVIDER SHALL ENTER INTO A MAINTENANCE AGREEMENT FOR THE ONGOING PERMANENT BMP MAINTENANCE.
16. PRIOR TO THE ISSUANCE OF ANY CONSTRUCTION PERMIT THE SUBDIVIDER SHALL INCORPORATE ANY CONSTRUCTION BEST MANAGEMENT PRACTICES NECESSARY TO COMPLY WITH CHAPTER 14, ARTICLE 2, DIVISION 1 (GRADING REGULATION) OF THE SAN DIEGO MUNICIPAL CODE INTO THE CONSTRUCTION PLANS OR SPECIFICATIONS.
17. PROJECT WILL BE CONDITIONED FOR GRADING PERMIT.
18. ALL ON–SITE WATER AND SEWER UTILITIES SHALL BE PRIVATE.

DEVIATIONS

1. LOTS 1–7, 15, 16, 19–21 AND 23 AVERAGE 3,976 SF WHEN ZONE RS–1–7 REQUIRES A MINIMUM LOT AREA OF 5,000 SF.
2. LOT 21 HAS AN AVERAGE LOT WIDTH OF LESS THAN 50–FEET WHEN ZONE RS–1–7 REQUIRES A MINIMUM FRONTAGE WIDTH OF 50–FEET.
3. ALL RETAINING WALLS ARE BETWEEN 1'–4" AND 16' WHERE ZONE RS–1–7 ALLOWS FOR A MAXIMUM OF TWO RETAINING WALLS WITH A MAX. HEIGHT OF 6–FEET IF THE TWO RETAINING WALLS ARE SEPARATED BY A HORIZONTAL DISTANCE EQUAL TO OR GREATER THAN THE HEIGHT OF THE UPPER WALL.
4. LOTS 1–9, 13–21 ARE NOT THE STANDARD 50' x 100' LOTS DUE TO THE SHAPE OF THE PROPERTY. THE AVERAGE LOT SIZE FOR THE 24 LOTS IS 5,160 SF.
5. PERIMETER WALLS FOR LOTS 1–6, 13, 1–19 EXCEED 6–FEET IN HEIGHT.
6. ALL THE LOTS ARE LOCATED ON PRIVATE STREET AND UNABLE TO PROVIDE THE 50' STREET FRONTAGE ON THE PUBLIC STREET. THE STREET FRONTAGE FOR THE PARCEL IS VERY NARROW AND OPENS TO A LARGER LOT. THE BUILDING OF A PUBLIC STREET ON THIS SLOPED IRREGULAR PANHANDLE LOT WILL GREATLY REDUCE THE NUMBER OF AFFORDABLE HOUSING BUILT ON THIS SITE.

NOTE

THE SUBDIVIDER SHALL RECORD A DECLARATION OF COVENANTS AND RESERVATION OF EASEMENTS SHALL STATE: SINCE THE MUTUAL ACCESS EASEMENT AGREEMENT IS A PRIVATE AND NOT A PUBLIC ISSUE, THE CITY OF SAN DIEGO IS NOT RESPONSIBLE FOR ANY DISPUTE THAT MIGHT ARISE IN THE FUTURE BETWEEN THE PRIVATE PARTIES.

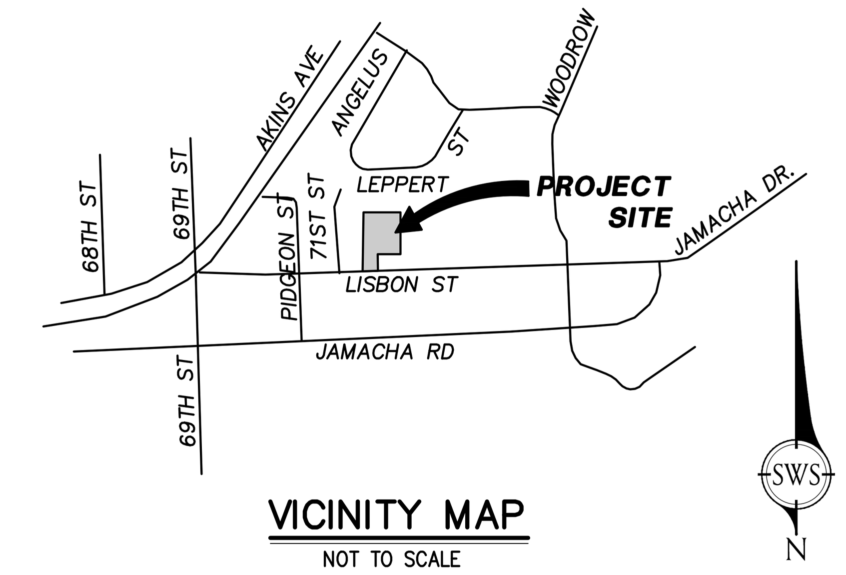


KEY MAP

SCALE: 1" = 100'

APPROVAL NOS.

TENTATIVE MAP..... 2225121
PDP....................... 2266624
SDP....................... 2309038
ROW VACATION..... 2405388



VICINITY MAP

NOT TO SCALE

LEGEND

RIGHT OF WAY
PROPERTY LINE/RIGHT OF WAY
CENTER LINE
CURB (PVT)
DRIVEWAY
CURB RAMP (PVT)
RIP RAP ENERGY DISSIPATOR (PVT)
BIOFILTRATION BASIN (PVT)
CONCRETE (PVT)
WHEEL STOP (PVT)
CONCRETE CATCH BASIN (PVT)
STORM DRAIN PIPE (PVT)
STORM DRAIN PIPE (PVT)
8" SEWER MAIN (PVC) (PVT)
SEWER MANHOLE (4' DIA) (PVT)
4" SEWER LATERAL (PVT)
4" WATER MAIN (PVT)
4" WATER SERVICE W/ 4" METER & BFP (PVT) TO 4" WATER SERVICE W/ 4" SUBMETER & BFP (PVT)
6" FIRE WATER SERVICE (PVC) (PVT)
1" IRR SERVICE W/ 3/4" METER & BFP (PVT)
WATER GATE VALVE (PVT)
FIRE HYDRANT (PVT)
EX. TREE
WOOD FENCE
CHAIN LINK FENCE
IRON FENCE
SEWER MANHOLE
WATER METER
WATER VALVE
EX. STREET LIGHT
EX. STORM DRAIN PIPE
EX. WATER LINE (PUBLIC)
EX. SEWER LINE (PUBLIC)
EX. GAS LINE (PVT)
EX. ELECTRICAL LINE (PVT)

LEGAL DESCRIPTION

REAL PROPERTY IN THE CITY OF SAN DIEGO, COUNTY OF SAN DIEGO, STATE OF CALIFORNIA, DESCRIBED AS FOLLOWS: PARCEL 1 OF PARCEL MAP NO. 9343, IN THE CITY OF SAN DIEGO, COUNTY OF SAN DIEGO, SATE OF CALIFORNIA, FILED IN THE OFFICE OF THE COUNTY RECORDER OF SAN DIEGO COUNTY, NOVEMBER 2, 1979 AS FILE NO. 79–463698 OF OFFICIAL RECORDS.

ASSESSOR'S PARCEL NUMBER

581–050–00–00
581–050–06–00

ZONING

EXISTING: RS–1–7 OF SKYLINE – PARADISE HILLS COMMUNITY PLAN
NO ZONING CHANGE

GROSS SITE AREA

3.73 ACRES = 162,478 SF

EXISTING USES

VACANT LOT

PROPOSED USES

24 SINGLE FAMILY DETACHED RESIDENCES WITH PRIVATE DRIVE AND OPEN SPACE.

PROJECT DESCRIPTION

TYPE V: N CONSTRUCTION
OCCUPANCY TYPE: R3
SINGLE FAMILY DWELLING UNITS
2 STORY, 2 BR, WITH 2 CAR GARAGE

OWNERSHIP STATEMENT

WE (I) HEREBY CERTIFY THAT (WE ARE) (I AM) THE OWNER(S) OF OR HAVE AN INTEREST IN THE LAND EMBRACED WITHIN THE SUBDIVISION TO BE KNOWN AS LISBON HEIGHTS, AND (WE) (I) HEREBY CONSENT TO THE PREPARATION OF THIS TENTATIVE MAP CONSISTING OF 6 SHEETS AND DESCRIBED IN THE CAPTION THEREOF.

CHERYL R.LEE, CEO
BAY VISTA METHODIST HEIGHTS, INC
1902 WRIGHT PLACE #200
CARLSBAD, CA 92008

PROJECT IS CONDITIONAL FOR GRADING PERMIT

SITE ADDRESS

7108–7112 LISBON STREET
SAN DIEGO, CA 92114

ENGINEER

SWS ENGINEERING, INC.
261 AUTUMN DRIVE, SUITE 115
SAN MARCOS, CA 92069
P: 760–744–0011
F: 760–744–0046

OWNER

BAY VISTA METHODIST HEIGHTS, INC
CHERYL R. LEE
1902 WRIGHT PLACE #200
CARLSBAD, CA 92008
P: 760 454 7800

ARCHITECT

rAd ARCHITECTS
CARYN BAILEY
1286 UNIVERSITY AVE #137
SAN DIEGO, CA 92103
P: 619 991 8194

LANDSCAPE ARCHITECT

ABOVE IT ALL DESIGN, INC
BRAIN L KATZ
6479 DWANE AVENUE
SAN DIEGO, CA 92120
P: 619 995 9773

GEOTECHNICAL

SCST, INC
6280 RIVERDALE STREET
SAN DIEGO, CA 92120
P: 619 280 4321

SHEET INDEX

TM–01 TENTATIVE MAP TITLE SHEET
TM–02 TENTATIVE MAP
TM–03 TENTATIVE MAP
TM–04 SECTIONS
TM–05 SECTIONS AND DETAILS
TM–06 CIRCULATION PLAN

REFENCE DRAWINGS

22703–13–D 7169–D
1209–D 8080–L
22703–12–D 17294–2–D
3497–B
100 SCALE MAP 198–1755 SEWER MAP
SDG&E CO. – GAS BOOK–36, PG'S 231–A

LAMBERT COORDINATES

CALIFORNIA COORDINATES: 200–1755

NAD 83

1840 6317

BENCHMARK

THE BENCHMARK FOR THIS PROJECT IS STATION NO. SEBP LISBON STREET & JAMACHA ROAD
ELEVATION: 323.971
DATUM: MSL

SOURCE OF TOPOGRAPHY

TOPOGRAPHIC MAP AT 2' CONTOURS FROM AERIAL PHOTOGRAMMICTRIC METHOD AND LAND SURVEYING BY GEOSPATIAL CONSULTING AND SWS ENGINEERING, INC. JANUARY 2018.

BASIS OF BEARINGS

THE BASIS OF BEARINGS FOR THIS PROJEC IS THE CALIFORNIA COORDINATE SYSTEM, ZONE 6,, NAD 83, (EPOCH 1991.35) AS DETERMINED LOCALLY BETWEEN POINT NO'S 27 AND 28 AS SHOWN ON RECORD OF SURVEY NO. 14492, I.E. N41°41'40"E

PRELIMINARY EARTHWORK

PERCENT OF TOTAL SITE GRADED:	100%
AMOUNT OF SITE W/25% SLOPES OR LESS:	10%
PERCENT OF SIE W/25% SLOPES OR GREATER:	90%
AMOUNT OF CUT:	18,400 CY
AMOUNT OF FILL:	14,000 CY
AMOUNT OF EXPORT:	4,400 CY
MAX HEIGHT OF FILL:	16 FT
MAX HEIGHT OF CUT:	15 FT
RETAINING WALLS LENGTH:	1,500 FT
RETAINING WALLS HEIGHT MAX:	16 FT
RETAINING WALLS HEIGHT MIN:	3 FT

UNIT SETBACKS

DENSITY CALCULATION

GROSS AREA (EXISTING): 3.73 ACRES
NET AREA: 2.79 ACRES

FLOOD ZONE

THIS SITE LIES WITHIN ZONE "X" (AREA OUTSIDE HE 500 YEAR FLOOD PLAIN) AS SHOWN ON FLOOD INSURANCE RATE MAP (FIRM).

PUBLIC SERVICE

WATER:	CITY OF SAN DIEGO (OFFSITE)
REFUSE DISPOSAL:	CITY OF SAN DIEGO
SCHOOLS:	SAN DIEGO UNIFIED SCHOOL DISTRICT
FIRE:	CITY OF SAN DIEGO FIRE DEPARTMENT
POLICE:	CITY OF SAN DIEGO
ELECTRIC & NATURAL GAS:	SDG&E COMPANY
TELEPHONE:	SOUTHWESTERN BELL, AT&T
SANITARY SEWERS:	CITY OF SAN DIEGO (OFFSITE)
LIGHTING:	PRIVATE
STORMDRAIN:	CITY OF SAN DIEGO SPECIFICATIONS
CABLE TV:	TIME WARNER SOUTHERN CABLE TV

PARKING

2 ENCLOSED SPACES PER UNIT:	48 PROVIDED
2 SPACES @ EACH UNIT WITH DRIVEWAY:	48 PROVIDED
TOTAL PARKING:	96 SPACES

PERMITS REQUIRED

TENTATIVE TRACT MAP
PLANNED DEVELOPMENT PERMIT – PROCESS 4 DECISION
VACATION OF EASEMENT – PROCESS 5 DECISION

USABLE OPEN SPACE

REQUIRED: 750 SF PER UNIT: 18,000 SF
PROVIDED: 87,063 SF

TOTAL OPEN SPACE

REQUIRED: 1,500 SF PER UNIT: 36,000 SF
PROVIDED: 99,401 SF

FLOOR AREA RATIO

TOTAL GROSS FLOOR AREA:
TOTAL GROSS SITE:

FIRE DEPARTMENT NOTES

1. FIRE ACCESS ROADWAY SIGNS OR RED CURBS IN ACCORDANCE WITH FHPS POLICY A–00–1
2. ALL BUILDINGS ARE TO BE FIRE SPRINKLERED.
3. AN ILLUMINATED DIRECTORY, IN ACCORDANCE WITH FHPS POLICY 1–00–6, SHALL BE PROVIDED AT BOTH VEHICLE ENTRY POINTS TO THE SITE.
4. THE VEHICLE ACCESS POINTS WILL NOT BE GATED.
5. POST INDICATOR VALVES, FIRE DEPARTMENT CONNECTIONS, AND ALARM BELLS ARE TO BE LOCATED ON THE ADDRESS / ACCESS SIDE OF THE STRUCTURE.
6. BUILDING ADDRESS NUMBERS SHOULD BE VISIBLE & LEGIBLE FROM THE STRUCTURE OR ROAD FRONTING THE PROPERTY PER FHPS POLICY P.00–6 (UFC 901.4.4.)

ABBREVIATIONS

AC	ASPHALT CONCRETE	MAX	MAXIMUM
AB	AGGREGATE BASE	MH	MANHOLE
CB	CATCH BASIN	MIN	MINIMUM
CF	CURB FACE	PIV	POST INDICATOR VALVE
CL	CENTERLINE	PL	PROPERTY LINE
CLR	CLEAR	PA	PLANTED AREA
CO	CLEAN OUT	R/W	RIGHT–OF–WAY
DDC	DOUBLE DETECTOR CHECK	RD	ROOF DRAIN
DF	DEEPENED FOOTING	S=	SLOPE
EC	EDGE OF CONCRETE	SD	STORM DRAIN
EP	EDGE OF PAVEMENT	SWR	SEWER
EX	EXISTING	SS	SANITARY SEWER
FDC	FIRE DPT CONNECTION	TC	TOP OF CURB
FF	FINISH FLOOR	TF	TOP OF FOOTING
FG	FINISH GRADE	TG	TOP OF GRATE
FS	FINISH SURFACE	TW	TOP OF WALL
FH	FIRE HYDRANT	TYP	TYPICAL
FL	FLOW LINE	W	WATER
G	GAS	WM	WATER METER
GB	GRADE BREAK	WV	WATER VALVE
HP	HIGH POINT	NDS	NATION DIVERSIFIED SALES
IE	INVERT ELEVATION	SDR	PIPE SCHEDULE
LD	LOCAL DEPRESSION	HDPE	HIGH DENSITY POLYETHYLENE
LG	LIP OF GUTTER	RCP	REINFORCED CONCRETE PIPE
LP	LOW POINT	RCB	REINFORCED CONCRETE BOX

UTILITY TABLE

UTILITY	OVERHEAD/UNDERGROUND
WATER	UNDERGROUND
SEWER	UNDERGROUND
GAS	UNDERGROUND
TELEPHONE	UNDERGROUND
ELECTRICITY	UNDERGROUND

P.T.S	622368
I.O.	24008090
SDP	2225122
TM	2225121

DESCRIPTION	BY	DATE	COMMENTS
TM	SWS	10/9/2019	
TM	SWS	1/13/2020	

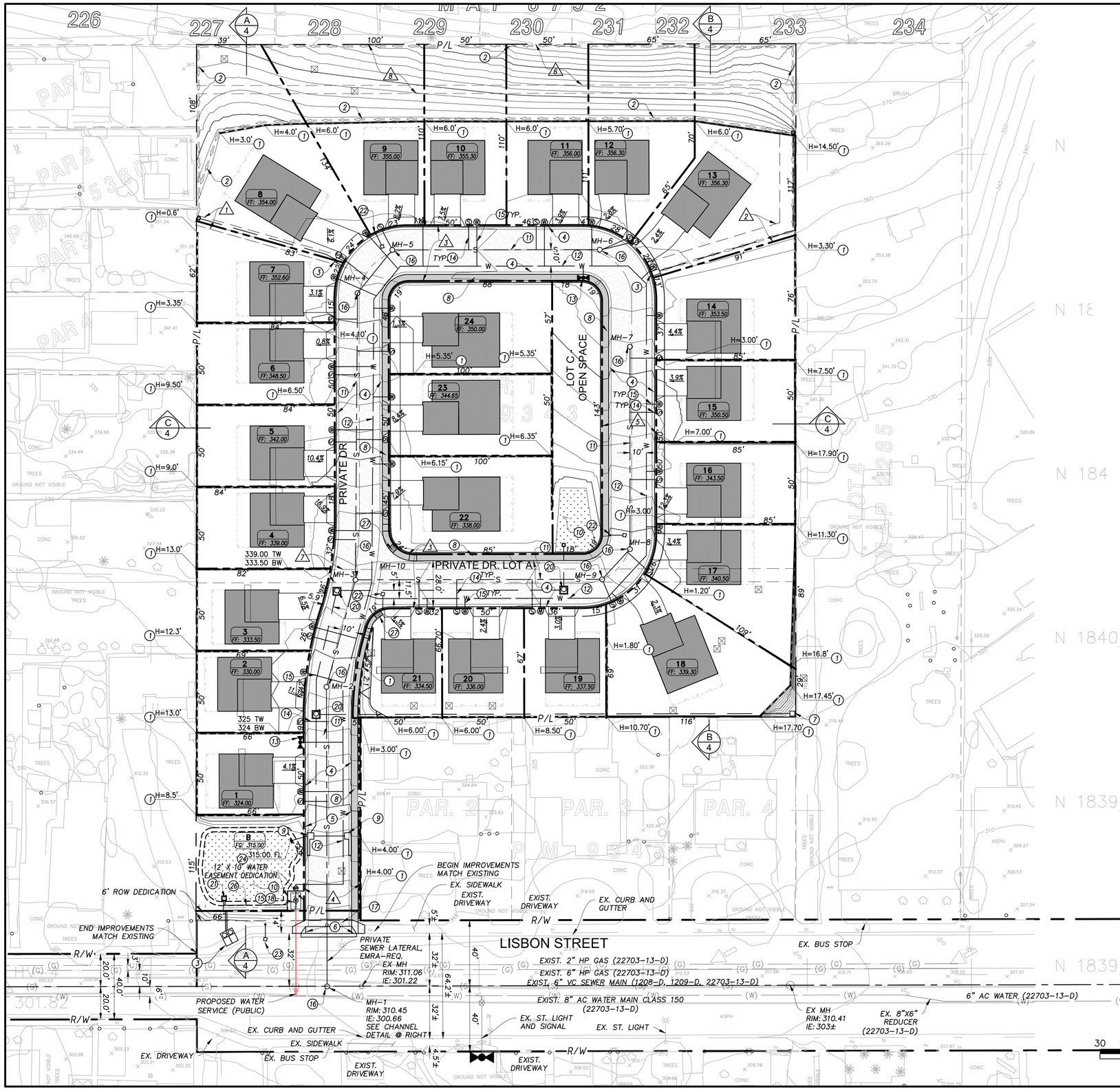
REGISTERED PROFESSIONAL ENGINEER
MICHAEL D SCHWEITZER
No. 59658
Exp.12–31–2021
CIVIL
STATE OF CALIFORNIA

SWS ENGINEERING, INC.
CIVIL ENGINEERING • LAND PLANNING • SURVEYING
1635 Lake San Marcos Drive, Suite 200
San Marcos, CA 92078
P: 760-744-0011 F: 760-744-0046
31045 Temecula Parkway, Suite 201
Temecula, CA 92592
P: 951-296-3407 F: 951-587-9451

DATE: Apr 29, 20 11:02am by:suzieberg
FILE: Z:\Projects\2018\18-001\PROD\Planning\TM\18-001_TTM01.dwg

LISBON VISTA HEIGHTS
7106-7115 LISBON STREET
SAN DIEGO, CA 92114

TM-01



CONSTRUCTION NOTES

1. RETAINING WALL PER __ STD.
2. CONCRETE BROW DITCH PER COSD STD, SDD-106
3. CURB OULET, TYPE A PER SDRSD STD, D-25
4. CURB AND GUTTER PER COSD STD, SDG-151
5. 28' PRIVATE DRIVE
6. 28-FOOT DRIVEWAY PER COSD STD, SDG-159
7. 18"X18" CATCH BASIN PER
8. 5' CONCRETE WALKWAY PER COSD STD, SDG-155
9. TYPE B CURB INLET
10. BIORETENTION BASIN PER DETAIL
11. PRIVATE 8" SEWER
12. PRIVATE 4" WATER
13. FIRE HYDRANT PER COSD STD, SDW-104
14. SEWER LATERAL PER COSD STD, SDS-105
15. 4" WATER SERVICE W/ 4" METER PER COSD STD
16. CONSTRUCT MANHOLE PER COSD STD, SDW-150
17. RELOCATE STREET LIGHT PER COSD STD, SDE-101
18. 4" BACKFLOW PREVENTER AND METERED SERVICE PER COSD STD, SDW-157 (MODIFIED)
19. 12"X12" CATCH BASIN PER SD PRECAST OF BROOKS PRODUCTS
20. S.D.C.O. PER COSD STD, D-09
21. 3' X 3' INLET
22. STREET LIGHT (PVT) PER COSD STD, SDE-101
23. RELOCATED STREET LIGHT (PUB) PER COSD STD, SDE-101
24. CONCRETE HEADWALL W/ GROUTED RIP-RAP
25. 5' CONCRETE WALKWAY PER COSD STD, SDG-155
26. TWO (2) 4' X 39' DETENTION PIPE
27. CURB RAMP TYPE C1 PER COSD STD, SDG-135

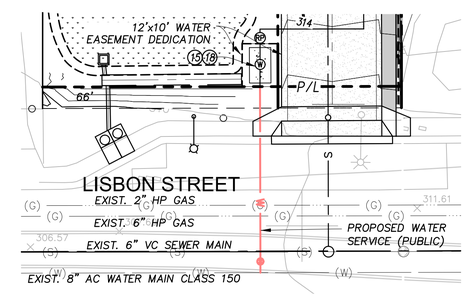
EASEMENT NOTES

1. PRIVATE 6' WIDE DRAINAGE EASEMENT
2. PRIVATE 10' WIDE DRAINAGE EASEMENT
3. 34' GENERAL EASEMENT
4. 34.5 GENERAL EASEMENT
5. 33.5 GENERAL EASEMENT
6. VACATE EASEMENT FOR PUBLIC STREET RECORDED TRACT MAP 2285 – ITEM 2
7. VACATE PUBLIC UTILITY EASEMENT RECORDED TRACT MAP 2285 – ITEM 3
8. QUITCLAIM EASEMENT FOR ROAD WAY, INGRESS & EGRESS RECORDED 5/21/1945 BOOK 1866 PAGE 471 OR ITEM 5 , GRANTED TO LEE ROY & ELAN PENNINGTON.

NOTES:

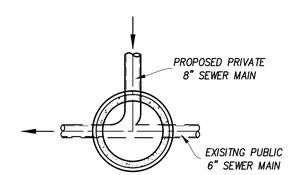
IF A 3" OR LARGER METER IS REQUIRED FOR THE PROJECT, THE OWNER/PERMITTEE SHALL CONSTRUCT THE NEW METER AND PRIVATE BACKFLOW DEVICE ON SITE. ABOVE GROUND, WITHIN ADEQUATELY SIZED WATER EASEMENT, IN A MANNER SATISFACTORY TO THE PUBLIC UTILITIES DIRECTOR AND CITY ENGINEER.

WATER SERVICES AND MAINS WILL BE LOCATED 3 FT. AWAY FROM DRIVEWAY FLARE.



4" WATER SERVICE W/ 4" METER & BFT (PRT) DETAIL

SCALE: 1"=20'



8" PRIVATE SEWER MAIN CHANNEL TO EXISTING 6" PUBLIC MAIN

NOT TO SCALE

DESCRIPTION	BY	DATE	COMMENTS
	SWS	10/9/2019	
	SWS	1/15/2020	
	TM		
	TM		

REGISTERED PROFESSIONAL ENGINEER
MICHAEL D. SCHWETTER
No. 59658
Exp.12-31-2021
CIVIL
STATE OF CALIFORNIA

SWS ENGINEERING, INC.
CIVIL ENGINEERING • LAND PLANNING • SURVEYING
27372 Calle Arroyo (Temecula Parkway), Suite 200
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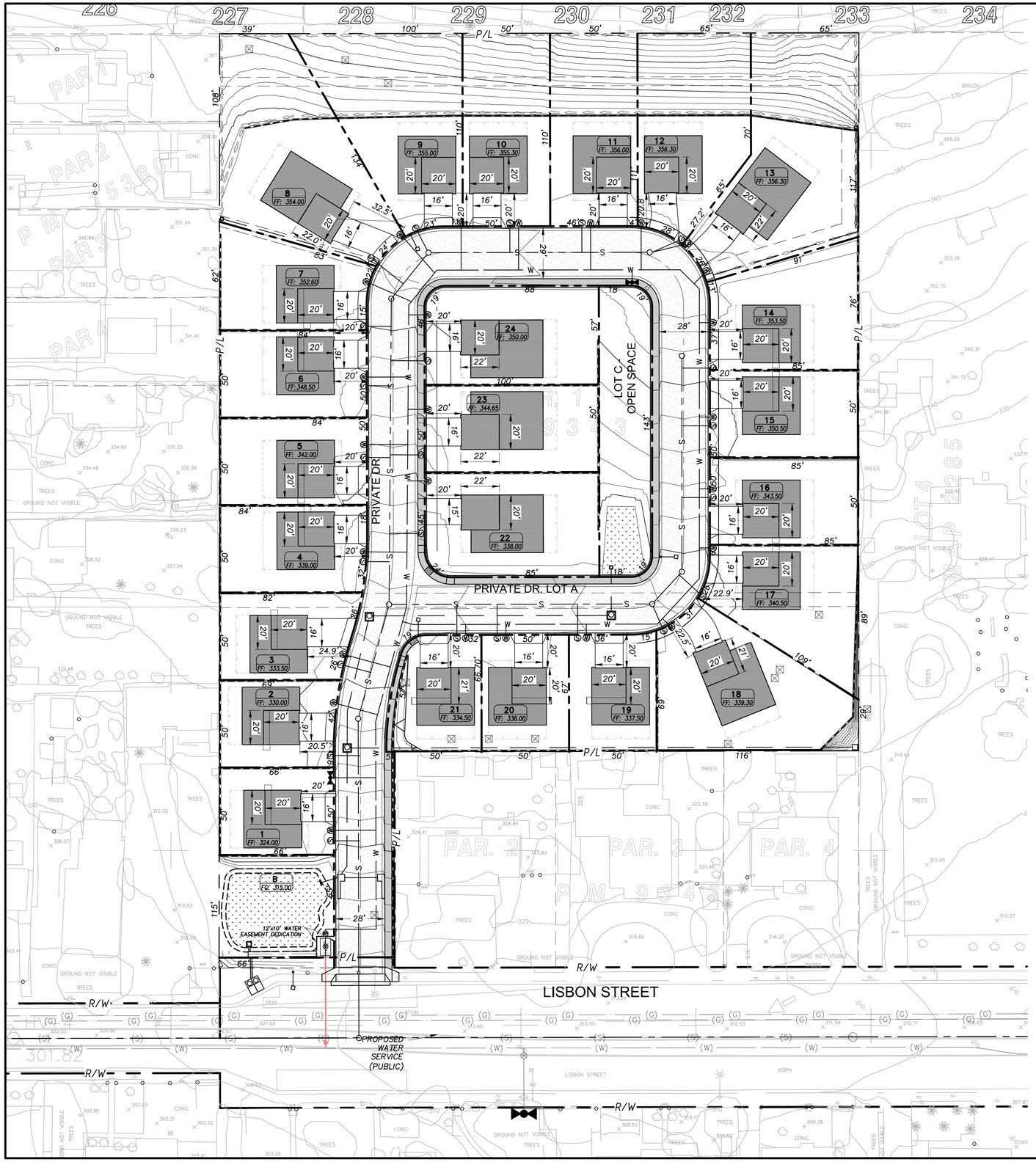
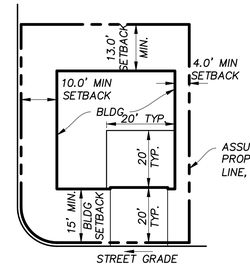
P: 951-296-2407 F: 951-587-3651
www.sws-inc.com

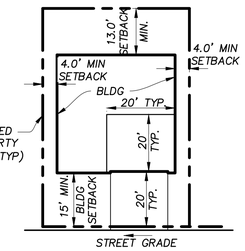
LISBON VISTA HEIGHTS
7106-7115 LISBON STREET
SAN DIEGO, CA 92114

TM-02





SETBACK
TYPICAL CORNER UNIT



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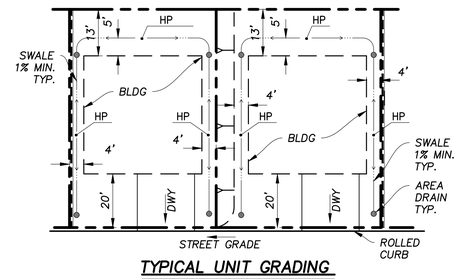

TYPICAL UNIT GRADING

LOT DIMENSIONS

UNIT	DEPTH	WIDTH
1	66'	50'
2	67'	50'
3	75'	50'
4	85'	50'
5	84'	50'
6	84'	50'
7	85'	51'
8	158'	67'
9	112'	63'
10	110'	50'
11	110'	50'
12	115'	65'
13	160'	76'
14	85'	62'
15	85'	50'
16	85'	50'
17	90'	59'
18	126'	81'
19	67'	50'
20	67'	50'
21	67'	50'
22	100'	60'
23	100'	50'
24	100'	57'

OPEN SPACE TABULATION

UNIT	BUILDING AREA	OPEN SPACE
1	1,083 SF	2,194 SF
2	1,081 SF	2,244 SF
3	1,081 SF	2,701 SF
4	1,081 SF	3,114 SF
5	1,081 SF	3,136 SF
6	1,083 SF	3,127 SF
7	1,083 SF	3,159 SF
8	1,472 SF	7,451 SF
9	1,082 SF	6,454 SF
10	1,082 SF	4,433 SF
11	1,082 SF	4,433 SF
12	1,082 SF	5,571 SF
13	1,472 SF	7,857 SF
14	1,083 SF	4,314 SF
15	1,083 SF	3,171 SF
16	1,083 SF	3,170 SF
17	1,083 SF	4,430 SF
18	1,391 SF	5,773 SF
19	1,088 SF	2,263 SF
20	1,083 SF	2,253 SF
21	1,083 SF	2,260 SF
22	1,472 SF	4,459 SF
23	1,475 SF	3,508 SF
24	1,472 SF	4,132 SF
LOT C	0 SF	3,794 SF
TOTAL	28,241 SF	99,401 SF
AVERAGE LOT		3,976 SF

UNIT TABULATION (PVT)

UNIT	PAD ELEV.	LOT AREA	SEWER B.F. PREVENTOR
1	324.00	3,277 SF	YES
2	330.00	3,325 SF	YES
3	333.50	3,782 SF	NO
4	339.00	4,195 SF	YES
5	342.00	4,217 SF	YES
6	348.50	4,210 SF	YES
7	352.60	4,242 SF	NO
8	354.00	8,923 SF	NO
9	355.00	7,536 SF	NO
10	355.30	5,515 SF	YES
11	356.00	5,515 SF	NO
12	356.30	6,653 SF	NO
13	356.30	9,329 SF	NO
14	353.50	5,397 SF	NO
15	350.50	4,254 SF	YES
16	343.50	4,253 SF	YES
17	340.50	5,513 SF	YES
18	339.30	7,164 SF	YES
19	337.50	3,346 SF	NO
20	336.00	3,336 SF	YES
21	334.50	3,343 SF	YES
22	338.00	5,931 SF	YES
23	344.65	4,983 SF	YES
24	350.00	5,604 SF	YES
LOT A	ROAD EASEMENT 29,478 SF		
LOT B	OPEN SPACE EASEMENT 4,263 SF		
LOT C	OPEN SPACE EASEMENT 4,980 SF		
–	DRAINAGE EASEMENT 2,010 SF		

UNIT TABULAION TABLE IS FOR PRIVATE PURPOSE.

1"=20'

SWS

N

30 15 0 30 60 90

SCALE IN FEET
GRAPHIC SCALE

DESCRIPTION	BY	DATE	COMMENTS
TM	SWS	10/9/2019	
TM	SWS	1/13/2020	

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MICHAEL D. SCHWETTER
No. 59658
Exp. 12-31-2021
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File No. 19-0015
File Path: J:\19-0015\CIVIL\TM\19-0015_TM02-03.dwg

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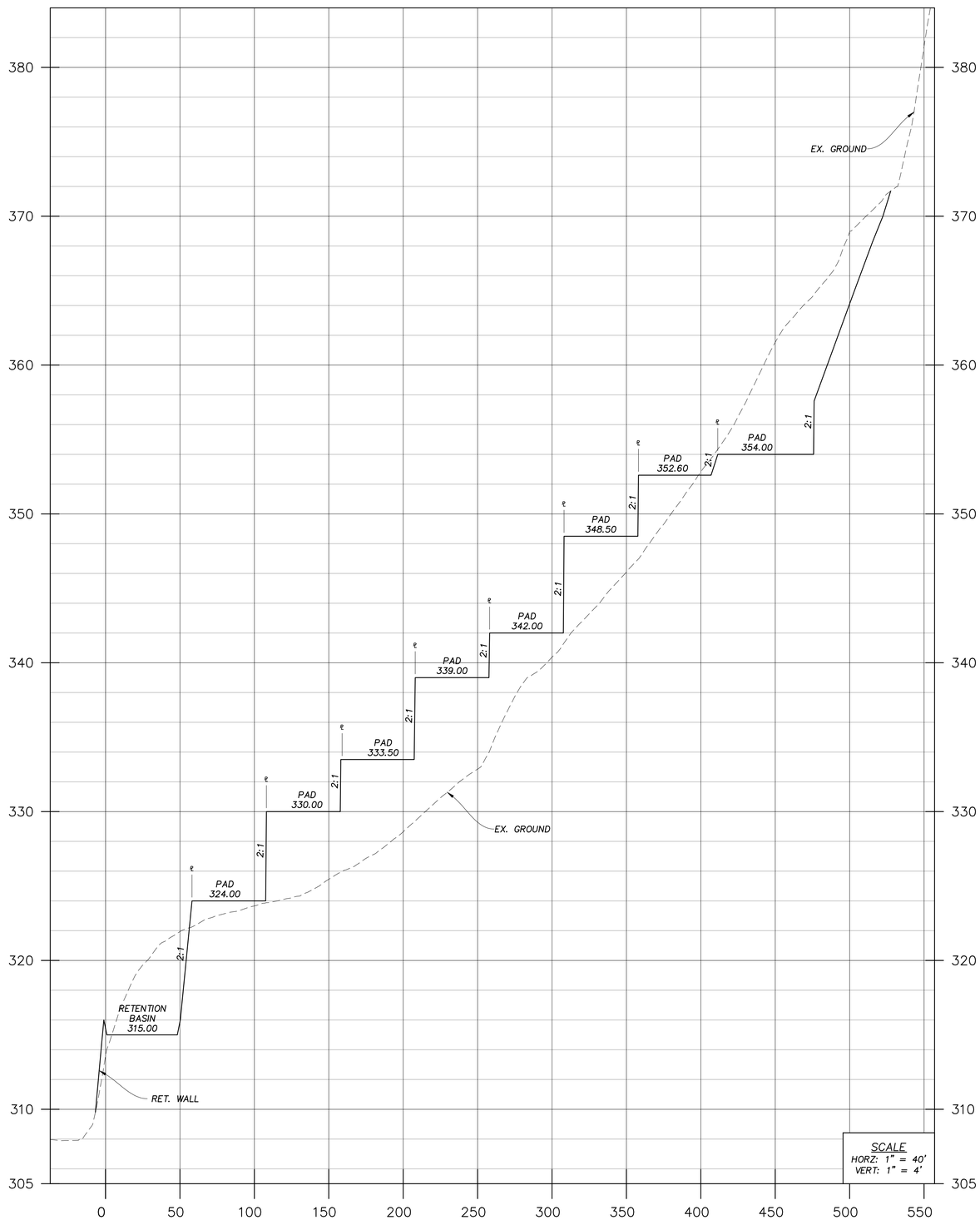
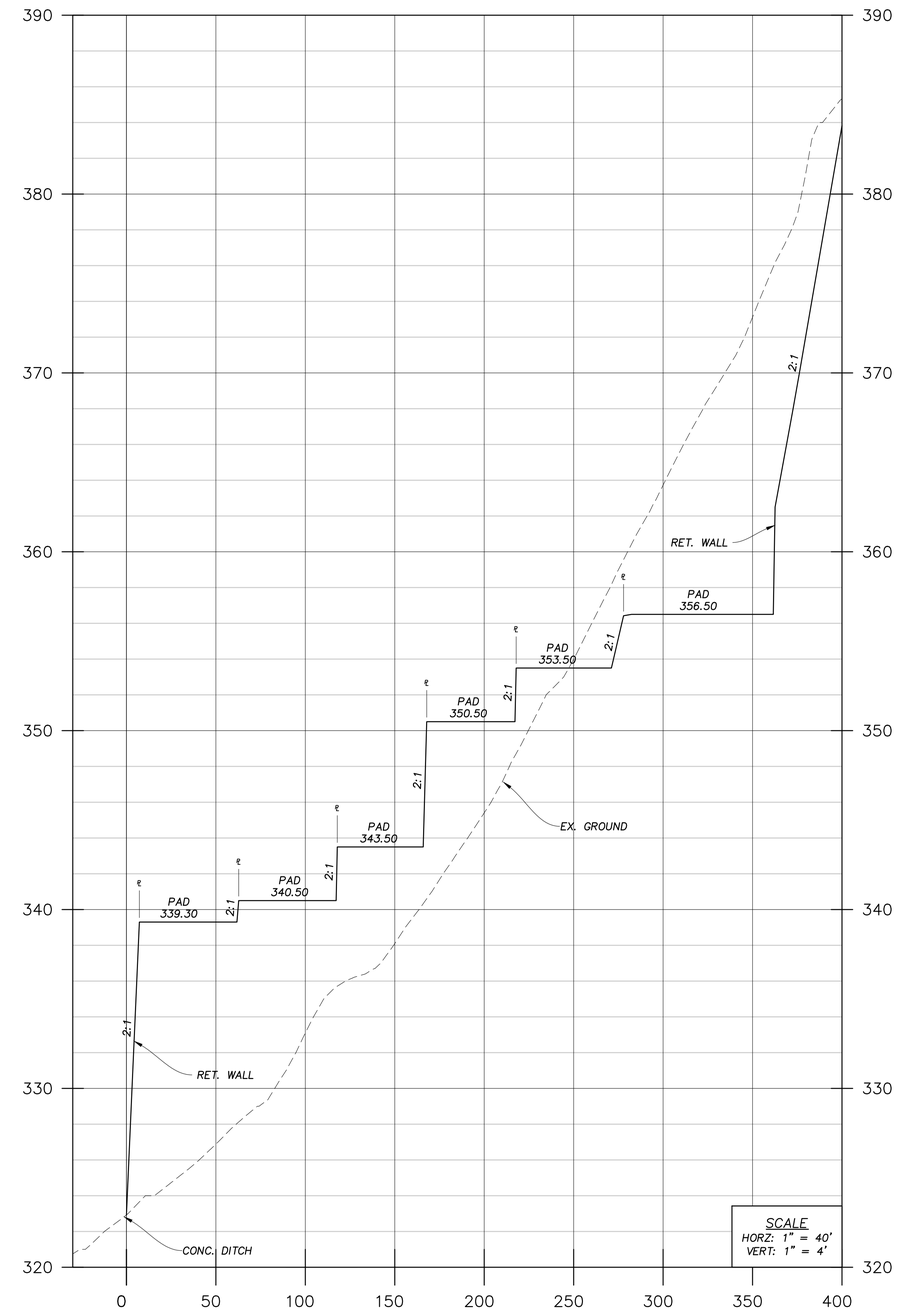
engineering must, precise.

LISBON VISTA HEIGHTS
7106-7115 LISBON STREET
SAN DIEGO, CA 92114

TM-03



SECTION A/2



SECTION B/2

DESCRIPTION	BY	DATE	COMMENTS
TM	SWS	10/9/2019	
TM	SWS	1/13/2020	

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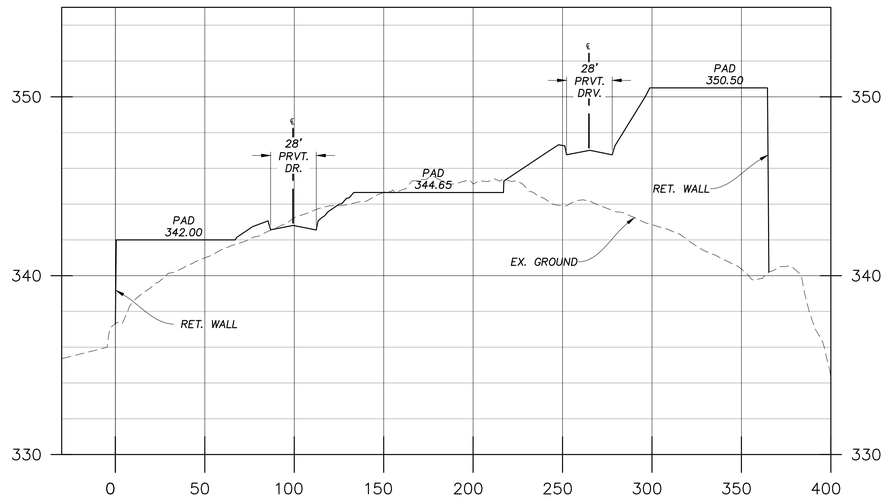
LISBON VISTA HEIGHTS
7106-7115 LISBON STREET
SAN DIEGO, CA 92114

TM-04



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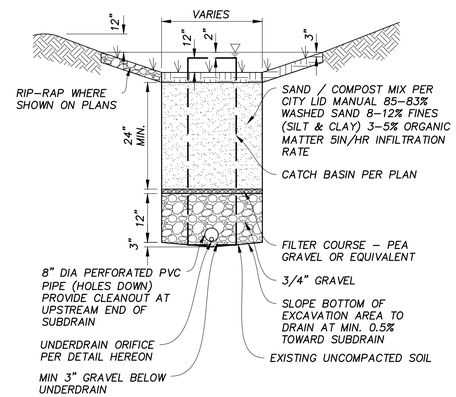
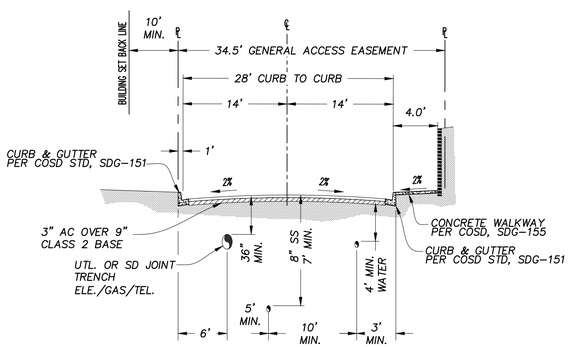


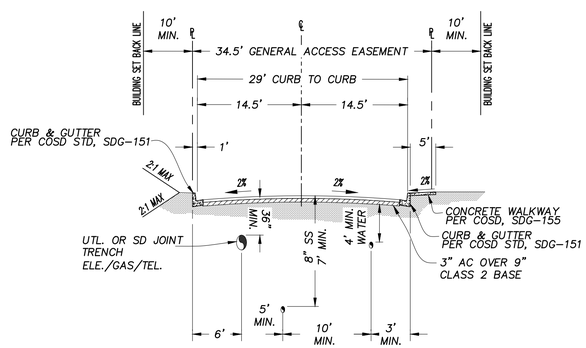
TYPICAL BIOFILTRATION DETAIL

NO SCALE



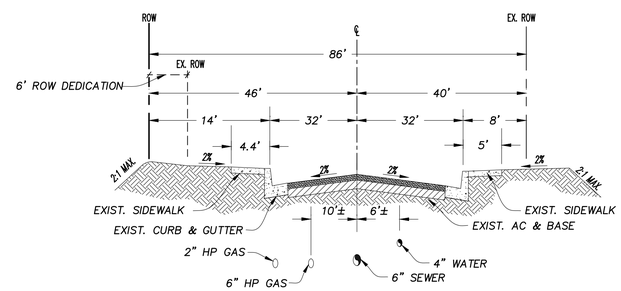
PRIVATE DRIVE SECTION AT ENTRANCE

NOT TO SCALE



28' PRIVATE DRIVE SECTION (TYP)

NOT TO SCALE



LISBON STREET IMPROVEMENTS (TYP)

4-LANE COLLECTOR - NOT TO SCALE

DESCRIPTION	BY	DATE	COMMENTS
TM	SWS	10/9/2019	
TM	SWS	1/13/2020	

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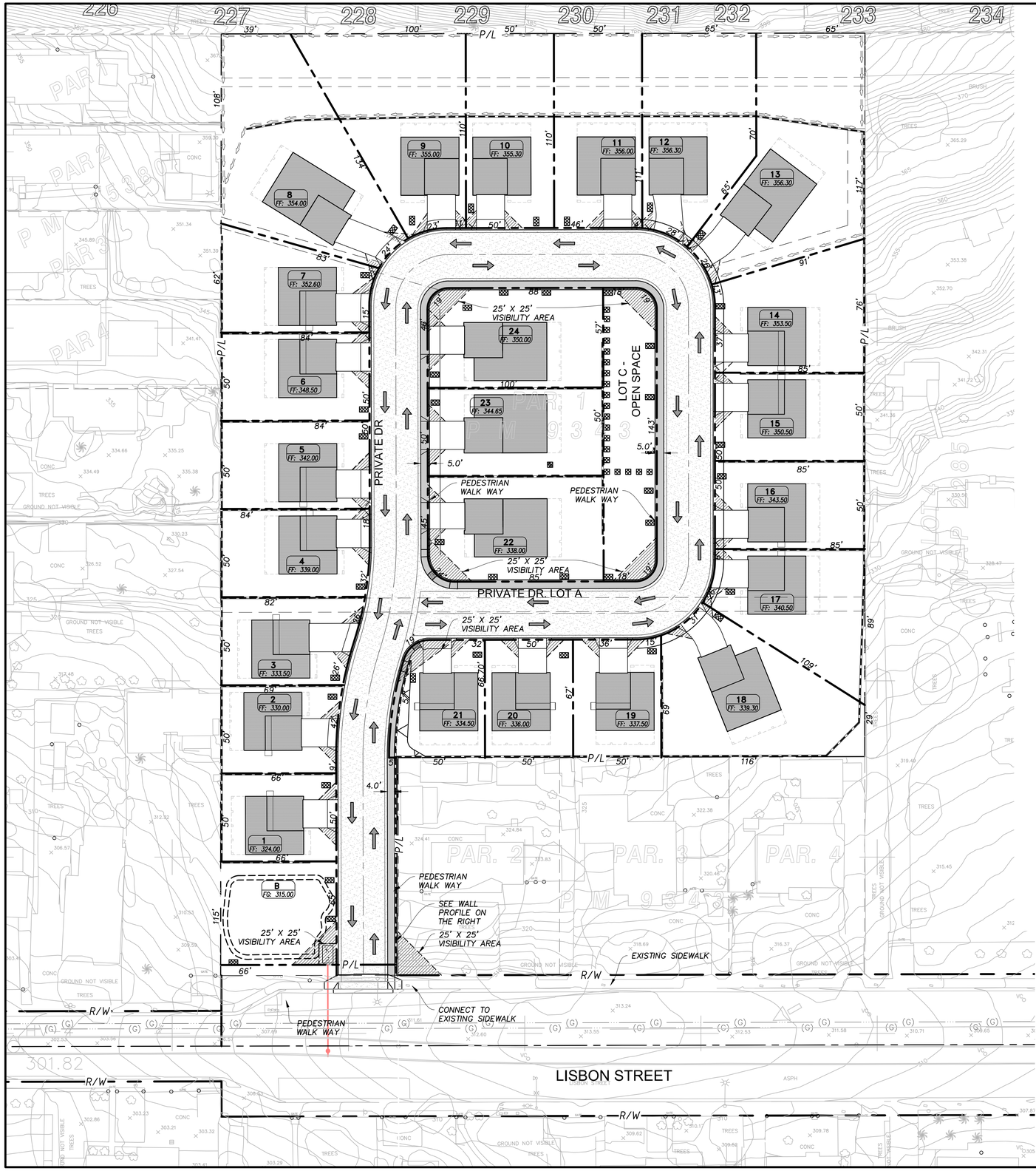
LISBON VISTA HEIGHTS
7106-7115 LISBON STREET
SAN DIEGO, CA 92114

TM-05

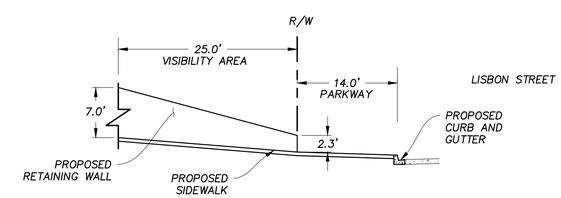


LEGEND

- PROPOSED TREES PER SDP APPROVAL NO. 2225122
- DIRECTION OF TRAVEL
- SIDEWALK
- 10' X 10' VISIBILITY AREA UNLESS NOTED OTHERWISE
- CURB RAMP

NOTE:

NO OBJECTS HIGHER THAN 24 INCHES WILL BE PROPOSED IN THE VISIBILITY AREAS.



WALL PROFILE A ENTRANCE

SCALE: 1"=10'

1"=20'

N

30 15 0 30 60 90

SCALE IN FEET
GRAPHIC SCALE

DESCRIPTION	BY	DATE	COMMENTS
TM	SWS	10/9/2019	
TM	SWS	1/13/2020	

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File Location: J:\2015\15-136-SWS\Engineering\TM\15-136_TM06.dwg

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engineering must, inspire.

LISBON VISTA HEIGHTS
7106-7115 LISBON STREET
SAN DIEGO, CA 92114

TM-06

Project Name: Lisbon Heights

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

The plans must identify:

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

Attachment 5
Drainage Report

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

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DRAINAGE STUDY

FOR

Lisbon Heights

San Diego, California

Engineer:

SWS Engineering, Inc.
261 Autumn Drive, Suite 115
San Marcos, California 92069
P: 760-744-0011
F: 760-744-0046
PN: 18-001

Prepared by: _____ Date: 9.12.19
Michael D. Schweitzer RCE# 59658 Exp. 12-31-19

REGISTERED PROFESSIONAL ENGINEER
MICHAEL D. SCHWEITZER
No. 59658
EXP. 12.31.19
CIVIL
STATE OF CALIFORNIA

Date	Comments
11/01/18	Original
09/11/19	Updated

TABLE OF CONTENTS

1.0 PROJECT DESCRIPTION 1
2.0 PURPOSE 2
3.0 METHODOLOGY 2
4.0 HYDROLOGY 2
4.1 Pre-Development Condition 2
4.2 Post-Development Conditions 3
5.0 CONCLUSION 3

APPENDICES
Appendix A – Reference Charts
Table A-1 Runoff Coefficients (Rational Method)
Figure I-1 Intensity- Duration – Frequency Curves
Soil Hydrologic Group
100 Year Rainfall Event – 6 Hours (P_6 Rainfall Isopluvials)
100 Year Rainfall Event – 24 Hours (P_{24} Rainfall Isopluvials)

Appendix B – Pre-Development Hydrology Calculations

Appendix C – Post-Development Hydrology Calculations

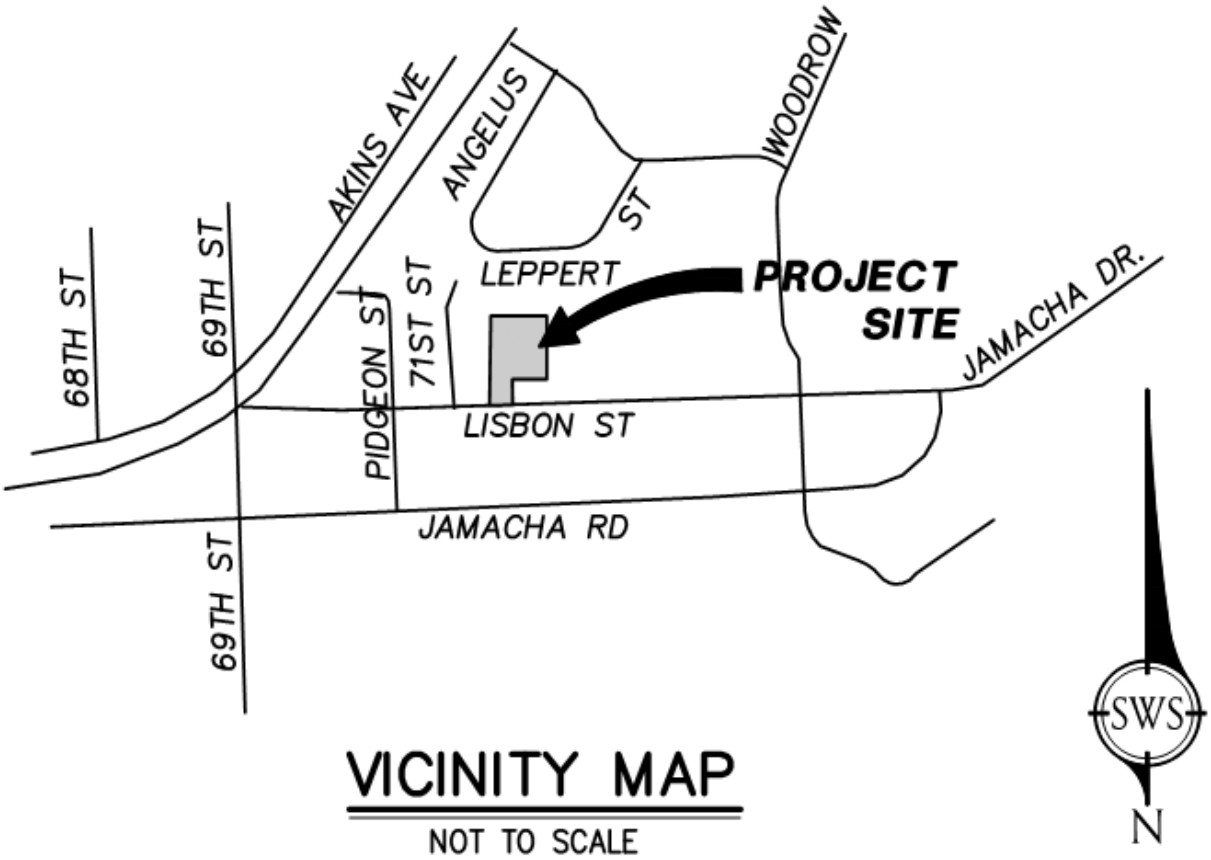
Appendix D – Detention Calculations

EXHIBITS
Exhibit “A” – Pre-Development Hydrology Map

Exhibit “B” – Post-Development Hydrology Map

1.0 PROJECT DESCRIPTION

The proposed project consists of the development of approximately 3.7 acres located within the City of San Diego. The existing condition of the site is an undeveloped dirt lot with seasonal weed cover. This housing development project proposes 24 residential homes with corresponding driveways and surrounding landscaping. A private street will also be developed to provide access to the new housing. A private storm drain system is proposed to convey and treat storm water.



VICINITY MAP

NOT TO SCALE

2.0 PURPOSE

The purpose of this study is to determine the peak runoff rates for the pre-development and post-development conditions. Comparisons will be made at the same discharge points for each drainage basin affecting the site and adjacent properties. The adequacy of existing and proposed conveyance facilities affected by the project will be determined.

3.0 METHODOLOGY

The Rational Method as outlined in the City of San Diego Drainage Design Manual, dated January 2017, was used to determine the runoff flow rate. The 100-year frequency storm event was analyzed to determine peak runoff rates discharging the site for both the existing and post-development condition.

Soil type was determined to be type D from the Soil Hydrologic Group, per the USDA Web Soil Survey (see Appendix A). The runoff coefficient "C" was determined using Table A-1 (Appendix A) using existing and proposed development type.

Runoff coefficients, "C" are summarized below:

- Pre-Development
    - Basin 100 (Rural, lots greater than ½ acre): 0.45

- Post-Development
    - Basin 100 (Multi-Units): 0.70

4.0 HYDROLOGY

4.1 Pre-Development Conditions

The existing site drainage consists of natural sheet flow across the site property from the northern end of the site towards the southwestern corner of the property. From there, the water begins its urban conveyance as it travels along Lisbon Street's gutter away from the site.

A pre-development hydrology map delineating basin areas, flow paths, and concentration points has been prepared and is attached to this report as Exhibit "A". Pre-development hydrology calculations can be found in Appendix "B".

4.2 Post-Development Conditions

The proposed site drainage will consist of a new, urban storm drain system to convey water from the site towards the southwestern corner of the property (the existing, pre-development, discharge point). A portion of the storm water will sheet flow directly into a biofiltration basin, located near the center of the site, any excess water will enter the private storm drain system. Most of the storm water will convey along the proposed gutters until entering one of two curb inlets to the private storm drain system.

The proposed storm drain system discharges to a biofiltration basin at the southwestern corner of the site. Water is retained, treated and, then discharged, via curb outlet, to the existing gutter along Lisbon Street for conveyance away from the site. In a 100-year storm event water will be detained in biofiltration basins and a detention pipe located south of the southwestern biofiltration basin and then released at pre-development flow rates. There is no negative impact to any adjacent properties.

A post-development hydrology map delineating basin areas, flow paths, concentration points, and proposed drainage facilities has been prepared and is attached to this report as Exhibit “B”. Post-development hydrology calculations can be found in Appendix C and detention calculations for the proposed site can be found in Appendix D.

5.0 CONCLUSION

Development of the project site will Increase the runoff from the pre-developed condition by 4.79 cfs due to an increased imperviousness and C coefficient. Aside from the addition of storm drains, the site runoff will continue to sheet flow towards the south west corner of the property. Runoff conveyed through the storm drain system will arrive at the same corner by way of biofiltration basin system. The excess water will be detained by proposed two biofiltration basins and 2-48 inch proposed detention pipe (980 cf volume) which will release the runoff at the pre-development flow rate. See summary table below for calculation.

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). The design 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.

This project development is not required to obtain approval from the Regional Water Quality Board under the Federal Clean Water Act section 401 or 404 as the proposed site is not located within, and does not drain directly to a wetland area. In addition, erosion control mitigation will protect construction site such that no dredged or fill material will be allowed to run off project site.

Table 1 – Pre-Development Areas and Flows

	Area (ac)	Q_{100} (cfs)	
Basin / Node	**Pre-Dev**	**Pre-Dev**	**Impervious %**
100	3.7	5.51	0

Table 2 – Post-Development Areas and Flows

	Area (ac)	Q_{100} (cfs)	
Basin / Node	**Post-Dev**	**Post-Dev**	**Impervious %**
100	3.7	10.3	47
Detention*	-	+4.79	-
TOTAL w/ DETENTION	**3.7**	**<5.51**	**-**

*See Detention Calculations, Appendix D

Table 3 - Volume provided by Biofiltration Basins

Basins	Required 100yr Volume (CF)	[1]Provided 100-yr Volume by Biofiltration (CF)
BMP#1	-	**465 [2]**
BMP#2	-	**2,361[2]**
Total	**1,581**	**2,826[3]**

[1] Calculated volume is only using the above surface storage
[2] 0.83 (Pons depth in ft) x 561 (basin area in sf) = 465 cf
0.83 (Pons depth in ft) x 2834 (basin area in sf) = 2,361 cf
[3] Biofiltration basins provide 1,245 cf extra volume + *980 cf extra volume by 2-48 inch storage pipes

*Pipe Storage Capacity calcs

Two	**4ft dia**			
Pipe Area		Formula		
12.57	SF area	PI()*((2)^2)		
10.68	85% area	0.85*12.57		
38.3				
39 LF				
Full Vol	85% Vol		Formula	
490.1	416.5752	x2	39*12.57	
980.2	833.1504	x2	2*490.1	

REFERENCES

CivilDesign Corporation. *San Diego County Rational Method*. (Software Version 7.7)

County of San Diego Department of Public Works Flood Control Section. *San Diego County Hydrology Manual.* (2003)

County of San Diego Department of Public Works Flood Control Section. *San Diego County Drainage Design Manual.* (2005)

City of San Diego. *City of San Diego Drainage Design Manual.* (2017)

APPENDIX A

Reference Charts

A.1.2. Runoff Coefficient

The runoff coefficients are based on land use (see Table A–1). Soil type "D" is used throughout the City of San Diego for storm drain conveyance design. An appropriate runoff coefficient (C) for each type of land use in the subarea should be selected from this table and multiplied by the percentage of the total area (A) included in that class. The sum of the products for all land uses is the weighted runoff coefficient (Σ[CA]). Good engineering judgment should be used when applying the values presented in Table A–1, as adjustments to these values may be appropriate based on site-specific characteristics.

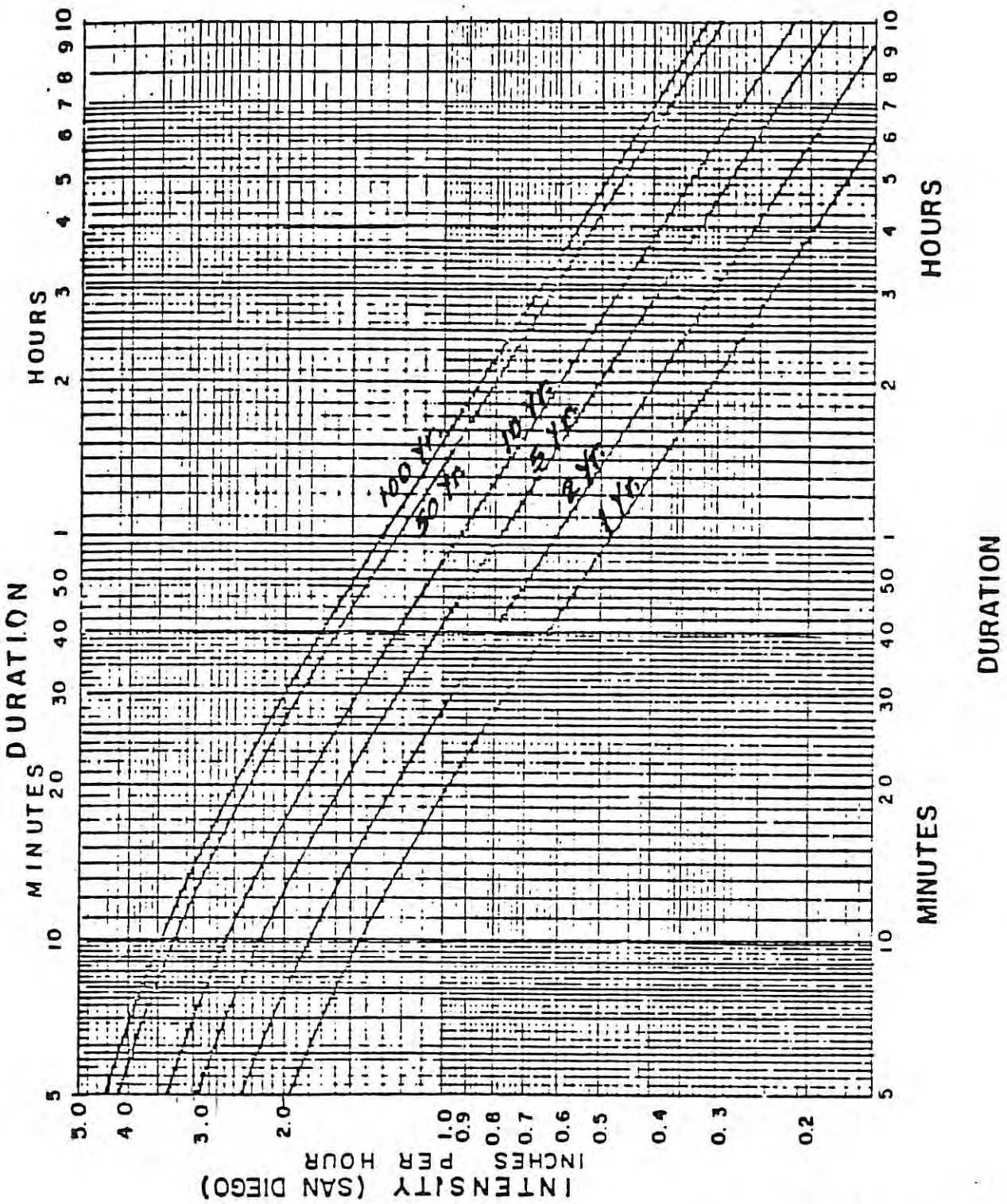
Table A-1. Runoff Coefficients for Rational Method

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

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

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

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



ELEV.	FACTOR
0–1500	1.00
1500–3000	1.25
3000–4000	1.42
4000–5000	1.60
5000–6000	1.70
DESERT	1.25

To obtain correct intensity, multiply intensity on chart by factor for design elevation.

RAINFALL

INTENSITY – DURATION – FREQUENCY

CURVES

for

COUNTY OF SAN DIEGO

APPENDIX I-1

Hydrologic Soil Group—San Diego County Area, California
(Lisbon Heights)

Map Scale: 1:1,200 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 15 30 60 90

Feet: 0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features

Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: San Diego County Area, California
Survey Area Data: Version 13, Sep 12, 2018

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

Date(s) aerial images were photographed: Dec 7, 2014—Jan 4, 2015

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
LeE2	Las Flores loamy fine sand, 15 to 30 percent slopes, eroded	D	6.5	84.8%
LfC	Las Flores-Urban land complex, 2 to 9 percent slopes	D	1.2	15.2%
Totals for Area of Interest			**7.7**	**100.0%**

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

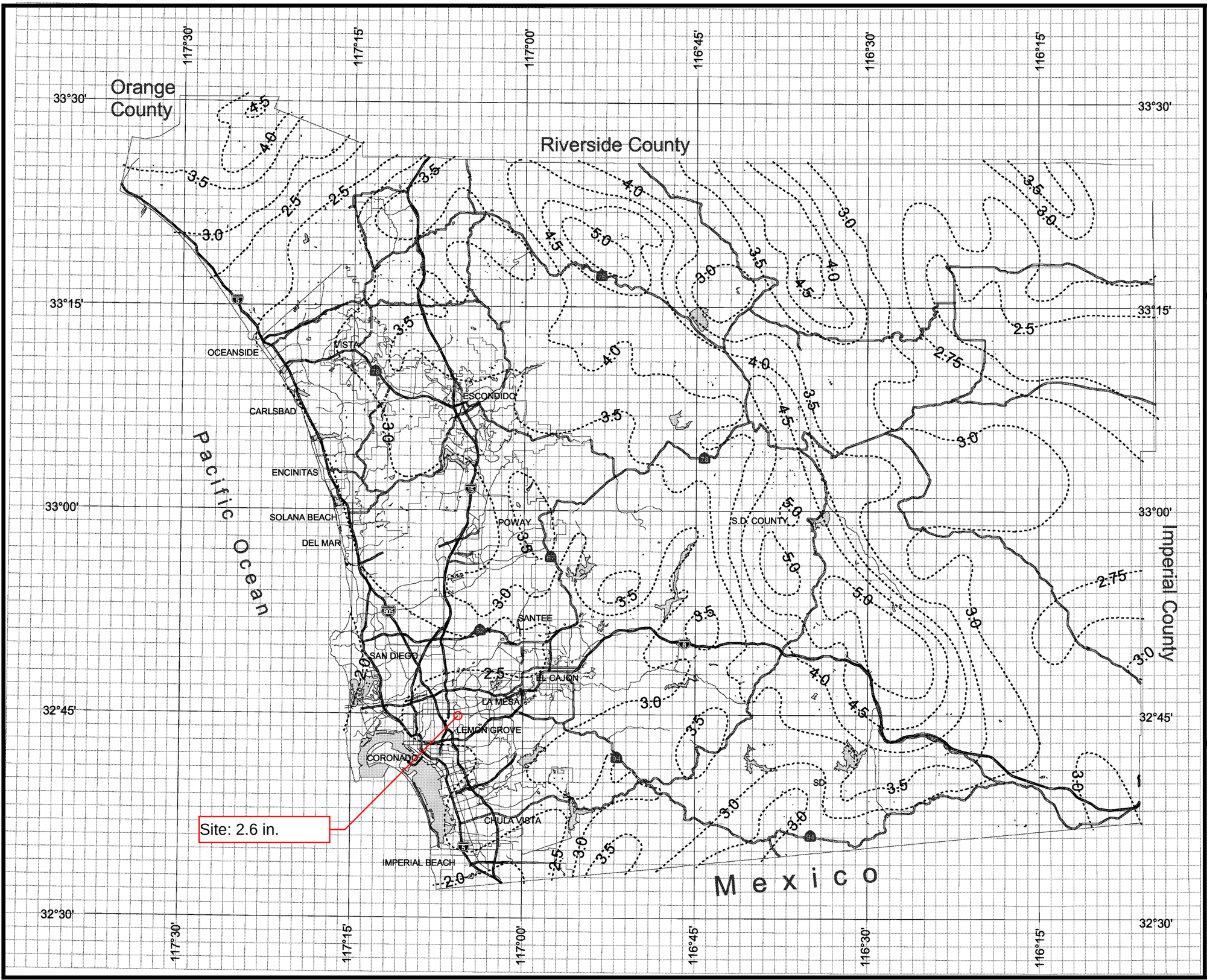
Tie-break Rule: Higher

County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 6 Hours

-------- Isopluvial (inches)



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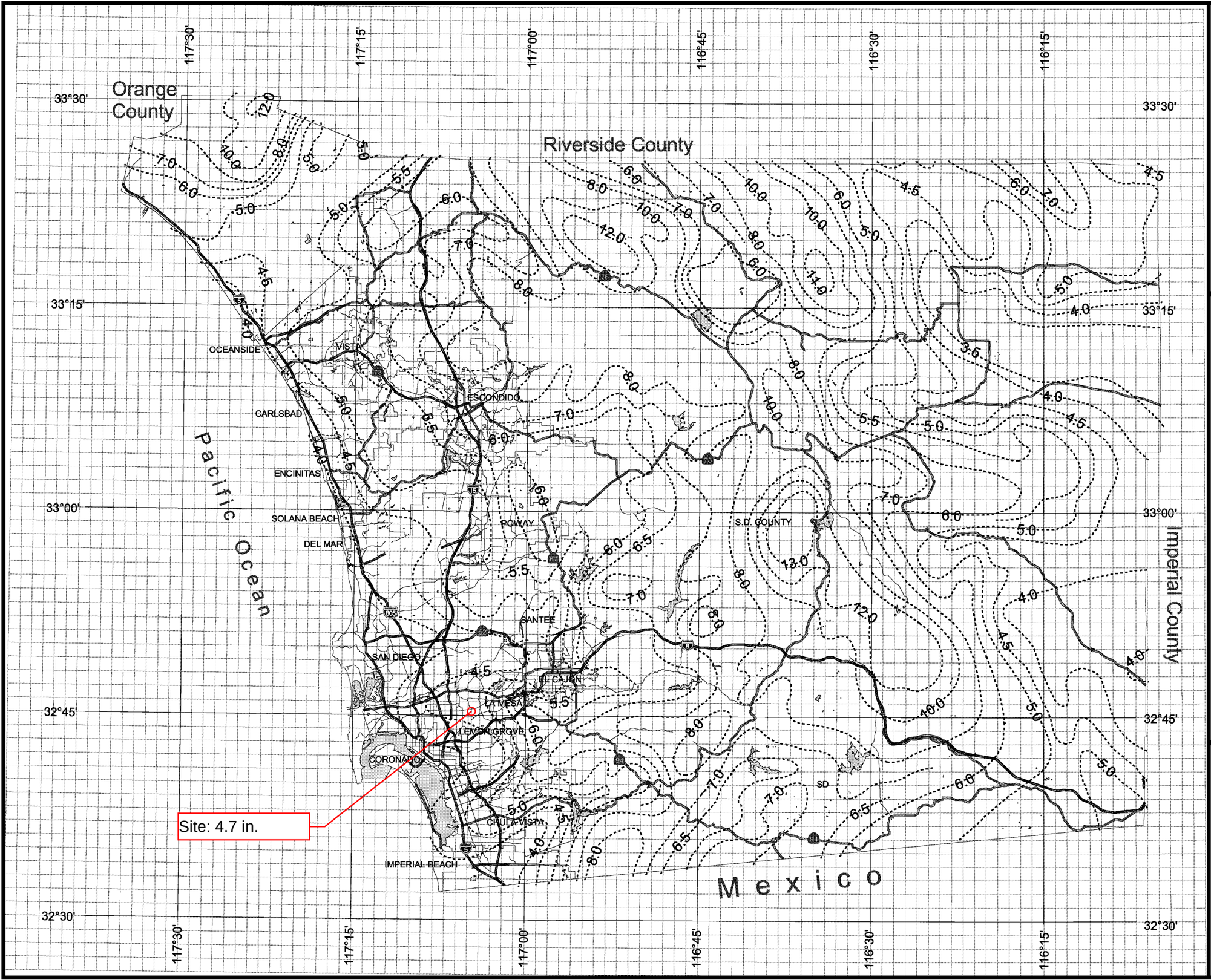
County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 24 Hours

Isopluvial (inches)



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APPENDIX B

Pre-Development Hydrology Calculations

```
                San Diego County Rational Hydrology Program

      CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 6.4

      Rational method hydrology  program based on
      San Diego County Flood Control Division 1985 hydrology manual
            Rational Hydrology Study        Date: 08/05/19
      ------------------------------------------------------------------
-----
      LISBON HEIGHTS
      PRE-DEVELOPMENT CONDITION 100-YEAR STORM
      BASIN 100
      PN 18-001
      ------------------------------------------------------------------
-----
       *********   Hydrology Study Control Information **********

      ------------------------------------------------------------------
-----


      Program License Serial Number 6144

      ------------------------------------------------------------------
-----
      Rational hydrology study storm event year is   100.0
      English (in-lb) input data Units used
      English (in) rainfall data used

      Standard intensity of Appendix I-B used for year and
      Elevation 0 - 1500 feet
      Factor (to multiply * intensity)  =  1.000
      Only used if inside City of San Diego
      San Diego hydrology manual 'C' values used
      Runoff coefficients by rational method


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      101.000 to Point/Station
102.000
      **** INITIAL AREA EVALUATION ****
      ___________________________________________________________________
___
      Decimal fraction soil group A = 0.000
      Decimal fraction soil group B = 0.000
      Decimal fraction soil group C = 0.000
      Decimal fraction soil group D = 1.000
      [RURAL(greater than 0.5 Ac, 0.2 ha) area type]
      Initial subarea flow distance  =  138.000(Ft.)
      Highest elevation =  382.000(Ft.)
      Lowest elevation =  362.500(Ft.)
      Elevation difference =   19.500(Ft.)
```

```
      Time of concentration calculated by the urban
      areas overland flow method (App X-C) =     5.69 min.
      TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
      TC = [1.8*(1.1-0.4500)*( 138.000^.5)/(14.130^(1/3)]=   5.69
      Rainfall intensity (I) =      4.168(In/Hr) for a   100.0 year storm
      Effective runoff coefficient used for area (Q=KCIA) is C = 0.450
      Subarea runoff =      0.394(CFS)
      Total initial stream area =        0.210(Ac.)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      102.000 to Point/Station
100.000
      **** IMPROVED CHANNEL TRAVEL TIME ****
      ____________________________________________________________________
___
      Upstream point elevation =   362.500(Ft.)
      Downstream point elevation =   310.000(Ft.)
      Channel length thru subarea  =   514.000(Ft.)
      Channel base width     =  100.000(Ft.)
      Slope or 'Z' of left channel bank = 100.000
      Slope or 'Z' of right channel bank = 100.000
      Estimated mean flow rate at midpoint of channel =      3.667(CFS)
      Manning's 'N'    = 0.023
      Maximum depth of channel  =    1.000(Ft.)
      Flow(q) thru subarea =      3.667(CFS)
      Depth of flow =   0.022(Ft.), Average velocity =   1.611(Ft/s)
      Channel flow top width =  104.453(Ft.)
      Flow Velocity =    1.61(Ft/s)
      Travel time  =    5.32 min.
      Time of concentration =   11.00 min.
      Critical depth =      0.034(Ft.)
       Adding area flow to channel
      Decimal fraction soil group A = 0.000
      Decimal fraction soil group B = 0.000
      Decimal fraction soil group C = 0.000
      Decimal fraction soil group D = 1.000
      [RURAL(greater than 0.5 Ac, 0.2 ha) area type]
      Rainfall intensity =      3.259(In/Hr) for a   100.0 year storm
      Runoff coefficient used for sub-area, Rational method,Q=KCIA, C =
0.450
      Subarea runoff =      5.119(CFS) for    3.490(Ac.)
      Total runoff =      5.513(CFS)    Total area =        3.70(Ac.)
      End of computations, total study area =           3.700 (Ac.)
```

APPENDIX C

Post-Development Hydrology Calculations

```
                San Diego County Rational Hydrology Program

      CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 6.4

      Rational method hydrology  program based on
      San Diego County Flood Control Division 1985 hydrology manual
            Rational Hydrology Study        Date: 09/11/19
      ----------------------------------------------------------------
-----
      LISBON HEIGHTS
      POST-DEVELOPMENT CONDITION - 100 YEAR STORM
      BASIN 100
      PN 18-001
      ----------------------------------------------------------------
-----
       *********   Hydrology Study Control Information **********

      ----------------------------------------------------------------
-----


      Program License Serial Number 6144

      ----------------------------------------------------------------
-----
      Rational hydrology study storm event year is   100.0
      English (in-lb) input data Units used
      English (in) rainfall data used

      Standard intensity of Appendix I-B used for year and
      Elevation 0 - 1500 feet
      Factor (to multiply * intensity)  =  1.000
      Only used if inside City of San Diego
      San Diego hydrology manual 'C' values used
      Runoff coefficients by rational method


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      101.000 to Point/Station
102.000
      **** INITIAL AREA EVALUATION ****
      ________________________________________________________________
___
      Decimal fraction soil group A = 0.000
      Decimal fraction soil group B = 0.000
      Decimal fraction soil group C = 0.000
      Decimal fraction soil group D = 1.000
      [MULTI - UNITS area type                     ]
      Initial subarea flow distance  =  185.000(Ft.)
      Highest elevation =  382.000(Ft.)
      Lowest elevation =  355.000(Ft.)
      Elevation difference =   27.000(Ft.)
```

```
      Time of concentration calculated by the urban
      areas overland flow method (App X-C) =     4.01 min.
      TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
      TC = [1.8*(1.1-0.7000)*( 185.000^.5)/(  14.595^(1/3)]=   4.01
      Setting time of concentration to 5 minutes
      Rainfall intensity (I) =      4.389(In/Hr) for a   100.0 year storm
      Effective runoff coefficient used for area (Q=KCIA) is C = 0.700
      Subarea runoff =      0.645(CFS)
      Total initial stream area =        0.210(Ac.)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      102.000 to Point/Station
100.000
      **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
      ____________________________________________________________________
___
      Top of street segment elevation =   355.000(Ft.)
      End of street segment elevation =   315.000(Ft.)
      Length of street segment  =   540.000(Ft.)
      Height of curb above gutter flowline  =    6.0(In.)
      Width of half street (curb to crown)  =  28.000(Ft.)
      Distance from crown to crossfall grade break  =  14.000(Ft.)
      Slope from gutter to grade break (v/hz) =   0.020
      Slope from grade break to crown (v/hz)  =   0.020
      Street flow is on [1] side(s) of the street
      Distance from curb to property line  =   5.000(Ft.)
      Slope from curb to property line (v/hz) =   0.020
      Gutter width =   1.500(Ft.)
      Gutter hike from flowline =  1.440(In.)
       Manning's N in gutter =  0.0150
       Manning's N from gutter to grade break =  0.0150
       Manning's N from grade break to crown =  0.0150
      Estimated mean flow rate at midpoint of street =      6.006(CFS)
      Depth of flow =   0.285(Ft.), Average velocity =   5.871(Ft/s)
      Streetflow hydraulics at midpoint of street travel:
      Halfstreet flow width =   9.775(Ft.)
      Flow velocity =   5.87(Ft/s)
      Travel time =    1.53 min.     TC =    6.53  min.
       Adding area flow to street
      Decimal fraction soil group A = 0.000
      Decimal fraction soil group B = 0.000
      Decimal fraction soil group C = 0.000
      Decimal fraction soil group D = 1.000
      [MULTI - UNITS area type                      ]
      Rainfall intensity =      3.949(In/Hr) for a   100.0 year storm
      Runoff coefficient used for sub-area, Rational method,Q=KCIA, C =
0.700
      Subarea runoff =      9.646(CFS) for    3.490(Ac.)
      Total runoff =     10.292(CFS)    Total area =        3.70(Ac.)
      Street flow at end of street =     10.292(CFS)
      Half street flow at end of street =     10.292(CFS)
      Depth of flow =   0.333(Ft.), Average velocity =   6.684(Ft/s)
```

```
Flow width (from curb towards crown)=  12.133(Ft.)
End of computations, total study area =           3.700 (Ac.)
```

APPENDIX D

Detention Calculations

ESTIMATED DETENTION STORAGE

METHODOLOGY

The estimate storage volume required for detention can be obtained using the Triangular Hydrograph Method. The methodology is outlined below in an excerpt from the Connecticut DOT Drainage Manual.

10.6.4 Triangular Hydrograph Method

A preliminary estimate of the storage volume required for peak flow attenuation may be obtained from a simplified design procedure that replaces the actual inflow and outflow hydrographs with standard triangular shapes. This method should not be applied if the hydrographs can not be approximated by a triangular shape. This would introduce additional errors of the preliminary estimate of the required storage. The procedure is illustrated by Figure 10-2. The required storage volume may be estimated from the area above the outflow hydrograph and inside the inflow hydrograph as defined by equation 10.1.

$$V_s = 0.5\, t_i\, (Q_i - Q_o) \qquad \textbf{(10.1)}$$

where: V_s = storage volume estimate, m^3 (ft^3)
Q_i = peak inflow rate into the basin, m^3/s (ft^3/s)
Q_o = peak outflow rate out of the basin, m^3/s (ft^3/s)
t_i = duration of basin inflow, s
t_p = time to peak of the inflow hydrograph, s

The duration of basin inflow should be derived from the estimated inflow hydrograph. The triangular hydrograph procedure, originally described by Boyd, was found to compare favorably with more complete design procedures involving reservoir routing.

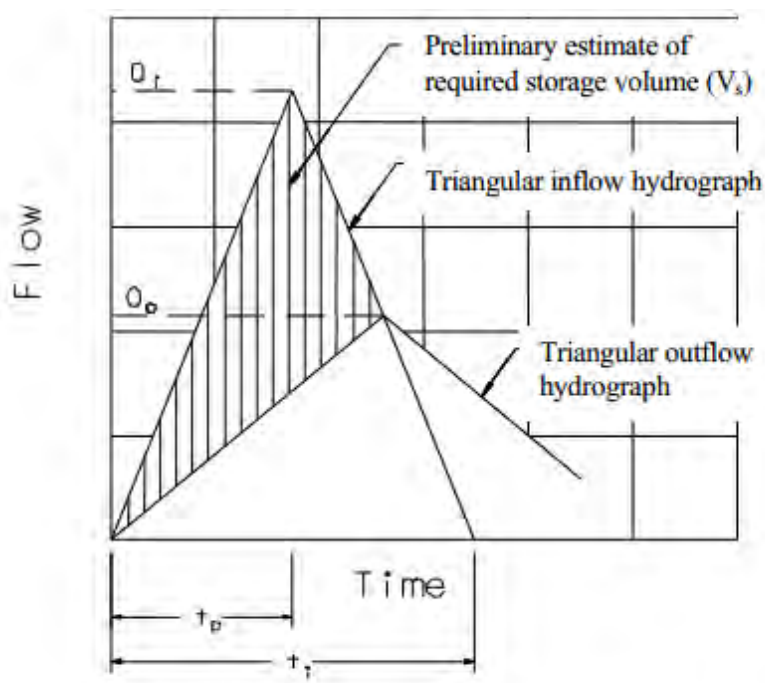


Figure 10-2 Triangular hydrograph method

CALCULATIONS

Input Values

Q_i = 10.3 cfs
Q_o = 5.51 cfs
t_p = 6.53 min.
t_i = 11.0 min.

Calculation

V_s = 0.5 (11.0*60) (10.3-5.51)
V_s = 1,581 cubic feet (Required Volume for 100-yr Flood Control)

UNDERGROUND STORAGE SIZING

Using the above hydrograph calculation, the required storage volume is 1,581 cubic feet. This required 100-yr flood control volume would be provided by two proposed oversized biofiltration basins which will also be used for treatment and HMP requirement.

Two 48" storage pipe 39 feet in length (volume of 980 cf) will be used as an additional storage.

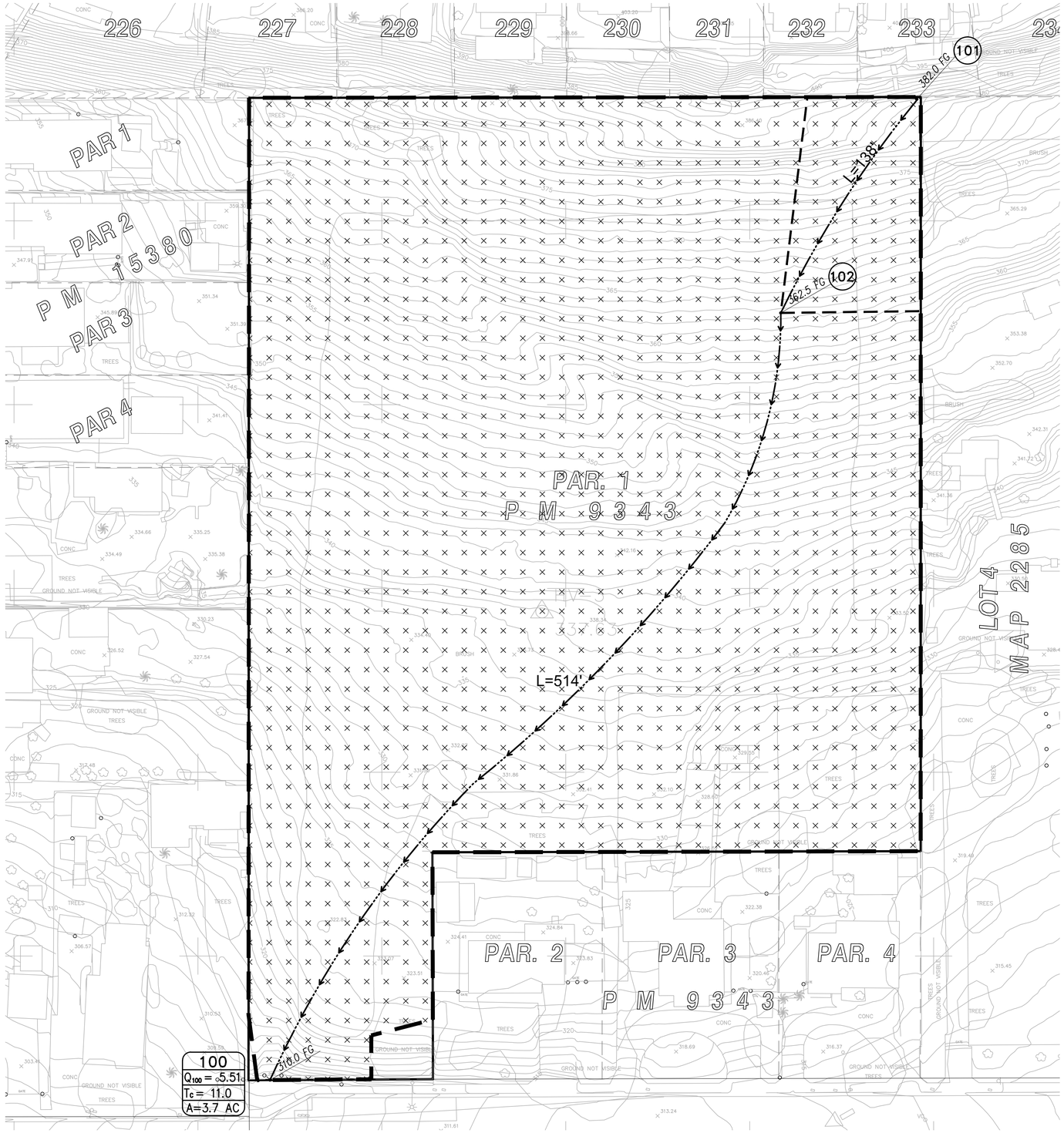
Volume provided by Biofiltration Basins

Basins	Required 100yr Volume (CF)	*Provided 100-yr Volume by Biofiltration (CF)
BMP#1	-	**465 [2]**
BMP#2	-	**2,361[2]**
Total	**1,581**	**2,826[3]**

* Calculated volume is only using the above surface storage
[2] 0.83 (Pons depth in ft) x 561 (basin area in sf) = 465 cf
0.83 (Pons depth in ft) x 2834 (basin area in sf) = 2,361 cf
[3] Biofiltration basins provide 1,245 cf extra volume + 980 cf extra volume by 2-48 inch storage pipes

EXHIBITS

LISBON HEIGHTS



LEGEND

(100)	NODE
100 / Q_{100} = XXX / T_c = XXX / A = XXX	100-YEAR FREQUENCY DISCHARGE (CFS) / TIME OF CONCENTRATION (MINUTES) / AREA (ACRES)
	MAJOR BASIN BOUNDARY
	SUBBASIN BOUNDARY
	FLOW PATH
0.00	BASIN AREA (ACRES)
	PERVIOUS AREA

1" = 30'

SWS

N

30 15 0 30 60 90

SCALE IN FEET
GRAPHIC SCALE

LISBON HEIGHTS
PRE -DEVELOPMENT
HYDROLOGY MAP

SWS ENGINEERING, INC.

CIVIL ENGINEERING ◆ LAND PLANNING ◆ SURVEYING

1635 Lake San Marcos Drive,
Suite 200
San Marcos, CA 92078
P: 760-744-0011 F: 760-744-0046

31045 Temecula Parkway,
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Temecula, CA 92592
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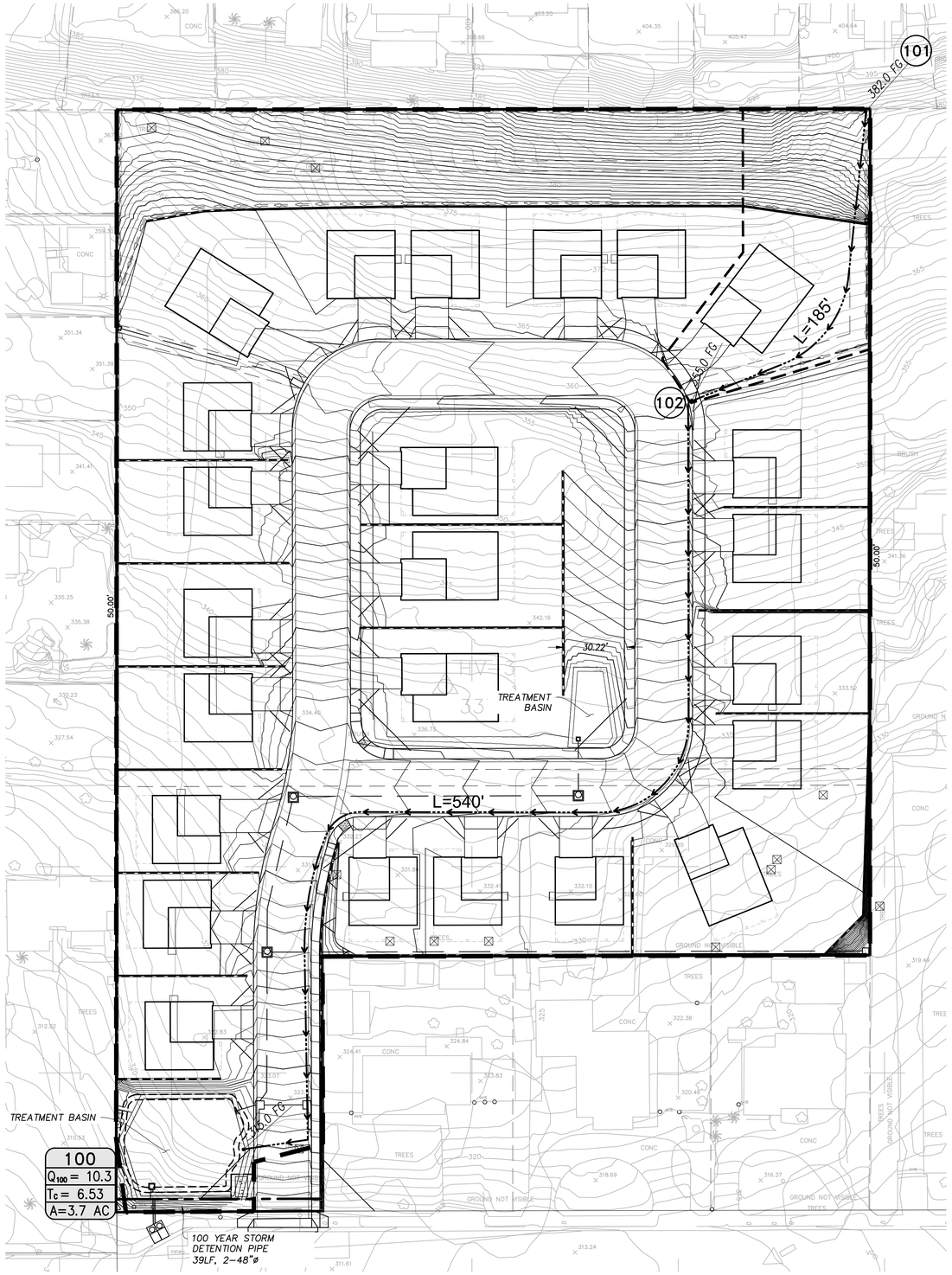
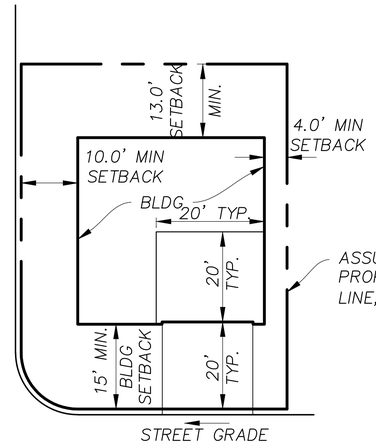
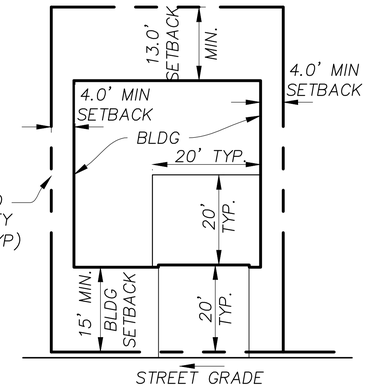
DATE: Aug 06, 19 1:47pm - by:Annette.Hernandez
FILE:Z:\Projects\2018\18-001\PROD\Reports\Hydrology\18-001_PRE.dwg

LISBON HEIGHTS





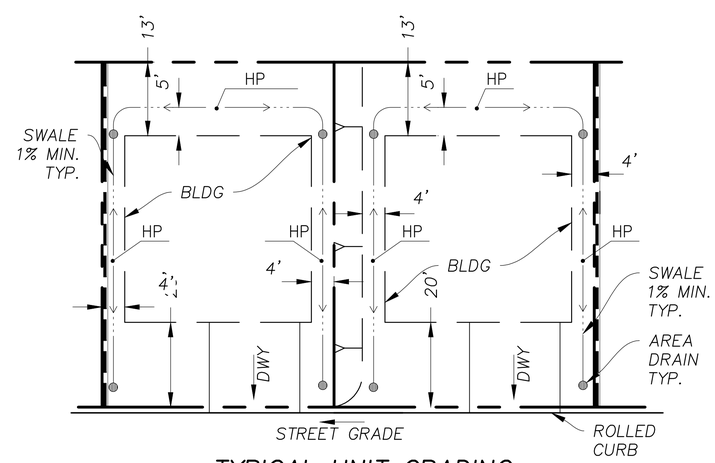
SETBACK
TYPICAL CORNER UNIT



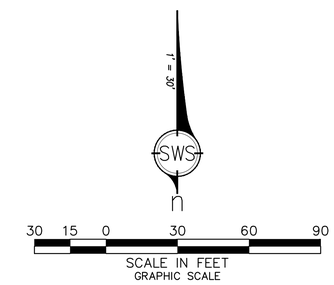
SETBACK
TYPICAL UNIT

LEGEND

(100)	NODE
100 / Q_{100} = XXX / T_c = XXX / A = XXX	100-YEAR FREQUENCY DISCHARGE (CFS) / TIME OF CONCENTRATION (MINUTES) / AREA (ACRES)
	MAJOR BASIN BOUNDARY
	SUBBASIN BOUNDARY
	FLOW PATH
0.00	BASIN AREA (ACRES)



TYPICAL UNIT GRADING



LISBON HEIGHTS POST -DEVELOPMENT HYDROLOGY MAP

SWS ENGINEERING, INC.
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1635 Lake San Marcos Drive, Suite 200
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P: 951-296-3407 F: 951-587-9451

DATE: Mar 31, 20 3:37pm by:MASSY,FATINI
FILE: Z:\Projects\2018\18-001\PROD\Reports\Hydrology\18-001_POST.dwg

Attachment 6
Geotechnical and Groundwater Investigation Report

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

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GEOTECHNICAL INVESTIGATION
BAY VISTA METHODIST HEIGHTS DEVELOPMENT
7108-7112 LISBON STREET
SAN DIEGO, CALIFORNIA

PREPARED FOR:

CHERYL LEE, CEO
BAY VISTA METHODIST HEIGHTS
140 NORTH ESCONDIDO BOULEVARD
ESCONDIDO, CALIFORNIA 92025

PREPARED BY:

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July 19, 2018

SCST No. 180224N
Report No. 1

Cheryl Lee, CEO
Bay Vista Methodist Heights
140 North Escondido Boulevard
Escondido, California 92025

Subject: GEOTECHNICAL INVESTIGATION
BAY VISTA METHODIST HEIGHTS DEVELOPMENT
7108-7112 LISBON STREET
SAN DIEGO, CALIFORNIA

Dear Ms. Lee:

SCST, Inc. (SCST) is pleased to present our report describing the geotechnical investigation performed for the subject project. We conducted the geotechnical investigation in general conformance with the scope of work presented in our proposal on April 13, 2018. Based on the results of our investigation, we consider the planned development feasible from a geotechnical standpoint, provided the recommendations of this report are followed. If you have any questions, please call us at (619) 280-4321.

Respectfully submitted,
SCST, INC.

REGISTERED PROFESSIONAL ENGINEER
THOMAS B. CANADY
No. 50057
Exp. 6/30/19
CIVIL
STATE OF CALIFORNIA

REGISTERED PROFESSIONAL GEOLOGIST
DOUGLAS A. SKINNER
No. 2472
CERTIFIED ENGINEERING GEOLOGIST
STATE OF CALIFORNIA

Thomas B. Canady, PE 50057
Principal Engineer

Douglas A. Skinner, CEG 2472
Senior Geologist

TBC:DAS:dm:af

(1) Addressee via e-mail: cheryl@bvmh.org
(1) Charles Davis via e-mail: cdavis@urbanwestdevelopment.net

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EXECUTIVE SUMMARY

This report presents the results of the geotechnical investigation SCST, Inc. (SCST) performed for the subject project. We understand the project will consist of the design and construction of 24 single-family residences and associated improvements on the undeveloped lot located north of Lisbon Street and east of Imperial Avenue in San Diego, California. The purpose of our work is to provide conclusions and recommendations regarding the geotechnical aspects of the project.

We explored the subsurface conditions by excavating 16 test pits to depths between about 5 and 16 feet below the existing ground surface using a track-mounted excavator. An SCST geologist logged the test pits and collected samples of the materials encountered for laboratory testing. SCST tested selected samples from the test pits to evaluate pertinent soil classification and engineering properties to assist in developing geotechnical conclusions and recommendations.

The materials encountered in the test pits consist of fill, colluvium, and Mission Valley Formation. The fill extends to depths up to about 7 feet below the existing ground surface and consists of loose to medium dense silty to clayey sand with varying amounts of gravel and cobbles. The colluvium is up to about 5 feet thick and consists of soft to medium stiff sandy clay. The Mission Valley Formation consists of interbedded sandstone, siltstone, and claystone that are poorly to strongly cemented. Groundwater was not encountered in the test pits.

We performed two double-ring infiltrometer tests. A tested infiltration rate of 0.0 inch per hour was measured at both locations. The tested infiltration rate does not support infiltration of storm water in any appreciable quantity. On-site storm water BMP facilities should be lined with an impermeable liner and a subdrain and collection pipe system installed to reduce the potential for lateral migration of the introduced water beneath structures and improvements.

The main geotechnical considerations affecting the proposed construction are the presence of potentially compressible soils (fill and colluvium), cut/fill transitions, expansive soils, and difficult excavations in the Mission Valley Formation. To reduce the potential for settlement, the existing fill and colluvium should be excavated in their entirety below planned structures, settlement sensitive improvements, and new fills. The planned building should not be underlain by cut/fill transitions or transitions from shallow fill to deep fill. To mitigate such transitions and reduce the potential for differential settlement, the Mission Valley Formation should be over-excavated and replaced with compacted fill to provide a relatively uniform layer of compacted fill beneath the entire building. To reduce the potential for expansive heave, material with an expansion index of 50 or less should be placed from 3 feet below the deepest planned footing bottom level to the finished pad grade elevation. Hardscape should be underlain by at least 2 feet of material with an expansion index less of 50 or less. Strongly cemented zones should be expected within the Mission Valley Formation. Gravel and cobbles should also be anticipated. The planned buildings can be supported on shallow spread footings with bottoms levels on compacted fill. The recommendations presented herein may need to be updated once final plans are developed.

1. INTRODUCTION

This report presents the results of the geotechnical investigation SCST, Inc. (SCST) performed for the subject project. We understand the project will consist of the design and construction of a residential development in San Diego, California. The purpose of our work is to provide conclusions and recommendations regarding the geotechnical aspects of the project. Figure 1 presents a site vicinity map.

2. SCOPE OF WORK

2.1 FIELD INVESTIGATION

We explored the subsurface conditions by excavating 16 test pits to depths between about 5 and 16 feet below the existing ground surface using a track-mounted excavator. Additionally, we performed two double-ring infiltrometer tests. Figure 2 shows the approximate locations of the test pits and double-ring infiltrometer tests. An SCST geologist logged the test pits and collected samples of the materials encountered for laboratory testing. Logs of the test pits are presented in Appendix I. Soils are classified according to the Unified Soil Classification System illustrated on Figure I-1.

2.2 LABORATORY TESTING

Selected samples were tested to evaluate pertinent soil classification and engineering properties and enable development of geotechnical conclusions and recommendations. The laboratory tests consisted of in situ moisture and density, grain size distribution, Atterberg limits, R-value, expansion index, and corrosivity. The results of the laboratory tests and brief explanations of the test procedures are presented in Appendix II.

2.3 ANALYSIS AND REPORT

The results of the field and laboratory tests were evaluated to develop conclusions and recommendations regarding:

- Subsurface conditions beneath the site
- Potential geologic hazards
- Criteria for seismic design in accordance with the 2016 California Building Code (CBC)
- Site preparation and grading
- Excavation characteristics
- Slope stability
- Foundation alternatives and geotechnical engineering criteria for design of the foundations
- Resistance to lateral loads
- Estimated foundation settlements
- Support for concrete slabs-on-grade
- Lateral pressures for the design of retaining walls
- Pavement sections

- Soil corrosivity
- Infiltration results and feasibility

3. SITE DESCRIPTION

The site is located north of Lisbon Street and east of Imperial Avenue in the Jamacha-Lomita community of San Diego, California. The site is an undeveloped, sloping property bordered on the north, east, and west by residences and on the south by Lisbon Street and residences. Site elevations range from about 388 feet on the north to about 304 feet on the south at Lisbon Street.

4. PROPOSED DEVELOPMENT

We understand the project will consist of the design and construction of 24 single-family residences and associated improvements including roads, retaining walls, underground utilities, and storm water BMP facilities. Based on the Tentative Map prepared by SWS Engineering, site grading will consist of cuts up to about 25 feet and fills up to about 10 feet.

5. GEOLOGY AND SUBSURFACE CONDITIONS

The materials encountered in our test pits consist of fill, colluvium, and Mission Valley Formation. Descriptions of the materials encountered are presented below. Figure 2 presents the site-specific geology. Figure 3 presents a geologic cross section. Figure 4 presents the regional geology in the vicinity of the site.

Fill: Fill was encountered in 4 of the 16 test pits. The fill consists of loose to medium dense silty to clayey sand with varying amounts of gravel and cobbles. The fill encountered in our test pits extends to depths varying from about 2 feet to 7 feet below the existing ground surface.

Colluvium: Colluvium was encountered in 14 of the 16 test pits. Colluvium is the accumulation of weathered material, usually on a slope, that is transported by gravity. The colluvium is about 2 to 5 feet thick and consists of soft to medium stiff sandy clay. The colluvium encountered in our test pits extends to depths up to about 8 feet below the existing ground surface.

Mission Valley Formation: Mission Valley Formation underlies the entire site. The Mission Valley Formation materials consist of interbedded sandstone, siltstone and claystone that are weakly to strongly cemented and slightly to intensely weathered.

Groundwater: Groundwater was not encountered in the test pits. The permanent groundwater table is expected to be below a depth that will influence the planned construction. However, groundwater levels may fluctuate in the future due to rainfall, irrigation, broken pipes, or changes in site drainage. Because groundwater rise or seepage is difficult to predict, such conditions are typically mitigated if and when they occur.

6. GEOLOGIC HAZARDS

6.1 CITY OF SAN DIEGO SEISMIC SAFETY STUDY

Figure 5 shows the site location on the City of San Diego Seismic Safety Study map. The site is located in Geologic Hazard Category 27, which is defined as being underlain by Otay, Sweetwater, or other slide-prone formations. Evidence of landslides or slope instabilities, however, was not observed at the subject site. In our opinion, the geologic risk is low.

6.2 FAULTING AND SURFACE RUPTURE

The closest known active fault is the Rose Canyon fault zone (Silver Strand fault) located about 4.3 miles (7.0 kilometers) west-southwest of the site. The site is not located in an Alquist-Priolo Earthquake Fault Zone. No active faults are known to underlie or project toward the site. Therefore, the probability of fault rupture at the site is low.

6.3 CBC SEISMIC DESIGN PARAMETERS

A geologic hazard likely to affect the project is ground shaking as a result of movement along an active fault zone in the vicinity of the subject site. The site coefficients and maximum considered earthquake (MCE_R) spectral response acceleration parameters in accordance with the 2016 CBC are presented below:

Site Coordinates: Latitude 32.71299°
Longitude -117.04498°

Site Class: D

Site Coefficients, F_a = 1.138
F_v = 1.707

Mapped Spectral Response Acceleration at Short Period, S_s = 0.905g
Mapped Spectral Response Acceleration at 1-Second Period, S_1 = 0.346g

Design Spectral Acceleration at Short Period, S_{DS} = 0.687g
Design Spectral Acceleration at 1-Second Period, S_{D1} = 0.394g

Site Peak Ground Acceleration, PGA_M = 0.412g

6.4 LIQUEFACTION AND DYNAMIC SETTLEMENT

Liquefaction occurs when loose, saturated sands and silts are subjected to strong ground shaking. The soils lose shear strength and become liquid, resulting in large total and differential ground surface settlements and possible lateral spreading during an earthquake. Due to the lack of shallow groundwater, and given the relatively dense nature of the materials beneath the site, the potential for liquefaction and dynamic settlement to occur is low.

6.5 LANDSLIDES AND SLOPE STABILITY

Evidence of landslides or slope instabilities was not observed during our investigation. The potential for landslides or slope instabilities to occur at the site is considered low.

6.6 FLOODING, TSUNAMIS AND SEICHES

The site is not located within a flood zone. The site is not located within a mapped area on the State of California Tsunami Inundation Maps (Cal EMA, 2009). Seiches are periodic oscillations in large bodies of water such as lakes, harbors, bays, or reservoirs. The site is not located adjacent to any lakes or confined bodies of water. Therefore, the potential for flooding, tsunamis or seiches to affect the site is considered low.

6.7 SUBSIDENCE

The site is not located in an area of known subsidence associated with fluid withdrawal (groundwater or petroleum); therefore, the potential for subsidence due to the extraction of fluids is considered low.

6.8 HYDRO-CONSOLIDATION

Hydro-consolidation can occur in recently deposited sediments (less than 10,000 years old) that were deposited in a semi-arid environment. Examples of such sediments are aeolian sands, alluvial fan deposits, and mudflow sediments deposited during flash floods. The pore spaces between the particle grains can re-adjust when inundated by groundwater causing the material to consolidate. The relatively dense materials underlying the site are not considered susceptible to hydro-consolidation.

7. CONCLUSIONS

Based on the results of our investigation, we consider the proposed construction feasible from a geotechnical standpoint, provided the recommendations of this report are followed. The main geotechnical considerations affecting the project are the presence of potentially compressible soils (fill and colluvium), cut/fill transitions, expansive soils, and difficult excavations in the Mission Valley Formation. Remedial grading will need to be performed to reduce the potential for distress to the proposed building and improvements. Remedial grading recommendations are provided in the following sections of this report. We anticipate that the building can be supported on shallow spread footings with bottoms levels on compacted fill. The recommendations presented herein may need to be updated once final plans are developed.

8. RECOMMENDATIONS

8.1 SITE PREPARATION AND GRADING

8.1.1 Site Preparation

Site preparation should begin with the removal of existing improvements, vegetation, and debris. Subsurface improvements that are to be abandoned should be removed, and the resulting excavations should be backfilled and compacted in accordance with the recommendations of this report. Pipeline abandonment can consist of capping or rerouting at the project perimeter and removal within the project perimeter. If appropriate, abandoned pipelines can be filled with grout or slurry as recommended by and observed by the geotechnical consultant.

8.1.2 Compressible Soils

The existing fill and colluvium should be excavated in their entirety beneath the proposed building, settlement sensitive improvements, and new fills. Excavations up to about 8 feet deep are anticipated. Horizontally, the excavations should extend at least 5 feet outside the planned perimeter foundations, at least 2 feet outside the planned hardscape and pavements, or up to existing improvements, whichever is less. An SCST representative should observe conditions exposed in the bottom of excavations to determine if additional excavation is required.

8.1.3 Cut/Fill Transitions

The new buildings should not be underlain by cut/fill transitions or transitions from shallow fill to deep fill. Where such transitions are encountered, the Mission Valley Formation should be over-excavated and replaced with compacted fill to provide a relatively uniform thickness of compacted fill beneath the entire building and reduce the potential for differential settlement. The over-excavation depth should be at least 3 feet below the planned finished pad elevation, at least 2 feet below the deepest planned footing bottom elevation, or to a depth of H/2, whichever is deeper, where H is the greatest depth of fill beneath the structure. Horizontally, the over-excavation should extend at least 5 feet outside the planned footing perimeter or up to existing improvements, whichever is less. Where practical, the bottom of excavations should be sloped toward the fill portion of the site and away from its center. An SCST representative should observe the conditions exposed in the bottom of excavations to determine if additional excavation is required.

8.1.4 Expansive Soil

The onsite soils tested have expansion indexes ranging from 40 to 100. To reduce the potential for expansive heave, soils with an expansion index of 50 or less should be placed from 3 feet below the deepest planned footing bottom level to the finished pad

grade elevation. Horizontally, the low expansion potential soils should extend at least 5 feet outside the planned footing perimeter or up to existing improvements, whichever is less. Hardscape should be underlain by at least 2 feet of material with an expansion index of 50 or less. Horizontally, the low expansion potential soils should extend at least 2 feet outside the planned hardscape or up to existing improvements, whichever is less. The onsite silty to clayey sands are generally expected to meet the expansion index criteria. The onsite clays are not expected to meet the expansion index criteria

8.1.5 Compacted Fill

Fill should be placed in 6- to 8-inch thick loose lifts, moisture conditioned to near optimum moisture content, and compacted to at least 90% relative compaction. The maximum density and optimum moisture content for the evaluation of relative compaction should be determined in accordance with ASTM D1557. Utility trench backfill beneath structures, pavements and hardscape should be compacted to at least 90% relative compaction. The top 12 inches of subgrade beneath pavements should be compacted to at least 95% relative compaction.

8.1.6 Imported Soil

Imported soil should consist of predominately granular soil, free of organic matter and rocks greater than 6 inches. Imported soil should have an expansion index of 20 or less and should be inspected and, if appropriate, tested by SCST prior to transport to the site.

8.1.7 Excavation Characteristics

It is anticipated that excavations can be achieved with conventional earthwork equipment in good working order. Difficult excavation should be anticipated in cemented zones within the Mission Valley Formation. Gravel and cobbles should also be anticipated. Contract documents should specify that the contractor mobilize equipment capable of excavating and compacting strongly cemented materials with gravel, cobbles and large concretions.

8.1.8 Oversized Material

Excavations may generate oversized material. Oversized material is defined as rocks or cemented clasts greater than 6 inches in largest dimension. Oversized material should be broken down to no greater than 6 inches in largest dimension for use in fill, used as landscape material, or disposed off-site.

8.1.9 Temporary Excavations

Temporary excavations 3 feet deep or less can be made vertically. Deeper temporary excavations in fill or colluvium should be laid back no steeper than 1:1 (horizontal:vertical). Deeper temporary excavations in Mission Valley Formation should be laid back no steeper

than ¾:1 (horizontal:vertical). The faces of temporary slopes should be inspected daily by the contractor's Competent Person before personnel are allowed to enter the excavation. Any zones of potential instability, sloughing, or raveling should be brought to the attention of the Engineer and corrective action implemented before personnel begin working in the excavation. Excavated soils should not be stockpiled behind temporary excavations within a distance equal to the depth of the excavation. SCST should be notified if other surcharge loads are anticipated so that lateral load criteria can be developed for the specific situation. If temporary slopes are to be maintained during the rainy season, berms are recommended along the tops of slopes to prevent runoff water from entering the excavation and eroding the slope faces. Slopes steeper than those described above will require shoring. Additionally, temporary excavations that extend below a plane inclined at 1½:1 (horizontal:vertical) downward from the outside bottom edge of existing structures or improvements will require shoring. Soldier piles and lagging, internally braced shoring, or trench boxes could be used. If trench boxes are used, the soil immediately adjacent to the trench box is not directly supported. Ground surface deformations immediately adjacent to the pit or trench could be greater where trench boxes are used compared to other methods of shoring.

8.1.10 Temporary Shoring

For design of cantilevered shoring with level backfill, an active earth pressure equal to a fluid weighing 35 pounds per cubic foot (pcf) can be used. An additional 20 pcf should be added for shoring with 2:1 sloping ground. The surcharge loads on shoring from traffic and construction equipment working adjacent to the excavation can be modeled by assuming an additional 2 feet of soil behind the shoring. For design of soldier piles, an allowable passive pressure of 350 psf per foot of embedment over two times the pile diameter up to a maximum of 5,000 psf can be used. Soldier piles should be spaced at least three pile diameters, center to center.

8.1.11 Temporary Dewatering

Groundwater seepage may occur locally and should be anticipated in excavations. Temporary dewatering can be accomplished by sloping the excavation bottom to a sump and pumping from the sump. A layer of gravel about 6 inches thick placed in the bottom of the excavation will facilitate groundwater flow and can be used as a working platform.

8.1.12 Slopes

All permanent slopes should be constructed no steeper than 2:1 (horizontal:vertical). Faces of fill slopes should be compacted either by rolling with a sheep-foot roller or other suitable equipment, or by overfilling and cutting back to design grade. Fills should be benched into sloping ground inclined steeper than 5:1 (horizontal:vertical). In our opinion,

slopes constructed no steeper than 2:1 (horizontal:vertical) will possess an adequate factor of safety. An engineering geologist should observe all cut slopes during grading to ascertain that no unforeseen adverse geologic conditions are encountered that require revised recommendations. All slopes are susceptible to surficial slope failure and erosion. Water should not be allowed to flow over the top of slope. Additionally, slopes should be planted with vegetation that will reduce the potential for erosion.

8.1.13 Surface Drainage

Final surface grades around structures should be designed to collect and direct surface water away from the structure and toward appropriate drainage facilities. The ground around the structure should be graded so that surface water flows rapidly away from the structure without ponding. In general, we recommend that the ground adjacent to the structure slope away at a gradient of at least 2%. Densely vegetated areas where runoff can be impaired should have a minimum gradient of at least 5% within the first 5 feet from the structure. Roof gutters with downspouts that discharge directly into a closed drainage system are recommended on structures. Drainage patterns established at the time of fine grading should be maintained throughout the life of the proposed structures. Site irrigation should be limited to the minimum necessary to sustain landscape growth. Should excessive irrigation, impaired drainage, or unusually high rainfall occur, saturated zones of perched groundwater can develop.

8.1.14 Grading Plan Review

SCST should review the grading plans and earthwork specifications to ascertain whether the intent of the recommendations contained in this report have been implemented, and that no revised recommendations are needed due to changes in the development scheme.

8.2 FOUNDATIONS

8.2.1 Shallow Spread Footings

The planned buildings can be supported on shallow spread footings with bottom levels on compacted fill. Footings should extend at least 24 inches below lowest adjacent finished grade. A minimum width of 12 inches is recommended for continuous footings and 24 inches for isolated or wall footings. An allowable bearing capacity of 2,500 psf can be used. The allowable bearing capacity can be increased by 500 psf for each foot of depth below the minimum and 250 psf for each foot of width beyond the minimum up to a maximum of 5,000 psf. The bearing value can be increased by ⅓ when considering the total of all loads, including wind or seismic forces. Footings located adjacent to or within slopes should be extended to a depth such that a minimum horizontal distance of 7 feet exists between the lower outside footing edge and the face of the slope.

Lateral loads will be resisted by friction between the bottoms of footings and passive pressure on the faces of footings and other structural elements below grade. An allowable coefficient of friction of 0.35 can be used. Passive pressure can be computed using an allowable lateral pressure of 350 psf per foot of depth below the ground surface for level ground conditions. The passive pressure can be increased by ⅓ when considering the total of all loads, including wind or seismic forces. The upper 1 foot of soil should not be relied on for passive support unless the ground is covered with pavements or slabs.

8.2.2 Settlement Characteristics

Total foundation settlements are estimated to be less than 1 inch. Differential settlements between adjacent columns and across continuous footings are estimated to be less than ¾ inch over a distance of 40 feet. Settlements should be completed shortly after structural loads are applied.

8.2.3 Foundation Plan Review

SCST should review the foundation plans to ascertain that the intent of the recommendations in this report has been implemented and that revised recommendations are not necessary as a result of changes after this report was completed.

8.2.4 Foundation Excavation Observations

A representative from SCST should observe the foundation excavations prior to forming or placing reinforcing steel.

8.3 SLABS-ON-GRADE

8.3.1 Interior Slabs-on-Grade

The project structural engineer should design the interior concrete slabs-on-grade floor. However, we recommend that building slabs be at least 5 inches thick and reinforced with at least No. 4 bars at 18 inches on center each way.

Moisture protection should be installed beneath slabs where moisture sensitive floor coverings will be used. The project architect should review the tolerable moisture transmission rate of the proposed floor covering and specify an appropriate moisture protection system. Typically, a plastic vapor barrier is used. Minimum 10-mil plastic is recommended. The plastic should comply with ASTM E1745. The vapor barrier installation should comply with ASTM E1643. The slab can be placed directly on the vapor barrier.

8.3.2 Exterior Slabs-on-Grade

Exterior slabs should be at least 4 inches thick and reinforced with at least No. 3 bars at 18 inches on center each way. Slabs should be provided with weakened plane joints.

Joints should be placed in accordance with the American Concrete Institute (ACI) guidelines. The project architect should select the final joint patterns. A 1-inch maximum size aggregate mix is recommended for concrete for exterior slabs. The corrosion potential of on-site soils with respect to reinforced concrete will need to be taken into account in concrete mix design. Coarse and fine aggregate in concrete should conform to the "Greenbook" Standard Specifications for Public Works Construction.

8.4 CONVENTIONAL RETAINING WALLS

8.4.1 Foundations

The recommendations provided in the foundation section of this report are also applicable to conventional retaining walls.

8.4.2 Lateral Earth Pressures

The active earth pressure for the design of unrestrained retaining walls with level backfills can be taken as equivalent to the pressure of a fluid weighing 35 pcf. The at-rest earth pressure for the design of restrained retaining wall with level backfills can be taken as equivalent to the pressure of a fluid weighing 55 pcf. These values assume a granular and drained backfill condition. Higher lateral earth pressures would apply if walls retain expansive clay soils. An additional 20 pcf should be added to these values for walls with 2:1 (horizontal:vertical) sloping backfill. An increase in earth pressure equivalent to an additional 2 feet of retained soil can be used to account for surcharge loads from light traffic. The above values do not include a factor of safety. Appropriate factors of safety should be incorporated into the design. If any other surcharge loads are anticipated, SCST should be contacted for the necessary increase in soil pressure.

Retaining walls should be designed to resist hydrostatic pressures or be provided with a backdrain to reduce the accumulation of hydrostatic pressures. Backdrains may consist of a 2-foot wide zone of ¾-inch crushed rock. The backdrain should be separated from the adjacent soils using a non-woven filter fabric, such as Mirafi 140N or equivalent. Weep holes should be provided or a perforated pipe should be installed at the base of the backdrain and sloped to discharge to a suitable storm drain facility. As an alternative, a geocomposite drainage system such as Miradrain 6000 or equivalent placed behind the wall and connected to a suitable storm drain facility can be used. The project architect should provide waterproofing specifications and details. Figure 6 presents typical conventional retaining wall backdrain details.

8.4.3 Seismic Earth Pressure

If required, the seismic earth pressure can be taken as equivalent to the pressure of a fluid weighing 15 pcf. This value is for level backfill and does not include a factor of safety.

Appropriate factors of safety should be incorporated into the design. This pressure is in addition to the un-factored, static active earth pressure. The passive pressure and bearing capacity can be increased by ⅓ in determining the seismic stability of the wall.

8.4.4 Backfill

Wall backfill should consist of granular, free-draining material having an expansion index of 20 or less. The backfill zone is defined by a 1:1 plane projected upward from the heel of the wall. Expansive or clayey soil should not be used. We anticipate that the on-site soils will not be suitable for wall backfill. Additionally, backfill within 3 feet from the back of the wall should not contain rocks greater than 3 inches in dimension. Backfill should be compacted to at least 90% relative compaction. Backfill should not be placed until walls have achieved adequate structural strength. Compaction of wall backfill will be necessary to minimize settlement of the backfill and overlying settlement sensitive improvements. However, some settlement should still be anticipated. Provisions should be made for some settlement of concrete slabs and pavements supported on backfill. Additionally, any utilities supported on backfill should be designed to tolerate differential settlement.

8.5 MECHANICALLY STABILIZED EARTH RETAINING WALLS

The following soil parameters can be used for design of mechanically stabilized earth (MSE) retaining walls.

MSE Wall Design Parameters

Soil Parameter	Reinforced Soil	Retained Soil	Foundation Soil
Internal Friction Angle (degrees)	32°	32°	32°
Cohesion (psf)	0	0	0
Moist Unit Weight (pcf)	130	130	130

The reinforced soil should consist of granular, free-draining material with an expansion index of 20 or less. We anticipate that imported material will be required. The bottom of MSE walls should extend to such a depth that a total of 5 feet exists between the bottom of the wall and the face of the slope. Figure 7 presents a typical MSE retaining wall backdrain detail. MSE retaining walls may experience lateral movement over time. The wall engineer should review the configuration of proposed improvements adjacent to the wall and provide measures to help reduce the potential for distress to these improvements from lateral movement.

8.6 PIPELINES

8.6.1 Thrust Blocks

For level ground conditions, a passive earth pressure of 350 psf per foot of depth below the lowest adjacent final grade can be used to compute allowable thrust block resistance. A value of 150 psf per foot should be used below groundwater level, if encountered.

8.6.2 Modulus of Soil Reaction

A modulus of soil reaction (E') of 2,000 psi can be used to evaluate the deflection of buried flexible pipelines. This value assumes that granular bedding material is placed adjacent to the pipe and is compacted to at least 90% relative compaction.

8.6.3 Pipe Bedding

Pipe bedding as specified in the "Greenbook" Standard Specifications for Public Works Construction can be used. Bedding material should consist of clean sand having a sand equivalent not less than 30 and should extend to at least 12 inches above the top of pipe. Alternative materials meeting the intent of the bedding specifications are also acceptable. Samples of materials proposed for use as bedding should be provided to the engineer for inspection and testing before the material is imported for use on the project. The on-site materials are not expected to meet "Greenbook" bedding specifications. The pipe bedding material should be placed over the full width of the trench. After placement of the pipe, the bedding should be brought up uniformly on both sides of the pipe to reduce the potential for unbalanced loads. No voids or uncompacted areas should be left beneath the pipe haunches. Ponding or jetting the pipe bedding should not be allowed.

8.6.4 Cutoff Walls

Where pipeline inclinations exceed 15 percent, cutoff walls are recommended in trench excavations. Additionally, we do not recommend that open graded rock be used for pipe bedding or backfill because of the potential for piping erosion. The recommended bedding is clean sand having a sand equivalent not less than 30 or 2-sack sand/cement slurry. If sand/cement slurry is used for pipe bedding to at least 1 foot over the top of the pipe, cutoff walls are not considered necessary. The need for cutoff walls should be further evaluated by the project civil engineer designing the pipeline.

8.7 PAVEMENT SECTION RECOMMENDATIONS

The pavement support characteristics of the soils encountered during our investigation are considered low. An R-value of 10 was assumed for design of preliminary pavement sections. The actual R-value of the subgrade soils should be determined after grading and final

pavement sections be provided. Based on an R-value of 10, the following preliminary pavement structural sections are recommended for the assumed Traffic Indexes.

Flexible Pavement Sections

Traffic Type	Traffic Index	Asphalt Concrete (inches)	Aggregate Base (inches)
Parking Stalls	4.5	3	8
Drive Lanes	6.0	4	11
Heavy Traffic Areas	7.0	5	13

Portland Cement Concrete (PCC) Pavement Sections

Traffic Type	Traffic Index	PCC (inches)	Aggregate Base (inches)
Parking Stalls	4.5	6	6
Drive Lanes	6.0	7	6
Heavy Traffic Areas	7.0	7	6

The top 12 inches of subgrade should be scarified, moisture conditioned to near optimum moisture content, and compacted to at least 95% relative compaction. All soft or yielding areas should be removed and replaced with compacted fill or aggregate base. Aggregate base and asphalt concrete should conform to the Caltrans Standard Specifications or the "Greenbook" and should be compacted to at least 95% relative compaction. Aggregate base should have an R-value of not less than 78.

8.8 PERVIOUS PAVEMENT SECTION RECOMMENDATIONS

Pervious pavement section recommendations are based on Caltrans (2014) pavement structural design guidelines. The pavement sections below are based on the strength of the materials. However, the actual thickness of the sections may be controlled by the reservoir layer design, which the project civil engineer should determine.

Pervious Asphalt Pavement

Traffic Type	Category	*Asphalt Treated Permeable Base (ATPB) (inches)	Class 4 Aggregate Base (inches)
Parking Stalls	B	4½	8½

***1¼ inches of an open graded friction course (OGFC) should be placed on top of the ATPB.**

Pervious Concrete Pavement

Traffic Type	Category	Pervious Concrete (inches)	Class 4 Aggregate Base (inches)
Parking Stalls	B	5½	8½

Permeable Interlocking Concrete Pavers (PICP)

Traffic Type	Category	PICP (inches)	Class 3 Permeable (inches)	Class 4 Aggregate Base (inches)
Parking Stalls	B	3⅛	4½	8½

The top 12 inches of subgrade should be scarified, moisture conditioned to near optimum moisture content, and compacted to at least 95% relative compaction. All soft or yielding subgrade areas should be removed and replaced with compacted fill or permeable base. All materials and methods of construction should conform to good engineering practices and the minimum local standards.

Deepened curbs or vertical cutoff membranes consisting of 30 mil HDPE or PVC should be installed at the edges of pervious pavements to reduce the potential for water-related distress to adjacent structures or improvements. The membrane should extend below the reservoir section

8.9 SOIL CORROSIVITY

Representative samples of the onsite soil were tested to evaluate corrosion potential. The test results are presented in Appendix II. The project design engineer can use the sulfate results in conjunction with ACI 318 to specify the water/cement ratio, compressive strength, and cementitious material types for concrete exposed to soil. A corrosion engineer should be contacted to provide specific corrosion control recommendations.

8.10 INFILTRATION FEASIBILITY

We performed two double-ring infiltrometer tests at the approximate locations shown on Figure 2 to assess storm water infiltration feasibility. Appendix III presents the field data and test results. The table below presents the tested infiltration rates.

Infiltration Rate Test Results

Test Location	Test Depth (feet)	Material Type at Test Depth	Infiltration Rate (inch/hour)
DR-1	6	Clayey Sandstone	0.0
DR-2	6	Clayey Sandstone	0.0

The tested infiltration rates do not support storm water infiltration in any appreciable quantity. Based on our test results, the feasibility screening category is No Infiltration. BMP facilities should be lined with an impermeable geomembrane to reduce the potential for water-related distress to adjacent structures or improvements. A subdrain system should be installed at the bottom of BMP facilities. Foundations should be set back at least 10 feet from BMP facilities, or the foundation should be deepened to a depth that extends below the bottom of the BMP.

9. GEOTECHNICAL ENGINEERING DURING CONSTRUCTION

The geotechnical engineer should review project plans and specifications prior to bidding and construction to check that the intent of the recommendations in this report has been incorporated. Observations and tests should be performed during construction. If the conditions encountered during construction differ from those anticipated based on the subsurface exploration program, the presence of the geotechnical engineer during construction will enable an evaluation of the exposed conditions and modifications of the recommendations in this report or development of additional recommendations in a timely manner.

10. CLOSURE

SCST should be advised of any changes in the project scope so that the recommendations contained in this report can be evaluated with respect to the revised plans. Changes in recommendations will be verified in writing. The findings in this report are valid as of the date of this report. Changes in the condition of the site can, however, occur with the passage of time, whether they are due to natural processes or work on this or adjacent areas. In addition, changes in the standards of practice and government regulations can occur. Thus, the findings in this report may be invalidated wholly or in part by changes beyond our control. This report should not be relied upon after a period of two years without a review by us verifying the suitability of the conclusions and recommendations to site conditions at that time.

In the performance of our professional services, we comply with that level of care and skill ordinarily exercised by members of our profession currently practicing under similar conditions and in the same locality. The client recognizes that subsurface conditions may vary from those encountered at the test pit locations, and that our data, interpretations, and recommendations are based solely on the information obtained by us. We will be responsible for those data, interpretations, and recommendations, but shall not be responsible for interpretations by others of the information developed. Our services consist of professional consultation and observation only, and no warranty of any kind whatsoever, express or implied, is made or intended in connection with the work performed or to be performed by us, or by our proposal for consulting or other services, or by our furnishing of oral or written reports or findings.

11. REFERENCES

American Concrete Institute (ACI) (2012), Building Code Requirements for Structural Concrete (ACI 318-11) and Commentary, August.

California Emergency Management Agency, California Geological Survey, University of Southern California (Cal EMA) (2009), Tsunami Inundation Map for Emergency Planning, June 1.

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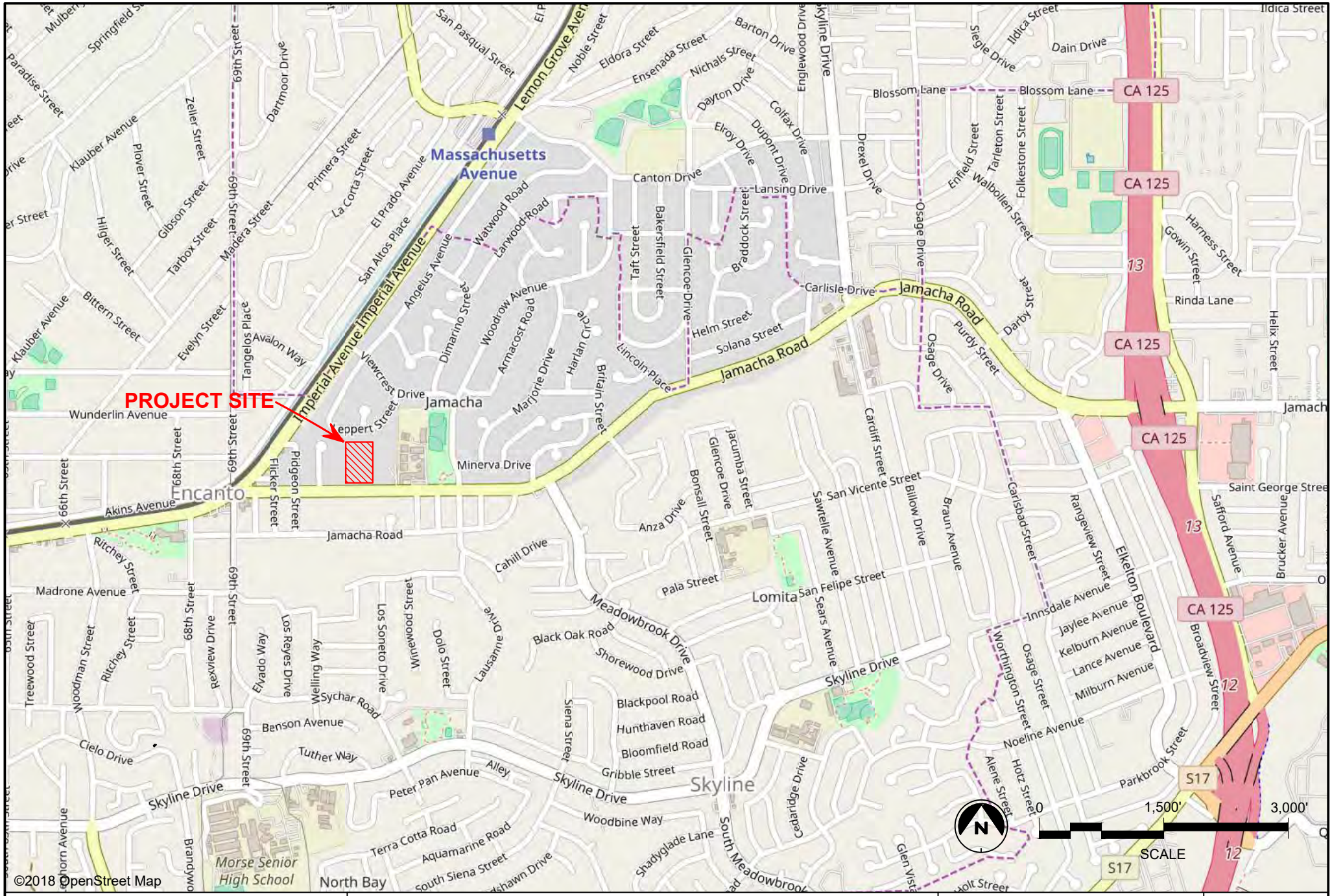
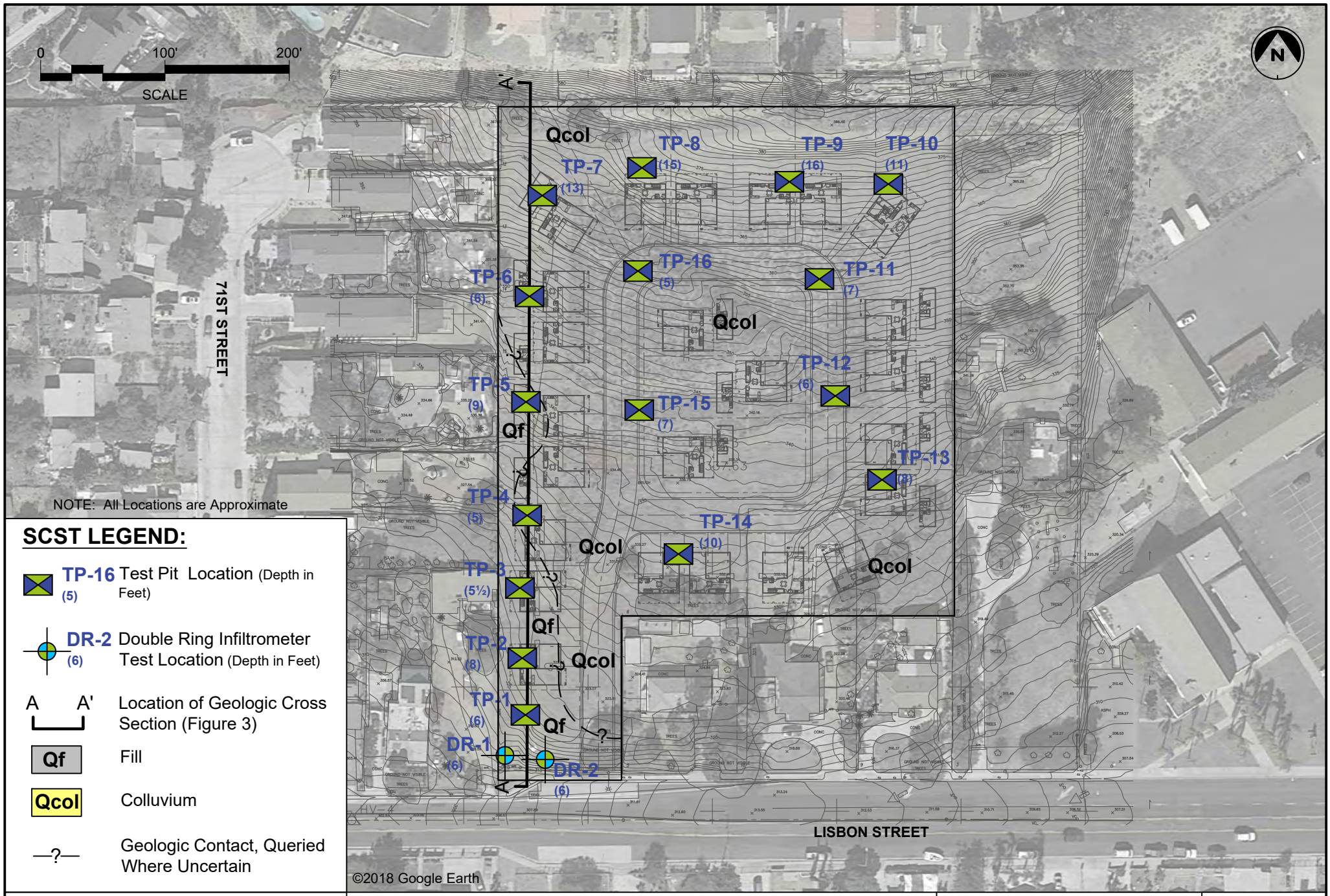
Public Works Standards, Inc. (2015), “Greenbook” Standard Specifications for Public Works Construction, 2015 Edition.



SCST, Inc.	**SITE VICINITY MAP** Bay Vista Methodist Heights Development San Diego, California	Date: July, 2018 By: NNW Job No.: 180224N-1	Figure: 1



SCST LEGEND:

- **TP-16** (5) Test Pit Location (Depth in Feet)
- **DR-2** (6) Double Ring Infiltrometer Test Location (Depth in Feet)
- A A' Location of Geologic Cross Section (Figure 3)
- **Qf** Fill
- **Qcol** Colluvium
- —?— Geologic Contact, Queried Where Uncertain

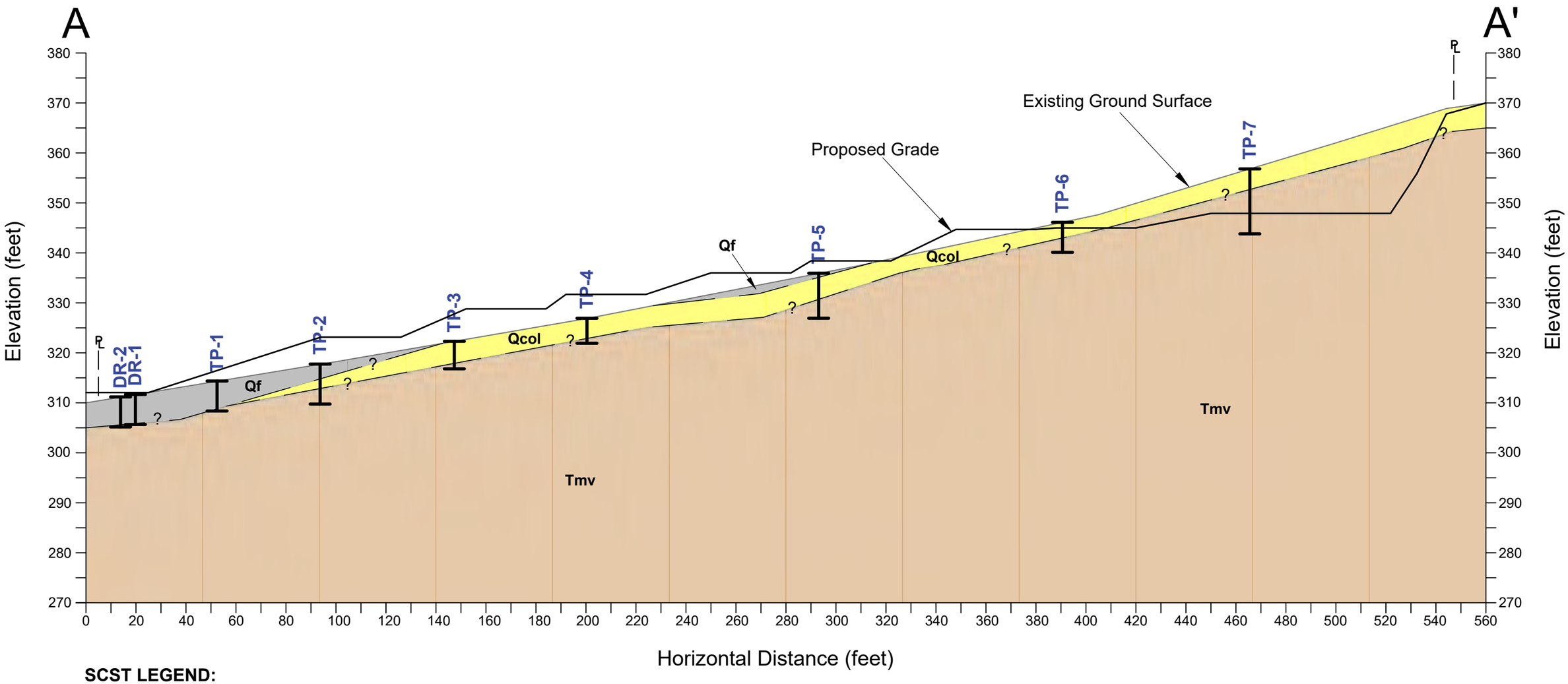
SCST, Inc.

GEOTECHNICAL MAP

Bay Vista Methodist Heights Development
San Diego, California

Date: July, 2018
By: NNW/PFL
Job No.: 180224N-1

Figure: 2



SCST LEGEND:

TP-7 — Test Pit Location

DR-2 — Double Ring Infiltrometer Test Location

Qf — Fill

Qcol — Colluvium

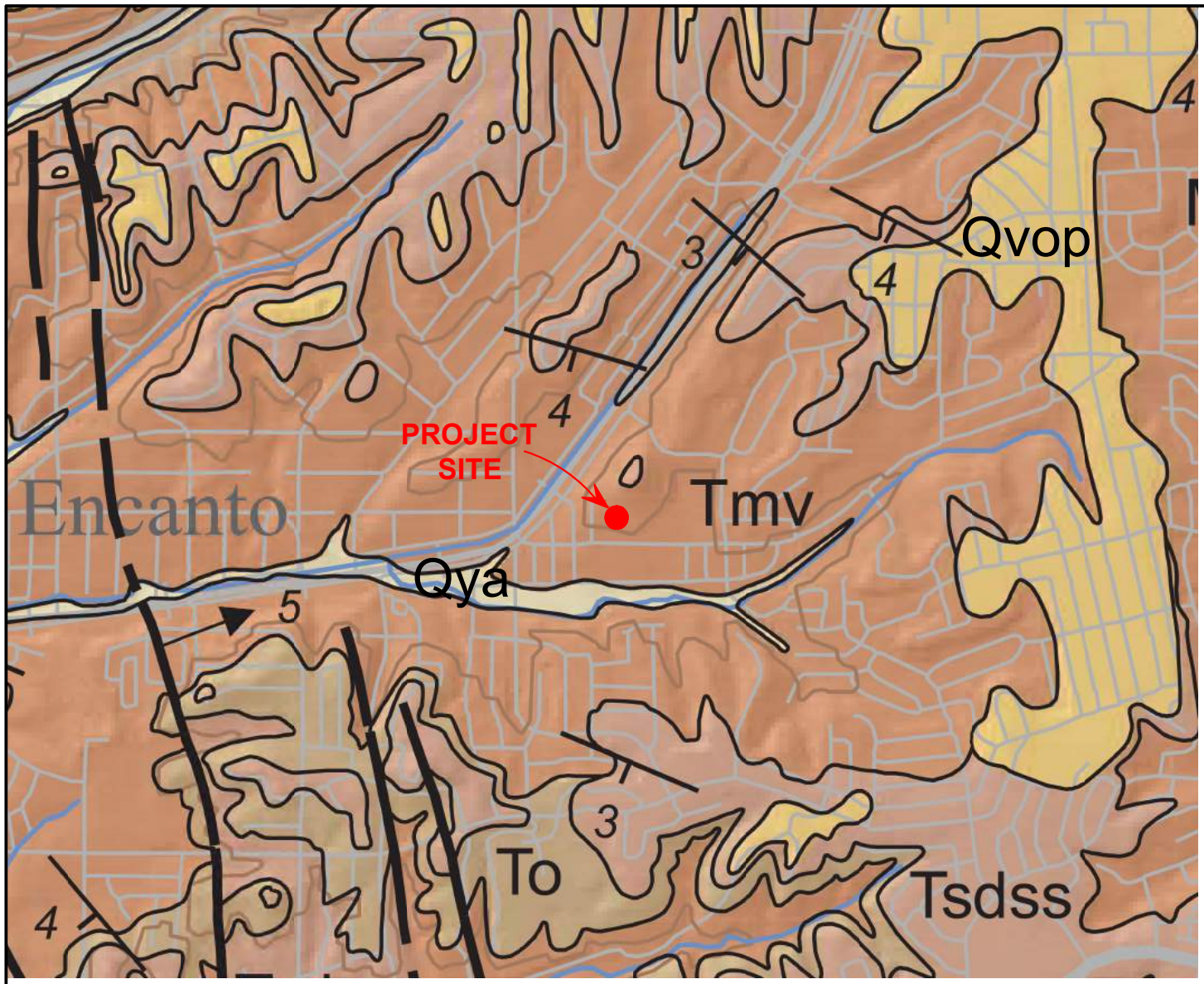
Tmv — Mission Valley Formation

—?— Geologic Contact, Queried Where Uncertain

SCALE
Horizontal:1" = 40'
Vertical :1" = 20'

NOTE: All Locations are Approximate

SCST, Inc.	**GEOLOGIC CROSS SECTION** Bay Vista Methodist Heights Development San Diego, California	Date: July, 2018 By: PFL Job No.: 180224N-1	Figure: 3



EXPLANATION:

Qya	Young alluvial flood-plain deposits (Holocene and late Pleistocene)
Qvop	Very old paralic deposits, undivided (middle to early Pleistocene)
Tsdss	San Diego Formation - marine sandstone (early Pleistocene and late Pliocene)
To	Otay Formation (late Oligocene)
Tmv	Mission Valley Formation (middle Eocene)

70 U D

Fault - Solid where accurately located; dashed where approximately located; dotted where concealed. U = upthrown block, D = downthrown block. Arrow and number indicate direction and angle of dip of fault plane.

4

Strike and **dip** of beds
Inclined

N

0 2,000' 4,000'
SCALE

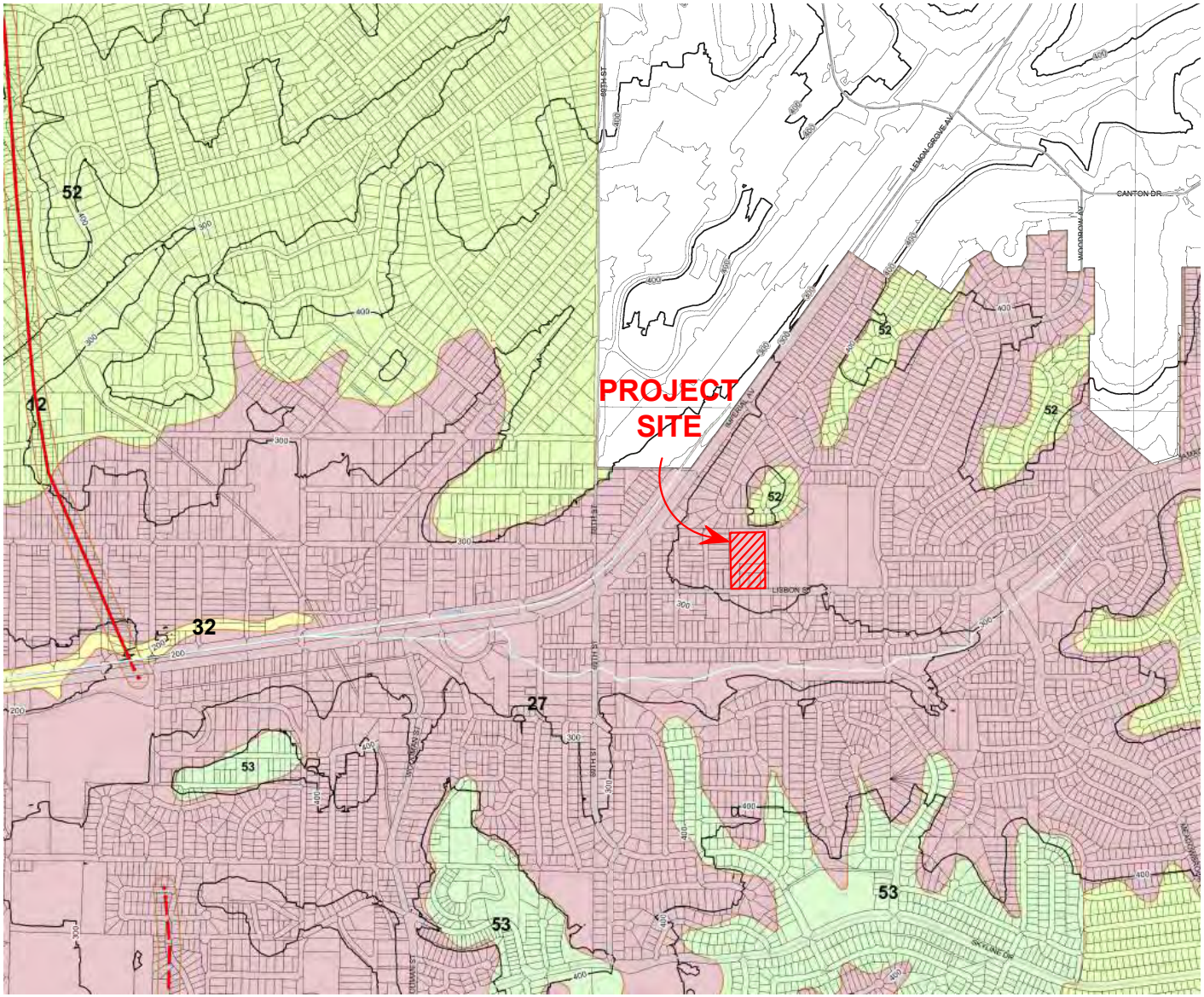
Reference:
Kennedy, M.P. and Tan, S.S. (2008), Geologic Map of the San Diego 30'x60' Quadrangle, California, California Geological Survey

SCST, Inc.

REGIONAL GEOLOGY MAP
Bay Vista Methodist Heights Development
San Diego, California

Date: July, 2018
By: NNW
Job No.: 180224N-1

Figure: 4



EXPLANATION:

SLIDE-PRONE FORMATIONS

27 Otay, Sweetwater, and others

LIQUEFACTION

32 Low Potential -- fluctuating groundwater minor drainages

OTHER TERRAIN

52 Other level areas, gently sloping to steep terrain, favorable geologic structure, Low risk

53 Level loping terrain, unfavorable geologic structure, Low to moderate risk

FAULTS

Fault

Inferred Fault

Concealed Fault

Shear Zone

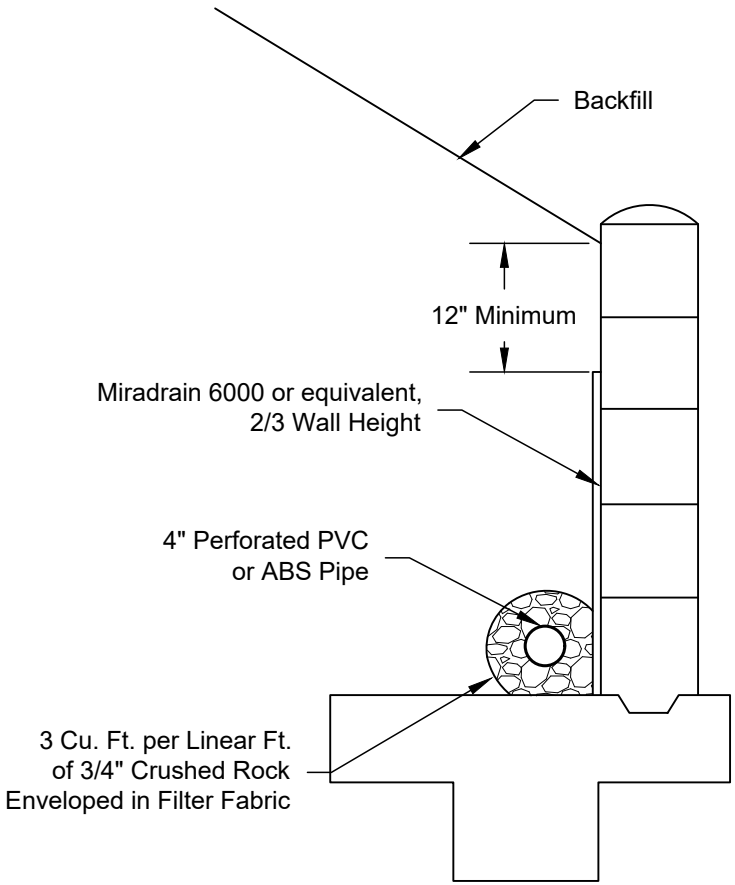
N

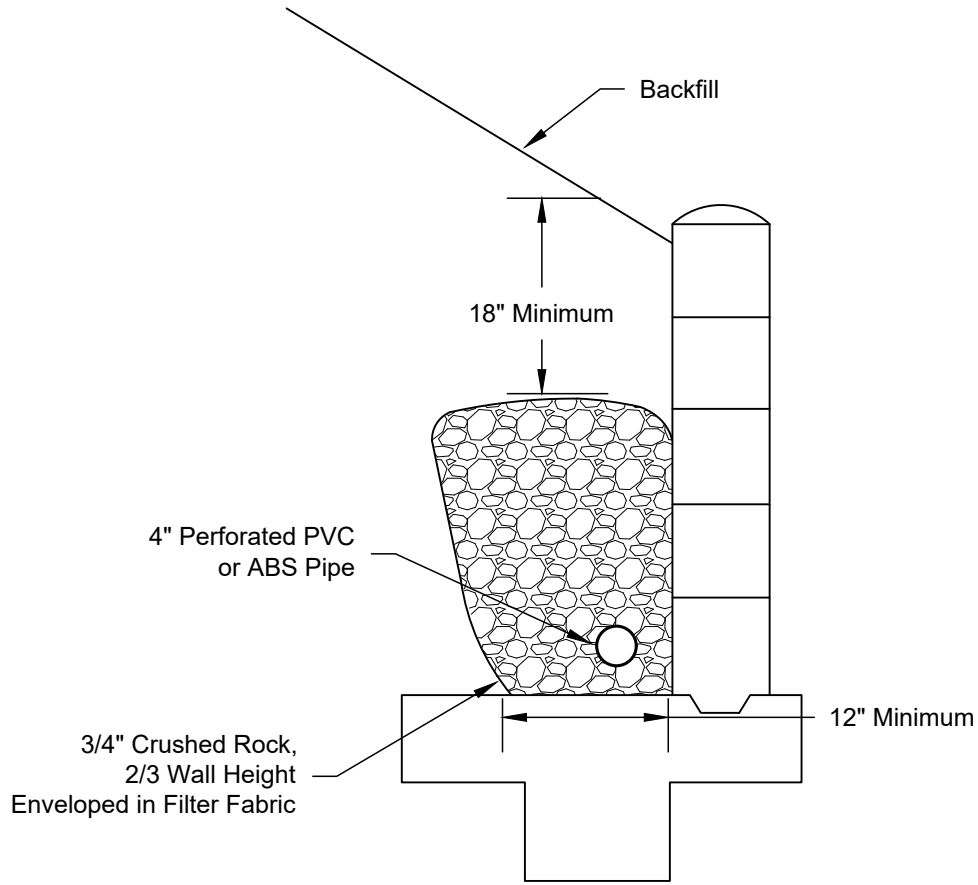
0 1,500' 3,000'

SCALE

Reference:
City of San Diego (2008), Seismic Safety Study, Geologic Hazards and Faults, Grid Tile: 18, Development Services Department, April 3.

SCST, Inc.	**CITY OF SAN DIEGO SEISMIC SAFETY STUDY MAP** Bay Vista Methodist Heights Development San Diego, California	Date: July, 2018 By: NNW Job No.: 180224N-1	Figure: 5



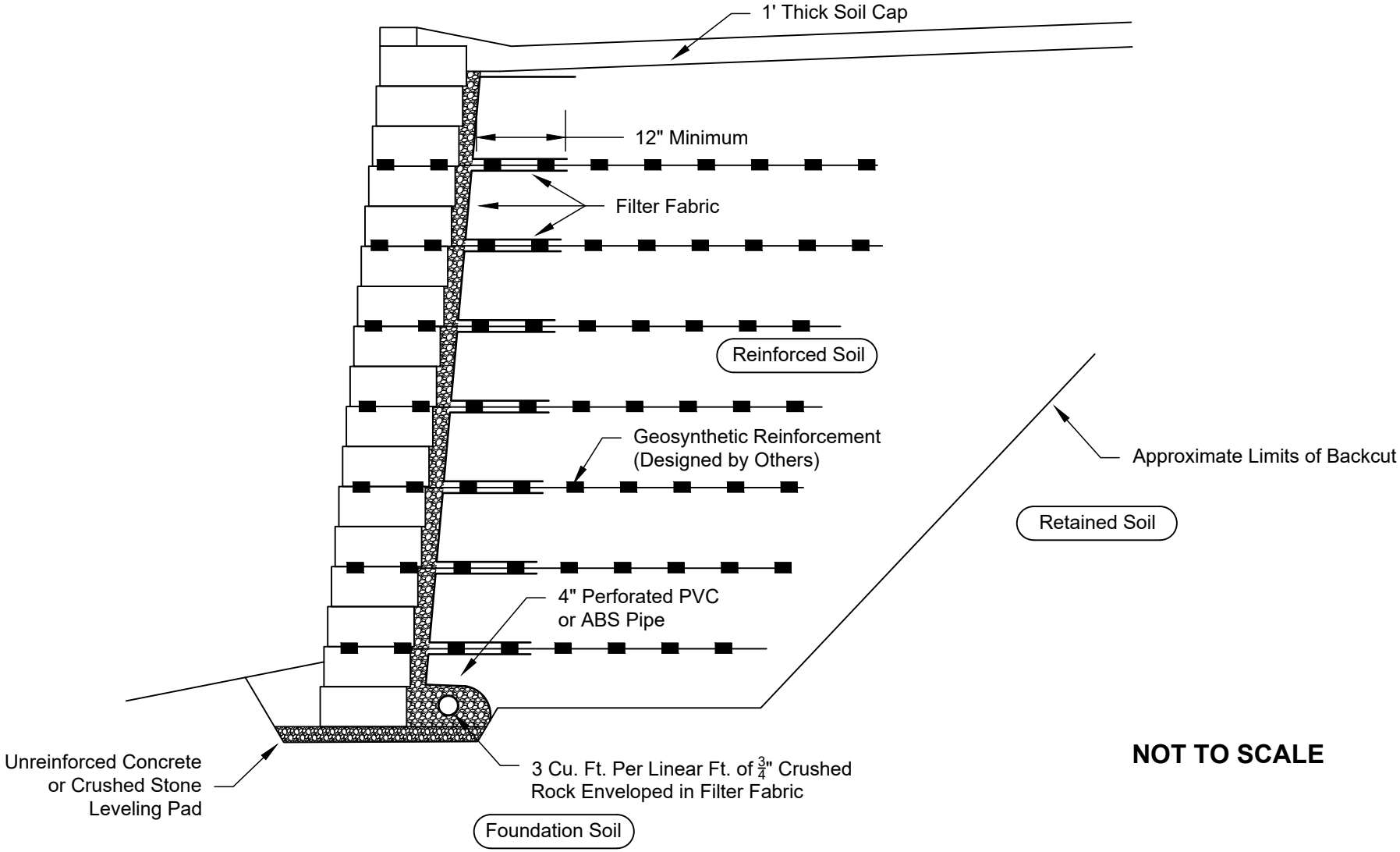


NOT TO SCALE

NOTES:

1) Dampproof or waterproof back of wall following architect's specifications.
2) 4" minimum perforated pipe, SDR35 or equivalent, holes down, 1% fall to outlet. Provide solid outlet pipe at suitable locations.
3) Drain installation and outlet connection should be observed by the geotechnical consultant.

SCST, Inc.	**TYPICAL RETAINING WALL BACKDRAIN DETAILS** Bay Vista Methodist Heights Development San Diego, California	Date: July, 2018 By: NNW Job No.: 180224N-1	Figure: 6



NOT TO SCALE

NOTES:

1) Backcut as recommended by the geotechnical report or field evaluation
2) Additional drain at excavation backcut may be recommended base on conditions observed during construction.
3) Filter fabric should be installed between crushed rock and soil. Filter fabric should consist of Mirafi 140N or equivalent. Filter fabric should be overlapped approximately 6 inches.
4) Perforated pipe should outlet through a solid pipe to an appropriate gravity outfall. Perforated pipe and outlet pipe should have a fall of at least 1%.

SCST, Inc.	**TYPICAL MSE RETAINING WALL DETAIL** Bay Vista Methodist Heights Development San Diego, California	Date: July, 2018 By: NNW Job No.: 180224N-1	Figure: 7

APPENDIX I
FIELD INVESTIGATION

Our field investigation consisted of a visual reconnaissance of the site and excavating 16 test pits on June 18 and 19, 2018 to depths between about 5 and 16 feet below the existing ground surface using a track-mounted excavator. Figure 2 presents the approximate locations of the test pits. The field investigation was performed under the observation of an SCST geologist who also logged the test pits and obtained samples of the materials encountered. The soils are classified in accordance with the Unified Soil Classification System as illustrated on Figure I-1. Logs of the test pits are presented on Figures I-2 through I-17.

SUBSURFACE EXPLORATION LEGEND

UNIFIED SOIL CLASSIFICATION CHART

SOIL DESCRIPTION		GROUP SYMBOL	TYPICAL NAMES
I. COARSE GRAINED, more than 50% of material is larger than No. 200 sieve size.			
GRAVELS More than half of coarse fraction is larger than No. 4 sieve size but smaller than 3".	CLEAN GRAVELS	GW	Well graded gravels, gravel-sand mixtures, little or no fines
		GP	Poorly graded gravels, gravel sand mixtures, little or no fines.
	GRAVELS WITH FINES (Appreciable amount of fines)	GM	Silty gravels, poorly graded gravel-sand-silt mixtures.
		GC	Clayey gravels, poorly graded gravel-sand, clay mixtures.
SANDS More than half of coarse fraction is smaller than No. 4 sieve size.	CLEAN SANDS	SW	Well graded sand, gravelly sands, little or no fines.
		SP	Poorly graded sands, gravelly sands, little or no fines.
		SM	Silty sands, poorly graded sand and silty mixtures.
		SC	Clayey sands, poorly graded sand and clay mixtures.
II. FINE GRAINED, more than 50% of material is smaller than No. 200 sieve size.			
	SILTS AND CLAYS (Liquid Limit less than 50)	ML	Inorganic silts and very fine sands, rock flour, sandy silt or clayey-silt-sand mixtures with slight plasticity.
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
		OL	Organic silts and organic silty clays or low plasticity.
	SILTS AND CLAYS (Liquid Limit greater than 50)	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
		CH	Inorganic clays of high plasticity, fat clays.
		OH	Organic clays of medium to high plasticity.
III. HIGHLY ORGANIC SOILS		PT	Peat and other highly organic soils.

SAMPLE SYMBOLS

- ☒ - Bulk Sample
- CAL - Modified California Sampler
- CK - Undisturbed Chunk sample
- MS - Maximum Size of Particle
- ST - Shelby Tube
- SPT - Standard Penetration Test sampler

GROUNDWATER SYMBOLS

- ▽ - Water level at time of excavation or as indicated
- ≀≀ - Water seepage at time of excavation or as indicated

LABORATORY TEST SYMBOLS

- AL - Atterberg Limits
- CON - Consolidation
- COR - Corrosivity Tests (Resistivity, pH, Chloride, Sulfate)
- DS - Direct Shear
- EI - Expansion Index
- MAX - Maximum Density
- RV - R-Value
- SA - Sieve Analysis

SCST, Inc.

Bay Vista Methodist Heights Development
San Diego, California

By:	DJM	Date:	July, 2018
Job Number:	180224P4-1	Figure:	I-1

LOG OF TEST PIT TP-1

Date Drilled: 6/19/2018
Equipment: Track-mounted Excavator
Elevation: Approximately 318 Feet MSL

Logged by: DJM
Reviewed by: TBC
Depth to Groundwater (ft): Not Encountered

DEPTH (ft)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES DRIVEN	SAMPLES BULK	DRIVING RESISTANCE (blows/ft of drive)	N_{60}	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LABORATORY TESTS
1	SM	**FILL (Qf):** SILTY SAND, loose to medium dense, brown, moist, fine to coarse grained, few gravel, some cobbles.		X					
2				X					SA
3				X					AL
4				X					
5		**MISSION VALLEY FORMATION (Tmv):** SILTY SANDSTONE, brown, moist, strongly cemented, slightly weathered, CLAYSTONE lenses.		X					
6		**TEST PIT TERMINATED AT 6 FEET**							
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

SCST, Inc.

Bay Vista Methodist Heights Development
San Diego, California

By:	DJM	Date:	July, 2018
Job Number:	180224P4-1	Figure:	I-2

LOG OF TEST PIT TP-2

Date Drilled: 6/19/2018
Equipment: Track-mounted Excavator
Elevation: Approximately 322 Feet MSL

Logged by: DJM
Reviewed by: TBC
Depth to Groundwater (ft): Not Encountered

DEPTH (ft)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES DRIVEN	SAMPLES BULK	DRIVING RESISTANCE (blows/ft of drive)	N_{60}	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LABORATORY TESTS
1	SC	**FILL (Qf):** CLAYEY SAND, loose, brown, moist, fine to coarse grained, few gravel and cobbles.							
2									
3									
4									
5									
6		**MISSION VALLEY FORMATION (Tmv):** SILTY SANDSTONE, light brown, moist, strongly cemented, slightly weathered, thin beds of CLAYSTONE.							
7									
8		**TEST PIT TERMINATED AT 8 FEET**							
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

SCST, Inc.

Bay Vista Methodist Heights Development
San Diego, California

By:	DJM	Date:	July, 2018
Job Number:	180224P4-1	Figure:	I-3

LOG OF TEST PIT TP-3

Date Drilled: 6/18/2018
Equipment: Track-mounted Excavator
Elevation: Approximately 324 Feet MSL

Logged by: DJM
Reviewed by: TBC
Depth to Groundwater (ft): Not Encountered

DEPTH (ft)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES DRIVEN	SAMPLES BULK	DRIVING RESISTANCE (blows/ft of drive)	N_{60}	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LABORATORY TESTS
1	SC	**FILL (Qf):** CLAYEY SAND, loose to medium dense, brown, moist, fine to coarse grained, trace gravel and cobbles.		X					
2	CL	**COLLUVIUM (Qcol):** SANDY CLAY, loose, brown, moist, fine to coarse grained, few gravel and cobbles.		X					
3				X					
4				X					
5		**MISSION VALLEY FORMATION (Tmv):** SILTY SANDSTONE, light brown, moist, strongly cemented, slightly weathered, some cobbles.		X					
6		**TEST PIT TERMINATED AT 5½ FEET**							
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

SCST, Inc.

Bay Vista Methodist Heights Development
San Diego, California

By:	DJM	Date:	July, 2018
Job Number:	180224P4-1	Figure:	I-4

LOG OF TEST PIT TP-4

Date Drilled: 6/18/2018
Equipment: Track-mounted Excavator
Elevation: Approximately 328 Feet MSL

Logged by: DJM
Reviewed by: TBC
Depth to Groundwater (ft): Not Encountered

DEPTH (ft)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES DRIVEN	SAMPLES BULK	DRIVING RESISTANCE (blows/ft of drive)	N_{60}	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LABORATORY TESTS
1	CL	**COLLUVIUM (Qcol):** SANDY CLAY, loose to medium dense, brown, moist, fine to coarse grained, trace gravel and cobbles.							
2									
3		**MISSION VALLEY FORMATION (Tmv):** SILTY SANDSTONE, light brown, moist, moderately cemented, moderately weathered, some cobbles.							
4									
5		**TEST PIT TERMINATED AT 5 FEET**							
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

SCST, Inc.

Bay Vista Methodist Heights Development
San Diego, California

By:	DJM	Date:	July, 2018
Job Number:	180224P4-1	Figure:	I-5

LOG OF TEST PIT TP-5

Date Drilled: 6/18/2018
Equipment: Track-mounted Excavator
Elevation: Approximately 334 Feet MSL

Logged by: DJM
Reviewed by: TC
Depth to Groundwater (ft): Not Encountered

DEPTH (ft)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES DRIVEN	SAMPLES BULK	DRIVING RESISTANCE (blows/ft of drive)	N_{60}	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LABORATORY TESTS
1	CL	**FILL (Qf):** SANDY CLAY, soft to medium stiff, grayish brown, moist, few gravel.		X					SA AL EI COR
2		Brown.		X					
3				X					
4	CL	**COLLUVIUM (Qcol):** SANDY CLAY, soft to medium stiff, brown, moist, trace gravel and cobbles.		X					
5				X					
6				X					
7				X					
8		**MISSION VALLEY FORMATION (Tmv):** SILTY SANDSTONE, yellowish brown, moist, strongly cemented, slightly weathered.		X					
9		**TEST PIT TERMINATED AT 9 FEET**							
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

SCST, Inc.

Bay Vista Methodist Heights Development
San Diego, California

By:	DJM	Date:	July, 2018
Job Number:	180224P4-1	Figure:	I-6

LOG OF TEST PIT TP-6

Date Drilled: 6/18/2018
Equipment: Track-mounted Excavator
Elevation: Approximately 345 Feet MSL

Logged by: DJM
Reviewed by: TBC
Depth to Groundwater (ft): Not Encountered

DEPTH (ft)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES DRIVEN	SAMPLES BULK	DRIVING RESISTANCE (blows/ft of drive)	N_{60}	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LABORATORY TESTS
1	CL	**COLLUVIUM (Qcol):** SANDY CLAY, loose to medium dense, gray to brown, moist, fine to coarse grained, trace gravel, white staining.							
2									
3									
4		**MISSION VALLEY FORMATION (Tmv):** SILTY SANDSTONE, yellowish brown to gray, moist, strongly cemented, slightly weathered.							
5									
6		**TEST PIT TERMINATED AT 6 FEET**							
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

SCST, Inc.

Bay Vista Methodist Heights Development
San Diego, California

By:	DJM	Date:	July, 2018
Job Number:	180224P4-1	Figure:	I-7

LOG OF TEST PIT TP-7

Date Drilled: 6/18/2018
Equipment: Track-mounted Excavator
Elevation: Approximately 358 Feet MSL

Logged by: DJM
Reviewed by: TBC
Depth to Groundwater (ft): Not Encountered

DEPTH (ft)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES DRIVEN	SAMPLES BULK	DRIVING RESISTANCE (blows/ft of drive)	N_{60}	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LABORATORY TESTS
1	CL	**COLLUVIUM (Qcol):** SANDY CLAY, soft to medium stiff, gray to brown, moist, trace gravel.		X					
2				X					
3				X					
4		**MISSION VALLEY FORMATION (Tmv):** SILTY SANDSTONE, yellowish brown to gray, dry, moderately cemented, moderately weathered.							
5									
6									
7									
8									
9									
10									
11				X					
12				X					
13		**TEST PIT TERMINATED AT 13 FEET**							
14									
15									
16									
17									
18									
19									
20									

SCST, Inc.

Bay Vista Methodist Heights Development
San Diego, California

By:	DJM	Date:	July, 2018
Job Number:	180224P4-1	Figure:	I-8

LOG OF TEST PIT TP-8

Date Drilled: 6/18/2018
Equipment: Track-mounted Excavator
Elevation: Approximately 366 Feet MSL

Logged by: DJM
Reviewed by: TBC
Depth to Groundwater (ft): Not Encountered

DEPTH (ft)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES DRIVEN	SAMPLES BULK	DRIVING RESISTANCE (blows/ft of drive)	N_{60}	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LABORATORY TESTS
1	CL	**COLLUVIUM (Qcol):** SANDY CLAY, soft to medium stiff, gray to brown, moist, trace gravel.							
2		**MISSION VALLEY FORMATION (Tmv):** SANDY CLAYSTONE, gray to brown, moist, poorly indurated, intensely weathered.		X					
3				X					
4				X					
5		SILTY SANDSTONE, yellowish brown to gray, moist, poorly cemented, intensely weathered.							
6									
7									
8				X					SA
9				X					AL
10				X					EI COR
11									
12									
13		SANDY CLAYSTONE, brown to gray, moist, strongly indurated, intensely weathered.							
14				X					
15		**TEST PIT TERMINATED AT 15 FEET**							
16									
17									
18									
19									
20									

SCST, Inc.

Bay Vista Methodist Heights Development
San Diego, California

By:	DJM	Date:	July, 2018
Job Number:	180224P4-1	Figure:	I-9

LOG OF TEST PIT TP-9

Date Drilled: 6/18/2018
Equipment: Track-mounted Excavator
Elevation: Approximately 370 Feet MSL

Logged by: DJM
Reviewed by: TBC
Depth to Groundwater (ft): Not Encountered

DEPTH (ft)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES DRIVEN	SAMPLES BULK	DRIVING RESISTANCE (blows/ft of drive)	N_{60}	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LABORATORY TESTS
1	CL	**COLLUVIUM (Qcol):** SANDY CLAY, soft to medium stiff, brown, moist, trace gravel.							
2		**MISSION VALLEY FORMATION (Tmv):** CLAYEY SANDSTONE , mottled yellowish brown, moist, poorly cemented, intensely weathered, oxidation.							
3									
4									
5		SILTY SANDSTONE, yellowish brown, moist, poorly cemented, intensely weathered.							
6									
7									
8									
9									
10									
11									
12									
13		SANDY CLAYSTONE, brown, moist, moderately indurated, moderately weathered.							
14									
15									
16		**TEST PIT TERMINATED AT 16 FEET**							
17									
18									
19									
20									

SCST, Inc.

Bay Vista Methodist Heights Development
San Diego, California

By:	DJM	Date:	July, 2018
Job Number:	180224P4-1	Figure:	I-10

LOG OF TEST PIT TP-10

Date Drilled: 6/18/2018
Equipment: Track-mounted Excavator
Elevation: Approximately 364 Feet MSL

Logged by: DJM
Reviewed by: TBC
Depth to Groundwater (ft): Not Encountered

DEPTH (ft)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES DRIVEN	SAMPLES BULK	DRIVING RESISTANCE (blows/ft of drive)	N_{60}	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LABORATORY TESTS
1	CL	**COLLUVIUM (Qcol):** SANDY CLAY, soft to medium stiff, brown, moist, trace gravel.		X					SA AL EI COR
2				X					
3		**MISSION VALLEY FORMATION (Tmv):** SANDY SILTSTONE, gray, moist, poorly indurated, intensely weathered, oxidation.		X					
4				X					
5				X					
6				X					
7									
8		SILTY SANDSTONE, yellowish brown, moist, strongly cemented, slightly weathered, oxidation.		X					
9				X					
10				X					
11		**TEST PIT TERMINATED AT 11 FEET**							
12									
13									
14									
15									
16									
17									
18									
19									
20									

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By:	DJM	Date:	July, 2018
Job Number:	180224P4-1	Figure:	I-11

LOG OF TEST PIT TP-11

Date Drilled: 6/18/2018
Equipment: Track-mounted Excavator
Elevation: Approximately 354 Feet MSL

Logged by: DJM
Reviewed by: TBC
Depth to Groundwater (ft): Not Encountered

DEPTH (ft)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES DRIVEN	SAMPLES BULK	DRIVING RESISTANCE (blows/ft of drive)	N_{60}	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LABORATORY TESTS
1	CL	**COLLUVIUM (Qcol):** SANDY CLAY, soft and medium stiff, brown, moist, trace gravel.							
2									
3									
4		**MISSION VALLEY FORMATION (Tmv):** SANDY SILTSTONE, yellowish brown to gray, moist, strongly indurated, slightly weathered.							
5									
6									
7		**TEST PIT TERMINATED AT 7 FEET**							
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

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San Diego, California

By:	DJM	Date:	July, 2018
Job Number:	180224P4-1	Figure:	I-12

LOG OF TEST PIT TP-12

Date Drilled: 6/18/2018
Equipment: Track-mounted Excavator
Elevation: Approximately 340 Feet MSL

Logged by: DJM
Reviewed by: TBC
Depth to Groundwater (ft): Not Encountered

DEPTH (ft)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES DRIVEN	SAMPLES BULK	DRIVING RESISTANCE (blows/ft of drive)	N_{60}	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LABORATORY TESTS
1	CL	**COLLUVIUM (Qcol):** SANDY CLAY, soft to medium stiff, brown, moist, trace gravel.		X					
2				X					
3				X					RV
4				X					
5				X					
6		**MISSION VALLEY FORMATION (Tmv):** SILTY SANDSTONE, reddish brown, moist, strongly cemented, slightly weathered.		X					
7		**TEST PIT TERMINATED AT 6 FEET**							
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

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By:	DJM	Date:	July, 2018
Job Number:	180224P4-1	Figure:	I-13

LOG OF TEST PIT TP-13

Date Drilled: 6/18/2018
Equipment: Track-mounted Excavator
Elevation: Approximately 334 Feet MSL

Logged by: DJM
Reviewed by: TBC
Depth to Groundwater (ft): Not Encountered

DEPTH (ft)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES DRIVEN	SAMPLES BULK	DRIVING RESISTANCE (blows/ft of drive)	N_{60}	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LABORATORY TESTS
1	CL	**COLLUVIUM (Qcol):** SANDY CLAY, soft to medium stiff, brown, moist, trace gravel.		X					SA AL EI COR
2				X					
3				X					
4				X					
5		**MISSION VALLEY FORMATION (Tmv):** SILTY SANDSTONE, gray to reddish brown, moist, moderately cemented, moderately weathered.							
6				X					
7				X					
8		**TEST PIT TERMINATED AT 6 FEET**							
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

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San Diego, California

By:	DJM	Date:	July, 2018
Job Number:	180224P4-1	Figure:	I-14

LOG OF TEST PIT TP-14

Date Drilled: 6/18/2018
Equipment: Track-mounted Excavator
Elevation: Approximately 332 Feet MSL

Logged by: DJM
Reviewed by: TBC
Depth to Groundwater (ft): Not Encountered

DEPTH (ft)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES DRIVEN	SAMPLES BULK	DRIVING RESISTANCE (blows/ft of drive)	N_{60}	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LABORATORY TESTS
1	CL	**COLLUVIUM (Qcol):** SANDY CLAY, soft to medium stiff, brown, moist, trace gravel.							
2		**MISSION VALLEY FORMATION (Tmv):** SILTY SANDSTONE, yellowish brown, moist, poorly cemented, intensely weathered, thin beds of CLAYSTONE.							
3									
4									
5									
6									
7									
8									
9				X					
10		**TEST PIT TERMINATED AT 10 FEET**							
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

SCST, Inc.

Bay Vista Methodist Heights Development
San Diego, California

By:	DJM	Date:	July, 2018
Job Number:	180224P4-1	Figure:	I-15

LOG OF TEST PIT TP-15

Date Drilled: 6/18/2018
Equipment: Track-mounted Excavator
Elevation: Approximately 338 Feet MSL

Logged by: DJM
Reviewed by: TBC
Depth to Groundwater (ft): Not Encountered

DEPTH (ft)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES DRIVEN	SAMPLES BULK	DRIVING RESISTANCE (blows/ft of drive)	N_{60}	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LABORATORY TESTS
1	CL	**COLLUVIUM (Qcol):** SANDY CLAY, soft to medium stiff, brown, moist, trace gravel.							
2									
3									
4									
5		**MISSION VALLEY FORMATION (Tmv):** CLAYEY SANDSTONE, yellowish brown, moist, strongly cemented, slightly weathered.		X					SA AL EI COR
6									
7		**TEST PIT TERMINATED AT 7 FEET**							
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

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Bay Vista Methodist Heights Development
San Diego, California

By:	DJM	Date:	July, 2018
Job Number:	180224P4-1	Figure:	I-16

LOG OF TEST PIT TP-16

Date Drilled: 6/18/2018
Equipment: Track-mounted Excavator
Elevation: Approximately 350 Feet MSL

Logged by: DJM
Reviewed by: TBC
Depth to Groundwater (ft): Not Encountered

DEPTH (ft)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES DRIVEN	SAMPLES BULK	DRIVING RESISTANCE (blows/ft of drive)	N_{60}	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LABORATORY TESTS
1	CL	**COLLUVIUM (Qcol):** SANDY CLAY, soft to medium stiff, reddish brown, moist, trace gravel.		X					
2		**MISSION VALLEY FORMATION (Tmv):** SILTY SANDSTONE, yellowish brown to gray, moist, strongly cemented, slightly weathered.		X					
3				X					
4				X					
5		**TEST PIT TERMINATED AT 5 FEET**							
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

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Bay Vista Methodist Heights Development
San Diego, California

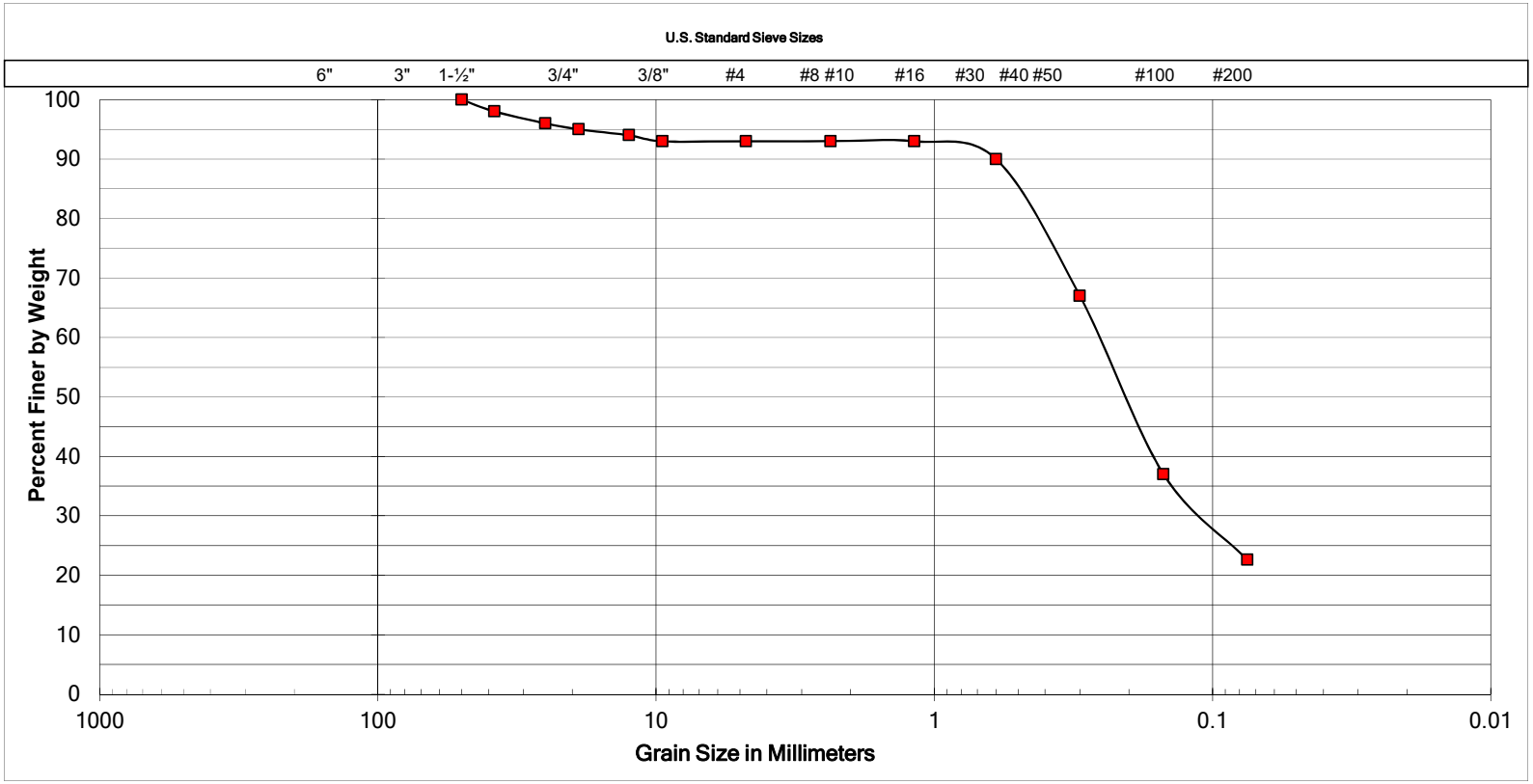
By:	DJM	Date:	July, 2018
Job Number:	180224P4-1	Figure:	I-17

APPENDIX II
LABORATORY TESTING

Laboratory tests were performed to provide geotechnical parameters for engineering analyses. The following tests were performed:

- **CLASSIFICATION:** Field classifications were verified in the laboratory by visual examination. The final soil classifications are in accordance with the Unified Soil Classification System.
- **GRAIN SIZE DISTRIBUTION:** The grain size distribution was determined on soil samples in accordance with ASTM D422.
- **ATTERBERG LIMITS:** The Atterberg limits were determined on soil samples in accordance with ASTM D4318.
- **R-VALUE:** An R-value test was performed on a soil sample in accordance with California Test Method 301.
- **EXPANSION INDEX:** The expansion index was determined on soil samples in accordance with ASTM D4829.
- **CORROSIVITY**: Corrosivity tests were performed on soil samples. The pH and minimum resistivity were determined in general accordance with California Test 643. The soluble sulfate content was determined in accordance with California Test 417. The total chloride ion content was determined in accordance with California Test 422.

Soil samples not tested are now stored in our laboratory for future reference and analysis, if needed. Unless notified to the contrary, all samples will be disposed of 30 days from the date of this report.



Cobbles	Gravel		Sand			Silt or Clay
	Coarse	Fine	Coarse	Medium	Fine	

SAMPLE LOCATION
TP-1 at 0 to 5 Feet
SAMPLE NUMBER
30131

UNIFIED SOIL CLASSIFICATION:	SM
DESCRIPTION	SILTY SAND

ATTERBERG LIMITS	
LIQUID LIMIT	NP
PLASTIC LIMIT	NP
PLASTICITY INDEX	NP

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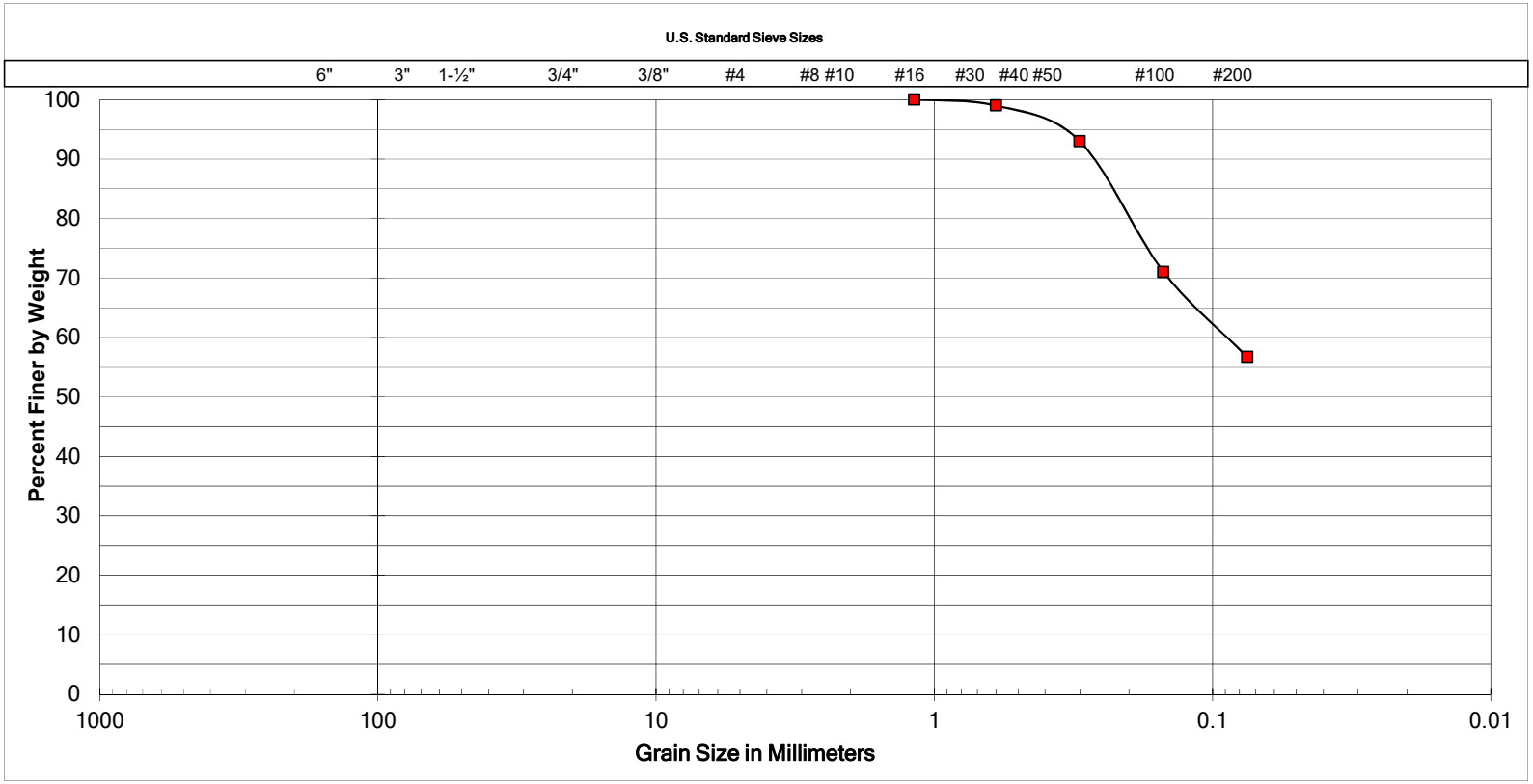
Bay Vista Methodist Heights Development
San Diego, California

By:	DJM	Date:	July, 2018
Job Number:	180224N-1	Figure:	II-1



Cobbles	Gravel		Sand			Silt or Clay
	Coarse	Fine	Coarse	Medium	Fine	

SAMPLE LOCATION
TP-5 at 0 to 4 Feet
SAMPLE NUMBER
30133

UNIFIED SOIL CLASSIFICATION:	CL
DESCRIPTION	SANDY CLAY

ATTERBERG LIMITS	
LIQUID LIMIT	42
PLASTIC LIMIT	20
PLASTICITY INDEX	22

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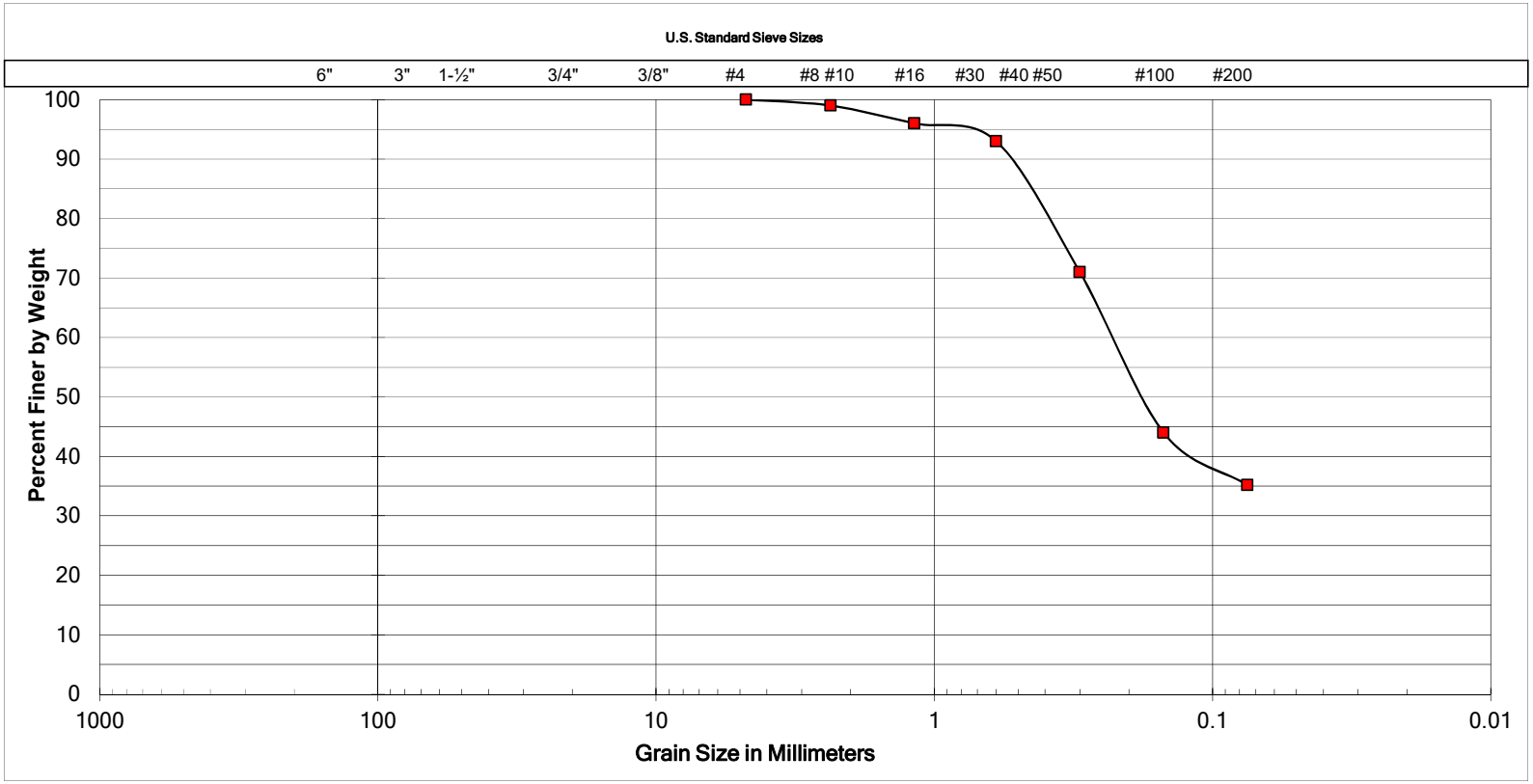
Bay Vista Methodist Heights Development
San Diego, California

By:	DJM	Date:	July, 2018
Job Number:	180224N-1	Figure:	II-2



Cobbles	Gravel		Sand			Silt or Clay
	Coarse	Fine	Coarse	Medium	Fine	

SAMPLE LOCATION
TP-8 at 8 at 10 Feet
SAMPLE NUMBER
30134

UNIFIED SOIL CLASSIFICATION:	SM
DESCRIPTION	SILTY SAND

ATTERBERG LIMITS	
LIQUID LIMIT	NP
PLASTIC LIMIT	NP
PLASTICITY INDEX	NP

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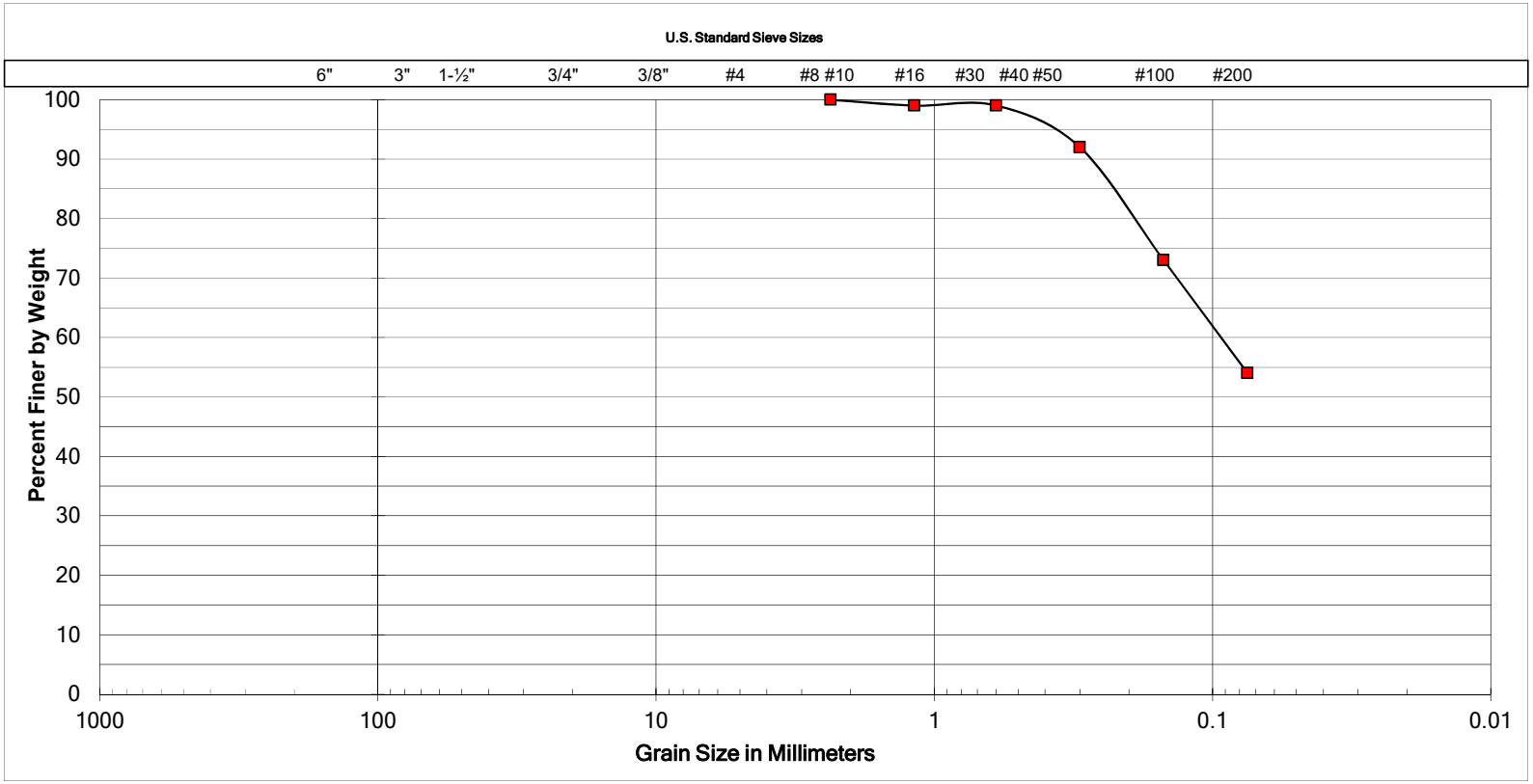
Bay Vista Methodist Heights Development
San Diego, California

By:	DJM	Date:	July, 2018
Job Number:	180224N-1	Figure:	II-3



Cobbles	Gravel		Sand			Silt or Clay
	Coarse	Fine	Coarse	Medium	Fine	

SAMPLE LOCATION
TP-10 at 0 to 3 Feet
SAMPLE NUMBER
30135

UNIFIED SOIL CLASSIFICATION:	CL
DESCRIPTION	SANDY CLAY

ATTERBERG LIMITS	
LIQUID LIMIT	37
PLASTIC LIMIT	21
PLASTICITY INDEX	16

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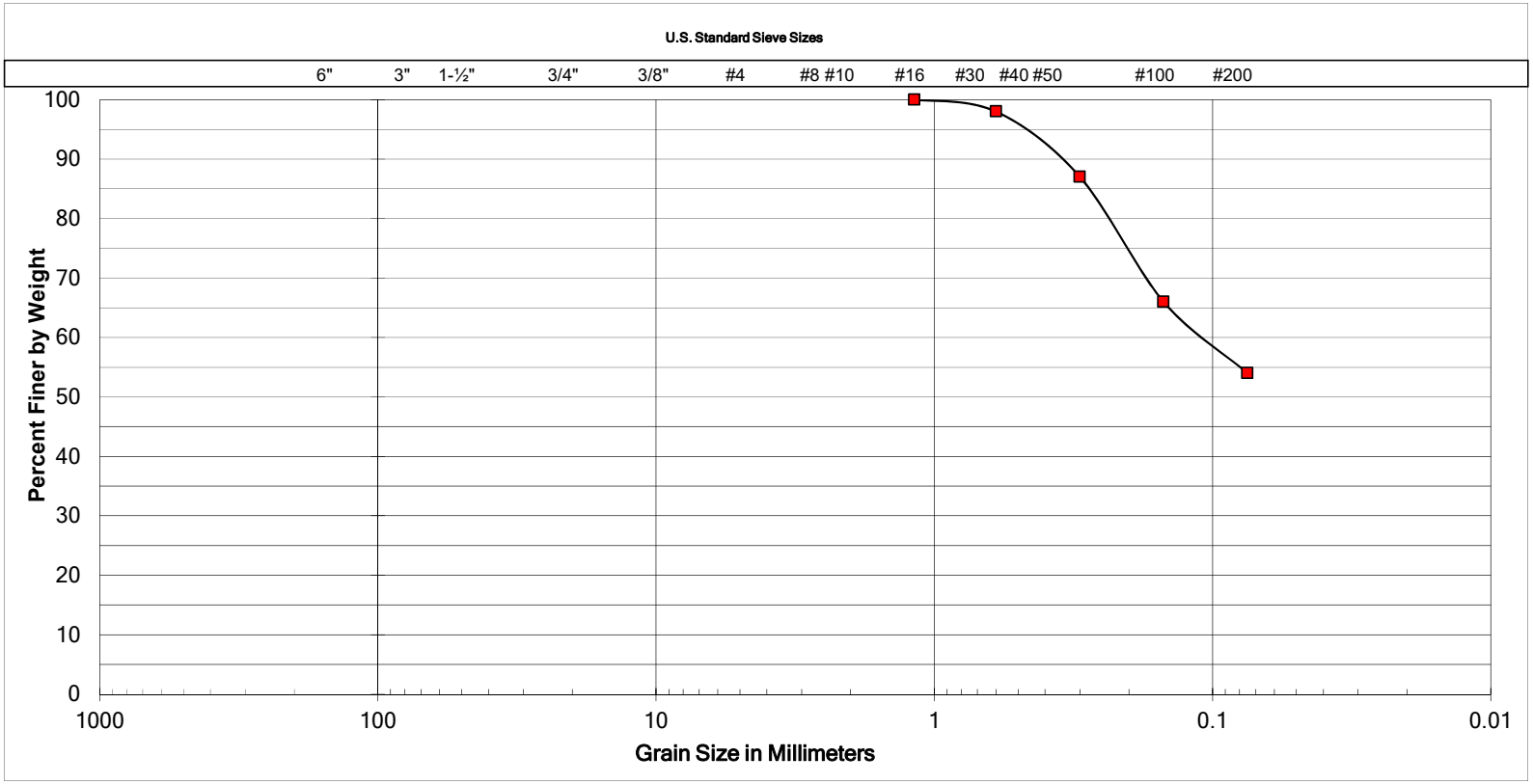
Bay Vista Methodist Heights Development
San Diego, California

By:	DJM	Date:	July, 2018
Job Number:	180224N-1	Figure:	II-4



Cobbles	Gravel		Sand			Silt or Clay
	Coarse	Fine	Coarse	Medium	Fine	

SAMPLE LOCATION
TP-13 at 0 to 4½ Feet
SAMPLE NUMBER
30137

UNIFIED SOIL CLASSIFICATION:	CL
DESCRIPTION	SANDY CLAY

ATTERBERG LIMITS	
LIQUID LIMIT	43
PLASTIC LIMIT	21
PLASTICITY INDEX	22

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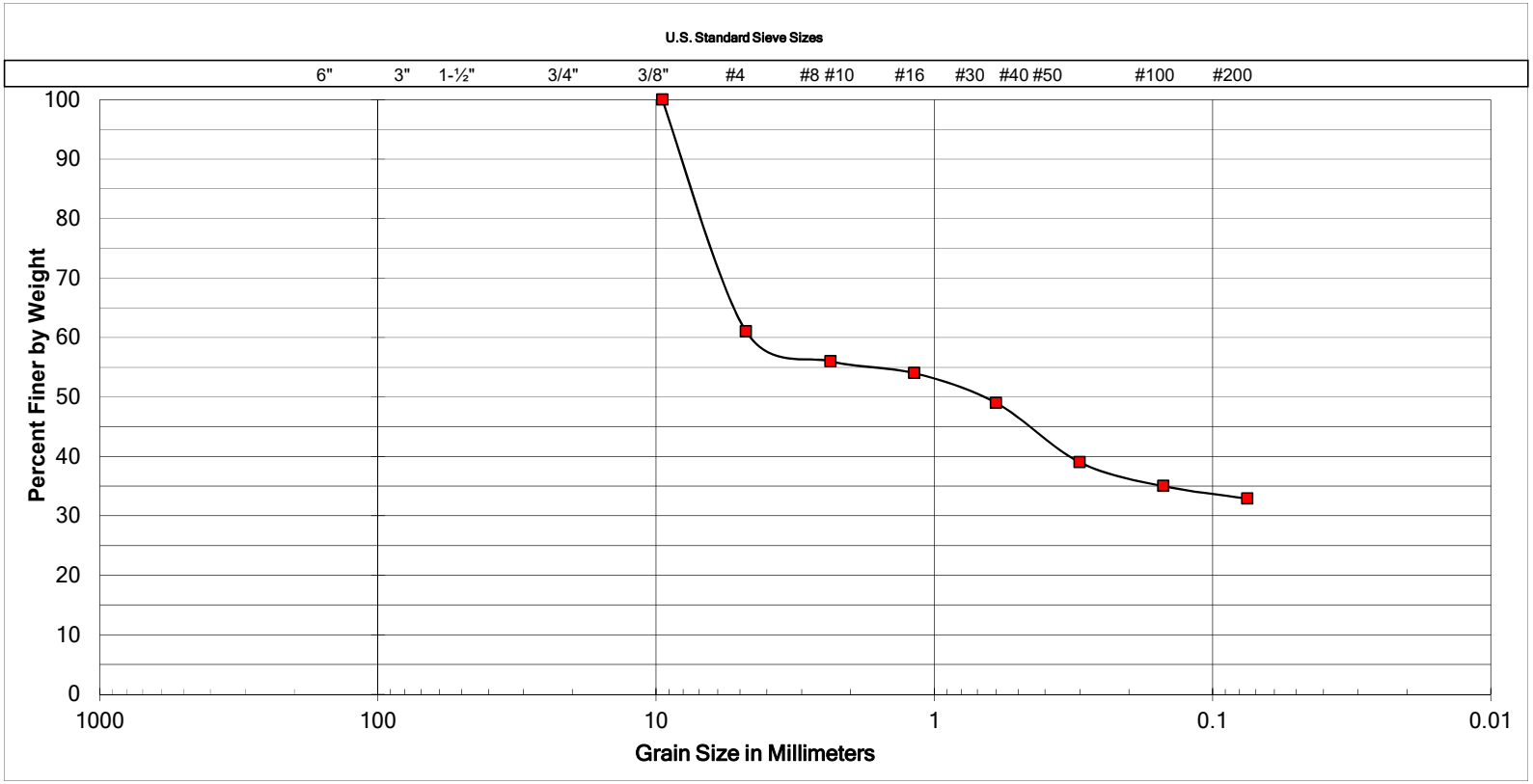
San Diego, California

By:	DJM	Date:	July, 2018
Job Number:	180224N-1	Figure:	II-5



Cobbles	Gravel		Sand			Silt or Clay
	Coarse	Fine	Coarse	Medium	Fine	

SAMPLE LOCATION
TP-15 at 5 to 7 Feet
SAMPLE NUMBER
30138

UNIFIED SOIL CLASSIFICATION:	SC
DESCRIPTION	CLAYEY SAND

ATTERBERG LIMITS	
LIQUID LIMIT	44
PLASTIC LIMIT	30
PLASTICITY INDEX	14

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Bay Vista Methodist Heights Development
San Diego, California

By:	DJM	Date:	July, 2018
Job Number:	180224N-1	Figure:	II-6

R-VALUE

CALIFORNIA TEST 301

SAMPLE	DESCRIPTION	R-VALUE
TP-12 at 0 to 5 Feet	SANDY CLAY, Brown	10

EXPANSION INDEX

ASTM D2489

SAMPLE	DESCRIPTION	EI
TP-5 at 0-4 Feet	SANDY CLAY, Grayish brown	100
TP-8 at 8 to 10 Feet	SILTY SAND, Yellowish Brown to Gray	40
TP-10 at 0 to 3 Feet	SANDY CLAY, Brown	80
TP-13 at 0 to 4.5 Feet	SANDY CLAY, Brown	100
TP-15 at 5 to 7 Feet	CLAYEY SAND, Yellowish brown	49

Classification of Expansive Soil [1]

EXPANSIVE INDEX	POTENTIAL EXPANSION
1-20	Very Low
21-50	Low
51-90	Medium
91-130	High
Above 130	Very High

1. ASTM - D4829

RESISTIVITY, pH, SOLUBLE CHLORIDE and SOLUBLE SULFATE

pH & Resistivity (Cal 643, ASTM G51)

Soluble Chlorides (Cal 422)

Soluble Sulfate (Cal 417)

SAMPLE	RESISTIVITY (Ω-cm)	pH	CHLORIDE (%)	SULFATE (%)
TP-5 at 0 to 4 Feet	516	7.97	0.043	0.001
TP-8 at 8 to 10 Feet	756	8.41	0.003	0.000
TP-10 at 0 to 3 Feet	809	7.84	0.059	0.000
TP-13 at 0 to 4½ Feet	716	7.95	0.044	0.000
TP-15 at 5 to 7 Feet	470	8.17	0.003	0.004

Sulphate Exposure Classes [2]

CLASS	SEVERITY	WATER-SOLUBLE SULFATE (SO_4) IN SOIL, PERCENT BY MASS
S0	Not applicable	$SO_4 < 0.10$
S1	Moderate	$0.10 \leq SO_4 < 0.20$
S2	Severe	$0.20 \leq SO_4 \leq 2.00$
S3	Very Severe	$SO_4 > 2.00$

2. ACI 318, Table 19.3.1.1

APPENDIX III
INFILTRATION RATE TEST RESULTS

We performed two double-ring infiltrometer tests. Figures III-1 and III-2 present the results of the testing.

Report of Double Ring Infiltrometer Testing

Project Name: **Bay Vista Methodist Heights Development**
Test Number: **DR-1**
Project Number: **180224P4-1**
Date Tested: **6/20/2018**
Test Depth (ft): **6 feet**
Tested By: **DJM**
Reviewed By: **TC**
Soil Type: **Clayey Sandstone**

Inner Ring Test Data

Graduated Cylinder Area (in^2): N/A- Direct Read in Liters
Inner Ring Diameter (in): 12

Test Time		Reading (L)		Interval (min)	Reading Difference (L)	Volume (in^3)	Rate (in/hr)
Initial	Final	Initial	Final				
9:45	10:00	0.0	1.0	15	-1.0	-61.0	-2.2
10:00	10:15	1.0	1.0	15	0.0	0.0	0.0
10:30	10:45	1.0	1.0	15	0.0	0.0	0.0
10:45	11:00	1.0	1.0	15	0.0	0.0	0.0
11:00	11:30	1.0	1.0	30	0.0	0.0	0.0

Outer Ring Test Data

Water Supply Cross-sectional Area (in^2): 281.0
Outer Ring Diameter (in): 22 2/5

Test Time		Reading (in)		Interval (min)	Reading Difference (in)	Volume (in^3)	Rate (in/hr)
Initial	Final	Initial	Final				
9:45	10:00	4.9	6.0	15	-1.1	-309.1	-4.4
10:00	10:15	6.0	6.0	15	0.0	0.0	0.0
10:30	10:45	6.0	6.0	15	0.0	0.0	0.0
10:45	11:00	6.0	6.0	15	0.0	0.0	0.0
11:00	11:30	6.0	6.0	30	0.0	0.0	0.0

Infiltration Rate: 0.0 in/hr

Remarks: No Infiltration
Method: **ASTM D3385**

Figure No.: III-1

Report of Double Ring Infiltrometer Testing

Project Name: **Bay Vista Methodist Heights Development**
Test Number: **DR-2**
Project Number: **180224P4-1**
Date Tested: **6/20/2018**
Test Depth (ft): **6 feet**
Tested By: **DJM**
Reviewed By: **TC**
Soil Type: **Clayey Sandstone**

Inner Ring Test Data

Graduated Cylinder Area (in^2): N/A- Direct Read in Liters
Inner Ring Diameter (in): 12

Test Time		Reading (L)		Interval (min)	Reading Difference (L)	Volume (in^3)	Rate (in/hr)
Initial	Final	Initial	Final				
11:45	12:00	0.0	0.6	15	-0.6	-36.6	-1.3
12:00	12:15	0.6	0.6	15	0.0	0.0	0.0
12:30	12:45	0.6	0.6	15	0.0	0.0	0.0
12:45	13:00	0.6	0.6	15	0.0	0.0	0.0

Outer Ring Test Data

Water Supply Cross-sectional Area (in^2): 281.0
Outer Ring Diameter (in): 22 2/5

Test Time		Reading (in)		Interval (min)	Reading Difference (in)	Volume (in^3)	Rate (in/hr)
Initial	Final	Initial	Final				
11:45	12:00	5.5	5.8	15	-0.3	-70.3	-1.0
12:00	12:15	5.8	5.8	15	0.0	0.0	0.0
12:30	12:45	5.8	5.8	15	0.0	0.0	0.0
12:45	13:00	5.8	5.8	15	0.0	0.0	0.0

Infiltration Rate: 0.0 in/hr

Remarks: No Infiltration
Method: **ASTM D3385**

Figure No.: III-2